

# Distribution Transformers

## Instructions for Mineral Oil Filled, Single-Phase Padmounted Distribution Transformers

Service Information  
**S201-20-1**

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### INTRODUCTION

These instructions have been prepared to assist competent technicians in the installation, operation and service of Cooper Power Systems (CPS) single-phase padmounted distribution transformers.

CPS padmounted distribution transformers are designed for installation on single-phase above ground 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 a factory representative at:

COOPER POWER SYSTEMS  
DISTRIBUTION TRANSFORMERS  
1900 EAST NORTH STREET  
WAUKESHA, WI 53188-3899  
262/547-1251 FAX 262/547-7268

### SAFETY

These instructions are not intended as a substitute for proper training or adequate experience in the safe operation of single-phase overhead distribution transformers. Personnel using these instructions should be fully acquainted with industry-accepted safe practices and procedures for installing, operating or servicing electrical power system distribution apparatus.

### 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. Do not use fork lifts or cranes with load capacity less than the weight of the transformer. Do not drop transformer from 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 & 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 systems 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

*These instructions do not claim to cover all details or variations in the equipment, procedure, or process described, nor to provide direction for meeting every possible contingency during installation, operation, or maintenance. When additional information is desired to satisfy a problem not covered sufficiently for the user's purpose, please contact your Cooper Power Systems sales engineer.*

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 compartment door, secure the locking bolt and padlock the unit.

## **DURING OPERATION**


De-energize the transformer before operating non-load-break 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:** Disregard of a WARNING may result in serious personal injury and/or serious damage to the equipment.


 **CAUTION:** When multiple 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 switches, check tap changer settings against nameplate information for correct voltages.

### **Dry-Well Non-Loadbreak Fuseholders**

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:** 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 hot stick operable devices. Do not attempt insertion or removal without insulated hot stick.

## **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 transformer.


## **RECEIVING**

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

Before the transformer 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 padmounted 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:** Before moving the transformer, check the weight of the transformer and the capacity and condition of all hoisting or lifting equipment. Do not use worn, frayed or damaged cables or slings. Do not use hoisting machinery with load capacity less than the weight of the transformer as shown on the transformer nameplate.

## **MOVING TRANSFORMERS SHIPPED ON PALLETS AND POLY PADS**


Transformers shipped on pallets or poly-pads 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.

 **CAUTION:** 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 provisions are 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 structures 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:** 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 be immediately be placed in service should be stored with terminal compartment doors closed and sealed to prevent damage to bushings or other attachments.

## INSTALLATION

**WARNING:** 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.

**CAUTION:** Transformers contain flammable mineral oil. Severe damage may cause fire or possible explosion. When a transformer must be installed in close proximity to buildings or public thoroughfares, R-Temp® or Envirotemp® FR3™ fluid should be used.

## 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. CPS transformers 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, or removing the tank cover.

**CAUTION:** The transformer tank must be vented to zero pressure before the oil-level plug is removed. Vent by manually pulling the pressure relief device with a hotstick.

**WARNING:** 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.

**CAUTION:** High voltage switches and tap changers are no-load devices. Do not operate unless the transformer is de-energized.

## EXTERNAL CONNECTIONS

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

**CAUTION:** Make only those connections indicated by 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.

**CAUTION:** 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.

## Low Voltage Connections

Stud terminals are the standard low-voltage connectors on single-phase pad mounted transformers. Various spade terminal configurations are available as options.

## Accessories

CPS single-phase padmounted transformers 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

**WARNING:** Do not connect primaries until all other connections are made.

CPS dead-front single-phase padmounted transformers are equipped with universal bushing wells, one-piece bushings, or bushing wells factory installed inserts. Bushing wells must be field equipped with bushing well inserts before load-break elbow cable connections can be made.

**WARNING:** Bushing well inserts to be used on CPS single-phase padmount transformers 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 one-piece bushings have been furnished, no field work is required to prepare the transformer or elbow connectors.

CPS live-front single-phase transformers are provided with spade or eyebolt terminals or direct connection to the primary line.

## OPERATION

CPS transformers 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

**WARNING:** 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.

### 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 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.

### HANDLING INSULATING FLUID Mineral Oil-Filled Transformers—Non-PCB(<1ppm) Insulating Fluid

Refer to ANSI C57.106, Guide for Acceptance and Maintenance of Insulating Oil in Equipment, for additional guidelines when testing and handling insulating oil.

### R-Temp or Envirotemp FR3 Fluid-Filled Transformers— High Firepoint, Non-PCB (<1 ppm) Insulating Fluid

For information on R-Temp or 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. If moisture is present in the fluid, the transformer must be dried out. Contact your CPS 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 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

 **WARNING:** When disposing of 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 dielectric tests are run on the transformer. Arresters 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 Cooper Power Systems Sales Engineer.

## REPLACEMENT PARTS

When ordering replacement parts, please provide:

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

To order parts contact:  
Distribution Transformers  
Cooper Power Systems  
1900 East North Street  
Waukesha, WI 53188-3899  
Phone: (262) 547-1251  
FAX: (262) 547-7268

