



GE Dry Type General Purpose Transformers

Type QL Single and Three Phase, 15-1500 KVA

GENERAL INFORMATION

Type QL transformers have a ventilated, encased construction suitable for indoor service only, unless converted for protected outdoor service. All encased models are designed for floor or platform mounting. The core and coil structure is mounted on rubber isolation pads at the base to minimize transmission of vibration.

Rainshield conversion kits are available to convert standard indoor Type QL NEMA Type 2 enclosures to NEMA Type 3R enclosures suitable for protected outdoor installation. The transformer nameplate specifies the proper kit to match the indoor enclosure and transformer. When these parts are properly installed, the enclosure is listed by UL and certified by CSA for NEMA Type 3R protected outdoor installation. Conversion kits include tamper proof hardware with a special tool to replace factory installed screws. Complete installation instructions are supplied. Most type QL transformers can be ordered from the factory with the proper NEMA 3R conversion kit.

In addition, vent guards are available to deter rodents or debris from entering ventilation openings. See following caution statement under Installation.

General purpose transformers are rated 600 volts and below for supplying appliance, lighting, and power loads from electrical distribution systems. Standard distribution voltages are 600, 480 and 240 volts; standard load voltages are 480, 240, and 120 volts. The transformer is used to match the load voltage to the distribution voltage. Since no vaults are required for installation, these transformers can be located at the load to provide the correct voltage for the application.

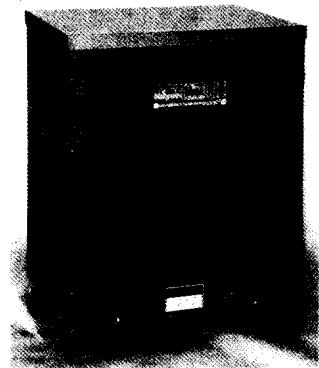


Figure 1. Type QL Transformers

APPLICATION

TEMPERATURE CLASS

Industry standards classify insulation systems in accordance with the following rating system:

INSULATION SYSTEMS CLASSIFICATION

Ambient	+ Winding Rise	+ Hot Spot	= Temp. Class
40° C	55° C	10° C	105° C
40° C	80° C	30° C	150° C
40° C	115° C	30° C	185° C
40° C	150° C	30° C	220° C

All standard, general purpose Type QL transformers meet applicable IEEE, ANSI, NEMA, UL, and CSA standards.

Type QL transformers are designed using a 220° C insulation system with a standard 150° C temperature rise. Transformers for applications requiring lower temperature rises, generally 115° and 80° C, are readily available.

The design life of transformers having different insulation systems is the same, since the allowable temperature rise of an insulation material system is predicated on a specified life for all insulation. The lower temperature systems are designed for the same life as higher temperature systems.

Consideration should be given to the specific application of the transformer such as the type of the load to be served, the space available for the installation, and any weight restrictions before specifying the class of insulation system to be used.

In addition, note that type QL units with a standard 150° C winding temperature rise, operating at full load will have a maximum 50° C/122° F temperature rise on the surface area of the enclosure. With a 40° C ambient, the measured enclosure surface temperature would be approximately 90° C/194° F.

HANDLING

Provisions for lifting are provided. Because transformers are surprisingly heavy, check the weight shown on the outline drawing or the shipping label to assure adequate capacity of lifting equipment. For safety, spreaders should be used with lifting equipment. Lifting holes are provided on the top core clamps, accessible by removing the top cover. The unit may also be lifted by forks or skidded at the base.

RECEIVING

Upon receipt of shipment, examine the package for damage that may have been sustained in transit. If the shipping container must be opened outdoors, take proper precautions to prevent the entrance of moisture. While unpacking, examine the product for broken, bent, or loose parts or other damage. If damage from shipment is evident, file a damage claim with the transportation company and notify the nearest sales office.

INSTALLATION

WARNING TO AVOID ELECTRICAL SHOCK DO NOT REMOVE COVERS WHILE TRANSFORMER IS ENERGIZED.

TRANSFORMER OPERATES AT HAZARDOUS VOLTAGES THAT COULD CAUSE SEVERE INJURY.

CAUTION WE RECOMMEND THAT OPEN VENTILATED TRANSFORMERS BE INSTALLED IN SECURE, CONTROLLED ACCESS AREAS, NEVER IN INDOOR OR OUTDOOR AREAS SUBJECT TO DELIBERATE, UNAUTHORIZED ACTS BY MEMBERS OF THE UNSUPERVISED GENERAL PUBLIC.

IF OPEN VENTILATED TRANSFORMERS ARE INSTALLED IN INDOOR OR OUTDOOR AREAS ACCESSIBLE TO UNAUTHORIZED OR UNTRAINED PERSONNEL, WE RECOMMEND AT A MINIMUM THE USE OF TAMPER RESISTANT ENCLOSURE SCREWS AND VENT GUARDS OVER THE TOP OPENINGS.

OUTDOOR RAINSHIELDS AND VENT GUARDS CAN BE INSTALLED TOGETHER OR SEPARATELY ON ANY TRANSFORMER. THE RAINSHIELD MODEL NUMBER IS SHOWN ON THE TRANSFORMER NAMEPLATE. CONTACT YOUR DISTRIBUTOR OR SUPPLIER FOR ADDITIONAL INFORMATION AND ORDERING.

PREPARATION

Any accumulation of dirt or dust may be removed by brushing or by blowing dry air on the unit. If moisture is evident by the appearance of rust or mildew, the unit 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.

Remove all shipping braces.

GROUNDING

Consideration must be given to equipment grounding (case and core) and to other grounding. Grounding methods and practices are well established and are beyond the scope of this installation guide. ANSI/IEEE standard 142 is a recommended publication for this subject and contains an extensive bibliography.

MOUNTING

The only foundation necessary is a non-combustible flat surface strong enough to support the weight of the unit. Regardless of the type of mounting surface, permanent and effective grounding of the metal case in accordance with the National Electrical Code is recommended as a safety precaution for personnel.

Free circulation of ambient air is essential for the proper operation of all ventilated dry type transformers. Type QL transformers require a minimum distance of six inches to adjacent noncombustible structures or equipment to ensure proper air circulation.

CAUTION WE RECOMMEND THAT TYPE QL TRANSFORMERS BE INSTALLED AT LEAST TWELVE INCHES FROM COMBUSTIBLE MATERIALS—INCLUDING MOUNTING SURFACE—UNLESS SEPARATED BY FIRE RESISTANT HEAT INSULATING BARRIERS. SPECIFIC REQUIREMENTS ARE DESCRIBED IN NEC, SECTION 450-21. CHECK LOCAL CODES.

VENTILATION

Dry type general purpose transformers are cooled by free circulation of surrounding air. Type QL transformers depend upon air to enter the case at the bottom, flow upward over the core and coil surfaces, and exit through openings near the top. These transformers will carry full-rated loads continuously when the surrounding air does not exceed 40° C/104° F and adjacent structures permit free movement of cooling air.

The room in which dry type transformers are located should be sized to permit locating transformers with sufficient spacing between units and sufficient clearances to walls and other obstructions to permit the free circulation of air around each unit and minimize noise amplification. Sufficient space should also be provided to permit routine inspection and maintenance.

Adequate ventilation is essential for the proper cooling of transformers. Clean, dry air is desirable. Filtered air at or above atmospheric pressure may reduce maintenance if dust or other contaminants present a problem. When transformers are located in rooms or other restricted spaces, sufficient ventilation should be provided to hold the air temperature within established limits when measured near the transformer inlets. This will usually require approximately 100 ft³/min of air per kilowatt of transformer loss. Room ventilation should not impede normal circulation of air through the transformer.

AUDIBLE SOUND CONTROL

AUDIBLE SOUND SOURCES

The audible sound produced by transformers is due to the energizing of the core by the alternating voltage applied to the windings. This creates vibrations whose fundamental frequency is twice the frequency of the applied voltage. The vibrations producing audible sound can occur in the core, coil, mounting and in the housing. The transmission of sound from the transformer can be by various media such as air, metal, concrete, wood or any combination. Amplification of audible sound can occur in a given area due to the presence of reflecting surfaces.

CONTROL OF AUDIBLE SOUND SOURCES

Vibration isolators installed between the transformer and its mounting surface will reduce case vibration and compensate for slight unevenness of the mount. They should be sized for the appropriate loading at twice the fundamental frequency.

The transformer housing must be securely fastened to the mounting surface to eliminate possible sound generation.

CONTROL OF AUDIBLE SOUND TRANSMISSION

Acoustical absorbing material should be mounted on reflecting surfaces to reduce sound reflection and possible amplification. Transformers should be mounted on a firm support having as great a mass as possible. Vibration pads or properly designed isolation mounts under the transformers will reduce transmittal of sound.

SITE SELECTION

Care should be used in selecting sites for transformer installation, particularly where sound levels are planned in the 40–50 db range. Specific attention should be given to office, classroom, medical and hospital facilities.

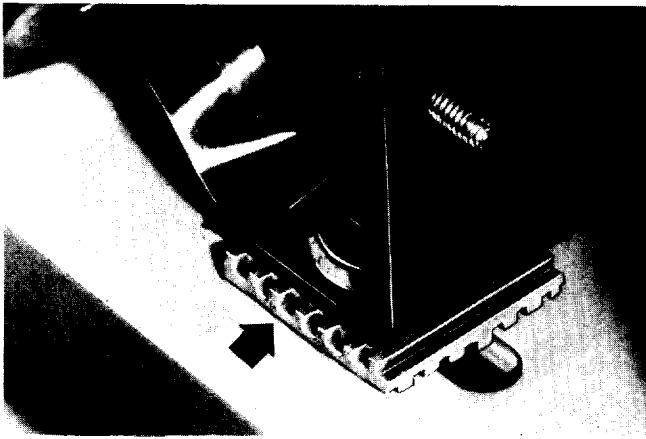


Figure 2. Isolation pads . . for “whisper-quiet” operation

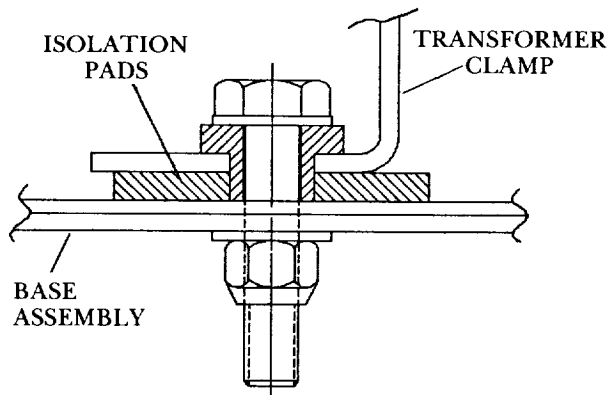


Figure 3. Isolation pad section drawing

On Type QL transformers, neoprene rubber isolation pads and neoprene sleeves around bolts—see Figures 2 and 3—insulate the core and coil assembly from transformer enclosure.

Isolation pad bolts are tightened for shipment and must be properly adjusted before transformer is energized.

There are four isolation pads (Figure 3) located between the bottom transformer clamps and the base assembly. Loosen the bolt and lock nut to allow the isolation pad to support the weight of the unit, then carefully retighten (just snug) so the isolation pad is not compressed.

Type QL dry type transformers are designed and manufactured to comply with NEMA and ANSI standards.

KVA 150°C RISE	Average Sound Levels in Decibels ANSI-C89.2
0-9	40
10-50	45
51-150	50
151-300	55
301-500	60

CONNECTIONS

Reference should be made to the wiring diagram and/or nameplate when making electrical connections to the transformer.

WARNING: BECAUSE OF DANGER OF ELECTRICAL SHOCK, DO NOT REMOVE ENCLOSURE PARTS OR CHANGE CONNECTIONS WHILE THE UNIT IS ENERGIZED.

Care must be taken to place all leads to the same load, or from the supply source through one knockout so that no part of the transformer case is positioned between such leads.

All Type QL general purpose transformers are designed for easy accommodation of cables sizes in accordance with NEC. *Connectors are not furnished.* Refer to cable connection label on inside of front cover of transformer and publication GEK-32278.

NOTE: Terminals must be clean. Clean contact surface area if necessary. If transformers are installed outdoors or in harsh environment, seal the connections with a copper-aluminum joint compound such as GE-G-624 silicone. Apply this after the bolts have been tightened.

The assembly of a connector to the line terminal is also important. The connector must be of the proper size for the cable and the proper type for the cable and terminal metals. Follow established installation procedures recommended by the connector manufacturer. Space and insulate connectors per NEC Section 374-7. Type QL transformers are designed to accommodate a variety of UL-listed copper or copper-aluminum cable connectors. Transformers 15 through 100 kva have terminals with holes for 3/8" bolts while large transformers have holes for 1/2" bolts. Publication GEK-33278 is a typical guide for selection of commercially available connectors.

NOTE: After installation of connectors and cabling, a minimum of 1" clearance must be maintained from energized parts to all case parts.

INSPECTION PRIOR TO ENERGIZATION

After the encased transformer is installed, but before it is energized, the bolt and nut connections which extend through the rubber mounting pads and secure the core and coil to the frame, should be loosened (with no visible compression of the pads under the bolt head and nut) to assure quiet operation. These connections should be retightened before transporting the transformer to another location.

Verify the selection of taps and ratio connections. Check tightness and clearance of all electrical connections.

If there is reason to suspect that moisture has entered the transformer while in transit or storage, it should be checked for dryness before being energized. This can be done by making an insulation resistance test.

PRESERVICE TESTS

It is recommended that the following preservice tests be made before placing a new transformer in service to determine that it is in satisfactory operating condition and to obtain data for future comparison:

1. Insulation resistance test

NOTE: If the insulation resistance is less than 1 megohm, the transformer should be dried as described under "Preparation."

2. Applied-voltage test —Hipot

3. Ratio Test

The following additional tests may be made if desired:

1. Resistance measurements of windings

2. No load losses and excitation current

3. Polarity and phase relation

4. Induced-voltage test (requires frequency above 60 Hz)

OPERATION

LOADING

In general, dry type transformers are designed to operate continuously at their nameplate kilovoltampere rating. ANSI C57.96 provides guidance for loading under unusual conditions including:

1. Ambient temperatures higher or lower than the basis for rating
2. Short term loading in excess of nameplate kilovoltampere with normal life expectancy
3. Loading that results in reduced life expectancy

IMPACT LOADING

ON-OFF switching of loads, such as full voltage starting of motors can place severe mechanical stresses on the winding conductors and support components. Where this type of loading is anticipated, special design measures may be necessary to restrain the mechanical forces.

OVEREXCITATION

Operation at voltages in excess of rating may cause core saturation and excessive core losses. This can result in overheating and abnormally high noise levels. Special care should be taken where overexcitation is anticipated.

General purpose transformers are designed to reach rated temperature rise above ambient air temperature when operating continuously at rated voltage, frequency, and load. Serious overheating with resultant fire damage may result if the unit is operated for sustained periods above rated voltage, and/or above rated current.

Rated current equals volt-amperes divided by rated voltage for single-phase units; or for three-phase units, rated volt-amperes divided by rated line-to-line volts, the quotient of which is divided by the square root of three (1.732).

Single-phase

$$\text{Rated Current} = \frac{\text{Rated Volt Amps}}{\text{Rated Voltage}}$$

Three-phase

$$\text{Rated Current} = \frac{\text{Rated Volt Amps}}{\sqrt{3} \times \text{Rated Line Voltage}}$$

PARALLEL OPERATION

General purpose transformers of identical design will operate satisfactorily when connected in parallel or in three-phase banks. (Tapped units must be connected on the same voltage tap.) Single-phase units may also be connected as autotransformers for boosting or bucking voltage. However, the use of autotransformers is subject to precautions: secondary circuits supplied by autotransformers may be subjected to exceptionally severe short circuits unless protected by current-limiting means. It is recommended that suitable current-limiting devices be installed, where necessary, to limit the short-circuit current to 25 times the rated current. In all cases, the National Electrical Code regulations should be followed.

MAINTENANCE

PERIODIC TESTS

It is recommended that the following tests be made as preventive maintenance tests before reinstalling a dry-type transformer that has been out of service.

1. Insulation resistance test
2. Applied-voltage test—Hipot



The following additional tests are recommended if the unit has been repaired or may be made if desired as periodic tests:

1. Resistance measurements of windings
2. Voltage ratio
3. No load losses and excitation current
4. Polarity and phase relation
5. Induced-voltage test

APPLIED VOLTAGE TEST—HIPOT

Initial installation tests using ac test equipment should be limited to 75% of NEMA factory test value and routine ac maintenance tests to 65% of factory test value. If dc equipment is used, the test voltage should not exceed factory rms test voltage.

PERIODIC INSPECTION AND MAINTENANCE

Like other electric equipment, transformers require maintenance from time to time to assure successful operation. Inspection should be made at regular intervals and corrective measures taken when necessary to assure the most satisfactory service from this equipment. Evidence of rusting, corrosion, and deterioration of the insulation, varnish or paint should be checked, and corrective measures taken when necessary. Auxiliary devices should be inspected and serviced during these inspection periods. Terminals, connections, and cabling should be inspected and accumulated dust, dirt and lint removed.

Additional information related to the installation and maintenance of general purpose transformers can be found in American National Standards Institute publication C57-94, "Guide for Installation and Maintenance of Dry-type Transformers."

STORAGE

Condensation and moisture absorption must be prevented during storage. Ventilated and nonventilated dry transformers should be stored in a warm, dry location. Openings should be covered to keep out dust. If outdoor storage cannot be avoided, the transformers must be protected to prevent the entrance of water, moisture, and other foreign material.

RENEWAL PARTS

The vacuum impregnated unit structure of the core and coil assembly precludes replacement parts. In most cases, field repairs are not recommended, are not economical and can be dangerous.

Renewal parts are available for all enclosure parts surrounding the core and coil assembly. Rainshield and vent guards can be added to any transformer enclosure.

If the conditions of use at the site dictate the need for standby equipment, a complete spare unit is recommended.

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the GE Company.

GE Electrical Distribution & Control

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