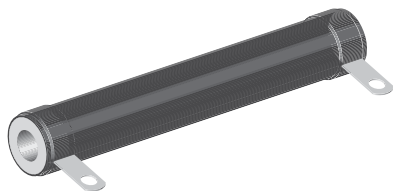


# Wirewound Resistors, Industrial Power, Tubular (HL), Non-Inductive Tubular (NHL)


**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.

**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

**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                |

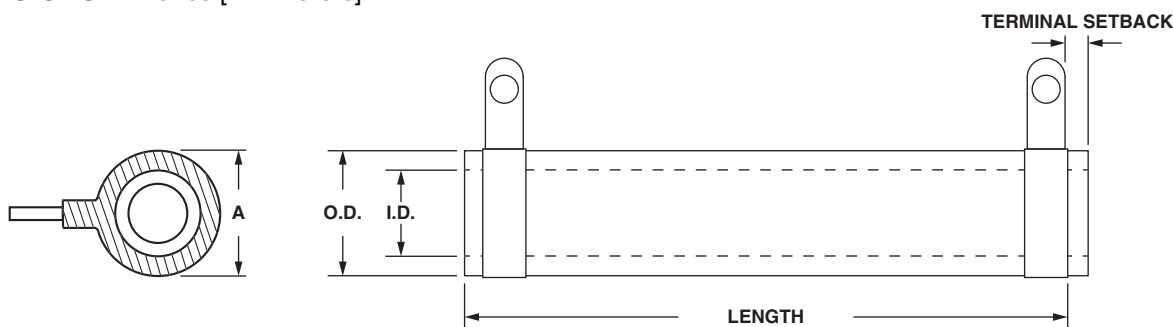
**GLOBAL PART NUMBER INFORMATION**

Global Part Numbering example: NHL10006Z10R00JJ

|                                                                             |   |   |                      |   |                    |   |                  |   |                                                        |   |                                    |   |   |   |                                                              |  |  |
|-----------------------------------------------------------------------------|---|---|----------------------|---|--------------------|---|------------------|---|--------------------------------------------------------|---|------------------------------------|---|---|---|--------------------------------------------------------------|--|--|
| N                                                                           | H | L | 1                    | 0 | 0                  | 0 | 6                | Z | 1                                                      | 0 | R                                  | 0 | 0 | J | J                                                            |  |  |
| GLOBAL MODEL                                                                |   |   | TERMINAL DESIGNATION |   | TERMINAL FINISH    |   | RESISTANCE VALUE |   | TOLERANCE                                              |   | PACKAGING CODE                     |   |   |   | SPECIAL                                                      |  |  |
| (See "Standard Electrical Specifications" table above for additional P/N's) |   |   | 02                   |   | E = Lead (Pb)-free |   | R = Decimal      |   | J = ± 5.0 %                                            |   | E = Lead (Pb)-free skin pack       |   |   |   | (Dash Number) (Up to 2 digits)<br>From 1 to 99 as applicable |  |  |
|                                                                             |   |   | 05                   |   |                    |   | K = Thousand     |   | K = ± 10.0 %                                           |   | J <sup>(1)</sup> = Skin pack (J01) |   |   |   |                                                              |  |  |
|                                                                             |   |   | 06                   |   | Z = Tin/lead       |   | 10R00 = 10.0 Ω   |   |                                                        |   |                                    |   |   |   |                                                              |  |  |
|                                                                             |   |   | 07                   |   | N = Nickel         |   | 1K000 = 1 kΩ     |   |                                                        |   |                                    |   |   |   |                                                              |  |  |
|                                                                             |   |   | 14                   |   |                    |   |                  |   | Note                                                   |   |                                    |   |   |   |                                                              |  |  |
|                                                                             |   |   | 15                   |   |                    |   |                  |   | (1) Tin/lead for type "Z", lead (Pb)-free for type "N" |   |                                    |   |   |   |                                                              |  |  |

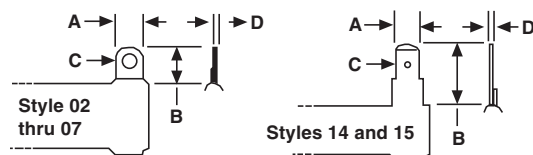
Historical Part Numbering example: NHL-100-06Z 10  $\Omega$  5 % J01

|                  |                 |                               |            |            |
|------------------|-----------------|-------------------------------|------------|------------|
| <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<br>MODEL | DIMENSIONS in inches [millimeters] |                               |         |                             |                                           |                                            |                      |          |                                 |
|-----------------|------------------------------------|-------------------------------|---------|-----------------------------|-------------------------------------------|--------------------------------------------|----------------------|----------|---------------------------------|
|                 | A<br>(MAX.)                        | CORE DIMENSIONS               |         |                             | TERMINAL<br>SETBACK<br>± 0.31<br>[± 0.79] | DISTANCE<br>BETWEEN<br>TERMINALS<br>(REF.) | TERMINAL DESIGNATION |          | BRACKET<br>TYPES <sup>(1)</sup> |
|                 |                                    | LENGTH<br>± 0.062<br>[± 1.59] | O.D.    | I.D.<br>± 0.031<br>[± 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****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).

| 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]  |

**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               | $(P \times R)^{1/2}$                                                     |
| 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

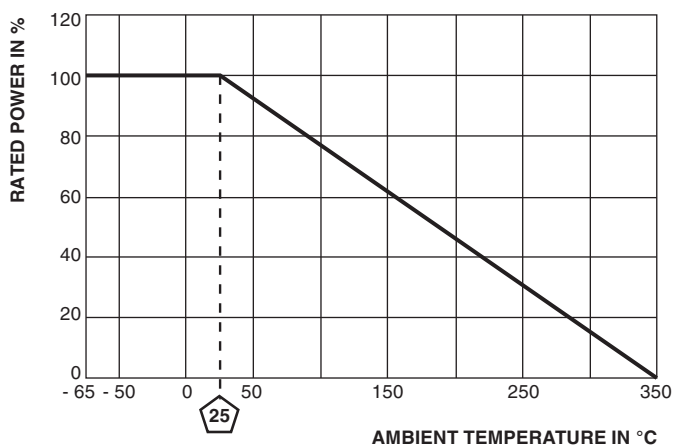
**Standard Terminals:** Model “E” terminals are tinned steel

**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             | 10 x 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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