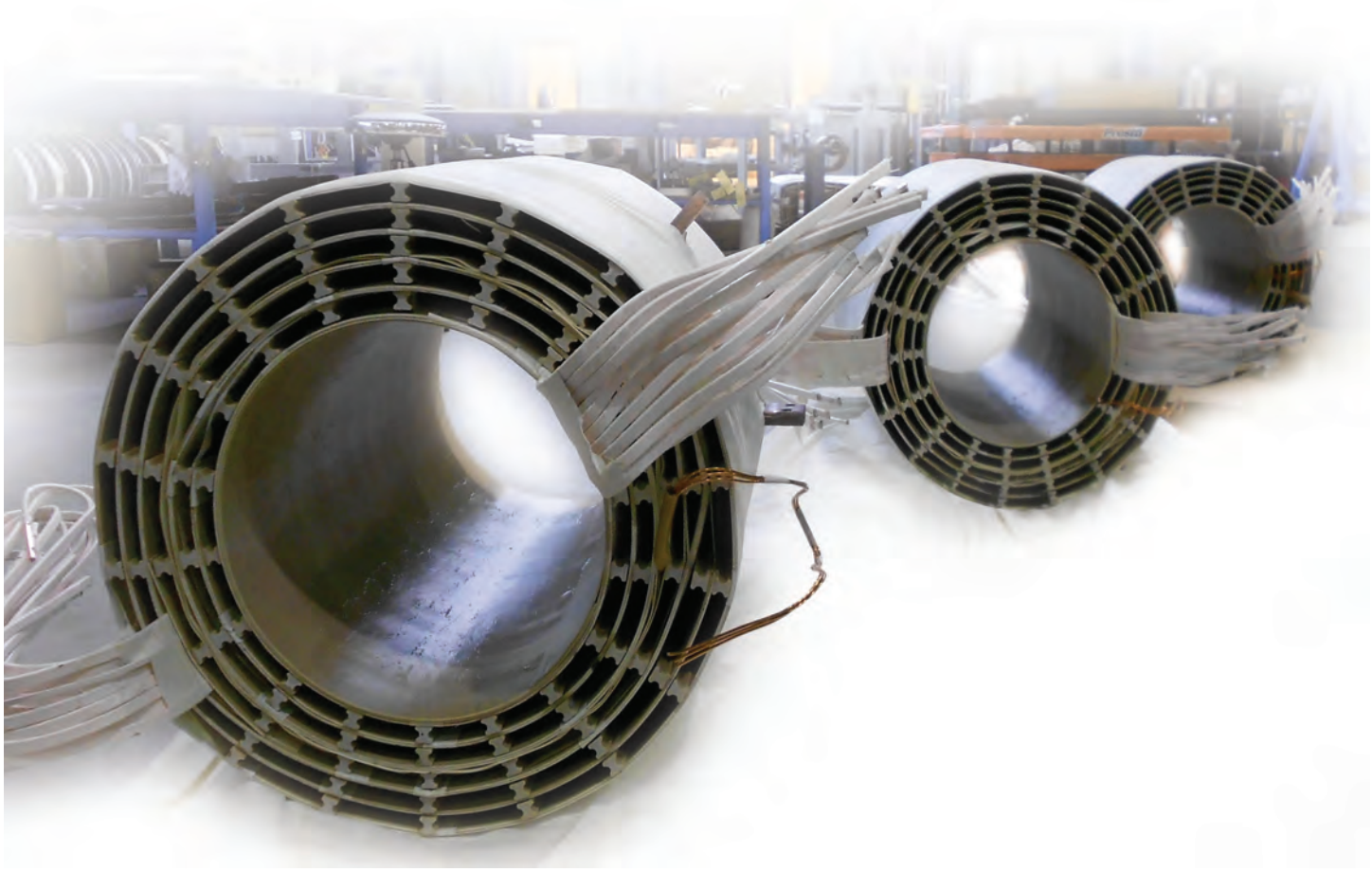
STI

Building Better Transformers

Dry Type Higher Efficiency Transformers

General Purpose
K-Rated
Harmonic Mitigation
For UPS Systems
Auto
Drive Isolation
Line Reactors

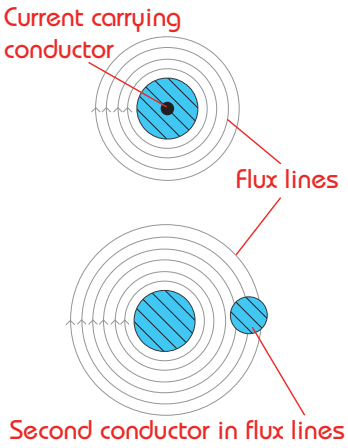
Medium and High Voltage Power Transformers



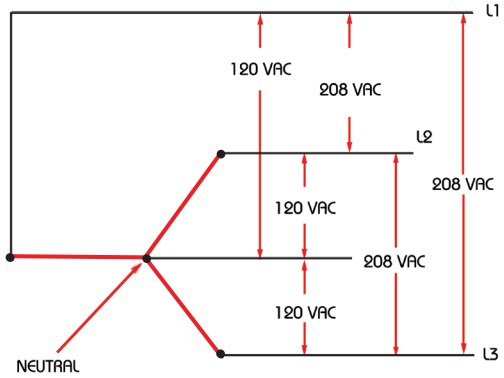
STI

Transformer Theory

The invention of the power transformer at the end of the nineteenth century made possible the development of the modern AC supply system. A power transformer normally consists of a pair of windings, primary and secondary that are linked by a magnetic circuit or core. When an alternating voltage is applied to the primary winding current will flow which sets up an alternating flux in the core which links both windings.



ISOLATION TRANSFORMERS: The majority of power transformers are double wound, i.e. they have two separate winding, a low-voltage and high-voltage windings. This provides a degree of isolation between systems of different voltage level and limits the extent that faults on one system can affect another.

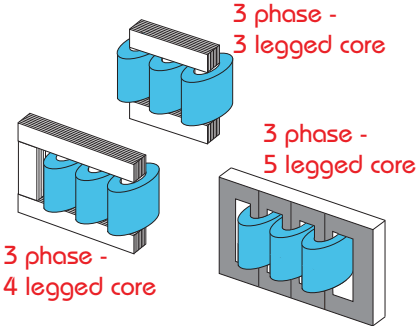


THE WYE SECONDARY CONNECTION: This is the most common type of transformer secondary connection. It comes with four leads one of which called the neutral is common to each phase. The line to line voltage is 1.732 times the line to neutral voltage. 120V x 1.732 = 208V

AUTOTRANSFORMERS: It is possible and in some circumstances economically advantageous for a section of the high-voltage winding to be common with the low-voltage winding. In this case there is no isolation between the primary and the secondary voltage levels.

WINDING MATERIAL: Copper or Aluminum? Both work and meet all technical specifications and industry standards. Generally comes down to designer's preference.

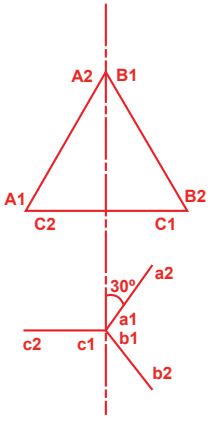
CORE MATERIAL AND CONSTRUCTION: Standard configuration of choice for most manufacturers for general purpose transformers is the 3 phase 3 legged core. Steel for laminations for the core is selected by the manufacturer and rarely specified by the user. The user may sometimes specify the type of core configuration required.



K-RATED TRANSFORMERS: K-Rated transformers; most specified of which are K13 transformers, are designed to withstand the extra heat produced by non-linear loads. These transformers maintain their temperature ratings when feeding non-linear loads.

HARMONIC MITIGATION TRANSFORMERS: Unlike K-Rated transformers, these transformers actually treat harmonics rather than just accommodate them.

TRANSFORMER IMPEDANCE: The normal method of expressing transformer impedance is as a % voltage drop in the transformer at full load current. The natural value for % impedance tends to increase as the rating of the transformer increases.



PHASE ANGLE DISPLACEMENT: The standard connection for a Δ-Y transformer is to have the high- side voltages lead the low-side voltages by 30°. These phase shifts can be varied to accommodate installations such as those with UPS systems or for harmonic mitigation where certain phase shifts are more desirable than others.

RATED QUANTITIES: The output of a transformer is usually expressed in kVA or MVA.

REGULATION: The regulation that occurs at the secondary terminals of a transformer when a load is supplied consists, as previously mentioned, of voltage drops due to the resistance of the windings and voltage drops due to the leakage reactance between the windings. The voltage regulation for specific loads is defined as a change in magnitude of secondary voltage after removal of the load (primary voltage being held constant) expressed as a fraction of the secondary voltage corresponding to the no-load condition.

Continued on last page...

STI

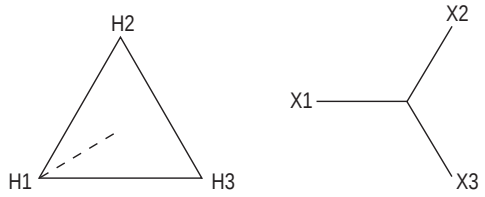
General Purpose Transformers

55 Saltsman Drive
Cambridge, ON, N3H 4R7
Tel: 519-653-1847
Fax: 519-653-3658

Available KVA	
15	300
30	450
45	500
75	600
112.5	750
150	1000
225	

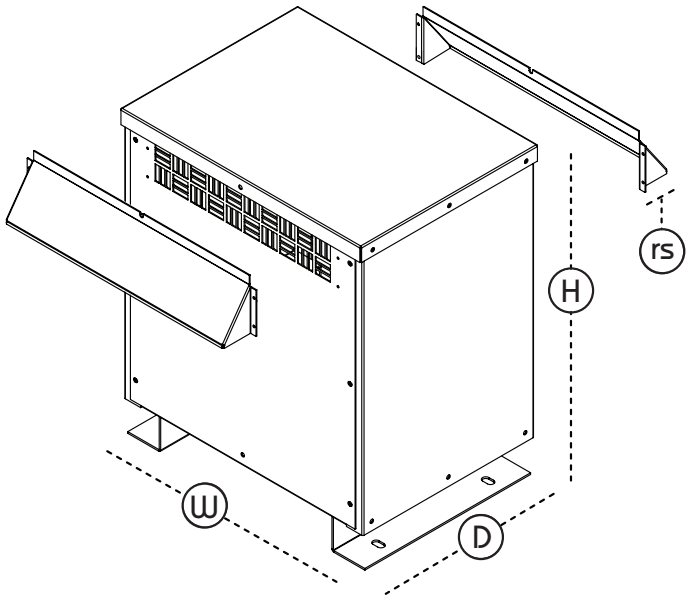
Winding Configuration

Delta Wye



Enclosure Specifications

All dimensions in inches



Standard Features

Input Voltage	600V
Output Voltage	120/208V
Phase	3 Ph
Frequency	60 Hz
Winding Material	Copper/Alum
Temp Rise	150°C
Insulation Class	220°C
Max Impedance	Approx. 5%
Minimum Efficiency	Per CSA 802.2
Regulation	Standard
Audible Noise	Per NEMA ST-20
Electrostatic Shield	Not Included
Taps	4-2.5%, 2FCAN, 2FCBN
Enclosure	Type 1
Applicable Standards	CSA, UL

KVA	15-30	45-75	112-150	225-300	450-500	600-1000
H	26	32	42	49	62	76
W	22	26	30	36	52	66
D	18	20	24	27	36	38
D+rs	23	25	31	37	42	44

Options

Temp Rise	80°C, 115°C, 130°C
Electrostatic Shield	Single, Double
Enclosure	Type 2, Type 3R
Thermal Sensors	Center Coil, All Coils

Client	
Project	
Notes	
Date	

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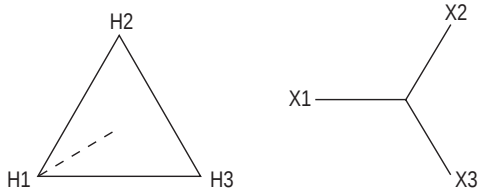
K-Rated Transformers

55 Saltsman Drive
Cambridge, ON, N3H 4R7
Tel: 519-653-1847
Fax: 519-653-3658

Available KVA	
15	300
30	450
45	500
75	600
112.5	750
150	1000
225	

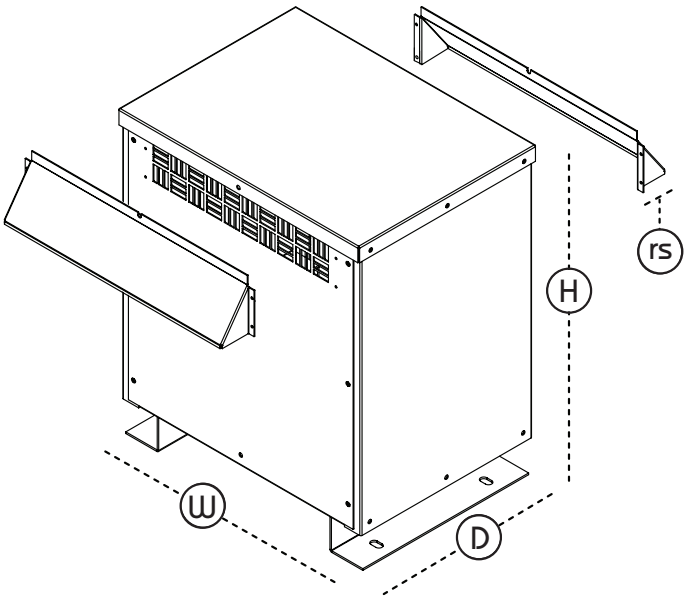
Winding Configuration

Delta Wye



Enclosure Specifications

All dimensions in inches



Standard Features

Input Voltage	600V
Output Voltage	120/208V
Transformer Type	K13 Rated
Phase	3 Ph
Frequency	60 Hz
Winding Material	Copper
Temp Rise	150°C
Insulation Class	220°C
Max Impedance	Approx. 5%
Minimum Efficiency	Per CSA 802.2
Regulation	Standard
Audible Noise	Per NEMA ST-20
Electrostatic Shield	Included, Single
Taps	4-2.5%, 2FCAN, 2FCBN
Neutral Rating	200% Rated
Enclosure	Type 1
Applicable Standards	CSA, UL

KVA	15-30	45-75	112-150	225-300	450-500	600-1000
H	26	32	42	49	62	76
W	22	26	30	36	52	66
D	18	20	24	27	36	38
D+rs	23	25	31	37	42	44

Options

Temp Rise	80°C, 115°C, 130°C
Electrostatic Shield	Double
Enclosure	Type 2, Type 3R
Thermal Sensors	Center Coil, All Coils

Client	
Project	
Notes	
Date	

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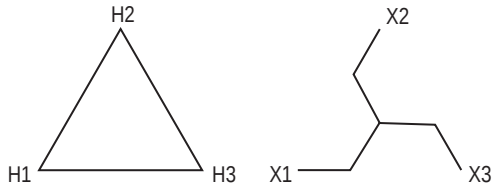
Harmonic Mitigation Transformers

55 Saltsman Drive
Cambridge, ON, N3H 4R7
Tel: 519-653-1847
Fax: 519-653-3658

Available KVA	
15	300
30	450
45	500
75	600
112.5	750
150	1000
225	

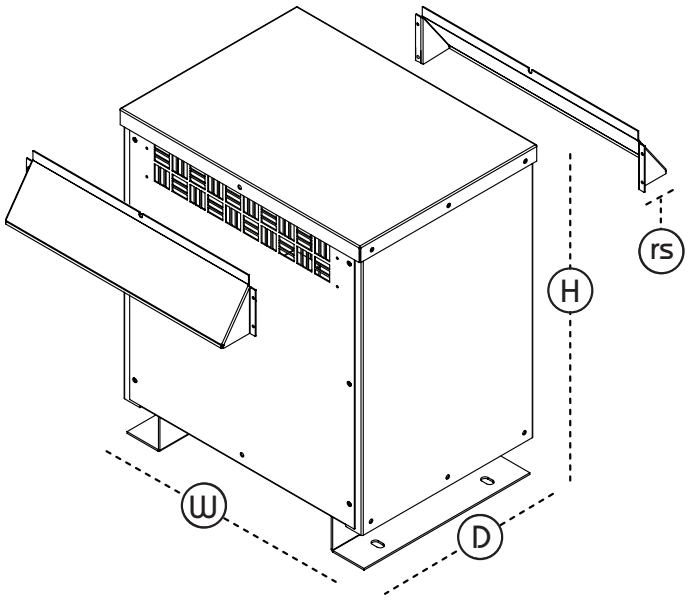
Winding Configuration

Delta Zig-Zag



Enclosure Specifications

All dimensions in inches



Standard Features

Input Voltage	600V
Output Voltage	120/208V
K-Rating	Load K-Factor upto 20
Phase	3 Ph
Frequency	60 Hz
Winding Material	Copper
Temp Rise	150°C
Insulation Class	220°C
Max Impedance	Approx. 5%
Minimum Efficiency	Per CSA 802.2
Regulation	Standard
Audible Noise	Per NEMA ST-20
Electrostatic Shield	Included, Single
Taps	4-2.5%, 2FCAN, 2FCBN
Neutral Rating	200% Rated
Phase Shift	0° or 30°
Enclosure	Type 1
Applicable Standards	CSA, UL

KVA	15-30	45-75	112-150	225-300	450-500	600-1000
H	26	32	42	49	62	76
W	22	26	30	36	52	66
D	18	20	24	27	36	38
D+rs	23	25	31	37	42	44

Options

Temp Rise	80°C, 115°C, 130°C
Electrostatic Shield	Double
Enclosure	Type 2, Type 3R
Thermal Sensors	Center Coil, All Coils

Client	
Project	
Notes	
Date	

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Transformers for UPS Systems

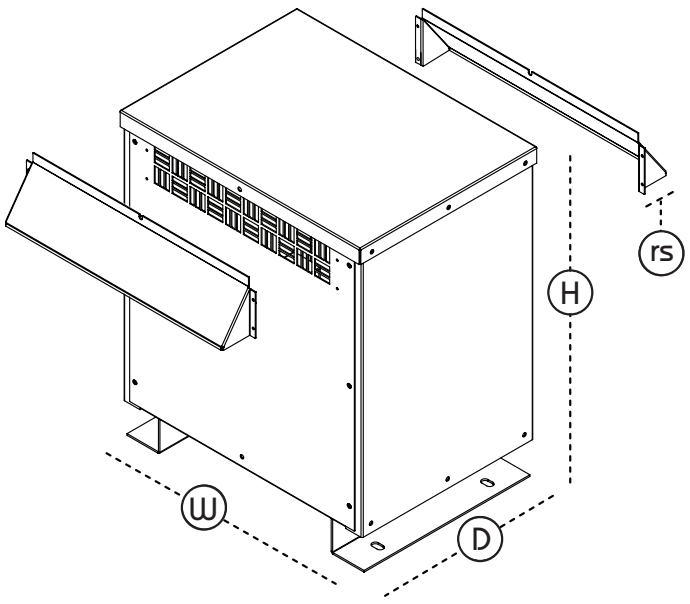
55 Saltsman Drive
Cambridge, ON, N3H 4R7
Tel: 519-653-1847
Fax: 519-653-3658

Winding Configuration

Delta Wye Isolation Transformer
Delta Wye K-Rated Transformer
Auto Transformer
Harmonic Mitigation Transformer 0°
Harmonic Mitigation Transformer 30°

Enclosure Specifications

All dimensions in inches



KVA	10-30	45-75	112-150	225-300	450-500	600-1000
H	26	32	42	49	62	76
W	22	26	30	36	52	66
D	18	20	24	27	36	38
D+rs	23	25	31	37	42	44

Client	
Project	
Notes	
Date	

Available KVA

10	80	380
15	100	400
20	120	450
30	150	480
35	160	500
50	180	625
60	225	750
62.5	320	925
75	350	1000

Standard Features

Input Voltage	600V, 480V, 208V
Output Voltage	600V, 480V, 208V
K-Rating	Load K-Factor upto 20
Phase	3 Ph
Frequency	60 Hz
Winding Material	Copper
Temp Rise	150°C
Insulation Class	220°C
Max Impedance	Auto 1%, Isolation 5%
Minimum Efficiency	Per CSA 802.2
Regulation	Standard
Audible Noise	Per NEMA ST-20
Electrostatic Shield	Auto, No; Iso. Single
Taps	4-2.5%, 2FCAN, 2FCBN
Neutral Rating	200% on Iso. Units
Phase Shift	0° or 30° for Harmonic
Enclosure	Type 1
Applicable Standards	CSA, UL

Options

Temp Rise	80°C, 115°C, 130°C
Electrostatic Shield	Double
Enclosure	Type 2, Type 3R
Thermal Sensors	Center Coil, All Coils

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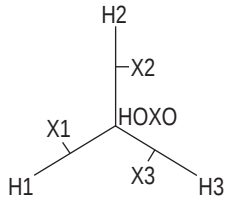
Auto Transformers

55 Saltsman Drive
Cambridge, ON, N3H 4R7
Tel: 519-653-1847
Fax: 519-653-3658

Available KVA	
10	225
15	300
30	450
45	500
75	600
112.5	750
150	1000

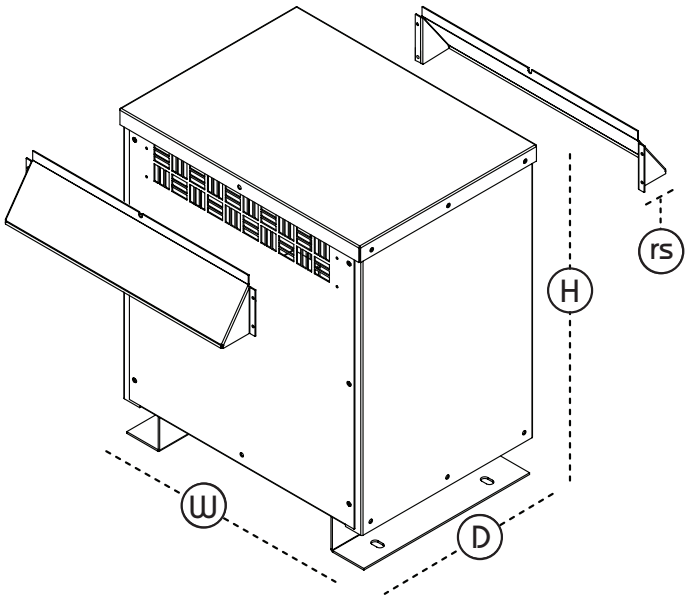
Winding Configuration

Delta Wye



Enclosure Specifications

All dimensions in inches



Standard Features

Input Voltage	208V to 600V
Output Voltage	208V to 600V
Phase	3 Ph
Frequency	60 Hz
Winding Material	Copper
Temp Rise	150°C
Insulation Class	220°C
Max Impedance	Approx. 1%
Minimum Efficiency	Per CSA 802.2
Regulation	Standard
Audible Noise	Per NEMA ST-20
Taps	2-4.5%, 1FCAN, 1FCBN
Enclosure	Type 1
Applicable Standards	CSA, UL

KVA	10-30	45-75	112-150	225-300	450-500	600-1000
H	26	32	42	49	62	76
W	22	26	30	36	52	66
D	18	20	24	27	36	38
D+rs	23	25	31	37	42	44

Options

Temp Rise	80°C, 115°C, 130°C
Enclosure	Type 2, Type 3R
Thermal Sensors	Center Coil, All Coils

Client	
Project	
Notes	
Date	

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Drive Isolation Transformers

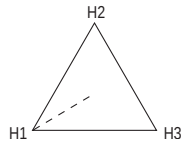
55 Saltsman Drive
Cambridge, ON, N3H 4R7
Tel: 519-653-1847
Fax: 519-653-3658

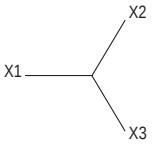
Available KVA

7.5	51	220
11	63	275
14	75	330
20	93	440
27	118	550
34	145	660
40	175	750

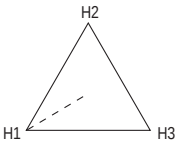
Winding Configuration

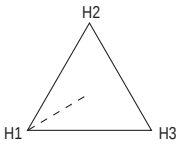
Delta Wye





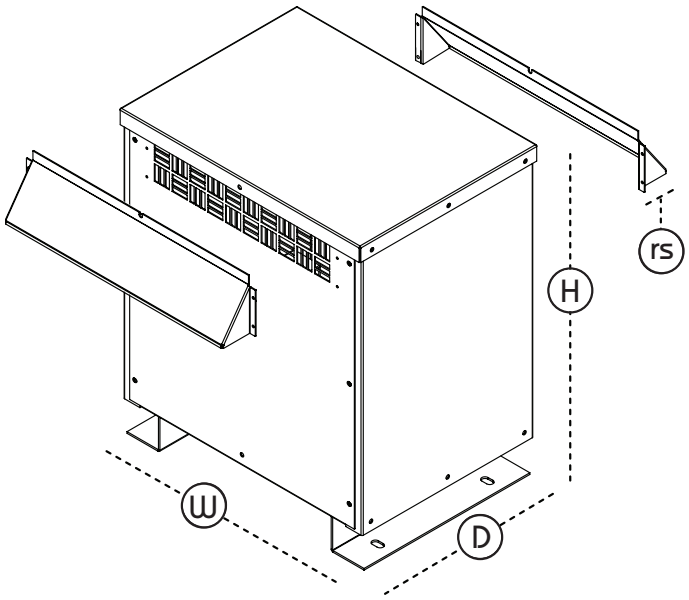
Delta Delta





Enclosure Specifications

All dimensions in inches



Standard Features

Input Voltage	230V to 600V
Output Voltage	230V to 600V
Transformer Type	K13 Rated
Phase	3 Ph
Frequency	60 Hz
Winding Material	Copper
Temp Rise	150°C
Insulation Class	220°C
Max Impedance	Approx. 5%
Minimum Efficiency	Per CSA 802.2
Regulation	Standard
Audible Noise	Per NEMA ST-20
Electrostatic Shield	Included, Single
Taps	4-2.5%, 2FCAN, 2FCBN
Neutral Rating	200% Rated
Enclosure	Type 1
Applicable Standards	CSA, UL

KVA	15-30	45-75	112-150	225-300	450-500	600-1000
H	26	32	42	49	62	76
W	22	26	30	36	52	66
D	18	20	24	27	36	38
D+rs	23	25	31	37	42	44

Options

Temp Rise	80°C, 115°C, 130°C
Electrostatic Shield	Double
Enclosure	Type 2, Type 3R
Thermal Sensors	Center Coil, All Coils

Client	
Project	
Notes	
Date	

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Three Phase Dry Type Power Transformers

Up To 15 MVA, 46 kV 200 kV Bil

INSULATION SYSTEM

Standard: Polyester Varnish Class 220°C Insulation System

Options: Epoxy Cast Class 185°C Insulation System
Epoxy Encapsulated (Epoxy Seal) Class 220°C Insulation System

WINDING TEMPERATURE RISE

Standard: Average Winding 150°C

Option: Average Winding 115°C or 80°C

TYPE COOLING

Standard: ANN Natural Convection Cooling

Options: ANN/ANF Natural Convection Cooling plus Forced Air Cooling with Fans to obtain 33% additional capacity
ANC Totally Enclosed Unit

WINDING MATERIAL

Standard: Copper

Options: Aluminum
Combination of Copper and Aluminum

TAPS AND TAP CHANGER

Standard: Off Load Tap 2-2.5% FCAN and 2-2.5% FCBN Tap Links and Terminal Board

Option: Designed to customer specification

TERMINATIONS

Standard: HV and LV Stub Up

Option: Bussed to customer specification or coordinated to switchgear

BASIC IMPULSE LEVELS

Standard: Designed to CSA Standard C9 and C22.2 No. 47 Standard

Option: Higher Basic Impulse Level to customer specs.

TYPE OF ENCLOSURE

Standard: EEMAC 1 Indoor Ventilated

Options: EEMAC 2 Sprinkler/Drip Proof Ventilated
EEMAC 3 Weatherproof Outdoor Filtered Ventilated/Enclosed

COLOUR OF ENCLOSURE

Standard: ASA 61 Grey Interior and Exterior

Option: Painted to customer specification

IMPEDANCE RANGE

Standard: Designed to CSA Standard C9 and C22.2 No.47 Standard Impedance Range

Option: Designed to customer specification to subject to constructional and Short Circuit Performance constraints

AVERAGE AUDIBLE SOUND LEVEL

Standard: Designed to CSA Standard C9 and C22.2 No. 47 Average Audible Sound Level

Option: Designed to customer specification subject to physical constraints

TESTS

Standard: All Production Tests per CSA Standard C9 and C22.2 No. 47 Production Tests

Options: Temperature Rise
Sound Level
Radio Influence Voltage
Partial Discharges (Corona)
Basic Insulation Impulse Level

OPTIONAL ACCESSORIES

Thermometer, Fans, Mimic Diagram
Lighting Arrestors, Power Supply Transformer,
Special Identification, Interlock Switch, etc.

All Dry Type Transformers are designed, built, and tested to CSA C9 M1981, and are certified by CSA to CSA Standard C22.2 No. 47-M90, up to 12 MVA, 34.5 kV BIL. Liquid Filled Transformers are designed, built and tested to CSA Standard C227.2, C227.4, C@ and C88, up to 20MVA, 72.5kV Class 350 kV BIL.

STI

Three Phase Dry Type Power Transformers

Up To 15 MVA, 46 kV 200 kV Bil

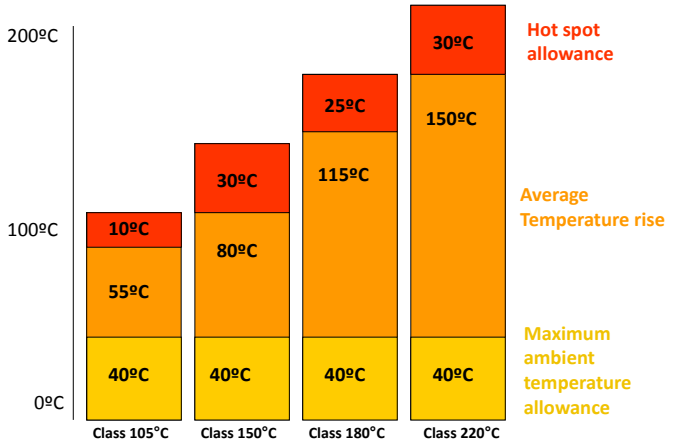
Capacity	Voltage Class	Dimensions (Inches)			Weight	Dimensions (mm)			Weight
(KVA)	(kV)	Width	Height	Depth	(lbs)	Width	Height	Depth	(kg)
500	5/15	58	60	60	4850	1470	1625	1525	2200
	25	58	60	60	4850	1470	1625	1525	2200
	34.5	58	60	60	5060	1470	1625	1525	2300
	46	64	72	64	5830	1625	1830	1625	2650
750	5/15	62	66	66	7700	1575	1675	1675	3500
	25	62	66	66	7700	1575	1675	1675	3500
	34.5	62	66	66	8140	1575	1675	1675	3700
	46	70	74	78	8800	1780	1880	1980	4000
1000	5/15	68	72	68	10120	1730	1830	1730	4600
	25	68	72	68	10120	1730	1830	1730	4600
	34.5	68	72	68	10560	1730	1830	1730	4800
	46	80	84	80	11880	2030	2130	2030	5400
1500	5/15	76	106	76	11000	1930	2690	1930	5000
	25	76	106	76	11000	1930	2690	1930	5000
	34.5	76	106	76	11880	1930	2690	1930	5400
	46	86	114	86	15840	2185	2895	2185	7200
2000	5/15	80	108	78	14800	2030	2740	1980	6400
	25	80	108	78	14800	2030	2740	1980	6400
	34.5	80	108	78	17530	2030	2740	1980	6900
	46	88	118	90	19140	2235	3000	2290	8700
2500	5/15	82	110	80	15840	2080	2795	2030	7200
	25	82	110	80	15840	2080	2795	2030	7200
	34.5	82	112	80	16720	2080	2845	2030	7600
	46	92	120	88	21120	2335	3050	2235	9600
3000	5/15	84	114	82	17160	2135	2895	2080	7800
	25	84	114	82	17160	2135	2895	2080	7800
	34.5	84	116	82	18700	2135	2945	2080	8500
	46	94	124	92	22200	3290	3150	2285	10100
4000	15	90	120	84	20240	2285	3050	2135	9200
	25	90	120	84	20240	2285	3050	2135	9200
	34.5	90	124	84	23100	2285	3150	2135	10500
	46	100	134	96	25520	2540	3400	2440	11600
5000	15	92	122	88	26840	2340	3100	2235	12200
	25	92	122	88	26840	2340	3100	2235	12200
	34.5	92	126	90	28380	2340	3200	2275	12900
	46	104	136	102	21460	2640	3455	2590	14300
7500	25	96	124	94	34540	2440	3150	2390	15700
	34.5	96	124	94	34540	2440	3150	2390	15700
	46	112	140	116	39160	2845	3555	2950	17800
10000	25	112	132	100	41800	2845	3350	2540	19000
	34.5	112	132	100	41800	2845	3350	2540	19000
	46	128	156	126	49280	3250	3960	3200	22400
15000	25	122	140	106	56400	3100	3550	2700	25600
	34.5	122	140	106	56400	3100	3550	2700	25600
	46	138	164	132	66700	3505	4165	3350	30300

All dimensions and weights in the above table are for estimating purposes only.
Dimensions and weights may vary to meet customer designs and performance specifications.
For dimensions and weights of ratings not listed in the table, please contact our office.

STI

Transformer Theory

TEMPERATURE RISE: This is the maximum temperature the transformer cannot exceed at full load and is a based on ambient, temp rise of the transformer and a hot spot allowance on the transformer.



INSULATION CLASS: This is the temperature rating of the insulation material, i.e. the maximum temperature the insulation material has to withstand based on temperature rating, the ambient temperature and hot spot.

TAPS: Transformers are equipped with the option of compensating for system regulation, as well as voltage drops introduced by the transformers themselves, by the use of taps. There are usually two tap positions above the nominal voltage rating and two tap positions below the nominal voltage plus a tap at the nominal voltage. The voltage increments between taps are generally 2 1/2% of the nominal voltage, so the full tap range is ±5%.

LOSSES IN CORE AND WINDINGS: Energy is dissipated in a transformer due to the magnetizing current that is required to take the core through alternating cycles of flux. This is called the core loss, no load loss or iron loss and is independent of the load on the transformer. Load losses, the other component of transformer losses are present only when the transformer is loaded. Load loss is proportional to the square of the load current.

Transformer Sound Level Standards	
Transformer kVA	Average dB
0-9	40
10-50	45
51-150	50
151-300	55
301-500	60
501-700	62
701-1000	64

TRANSFORMER "NOISE": All transformers emit an audible sound. The "hum" is due to the alternating flux in the core. Noise is an inherent characteristic of the core and cannot be completely eliminated. Quality core steel will minimize audible sound levels.

ELECTROSTATIC SHIELDING: Dry type transformers can be manufactured with its windings separated by a grounded metal-foil shield, the purpose of which is to provide electrical noise attenuation.

DIPPING OR VACUUM IMPREGNATION: The practice of dipping core and coil assemblies sometimes leaves air pockets, and the varnish or epoxy does not penetrate the assembly completely. Using vacuum chambers manufacturers are able to remove all air pockets and penetrate the core and coil assembly completely to provide a better insulated transformer that runs cooler and quieter.

ENCLOSURE: Standard enclosure is usually Type 1 but the enclosure should be selected based on application and installation. Type 3R for outdoor use and totally enclosed units are options.

TRANSFORMER TESTING

All transformers are subjected to the following routine tests.

- Voltage ratio and polarity
- Winding resistance
- Impedance test
- Dielectric tests
- No load losses and current

Special tests of the following variety can also be conducted. These can usually be witnessed for a fee.

- Basic Impulse Level test
- Partial discharge test
- Heat run test
- Noise level test
- Short circuit test

DWG. NO.	SH	REV.
ST50012RT	1	N/C

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED

WWW.STIPOWER.CA

45 KVA, 3 PHASE, 60 Hz
INPUT: 600 VOLTS WITH 2-2.5% FCAN & 2-2.5% FCB
OUTPUT: 208Y/120
LOAD K-FACTOR: 13
SHIELD BETWEEN PRIMARY AND SECONDARY
AUDIBLE NOISE: 48 db
ENCLOSURE TYPE: NEMA 3R
TEMPERATURE RISE: 150°C AMBIENT: 40°C
NO-LOAD LOSSES: 245 WATTS
FULL-LOAD LOSSES: 1491 WATTS
%IR: 2.77 %IX: 2.30 %IZ: 3.60
PEAK INRUSH CURRENT: 574 AMPS
(13.2 TIMES INPUT FULL-LOAD)
EFFICIENCY:
25% LOAD: 97.21% 50% LOAD: 97.59%
75% LOAD: 97.27% FULL LOAD: 96.79%
35% LOAD (TP1): 97.72%

INPUT TERMINALS: .13x0.75 CU @ ø.281 HOLE
OUTPUT TERMINALS: .25x1.00 CU @ ø.281 HOLE
GND TERMINAL: AL LUG FOR 2-14 AWG WIRE

55 Saltsman Drive
Cambridge, ON, N3H 4R7
Tel: 519-653-1847
Fax: 519-653-3658

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON:
.X DECIMAL ±.125
.XX DECIMAL ±.0625
.XXX DECIMAL ±.03125
ANGLES ±2°

CAD FILE NAME: ST50012RT_1

DO NOT SCALE DRAWING

MODEL NUMBER: STKTCA0045ABA6DYC

APPROVALS	DATE
DRAWN P. SINGH	11/11/18
CHECKED O. MOLINA	11/11/19
ENGR A. BAJWA	11/11/19
DESIGN ACTIVITY	

TITLE: TRANSFORMER NEMA 3R
45 KVA K13 600/208Y120

SIZE	CAGE CODE	DWG. NO.	REV.
B	86301	ST50012RT	N/C

SCALE: NONE WT. CALC.: 481 LBS SHEET 1 OF 1