

### Coated Type Kit Resistors (MFR)

1. Scope:

This specification for approval relates to Coated Type Kit Resistors (MFR) manufactured by ROYALOHM 's specifications.

2. Type designation:

The type designation shall be in the following form :

(Ex.)	MF	0.6W-S	F	1kΩ
	Type	Power Rating	Resistance Tolerance	Nominal Resistance

3. Ratings:

Ratings shall be shown in the table 1.

Table 1

Type	MF
Rated Power	0.6W at 70°C
Max. Working Voltage	250 V
Max. Overload Voltage	500 V
Dielectric Withstanding Voltage	500 V
Rated Ambient Temp.	70 °C
Operating Temp. Range	-55°C --- +155°C
Resistance Tolerance	± 1%
Resistance Range	10Ω ~ 1MΩ

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)

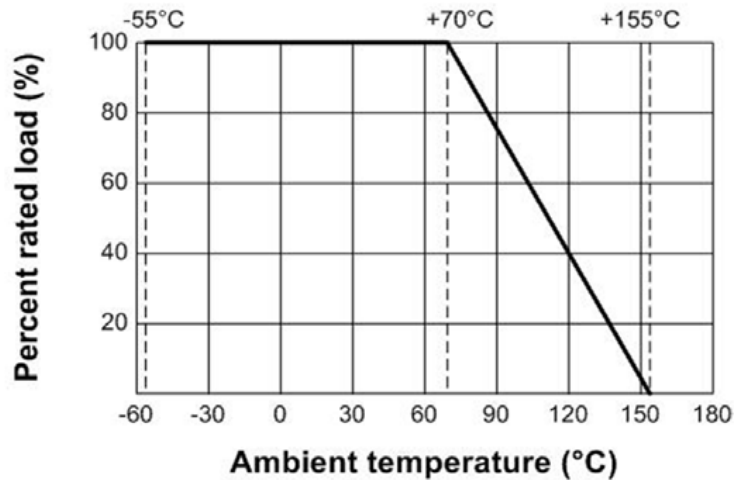
P = Power Rating (watt)

R = Nominal Resistance (ohm)

### Coated Type Kit Resistors (MFR)

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

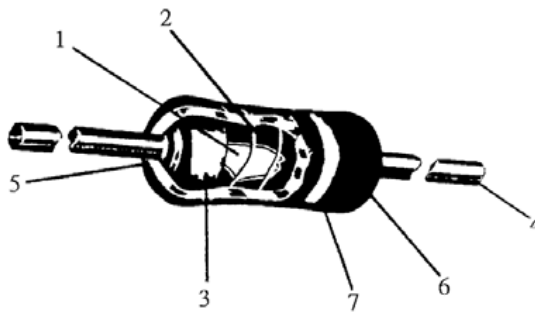
Figure 1.



3.3 Nominal resistance :

Effective figures of nominal resistance shall be in accordance with E-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	Metal Film
3	End Cap	Steel (Tin plated iron surface)
4	Lead Wire	Annealed copper wire coated with tin
5	Joint	By Welding
6	Coating	Insulated epoxy resin ( Color : Apple Green )
7	Color Code	Epoxy Resin

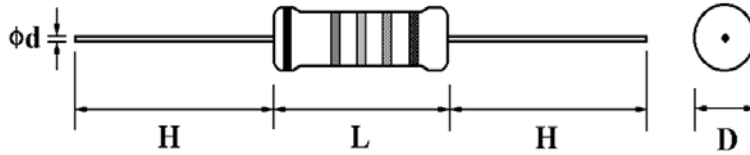
Coated Type Kit Resistors (MFR)		
5. Characteristics :		
Characteristics	Limits	Test Methods ( JIS C 5201-1 )
DC. resistance	Must be within the specified tolerance	The limit of error of measuring apparatus shall not exceed allowable range or 1% of resistance tolerance (Sub-clause 4.5)
Insulation resistance	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	Within the temperature coefficient specified below : ± 50 PPM/°C Max.	Natural resistance change per temp. degree centigrade $\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \quad (\text{PPM}/^\circ\text{C})$ R1: Resistance value at room temperature (t1) R2: Resistance value at room temp. plus 100 °C ( t2) (Sub-clause 4.8)
Short time overload	Resistance change rate is ± (0.5% + 0.05Ω) 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	<b>Direct load :</b> Resistance to a 2.5 kgs direct load for 10 secs. in the direction of the longitudinal axis of the terminal leads <b>Twist test :</b> 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 alternating direction for a total of 3 rotations (Sub-clause 4.16)
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)

Coated Type Kit Resistors (MFR)																	
Characteristics	Limits	Test Methods ( JIS C 5201-1 )															
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% + 0.05Ω) 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% + 0.05Ω) 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% + 0.05Ω) Max.	55Hz, 3 planes 2hrs each Total amplitude = 1.5mm (Sub-clause 4.22)															
Load life in humidity	<table border="1"> <thead> <tr> <th>Resistance value</th> <th>Δ R/R</th> </tr> </thead> <tbody> <tr> <td>Normal type</td> <td>± 1.5 %</td> </tr> </tbody> </table>	Resistance value	Δ R/R	Normal type	± 1.5 %	Resistance change after 1,000 hours (1.5 hours "on", 0.5 hour "off") at RCWV in a humidity test chamber controlled at 40 °C ± 2 °C and 90 to 95 % relative humidity (Sub-clause 4.24.2.1)											
	Resistance value	Δ R/R															
	Normal type	± 1.5 %															
<table border="1"> <thead> <tr> <th>Resistance value</th> <th>Δ R/R</th> </tr> </thead> <tbody> <tr> <td>Normal type</td> <td>± 1.5 %</td> </tr> </tbody> </table>	Resistance value	Δ R/R	Normal type	± 1.5 %	7.10 Permanent resistance change after 1,000 hours operating at RCWV with duty cycle of (1.5 hours "on", 0.5 hour "off") at 70°C ± 2°C ambient (Sub-clause 4.25.1)												
Resistance value	Δ R/R																
Normal type	± 1.5 %																
Resistance to solvent	No deterioration of protective coatings and markings	Specimens shall be immersed in a bath of trichroethane completely for 3 minutes with ultrasonic (Sub-clause 4.30)															
Pulse overload	Resistance change rate is ± (1% + 0.05Ω) Max. with no evidence of mechanical damage	Resistance change after 10,000 cycles (1 sec. "on" , 25 secs. "off" ) at 4 times RCWV (Sub-clause 5.8)															

### Coated Type Kit Resistors (MFR)

6. Dimension :

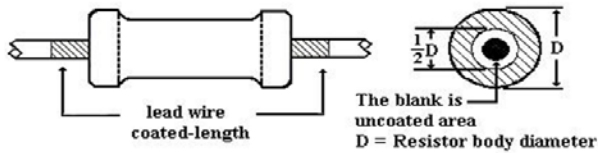
Unit : mm



Type	Power Rating	D (Max.)	L (Max.)	d ± 0.05	H ± 3
MF	0.6W-S	2.5 mm	6.8 mm	0.54 mm	28 mm

Painting method:

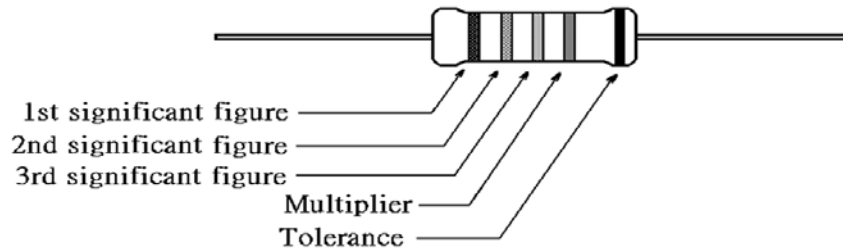
Welding point, terminal and lead wire, is permissible to be exposed without the outer coated cover. The extent should be within 1/2 of the arc angle.



7. Marking :

7.1 Resistor :

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

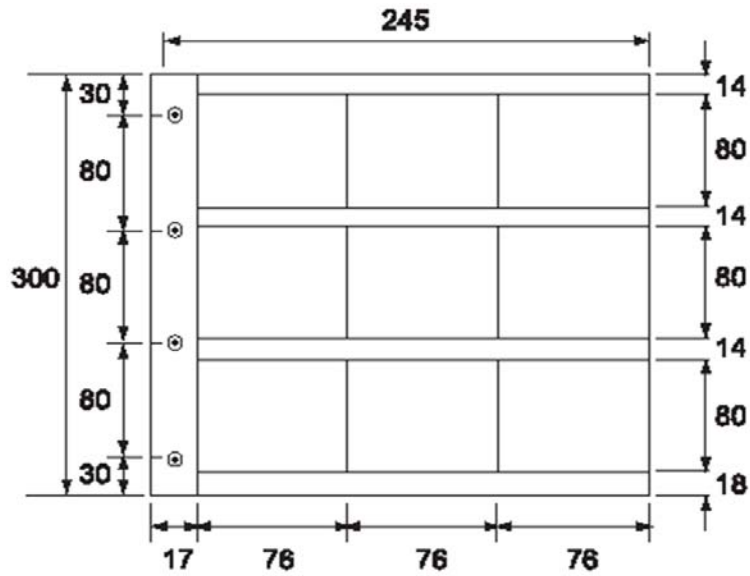


**Coated Type Kit Resistors (MFR)**

8. Kit resistors :

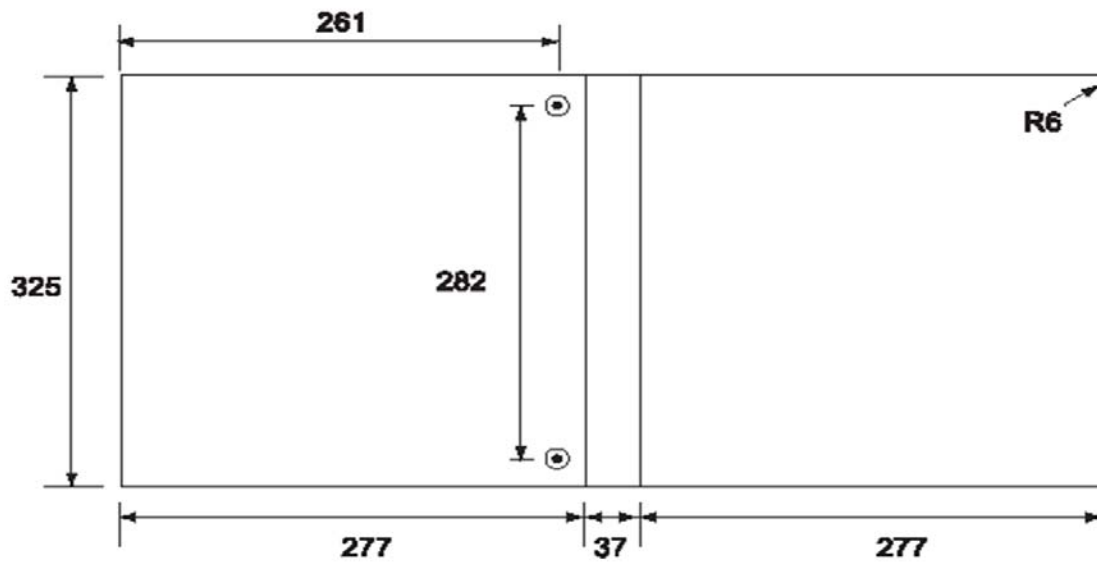
8.1 Insert for Coated Kit

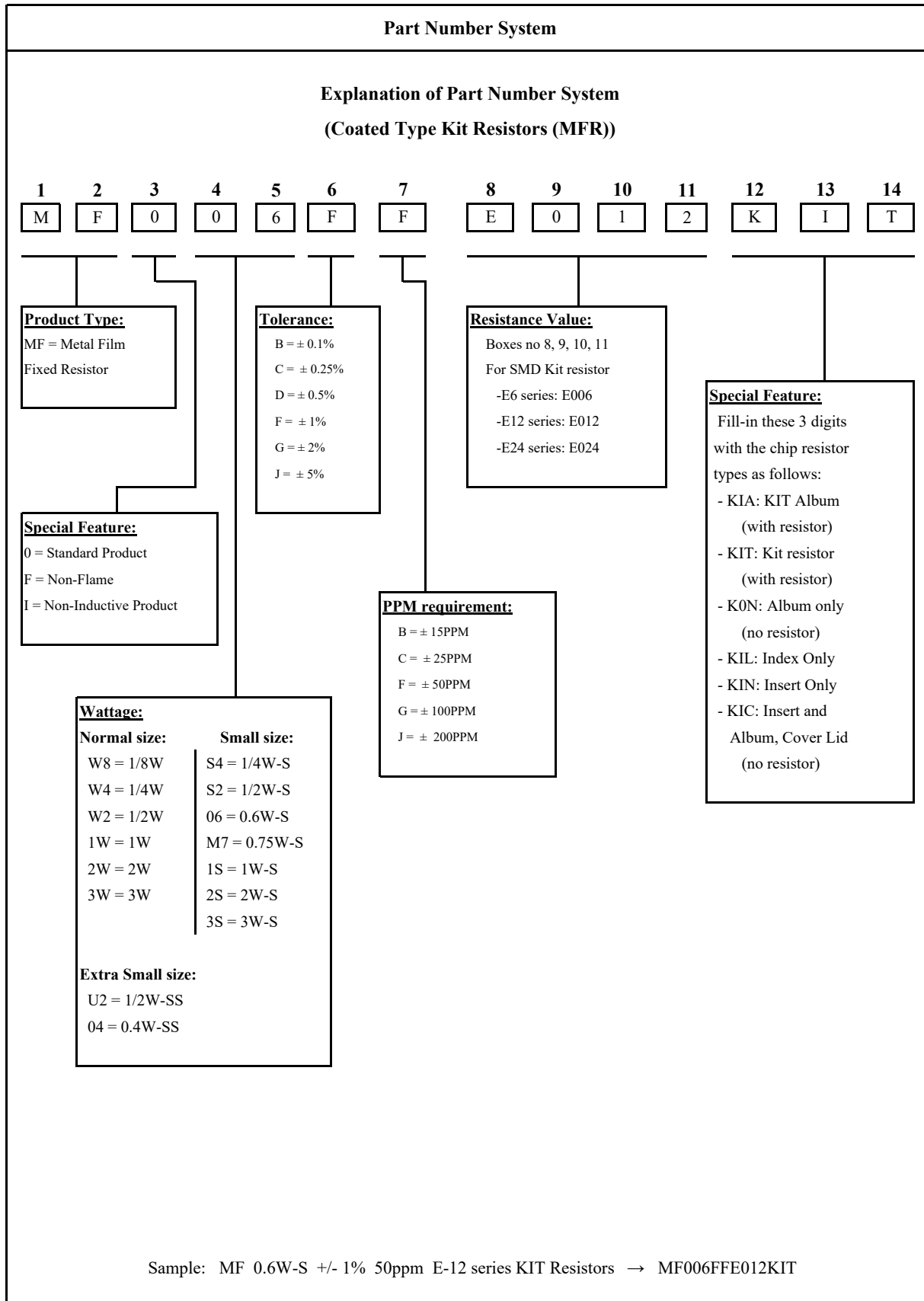
Dimension (mm)



8.2 Album for Coated Kit

Dimension (mm)





Sample: MF 0.6W-S +/- 1% 50ppm E-12 series KIT Resistors → MF006FFE012KIT

## Coated Type Kit Resistors (MFR)

### 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  $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$  and a relative humidity of  $60\%\text{RH} \pm 10\%\text{RH}$

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  $\text{Cl}_2$ ,  $\text{H}_2\text{S}$ ,  $\text{NH}_3$ ,  $\text{SO}_2$ , or  $\text{NO}_2$
2. In direct sunlight



**Coated Type Kit Resistors (MFR)**

**PRODUCT: MF 0.6W-S 1% (2.5x6.8) E-12 Series (61 Values)**

**(With resistor 20 pcs. per value)**

**Total Qty : 1,220pcs.**

NO.	Value
1	10R
2	12R
3	15R
4	18R
5	22R
6	27R
7	33R
8	39R
9	47R
10	56R
11	68R
12	82R
13	100R
14	120R
15	150R
16	180R
17	220R
18	270R
19	330R
20	390R

NO.	Value
21	470R
22	560R
23	680R
24	820R
25	1K
26	1K2
27	1K5
28	1K8
29	2K2
30	2K7
31	3K3
32	3K9
33	4K7
34	5K6
35	6K8
36	8K2
37	10K
38	12K
39	15K
40	18K

NO.	Value
41	22K
42	27K
43	33K
44	39K
45	47K
46	56K
47	68K
48	82K
49	100K
50	120K
51	150K
52	180K
53	220K
54	270K
55	330K
56	390K
57	470K
58	560K
59	680K
60	820K

NO.	Value
61	1M

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