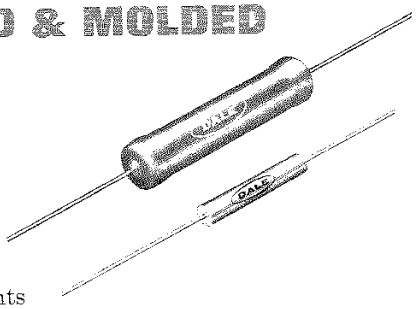
DALE®

date 1973

TYPE RS SILICONE COATED & MOLDED

NS-non-inductive



FEATURES

- Complete welded construction
- High temperature silicone coating and molding
- Meets applicable requirements of MIL-R-26
- Available in non-inductive styles (Type NS) with Aryton-Perry winding for lowest reactive components
- Over 44 million unit-hours of testing with no catastrophic failures have proven a failure rate of less than 0.0066% per 1000 hours (at 60% confidence) with full rated power at 25°C. A failure is defined as ±1% resistance change.
- Coated models: RS-2, RS-2A, 2B, 2C, 5, 7, and 10. Molded models: RS-1/8 thru RS-1B.

STANDARD ELECTRICAL SPECIFICATIONS

DALE TYPE	MIL-R-26 TYPE*	DALE RATING U .05% thru 5%	DALE RATING V 3% & 5%	RESISTANCE RANGE** (Ohms) .05%	.1%	.25%	.5%, 1%, 3%, 5%	MAX.*** WORKING VOLTAGE U	MAX.*** WORKING VOLTAGE V	MAX. WT. GRAMS
†RS-1/8	–	.25 W	–	–	–	–	1-950	8.5	–	.15
RS-1/4	–	.4 W	–	1-950	.499-950	.499-3.4K	.1-3.4K	20	–	.21
RS-1/2	–	.75 W	–	1-1.3K	.499-1.3K	.499-4.9K	.1-4.9K	29	–	.23
RS-1A	RW-70	1.0 W	–	1-2.7K	.499-2.7K	.499-10.4K	.1-10.4K	52	–	.34
RS-1B	–	1.1 W	–	1-4.0K	.499-4K	.499-15K	.1-15K	62	–	.40
RS-2	–	4.0 W	5.5 W	.499-12.7K	.499-12.7K	.1-47.1K	.1-47.1K	210	250	2.1
RS-2A	–	3.25 W	4.75 W	.499-11.4K	.499-11.4K	.1-42.1K	.1-42.1K	185	220	.90
RS-2B	RW-79	3.0 W	3.75 W	.499-6.5K	.499-6.5K	.1-24.5K	.1-24.5K	140	157	.70
RS-2C	–	2.5 W	3.25 W	.499-8.6K	.499-8.6K	.1-32.3K	.1-32.3K	138	157	1.6
RS-2C-23	RW-69	2.5 W	3.25 W	.499-8.6K	.499-8.6K	.1-32.3K	.1-32.3K	138	157	1.6
RS-5	–	5.0 W	6.5 W	.499-25.7K	.499-25.7K	.1-95.2K	.1-95.2K	360	410	4.2
RS-5-69	RW-74	5.0 W	6.5 W	.499-24.5K	.499-24.5K	.1-91.0K	.1-91.0K	350	400	4.2
RS-5-70	RW-67	5.0 W	6.5 W	.499-25.7K	.499-25.7K	.1-95.2K	.1-95.2K	360	410	4.2
RS-7	–	7.0 W	9.0 W	.499-41.4K	.499-41.4K	.1-154K	.1-154K	504	576	4.7
RS-10	–	10 W	13 W	.499-73.4K	.499-73.4K	.1-273K	.1-273K	858	978	9.0
RS-10-38	RW-78	10 W	13 W	.499-71.5K	.499-71.5K	.1-265K	.1-265K	846	966	9.0
RS-10-39	RW-68	10 W	13 W	.499-73.4K	.499-73.4K	.1-273K	.1-273K	858	978	9.0

*NOTE: The following Dale RS series resistors meet requirements of MIL-R-26C (Char. G & V) and MIL-R-23379.

**Consult factory for extended values.

***Max. working voltage determined at .0008 dia. wire resistance values.

†RS-1/8 available in 1% tolerance and above.

Standard Temperature Coefficients: ±90 ppm, below 1Ω; ±50 ppm, 1Ω-9.9Ω; ±20 ppm, 10Ω and beyond.

Consult factory for special T.C. requirements

MIL-R-26C			
DALE TYPE	RS-2C	RS-5	RS-10
MIL. TYPE	RW-69	RW-67	RW-68

MIL-R-23379				
DALE TYPE	RS-1A	RS-2C-23	RS-5	RS-10
MIL. TYPE	RWP-18	RWP-20	RWP-21	RWP-23

SPECIAL MODIFICATIONS

- Terminals can be supplied in any commercial material with several type finishes
- Terminal lengths and diameters can be varied
- Various elements available for special T.C.
- Special configurations available on request
- Tolerances available to .01% on most types
- Special matching available (T.C. and tolerance)

NS-NON-INDUCTIVE

Models of equivalent physical and electrical specifications are available with non-inductive (Aryton-Perry) winding. They are identified by substituting the letter N for R in the part number (NS-5), for example). Three conditions apply:

1. For NS Types, divide maximum resistance values by two
2. For NS Types, multiply maximum working voltage by .707
3. For NS Types, maximum weights may slightly exceed those shown on low values.

*Body O.D. may exceed that of the RS-2C by .010".

NS-½
NS-1A
NS-1B
NS-2
NS-2A
NS-2B
*NS-2C
NS-5
NS-7
NS-10

SPECIFICATIONS

APPLICABLE MIL SPECIFICATIONS

MIL-R-26E: This is a new military specification designed especially for precision and non-precision power wirewound resistors. The RS series meet the requirements of this specification as well as the older MIL-R-26C and MIL-R-23379 specifications.

ELECTRICAL

Tolerance: RS Types are available in the following standard tolerances: 5%, 3%, 1%, .5%, .25%, .10%, .05% except RS-1/8 (1% and greater).

Dielectric Strength: 500 VAC for RS-1/8 through RS-1B models: 1000 volts for all others

Insulation Resistance: 1000 megohms minimum dry, 100 megohms minimum after moisture test

Short Time Overload: 5 seconds at 5 times rated power= RS-1/8 through RS-2C; 5 seconds at 10 times rated power=RS-2 through RS-10

MECHANICAL

Terminal Strength: 2 lb. pull test=RS-1/8
5 lb. pull test=RS-1/4 thru RS-1B
10 lb. pull test=all others

Solderability: Continuous, satisfactory coverage when tested in accordance with MIL-R-26E.

MATERIAL

Core: Ceramic: Steatite or alumina, depending on physical size

Element: Copper-nickel alloy or nickel-chrome alloy, depending on resistance value

End Caps: Stainless steel except RS-1/8 (nickel silver)

Coating: Special high temperature silicone

Standard Terminals: Tinned copperweld except RS-1/8 (tinned copper)

Weldable Leads: The following weldable lead materials are available from Dale on a standard stocking basis, and can be specified by adding the dash number shown below to the standard part number. Consult factory for charges on special lead materials.
Grade "A" Nickel, untinned –53 (Example: RS-1A-53)
Gold-plated Dumet (50 micro-inch) –52 (Example: RS-1A-52)

ENVIRONMENTAL SPECIFICATIONS*

TEST	MIL-R-26E REQUIREMENT	DALE MAXIMUM
Load Life	± (.5%+.05Ω)Δ R	± (.5%+.05Ω)Δ R
Moisture Resistance	± (.2%+.05Ω)Δ R	± (.2%+.05Ω)Δ R
Temp. Coefficient	30-90 PPM/°C Max.	20-90 PPM/°C
Thermal Shock	± (.2%+.05Ω)Δ R	± (.2%+.05Ω)Δ R
Short Time Overload	± (.2%+.05Ω)Δ R	± (.2%+.05Ω)Δ R
Dielectric	± (.1%+.05Ω)Δ R	± (.1%+.05Ω)Δ R
Low Temp. Storage	± (.2%+.05Ω)Δ R	± (.2%+.05Ω)Δ R
High Temp. Exposure	± (.5%+.05Ω)Δ R	± (.5%+.05Ω)Δ R
Shock	± (.1%+.05Ω)Δ R	± (.1%+.05Ω)Δ R
Vibration	± (.1%+.05Ω)Δ R	± (.1%+.05Ω)Δ R
Terminal Strength	± (.1%+.05Ω)Δ R	± (.1%+.05Ω)Δ R

*All Δ R figures shown are maximum, based on units with an initial tolerance of 1% and maximum operating temperature of 275°C.

POWER RATINGS

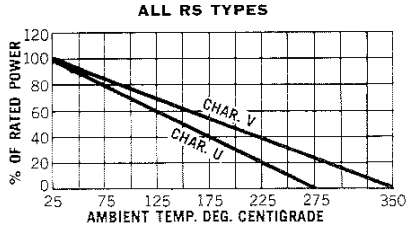
Dale RS Series have two power ratings, depending on operating temperature and stability requirements.

CHARACTERISTIC U: 1. 275° C maximum hotspot temperature
2. .5% maximum Δ R in 2000 hour load life

CHARACTERISTIC V: 1. 350° C maximum hotspot temperature
2. 3% maximum Δ R in 2000 hour load life

DERATING

Dale RS coated resistors have an operating temperature range of –55° C to +350° C. Dale RS molded resistors have an operating temperature range of –55° C to +275° C. They must be derated at high ambient temperatures according to the curves at the right.

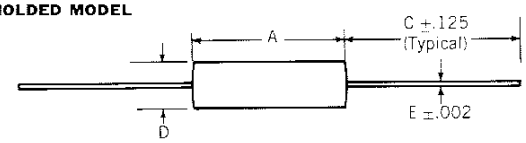


CHARACTERISTIC V: Coated resistors are available in 3% and 5% tolerance only.

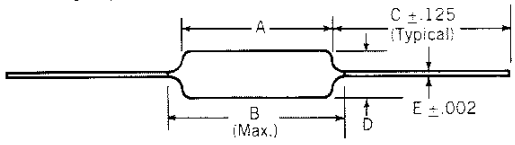
CHARACTERISTIC U: Coated or molded resistors are available in any tolerance.

PHYSICAL CONFIGURATIONS

MOLDED MODEL



COATED MODEL



	TYPE	DIM. A	DIM. B	DIM. C	DIM. D	DIM. E
MOLDED MODELS	RS-1/8	.155±.015	–	1.500	.065±.015	.016
	RS-1/4	.250±.015	–	1.500	.078±.015	.020
	RS-1/2	.312±.015	–	1.500	.078±.015	.020
	RS-1A	.422±.015	–	1.500	.110±.015	.020
	RS-1B	.575±.015	–	1.500	.110±.015	.020
COATED MODELS	RS-2	.625±.062	.765	2.000	.250±.031	.040
	RS-2A	.812±.062	.890	1.500	.187±.031	.032
	RS-2B	.560±.062	.622	1.500	.187±.031	.032
	RS-2C	.500±.062	.593	1.500	.218±.031	.040
	RS-2C-23	.500±.062	.593	1.500	.218±.031	.032
	RS-5	.875±.062	1.000	2.000	.312±.031	.040
	RS-5-69	.875±.062	.937	2.000	.312±.031	.040
	RS-5-70	.875±.062	1.000	1.500	.312±.031	.032
	RS-7	1.218±.062	1.281	2.000	.312±.031	.040
	RS-10	1.780±.062	1.875	2.000	.375±.031	.040
	RS-10-38	1.780±.062	1.842	2.000	.375±.031	.040
	RS-10-39	1.780±.062	1.875	1.500	.375±.031	.032

DALE

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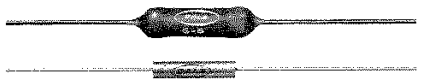
TYPE G SILICONE COATED & MOLDED BERYLLIUM OXIDE CORE



FEATURES

Optimum heat dissipation pattern

Beryllium oxide core

From 1.4 to 4 times higher power ratings than conventional resistors of equivalent size.

Completely welded construction

- High temperature silicone coated and molded
- Meets applicable requirements of MIL-R-26
- Available in non-inductive styles (Type GN) with Aryton-Perry winding for lowest reactive components.
- Coated models: G-5, 5A, 5C, 6, 10, 12 and 15
  Molded models: G-1, 2, 3
- Covered by U.S. Patent 3,295,090

STANDARD ELECTRICAL SPECIFICATIONS

DALE TYPE	MIL-R-26 TYPE*	DALE RATING U .05% thru 5%	DALE RATING V 3% & 5%	RESISTANCE RANGE** (Ohms) .05%	.1%	.25%	.5%, 1%, 3%, 5%	MAX.*** WORKING VOLTAGE U	MAX.*** WORKING VOLTAGE V	MAX. WT. GRAMS
G-1	RW-81	1.0 W	–	1-950	.499-950	.499-3.4K	.1-3.4K	33	–	.20
G-2	–	1.5 W	–	1-1.3K	.499-1.3K	.499-4.9K	.1-4.9K	42	–	.21
G-3	RW-80	2.25 W	–	1-2.7K	.499-2.7K	.499-10.4K	.1-10.4K	80	–	.34
G-5	–	4.0 W	5 W	.499-6.5K	.499-6.5K	.1-24.5K	.1-24.5K	162	184	.80
G-5A	–	4.5 W	6.5 W	.499-11.4K	.499-11.4K	.1-42.1K	.1-42.1K	214	257	.95
G-5C	–	5 W	7 W	.499-8.6K	.499-8.6K	.1-32.3K	.1-32.3K	194	230	1.2
G-6	–	6 W	8 W	.499-12.7K	.499-12.7K	.1-47.1K	.1-47.1K	258	298	2.0
G-10	–	7 W	10 W	.499-25.7K	.499-25.7K	.1-95.2K	.1-95.2K	425	508	3.6
G-12	–	10 W	12 W	.499-41.4K	.499-41.4K	.1-154K	.1-154K	607	665	4.2
G-15	–	15 W	18 W	.499-73.4K	.499-73.4K	.1-273K	.1-273K	1050	1150	7.6

*NOTE: The following Dale G series resistors meet requirements of MIL-R-26C (Char. G & V) and MIL-R-23379.

**Consult factory for extended values.

***Maximum Working Voltage determined at .0008 dia. wire resistance values.

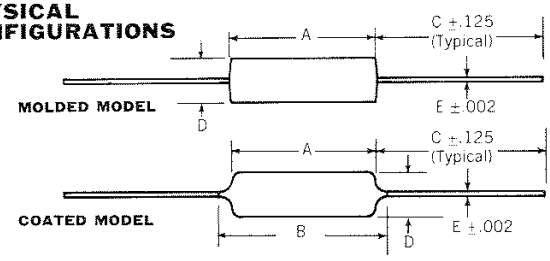
Standard Temperature Coefficients: ±90 ppm, below 1Ω; ±50 ppm, 1Ω-9.9Ω; ±20 ppm, 10Ω and beyond.

Consult factory for special T.C. requirements.

MIL-R-26C			
DALE TYPE	G-5C	G-10	G-15
MIL. TYPE	RW-69	RW-67	RW-68

MIL-R-23379					
DALE TYPE	G-1	G-3	G-5C-2	G-10	G-15
MIL. TYPE	RWP-17	RWP-19	RWP-20	RWP-21	RWP-23

PHYSICAL CONFIGURATIONS



SPECIAL MODIFICATIONS

- Terminals can be supplied in any commercial material with several type finishes
- Terminal lengths and diameters can be varied
- Various elements available for special T.C.
- Special configuration available on request
- Tolerances available to .01% on most types
- Special matching available (T.C. and tolerance)

GN – NON-INDUCTIVE

Models of equivalent physical and electrical specifications are available with non-inductive (Aryton-Perry) winding. They are identified by adding the letter N to the letter G in the part number (GN-5, for example). Three conditions apply:

1. For GN Types, divide maximum resistance values by two.
2. For GN Types, multiply maximum working voltage by .707.
3. For GN Types, maximum weights may slightly exceed those shown on low values.

*Body O.D. may exceed that of the G-5C by .010".

GN-2
GN-3
GN-5
GN-5A
*GN-5C
GN-6
GN-10
GN-12
GN-15

	TYPE	DIM. A	DIM. B	DIM. C	DIM. D	DIM. E
MOLDED MODELS	G-1	.250±.015	–	1.500	.078±.015	.020
	G-2	.312±.015	–	1.500	.078±.015	.020
	G-3	.422±.015	–	1.500	.110±.015	.020
COATED MODELS	G-5	.562±.062	.640	1.500	.188±.032	.032
	G-5A	.812±.062	.890	1.500	.188±.032	.032
	G-5C	.500±.062	.593	1.500	.218±.032	.040
	G-6	.625±.062	.765	2.000	.250±.032	.040
	G-10	.875±.062	1.000	2.000	.312±.032	.040
	G-12	1.218±.062	1.281	2.000	.312±.032	.040
	G-15	1.780±.062	1.875	2.000	.375±.032	.040

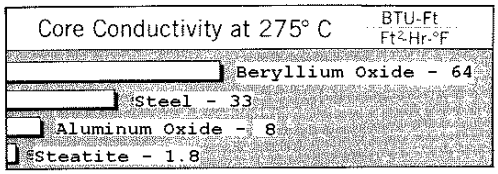
SPECIFICATIONS

APPLICABLE MIL-SPECIFICATIONS

MIL-R-26E: This is a new military specification designed especially for precision and non-precision power wirewound resistors. The G series meet the requirements of this specification as well as the older MIL-R-26C and MIL-R-23379 specifications.

MATERIAL

Core: Beryllium oxide for optimum heat dissipation. Dale's pioneer use of beryllium oxide cores in conjunction with superior wire and coating materials gives G resistors a big edge over conventional precision power resistors. The outstanding thermal conductivity of beryllium oxide over other commonly used resistor core materials (steatite and aluminum oxide) is demonstrated in the chart.



Element: Copper-nickel alloy or nickel-chrome alloy, depending on resistance value

End Caps: Stainless steel

Coating: Special high temperature silicone

Standard Terminals: Tinned copperweld

Weldable Leads: The following weldable lead materials are available from Dale on a standard stocking basis, and can be specified by adding the dash number shown below to the standard part number.

Grade "A" Nickel, untinned –53
Gold-plated Dumet (50 micro-inch) –52
(Example: G-1-53 or G-1-52)

ELECTRICAL

Tolerance: G Types are available in the following standard tolerances: 5%, 3%, 1%, .5%, .25%, .10%, .05%.

Dielectrical Strength: 500 VAC for G-1, G-2, G-3 models; 1000 volts for all others.

Insulation Resistance: 1000 megohms minimum dry, 100 megohms minimum after moisture test.

Short Time Overload: 5 seconds at 5 times rated power=G-1 thru G-5C (Char. U)
5 seconds at 10 times rated power=all others.

MECHANICAL

Terminal Strength: 5 lb. pull test=G-1, G-2 and G-3
10 lb. pull test=all others

Solderability: Continuous satisfactory coverage when tested in accordance with MIL-R-26E.

Termination: When G resistors will be operated at full rated power, resistance welding or high temperature solder are the recommended termination methods. Termination should be made within ½ inch from end of resistor body.

ENVIRONMENTAL SPECIFICATIONS*

TEST	MIL-R-26E REQUIREMENT	DALE MAXIMUM
Load Life	± (.5%+.05Ω)Δ R	± (.5%+.05Ω)Δ R
Moisture Resistance	± (.2%+.05Ω)Δ R	± (.2%+.05Ω)Δ R
Temp. Coefficient	30-90 PPM/°C Max.	See table
Thermal Shock	± (.2%+.05Ω)Δ R	± (.2%+.05Ω)Δ R
Short Time Overload	± (.2%+.05Ω)Δ R	± (.2%+.05Ω)Δ R
Dielectric	± (.1%+.05Ω)Δ R	± (.1%+.05Ω)Δ R
Low Temp. Storage	± (.2%+.05Ω)Δ R	± (.2%+.05Ω)Δ R
High Temp. Exposure	± (.5%+.05Ω) Δ R	± (.5%+.05Ω) Δ R
Shock	± (.1%+.05Ω)Δ R	± (.1%+.05Ω)Δ R
Vibration	± (.1%+.05Ω)Δ R	± (.1%+.05Ω)Δ R
Terminal Strength	± (.1%+.05Ω)Δ R	± (.1%+.05Ω)Δ R

*All Δ R figures shown are maximum, based on units with an initial tolerance of 1% and maximum operating temperature of 275°C.

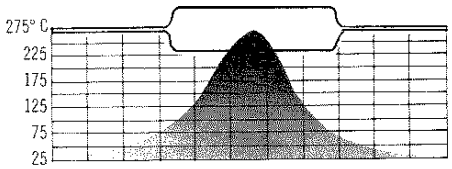
POWER RATING

Power ratings of Dale G resistors are 1.4 to 4 times higher than those of conventional wirewound resistors of equivalent size. These increases are possible because of their improved heat dissipation pattern shown in the comparative charts. At the higher ratings, Dale G resistors will meet the same environmental and life stability requirements of the lower rated conventional resistors:

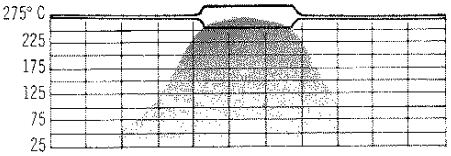
CHARACTERISTIC U
1. 275°C maximum hotspot temperature
2. .5% maximum Δ R in 2000 hour load life

CHARACTERISTIC V
1. 350°C maximum hotspot temperature
2. 3% maximum Δ R in 2000 hour load life

HEAT DISSIPATION PATTERN OF PRESENT 5 WATT RESISTOR "G" RATING



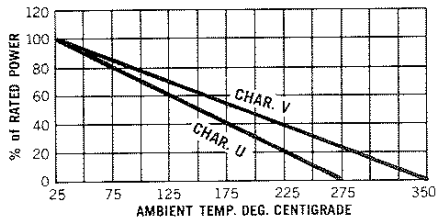
GREATLY IMPROVED HEAT DISSIPATION PATTERN OF NEW G-5 RESISTOR



DERATING

Ambient Temperature: Dale G coated resistors have an operating temperature range of –55° C to +350° C. Dale G molded resistors have an operating temperature range of –55° C to +275° C. They must be derated at higher temperatures according to the curve at the right.

Stability: When Dale G resistors are operated at the same ratings (Char. U) as conventional Dale RS resistors of equivalent size, the shift in resistance is 50% or less than that of the RS.



CHAR. U: Coated or molded resistors are available in any tolerance.
CHAR. V: Coated resistors are available in 3% and 5% tolerance.