

DATA SHEET

Product Name Carbon Film Fixed Resistors

Part Name CFR/CPR Series

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Brands *RoyalOhm* *UniOhm*



1. Scope

- 1.1 This specification for approve relates to the Carbon Film Fixed Resistors manufactured by UNI-ROYAL.
 1.2 High quality performance ; Great economy.
 1.3 Flame Retardant available ; Automatically insertable .

2. Part No. System

The standard Part No. includes 14 digits with the following explanation:

2.1 1th ~4th digits

This is to indicate the Chip Resistor. Example: CFR0= Carbon Film Fixed Resistors ;CPR0= Carbon Film Power Resistors

2.2 5th~6th digits:

2.2.1 This is to indicate the wattage or power rating. To dieting the size and the numbers,

The following codes are used; and please refer to the following chart for detail:

W=Normal Size; 1"~"G"to denote"1"~"16"as Hexadecimal:

1/16W~1W: (<1W)

| Wattage | 1/2 | 1/3 | 1/4 | 1/5 | 1/6 | 1/8 | 1/10 | 1/16 |
|------------------|-----|-----|-----|-----|-----|-----|------|------|
| Normal Size | W2 | W3 | W4 | W5 | W6 | W8 | WA | WG |
| Small Size | S2 | S3 | S4 | S5 | S6 | S8 | SA | SG |
| Extra Small Size | U2 | U3 | U4 | U5 | U6 | U8 | UA | UG |

1W~16W (≥1W)

| Wattage | 1 | 2 | 3 | 5 | 7 | 8 | 9 | 10 | 15 |
|------------------|----|----|----|----|----|----|----|----|----|
| Normal Size | 1W | 2W | 3W | 5W | 7W | 8W | 9W | AW | FW |
| Small Size | 1S | 2S | 3S | 5S | 7S | 8S | 9S | AS | FS |
| Extra Small Size | 1U | 2U | 3U | 5U | 7U | 8U | 9U | AU | FU |

2.2.2 For power rating less or equal to 1 watt, the 5th digit will be the letters W to represent the size required & the 6th digit will be a number or a letter code. Example: WA=1/10W; W4=1/4W

2.2 The 7th digit is to denote the Resistance Tolerance. The following letter code is to be used for indicating the standard Resistance Tolerance. D=±0.5% F=±1% G=±2% J=±5% K= ±10%

2.3 The 8th to 11th digits is to denote the Resistance Value.

2.4.1 For the standard resistance values of 5%&10% series, the 8th digit is "0",the 9th & 10th digits are to denote the significant figures of the resistance and the 11th digit is the number of zeros following;

For the standard resistance values of ≤2% series in, the 8th digit to the 10th digits is to denote the significant figures of the resistance and the 11th digit is the zeros following.

2.4.2 The following number s and the letter codes are to be used to indicate the number of zeros in the 11th digit:0=10⁰ 1=10¹ 2=10² 3=10³ 4=10⁴ 5=10⁵ 6=10⁶ J=10⁻¹ K=10⁻² L=10⁻³ M=10⁻⁴

2.4.3 The 12th, 13th & 14th digits.

The 12th digit is to denote the Packaging Type with the following codes:

C=Bulk in (Chip Product) T=Tape/Reel

2.4.4 The 13th digit is normally to indicate the Packing Quantity of Tape/Reel packaging types. The following letter code is to be used for some packing quantities:

4=4000pcs 5=5000pcs C=10000pcs D=20000pcs E=15000pcs

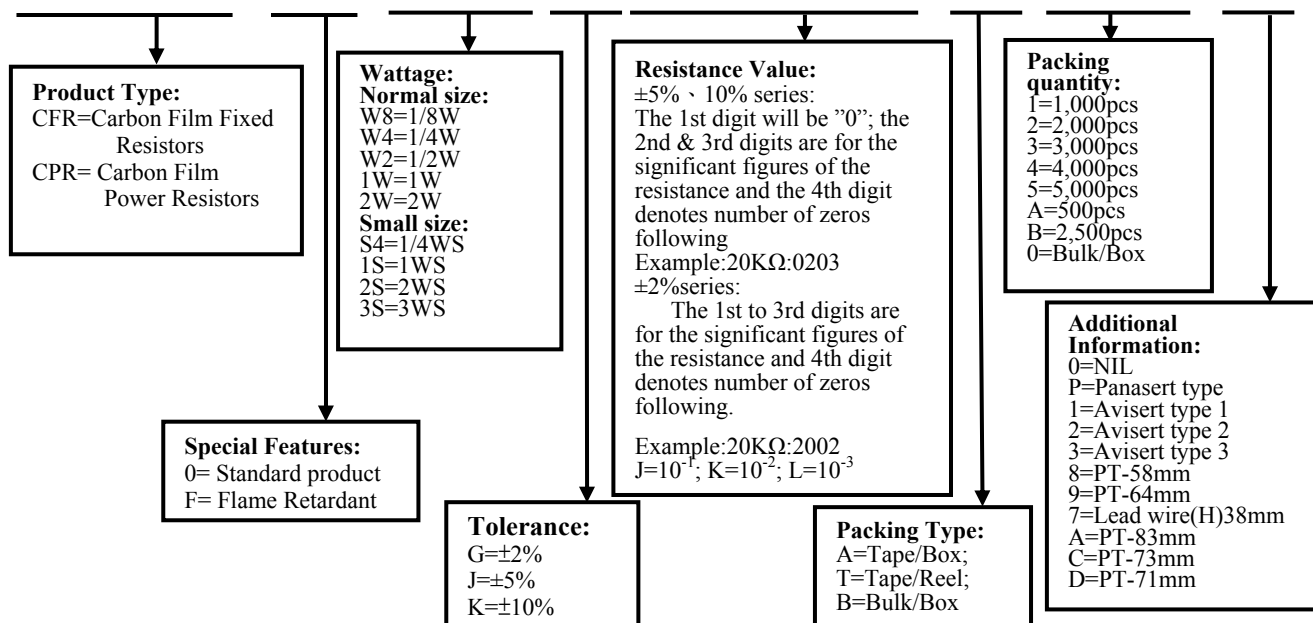
2.4.5 For some items, the 14th digit alone can use to denote special features of additional information with the following codes:

0=NIL P=Panasert type 1=Avisert type 1 2=Avisert type 2
 3=Avisert type 3 8=PT-58mm 9=PT-64mm 7=Lead wire(H)38mm
 A=PT-83mm C=PT-73mm D=PT-71mm

3. Ordering Procedure

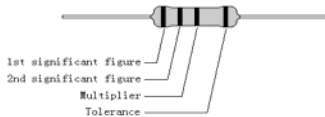
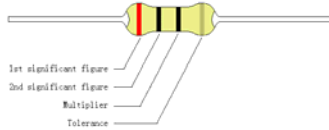
(Example: CFR 2W ±5% 100Ω T/B-500)

C F R 0 2 W J 0 1 0 1 A A 0



4. Marking

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



4.1 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:

CARBON FILM FIXED RESISTORS

WATT: 2W

VAL: 100Ω

Q'TY: 500

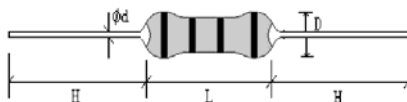
TOL: 5%

LOT: 4021548

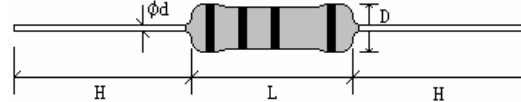
PPM:

5. Dimension

For 1/8W、1/4WS :



Other:



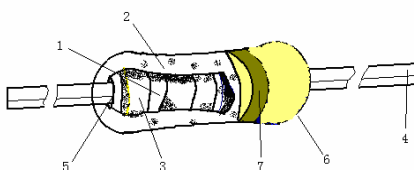
5.1 Ordinary Products:

| Type | Dimension(mm) | | | | | Max Working Voltage | Max Overload Voltage | Dielectric Withstanding Voltage | Resistance Range | Tolerance |
|----------|---------------|----------|------------|---------|----|---------------------|----------------------|---------------------------------|------------------|--------------------|
| | D | L | d ±0.05 | H ±3 | PT | | | | | |
| CR1/8W | 1.9±0.3 | 3.3±0.3 | 0.45 | 28 | 52 | 200V | 400V | 400V | 1Ω~1MΩ | ±2% ±5% ±10% |
| CR 1/4WS | 1.9±0.3 | 3.3±0.3 | 0.45 | 28 | 52 | 200V | 400V | 400V | 1Ω~1MΩ | |
| CR 1/4W | 2.2±0.3 | 6.5±1.0 | 0.54 | 28 | 52 | 250V | 500V | 500V | 1Ω~10MΩ | |
| CR 1/2W | 3.0±0.6 | 9.5±1.0 | 0.54 | 28 | 52 | 350V | 700V | 700V | 1Ω~10MΩ | |
| CR 1WS | 4.5±0.6 | 11.5±1.0 | 0.70 | 25 | 52 | 500V | 1000V | 1000V | 1Ω~10MΩ | |
| CR 1W | 5.0±0.6 | 15.5±1.0 | 0.70 | 28 | 64 | 500V | 1000V | 1000V | 1Ω~10MΩ | |
| CR 2WS | 5.0±0.6 | 15.5±1.0 | 0.70 | 28 | 64 | 500V | 1000V | 1000V | 1Ω~10MΩ | |
| CR 2W | 6.0±0.6 | 17.5±1.0 | 0.75 | 28 | 64 | 500V | 1000V | 1000V | 1Ω~10MΩ | |
| CR 3WS | 6.0±0.6 | 17.5±1.0 | 0.75 | 28 | 64 | 500V | 1000V | 1000V | 1Ω~10MΩ | |

5.2 High Power Products:

| Type | Dimension(mm) | | | | | Max Working Voltage | Max Overload Voltage | Dielectric Withstanding Voltage | Resistance Range | Tolerance |
|---------|---------------|----------|------------|---------|----|---------------------|----------------------|---------------------------------|------------------|-----------|
| | D | L | d ±0.05 | H ±3 | PT | | | | | |
| CPR1/2W | 2.2±0.5 | 6.5±1.0 | 0.54 | 28 | 52 | 300V | 500V | 700V | 3Ω~10MΩ | ±2% |
| CPR 1W | 3.5±0.5 | 9.5±1.0 | 0.54 | 28 | 52 | 500V | 700V | 1000V | 3Ω~10MΩ | ±5% |
| CPR 2W | 4.5±0.5 | 11.0±1.0 | 0.70 | 25 | 52 | 500V | 1000V | 1000V | 3Ω~10MΩ | ±10% |

6. Structure

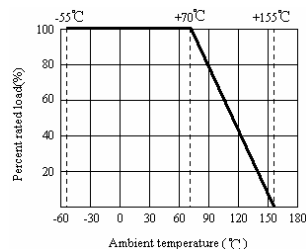


| No. | Name | Material |
|-----|------------|--|
| 1 | Basic Body | Rod Type Ceramics |
| 2 | Resistor | Carbon Film |
| 3 | End Cap | Cold steel plated with copper/tin |
| 4 | Lead Wire | Tin solder coated copper wire |
| 5 | Joint | By welding |
| 6 | Coating | (1). Celluloid paint (2). Insulated Resin Color: Beige(Standard) Light Brown(CFR1WS, CFR2WS, CFR3WS) Gray Green(CPR1/2W, CPR1W, CPR2W) |
| 7 | Color Code | Epoxy resin |

7. Derating Curve

Resistors shall have a power rating based on continuous load operation at an ambient temperature from -55°C to 70°C. For temperature in excess of 70°C, the load shall be derated as shown in figure 1

Figure 1



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:

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

Where: RCWV commercial-line frequency and waveform (Volt.)

P = power rating (WATT.) R = nominal resistance (OHM)

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

The overload voltage is 2.5 times RCWV or Max. Overload voltage whichever is less

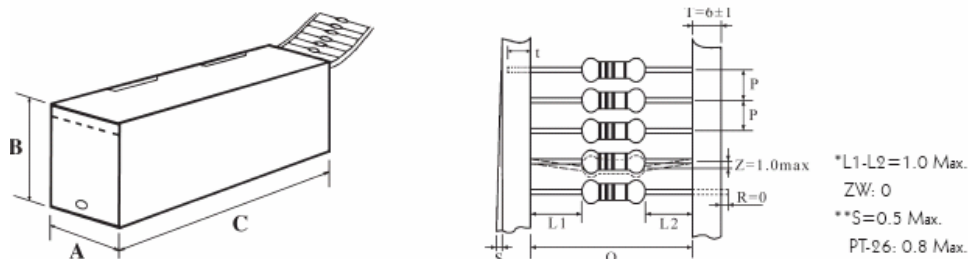
8. Performance Specification

| Characteristic | Limits | Test Method (GB/T5729&JIS-C-5201&IEC60115) |
|------------------------------|--|--|
| Temperature Coefficient | $\leq 10\Omega$: ± 300 PPM/°C $11\Omega \sim 99K\Omega$: ± 450 PPM/°C $100K\Omega \sim 1M\Omega$: $0 \sim 700$ PPM/°C $1.1M\Omega \sim 10M\Omega$: $0 \sim 1500$ PPM/°C | 4.8 Natural resistance changes per temp. Degree centigrade $\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (PPM/°C)} \quad \frac{R_3 - R_1}{R_1(t_3 - t_1)} \times 10^6 \text{ (PPM/°C)}$ R ₁ : Resistance Value at room temperature (t ₁) ; R ₂ : Resistance Value at upper limit temperature $\pm 2^\circ\text{C}$ (t ₂) R ₃ : Resistance Value at lower limit temperature $\pm 3^\circ\text{C}$ (t ₃) Test pattern : Room temperature : (t ₁) Upper limit temperature : (t ₂) Lower limit temperature : (t ₃) |
| Short-time overload | CFR: $\Delta R/R \leq \pm(1\% + 0.05\Omega)$ CPR: $\Delta R/R \leq \pm(0.75\% + 0.05\Omega)$ | 4.13 Permanent resistance change after the application of a potential of 2.5 times RCWV for 5 seconds. |
| Insulation resistance | Insulation resistance is: 10,000 M Ω Min. | 4.6 The measuring voltage shall be either (100 \pm 15) V DC for resistors with an isolation voltage <500V or (500 \pm 50)V DC. for resistors with an isolation voltage \geq 500V |
| Terminal strength | No evidence of mechanical damage | 4.16 Direct load: Resistance to a 2.5 Kg direct load for 10 seconds in the direction of the longitudinal axis of the terminal leads. 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 alternating direction for a total of 3 rotations. |
| Resistance to soldering heat | Resistance change rate must be in $\pm(1\% + 0.05\Omega)$, and no mechanical damage. | 4.18 permanent resistance change when leads immersed to a point 2.0-2.5mm from the body in 260°C \pm 5°C solder for 10 \pm 1 seconds. |
| Solderability | 95% coverage Min. | 4.17 The area covered with a new, smooth, clean, shiny and continuous surface free from concentrated pinholes. Test temp. Of solder: 245°C \pm 3°C Dwell time in solder 2~3 seconds. |

| | | |
|-----------------------------|--|---|
| Resistance to solvent | No deterioration of protective coatings & markings | 4.29 Specimens shall be immersed in a bath of alcohol completely for 3 min. With ultrasonic |
| Rapid change of temperature | Normal type: $\Delta R/R \pm 2\%$ for $<56K\Omega$ $\pm 3\%$ for $\geq 56K\Omega$ Flame retardant type: $\Delta R/R \pm 5\%$ for $<100K\Omega$; $\pm 10\%$ for $\geq 100K\Omega$; High Power Products : $\Delta R/R \pm (3\% + 0.05\Omega)$ | 4.19 30 min at lower limit temperature and 30 min at upper limit temperature , 5 cycles. |
| Load life in humidity | Normal type: $\Delta R/R \pm 3\%$ for $<100K\Omega$ $\pm 5\%$ for $\geq 100K\Omega$ Flame retardant type: $\Delta R/R \pm 5\%$ for $<100K\Omega$; $\pm 10\%$ for $\geq 100K\Omega$; High Power Products : $\Delta R/R \pm (3\% + 0.05\Omega)$ | 7.9 Resistance change after 1,000 hours (1.5 hours “ON”, 0.5 hour “OFF”) at RCWV in a humidity test chamber controlled at $40^\circ\text{C} \pm 2^\circ\text{C}$ and 90 to 95% relative humidity. |
| Load life | Normal type: $\Delta R/R \pm 2\%$ for $<56K\Omega$ $\pm 3\%$ for $\geq 56K\Omega$ Flame retardant type: $\Delta R/R \pm 5\%$ for $<100K\Omega$; $\pm 10\%$ for $\geq 100K\Omega$; High Power Products : $\Delta R/R \pm (3\% + 0.05\Omega)$ | 4.25.1 Permanent resistance change after 1,000 hours operating at RCWV with duty cycle of 1.5 hours “ON”, 0.5 hour “OFF” at $70^\circ\text{C} \pm 2^\circ\text{C}$ ambient. |
| Low Temperature Storage | Normal type: $\Delta R/R \pm 2\%$ for $<56K\Omega$ $\pm 3\%$ for $\geq 56K\Omega$ Flame retardant type: $\Delta R/R \pm 5\%$ for $<100K\Omega$; $\pm 10\%$ for $\geq 100K\Omega$; High Power Products : $\Delta R/R \pm (3\% + 0.05\Omega)$ | 4.23.4 Lower limit temperature , for 2H. |
| High Temperature Exposure | Normal type: $\Delta R/R \pm 2\%$ for $<56K\Omega$ $\pm 3\%$ for $\geq 56K\Omega$ Flame retardant type: $\Delta R/R \pm 5\%$ for $<100K\Omega$; $\pm 10\%$ for $\geq 100K\Omega$; High Power Products : $\Delta R/R \pm (3\% + 0.05\Omega)$ | 4.23.2 Upper limit temperature , for 16H. |

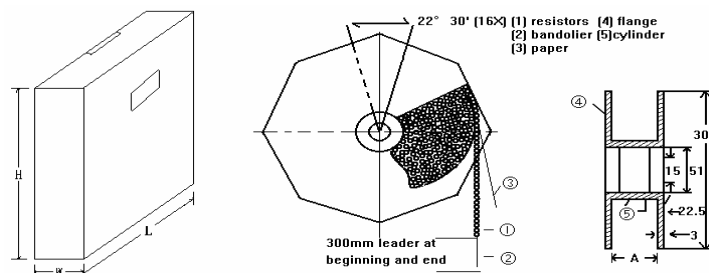
9. Standard Packing

9.1 Tapes in Box Packing:



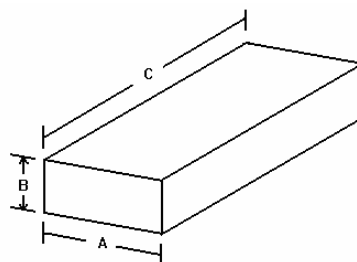
| Dimension of T/B (mm) | | | | | | |
|-----------------------|------|--------|---------|---------|---------|------------------|
| TYPE | O | P | W (A)±5 | H (B)±5 | L (C)±5 | Quantity Per Box |
| CR 1/8W | 52±1 | 5±0.3 | 75 | 70 | 255 | 5,000pcs |
| CR 1/4WS | 52±1 | 5±0.3 | 75 | 70 | 255 | 5,000pcs |
| CR 1/4W | 52±1 | 5±0.3 | 75 | 98 | 255 | 5,000pcs |
| CR 1/2W | 52±1 | 5±0.3 | 75 | 45 | 255 | 1,000pcs |
| CR 1WS | 52±1 | 5±0.3 | 86 | 82 | 255 | 1,000pcs |
| CR 1W | 64±5 | 10±0.5 | 94 | 88 | 255 | 1,000pcs |
| CR 2WS | 64±5 | 10±0.5 | 94 | 88 | 255 | 1,000pcs |
| CR 2W | 64±5 | 10±0.5 | 90 | 88 | 255 | 500pcs |
| CR 3WS | 64±5 | 10±0.5 | 90 | 88 | 255 | 500pcs |
| CPR1/2W | 52±1 | 5±0.3 | 75 | 116 | 255 | 5,000pcs |
| CPR1W | 52±1 | 5±0.3 | 75 | 45 | 255 | 1,000pcs |
| CPR2W | 52±1 | 5±0.3 | 86 | 82 | 255 | 1,000pcs |

9.2 Tapes in Reel Packing



| Dimension of Reel (mm) | | | | | | |
|------------------------|------|------|-----|-----|-----|-------------------|
| Type | O | A | W±5 | H±5 | L±5 | Quantity Per Reel |
| CR 1/8W | 52±1 | 73±2 | 85 | 295 | 293 | 5,000pcs |
| CR 1/4WS | 52±1 | 73±2 | 85 | 295 | 293 | 5,000pcs |
| CR 1/4W | 52±1 | 73±2 | 85 | 295 | 293 | 5,000pcs |
| CR 1/2W | 52±1 | 73±2 | 85 | 295 | 293 | 2,500pcs |
| CR 1WS | 52±1 | 73±2 | 85 | 295 | 293 | 2,500pcs |
| CR 1W | 64±5 | 80±5 | 95 | 295 | 293 | 1,000pcs |
| CR 2WS | 64±5 | 80±5 | 95 | 295 | 293 | 1,000pcs |
| CR 2W | 64±5 | 80±5 | 95 | 295 | 293 | 1,000pcs |
| CR 3WS | 64±5 | 80±5 | 95 | 295 | 293 | 1,000pcs |
| CPR 1/2W | 52±1 | 73±2 | 85 | 295 | 293 | 5,000pcs |
| CPR 1W | 52±1 | 73±2 | 85 | 295 | 293 | 2,500pcs |
| CPR 2W | 52±1 | 73±2 | 85 | 295 | 293 | 2,500pcs |

9.3 Bulk in Box Packing



| Type | Dimension of Box (mm) | | | |
|----------|-----------------------|-----|-----|-------------------|
| | A±5 | B±5 | C±5 | Quantity Per Reel |
| CR 1/8W | 140 | 80 | 240 | 1,000/20,000pcs |
| CR 1/4WS | 140 | 80 | 240 | 1,000/20,000pcs |
| CR 1/4W | 140 | 80 | 240 | 500/10,000pcs |
| CR 1/2W | 140 | 80 | 240 | 250/5,000pcs |
| CR 1WS | 140 | 80 | 240 | 100/2,500pcs |
| CR 1W | 140 | 80 | 240 | 100/1,500pcs |
| CR 2WS | 140 | 80 | 240 | 100/1,500pcs |
| CR 2W | 140 | 80 | 240 | 100/1,000pcs |
| CR 3WS | 140 | 80 | 240 | 100/1,000pcs |
| CPR 1/2W | 140 | 80 | 240 | 500/10,000pcs |
| CPR 1W | 140 | 80 | 240 | 250/5,000pcs |
| CPR 2W | 140 | 80 | 240 | 100/2,500pcs |

10. Precaution for storage/Transportation

10.1. UNI-ROYAL recommend the storage condition temperature: 15°C~35°C, humidity :25%~75%.

(Put condition for individual product).Even under UNI-ROYAL recommended storage condition, solderability of products over 1 year old.

(Put condition for each product) may be degraded.

10.2. Store / transport cartons in the correct direction, which is indicated on a carton as a symbol.

Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.

10.3. Product performance and soldered connections may deteriorate if the products are stored in the following places:

- Storage in high Electrostatic.
- Storage in direct sunshine 、rain and snow or condensation.
- Where the products are exposed to sea winds or corrosive gases, including Cl₂, H₂S₃ NH₃, SO₂, NO₂.

11. Record

| Version | Description of amendment | Page | Date | Amended by | Checked by |
|---------|-----------------------------------|------|--------------|-------------|------------|
| 1 | First issue of this specification | 1~7 | Mar.20, 2018 | Chen Haiyan | Chen Nana |

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