Safety Standard Recognized, 900 Series, Radial Disc, Encapsulated, AC Type, X1 440 VAC/Y2 300 VAC (Industrial Grade)

Overview

KEMET's 900 Series encapsulated radial through-hole ceramic disc capacitors are specifically designed for interference-suppression AC line filtering applications. Having internationally recognized safety certifications, these capacitors are well-suited for applications that require keeping potentially disruptive or damaging line transients and EMI out of susceptible equipment. They are also an ideal solution in situations where there is a need to suppress line disturbances at the source.

Safety Certified Capacitors are classified as either X and/or Y capacitors. Class X capacitors are primarily used in line-to-line (across-the-line) applications. In this application there is no danger of electric shock to humans should the capacitor fail, but could result in a risk of fire. The class Y capacitor is primarily used in line-to-ground (line by-pass) applications. In this application, failure of the capacitor could lead to danger of electric shock.

With a working voltage of 440 VAC in line-to-line (Class X) and 300 VAC in line-to-ground (Class Y) applications, these safety capacitors meet the impulse test criteria outlined in IEC Standard 60384. Meeting subclass X1 and Y2 requirements, these devices are certified to withstand impulses up to 4 KV (X1) and 5 KV (Y2) respectively. These encapsulated devices also meet the flame test requirements outlined in UL Standard 94V–0.

Ordering Information

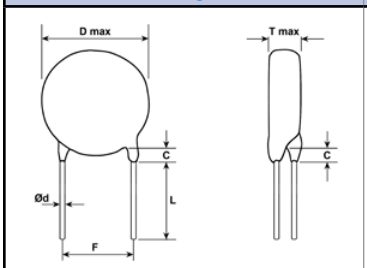
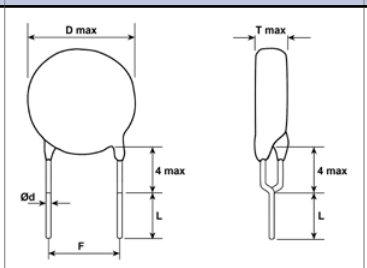
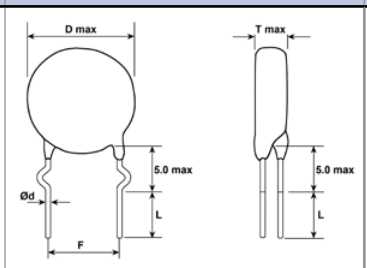
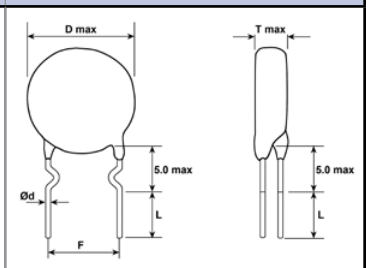
C9	7	1	U	472	M	Z	W	D	A	A	7317
Ceramic Series	Body Diameter	Lead Spacing[1,3]	Spec.	Capacitance Code (pF)	Capacitance Tolerance	Rated Voltage	Dielectric/ Temp. Char.	Design	Lead Config.[2,3]	Failure Rate	Packaging (C-Spec)[2,3]
C9 = Ceramic 900 Series	0 = 7.0 mm 1 = 8.0 mm 2 = 9.0 mm 3 = 10.0 mm 4 = 11.0 mm 6 = 13.0 mm 8 = 15.0 mm	7 = 7.5 mm 1 = 10.0 mm	U = Safety	2 significant digits + Number of zeroes Use 9 for 1.0 - 9.9 pF e.g., 2.2 pF = 229	C = ±0.25 pF D = ±0.5 pF J = ±5% K = ±10% M = ±20%	Z = X1 440 VAC / Y2 300 VAC	N = CH (NP0) S = SL Y = Y5P W = Y5U V = Y5V	D = Disc	A = Straight B = Vertical Kink C = Outside Kink D = Inside Kink	A = N/A	7317 = Ammo Pack WL30 = Bulk/3.0 mm Lead length WL35 = Bulk/3.5 mm Lead length WL40 = Bulk/4.0 mm Lead length WL45 = Bulk/4.5 mm Lead length WL50 = Bulk/5.0 mm Lead length WL20 = Bulk/20 mm Lead length

[1] Capacitor body diameter will limit available lead spacing and packaging options. See "Dimensions" and "Product Ordering Codes and Ratings" sections of this document to determine availability.

[2] "Vertical Kink","Outside Kink" and "Inside Kink" lead configurations cannot be combined with the bulk/20 mm lead length option (WL20). 20 mm lead length is only available on capacitors with straight leads (lead configuration ordering code "A"). For nonstandard lead length inquiries, please contact KEMET.

[3] Bulk packaging lead length availability is dependent upon "Lead Configuration" and "Lead Spacing." See "Dimensions" section of this document to verify availability of a specific lead length option. For nonstandard lead length inquiries, please contact KEMET.

Lead Configurations

Straight	Vertical Kink	Outside Kink	Inside Kink
			

Dimensions – Millimeters

Lead Config.	Lead Config. Ordering Code[1]	F Lead Spacing[2]	Lead Spacing Tolerance	Packaging Type[2]	L Lead Length	Packaging C-Spec Ordering Code[3]	D Body Diameter[2]	T Body Thickness	e Lead Meniscus	Ød Lead Dia.
Straight	A	7.5	±1.0	Ammo Pack	20.0 +1.5/-1.0	7317	See Table 1 - "Product Ordering Codes and Ratings"		3.0 maximum	0.5 ±0.1
				Bulk	3.0 ±1.0	WL30				
					4.5 ±1.0	WL45				
					5.0 ±1.0	WL50				
		10.0	±1.0	Ammo Pack	20.0 +1.5/-1.0	7317				
				Bulk	3.0 ±1.0	WL30				
					4.5 ±1.0	WL45				
					5.0 ±1.0	WL50				
Vertical Kink (Preformed)	B	7.5	±1.0	Ammo Pack	18.0 +2.0/-0	7317	See Table 1 - "Product Ordering Codes and Ratings"		3.0 maximum	0.5 ±0.1
				Bulk	3.5 ±1.0	WL35				
					4.0 ±1.0	WL40				
		10.0	±1.0	Ammo Pack	18.0 +2.0/-0	7317				
				Bulk	3.5 ±1.0	WL35				
					4.0 ±1.0	WL40				

[1] Lead Configuration is identified in the 13th character of the ordering code. See "Lead Configuration" and "Ordering Information" sections of this document for further details.

[2] Body diameter of capacitor will limit available lead spacing and packaging options. See "Product Ordering Codes and Ratings" sections of this document for further details.

[3] The "Packaging C-Spec" is a 4-digit numeric or alphanumeric code which identifies both the packaging type and lead length requirement. When ordering, this code must be included in the 15th through 18th character positions of the ordering code. See "Ordering Information" section of this document for further details.

Dimensions – Millimeters cont'd

Lead Config.	Lead Config. Ordering Code[1]	F	Lead Spacing Tolerance	Packaging Type[2]	L	Packaging C-Spec Ordering Code[3]	D	T	e	Ød
		Lead Spacing[2]			Lead Length		Body Diameter[2]	Body Thickness	Lead Meniscus	Lead Dia.
Outside Kink (Preformed)	C	7.5	±1.0	Ammo Pack	18.0 +2.0/-0	7317	See Table 1 - "Product Ordering Codes and Ratings"		3.0 maximum	0.5 ±0.1
				Bulk	3.5 ±1.0	WL35				
					4.0 ±1.0	WL40				
					5.0 ±1.0	WL50				
		10.0	±1.0	Ammo Pack	18.0 +2.0/-0	7317				
				Bulk	3.5 ±1.0	WL35				
					4.0 ±1.0	WL40				
					5.0 ±1.0	WL50				
Inside Kink (Preformed)	D	7.5	±1.0	Ammo Pack	18.0 +2.0/-0	7317	13.0 maximum	7.0 maximum	3.0 maximum	0.5 ±0.1
				Bulk	3.5 ±1.0	WL35				
		10.0		Ammo Pack	18.0 +2.0/-0	7317				
				Bulk	3.5 ±1.0	WL35				

[1] Lead Configuration is identified in the 13th character of the ordering code. See "Lead Configuration" and "Ordering Information" sections of this document for further details.

[2] Body diameter of capacitor will limit available lead spacing and packaging options. See "Product Ordering Codes and Ratings" sections of this document for further details.

[3] The "Packaging C-Spec" is a 4-digit numeric or alphanumeric code which identifies both the packaging type and lead length requirement. When ordering, this code must be included in the 15th through 18th character positions of the ordering code. See "Ordering Information" section of this document for further details.

Benefits

- Safety Standard Recognized (IEC 60384-14)
- Reliable operation up to 125°C
- Class X1/Y2
- 7.5 mm and 10 mm lead spacing
- Lead (Pb)-free and RoHS Compliant
- Halogen Free
- Capacitance offerings ranging from 2.0 pF up to 10,000 pF
- Available capacitance tolerances of ±0.25 pF, ±0.5 pF, ±5%, ±10%, and ±20%
- High reliability
- Preformed (crimped) or straight lead configurations
- Non-polar device, minimizing installation concerns
- Encapsulation meets flammability standard UL 94V–0

Applications

Typical applications include:

- Line-to-line (Class X) filtering
- Line-to-ground (Class Y) filtering
- Antenna coupling
- Primary and secondary coupling (switching power supplies)
- Line disturbances suppression (motors and motor controls, relays, switching power supplies, and inverters)

Approval Standard and Certification No.

Safety Standard	Standard No.	Subclass	Working Voltage	Certificate No.
VDE (ENEC)	IEC 60384–14	X1	440 VAC	40036415
		Y2	300 VAC	

These devices are VDE/ENEC recognized for antenna coupling and AC line-to-line (Class X) and line-to-ground (Class Y) applications per IEC60384–14.

Environmental Compliance

These devices are Halogen Free and RoHS Compliant. They meet all requirements set forth by both EU and China RoHS directives.

RoHS Compliant

Halogen Free

General Specifications/Performance Characteristics

Dielectric/Temperature Characteristic:	CH(NP0)	SL	Y5P	Y5U	Y5V
Operating Temperature Range	-40°C to +125°C				
Capacitance Change with Reference to +25°C and 0 VDC Applied (TCC)	±60 ppm/°C	-1,000 ~ +350 ppm/°C	±10%	+20%/-55%	~ +30%/-80%
Dielectric Withstanding Voltage (7.5 mm and 10 mm Lead Spacing)	2,600 VAC (60 ±5 seconds at 25°C)				
Quality Factor (Q)	30 pF% and above: ≥ 1,000 Below 30 pF: ≥ 400 +(20 x C)*		See "Dissipation Factor"		
Dissipation Factor (tanδ) at +25°C[1]	See "Quality Factor"		2.50%	2.50%	5.0%
Insulation Resistance (IR) Limit at +25°C	10,000 MΩ Minimum (500 VDC applied for 60 ±5 seconds @ 25°C)				

**C = Nominal capacitance*

[2] Capacitance and Dissipation Factor (DF) measured under the following conditions:

CH(NP0) & SL: 1 MHz ± 100 kHz and 1.0 ±0.2 Vrms

X5P, Y5U and Y5V: 1 kHz ± 50 Hz and 1.0 ±0.2 Vrms

Note: When measuring capacitance, it is important to ensure the set voltage level is held constant. The HP4284 & Agilent E4980 have a feature known as Automatic Level Control (ALC). The ALC feature should be switched to "ON."

Table 1 – Product Ordering Codes and Ratings

Dielectric/ Temp. Char.	KEMET Part Number	Capacitance	Capacitance Tolerance	Dimensions (mm)			Lead Spacing	
				Body Diameter (Maximum)	Body Thickness (Maximum)	Lead Diameter	Bulk Packaging	Ammo Packaging
CH (NP0)	C90(1)U209CZND(2)A(3)	2.0 pF	±0.25 pF	7.0	5.0	0.5 ±0.1	7.5 mm or 10 mm	
	C90(1)U309CZND(2)A(3)	3.0 pF						
	C90(1)U409CZND(2)A(3)	4.0 pF						
	C90(1)U509CZND(2)A(3)	5.0 pF						
	C90(1)U609DZND(2)A(3)	6.0 pF	±0.5 pF					
	C90(1)U709DZND(2)A(3)	7.0 pF						
	C90(1)U809DZND(2)A(3)	8.0 pF						
	C90(1)U909DZND(2)A(3)	9.0 pF						
	C90(1)U100DZND(2)A(3)	10 pF						
	C90(1)U120JZND(2)A(3)	12 pF	±5%					
	C90(1)U150JZND(2)A(3)	15 pF						
	C91(1)U180JZND(2)A(3)	18 pF		8.0				
	C91(1)U200JZND(2)A(3)	20 pF						
	C91(1)U220JZND(2)A(3)	22 pF						
	C91(1)U240JZND(2)A(3)	24 pF						
	C92(1)U270JZND(2)A(3)	27 pF		9.0				
	C92(1)U300JZND(2)A(3)	30 pF						
	C92(1)U330JZND(2)A(3)	33 pF						
	C93(1)U360JZND(2)A(3)	36 pF		10.0				
	C93(1)U390JZND(2)A(3)	39 pF						
	C94(1)U470JZND(2)A(3)	47 pF		11.0				
SL	C90(1)U100JZSD(2)A(3)	10 pF	±5%	7.0	5.0	0.5 ±0.1	7.5 mm or 10 mm	
	C90(1)U120JZSD(2)A(3)	12 pF						
	C90(1)U150JZSD(2)A(3)	15 pF						
	C90(1)U180JZSD(2)A(3)	18 pF						
	C90(1)U200JZSD(2)A(3)	20 pF						
	C90(1)U220JZSD(2)A(3)	22 pF						
	C90(1)U240JZSD(2)A(3)	24 pF						
	C90(1)U270JZSD(2)A(3)	27 pF						
	C90(1)U300JZSD(2)A(3)	30 pF						
	C90(1)U330JZSD(2)A(3)	33 pF						
	C90(1)U360JZSD(2)A(3)	36 pF						
	C90(1)U390JZSD(2)A(3)	39 pF						
	C90(1)U470JZSD(2)A(3)	47 pF						
	C90(1)U500JZSD(2)A(3)	50 pF						
	C90(1)U510JZSD(2)A(3)	51 pF						
	C91(1)U560JZSD(2)A(3)	56 pF		8.0				
	C91(1)U620JZSD(2)A(3)	62 pF						
	C91(1)U680JZSD(2)A(3)	68 pF						
	C91(1)U750JZSD(2)A(3)	75 pF						
	C92(1)U820JZSD(2)A(3)	82 pF		9.0				
	C93(1)U101JZSD(2)A(3)	100 pF		10.0				
	KEMET Part Number	Capacitance	Capacitance Tolerance	Body Diameter (Maximum)	Body Thickness (Maximum)	Lead Diameter	Lead Spacing	

(1) To properly complete ordering code, insert the one-digit numeric code to reflect required lead spacing: (Note that select capacitance values and packaging options may limit lead spacing availability. See table above to verify availability.)

7 = 7.5 mm

1 = 10.0 mm

(2) To properly complete ordering code, insert the one-digit character code to reflect the required lead configuration: (See "Lead Configuration" section of this document, page 2, for further details.)

A = Straight

B = Vertical Kink

C = Outside Kink

D = Inside Kink

(3) To properly complete ordering code, enter the four-digit numeric or alphanumeric "Packaging C-Spec Ordering Code." See "Dimensions" section of this document, page 2, for available options.

Table 1 – Product Ordering Codes and Ratings cont'd

Dielectric/ Temp. Char.	KEMET Part Number	Capacitance	Capacitance Tolerance	Dimensions (mm)			Lead Spacing	
				Body Diameter (Maximum)	Body Thickness (Maximum)	Lead Diameter	Bulk Packaging	Ammo Packaging
Y5P	C90(1)U101KZYD(2)A(3)	100 pF	±10%	7.0	5.0	0.5 ±0.1	7.5 mm or 10 mm	
	C90(1)U151KZYD(2)A(3)	150 pF						
	C90(1)U221KZYD(2)A(3)	220 pF						
	C90(1)U331KZYD(2)A(3)	330 pF						
	C90(1)U471KZYD(2)A(3)	470 pF						
	C91(1)U561KZYD(2)A(3)	560 pF		8.0				
	C91(1)U681KZYD(2)A(3)	680 pF						
	C92(1)U821KZYD(2)A(3)	820 pF		9.0				
	C92(1)U102KZYD(2)A(3)	1,000 pF						
Y5U	C90(1)U102MZWD(2)A(3)	1,000 pF	±20%	7.0	5.0	0.5 ±0.1	7.5 mm or 10 mm	7.5 mm or 10 mm
	C92(1)U152MZWD(2)A(3)	1,500 pF		9.0				
	C92(1)U222MZWD(2)A(3)	2,200 pF						
	C94(1)U332MZWD(2)A(3)	3,300 pF		11.0				
	C96(1)U392MZWD(2)A(3)	3,900 pF		13.0				10 mm only
	C96(1)U472MZWD(2)A(3)	4,700 pF						
Y5V	C90(1)U102MZVD(2)A(3)	1,000 pF	±20%	7.0	5.0	0.5 ±0.1	7.5 mm or 10 mm	7.5 mm or 10 mm
	C90(1)U152MZVD(2)A(3)	1,500 pF						
	C90(1)U222MZVD(2)A(3)	2,200 pF						
	C92(1)U332MZVD(2)A(3)	3,300 pF		9.0				
	C94(1)U392MZVD(2)A(3)	3,900 pF		11.0				
	C94(1)U472MZVD(2)A(3)	4,700 pF						
	C96(1)U682MZVD(2)A(3)	6,800 pF		13.0				10 mm only
	C98(1)U103MZVD(2)A(3)	10,000 pF		15.0				
	KEMET Part Number	Capacitance	Capacitance Tolerance	Body Diameter (Maximum)	Body Thickness (Maximum)	Lead Diameter	Lead Spacing	

(1) To properly complete ordering code, insert the one-digit numeric code to reflect required lead spacing: (Note that select capacitance values and packaging options may limit lead spacing availability. See table above to verify availability.)

7 = 7.5 mm

1 = 10.0 mm

(2) To properly complete ordering code, insert the one-digit character code to reflect the required lead configuration: (See "Lead Configuration" section of this document, page 2, for further details.)

A = Straight

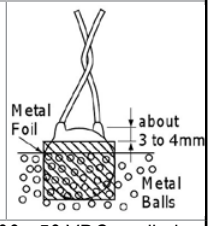
B = Vertical Kink

C = Outside Kink

D = Inside Kink

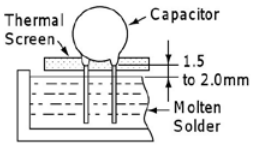
(3) To properly complete ordering code, enter the four-digit numeric or alphanumeric "Packaging C-Spec Ordering Code." See "Dimensions" section of this document, page 2, for available options.

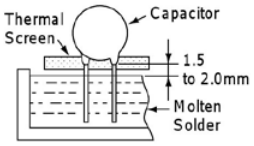
Table 2 – Performance & Reliability: Test Methods and Conditions

<table>
<tr><th colspan="2">Item</th><th>Specification</th><th>Test Method</th></tr>
<tr><td colspan="2">Operating Temperature Range</td><td colspan="2">-40°C to +125°C</td></tr>
<tr><td rowspan="2">Dielectric Strength</td><td>Between lead wires</td><td>No failures</td><td>The capacitor shall not be damaged when 2,600 VAC(rms) is applied between the lead wires for 60 seconds.</td></tr>
<tr><td>Body Insulation</td><td>No failures</td><td>The terminals (leads) of the capacitor shall be connected together. A metal foil is tightly wrapped around the body of the capacitor at a distance of about 3 to 4 mm from each terminal. The capacitor is then inserted into a container filled with metal balls approximately 1 mm in diameter. 2,600 VAC(rms) is applied for 60 seconds between the capacitor lead wires and metal balls.
 
</td></tr>
<tr><td colspan="2">Insulation Resistance (IR)</td><td>10,000 MΩ minimum</td><td>The insulation resistance shall be measured with 500 ±50 VDC applied after 60 ±5 seconds of charging.</td></tr>
<tr><td colspan="2">Capacitance</td><td>Within specified tolerance</td><td rowspan="2">Y5P, Y5U and Y5V: Capacitance is measured at 1 kHz ±20% and 5 Vrms or less. (20 ±2°C)
NP0 and SL: Capacitance is measured at 1 MHz ±20% and 1.0 ±0.2 Vrms (25°C)</td></tr>
<tr><td colspan="2">Dissipation Factor (DF) or Q</td><td>
<table>
<tr><th>Temperature Characteristics</th><th>Specification</th></tr>
<tr><td>Y5P, Y5U</td><td>DF ≤ 2.5%</td></tr>
<tr><td>Y5V</td><td>DF ≤ 5.0%</td></tr>
<tr><td>NP0,SL</td><td>≥ 30 pF: Q ≥ 1000
< 30 pF: Q ≥ 400 +(20 x C)
C = Nominal capacitance</td></tr>
</table>
</td></tr>
<tr><td colspan="2">Temperature Characteristics</td><td>
<table>
<tr><th>Temperature Characteristics</th><th>Capacitance Change</th></tr>
<tr><td>Y5P</td><td>Within ±10%</td></tr>
<tr><td>Y5U</td><td>Within +20%/-55%</td></tr>
<tr><td>Y5V</td><td>Within ~+30%/-80%</td></tr>
<tr><td>CH</td><td>0 ±60 ppm/°C</td></tr>
<tr><td>SL</td><td>-1,000 ~+350 ppm°C (+20°C ~+85°C)</td></tr>
</table>
</td><td>A capacitance measurement is made at each step specified:
<table>
<tr><th>Step</th><th>Temperature</th></tr>
<tr><td>1</td><td>+20 ±2°C</td></tr>
<tr><td>2</td><td>-25 ±2°C</td></tr>
<tr><td>3</td><td>+20 ±2°C</td></tr>
<tr><td>4</td><td>+85 ±2°C</td></tr>
<tr><td>5</td><td>+20 ±2°C</td></tr>
</table>
Pre-treatment:
Capacitor is stored at 85 ±2°C for 1 hour and then placed at room condition[1] for 24 ±2 hours before measurement.</td></tr>
<tr><td rowspan="2">Terminal Strength</td><td>Tensile</td><td>Lead wire or capacitor body shall not break.</td><td>With the termination in its normal position, the specimen is held by its body in such a manner that the axis of the termination is vertical; a tensile force of 10 N is applied to the termination in the direction of its axis and acting in a direction away from the body of the specimen.</td></tr>
<tr><td>Bending</td><td>Lead wire or capacitor body shall not break.</td><td>With the termination in its normal position, the specimen is held by its body in such a manner that the axis of the termination is vertical; a mass force of 5 N is then suspended from the end of the termination. The body of the specimen is then inclined within a period of 2 to 3 seconds, through an angle of approximately 90° in the vertical plane and then resumed to its initial position over the same period of time; this operation constitutes one bend. One bend immediately followed by a second bend in the opposite direction.</td></tr>
<tr><td colspan="2">Solderability</td><td>Lead wire should have a uniform coating of solder in the axial direction and over 3/4 of its circumference.</td><td>The lead wire of the capacitor is dipped into molten solder for 2 ±0.5 seconds. The depth of immersion is up to 1.5 mm (+5/-0 mm) from the root of lead wires.
Solder Temperature: Lead free solder (Sn-3Ag – 0.5Cu) 245°C ±5°C.</td></tr>
</table>

[1] *"Room Condition" is defined as follows: Temperature: 15 ~ 35°C/Humidity: 45 ~ 75%/Atmospheric Pressure: 86 ~ 106 kPa.*

Table 2 – Performance & Reliability: Test Methods and Conditions cont'd

<table>
<tr><th colspan="2">Item</th><th>Specification</th><th colspan="2">Test Method</th></tr>
<tr><td rowspan="4">Soldering Effect (Non-Preheat)</td><td>Appearance</td><td>No visual defect</td><td colspan="2" rowspan="4">As shown in the figure below, the lead wires are immersed in molten solder up to 1.5 mm (+5/-0 mm) from the end of the epoxy meniscus (root of lead wire).
Duration/Solder Temperature: 3.5 ±0.5 seconds/350°C ±10°C or 10 ±1 seconds/260°C ±5°C
 

Pre-treatment: Capacitor is stored at 85°C ±2°C for 1 hour and then placed at room condition[1] for 24 ±2 hours before initial measurements.
Post-treatment: Capacitor is stored for 1 to 2 hours at room condition[1].</td></tr>
<tr><td>IR</td><td>1,000 MΩ</td></tr>
<tr><td>Dielectric Strength</td><td>Per item 1</td></tr>
<tr><td>Capacitance</td><td>Y5P, Y5U and Y5V: Within ±10%
SL, CH (NP0): Within ±2.5% or ±0.25 pF, whichever is larger.</td></tr>
<tr><td rowspan="4">Soldering Effect (Preheat)</td><td>Appearance</td><td>No visual defect</td><td colspan="2" rowspan="4">Capacitor is stored at 120°C +0/-5°C for 60 +0/-5 seconds. Then, as shown in the figure below, the lead wires are immersed in molten solder up to 1.5 mm (+5/-0mm) from the end of the epoxy meniscus (root of lead wire).
Duration/Solder Temperature: 7.5 +0/-1 seconds/260°C ±5°C
 

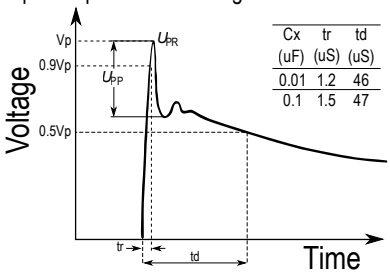
Pre-treatment: Capacitor is stored at 85°C ±2°C for 1 hour and then placed at room condition[1] for 24 ±2 hours before initial measurements.
Post-treatment: Capacitor is stored for 1 to 2 hours at room condition[1].</td></tr>
<tr><td>IR</td><td>1,000 MΩ</td></tr>
<tr><td>Dielectric Strength</td><td>Per item 1</td></tr>
<tr><td>Capacitance</td><td>Y5P, Y5U and Y5V: Within ±10%
SL, CH (NP0): Within ±2.5% or ±0.25 pF, whichever is larger.</td></tr>
<tr><td rowspan="6">Biased Humidity</td><td>Appearance</td><td>No visual defect</td><td>Steady State Humidity:</td><td>Load Humidity:</td></tr>
<tr><td>Capacitance</td><td><table><tr><th>Temperature Characteristics</th><th>Capacitance Change</th></tr><tr><td>Y5P</td><td>Within ±10%</td></tr><tr><td>Y5U</td><td>Within ±20%</td></tr><tr><td>Y5V</td><td>Within ±30%</td></tr><tr><td>SL CH (NP0)</td><td>Within ±2.5% or ±0.25 pF, whichever is larger.</td></tr></table></td><td rowspan="5">90 to 95% humidity at 40°C ±2°C for 500 ±12 hours.

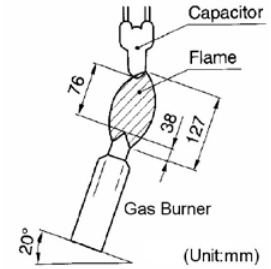
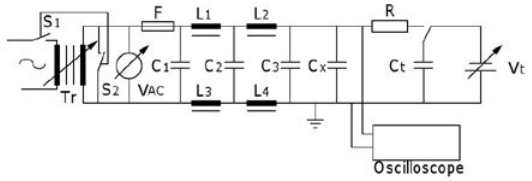
Post Treatment:
Capacitor is stored for 1 to 2 hours at room condition[1].</td><td rowspan="5">90 to 95% humidity at 40°C ±2°C for 500 ±12 hours with full rated voltage applied.

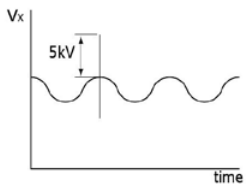
Post Treatment:
Capacitor is stored for 1 to 2 hours at room condition[1].</td></tr>
<tr><td>DF</td><td>Y5P and Y5U: 5.0% maximum
Y5V: 7.5% maximum</td></tr>
<tr><td>Q</td><td>SL and CH(NP0): Less than 30 pF:
Q ≥ 100 + 10 × C/3
More than 30 pF: Q ≥ 200
C = Nominal capacitance</td></tr>
<tr><td>IR</td><td>Y5P, Y5V and Y5U: 3,000 MΩ minimum
SL and CH (NP0): 1,000 MΩ minimum</td></tr>
<tr><td>Dielectric Strength</td><td>No failures</td></tr>
</table>

[1] "Room Condition" is defined as follows: Temperature: 15 ~ 35°C/Humidity: 45 ~ 75%/Atmospheric Pressure: 86 ~ 106 kPa.

Table 2 – Performance & Reliability: Test Methods and Conditions cont'd

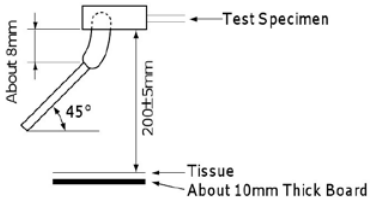
<table>
<tr><th colspan="2">Item</th><th>Specification</th><th>Test Method</th></tr>
<tr><td rowspan="4">High Temperature Life</td><td>Appearance</td><td>No visual defect</td><td rowspan="4">Impulse Voltage: Each individual capacitor is subjected to three 5 kv impulses prior to life testing.
 

<table>
<tr><th>Cx (uF)</th><th>tr (uS)</th><th>td (uS)</th></tr>
<tr><td>0.01</td><td>1.2</td><td>46</td></tr>
<tr><td>0.1</td><td>1.5</td><td>47</td></tr>
</table>
Capacitors are placed in a circulating air oven for a period of 1,000 hours. The air in the oven is maintained at a temperature of 125°C ±2 throughout the test. The capacitors are subjected to AC 510 Vrms. Each hour the voltage is increased to 1,000 Vrms for 0.1 seconds.</td></tr>
<tr><td>Capacitance Change</td><td>Y5P, Y5V and Y5U: Within ±20%
SL and CH (NP0): Within ±3 or ±0.3 pF, whichever is larger.</td></tr>
<tr><td>IR</td><td>3,000 MΩ minimum
SL and CH (NPO): 1,000 MΩ minimum</td></tr>
<tr><td>Dielectric Strength</td><td>No failures</td></tr>
<tr><td colspan="2">Flame Test</td><td>The capacitor flame extinguishes as follows:
<table>
<tr><th>Cycle</th><th>Time</th></tr>
<tr><td>1 ~ 4</td><td>30 seconds maximum</td></tr>
<tr><td>5</td><td>60 seconds maximum</td></tr>
</table></td><td>The capacitor is exposed to a flame for 15 seconds and then removed for 15 seconds. This test is repeated for 5 cycles.
 
</td></tr>
<tr><td colspan="2">Active Flammability</td><td>The cheesecloth should not ignite.</td><td>The capacitors are individually wrapped in at least one, but not more than two, complete layers of cheesecloth. They are then subjected to 20 discharges. The interval between successive discharges is 5 seconds. The VAC is maintained for 2 minutes after the last discharge.
 

<table>
<tr><td>$C_{1,2}$</td><td>1 µF ±10%</td><td>C_3</td><td>0.033 µF ±5% 10 kV</td></tr>
<tr><td>L_{1-4}</td><td>1.5 Mh ±20% 16A Rod core choke</td><td>Cx</td><td>Test capacitor</td></tr>
<tr><td>R</td><td>100 ±2%</td><td>V_{AC}</td><td>VR ±5%</td></tr>
<tr><td>Ct</td><td>3 µF ±5% 10 kV</td><td>V_R</td><td>Rated Voltage</td></tr>
<tr><td>F</td><td>Fuse, Rated 10A</td><td>Vt</td><td>Voltage applied to Ct</td></tr>
</table>

</td></tr>
</table>

[1] *"Room Condition" is defined as follows: Temperature: 15 ~ 35°C/Humidity: 45 ~ 75%/Atmospheric Pressure: 86 ~ 106 kPa.*

Table 2 – Performance & Reliability: Test Methods and Conditions cont'd

<table>
<tr><th colspan="2">Item</th><th>Specification</th><th>Test Method</th></tr>
<tr><td colspan="2">Passive Flammability</td><td>The burning time should not exceed 30 seconds.
The tissue paper should not ignite.</td><td>The capacitor under test is held into a flame and in a position which best promotes burning. Each specimen is exposed to the flame one time.
 

Time of exposure to flame: 30 seconds
Length of flame: 12 ±1 mm
Gas burner length: 35 mm minimum
Inside diameter: 0.5 ±0.1 mm
Outside diameter: 0.9 mm maximum
Gas butane gas purity: 95% minimum</td></tr>
<tr><td rowspan="5">Temperature Cycle</td><td>Appearance</td><td>No visual defect</td><td rowspan="5">The capacitor is subjected to 5 temperature cycles.
(Temperature Cycle)
<table><tr><th>Step</th><th>Temperature (°C)</th><th>Time (minutes)</th></tr><tr><td>1</td><td>-40 +0/-3</td><td>30</td></tr><tr><td>2</td><td>Room temperature</td><td>3</td></tr><tr><td>3</td><td>125 +3/-0</td><td>30</td></tr><tr><td>4</td><td>Room temperature</td><td>3</td></tr></table>
Pre-treatment: Capacitor shall be stored at 85 ±2 for 1 hour then placed at room condition[1] for 24 ±2 hours.
Post-treatment: Capacitor is stored for 1 to 2 hours at room condition[1].</td></tr>
<tr><td>Capacitance</td><td><table><tr><th>Temperature Characteristics</th><th>Capacitance Change</th></tr><tr><td>SL, CH (NP0)</td><td>Within ±5%</td></tr><tr><td>Y5P</td><td>Within ±10%</td></tr><tr><td>Y5U, Y5V</td><td>Within ±20%</td></tr></table></td></tr>
<tr><td>DF/Q</td><td><table><tr><td>SL, CH (NP0)</td><td>≥ 30 pF: Q ≥ 350
< 30 pF: Q ≥ 275
+5/2C
C = Nominal capacitance</td></tr><tr><td>Y5P</td><td>DF ≤ 5%</td></tr><tr><td>Y5U, Y5V</td><td>DF ≤ 7.5%</td></tr></table></td></tr>
<tr><td>IR</td><td>3,000 MΩ minimum</td></tr>
<tr><td>Dielectric Strength</td><td>No failures</td></tr>
</table>

[1] *"Room Condition" is defined as follows: Temperature: 15 ~ 35°C/Humidity: 45 ~ 75%/Atmospheric Pressure: 86 ~ 106 kPa.*

Soldering and Mounting Information

Soldering:
When soldering this product to a PCB/PWB, do not exceed the solder heat resistance specification of the capacitor. Subjecting this product to excessive heating could reflow the solder joint between the lead and ceramic element and/or may result in thermal shocks that can crack the ceramic element.

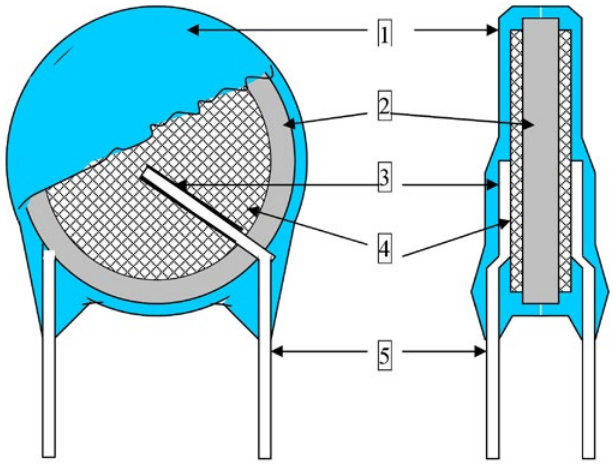
When soldering these capacitors with a soldering iron, it should be performed under the following conditions:
- Temperature of iron-tip: 400ºC maximum
- Soldering iron wattage: 50 W maximum
- Soldering time: 3.5 seconds maximum

Cleaning (ultrasonic cleaning):
To perform ultrasonic cleaning, observe the following conditions:
- Rinse bath capacity: Output of 20 watts per liter or less
- Rinsing time: 5 minute maximum
- Do not vibrate the PCB/PWB directly
- Excessive ultrasonic cleaning may lead to fatigue destruction of the lead wires

Construction

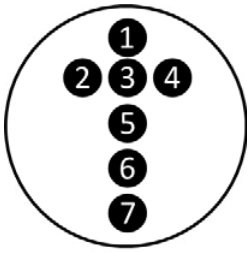
Reference	Item	Material
1	Encapsulation[1]	Epoxy resin, Pigment (Blue/UL 94 V–0)
2	Dielectric Material	$BaTiO_3$
3	Solder	Sn 96.5, Ag 3, Cu 0.5
4	Electrodes	Ag (Glass frit)
5	Lead Wires	Tinned copper clad steel wire (Sn Plating 100% 3-7 µm)

[1] The minimum thickness of the insulation coating (encapsulation) is 0.4 mm
Note: Image is exaggerated in order to clearly identify all components of construction.



Capacitor Marking

These capacitors shall be stamped or laser marked with KEMET's trademark, type designation, capacitor class, rated voltage, rated capacitance, and capacitance tolerance codes. In addition, all devices are marked with the recognized approval mark and a date/lot code for traceability. Marking will be supplied either on one side or both sides of the encapsulated capacitor body. All marking shall be legible to allow for clear identification of the component. Marking appears in legible contrast. Illustrated below is an example of the marking format and content. (Two sided marking is limited to capacitors with body diameters ≤ 8.0 mm.)



Location #	Description	Detail
1	KEMET Trademark	K
2	Type Designation (2 characters)	AC
3	Rated Capacitance (3 numeric characters)	First two digits are the significant figures of capacitance. Third digit indicates the additional number of zeros. For example, 4,700 pF is identified as 472. (For values below 10 pF an "R" is used in place of the decimal point, e.g., 2R0 = 2.0 pF.)
4	Capacitance Tolerance Code (1 character)	C = 0.25 pF, D = 0.5 pF, J = ±5%, K = ±10%, M = ±20%
5	VDE & ENEC approval mark IEC 60384–14 3rd (2005)	
6	Capacitor Class and Rated Voltage	X1: 440 V ~ Y2: 300 V ~
7	Date/Lot Code	Date/Lot Code, e.g., 3C12345

3	C	1	2345
Last digit of year, e.g., 3 = 2013	Manufacturing Location Code	Manufacturing Month: 1-9 = Jan - Sept, A = October, N = November, D = December	Last 4 digits of lot no.

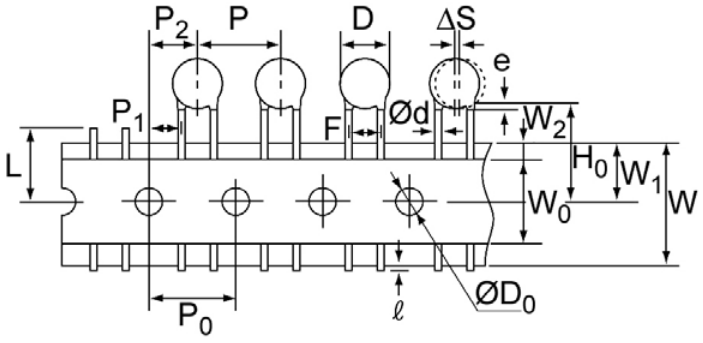
Packaging Quantities

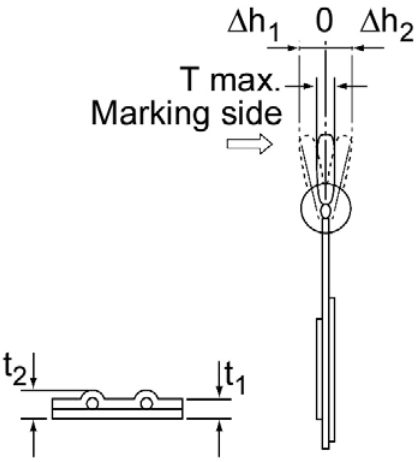
Packaging Type	Loose (Bulk Bag)	Carrier Tape Quantity		
		(12.7 mm Pitch[1])	(15 mm Pitch[1])	(25.4 mm Pitch[1])
Ammo Pack	N/A	1,000 pieces/box		500 pieces/box
Bulk	500 pieces/bag	N/A		

[1] For details regarding component pitch on carrier tape, see "Ammo Pack Taping Format" and "Ammo Pack Taping Specifications" sections of this document.

Figure 1 - Ammo Pack Taping Format

5 mm and 7.5 mm Lead Spacing:





10 mm Lead Spacing:

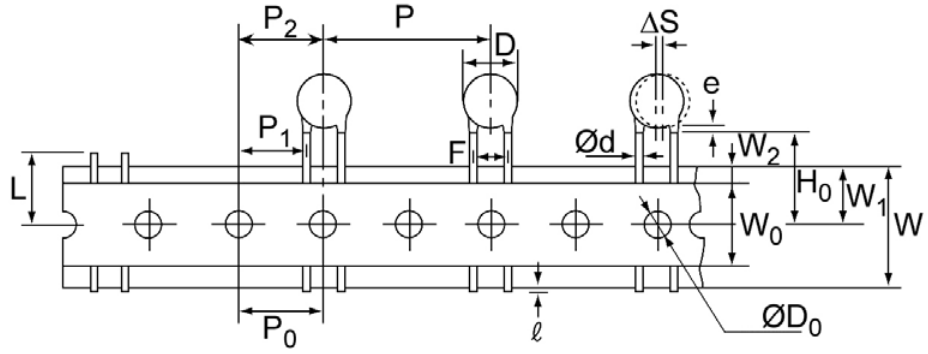


Table 3 – Ammo Pack Taping Specifications

Lead Spacing		5 mm		7.5 mm		10 mm	
Lead Style		Straight	Preformed[1]	Straight	Preformed[1]	Straight	Preformed[1]
Item	Symbol	Dimensions (mm)					
Lead Spacing	F	5.0 +0.8/-0.2		7.5 ±1.0		10.0 ±1.0	
Component Pitch	P	12.7		15.0		25.4 ±2	
Sprocket Hole Pitch	P_0	12.7 ±0.3		15.0 ±0.3		12.7 ±0.3	
Sprocket Hole Center to Component Center	P_2	6.35 ±1.5		7.5 ±1.5		12.7 ±1.5	
Sprocket Hole Center to Lead Center	P_1	3.75 ±1.0		3.75 ±1.0		7.7 ±1.5	
Body Diameter	D	See "Product Ordering Codes and Ratings" section of this document.					
Component Alignment (side/side)	ΔS	0 ±2.0					
Carrier Tape Width	W	18.0 +1.0/-0.5					
Sprocket Hole Position	W_1	9.0 ±0.5					

[1]Preformed (crimped) lead configurations include vertical kink, outside kink and inside kink. See "Lead Configurations" and "Ordering Information" sections of this document for further details.

[2]Also referred to as "lead length" in this document.

Table 3 – Ammo Pack Taping Specifications cont'd

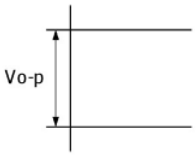
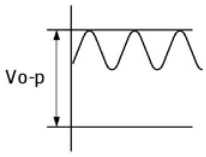
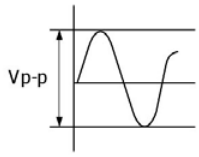
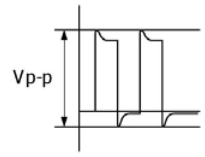
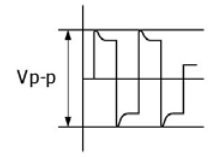
Lead Spacing		5 mm		7.5 mm		10 mm	
Lead Style		Straight	Preformed[1]	Straight	Preformed[1]	Straight	Preformed[1]
Item	Symbol	Dimensions (mm)					
Height to Seating Plane[2] (preformed leads[1])	H_0	N/A	18.0 +2.0/-0	N/A	18.0 +2.0/-0	N/A	18.0 +2.0/-0
Height to Seating Plane[2] (straight leads)	H	20.0 +1.5/-1.0	N/A	20.0 +1.5/-1.0	N/A	20.0 +1.5/-1.0	N/A
Lead Protrusion	ℓ	2.0 maximum					
Diameter of Sprocket Hole	D_0	4.0 ±0.2					
Lead Diameter	φd	0.5 ±0.1					
Carrier Tape Thickness	t_1	0.6 ±0.3					
Total Thickness (Carrier Tape, Hold-Down Tape and Lead)	t_2	1.5 maximum					
Component Alignment (front/back)	Δh_1	2.0 maximum					
	Δh_2						
Cut Out Length	L	11.0 maximum					
Hold-Down Tape Width	W_0	11.0 minimum		11.5 minimum			
Hold-Down Tape Position	W_2	3.0 maximum		1.5 ±1.5			

[1]Prefromed (crimped) lead configurations include vertical kink, outside kink and inside kink. See "Lead Configurations" and "Ordering Information" sections of this document for further details.
[2]Also referred to as "lead length" in this document.

Application Notes:

Storage and Operating Conditions:
The insulating coating of these devices does not form an air and moisture-tight seal. Avoid exposure to moisture and do not use or store these devices in a corrosive atmosphere, especially where chloride gas, sulfide gas, acid, alkali, salt, or the like are present. Before cleaning, bonding or molding these devices, it is important to verify that your process does not affect product quality and performance. KEMET recommends testing and evaluating the performance of a cleaned, bonded or molded product prior to implementing and/or qualifying any of these processes. Store the capacitors where the temperature and relative humidity do not exceed 40 degrees Centigrade and 70% respectively. For optimum solderability, capacitor stock should be used promptly, preferably within 6 months of receipt.

Working Voltage:
Application voltage (Vp-p or Vo-p) must not exceed the voltage rating of the capacitor. Irregular voltages can be generated for a transient period of time when voltage is initially applied and/or removed from a circuit. It is important to choose a capacitor with a voltage rating greater than or equal to these irregular voltages.

Voltage	DC Voltage	DC+AC Voltage	AC Voltage	Pulse Voltage (1)	Pulse Voltage (2)
Positional Measurement					

Operating Temperature and Self-Generating Heat:
The surface temperature of a capacitor should be kept below the upper limit of its rated operating temperature range. Be sure to take into account the heat generated by the capacitor itself. When the capacitor is used in a high-frequency current, pulse current or similar current, it may self-generate heat due to dielectric loss. Temperature rise due to self-generated heating should not exceed 20°C (while operated at an atmosphere temperature of 25°C).

Handling - Vibration and Impact:
Do not expose these devices or their leads to excessive shock or vibration during use.

FAILURE TO FOLLOW THE ABOVE CAUTIONS MAY RESULT, WORST CASE, IN A SHORT CIRCUIT AND CAUSE FUMING OR PARTIAL DISPERSION WHEN THE PRODUCT IS USED.

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Kamen, Germany
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Northern Europe
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Espoo, Finland
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Asia

Northeast Asia
Hong Kong
Tel: 852-2305-1168

Shenzhen, China
Tel: 86-755-2518-1306

Beijing, China
Tel: 86-10-5829-1711

Shanghai, China
Tel: 86-21-6447-0707

Taipei, Taiwan
Tel: 886-2-27528585

Southeast Asia
Singapore
Tel: 65-6586-1900

Penang, Malaysia
Tel: 60-4-6430200

Bangalore, India
Tel: 91-806-53-76817

Note: KEMET reserves the right to modify minor details of internal and external construction at any time in the interest of product improvement. KEMET does not assume any responsibility for infringement that might result from the use of KEMET Capacitors in potential circuit designs. KEMET is a registered trademark of KEMET Electronics Corporation.

Other KEMET Resources

Tools	
Resource	Location
Configure A Part: CapEdge	http://capacitoredge.kemet.com
SPICE & FIT Software	http://www.kemet.com/spice
Search Our FAQs: KnowledgeEdge	http://www.kemet.com/keask
Electrolytic LifeCalculator	http://www.kemet.com:8080/elc

Product Information	
Resource	Location
Products	http://www.kemet.com/products
Technical Resources (Including Soldering Techniques)	http://www.kemet.com/technicalpapers
RoHS Statement	http://www.kemet.com/rohs
Quality Documents	http://www.kemet.com/qualitydocuments

Product Request	
Resource	Location
Sample Request	http://www.kemet.com/sample
Engineering Kit Request	http://www.kemet.com/kits

Contact	
Resource	Location
Website	www.kemet.com
Contact Us	http://www.kemet.com/contact
Investor Relations	http://www.kemet.com/ir
Call Us	1-877-MyKEMET
Twitter	http://twitter.com/kemetcapacitors

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Although KEMET designs and manufactures its products to the most stringent quality and safety standards, given the current state of the art, isolated component failures may still occur. Accordingly, customer applications which require a high degree of reliability or safety should employ suitable designs or other safeguards (such as installation of protective circuitry or redundancies) in order to ensure that the failure of an electrical component does not result in a risk of personal injury or property damage.

Although all product–related warnings, cautions and notes must be observed, the customer should not assume that all safety measures are indicted or that other measures may not be required.

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