

**GUMENI SUBSTRATION
EARTH MAT CONTINUITY
TEST REPORT
OCTOBER 2019**

Tested By	:	Sindisiwe Mlotshwa & Rudzani Makwarela
Phone No	:	(013) 693 2485
Date	:	13-16 October 2019
Task No	:	Tsm29340

CONTENT

SECTION	Page
1 SUMMARY	3
2 INTRODUCTION	3
2.1 Terms of reference.....	3
3 FINDINGS.....	3
4 CONCLUSION / RECOMMENDATIONS	3
5 READINGS	4
6 COMPILED BY	14
7 TEST PERFORMED BY	14
8 APPROVED BY	14
9 REPORT DISTRIBUTION	14
9.1 Relias Nokeri TX NE Grid	14

1 SUMMARY

The Earth Mat continuity test was performed during October 2019 .The Earth Mat seems to be in a good condition.

2 INTRODUCTION

2.1 Terms of reference

ESKOM TECHNOLOGY GROUP, PTM was requested to perform an Earth Mat Continuity Test at Gumeni Substation.

3 FINDINGS

- All readings above 10 milli ohms (highlighted and marked in red) should be inspected and corrected.
- Open readings means that there is no connection between the station earth and the object tested.
- NIS (Not in service) refers to object that are not installed. It is totally or partially removed.

4 CONCLUSION / RECOMMENDATIONS

We recommend that 50 x 3 mm flat copper be installed where required. All readings above 10 Milli Ohm should be inspected cleaned and re – tightened.

5 READINGS

Reference point	Plant Description Transfer Busbar Supports	Test Result mΩ
BS153	BS161	7.8
	BS162	7.8
	BS163	8.9
	BS152	7.5
	BS153	6.3
	BS154	7.5
	BS143	7.5
	BS144	6.2
	BS145	7.2
BS126	BS134	8.3
	BS135	6.8
	BS136	5.9
	BS125	6.2
	BS126	5.7
	BS127	6.6
	BS116	5.8
	BS117	6.4
	BS118	5.9
BS117	BS107	6.9
	BS108	7.2
	BS109	7.9
Reference point	Plant Description Busbar 2 Supports	Test Result mΩ
BS111	BS101	7.8
	BS102	3.8
	BS103	3.7
	BS110	3.3
	BS111	4.3
	BS112	3.1
	BS119	3.4
	BS120	4.2
	BS121	3.8
BS138	BS128	4.2
	BS129	3.3
	BS130	3.3
	BS137	4.1
	BS138	3.5
	BS139	3.3
	BS146	4.0
	BS147	3.9
	BS148	3.6

Reference point	Plant Description Busbar 2 Supports	Test Result mΩ
BS156	BS155	2.8
	BS156	4.0
	BS157	4.1
	BS164	4.4
	BS165	4.6
	BS166	4.7
Reference point	Plant Description Busbar 1 Supports	Test Result mΩ
BS159	BS167	5.1
	BS168	5.7
	BS169	5.4
	BS158	5.7
	BS159	5.5
	BS160	5.3
	BS149	5.6
	BS150	5.2
	BS151	5.1
BS132	BS140	5.4
	BS141	5.6
	BS142	5.2
	BS131	5.1
	BS132	5.7
	BS133	5.9
	BS122	5.3
BS132	BS123	4.5
	BS124	4.8
BS114	BS113	4.5
	BS114	4.3
	BS115	4.1
	BS104	4.5
	BS105	4.3
	BS106	4.5
Reference point	Plant Description 400kV Bus Coupler A	Test Result mΩ
Busbar Support	JB	3.7
	Busbar 1 isolator red phase	3.1
	Insulator red phase	3.5
	Busbar 1 isolator white phase	3.6
	Insulator red phase	3.4
	Insulator white phase	3.4
	Busbar 1 isolator blue phase	4.8
	Insulator red phase	3.3
	Insulator white phase	4.9
	Insulator blue phase	3.4

Reference point	Plant Description 400kV Bus Coupler A	Test Result mΩ
	Breaker red phase	4.4
	Breaker white phase	3.4
	Breaker blue phase	3.5
	CT red phase	3.4
	CT white phase	3.8
	CT Insulator blue phase	3.9
	Insulator red phase	5.6
	Insulator white phase	4.0
	Busbar 2 isolator blue phase	4.1
	Insulator red phase	3.9
	Busbar 2 isolator white phase	4.3
	Busbar 2 isolator red phase	4.1
Reference point	Plant Description 400kV Transformer 1	Test Result mΩ
132kV Yard Vehicle Gate	Small gate (transformer entrance)	8.8
	Transformer gate	8.0
	LV Surge Arrestor red phase	6.6
	LV Surge Arrestor white phase	6.0
	LV Surge Arrestor blue phase	6.0
	Transformer	5.9
	Cable structure	6.1
	22kV/380V Aux Transformer	8.6
	Shield	6.2
	TDB	7.8
	Plugbox	8.3
	Earth switch	5.4
	CT red phase	5.1
	CT white phase	5.5
	CT blue phase	4.9
	Gantry	7.8
	Light	3.8
	Insulator red phase	3.7
	Insulator white phase	3.1
	Insulator blue phase	3.3
	Shield (Between transformer and workshop)	4.3
Busbar 2 Support	Breaker red phase	3.9
	Breaker white phase	3.4
	Breaker blue phase	4.2
	Busbar 1 isolator red phase	3.8
	Insulator white phase	3.5
	Insulator blue phase	4.2
	JB	3.3
	Insulator red phase	3.3
	Busbar 1 isolator white phase	3.5
	Insulator blue phase	4.1
	Insulator red phase	3.5
	Insulator white phase	3.3
	Busbar 1 isolator blue phase	3.4
	Insulator red phase	4.0
	Insulator white phase	3.9
	Insulator blue phase	3.6
	Busbar 2 isolator	3.8
	Insulator red phase	2.8
	Insulator blue phase	4.3

Reference point	Plant Description 400kV Transformer 1	Test Result mΩ
	Insulator red phase	3.2
	Insulator white phase	5.2
	Insulator blue phase	2.6
	Insulator red phase	2.8
	Insulator white phase	2.7
	Insulator blue phase	4.1
	Insulator red phase	7.8
	Insulator white phase	4.7
	Insulator blue phase	4.8
	Light Tower	3.8
	Insulator red phase	3.7
	Insulator white phase	3.1
	Insulator blue phase	3.3
	Insulator red phase	4.3
Busbar 2 Support	Insulator red phase	3.1
	Busbar 1 isolator	3.9
	Insulator red phase	3.4
	Insulator white phase	4.2
	Insulator blue phase	3.8
	Insulator red phase	3.5
	Insulator white phase	4.2
	Busbar 2 isolator blue phase	3.3
	Insulator red phase	3.3
	Busbar 2 isolator white phase	3.5
	Insulator blue phase	4.1
	Busbar 2 isolator red phase	3.5
	Insulator white phase	3.3
	Insulator blue phase	3.4
	JB	4.0
Reference point	Plant Description 400kV Hendrina No.1 Feeder	Test Result mΩ
Busbar 2 Support	Breaker red phase	4.8
	Breaker white phase	4.6
	Breaker blue phase	4.6
	Line isolator	4.7
	Insulator red phase	4.7
	Insulator white phase	4.6
	Transfer Busbar Isolator blue phase	4.8
	Insulator red phase	4.5
	Transfer Busbar Isolator white phase	4.7
	Insulator blue phase	4.6
	Transfer Busbar Isolator red phase	4.3
	Insulator white phase	4.6
	Insulator blue phase	4.9
	CT red phase	4.9
	CT white phase	4.6
	CT Insulator blue phase	4.6
	Earth switch	4.4
	Line trap red phase	4.7
	Line trap white phase	4.9
	Insulator blue phase	4.5
	CVT red phase	4.6
	CVT white phase	4.4
	CVT Insulator blue phase	4.8

Reference point	Plant Description 400kV Hendrina No.1 Feeder	Test Result mΩ
Busbar 2 Support	Gantry	4.0
	Surge Arrestor red phase	4.6
	Surge Arrestor white phase	4.3
	Surge Arrestor blue phase	4.8
	Fence	4.9
Reference point	Plant Description 400kV Busbar 1 Bus Section	Test Result mΩ
Busbar 1 Support	Earth switch	4.5
	CVT red phase	4.6
	CVT white phase	4.0
	CVT Insulator blue phase	4.4
	Plug box	4.4
Reference point	Plant Description 400kV Busbar 2 Bus Section	Test Result mΩ
Busbar 2 Support	Earth switch	4.6
	CVT red phase	4.4
	CVT white phase	4.1
	CVT Insulator blue phase	4.0
Reference point	Plant Description 400kV Marathon 1	Test Result mΩ
Busbar 2 Support	Insulator red phase	3.4
	Busbar 1 isolator	3.3
	Insulator red phase	3.5
	Insulator white phase	3.4
	Insulator blue phase	3.6
	Insulator red phase	3.6
	Insulator white phase	3.8
	Busbar 2 isolator blue phase	3.7
	Insulator red phase	3.9
	Busbar 2 isolator white phase	3.9
	Insulator blue phase	3.8
	Busbar 2 isolator red phase	3.5
	Insulator white phase	3.7
	Insulator blue phase	3.5
	JB	3.6
	Plug box	3.7
	Breaker red phase	4.5
	Breaker white phase	4.9
	Breaker blue phase	3.8
	Line isolator	3.7
	Insulator red phase	3.8
	Insulator white phase	3.9
	Transfer Busbar Isolator blue phase	3.8
	Insulator red phase	3.0
	Transfer Busbar Isolator white phase	3.7
	Insulator blue phase	3.5
	Transfer Busbar Isolator red phase	3.6
	Insulator white phase	3.3
	Insulator blue phase	4.5
	CT red phase	4.3

Reference point	Plant Description 400kV Marathon 1	Test Result mΩ
Busbar 2 Support	CT white phase	3.2
	CT Insulator blue phase	3.7
	Earth switch	3.5
	Line trap red phase	3.1
	Line trap white phase	3.8
	Insulator blue phase	4.9
	CVT red phase	3.1
	CVT white phase	3.2
	CVT Insulator blue phase	3.6
	Gantry	3.7
	Surge Arrestor red phase	3.6
	Surge Arrestor white phase	3.2
	Surge Arrestor blue phase	3.6
	DB Box	3.8
	Fence	3.0
Reference point	Plant Description 400kV Control Room	Test Result mΩ
400kV Yard Small gate	IDF	6.8
IDF	DB 400/230V AC Board	5.9
	Fibre Optic Panel 2	7.3
	Fibre Optic Panel 1	10.0
	D20 Station RTU	5.1
	D400 ERTU	5.8
	Teleprotection Hendriena 1	9.4
	BME Cabinet	7.4
	Fibre optic cabinet	7.4
	Telecomms Bearer cabinet	7.6
	Control Room AC Board	7.6
	50V DC Charger 1 – 220DC Charger 2	7.6
	Marathon 1 Interface panel	7.4
	Marathon 1 Relay panel	6.6
	Hendriena 1 Interface panel	3.5
	Hendriena 1 Relay panel	3.4
	400/132/22kV Coupling Transformer Interface panel	3.5
	400/132/22kV Coupling Transformer Relay Panel	3.5
	Bus Coupler A Interface panel	3.7
	Bus Coupler A Relay panel	3.6
	Bus Zone Interface panel	4.8
	Bus Zone Relay panel	3.3
	Engineering workstation	3.4
	Disturbance recorder	3.2
	Internal Tariff meterting	3.1
Reference point	Plant Description Transformer 23	Test Result mΩ
Gantry	22KV breaker	4.6
	CT	4.8
	JB	4.3
Reference point	Plant Description 132kV Komati 1	Test Result mΩ
Gantry	Vehicle Gate	3.8

Reference point	Plant Description 132kV Komati 1	Test Result mΩ
Gantry	Light Tower	3.7
	Breaker red phase	3.7
	Breaker white phase	3.3
	Breaker blue phase	3.9
	JB	3.4
	CT red phase	3.2
	CT white phase	3.9
	CT blue phase	3.2
	Earth switch	3.8
	Surge arrestor blue phase	3.3
	Surge arrestor red phase	3.4
	Surge arrestor white phase	3.4
	Busbar isolator 1	3.9
	Insulator red phase	3.3
	Insulator white phase	3.7
	Insulator blue phase	3.9
	Insulator red phase	3.4
	Busbar isolator 2	3.6
	Insulator red phase	3.9
	Insulator white phase	3.5
	Insulator blue phase	3.3
	Insulator red phase	3.2
Reference point	Plant Description 132kV Komati 2	Test Result mΩ
Gantry	Breaker red phase	3.7
	Breaker white phase	3.3
	Breaker blue phase	3.9
	JB	3.4
	CT red phase	3.2
	CT white phase	3.9
	CT blue phase	3.2
	Earth switch	3.8
	Surge arrestor blue phase	3.3
	Surge arrestor red phase	3.4
	Surge arrestor white phase	3.4
	Busbar isolator 1	3.9
	Insulator red phase	3.3
	Insulator white phase	3.7
	Insulator blue phase	3.9
	Insulator red phase	3.4
	Busbar isolator 2	3.7
	Insulator red phase	3.5
	Insulator white phase	3.8
	Insulator blue phase	3.6
	Insulator red phase	3.9
Reference point	Plant Description 132kV Busbars 1&2 VT	Test Result mΩ
Gantry	Light Tower	5.4
	Small Gate	4.6
	Busbar 1 VT blue phase	5.6
	Busbar 1 VT red phase	5.6
	Busbar 1 VT white phase	5.0

Reference point	Plant Description 132kV Busbar 1&2 VT	Test Result mΩ
Gantry	Busbar 1 VT JB	6.0
	Busbar 2 VT blue phase	5.9
	Busbar 2 VT red phase	4.8
	Busbar 2 VT white phase	5.5
	VT blue phase	5.1
	First Pylon	6.3
Reference point	Plant Description 132kV Busbar 1&2	Test Result mΩ
Gantry	Busbar 1 blue phase	3.4
	Busbar 1 red phase	3.3
	Busbar 1 white phase	3.5
	Busbar 2 blue phase	3.4
	Busbar 2 red phase	3.6
	Busbar 2 white phase	3.6
Reference point	Plant Description 132kV Bus Coupler	Test Result mΩ
Gantry	Light Tower	3.4
	Insulator red phase	6.6
	Busbar 1 link	3.5
	Insulator blue phase	3.4
	CT red phase	3.5
	CT white phase	3.5
	CT blue phase	3.7
	Breaker red phase	3.6
	Breaker white phase	4.8
	Breaker blue phase	3.3
	CT red phase	3.4
	CT white phase	3.2
	CT blue phase	3.0
	JB	3.1
Reference point	Plant Description 132kV Transformer No.1	Test Result mΩ
Gantry	Insulator red phase	2.1
	Busbar 2 link	2.1
	Insulator blue phase	2.4
	Busbar 1 link	2.5
	JB	2.5
	Breaker red phase	2.7
	Breaker white phase	2.6
	Breaker blue phase	3.0
	CT red phase	2.7
	CT white phase	3.0
	CT blue phase	2.9
	Earth switch	3.0
	Surge Arrestor red phase	3.2
	Surge Arrestor white phase	3.4
	Surge Arrestor blue phase	2.9


Reference point	Plant Description 132kV Machado 1	Test Result mΩ
Gantry	Busbar Link 1	2.1
	Busbar Link 2	2.5
	Breaker	3.8
	JB	3.1
	CT blue phase	1.8
	CT red phase	2.6
	CT white phase	2.3
	Line Link	2.1
	Line Trap white phase	1.9
	Surge arrestor blue phase	2.6
	Surge arrestor red phase	3.1
	Surge arrestor white phase	2.7
	Plug box	2.8
	First Pylon	2.6
	Line trap	3.1
	Busbar Link 1	3.6
	Earth switch	6.3
Reference point	Plant Description 132kV Witkloof 1	Test Result mΩ
Gantry	Busbar Link 1	2.1
	Busbar Link 2	2.7
	Breaker	2.1
	JB	3.2
	CT blue phase	1.8
	CT red phase	2.0
	CT white phase	2.6
	Line Link	2.3
	Line Trap white phase	2.1
	Surge arrestor blue phase	1.9
	Surge arrestor red phase	3.2
	Surge arrestor white phase	3.1
	Plug box	NIS
	First Pylon	2.0.
	Line trap	2.6
	Busbar Link 1	2.1
	Earth switch	3.7
	Busbar Link 1	5.8
Reference point	Plant Description 132kV Prairie 1	Test Result mΩ
Gantry	Busbar Link 1	5.7
	Busbar Link 2	2.3
	Breaker	2.3
	JB	2.2
	CT blue phase	2.7
	CT red phase	2.6
	CT white phase	2.8
	Line Link	2.7
	Line Trap white phase	2.8
	Surge arrestor blue phase	2.9
	Surge arrestor red phase	3.2
	Surge arrestor white phase	3.1
	Plug box	3.2
	First Pylon	5.5

Reference point	Plant Description 132kV Prairie 1	Test Result mΩ
Gantry	Line trap	6.4
	Busbar Link 1	6.8
	Earth switch	5.8
Reference point	Plant Description 132kV Prairie 2	Test Result mΩ
Gantry	Busbar Link 1	3.1
	Busbar Link 2	3.9
	Breaker	2.2
	JB	3.9
	CT blue phase	1.9
	CT red phase	2.6
	CT white phase	2.4
	Line Link	2.0
	Line Trap white phase	3.1
	Surge arrestor blue phase	2.6
	Surge arrestor red phase	3.2
	Surge arrestor white phase	3.1
	Plug box	3.2
	First Pylon	3.4
	Line trap	3.2
	Busbar Link 1	2.1
	Earth switch	2.0
Reference point	Plant Description 132kV control room	Test Result mΩ
Gantry	Eskom light panel emergency TRF	6.2
	Sasol1 & 2 FCLR control panel	6.4
	50VDC charger	6.6
	50VDC BOARD 1 & 2	6.1
	Sasol 1 CP & FMP	6.3
	Sasol 1 RP2 & RP1	6.5
	Sasol 2 CP & FMP	6.4
	Sasol 2 RP1 & RP2	6.6
	RTU & BME cabinet	6.5
	Telecom ABC	4.4
	Sasol 2 carrier & Sasol 1 carrier	6.7

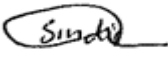

EQUIPMENT: Chauvin Arnoux

SERIAL NO: OOGI 19


6 COMPILED BY

COMPILED BY: - Technician		
Rudzani Makwarela		26/10/2019
NAME	SIGNATURE	DATE

7 TEST PERFORMED BY

TEST PERFORMED BY: - Technician		
Sindisiwe Mlotshwa & Rudzani Makwarela	 	26/10/2019
NAME	SIGNATURE	DATE

8 APPROVED BY

VERIFIED BY:		
Ashley Harinarain		26/10/2019
NAME	SIGNATURE	DATE

9 REPORT DISTRIBUTION

9.1 Relias Nokeri

TX NE Grid

***** All re-submissions of reports will be additionally charged*****