Underground Distribution Switchgear
Technical Data
TD285003EN

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COOPER POWER SERIES

Guide for atmospheric retrofilling of 38 kV (or lower) fluid-filled switchgear

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Product information

Introduction

This document provides installation instructions and technical data for the atmospheric retrofilling of 38 kV or lower fluid-filled underground distribution switchgear.

⚠ Read this manual first

Read and understand the contents of this manual and follow all locally approved procedures and safety practices before installing 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. When additional information is desired to satisfy a problem not covered sufficiently for the user's purpose, contact your Eaton representative.

In addition to this manual, also refer to the appropriate service manual for the model being retrofilled with E200 fluid.

Product type	Model	Service information
Underground Distribution Switchgear	VFI	MN285006EN
	RVAC	MN285005EN

Quality standards

ISO 9001 Certified Quality Management System

Residual oil information

Replacing the dielectric oil in switchgear (retrofilling) with E200 fluid can be an effective way to upgrade fire safety and lower the environmental risk. Mineral oil is fully miscible and compatible with E200 fluid; however, if the concentration of residual mineral oil exceeds 1% by volume, the E200 fluid fire point may fall below 300 °C. Following this guide should limit the residual oil to less than 1%.

IMPORTANT

This reference guide applies to retrofilling mineral oil-filled underground distribution switchgear in general and is not intended to convey safety information. Refer to the original manufacturer's Operation and Maintenance guide for switchgear prior to beginning the retrofill process. Each installation may require additional steps. Stricter compliance with the above steps, or additional steps not listed, may be indicated by service records, test results, manufacturer and installer's recommendations, applicable code requirements, site inspection of the switchgear or other industry maintenance and operating practices. All applicable safety codes and procedures must be followed.

Liquid-filled switchgear condition assessment

A visual inspection to confirm integrity of all seals (including gaskets), bolted connections, and proper operation of gauges should be performed. This may indicate whether additional maintenance operations should be performed while the unit is out of service.

Pre-retrofill steps:

1. Obtain original Switchgear Operation and Maintenance guide for this equipment.

   Service Information MN285006EN, Type VFI, Oil-Insulated, Vacuum Fault Interrupter; Installation, Operation, and Maintenance Instructions

   Service Information MN285005EN, Type RVAC, Oil-Insulated, Vacuum Switchgear; Installation, Operation, and Maintenance Instructions
2. Obtain switchgear gasket set (cover and bushing gaskets) if needing replacement.
3. Order parts noted during visual inspection as needing replacement.
4. Note site limitations for service equipment. Plan for protective barriers necessary to guard against moisture, dust, etc.
5. Schedule old oil disposal.
6. Schedule new fluid delivery (with additional fluid for rinsing the switchgear after draining).
7. Obtain container for used rinsing fluid.
8. Note location of drain and fill connections on front plate of switchgear.
9. Limit air and moisture exposure whenever possible.

⚠ CAUTION

Hazardous voltage. This equipment must be de-energized and grounded prior to conducting any maintenance, dielectric fluid sampling, or dielectric fluid filling procedures. Failure to comply can result in death or severe personal injury. T239.2

Guide for replacing mineral oil with E200 fluid in underground distribution switchgear (≤38 kV)

Step	Key points	Comments
1. Adhere to all required safety precautions, codes, and regulations. Follow all locally approved safety practices and procedures.	Follow manufacturer's recommendations for servicing switchgear; additionally, adhere to all required safety precautions, codes, and regulations.	
2. De-energize switchgear at all locations which could feed (energize) switchgear.		
3. Ground all equipment.	Includes switchgear, pump, and tanks.	Ensures static discharge.
4. Visual inspection.	Confirm integrity of seals, bushings, and bolted connections.	
5. Remove tank cover.		
6. Drain or pump oil from tank drain valve or drain plug at base of switchgear to a catch basin or empty drums. Allow time (minimum ½ hour) for oil to drip to bottom of tank. Vacuum bottom to remove residual standing fluid and to remove sediment from tank bottom.	These steps remove most of the oil from the bottom of the tank.	If the concentration of residual mineral oil exceeds 1% by volume, the E200 fluid fire point may fall below 300 °C.
7. Rinse with E200 fluid (~5-10% of the fluid volume) draining or pumping out used flushing fluid.	This step rinses most of the remaining free oil to the bottom of the tank.	Minimizes residual oil and other contaminants.
8. Vacuum bottom to remove residual standing fluid and sediment from tank bottom.	Minimizes the residual oil and other contaminants.	
9. Fill switchgear to proper level (using gauge) directly from tote or drum.	Filling from the bottom is preferred. If filling from the top, place the hose outlet at the bottom of the tank. This introduces fluid below the surface as the unit fills. Avoid splashing the fluid so it does not become aerated. Heating and filtering are not required.	E200 fluid as-received in sealed totes and drums is satisfactory for use in distribution switchgear.
10. Replace cover gasket with new gasket if cover is removed. Position gaskets so they will seal properly.	Old gaskets may leak after retrofill.	
11. Top off with dry nitrogen bringing head space pressure to 2-3 psi gauge.	Verify gaskets and seals are working properly.	Limits exposure to oxygen and atmospheric contaminants.
12. Install retrofill label. Insert E200 fluid batch number on Eaton Retrofill label using indelible pen.	Document E200 fluid batch number from tote or drum for future reference.	
13. Wait a minimum of one hour to energize switchgear.	At a minimum, waiting 1 hour is preferred. High-potential withstand testing may be performed at this point to help verify dielectric integrity. Refer to the appropriate Service Instructions for your switchgear for High-Potential Withstand Test Procedure.	Allows gas bubbles to dissipate.

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