

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

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

Composants inductifs à haute fréquence –  
Partie 1: Inductances fixes pour montage en surface utilisées dans les matériels  
électroniques et les équipements de télécommunications



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**HIGH FREQUENCY INDUCTIVE COMPONENTS –**

**Part 1: Fixed surface mount inductors for use in electronic and telecommunication equipment**

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International Standard IEC 62674-1 has been prepared by IEC technical committee 51: Magnetic components and ferrite materials.

The text of this standard is based on the following documents:

FDIS	Report on voting
51/1006/FDIS	51/1009/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.

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## HIGH FREQUENCY INDUCTIVE COMPONENTS –

### Part 1: Fixed surface mount inductors for use in electronic and telecommunication equipment

#### 1 Scope

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

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

#### 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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, *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, *Basic environmental testing procedures – Part 2-45: Tests – Test XA and guidance: Immersion in cleaning solvents*

IEC 60068-2-58:2004, *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 60068-2-78, *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, *High frequency inductive components – Electrical characteristics and measuring methods – Part 1: Nanohenry range chip inductor*

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

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

IEC 62211:2003, *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, *Geometrical product specifications (GPS) – Dimensional measuring equipment: Micrometers for external measurements – Design and metrological characteristics*

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

### 3 Terms and definitions

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

#### 3.1

##### rated current

maximum current which may be loaded continuously by inductors at the rated 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, 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.

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### 4 Designation

It is recommended to express the designation of the fixed surface mount inductors by the following 12 digits 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.

$\square\square\square$     $\square\square\square\square$     $\square$     $\square\square\square$     $\square$   
 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, Clause 4, indicate the nominal inductance value (see Table 1).

**Table 1 – Letter code for inductance value**

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

e) 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.

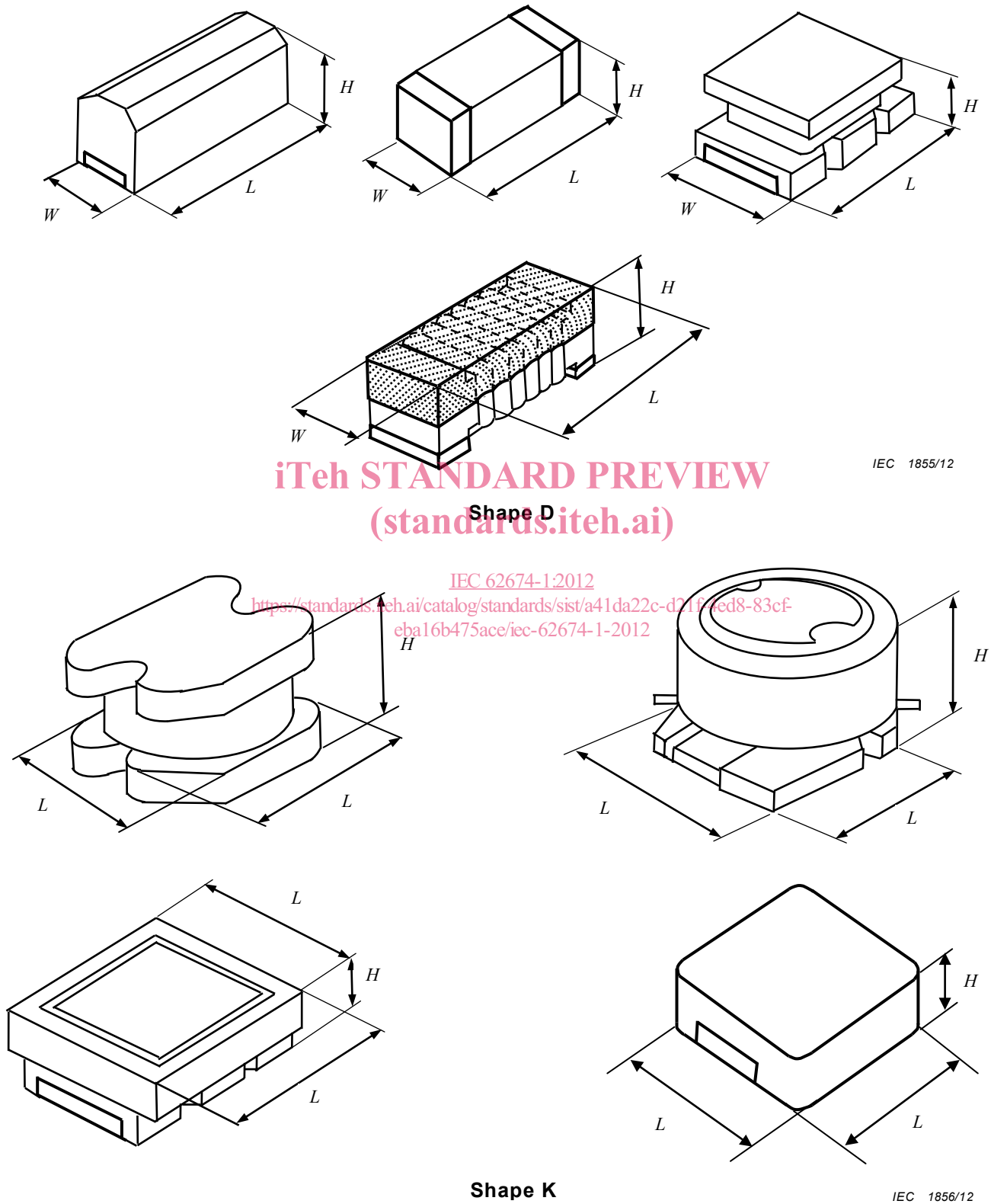


Figure 1 – Shapes of inductor and ferrite beads (examples)

## 6 Dimensions

### 6.1 Shape D

For the dimensions for shape D, see a) and b).

- 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.
- 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.

**Table 2 – Dimensions for shape D**

$L$ (long side) mm	$W$ (short side) mm																
	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
0,4	X																
0,6		X															
0,8			X														
1,0				X													
1,2						X											
1,6					X												
2,0						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 (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	

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

**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				

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## 6.3 Tolerance for outline dimensions

Tolerance for 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
$x \leq 0,6$	$\pm 0,05$	$\pm 0,10$
$0,6 < x \leq 1,0$	$\pm 0,10$	$\pm 0,20$
$1,0 < x \leq 1,6$	$\pm 0,15$	$\pm 0,30$
$1,6 < x \leq 2,5$	$\pm 0,20$	$\pm 0,40$
$2,5 < x \leq 4,0$	$\pm 0,30$	$\pm 0,60$
$4,0 < x \leq 8,0$	$\pm 0,40$	$\pm 0,80$
$8,0 < x \leq 10,0$	$\pm 0,50$	$\pm 1,00$

## 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, 5.1.

**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 nH should be applied to inductance only.  
NOTE 2 ± 25 % should be applied to impedance only.

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**7.3 Operating temperature range** [IEC 62674-1:2012](https://standards.iteh.ai/catalog/standards/sist/a41da22c-d21f-4ed8-83cf-eba16b475acc/iec-62674-1-2012)

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
- 40	+ 150
- 25	+ 125
- 10	+ 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 +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 AEC Q200, Grade 4
NOTE AEC Q200 and IEC 62211:2003 are component-level reliability specifications. A distinction exists between component-level and system-level specifications.		

## 8 Marking

The selection of type(s) of marking information is subject to agreement between supplier and user. In lieu of such an agreement, the marking information should be as published in the supplier's data sheet. One or more of the following types of marking information is recommended on the body or the packaging:

- user part number;
- serial number, lot code or date code;
- characteristics as specified in IEC 61605:2005;
- supplier part number and logo or mark;
- quantity (packaging only).

## 9 Direction marking or shape of polarity

For the purpose of indicating the winding start location, or the first pin number, or first electrode, or winding orientation, either a mark or a shape should be used. A shape inductor is a corner cut, or small circle indent, or other molded feature, or terminal shape that indicates polarity on the inductor (if such an indication is necessary).