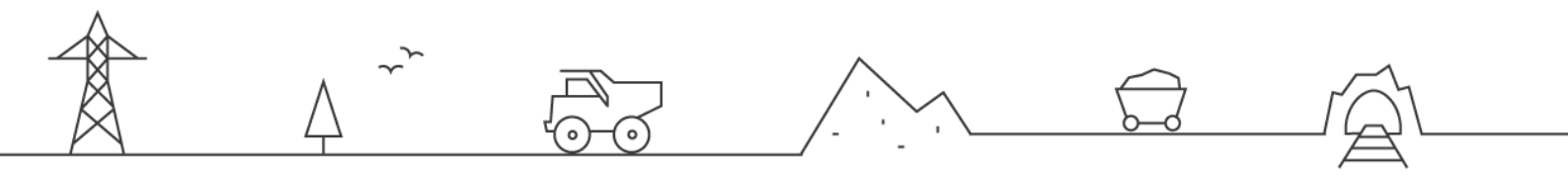
RMM
PROJECT ENGINEERS

Preparation, Commissioning, Start-up & Maintenance



Contents

1. Educational requirements on the personnel:

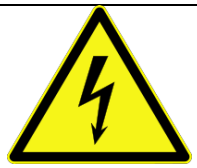
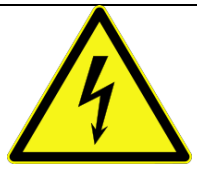
The execution of the tasks described herein requires well-trained and instructed professionals with knowledge of the EN 50110 "Operation of electrical installations" Parts 1 and 2.

Moreover, supplementary safety provisions as well as both national and international provisions for the required safety precautions and working on electrical equipment must be taken into consideration.

2. Disclaimer:

Manufacturer does not accept any liability for any damages and consequential damages which occurred due to inappropriate work or disregarding applicable safety provisions.

3. Safety provisions must be applied during whole maintenance procedure:

 **DANGER!**	**Electric shock!** Before starting to work, switch the transformer off, earth it and prevent reconnection to avoid injuries, death or burns caused by electric shock!
 **WARNING!**	**Burn hazard!** Before starting to work, make sure the surfaces of the transformer are cooled down below 40°C, to prevent burns may be caused by touching the transformer.
IMPORTANT! RECOMMENDATION!	**Shut the transformer down early enough** Shut the transformer at least 3-4 hours before the scheduled start time. Let the ventilation system cool the transformer. Shut it down only shortly before scheduled start. This will shorten the cool-down time. Depending on the load conditions prior to shut down, longer waiting times may have to be observed.
 **DANGER!**	**Electric shock by auxiliary voltage!** Before starting to work, switch the auxiliary voltage off, prevent reconnection and test for absence of harmful voltages to avoid injuries, death or burns caused by electric shock!!

4. Maintenance Intervals:

After installation in a new place with unknown pollution risk we recommend a first check at the latest six months after. If pollution is not apparent, maintenance check intervals can be lengthened without problems. If transformer surfaces are especially dirty, cleaning should occur more frequent according to the extent of the dirt, and preventive measures should be taken to reduce the amount of dirt in the future.

5. Preparation

Item No.	Description
01	Cleaning cloth
02	Technical cleaner
03	Vacuum cleaner
04	Torque wrench-HV delta bars [M8, M10, M12, M16]
05	MCT Modules / Cable gland for HV-LV Entry
06	Electrical termination tools

6. Ensuring safety before commencing maintenance work

Item No.	Description
01	Transformer is disconnected from the power supply
02	Transformer and plant have been protected against reclosing
03	Absence of voltage has been verified on the transformer and the plant
04	Transformer is grounded and short-circuit on the high-voltage and low-voltage side
05	All adjacent live parts of the plant have been made safely inaccessible

7. Maintenance work on the transformer:

	slight	medium	high
Degree of contamination determined on the windings: [**Refer to page 5 section 10** for contamination descriptions]			

Transformer windings have been cleaned:	
Temperature sensors on the transformer are in proper working order [Measure the resistances and compare to the values on test report. When checking the cold resistance of the thermistors, the measuring voltage of the meter must not exceed 2.5 V]	

Item No.	Description
01	Bars and outgoing feeders of the transformer are in proper working order: connecting surfaces polished metallically bright, torques checked, any existing insulation in proper working order, cable terminals free from mechanical tension

02	Check the windings for symmetrical and identical arrangement on all three limbs
03	Check coils for tight fit: the compression of the rubber pads on the winding supports have to be 1-1,5 mm for rubber thinner 10mm and 1,5-2 mm for rubber thicker as 10mm
04	All labels, plates and warning signs are present and placed in the correct positions on the transformer: no labels on the HV windings
05	There are no foreign bodies in and on the transformer and its coils
06	Safety clearances from grounded parts around the transformer are being complied with [see circle of protection on dimensional diagram of transformer]
07	A visual inspection proves the transformer to be in proper working order
08	***[NB] MCT modules / Cable gland are installed on the HV & LV side***
09	***[NB] MCT modules / Cable gland is compressed on HV & LV side***

8. Maintenance work on housing:

Item No.	Description
01	Check visually for contamination inside the housing (clean if necessary)
02	Check the louvres for contamination (clean if necessary) and min. distance to the wall (400mm)
03	Check all mechanically movable parts for smooth operation
04	If housing have a control cabinet mounted on it, so check it for contamination and clean if necessary
05	Check the condition of bushings and clean if necessary. The surfaces must not be cracked
06	Reconnect all equipotential bonding conductors disconnected to access the housing
07	Check to rule out the presence of foreign bodies, e. g. tools left back and remove them
08	***[NB] The housing was closed correctly once maintenance work was completed***

9. Fans maintenance

Item No.	Description
01	Motor fan impeller correctly stopped, and motor disconnected from the power supply on all poles
02	The fan blades are at a standstill
03	Protected against being switched on again
04	Fan impellers checked for contamination and, if necessary, cleaned: • Do not use tools which scratch or chafe • Do not flood the motor • Do not deform the fan impeller and the fan blades
05	Neither major bearing backlash nor lubricant leaking from the bearings detected
06	The fan impeller surface has not been attacked
07	All parts checked for tight fit
08	No extraordinary operating sound of the motors detected

10. Maintenance information

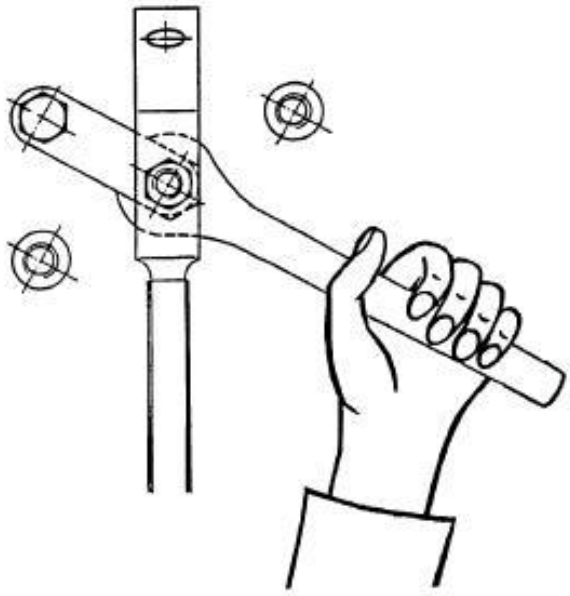
Degree of contamination	Recognizable by	Approach on cleaning the transformer
slight	Deposits of dry dust on the transformer	Cleaning by means of dry cloth, brushes and compressed air
medium	Deposits of dust containing moisture and/or salt on the transformer	Cleaning by means of sponges and brushes soaked in water (no salt-water)! In the case of very tenacious attachments, use special cleaning products (e.g. Rivolta S.L.X.-Top/ by Bremer & Leguil GmbH). Do not connect the transformer for at least 1 hour to allow it to dry! When using cleaning products, re-seal the coil surfaces. (e.g. using impregnating varnish 3H by Dr. Wiedeking or a cloth soaked in shellack)
serious	As for medium contamination, however with traces of partial discharge / clearly visible partial discharge grooves	Contact the person in charge of the area in question

Cleaning requires special care to the cooling ducts in and between the windings.

11. Torque Table

Thread size	Copper bar connections	Switch links
M8 [13 Spanner or Socket]		10Nm
M10 [17 Spanner or Socket]	40Nm	20Nm
M12 [19 Spanner or Socket]	70Nm	35Nm
M16 [24 Spanner or Socket]	140Nm	

Attention! When attaching the switch link screws, make sure that the switch link is blocked with an open-end wrench size 21 mm! See picture below.



12. Client Signal Cable Termination [Terminal-1X2-Possiblity that the signal wire is not as shown below]

Cable Colour
(Alarm) - **Brown**
(Common) - **Black**
(Trip) - **Blue**
(Fault) - **Yellow**

13. Programming T154

1. Close breaker to control system.
2. Check if T154 comes on.

Step	Press	Effect	Press	Note
1		Press & hold the PRG button until display shows PRG		
2		Press the PRG button again and ensure the LED next to Alarm is blinking		
3		Set value		90°C
4		Press the PRG button again and ensure the LED next to Trip is blinking		
5		Set value		120°C
6		Press the PRG button again until you see ON in the TECH unit display		
7		Set value		65°C
8		Press the PRG button again until you see OFF in the TECH unit display		
9		Set value		55°C
10		Press ENT button to save settings		

13.1 Result Table

Test Results for Programming Settings

Action	Service Activity	Expected Result
Fan on	Program	65
Fan off	Program	55
Alarm	Program	90
Trip	Program	120