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Instruction Sheet

Subject: Boost Transformer Installation

APPLIES TO MANITOWOC PART NUMBER 000010862 ONLY

MANUFACTURER SOLA-HD CATALOG #HS19F500B

Boost Transformer Installation

⚠Warning

Authorized Service Representatives are obligated to follow industry standard safety procedures, including, but not limited to, local/national regulations for disconnection / lock out / tag out procedures for all utilities including electric, gas, water and steam.

⚠DANGER

Disconnect electric power to the ice machine at the electric switch box before proceeding. Failure to disconnect the power at the main power supply disconnect could result in serious injury or death. The power switch DOES NOT disconnect all incoming power.

Application Limitations with Boost Transformers

1. Three phase applications require two transformers.
2. The frequency of the transformer must match the frequency of the load (50 or 60 Hz).
3. A Boost transformer cannot be used to develop a three phase, four wire wye circuit from a three phase, three wire delta circuit.
   A delta to wye connection does not supply enough current carrying capability to provide for unbalanced currents flowing in the neutral wire of the four wire circuit. The neutral created is not stable and under load will not deliver desired line to neutral voltages. This connection would also be in violation of the National Electric Code, Article 210-9.
4. Buck-Boost transformers cannot be used in a closed delta connection.
   A closed delta requires more KVA capacity than a wye or an open delta connection, plus phase shifting comes into play on the output side.
5. Buck-Boost transformers should not be used to correct for voltage drop on a long circuit run where the load fluctuates.

   Voltage drop varies with the load and buck-boost transformers are connected for a specific voltage change. If a buck-boost transformer was used to correct voltage drop during peak loading conditions, high voltages may result under light load conditions. This could be equally detrimental to the load and possibly pose safety hazards.
6. Buck-Boost transformers cannot be used to create a 240/120 Volt, single phase service from a 208Y/120Volt three phase supply.
   Two problems are created if you were to try this:
   A. Two neutrals would exist on the same circuit. Since neutrals must be grounded according to the National Electric Code, a short circuit would be created.
   B. Unbalanced line to output neutral voltages would be created; one line would read 120 Volts, the other 130+Volts.

⚠DANGER

There is the potential of electric shock whenever working in or around electrical equipment such as transformers. Power must be shut off before any work is conducted on a transformer.

This transformer must be installed according to the requirements of the national and local electrical codes. ANSI/IEEE C57-94 can be referenced for recommended installation, application, operation and maintenance of dry-type transformers.

1. Do not install the transformer until a full inspection has been completed.
2. Use terminals only for electrical connections, and flexible connectors are recommended.
3. Connections should only be in accordance with the nameplate diagram or connection drawings.
4. Make sure all power is disconnected before attempting any work on the transformer.
5. Make certain all ground connections are complete and tightened before energizing the transformer.
6. Do not attempt to change any taps - primary or secondary, while the transformer is energized.
7. Do not change connections when the transformer is energized.
8. Do not adjust or remove any accessories or cover plates while the transformer is energized.

Installation

This transformer is equipped with a NEMA 3R enclosure. NEMA 3R units may be installed indoors or outdoors where applicable.

- Locate as close to the equipment as possible, while adhering to the requirements listed and applicable codes.
- For any outdoor location, the appropriate applicable codes must be followed including cable installation and hardware suitable for outdoor service. Water tight couplings must be used at the knockouts.
- Encapsulated transformers must be located in an upright position on walls, posts, beams or other locations capable of supporting their weight.
- If encapsulated units are to be either stored or installed outdoors, the unit must be oriented vertically with the wiring compartment down to prevent the ingress of moisture.
- Units should be mounted away from corners or reflecting walls or ceilings.
- Cable or other flexible conduit should be considered to make connections.
- Acoustically absorbing materials could be considered for walls and ceilings around the unit.
- The location of the unit should be located as far as practical from areas where sound levels could be considered undesirable.

MOUNTING INSTRUCTIONS

1. Select an installation location that is on a non-combustible surface.
2. The mounting location must allow for air circulation around the transformer for cooling purposes.
3. Using the appropriate mounting template provided, drill the top two mounting holes on the mounting surface.
4. Lift the transformer into position and install the top two mounting bolts.
5. With the transformer hanging on the top two mounting bolts, level the unit, then with the wiring compartment cover open, mark and drill the lower mounting hole(s) into the mounting surface.
6. To provide NEMA 3R protection (protection from falling rain), the transformer must be mounted vertically with the mounting tabs facing up.
7. Install the lower mounting bolt, lock washer, flat washer and rubber washer into the lower mounting hole(s).

VENTILATION

Transformers are required to be installed in an area where they can be cooled by means of the free circulation of air where the average ambient temperature is 30°C (86°F) and should not exceed 40°C (104°F) at any time.

Adequate ventilation is essential for transformers to meet their nameplate kVA capability. Locate the transformer at least 2 inches on units up to 10kVA and at least 4 inches on units over 10kVA, away from walls or any other obstructions to allow free, clean circulation of air.

ACCESSIBILITY

NEC standards require that transformers be accessible for inspection and located accordingly.

However, transformers should not be located in areas where stored items are likely to interfere with either natural air convection or the capability to have them inspected. Passage ways or other areas where people could be exposed to live parts during inspection should also be avoided.

Adequate protection should be provided under any circumstances.

TRANSFORMER SOUND LEVELS

Transformers are an electrically energized apparatus and by their nature emit sound due to their component materials.

Transformers are required to meet NEMA standards for the maximum sound levels permissible. These sound level standards vary from 40 to 60 DB and hence, can be an annoyance if located in close proximity to where people work or reside.

Care must be exercised in selecting sites for transformers particularly to avoid sensitive areas like hospitals, classrooms, medical or office facilities.

Cable Connections

1. Open the wiring compartment by loosening the cover screw.
2. Terminals must be clean and electrical joint compounds are recommended for use on all electrical connections.
3. Make the appropriate electrical connection to suit the desired voltages as per the connection diagram on the equipment nameplate. This includes the input connections, output connections and the ground(s).
4. Make certain to insulate any unused wire leads with marrette connectors and electrical tape.
5. Close the wiring compartment and ensure that the cover screw is tightly secured.



The connecting cable size is determined from the line current rating of the transformers primary and secondary windings. Convenient pre-punched knockouts are provided on all transformer enclosures, to facilitate cable entry

Grounding

All core and coil assemblies are solidly grounded to the enclosure internally to ensure that all conductive metal parts have the same potential.

The transformer enclosure in turn must also be securely and effectively grounded as a safety precaution. This grounding must be in accordance with national electrical code standards.

Inspection Before Energizing

For the safe and proper operation of the transformer the following items must be checked:

a. The insulation resistance, enclosure to primary, enclosure to secondary and primary to secondary, must be greater than 10k ohms.
b. Before energizing and connecting any loads, measure and verify the output voltage matches nameplate specifications.
c. Ensure correct phase connections. Refer to the nameplate vector diagram.
d. When windings are connected in parallel (as in the case of dual voltage primaries), the primary taps for all coils must be connected to the identical percentage tap positions to avoid the shorting of turns. For tap positions, refer to the nameplate on the transformer.
e. The enclosure must be grounded with the appropriately sized conductor.
f. Check the clearance and tightness of all electrical connections.
g. For single phase 3-wire 240/120 volt loads, care must be taken to ensure the neutral current does not exceed 1/2 of the transformers kVA rating.

Operation

If the transformer is experiencing increased temperatures, the following load characteristics must be considered immediately:

- Rigorous motor starting loads or other impact type loading for which a specific transformer for that application is required.
- Over-excitation of unit due to excess supply line voltage or current.
- Ambient temperatures above standard.
- Harmonic distortions of the supply line voltage and currents.

NOTE: Fully loaded transformers will be very warm to the touch, particularly on the top of the unit.

Standards permit the temperatures of the enclosure to be 65°C (149°F) higher than the ambient temperature. This represents normal loading and is not of concern.

Encapsulated transformers are designed to operate continuously at their full nameplate kVA rating.

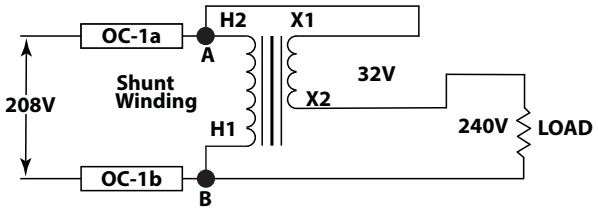
Fusing Buck-BoostTransformers

For determining the correct size of breaker or fuse for a given range of input or output ampere ratings, refer to Section 450-4, of the National Electric Code (NEC).

" 450-4, Autotransformers 600 Volts, Nominal or Less.

a. Overcurrent Protection. Each autotransformer 600 volts, nominal or less shall be protected by an individual overcurrent device installed in series with each ungrounded input conductor. Such overcurrent device shall be rated or set at not more than 125 percent of the rated full-load input current of the auto- transformer. An overcurrent device shall not be installed in series with the shunt winding".

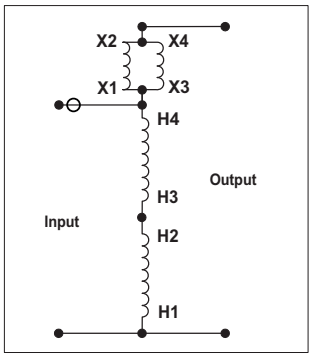
Exception. Where the rated input current of an autotransformer 9 amperes or more and 125 percent of this current does not correspond to a standard rating of a fuse or non-adjustable circuit breaker, the next higher standard rating described in Section 240-6 shall be per- mitted. Where the rated input current is less than 9 amperes, an overcurrent device rated or set at no more than 167 percent of the input current shall be permitted...".



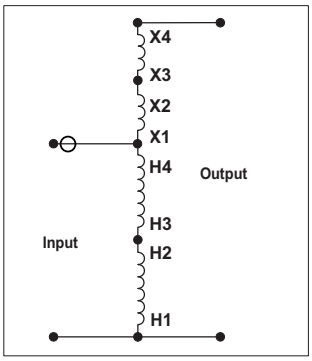
Overcurrent devices OC-1a and OC-1b are shown correctly installed in accordance with 450-4. Locating an overcurrent device in series with the shunt winding anywhere between A and B is not permitted. The shunt winding is the winding common to both the input and the output circuits.

Single Phase

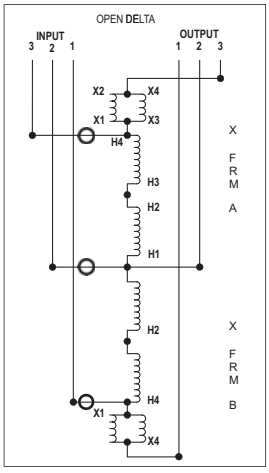
Input Voltage	Output Voltage	Number of Transformers Required	Connection Diagram	Application Data	Boost Transformer
197	208	1	C1	KVA	8.65
				Load Amps	41.6
				Fuse Size	60
208	229	1	D1	KVA	4.77
				Load Amps	20.8
				Fuse Size	30
Three Phase					
Input Voltage	**Output Voltage**	**Number of Transformers Required**	**Connection Diagram**	**Application Data**	**Boost Transformer**
198	208	2	E1	KVA	15.0
				Load Amps	41.6
				Fuse Size	60
208	229	2	F1	KVA	8.26
				Load Amps	20.8
				Fuse Size	30



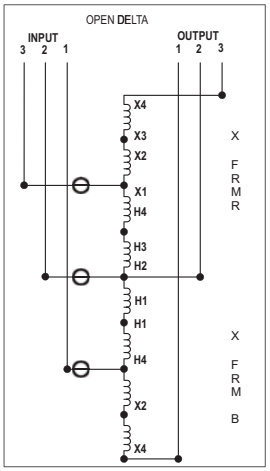
Connection Diagram C1 – Boosting 197V to 208V 1 phase



Connection Diagram D1 – Boosting 208V to 229V 1 phase



Connection Diagram E1 – Boosting 197V to 208V 3 phase



Connection Diagram F1 – Boosting 208V to 229V 3 phase