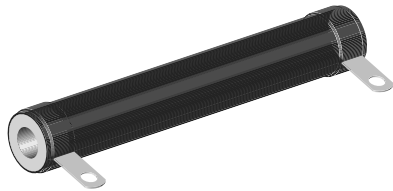




## Wirewound Resistors, Industrial Power, Tubular (HL), Non-Inductive Tubular (NHL)



### FEATURES

- High temperature silicon coating
- Complete welded construction
- Available in non-inductive styles (model NHL) with Ayrton-Perry winding
- Tight tolerance of 5 % for values above 1 W
- Excellent stability in operation (< 3 % change in resistance)
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



RoHS\* Available

HALOGEN FREE Available

GREEN (5-2008) Available

### Note

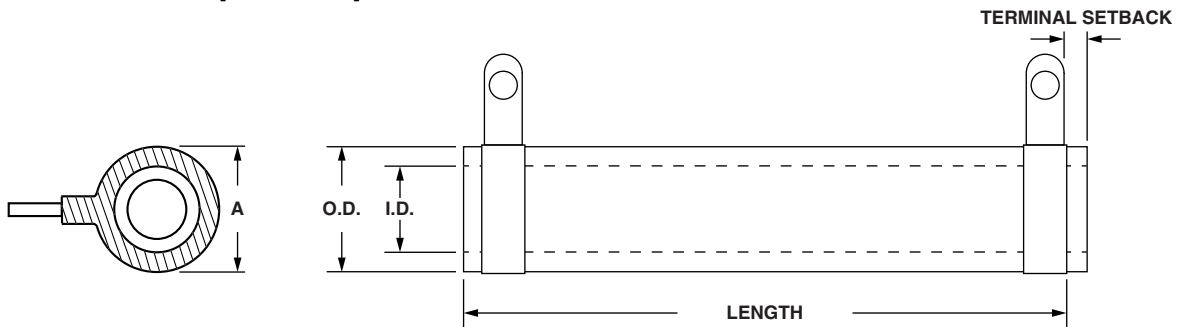
\* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non-RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details.

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

| GLOBAL PART NUMBER INFORMATION   |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |  |  |
|--|--|--|--|---|---|---|---|---|---|---|---|---|---|---|---|--|--|
| Global Part Numbering example: NHL10006Z10R00JJ  |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |  |  |
| N  | H  | L  | 1  | 0   | 0   | 0   | 6 | Z | 1 | 0 | R | 0 | 0 | J | J |  |  |
| GLOBAL MODEL<br><b>NHL100</b><br>(see "Standard Electrical Specifications" table above for additional P/N's) | TERMINAL DESIGNATION<br><b>02</b><br><b>05</b><br><b>06</b><br><b>07</b><br><b>14</b><br><b>15</b> | TERMINAL FINISH<br><b>E</b> = lead (Pb)-free<br><b>Z</b> = tin / lead<br><b>N</b> = nickel | RESISTANCE VALUE<br><b>R</b> = decimal<br><b>K</b> = thousand<br><b>10R00</b> = 10.0 $\Omega$<br><b>1K000</b> = 1 k $\Omega$ | TOLERANCE<br><b>J</b> = $\pm 5.0\%$<br><b>K</b> = $\pm 10.0\%$<br><b>Note</b><br>(1) Tin / lead for type "Z", lead (Pb)-free for type "N" | PACKAGING CODE<br><b>E</b> = lead (Pb)-free skin pack<br><b>J</b> (1) = skin pack (J01) | SPECIAL<br>(dash number) (up to 2 digits) from <b>1 to 99</b> as applicable |   |   |   |   |   |   |   |   |   |  |  |
| Historical Part Numbering example: NHL-100-06Z 10 $\Omega$ 5 % J01   |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |  |  |
| <b>NHL-100</b>   | <b>06Z</b>   | <b>10 <math>\Omega</math></b>  | <b>5 %</b>   | <b>J01</b>  |   |   |   |   |   |   |   |   |   |   |   |  |  |
| HISTORICAL MODEL   | TERMINAL/FINISH  | RESISTANCE VALUE   | TOLERANCE  | PACKAGING   |   |   |   |   |   |   |   |   |   |   |   |  |  |



**DIMENSIONS** in inches [millimeters]



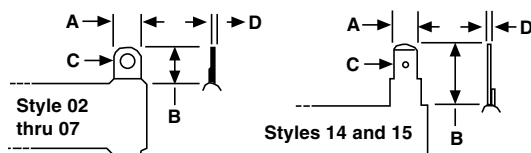
(Includes Coating and Terminal Band)

| GLOBAL MODEL | DIMENSIONS in inches [millimeters] |                         |         |                       |                                  |                                   |                      |          |                              |
|--------------|------------------------------------|-------------------------|---------|-----------------------|----------------------------------|-----------------------------------|----------------------|----------|------------------------------|
|              | A (MAX.)                           | CORE DIMENSIONS         |         |                       | TERMINAL SETBACK ± 0.31 [± 0.79] | DISTANCE BETWEEN TERMINALS (REF.) | TERMINAL DESIGNATION |          | BRACKET TYPES <sup>(1)</sup> |
|              |                                    | LENGTH ± 0.062 [± 1.59] | O.D.    | I.D. ± 0.031 [± 0.79] |                                  |                                   | STANDARD             | OPTIONAL |                              |
| HL011        | 0.469                              | 1.750                   | 0.375   | 0.188                 | 0.094                            | 1.187                             | 02                   | -        | 101, 204, 301                |
| NHL011       | [11.91]                            | [44.45]                 | [9.53]  | [4.76]                | [2.38]                           |                                   |                      |          |                              |
| HL012        | 0.406                              | 1.750                   | 0.313   | 0.188                 | 0.094                            | 1.187                             | 05                   | 14       | 101, 204, 301                |
| NHL012       | [10.32]                            | [44.45]                 | [7.94]  | [4.76]                | [2.38]                           |                                   |                      |          |                              |
| HL015        | 0.563                              | 1.500                   | 0.438   | 0.313                 | 0.094                            | 0.937                             | 02                   | 14       | 101, 203, 301                |
| NHL015       | [14.29]                            | [38.10]                 | [11.11] | [7.94]                | [2.38]                           |                                   |                      |          |                              |
| HL020        | 0.563                              | 2.000                   | 0.438   | 0.313                 | 0.094                            | 1.437                             | 02                   | 14       | 101, 203, 301                |
| NHL020       | [14.29]                            | [50.8]                  | [11.11] | [7.94]                | [2.38]                           |                                   |                      |          |                              |
| HL025        | 0.688                              | 2.000                   | 0.563   | 0.313                 | 0.094                            | 1.312                             | 06                   | 15       | 101, 203, 301                |
| NHL025       | [17.46]                            | [50.8]                  | [14.29] | [7.94]                | [2.38]                           |                                   |                      |          |                              |
| HL026        | 0.563                              | 3.000                   | 0.438   | 0.313                 | 0.094                            | 2.437                             | 02                   | 14       | 101, 203, 301                |
| NHL026       | [14.29]                            | [76.2]                  | [11.11] | [7.94]                | [2.38]                           |                                   |                      |          |                              |
| HL050        | 0.688                              | 4.000                   | 0.563   | 0.313                 | 0.094                            | 3.312                             | 06                   | 15       | 101, 203, 301                |
| NHL050       | [17.46]                            | [101.6]                 | [14.29] | [7.94]                | [2.38]                           |                                   |                      |          |                              |
| HL051        | 0.906                              | 3.500                   | 0.750   | 0.500                 | 0.125                            | 2.75                              | 06                   | 15       | 102, 206, 303                |
| NHL051       | [23.02]                            | [88.9]                  | [19.05] | [12.70]               | [3.18]                           |                                   |                      |          |                              |
| HL060        | 0.906                              | 4.000                   | 0.750   | 0.500                 | 0.125                            | 3.250                             | 06                   | 15       | 102, 206, 303                |
| NHL060       | [23.02]                            | [101.6]                 | [19.05] | [12.70]               | [3.18]                           |                                   |                      |          |                              |
| HL065        | 0.906                              | 4.500                   | 0.750   | 0.500                 | 0.125                            | 3.750                             | 06                   | 15       | 102, 206, 303                |
| NHL065       | [23.02]                            | [114.3]                 | [19.05] | [12.70]               | [3.18]                           |                                   |                      |          |                              |
| HL080        | 1.313                              | 4.000                   | 1.125   | 0.750                 | 0.219                            | 2.812                             | 07                   | 15       | 103, 205, 303                |
| NHL080       | [33.34]                            | [101.6]                 | [28.58] | [19.05]               | [5.56]                           |                                   |                      |          |                              |
| HL100        | 0.906                              | 6.500                   | 0.750   | 0.500                 | 0.125                            | 5.750                             | 06                   | 15       | 102, 206, 303                |
| NHL100       | [23.02]                            | [165.1]                 | [19.05] | [12.70]               | [3.18]                           |                                   |                      |          |                              |
| HL120        | 1.313                              | 6.000                   | 1.125   | 0.750                 | 0.219                            | 4.812                             | 07                   | 15       | 103, 205, 303                |
| NHL120       | [33.34]                            | [152.4]                 | [28.58] | [19.05]               | [5.56]                           |                                   |                      |          |                              |
| HL130        | 1.313                              | 6.500                   | 1.125   | 0.750                 | 0.219                            | 5.312                             | 07                   | 15       | 103, 205, 303                |
| NHL130       | [33.34]                            | [165.1]                 | [28.58] | [19.05]               | [5.56]                           |                                   |                      |          |                              |
| HL160        | 1.313                              | 8.000                   | 1.125   | 0.750                 | 0.219                            | 6.812                             | 07                   | 15       | 103, 205, 303                |
| NHL160       | [33.34]                            | [203.2]                 | [28.58] | [19.05]               | [5.56]                           |                                   |                      |          |                              |
| HL175        | 1.313                              | 8.500                   | 1.125   | 0.750                 | 0.219                            | 7.312                             | 07                   | 15       | 103, 205, 303                |
| NHL175       | [33.34]                            | [215.9]                 | [28.58] | [19.05]               | [5.56]                           |                                   |                      |          |                              |
| HL225        | 1.313                              | 10.500                  | 1.125   | 0.750                 | 0.219                            | 9.312                             | 07                   | 15       | 103, 205, 303                |
| NHL225       | [33.34]                            | [266.7]                 | [28.58] | [19.05]               | [5.56]                           |                                   |                      |          |                              |

**Note**

<sup>(1)</sup> Brackets are available for mounting HL series resistors - see Mounting Hardware section.

**TERMINAL DIMENSIONS**



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

Mounting hardware is available for HL resistors, see HL Brackets and Sliders datasheet for more information: [www.vishay.com/doc?30279](http://www.vishay.com/doc?30279)

| TECHNICAL SPECIFICATIONS        |                 |  |
|---------------------------------|-----------------|--|
| PARAMETER                       | UNIT            | HL, NHL RESISTOR CHARACTERISTICS   |
| Temperature Coefficient         | ppm/°C          | ± 30 for 10 Ω and above; ± 50 for 1 Ω to 9.9 Ω; ± 90 for 0.1 Ω to 0.99 Ω |
| Short Time Overload             | -               | 10 x rated power for 5 s   |
| Dielectric Withstanding Voltage | V <sub>AC</sub> | 1000, from terminal to mounting hardware                                 |
| Maximum Working Voltage         | V               | (P x R) <sup>1/2</sup>   |
| Insulation Resistance           | Ω               | 1000 MΩ minimum dry, 100 MΩ minimum after moisture test                  |
| Operating Temperature Range     | °C              | -55 to +350  |

**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

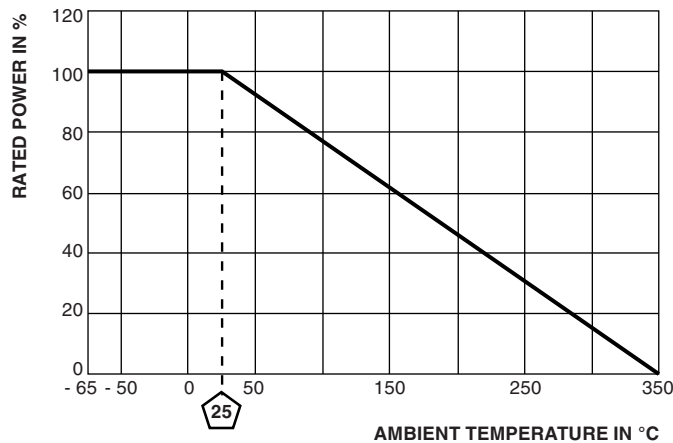
**Terminal Bands:** steel

**Part Marking:** Vishay Dale, model, wattage, value, tolerance, date code

**NHL NON-INDUCTIVE**

Models of equivalent physical and electrical specifications are available with non-inductive (Ayrton-Perry) winding. They are identified by adding the letter N to the front of the HL type designation (NHL225 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 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 <sub>RMS</sub> for 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 |
| Humidity                        | 75 °C, 90 % to 100 % RH, 240 h   | ± (5.0 % + 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 |
| 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 |



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