1. INTRODUCTION

These Metal Oxide Resistors offer excellent performance in applications where stability and uniformity of characteristics are desired. They provide lower cost alternatives to Carbon Composition Resistors and General Purpose Metal Films. Metal Oxide also can replace many low power General Purpose wire wound applications, saving both money and time, with shorter delivery cycles.

Liquid SnCl 4 heated 400-700℃ sprayed on ceramic rod and Become a thin film on the surface of rod. Then SbCl 3 added to make it acid film. As the film is strong metal oxide, it will last for years with very little change of resistance. SYNTON-TECH's MO series are especially fit for the requirements of large load or high temperature.

2. FEATURES

- Excellent long-term stability and reliability!
- Meet MIL-R-22684B requirements!
- Extremely low for annual shift!
- Excellent flame retardant coating with "freon" Resistant performances!
- Can produce high resistance value to replace Wire wound resistor with lower cost!
- Non-inductive type available on request!

3. EXPLANATIONS OF ORDERING CODE

DESCRIPTION : MO 1W 5% 100Ω

SYNTON CODE : MO 100 J 101 T

SERIES	POWER	TOLERANCE	RESISTANCE	PACKAGE
METAL OXIDE FILM RESISTOR MO TYPE	012 : 1/8W 025 : 1/4W 050 : 1/2W 100 : 1W 200 : 2W 300 : 3W 500 : 5W 700 : 7W 1000 : 10W 100 S : 1W small Size 200 B : 2W big Size (Please see detail of Figure1)	D: ±0.5% F : ±1% G : ±2% J : ±5%	VALUE E24 Series 3 Digits : 2R2 : 2.2Ω 101 : 100Ω 103 : 10K 105 : 1M E96 Series 4 Digits : 2R20 : 2.2Ω 1000 : 100Ω 1002 : 10K 1004 : 1M (Please see detail of Figure7&8)	T=Tape Box S=Tape 26mm TR=Tape Reel B=Bulk M / MK / MB= Forming horizontal type F / FK / FKK= Forming vertical type (Please see detail of Figure4&5.6)

4. ELECTRICAL CHARACTERISTICS

TYPE	Power Rating at70℃	Maximum Working Volt.	Maximum Overload Volt.	Dielectric withstanding Volt.
MO-12	1/8W	200V	400V	400V
MO-25S	1/4W	200V	400V	400V
MO-25	1/4W	250V	500V	400V
MO-50S	1/2W	350V	700V	500V
MO-50	1/2W	350V	700V	500V
MO-100SS	1W	250V	500V	400V
MO-100S	1W	350V	700V	500V
MO-100	1W	350V	700V	500V
MO-200SS	2W	350V	700V	500V
MO-200S	2W	350V	700V	500V
MO-200	2W	350V	700V	500V
MO-300SS	3W	500V	800V	700V
MO-300S	3W	500V	800V	700V
MO-300	3W	500V	800V	700V
MO-400	4W	500V	800V	700V
MO-500S	5W	750V	1000V	800V
MO-500	5W	750V	1000V	800V
MO-500B	5W	750V	1000V	800V
MO-700S	7W	750V	1000V	800V
MO-700	7W	750V	1000V	800V
MO-1000	10W	750V	1000V	800V

Value Range	** STANDARD 10 OHM ~ 56K OHM ** SPECIAL LOW TO 0.1OHM HIGH TO 1MOHM ** SS TYPE STANDARD 0.1Ω ~ 1KΩ
Operating Temp. Range	-55℃ ~ +155℃
Temp. Coefficient	1 OHM ~ 56K OHM : ±350PPM／℃ 56K OHM ~ 470K OHM : -500PPM／℃ 470K OHM ~ 1M OHM : -800PPM／℃ Special PPM Available On Your Request.

*AL_2O_3 85% FOR S TYPE

Figure 1

5. POWER RATING

(1)Power Derating : The rated power at the temperature in excess of 70℃ shall be derated in accordance with figure2

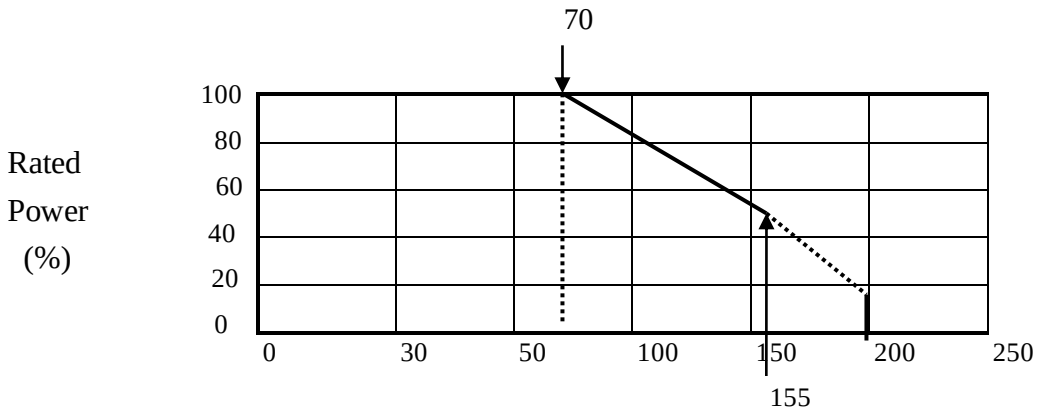


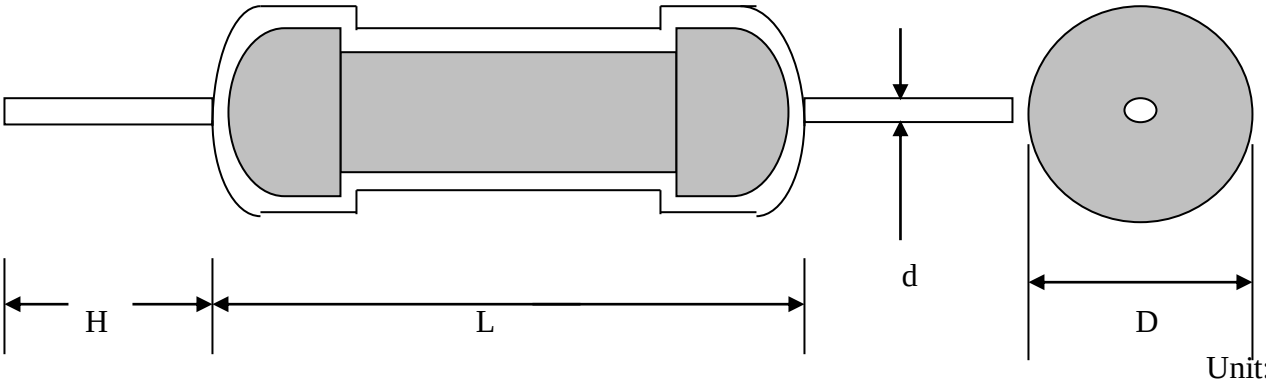
Figure2

(2)Rated Voltage : The DC or AC(rms) continuous working voltage corresponding to the rated power is determined by the following formula:

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

Where E : Continuous rated DC or AC (rms) working voltage (v)
P : Rated power (w)
R : Resistance value (Ω)

6. DIMENSIONS



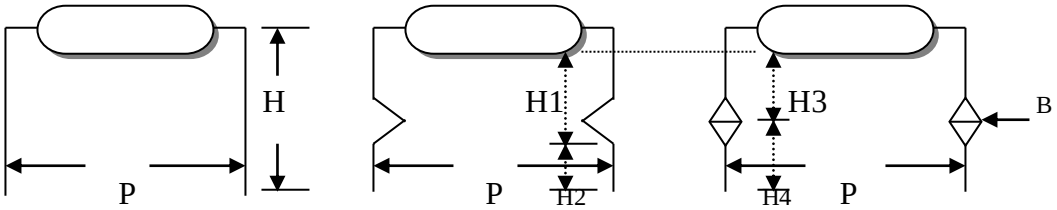
Unit: m/m

TYPE	L	D	H	d
MO-12 MO-25S	3.5 ± 0.3	1.8 ± 0.3	25 ± 3	0.4 ± 0.05
MO-25 MO-50S	6.0 ± 0.5	2.3 ± 0.3	25 ± 3	0.45 ± 0.05
MO-50 MO-100S	9.0 ± 0.5	3.2 ± 0.5	25 ± 3	0.5 ± 0.1
MO-100SS	6.0 ± 0.5	2.3 ± 0.3	25 ± 3	0.45 ± 0.05
MO-100 MO-200S	11 ± 1.0	4.5 ± 0.5	35 ± 3	0.65 ± 0.1
MO-200SS	9.0 ± 0.5	3.2 ± 0.5	25 ± 3	0.5 ± 0.1
MO-200 MO-300S	15 ± 1.0	5.0 ± 0.5	35 ± 3	0.7 ± 0.1
MO-300SS	11 ± 1.0	4.5 ± 0.5	35 ± 3	0.65 ± 0.1
MO-300	17 ± 1.0	6.0 ± 0.5	35 ± 3	0.7 ± 0.1
MO-400	17 ± 1.0	6.0 ± 0.5	35 ± 3	0.7 ± 0.1
MO-500S	17 ± 1.0	6.0 ± 0.5	35 ± 3	0.7 ± 0.1
MO-500	24 ± 1.0	8.0 ± 1.0	35 ± 3	0.7 ± 0.1
MO-500B	39 ± 2.0	8.0 ± 1.0	28 ± 3	0.7 ± 0.1
MO-700S	24 ± 1.0	8.0 ± 1.0	35 ± 3	0.7 ± 0.1
MO-700	39 ± 2.0	8.0 ± 1.0	28 ± 3	0.7 ± 0.1
MO-1000	52 ± 3.0	8.0 ± 1.0	28 ± 3	0.7 ± 0.1

Figure3

(1) FORMING PACKING

M / MK / MB= Forming horizontal type



M TYPE **MK TYPE** **MB TYPE**

Unit : m/m

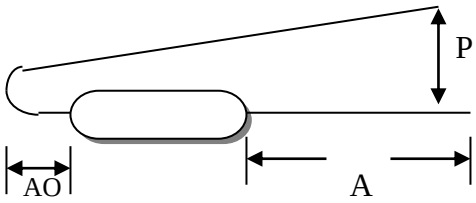
TYPE	POWER	FORMING Type	P ± 1	H ±2.5	H1 ± 1	H2 ± 1	H3 ± 1	H4 ± 1
MO-12 MO-25S	1/8W 1/4W	M	5~	5~	—	—	—	—
MO-25 MO-50S MO-100SS	1/4W 1/2W 1W	M	10~	5~	—	—	—	—
		MK		—	5 8	3~	—	—
MO-50 MO-100S M0-200SS	1/2W 1W 2W	M	12.5~	10~	—	—	—	—
		MK.MB		—	5 8	3~	5 8	5~
MO-100 MO-200S MO-300SS	1W 2W 3W	M	15~	10~	—	—	—	—
		MK.MB		—	5 8	3~	5 8	5~
MO-200 MO-300S	2W 3W	M	20~	10~	—	—	—	—
		MK MB		—	5 8	3~	5 8	5~
MO-300 MO-400 MO-500S	3W 4W 5W	M	25~	10~	—	—	—	—
		MK MB		—	8	3~	8	5~

1. B = 1.15 ~
2. ***ALTERNATE MARKING METHOD ALSO AVAILABLE ON REQUEST.***

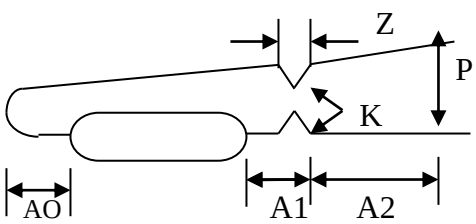
Figure4

(2) FORMING PACKING

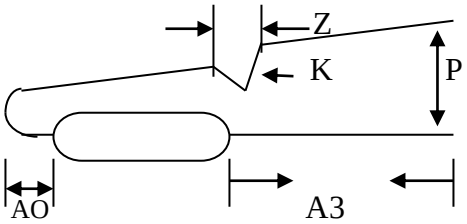
F / FK / FKK=Forming vertical type



F TYPE



FKK TYPE



FK TYPE

Unit : m/m

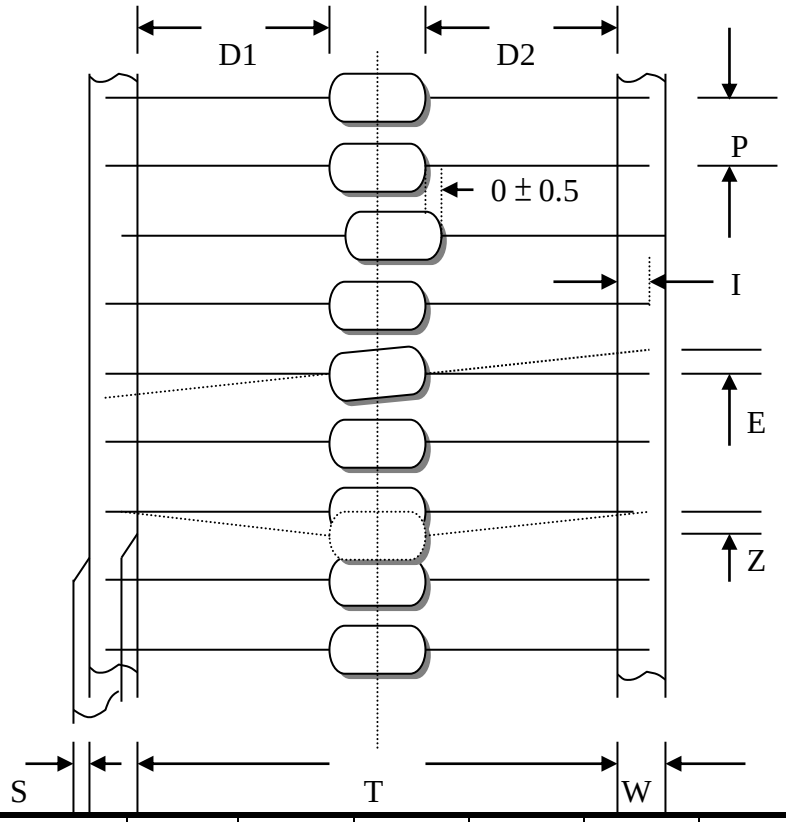
TYPE	POWER	FORMING Type	P ± 1	A ± 1	A1 ± 1	A2 ± 1	A3 ± 1	A0 Max
MO-12 MO-25S	1/8W 1/4W	F		25±3				4.0
MO-25 MO-50S	1/4W 1/2W	F	5~10	25±3	—	—	—	4.0
		FK	5~10	—	—	—	25±3	4.0
		FK FKK	5~10	—	4	3~	5~	4.0
MO-50 MO100S	1/2W 1W	F	5~10	5~	—	—		4.0
		FK	5~10				25±3	4.0
		FK FKK	5~10		4	3~	5~	4.0
MO-100 MO-200S	1W 2W	F	5~10	5~	—	—	—	4.0
		FK FKK	5~10	—	4	3~	5~	4.0
MO-200 MO-300S	2W 3W	F	5~10	5~	—	—	—	4.0
		FK FKK	5~10	—	4	3~	5~	4.0
MO-300 MO-400 MO-500S	3W 4W 5W	F	5~10	5~	—	—	—	4.0
		FK FKK	5~10	5~	4	3~	5~	4.0

1. Z = 3 ±1. K = 2 ±0.5,

2. ***ALTERNATE MARKING METHOD ALSO AVAILABLE ON REQUEST.***

Figure5

(3) TAPE PACKING (T-TYPE)



Unit:m/m

TYPE	SIZE	T	P ±0.5	W ±0.5	D1—D2 Max.	E Max.	Z Max.	S Max.	I Min.
MO-12 MO-25S MO-25 MO-50S MO-100SS	T-26	26±1.0	5	6	1.0	1	1.2	1	3
	T-52	52±2.0	5	6	1.0	1	1.2	1	3
MO-50 MO-100S MO-200SS	T-52	52±2.0	5	6	1.2	1	1.2	1	3
MO-100 MO-200S MO-300SS	T-52	52±2.0	5	6	1.2	1	1.2	1	3
	T-63	63±2.0	5	6	1.4	1	1.2	1	3
	T-74	74±2.0	5	6	1.4	1	1.2	1	3
MO-200 MO-300S	T-52	52±2.0	10	6	1.2	1	1.2	1	3
	T-63	63±2.0	10	6	1.4	1	1.2	1	3
	T-74	74±2.0	10	6	1.4	1	1.2	1	3
MO-300 MO-400 MO-500S	T-74	74±2.0	10	6	1.4	1	1.2	1	3
	T-63	63±2.0	10	6	1.4	1	1.2	1	3
MO-500 MO-700S	T-86	86±2.0	10	6	1.4	1	1.2	1	3

Figure6

7. CHARACTERISTICS

(1) Insulation Resistance

Test Method : Resistors shall be clamped in the trough of a 90 degree metallic V-block, apply DC 100V between this electrode and another lead wire for 1 minute.

Acceptance Standard : 1,000 M ohm above

(2) Terminal Strength

Test Method : Pull a resistor with a weight of 1 kg for 5 seconds. Bend the terminal lead wire with 500gs weight for 90 degree and bend it for 90 degree oppositely and return to normal.

Acceptance Standard : Resistance shall not change more than ±1%. No evidence of mechanical damage.

(3) Vibration

Test Method : Total amplitude of 1.5mm. The frequency shall vary from 10 HZ to 55 HZ, for approximate 1 second. Make this test in the direction parallel to the resistor axis, and up/down for 2 hours respectively. (altogether 6 hours.)

Acceptance Standard : Resistance shall not change more than ±1%. No evidence of mechanical damage.

(4) Short Time Overload

Test Method : Resistors shall be tested 2.5 times rated voltage for 5 seconds at ambient room temperature.

Acceptance Standard : Resistance shall not change more than ±1%. No evidence of mechanical damage.

(5) Load Life

Test Method : Thermostatic chamber at a temperature of 70±5℃ under a rated DC voltage for 1.5 hours on and 1/2 hour off repeat this cycle for 1000±12 hours.

Acceptance Standard : Resistance shall not change more than ±5%. No evidence of mechanical damage.

(6) Moisture Resistance

Test Method : At temperature of 40±2℃ and a relative humidity of 90-95% for 1000±12 hours, under a rating DC voltage for hours on and 1/2 hour off.

Acceptance Standard : Resistance shall not change more than ±5%. No evidence of mechanical damage.

(7) Temperature Cycling

Test Method :

STEP	1	2	3	4
TEMP	-55±3℃	20±5℃	85±2℃	20±5℃
TIME	30min.	10~15min.	30min.	10~15min.

Form 1 to 4 is a cycle as shown above, repeat 5 cycles Measure resistance after 1 hour in normal temperature.

Acceptance Standard : Resistance shall not change more than ±1%. No evidence of mechanical damage.

(8) Resistance to Soldering Heat

Test Method : Immerse each terminal wire of a resistor up to 4±0.8mm away from the resistor body in the solder tank at 350±10℃ for 3±0.5 seconds. Measure resistance in 3 hours.

Acceptance Standard : .Resistance shall not change more than ±1%. No evidence of mechanical damage.

(9) Resistance to Solvent

Test Method : immerse a resistor completely in reagent at a temperature of 20~25℃ for 30±5 seconds.

Acceptance Standard : No evidence of mechanical damage.

(10) Dielectric Withstanding Voltage

Test Method : Resistors shall be clamped in the trough of a 90 degree metallic V-black, apply AC between this electrode and another lead wire for 1 minute.

Acceptance Standard : Resistance shall not change more than ±1%. No evidence of mechanical damage.

(11) Solderability

Test Method : apply flux to the terminal wire of a resistor up to 4±0.8mm away from the resistor body and immerse the flux applied portion in the solder tank at 260±5℃ for 3±0.5 seconds

Acceptance Standard : more than 95% of a circumference of the immersed portion shall be completely covered with new solder.

(12) Soldering Recommendation

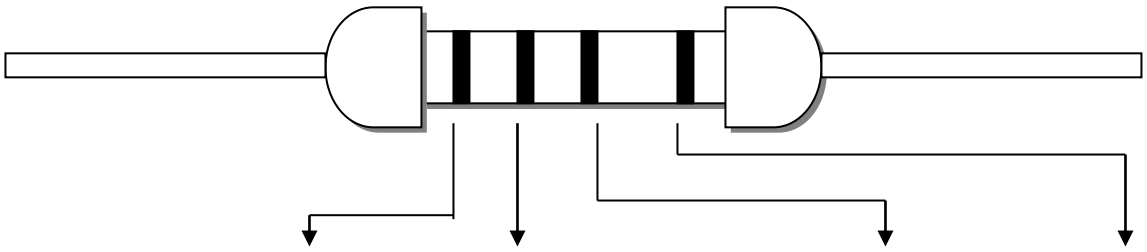
Test Method : The Standard Length of epoxy on the terminal of our product is less than 1.5mm. Also, the Standard Welding Point must be over than 1.6mm from Resistor body.

- **Rated continuous Working Voltage (RCWV)**

$$= \sqrt{\textbf{power rating} \times \textbf{resistance value}}$$

8. COLOR CODING

J (±5%)

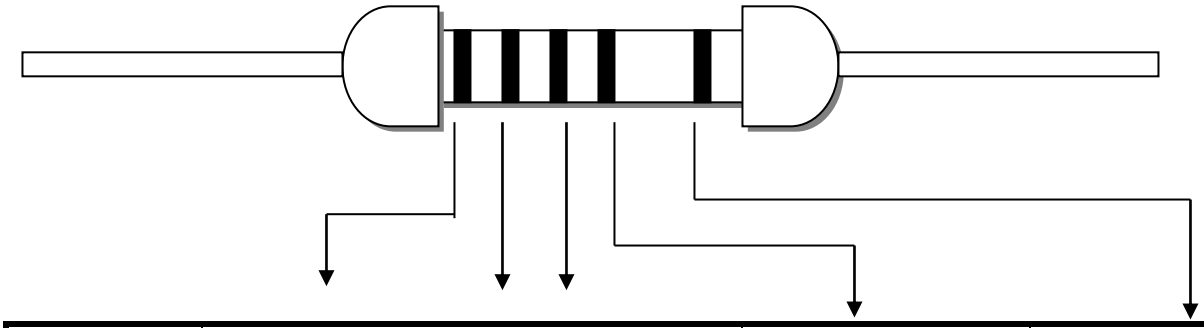


Color	1st, 2nd (Significant Figure)		3rd (Multiplier)	4th (Tolerance)
Black	0	0	10^0	—
Brown	1	1	10^1	—
Red	2	2	10^2	—
Orange	3	3	10^3	—
Yellow	4	4	10^4	—
Green	5	5	10^5	—
Blue	6	6	10^6	—
Violet	7	7	10^7	—
Gray	8	8	10^8	—
White	9	9	10^9	—
Gold	—	—	10^{-1}	J (±5%)
Silver	—	—	10^{-2}	—
Plain	—	—	10^{-3}	—

- stamping or color bands for marking of 5W and up.

Figure7

F (± 1%) **G (± 2%)** **D (± 0.5%)**
C (± 0.25%) **B (± 0.1%)**



Color	1st, 2nd 3rd (Significant Figure)			(Multiplier)	(Tolerance)
Black	0	0	0	10^0	—
Brown	1	1	1	10^1	F (±1%)
Red	2	2	2	10^2	G (±2%)
Orange	3	3	3	10^3	—
Yellow	4	4	4	10^4	—
Green	5	5	5	10^5	D (±0.5%)
Blue	6	6	6	10^6	C (±0.25%)
Violet	7	7	7	10^7	B (±0.1%)
Gray	8	8	8	10^8	—
White	9	9	9	10^9	—
Gold	—	—	—	10^{-1}	
Silver	—	—	—	10^{-2}	—
Plain	—	—	—	10^{-3}	—

- stamping or color bands for marking of 5W and up.

Figure8