

# DRY-TYPE TRANSFORMER



**DELTA STAR**  
**Power Mfg. Corp.**

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**D**ELTA STAR Dry Type Transformers are rated 600 volts and below for supplying appliance, lighting and power loads from electrical distribution systems. Capacity ratings are available from 5 to 1500 KVA. Standard distribution voltages are 480 and 240 Volts; standard load voltages are 480, 380, 240, 208 and 120 volts. (However, other voltages as per customer's specifications can be made available in a case to case basis). The transformer is used to match the load voltage to the distribution voltage. Since no vaults are required for installation and they are housed in free-standing enclosures, these transformers can be located right at the load to provide the correct voltage for the application. This eliminates the need for long, costly low voltage feeders.

Delta Star Transformers are designed, manufactured, and tested in accordance with all applicable ANSI/NEMA & IEEE Standards.

All Delta Star Transformers are designed for continuous operation at rated KVA, 24 hours a day, 365 days a year.



## CORE AND COIL ASSEMBLIES

Transformer cores are constructed with high grade, non-aging, grain-oriented silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Maximum magnetic flux densities are substantially below the saturation point. The core volume allows efficient transformer operation at ten percent (10%) above the highest tap voltage. The core laminations are tightly clamped and compressed. Coils are wound of electrical grade fiberglass-coated aluminum with continuous wound construction. The coil assembly are impregnated with a non-hydroscopic thermo setting varnish and cured to reduce hotspots and seal out moisture.

Low core loss and winding loss are thus guaranteed. (Refer to page 8 for transformer losses).



## INSULATION SYSTEM

All insulation materials are flame-retardant and do not support combustion.

Transformers are insulated at 220°C with 150°C rise. Required performances are obtained without exceeding the above rise in a 40°C maximum 30°C average ambient temperature.

## ENCLOSURES

The enclosures are made of heavy gauge steel and are degreased, cleaned, primed, and finished with gray color weather-resistant enamel.

On ventilated designs, the side enclosures are constructed with drip-proof louvers, with lifting holes. This ensures easy heat dissipation. All ventilation openings are protected against falling dirt.

All transformers are equipped with a wiring compartment suitable for conduit entry and large enough to allow convenient wiring. The maximum temperature of the enclosure does not exceed 90°C.

The core of the transformer is visibly grounded to the enclosure.

## TESTS

The following test are conducted on all transformers:

1. Ratio tests on the rated voltage connection and on all tap connections.
2. Polarity and phase-relation tests on the rated voltage connection.
3. Insulation resistance test.
4. No-load and excitation current at rated voltage.
5. Impedance measurement.

### SPECIFYING THE TRANSFORMER NEEDED:

- Determine the primary voltage – the source voltage presently available.
- Determine the secondary voltage – the voltage needed at the load.
- Determine the KVA load, allowing room for expansion.
- For three phase transformers, determine connection vector configuration.

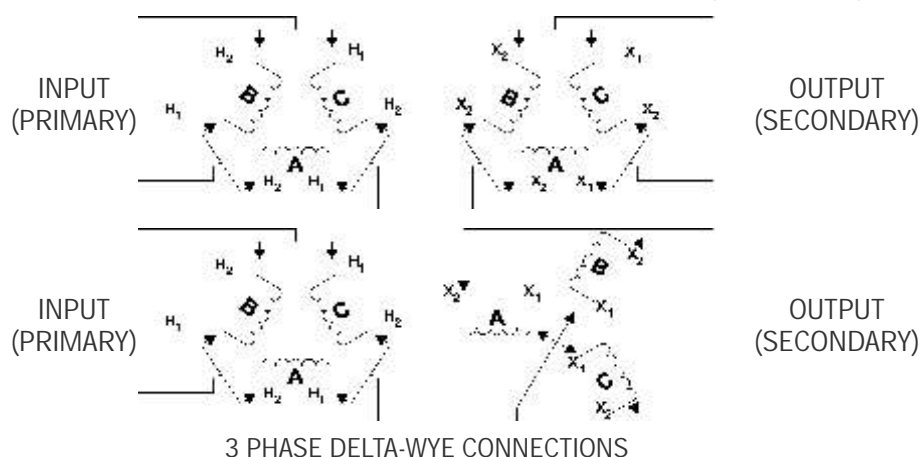
Basically the above specifications are sufficient to determine the right transformer for your need.

## THE FOLLOWING ITEMS MUST ALSO BE CONSIDERED IN SELECTING THE RIGHT TRANSFORMER FOR YOUR PARTICULAR APPLICATION:

Transformer taps compensate for high or low line voltages. Standard three phase taps are two (2) 5 percent taps below normal on all transformers. This arrangement provides a 10-percent range of tap adjustment. However, voltage tap arrangement could be designed as per customers' specifications.

### SINGLE - AND THREE- PHASE CONNECTIONS

The single-phase transformers can be connected as a three phase bank. Each single phase transformer is rated one-third the bank KVA rating. See diagrams for typical connections.



When three phase loads are to be supplied, single unit three-phase transformers should be specified. Primary to secondary winding connections can be chosen on any of the following configurations.

- a) delta-wye
- b) delta-delta
- c) wye-delta
- d) wye-wye

Please refer to wiring diagrams for single-phase and three-phase transformers on page 6.

For approximate weight and dimensions, refer to 7 & 8

## **SERIES AND MULTIPLE CONNECTIONS (SINGLE PHASE TRANSFORMERS ONLY)**

Transformers with two (2) identical voltage (i.e., 120/240 or 120 x 240) may be connected either in series or in parallel. Connected in series, the transformer will provide the higher voltage (240 Volts); connected in parallel, the lower voltage (120 Volts) is obtained.

## **K-RATED TRANSFORMERS**

Over the past years, new electronic equipment have been studied to produce harmonics that create non-linear current load which in turn generate extra heat in distribution transformer windings.

Technically-designed K-Rated Transformers by Delta Star are available to efficiently supply power to such various electronic equipment and neutralizing the problem of overheating.

## **AUTO TRANSFORMERS**

An auto transformer has only one (1) winding and therefore, is smaller and economical than conventional two (2) winding transformers; they can be used in banks on three-phase circuits or single phase to perform the same functions as transformers, with the exception of two (2) isolating circuits. Single unit Three-phase auto transformers are available as well.

## **REDUCED VOLTAGE AUTOSTARTERS**

Auto transformers as motor starters are also available at 220 & 440V ratings. Voltage taps are standard at 50%, 65% and 80%. Auto transformers with special voltages up to 4160V can be fabricated upon customer's request.

## IMPORTANCE OF SOUND LEVELS IN TRANSFORMERS

All transformers make some sound... due to the vibration generated within the magnetic steel core.

Fortunately, the noises in and around most locations – “the ambient sound level” – usually mask transformer sounds if certain precautions are taken in selecting and in installing the unit.

Not all noise can be heard!

To illustrate: you are riding in your car, the radio and heater are on. Everything's fine ... no annoying rattles.

If you turn the heater off, you hear slight rattles and squeaks. If you turn the radio off, you'll hear even more noises. The noises you hear were there all the time... which brings us to an important truth about sound: only the loudest sounds are heard. Still not convince? Shoot off cannon and drop a pin at the same time. Which do you hear? And yet the pin did make a sound when it struck.

Let's illustrate this principle with transformers: a 50 db transformer located in a 60 db ambient noise level- say an office with typewriters chattering, telephones ringing – wouldn't bother anyone. The office noises drown out the humming of the transformer. But at night, the ambient sound level drops, and the humming becomes quite apparent.

Delta Star Transformers core are clamped tightly and coils are wound tightly. Thus sound levels of Delta Star Transformers are guaranteed to conform with ANSI-C89 specifications.

# WIRING DIAGRAMS

## 1) Single-phase with taps

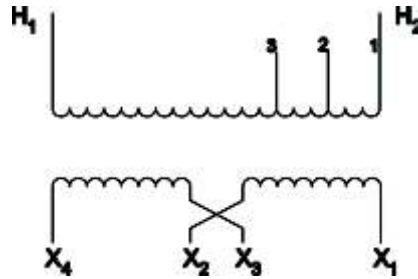


Diagram 1

## 2) Delta-wye

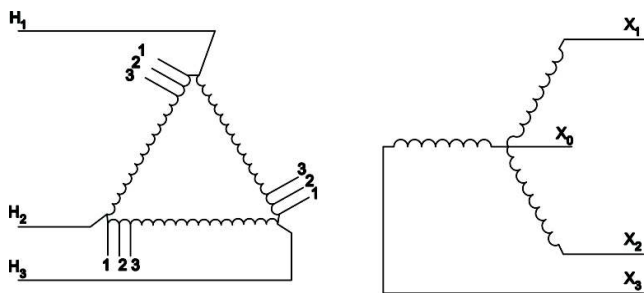


Diagram 2

## 3) Delta-delta

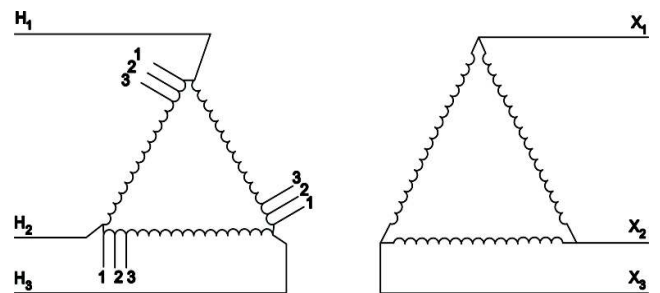


Diagram 3

## 4) Wye-delta

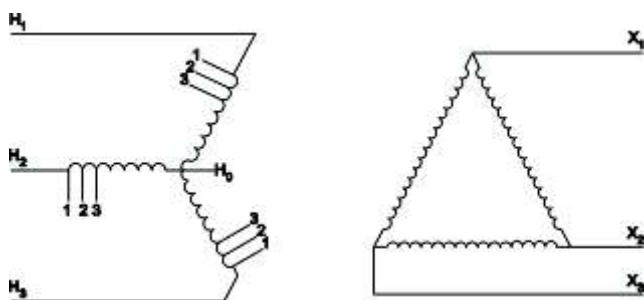


Diagram 4

## 5) Wye-wye

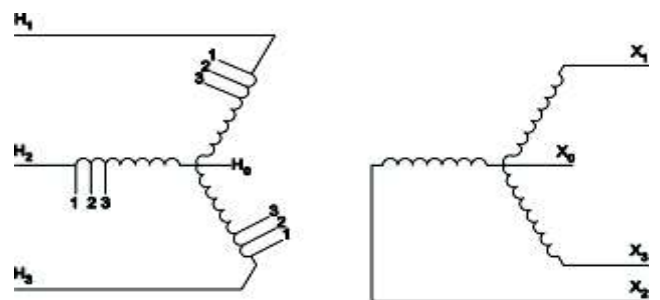


Diagram 5



# DIMENSIONS

## TRANSFORMER DIMENSIONS



Note: Dry-type Transformers rated 300 KVA and above are equipped with blowers.

## TYPICAL CORE & COIL ASSEMBLY



# DIMENSIONS

## SINGLE PHASE DRY TYPE TRANSFORMERS

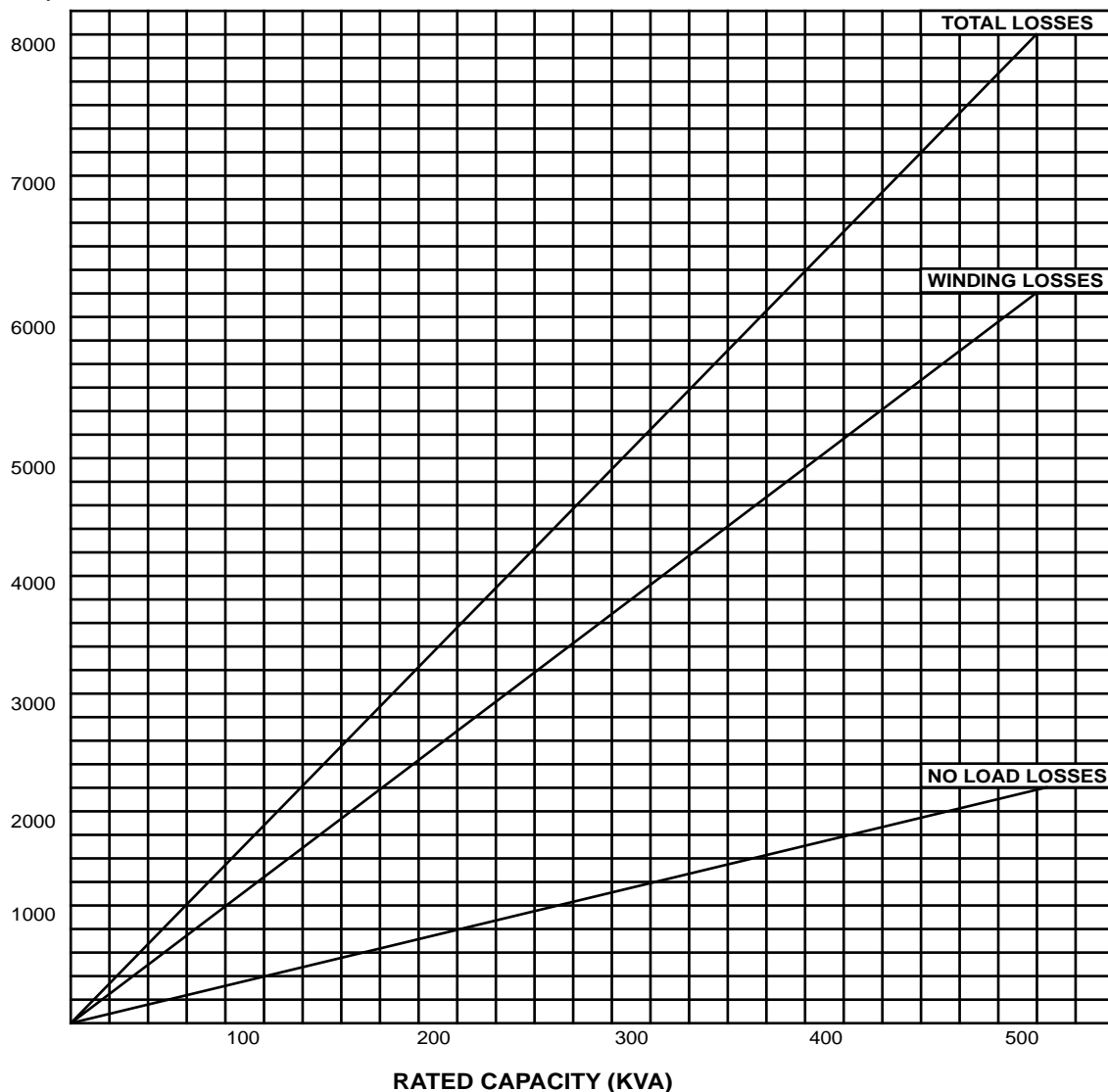
KVA	Approx. Net Wt. in kgs.	Approximate Dimensions in Inches		
		Height	Length	Width
5	45	6	12	12
7.5	55	18	14	14
10	65	20	15	15
15	80	24	17	17
20	90	26	18	18
25	115	28	20	20
30	135	32	20	20
45	165	34	22	22
50	195	34	22	22
75	265	36	26	26
112.5	335	40	26	26
150	440	46	30	30
225	570	48	32	32
300	780	52	36	36

## THREE PHASE DRY TYPE TRANSFORMERS

KVA	Approx. Net Wt. in kgs.	Approximate Dimensions in Inches		
		Height	Length	Width
5	45	16	22	12
7.5	55	18	21	13
10	65	18	22	14
15	80	20	22	15
20	90	21	23	16
25	115	23	23	16
30	135	31	24	16
45	165	32	24	18
50	195	32	24	18
75	265	36	32	22
112.5	335	40	32	22
150	440	46	35	24
225	570	48	38	25
300	780	52	42	30
400	955	58	48	32
500	1070	58	48	32
750	1565	68	60	48
1000	1950	76	60	48

## LOSSES OF DRY TYPE TRANSFORMERS

**LOSSES (WATTS)**



**A. INSPECTION**

When Delta Star Transformer is received, please check the following:

1. Whether the ratings on the nameplate such as the capacity, voltage, frequency, etc. are the same as those you requested.
2. Whether there are any damage caused during transport. If there exists a part which malfunctions, please contact immediately the agent where you purchased the transformers.

**B. OPERATION**

After wiring and installation have been completed, examine the following items prior to energizing the transformer:

1. Are the fuses/circuit breakers on the line side and load side adequate?
2. Measure the insulation resistance between primary and secondary, primary to ground, and secondary to ground.
3. Double check all connections, especially for short circuits and ground on the load side.
4. Is the grounding wire securely connected?
5. Finally, check the connections of the high tension lines to the transformer terminals, energize the transformer.
6. Check the output voltage if the desired value is realized. Adjust the tap-changer position accordingly until desired voltage is attained.
7. Finally, load the transformer in possible increments.

**C. MAINTENANCE**

Periodical maintenance should be conducted as follows:

1. Check abrasion of painted surface. Determine causes and remedy.
2. Visual check / inspect for possible overheating sections of the coil and of the other live parts.
3. Retighten bolts and units on primary and secondary terminals.
4. Check whether the grounding wire is still securely fastened.
5. Check insulation resistance.



# DELTA STAR

" THE TRANSFORMER PEOPLE "

- Substation Engineers
- Transformers
- Consultants

## SALES

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- GENERAL REPAIR/RECONDITIONING OF POWER AND DISTRIBUTION TRANSFORMERS
- MANUFACTURING OF DRY-TYPE TRANSFORMERS AND MOTOR AUTO-STARTERS
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- DISTRIBUTION TRANSFORMERS

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- TRANSFORMER TURN-RATIO (TTR) TEST SET
- AUTOMATIC OIL DBV TESTER (60 KV)
- RELAY CALIBRATION TESTER
- LOW RESISTANCE OHMMETER
- EARTH/GROUND RESISTANCE TESTER
- OIL FILTER PRESS/ PURIFIER
- SERVICE GENERATOR



DRY-TYPE TRANSFORMER  
(FROM 3KVA UP TO 2000KVA)



DISTRIBUTION TRANSFORMER



3 PHASE POWER TRANSFORMER  
(1MVA TO 20 MVA)

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