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 2016 [1]
- 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

E25872

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

- UL 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

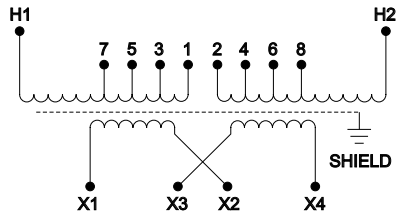
kVA	Catalog Number	Type 3R Weather Shield [1]	Height in (mm)	Width in (mm)	Depth in (mm)	Approx. Ship Weight lbs (kg)	Design Style [2]	Elec Conn [2]	Primary Amps	Secondary Amps
15	**K20E2H15S**	**WS–14**	28 (711)	23 (584)	16 (406)	310 (141)	1	5	18.1	41.7
30	**K20E2H30S**	**WS–14**	28 (711)	23 (584)	16 (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:
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.

Electrical Connections (Single Phase)

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

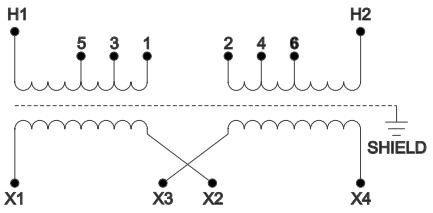
1



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
120	X1 to X3 X2 to X4	X1 & X4
ES5 Series		

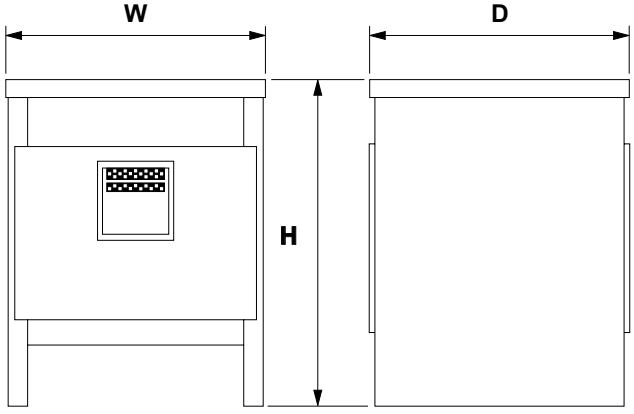
120/208/240/277 Volt Primary,
120/240 Volt Secondary
Taps: None

2



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
120	X1 to X3 X2 to X4	X1 & X4
ES12 Series		

Design Style

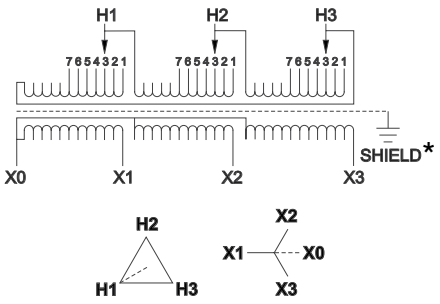


Style 1 - Ventilated

Electrical Connections (Three Phase)

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

5



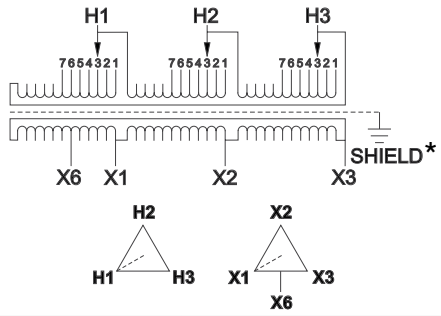
Primary H1-H2-H3		Secondary Voltage	
@ Tap	Voltage	X1, X2, X3	X0- X1, X2, X3
1	504	208	120
2	492		
3	480		
4	468		
5	456		
6	444		
7	432		

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



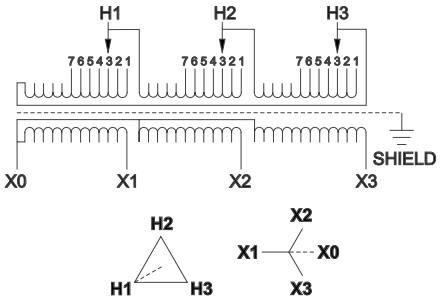
Primary H1-H2-H3		Secondary Voltage	
@ Tap	Voltage	X1, X2, X3	X6-X1, X6-X3
1	504	240	120
2	492		
3	480		
4	468		
5	456		
6	444		
7	432		

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

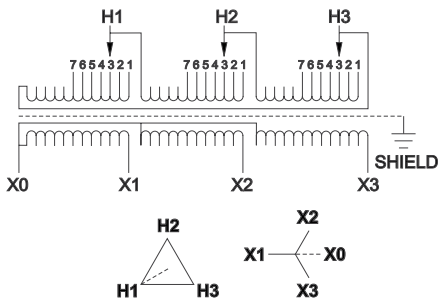


Primary H1–H2–H3		Secondary Voltage	
@ Tap	Voltage	X1, X2, X3	X0– X1, X2, X3
1	504	380	220
2	492		
3	480		
4	468		
5	456		
6	444		
7	432		

E79 Series

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

8

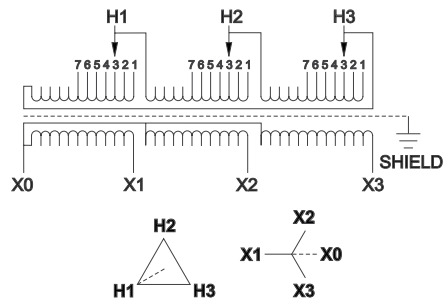


Primary H1-H2-H3		Secondary Voltage	
@ Tap	Voltage	X1, X2, X3	X0- X1, X2, X3
1	504	480	277
2	492		
3	480		
4	468		
5	456		
6	444		
7	432		

E81 Series

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

9



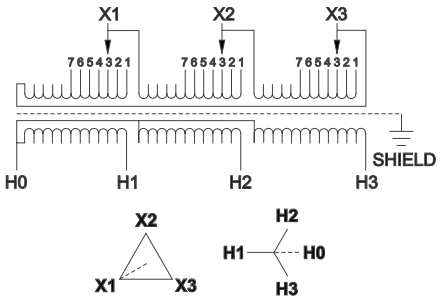
Primary H1-H2-H3		Secondary Voltage	
@ Tap	Voltage	X1, X2, X3	X0- X1, X2, X3
1	218	208	120
2	213		
3	208		
4	203		
5	198		
6	192		
7	187		

E3 Series

Electrical Connections (Three Phase) cont.

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

10

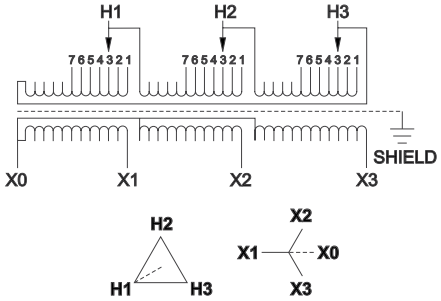


Primary X1-X2-X3		Secondary Voltage	
@ Tap	Voltage	H1-H2-H3	H0-H1, H2, H3
1	218	480	277
2	213		
3	208		
4	203		
5	198		
6	192		
7	187		

E84 Series

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

11

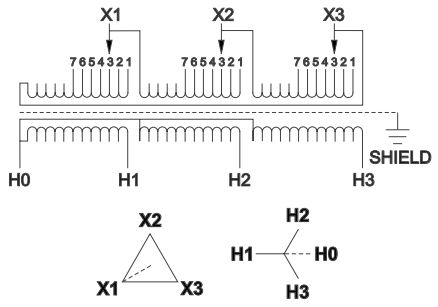


Primary H1-H2-H3		Secondary Voltage	
@ Tap	Voltage	X1, X2, X3	X0- X1, X2, X3
1	252	208	120
2	246		
3	240		
4	234		
5	228		
6	222		
7	216		

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