

K-Factor Harmonic Transformers

In today's industrial workplace, the proliferation of solid state devices (lighting ballasts, motor drives and controls, communications equipment, and other DC-powered loads) has created a major problem for specifying engineers, contractors and building owners. The non-linear nature of their switch mode power supplies generate harmonic currents that cause transformers and system neutrals to overheat and destroy themselves.

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. Sola/Hevi-Duty K-Factor transformers have UL ratings of K-4, K-13 and K-20.

The Sola/Hevi-Duty 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. Paralleled conductors are used to reduce and control skin effect losses.
- 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. The K-Factor is designed to function within safe operating temperatures.
- 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.
- K-Factor transformers are UL 1561 listed.
- Designed to supply non-linear loads without overheating the windings or saturating the core.
- All Sola/Hevi-Duty K-Factor transformers have a rated temperature rise of 150°C.

Contact **Technical Services** for weather shield information.

*Triplen harmonics are those harmonics which are odd multiples of third harmonic (9th, 15th, 21st, etc.).



Listed



Certified

Accessories and Optional Design Styles

- Wall mounting brackets (through 45 KVA only).
- Weather Shields (UL-3R).
- Stainless Steel Enclosures.
- Totally enclosed non-ventilated designs.
- Low temperature rise units available.
- Open core and coil designs.
- Copper Wound designs.

Chart A: Typical Load K-Factors

Load	K-Factor
Electric discharge lighting	K-4
UPS with optional input filtering	K-4
Welders	K-4
Induction heating equipment	K-4
PLCs and solid state controls (other than variable speed drives)	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
Multiwire 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
Multiwire receptacle circuits in critical care areas and operating/recovery rooms of hospitals	K-20

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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.

Selection Tables: Three Phase

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



KVA	Catalog Number	NEMA 3R Weather Shield*	Height (inch)	Width (inch)	Depth (inch)	Ship Weight (lbs)	Primary Amps	Secondary Amps
15	3H4T2H15S	WS-02	23	18	14	180	18.1	41.7
30	3H4T2H30S	WS-14	28	23	16	329	36.1	83.4
45	3H4T2H45S	WS-14	28	23	16	357	54.2	125
75	3H4T2H75S	WS-30	34	28	22	647	90.3	208
112.5	3H4T2H112S	WS-10	44	33	21	890	135	313
150	3H4T2H150S	WS-10	44	33	21	1045	181	417
225	3H4T2H225S	WS-11	46	36	24	1230	271	625
300	3H4T2H300S	WS-11	46	36	24	1420	361	834
500	3H4T2H500S	WS-12	65	45	35	2400	602	1390

*Weather shields (set of two) must be ordered separately.

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

KVA	Catalog Number	NEMA 3R Weather Shield*	Height (inch)	Width (inch)	Depth (inch)	Ship Weight (lbs)	Primary Amps	Secondary Amps
15	3H13T2H15S	WS-14	28	23	16	239	18.1	41.7
30	3H13T2H30S	WS-30	34	28	22	409	36.1	83.4
45	3H13T2H45S	WS-30	34	28	22	480	54.2	125
75	3H13T2H75S	WS-30	34	28	22	647	90.3	208
112.5	3H13T2H112S	WS-10	44	33	21	972	135	313
150	3H13T2H150S	WS-11	46	36	24	1210	181	417
225	3H13T2H225S	WS-11	46	36	24	1230	271	625
300	3H13T2H300S	WS-11	46	36	24	1420	361	834
500	3H13T2H500S	WS-12	65	45	35	2400	602	1390

*Weather shields (set of two) must be ordered separately.

Selection Tables: Three Phase

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

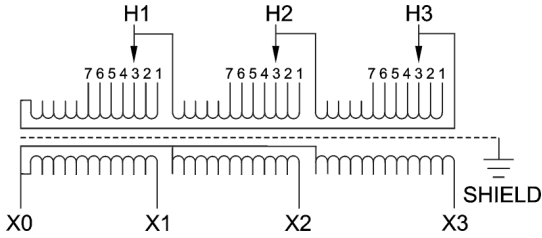


KVA	Catalog Number	NEMA 3R Weather Shield*	Height (inch)	Width (inch)	Depth (inch)	Ship Weight (lbs)	Primary Amps	Secondary Amps
15	3H20T2H15S	WS-14	28	23	16	239	18.1	41.7
30	3H20T2H30S	WS-30	34	28	22	422	36.1	83.4
45	3H20T2H45S	WS-30	34	28	22	532	54.2	125
75	3H20T2H75S	WS-30	34	28	22	654	90.3	208
112.5	3H20T2H112S	WS-10	44	33	21	980	135	313
150	3H20T2H150S	WS-11	46	36	24	960	181	417
225	3H20T2H225S	WS-11	46	36	24	1230	271	625
300	3H20T2H300S	WS-12	65	45	35	1420	361	834
500	3H20T2H500S	WS-12	65	45	35	2400	602	1390

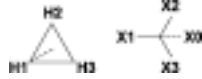
*Weather shields come in a set of two and need to be ordered separately.

Electrical Connection

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



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		



Tap Information

All Sola/Hevi-Duty non-linear load transformers are provided with two 2½% FCAN and four 2½% FCBN taps in addition to the nominal rating tap. For actual tap voltages, refer to the Electrical Connection Diagram.

