

**General Electric  
single-phase, pole-type  
transformers:**

A close-up look at  
dependability in design  
and construction



GENERAL  ELECTRIC

# Quality

## through external value features

- Easy, fast installation
- Attractive, modern appearance
- Superior insulation and sealing systems

**1 HIGH-VOLTAGE BUSHING TERMINALS** are tin plated to accommodate both aluminum and copper conductors. Cover-mounted bushings (above 5kV) are equipped with clamp-type terminals which have two stainless-steel, coned-disk Belleville washers to maintain adequate pressure on the conductors during thermal cycling. Side-wall mounted h-v bushings (5kV and below) are handwheel operated with clamp-type terminals which incorporate a stainless-steel follow-up spring to provide adequate pressure on the conductors during thermal cycling.

**2 LOW-VOLTAGE TANK-WALL BUSHING TERMINALS** are tin plated to accommodate both aluminum and copper conductors. Clamp-type terminals simplify connections to the low-voltage leads and are provided with two coned-disk Belleville washers to provide adequate pressure on the conductors during thermal cycling.

**3 LOW-VOLTAGE STUD** offers provision for grounding the neutral. A stud is provided on single-bushing transformers through 25 kVA. A grounding pad is provided on all two-bushing transformers and on single-bushing units above 25 kVA. The low-voltage grounding pad has a tapped hole with .500" wide — 13 NC thread.

**4 COVER FINISH** is an insulating material that reduces out-gases caused by wildlife which come in contact with the cover and a bushing terminal.

**5 ONE-PIECE CLAMPING BAND** prolongs life of the transformer, facilitates inspection and maintains even pressure around the entire rim. It combines with a specially formed tank rim, drawn cover, and Nitrile gasket to form an effective seal which will not deteriorate with age. The weep channels along the cover band provide drainage and inhibit corrosion.

**6 LIFTING LUGS** welded to the tank, are strong enough to support many times the weight of the complete unit.

**7 TANK GROUNDING PROVISION** (not shown) provides a convenient means of making a positive ground.

**8 ALL-WELDED STEEL TANK** is manufactured from shot-blasted, hot rolled steel and pressure tested to assure freedom from oil leaks.

**9 EXTERNALLY GAPPED ARRESTER** (provided on self-protected units) and solidly grounded to the tank directly through the welded stud.

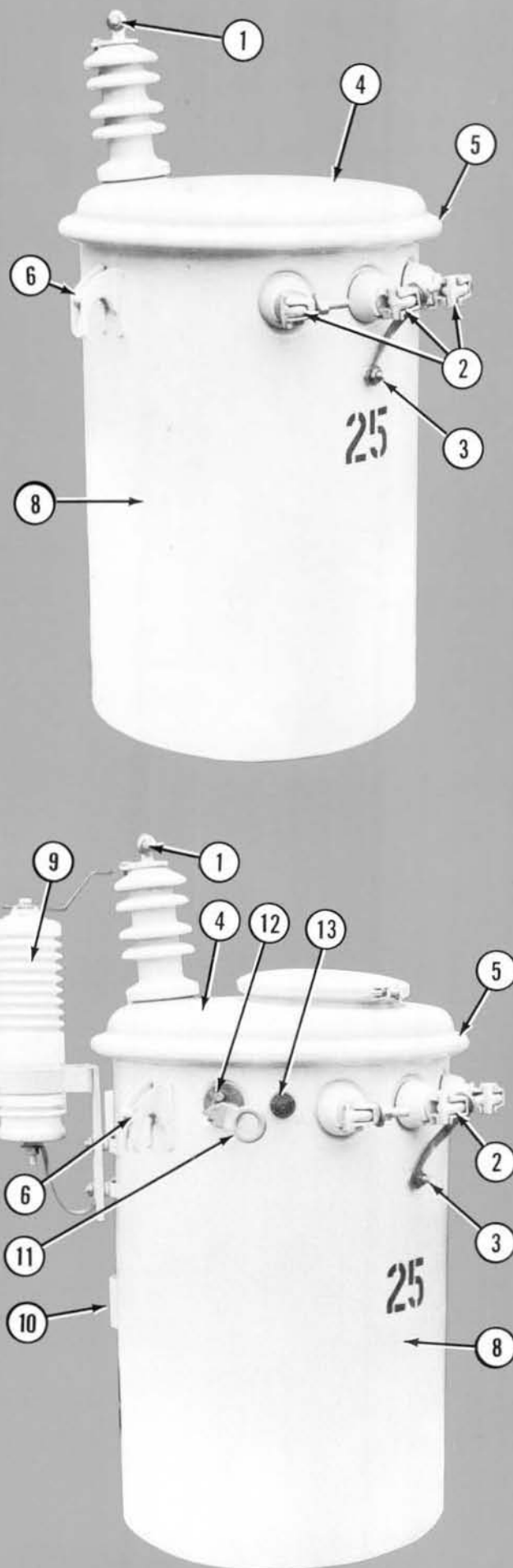
**10 SUPPORT LUGS** conform to ANSI Standards, are made of hot-rolled steel, and are welded to the tank.

**11 LOW-VOLTAGE CIRCUIT BREAKER** (provided on self-protected units) operating handle and position indicator are easily accessible and are operated either by hand or hook stick.

**12 EMERGENCY OVERLOAD RESET HANDLE** (provided on self-protected units) is located adjacent to the breaker handle. It enables overloading of the unit under emergency conditions.

**13 OVERLOAD WARNING SIGNAL LAMP** (provided on self-protected units) as an optional accessory and can easily be seen from the ground.

**14 NAMEPLATE** (not shown) is located for convenient reference from pole side of the tank. On units rated 50-kVA and below location is on the lower hanger bracket; on units 75kVA and above, nameplate is on tank-mounted bracket.



# Quality

through internal  
value features

- Higher system reliability
- Lower operating costs

**1 CORE-AND-COIL STRUCTURE**, (shown is the core type construction) utilizing General Electric's superior transformer insulation system. The core is held in a close-fitting, steel-core cradle which permanently centers it in the tank.

**2 TAP CHANGER**, when specified, is provided for voltage selection when the transformer is de-energized.

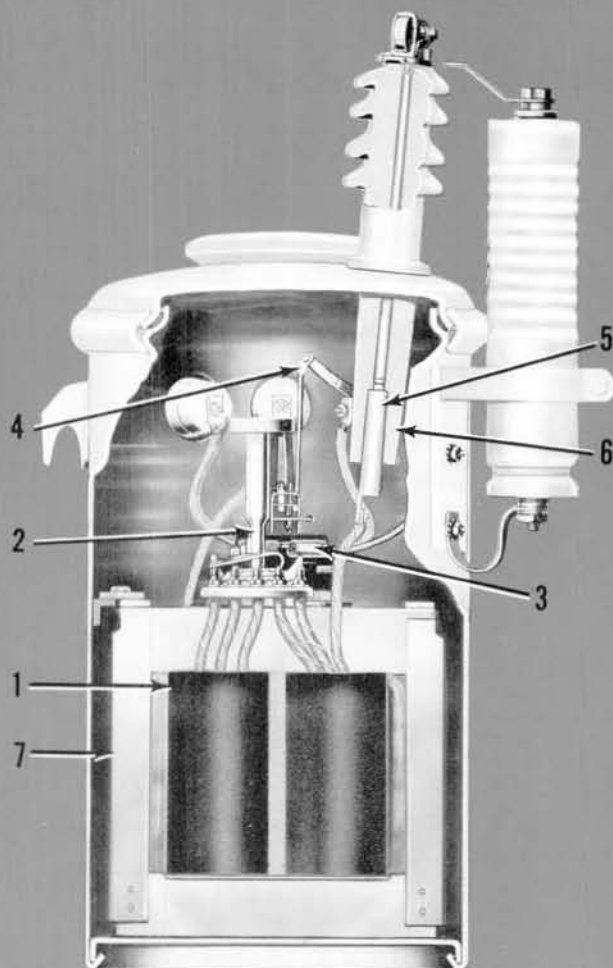
**3 LOW-VOLTAGE CIRCUIT BREAKER**, located below the oil level, is tripped by the deflection of bimetallic elements in series with the low-voltage leads on self-protected units.

**4 OPERATING SHAFT** for the low-voltage circuit breaker is brought through a sealed bearing gland.

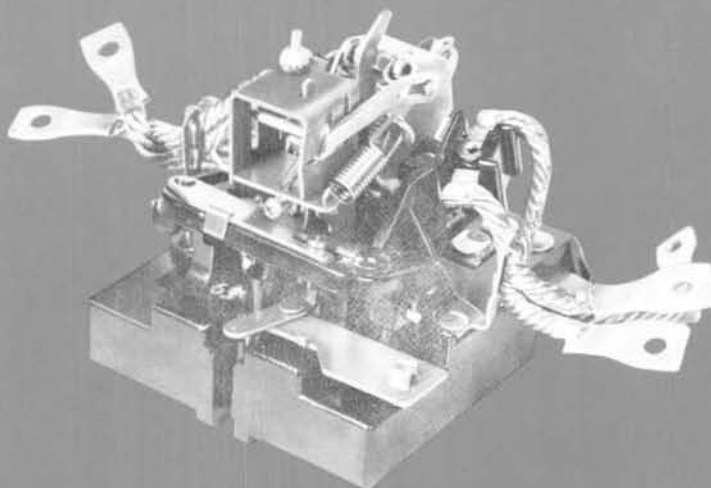
**5 HIGH-VOLTAGE FUSE** on self-protected units disconnects the transformer from the line in the event of an internal fault.

**6 LOWER END OF PORCELAIN** is below the oil level to eliminate the possibility of internal flashover of the bushing.

**7 CORE CLAMPS**, made of steel channels, brace the core and minimize mechanical stress.



The complete line of secondary breakers now has higher interrupting capability. GE low-voltage breakers will successfully clear a bolted secondary fault 5 times without contact welding. A rigid bar gives simultaneous interruption of both breaker contacts.



# Dependability

## through a superior core-and-coil assembly

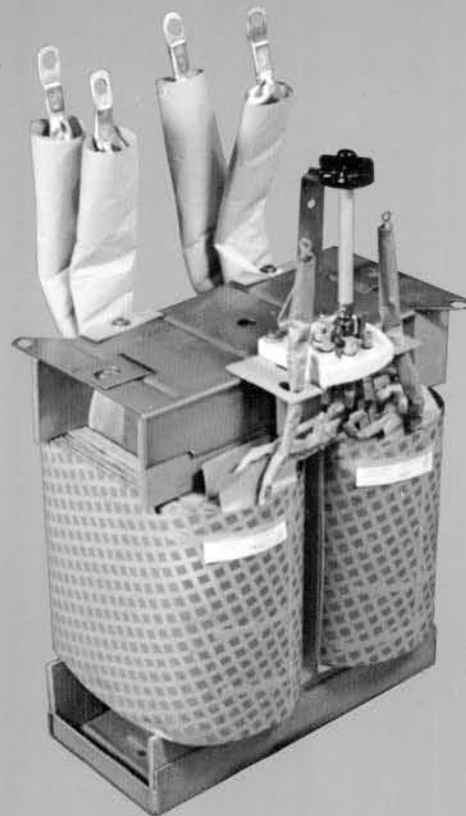
General Electric is currently manufacturing two designs of core-and-coil assemblies for single-phase distribution transformers.

The **shell-type** and the **core-type** designs both use GE's 65°C insulation system, made up of thermally-upgraded paper, superior wire enamel, and insulating oil.

### SHELL TYPE



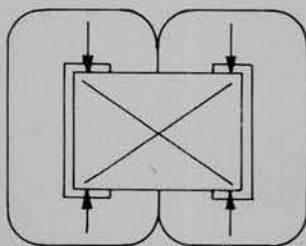
### CORE TYPE



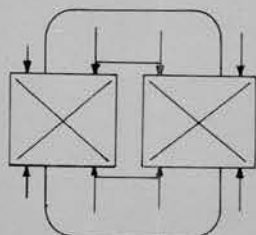
### COIL BRACING

Both shell-type and core-type designs have coil bracing by means of steel channels top and bottom to prevent movement during shipment or short circuit. The construction maintains components in a fixed relation one-to-another for long-term reliability.

#### Shell-Type



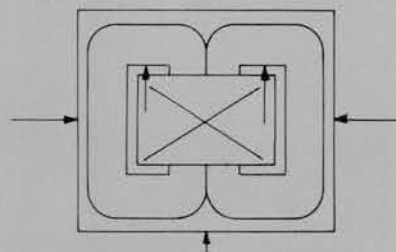
#### Core-Type



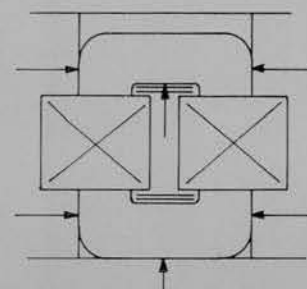
### CORE CLAMPING

Cores in the shell construction are held permanently in place by the coil window and bars welded vertically between the top and bottom channel. This arrangement cradles the cores without applying mechanical stress. In core-type construction, the weight of the larger core is primarily supported by the coils to avoid mechanical stress.

#### Shell-Type



#### Core-Type



# Dependability

## through a superior sealing system

### Sealed against moisture

General Electric distribution transformers are designed and built to resist moisture attack. Manufacturing standards call for the low initial moisture content ( $\frac{1}{2}\%$  or less, which equals less than 8 grams of moisture in a 10 kVA unit). A thermally-upgraded insulation system is designed which minimizes the amount of moisture formed by gradual molecular breakdown of the cellulose insulation components, and the cover sealing system provides excellent resistance to moisture.

### Sealed for safety

General Electric's pole-type transformer cover clamping band and tank bead are designed to contain fast pressure build-up from low-impedance faults. GE self-protected pole-type transformers will withstand a primary fault up to the interrupting rating of the fuse. Conventional transformers will withstand a one-inch arcing fault at a current of 800 amps symmetrical.

In a high-impedance fault, the arc voltage and current are quite low, but the total energy and tank pressure can become dangerously high if the arc continues for an extended period of time. General Electric's cover designs will vent, thus limiting the pressure to a low value. However, it is recommended that the vent plug be removed to relieve the residual internal pressure in the tank before removing the cover.

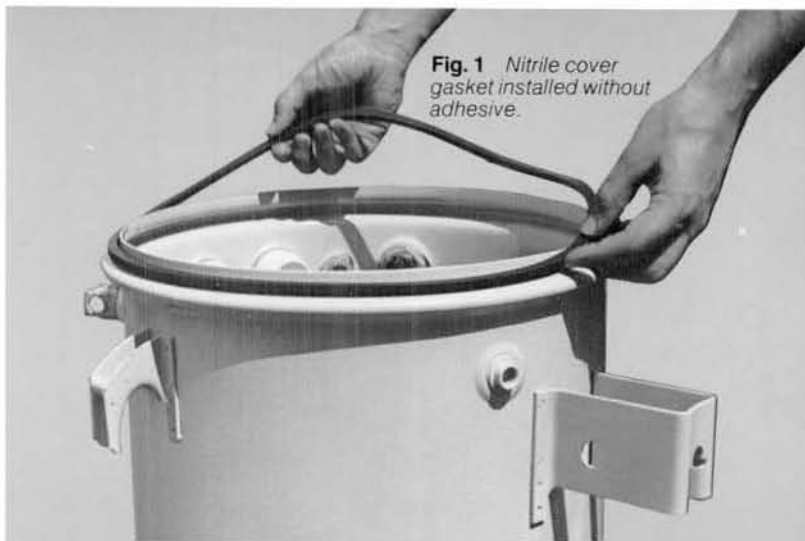
### Here's how GE seals in transformer reliability

General Electric uses a Nitrile rubber gasket at all tank openings on pole-type distribution transformers. Installed without adhesive (see Fig. 1) it is not affected by oil or atmospheric contamination.

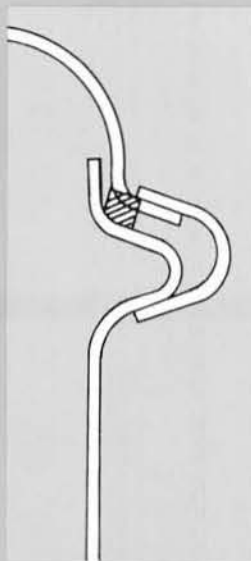
The tank and handhole are sealed with a "floating" gasket joint (see Fig. 2). The tank and cover gasket joints are designed so that pressure is applied edgewise at an angle for best sealing action thus eliminating the possibility of overcompression.

The cover band is tightened to bolt torque specifications on the assembly line. A slotted, hexhead bolt permits field use of an ordinary wrench or screwdriver. Bolt and nut are made of corrosion-resistant stainless steel (see Fig. 3).

Cover bands are provided with crimped weep channels along the bottom outer edge to provide drainage and inhibit corrosion behind the band (see Fig. 4).



**Fig. 1** Nitrile cover gasket installed without adhesive.



**Fig. 2** "Floating" gasket joint.



**Fig. 3** Pressure vent plug and cover band clamp.



**Fig. 4** Weep channel on cover-clamp band.

# Dependability

## through TOTAL QUALITY CONTROL

The most reliable transformer results from rigid control of materials and processes during manufacturing.

For this reason, a Total Quality Control system is an integral part of General Electric's manufacturing process.

Beginning with the Engineering Product Specifications, written for every component by the design engineer, the manufacturing operation develops a Product Manufacturing Instruction that defines how and on what equipment each part is to be made, the essential quality characteristics, and its individual measurements.



*Insulating oils are continually tested to determine adequacy for use with present and future insulation systems. Tests, such as the infra-red spectrophotometer — more stringent than simple chemical measurements — are necessary.*



*Since water is a distribution transformer's worst enemy, all incoming insulating oil is checked for moisture content by titration with Karl Fischer reagent.*



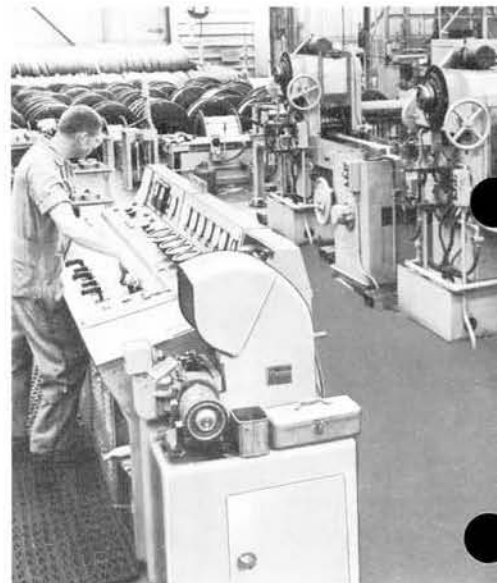
*A quality control specialist is shown making a "tear-down" audit. This audit is performed on randomly sampled, fully completed ready-to-ship units. This specialist checks 97 specific characteristics that affect reliability.*



*One of every ten factory employees perform transformer inspection, thoroughly checking workmanship on all manufacturing processes.*



*An automatic test facility provides a quick, accurate electrical check on the assembly line. ANSI Standard tests are performed, measured and recorded automatically.*



*GE transforms aluminum bull ring into rectangular wire in one of the wire mills at each plant location. Vertical integration of transformer components results in a quality-built product.*

# Dependability

through sales and service

## Before a transformer is sold

Many programs and people lay the groundwork for the sale beforehand. Communications programs are initiated to inform the public of the value of electric living. Utility Executive Conferences introduce new products and innovations. Scores of publications and technical reference books and conferences are offered to assist electric utilities in their future planning. Meeting and serving our customers are the field sales engineers, application engineers and many other highly trained personnel. The high quality of skilled service is matched only by the product itself.

## During sale

Our field sales engineers, working with application engineers and members of the Distribution Transformer Department, develop the best possible information to fill customer's requirements.

Delivery of the transformer is expedited by the new Hickory, N. C., Physical Distribution Center. This facility increases Hickory storage capacity four-fold, which means chances are greater that a unit will be in stock when ordered by customers. In combination with our nationwide network of warehouses (see map), this Center provides excellent customer service capability.

## After delivery

The GE field sales engineer is in constant contact with the customer. He is the first customer contact when help is needed. When assistance is required, the sales engineer knows the route to solve the problem quickly and efficiently.

There are cases when customers need to conduct tests for which they do not have facilities. In those cases, the sales engineer may arrange for work to be done in our laboratories and test facilities.



*General Electric's new Hickory, N. C., Physical Distribution Center greatly increases storage capacity on all units. This center, and our other strategically located warehouses (shown below), allows us to give our customers outstanding service and product accessibility.*



# Dependability

...standard in all  
GE distribution transformers

## Each GE core-and-coil has the same superior design:

- Reliable core-and-coil quality manufacturing processes
- Low operating costs
- High structural soundness
- Superior insulation through thermally-upgraded paper, superior wire enamel and SPIRAKORE® transformer core design.

This coordinated effort results in a transformer having maximum reliability to meet the future operating needs of the electric utility industry.



### Single-phase pole-type transformers

*GE pole-type transformers offer dependable service through superior insulation and sealing systems.*



### MINI-PAD\* pad mount

*The flip-top door on the MINI-PAD transformer opens up to completely expose bushings and connections. Bushings are tilted up so your linemen can work waist high with standard hot-line tools.*

### MAXI-PAD\* pad mount

*The MAXI-PAD unit offers an expanded range of available accessories while maintaining a pleasing appearance similar to the MINI-PAD design.*



### LEAPFROG® II RST underground transformers

*The LEAPFROG II transformer is the first all-welded, stainless-steel, hermetically sealed transformer offered for total underground residential distribution. It is designed to permit pole-top loadability and life.*



### Direct-buried UD transformers

*GE Direct-buried transformers are the result of years of extensive research and field testing. DB's are the latest addition to our line of dependable pole, pad and subsurface transformers.*

General Electric Company  
Distribution Transformer Products Department  
Hickory, N. C./Pittsfield, Mass./Shreveport, La.

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