

ROYALOHM

CONFIDENTIAL DOCUMENT

SPECIFICATION FOR APPROVAL

MARITEX PHP Sp.

Description : Carbon Film Fixed Resistors

Royalohm Part no.:

<u>Normal Size</u>	CFR0W8xxxxxA50	(CR 1/8W +/- 1%, +/- 5% Series)
	CFR0W4xxxxxA50	(CR 1/4W +/- 1%, +/- 5% Series)
	CFR0W2xxxxxA10	(CR 1/2W +/- 1%, +/- 5% Series)
	CFR01WxxxxxA19	(CR 1W +/- 1%, +/- 5% Series)
	CFR02WxxxxxAA9	(CR 2W +/- 1%, +/- 5% Series)
<u>Small Size</u>	CFR0S4xxxxxA50	(CR 1/4W-S +/- 1%, +/- 5% Series)
	CFR0S2xxxxxA40	(CR 1/2W-S +/- 1%, +/- 5% Series)
	CFR01SxxxxxA10	(CR 1W-S +/- 1%, +/- 5% Series)
	CFR02SxxxxxA19	(CR 2W-S +/- 1%, +/- 5% Series)
	CFR03SxxxxxAA9	(CR 3W-S +/- 1%, +/- 5% Series)
<u>Extra Small Size</u>	CFRFU2xxxxxA50	(CR 1/2W-SS +/- 1%, +/- 5% Series)
	CFRF1UxxxxxA10	(CR 1W-SS +/- 1%, +/- 5% Series)

Approved by

RoHS V3 Compliant (EU) 2015/863
REACH Compliant

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Carbon Film Fixed Resistors

1. Scope:

This specification for approval relates to Carbon Film Fixed Resistors manufactured by ROYALOHM 's specifications.

2. Type designation:

The type designation shall be in the following form :

(Ex.)	<u>CFR</u>	<u>1/4W-S</u>	<u>F, J</u>	<u>1Ω</u>
	Type	Power Rating	Resistance Tolerance	Nominal Resistance

3. Ratings:

Ratings shall be shown in the table 1.

Table 1

Type		Rated Power at 70°C	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Resistance Range	Operating Temp. Range
Normal size	CFR-12	1/8W (0.125W)	200 V	400 V	400 V	1Ω ~ 10MΩ	-55°C -- +155°C
	CFR-25	1/4W (0.25W)	250 V	500 V	500 V		
	CFR-50	1/2W (0.50W)	350 V	700 V	700 V		
	CFR-100	1W	500 V	1,000 V	1,000 V		
	CFR-200	2W					
Small size	CFR-25-S	1/4W (0.25W)	200 V	400 V	400 V		
	CFR-50-S	1/2W (0.50W)	350 V	700 V	700 V		
	CFR-100-S	1W	500 V	1,000 V	1,000 V		
	CFR-200-S	2W					
	CFR-300-S	3W					
Extra small size	CFR-50-SS	1/2W (0.50W)	250 V	500 V	250 V		
	CFR-100-SS	1W	350 V	700 V	350 V		

3.1 Power rating:

Resistors shall have a power rating based on continuous full load operation at an ambient temperature of 70 °C. For temperature in excess of 70 °C , the load shall be derated as shown in the figure 1.

3.2 Voltage rating:

Resistors shall have a rated direct-current (DC) continuous working voltage or an approximate sine-wave root-mean-square (RMS) alternating-current (AC) continuous working voltage at commercial-line frequency and waveform corresponding to the power rating , as determined from the following formula :

$$RCWV = \sqrt{P \times R}$$

Note : Max. Working Voltage or $\sqrt{P \times R}$ whichever is lesser

Max. Overload Voltage or $2.5 \sqrt{P \times R}$ whichever is lesser

Were : RCWV = Rated DC or RMS AC continuous working voltage at commercial-line frequency and waveform (volt)

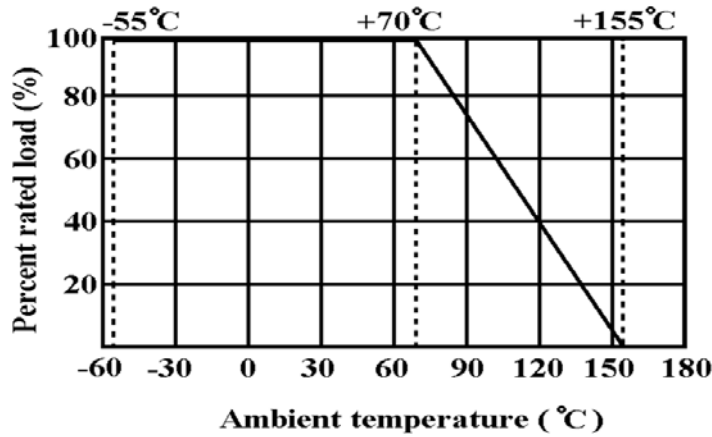
P = Power Rating (watt)

R = Nominal Resistance (ohm)

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In no case shall the rated DC or RMS AC continuous working voltage be greater than the applicable maximum value.

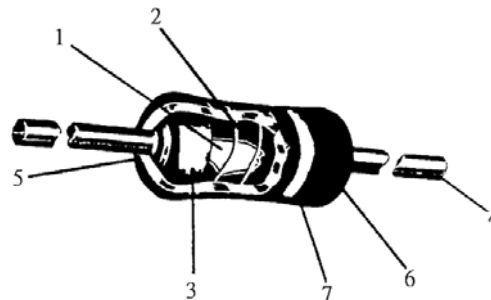
Figure 1.



3.3 Nominal resistance :

Effective figures of nominal resistance shall be in accordance with E-96,E-24 series, and resistance tolerance shall be shown by table 1.

4. Construction :



No.	Name	Material
1	Basic Body	Rod Type Ceramics
2	Resistance Film	Carbon Film
3	End Cap	Steel (Tin plated iron surface)
4	Lead Wire	Annealed copper wire coated with tin
5	Joint	By welding
6	Coating	Normal type: --Insulated resin (Color : Beige) Non-Flame type: --Insulated & Non-Flame paint (Color : Gray & Green mixed) meeting U L 94 V O standard
7	Color Code	Normal type: --Epoxy Resin Non-Flame type: --Non-Flame epoxy resin

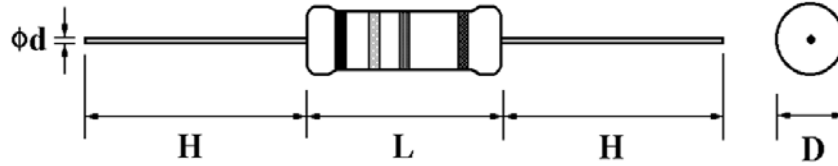
Carbon Film Fixed Resistors		
5. Characteristics :		
Characteristics	Limits	Test Methods (JIS C 5201-1)
DC. resistance	Must be within the specified tolerance.	The limit of error of measuring apparatus shall not exceed allowable range or resistance tolerance of specification. (Sub-clause 4.5)
Insulation resistance	Insulation resistance is 10,000 MΩ Min	Resistors shall be clamped in the trough of a 90° metallic V-block or foil method use a metal foil shall be wrapped closely around the body of the resistor. After that shall be tested at DC potential respectively specified in the above list for 60 +10/-0 secs. (Sub-clause 4.6)
Dielectric withstanding voltage	No evidence of flashover mechanical damage, arcing or insulation break down	Resistors shall be clamped in the trough of a 90° metallic V-block or foil method use a metal foil shall be wrapped closely around the body of the resistor. After that shall be tested at AC potential respectively specified in the table 1. for 60 +10/-0 secs. (Sub-clause 4.7)
Temperature coefficient	Resis.Range	T.C.R. (PPM/°C)
	$\leq 10 \Omega$ $11\Omega \sim 99k\Omega$ $100k\Omega \sim 1M\Omega$ $1.1M\Omega \sim 10M\Omega$	
<p>Natural resistance change per temp. degree centigrade.</p> $\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \quad (\text{PPM}/^\circ\text{C})$ <p>R1: Resistance value at room temperature (t1) R2: Resistance value at room temp.plus 100°C (t2) (Sub-clause 4.8)</p>		
Short time overload	Resistance change rate is $\pm (1.0 \% + 0.05\Omega)$ Max. with no evidence of mechanical damage	Permanent resistance change after the application of a potential of 2.5 times RCWV for 5 seconds. (Sub-clause 4.13)
Terminal strength	No evidence of mechanical damage.	<p>Direct load : Resistance to a 2.5 kgs direct load for 10 secs. in the direction of the longitudinal axis of the terminal leads.</p> <p>Twist test : Terminal leads shall be bent through 90 ° at a point of about 6mm from the body of the resistor and shall be rotated through 360° about the original axis of the bent terminal in (Sub-clause 4.16)</p>

Carbon Film Fixed Resistors																		
Characteristics	Limits		Test Methods (JIS C 5201-1)															
Solderability	95 % coverage Min.		The area covered with a new , smooth clean , shiny and continuous surface free from concentrated pinholes. Test temp. of solder : 245°C ± 3°C Dwell time in solder : 2 ~ 3 seconds (Sub-clause 4.17)															
Soldering temp. reference	Electrical characteristics shall be satisfied. Without distinct deformation in appearance. (95 % coverage Min.)		The leads immersed into solder bath to 3.2 to 4.8 mm. from the body. Permanent resistance change shall be checked. <u>Wave soldering condition: (2 cycles Max.)</u> Pre-heat : 100 ~ 120 °C, 30 ± 5 sec. Suggestion solder temp.: 235 ~ 255 °C, 10 sec. (Max.) Peak temp.: 260 °C <u>Hand soldering condition:</u> Hand Soldering bit temp. : 380 ± 10 °C Dwell time in solder : 3 +1/-0 sec.															
Resistance to soldering heat	Resistance change rate is ± (1.0% + 0.05Ω) Max. with no evidence of mechanical damage.		Permanent resistance change when leads immersed to 3.2 to 4.8 mm from the body in 350°C ± 10 °C solder for 3 ± 0.5 seconds (Sub-clause 4.18)															
Temperature cycling	Resistance change rate is ± (1.0% + 0.05Ω) Max. with no evidence of mechanical damage.		Resistance change after continuous 100 cycles for duty shown below:															
			<table border="1"> <thead> <tr> <th>Step</th> <th>Temperature</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-55°C ±3°C</td> <td>30 mins</td> </tr> <tr> <td>2</td> <td>Room temp.</td> <td>10~15 mins</td> </tr> <tr> <td>3</td> <td>+155°C ±2°C</td> <td>30 mins</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>10~15 mins</td> </tr> </tbody> </table>	Step	Temperature	Time	1	-55°C ±3°C	30 mins	2	Room temp.	10~15 mins	3	+155°C ±2°C	30 mins	4	Room temp.	10~15 mins
			Step	Temperature	Time													
			1	-55°C ±3°C	30 mins													
			2	Room temp.	10~15 mins													
3	+155°C ±2°C	30 mins																
4	Room temp.	10~15 mins																
(Sub-clause 4.19)																		
Vibration																		
Resistance change rate is ± (1.0% + 0.05Ω) Max.		55Hz, 3 planes 2hrs each Total amplitude = 1.5mm (Sub-clause 4.22)																
Load life in humidity	Resistance value ΔR/R		Resistance change after 1,000 hours operating at RCWV with duty cycle of (1.5 hours "on", 0.5 hour "off") in a humidity test chamber controlled at 40 °C ± 2 °C and 90 to 95 % relative humidity (Sub-clause 4.24.2.1)															
	Normal Type	< 100kΩ		± 3 %														
		≥ 100kΩ		± 5 %														
	Non-Flame type	< 100kΩ		± 5 %														
≥ 100kΩ		± 10 %																
Load life			Permanent resistance change after cycle of (1.5 hours "on", 0.5 hour "off") at 70°C ± 2°C ambient (Sub-clause 4.25.1)															
	Normal Type	< 56kΩ		± 2 %														
		≥ 56kΩ		± 3 %														
	Non-Flame type	< 100kΩ		± 5 %														
≥ 100kΩ		± 10 %																
Resistance to solvent	No deterioration of protective coatings and markings		Specimens shall be immersed in a bath of Isopropyl alcohol completely for 3 minutes with ultrasonic (Sub-clause 4.30)															

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6. Dimension :

Unit : mm



Normal size						
Part No.	Style	Power Rating at 70 °C	Dimension (mm)			
			D (Max.)	L (Max.)	d ± 0.05	H ± 3
CFR0W8	CFR-12	1/8W (0.125W)	1.85	3.5	0.45	28
CFR0W4	CFR-25	1/4W (0.25W)	2.5	6.8	0.54	28
CFR0W2	CFR-50	1/2W (0.50W)	3.5	10.0	0.54	28
CFR01W	CFR-100	1W	5.5	16.0	0.70	28
CFR02W	CFR-200	2W	6.5	17.5	0.75	28

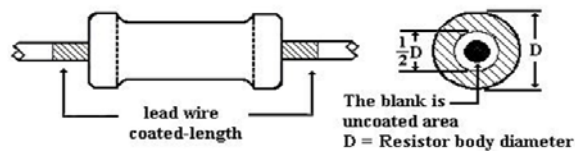
Small size						
Part No.	Style	Power Rating at 70 °C	Dimension (mm)			
			D (Max.)	L (Max.)	d ± 0.05	H ± 3
CFR0S4	CFR-25-S	1/4W (0.25W)	1.85	3.5	0.45	28
CFR0S2	CFR-50-S	1/2W (0.50W)	3.0	9.0	0.54	28
CFR01S	CFR-100-S	1W	5.0	12.0	0.70	25
CFR02S	CFR-200-S	2W	5.5	16.0	0.70	28
CFR03S	CFR-300-S	3W	6.5	17.5	0.75	28

Extra small size						
Part No.	Style	Power Rating at 70 °C	Dimension (mm)			
			D (Max.)	L (Max.)	d ± 0.05	H ± 3
CFRFU2	CFR-50-SS	1/2W (0.50W)	2.5	6.8	0.54	28
CFRF1U	CFR-100-SS	1W	3.5	10.0	0.54	28

Painting method:

Welding point, terminal and lead wire, is permissible to be exposed without the outer coated cover.

The extent should be within 1/2 of the arc angle.



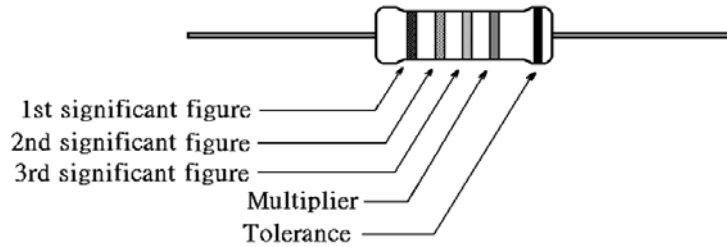
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7. Marking :

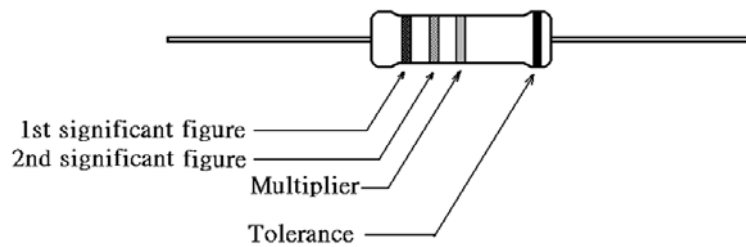
7.1 Resistor :

Resistors shall be marked with color coding
 colors shall be in accordance with JIS C 0802

* For 1%



* For 5%



7.2 Label :

Label shall be marked with following items:

- (1) Type and style
- (2) Nominal resistance
- (3) Resistance tolerance
- (4) Quantity
- (5) Lot number
- (6) PPM

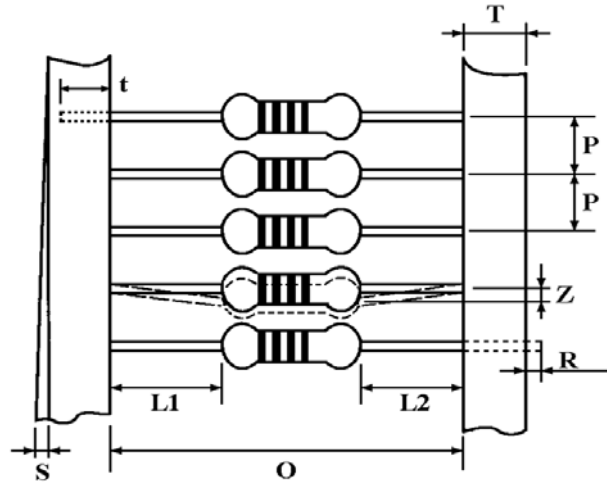
Example :

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Watt :	1/4W-S	Val :	1R
Q'TY :	5,000	Tol :	5%
LOT :		PPM :	350
	ROYALOHM		Pb Free

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8. Packing specification :

8.1 Taping dimension :



Dimensions (mm)

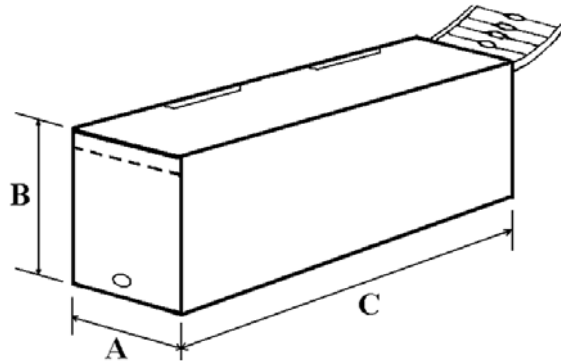
Normal size										
Part No.	Style	Style	O	P	L1-L2	T	Z	R	t	S
CFR0W8	CFR-12	PT-52	52 ± 1	5 ± 0.3	1 Max.	6 ± 1	1 Max.	0	4 ± 1	0.5 Max.
CFR0W4	CFR-25	PT-52	52 ± 1	5 ± 0.3	1 Max.	6 ± 1	1 Max.	0	4 ± 1	0.5 Max.
CFR0W2	CFR-50	PT-52	52 ± 1	5 ± 0.3	1 Max.	6 ± 1	1 Max.	0	4 ± 1	0.5 Max.
CFR01W	CFR-100	PT-64	64 ± 1	10 ± 0.5	1 Max.	6 ± 1	1 Max.	0	5 ± 1	0.5 Max.
CFR02W	CFR-200	PT-64	64 ± 1	10 ± 0.5	1 Max.	6 ± 1	1 Max.	0	5 ± 1	0.5 Max.

Small size										
Part No.	Style	Style	O	P	L1-L2	T	Z	R	t	S
CFR0S4	CFR-25-S	PT-52	52 ± 1	5 ± 0.3	1 Max.	6 ± 1	1 Max.	0	4 ± 1	0.5 Max.
CFR0S2	CFR-50-S	PT-52	52 ± 1	5 ± 0.3	1 Max.	6 ± 1	1 Max.	0	4 ± 1	0.5 Max.
CFR01S	CFR-100-S	PT-52	52 ± 1	5 ± 0.3	1 Max.	6 ± 1	1 Max.	0	4 ± 1	0.5 Max.
CFR02S	CFR-200-S	PT-64	64 ± 1	10 ± 0.5	1 Max.	6 ± 1	1 Max.	0	5 ± 1	0.5 Max.
CFR03S	CFR-300-S	PT-64	64 ± 1	10 ± 0.5	1 Max.	6 ± 1	1 Max.	0	5 ± 1	0.5 Max.

Extra small size										
Part No.	Style	Style	O	P	L1-L2	T	Z	R	t	S
CFRFU2	CFR-50-SS	PT-52	52 ± 1	5 ± 0.3	1 Max.	6 ± 1	1 Max.	0	4 ± 1	0.5 Max.
CFRF1U	CFR-100-SS	PT-52	52 ± 1	5 ± 0.3	1 Max.	6 ± 1	1 Max.	0	4 ± 1	0.5 Max.

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8.2 Tape in box packing :



Bandoliers may also be contained in a cardboard box ("Ammopack")

Dimension (mm)

Normal size						
Part No.	Style	Style	L (C) ±5	W (A) ±5	H (B) ±5	Quantity Per Box (pcs.)
CFR0W8	CFR-12	PT-52	250	75	66	5,000
CFR0W4	CFR-25	PT-52	250	75	96	5,000
CFR0W2	CFR-50	PT-52	255	75	43	1,000
CFR01W	CFR-100	PT-64	260	94	87	1,000
CFR02W	CFR-200	PT-64	262	96	69	500

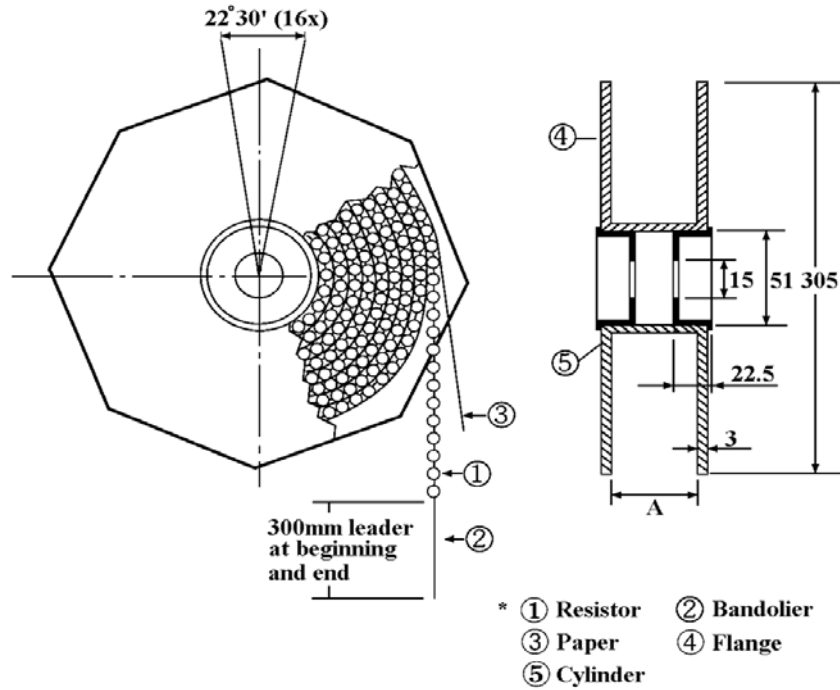
Small size						
Part No.	Style	Style	L (C) ±5	W (A) ±5	H (B) ±5	Quantity Per Box (pcs.)
CFR0S4	CFR-25-S	PT-52	250	75	66	5,000
CFR0S2	CFR-50-S	PT-52	250	75	96	4,000
CFR01S	CFR-100-S	PT-52	255	79	73	1,000
CFR02S	CFR-200-S	PT-64	260	94	87	1,000
CFR03S	CFR-300-S	PT-64	262	96	69	500

Extra small size						
Part No.	Style	Style	L (C) ±5	W (A) ±5	H (B) ±5	Quantity Per Box (pcs.)
CFRFU2	CFR-50-SS	PT-52	250	75	96	5,000
CFRF1U	CFR-100-SS	PT-52	260	75	31	1,000

"Ammopack" is an abbreviation of "ammunition pack"

Carbon Film Fixed Resistors

8.3 Tape on reel packing :

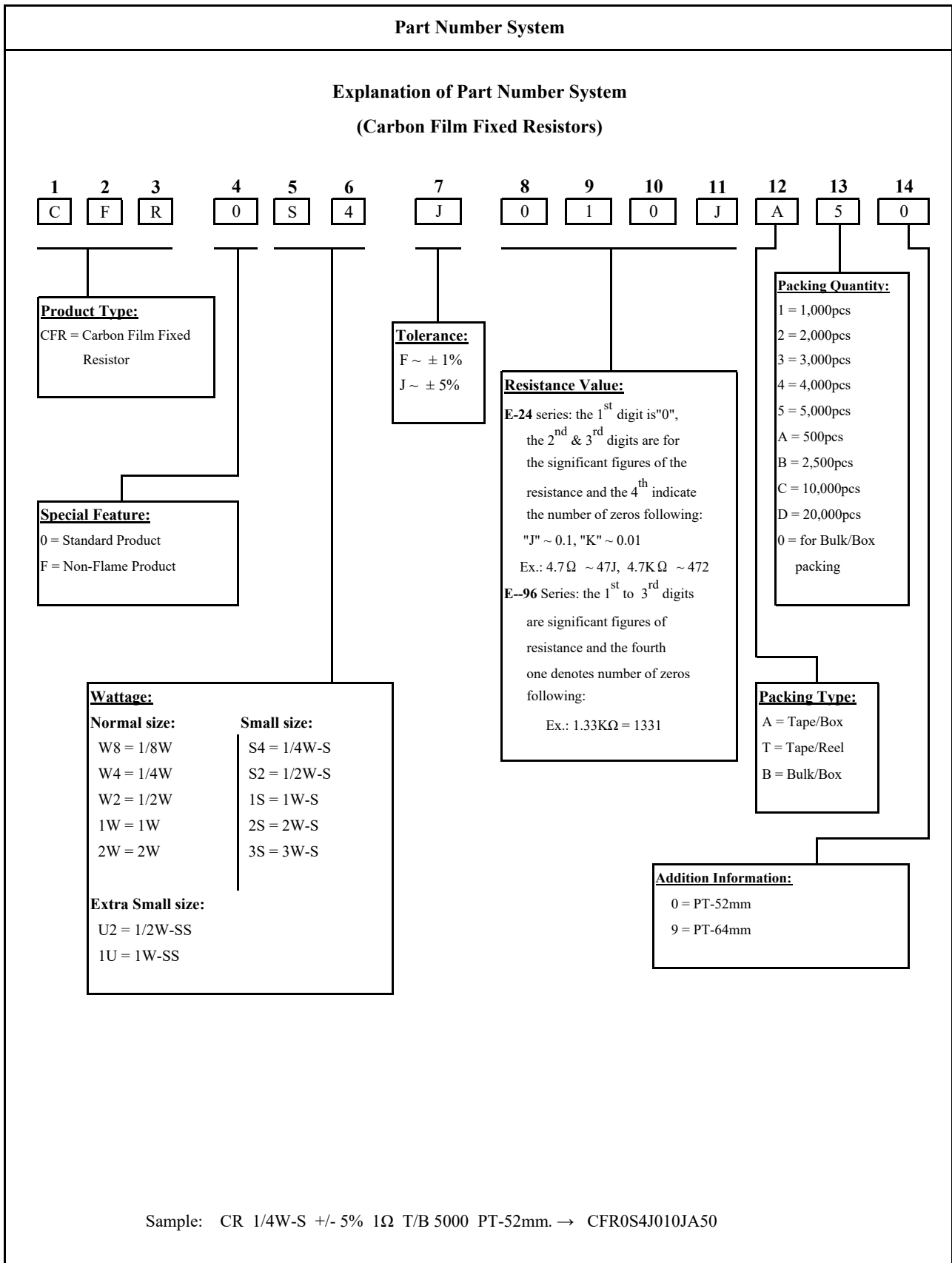


Dimension (mm) :

Normal size				
Part No.	Type	Style	Across Flange (A)	Quantity Per Reel
CFR0W8	CFR-12	PT-52	73 ± 2	5,000
CFR0W4	CFR-25	PT-52	73 ± 2	5,000
CFR0W2	CFR-50	PT-52	73 ± 2	2,500
CFR01W	CFR-100	PT-64	81 ± 5	1,000
CFR02W	CFR-200	PT-64	81 ± 5	500

Small size				
Part No.	Type	Style	Across Flange (A)	Quantity Per Reel
CFR0S4	CFR-25-S	PT-52	73 ± 2	5,000
CFR0S2	CFR-50-S	PT-52	73 ± 2	5,000
CFR01S	CFR-100-S	PT-52	73 ± 2	2,500
CFR02S	CFR-200-S	PT-64	81 ± 5	1,000
CFR03S	CFR-300-S	PT-64	81 ± 5	500

Extra small size				
Part No.	Type	Style	Across Flange (A)	Quantity Per Reel
CFRFU2	CFR-50-SS	PT-52	73 ± 2	5,000
CFRF1U	CFR-100-SS	PT-52	73 ± 2	2,500



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Environment Related Substance

This product complies to EU RoHS directive, EU PAHs directive, EU PFOS directive and Halogen free.

Ozone layer depleting substances.

Ozone depleting substances are not used in our manufacturing process of this product.

This product is not manufactured using Chloro fluorocarbons (CFCs), Hydrochlorofluorocarbons (HCFCs), Hydrobromofluorocarbons (HBFCs) or other ozone depleting substances in any phase of the manufacturing process.

Storage Condition (MSL1)

The performance of these products, including the solderability, is guaranteed for a year from the date of arrival at your company, provided that they remain packed as they were when delivered and stored at a temperature of $25^{\circ}\text{C} \pm 10^{\circ}\text{C}$ and a relative humidity of $60\%\text{RH} \pm 10\%\text{RH}$, chemical and dust free atmosphere

Even within the above guarantee periods, do not store these products in the following conditions.

Otherwise, their electrical performance and/or solderability may be deteriorated, and the packaging materials (e.g. taping materials) may be deformed or deteriorated, resulting in mounting failures.

1. In salty air or in air with a high concentration of corrosive gas, such as Cl_2 , H_2S , NH_3 , SO_2 , or NO_2
2. In direct sunlight

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Legal Disclaimer

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Regardless of the application of ROYALOHM products, it is recommended to carry out safety tests while using measures such as protective circuits and redundant circuits to protect the safety of equipment.