DOCUMENT CHANGE REQUEST

DCR number 330	Changes required for: General	Originator: Steve Thacker - ESCC
Date: 2007/11/20	Date sent: 2007/11/20	Organisation: ESA/ESTEC
Status: IMPLEMENTED		

Title:	General Requirements for the Marking of ESCC Components		
Number:	21700	Issue:	1

Other documents affected:

Page:

Major update to the specification with the majority of paragraphs & pages affected. see "Proposed Wording of Change" below for details.

Paragraph:

Major update to the specification with the majority of paragraphs & pages affected. see "Proposed Wording of Change" below for details.

Original wording:

Proposed wording:

Specification has been rewritten with changes as detailed below. See attached 21700 draft 2D for proposed new issue & full details.

Summary of changes as follows:
1) Document structure amended to follow the standard to be followed for ESCC Basic Specifications. Para numbers amended accordingly. Standard structure to be followed is as follows:
PURPOSE
SCOPE (Optional)
- General (Only if Applicability sub-para is used)
- Applicability (Optional)

RELATED DOCUMENTS
- Applicable Documents (Optional)
- Reference Documents (Optional)

TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS
- Definitions (Optional)
- Abbreviations (Optional)
- Symbols and Units (Optional)

INTRODUCTION (Optional)
REQUIREMENTS

2) Para 1 Scope - re-titled as "PURPOSE"
Amend "... electronic components ..." to be "... components ..."

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Delete 2nd sub-para (transferred to new para 2.1)

3) Add new para "2. SCOPE" with sub-paras "2.1 General" & "2.2 Applicability" as follows:
.....
2. SCOPE
2.1 GENERAL
All components procured in accordance with the relevant ESCC Generic and Detail Specifications shall be marked in accordance with the requirements specified herein. The precise marking requirements for a component are provided in the relevant Detail Specification.

2.2 APPLICABILITY
2.2.1 QUALIFIED COMPONENTS;
2.2.2 UNQUALIFIED COMPONENTS;
2.2.3 NON-CONFORMING COMPONENTS
(as per current paras 3.1, 3.2, 3.3)
.....

4) Para 2 Applicable Documents (re-titled as "3. Related Documents")
Delete (d) IEC Pub. No.62 (which is now obsolete) from 'Applicable Documents' (renumbered as para 3.1).
Add ESCC 21300 as an applicable document.
Add new sub-para "3.2 Reference Documents" to include IEC 60062 & IEC 61605.

5) Add new para "4. TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS"

6) Para 3 Required Marking
Amend title to be "2.2 APPLICABILITY (see 3) above).

7) Para 3.1 Qualified Components (new para 2.2.1)
Amend text "... be marked with the ESCC qualified component symbol ..." to be: "... be marked as specified herein including the ESCC qualified component symbol ..."

8) Para 4.2 Location of Marking
Delete this para (to become part of para 5.3.1 "Location, Layout and Grouping of Marking").

9) Para 4.3 Colour of Marking
Add note about colour code marking of numerical value & tolerance (for clarification purposes) as follows:
"With the exception of colour code marking of numerical value and tolerance and unless otherwise specified ... etc."
2nd sub-para amended to read:
"The colour of marking on a component shall be specified in the PID."

10) Para 4.4 Marking Precedence
Para number and title amended to be "5.3 Required Marking and Marking Precedence"
Text replaced by the following:

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.....

5.3 REQUIRED MARKING AND MARKING PRECEDENCE

The precise marking requirements shall be as specified in the relevant Detail Specification. The marking implementation shall be specified in the PID.

Unless otherwise specified in the relevant Detail Specification:

- the marking shall include, where specified, items 1 to 8 inclusive;
- item 9 is at the Manufacturer's option.
- where there is insufficient space available on the component body to mark all the required items, the order of precedence 1 to 9 shall apply (1 being the highest);
- items 3 to 7 inclusive shall be complete or shall otherwise be omitted. If an item is omitted due to space constraints, a smaller item of lower precedence may then be marked;
- where item 3 includes characteristics and/or ratings codes and there is insufficient space available on the component body for the complete ESCC Component Number, the relevant Detail Specification may specify a truncated marking requirement.

(1) Polarity and Lead Identification.
(2) ESCC Qualified Components Symbol (for ESCC qualified components only).
(3) ESCC Component Number.
(4) Traceability information: manufacturing date code, lot identification.
(5) Traceability information: serial number.
(6) Warning signs (e.g. BeO, electrostatic discharge sensitivity, dangerous materials).
(7) Additional (special-to-purpose) marking.
(8) Manufacturer's name, symbol, or code.
(9) Manufacturer's own marking.

.....

Note - specific changes to para 4.4 include:

- the definition of the ESCC Component Number, (3), to include (4) characteristics and/or ratings codes. This change also results in the option to mark the characteristics and/or ratings separately from the ESCC Component number being modified.
- the addition of "Unless otherwise specified" and "where specified" to the text clarifies that the Detail Specification is able to define its own specific marking & precedence if necessary.
- the addition of new item "Manufacturer's Own Marking" (to provide flexibility to the manufacturers to mark additional information as considered useful)

11) Para 4.5 Layout and Grouping of Marking

Para number and title amended to be "5.3.1 Location, Layout and Grouping of Marking".

Text replaced by the following (to include the content of para 4.2):

.....

4.3.1 LOCATION, LAYOUT AND GROUPING OF MARKING

Unless otherwise specified in the relevant Detail Specification, the location of marking on a component shall be such that it is clearly visible under all normal mounting arrangements for the component.

Each required item of marking marked on a component shall be grouped separately. The relevant Detail Specification may specify the sequence and division or line spacing of the marking, but in any case the marking shall be so disposed that each of the items is readily identifiable.

Where space or other practical considerations so demand, the items may be marked contiguously provided that this does

not contravene the requirements of the relevant Detail Specification and the marking remains unambiguous.
The location, layout and grouping of the marking on a component shall be specified in the PID.
.....

12) Para 5 Marking Codes
Amend title to be "6. Marking Item Requirements"

13) Para 5.1 Polarity and Lead Identification
Amend "polarity or lead ..." to be "polarity and lead ..."

14) Para 5.3 The ESCC Component Number
Add note to (a) "(excluding the /)" and change "applicable" to be "relevant"
Amend in (b) ".. the Detail Specification, ... " to be: "... the relevant Detail Specification, ..."
Add new item d: "(d) The characteristics and/or ratings codes (as applicable)".
Amend last sentence to read:
"The relevant Detail Specification will show, by an example, how the ESCC Component Number is to be constituted. The ESCC Component Number shall be marked as a single group."

15) Para 5.4. Para number and title amended to be "6.3.2 Characteristics and/or Ratings"
Text replaced by the following:
.....
6.3.2 Characteristics and/or Ratings
A coded combination of numbers and letters shall be used to indicate the characteristics and/or ratings. The relevant Detail Specification will define the code to be used for a particular component.
For passive components, unless otherwise specified in the relevant Detail Specification, the code shall conform to the requirements of Para. 7.
.....

16) Para 5.5 Traceability Information (new para 6.4)
Amend " ... and, when applicable ..." to read: " ... and, when specified ... "; and "... as a group in ..." to read: " ... as a single group in ... "

17) Para 5.5.1 (new para 6.4.1) Delete "number" from 1st sentence.

18) Para 5.6 Warning Signs
Amend ".. the Detail Specification, ... " to be: "... the relevant Detail Specification, ..."

19) Para 5.8 Manufacturer's Name, Symbol or Code. Para number and text amended to read as follows:
.....
6.7 Manufacturer's Name, Symbol or Code
Providing there is no conflict with any of the requirements specified herein or in the relevant Detail Specification the method used by the Manufacturer to identify himself is left to his discretion.
.....

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20) Add new para 6.8 as follows:
.....
6.8 Manufacturer's Own Marking
Providing there is no conflict with any of the requirements specified herein or in the relevant Detail Specification the Manufacturer may, at his own discretion, also mark the component with his own information or codes.
.....

21) Paras 5.9 Numerical Values, 5.10 Tolerance & 5.9.4 Colour code, deleted and replaced by paras 7, 7.1 & 7.1.1 as follows:
.....
7. Marking Codes for Passive Components
Unless otherwise specified in the relevant Detail specification characteristics and ratings of passive components shall be expressed by a group of characters, forming part of the ESCC Component Number, as specified herein. The relevant Detail Specification will define the code to be used for any particular component.

.....
7.1 Numerical Value and Tolerance
Numerical value together with the applicable tolerance shall be expressed as a series of digits and letters as tabulated below. Numerical values with two, three, or four significant figures shall be expressed by three, four or five characters respectively. This includes the significant figures themselves plus, as applicable, either a letter to represent the decimal point, or a digit (n) to represent a multiplier (10n). When the letter is used all succeeding digits represent significant figures. The letter and unit quantity shall be defined in the relevant Detail Specification and unless otherwise specified shall be:
- R for resistance in ohm (ohm-symbol)
- C for capacitance in pico-farad (pF)
- L for inductance in micro-henry (uH)

Tolerance shall be expressed by a single letter placed after the value characters.

Examples:
10R00J = 10ohm-symbol Â±5%
5114F = 5.11Mohm-symbol Â±1%
3C9C = 3.9pF Â±0.25pF
157M = 150uF Â±20%
L012K = 12nH Â±10%

In addition, in cases where it is more practical to mark the numerical value and tolerance on the body of the component by means of a colour code, the coding shall be in accordance with Para. 7.1.1.

Numerical Value Code (see attached Table)
Tolerance Code (see attached Table)

.....

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7.1.1 Colour Code Marking of Numerical Value and Tolerance
For resistors numerical value and tolerance may be marked using four or five coloured bands. The colour code of the bands shall be as tabulated below.
For values of two significant figures the first two bands represent the significant figures, the third band the multiplier, and the fourth band the tolerance.
For values of three significant figures the first three bands represent the significant figures, the fourth band the multiplier, and the fifth band the tolerance.
The first band shall be the one nearest the end of the resistor. The last band, representing tolerance, shall be 1.5 to 2 times wider than the other bands. The bands shall be so placed and spaced that there is no ambiguity in the coding.
If colour coding is used for capacitors or inductors the precise requirements, disposition of colour bands or dots, etc will be clearly specified in the relevant Detail Specification.
(see attached Table)

.....
Note - Specific changes include:
- Correction of table in para 5.9.4 for the multiplier for colour:
'Black' to be 10(**0)
'Brown' to be 10(**1)
- Para 5.10, 5.10.1, 5.10.3 addition of tolerance codes for Inductors (based on IEC61605) and for capacitors (based on IEC60062). This includes new tolerance codes H(3%) for all types and C(0.2%), S(0.3%), L(15%) for just inductors.
- Clarification of the position & thickness of the colour bands for resistors.

22) Para 5.11 Temperature Coefficient (renumbered 7.2)
Editorial changes as per attachment.

23) Para 5.12 Rated Voltage (renumbered to 7.3)
Delete reference to "Aluminium, Solid Dielectric"
Editorial changes as per attachment.

Justification:

see individual comments above plus as follows:
Change items 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23):
Includes editorial changes for logical structure, simplification, clarification and consistency purposes.

Change items 4, 21):
To incorporate and be consistent with current IEC marking Codes used for passive components (resistors/capacitors/inductors). Some tolerance codes are missing from 21700.

Change items 10, 11, 14):
To clarify the definition of the "ESCC Component Number" which should include the characteristics and/or ratings codes when specified. This is then consistent with the latest format/content of ESCC Generic and Detail specifications. This facilitates clear component definition and ordering as the ESCC Component number fully & uniquely specifies any

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component in an available range. Full flexibility for the Detail spec to take precedence over the basic spec on the marking requirements for special cases is maintained.

Change items 10, 19, 20):
To clarify that the Manufacturer is permitted to add his own marking on ESCC Components and that this marking does not have to be limited to just the manufacturer's name or symbol. This meaning had become unclear in the previous update of the 21700.

Attachments:

21700DraftE.pdf, null

Modifications:

N/A

Approval signature:

Date signed:

2007-11-20

GENERAL REQUIREMENTS FOR THE MARKING OF ESCC COMPONENTS

ESCC Basic Specification No. 21700

Issue 2 Draft E	November 2007

Document Custodian: European Space Agency - see https://escies.org

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DOCUMENTATION CHANGE NOTICE

(Refer to https://escies.org for ESCC DCR content)

DCR No.	CHANGE DESCRIPTION
330	Technical and editorial changes per DCR.

TABLE OF CONTENTS

1. PURPOSE

This specification defines the general marking requirements for components produced to the ESCC system of specifications.

2. SCOPE

2.1 GENERAL

All components procured in accordance with the relevant ESCC Generic and Detail Specifications shall be marked in accordance with the requirements specified herein. The precise marking requirements for a component are provided in the relevant Detail Specification.

2.2 APPLICABILITY

2.2.1 Qualified Components

Components procured from a qualified source, whose qualification status is valid at the time of delivery, shall be marked as specified herein including the ESCC qualified component symbol to signify their conformance to the ESCC qualification requirements and their full compliance with the relevant ESCC Generic and Detail Specifications. For such components, the marking requirements specified herein are mandatory.

Note: Delivery is taken to mean despatch to the orderer or delivery into a “finished goods store” provided that the components are enclosed in their primary package per the requirements of ESCC Basic Specification No. 20600.

2.2.2 Unqualified Components

Components procured from sources which are not qualified but which fully comply with the procurement requirements of the relevant ESCC Generic and Detail Specifications, may be marked in accordance with the requirements specified herein. They may not be marked with the ESCC qualified components symbol.

2.2.3 Non-Conforming Components

Components failing any test or inspection or non-conforming in any respect with the procurement requirements of the relevant ESCC Generic and Detail Specification shall have any and all ESCC marking removed or permanently obliterated.

3. RELATED DOCUMENTS

3.1 APPLICABLE DOCUMENTS

The following documents form part of this specification and shall be read in conjunction with it:

ESCC 20600	Preservation, Packaging and Despatch of ESCC Components
ESCC 21300	Terms, Definitions, Abbreviations, Symbols and Units
ESCC 22900	Total Dose Steady-State Irradiation Test Method
ESCC 24800	Resistance to Solvents of Marking, Materials and Finishes

3.2 REFERENCE DOCUMENTS

IEC 60062	Marking Codes for Resistors and Capacitors
IEC 61605	Fixed Inductors for Use in Electronic and Telecommunication Equipment - Marking Codes

4. TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS

The terms, definitions, abbreviations, symbols and units specified in ESCC Basic Specification No. 21300 shall apply.

5. GENERAL REQUIREMENTS

5.1 CHARACTERS AND NUMERALS

Alphabetic characters shall be in upper case Roman and numerals shall be of Arabic type. Letters and numbers shall be uniform in height. The physical dimensions may be varied to suit particular requirements provided legibility is maintained.

5.2 COLOUR OF MARKING

With the exception of colour code marking of numerical value and tolerance and unless otherwise specified in the relevant Detail Specification, the colour of the marking shall be at the discretion of the Manufacturer. The colour chosen shall provide clear legibility.

The colour of marking on a component shall be specified in the PID.

5.3 REQUIRED MARKING AND MARKING PRECEDENCE

The precise marking requirements shall be as specified in the relevant Detail Specification. The marking implementation shall be specified in the PID.

Unless otherwise specified in the relevant Detail Specification:

- the marking shall include, where specified, items 1 to 8 inclusive;
- item 9 is at the Manufacturer's option;
- where there is insufficient space available on the component body to mark all the required items, the order of precedence 1 to 9 shall apply (1 being the highest);
- item 3 shall be complete or may be truncated when it contains characteristics and/or ratings codes, otherwise it shall be omitted. Truncation shall only be in respect of the characteristics and/or ratings codes. Items 4to 8 inclusive shall be complete or shall otherwise be omitted. If an item is truncated or omitted due to space constraints, a smaller item of lower precedence may then be marked;

(1) Polarity and Lead Identification.
(2) ESCC Qualified Component Symbol (for ESCC qualified components only).
(3) ESCC Component number.
(4) Traceability information: manufacturing date code, lot identification.
(5) Traceability information: serial number.
(6) Warning signs (e.g. BeO, electrostatic discharge sensitivity, dangerous materials).
(7) Additional (special to purpose) marking
(8) Manufacturer's name, symbol or code.
(9) Manufacturer's own marking.

5.3.1 Location, Layout and Grouping of Marking

Unless otherwise specified in the relevant Detail Specification, the location of the marking on a component shall be such that it is clearly visible under all normal mounting arrangements for the component.

Each required item of marking marked on a component shall be grouped separately. The relevant Detail Specification may specify the sequence and division, or line spacing, of the marking but, in any case, the marking shall be so disposed that each of the items is readily identifiable.

Where space or other practical considerations so demand, the items may be marked contiguously provided that this does not contravene the requirements of the relevant Detail Specification and the marking remains unambiguous.

The location, layout and grouping of the marking on a component shall be specified in the PID.

5.4 PERMANENCE OF MARKING

All marking shall remain legible after being submitted to all the tests and conditions specified for the component in the relevant Generic and Detail Specifications. When a permanence of marking test is called for in a Generic Specification it shall include the ESCC resistance to solvents test as specified in ESCC Basic Specification No. 24800.

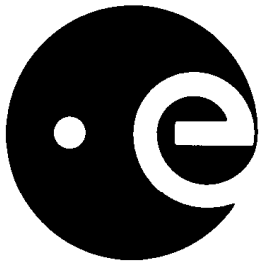
6. MARKING ITEM REQUIREMENTS

6.1 POLARITY AND LEAD IDENTIFICATION

When applicable, the marking requirements for polarity and lead identification will be specified in the relevant Detail Specification.

6.2 ESCC QUALIFIED COMPONENT SYMBOL

The ESCC qualified component symbol shall be scaled to an appropriate size for use in marking the component and, where appropriate, its primary package, the latter in accordance with ESCC Basic Specification No. 20600. The dot and the stylised e shall remain distinct.



6.3 THE ESCC COMPONENT NUMBER

The ESCC Component Number shall be as specified in the relevant Detail Specification.

The ESCC Component Number shall be formed by grouping together the following:

(a) The number of the relevant Detail Specification (excluding the /).
(b) The type variant number. (If there is only one component type variant covered by the relevant Detail Specification, Variant 01 shall be used. It is not permitted to omit a variant number).
(c) The total dose radiation level letter (as applicable).
(d) The characteristics and/or ratings codes (as applicable).

The relevant Detail Specification will show, by an example, how the ESCC Component Number is to be constituted. The ESCC Component Number shall be marked as a single group.

6.3.1 Total Dose Radiation Level Letter

The marking to indicate the total dose radiation level shall only be added to those components for which the test has been specified and for which the lot has been successfully tested to the level indicated by the marking.

The total dose radiation level letter shall be as specified in ESCC Basic Specification No. 22900.

6.3.2 Characteristics and/or Ratings

A coded combination of numbers and letters shall be used to indicate the characteristics and/or ratings. The relevant Detail Specification will define the code to be used for a particular component.

For passive components, unless otherwise specified in the relevant Detail Specification, the code shall conform to the requirements of Para. 7.

6.4 TRACEABILITY INFORMATION

The traceability information to be marked on a component shall comprise a manufacturing date code, a lot identification and, when specified, a serial number. This information shall be coded in accordance with the codes specified herein and marked as a single group in this order of sequence.

Manufacturing date code, e.g.	0216
Lot and Selected Sublot identification, e.g.	AA
Serial number, e.g.	116
Example	0216AA116

6.4.1 Manufacturing Date Code

A four-digit code shall be used for the manufacturing date. The first two digits shall be the last two figures of the year of manufacture. The last two digits shall indicate the week of the year (i.e. 01 to 52), during which encapsulation or the final production process occurred.

6.4.2 Lot and Selected Sublot Identification

If it is necessary to differentiate between more than one lot processed in the same week, a suffix letter (beginning with the letter A) shall be added to the date code. For a single lot, the suffix letter shall always be A.

For a Selected Sublot a second suffix letter (beginning with the letter A) shall be added to the date code. This letter shall be omitted when there are no Selected Sublots.

6.4.3 Serial Number

Where serialisation of components is required, a serial number consisting of two or more digits shall be used. Serial numbers shall run sequentially and shall not be duplicated if more than one sub-lot is taken

from one production lot.

6.5 WARNING SIGNS

A warning sign will be required if a component is either susceptible to damage from external conditions or contains hazardous material(s). When such a warning is required, an appropriate safety clause shall be contained in the relevant Detail Specification.

The symbol to be used to indicate the warning shall be selected from those given in Appendix A of this specification.

6.6 ADDITIONAL MARKING

If additional (special to purpose) marking is required it will be fully specified in the relevant Detail Specification, together with its degree of precedence.

6.7 MANUFACTURER'S NAME, SYMBOL OR CODE

Providing there is no conflict with any of the requirements specified herein or in the relevant Detail Specification, the method used by the Manufacturer to identify himself is left to his own discretion.

6.8 MANUFACTURER'S OWN MARKING

Providing there is no conflict with any of the requirements specified herein or in the relevant Detail Specification, the Manufacturer may, at his own discretion, also mark the component with his own information or codes.

7. MARKING CODES FOR PASSIVE COMPONENTS

Unless otherwise specified in the relevant Detail Specification characteristics and ratings of passive components shall be expressed by a group of characters, forming part of the ESCC Component Number, as specified herein. The relevant Detail Specification will define the code to be used for any particular component.

7.1 NUMERICAL VALUE AND TOLERANCE MARKING CODES FOR RESISTORS, CAPACITORS AND INDUCTORS

A numerical value, together with the applicable tolerance, shall be expressed as a series of digits and letters as tabulated below.

A numerical value with two, three or four significant figures shall be expressed by three, four or five characters respectively. This includes the significant figures themselves plus, as applicable, either a letter to represent the decimal point, or a digit (n) to represent a multiplier (10^n). When the letter is used all succeeding digits represent significant figures. The letter and unit quantity shall be defined in the relevant Detail Specification and, unless otherwise specified, shall be:

– R for resistance in ohm (Ω)
– C for capacitance in pico-farad (pF)
– L for inductance in micro-henry (μH)

Tolerance shall be expressed by a single letter placed after the value characters.

Examples:

10R00J	10Ω ±5%
5114F	5.11MΩ ±1%
3C9C	3.9pF ±0.25pF
157M	150µF ±20%
L012K	12nH ±10%

In addition, in cases where it is more practical to mark the numerical value and tolerance on the body of the component by means of a colour code, the coding shall be in accordance with Para. 7.1.1.

Numerical Value Codes

Number of Significant Figures	Numerical Value (Ω, pF, µH)	Code (1) (R,C,L)
2	0.XX	RXX
	X.X	XRX
	XX	XX0
	XX0	XX1
	etc.	etc.
3	0.XXX	RXXX
	X.XX	XRXX
	XX.X	XXRX
	XXX	XXX0
	XXX0	XXX1
	etc.	etc.
4	0.XXXX	RXXX
	X.XXX	XRXX
	XX.XX	XXRXX
	XXX.X	XXXRX
	XXXX	XXXX0
	XXXX0	XXXX1
	etc.	etc.

NOTES:

1. The codes shown are for resistors using the letter R to represent the decimal point.

Tolerance Codes

Tolerance Value (1)			Code
Resistance	Capacitance	Inductance	
±0.005%	±0.005%	-	E
±0.01%	±0.01%	-	L
±0.02%	±0.02%	-	P

±0.05%	±0.05%	±0.05%	W
±0.1%	±0.1% or pF (2)	±0.1%	B
-	-	±0.2%	C
±0.25%	±0.25% or pF (2)	-	C
-	-	±0.3%	S
±0.5%	±0.5% or pF (2)	±0.5%	D
±1%	±1% or pF (2)	±1%	F
±2%	±2% or pF (2)	±2%	G
±3%	±3%	±3%	H
±5%	±5%	±5%	J
±10%	±10%	±10%	K
-	-	±15%	L
±20%	±20%	±20%	M
±30%	±30%	±30%	N
-10% +30%	-10% +30%	-	Q
-10% +50%	-10% +50%	-	T
-20% +50%	-20% +50%	-	S
-20% +80%	-20% +80%	-	Z

NOTES:

1. Any tolerance, applicable to a specific component, that is not covered shall be specified in the relevant Detail Specification and a letter code allocated.
2. For values less than 10pF, a tolerance in pF may apply as specified in the relevant Detail Specification.

7.1.1 Colour Code Marking of Numerical Value and Tolerance

For resistors, the numerical value and tolerance may be marked using four or five coloured bands. The colour code of the bands shall be as tabulated below.

For values of two significant figures the first two bands represent the significant figures, the third band the multiplier and the fourth band the tolerance.

For values of three significant figures the first three bands represent the significant figures, the fourth band the multiplier and the fifth band the tolerance.

The first band shall be the one nearest the end of the resistor. The last band, representing the tolerance, shall be 1.5 to 2 times wider than the other bands. The bands shall be so placed and spaced that there is no ambiguity in the coding.

If colour coding is used for capacitors or inductors, the precise requirements, disposition of colour bands or dots etc. will be specified in the relevant Detail Specification.

Colour	Significant Figure	Multiplier	Tolerance
Silver	-	10^{-2}	±10%
Gold	-	10^{-1}	±5%
Black	0	10^{0}	-
Brown	1	10^{1}	±1%
Red	2	10^{2}	±2%
Orange	3	10^{3}	-
Yellow	4	10^{4}	-
Green	5	10^{5}	±0.5%
Blue	6	10^{6}	±0.25%
Violet	7	10^{7}	±0.1%
Grey	8	10^{8}	-
White	9	10^{9}	-
None	-	-	±20%

7.2 TEMPERATURE COEFFICIENT MARKING CODES FOR RESISTORS AND CAPACITORS

To indicate the temperature coefficient applicable to a component, a numerical code shall be used. The range of applicable temperature coefficients shall be tabulated in the relevant Detail Specification and each allocated a single digit (1-9) code.

Where applicable, the following codes shall be used.

Temperature Coefficient (±ppm/^{0}C)	10	25	50	100	150	200	250	500
Code	1	2	3	4	5	6	7	8

Any temperature coefficient, applicable to a specific component, that is not covered by the above will be specified in the relevant Detail Specification and a numerical code allocated.

7.3 RATED VOLTAGE MARKING CODES FOR CAPACITORS

The rated voltage applicable to a component shall be indicated by a letter code. The range of applicable rated voltages shall be tabulated in the relevant Detail Specification and each allocated a single letter code. Where applicable, the following codes shall be used.

For Capacitors: Tantalum; Glass; Mica.

Rated Voltage (V)	6	6.3	8	10	15	20	25	30	35	40	50
Code	A	B	C	D	E	F	G	H	J	K	L

Rated Voltage (V)	60	63	75	100	150	160	200	250	300	400	500
Code	M	N	P	Q	R	S	T	U	V	W	Y

For Capacitors: Ceramic; Metallised Plastic Film

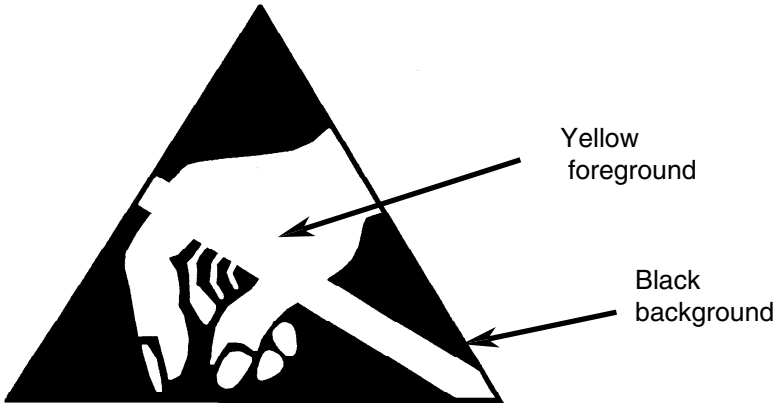
Rated Voltage (V)	25	40	50	63	100	160	200	250	300	400	500
Code	A	B	C	D	E	F	G	H	J	K	L

Rated Voltage (V)	1k	1.6k	2k	2.5k	3k	4k	6k	6.3k	8k	10k	12.5k
Code	M	N	P	Q	R	S	T	U	V	W	Y

Any rated voltage applicable to a specific component, that is not covered by the above, will be specified in the relevant Detail Specification and a letter code allocated.

APPENDIX A: WARNING SIGNS

1. Sensitivity to Electrostatic Discharge Symbol



2. Beryllium Oxide Symbol

BeO