IN-HOUSE RESEARCH AND DEVELOPMENT FOR TOMORROW'S NEEDS

Evox Rifa has over fifty years accumulated experience in developing a wide range of world-class capacitor products. Our leading position in the market with a wide product range is based on our deep knowledge of the materials and ways in which they can be used in capacitor designs to provide the best possible solutions.
Evox Rifa invests substantial human and financial resources in finding new highly reliable and cost effective solutions for today's and tomorrow's needs. Our R&D department can simulate most operational conditions and apply our products to the envisaged working environment, giving to the customer optimized capacitors for a particular specification.
The simulation capabilities substantially shorten the design cycle of capacitors. To assist in shortening the design cycle of our customers, we have brought our R&D department to our customers by providing them with a CAD software, which allows them to select the most suitable capacitors for their application (Figure 1). For easy calculation of signal stresses, there is also a fast Fourier transform software available. In this software complicated signal forms can easily be simulated and analysed (Figures 2 and 3).

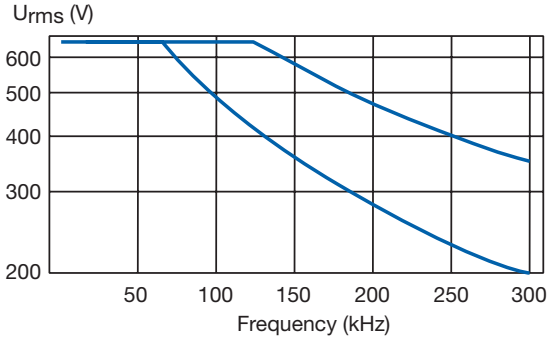


Fig. 1. From CAD software, showing max U_{rms} vs. frequency for two different capacitors

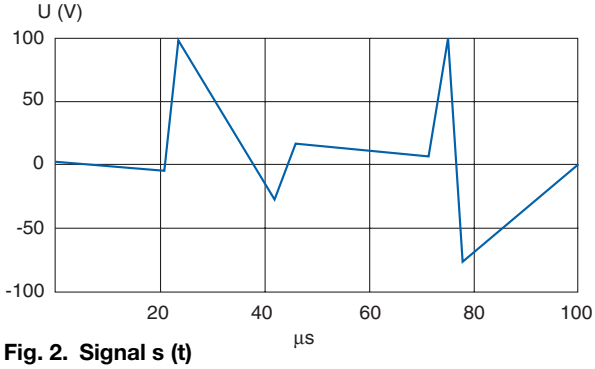


Fig. 2. Signal s (t)

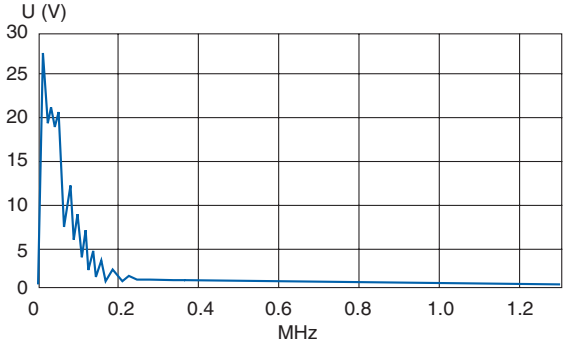


Fig. 3. Frequency spectrum

PRODUCT SPECIFICATION

All descriptions, drawings and other particulars (including dimensions, materials and performance data) given by Evox Rifa are as accurate as possible but, being given for general information, are not binding on Evox Rifa unless specifically agreed in writing. All dimensions and materials are, unless otherwise stated, subject to reasonable variations resulting from the raw material available or arising in the ordinary course of manufacture. Any performance data are based upon Evox Rifa's experience and are such as Evox Rifa normally expects to achieve.

WARRANTY, PRODUCT LIABILITY

Evox Rifa warrants that the goods manufactured by Evox Rifa are free from defects in design, material and workmanship.
Evox Rifa's liability under this warranty shall be limited to replacement or repair free of charge, at one of Evox Rifa's factories selected by Evox Rifa, provided that notification of such failure or defect is given to Evox Rifa immediately upon the same becoming apparent and that on Evox Rifa's request and instruction the goods are promptly returned to Evox Rifa carriage paid by buyer.
In case the goods thus returned as defective, prove to be without fault or defect, Evox Rifa is entitled to charge buyer 10% of the value of the returned goods.
If the goods supplied or part thereof are not manufactured by or branded Evox Rifa, Evox Rifa will only extend to the buyer the benefit of the warranty granted by the manufacturer of the goods.
Evox Rifa's liability is further limited to a period of 12 months from the date of shipment to buyer.

Evox Rifa shall not be liable for any defect which is due to accident, fair wear and tear, negligent use, tampering, improper handling, improper use, improper operation or improper storage or any other default on the part of any person other than Evox Rifa.
Evox Rifa shall have no other liabilities in case of defective goods than those stated above shall under no circumstances be liable for any consequential loss or damage arising from the use of goods sold by Evox Rifa. Liability under paragraph 823 BGB is expressly excluded.
The above limitations of Evox Rifa's liability for defective goods shall apply also with regard to product liability, and Evox Rifa shall have no responsibility for injury to persons or for damage to goods or property of any kind.
In case of product liability claims from third parties against Evox Rifa, not falling within Evox Rifa's liability in accordance with the above, buyer shall hold Evox Rifa harmless.

TERMS AND DEFINITIONS

Rated capacitance (C_R)
The rated capacitance of a capacitor is the value which is indicated upon it. The capacitance is measured at 1 kHz and +23°C.

Rated voltage (U_R)
The rated voltage is the maximum direct voltage or the maximum RMS alternating voltage which may be applied continuously to the terminals of the capacitor at any temperature within the rated temperature range.

Rated temperature
The rated temperature is the maximum ambient temperature at which the rated voltage can be continuously applied.

Climatic category
The climatic category states the category temperature range and the humidity class. For example 40/085/56 stands for –40°C to +85°C; 56 states that the steady state humidity test should take 56 days.

Tangent of the loss angle (Dissipation factor, tanδ)
The tangent of the loss angle is the power loss of the capacitor divided by the reactive power of the capacitor at a sinusoidal voltage of specified frequency. The tangent of loss angle is given in percent (Eg 0.01 tanδ=1%).
The dissipation factor is of interest especially when the capacitor is operated on AC. The dielectric loss causes heating of the capacitor which under unfavourable circumstances may lead to a destructive breakdown. This will not happen if the capacitor is used within specified limits. The ability to withstand short duration thermal and voltage overload is greater for small capacitors than for large ones.

Insulation resistance
The values given in the catalogue indicate the insulation resistance after one minute of electrification at +23°C with the following voltages: 100 VDC for capacitors rated at 100 to 500 VDC and 500 VDC for capacitors rated at 500 VDC. Insulation resistance is temperature dependent and is approximately halved for each 7 °C of temperature rise. Multilayer construction provides insulation resistance higher than that of single-layer types.

Pulse operation
Capacitors loaded with pulses with fast rise or fall times (high dU/dt) will be exposed to high current pulses. In order not to overload the internal connections the current must be limited. The current limits for a specific type are dependent upon:
- Amplitude and form of the pulse
- Rated voltage of the capacitor
- Capacitance
- Geometrical configuration of the winding

$dU/dt = U_R/(R \times C)$

U_R = Rated voltage
R = Discharge resistor
C = Rated capacitance

At repeated pulse operation, self-heating, ambient temperature and cooling set the load limit.
Pulse current limits are commonly expressed in the form of maximum permitted dU/dt in volts per microsecond. The figures stated in the type specifications refer to an unlimited number of pulses charging or discharging from rated voltage U_R.

Passive flammability
The ability of a capacitor to burn with a flame as a consequence of the application of an external source of heat.

Resonance frequency
The resonance frequency of a capacitor is reached when

$\omega L = 1/\omega C$

$\omega = 2\pi f$ (f = frequency)
L = inductance caused by the winding
and the length of the leads
C = the capacitance at f.

Dielectric absorption (DA)
Dielectric absorption describes the dielectric material's properties to "remember" the applied voltage. One method to define DA is:
The capacitor is to be charged for one hour at rated voltage DC (U_R) then discharged through a resistor of 5 ohms for 10 seconds. The discharge resistor must then be disconnected and the recovery voltage U_r measured 15 minutes after disconnection. The dielectric absorption is defined by:
$DA = (U_r/U_R) \times 100\%$

PROPERTIES OF DIELECTRICS

POLYESTER
(Polyethylene Terephthalate, PET)
Metallized and Film/foil
High dielectric constant and high dielectric strength provides good volumetric efficiency for metallized polyester film capacitors. Metallized polyester film has excellent self-healing properties.
Typical applications: Bypassing, coupling, filtering.

POLYESTER
(Polyethylene Naphthalate, PEN)
Metallized
High temperature Polyester. Relatively high dielectric constant and dielectric strength, and availability of thin films, provide good volymeric efficiency for metallized construction. High melting point allowes SMD constructions and service in high ambient temperatures. General purpose capacitor.

POLYPROPYLENE (PP)
Metallized and Film/foil
Very low losses, low dielectric absorption, high dielectric strength, very high insulation resistance, and negative temperature coefficient.
Typical applications: Stable oscillators and filters. Sample & hold circuits, pulse handling circuits, AC applications and mains filtering.

POLYCARBONATE (PC) *)
Metallized and Film/foil
Very low temperature dependency, wide operating temperature range, good long term stability, and low losses.Typical applications: Timers and filters. Applications in high ambient temperatures.

POLYPHENYLENE SULPHIDE (PPS)
Metallized
Low losses, wide operating temperature range, low temperature coefficient, good stability.
Typical applications: Timers and filters. Automotive and other applications in high ambient temperatures. Available in SMD constructions.

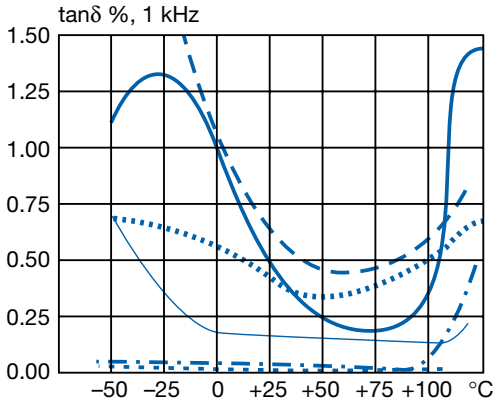
PAPER
Metallized
High dielectric constant. Excellent self-healing properties and transient handling capability. High ionisation level due to impregnated dielectric material. Outstanding reliability in mains connected and other low frequency applications.

NUMERICAL COMPARISON OF FILM MATERIALS

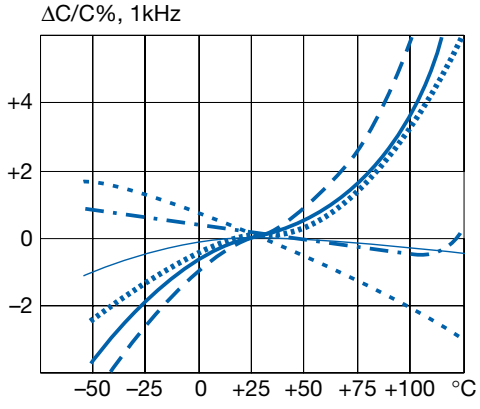
Material (Trade names)	Abbreviation	Min. film thickness (µm)	Dielectric constant at 1 kHz, +23°C	Operating temperature (°C)	Temperature coefficient (ppm/°C)	Dissipation factor at 1 kHz, +23°C	Insulation time constant (s) at +23°C	Dielectric absorption %
Polyester (Mylar, Lumirror, Hostaphan, Diafoil)	PET	0.9	3.3	–55 ... +100 (... +125)	+400 (±200)	0.5%	25 000	0.5
Polyethylene Naphthalate	PEN	1.4	3.0	–55 ... +125 (... +150)	+200 (±150)	0.4%	25 000	1.2
Polycarbonate *) (Makrofol)	PC	2.0	2.8	–55 ... +125	0 (±100) nonlinear	0.15%	25 000	0.06
Polypropylene (Torayfan, Trespaphan)	PP	3.5	2.2	–55 ... +105	–200 (–100, +50) almost linear	0.03%	100 000	0.01
Polyphenylene sulfide (Torelina)	PPS	1.2	3.0	–55 ... +125 (... +150)	0 (–50) up to +100 °C	0.06%	25 000	0.05
Paper Impregnated	P	7.0	5.5	–40 ... +115	+1200 (±200)	0.8%	15 000	

*) Please note: Polycarbonate no more available, only for comparison. Replaced by polyphenylene sulfide.

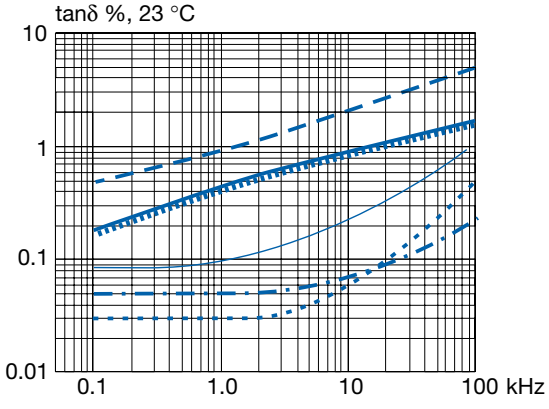
PROPERTIES OF DIELECTRICS



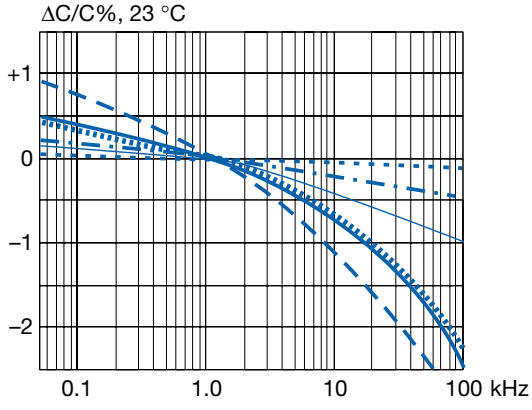
Dissipation factor vs. temperature



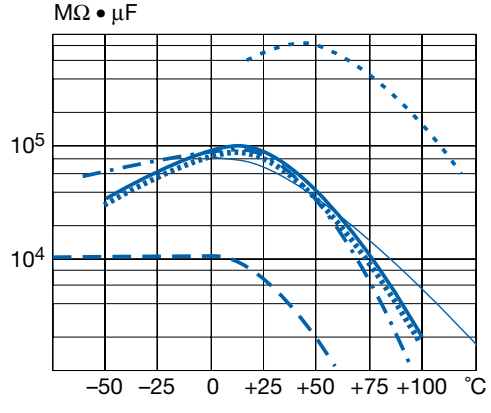
Capacitance vs. temperature



Dissipation factor vs. frequency



Capacitance vs. frequency

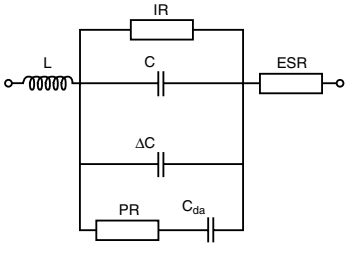


Insulation resistance vs. temperature

Polyester PET
Polyethylene Naphthalate PEN
Polycarbonate PC *
Polyphenylene sulfide PPS
Polypropylene PP
Paper

*) Please note: Polycarbonate no more available, only for comparison. Replaced by polyphenylene sulfide.

CAPACITOR EQUIVALENT DIAGRAM



C = nominal value of the capacitor
L = inductance (leads, metallization, winding)
ESR = equivalent series resistance (leads, metallization, metal spraying)
IR = insulation resistance (properties of the dielectric material)
ΔC = capacitance change (depending on changes in temperature, DC voltage and/or frequency)
PR = dielectric polarization resistance
C_{da} = dielectric absorption

RELIABILITY

The reliability of a capacitor is mainly a function of:
- The construction; dielectric material and its thickness
- The manufacturing process
- The application; electrical stress and temperature

The failure rate, λ, vs. voltage and temperature for the most common dielectric materials is shown in the diagrams below. U_R = rated voltage.

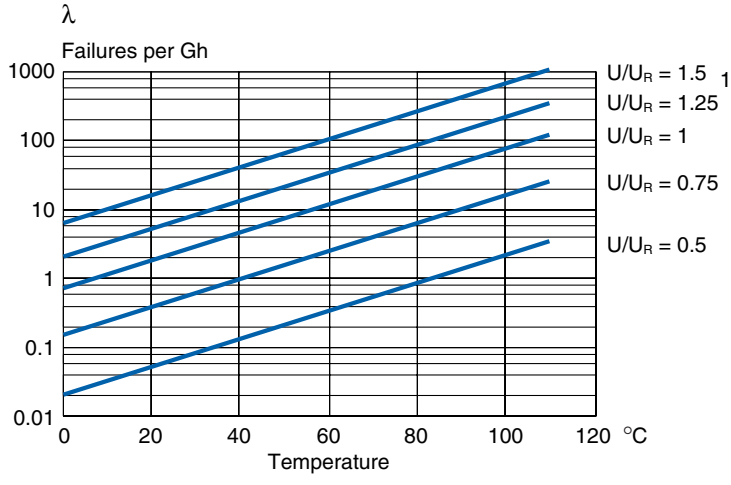
The operating life (L) can be calculated as:

$$L = \frac{1}{\lambda} \times \ln \frac{1}{1 - F}$$

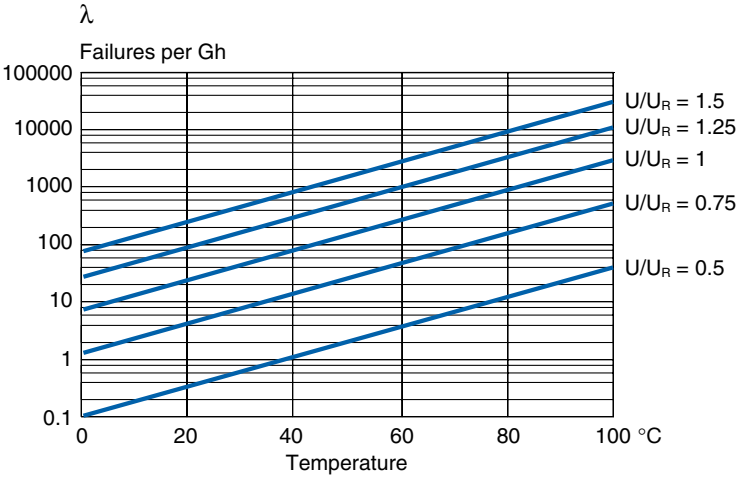
where F is the expected probability of failures.
Example: If λ = 20×10^{-9} it takes 6 years to have
F = 0.001 (0.1% failures)
and 300 years to have
F = 0.05 (5% failures)

MTBF (mean time between failures) = 1 / λ

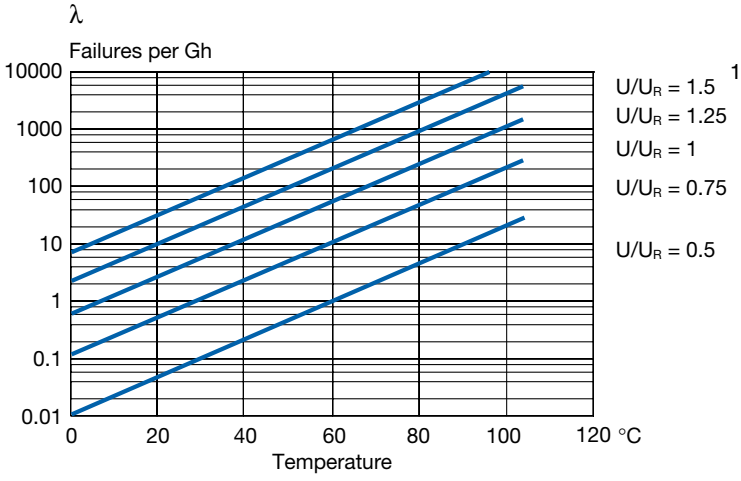
Failure rates vs. temperature and voltage Paper



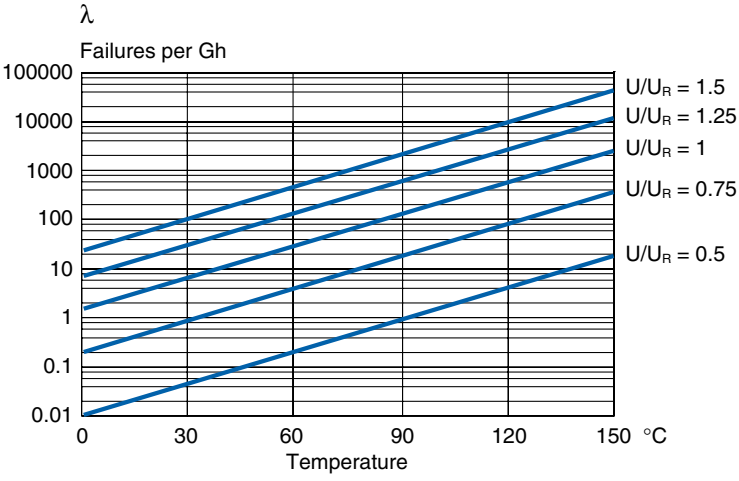
Failure rates vs. temperature and voltage Polyester



Failure rates vs. temperature and voltage Polypropylene



Failure rates vs. temperature and voltage Polyphenylene sulfide



SIZE CODES OF LEADED CAPACITORS

A size code has been added to the following leaded Evox Rifa capacitors: MMK, SMR, PHE840M, PHE846, PFR. The size code determines the size of the component and the packing quantities. The size codes are as follows:

Size code in Article Code	Box dimensions in mm				Quantity per package						
	B_{max}	H_{max}	L_{max}	p	Bulk [1]	Bulk [2]	Bulk [3]	Tray	Reel Ø360 mm	Reel Ø500 mm	Ammo [4]
A01	4.0	9.0	13.0	10.0	1000	1000			900	1800	
A02	4.5	10.5	13.0	10.0	1000	1000			800	1600	
A03	5.0	11.0	13.0	10.0	800	800			700	1400	
A04	6.0	12.0	13.0	10.0	600	600			500	1000	
A05	9.5	7.5	13.0	10.0	600	600			350	700	
A06	4.0	8.0	13.0	10.0	1000	1000			900	1800	
B01	5.5	10.5	18.5	15.0			500				
B02	5.5	14.0	18.5	15.0			500				
B03	6.5	12.5	18.5	15.0			250				
B04	5.5	10.5	18.0	15.0	1000	800			600	1200	
B05	5.5	12.5	18.0	15.0	1000	800			600	1200	
B06	7.5	14.5	18.0	15.0	800	400			400	800	
B07	8.5	14.5	18.5	15.0			250				
B10	6.5	12.5	18.0	15.0	1000	600			500	1000	
B11	8.5	16.0	18.0	15.0	600	400			400	800	
B12	8.0	15.0	18.0	15.0	600	400			400	800	
B14	9.5	17.5	18.0	15.0	500	300			350	700	
B15	6.0	12.0	18.0	15.0	1000	800			500	1000	
B16	11.0	19.0	18.0	15.0	450	250			300	600	
B17	13.0	12.5	18.0	15.0	400	300			250	500	
D01	7.5	15.5	27.0	22.5			250				
D02	8.5	16.5	27.0	22.5			200				
D03	10.5	18.5	27.0	22.5			200				
D13	6.5	14.5	26.0	22.5				234	300	600	
D14	8.0	16.0	26.0	22.5				186	250	500	
D15	9.0	18.5	26.0	22.5				168	250	500	
D16	11.0	21.5	26.0	22.5				253			
D17	7.0	16.5	26.0	22.5				216	300	600	
D18	10.5	19.0	26.0	22.5				264			
D19	15.5	24.5	26.0	22.5				176			
D20	13.5	23.0	26.0	22.5				209			
F03	13.5	23.0	31.5	27.5				171			
F11	10.5	20.5	31.5	27.5				216			
F12	11.5	22.5	31.5	27.5				198			
F13	14.5	24.5	31.5	27.5				153			
F14	17.5	28.0	31.5	27.5				126			
F15	19.0	29.0	31.5	27.5				117			
F16	21.0	30.0	31.5	27.5				108			
F17	21.0	12.5	31.5	27.5				108			
F18	31.0	18.5	31.5	27.5				72			
F19	27.5	16.0	31.5	27.5				81			
J01	2.5	6.5	7.2	5.0	2000	2000			2500	5000	3000
J02	3.5	8.0	7.2	5.0	2000	2000			2000	4000	2000
J03	4.5	9.0	7.2	5.0	1000	1000			1500	3000	1700
J04	5.0	10.0	7.2	5.0	1000	1000			1300	2600	1500
J05	6.0	11.0	7.2	5.0	1000	1000			1000	2000	1200
J06	7.2	13.0	7.2	5.0	1000	1000			800	1600	
J11	4.5	6.0	7.2	5.0	1000				1500	3000	1700
J12	5.5	7.0	7.2	5.0	1000				1200	2400	1300
J13	6.5	8.0	7.2	5.0	1000				900	1800	1100
K00	2.5	6.0	10.0	7.5	2000	2000			2500	5000	3000
K01	4.0	8.0	10.0	7.5	1000	1000			1700	3400	1900
K03	5.0	11.0	10.0	7.5	1000	1000			1300	2600	1500
K04	6.0	12.0	10.5	7.5	1000	1000			1000	2000	1200

[1] Capacitors with lead length of 4 to 6 mm according to the data sheet.
[2] Capacitors with lead length of 16.5 mm or 17.0 mm according to the data sheet.
[3] Capacitors with lead length of 30 mm and insulated leads.
[4] For Ammo packaging of parts in 15 mm lead spacing, please ask Evox Rifa Customer Service.

SIZE CODES OF LEADED CAPACITORS

Size code in Article Code	Box dimensions in mm B_{max}	H_{max}	L_{max}	p	Quantity per package Bulk[1]	Bulk[2]	Bulk[3]	Tray	Reel Ø360 mm	Reel Ø500 mm	Ammo
R02	16.5	32.0	41.0	37.5				105			
R03	19.0	36.0	41.0	37.5				91			
R04	15.0	26.0	41.0	37.5				119			
R05	13.0	24.0	41.0	37.5				140			
R06	21.0	38.0	41.0	37.5				84			
R08	28.0	43.0	41.0	37.5				63			

[1] Capacitors with lead length of 4 to 6 mm according to the data sheet.
[2] Capacitors with lead length of 16.5 mm or 17.0 mm according to the data sheet.
[3] Capacitors with lead length of 30 mm and insulated leads.

SIZE CODES OF SMD CAPACITORS

A size code has been added to the Evox Rifa SMD capacitors. The size code determines the size of the component and the packing quantities. The size codes are as follows:

Encapsulated SMD capacitors MMC, SMC, GMC, GPC, SPC

Size code in Article Code	Box dimensions in mm ±0.2 B	H	L	p	Quantity per package Bulk	Reel	Reel, vertical taping	Packaging code Bulk	Reel	Reel, vertical taping
A31	9.1	5.5	10.2	10.2	1000	800	500	BULK	TR16	TV24
B31	11.5	6.5	12.7	12.7	1000	600	400	BULK	TR24	TV24
C31	15.0	7.0	16.5	16.5	800	500	200	BULK	TR24	TV44
J31	5.0	2.5	5.7	5.7	2000	3100		BULK	TR12	
J33	5.0	3.0	5.7	5.7	2000	2400		BULK	TR12	
J35	5.0	4.0	5.7	5.7	2000	2100		BULK	TR12	
K31	6.0	2.5	7.3	7.3	2000	3100		BULK	TR12	
K33	6.0	3.0	7.3	7.3	2000	2500		BULK	TR12	
K35	6.0	3.5	7.3	7.3	2000	2300		BULK	TR12	
K37	6.0	4.5	7.3	7.3	1000	1700		BULK	TR12	

Naked SMD capacitors SMW, GMW

Size code in Article Code	Dimensions in mm B±0.4	H_{max}	L±0.4	p	Quantity per package Bulk	Reel	Packaging code Bulk	Reel
J91	5.0	2.0	5.7	5.7	2000	3100	BULK	TR12
J93	5.0	3.0	5.7	5.7	2000	2400	BULK	TR12
J95	5.0	4.0	5.7	5.7	2000	2100	BULK	TR12
K91	6.0	2.0	7.3	7.3	2000	3100	BULK	TR12
K93	6.0	2.7	7.3	7.3	2000	2500	BULK	TR12
K95	6.0	3.2	7.3	7.3	2000	2300	BULK	TR12
K97	6.0	4.2	7.3	7.3	1000	1700	BULK	TR12

SIZE CODES OF DIL CAPACITORS

The size code in the article code determines the size of the component and the packing quantities. The size codes for MDC, MDK and MDS are as follows:

Size code in Article Code	Box dimensions in mm ±0.2 B	H	L	p	Quantity per package Tube	Reel	Packaging code Reel	Tube
A52	12.2	6.05	11.0	10.0	43			TUBE
A53	12.7	9.0	14.0	10.0	35	200	TR32	TUBE
A54	12.2	6.05	13.5	10.0	35			TUBE
A55	12.2	6.05	16.5	10.0	28			TUBE
A57	12.7	9.0	23.0	10.0	21			TUBE
A58	12.7	11.0	23.0	10.0	21			TUBE
B53	16.5	6.05	11.0	15.0	43			TUBE
B55	16.5	6.05	12.2	15.0	39			TUBE

HOW TO ORDER EVOX CAPACITORS

The Evox article code includes all the information needed to specify the product characteristics and type of packing. This article code construction applies for the following products in this catalogue: MMK, SMR, PFR, MMC, SMC, GMC, GPC, SPC, GMW, SMW, MDC, MDK and MDS. The following articles have the same article code system except for the size code: CQ, SCQ.

MMK **5** **104** **K** **63** **J01** **L16.5** **TA18**

Capacitor type

The first letter specifies the dielectric material:
M = Polyester (PET)
P = Polypropylene (PP)
G = Polyethylene naphthalate (PEN)
S = Polyphenylene sulphide (PPS)

The second letter indicates the electrode construction:
M = Metallized film
F = Metal foil

Lead spacing in mm

Capacitance tolerance

M = ± 20 %
V = -0%, +20 %
P = -0%, +10 %
L = -10%, +0 %
K = ± 10 %
J = ± 5 %
X = ± 3.5 %
H = ± 2.5 %
G = ± 2 %
F = ± 1 %

Rated voltage in DC Volts

Capacitor size code

See size codes on pages 18 and 19.

Rated capacitance

Expressed in picofarads. Three digit code where the first two digits indicate the two most significant digits of the capacitance value in pF. The third digit is the number of following zeroes.

103 = 10000 pF = 10 nF = 0.01 µF
104 = 100000 pF = 100 nF = 0.1 µF
106 = 10000000 pF = 10000 nF = 10 µF

When three significant digits are needed to express the capacitance value, a four digit code is used. The last digit gives the amount of numbers after the two most significant digits. Example:

4582 = 4580 pF = 4.58 nF = 0.00458 µF
1464 = 146000 pF = 146 nF = 0.146 µF

Lead length

Letter L followed by lead length in mm and a tolerance code according to the table below. L3.5E = lead length 3.5 +0/-0.7 mm.

Exceptions:
- Only L4 for std 4 mm lead length and std tolerance.
- L16.5 for taped parts on reel or ammo. L16.5C for bulk parts with 16.5 ±0.5 mm leads.

Code	Tolerance mm	
A	+1, -0	Std for Evox parts in bulk and tray
B	+0.3, -0.1	
C	±0.5	
E	+0, -0.7	
F	±3.2	
G	±0.4	
J	+0, -1	
K	+0.3, -0.2	
L	+5, -0	
M	±0.25	

Packaging

BULK [1]	Loose capacitors in a box
TRAY [1]	Capacitors with 22.5 to 37.5 mm lead spacing on a tray.
TR16 [1]	Taped on reel; H*)=16.5 mm
TR18 [1]	Taped on reel; H*)=18.5 mm
LR18 [2]	Taped on reel; ∅ 500 mm, H*)=18.5 mm
XR18 [3]	Taped on reel; ∅ 360 mm, H*)=18.5 mm, crimped leads with F*)=7.5 mm
XA18 [3]	Taped, packed in ammo, H*)=18.5 mm, crimped leads with F*)=7.5 mm
TA16 [1]	Taped, packed in ammo, H*)=16.5 mm
TA18 [1]	Taped, packed in ammo, H*)=18.5 mm
TUBE [1]	Tube packaging of DIL capacitors
TR12 [1]	Horizontally taped SMD capacitors, L*) = 5.7 and 7.3 mm
TR16 [1]	Horizontally taped SMD capacitors, L*) = 10.2 mm
TR24 [1]	Horizontally taped SMD capacitors, L*) = 12.7 and 16.5 mm
TV24 [4]	Vertically taped SMD capacitors, L*) = 10.2 and 12.7 mm
TV44 [4]	Vertically taped SMD capacitors, L*) = 16.5 mm

[1] Quantity/package according to article table
[2] Quantity/package according to article table x 2
[3] Quantity/package according to table below
[4] Quantity per package according to table on page 19.
*) See figure on page 22.

Size code **)	Quantity/package XR18	XA18
B04	550	570
B05	550	570
B15	450	520
B10	450	480
B06	350	378
B12	350	351
B11	350	324
B14	250	297
B16	250	252
B17	200	216

**) See page 18.

Standard lead length and packaging

Part	Lead spacing mm	Standard lead length mm	Standard packaging	Taping lead length mm
Evox capacitors	≤ 15.0	4	bulk	16.5 [1]
Evox capacitors	22.5-27.5	4	tray	16.5

[1] 24.5 mm lead length for capacitors with crimped leads and taped

HOW TO ORDER RIFA CAPACITORS

The Rifa article code includes all the information needed to specify the product characteristics and type of packing. This article code construction applies for the following products in this catalogue: PHE820, PHE830, PHE840E, PHE840M, PHE841, PHE842, PHE843, PHE844, PHE845, PHE846, PME261, PME264, PME271, PME278, PME285, PME289, PME290, PME291, PME294, SMP253, PZB300, PMZ2074, PHZ9004, PMR205, PMR209, PMR210, PMZ2035, PHE426, PHE427, PHE428, PHE448, PHE450. Please see the example below.

PHE450 **H** **B** **6470** **J** **(B14)** **R17** **T0**

Capacitor type

Rated voltage

C	= 63 VDC	EMI capacitors	
D	= 100 VDC	have the rated	
F	= 160 VDC	voltage expressed	
H	= 250 VDC	in volts AC:	
J	= 300 VDC	**A**	= 125 VAC
K	= 400 VDC	**K**	= 220 VAC
L	= 500 VDC	**M**	= 250-275 VAC
M	= 630 VDC	**E**	= 300-330 VAC
P	= 1000 VDC	**R**	= 440VAC
R	= 1600 VDC	**J**	= 500 VAC
S	= 2000 VDC	**N**	= 660 VAC
T	= 2500 VDC	**V**	= 760 VAC

Lead spacing

J	= 5.0 mm
K	= 7.5 mm
A	= 10.0 mm
B	= 15.0 mm
C	= 20.3 mm
D	= 22.5 mm
E	= 25.4 mm
F	= 27.5 mm
R	= 37.5 mm

Rated capacitance

Expressed in picofarads. Four digit code where the first digit is the number of digits in the capacitance value in pF. The next three digits are the three significant digits in the capacitance value.
6100 = 100000 pF = 0.1 µF
4625 = 6250 pF = 0.00625 µF

Capacitance tolerance

M	= ± 20 %
V	= -0%, +20 %
P	= -0%, +10 %
L	= -10%, +0 %
K	= ± 10 %
J	= ± 5 %
X	= ± 3.5 %
H	= ± 2.5 %
G	= ± 2 %
R	= ± 1.25 %
F	= ± 1 %
D	= ± 0.5 %

Capacitor size code

See size codes on page 18.

Lead length

Letter R followed by a 3 digit integer, lead length in tenths of millimetres, and a tolerance code according to the table below. R035E = lead length 3.5 +0/-0.7 mm.
Exception:
- When std tolerance and the lead length is an integer in mm, only 2 digits for the length and no tolerance code. R05 = lead length 5 +0/-1 mm.

Tolerance Code	mm	
A	+1, -0	
B	+0.3, -0.1	
C	±0.5	
E	+0, -0.7	
F	±3.2	
G	±0.4	
J	+0, -1	Std for Rifa parts with lead length < 30 mm
K	+0.3, -0.2	
L	+5, -0	Std for Rifa parts with lead length = 30 mm
M	±0.25	

Packaging

No code [1]	Bulk; loose parts in a box
L2 [1]	PHE parts in 22.5 to 37.5 mm lead spacing on tray.
T0 [1]	Taped on reel; ∅ 360 mm, H*)=18.0 mm
T1 [2]	Taped on reel; ∅ 500 mm, H*)=18.0 mm
TA [3]	Taped, packed in ammo
X2 [4]	Taped on reel; ∅ 360 mm, crimped leads with F*)=7.5 mm
X3 [4]	As for code X2, but P_0*)=12.7 mm
XA [4]	Taped, packed in ammo, crimped leads with F*)=7.5 mm

[1] Quantity/package according to article table
[2] Quantity/package according to article table x 2
[3] Quantity per package according to table on page 18.
[4] Quantity/package according to table below
*) See figure on page 22

Size code **)	Quantity/package X2, X3	XA
B04	550	570
B05	550	570
B15	450	520
B10	450	480
B06	350	378
B12	350	351
B11	350	324
B14	250	297
B16	250	252
B17	200	216

**) See page 18.

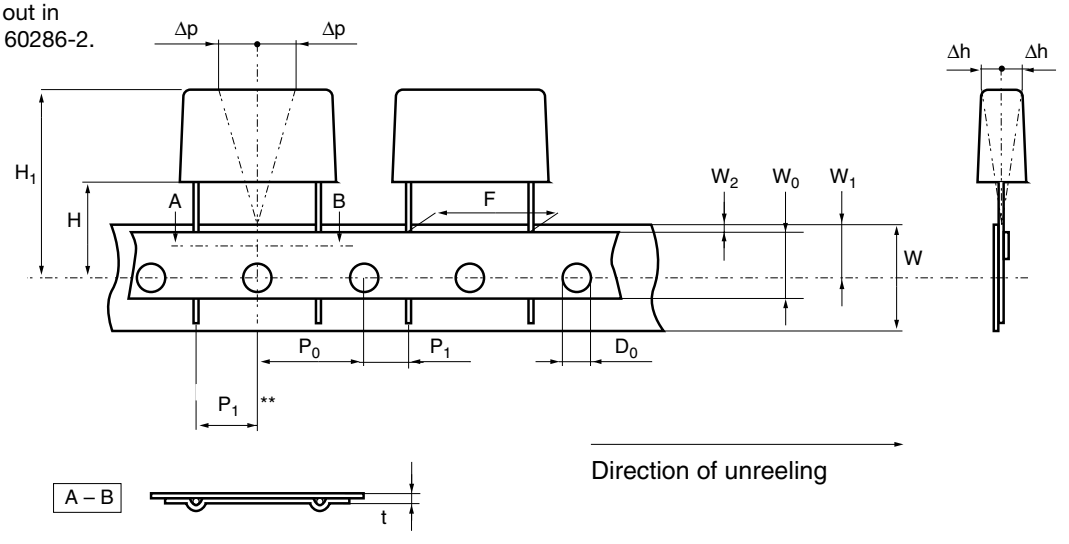
Standard lead length and packaging

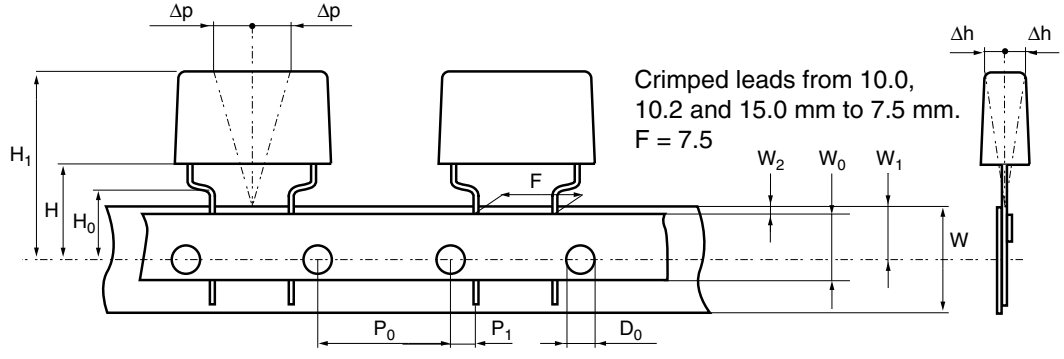
Part	Lead spacing mm	Standard lead length mm	Standard packaging	Taping lead length mm [3]
PME, PMR	≤ 15.2	30	bulk	19
PME, PMR	≥ 20.3	30	bulk [1]	19
PHE426-PHE450	5.0 to 10.0	5	bulk	17
PHE426-PHE450	15.0	6	bulk	17
PHE820-PHE845	≤ 15.0	17	bulk	17
All PHE	≥ 22.5	6	tray [2]	17

[1] packed on tray if lead length ≤ 6 mm
[2] max lead length 6 mm for tray packaging in 22.5 mm lead spacing, bulk for longer leads
[3] 25 mm lead length for capacitors with crimped leads and taped

TAPING OF EVOX RIFA RADIAL CAPACITORS

The taping is carried out in accordance with IEC 60286-2.





Crimped leads from 10.0, 10.2 and 15.0 mm to 7.5 mm.
F = 7.5

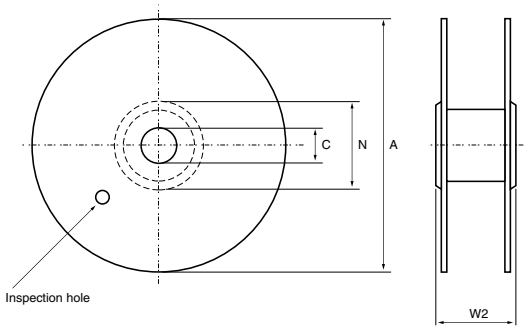
Taping specification

Dimensions in mm						IEC 60286-2
Lead spacing	F	5.0/7.5 $^{+0.6}_{-0.1}$	7.5 $^{+0.6}_{-0.1}$ Crimped leads 4)	10.0/15.0/ * $^{+0.6}_{-0.1}$	10.2/15.2/20.3 $^{+0.6}_{-0.1}$	F $^{+0.6}_{-0.1}$
Carrier tape width	W	18 ± 0.5	18 ± 0.5	18 ± 0.5	18 ± 0.5	18 $^{+1.0}_{-0.5}$
Hold-down tape width	W_0	9 ± 0.3	12 ± 0.3	12 ± 0.3	12 ± 0.3	
Position of sprocket hole	W_1	9 ± 0.5	9 ± 0.5	9 ± 0.5	9 ± 0.5	9 $^{+0.75}_{-0.5}$
Distance between tapes	W_2	3 max	3 max	3 max	3 max	3 max
Sprocket hole diameter	D_0	4 ± 0.2	4 ± 0.2	4 ± 0.2	4 ± 0.2	4 ± 0.2
Feed hole pitch	P_0 1)	12.7 ± 0.3	15 ± 0.3	12.7 ± 0.3	12.7 ± 0.3	12.7 ± 0.3
Distance lead – feed hole	P_1	3.85/3.75 ** ± 0.7	3.75 ± 0.7	7.7/5.2/7.8 ± 0.7	7.6/5.1/8.9 ± 0.7	P_1 ± 0.7
Max deviation tape – plane	Δp	1.3 max	1.3 max	1.3 max	1.3 max	1.3 max
Max lateral deviation	Δh	2 max	2 max	2 max	2 max	2 max
Total thickness	t	0.7 ± 0.2	0.7 ± 0.2	0.7 ± 0.2	0.7 ± 0.2	0.9 max
Sprocket hole/cap body	H 2)	18.5 ± 0.5 16.5 ± 0.5		18.5 ± 0.5 16.5 ± 0.5 18.0 $^{+2}_{-0}$	18.0 $^{+2}_{-0}$	18.0 $^{+2}_{-0}$
Sprocket hole/crimped leads	H_0 2)		16 ± 0.5 18 ± 0.5			16 ± 0.5
Sprocket hole/top of cap body		H_1 3)	32/31 max	40 max	43 max	35 max 58 max

1) Cumulative pitch error
2) Alternatives for different insertion machines
3) Depending on case size
4) CQ/SCQ with crimped leads are taped like this with the following exceptions: P_1 = 3.85 and W = 18 $^{+1.0}_{-0.5}$
*) On request 22.5 mm

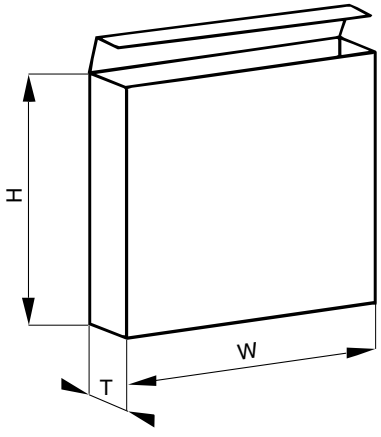
TAPING OF EVOX RIFA RADIAL CAPACITORS

Reel specification			
Reel dimensions in mm			Tol.
Reel diameter	A	360/500	max
Hub diameter	N	80	min
Arbor hole	C	30	± 1
Total reel width measured at hub	W2	58	max
Quantity/reel in this catalogue is specified for 360 mm reel. The quantity in 500 mm reel is 2x the quantity on 360 mm reel.			



Ammo pack specification

Ammo pack dimensions in mm			
Height	H	330	(135 or 200 for CQ/SCQ depending on capacitance value)
Width	W	330	(335 for CQ/SCQ)
Thickness	T	50	



Taping of SMD capacitors, see page 69. Taping of DIL capacitors, see page 111.

THE MANUFACTURING CODE Y Z, ACCORDING TO IEC 60062

where Y = year, Z = month.

Year	Code	Year	Code	Year	Code	Month	Code	Month	Code
1985	T	1992	C	1999	L	Jan	1	July	7
1986	U	1993	D	2000	M	Febr	2	Aug	8
1987	V	1994	E	2001	N	March	3	Sept	9
1988	W	1995	F	2002	P	April	4	Oct	O
1989	X	1996	H	2003	R	May	5	Nov	N
1990	A	1997	J	2004	S	June	6	Dec	D
1991	B	1998	K	2005	T				