

## Multi-function Gain-Phase Analyzer (Frequency Response Analyzer) Model 2505



### Standard Configurations

- Gain phase analyzer
- Frequency response analyzer
- Phase Angle Voltmeter (PAV)
- Fast dual channel wide-band voltmeter
- Phase meter
- Complex impedance bridge
- Spectrum / Harmonic analyzer
- Wide-band power analyzer
- Dual channel sampling oscilloscope



### Features

- Isolated / floating inputs, dc-2MHz
- Auto rejection of noise and harmonics
- Internal Function Generator
- 0.1mV to 500V range
- Alarm on any measurement
- RS232 and printer port, IEEE-488 option

### Display

- High resolution vacuum fluorescent display
- Outputs presented as tables or graphs
- Magnification for large clear results

### Typical applications

- Testing of closed loop feedback systems
- Synchro, resolver, RVDT and LVDT test
- Inductor / transformer testing
- Incoming inspection of components

- Complex impedance measurement
- Core loss measurements
- Ultrasonic power measurements
- Power line carrier signal measurements
- Multi-function testing in University labs

## Description

The Model 2505 is a multi-function instrument which is ideal for users that must make a large variety of sophisticated measurements. A single package, contains a Gain Phase Analyzer (Frequency Response Analyzer), Phase Angle Voltmeter with a null detector, Function Generator, Pulse Generator, Spectrum Analyzer, Digital Sampling Oscilloscope, Wattmeter, Phase Meter and Complex Impedance Bridge. These internal instruments cover the frequency range from dc (10mHz for the ac instruments) to more than 2MHz.

Each of these internal instruments may be used independently or in an internally correlated fashion. By selecting the internal Function Generator and the two Voltmeters, the user can obtain dual gain-phase data for two outputs of any network he is testing. This is particularly useful for making Bode plots to check the stability of networks having feedback. These plots can be displayed in several formats using the oscilloscope capability of the Model 2505. Because of the floating inputs, the measurements can be made across network components with neither side connected to ground.

In its Phase Angle Voltmeter (PAV) mode, the Model 2505 presents, on a single display, the total rms, the in-phase and quadrature components, the phase angle and the fundamental magnitude. An additional display provides the ratios of the various parameters. An internal null meter provides the user with the ability to make precision ratio adjustments. The specifications in this mode are superior to the specifications of all competing PAVs regardless of their cost. In addition, unlike traditional PAVs, the Model 2505 has the advantage of a built-in signal generator. All of these features make the Model 2505 ideal for synchro, resolver, RVDT and LVDT testing.

The Spectrum Analyzer feature can be used to observe the harmonic content of complex, periodic input signals. This proves to be especially useful for examining current waveforms to ensure that they do not exceed the requirements placed on harmonics.

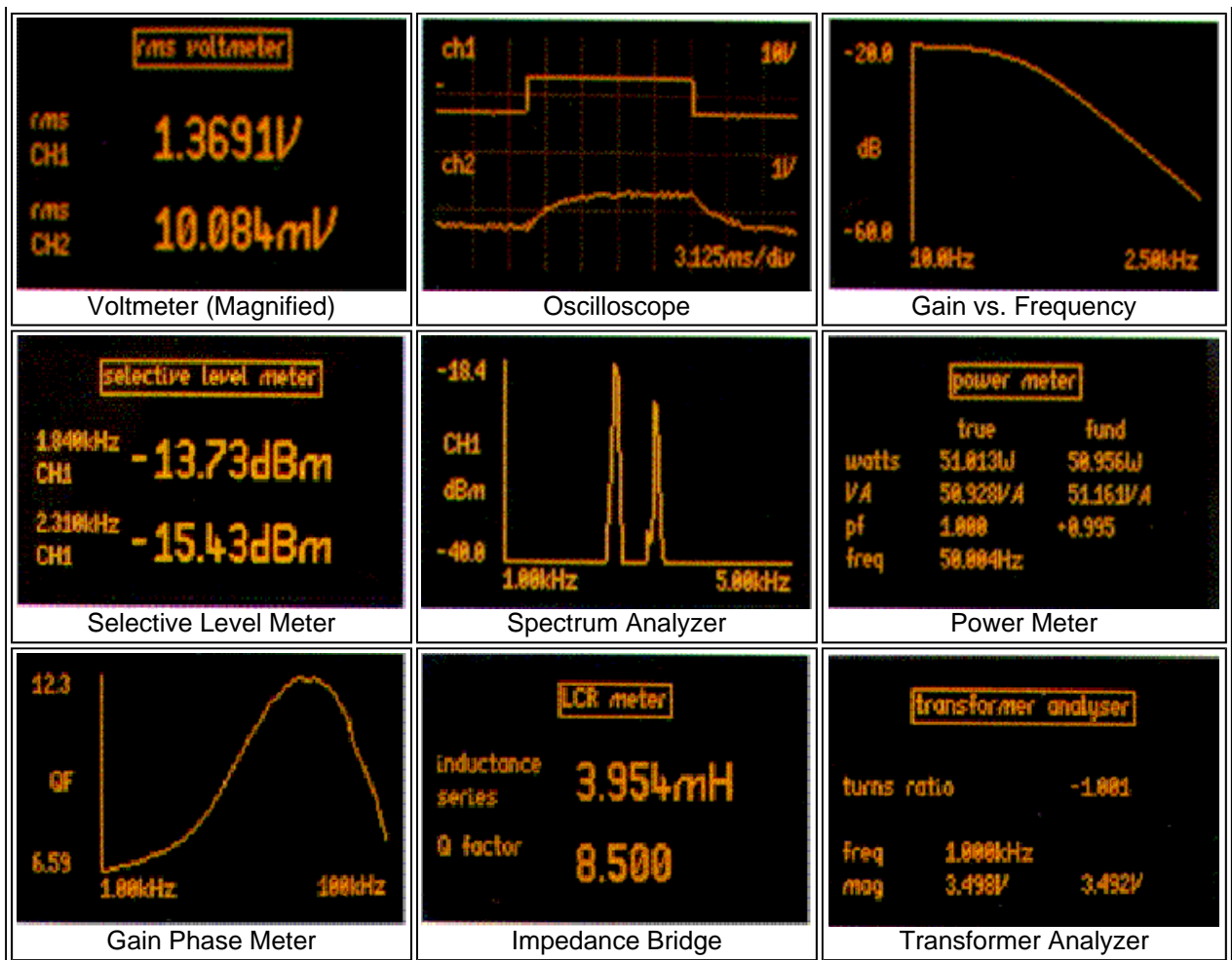
As a true rms Wattmeter, the Model 2505 is ideally suited to measure core loss, input power to ultrasonic transducers, power consumed by switching power supplies, and many other devices operating at higher frequencies. It also performs exceptionally well with measurements at 50Hz or 60Hz.

The Complex Impedance Bridge function permits the user to measure Resistance, Inductance and Capacitance at frequencies from dc (Resistance only) to 2MHz. Secondary functions such as Q (quality factor), D (dissipation factor), and ESR (equivalent series resistance) can also be measured over the same frequency range.

Data are presented on an orange, vacuum luminescent display either in tabular form or in a swept graphical form, e.g., an amplitude vs. frequency plot for a linear network. The tabular form comprises a list of the frequencies with their corresponding amplitudes. A zoom function permits the user to enlarge items of interest on the display.

## Typical Displays

---



## Specifications

### CH1 & CH2 Voltmeters

|                              |   |
|------------------------------|---|
| Channels / display           | 2 isolated / 5 digits   |
| Measurement                  | Rms, ac, dc, peak, cf, surge  |
| Frequency                    | Dc to 2MHz  |
| Coupling                     | Ac or ac+dc   |
| Max input                    | ±500V peak<br>±500V peak from earth   |
| Input ranges                 | 500V 300V, 100V, 30V, 10V, 3V, 1V, 300mV, 100mV, 30mV, 10 mV                                |
| Ranging control              | Full auto, up only, or manual   |
| Input impedance              | 1 M // 30pF (excluding. Leads)  |
| Accuracy (ac)<br>All + 0.4mV | 0.1 % range < 1 kHz<br>0.3% range < 10kHz<br>1 % range < 50kHz + 0.004% rdg per kHz to 2MHz |
| Accuracy (dc)                | 0.2% range + 2mV  |
| CMRR                         | >55dB @ 10V 1 MHz<br>>110dB @ 100V 1 kHz  |
| Time constant                | 0.2s, 1.5s or 12s   |

### Phase Meter

|                |  |
|----------------|--|
| Frequency      | 10mHz to 2MHz*   |
| Measurement    | DFT analysis   |
| Phase accuracy | $0.02^{\circ} < 100\text{Hz}$ $0.05^{\circ} < 1\text{ kHz}$<br>$0.25^{\circ} < 10\text{kHz} + 0.005^{\circ}$ per kHz |

### Gain phase analyzer (Frequency response analyzer)

|                 |                              |
|-----------------|------------------------------|
| Frequency range | 10mHz to 2MHz*               |
| Modes           | Gain, angle, real, imaginary |
| Accuracy        | $\pm 0.02\text{dB}$          |

### LCR meter

|                 |  |
|-----------------|--|
| Frequency range | 10mHz to 2MHz*   |
| Measurement     | DFT analysis   |
| Functions       | L, C, R (ac), R (dc), Z, Q, $\tan\delta$ , $\emptyset$ , series or parallel                          |
| Ranges          | 10pF to 1F<br>100nH to 1000H<br>100m $\Omega$ to 10M $\Omega$  |
| Accuracy        | $0.3\% < 1\text{ kHz}$ , $0.75\% < 10\text{kHz}$ $2.5\% < 50\text{kHz}$ ,<br>$12.5\% < 1\text{ MHz}$ |

### Transformer analyzer

|                                 |   |
|---------------------------------|---|
| Inductance L                    | 100nH to 1000H Series / Parallel                  |
| Quality factor Q                | 0.001 to 2000                                     |
| Leakage inductance              | 100nH to 1000H                                    |
| Inductance match                | 1:5000 to 5000:1                                  |
| Turns ratio (voltage)           | 1:70000 to 70000:1                                |
| Turns ratio (Inductance)        | 1:2000 to 2000:1                                  |
| Winding polarity / phasing      | Pass/fail or $\pm$ indication                     |
| Dc R & winding continuity       | 20m $\Omega$ to 100k $\Omega$                     |
| Inter winding phase angle       | $0^{\circ}$ to $360^{\circ}$ or $\pm 180^{\circ}$ |
| Impedance test                  | 10m $\Omega$ to 100M $\Omega$                     |
| Insertion / return loss         | -100dB to 100dB                                   |
| Frequency response              | 10Hz to 2MHz                                      |
| Longitudinal balance            | 0dB to 100dB                                      |
| Inter winding capacitance       | 10pF to 1F  |
| Inter winding capacitance match | 1:5000 to 5000:1                                  |

|                |               |
|----------------|---------------|
| Distortion THD | 0.1 % to 100% |
|----------------|---------------|

### Signal generator

|                  |  |
|------------------|--|
| Waveforms        | sine, triangle, square, sawtooth, dc only                |
| Frequency        | 10mHz to 2.4MHz (sine); 10mHz to 1MHz (other)            |
| Accuracy         | Frequency $\pm 0.05\%$ ; Amplitude $\pm 5\%$ (to 100kHz) |
| Output impedance | 50 $\Omega$  |
| Output voltage   | 10mV to 10V peak   |
| Offset           | 0V to 10V  |

### Pulse generator

|                    |                                |
|--------------------|--------------------------------|
| Frequency          | 10mHz to 2.4MHz                |
| Pulse width        | 200ns to 10s (50ns resolution) |
| Rise and fall time | selectable 50ns (5V) to 1s     |

### Phase Angle Voltmeter PAV (Vector Voltmeter)

|             |  |
|-------------|--|
| Measurement | Total rms, in-phase and quadrature components, phase angle, fundamental magnitude, and ratio with null meter capability. |
| Range       | 10mHz to 1MHz  |
| Accuracy    | See voltmeter/phase meter specifications   |

### Low frequency DSO / waveform display

|             |                               |
|-------------|-------------------------------|
| Channels    | 2                             |
| Time-base   | 20 $\mu$ s to 5s per division |
| Roll mode   | Time-base >1s/div             |
| Pretrigger  | None, 25%, 50%, 75%           |
| Sample rate | 800k sample/sec               |

### Power meter

|                                    |  |
|------------------------------------|--|
| Measurements                       | W, VA, power factor, V, A total, fundamental, integrated   |
| Current and Voltage accuracy       | $\pm 0.1\%$ reading  |
| Power accuracy (power factor >0.7) | $\pm(0.3\% \text{ rng} + 0.3\% \text{ rdg})$ , $f < 1\text{kHz}$ ;<br>$\pm(0.7\% \text{ mg} + 0.3\% \text{ rdg})$ , $f < 10\text{kHz}$ ;<br>$\pm(2\% \text{ mg} + 0.5\% \text{ rdg})$ , $f < 50\text{kHz}$ ;<br>$\pm(2\% \text{ rng} + 5\% \text{ rdg})$ , $f < 1\text{MHz}$ |

### Selective level meter

|  |  |
|--|--|
|  |  |
|--|--|

|                    |                        |
|--------------------|------------------------|
| Frequency range    | 10Hz to 2MHz           |
| Scan               | single, dual, or sweep |
| Selectivity (-3dB) | 3Hz, 24Hz, or 100Hz    |

### General

|                   |   |
|-------------------|---|
| Display           | 160 x 80 dot graphic electroluminescent                 |
| Size              | Approximately 30 x 15 x 25 cm (Upright unit)            |
| Temperature range | Operating: 0° to 40°C<br>Within specification: 23° ±5°C |
| Weight            | Approximately 5kg                                       |
| Power supply      | 115 V rms ±10%, 60Hz, 30VA max.                         |
| Warranty          | 1 year  |

### Ordering information

|              |  |   |
|--------------|--|---|
| Model number | 2505   | rack mount unit, 2U high, specify front or rear connections |
| Included:    | Input probes, BNC output cable, RS232, RS232 cable; power cord, manual, Certificate of Calibration |   |
| Option IEEE  | IEEE-488 interface   |   |
| Option 01-A  | Active LCR Test Head Includes Kelvin clips   |   |
| Option 01-P  | Passive LCR Test Head Includes Kelvin clips  |   |
| Option 03A   | Injection transformer (for gain-phase measurements)  |   |
| Option 04    | Amplifier, 20Vp-p at 1 A   |   |

\*20mHz to 1 MHz if not using generator

[home](#)

[e-mail clarke-hess](#)

**clarke-hess**

43-24 21 Street, Long Island City, NY 11101  
Phone: (718) 784-0445 Fax: (718) 784-2438