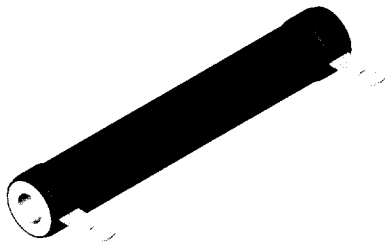




Wirewound Resistors

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

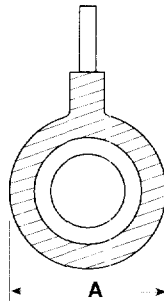
STANDARD ELECTRICAL SPECIFICATIONS

MODEL	POWER RATING $P_{25^{\circ}\text{C}}$ W	RESISTANCE RANGE		WEIGHT (Typical) g
		Ω		
		$\pm 5\%$	$\pm 10\%$	
HL-11 NHL-11	11	1.0 - 70k 1.0 - 4.7k	0.10 - 70k 1.0 - 4.7k	10.50
HL-12 NHL-12	12	1.0 - 58k 1.0 - 3.9k	0.10 - 58k 1.0 - 3.9k	6.69
HL-15 NHL-15	15	1.0 - 60k 1.0 - 4.3k	0.10 - 60k 1.0 - 4.3k	8.64
HL-20 NHL-20	20	1.0 - 95k 1.0 - 6.8k	0.10 - 95k 1.0 - 6.8k	12.57
HL-25 NHL-25	25	1.0 - 115k 1.0 - 8.8k	0.10 - 115k 1.0 - 8.8k	20.72
HL-26 NHL-26	26	1.0 - 170k 1.0 - 11.8k	0.10 - 170k 1.0 - 11.8k	15.34
HL-50 NHL-50	50	1.0 - 112k 1.0 - 21.5k	0.10 - 112k 1.0 - 21.5k	42.08
HL-51 NHL-51	51	1.0 - 124k 1.0 - 22.9k	0.10 - 124k 1.0 - 22.9k	51.96
HL-60 NHL-60	60	1.0 - 145k 1.0 - 27.2k	0.10 - 145k 1.0 - 27.2k	65.64
HL-65 NHL-65	65	1.0 - 170k 1.0 - 31.4k	0.10 - 170k 1.0 - 31.4k	64.82
HL-80 NHL-80	80	1.0 - 190k 1.0 - 38.3k	0.10 - 190k 1.0 - 38.3k	121.58
HL-100 NHL-100	100	1.0 - 260k 1.0 - 48.5k	0.10 - 260k 1.0 - 48.5k	91.37
HL-120 NHL-120	120	1.0 - 330k 1.0 - 64.1k	0.10 - 330k 1.0 - 64.1k	183.82
HL-130 NHL-130	130	1.0 - 380k 1.0 - 70.2k	0.10 - 380k 1.0 - 70.2k	192.36
HL-160 NHL-160	160	1.0 - 470k 1.0 - 105k	0.10 - 470k 1.0 - 105k	245.86
HL-175 NHL-175	175	1.0 - 500k 1.0 - 112k	0.10 - 500k 1.0 - 112k	250.80
HL-225 NHL-225	225	1.0 - 645k 1.0 - 121k	0.10 - 645k 1.0 - 121k	309.97

ORDERING INFORMATION

HL-100 MODEL	06 TERMINAL	Z TERMINAL FINISH	10Ω RESISTANCE Ω	5% TOLERANCE ± %
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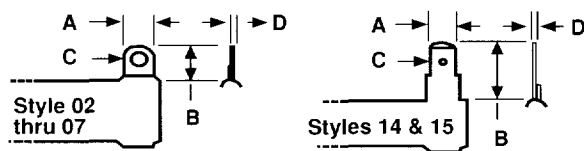
DIMENSIONS



(Includes Coating and Terminal Band)

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	
HL-11	0.469	1.750	0.375	0.188	0.094	1.187	02	---	101, 204, 301
NHL-11	[11.91]	[44.45]	[9.53]	[4.76]	[2.38]				
HL-12	0.406	1.750	0.313	0.188	0.094	1.187	05	14	101, 204, 301
NHL-12	[10.32]	[44.45]	[7.94]	[4.76]	[2.38]				
HL-15	0.563	1.500	0.438	0.313	0.094	0.937	02	14	101, 203, 301
NHL-15	[14.29]	[38.10]	[11.11]	[7.94]	[2.38]				
HL-20	0.563	2.000	0.438	0.313	0.094	1.437	02	14	101, 203, 301
NHL-20	[14.29]	[50.8]	[11.11]	[7.94]	[2.38]				
HL-25	0.688	2.000	0.563	0.313	0.094	1.312	06	15	101, 203, 301
NHL-25	[17.46]	[50.8]	[14.29]	[7.94]	[2.38]				
HL-26	0.563	3.000	0.438	0.313	0.094	2.437	02	14	101, 203, 301
NHL-26	[14.29]	[76.2]	[11.11]	[7.94]	[2.38]				
HL-50	0.688	4.000	0.563	0.313	0.094	3.312	06	15	101, 203, 301
NHL-50	[17.46]	[101.6]	[14.29]	[7.94]	[2.38]				
HL-51	0.906	3.500	0.750	0.500	0.125	2.75	06	15	102, 206, 303
NHL-51	[23.02]	[88.9]	[19.05]	[12.70]	[3.18]				
HL-60	0.906	4.000	0.750	0.500	0.125	3.250	06	15	102, 206, 303
NHL-60	[23.02]	[101.6]	[19.05]	[12.70]	[3.18]				
HL-65	0.906	4.500	0.750	0.500	0.125	3.750	06	15	102, 206, 303
NHL-65	[23.02]	[114.3]	[19.05]	[12.70]	[3.18]				
HL-80	1.313	4.000	1.125	0.750	0.219	2.812	07	15	103, 205, 303
NHL-80	[33.34]	[101.6]	[28.58]	[19.05]	[5.56]				
HL-100	0.906	6.500	0.750	0.500	0.125	5.750	06	15	102, 206, 303
NHL-100	[23.02]	[165.1]	[19.05]	[12.70]	[3.18]				
HL-120	1.313	6.000	1.125	0.750	0.219	4.812	07	15	103, 205, 303
NHL-120	[33.34]	[152.4]	[28.58]	[19.05]	[5.56]				
HL-130	1.313	6.500	1.125	0.750	0.219	5.312	07	15	103, 205, 303
NHL-130	[33.34]	[165.1]	[28.58]	[19.05]	[5.56]				
HL-160	1.313	8.000	1.125	0.750	0.219	6.812	07	15	103, 205, 303
NHL-160	[33.34]	[203.2]	[28.58]	[19.05]	[5.56]				
HL-175	1.313	8.500	1.125	0.750	0.219	7.312	07	15	103, 205, 303
NHL-175	[33.34]	[215.9]	[28.58]	[19.05]	[5.56]				
HL-225	1.313	10.500	1.125	0.750	0.219	9.312	07	15	103, 205, 303
NHL-225	[33.34]	[266.7]	[28.58]	[19.05]	[5.56]				

TERMINAL DIMENSIONS



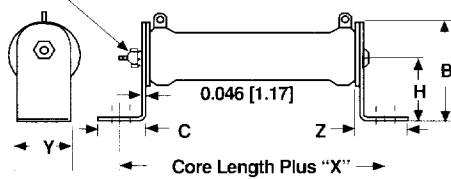
DIMENSION	TERMINAL TYPE					
	02	05	06	07	14	15
A	0.188 [4.76]	0.188 [4.76]	0.250 [6.35]	0.375 [9.53]	0.188 [4.76]	0.250 [6.35]
B	0.406 [10.32]	0.438 [11.11]	0.563 [14.29]	0.625 [15.88]	0.563 [14.29]	0.594 [15.08]
C	0.093 [2.36]	0.104 [2.64]	0.166 [4.22]	0.173 [4.39]	0.050 [1.27]	0.065 [1.65]
D	0.020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

TERMINAL FINISH - Finish for terminal style 14 & 15 is limited to nickel plated steel (N), all other terminals will be steel supplied with tinned solder finish (Z).

MOUNTING HARDWARE DIMENSIONS in inches [millimeters]

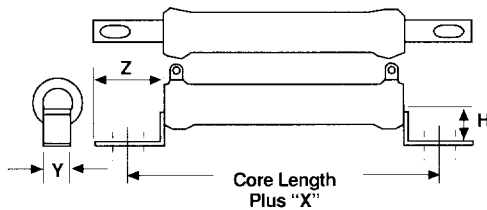
Horizontal Thru-Bolt

(Threaded Rod Supplied as Standard on HL-50 thru HL-225 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]

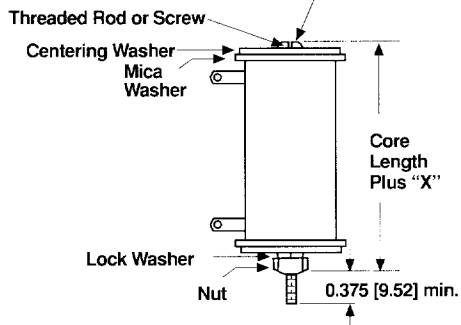
Push-In



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 HL-50 thru HL-225 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 x 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

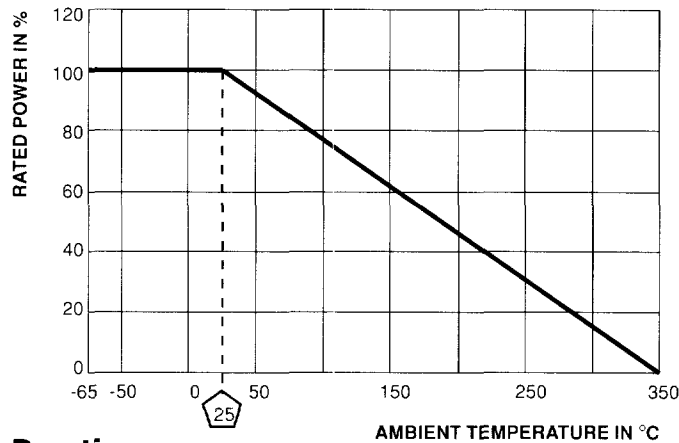
Standard Terminals: Model "Z" terminals are tinned steel

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	$\pm (2.0\% + 0.05\Omega)\Delta R$
Short Time Overload	10 x rated power for 5 seconds	$\pm (2.0\% + 0.05\Omega)\Delta R$
Dielectric Withstanding Voltage	1,000V rms, 1 minute	$\pm (0.1\% + 0.05\Omega)\Delta R$
Low Temperature Storage	- 55°C for 24 hours	$\pm (2.0\% + 0.05\Omega)\Delta R$
High Temperature Exposure	250 hours at + 350°C	$\pm (2.0\% + 0.05\Omega)\Delta R$
Moisture Resistance	MIL-STD-202 Method 106, 7b not applicable	$\pm (2.0\% + 0.05\Omega)\Delta R$
Shock, Specified Pulse	MIL-STD-202 Method 213, 100g's for 6 milliseconds, 10 shocks	$\pm (0.2\% + 0.05\Omega)\Delta R$
Vibration, High Frequency	Frequency varied 10 to 2,000Hz, 20g peak, 2 directions 6 hours each	$\pm (0.2\% + 0.05\Omega)\Delta R$
Load Life	1,000 hours at rated power, + 25°C, 1.5 hours "ON", 0.5 hours "OFF"	$\pm (3.0\% + 0.05\Omega)\Delta R$