

Oil-filled, single-phase pad-mounted distribution transformers
installation, operation and maintenance instructions



Powering Business Worldwide

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Safety for life



Eaton's Cooper Power series products meet or exceed all applicable industry standards relating to product safety. We actively promote safe practices in the use and maintenance of our products through our service literature, instructional training programs, and the continuous efforts of all Eaton employees involved in product design, manufacture, marketing, and service.

We strongly urge that you always follow all locally approved safety procedures and safety instructions when working around high voltage lines and equipment, and support our "Safety For Life" mission.

Safety information

The instructions in this manual are not intended as a substitute for proper training or adequate experience in the safe operation of the equipment described. Only competent technicians who are familiar with this equipment should install, operate, and service it.

A competent technician has these qualifications:

- Is thoroughly familiar with these instructions.
- Is trained in industry-accepted high and low-voltage safe operating practices and procedures.
- Is trained and authorized to energize, de-energize, clear, and ground power distribution equipment.
- Is trained in the care and use of protective equipment such as arc flash clothing, safety glasses, face shield, hard hat, rubber gloves, clampstick, hotstick, etc.

Following is important safety information. For safe installation and operation of this equipment, be sure to read and understand all cautions and warnings.

Hazard Statement Definitions

This manual may contain four types of hazard statements:

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION: Indicates a potentially hazardous situation which, if not avoided, may result in equipment damage only.

Safety instructions

Following are general caution and warning statements that apply to this equipment. Additional statements, related to specific tasks and procedures, are located throughout the manual.

DANGER

Hazardous voltage. Contact with hazardous voltage will cause death or severe personal injury. Follow all locally approved safety procedures when working around high- and low-voltage lines and equipment.

G103.3

WARNING

Before installing, operating, maintaining, or testing this equipment, carefully read and understand the contents of this manual. Improper operation, handling or maintenance can result in death, severe personal injury, and equipment damage.

G101.0

WARNING

This equipment is not intended to protect human life. Follow all locally approved procedures and safety practices when installing or operating this equipment. Failure to comply can result in death, severe personal injury and equipment damage.

G102.1

WARNING

Power distribution and transmission equipment must be properly selected for the intended application. It must be installed and serviced by competent personnel who have been trained and understand proper safety procedures. These instructions are written for such personnel and are not a substitute for adequate training and experience in safety procedures. Failure to properly select, install or maintain power distribution and transmission equipment can result in death, severe personal injury, and equipment damage.

G122.3

Product information

Introduction

These instructions have been prepared to assist competent technicians in the installation, operation and service of Eaton's Cooper Power series single-phase pad-mounted distribution transformers.

Pad-mounted distribution transformers from Eaton's Cooper Power series are designed for installation on single-phase underground systems. All units are constructed for weather exposed mounting on a concrete pad with high and low voltage cables entering the operating compartment through an opening in the pad. Although every effort has been made to anticipate normal installation, operation and servicing problems, these instructions do not cover all possible variations in equipment or application conditions. All possible installation, operation or service contingencies are not discussed. If additional information is required, contact an Eaton representative.

Read this manual first

Read and understand the contents of this manual and follow all locally approved procedures and safety practices before connecting or operating this equipment.

Additional information

These instructions cannot cover all details or variations in the equipment, procedures, or process described, nor provide directions for meeting every possible contingency during installation, operation, or maintenance. For additional information, contact your Eaton representative.

Quality standards

ISO 9001 Certified Quality Management System

Safety requirements

Before you start work

Check your supplies and equipment

Check your tools and supplies before beginning work. Make sure all needed equipment is in good working order; make sure all necessary materials are available.

While you are working

Protect yourself

Observe all safe practices and procedure regulations established by your employer. Wear all protective gear and clothing (boots, helmets, gloves, masks, goggles, safety glasses) supplied by your employer or required for safety on the job.

Follow manufacturer's instructions when installing or using any apparatus or attachments. Observe all precautions recommended in manufacturer's literature.

Handle all electrical equipment with respect. Make sure you know circuit and load current conditions before operating or servicing a system connected transformer.

Lift and move transformer with care

Before moving the transformer, check the total weight of the equipment (see nameplate) and check the condition and capacity of all lifting and hoisting equipment. When lifting the unit from above, use lifting lugs only. Do not use radiators or cooling fins for lifting. Do not use worn, frayed or damaged hooks, cables, or slings. Do not use fork lifts or cranes with load capacity less than the weight of the transformer. Do not drop the transformer from the truck.

Mount transformer securely

The transformer must be securely fastened to the mounting pad. When the transformer is bolted in place, there should be no gaps between the pad and the transformer tank base or operating compartment underframe.

When you make the system connection

Make sure multiple voltage switches and tap-changers are in the proper position.

Make sure the tank is grounded before doing any other work

Ground the tank before making any other system connection. The transformer tank ground must be connected to a permanent, low-impedance ground.

Clean all bushings and terminals before making system connections

Clean bushings, terminal lugs, and all connection points before making connections. Remove all dirt, grease, or foreign material.

Complete the neutral connections before making other system connections

Connect all available transformer neutrals to system neutrals before completing other system connections.

Keep unused leads isolated from system wiring

Insulate all unused leads from ground and from all other leads and connections.

Observe manufacturer's instructions when installing attachments

Follow manufacturer's instructions for installing accessories or attachments. Make sure all connectors are correctly rated for the application.

Check insulating fluid level before energizing the transformer

Make sure the insulating fluid is at the proper level before the transformer is energized.

Close and lock unattended transformers

When leaving a transformer unattended, close the compartment door, secure the locking bolt and padlock the unit.

During operation

De-energize the transformer before operating non-loadbreak accessories.

Tap-changers

The transformer must be de-energized before tap-changer settings are adjusted.

Multiple voltage switches

The transformer must be de-energized before multi-voltage switch settings are changed. (Check the transformer nameplate for the correct voltage before re-energizing the unit.) Check tap-changer position before energizing a transformer with a multi-voltage switch.

WARNING

When multiple voltages switches are set to connect transformer windings in parallel, tap-changers must be in the position shown on the transformer nameplate. Tap-changers usually cannot be used to adjust voltage ratings when transformer windings are connected in parallel. Before re-energizing transformer after resetting multiple voltage switches, check tap-changer settings against nameplate information for correct voltages. Failure to have tap switch in correct position could result in equipment failure or personal injury after unit is energized.

Dry-well non-loadbreak fuseholders

WARNING

Failure to ground the unit prior to energizing could result in equipment failure or personal injury.

The transformer must be de-energized before a fuseholder cap is removed or installed. (Check the fuseholder before reinstallation; do not exceed the fuseholder rating.)

Internal fuses

The transformer must be de-energized before it can be opened to service internal fuses. Do not attempt to open an energized transformer.

WARNING

Do not attempt to open an energized transformer. Opening an energized unit could result in personal injury or death.

WARNING

Operate all loadbreak equipment with caution-make sure you are aware of circuit conditions; make sure you understand the purpose and function of all equipment's accessories. Wear any protective clothing or equipment required.

Bay-O-Net fuses

Read the manufacturer's instructions carefully and vent the transformer before operating a Bay-O-Net fuse holder.

WARNING

Bay-O-Net fuses are hotstick operable devices. Do not attempt insertion or removal without insulated hotstick.

Internal loadbreak switches

Internal loadbreak switches are designed to interrupt rated current only; they are not designed to interrupt fault currents. Do not exceed switch ratings.

Do not exceed transformer ratings

Transformers should be operated only at the ratings specified on the transformer nameplate. Prolonged overload operation will measurably shorten the projected service life of a mineral oil-filled transformer. Eaton's Cooper Power series PEAK™ transformers have extended life and can be operated at overload conditions while still exceeding ANSI® standard insulation life.

Receiving

Immediately upon receipt, the transformer should be inspected for evidence of any damage or mishandling that may have occurred during shipment. Notify your Eaton representative of any evidence of damage or defect observed. Claims for shipping damage should be filed with the delivering carrier.

Before the transformers is moved, parts or attachments that may have been loosened or damaged during shipment should be tightened, repaired or replaced.

Moving the transformer

Most of the weight in a pad-mounted transformer assembly is in the main tank which holds the core and coil assembly and the insulating fluid. The terminal compartments are largely empty and weigh relatively little. Improper use of hoists and jacks could seriously damage the transformer or its attachments or cause serious personal injury.

CAUTION

Equipment damage. Before moving the transformer, check the total weight of the equipment (see nameplate) and check the condition and capacity of all lifting and hoisting equipment. When lifting unit from above, use lifting lugs only. Do not use bushings as handles. Do not use worn, frayed or damaged hooks, cables or slings. Do not use fork lifts or cranes with load capacity less than the weight of the transformer. Do not drop transformer from truck. Improper lifting may result in equipment damage.

Moving transformer shipped on pallets

Transformers shipped on pallets may be moved by fork lift trucks of proper capacity. Pallet mounted or poly pad-mounted equipment may also be moved by crane or hoist.

WARNING

Lifting a non-palletized transformer with a fork truck may cause damage to the finish, misalignment of the sill, or damage to the tamper resistant features. Failure to comply may result in serious personal injury.

Lifting the transformer by crane or hoist

For unloading, lifting lugs are provided near the top of the transformer case. Cable pull angles should not be over 30° from the vertical. Otherwise, spreaders should be used to hold the lifting cables apart to avoid any bending of the structure or lifting hooks. Bolts attached to lifting lugs should be 1-1/4" or less in length.

Do not attempt to lift the transformer by placing a continuous loop of cable or chain around the unit or lifting lugs.

CAUTION

Equipment damage. Lift the transformer using all of the lifting pads or lugs provided. Do not use radiators or cooling fins for lifting. Failure to comply may result in damage to the equipment.

Storage

The transformer should be installed in its permanent location and all attachments should be assembled as soon as possible after receiving. Transformers which will not immediately be placed in service should be stored with terminal compartment doors closed and sealed to prevent damage to bushings or other attachments.

Installation

Make sure you understand the purpose and function of all equipment and accessories. Wear any protective clothing or equipment required. Use a hotstick for all grounding, testing, disconnect, or reconnect operations when possible. Treat the transformer as energized until you are certain of its condition.

Pre-service inspection

New transformers or transformers energized after a period of storage, should be thoroughly inspected before being connected to the system.

1. The transformer exterior should be inspected for nicks, dents, and scratches. Any damage to weather-resistant finishes should be repaired promptly.
2. All gaskets or seals at gauges, fuses, operating devices, etc., should be inspected for evidence of insulating fluid seepage. Leaking or improperly tightened gaskets and seals must be repaired before the transformer is placed in service.
3. The fluid level inside the tank must be checked. Transformers from Eaton's Cooper Power series are shipped ready for installation, with the insulating fluid at the 25 °C level. On units which are not gauge equipped, the fluid level can be determined by removing the oil-level plug.

WARNING

The transformer tank must be vented to zero pressure before the cover or oil-level plug is removed. Vent by manually pulling the pressure relief device with a hotstick. Failure to properly vent the transformer to atmospheric pressure before and after moving, prior to installation, and before initiating any inspection or repair procedures may result in damage to the equipment or in serious personal injury.

Care should be taken to avoid bodily contact with oil which may be released from the transformer during the venting procedures.

Mounting the transformer

The transformer should be mounted on a level pad. The pad should be strong enough to support the weight of the transformer. Units equipped with poly pads do not require a concrete mounting pad. To maintain full cabinet security, the transformer tank and cabinet base have provisions for installing cleats to secure transformer to pad.

Non-loadbreak accessories

All settings of multiple voltage switches and tap-changers should be made prior to any high voltage or low voltage connections.

The multiple voltage switch was set at the factory at the highest voltage position. Check the position of this switch.

The tap-changer was set at the factory to the rated nameplate voltage. The tap positions are referenced on the nameplate. Check the position of the tap-changer.

WARNING

High voltage switches and tap-changers are no-load devices. Do not operate unless the transformer is de-energized. Operating switches when transformer is energized could result in equipment failure or personal injury.

External connections

Transformers must be connected and operated as indicated by the transformer nameplate.

CAUTION

Equipment damage. Make only those connections indicated on the diagrams and information on the transformer nameplate. Available transformer neutrals must be connected to system neutrals. Leads and connections not in use must be insulated from ground and from all other leads. Improper connections may result in equipment damage.

Clean all bushings and terminals before making system connections. Remove all dirt, grease, or foreign material.

WARNING

The transformer tank must be grounded before any other electrical connection is made. A transformer which is system connected and not grounded should be regarded as energized. An energized transformer is extremely dangerous. Contact with an energized transformer tank can be fatal. Wye-Wye winding connected transformers (no Delta winding) are designed for use on systems having a grounded neutral connector. All windings designed for grounded neutral operation MUST be permanently and solidly grounded to the system neutral without resistance.

Low voltage connections

Stud terminals are the standard low-voltage connectors on single-phase pad-mounted transformers from Eaton's Cooper Power series. Various spade terminal configurations are available as options.

Accessories

Single-phase pad-mounted transformers from Eaton's Cooper Power series may be equipped with a variety of optional equipment. Many types of fuses and switches are available and different gauges, drain-valves, and pressure-relief devices may be obtained. Most accessories are factory installed and no field work is required to prepare them for operation. Check that system fault current is within accessory's rating.

Follow manufacturer's instructions for installing accessories or attachments. Make sure all connectors (permanent or separable) are correctly rated for the application.

Primary connections

Primary connections are provided by internally clamped bushings with tin-plated eye bolt terminals suitable for either copper or aluminum conductors. Do not connect primaries until all other connections are made.

Dead-front single-phase pad-mounted transformers from Eaton's Cooper Power series are equipped with universal bushing wells, one-piece bushings, or bushing wells with factory installed inserts. Bushing wells must be field equipped with bushing well inserts before loadbreak elbow cable connections can be made.

Bushing well inserts to be used on single-phase pad-mounted transformers from Eaton's Cooper Power series must be compatible with the universal bushing wells provided on the transformer. Read the manufacturer's instructions furnished with the insert before installing the device. Where a one-piece bushing has been furnished, no field work is required to prepare the transformer for elbow connectors.

Live-front single-phase transformers from Eaton's Cooper Power series are provided with spade or eyebolt terminals for direct connection to the primary line.

Operation

Transformers from Eaton's Cooper Power series are designed to carry a 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-upgraded materials to ensure long life at rated loads. Severe and prolonged overloads will result in overheating and accelerated aging of the insulation, which may lead to premature failure.

Maintenance

Disconnection



The transformer MUST be de-energized before any service is performed. Working on an energized transformer is extremely dangerous—do not attempt to open or service energized equipment. Opening or servicing an energized unit could result in personal injury or death.

Exterior maintenance

Periodically inspect all exposed surfaces for evidence of tampering, battered metal, etc. Dents or deformities should be repaired at once. Scratched or weathered paint or protective coatings should be touched up promptly. Keep the area around the transformer clean. Do not store tools, materials or equipment on or against the transformer.

Inspect plugs and switches. Look for evidence of insulating fluid seepage around tank-wall gaskets, seals, etc.

Bushing removal and replacement

1. Disconnect all external cables and leads.
2. Thoroughly clean around the bushing. Remove all dirt, grease, and moisture.
3. Tip the transformer on its back.
4. Operate the pressure relief valve to vent possible built-up internal transformer pressure.
5. Remove external nuts, washers, etc.
6. Pull the bushing away from the faceplate until the internal lead connection is exposed, then disconnect the lead.
7. Install a new bushing and gasket, then reconnect the lead. The original gasket may be reused unless pinched or cut.
8. Center the bushing and gasket to obtain an effective seal.
9. Install the bushing clamp and clamp nuts, then tighten the nuts.
10. Tip the transformer upright and check for leaks.

CAUTION

The life of any transformer depends on the absence of moisture in the insulation. Therefore, if a transformer seal is broken for any reason, it is imperative that the transformer be kept free of moisture and resealed carefully. Excess moisture in the transformer fluid leads to accelerated breakdown of insulation and may result in equipment failure.

Handling insulating fluid

Mineral oil-filled transformers–non-PCB (<1 ppm) insulating fluid

Refer to IEEE Std C57.106™-1977 standard, Guide for Acceptance and Maintenance of Insulating Oil in Equipment, for additional guidelines when testing or handling insulating oil.

Envirotemp™ FR3™ fluid-filled transformers–high firepoint, non-PCB (<1 ppm) insulating fluid

For information on Envirotemp™ FR3™ fluid, refer to factory.

Contaminated insulating fluid

If moisture is found inside the tank, or there is evidence that the insulating fluid may be otherwise contaminated, a fluid sample should be taken for analysis. Samples should be drawn from the bottom of the tank through the oil fill hole on the face plate. If moisture is present in the fluid, the transformer must be dried out. Contact your Eaton representative for special instructions on dry-out or other decontamination processes.

Note: Fluid samples should be taken when the unit is warmer than the surrounding air to avoid condensation of the moisture on the fluid. Samples must be drawn from the bottom of the transformer tank.

A clean and dry bottle is required. Rinse the bottle three (3) times with the fluid being sampled. Make sure fluid being sampled is representative of the fluid in the unit.

Test samples should be taken only after the fluid has settled for some time, varying from several hours to several days for a large transformer. Cold insulating fluid is much slower in settling.

Insulating fluid level

The transformer tank should be filled to the oil plug with insulating fluid. If additional fluid is needed, the following procedure should be followed:

1. Use pumps and hoses that have not been contaminated by contact with dissimilar fluids. Use a metal or non-rubber hose as oil dissolves the sulfur found in rubber and will prove harmful to the conductor material.
2. Place the pump output line in the transformer tank through the oil fill plug hole. Be sure the hose is submerged in the tank oil to prevent aeration.

3. Pump from near the bottom of the storage tank. Do not permit the intake line to suck air.
4. Pump slowly-fill the transformer tank to the plug level. Remove the hose and insert the fill plug.
5. Sufficient time should be allowed between refilling and energizing of the transformer to be sure that any gas bubbles created during the process have dissipated.

Disposal

When disposing of a transformer or transformer insulating oil, follow all applicable state and federal regulations regarding the disposal of oil-filled electrical equipment.

Testing

Surge arresters

Surge arresters must be disconnected before tests are run on the transformer and should be reconnected immediately after tests are completed.



CAUTION

Failure to disconnect arresters during dielectric test may result in failure of the transformer upon energizing.

Accessories

Accessory items on transformers vary in function and are not generic for simple instruction. Information on accessories can be obtained from your Eaton representative.

Replacement parts

When ordering replacement parts, please provide:

1. Transformer serial number.
2. Description of replacement part required.

To order parts, contact:

Distribution Transformers
Eaton
1900 East North Street
Waukesha, WI 53188-3899
Phone: (262) 547-1251
Fax: (262) 547-7268

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