Kendeil Indfarad™

Aluminium Electrolytic Capacitors

COMPANY WITH QUALITY SYSTEM CERTIFIED BY DNV
= ISO 9001:2008 =

Data Book 2014

Company Presentation

Kendeil Indfarad Electronics Pvt Ltd (KIEPL), an ISO 9001:2008 certified company is a joint venture between KENDEIL S.r.l., Italy and the MEHER Group, India for the Design and Manufacture of Aluminium Electrolytic capacitors. The joint venture will focus on addressing the Indian market needs and will expand its business into other targeted regions.

The state of art manufacturing plant is located at Bangalore. The products are made using advanced machinery, integrated technologies and production processes, which are regularly updated to meet the highest international performance and quality standards. Production range spreads over entire range of Screw type Aluminium Electrolyitc Capacitors-IKEN Series. Our reference standards are IEC.

Company's continuous effort in improvement in technology and usage of computer controlled automatic machines gives it a leading role in the market of electronic components. Flexibility of its structure enables it to meet needs of custom designed products. Entire range of products offered are of reliable performance and are competitively priced.

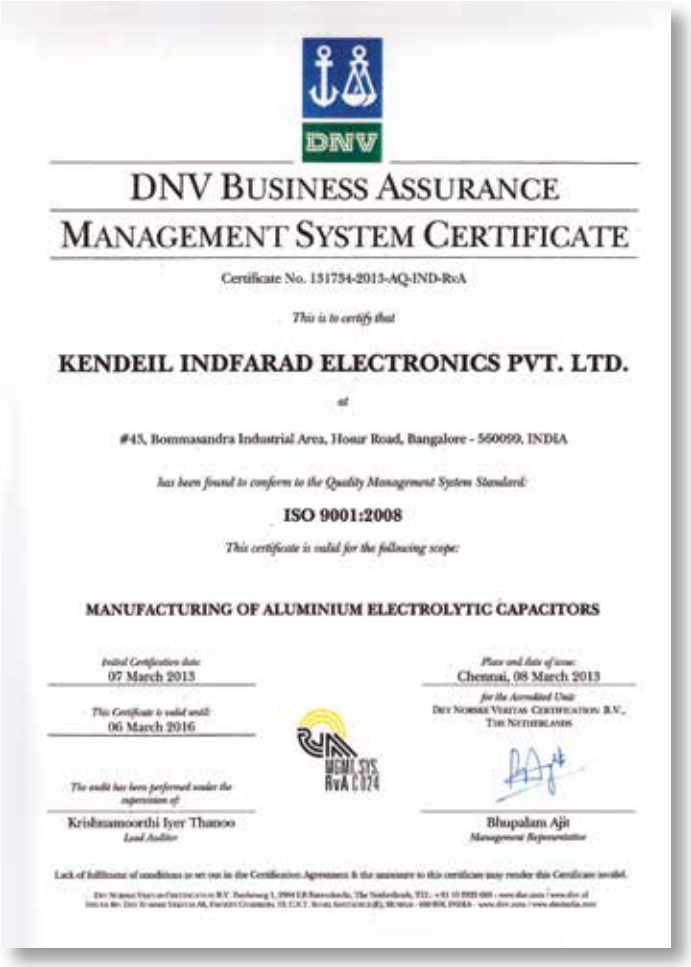
The R&D activities in Europe will reinforce capabilities that are critical for evolving contemporary products & enhancing long term competitiveness. The unique vertically integrated business model of KENDEIL combined with the strengths of MEHER will offer a distinctly superior long-term value proposition to our customers across the geographies.

About Kendeil
Kendeil Group is the leading producer of power electronic components for all power inverter applications such as wind and solar power, industrial motor drives, UPS, battery chargers and aluminium foil for electrolytic capacitors with more than 32 years of experience.
www.kendeil.com

About MEHER
Headquartered in Bangalore, India, since 1977, the MEHER group has business interests in strategically selected areas in the energy domain such as passive components, thin film dielectrics, dynamic electrical braking systems.
www.meher.com

Visit our website: www.kendeil-indfarad.com

Quality



DNV

DNV BUSINESS ASSURANCE

MANAGEMENT SYSTEM CERTIFICATE

Certificate No. 151734-2013-AQ-IND-RvA

This is to certify that

KENDEIL INDFARAD ELECTRONICS PVT. LTD.

at

#43, Bommasandra Industrial Area, Hosur Road, Bangalore - 560099, INDIA

has been found to conform to the Quality Management System Standard:

ISO 9001:2008

This certificate is valid for the following scope:

MANUFACTURING OF ALUMINIUM ELECTROLYTIC CAPACITORS

Initial Certification date: 07 March 2013

This Certificate is valid until: 06 March 2016

The audit has been performed under the supervision of:

Krishnamoorthi Iyer Thanoo
Lead Auditor

Place and date of issue: Chennai, 08 March 2013

for the Accredited Unit: DET NORSKE VERITAS CERTIFICATION B.V., THE NETHERLANDS

Bhupalam Ajit
Management Representative

Lack of fulfilment of conditions as set out in the Certification Agreement & the annexure to this certificate may render this Certificate invalid.

Overview

Technical Information

Capacitors

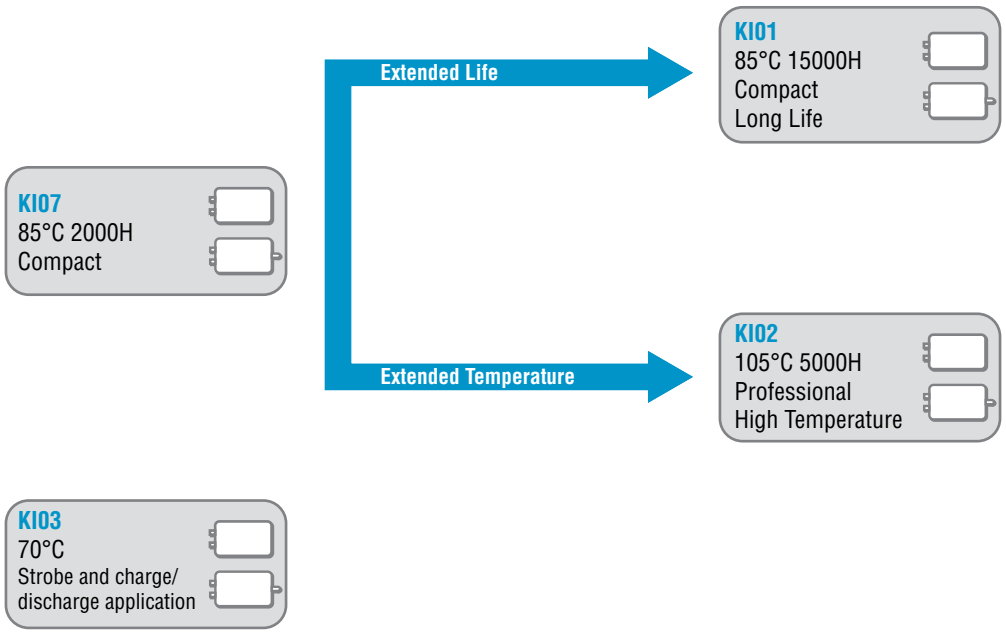
All sections include specifications and standard ratings

Screw Capacitors-IKEN SERIES

Accessories

Product Road Map

IKEN Series Screw Terminals



Part Number System

Total length is 18 digits.
Please see examples below and have a reference code from the standard ratings capacitors pages.

SCREW CAPACITORS

K	I													Ø	n	n	n
Type		Voltage		Capacitance			Term	Insert	Tol	Res	Case Size						

Case Size
Ø=Diameter code:
A=20 B=22 C=25 D=30 E=35 F=40
N=45 G=51 H=63 J=76 L=90
nnn=Length in mm

Reserved
0 = standard ratings, 1= special

Tolerance
tolerance range as IEC62
M= ±20%, Q= -10% +30%, X= custom
T= -10% +50%, U= -10% +75%

Insert Style
insert type on decks
0= Dia 35 (small Dia M5)
H= Standard High Ripple
Dia 51-63-76(M5), Dia 90 (M6)
6= M6 Dia 76 Only,
L= M5 long insert style*

Termination
terminal as follows:
screw type: 0 = no stud/flat bottom,
M = M8 stud, S = M12 stud

Capacitance
[µF] - 2 significant digits plus multiplying factor
1= x10, 2= x100, 3x1000, 4x10000

Voltage
DC rated voltage [V]

Series Type
IKEN Series Kendeil Indfarad Aluminium Electrolytic capacitor type.

Examples

KI01 100V 22000µF, High Ripple, -20%+20%, 63x105

K	I	0	1	1	0	0	2	2	3	0	H	M	0	H	1	0	5

KI02 40V 100000µF, High Ripple, -20%+20%,76x143

K	I	0	2	0	4	0	1	0	4	0	H	M	0	J	1	4	3

* Note for Insert Style
M5 long insert style dedicated to not insulated bus bar (+2mm height as against Standard High Ripple code).

Capacitor Weight Table

Size ØxL (mm)	**Case Code**	**Approx Unit Weight**(gms)	**Qty/Box** (nos.)	**Box Dimensions** (cms)
35x51	E051	80	60	36 x 25 x 6
35x60	E060	70	60	36 x 25 x 8
35x79	E079	110	60	36 x 25 x 8
51x60	G060	110	42	38.5 x 38.5 x 14
51x79	G079	200	42	38.5 x 38.5 x 14
51x96	G096	252	42	38.5 x 38.5 x 14
51x105	G105	260	42	38.5 x 38.5 x 14
51x115	G115	270	42	38.5 x 38.5 x 14
51x130	G130	352	42	38.5 x 38.5 x 20
51x143	G143	370	42	38.5 x 38.5 x 20
63x60	H060	240	25	38.5 x 38.5 x 14
63x79	H079	280	25	38.5 x 38.5 x 14
63x96	H096	366	25	38.5 x 38.5 x 14
63x105	H105	420	25	38.5 x 38.5 x 14
63x115	H115	488	25	38.5 x 38.5 x 20
63X130	H130	527	25	38.5 x 38.5 x 20
63x143	H143	540	25	38.5 x 38.5 x 20
76x79	J079	450	16	38.5 x 38.5 x 14
76x105	J105	600	16	38.5 x 38.5 x 20
76x115	J115	616	16	38.5 x 38.5 x 20
76x130	J130	720	16	38.5 x 38.5 x 20
76x143	J143	940	16	38.5 x 38.5 x 20
76x214	J214	1540	8	37 x 26 x 26
90x145	L145	1250	6	37 x 26 x 26
90x220	L220	1790	6	37 x 26 x 26
90x240	L240	1880	6	37 x 26 x 26

Note: Only main products listed

Building an Electrolytic Capacitor

Applications

A capacitor is an electrical component that stores a quantity of electrical charge defined with a linear relationship as:

Q = C x V

where:
Q = electrical charge [Coulomb]
C = Capacitance [Farad]
V = Voltage [Volt]

Usually values are indicated in a smaller unit called micro Farad [µF] that is one million times smaller. An aluminium electrolytic capacitor is composed of one anode of aluminium foil (or one aluminium foil anode) having a dielectric oxidation on its surface, with semiconductor characteristics to prevent the current flow in one direction, and another aluminium foil cathode. There is also an electrolyte impregnated paper layer positioned between the anode and the cathode in order to avoid short circuits. Both the aluminium foils have been etched to obtain active surfaces, increasing their effective area. Aluminium tabs are then connected to the two foils to act as terminals. When in use the impregnated section is then closed inside a suitable case and sealed with a deck. The matching of thin dielectric and a large surface area allows to create capacitors with exceptional high capacitance per volume.

International standards (IEC) have classified the capacitors in two categories:
i. Long Life Grade
ii. General Purpose Grade

Electrolytic capacitors for high reliability applications (Long Life Grade): In addition to the possible over anodization (the difference between forming voltage and operating voltage) it must generally satisfy high endurance requirements and a careful selection on materials is needed. However, such efforts are not required for capacitors standard version used for less severe reliability (General Purpose Grade).

The whole manufacturing process required to build a Kendeil-Indfarad IKEN Series electrolytic capacitor could be reasonably split into the following phases:

- Etching
- Winding
- Impregnation
- Sealing
- Ageing
- Production Inspections

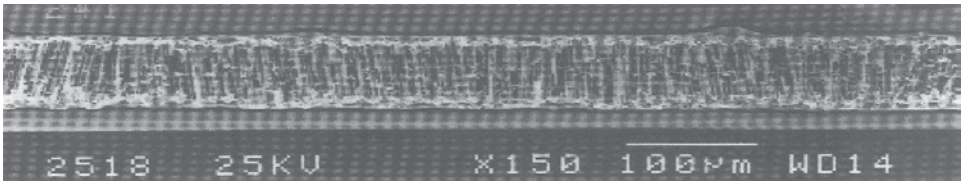
Etching

Plates or electrodes are made of high purity, very thin aluminium foil (0.05 to 0.1 mm thickness). To get the maximum capacitance for a given electrode surface area, an electrochemical process called “etching” is used to dissolve metal and increase the surface area of the foil in the form of a dense network of microscopic channels.

The etching process consists of continuously running aluminium foil through a chloride solution with an AC, DC or AC/DC voltage applied between the etch solution and aluminium foil.

The increase in surface area is referred to as foil gain and can be increased as much as 100 times for foil being used in low voltage capacitor applications and 20 to 25 times for higher voltage applications.

The dielectric of the aluminium electrolytic capacitor is composed of a thin layer of aluminium oxide (Al2O3) which “forms” on the surface of the etched aluminium foil during a process called “formation.”



Micrographs view of Etched Aluminium Foil

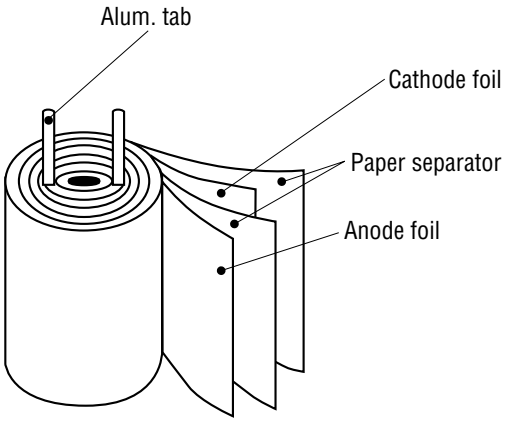
Since capacitance is inversely proportional to the dielectric thickness and this is proportional to the forming voltage, the following relation is appliable:

Capacitance x Forming Voltage = Constant

This is true for high voltage foils with a relatively coarse etch structure. However, for foils with extremely fine structures, the process to convert aluminium to aluminium oxide has a significant smoothing effect on the structure that might be described by a non-linear relationship.

Winding

Each capacitor contains two foils, the positive foil is called the ANODE and the negative is called the CATHODE. Both foils, along with a separator paper are rolled into a cylinder. The separator paper prevents anode and cathode foils from coming into contact with each other and shorting. As part of a highly automated winding process, aluminium tabs are attached to the anode and cathode foils. This completed assembly of etched and formed foil, together with separator paper and attached tabs is called the capacitor ELEMENT.

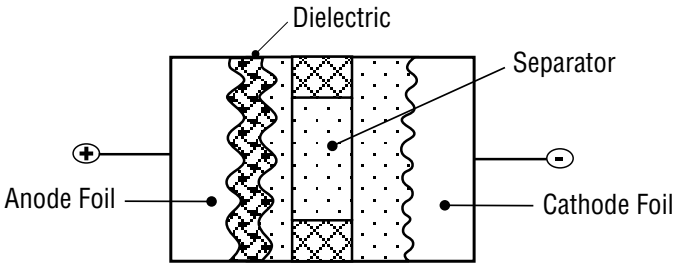


The Capacitor Element

Impregnation

The method of impregnation requires the winding element to be immersed into the electrolyte by either a vacuum/pressure cycle with or without applied heat or by simple absorption.

The electrolyte contains a solvent such as ethylene glycol and a solute such as ammonium borate.
Should the dielectric film be damaged, the presence of the electrolyte will allow the capacitor to heal itself by forming more oxide. By selecting different electrolytes, the capacitor characteristics such as operating temperature range, frequency response, shelf life and load life could be improved.



The cross section for a typical element

Sealing

After impregnation phase, the element is sealed into an aluminium can. Sealing deck materials may be rubber/bakelite or phenolic plastic.

Ageing

Before being sleeved and packed the capacitor is aged and tested, this being the final process of the production chain, usually called “ageing”. A voltage greater than the rated voltage is then applied at very high temperatures. The purpose is to reform or to repair any oxide film which may have been damaged during the slitting, winding and assembly processes,
thus reducing the leakage current to an acceptable low level.

Production Inspections

After ageing, capacitors are 100% tested. All electrical requirements are checked using highly advanced automated test equipment and any rejects are removed. Capacitors are also visually inspected, and only capacitors passing both tests are accepted for packaging.

Electrical Characteristics

Rated Capacitance

The rated capacitance, defined at 100Hz and 20°C, is the capacitance of an equivalent circuit having capacitance and resistance connected in series. The value is indicated on the external sleeve, specified in micro Farads [µF]. The variation of capacitance drift versus temperature and frequency is as shown in Fig.1.

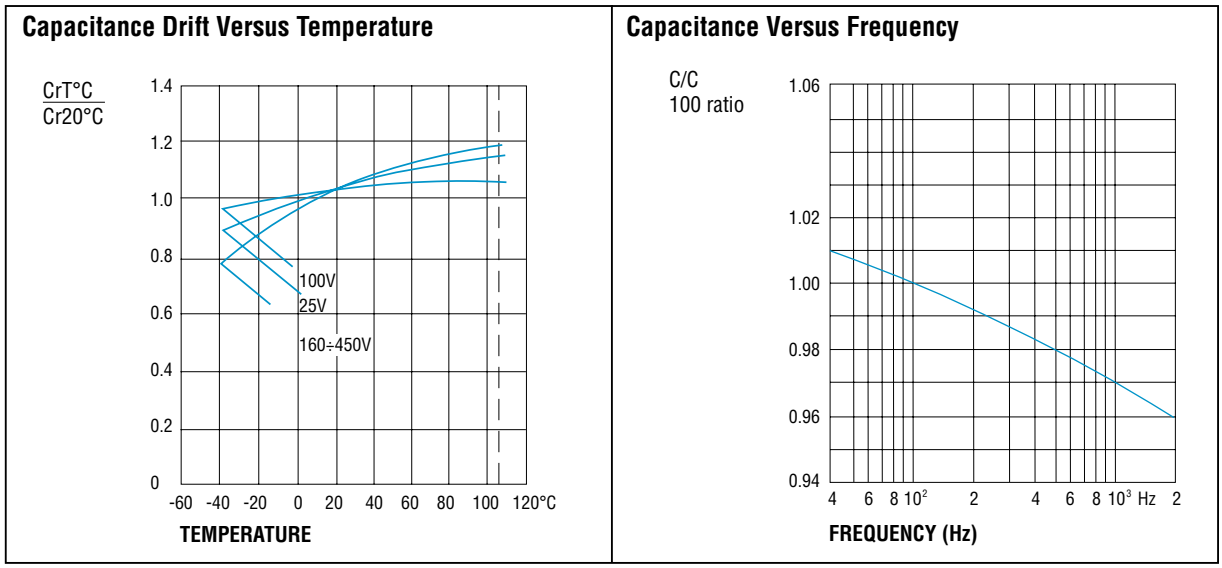


Fig. 1

Rated Voltage (V_r)

The rated voltage is the value of voltage that could be applied continuously within the operating temperature range of capacitors. When using a capacitor with AC voltage superimposed on a DC voltage, care should be taken such that the peak value of AC voltage plus the DC voltage does not exceed the rated voltage.

Reverse polarization shall not exceed two times VDC value.
When capacitors are series connected, the voltage distribution across the series may not be the same. This is due to normal DC leakage distribution and should be considered in the design process either using a higher rated voltage capacitor or using balancing resistors in parallel with each series capacitor.

Surge Voltage (V_p)

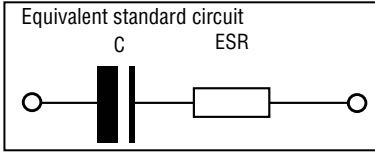
The surge voltage is the maximum overvoltage including DC, peak AC and transients to which the capacitor could be subjected for short periods of time (not more then 30 seconds in any 5 minute period). Depending on applicable specifications, this test is usually performed at maximum operative temperature. A current limiting resistor of 1000 W should be used.

Charge is held for 30 seconds for 1000 cycles, then the capacitor is allowed to discharge without load for 5 minutes. Rated and surge voltage values for Kendeil Indfarad capacitors are listed in following table, where a different relation is applied depending on rated value (V_r).

	$V_p = 1.15\ V_r$										$V_p = 1.10\ V_r$			$V_p = 1.05\ V_r$	
RATED VOLTAGE [V_r]	16	25	40	50	63	75	100	160	200	250	350	400	450	500	550
SURGE VOLTAGE [V_p]	18	29	46	57	72	86	115	184	230	287	385	440	495	525	578

Equivalent Series Resistance (ESR)

The equivalent series resistance is the resistance that a capacitor has to the alternating current flow. Various resistive components such as: electrolyte, paper foil, aluminium foil, tabs, and others determine the total ESR value. It is measured at 100Hz and 20°C. It is related and dependant on temperature and frequency and generally when either these factors increase, a reduction in ESR results. The construction technology of Kendeil-Indfarad capacitors reduces significantly the ESR value.



$ESR = R_1 + R_2 + R_3$
R_1 = Resistance of aluminium oxide thickness
R_2 = Resistance of electrolyte, spacer
R_3 = Resistance due to materials: foil lenght, tabs, terminations contact resistance

Leakage Current (I_L)

Measured at 20°C after 5 minutes under rated voltage.
It is the current flowing through the insulation resistance when a direct current is applied to the capacitor. After charging a capacitor to a set voltage we obtain, initially, a high current flow which decreases rapidly until a constant very small value is reached, the final leakage current. The leakage current value increases both with voltage and temperature. After a long storage period, the leakage current value can be exceeding the rated value and before the output measurement reanodization is necessary.

For typical leakage current versus time and temperature, see Fig. 2-3.

I_L Drift Versus Time

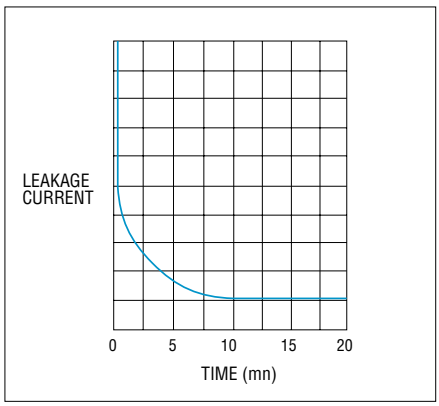


Fig. 2

I_L Drift Versus Temperature

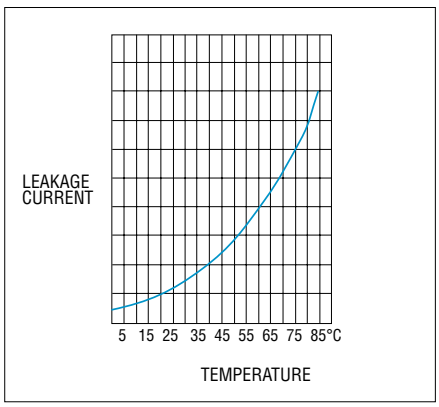


Fig. 3

Dissipation Factor (tan δ)

Dissipation factor or loss angle tangent (tan δ) is a main electrical characteristic of an electrolyte capacitor, a measure of the deviation from an ideal capacitance value.

Relationship is included in the following formula:

$$\tan \delta = 2 \pi f C ESR$$

where f = frequency, C= rated capacitance

Maximum values in the datasheets have been indicated at 100Hz and 20°C.
Drift versus frequency as Fig. 4-5.

tan δ Drift Versus Frequency Low Voltage (≤ 100 Vr DC)

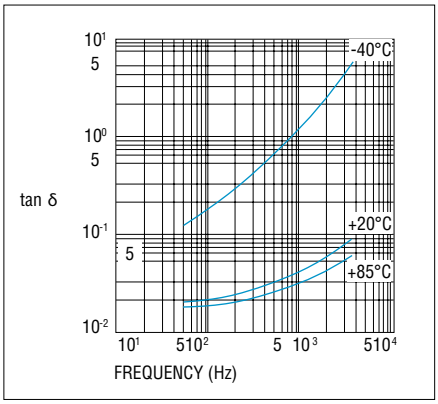


Fig. 4

tan δ Drift Versus Frequency High Voltage (> 100 Vr DC)

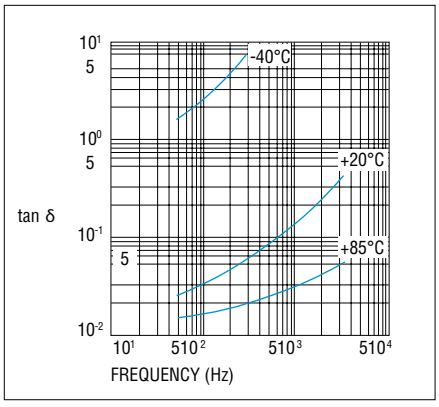


Fig. 5

INDUCTANCE

Some inductance is present in aluminium electrolytic capacitors, but values are usually less than few tens of nH.

Impedance (Z)

$$Z = \sqrt{ESR^2 + (X_L - X_C)^2}$$

Impedance is dominated by the capacitive reactance (X_C) at low frequencies and by the inductive reactance (X_L) at high frequencies. At the point of series resonace Z=ESR.

Typical impedance drift versus frequency, see Fig. 6-7.

Z Drift Versus Frequency
Low Voltage (≤ 100 V_r DC)

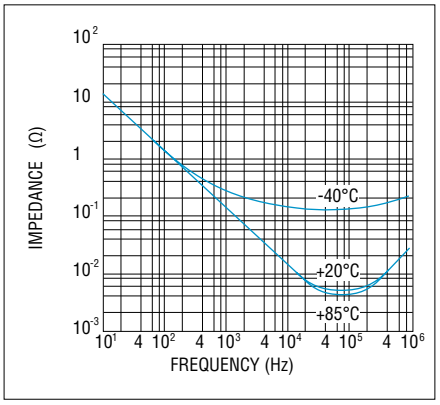


Fig. 6

Z Drift Versus Frequency
High Voltage (> 100 V_r DC)

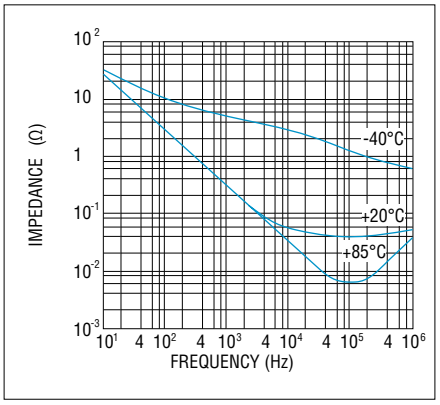


Fig. 7

Ripple Current (I_r)

It is defined as the superimposed alternated ripple current (sinusoidal alternating current at 100Hz). It depends mostly on an allowable temperature rise within a capacitor section due to the power relation formula: I^2 x R. Heating occurs, due to an alternating current flowing through the equivalent series resistance of capacitor. Actual power must be considered when defining ripple current capability. The thermal gradient of an aluminium foil capacitor in an aluminium can is 10^{-3} Watt/cm^2/°C. Since the ripple current raises the temperature of the capacitor it has a significant effect on the operational life of the component. A diagram of useful life specifies life under given operating conditions of different temperature values and ripple current values.

Shelf Life (Voltage free storage)

Capacitors generally can be stored at temperatures up to 50°C without any reduction of their reliability. Overall characteristics such as capacitance, ESR and impedance should show good performance with no sensitive changes while the leakage current will exhibit a slow drift upwords.
In practical use, we experience the following scheme meaningful for voltage related classes of capacitors:

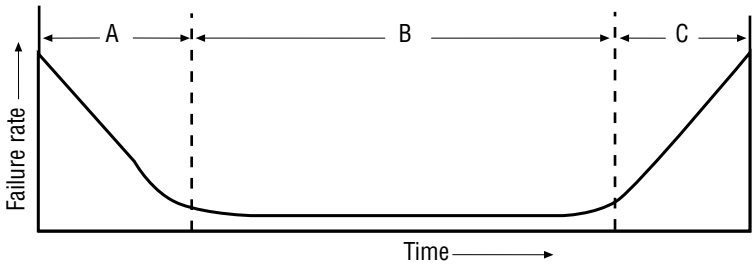
Three Years	Two Years
≤ 100 V DC	> 100 V DC

After an extended storage period, the leakage current value may exceed the rated value and, before the output measurement, a re-anodisation process is required.

It could be realised by applying the rated voltage at room temperature for one hour. In any case it is advisable to use a maximum charging current of 5mA or twice typical value specified for each series.

Reliability

With the advancements in aluminium electrolytic capacitor technology, the capacitors used in equipments must have a very long life characteristics and must operate even under severe conditions. A careful choice of a capacitor for a particular application and an adequate installation in the circuit will assure a good service life. In any case any component will eventually fail, usually this occurs due to a slow, steady drift of parameters called wear-out; sometimes there is a sharp change in capacitor properties also called catastrophic failure. In general terms the failure rate of aluminium electrolytic capacitors follows a bathtub curve with time as shown here.



THE BATHTUB CURVE
Three different areas are defined where capacitor life could be observed: A, B, C.

(A) Initial Failure Period

This is the period during which failures are caused by deficiencies in design, structure, manufacturing processes or severe applications. Such failures occur soon after the components are exposed to circuit conditions. In aluminium electrolytic capacitors, these failures are either corrected through ageing or found during the 100% inspection processes and do not reach the field.

Initial failures due to a bad application of the capacitor such as inappropriate ambient conditions, over voltage, reverse voltage or excessive ripple current can be avoided with an adequate circuit design and careful installation.

(B) Random Failure Period (Useful Life)

Here the failure rate is low. During this period a constant failure rate is shown. These failures are not related to operating time but to application conditions. This period of useful life is normally calculated with a confidence level of 60%.

(C) Wear-Out Failure Period

In this period the properties of a component gradually deteriorate and the failure rate increases with time. Aluminium electrolytic capacitors end their useful life during this period. Criteria for judging failures varies with application design factors. Reliability represents this measure of the expected failure rate during the useful life of the capacitor.

Failure rate is defined as the number of components failing during a unit working time. It is expressed by following formula:
1 fit = 1 10^{-9}/hours (failure in time) also indicated as percentage of failures in 1000 hours.

λ ***= number of failures / (number of components tested x working time)***

MTBF (Mean Time Before Failure) could be calculated according to failure rate following the relationship:
MTBF= 1/λ
This value defines the failure frequency occurring on a large number of components inside an equipment, therefore is not suitable to predict failure on one single capacitor. Statistical calculations should be used instead. It is helpful as a design tool to determinate reliability features for components and complex systems.

EXAMPLE
A batch of 10000 capacitor tested, for 40000 operating hours, finding 4 failures.
λ= 4/10000 x 1/40000 h = 10 fit = 0.001% /1000 hours

The failure rate calculation is derived from endurance tests at specified temperatures, taking into account all measurable and non-measurable defects arised. Kind of measurable defects are meant for each type of capacitor endurance test point. While non-measurable defects are meant to be open and short circuit, safety valve break or electrolyte leakage. Ripple current and ambient temperature contribute to the internal temperature rise of the capacitor, so affecting its useful life. In general, every 10°C reduction in temperature carries a multiplier factor of two times the life value.

Useful Life

The typical useful life represents a period of time until the end of life of the capacitor. The end is caused by different incidents (or different failure modes) such as the following:

Mechanical Failures

Operation of safety vent due to overpressure, splitting of PVC sleeve and damaged insulation, unusable terminals, external short circuiting of terminals due to spilling of electrolyte.

Over Failures

When a short or open circuit occurs.

Electrical Characteristics Failures

In a group of capacitors considered to have reached the end when 3% of them have failed, useful life is influenced by following failure criteria:

a) ESR > 3 times initial value
b) Impedance > 3 times initial value
c) Capacitance value change of greater than 30%
d) Leakage current over initial limit.

In some cases, it is possible that even larger values of the above indicated could be applied without leading to failure, but generally capacitors tested in the laboratory at Kendeil-Indfarad show standard behaviour around these limits. Obviously, when operating at lower voltages together with moderate temperature as well as lower values of current, the final life expectation should be better. When an adequate cooling system has been provided, the overall performance is substantially better and the life of the capacitor is improved.

In normal conditions, statistics are produced after extensive endurance tests compliant to standard specifications. Depending on the type of capacitor, endurance tests have been undertaken over different lengths of time using capacitors coming from production batches. Data is collected and results summarized, so we have generated wide information displayed graphically for each model, which can be seen on each product datasheet.

The useful lifetime regarding the ambient temperature is given by following practical formula:

$$\textit{Useful Lifetime} = L_{OPMAX} \times 2^{(Tmax+10-Tc)/10}$$

Where:
Useful Lifetime - expressed in hours
L_{OPMAX} = Lifetime at max rated operating temperature (eg.: 10000 hs at 85°C)
T_{max} = Actual operating temperature of the capacitors (eg.: 85°C for KI01 type)
T_c = Temperature of the core = Internal hot spot of the capacitor (°C)

Example:
For a capacitor that has an internal core temperature of 55.43°C, at ambient temperature of 45°C, the life, expected calculation gives the following:
Userful Lifetime
$= 10000 \times 2^{(85+10-55.43)/10}$
$= 10000 \times 2^{3.956}$
= 155194 hours

Note
Applicable temperature range is the temperature depending on the capacitor type characteristics, usually situated in the operating range of -40°C to +85°C or 105°C . Typically, each 10°C step carries a reduction factor of 2 times the lifetime value. Useful life is also determined by ripple current.

It is advisable not to apply a ripple current exceeding the max ripple current allowed as this will shorten capacitor life and may result in opening of the vent or catastrophic failure. It often happens that heating due to ripple current is even more severe than ambient temperature stress.

Guidelines For Aluminium Electrolytic Capacitors

- Polarity
- Charge - Discharge Applications
- Insulation
- Operating Temperature
- Climatic Conditions
- Mechanical Stress
- Soldering
- Cleaning
- Storage
- Safety
- Balancing Resistors
- Flammability

Polarity

In DC applications polarity is required; if polarity is reversed, the circuit life will be shortened or the capacitor may be damaged. Generally, an intermittent reverse voltage of 1V DC is allowed. If during operation, it is possible that polarity could be reversed or unknown, extensive use of a bipolar capacitor is required.

Charge - Discharge Applications

Kendeil-Indfarad IKEN Series aluminium electrolytic capacitors are suitable for circuits in which a charge and discharge cycle is requested. The frequent cycles due to a charge or discharge operation could take some drop of cap value.In general one million of switching with rated voltage one cycle for second a time costant of 0.1 carries an overall capacitance decrease less then 10%.

Insulation

In general all aluminium electrolytic capacitors are covered with a PVC sleeve, that is also used for marking. The aluminium can is not insulated from the cathode, so when the internal element needs to be electrically insulated from the can, capacitors specially designed for insulation requirements should be used.

Operating Temperature

A capacitor should be chosen with a maximum specified temperature greater than the operating temperature of the application; this will increase the capacitor useful lifetime.

Climatic Conditions

All Kendeil-Indfarad IKEN Series capacitors maintain good behaviour under any climatic conditions when operating conditions are within the design specifications limits of each product type. Since each capacitor is hermetically sealed, the wet element inside impregnated with electrolyte will not be exposed to external conditions such as high pressure or vacuum.

Furthermore, all electrical parameters such as impedance, leakage current, ESR and capacitance, will not be significantly changed by these external conditions. Temperature range of Kendeil-Indfarad IKEN Series electrolytic capacitors (IEC 68-1):

Capacitor type	Range
KI01-KI07	-40°C + 85°C
KI02	-40°C + 105°C
KI03	-20°C + 70°C

Air Pressure

When operating at low values of external air pressure, there could also be an increase in the pressure inside the case. When an external vacuum exists, the pressure inside the capacitor could rise up to 1 bar. In these circumstances the internal vapour loss becomes greater resulting in an overall reduction in expected life.

Altitude

When in extreme altitude situations, consideration must be given to the shortening of capacitor life due to the reduced air density, preventing heat from being adequately dissipated from the external surfaces of the capacitor leading to an increase in internal temperatures.

Mechanical Stress

If excessive force is applied to terminations, they may break or their connections with the inside element may be badly affected. The distance between terminations holes on the circuit board should be the same as the spacing between terminations on the capacitor.

Screw Terminal

Excessive torque force applied in tightening the screws into terminals will result in stripping the threads and possibly increasing the contact resistance. On the other hand, if screws are not tightened enough, the high contact resistance will cause localized heating at terminals plus an early failure of the capacitor.

Application of Torque to Aluminium Threads

Please note the max applicable torque strength to screw type capacitors:
With M5 insert screw torque = 2Nm
With M6 insert screw torque = 4Nm
Screw torque strength for stud M8 = 4Nm
Screw torque strength for stud M12 = 8Nm

Cleaning

Aluminium can be aggressively attacked by halide ions, particularly by chloride ions. Even small amounts of chloride ions inside the capacitor will cause corrosion which contributes to rapid capacitance drop and venting. Therefore, the prevention of chloride contamination is the most important check point for quality control in production. Solvent proof capacitors are required when chlorinated hydrocarbons are used for cleaning. If aluminium electrolytic capacitors without the solvent-proof construction are present on the circuit board, alcohol based solvents are recommended for cleaning.

In this case, solvents such as methanol, ethanol, propanol and isopropanol should be used. Normal tests show that any detrimental effect is eliminated. An alkaline detergent may damage the aluminium metal and marking. Aqueous cleaning methods in conjunction with saponification are commonly used. However it is advisable to dry immediately with hot air, which is best achieved at 85°C for few minutes.

Storage

After having a capacitor exposed to high temperatures such as direct sunlight or heating elements, the capacitor life may be adversely affected. Also when capacitors have been stored under humid conditions for a long period of time, humidity will cause terminals to oxidize. Therefore it is highly recommended they should be stored at room temperature, in a dry place, out of direct sunlight.

A voltage treatment process should be applied after some years storage period. When capacitors have been stored above room temperature, the anode foil may react with the electrolyte causing increased leakage current values. Application of normal voltages to these capacitors may result in higher leakage current values, but in most cases, they will return to normal levels in short time.

However on occasion it is possible that a certain amount of gas will be generated which might cause the safety vent to open. Capacitors that have been stored for long time should be subjected to a voltage reforming process which will regenerate internal dielectric layers.

Safety

When an escape of electrolyte has occurred, wash the affected area with hot water. Use rubber gloves to avoid skin contact. Any contact with eyes should be immediately irrigated with water and medical advise is sought.

Kendeil-Indfarad electrolyte blends do not contain materials currently listed as carcinogetic or mutagenic such as polychlorinated biphenyls (PCB) or dimethylformamide (DMF). No Butyrolactone used as solvent.

Under exposure to electrolyte skin could become dry. Other irritations or effects may be caused to the mucous membranes particularly eyes, where conjunctivitis may result.

Balancing Resistors in series and parallel connections

The following explanation is given for a typical connection scheme, when two capacitors have been connected in series, this is a brief approach answering to the question “How much could be the maximum voltage applied to a capacitor?”
If we have two capacitors of 400V rated with ±20% tolerance range each.

Total voltage applied is 800V (Vcircuit), in the best situation each capacitor is well balanced. Anyway the maximum and minimum values due to the tolerance range is then put in the formula. It is easy to calculate the maximum exposing voltage to whom the minimum capacitor could be applied.

$$\mathbf{V_{MINCAP} = V_{circuit} \times (1+20\%) / (MIN_{tolerance} + MAX_{tolerance})}$$

Using the values from example, we have: V_{MINCAP} = 800 x 1.2 / (0.8 +1.2) = 480V
This is the real maximum voltage value applied to the capacitor in a serial connection. It is strongly recommended to use a resistor that would share the over-voltage. In the practical field of designing these kind of circuits, we have found that a good balancing system could be obtained using the following formula in which only the capacitor value is required.

We assume that a current from 15 to 20 times the leakage current value would be flowing in the resistor, therefore a simple relationship could be applied:

Balancing Resistor [kΩ] = 60,000 / Capacitance [µF]

The resistor should have very good characteristic, usually with tolerance range of ±5% but better tolerance range is preferred when dealing with high transients and a top level performance is required. When designing high current applications, a parallel configuration should be preferred.

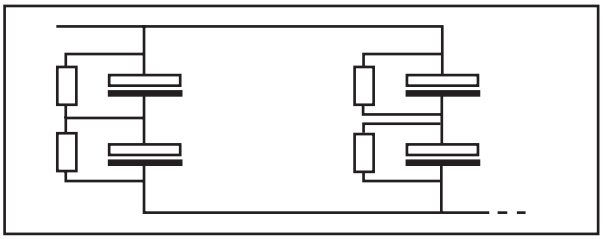
Practical Table

Capacitor	Balancing Resistor
470 µF	127 k Ω
680 µF	88 k Ω
1000 µF	60 k Ω
2200 µF	27 k Ω
4700 µF	13 k Ω
6800 µF	9 k Ω
10000 µF	6 k Ω

Configuration Schemes

Two ways of connecting balancing resistors are implemented in the industry, depending on design and experience. Both of them have important features that must be borne in mind for the appropriate performances required.

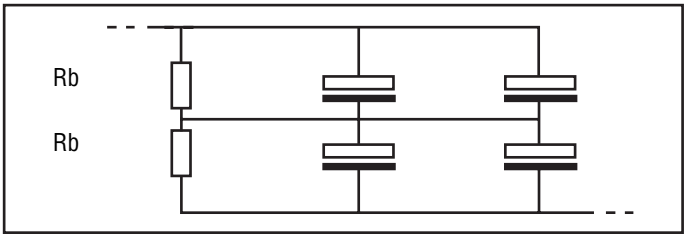
Single balancing resistor



(+) Plus features
When one capacitor fails, the adjacent capacitor will probably fail too, but the other capacitor will remain undamaged.

(-) Minus features
There are many resistors to be placed in the circuit.

Two parallel resistor



(+) Plus features
A better balancing system is achieved with “the most parallel capacitors used”.
The total leakage current as the sum of the single branches components gives a very good balancing system. This configuration needs only two resistors and since the delta LC would be a very small value, it could be realized also without any resistor.

(-) Minus features
When one capacitor fails, the parallel branch in which it is operating will also fail as the total voltage will be applied under operating voltage conditions.

FLAMMABILITY

Some component parts of a capacitor are suitable to burn depending on ambient temperature and adjacent elements, being made of plastic, PVC or other, even when classified as non flammable material.

In the table you find the main materials with self extinguish capability under normal circumstances:

Part	Use	Material	
Deck	for screw type terminal	Phenolic	No ignition non flammable
Sleeve	all screw type	PVC	No ignition
Vent Plug	for screw type terminal only	Silicone	Ignition non flammable
Electrolyte	all internal wound elements in each capacitor	Glycol based (*)	not self extinguishing non flammable (*1) flash point 110°C higher then rated 85° or 105° class

(*) NOTE FOR ELECTROLYTE

Kendeil-Indfarad uses glycol based electrolyte through all ranges of products.

The impregnation process is computer controlled with supervisor agent software to assure the correct time and level of electrolyte needed by each single capacitor. Different kinds of electrolyte blends are being used, especially designed for low voltage, medium voltage and high voltage range. Each production batch is controlled in the internal laboratory to test the specifications of recipes.

<120V	120V - 400V	>400V
Low Voltage	Medium Voltage	High Voltage

(*1) Flash point is defined as the lowest temperature at which a flame is ignited.
In our case, no flammable behaviour is possible as the rated class of capacitors are under that value.

PRINTING ON CAPACITOR

The picture shows the print on the sleeve of an IKEN Electrolytic capacitor
4700 µfd , 450VDC

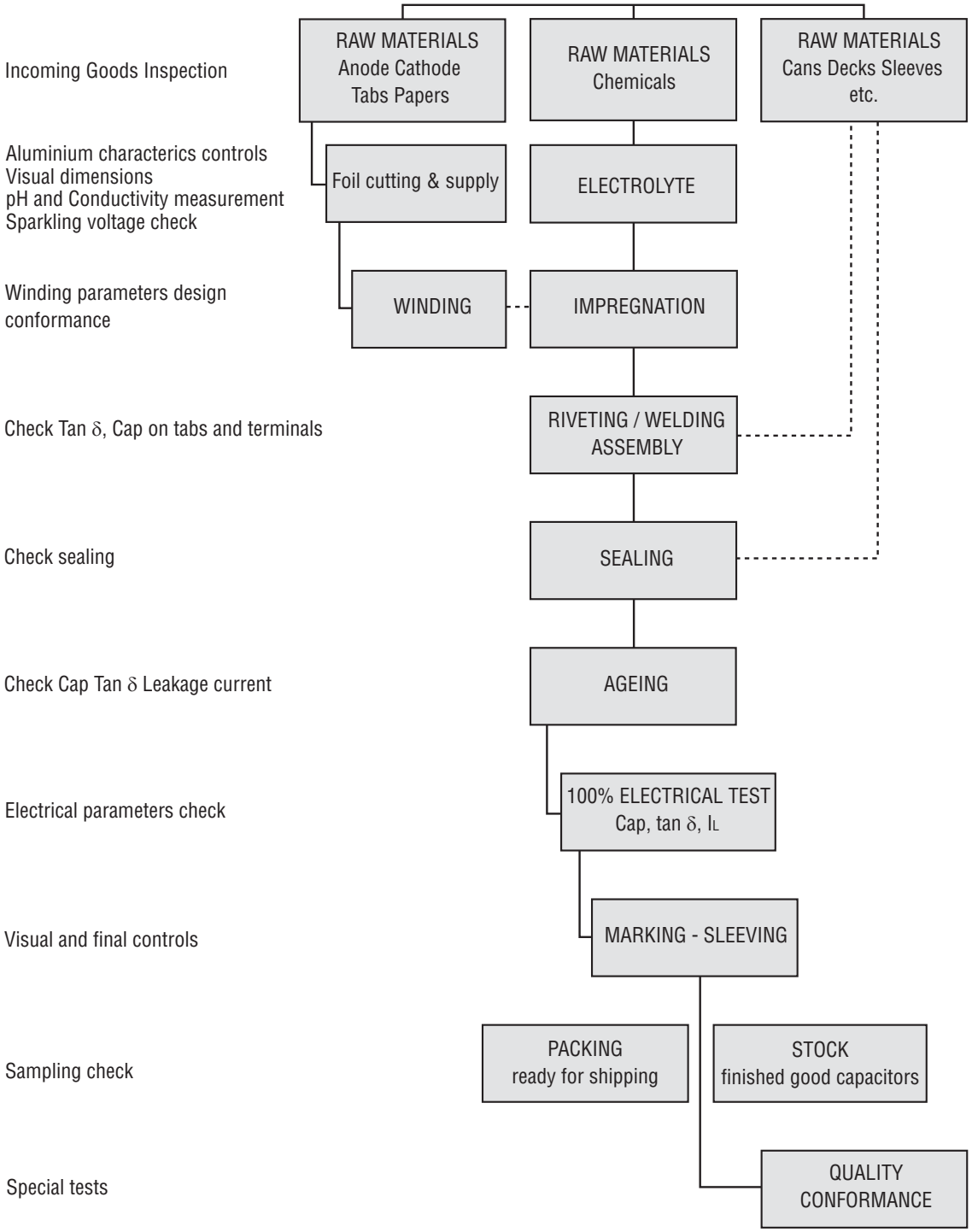
Where “M” indicates -20% to +20% tolerance on capacitance

The lines on the right shows the (-) polarity of the Capacitor (Cathode)

The next line “ 40 / 85 / 56”represents Environmental Classification

The bottom line indicates the lot number,
Where ,
1319 means that it has been made in the year 2013 , week 19
1105 means “production batch number”

Manufacturing Control Flow



IKEN Series KI01 TYPE -40°C +85°C 15000 H

- Surge-proof capacitor in aluminium can with insulation sleeve.
- Poles brought out to heavy duty screw terminals.
- To be mounted with ring clips or with threaded stud.
- Very high CV for unit volume with low ESR.
- High ripple current.
- Excellent electrical data in small dimensions case size.

Applications

Designed for professional power electronics. Switch mode power supplies, converters, filtering devices.

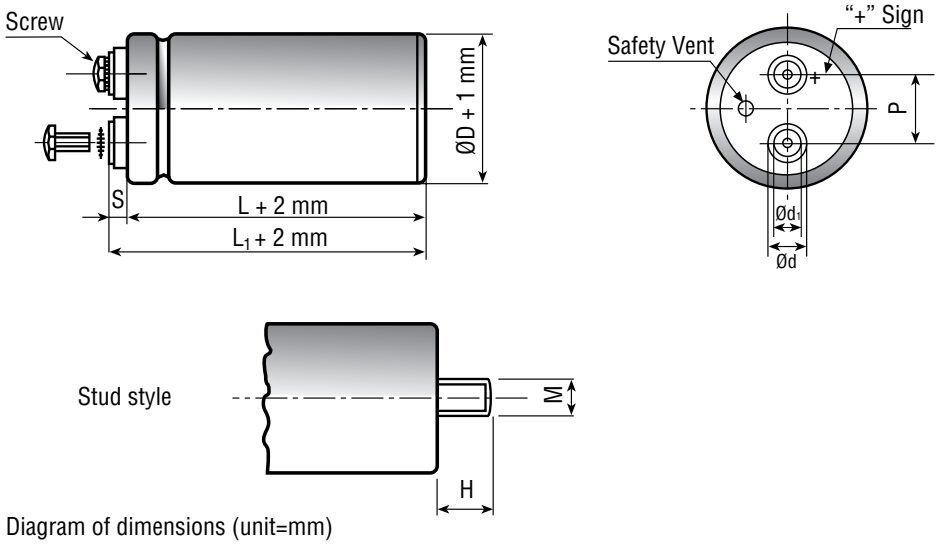


Diagram of dimensions (unit=mm)

ØD	d	d_1	P	M	H	Insert	Screw	$L_1 - L_{(-1+3)}$	$S_{(-1+1)}$
35	11	7.9	12.7	M 8	12	M5	5MA x 9.5	2.5	5
51	18.5	13	22.7	M 12	16	M5	5MA x 9.5	2.5	5
51	18.5	13	22.7	M 12	16	M5 Long	5MA x 9.5*	4.5	7
63	18.5	13	28.6	M 12	16	M5	5MA x 9.5	2.5	5
63	18.5	13	28.6	M 12	16	M5 Long	5MA x 9.5*	4.5	7
76	18.5	13	31.8	M 12	16	M5	5MA x 9.5	2.5	5
76	18.5	13	31.8	M 12	16	M5 Long	5MA x 9.5*	4.5	7
76	23.2	17.7	31.8	M 12	16	M6	6MA x 10	4.5	7
90	23.2	17.7	31.8	M 12	16	M6	6MA x 10	4.5	7

Note for M5 Long: (*) also available as 5MA x 12

Specifications

Temperature Range	Operating: -40°C +85°C (Environmental classification 40/85/56 IEC-68) Storage : Preferably below +25°C, not exceeding +40°C
Rated Voltage Range (V_r)	from 16V to 500V DC
Surge Voltage (V_p)	$V_P = 1.05\ V_r$ ($V_r > 450V$ DC) $V_P = 1.15\ V_r$ ($V_r \leq 250V$ DC) $V_P = 1.10\ V_r$ ($V_r > 250V$ DC)
Rated Capacitance Range	from 220 uF to 1,500,000 µF
Capacitance Tolerance	±20% at 100Hz, 20°C (M class IEC-62) on request: -10% +30% at 100 Hz, 20°C (Q class IEC-62)
Leakage Current (I_L) (mA, 5 min, 20°C)	max $I_L = 0.006\ C_r\ V_r + 4$ µA Product limit: $I_L = 0.003\ C_r\ V_r$ At 85°C max $I_L = 0.04\ C_r\ V_r$ µA
Ripple current (I_r)	Refer to table at 85°C and 100Hz. For different temperature and frequency multiplier must be used as follows: Frequency 50Hz 100Hz 500Hz 1000Hz >10kHz Multiplier 0.8 1.0 1.2 1.3 1.5 Ambient Temp 35°C 45°C 55°C 65°C 75°C 85°C 95°C Multiplier 2.2 2.1 1.8 1.6 1.4 1.0 0.5 Maximum internal temperature 98°C Due to the current load capability of the contact elements, the following limits must not be exceeded: Capacitor Diameter 35mm 51mm 63mm 76mm 90mm Maximum current 20A 30A 40A 50A 70A
Insulation Resistance	At 100V DC for 1 min is >100 MΩ across insulating sleeve and terminals.
Vibration Resistance	Frequency range: 10Hz to 55Hz, amplitude 0.75 mm Capacitor length ≤ 143 : max acceleration 10g for 3x2 h Capacitor length > 143 : max acceleration 5g for 3x0.5 h
Life test	After 2,000 hours application of rated voltage at 85°C capacitors meet characteristics aside Cap change ≤ 20% tan δ ≤ 200% Leakage current(I_L) < initial limit Impedance (Z) ≤ 200%
Shelf life	After leaving capacitors under no load for 500 hours at 85°C, when restored at 20°C meet specifications aside Cap change ≤ ±15% tan δ ≤ 150% Leakage current(I_L) < initial limit
Useful life	> 200,000 h at 40°C > 12,000 h at 85°C for $V_r \leq 100V$ and for $V_r \geq 500V$ > 15,000 h at 85°C for $100V < V_r < 500V$
Failure percentage Failure rate	≤ 1% (during useful life) ≤ 25 fit (25 10^{-9}/h) ($V_r \leq 160V$ DC) ≤ 33 fit (33 10^{-9}/h) ($V_r > 160V$ DC)
Self inductance	Approx. 20 nH
Sectional Specifications / Reference	CECC 30.300 IEC 60384-4 Long Life Grade

IKEN Series KI01 Type Standard Ratings

Rated Voltage VDC

16V

Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**ESR** TYP m Ω 100 Hz 20°C	**Z** TYP m Ω 10 kHz 20°C	**Ir a.c.** A max 100 Hz 85°C	**Part Number** stud and insert style excluded
22000	35x60	0.35	18	16	6.6	KI01016223_M0E060
33000	35x60	0.40	15	13	9.2	KI01016333_M0E060
33000	35x79	0.40	15	13	10.2	KI01016333_M0E079
47000	35x79	0.55	13	12	10.8	KI01016473_M0E079
47000	51x79	0.55	13	12	12.5	KI01016473_M0G079
68000	51x79	0.60	12	11	15.7	KI01016683_M0G079
100000	51x79	0.80	10	11	16.5	KI01016104_M0G079
100000	51x105	0.80	10	10	18.7	KI01016104_M0G105
150000	51x105	1.10	10	9	19.5	KI01016154_M0G105
150000	63x105	1.10	10	9	21.5	KI01016154_M0H105
220000	63x105	1.50	8	8	22.4	KI01016224_M0H105
330000	63x105	1.90	8	8	23.3	KI01016334_M0H105
330000	76x105	1.90	8	8	25.0	KI01016334_M0J105
470000	76x105	1.90	5	5	28.5	KI01016474_M0J105
470000	76x143	1.90	5	5	32.0	KI01016474_M0J143
680000	76x143	2.50	4	4	32.5	KI01016684_M0J143
1000000	76x143	2.50	3	3	34.5	KI01016105_M0J143
1500000	90x220	3.00	3	3	48.7	KI01016155_M0L220

Rated Voltage VDC

25V

Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**ESR** TYP m Ω 100 Hz 20°C	**Z** TYP m Ω 10 kHz 20°C	**Ir a.c.** A max 100 Hz 85°C	**Part Number** stud and insert style excluded
10000	35x60	0.25	27	21	5.9	KI01025103_M0E060
15000	35x60	0.28	16	12	9.3	KI01025153_M0E060
22000	35x79	0.35	18	16	11.8	KI01025223_M0E079
33000	35x79	0.40	15	14	12.1	KI01025333_M0E079
33000	51x79	0.40	15	14	13.3	KI01025333_M0G079
47000	51x79	0.50	12	10	15.7	KI01025473_M0G079
68000	51x79	0.60	10	9	16.4	KI01025683_M0G079
68000	51x105	0.60	10	9	18.7	KI01025683_M0G105
100000	63x105	0.70	10	9	19.5	KI01025104_M0H105
100000	51x105	0.70	10	9	21.5	KI01025104_M0G105
150000	63x105	1.00	9	9	22.0	KI01025154_M0H105
150000	76x105	1.00	9	9	23.5	KI01025154_M0J105
220000	76x105	1.50	9	9	24.2	KI01025224_M0J105
220000	76x143	1.50	9	9	28.5	KI01025224_M0J105
330000	76x143	2.00	9	9	30.5	KI01025334_M0J143
470000	76x214	2.00	5	5	35.6	KI01025474_M0J214

IKEN Series KI01 Type Standard Ratings

Rated Voltage VDC

40V

Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**ESR** TYP m Ω 100 Hz 20°C	**Z** TYP m Ω 10 kHz 20°C	**Ir a.c.** A max 100 Hz 85°C	**Part Number** stud and insert style excluded
10000	35x60	0.20	18	12	6.5	KI01040103_M0E060
15000	35x60	0.25	13	10	7.4	KI01040153_M0E060
15000	35x79	0.25	13	10	8.6	KI01040153_M0E079
22000	35x79	0.30	16	14	8.9	KI01040223_M0E079
22000	51x79	0.30	16	14	10.4	KI01040223_M0G079
33000	51x79	0.35	15	13	13.5	KI01040333_M0G079
47000	51x79	0.40	10	9	14.2	KI01040473_M0G079
47000	51x105	0.40	10	9	15.1	KI01040473_M0G105
47000	63x105	0.40	10	9	17.6	KI01040473_M0H105
68000	51x105	0.50	10	8	18.2	KI01040683_M0G105
68000	63x105	0.50	10	8	19.5	KI01040683_M0H105
100000	63x105	0.60	9	8	21.2	KI01040104_M0H105
100000	76x75	0.70	8	8	21.0	KI01040104_M0J075
150000	76x105	0.90	9	8	25.7	KI01040154_M0J105
220000	76x143	1.00	6	6	31.5	KI01040224_M0J143
330000	76x214	1.20	5	5	38.5	KI01040334_M0J214

Rated Voltage VDC

50V

Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**ESR** TYP m Ω 100 Hz 20°C	**Z** TYP m Ω 10 kHz 20°C	**Ir a.c.** A max 100 Hz 85°C	**Part Number** stud and insert style excluded
4700	35x60	0.20	33	30	5.6	KI01050472_M0E060
6800	35x60	0.20	25	24	7.0	KI01050682_M0E060
10000	35x60	0.20	21	20	10.0	KI01050103_M0E060
15000	35x79	0.25	17	15	11.3	KI01050153_M0E079
22000	51x79	0.30	16	13	13.1	KI01050223_M0G079
33000	51x105	0.35	15	13	16.0	KI01050333_M0G105
33000	63x105	0.35	15	13	17.5	KI01050333_M0H105
47000	51x105	0.40	12	10	16.2	KI01050473_M0G105
47000	63x105	0.40	12	10	18.3	KI01050473_M0H105
68000	63x105	0.60	12	9	18.0	KI01050683_M0H105
68000	76x105	0.60	12	9	22.1	KI01050683_M0J105
100000	76x105	0.90	8	8	23.8	KI01050104_M0J105
100000	76x143	0.90	8	8	25.8	KI01050104_M0J143
150000	76x143	1.00	6	6	31.5	KI01050154_M0J143

IKEN Series KI01 Type Standard Ratings

Rated Voltage VDC

63V

Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**ESR** TYP m Ω 100 Hz 20°C	**Z** TYP m Ω 10 kHz 20°C	**Ir a.c.** A max 100 Hz 85°C	**Part Number** stud and insert style excluded
4700	35x60	0.15	29	25	6.2	KI01063472_M0E060
6800	35x60	0.18	21	20	7.0	KI01063682_M0E060
6800	35x79	0.18	21	20	8.2	KI01063682_M0E079
10000	35x79	0.20	21	20	8.7	KI01063103_M0E079
10000	51x79	0.20	18	16	10.1	KI01063103_M0G079
15000	51x79	0.25	15	13	11.1	KI01063153_M0G079
22000	51x79	0.30	13	11	12.4	KI01063223_M0G079
22000	51x105	0.30	13	11	14.6	KI01063223_M0G105
33000	51x105	0.35	11	10	15.6	KI01063333_M0G105
33000	63x105	0.35	11	10	17.9	KI01063333_M0H105
47000	51x105	0.45	10	9	15.8	KI01063473_M0G105
47000	63x105	0.45	11	10	18.8	KI01063473_M0H105
68000	76x105	0.50	11	10	25.7	KI01063683_M0J105
100000	76x105	0.55	8	8	31.5	KI01063104_M0J105
100000	76x143	0.55	8	8	34.5	KI01063104_M0J143
150000	76x143	0.60	6	6	36.1	KI01063154_M0J143

Rated Voltage VDC

75V

Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**ESR** TYP m Ω 100 Hz 20°C	**Z** TYP m Ω 10 kHz 20°C	**Ir a.c.** A max 100 Hz 85°C	**Part Number** stud and insert style excluded
4700	35x60	0.15	29	25	5.4	KI01075472_M0E060
6800	35x79	0.18	20	20	8.5	KI01075682_M0E079
10000	51x79	0.20	18	16	11.0	KI01075103_M0G079
15000	51x105	0.25	15	13	12.7	KI01075153_M0G105
22000	51x105	0.30	12	11	15.2	KI01075223_M0G105
22000	63x105	0.30	12	11	16.2	KI01075223_M0H105
33000	63x105	0.35	11	10	16.8	KI01075333_M0H105
33000	76x105	0.35	11	10	18.5	KI01075333_M0J105
47000	76x105	0.45	10	10	20.1	KI01075473_M0J105
47000	76x143	0.45	10	10	22.1	KI01075473_M0J143
68000	76x143	0.60	10	10	26.0	KI01075683_M0J143
100000	76x143	0.60	8	8	34.9	KI01075104_M0J143

IKEN Series KI01 Type Standard Ratings

Rated Voltage VDC

100V

Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**ESR** TYP m Ω 100 Hz 20°C	**Z** TYP m Ω 10 kHz 20°C	**Ir a.c.** A max 100 Hz 85°C	**Part Number** stud and insert style excluded
1500	35x60	0.15	84	65	4.0	KI01100152_M0E060
2200	35x60	0.15	57	47	5.0	KI01100222_M0E060
3300	35x60	0.15	48	39	5.3	KI01100332_M0E060
3300	35x79	0.15	48	39	6.8	KI01100332_M0E079
4700	35x79	0.15	30	26	7.5	KI01100472_M0E079
4700	51x79	0.15	30	26	10.0	KI01100472_M0G079
6800	51x79	0.20	23	20	11.1	KI01100682_M0G079
10000	51x79	0.20	16	14	11.9	KI01100103_M0G079
10000	51x105	0.20	16	14	13.9	KI01100103_M0G105
10000	63x105	0.20	16	14	14.5	KI01100103_M0H105
15000	51x105	0.25	13	12	14.8	KI01100153_M0G105
15000	63x105	0.25	13	12	17.5	KI01100153_M0H105
22000	63x105	0.25	12	12	18.2	KI01100223_M0H105
33000	76x105	0.25	10	10	23.1	KI01100333_M0J105
47000	76x143	0.30	10	9	30.2	KI01100473_M0J143
68000	76x143	0.30	8	8	36.5	KI01100683_M0J143
68000	76x214	0.40	6	5	39.5	KI01100683_M0J214

Rated Voltage VDC

160V

Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**ESR** TYP m Ω 100 Hz 20°C	**Z** TYP m Ω 10 kHz 20°C	**Ir a.c.** A max 100 Hz 85°C	**Part Number** stud and insert style excluded
1000	35x79	0.10	98	90	4.0	KI01160102_M0E079
1500	51x79	0.10	62	71	5.3	KI01160152_M0G079
2200	51x79	0.10	50	43	7.0	KI01160222_M0G079
3300	51x105	0.12	35	30	8.6	KI01160332_M0G105
4700	51x105	0.12	25	25	11.9	KI01160472_M0G105
4700	63x105	0.12	25	25	11.9	KI01160472_M0H105
6800	51x105	0.12	21	22	11.4	KI01160682_M0G105
6800	63x105	0.12	20	22	13.0	KI01160682_M0H105
10000	76x105	0.15	13	12	17.4	KI01160103_M0J105
10000	76x143	0.15	13	12	19.4	KI01160103_M0J143
15000	76x143	0.15	11	10	20.9	KI01160153_M0J143
22000	76x143	0.20	10	10	26.4	KI01160223_M0J143
33000	76x214	0.20	8	8	34.1	KI01160333_M0J214

IKEN Series KI01 Type Standard Ratings

Rated Voltage VDC

200V

Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**ESR** TYP m Ω 100 Hz 20°C	**Z** TYP m Ω 10 kHz 20°C	**Ir a.c.** A max 100 Hz 85°C	**Part Number** stud and insert style excluded
680	35X60	0.10	124	119	3.4	KI01200681_M0E060
1000	35x79	0.10	86	88	3.5	KI01200102_M0E079
1500	51x79	0.10	60	63	5.8	KI01200152_M0G079
2200	51x105	0.10	40	37	7.2	KI01200222_M0G105
3300	51x105	0.12	32	30	9.0	KI01200332_M0G105
3300	63x105	0.12	31	29	10.2	KI01200332_M0H105
4700	51x105	0.12	28	26	10.4	KI01200472_M0G105
4700	63x105	0.12	27	25	11.1	KI01200472_M0H105
5600	63x105	0.12	21	18	12.1	KI01200562_M0H105
6800	63x105	0.12	20	16	13.9	KI01200682_M0H105
6800	76x105	0.12	19	15	14.3	KI01200682_M0J105
8200	76x105	0.12	16	14	14.8	KI01200822_M0J105
10000	76x105	0.15	13	12	15.8	KI01200103_M0J105
10000	76x143	0.15	13	12	18.6	KI01200103_M0J143
15000	76x143	0.18	12	12	21.4	KI01200153_M0J143
22000	76x143	0.18	9	9	28.9	KI01200223_M0J143
33000	76x214	0.22	8	8	36.1	KI01200333_M0J214

Rated Voltage VDC

250V

Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**ESR** TYP m Ω 100 Hz 20°C	**Z** TYP m Ω 10 kHz 20°C	**Ir a.c.** A max 100 Hz 85°C	**Part Number** stud and insert style excluded
470	35x60	0.10	211	200	2.8	KI01250471_M0E060
680	35x79	0.10	127	121	3.5	KI01250681_M0E079
1000	51x79	0.10	86	88	4.1	KI01250102_M0G079
1500	51x79	0.10	64	56	5.0	KI01250152_M0G105
1500	51x105	0.10	74	65	6.1	KI01250152_M0G105
2200	51x105	0.10	40	36	7.5	KI01250222_M0G105
3300	51x105	0.12	31	26	9.8	KI01250332_M0G105
3300	63x105	0.12	30	25	11.0	KI01250332_M0H105
4700	63x105	0.12	24	21	11.8	KI01250472_M0H105
4700	76x105	0.12	20	18	13.2	KI01250472_M0J105
5600	76x105	0.12	17	16	13.8	KI01250562_M0J105
6800	76x105	0.12	15	13	14.1	KI01250682_M0J105
8200	76x143	0.12	14	13	16.0	KI01250822_M0J143
10000	76x143	0.13	13	12	19.7	KI01250103_M0J143
15000	76x143	0.13	11	11	21.9	KI01250153_M0J143
22000	76x214	0.14	10	9	34.2	KI01250223_M0J214

IKEN Series KI01 Type Standard Ratings

Rated Voltage VDC

350V

Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**ESR** TYP m Ω 100 Hz 20°C	**Z** TYP m Ω 10 kHz 20°C	**Ir a.c.** A max 100 Hz 85°C	**Part Number** stud and insert style excluded
470	35X60	0.10	170	136	3.3	KI01350471_M0E060
680	35X79	0.10	108	95	4.0	KI01350681_M0E079
1000	51x79	0.10	79	62	5.0	KI01350102_M0G079
1000	51x105	0.10	79	62	5.5	KI01350102_M0G105
1500	51x105	0.10	60	52	7.4	KI01350152_M0G105
2200	51x105	0.10	44	40	9.0	KI01350222_M0G105
2200	63x105	0.10	37	34	9.5	KI01350222_M0H105
3300	63x105	0.12	26	22	10.1	KI01350332_M0H105
3300	76x105	0.12	26	22	12.8	KI01350332_M0J105
4700	76x105	0.12	17	16	14.5	KI01350472_M0J105
4700	76x143	0.12	17	16	17.5	KI01350472_M0J143
5600	76x143	0.12	17	16	18.5	KI01350562_M0J143
6800	76x143	0.12	16	15	19.2	KI01350682_M0J143
8200	76x143	0.12	16	15	20.7	KI01350822_M0J143
10000	76x143	0.12	15	15	23.0	KI01350103_M0J143
10000	76x214	0.14	15	14	26.6	KI01350103_M0J214
15000	76x214	0.15	14	14	31.7	KI01350153_M0J214
22000	90x220	0.20	13	13	35.4	KI01350223_M0L220

Rated Voltage VDC

400V

Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**ESR** TYP m Ω 100 Hz 20°C	**Z** TYP m Ω 10 kHz 20°C	**Ir a.c.** A max 100 Hz 85°C	**Part Number** stud and insert style excluded
220	35x60	0.10	350	288	2.1	KI01400221_M0E060
330	35x60	0.10	290	273	2.8	KI01400331_M0E060
470	35x60	0.10	160	149	3.0	KI01400471_M0E060
470	35x79	0.10	165	155	3.5	KI01400471_M0E079
680	51x79	0.10	120	115	4.7	KI01400681_M0G079
680	51x105	0.10	124	120	5.1	KI01400681_M0G105
1000	51x79	0.10	105	95	5.8	KI01400102_M0G079
1000	51x105	0.10	110	85	6.3	KI01400102_M0G105
1500	51x105	0.10	65	55	7.0	KI01400152_M0G105
1500	63x105	0.10	65	55	7.9	KI01400152_M0H105
2200	51x105	0.10	50	47	8.3	KI01400222_M0G105
2200	63x105	0.10	50	47	9.0	KI01400222_M0H105
2200	76x105	0.10	50	47	10.7	KI01400222_M0J105
3300	63x105	0.12	35	30	11.0	KI01400332_M0H105
3300	76x105	0.12	35	30	13.1	KI01400332_M0J105
3300	76x143	0.12	35	30	14.2	KI01400332_M0J143
4700	76x105	0.15	30	29	14.9	KI01400472_M0J105
4700	76x143	0.15	30	29	16.8	KI01400472_M0J143
5600	76x143	0.15	26	25	19.0	KI01400562_M0J143
6800	76x143	0.15	20	18	19.5	KI01400682_M0J143
8200	76x143	0.15	22	20	19.0	KI01400822_M0J143
10000	76x143	0.15	22	20	19.0	KI01400103_M0J143
10000	76x214	0.15	20	19	26.0	KI01400103_M0J214
15000	90x220	0.20	15	12	33.5	KI01400153_M0L220

IKEN Series KI01 Type Standard Ratings

Rated Voltage VDC

450V

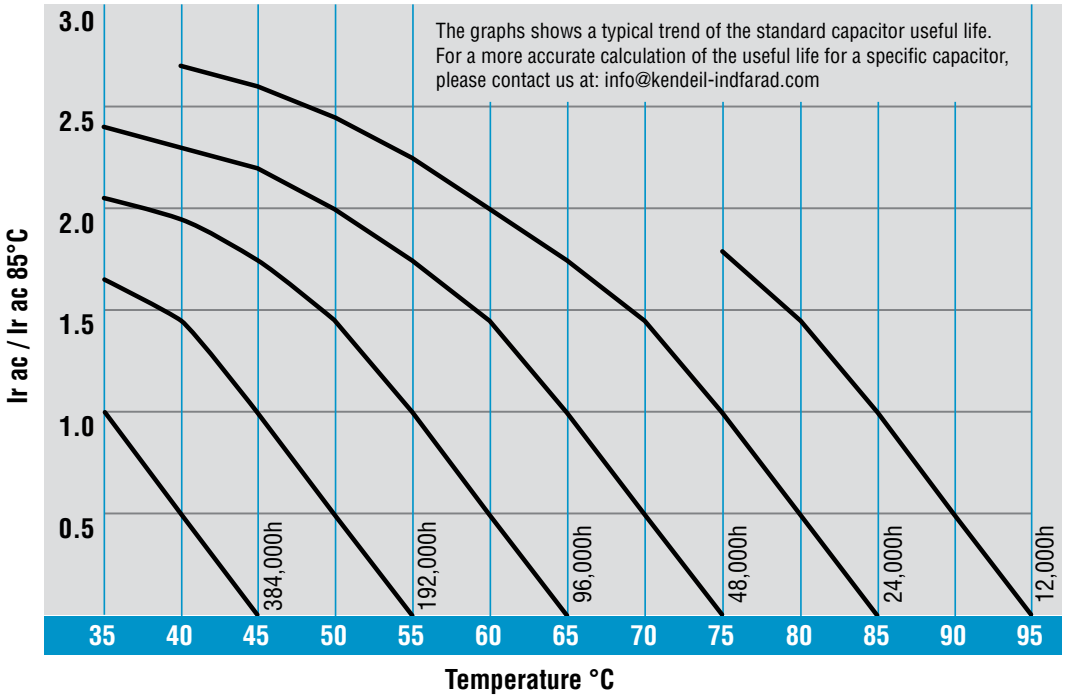
Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**ESR** TYP m Ω 100 Hz 20°C	**Z** TYP m Ω 10 kHz 20°C	**Ir a.c.** A max 100 Hz 85°C	**Part Number** stud and insert style excluded
220	35X60	0.10	360	300	2.0	KI01450221_M0E060
330	35X60	0.10	240	210	2.8	KI01450331_M0E060
470	51x79	0.10	200	179	4.0	KI01450471_M0G079
680	51X79	0.10	140	128	4.4	KI01450681_M0G079
680	51x105	0.10	140	128	5.0	KI01450681_M0G105
1000	51x79	0.10	100	88	4.8	KI01450102_M0G079
1000	51x105	0.10	100	88	6.4	KI01450102_M0G105
1500	51X105	0.10	67	55	7.1	KI01450152_M0G105
1500	63x105	0.10	67	55	8.0	KI01450152_M0H105
2200	63x105	0.10	60	55	9.0	KI01450222_M0H105
2200	76x105	0.10	60	47	11.2	KI01450222_M0J105
2200	76x143	0.10	60	47	12.5	KI01450222_M0J143
3300	76x105	0.12	35	30	11.2	KI01450332_M0J105
3300	76x143	0.12	35	30	12.9	KI01450332_M0J143
4700	76x143	0.15	32	30	15.0	KI01450472_M0J143
5600	76x143	0.15	26	25	19.0	KI01450562_M0J143
6800	76x143	0.15	23	22	19.0	KI01450682_M0J143
8200	76x143	0.15	22	20	19.0	KI01450822_M0J143
10000	76x143	0.20	22	20	19.0	KI01450103_M0J143
10000	76x214	0.20	20	19	23.1	KI01450103_M0J214
12000	76x214	0.20	15	12	29.8	KI01450123_M0J214
15000	90x220	0.20	14	12	32.6	KI01450153_M0L220

Rated Voltage VDC

500V

Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**ESR** TYP m Ω 100 Hz 20°C	**Z** TYP m Ω 10 kHz 20°C	**Ir a.c.** A max 100 Hz 85°C	**Part Number** stud and insert style excluded
1000	51x105	0.15	125	114	4.0	KI01500102_M0G105
1500	63x105	0.15	100	91	5.2	KI01500152_M0H105
2200	76x105	0.15	70	66	7.4	KI01500222_M0J105
2200	76x143	0.15	70	66	8.2	KI01500222_M0J143
3300	76x143	0.15	55	53	10.3	KI01500332_M0J143
4700	76x143	0.15	35	32	11.6	KI01500472_M0J143
5600	76x214	0.15	26	22	19.8	KI01500562_M0J214
6800	76x214	0.15	24	22	20.2	KI01500682_M0J214

Useful Life IKEN Series KI01



The graphs shows a typical trend of the standard capacitor load life. For a more accurate calculation of the load life for a specific capacitor, please contact us at our website www.kendeil-indfarad.com

IKEN Series KI02 TYPE -40°C +105°C 5000H

- Surge-proof capacitor in aluminium can with insulation sleeve.
- Poles brought out to heavy duty screw terminals.
- To be mounted with ring clips or with threaded stud
- Very high CV for unit volume with low ESR and impedance.
- High ripple current capability. Extended temperature range.
- High level reliability with outstanding high frequency characteristics.

Applications

High professional power supplies. Switch power supplies, power converters, filtering devices, motor drive.

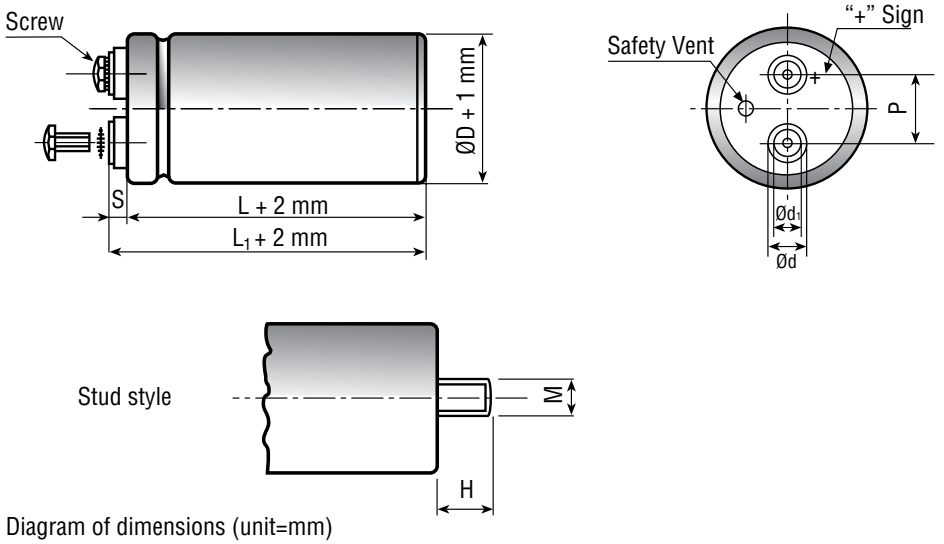


Diagram of dimensions (unit=mm)

ØD	d	d_1	P	M	H	Insert	Screw	$L_1 - L_{(-1+3)}$	$S_{(-1+1)}$
35	11	7.9	12.7	M 8	12	M5	5MA x 9.5	2.5	5
51	18.5	13	22.7	M 12	16	M5	5MA x 9.5	2.5	5
51	18.5	13	22.7	M 12	16	M5 Long	5MA x 9.5*	4.5	7
63	18.5	13	28.6	M 12	16	M5	5MA x 9.5	2.5	5
63	18.5	13	28.6	M 12	16	M5 Long	5MA x 9.5*	4.5	7
76	18.5	13	31.8	M 12	16	M5	5MA x 9.5	2.5	5
76	18.5	13	31.8	M 12	16	M5 Long	5MA x 9.5*	4.5	7
76	23.2	17.7	31.8	M 12	16	M6	6MA x 10	4.5	7
90	23.2	17.7	31.8	M 12	16	M6	6MA x 10	4.5	7

Note for M5 Long: (*) also available as 5MA x 12

Specifications

Temperature Range	Operating: -40°C +105°C (Environmental classification 40/105/56 IEC-68) Storage : Preferably below +25°C, not exceeding +40°C
Rated Voltage Range (V_r)	from 16V to 450V DC
Surge Voltage (V_p)	$V_P = 1.15\ V_r$ ($V_r \leq 250$V DC) $V_P = 1.10\ V_r$ ($V_r > 250$V DC)
Rated Capacitance Range	from 100 µF to 470,000 µF
Capacitance Tolerance	±20% at 100 Hz, 20°C (M class IEC-62) on request: -10% +30% at 100 Hz, 20°C (Q class IEC-62)
Leakage Current (I_L) (mA, 5 min, 20°C)	max $I_L = 0.003\ C_r\ V_r + 4$ µA At 85°C max $I_L = 0.02\ C_r\ V_r$ µA
Ripple current (I_r)	Refer to table at 105°C and 100Hz. For different temperature and frequency multiplier must be used as follows: Frequency 50Hz 100Hz 500 Hz 1000Hz >10kHz Multiplier 0.8 1.0 1.2 1.3 1.5 Ambient Temp 35°C 45°C 55°C 65°C 75°C 85°C 95°C 105°C 110°C Multiplier 3.0 2.80 2.60 2.40 2.20 1.80 1.5 1.0 0.5 Maximum internal temperature 108°C Due to the current load capability of the contact elements, the following limits must not be exceeded: Capacitor Diameter 35mm 51mm 63mm 76mm 90mm Maximum current 20A 30A 40A 50A 70A
Insulation Resistance	At 100V DC for 1 min is >100 MΩ across insulating sleeve and terminals.
Vibration Resistance	Frequency range: 10 Hz to 55 Hz, amplitude 0.75 mm Capacitor length ≤ 143 : max acceleration 10g for 3x2 h Capacitor length > 143 : max acceleration 5g for 3x0.5 h
Life test	After 2,000 hours application of rated voltage at 105°C capacitors meet characteristics aside Cap change ≤ 20% tan δ ≤ 200% Leakage current(I_L) < initial limit Impedance (Z) ≤ 200%
Shelf life	After leaving capacitors under no load for 500 hours at 105°C, when restored at 20°C meet specifications aside Cap change ≤ ±15% tan δ ≤ 150% Leakage current(I_L) < initial limit
Useful life	250,000 h at 40°C 15,000 h at 85°C 5,000 h at 105°C
Failure percentage Failure rate	≤ 1% (during useful life) ≤ 30 fit (30 10^{-9}/h) ($V_r \leq 160$V DC), ≤ 40 fit (40 10^{-9}/h) ($V_r > 160$V DC)
Self inductance	Approx. 20 nH
Sectional Specifications / Reference	CECC 30.300 IEC 60384-4 Long Life Grade

IKEN Series KI02 Type Standard Ratings

Rated Voltage VDC

16V

Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**ESR** TYP m Ω 100 Hz 20°C	**Z** TYP m Ω 10 kHz 20°C	**Ir a.c.** A max 100 Hz 105°C	**Part Number** stud and insert style excluded
10000	35x60	0.25	25	24	3.3	KI02016103_M0E060
15000	35x60	0.30	16	16	3.5	KI02016153_M0E060
22000	35x60	0.35	12	12	4.4	KI02016223_M0E060
33000	35x60	0.40	12	12	4.6	KI02016333_M0E060
47000	35x79	0.55	9	10	7.5	KI02016473_M0E079
68000	51x79	0.60	8	8	11.9	KI02016683_M0G079
100000	51x105	0.80	8	8	12.3	KI02016104_M0G105
150000	63x105	1.10	7	7	15.4	KI02016154_M0H105
220000	76x105	1.50	7	7	18.8	KI02016224_M0J105
330000	76x105	1.90	7	7	19.7	KI02016334_M0J105
470000	76x143	2.00	6	6	22.5	KI02016474_M0J143

Rated Voltage VDC

25V

Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**ESR** TYP m Ω 100 Hz 20°C	**Z** TYP m Ω 10 kHz 20°C	**Ir a.c.** A max 100 Hz 105°C	**Part Number** stud and insert style excluded
10000	35x60	0.20	23	18	3.8	KI02025103_M0E060
15000	35x60	0.25	16	12	4.8	KI02025153_M0E060
22000	35x60	0.30	12	12	7.0	KI02025223_M0E060
33000	51x79	0.35	10	10	8.9	KI02025333_M0G079
47000	51x79	0.40	9	9	11.6	KI02025473_M0G079
68000	51x105	0.50	8	8	13.0	KI02025683_M0G105
100000	63x105	0.60	8	8	15.8	KI02025104_M0H105
150000	76x105	0.90	7	7	18.3	KI02025154_M0J105
220000	76x143	1.30	7	7	21.6	KI02025224_M0J143
330000	76x143	2.00	7	7	23.8	KI02025334_M0J143

Rated Voltage VDC

40V

Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**ESR** TYP m Ω 100 Hz 20°C	**Z** TYP m Ω 10 kHz 20°C	**Ir a.c.** A max 100 Hz 105°C	**Part Number** stud and insert style excluded
4700	35x60	0.20	31	29	3.3	KI02040472_M0E060
6800	35x60	0.20	23	20	3.9	KI02040682_M0E060
10000	35x79	0.20	16	12	4.8	KI02040103_M0E079
15000	35x79	0.20	12	10	5.4	KI02040153_M0E079
22000	51x79	0.25	10	10	8.9	KI02040223_M0G079
33000	51x105	0.35	10	10	11.2	KI02040333_M0G105
47000	51x105	0.45	9	9	13.8	KI02040473_M0G105
47000	63x105	0.45	9	9	14.5	KI02040473_M0H105
68000	63x105	0.60	7	7	15.0	KI02040683_M0H105
68000	76x105	0.60	7	7	15.9	KI02040683_M0J105
100000	76x105	0.90	7	7	19.1	KI02040104_M0J105
100000	76x143	0.90	7	7	21.0	KI02040104_M0J143
150000	76x143	1.30	7	7	25.9	KI02040154_M0J143

IKEN Series KI02 Type Standard Ratings

Rated Voltage VDC

63V

Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**ESR** TYP m Ω 100 Hz 20°C	**Z** TYP m Ω 10 kHz 20°C	**Ir a.c.** A max 100 Hz 105°C	**Part Number** stud and insert style excluded
2200	35x60	0.15	72	60	2.5	KI02063222_M0E060
3300	35x60	0.15	48	39	3.5	KI02063332_M0E060
4700	35x60	0.15	33	28	4.2	KI02063472_M0E060
6800	35x79	0.18	18	13	6.3	KI02063682_M0E079
10000	51x79	0.20	15	11	8.2	KI02063103_M0G079
15000	51x79	0.25	15	13	8.9	KI02063153_M0G079
15000	51x105	0.25	13	10	18.0	KI02063153_M0G105
22000	51x105	0.30	11	10	11.8	KI02063223_M0G105
22000	63x105	0.30	11	10	13.5	KI02063223_M0H105
33000	63x105	0.35	11	10	14.8	KI02063333_M0H105
33000	76x105	0.35	11	8	16.6	KI02063333_M0J105
47000	76x105	0.45	9	8	17.7	KI02063473_M0J105
47000	76x143	0.45	9	8	19.0	KI02063473_M0J143
68000	76x105	0.45	8	8	20.1	KI02063683_M0J105
68000	76x143	0.70	8	8	22.8	KI02063683_M0J143
100000	76x143	0.70	8	8	24.1	KI02063104_M0J143

Rated Voltage VDC

100V

Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**ESR** TYP m Ω 100 Hz 20°C	**Z** TYP m Ω 10 kHz 20°C	**Ir a.c.** A max 100 Hz 105°C	**Part Number** stud and insert style excluded
1000	35x60	0.15	110	100	2.9	KI02100102_M0E060
1500	35x60	0.15	80	73	3.2	KI02100152_M0E060
2200	35x60	0.15	59	53	4.4	KI02100222_M0E060
3300	35x79	0.15	33	31	5.8	KI02100332_M0E079
4700	51x79	0.15	25	22	7.2	KI02100472_M0G079
6800	51x79	0.15	19	17	8.9	KI02100682_M0G079
6800	51x105	0.15	19	17	8.9	KI02100682_M0G105
10000	51x105	0.15	17	15	11.0	KI02100103_M0G105
10000	63x105	0.15	17	15	12.5	KI02100103_M0H105
15000	63x105	0.15	12	12	15.1	KI02100153_M0H105
22000	76x105	0.18	10	9	16.5	KI02100223_M0J105
33000	76x143	0.22	8	8	20.9	KI02100333_M0J143

IKEN Series KI02 Type Standard Ratings

Rated Voltage VDC

160V

Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**ESR** TYP m Ω 100 Hz 20°C	**Z** TYP m Ω 10 kHz 20°C	**Ir a.c.** A max 100 Hz 105°C	**Part Number** stud and insert style excluded
1000	35x79	0.11	105	90	3.3	KI02160102_M0E079
1500	51x79	0.11	65	60	4.1	KI02160152_M0G079
2200	51X105	0.11	46	43	4.8	KI02160222_M0G105
3300	63x105	0.11	32	30	6.8	KI02160332_M0H105
4700	63x105	0.11	27	25	8.5	KI02160472_M0H105
6800	76x105	0.13	23	20	11.3	KI02160682_M0J105
10000	76x105	0.14	22	20	14.2	KI02160103_M0J105
10000	76x143	0.15	17	16	14.9	KI02160103_M0J143
15000	76x143	0.20	16	12	17.2	KI02160153_M0J143
22000	76X214	0.20	11	10	19.0	KI02160223_M0J214

Rated Voltage VDC

200V

Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**ESR** TYP m Ω 100 Hz 20°C	**Z** TYP m Ω 10 kHz 20°C	**Ir a.c.** A max 100 Hz 105°C	**Part Number** stud and insert style excluded
680	35X60	0.11	133	98	2.5	KI02200681_M0E060
1000	51x79	0.11	85	64	4.6	KI02200102_M0G079
1500	51x105	0.11	65	58	5.1	KI02200152_M0G105
2200	51x105	0.11	60	53	6.1	KI02200222_M0G105
3300	63x105	0.11	40	35	7.9	KI02200332_M0H105
4700	63x105	0.11	25	23	8.7	KI02200472_M0H105
5600	63X105	0.11	22	20	9.8	KI02200562_M0H105
6800	76X105	0.11	18	16	11.8	KI02200682_M0J105
8200	76x105	0.11	17	15	12.8	KI02200822_M0J105
10000	76x105	0.13	15	13	14.5	KI02200103_M0J105
10000	76x143	0.15	13	12	16.0	KI02200103_M0J143
15000	76x143	0.20	12	11	17.3	KI02200153_M0J143
22000	76x214	0.20	11	10	18.9	KI02200223_M0J214

Rated Voltage VDC

250V

Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**ESR** TYP m Ω 100 Hz 20°C	**Z** TYP m Ω 10 kHz 20°C	**Ir a.c.** A max 100 Hz 105°C	**Part Number** stud and insert style excluded
470	35x60	0.11	211	193	2.0	KI02250471_M0E060
680	35x79	0.11	130	98	2.2	KI02250681_M0E079
1000	51x79	0.11	110	85	4.1	KI02250102_M0G079
1500	51x105	0.11	74	65	5.4	KI02250152_M0G105
2200	51x105	0.11	41	39	6.8	KI02250222_M0G105
3300	63x105	0.11	30	26	8.2	KI02250332_M0H105
4700	76x105	0.11	18	17	11.9	KI02250472_M0J105
5600	76x105	0.11	17	16	13.2	KI02250562_M0J105
6800	76x143	0.15	15	14	14.3	KI02250682_M0J143
8200	76x143	0.15	14	14	15.2	KI02250822_M0J143
10000	76x143	0.20	14	13	16.0	KI02250103_M0J143
15000	76x214	0.20	12	10	17.4	KI02250153_M0J214

IKEN Series KI02 Type Standard Ratings

Rated Voltage VDC

350V

Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**ESR** TYP m Ω 100 Hz 20°C	**Z** TYP m Ω 10 kHz 20°C	**Ir a.c.** A max 100 Hz 105°C	**Part Number** stud and insert style excluded
330	35x60	0.11	255	196	1.8	KI02350331_M0E060
470	35x79	0.11	170	141	2.1	KI02350471_M0E079
680	51x79	0.11	128	96	3.8	KI02350681_M0G079
1000	51x105	0.11	85	68	5.0	KI02350102_M0G105
1500	63x105	0.11	59	52	6.4	KI02350152_M0H105
2200	76x105	0.11	44	40	8.1	KI02350222_M0J105
3300	76x105	0.11	26	23	10.2	KI02350332_M0J105
4700	76x143	0.11	18	16	13.5	KI02350472_M0J143
5600	76x143	0.12	18	17	14.3	KI02350562_M0J143
6800	76x143	0.15	16	15	15.1	KI02350682_M0J143
8200	76x143	0.15	16	15	17.8	KI02350822_M0J143
10000	76x214	0.20	15	14	19.9	KI02350103_M0J214

Rated Voltage VDC

400V

Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**ESR** TYP m Ω 100 Hz 20°C	**Z** TYP m Ω 10 kHz 20°C	**Ir a.c.** A max 100 Hz 105°C	**Part Number** stud and insert style excluded
220	35x60	0.11	350	280	1.4	KI02400221_M0E060
330	35x60	0.11	250	210	2.2	KI02400331_M0E060
470	51x79	0.11	170	150	2.8	KI02400471_M0G079
680	51x79	0.11	110	100	3.2	KI02400681_M0G079
1000	51x105	0.11	95	82	4.1	KI02400102_M0G105
1500	63x105	0.11	64	53	5.8	KI02400152_M0H105
2200	63x105	0.11	45	53	6.0	KI02400222_M0H105
2200	76x105	0.11	45	39	7.3	KI02400222_M0J105
3300	76x143	0.11	28	25	11.1	KI02400332_M0J143
4700	76x143	0.11	24	23	12.8	KI02400472_M0J143
5600	76x143	0.12	21	17	12.9	KI02400562_M0J143
6800	76x214	0.15	19	15	15.0	KI02400682_M0J214
8200	76x214	0.15	18	16	18.0	KI02400822_M0J214
10000	90x220	0.20	16	14	22.5	KI02400103_M0L220

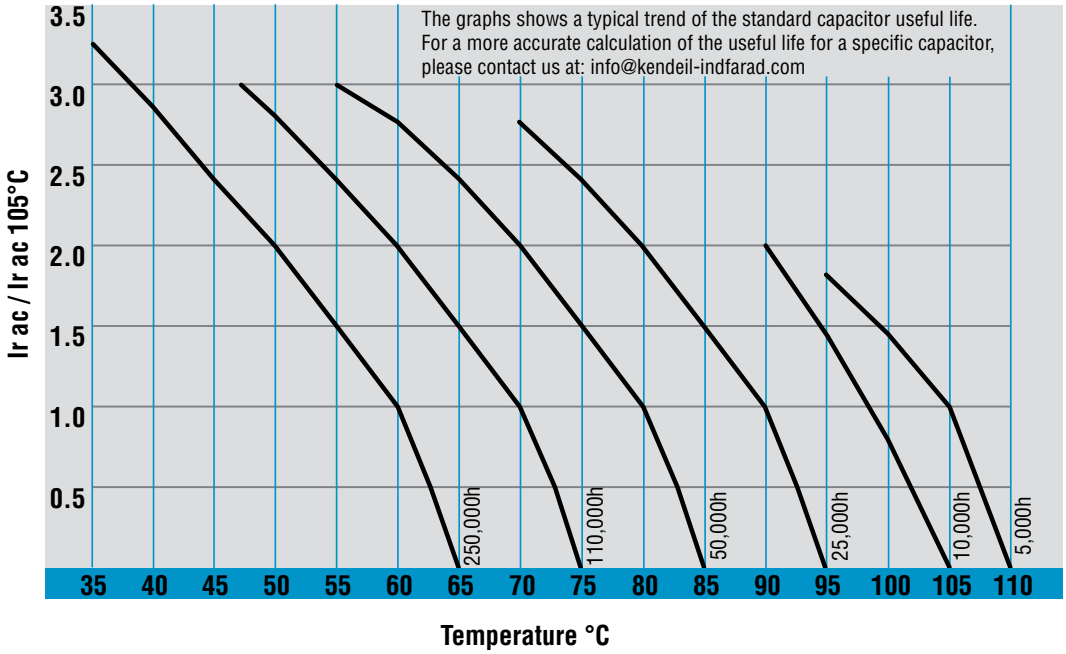
IKEN Series KI02 Type Standard Ratings

Rated Voltage VDC

450V

Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**ESR** TYP m Ω 100 Hz 20°C	**Z** TYP m Ω 10 kHz 20°C	**Ir a.c.** A max 100 Hz 105°C	**Part Number** stud and insert style excluded
100	35x60	0.11	800	650	1.2	KI02450101_M0E060
150	35x60	0.11	550	490	1.6	KI02450151_M0E060
220	35x60	0.11	370	310	1.8	KI02450221_M0E060
330	35x79	0.11	240	210	2.4	KI02450331_M0E079
470	51x79	0.11	200	179	3.0	KI02450471_M0G079
680	51x105	0.11	140	128	4.2	KI02450681_M0G105
1000	51x105	0.11	100	88	4.4	KI02450102_M0G105
1000	63x105	0.11	100	88	5.3	KI02450102_M0H105
1500	63x105	0.11	63	57	5.7	KI02450152_M0H105
1500	76x105	0.11	63	57	6.6	KI02450152_M0J105
2200	76x143	0.11	60	47	8.8	KI02450222_M0J143
3300	76x143	0.15	35	30	10.4	KI02450332_M0J143
4700	76x143	0.15	28	25	10.9	KI02450472_M0J143
4700	76x214	0.15	28	25	12.8	KI02450472_M0J214
5600	76x143	0.12	21	17	12.9	KI02450562_M0J143
6800	76x214	0.15	21	16	15.5	KI02450682_M0J214
8200	76x214	0.15	18	16	19.2	KI02450822_M0J214
10000	90x220	0.20	16	14	22.5	KI02450103_M0L220

Useful Life IKEN Series KI02



The graphs shows a typical trend of the standard capacitor load life. For a more accurate calculation of the load life for a specific capacitor, please contact us at our website www.kendeil-indfarad.com

IKEN Series KI03 TYPE -20°C +70°C

- Surge-proof capacitor in aluminium can with insulation sleeve.
- Heavy charge/discharge duty.
- To be mounted with ring clips or with threaded stud.

Applications
Extreme application welding. Strobe applications.

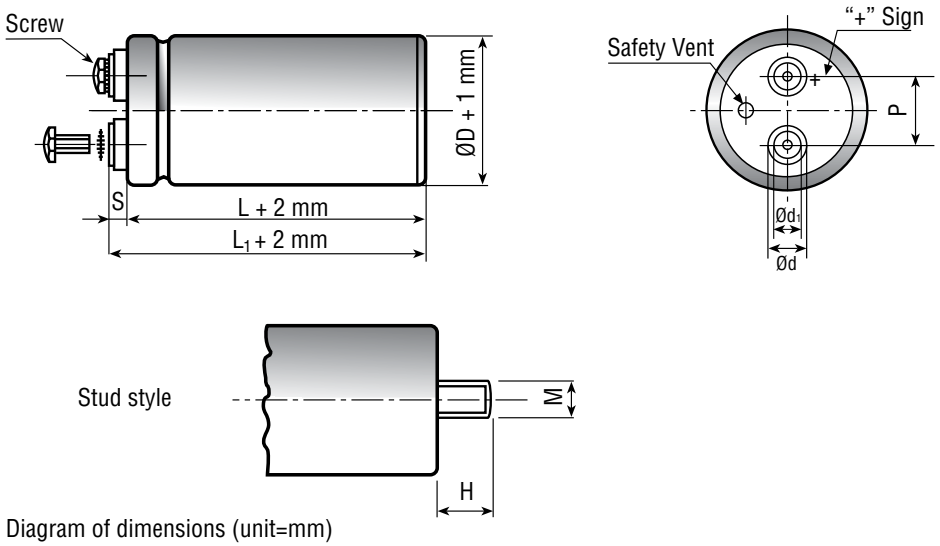


Diagram of dimensions (unit=mm)

ØD	d	d_1	P	M	H	Insert	Screw	L_1 - $L_{(-1+3)}$	$S_{(-1+1)}$
35	11	7.9	12.7	M 8	12	M5	5MA x 9.5	2.5	5
51	18.5	13	22.7	M 12	16	M5	5MA x 9.5	2.5	5
51	18.5	13	22.7	M 12	16	M5 Long	5MA x 9.5*	4.5	7
63	18.5	13	28.6	M 12	16	M5	5MA x 9.5	2.5	5
63	18.5	13	28.6	M 12	16	M5 Long	5MA x 9.5*	4.5	7
76	18.5	13	31.8	M 12	16	M5	5MA x 9.5	2.5	5
76	18.5	13	31.8	M 12	16	M5 Long	5MA x 9.5*	4.5	7
76	23.2	17.7	31.8	M 12	16	M6	6MA x 10	4.5	7
90	23.2	17.7	31.8	M 12	16	M6	6MA x 10	4.5	7

Note for M5 Long: (*) also available as 5MA x 12

Specifications

Temperature Range	Operating: -20°C +70°C Storage : Preferably below +25°C, not exceeding +40°C		
Rated Voltage Range (V_r)	from 400V to 500V DC		
Surge Voltage (V_p)	$V_P = 1.05\ V_r$ ($V_r \geq 475$V DC) - $V_P = 1.10\ V_r$ ($V_r >$ 250V DC)		
Rated Capacitance Range	from 560 µF to 3300 µF		
Capacitance Tolerance	±20% at 100 Hz, 20°C (M class IEC-62) on request: -10% +30% at 100 Hz, 20°C (Q class IEC-62)		
Leakage Current (I_L) (mA, 5 min, 20°C)	max $I_L = 0.006\ C_r\ V_r + 4$ µA		
Insulation Resistance	At 100V DC for 1 min is >100 MΩ across insulating sleeve and terminals.		
Vibration Resistance	Frequency range: 10 Hz to 55 Hz, amplitude 0.75 mm Capacitor length ≤ 143 : max acceleration 10g for 3x2 h Capacitor length > 143 : max acceleration 5g for 3x0.5 h		
Discharge life	Test conditions: 10000 times at room temperatures (5-35°C) Charge and Discharge cycles: 30 sec	Cap change tan δ Leakage current(I_L) Impedance (Z)	≤ 10% ≤ 150% < 150% initial limit ≤ 200%
Shelf life	After leaving capacitors under no load for 500 hours at 55°C, when restored at 20°C meet specifications aside	Cap change tan δ Leakage current(I_L)	≤ ±15% ≤ 150% < initial limit
Failure percentage **Failure rate**	≤ 1% (during useful life) ≤ 33 fit (33 10^{-9}/h) (V_r >160V DC)		
Self inductance	Approx. 20 nH		
Sectional Specifications / Reference	CECC 30.300 IEC 60384-4 Long Life Grade		

IKEN Series KI03 TYPE Standard Ratings

Rated Voltage VDC

400V

Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**Part Number** stud and insert style excluded
680	51x105	0.10	KI03400681_M0G105
820	51x105	0.10	KI03400821_M0G105
1000	63x105	0.10	KI03400102_M0H105
1200	63x105	0.10	KI03400122_M0H105
1500	76x105	0.10	KI03400152_M0J105
2200	76x143	0.10	KI03400222_M0J143
3300	90x145	0.10	KI03400332_M0L145

Rated Voltage VDC

450V

Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**Part Number** stud and insert style excluded
680	51x105	0.10	KI03450681_M0G105
820	51x105	0.10	KI03450821_M0G105
1000	63x105	0.10	KI03450102_M0H105
1200	63x105	0.10	KI03450122_M0H105
1500	76x105	0.10	KI03450152_M0J105
2200	76x143	0.10	KI03450222_M0J143
3300	90x145	0.10	KI03450332_M0L145

Rated Voltage VDC

475V

Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**Part Number** stud and insert style excluded
560	51x105	0.15	KI03475561_M0G105
680	51x105	0.15	KI03475681_M0G105
820	51x105	0.15	KI03475821_M0G105
1000	63x105	0.15	KI03475102_M0H105
1000	63x105	0.15	KI03475102_M0H105
1000	76x105	0.15	KI03475102_M0J105
1000	76x143	0.15	KI03475102_M0J143
1500	76x143	0.15	KI03475152_M0J143
2200	90x145	0.15	KI03475222_M0L145

Rated Voltage VDC

500V

Cap µF	**Ø x L** mm	**Tan δ** MAX 100 Hz 20°C	**Part Number** stud and insert style excluded
560	51x105	0.15	KI03500581_M0G105
680	63x105	0.15	KI03500681_M0H105
820	63x105	0.15	KI03500821_M0H105
1000	63x105	0.15	KI03500102_M0H105
1000	63x105	0.15	KI03500102_M0H105
1000	63x143	0.15	KI03500102_M0H143
1500	76x143	0.15	KI03500152_M0J143
2200	90x145	0.15	KI03500222_M0L145

IKEN Series KI07 TYPE -40°C +85°C 2000H

- Surge-proof capacitor in aluminium can with insulation sleeve
- To be mounted with ring clips or with threaded stud
- Case size optimized for Asian Market

Applications
Industrial Market, UPS, Frequency Converters

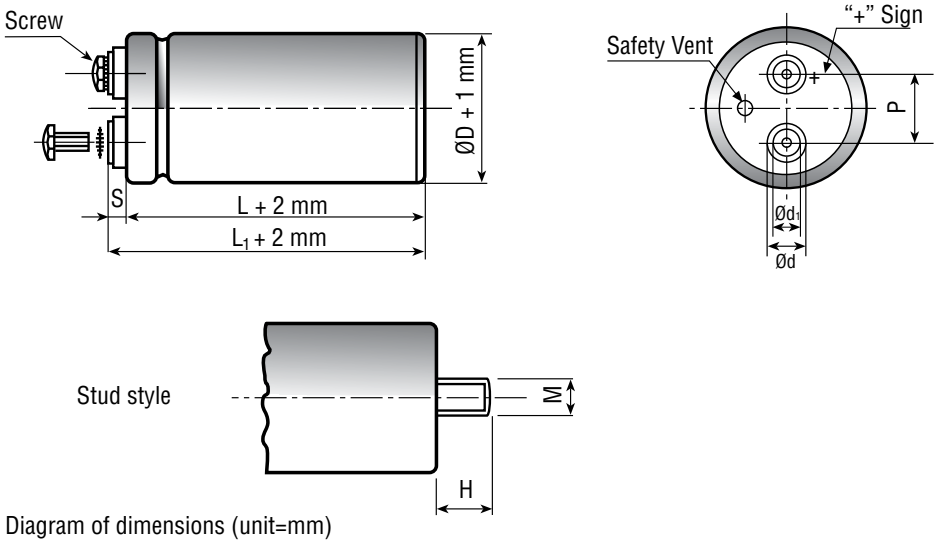


Diagram of dimensions (unit=mm)

ØD	d	d_1	P	M	H	Insert	Screw	$L_1 - L_{(-1+3)}$	$S_{(-1+1)}$
35	11	7.9	12.7	M 8	12	M5	5MA x 9.5	2.5	5
51	18.5	13	22.7	M 12	16	M5	5MA x 9.5	2.5	5
51	18.5	13	22.7	M 12	16	M5 Long	5MA x 9.5*	4.5	7
63	18.5	13	28.6	M 12	16	M5	5MA x 9.5	2.5	5
63	18.5	13	28.6	M 12	16	M5 Long	5MA x 9.5*	4.5	7
76	18.5	13	31.8	M 12	16	M5	5MA x 9.5	2.5	5
76	18.5	13	31.8	M 12	16	M5 Long	5MA x 9.5*	4.5	7
76	23.2	17.7	31.8	M 12	16	M6	6MA x 10	4.5	7
90	23.2	17.7	31.8	M 12	16	M6	6MA x 10	4.5	7

Note for M5 Long: (*) also available as 5MA x 12

Specifications

Temperature Range	Operating: -40°C +85°C Storage: Preferably below +25°C, not exceeding +40°C					
Rated Voltage Range (V_r)	from 160V to 350V DC from 400V to 450V DC					
Surge Voltage (V_p)	$V_P = 1.15\ V_r$ ($V_r \leq 250V$ DC) $V_P = 1.10\ V_r$ ($V_r \geq 250V$ DC)					
Rated Capacitance Range	from 1800 µF to 47000 µF					
Capacitance Tolerance	±20% at 120 Hz, 20°C (M class IEC-62) on request: -10% +30% at 120 Hz, 20°C (Q class IEC-62)					
Leakage Current (I_L) (mA, 5 min, 20°C)	max $I_L = 0.008\ C_r\ V_r + 4$ µA					
Ripple current (I_r)	Refer to table at 85°C and 120Hz.					
	Frequency	50Hz	100Hz	500 Hz	1000Hz	>10kHz
	Multiplier	0.88	1.0	1.45	1.5	1.55
	Due to the current load capability of the contact elements, the following limits must not be exceeded:					
	Capacitor Diameter	35mm	51mm	63mm	76mm	90mm
	Maximum current	20A	30A	40A	50A	70A
Insulation Resistance	At 100V DC for 1 min is >100 MΩ across insulating sleeve and terminals.					
Vibration Resistance	Frequency range: 10 Hz to 55 Hz, amplitude 0.75 mm Capacitor length ≤ 130 : max acceleration 10g for 3x2 h Capacitor length > 130 : max acceleration 5g for 3x0.5 h					
Life test	After 2,000 hours application of rated voltage at 85°C capacitors meet characteristics aside	Cap change tan δ Leakage current(I_L) Impedance (Z)	≤ ±15% ≤ 175% < initial limit ≤ 175%			
Shelf life	After leaving capacitors under no load for 500 hours at 85°C, when restored at 20°C meet specifications aside	Cap change tan δ Leakage current(I_L)	≤ ±15% ≤ 150% < initial limit			
Self inductance	Approx. 20 nH					
Sectional Specifications / Reference	CECC 30.300 IEC 60384-4 Long Life Grade					

IKEN Series KI07 TYPE Standard Ratings

Rated Voltage VDC

160V

Cap µF	**Ø x L** mm	**Tan δ** MAX 120 Hz 20°C	**ESR** TYP m Ω 120 Hz 20°C	**Ir a.c.** A max 120 Hz 40°C	**Ir a.c.** A max 120 Hz 85°C	**Part Number** stud and insert style excluded
6800	51x96	0.15	21	23.4	10.9	KI07160682_M0G096
8200	51x105	0.15	18	27.5	12.8	KI07160822_M0G105
10000	51x115	0.15	13	29.0	13.5	KI07160103_M0G115
12000	51x130	0.15	13	34.1	15.8	KI07160123_M0G130
10000	63x96	0.15	13	26.6	12.4	KI07160103_M0H096
15000	63x105	0.15	13	31.3	14.6	KI07160153_M0H105
15000	63x115	0.15	13	32.4	15.1	KI07160153_M0H115
18000	63x130	0.15	12	38.1	17.7	KI07160183_M0H130
22000	63x143	0.20	10	48.1	22.4	KI07160223_M0H143
22000	76x105	0.20	10	48.1	22.4	KI07160223_M0J105
22000	76x115	0.20	10	49.7	23.1	KI07160223_M0J115
27000	76x130	0.20	10	54.4	25.3	KI07160273_M0J130
33000	76x143	0.20	8	65.7	30.6	KI07160333_M0J143
47000	76x214	0.25	7	81.5	37.6	KI07160473_M0J214
47000	76x220	0.25	7	81.5	37.6	KI07160473_M0J220

Rated Voltage VDC

200V

Cap µF	**Ø x L** mm	**Tan δ** MAX 120 Hz 20°C	**ESR** TYP m Ω 120 Hz 20°C	**Ir a.c.** A max 120 Hz 40°C	**Ir a.c.** A max 120 Hz 85°C	**Part Number** stud and insert style excluded
5600	51x96	0.15	27	23.0	10.7	KI07200562_M0G096
6800	51x105	0.15	22	27.0	12.6	KI07200682_M0G105
6800	63x96	0.15	22	26.4	12.3	KI07200682_M0H096
8200	51x115	0.15	18	28.5	13.2	KI07200822_M0G115
10000	51x130	0.15	13	33.4	15.5	KI07200103_M0G130
10000	63x105	0.15	13	31.3	14.6	KI07200103_M0H105
12000	63x115	0.15	13	31.9	14.8	KI07200123_M0H115
14000	63x130	0.15	12	37.6	17.5	KI07200143_M0H130
15000	63x143	0.15	12	40.4	18.8	KI07200153_M0H143
15000	76x105	0.15	12	40.4	18.8	KI07200153_M0J105
18000	76x115	0.15	12	44.5	20.7	KI07200183_M0J115
22000	76x130	0.18	10	50.0	23.4	KI07200223_M0J130
27000	76x143	0.18	9	64.6	30.0	KI07200273_M0J143
33000	76x214	0.22	8	75.7	35.2	KI07200333_M0J214
33000	76x220	0.22	8	75.7	35.2	KI07200333_M0J220

IKEN Series KI07 TYPE Standard Ratings

Rated Voltage VDC

250V

Cap µF	**Ø x L** mm	**Tan δ** MAX 120 Hz 20°C	**ESR** TYP m Ω 120 Hz 20°C	**Ir a.c.** A max 120 Hz 40°C	**Ir a.c.** A max 120 Hz 85°C	**Part Number** stud and insert style excluded
3300	51x96	0.15	34	21.3	9.8	KI07250332_M0G096
3900	51x96	0.15	32	22.0	10.2	KI07250392_M0G096
4700	51x105	0.15	25	25.7	11.9	KI07250472_M0G105
5600	51x115	0.15	24	27.5	12.8	KI07250562_M0G115
6800	51x130	0.15	19	32.1	14.9	KI07250682_M0G130
3300	63x96	0.15	33	24.2	11.2	KI07250332_M0H096
3300	63x120	0.15	33	29.8	13.8	KI07250332_M0H120
4700	63x96	0.15	30	25.7	12.0	KI07250472_M0H096
4700	63x120	0.15	30	35.4	16.4	KI07250472_M0H120
5000	63x120	0.15	29	36.3	16.9	KI07250502_M0H120
5600	63x120	0.15	26	38.6	17.9	KI07250562_M0H120
6800	63x120	0.15	24	42.2	19.5	KI07250682_M0H120
8200	63x105	0.15	22	30.9	14.4	KI07250822_M0H105
10000	63x115	0.15	20	31.6	14.7	KI07250103_M0H115
10000	63x120	0.15	20	31.6	14.7	KI07250103_M0H120
10000	76x143	0.15	17	46.2	21.4	KI07250103_M0J143
12000	63x130	0.15	19	37.1	17.2	KI07250123_M0H130
12000	63x143	0.15	19	45.8	21.3	KI07250123_M0H143
12000	76x105	0.15	17	45.8	21.3	KI07250123_M0J105
12000	76x115	0.15	17	47.4	22.0	KI07250123_M0J115
15000	76x130	0.15	16	46.6	21.6	KI07250153_M0J130
18000	76x143	0.20	10	47.6	22.1	KI07250183_M0J143
27000	76x214	0.25	8	70.0	32.6	KI07250273_M0J214
27000	76x220	0.25	8	70.0	32.6	KI07250273_M0J220

IKEN Series KI07 TYPE Standard Ratings

Rated Voltage VDC

315V

Cap µF	**Ø x L** mm	**Tan δ** MAX 120 Hz 20°C	**ESR** TYP m Ω 120 Hz 20°C	**Ir a.c.** A max 120 Hz 40°C	**Ir a.c.** A max 120 Hz 85°C	**Part Number** stud and insert style excluded
2200	51x96	0.15	31	19.4	9.0	KI07315222_M0G096
2700	51x105	0.15	24	22.6	10.5	KI07315272_M0G105
2700	51x115	0.15	24	23.4	10.9	KI07315272_M0G115
3300	51x130	0.15	20	27.3	12.7	KI07315332_M0G130
2700	63x96	0.15	24	23.2	10.8	KI07315272_M0H096
3900	63x105	0.15	20	28.1	13.1	KI07315392_M0H105
4700	63x115	0.15	20	29.8	13.9	KI07315472_M0H115
5600	63x130	0.15	17	34.7	16.1	KI07315562_M0H130
6800	63x143	0.15	14	39.8	18.5	KI07315682_M0H143
3300	76x120	0.15	27	33.0	15.3	KI07315332_M0J120
4700	76x120	0.15	22	36.9	17.1	KI07315472_M0J120
5000	76x120	0.15	21	37.5	17.4	KI07315502_M0J120
5600	76x105	0.15	14	39.0	18.1	KI07315562_M0J105
5600	76x120	0.15	14	39.0	18.1	KI07315562_M0J120
6800	76x115	0.15	12	42.5	19.8	KI07315682_M0J115
6800	76x120	0.15	12	42.5	19.8	KI07315682_M0J120
8200	76x130	0.15	10	49.2	22.9	KI07315822_M0J130
10000	76x143	0.15	8	49.4	23.0	KI07315103_M0J143
15000	76x214	0.20	8	67.6	31.4	KI07315153_M0J214
15000	76x220	0.25	8	67.6	31.4	KI07315153_M0J220

Rated Voltage VDC

350V

Cap µF	**Ø x L** mm	**Tan δ** MAX 120 Hz 20°C	**ESR** TYP m Ω 120 Hz 20°C	**Ir a.c.** A max 120 Hz 40°C	**Ir a.c.** A max 120 Hz 85°C	**Part Number** stud and insert style excluded
1800	51x96	0.15	33	18.8	8.7	KI07350182_M0G096
2200	51x105	0.15	26	21.8	10.1	KI07350222_M0G105
2700	51x115	0.15	23	23.9	11.1	KI07350272_M0G115
3300	51x130	0.15	19	27.9	13.0	KI07350332_M0G130
3300	63x96	0.15	27	23.5	10.9	KI07350332_M0H096
3300	63x120	0.15	27	25.7	11.9	KI07350332_M0H120
3900	63x105	0.15	20	27.8	12.9	KI07350392_M0H105
3900	63x115	0.15	20	28.8	13.4	KI07350392_M0H115
4700	63x130	0.15	17	33.6	15.6	KI07350472_M0H130
5600	63x143	0.15	13	39.8	18.5	KI07350562_M0H143
3300	76x105	0.15	27	32.4	15.0	KI07350332_M0J105
3300	76x120	0.15	27	34.1	15.8	KI07350332_M0J120
4700	76x105	0.15	18	38.1	17.7	KI07350472_M0J105
4700	76x120	0.15	18	40.1	18.6	KI07350472_M0J120
5600	76x105	0.15	13	39.8	18.5	KI07350562_M0J105
5600	76x115	0.15	13	41.1	19.2	KI07350562_M0J115
6800	76x130	0.15	12	41.1	19.2	KI07350682_M0J130
8200	76x143	0.15	12	45.2	21.0	KI07350822_M0J143
10000	76x143	0.15	12	46.3	21.5	KI07350103_M0J143
12000	76x214	0.20	8	66.1	30.7	KI07350123_M0J214
12000	76x220	0.25	8	66.1	30.7	KI07350123_M0J220

IKEN Series KI07 TYPE Standard Ratings

Rated Voltage VDC

400V

Cap µF	**Ø x L** mm	**Tan δ** MAX 120 Hz 20°C	**ESR** TYP m Ω 120 Hz 20°C	**Ir a.c.** A max 120 Hz 40°C	**Ir a.c.** A max 120 Hz 85°C	**Part Number** stud and insert style excluded
2200	51x130	0.20	55	19.95	9.25	KI07400222_M0G130
2200	63x96	0.20	55	18.58	8.61	KI07400222_M0H096
2200	63x120	0.20	55	22.86	10.60	KI07400222_M0H120
2700	63x96	0.20	48	19.47	9.03	KI07400272_M0H096
3300	63x105	0.20	35	22.80	10.60	KI07400332_M0H105
3300	63x115	0.20	35	23.70	10.90	KI07400332_M0H115
3300	63x120	0.20	35	23.70	10.90	KI07400332_M0H120
3900	63x130	0.20	33	27.30	12.60	KI07400392_M0H130
3300	76x120	0.20	35	28.70	13.30	KI07400332_M0J120
4700	76x105	0.20	31	31.14	14.40	KI07400472_M0J105
4700	76x115	0.20	31	32.20	14.90	KI07400472_M0J115
5600	76x130	0.20	28	37.06	17.20	KI07400562_M0J130
6800	76x143	0.20	24	42.26	19.60	KI07400682_M0J143
6800	76x155	0.20	24	43.64	20.20	KI07400682_M0J155
8200	90x157	0.20	22	54.10	25.10	KI07400822_M0L157

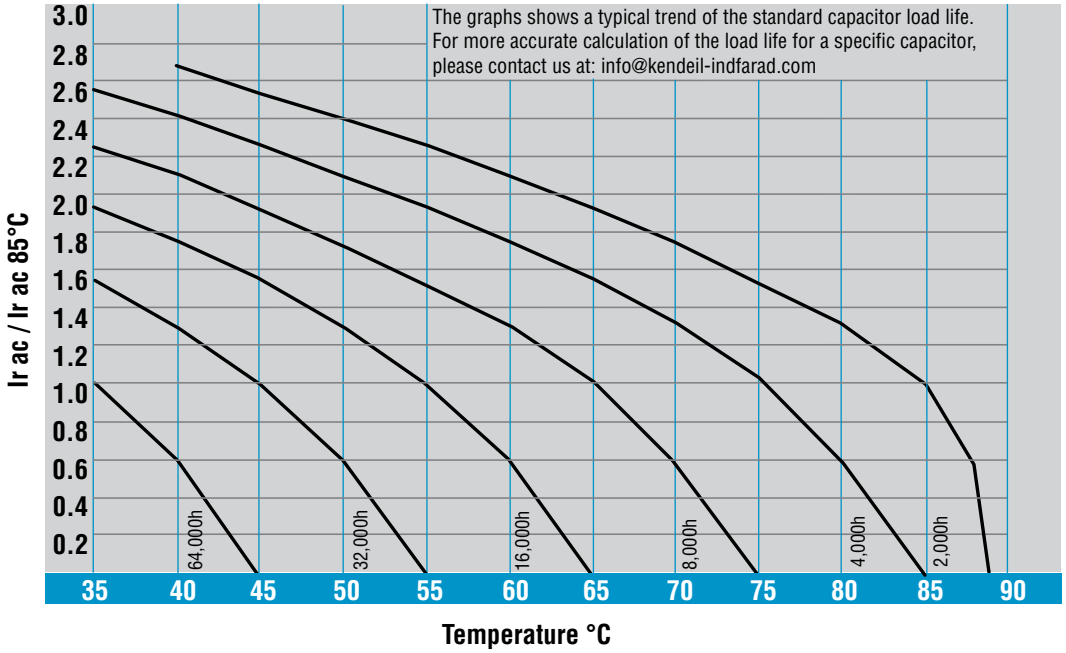
Rated Voltage VDC

450V

Cap µF	**Ø x L** mm	**Tan δ** MAX 120 Hz 20°C	**ESR** TYP m Ω 120 Hz 20°C	**Ir a.c.** A max 120 Hz 40°C	**Ir a.c.** A max 120 Hz 85°C	**Part Number** stud and insert style excluded
1800	51x130	0.20	84	16.25	6.11	KI07450182_M0G130
2200	63x96	0.20	80	17.35	6.52	KI07450222_M0H096
2700	63x105	0.20	62	20.74	7.60	KI07450272_M0H105
2700	63x115	0.20	62	20.74	7.80	KI07450272_M0H115
3300	63x130	0.20	51	24.22	9.11	KI07450332_M0H130
3300	76x105	0.20	50	25.54	9.60	KI07450332_M0J105
3900	76x105	0.20	44	26.25	9.70	KI07450392_M0J105
3900	76x115	0.20	44	26.25	9.87	KI07450392_M0J115
4700	76x130	0.20	36	30.90	11.62	KI07450472_M0J130
5600	76x143	0.20	30	35.69	13.22	KI07450562_M0J143
5600	76x155	0.20	30	35.69	13.42	KI07450562_M0J155
6800	90x157	0.20	25	41.36	15.55	KI07450682_M0L157
8200	90x157	0.20	22	45.09	16.95	KI07450822_M0L157
10000	90x196	0.20	18	54.75	20.60	KI07450103_M0L196
12000	90x220	0.20	15	63.15	23.75	KI07450123_M0L220

Please contact our technical service for more information or spec-in analysis.

Load Life IKEN Series KI07



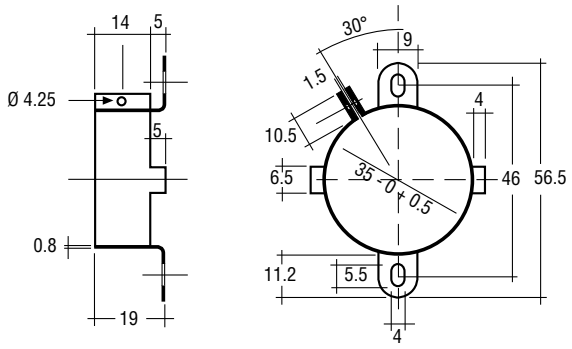
The graphs shows a typical trend of the standard capacitor load life. For a more accurate calculation of the load life for a specific capacitor, please contact us at our website www.kendeil-indfarad.com

Dimensions (mm)

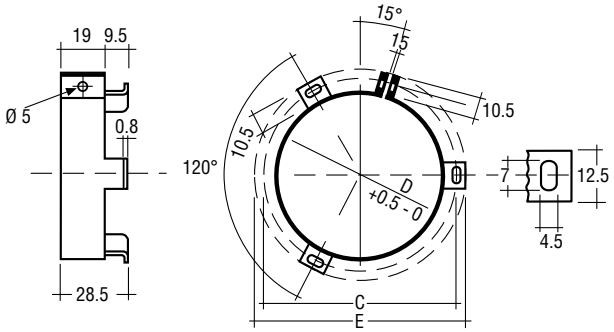
ØD	L	P	M	H	Screw
51	96	22.7	M 12	16	5MA x 9.5
	105	22.7	M 12	16	5MA x 9.5
	115	22.7	M 12	16	5MA x 9.5
	130	22.7	M 12	16	5MA x 9.5
63	96	28.6	M 12	16	5MA x 9.5
	105	28.6	M 12	16	5MA x 9.5
	115	28.6	M 12	16	5MA x 9.5
	130	28.6	M 12	16	5MA x 9.5
76	105	31.8	M 12	16	5MA x 9.5
	115	31.8	M 12	16	5MA x 9.5
	130	31.8	M 12	16	5MA x 9.5
	155	31.8	M 12	16	5MA x 9.5
90	157	31.8	M 12	16	6MA x 10
	196	31.8	M 12	16	6MA x 10
	220	31.8	M 12	16	6MA x 10

Rings Clips

RING CLIPS Ø 35mm



RING CLIPS Ø 51-63-76 mm



D	C	E	Ordering Code
35	46	56.5	ARC1635000
51	63.5	73.4	ARC1650000
63	76.0	86.1	ARC1664000
76	89.0	98.6	ARC1676000

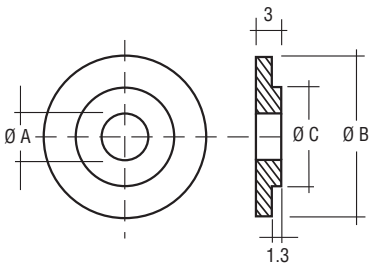
Insulated Hex Nuts, Washers

To be used with Screw Type Capacitors

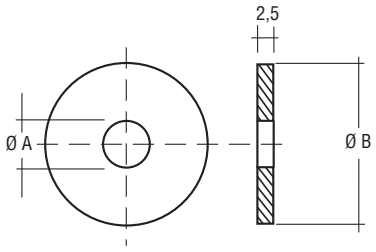
Dimensions (mm)

Thread	Description	Ø	h	H	D	Ordering Code
M12	NUT S17	17	1.3	18	28	AN1300010
M12	NUT S17 + Flat Washer					ANW1300011
M12	NUT S15	15	1.3	18	25	AN1300012
M12	NUT S15 + Flat Washer					ANW1300013
M12	NUT S22	22	1.3	18	28	AN1300014
M12	NUT S22 + Flat Washer					ANW1300015
M8	NUT M8	17	1.3	15	25	AN1300016
M8	NUT M8 + Flat Washer					ANW1300017
M12	Center Ring Washer					AW1300001

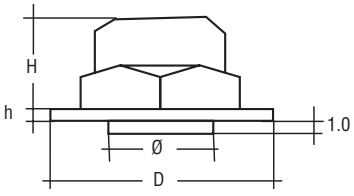
Insulated mounting with Hex Nut
Hex Nuts and Spring Washers are delivered loosely with the capacitor. Insulation Washers shall be ordered separately.



Center Ring Washer



Flat Washer



M	A	B	C
8	8.4	25	18.5
12	12.5	35	18.5

Mounting Hardware

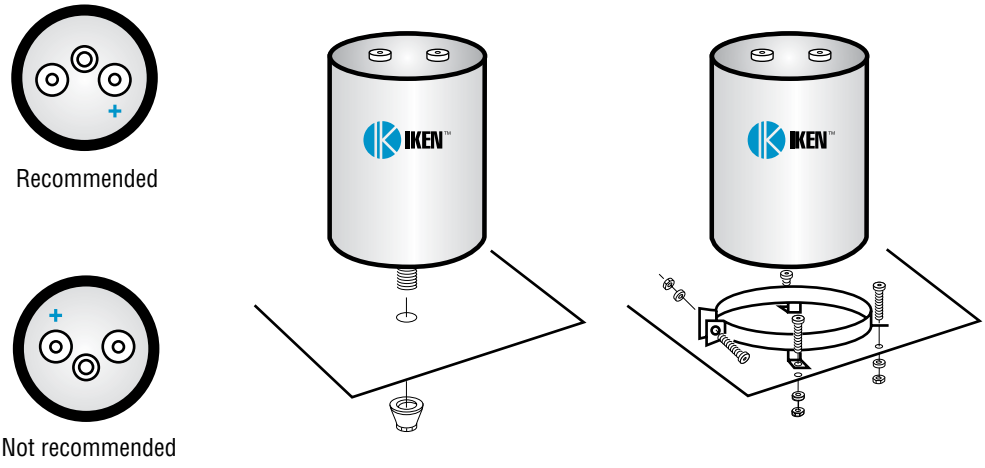
During normal operation electrolytic capacitors are subjected to an internal generation of gas due to heating combined with the inside pressure. Therefore a safety vent is provided to prevent catastrophic failure.

Kendeil-Indfarad IKEN Series aluminium electrolytic capacitors screw terminals type have been provided with a safety vent plug on the deck, a tiny rubber capsule designed to support a critical bursting pressure up to 8 bar. To fix these capacitors use the appropriate mounting clamps furnished in different diameter size.

When mounting the capacitor, it should be borne in mind that in the event of the vent being blown under failure conditions, a small quantity of hot conductive electrolyte and vapours can, in some cases, flow out from the vent, so the position is important and the can should be carefully located. If possible, we recommend that capacitors are mounted with the safety vent uppermost.

In any case, screw terminal capacitors can be mounted in any position as long as the vent is free to operate. The overall characteristic parameters such as capacitance, ESR, currents, etc. remain the same whatever is the orientation, but once the vent has been blown, an eventual overflow of electrolyte could damage importants parts of the circuit.

Lastly, a good cooling system must be designed. Consideration must be given as to where to place the circuits especially when dealing with high ripple currents; the area around electrolytic capacitors should be well aired with enough distance between the radiant elements, both for maintenance and for security reasons.



Notes when mounting a screw type capacitor:
Special attention has to be applied during assembling in case of stud capacitors. The threaded stud termination (M8 or M12 diameter) is the bottom part of capacitor's can and it is in electrical contact with negative end termination of capacitor. Please use our plastic nut and plastic ring or other well protected system in order to avoid short circuit between stud and assembling frame.

Can and stud are in electrical contact with negative end termination. Can is coverd by sleeve, designed to prevent accident short circuit during maintanances or assembling operation. Air gap between capacitor and machinerie's electrical parts, active parts or machinerie's frame has to be taken into consideration for good insulation as defined to many standards of machines.

General Warning

Information and data contained in the section “Technical Information” must be considered as a completing part of each family type of capacitor. Before using a Kendeil-Indfarad IKEN Series capacitor in any application, please read carefully the related specifications included in the catalogue.

An improper installation or not respecting parameters limits might cause damage to the components, their characteristics modification and a decrease of their reliability and useful life. Products manufactured by Kendeil-Indfarad are made with maximum care, in order to result free of defects in design, materials and workmanship, according with adequate specifications and international standard requirements.

Disclaimer

Cooperation between Customers and Kendeil-Indfarad is basically precious in order to solve problems or when a failure occurs. In case of complaint you might have, please forward the following information along with an immediate communication of the failure.

Only upon previous agreement with Kendeil-Indfarad, you could send a detailed description of failure, indicating operative condition and type of application, number of defective pieces, eventually expressed in percent on whole quantity used. It is mandatory to know the original batch of goods as printed on the capacitor sleeve or labelled on the box, also let us know the delivery date and others relevant data from the billing documents. Samples of defective products should be sent to Kendeil-Indfarad for analysis, packed in order to prevent additional damages different from the ones detected.

Data sheets specifications are referred to a fairly large number of components and do not constitute a guarantee of characteristics or properties in the legal sense. However, agreement on these specifications does not mean that the customer may not claim for replacement of individual defective capacitors within the terms of delivery, Kendeil-Indfarad will not assume any further liability beyond the replacement of defective capacitors. This applies in particular to any further consequences of component failure as better specified further in this section.

A single failure among a delivered batch of capacitors should not be meaningful of poor reliability of the whole production batch, but should be understood to have reached incidentally the end of life within the failure rate defined for each series type.

No Liability For Consequential Damages

Kendeil-Indfarad liability shall be limited to only replacement or repairing of goods, free of charge, after acknowledge of received notification by customer.

Kendeil-Indfarad is not responsible for any possible damage to people or things, of any kind, derived from improper installation,use of application of its products.

Also, the producer shall not be liable for any defect due to accident, fair wear and tear, negligent use, tampering,
improper handling and shipment, operation and storage or any other default on the parts of any person other then Kendeil-Indfarad.

In customer applications requiring a very high level of operational safety and especially in customer applications in which the malfunction or failure of a passive electronic component could endanger human life or health (e.g. in accident prevention of life-saving systems), it must therefore be ensured by means of suitable design of the customer application or other action taken by the customer (e.g. installation of protective circuity or redundancy) that no injury or damage is sustained by third parties in the event of malfunction or failure of a passive electronic component.

Any warnings, cautions and product specific notes must be observed.

To the maximum extent permitted by above statements, in no event shall Kendeil-Indfarad or its referred dealers be liable for any damages whatsoever (including without limitation, special, incidental, consequential, or indirect damages for personal injury, loss of business profits, business interruption or any pecuniary loss) arising out of the use or inability to use Kendeil-Indfarad products.

In the case of any product liability claim from third parties against Kendeil-Indfarad, not falling within Kendeil-Indfarad
liability, customer or Buyer should hold Kendeil-Indfarad harmless.

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Notes

Notes

Kendeil Indfarad™

Aluminium Electrolytic Capacitors

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= ISO 9001:2008 =

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Data Book 2014