R.49

X1 CLASS (IEC 60384-14) - MKP Series

METALLIZED POLYPROPYLENE FILM CAPACITOR

SELF-HEALING PROPERTIES

Typical applications: interference suppression and «across-the-line» applications. Suitable for use in situations where failure of the capacitor would not lead to danger of electric shock.
Class X1 shall be applied for PERMANENTLY CONNECTED APPARATUS.

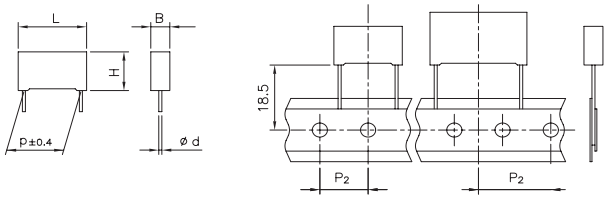
Note: **PERMANENTLY CONNECTED APPARATUS:** apparatus which is intended for connection to the mains by a connection which cannot be loosened **BY HAND**.
BY HAND: operation that does not require the use of any object such a tool, coin, etc.

PRODUCT CODE: **R49**

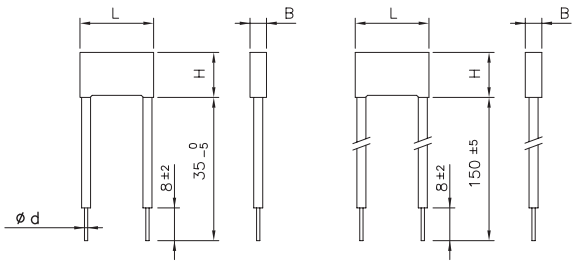
Note: R.49 series has replaced the 1.58 series (available upon request). For new design we suggest the use of the R.49 series.

Loose Taped

Fig.1 Fig.2



Insulated rigid leads Insulated flexible leads 0.5mm²



Ø d ±0.05	p ≤15	22.5 ≤ p ≤ 27.5	p = 37.5
	0.6 or 0.8*	0.8	1.0

*See size table.
All dimensions are in mm.

Pitch	Box thickness (B)	Maximum dimensions (mm)		
(mm)	(mm)	B max	H max	L max
10.0	All	B +0.2	H +0.1	L +0.2
15.0	<7.5	B +0.2	H +0.1	L +0.3
15.0	≥7.5	B +0.2	H +0.1	L +0.5
22.5	All	B +0.2	H +0.1	L +0.3
27.5	All	B +0.2	H +0.1	L +0.3
37.5	All	B +0.3	H +0.1	L +0.3

GENERAL TECHNICAL DATA

Dielectric: polypropylene film.

Plates: metal layer deposited by evaporation under vacuum.

Winding: non-inductive type.

Leads: tinned wire.

Protection: plastic case, thermosetting resin filled.
Box material is solvent resistant and flame retardant according to UL94 V0.

Marking: Manufacturer's logo, series, capacitance, tolerance, rated voltage, capacitor class, dielectric code, climatic category, passive flammability category, manufacturing date code, approvals, manufacturing plant.

Climatic category: 40/110/56 IEC 60068-1

Operating temperature range: -40 to +110°C

Related documents: IEC 60384-14, EN 60384-14.

ELECTRICAL CHARACTERISTICS

Rated voltage (V_R): 310Vac / 800Vdc; (50/60Hz)
330Vac / 800Vdc; (50/60Hz)

Capacitance range: 0.01µF to 6.8µF

Capacitance values: E6 series (IEC 60063 Norm).

Capacitance tolerances (measured at 1 kHz)**:**
±10% (K); ±20% (M);
Tolerance ±5% (J) available upon request.

Dissipation factor (DF):
tgδx10⁻⁴ at +25°C ±5°C: ≤10 (6)* at 1kHz *
Typical value

Insulation resistance:

Test conditions
Temperature: +25°C±5°C
Voltage charge time: 1 min
Voltage charge: 100 Vdc

Performance
≥1x10⁵ MΩ (5x10⁵ MΩ)* for C≤0.33µF
≥30000 s (150000 s)* for C>0.33µF
* Typical value

Test voltage between terminations (on all pieces)**:**
1500Vac for 1 s + 2200Vdc for 1 s at +25°C±5°C

TEST METHOD AND PERFORMANCE

Damp heat, steady state:

Test conditions
Temperature: +40°C±2°C
Relative humidity (RH): 93% ±2%
Test duration: 56 days

Performance
Dielectric strength: no dielectric breakdown or flashover at 4.3 x V_R (d.c.)/1 min
Capacitance change |ΔC/C|: ≤5%
Insulation resistance: ≥50% of initial limit.

Endurance:

Test conditions
Temperature: +110°C±2°C
Test duration: 1000 h
Voltage applied: 1.25 x V_R +1000Vac 0.1 s/h

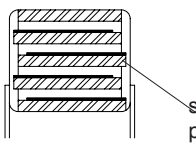
Performance
Dielectric strength: no dielectric breakdown or flashover at 4.3 x V_R (d.c.)/1 min
Capacitance change |ΔC/C|: ≤10%
Insulation resistance: ≥50% of initial limit.

Resistance to soldering heat:

Test conditions
Solder bath temperature: +260°C±5°C
Dipping time (with heat screen):10 s±1 s

Performance
Capacitance change |ΔC/C|: ≤2%

Winding scheme



R.49

X1 CLASS (IEC 60384-14) - MKP Series

METALLIZED POLYPROPYLENE FILM CAPACITOR

SELF-HEALING PROPERTIES

PRODUCT CODE: **R49**

Rated Cap. (*)	310 Vac / 800 Vdc Std dimensions B	H	L	p	Ø d	Max dv/dt at 440Vdc (V/ µs)	Part Number
0.010 µF	5.0	11.0	13.0	10.0	0.6	600	R49AF 2100 - - 01 -
0.015 µF	5.0	11.0	13.0	10.0	0.6	600	R49AF 2150 - - 01 -
0.022 µF	6.0	12.0	13.0	10.0	0.6	600	R49AF 2120 - - 01 -
0.033 µF	6.0	12.0	13.0	10.0	0.6	600	R49AF 2330 - - 01 -
0.010 µF	5.0	11.0	18.0	15.0	0.6	500	R49AI 2100 - - 01 -
0.015 µF	5.0	11.0	18.0	15.0	0.6	500	R49AI 2150 - - 01 -
0.022 µF	5.0	11.0	18.0	15.0	0.6	500	R49AI 2220 - - 01 -
0.033 µF	5.0	11.0	18.0	15.0	0.6	500	R49AI 2330 - - 01 -
0.047 µF	6.0	12.5	18.0	15.0	0.6	500	R49AI 2470 - - 01 -
0.068 µF	6.0	12.0	18.0	15.0	0.6	500	R49AI 2680 - - M1 -M
0.068 µF	7.5	13.5	18.0	15.0	0.6	500	R49AI 2680 - - 01 -
0.10 µF	7.5	13.5	18.0	15.0	0.6	500	R49AI 3100 - -M1 -M
0.10 µF	8.5	14.5	18.0	15.0	0.6	500	R49AI 3100 - - 01 -
0.15 µF	10.0	16.0	18.0	15.0	0.8	500	R49AI 3150 - - 01 -
0.10 µF	6.0	15.0	26.5	22.5	0.8	400	R49AN 3100 - - 01
0.15 µF	7.0	16.0	26.5	22.5	0.8	400	R49AN 3150 - - 01
0.22 µF	8.5	17.0	26.5	22.5	0.8	400	R49AN 3220 - - 01
0.33 µF	10.0	18.5	26.5	22.5	0.8	400	R49AN 3330 - - 01
0.47 µF	11.0	20.0	26.5	22.5	0.8	400	R49AN 3470 - - 01
0.33 µF	9.0	17.0	32.0	27.5	0.8	200	R49AR 3330 - - 01
0.47 µF	11.0	20.0	32.0	27.5	0.8	200	R49AR 3470 - - 01
0.68 µF	13.0	22.0	32.0	27.5	0.8	200	R49AR 3680 - - 01
1.0 µF	14.0	28.0	32.0	27.5	0.8	200	R49AR 4100 - - 01
1.5 µF	18.0	33.0	32.0	27.5	0.8	200	R49AR 4150 - - 01
2.2 µF	22.0	37.0	32.0	27.5	0.8	200	R49AR 4220 - - 01

Mechanical version and packaging (Table1)
Tolerance: K (±10%); M (±20%)

All dimensions are in mm

E12 Series available upon request

For “capacitor connected in serial with main line” (two - phase and three - phase net) application, please read the “SHORT GUIDE TO CHOOSE THE RIGHT FILM CAPACITORS” at pag. 152 and contact our Technical Service for choosing the safest solution.

Rated Cap. (*)	330 Vac / 800 Vdc Std dimensions B	H	L	p	Ø d	Max dv/dt at 440Vdc (V/ µs)	Part Number
0.047 µF	5.0	11.0	18.0	15.0	0.6	500	R49AI 2470 - - B1 -
0.068 µF	6.0	12.0	18.0	15.0	0.6	500	R49AI 2680 - - B1
0.068 µF	6.0	17.5	18.0	15.0	0.6	500	R49AI 2680 - - A2 -
0.10 µF	6.0	17.5	18.0	15.0	0.6	500	R49AI 3100 - - A2 -
0.15 µF	13.0	12.0	18.0	15.0	0.8	500	R49AI 3150 - - A3 -
0.15 µF	8.5	14.5	18.0	15.0	0.8	500	R49AI 3150 - - B1 M
0.22 µF	10.0	16.0	18.0	15.0	0.8	500	R49AI 3220 - - B2 M
0.22 µF	11.0	19.0	18.0	15.0	0.8	500	R49AI 3220 - - B1-
0.15 µF	6.0	15.0	26.5	22.5	0.8	400	R49AN 3150 - - B1 -
0.22 µF	7.0	16.0	26.5	22.5	0.8	400	R49AN 3220 - - B1 -
0.33 µF	8.5	17.0	26.5	22.5	0.8	400	R49AN 3330 - - B1 M
0.47 µF	10.0	18.5	26.5	22.5	0.8	400	R49AN 3470 - - B1 M
0.68 µF	13.0	22.0	26.5	22.5	0.8	400	R49AN 3680 - - B1 M
0.33 µF	9.0	17.0	32.0	27.5	0.8	200	R49AR 3330 - - A1 -
0.47 µF	11.0	20.0	32.0	27.5	0.8	200	R49AR 3470 - - A1 -
0.68 µF	11.0	20.0	32.0	27.5	0.8	200	R49AR 3680 - - B1 -
0.68 µF	13.0	22.0	32.0	27.5	0.8	200	R49AR 3680 - - A1 -
1.0 µF	13.0	25.0	32.0	27.5	0.8	200	R49AR 4100 - - B1 -
1.0 µF	14.0	28.0	32.0	27.5	0.8	200	R49AR 4100 - - A1 -
1.5 µF	14.0	28.0	32.0	27.5	0.8	200	R49AR 4150 - - B1 -
1.5 µF	18.0	33.0	32.0	27.5	0.8	200	R49AR 4150 - - A1 -
2.2 µF	18.0	33.0	32.0	27.5	0.8	200	R49AR 4220 - - B1 -
2.2 µF	22.0	37.0	32.0	27.5	0.8	200	R49AR 4220 - - A1 -
3.3 µF	22.0	37.0	32.0	27.5	0.8	200	R49AR 4330 - - B1 -
0.68 µF	11.0	22.0	41.5	37.5	1.0	100	R49AW 3680 - - B1 -
1.0 µF	11.0	22.0	41.5	37.5	1.0	100	R49AW 4100 - - B1 -
1.5 µF	13.0	24.0	41.5	37.5	1.0	100	R49AW 4150 - - B1 -
2.2 µF	16.0	28.5	41.5	37.5	1.0	100	R49AW 4220 - - B1 -
3.3 µF	19.0	32.0	41.5	37.5	1.0	100	R49AW 4330 - - B1 -
4.7 µF	19.0	32.0	41.5	37.5	1.0	100	R49AW 4470 - - B1 -
6.8 µF	30.0	45.0	41.5	37.5	1.0	100	R49AW 4680 - - B1 -

Mechanical version and packaging (Table1)
Tolerance: K (±10%); M (±20%)

APPROVALS

	ENEC IEC 60384-14	Class X1	File No.CA08.00030
	UL 1414 (up to 1µF, 85°C; 250Vac)	Across-the-line	File No.E97797
	CSA - C22.2 No.1 (up to 1µF, 85°C; 250Vac)	Across-the-line certified for Canad	File No.E97797
c UL us	UL 1283 (310 Vac)	Electromagnetic Interference Filters	File No.E85238
	CSA - C22.2 No.8 (310 Vac)	Electromagnetic Interference Filters certified for Canada	File No.E85238

Approved according to IEC 60384-14

According to IEC 60065.

Table 1

Standard packaging style	Lead length (mm)	Taping style P_2 (mm)	Fig. (No.)	Pitch (mm)	Ordering code (Digit 10 to 11)
AMMO-PACK		12.70	1	10.0/15.0	DQ
AMMO-PACK		19.05	2	22.5	DQ
REEL Ø500mm		12.70	1	10.0/15.0	CK
REEL Ø500mm		19.05	2	22.5/27.5	CK
Loose, short leads	4^{+2}				00
Loose, long leads	$25^{-1/+2}$				50
Loose, long leads	30^{+5}				40
Loose, insulated rigid leads	30^{+5}				51
Loose, insulated flexible leads	$150^{\pm5}$				52

Note: Ammo-pack is the preferred packaging for taped version.

R.49+R

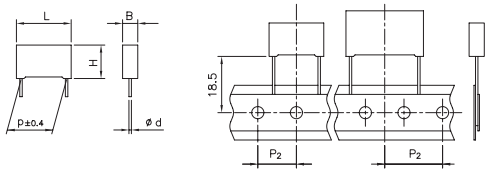
Capacitors with discharge resistor
X1 CLASS (IEC 60384-14) - MKP Series
METALLIZED POLYPROPYLENE FILM CAPACITOR
SELF-HEALING PROPERTIES

Typical applications: interference suppression and «across-the-line» applications. Suitable for use in situations where failure of the capacitor would not lead to danger of electric shock.
Class X1 shall be applied for PERMANENTLY CONNECTED APPARATUS.

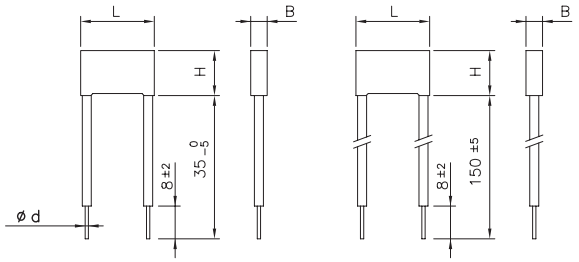
Note: **PERMANENTLY CONNECTED APPARATUS:** apparatus which is intended for connection to the mains by a connection which cannot be loosened **BY HAND**.
BY HAND: operation that does not require the use of any object such a tool, coin, etc.

Loose Taped

Fig.1 Fig.2



Insulated rigid leads Insulated flexible leads 0.5mm²



Ø d ±0.05	p= 27.5	p = 37.5
	0.8	1

All dimensions are in mm.

PRODUCT CODE: **R49**

Pitch	Box thickness	Maximum dimensions (mm)		
(mm)	(mm)	B max	H max	L max
27.5	All	B +0.2	H +0.1	L +0.3
37.5	All	B +0.3	H +0.1	L +0.3

GENERAL TECHNICAL DATA

Dielectric: polypropylene film.

Plates: metal layer deposited by evaporation under vacuum.

Winding: non-inductive type.

Leads: tinned wire.

Protection: plastic case, thermosetting resin filled.
Box material is solvent resistant and flame retardant according to UL94 V0.

Marking: Manufacturer's logo, series, capacitance, tolerance, rated voltage, capacitor class, dielectric code, climatic category, passive flammability category, manufacturing date code, approvals, manufacturing plant.

Climatic category: 40/110/56 IEC 60068-1

Operating temperature range: -40 to +110°C

Related documents: IEC 60384-14, EN 132400.

ELECTRICAL CHARACTERISTICS

Rated voltage (V_R): 330Vac; 800Vdc(50/60Hz)*

Capacitance range: 0.33µF to 6.8µF

Capacitance values: E6 series (IEC 60063 Norm).

Capacitance tolerances (measured at 1 kHz)**:**
±10% (K); ±20% (M).

Dissipation factor (DF):
tgδx10^{-4} at +25°C ±5°C: ≤10 (6)* at 1kHz *
Typical value

Insulation resistance:

Test conditions
Temperature: +25°C±5°C
Voltage charge time: 1 min
Voltage charge: 100 Vdc

Performance
≥1x10^5 MΩ (5x10^5 MΩ)* for C≤0.33µF
≥30000 s (150000 s)* for C>0.33µF
* Typical value

Test voltage between terminations (on all pieces)**:**
1500Vac for 1 s + 2200Vdc for 1 s at +25°C±5°C

TEST METHOD AND PERFORMANCE

Damp heat, steady state:

Test conditions
Temperature: +40°C±2°C
Relative humidity (RH): 93% ±2%
Test duration: 56 days

Performance
Dielectric strength: no dielectric breakdown or flashover at 4.3 x V_R (d.c.)/1 min
Capacitance change |ΔC/C|: ≤5%
Insulation resistance: ≥50% of initial limit.

Endurance:

Test conditions
Temperature: +110°C±2°C
Test duration: 1000 h
Voltage applied: 1.25 x V_R +1000Vac 0.1 s/h

Performance
Dielectric strength: no dielectric breakdown or flashover at 4.3 x V_R (d.c.)/1 min
Capacitance change |ΔC/C|: ≤10%
Insulation resistance: ≥50% of initial limit.

Resistance to soldering heat:

Test conditions
Solder bath temperature: +260°C±5°C
Dipping time (with heat screen):10 s±1 s

Performance
Capacitance change |ΔC/C|: ≤2%

R.49+R

Capacitor with discharge resistor
X1 CLASS (IEC 60384-14) - MKP Series
METALLIZED POLYPROPYLENE FILM CAPACITOR
SELF-HEALING PROPERTIES
PRODUCT CODE: **R49**

Rated Cap. (*)	330 Vac / 800 Vdc Std dimensions B	H	L	p	Ø d	Max dv/dt at 440Vdc (V/ µs)	Part Number
0.33 µF	9.0	17.0	32.0	27.5	0.8	200	R49AR 3330 - - B1 - -
0.47 µF	11.0	20.0	32.0	27.5	0.8	200	R49AR 3470 - - B1 - -
0.68 µF	13.0	22.0	32.0	27.5	0.8	200	R49AR 3680 - - B1 - -
1.0 µF	13.0	22.0	32.0	27.5	0.8	200	R49AR 4100 - - B1 M -
1.0 µF	14.0	28.0	32.0	27.5	0.8	200	R49AR 4100 - - B2 - -
1.5 µF	18.0	33.0	32.0	27.5	0.8	200	R49AR 4150 - - B1 M -
1.5 µF	14.0	28.0	32.0	27.5	0.8	200	R49AR 4150 - - B2 - -
2.2 µF	22.0	37.0	32.0	27.5	0.8	200	R49AR 4220 - - B1 - -
0.68 µF	11.0	22.0	41.5	37.5	1.0	100	R49AW 3680 - - A1 - -
1.0 µF	11.0	22.0	41.5	37.5	1.0	100	R49AW 4100 - - B1 - -
1.5 µF	13.0	24.0	41.5	37.5	1.0	100	R49AW 4150 - - B1 - -
2.2 µF	16.0	28.5	41.5	37.5	1.0	100	R49AW 4220 - - B1 - -
3.3 µF	19.0	32.0	41.5	37.5	1.0	100	R49AW 4330 - - B1 - -
4.7 µF	20.0	40.0	41.5	37.5	1.0	100	R49AW 4470 - - B1 - -
6.8 µF	30.0	45.0	41.5	37.5	1.0	100	R49AW 4680 - - B1 - -

Rated voltage (A=330Vac)
Mechanical version and packaging (Table 1)
Tolerance: K (±10%); M (±20%)
Value of discharge resistor (Table 2)

All dimensions are in mm

APPROVALS

	ENEC IEC 60384-14	Class X1	File No.CA08.00030
c UL us	UL 1283 (310 Vac-105°C)	Electromagnetic Interference Filters	File No.E85238
	CSA - C22.2 No.8 (310 Vac-105°C)	Electromagnetic Interference Filters certified for Canada	File No.E85238

Approved according to IEC 60384-14
According to IEC 60065.

Table 1

Standard packaging style	Lead length (mm)	Taping style P_2 (mm)	Fig. (No.)	Pitch (mm)	Ordering code (Digit 10 to 11)
REEL Ø500mm		19.05	2	27.5	CK
Loose, short leads	4^{+2}				00
Loose, long leads	$25^{-1/+2}$				50
Loose, long leads	30^{+5}				40
Loose, insulated rigid leads	30^{+5}				51
Loose, insulated flexible leads	$150^{\pm5}$				52

PRODUCT CODE SYSTEM

The part number, comprising 15 digits, is formed as follows:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
R	4	9										-		-

Digit 1 to 3 Series code.
Digit 4 a.c. rated voltage:
A = 330Vac;
Digit 5 Pitch:
R = 27.5; W = 37.5 mm
Digit 6 to 9 Digits 7 - 8 - 9 indicate the first three digits of Capacitance value and the 6th digit indicates the number of zeros that must be added to obtain the Rated Capacitance in pF.
Digit 10 to 11 Mechanical version and/or packaging (table 1)
Digit 12 Identifies the dimensions and electrical characteristics.
Digit 13 Internal use
Digit 14 Capacitance tolerance:
K=±10%; M=±20%
Digit 15 Value of the discharge resistor (tolerance±10%) according to the following table*:

Table 2

R	code (-)
470 kΩ	E
680 kΩ	F
1 MΩ	G
1.2 MΩ	L
1.5 MΩ	N
2.2 MΩ	P
3.3 MΩ	Q
4.7 MΩ	S
6.8 MΩ	T
10 MΩ	V

*Other resistors are avaible upon request.