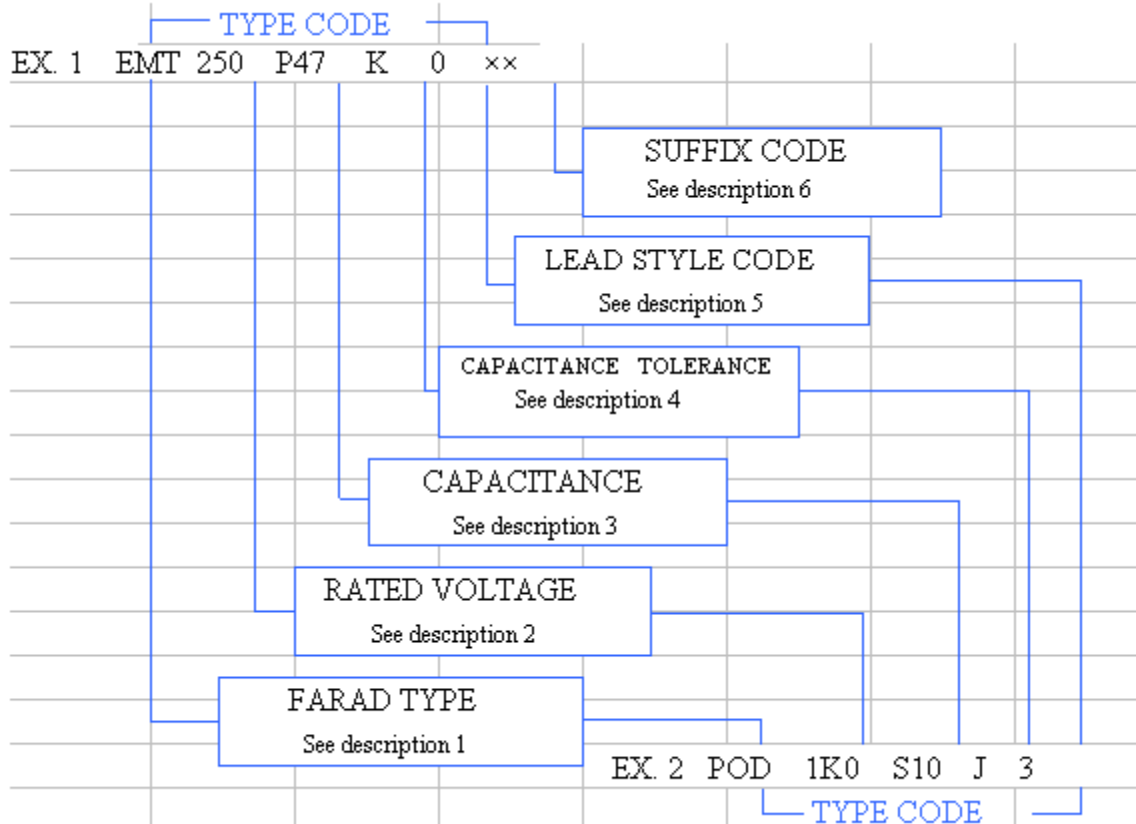


## BREL CAPACITOR REFERENCE DATA-1

### INSTRUCTION FOR MANUFACTURE CODE

Manufacture code including TYPE Code & Lot Number, such as



## DESCRIPTION

### 1. Symbols of Farad Type: (with three letters)

- a) First alphabet symbolizes dielectric used:
  - "E"-Polyester Capacitor as type: EOT, EMF, EWT, EHP, EXD, etc.
  - "P"-Polypropylene Capacitor as type: POT, PMD, POR, etc.
  - "C"-Polycarbonate Capacitor as type: CMD, CMF, CMT, etc.
  - "S"-Polystyrene Capacitor as type: SOQ, SOC, SOT, etc.
- b) The second alphabet symbolizes product characteristics:
  - "M"-Metallized film dielectric material.
  - "W"-Wax impregnated for pulse application.
  - "O"-Not characteristic code defined but for computer code system.



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"H"-Very high voltage film capacitor.

"X"-Across-Line capacitor.

c)The third alphabet symbolizes the construction:

T: Tubular/JIS 0.8    D: Dipped/JIS 93.    Q: Tubular, Inductive.    Z: Tubular, Coated.  
R: Round/JIS 16.    F: Flat Oval/JIS 91.    P: Flat Oval, Inductive.    G: Round, Inductive, Coated.  
L: Inductive/JIS 92.    K: Encased/JIS 99.    C: Round, Inductive.

## 2.Symbols of Rated Voltage:(with three digits)

063: 63VDC/JIS 1J.    1K0: 1,000VDC/JIS 3A.  
100: 100VDC/JIS 2A.    1K6: 1,600VDC/JIS 3C.  
250: 250VDC/JIS 2E.    2N0: 20,000VDC/JIS 4D.  
400: 400VDC/JIS 2G.    1A2: 120VAC.  
630: 630VDC/JIS 2J.    2A2: 220VAC.



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## *BRELE CAPACITOR REFERENCE DATA-2*

### 3. Symbols of capacitance in Mfd: (with three digits)

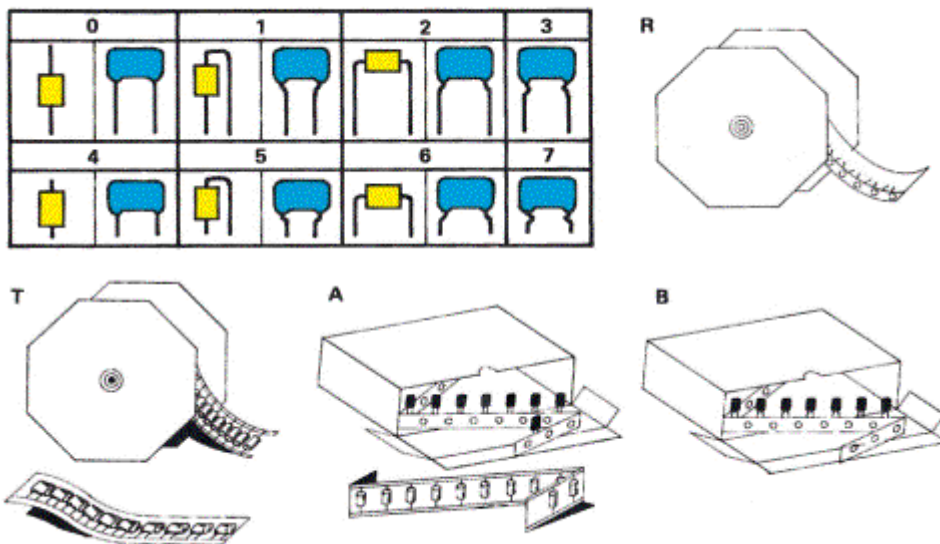
- A: Indicate tens. EX: 12Mfd=A12, 10Mfd=A10.(Mfd: Micro-Farad)
- W(Word): Indicate unit. EX: 1.5Mfd=W15
- P(Point): Indicate the first figure after decimal point. EX: 0.22Mfd=P22
- S(Single Zero): Decimal point follow one zero. EX: 0.015Mfd=S15
- D(Double Zeroes): Decimal point follow two zeroes. EX: 0.0047Mfd=D47
- T(Triple Zeroes): Decimal point follow three zeroes. EX: 0.00068Mfd=T68

### 4. Symbols of capacitance Tolerance: Same as JIS and EIA Standard.

Symbols	B	C	D	F	G	H	I	J	K	M	N	V	Z
Tolerance percentage	±0.1	±0.25	±0.5	±1.0	±2.0	±2.5	±3.0	±5.0	±10	±20	±30	+20 -10	+80 -20

### 5. Lead Style Code:

- |                                   |                            |                             |
|-----------------------------------|----------------------------|-----------------------------|
| 0 straight long leads/non-formint | 4 non-forming with cut     | R: radial reel with forming |
| 1 inside forming without cut      | 5 inside forming with cut  | T: reel packing             |
| 2 outside forming without cut     | 6 outside forming with cut | A: ammo packing             |
| 3 kink without cut                | 7 kink cut                 | B:radial ammo with forming  |



### 6. Suffix Code: It's a code for internal identification purpose.

## **BREL CAPACITOR REFERENCE DATA-3**

Brel capacitors are produced by fully automatic machines and highly reliable and precise. They have been well controlled in each manufacturing process using techniques proven to be effective over many years. All capacitors are 100% tested and recorded on each production lot and the distribution curves are obtained directly from the dot matrix terminal printer for capacitance, dissipation factor, dielectric strength and insulation resistance on the final test report.

Unless otherwise specified, we apply MIL-STD-105E, Level II AQL 0.4% sampling plan for major electrical characteristics and 1.5% for minor characteristics before shipping.

**\*CAPACITANCE:** Measured at 1 KHz 25°C.

**\*INSULATION RESISTANCE:** Measurement shall be made at 20±5°C after applying for 60±5 sec. at rated DC voltage or 500 VDC whichever is lower.

**\*A.C. APPLICATION:** The peak value of the superimposed AC plus DC voltage should not exceed the rated DC voltage. Please refer to relative characteristic on derated curves.

**\*TEMPERATURE COEFFICIENT:**(Refer to operating temperature range or within -40°C to +85°C.

Polyester :400±200PPM/°C  
 Polypropylene:-220±110PPM/°C  
 Polycarbonate:150±50PPM/°C  
 Polystyrene :-150±50PPM/°C

**\*LONG TERM STABILITY:** Capacitance shall change no more than ±2% for Polyester & Polycarbonate and ±0.5% for Polypropylene & Polystyrene when stored for two years at temperature +20 to +40°C and R.H. 40 to 60%.

**\*LIFE TEST:**1000 hours at 85°C (70°C for Polystyrene Capacitor) with 150% rated DC voltage applied.

Test criteria:	△C/C	△D.F.	△I.R.
Polyester	≤ ±5%	≤ 1.2%	≥ 0.5 × I.R. min.
Polypropylene	≤ ±3%	≤ 0.2%	≥ 0.5 × I.R. min.
Polycarbonate	≤ ±2%	≤ 0.4%	≥ 0.5 × I.R. min.
Polystyrene	≤ ±2%	≤ 0.1%	≥ 0.5 × I.R. min.

**\*FLAME RETARDANT:**

Flame retardant tape upon request; valox case, epoxy comply with UL 94 V-O.

**\*LEAD MATERIAL:**

Tinned copper clad steel wire meets requirements of IEC 384-1, IEC 68-2-20. Solder ability



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Test.

**\*PULL TEST:**

Meet IEC 384-1 4.13(IEC 68-2-21 Test Ua) test required.

**\*BEND TEST:**

Meet IEC 384-1 4.13(IEC 68-2-21 Test Ub) test required.

**\*VIBRATION TEST:**

Refer to IEC 384-1 4.17, capacitor is mounted in apparatus and subjected to a simple harmonic motion with 0.03" amplitude. The entire frequency range, from 10 to 55 Hz, applied for a period of 2 hours in each of 3 mutually perpendicular planes (total 6 hours). After the test, capacitor shall show no evidence of physical damage and electrical performance shall not be degraded.



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## ***BREL CAPACITOR REFERENCE DATA-4***

### **\*HUMIDITY TEST:**

Refer to IEC 384-1 4.22, capacitors are subjected to an environmental test chamber at R.H. 90 to

95%, 40°C for 240 hours. After the test, capacitor shall be conditional at room temperature for 2

hours and meet the following criteria:

- (1) Capacitance changes shall be less than 5% for polyester, 3% for polypropylene, 2% for Polycarbonate and polystyrene.
- (2) Dissipation factor shall be less than 1.2% for polyester, 0.2% for polypropylene, 0.4% for Polycarbonate and polystyrene.
- (3) Insulation resistance shall be over 50% of the minimum requirement.

### **\*MARKING:**

Capacitors are legibly and permanently marked with capacitance, tolerance, rated voltage in DC and manufacture's name "FARAD" trade mark: or symbol: " ", F.

### **\*PACKING:**

Please refer to related pictures on inside back cover.

- (1) Bulk  
Small inner cardboard box / PVC bag.  
with desiccants and label packed in one standard export carton.
- (2) Axial Tape and Reel  
5 boxed reels packed in one standard export carton.
- (3) Radial Tape and Reel (inductive and non-inductive)
  - (a) 8 boxed reels packed in one standard export carton.
  - (b) 10 ammo boxed reels packed in one standard export carton.

### **\*LABEL FORM:**



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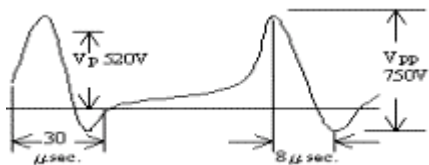
## BREL CAPACITOR REFERENCE DATA-5

### GENERAL APPLICATION REFERENCE:

Plastic film capacitors now widely used by electronic industry vary with the following factors. When selecting BREL capacitor, the following reference information is suggested to be taken into consideration.

(1) **FREQUENCY:** Polyester capacitor with higher dielectric loss factor is generally suitable to use at frequency below 10 KHz at a comparatively wide range of temperature. Polypropylene, with lower D.F. is the most popular selection for high frequency and higher pulse current application although its size is larger and lower temperature range. Polycarbonate has moderate features of both PE & PP, but the dielectric material cost much higher can't make application wide and common. Polystyrene shows excellent high frequency performance and is commonly used to replace Mica Capacitor, but lower temperature range and comparative larger size limit its application choice to low capacitance range.

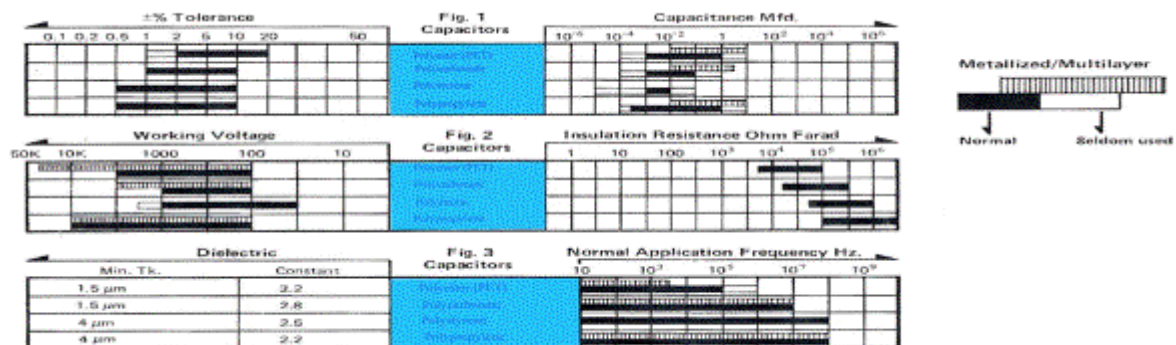
(2) **PEAK VOLTAGE:** The peak voltage against a zero potential reference shall always be less than nominal DC voltage rating of the capacitor. The rate of voltage change



(dv/dt) of individual specs is valid for pulse voltages equal to the rated voltage. If the pulse voltages are of lower values, a factor of "Vdc/applied voltage" may be multiplied.  $V_p \leq V_{DC}$  rated and the  $V_{rms}$  voltage derived from the peak voltage shall always be less than the nominal AC voltage rating of the capacitor.  $V_{rms} \leq V_{AC}$  rated (for sinusoidal wave where

$$V_{rms} = V_{pp} / 2 * \text{square\_rt}(2))$$

(3) **PULSE CURRENT:** Proper selection of Farad capacitors can meet various usages when stressed under pulse or non-sinusoidal voltage. For instance: POR type: up to 10 Ap-p at 25KHz. PAD type: up to 20 Ap-p for frequency up to 100KHz. Fig. 1 to 3 show the general characteristics of capacitance, tolerance, insulation resistance, working voltage, dielectric constant, minimum thickness and application. For further details, please refer to each individual type and curves or contact Farad Business and Technology Department.



## BRELE CAPACITOR REFERENCE DATA-6

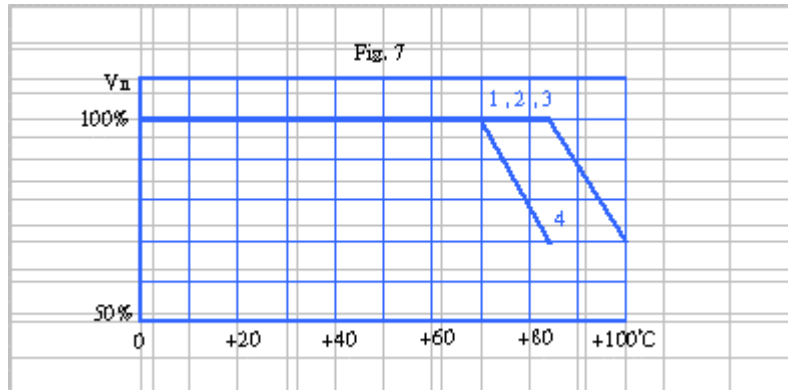
### TEMPERATURE AND FREQUENCY CHARACTERISTICS

Curve 1: Polyester dielectric.

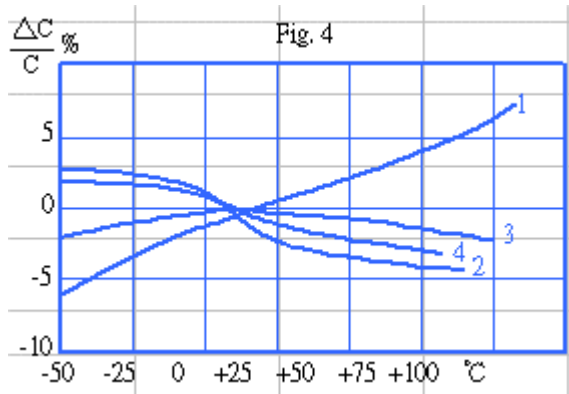
Curve 2: Polypropylene dielectric.

Curve 3: Polycarbonate dielectric.

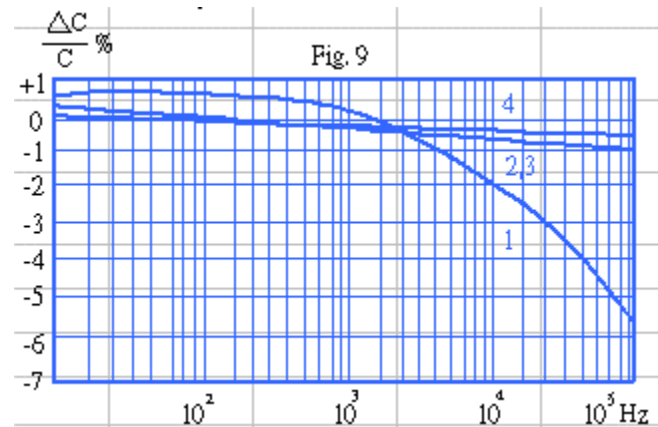
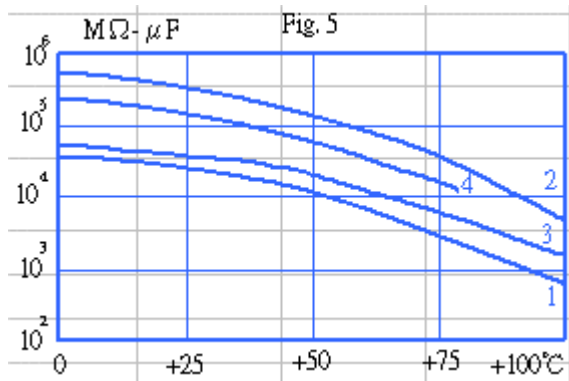
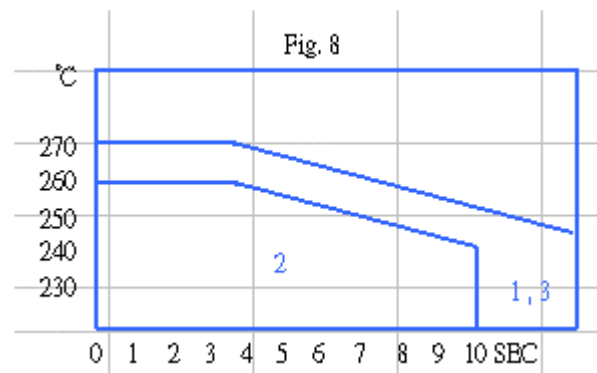
Curve 4: Polystyrene dielectric.



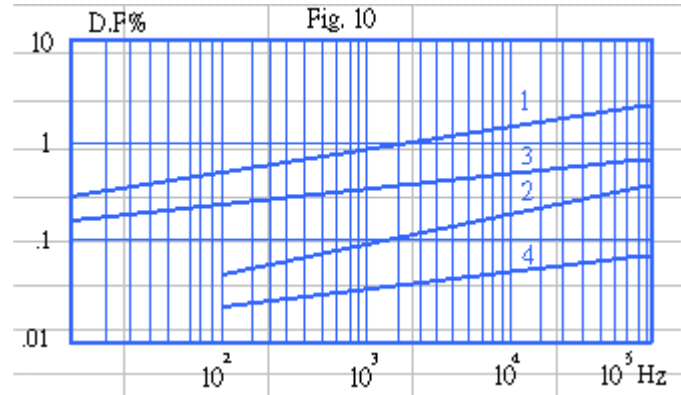
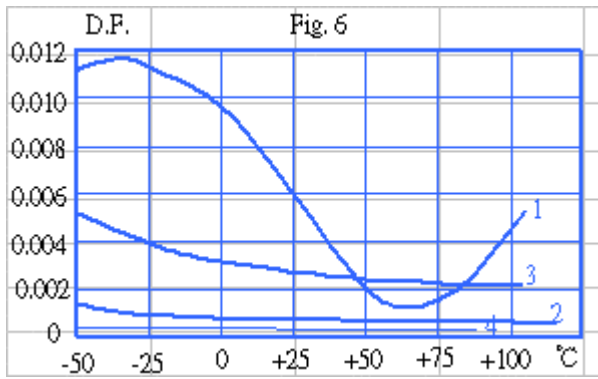
#### TEMPERATURE CHARACTERISTICS



#### SOLDERING TEMPERATURE VS TIME







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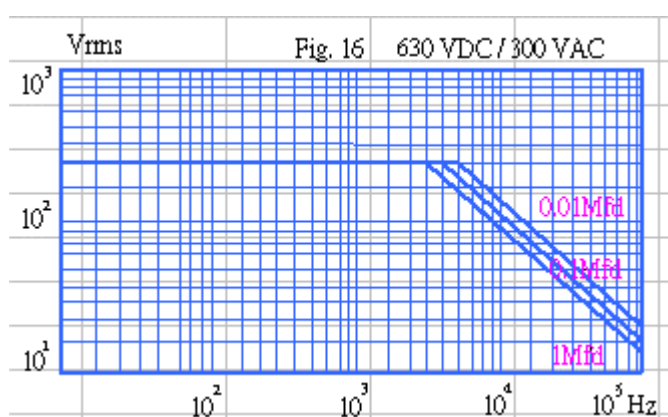
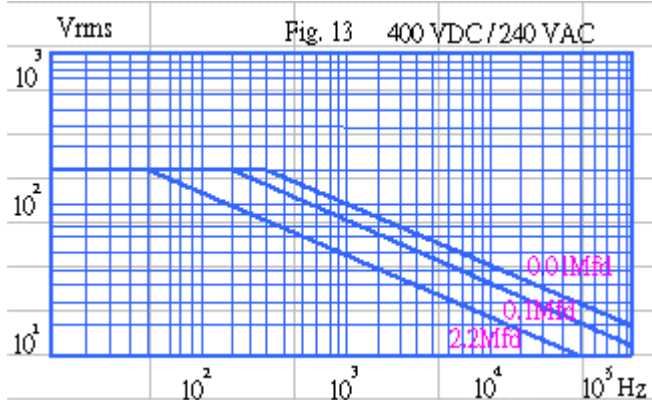
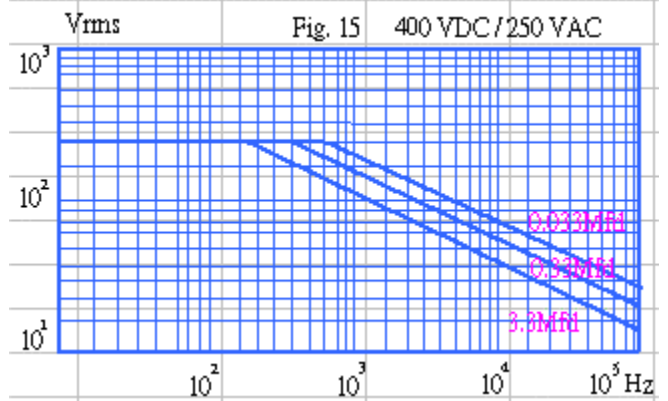
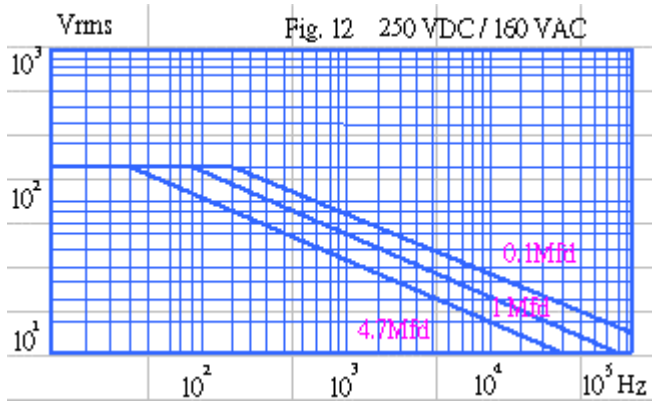
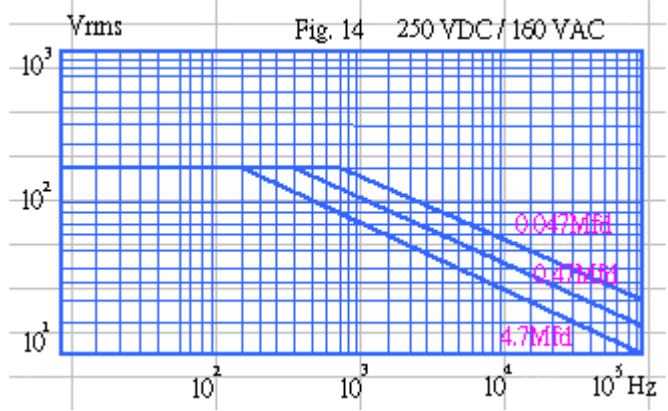
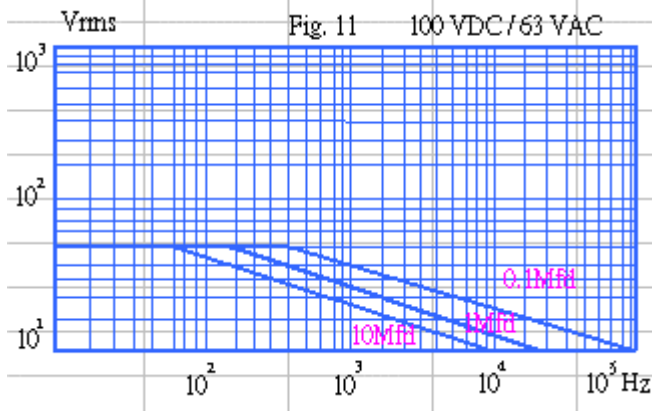
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## BREL CAPACITOR REFERENCE DATA-7

### AC RATED VOLTAGE-FREQUENCY DERATING CHARACTERISTICS

\*Fig. 11 to 13:Polyester dielectric.

\*Fig. 14 to 16:Polypropylene dielectric.

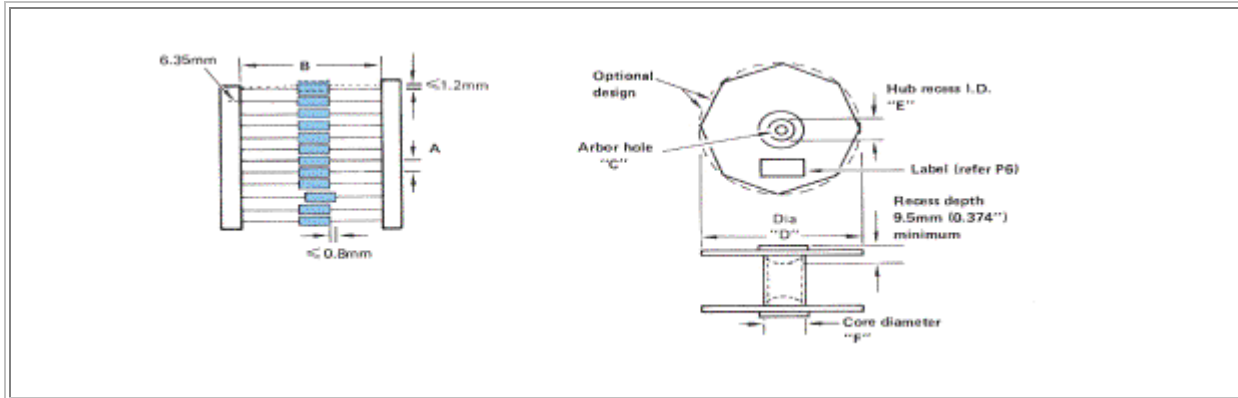


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**BREL CAPACITOR REFERENCE DATA-8**  
**TAPE & REEL OF AXIAL LEAD CAPACITORS FOR AUTOMATIC**  
**INSERTION EIA STANDARD RS-296-D**



CAPACITOR BODY DIAMETER	CAPACITOR PITCH "A" $\pm 0.5mm(0.020")$
$\varnothing 5 \text{ mm ( } \varnothing 0.197" \text{ )}$	5 mm or 0.200"
5.01-10 mm ( 0.197-0.394" )	10 mm or 0.400"
10.01-15 mm ( 0.394-0.591" )	15 mm or 0.600"

CAPACITOR BODY LENGTH	INSIDE TAPE SPACING "B" $\pm 1.5mm(0.059")$
$\varnothing 16.50 \text{ mm ( } \varnothing 0.65" \text{ )}$	52.4 mm or 2.062"
16.51-28.45 mm ( 0.651-1.12" )	63.5 mm or 2.500"
28.46-37.00 mm ( 1.121-1.45" )	73.0 mm or 2.874"

	C	D	E	F
EIA Std.	13.9-38.1mm	76.2-355.6mm	28.6-78.0mm	34.5-92.0mm
	( 0.547-1.50" )	( 3.0-14.0" )	(1.126-3.071")	(1.374-3.626")
Farad Spec.	16.0mm(0.63")	355.0mm(13.97")	50.0mm(1.97")	60.0mm(2.36")

Capacitor Body Dia.	Pitch	Quantity Pcs / reel
$\varnothing 5.0 \text{ mm}$	5 mm	4,000 max.
5.1-7.0 mm	10 mm	2,000 max.
7.1-9.5 mm	10 mm	1,000 max.