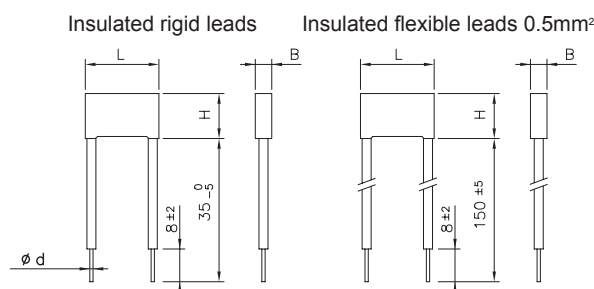
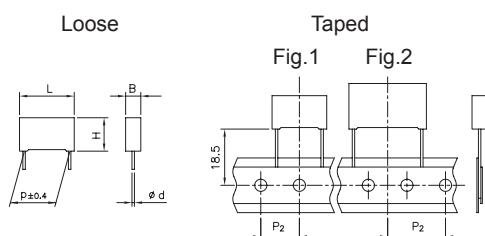




**EN:** This Datasheet is presented by the manufacturer.

Please visit our website for pricing and availability at [www.hestore.hu](http://www.hestore.hu).



| Ø d ±0.05 | p ≤ 15      | 22.5 ≤ p ≤ 27.5 | p = 37.5 |
|-----------|-------------|-----------------|----------|
|           | 0.6 or 0.8* | 0.8             | 1        |

\*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 ( $V_R$ ):** 275Vac (50/60Hz) / 560 Vdc  
300Vac (50/60Hz) / 630 Vdc

**Capacitance range:** 0.01µF to 10µF

**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):**

$\tan \delta$  10<sup>-4</sup> 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**

≥1×10<sup>5</sup> MΩ (5×10<sup>5</sup> 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

## X2 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.

**PRODUCT CODE: R46**

**Note:** R.46 series has replaced the 1.40 series and 1.47 series.  
For new design we suggest the use of the R.46 series.

| Pitch<br>(mm) | Box thickness (B)<br>(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 1st**

Temperature: +40°C ± 2°C

Relative humidity (RH): 93% ±2%

Test duration: 56 days

**Test conditions 2nd**

Temperature: +60°C ± 2°C

Relative humidity (RH): 95% ±2%

Test duration: 500 hours

**Performance**

Dielectric strength: no dielectric breakdown or  
flashover at 4.3 x  $V_R$  (d.c.)/1 min

Capacitance change  $|\Delta C/C|$ : ≤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  $|\Delta C/C|$ : ≤10%

Insulation resistance: ≥50% of initial limit.

**Resistance to soldering heat:**

**Test conditions**

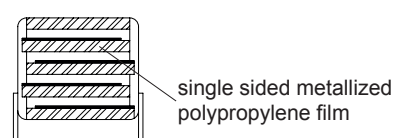
Solder bath temperature: +260°C ± 5°C

Dipping time (with heat screen): 10 s ± 1 s

**Performance**

Capacitance change  $|\Delta C/C|$ : ≤2%

**Winding scheme**



X2 CLASS (IEC 60384-14) - MKP Series  
METALLIZED POLYPROPYLENE FILM CAPACITOR  
SELF-HEALING PROPERTIES

APPROVALS

|                                                                                   |                                         |                                            |                                     |
|-----------------------------------------------------------------------------------|-----------------------------------------|--------------------------------------------|-------------------------------------|
|  | ENEC<br>IEC 60384-14                    | Class X2                                   | File No.V4413                       |
|  | CSA<br>E 384-14<br>(up to 5.6μF)        | Across-the-line                            | File No.154612<br>(LR 83890)        |
|  | UL 1414<br>(up to 1μF, 85°C;<br>250Vac) | Across-the-line                            | File No.E97797                      |
|                                                                                   | UL 1283<br>(310 Vac)                    | Electromagnetic<br>Interference<br>Filters | File No.E85238                      |
|  | GB/T 14472                              | Class X2                                   | File CQC3001008199<br>CQC3001008842 |

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

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



Table 1

| Standard<br>packaging style        | Lead<br>length<br>(mm) | Taping style           |               |               | Ordering<br>code<br>(Digit 10 to<br>11) |
|------------------------------------|------------------------|------------------------|---------------|---------------|-----------------------------------------|
|                                    |                        | P <sub>2</sub><br>(mm) | Fig.<br>(No.) | Pitch<br>(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 <sup>+2</sup>        |                        |               |               | 00                                      |
| Loose, long leads                  | 25 <sup>-1/+2</sup>    |                        |               |               | 50                                      |
| Loose, long leads                  | 30 <sup>+5</sup>       |                        |               |               | 40                                      |
| Loose, insulated<br>rigid leads    | 30 <sup>+5</sup>       |                        |               |               | 51                                      |
| Loose, insulated<br>flexible leads | 150 <sup>+5</sup>      |                        |               |               | 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. 152 and contact our Technical Service for choosing the safest solution.

| Rated Cap. | 275 Vac / 560 Vdc<br>Std dimensions |      |      |      | Ø d | Max<br>dv/dt at<br>390Vdc<br>(V/μs) | Part Number |      |       |   |
|------------|-------------------------------------|------|------|------|-----|-------------------------------------|-------------|------|-------|---|
|            | B                                   | H    | L    | p    |     |                                     |             |      |       |   |
| 0.010 μF   | 4.0                                 | 9.0  | 13.0 | 10.0 | 0.6 | 500                                 | R46 KF      | 2100 | -- N0 | - |
| 0.015 μF   | 4.0                                 | 9.0  | 13.0 | 10.0 | 0.6 | 500                                 | R46 KF      | 2150 | -- N0 | - |
| 0.022 μF   | 4.0                                 | 9.0  | 13.0 | 10.0 | 0.6 | 500                                 | R46 KF      | 2220 | -- N0 | - |
| 0.033 μF   | 5.0                                 | 11.0 | 13.0 | 10.0 | 0.6 | 500                                 | R46 KF      | 2330 | -- M1 | - |
| 0.047 μF   | 5.0                                 | 11.0 | 13.0 | 10.0 | 0.6 | 500                                 | R46 KF      | 2470 | -- N0 | - |
| 0.068 μF   | 6.0                                 | 12.0 | 13.0 | 10.0 | 0.6 | 500                                 | R46 KF      | 2680 | -- M1 | - |
| 0.10 μF    | 6.0                                 | 12.0 | 13.0 | 10.0 | 0.6 | 500                                 | R46 KF      | 3100 | -- M1 | M |
| 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 | - |
| 0.15 μF    | 6.0                                 | 12.0 | 18.0 | 15.0 | 0.6 | 400                                 | R46 KI      | 3150 | -- M2 | - |
| 0.15 μF    | 9.0                                 | 12.5 | 18.0 | 15.0 | 0.6 | 400                                 | R46 KI      | 3150 | -- L2 | - |
| 0.22 μF    | 7.5                                 | 13.5 | 18.0 | 15.0 | 0.6 | 400                                 | R46 KI      | 3220 | -- M2 | - |
| 0.22 μF    | 9.0                                 | 12.5 | 18.0 | 15.0 | 0.6 | 400                                 | R46 KI      | 3220 | -- L2 | - |
| 0.22 μF    | 6.0                                 | 17.5 | 18.0 | 15.0 | 0.6 | 400                                 | R46 KI      | 3220 | -- 02 | - |
| 0.33 μF    | 8.5                                 | 14.5 | 18.0 | 15.0 | 0.6 | 400                                 | R46 KI      | 3330 | -- N0 | - |
| 0.33 μF    | 10.0                                | 16.0 | 18.0 | 15.0 | 0.8 | 400                                 | R46 KI      | 3330 | -- M1 | - |
| 0.33 μF    | 9.0                                 | 12.5 | 18.0 | 15.0 | 0.6 | 400                                 | R46 KI      | 3330 | -- N1 | M |
| 0.33 μF    | 7.5                                 | 18.5 | 18.0 | 15.0 | 0.8 | 400                                 | R46 KI      | 3330 | -- 02 | - |
| 0.33 μF    | 13.0                                | 12.0 | 18.0 | 15.0 | 0.8 | 400                                 | R46 KI      | 3330 | -- 01 | - |
| 0.47 μF    | 7.5                                 | 18.5 | 18.0 | 15.0 | 0.8 | 400                                 | R46 KI      | 3470 | -- 02 | M |
| 0.47 μF    | 10.0                                | 16.0 | 18.0 | 15.0 | 0.8 | 400                                 | R46 KI      | 3470 | -- N0 | M |
| 0.47 μF    | 11.0                                | 19.0 | 18.0 | 15.0 | 0.8 | 400                                 | R46 KI      | 3470 | -- M1 | - |
| 0.56 μF    | 11.0                                | 19.0 | 18.0 | 15.0 | 0.8 | 400                                 | R46 KI      | 3560 | -- N0 | - |
| 0.60 μF    | 11.0                                | 19.0 | 18.0 | 15.0 | 0.8 | 400                                 | R46 KI      | 3600 | -- N0 | - |
| 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    | 6.0                                 | 15.0 | 26.5 | 22.5 | 0.8 | 200                                 | R46 KN      | 3330 | -- N0 | - |
| 0.47 μF    | 7.0                                 | 16.0 | 26.5 | 22.5 | 0.8 | 200                                 | R46 KN      | 3470 | -- N0 | - |
| 0.68 μF    | 10.0                                | 18.5 | 26.5 | 22.5 | 0.8 | 200                                 | R46 KN      | 3680 | -- M2 | - |
| 1.0 μF     | 10.0                                | 18.5 | 26.5 | 22.5 | 0.8 | 200                                 | R46 KN      | 4100 | -- N2 | M |
| 1.0 μF     | 11.0                                | 20.0 | 26.5 | 22.5 | 0.8 | 200                                 | R46 KN      | 4100 | -- N1 | - |
| 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 | - |
| 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 | - |
| 2.2 μF     | 13.0                                | 25.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46 KR      | 4220 | -- M2 | - |
| 2.2 μF     | 14.0                                | 28.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46 KR      | 4220 | -- M1 | - |
| 3.3 μF     | 18.0                                | 33.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46 KR      | 4330 | -- M2 | - |
| 4.7 μF     | 18.0                                | 33.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46 KR      | 4470 | -- M2 | - |
| 4.7 μF     | 22.0                                | 37.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46 KR      | 4470 | -- M1 | - |
| 1.5 μF     | 11.0                                | 22.0 | 41.5 | 37.5 | 1.0 | 100                                 | R46 KW      | 4150 | -- M1 | - |
| 2.2 μF     | 11.0                                | 22.0 | 41.5 | 37.5 | 1.0 | 100                                 | R46 KW      | 4220 | -- M2 | M |
| 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     | 16.0                                | 28.5 | 41.5 | 37.5 | 1.0 | 100                                 | R46 KW      | 4470 | -- M2 | M |
| 4.7 μF     | 19.0                                | 32.0 | 41.5 | 37.5 | 1.0 | 100                                 | R46 KW      | 4470 | -- M1 | - |
| 6.8 μF     | 20.0                                | 40.0 | 41.5 | 37.5 | 1.0 | 100                                 | R46 KW      | 4680 | -- M2 | - |
| 6.8 μF     | 24.0                                | 44.0 | 41.5 | 37.5 | 1.0 | 100                                 | R46 KW      | 4680 | -- M1 | - |
| 10.0 μF    | 30.0                                | 45.0 | 41.5 | 37.5 | 1.0 | 100                                 | R46 KW      | 5100 | -- M1 | - |

Rated voltage (K=275Vac)  
Mechanical version and packaging (Table 1)  
Tolerance: K (±10%); M (±20%)

All dimensions are in mm

E12 Series available upon request

## X2 CLASS (IEC 60384-14) - MKP Series METALLIZED POLYPROPYLENE FILM CAPACITOR SELF-HEALING PROPERTIES

### APPROVALS

| Rated Cap. | 275 Vac / 560 Vdc<br>Std dimensions |      |      |      | Ø d | Max<br>dv/dt at<br>390Vdc<br>(V/µs) | Part Number |             |   |
|------------|-------------------------------------|------|------|------|-----|-------------------------------------|-------------|-------------|---|
|            | B                                   | H    | L    | p    |     |                                     |             |             |   |
| 0.033 µF   | 4.0                                 | 9.0  | 13.0 | 10.0 | 0.6 | 500                                 | R46 KF      | 2330 - - P0 | - |
| 0.047 µF   | 4.0                                 | 9.0  | 13.0 | 10.0 | 0.6 | 500                                 | R46 KF      | 2470 - - P0 | - |
| 0.068 µF   | 5.0                                 | 11.0 | 13.0 | 10.0 | 0.6 | 500                                 | R46 KF      | 2680 - - P0 | - |
| 0.1 µF     | 5.0                                 | 11.0 | 13.0 | 10.0 | 0.6 | 500                                 | R46 KF      | 3100 - - P1 | M |
| 0.1 µF     | 6.0                                 | 12.0 | 13.0 | 10.0 | 0.6 | 500                                 | R46 KF      | 3100 - - P0 | - |
| 0.15 µF    | 6.0                                 | 12.0 | 13.0 | 10.0 | 0.6 | 500                                 | R46 KF      | 3150 - - P0 | M |
| 0.15 µF    | 5.0                                 | 11.0 | 18.0 | 15.0 | 0.6 | 400                                 | R46 KI      | 3150 - - P0 | - |
| 0.22 µF    | 6.0                                 | 12.0 | 18.0 | 15.0 | 0.6 | 400                                 | R46 KI      | 3220 - - P0 | - |
| 0.33 µF    | 7.5                                 | 13.5 | 18.0 | 15.0 | 0.6 | 400                                 | R46 KI      | 3330 - - P0 | - |
| 0.33 µF    | 9.0                                 | 12.5 | 18.0 | 15.0 | 0.6 | 400                                 | R46 KI      | 3330 - - P1 | - |
| 0.33 µF    | 6.0                                 | 17.5 | 18.0 | 15.0 | 0.6 | 400                                 | R46 KI      | 3330 - - P2 | - |
| 0.47 µF    | 8.5                                 | 14.5 | 18.0 | 15.0 | 0.6 | 400                                 | R46 KI      | 3470 - - P0 | - |
| 0.47 µF    | 9.0                                 | 12.5 | 18.0 | 15.0 | 0.6 | 400                                 | R46 KI      | 3470 - - P1 | M |
| 0.47 µF    | 6.0                                 | 17.5 | 18.0 | 15.0 | 0.6 | 400                                 | R46 KI      | 3470 - - P2 | M |
| 0.47 µF    | 7.5                                 | 18.5 | 18.0 | 15.0 | 0.8 | 400                                 | R46 KI      | 3470 - - P3 | - |
| 0.68 µF    | 10.0                                | 16.0 | 18.0 | 15.0 | 0.8 | 400                                 | R46 KI      | 3680 - - P1 | M |
| 0.68 µF    | 11.0                                | 19.0 | 18.0 | 15.0 | 0.8 | 400                                 | R46 KI      | 3680 - - P0 | - |
| 0.82 µF    | 11.0                                | 19.0 | 18.0 | 15.0 | 0.8 | 400                                 | R46 KI      | 3820 - - P0 | M |
| 0.47 µF    | 6.0                                 | 15.0 | 26.5 | 22.5 | 0.8 | 200                                 | R46 KN      | 3470 - - P1 | - |
| 0.56 µF    | 6.0                                 | 15.0 | 26.5 | 22.5 | 0.8 | 200                                 | R46 KN      | 3560 - - P1 | M |
| 0.56 µF    | 7.0                                 | 16.0 | 26.5 | 22.5 | 0.8 | 200                                 | R46 KN      | 3560 - - P0 | - |
| 0.68 µF    | 7.0                                 | 16.0 | 26.5 | 22.5 | 0.8 | 200                                 | R46 KN      | 3680 - - P0 | - |
| 1.0 µF     | 8.5                                 | 17.0 | 26.5 | 22.5 | 0.8 | 200                                 | R46 KN      | 4100 - - P1 | M |
| 1.0 µF     | 10.0                                | 18.5 | 26.5 | 22.5 | 0.8 | 200                                 | R46 KN      | 4100 - - P0 | - |
| 1.5 µF     | 10.0                                | 18.5 | 26.5 | 22.5 | 0.8 | 200                                 | R46 KN      | 4150 - - P1 | M |
| 1.5 µF     | 11.0                                | 20.0 | 26.5 | 22.5 | 0.8 | 200                                 | R46 KN      | 4150 - - P0 | - |
| 2.2 µF     | 13.0                                | 22.0 | 26.5 | 22.5 | 0.8 | 200                                 | R46 KN      | 4220 - - P0 | M |
| 1.0 µF     | 9.0                                 | 17.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46 KR      | 4100 - - P0 | - |
| 1.5 µF     | 11.0                                | 20.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46 KR      | 4150 - - P0 | - |
| 2.2 µF     | 13.0                                | 22.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46 KR      | 4220 - - P0 | - |
| 3.3 µF     | 14.0                                | 28.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46 KR      | 4330 - - P0 | - |
| 4.7 µF     | 14.0                                | 28.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46 KR      | 4470 - - P1 | M |
| 4.7 µF     | 18.0                                | 33.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46 KR      | 4470 - - P0 | - |
| 6.8 µF     | 22.0                                | 37.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46 KR      | 4680 - - P0 | - |
| 2.2 µF     | 11.0                                | 22.0 | 41.5 | 37.5 | 1.0 | 100                                 | R46 KW      | 4220 - - P0 | - |
| 3.3 µF     | 13.0                                | 24.0 | 41.5 | 37.5 | 1.0 | 100                                 | R46 KW      | 4330 - - P0 | - |
| 4.7 µF     | 16.0                                | 28.5 | 41.5 | 37.5 | 1.0 | 100                                 | R46 KW      | 4470 - - P0 | - |
| 6.8 µF     | 19.0                                | 32.0 | 41.5 | 37.5 | 1.0 | 100                                 | R46 KW      | 4680 - - P0 | - |
| 10.0 µF    | 20.0                                | 40.0 | 41.5 | 37.5 | 1.0 | 100                                 | R46 KW      | 5100 - - P0 | - |

Rated voltage (K=275Vac)

Mechanical version and packaging (Table 1)

Tolerance: K (±10%); M (±20%)

|  |                                         |                                            |                                             |
|--|-----------------------------------------|--------------------------------------------|---------------------------------------------|
|  | ENEC<br>IEC 60384-14                    | Class X2                                   | File No.V4413                               |
|  | CSA<br>E 384-14<br>(up to 5.6µF)        | Across-the-line                            | File No.154612<br>(LR 83890)<br>in progress |
|  | UL 1414<br>(up to 1µF, 85°C;<br>250Vac) | Across-the-line                            | File No.E97797<br>in progress               |
|  | UL 1283<br>(310 Vac)                    | Electromagnetic<br>Interference<br>Filters | File No.E85238                              |
|  | GB/T 14472                              | Class X2                                   | File CQC3001008199<br>CQC3001008842         |

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

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



Table 1

| Standard<br>packaging style        | Lead<br>length<br>(mm) | Taping style           |               |               | Ordering<br>code<br>(Digit 10 to 11) |
|------------------------------------|------------------------|------------------------|---------------|---------------|--------------------------------------|
|                                    |                        | P <sub>2</sub><br>(mm) | Fig.<br>(No.) | Pitch<br>(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 <sup>+2</sup>        |                        |               |               | 00                                   |
| Loose, long leads                  | 25 <sup>-1/+2</sup>    |                        |               |               | 50                                   |
| Loose, long leads                  | 30 <sup>+5</sup>       |                        |               |               | 40                                   |
| Loose, insulated<br>rigid leads    | 30 <sup>+5</sup>       |                        |               |               | 51                                   |
| Loose, insulated<br>flexible leads | 150 <sup>±5</sup>      |                        |               |               | 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. 152 and contact our Technical Service for choosing the safest solution.

All dimensions are in mm

E12 Series available upon request

X2 CLASS (IEC 60384-14) - MKP Series  
METALLIZED POLYPROPYLENE FILM CAPACITOR  
SELF-HEALING PROPERTIES

APPROVALS

| Rated Cap. | 300 Vac / 630 Vdc<br>Std dimensions |      |      |      | Ø d | Max<br>dv/dt at<br>390Vdc<br>(V/µs) | Part Number |      |       |   |
|------------|-------------------------------------|------|------|------|-----|-------------------------------------|-------------|------|-------|---|
|            | B                                   | H    | L    | p    |     |                                     |             |      |       |   |
| 0.010 µF   | 5.0                                 | 11.0 | 13.0 | 10.0 | 0.6 | 500                                 | R46 3F      | 2100 | -- M1 | - |
| 0.015 µF   | 5.0                                 | 11.0 | 13.0 | 10.0 | 0.6 | 500                                 | R46 3F      | 2150 | -- M1 | - |
| 0.022 µF   | 5.0                                 | 11.0 | 13.0 | 10.0 | 0.6 | 500                                 | R46 3F      | 2220 | -- M1 | - |
| 0.033 µF   | 5.0                                 | 11.0 | 13.0 | 10.0 | 0.6 | 500                                 | R46 3F      | 2330 | -- M1 | - |
| 0.047 µF   | 6.0                                 | 12.0 | 13.0 | 10.0 | 0.6 | 500                                 | R46 3F      | 2470 | -- M1 | - |
| 0.068 µF   | 6.0                                 | 12.0 | 13.0 | 10.0 | 0.6 | 500                                 | R46 3F      | 2680 | -- M1 | - |
| 0.1 µF     | 6.0                                 | 12.0 | 13.0 | 10.0 | 0.6 | 500                                 | R46 3F      | 3100 | -- M1 | M |
| 0.010 µF   | 5.0                                 | 11.0 | 18.0 | 15.0 | 0.6 | 400                                 | R46 3I      | 2100 | -- 01 | - |
| 0.015 µF   | 5.0                                 | 11.0 | 18.0 | 15.0 | 0.6 | 400                                 | R46 3I      | 2150 | -- 01 | - |
| 0.022 µF   | 5.0                                 | 11.0 | 18.0 | 15.0 | 0.6 | 400                                 | R46 3I      | 2220 | -- 01 | - |
| 0.033 µF   | 5.0                                 | 11.0 | 18.0 | 15.0 | 0.6 | 400                                 | R46 3I      | 2330 | -- 01 | - |
| 0.047 µF   | 5.0                                 | 11.0 | 18.0 | 15.0 | 0.6 | 400                                 | R46 3I      | 2470 | -- 01 | - |
| 0.068 µF   | 5.0                                 | 11.0 | 18.0 | 15.0 | 0.6 | 400                                 | R46 3I      | 2680 | -- 01 | - |
| 0.1 µF     | 5.0                                 | 11.0 | 18.0 | 15.0 | 0.6 | 400                                 | R46 3I      | 3100 | -- M1 | M |
| 0.10 µF    | 6.0                                 | 12.0 | 18.0 | 15.0 | 0.6 | 400                                 | R46 3I      | 3100 | -- 01 | - |
| 0.15 µF    | 6.0                                 | 12.0 | 18.0 | 15.0 | 0.6 | 400                                 | R46 3I      | 3150 | -- M2 | M |
| 0.15 µF    | 7.5                                 | 13.5 | 18.0 | 15.0 | 0.6 | 400                                 | R46 3I      | 3150 | -- M1 | - |
| 0.22 µF    | 7.5                                 | 13.5 | 18.0 | 15.0 | 0.6 | 400                                 | R46 3I      | 3220 | -- M2 | M |
| 0.22 µF    | 8.5                                 | 14.5 | 18.0 | 15.0 | 0.6 | 400                                 | R46 3I      | 3220 | -- M1 | - |
| 0.22 µF    | 9.0                                 | 12.5 | 18.0 | 15.0 | 0.6 | 400                                 | R46 3I      | 3220 | -- L2 | - |
| 0.33 µF    | 10.0                                | 16.0 | 18.0 | 15.0 | 0.8 | 400                                 | R46 3I      | 3330 | -- M1 | - |
| 0.33 µF    | 13.0                                | 12.0 | 18.0 | 15.0 | 0.8 | 400                                 | R46 3I      | 3330 | -- 01 | - |
| 0.47 µF    | 11.0                                | 19.0 | 18.0 | 15.0 | 0.8 | 400                                 | R46 3I      | 3470 | -- M1 | - |
| 0.15 µF    | 6.0                                 | 15.0 | 26.5 | 22.5 | 0.8 | 200                                 | R46 3N      | 3150 | -- 01 | - |
| 0.22 µF    | 6.0                                 | 15.0 | 26.5 | 22.5 | 0.8 | 200                                 | R46 3N      | 3220 | -- M1 | - |
| 0.33 µF    | 7.0                                 | 16.0 | 26.5 | 22.5 | 0.8 | 200                                 | R46 3N      | 3330 | -- M1 | - |
| 0.47 µF    | 8.5                                 | 17.0 | 26.5 | 22.5 | 0.8 | 200                                 | R46 3N      | 3470 | -- M1 | - |
| 0.68 µF    | 10.0                                | 18.5 | 26.5 | 22.5 | 0.8 | 200                                 | R46 3N      | 3680 | -- M2 | - |
| 1.0 µF     | 13.0                                | 22.0 | 26.5 | 22.5 | 0.8 | 200                                 | R46 3N      | 4100 | -- M1 | - |
| 0.47 µF    | 9.0                                 | 17.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46 3R      | 3470 | -- 01 | - |
| 0.68 µF    | 9.0                                 | 17.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46 3R      | 3680 | -- M1 | - |
| 1.0 µF     | 11.0                                | 20.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46 3R      | 4100 | -- M1 | - |
| 1.5 µF     | 13.0                                | 22.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46 3R      | 4150 | -- M1 | - |
| 2.2 µF     | 13.0                                | 25.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46 3R      | 4220 | -- M2 | - |
| 2.2 µF     | 14.0                                | 28.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46 3R      | 4220 | -- M1 | - |
| 2.2 µF     | 18.0                                | 33.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46 3R      | 4220 | -- 01 | - |
| 3.3 µF     | 18.0                                | 33.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46 3R      | 4330 | -- M2 | - |
| 3.3 µF     | 22.0                                | 37.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46 3R      | 4330 | -- M1 | - |
| 4.7 µF     | 18.0                                | 33.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46 3R      | 4470 | -- M2 | - |
| 4.7 µF     | 22.0                                | 37.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46 3R      | 4470 | -- M1 | - |
| 1.5 µF     | 11.0                                | 22.0 | 41.5 | 37.5 | 1.0 | 100                                 | R46 3W      | 4150 | -- M1 | - |
| 2.2 µF     | 11.0                                | 22.0 | 41.5 | 37.5 | 1.0 | 100                                 | R46 3W      | 4220 | -- M2 | M |
| 2.2 µF     | 13.0                                | 24.0 | 41.5 | 37.5 | 1.0 | 100                                 | R46 3W      | 4220 | -- M1 | - |
| 3.3 µF     | 16.0                                | 28.5 | 41.5 | 37.5 | 1.0 | 100                                 | R46 3W      | 4330 | -- M1 | - |
| 4.7 µF     | 16.0                                | 28.5 | 41.5 | 37.5 | 1.0 | 100                                 | R46 3W      | 4470 | -- M2 | M |
| 4.7 µF     | 19.0                                | 32.0 | 41.5 | 37.5 | 1.0 | 100                                 | R46 3W      | 4470 | -- M1 | - |
| 6.8 µF     | 20.0                                | 40.0 | 41.5 | 37.5 | 1.0 | 100                                 | R46 3W      | 4680 | -- M2 | - |
| 6.8 µF     | 24.0                                | 44.0 | 41.5 | 37.5 | 1.0 | 100                                 | R46 3W      | 4680 | -- M1 | - |
| 10.0 µF    | 30.0                                | 45.0 | 41.5 | 37.5 | 1.0 | 100                                 | R46 3W      | 5100 | -- M1 | - |

Rated voltage (3=300Vac)  
Mechanical version and packaging (Table 1)  
Tolerance: K (±10%); M (±20%)

All dimensions are in mm

E12 Series available upon request

|  |                                       |                                            |                                     |
|--|---------------------------------------|--------------------------------------------|-------------------------------------|
|  | ENEC<br>IEC 60384-14                  | Class X2                                   | File No.V4413                       |
|  | CSA<br>E 384-14-95<br>(up to 5.6µF)   | Across-the-line                            | File No.154612<br>(LR 83890)        |
|  | UL 1414<br>up to 1µF, 85°C;<br>250Vac | Across-the-line                            | File No.E97797                      |
|  | UL 1283<br>(310 Vac)                  | Electromagnetic<br>Interference<br>Filters | File No.E85238                      |
|  | GB/T 14472                            | Class X2                                   | File CQC3001008199<br>CQC3001008842 |

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

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

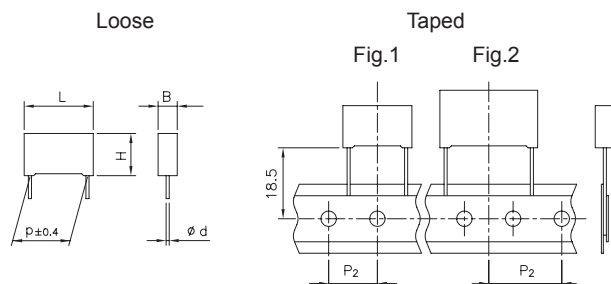


Table 1

| Standard<br>packaging style        | Lead<br>length<br>(mm) | Taping style           |               |               | Ordering<br>code<br>(Digit 10 to 11) |
|------------------------------------|------------------------|------------------------|---------------|---------------|--------------------------------------|
|                                    |                        | P <sub>2</sub><br>(mm) | Fig.<br>(No.) | Pitch<br>(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 <sup>+2</sup>        |                        |               |               | 00                                   |
| Loose, long leads                  | 25 <sup>-1/+2</sup>    |                        |               |               | 50                                   |
| Loose, long leads                  | 30 <sup>+5</sup>       |                        |               |               | 40                                   |
| Loose, insulated<br>rigid leads    | 30 <sup>+5</sup>       |                        |               |               | 51                                   |
| Loose, insulated<br>flexible leads | 150 <sup>+5</sup>      |                        |               |               | 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. 152 and contact  
our Technical Service for choosing the safest solution.



|           |             |          |
|-----------|-------------|----------|
| Ø d ±0.05 | p ≤15       | p = 22.5 |
|           | 0.6 or 0.8* | 0.8      |

\*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:** 40/125/56 IEC 60068-1

**Operating temperature range:** -40 to +125°C

**Related documents:** IEC 60384-14; EN 60384-14

### ELECTRICAL CHARACTERISTICS

**Rated voltage (V<sub>R</sub>):** 275 Vac (50/60Hz) / 560 Vdc

**Capacitance range:** 0.01µF to 1µF

### TEST METHOD AND PERFORMANCE

#### Endurance:

##### Test conditions

Temperature: +125°C±2°C

Test duration: 1000 h

Voltage applied: 1.25 x V<sub>R</sub> +1000Vac 0.1 s/h

##### Performance

Dielectric strength: no dielectric breakdown or flashover at 4.3 x V<sub>R</sub> (d.c.)/1 min

Capacitance change |ΔC/C|: ≤ 10%

Insulation resistance: ≥ 50% of initial limit.

### APPROVALS

|  |                                       |                                            |                             |
|--|---------------------------------------|--------------------------------------------|-----------------------------|
|  | ENEC<br>IEC 60384-14                  | Class X2                                   | File No.CA08.00063          |
|  | CSA<br>E 384-14-95                    | Across-the-line                            | File No.154612<br>(LR83890) |
|  | UL 1414<br>up to 1µF, 85°C;<br>250Vac | Across-the-line                            | File No.E97797              |
|  | UL 1283<br>(310 Vac)                  | Electromagnetic<br>Interference<br>Filters | File No.E85238              |

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

According to IEC 60065

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



## X2 CLASS (IEC 60384-14) - MKP 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**

**NEW 125°C**

| Rated Cap. | 275 Vac / 560 Vdc<br>Std dimensions |      |      |      | 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 K F 2100 - - H1 - |
| 0.015 µF   | 5.0                                 | 11.0 | 13.0 | 10.0 | 0.6 | 500                        | R46 K F 2150 - - H1 - |
| 0.022 µF   | 5.0                                 | 11.0 | 13.0 | 10.0 | 0.6 | 500                        | R46 K F 2220 - - H1 - |
| 0.033 µF   | 5.0                                 | 11.0 | 13.0 | 10.0 | 0.6 | 500                        | R46 K F 2330 - - H1 - |
| 0.047 µF   | 6.0                                 | 12.0 | 13.0 | 10.0 | 0.6 | 500                        | R46 K F 2470 - - H1 - |
| 0.068 µF   | 6.0                                 | 12.0 | 13.0 | 10.0 | 0.6 | 500                        | R46 K F 2680 - - H1 M |
| 0.010 µF   | 5.0                                 | 11.0 | 18.0 | 15.0 | 0.6 | 400                        | R46 K I 2100 - - H1 - |
| 0.015 µF   | 5.0                                 | 11.0 | 18.0 | 15.0 | 0.6 | 400                        | R46 K I 2150 - - H1 - |
| 0.022 µF   | 5.0                                 | 11.0 | 18.0 | 15.0 | 0.6 | 400                        | R46 K I 2220 - - H1 - |
| 0.033 µF   | 5.0                                 | 11.0 | 18.0 | 15.0 | 0.6 | 400                        | R46 K I 2330 - - H1 - |
| 0.047 µF   | 5.0                                 | 11.0 | 18.0 | 15.0 | 0.6 | 400                        | R46 K I 2470 - - H1 - |
| 0.068 µF   | 5.0                                 | 11.0 | 18.0 | 15.0 | 0.6 | 400                        | R46 K I 2680 - - H1 - |
| 0.10 µF    | 6.0                                 | 12.0 | 18.0 | 15.0 | 0.6 | 400                        | R46 K I 3100 - - H1 - |
| 0.15 µF    | 6.0                                 | 17.5 | 18.0 | 15.0 | 0.6 | 400                        | R46 K I 3150 - - H2 - |
| 0.15 µF    | 9.0                                 | 12.5 | 18.0 | 15.0 | 0.6 | 400                        | R46 K I 3150 - - H3 - |
| 0.15 µF    | 7.5                                 | 13.5 | 18.0 | 15.0 | 0.6 | 400                        | R46 K I 3150 - - H1 - |
| 0.22 µF    | 8.5                                 | 14.5 | 18.0 | 15.0 | 0.6 | 400                        | R46 K I 3220 - - H1 - |
| 0.22 µF    | 6.0                                 | 17.5 | 18.0 | 15.0 | 0.6 | 400                        | R46 K I 3220 - - H2 M |
| 0.22 µF    | 9.0                                 | 12.5 | 18.0 | 15.0 | 0.6 | 400                        | R46 K I 3220 - - H3 M |
| 0.22 µF    | 7.5                                 | 18.5 | 18.0 | 15.0 | 0.8 | 400                        | R46 K I 3220 - - H4 - |
| 0.33 µF    | 10.0                                | 16.0 | 18.0 | 15.0 | 0.8 | 400                        | R46 K I 3330 - - H1 M |
| 0.33 µF    | 7.5                                 | 18.5 | 18.0 | 15.0 | 0.8 | 400                        | R46 K I 3330 - - H2 M |
| 0.33 µF    | 13.0                                | 12.0 | 18.0 | 15.0 | 0.8 | 400                        | R46 K I 3330 - - H3 M |
| 0.47 µF    | 11.0                                | 19.0 | 18.0 | 15.0 | 0.8 | 400                        | R46 K I 3470 - - H1 M |
| 0.15 µF    | 6.0                                 | 15.0 | 26.5 | 22.5 | 0.8 | 200                        | R46 K N 3150 - - H1 - |
| 0.22 µF    | 6.0                                 | 15.0 | 26.5 | 22.5 | 0.8 | 200                        | R46 K N 3220 - - H1 - |
| 0.33 µF    | 7.0                                 | 16.0 | 26.5 | 22.5 | 0.8 | 200                        | R46 K N 3330 - - H1 - |
| 0.47 µF    | 10.0                                | 18.5 | 26.5 | 22.5 | 0.8 | 200                        | R46 K N 3470 - - H1 - |
| 0.68 µF    | 11.0                                | 20.0 | 26.5 | 22.5 | 0.8 | 200                        | R46 K N 3680 - - H1 - |
| 1.0 µF     | 13.0                                | 22.0 | 26.5 | 22.5 | 0.8 | 200                        | R46 K N 4100 - - H1 - |

Rated voltage (K=275Vac)

Mechanical version and packaging (Table 1)

Tolerance: K (±10%); M (±20%)

E12 Series available upon request

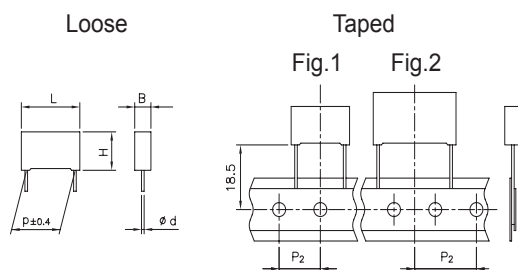
All dimensions are in mm

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.

X2 CLASS (IEC 60384-14) - MKP Series  
**METALLIZED POLYPROPYLENE FILM CAPACITOR**  
 SELF-HEALING PROPERTIES

**Typical applications:** This special R46 release is specifically designed for applications with particular protection against severe ambient conditions.

PRODUCT CODE: **R46**



| 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<br>(mm) | Box thickness (B)<br>(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 |

### 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<sub>R</sub>):** 275Vac (50/60Hz) / 560 Vdc

**Capacitance range:** 0.022µF to 10µF

**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<sup>-4</sup> at +25°C ±5°C: ≤15 (8)\* at 1kHz  
 \* Typical value

### Insulation resistance:

#### Test conditions

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

#### Performance

≥ 1x10<sup>5</sup> MΩ (5x10<sup>5</sup> 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 1st

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

##### Test conditions 2nd

Temperature: +60°C ± 2°C  
 Relative humidity (RH): 95% ± 2%  
 Test duration: 500 hours

##### Test conditions 3rd

Temperature: +40°C ± 2°C  
 Relative humidity (RH): 93% ± 2%  
 Test duration: 500 hours  
 Voltage value: 230 Vac, 50 Hz

#### Performance

Dielectric strength: no dielectric breakdown or flashover at 4.3 x V<sub>R</sub> (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<sub>R</sub> + 1000Vac 0.1 s/h

#### Performance

Dielectric strength: no dielectric breakdown or flashover at 4.3 x V<sub>R</sub> (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%

X2 CLASS (IEC60384-14) - MKP Series  
METALLIZED POLYPROPYLENE FILM CAPACITOR  
SELF-HEALING PROPERTIES

APPROVALS

| Rated Cap.<br>(*) | 275 Vac / 560 Vdc<br>Std dimensions |      |      |      | Ø d | Max<br>dv/dt at<br>390Vdc<br>(V/ µs) | Part Number |             |   |
|-------------------|-------------------------------------|------|------|------|-----|--------------------------------------|-------------|-------------|---|
|                   | B                                   | H    | L    | p    |     |                                      |             |             |   |
| 0.022 µF          | 4.0                                 | 9.0  | 13.0 | 10.0 | 0.6 | 500                                  | R46 KF      | 2220 - - S0 | - |
| 0.033 µF          | 5.0                                 | 11.0 | 13.0 | 10.0 | 0.6 | 500                                  | R46 KF      | 2330 - - S0 | - |
| 0.047 µF          | 5.0                                 | 11.0 | 13.0 | 10.0 | 0.6 | 500                                  | R46 KF      | 2470 - - S0 | - |
| 0.068 µF          | 6.0                                 | 12.0 | 13.0 | 10.0 | 0.6 | 500                                  | R46 KF      | 2680 - - S0 | - |
| 0.068 µF          | 5.0                                 | 11.0 | 18.0 | 15.0 | 0.6 | 400                                  | R46 KI      | 2680 - - S0 | - |
| 0.10 µF           | 5.0                                 | 11.0 | 18.0 | 15.0 | 0.6 | 400                                  | R46 KI      | 3100 - - S1 | M |
| 0.10 µF           | 6.0                                 | 12.0 | 18.0 | 15.0 | 0.6 | 400                                  | R46 KI      | 3100 - - S0 | - |
| 0.15 µF           | 6.0                                 | 12.0 | 18.0 | 15.0 | 0.6 | 400                                  | R46 KI      | 3150 - - S1 | M |
| 0.15 µF           | 7.5                                 | 13.5 | 18.0 | 15.0 | 0.6 | 400                                  | R46 KI      | 3150 - - S0 | - |
| 0.22 µF           | 7.5                                 | 13.5 | 18.0 | 15.0 | 0.6 | 400                                  | R46 KI      | 3220 - - S1 | M |
| 0.22 µF           | 8.5                                 | 14.5 | 18.0 | 15.0 | 0.6 | 400                                  | R46 KI      | 3220 - - S0 | - |
| 0.22 µF           | 6.0                                 | 17.5 | 18.0 | 15.0 | 0.6 | 400                                  | R46 KI      | 3220 - - S2 | - |
| 0.22 µF           | 9.0                                 | 12.5 | 18.0 | 15.0 | 0.6 | 400                                  | R46 KI      | 3220 - - S3 | - |
| 0.33 µF           | 13.0                                | 12.0 | 18.0 | 15.0 | 0.8 | 400                                  | R46 KI      | 3330 - - S1 | - |
| 0.33 µF           | 10.0                                | 16.0 | 18.0 | 15.0 | 0.8 | 400                                  | R46 KI      | 3330 - - S0 | - |
| 0.33 µF           | 7.5                                 | 18.5 | 18.0 | 15.0 | 0.8 | 400                                  | R46 KI      | 3330 - - S2 | - |
| 0.47 µF           | 11.0                                | 19.0 | 18.0 | 15.0 | 0.8 | 400                                  | R46 KI      | 3470 - - S0 | - |
| 0.22 µF           | 6.0                                 | 15.0 | 26.5 | 22.5 | 0.8 | 200                                  | R46 KN      | 3220 - - S0 | - |
| 0.33 µF           | 6.0                                 | 15.0 | 26.5 | 22.5 | 0.8 | 200                                  | R46 KN      | 3330 - - S1 | M |
| 0.33 µF           | 7.0                                 | 16.0 | 26.5 | 22.5 | 0.8 | 200                                  | R46 KN      | 3330 - - S0 | - |
| 0.47 µF           | 7.0                                 | 16.0 | 26.5 | 22.5 | 0.8 | 200                                  | R46 KN      | 3470 - - S1 | M |
| 0.47 µF           | 8.5                                 | 17.0 | 26.5 | 22.5 | 0.8 | 200                                  | R46 KN      | 3470 - - S0 | - |
| 0.68 µF           | 10.0                                | 18.5 | 26.5 | 22.5 | 0.8 | 200                                  | R46 KN      | 3680 - - S0 | - |
| 1.0 µF            | 10.0                                | 18.5 | 26.5 | 22.5 | 0.8 | 200                                  | R46 KN      | 4100 - - S2 | M |
| 1.0 µF            | 11.0                                | 20.0 | 26.5 | 22.5 | 0.8 | 200                                  | R46 KN      | 4100 - - S1 | - |
| 1.0 µF            | 13.0                                | 22.0 | 26.5 | 22.5 | 0.8 | 200                                  | R46 KN      | 4100 - - S0 | - |
| 1.2 µF            | 13.0                                | 22.0 | 26.5 | 22.5 | 0.8 | 200                                  | R46 KN      | 4120 - - S0 | - |
| 0.47 µF           | 9.0                                 | 17.0 | 32.0 | 27.5 | 0.8 | 150                                  | R46 KR      | 3470 - - S0 | - |
| 0.68 µF           | 9.0                                 | 17.0 | 32.0 | 27.5 | 0.8 | 150                                  | R46 KR      | 3680 - - S1 | - |
| 1.0 µF            | 11.0                                | 20.0 | 32.0 | 27.5 | 0.8 | 150                                  | R46 KR      | 4100 - - S1 | - |
| 1.5 µF            | 13.0                                | 22.0 | 32.0 | 27.5 | 0.8 | 150                                  | R46 KR      | 4150 - - S1 | - |
| 2.2 µF            | 13.0                                | 25.0 | 32.0 | 27.5 | 0.8 | 150                                  | R46 KR      | 4220 - - S2 | - |
| 3.3 µF            | 18.0                                | 33.0 | 32.0 | 27.5 | 0.8 | 150                                  | R46 KR      | 4330 - - S2 | - |
| 4.7 µF            | 18.0                                | 33.0 | 32.0 | 27.5 | 0.8 | 150                                  | R46 KR      | 4470 - - S2 | - |
| 1.5 µF            | 11.0                                | 22.0 | 41.5 | 37.5 | 1.0 | 100                                  | R46 KW      | 4150 - - S1 | - |
| 2.2 µF            | 11.0                                | 22.0 | 41.5 | 37.5 | 1.0 | 100                                  | R46 KW      | 4220 - - S2 | M |
| 2.2 µF            | 13.0                                | 24.0 | 41.5 | 37.5 | 1.0 | 100                                  | R46 KW      | 4220 - - S1 | - |
| 3.3 µF            | 16.0                                | 28.5 | 41.5 | 37.5 | 1.0 | 100                                  | R46 KW      | 4330 - - S1 | - |
| 4.7 µF            | 16.0                                | 28.5 | 41.5 | 37.5 | 1.0 | 100                                  | R46 KW      | 4470 - - S2 | M |
| 4.7 µF            | 19.0                                | 32.0 | 41.5 | 37.5 | 1.0 | 100                                  | R46 KW      | 4470 - - S1 | - |
| 6.8 µF            | 20.0                                | 40.0 | 41.5 | 37.5 | 1.0 | 100                                  | R46 KW      | 4680 - - S2 | - |
| 10.0 µF           | 30.0                                | 45.0 | 41.5 | 37.5 | 1.0 | 100                                  | R46 KW      | 5100 - - S1 | - |

Rated voltage (K=275Vac)  
Mechanical version and packaging (Table 1)  
Tolerance: K (±10%); M (±20%)

E12 Series available upon request

All dimensions are in mm

|  |                                       |                                            |                                     |
|--|---------------------------------------|--------------------------------------------|-------------------------------------|
|  | ENEC<br>IEC 60384-14                  | Class X2                                   | File No.V4413                       |
|  | CSA<br>E 384-14-95<br>(up to 5.6 µF)  | Across-the-line                            | File No.154612<br>(LR 83890)        |
|  | UL 1414<br>up to 1µF, 85°C;<br>250Vac | Across-the-line                            | File No.E97797                      |
|  | UL 1283<br>(310 Vac)                  | Electromagnetic<br>Interference<br>Filters | File No.E85238                      |
|  | GB/T 14472                            | Class X2                                   | File CQC3001008199<br>CQC3001008842 |

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

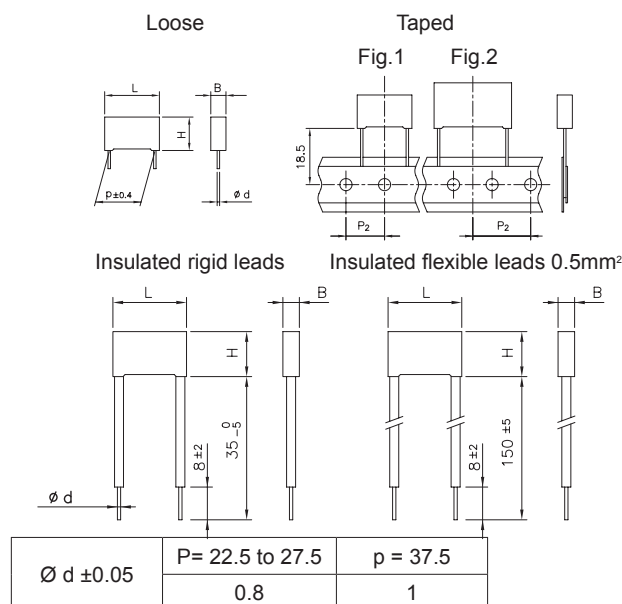
(\*\*) ENEC mark has replaced all the following European  
National marks:



Table 1

| Standard<br>packaging style        | Lead<br>length<br>(mm) | Taping style           |               |               | Ordering<br>code<br>(Digit 10 to 11) |
|------------------------------------|------------------------|------------------------|---------------|---------------|--------------------------------------|
|                                    |                        | P <sub>2</sub><br>(mm) | Fig.<br>(No.) | Pitch<br>(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 <sup>+2</sup>        |                        |               |               | 00                                   |
| Loose, long leads                  | 25 <sup>-1/+2</sup>    |                        |               |               | 50                                   |
| Loose, long leads                  | 30 <sup>+5</sup>       |                        |               |               | 40                                   |
| Loose, insulated<br>rigid leads    | 30 <sup>+5</sup>       |                        |               |               | 51                                   |
| Loose, insulated<br>flexible leads | 150 <sup>±5</sup>      |                        |               |               | 52                                   |

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



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<sub>R</sub>):** 275Vac (50/60Hz) / 560 Vdc  
300Vac (50/60Hz) / 630 Vdc

**Capacitance range:** 0.22µF to 10µF

**Capacitance values:** E6 series (IEC 60063 Norm).

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

**Dissipation factor (DF):**  
tgδ 10<sup>-4</sup> 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<sup>5</sup> MΩ (5x10<sup>5</sup> 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 X2 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.

PRODUCT CODE: **R46**

| Pitch<br>(mm) | Box thickness (B)<br>(mm) | Maximum dimensions (mm) |        |        |
|---------------|---------------------------|-------------------------|--------|--------|
|               |                           | B max                   | H max  | L max  |
| 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 1st

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<sub>R</sub> (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<sub>R</sub> +1000Vac 0.1 s/h

#### Performance

Dielectric strength: no dielectric breakdown or  
flashover at 4.3 x V<sub>R</sub> (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%

## APPROVALS

|  |                                       |                                            |                |
|--|---------------------------------------|--------------------------------------------|----------------|
|  | ENEC<br>IEC 60384-14                  | Class X2                                   | File No.V4413  |
|  | UL 1414<br>up to 1µF, 85°C;<br>250Vac | Across-the-line                            | File No.E97797 |
|  | UL 1283<br>(250 Vac-105°C)            | Electromagnetic<br>Interference<br>Filters | File No.E85238 |

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

Capacitors with discharge resistor  
X2 CLASS (IEC 60384-14) - MKP Series  
**METALLIZED POLYPROPYLENE FILM CAPACITOR**  
SELF-HEALING PROPERTIES

PRODUCT CODE: **R46**

| Rated<br>Cap. (*) | 275 Vac / 560 Vdc<br>Std dimensions |      |      |      | Ø d | Max<br>dv/dt at<br>390Vdc<br>(V/µs) | Part Number           |
|-------------------|-------------------------------------|------|------|------|-----|-------------------------------------|-----------------------|
|                   | B                                   | H    | L    | p    |     |                                     |                       |
| 0.22 µF           | 7.0                                 | 16.0 | 26.5 | 22.5 | 0.8 | 200                                 | R46KN 3220 - - 01 - - |
| 0.33 µF           | 8.5                                 | 17.0 | 26.5 | 22.5 | 0.8 | 200                                 | R46KN 3330 - - 01 - - |
| 0.47 µF           | 10.0                                | 18.5 | 26.5 | 22.5 | 0.8 | 200                                 | R46KN 3470 - - 01 - - |
| 0.68 µF           | 11.0                                | 20.0 | 26.5 | 22.5 | 0.8 | 200                                 | R46KN 3680 - - 01 - - |
| 0.47 µF           | 11.0                                | 20.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46KR 3470 - - 01 - - |
| 0.68 µF           | 11.0                                | 20.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46KR 3680 - - M1 - - |
| 1.0 µF            | 13.0                                | 22.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46KR 4100 - - M1 - - |
| 1.5 µF            | 13.0                                | 22.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46KR 4150 - - M1 - - |
| 2.2 µF            | 14.0                                | 28.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46KR 4220 - - M1 - - |
| 3.3 µF            | 18.0                                | 33.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46KR 4330 - - M2 - - |
| 4.7 µF            | 22.0                                | 37.0 | 32.0 | 27.5 | 0.8 | 150                                 | R46KR 4470 - - M1 - - |
| 1.5 µF            | 11.0                                | 22.0 | 41.5 | 37.5 | 1.0 | 100                                 | R46KW 4150 - - M1 - - |
| 2.2 µF            | 13.0                                | 24.0 | 41.5 | 37.5 | 1.0 | 100                                 | R46KW 4220 - - M1 - - |
| 3.3 µF            | 16.0                                | 28.5 | 41.5 | 37.5 | 1.0 | 100                                 | R46KW 4330 - - M1 - - |
| 4.7 µF            | 19.0                                | 32.0 | 41.5 | 37.5 | 1.0 | 100                                 | R46KW 4470 - - M1 - - |
| 6.8 µF            | 20.0                                | 40.0 | 41.5 | 37.5 | 1.0 | 100                                 | R46KW 4680 - - M2 - - |
| 10.0 µF           | 24.0                                | 44.0 | 41.5 | 37.5 | 1.0 | 100                                 | R46KW 5100 - - M1 - - |

Rated voltage (K=275Vac) \_\_\_\_\_  
Mechanical version and packaging (Table 1) \_\_\_\_\_  
Tolerance: K (±10%); M (±20%) \_\_\_\_\_  
Value of discharge resistor (Table 2) \_\_\_\_\_

| Rated<br>Cap. (*) | 300 Vac / 630 Vdc<br>Std dimensions |      |      |      | Ø d | Max<br>dv/dt at<br>390Vdc<br>(V/µs) | Part Number           |
|-------------------|-------------------------------------|------|------|------|-----|-------------------------------------|-----------------------|
|                   | B                                   | H    | L    | p    |     |                                     |                       |
| 0.22 µF           | 7.0                                 | 16.0 | 26.5 | 22.5 | 0.8 | 200                                 | R463N 3220 - - 01 - - |
| 0.33 µF           | 8.5                                 | 17.0 | 26.5 | 22.5 | 0.8 | 200                                 | R463N 3330 - - 01 - - |
| 0.47 µF           | 10.0                                | 18.5 | 26.5 | 22.5 | 0.8 | 200                                 | R463N 3470 - - 01 - - |
| 0.68 µF           | 11.0                                | 20.0 | 26.5 | 22.5 | 0.8 | 200                                 | R463N 3680 - - 01 - - |
| 0.47 µF           | 11.0                                | 20.0 | 32.0 | 27.5 | 0.8 | 150                                 | R463R 3470 - - 01 - - |
| 0.68 µF           | 11.0                                | 20.0 | 32.0 | 27.5 | 0.8 | 150                                 | R463R 3680 - - M1 - - |
| 1.0 µF            | 13.0                                | 22.0 | 32.0 | 27.5 | 0.8 | 150                                 | R463R 4100 - - M1 - - |
| 1.5 µF            | 13.0                                | 22.0 | 32.0 | 27.5 | 0.8 | 150                                 | R463R 4150 - - M1 - - |
| 2.2 µF            | 14.0                                | 28.0 | 32.0 | 27.5 | 0.8 | 150                                 | R463R 4220 - - M1 - - |
| 3.3 µF            | 18.0                                | 33.0 | 32.0 | 27.5 | 0.8 | 150                                 | R463R 4330 - - M2 - - |
| 4.7 µF            | 22.0                                | 37.0 | 32.0 | 27.5 | 0.8 | 150                                 | R463R 4470 - - M1 - - |
| 1.5 µF            | 11.0                                | 22.0 | 41.5 | 37.5 | 1.0 | 100                                 | R463W 4150 - - M1 - - |
| 2.2 µF            | 13.0                                | 24.0 | 41.5 | 37.5 | 1.0 | 100                                 | R463W 4220 - - M1 - - |
| 3.3 µF            | 16.0                                | 28.5 | 41.5 | 37.5 | 1.0 | 100                                 | R463W 4330 - - M1 - - |
| 4.7 µF            | 19.0                                | 32.0 | 41.5 | 37.5 | 1.0 | 100                                 | R463W 4470 - - M1 - - |
| 6.8 µF            | 20.0                                | 40.0 | 41.5 | 37.5 | 1.0 | 100                                 | R463W 4680 - - M2 - - |
| 10.0 µF           | 24.0                                | 44.0 | 41.5 | 37.5 | 1.0 | 100                                 | R463W 5100 - - M1 - - |

Rated voltage (3=300Vac) \_\_\_\_\_  
Mechanical version and packaging (Table 1) \_\_\_\_\_  
Tolerance: K (±10%); M (±20%) \_\_\_\_\_  
Value of discharge resistor (Table 2) \_\_\_\_\_

Table 1

| Standard<br>packaging style     | Lead<br>length<br>(mm) | Taping style           |               |               | Ordering<br>code<br>(Digit 10 to 11) |
|---------------------------------|------------------------|------------------------|---------------|---------------|--------------------------------------|
|                                 |                        | P <sub>2</sub><br>(mm) | Fig.<br>(No.) | Pitch<br>(mm) |                                      |
| REEL Ø500mm                     |                        | 19.05                  | 2             | 22.5/27.5     | CK                                   |
| Loose, short leads              | 4 <sup>+2</sup>        |                        |               |               | 00                                   |
| Loose, long leads               | 25 <sup>-1/4+2</sup>   |                        |               |               | 50                                   |
| Loose, long leads               | 30 <sup>+5</sup>       |                        |               |               | 40                                   |
| Loose, insulated rigid leads    | 30 <sup>+5</sup>       |                        |               |               | 51                                   |
| Loose, insulated flexible leads | 150 <sup>+5</sup>      |                        |               |               | 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 | 6 |   |   |   |   |   |   |    |    |    | -  |    | -  |

- Digit 1 to 3 Series code.  
Digit 4 a.c. rated voltage:  
K = 275Vac; 3 = 300Vac  
Digit 5 Pitch:  
N = 22.5; 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.

All dimensions are in mm