［製品案内］

English

TAMAOHM

PRODUCTS CATALOG

ALL FOR ONE ›

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GLOBAL COMPLIANCE CERTIFICATION GCC ISO 9001 Certified

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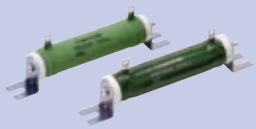
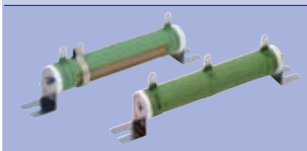
ALL FOR ONE

CONTENT





Cautions for use / Standards

⚠ Cautions for use

- Using power type wire wound resistor at the rated power specified in the catalog may accelerate deterioration of material due to the raise of surface temperature. The load rate should be less than 50% under favourable circumstances of use.
- Mount resistor carefully and reduce the load power in order to avoid the damage to the wiring material, panel or other electric parts.
- Using resistor where transient load is applied to may be a risk of local degradation, short circuit, breakage, melting etc.
- Take measures for safety to prevent anybody touching it with hands as resistor is a heating unit.
- Handle resistor carefully to avoid dropping or applying impact received from the outside. Broken resistor and broken pieces may cause injury.
- Do not put excessive torque when power type wire wound resistor is fixed by screw.
- Use crimp terminal to connect to the resistor terminal as resistor body is a heating unit.
- Avoid injuring or scratching the surface of paint coated resistor when using.
- Do not apply excessive force to the lead wire terminal when the lead wire is bent for use.
- It may cause loosened wire and a crack in exterior.
- Non-inductive winding is applied for the improvement of high-frequency waves, but it does not mean inductive component is zero. Also the winding method and special characteristics vary depending on the type of resistor and resistance values.
- Metal clad resistor with chassis should be used at smooth and in good adhesive conditions.
- Metal clad resister may not achieve enough heat radiation against chasiss while application time of such a single-engine pulse load is short. In this case, use resistor based on normal rated power in outer space use.
- While washing some board mounting types (cement resistor, metal clad resistor), they may have problems of quality degradation and display peeling off caused by the type of organic solvents or by washing conditions.
- Do not use or store resistors at high temperature and high humidity conditions, in the water, at the corrosive gases or condensing atmosphere.
- It should be tested and evaluated on actual unit in the actual use conditions for uses requiring high reliability.
- For further information about basic precautions and above mentioned causion of uses, the technical report guideline 『EIAJ RCR-2121(Guidelines of notabilia for fixed resistors for use in electronic equipment』is also available at the the Japan Electronic Machinery Industrial Association.
- The content of this catalog may be changed without prior notice.
- Please visit and check the official web-site for the latest information (http://www.tamaohm.co.jp/en/).

If you have any questions or unclear points, please send your request through fax or e-mail in order to avoid the troubles. 》【FAX: 044-944-8081　E-mail: info@tamaohm.co.jp】

Ceramic Bobbin Resistors Attention & Information

ELECTRICAL CHARACTERISTICS

in accordance with JIS

	Test conditions	Standard values
Resistance values / Resistance toleranceo	—	Refer to the resistance range in specifications list
Temperature coefficient of resistance	—	+100～+400 ppm/℃ max
Power rating load	Apply 100% rated electric power for 30 minutes. After applying, leave for another 2 hours.	Surface temperature is below 350℃. Resistance values variations ±(0.5%+0.05Ω)
Short time overload	Apply 10 times±5% of rated electric power for 5 seconds. After applying, leave for 30 seconds.	No evidence of arc or other abnormalities. Resistance values variations ±(2%+0.05Ω)
Insulation resistance	Apply DC500V between terminal and angle for 1 minute.	More than 20Ω
Dielectric Strength	Apply below voltage between terminal and angle for 1 minute. OS/EO type : AC2000V (5W/E10W : AC 1500V)S type : AC1000V	No evidence of burnout or other abnormalities. Resistance values variationst ±(0.1%+0.05Ω)

MECHANICAL CHARACTERISTICS

in accordance with JIS

	Test conditions	Standard values
Terminal Strength	Apply 4.5 kg weight to the feed direction of terminal for 30 minutes	No evidence of abnormalities of resistor.
Resistor strength	Apply 20 kg weight to the center of resistor body for 10 seconds	No evidence of breakage of resistor.
Vibration Proof	Repeat 1 minute vibration cycle (up-down, front-back, left-right) of 1.5mm length at 10-55Hz frequency for 2 hours	No evidence of mechanical damage. Resistance values variations ±(1%+0.05Ω)
Solderability	Solder temperature 325℃±5℃ Immersion time 10±0.5 sec	Over 3/4 of terminal surface is covered by new soldering.

ENVIRONMENTAL CHARACTERISTICS

in accordance with JIS

	Test conditions	Standard values
Flame resistance	Leave resistor at 350℃±5℃ temperature for 2 hours	No evidence of remarkable change of color or damages.Displayed values are readable.
Thermal Shock	Apply rated electric power ±5% for 30 minutes, then leave resistor at −55℃ temperature for 15 minutes. After applying the mentioned process, leave it at normal temperature for 2 hours.	No evidence of remarkable change of color or damages at resistor. Displayed values are readable. Resistance values variations ±(3%+0.05Ω)
Humidity resistance	Apply 1/10 of rated elecrtric power at 40℃ 95%Rh atmosphere for 500 hours. After applying the mentioned process, leave it for 30 minutes.	No evidence of remarkable change of color or damages.Displayed values are readable.
Load Life	Leave resistor at 350℃±5℃ temperature for 2 hours	No evidence of remarkable breakage, fragmentation or terminal looseness. Resistance values variations ±(5%+0.05Ω)

TAMAOHM

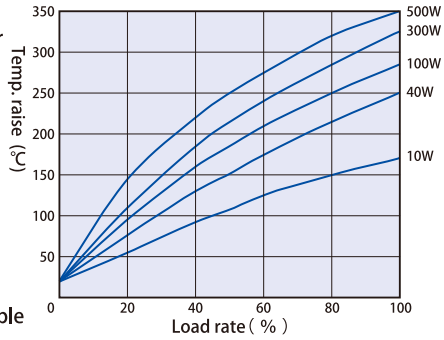
RoHS対応

TRH Power Type Flame Proof Wire Wound Resistor

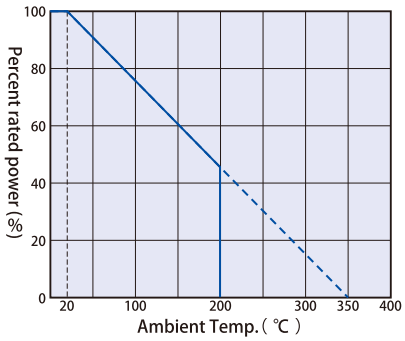
Features

- Equivalent of JS RWH
- Same specifications as traditional enamel coated resistor (RWH type)
- Current standard product with improvements to details.
- Without deterioration of resistance wire during manufacturing process at high temperature processing, TRH type can be manufactured with wider resistance range than RWH type.
- The terminal strength is higher than of RWH type due to appalication of screw clamp (band terminal).

Surface temperature raise curve



Rated power reduction curve



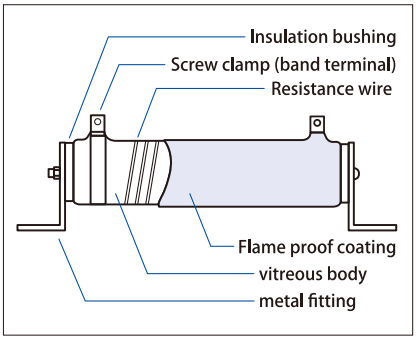
Standard

●Resistance value range	See below specifications table
●Resistance value tolerance	5-400W: J=±5% (≧1Ω) K=±10% (<10Ω) 500W: J (≧3Ω) K(<3Ω) 750W: J (≧4Ω) K(<4Ω) 1000W: J (≧5.5Ω) K(<5.5Ω)
●Temperature coefficient of resistance	+100 - 400 ppm/℃max Combination of type O•S/
●Dielectric strength	Type O - AC2000V 1min (5W•10W, AC 1500V) Type S- AC 1000V 1min
●Insulation resistance	≧ 20MΩ (DC 1000V mega)
●Maximum use temperature	340℃

Options

- ☐Slide - refer to P6 (TRH-A)
- ☐Intermediate terminal - refer to P7 (TRH-HH)
- ☐Non-inductive winding - provided depending on the resistance values

Straction drawing

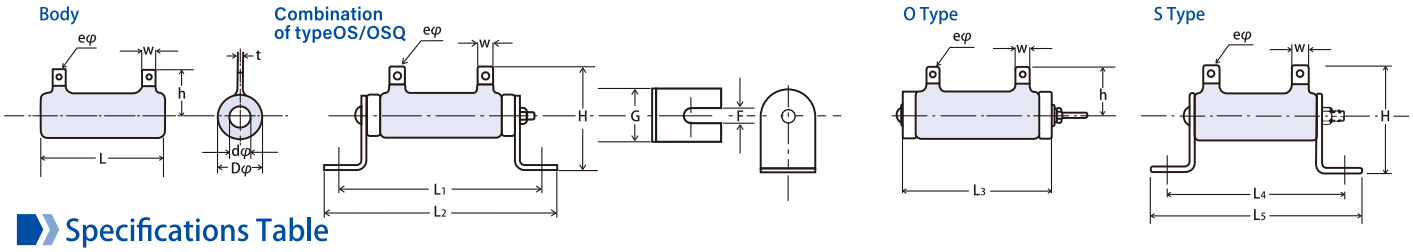


Product designation (reference)

–	TRH	100	G	50	Ω	J	– OS
no mark: induction winding N- : non-inductive winding		Wattage	Characteristics G:standard V	Resistance value		Tolerance J(=±5%) K(=±10%)	Part fitting no mark : no fitting – OS/OSQ – O – S

Dimensional drawing

※Further information is available for the terminal shape which may vary with rated power/w



Specifications Table

Model (rated power/W)	Resistance value range(Ω) G characteristics (standard)	Resistance value range(Ω) V characteristics	Dimenstions(mm) Body L±2	OS L1±2	OS L2±2	OSQ L1±2	OSQ L2±2	O L3±2	S L4±2	S L5±2	Dφ	dφ	OS G	OS H±3	OSQ G	OSQ H±3	h±2	F	W	t	eφ	Weight Body	O	OS/OSQ	S
																						Metal fittings			
5	0.1~3.5K	0.2~3.5K	30	53	71	48	58	37	47	63	≦15	≦5	12	30	12	30	19	3.2	≧5	≧0.8	≧3	4	6	8	6
10	0.1~7K	0.3~7K	45	68	85	63	74	53	62	77	≦15	≦5	12	30	12	30	19	3.2	≧5	≧0.8	≧3	6	6	8	6
15	0.1~7K	0.3~7K	45	68	85	63	74	53	62	77	≦15	≦5	12	30	12	30	19	3.2	≧5	≧0.8	≧3	7	6	8	6
20	0.1~13K	0.5~13K	50	76	92	74	86	60	66	83	≦22	≦8.5	16	36	18	36	20	4.2	≧5	≧0.8	≧3	16	10	16	10
30	0.1~20K	0.5~20K	75	101	117	99	111	85	91	108	≦22	≦8.5	16	36	18	36	20	4.2	≧5	≧0.8	≧3	22	11	17	11
40	0.1~25K	0.5~25K	90	117	133	115	127	101	106	122	≦22	≦8.5	16	36	18	36	20	4.2	≧5	≧0.8	≧3	26	12	18	12
50	0.2~30K	0.5~30K	75	114	140	104	126	87	101	128	≦32	≦15	26	59	27	58	33	6	≧8	≧1	≧3.5	52	30	51	31
60	0.2~40K	0.5~40K	90	128	154	118	140	102	124	145	≦32	≦15	26	59	27	58	33	6	≧8	≧1	≧3.5	60	30	52	32
80	0.2~50K	0.5~50K	115	154	180	144	166	127	138	168	≦32	≦15	26	59	27	58	33	6	≧8	≧1	≧3.5	77	33	54	34
100	0.2~65K	0.7~65K	140	179	205	169	191	151	164	191	≦32	≦15	26	59	27	58	33	6	≧8	≧1	≧3.5	98	33	55	36
120	0.3~75K	0.8~75K	165	204	230	194	216	176	191	218	≦32	≦15	26	59	27	58	33	6	≧8	≧1	≧3.5	115	35	56	37
150	0.3~95K	1~95K	195	234	260	224	246	208	222	248	≦32	≦15	26	59	27	58	33	6	≧8	≧1	≧3.5	133	38	59	39
200	0.4~120K	1.3~120K	254	294	320	284	306	267	281	306	≦32	≦15	26	59	27	58	33	6	≧8	≧1	≧3.5	175	41	63	42
250	0.5~150K	1.7~150K	305	344	370	334	356	–	331	358	≦32	≦15	26	59	27	58	33	6	≧8	≧1	≧3.5	212	45	67	46
300	0.2~100K	2~100K	254	315	345	305	335	–	–	–	≦45	≦25	38	91	40	87	48	10	≧13	≧1.5	≧5	403	90	170	102
400	0.3~100K	3~100K	330	390	420	380	410	–	–	–	≦45	≦25	38	91	40	87	48	10	≧13	≧1.5	≧5	530	98	178	107
500	0.3~100K	3~100K	300	350	385	–	–	–	–	–	≦55	≦30	48	100	–	–	51	10	≧13	≧1.5	≧5	760	126	234	–
750	0.5~5K	4~5K	300	360	395	–	–	–	–	–	≦76	≦50	48	120	–	–	60	10	≧13	≧2	≧5	1160	–	434	–
1000	0.6~5K	5.5~5K	300	389	440	–	–	–	–	–	≦120	≦70	100	163	–	–	78	8.5	≧13	≧2	≧5	2520	–	1294	–

Supplementary information

● In accordance with JIS standards, more reliable wire is used for V characteristics comparing with G. ● For safety reason, it is recommended to be used under 50% of rated power and under favourable circumstances. ● Use crimp terminal to connect to the resistor terminal as resistor body is a heating unit.

●Low-resistance value over 50W ⇒ TRR (P8) is recommended

OBSOLETE ➡ Substitute : TRH
see p4 : TRH for a substitute of RWH

RWH

Power Ttype Enamel Wire Wound Resistor

TAMAOHM

RoHS対応

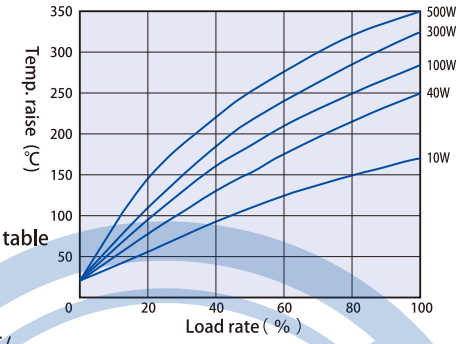
Features

- Enamel resistor with good supply records
- Use of in-house developed leed-free enamel

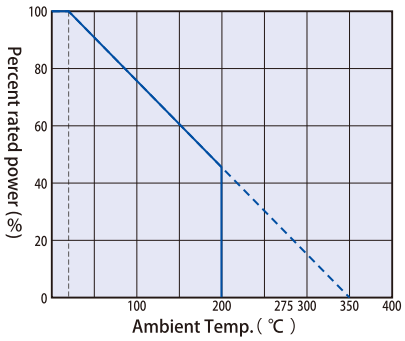
Standard

●Resistance value range	See below specifications table
●Resistance value tolerance	5-400W: J=±5% (≧1Ω) K=±10% (＜10Ω) 500W～100W: J= ±5%
●Temperature coefficient of resistance	+100 - 400 ppm/℃max Combination of type O・S/
●Dielectric strength	Type O - AC2000V 1min (5W・10W, AC 1500V) Type S- AC 1000V 1min
●Insulation resistance	≧ 20MΩ (DC 1000V mega)
●Maximum use temperature	340℃

Surface temperature raise curve



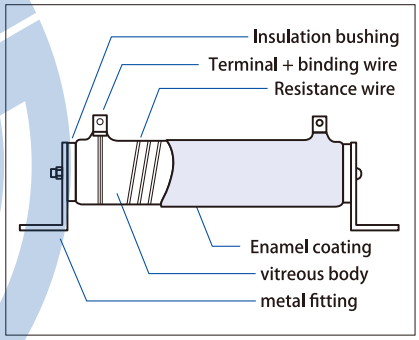
Rated power reduction curve



Options

- ☐Slide - refer to P6 (TRH-A)
- ☐Intermediate terminal - refer to P7 (TRH-HH)
- ☐Non-inductive winding - provided depending on the resistance values

Straction drawing

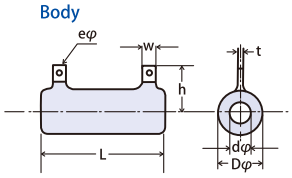


Product designation (reference)

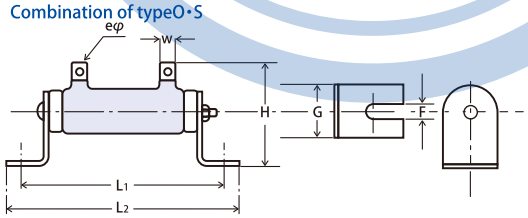
–	RWH	100	G	50	Ω	J	– OS
no mark: induction winding N- : non-inductive winding		Wattage	Characteristics G:standard V	Resistance value		Tolerance J(＝±5%) K(＝±10%)	Part fitting no mark : no fitting – OS – O – S

Dimensional drawing

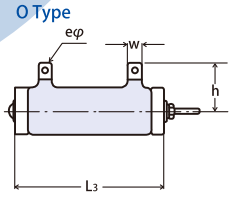
Body



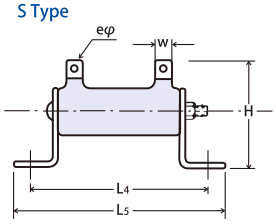
Combination of typeO・S



O Type



S Type



Specifications Table

Model (rated power/w)	Resistance value range (Ω)		Dimenstions (mm)															Weight
	G characteristics (standard)	V characteristics	Body	OS			S											Body+OS
			L±2	L1±2	L2±2	L3±2	L4±2	L5±2	Dφ	dφ	H±3	h±2	G	F	W	t	eφ	/g
5	0.2 ～ 1.2K	0.5 ～ 1.2K	30	53	71	37	47	63	≦15	≦5	30	16	12	3.2	≧5	≧0.8	≧3	19
10	0.3 ～ 2.1K	1 ～ 2.1K	45	68	85	53	62	77	≦15	≦5	30	16	12	3.2	≧5	≧0.8	≧3	24
15	0.3 ～ 2.2K	1 ～ 2.2K	45	68	85	53	62	77	≦15	≦5	30	16	12	3.2	≧5	≧0.8	≧3	28
20	0.6 ～ 3.9K	2 ～ 3.9K	50	76	92	60	66	83	≦22	≦8.5	36	20	16	4.2	≧5	≧0.8	≧3	50
30	0.9 ～ 6.3K	3 ～ 6.3K	75	101	117	85	91	108	≦22	≦8.5	36	20	16	4.2	≧5	≧0.8	≧3	70
40	1.2 ～ 8.2K	3.5 ～ 8.2K	90	117	133	101	106	122	≦22	≦8.5	36	20	16	4.2	≧5	≧0.8	≧3	75
50	1.2 ～ 8.2K	3.5 ～ 8.2K	75	114	140	87	101	128	≦32	≦15	55	30	26	6	≧6	≧0.8	≧3.2	145
60	2 ～ 12K	5 ～ 12K	90	128	154	102	124	145	≦32	≦15	55	30	26	6	≧6	≧0.8	≧3.2	165
80	3 ～ 15K	7 ～ 15K	115	154	180	127	138	168	≦32	≦15	55	30	26	6	≧6	≧0.8	≧3.2	190
100	3 ～ 20K	9 ～ 20K	140	179	205	151	164	191	≦32	≦15	55	30	26	6	≧6	≧0.8	≧3.2	225
120	4 ～ 23K	11 ～ 23K	165	204	230	176	191	218	≦32	≦15	55	30	26	6	≧6	≧0.8	≧3.2	255
150	4 ～ 30K	13 ～ 30K	195	234	260	208	222	248	≦32	≦15	55	30	26	6	≧6	≧0.8	≧3.2	290
200	6 ～ 38K	17 ～ 38K	254	294	320	267	281	306	≦32	≦15	55	30	26	6	≧6	≧0.8	≧3.2	365
250	7 ～ 46K	21 ～ 46K	305	344	370	—	331	358	≦32	≦15	55	30	26	6	≧6	≧0.8	≧3.2	440

※over 300W ➡ TRH (P4) is recommendable.

300	8 ～ 57K	26 ～ 57K	254	315	345	—	—	—	≦45	≦25	87	44	38	10	≧10	≧1.5	≧5	780
400	10 ～ 77K	35 ～ 77K	330	390	420	—	—	—	≦45	≦25	87	44	38	10	≧10	≧1.5	≧5	970
500	11 ～ 83K	38 ～ 83K	300	350	385	—	—	—	≦55	≦30	99	50	48	10	≧10	≧1.5	≧5	1470
750	16 ～ 5K	50 ～ 5K	300	360	395	—	—	—	≦76	≦50	120	60	48	10	≧15	≧2	≧6.5	2300
1000	22 ～ 5K	70 ～ 5K	300	389	440	—	—	—	≦120	≦70	163	78	100	8.5	≧15	≧2	≧6.5	4950

Supplementary information

● In accordance with JIS standards, more reliable wire is used for V caracteristics comparing with G. ● For quality maintainance, it is recommended to be used under 50% of rated power and under favourable circumstances. ● Use crimp terminal to connect to the resistor terminal as resistor body is a heating unit.
●RWH is the same specifictaions product with TRH except diferrence of coating method.

●Resistance value not stated on the specifications table ⇒ TRH (P4) is recommendable. ●Low-resistance value over 50W ⇒ TRR (P8) is recommended

TAMAOHM

RoHS対応

TRH-A

Nonflammable coating

Adjustable Resistor (by sliding method)

Features

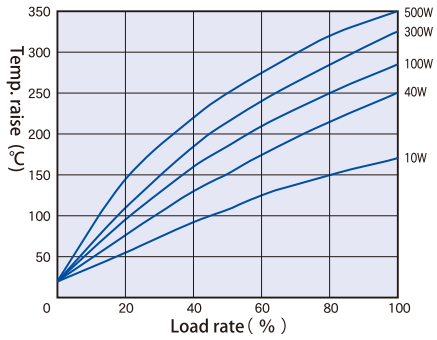
●Resistance values are resistable by adjusting/sliding screw clamp (band terminal)
●Suitable for testing use due to capability of resistance value adjustment

Standard

●Resistance value range	See below specifications table
●Resistance value tolerance	5-400W: J=±5% (≧1Ω) K=±10% (<10Ω) 500W: J 750W: J (≧4Ω) K(<4Ω) 1000W: J (≧6Ω) K(<6Ω)
●Temperature coefficient of resistance	+100 - 400 ppm/℃max
●Dielectric strength	Combination of type O•S/ Type O - AC2000V 1min (5W•10W, AC 1500V) Type S- AC 1000V 1min
●Insulation resistance	≧ 20MΩ (DC 1000V mega)
●Maximum use temperature	340℃
●Maximum adjustment range of resistance value	5-20W = ≧75%/ ≧30W = ≧80%

《Caution》
●Using this resistor in high humid surroundings may cause corrosion or wire breaking to exposed resistance wire.
●To avoid damaging exposed part of resistor, loosen the screw clamp enough before adjustment.
●The rated power may change by variableness of resistance values.

Surface temperature raise curve



Options

□Ribbon type :
Refer to P8 (TRR-A)

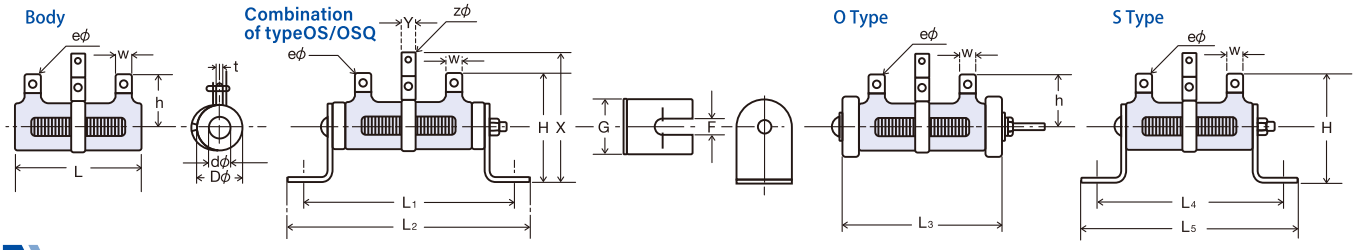
□Non-inductive wire : ×

Product designation (reference)

TRH	100	A	1	G	50	Ω	J	– OS
	Wattage		No. of adjustable sliding band	Characteristics G:standard V	Resistance value		Tolerance J(=±5%) K(=±10%)	Part fitting no mark : no fitting – OS/OSQ – O – S

Dimensional drawing

※Further information is available for the terminal shape which may vary with rated power/w



Specifications Table

Model (rated power/W)	Resistance value range(Ω) G characteristics (standard)	V characteristics	Dimenstions(mm) Body L±2	OS L1±2	OS L2±2	OSQ L1±2	OSQ L2±2	O L3±2	S L4±2	S L5±2	Dϕ	dϕ	OS G	OS H±3	OSQ G	OSQ H±3	F	W	t	eϕ
5	0.5~200	0.5~200	30	53	71	48	58	37	47	63	≦15	≦5	12	30	12	30	3.2	≧5	≧0.8	≧3
10	0.5~400	0.5~400	45	68	85	63	74	53	62	77	≦15	≦5	12	30	12	30	3.2	≧5	≧0.8	≧3
15	0.5~400	0.5~400	45	68	85	63	74	53	62	77	≦15	≦5	12	30	12	30	3.2	≧5	≧0.8	≧3
20	0.5~800	0.5~800	50	76	92	74	86	60	66	83	≦22	≦8.5	16	36	18	36	4.2	≧5	≧0.8	≧3
30	0.5~1K	0.5~1K	75	101	117	99	111	85	91	108	≦22	≦8.5	16	36	18	36	4.2	≧5	≧0.8	≧3
40	0.5~1.5K	0.5~1.5K	90	117	133	115	127	101	106	122	≦22	≦8.5	16	36	18	36	4.2	≧5	≧0.8	≧3
50	0.3~1.8K	0.3~1.8K	75	114	140	104	126	87	101	128	≦32	≦15	26	59	27	58	6	≧8	≧1	≧3.5
60	0.4~2K	0.4~2K	90	128	154	118	140	102	124	145	≦32	≦15	26	59	27	58	6	≧8	≧1	≧3.5
80	0.5~2.5K	0.5~2.5K	115	154	180	144	166	127	138	168	≦32	≦15	26	59	27	58	6	≧8	≧1	≧3.5
100	0.7~3K	0.7~3K	140	179	205	169	191	151	164	191	≦32	≦15	26	59	27	58	6	≧8	≧1	≧3.5
120	0.8~4K	0.8~4K	165	204	230	194	216	176	191	218	≦32	≦15	26	59	27	58	6	≧8	≧1	≧3.5
150	1~4K	1~4K	195	234	260	224	246	208	222	248	≦32	≦15	26	59	27	58	6	≧8	≧1	≧3.5
200	1~6K	1~6K	254	294	320	284	306	267	281	306	≦32	≦15	26	59	27	58	6	≧8	≧1	≧3.5
250	2~6K	2~6K	305	344	370	334	356	–	331	358	≦32	≦15	26	59	27	58	6	≧8	≧1	≧3.5
300	2~7K	2~7K	254	315	345	305	335	–	–	–	≦45	≦25	38	91	40	87	10	≧13	≧1.5	≧5
400	3~8K	3~8K	330	390	420	380	410	–	–	–	≦45	≦25	38	91	40	87	10	≧13	≧1.5	≧5
500	3~10K	3~10K	300	350	385	–	–	–	–	–	≦55	≦30	48	100	–	–	10	≧13	≧1.5	≧5
750	3~4K	3~4K	300	360	395	–	–	–	–	–	≦76	≦50	48	120	–	–	10	≧13	≧2	≧5
1000	3~2K	6~2K	300	389	440	–	–	–	–	–	≦120	≦70	100	163	–	–	8.5	≧13	≧2	≧5

Supplementary information ● In accordance with JIS standards, more reliable wire is used for V characteristics comparing with G. ● For safety reason, it is recommended to be used under 50% of rated power and under favourable circumstances. ● Use crimp terminal to connect to the resistor terminal as resistor body is a heating unit.

TAMAOHM

RoHS対応

TRH-HH

Nonflammable coating

Resistor with intermeriate terminal (Tap Type)

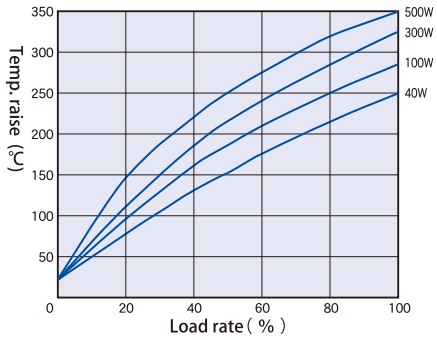
Features

●Fixed type terminal can be fixed in the middle.
●The number of intermediate terminals and resistance value inbetween intermediate terminals must be specified depending on a use.

Standard

●Resistance value range	See below specifications table
●Resistance value tolerance	5-400W: J=±5% (≧1Ω) K=±10% (<10Ω) 500W: J (≧7Ω) K(<7Ω) 750W: J (≧4Ω) K(<4Ω) 1000W: J (≧6Ω) K(<6Ω) Tolerance between intermediate terminal and each terminal is the double of above stated values.
●Temperature coefficient of resistance	+100 - 400 ppm/℃max
●Dielectric strength	Combination of type O・S/ Type O - AC2000V 1min (5W・10W, AC 1500V) Type S- AC 1000V 1min
●Insulation resistance	≧ 20MΩ (DC 1000V mega)
●Maximum use temperature	340℃

Surface temperature raise curve



Options

□Ribbon type : Refer to P8 (TRR-A)

□Non-inductive wire - provided depending on the resistance values

Product designation (reference)

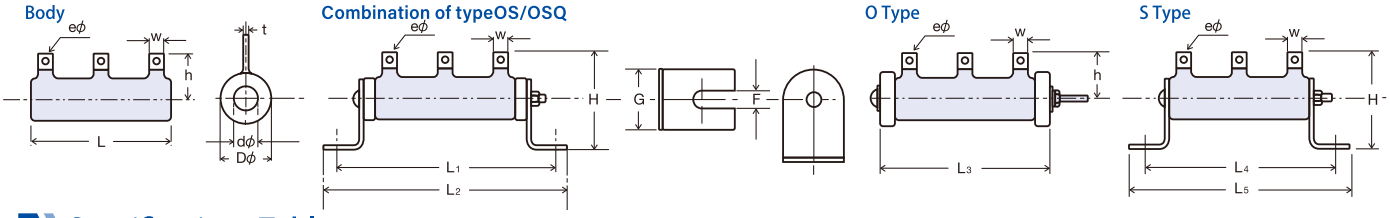
– TRH	100	HH	1	G	50	Ω	J	– OS
no mark: induction winding N- : non-inductive winding	Wattage		No. of intermediate terminal *see the below spec. table for the limit on the number of taps	Characteristics G:standard V	Resistance value		Tolerance J(=±5%) K(=±10%)	Part fitting no mark : no fitting – OS/OSQ – O – S

Specify resistance value between taps. (25 Ω + 25 Ω ⋮ + □ Ω)

case of more than 2 taps

Dimensional drawing

※Further information is available for the terminal shape which may vary with rated power/w



Specifications Table

Model (rated power) W	Resistance value range (Ω) G characteristics (standard)	V characteristics	Limit on the number of taps	Lowest value of taps (paint) G	Lowest value of taps (paint) V	Dimenstions (mm) Body L±2	OS L1±2	OS L2±2	OSQ L1±2	OSQ L2±2	O L3±2	S L4±2	S L5±2	Dφ	dφ	OS G	OS H±3	OSQ G	OSQ H±3	h±2	G	F	W	t	eφ
20	0.5~1.2K	1.5~1.2K	1	0.2	0.5	50	76	92	74	86	60	66	83	≦22	≦8.5	16	36	18	36	20	16	4.2	≧5	≧0.8	≧3
30	0.5~2.1K	2~2.1K	2	0.2	0.8	75	101	117	99	111	85	91	108	≦22	≦8.5	16	36	18	36	20	16	4.2	≧5	≧0.8	≧3
40	0.5~2.6K	3~2.6K	3	0.2	1	90	117	133	115	127	101	106	122	≦22	≦8.5	16	36	18	36	20	16	4.2	≧5	≧0.8	≧3
50	0.3~2.6K	1~2.6K	3	0.1	0.5	75	114	140	104	126	87	101	128	≦32	≦15	26	59	27	58	33	26	6	≧8	≧1	≧3.5
60	0.3~3.6K	1~3.6K	3	0.1	0.5	90	128	154	118	140	102	124	145	≦32	≦15	26	59	27	58	33	26	6	≧8	≧1	≧3.5
80	0.3~4.8K	2~4.8K	4	0.1	1	115	154	180	144	166	127	138	168	≦32	≦15	26	59	27	58	33	26	6	≧8	≧1	≧3.5
100	0.3~6.2K	2~6.2K	4	0.1	1	140	179	205	169	191	151	164	191	≦32	≦15	26	59	27	58	33	26	6	≧8	≧1	≧3.5
120	0.5~7.5K	3~7.5K	5	0.2	1.5	165	204	230	194	216	176	191	218	≦32	≦15	26	59	27	58	33	26	6	≧8	≧1	≧3.5
150	0.5~9.1K	3~9.1K	6	0.2	1.5	195	234	260	224	246	208	222	248	≦32	≦15	26	59	27	58	33	26	6	≧8	≧1	≧3.5
200	0.5~12K	4~12K	6	0.2	2	254	294	320	284	306	267	281	306	≦32	≦15	26	59	27	58	33	26	6	≧8	≧1	≧3.5
250	0.6~15K	5~15K	6	0.3	2.5	305	344	370	334	356	–	331	358	≦32	≦15	26	59	27	58	33	26	6	≧8	≧1	≧3.5
300	1~18K	6~18K	6	0.5	3	254	315	345	305	335	–	–	–	≦45	≦25	38	91	40	87	48	38	10	≧13	≧1.5	≧5
400	1~25K	7~25K	6	0.5	3.5	330	390	420	380	410	–	–	–	≦45	≦25	38	91	40	87	48	38	10	≧13	≧1.5	≧5
500	1~27K	7~27K	6	0.5	3.5	300	350	385	–	–	–	–	–	≦55	≦30	48	100	–	–	51	48	10	≧13	≧1.5	≧5
750	1~5K	8~5K	6	0.5	4	300	360	395	–	–	–	–	–	≦76	≦50	48	100	–	–	60	48	10	≧13	≧2	≧5
1000	1~5K	10~5K	6	0.5	5	300	389	440	–	–	–	–	–	≦120	≦70	100	163	–	–	78	100	8.5	≧13	≧2	≧5

Supplementary information

● In accordance with JIS standards, more reliable wire is used for V caracteristics comparing with G. ● For quality maintainance, it is recommended to be used under 50% of rated power and under favourable circumstances. ● Use crimp terminal to connect to the resistor terminal as resistor body is a heating unit. ●TRH-HH is the reference standard since TRH-HH and RWH-HH have the same specifications.

TRR

Nonflammable coating

Options TRR-A / TRR-HH High power ribbon wire wound resistor

TAMAOHM

RoHS対応

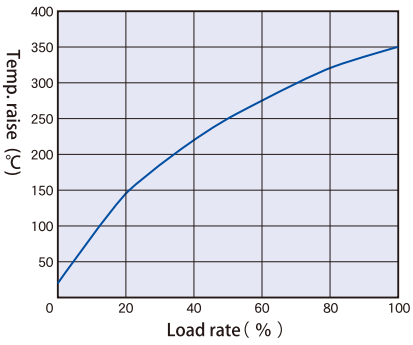
Features

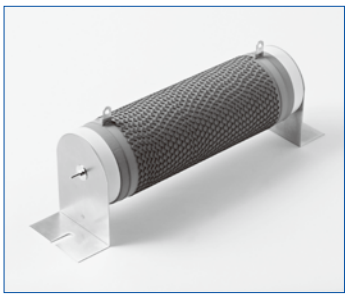
- Good heat radiating effect by adopting ribbon-shaped (tenioid) resistor line.
- Suitable for large current and low resistance value despite of its small body.

Standard

●Resistance value range	See below specifications table
●Resistance value tolerance	K=±10% M=±20%
●Temperature coefficient of resistance	+100 - 400 ppm/℃max
●Dielectric strength	Combination of type O・S/ Type O - AC2000V 1min Type S- AC 1000V 1min
●Insulation resistance	≧ 20MΩ (DC 1000V mega)
●Maximum use temperature	340℃

Surface temperature raise curve





Options

- □Slide - depends on resistance value (TRR-A)
- □Intermediate terminal : depends on resistance value (TRR-HH)
- □Non-inductive wire : ×

Product designation (reference)

(Example) Standard product

TRR [100] G [5] Ω [K] [– OS]

- Model: 100
- Resistance value: 5 Ω
- Tolerance: J(=±5%) K(=±10%)
- Part fitting: no mark : no fitting / – OS/OSQ / – O / – S

(Example) With options

TRR [100] [A] [1] G [5] Ω [K] [– OS]

- Model: 100
- A :slide / HH : with intermidiate terminal
- Number of slide band / Number of intermediate terminal: 1
- Resistance value: 5 Ω
- Tolerance: J(=±5%) K(=±10%)
- Part fitting: no mark : no fitting / – OS/OSQ / – O / – S

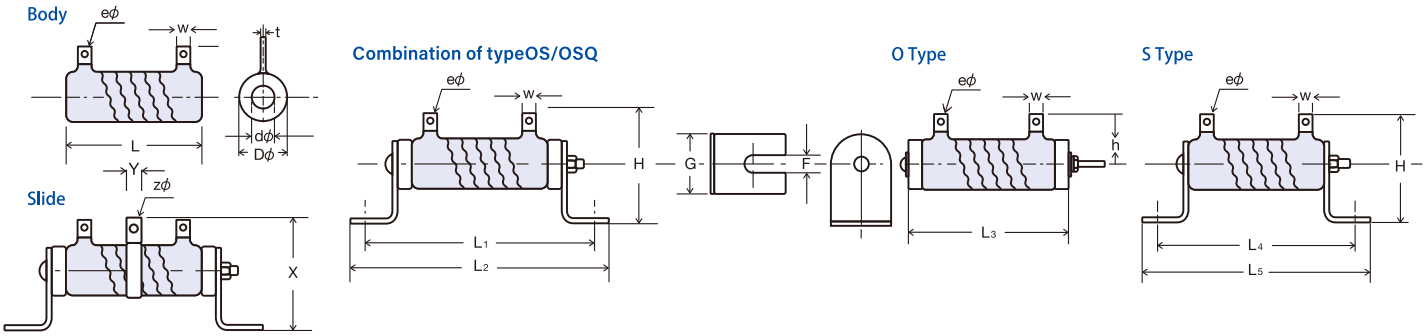
※Specify resistance values in between taps for intermediate terminal

([ ] Ω + [ ] Ω ⋮ + [ ] Ω)

case of more than 2 taps

Dimensional drawing

※Further information is available for the terminal shape which may vary with rated power/w



Specifications Table

Model	Reted power (W)	Resistance value range(Ω) Standard	Slide/Tap	Dimenstions(mm) Body L±2	OS L1±2	OS L2±2	OSQ L1±2	OSQ L2±2	O L3±2	S L4±2	S L5±2	Dϕ	dϕ	OS G	OS H±3	OSQ G	OSQ H±3	h±2	G	F	W	t	eϕ	X±3	Y	Zϕ	Weight Body+OS/OSQ About/g
50	80	0.05~4	0.1~4	75	114	140	104	126	87	101	128	≦40	≦15	26	59	27	58	33	26	6	8	1.5	4.5	66	≧11	≧4.1	165
60	100	0.05~5	0.1~5	90	128	154	118	140	102	124	145	≦40	≦15	26	59	27	58	33	26	6	8	1.5	4.5	66	≧11	≧4.1	190
80	120	0.05~6	0.1~5	115	154	180	144	166	127	138	168	≦40	≦15	26	59	27	58	33	26	6	8	1.5	4.5	66	≧11	≧4.1	225
100	150	0.05~8	0.1~6	140	179	205	169	191	151	164	191	≦40	≦15	26	59	27	58	33	26	6	8	1.5	4.5	66	≧11	≧4.1	260
120	180	0.05~10	0.1~7	165	204	230	194	216	176	191	218	≦40	≦15	26	59	27	58	33	26	6	8	1.5	4.5	66	≧11	≧4.1	285
150	220	0.1~12	0.2~9	195	234	260	224	246	208	222	248	≦40	≦15	26	59	27	58	33	26	6	8	1.5	4.5	66	≧11	≧4.1	315
200	300	0.1~15	0.2~12	254	294	320	284	306	267	281	306	≦40	≦15	26	59	27	58	33	26	6	8	1.5	4.5	66	≧11	≧4.1	405
250	370	0.1~20	0.2~15	305	344	370	334	356	–	331	358	≦40	≦15	26	59	27	58	33	26	6	8	1.5	4.5	66	≧11	≧4.1	480
300	450	0.1~20	0.2~18	254	315	345	305	335	–	–	–	≦55	≦25	38	91	40	87	48	38	10	13	1.2	6	95	≧11	≧4.2	875
400	600	0.2~30	0.4~23	330	390	420	380	410	–	–	–	≦55	≦25	38	91	40	87	48	38	10	13	1.2	6	95	≧11	≧4.2	1000
500	750	0.2~40	0.4~25	300	350	385	–	–	–	–	–	≦65	≦30	48	100	–	–	51	48	10	13	1.2	6	105	≧15	≧5.5	1480
750	1100	0.3~45	0.6~35	300	360	395	–	–	–	–	–	≦85	≦50	48	120	–	–	60	48	10	13	1.2	6	128	≧15	≧4.5	2250
1000	1500	0.5~30	1~28	300	389	440	–	–	–	–	–	≦120	≦70	100	163	–	–	78	100	8.5	13	1.2	6	173	≧15	≧4.5	4900

Supplementary information

● For quality maintainance, it is recommended to be used under 50% of power rating and under favourable circumstances. ● Use crimp terminal to connect to the resistor terminal as resistor body is a heating unit. ●TRR is the reference standard since TRR and R are the same specifications product of different colors. ● The rated power of TRR-A may be changed by variableness of resistance values.

TWC

Nonflammable coating

Resistor with metal end caps

TAMAOHM

RoHS対応

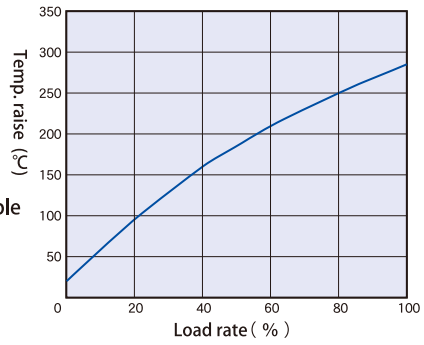
Features

- Equivalent of JIS RWC
- Metal caps are attached to the terminal part by using C-shaped holder (shaft not used)

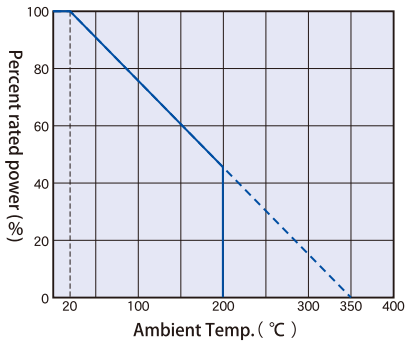
Standard

●Resistance value range	See below specifications table
●Resistance value tolerance	J=±5% K=±10%
●Temperature coefficient of resistance	+100 - 400 ppm/℃max
●Insulation resistance	≧ 20MΩ (DC 1000V mega)
●Maximum use temperature	340℃

Surface temperature raise curve



Rated power reduction curve



Product designation (reference)

(Example) Standard product

–	TWC	100	G	50 Ω	J	– CH
no mark: induction winding N- : non-inductive winding		Wattage	Characteristics G:standard V	Resistance value	Tolerance J(=±5%) K(=±10%)	Part fitting no mark : no fitting - CH (with C-shaped holder)

(Example) With options

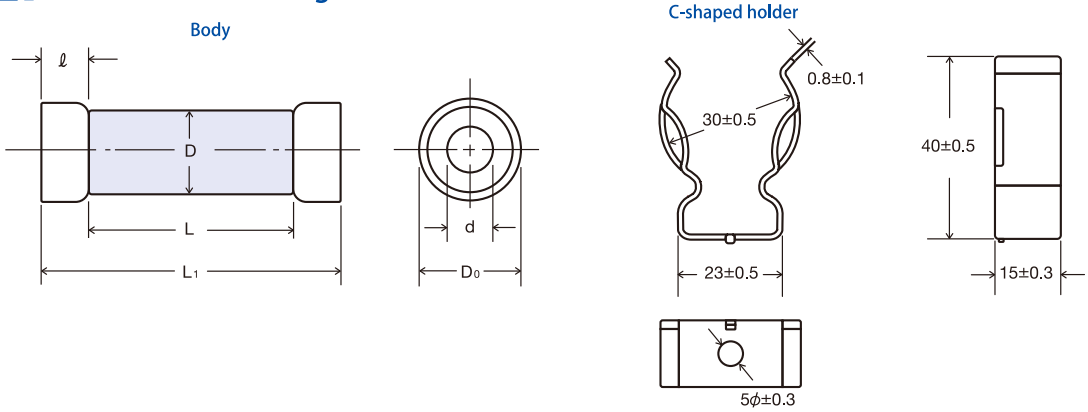
–	TWC	100	A	1	G	50 Ω	J	– CH
no mark: induction winding N- : non-inductive winding (without slide)		Wattage	A :slide HH : with intermidiate terminal	Number of slide band Number of intermediate terminal	Characteristics G:standard V	Resistance value	Tolerance J(=±5%) K(=±10%)	Part fitting no mark : no fitting - CH (with C-shaped holder)

※Specify resistance values in between taps for intermediate terminal

Options

- □Slide : provided depending on the resistance values (non-inductive wire is not applicable
- □Intermediate terminal : provided depending on the resistance values
- □Non-inductive wire : provided depending on the resistance values (without slide)

Dimensional drawing



Specifications Table

Model (rated power/w)	Resistance value range (Ω)		Dimenstions (mm)					
	G characteristics (standard)	V characteristics	L±2	L1±2	Dϕ	Do ϕ ±1	d ϕ ±1	ℓ±1
50	1 ～ 20K	3 ～ 20K	75	100	≦32	30	13	12
60	1.5 ～ 25K	4 ～ 25K	90	115	≦32	30	13	12
80	2 ～ 30K	6 ～ 30K	115	140	≦32	30	13	12
100	2.5 ～ 40K	7 ～ 40K	140	165	≦32	30	13	12
120	3 ～ 50K	9 ～ 50K	165	190	≦32	30	13	12
150	3 ～ 60K	10 ～ 60K	195	220	≦32	30	13	12
200	5 ～ 70K	14 ～ 70K	254	280	≦32	30	13	12
250	5 ～ 80K	17 ～ 80K	305	330	≦32	30	13	12

Supplementary information

- In accordance with JIS standards, more reliable wire is used for V caracteristics comparing with G.
- For quality maintainance, it is recommended to be used under 50% of rated power and under favourable circumstances.

TAMAOHM

TRV

Nonflammable coating

Power type wire wound variable resistor

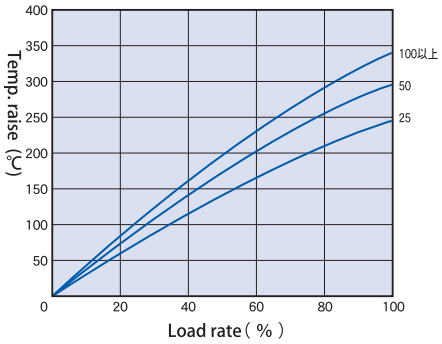
Features

- Equivalent of JIS RPC
- Resistance values are changeable by rotating brush.

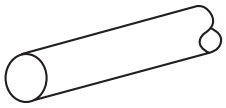
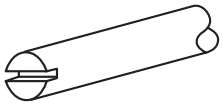
Standard

●Resistance value range	See below specifications table
●Resistance value tolerance	K=±10%
●Temperature coefficient of resistance	+100 - 400 ppm/℃max
●Dielectric strength	25W - 50W AC 1000V 1 min ≧ 100W AC 2000V 1 min
●Insulation resistance	≧ 20MΩ (DC 1000V mega)
●Maximum use temperature	340℃

Surface temperature raise curve

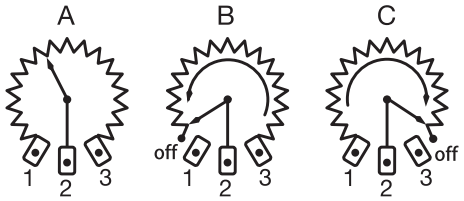


Shaft head

Round R	
With ditch S	

Standard | Positions of breakers

Shape viewed from the shaft side



A	Standard	No electical breakage
B	Breaker B	There is a breaker position when the shaft is fully rotated counterclockwise
C	Breaker C	There is a breaker position when the shaft is fully rotated clockwise

Product designation (reference)

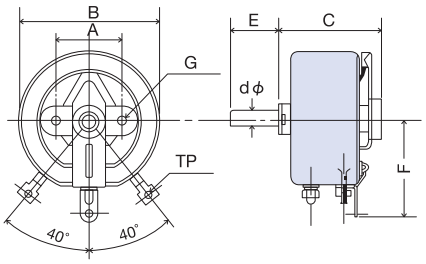
TRV [100] [A] [45] [R] [50] **Ω** **KK**

- 100: Wattage
- A: A - no breaker, B - breaker B, C - breaker C
- 45: Shaft dimention standard : Refer to value [E] in specfications table
- R: Shaft head R:round (standard) S:with ditch
- 50: ※resistance value
- KK: Tolerance

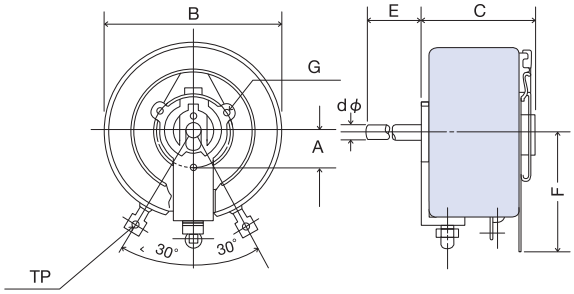
※Specify the necessary maximum resistance value from [resistance value range] in specification table. (range from 0Ω- specified maximum value)

Dimensional drawing

25W・50W



100W～1000W



Specifications Table

Model	Reted power (W)	Resistance value range (Ω) ※	Dimenstions (mm)								Rotation angle	Weight (g)
			A±0.5	B	C	dϕ	E±5	F±5	Gϕtap	TP(ϕ)		
TRV 25	25	1 ～ 5K	25	42±5	35±5	6	20	30	M3	3.2	280	150
TRV 50	50	1 ～ 5K	25	57±5	42±5	6	20	40	M3	3.2	280	250
TRV 100	100	1 ～ 10K	18	85±5	55±5	6	45	55	M4	4.2	300	700
TRV 200	200	1 ～ 10K	18	105±5	70±5	8	60	65	M4	4.2	300	1300
TRV 300	300	1 ～ 10K	18	105±5	95±5	8	50	65	M4	4.2	300	1800
TRV 500	500	1 ～ 3K	38	155±5	105±5	12	65	115	M6	5.2	300	3000
TRV 750	750	1.5 ～ 1K	38	205±10	135±10	12	65	140	M6	6.2	300	6000
TRV 1000	1000	3 ～ 1K	60	260±10	165±10	14	65	190	M6	6.2	300	12000

Supplementary information ● For quality maintainance, it is recommended to be used under 50% of rated power and under favourable circumstances. ● Use crimp terminal to connect to the resistor terminal as resistor body is a heating unit. ● The rated power of TRR-A may be changed by variableness of resistance values. ● Please send inquiries to technical support in case specified resistance value is beyond maximum resistance value.

TRV Connection

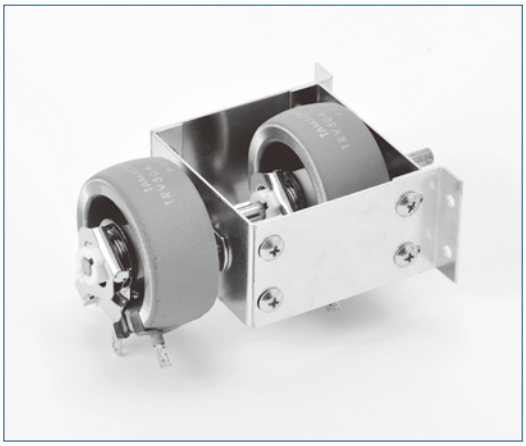
Nonflammable coating

Power type wire wound variable resistor

TAMAOHM

Features

- Equivalent of JIS RPC
- TRV models are connected together on the same axis.



Standard

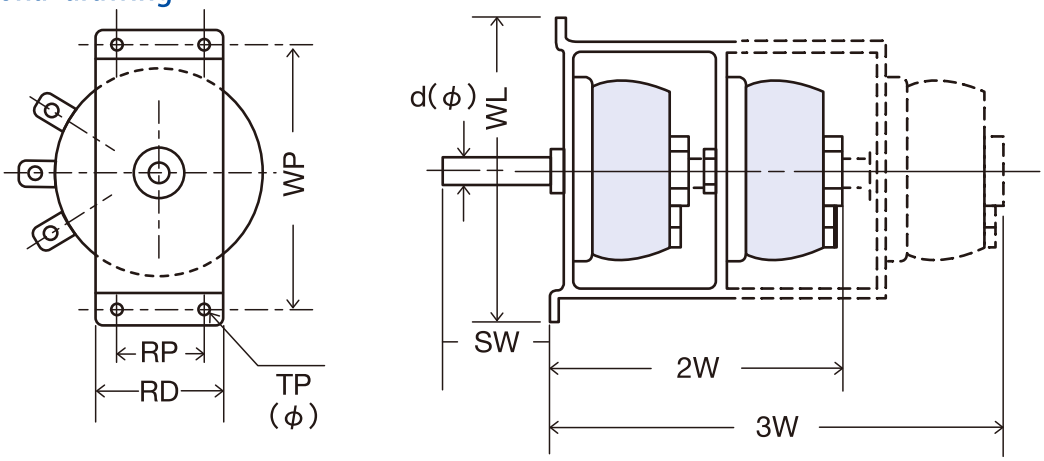
●Resistance value range	See below specifications table
●Resistance value tolerance	K=±10%
●Temperature coefficient of resistance	+100 - 400 ppm/℃max
●Dielectric strength	25W - 50W AC 1000V 1 min ≧ 100W AC 2000V 1 min
●Insulation resistance	≧ 20MΩ (DC 1000V mega)
●Maximum use temperature	340℃

Product designation (reference)

TRV [100] [A] × [2] ([50] Ω + [50] Ω + [ ] Ω)

- 100: Wattage
- A: A-no breaker, B-breaker B, C-breaker C
- 2: Number of connection
- 50 Ω: resistance value
- 50 Ω: resistance value
- [ ] Ω: ≧ 3 connections

Dimensional drawing



Specifications Table

Model	Dimenstions (mm)								
	WL±3	RD±3	WP±3	RP±0.5	2W±3	3W±3	TP (ϕ)±0.3	SW	dϕ
TRV 25	75	30	65	20	100	152	3.2	20	6
TRV 50	90	40	80	20	110	175	3.2	20	6
TRV 100	135	60	123	40	135	205	4.2	45	6
TRV 200	160	70	150	50	178	315	4.2	45	8
TRV 300	170	70	150	50	227	330	4.2	50	8
TRV 500	220	100	205	80	248	383	5.2	65	12
TRV 750	290	120	270	90	315	487	6.2	65	12
TRV 1000	370	180	340	140	400	585	6.2	65	14

Supplementary information

- For quality maintainance, it is recommended to be used under 50% of rated power and under favourable circumstances.
- Use crimp terminal to connect to the resistor terminal as resistor body is a heating unit.

TRF

Nonflammable coating

Flat resistor

TAMAOHM

RoHS対応

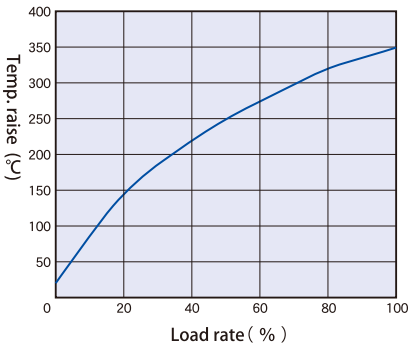
Features

- Space saving is achieved by its flat shape
- Suitable for non-inductive winding

Standard

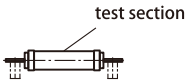
●Resistance value range	See below specifications table
●Resistance value tolerance	J=≧ ±5% K=< ±10%
●Temperature coefficient of resistance	+100 - 400 ppm/℃max
●Dielectric strength	AC 1000V 1 min
●Insulation resistance	≧ 20MΩ (DC 1000V mega)
●Maximum use temperature	340℃

Surface temperature raise curve



Options

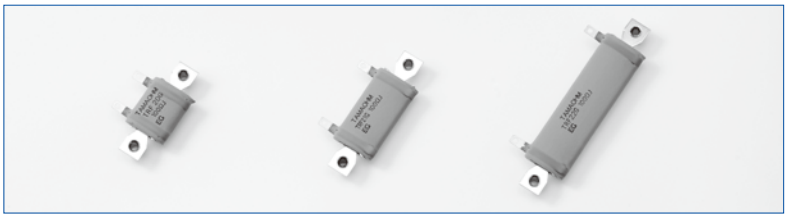
- □Intermediate terminal - 20-24W
- □Non-inductive wire - provided depending on the resistance values



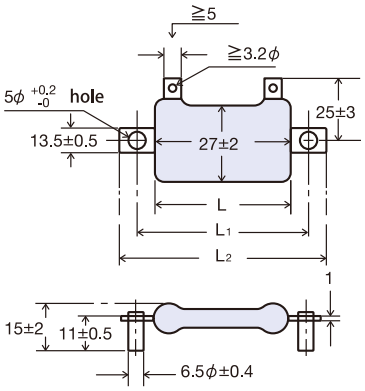
Product designation (reference)

–	TRF	150			G	50	Ω	J
no mark: induction winding (standard) N- : non-inductive winding		Wattage	no mark: no options HH- itnermediate terminal	no mark: no options Number of intermediate terminal	Characteristics G (standard) V	resistance value		Tolerance J K

※Specify resistance values in between taps for intermediate terminal



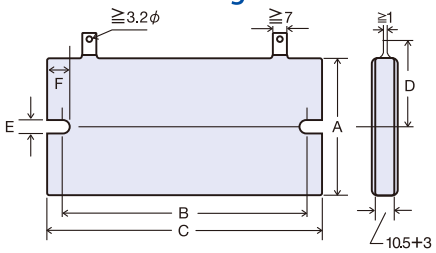
Dimensional drawing



Specifications Table（TRF20~24）

Model	Rated power（w）		Resistance value range（Ω）				Dimenstions (mm)			Weight
	G characteristics (standard)	V characteristics	Inductive winding		Non-inductive winding		L±2	L1±2	L2±2	/g
			G characteristics (standard)	V characteristics	G characteristics (standard)	V characteristics				
20	15	21	0.3～1K	1～1K	0.1～1K	0.3～1K	32	51	64	22
21	22	31	0.6～2K	2～2K	0.2～2K	0.5～2K	51	70	83	27
22	37	53	1.2～3.5K	4～3.5K	0.3～3.5K	1～3.5K	89	108	120	45
23	47	68	2～5K	6～5K	0.4～5K	1.5～5K	120	140	153	53
24	63	91	2.5～7K	8～7K	0.5～7K	2～7K	152	171	184	69

Dimensional drawing



Specifications Table（TRF150,250）

Model	Rated power（w）		Resistance value range（Ω）				Dimenstions (mm)						Weight
	G characteristics (standard)	V characteristics	Inductive winding		Non-inductive winding		A±2	B±2	C±3	D±2	E±2	F±2	/g
			G characteristics (standard)	V characteristics	G characteristics (standard)	V characteristics							
150	110	110	2.5～20K	8～20K	0.5～20K	2～20K	75	135	150	50	13	14	200
250	180	180	5～30K	15～30K	1～30K	3～30K	100	180	200	63	18	19	340

Supplementary information ● In accordance with JIS standards, more reliable wire is used for V caracteristics comparing with G. ● For quality maintainance, it is recommended to be used under 50% of rated power and under favourable circumstances.● Use crimp terminal to connect to the resistor terminal as resistor body is a heating unit.

SG / M Axial terminal cement resistor

TAMAOHM

RoHS対応

Features

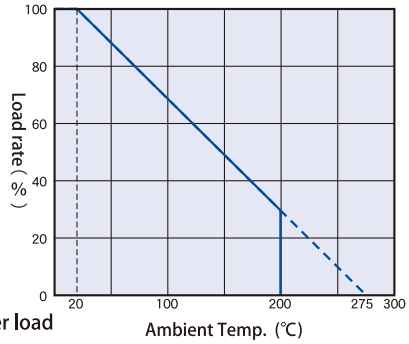
●Completely sealed high insulation case filled with special cement
●Capable of stable fitting and suitable for PCB mounting as it is excellent in flame retardancy and hightemperature resistance.

SG / SM

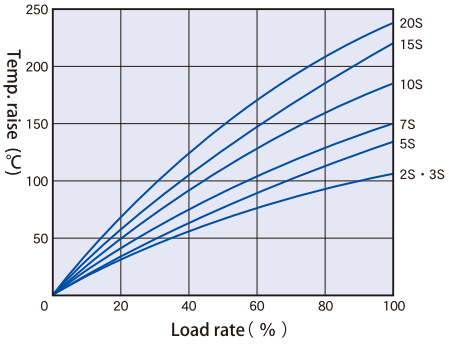
Standard

●Resistance value tolerance	J= ±5% K= ±10%
●Temperature coefficient of resistance	±400 ppm/℃max <20Ω) ±260 ppm/℃ (≧20 Ω)
●Withstand Voltage	△R ± (0.1% + 0.05Ω) AC 1000V 1 min
●Insulation resistance	≧ 20MΩ (DC 500V)
●Short-time overload	△R ± (2% + 0.05Ω) 10 times more, than rated load voltage 5 sec
●Durability	△R ± (2% + 0.05Ω) Rated power load - 90minutes ON 30minutesOFF 1000hours
●Soliderbility	230℃, immersing 5 seconds
●Flame resistance	No evidence of flaming for 1 minute after 1000% rated power load
●Use temperature range	-40℃ +200℃
●Solvent resistance	No evidence of abnormality after 3 minutes immersing into IPA

Rated power reduction curve



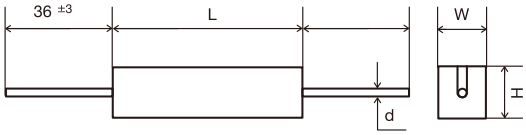
Surface temperature raise curve



Specifications Table

Model		Rated power (W)	Resistance value range(Ω)				Dimenstions (mm)			
			SG		SM					
SG	SM		Min (Ω)	Max (KΩ)	Min (Ω)	Max (KΩ)	L±1.5	H±1	W±1	dϕ
2SG	2SM	2	0.1	0.22	240	13	18	6.3	6.3	0.8
3SG	3SM	3	0.1	0.27	300	22	22.4	8	8	0.8
5SG	5SM	5	0.1	0.33	360	27	22.4	9	10	0.8
7SG	7SM	7	0.1	0.68	750	30	35.5	9	10	0.8
10SG	10SM	10	0.1	1.5	1600	30	50	9	10	0.8
15SG	—	15	0.1	2.2	—	—	50	12.5	12.5	0.8
20SG	—	20	0.1	2.7	—	—	63	12.5	12.5	0.8

Dimensional drawing



Product designation (reference)

2SG	1K	Ω	J
Model SG SM	Resistance value		Tolerance J=±5% K=±10%

M / RFM

Standard

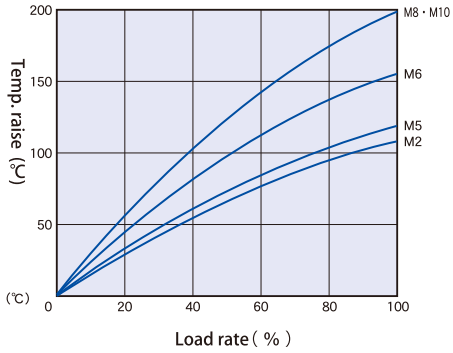
●Resistance value tolerance	F= ±1% J= ±5% K= ±10%
●Insulation resistance	≧ 100MΩ
●Withstand voltage	AC 1000 V for 1 minute

RFM is non-inductive winding

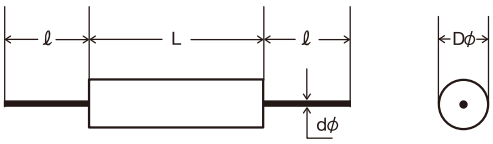
Specifications Table

Model	Rated power (W)	Resistance value range (Ω～KΩ)	Dimenstions (mm)			
			Dϕ	L	ℓ±3	dϕ
M 2	2	0.1～1	6	13	38	0.8
M 5	5	0.1～3	9	26	38	0.8
M 6	6	0.1～6	12	35	38	0.8
M 8	8	0.1～7	10	48	38	0.8
M10	10	0.1～13	12	51	38	0.8

Surface temperature raise curve



Dimensional drawing



Product designation (reference)

M2	1K	Ω	J
Model M : inductive winding (standard) RFM : non-inductive winding	Resistance value		Tolerance F=±1% J=±5% K=±10%

SH Hone type cement resistor

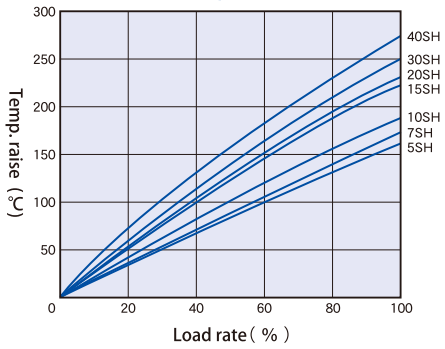
TAMAOHM

RoHS対応

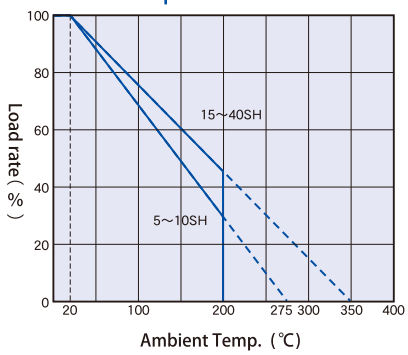
Features

- Resister the body of which is completely sealed and filled with special cement
- Solderless terminal (faston terminal) is available for easiler hard wiring
- Very low resistance product is manufacturable depending on applications.

Surface temperature raise curve



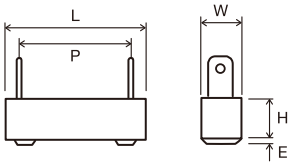
Rated power reduction curve



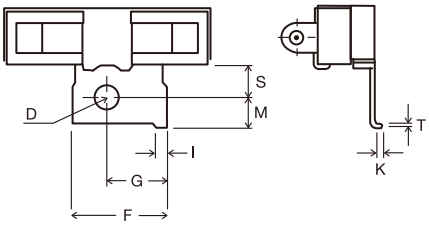
Standard

●Resistance value tolerance	J=±5% K=±10% F=±1% (≧10Ω) G=2% (≧10 Ω)
●Temperature coefficient of resistance	±400 ppm/℃max <20Ω) ±260 ppm/℃ (≧20 Ω)
●Withstand Voltage	△R ± (0.1% + 0.05Ω) AC 2000V 1 min
●Insulation resistance	≧ 20MΩ (DC 500V)
●Short-time overload	270℃, immersing 5 seconds 75% of this is covered by new soldering △R ± (2% + 0.05Ω) 10 times more, than rated load voltage 5 sec
●Durability	△R ± (2% + 0.05Ω) Rated load 90minutesON 30minutesOFF 1000 hours
●Soliderbility	270℃, immersing 5 seconds Over 75% should be covered by new soldering
●Flame resistance	No evidence of flaming for 1 minute after 1000% rated power load
●Use temperature range	- 55℃ +200℃
●Solvent resistance	No evidence of abnormality after 3 minutes immersing into IPA

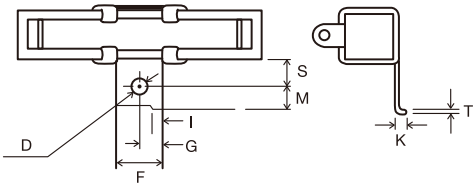
Dimensional drawing



Metal fitting : Type 1 (5W~7W)



Metal fitting : Type 2 (10W~40W)



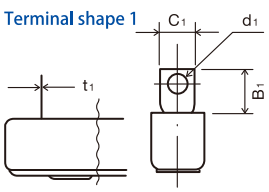
Specifications Table

Model	Rated power (W)	Resistance value range		Dimenstions (mm)												
		Min(Ω)	Max(KΩ)	L	W±1.5	H±1.5	E±0.3	S±2	M±0.5	F±0.5	D±0.3	G±0.3	T±0.1	I±0.3	K±0.3	P *
5 SH	5	0.001	3.6	27±1.5	9.5	9.5	—	5.5	5	16	4.5	10	0.6	2	0.9	15
7 SH	7	0.001	5.6	35±1.5	9.5	9.5	—	5.8	5	16	4.5	10	0.6	2	0.9	22.5
10 SH	10	0.001	8.2	48±1.5	9.5	9.5	0.8	8	6	12	4	6	0.6	3	2.2	35
15 SH	15	0.001	10	48±1.5	12.5	12.5	1	8	6	12	4.2	6	0.8	3	2.2	35
20 SH	20	0.001	16	63.5±2	12.5	12.5	1	8	6	12	4.2	6	0.8	3	2.2	50
30 SH	30	0.001	20	75±2	19	19	1	10	8	18	4.2	9	0.8	3	2.2	55
40 SH	40	0.001	24	90±2	19	19	1	10	8	18	4.2	9	0.8	3	2.2	69

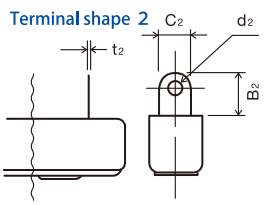
※P : Terminal shape 1 $^{+5}_{-10}$/ Terminal shape 2±1.5

Dimensional drawing

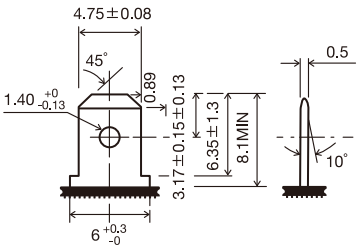
Terminal shape 1



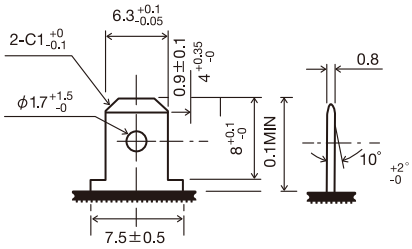
Terminal shape 2



187 solderless terminal (15W~20W)



250 solderless terminal (15W~40W)



Specifications Table

Model	Terminal shape 1 dimensions (mm)					Terminal shape 2 dimensions (mm)				
	Resistance value range	C1	B1	d 1	t 1	Resistance value range	C2	B2	d 2	t 2
5 SH	0.001Ω~0.009Ω	5	8	3	1	0.01Ω以上	5	6.5	2	0.4
7 SH ~ 10 SH	0.001Ω~ 0.06Ω	5	8	3	1	0.07Ω以上	5	6.5	2	0.4
15 SH ~ 20 SH	0.001Ω~ 0.09Ω	7.5	12	3.5	1.2	0.1Ω以上	6	7.5	2.5	0.5
30 SH ~ 40 SH	0.001Ω~ 0.09Ω	7.5	12	4.5	1.2	0.1Ω以上	7.5	11	3	0.5

※The resistance values of salderless terminal is the same as terminal shape 2.

Product designation (reference)

20SH		10	Ω	J	A	
Model	Terminal shape 1&2 =no mark (standard) solderless terminal = T	Resistance Value		Tolerance J=±5% K=±10%	Metal fitting	Terminal shape 1&2=no mark (standard) Solderless terminal No. : 15~40W (or specify 187 or 250) 30W~40W : 250

SHP

Cement resistor

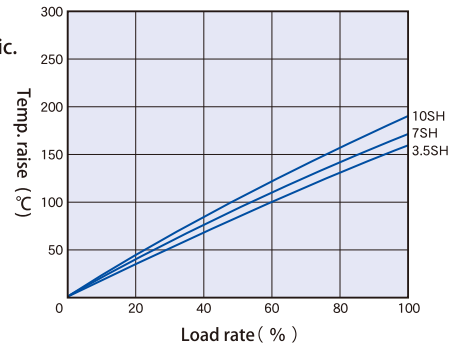
TAMAOHM

RoHS対応

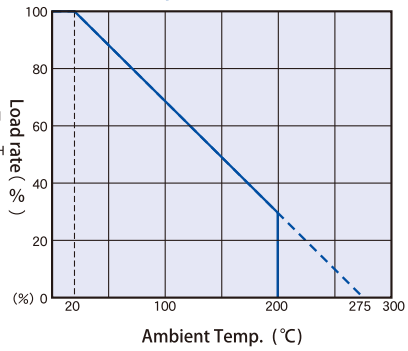
Features

- Easily mounted on printed circuit board
- Excellent safety achieved as the case material is of ceramic.
- The terminal shape changes for 3SHP.

Surface temperature raise curve

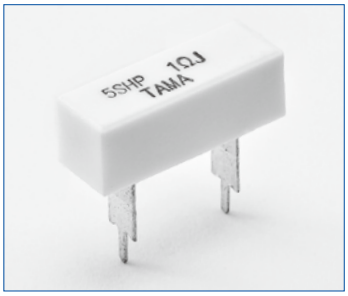


Rated power reduction curve

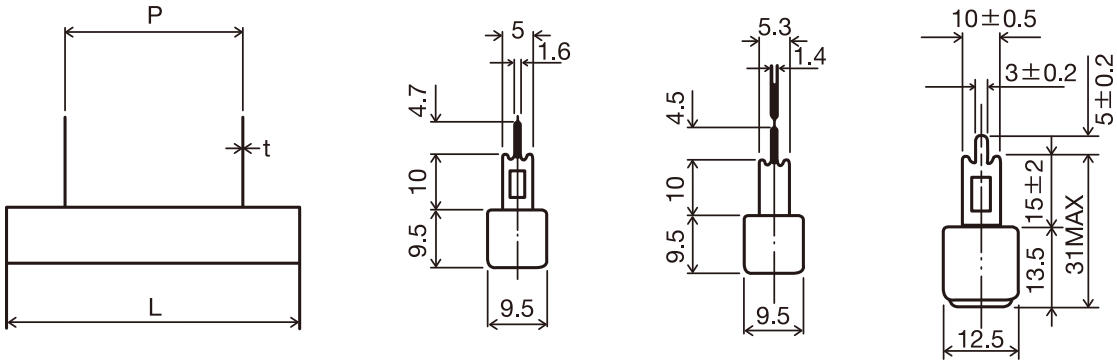


Standard

●Resistance value tolerance	J= ±5%(≧10Ω) K= ±10% (<10Ω)
●Temperature coefficient of resistance	±400 ppm/℃max <20Ω) ±260 ppm/℃ (≧20 Ω)
●Withstand Voltage	△R ± (0.1% + 0.05Ω) AC 1000V 1 min
●Insulation resistance	≧ 20MΩ (DC 500V)
●Short-time overload	△R ± (2% + 0.05Ω) 10 times more, than rated load voltage 5 sec
●Durability	△R ± (2% + 0.05Ω) Rated power load - 90minutes ON 30minutesOFF 1000hours
●Soliderbility	270℃, immersing 5 seconds Over 75% should be covered by new soldering
●Flame resistance	No evidence of flaming for 1 minute after 1000% rated power load
●Use temperature range	-40℃ +200℃
●Solvent resistance	No evidence of abnormality after 3 minutes immersing into IPA



Dimensional drawing



Product designation (reference)

5SHP	100 Ω	J
Model	Resistance value	Tolerance J=±5% K=±10%

Specifications Table

Model	Rated power (W)	Resistance value range		Dimenstions (mm)		
		Min(Ω)	Max(KΩ)	L±1.5	P±1	t
3 SHP	3	0.1	0.39	24	12.5	0.4
5 SHP	5	0.1	0.5	27	15	0.4
7 SHP	7	0.1	1.2	35	22.5	0.4
10 SHP	10	0.1	1.5	48	35	0.4
15 SHP	15	0.1	2.2	48	35	0.5
20 SHP	20	0.1	2.7	63.5	50	0.5

RHA

Power type metal clad wire wound resistor

TAMAOHM

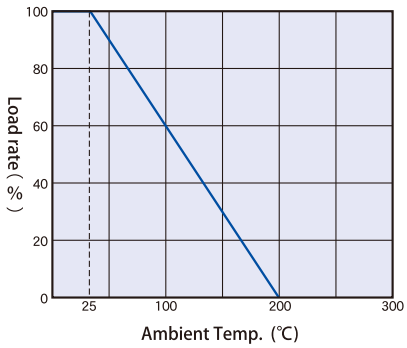
RoHS対応

This is minitureized power type wire wound resistor which radiates the heat generated inside efficiently by use of lead-free nonflammable silicon mould.

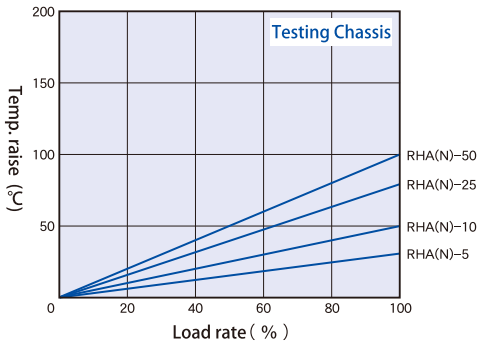
Features

- Excellent performance in short time overload characteristics.
- Excellent temperature characteristics.
- Non-inductive wire with improved frequency characteristics is also available.

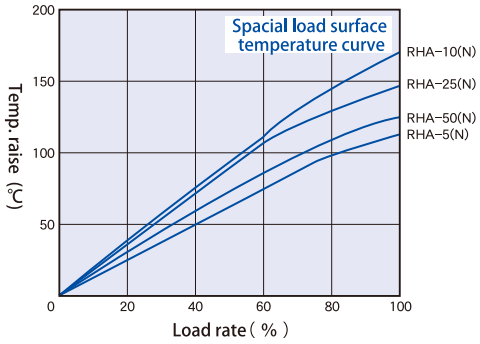
Rated power reduction curve



Surface temperature raise curve



Testing Chassis Dimenstions (mm)	RHA(N)5 152×102×51×1t RHA(N)10 152×102×51×1t RHA(N)25 178×127×51×1t RHA(N)50 178×127×51×1t



●Characteristics

(the characteristics in the below table can not be applied to the resistance values less than 0.1Ω)

Item	Testing conditons	Standard values
Terminal strength	Full test 30sec MIN / RHA5 10N,RHA10 22N / RHA25 RHA50 44N	±(0.2%+0.05Ω)
Flame resistance	200℃, 2 hours	±(0.5%+0.05Ω)
Withstand voltage	Standard values (value of withstand voltage in the spec. table) 1minute	±(0.2%+0.05Ω)
Insulation resistance	DC500V	≧1000MΩ
Short-time overload	500% Rated voltage, 5 seconds, once	±(0.5%+0.05Ω)
Moisture resistance (in steady state)	Temp. 40℃, Humidity 95%, 1/10 rated voltage (1.5 hours ON, 30 min OFF) for 500 hours	±(0.5%+0.05Ω)
Durability (rated load)	Room temperature (with chassis), rated voltage, 1.5 hour ON, 30 min OFF - 1000 hours	±(1%+0.05Ω)
Anti-shock	10Hz?55Hz?10Hz (1min.) paralell and right-angled for 2 hours	±(0.2%+0.05Ω)

Product designation (reference)

RHA10	N	50 Ω	J
Model	Inductive winding : G (standard) Non-inductive winding : N	Residence value	Tolerance D=±0.5% J=±5% (standard) F=±1% K=±10% G=±2% H=±3%

Specifications Table

Model	Rated power(W)		Resistance value range(Ω)		Resistance value tolerance (%)	Maximum use voltage (V) ※		Withstand voltage (V)	Use temeparature range (℃)	Maximum weight (g)
	With chassis fitting	Space	Inductive winding	Non-inductive winding		Inductive winding	Non-inductive winding			
RHA 5	5	3	0.05～3K	0.1～1K	±0.5 (D) ≧10Ω ±1 (F) ≧0.1Ω ±2 (G) ±3 (H) ±5 (J) ±10 (K)	120	70	500	−55～+200	3
RHA 10	10	6	0.02～6K	0.03～2.3K		245	180	1000		7
RHA 25	20	8	0.012～15K	0.02～5.5K		500	300			15
RHA 50	30	10	0.01～40K	0.02～12K		1300	600	2000		33

※The maximum use limit voltage can be calculated from the rated voltage(= √Rated power x resistance value), or one of the smaller value of themaximum use voltages listed in the spec. table.

●Temperature characteristics (basic temperature 25℃, testing temperature - 55℃, +125℃, +200℃)

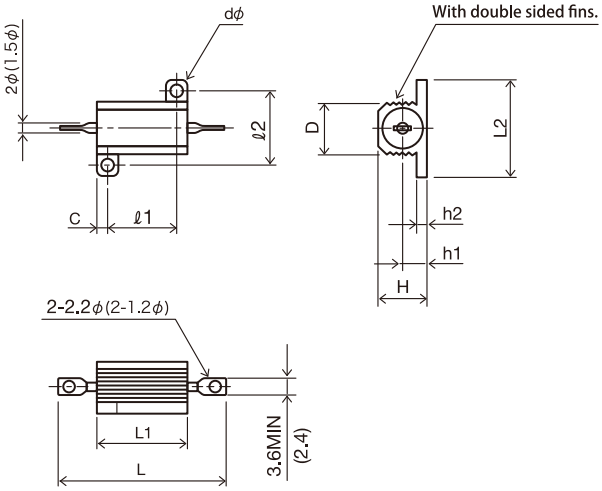
Model	Temperature coefficient (ppm/℃)							
	±30	±50		±100		±500	
RHA 5	30Ω以上	0.1Ω～	<30Ω	0.05Ω～	<0.1Ω	—	
RHA 10	50Ω以上	0.1Ω～	<50Ω	0.05Ω～	<0.1Ω	0.02Ω～	<0.05Ω
RHA 25	200Ω以上	0.1Ω～	<200Ω	0.05Ω～	<0.1Ω	0.012Ω～	<0.05Ω
RHA 50	400Ω以上	0.1Ω～	<400Ω	0.05Ω～	<0.1Ω	0.01Ω～	<0.05Ω
RHA 5N	10Ω以上	0.1Ω～	<10Ω	—		—	
RHA 10N	30Ω以上	0.1Ω～	<30Ω	0.05Ω～	<0.1Ω	0.03Ω～	<0.05Ω
RHA 25N	50Ω以上	0.1Ω～	<50Ω	0.05Ω～	<0.1Ω	0.02Ω～	<0.05Ω
RHA 50N	100Ω以上	0.1Ω～	<100Ω	0.05Ω～	<0.1Ω	0.02Ω～	<0.05Ω

●Dimension table

Model	Dimensions (mm)										
	L±1.5	L1±1	L2±0.8	ℓ1±0.8	ℓ2±0.8	D±1	H±0.8	d±0.3	c±0.8	h1±1	h2±0.5
RHA 5	28	15.3	16.4	11.3	12.5	8.5	8	2.3	2	4	1.6
RHA 10	35	19	20	14.3	15.9	10.8	10	2.4	2.4	5.3	2.4
RHA 25	49	27	28	18.3	19.8	13.5	14	3.2	4.4	7.1	2.4
RHA 50	71	49.2	29.2	39.7	21.4	15.1	16	3.2	4.8	8	2.5

Dimensional drawing

RHA5（N）～RHA50（N）　（　）尺寸 RHA5（N）



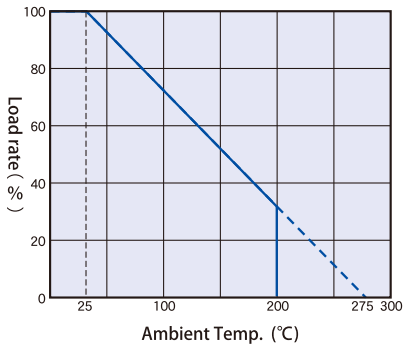
RHA | Power type metal clad wire wound resistor

This is by heat-resistant cement sealed minitureized power type wire wound resistor.

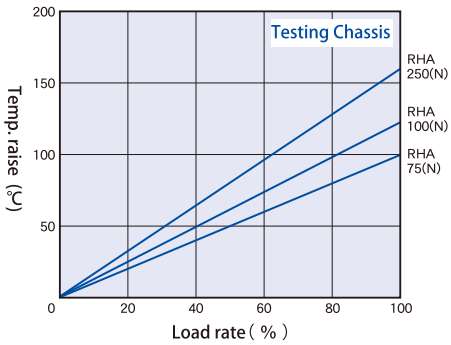
Features

- Excellent performance in short time overload characteristics.
- Excellent temperature characteristics.
- Non-inductive wire with improved frequency characteristics is also available.

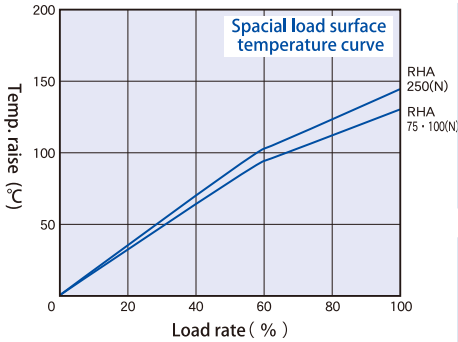
Rated power reduction curve



Surface temperature raise curve



Testing Chassis Dimenstions (mm)	RHA75(N) 305×305×3t RHA100(N) 305×305×3t RHA250(N) 305×305×3t



●Characteristics
(the characteristics in the below table can not be applied to the resistance values less than 0.1Ω)

Item	Testing conditons	Standard values
Terminal strength	Torque test 5～15sec/RHA75 2.7N・m,RHA100 RHA250 3.6N・m	±(0.2%+0.05Ω)
Flame resistance	275℃, 2 hours	±(0.5%+0.05Ω)
Withstand voltage	4500V 1 minute	±(0.2%+0.05Ω)
Insulation resistance	DC500V	≧1000MΩ
Short-time overload	500% Rated voltage, 5 seconds, once	±(0.5%+0.05Ω)
Moisture resistance (in steady state)	Temp. 40℃, Humidity 95%, 1/10 rated voltage (1.5 hours ON, 30 min OFF) for 500 hours	±(0.5%+0.05Ω)
Durability (rated load)	Room temperature (with chassis), rated voltage, 1.5 hour ON, 30 min OFF - 1000 hours	±(3%+0.05Ω)
Anti-shock	10Hz?55Hz?10Hz (1min.) paralell and right-angled for 2 hours	±(0.2%+0.05Ω)

Product designation (reference)

RHA100	N	50 Ω	J
Model	Inductive winding : G (standard) Non-inductive winding : N	Residence value	Tolerance D=±0.5% J=±5% (standard) F=±1% K=±10% G=±2% H=±3%

Specifications Table

Model	Rated power(W)		Resistance value range(Ω)		Resistance value tolerance (%)	Maximum use voltage (V) ※		Withstand voltage (V)	Use temeparature range (℃)	Maximum weight (g)
	With chassis fitting	Space	Inductive winding	Non-inductive winding		Inductive winding	Non-inductive winding			
RHA 75	75	30	0.2～20K	0.07～10K	±0.5 (D) ≧10Ω ±1 (F) ≧0.1Ω ±2 (G) ±3 (H) ±5 (J) ±10 (K)	1500	1050	4500	−55～+200	200
RHA 100	120	50	0.4～50K	0.12～25K		1900	1340			450
RHA 250	200	75	0.6～80K	0.1～40K		2500	1750			800

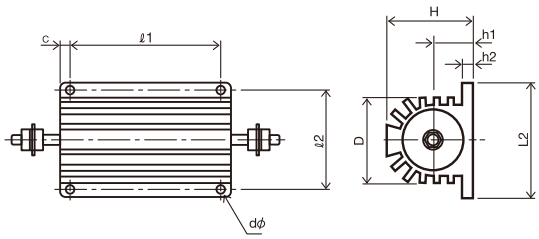
※The maximum use limit voltage can be calculated from the rated voltage(= √Rated power x resistance value), or one of the smaller value of themaximum use voltages listed in the spec. table.

●Temperature characteristics (basic temperature 25℃, testing temperature - 55℃, +125℃, +200℃)

Model	Temperature coefficient (ppm/℃)		
	±30	±50	±100
RHA 75	≧2KΩ	0.3Ω～ <2KΩ	0.2Ω～ <0.3Ω
RHA 100	≧4KΩ	0.5Ω～ <4KΩ	0.4Ω～ <0.5Ω
RHA 250	≧6KΩ	0.8Ω～ <6KΩ	0.6Ω～ <0.8Ω
RHA 75N	≧1KΩ	0.5Ω～ <1KΩ	0.07Ω～ <0.5Ω
RHA 100N	≧2KΩ	0.7Ω～ 2KΩ	0.12Ω～ <0.7Ω
RHA 250N	≧3KΩ	1Ω～ <3KΩ	0.1Ω～ <1Ω

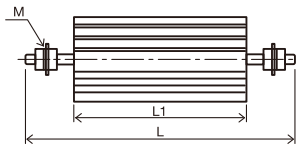
Dimensional drawing

RHA75（N）～RHA250（N）



●Dimension table

Model	Dimensions (mm)											
	L	L1±1	L2±0.8	ℓ1±0.8	ℓ2±0.8	D±1	H±0.8	d±0.3	c±0.8	h1±1	h2±0.5	M
RHA 75	110	66	52	56	42	32	33	4.8	5	16	3.2	5
RHA 100	140	88.9	71.4	69.9	57.2	46	44.5	4.8	9.5	19.5	4.8	6
RHA 250	177.8	114.3	76.2	98.4	63.5	54	55.6	4.8	7.9	25.4	6.4	6



IRH/IRV

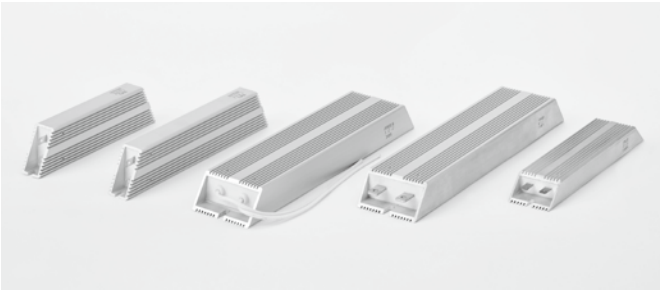
TAMAOHM

RoHS対応

High power universal metal clad wire wound resistor

Features

Excellent heat-resistant cement sealed resistor.



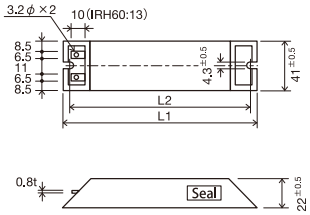
Specifications Table

Model	Shape	Rated power (W)※	Resistance value range(Ω) Inductive winding	Resistance value range(Ω) Non-inductive winding	Resistance value tolerance(%) Use temeparature range	Avarage weight (g)
IRH60	A	60	0.1～400	0.1～180	±2(G) ±5(J) ±10(K) Use temperature range −55℃～+200℃	115
IRH60L	B					
IRH60W	C					
IRV60L	E					
IRV60W	F					
IRH80	A	80	0.1～910	0.1～110		200
IRH80L	B					
IRH80W	C					
IRV80L	E					
IRV80W	F					
IRH100	A	100	0.1～1.1K	0.1～240		220
IRH100L	B					
IRH100W	C					
IRV100L	E					
IRV100W	F					
IRH120	A	120	0.1～1.3K	0.1～300		250
IRH120L	B					
IRH120W	C					
IRV120L	E					
IRV120W	F					
IRH150	A	150	0.1～1.6K	0.1～390		290
IRH150L	B					
IRH150W	C					
IRV150L	E					
IRV150W	F					
IRH200	AA	200	0.1～2.2K	0.1～1.1K		490
IRH200L	BB					
IRH200W	CC					
IRV200	DD					
IRV200L	EE					
IRV200W	FF					
IRH300	AA	300	0.1～2.7K	0.1～1.5K		600
IRH300L	BB					
IRH300W	CC					
IRV300	DD					
IRV300L	EE					
IRV300W	FF					
IRH400	AA	400	0.1～4.3K	0.1～2.2K		800
IRH400L	BB					
IRH400W	CC					
IRV400	DD					
IRV400L	EE					
IRV400W	FF					
IRH500	AA	500	0.1～6.8K	0.1～3K		990
IRH500L	BB					
IRH500W	CC					
IRV500	DD					
IRV500L	EE					
IRV500W	FF					

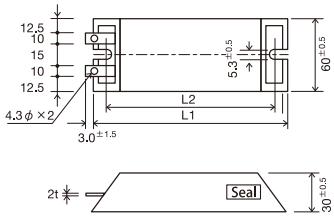
※Testing Chassis

Shapes and dimensions

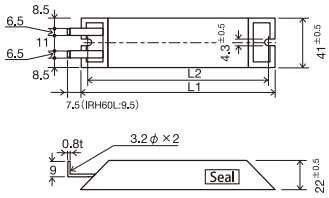
A IRH60～IRH150



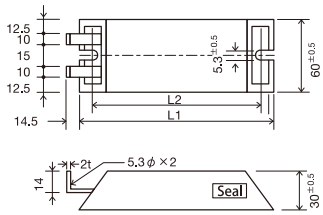
AA IRH200～IRH500



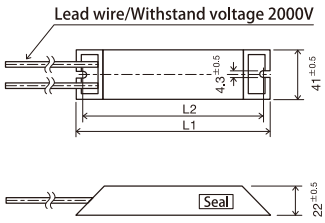
B IRH60L～IRH150L



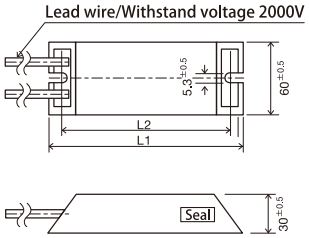
BB IRH200L～IRH500L



C IRH60W～IRH150W



CC IRH200W～IRH500W



Model	Dimensions (mm) L1±2	Dimensions (mm) L2±2	Lead wire/Withstand voltage 2000V (IRH/V 60W～500W applied) 1.25mm² 0.18φx50 twisted wires finished outer diameter 2.9φ	2mm² 0.26φx37 twisted wires finished outer diameter 3.33φ	5.5mm² 0.45φx35 twisted wires finished outer diameter 6.3φ	8mm² 0.45φx50 twisted wires finished outer diameter 6.9φ	Length (mm)
IRH / V60	100	87	1Ω～	0.1Ω～	—	—	300
IRH / V80	150	137	1Ω～	0.1Ω～	—	—	300
IRH / V100	165	152	1Ω～	0.1Ω～	—	—	300
IRH / V120	182	169	1Ω～	0.1Ω～	—	—	300
IRH / V150	210	197	1Ω～	0.1Ω～	—	—	300
IRH / V200	165	146	—	5Ω～	1Ω～	0.1Ω～	200
IRH / V300	215	196	—	5Ω～	1Ω～	0.1Ω～	200
IRH / V400	265	246	—	5Ω～	1Ω～	0.1Ω～	200
IRH / V500	335	316	—	5Ω～	1Ω～	0.1Ω～	200

Product designation (reference)

IRV150L	N	3 Ω	J
Model	Inductive winding : G (standard) Non-inductive winding : N	Residence value	Tolerance D=±0.5% F=±1% G=±2%

Supplementary information

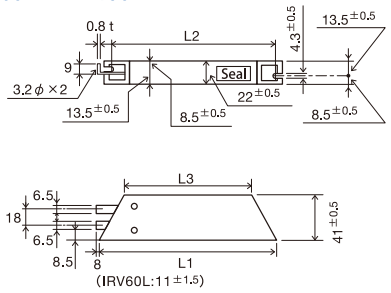
●The heat-resistant temperature of IRH W and IRV W is limited by the maximum use temperature of lead wire (silicon heat resistant wire) + 180?. Regardless of whether the load is within the range of rated power, the surface temperature raise curve chart should be considered as reference and the reduced load power should be applied for actual use.

●The heat radiation by resistor may cause warping of radiating chassis and may result in damaging adhesiveness between chassis and resistor. Metal fittings can be used for fixation to avoid this damage.

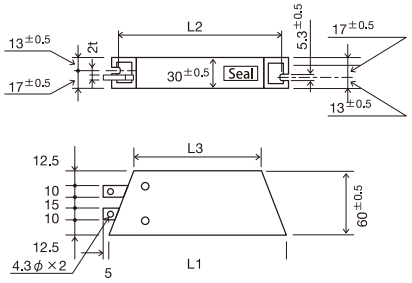
IRH / IRV | High power universal metal clad wire wound resistor

Shapes and dimensions

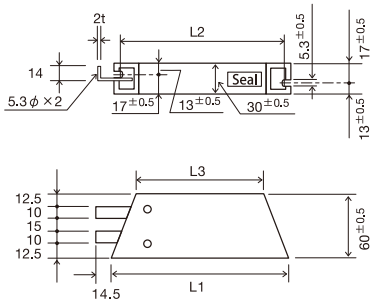
E IRV60L～IRV150L



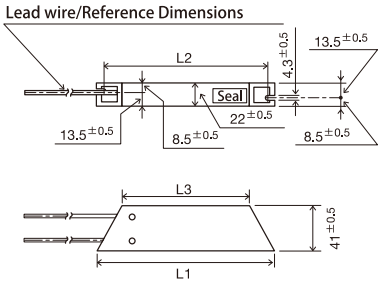
DD IRV200～IRV500



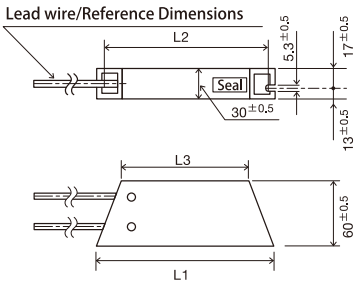
EE IRV200L～IRV500L



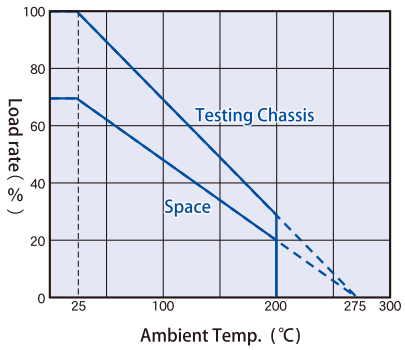
F IRV60W～IRV150W



FF IRV200W～IRV500W

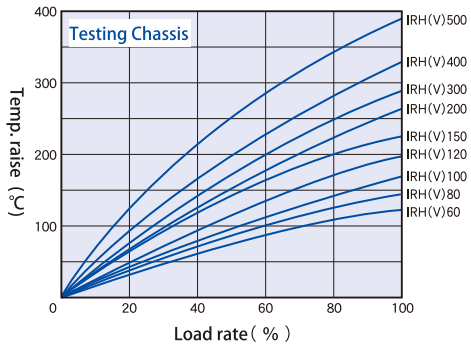


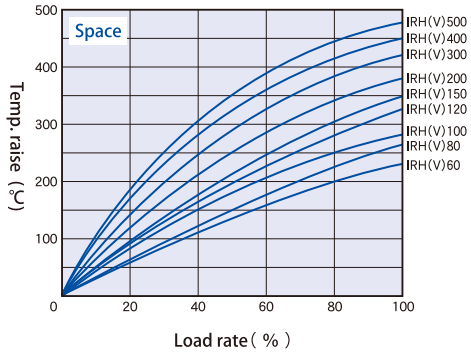
Rated power reduction curve



Testing Chassis Dimenstions (mm)	IRH(V)60～150 Aℓ 305×305×3t IRH(V)200～500 Aℓ 604×604×3t

Surface temperature raise curve





●Dimension table

Model	Dimensions (mm)		
	L1±2	L2±2	L3±2
IRV 60	100	87	60
IRV 80	150	137	110
IRV 100	165	152	125
IRV 120	182	169	142
IRV 150	210	197	170
IRV 200	165	146	125
IRV 300	215	196	175
IRV 400	265	246	225
IRV 500	335	316	295

●Features

Item	Testing conditons	Standard values
Withstand voltage	AC1500V 1minute	±(0.5%+0.05Ω)
Insulation resistance	Fix the same way as withstand voltage test, apply DC500V and measure again	20MΩ MIN
Short-time overload	500% rated load, 5 seconds, once	±(2%+0.05Ω)
Anti-shock	Apply the voltage same as rated power for 30 minutes, set it at -25℃ within 8-12 sec., then leave for 15 minutes	±(2%+0.05Ω)
Moisture resistance (in steady state)	Temp. 40?, Humidity 95%, 1/10 rated power (1.5 hrs ON, 30 min OFF) for 500 hours	±(3%+0.05Ω) 5MΩ MIN
Temperature coefficient of resistance	Basic temperature 20℃, testing temperature 0℃, 120℃, 200℃	±260ppm/℃
Durability (power rating load)	Room temperature (with chassis), rated power, 1.5 hrs. ON, 30 mins. OFF - 1000 hours	±(5%+0.05Ω)
Vibration resistance	10Hz-55Hz-10Hz (1min), parallel and right-angled for 2 hours	±(2%+0.05Ω)

TAMAOHM

Standard electronic load unit / Switching-type standard electronic load unit

Our standard elec. load unit / switching-type standard elec. load unit is the extensible resistor which consists of combined several to dozens of resistors. The standard unit can apply safe and constant 1KW per box unit, and the switching-type one can apply up to 2KW per box unit by switching function.

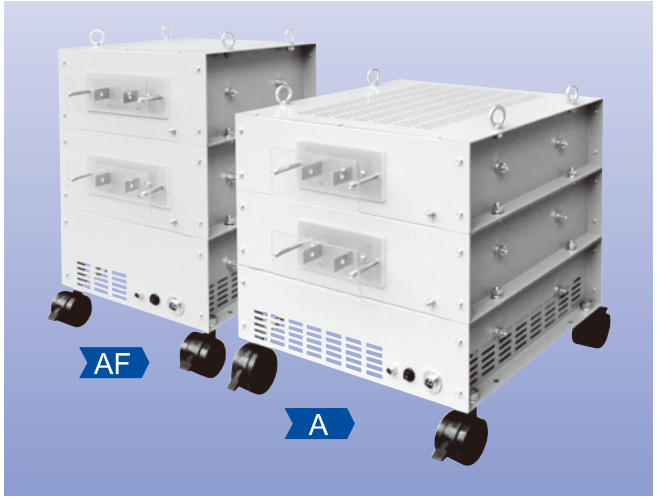
Features

Features

- Capable of 1KW application per box unit.
- Capable of maximum 4KW application by increasing up to 4 box units.
- In addition to the standard type, the flat type unit which saves installing area is also available.
- Optional coolling fans are available depending on purpose.

Specifications Table <reference>

Item	Product name	
	A : Standard elec. load unit	AF : Flat-type standard elec.load unit
Power applying	1KW per box unit	1KW per box unit
Working voltage	AC/DC 20V～250V	AC/DC 20V～250V
Working current	Min. 4A～max.50A per box unit	Min. 4A～max.50A per box unit
Working resistor	500W power type wire wound resistor x 4S	250W flat type flame proof wire wound resistor x 8P
Insulation resistance	No evidence of abnormality after applying AC2000V for 1 minute	No evidence of abnormality after applying AC2000V for 1 minute
Dielectric strength	≧ 10MΩ at DC1000V mega	≧ 10MΩ at DC1000V mega
Flame	With SPC coating (similar color to Marusen5Y7/1)	With SPC coating (similar color to Marusen5Y7/1)
Outer diameter	460W×360H×360D(mm)	310W×420H×180D(mm)



Product designation (reference)

A	2	F	—	10	Ω	J
A:Standard AF: Flat type standard	No. of extensible box unit up to 4	F: With fan unit		Resistance value		Torelance J(=±5%) K(=±10%)

※Please consult with us in case additional works such as installation of terminals on each box unit are required.

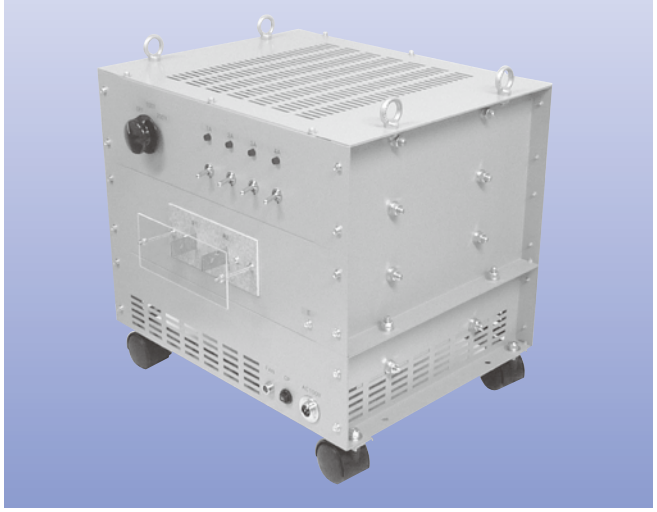
Features

Features

- Capable of 2KW application per box unit.
- Switching type standard load unit which is capable of varying electric current and voltage.
- Capable of maximum 4KW application by increasing up to 2 box units.
- Optional coolling fans are available depending on purpose.

Specifications Table <reference>

Item	Product name
	Switching type standard electronic load unit
Power applying	2KW per box unit
Working voltage	AC/DC 20V～250V (possible to specify voltage)
Working current	Min. 1A～max.10A (possible to specify current)
Working resistor	250W power type wire wound resistor x 8P
Insulation resistance	≧ 10MΩ at DC1000V mega
Dielectric strength	No evidence of abnormality after applying AC2000V for 1 minute
Flame	With SPC coating (similar color to Marusen5Y7/1)
Outer diameter	460W×360H×360D(mm)



Product designation (reference)

B	2	F	—	10	Ω	J
	No. of extensible box unit up to 2	No. of extensible box unit		F: With fan unit		Torelance J(=±5%) K(=±10%)

※Please consult with us in case varying electric current and voltage is required.

Multi-functional inductive load device / Adjustable electronic load unit

This inductive load device can conduct tests for verifying the authenticity of induction circuit easier than conventional devices. It enables operators easy and quick settings of induction circuit during evaluation of performance examination of electronic parts, relays, batteris or power supplies.

Features

Features

- Universal (AC/DC) inductive load (Possible to manufacture device either only for DC or for AC).
- Possible to switch voltage, electric current, power factor and time constant by using the front switch.
- It covers wider range of voltage and electric current values by custom fabricating.
- Achieved f ull control of electric current, power factor and time constant values by choosing appropriate element values.

Specifications Table <reference>

Item	Product name
	Multi-functional inductive load device
Power applying	125VAC(50Hz) /24VDC
Working voltage	0.1A～5.0A (every 0.1A)
Working current	Set by thumb rotary switch
Working resistor	1.0 / 0.8 / 0.45
Insulation resistance	0msec / 7msec / 14msec
Dielectric strength	Selected by lighted push button switch (momentary type) with interlock
Flame	50% ED (1sec ON/OFF) max.
Outer diameter	steel sheet product (460W×360Dmm) standard rack

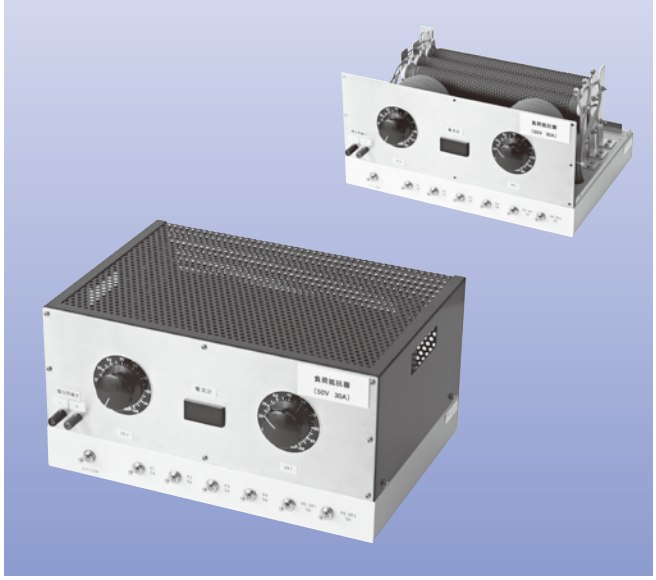
Supplementary information

- Changing voltage, power factor and time constant during carrying current is not allowed.
- Changing electricity is voluntery
- Cooling down of resistor is required.

Features

Features

- Capable of maximum 1500W application
- Possible to control current at every 5A up to the limit of 30A
- Possible to trim current by using variable resistor
- It cuts off electric flow by a circuit protector when the temperature rises.
- Optional equipment/\such as voltmeter is provided.



Specifications Table <reference>

Item	Product name
	Switching type standard electronic load unit
Power applying	2KW per box unit
Working voltage	AC/DC 20V～250V (possible to specify voltage)
Working current	Min. 1A～max.10A (possible to specify current)
Working resistor	250W power type wire wound resistor x 8P
Insulation resistance	≧ 10MΩ at DC1000V mega
Dielectric strength	No evidence of abnormality after applying AC2000V for 1 minute
Flame	With SPC coating (similar color to Marusen5Y7/1)
Outer diameter	460W×360H×360D(mm)

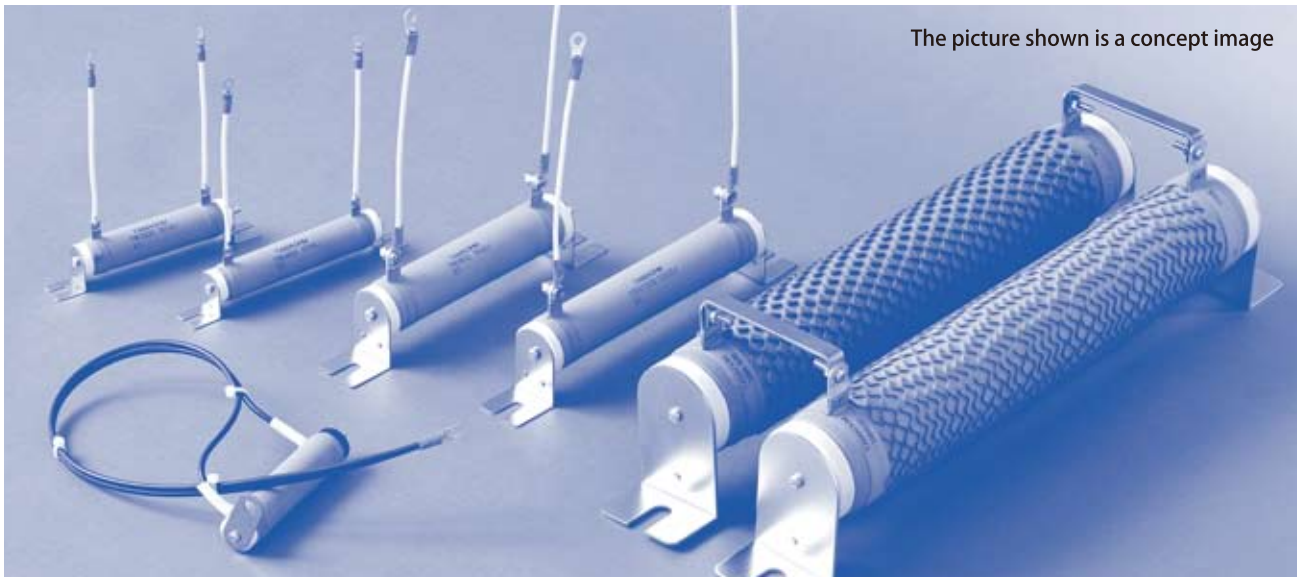
Service Information

All-in-One / Custom Loading Device

"All-in-One" Package Service

With its Quality policy of "All the best for every piece", TAMA OHM's "All-in-one" package service suggests you the most suitable resistor for customer's needs, totally including design, customize, and assembling. By reviewing the material sourcing, management cost and assembly time,
By reviewing the material sourcing, management cost and assembly time,
"All-in-one" package service gives you the lower cost and shorter lead time.
We always aimed to be a company that provide the resistors with customer's trust.

TAMAOHM's "All-in-one" package service



BASIC DESIGN → MATERIAL SOURCING → ASSEMBLY → VERIFICATION OF RESISTANCE VALUE → SUPPLY

"All-in-one" <reference>

Cable Assembly

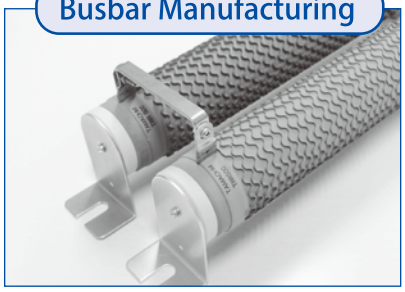
Soldering connectors and crimp type terminals by using over 200 kinds of applications at UL licensed subcontract factories.

Main manufacturers ; JST/Tyco AMP/JAE/MOLEX /HIROSE,etc

Resistor Assembly Processing

Assembling resistors with fittings, stay hinges and various components, then wiring process is proceeded.
Custom-made metal fittings with either cutting or press processing can be applied for assembling.
After cable assembly on finished resistor, it is supplied to customer as a complete product.

Busbar Manufacturing



"All-in-one" package service provide you various option, as well as manufacturing and assembly of high-power busbar and stand, wiring, etc.

Service Information

Custom Loading Device

Custom loading devices can be designed and manufactured according to our customers needs.
We have an experience in manufacturing and selling different kinds of inspection equipment.
For more information, please consult with us.

Supply Record • Reference Example

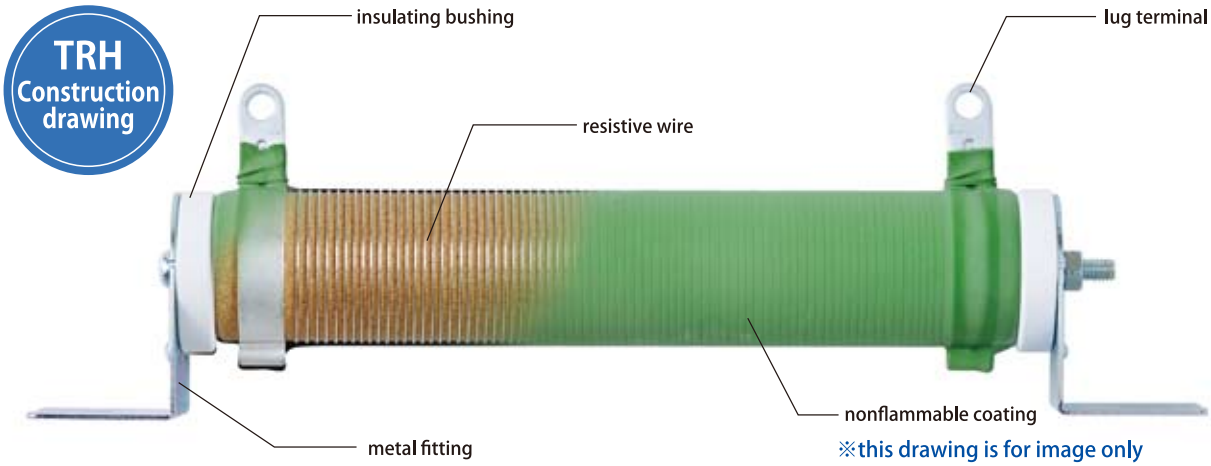
●Variable Load Device for hydrogene generatoe testing equipments

●Load Devuce for Power generator mock tests

●Load Devuce for high voltage relay inspection

High voltage relay inspection load device	Hydrogene generator testing equipment load device
Generator control load device	Generator elements testing load device
Transformer inspection load device	Sun generator testing device
Wind power generator testing device	Fuel batteries testing device
Lithium batteries discharge testing device	Generator controlling device
Electric power dummy load	Battery discharge testing device


ONE BY ONE
TAMAOHM
TWC150G 100ΩJ
LF TAMAOHM



※this drawing is for image only

ONE BY ONE>> The trust to one product creates the solid bond and harmony

One resistor doesn't stand center stage in general parts. This is one of the electronic parts that composes a completed product and may look plain and inconspicuous.
But please imagine our bodies. As every organ of our bodies has an important function to play and the aggregate of healthy organs can generate the harmony andbeautiful performance in all human activities, so an electronic part takes exactly the same role and one resister is no exception to this rule.
TAMA OHM'S resistors support every electrical product in the world and make contribution to human society - now and forever.

Support one product from inside

Quality management system for wire materials.

Various essential wires for resistor are stored and controlled in desiccator.

- The stored wires and wires in use are protected by rust-proof paper (CUBELIGHT)
- Strict check by the inspectors who have expert knowledge of wire nature and properties
- Wires whose storage term passes 1year are re-inspected by their manufacturers.
- Silica gel is placed in the desiccator to keep the chamber dry.

▶ Wires in desiccator

Win the trust for one product

We have been keeping a close eye on the product reliability which is the most important matter for our management philosophy.
We conduct many experimental tests by using our own testing power supply for resistor evaluation and also by the cooperation of public testing institutes. We try very hard to improve the quality. Also, if we use it for the need of high reliability, we get the evaluation test at the device, close to original.

Testing equipments

- **Resistor evaluation device**
  Maximal electric power - 1500W/Maximal voltage - AC 600V/
  Maximal electric flow - 30A
  Load for small period of time (0.5 sec)/ ON-OFF intermittent load (0.5 sec)
- **DC electric power (Takasago seisakusho ZX-400L)**
  Maximal electric power - 400W/Maximal voltage - DC80V/
  Maximal electric flow - 40A
  Fixed voltage load/Fixed flow voltage
- **Memory high logger (Hioki electricity 8420-50)**
  It is possible to conduct the temperature raise test and record in chronological order
  It is possible to measure the temperature simultaneously at max. 8ch for thermoelectric unit
  Also, for pressure resistance tester or for isolation tester.

▶ Resistor evaluation device

TAMA

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