

- **Miniature**
- **For Low Profile AC-DC Adaptors**
- **High Voltage**
- **High Ripple Capability**
- **+105°C Maximum Temperature**



The PAG series is a new radial lead series from United Chemi-Con that is specifically designed to meet the high voltage requirements, high ripple current duty and low ESR for input filtering of low profile AC-DC adaptors. With improved construction and enhanced parameters, compared to the current PA series, these PAG capacitors are available in slim compact case sizes with a wider voltage range of 250 to 450 volts and broader capacitance range of 18 to 560µF. The rated lifetime is 2,000 hours at +105°C with the full rated ripple current applied.

The PAG series capacitors are non-solvent proof. Refer to the Mini-Glossary for cleaning guidelines and recommended cleaning agents that are compatible with United Chemi-Con products.

## Summary of Specifications

- **Radial lead terminals.**
- **Capacitance range: 18 to 560µF.**
- **Voltage range: 200 to 450VDC.**
- **Category temperature range: -40°C to +105°C for 200 and 400V; -25°C to +105°C for 420 and 450V.**
- **Leakage current: 0.1CV+40µA after 1 minute or 0.03CV+15µA after 5 minutes for 1,000CV or less; 0.04CV+100µA after 1 minute or 0.02CV+25µA after 5 minutes for more than 1,000CV at +20°C.**
- **Standard capacitance tolerance: ±20%**
- **Nominal case size (D×L): 10×30mm to 18×45mm.**
- **Rated lifetime: 2,000 hours at +105°C with the rated ripple current applied.**

## PAG Specifications

Item	Characteristics															
Category Temperature Range	- 40 to +105°C for 200 and 400VDC; - 25 to +105°C for 420 and 450VDC															
Rated Voltage Range	200 to 450VDC															
Capacitance Range	18 to 560 $\mu$ F															
Capacitance Tolerance	$\pm 20\%$ (M) at +20°C, 120Hz															
Leakage Current	At +20°C <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>CV Product</th> <th>After 1 Minute</th> <th>After 5 Minutes</th> </tr> </thead> <tbody> <tr> <td>CV <math>\leq 1,000</math></td> <td>I = 0.1CV + 40<math>\mu</math>A</td> <td>I = 0.03CV + 15<math>\mu</math>A</td> </tr> <tr> <td>CV &gt; 1,000</td> <td>I = 0.04CV + 100<math>\mu</math>A</td> <td>I = 0.02CV + 25<math>\mu</math>A</td> </tr> </tbody> </table> Where I = Max. leakage current ( $\mu$ A), C = Nominal capacitance ( $\mu$ F) and V = Rated voltage (V)	CV Product	After 1 Minute	After 5 Minutes	CV $\leq 1,000$	I = 0.1CV + 40 $\mu$ A	I = 0.03CV + 15 $\mu$ A	CV > 1,000	I = 0.04CV + 100 $\mu$ A	I = 0.02CV + 25 $\mu$ A						
CV Product	After 1 Minute	After 5 Minutes														
CV $\leq 1,000$	I = 0.1CV + 40 $\mu$ A	I = 0.03CV + 15 $\mu$ A														
CV > 1,000	I = 0.04CV + 100 $\mu$ A	I = 0.02CV + 25 $\mu$ A														
Dissipation Factor (Tan $\delta$ )	At +20°C, 120Hz <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Rated Voltage (V)</th> <th>200</th> <th>400</th> <th>420</th> <th>450</th> </tr> </thead> <tbody> <tr> <td>Tan <math>\delta</math> (DF)</td> <td>0.12</td> <td>0.15</td> <td>0.20</td> <td>0.20</td> </tr> </tbody> </table>	Rated Voltage (V)	200	400	420	450	Tan $\delta$ (DF)	0.12	0.15	0.20	0.20					
Rated Voltage (V)	200	400	420	450												
Tan $\delta$ (DF)	0.12	0.15	0.20	0.20												
Low Temperature Characteristics	At 120Hz, impedance (Z) ratio between the -25°C or -40°C value and +20°C value shall not exceed the values given below. <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Rated Voltage (V)</th> <th>200</th> <th>400</th> <th>420</th> <th>450</th> </tr> </thead> <tbody> <tr> <td>Z (-25°C) / Z (+20°C)</td> <td>3</td> <td>5</td> <td>6</td> <td>6</td> </tr> <tr> <td>Z (-40°C) / Z (+20°C)</td> <td>6</td> <td>6</td> <td>-</td> <td>-</td> </tr> </tbody> </table>	Rated Voltage (V)	200	400	420	450	Z (-25°C) / Z (+20°C)	3	5	6	6	Z (-40°C) / Z (+20°C)	6	6	-	-
Rated Voltage (V)	200	400	420	450												
Z (-25°C) / Z (+20°C)	3	5	6	6												
Z (-40°C) / Z (+20°C)	6	6	-	-												
Rated Ripple Current Multipliers <i>Refer to Section 4 of the Mini-Glossary for explanation of Rated Ripple Current Multipliers.</i>	Frequency (Hz) <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Capacitance (<math>\mu</math>F)</th> <th>120Hz</th> <th>1kHz</th> <th>10kHz</th> <th>100kHz</th> </tr> </thead> <tbody> <tr> <td>18-82<math>\mu</math>F</td> <td>1.00</td> <td>1.50</td> <td>1.75</td> <td>1.80</td> </tr> <tr> <td>100-560<math>\mu</math>F</td> <td>1.00</td> <td>1.30</td> <td>1.40</td> <td>1.50</td> </tr> </tbody> </table>	Capacitance ( $\mu$ F)	120Hz	1kHz	10kHz	100kHz	18-82 $\mu$ F	1.00	1.50	1.75	1.80	100-560 $\mu$ F	1.00	1.30	1.40	1.50
Capacitance ( $\mu$ F)	120Hz	1kHz	10kHz	100kHz												
18-82 $\mu$ F	1.00	1.50	1.75	1.80												
100-560 $\mu$ F	1.00	1.30	1.40	1.50												
Endurance (Load Life)	The following specifications shall be satisfied when the capacitors are restored to +20°C after subjecting them to DC voltage for 2,000 hours at +105°C with the rated ripple current applied. The sum of the DC voltage and peak AC voltage must not exceed the full rated voltage of the capacitors. Capacitance change: $\leq \pm 20\%$ of initial measured value Tan $\delta$ (DF) : $\leq 200\%$ of initial specified value Leakage current : $\leq$ initial specified value															
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to +20°C after exposing them for 1,000 hours at +105°C without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change: $\leq \pm 20\%$ of initial measured value Tan $\delta$ (DF) : $\leq 200\%$ of initial specified value Leakage current : $\leq 500\%$ of initial specified value															

## Part Numbering System for PAG Series

When ordering, always specify complete catalog number for PAG Series.

Part Number	Description
<b>PAG</b>	Series Name: Indicates Basic Capacitor Design.
<b>400</b>	DC Rated Voltage: Expressed in Volts (e.g. 400 = 400WVDC).
<b>VB</b>	Lead Configuration: VB = Radial Lead Terminals.
<b>68R</b>	Capacitance Value: Expressed in Microfarads. The first two digits are significant figures, and the third digit indicates the number of zeros for capacitance of 100 $\mu$ F or more. R indicates the decimal point for capacitance less than 100 $\mu$ F (e.g. R68 = .68 $\mu$ F; 6R8 = 6.8 $\mu$ F; 68R = 68 $\mu$ F; 681 = 680 $\mu$ F; 682 = 6,800 $\mu$ F; 683 = 68,000 $\mu$ F).
<b>M</b>	Capacitance Tolerance: M = $\pm 20\%$
<b>12X40</b>	Case Code: See Case Sizes in Tables.
<b>LL</b>	Lead Length: LL is Standard.

## Diagram of Dimensions

**VB/Radial Lead** Unit: mm

**Diameter ≤ Ø12.5**

**Diameter ≥ Ø14.5**

\*Gas escape end seal for Ø10 and Ø12.5

ØD	ØD' max	L' max	Ød	F ±0.5
10	ØD+0.5	L+2.0	0.6	5.0
12.5	ØD+0.5	L+2.0	0.6	5.0
14.5	ØD+0.5	L+2.0	0.8	7.5
16	ØD+0.5	L+2.0	0.8	7.5
18	ØD+0.5	L+2.0	0.8	7.5

Refer to Packaging section for Miniature taping and ammo box specifications and Lead Configurations section for Miniature radial lead cut and lead forming options.

## Standard Voltage Ratings - VB/Radial Lead

Rated Voltage (WVDC)	Capacitance (µF)	Catalog Part Number	Nominal Case Size* D × L (mm)	Maximum ESR (Ω) at +20°C, 120Hz	Rated Ripple Current (A rms) at +105°C, 120Hz
200 Volts 250 Volts Surge	82	PAG200VB82RM10X30LL	10 × 30	2.426	0.44
	100	PAG200VB101M10X35LL	10 × 35	1.989	0.51
	120	PAG200VB121M10X40LL	10 × 40	1.658	0.59
	150	PAG200VB151M12X30LL	12.5 × 30	1.326	0.65
	180	PAG200VB181M12X35LL	12.5 × 35	1.105	0.75
	220	PAG200VB221M12X40LL	12.5 × 40	0.904	0.83
	220	PAG200VB221M14X30LL	14.5 × 30	0.904	0.83
	270	PAG200VB271M14X35LL	14.5 × 35	0.737	0.96
	270	PAG200VB271M16X30LL	16 × 30	0.737	0.96
	330	PAG200VB331M16X35LL	16 × 35	0.603	1.10
	330	PAG200VB331M18X30LL	18 × 30	0.603	1.10
	390	PAG200VB391M16X40LL	16 × 40	0.51	1.24
	390	PAG200VB391M18X35LL	18 × 35	0.51	1.24
	470	PAG200VB471M18X40LL	18 × 40	0.423	1.39
560	PAG200VB561M18X45LL	18 × 45	0.355	1.56	
400 Volts 450 Volts Surge	27	PAG400VB27RM10X30LL	10 × 30	9.21	0.26
	33	PAG400VB33RM10X35LL	10 × 35	7.536	0.30
	39	PAG400VB39RM10X40LL	10 × 40	6.376	0.34
	47	PAG400VB47RM12X30LL	12.5 × 30	5.291	0.37
	56	PAG400VB56RM12X35LL	12.5 × 35	4.441	0.42

\*The case sizes in table are with no sleeve, refer to diagrams for case sizes with sleeve.

## Standard Voltage Ratings - VB/Radial Lead

Rated Voltage (WVDC)	Capacitance (µF)	Catalog Part Number	Nominal Case Size* D × L (mm)	Maximum ESR (Ω) at +20°C, 120Hz	Rated Ripple Current (A rms) at +105°C, 120Hz
<b>400 Volts</b> 450 Volts Surge	68	PAG400VB68RM12X40LL	12.5 × 40	3.657	0.48
	68	PAG400VB68RM14X30LL	14.5 × 30	3.657	0.48
	82	PAG400VB82RM14X35LL	14.5 × 35	3.033	0.53
	100	PAG400VB101M14X40LL	14.5 × 40	2.487	0.58
	100	PAG400VB101M16X30LL	16 × 30	2.487	0.58
	120	PAG400VB121M16X35LL	16 × 35	2.072	0.67
	120	PAG400VB121M18X30LL	18 × 30	2.072	0.67
	150	PAG400VB151M16X40LL	16 × 40	1.658	0.77
	150	PAG400VB151M18X35LL	18 × 35	1.658	0.77
	180	PAG400VB181M18X40LL	18 × 40	1.382	0.88
220	PAG400VB221M18X45LL	18 × 45	1.13	1.00	
<b>420 Volts</b> 470 Volts Surge	22	PAG420VB22RM10X30LL	10 × 30	15.071	0.23
	27	PAG420VB27RM10X35LL	10 × 35	12.28	0.27
	33	PAG420VB33RM10X40LL	10 × 40	10.047	0.31
	39	PAG420VB39RM12X30LL	12.5 × 30	8.502	0.33
	47	PAG420VB47RM12X35LL	12.5 × 35	7.055	0.39
	56	PAG420VB56RM12X40LL	12.5 × 40	5.921	0.43
	56	PAG420VB56RM14X30LL	14.5 × 30	5.921	0.43
	68	PAG420VB68RM14X35LL	14.5 × 35	4.876	0.51
	68	PAG420VB68RM16X30LL	16 × 30	4.876	0.51
	82	PAG420VB82RM14X40LL	14.5 × 40	4.043	0.57
	82	PAG420VB82RM16X35LL	16 × 35	4.043	0.57
	100	PAG420VB101M16X40LL	16 × 40	3.316	0.61
	100	PAG420VB101M18X30LL	18 × 30	3.316	0.61
	120	PAG420VB121M18X35LL	18 × 35	2.763	0.69
150	PAG420VB151M18X40LL	18 × 40	2.21	0.79	
<b>450 Volts</b> 500 Volts Surge	18	PAG450VB18RM10X30LL	10 × 30	18.42	0.21
	22	PAG450VB22RM10X35LL	10 × 35	15.071	0.24
	27	PAG450VB27RM10X40LL	10 × 40	12.28	0.28
	33	PAG450VB33RM12X30LL	12.5 × 30	10.047	0.31
	39	PAG450VB39RM12X35LL	12.5 × 35	8.502	0.35
	47	PAG450VB47RM12X40LL	12.5 × 40	7.055	0.39
	47	PAG450VB47RM14X30LL	14.5 × 30	7.055	0.39
	56	PAG450VB56RM14X35LL	14.5 × 35	5.921	0.44
	56	PAG450VB56RM16X30LL	16 × 30	5.921	0.44
	68	PAG450VB68RM14X40LL	14.5 × 40	4.876	0.50
	68	PAG450VB68RM16X35LL	16 × 35	4.876	0.50
	82	PAG450VB82RM16X40LL	16 × 40	4.043	0.55
	82	PAG450VB82RM18X30LL	18 × 30	4.043	0.55
	100	PAG450VB101M18X35LL	18 × 35	3.316	0.65
	120	PAG450VB121M18X40LL	18 × 40	2.763	0.74
	150	PAG450VB151M18X45LL	18 × 45	2.21	0.81

\*The case sizes in table are with no sleeve, refer to diagrams for case sizes with sleeve.