DISTRIBUTION COMMISSIONING TEST SHEET – HIGH VOLTAGE XLPE CABLES
HPC-4DL-07-0005-2014

This commissioning test sheet covers the checking, testing and commissioning of all replacement or new installations of high voltage cross-linked polyethylene (XLPE) cable.

NOTE: XLPE cables must **never be tested** with a high voltage DC cable tester (high potential), as it may cause damage to the cable. Tests must be carried out after the installation, alteration, repair or cut-in and before putting back to service.

SAFETY: At all times maintain suitable clearance to all other electrical equipment and verify planned escape routes.
In preparation for the tests, wherever possible, disconnect the cable from the equipment on both sides and make the area safe.

DATE:		**Project No.:**		**Name of Officer:**	
Test Site:					
Location of Cable:	**From:**			**To:**	

1. CABLE DESCRIPTION

Rated Voltage	kV	Length of cable (approx.)	m	Stock code	
Cable size	mm²	No. of in-line joints		Cable function	Transformer cable ☐ Feeder cable ☐

2. VISUAL INSPECTION AND SAFETY CHECK

Inspect the following • Cable • Cable surge arresters • Cap test points	Check that the installation complies with the distribution construction standards, applicable design drawings, and is appropriate for the area (including termite protection).	☐
	Check the supply to the cable, that it is switched off and isolated as per switching schedule and permit.	☐
	Confirm that the cable is de-energised (with approved testing device).	☐
	Ensure that the earthing system is complete, undamaged and bonded to earth points.	☐
	Wherever possible, check that there is no physical damage to the cable or equipment.	☐
	Check that the cable is clearly marked with each phase colour and labelled (if applicable).	☐
	Ensure the surge arrestors are disconnected from the cable terminations (if applicable).	☐

3. END TO END PHASING TEST

	Test Connection	Resistor Values	Test Results
Using the three (3) phase resistor box in conjunction with a 500 V insulation resistance tester test to identify the correct cable end and phasing.	Red phase to neutral	MΩ	MΩ
	White phase to neutral	MΩ	MΩ
	Blue phase to neutral	MΩ	MΩ

4. INSULATION RESISTANCE TEST

	Test Connection	Minimum Values	Test Results
Use a 5 kV insulation resistance tester for 1 to 10 minutes (subject to the length of the cable) or until the reading is stable, between each phase conductor and the other cable conductors and screens. All screens should be connected together, and the other phase conductors should also be connected to the cable screens. (Note: 1,000 MΩ = 1 GΩ)	Red phase conductor to all cable screens, white and blue phase conductors.	Refer to last page	Ω
	White phase conductor to all cable screens, red and blue phase conductors.		Ω
	Blue phase conductor to all cable screens, red and white phase conductors.		Ω

Confirm cables have been discharged after each test.	☐

5. SHEATH INTEGRITY TEST

	Test Connection	Minimum Values	Test Results
Use an insulation resistance tester set to 1 kV for 1 to 10 minutes (subject to the length of the cable) or until the reading is stable, between each cable screen to earth. (Note: 1,000 MΩ = 1 GΩ)	Red phase cable screen to earth	Refer to last page	Ω
	White phase cable screen to earth		Ω
	Blue phase cable screen to earth		Ω

Confirm cables, including parallel phase conductors and screens, have been discharged after each test.	☐

6. CABLE TERMINATION CHECKS

1	Ensure all cable connections and terminations are made and tightened to the manufactures required standard.	☐
2	Ensure all cables are clearly and correctly labelled.	☐

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/Cable Jointer/CPM: _____ Pay Number: _____

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

The commissioning officer must sign this document before energisation.

8. VERY LOW FREQUENCY (VLF) TEST

Refer to VLF Testing of HV Cables Manual DM# 11849149

Is VLF Testing required? Cables less than 250 meters long and are without in-line joints do not require VLF Testing.	Yes ☐ / No ☐	
Set the VLF tester to apply the required voltage @ 0.01 to 0.1 Hz frequency (subject to the length of the cable) for duration of 60 minutes between phases to screen (earth). Record the applied voltage: Note: Cable screen must be connected to earth and test equipment earth is connected to this bond.	Value _____(kV)	Result Pass ☐ Fail ☐

Repetitive or successive VLF testing of the cable should be avoided.
The test is performed using a VLF tester. Test will be carried out between conductors and screens (which shall be earthed) for the duration of 60 minutes at a voltage of $3V_N$ @ 0.1 Hz as per the below table. Test will return acceptable results when no breakdown occurs.

Note: 1) For True Sine Wave VLF testers, $V_{peak} = \sqrt{2} \times V_{rms}$. Test at V_{rms}
2) For Cosine-Rectangular Waveform VLF testers, $V_{peak} = V_{rms}$. Test at V_{peak}
3) Maintenance testing is at 80%. Acceptance testing for any cable that has previously been in service.
4) A further reduction to 60% should be applied to cables over 30 years old or PILC cables.

System Voltage (phase to phase)	Acceptance testing (Phase to Neutral)	Maintenance testing (phase to neutral)	System Voltage (phase to phase)	Acceptance testing (Phase to Neutral)	Maintenance testing (phase to neutral)
6.6 kV	9 kV rms (12 kV peak)	7.2 kV rms (10 kV peak)	22 kV	27 kV rms (38 kV peak)	21.6 kV rms (31 kV peak)
11 kV	14 kV rms (19 kV peak)	11.2 kV rms (16 kV peak)	33 kV	41 kV rms (57 kV peak)	32.8 kV rms (46 kV peak)

AC (VLF) Tester – Triplex or Single Phase XLPE Cables					
Connection	Voltage Peak	Test Duration	Record or Check		
			Start Leakage Current (mA)	Finish Leakage Current (mA)	Pass ☐ Fail ☐
R & W & B to E		60 min			

9. INSULATION RESISTANCE TEST (POST-VLF TEST)

	Test Connection	Minimum Values	Test Results
Conduct an insulation resistance test for 1 to 10 minutes (subject to the length of the cable) or until the reading is stable. After the VLF test, use a 5 kV insulation resistance tester between each phase to the other phases and screens. Record the measured values. (Note: 1,000 MΩ = 1 GΩ)	Red to (white & blue) phase & earth screens	Refer to last page for new cable >100 MΩ for old cable	Ω
	White to (blue & red) phase & earth screens	Refer to last page for new cable >100 MΩ for old cable	Ω
	Blue (red & white) phase & earth screens	Refer to last page for new cable >100 MΩ for old cable	Ω
If Insulation Resistance is <1,000 MΩ for new cables and <100 MΩ for old cables, repeat 1 kV sheath test as per Section 5 Note: Not applicable for mixed cables.	Red phase cable screen to earth	Refer to last page	Ω
	White phase cable screen to earth	Refer to last page	Ω
	Blue phase cable screen to earth	Refer to last page	Ω

Sheath integrity test (post-VLF) pass?	**Yes** ☐ **No** ☐ **N/A** ☐ If **NO** the tester needs to locate the sheath fault and report to the HP Asset Manager to arrange repairs

10. HANDOVER OF RESPONSIBILITY FOR THE COMPLETION OF SECTIONS 7 TO 9

I hereby certify that sections 7 to 9 have been completed with satisfactory results and transfer responsibility to the commissioning officer.

VLF Testing Officer: _____ Pay Number: _____

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

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 to be **SAFELY** energised.

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.

Insulation Resistance Criteria – New XLPE cables				
Cable Length/Size	**250 m**	**500 m**	**1,000 m**	**2,000 m**
22 kV or 33 kV	**GΩ**	**GΩ**	**GΩ**	**GΩ**
630 mm²	20	10	5	2.5
400 mm²	28	14	7	3.5
240 mm²	30	15	8	4
185 mm²	35	17	9	4
50 mm²	53	27	13	7
35 mm²	60	30	15	7.5

*Insulation resistance (GΩ) for cable lengths other than those listed in the table can be obtained by using formula: New resistance = Resistance at 1,000 m/cable length (in m)

Sheath Test Criteria – New HDPE Sheaths				
Cable Length/Size	**250 m**	**500 m**	**1,000 m**	**2,000 m**
22 kV or 33 kV	**MΩ**	**MΩ**	**MΩ**	**MΩ**
185 – 630 mm²	500	250	125	62
50 mm²	420	210	105	52
35 mm²	400	200	100	50

Sheath Test Criteria – New PVC Sheaths – The minimum acceptable value is 1 MΩ