SAT TESTS

Document Control			
Project name:			
Project number:			
Revision:		**Date:**	

Document Number	Document Name
S1	Ring Main Unit Test/Commissioning Report
S2	Reactor Test/Commissioning Report
S2	Low Voltage Cable Reticulation Test/Commissioning Report
S4	Earthing Points Testing and Commissioning Report
S5	Inspection of Excavation and Backfilling of Cable Trenches
S6	Inspection of Jointing and Terminations of Cables
S7	Medium Voltage Cables Test/Commissioning Report

SAT 1 - Ring Main Unit
Test/Commissioning Report

Test Report:		**Revision:**	0	**Date of last rev.:**	2025-11-24
Project no:					
Project description:					
Commissioning date:					
Retention period:					

Description of tested network (Miniature Substations names, Kiosk names, Street Names)

Substation Name:	
RMU Designation:	

1 Drawings

Drawing number	Title	Revision

2 RMU Detail

Make:	
Model Name / Number:	
Current Rating:	
Nominal Voltage (V_{L-L}):	
Breaking Capacity:	
Making Capacity:	
Short Time Current & Duration:	
RMU Configuration:	

3 Manual

Thorough Operating and Maintenance Manuals Received?	YES	NO	N/A
Nameplate mounted & information correct?	YES	NO	N/A
Final drawings received?	YES	NO	N/A
Test Certificates (Type & Routine)	YES	NO	N/A

4 Physical Inspection

Does RMU comply with technical requirements?	YES	NO	N/A
RMU plinth installed and earth mat tested?	YES	NO	N/A
RMU correctly positioned?	YES	NO	N/A
Configuration of Isolators and Circuit Breakers Confirmed	YES	NO	N/A
Frames connected to earth mat?	YES	NO	N/A
Earth switch connected to earthing conductor?	YES	NO	N/A
Enclosures, instrument cases, glands, earthing terminals, other metal work earthed?	YES	NO	N/A
Voltage indication lamps visible and in working order?	YES	NO	N/A
Interlocking with upstream and downstream switchgear implemented and functional?	YES	NO	N/A
Manual operation of circuit breaker(s) functional?	YES	NO	N/A
Manual operation of isolator(s) functional?	YES	NO	N/A
Manual operation of earth switch(es) functional?	YES	NO	N/A
Gas levels correct	YES	NO	N/A

5 Tests

5.1 Pressure Test

Method:											
Ensure: 1. All CT secondary windings earthed 2. Disconnect all cables 3. Open switchgear											
Voltage:		kV for 1 minute									
Leakage Current											
R		**mA**	**W**		**mA**	**B**		**mA**			

5.2 Insulation Test: RMU to Earth Bar

Injected Voltage		V DC	Resistance		Ω

5.3 Current Transformers

NOTE: Add applicable test reports to this document.

Polarity	YES	NO	N/A
Loop Resistance	YES	NO	N/A
Burden	YES	NO	N/A
Turns Ratio	YES	NO	N/A

5.4 Protection

NOTE: Tick which protection elements included and active. Add applicable test reports to this document.

Earth Fault	Yes	NO	N/A
Overcurrent	Yes	NO	N/A

6 Cables

Cable Phasing correct and colour code phasing markers	
Cable Earthing	
Cable Pressure Test	
Cable correctly terminated, ready to be switched on	

7 Labelling

Tier 1 - Cable Feed Right (name)	
Tier 3 - Cable Feed Left (name)	
Substation / Switching Station Name	
Tier 2 - Transformer / feeder Label	
Danger Signs	

8 Surge Protection

Are Surge Arresters provided?			YES		NO
		Detail of Surge Arresters			
Manufacturer		Current Rating	kA	MCOV Rating	kV
Class:	DISTRIBUTION Class 1		INTERMEDIATE Class 2		SATION Class 3
Is earthing according to specification?			YES		NO

9 General

Paint	
Locks	

10 Outstanding Items/Fault List

Any outstanding items and modifications:

11 Testing Instrumentation

NOTE: Duplicate sheet, populate individually for all test equipment used. Attach certificates for all test equipment used.

Manufacturer:	
Model and or type:	
Serial number:	
Calibration details:	
Date of calibration:	
Calibration register no.	
Calibration valid:	YES / NO
Copy of Calibration certificate attached:	YES / NO

12 Declaration

Herewith it is certified that the complete installation described above complies with all necessary specifications and that the installation is complete, all the required tests have been carried out and that it is safe for use.

NOTE: CVs and Qualifications of responsible person(s) must be attached to this document.

	Main Contractor	Sub-Contractor
Name of firm:		
Name of responsible person:		
Contact no:		
Date		
Signature		

	SARAO Engineer	SARAO Operations team	Supply Authority
Name of firm:			
Name of responsible person:			
Contact no:			
Date			
Signature			

SAT 2 - Reactor
Test/Commissioning Report

Test Report:		**Revision:**	0	**Date of last rev.:**	2025-11-24
Project no:					
Project description:					
Commissioning date:					
Retention period:					

Description of tested network (Miniature Substations names, Kiosk names, Street Names)	
Substation Name:	
Equipment Name:	

1 Drawings

Drawing number	Title	Revision

2 Reactor Detail

Make:		**Serial Number:**	
Primary Voltage:		**kVA Rating:**	
Secondary No Load Voltage:		**Vector Group:**	
Impedance:		**Number of Taps:**	

3 Manual

Thorough Operating and Maintenance Manuals Received?	YES	NO	N/A
Nameplate mounted & information correct?	YES	NO	N/A
Final drawings received?	YES	NO	N/A
Test Certificates (Type & Routine)	YES	NO	N/A

4 Physical Inspection

Does reactor comply with technical requirements?	YES	NO	N/A
Reactor correctly positioned?	YES	NO	N/A
Anti-damp layer installed?	YES	NO	N/A
Clearances according to design?	YES	NO	N/A
Oil Leaks	YES	NO	N/A
Oil Level	YES	NO	N/A
Silica gel breathers	YES	NO	N/A
Insulators	YES	NO	N/A
Tap Switches - add lock or bolt to prevent switching on load	YES	NO	N/A
Temperature Indicators / alarm and trip set points	YES	NO	N/A
Impact recorder in healthy condition	YES	NO	N/A

5 Oil Samples

Isolation Resistance Tests	YES	NO	N/A
Acid content (ph)	YES	NO	N/A
Gas Analysis/ Fibre content	YES	NO	N/A

6 Earthing

Reactors earthed according to construction drawings?	YES	NO	N/A
All connections tinned?	YES	NO	N/A
Items independently connected to Main Earth Mat (Tap Switch, cover plates, core, surge arrestors, structures etc.).	YES	NO	N/A

Transformer/reactor star point:				
Solid	Surge-arrestor	NER / NECR	Unearthed	Delta Winding

7 Surge Arrestors

Model & Make	Class	System Voltage	MCOV	kA

8 Tests

8.1 Insulation Resistance Test

Method:	Reading:
Apply 500 VDC between the primary winding and earth (tank) for 1 minute.	Ω

8.2 Reactor Winding Resistance

NOTE: Add applicable FAT test reports to this document. If FAT results not available, verify on site.

#TAP	A to N	B to N	C to N	a to b / a to n	b to c / b to n	c to a / c to n
1						
2						
3						
4						
5						

9 Bushing CTs

NOTE: Add applicable FAT test reports to this document. If FAT results not available, verify on site.

Polarity	YES	NO	N/A
Loop Resistance	YES	NO	N/A
Burden	YES	NO	N/A
Turns Ratio	YES	NO	N/A

10 Outstanding Items/Fault List

Any outstanding items and modifications:

11 Testing Instrumentation

NOTE: Duplicate sheet, populate individually for all test equipment used. Attach certificates for all test equipment used.

Manufacturer:	
Model and or type:	
Serial number:	
Calibration details:	
Date of calibration:	
Calibration register no.	
Calibration valid:	YES / NO
Copy of Calibration certificate attached:	YES / NO

12 Declaration

Herewith it is certified that the complete installation described above complies with all necessary specifications and that the installation is complete, all the required tests have been carried out and that it is safe for use.

NOTE: CVs and Qualifications of responsible person(s) must be attached to this document.

	Main Contractor	Sub-Contractor
Name of firm:		
Name of responsible person:		
Contact no:		
Date		
Signature		

	SARAO Engineer	SARAO Operations team	Supply Authority
Name of firm:			
Name of responsible person:			
Contact no:			
Date			
Signature			

SAT 3 - Low Voltage Cable Reticulation Test/Commissioning Report

Test report:		**Revision:**	0	**Date of last rev.:**	2025-11-24
Project no:					
Project description:					
Commissioning date:					
Retention period:					

1 Drawings

Drawing number	Title	Revision

2 Feeder Cable Identification

Nr	Cable Route			Description	
	From	To	Cable		Earth Wire
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					

Nr	Cable Route		Description	
	From	To	Cable	Earth Wire
14				
15				
16				
17				
18				

3 Tests

Do isolation tests between the LV feeder cables with a 500VAC Megger.

Nr	Isolation Resistance (MΩ)					
	R-W	R-B	W-B	R-N	W-N	B-N
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						

4 Cable Installation

Do all the trenches, the back filling and compaction thereof comply with the specification?	YES	NO
Does the bedding consist of graded soil that has proper thermal resistivity?	YES	NO
Is the spacing between adjacent cables adequate and does it comply with the manufacturer's requirements?	YES	NO
Does the termination and jointing of all cables comply with the specification?	YES	NO

5 Outstanding Items/Fault List

Any outstanding items and modifications:

6 Testing Instrumentation

6.1 500VAC Megger

Manufacturer:	
Model and or type:	
Serial number:	
Calibration details:	
Date of calibration:	
Calibration register no.	
Calibration valid:	YES / NO
Copy of Calibration certificate attached:	YES / NO

6.2 Multimeter

Manufacturer:	
Model and or type:	
Serial number:	
Calibration details:	
Date of calibration:	
Calibration register no.	
Calibration valid:	YES / NO
Copy of Calibration certificate attached:	YES / NO

7 Declaration

Herewith it is certified that the complete installation described above complies with all necessary specifications and that the installation is complete, all the required tests have been carried out and that it is safe for use.

	Main Contractor	Sub-Contractor
Name of firm:		
Name of responsible person:		
Contact no:		
Date		
Signature		

	SARAO Engineer	SARAO Operations Team	Supply Authority
Name of firm:			
Name of responsible person:			
Contact no:			
Date			
Signature			

SAT 4- Earthing Points
Testing and Commissioning Report

Test Report:		**Revision:**	0	**Date of last rev.:**	2025-11-24
Project no:					
Project description:					
Commissioning date:					
Retention period:					

Description of tested network (Miniature Substations names, Kiosk names, Street Names)

1 Drawings

Drawing number	**Title**	**Revision**

2 Earthing point test

Distinguish between HV and LV earthing points

Item no	**Detailed description of where earthing point occur/and or goal**	**Date**

Item no	Detailed description of where earthing point occur/and or goal	Date

3 Earthing point type and test results

Item no	Earth mat/grid	Chicken paw	Pen	According to Specification (Yes/No)	Resistance reading (Ω)

Outstanding items / Fault list
Record of all outstanding items and modifications

4 Testing instrumentation

Manufacturer:	
Model and or type:	
Serial number:	
Calibration details:	
Date of calibration:	
Calibration register no.	
Calibration valid:	YES / NO
Copy of Calibration certificate attached:	YES / NO

5 Declaration

Herewith it is certified that the complete installation described above complies with all necessary specifications and that the installation is complete, all the required tests have been carried out and that it is safe for use.

	Main Contractor	Sub-Contractor
Name of firm:		
Name of responsible person:		
Contact no:		
Date:		
Signature		

	SARAO Engineer	SARAO Operations Team	Supply Authority
Name of firm:			
Name of responsible person:			
Contact no:			
Date:			
Signature:			

SAT 5 - Inspection of Excavation and Backfilling of Cable Trenches

Date:	
Project :	

	Description	Yes	No
1	Excavations in accordance with drawing		
2	Is pegs for the defined bend points visible		
3	Has the trench line been indicated prior to excavation		
4	Correct depth and straight		
5	Suitable soil next to cable trench		
6	No rocks in cable trench		
7	Surface bed 100mm		
8	Percentage of rock in excavated soil		
9	Centre line distance between cables		
10	Cables laid in correct sequence		
11	Any impact with other services		
12	Sleeves fitted with draw wires and ends of sleeves sealed		
13	Damage of other services		
14	Danger Tape Installed at correct depth		
15	Clearance with other services - concrete planks		
16	Electrical services across the road		
17	All material in accordance with the specification		
18	Ground between cables at point where cables cross		
19	Sleeves install correctly, with draw wire		
20	Safety measures at excavations		
21	Excessive bends in cables		
22	Ends of 11kV cables sealed		
23	LV Cable joints only at 500m intervals allowed, record location		
24	Ends of 11kV cables must overlap for jointing of cables		
25	All deviations indicated on “as-built” drawing		
26	All variations must be entered in the Site Book		
27	Meter boxes and Mini-substations positioned in accordance with drawing		
28	Approval of cable trench entered in Site Book		
29	Backfilling of cable trench		

INSPECTED BY:

	Contractor	SARAO Engineer	Site Operation
Name (print)			
Date			
Signature			

SAT 6 - Inspection of Jointing and Terminations of Cables

Date:			
Project :			
Report number:		**Revision:**	

Item	Description	Comments			
		Contractor	SARAO Engineer	Site Operation Team	
1.	**MV – 22 kV**				
1.1	**Cable joint**				
1.1.1	Cable joint made by an approved cable jointer				
1.1.2	Correct size jointing kit for the cable				
1.1.3	Cable joint executed in accordance with the instructions of the OEM				
1.1.4	Cable card completed				
1.1.5	Cable joint supported by soil				
1.1.6	Concrete slab longitudinal over cable joint				
1.1.7	Armouring of the cables bonded				
1.1.8	Pressure test carried out				
1.2	**22 kV Cable termination**				
1.2.1	Correct size termination kit for cable and location				
1.2.2	Cable end made off in accordance with the instructions of the OEM				
1.2.3	Insulating boots / push-on connectors fitted on cable cores and connections				
1.2.4	Permanent Colour coded phase indicators or tape				
1.2.5	Hot phasing to confirm correctness				
1.2.6	Cables labelled on both ends to identify alternative end				

Item	Description	Comments			
		Contractor	SARAO Engineer	Site Operation Team	
1.2.7	Cable end box label				
1.2.8	Connections carried out by means of the correct size crimping cable lugs and matched crimper tool				
1.2.9	Connections carried out by means of the correct size bolts, nuts and spring washer				
1.2.10	Connections tightened / torque to OEM requirements				
1.2.11	Armoring of the cable connected to the earth-bar or earth-stud				
2.	**Low Voltage**				
2.1	**Cable joint**				
2.1.1	Correct size jointing kit for the cable				
2.1.2	Cable joint executed in accordance with the instructions of the OEM				
2.1.3	Cable joint supported by soil				
2.1.4	Armouring of the cables bonded				
2.2	**Cable end termination**				
2.2.1	Correct size termination kit for the cable and location				
2.2.2	Cable cores taped to indicate phases				
2.2.3	Phase rotation correct RWB				
2.2.4	Connections carried out by means of the correct size crimping cable lugs				
2.2.5	Connections carried out by means of the correct size bolts, nuts and spring washers				
2.2.6	Connections torque to OEM's requirements				
2.2.7	Armoring of the cable connected to the earthing installation				
2.2.8	Cable labelled at both ends indicating other end installation name				

LIST OF FAULTS						
POSITION	**Item**	**Item**	**Item**	**Item**	**Item**	**Item**
22kV JOINT						
22kV TERMINATION						
LV JOINT						
LV TERMINATION						

INSPECTION BY:

	Contractor		
Name (print)		**Date**	
Place		**Signature**	
	SARAO Engineer		
Name (print)		**Date**	
Place		**Signature**	
	Site Operation Team		
Name (print)		**Date**	
Place		**Signature**	
	Supply Authority		
Name (print)		**Date**	
Place		**Signature**	

SAT 7 - Medium Voltage Cables

Test/Commissioning Report

Test Report:		**Revision:**	1	**Date of last rev.:**	2025/11/24
Project no:					
Project description:					
Commissioning date:					
Retention period:					

Description of tested network (Miniature Substations names, Kiosk names, Street Names)

1 Drawings

Drawing number	**Title**	**Revision**

2 Cable Detail

Mark with Cross

2.1	Conductor Material					CU	AL					
2.2	Conductor Diameter (mm)	35	50	70	95	120		185	240	300	400	500	
2.3	Number of												