



4061 DATASHEET

**200VA CURRENT INJECTION
SYSTEM WITH REMOTE STATUS
MONITORING & CONTROL**



REDPHASE INSTRUMENTS

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1.0. BRIEF DESCRIPTION & APPLICATION

The Model 4061 is an electronic current source that is used to drive an internal multi-tapped transformer to produce either a high current low voltage or high voltage low current sinusoid signal which is injected into an earthed system or passive load loop.

The objective of this is to simulate fault currents, albeit at lower levels, which will manifest as different voltages in and around an electrical asset such as a small substation.

To perform a fault current simulation, a test loop circuit is established which consists of the earthed grid under test connected to a remotely earthed grid through a dedicated current injection cable or out of service feeder. The simulated fault current which originates at the remote earth is the current return path through the soil and/or other conductive elements such as OHEW's or Sky wires.

Frequencies from 40Hz to 200Hz can be selectively generated by the 4061 to avoid interference with background line frequencies. Voltage drops or potentials generated by the injected current around the earth loop are measured with a separate tuneable multimeter fixed to the injection frequency.

In most cases the operator will try to inject as much current as possible into the earth loop to achieve the best readable signal possible for the frequency tuned multimeter.

The amount of current the operator can inject will depend on the encountered earth loop impedance and the power available to the injection unit.

The 4061 has 7 injection tap settings which closely match typically encountered earth loop impedances from 2 Ω up to 128 Ω . When an injection tap is chosen which closely matches the loop impedance measured by the 4061, the injection unit will see a close to 200VA load and deliver maximum power at a constant rate. This allows the operator to perform their measurement task knowing that as much power as possible is being injected into the site under test so that they can achieve the clearest results possible.

For loop impedances outside of the 7 available injection taps, the earth loop current and power will be less than maximum but still sufficient for testing most small to medium electrical assets.

Optionally the operator may consider our larger and more powerful 2kVA and 8kVA injection systems for larger or more inductively challenging environments which the test loop may be subject to.

1.1. Where and why it is used

The 200VA, 4061 injection system is used in the evaluation of electrically earthed systems such as small to medium substations, electrical pylons, telecommunication hubs, mining and industrial sites. Injection tests performed with the 4061 generally occur during the commissioning and post maintenance activities of these earthed systems.

When in use, the 200VA injection system will induce current flow throughout the earthed site under test. The induced current will encounter different impedances due to the varying soil conditions and the grid bond integrity of structures or equipment on and around the site. The combination of current flowing through these various impedances will manifest as different voltages or potentials at these points which can assist engineers to develop a comprehensive potential and impedance profile of a site.

These measured parameters will indicate to engineers an earthed systems robustness or vulnerability to withstand or dissipate dangerous fault currents effectively.

This information will help to ascertain the level of risk to public and site personnel during a line or current fault event. The operator can then determine whether risk mitigation or remedial action is required to bring the earthed system or test site up to acceptable standards.

1.2. Induced Measureable Parameters

The following is typical of the type of measurements undertaken at an earthed site under test.

- Step Potential
- Touch Potential
- Ground or Earth grid impedance
- Current splits / branching on structures which act as current return paths within and external to the site under test such as towers with OHEW's or Sky wires.

2.0. HARWARE FEATURES

2.1. 4061 Power Source

Input Supply: Single Phase, 2 wire + Earth
85 - 264VAC, 50/60Hz

Output Voltage: 0 - 160VAC

Output Injection frequency: 40Hz to 200Hz

Constant Output power: 200VA max, depending
on loop impedance

Measurement category: CAT III / 200V

Overvoltage category: CAT III / 200V

Degree of Pollution: 3

2.2. Interactive Interface

The 4061 comes with a sunlight readable 7 inch colour touch screen display.

The operating functions and parameters shown below are all accessible via icons displayed on the screen.

Functions

- Injection frequency settings
- Target current settings
- V & I Tap selection / Loop impedance
- Induced voltage measurement
- Self test

There is also an LED located on the front panel which is active and flashing which indicates an active applied injection source

A USB type A interface is provided for system and software upgrades.

2.3. Remote interface

The 4061 has an embedded web server and a 4G / LTE data modem which allows the user to access the 4061's operating functions via a secure web portal on a mobile phone or tablet.

This gives the operator the ability to monitor the unit's operating status and to control the unit's injection current, injection frequency and loop impedance tap while away from the 4061.

2.4. Transformer impedance selections

The 4061 internal coupling transformer offers a variety of tap selections to match the injection loop impedance

- 2.0 Ω 10A / 20V
- 4.5 Ω 6.67A / 30V
- 8 Ω 5A / 40V
- 18 Ω 3.33A / 60V
- 32 Ω 2.5A / 80V
- 72 Ω 1.67A / 120V
- 128 Ω 1.25A / 160V

3.0. SOFTWARE FEATURES

3.1. Auto Impedance Tap Selection

The Model 4061 has a default auto impedance range selection feature. This feature measures the loop impedance and then select the appropriate tap to perform the current injection.

The user may override this manually via the user interface on the 4061 or their 4G / LTE device such as a phone or tablet.

3.2. Current Ramping

The software enables automatic or manual ramping from zero to maximum current and ramping down to zero again in any impedance tap setting.

Ramping may be selected as fast or slow.

3.3. GPS and Synchronization

The 4061 has an additional GPS module which gives accurate position and timing information.

A feature of this allows for phase synchronization with one or more Red Phase tuneable multimeters when performing current split or branching measurements.

This feature frees the operator from using a separate cable to attain the phase synchronization required for these types of measurements.

4.0. OPERATING CONDITIONS

4.1. Operating Temperatures

Test performed between 40Hz and 70Hz.

At 45°C or 113°F ambient

Up to 200VA continuous at matched impedance

At 50°C or 122°C ambient

100VA continuous at matched impedance

200VA continuous operation at a 50% duty cycle, (i.e **Injection On:** 20min, **Off:** 20min)

4.2. Frequency Range Output Power

Test performed between 20°C to 25°C or 68°F to 77°F

Maximum output performance level from 40Hz to 70Hz at a closely matched impedance tap is 200VA.

Maximum output performance level from 70Hz to 200Hz at a closely matched impedance tap is 160VA.

Relative Humidity: To 90%

IP Category:

Lid Closed: IP 64

Lid Open: IP 30

5.0. PROTECTION / SAFETY FEATURES

5.1. Hardware protection

To protect the internal electronic modules and the injection output on the 4061 a number of thermally resettable fuses are used along with overvoltage clamps which cut-out or trip to protect 4061 and its drive circuit. When these sensors trip, the current is ramped down to zero and will only reset once the temperature drops to a safe level.

5.2. Open Circuit Condition

In the event that the injection line has been tampered with during operation causing an open circuit condition; the 200VA system is designed to shutdown the injection process in less than 100 milliseconds.

5.3. Induction Test

Prior to injection the 4061 unit will automatically perform a line induction test and will then proceed with the current injection only if the induced voltage and power levels are within tolerable and operational limits.

6.0. ENCLOSURE.AND CARRY CASE

The 4061 is housed in a metal chassis which is mounted and enclosed in a protective moulded case.

The case comes with rolling wheels and a trolley handle for easy transport to test site.



7.0. SIZE AND WEIGHT (LxWxH)

Moulded 1510 Pelican Case with Trolley handle and wheels

Dimensions: 560 mm X 345 mm X 230 mm

22.0 in X 13.6 in X 9.0 in

Weight: 16 KG or 35.3 lb

8.0. ACCESSORIES

8.1. Supplied

IEC to GPO supply cable.

8.2. Accessory Guide

The Injection line cable should be typically 2.5mm² in diameter as a minimum.

Earth stakes or rods metal electrodes can be made from copper clad steel, galvanized rods, and copper bars.

Rod sizes may vary in length but in general 1.0m to 1.8m lengths are acceptable for smaller earthed systems and remote earth setups.

8.3. Recommended Accessories - *not supplied*

Red Phase instruments can also supply the necessary cables, stakes and accessories required to establish an effective injection test setup for connection into an earth loop up to 300 metres in length.

The 4061 earth testing accessory kit is listed as, Part no. **AX_Kit -300**

The accessory kit comes with the hardware accessories shown below.

Connection instructions are provided..

AX_Kit-300 list of accessories

2.5mm² / 14 AWG cable for remote earth injection

- 3 x 100m or 330ft cable for remote earth connect, supplied on 3 lightweight reels.
- 1 x 10m or 33ft of cable for local earth connect

1.0mm² / 17 AWG potential cable

- 2 x 100m or 330ft cable for potential earth reference supplied on two reels
- 1 x 1.5m or 5.2ft cable for the potential rod connection.

Used with tuneable multimeters 4031 & 4025E

Clamps for Local Earth Bar and Remote Earth Rods

- 20 x rod clamps and interconnect cables for local, remote earth and potential connections

Copper Clad Earth Rods

- 10 x rods, 1.44m or 4.7ft with a diameter of 13mm or 0.51in

All cable and clamp interconnections are supplied for a typical injection loop set up outlined in the connection instructions which is supplied with the kit.

Longer loop lengths can be supplied upon request.

9.0. WARRANTY

The model 4061 comes with a 24 month limited warranty on parts and labour.

First 12 months Data and DNS management free of charge.