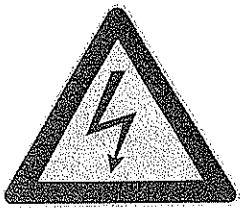
DRY-TYPE VENTILATED TRANSFORMERS

INSTALLATION, OPERATION AND MAINTENANCE GUIDE

DONGAN TRANSFORMERS



Safety Warning

When energized, potentially hazardous electrical potentials exist within this transformer. De-energize and lockout all incoming supply power prior to removing case parts, working inside the enclosure or touching any internal parts.

Dongan Electric Manufacturing Company
2987 Franklin Street
Detroit, MI 48207 USA

Voice: 313.567.8500
Fax: 313.567.8828
www.dongan.com

Engineered Transformer Solutions Since 1909

Introduction

This manual is intended to cover most ventilated single and three phase transformers rated 600 volts and below. The information that follows is intended to describe the general requirements for inspecting, installing and maintaining transformers of this type. Installers are required to be knowledgeable, qualified and trained in the inspection, installation and maintenance of transformers of this type and electricity in general. Installers and users must have knowledge of and adhere to all national and local electrical and safety codes when installing, operating and servicing this equipment.

Failure of qualified personnel to follow electrical and safety codes can result in reduced operational life and possible shock or fire hazards.

Incoming Inspection

Upon receipt, all transformers should be thoroughly inspected for external, internal and hidden damage during shipment. Damage claims should be filed immediately with the delivering carrier and with notification to your local Dongan Representative. Save all shipping crates, cartons and skids for inspection by the delivering carrier.

Ventilated transformers are attached to a wooden skid and are shipped from the factory in an upright position. Ventilated transformers are placarded with "Do Not Stack" stickers attached to the top of the protective shrink wrap. Transformers with dented enclosure tops or sides may have hidden damage due to stacking other shipments on top of the enclosure or from tipping over.

The transformer enclosure, coils, and insulation should be inspected for any damage, as minor damage may result in failure of the transformer.

Care should be used in confirming the nameplate specifications match the installation's electrical requirements.

Handling

Ventilated transformers should be maintained in an upright position at all times. Please remember these units typically have a high center of gravity and care is required when moving them. Lift truck forks should be placed under the skid provided to avoid enclosure damage.

Lifting provisions are provided on the transformer core, necessitating the removal of the top cover. Spreader bars should be used when lifting by the core clamps and caution observed to avoid damage to conductors, core and enclosure parts.

Location

Ventilated transformers should be located in areas in accordance with all requirements of the National Electrical Code and applicable local codes. Locations should be chosen with safety as a priority. Please consider accessibility, ventilation and environmental conditions when locating the product. Locate the transformer where it is free from corrosive fumes.

The location should be adequately ventilated, reasonably free of dust, moisture and flammable particulates. The installation site should maintain a ***minimum*** of 6 inches from all adjacent structures to provide adequate ventilation. In addition, area must be provided to allow installation of guards for maintenance personnel and, if necessary, for the removal of the transformer without major disassembly of other components.

Outdoor applications should be in areas where water will not pond or flood into or around the enclosure or connections. Enclosure must be appropriate for outdoor use.

Transformer enclosures are not tamper proof. Please choose a location away from children and persons unauthorized to service electrical apparatus.

Installation locations should be as far as possible from any location where higher audible sound levels may be objectionable.

Room Requirements

Dry -type transformer installation in indoor locations must be installed in accordance with the National Electrical Code and all applicable local codes.

Dongan dry-type transformers are air cooled and depend on air flow through the transformer coils for cooling. Transformer rooms should have vents sufficient to allow air to enter and exit the room to assure that air flow through the transformer remains continuous and unimpeded.

Accessibility

For convenience of maintenance and service, the transformer must be installed where access is allowed to the front cover, and the wiring compartment. Both national and local codes should be reviewed for determination of specific requirements on your application.

Installation

Dry-type transformer installations must comply with all applicable national and local codes for over current protection, enclosure ratings and bonding requirements, grounding, clearance from walls, ceilings and ventilation. Careful installation of this product will insure safety, long life and minimal sound levels.

Caution: When energized, transformers may have electrical potentials that are hazardous to humans. Care should be exercised to disconnect, de-energize and lock out supply circuits before installing this product, changing tap connections, performing maintenance or making any type of cable or conduit connections.

Transformers should not be operated with any protective enclosure part removed. Install all ventilated units in an upright fashion. Do not install transformers in close proximity to heat generating equipment. Do not place combustible materials on or near the transformer. Maintain a ***minimum*** of 6 inches to any adjacent wall.

Connections

Installers should select line and load cable sizes and lugs in accordance with all applicable national and local codes. Lugs should be suitable for both copper and aluminum transformer terminals. All connections should be made in accordance with the nameplate and connection diagram information supplied.

Note: Use two wrenches when tightening or loosening bolted connection points. This will help prevent twisting or distortion of lugs and taps.

The use of a suitable electrical joint compound is recommended when making an electrical connection to a tap or input/output terminals.

Magnet wire is frequently coated with an insulating varnish layer and/or an outer insulating wrap. When changing taps or connection points, it is necessary to remove these insulations by gently wire brushing or scraping the new terminal or tap connections.

Before energizing, confirm all bolted, input/output, ground and tap connections are tight. Confirm there is a minimum of 1" spacing between any energized part and all case parts. Confirm all debris has been removed from the inside of the enclosure and that all ventilation openings are clear.

Taps

Dongan transformers are normally supplied with primary above and below normal taps to correct for inherently high or low supply voltages. Tap jumpers are supplied for tap changing. Tap connections are normally preset at nominal (100%) of rated voltage. Only a qualified electrician should change the tap configuration and only with the transformer de-energized and locked out. Tap settings must be the same for all three coils when installing three phase transformers.

Lighting Taps for Three Phase, 240 Delta Transformers

Many Dongan 240 volt delta secondary transformers are equipped with a 120 volt lighting tap. We recommend you do not exceed 5% of nameplate capacity when using this type of connection. The single phase load must be balanced equally on either side of the center tap. Use of single phase loads results in a mandatory reduction of the three phase load.

Grounding

The National Electric Code, Articles 250 and 450, NEMA ST- 20 and local electrical codes mandate methods and practices for providing adequate and appropriate grounds and enclosure bonds. Grounding conductors must be sized in accordance with the above cited codes. All ground connections must be free of paint and nonconducting materials including rust, dust and corrosion. In addition, connections must be tight at all points to maintain adequate bonds throughout.

Sound

All transformers hum due to the inherent characteristics of the alternating magnetic field in the transformer's core. While transformer noise is not avoidable, certain installation techniques will help minimize sound levels, particularly in areas where ambient sound levels are low.

In order to minimize audible sound, mount the transformer as far as convenient from areas where higher audible sound levels may not be desirable and away from corners and walls where sound may reflect from these sorts of hard surfaces. This is generally away from the facility's quiet zones.

Dongan ventilated transformers are assembled with vibration dampers which help isolate vibration from the core and coil and the transformer enclosure. When additional noise reduction is required, the installer may:

- Provide vibration damping mounts at the point of installation.
- Use flexible conduit for housing incoming and outgoing connections (where code allows).
- Use sound absorbing material on reflective surfaces.

Dongan transformers comply with ANSI and NEMA standards for sound requirements. These standards establish maximum sound levels for various transformer kVA ratings as listed in the chart.

Transformer kVA Range	Average Sound Level (Decibels)
0 - 9	40
10 - 50	45
51 - 150	50
151 - 300	55
301 - 500	60

Maintenance

Maintenance must be performed with the transformer de-energized. Be certain the transformer is disconnected from any and all electrical sources prior to removal of any enclosure parts, maintenance operations or other service. Periodic maintenance should be performed by qualified personnel only.

Transformers generally require little periodic maintenance, particularly those that are continuously energized. Ventilation openings should be inspected and cleaned at least once per year in operating environments that are relatively clean, more frequently if required. In addition:

- Remove debris from on or around the enclosure parts.
- Check all terminal, tap and ground connections to ensure all are tight. Tighten terminals using two wrenches to prevent any damage to the terminals or supporting structures.
- Inspect all terminals, connectors and grounding hardware for signs of corrosion or burning. Replace as necessary.
- Remove dirt and debris from ventilation openings and the cooling "chimneys" built into the transformers coils. This is best accomplished with the use of a vacuum cleaner. Low pressure air (<20 psi) may be used in place of a vacuum if the air is dry and contaminants are not forced into the airways built into the coil.
- Check enclosure for rust and paint deterioration.
- Check for any signs of overheating.

Drying

Moisture and electrical components aren't typically compatible. Transformers subjected to high moisture or high humidity levels should be dried before they are energized. Certainly, whenever moisture is visible on protective insulated surfaces of the coil, the transformer should be dried.

Drying is performed by applying warm air underneath the element to both the front and back of the enclosure, allowing the heated air to rise through and around the coils. Various types of heat sources may be used such as radiant heat, strip or space heaters or other sources of warm air. Care should be taken to prevent burning of insulation systems by allowing heat sources to contact the coils, element or any insulation system.

Moisture due to flooding may not be relieved by the techniques sited above. Consult the factory or your Dongan Representative in these cases.

Temperature and Insulation

Ambient Temperature

The ambient temperature is the average temperature of the air in the immediate area surrounding the transformer. Air cooled transformers dissipate their heat into the ambient air.

Temperature Rise

Temperature rise refers to the difference between the ambient air temperature and the actual temperature of the transformer windings.

Hot-Spot Temperature

The hot-spot temperature refers to the highest temperature found inside the transformer winding. Hot-spot temperature allowances vary with insulation classes.

Enclosure Temperatures

In air-cooled transformers, much of the heat produced by the transformer is transferred to the air flowing through the enclosure. This allows the enclosure surface to be cooler than the transformer element inside.

National standards strictly regulate the highest temperature which the enclosure can reach. The enclosure temperature rise shall not exceed 50°C in a 40°C ambient at full rated current, giving a total temperature of 90°C (194°F) While this temperature is quite warm to the touch, it is completely within the allowed parameters of the insulation system and UL and NEMA standards.

Operation of Transformers in Ambient Temperatures Exceeding 40°C

Operating transformers in ambient air exceeding 40°C will reduce the operational life of the transformer unless the transformer is allowed to operate under conditions of reduced maximum load. The chart below indicates recommended derating for various ambient temperatures. Consult the factory for ambient temperatures exceeding 60°C.

Maximum Ambient Temperature	Maximum Percentage of Loading
40°C (104°F)	100%
50°C (122°F)	92%
60°C (140°F)	84%

Storage

Transformers that will not be used upon receipt should be stored indoors in a clean, dry and heated building. The protective plastic wrap used in shipping should remain in place to keep dirt, dust and airborne contaminants out of the transformer's interior. Avoid storage areas that will subject the transformer to high moisture air.