

Corporate-wide Procedure

CONTROLLED DOCUMENT

Proving High Voltage Conductors De-Energised

Summary

This work instruction supports the Power System Safety Rules and its requirements for HV Field Operating. It describes equipment which has been approved for proving HV conductors safe to earth and the methods in which this equipment must be used.

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1. Purpose

This work instruction describes equipment which has been approved for proving HV conductors safe to earth and the methods in which this equipment must be used.

2. Scope

This procedure describes equipment for proving HV conductors safe to earth (de-energised) and the way in which this equipment must be used. This procedure also includes methods for checking the operation of the equipment along with inspection and maintenance procedures.

3. Definitions

Term	Definition
Audible Discharge Test	An alternative method of proving a conductor de-energised at voltages of 33 kV and above.
Contact Mode	Where the contact piece of the tester touches the conductor.
Contact Piece	Used when proving conductors de-energised in contact mode
De-energised	Isolated from a source of electrical supply.
Operating Rod	Approved HV operating rods.
Non-Contact Mode	Where contact is not made with the conductor.
Proven De-energised	When proving de-energised test equipment has been applied to prove that it is safe to apply earths to the conductor
Special Probe	Fitted to special testers for non-contact testing. The design of the probe prevents the tester from entering the equipment spout.

4. Introduction

Before earthing is applied to any High Voltage (HV) conductors, each conductor of the HV equipment that has been isolated for work must be proven safe to earth (de-energised) at the point where earths are to be applied.

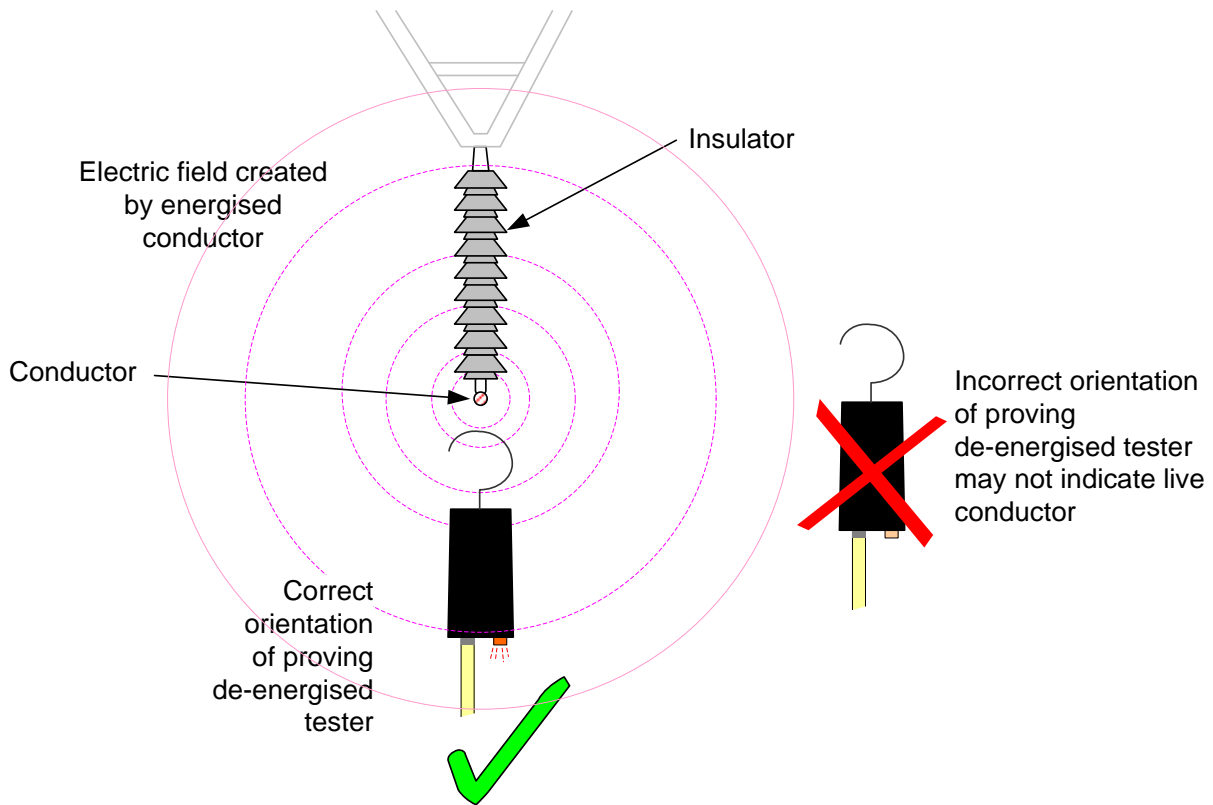
Proving HV conductors de-energised must only be carried out by a person authorised [HV Field Operator](#).

4.1. Proving De-Energised Equipment (Testers)

Proving de-energised equipment consists of a tester (Universal or Special), and associated contact pieces or non-contact probes.

Testers detect the presence of an alternating electric field surrounding a live electric conductor when the tester is placed within an alternating electric field.

The tester must be pointed directly towards the conductor being tested as shown below otherwise a false indication may occur.



5. Approved Equipment and Testers

Only the approved equipment and testers described in this document must be used to prove de-energised. For easy identification of testers, coloured cases have been provided:

- Black case Universal Testers
- Red case Special testers except overhead line testers
- Green case Special non-contact overhead line testers

Proving de-energised is required to ensure it is safe to apply earths. In some situations, it may not be practical to follow this method. In special circumstances the following methods are approved:

- At approved locations, and as described in the relevant operating manuals, voltage transformers and associated interlocks may be used as the approved method of proving safe to earth;
- If an approved tester is not available at the site or non-functional then permission may be granted by the Controller to use a HV operating rod to carry out an "audible discharge test" to prove conductors de-energised at voltages of 33 kV and above; and
- Where integrated isolating, earthing and short-circuiting equipment is fitted to the outgoing circuit of a HV switchboard and there are no other sources of HV to the circuit.

The following table lists approved proving de-energised equipment and the situations for its use. When using this equipment, the following conditions must be observed:

- Only the test equipment, as listed, must be used in each situation; and
- An authorised person should not use a HV tester unless they are familiar in its use.

5.1. Proving De-Energised Equipment for Various Situations

Situations	Tester		Mode	Contact Piece or Probe	Method of Application	Example Locations	Reference
Overhead Conductors in Substations	Universal Tester	UT	Contact	Hook Contact Piece	Operating Rod		Section 3.2.1 Section 4.4.1
Through Transparent Panels of Cubicles and High Voltage Cages	Universal Tester		Non-Contact	-	Handheld	Kangaroo Valley PS	Section 3.2.2 Section 4.4.3
At the spouts of Metalclad switchgear	Universal tester		Non-Contact	Appropriate probe	Handheld	LTSS	Section 3.2.2 Section 4.4.4
Transmission Lines	Universal Tester	Green	Contact	Hook Contact Piece	Operating Rod		Section 3.2.1
	Special Transmission Line Tester		Non-Contact	-	"Stubby" Operating Rod		Section 3.3.2 Section 4.5.7
High 500kV Conductors	Special 500kV Tester	Red	Non-Contact	-	Operating Rod		Section 3.3.2 Section 4.5.1
High 330kV Conductors	Special 330kV Tester		Non-Contact	-	Operating Rod		Section 3.3.2 Section 4.5.2
Overhead Conductors in Substations Non-standard voltages. E.g., 3.3kV	Special Tester		Contact	Hook Contact Piece	Operating Rod	Wallerawang	Section 3.3.1 Section 4.5.6
Inside cabinets containing HV conductors	Special tester	Contact	Special contact probe – nylon rod	Hand held	Mt Piper in 3.3kV cubicles	Section 3.3.1 Section 4.5.5	
Gas Insulated Switchgear (GIS)	Special Tester	Red	Non-Contact	Probe built into Switchgear	Coaxial Cable	Beaconsfield West	Section 3.3.2.3 Section 4.5.3
At the spouts of Metalclad switchgear	Special tester		Non-Contact	Special contact probe	Operating rod	Balranald Murray (Black case)	Section 3.3.2.4 Section 4.5.4
Voltage Transformers	Two-pole voltage & continuity tester		Contact	-	Hand	At the low voltage links	Section 3.3.3 Section 4.5.7

5.2. Universal Tester (UT)

The UT is used for most applications involved in contact and non-contact testing. UT's can be used:

- In contact mode at voltage levels from 11 kV up to 330 kV. Switch-selectable ranges of 11-66 kV, 132 kV and 330 kV are provided.
- In non-contact mode. There are two switch-selectable sensitivities; NC1 and NC2. NC1 is the more sensitive.



The UT is used in the majority of proving de-energised situations and has the following features:

- Front face plate containing a threaded hole with a metal surround (in which to screw an operating rod), an indicating lamp, a test push-button, and a selector switch with positions NC 1, NC2, 11-66 kV, 132 kV, 330 kV and OFF.
- Name plate and instructions on one side and battery case on the other.
- The mounting socket for contact pieces or special non-contact probes is on the end.

5.2.1. Universal Tester - Contact Mode

When a UT is to be used for contact mode testing, an operating rod or adaptor piece is screwed into the mounting socket. The operating rod activates a micro-switch which, together with placing the selector switch in either 11-66 kV; 132 kV or 330 kV positions, sets up the tester for contact mode testing. An accessory aluminium hook is then screwed onto the end of the tester. With the operator holding the handle of the operating rod, the rod is raised to enable the hook to be brought into contact with a live conductor.



5.2.2. Universal Tester - Non-Contact Mode

The UT can be used in non-contact mode with or without special purpose probes to detect live HV conductors without making contact. In non-contact mode, the selector switch should be turned to a non-contact range, NC1 or NC2. NC1 is the more sensitive and should be used at most locations. A UT fitted with a standard non-contact probe is shown below.



Non-contact mode testing is performed with the UT held in the hand and with the range switch selected to either NC1 or NC2. For this mode of testing, nothing must be screwed into the mounting socket and the micro-switch must not be activated.

WARNING: When used for non-contact testing, a UT and its associated special probe care must be taken to ensure that the safe approach distances to exposed HV conductors, as set out in the Power System Safety Rules, are maintained **except** when testing at approved locations, where approach to the exposed conductors is limited by:

- Clear glass panels without metal reinforcing; or
- Flange on non-contact probe (metalclad switch gear).

5.3. Special Testers

Special testers can be either contact mode or non-contact mode devices and have been developed for use in situations which are not covered by the UT. These testers were developed from the UT with modifications to one or more of the following: sensitivity, selector switch, audible indication or micro-switch in operating rod socket.

Special testers have a coloured case to distinguish them from the UT and are clearly marked with the location and type of apparatus for which they are to be used.

5.4. Special Testers – Contact Mode

Special contact mode testers and probes have been approved for the following situations:

- HV conductors in substations with non-standard voltages e.g., 3.3kV; and
- Inside cabinets containing HV conductors with non-standard voltages e.g., 3.3kV.

These special testers have a label clearly indicating the approved locations. Each contact test probe and tester combination are specifically designed for use at a particular voltage and equipment type.

Contact test probes comprise a nylon shaft approx. 20mm in diameter and 720 mm long. A "shield" on the handle of the probe limits the length of shaft inserted into the cabinet and a co-axial cable 1 metre long connects the test probe to the special tester.

These special probes provide a positive method of proving conductors de-energised. Each probe is designed and approved for a specific voltage which is indicated on the probe.

5.4.1. Special Testers - Non-Contact Mode

Special non-contact testers are to be used conjunction with the number of HV operating rod extensions appropriate for the conductor voltage and the appropriate non-contact probe. The same general test procedure is used with this tester as would be used with contact mode testers, except that the tester may only approach the conductors but should not touch them. If the tester does touch the conductor, the tester will not be damaged.

- Special non-contact mode testers have been approved for the following situations:
- 500 kV conductors in switchyards, which are too high to permit contact mode testing;
- 330 kV conductors in switchyards, which are too high to achieve contact mode testing;
- Gas Insulated Switchgear, where special test points are built into the switch gear and "proving de-energised" is carried out using a co-axial cable to connect the tester to the test point;
- Metal clad switchgear where the UT in the non-contact mode is unsuitable; and
- Special non-contact mode overhead line tester.

Special Testers – Non-Contact Probes

All non-contact probes are HV tested to 23 kV however, to increase the margin of safety in actual use the probe must not be allowed to contact the HV conductor being tested.

The flange on the probe is designed to limit amount of penetration of the probe into the switch gear spout. This is for safety and correct functioning of the tester on the particular design of switch gear. Thus, it is important to use only the appropriate non-contact probe which has been approved for the particular switch gear at the location concerned.

The switch gear and locations for which a special probe has been approved will be listed on the probe.

Special Non-Contact Testers for High Conductors in Switchyards

Special non-contact testers for high conductors have the following features:

- A label clearly indicating the approved use.
- Single sensitivity setting and hence no selection switch;
- A threaded socket in which to screw the operating rod. The tester is turned on by screwing the operating rod into the socket;
- An amber indicating lamp and audible buzzer; and
- A test push-button.

When the tester is brought within a particular distance from the live conductor, the electric field will be detected and the indicating lamp will flash.

Special Non-Contact Tester for 500 kV Conductors

All 500 kV non-contact substation testers have the same sensitivity and may be used in any 500kV switchyard.



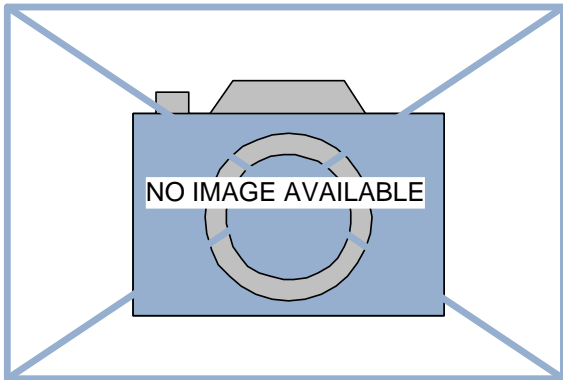
Special Non-Contact Tester for High 330 kV Conductors

At some locations in 330 kV substations the conductors are situated at a height above ground level which prevents proving these conductors de-energised using conventional HV operating rods and the UT in contact mode. All 330 kV non-contact substation testers have the same sensitivity and may be used in any 330kV switchyard.



Special Non-Contact Tester for Gas Insulated Switchgear

At some sites, GIS earth switches have been provided with a test point to which a special tester may be connected by coaxial cable. This special tester has a selector switch with only two sensitivity settings, NC1 and NC2 (NC1 is the more sensitive).



On the NC1 range, the lamp will flash if the circuit is de-energised on one side of an open isolator, but live on the other side of the isolator. If the range switch is changed to the NC2 position, the tester will indicate that the circuit is de-energised. With the tester on the NC2 position, the lamp will flash if the isolator is closed and alive, and hence will correctly indicate whether the conductor being tested is de-energised or alive.

The tester indicates that a conductor is alive by flashing a lamp. These special testers have a label clearly indicating the locations for which it is approved.

Special Non-Contact Tester for Metal clad switchgear

The tester indicates that a conductor is alive by flashing a lamp. These special testers have a label clearly indicating the locations for which it is approved.



Special Non-Contact Tester for Overhead Lines

Non-contact overhead line testers are suitable for use on 500kV, 330kV and 132kV lines. The tester indicates that a conductor is alive by flashing a lamp and sounding a buzzer. The cases of these special testers are coloured green. Overhead line testers have a single sensitivity and are approved for use with “stubby operating rods”.



Stubby Operating Rod

The approved stubby operating rod is a T-Mac TMC30 shown below.



1.1.1 Two-pole voltage & continuity tester

The Steinel Combi-Check is approved for use at the secondary terminals of voltage transformers.

Range AC: 6V to 690V



1.2 Procurement

Equipment Type	Stockcode	Colour	Comments
Universal Tester	003582004	Black	
UT non-contact probe	-	Red	Not stocked
UT adaptor piece	-		Not stocked
Special Transmission Line Tester	003582079	Green	
Stubby operating rod	003582657		T-Mac TMC30
Special Tester - 330kV non-contact	003588274	Red	
Special Tester - 500kV non-contact	003591211	Red	
Special Tester - Non-standard voltages	-	Red	Not stocked
Special Tester - cabinets containing HV conductors	-	Red	Not stocked
Special Tester - (GIS)	-	Red	Not stocked
Special Tester - Metalclad switchgear	-	Red	Not stocked
Two-pole voltage & continuity tester	000333351	-	
Modielive EMF Generator	362378	Orange	Not stocked

6. Use of Proving De-energised Testers

Proving de-energised must only be carried out by a person authorised **HV Field Operator** who is familiar with the type of proving de-energised equipment to be used.

6.1. Checking the Operation of Proving De-energised Equipment

The most thorough method of checking the operation of proving de-energised equipment is by testing against a known live HV conductor of the same or lower nominal voltage, as it verifies that the electronics of the tester are working and also that the appropriate range has been selected, contact pieces are correctly engaged etc.

Where there is no known live conductor of the appropriate voltage available at the location there are three alternative methods:

- 240V method;
- In-built test button check; and
- Modielive EMF Generator

The use of either of these alternative methods is only permitted using a tester that has been applied to live HV conductors in the previous six months and has a sticker indicating a current test period.

6.1.1. High Voltage Method

The operation of proving de-energised equipment is checked by testing against a known live conductor of the same or lower nominal voltage and similar physical configuration of the conductors to be proven de-energised:

Attach associated equipment (operating rod, contact piece, non-contact probe) and set the tester range to the known live conductor voltage;

Apply the tester to a known live conductor and verify that the tester correctly indicates 'live', the tester may now be used to prove de-energised.

6.1.2. 240 Volt Method

Checking Universal Tester, Non-Contact NC1 Range on a GPO

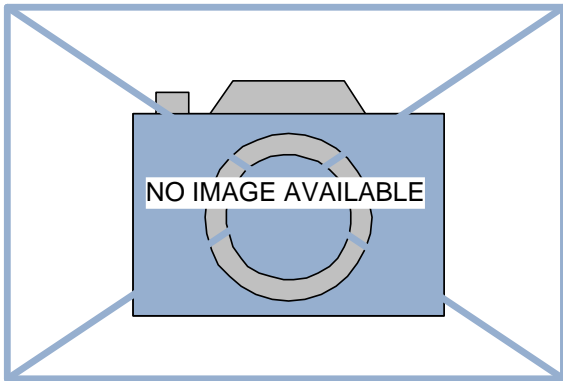
This method must only be used when:

- There is no known live conductor readily available at the location, and
- Testing is to be carried out using a UT in non-contact mode, selected to the NC1 range.

Any 240 Volt GPO which does not have a metal cover plate can be used for this test:

- Select the NC1 range;
- Connect the non-contact probe if appropriate; and
- Place the tester or probe on or near the G.P.O. The tester lamp should flash.

240 Volt Test Box for Special GIS Non-contact Tester



The Special GIS non-contact tester may be checked by using a specially designed test box. The test box is only to be used when no known live conductor is readily available.

The following procedure must be used:

- Plug the test box into a GPO with the GPO switch Off;
- Connect the special tester to the test box using the coaxial cable;
- Switch both the tester and the test box switch to NC1 and turn on the GPO. The tester lamp should flash;
- Switch both the tester and the test box switch to NC2. The tester lamp should flash;
- Turn the GPO Off.

6.1.3. Inbuilt Test Button Check

All testers (Universal and Special) are fitted with a test push-button. Test Button Checks must be performed with the tester turned ON and any associated equipment attached (operating rod, contact piece, non-contact probe) and the appropriate range selected.

If the lamp flashes when the test push-button is depressed, this proves that the battery is healthy and the circuitry is functioning correctly for the selected range.

6.1.4. General Method of Proving Conductors De-Energised

General Comments:

- The person using the approved tester must maintain at least the safe approach distances set down in the Power System Safety Rules from the HV conductor whilst proving de-energised.
- Contact type testers must be used with a HV operating rod.
- With the tester and contact piece attached to a HV operating rod, the contact piece is brought into contact with a HV conductor in a manner which will not reduce the phase-to-phase or phase-to-earth clearances.

Method:

1. Step 1 - Inspect the tester and any attachments to confirm that the equipment is in good condition.
2. Step 2- Connect all associated equipment (HV operating rod, probes, etc.) to the tester, and select the appropriate mode/range as applicable.
3. Step 3 - Check the operation of the proving de-energised equipment by one of the methods detailed in [Section 4.1](#).
4. Step 4 - Apply the tester to each phase of the circuit to be proven de-energised and verify that the lamp does not flash. If the lamp flashes, the conductor must be regarded as live.
5. Step 5 - Again check the operation of the proving de-energised equipment by the same method used in Step 3.
6. Step 6 - For contact mode testing hang the tester to one phase of the circuit previously proved de-energised. Earth the conductor.
7. Step 7 - For contact mode testing, repeat Step 6 for the remaining two phases (not applicable when earthing via an earthing switch)

6.2. Audible Discharge Method of Proving Conductors De-Energised

This method is not approved for voltages below 33 kV. When using the audible discharge method, the same general 8-step procedure must be followed as that detailed in Section 4.2 [General Method of Proving Conductors De-Energised](#). The person carrying out the test must hear the discharge when the operating rod is touched on, and withdrawn slightly from, a live conductor.

6.3. Use of Universal Tester

6.3.1.1. Overhead Conductors in Substations

Equipment Used:

- Universal tester (UT) in contact mode
- Hook contact piece
- High voltage operating rod

General Comments:

- Nil

Method:

Per Section [4.2 General Method of Proving Conductors De-Energised](#).

6.3.2. Transmission Lines up to 330kV

Equipment Used:

- Universal tester (UT) in contact mode
- Hook contact piece and HV operating rod.

D2004/10691, Proving High Voltage Conductors De-Energised, Corporate-wide Procedure Revision 5

General Comments:

1. Where there are no live or reachable conductors via which the UT can be proved functional, the test push-button method of checking the operation of the tester is permitted. Refer Inbuilt Test Button Check.

Method:

- Per Section 4.2 General Method of Proving Conductors De-Energised.

OR

- (a) Turn the selector switch of the tester to the appropriate contact mode range (11-66 kV, 132 kV or 330 kV), corresponding to the nominal voltage of the conductors to be proved de-energised;
- (b) Press the test push-button to check the operation of the tester;
- (c) Apply the tester to the first conductor under test and verify that the tester indicates that the conductor is de-energised.
- (d) Earth the proven de-energised conductor with the appropriate earthing equipment.
- (e) Using the test button verify that the tester is still functioning correctly.
- (f) Prove the second phase conductor de-energised as done in step (c).
- (g) Earth the proven de-energised conductor.
- (h) Again verify by means of the test button test that the tester is still functioning correctly.
- (i) Prove the third phase conductor de-energised as done in step (c).
- (j) Earth the proven de-energised conductor.

6.3.3. Through Transparent Panels of Cubicles and High Voltage Cages

Equipment Used:

- Universal tester in non-contact mode

General Comments:

1. This method cannot be used on any glass panel in which wire grid reinforcing is included in the glass, since the wire grid may shield the HV conductors. In this case a tester may indicate that the HV conductors were de-energised when they may be live.
2. External probe is not required.

Method:

- (k) Select the most sensitive non-contact range on the tester (i.e., NC1). Note that the operating rod socket micro-switch must not be activated for non-contact mode testing.



Tester Being Held at Test Window of a HV Cage

- (l) Place the tester against the glass panel containing known live equipment, which is physically similar to, and of the same nominal voltage as the conductor to be proved de-energised and check that the tester indicates live.
- (m) Place the tester against the glass panel containing the equipment to be proved de-energised and check that the tester indicates that such equipment is de-energised.

Note 1: If the de-energised indication is prevented in this step by interference from strong fields due to nearby live conductors, turn the tester selector switch to NC2 range and return to Step (b) to check the tester against a live conductor.

- (n) Repeat step (b) to again verify that the tester is functioning correctly.
- (o) Repeat step (c) above for the equipment previously proved de-energised. Check that the tester still indicates such equipment de-energised.
- (p) Earth the equipment which is proved de-energised. Turn the tester OFF.

Note 2: If at the location there is no live conductor of the same nominal voltage, then either the test pushbutton method or the 240 Volt GPO method can be used instead to check the operation of the tester. However, the NC1 (most sensitive) range must be used for steps (b), (c), (d) and (e) in this case.

6.3.4. At the spouts of Metalclad Switchgear

Equipment Used:

- Universal tester in non-contact mode
- Appropriate non-contact probe

General Comments:

1. The tester (with probe attached) is held in the hand.

Method:

- (a) Attach the probe to the tester. Select the most sensitive non-contact range (NC1). (The operating rod socket micro-switch must not be activated for non-contact mode testing)
- (b) Place the probe of the tester within the field of a live conductor of the same nominal voltage with a similar physical configuration as the circuit to be tested, e.g., the bus side spouts, and check that the tester indicates correctly that such conductor is 'alive'. (See Note 1 below)
- (c) Apply the tester to each phase of the circuit to be proved de-energised and check that the tester indicates that each conductor is de-energised.



Note 1: If the de-energised indication is prevented in this step by interference from strong fields due to nearby live conductors, turn the tester selector switch to NC2 range and return to Step (b) to check the tester against a live conductor.

- (d) Repeat step (b) to again verify that the tester is functioning correctly.
- (e) Repeat step (c) above for the conductors previously proved de-energised. Check that the tester still indicates such conductors de-energised.
- (f) Turn the tester OFF,
- (g) Earth the conductors which are proved de-energised.

Note 2: If at the location there is no live conductor of the same nominal voltage, then either the test pushbutton method or the 240 Volt GPO method can be used instead to check the operation of the tester. However, the NC1 (most sensitive) range must be used for steps (b), (c), (d) and (e) in this case.

6.4. Use of Special Testers

6.4.1. Special Tester - High 500 kV Conductors in Switchyards

Equipment Used:

- Special non-contact tester for 500 kV conductors in switchyards
- HV operating rod (handle plus one section)

General Comments:

1. Special testers provided for these situations have a single sensitivity.
2. The most positive indication is obtained when the tester is raised up the side of and within one metre of a 500 kV insulator support structure.

Method:

- a) Beneath a known live 500 kV conductor, use the HV operating rod to raise the tester to a height just above the base of the insulator and at a horizontal distance of 0.5 to 1 metre away from the insulator support structure. Check that the tester correctly indicates that the conductor is alive.
- b) At a suitable position beneath the 500 kV conductors to be proved de-energised, raise the tester to a height just above the base of the insulators and at a horizontal distance of about 0.5 to 1 metre away from the insulator support structure. Check that the tester indicates each conductor is de-energised. If the lamp flashes or the buzzer sounds, the conductor must be regarded as being alive.
- c) Repeat step (a) to again verify that the tester is functioning correctly,
- d) For each conductor in turn, again check that the tester indicates that the conductor is de-energised, using the general procedure described in (b), prior to earthing the conductor,
- e) Remove the tester from the operating rod to avoid flattening the battery.

6.4.2. Special Tester - High 330 kV Conductors in Switchyards

Equipment Used:

- Special non-contact tester for high 330 kV conductors
- High voltage operating rod.

General Comments:

1. Special testers provided for these situations have a single sensitivity.
2. This device is sensitive to stray fields, thus it is essential that the location chosen near the conductors to be proved de-energised is sufficiently remote from live conductors to minimise any stray field effects. To ensure correct indication when testing a high overhead bus, a location should be chosen beneath the conductor and at a horizontal distance of about two metres from an insulator support structure. The tester should then be raised above the level of the steelwork. If used within 300mm of structural steelwork, the tester may not indicate correctly.

Method:

- (h) Screw the tester on to the HV operating rod comprising the correct number of sections to suit the nominal voltage of the conductors to be proved de-energised. Switch tester ON.

- (i) Using the HV operating rod, position the tester near a live conductor of the same nominal voltage as the circuit to be proved de-energised, coming no closer than can be achieved for the conductors to be proved de-energised, and check that the tester correctly indicates the conductor to be alive.
- (j) Using the operating rod, position the tester as close as practical, and no further than was used in step (b) to each of the conductors to be proved de-energised and check that the tester indicates each conductor is de-energised. If the lamp flashes, the conductor must be regarded as alive. Attention needs to be given to the possibility of stray field effects from adjacent live sources. A different position, more remote from the stray source may have to be chosen, in which case, step (b) onwards will have to be repeated.
- (k) Repeat step (b) to again check the operation of the tester in a location similar to that chosen for the conductors to be proved de-energised.
- (l) Using the HV operating rod, apply the tester as near as practicable to each of the conductors previously proved de-energised in turn. Check that the tester still indicates such conductors de-energised and then (but not before) earth the conductor with the appropriate earthing switch.
- (m) Switch OFF the tester and remove it from the HV operating rod.

Special Tester - Gas Insulated Switchgear (GIS)

Equipment Used:

- Special non-contact tester for Gas Insulated Switch gear.
- Associated coaxial cables.

General Comments:

1. SF₆ metalclad earth switches have been provided with a test point (essentially a non-contact probe built into the switch gear). This is connected to the special tester via a coaxial cable.
2. The special tester has two sensitivity settings, NC1 and NC2, the NC2 range must be used for the proving de-energised of GIS apparatus.

Method:

- a) Attach the coaxial cable to the tester, and select the NC2 range. Turn the switch ON.
- b) Plug the coaxial cable into the test point of a circuit which is known to be alive. Check that the lamp flashes, thereby verifying correct operation of the tester.
- c) Plug the coaxial cable into the test point of the first phase of the circuit to be proved de-energised. If the lamp flashes, the circuit must be regarded as alive.
- d) Repeat step (c) for the other two phases of the circuit to be proved de-energised.
- e) Repeat step (b) to again verify the correct operation of the tester on a known live circuit.
- f) Again plug the coaxial cable into the test point of the first phase of the conductor to be proved de-energised. Provided that the lamp is not flashing, close the earth switch (while the tester remains connected to the test point).
- g) Repeat step (f) for the remaining two phases of the conductor to be proved de-energised.
- h) Turn the tester OFF.

6.4.3. Special Tester - At the spouts of Metalclad Switchgear

Equipment Used:

- Special non-contact tester
- Associated non-contact probe (may be site specific)
- Handle of HV operating rod with special adaptor.

General Comments:

1. The special tester, with probe attached, is to be attached to the handle of an operating rod so that the person carrying out the test can remain clear of the spouts being tested. The operating rod socket micro-switch in the tester functions as the ON/OFF switch.
2. The switch gear and locations for which a special probe has been approved will be listed on the probe.
3. The probe must not be allowed to make contact with the HV conductor being tested



Method:

- a) Attach the probe to the tester. Select the most sensitive non-contact range (NC1).
- b) Place the probe of the tester within the field of a live conductor of the same nominal voltage with a similar physical configuration as the circuit to be tested, e.g., the bus side spouts, and check that the tester indicates correctly that such conductor is 'alive'.
- c) Note 1: If at the location there is no live conductor of the same nominal voltage, then either the test pushbutton method or the 240 Volt GPO method can be used instead to check the operation of the tester. However, the NC1 (most sensitive) range must be used for steps (b), (c), (d) and (e) in this case.
- d) Apply the tester to each phase of the circuit to be proved de-energised and check that the tester indicates that each conductor is de-energised.

Note: If the de-energised indication is prevented in this step by interference from strong fields due to nearby live conductors, turn the tester selector switch to NC2 range and return to Step (b) to check the tester against a live conductor. When selected to the NC2 range, the test pushbutton method of checking the operation of the tester is not permitted.

- e) Repeat step (b) to again verify that the tester is functioning correctly.
- f) Repeat step (c) above for the conductors previously proved de-energised. Check that the tester still indicates such conductors de-energised.
- g) Remove the handle of the operating rod to turn the tester OFF,
- h) Earth the conductors which are proved de-energised.

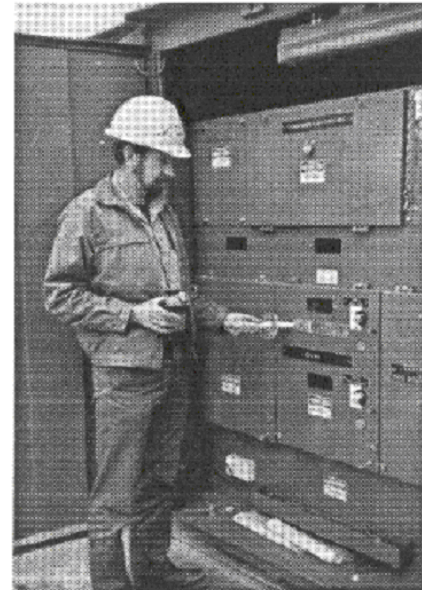
6.4.4. Special Tester - Contact Mode Testing inside Cabinets Containing HV Conductors

Equipment Used:

- Special Contact Tester
- Associated Test Probe

General Comments:

1. To use a tester and probe combination, a sight window and a hole approx. 25mm diameter are provided in the side of the cabinet adjacent to the conductors to be proved de-energised.
2. Testers must only be used on equipment which is specified on the probe.



on

Method:

- a) Switch the tester on.
- b) Insert the probe through the test hole in the cabinet containing the live conductors of the same nominal voltage as the circuit to be tested, e.g. the bus side of the conductors. Check that the tester correctly indicates that such conductor is 'alive' when the end of the test probe touches the conductor. (See Note below).
- c) Note: The test push button method of checking the operation of the tester can be used ONLY if there are no live conductors of the same voltage readily available at the location.
- d) Insert the probe through the test hole in the cabinet containing the conductors to be proved de-energised. Ensure, by viewing through the sight window, that when each phase of the circuit being tested is touched by the tip of the probe, that the tester indicates that the conductors are de-energised (see Figure A9.1).
- e) Repeat step (b) to again verify that the tester is functioning correctly.
- f) Repeat step (c) above for the equipment previously proved de-energised. Check that the tester still indicates such equipment de-energised.
- g) Switch the tester off.
- h) Earth the equipment which is proved de-energised.

6.4.5. Special Tester - Contact Mode Testing in Substations with Non-standard Voltages

Equipment Used:

- Special Contact Tester

General Comments:

1. Testers must only be used on equipment which is specified on the probe.

Method:

- a) Per Section 4.2 General Method of Proving Conductors De-Energised

6.4.6. Special Tester - Non-Contact Testing of Transmission Line Conductors

Equipment Used:

- Special non-contact transmission line tester
- Stubby operating rod

Range of Use:

Non-contact testing of transmissions line must only be carried out on:

- 500 kV double circuit lines (including 500 kV circuits operating at 330 kV)
- 330 kV double circuit tower lines
- 330 kV double circuit steel pole lines
- 330 kV single circuit delta tower lines
- 220 kV single circuit tower lines
- 132 kV double circuit lines on 330 kV delta towers
- 132 kV single circuit 'n' type wood pole lines

For all other transmission line structures, such as 132 kV steel tower and 132 kV single circuit single pole lines, contact mode testing must be used.

General Comments:

1. Holding the handle of the stubby operating rod, the tester is pointed towards the conductor being tested. If the lamp flashes or the buzzer sounds, the conductor being tested must be regarded as being alive.
2. At all times the tester must not encroach upon safe approach distance.

Method:

- (a) Screw the tester onto the stubby operating rod.
- (b) By pointing the tester towards a known live conductor of an adjacent circuit, verify that the tester correctly indicates the conductor is alive.

Note 1: If there are no live conductors of the same voltage at the location, then the tester operation can be verified by use of the Test button.

- (c) Test each of the three phases of the circuit to be proved de- energised in turn by extending the tester horizontally beyond the steelwork towards the conductors, and verify that each conductor is de-energised.
- (d) Repeat step (b) to again verify that the tester is functioning correctly in a location similar to that chosen for the conductors to be proven de-energised.
- (e) The conductors tested in step (c) can then be regarded as de-energised and earths applied.
- (f) Remove the tester from the stubby operating rod.

6.4.7. Two-pole voltage & continuity tester

Equipment Used:

- Steinel Combi-Check tester

General Comments:

- Apply at the secondary terminals of voltage transformers.
- Voltage Measuring Range AC: 6V to 690V

Method:

- Check the operation of the tester by applying against known live VT terminals.
- Prove de-energised each phase of the terminals to be earthed.
- Install shorting bar to the terminals to be earthed.

7. Periodic Testing and Maintenance of Equipment

7.1.1. Periodic Testing of Equipment

- > UT's issued for proving HV transmission lines de-energised must on a six monthly basis be checked on a live HV conductor. A sticker must be attached to the case of the tester which records the date when the tester was last proven.
- > Other testers do not require periodic testing.

7.1.2. Defective Equipment

When any part of a set of proving de-energised equipment is found to be faulty (including noticeable change in sensitivity) or fails a test or inspection, it must immediately be withdrawn from use and identified as defective. Faulty items must not be used or re-issued for use until repaired and successfully re-tested.

7.1.3. Maintenance of Equipment

The only field maintenance permitted to be carried out on HV proving de-energised equipment is the changing of batteries. The preferred batteries for HV testers are:

- One 9V transistor battery type PP3 (e.g. Eveready 216)

7.1.4. Care of Equipment

When not in use, all proving de-energised equipment must be switched OFF and adaptor pieces unscrewed and removed. They must be stored and transported in suitable protective cases.

8. Attachments

Nil

2. Change history

9. Implementation

Procedure to be published on the WIRE.

10. Monitoring and review

This procedure will be reviewed every three years in line with the Document and Records Management

Procedure and will be subject to ongoing HSE assurance activities.

11. Change from previous revision

Revision no	Approved by	Amendment
0	L Smyth, EGM/ Network Services & Operations	Replaces 'Proving HV Equipment De-energised' Formatting and typographical errors corrected. Removed sections relating to proving de-energised on different transmission tower types Remove sections relating to obsolete equipment Revised scope, history & introduction Added testing at LV voltage transformer terminals
1	L Smyth, EGM/ Network Services & Operations	Section 4.2 – Steps revised in line with field practise
2	J Workman, Acting Manager/HSE	Minor changes to procedure include updating position titles
3	J Workman, Safety Manager	Inclusion of Modielive EMF Generator
4	Krista-Lee Fogarty, Head of HSE	Procedure updated to new template
5	GM/Health, Safety & Environment	Terminology aligned to current version of PSSR

12. References

Transgrid:

Power System Safety Rules (PSSR)