PRODUCT QUICK REFERENCE GUIDE

I. RADIAL LEAD TYPE – ALUMINIUM ELECTROLYTIC CAPACITORS

SA - SERIES	RADIAL LEAD TYPE/ GENERAL PURPOSE/ +85°C/ 2000 Hrs / 0.1µF-22,000 µF/ 6.3-450VDC
SE - SERIES	RADIAL LEAD TYPE/ HIGH TEMP/ +105°C/ 1000-2000 Hrs/ 0.47µF-10,000µF/ 6.3-450VDC
SN - SERIES	RADIAL LEAD TYPE/ NON-POLAR/ +85°C/ 2000 Hrs/ 0.1µF-2200µF/ 6.3-100VDC
SZ - SERIES	RADIAL LEAD TYPE/ LOW ESR/ +85°C/ 2000 Hrs/ 1µF-4700µF/ 6.3-100VDC
SH - SERIES	RADIAL LEAD TYPE/ NON POLAR HORIZONTAL CORRECTION/ +85°C/ 2000 Hrs/ 1µF-18µF/ 25 & 50VDC
SB - SERIES	RADIAL LEAD TYPE/ PROFESSIONAL GRADE FOR DEFENCE APPLICATION/ +85°C/ 2000 Hrs/ 0.47µF-6800µF/ 6.3-63VDC

II. AXIAL LEAD TYPE – ALUMINIUM ELECTROLYTIC CAPACITORS

DB - SERIES	AXIAL LEAD TYPE/ GENERAL PURPOSE MINIATURE/ +85°C/ 2000-3000 Hrs/ 1µF-4700µF/ 6.3-400VDC
DC - SERIES	AXIAL LEAD TYPE DIAMETER 16mm & ABOVE/ GENERAL PURPOSE/ +85°C/ 3000 Hrs/ 22µF-22000µF/ 6.3-400VDC

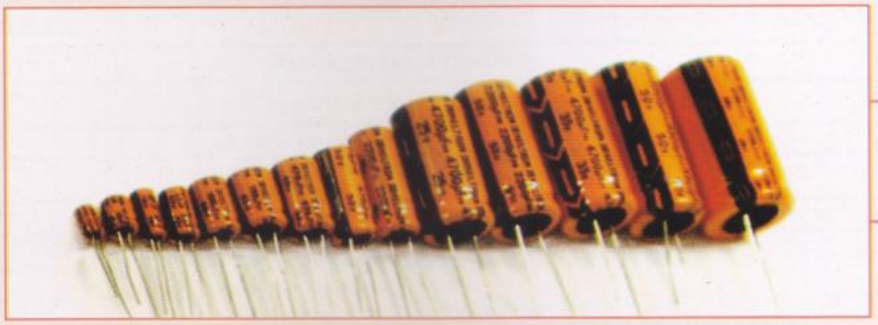
III. AC MOTOR START – ALUMINIUM ELECTROLYTIC CAPACITORS

MS - SERIES	AC MOTOR START/ SINGLE CAN CONSTRUCTION/ +70°C/ 20µF-350µF/ 110-330VAC
MD - SERIES	AC MOTOR START/ DOUBLE CAN CONSTRUCTION/ +70°C/ 20µF-250µF/ 110-330VAC
MU - SERIES	UL APPROVED/ AC MOTOR START/ PHENOLIC CASE/ 20µF-552µF/ 110-330VAC

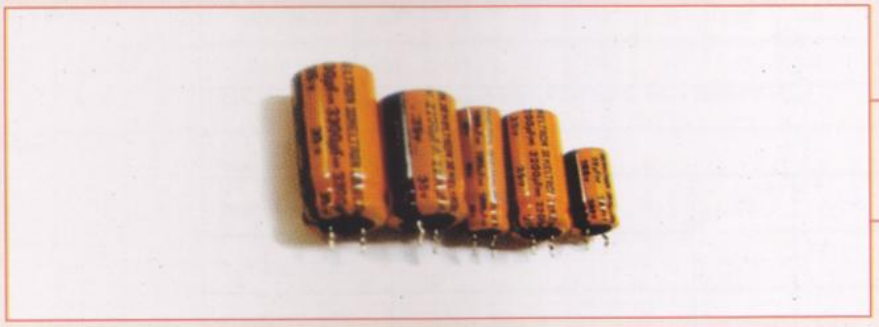
IV. LARGE CAN – ALUMINIUM ELECTROLYTIC CAPACITORS

MB - SERIES	SNAP-IN TERMINAL TYPE/ LARGE ALUMINIUM CAN/ +85°C / 2000Hrs/ 47µF-33000µF/ 16-450VDC
ML - SERIES	LUG TERMINAL TYPE/ LARGE ALUMINIUM CAN/ +85°C / 2000Hrs/ 150µF-100000µF/ 16-450VDC
MP - SERIES	SCREW TERMINAL TYPE/ LARGE ALUMINIUM CAN/ +85°C / 2000Hrs/ 220µF-100000µF/ 16-450VDC

RADIAL LEAD TYPE CAPACITORS SA, SE, SN, SZ, SH and SB Series

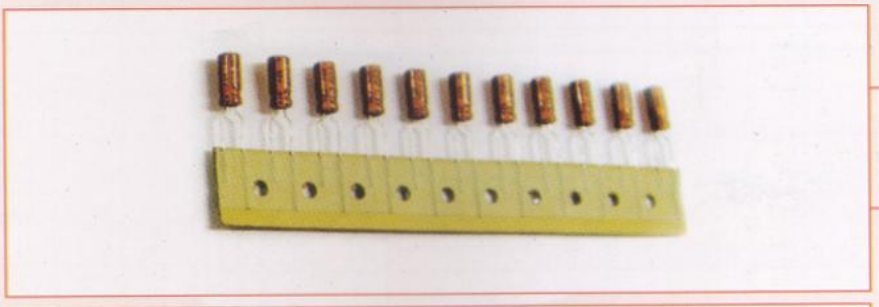


STRAIGHT LEAD

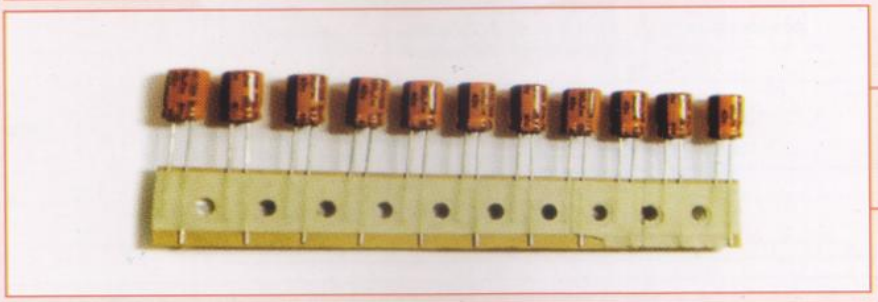


LEAD FORMED AND CUT

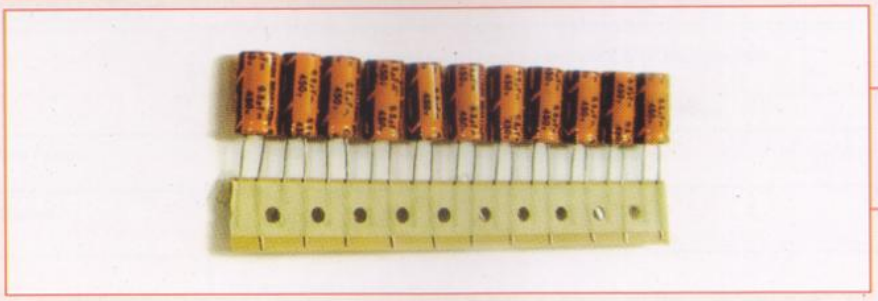
TAPED CAPACITORS



TAPED CODE T0 (5 mm PITCH)



TAPED CODE T2 (2.5 mm PITCH)



TAPED CODE T0 (5 mm PITCH)

SA SERIES

FEATURES : GENERAL PURPOSE RADIAL TYPE FOR CONSUMER ELECTRONICS MARKET.

ENDURANCE : +85°C, 2000 Hrs

REFERENCE STANDARDS : IS4317/ IEC 384-4.

PRODUCT MARKING } PROVIDED WITH ORANGE COLOUR SLEEVE AND BLACK PRINT

▪SPECIFICATIONS

PARAMETERS.	PERFORMANCE CHARACTERISTICS
Operating Temperature	- 40°C to +85 °C for WV ≤ 250 Vdc, -25°C to + 85°C for WV > 250 Vdc.
Working Voltage	6.3 Vdc to 450 Vdc. (500 Wvdc on request.)
Capacitance Range	0.10 to 22000μF (at +27° C, 100 Hz)
Capacitance Tolerance	±20%, (Other tolerance on request)
Leakage Current (After 3mt charging through 1000 Ω resistor) IL in μA	IL ≤ 0.01 CV or 4 μA, whichever is greater for WV 6.3 to 100 V ≤ 0.02 CV+ 10μA for WV 160 to 500 V, Where IL = Leakage current in μA C= Capacitance(μF) , V= Working Voltage in Volt

Dissipation factor (Tan δ) Max (at + 27°C, 100 Hz)

WV Vdc	6.3	10	12	16	25	35	40	50	63	100	160	200	250 ~500
Tan δ %	26	22	21	20	17	15	14	13	12	10	15	18	20

For Capacitor ratings with cap value >1000μF add 2% for every 1000μF increase

Low Temperature Stability

Impedance Ratio at 100 Hz.

Rated Voltage (V)	6.3	10~12	16	25	35~40	50~100	160	200 ~350	400~500
Z -25°C/Z + 27°C	6	4	4	3	3	2	3	6	7
Z -40°C/ Z + 27°C	12	9	8	6	4	3	4	-	-

Add 0.5 to the Ratio for Z- 25°C, 1.0 to the Ratio Z- 40°C Per 1000μF, for Cap>1000μF

Life Tests

(i). Endurance Test at High Temperature +85°C at WV.

(ii). Storage Test at High Temperature +85°C at 0V.

Tests	Endurance DC Life Test	Storage Shelf Life Test
Test Condition / Parameters	Capacitor at rated voltage At +85°C for 2000 Hrs Measurements after recovery to +27°C	Capacitor under no voltage At +85°C for 1000 Hrs Measurements after recovery to +27°C
Δ Capacitance	Within ± 30% for 6.3 to 16 V Within ± 25% for 25 to 100 V Within ± 20% for 160 to 500V } of initial measured Value	Within ± 25% of initial measured Value
Tan ∂	Within 200% of initial limits for WV 6.3 ~16 V Within 150% of initial limits for WV 25 ~ 500 V	Within 150% of initial limit
D.C Leakage Current	Within initial limit	Within 150% of initial limit for WV ≤100V Within 300% of initial limit for WV 160~500V

SE SERIES

FEATURES : RADIAL TYPE HIGH TEMPERATURE CATEGORY +105°C, FOR USE IN SWITCHED MODE POWER SUPPLIES, AUTOMOBILE ELECTRONIC CIRCUITS AND INDUSTRIAL EQUIPMENTS.

REFERENCE STANDARDS : IS4317/ IEC 384-4.

ENDURANCE : +105°C, 1000 Hrs FOR DIAMETER < 8mm.
+ 105 °C, 2000 Hrs FOR DIAMETER ≥ 8mm

PRODUCT MARKING } PROVIDED WITH ORANGE COLOUR SLEEVE AND BLACK PRINT

■SPECIFICATIONS

PARAMETERS.	PERFORMANCE CHARACTERISTICS
Operating Temperature	- 40° C to +105°C for WV ≤ 250 Vdc, -25°C to + 105°C for WV > 250 Vdc.
Working Voltage	6.3 Vdc to 450 Vdc.
Capacitance Range	0.47μF to 10,000μF (at +27°C, 100 Hz)
Capacitance Tolerance	±20%, (Other tolerance on request)
Leakage Current (After 3mt charging through 1000 Ω resistor) IL in μA	IL ≤ 0.01 CV or 4 μA, whichever is greater for WV 6.3 to 100 V ≤ 0.02 CV+ 4μA for WV 160 to 450 V, Where IL = Leakage current in μA C= Capacitance (μF), V= Working Voltage in Volt

Dissipation factor (Tan δ) Max (at + 27°C, 100 Hz)

WV Vdc	6.3	10	16	25	35	40	50	63	100	160~200	250 ~450
Tan δ %	22	19	16	14	13	12	11	10	9	12	15

For Capacitor ratings with cap value >1000μF add 2% for every 1000μF increase

Low Temperature Stability

Impedance Ratio at 100 Hz.

Rated Voltage (V)	6.3	10	16	25	35	40~50	63~100	160~250	350~450
Z -25°C/ Z +27°C	6	4	3	3	2	2	2	3	7
Z -40°C/ Z + 27°C	12	8	6	5	4	3	3	4	-

Add 0.5 to the Ratio for Z- 25°C, 1.0 to the Ratio Z- 40°C Per 1000μF, for Cap>1000μF

Life Tests

Tests	Endurance DC Life Test	Storage Shelf Life Test
Test Condition / Parameters	Capacitor at rated voltage (For Ø< 8mm, 1000 Hrs +105°C) (For Ø≥ 8mm, 2000 Hrs +105°C) Measurements after recovery to +27°C	Capacitor under no voltage At +105°C for 1000 Hrs Measurements after recovery to +27°C
Δ Capacitance	Within ± 25% of the initial measured Value	Within ± 20% of initial measured Value
Tan ∂	Within 200% of initial limit	Within 150% of initial limit
D.C Leakage Current	Within initial limit	Within 150% of initial limit

(i). Endurance Test at High Temperature +105°C at WV.

(ii). Storage Test at High Temperature +105°C at 0V.

KELTRON

ALUMINIUM ELECTROLYTIC CAPACITORS
RADIAL LEAD TYPE

SN SERIES

FEATURES : MINIATURE RADIAL NONPOLAR TYPE FOR AUDIO SIGNAL CIRCUITS.

ENDURANCE : 2000Hrs, +85°C

REFERENCE STANDARDS : IS4317/ IEC 384-4

PRODUCT MARKING } PROVIDED WITH ORANGE COLOUR SLEEVE AND BLACK PRINT

■SPECIFICATIONS

PARAMETERS.	PERFORMANCE CHARACTERISTICS
Operating Temperature	- 40° C to +85 ° C
Working Voltage	6.3 Vdc to 100 Vdc
Capacitance Range	0.1μF to 2200μF
Capacitance Tolerance	±20%
Leakage Current (After 5mt charging through 1000 Ω resistor) IL in μA	IL ≤ 0.03 CV or 4 μA, whichever is greater Where IL = Leakage current in μA C= Capacitance (μF), V= Working Voltage in Volt

Dissipation factor (Tan δ) Max (at + 27°C, 100 Hz)

WV Vdc	6.3	10	16	25	40	50	63	100
Tan δ %	26	24	22	20	15	14	12	10

For Capacitor ratings with cap value >1000μF add 2% for every 1000μF increase

Low Temperature Stability

Impedance Ratio at 100 Hz.

Rated Voltage (V)	6.3	10	16	25	40	50	63	100
Z - 40°C / Z + 27°C	10	8	6	5	4	4	3	3

Add 1.0 to the Ratio Z- 40°C Per 1000μF, for Cap>1000μF

Life Tests

Tests	Endurance DC Life Test	Storage Shelf Life Test
Test Condition / Parameters	Capacitor at rated voltage and At +85°C for 2000 Hrs. Polarity reversal after 1000 Hrs Measurements after recovery to +27°C	Capacitor under no voltage At +85°C for 1000 Hrs Measurements after recovery to +27°C
Δ Capacitance	Within ± 20% of initial measured Value	Within ± 10% of initial measured Value
Tan ∂	Within 150% of initial limit	Within 120% of initial limit
D.C Leakage Current	Within initial limit	Within 200% of initial limit

(i). Endurance Test at High Temperature + 85°C at WV.

(ii). Storage Test at High Temperature + 85°C at 0V.

SZ SERIES

FEATURES : RADIAL LEAD TYPE WITH LOW ESR.

ENDURANCE : +85°C, 2000Hrs.

REFERENCE STANDARDS : IS4317/ IEC 384-4.

PRODUCT MARKING } PROVIDED WITH ORANGE COLOUR SLEEVE AND BLACK PRINT

▪SPECIFICATIONS

PARAMETERS.	PERFORMANCE CHARACTERISTICS
Operating Temperature	- 40° C to +85 °C
Working Voltage	6.3 Vdc to 100 Vdc
Capacitance Range	1.0 to 4700μF (at +27°C, 100 Hz)
Capacitance Tolerance	±20% (other tolerance on request)
Leakage Current (After 3mt charging through 1000 Ω resistor) IL in μA	IL ≤ 0.006 CV +1μA Where IL = Leakage current in μA C= Capacitance (μF), V= Working Voltage in Volt

Dissipation factor (Tan δ) Max (at +27°C, 100 Hz)

WV Vdc	6.3	10	16	25	35	50	63	100
Tan δ %	20	15	12	10	8	7	6	5

For Capacitor ratings with cap value >1000μF add 2% for every 1000μF increase

Low Temperature Stability

Impedance Ratio at 100 Hz.

Rated Voltage (V)	6.3	10	16	25 ~ 63	100
Z - 40°C / Z + 27°C	5	4	3	2	3

Add 1.0 to the Ratio Z- 40°C Per 1000μF, for Cap>1000μF

Life Tests

Tests	Endurance DC Life Test	Storage Shelf Life Test
Test Condition / Parameters	Capacitor at rated voltage and At +85°C for 2000 Hrs. Measurements after recovery to +27°C	Capacitor under no voltage At +85°C for 1000 Hrs Measurements after recovery to +27°C
Δ Capacitance	Within ±20% of initial measured Value	Within ±10% of initial measured Value
Tan ∂	Within 200% of initial limit	Within 130% of initial limit
D.C Leakage Current	Within initial limit	Within 200% of initial limit

(i). Endurance Test at High Temperature + 85°C at WV.

(ii). Storage Test at High Temperature +85°C at 0V.

SH SERIES

FEATURES : NONPOLAR RADIAL LEAD TYPE FOR HORIZONTAL DEFLECTION EQUALIZATION, IN TV RECEIVERS & VIDEO MONITOR DISLPAYS.

REFERENCE STANDARDS : IS4317/ IEC 384-4.

ENDURANCE: +85°C, 2000 Hrs

PRODUCT MARKING } PROVIDED WITH ORANGE COLOUR SLEEVE AND BLACK PRINT

■SPECIFICATIONS

PARAMETERS.	PERFORMANCE CHARACTERISTICS
Operating Temperature	- 40° C to +85°C
Working Voltage	25 Vdc and 50 Vdc
Capacitance Range	1 to 18μF (at +27°C, 100 Hz)
Capacitance Tolerance	±20%
Leakage Current (After 3mt charging in both direction through 1000 Ω resistor) IL in μA	IL ≤ 0.2 CV Where IL = Leakage current in μA C= Capacitance(μF) , V= Working Voltage in Volt
Dissipation factor (Tan δ) Max (at + 27°C, 100 Hz)	4% (at 27°C, 100 Hz)
Life Tests	

Tests	Endurance DC Life Test	Storage Shelf Life Test
Test Condition / Parameters	Capacitor at rated voltage and At +85°C for 2000 Hrs, Polarity reversal after 1000 Hrs Measurements after recovery to +27°C	Capacitor under no voltage At +85°C for 1000 Hrs Measurements after recovery to +27°C
(i). Endurance Test at High Temperature +85°C at WV. — Δ Capacitance	Within ± 15% of initial measured Value	Within ± 10% of initial measured Value
Tan ∂	Within 200% of initial limit	Within 150% of initial limit
(ii). Storage Test at High Temperature +85°C at 0V. — D.C Leakage Current	Within initial limit	Within 200% of initial limit

SB SERIES

FEATURES : PROFESSIONAL GRADE LONG LIFE RADIAL LEAD TYPE FOR DEFENCE APPLICATION

ENDURANCE : + 85°C, 2000 Hrs

REFERANCE STANDARDS : JSS 50207 - CLU 07 STYLE

PRODUCT MARKING } PROVIDED WITH ORANGE COLOUR SLEEVE AND BLACK PRINT

▪SPECIFICATIONS

PARAMETERS.	PERFORMANCE CHARACTERISTICS
Operating Temperature	- 40°C to +85°C
Working Voltage	6.3 Vdc to 63 Vdc.
Capacitance Range	0.47 µF to 6800 µF (at +27°C, 100Hz)
Capacitance Tolerance	-10% to +50% (T) or ±20% (M) on request
Leakage Current (After 5mt charging through 1000 Ω resistor) IL in µA	IL ≤ 0.01 CV or 1 µA, whichever is greater for CV ≤ 1000 and IL ≤ 0.006 CV + 4µA for CV >1000 Where IL = Leakage current in µA. C= Capacitance (µF), V= Working Voltage in Volt

Dissipation factor (Tan δ) Max (at +27°C, 100Hz)

Cap in µF \ WV	6.3 ~ 10V	16 ~ 25V	35 ~ 63V
≤ 470 µF	24	19	13
680 ~ 4700 µF	31	22	22
> 4700 µF	50	50	50

Low Temperature Stability

W.V	6.3 ~ 10V	16 ~ 63 V
Z - 40°C / Z + 27°C	4	3

Impedance Ratio at 100 Hz.

Life Tests

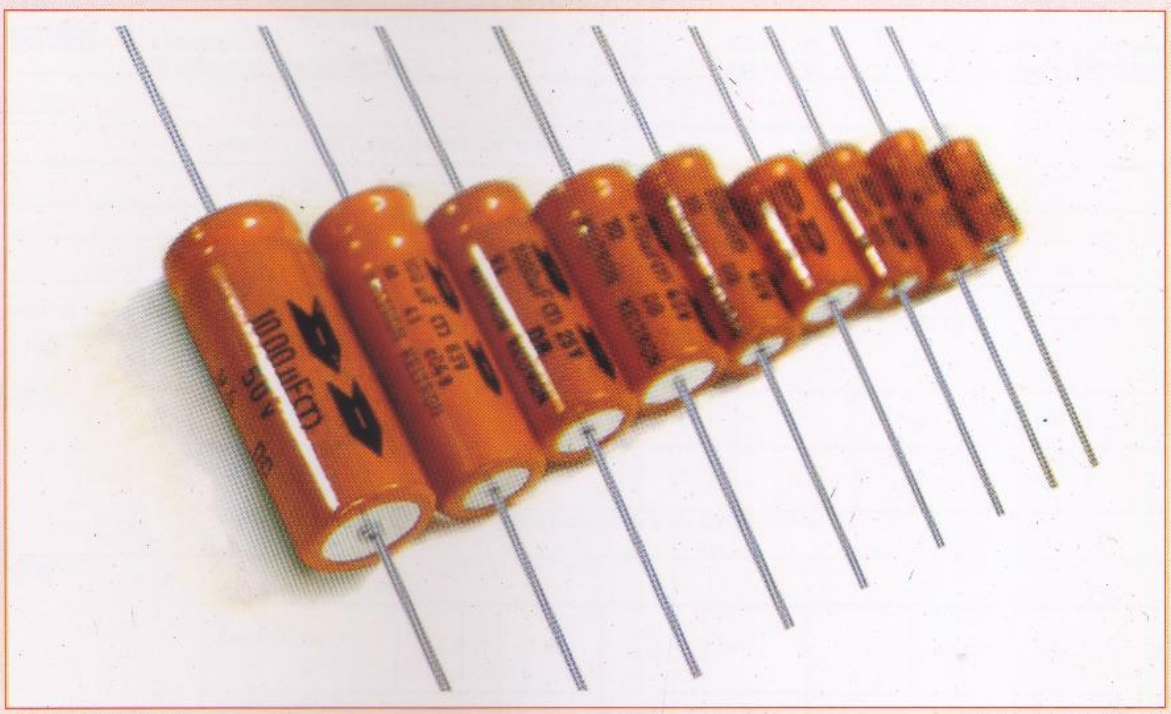
Tests	Endurance DC Life Test	Storage Shelf Life test
Test Condition / Parameters	Capacitor at rated voltage and At +85°C, for 2000 Hrs Measurements after recovery to +27°C	Capacitor under no voltage At +85°C for 500 Hrs Measurements after recovery to +27°C
Δ Capacitance	Within ± 15% of the initial measured Value	Within ± 10% of initial measured Value
Tan ∂	Within 130% of initial limit	Within 120% of initial limit
D.C Leakage Current	Within initial limit	Within 200% of initial limit
Impedance Change	Within 200% of initial Measured value at 10KHz	
Visual	No seepage of electrolyte No damage of sleeve	No seepage of electrolyte No. damage of sleeve. Solderablity test to be passed with wetting above 85%

(i). Endurance Test at High Temperature +85°C at WV.

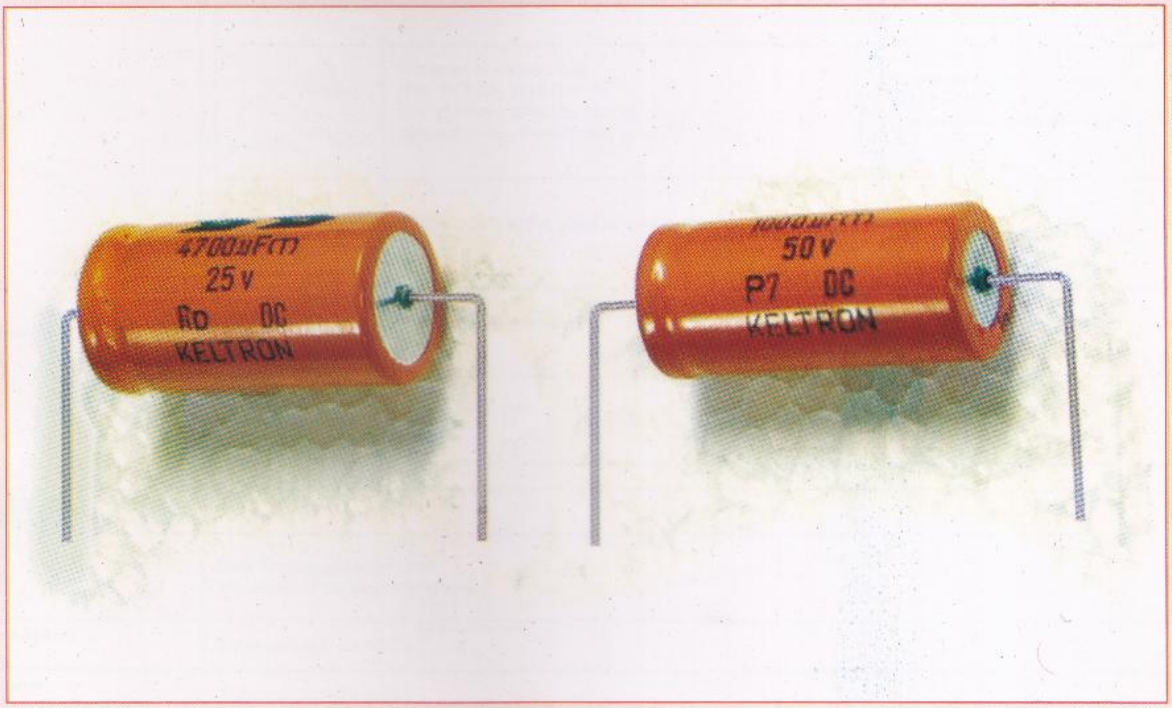
(ii). Storage Test at High Temperature +85°C at 0V.

Stability test at high temperature (Measurements after recovery to + 27°C)

Δ Capacitance	Within ± 10% of initial measured Value
Tan ∂	Within 130% of initial measured Value
D.C Leakage current	Within 300% of initial limit
Visual	No seepage of electrolyte. No damage of sleeve.



AXIAL LEAD TYPE CAPACITORS



DB / DC SERIES

DB/DC SERIES

FEATURES : GENERAL PURPOSE AXIAL TYPE
DB SERIES- MINIATURE AXIAL TYPE
DC SERIES- LARGE AXIAL TYPE
FOR DIAMETER ≥ 16 mm

REFERENCE STANDARDS : IS4317/ IEC 384-4

ENDURANCE : +85°C, 2000 Hrs FOR DIAMETER < 8mm.
+85 °C, 3000 Hrs FOR DIAMETER ≥ 8mm.

PRODUCT MARKING } PROVIDED WITH ORANGE COLOUR SLEEVE AND BLACK PRINT

1. SPECIFICATIONS

PARAMETERS.	PERFORMANCE CHARACTERISTICS
Operating Temperature	- 40° C to +85 ° C for WV ≤ 160 Vdc & -25°C to +85°C for WV > 160 Vdc.
Working Voltage	6.3 Vdc to 400 Vdc. (450 Vdc on request)
Capacitance Range	1.0μF to 22,000μF (at +27° C, 100 Hz)
Capacitance Tolerance	-10% +50% (Other tolerance on request)
Leakage Current (After 5mt charging through 1000 Ω resistor) IL in μA	IL ≤ 0.01 CV or 3 μA, whichever is greater Where IL = Leakage current in μA C= Capacitance (μF), V= Working Voltage in Volt

Dissipation factor (Tan δ) Max (at +27°C, 100 Hz)

WV Vdc	6.3	10	16	25	35~50	63~100	160~250	350~400
Tan δ %	24	20	17	15	12	10	12	13

For Capacitor ratings with cap value >1000μF add 2% for every 1000μF increase

Low Temperature Stability

Impedance Ratio at 100 Hz.

Rated Voltage (V)	6.3	10	16	25	35	40~100	160~250	350	400
Z-25°C / Z+27°C	5	3	3	2	2	2	3	6	7
Z-40°C / Z+27°C	11	9	7	5	3	3	For 160V 3	-	-

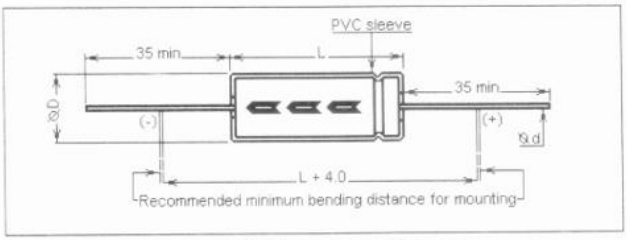
Add 0.5 to the Ratio for Z- 25°C, 1.0 to the Ratio Z- 40°C Per 1000μF, for Cap>1000μF

Life Tests

Tests	Endurance DC Life Test	Storage Shelf Life Test
Test Condition / Parameters	Capacitor at rated voltage (For Ø< 8mm, 2000 Hrs +85°C) (For Ø≥ 8mm, 3000 Hrs +85°C) Measurements after recovery to +27°C	Capacitor under no voltage At +85°C for 1000 Hrs Measurements after recovery to +27°C
(i). Endurance Test at High Temperature +85°C at WV. Δ Capacitance	Within ± 20% of the initial measured Value	Within ± 15% of initial measured Value
(ii). Storage Test at High Temperature +85°C at 0V. Tan ∂	Within 200% of initial limit	Within 150% of initial limit
D.C Leakage Current	Within initial limit	Within 150% of initial limit

DB/DC SERIES

2. PHYSICAL OUTLINE- DB/DC SERIES



All Dimensions in mm

3. DIMENSIONS (All units in mm)

Case code and Dimensional details of axial type DB/DC series capacitors in sleeved conditions are given below.

Case code		LL	LA	MA	NA	NR	PR	PS	FH	GH	HH	JH	KH
Diameter	Ø D ± 0.5	6.5	6.5	8	10	10	12.5	12.5	12.5	16	18	21	25
Length	L ± 1	13	18	18	18	25	26	32	38	40	40	40	40
Lead. Dia	Ø d ± 0.02	0.6	0.6	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8

AC MOTOR START CAPACITORS

MS SERIES

MD SERIES

MS/MD SERIES
AC MOTOR START CAPACITORS

MS SERIES : SINGLE ALUMINIUM CAN CONSTRUCTION
MD SERIES : DOUBLE ALUMINIUM CAN CONSTRUCTION

Aluminium Electrolytic Motor start Capacitors Consisting of high purity Etched and Formed foil interlaced with condensor grade absorbant insulating paper soaked with electrolyte and are encapsulated in Aluminium Can. **MS SERIES** Capacitors are with rubber bakelite cover with vent and solder lugs used as terminals and are provided with green coloured sleeve. **MD SERIES** are MS Capacitors insulated in an outer Aluminium Can (Double Can Construction) and tinned copper wire with or without eyelets are provided to take out the connection.

The intended use is for generating starting torque in single-phase motor when connected in series with the starting coil of the motor and upon reaching near the synchronous speed the Capacitor is disconnected. The intended application is for intermittent duty cycle of 1.7%.

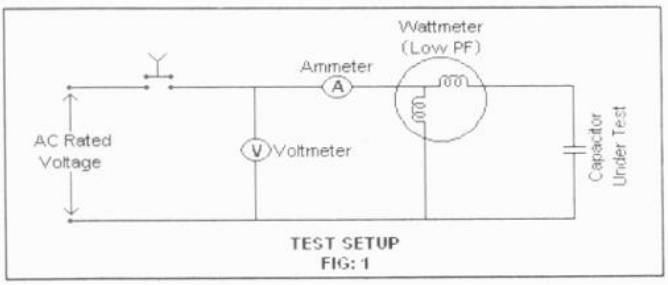
1. SPECIFICATIONS

Series	(i) MS Series – Single can construction with green coloured sleeve. (ii) MD Series – Double can construction with outer Aluminium Can.
Type	Aluminium Electrolytic Motor Start.
Reference Standard	IS 2993/ IEC 252
Operating Temperature	-30^0C to $+70^0$C
Working Voltage	(i) 110 AC Single phase 50/60 Hz (150 VAC surge) (ii) 230V AC Single phase 50/60 Hz (275 VAC surge) (iii) 330V AC Single phase 50/60 Hz (400 VAC surge)
Capacitance Range	20μF to 280μF (Capacitance will be within specified limits of minimum and maximum value when measured at 27^0C)
Power factor	Power factor shall be determined by recording current in amperes within 3 seconds after application of rated voltage and power in watts within 4 seconds after application of test voltage. Power factor shall not exceed 8% at rated voltage & frequency.
Duty cycle	20 starts per hour maximum. Each start shall be of not more than 3 seconds per 3 minutes duration at rated voltage confirming to 1.7% duty cycle. Other duty cycles are available on special request.
High voltage withstand Test	Capacitors shall be capable of withstanding without breakdown for 60 seconds a test between terminals and the case with 2000V sinusoidal AC Voltage of 50Hz. If the outer case is metal, the voltage is applied between the outer case and the terminals and if the outer case is insulating material a metal foil is wrapped tightly round the case and the voltage is applied between foil and terminals.

2. SCHEMATIC TEST SET UP FOR MEASURING CURRENT AND DETERMINATION OF POWER FACTOR AND CAPACITANCE:

Capacitance:

Capacitance shall be determined by recording current within 3 seconds after the application of rated voltage at temperature 27^0C as per the schematic set up in figure1.



TEST SETUP
FIG: 1

$$C = \frac{I \times 10^6}{2 \times 3.14 \times f \times V}$$

Where C = Capacitance in μF
I = Current in Ampere
f = Frequency in Hz
V = Applied line voltage.

Power Factor:

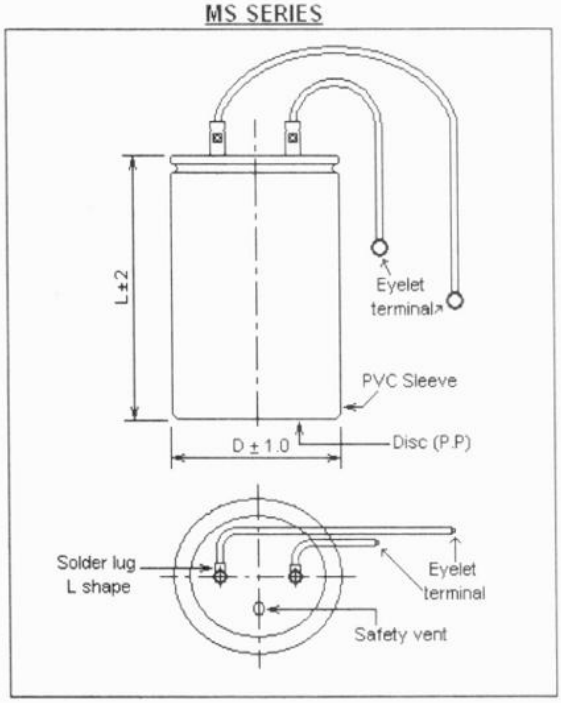
Power factor shall be determined by recording current in Amperes within 3 seconds and power in watts within 4 seconds after application of rated voltage in the setup in figure 1.

$$PF(\%) = \frac{P}{V \times I} \times 100$$

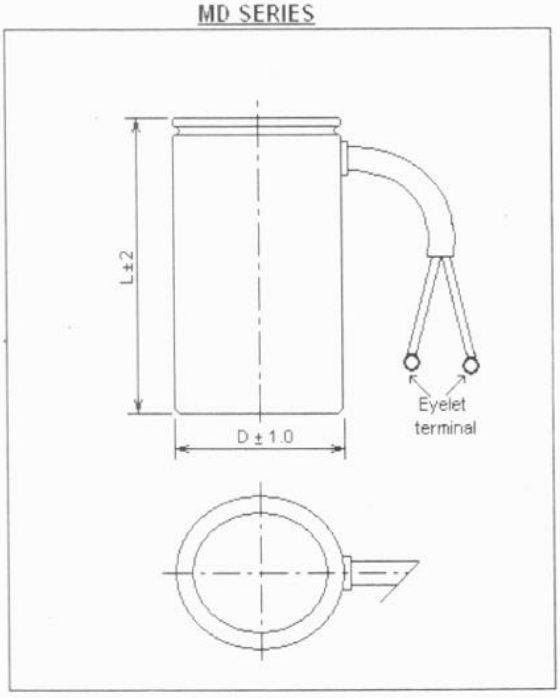
Where PF= Power Factor in %
P = Power in Watts
V = Applied Voltage in Volts
I = Current in Amperes

3. PHYSICAL OUTLINES – MS SERIES & MD SERIES

MS SERIES



MD SERIES



All Dimensions in mm

MS/MD SERIES

4. DIMENSIONS (All units in mm)

(a) MS Series

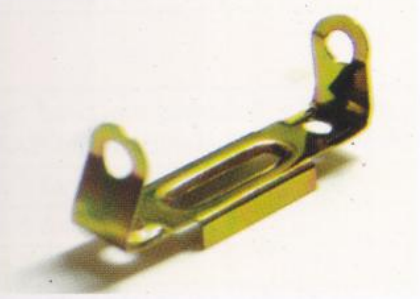
Case Code	Diameter D ± 1.0	Length L ± 2	Pitch P ± 0.2
CG	30	55	12
DG	35	55	14
DK	35	70	14
EK	40	70	16
EQ	40	100	16
FQ	45	100	18

(b) MD Series

Case Code	Diameter D ± 1.0	Length L ± 2
DL	35	75
EL	40	75
EP	40	95
FP	45	95
FS	45	125

UL APPROVED MOTOR START CAPACITORS

MU Series



Mounting Bracket

MU SERIES
AC MOTOR START CAPACITORS

UL APPROVED CAPACITORS FOR USA AND CANADIAN MARKET

KELTRON MU Series Motor Start Capacitors have been investigated by UL India Pvt. Limited, a subsidiary of Underwriters Laboratories Inc. for the standards for safety 'UL 810 Standard for Capacitors' and 'Canadian standard C 22.2 No.190 for Capacitors'. All the MU series capacitors manufactured at Keltron bears component recognition mark for USA and Canadian market c US. The manufacturing facility at KCCL is under 'FOLLOW UP SERVICE INSPECTION PLAN' of UL India Pvt. Ltd. They also carry out periodic review of the product file. The UL file for MU series capacitors is **"CZDS2E251759."**

MU series motor start capacitors are constructed using high purity etched & formed Aluminum foil interlaced with condensor grade absorbant insulating paper and then encapsulated in PHENOLIC CASING and sealed hermetically using rubber bakelite cover. Connections are taken out through solder tag and flexible PVC sheathed multistrand copper wire with SNAP-ON terminals.

The intended use is for generating starting torque in single-phase induction motors when connected in series with the starting coil of the motor. The intended application is for intermittent duty cycle of 1.7 %. Capacitors are supplied with or without mounting bracket as per customer requirement

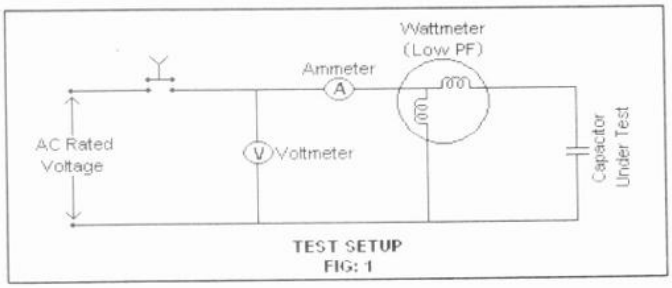
1. SPECIFICATIONS

Series	MU series
Type	Aluminium Electrolytic Motor Start.
Reference Standard	UL 810, C 22.2 No.190, EIA - 463 - B
Operating Temperature	-30^0C to $+70^0$C
Working Voltage	(i) 110 VAC Single phase 50/60 Hz (150 VAC surge) (ii) 230 VAC Single phase 50/60 Hz (275 VAC surge) (iii) 330 VAC Single phase 50/60 Hz (400 VAC surge)
Capacitance Range	20μF to 552μF (Capacitance will be within specified limits of minimum and maximum value when measured at $+27^0$C)
Power factor	Power factor shall be determined by recording current in amperes within 3 seconds after application of rated voltage and power in watts within 4 seconds after application of test voltage. Power factor shall not exceed 10% of rated voltage & frequency.
Duty cycle	20 starts per hour maximum each start shall be of not more than 3 seconds per 3 minutes duration at rated Voltage confirming to 1.7% duty cycle. Other duty cycles are available on special request.
High voltage withstand Test	Capacitors shall be capable of withstanding the application of 2000 volts AC rms 50 Hz for 1 second between the terminals and a metal foil wrapped tightly surrounding the lateral surface of the PHENOLIC CASE with out breakdown or flash over

2. SCHEMATIC TEST SET UP FOR MEASURING CURRENT AND DETERMINATION OF POWER FACTOR AND CAPACITANCE:

Capacitance:

Capacitance shall be determined by recording current within 3 seconds after the application of rated voltage at temperature 27^0C as per the schematic set up in figure1.



TEST SETUP
FIG: 1

$$C = \frac{I \times 10^6}{2 \times 3.14 \times f \times V}$$

Where C = Capacitance in μF
I = Current in Ampere

f = Frequency in Hz
V = Applied line voltage.

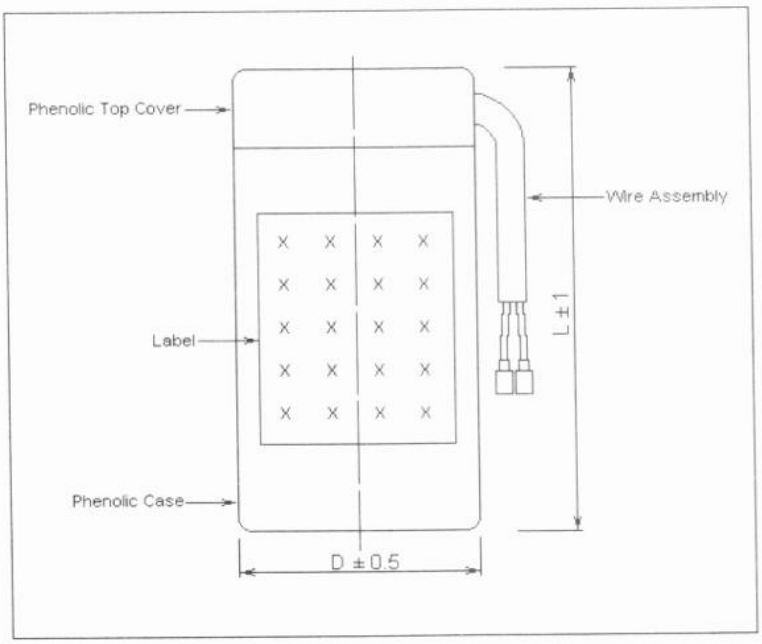
Power Factor:

Power factor shall be determined by recording current in Amperes within 3 seconds and power in watts within 4 seconds after application of rated voltage in the setup in figure 1.

$$PF\ (\%) = \frac{P}{V \times I} \times 100$$

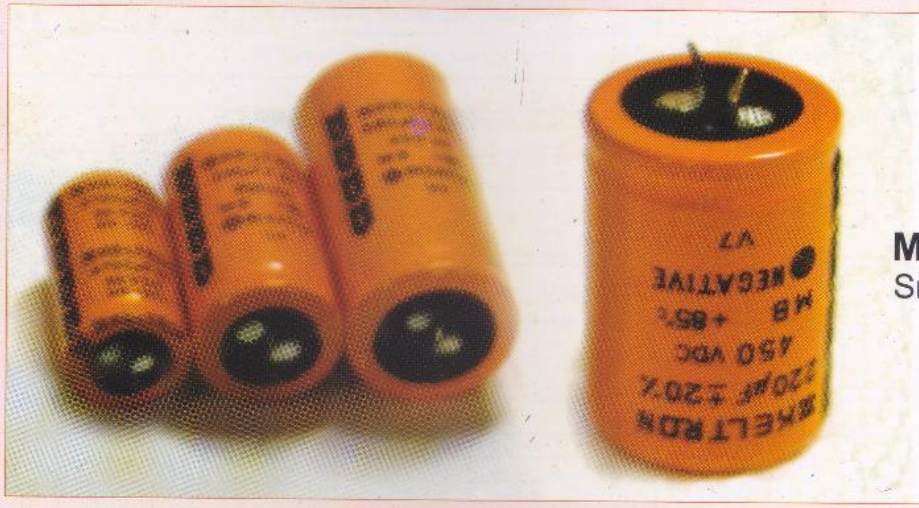
Where PF= Power Factor in %
P = Power in Watts
V = Applied Voltage in Volts
I = Current in Amperes

3. PHYSICAL OUTLINE - MU SERIES



All Dimensions in mm

LARGE CAN ALUMINIUM ELECTROLYTIC CAPACITORS



MB Series
Snap-in terminal type

ML Series
Lug terminal type

MP Series
Screw terminal type

MB SERIES

FEATURES : GENERAL PURPOSE SNAP-IN TERMINAL TYPE CAPACITORS RECOMMENDED FOR USE IN SWITCHED MODE POWER SUPPLIES, INDUSTRIAL AND ENTERTAINMENT ELECTRONIC SYSTEMS.

REFERENCE STANDARDS : IS4317/ IEC 384-4

ENDURANCE : +85°C, 2000 Hrs

PRODUCT MARKING } PROVIDED WITH ORANGE COLOUR SLEEVE AND BLACK PRINT

1. SPECIFICATIONS

PARAMETERS.	PERFORMANCE CHARACTERISTICS
Operating Temperature	- 40° C to +85°C for WV ≤ 160 Vdc & -25°C to +85°C for WV > 160 Vdc.
Working Voltage	16 Vdc to 450 Vdc
Capacitance Range	47μF to 33,000μF (at +27° C, 100 Hz)
Capacitance Tolerance	± 20%
Leakage Current (After 5mt charging through 1000 Ω resistor) IL in μA	IL ≤ 3 √(CV) Where IL = Leakage current in μA C= Capacitance (μF), V= Working Voltage in Volt

Dissipation factor (Tan δ) Max (at +27°C, 100 Hz)

WV Vdc	16~25	35~63	100~160	200~250	350 ~450
Tan δ %	20	16	12	11	10

For Capacitor ratings with cap value >1000μF add 2% for every 1000μF increase

Life Tests

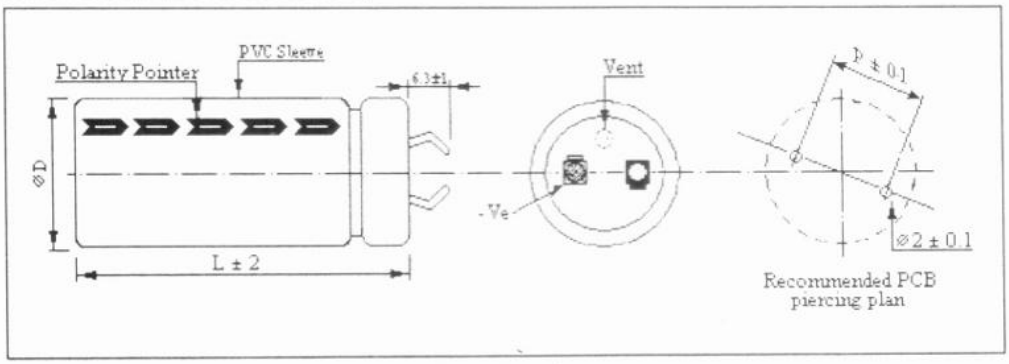
Tests	Endurance DC Life Test	Storage Shelf Life Test
Test Condition / Parameters	Capacitor at rated voltage And at +85°C for 2000 Hrs Measurements after recovery to +27°C	Capacitor under no voltage At +85°C for 1000 Hrs Measurements after recovery to +27°C
Δ Capacitance	Within ± 20% of the initial measured Value	Within ± 15% of initial measured Value
Tan ∂	Within 200% of initial limit	Within 150% of initial limit
D.C Leakage Current	Within initial limit	Within 150% of initial limit

(i). Endurance Test at High Temperature +85°C at WV.

(ii). Storage Test at High Temperature +85°C at 0V.

MB SERIES

2. PHYSICAL OUTLINE – MB SERIES



All dimensions in mm

3. DIMENSIONS (All units in mm)

Case code		AC	AD	BB	BC	BE	BF	CE	CF	CG	DG
Diameter	Ø D ± 0.5 (mm)	22	22	25	25	25	25	30	30	30	35
Length	L ± 2 (mm)	35	40	30	35	45	50	45	50	55	55
Pitch	P ± 0.1 (mm)	10	10	10	10	10	10	10	10	10	10

ML SERIES

FEATURES : GENERAL PURPOSE LUG TERMINAL TYPE CAPACITORS RECOMMENDED FOR USE IN SWITCHED MODE POWER SUPPLIES, TELE-COMMUNICATION & INDUSTRIAL SYSTEMS.

REFERENCE STANDARDS : IS4317/ IEC 384-4

ENDURANCE : +85°C, 2000 Hrs

PRODUCT MARKING } PROVIDED WITH GREEN COLOUR SLEEVE AND BLACK PRINT

1. SPECIFICATIONS

PARAMETERS.	PERFORMANCE CHARACTERISTICS
Operating Temperature	- 40°C to +85°C for WV ≤ 160 Vdc & -25°C to +85°C for WV > 160 Vdc.
Working Voltage	16 Vdc to 450 Vdc.
Capacitance Range	150μF to 1,00,000μF (at +27°C, 100 Hz)
Capacitance Tolerance	± 20%
Leakage Current (After 5mt charging through 1000 Ω resistor) IL in μA	IL ≤ 3 √(CV) Where IL = Leakage current in μA C= Capacitance (μF), V= Working Voltage in Volt Note: For C ≤ 2500 μF, the charging resistor R=1000 Ω For C > 2500 μF, the charging resistor R= 2.5 /C

Dissipation factor (Tan δ) Max (at +27°C, 100 Hz)

WV (V)	16	25	35	50	63	100	160~250	350 ~450
Tan δ %	50	40	35	30	25	20	22	25

For Capacitor ratings with cap value >10000μF, add 1% for every 1000μF increase

Life Tests

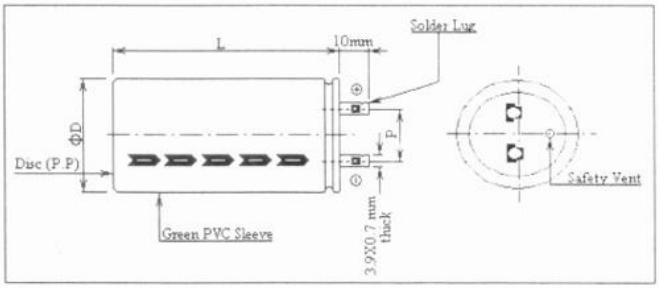
Tests	Endurance DC Life Test	Storage Shelf Life Test
Test Condition / Parameters	Capacitor at rated voltage and At +85°C for 2000 Hrs. Measurements after recovery to +27°C	Capacitor under no voltage At +85°C for 1000 Hrs Measurements after recovery to +27°C
Δ Capacitance	Within ± 30% for WV 16V to 25V Within ± 25% for WV 35V to 100V Within ± 20% for WV 160V to 450V of initial measured value	Within ±20% of initial measured Value
Tan ∂	Within 200% of initial limit	Within 150% of initial limit
D.C Leakage Current	Within initial limit	Within 150% of initial limit

(i). Endurance Test at High Temperature +85°C at WV.

(ii). Storage Test at High Temperature +85°C at 0V.

ML SERIES

2. PHYSICAL OUTLINE – ML SERIES



All dimensions in mm

3. DIMENSIONS (All units in mm)

Dimensions provided without sleeve. For sleeved dimensions add 1.0mm to the diameter and 2mm to the length of the capacitor.

Case code	CE	CG	DE	DG	DK	DQ	EK	EQ	FQ
Diameter Ø D ± 1 (mm)	30	30	35	35	35	35	40	40	45
Length L ± 2 (mm)	45	55	45	55	70	100	70	100	100
Pitch P ± 0.5 (mm)	12	12	14	14	14	14	16	16	18

MP SERIES

FEATURES : GENERAL PURPOSE SCREW TERMINAL TYPE. RECOMMENDED FOR USE IN TELE-COMMUNICATIONS AND INDUSTRIAL SYSTEMS

REFERENCE STANDARDS : IS4317/ IEC 384-4

ENDURANCE : +85°C, FOR 2000 Hrs

PRODUCT MARKING } PROVIDED WITH GREEN COLOUR SLEEVE AND BLACK PRINT

1. SPECIFICATIONS

PARAMETERS.	PERFORMANCE CHARACTERISTICS
Operating Temperature	- 40°C to +85°C for WV ≤ 160 Vdc & -25°C to +85°C for WV > 160 Vdc.
Working Voltage	16 Vdc to 450 Vdc
Capacitance Range	220 μF to 1,00,000μF at +27° C, 100 Hz
Capacitance Tolerance	± 20%
Leakage Current (After 5mt charging through 1000 Ω resistor) IL in μA	IL ≤ 3 √ (CV) Where IL = Leakage current in μA C= Capacitance (μF), V= Working Voltage in Volt Note: For C ≤ 2500μF, the charging resistor for R= 1000Ω For C> 2500μF, the charging resistor R = 2.5 /C

Dissipation factor (Tan δ) Max
(To be measured in four wire Kelvin clip terminal Method)

Tan δ at +27°C, 100 Hz in percentage

WV in Volts / Diameter in mm	16	25	35	50	63	100	160	200	250	350	400	450
Ø 35	85	70	55	40	35	25	17	15	16	19	23	25
Ø50	105	85	70	50	45	35	25	21	23	26	30	32
Ø63	140	100	90	75	50	45	34	30	32	35	40	42

Note: The DF value indicated is the maximum value permitted. But the typical values will be lower than the above table.

Life Tests

Tests	Endurance DC Life Test	Storage Shelf Life Test
Test Condition / Parameters	Capacitor at rated voltage and At +85°C for 2000 Hrs Measurements after recovery to +27°C	Capacitor under no voltage At +85°C for 1000 Hrs Measurements after recovery to +27°C
Δ Capacitance	Within ±25% for WV 16 V to 25V Within ±20% for WV 35 V to 100V Within ±15% for WV 160 V to 450V of initial measured value	Within ±15% of initial measured Value
Tan ∂	Within 200% of initial limit	Within 150% of initial limit
D.C Leakage Current	Within initial limit	Within 150% of initial limit

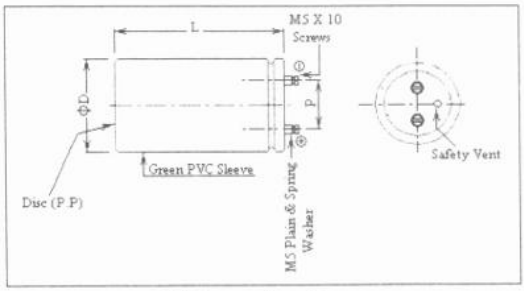
(i). Endurance Test at High Temperature +85°C at WV.

(ii). Storage Test at High Temperature +85°C at 0V.

MP SERIES

2. PHYSICAL OUT LINES – MP SERIES

Dimensions provided without sleeve. For sleeved dimensions add 1.0mm to the diameter and 2mm to the length of the capacitor.



All dimensions in mm

3. DIMENSIONS (All units in mm)

Case code	DG	DH	DM	DQ	GM	GQ	HQ
Diameter Ø D ± 1 (mm)	35	35	35	35	50	50	63
Length L ± 2 (mm)	55	60	80	105	80	105	105
Pitch P ± 0.5 (mm)	12.5	12.5	12.5	12.5	22	22	28.5

KELCAP - LDC

POWER CAPACITOR - METALLIZED POLY PROPYLENE FILM SELF HEALING TYPE
LIGHT DUTY - CYLINDRICAL CONSTRUCTION

KELCAP - LDC capacitors are light duty power factor correction capacitors of cylindrical aluminium can construction. Capacitors confirm to Indian standard IS 13340 -1993. Mounting clamp is fitted with nut and washer along with the capacitor. These capacitors are meant for light duty application and are mainly used for agriculture pump sets with a maximum of 5% harmonics withstand capability.

Technical Specifications :-

Voltage rating	440V/415V/3 phase/50Hz
Kvar rating	1 kvar - 10 kvar
Connection	Delta
Temperature class	-10°C to +55°C
Dielectric	MPP
Maximum over current	1.3 rated I
Peak inrush current	100 times rated I
Operational losses at dielectric level	≤ 0.20 W/kvar
Operational losses at termination including discharge resistor	≤ 0.45 W/kvar
Insulation level	3 KV
Installation	Indoor
Reference standard	IS 13340/1993, IS 13341/1992, IEC 60831-1(2002), IEC 60831-2(1995)
Mounting position	Any position except upside down
Mounting and earthing	Threaded stud with clamp
Protection and safety	Selfhealing, discharge resistor
Termination	Provided with wire

KELCAP - LDS

POWER CAPACITOR - METALLIZED POLY PROPYLENE FILM SELF HEALING TYPE
LIGHT DUTY - SQUARE CAP CONSTRUCTION

KELCAP - LDS capacitors are light duty power factor correction capacitors of square cap construction. Capacitors confirm to Indian standard IS 13340 -1993. Mounting of capacitors are with the help of mounting stud. These capacitors are meant for light duty application and are mainly used for agriculture pump sets with a maximum of 5% harmonics withstand capability.

Technical Specifications :-

Voltage rating	440V/415V/3 phase/50Hz
Kvar rating	1 kvar - 10 kvar
Connection	Delta
Temperature class	-10°C to +55°C
Dielectric	MPP
Maximum over current	1.3 rated I
Peak inrush current	100 times rated I
Operational losses at dielectric level	≤ 0.20 W/kvar
Operational losses at termination including discharge resistor	≤ 0.45 W/kvar
Insulation level	3 KV
Installation	Indoor
Reference standard	IS 13340/1993, IS 13341/1992, IEC 60831-1(2002), IEC 60831-2(1995)
Mounting position	Any position except upside down
Mounting and earthing	Stud mounting
Protection and safety	Self healing, discharge resistor
Termination	Provided with wire

KELCAP - IDC

POWER CAPACITOR - METALLIZED POLY PROPYLENE FILM SELF HEALING TYPE
INDUSTRIAL DUTY - CYLINDRICAL CONSTRUCTION

KELCAP - IDC capacitors are industrial duty power factor correction capacitors of cylindrical aluminium can construction. Capacitors confirm to Indian standard IS 13340-1993. These capacitors are provided with explosion proof design. Mounting of capacitors are with the help of mounting stud. These capacitors are meant for standard duty PF correction in low voltage/medium voltage networks, lighting, small scale industries, machine shops and process industries with harmonics withstand capability of maximum 10%.

Technical Specifications :-

Voltage rating	440V/415V/3 phase/50Hz
Kvar rating	1 kvar - 25 kvar
Connection	Delta
Temperature class	-10°C to +55°C
Dielectric	MPP
Maximum over current	1.3 rated I
Peak inrush current	150 times rated I
Operational losses at dielectric level	≤ 0.20 W/kvar
Operational losses at termination including discharge resistor	≤ 0.45 W/kvar
Insulation level	3 KV
Installation	Indoor
Reference standard	IS 13340/1993, IS 13341/1992, IEC 60831-1(2002), IEC 60831-2(1995)
Mounting position	Any position except upside down
Mounting and earthing	Threaded stud
Protection and safety	Provided with over pressure cut off device, self healing, discharge resistors and protection plastic cap
Termination	1-9 kvar fast on 'U' terminal, 10-25 kvar screw type connection

KELCAP - IDS

POWER CAPACITOR - METALLIZED POLY PROPYLENE FILM SELF HEALING TYPE
INDUSTRIAL DUTY - SQUARE CAP CONSTRUCTION

KELCAP - IDS capacitors are industrial duty power factor correction capacitors of square cap construction. Capacitors confirm to Indian standard IS 13340 -1993. These capacitors are provided with explosion proof design. Mounting of capacitors are with the help of mounting stud. These capacitors are meant for standard duty PF correction in low voltage/medium voltage networks, lighting, small scale industries, machine shops and process industries with harmonics withstand capability of maximum 10%.

Technical Specifications :-

Voltage rating	440V/415V/3 phase/50Hz
Kvar rating	1 kvar - 25 kvar
Connection	Delta
Temperature class	-10^{0}C to +55^{0}C
Dielectric	MPP
Maximum over current	1.3 rated I
Peak inrush current	150 times rated I
Operational losses at dielectric level	≤ 0.20 W/kvar
Operational losses at termination including discharge resistor	≤ 0.45 W/kvar
Insulation level	3 KV
Installation	Indoor
Reference standard	IS 13340/1993, IS 13341/1992, IEC 60831-1(2002), IEC 60831-2(1995)
Mounting position	Vertical
Mounting and earthing	M8
Protection and safety	Provided with over pressure cut off device for 10 kvar and above, self healing, discharge resistors
Termination	1-4 kvar: wire, 5-9 kvar: M6 terminal, 10-25 kvar: M8 terminal

KELCAP - HDC

POWER CAPACITOR - METALLIZED POLY PROPYLENE FILM SELF HEALING TYPE
HEAVY DUTY - CYLINDRICAL CONSTRUCTION

KELCAP - HDC capacitors are heavy duty power factor correction capacitors of cylindrical aluminium can construction. Capacitors confirm to Indian standard IS 13340 -1993. The capacitors are provided with explosion proof design. Mounting of capacitors are with the help of M12 mounting stud. These capacitors are meant for industries having fluctuating loads with 20% max harmonics such as chemical industries, pharmaceuticals, flour mills, process industries and food processing plants.

Technical Specifications :-

Voltage rating	440V/415V/3 phase/50Hz
Kvar rating	5 kvar - 25 kvar
Connection	Delta
Temperature class	-10°C to +55°C
Dielectric	MPP
Maximum over current	1.8 rated I
Peak inrush current	200 times rated I
Operational losses at dielectric level	≤ 0.20 W/kvar
Operational losses at termination including discharge resistor	≤ 0.45 W/kvar
Insulation level	3 KV
Installation	Indoor
Reference standard	IS 13340/1993, IS 13341/1992, IEC 60831-1(2002), IEC 60831-2(1995)
Mounting position	Vertical
Mounting and earthing	M12
Protection and safety	Provided with over pressure cut off device, self healing, discharge resistors
Termination	5-8 kvar fast on 'U' terminal, 10-25 kvar screw type connection

KELCAP - SHS

POWER CAPACITOR - METALLIZED POLY PROPYLENE FILM SELF HEALING TYPE
SUPER HEAVY DUTY - SQUARE CAP CONSTRUCTION

KELCAP- SHS capacitors are super heavy duty power factor correction capacitors of square cap construction. Capacitors confirm to Indian standard IS 13340 -1993. The capacitors are provided with explosion proof design. Mounting is provided with the help of clamps attached to the capacitor body. These capacitors are meant for industries having fluctuating loads with 25% max harmonics such as rolling mills, cement plants, welding equipments, automobile industries, sugar plants and paper industries.

Technical Specifications :-

Voltage rating	440V/415V/3 phase/50Hz
Kvar rating	1 kvar - 25 kvar
Connection	Delta
Temperature class	-10^{0}C to $+55^{0}$C
Dielectric	MPP
Maximum over current	2 rated I
Peak inrush current	250 times rated I
Operational losses at dielectric level	≤ 0.20 W/kvar
Operational losses at termination including discharge resistor	≤ 0.45 W/kvar
Operational losses at termination including resistor & inductor coil	≤ 0.65 W/kvar
Insulation level	3 KV
Installation	Indoor
Reference standard	IS 13340/1993, IS 13341/1992, IEC 60831-1(2002), IEC 60831-2(1995)
Mounting position	Vertical
Mounting and earthing	M8
Protection and safety	Provided with over pressure cut off device for 3 kvar & above, self healing, discharge resistors
Termination	M8 terminal provided