

FREQUENCY RESPONSE ANALYZER

FRA5022

Servo, resonance, and fuel cell impedance analysis



Loop response for switching power supplies



Servo response for magnetic and optical disks



Resonance response for piezo-electric components



AC impedance of fuel cells



For production lines



The FRA5022 is a frequency response analyzer (FRA) for measurement frequencies of 0.1 mHz to 100 kHz. With a slim, space-efficient case design and simple operation for ease of use, it is well suited for integration into production lines and systems.

Frequency response analyzers utilize the digital Fourier integral method, excelling in noise elimination characteristics, for highly accurate measurement of the frequency response. From stability evaluation for servo systems and switching power supplies, to fuel cell AC impedance measurement, the FRA5022 can be used for a number of different situations in a wide variety of fields, ranging from electronic circuits/materials to mechanics and electrochemicals.

● **Gain accuracy: ± 0.05 dB, Phase accuracy: $\pm 0.3^\circ$**

Digital Fourier transforms and a self calibration function always achieve highly accurate measurements.

● **Frequency range: 0.1 mHz to 100 kHz**

The FRA5022 covers the frequency range best suited for electrochemicals measurement and mechanical servo analysis, allowing for support of a wide range of applications.

● **Dynamic range: 120 dB or wider**

Auto ranging and a high resolution A/D converter secure a wider dynamic range. Measurement is secured even if a drastic change occurs during measurement.

● **Isolation**

Oscillator output and each input are isolated from the case, allowing for easy signal injection during servo loop measurement, thus protecting the instrument from being damaged and preventing errors.

● **Shortened measurement time of ultra-low frequencies**

2-channel synchronized sampling shortens the measurement time for ultra-low frequency ranges in electrochemical fields.

● **Quick switching of settings**

Multiple presettings can be switched with "one touch". This stresses the importance of ease of use on production lines.

● **Slim case optimal for a rack system**

The space-efficient case, with a height of only 88 mm (2U), makes it perfect for installation in a rack system.

● **Equipped with color display**

A 3.5" color TFT-LCD allows for displaying measurement result graphs (Bode plots), multiple values, and so forth.

● **Data display software**

Software for loading measurement data onto a PC and displaying graphs is included as standard. Besides display in graphs, measurement data can also be saved in CSV format.0

FREQUENCY RESPONSE ANALYZER FRA5022

Oscillator section

| | |
|--------------------------|--|
| Output waveform | Sine wave |
| Frequency range | Setting range: 0.1 mHz to 100 kHz Setting resolution: 5 digits or 0.01 mHz, whichever greater |
| AC amplitude | Setting range: 0 to 10 Vpk or 0 to 7.07 Vrms Setting resolution: 0.01 Vpk (amplitude ≥ 1 Vpk), 0.001 Vpk (amplitude < 1 Vpk) or 0.01 Vrms (amplitude ≥ 1 Vrms), 0.001 Vrms (amplitude < 1 Vrms) |
| DC bias | Setting range: 10 V to +10 V Setting resolution: 0.01 V |
| Maximum output (AC + DC) | Voltage: ± 10 V (no load) Current: ± 100 mA |
| Output impedance | 50 Ω , unbalanced |
| Output control | Both AC and DC on, both AC and DC off, only AC off, SLOW control that gradually changes AC and DC |
| Isolation | Withstand voltage: 42 Vpk or 30 Vrms Electrostatic capacitance against casing: 250 pF or less |

Analysis input section

| | |
|--------------------------|--|
| Number of input channels | 2 |
| Input impedance | 1 M Ω , 60 pF in parallel |
| Frequency range | 0.1 mHz to 100 kHz |
| Maximum input voltage | Measurement range: ± 10 V |
| Over-detection level | Setting range: 0.01 to 19.99 Vrms |
| Measurement range | Automatic switching (autoranging) |
| IMRR | 120 dB or more |
| Dynamic range | 120 dB or more |
| Isolation | Withstand voltage: 42 Vpk or 30 Vrms Electrostatic capacitance against casing: 300 pF or less |

Analysis processing section

| | |
|------------------|--|
| Measuring mode | CH2/CH1, CH2/OSC |
| Integration time | Cycle setting range: 1 to 999 Time setting range: 0.01 to 999.99 s |
| Ratio accuracy | 0.1 Hz to 20 kHz: Gain ± 0.05 dB ($\pm 0.5\%$), phase $\pm 0.3^\circ$ Outside the range above: Gain ± 0.15 dB ($\pm 15\%$), phase $\pm 1^\circ$ (Input signal levels of both channels: 10 mVrms or higher) |

Measurement processing section

| | |
|---------------------|---|
| Measuring operation | Sweep measurement/graph display Spot measurement/numeric display Scan measurement (Up to ten spots are measured in sequence.) |
| Sweep control | Frequency axes: Linear/logarithmic Sweep operations: Up, down, hold, stop Delay time setting range: 0.00 to 999.99 s |

Display section (3.5-inch color TFT-LCD)

| | |
|---------------------------------------|---|
| Graph display | Bode plots (gain dB, phase vs. frequency split display) Orthogonal coordinate display: Numeric display of the value of $a + jb$ |
| Spot display | Numeric display of frequency, gain, phase, and amplitude GO/NO-GO judgment based on the range specification of gain and phase |
| Numeric display of measurement values | Gain: ± 199.99 dB when dB $0, \pm(1.0000E - 9$ to $9.9999E + 9)$ when linear Phase: Any 360° in $\pm 360.00^\circ$ a, b: $0, \pm(1.0000E - 9$ to $9.9999E + 9)$ Amplitude: 0.000 mVrms to 19.99 Vrms |
| Measured data memory | Memory units: 2 Memory capacity: up to 1,000 points (per memory unit) |
| Memory display mode | A, B, A & B (overlapping), A/B (vector ratio) |

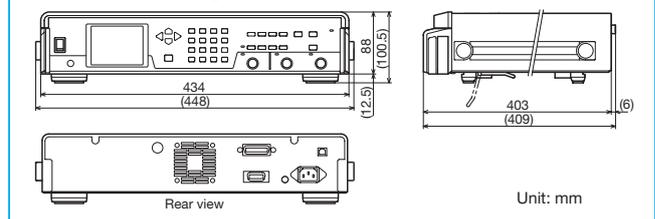
Other

| | |
|--|---|
| Setting memory | 10 |
| Interface | GPIO, USB: USBTMC |
| DC power supply output | Connector for 5055 (sold separately), ± 24 V |
| Memory backup | The settings immediately before power-off and measured data are retained. |
| Power supply | AC 100 V to AC 230 V $\pm 10\%$ (AC 250 V or lower) 50 Hz/60 Hz ± 2 Hz |
| Power consumption | 55 VA max. |
| Overvoltage category | II |
| Temperature and humidity for guarantee | +5 to +35 $^\circ\text{C}$, 5 to 85% relative humidity (Absolute humidity of 1 to 25 g/m 3 with no condensation) |
| Dimensions | 434(W)*88(H)*403(D) (not including projections) |
| Weight | About 6.8 kg |
| Accessories | 1 instruction manual, 1 power supply cable, 1 CD-ROM (data display software, LabVIEW driver, sample program) |

Data display software (included as standard)

| | |
|-------------------|---|
| Data capture | Measured data loaded from FRA to PC |
| Data save | Measured data stored in CSV format |
| Graph display | Bode, Nyquist, Nicols, and Cole-Cole plots |
| Parameter setting | Main FRA parameters are set and controlled. |

External drawings



*A rack mount bracket kit is available.

High-end model for even higher measurement accuracy

FREQUENCY RESPONSE ANALYZER FRA5087/FRA5097



FRA5097

- Frequencies measured: FRA5087 0.1 mHz to 10 MHz
FRA5097 0.1 mHz to 15 MHz
- Amplitude accuracy: ± 0.05 dB, Phase accuracy: $\pm 0.3^\circ$
- Dynamic range: 140 dB
- Isolation voltage: 250 Vrms
- Equipped with impedance display function* and calculation functions such as automatic integration and amplitude compression.

*optional for FRA5087

*The contents of this catalog are current as of April 1, 2007.

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