SQUARE D
Instruction Bulletin

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Guide for Operation and Maintenance of Dry-Type Transformers 600 Volts & Below Class 7410

INSTALLATION

Location

Factors which should be kept clearly in mind in locating dry type transformers are accessibility, ventilation and atmospheric conditions.

Ventilated dry type transformers normally are designed for installation in dry locations. They will operate successfully while energized where the humidity is high, but under this condition, it may be necessary to take precautions to keep them dry if they are shut down for prolonged periods. This is discussed more fully under "Operation." Locations where there is dripping water should be avoided. If this is not possible, suitable protection should be provided to prevent water from entering the transformer enclosure. Precautions should be taken to guard against accidental entrance of water,such as might be obtained from an open window, by a break in water or steam line, or from use of water near the transformers.

Ventilated general purpose dry type transformers are supplied in enclosures rated NEMA Type 2 for indoor installation. Weathershield kits are available to convert these enclosures for UL listed outdoor NEMA 3R use. The appropriate weathershield kit number can be obtained from the transformer front panel label or from a Square D distributor or representative. Non-ventilated resin filled transformers are rated indoor/outdoor and do not require weathershield kits for outdoor use.

Adequate ventilation is essential for the proper cooling of ventilated transformers Clean, dry air is desirable. Filtered air may reduce maintenance if the location presents a particular problem. See N.E.C. Article 450. Forced air cooling should provide a minimum of 100 CFM per KW. of losses. (Based on 40° C. Max. Amb.)

Dry type transformers should be installed in locations free from unusual dust producing mediums or chemical fumes. Transformers have been tested in accordance with UL 1561. Unless labeled otherwise, the transformer ventilation openings should be located at least 6 inches away from walls or other obstructions that might prevent free circulation of air through and around each unit. Non-ventilated transformers can be mounted directly on wall. Accessibility for maintenance should be taken into account in locating the transformer. If the transformer is to be located near combustible materials, the minimum separations established by the National Electrical Code should be maintained.

The transformer enclosure is designed to prevent the entrance of most small animals and foreign objects, However, in some locations, it may be necessary to give consideration to additional protection.

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Inspection

New transformers should be inspected when received for damage during shipment. Examination should be made before removing from cars or trucks and if any damage is evident, or if any indication of rough handling is visible, a claim should be filed at once with the carrier and the Square D Company should be notified.

Subsequently, covers or panels should be removed and an internal inspection made for damage or displacement of parts, loose or broken connections, cracked insulators, dirt or foreign material and for presence of water or moisture. Corrective measures should be taken where necessary (see maintenance section).

After a transformer is moved, or if it is stored before installation, this inspection should be repeated before placing the transformer in service.

Handling

All transformers should be kept in the upright position in which they were shipped. Lifting cables or chains should be used with spreader bars to avoid damage to the finish or parts. Whenever there are no external lifting provisions, the top cover should be removed and cables or chains secured to the top core-clamping channels or angles where holes are provided for this purpose.

Lifting with hand trucks or fork lifts is permissible if the blades or forks are long enough to pass completely under the enclosure. Since most dry type transformers have a high center of gravity and are top heavy, extreme caution should be exercised when lifting or moving units in this manner.

Rolling may be utilized to move a dry type transformer if the shipping skids remain attached to the base.

For superficial or minor case part damage, spare parts may be available, contact your local Square D field office.

Grounding

The enclosure and core assembly of these transformers should be permanently and adequately grounded in accordance with National Electrical Code Requirements. Windings may be grounded with consideration given to local conditions in accordance with the NEC.

SOUND CONTROL

All transformers emit sound. This is caused by the alternating voltage applied to the transformer. The resulting magnetic field causes the core steel to expand and contract resulting in audible sound. The transformer has been designed to minimize the level of sound produced.

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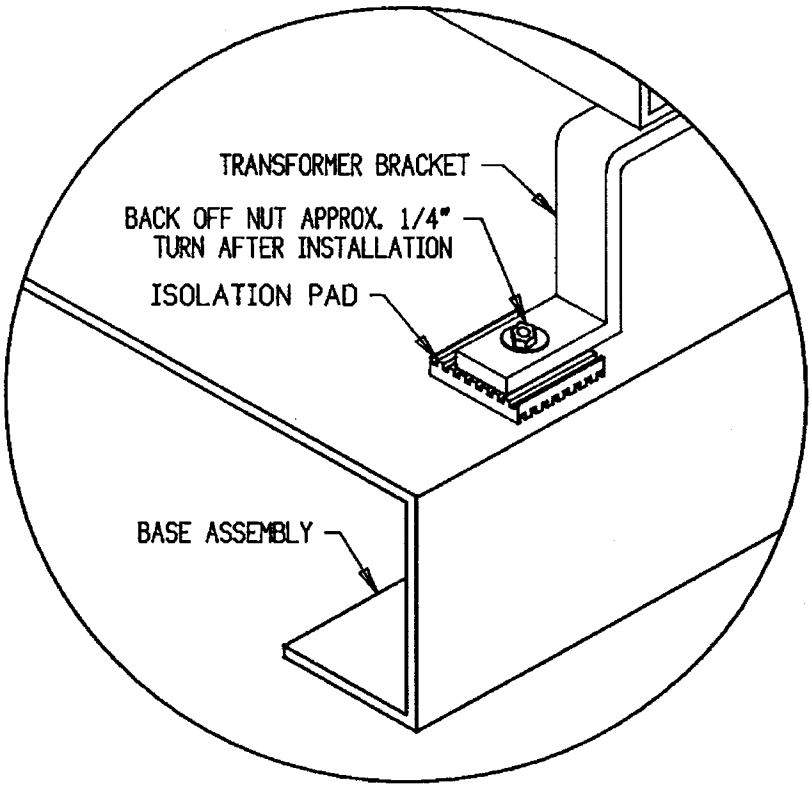
During manufacture, sound isolating pads have been secured between the transformer mounting bracket and the enclosure using bolts and nuts (see diagram below). The mounting hardware is tightened prior to shipment to prevent damage. To reduce audible sound levels further; back off the nut securing the transformer 1/4" to float the transformer on the pads, isolating the transformer from the enclosure.



ISOLATION PADS FOR "QUIET OPERATION"

The area the transformer is located can effect the sound level. Installing the transformer in a corner, narrow hall and or in an area with smooth surfaces can result in the sound being reflected and amplified.

All the enclosure panels should be securely fastened down, looseness can rattle increasing the sound produced.

Flexible conduit should be used if possible.

The type of structure the transformer is mounted on should be strong enough to support the weight of the transformer.

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As a final note the installed sound level may exceed the NEMA tested level due to some of the points illustrated above.

The NEMA maximum allowable average of the readings in decibels are as follows:

Transformer kVA Rating	NEMA Maximum db Rating
0-9	40
10-15	45
25-50	45
51-150	50
151-300	55
301-500	60
501-700	64
701-1000	64

STORAGE

Dry type transformers preferably should be stored in a warm dry location, with a uniform temperature. Ventilating openings should be covered to keep out dust. If it is necessary to leave a tranformer outdoors, it should be completely protected to prevent moisture and foreign material from entering. Condensation and absorption of moisture can be prevented or greatly reduced by the installation of space heaters or small electric heaters. If condensation is evident, it may be necessary to dry out the unit.

⚠ DANGER

HAZARD OF ELECTRICAL SHOCK OR BURN.

Turn off power supplying this equipment before working on it.
Discharge all static charges held by coils.
Failure to observe this precaution will result in severe personal injury or death!

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MAINTENANCE

Periodic Inspection & Maintenance

Like other electrical equipment, transformers require maintenance and inspections from time to time to assure successful operation. Inspections should be made at regular intervals. Corrective measures and maintenance are necessary to assure the most satisfactory service from this equipment.

The frequency at which these transformers should be inspected depends on operating conditions. For clean dry locations, an inspection anually may be sufficient. However, for other locations, such as may be encountered where the air is contaminated with dust or chemical fumes, an inspection at three or six month intervals may be required. Usually after the first few inspection periods a definate schedule can be set up, based on the existing conditions. With the transformer de-energized, access covers should be removed. Inspection should be made for dirt on insulating surfaces, and at areas which tend to restrict air flow; for loose connections, for the condition of tap changers or terminal boards; and for the general condition of the transformer. Observation should be made for sign of overheating and of voltage creepage over insulating surfaces as evidenced by tracing or carbonization.

Evidence of rusting, corrosion and deterioration of the paint should be checked and corrective measures taken where necessary.

Cleaning

If excessive accumulations of dirt are found on the transformer windings or insulators when the transformer is inspected, the dirt should be removed to permit free circulation of air and to guard against the possibility of insulation breakdowns. Particular attention should be given to carefully and thoroughly cleaning top and bottom ends of winding assemblies and to cleaning out ventilating ducts.

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With the trasnsformer de-energized, the windings may be cleaned with a vacuum cleaner, a blower or with compressed air. The use of a vacuum cleaner is preferred as the first step in cleaning, followed by the use of compressed air.
The compressed air should be clean and dry, and should be applied at relatively low pressure (not over 25 psi). Lead supports, tap changers and terminal boards, bushings and other major insulating surfaces should be brushed or wiped with a dry cloth. The use of liquid cleaners is undesirable because some of them have a solvent or deteriorating effect on most insulating materials.

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CONNECTION

NOTE; Terminals must be clean. Clean contact surface area is necessary. If transformers are installed outdoors or in a harsh environment, seal the connections with Alco #2 electrical joint compound or equivalent. Apply this after the bolts have been tightened.

The following table includes available transformer lug kits. For additional information on terminal connectors, see label on reverse side of front panel on transformer.

LUG KITS	TRANSFORMER LUG KIT					
	VERSAtile COMPRESSION LUGS AND MECHANICAL SET-SCREW TYPES					
Transformer kVA Sizes	Tool Type	Terminals Lugs Qty	Terminals Lugs Catalog Number	Hardware Included Qty	Hardware Included Type	Kit Catalog Number
Versatile Compression Equipment Lugs						
15-37½ 1ϕ 15-45 3ϕ	VC6 (All)	8 4	VCEL-021-14S1 VCEL-030-516H1	8	.1/4" x 1" Cap Screws	VCEL-SK1
50-75 1ϕ 75-112½ 3ϕ		12	VCEL-030-516H1	8 8	1/4" x 1" Cap Screws 1/4" x 2" Cap Screws	VCEL-SK2
100-167 1ϕ 150-300 3ϕ	VC6FT	3 22	VCEL-030-516H1 VCEL-075-12H1	3 16	1/4" x 3/4" Cap Screws 3/8" x 2" Cap Screws	VCEL-SK3
100-167 1ϕ 150-300 3ϕ	VC6FT		VCEL-030-516H1 VCEL-050-12H1	3 16	1/4" x 1" Cap Screws 3/8" x 2" Cap Screws	VCEL-SK3-050
500 3ϕ	VC6FT VC8	29	VCEL-075-12H11	18	3/8" x 2" Cap Screws	VCEL-SK4
Mechanical Set - Screw Type Lugs						
15-37½ 1ϕ 15-45 3ϕ	-	8 4	DA-2 DA-250	8	1/4" x 3/4" Cap Screws	DA-SK1
50-75 1ϕ 75-112½ 3ϕ	-	12	DA-250	8 8	1/4" x 3/4" Cap Screws 1/4" x 1 3/4" Cap Screws	DA-SK2
100-167 1ϕ 150-300 3ϕ	-	3 22	DA-250 DA-600	3 16	1/4" x 3/4" Cap Screws 3/8" x 2" Cap Screws	DA-SK3
500 3ϕ	-	29	DA-600	18	3/8" x 2" Cap Screws	DA-SK4

Operation

Removal of Access Panels or Plates

Access panels or plates should not be removed while the transformer is energized.

Effect of Humidity

As long as the transformer is energized, humidity conditions are unimportant. In the event that a dry-type transformer is de-energized and allowed to cool to ambient temperature, consideration must be given to the possible effects of humidity.

⚠ CAUTION

Experience indicates that if a shutdown exceeding 12 hours occurs, and especially if high humidity conditions exist, then the following precautions should be taken: Small strip heaters may be placed in the bottom of the unit shortly after shutdown to maintain the temperature of the unit a few degrees above that of the outside air. Before returning to service, the unit should be inspected for evidence of moisture, and insulation resistance should be checked. If there is evidence of moisture, or if the insulation resistance is less than 1 megohm, the transformer should be dried out by placing it in an oven or by blowing heated air over it. In either case the temperature should not exceed 110°C/230°F.

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Enclosure Temperature

The temperature rise on the enclosure exterior for ventilated transformers should not exceed 50 °C (90° F), except as indicated in UL 1561. For non-ventilated transformers, see marking on transformer or contact manufacturer for details.

APPENDIX REFERENCE

1. American National Standard for Transformers, Regulators and Reactors, ANSI.,C57.12.01.
2. NEMA Standard Publications for Dry Type Transformers, TR27 and ST20, latest edition.
3. National Electrical Code, NFPA Pamphlet No.70, latest edition.
4. National Electrical Safety Code, ANSI, latest edition.

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PLEASE NOTE:

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