ROYALOHM

C O N F I D E N T I A L D O C U M E N T

SPECIFICATION FOR APPROVAL

SPARK

Description : Wire-Wound Fixed Resistors

Royalohm Part no.:	**(Non-Inductive type)**	
Normal Size	KNPIW2JxxxxA10	(KNP 1/2W ± 5% T/B)
	KNPI1WJxxxxA10	(KNP 1W ± 5% T/B)
	KNPI2WJxxxxA19	(KNP 2W ± 5% T/B)
	KNPI3WJxxxxAA9	(KNP 3W ± 5% T/B)
	KNPI5WJxxxxB00	(KNP 5W ± 5% B/B)
	KNPI7WJxxxxB00	(KNP 7W ± 5% B/B)
	KNPI8WJxxxxB00	(KNP 8W ± 5% B/B)
	KNPI9WJxxxxB00	(KNP 9W ± 5% B/B)
Small Size	KNPI1SJxxxxA10	(KNP 1W-S ± 5% T/B)
	KNPI2SJxxxxA10	(KNP 2W-S ± 5% T/B)
	KNPI3SJxxxxA19	(KNP 3W-S ± 5% T/B)
	KNPI5SJxxxxAA9	(KNP 5W-S ± 5% T/B)
	KNPI7SJxxxxB00	(KNP 7W-S ± 5% B/B)
	KNPI8SJxxxxB00	(KNP 8W-S ± 5% B/B)
	KNPI9SJxxxxB00	(KNP 9W-S ± 5% B/B)
	KNPIASJxxxxB00	(KNP 10W-S ± 5% B/B)

Approved by

Parts corresponding to RoHS Compliant: 2005-Apr.-1

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Issue Date: 2013/08/15

CHANGE NOTIFICATION HISTORY

Version	Date of Version	History	Remark
1	2013/08/15	1. KNP Series	
		2. Resistance Tolerance: ± 5%	
		3. Non-Inductive type	

Customer: SPARK

1. Scope:

This specification for approval relates to Wire-Wound Fixed Resistors manufactured by ROYALOHM 's specifications.

2. Type designation:

The type designation shall be in the following form :

(Ex.)	KNP	9W	J	100Ω
	Type	Power Rating	Resistance Tolerance	Nominal Resistance

3. Ratings:

Ratings shall be shown in the table 1.

Table 1

Type		Rated Power at 70℃	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Resistance Range	Operating Temp. Range
Normal size	KNP 1/2W	0.50 W	500 V	1,000 V	350 V	1Ω--39Ω	-55℃ -- +155℃
	KNP 1W	1 W			500 V	1Ω--50Ω	
	KNP 2W	2 W				1Ω--120Ω	
	KNP 3W	3 W				1Ω--200Ω	
	KNP 5W	5 W				1Ω--470KΩ	
	KNP 7W	7 W				1Ω--470KΩ	
	KNP 8W	8 W				1Ω--1.5KΩ	
	KNP 9W	9 W				1Ω--1.5KΩ	
Small size	KNP 1W-S	1 W			350 V	1Ω--39Ω	
	KNP 2W-S	2 W			500 V	1Ω--50Ω	
	KNP 3W-S	3 W				1Ω--120Ω	
	KNP 5W-S	5 W				1Ω--200Ω	
	KNP 7W-S	7 W				1Ω--470KΩ	
	KNP 8W-S	8 W				1Ω--470KΩ	
	KNP 9W-S	9 W				1Ω--1.5KΩ	
	KNP 10W-S	10 W				1Ω--1.5KΩ	

3.1 Power rating:

Resistors shall have a power rating based on continuous full load operation at an ambient temperature of 70 ℃. For temperature in excess of 70 ℃ , 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 curresponding to the power rating , as determined from the following formula :

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

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

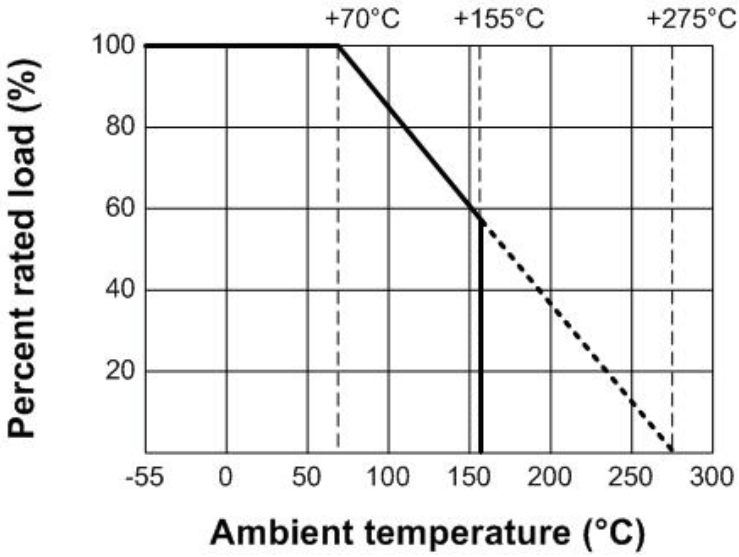
P = Power Rating (watt)

R = Nominal Resistance (ohm)

Wire-Wound Fixed Resistors

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

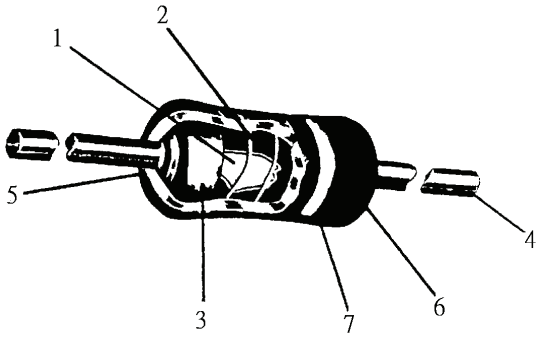
Figure 1.



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 Wire	Resistance Wire Alloy
3	End Cap	Steel (Tin plated iron surface)
4	Lead Wire	Annealed copper wire coated with tin
5	Joint	By Welding
6	Coating	Insulated & Non-Flame paint (Color : Gray)
7	Color Code	Epoxy Resin

Wire-Wound Fixed Resistors

5. Characteristics :

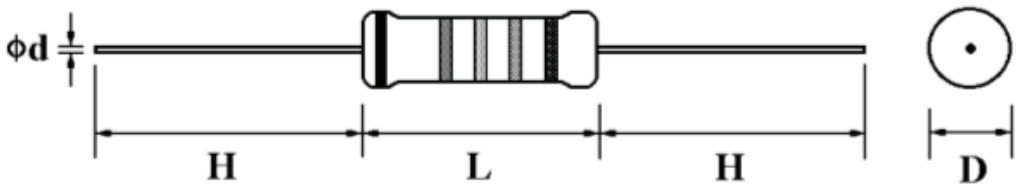
Characteristics	Limits	Test Methods (JIS C 5201-1)
DC. Resistance	Must be within the specified tolerance	The limit of error of measuring apparatus shall not exceed allowable range or 5% of resistance tolerance (Sub-clause 5.1)
Temperature coefficient	± 300 PPM/℃ Max. ＜20Ω ± 400PPM/℃	Natural resistance change per temp. degree centigrade. $\frac{R_2-R_1}{R_1(t_2-t_1)} \times 10^6$ (PPM/℃) R_1: Resistance value at room temperature (t1) R_2: Resistance value at room temp. plus 100 ℃ (t_2) (Sub-clause 5.2)
Short time overload	Resistance change rate is ± (2.0% + 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 5.5)
Insulation resistance	1,000 MΩ or more	Apply 500V DC between protective coating and termination for 1 min, then measure (Sub-clause 4.6)
Dielectric withstanding voltage	No evidence of flashover mechanical damage, arcing or insulation break down	Apply 500V AC between protective coating and termination for 1 minute (Sub-clause 4.7)
Terminal strength	No evidence of mechanical damage	**Direct load** : Resistance to a 2.5 kgs direct load for 10 secs. 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 (Sub-clause 6.1)
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℃ ± 10 ℃ solder for 3 ± 0.5 seconds. (Sub-clause 6.4)

Wire-Wound Fixed Resistors

Characteristics	Limits	Test Methods (JIS C 5201-1)
Load life in humidity	Resistance change rate is ±(5% + 0.05Ω) Max. with no evidence of mechanical damage	Resistance change after 1,000 hours (1.5 hours "on", 0.5 hour "off") at RCWV in a humidity test chamber controlled at 40 ℃ ± 2 ℃ and 90 to 95 % relative humidity (Sub-clause 7.9)
Load life	Resistance change rate is ±(5% + 0.05Ω) Max. with no evidence of mechanical damage	Permanent resistance change after 1,000 hours operating at RCWV with duty cycle of (1.5 hours "on", 0.5 hour "off") at 70℃ ± 2℃ ambient (Sub-clause 7.10)
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℃ ± 3℃ Dwell time in solder : 2 ~ 3 seconds (Sub-clause 6.5)
Temperature cycling	Resistance change rate is ± (1.0% + 0.05Ω) Max.	Resistance change after continuous 5 cycles for duty cycle specified below : **Step** / **Temperature** / **Time** 1 / -55℃ ± 3℃ / 30 mins 2 / Room temp. / 10～15 mins 3 / +155℃ ± 2℃ / 30 mins 4 / Room temp. / 10～15 mins (Sub-clause 4.19)
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)

Wire-Wound Fixed Resistors

6. Dimension : Unit : mm



Normal size						
Part No.	Style	Power Rating at 70 ℃	Dimension (mm)			
			D ± 1	L ± 1	d ± 0.05	H
KNPIW2	KNP-50	1/2W (0.50W)	3.5	10	0.54	28± 3
KNPI1W	KNP-100	1W	5	12	0.70	25± 2
KNPI2W	KNP-200	2W	5.5	16	0.70	28± 3
KNPI3W	KNP-300	3W	6.5	17.5	0.75	28± 3
KNPI5W	KNP-500	5W	8.5	25	0.75	38± 3
KNPI7W	KNP-700	7W	8.5	30	0.75	38± 3
KNPI8W	KNP-800	8W	8.5	40	0.75	38± 3
KNPI9W	KNP-900	9W	8.5	53	0.75	38± 3

Small size						
Part No.	Style	Power Rating at 70 ℃	Dimension (mm)			
			D (Max.)	L (Max.)	d ± 0.05	H
KNPI1S	KNP-100-S	1W	3.5	10	0.54	28± 3
KNPI2S	KNP-200-S	2W	5	12	0.70	25± 2
KNPI3S	KNP-300-S	3W	5.5	16	0.70	28± 3
KNPI5S	KNP-500-S	5W	6.5	17.5	0.75	28± 3
KNPI7S	KNP-700-S	7W	8.5	25	0.75	38± 3
KNPI8S	KNP-800-S	8W	8.5	30	0.75	38± 3
KNPI9S	KNP-900-S	9W	8.5	40	0.75	38± 3
KNPIAS	KNP-1000-S	10W	8.5	53	0.75	38± 3

Painting method:

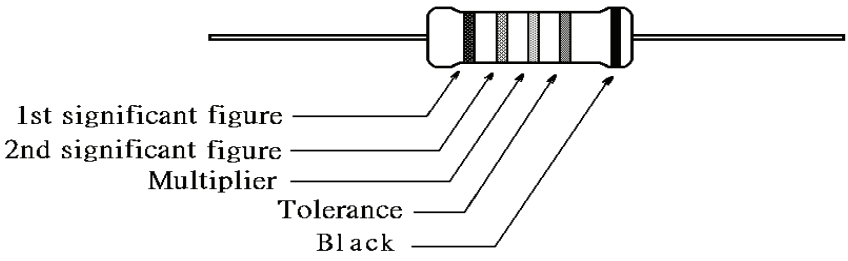
Welding point, terminal and lead wire, is permissible to be exposed without the outer coated cover. The extent should be within 1/2 of the are angle.

Wire-Wound Fixed Resistors

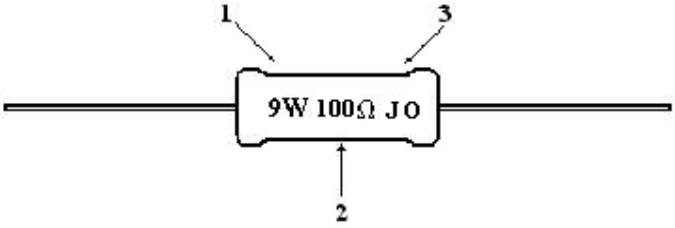
7. Marking :

7.1 For KNP normal size: 1/2W, 1W, 2W, 3W and KNP small size : 1W-S, 2W-S, 3W-S, 5W-S

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



7.2 For KNP normal size: 5W, 7W, 8W, 9W and KNP small size : 7W-S, 8W-S, 9W-S, 10W-S



Code description and regulation

1. Wattage rating.
2. Nominal resistance value.
3. Resistance Tolerance.

G : ± 2 %
J : ± 5 %
K : ± 10 %

4. Non-Inductive type: O.

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

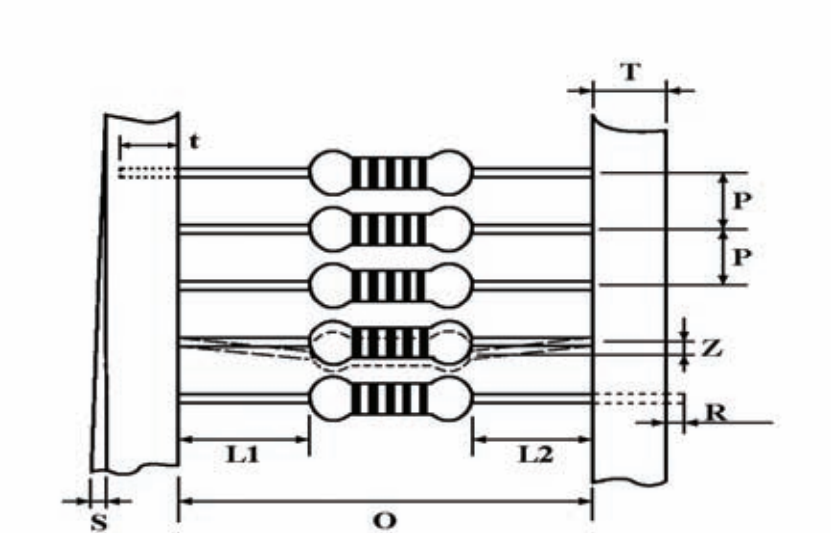
Example :

Wire-Wound Fixed Resistors			
Watt :	9W	Val	: 100E
Q'TY :	300	Tol	: 5%
Lot :	702312	PPM	:
	ROYALOHM		Pb Free

Wire-Wound Fixed Resistors

8. Packing specification :

8.1 Taping dimension :



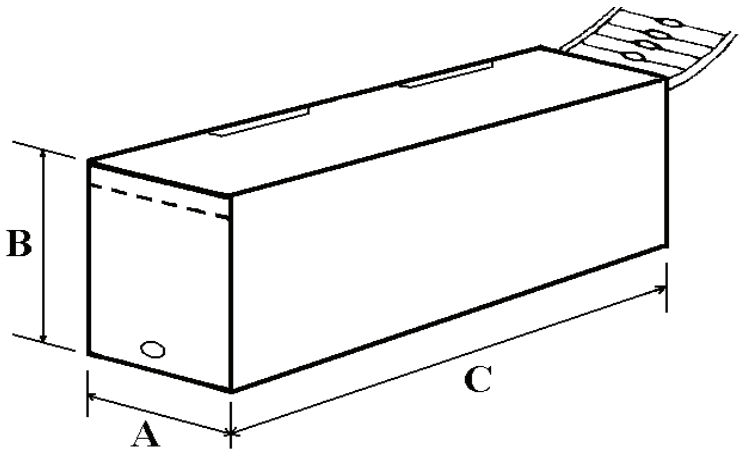
Dimensions (mm)

Normal size										
Part No.	Style	Style	O	P	L1-L2	T	Z	R	t	S
KNPIW2	KNP-50	PT-52	52 ± 1	5 ± 0.3	1 Max.	6 ± 1	1 Max.	0	4 ± 1	0.5 Max.
KNPI1W	KNP-100	PT-52	52 ± 1	5 ± 0.3	1 Max.	6 ± 1	1 Max.	0	4 ± 1	0.5 Max.
KNPI2W	KNP-200	PT-64	64 ± 1	10 ± 0.5	1 Max.	6 ± 1	1 Max.	0	5 ± 1	0.5 Max.
KNPI3W	KNP-300	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
KNPI1S	KNP-100-S	PT-52	52 ± 1	5 ± 0.3	1 Max.	6 ± 1	1 Max.	0	4 ± 1	0.5 Max.
KNPI2S	KNP-200-S	PT-52	52 ± 1	5 ± 0.3	1 Max.	6 ± 1	1 Max.	0	4 ± 1	0.5 Max.
KNPI3S	KNP-300-S	PT-64	64 ± 1	10 ± 0.5	1 Max.	6 ± 1	1 Max.	0	5 ± 1	0.5 Max.
KNPI5S	KNP-500-S	PT-64	64 ± 1	10 ± 0.5	1 Max.	6 ± 1	1 Max.	0	5 ± 1	0.5 Max.

Wire-Wound Fixed Resistors

8.2 Tape in box packing :



Dimension (mm)

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

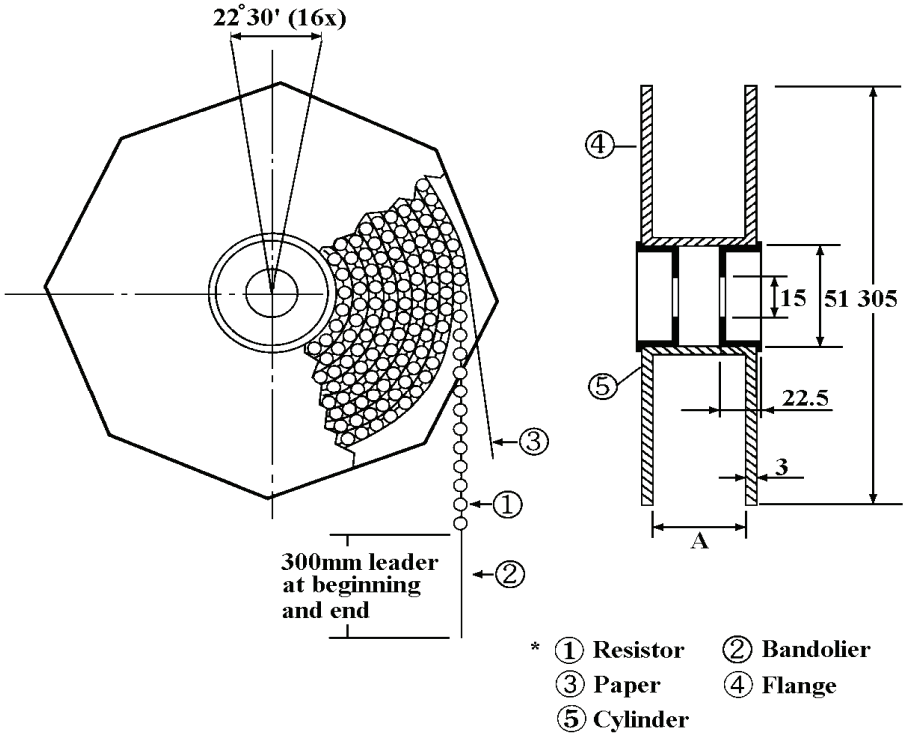
Normal size						
Part No.	Style	Style	L (C) ±5	W (A) ±5	H (B) ±5	Quantity Per Box (pcs.)
KNPIW2	KNP-50	PT-52	260	85	70	1,000
KNPI1W	KNP-100	PT-52	262	86	80	1,000
KNPI2W	KNP-200	PT-64	262	92	108	1,000
KNPI3W	KNP-300	PT-64	256	92	80	500

Small size						
Part No.	Style	Style	L (C) ±5	W (A) ±5	H (B) ±5	Quantity Per Box (pcs.)
KNPI1S	KNP-100-S	PT-52	260	85	70	1,000
KNPI2S	KNP-200-S	PT-52	262	86	80	1,000
KNPI3S	KNP-300-S	PT-64	262	92	108	1,000
KNPI5S	KNP-500-S	PT-64	256	92	80	500

"Ammopack" is an abbreviation of "ammunition pack"

Wire-Wound Fixed Resistors

8.3 Tape on reel packing :



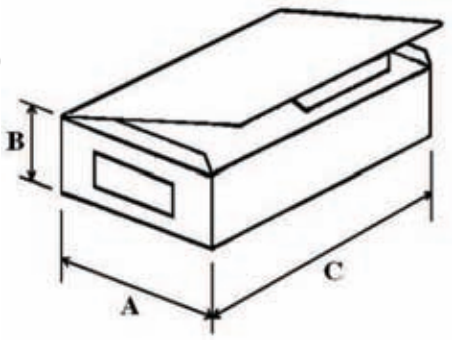
Dimension (mm) :

Normal size				
Part No.	Type	Style	Across Flange (A)	Quantity Per Reel
KNPIW2	KNP-50	PT-52	73 ± 2	2,500
KNPI1W	KNP-100	PT-52	73 ± 2	2,500
KNPI2W	KNP-200	PT-64	81 ± 5	1,000
KNPI3W	KNP-300	PT-64	81 ± 5	500

Small size				
Part No.	Type	Style	Across Flange (A)	Quantity Per Reel
KNPI1S	KNP-100-S	PT-52	73 ± 2	2,500
KNPI2S	KNP-200-S	PT-52	73 ± 2	2,500
KNPI3S	KNP-300-S	PT-64	81 ± 5	1,000
KNPI5S	KNP-500-S	PT-64	81 ± 5	500

Wire-Wound Fixed Resistors

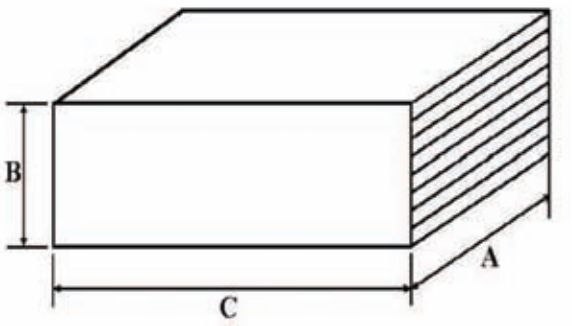
8.4 Bulk in box packing (in plastic bag)



Normal size					
Part No.	Type	L(C) ± 5	W(A) ± 5	H(B) ± 5	Quantity Per Bag (Pcs.)
KNPIW2	KNP-50	155	95	53	100 / 1,000
KNPI1W	KNP-100	155	95	53	100 / 500
KNPI2W	KNP-200	155	95	53	100 / 500
KNPI3W	KNP-300	155	95	53	100 / 400

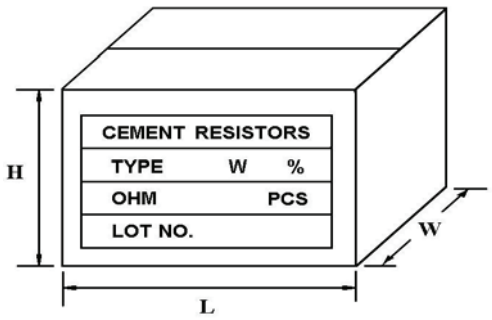
Small size					
	Type	L(C) ± 5	W(A) ± 5	H(B) ± 5	Quantity Per Bag (Pcs.)
KNPI1S	KNP-100-S	155	95	53	100 / 1,000
KNPI2S	KNP-200-S	155	95	53	100 / 500
KNPI3S	KNP-300-S	155	95	53	100 / 500
KNPI5S	KNP-500-S	155	95	53	100 / 400

8.5 Bulk in plastic case packing

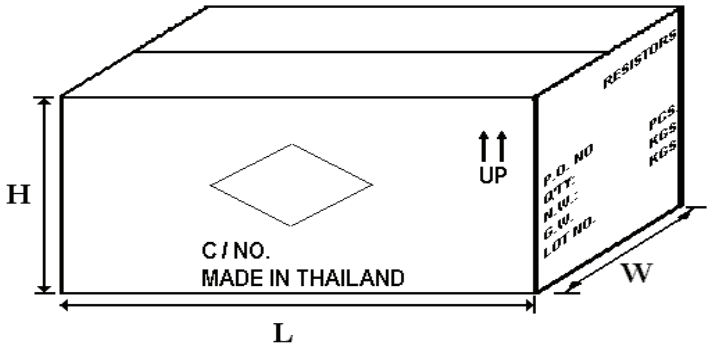


Part No.	Type	L(C) ± 5	W(A) ± 5	H(B) ± 5	Quantity Plastic case / Box (Pcs.)
KNPI5W	KNP-500	36	20	8	100 / 1,000
KNPI7S	KNP-700-S	36	20	8	100 / 1,000

8.6 Bulk in inner box packing (in plastic bag)



Inner Box of Plastic bag.



Carton Box

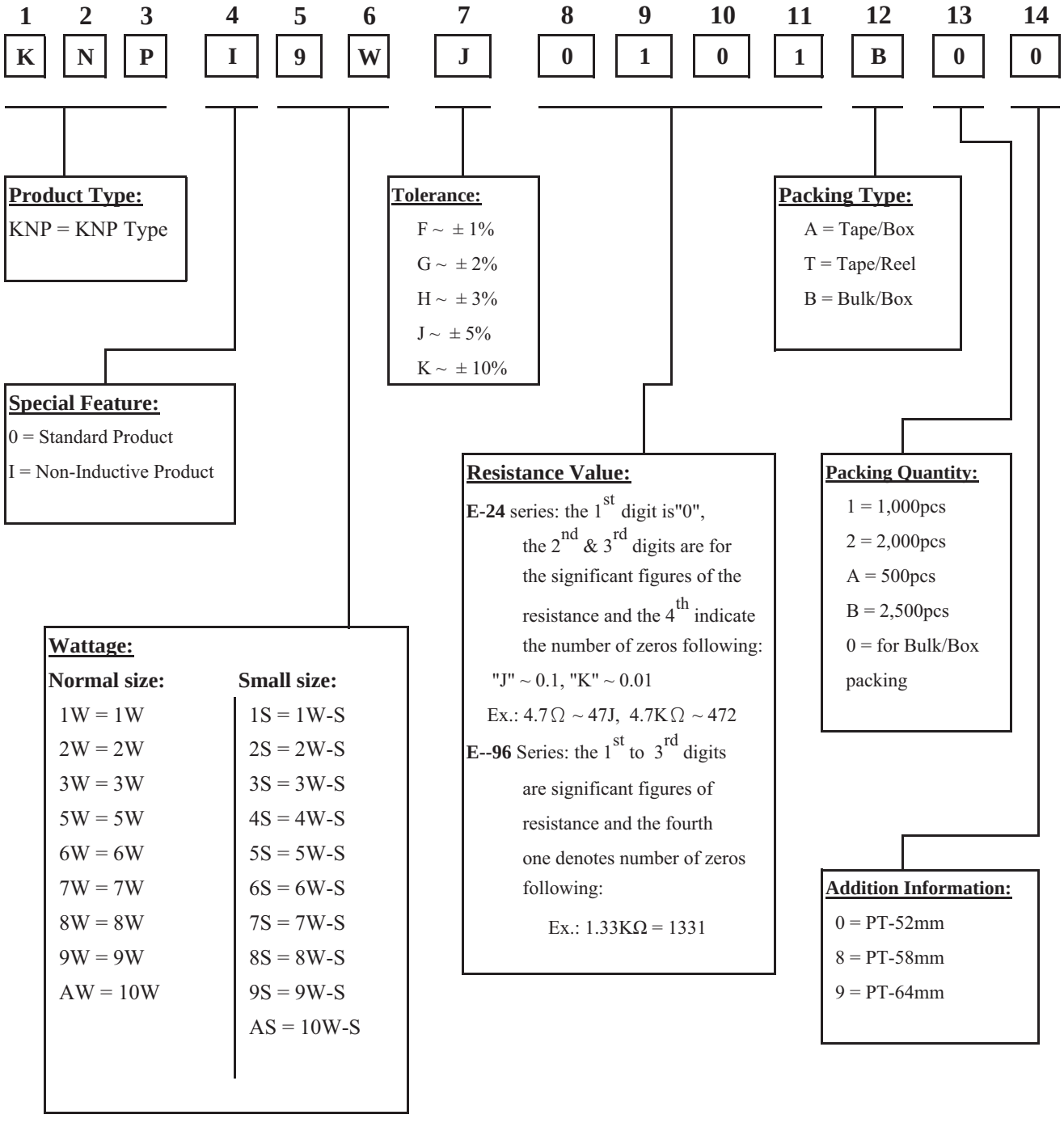
Dimension : Unit : mm

Part No.	Type	Q'ty / Bag (pcs.)	Q'ty / Inner Box (pcs.)	Q'ty / Carton (pcs.)	Inner Box Size L x W x H (±5)	Carton Box Size L x W x H (±5)
KNPI7W	KNP-700	8	32	3,200	153 x 95 x 68	210 x 130 x 56
KNPI8W	KNP-800	10	300	1,800	200 x 171 x 113	520 x 215 x 250
KNPI9W	KNP-900	10	300	1,800	200 x 171 x 113	520 x 215 x 250

Part No.	Type	Q'ty / Bag (pcs.)	Q'ty / Inner Box (pcs.)	Q'ty / Carton (pcs.)	Inner Box Size L x W x H (±5)	Carton Box Size L x W x H (±5)
KNPI8S	KNP-800-S	8	32	3,200	225 x 555 x 200	210 x 130 x 56
KNPI9S	KNP-900-S	10	300	1,800	200 x 171 x 113	520 x 215 x 250
KNPIAS	KNP-1000-S	10	300	1,800	200 x 171 x 113	520 x 215 x 250

Part Number System

Explanation of Part Number System
(Wire-Wound Fixed Resistors)



Sample: KNP 9W +/- 5% 100Ω B/B → KNPI9WJ0101B00

Wire-Wound Fixed Resistors

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

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°C ± 5°C and a relative humidity of 60%RH ± 10%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 Cl_2, H_2S, NH_3, SO_2, or NO_2
2. In direct sunlight