

# PHE 425

- High capacitance density.
- High stability.
- High reliability.

- MUAHAG approval.
- CECC 31201-001

## Typical applications

This capacitor covers  $7.5 \times 7.5$  mm PCB area, and together with RM6 ferrite cores, can be designed into very dense constructions, i.e. LC-filters in telephone systems, measurement equipment or timing circuits.

## Construction

The winding in PHE 425 is metallized polypropylene. It is designed to achieve low inductance and low ESR. The encapsulation is made of self-extinguishing material (UL 94V-0).

The capacitor will withstand all commonly used solvents and rinsing liquids without damage. The mechanical design will assure narrow dimensional tolerances and highest possible packing density on PC-board.

## General data

Rated voltage $U_R$ VDC	400	250	100	63
Rated voltage $U_R$ VAC, 50 Hz	220	125	63	40
Capacitance range, $C_R$ nF	3.3 – 10	3.3 – 10	10 – 35	35 – 135*
Capacitance tolerance	1%, 2%, 5%			
Climatic category	55/085/56			
IEC standard	384-16, Stability class 1, Grade 1			

\*For PHE 225 replacement in smaller C values, please contact manufacturer.

## Electrical Characteristics

### Rated capacitance

According to article table. The E12 and E48 series are preferred. Measured at  $+23^\circ\text{C}$  and at 1 kHz. Other values on request.

### Test voltage

Between terminals:  $1.6 \times U_R$  (rated voltage). The capacitors will withstand the voltage above without breakdowns or flashovers for 60 seconds. Between terminals and case: 400 VDC.

### Insulation resistance

The insulation resistance is measured at  $+23^\circ\text{C}$  and after 60 s.

Test voltage is 100 VDC for 100 and 250 VDC capacitors and for 63 VDC capacitors at 10 VDC. The requirement is an insulation of at least 200 G.

### Pulse rise time, $dU/dt$

The capacitors can withstand an unlimited number of pulses with a pulse steepness according to values given in table. The capacitors are sample tested with five times stated values and with 10000 pulses.

Capacitance (nF)	max $dU/dt$ (V/ $\mu$ s)
3.3 – 10	40
10.5 – 35	30
36.5 – 135	10

### Inductance

Measured at 1.5 mm from the capacitor body. Typical value is 12 nH. Maximum value 15 nH. Add 1.5 nH/mm for extra wire length.

### Terminals

Heavily tinned, low resistance wires are placed symmetrically along the base diagonal.

### Needle flame test

According to IEC publ. 695-2-2 with underlaying layer of tissue paper. The flame can be applied for 20 seconds, without any glowing particles falling.

### Long term stability

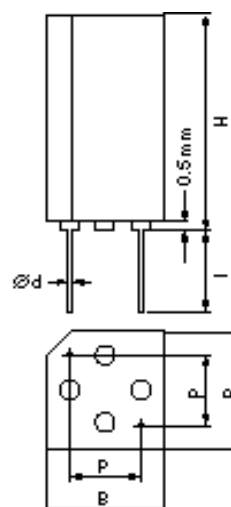
After three years at rated voltage, and maximum 70% relative humidity, the capacitance drift will not exceed  $0.2\% + 0.2$  pF.

### Dielectric absorption

According to MIL-C-19978 B paragraph 4.6.15, the absorption is less than 0.01%.

### Dissipation factor

Capacitance (nF)	Frequency (kHz)	$\tan (\times 10^{-4})$
3.3 – 135	1	$< 3$
3.3 – 135	10	$< 5$
3.3 – 34.8	100	$< 20$
36.5 – 135	100	$< 35$



B	$7.4 \pm {}^{+0}_{-1}$ mm
H	$\leq 13.1$ mm
P	5.08 mm
I	Standard $3.1 \pm 0.3$ mm
	Optional 6–10 mm with tolerance $\pm {}^{+0}_{-1}$
d	0.6 mm
Weight	1.2 g

The outer foil is always connected to the outer terminal that is closest to the cut-off corner.

### Temperature coefficient

The linear relation between temperature and capacitance value is valid for the total temperature range ( $-40^\circ\text{C}$  to  $+85^\circ\text{C}$ ).

Capacitance (nF)	Typical values (ppm/ $^\circ\text{C}$ ) $< 23^\circ\text{C}$	(ppm/ $^\circ\text{C}$ ) $> 23^\circ\text{C}$
3.3 – 10	$-135 \pm 35$	$-170 \pm 60$
10.0 – 35	$-180 \pm 30$	$-235 \pm 40$
35.0 – 135	$-205 \pm 35$	$-250 \pm 50$

## Environmental test data

### Soldering heat

According to IEC 68-2-20 Test Tb, Method 1A (Solder bath 260°C during 10 seconds). The following requirements are to be met:

1. C/C 0.5%
2. The change in  $\tan \delta$   $20 \times 10^{-4}$  at 100 kHz or lower than  $5 \times 10^{-4}$  at 10 kHz.
3. No visible damage

### Endurance test DC

2000 h at  $1.25 \times U_R$  and + 85°C. The following requirements are met:

1. Insulation resistance more than 100 G .
2. Other requirements according to "Soldering heat".

### Endurance test AC

1000 h at  $1.25 \times U_R$  and + 85°C. The following requirements are met:

1. Insulation resistance more than 100 G
2. C/C < 5% at 1 kHz.
3.  $\tan \delta < 15 \times 10^{-4}$  at 1 kHz.

### Damp heat steady state

According to IEC 68-2-3 Test Ca. The same requirements as under "Soldering heat" must be met after 56 days at + 40°C and 93 % relative humidity. Insulation resistance 100 G .

### Bump

According to IEC 68-2-29 Test Eb mounted on a PCB. 4000 bumps with a peak acceleration of 390 m/s<sup>2</sup>. The same requirements as under "Soldering heat" shall be met.

### Vibration

According to IEC 68-2-6 Test Fc, proc. B4 6 h with 10 – 2000 Hz and 0.75 mm displacement amplitude.

### Low air pressure

In accordance with IEC 68-2-13 Test M. The capacitor is to be stored at 20 mbar (2 kPa) for one hour. For the last five minutes the rated voltage is to be applied between the terminals. The requirements are that there shall be no breakdowns or flashovers in the voltage test, and no visible damage.

### Reliability

The failure rate of PHE 425 is so low that reliability data referring to normal operation cannot be achieved in laboratory tests. However, operational statistics for a total of  $0.6 \times 10^6$  unit-hours have revealed a mean failure rate of  $3 \times 10^{-9}$ /h.

## CECC approval

PHE 425 has its properties documented in its own detail specification. Compared to the sectional specification the AQL levels are more severe for PHE 425.

The complete detail specification will be sent on request.

## Marking

- **RIFA**
- **RIFA article code**
- **Rated capacitance**
- **Capacitance tolerance code**
- **Rated voltage**
- **Type designation unless otherwise specified under each detail specification**
- **Manufacturing code (month, year)**

## Article table PHE 425

Rated voltage $U_R$	Capacitance $C_R$ nF	Quantity/std. package pcs	Reel	Article code
<b>63 VDC/40 VAC</b>	36.5 – 135	250	600	PHE 425CB ...
<b>100 VDC/63 VAC</b>	10.5 – 34.8	250	600	PHE 425DB ...
<b>250 VDC/125 VAC</b>	3.3 – 10	250	600	PHE 425HB ...
<b>400 VDC/220 VAC</b>	3.3 – 10	250	600	PHE 425KB ...

## Ordering information

### Article code

#### 1st block

See article table and below

Pos. 13. Tolerance code J =  $\pm 5\%$ ,  
G =  $\pm 2\%$ , F =  $\pm 1\%$ .

**P H E 4 2 5 D B 5 1 5 0 G**

1 2 3 4 5 6 7 8 9 10 11 12 13

#### 2nd block

The capacitor is also available with 6 or 10 mm lead length (add R06 or R10 in pos. 14 – 16). Taped on reel add R12 T0 in pos. 14–18. If CECC approved capacitor is requested add C in pos. 17.

**R 0 6 C**

14 15 16 17 18 19 20

## Packing

The capacitors are packed bulk in a box with the dimensions 146 × 55 × 62 mm.

Reels with taped capacitors are packed 10 in a box with dimensions 600 × 400 × 400 mm. Quantity/reel according to article table.

## Typical data, graphs

