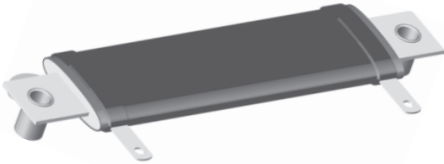




Wirewound Resistors, Industrial Power, Flat (HL)



FEATURES

- High temperature silicon coating
- Mounting accommodations ideally suited to high density packaging
- Self-stacking hardware for horizontal or vertical placement
- Withstands high vibrations without loosening
- Mounting hardware functions as a heat sink allowing greater heat dissipation and less derating of stacked units
- Available in non-inductive styles (type NHL) with Aryton-Perry winding
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



Note

* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non-RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details.

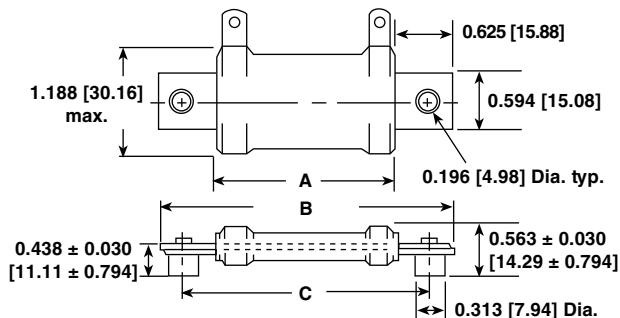
STANDARD ELECTRICAL SPECIFICATIONS					
GLOBAL MODEL	HISTORICAL MODEL	POWER RATING $P_{25^{\circ}\text{C}}$ W	RESISTANCE RANGE Ω $\pm 5\%$	RESISTANCE RANGE Ω $\pm 10\%$	WEIGHT (typical) g
HL024 NHL024	HL-24 NHL-24	30	1.0 to 11K 1.0 to 1.2K	0.10 to 11K 1.0 to 1.2K	20.14
HL035 NHL035	HL-35 NHL-35	40	1.0 to 26K 1.0 to 3K	0.10 to 26K 1.0 to 3K	30.07
HL055 NHL055	HL-55 NHL-55	55	1.0 to 54K 1.0 to 6.8K	0.10 to 54K 1.0 to 6.8K	51.25
HL070 NHL070	HL-70 NHL-70	70	1.0 to 77K 1.0 to 9.4K	0.10 to 77K 1.0 to 9.4K	60.48
HL095 NHL095	HL-95 NHL-95	95	1.0 to 99.9K 1.0 to 12.4K	0.10 to 99.9K 1.0 to 12.4K	76.51

TECHNICAL SPECIFICATIONS		
PARAMETER	UNIT	HL, NHL FLAT RESISTOR CHARACTERISTICS
Temperature Coefficient	ppm/ $^{\circ}\text{C}$	± 90 for 0.1 Ω to 0.99 Ω ; ± 50 for 1 Ω to 9.9 Ω ; ± 30 for 10 Ω and above
Dielectric Withstanding Voltage	V_{AC}	1000, from terminal to mounting hardware
Short Time Overload	-	10 x rated power for 5 s
Maximum Working Voltage	V	$(P \times R)^{1/2}$
Insulation Resistance	Ω	1000 M Ω minimum dry, 100 M Ω minimum after moisture test
Operating Temperature Range	$^{\circ}\text{C}$	-55 to +350

GLOBAL PART NUMBER INFORMATION																	
Global Part Numbering example: NHL02409Z10R00JJ																	
N	H	L	0	2	4	0	9	Z	1	0	R	0	0	J	J		
GLOBAL MODEL	TERMINAL DESIGNATION	TERMINAL FINISH	RESISTANCE VALUE	TOLERANCE	PACKAGING CODE	SPECIAL											
NHL024 (see "Standard Electrical Specifications" table above for additional P/N's)	09 16	E = lead (Pb)-free Z = tin / lead N = nickel	R = decimal K = thousand 10R00 = 10.0 Ω 1K000 = 1 k Ω	J = $\pm 5.0\%$ K = $\pm 10.0\%$	E = lead (Pb)-free skin pack J ⁽¹⁾ = skin pack (J01)	(dash number) (up to 2 digits) from 1 to 99 as applicable	Note (1) Tin / lead for type "Z", lead (Pb)-free for type "N"										
Historical Part Number example: NHL-24-09Z 10 Ω 5% J01																	
NHL-24	09Z	10 Ω	5%	J01													
HISTORICAL MODEL	TERMINAL/FINISH	RESISTANCE VALUE	TOLERANCE	PACKAGING													



DIMENSIONS in inches [millimeters]
TYPE HL FLAT STYLE



MODEL	DIMENSIONS in inches [millimeters]				TERMINAL DESIGNATION	
	A	B	C	DISTANCE BETWEEN TERMINALS (ref.)	STANDARD	OPTIONAL
	± 0.063 [1.59]	± 0.063 [1.59]	± 0.031 [0.79]			
HL024 NHL024	1.250 [31.75]	2.500 [63.50]	2.000 [50.80]	0.718 [18.24]	09Z	16N
HL035 NHL035	2.000 [50.80]	3.250 [82.55]	2.750 [69.85]	1.468 [37.29]	09Z	16N
HL055 NHL055	3.500 [88.90]	4.750 [120.65]	4.250 [107.95]	2.968 [75.39]	09Z	16N
HL070 NHL070	4.750 [120.65]	6.000 [152.40]	5.500 [139.70]	4.218 [107.14]	09Z	16N
HL095 NHL095	6.000 [152.40]	7.250 [184.15]	6.750 [171.45]	5.468 [138.89]	09Z	16N

POWER RATING

Vishay HL flat resistor wattage ratings are based on mounting horizontally to 10" x 10" x 0.04" [254.0 mm x 254.0 mm x 1.02 mm] steel plate in 25 °C ambient with no air flow.

EXCLUSIVE BRACKET DESIGN

Mounting strap fits snugly through resistor core and is bound against unit by two eccentric spacers. The bracket eliminates expensive cements and improves heat transfer and power handling capabilities.

MATERIAL SPECIFICATIONS

Element: copper-nickel alloy of nickel-chrome alloy, depending on resistance value

Core: ceramic, steatite

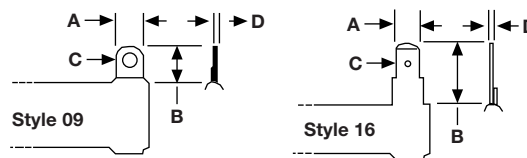
Coating: special high temperature silicone

Standard Terminals: model "E" terminals are tinned steel

Terminal Bands: steel

Part Marking: DALE, model, wattage, value, tolerance, date code

TERMINAL DIMENSIONS



DIMENSION	DIMENSIONS in inches [millimeters]	
	STYLE 09	STYLE 16
A	0.188 [4.76]	0.188 [4.76]
B	0.500 [12.70]	0.563 [14.29]
C	0.104 [2.64]	0.050 [1.27]
D	0.020 [0.51]	0.020 [0.51]

TERMINAL FINISH

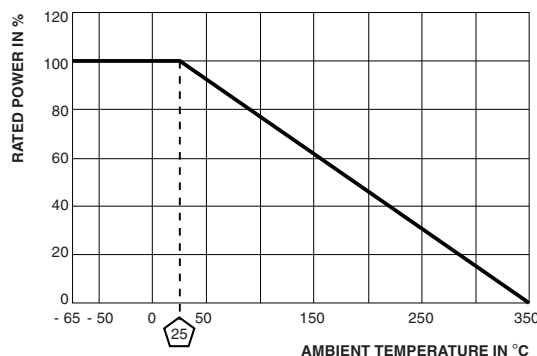
"E" Finish - 100 % Sn coated steel. "Z" Finish - 60/40 Sn/Pb coated steel. "N" Finish - Nickel coated steel. Finish for terminal style 16 is limited to nickel plated steel (N).

NHL 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 front of the HL type designation (NHL024, for example). For NHL models maximum resistance values are lower, see STANDARD ELECTRICAL SPECIFICATIONS table.

Derating is required for ambient temperatures above 25 °C per the following graph.

DERATING



PERFORMANCE		
TEST	CONDITIONS OF TEST	TEST LIMITS
Thermal Shock	Rated power applied until thermally stable, then a minimum of 15 min at -55 °C	± (2.0 % + 0.05 Ω) ΔR
Short Time Overload	10x rated power for 5 s	± (2.0 % + 0.05 Ω) ΔR
Dielectric Withstanding Voltage	1000 V _{RMS} , 1 min	± (0.1 % + 0.05 Ω) ΔR
Low Temperature Storage	-55 °C for 24 h	± (2.0 % + 0.05 Ω) ΔR
High Temperature Exposure	250 h at + 350 °C	± (2.0 % + 0.05 Ω) ΔR
Moisture Resistance	MIL-STD-202 Method 106, 7b not applicable	± (2.0 % + 0.05 Ω) ΔR
Shock, Specified Pulse	MIL-STD-202 Method 213, 100 g's for 6 ms, 10 shocks	± (0.2 % + 0.05 Ω) ΔR
Vibration, High Frequency	Frequency varied 10 Hz to 2000 Hz, 20 g peak, 2 directions 6 h each	± (0.2 % + 0.05 Ω) ΔR
Load Life	1000 h at rated power, + 25 °C, 1.5 h "ON", 0.5 h "OFF"	± (3.0 % + 0.05 Ω) ΔR



Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.