

# FrelTec GmbH

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82319 Starnberg  
Germany

## Metal Film Resistor

### SPECIFICATION

### Part Number

052	012*	N*	---	J*	TB*	E*	1*	*	*
Type	Power Rating Code : Watt	Body Size	Value	Tolerance	Packing Type	TCR	Packing quantity	Option 1	Option 2
052 : Metal Film Resistor	012 : 0,125(1/8W)	N:Normal size	The last digit is the multiplier which denotes the number of zero following	B:±0,1%	TR : Tape in Reel	C : 15ppm	W : 100 pc	0 = PT-52mm	F : Non-Flame Product**
	025 : 0,25(1/4 W)	S:Small Size)		C:±0,25%	TB : Tape in Box	D : 25ppm	Z : 400 pc	8 = PT-58mm	I : Non-Inductive product)
	040 : 0,40(2/5W)	U : Ultra small size		D : ±0,5%	BP : Bulk Packing	E : 50ppm	A : 500 pc	9 = PT-64mm	
	050 : 0,50(1/2W)		0000 = 00Ohm	F : ±1%		F : 100ppm	1 : 1k pc	P = Panaset type	
	060 : 0,60(3/5W)			G : ±2%		G : 200ppm	2 : 2k pc	1 = Avisert type 1	
	075 : 0,75(3/4W)		Example: R010 = 0,01Ohm	J : ±5%			B : 2.500 pc	2 = Avisert type 2	
	100 : 1,0 (1 W)		97R6=				3 : 3k pc	3 = Avisert type 3	
	200 : 2,0 (2 W)		9760 = 976Ohm				4 : 4k pc		* not all combination is possible
	300 : 3,0 (3 W)		1001 = 1kOhm				5 : 5k pc		**only Ultra Small size
							C : 10k pc		
							D : 20k pc		

#### Example:

#### Part Number

052025N1000FTRE1:

#### Description

Metal Film Fixed Resistor, 1/4W, Normal Size, 100Ω, +/-1% tolerance, Tape in Reel TCR: 50ppm, 1kpc

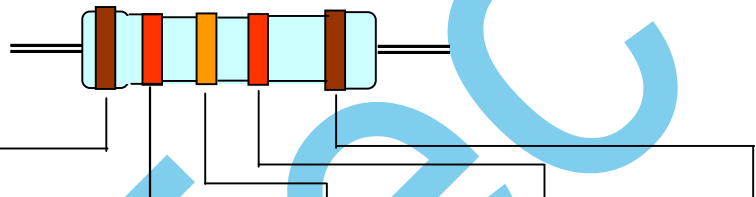
1. Applicable Scope:

This specification is for use in Metal FILM FIXED RESISTORS  
 Characteristics and specifications are according to those of:  
 JIS C 5202

2. Marking

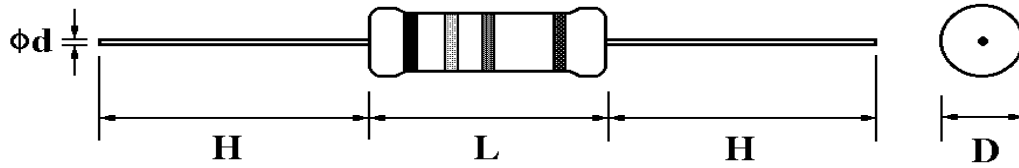
Colour code indication for nominal resistance value and tolerance

Fixed resistors of which the nominal resistance value and tolerance are indicated by colour codes in accordance with JIS C 0802, following the standard as below:



COLOR	1 <sup>ST</sup> DIGIT	2 <sup>ND</sup> DIGIT	3 <sup>RD</sup> DIGIT	MULTIPLIER	TOLERANCE
BLACK	0	0	0	1	
BROWN	1	1	1	10	F(±1%)
RED	2	2	2	100	G(±2%)
ORANGE	3	3	3	1.000	
YELLOW	4	4	4	10.000	
GREEN	5	5	5	100.000	D(±0.5%)
BLUE	6	6	6	1.000.000	C(±0.25%)
VIOLET	7	7	7	10.000.000	B(±0.10%)
GREY	8	8	8		
WHITE	9	9	9		
GOLD				0,1	J (±5%)
SILVER				0,01	K (±10%)

### 3. DIMENSIONS:

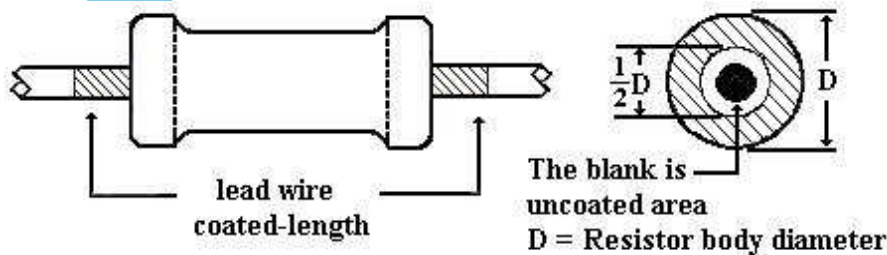


Normal size (not for Non-Flame and not for Non Inductive)					
Part No.	Power Rating at 70 °C	Dimension (mm)			
		D (Max.)	L (Max.)	$d \pm 0.05$	$H \pm 3$
052 012 N	1/8W (0,125W)	1,85	3,5	0,45	28
052 025 N	1/4W (0,25W)	2,5	6,8	0,54	28
052 050 N	1/2W (0,50W)	3,5	10,0	0,54	28
052 100 N	1W	5,0	12,0	0,70	25
052 200 N	2W	5,5	16,0	0,70	28
052 300 N	3W	6,5	17,5	0,75	28

Small size (not for Non-Flame and not for Non Inductive)					
Part No.	Power Rating at 70 °C	Dimension (mm)			
		D (Max.)	L (Max.)	$d \pm 0.05$	$H \pm 3$
052 025 S	1/4W (0,25W)	1,85	3,5	0,45	28
052 040 U	2/5W (0,40W)	1,90	3,7	0,45	28
052 050 U	1/2W (0,50W)	2,5	6,8	0,54	28
052 060 S	3/5W (0,60W)	2,5	6,8	0,54	28
052 050 S	1/2W (0,50W)	3,0	9,0	0,54	28
052 075 S	3/4W (0,75W)	3,5	10,0	0,54	28
052 100 S	1W	3,5	10,0	0,54	28
052 200 S	2W	5,0	12,0	0,70	25
052 300 S	3W	5,5	16,0	0,70	28

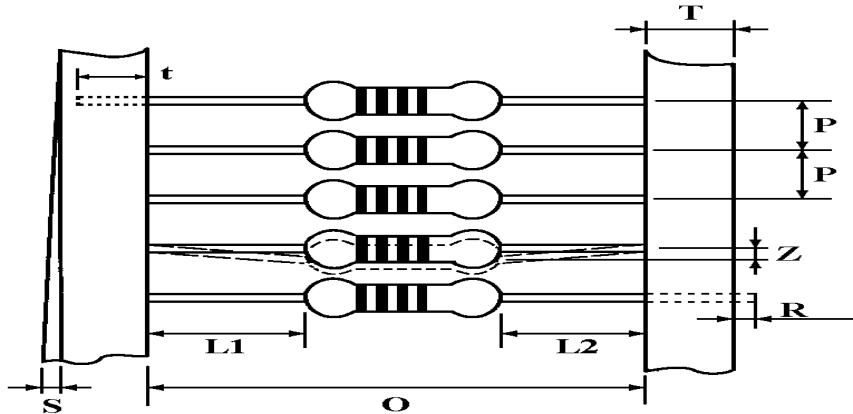
### 4. Painting method:

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 angle.



### 5. Packing

#### Tape Packing

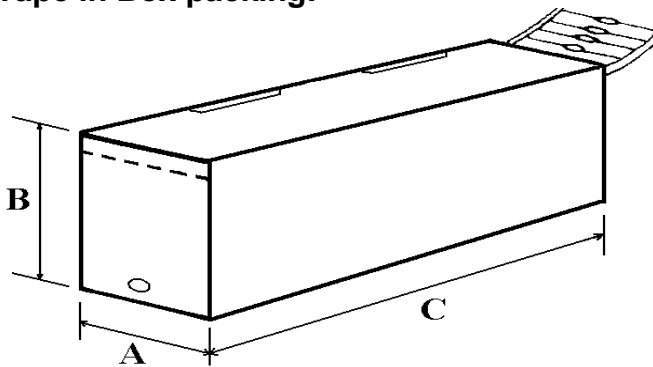


Normal size									
Part No.	Style	O	P	L1-L2	T	Z	R	t	S
052 012 N	PT-52	$52 \pm 1$	$5 \pm 0,3$	1 Max.	$6 \pm 1$	1 Max.	0	$4 \pm 1$	0,5 Max.
052 025 N	PT-52	$52 \pm 1$	$5 \pm 0,3$	1 Max.	$6 \pm 1$	1 Max.	0	$4 \pm 1$	0,5 Max.
052 050 N	PT-52	$52 \pm 1$	$5 \pm 0,3$	1 Max.	$6 \pm 1$	1 Max.	0	$4 \pm 1$	0,5 Max.
052 100 N	PT-52	$52 \pm 1$	$5 \pm 0,3$	1 Max.	$6 \pm 1$	1 Max.	0	$4 \pm 1$	0,5 Max.
052 200 N	PT-64	$64 \pm 1$	$10 \pm 0,5$	1 Max.	$6 \pm 1$	1 Max.	0	$5 \pm 1$	0,5 Max.
052 300 N	PT-64	$64 \pm 1$	$10 \pm 0,5$	1 Max.	$6 \pm 1$	1 Max.	0	$5 \pm 1$	0,5 Max.

Small size									
Part No.	Style	O	P	L1-L2	T	Z	R	t	S
052 025 S	PT-52	$52 \pm 1$	$5 \pm 0,3$	1 Max.	$6 \pm 1$	1 Max.	0	$4 \pm 1$	0,5 Max.
052 040 U	PT-52	$52 \pm 1$	$5 \pm 0,3$	1 Max.	$6 \pm 1$	1 Max.	0	$4 \pm 1$	0,5 Max.
052 050 U	PT-52	$52 \pm 1$	$5 \pm 0,3$	1 Max.	$6 \pm 1$	1 Max.	0	$4 \pm 1$	0,5 Max.
052 060 S	PT-52	$52 \pm 1$	$5 \pm 0,3$	1 Max.	$6 \pm 1$	1 Max.	0	$4 \pm 1$	0,5 Max.
052 050 S	PT-52	$52 \pm 1$	$5 \pm 0,3$	1 Max.	$6 \pm 1$	1 Max.	0	$4 \pm 1$	0,5 Max.
052 075 S	PT-52	$52 \pm 1$	$5 \pm 0,3$	1 Max.	$6 \pm 1$	1 Max.	0	$4 \pm 1$	0,5 Max.
052 100 S	PT-52	$52 \pm 1$	$5 \pm 0,3$	1 Max.	$6 \pm 1$	1 Max.	0	$4 \pm 1$	0,5 Max.
052 200 S	PT-52	$52 \pm 1$	$5 \pm 0,3$	1 Max.	$6 \pm 1$	1 Max.	0	$4 \pm 1$	0,5 Max.
052 300 S	PT-64	$64 \pm 1$	$10 \pm 0,5$	1 Max.	$6 \pm 1$	1 Max.	0	$5 \pm 1$	0,5 Max.

## Metal Film

Tape in Box packing:



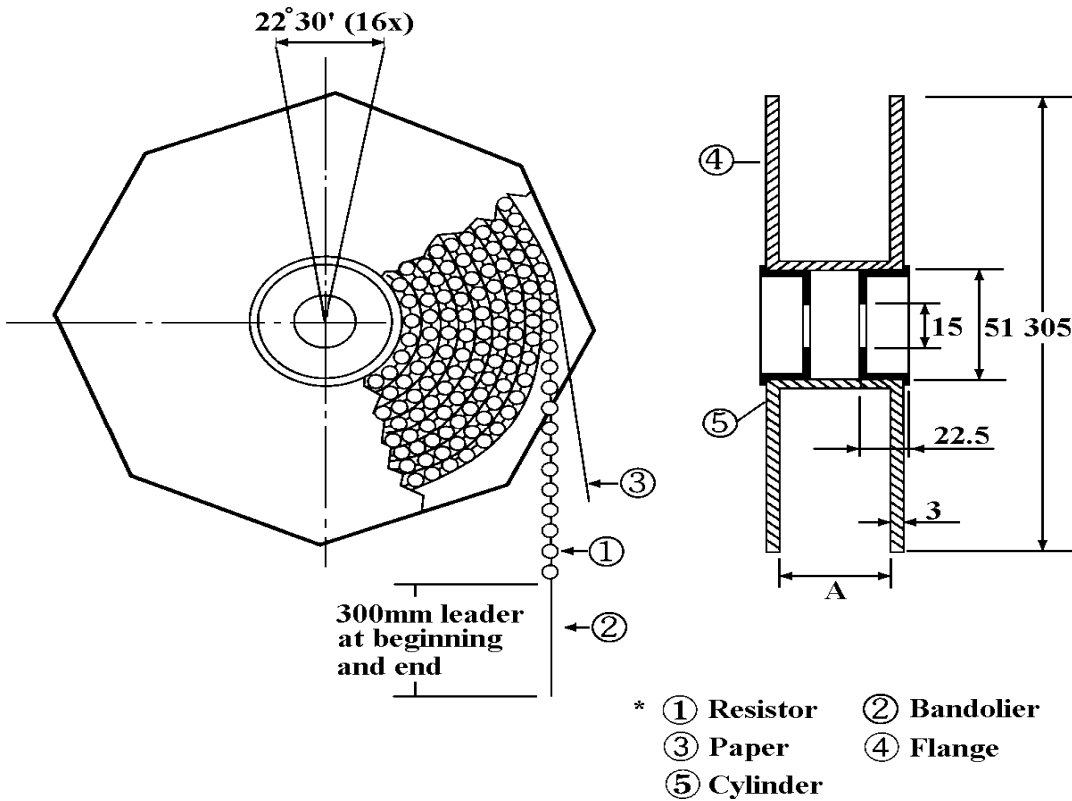
Bandoliers may also be contained in a cardboard box ("Ammopack")

Normal size					
Part No.	Style	L (C) ±5	W (A) ±5	H (B) ±5	Quantity Per Box (pcs.)
052 012 N	PT-52	250	75	66	5.000
052 025 N	PT-52	250	75	96	5.000
052 050 N	PT-52	255	75	43	1.000
052 100 N	PT-52	255	79	73	1.000
052 200 N	PT-64	260	94	87	1000
052 300 N	PT-64	262	96	69	500

Small size					
Part No.	Style	L (C) ±5	W (A) ±5	H (B) ±5	Quantity Per Box (pcs.)
052 025 S	PT-52	250	75	66	5.000
052 040 U	PT-52	250	75	66	5.000
052 050 U	PT-52	250	75	96	5.000
052 060 S	PT-52	250	75	96	5.000
052 050 S	PT-52	255	75	56	2.000
052 075 S	PT-52	255	75	43	1.000
052 100 S	PT-52	255	75	43	1.000
052 200 S	PT-52	255	79	73	1.000
052 300 S	PT-64	260	94	87	1000

"Ammopack" is an abbreviation of "ammunition pack"

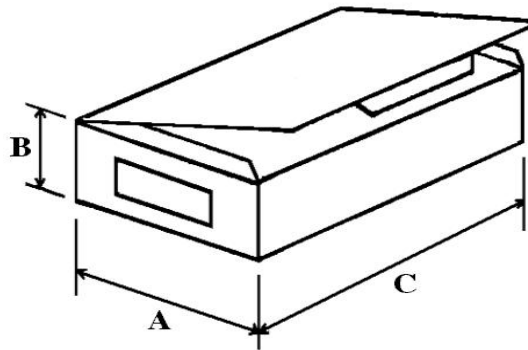
Tape in Reel packing:



Normal size			
Part No.	Style	Across Flange (A)	Quantity Per Reel
052 012 N	PT-52	73 ± 2	5.000
052 025 N	PT-52	73 ± 2	5.000
052 050 N	PT-52	73 ± 2	2.500
052 100 N	PT-52	73 ± 2	2.500
052 200 N	PT-64	81 ± 5	1000
052 300 N	PT-64	81 ± 5	500

Small size			
Part No.	Style	Across Flange (A)	Quantity Per Reel
052 025 S	PT-52	73 ± 2	5.000
052 040 U	PT-52	73 ± 2	5.000
052 050 U	PT-52	73 ± 2	5.000
052 060 S	PT-52	73 ± 2	5.000
052 050 S	PT-52	73 ± 2	5.000
052 075 S	PT-52	73 ± 2	2.500
052 100 S	PT-52	73 ± 2	2.500
052 200 S	PT-52	73 ± 2	2.500
052 300 S	PT-64	81 ± 5	1000

**Bulk in box packing:**  
(plastic bag)

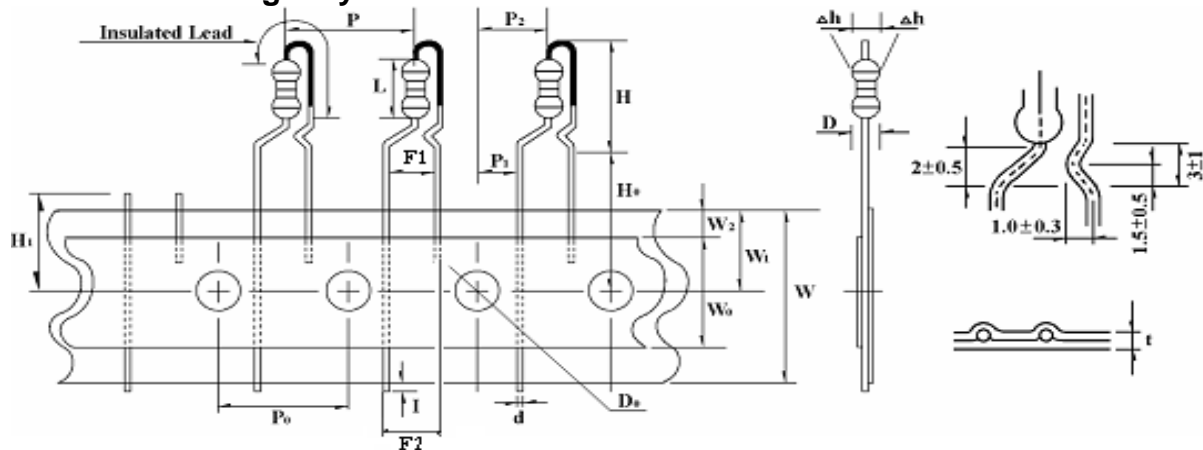


<b>Normal size</b>				
Part No.	L(C) ± 5	W(A) ± 5	H(B) ± 5	Quantity Per Bag (Pcs.)
052 012 N	150	77	33	500 / 1.000
052 025 N	150	77	33	500 / 1.000
052 050 N	150	75	67	100 / 1.000
052 100 N	155	95	53	100 / 500
052 200 N	155	95	53	100 / 500
052 300 N	155	95	53	100 / 400

<b>Small size</b>				
	L(C) ± 5	W(A) ± 5	H(B) ± 5	Quantity Per Bag (Pcs.)
052 025 S	150	77	33	500 / 1.000
052 040 U	150	77	33	500 / 1.000
052 050 U	150	77	33	500 / 1.000
052 060 S	150	77	33	500 / 1.000
052 050 S	150	75	67	100 / 1.000
052 075 S	150	75	67	100 / 1.000
052 100 S	150	75	67	100 / 1.000
052 200 S	155	95	53	100 / 500
052 300 S	155	95	53	100 / 500



Panasert-Forming only 1/4W:



Items	Symbol	Dimension (mm)	Items	Symbol	Dimension (mm)
Body diameter	D	2,5 Max,	Tape width	W	18 ± 1
Body length	L	6,8 Max,	Hold down tape width	W0	12,5 Min
Body height	H	12 Max,	Hole position	W1	9 ± 0,5
Lead wire diameter	d	0,54 +/- 0,05	Hold down tape position	W2	3,0 Max
Pitch of component	P	12,7 ± 1	Lead wire clinch height	H0	16,5 Max
Feed hold pitch	P0	12,7 ± 0,3	Length of snapped lead	H1	11,0 Max
Hole center to lead	P1	3,85 ± 0,7	Lead wire protrusion	l	1,0 Max
Hole center to body		6,35 ± 1,3	Feed hole diameter	D0	4,0 ± 0,3
Lead to lead spacing	F1	4,19 Min	Total tape thickness	t	0,5 ± 0,2
	F2	6,22 Max	Length of lead cut	H1 - H2	2 ± 0,5
Component alignment	Δh	0 ± 1			

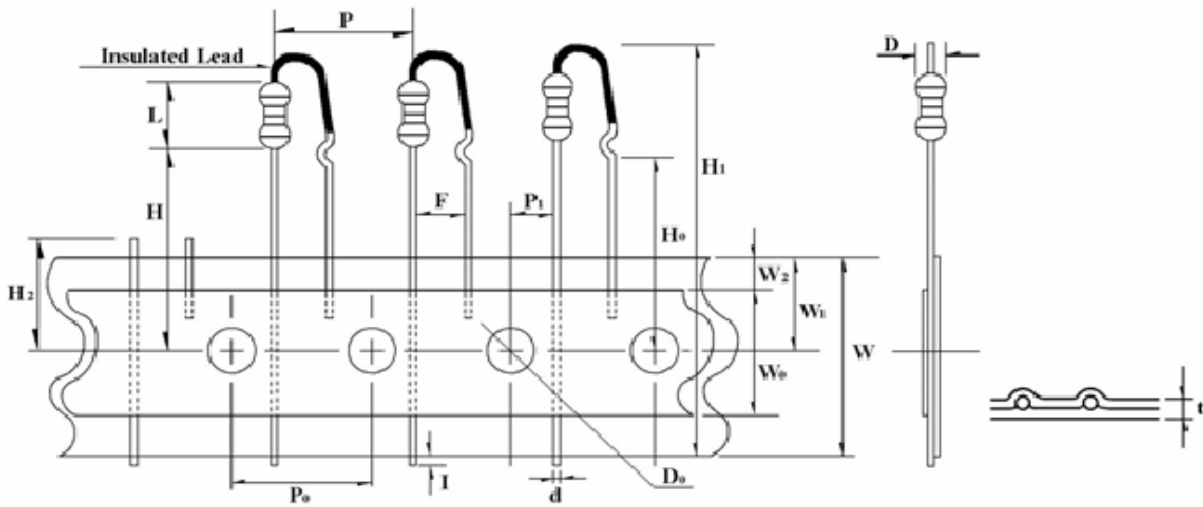
Remark: P0 Cumulative pitch error 1 mm / 20 pitch.

Size and Type	Ammo packing		Reel packing	
Figure				
Dimension	A	50 mm.	A	30 mm.
	B	150 mm.	B	50 mm.
	C	330 mm.	D	370 mm.
	D	50 mm.	W1	41 mm.
			W2	45 mm.
Quantity	2.000 pcs.		2.500 pcs.	

Ordering number example: 052025N110kFTREBP

Metal Film resistor 1/4W, 110kOhm, 1% Tape in Reel, TCR: 50ppm, 2.5kpc  
Panasert-Forming

Avisert-Type 1, only 1/4W:



Items	Symbol	Dimension (mm)	Items	Symbol	Dimension (mm)
Body diameter	D	2,5 Max,	Hold down tape width	W <sub>0</sub>	12,5 Min
Body length	L	6,8 Max,	Hole position	W <sub>1</sub>	9,5 ± 0,5
Lead wire diameter	d	0,54 +/-0,05	Hold down tape position	W <sub>2</sub>	3,0 Max
Pitch of component	P	12,7 ± 1	Height of Component from tape center	H	17±0,5
Feed hole pitch	P <sub>0</sub>	12,7 ± 0,3	Lead wire clinch height	H <sub>0</sub>	16±0,5
Feed hole center to lead	P <sub>1</sub>	3,85 ± 0,7	Component height	H <sub>1</sub>	34,50 Max
Lead to lead distance	F	5±1	Length of snapped lead	H <sub>2</sub>	11,0 Max
Component alignment	Δh	0 ± 1	Lead wire protrusion	l	1,0 Max
Tape width	W	18 ± 1	Feed hole diameter	D <sub>0</sub>	4,0 ± 0,3
Remark: P <sub>0</sub> Cumulative pitch error 1 mm / 20 pitch.			Total tape thickness	t	0,5 ± 0,2

Size and Type	Ammo packing		Reel packing	
Figure				
Dimension	A	50 mm.	A	30 mm.
	B	150 mm.	B	50 mm.
	C	330 mm.	D	370 mm.
	D	50 mm.	W <sub>1</sub>	41 mm.
			W <sub>2</sub>	45 mm.
Quantity	2.000 pcs.		2.500 pcs.	

Ordering number example: 052-025-N-1103-F-TR-E-B-1

Metal Film resistor 1/4W, 110kOhm, 1% Tape in Reel, TCR: 50ppm, 2.5kpc

Avisert type 1 - Forming

10/5/2010

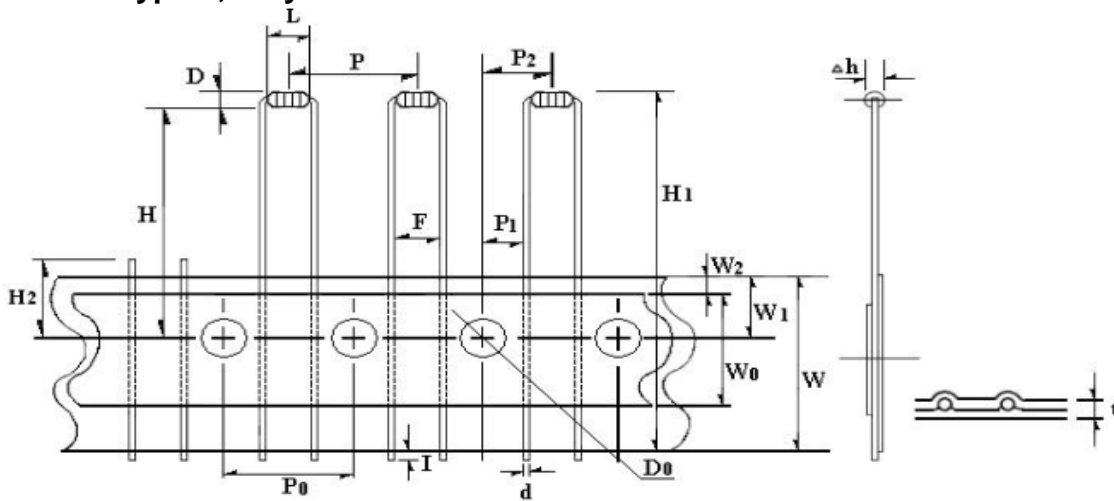
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Avisert-Type 2, only 1/8W:



Items	Symbol	Dimension (mm)	Items	Symbol	Dimension (mm)
Body diameter	D	1,85 Max,	Tape width	W	18 ± 1
Body length	L	3,5 Max,	Hole down tape width	W0	12,5 Min
Lead wire diameter	d	0,45 +/-0,05	Hole position	W1	9 ± 0,5
Pitch of component	P	12,7 ± 1	Hold down tape position	W2	3,0 Max
Feed hold pitch	P0	12,7 ± 0,3	Component height	H1	32,25 Max
Hole center to lead	P1	3,84 ± 0,7	Lead wire clinch height	H	21,25 Max
Hole center to component Center	P2	6,35 ± 1,3	Lead wire protrusion	l	1,0 Max
Lead to lead distance	F	5 ± 1	Feed hole diameter	D0	4,0 ± 0,3
Component alignment	Δh	0 ± 1	Total tape thickness	t	0,5 ± 0,2
Remark: P0 Cumulative pitch error 1 mm / 20 pitch.			Length of snipped lead	H2	11,0 Max

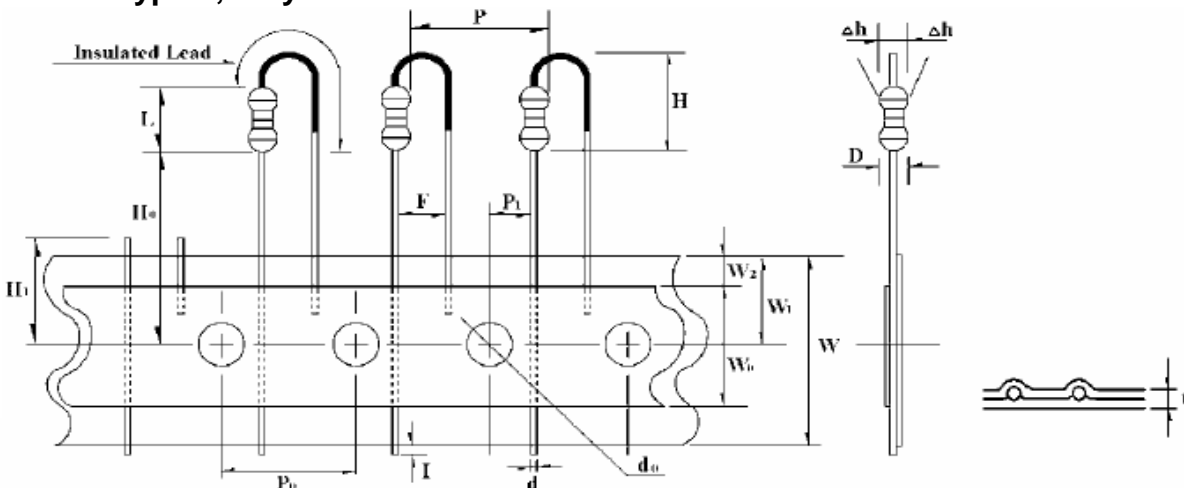
Size and Type	Ammo packing		Reel packing	
Figure				
Dimension	A	50 mm.	A	30 mm.
	B	150 mm.	B	50 mm.
	C	330 mm.	D	370 mm.
	D	50 mm.	W1	41 mm.
			W2	45 mm.
Quantity	2.000 pcs.		2.500 pcs.	

Ordering number example: 052012N1103FTREB2

Metal Film resistor 1/8W, 110kOhm, 1% Tape in Reel, TCR: 50ppm, 2.5kpc

Avisert type 2 - Forming

Avisert-Type 3, only 1/8W and 1/4W:



Items	Symbol	Dimension (mm)		Items	Symbol	Dimension (mm)	
Body diameter	D	1/8W	2,0 Max	Tape width	W	18 ± 1	
		1/4W	2,5 Max			Hole down tape width	W0
Body length	L	1/8W	4,2 Max	Hole position	W1		
		1/4W	6,8 Max			Hold down tape position	W2
Lead wire diameter	d	1/8W	0,45±0,05	Lead wire clinch position	H0		
		1/4W	0,54±0,05			1/4W	16,5 Max
Pitch of component	P	12,7 ± 1		Length of snipped lead	H1	11,0 Max	
Feed hold pitch	P0	12,7 ± 0,3		Body height	H	1/8W	7,0 Max
						1/4W	10,0 Max
Hole center to lead	P1	3,85 ± 0,7		Lead wire protrusion	I	1,0 Max	
Lead to lead spacing	F	1/8W	2,5 ± 1	Feed hole diameter	d0	4,0 ± 0,3	
		1/4W	5 ± 1				
Component alignment	Δh	0 ± 1		Total tape thickness	t	0,5 ± 0,2	

Remark: P0 Cumulative pitch error 1 mm / 20 pitch.

Size and Type	Ammo packing		Reel packing	
Figure				
Dimension	A	50 mm.	A	30 mm.
	B	150 mm.	B	50 mm.
	C	330 mm.	D	370 mm.
	D	50 mm.	W1	41 mm.
			W2	45 mm.
Quantity	2.000 pcs.		2.500 pcs.	

Ordering number example: 052012N1103FTREB3

Metal Film resistor 1/8W, 110kOhm, 1% Tape in Reel, TCR: 50ppm, 2.5kpc

Avisert type 3 - Forming

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### 6. Specification

Type	Rated Power at 70°C	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Resistance Tolerance %	T.C.R (PPM/°C)	Resistance Range	Operating Temp. Range
052 012 N	1/8W (0,125W)	200 V	400 V	400 V	± 5	± 200	1Ω-1MΩ	-55°C -- +155°C
					± 2	± 100	10Ω-1MΩ	
					± 1	± 200	<10Ω	
						± 50	10Ω-1MΩ	
					± 0,5	± 25	51,1Ω-511kΩ	
						± 50		
± 15								
± 0,25	± 25	51,1Ω-200kΩ						
	± 50							
	± 15							
052 025 N	1/4W (0,25W)	250 V	500 V	500 V	± 5	± 200	1Ω-1MΩ	
					± 2	± 100	10Ω-1MΩ	
					± 1	± 200	<10Ω	
						± 50	10Ω-1MΩ	
					± 0,5	± 50	10Ω-1MΩ	
						± 25		
± 15								
± 0,25	± 50	51,1Ω-330kΩ						
	± 25							
	± 15							
± 0,1	± 50	100Ω-100kΩ						
	± 25							
	± 15							
052 050 N	1/2W (0,50W)	350 V	700 V	700 V	± 5	± 200	1Ω-1MΩ	
					± 2	± 100	10Ω-1MΩ	
					± 1	± 200	<10Ω	
						± 50	10Ω-1MΩ	
					± 0,5	± 50	10Ω-1MΩ	
						± 25		
± 15								
± 0,25	± 50	51,1Ω-511kΩ						
	± 25							
	± 15							
± 0,1	± 50	100Ω-330kΩ						
	± 25							
	± 15							
052 100 N	1W	500 V	1.000 V	1.000 V	± 5	± 200	10Ω-1MΩ	
					± 2	± 100	51,1Ω-1MΩ	
					± 1	± 50	51,1Ω-1MΩ	
						± 50	51,1Ω-1MΩ	
					± 0,5	± 25		
						± 15		
± 0,25	± 50	51,1Ω-511kΩ						
	± 25							
	± 15							
± 0,1	± 50	100Ω-330kΩ						
	± 25							
	± 15							

# FrelTec

## Metal Film

## Resistors

052 200 N	2W	500 V	1.000 V	1.000 V	± 5	± 200	10Ω-1MΩ
					± 2	± 100	51,1Ω-1MΩ
					± 1	± 50	51,1Ω-1MΩ
					± 0,5	± 50	51,1Ω-1MΩ
						± 25	
						± 15	
					± 0,25	± 50	51,1Ω-511kΩ
						± 25	
						± 15	
					± 0,1	± 50	100Ω-330kΩ
± 25							
± 15							
052 300 N	3W	500 V	1.000 V	1.000 V	± 5	± 200	10Ω-1MΩ
					± 2	± 100	51,1Ω-1MΩ
					± 1	± 50	51,1Ω-1MΩ
					± 0,5	± 50	51,1Ω-1MΩ
						± 25	
						± 15	
					± 0,25	± 50	51,1Ω-511kΩ
						± 25	
						± 15	
					± 0,1	± 50	100Ω-330kΩ
± 25							
± 15							

FrelTec

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## Metal Film

## Resistors

Type	Rated Power at 70°C	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Resistance Tolerance %	T.C.R (PPM/°C)	Resistance Range	Operating Temp. Range
052 025 S	1/4W (0,25W)	200 V	400 V	400 V	± 5	± 200	1Ω-1MΩ	-55°C -- +155°C
					± 2	± 100	10Ω-1MΩ	
					± 1	± 200	<10Ω	
						± 50	10Ω-1MΩ	
					± 0,5	± 50	51,1Ω-511kΩ	
						± 25		
± 0,25	± 15							
	± 50	51,1Ω-200kΩ						
± 0,25	± 25	51,1Ω-200kΩ						
	± 15							
052 040 U	2/5W (0,4W)	200 V	400 V	200 V	± 5	± 200	1Ω-1MΩ	
					± 2	± 100	10Ω-1MΩ	
					± 1	± 200	<10Ω	
						± 50	10Ω-1MΩ	
					± 0,5	± 50	51,1Ω-511kΩ	
						± 25		
± 0,25	± 15	51,1Ω-200kΩ						
	± 50							
± 0,25	± 25	51,1Ω-200kΩ						
	± 15							
052 050 U	1/2W (0,50W)	250 V	500 V	250 V	± 5	± 200	1Ω-1MΩ	
					± 2	± 100	10Ω-1MΩ	
					± 1	± 200	<10Ω	
						± 50	10Ω-1MΩ	
					± 0,5	± 50	10Ω-1MΩ	
						± 25		
± 0,25	± 15	51,1Ω-511kΩ						
	± 50							
± 0,25	± 25	51,1Ω-511kΩ						
	± 15							
± 0,1	± 50	100Ω-100kΩ						
	± 25							
± 0,1	± 15	100Ω-100kΩ						
	± 50							
052 060 S	3/5W (0,6W)	250 V	500 V	500 V	± 5	± 200	1Ω-1MΩ	
					± 2	± 100	10Ω-1MΩ	
					± 1	± 200	<10Ω	
						± 50	10Ω-1MΩ	
					± 0,5	± 50	10Ω-1MΩ	
						± 25		
± 0,25	± 15	51,1Ω-330kΩ						
	± 50							
± 0,25	± 25	51,1Ω-330kΩ						
	± 15							
± 0,1	± 50	100Ω-100kΩ						
	± 25							
± 0,1	± 15	100Ω-100kΩ						
	± 50							
052 050 S	1/2W (0,50W)	350 V	700 V	700 V	± 5	± 200	1Ω-1MΩ	
					± 2	± 100	10Ω-1MΩ	
					± 1	± 200	<10Ω	
						± 50	10Ω-1MΩ	
					± 0,5	± 50	10Ω-1MΩ	
						± 25		
± 0,25	± 15	51,1Ω-511kΩ						
	± 50							

# FrelTec

## Metal Film

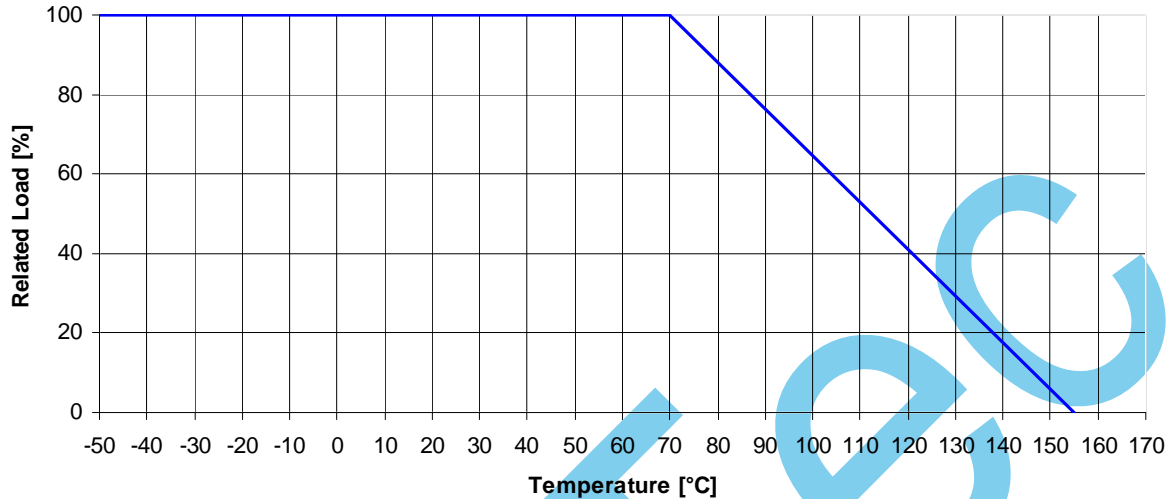
## Resistors

						± 25	100Ω-330kΩ	
						± 15		
						± 0,1		± 50
						± 25		± 15
						± 15		
052 075 S	3/4W (0,75W)	350 V	700 V	700 V	± 5	± 200	1Ω-1MΩ	
					± 2	± 100	10Ω-1MΩ	
					± 1	± 200	<10Ω	
						± 50	10Ω-1MΩ	
					± 0,5	± 50	10Ω-1MΩ	
						± 25		
						± 15		
					± 0,25	± 50	51,1Ω-511kΩ	
						± 25		
						± 15		
± 0,1	± 50	100Ω-330kΩ						
	± 25							
	± 15							
052 100 S	1W	350 V	700 V	700 V	± 5	± 200	1Ω-1MΩ	
					± 2	± 100	10Ω-1MΩ	
					± 1	± 200	<10Ω	
						± 50	10Ω-1MΩ	
					± 0,5	± 50	10Ω-1MΩ	
						± 25		
						± 15		
					± 0,25	± 50	51,1Ω-511kΩ	
						± 25		
						± 15		
± 0,1	± 50	100Ω-330kΩ						
	± 25							
	± 15							
052 200 S	2W	500 V	1.000 V	1.000 V	± 5	± 200	10Ω-1MΩ	
					± 2	± 100	51,1Ω-1MΩ	
					± 1	± 50	51,1Ω-1MΩ	
						± 50	51,1Ω-1MΩ	
					± 0,5	± 50		
						± 25		
						± 15		
					± 0,25	± 50	51,1Ω-511kΩ	
						± 25		
						± 15		
± 0,1	± 50	100Ω-330kΩ						
	± 25							
	± 15							
052 300 S	3W	500 V	1.000 V	1.000 V	± 5	± 200	10Ω-1MΩ	
					± 2	± 100	51,1Ω-1MΩ	
					± 1	± 50	51,1Ω-1MΩ	
						± 50	51,1Ω-1MΩ	
					± 0,5	± 50		
						± 25		
						± 15		
					± 0,25	± 50	51,1Ω-511kΩ	
						± 25		
						± 15		
± 0,1	± 50	100Ω-330kΩ						
	± 25							
	± 15							



**7. 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 below.

**8. Voltage rating:**

The resistor shall have a DC continuous working voltage or a rms AC continuous working voltage at commercial-line frequency and wave form corresponding to the power rating, as determined from the following:

E= Rated voltage [V]

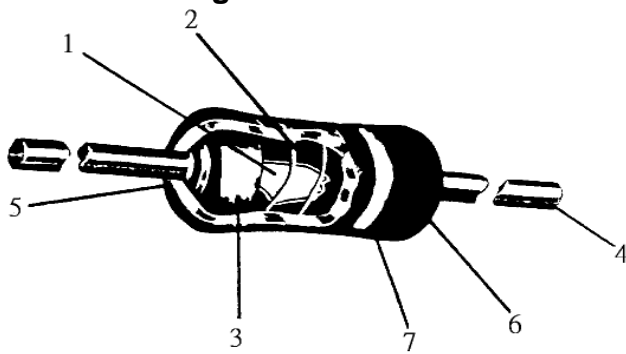
P= Power rating [W]

R= Nominal resistance [ $\Omega$ ]

$$E = \sqrt{R \cdot P}$$

## Metal Film

## 9. Structure Diagram



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	Normal type: Normal size--Insulated resin (Color : Sky blue) Small size --Insulated resin (Color : Apple Green) Except 1/2W small size color is Sky blue Non-Flame type: --Insulated & Non-Flame paint (Color : Green) meeting UL 94V0 standard
7	Color Code	Refer to 2. Marking

## 10. 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 above.

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 4.5)
Insulation resistance	Epoxy: Insulation resistance is 10 MΩ Min  Non Flame: Insulation resistance is 20 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 sec. (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 sec. (Sub-clause 4.7)
Temperature coefficient	Please refer to Specification above	Natural resistance change per temp. degree centigrade. $\frac{R_2 - R_1}{R_1(t_2 - t_1)} \cdot 10^6 \text{ (PPM/°C)}$ 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 kg direct load for 10 sec. 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 sec (Sub-clause 4.17)

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## Metal Film

## Resistors

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 5 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 min</td> </tr> <tr> <td>2</td> <td>Room temp.</td> <td>10~15 min</td> </tr> <tr> <td>3</td> <td>+155°C ±2°C</td> <td>30 min</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>10~15 min</td> </tr> </tbody> </table>	Step	Temperature	Time	1	-55°C ±3°C	30 min	2	Room temp.	10~15 min	3	+155°C ±2°C	30 min	4	Room temp.	10~15 min
		Step	Temperature	Time													
		1	-55°C ±3°C	30 min													
		2	Room temp.	10~15 min													
3	+155°C ±2°C	30 min															
4	Room temp.	10~15 min															
(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	Resistance value	ΔR/R															
	Normal Type	± 1,5%															
	Non-Flame type	± 5 %															
Load life	Resistance value	ΔR/R															
	Normal Type	± 1,5 %															
	Non-Flame type	± 5 %															
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)															
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 sec. "off" ) at 4 times RCWV (Sub-clause 5.8)															

### Environment Related Substance:

This product comply 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 these products.

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

**Published by FrelTec® GmbH**  
**Mathildenstr. 10A; 82319 Starnberg; Germany**  
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