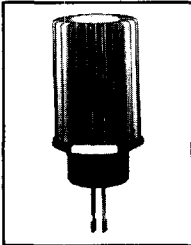


MODEL PH Wirewound Resistors

Precision Power Aluminum Housed, Thru-Chassis Mount



FEATURES

- Complete welded construction
- Complete environmental protection
- Designed to utilize heat-sink effect of chassis
- Plug-in connections available for quick connect/disconnect from circuit

STANDARD ELECTRICAL SPECIFICATIONS

MODEL	RATING (Watts)	RESISTANCE RANGES (Ohms) *		MAX. WORKING VOLTAGE	MAX. WEIGHT (Grams)	STANDARD TEMPERATURE COEFFICIENT VALUE RANGES (Ohms) †		
		.05%, .1%, .25%	.5%, 1%, 3%			± 50PPM	± 30PPM	± 20PPM
PH-10-1	10	1-12.7k	.1-47.1k	240	6	1-9.9	10-79	80-47.1k
PH-25	25	.5-25.7k	.1-95.2k	550	22	1-9.9	10-169	170-95.2k
PH-25A	25	.5-25.7k	.1-95.2k	550	22	1-9.9	10-169	170-95.2k
PH-50	50	3-52k	.1-75k	1500	80	1-99	100-999	1k-75k
PH-100	100	5-35k	.1-50k	1700	186	1-99	100-999	1k-50k

* Consult factory for extended values. † Consult factory for values below 1 ohm and for special T.C. requirements.

ELECTRICAL SPECIFICATIONS

Resistance Tolerance: ± 3%, ± 1%, ± .5%, ± .25%, ± .10%, ± .05%.

Dielectric Strength: 1000 VAC on PH-10-1.
2500 VAC on PH-25, PH-25A, PH-50 and PH-100.

Maximum Working Voltage: Maximum working voltage determined at .001" diameter wire resistance values.

ENVIRONMENTAL PERFORMANCE

General: Testing of PH resistors is done according to the procedures and test methods described in MIL-R-18546.

MATERIAL SPECIFICATIONS

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.

Housing: Aluminum with hard anodic coating.

Standard Terminal(s): Tinned Copperweld® on PH-10-1.
180 alloy on PH-25A, PH-25, PH-50 and PH-100.

DIMENSIONAL CONFIGURATIONS [Numbers in brackets indicate millimeters]

MODEL	A	B	C	D	E	F	G
PH-10-1	.312 ± .031 [7.93 ± .787]	.750 ± .015 [19.05 ± .381]	1.375 ± .062 [34.92 ± 1.57]	.250 ± .010 [6.35 ± .254]	.086 ± .005 [2.18 ± .127] DIA.	.500 ± .010 [12.70 ± .254]	
PH-25	.812 ± .031 [20.62 ± .787]	.750 ± .031 [19.05 ± .787]	1.970 ± .062 [50.04 ± 1.57]	.875 ± .031 [22.23 ± .787]	.086 ± .010 [2.18 ± .254] DIA.	.375 ± .062 [9.52 ± 1.57]	
PH-50 & PH-100							
PH-25A Smaller Version of PH-25	.812 ± .031 [20.62 ± .787]	.750 ± .031 [19.05 ± .787]	1.343 ± .015 [34.11 ± .381]	.875 ± .031 [22.23 ± .787]	.086 ± .010 [2.18 ± .254] DIA.	.437 ± .031 [11.10 ± .787]	

MODEL PH

APPLICABLE MIL SPECIFICATIONS

The Dale® PH models meet the electrical and environmental requirements of MIL-R-18546. There are, however, no direct mil equivalents in this configuration.

POWER RATING

Dale PH resistor ratings are based on the following requirements:

1. 275°C maximum internal hotspot temperature.
2. 1% maximum ΔR in 1000-hours load life for PH-10-1, PH-25 and PH-50.
3% maximum ΔR in 1000-hours load life for PH-100.
3. Proper heat sink
4 x 6 x 2 x .040 aluminum chassis = PH-10-1.
5 x 7 x 2 x .040 aluminum chassis = PH-25.
12 x 12 x .125 aluminum panel = PH-50 and PH-100.

SPECIAL MODIFICATIONS

1. Special resistance-temperature characteristics.
2. Special terminal configurations and materials.
3. Non-inductive type resistor.
4. Special resistances and tolerances.
5. Special exterior finishes and platings.

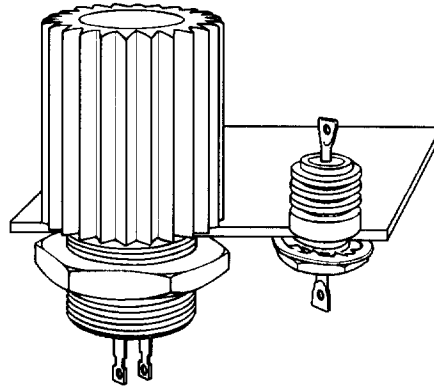
PH — NON-INDUCTIVE

Models of equivalent physical and electrical specifications are available with non-inductive (Aryton-Perry) winding.

Two conditions apply:

1. Maximum resistance value must be divided by two.
2. Maximum working voltage must be multiplied by .707.

MOUNTING INFORMATION

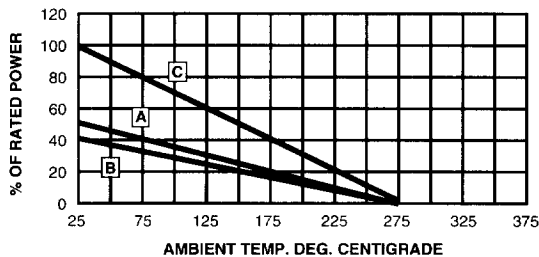


Two Terminal Configurations (PH-10-1, PH-25, PH-50 and PH-100)
Thru chassis mounting

DERATING

Dale PH resistors have an operating temperature range of -55°C to +275°C. Derating is required for reduced chassis mounting area and for high ambient temperatures. The following curves apply to the operation of unmounted resistors:

A = PH-10-1, PH-25, unmounted. **B** = PH-50, PH-100, unmounted.
C = Mounted to aluminum chassis.



PART MARKING

- Dale
- Style
- Value and tolerance
- Wattage
- Date code

HOW TO ORDER

PH-100
MODEL
10
RESISTANCE
1%
TOLERANCE

CHECKLIST FOR ORDERING FILM RESISTORS



ORDERS MUST HAVE COMPLETE INFORMATION INCLUDING THE FOLLOWING:

1. Resistor type and model number
2. Resistor wattage rating
3. Resistor value
4. Resistor tolerance
5. Temperature Coefficient
6. Special quantity of each item
7. Specify routing
8. Desired delivery
9. If you have a drawing covering the part, specify your part number and drawing number and supply a copy with the order. Including the Dale® specification number on your drawings will assure you of exact duplication on all future orders.
10. Priority rating under DMS regulations and contract number (if applicable).
11. Specify if Letter of Certification is required.
12. Prices on specific items and quantities will be quoted on request. Quantity of each item ordered at one time determines unit price for manufacturers' orders.

STANDARD DECADE RESISTANCE VALUES

The following table lists four established number series which are used as preferred values in electronic design. Each series is shown under an associated value of tolerance %. The number series under the 10% column is known as the E12 Series because there are 12 standard values within a decade range. 2% and 5% utilize the E24 Series, 1% uses E96 and .1%, .25% and .5% use E192. Successive values within a decade series are related (approximately) by a factor of $^{12}\sqrt{10}$ for the E12 Series, $^{24}\sqrt{10}$ for the E24 Series, $^{96}\sqrt{10}$ for the E96 Series and $^{192}\sqrt{10}$ for the E192 Series.

Use of standard values is encouraged because stocking programs are designed around them. However, intermediate values can be special ordered where permitted. Consult factory.

.1%, .25%, .5%		.1%, .25%, .5%		.1%, .25%, .5%		.1%, .25%, .5%		.1%, .25%, .5%		.1%, .25%, .5%		.1%, .25%, .5%		2%, 5%		10%	
.5%	1%	.5%	1%	.5%	1%	.5%	1%	.5%	1%	.5%	1%	.5%	1%	2%	5%	10%	
10.0	10.0	13.3	13.3	17.8	17.8	23.7	23.7	31.6	31.6	42.2	42.2	56.2	56.2	75.0	75.0	10	10
10.1		13.5		18.0		24.0		32.0		42.7		56.9		75.9		11	—
10.2	10.2	13.7	13.7	18.2	18.2	24.3	24.3	32.4	32.4	43.2	43.2	57.6	57.6	76.8	76.8	12	12
10.4		13.8		18.4		24.6		32.8		43.7		58.3		77.7		13	—
10.5	10.5	14.0	14.0	18.7	18.7	24.9	24.9	33.2	33.2	44.2	44.2	59.0	59.0	78.7	78.7	15	15
10.6		14.2		18.9		25.2		33.6		44.8		59.7		79.6		16	—
10.7	10.7	14.3	14.3	19.1	19.1	25.5	25.5	34.0	34.0	45.3	45.3	60.4	60.4	80.6	80.6	18	18
10.9		14.5		19.3		25.8		34.4		45.9		61.2		81.6		20	—
11.0	11.0	14.7	14.7	19.6	19.6	26.1	26.1	34.8	34.8	46.4	46.4	61.9	61.9	82.5	82.5	22	22
11.1		14.9		19.8		26.4		35.2		47.0		62.6		83.5		24	—
11.3	11.3	15.0	15.0	20.0	20.0	26.7	26.7	35.7	35.7	47.5	47.5	63.4	63.4	84.5	84.5	27	27
11.4		15.2		20.3		27.1		36.1		48.1		64.2		85.6		30	—
11.5	11.5	15.4	15.4	20.5	20.5	27.4	27.4	36.5	36.5	48.7	48.7	64.9	64.9	86.6	86.6	33	33
11.7		15.6		20.8		27.7		37.0		49.3		65.7		87.6		36	—
11.8	11.8	15.8	15.8	21.0	21.0	28.0	28.0	37.4	37.4	49.9	49.9	66.5	66.5	88.7	88.7	39	39
12.0		16.0		21.3		28.4		37.9		50.5		67.3		89.8		43	—
12.1	12.1	16.2	16.2	21.5	21.5	28.7	28.7	38.3	38.3	51.1	51.1	68.1	68.1	90.9	90.9	47	47
12.3		16.4		21.8		29.1		38.8		51.7		69.0		92.0		51	—
12.4	12.4	16.5	16.5	22.1	22.1	29.4	29.4	39.2	39.2	52.3	52.3	69.8	69.8	93.1	93.1	56	56
12.6		16.7		22.3		29.8		39.7		53.0		70.6		94.2		62	—
12.7	12.7	16.9	16.9	22.6	22.6	30.1	30.1	40.2	40.2	53.6	53.6	71.5	71.5	95.3	95.3	68	68
12.9		17.2		22.9		30.5		40.7		54.2		72.3		96.5		75	—
13.0	13.0	17.4	17.4	23.2	23.2	30.9	30.9	41.2	41.2	54.9	54.9	73.2	73.2	97.6	97.6	82	82
13.2		17.6		23.4		31.2		41.7		55.6		74.1		98.8		91	—

Standard resistance values are obtained from the decade table by multiplying by powers of 10. As an example, 13.3 can represent ohms, 133 ohms, 1.33k, 13.3k, 133k, 1.33 Megohm.



Military Product Identification

MILITARY PART ORDERING EXAMPLES

To help in ordering, the following are representative samples of military part numbers cross-referenced to Dale® part numbers. For complete information, consult Military Specification Qualified Products List.

RESISTORS: Fixed and Variable

MIL-R-26E (Basic [RW]) (Established Reliability MIL-R-39007 [RWR]) RW80 $\frac{U}{1}$ $\frac{49R9}{2}$ $\frac{F}{3}$ $\frac{4}{4}$ = Dale Type G-3 $\frac{49.9}{3}$ ohm $\frac{1}{4}$ % RW69 $\frac{V}{1}$ $\frac{101}{2}$ $\frac{3}{3}$ = Dale Type CW-2C-1 $\frac{100}{3}$ ohm, 5%	1. Style 2. Characteristic 3. Resistance Value 4. Tolerance	1. Style 2. Characteristic 3. Value (Tolerance below 1 ohm 10%, 1 ohm and up 5%)
MIL-R-10509F (Basic [RN]) (Established Reliability MIL-R-55182 [RNR]) RN60 $\frac{D}{1}$ $\frac{1003}{2}$ $\frac{F}{3}$ $\frac{4}{4}$ = Dale Type CMF-60 $\frac{T-1}{2}$ $\frac{100k}{3}$ $\frac{1}{4}$ %	1. Style 2. Characteristic - Temperature Coefficient 3. Resistance Value 4. Tolerance	
MIL-R-18546D (Basic [RE]) (Established Reliability MIL-R-39009 [RER]) RE65 $\frac{G}{1}$ $\frac{1001}{2}$ $\frac{3}{3}$ = Dale Type RH-10 $\frac{1k}{3}$	NOTE: 1% tolerance per Military Specification.	1. Style 2. Characteristic - Maximum continuous operating temperatures 3. Resistance Value
MIL-R-22684C (Basic [RL]) (Established Reliability MIL-R-39017 [RLR]) RL07 $\frac{S}{1}$ $\frac{103}{2}$ $\frac{J}{3}$ $\frac{4}{4}$ = Dale Type CMF-07 $\frac{10k}{3}$ $\frac{5\%}{4}$	NOTE: Parts will be color banded.	1. Style 2. Terminal 3. Resistance Value 4. Tolerance
MIL-R-22097F (Basic [RJ]) (Established Reliability MIL-R-39035 [RJR]) RJ24 $\frac{F}{1}$ $\frac{P}{2}$ $\frac{103}{3}$ $\frac{4}{4}$ = Techno Type 412 $\frac{1k}{1,3}$ $\frac{10\%}{4}$	NOTE: 10% tolerance per Military Specification.	1. Style 2. Characteristic 3. Terminal 4. Resistance
MIL-R-27208C (Basic [RT]) (Established Reliability MIL-R-39015 [RTR]) RT24 $\frac{C}{1}$ $\frac{2}{2}$ $\frac{P}{3}$ $\frac{102}{4}$ $\frac{5}{5}$ = Techno Type 126S $\frac{1k}{1,4}$ $\frac{5\%}{5}$	NOTE: 5% tolerance per Military Specification.	1. Style 2. Resistance - Temperature Characteristic 3. Temperature Characteristic 4. Terminal 5. Resistance
MIL-R-39007G (Established Reliability [RWR]) (Basic - MIL-R-26 [RW]) RWR74 $\frac{S}{1}$ $\frac{10R1}{2}$ $\frac{F}{3}$ $\frac{R}{4}$ $\frac{5}{5}$ = Dale Type ESS-5 $\frac{10.1}{3}$ ohm $\frac{1}{4}$ % $\frac{R}{5}$		1. Style 2. Terminal 3. Resistance Value 4. Tolerance 5. Failure Rate Level
MIL-R-39009C (Established Reliability [RER]) (Basic - MIL-R-18546 [RE]) RER65 $\frac{F}{1}$ $\frac{1001}{2}$ $\frac{R}{3}$ $\frac{4}{4}$ = Dale Type ERH-10 $\frac{1\%}{1}$ $\frac{1k}{2}$ $\frac{R}{3}$ $\frac{4}{4}$		1. Style 2. Tolerance 3. Resistance Value 4. Failure Rate Level
MIL-R-39015C (Established Reliability [RTR]) (Basic - MIL-R-27208 [RT]) RTR24 $\frac{D}{1}$ $\frac{P}{2}$ $\frac{102}{3}$ $\frac{R}{4}$ $\frac{5}{5}$ = Techno Type M39015/3 $\frac{007}{1,2}$ $\frac{P}{4}$ $\frac{R}{3}$ $\frac{5}{5}$	NOTE: 5% tolerance per Military Specification.	1. Style 2. Characteristic 3. Terminal 4. Resistance 5. Failure Rate Level
MIL-R-39017E (Established Reliability [RLR]) (Basic - MIL-R-22684 [RL]) RLR07 $\frac{C}{1}$ $\frac{1002}{2}$ $\frac{G}{3}$ $\frac{R}{4}$ $\frac{5}{5}$ = Dale Type ERL-07 $\frac{10k}{1}$ $\frac{2\%}{3}$ $\frac{R}{4}$ $\frac{5}{5}$		1. Style 2. Terminal Type 3. Resistance Value 4. Tolerance 5. Failure Rate Level
MIL-R-39035B (Established Reliability [RJR]) (Basic - MIL-R-22097 [RJ]) RJR24 $\frac{F}{1}$ $\frac{P}{2}$ $\frac{102}{3}$ $\frac{R}{4}$ $\frac{5}{5}$ = Techno Type RJR24 $\frac{F}{1}$ $\frac{P}{2}$ $\frac{1k}{3}$ $\frac{10\%}{4}$	NOTE: 10% tolerance per Military Specification.	1. Style 2. Characteristic 3. Terminal 4. Resistance 5. Failure Rate Level
MIL-R-49465A (Basic [RLV]) (Established Reliability - None) M49465 $\frac{02}{1}$ $\frac{L}{2}$ $\frac{R0100}{3}$ $\frac{J}{4}$ $\frac{5}{5}$ = Dale Type CPSL-3-6 $\frac{0.01}{4}$ ohm $\frac{5\%}{5}$	NOTE: L Characteristic.	1. Military Specification 2. Specification Sheet Number 3. Characteristic 4. Resistance Value 5. Tolerance
MIL-R-55182F (Established Reliability [RNR]) (Basic MIL-R-10509 [RN]) RNC55 $\frac{H}{1}$ $\frac{49R9}{2}$ $\frac{F}{3}$ $\frac{S}{4}$ $\frac{5}{5}$ = Dale Type ERC-55 $\frac{T-2}{1}$ $\frac{49.9}{2}$ ohm $\frac{1}{3}$ % $\frac{S}{4}$ $\frac{5}{5}$		1. Style 2. Characteristic/Temperature Coefficient 3. Resistance Value 4. Tolerance 5. Failure Rate Level
MIL-R-55342E (Established Reliability [RM]) (Basic - None) M55342 $\frac{M}{1}$ $\frac{02}{2}$ $\frac{S}{3}$ $\frac{100E}{4}$ $\frac{R}{5}$ $\frac{6}{6}$ = Dale Type RCM550 $\frac{100k}{3,4}$ $\frac{1\%}{5}$ $\frac{R}{6}$	NOTES: M Characteristic. One surface, pretinned, solderable terminations. D55342 is used for 07 detail specification sheet. Separate code for resistance value and tolerance is used in this Military Specification.	1. Military Specification 2. Characteristic 3. Specification Sheet Number 4. Termination Material 5. Resistance Value and Tolerance 6. Failure Rate Level

Military Product Identification

MILITARY PART ORDERING EXAMPLES			
RACK AND PANEL CONNECTORS			
MIL-C-28748A (Basic) (Established Reliability - None)		1. Military Specification 2. Specification Sheet Number 3. Insert Designator (B-7 Contacts) 4. Shield (0 = None)	
M28748 1	7 2	B 3	0 0 F 1A 4 5 6 7 = Dale Type
MMP22G5		7 3	SL2L 6
5. Shell Polarization (0 = None) 6. Jackscrews or Guidepins 7. Contacts (1A = 100 percent size 22)			
RESISTOR NETWORKS			
MIL-R-83401F (Basic [RZ]) (Established Reliability MIL-R-874 [RZR])		1. Military Specification 2. Specification Sheet Number 3. Characteristic 4. Resistance Value	
M8340101 1,2	M 3	1003 4	G A = Dale Type
MDM		100k 4	2% 5
NOTE: M Characteristic.		A 6	6. Schematic
Resistance Value Examples			
Three Digit Figure		Four Digit Figure	
100 = 10 ohm, 101 = 100 ohm 102 = 1k ohm, 203 = 20k ohm		49R9 = 49.9 ohm, 1000 = 100 ohm 1001 = 1k ohm, 1004 = 1 Megohm	
Five Digit Figure			
10R60 = 10.6 ohm, 10000 = 1k ohm 12701 = 12.7k ohm, 10202 = 102k ohm			
Tolerance Examples			
A = ± 0.05%		B = ± 0.10%	
D = ± 0.50%		F = ± 1.0%	
G = ± 2.0%		J = ± 5.0%	
TRANSFORMERS AND INDUCTORS			
MIL-T-27E (Basic [TF]) (Established Reliability - None)		1. Military Specification 2. Specification Sheet Number 3. Specification Sheet Dash Number Indicating Value and Electrical Ratings	
M27 1	215 2	05 3	= Dale Type
TE-3Q0TR		1.0 mH	2%
MIL-C-15305E (Basic [LT]) (Established Reliability MIL-C-39010)		NOTES: Parts will be color banded. Value per Military Standard dash number.	
LT 1	4 2	K 3	= Dale Type
IM-2 (.10 µH to 1.00 µH)		10%	
1. Style 2. Grade and Class 3. Family K = Coil, Radio Frequency, Fixed			

MILITARY COLOR CODES - FILM RESISTORS			
BAND A & B		BAND C	
COLOR	1st and 2nd SIGNIFICANT FIGURE	COLOR	VALUE MULTIPLIER
Black	0	Black	1
Brown	1	Brown	10
Red	2	Red	100
Orange	3	Orange	1,000
Yellow	4	Yellow	10,000
Green	5	Green	100,000
Blue	6	Blue	1,000,000
Purple (Violet)	7	Silver	0.01
Gray	8	Gold	0.1
White	9		
BAND D		BAND E	
COLOR	RESISTANCE TOLERANCE (Percent)	COLOR	TERMINAL
Gold	± 5%	White	Solderable
Red	± 2%		

8 1/2 x 11 & Pocket-Size Color Code ID Charts

For a 8 1/2 x 11 chart, or a supply of pocket-size charts showing actual colors used in marking film resistors and RF chokes, write to Dale Electronics, Inc., Advertising Department, 2064 12th Avenue, P.O. Box 609, Columbus, NE 68602-0609 or call (402) 563-6417.

Indicate size and type of chart desired: Film Resistor chart or RF Choke.

MILITARY COLOR CODES - RF COILS			
	BAND A & B	BAND C	BAND C
COLOR	SIGNIFICANT FIGURES or DECIMAL POINT	MULTIPLIER* or SIGNIFICANT FIGURE	INDUCTANCE TOLERANCE
Black	0	1	—
Brown	1	10	± 1%
Red	2	100	± 2%
Orange	3	1,000	± 3%
Yellow	4	10,000	± 4%
Green	5	—	—
Blue	6	—	—
Violet	7	—	—
Gray	8	—	—
White	9	—	—
None**	—	—	± 20%
Silver	—	—	± 10%
Gold	Decimal Point	—	± 5%
<p>Band "A" is twice the width of the other bands and is silver in color to identify part as an inductor. ***</p> <p>For Inductance Values Less Than 10 either Band "B" or Band "C" will be gold and will represent the decimal point. The other two bands ("B" and "D" or "C" and "D") will represent significant figures.</p> <p>For Inductance Values of 10 or More Band "B" and Band "C" represent significant figures and Band "D" is the Multiplier.</p> <p>For small units, dots may be used in place of bands.</p>			

* The multiplier is the factor by which two significant figures are multiplied to yield the nominal inductance value.

** Indicates body color.

*** Coated inductors are marked with four color bands, the first being a double wide significant figure or decimal point in lieu of the double wide silver inductor identifier.