INTERNATIONAL STANDARD

IEC 60115-9-1

First edition
2003-10

Fixed resistors for use in electronic equipment –

Part 9-1:
Blank detail specification:
Fixed surface mount resistor networks with individually measurable resistors –
Assessment level EZ

Reference number
IEC 60115-9-1:2003(E)

Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

Consolidated editions

The IEC is now publishing consolidated versions of its publications. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

Further information on IEC publications

The technical content of IEC publications is kept under constant review by the IEC, thus ensuring that the content reflects current technology. Information relating to this publication, including its validity, is available in the IEC Catalogue of publications (see below) in addition to new editions, amendments and corrigenda. Information on the subjects under consideration and work in progress undertaken by the technical committee which has prepared this publication, as well as the list of publications issued, is also available from the following:

- **IEC Web Site (www.iec.ch)**

- **Catalogue of IEC publications**

  The on-line catalogue on the IEC web site (www.iec.ch/searchpub) enables you to search by a variety of criteria including text searches, technical committees and date of publication. On-line information is also available on recently issued publications, withdrawn and replaced publications, as well as corrigenda.

- **IEC Just Published**

  This summary of recently issued publications (www.iec.ch/online_news/ justpub) is also available by email. Please contact the Customer Service Centre (see below) for further information.

- **Customer Service Centre**

  If you have any questions regarding this publication or need further assistance, please contact the Customer Service Centre:

  Email: custserv@iec.ch
  Tel: +41 22 919 02 11
  Fax: +41 22 919 03 00

INTERNATIONAL STANDARD

IEC 60115-9-1

First edition
2003-10

Fixed resistors for use in electronic equipment –

Part 9-1: Blank detail specification: Fixed surface mount resistor networks with individually measurable resistors – Assessment level EZ

International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch

Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE L

For price, see current catalogue

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

FIXED RESISTORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 9-1: Blank detail specification: Fixed surface mount resistor networks with individually measurable resistors – Assessment level EZ

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of 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 IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60115-9-1 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
40/1345/FDIS	40/1367/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.

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 edition of this standard may be issued at a later date.

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 may not be considered as being in accordance with IEC specifications nor shall they be so described.

In the preparation of detail specifications the content of 1.4 of the sectional specification shall be taken into account.

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

Identification of the detail specification

[1] The "International Electrotechnical Commission" or the National Standards 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 resistor network

[5] A short description of the type of resistor network.

[6] Information on typical construction (when applicable).

[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 resistor network types.

[1]	IEC 60115-9-1-XXX [2] QC 400701XXXXXX
ELECTRONIC COMPONENTS OF ASSESSED QUALITY IN ACCORDANCE WITH: [3]	IEC 60115-9-1 [4] QC 400701
Outline drawing: (see Table 1) (... angle projection) [7]	FIXED SURFACE MOUNT RESISTOR NETWORKS WITH INDIVIDUALLY MEASURABLE RESISTORS [5]
	[6]
(Other shapes are permitted within the dimensions given)	Assessment level: EZ [8]
NOTE For [1] to [9]: see previous page.	

Information on the availability of components qualified to this detail specification is given in the IEC QC 001005	[9]

FIXED RESISTORS FOR USE IN ELECTRONIC EQUIPMENT –

Part 9-1: Blank detail specification: Fixed surface mount resistor networks with individually measurable resistors – Assessment level EZ

1 General data

1.1 Dimensions, ratings and characteristics

Table 1 – Styles related to dimensions, ratings and characteristics

Style	Rated element dissipation at 70 °C [a)]	Rated network dissipation at 70 °C	Limiting element voltage (DC or AC r.m.s.)	Insulation voltage against ambient	Insulation voltage between neighbouring resistors	Dimensions mm						
	W	W	V	V	V	*L*	*W*	*T*	*A*	*B*	*P*	…

[a)] The detail specification shall specify the conditions under which the rated dissipation applies.

Resistance range[1]	… Ω to … Ω
Tolerances on rated resistance	± … %
Climatic category	–/–/–/
Stability class	… %
Limits for change of resistance:	
– for long-term tests	±(… %R + … Ω)
– for short-term tests	±(… %R + … Ω)
Temperature coefficient	α: …10^{-6}/K

[1] The preferred values are those of the E24 and E96 series of IEC 60063.

1.1.1 Derating

Resistors 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 the sectional specification.

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

(See 1.4.2 of IEC 60115-9.)

1.3 Related documents

Generic specification

IEC 60115-1:1999, *Fixed resistors for use in electronic equipment – Part 1: Generic specification*

Sectional specification

IEC 60115-9:2003, *Fixed resistors for use in electronic equipment – Part 9: Sectional specification: Fixed surface mount resistor networks with individually measurable resistors*

1.4 Marking

The marking of the resistors and the package shall be in accordance with the requirements of 2.4 of IEC 60115-1 and 1.4.5 of IEC 60115-9.

The details of the marking of the component and packaging shall be given in full in the detail specification.

1.5 Ordering information

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

a) rated element resistance;

b) tolerance on rated resistance;

c) number and issue reference of the detail specification and style reference;

d) packaging instructions.

1.6 Certified records of released lots

Required/non required.

1.7 **Additional information** (not for inspection purposes)

1.8 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.

2 Inspection requirements

2.1 Procedures

2.1.1 For qualification approval, the procedure shall be in accordance with 3.2 of IEC 60115-9.

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 60115-9.

The following list applies to the test schedules developed in Table 2 and Table 3.

a) Subclause numbers of tests and performance requirements refer to the generic specification, IEC 60115-1, except for resistance change requirements, which shall be selected from Table 3 of IEC 60115-9, as appropriate.

b) Number to be tested: sample size as directly allotted to the code letter for IL in Table IIA of IEC 60410 (single sampling plan for normal inspection).

c) In these tables: p is the periodicity (in months)
n is the sample size
c is the acceptance criterion (permitted number of non-conforming items)
D indicates a destructive test
ND indicates a non-destructive test
IL is the inspection level

d) 100 % testing shall be followed by re-inspection by sampling in order to monitor outgoing quality level by non-conforming items per million (ppm). The sampling level shall be established by the manufacturer. For the calculation of $\times 10^{-6}$ values, any parametric failure shall be counted as a non-conforming item. In case one or more non-conforming items occur in a sample, this lot shall be rejected.

e) If one non-conforming item is obtained, all the tests of the subgroup shall be repeated on a new sample and then no further non-conforming items are permitted. Release of product may continue during repeat testing.

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

Subclause number and test	D or ND	Conditions of test	*IL*	*n*	*c*	Performance requirements
(see 2.1.2, list item a of this specification)		(see 2.1.2, list item a of this specification)	(see 2.1.2, list item c of this specification)			(see 2.1.2, list item a of this specification)
GROUP A INSPECTION (lot-by-lot)						
Subgroup A0	ND		100 % (see 2.1.2, list item d of this specification)			
4.5 Resistance						As in 4.5.2
Subgroup A1	ND		S-4	[1)]	0	
4.4.1 Visual examination						As in 4.4.1
4.4.2 Dimensions (gauging)						As specified in the detail specification
GROUP B INSPECTION (lot-by-lot)						
Subgroup B1	ND		S-3	[1)]	0	
4.7 Voltage proof (insulated resistors only)		Method: …				As in 4.7.3
		Insulation resistance (insulated resistors only)				≥ 100 MΩ
Voltage proof between neighbouring resistors		Voltage: … V				As in 4.7.3
Subgroup B2	D		S-3	[1)]	0	
4.17 Solderability		Aging, if applicable				As in 4.17.5
Subgroup B3	D		S-3	[1)]	0	
4.31 Mounting		Substrate material and spacing: see 2.3.2 of IEC 60115-9				
4.13 Overload (in the mounted state)		The applied voltage shall be 2,5 times the rated voltage or twice the limiting element voltage, whichever is the less severe				
		Duration: 2 s				
		Visual examination				No visible damage
		Resistance				$\Delta R \leq \pm(\ldots\ \%R + \ldots\ \Omega)$
4.30 Solvent resistance of the marking (if applicable)		Solvent: …				Legible marking
		Solvent temperature: …				
		Method 1				
		Rubbing material: cotton wool				
		Recovery: …				

[1)] See 2.1.2, list item b of this specification.

Table 3 – Test schedule for quality conformance inspection: periodic

Subclause number and test (see 2.1.2, list item a of this specification)	D or ND	Conditions of test (see 2.1.2, list item a of this specification)	Sample size & criterion of acceptability (see 2.1.2, list item c of this specification) *p*	*n*	*c*[1)]	Performance requirements (see 2.1.2, list item a of this specification)
GROUP C INSPECTION (periodic)						
Subgroup C1	D		3	20	0	
4.31 Mounting		Substrate material: …				
4.33 Substrate bending test		Resistance				$\Delta R \leq \pm(\ldots\%R + \ldots\ \Omega)$
4.33.6 Final Inspection		Visual examination				No visible damage
Subgroup C2	D		3	20	0	
4.18 Resistance to soldering heat		Visual examination				As in 4.18.3
		Resistance				$\Delta R \leq \pm(\ldots\%R + \ldots\ \Omega)$
4.29 Component solvent resistance		Solvent: …				See detail specification
		Solvent temperature: …				
		Method 2				
		Recovery: …				
Subgroup C3	D		3	20	0	
4.31 Mounting		Substrate material: …				
4.32 Shear		Visual examination				No visible damage
4.19 Rapid change of temperature		T_A: Lower category temperature				
		T_B: Upper category temperature				
		Visual examination				No visible damage
		Resistance				$\Delta R \leq \pm(\ldots\%R + \ldots\ \Omega)$
4.23 Climatic sequence						
- Dry heat						
- Damp heat, cyclic, Test Db, first cycle						
- Cold						
- Damp heat, cyclic, Test Db, remaining cycles						
- DC load						
		Visual examination				No visible damage
		Resistance				$\Delta R \leq \pm(\ldots\%R + \ldots\ \Omega)$
Subgroup C4	D		3	20	0	
4.31 Mounting		Substrate material: …				
		Spacing as in 2.3.2 of IEC 60115-9				
		Duration: 1 000 h				
4.25.1 Endurance at 70 °C		Examination at 48 h, 500 h and 1 000 h:				
		Visual examination				No visible damage
		Resistance				$\Delta R \leq \pm(\ldots\%R + \ldots\ \Omega)$

Table 3 – Test schedule for quality conformance inspection: periodic (*continued*)

Subclause number and test (see 2.1.2, list item a of this specification)	D or ND	Conditions of test (see 2.1.2, list item a of this specification)	Sample size & criterion of acceptability (see 2.1.2, list item c of this specification)			Performance requirements (see 2.1.2, list item a of this specification)
			p	*n*	*c*[1)]	
Subgroup C5	D		3	20	0	
4.31 Mounting		Substrate material: …				
4.8 Variation of resistance with temperature		Lower category temperature /20 °C				$\frac{\Delta R}{R} \leq$ …% or α: … 10^{-6}/°C
		20 °C/upper category temperature				$\frac{\Delta R}{R} \leq$ …% or α: … 10^{-6}/°C
GROUP D INSPECTION (periodic)						
Subgroup D1	D		12	20	0	
4.31 Mounting		Substrate material: …				
		Spacing as in 2.3.2 of IEC 60115-9				
4.24 Damp heat, steady state		Without polarizing voltage				
		Visual examination				No visible damage Legible marking
		Resistance				$\Delta R \leq \pm(\ldots\%R + \ldots\ \Omega)$
Subgroup D2	D		36	20	0	
4.4.3 Dimensions (detail)						As specified in the detail specification
4.31 Mounting		Substrate material: …				
		Spacing as in 2.3.2 of IEC 60115-9				
4.25.3 Endurance at upper category temperature		Duration: 1 000 h				
		Examination at 48 h, 500 h and 1 000 h:				
		Visual examination				No visible damage
		Resistance				$\Delta R \leq \pm(\ldots\%R + \ldots\ \Omega)$

[1)] See 2.1.2, list item e of this specification.

Standards Survey

The IEC would like to offer you the best quality standards possible. To make sure that we continue to meet your needs, your feedback is essential. Would you please take a minute to answer the questions overleaf and fax them to us at +41 22 919 03 00 or mail them to the address below. Thank you!

Customer Service Centre (CSC)

International Electrotechnical Commission
3, rue de Varembé
1211 Genève 20
Switzerland

or

Fax to: **IEC**/CSC at +41 22 919 03 00

Thank you for your contribution to the standards-making process.

Nicht frankieren
Ne pas affranchir

Non affrancare
No stamp required

A Prioritaire

RÉPONSE PAYÉE

SUISSE

Customer Service Centre (CSC)
International Electrotechnical Commission
3, rue de Varembé
1211 GENEVA 20
Switzerland

Q1 Please report on **ONE STANDARD** and **ONE STANDARD ONLY**. Enter the exact number of the standard: *(e.g. 60601-1-1)*

.....

Q2 Please tell us in what capacity(ies) you bought the standard *(tick all that apply).* I am the/a:

purchasing agent ❑
librarian ❑
researcher ❑
design engineer ❑
safety engineer ❑
testing engineer ❑
marketing specialist ❑
other.....

Q3 I work for/in/as a: *(tick all that apply)*

manufacturing ❑
consultant ❑
government ❑
test/certification facility ❑
public utility ❑
education ❑
military ❑
other.....

Q4 This standard will be used for: *(tick all that apply)*

general reference ❑
product research ❑
product design/development ❑
specifications ❑
tenders ❑
quality assessment ❑
certification ❑
technical documentation ❑
thesis ❑
manufacturing ❑
other.....

Q5 This standard meets my needs: *(tick one)*

not at all ❑
nearly ❑
fairly well ❑
exactly ❑

Q6 If you ticked NOT AT ALL in Question 5 the reason is: *(tick all that apply)*

standard is out of date ❑
standard is incomplete ❑
standard is too academic ❑
standard is too superficial ❑
title is misleading ❑
I made the wrong choice ❑
other .....

Q7 Please assess the standard in the following categories, using the numbers:
(1) unacceptable,
(2) below average,
(3) average,
(4) above average,
(5) exceptional,
(6) not applicable

timeliness.....
quality of writing.....
technical contents.....
logic of arrangement of contents .....
tables, charts, graphs, figures.....
other .....

Q8 I read/use the: *(tick one)*

French text only ❑
English text only ❑
both English and French texts ❑

Q9 Please share any comment on any aspect of the IEC that you would like us to know:

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

ISBN 2-8318-7256-1

ICS 31.040.10

Typeset and printed by the IEC Central Office
GENEVA, SWITZERLAND