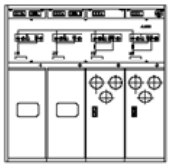
DISTRIBUTION COMMISSIONING TEST SHEET – HV RING MAIN SWITCHGEAR
HPC-4DL-07-0012-2014

This commissioning test sheet covers the checking, testing and commissioning of all replacement or new installations of high voltage (HV) ring main switchgear before energisation.



NOTE: Tests must be carried out after the installation, alteration or repair and before putting back to service.
SAFETY: At all times maintain suitable clearance to all other electrical equipment and verify planned escape routes and fire risks.
In preparation for the tests, wherever possible, de-energise and disconnect the HV cables from the equipment and make the area safe.

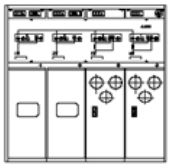
DATE:		**Project/Work Order No.**		**Name of Officer**	
Location of Equipment:					

1. RING MAIN DESCRIPTION

Rated Voltage	kV	Stock Code		Serial Number	

2. VISUAL INSPECTION AND SAFETY CHECK (SWITCHGEAR)

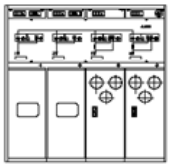
1	Check that the installation complies with the distribution construction standards and applicable design drawings.			☐
2	Check that Public Safety has been considered (e.g. cabinets secured and locked, trip hazards removed where applicable).			☐
3	Check the LV supply to the switchgear, that it is switched off and isolated if possible.			☐
4	Confirm that the switchgear is de-energised (with approved testing device).			☐
5	Ensure that the earth system is completed as per design drawings (correct size of earths use), and that the grading ring is installed, undamaged and connected to the HV earth bar.			☐
6	Check that the nearest conductive material is at least two (2) metres away from the earth ring/system (take a photo if possible)	Measured distance	m	☐
7	Switchgear voltage rating matches or is greater than system voltage.			☐
8	Check that the switchgear is numbered and labelled correctly.			☐
9	Check that the gas pressure is sufficient (if applicable record reading).		MPa	☐
10	Check the alignment of face plate and operation of the interlocks.			☐
11	Inspect labels, markings, safety signs and safety devices.			☐
12	Conduct functional tests of the electrical equipment and parts of the installation; verify settings, circuitry and programming; verify the operation and configuration by measurement or testing of protective, monitoring, measuring and control devices.			☐



13	Is RTU (T300) installed? If No, please proceed to Point 21.	☐
14	a) Check the AC supply to the Supply BILL cut-out is switched off and isolated.	☐
15	b) Check that LV Cable has been tested using commissioning test sheet HPC-4DL-07-0016-2014.	☐
16	c) Check that AC Supply BILL cut-out correctly installed, cables made off and terminated correctly.	☐
17	d) Check that AC Cable, CT Cable, SF6 Low gas cable and Door switch cable have been installed, made off and terminated correctly.	☐
18	e) Check that VT Ethernet cable RJ45 is plugged in.	☐
19	f) Check that the control cable is plugged in.	☐
20	g) Check that AC Supply, Control, Indication, CT and VT cables to RTU are neatly stowed away.	☐
21	Check that CT's cables shorted if no RTU installed.	☐

3. EARTH RESISTANCE TEST

1	Test earth resistance using one of the following DCT's and record value in 3.4.					☐
2	New earth stakes, use HPC-4DL-07-0004-2014 DCT- Earth Testing of Distribution Substation, to test the earths.					☐
3	Existing earth stakes, use HPC-4DL-07-0037-2017 DCT- Earth Testing of Altered Systems, to test the earths.					☐
4	Previous test value if known	= _____Ω	Measured value	= _____Ω	Value acceptable	Yes ☐ No ☐
	Measured value would be acceptable if **below 10 Ohms** or a value between 0.8 and 1.2 which is obtained when dividing the Measured value by the Previous test value. **Note:** If previous test value is not known a value less than or equal to, 10 Ohms is acceptable.					☐
5	Earth stake resistance **above 10 Ohms or outside of an acceptable value** must be communicated to the formal leader or Asset manager.					☐

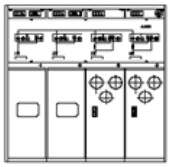


4. INSULATION RESISTANCE TEST

Disconnect all cables connected to the switchgear, open all earth switches and close all load-carrying switches before testing.				☐
Verify the integrity of the busbar to earth by using a 5 kV insulation resistance tester for a minimum of 1 minute for a stable reading. Test results are to be greater than 5,000 MΩ.		Test Connection	Expected Results	Test Results
		Red phase to white phase	>5,000 MΩ	Ω
		White phase to blue phase	>5,000 MΩ	Ω
		Blue phase to red phase	>5,000 MΩ	Ω
		Red phase to earth	>5,000 MΩ	Ω
Instrument Serial no.		White phase to earth	>5,000 MΩ	Ω
Date last tested		Blue phase to earth	>5,000 MΩ	Ω
Confirm busbar has been discharged after each test.				☐

5. CONTINUITY TEST

	Test Connection	Expected Results	Test Results	
Using a multimeter, test between all bushings of the same phase to prove continuity.	Red phase to red phase	< 0.1 Ω	Ω	Pass ☐
	White phase to white phase	< 0.1 Ω	Ω	Fail ☐
	Blue phase to blue phase	< 0.1 Ω	Ω	
Open all load-carrying switches and close all earth switches. Using a multimeter, test between all bushings of the same phase and earth to prove continuity.	Red phase to earth	< 0.1 Ω	Ω	Pass ☐
	White phase to earth	< 0.1 Ω	Ω	Fail ☐
	Blue phase to earth	< 0.1 Ω	Ω	

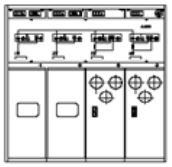


6. ANCILLARY EQUIPMENT TESTS

1	CT's – Check polarity and verify ratio.	☐
2	Check HV Fuses with design drawings.	☐
3	Test Protection relay to settings provided (if installed).	☐
4	RTU (if installed) – T300 is present, energise RTU and test controls:	☐
5	a) Energise AC supply and confirm AC voltage at BILL cut-out.	☐
6	b) Energise RTU from BILL cut-out.	☐
7	c) Check switch indications to RTU by mechanically closing and opening switches.	☐
8	d) Operate switches from RTU by closing and opening switches.	☐
9	e) Check SF6 low gas alarm to RTU.	☐
10	f) Check Door switch alarm to RTU.	☐
11	g) De-energise RTU, isolate LV supply.	☐
12	h) Check that OT Commissioning Sheet is available for network synchronisation and has been completed.	☐

7. REINSTATEMENT OF CABLES

1	Check that all testing equipment, leads, tools, bridges and shorts have been removed from HV cable enclosure.	☐
2	Check that all load switches are open and all earth switches are closed.	☐
3	Check that all cables still dead and isolated before reconnecting cables to RMU.	☐
4	Check that all cable boots are bagged and secured where applicable.	☐
5	Check boots have no foreign material, dead end receptacle etc.	☐
6	Check that dead end receptacle have been fitted, greased and tight.	☐
7	Check that venting rod has been removed.	☐
8	Check that all the HV cable terminations are secure and that the correct bailing assemblies are used.	☐



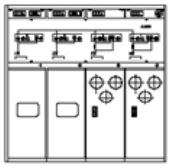
9	Check that all the HV cable terminations are tightened to the manufactures required standard.		☐
10	Check that the drain wires are fitted to all HV elbow connectors and are connected to the cable screen.		☐
11	Check that the HV cable screens are all solidly and separately connected and bolted to the HV earth bar.		☐
12	Check that there is a 25 mm clearance between the cable screens and the cable support brackets.		☐
13	Check that phase indication wires are connected to bushings.		☐
14	Check that HV cable plug earth drain wires have been connected and earthed.		☐
15	Check that all cable screens have been connected to earth.		☐
16	Check that all CT's have been installed correctly and cables connected correctly.		☐
17	Check that all secondary wiring in HV cable enclosure have been terminated and secured.		☐
18	Check that all earthing has been correctly connected.		☐
19	Check that any foreign materials have been removed from the cable enclosure.		☐
20	Secure HV cable enclosure covers.		☐
21	RTU (if installed) – Check all CT's, VT's, Gas, Door switch cables are correctly connected.		☐
22	Check that no HV cables are exposed. Backfill if necessary.		☐
23	Is RMU ready for service?	YES ☐	NO ☐

8. HANDOVER OF RESPONSIBILITY FOR THE COMPLETION OF SECTIONS 1 TO 7

I hereby certify that sections 1 to 7 have been completed with satisfactory results and transfer responsibility to the commissioning officer.

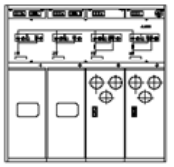
Testing Officer: _____ Pay Number: _____

Signature: _____ Date: DD/MM/YY Time: HH:MM



9. PRE-COMMISSIONING

1	Open HV cable enclosure covers.	☐
2	Confirm that all the HV cable terminations are secure and that the correct bailing assemblies are used.	☐
3	Confirm that all the HV cable terminations are tightened to the manufactures required standard.	☐
4	Confirm that the drain wires have been fitted to all HV elbow connectors and are connected to the cable screen.	☐
5	Confirm that the HV cable screens are all solidly and separately connected and bolted to the HV earth bar.	☐
6	Confirm that none of the HV cable screen wires have broken.	☐
7	Confirm that the 25 mm clearance between the cable screens and the cable support brackets is maintained.	☐
8	Confirm that the phase indication wire is connected to bushing.	☐
9	Confirm that the HV cable plug earth drain wire is connected and earthed.	☐
10	Confirm that all cable screens are connected to earth.	☐
11	Confirm that all cable boots (if applicable) are bagged and secured.	☐
12	Confirm that all secondary wiring in HV cable enclosure is terminated and secured.	☐
13	Confirm that all foreign materials are removed from the cable enclosures.	☐
14	Confirm the functionality of the HV cable enclosure covers.	☐
15	Secure HV cable enclosure covers.	☐
16	Confirm that no HV cables are exposed.	☐
17	If the ring main unit is in a kiosk, confirm that the kiosk body is earthed correctly, including the kiosk doors.	☐
18	Confirm the functionality of the switch interlock (i.e. earth cannot be engaged when the switch is closed).	☐
19	Confirm the functionality of the earthing interlocks (i.e. switch cannot close when the earth is engaged).	☐
20	RTU (if installed) – Confirm that OT Commissioning sheet available and signed off.	☐



21	Confirm that all CT cables connected to RTU (if installed) or shorted (if no RTU installed).	☐
22	Ensure that all load-carrying and earth switches are as per the switching program and that padlocks and danger labels are fitted.	☐
23	Ensure that the site is safe and barricaded where necessary, with no hazards to personnel or public.	☐

For Schneider RM6 ring main switchgear	24	Confirm that the RM6 has a transportable base Yes ☐ No ☐	
	25	Confirm that the face-plate is aligned and that the interlocks operate freely.	☐
	26	Confirm that the two black bolts located on the top edge of all switch disconnector panels are installed and tightened.	☐
	27	Confirm the interlocking pin on the top edge of the door panels, and the metal tabs on the inner edge of the fuse cover panel are in good condition.	☐

10. HANDOVER OF RESPONSIBILITY FOR THE COMPLETION OF SECTION 9

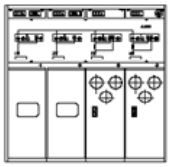
I hereby certify that section 9 has been completed with satisfactory results and transfer responsibility to the commissioning officer.

Testing Officer: _____ Pay Number: _____

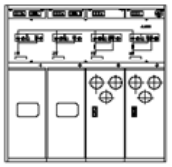
Signature: _____ Date: DD/MM/YY Time: HH:MM

11. COMMISSIONING AND ENERGISATION

1	Ensure that the high voltage cable testing schedule is available and that the results are acceptable.			☐
2	Ensure that the earth system test result is available and that the results are acceptable.	Earth Resistance Value	Ω	☐
3	Ensure that the inside of the fuse compartment is clean and install the HV high rupturing capacity fuses according to the fuse chart size. Ensure that the striker pins face the striker bar.			☐
4	The switching operator must ensure that the switchgear labels match the ENMAC or GIS diagrams.			☐



5	Record switching program:							☐
6	RTU (if installed) – Energise RTU by closing LV supply cut-out							☐
7	Energise RMU from remote location as per switching program							☐
8	The following checks need to be completed in conjunction with the appropriate steps in the switching program (where applicable) Check that the neon light is connected to the correct phase by measuring the voltage at the test points. Take one cubicle as a reference and test the red phase of that cubicle against the red phase and other phase of another cubicle. Red to red should record minimum volts, and other phases should have a maximum voltage. Repeat this procedure with all other phases	Connection		Connection		Connection		
		R1 – R2	Pass ☐ Fail ☐	W1 – R2	Pass ☐ Fail ☐	B1 – R2	Pass ☐ Fail ☐	
		R1 – W2	Pass ☐ Fail ☐	W1 – W2	Pass ☐ Fail ☐	B1 – W2	Pass ☐ Fail ☐	
		R1 – B2	Pass ☐ Fail ☐	W1 – B2	Pass ☐ Fail ☐	B1 – B2	Pass ☐ Fail ☐	
9	RTU (if installed) – Confirm with HPCC as per OT commissioning requirements operation of RTU/RMU.							☐
10	Ensure that all equipment is in its final circuit condition as per the switching program.							☐
11	Ensure that all equipment is locked, numbered and labelled correctly, and secure from unauthorized entry.							☐
Note: Any changes to the original design must be marked, documented and stamped “As Constructed”.								☐



12. OPERATIONAL HANDOVER

The commissioning officer must ensure that all checks are completed and the test results comply with the minimum standards.

I hereby certify that all sections have been completed with satisfactory results and transfer responsibility to the network operating authority.
(This equipment is ready for operational service)

Commissioning Officer: _____ Pay Number: _____

Signature: _____ Date: DD/MM/YY Time: HH:MM

1. Ensure the work area is left tidy with no hazards to the public.
2. Hand over responsibility to the operating authority
3. Return this sheet to the project/working file as a record of commissioning and as a document required for the Handover Certificate.