Wirewound Resistors
Industrial Power, Tubular (HL), Non-Inductive Tubular (NHL)

FEATURES

- High temperature silicon coating
- Complete welded construction
- Available in non-inductive styles (model NHL) with Aryton-Perry winding for lowest reactive components
- Tight tolerance of 5% for values above 1Ω
- Excellent stability in operation

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	HISTORICAL MODEL	POWER RATING $P_{25°C}$ W	RESISTANCE RANGE Ω		WEIGHT (Typical) g
			± 5%	± 10%	
HL011 NHL011	HL-11 NHL-11	11	1.0 - 70k 1.0 - 4.7k	0.10 - 70k 1.0 - 4.7k	10.50
HL012 NHL012	HL-12 NHL-12	12	1.0 - 58k 1.0 - 3.9k	0.10 - 58k 1.0 - 3.9k	6.69
HL015 NHL015	HL-15 NHL-15	15	1.0 - 60k 1.0 - 4.3k	0.10 - 60k 1.0 - 4.3k	8.64
HL020 NHL020	HL-20 NHL-20	20	1.0 - 95k 1.0 - 6.8k	0.10 - 95k 1.0 - 6.8k	12.57
HL025 NHL025	HL-25 NHL-25	25	1.0 - 115k 1.0 - 8.8k	0.10 - 115k 1.0 - 8.8k	20.72
HL026 NHL026	HL-26 NHL-26	26	1.0 - 170k 1.0 - 11.8k	0.10 - 170k 1.0 - 11.8k	15.34
HL050 NHL050	HL-50 NHL-50	50	1.0 - 112k 1.0 - 21.5k	0.10 - 112k 1.0 - 21.5k	42.08
HL051 NHL051	HL-51 NHL-51	51	1.0 - 124k 1.0 - 22.9k	0.10 - 124k 1.0 - 22.9k	51.96
HL060 NHL060	HL-60 NHL-60	60	1.0 - 145k 1.0 - 27.2k	0.10 - 145k 1.0 - 27.2k	65.64
HL065 NHL065	HL-65 NHL-65	65	1.0 - 170k 1.0 - 31.4k	0.10 - 170k 1.0 - 31.4k	64.82
HL080 NHL080	HL-80 NHL-80	80	1.0 - 190k 1.0 - 38.3k	0.10 - 190k 1.0 - 38.3k	121.58
HL100 NHL100	HL-100 NHL-100	100	1.0 - 260k 1.0 - 48.5k	0.10 - 260k 1.0 - 48.5k	91.37
HL120 NHL120	HL-120 NHL-120	120	1.0 - 330k 1.0 - 64.1k	0.10 - 330k 1.0 - 64.1k	183.82
HL130 NHL130	HL-130 NHL-130	130	1.0 - 380k 1.0 - 70.2k	0.10 - 380k 1.0 - 70.2k	192.36
HL160 NHL160	HL-160 NHL-160	160	1.0 - 470k 1.0 - 105k	0.10 - 470k 1.0 - 105k	245.86
HL175 NHL175	HL-175 NHL-175	175	1.0 - 500k 1.0 - 112k	0.10 - 500k 1.0 - 112k	250.80
HL225 NHL225	HL-225 NHL-225	225	1.0 - 645k 1.0 - 121k	0.10 - 645k 1.0 - 121k	309.97

GLOBAL PART NUMBER INFORMATION

New Global Part Numbering: NHL10006Z10R00JJ (preferred part numbering format)

N	H	L	1	0	0	0	6	Z	1	0	R	0	0	J	J		

GLOBAL MODEL	TERMINAL DESIGNATION	TERMINAL FINISH	VALUE	TOLERANCE	PACKAGING	SPECIAL
NHL10	**06**	**E*** = Lead Free **Z** = Tin/lead **N** = Nickel	**R** = Decimal **K** = Thousand **10R00** = 10.0Ω **1K000** = 1KΩ	**J** = ± 5.0% **K** = ± 10%	**E*** = Lead Free Skin Pack **J** = Tin/lead skin pack (J01)	(Dash Number) (up to 2 digits) From **1-99** as applicable

*Lead Free will not be available until Q1 2005

Historical Part Number example: NHL-100-06Z 10Ω 5% J01 (will continue to be accepted)

NHL-100	06Z	10Ω	5%	J01
HISTORICAL MODEL	TERMINAL / FINISH	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING

For technical questions, contact ww2bresistors@vishay.com

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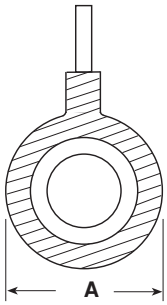
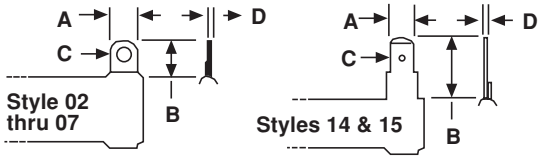
DIMENSIONS



(Includes Coating and Terminal Band)

GLOBAL MODEL	DIMENSIONS in inches [millimeters]								
	A (Max)	CORE DIMENSIONS			TERMINAL SETBACK ± 0.31 [± 0.79]	DISTANCE BETWEEN TERMINALS (REF)	TERMINAL DESIGNATION		MOUNTING HARDWARE OPTIONS
		LENGTH ± 0.062 [± 1.59]	O.D.	I.D. ± 0.031 [± 0.79]			STANDARD	OPTIONAL	
HL011 NHL011	0.469 [11.91]	1.750 [44.45]	0.375 [9.53]	0.188 [4.76]	0.094 [2.38]	1.187	02	---	101, 204, 301
HL012 NHL012	0.406 [10.32]	1.750 [44.45]	0.313 [7.94]	0.188 [4.76]	0.094 [2.38]	1.187	05	14	101, 204, 301
HL015 NHL015	0.563 [14.29]	1.500 [38.10]	0.438 [11.11]	0.313 [7.94]	0.094 [2.38]	0.937	02	14	101, 203, 301
HL020 NHL020	0.563 [14.29]	2.000 [50.8]	0.438 [11.11]	0.313 [7.94]	0.094 [2.38]	1.437	02	14	101, 203, 301
HL025 NHL025	0.688 [17.46]	2.000 [50.8]	0.563 [14.29]	0.313 [7.94]	0.094 [2.38]	1.312	06	15	101, 203, 301
HL026 NHL026	0.563 [14.29]	3.000 [76.2]	0.438 [11.11]	0.313 [7.94]	0.094 [2.38]	2.437	02	14	101, 203, 301
HL050 NHL050	0.688 [17.46]	4.000 [101.6]	0.563 [14.29]	0.313 [7.94]	0.094 [2.38]	3.312	06	15	101, 203, 301
HL051 NHL051	0.906 [23.02]	3.500 [88.9]	0.750 [19.05]	0.500 [12.70]	0.125 [3.18]	2.75	06	15	102, 206, 303
HL060 NHL060	0.906 [23.02]	4.000 [101.6]	0.750 [19.05]	0.500 [12.70]	0.125 [3.18]	3.250	06	15	102, 206, 303
HL065 NHL065	0.906 [23.02]	4.500 [114.3]	0.750 [19.05]	0.500 [12.70]	0.125 [3.18]	3.750	06	15	102, 206, 303
HL080 NHL080	1.313 [33.34]	4.000 [101.6]	1.125 [28.58]	0.750 [19.05]	0.219 [5.56]	2.812	07	15	103, 205, 303
HL100 NHL100	0.906 [23.02]	6.500 [165.1]	0.750 [19.05]	0.500 [12.70]	0.125 [3.18]	5.750	06	15	102. 206, 303
HL120 NHL120	1.313 [33.34]	6.000 [152.4]	1.125 [28.58]	0.750 [19.05]	0.219 [5.56]	4.812	07	15	103, 205, 303
HL130 NHL130	1.313 [33.34]	6.500 [165.1]	1.125 [28.58]	0.750 [19.05]	0.219 [5.56]	5.312	07	15	103, 205, 303
HL160 NHL160	1.313 [33.34]	8.000 [203.2]	1.125 [28.58]	0.750 [19.05]	0.219 [5.56]	6.812	07	15	103, 205, 303
HL175 NHL175	1.313 [33.34]	8.500 [215.9]	1.125 [28.58]	0.750 [19.05]	0.219 [5.56]	7.312	07	15	103, 205, 303
HL225 NHL225	1.313 [33.34]	10.500 [266.7]	1.125 [28.58]	0.750 [19.05]	0.219 [5.56]	9.312	07	15	103, 205, 303

TERMINAL DIMENSIONS



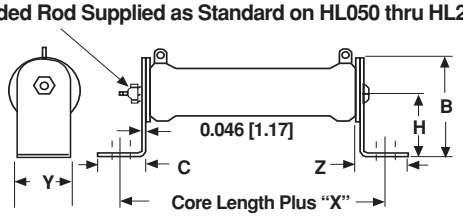
DIMENSION	TERMINAL TYPE					
	02	05	06	07	14	15
A	0.188 [4.76]	0.188 [4.76]	0.250 [6.35]	0.375 [9.53]	0.188 [4.76]	0.250 [6.35]
B	0.406 [10.32]	0.438 [11.11]	0.563 [14.29]	0.625 [15.88]	0.563 [14.29]	0.594 [15.08
C	0.093 [2.36]	0.104 [2.64]	0.166 [4.22]	0.173 [4.39]	0.050 [1.27]	0.065 [1.65]
D	0.020 [0.51]	0.020 [0.51]	0.020 [0.51]	0.020 [0.51]	0.020 [0.51]	0.031 [0.79]

TERMINAL FINISH - "E" Finish - 100% Sn coated steel. "Z" Finish - 60/40 SnPb coated steel. "N" Finish - Nickel coated steel. Finish for terminal style 14 and 15 limited to nickel plated steel (N).

MOUNTING HARDWARE DIMENSIONS in inches [millimeters]

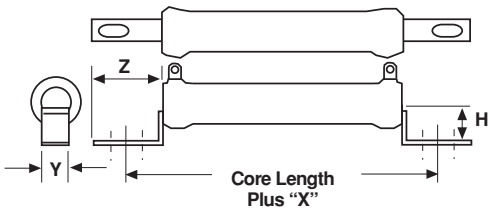
Horizontal Thru-Bolt

(Threaded Rod Supplied as Standard on HL050 thru HL225 sizes.)



BRACKET TYPE	X	Y	Z	H	MOUNTING SLOT	C	B
101	1.063 [26.99]	0.500 [12.70]	0.859 [21.83]	1.000 [25.40]	0.219 x 0.438 [5.56] x [11.11]	0.750 [19.05]	1.375 [34.93]
102	1.063 [26.99]	0.750 [19.05]	0.859 [21.83]	1.250 [31.75]	0.219 x 0.438 [5.56] x [11.11]	0.750 [19.05]	1.750 [44.45]
103	1.063 [26.99]	1.250 [31.75]	1.000 [25.40]	1.500 [38.10]	0.281 x 0.563 [7.14] x [14.29]	0.875 [22.23]	2.125 [53.98]

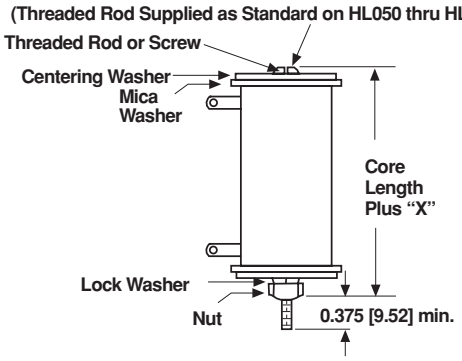
Push-In



BRACKET TYPE	X	H	Y	Z	HOLE (DIA)
203	0.625 [15.88]	0.672 [17.07]	0.250 [6.35]	0.469 [11.91]	0.161 [4.09]
204	0.375 [9.53]	0.281 [7.14]	0.250 [6.35]	0.344 [8.73]	0.144 [3.66]
205	0.813 [20.64]	1.391 [35.32]	0.500 [12.70]	0.688 [17.46]	0.196 x 0.260 [4.98 x 6.60]
206	0.719 [18.26]	0.969 [24.61]	0.375 [9.53]	0.625 [15.88]	0.196 x 0.260 [4.98 x 6.60]

Vertical Thru-Bolt

(Threaded Rod Supplied as Standard on HL050 thru HL225 sizes.)



BRACKET TYPE	X (Approximate)	THREAD
301	0.438 [11.11]	8-32
303	0.500 [12.70]	10-32

TECHNICAL SPECIFICATIONS

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

MATERIAL SPECIFICATIONS

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

Core: Ceramic, steatite

Coating: Special high temperature silicone

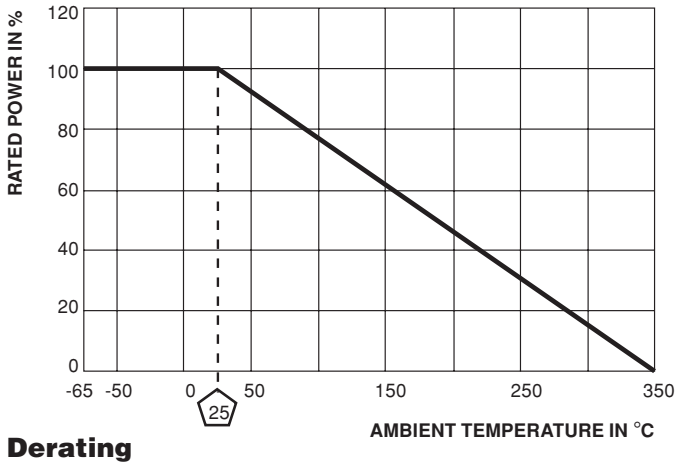
Standard Terminals: Model "Z" terminals are tinned steel

Terminal Bands: Steel

Part Marking: DALE, Model, Wattage, Value, Tolerance, Date Code

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 (NHL-225 for example). For NHL models maximum resistance values are lower, see STANDARD ELECTRICAL SPECIFICATIONS table.



Derating

PERFORMANCE		
TEST	**CONDITIONS OF TEST**	**TEST LIMITS**
Thermal Shock	Rated power applied until thermally stable, then a minimum of 15 minutes at - 55°C	± (2.0% + 0.05Ω)ΔR
Short Time Overload	10 x rated power for 5 seconds	± (2.0% + 0.05Ω)ΔR
Dielectric Withstanding Voltage	1,000V rms, 1 minute	± (0.1% + 0.05Ω)ΔR
Low Temperature Storage	- 55°C for 24 hours	± (2.0% + 0.05Ω)ΔR
High Temperature Exposure	250 hours at + 350°C	± (2.0% + 0.05Ω)ΔR
Moisture Resistance	MIL-STD-202 Method 106, 7b not applicable	± (2.0% + 0.05Ω)ΔR
Shock, Specified Pulse	MIL-STD-202 Method 213, 100g's for 6 milliseconds, 10 shocks	± (0.2% + 0.05Ω)ΔR
Vibration, High Frequency	Frequency varied 10 to 2,000Hz, 20g peak, 2 directions 6 hours each	± (0.2% + 0.05Ω)ΔR
Load Life	1,000 hours at rated power, + 25°C, 1.5 hours "ON", 0.5 hours "OFF"	± (3.0% + 0.05Ω)ΔR