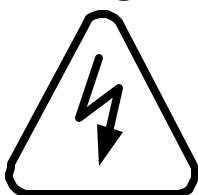


## Powersmiths Dry Type Transformers 600V and under Installation, Operation and Maintenance

### Safety Instructions

**Important Notice:** Retain these instructions for future reference. Failure to follow these instructions could result in serious injury or death. Powersmiths International accepts no liability from damages arising from handling, miss-installation or miss-application of this product.

#### DANGER



#### HAZARD OF ELECTRIC SHOCK OR ARC FLASH

This equipment to be installed and maintained only by qualified personnel  
Use appropriate personal protective equipment (PPE) and follow safe electrical work practices (see NFPA 70E)  
Before working on this equipment ensure that all power is off and locked out  
Ensure all covers and doors are in a closed condition prior to applying power

**FOR YOUR SAFETY: IT IS IMPERATIVE THAT POWER BE PROVEN DISCONNECTED BEFORE ANY WORK ON OR PHYSICAL CONTACT TO ELECTRICAL CIRCUITS IS ATTEMPTED. DO NOT ASSUME BUT CHECK ACROSS THE LINES AND TO GROUND WITH A SUITABLE METER AND ENSURE THAT THE SOURCE DISCONNECTION DEVICES ARE SECURELY LOCKED OUT**

### Receiving and Handling

#### Inspection

Upon receipt of the equipment, immediately inspect for damage that may have occurred during transit. Any damage claims are to be filed with the carrier and reported to Powersmiths expeditiously.

#### Storage

Store Transformers in a dry and clean location protected from the elements if stored outside and also ensure that the ventilation openings remain covered to prevent the entry of dust. No special precautions are required for temperature extremes in the range of  $-40^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$ .

#### Handling

#### CAUTION



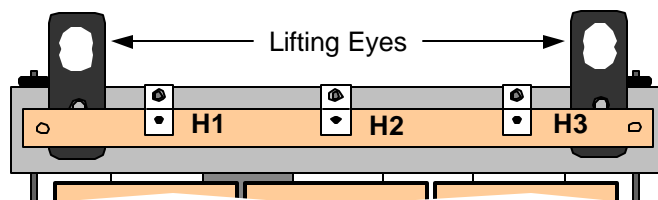
Transformers can be very heavy with a relatively high center of gravity

Handle with care and move slowly to avoid tipping

Ensure that lifting devices evenly distribute the load over the base or lifting eyes

Powersmiths Transformers are shipped using Powersmiths "Easy Skid" (except core and coil units which are shipped on skids and equipped with lifting eyes) which is designed to minimize the use of shipping materials, maximize shipping efficiency and facilitate easy moving and safer installation.

The transformers are also equipped with lifting eyes to facilitate lifting with cable hooks. To access the lifting eyes for indoor type transformer enclosures, remove case covers and top, lifting eyes are attached to the top of the transformer bracket (illustrated opposite).



## Installation

### Transformer Installation Notes

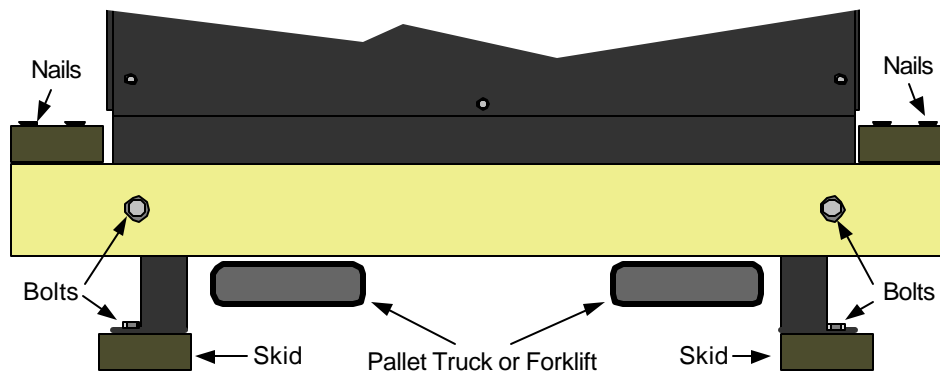
The following notes are provided as a guide to installation of the transformer; for more indebt installation guidelines refer to ANSI/IEEE C57.94-2002 (Recommended Practice for Installation, Application, Operation and Maintenance of Dry-Type General Purpose Distribution and Power Transformers)

- Check that the nameplate ratings (Voltage/Power) of the Transformer matches the site requirements
- Requirement of 6 inches minimum between the ventilation openings and adjacent surfaces
- Front access space requirement for installation, inspection and service (re NEC)
- Mounting to a non-combustible floor only
- Wiring access availability through sides or bottom (see “Outline Dimensions and Wiring Access”)
- Ventilation must be adequate to remove heat from room
- Environmental conditions – Temperature and Water (may require N3R option; shields and gasketing)
- N1000 units to be located at the source (non-linear loads) of the harmonics to be treated
- Transformers generate Audible noise which can propagate through walls

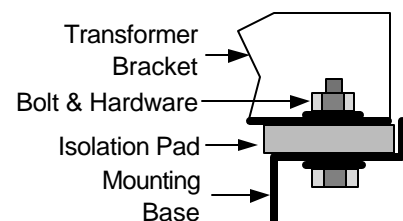
*Note: Where sound levels may be of concern (in close proximity to people), a low noise model (-SE) is recommended and/or utilize the services of a recognized acoustical consultant to provide the proper installation environment to minimize noise and vibration transmission*

### Moving and Mounting

- Locate the transformer in the desired location using a Pallet or Forklift truck and while still supported remove the protective wooden skids from the mounting base as illustrated below



- To use internal lifting eyes, unbolt and remove Front/Rear covers and Top and attach lifting device to the lifting eyes attached to the top of the Transformer bracket
- Mark out and drill the mounting holes by which the Transformer will be secured
- Lower the Transformer onto the mounting area and secure to the floor
- Carefully remove the wooden side protective wooden skirts using a claw hammer and unbolt and remove the front and back protective wooden skirts (Note: Outdoor cabinets require inside access)
- Unbolt and remove (or open where hinged) the front and rear covers (if not already done)
- Locate the four Transformer mounting bolts and back off to finger tight, then retighten one full turn as illustrated



## Connection Guidelines


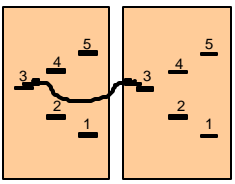
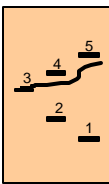
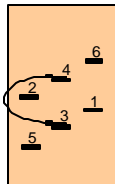
- Identify the applicable Terminal and Phasor diagram from the Nameplate and figures provided at the end of this bulletin; Input is labeled H\* and Output X\* (\* indicates terminal number)
- Wire according to the relevant National Electric Code (NEC) or prevailing electrical code requirements with the following additional considerations:
  - Safety Grounding of the enclosure is mandatory (core internally bonded to case)
  - A Neutral to ground bond is mandatory either at the transformer or at distribution panel
  - Neutral wiring normally requires over-sizing for non-linear loading  
*Note: All Powersmiths Transformers are equipped with a 200% rated neutral*
  - Multi-output Secondaries must be protected to a maximum of 60% of the total load
  - For outdoor installations seal connections with an approved electrical joint compound
- N1000 Models are for local Harmonic treatment and are connected to the circuit by the X\* terminals
  - Unit is to be protected by fuse or breaker to the listed Nameplate current rating
  - Neutral must be oversized to 200% of nominal current rating
- Lugs are not normally supplied for Transformers 112kVA and larger but may be ordered as a Lug Kit
- An Electrostatic shield (when supplied) is normally factory bonded to ground; additional shields are identified by S1 / S2 / S3 etc. for connection by the user to the desired grounding potential
- Torque all connections and check all internal bolted bus-bar connections for tightness
- Terminals are designed to support the weight of wires specific to its own connection  
*Note: Do not allow wires from the other terminals to load adjacent ones (weight can be significant)*

## Startup and Operation

- Check connections for tightness, clearances and presence of loose strands
- Close/install all covers/doors and install external optional hardware (eg. rain shields) prior to energizing
- Energize and check output voltages and phase rotation at the downstream distribution point
- Should Voltage adjustment be required follow Tap adjustment procedure
- No operator input is required for normal operation but refer to section on Maintenance

## Tap Adjustment Procedure

Taps are used to adjust for the average available input voltage or to 'tweak' the output voltage (e.g. adjust for cable voltage drops). Transformers are normally supplied with two 2½ % Taps above nominal (2 x 2½ % FCAN) and two 2½ % Taps below (2 x 2½ % FCBN) and factory set at the nominal setting. The Tap adjustment procedure is as follows using 480V input by way of illustration:

DANGER  See safety Instructions	Single Phase		Three Phase					
	Tap	Link	Tap	Link	Tap	Link		
	504	1 - 1		504	1		504	1 - 2
	492	2 - 2		492	2		492	2 - 3
	480	3 - 3		480	3		480	3 - 4
	468	4 - 4		468	4		468	4 - 5
	456	5 - 5		456	5		456	5 - 6

### To adjust for:

- |                           |   |
|---------------------------|---|
| ▪ Higher Input voltage    | Unbolt Tap and reconnect to a higher voltage output setting |
| ▪ Lower Input voltage     | Unbolt Tap and reconnect to a lower voltage output setting  |
| ▪ Reduce output voltage   | Unbolt Tap and reconnect to the next higher voltage setting |
| ▪ Increase output voltage | Unbolt Tap and reconnect to the next lower voltage setting  |

*Note: Refer to Transformer Nameplate for specific Voltage and Tap configurations as some models are equipped with two 5% taps and others six 2 ½% taps or more*

## Options

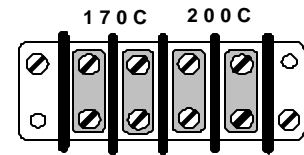
Please refer to the specific equipment bulletin/manual for more complete information on the listed options.

### Thermal Sensors

Thermal sensors (when supplied) are wired and mounted to the upper Transformer bracket and are for user connection.

Electrical Rating is 1amp @ 250VAC or 24VDC max.

Wiring must be rated for the Transformer voltages and it is recommended that it be separately run from the power wires to avoid interference



### Smart-1 Package

The SMART-1 option provides a convenient externally accessible metering access Port, which facilitates for quick and accurate system Commissioning, Maintenance, Power, Power quality and Efficiency measurements. It is a factory-installed option mounted on the top right of the transformer cabinet and integrates fused voltage terminals and precision Cts with shunt switches and open-circuit CT protection.




### Cyberhawk-TX

The *Cyberhawk -TX* option is an energy and power quality monitor, which is integrated with Powersmiths Transformers (mounted on the top right corner of the cabinet). It measures electrical parameters (V, I, THD, kW, kWh, kVA, VAR, PF, SH, etc.) and provides date stamped event recording of deviations from user set points, including Sags and Swells. It also directly measures the efficiency of the Transformer under real world operating conditions. Communication options include an integral server gateway (ISG), which facilitates remote access to the data coupled with email notifications of critical alarms.



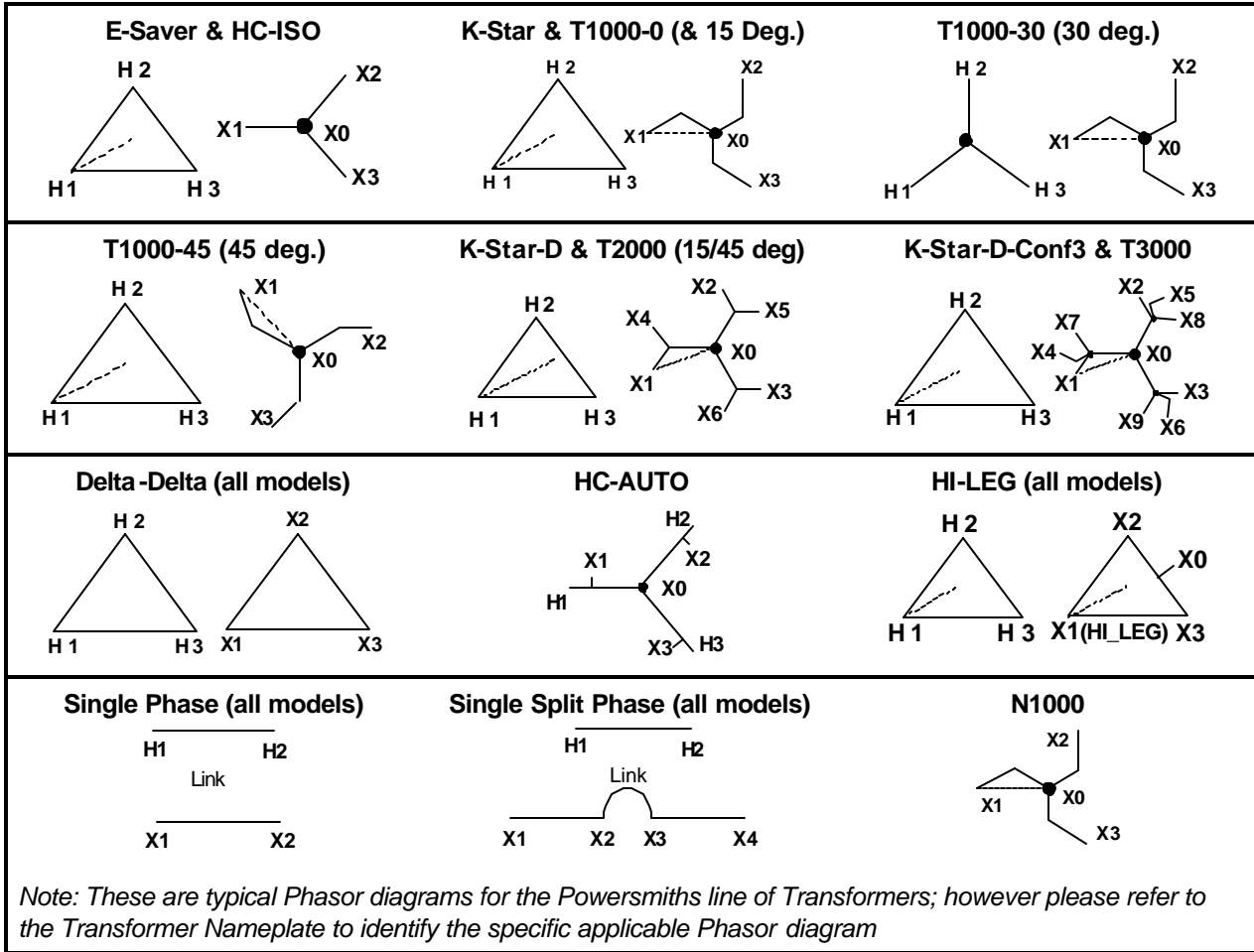
## Maintenance

Transformers require periodic attention and maintenance in order to ensure trouble-free service. An annual maintenance regime is normally adequate but should be more frequent for adverse environmental conditions (eg. airborne contaminants, etc.). Following is a suggested maintenance regime;:

Maintenance Schedule	Procedure
Monthly	Check that the air intakes at the bottom and sides are not obstructed by foreign objects
Bi-annual	Check for external dust buildup and if significant schedule an annual maintenance procedure as soon as convenient
Annual  See safety precautions	<p>Power checks (at the down stream distribution panel):</p> <ul style="list-style-type: none"> <li>- Check that loading is in correct range for the transformer</li> <li>- Check load balance per phase and redistribute loading if possible</li> </ul> <p>Visual Checks: De-energize transformer and remove covers, then:</p> <ul style="list-style-type: none"> <li>- Vacuum or blow off (dry compressed air) any excessive dust buildup from windings, terminals and core</li> <li>- Check for signs of discoloration on the coils and terminals (overheating)</li> <li>- Check that connections are tight and re-torque as required</li> <li>- Check for traces of carbonization on coils (ionization)</li> </ul>

*Note: For more in-depth recommendations refer to ANSI/IEEE C57.94-2002 (Recommended Practice for Installation, Application, Operation and Maintenance of Dry-Type General Purpose Distribution and Power Transformers)*

Connection and Phasor Diagrams

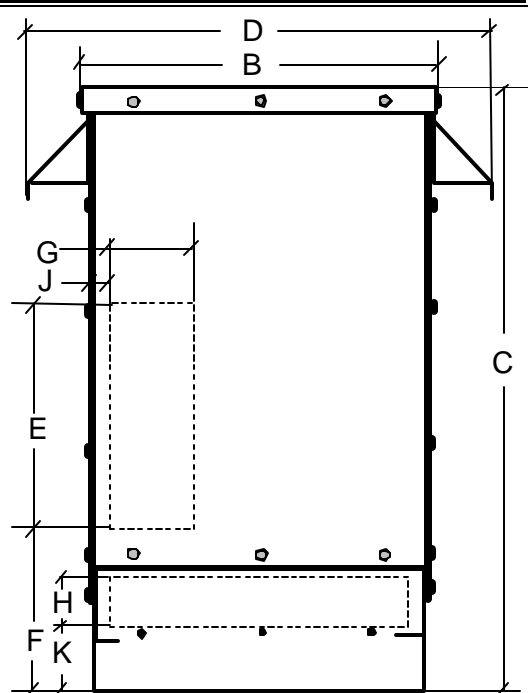


Outline Dimensions and Wiring Access

	A-Case	B-Case	C-Case	C-Plus	D-Case	D-Plus	E-Case	E-Plus	F-Case
A	17.4	25.4	31.4	31.4	37.4	37.4	51.4	51.4	63.4
B	16.8	17.8	21.5	22.5	26.5	31.5	31.5	37.5	44.5
C	27.1	29.9	39.9	39.9	47.6	51.6	60.6	60.6	66.6
D	24.3	25.3	29.3	33.3	34.3	39.3	39.3	45.3	52.3
E+	9	9	16	16	21	24	28	30	36
F	11	11	11	11	11	13	14	14	14
G+	4	6	6	6	7	8	9	10	11
H	3	3	3	3	3	5	5	5	6
J*	1	1	1	1	1	1	1	1	1
K	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5

**Notes:**

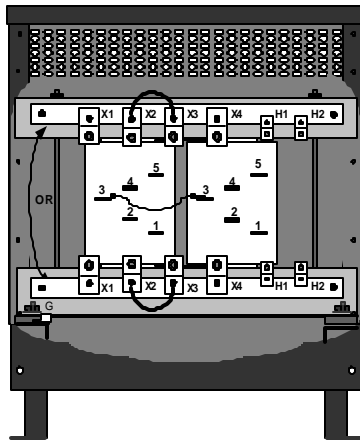
- All dimensions in inches
- 'A' dimension is width (not illustrated)
- \* is Minimum & + is maximum recommended
- 'D' dimension only with rain-shields installed
- Wiring permissible through bottom grille which is at height K-1.0 inches from footing



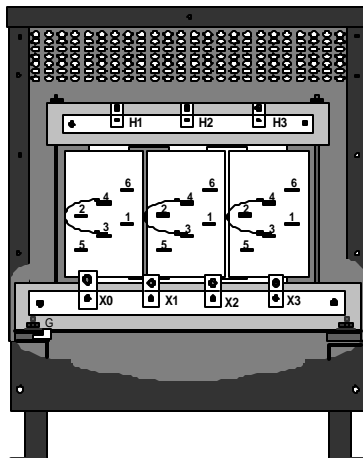
*Note: Dotted lines for side wiring access area; Bottom wiring access permissible (not shown)*

Terminal Layouts

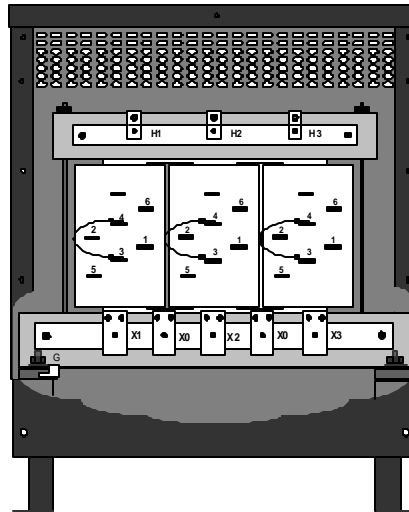
Single Phase  $\leq 167\text{kVA}$



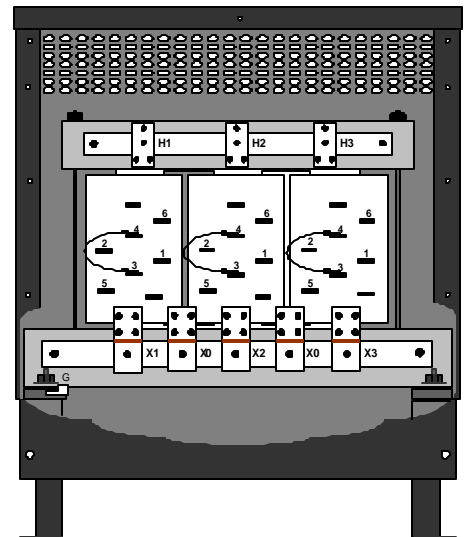
Three Phase  $\leq 75\text{kVA}$



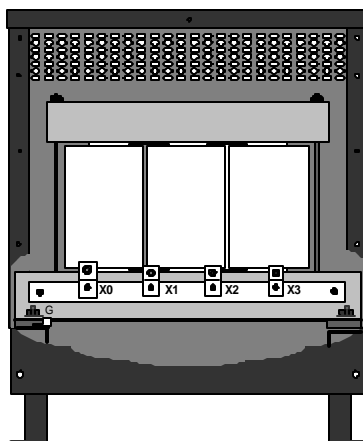
Three Phase 112 – 150kVA



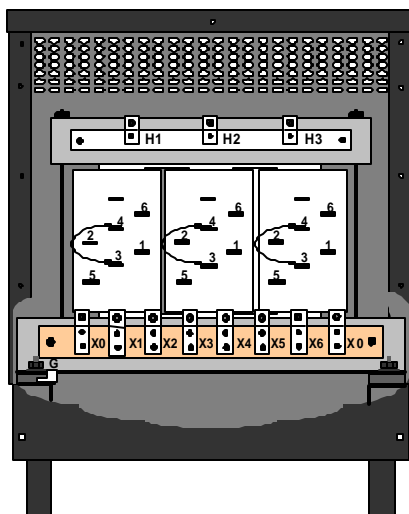
Three Phase  $\geq 225\text{kVA}$



N1000



Three Phase Dual Output



Three Phase Triple Output

