



Specification for Approval

Customer :

Product Name: LEAD-FREE WIRE-WOUND FIXED RESISTORS

Part Name : KNP SERIES $\pm 5\%$ 、 $\pm 10\%$

Part No. : KNP0**J*****0
KNP0**K*****0

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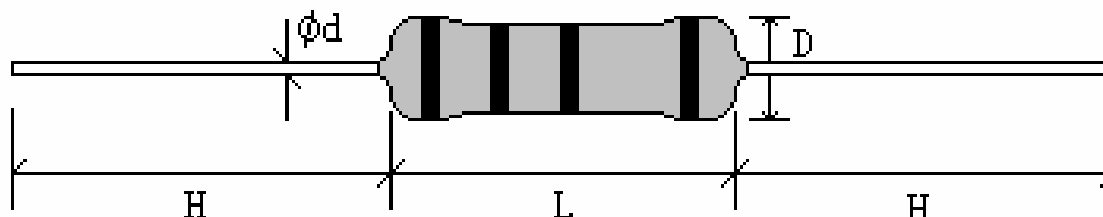
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1.0 Scope:

This specification for approve relates to Lead-Free Wire-wound Fixed Resistors manufactured by ROYAL-OHM'S specification.

2.0 Ratings & Dimension:



2.1 Normal size

Type	Dimension(mm)				Tolerance	Resistance Range
	D \pm 1	L Max.	d \pm 0.05	H \pm 3		
KNP 1/2W	4.5	10.0	0.54	28	\pm 5%、 \pm 10%	0.01 Ω ~510 Ω
KNP 1W	5	12	0.65	28	\pm 5%、 \pm 10%	0.01 Ω ~910 Ω
KNP 2W	5.5	16.0	0.65	28	\pm 5%、 \pm 10%	0.01 Ω ~1.8K Ω
KNP 3W	6.5	17.5	0.75	28	\pm 5%、 \pm 10%	0.039 Ω ~2.4K Ω
KNP 5W	8.5	26.0	0.75	38	\pm 5%、 \pm 10%	0.082 Ω ~5.1K Ω
KNP 7W	8.5	32.0	0.75	38	\pm 5%、 \pm 10%	0.1 Ω ~6.8K Ω
KNP 8W	8.5	41.0	0.75	38	\pm 5%、 \pm 10%	0.15 Ω ~10K Ω
KNP 9W	8.5	54.0	0.75	38	\pm 5%、 \pm 10%	0.22 Ω ~13K Ω

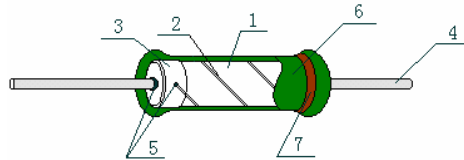
2.2 Small Size & Extra Small Size

Type	Dimension(mm)				Tolerance	Resistance Range
	D \pm 1	L Max.	d \pm 0.05	H \pm 3		
KNP 1WS	4.5	10.0	0.54	28	\pm 5%、 \pm 10%	0.01 Ω ~470 Ω
KNP 2WS	5	12	0.65	28	\pm 5%、 \pm 10%	0.01 Ω ~750 Ω
KNP 3WS	5.5	16.0	0.65	28	\pm 5%、 \pm 10%	0.01 Ω ~1.5K Ω
KNP 5WS	6.5	17.5	0.75	28	\pm 5%、 \pm 10%	0.039 Ω ~2K Ω
KNP 7WS	8.5	26.0	0.75	38	\pm 5%、 \pm 10%	0.082 Ω ~4.3K Ω
KNP 8WS	8.5	32.0	0.75	38	\pm 5%、 \pm 10%	0.1 Ω ~5.6K Ω
KNP 9WS	8.5	41.0	0.75	38	\pm 5%、 \pm 10%	0.15 Ω ~8.2K Ω
KNP 10WS	8.5	54.0	0.75	38	\pm 5%、 \pm 10%	0.22 Ω ~11K Ω

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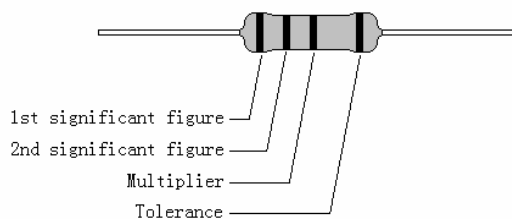
3.0 Construction:



No.	Name	Raw materials
1	Basic body	Rod Type Ceramics
2	Resistor	Ni-Cr Alloys
3	End cap	Steel (Tin Plated iron Surface)
4	Lead wire	Tin solder coated copper wire
5	Joint	By welding
6	Coating	Normal size & Insulated Non-Flame Paint Color: Deep Green (Normal size) Light Green (small size)
7	Marking	Epoxy Resin

4.0 Resistor marked:

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

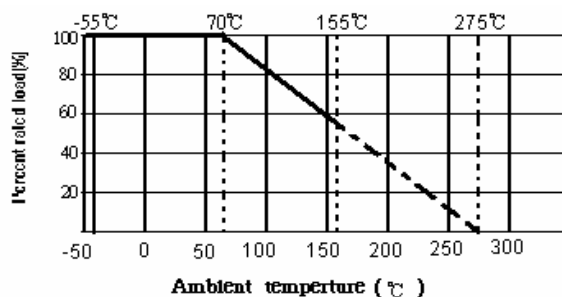
Example:

WIRE-WOUND FIXED RESISTORS	
WATT : 1W	VAL: 1Ω
Q'TY: 1000	TOL: 5%
LOT: 9021528	PPM:

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5.0 Derating Curve:



5.1 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 = rated dc or RMS ac continuous working voltage at commercial-line frequency and waveform (VOLT.)

P = power rating (WATT.)

R = nominal resistance (OHM)

6.0 Performance Specification:

Characteristic	Limits	Test Method (JIS-C-5201&5202)
Temperature Coefficient	$\geq 20 \Omega$: $\pm 300 \text{ PPM}/^\circ\text{C}$ Max. $< 20 \Omega$: $\pm 400 \text{ PPM}/^\circ\text{C}$ Max	4.8 natural resistance changes per temp. Degree centigrade $\frac{R_2 - R_1}{R_1(T_2 - T_1)} \times 10^6 \text{ (PPM}/^\circ\text{C)}$ R ₁ : Resistance value at room temp. (T ₁) R ₂ : Resistance value at room temp.+100°C (T ₂) Test pattern: room temp. (T ₁), room temp. +100°C (T ₂)
Short-Time Overload	Resistance change rate is: $\pm (2\% + 0.05 \Omega)$ Max. With no evidence of mechanical damage.	4.13 Permanent resistance change after the application of a potential of 2.5 times rcwv for 5 seconds.
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 is: $\pm (1\% + 0.05 \Omega)$ Max. With no evidence of mechanical damage	4.18 Permanent resistance change when leads immersed to a point 2.0-2.5mm from the body in 260°C $\pm 5^\circ\text{C}$ solder for 10 ± 1 seconds.

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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 ± 3°C Dwell time in solder: 2~3seconds.
Load life in humidity	Resistance change rate is: ±(5%+0.05Ω) Max.. With no evidence of mechanical damage.	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°C ± 2°C and 90 to 95% relative humidity.
Load life	Resistance change rate is: ±(5%+0.05Ω) Max.. With no evidence of mechanical damage.	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°C ± 2°C ambient.

7.0 Explanation of Part No. System:

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

7.1 Wire-Wound Fixed Resistors type, the 1st to 3rd digits are to indicate the product type and 4th digit is the special feature.

Example:

KNP0= Wire-Wound Fixed Resistors type.

7.2 5th~6th digits:

7.2.1 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; S=Small Size; U=Extra Small Size; "1" ~ "G" to denotes "1" ~ "16" as Hexadecimal:

1/16W~1/2W (<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

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

7.2.2 For power rating less than 1 watt, the 5th digit will be the letters W, S or U to represent the size required & the 6th digit will be a number or a letter code.

Example:

WA=1/10W; U2=1/2W-SS.

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7.2.3 For power of 1 watt to 16 watt, the 5th digit will be a number or a letter code and the 6th digit will be the letters of W, S or U.

Example: AW=10W; 3S=3W-S

7.3 The 7th digit is to denote the Resistance Tolerance. The following letter code is to be used for indicating the standard Resistance Tolerance.

F=±1% G=±2% J=±5% K= ±10%

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

7.4.1 For the standard resistance values of E-24 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 E-96 series, the 8th digit to the 10th digits is to denote the significant figures of the resistance and the 11th digit is the zeros following.

7.4.2 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

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

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

A=Tape/Box (Ammo pack) B=Bulk/Box
T=Tape/Reel P=Tape/Box of PT-26 products

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

A=500pcs B=2500pcs C=10000pcs
D=20000pcs G=25000pcs H=50000pcs

7.4.5 For the FORMED type products, the 13th & 14th digits are used to denote the forming types of the product with the following letter codes:

MF=M-type with flattened lead wire F0= F-type
MK= M-type with kinked lead wire F1= F1-type
ML= M-type with normal lead wire F2= F2-type
MC= M type with kinked lead and narrow pitch wire F3= F3-type

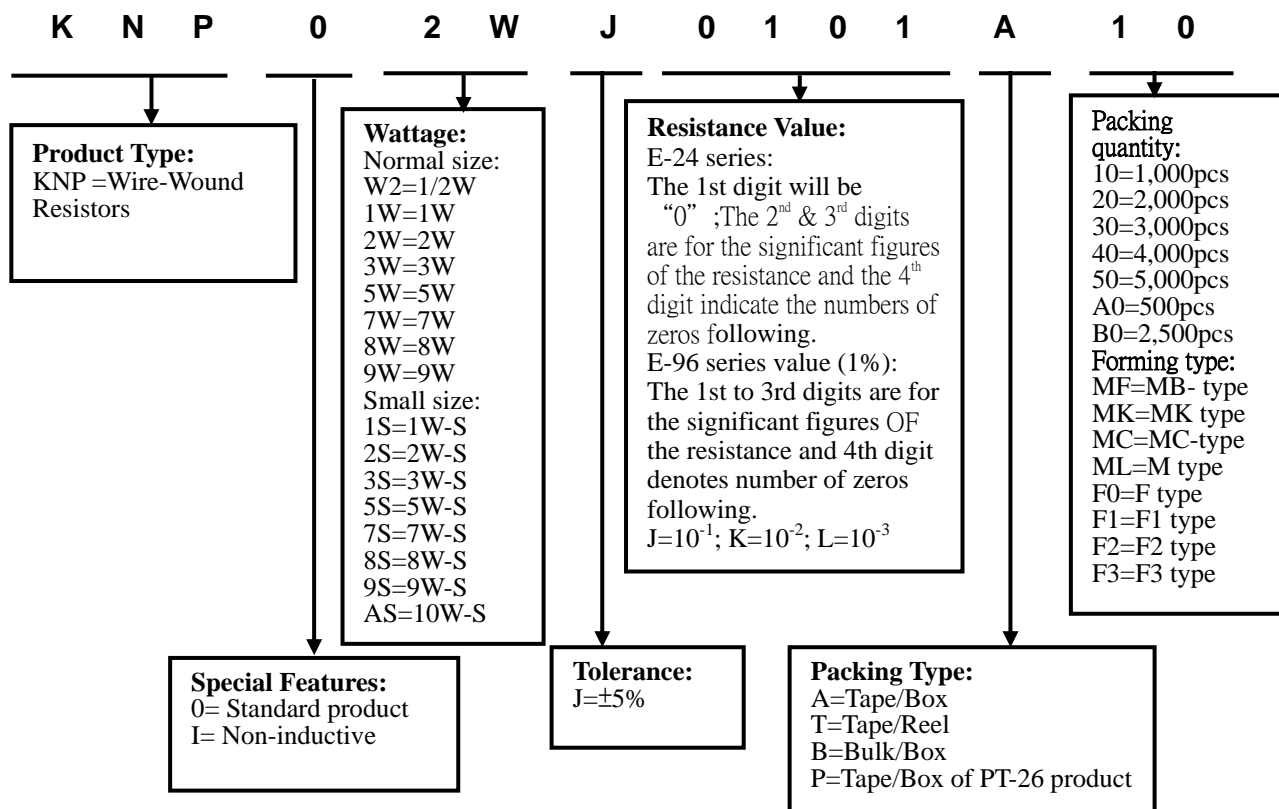
7.4.6 For some items, the 14th digit alone can use to denote special features of additional information with the following codes:

P=Panasert type 1=Avisert type 1 2=Avisert type 2
3=Avisert type 3 A=Cutting type CO 1/4W-A type B= Cutting type CO 1/4W-B type

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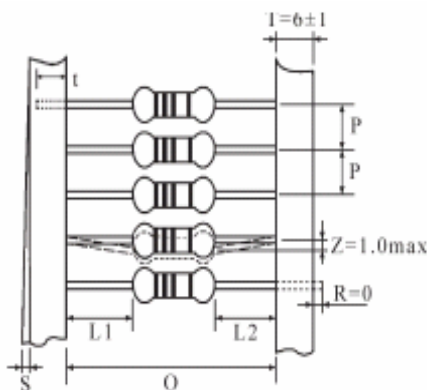
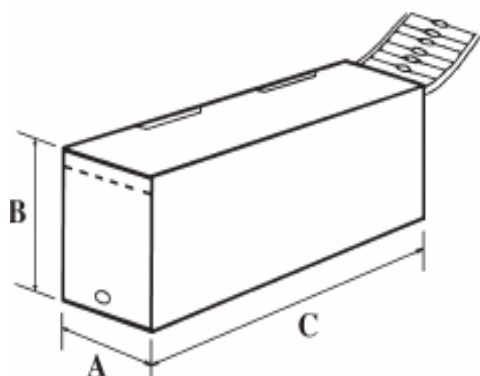


8.0 Ordering Procedure (Example: KNP 2W ±5% 100Ω T/B-1000)



9.0 Standard Packing:

9.1 Tapes in Box Packing



*L1-L2=1.0 Max.
ZW: 0
**S=0.5 Max.
PT-26: 0.8 Max.

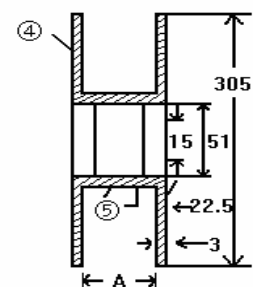
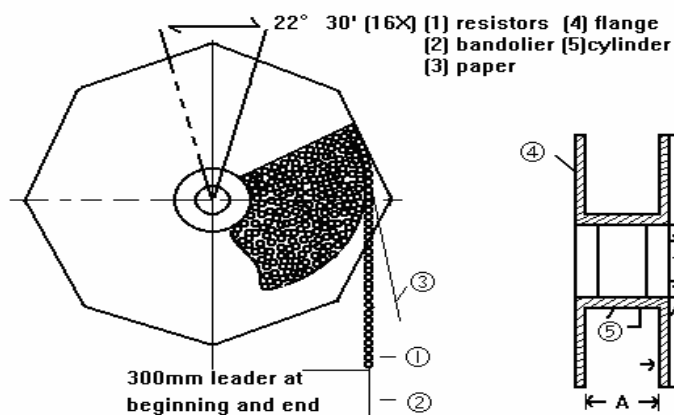
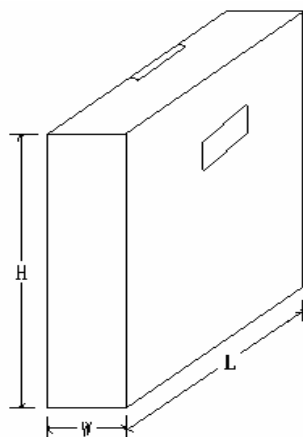
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Dimension of T/B (mm)

Part No.	O	P	A±5	B±5	C±5	Qty/Box
KNP 1/2W	58±1	5±0.3	75	45	250	1,000pcs
KNP 1WS	58±1	5±0.3	75	65	255	1,000pcs
KNP 1W	58±1	5±0.3	75	80	255	1,000pcs
KNP 2WS	58±1	5±0.3	75	80	255	1,000pcs
KNP 2W	65±5	10±0.5	85	105	255	1,000pcs
KNP 3WS	65±5	10±0.5	85	105	255	1,000pcs
KNP 3W	65±5	10±0.5	85	75	255	500pcs
KNP 5WS	65±5	10±0.5	85	75	255	500pcs

9.2 Tapes in Reel Packing



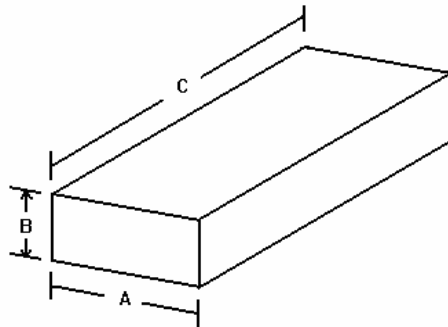
Dimension of Reel (mm)

Part No.	A±5	W±5	H±5	L±5	Qty/Box
KNP 1/2W	73±2	85	295	290	2,500pcs
KNP 1WS	73±2	85	295	290	2,500pcs
KNP 1W	73±2	85	295	290	2,500pcs
KNP 2WS	73±2	85	295	290	2,500pcs
KNP 2W	80±5	95	295	290	1,000pcs
KNP 3WS	80±5	95	295	290	1,000pcs
KNP 3W	80±5	95	295	290	1,000pcs
KNP 5WS	80±5	95	295	290	1,000pcs

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9.3 Bulk in Box Packing



Dimension of Box (mm)

Part No.	A±5	B±5	C±5	Qty/Box
KNP 1/2W	140	80	240	250/5,000pcs
KNP 1WS	140	80	240	250/4,000pcs
KNP 1W	140	80	240	100/2,500pcs
KNP 2WS	140	80	240	100/2,500pcs
KNP 2W	140	80	240	100/1,500pcs
KNP 3WS	140	80	240	100/1,500pcs
KNP 3W	140	80	240	100/1,000pcs
KNP 5WS	140(185)	80(100)	240(365)	25/400 (100/1,000)pcs
KNP 5W	140(185)	80(100)	240(365)	25/400 (100/1,000)pcs

10.0 Storage:

The products should be placed in the dry and ventilation with 6~35°C and lower than 35~88%RH, and prevent it from pressing and humidity.

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