

K-Factor Transformers

SolaHD 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. Our 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

- Energy Efficient Compliant to DOE 2016¹
- 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
- Meets transit test requirements for ISTA (International Safe Transit Association) – Test Procedure 1E for packaged-product
- Quiet operation with sound levels 3-6 dB below the NEMA ST-20 requirements



Accessories and Optional Design Styles

- Wall mounting brackets (500 lbs maximum) (Item WB1C)
- Weather Shields (UL Listed/NEMA Type 3R)
- Totally enclosed non-ventilated designs (TENV) (Non UL) *
- Low temperature rise units available
- Open core and coil designs (UL Recognized)
- Copper Wound designs
- Alternate voltages

Certifications and Compliances

-  Listed: E25872
- UL 1561

Chart A: Typical Load K-Factors

| Load | K-Factor |
|--|----------|
| Electric discharge lighting | K-4 |
| UPS with optional input filter | K-4 |
| Welders | K-4 |
| Induction heating equipment | K-4 |
| PLCs and solid state controls | K-4 |
| Telecommunications equipment (e.g.. PBX) | K-13 |
| UPS without input filtering..... | K-13 |
| Multiwire receptacle circuits in general care areas of health care facilities and classrooms of schools, etc. | K-13 |
| Multi-wire receptacle circuits supplying inspection or testing equipment on an assembly or production line..... | K-13 |
| Mainframe computer loads | K-20 |
| Solid state motor drives (variable speed drives)..... | K-20 |

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* Not all optional designs are UL Listed. Contact Technical Services.

1. DOE 2016 refers to Department of Energy CFR (Code of Federal Regulations) title 10, part 431.196).

Selection Tables: Three Phase

Group A: K-4 Rated 480 Δ Primary, 208Y/120 Secondary, 60 Hz

| kVA | Catalog Number | Type 3R Weather Shield ¹ | Height in (mm) | Width in (mm) | Depth in (mm) | Approx. Ship Weight lbs (kg) | Design Style ² | Elec Conn ² | Primary Amps | Secondary Amps |
|-------|----------------|-------------------------------------|----------------|---------------|---------------|------------------------------|---------------------------|------------------------|--------------|----------------|
| 15 | K4E2H15S | WS-02 | 23 (584) | 18 (457) | 14 (356) | 221 (100) | 1 | 5 | 18.1 | 41.7 |
| 30 | K4E2H30S | WS-14 | 28 (711) | 23 (584) | 16 (406) | 310 (141) | 1 | 5 | 36.1 | 83.4 |
| 45 | K4E2H45S | WS-14 | 28 (711) | 23 (584) | 16 (406) | 387 (176) | 1 | 5 | 54.2 | 125 |
| 75 | K4E2H75S | WS-30 | 34 (864) | 28 (711) | 22 (559) | 678 (308) | 1 | 5 | 90.3 | 208 |
| 112.5 | K4E2H112S | WS-30 | 34 (864) | 28 (711) | 22 (559) | 794 (360) | 1 | 5 | 135 | 313 |
| 150 | K4E2H150S | WS-10 | 44 (1118) | 33 (838) | 21 (533) | 1005 (456) | 1 | 5 | 181 | 417 |
| 225 | K4E2H225S | WS-11 | 46 (1168) | 36 (914) | 24 (610) | 1368 (621) | 1 | 5 | 271 | 625 |
| 300 | K4E2H300S | WS-11 | 46 (1168) | 36 (914) | 24 (610) | 1479 (671) | 1 | 5 | 361 | 834 |
| 500 | K4E2H500S | WS-12 | 65 (1651) | 45 (1143) | 35 (889) | 2457 (1114) | 1 | 5 | 602 | 1390 |

Group B: K-13 Rated 480 Δ Primary, 208Y/120 Secondary, 60 Hz

| kVA | Catalog Number | Type 3R Weather Shield ¹ | Height in (mm) | Width in (mm) | Depth in (mm) | Approx. Ship Weight lbs (kg) | Design Style ² | Elec Conn ² | Primary Amps | Secondary Amps |
|-------|----------------|-------------------------------------|----------------|---------------|---------------|------------------------------|---------------------------|------------------------|--------------|----------------|
| 15 | K13E2H15S | WS-14 | 28 (711) | 23 (584) | 16 (406) | 310 (141) | 1 | 5 | 18.1 | 41.7 |
| 30 | K13E2H30S | WS-14 | 28 (711) | 23 (584) | 16 (406) | 387 (176) | 1 | 5 | 36.1 | 83.4 |
| 45 | K13E2H45S | WS-30 | 34 (864) | 28 (711) | 22 (559) | 678 (308) | 1 | 5 | 54.2 | 125 |
| 75 | K13E2H75S | WS-30 | 34 (864) | 28 (711) | 22 (559) | 794 (360) | 1 | 5 | 90.3 | 208 |
| 112.5 | K13E2H112S | WS-10 | 44 (1118) | 33 (838) | 21 (533) | 1005 (456) | 1 | 5 | 135 | 313 |
| 150 | K13E2H150S | WS-11 | 46 (1168) | 36 (914) | 24 (610) | 1368 (621) | 1 | 5 | 181 | 417 |
| 225 | K13E2H225S | WS-11 | 46 (1168) | 36 (914) | 24 (610) | 1479 (671) | 1 | 5 | 271 | 625 |
| 300 | K13E2H300S | WS-12 | 65 (1651) | 45 (1143) | 35 (889) | 2457 (1114) | 1 | 5 | 361 | 834 |

Group C: K-20 Rated 480 Δ Primary, 208Y/120 Secondary, 60 Hz

| kVA | Catalog Number | Type 3R Weather Shield ¹ | Height in (mm) | Width in (mm) | Depth in (mm) | Approx. Ship Weight lbs (kg) | Design Style ² | Elec Conn ² | Primary Amps | Secondary Amps |
|-------|----------------|-------------------------------------|----------------|---------------|---------------|------------------------------|---------------------------|------------------------|--------------|----------------|
| 15 | K20E2H15S | WS-14 | 28 (711) | 23 (584) | 16 (406) | 310 (141) | 1 | 5 | 18.1 | 41.7 |
| 30 | K20E2H30S | WS-14 | 28 (711) | 23 (584) | 16 (406) | 387 (176) | 1 | 5 | 36.1 | 83.4 |
| 45 | K20E2H45S | WS-30 | 34 (864) | 28 (711) | 22 (559) | 678 (308) | 1 | 5 | 54.2 | 125 |
| 75 | K20E2H75S | WS-30 | 34 (864) | 28 (711) | 22 (559) | 794 (360) | 1 | 5 | 90.3 | 208 |
| 112.5 | K20E2H112S | WS-10 | 44 (1118) | 33 (838) | 21 (533) | 1005 (456) | 1 | 5 | 135 | 313 |
| 150 | K20E2H150S | WS-11 | 46 (1168) | 36 (914) | 24 (610) | 1368 (621) | 1 | 5 | 181 | 417 |
| 225 | K20E2H225S | WS-11 | 46 (1168) | 36 (914) | 24 (610) | 1479 (671) | 1 | 5 | 271 | 625 |
| 300 | K20E2H300S | WS-12 | 65 (1651) | 45 (1143) | 35 (889) | 2457 (1114) | 1 | 5 | 361 | 834 |

Notes:

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

Electrical Connections (Single Phase)

1
 240 x 480 Volt Primary,
 120/240 Volt Secondary
 Taps: 2, 2½% FCAN; 4, 2½% FCBN

| 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 \perp | X1-X2-X4 |
| 120 | X1 to X3 X2 to X4 | X1 & X4 |

ES5 Series

2
 120/208/240/277 Volt Primary,
 120/240 Volt Secondary
 Taps: None

| 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 \perp | X1-X2-X4 |
| 120 | X1 to X3 X2 to X4 | X1 & X4 |

ES12 Series

Design Style



Style 1 - Ventilated

Electrical Connections (Three Phase)

480 Δ Volt Primary,
208Y/120 Volt Secondary
Taps: 2, 2½% FCAN; 4, 2½% FCBN

5

| Primary H1-H2-H3 | | Secondary Voltage | |
|------------------|---------|-------------------|----------------|
| @ Tap | Voltage | X1, X2, X3 | X0- X1, X2, X3 |
| 1 | 504 | 208 | 120 |
| 2 | 492 | | |
| 3 | 480 | | |
| 4 | 468 | | |
| 5 | 456 | | |
| 6 | 444 | | |
| 7 | 432 | | |

E2 and 3H Series

** Shield available in electrostatically shielded units only.*

480 Δ Volt Primary,
240 Δ W/120 CT Volt Secondary
Taps: 2, 2½% FCAN; 4, 2½% FCBN

6

| Primary H1-H2-H3 | | Secondary Voltage | |
|------------------|---------|-------------------|--------------|
| @ Tap | Voltage | X1, X2, X3 | X6-X1, X6-X3 |
| 1 | 504 | 240 | 120 |
| 2 | 492 | | |
| 3 | 480 | | |
| 4 | 468 | | |
| 5 | 456 | | |
| 6 | 444 | | |
| 7 | 432 | | |

E5 Series

** Shield available in electrostatically shielded units only.*

480 Δ Volt Primary
380Y/220 Volt Secondary
Taps: 2, 2½% FCAN; 4, 2½% FCBN

7

| Primary H1-H2-H3 | | Secondary Voltage | |
|------------------|---------|-------------------|----------------|
| @ Tap | Voltage | X1, X2, X3 | X0- X1, X2, X3 |
| 1 | 504 | 380 | 220 |
| 2 | 492 | | |
| 3 | 480 | | |
| 4 | 468 | | |
| 5 | 456 | | |
| 6 | 444 | | |
| 7 | 432 | | |

E79 Series

480 Δ Volt Primary
480Y/277 Volt Secondary
Taps: 2, 2½% FCAN; 4, 2½% FCBN

8

| Primary H1-H2-H3 | | Secondary Voltage | |
|------------------|---------|-------------------|----------------|
| @ Tap | Voltage | X1, X2, X3 | X0- X1, X2, X3 |
| 1 | 504 | 480 | 277 |
| 2 | 492 | | |
| 3 | 480 | | |
| 4 | 468 | | |
| 5 | 456 | | |
| 6 | 444 | | |
| 7 | 432 | | |

E81 Series

208 Δ Volt Primary
208Y/120 Volt Secondary
Taps: 2, 2½% FCAN; 4, 2½% FCBN

9

| Primary H1-H2-H3 | | Secondary Voltage | |
|------------------|---------|-------------------|----------------|
| @ Tap | Voltage | X1, X2, X3 | X0- X1, X2, X3 |
| 1 | 218 | 208 | 120 |
| 2 | 213 | | |
| 3 | 208 | | |
| 4 | 203 | | |
| 5 | 198 | | |
| 6 | 192 | | |
| 7 | 187 | | |

E3 Series

Electrical Connections (Three Phase) cont.

208 Δ Volt Primary
480Y/277 Volt Secondary
Taps: 2, 2½% FCAN; 4, 2½% FCBN

10

| Primary X1-X2-X3 | | Secondary Voltage | |
|------------------|---------|-------------------|---------------|
| @ Tap | Voltage | H1-H2-H3 | H0-H1, H2, H3 |
| 1 | 218 | 480 | 277 |
| 2 | 213 | | |
| 3 | 208 | | |
| 4 | 203 | | |
| 5 | 198 | | |
| 6 | 192 | | |
| 7 | 187 | | |

E84 Series

240 Δ Volt Primary
208Y/120 Volt Secondary
Taps: 2, 2½% FCAN; 4, 2½% FCBN

11

| Primary H1-H2-H3 | | Secondary Voltage | |
|------------------|---------|-------------------|----------------|
| @ Tap | Voltage | X1, X2, X3 | X0- X1, X2, X3 |
| 1 | 252 | 208 | 120 |
| 2 | 246 | | |
| 3 | 240 | | |
| 4 | 234 | | |
| 5 | 228 | | |
| 6 | 222 | | |
| 7 | 216 | | |

E6 Series

240 Δ Volt Primary
480Y/277 Volt Secondary
Taps: 2, 2½% FCAN; 4, 2½% FCBN

12

| Primary X1-X2-X3 | | Secondary Voltage | |
|------------------|---------|-------------------|----------------|
| @ Tap | Voltage | H1, H2, H3 | H0- H1, H2, H3 |
| 1 | 252 | 480 | 277 |
| 2 | 246 | | |
| 3 | 240 | | |
| 4 | 234 | | |
| 5 | 228 | | |
| 6 | 222 | | |
| 7 | 216 | | |

E85 Series

Данный компонент на территории Российской Федерации

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