4025E FREQUENCY SELECTIVE MULTIMETER

REDPHASE INSTRUMENTS

Contents

RED PHASE INSTRUMENTS PTY. LTD. ABN 47 005 176 670
10 Ceylon Street, Nunawading, Melbourne, Victoria, 3131, Australia
Tel: + 61 3 9877 6988 **Fax:** + 61 3 9878 8508
E-mail: sales@redphase.com.au

1. DESCRIPTION

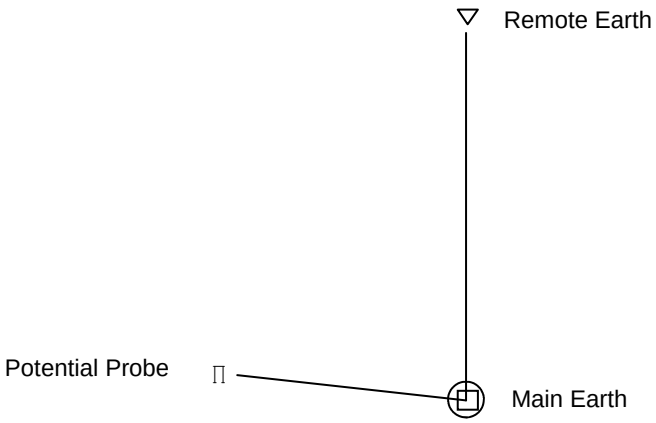
The Model 4025E Frequency Selectable Multimeter is a frequency tuneable ammeter and voltmeter used to measure the magnitude and phase angles of signals produced by the Model 4024B, 4041 and 4046 Injection Units. The voltmeter part of the 4025E allows step, touch and terrestrial potentials to be measured easily and accurately, which is important for the safety of both the general public and utility personnel.

The current input is specifically for use with a (Rogowski) Type 545 worm coil or a LEM~Proflex AC current probe . The Rogowski coil and LEM current probe are available as optional accessories. These accessories are very convenient current measuring devices, which can simply be wrapped around current carrying structures. The ability to measure currents in various structures is important in tracking earth currents during investigations. Utility engineers need an accurate picture of the earth currents flowing in Earth systems such as substations, power stations and similar large installations when designing protection systems.

The Multimeter operates in the 40 - 69 Hz range, catering for both 50 Hz or 60 Hz power frequencies. The high quality of the Multimeter's filters allows it to be used at step frequencies up to a limit of 0.1Hz from the power frequency and still reject power frequency interference. The Model 4025E is designed for portable use in the field; powered via an internal rechargeable battery.

Another feature is the on board GPS function which allows for accurate time stamping and position recording.
Additionally the 4025E can also use a universal timing feature on the GPS to synchronize itself with the injection system, (4041 and 4046 only) to determine current phase measurements without the need for a separate voltage cable.
Another feature of the GPS inclusion is the fact that the 4025E can now also provide the operator with their relative position with respect to the system's injection points. This can be very valuable in determining which direction is best when performing potential readings for large earth systems so as to avoid capacitive coupling between the injection and potential lines.

GPS Enabled positioning and Injection signal synchronization



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2.0. CONTROLS & INSTRUMENTATION

2.1 Multifunction LCD and keypad:

LCD

The LCD with backlight, shows measurements in large easy to read digits and all instrument settings. Multi-function keypad to enter user and device test parameters.

Measurement selection

Simultaneous measurement of voltage and current (Rogowski coil or Lem) are made.
Phase and impedance calculations are also displayed.

Frequency selection

Frequency is selectable within range of:
40 to 69 Hz in 0.1 Hz or 1 Hz steps.

Range selection

Possible ranges are:
Voltage: **20mV, 0.2V, 2V, 20V, 200V, 800V**
Current: **0.2A, 2A, 20A, 200A**
LEM: **3000mV** (full-scale output from LEM).
(Current range on LEM RR3020:
30A / 300A / 3000A select via slide switch).

Measurement Hold

The measured values can be put on hold via the HOLD feature.

Please note that the Lem and Rogowski inputs cannot be used or measured at the same time. Only one or the other may used at a time.

2.2 Input Connections

Voltage Input

The input connection is made via two 4mm binding post terminals on the front panel.

Rogowski Coil / Type 545 worm Current Input

The coil connection is made with a 3 pin socket on the front panel.

LEM~flex Current Input

The LEM~flex module 4mm safety plugs connect directly to the LEM input terminals without any additional cables required.

2.3 Overload Indication

Overload is indicated on the LCD when the input circuit is overloaded with excessively high signal levels and/or noise.

2.4 Voltage Input impedance:

In the “Hi-Z” position the voltmeter measures voltages, with 1MΩ input. In the 1kΩ (or 1k5Ω) position the voltmeter simulates a human body for “step and touch” potential measurements.
The voltage input is fuse protected.

2.5 BNC Output:

For monitoring the conditioned signal from a Rogowski coil. Due to filtering, this lags the actual by a few degrees typically.

2.6 Test records and Software updates via USB interface:

The instrument can store up to 5000 test records, including time, date and GPS positional information (if required). The test results may be downloaded to a PC via the type B front panel USB interface.
There is an additional type A USB interface for convenient easy copying of test records to an external USB flash drive / memory stick.

3.0. BATTERY Operation

The instrument is powered by a internal rechargeable lead-acid battery 6V 4.5Ah .
The battery can be recharged by the AC mains supply. Each full recharge will provide continuous use for approximately 7 to 8 hours (no backlight) .
The user will be alerted to a low battery condition via the LCD. Battery voltage is also shown during instrument power-up.
To conserve battery life, the unit turns off automatically after 1 hour if no keys are pressed.

4.0. ENCLOSURE

The unit is housed in a fully moulded light weight case. The case offers high resistance to impact, temperature, moisture, weather, and corrosion.
The front panel is covered with a Lexan polycarbonate label for durability and appearance.

For transport the unit is further housed in a foam lined transit case.

5.0 Performance Specifications

Supply	
Operating voltage	6V - 4.5mAh Internal Battery
Charger / Power Supply	100 to 265VAC
Charge current	500mA
Charge Time	12 hours typical
Bandwidth and resolution	
Frequency range:	40 - 69 Hz
Frequency increment and Step resolution	0.1 Hz or 1 Hz
Linearity Error	< 1%
Magnitude Error	< 1%
Phase Error	< 1 degree max, +/- 3 counts typ
Typical 50Hz or 60Hz noise attenuation	
+/- 1 Hz of power frequency	-42 dB min
> +/- 3 Hz of power frequency	-48 to –60dB
> +/- 5 Hz power frequency	–54 to –64dB
> +/- 10Hz power frequency	–60 to –74dB
Noise overload level	+17.5dB typically above full scale
Maximum power consumption	4.8 Watts
LCD Backlight Power consumption	0.7W
Input Ranges	
Input Impedance	1 MΩ / 1kΩ or 1 MΩ / 1k5Ω (country dependent)
Voltage Input Range	20mV, 0.2V, 2V, 20V, 200V, 800V
Lem Voltage Range	0 to 3000mV
Current Ranges	
Rogowski	0.2A, 2A, 20A, 200A
LEM	30A, 300A, 3000A
4025E chassis and user interface isolation	
From Voltage Input	1000Vdc or 1000Vac min
From LEM Input	1000Vdc or 1000Vac min
GPS Specification	
Time To First Fix (TTFF)	34 seconds typically
Power consumption	75mW
Update Rate	1 fix / second
Environmental	
Operating Temperature	0 to 45^{o}C Degrees
Relative Humidity (RH)	90%
Size	
Instrument (including moulded case)	345 x 300 x 150 mm. Weight 5.5 kg approx.