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High frequency inductive components - Part 1: Fixed surface mount inductors for use in electronic and telecommunication equipment

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High frequency inductive components - Part 1: Fixed surface mount inductors for use in electronic and telecommunication equipment

FOREWORD

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 62674-1:2012. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC 62674-1 has been prepared by IEC technical committee 51: Magnetic components, ferrite and magnetic powder materials. It is an International Standard.

This second edition cancels and replaces the first edition published in 2012. This edition constitutes a technical revision.

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

a) addition of dimensions for shape D;

b) addition of upper temperature for operating temperature ranges.

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

Draft	Report on voting
51/1623/FDIS	51/1628/RVD

Full information on the voting for its approval 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 www.iec.ch/publications.

A list of all parts in the IEC 62674 series, published under the general title *High frequency inductive components*, can be found on the IEC website.

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

– reconfirmed,

– withdrawn, or

– revised.

1 Scope

This part of IEC 62674 applies to fixed surface mount inductors and fixed surface mount ferrite beads.

The object of this document is to define the terms necessary to describe the inductors covered by this document, provide recommendations for preferred characteristics, recommended performance, test methods and general guidance.

2 Normative references

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 60068-1:~~1988~~2013, *Environmental testing - Part 1: General and guidance*

IEC 60068-2-1~~:2007~~, *Environmental testing - Part 2-1: Tests - Test A: Cold*

IEC 60068-2-2~~:2007~~, *Environmental testing - Part 2-2: Tests - Test B: Dry heat*

IEC 60068-2-14~~:2009~~, *Environmental testing - Part 2-14: Tests - Test N: Change of temperature*

IEC 60068-2-45:1980, *Basic environmental testing procedures - Part 2-45: Tests - Test XA and guidance: Immersion in cleaning solvents*
IEC 60068-2-45:1980/AMD1:1993

IEC 60068-2-58:~~2004~~2015, *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 60068-2-58:2015/AMD1:2017

IEC 60068-2-78, *Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state*

~~IEC 61605:2005, *Fixed inductors for use in electronic and telecommunication equipment – Marking codes*~~

IEC 62024-1:~~2008~~2024, *High frequency inductive components - Electrical characteristics and measuring methods - Part 1: Nanohenry range chip inductor*

IEC 62024-2:~~2008~~2024, *High frequency inductive components - Electrical characteristics and measuring methods - Part 2: Rated current of inductors for DC-to-DC converters*

IEC 62025-2:~~2005~~2019, *High frequency inductive components - Non-electrical characteristics and measuring methods - Part 2: Test methods for non-electrical characteristics*

IEC 62211:~~2003~~2017, *Inductive components - Reliability management*

ISO 3~~:1973~~, *Preferred numbers - Series of preferred numbers*

~~ISO 3599, *Vernier callipers reading to 0,1 and 0,05 mm*~~

ISO 3611:2023, *Geometrical product specifications (GPS) - Dimensional measuring equipment - Design and metrological characteristics of micrometers for external measurements*

~~ISO 6906, *Vernier callipers reading to 0,02 mm*~~

ISO 13385-1:2019, *Geometrical product specifications (GPS) - Dimensional measuring equipment - Part 1: Design and metrological characteristics of callipers*

ISO 13385-2:2020, *Geometrical product specifications (GPS) - Dimensional measuring equipment - Part 2: Design and metrological characteristics of calliper depth gauges*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

– IEC Electropedia: available at https://www.electropedia.org/
– ISO Online browsing platform: available at https://www.iso.org/obp

3.1
rated current
maximum current which ~~may~~ can be loaded continuously by inductors at the rated ambient temperature

Note 1 to entry: A DC saturation limited current value or a temperature rise limited current value, whichever is less, has been adopted as the rated current (see IEC 62024-2:~~2008~~2024, Clause 7).

3.2
operating temperature range
~~category temperature range~~
range of ambient temperatures for which the inductor has been designed to operate continuously

Note 1 to entry: Unless otherwise specified in the detail specification, the operating temperature is ambient temperature plus temperature rise of components.

4 Designation

It is recommended to express the designation of the fixed surface mount inductors by the following 12-digit format. In the case of another format, designation shall be specified in the detail specifications.

The designation of ferrite beads shall be specified in the detail specifications.

□□□	□□□□	□	□□□	□
a)	b)	c)	d)	e)

a) Identification of the type of inductor

Fixed surface mount inductors shall be identified by the three alphabetic characters "LCL".

b) Indication of outline dimensions

The outline dimensions of the surface mount inductor shall be indicated by a four-digit number based on two significant figures for each dimension of L and W (or H). As for the dimensions of shape D, the first two digits indicate the longer side dimension L, and the last two digits indicate the shorter side dimension W, as shown in Figure 1. As for the dimensions of shape K, the first two digits indicate the outline dimension L, and the last two digits indicate the height dimension H.

c) Indication of shape

A single alphabetic character as given in Figure 1 indicates the shape for fixed surface mount inductors.

The shape codes are classified by the base shape of inductors.

D: rectangular

K: square

d) Indication of nominal inductance

Three alphanumeric characters specified in IEC 61605:~~2005~~2016, Table 3, indicate the nominal inductance value (see Table 1). The use of alphanumeric characters other than those specified in IEC 61605 shall be subject to agreement between the parties concerned.

Table 1 – Letter code for inductance value

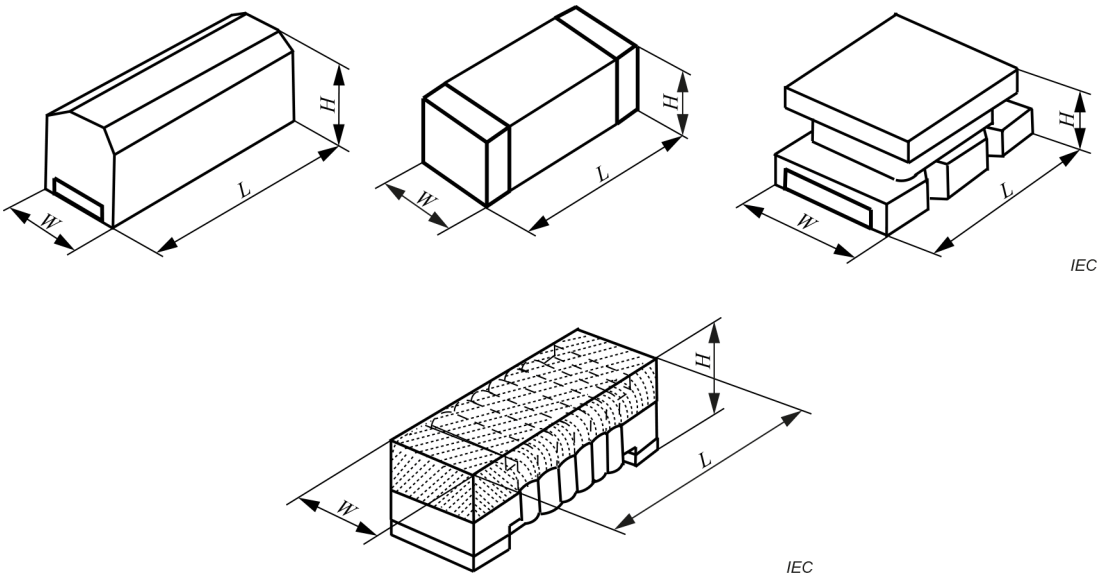
Inductance values		Digit and letter code
0,1	nH	N10
0,47	nH	N47
1	nH	1N0
4,7	nH	4N7
10	nH	10N
47	nH	47N
0,1	µH	R10
0,47	µH	R47
1	µH	1R0
4,7	µH	4R7
10	µH	100
47	µH	470
100	µH	101
470	µH	471
1	mH	102
4,7	mH	472
10	mH	103
47	mH	473
100	mH	104
470	mH	474
1	H	105
4,7	H	475
10	H	106
47	H	476

d) Indication of tolerance for inductance

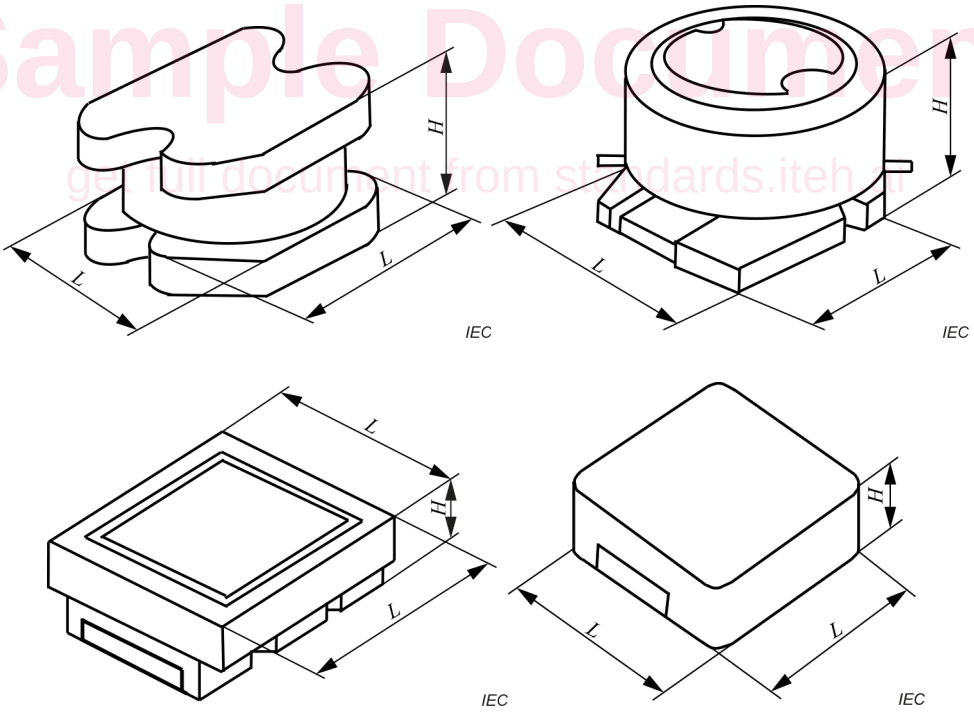
Single alphabetic characters specified in Table 8 indicate the tolerance for the inductance value.

5 Shape

The shapes of fixed surface mount inductors and ferrite beads are classified as shown in Figure 1.



Shape D



Shape K

Figure 1 – Shapes of inductor and ferrite beads (examples)

6 Dimensions

6.1 Shape D

For the dimensions for shape D, see the following a) and b). Dimensions outside Table 2,Table 3 and Table 4 shall be specified between parties concerned.

a) Outline dimensions L (long side) and W (short side) of shape D shall be chosen from the values marked with x in Table 2. These values have been selected from the R 20 series of ISO 3~~:1973~~, but the values 0,315, 0,56 and 3,15 have been rounded off to 0,3, 0,6 and 3,2, respectively. 1,25 may be rounded off to 1,2. Any dimension L greater than 8 mm and any dimension W greater than 7,1 mm shall be specified subject to agreement between the parties concerned.

b) Dimensions of height greater than 1,00 mm shall be chosen from Table 3. These values are taken from the R 20 series of ISO 3~~:1973~~ where, however, the values 1,12, 2,24, 3,15 and 3,55 have been rounded off to 1,1, 1,2, 3,2 and 3,6, respectively. 1,25 may be rounded off to 1,2. Dimensions of height less than 1,00 mm shall be selected from Table 4. Dimension H, which is more than 10 mm, shall be specified between parties concerned.

Table 2 – Dimensions for shape D

L **(long side)** mm	***W*** **(short side)** mm																	
	0,1 (0,125)	0,2	0,3	0,4	0,5	0,8	1,0	1,25 (1,2)	1,6	1,8	2,0	2,5	3,2	4,0	5,0	5,6	6,3	7,1
0,2 (0,25)	X																	
0,4		X																
0,6			X															
0,8				X														
1,0					X													
1,2							X											
1,6						X	X											
2,0							X	X	X									
2,5										X	X							
3,2									X	X		X						
4,0																		
4,5									X			X	X					
5,0														X				
5,6															X			
6,3																X		
7,1																	X	
8,0																		X

Table 3 – Dimensions of height for shape D greater than 1,00 mm (R 20 series)

~~*Dimensions in millimetres*~~

~~1,0~~	~~1,1~~	~~1,25 (1,2)~~	~~1,4~~	~~1,6~~	~~1,8~~	~~2,0~~	~~2,2~~	~~2,5~~	~~2,8~~	~~3,2~~
~~3,6~~	~~4,0~~	~~4,5~~	~~5,0~~	~~5,6~~	~~6,3~~	~~7,1~~	~~8,0~~	~~9,0~~	~~10,0~~	

H **(height)** mm	***W*** **(short side)** mm
	0,1 to 7,1
1,0	X
1,1	X
1,25 (1,2)	X
1,4	X
1,6	X
1,8	X
2,0	X
2,2	X
2,5	X
2,8	X
3,2	X
3,6	X
4,0	X
5,0	X
5,6	X
6,3	X
7,1	X
8,0	X
9,0	X
10,0	X

H **(height)** mm																		
1,0	1,1	1,25	1,4	1,6	1,8	2,0	2,2	2,5	2,8	3,2	3,6	4,0	5,0	5,6	6,3	7,1	8,0	9,0	10,0

Table 4 – Dimensions of height for shape D less than 1,00 mm

H (height) mm	*W* (short side) mm
	0,1 to 7,1
0,2	X
0,3	X
0,4	X
0,5	X
0,6	X
0,7	X
0,8	X
0,85	X
0,9	X

H (height) mm								
0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,85	0,9

6.2 Shape K

Outline dimensions *L* and *H* of shape K shall be chosen from the values marked with x in Table 5. These values are based on the R 20 series of ISO 3~~:1973~~. Dimensions outside this table shall be specified between parties concerned. Any dimension *L* greater than 12 mm and any dimension *H* greater than 9 mm shall be subject to agreement between the parties concerned.

Table 5 – Dimensions for shape K

L (length) mm	*H* (height) mm																			
	0,6	0,8	0,9	1,0	1,1	1,2	1,4	1,6	1,8	2,0	2,2	2,5	3,2	4,0	4,5	5,0	6,3	7,1	8,0	9,0
2,5	X	X		X					X											
2,8	X	X	X	X	X															
3,2				X		X	X	X												
3,6										X										
4,0				X		X	X	X	X	X		X								
4,5													X							
5,0							X			X	X			X	X					
5,6									X							X				
6,3																	X			
7,1																		X		
8,0														X					X	
9,0																				X
10,0														X		X				
12,0																X				

6.3 Tolerance for outline dimensions

Tolerance for the outline dimension and height shall be selected from Table 6.

Table 6 – Tolerance for outline dimension and height

Outline dimensions (X) mm	Tolerances mm	
	Standard	Maximum
$X \leq 0,6$	±0,05	±0,10
$0,6 < X \leq 1,0$	±0,10	±0,20
$1,0 < X \leq 1,6$	±0,15	±0,30
$1,6 < X \leq 2,5$	±0,20	±0,40
$2,5 < X \leq 4,0$	±0,30	±0,60
$4,0 < X \leq 8,0$	±0,40	±0,80
$8,0 < X \leq 10,0$	±0,50	±1,00

7 Ratings and characteristics

7.1 Nominal inductance or impedance

The preferred values of nominal inductance or impedance shall be selected from the numeric values of the E 24 series in Table 7 and their decimal multiples or submultiples.

The detail specification sheet should clearly note whether the value given is inductance or impedance, as well as the units and measuring frequency. The choice of specifying either inductance or impedance depends on the intended application for the inductor.

Table 7 – E 24 series for nominal inductance or impedance

1,0	1,1	1,2	1,3	1,5	1,6	1,8	2,0	2,2	2,4	2,7	3,0
3,3	3,6	3,9	4,3	4,7	5,1	5,6	6,2	6,8	7,5	8,2	9,1

7.2 Tolerance for nominal inductance or impedance

The tolerance for nominal inductance or impedance shall be selected from Table 8 which includes the tolerances specified in IEC 61605:~~2005~~2016, Table 4.

Table 8 – Tolerance for nominal inductance or impedance

Tolerance	±0,05 nH	±0,1 nH	±0,2 nH	±0,3 nH	±0,5 nH	±1 %	±2 %	±3 %	±5 %	±10 %	±15 %	±20 %	±25 %	±30 %
Letter code	W	B	C	S	D	F	G	H	J	K	L	M	-	N
NOTE 1 The unit "nH "~~ should be applied to~~ is used for inductance~~ only~~.														
NOTE 2 A tolerance of ±25 %~~ should be~~ is typically applied to impedance~~ only~~.														

7.3 Operating temperature range

The operating temperature range shall be selected from a lower temperature and an upper temperature in Table 9. Examples of the application and operating temperature range (user reference) are shown in Table 10.

Table 9 – Temperatures to be selected for operating temperature ranges

Lower temperature °C	Upper temperature °C
−55	~~+ 155~~ +175
−40	~~+ 150~~ +155
−25	~~+ 125~~ +150
−10	~~+ 105~~ +125
	+105
	+100
	+85
	+70
	+40
NOTE Unless otherwise specified in the detail specification, the operating temperature is the ambient temperature plus the temperature rise of components.	

Table 10 – User reference /
Examples of application and operating temperature range

Category applies	Temperature range °C	Standard identification
Automobile and aerospace	−55 to +175	-
	−55 to +155	MIL-PRF-27, Class V
	−55 to +150	IEC 62211~~:2003~~, Level S
	−55 to +125	-
	−40 to +150	-
	−40 to +125	~~AEC Q200,Grade 1~~ IEC 62211~~:2003~~, Level A
Telecommunication and power supply	−55 to +105	MIL-PRF-27, Class R
	−55 to +85	MIL-PRF-27, Class Q
	−40 to +125	IEC 62211~~:2003~~, Level B
	−40 to +105	~~AEC Q200, Grade 2~~ IEC 62211~~:2003~~, Level B
	−40 to +85	~~AEC Q200, Grade 3~~ IEC 62211~~:2003~~, Level B
Consumer and commercial electronics	−40 to +85	IEC 62211~~:2003~~, Level C ~~AEC Q200, Grade 3~~
	−25 to +105	-
	−25 to +100	-
	−25 to +85	-
	−25 to +70	IEC 62211~~:2003~~, Level D
	0 to +70	~~AEC Q200, Grade 4~~
NOTE ~~AEC Q200 and~~ IEC 62211~~:2003~~ is a component-level reliability specification. A distinction exists between component-level and system-level specifications.		