



PROLEC

GEK-28055B

INSTRUCTIONS

DISTRIBUTION TRANSFORMERS POLE AND STATION TYPE

GENERAL

These instructions apply to pole-type and station-type distribution transformers, both single phase and three phase. Read these instructions carefully before attempting to use the transformer.

The equipment covered by these instructions should be operated and serviced only by competent personnel familiar with good safety practices. These instructions are written for such personnel and are not intended as a substitute for adequate training and experience in safe procedures for this type of equipment.

The text of this instruction manual includes information concerning hazards to safety which are common to all transformers. This safety hazard information is offered for guidance when installing, operating, and maintaining this equipment. Caution statements are interspersed with the descriptive matter to aid in preventing damage to the equipment and to advise of possible hazards to personnel. When reading this text, the meaning and content of these statements should be understood and followed carefully.

INSTALLATION

Lift the transformer by means of a sling and spreader attached to the lifting lugs. The spreader should have a length equal to the distance between the lifting points. Failure to make use of a spreader may result in damage to the seal or accessories. A pole-type transformer is supplied with support lugs conforming to American National Standards for pole mounting.

This transformer has been carefully sealed and leak tested at the factory. Best results will be obtained if the transformer is installed without breaking the seal, unless it is necessary to install bushings, or to repair obvious damage.

CAUTION: THE LIFE OF ANY TRANSFORMER DEPENDS ON THE ABSENCE OF MOISTURE IN THE INSULATION. THEREFORE, IF A TRANSFORMER IS OPENED

FOR ANY REASON, IT IS IMPERATIVE THAT IT BE KEPT FREE OF MOISTURE AND RESEALED CAREFULLY TO PREVENT BREATHING.

CAUTION: ALWAYS RELEASE ANY POSSIBLE PRESSURE IN THE TANK BY CAREFULLY REMOVING THE PIPE PLUG ABOVE LIQUID LEVEL OR VENTING THE PRESSURE RELIEF VALVE BEFORE ATTEMPTING TO REMOVE HANDHOLE COVERS OR SIMILAR COVERS, INCLUDING SHIPPING COVERS WHEN USED.

When connecting the bushings to the line or external circuit, inspect the bushing terminals or couplings after the connection is made to make sure they are tight. The line connections must not bring any strain on the terminals, which may cause the joints or contacts to become loose. Sufficient flexibility in connecting leads must be provided to avoid mechanical strains due to expansion or contraction which may break the porcelain. The bushings will support a reasonable weight of connecting conductor; but long spans of unsupported conductor, especially if out-of-doors, must be avoided.

GROUNDING

A substantial and thoroughly reliable ground connection should be made between the tank and a low resistance ground through a conductor of adequate cross section. A poor ground can be worse than no ground at all, since it gives a false feeling of safety to those working around the equipment, and might result in loss of life or damage to the apparatus. A tapped pad ground stud is provided for grounding the tank.

CAUTION: EXCEPT WHERE PROHIBITED BY LOCAL ELECTRICAL CODES, THE TANK OF SINGLE-PHASE TRANSFORMERS WITH TWO HIGH-VOLTAGE BUSHINGS AND ALL THREE-PHASE UNITS EXCEPT THOSE WITH GROUND-ED WYE RATINGS SHOULD BE

PERMANENTLY AND SOLIDLY GROUND BY MEANS OF THE EXTERNAL GROUNDING PROVISION LOCATED ON THE TANK, TO AVOID POSSIBLE SERIOUS INJURY TO PERSONNEL.

A single-phase distribution transformer with one high-voltage bushing or three-phase distribution transformer rated grounded wye is designed for use on a system having a solidly grounded neutral. These transformers have high-voltage line leads brought out through bushings and the neutral (the ground end) connected to the tank internally.

CAUTION: FOR SINGLE PHASE TRANSFORMERS HAVING ONE HIGH-VOLTAGE BUSHING AND THREE-PHASE UNITS WITH GROUND-ED WYE RATINGS, GROUND THE TANK AND THE LOW-VOLTAGE NEUTRAL PERMANENTLY AND SOLIDLY TO

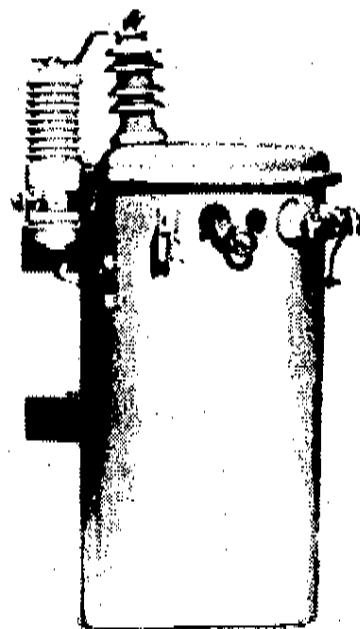


Fig. 1. Typical, single-bushing, Type HSBA, single-phase, distribution transformer

SYSTEM BEFORE THE TRANSFORMER IS EXCITED. IF THIS IS NOT DONE, HIGH VOLTAGE MAY BE IMPRESSED BETWEEN THE LOW-VOLTAGE CIRCUIT AND GROUND, CONSTITUTING A HAZARD TO LIFE AND PROPERTY.

The safest procedure is to make the ground connection first, the connection to the low-voltage lines next, and finally the high-voltage connections. When the transformer is removed from service, all high-voltage connections (including those to protective devices) should be opened first.

TANK ISOLATING GAP

CAUTION: AVOID CONTACT WITH ANY TRANSFORMER TANK EQUIPPED WITH TANK-ISOLATING GAP WHEN THE TRANSFORMER IS ENERGIZED.

Upon request, some single-phase distribution transformers with two high-voltage bushings are equipped with a tank-isolating gap, when it is preferred to operate the transformer with the tank isolated from ground, as distinguished from direct-grounding connection to the tank ground stud. The tank-isolating gap should be used with the grounding conductor connected to the bottom terminal of the isolating gap.

CONNECTIONS

Carefully check the nameplate for the rating of the transformer and make no internal connections other than those shown.

CAUTION: DO NOT CHANGE CONNECTIONS WHILE A TRANSFORMER IS UNDER EXCITATION. FAILURE TO OBSERVE THIS WARNING MAY RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

Unless otherwise specified by the purchaser, transformers are shipped with both high-voltage and low-voltage windings connected for the rated voltages. If a transformer has an external dual voltage switch handle, the connection is for the lower voltage.

To change taps on a transformer having a tap changer handle through the tank wall, withdraw the hex-head position locking screw, change to desired position and replace the position locking screw.

CAUTION: THE TAP CHANGER AND/OR THE DUAL-VOLTAGE SWITCH MUST NOT BE OPERATED WHILE THE TRANSFORMER IS ENERGIZED. PERSONAL INJURY OR DEATH MAY RESULT.

If a three-wire low-voltage connection is used, the loads from line to neutral should be as nearly equal as possible and should not exceed $\frac{1}{2}$ rated kVA for prolonged time periods.

Information on connections of single-phase and three-phase distribution transformers can be found in the Distribution Transformer Manual GET-2485. For copies of the manual, contact the nearest General Electric Sales Office.

PIPE-FITTING

When assembling the pipe fitting, clean the threads thoroughly to remove all insulating liquid, grease, old compound, and dirt. Apply GE Compound No. A15A11A or Telfon® tape to the threads and screw the mating parts lightly in place.

VENTING

The transformer should be vented to the atmosphere before it is placed in service if it has been pressurized for leak tests or storage.

CAUTION: ALWAYS RELEASE ANY POSSIBLE PRESSURE IN THE TANK BY CAREFULLY REMOVING A PIPE PLUG ABOVE LIQUID LEVEL OR VENTING THE PRESSURE RELIEF VALVE BEFORE ATTEMPTING TO REMOVE HAND-HOLE COVERS OR SIMILAR COVERS, INCLUDING SHIPPING COVERS WHEN USED.

OPERATION

This transformer has been designed to carry rated load with a temperature rise equal to or less than the value shown on the nameplate. The coil insulation has been carefully made with thermally-uprated materials to ensure long life at the rated temperature rise in 30C average ambient and 40C maximum ambient. Peak loads in excess of the rating can be tolerated if accompanied by longer periods of light loading. Severe and prolonged overloads will result in overheating and accelerated aging of the insulation, which may lead to premature failure. For more information about the relationship between loading and insulation life, refer to the American National Standards Institute C57.91 *Guide for Loading Mineral Oil-Immersed Overhead-Type Distribution Transformers*.

Transformers should be protected from transient voltages, fault currents, and dangerous overloads. Some transformers are equipped with lightning arresters, fuses, and circuit breakers to provide this protection; the operation of these accessories is described in the following paragraphs. If this transformer is not so equipped, contact the nearest General

Electric Sales Office for specific recommendations.

LOW-VOLTAGE CIRCUIT BREAKER AND SIGNAL LIGHT

CAUTION: ON SINGLE-PHASE AND THREE-PHASE TRANSFORMERS WITH THE SECONDARY CIRCUIT BREAKER OPEN, THERE MAY BE SUFFICIENT CAPACITIVE COUPLING TO THE WINDINGS SO THAT PERCEPTIBLE SHOCK MAY BE OBTAINED FROM THE SECONDARY TERMINALS.

A circuit breaker, when provided, is mounted inside the tank, under the liquid level. The function of this breaker is to open the low-voltage circuit and protect the transformer from faults or severe overloads. A red signal light, when provided, gives warning that the load has reached a value near the tripping point of the breaker. The signal light remains lighted until reset (turned off) by means of the breaker operating handle. Transformers should not be operated under load conditions that will cause the red light to appear frequently, since it indicates an overload on the transformers. When such a condition exists, it is recommended that a larger transformer be substituted to avoid impairing the life to the smaller unit.

The circuit breaker operating handle and position indicator are shown in Fig 2. Transformers are shipped with circuit breakers closed. To open the low-voltage circuit manually, move the handle so that the pointer moves from "C" (closed) to "O" (open). Verify that the circuit breaker is latched in the "open" position. To ensure the discharge of the static charge which is sometimes present in the low voltage winding due to capacitance, it is recommended that all low-voltage bushings be grounded after opening the circuit breaker until after the high-voltage is disconnected.

To close the breaker, rotate the handle to "R" (reset), which engages the latch mechanism, and then to "C". If a fault exists or an excessive load exists at the time the breaker is closed, the breaker will reopen even though the operating handle is held in the "C" (closed) position.

To reset the signal light, rotate the handle to "L" (light), and then return to "C" (closed). If the light fails to go out, the transformer is still overheated.

Provision is made for checking the signal-light bulb when the transformer is in service. To do this, rotate the handle

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to "L" (light) and the light should come on. If it does not, the bulb should be replaced. The bulb is a standard, six-volt GE bulb No. 44, and is replaceable from outside the transformer tank by removing the signal light lens. After checking, return the operating handle to "C". Faulty bulbs should be replaced, since operating the transformer with a faulty bulb or without a bulb may result in radio noise.

Some circuit breakers are equipped with emergency overload devices which can be used to restore service following a circuit breaker operation due to overload. With the emergency lever in the normal position, the breaker will trip at its normal setting as calibrated at the factory. Moving the lever in a clockwise direction (see dotted position in Fig. 2) increases the setting so that a higher temperature is required to trip the breaker. This emergency setting provides extra load capacity and still permits manual breaker operation, and also retains short circuit protection of the transformer. It is important that the emergency setting be used only when, and as long as, absolutely necessary because its use will result in a reduction of transformer life.

A meter seal is provided on the emergency level to prevent tampering. It is recommended that a new seal be applied to the lever when it is returned to the normal position after emergency operation.

INTERNAL EXPULSION FUSES

Internal expulsion fuses are provided on self-protected transformers to disconnect a failed transformer from the line and maintain continuity of service to the remainder of the circuit. The fuse operation gives a positive indication of fault location and aids in quick restoration of service.

Internal expulsion fuses are generally mounted on a terminal board below the oil level or in the high voltage cover bushing. If it is necessary to replace a fuse in the high voltage bushing, care

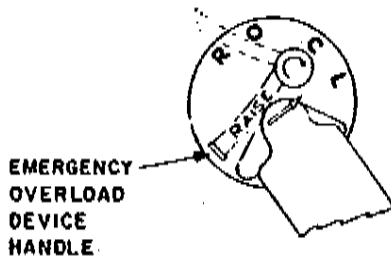


Fig. 2. Breaker position indicator

should be taken to vent the bushing cap to insure proper immersion of the fuse in oil.

OVERLOAD INDICATOR

The loadlite, when supplied, is an overload indicating device consisting of a red light controlled by a switch which is sensitive to top oil temperature. The switch is designed to operate and turn the light on when the transformer has been overloaded long enough to overheat the windings. The light will remain on until the switch is reset by turning the external handle clockwise.

The transformer should not be operated under load conditions that will cause the red light to appear frequently, since it indicates an abnormal load on the transformer. When this condition does exist, it is recommended a larger transformer be substituted to avoid impairing the life of the smaller unit.

The loadlite switch and circuit have been tested after assembly in the transformer. However, it is possible to trip the switch by a heavy jar such as might occur in shipping or handling the transformer. If the light glows immediately when the transformer is first energized it may be turned off by rotating the handle clockwise.

The loadlite operating handle and bearing are shown in Fig. 3. The bulb in the signal light is a standard six volt, GE No. 44 bulb which is replaceable from outside. The bulb may be checked when the transformer is excited by rotating the handle clockwise against the stop.

LIGHTNING ARRESTERS

The use of lightning arresters is strongly recommended, and these arresters can be mounted either on the tank or separate from the tank. If they are separately mounted, they should be as near the transformer as practical. Protection afforded by the arrester decreases rapidly with distance. Transformers with circuit breakers are supplied either with arresters or with provisions for arresters.

Interconnection of the arrester ground and the low-voltage grounded neutral places the arrester in direct shunt relation to the transformer insulation, thereby giving the most effective protection. This should be done whether the arresters are mounted separately or on the transformer.

Transformer-mounted arresters are permanently grounded to the tank by a link from the bottom of the arrester to a stud welded on the tank. These connections must be tight when the transformer is installed. Ground connections from the tank or from separately mounted

arresters should be completed before any connection to the high voltage line is made.

After the transformer is installed and before excitation, the external series gap, if present, should be checked in accordance with the setting specified on the arrester. This gap has been set at the factory for operation at 0-6,000 feet altitude. Vertical adjustment of the gap is obtained by shifting the position of the arrester mounting bracket on the transformer tank. For application in excess of 6,000 feet altitude, refer to the nearest GE Sales Representative for recommendation.

If a transformer with arresters connected to the high-voltage bushing is to receive high-potential or induced-potential tests, the arrester must be disconnected during the test and reconnected after the test is completed. If there is a series air gap between the arrester and the bushing, temporarily insert an insulating barrier in the gap, increase the gap setting, or remove one electrode of the series gap. Replace arresters in proper operating condition after tests are completed.

FLIP-OPEN CUTOUT AND ARRESTER COMBINATIONS

Distribution transformers equipped with a combination cutout and lightning arrester are shipped with the fuse and flipper removed and the fuse contact rotated toward the transformer. Loosen the locking nut and rotate the contact so that the open end is away from the transformer. Adjust electrode gap to the spacing shown on the arrester. Retighten the locking nut. The assembly of the fuse and flipper is as follows. See Fig. 4.

Flipper

Assemble the rod end of the flipper into the high-voltage bushing cable clamp, with the open side of the contact end away from the lightning arrester.

Fuse

The standard fuse has a pointed ring

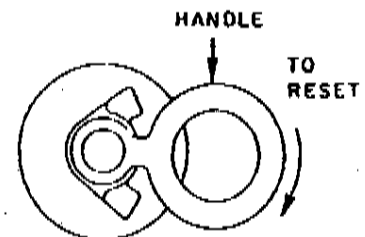


Fig. 3. Loadlite operating handle

attached to one lead and a round ring on the the other lead. Insert the fuse lead with the pointed ring into the "V" of the flipper contact. Bend the flipper toward the arrester and insert the fuse lead with the round ring into the "V" of the arrester contact fork.

Line Connection

The high-voltage line lead is connected to the terminal on the top of the lightning arrester. An eight-inch minimum strike distance is recommended between the flipper contact fork and the line lead.

MAINTENANCE

Periodic maintenance is usually not necessary for GE PROLEC distribution transformers in regular service. Transformers may be removed from service and stored with no harmful effects. For extended storage, the recommendations of ANSI C57.93 should be followed. Whenever a transformer is removed from service, the following maintenance is recommended before it is reinstalled:

1. Test the insulating oil and replace if necessary.
2. Replace broken bushings and leaking gaskets. A dry cycle is recommended to remove moisture which may have entered. Reseal the transformer and check for leaks.
3. Clean the exterior, remove all rust, prime bare spots, and repaint.
4. When assembling the pipe fitting, clean the threads thoroughly to remove all insulating oil, grease, old compound, and dirt. Apply Teflon® tape to the threads and screw the mating parts tightly in place.
5. Inspect the liquid level. Add insulating oil as needed to restore the correct level.

There may be some conditions in which monitoring of the condition of insulating oil is warranted, such as transformers serving unusually critical loads. Under such conditions the following is recommended.

1. Sample and test the oil annually.
2. Filter or replace the oil if needed.
3. Keep careful records of the test data.
4. Change-out the transformer if the records indicate an increase in the rate of oil contamination.

Special information about the characteristics and testing of transformer liquids can be found in the following GE publications:

- GEH-754—Oil Drier and Filter Equipment
- GEH-1333—Oil Filter Presses

INSULATING OIL

GE PROLEC distribution transformers are thoroughly dried at the factory and shipped filled with insulating oil as indicated on the nameplate. The correct liquid level, at approximately 25°C, is marked on the inside of the tank. The liquid level should be inspected before the unit is returned to service. Add oil as needed to restore the correct level.

When it is necessary to add or refill with oil, a GE PROLEC approved insulating oil should be used. The work should be done in a clean, dry area. A metal or oil-proof synthetic-rubber hose should be used for oil lines. Sulfur in natural-rubber hoses will dissolve in the oil and prove harmful to the windings.

TRANSPORTATION AND RECEIVING

Immediately upon receipt of the equipment and following any transportation or handling accident which could affect the integrity of the tank, bushings or radiators, examine the transportation vehicle, tank and fittings for leakage or spillage that may have occurred in shipping. If leakage is evident, correct the cause and soak up spillage with absorbent materials such as sawdust, following with clean-up of the affected area with rags soaked with kerosene or other approved solvent such as perchloroethylene or trichloroethylene.

It should not be necessary to inspect the transformer internally or examine the insulating oil unless the unit has been damaged during shipment. If injury or rough handling is evident, file a damage claim with the transportation company immediately, and notify the nearest General Electric Sales Representative.

Tighten any external parts which may have worked loose, and check the materials against the shipping lists for possible shortages.

SEALING

In order to obtain the full life of transformer insulation, it is important that the transformer be sealed against entry of water and water vapor. Whenever a sealed joint is opened for any reason, it should be resealed as promptly as possible and the seal tested to ensure a tight joint. A simple test can be made by pressurizing the tank at about 5 psig with inert gas and checking for leaks with a soap solution.

GASKETS

All gaskets are compounded to GE PROLEC specifications to be compatible with the insulation oil in the transformer. Nitrile rubber gaskets are used. Gaskets should be clamped firmly

in place to produce an effective seal, but must not be compressed to less than 65 percent of their original thickness. Too much compression can lead to premature deterioration of gaskets. It is recommended that bolts on cover bands and handhole bands be replaced with torque value within factory tolerance. No adhesive is necessary. Gaskets may be reused if they are not damaged.

STORAGE

Before placing a transformer in storage, be sure it is filled with oil to correct level and the seals are tight. The storage area should preferably be dry and the transformer should be protected from mechanical damage.

Orders for renewal parts may be placed by describing the part and giving the rating and serial number appearing on the nameplate. When ordering lightning arresters, also specify the type and kV rating of the arrester required.

WHEN YOU NEED SERVICE

If you need service on products manufactured by Distribution Transformer Department, a world wide service organization is ready to serve you. Warranty administration, site testing services, installation, system studies, maintenance, trouble-shooting, site repairs, and training seminars are provided by the Installation and Service Engineering Division (I&SED).

shop repairs, reconditions, or rebuilds of electrical apparatus as provided by the Apparatus Service Business Division (ASBD) in the GE Shop or on your premises. Contact your GE Sales Office, I&SED, or ASBD for full information about these services.

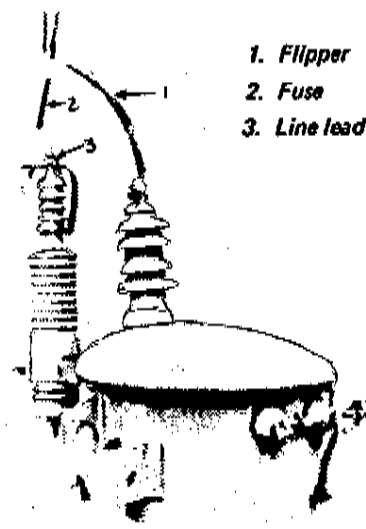


Fig. 4. Distribution transformer equipment with flipper-type cutout and lightning arrester