

INFORMATION ON INTERNATIONAL STANDARDS

- **SAFETY**

Electronic devices such as TV sets, radios, computers, stereos, hair dryers, washing machines, etc. are all connected to the mains power supply and all generate «noise».

Since these devices, even when in the off mode, are continuously connected to the mains they must comply with rigorous safety standards. In addition, the noise they generate can be picked up by TV sets and radios in the form of visual and audible distortions and, in the case of computers, as malfunctions and errors. This noise must be filtered or suppressed.

- **MAIN INTERNATIONAL COMMITTEES**

- IEC (International Electrotechnical Commission)
- CEN (European Committee for Standardization / Comité Européen de Normalisation)
- CENELEC (European Committee for Electrotechnical Standardization / Comité Européen de Normalisation Electrotechnique)
- CECC (CENELEC Electronic Components Committee)

Note: EN . . . (European Standard / Norme Européenne)

- **NEW EUROPEAN STANDARD (EN 132400)**

With the aim to standardize all the European National Standards and have only one Standard of reference in all the member countries of CENELEC, EN 132400 Standard was issued on 26th June, 1995 replacing all the European National Standards in force up to that date.

The European Standard EN 132400 is identical to the International Standard IEC 60384-14 2nd Edition 1993 (plus amendment A1: 1995).

The old European National Standards used IEC 384-14, Edition 1981 as a reference.

Now the IEC 384-14 Edition 1981 has been replaced by IEC 60384-14 2nd Edition 1993.

CENELEC members are:

Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom.

Effects of the coming into force of EN 132400 Standard:

- since 26th June 1995 it is no longer possible to request approvals according to the old European National Standards (VDE, ASEV, IMQ, etc.);
- any national body can issue the approval and its validity is recognized by the bodies of all the other CENELEC member countries wish no need to repeat the tests;
- marking: the coordinating committee has not yet released their unified marking (logo). At present, the name of the standard EN 132400 or IEC 60384-14, 2nd Edition 1993, is stamped near the logo of the institute performing the tests. Please note that if the component is approved according to the EN132400, it is no longer necessary to stamp the marking relevant to the old European National Standards;
- approval certificates relevant to the old European National Standards: they remain valid up to 26th June 2000 (except for anticipated expirations due to National Rules).

- **COMPARISON BETWEEN THE OLD STANDARDS AND THE EN 132400**

Listed below you find the summary tables and some information on the most significant tests introduced by the new EN 132400 Standard (see table 1, 2 and 3).

Table 1

Test	IEC 384-14 Ed. '81 (Old Standard)	IEC 60384-14 2nd Ed.'93 + A1:1995 / EN 132400 (Present Standard)
Impulse voltage before Endurance test	NO	YES
Active Flammability test	NO	YES
Passive Flammability test	NO	YES

Table 2

Application	Peak pulse in service	Peak impulse before endurance test	Sub-class	
			IEC 384-14 Ed.'81 (Old Standard)	IEC 60384-14 2nd Ed.'93 (Present Standard)
High pulse application	> 2.5kV; ≤ 4.0kV	4 kV per C ≤ 1μF $\frac{4}{\sqrt{C}}$ kV per C > 1μF	-	X1
High pulse application	> 1.2kV	4 kV per C ≤ 0.33μF 4e ^(0.33-C) kV per C > 0.33μF	X1	-
General purposes	≤ 2.5kV	2.5 kV per C ≤ 1μF $\frac{2.5}{\sqrt{C}}$ kV per C > 1μF	-	X2
General purposes	≤ 1.2kV	1.4kV (*)	X2 (*)	-
General purposes	≤ 1.2kV	None	-	X3

Note: (*) Some National Standards in Europe, prior to the release of EN 132400, did not include this test; for the last ones Class X2 corresponded to Class X3 of the present Standard.

Table 3

Type of insulation bridged	Rated voltage	Peak impulse before endurance test	Sub-class	
			IEC 384-14 Ed.'81 (Old Standard)	IEC 60384-14 2nd Ed.'93 (Present Standard)
Double or reinforced insulation	≤ 500Vac	8 kV	-	Y1
Basic or supplementary insulation	≥ 150Vac; ≤ 300Vac	5 kV	-	Y2
Basic or supplementary insulation	≥ 150Vac; ≤ 250Vac	None	-	Y3
	> 125Vac; ≤ 250Vac	None	Y	-
Basic or supplementary insulation	< 150Vac	2.5kV	-	Y4

Note: The sub-class Y3 of the present Standard EN 132400 (IEC 60384-14, 2nd Edition '93 plus amendment 1-95) corresponds to Class Y of the old standard IEC 384-14 Edition 1981

- **CCA (CENELEC Certification Agreement) and CB (Certification Body) Test Certificate:**

These have their origin from an agreement taken by the International Committees. Following these agreements, certificates are issued which are called CCA and CB certificates.

These certificates allow the mutual recognition at a European (CCA) and world (CB) level and are particularly effective in case the reference standards are the EN ...

The countries accepting the CCA are:

Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom.

The countries accepting the CB are:

Australia*, Austria, Belgium, Canada*, China, Czech. Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, India, Ireland, Israel, Italy, Japan, Netherlands, Norway, Poland, Republic of Korea, Russia, Singapore, Slovenian, Spain, Sweden, Switzerland, United Kingdom, U.S.A.*

The countries with an asterisk may require additional tests to obtain the approval.

- **MAIN STANDARDS FOR SUPPRESSION CAPACITORS**

EUROPE

Reference Standard: EN 132400

This standard, already in force, is identical to IEC 60384-14 2nd Edition 1993+A1: 1995. It harmonizes and supersedes any previous national standards into only one European Standard

U.S.A.

Reference Standard: UL 1414 and UL 1283

UL 1414: Across-the-line applications

- Max capacitance value: 1μF
- Max operating temperature: +85°C
- UL 1414 mark covers also 1283 mark (not viceversa)

UL 1283: Electromagnetic Interference filters

- The UL 1283 mark can be requested also for capacitance values higher than 1μF and temperatures higher than +85°C.

CANADA

Reference Standard: CSA C22.2N°1

CSA C22.2 N°1 : Across-the-line applications

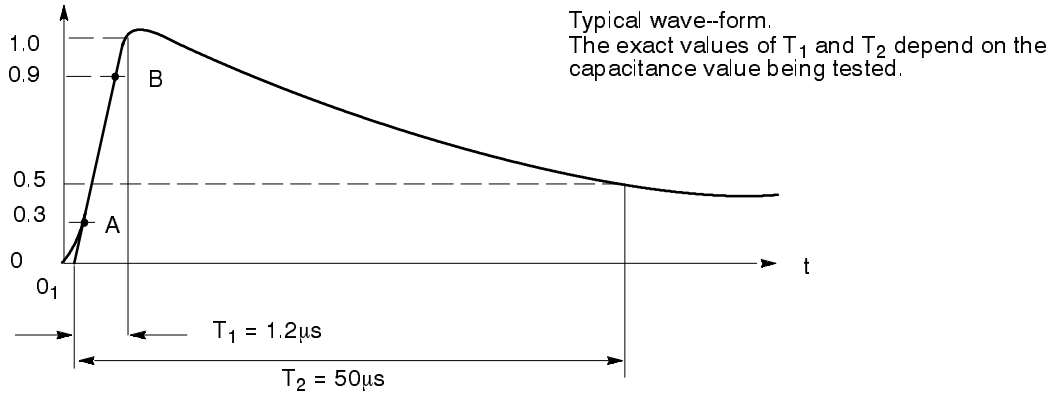
- Max capacitance value: 1μF
- Max operating temperature: +85°C

TESTS RELATED TO IEC 60384-14 (2nd edition '93 plus amendment A1: 1995) AND EN 132400

According to IEC 60384-14 (2nd Edition 1993 plus amendment A1: 1995) and EN132400 our X2 and Y2 suppression capacitors withstand the following tests (type test):

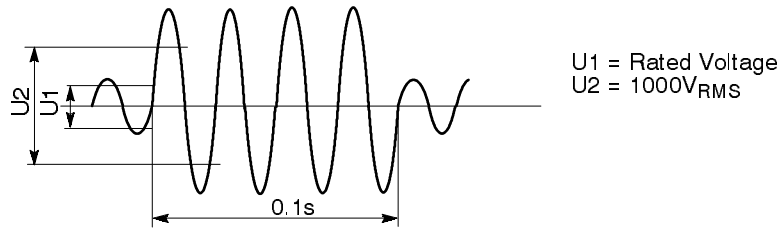
- **IMPULSE VOLTAGE TEST (before ENDURANCE TEST)**

$V_{PEAK} = 2.5kV$ (Class X2)
 $V_{PEAK} = 5.0kV$ (Class Y2)



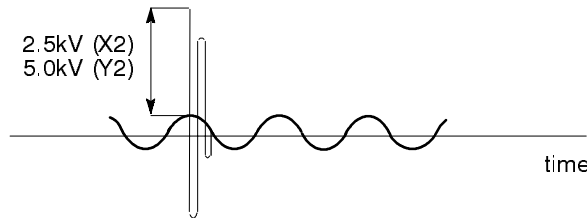
- **ENDURANCE TEST**

The capacitors are tested for 1000 hours at upper category temperature with a voltage of $1.25 \times V_R$ for Class X2 and $1.7 \times V_R$ for Class Y2.
 Every hour the test voltage is increased up to $1000 V_{RMS}/50Hz$ for a period of 0.1 s.



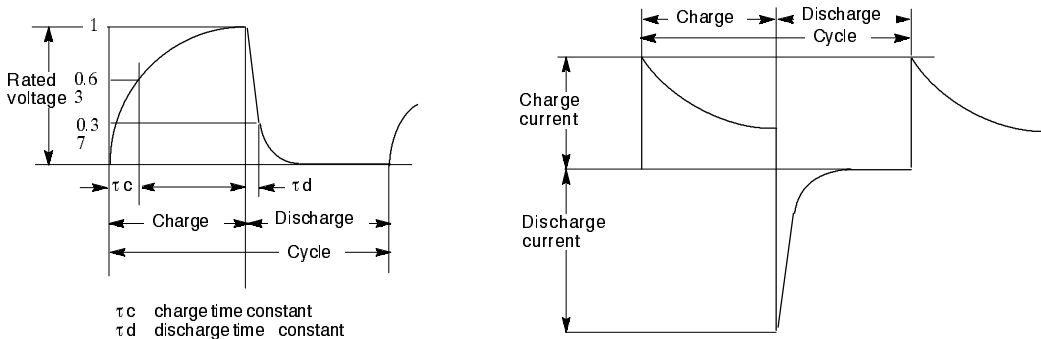
- **ACTIVE FLAMMABILITY TEST**

The capacitors are tested at the rated voltage (V_{ac}) at 50 Hz with superimposed 20 pulses at 2.5kV for Class X2 and 5kV for Class Y2 with an interval between the successive pulses of 5 seconds.
 The rated voltage is kept for 2 min after the last discharge. At the end of the test the capacitor does not burn (control made with the cheese-cloth wrapped on the body of capacitors).



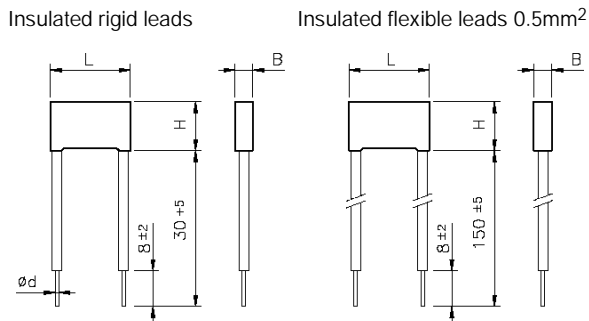
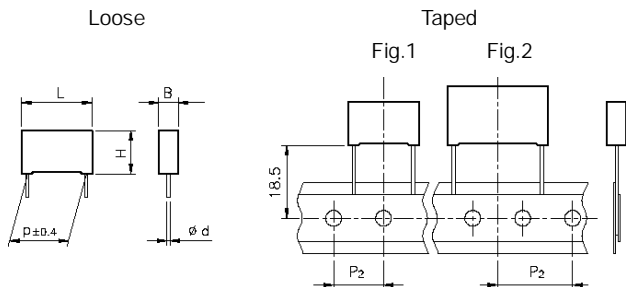
- **CHARGE AND DISCHARGE TEST**

The capacitors are subjected to 10000 cycles of charge and discharge at the rate of approximately one operation per second.



X2 CLASS (EN132400) - 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.
PRODUCT CODE: R46



$\varnothing d \pm 0.05$	$p \leq 15^*$	$22.5 \leq p \leq 27.5$	$p = 37.5$
	0.6	0.8	1

*Except for box $\geq 10 \times 16 \times 18$ having $\varnothing d = 0.8 \pm 0.05$ mm
 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, epoxy 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 2nd edition '93; EN 132400.

ELECTRICAL CHARACTERISTICS

- Rated voltage (V_R):** 275Vac; 50/60Hz
- Permissible DC Voltage:** 630Vdc
- Capacitance range:** 0.01 μ F to 4.7 μ F
- Capacitance values:** E6 series (IEC 60063 Norm).
- Capacitance tolerances** (measured at 1 kHz): $\pm 10\%$ (K); $\pm 20\%$ (M).
- Dissipation factor (DF):**
 $\text{tg}\delta \times 10^{-4}$ at +25_C $\pm 5_C$: ≤ 10 (6)* at 1kHz
 * Typical value

Insulation resistance:

- Test conditions**
 Temperature: +25_C $\pm 5_C$
 Voltage charge time: 1 min
 Voltage charge: 100 Vdc
- Performance**
 $\geq 1 \times 10^5$ M Ω (5×10^5 M Ω)* for $C \leq 0.33\mu$ F
 ≥ 30000 s (150000 s)* for $C > 0.33\mu$ F
 * Typical value

Test voltage between terminations (on all pieces):
 1500Vac for 1 s + 2200Vdc for 1 s at +25_C $\pm 5_C$

TEST METHOD AND PERFORMANCE

Damp heat, steady state:

- Test conditions 1st**
 Temperature: +40_C $\pm 2_C$
 Relative humidity (RH): 93% $\pm 2\%$
 Test duration: 56 days

- Test conditions 2nd**
 Temperature: +60_C $\pm 2_C$
 Relative humidity (RH): 95% $\pm 2\%$
 Test duration: 500 hours

- Performance**
 Dielectric strength: no dielectric breakdown or flashover at $4.3 \times V_R$ (d.c.)/1 min
 Capacitance change $|\Delta C/C|$: $\leq 5\%$
 Insulation resistance: $\geq 50\%$ of initial limit.

Endurance:

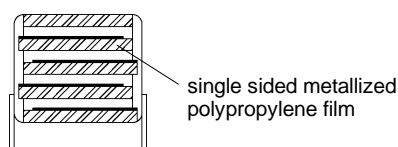
- Test conditions**
 Temperature: +110_C $\pm 2_C$
 Test duration: 1000 h
 Voltage applied: $1.25 \times V_R + 1000$ Vac 0.1 s/h

- Performance**
 Dielectric strength: no dielectric breakdown or flashover at $4.3 \times V_R$ (d.c.)/1 min
 Capacitance change $|\Delta C/C|$: $\leq 10\%$
 Insulation resistance: $\geq 50\%$ of initial limit.

Resistance to soldering heat:

- Test conditions**
 Solder bath temperature: +260_C $\pm 5_C$
 Dipping time (with heat screen): $10 \text{ s} \pm 1 \text{ s}$
- Performance**
 Capacitance change $|\Delta C/C|$: $\leq 2\%$

Winding scheme



X2 CLASS (EN132400) - MKP Series
METALLIZED POLYPROPYLENE FILM CAPACITOR
 SELF-HEALING PROPERTIES

(All dimensions are in mm)

Rated Cap. (*)	275 Vac				Ø d	Max dv/dt at 390Vdc (V/µs)	Part Number
	B	H	L	p			
0.010 µF	5.0	11.0	13.0	10.0	0.6	500	R46.KF. 2100.-.-M1. -
0.015 µF	5.0	11.0	13.0	10.0	0.6	500	R46.KF. 2150.-.-M1. -
0.022 µF	5.0	11.0	13.0	10.0	0.6	500	R46.KF. 2220.-.-M1. -
0.033 µF	5.0	11.0	13.0	10.0	0.6	500	R46.KF. 2330.-.-M1. -
0.047 µF	6.0	12.0	13.0	10.0	0.6	500	R46.KF. 2470.-.-M1. -
0.068 µF	6.0	12.0	13.0	10.0	0.6	500	R46.KF. 2680.-.-M1. -
0.010 µF	5.0	11.0	18.0	15.0	0.6	400	R46.KI. 2100.-.-01. -
0.015 µF	5.0	11.0	18.0	15.0	0.6	400	R46.KI. 2150.-.-01. -
0.022 µF	5.0	11.0	18.0	15.0	0.6	400	R46.KI. 2220.-.-01. -
0.033 µF	5.0	11.0	18.0	15.0	0.6	400	R46.KI. 2330.-.-01. -
0.047 µF	5.0	11.0	18.0	15.0	0.6	400	R46.KI. 2470.-.-01. -
0.068 µF	5.0	11.0	18.0	15.0	0.6	400	R46.KI. 2680.-.-01. -
0.10 µF	5.0	11.0	18.0	15.0	0.6	400	R46.KI. 3100.-.-M1.M
0.10 µF	6.0	12.0	18.0	15.0	0.6	400	R46.KI. 3100.-.-01. -
0.15 µF	6.0	12.0	18.0	15.0	0.6	400	R46.KI. 3150.-.-M2.M
0.15 µF	7.5	13.5	18.0	15.0	0.6	400	R46.KI. 3150.-.-M1. -
0.22 µF	7.5	13.5	18.0	15.0	0.6	400	R46.KI. 3220.-.-M2.M
0.22 µF	8.5	14.5	18.0	15.0	0.6	400	R46.KI. 3220.-.-M1. -
0.33 µF	10.0	16.0	18.0	15.0	0.8	400	R46.KI. 3330.-.-M1. -
0.47 µF	11.0	19.0	18.0	15.0	0.8	400	R46.KI. 3470.-.-M1. -
0.15 µF	6.0	15.0	26.5	22.5	0.8	200	R46.KN. 3150.-.-01. -
0.22 µF	6.0	15.0	26.5	22.5	0.8	200	R46.KN. 3220.-.-M1. -
0.33 µF	7.0	16.0	26.5	22.5	0.8	200	R46.KN. 3330.-.-M1. -
0.47 µF	8.5	17.0	26.5	22.5	0.8	200	R46.KN. 3470.-.-M1. -
0.47 µF	10.0	18.5	26.5	22.5	0.8	200	R46.KN. 3470.-.-01. -
0.68 µF	10.0	18.5	26.5	22.5	0.8	200	R46.KN. 3680.-.-M2. -
0.68 µF	11.0	20.0	26.5	22.5	0.8	200	R46.KN. 3680.-.-M1. -
1.0 µF	13.0	22.0	26.5	22.5	0.8	200	R46.KN. 4100.-.-M1. -
0.47 µF	9.0	17.0	32.0	27.5	0.8	150	R46.KR. 3470.-.-01. -
0.68 µF	9.0	17.0	32.0	27.5	0.8	150	R46.KR. 3680.-.-M1. -
0.68 µF	10.0	20.0	32.0	27.5	0.8	150	R46.KR. 3680.-.-01. -
1.0 µF	11.0	20.0	32.0	27.5	0.8	150	R46.KR. 4100.-.-M1. -
1.5 µF	13.0	22.0	32.0	27.5	0.8	150	R46.KR. 4150.-.-M1. -
1.5 µF	15.0	24.5	32.0	27.5	0.8	150	R46.KR. 4150.-.-01. -
2.2 µF	14.0	28.0	32.0	27.5	0.8	150	R46.KR. 4220.-.-M1. -
2.2 µF	18.0	33.0	32.0	27.5	0.8	150	R46.KR. 4220.-.-01. -
3.3 µF	18.0	33.0	32.0	27.5	0.8	150	R46.KR. 4330.-.-M2. -
3.3 µF	22.0	37.0	32.0	27.5	0.8	150	R46.KR. 4330.-.-M1. -
4.7 µF	22.0	37.0	32.0	27.5	0.8	150	R46.KR. 4470.-.-M1. -
2.2 µF	13.0	24.0	41.5	37.5	1.0	100	R46.KW.4220.-.-M1. -
3.3 µF	16.0	28.5	41.5	37.5	1.0	100	R46.KW.4330.-.-M1. -
4.7 µF	19.0	32.0	41.5	37.5	1.0	100	R46.KW.4470.-.-M1. -

Mechanical version and packaging (Table 1) _____
 Tolerance: K (±10%); M (±20%) _____

(*) E12 series available up to 5.6µF upon request

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 Ø355mm		12.70	1	10.0/15.0	CK
REEL Ø500mm		19.05	2	22.5/27.5	CK
Loose, short leads	4 +0.5				JP
Loose, long leads	≥ 24				55
Loose, long leads	30 +5				45
Loose, insulated rigid leads	30 +5				51
Loose, insulated flexible leads	150 ±5				52

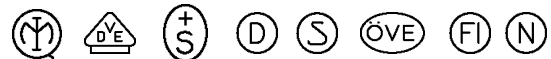
Note: Ammo-pack is the preferred packaging for taped version.

APPROVALS

	ENEC-IMQ EN132400 CB	Class X2	File No. V4413 File No. IT-1524
	CSA C22.2 N_1 (up to 1µF)	Across-the-line	File No. LR 83890
	UL 1414 (up to 1µF)	Across-the-line	File No.E97797
	UL 1283 (310 Vac)	Electromagnetic Interference Filters	File No.E85238
	CCEE IEC60384-14	Class X2	File No.CH0045034-2000

CSA and UL 1414 for 250Vac only.
 Approved according to EN 132400 (IEC 60384-14 2nd edition 1993 plus Amendment A1: 1995).
 According to IEC 60065.

(*) ENEC mark has replaced all the following European National marks:



TYPICAL GRAPHS

Z = f (f) (lead length 2 mm). Typical values.

