

OPERATION, MAINTENANCE AND INSTALLATION GUIDE
FOR SINGLE & THREE PHASE, INDOOR/OUTDOOR
ENCAPSULATED TRANSFORMERS



Always Safety First

- (1) Do not attempt to Move or Lift transformers without the proper Supervision and Equipment.
- (2) Make sure that the transformer is fully inspected prior to installation and energization.
- (3) Use suitable UL listed terminals for electrical connections. Maddox Recommends the use of flexible connectors.
- (4) Connections should only be in accordance with the nameplate diagram or connection drawings.
- (5) Disconnect power before attempting any work on the transformer.
- (6) Always make certain all ground connections are complete and tightened before energizing the transformer.
- (7) NEVER change any taps - primary or secondary, while the transformer is energized.
- (8) NEVER change connections when the transformer is energized.
- (9) NEVER adjust or remove any accessories or cover plates while the transformer is energized.

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INSTALLATION, OPERATION AND MAINTENANCE OF ENCAPSULATED TRANSFORMERS

GENERAL

Encapsulated transformers are made to provide a lifetime of trouble free performance. Attention should be paid to the following instructions for safe and trouble free operation.

ONLY Qualified people should Install, operate and maintain transformers.

WARNING: Danger *The risk of electric shock is present whenever working in or around transformers. Power must be shut off before any work is conducted on a transformer.*

As with any electrical device, transformers must be installed per the requirements of the national, and local electrical codes. Refer to ANSI/IEEE C57-94 may also be referred to for recommended installation, application, operation and maintenance of dry-type transformers.

HANDLING

Smaller transformers are shipped in cartons. Larger transformers are palletized. The palletized units, can either be lifted using a forklift or by the lifting lugs provided. On larger transformers, the lifting lugs are removable and are packed inside the transformer wiring compartment. Use the supplied bolts to attach.

The proper lifting equipment should be used in relation to the size and weight of each transformer. Do NOT attempt to lift or move a transformer from any points on the unit other than those indicated.

RECEIVING & INSPECTION

BEFORE receiving the transformer, it should be inspected for any damage and number matching the information on the shipping Bill of Lading.

Each unit should be inspected carefully, looking for any breaks in its packaging, dented or damaged enclosures or missing parts from the packing list.

If damage is noted, ALL copies of the Bill of Lading should note the damage and a more complete inspection should be performed. Proper paperwork should be filed with the local Freight Carriers office.

STORAGE

Any transformer that will not be used quickly, should be stored in a clean, dry and warm environment away from any potential contaminants.

We recommended that transformers be stored in a conditioned building. If the temperature reaches -40°C (-40°F), the Units that are to be energized after being stored at a low temperature must be warmed to -25°C (-13°F) using warm air or radiant heat.

INSTALLATION

All encapsulated transformers are supplied with a NEMA 3R enclosure. NEMA 3R units may be installed indoors, or outdoors where applicable.

For outdoor location, the appropriate Electrical codes must be followed including cable installation and hardware suitable for outdoor service. Rain tight connectors must be used at the knockouts. We strongly recommend that a licensed, professional Electrician, do the installation.

It is required that encapsulated transformers be installed in an upright position on walls, posts, beams or other locations capable of supporting their weight. All units must be oriented vertically with the wiring compartment down to prevent moisture from entering the transformer.

Mounting Instructions

1. Choose a location that is on a non-combustible surface. Make sure that the location allows for air circulation around the transformer for cooling purposes.
2. Transformers up to 100lbs. will be boxed. Units over 100lbs. will be bolted to a wooden pallet.
3. Smaller transformers are shipped with the mounting ears in a down position to prevent damage in shipping. Loosen the bolts and position the ears upwards. Tighten the bolts and install on selected surface.
4. Medium Sized transformers have a side positioned mounting bracket, that attaches to the back of the transformer. Loosen the pre-installed bolts on the back, and place the bracket over the bolt head and slide into the smaller slot. Retighten the bolts. Lift and position the transformer with bracket to the desired installation point and secure with bolts.
5. On larger wall mount units, you will find the lifting brackets packed inside the wiring compartment. Secure the bracket to the side of the transformer and lift into place. On Transformers with the wiring compartment on top, the units will come with lifting eye bolts, in place of the brackets. Remove 2 screws from

the corners of the cover, and replace with the lifting eye bolts. Lift unit into place and secure to wall. Remove and dispose of the eye bolts and replace the screws that were removed.

6. On floor mounted units, secure the transformers to the floor using appropriate anchors

7. With the wiring compartment cover open, mark and drill the lower mounting hole(s) into the mounting surface. Install the lower mounting bolt(s).

VENTILATION

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

Sufficient ventilation is essential for transformers to meet their nameplate kVA capability as well as life expectancy. All encapsulated general purpose transformers should be located at least 2 inches on units up to 10kVA and at least 4 inches on units over 10 kVA, away from walls or any other obstructions to allow free, clean circulation of air.

ACCESSIBILITY

NEC requires that transformers be accessible for inspection and located in easily accessible areas. Transformers should never be in areas where stored items are likely to interfere with either natural air convection.

TRANSFORMER SOUNDLEVELS

Transformers, by nature, are an electrically energized apparatus and emit sound due to their construction.

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

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

Follow these guide lines;

- 1-Units should be mounted away from corners or reflecting walls or ceilings.
- 2- Cable or flexible conduit should be considered to make connections.

- 3- Surface materials should be soft. Hard surfaces such as brick, tile, should be avoided for walls and ceilings around the unit. Additionally, the location of the unit should be located as far as practical from areas where sound levels could be considered undesirable.

CABLE CONNECTIONS

1. Open the wiring compartment by loosening the cover screw, and sliding out the door.
2. 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 as listed on the nameplate.
4. Make certain to insulate any unused wire leads with UL listed wire connectors and electrical tape.
5. Close the wiring compartment and ensure that the cover screw is tightly secured.



GROUNDING

Assure that the 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, should also be securely and effectively grounded as a safety precaution. This grounding should be in accordance with national electrical code standards.

INSPECTION BEFORE ENERGIZATION

We recommend for the safe and proper operation of the transformer, that the following items be checked.

- a) Before energizing and connecting loads, measure the output voltage and make sure it matches name plate voltages listed.
- b) When windings are connected in parallel (as with dual voltage primaries), the primary taps for all coils must be connected to the identical percentage tap positions to avoid the shorting of turns. Refer to the nameplate on the transformer for tap positions.
- c) Always ground the enclosure using the appropriately sized conductor.

- d) On 3 phase transformers, verify that the total load among all phases is balanced for problem free performance. Any 3 phase or single phase load can be connected to the transformer, but the kVA loading per phase should not exceed 33% of the total Nameplate kVA rating.
- e) The clearance and tightness of all electrical connections should be checked.
- f) For single phase 3-wire 240/120 volt loads, verify that the neutral current does not exceed 1/2 of the transformers kVA rating.

OPERATION

In normal installations, in a conditioned environment, encapsulated transformers will function to their design. If you are experiencing higher temperatures, Please confirm that the following conditions are not present:

- 1- Motor starting more than twice per hour. For applications where there is multiple starts, a larger Kva is required.
- 2- Higher Supply side voltages can cause over excitation of unit.
- 3- Ambient temperatures above the nameplate rating. For every 10% above the nameplate ambient, you will reduce the life expectancy of the transformer

ANSI C57.96 Standards permit the temperature soft he enclosure to be 65°C over ambient. This is normal and should not be of concern. Encapsulated transformers are designed to operate continuously at their full nameplate Kva rating.

conditions including:

- ➔ Ambient temperatures that are outside of the ambient temperatures recommended for transformer operation.
- ➔ Short term over loads as it relates to time and temperature and the applicable loss of life of the transformer.
- ➔ Overloading that results in are duction of the life expectancy of the transformer.

by 1/2. When energized, transformers may be very warm to the touch.

- ➔ Overload beyond ANSI C57.96 guidelines.
- ➔ Harmonic distortion of the supply side line voltage and currents.

MAINTENANCE

Under normal operating conditions and environments, encapsulated transformers do not require maintenance, but periodic preventative maintenance is a good practice especially if the unit is installed in an area exposed to extreme environmental conditions.

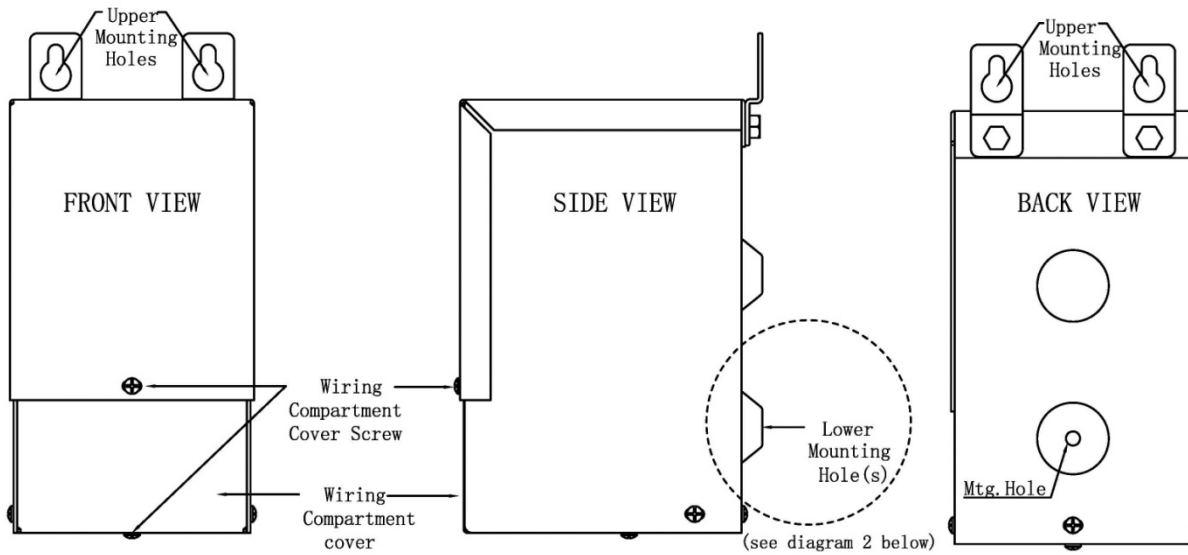
Peripheral inspection and external dust and dirt removal may be carried out while the transformer is in operation. However, access covers must not be opened under energized conditions.

Normal accumulation of ice or snow will not adversely affect the operation of an encapsulated transformer, However, the accumulation of dust or dirt can have an adverse effect with cooling of the transformer and can become a fire hazard.

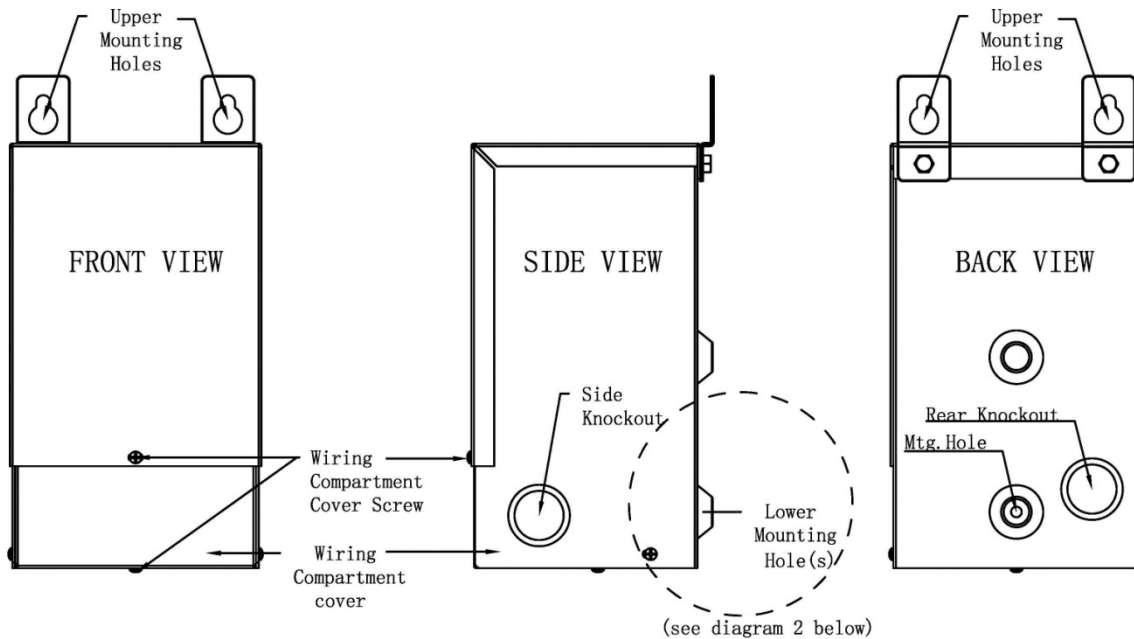
ANY internal maintenance must be done with the transformer de-energized and isolated from the circuit.

ALWAYS check the ground connection assure a low impedance connection.

Drawing1a: C0, C1 & C2,Details for mounting Small Single Phase Encapsulated Transformers.



Drawing1b: C3,C4& C5,Details for mounting Small Single Phase Encapsulated Transformers.



Drawing1c: C6A,C6,C7&C8 Details for Mounting for Medium Single Phase Encapsulated Transformers.

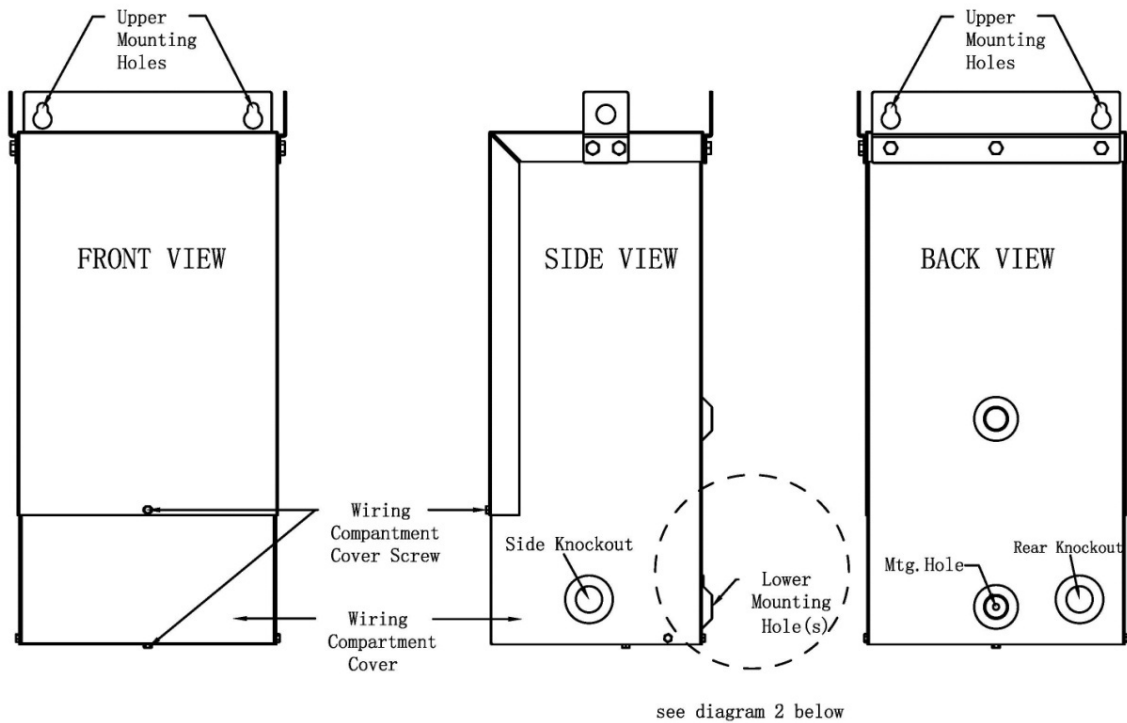
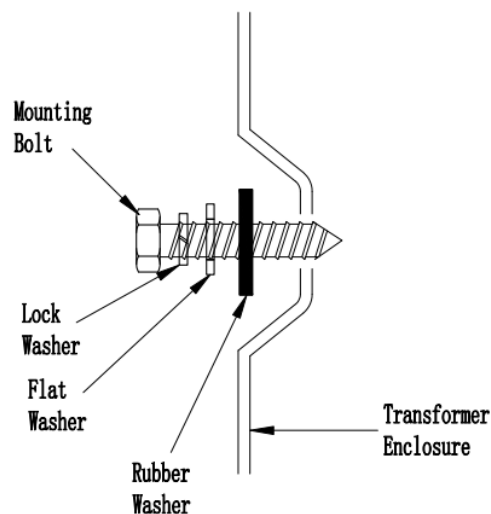
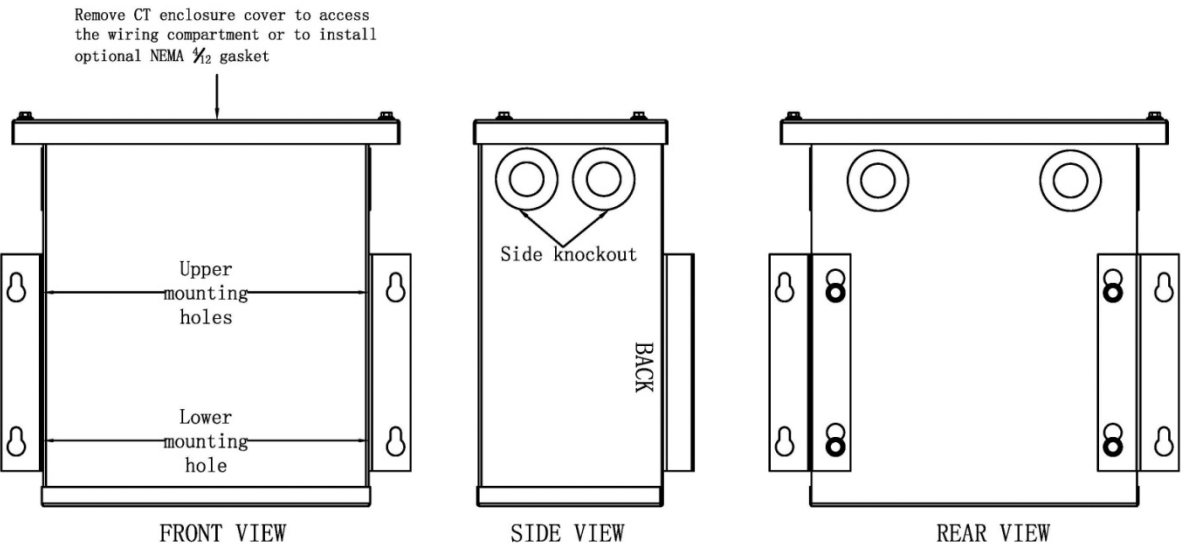


DIAGRAM2: Lower wiring compartment mounting hole(s), mounting hardware installation assembly diagram.



Drawing 3: CT3,CT5, & CT6 Details for Mounting Large Single Phase Encapsulated Transformers



Drawing 4: CT7,CT9, C10S, CT9A Details for Large Floor Mounted Encapsulated Transformers

