Notice for TAIYO YUDEN products

Please read this notice before using the TAIYO YUDEN products.

⚠ REMINDERS

■ Product information in this catalog is as of October 2008. All of the contents specified herein are subject to change without notice due to technical improvements, etc. Therefore, please check for the latest information carefully before practical application or usage of the Products.

Please note that Taiyo Yuden Co., Ltd. shall not be responsible for any defects in products or equipment incorporating such products, which are caused under the conditions other than those specified in this catalog or individual specification.

■ Please contact Taiyo Yuden Co., Ltd. for further details of product specifications as the individual specification is available.

■ Please conduct validation and verification of products in actual condition of mounting and operating environment before commercial shipment of the equipment.

■ All electronic components or functional modules listed in this catalog are developed, designed and intended for use in general electronics equipment.(for AV, office automation, household, office supply, information service, telecommunications, (such as mobile phone or PC) etc.). Before incorporating the components or devices into any equipment in the field such as transportation,(automotive control, train control, ship control), transportation signal, disaster prevention, medical, public information network (telephone exchange, base station) etc. which may have direct influence to harm or injure a human body, please contact Taiyo Yuden Co., Ltd. for more detail in advance.

Do not incorporate the products into any equipment in fields such as aerospace, aviation, nuclear control, submarine system, military, etc. where higher safety and reliability are especially required.

In addition, even electronic components or functional modules that are used for the general electronic equipment, if the equipment or the electric circuit require high safety or reliability function or performances, a sufficient reliability evaluation check for safety shall be performed before commercial shipment and moreover, due consideration to install a protective circuit is strongly recommended at customer's design stage.

■ The contents of this catalog are applicable to the products which are purchased from our sales offices or distributors (so called “TAIYO YUDEN’s official sales channel”).
It is only applicable to the products purchased from any of TAIYO YUDEN’s official sales channel.

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Should you have any question or inquiry on this matter, please contact our sales staff.

アキシャルリード形インダクタ
AXIAL LEADED INDUCTORS

OPERATING TEMP	−25〜＋105℃（製品自己発熱を含む） (Including self-generated heat)

フロー／WAVE

特長　FEATURES

・自動挿入に対し極めて高い信頼性を有するインダクタ
・自動化高速ラインによる生産の為、量産性に優れかつ高品質
・アキシャルリードタイプの他、ラジアルテーピング、単品加工品がありバリエーションが豊富

・Extremely reliable inductors that are ideal for automatic insertion.
・Highly efficient automated production processes can provide high quality inductors in large volumes.
・Wide selection of configurations including axial leaded, formed radial leads and bulk products to meet most manufacturing needs.

用途　APPLICATIONS

・CTV、DVD、オーディオ、通信機、チューナー、その他電子機器全般

・Use for TVs, DVD, audio equipment, communication instrument, tuner, and general electrical instrument.

形名表記法　ORDERING CODE

1 形式

FA	アキシャルリードインダクタ

2 製品区分

L△	一般
N△	高電流タイプ

△＝スペース

3 形状寸法(L×D)〔mm〕max

02	3.4×2.3 (FAL) 3.6×2.4 (FAN)

4 リード加工形状

KR	フォーミング単品(02タイプ)
NA	ストレート単品
TA	アキシャルつづらテーピング26.0幅
TB	アキシャルつづらテーピング52.0幅
VD	ラジアルテーピング

5 公称インダクタンス〔μH〕

例	※R=小数点
1R5	1.5
120	12

6 インダクタンス許容差〔%〕

J	±5
K	±10

7 当社管理記号

△△△△△	標準品

△＝スペース

F A L △ 0 2 T A R 2 2 K ○ ○ ○ ○ ○
1 2 3 4 5 6 7

1 Type

FA	Axial leaded inductor

2 Product Specification

L△	Standard type
N△	High current type

△＝Blank space

3 Dimensions(L×D)〔mm〕max

02	3.4×2.3 (FAL) 3.6×2.4 (FAN)

4 Lead configurations

KR	Formed lead/bulk(02 type)
NA	Axial lead/bulk
TA	Axial lead(26mm lead space) /ammo pack(02/03 type)
TB	Axial lead(52mm lead space) /ammo pack(all types)
VD	Formed lead/ammo pack(02 type)

5 Nominal inductance〔μH〕

example	※R=decimal point
1R5	1.5
120	12

6 Inductance tolerance〔%〕

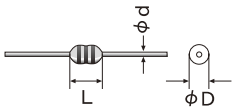
J	±5
K	±10

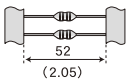
7 Internal code

△△△△△	Standard product

△＝Blank space

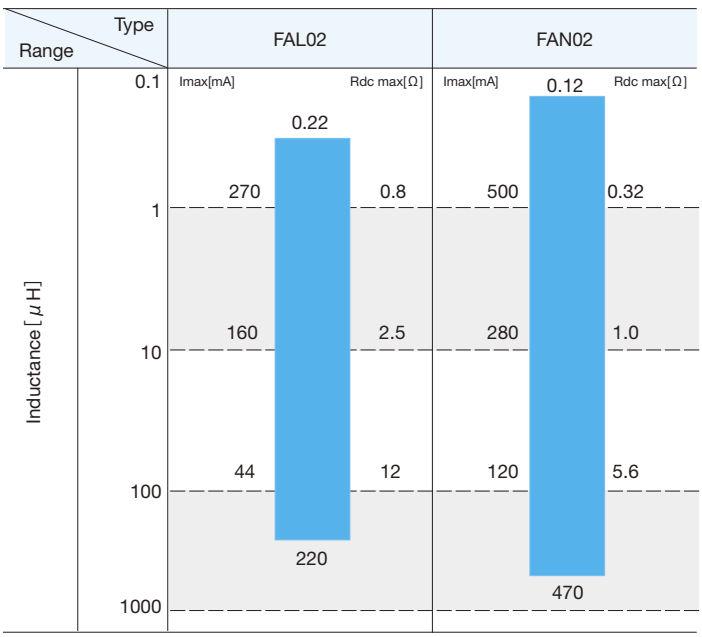
外形寸法　EXTERNAL DIMENSIONS



Type	Dimensions [mm] (inch)			テーピング Taped		単品 Bulk	
	L	φD	φd	ストレート Straight	フォーミング Formed	ストレート Straight	フォーミング Formed
FAL02	3.4max (0.134max)	2.3max (0.091max)	0.41±0.05 (0.016±0.002)	TB  52 (2.05)	VD  Pitch：5mm (0.197)	NA 	———
FAN02	3.6max (0.142max)	2.4max (0.094max)	0.41±0.05 (0.016±0.002)	TA  26 (1.02)	———	———	KR  Pitch：5mm (0.197)

Unit：mm (inch)

概略バリエーション　AVAILABLE INDUCTANCE RANGE



	Inductance	Imax [mA]	Rdcmax [Ω]	Imax [mA]	Rdcmax [Ω]
代表値 Examples	1 μH	270	0.8	500	0.32
	10 μH	160	2.5	280	1.0
	100 μH	44	12	120	5.6

セレクションガイド Selection Guide ◀ P.14
アイテム一覧 Part Numbers P.286 ▶
特性図 Electrical Characteristics P.288 ▶
梱包 Packaging P.289 ▶
信頼性 Reliability Data P.322 ▶
使用上の注意 Precautions P.340 ▶
etc

FAN02

形　名 Ordering code		EHS (Environmental Hazardous Substances)	公　称 インダクタンス Inductance [μH]	インダクタンス 許容差 Inductance Tolerance	Q (min.)	測　定 周波数 Measuring frequency 〔MHz〕	自己共振 周 波 数 Self−resonant frequency 〔MHz〕 (min.)	直流抵抗 DC Resistance 〔Ω〕 (max.)	定格電流 Rated current 〔mA〕 (max.)
FAN 02 ○R12K		RoHS	0.12				500	0.12	850
FAN 02 ○R15K		RoHS	0.15				500	0.14	800
FAN 02 ○R18K		RoHS	0.18				500	0.15	760
FAN 02 ○R22K		RoHS	0.22				500	0.16	730
FAN 02 ○R27K		RoHS	0.27				500	0.18	690
FAN 02 ○R33K		RoHS	0.33	±10%		25.2	480	0.19	660
FAN 02 ○R39K		RoHS	0.39				430	0.21	640
FAN 02 ○R47K		RoHS	0.47				380	0.23	610
FAN 02 ○R56K		RoHS	0.56				350	0.25	580
FAN 02 ○R68K		RoHS	0.68		50		310	0.27	550
FAN 02 ○R82K		RoHS	0.82				270	0.29	520
FAN 02 ○1R0J		RoHS	1.0				240	0.32	500
FAN 02 ○1R2J		RoHS	1.2				210	0.35	480
FAN 02 ○1R5J		RoHS	1.5				190	0.38	450
FAN 02 ○1R8J		RoHS	1.8				140	0.42	430
FAN 02 ○2R2J		RoHS	2.2				90	0.47	410
FAN 02 ○2R7J		RoHS	2.7				70	0.52	390
FAN 02 ○3R3J		RoHS	3.3			7.96	50	0.57	370
FAN 02 ○3R9J		RoHS	3.9				35	0.63	360
FAN 02 ○4R7J		RoHS	4.7				32	0.69	340
FAN 02 ○5R6J		RoHS	5.6				30	0.75	320
FAN 02 ○6R8J		RoHS	6.8				28	0.84	310
FAN 02 ○8R2J		RoHS	8.2				26	0.92	290
FAN 02 ○100J		RoHS	10		40		24	1.0	280
FAN 02 ○120J		RoHS	12				22	1.0	280
FAN 02 ○150J		RoHS	15				20	1.2	265
FAN 02 ○180J		RoHS	18				18	1.3	250
FAN 02 ○220J		RoHS	22	±5 %			17	1.5	235
FAN 02 ○270J		RoHS	27				15	1.7	220
FAN 02 ○330J		RoHS	33			2.52	14	2.2	180
FAN 02 ○390J		RoHS	39				13	2.4	170
FAN 02 ○470J		RoHS	47				12	2.8	160
FAN 02 ○560J		RoHS	56				10	4.1	140
FAN 02 ○680J		RoHS	68				9.2	4.5	130
FAN 02 ○820J		RoHS	82				8.8	5.0	125
FAN 02 ○101J		RoHS	100				8.0	5.6	120
FAN 02 ○121J		RoHS	120		50		6.6	9.2	90
FAN 02 ○151J		RoHS	150				5.8	10.5	85
FAN 02 ○181J		RoHS	180				5.4	11.5	80
FAN 02 ○221J		RoHS	220			0.796	4.8	13	75
FAN 02 ○271J		RoHS	270				3.6	16	70
FAN 02 ○331J		RoHS	330				3.4	18	66
FAN 02 ○391J		RoHS	390				3.2	20	63
FAN 02 ○471J		RoHS	470				3.0	22	60

形名の○にはリード加工形状記号が入ります。

○ Please specify the Lead configuration code.

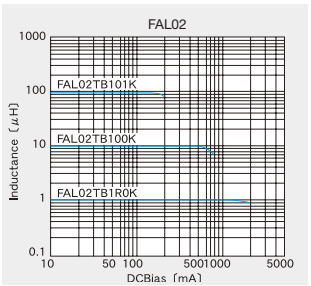
FAL02

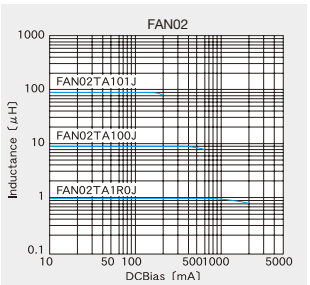
形　名 Ordering code		EHS (Environmental Hazardous Substances)	公　称 インダクタンス Inductance [μH]	インダクタンス 許容差 Inductance Tolerance	Q (min.)	測　定 周波数 Measuring frequency 〔MHz〕	自己共振 周　波　数 Self−resonant frequency 〔MHz〕 (min.)	直流抵抗 DC Resistance 〔Ω〕 (max.)	定格電流 Rated current 〔mA〕 (max.)
FAL 02 ○ R22K		RoHS	0.22	±10%	35	25.2	450	0.40	400
FAL 02 ○ R27K		RoHS	0.27				410	0.43	380
FAL 02 ○ R33K		RoHS	0.33				360	0.48	370
FAL 02 ○ R39K		RoHS	0.39				300	0.51	350
FAL 02 ○ R47K		RoHS	0.47				230	0.56	330
FAL 02 ○ R56K		RoHS	0.56				210	0.61	320
FAL 02 ○ R68K		RoHS	0.68				190	0.67	310
FAL 02 ○ R82K		RoHS	0.82				170	0.74	290
FAL 02 ○ 1R0K		RoHS	1.0				150	0.80	270
FAL 02 ○ 1R2K		RoHS	1.2		40	7.96	110	0.9	260
FAL 02 ○ 1R5K		RoHS	1.5				80	1.0	250
FAL 02 ○ 1R8K		RoHS	1.8				60	1.1	240
FAL 02 ○ 2R2K		RoHS	2.2				45	1.2	230
FAL 02 ○ 2R7K		RoHS	2.7				40	1.3	220
FAL 02 ○ 3R3K		RoHS	3.3				38	1.4	210
FAL 02 ○ 3R9K		RoHS	3.9				35	1.6	200
FAL 02 ○ 4R7K		RoHS	4.7				32	1.7	190
FAL 02 ○ 5R6K		RoHS	5.6				30	1.9	180
FAL 02 ○ 6R8K		RoHS	6.8				28	2.0	175
FAL 02 ○ 8R2K		RoHS	8.2				26	2.2	165
FAL 02 ○ 100K		RoHS	10				24	2.5	160
FAL 02 ○ 120K		RoHS	12			2.52	22	2.5	150
FAL 02 ○ 150K		RoHS	15				20	2.8	145
FAL 02 ○ 180K		RoHS	18				18	3.1	140
FAL 02 ○ 220K		RoHS	22				17	3.4	130
FAL 02 ○ 270K		RoHS	27				16	4.3	80
FAL 02 ○ 330K		RoHS	33				14	4.7	76
FAL 02 ○ 390K		RoHS	39				13	5.2	74
FAL 02 ○ 470K		RoHS	47				12	5.8	70
FAL 02 ○ 560K		RoHS	56				11	6.4	68
FAL 02 ○ 680K		RoHS	68				10	7.2	64
FAL 02 ○ 820K		RoHS	82				9.5	11	46
FAL 02 ○ 101K		RoHS	100				9.0	12	44
FAL 02 ○ 121K		RoHS	120		30	0.796	8.0	13	42
FAL 02 ○ 151K		RoHS	150				6.0	16	39
FAL 02 ○ 181K		RoHS	180				5.5	18	37
FAL 02 ○ 221K		RoHS	220				5.0	20	35

形名の□には製品区分記号（リード線径）が入ります。（L:標準0.5mm,　P:0.45mm）
形名の○にはリード加工形状記号が入ります。
□ Please specify the Product Specification (lead diameter) code. (L:standard 0.5mm or P:0.45mm)
○ Please specify the Lead configuration code.

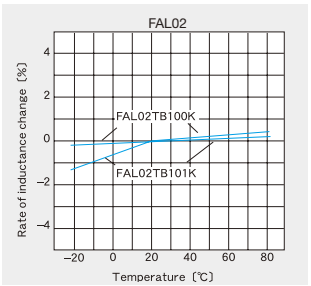
特性図　ELECTRICAL CHARACTERISTICS

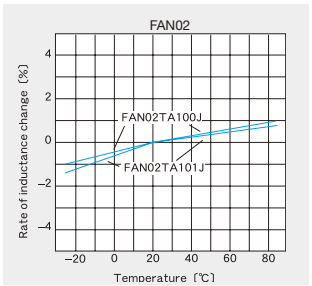
直流重量特性例　DC Bias characteristics（Measured by HP4285A）



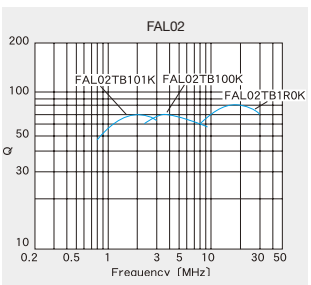


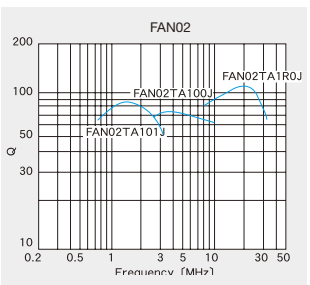
温度特性例　Temperature characteristics（Measured by HP4285A）





Q-周波数特性例　Q-Characteristics（Measured by HP4285A＋HP42851A）





最小受注単位数　Minimum Quantity

①アキシャルリードの横テーピング　Taping for Straight Leads

Type	リード加工記号 Lead Configuration code	標準数量（pcs.） Standard quantity
FAL02	TA・TB	2,000
FAN02	TA	2,000

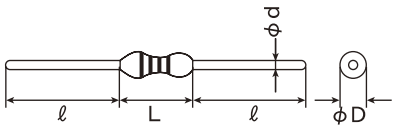
②アキシャルリードの縦テーピング　Taping for Formed Leads

Type	リード加工記号 Lead Configuration code	標準数量（pcs.） Standard quantity
FAL02	VD	2,000

③バルク（袋づめ）Bulk

Type	リード加工記号 Lead Configuration code	標準数量（pcs.） Standard quantity
FAL02	NA	500
	KR	2,000
FAN02	KR	2,000

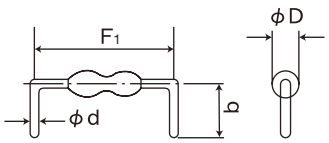
NA形状



Type	寸　法 Dimensions				最小挿入ピッチ Minimum insertion pitch
	φD	L	φd	ℓ	
FAL02	2.3max (0.091max)	3.4max (0.134max)	0.41±0.05 (0.016±0.002)	24±2.0 (0.945±0.079)	5.0 (0.197)

Unit：mm（inch）

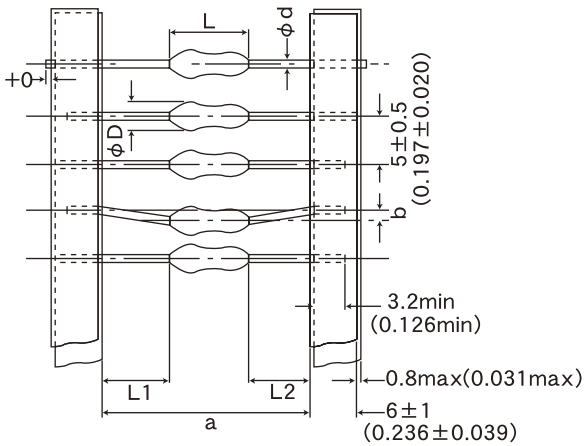
KR/KH/KB形状



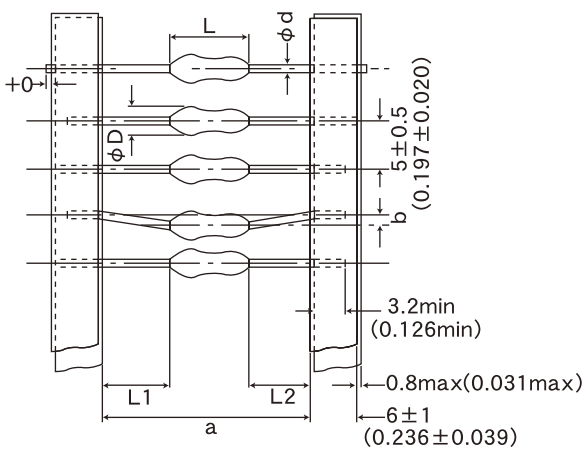
Type	リード加工形状記号 Lead configuration code	寸　法 Dimensions			
		φD	F1	φd	b
FAL02	KR	2.3max (0.091max)	5.0±0.5 (0.197±0.020)	0.41±0.05 (0.016±0.002)	7.0±1.0 (0.276±0.039)
FAN02	KR	2.4max (0.094max)	5.0±0.5 (0.197±0.020)	0.41±0.05 (0.016±0.002)	7.0±1.0 (0.276±0.039)

Unit：mm（inch）

TA（a：26mm lead space）形状
（1.02 inch）



TB（a：52mm lead space）形状
（2.05 inches）



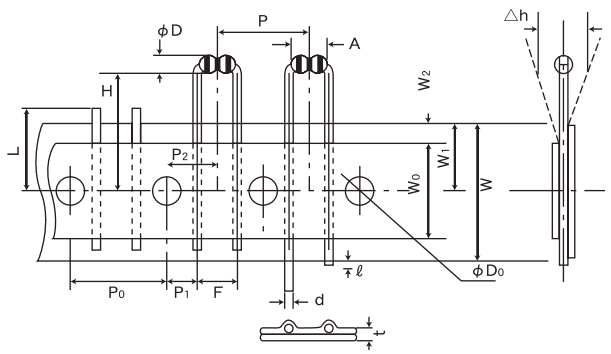
Type	寸　法 Dimensions						最小挿入ピッチ Minimum insertion pitch
	φ D	L	a	b	$\lvert L_1-L_2 \rvert$	φ d	
FAL02	2.3max (0.091max)	3.4max (0.134max)	$26^{+0.5}_{-0}$ $(1.02^{+0.020}_{-0})$	0.8max (0.031max)	0.5max (0.020max)	0.41 ± 0.05 (0.016 ± 0.002)	5.0 (0.197)
FAN02	2.4max (0.094max)	3.6max (0.142max)	$26^{+0.5}_{-0}$ $(1.02^{+0.020}_{-0})$	0.8max (0.031max)	0.5max (0.020max)	0.41 ± 0.05 (0.016 ± 0.002)	5.0 (0.197)

Unit：mm（inch）

Type	寸　法 Dimensions						最小挿入ピッチ Minimum insertion pitch
	φ D	L	a	b	$\lvert L_1-L_2 \rvert$	φ d	
FAL02	2.3max (0.091max)	3.4max (0.134max)	52^{+2}_{-1} $(2.05^{+0.079}_{-0.039})$	1.2max (0.047max)	1.0max (0.039max)	0.41 ± 0.05 (0.016 ± 0.002)	5.0 (0.197)

Unit：mm（inch）

VD 形状



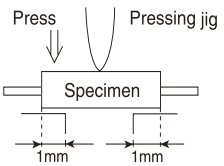
Type	記号 Symbol	寸　法 Dimensions	記号 Symbol	寸　法 Dimensions
FAL02	A	3.9max (0.154max)	W	$18.0^{+1.0}_{-0.5}$ ($0.709^{+0.039}_{-0.020}$)
	φ D	2.3max (0.091max)	W_0	12.5min (0.492min)
	H	19.5 ± 0.5 (0.768 ± 0.020)	W_1	$9.0^{+0.75}_{-0.5}$ ($0.354^{+0.030}_{-0.020}$)
	P	12.7 ± 1.0 (0.500 ± 0.039)	W_2	3.0max (0.118max)
	P_0	12.7 ± 0.3 (0.500 ± 0.012)	ℓ	2.0max (0.079max)
	P_1 P_2	3.85 ± 0.7 (0.152 ± 0.028) 6.35 ± 0.5 (0.250 ± 0.020)	φ D_0	4.0 ± 0.3 (0.157 ± 0.012)
	F	5.08 ± 0.5 (0.200 ± 0.020)	φ d	0.41 ± 0.05 (0.016 ± 0.002)
	△h	0 ± 1.0 (0 ± 0.039)	L	11.0max (0.433max)
	—	—	t	0.5 ± 0.2 (0.020 ± 0.008)

Unit：mm（inch）

Item	Specified Value						Test Method and Remarks
	FA02 Type	CAL45 Type	LHL □□□	FBA/FBR	FL05 □ Type	FL06BT Type	
1.Operating temperature Range	−25～+105℃			−25～+85℃	−25～+105℃		FA・CA・FL： Including self-generated heat LHL□□□： Including self-generated heat
2.Storage temperature Range	−40～+85℃						
3.Rated current	Within the specified tolerance						FA・CA： The maximum DC value having inductance within 10% and temperature incease within 20℃ by the application of DC bias. LHL□□□： The maximum DC value having inductance decrease within 10%（LHLC08, LHLC10 ： within 30%）and temperaturea incease within the following specified temperature by the application of DC bias. Reference temperature：25℃（LHL08, LHL10, LHL13） ：30℃（LHL16, LHLP□□） ：40℃（LHLC08, LHLC10） FB： No disconnection or appearance abnormaliry by continuous current application for 30 min. Chage after the application shall be within ±20% of the initial value.This is not guaranteed for electrial characteristics during current application. FL： The maximum DC value having temperature rise within specified value.
4.Impedance				Within the specified tolerance		Refer to individual specification	FB： Measuring equipment：Impedance analyzer（HP4191A）or its equivalent Measuring frequency：Specified frequency FL06BT： Measuring equipment：4291A（HP）or its equivalent Measuring frequency：Specified frequency
5. Inductance	Within the specified tolerance				Within the specified tolerance		FA・CA： Measuring equipment：LCR meter（HP4285A＋HP42851A or its equivalent） Measuring frequency：Specified frequency LHL□□□： Measuring equipment：LCR meter（HP4285A＋HP42851A or its equivalent） LCR meter（HP4262A）or its equivalent（at 1KHz） Measuring frequency：Specified frequency FL05R□： Measuring equipment：HP4262A or its equivalent. Measuring frequency：1kHz

Item	Specified Value						Test Method and Remarks
	FA02 Type	CAL45 Type	LHL□□□	FBA/FBR	FL05□ Type	FL06BT Type	
6.Q	Within the specified tolerance						FA・CA： Measuring equipment ： LCR meter（HP4285A＋HP42851A or its equivalent） Measuring frequency：Specified frequency LHL□□□（except LHLP）： Measuring equipment ： LCR meter（HP4285A＋HP42851A or its equivalent） LCR meter（HP4262A） or its equivalent（at 1kHz） Measuring frequency：Specified frequency
7.DC Resisitance	Within the specified tolerance						FA・CA： Measuring equipment ： low ohmmeter（A&D AD5812 or its equivalent） LHL□□□・FB・FL： Measuring equipment：DC ohmmeter
8.Self resonance frequency	Within the specified tolerance						FA・CA： Measuring equipment ： Network analyzer（Anritsu MS620J or its equivalent） LHL□□□（except LHLP）： Measuring equipment：（HP4191A, 4192A）its equivalent
9.Temperature characteristic	△L/L： Within±5%		△L/L： Within±7% （except LHLP16： Within±20%）				FA・CA： Change of maximum inductance deviation in step 1to5 step / Temperature（℃） 1 / 20 2 / −25（Minimum operating temperature） 3 / 20（Standard temperature） 4 / ＋85（Maximum operating temperature） 5 / 20 LHL□□□ Change of maximum inductance deviation in step 1to5 Temperature at step 1：20℃ Temperature at step 2：Minimum operating temperature Temperature at step 3：20℃（Standard temperature） Temperature at step 4：Maximum operating temperature Temperature at step 5：20℃

<table>
<tr><th rowspan="2">Item</th><th colspan="6">Specified Value</th><th rowspan="2">Test Method and Remarks</th></tr>
<tr><th>FA02 Type</th><th>CAL45 Type</th><th>LHL□□□</th><th>FBA/FBR</th><th>FL05□ Type</th><th>FL06BT Type</th></tr>
<tr><td>10.Terminal strength：
tensile force</td><td colspan="3">No abnormality such as cut lead, or looseness.</td><td>No abnormality such as cut lead, or looseness.</td><td>No abnormality such as cut lead, or looseness.</td><td></td><td>FA・CA：
Apply the stated tensile force progressively in the direction to draw terminal.
<table><tr><th>force (N)</th><th>duration (S)</th></tr><tr><td>25</td><td>5</td></tr></table>
LHL□□□：
Apply the stated tensile force progressively in the direction to draw terminal.
<table><tr><th>Nominal wire diameter tensile φd (mm)</th><th>force (N)</th><th>duration(S)</th></tr><tr><td>0.3＜φd≦0.5</td><td>5</td><td rowspan="3">30±5</td></tr><tr><td>0.5＜φd≦0.8</td><td>10</td></tr><tr><td>0.8＜φd≦1.2</td><td>25</td></tr></table>
FBA/FBR：
A bead shall be fixed and static loaded 20±1N (2.0±0.1 kgf) in axial direction of lead wire in 10±1 seconds.
FL05R□：
Fix the component in the direction to draw terminal,and gradually apply the tensile force of 4.9 N.</td></tr>
<tr><td>11.Over current</td><td></td><td></td><td>There shall be no scorch or short of wire.
LHLC08,LHLC10:
There shall be no firing.</td><td></td><td></td><td></td><td>LHL□□□：
Measuring current：Rated current×2
Duration：5min.
Number of measuring：one time</td></tr>
<tr><td>12.Terminal strength：
bending</td><td colspan="4">No abnormality such as cut lead, or looseness.</td><td></td><td></td><td>FA・CA：
Suspend a mass at the end the terminal, incline the body though angel of 90 and return it to initial position. This operation is done over a period of 2-3 sec.Then second bend in the opposite direction shall be made.
Number of bends：Two times.
<table><tr><th>Nominal wire diameter tensile φd (mm)</th><th>Bending force (N)</th><th>Mass reference weight (kg)</th></tr><tr><td>0.3＜φd≦0.5</td><td>2.5</td><td>0.25</td></tr><tr><td>0.5＜φd≦0.8</td><td>5</td><td>0.50</td></tr></table>
LH・FB：
Suspend a mass at the end the terminal, incline the body though angel of 90 and return it to initial position. This operation is done over a period of 2-3 sec.Then second bend in the opposite direction shall be made.
Number of bends：Two times.
<table><tr><th>Nominal wire diameter tensile φd (mm)</th><th>Bending force (N)</th><th>Mass reference weight (kg)</th></tr><tr><td>0.3＜φd≦0.5</td><td>2.5</td><td>0.25</td></tr><tr><td>0.5＜φd≦0.8</td><td>5</td><td>0.5</td></tr><tr><td>0.8＜φd≦1.2</td><td>10</td><td>1.0</td></tr></table></td></tr>
<tr><td>13.Insulation resisitance：
between the terminals and body</td><td></td><td></td><td>100MΩmin.</td><td></td><td></td><td></td><td>LHL□□□：
Applied voltage：500 VDC
Duration：60 sec.</td></tr>
<tr><td>14.Insulation resistance：
between terminals and core</td><td></td><td></td><td></td><td>1MΩmin.
(Other than materail code MA)</td><td></td><td></td><td>FBA・FBR：
Applied voltage：100 VDC
Duration：60±5 sec.</td></tr>
<tr><td>15.Withstanding：between the terminals and body</td><td></td><td></td><td>No abnormality such as insulation damage</td><td></td><td></td><td></td><td>LHL□□□：
Accoding to JIS C5102. 7. 1. 3 (C)
Metal global method
Applied voltage：500 VDC
Duration：60 sec.</td></tr>
</table>

Item	Specified Value						Test Method and Remarks
	FA02 Type	CAL45 Type	LHL□□□	FBA/FBR	FL05□ Type	FL06BT Type	
16.DC bias characteristic	△L/L : Within −10%						FA・CA : Measure inductance with appliation of rated current using LCR meter to compare it with the initial value.
17.Body strength	No abnormality as damage.			No abnormality such as cracks on body.			FA02 : Applied force : 30N Duration : 10 sec. Speed : Shall attain to specified force in 2 sec. CAL45 : Applied force : 50N Duration : 10 sec. Speed : Shall attain to specified force in 2 sec. FBA : Applied force : 50±3N Duration : 30±1 sec. 
18.Resisitance to vibration	△L/L : Within±5% Q : 30min.	△L/L : Within±5%	Appearance : No abnomality △L/L : Within±5% Q change : Within±30% (LHLP : only △L/L)	Appearance : No abnomality Impedance change : Within±20%			FA・CA : Directions : 2 hrs each in X, Y and Z directions total : 6hrs. Frequency range : 10 to 55 to 10Hz(1min.) Amplitude : 1.5mm Mounting method : Soldering onto printed board. Recovery : At least 1hr of recovery under the standard condition after the test, followed by the measurement within 2hrs. LHL□□□・FB : Directions : 2 hrs each in X, Y and Z directions total : 6hrs. Frequency range : 10 to 55 to 10Hz(1min.) Amplitude : 1.5mm (But don't exceed acceleration 196m/s (two power) Mounting method : Soldering onto printed board.

Item	Specified Value						Test Method and Remarks
	FA02 Type	CAL45 Type	LHL□□□	FBA/FBR	FL05□ Type	FL06BT Type	
19.Resistance to shock	No significant abnormality in appearance						FA・CA： Drop test Impact material：concrete or vinyl tile Height：1m Total number of drops：10 times
20.Solderability	At least 75% of terminal electrode is coverd by new solder.		At least 75% of lead circu, ference is covered by new solder.	At least 90% of lead circu, ference is covered by new solder.	At least 75% of lead circu, ference is covered by new solder.		FA・CA： Solder temperature：230±5℃ Duration：2±0.5 sec. LHL□□□： Solder temperature：235±5℃ Duration：2±0.5 sec. Immersion depth：Up to 1.5mm from bottom of case. FB： Solder temperature：230±5℃ Duration：3±1 sec. Immersion depth：Up to 1.5mm from terminal root. FL05R□： Solder temperature：230±5℃ Duration：2±0.5 sec. Immersion depth：Up to 2～2.5mm from terminal root. FL06BT： Solder temperature：230±5℃ Duration：3±1 sec. Immersion depth：Up to 0.5～1.0mm from terminal root.

Item	Specified Value						Test Method and Remarks
	FA02 Type	CAL45 Type	LHL□□□	FBA/FBR	FL05□ Type	FL06BT Type	
21.Resisitance to soldering heat	No significant abnormality in appearance		No significant abnormality in appearance Inductance change : Within±5% Q change : Within±30% (LHLP : only △L/L)	No significant abnormality in appearance Impedance change : Within±20%	Refer to individual specification	No significant abnormality in appearance Impedance change : Within±20%	FA・CA : Solder temperature : 260±5℃ (CP02・LA02) 270±5℃ (LA03・LA04・LA45) Duration : 5±0.5 sec. One time Immersed conditions : Inserted into substrate with t = 1.6mm Recovery : At least 1hr of recovery under the standard condition after the test, followed by the measurement within 2hrs. LHL□□□ : Solder bath method Solder temperature : 260±5℃ Duration : 10±1 sec. : Up to 1.5mm from bottom of case. Manual soldering Solder temperature : 350±10℃ (At the tip of soldering iron) Duration : 5±1 sec. : Up to 1.5mm from bottom of case. Caution : No excessive pressing shall be applied to terminald Recovery : 4 to 24hrs of recovery under the standard condition after the tset. FB : Solder bath method Condition 1 Solder temperature : 260±5℃ Duration : 10±1 sec. Immersion depth : Up to 1.5mm from terminal root. Condition 2 Solder temperature : 350±5℃ Duration : 3±1 sec. Immersion depth : Up to 1.5mm from terminal root. Recovery : 3hrs of recovery under the standard condition after the test. FL : Solder condition : 260±5℃ 10±1 sec. Immersion depth : Up to 0.5 to 1.0mm from terminal root. Recovery : 3hrs of recovery under the standard condition after the test.

<table>
<tr><th rowspan="2">Item</th><th colspan="6">Specified Value</th><th rowspan="2">Test Method and Remarks</th></tr>
<tr><th>FA02 Type</th><th>CAL45 Type</th><th>LHL□□□</th><th>FBA/FBR</th><th>FL05□ Type</th><th>FL06BT Type</th></tr>
<tr><td>22.Resisitance to solvent</td><td colspan="2">Pleasa avoid the ultrasonic cleaning of this product.</td><td></td><td>No significant abnormality in appearance
Impedance change : Within±20%</td><td></td><td></td><td>FB :
Solvent temperature : 20～25℃
Duration : 30±5 sec.
Solvent type : Acetone, trichloroethylene
Recovery : 3hrs of recovery under the standard condition after the test.</td></tr>
<tr><td>23.Thermal shock</td><td>△L/L : Within±10%
Q : 30min.</td><td>△L/L : Within±10%</td><td>Appearance : No abnormality
Inductance change : Within±10%
Q change : Within±30%
(LHLP : only △L/L)</td><td>Appearance : No abnormality
Impedance change : Within±20%</td><td>Refer to individual specification</td><td>Appearance : No abnormality
Impedance change : Within±20%</td><td>FA・CA :
Conditions for 1cycle
<table>
<tr><th>Step</th><th>Temperature (℃)</th><th>Duration (min)</th></tr>
<tr><td>1</td><td>-25^{+0}_{-3}</td><td>30±3</td></tr>
<tr><td>2</td><td>Room temperature</td><td>Within 3</td></tr>
<tr><td>3</td><td>$+85^{+2}_{-0}$</td><td>30±3</td></tr>
<tr><td>4</td><td>Room temperature</td><td>Within 3</td></tr>
</table>
Number of cycles : 5 cycles
Recovery : At least 1hr of recovery under the standard condition after the removal from test chamber, followed by the measurement within 2hrs.

LHL□□□・FB :
Accoding to JIS C0025
Conditions for 1 cycle
<table>
<tr><th>Step</th><th>Temperature (℃)</th><th>Duration (min)</th></tr>
<tr><td>1</td><td>Minimum operating temperature $^{+0}_{-3}$</td><td>30±3</td></tr>
<tr><td>2</td><td>Room temperature</td><td>Within 3</td></tr>
<tr><td>3</td><td>Maximum oparating temperature $^{+2}_{-0}$</td><td>30±3</td></tr>
<tr><td>4</td><td>Room temperature</td><td>Within 3</td></tr>
</table>
Number of cycles : 10 cycles
〔LHL□□□〕
: 5 cycles (FBA, FBR)
Recovery : 4 to 24hrs of recovery under the standard condition after the removal from the test cfamber.
〔LHL□□□〕
: 3hrs of recovery under the standard condition after the removal from the test cfamber. (FBA, FBR)

FL :
Accoding to JIS C0025
Conditions for 1 cycle
<table>
<tr><th>Step</th><th>Temperature (℃)</th><th>Duration (min)</th></tr>
<tr><td>1</td><td>-25^{+0}_{-3}</td><td>30±3</td></tr>
<tr><td>2</td><td>Room temperature</td><td>Within 3</td></tr>
<tr><td>3</td><td>$+85^{+2}_{-0}$</td><td>30±3</td></tr>
<tr><td>4</td><td>Room temperature</td><td>Within 3</td></tr>
</table>
Number of cycles : 10 cycles
Recovery : 1 to 2hrs of recovery under the standard condition after the removal from the test cfamber.</td></tr>
</table>

Item	Specified Value						Test Method and Remarks
	FA02 Type	CAL45 Type	LHL□□□	FBA/FBR	FL05□ Type	FL06BT Type	
24.Damp heat	△L/L： Within±10% Q：30min.	△L/L： Within±10%		Appearance： No abnormality Impedance change： Within±20%			FA・CA： Temperature：40±2℃ Humidity：90～95%RH Duration：1000 hrs Recovery ： At least 1hr of recovery under the standard removal from test chamber, followed by the measurement within 2hrs. FB： Temperature：60±2℃ Humidity：90～95%RH Duration：1000 hrs Recovery：1 to 2hrs of recovery under the standard condition after the removal from the test cfamber.
25.Loading under damp heat	△L/L： Within±10% Q：30min.	△L/L： Within±10%	Appearance： No abnormality Imductance change： Within±10% Q change： Within±30% (LHLP： only △L/L)		Refer to individual specification	Appearance： No abnormality Impedance change： Within±20%	FA・CA： Temperature：40±2℃ Humidity：90～95%RH Duration：1000 hrs Applied current：Rated current Recovery ： At least 1hr of recovery under the standard removal from test chamber, followed by the measurement within 2hrs. LHL□□□： Temperature：40±2℃ Humidity：90～95%RH Duration：1000±24 hrs Applied current：Rated current Recovery：1 to 2hrs of recovery under the standard condition after the removal from the test cfamber. FL： Temperature：60±3℃ Humidity：90～95%RH Duration：500（+12, −0）hrs Applied current：Rated current Recovery：1 to 2hrs of recovery under the standard condition after the removal from the test cfamber.
26.Loading at high temperature	△L/L： Within±10% Q：30min.	△L/L： Within±10%					FA・CA： Temperature：85±2℃ Duration：1000 hrs Applied current：Rated current Recovery ： At least 1hr of recovery under the standard removal from test chamber, followed by the measurement within 2hrs.

Item	Specified Value						Test Method and Remarks
	FA02 Type	CAL45 Type	LHL□□□	FBA/FBR	FL05□ Type	FL06BT Type	
27.Low temperature life test	△L/L： Within±10% Q：30min.	△L/L： Within±10%	Appearance： No abnormality Inductance change： Within±10% Q change： Within±30% (LHLP： only △L/L)		Refer to individual specification	Appearance： No abnormality Impedance change： Within±20%	FA・CA： Temperature：−25±2℃ Duration：1000 hrs Recovery：At least 1hr of recovery under the standard removal from test chamber, followed by the measurement within 2hrs. LHL□□□： Temperature：−40±3℃ Duration：1000±24 hrs Recovery：1 to 2hrs of recovery under the standard condition after the removal from the test cfamber. FL： Temperature：−40±3℃ Duration：500 (+12, −0) hrs Recovery：1 to 2hrs of recovery under the standard condition after the removal from the test cfamber.
28.High temperature life test			Appearance： No abnormality Inductance change： Within±10% Q change： Within±30%		Refer to individual specification	Appearance： No abnormality Impedance change： Within±20%	LHL□□□： Temperature：105±3℃ Duration：1000±24 hrs Recovery：1 to 2hrs of recovery under the standard condition after the removal from the test cfamber. FL： Temperature：85±3℃ Duration：500 (+12, −0) hrs Recovery：1 to 2hrs of recovery under the standard condition after the removal from the test cfamber.

FA Type, CAL Type, LH Type, FB Type, FL Type

Stages	Precautions	Technical considerations
1.Circuit Design	Operating environment, 1.The products described in this specification are intended for use in general electronic equipment,(office supply equipment, telecommunications systems, measuring equipment, and household equipment). They are not intended for use in mission-critical equipment or systems requiring special quality and high reliability (traffic systems, safety equipment, aerospace systems, nuclear control systems and medical equipment including life-support systems,) where product failure might result in loss of life, injury or damage. For such uses, contact TAIYO YUDEN Sales Department in advance.	
2.PCB Design	Design 1.Please design insertion pitches of a base in the pitches that fitted a terminal interval.	1.When Inductors are mounted onto a PC board, hole dimensions on the board should match the lead pitch of the component, if not, it will cause breakage of the terminals or cracking of terminal roots covered with resin as excess stress travels through the terminal legs.
3.Considerations for automatic placement	Adjustment of mounting machine 1.Excessive impact load should not be imposed on the products when mounting onto the PC boards. 2.Mounting and soldering conditions should be checked beforehand.	1. When installing products, care should be taken not to apply distortion stress as it may deform the products.
4.Soldering	Wave soldering 1.Please refer to the specifications in the catalog for a wave soldering. 2.Do not immerse the entire Inductors in the flux during the soldering operation. Lead free soldering 1.When using products with lead free soldering, we request to use them after confirming of adhesion, temperature of resistance to soldering heat, soldering etc sufficiently. Recommended conditions for using a soldering iron: Put the soldering iron on the land-pattern. Soldering iron's temperature - Below 350 ℃ Duration - 3 seconds or less The soldering iron should not directly touch the inductor. ◆Reflow soldering 1.As for reflow soldering, please contact our sales staff.	1.If products are used beyond the range of the recommended conditions, heat stresses may deform the products, and consequently degrade the reliability of the products.
5.Cleaning	Cleaning conditions 1.CP Type, LA type, CAL type, LH type Please do not do cleaning by a supersonic wave.	CP Type, LA type, CAL type, LH type 1.If washing by supersonic waves, supersonic waves may deform products.
6.Handling	Handling 1.Keep the inductors away from all magnets and magnetic objects. Mechanical considerations 1.Please do not give the inductors any excessive mechanical shocks. 2.LH type If inductors are dropped onto the floor or a hard surface they should not be used. Packing 1.Please do not give the inductors any excessive mechanical shocks. In loading, please pay attention to handling indication mentioned in a packing box (a loading direction / number of maximum loading / fragile item).	1.There is a case that a characteristic varies with magnetic influence. 1.There is a case to be damaged by a mechanical shock. 2.LH type There is a case to be broken by a fall. 1.There is a case that a lead route turns at by a fall or an excessive shock.
7.Storage conditions	Storage 1.To maintain the solderability of terminal electrodes and to keep the packing material in good condition, temperature and humidity in the storage area should be controlled.. ･Recommended conditions Ambient temperature 0～40℃ Humidity Below 70 % RH The ambient temperature must be kept below 30℃. Even under ideal storage conditions, solderability of products electrodes may decrease as time passes. For this reason, inductors should be used within one year from the time of delivery. In case of storage over 6 months, solderability shall be checked before actual usage.	1. Under a high temperature and humidity environment, problems suchas reduced solderability caused by oxidation of terminal electrodes and deterioration oftaping/packaging materials may take place.