



SLOVENSKI STANDARD
oSIST prEN IEC 60393-4:2023
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Potenciometri za elektronsko opremo - 4. del: Področna specifikacija: enoobratni vrtljivi potenciometri moči - Metode in navodila

Potentiometers for use in electronic equipment - Part 4: Sectional specification: Single-turn rotary power potentiometers - Methods and guidance

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Potentiomètres utilisés dans les équipements électroniques - Partie 4: Spécification intermédiaire: Potentiomètres de puissance rotatifs, à un seul tour

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TITLE:

Potentiometers for use in electronic equipment – Part 4: Sectional specification: Single-turn rotary power potentiometers – Methods and guidance

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CONTENTS

FOREWORD	4
1 Scope	6
2 Normative reference	6
3 Terms and definitions	7
3.1 Terms	7
3.1.1 Potentiometer / Rheostat	7
3.1.2 Total Resistance (Rt)	7
3.1.3 Minimum resistance	7
3.1.4 End resistance	7
3.1.5 Category dissipation	7
3.1.6 Nominal temperature	7
3.1.7 Nominal dissipation (Pn)	8
4 Preferred characteristics	8
4.1 General	8
4.2 Style and dimensions	8
4.2.1 Preferred styles and outline dimensions	8
4.3 Preferred climatic categories	9
4.4 Resistance law	9
4.5 Nominal total resistance	9
4.6 Tolerances on nominal total resistance	9
4.7 Rated dissipation	9
4.8 Limiting element voltage	10
4.9 Insulation voltage	10
4.10 Number of cycles of operation	10
4.11 Spindle rotational speed	10
5 Tests and test severities	11
5.2 Mounting	10
5.3 Tests	11
5.3.1 Resistance	10
5.4 Drying	10
5.5 Vibration	11
5.6 Bump	11
5.7 Shock	11
5.7.1 Temperature coefficients and temperature characteristics of resistance	12
6 Performance requirements	12
6.1 General	12
6.2 Limits for change in resistance or output voltage ratio	13
6.3 Limits for temperature rise	12
6.4 Limits for insulation resistance	13
6.5 Limits for resistance law	13
6.6 Limits for operating torque	13
6.7 Limits for end stop torque	14
6.8 Limits for Residual Resistances	14
6.9 Visual inspection	14

6.9.1	General visual criteria	14
6.9.2	Visual criteria after tests	15
6.10	Solderability	15
7	Marking, packaging and ordering information	15
7.1	Marking of the component	15
7.2	Marking for packaging	15
7.3	Additional marking	15
7.4	Style	15
7.5	Ordering information	16
8	Detail specifications	16
8.1	General	16
8.2	Information to be specified in a detail specification	16
8.2.1	Outline drawing or illustration	16
8.2.2	Style and dimensions	16
8.2.3	Mounting	16
8.2.4	Resistance law	16
8.2.5	Ratings and characteristics	16
8.2.6	General	16
8.2.7	Nominal total resistance range	17
8.2.8	Marking	17
8.2.9	Ordering information	17
8.2.10	Additional information	17
9	Quality assessment procedures	17
9.1	General	17
9.2	Definitions	17
9.2.1	Primary stage of manufacture	17
9.2.2	Structurally similar components	17
9.3	Assessment level EZ	17
10	Qualification Approval	18
10.1	General	18
10.2	Qualification Approval on the basis of the fixed sample size procedure Sampling	18
10.3	Tests	18
11	Quality Conformance Inspection	32
11.1	Formation of inspection lots	32
11.2	Test schedule	32
11.3	Assessment levels	32
11.4	Delayed delivery	35
12	Apparatus for measuring mechanical accuracy	35
12.1	Dial indicator	35
12.2	Cylindrical spindle adaptor	35
12.3	Potentiometer mounting fixture	36
12.4	Potentiometer spindle holding fixture	36
Bibliography		37
Annex A (informative) Letter symbols and abbreviations		38
A.1	Letter symbols	38

INTERNATIONAL ELECTROTECHNICAL COMMISSION

POTENTIOMETERS FOR USE IN ELECTRICAL EQUIPMENT –**Part 4: Sectional specification:
Single-turn rotary power potentiometers**

FOREWORD

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International Standard IEC 60393-3 has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment.

This third edition cancels and replaces the second edition published in 1992 and constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) Revised all parts of the document based on the ISO/IEC Directives, Part 2:2018 (eighth edition) and harmonized with other similar kinds of documents.
- b) The document structure has been organized to follow new sectional specification structure decided in TC 40
- c) revision of the information on the assessment level EZ and FZ (zero nonconforming).

The text of this International Standard is based on the following documents:

FDIS	Report on voting
40/XX/FDIS	40/XX/RVD

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

The language used for the development of this International Standard is English

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at <http://www.iec.ch/standardsdev/publications>.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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

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The National Committees are requested to note that for this document the stability date is 2028

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THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED AT THE PUBLICATION STAGE.

POTENTIOMETERS FOR USE IN ELECTRICAL EQUIPMENT

Part 4: Sectional specification: Single-turn rotary power potentiometers – Methods and guidance

1 Scope

This standard is applicable to single-turn rotary power potentiometers wire-wound technology. Enamelled, cemented, moulded, enclosed.

This specification is applicable to rotary potentiometers with nominal dissipation in excess of 10 Watts, the resistive element of which consists of a wire or a wound tape. All the potentiometers prescribed by this specification are slider-driven without reduction. Their stroke less than 360° is limited by stops.

This part of IEC 60393-4 prescribes preferred ratings and characteristics and selects from IEC 60393-1, appropriate quality assessment procedures, tests and measuring methods. It provides general performance requirements for this type of potentiometer

This standard gives the minimum performance requirements and test severities.

2 Normative reference

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60027 (all parts), Letter symbols to be used in electrical technology

IEC 60050 (all parts), International Electrotechnical Vocabulary

IEC 60062, Marking codes for resistors and capacitors

IEC 60068-1:2013, Environmental testing – Part 1: General and guidance

IEC 60393-1:2008, *Potentiometers for use in electronic equipment – Part 1: Generic specification*

IEC 60068-2-1, Environmental testing – Part 2-1: Tests – Tests A: Cold

IEC 60068-2-2, Environmental testing – Part 2-2: Tests – Tests B: Dry heat

IEC 60915, *Capacitors and resistors for use in electronic equipment – Preferred dimensions of shaft ends, bushes and for the mounting of single-hole, bush-mounted, shaft-operated electronic components*

IEC 61439-1, Low-voltage switchgear and control gear assemblies – General rules (in particular-temperature rise)

IEC 61193-2, Quality assessment systems – Part 2: Selection and use of sampling plans for inspection of electronic components and package–

IEC 80000 (all parts), Quantities and units

IECQ 03-1:2012, Rules of procedure — Part 1: General Requirements for all IECQ Schemes

40 3 Terms and definitions

41

42 3.1 Terms

43 For the purpose of this document, the terms and definitions given in IEC 60393-1, as well as the following, apply.
44 ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- 45 • IEC Electropedia: available at <https://www.electropedia.org/>
- 46 • ISO Online browsing platform: available at <https://www.iso.org/obp>

47 3.1.1 Potentiometer

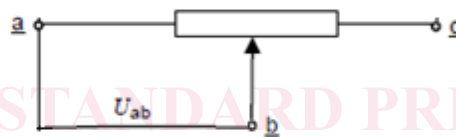
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49 Component for use as a voltage divider with three terminals of which two are connected to the
50 ends of a resistive element and the third is connected to a moving contact which can be
51 moved mechanically along the resistive element.

52

53 3.1.2 Rheostat

54 Rheostat which is a variable resistor with two terminals



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<https://standards.iteh.ai> Figure 1 – schematic view 4be-2757-4eed-8ec3-
e55bf4cef682/osist-pren-iec-60393-4-2023

58

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61 3.1.3 Total Resistance (R_t)

62 Total resistance is the resistance between terminal a and c (R_{ac})

63 Resistance value for which the variable resistor has been designed and which is generally
64 marked upon the variable resistor

65 3.1.4 Minimum resistance

66 The resistance measured between the wiper terminal and any terminal with the shaft positioned
67 to give the minimum value

68 3.1.5 End resistance

69 The resistance measured between the wiper terminal and an end terminal with the shaft
70 positioned at the corresponding end point.

71 3.1.6 Category dissipation

72 Fraction of the rated dissipation exactly defined by the relevant specification, applicable at the
73 upper category temperature, taking account of the derating curve prescribed by the relevant
74 specification

75 3.1.7 Nominal temperature

76 Ambient temperature

77 **3.1.8 Nominal dissipation (P_n)**

78 Power dissipated over the entire resistive element in continuous operation, at the rated service
79 temperature

80 **3.1.9 Shaft**

81 The mechanical input element of the variable resistor

82 **4 Preferred characteristics**

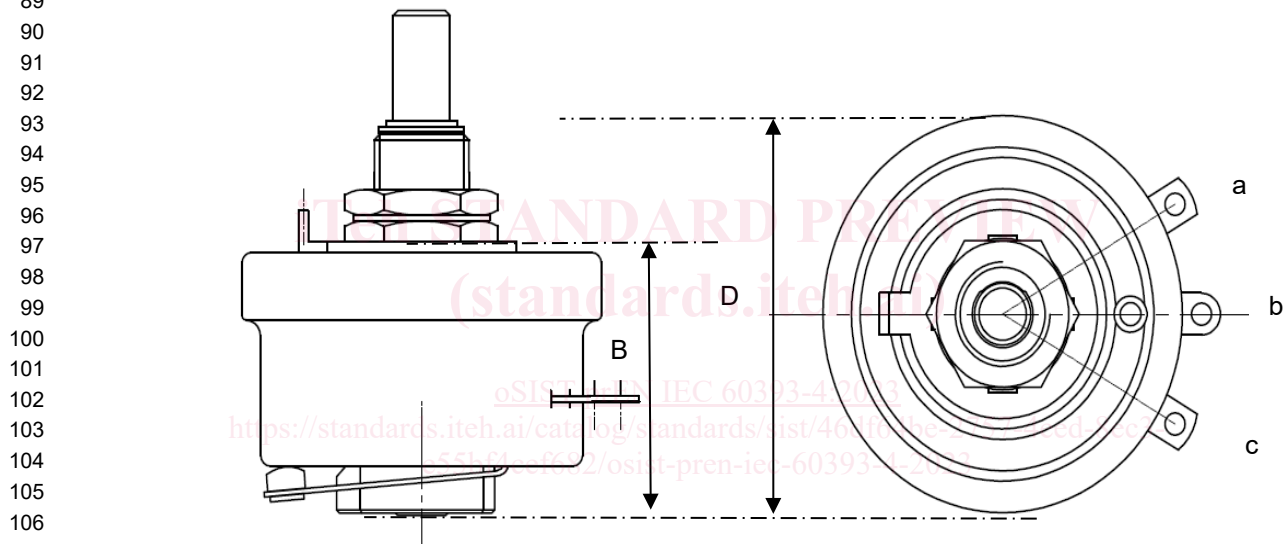
83 **4.1 General**

84 The values given in detail specifications shall preferably be selected from the following.

85 **4.2 Style and dimensions**

86 **4.2.3 Preferred outline dimensions**

87
88 The dimensions of potentiometer are shown in Figure 2,



113 **Figure 2 – Outline drawing and dimensions**

114 The drawing shall give the following details:

- 115 – the dimensions of the shaft and bush. These may be given either on the outline drawing or by
116 reference to IEC 60915.
- 117 – any locating devices;
- 118 – the total mechanical travel;
- 119 – the effective electrical travel;
- 120 – the angle of ineffective mechanical travel;
- 121 – the dimensions and the location of terminations;
- 122 – the dimensions which shall be measured in accordance with IEC 60393-1:2008, 4.4.2;
- 123 – any other dimensional information which will adequately describe the potentiometer.

124 All dimensions shall preferably be stated in millimetres, however, when the original dimensions
125 are given in inches, the converted metric dimensions in millimetres shall be added.

126 When the potentiometer is not designed for use on printed boards, this shall be clearly indicated
127 in the detail specification.

128 4.3 Preferred climatic categories

129 The potentiometers covered by this specification are classified into climatic categories according
130 to the general rules given in IEC 60068-1:2013, Annex A.

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

133 Lower category temperature: -65 °C, -55 °C, -40 °C, -25 °C and -10 °C.

134 Upper category temperature: +70 °C, +85 °C, +100 °C, +125 °C, +155 °C,
135 +175 °C and +200 °C

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

137 The severities for the cold and dry heat tests are the lower and upper category temperatures
138 respectively. Because of the construction of some potentiometers these temperatures will occur
139 between two of the preferred temperatures given in IEC 60068-2-1:2007 and IEC 60068-2-
140 2:2007. In this case the nearest preferred temperature within the actual temperature range of
141 the potentiometer shall be chosen for this severity.

142 4.4 Resistance law

143 See 6.5

144 4.5 Nominal total resistance

145 See IEC 60393-1:2008, 2.3.2.

146 4.6 Tolerances on nominal total resistance

147 The preferred tolerances on nominal total resistance shall be taken from the series specified in

148 IEC 60063 (E24 – E12 – E6)

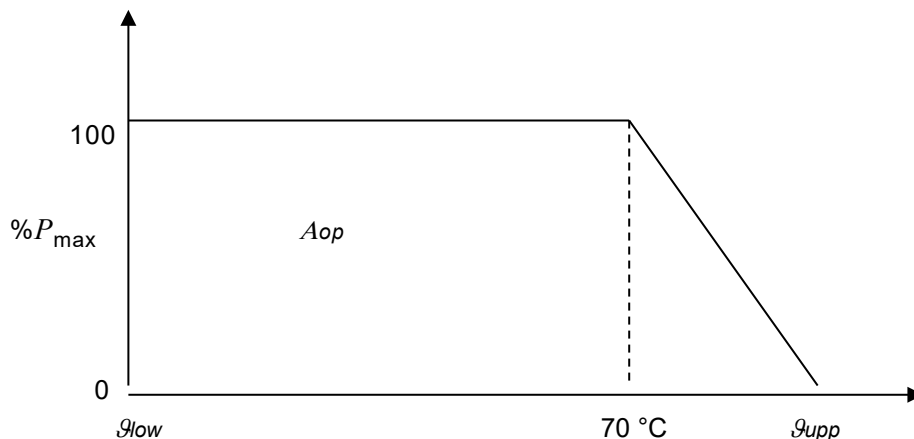
149 $\pm 20\%$, $\pm 10\%$, $\pm 5\%$,

150 4.7 Rated dissipation

151 The preferred values of rated dissipation at 70 °C, are:

152 10 W, 16 W, 25 W, 40 W, 50 W, 63 W, 80 W, 100 W, 125 W, 160 W, 250 W, 315 W, 400 W, 500 W, 630
153 W, 800 W and 1 000 W

154
155 The derated values of dissipation at temperatures in excess of 70 °C shall be as indicated by
156 the curve as shown in Figure 3.



176
177
178

Figure 3 – Rated dissipation curve

179 A larger area of operation may be given in the detail specification, provided it includes all the
180 area given above. In this event the detail specification shall state the maximum allowable
181 dissipation at temperatures other than 70 °C. All break points on the curve shall be verified by
182 test.

183

184 An example of a derating curve having a larger area of operation is given in Figure 4.
185 In certain circumstances, the rated dissipation may continue up to the upper category
186 temperature.

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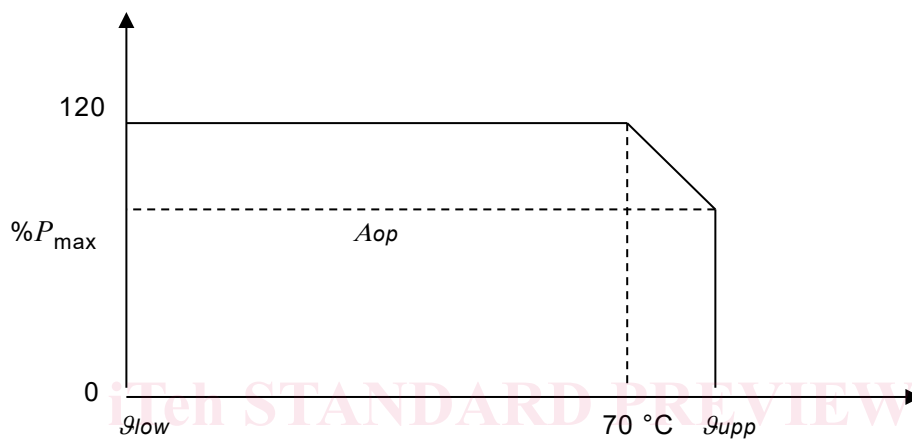


Figure 4 – Rated dissipation curve (example of larger area)

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204

205

4.8 Limiting element voltage

206

207

208

The preferred values of DC or AC r.m.s. limiting element voltage U_{max} are:
160 V; 250 V; 400 V; 630 V; 1 000 V and 1 600 V.

209

4.9 Insulation voltage

210

211

The detail specification shall prescribe the value of the insulation voltage, rounded off to the
nearest 10 V. The numerical value of the insulation voltage shall be:

212

213

214

- Normal air pressure: $\geq 1,42$ times the limiting element voltage
- Low air pressure (at 8 kPa): \geq two-thirds the value at normal air pressure

215

4.10 Number of cycles of operation

216

The preferred number of cycles of operation are:

217

Single turn/continuous rotation: $1,25 \times 10^5$, $2,5 \times 10^5$ or 5×10^5

218

4.11 Spindle rotational speed

219

The preferred spindle rotational speeds in revolutions per minute (r.p.m.) are:

220

221

- 40 ± 5

222 5 Tests and test severities

223 5.1 General

224

225 The detail specification shall specify the method of mounting to be applied for the voltage proof
226 and the insulation resistance tests and for the application of the vibration and shock tests.

227 5.2 Mounting

228 The potentiometers shall be mounted by their normal means, but the design may be such that
229 special mounting fixtures are required. In this case, the detail specification shall describe the
230 mounting fixtures that shall be used for the voltage proof and the insulation resistance tests and
231 for the application of the vibration and shock tests. For the latter tests the mounting shall be
232 such that there shall be no parasitic vibration.

233 5.3 Tests

234 5.3.3 Drying

235 See IEC 60393-1:2008, 4.3, Procedure 1 shall be used.

236 5.3.4 Resistance Measurement

237 The methods described in IEC 60393-1:2008, 4.6 and 4.7 shall be used

238 5.3.5 Vibration

239 See IEC 60393-1:2008, 4.35, with the following details:

240 Frequency range: 10 Hz to 55 Hz, or

241 10 Hz to 500 Hz.

242 Amplitude: 0,75 mm or acceleration 98 m/s² (whichever is the less severe)

243 Sweep endurance: Total duration: 6 h

244 The detail specification shall prescribe the mounting method to be used. (See 4.3)

245 5.3.6 Bump

246 See IEC 60393-1:2008, 4.36, with the following details:

247 Acceleration: 400 m/s²

248 Number of bumps: 4 000 (total)

249 Or

250 Acceleration: 98 m/s²

251 Number of bumps: 1 000 (total)

252 The detail specification shall prescribe the to be used. (See 4.3)

253 5.3.7 Shock

254 IEC 60393-1:2008, 4.37, with the following details:

255 Pulse shape: Half-sine

256 Acceleration: 490 m/s²

257 Pulse duration: 11 ms