



This document is legally privileged document, any unauthorised copying or transmission is prohibited

Installation, Inspection and Maintenance of Dry Type Transformers

Dry Type TX

1 of 8



Installation, Inspection and Maintenance of Dry Type Transformers



This document is legally privileged document, any unauthorised copying or transmission is prohibited

Installation, Inspection and Maintenance of Dry Type Transformers

Dry Type TX

2 of 8

Table Of Contents

	Page Number
1. General.....	3
2. Installation	3
3. Safety Inspections	4
4. Safety Inspections after Equipment Energized.....	5
5. Scheduled Inspections.....	6
6. Maintenance.....	7
6.1. Scheduled Maintenance	7
6.2. Scheduled Major Overhaul	7



Installation, Inspection and Maintenance of Dry Type Transformers

1. General

As per SANS 10086-2, mines should have Code of Practices (COP) in place to ensure correct selection, installation and maintenance of equipment used in mines. This document is an extension of the mine's COP and should be incorporated within the mine's COP.

This document covers the following:

- Installation of the transformer assemblies
- Scheduled inspection, which shall be carried out regularly
- Scheduled maintenance and overhaul program, which shall be carried out periodically
- Operating procedure

2. Installation

Due to the arduous operating conditions experienced in a mine, equipment must be rated for the specific application it will be exposed to.

The following points must be taken into consideration.

- a. Transformer primary fault current, cable insulation and conductor size, connections, bushings, MV switchgear and protection shall be rated to withstand full fault conditions.
- b. Transformer core heat dissipation.
To avoid possible de-rating of design specifications it is essential to ensure adequate heat dissipation is allowed. Adequate space must be allowed around the transformer for this purpose. It is also essential to ensure that equipment such as cables, mining utensils, boxes etc. are not stored on top of the transformer and that the top area is kept clean from accumulated dirt. This is where most of the transformer heat is dissipated and if inhibited in any way will result in higher transformer temperatures, reduced life time of the transformer and possibly even de-rating of the transformer capacity.
- c. Inspect the core and windings to ensure the bracing and securing of the transformer core has not moved during transportation.
- d. Tap change links
The tap change links shall be suitably positioned to ensure ease of access. Connection drawings of the link positions shall be clearly displayed.
Ensure clearances between the tap link board and earth is adequate.
- e. Check earth straps
To ensure a good bond to earth is in place.
- f. Transformer secondary fault current.
Ensure cable insulation and conductor size, connections, bushings, MV switchgear, protection equipment is rated to withstand full calculated fault conditions and voltage rating.
- g. Cable connections / Terminations
All MV and LV cable couplings, connections and terminations shall be properly secured and earth continuity maintained with the transformer enclosure.
- h. Drawings
Electrical and mechanical lay out drawings for the transformer assembly shall be available to allow easy identification of components and their connection details.
- i. Approval certification
Ensure that all inspection Authority approval certificates and test reports are available and filed, and that the correct approval has been given for the hazardous area in which the equipment is to be used.



Installation, Inspection and Maintenance of Dry Type Transformers

Dry Type TX

4 of 8

- j. Internal components
Once the transformer assembly has been positioned open all the panel doors and inspection covers to ensure that internal components, cables and connections are in place, secure and free from damage.
- k. Busbar connections
Where possible ensure that all bus bar and cable box connections are secure.
- l. Protection settings
Protection settings shall be correctly configured and set for the specific installation.
- m. Insulation tests
Before any energisation the following insulation tests shall be conducted:
 - The transformer windings, MV to earth, LV to earth (neutral to be disconnected if applicable) and between the LV and MV windings.
 - The incoming MV phase leads, between phases and each phase to earth, the outgoing LV phase leads between phases and to earth. (Ensure any electronic instrumentation is disconnected if necessary to prevent inadvertent damage).

NOTE: INSULATION TESTING SHOULD BE CARRIED OUT WITH AN APPROVED TESTER AND TESTING SHOULD BE DONE AS PER A SPECIFIC MINE STANDARD

3. Safety Inspections

Critical safety inspections prior to the energisation of the transformer assembly.

- a. Ensure that the transformer assembly is located in a clean, dry location where the roof and sidewalls are in good condition and which is clear of moving traffic. The location should be such that the accumulation of dust or water is minimized.
- b. Ensure that adequate space is allowed around the transformer assembly to provide the following:
 - c. Unobstructed ventilation around the assembly.
 - d. Easy installation and removal of incoming and outgoing cables.
 - e. Uninhibited access to the assembly and in particular operating handles, push buttons, emergency stops, inspection covers, access covers and doors.
 - f. Free visual access to inspection windows, inspection lamps and transformer assembly labeling.
 - g. Confirm the integrity of the neutral earth resistor (if applicable)
 - h. Confirm the integrity of all back tripping circuits, i.e. doors, cover, short circuit back trip provisions and any further electrical interlocks.
 - i. Ensure that all incoming and outgoing adaptors and sockets are clean, free from damage and are secure.
 - j. Ensure that any drain or blanking plugs fitted are in place and are secure.
 - k. Ensure that any instrument glassed and inspection windows are intact.
 - l. Ensure that all panel doors, inspection and access covers are in place and correctly secured by the specific bolts, which are proper and uniform size, type and are tight.
 - m. Ensure that all covers over set/reset buttons etc are fitted and secure.
 - n. Ensure that the earth bonding of equipment complies with specific mine requirements
 - o. Ensure that the firefighting and statutory notices are available, legible and in place that the correct explosion protected approval mark is displayed for the hazardous area in which the equipment is used.
 - p. Carry out any other checks or test required by the mines standards.

Once the above operations have been carried out satisfactorily the incoming and outgoing cables can be connected. Ensure that the cables are suitably anchored and positioned so as to prevent undue tension or twisting of the cable under operating conditions. Once this is done the electrical supply can be energized.



Installation, Inspection and Maintenance of Dry Type Transformers

Dry Type TX

5 of 8

4. Safety Inspections after Equipment Energized

The following critical safety inspections will be carried out after energisation.

- a. Ensure the correct operation of the earth leakage trip and earth fault lockout protection
- b. Ensure the correct pilot operation (if applicable)
- c. Ensure all live line indicators are operational
- d. Check the correct operation of the assembly.
- e. Ensure adequate lighting is available to follow for the reading of labels and location of operating handles and push buttons.

- f. Installation Inspection Records
All installation and inspection test results shall be recorded and filed for future reference and inspection.

- g. Log book
A log book should be provided, to record all switching operations, isolations and trip occurrences.



Installation, Inspection and Maintenance of Dry Type Transformers

Dry Type TX

6 of 8

5. Scheduled Inspections

The frequency of regular inspections shall be in accordance with mine specific procedures.

- a. Ensure that the transformer assembly is free from obstruction and accumulation of dust, dirt or water and the surface temperature is not unduly hot.
- b. Ensure the tap change cover is secure
- c. Ensure that all inspection covers, access, doors, plug and socket fastening bolts are in position and tight.
- d. Check the conditioning of incoming and outgoing cables. Ensure that there is no twisting, undue tension or sharp bends that the cable is secure in the glands.
- e. Ensure that all statutory notices and firefighting appliances are provided and in position.
- f. Ensure that all earth bonding is fitted and securely attached.
- g. Ensure that the logbook is available and correctly utilized.
- h. Perform any other inspections advised by the mines specific requirements.



Installation, Inspection and Maintenance of Dry Type Transformers

Dry Type TX

7 of 8

6. Maintenance

Two types of maintenance programs should be in place.

6.1. Scheduled Maintenance

Note: Ensure correct isolation of equipment as per the mines specific lockout procedures before attempting to open any covers or remove any incoming and outgoing cables.

- a. Maintenance intervals should be according to approved mine specific procedures.
- b. Perform all checks described under regular inspection.
- c. Ensure all incoming and outgoing sockets are free from damage dust or moisture.
- d. Inspect all MV connections for signs of damage or tracking.
- e. Where possible check all MV and LV connections for tightness and signs of overheating, inspect any densely packed cable trucking and take specific notice around the vicinity of any tight strapping together of cables such as run locks for signs of insulation damage or overheating.
- f. Where possible inspect MV and LV bushings to ensure that they are free from damage dust or moisture.
- g. Ensure that all tap-change link connections are secure and free from dust, moisture and signs of overheating or tracking between phases of phase to earth.
- h. Perform insulation tests between MV and LV windings and earth. Ensure the neutral is disconnected from earth when testing the LV. Test between the MV and LV windings. Ensure the neutral is re-connected after performing the tests.
- i. Ensure the integrity of the neutral earthing system.
- j. Switchgear associated with the transformer should be inspected as described under the switchgear maintenance procedures.
- k. Perform any other maintenance and tests advised by the mine or industry specific standards.
- l. All periodic inspection and results of tests performed shall be recorded and filed for future reference and inspection.

6.2. Scheduled Major Overhaul

In order to facilitate major overhaul, the transformer assembly should be removed from service and taken to a workshop environment.

- a. All transformer covers shall be removed.
- b. Remove the transformer core from its enclosure:
 - Remove any rust & dust from the core and windings.
 - Remove any rust, dust or moisture from the enclosure. Special attention should be given to the inside corners which can be susceptible to a buildup of powder and rust which can impair the integrity of the enclosure.
- c. Ensure all bracings; connections are secure after reassembly into the enclosure.
- d. All bushings should be cleaned, inspected for damage and insulation tested.



This document is legally privileged document, any unauthorised copying or transmission is prohibited

Installation, Inspection and Maintenance of Dry Type Transformers

Dry Type TX

8 of 8

- e. Switchgear associated with the transformer should be maintained as described under the section on switchgear.
- f. Perform any other necessary tests specified by the mine standards.
- g. Perform all other inspections and test described under periodic underground inspections.
- h. All maintenance and test results should be recovered and filed for future reference and inspection.