K-Factor Transformers

K-Factor transformers are designed to reduce the heating effects of harmonic currents created by loads like those shown in Chart A. The K-Factor rating is an index of the transformer’s ability to withstand harmonic content while operating within the temperature limits of its insulating system. SolaHD K-Factor transformers have UL ratings of K-4, K-13, and K-20.

The SolaHD K-Factor design is a specialized transformer that offers these benefits:

- Conductors capable of carrying the harmonic currents of non-linear loads without exceeding the temperature rating of the insulation system.

- A transformer design that takes into account the increase in naturally occurring “stray” losses caused by non-linear loads. These losses cause standard transformers to dramatically overheat and substantially shorten design life.

- A core and coil design that manages the DC flux caused by triplen harmonics. As these harmonics increase, they cause additional current to circulate in the delta winding. This produces a DC flux in the core which leads to core saturation, voltage instability and overheating.

Features

- Conductors to carry harmonics of a K-rated load without exceeding insulation temperature ratings
- UL 1561 Listed up to K-20 rated protection
- Rated temperature rise of 150°C, 220°C insulation
- Shielded for quality power
- Basic design takes “stray losses” into account and functions within safe operating temperatures
- Core and coil design engineered to manage the zero sequence flux caused by triplen harmonics
- Provides 100% rated current without overheating the windings or saturating the core

Certifications and Compliances

- UL Listed: E25872
  - UL 1561

Chart A: Typical Load K-Factors

<table>
<thead>
<tr>
<th>Load</th>
<th>K-Factor</th>
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<tbody>
<tr>
<td>Electric discharge lighting</td>
<td>K-4</td>
</tr>
<tr>
<td>UPS with optional input filter</td>
<td>K-4</td>
</tr>
<tr>
<td>Welders</td>
<td>K-4</td>
</tr>
<tr>
<td>Induction heating equipment</td>
<td>K-4</td>
</tr>
<tr>
<td>PLCs and solid state controls</td>
<td>K-4</td>
</tr>
<tr>
<td>Telecommunications equipment (e.g., PBX)</td>
<td>K-13</td>
</tr>
<tr>
<td>UPS without input filtering</td>
<td>K-13</td>
</tr>
<tr>
<td>Multiwire receptacle circuits in general care areas of health care facilities and classrooms of schools, etc.</td>
<td>K-13</td>
</tr>
<tr>
<td>Multi-wire receptacle circuits supplying inspection or testing equipment on an assembly or production line.</td>
<td>K-13</td>
</tr>
<tr>
<td>Mainframe computer loads</td>
<td>K-20</td>
</tr>
<tr>
<td>Solid state motor drives (variable speed drives)</td>
<td>K-20</td>
</tr>
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* Not all optional designs are UL Listed. Contact Technical Services.
### Selection Tables: Three Phase

#### Group A: K-4 Rated 480 \(\Delta\) Primary, 208Y/120 Secondary, 60 Hz

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<thead>
<tr>
<th>kVA</th>
<th>Catalog Number</th>
<th>Type 3R Weather Shield</th>
<th>Height in (mm)</th>
<th>Width in (mm)</th>
<th>Depth in (mm)</th>
<th>Approx. Ship Weight lbs (kg)</th>
<th>Design Style</th>
<th>Elec Conn</th>
<th>Primary Amps</th>
<th>Secondary Amps</th>
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<tbody>
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<td>15</td>
<td>3H13T2H1SS</td>
<td>WS-02</td>
<td>28.00 (711.2)</td>
<td>23.00 (584.2)</td>
<td>16.00 (406.4)</td>
<td>305.0 (138.35)</td>
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<td>5</td>
<td>18.1</td>
<td>41.7</td>
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<tr>
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<td>3H13T2H30S</td>
<td>WS-14</td>
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<td>28.00 (711.2)</td>
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<tr>
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<td>33.00 (838.2)</td>
<td>21.00 (533.4)</td>
<td>972.0 (440.89)</td>
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<td>208.0</td>
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<tr>
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<td>65.00 (1651.0)</td>
<td>45.00 (1143.0)</td>
<td>35.00 (889.0)</td>
<td>2460.0 (1115.84)</td>
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<tr>
<td>112.5</td>
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<td>WS-11</td>
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<td>24.00 (609.6)</td>
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#### Group B: K-13 Rated 480 \(\Delta\) Primary, 208Y/120 Secondary, 60 Hz

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<th>Type 3R Weather Shield</th>
<th>Height in (mm)</th>
<th>Width in (mm)</th>
<th>Depth in (mm)</th>
<th>Approx. Ship Weight lbs (kg)</th>
<th>Design Style</th>
<th>Elec Conn</th>
<th>Primary Amps</th>
<th>Secondary Amps</th>
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<tr>
<td>30</td>
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<td>23.00 (584.2)</td>
<td>16.00 (406.4)</td>
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<tr>
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<td>23.00 (584.2)</td>
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<td>602.0</td>
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#### Group C: K-20 Rated 480 \(\Delta\) Primary, 208Y/120 Secondary, 60 Hz

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<th>kVA</th>
<th>Catalog Number</th>
<th>Type 3R Weather Shield</th>
<th>Height in (mm)</th>
<th>Width in (mm)</th>
<th>Depth in (mm)</th>
<th>Approx. Ship Weight lbs (kg)</th>
<th>Design Style</th>
<th>Elec Conn</th>
<th>Primary Amps</th>
<th>Secondary Amps</th>
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<tbody>
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<td>112.5</td>
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<td>36.00 (914.4)</td>
<td>24.00 (609.6)</td>
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<td>2460.0 (1115.84)</td>
<td>1</td>
<td>5</td>
<td>361.0</td>
<td>834.0</td>
</tr>
</tbody>
</table>

**Notes:**
1. Weather shields (set of two) must be ordered separately.
2. Design Styles and Electrical Connections can be found at the end of the Ventilated Distribution Transformers section.

Contact Technical Services at (800) 377-4384 with any questions.
Ventilated Distribution Transformers

Contact Technical Services at (800) 377-4384 with any questions.
Electrical Connections (Single Phase)

240 x 480 Volt Primary, 120/240 Volt Secondary
Taps: None

Primary Voltage | Interconnect | Connect Lines To
--- | --- | ---
504 | 1 to 2 | H1 & H2
492 | 2 to 3 | H1 & H2
480 | 3 to 4 | H1 & H2
468 | 4 to 5 | H1 & H2
456 | 5 to 6 | H1 & H2
444 | 6 to 7 | H1 & H2
432 | 7 to 8 | H1 & H2
252 | H1 to 2 H2 to 1 | H1 & H2
240 | H1 to 4 H2 to 3 | H1 & H2
228 | H1 to 6 H2 to 5 | H1 & H2
216 | H1 to 8 H2 to 7 | H1 & H2

Secondary Voltage | Interconnect | Connect Lines To
--- | --- | ---
240 | X2 to X3 | X1 & X4
120-0-120 | X2 to X3 X2 to X1-X2-X4 | X1-X2-X4
120 | X1 to X3 X2 to X4 | X1 & X4

ES12 Series

Electrical Connections (Three Phase)

480 \( \Delta \) Volt Primary, 208Y/120 Volt Secondary
Taps: 2, 2½% FCAN; 4, 2½% FCBN

Primary Voltage | Interconnect | Connect Lines To
--- | --- | ---
277 | 1 to 2 | H1 & H2
240 | 3 to 4 | H1 & H2
208 | 5 to 6 | H1 & H2
120 | H1 to 4 H2 to 3 | H1 & H2

Secondary Voltage | Interconnect | Connect Lines To
--- | --- | ---
240 | X2 to X3 | X1 & X4
120-0-120 | X2 to X3 X2 to X1-X2-X4 | X1-X2-X4
120 | X1 to X3 X2 to X4 | X1 & X4

ET2 and 3H Series

* Shield available in electrostatically shielded units only.

480 \( \Delta \) Volt Primary, 240 \( \Delta \) W/120 CT Volt Secondary
Taps: 2, 2½% FCAN; 4, 2½% FCBN

Primary H1-H2-H3 | Secondary Voltage
--- | ---
Tap | Voltage | X0-X1, X2, X3
--- | --- | ---
1 | 504 | 206
2 | 492 | 480
3 | 480 | 468
4 | 468 | 456
5 | 444 | 432
6 | 444 | 432
7 | 432 | 432

* Shield available in electrostatically shielded units only.

ES5 Series

ET5 and 3H Series

* Shield available in electrostatically shielded units only.
### Electrical Connections (Three Phase) cont.

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<tr>
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<table>
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### ET79 Series

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### ET6 Series

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**Contact Technical Services at (800) 377-4384 with any questions.**

Visit our website at [www.solahd.com](http://www.solahd.com).