Power-Dry II™

Dry Type Transformers
Class 7420

Instruction Bulletin

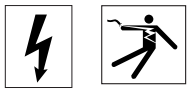
Retain for future use.

a brand of Schneider Electric

SQUARE D

NOTICE

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, **will result** in death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **can result** in death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can result** in minor or moderate injury.

CAUTION

CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result** in property damage.

NOTE: Provides additional information to clarify or simplify a procedure.

PLEASE NOTE

Electrical equipment should be serviced only by qualified electrical maintenance personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

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SECTION 1—INTRODUCTION

This instruction bulletin details information about installing, operating, and maintaining ventilated and nonventilated dry type transformers. Each transformer has its own specification and unique construction features. These features are detailed in the transformer outline and nameplate drawings.

This instruction bulletin is not an application guide for the ventilated dry type transformers or a substitute for adequate training in safe working procedures for this and related electrical equipment. Installation of this electrical equipment may require special licenses or training. Consult applicable national, industry, and local codes for specific requirements.

The successful operation of any transformer depends on various factors such as installation, loading, service conditions, and maintenance. Electrical systems in which transformers, along with vacuum or SF^6 circuit breakers, are used are capable of high frequency overvoltages which will not be suppressed by lightning arresters. These medium voltage systems may require a detailed, high frequency overvoltage system analysis and/or the addition of high frequency overvoltage protection. The transformer should be installed in conditions as specified in ANSI/IEEE Section C57.12.01 *Usual Service Conditions*, unless the transformer is designed specifically for operation in conditions other than the usual service conditions.

NOTE: If additional information is needed that is not covered by this instruction bulletin, contact the nearest Schneider Electric Field Sales Office, or Square D Services at 1-800-634-2003.

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SECTION 2—
SAFETY PRECAUTIONS

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- Read and understand this entire instruction bulletin before installing, operating, or maintaining a dry type transformer. Follow all applicable local and national codes.
- Disconnect all power and verify the transformer is de-energized before servicing the transformer. Operation of a primary protective device may be evidence of a faulted transformer. Do not re-energize the transformer until the cause of operation of the primary protective device is found and corrected.
- Many parts of the transformer operate at high voltages. DO NOT TOUCH. Use only electrically insulated tools and clothing, and protective gear when working around electrical equipment.
- Do not rely on visual indications such as switch position or fuse removal for determining a de-energized condition. Always assume that a terminal is energized unless it is checked with a properly rated meter to ensure the terminal is de-energized and grounded.
- Before servicing the transformer, ensure all static charge has been discharged by grounding the coils with an appropriate grounding device.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

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SECTION 3—RECEIVING, HANDLING, AND STORAGE

Ventilated open wound transformers are shipped either completely assembled in a sheet metal enclosure or as a core and coil assembly. They are covered with a clear plastic sheet to prevent entrance of moisture and dust.

Figure 1: Typical Packaging of Transformers for Shipment

Typical Packaging for an Enclosed-indoor Ventilated Dry Transformer

Typical Crating and Cover for a Core and Coil Assembly

Initial Inspection

Before unloading the transformer, perform the following inspection:

1. Remove the protective covering.
2. Verify that the serial number on the transformer nameplate (Figure 2 on page 8) matches the serial number listed on the bill of lading. If the numbers do not match, contact your field sales representative immediately.
3. Review the shipping papers to ensure shipment is complete. Accessories, hardware, or both may arrive in a separate container on a separate pallet.
4. Inspect the transformer for any obvious external damage that may have occurred during shipment. An internal inspection of the enclosure is not usually required unless possible external damage has been observed. If an internal inspection is required, carefully inspect the leads, bolted mechanical and electrical joints, the core and coils, and accessory equipment such as fans, controls, heater strips, control power transformers, or current transformers. List any noticeable damage on the receiving papers, file a claim with the carrier at once, and notify Schneider Electric .
5. After completing all of the above steps and if no problems are found, off load the transformer. Refer to “Handling” below.

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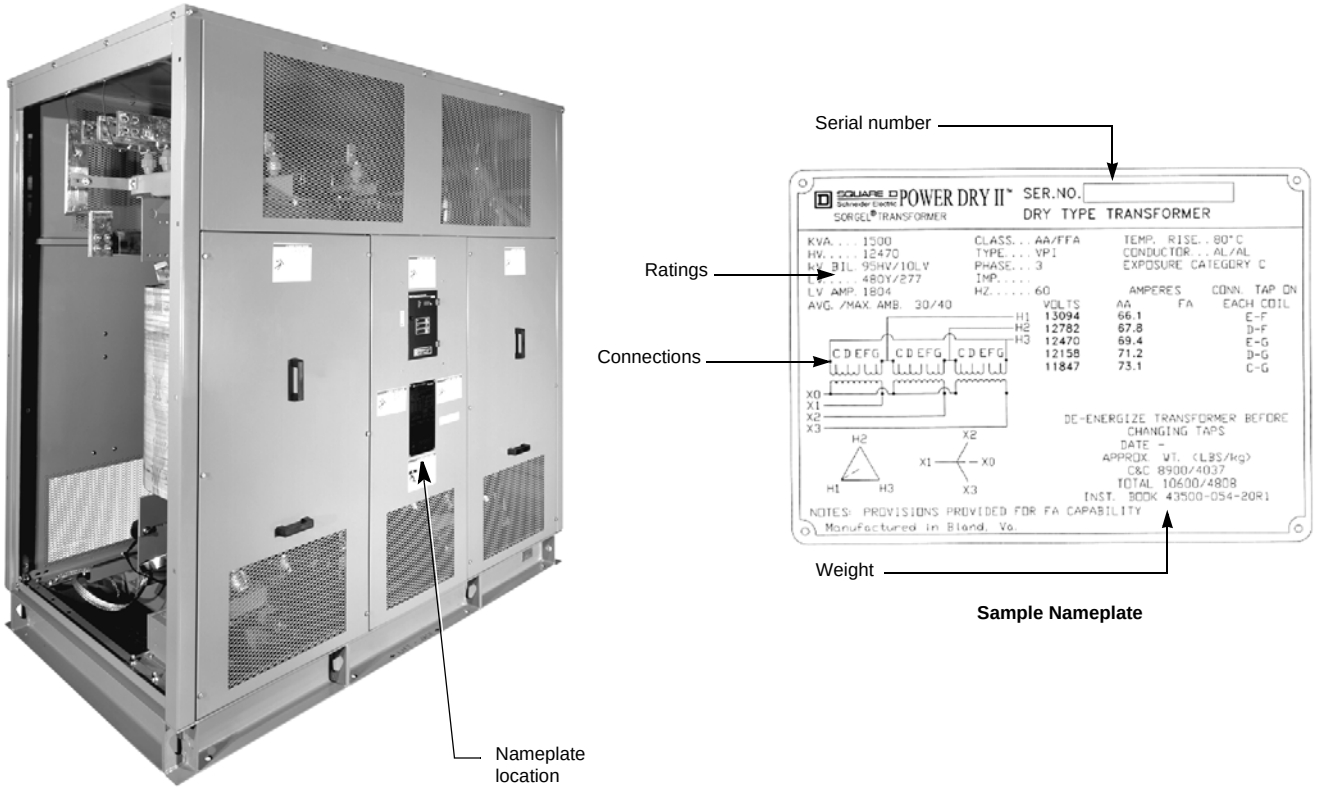
Figure 2: Typical Transformer Nameplate



Sample Nameplate

Ventilated Transformer (shown with optional features)

Handling

Observe the following safety measures when handling the transformer:

⚠ DANGER

HAZARD OF FALLING EQUIPMENT AND CRUSHING

- Transformer is top heavy and may become unbalanced.
- Verify that the capacity of the handling equipment is adequate for the transformer weight.
- Keep all unnecessary personnel away while handling and moving the transformer.

Failure to follow these instructions will result in death or serious injury.

Unloading and Lifting

Whenever possible, use a crane to unload the transformer. In some cases, smaller transformers may be shipped in a box-type trailer that cannot be unloaded with a crane. In these cases, a forklift may be used to unload the transformer.

The approximate weight of the transformer is shown on the nameplate. Verify that the capacity of the handling equipment is adequate for the weight of the transformer.

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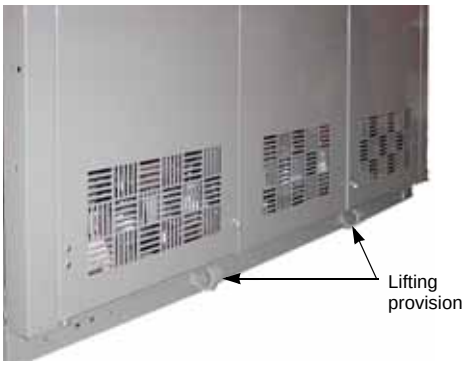
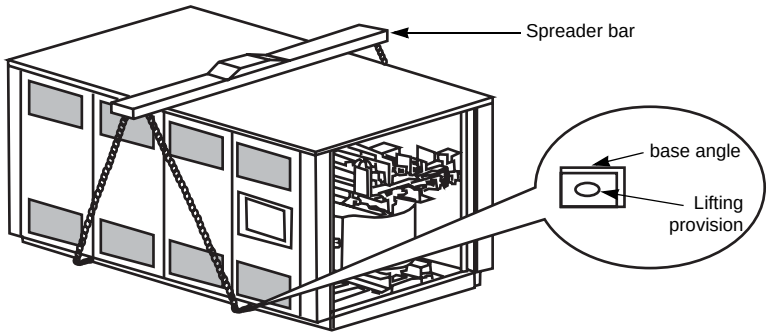
External Lifting Procedures

The transformer assembly may be lifted from provisions on the base frame using lifting slings, chains, or cables with spreaders. Care should be taken to avoid damage to the enclosure by allowing at least 20 feet from the top of the enclosure to the lift hook, or by using a spreader bar (Figure 3).

1. Use spreaders or spanner bars (Figure 3) to provide the vertical lift on lifting pads and slings to prevent crushing or otherwise damaging the frame or its finish.

Figure 3: Using a Spreader Bar



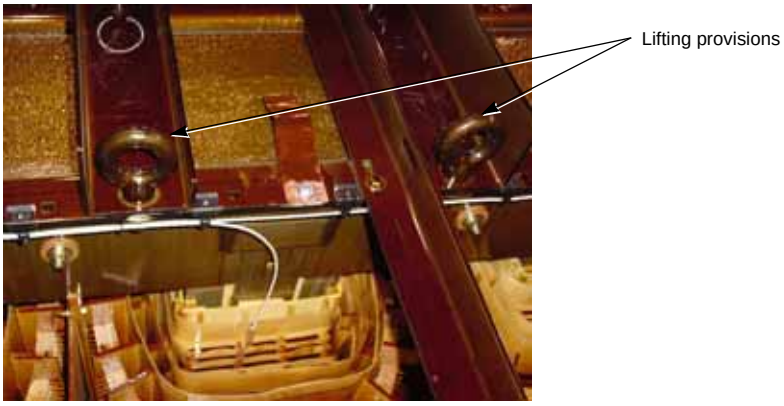


2. Select or adjust the rigging lengths to compensate for any unequal weight distribution of load and to maintain the transformer in an upright position.
3. Do not allow the angle between the lifting cables and vertical to exceed 45° in order to reduce the tension on the rigging and the compressive load on the lifting or spanner bars and spreaders.
4. Do not pass ropes or cables through the lift holes in bars, angles, or channels. Use slings with safety hooks or shackles.
5. Small cushioned pads may be placed on the transformer sides and cover to avoid contact with the enclosure.

Optional Lifting Procedures

If external lifting is not possible, removal of the enclosure top (Figure 4) allows easy attachment of shackles to the lifting provisions located on the top core clamps.

Figure 4: Recommended Method of Lifting from Overhead



NOTE: Cable pull angles should not exceed 45° from vertical. Avoid tilting. Unit is top heavy.

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Using a Forklift

If the transformer must be unloaded with a forklift, observe the following safety precautions.

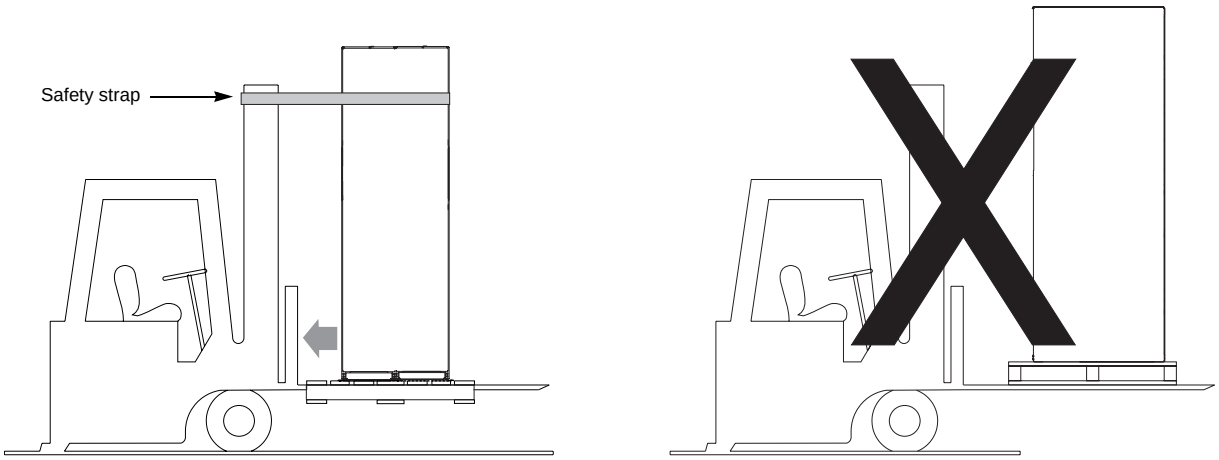
⚠ DANGER

HAZARD OF FALLING EQUIPMENT AND CRUSHING

- Transformer is top heavy and may become unbalanced.
- Verify that the capacity of the handling equipment is adequate for the transformer weight.
- Stabilize the transformer with a safety strap to reduce the possibility of tipping.
- Keep all unnecessary personnel away while handling and moving the transformer.

Failure to follow these instructions will result in death or serious injury.

Figure 5: Handling Using a Forklift



Towing and Moving

After the transformer has been off loaded, moving the transformer into position by a crane is preferred. When a crane cannot be used, the transformer can be skidded or moved on rollers. When doing so, take extra care not to damage the transformer.

The enclosure is a “bolt-together” design. If necessary, the enclosure can be disassembled to facilitate installation.

NOTE: Any disassembly and reassembly of the enclosure will be the sole responsibility of the owner and may void the warranty. Contact Schneider Electric for more information.

Storing

If the transformer must be stored, it is preferable to locate it in its permanent location on a concrete pad. If a level concrete surface is not available, take precautions to keep the unit from contacting an earthen surface. Protect the transformer and the connection points from the environment. Store an indoor unit indoors only. Maintain adequate ventilation so that air can flow through the transformer enclosure.

To reduce condensation and avoid moisture absorption in the transformer while it is being stored, immediately install space heaters, incandescent lamps, other small electric heaters. See “Drying the Core and Coil Assembly” on page 16 for more information.

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If the transformer is stored for an extended time, make periodic inspections of the transformer exterior and interior for corrosion or other possible damage. Always make an internal inspection before the transformer is placed in service. If you have any concerns, contact Schneider Electric.

SECTION 4—INSTALLATION

NOTE: Complete start-up services are available from Square D Services. They can provide assistance in a variety of areas, from installation to comprehensive testing and verification of the new equipment. Contact Square D Services at 1-800-634-2003, 24-hours a day.

Transformer Location Indoor

Follow all local and national codes when locating the transformer. Make sure the ventilated openings, on the top and bottom of the enclosure, are clear. The transformer must be at least 12 inches (305 mm) from walls or other obstructions to allow circulation of air through and around each unit.

For indoor installations, consult local and national codes to ensure all applicable requirements are satisfied. If the transformer is located near combustible materials, make sure the transformer meets or exceeds the minimum clearances as required by the National Electrical Code® (NEC) or other applicable local codes.

Locate the transformer on a level foundation strong enough to support the weight of the transformer, preferably of reinforced concrete. The manufacturer recommends that you do not place the transformer directly on an earthen surface. Ensure the foundation has adequate drainage. Seismic regulations may require that the transformer be anchored to the pad.

Restricting Access to the Transformer

Ventilated dry type transformers are not designed or constructed to be tamperproof. Install the transformer in an area that is secure and that allows only authorized personnel access to the transformer.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

The transformer is not tamperproof, therefore restrict access to it. Allow only authorized personnel access to the transformer.

Failure to follow these instructions will result in death or serious injury.

Transformer Location Outdoor

For outdoor installations, consult local and national codes to ensure all applicable requirements are satisfied. If the transformer is located near combustible materials, make sure the transformer meets or exceeds the minimum clearances as required by the NEC or other applicable local codes. The transformer must be at least 12 inches (305 mm) from walls or other obstructions to allow circulation of air through and around each unit. Ventilated and nonventilated, outdoor substation transformers and pad-mounted unit substations are designed for installation on a well-drained, concrete pad. Unless specified otherwise, the transformer is supplied without a bottom plate in the enclosure. If installing the transformer in a elevated position where the bottom is exposed, add a bottom plate (for rodent resistance) with provisions for drainage to the enclosure.

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Atmospheric Conditions

Atmospheric conditions and accessibility are important considerations when locating the transformer outdoors. Install outdoor ventilated transformers in locations that are free from unusual dust or chemical fumes.The enclosure helps protect the transformer from atmospheric conditions such as dust, rain, or snow. Also, the enclosure is designed to divert water from energized parts, insulation, and wiring. However, it may not protect against internal condensation or ice, or completely stop snow from entering. If possible, locate the transformer in a shielded area such as in the corner of a building or landscaped windbreak to provide extra protection from driving wind, rain, or snow. When subjected to severe weather, outdoor dry type transformers should be inspected to determine if added protection is necessary.

Accessibility

Outdoor pad-mounted enclosures have a hinged door on the low voltage compartment with a handle suitable for padlocking. Access to the high voltage is possible only after the low voltage door is opened, allowing authorized personnel access through a second door. Also consider accessibility for maintenance when locating the transformer. Installations where the transformer may be fully exposed to the public spaces, such as shopping centers or school yards may require additional precautions.

The pad-mounted enclosure design meets the ANSI and NEMA standard rod entry test to prevent the entrance of a rod having a diameter of 0.125 inch (3.175 mm) at any point on the enclosure. Ventilated enclosures have the same provisions as the nonventilated, except that the ventilated units have ventilation openings, which are designed according to the ANSI and NEMA standard rod entry test to prevent the entrance of a rod having a diameter of 0.500 inch (12.7 mm).

Cable Connections

When cable connections are required, conductors suitable for at least 194° F (90° C) should be used. Minimum clearance at terminals should be maintained in accordance with the following table.

Table 1: Terminal Clearances

Transformer BIL	Minimum Clearance (in.)
10	1.00
20	1.00
30	1.50
45	2.50
60	3.50
75	4.75
95	6.00
110	7.50
125	8.75
150	11.25
200	15.50

All connections should be made without placing undue stress on the terminals. Connectors should be securely fastened in place and adequately supported with allowances for expansion and contraction.

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Lightning Arresters

At times, it becomes necessary to ship the specified lightning arresters loose to the job site due to physical size and/or to prevent damage. See Figure 6 for the typical installation method.

Figure 6: Installing Lightning Arresters

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Low voltage on the transformer windings may exceed 600 V. Do not touch the windings.

Failure to follow these instructions will result in death or serious injury.

The transformer has both high voltage (HV) and low voltage (LV) winding connections. Multiple tap positions are available on the HV winding to allow for adjustments, which may be necessary because of the specific supply voltage or transformer load characteristics. If tap adjustments are necessary, see “Changing Tap Positions to Adjust Voltage” on page 20. Connection points are clearly labeled on the transformer. Refer to the nameplate and wiring diagram to make the electrical connections.

Follow these guidelines when making connections:

1. Clean the contact areas of the terminals (if applicable).
2. Use leads that are long enough to avoid mechanical strain caused by expansion and contraction. Strain can cause loose connections over time.
3. Using a torque wrench, ensure all bolted connections are torqued to the values given on the transformer label and in this bulletin. Refer to Table 2 on page 14 for torque information.

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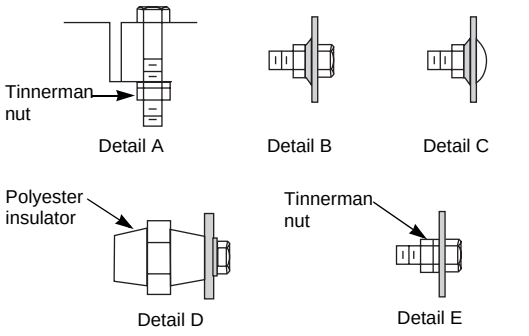
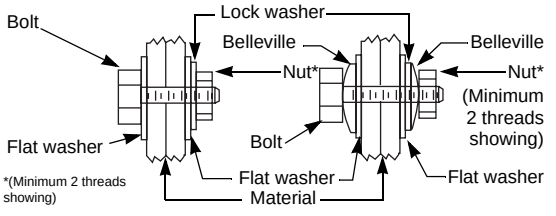
Table 2: Torque Guidelines



Bolt Size	Grade	Application (see diagram at left)	Torque Range
.38–16	2	Detail A	3–6 lb-ft (4.0–8.1 N•m)
.38–16	2	Detail B, C, D	15–20 lb-ft (20.3–27.1 N•m)
.75–10	5	Detail B	100–155 lb-ft (135.7–210.3 N•m)
.25–20	2	Detail E	3–6 lb-ft (4.0–8.1 N•m)
.50–13	2	Detail B, D	40–50 lb-ft (54.3–67.8 N•m)
.50–13	5	Detail B	40–70 lb-ft (54.3–95.0 N•m)
.62–11	2	Detail B	80–90 lb-ft (108.5–122.1 N•m)
1.00–14	1018	Detail B	110–170 lb-ft (149.2–230.6 N•m)
.62–11	5	Detail B	110–130 lb-ft (149.2–176.4 N•m)



Electrical Connections		
Bolt Size	**Grade**	**Torque Range**
.38–16	2	15–20 lb-ft (20.3–27.1 N•m)
.50–13	2	40–50 lb-ft (54.3–67.8 N•m)
.62–11	2	80–90 lb-ft (108.5–122.1 N•m)
.62–11	5	110–130 lb-ft (149.2–176.4 N•m)

Electrical Connections for Pad-Mounted Transformers

Pad-mounted dry type transformers are provided with HV and LV terminals for primary and secondary connections. Multiple tap connections are available on the HV windings to allow for adjustments, which may be necessary because of the specific supply voltage or transformer load characteristics. If tap adjustments are necessary, see “Changing Tap Positions to Adjust Voltage” on page 20. Connection points are clearly labeled on the transformer. Refer to the nameplate and wiring diagram to make the electrical connections.

High Voltage Bushing Connections

Depending on the transformer specification, HV bushings are either live-front with exposed-metal terminals or molded dead-front (Figure 7).

Live Front: Lugs are required to terminate the cable on a live front bushing. If the live front design and shielded cable are used, install a cable stress relief terminator kit on each high voltage cable.

Dead Front: Install an elbow terminator kit on the cable to connect to the dead front bushing. On the dead-front design, the elbow terminator kit includes the necessary cable stress relief.

Contact the Square D Medium Voltage Transformer facility at 704-283-7411 for application or order information regarding live front or dead front terminator kits. Installation instructions are provided with the terminator kits. Elbow terminators and stress cones are not provided by the manufacturer.

Figure 7: Dead Front Molded HV Bushings

Universal Bushing Well
(requires a separate insert)

One-Piece Integrated Bushing
(well and insert molded in one-piece construction)

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The one-piece integrated bushing is shipped with a red plastic protective cap to protect the internal bushing contact points from dirt or moisture. Leave this cap in place until the transformer is energized. When the transformer is energized, plug the ground cap onto any unused bushing well or insert to avoid partial discharge and subsequent bushing damage.

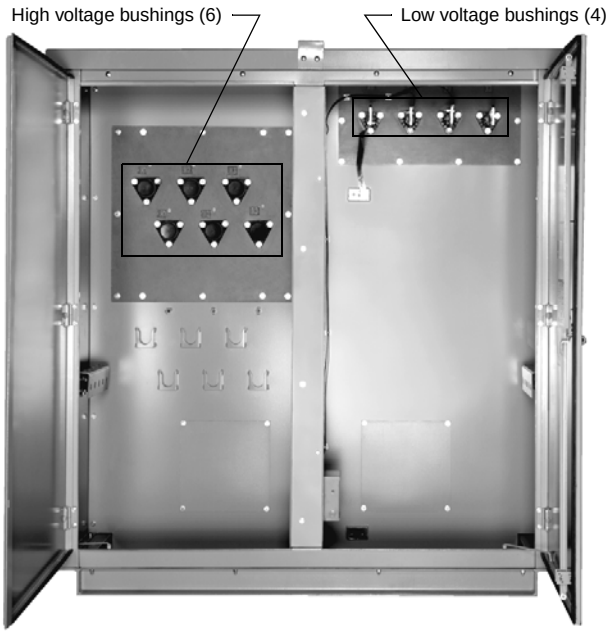
The transformer nameplate (Figure 2 on page 8) illustrates the internal wiring and external marking of each bushing. Refer to the nameplate on the transformer for clarity on where to connect each incoming cable.

On live front designs, ensure that adequate air clearances are between all energized parts in accordance with the latest ANSI Standard C57.12.22.

Low Voltage Bushing Connections

Low voltage terminals through 600 V are supplied with NEMA standard hole drillings and spacings, but are not supplied with lugs. Lugs may be stacked or mounted on either face of the spade. For 600 V bushings only, maintain a minimum of one inch air clearance between phase to phase or phase to ground.

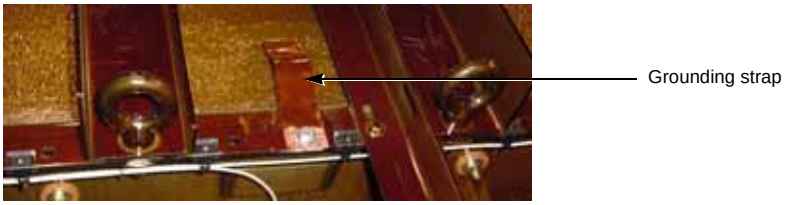
Figure 8: Typical Locations for Bushings on Pad Mounted Dry Type



Grounding

To ground the transformer, use only the ground pads on the base of the transformer. Do not use hold-down bolts or cleats, or any other component to establish the transformer ground.

Figure 9: Core Ground Strap Location



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⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- When grounding the transformer, conform to all applicable codes. Improper grounding can cause high voltage on the transformer secondary terminals.
- Secondary voltages may reach supply voltage levels. Under certain fault conditions, the secondary voltages from line to ground of transformers with ungrounded secondary windings (such as delta, floating wye and open delta) may approach a level as high as the supply voltage. DO NOT TOUCH THE WINDINGS.
- Before servicing the transformer, ensure all static charge has been discharged by grounding the coils with an appropriate grounding device.

Failure to follow these instructions will result in death or serious injury.

SECTION 5—START-UP TESTING

NOTE: Complete start-up services are available from Square D Services. They can provide assistance in a variety of areas, from installation to comprehensive testing and verification of the new equipment. Contact Square D Services at 1-800-634-2003, 24-hours a day.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Only qualified personnel should perform these tests.
- Disconnect ALL high voltage, low voltage, and neutral connections.
- Disconnect auxiliary equipment such as lightning arresters, the fan and temperature control system, meters, or any other low voltage control system that is connected to the windings that are involved in these tests.
- DO NOT disconnect the ground connection to the transformer frame.

Failure to follow these instructions will result in death or serious injury.

Before energizing the transformer and placing it in service, the manufacturer recommends that the following tests be performed at the installation site:

- **Insulation Resistance:** Measures the resistance of the insulation between the primary and secondary windings and from each winding to ground.
- **Turns Ratio:** Measures the ratio of the primary to secondary turns to check for possible insulation degradation in the windings.
- **Core Megger® Test**: Measures the resistance to the flow of current through and over the surface of the transformer insulation. Results can indicate possible insulation deterioration. Applicable for units ordered with an isolated core only.

Drying the Core and Coil Assembly

If the transformer is to be held in storage or will undergo periods of de-energization, it is recommended that space heaters be used to prevent accumulation of moisture on the core and coil assembly. The space heaters are typically 120 volt/50 watt and are usually thermostatically controlled. Heaters are mounted directly beneath the coils, front and back, on brackets attached to the bottom core clamps and mounting feet. Two heaters are used per coil, with three heaters on the high-voltage side and three on the

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low-voltage side. Space heaters are provided with a terminal block for connection to an external power source.

Using the Insulation Resistance Test to Determine Drying Time

The transformer core and coils must be dry before the transformer can be tested and energized. If the transformer has more than surface moisture present, more extensive drying may be required to ensure that the core and coils are dry. To dry the transformer, apply external heat to the transformer using the heater or lamp method described above. For transformers without an enclosure, the core and coil assembly can also be placed in a suitably ventilated oven.

Drying time depends on the condition of the transformer, size, voltage, amount of moisture absorbed, and method of drying. Measuring insulation resistance is valuable in determining the drying status.

Normal humidity has little effect on energized dry type transformers. If a shutdown occurs during a period of low humidity, no special precautions are necessary before re-energizing the transformer.

However, under conditions of high humidity, take precautions to ensure there is no condensation inside the transformer. Space heaters (optional) placed inside the housing should be energized to provide protection against this condition. As a simple rule, always keep the transformer a few degrees above the ambient temperature.

⚠ CAUTION

FIRE HAZARD

Constant attendance during the drying process is recommended. Have a suitable fire extinguisher on hand for use in the event of an emergency.

Failure to follow this instruction can result in injury or equipment damage.

Drying

To remove moisture from a transformer that has been exposed to high humidity, spray, or extended storage, the following methods are recommended:

1. **Applications of external heat**
   External heat is applied by passing heated air through the inlets in the bottom of the transformer housing. Direct the air so that it passes through the winding ducts and not only around the sides of the coils. Adequate ventilation is essential during this process. The most effective way to apply external heat is to place the core and coil assembly into a well ventilated oven.
2. **Heating by circulation of current**
   Heating by circulation of current is accomplished by short circuiting the secondary terminals of the transformer and applying impedance voltage to the primary terminals. This will produce 100% rated current in all windings. To obtain the impedance voltage, multiply the “per unit” value of the nameplate % impedance by the primary voltage noted on the nameplate. For example, for 13,800 volts with 5.75% impedance, multiply 0.0575 x 13,800 = 794 volts.

The heating process should be continued until an insulation test gives satisfactory results. In no case should the windings exceed 302° F (150° C) at the hottest measurable spot while applying the circulating current method.

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Use of Insulation Resistance for Determining Drying Time

Drying time depends on the condition of the transformer, size, voltage, amount of moisture absorbed and the method of drying used.

The measurement of insulation resistance is a value in determining the status of drying. Take measurements before starting the drying process and at two hour intervals during drying. The initial value, if taken at ambient temperature, may be high even though the insulation may not be dry. Keep the temperature of the transformer constant during the drying period to obtrain comparative readings.

As the transformer is heated, the presence of moisture will be evident by the rapid drop in resistance measurements. Following this period, the insulation resistance will generally increase gradually until near the end of the drying period when it will increase more rapidly. Sometimes it will rise and fall through a short range before steadying, because moisture in the interior of the insulation is working out through the initially dried portions. A curve with the time as abscissa and resistance as ordinate can be plotted. Continue the drying until the resistance levels off and remains relatively constant for three to four hours.

Before taking resistance measurements, the transformer should be de-energized and the winding should be short circuited and grounded for at least one minute to drain any static charge. All readings should be taken at the same time of application of the test voltage, preferably one minute.

Insulation resistance measurements should be taken in this order:

1. Primary to ground with secondary grounded.
2. Secondary to ground with primary grounded.
3. Primary and secondary to ground.

If winding resistance is used in determining winding temperature, contact the factory to obtain the needed information.

Insulation Resistance Testing

Before performing the insulation resistance test, use a vacuum cleaner to clean the core and coil assembly. When measured in accordance with ANSI/IEEE Standard C57.94, the minimum insulation resistance should be as listed in Table 3:

Table 3: Insulation Resistance Values

Winding kV Class	Insulation Resistance (MΩ)
1.2	600
2.5	1000
5.0	1500
8.7	2000
15.0	3000

Turns Ratio Test

Perform the turns ratio test at each tap position and for the full winding.

1. Use a Transformer Turns Ratio (TTR) to measure the ratio between the primary and secondary windings.
2. Compare these measurements to the transformer nameplate voltage ratio. The measurements should be within 1/2 of 1% of the nameplate voltage ratio. Refer to ANSI C57.12.91 for additional information.

Core Megger® Test

The core of a ventilated dry type transformer is constructed using one of two methods. For standard construction, the core is not insulated from the clamping structure. The core and clamping structure are at the same potential. In this case, the core Megger test is not applicable.

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When specified, the transformer core is totally isolated from the core clamping structure by a layer of insulation. The core does not make contact with the clamping structure. A core ground strap is inserted between the laminations to ground the core to the clamping structure. A core Megger test can be performed to measure the resistance of the flow of current through and over the surface of the transformer insulation.

Before the core Megger test can be performed, inspect the transformer. The copper-foil ground strap extends out from the top of the core and attaches to the top core clamp. Follow these steps to perform the core Megger test:

1. Obtain a 1000 V megohmmeter.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Read and understand the equipment manufacturer's instructions. Use caution while operating the megohmmeter.

Failure to follow these instructions will result in death or serious injury.

2. Disconnect the core ground strap from the core clamp. Make sure the ground strap is clear from any contact with the transformer ground to isolate the clamp structure.
3. Taking care not to pull the core ground strap out of the core, attach the hot lead of the megohmmeter to the core ground strap.
4. Attach the ground lead of the megohmmeter to the core clamping bolt, which is next to the core ground strap. Ensure the lead and core ground strap are not in contact with the ground.
5. Energize the megohmmeter.

   NOTE: A reading of 10 megohms or greater is acceptable. If the reading is less than 10 megohms, contact Square D Services at 1-800-634-2003.
6. Reattach the core ground strap to the core clamp.

SECTION 6—OPERATION

Energizing the Transformer

Before energizing the transformer, do the following:

1. Remove all shipping braces and shipping bolts (if present). They are clearly tagged or painted yellow.

   NOTE: DO NOT remove the fiberglass tubing (if provided) that surrounds the high voltage cables.
2. Verify the operation of fans, motors, controllers, relays, or other auxiliary devices.
3. Verify the selection of taps and ratio connections against the transformer nameplate information.
4. Torque all connections according to the torque guidelines in Table 2 on page 14 and ensure clearances are adequate between the transformer enclosure and internal bus bars.
5. Remove all hand tools, equipment, or any other foreign material from inside the enclosure. **Do not** leave tools or other equipment on the core and coil assembly.
6. Energize the transformer.

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Only qualified personnel with appropriate measurement devices should measure the voltages on the transformer.

Failure to follow these instructions will result in death or serious injury.

7. Check the transformer nameplate before measuring voltages and ensure that properly rated meters are used to verify the primary and secondary transformer voltages.
8. Verify the voltages on the transformer primary and secondary.

If the voltages are not as required, use the taps to adjust the voltage. See the following section, “Changing Tap Positions to Adjust Voltage”.

Changing Tap Positions to Adjust Voltage

To change the tap position:

⚠ DANGER

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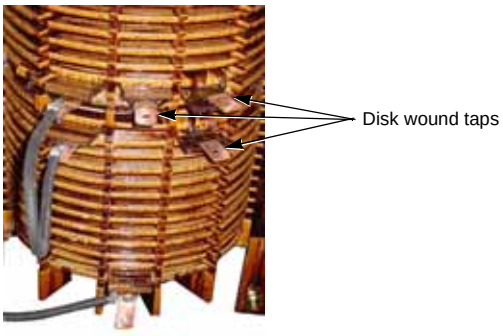
- Before performing this procedure, review “Section 2—Safety Precautions” on page 6.
- Do not change the tap connections when the transformer is energized.
- Disconnect all power and verify the transformer is de-energized before servicing the transformer. Use a properly rated meter to measure for the presence of voltage at the terminal and to verify the transformer is de-energized. Do not rely on visual indications such as switch position or fuse removal for determining a de-energized condition.
- Ensure no paths are present for backfeeding power to the transformer (such as through a tie-breaker).

Failure to follow these instructions will result in death or serious injury.

NOTE: Do not bend or position the hardware in a manner that would reduce clearance between tap terminals.

Figure 10: Disk Wound Tap Connections



1. De-energize the transformer following the safety messages above and your company’s lock-out/tag-out procedures.
2. Remove the enclosure panel or door to access the transformer high voltage windings.
3. Use an appropriate grounding device to ground the coils and discharge any static charge.
4. Locate the tap jumpers.
5. Change the tap jumpers on each phase to the appropriate tap connection (Figure 10). The tap jumpers must be on the same tap position for each phase.
6. Torque the tap connections. Refer to the torque values in Table 2 on page 14.

   NOTE: For multiple voltages or other special arrangements, see the transformer nameplate.
7. Inspect the enclosure to ensure all hand tools, equipment, or any other foreign materials are removed from the enclosure.

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8. Re-install the door or enclosure panel.
9. Energize the transformer.

Sound Level

All transformers have an inherent sound level that varies with the size of the units. The fundamental frequency is twice that of the applied voltage.

Sound waves may be amplified by means of reflected waves and/or radiated waves via walls, floors, ceilings, mechanical vibrations of air ducts, conduits, and mounting bases. For average expected sound levels, refer to NEMA ST-20.

To meet NEMA listed average sound levels, each unit should be installed in a location where there is a 10-foot clearance on all sides except floor or ground. Units located in close proximity to hard surfaces may produce higher than average sound levels. When transformers must be located in noise sensitive areas, precautions should be taken to avoid amplification of the transformer sound.

Install the unit in an area where the noise will be least objectionable. Avoid rooms where hard surfaces are in close proximity to the transformer.

Use acoustic absorbing materials on walls, floors, and ceilings. Avoid installation of units in corners, hallways, and stairways, and near heating and air conditioning ducts.

Reduction of Structure Borne Noise

Loosen anchor bolts between the transformer and enclosure and let the unit rest on the vibration pads only. (Except on certified seismic units.)

Use flexible conduit and bus connections.

Avoid mounting the unit on walls, balconies, and floors with low masses. Avoid uneven mounting surfaces. If specified, low sound level transformers can be provided for most applications.

SECTION 7—MAINTENANCE

Complete start-up services are available from Square D Services. They can provide assistance in a variety of areas, from installation to comprehensive testing and verification of the new equipment. Contact Square D Services at 1-800-634-2003, 24-hours a day.

Inspect the transformer regularly. The frequency of inspection depends on operating conditions. If the transformer is operating in usual service conditions as defined in ANSI/IEEE C57.12.01, an inspection every two years may be sufficient. However, for unusual locations where the air is contaminated with particles such as dust or chemical fumes, inspect the transformer every three months or sooner. After the first few inspections, determine a more definite schedule based on the existing conditions. Perform the following procedures for maintenance.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Before performing this procedure, review “Section 2—Safety Precautions” on page 6.
- Before servicing the transformer, ensure all static charge has been discharged by grounding the coils with an appropriate grounding device.

Failure to follow these instructions will result in death or serious injury.

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1. De-energize the transformer following the preceding safety messages and your facility's lock-out /tag-out procedures.
2. Ground unit for one minute to drain static charge.
3. Clear away any debris or other foreign objects from all ventilation openings. If the transformer design includes an optional solid base, make sure air can flow through the bottom grills of the enclosure.
4. Remove the enclosure panel or door to access the transformer high voltage windings.
5. Check the enclosure for deterioration. If deterioration is present, determine the cause and correct (if possible). Repaint deteriorated areas.
6. Replace corroded hardware, as required. See "Replacement Parts" on page 24.
7. Ensure all interior surfaces are clean by following the procedure in "Cleaning" below.
8. Inspect safety labels and replace as necessary.
9. See "Energizing the Transformer" on page 19 to power up the transformer.

After a Major Fault

1. If the transformer is energized, de-energize the transformer following the safety messages above and your facility's lock-out/tag-out procedures.
2. Remove the enclosure panels and inspect the transformer core and coil assembly for any physical damage. If damage has occurred, contact the Square D Medium Voltage Transformer facility at 704-283-7411.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Do not re-energize the transformer if the transformer has been damaged.

Failure to follow these instructions will result in death or serious injury.

3. Using a torque wrench, ensure all bolted connections are torqued according to the torque guidelines in Table 2 on page 14.
4. Perform the tests described in "Section 5—Start-Up Testing" on page 16. DO NOT re-energize the transformer if the test results are not acceptable. If no damage has occurred and all test results are acceptable, perform maintenance by following the procedures in "Section 7—Maintenance" on page 21.

Cleaning

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Before performing this procedure, review "Section 2—Safety Precautions" on page 6.
- Before servicing the transformer, ensure all static charge has been discharged by grounding the coils with an appropriate grounding device.

Failure to follow these instructions will result in death or serious injury.

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To clean the transformer, do the following:

1. De-energize the transformer following the safety messages above and your facility's lock-out/tag-out procedures.
2. Ground unit for one minute to drain static charge.
3. Remove the enclosure panel or door to access the transformer high voltage windings.

⚠ CAUTION

HAZARD OF EQUIPMENT DAMAGE

Do not push or pull the cloth through the coils.

Failure to follow this precaution can result in injury or equipment damage.

4. Wipe down all parts of the core, being careful not to cut yourself on any sharp edges or protrusions.
5. Use an industrial vacuum cleaner to clean the ventilation openings and remove dirt and dust from the core, coils, insulators, and remaining structures.
6. Remove all rags or other maintenance equipment from the coil ducts and check for tools when finished. Confirm that the coil ducts are clear.

SECTION 8—OPTIONAL EQUIPMENT

This section provides information about optional equipment and replacement parts.

Temperature Monitoring Systems

Optional temperature control modules are available on ventilated dry type transformers.The monitor controls the fans and provides alarm indication. See the manufacturer's instruction manual included with the transformer documentation package for detailed information about the installation, operation, and maintenance of the monitor.

The factory pre-set temperature alarm and control settings for ventilated transformers are listed in Table 4.

Table 4: Factory-Set Temperature Alarm and Control Settings

Stage	Temperature Rise
	Transformers with 80 °C / 150 °C Temperature Rise Rating
Fan On	110 °C
Alarm On	125 °C
Trip Signal	220 °C
	Transformers with 115 °C / 150 °C Temperature Rise Rating
Fan On	145 °C
Alarm On	160 °C
Trip Signal	220 °C
	Transformers with 150 °C Temperature Rise Rating
Fan On	180 °C
Alarm On	195 °C
Trip Signal	220 °C

Fans (Forced Air)

When provided, bladed fans located under the transformer coils provide the forced air cooling.

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Neutral Grounding Resistors

If specified, optional neutral grounding resistors may be supplied. See the manufacturer's instruction manual included with the transformer documentation package for detailed information about the resistors.

Other Optional Equipment

Other optional equipment, such as monitors, current or potential transformers, or space heaters, may be supplied if specified.

Replacement Parts

Some replacement parts for the transformer are available. Contact your Schneider Electric field sales representative for price and availability. Provide full nameplate information and a description of the part needed. Sketches or photographs may be useful in describing the part.

SECTION 9—TROUBLESHOOTING

If any of the problems listed in Table 5 are identified, the transformer should be removed from service at once. Immediate attention to the problem may prevent dangerous conditions or expensive repairs. In many instances, the trouble can be found quickly and the unit returned to service.

If the trouble cannot be corrected, do not re-energize the transformer. Contact the factory immediately.

Further inspection may require disassembly of the core and coils. This work must be performed by a factory representative or authorized repair facility.

Table 5: Troubleshooting Guide

Circuit	Symptom	Cause
Electric	Overheating	Continuous overload; wrong external connections; poor ventilation; high surrounding air temperature [a]; damaged or improperly directed fan blades; high harmonic or unbalanced loads
	Reduced or zero voltage	Shorted turns; loose primary tap connections
	Excess secondary voltage	High input voltage; improper primary tap connections
	Unbalanced secondary voltages	Overload; tap connections not on identical tap positions; neutral ungrounded
	Insulation failure	Continuous overloads; dirt accumulation on coils; mechanical damage in handling; lightning or switching surges
	Breakers or fuses opening	Short circuit; overload
	Excessive cable heating	Improperly bolted connection; incorrect cable size for load; incorrect cable routing
	High voltage to ground [b]	Usually a static charge condition
Magnetic	Vibration and noise	Low frequency; high input voltage; core clamps loosened in shipment/handling; improper tap connection
	Overheating	High input voltage; improper loads; harmonics; dirty core
	High exciting current	Low frequency; high input voltage; shorted turns
Dielectric	Smoke	Insulation failure
	Burned insulation	Lightning surge; switching/line disturbance; broken bushings, taps, or arresters; excess dirt or dust on coils
	Overheating	Clogged air ducts or inadequate ventilation
	Breakers or fuses opening	Insulation failure

[a] Rating is based on 86° F (30° C) average temperature over a 24-hour period, with peaks not to exceed 104° F (40° C).
[b] Using rectifier or VTVM meter.

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1010 Airpark Center Drive
Nashville, TN 37217 USA
1-888-SquareD
(1-888-778-2733)
www.us.SquareD.com

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