

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

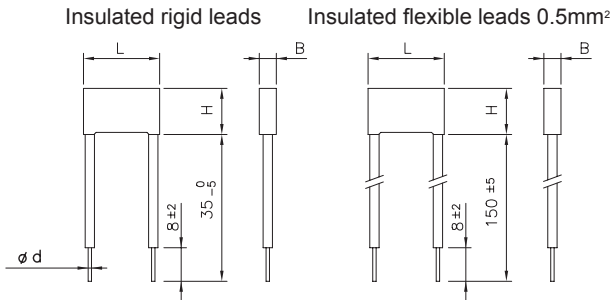
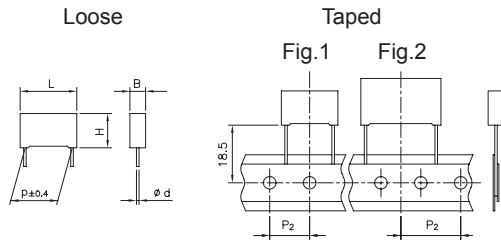
Typical applications: interference suppression and «across-the-line» applications. Suitable for use in situations where failure of the capacitor would not lead to danger of electric shock.

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.



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.

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):** 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):** tgδ × 10⁻⁴ 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**
 - ≥1 × 10⁵ MΩ (5 × 10⁵ 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

Pitch (mm)	Box thickness (B) (mm)	Maximum dimensions (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

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 × 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 × V_R + 1000Vac 0.1 s/h

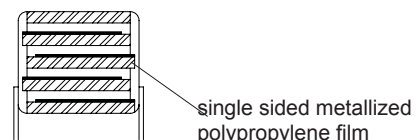
- Performance**
 - Dielectric strength: no dielectric breakdown or flashover at 4.3 × V_R (d.c.)/1 min
 - Capacitance change |ΔC/C|: ≤10%
 - Insulation resistance: ≥50% of initial limit.

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



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METALLIZED POLYPROPYLENE FILM CAPACITOR
 SELF-HEALING PROPERTIES
 PRODUCT CODE: **R49**

APPROVALS

	ENEC IEC 60384-14	Class X1	File No.CA08.00030
	CSA C22.2 N°1 (up to 1µF - 250Vac)	Across-the-line	File No.LR83890
	UL 1414 up to 1µF, 85°C; 250Vac)	Across-the-line	File No.E97797
	UL 1283 (310 Vac)	Electromagnetic Interference Filters	File No.E85238

Approved according to IEC 60384-14 (ex-former EN 132400)
 According to IEC 60065.

Rated Cap. (*)	330 Vac / 800 Vdc Std dimensions				Ø d	Max dv/dt at 440Vdc (V/µs)	Part Number	
	B	H	L	p				
0.010 µF	5.0	11.0	13.0	10.0	0.6	600	R49AF	2100 -- A1 -
0.015 µF	5.0	11.0	13.0	10.0	0.6	600	R49AF	2150 -- A1 -
0.022 µF	6.0	12.0	13.0	10.0	0.6	600	R49AF	2220 -- A1 -
0.033 µF	6.0	12.0	13.0	10.0	0.6	600	R49AF	2330 -- A1 -
0.010 µF	5.0	11.0	18.0	15.0	0.6	500	R49AI	2100 -- A1 -
0.015 µF	5.0	11.0	18.0	15.0	0.6	500	R49AI	2150 -- A1 -
0.022 µF	5.0	11.0	18.0	15.0	0.6	500	R49AI	2220 -- A1 -
0.033 µF	5.0	11.0	18.0	15.0	0.6	500	R49AI	2330 -- A1 -
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	7.5	13.5	18.0	15.0	0.6	500	R49AI	2680 -- A1 -
0.068 µF	6.0	17.5	18.0	15.0	0.6	500	R49AI	2680 -- A2 -
0.10 µF	7.5	13.5	18.0	15.0	0.6	500	R49AI	3100 -- B1 -
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	10.0	16.0	18.0	15.0	0.8	500	R49AI	3150 -- A1 -
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 -- B1 M
0.22 µF	11.0	19.0	18.0	15.0	0.8	500	R49AI	3220 -- A1 -
0.10 µF	6.0	15.0	26.5	22.5	0.8	400	R49AN	3100 -- A1 -
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
0.33 µF	10.0	18.5	26.5	22.5	0.8	400	R49AN	3330 -- A1 -
0.47 µF	10.0	18.5	26.5	22.5	0.8	400	R49AN	3470 -- B1 M
0.47 µF	11.0	20.0	26.5	22.5	0.8	400	R49AN	3470 -- A1 -
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 -

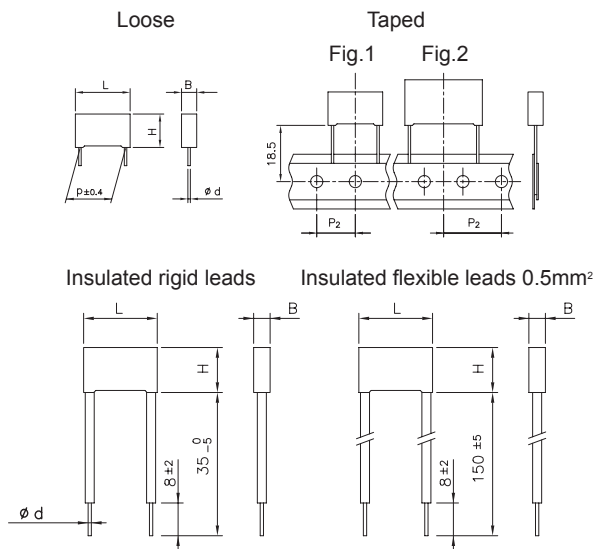
Table 1

Standard packaging style	Lead length (mm)	Taping style			Ordering code (Digit 10 to 11)
		P ₂ (mm)	Fig. (No.)	Pitch (mm)	
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 ^{±5}				52

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

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. 184 and contact our Technical Service for choosing the safest solution.

Mechanical version and packaging (Table1) _____
 Tolerance: K (±10%); M (±20%) _____
 All dimensions are in mm
 E12 Series available upon request



Ø d ±0.05	p = 27.5	p = 37.5
	0.8	1

All dimensions are in mm.

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):** tgδ×10⁻⁴ 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**
 - ≥1×10⁵ MΩ (5×10⁵ 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

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.

PRODUCT CODE: **R49**

Pitch (mm)	Box thickness (mm)	Maximum dimensions (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

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%



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				Ø d	Max dv/dt at 440Vdc (V/µs)	Part Number		
	B	H	L	p					
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
	UL 1414 up to 1µF, 85°C; 250Vac)	Across-the-line	File No.E97797
	UL 1283 (250 Vac-105°C)	Electromagnetic Interference Filters	File No.E85238

Approved according to IEC 60384-14 (ex-former EN 132400)
 According to IEC 60065.

Table 1

Standard packaging style	Lead length (mm)	Taping style			Ordering code (Digit 10 to 11)
		P ₂ (mm)	Fig. (No.)	Pitch (mm)	
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 ^{±5}				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 available upon request.