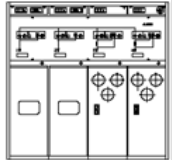




DISTRIBUTION COMMISSIONING TEST SHEET – HV RING MAIN SWITCHGEAR
HPC-4DL-07-0012-2014

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

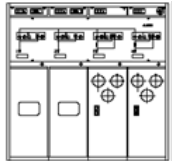
Rated Voltage	kV	Stock Code		Serial Number	

2. VISUAL INSPECTION AND SAFETY CHECK (SWITCHGEAR)

1	Check that the installation complies with the distribution construction standards and applicable design drawings.		<input type="checkbox"/>	
2	Check that Public Safety has been considered (e.g. cabinets secured and locked, trip hazards removed where applicable).		<input type="checkbox"/>	
3	Check the LV supply to the switchgear, that it is switched off and isolated if possible.		<input type="checkbox"/>	
4	Confirm that the switchgear is de-energised (with approved testing device).		<input type="checkbox"/>	
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.		<input type="checkbox"/>	
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	<input type="checkbox"/>
7	Switchgear voltage rating matches or is greater than system voltage.		<input type="checkbox"/>	
8	Check that the switchgear is numbered and labelled correctly.		<input type="checkbox"/>	
9	Check that the gas pressure is sufficient (if applicable record reading).		MPa	<input type="checkbox"/>
10	Check the alignment of face plate and operation of the interlocks.		<input type="checkbox"/>	
11	Inspect labels, markings, safety signs and safety devices.		<input type="checkbox"/>	
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.		<input type="checkbox"/>	

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HPC-4DL-07-0012-2014**

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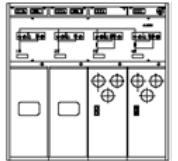
13	Is RTU (T300) installed? If No, please proceed to Point 21.	<input type="checkbox"/>
14	a) Check the AC supply to the Supply BILL cut-out is switched off and isolated.	<input type="checkbox"/>
15	b) Check that LV Cable has been tested using commissioning test sheet HPC-4DL-07-0016-2014.	<input type="checkbox"/>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

3. INSULATION RESISTANCE TEST

Disconnect all cables connected to the switchgear, open all earth switches and close all load-carrying switches before testing.				<input type="checkbox"/>
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.				<input type="checkbox"/>

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HPC-4DL-07-0012-2014**

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4. CONTINUITY TEST

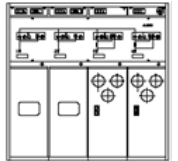
	Test Connection	Expected Results	Test Results	
			Ω	Pass <input type="checkbox"/> Fail <input type="checkbox"/>
Using a multimeter, test between all bushings of the same phase to prove continuity.	Red phase to red phase	< 0.1 Ω	Ω	Pass <input type="checkbox"/> Fail <input type="checkbox"/>
	White phase to white phase	< 0.1 Ω	Ω	
	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 <input type="checkbox"/> Fail <input type="checkbox"/>
	White phase to earth	< 0.1 Ω	Ω	
	Blue phase to earth	< 0.1 Ω	Ω	

5. ANCILLARY EQUIPMENT TESTS

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

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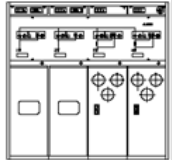
6. REINSTATEMENT OF CABLES

1	Check that all testing equipment, leads, tools, bridges and shorts have been removed from HV cable enclosure.	<input type="checkbox"/>
2	Check that all load switches are open and all earth switches are closed.	<input type="checkbox"/>
3	Check that all cables still dead and isolated before reconnecting cables to RMU.	<input type="checkbox"/>
4	Check that all cable boots are bagged and secured where applicable.	<input type="checkbox"/>
5	Check boots have no foreign material, dead end receptacle etc.	<input type="checkbox"/>
6	Check that dead end receptacle have been fitted, greased and tight.	<input type="checkbox"/>
7	Check that venting rod has been removed.	<input type="checkbox"/>
8	Check that all the HV cable terminations are secure and that the correct bailing assemblies are used.	<input type="checkbox"/>
9	Check that all the HV cable terminations are tightened to the manufactures required standard.	<input type="checkbox"/>
10	Check that the drain wires are fitted to all HV elbow connectors and are connected to the cable screen.	<input type="checkbox"/>
11	Check that the HV cable screens are all solidly and separately connected and bolted to the HV earth bar.	<input type="checkbox"/>
12	Check that there is a 25 mm clearance between the cable screens and the cable support brackets.	<input type="checkbox"/>
13	Check that phase indication wires are connected to bushings.	<input type="checkbox"/>
14	Check that HV cable plug earth drain wires have been connected and earthed.	<input type="checkbox"/>
15	Check that all cable screens have been connected to earth.	<input type="checkbox"/>
16	Check that all CT's have been installed correctly and cables connected correctly.	<input type="checkbox"/>
17	Check that all secondary wiring in HV cable enclosure have been terminated and secured.	<input type="checkbox"/>
18	Check that all earthing has been correctly connected.	<input type="checkbox"/>
19	Check that any foreign materials have been removed from the cable enclosure.	<input type="checkbox"/>
20	Secure HV cable enclosure covers.	<input type="checkbox"/>
21	RTU (if installed) – Check all CT's, VT's, Gas, Door switch cables are correctly connected.	<input type="checkbox"/>



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22	Check that no HV cables are exposed. Backfill if necessary.	<input type="checkbox"/>
23	Is RMU ready for service?	YES <input type="checkbox"/> NO <input type="checkbox"/>

7. HANDOVER OF RESPONSIBILITY FOR THE COMPLETION OF SECTIONS 1 TO 6

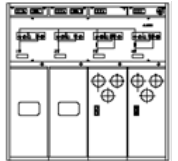
I hereby certify that sections 1 to 6 have been completed with satisfactory results and transfer responsibility to the commissioning officer.

Testing Officer: _____ Pay Number: _____

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

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

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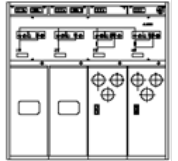


8. PRE-COMMISSIONING

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

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22	Ensure that all load-carrying and earth switches are as per the switching program and that padlocks and danger labels are fitted.		<input type="checkbox"/>
23	Ensure that the site is safe and barricaded where necessary, with no hazards to personnel or public.		<input type="checkbox"/>
For Schneider RM6 ring main switchgear	24	Confirm that the RM6 has a transportable base Yes <input type="checkbox"/> No <input type="checkbox"/>	
	25	Confirm that the face-plate is aligned and that the interlocks operate freely.	<input type="checkbox"/>
	26	Confirm that the two black bolts located on the top edge of all switch disconnecter panels are installed and tightened.	<input type="checkbox"/>
	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.	<input type="checkbox"/>

9. HANDOVER OF RESPONSIBILITY FOR THE COMPLETION OF SECTION 8

I hereby certify that section 8 has been completed with satisfactory results and transfer responsibility to the commissioning officer.

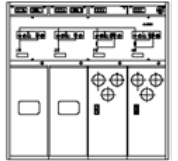
Testing Officer: _____ Pay Number: _____
 Signature: _____ Date: / / Time: :

10. COMMISSIONING AND ENERGISATION

1	Ensure that the high voltage cable testing schedule is available and that the results are acceptable.		<input type="checkbox"/>
2	Ensure that the earth system test result is available and that the results are acceptable.	Earth Resistance Value	Ω <input type="checkbox"/>
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.		<input type="checkbox"/>
4	The switching operator must ensure that the switchgear labels match the ENMAC or GIS diagrams.		<input type="checkbox"/>
5	Record switching program:		<input type="checkbox"/>
6	RTU (if installed) – Energise RTU by closing LV supply cut-out		<input type="checkbox"/>

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7	Energise RMU from remote location as per switching program							<input type="checkbox"/>
8	<p>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</p>	Connection		Connection		Connection		
		R1 – R2	Pass <input type="checkbox"/> Fail <input type="checkbox"/>	W1 – R2	Pass <input type="checkbox"/> Fail <input type="checkbox"/>	B1 – R2	Pass <input type="checkbox"/> Fail <input type="checkbox"/>	
		R1 – W2	Pass <input type="checkbox"/> Fail <input type="checkbox"/>	W1 – W2	Pass <input type="checkbox"/> Fail <input type="checkbox"/>	B1 – W2	Pass <input type="checkbox"/> Fail <input type="checkbox"/>	
		R1 – B2	Pass <input type="checkbox"/> Fail <input type="checkbox"/>	W1 – B2	Pass <input type="checkbox"/> Fail <input type="checkbox"/>	B1 – B2	Pass <input type="checkbox"/> Fail <input type="checkbox"/>	
9	RTU (if installed) – Confirm with HPCC as per OT commissioning requirements operation of RTU/RMU.						<input type="checkbox"/>	
10	Ensure that all equipment is in its final circuit condition as per the switching program.						<input type="checkbox"/>	
11	Ensure that all equipment is locked, numbered and labelled correctly, and secure from unauthorized entry.						<input type="checkbox"/>	
Note: Any changes to the original design must be marked, documented and stamped “As Constructed”.							<input type="checkbox"/>	

11. 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.