COSINUS®
MESSTECHNIK GMBH

FREQUENCY RESPONSE ANALYZERS

FRA series

Measures frequency responses with high accuracy.

Function and performance further improved.

FRA5097 15 MHz

Abgekündigt

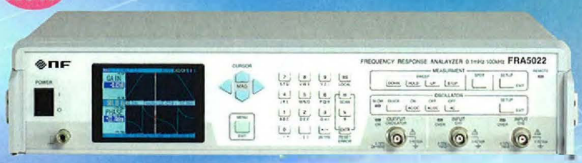
0.1mHz to 15MHz, Impedance display

FRA5087 10 MHz

Abgekündigt

0.1mHz to 10MHz, Multifunction

New



FRA5022 100 kHz

0.1mHz to100kHz, High C/P model

As FRA servo analyzers, they are useful for a wide range of measurement applications.

SWPS	DCPS					EDLC	etc.
Loop response for switching power supplies	Ripple rejection ratio for series regulators	Servo response for magnetic and optical disks	Resonance response for piezo-electric components	Impedance of electronic components	AC impedance of fuel cells	Internal resistance for electric double layer capacitors	For other measurement applications

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◆Oscillator section

Output waveform	∿Sine wave, ⊓Square wave, △Triangular wave
Frequency range	∿ : FRA5087 0.1mHz to10MHz FRA5097 0.1mHz to15MHz ⊓ △ : 0.1mHz to100kHz Setting resolution : 0.1mHz Accuracy : ±10ppm
AC amplitude	0V to 10Vpeak (no load) Setting resolution : Three digits or 0.01mVpeak, whichever is greater
DC bias	−10V to 10V (no load) Resolution : 10mV
Output control	Quick : Goes to a set voltage or 0V instantaneously. Slow : Goes to a set voltage or 0V slowly. Phase control : Sets the start and stop phases of oscillation in 1° steps. AC/DC simultaneous ON/OFF and AC only OFF possible.
Frequency sweep	Logarithmic sweep : 3 to 20,000 steps/sweep or 1 to 20,000 steps/decade (3 steps/sweep minimum ; 20,000 steps/sweep maximum). Linear sweep : 3 to 20,000 steps/sweep or 0.1mHz to 10MHz/step (FRA5087), 0.1mHz to 15MHz/step (FRA5097) (where, 3 steps/sweep minimum and 20,000 steps/sweep maximum). Frequency axis high density sweep : When measured data changes greatly, sweep density is made higher around the frequency area automatically for accurate measurement.
Isolation	Withstand voltage : 250Vrms (to chassis, to analysis section input) Measurement category : I

◆Analysis section input

Number of input channels	Two (CH1 and CH2)
Isolation	250Vrms (signal and ground to oscillator section and analysis section input channel) Measurement category : I
Maximum input voltage	±350Vpeak (AC+DC)
Maximum measuring voltage	250Vrms
Dynamic range	140dB typ. (10Hz to 1MHz)
Measuring mode	REPEAT, SINGLE, SWEEP
Analysis mode	Ratio : CH1/CH2, CH2/CH1 Level : CH1, CH2
Harmonic measurement	2nd to 10th order (up to 10MHz for FRA5087 and 15MHz for FRA5097)
Harmonic wave and noise rejection ratio	Normal mode DC : 60dB or greater Wide band white noise : 50dB or greater (noise band width 500kHz) Harmonic (10th or less) : 60dB or greater (100kHz or less) 40dB or greater (100kHz or greater)
Auto ranging function	Switches the input range according to the input signal level.
Delay function	Delays time until a start of measurement following switching the frequency. 0 to 9,999 seconds or 0 to 9,999 cycles.
Integration function	Integrates data for measurement, eliminating the noise. 0 to 9,999 seconds or 0 to 9,999 cycles.
Auto integration function	Repeats integration until a certain reliability is obtained. 0 to 9,999 seconds or 2 to 9,999 cycles.
Amplitude compression function	Controls the level of oscillation so that the amplitude level of DUT may stay at a certain value in order to keep the DUT from saturation and damage.
Equalize function	Measures the frequency characteristics of measuring systems such as the sensors and cables beforehand and then removes the error of the system in measurement to obtain the characteristics of the DUT only.
Operation function	Arithmetic operation (data to data, data to logarithmic value, value to value), differentiation of data, second differentiation, integration, second integration, open-loop to closed-loop conversion, closed-loop to open-loop conversion.

◆Measurement error

CH1/CH2 or CH2/CH1	≤20kHz	≤500kHz	≤2.2MHz	>2.2MHz
a, b, R	±0.5%	±1%	±10%	±25%
dBR	±0.05dB	±0.1dB	±1dB	±2dB
Phase (deg.)	±0.3°	±0.5°	±2°	±5°

In case analysis input voltage is 100mVpeak to 10Vpeak (2Vpeak maximum when exceeding 2.2MHz) immediately after calibration

◆Display section

Display	6.5 inches, color TFT LCD
Graph display	Bode, Nyquist, Nicols, and Cole-Cole plots Interconversion is also available. (reading and auto-scale are available with use of the cursor)
Measured data display	Gain (linear, logarithmic), phase enlarged display possible
Other functions	Auto scaling as well as marker, measurement condition, title, date and time displays

◆External memory

Media	USB memory (USB 1.1 or USB 2.0)
Connector	Front panel, USB-A connector
File format	FAT (compatible with Windows 98SE or later, compatible with IBM PC/AT)
Recorded contents	Setting conditions, measured data, screen data (bit map format)
File operation function	Directory, rename, delete, save, load

◆External I/O

Interface	GPIB : Condition setting, condition and data inquiry, operation command USB : USB 1.1 (low speed, full speed), TMC rear panel, USB-B connector
Thermosensitive printer	Takes hard copy of LCD screen image on the internally stored thermosensitive paper
DC power supply output	5055 connector (optional), ±24V, 100mA maximum

◆Impedance display function (optional for FRA5087)

Display items	Impedance, resistance, reactance, admittance, conductance, and susceptance are displayed on linear and logarithmic graphs.
Current shunt input convert coefficient	0 to 1.0E+6 (five digit resolution or 0.01E-9), phase inversion function
Open/short correction functions	Sets the open and short correction memories and displays a graph with open/short correction at measurement.
Maximum, minimum search functions	Searches the maximum and minimum values of vertical axis parameters on a bode diagram, moves the marker, and displays the calculated values.

◆Other

Power supply	AC 100V/120V/230V ±10% Where, 250V or less and 50Hz/60Hz ±2Hz
Power consumption	100 VA maximum
Guaranteed temperature and humidity ranges	+5 to +35°C, 5 to 85% relative humidity (Absolute humidity of 1 to 25g/m³ with no condensation)
Dimensions	434 (W) ×177 (H) ×453 (D) mm (not including projections)
Weight	Approx. 12kg
Accessories	1 instruction manual, 1 GPIB/USB instruction manual, 1 power supply cable (3-pin, 2m), 3 signal cables (BNC-BNC), 1 T-type divider, 1 roll of thermosensitive paper

■Optional accessories

Product name	Type
●High withstand voltage clip set (3 per set)	PA-001-0419
●High withstand voltage alligator clip cable set (small) (3 per set)	PA-001-0420
●High withstand voltage alligator clip cable set (large) (3 per set)	PA-001-0421
●Alligator clip cable set (3 per set)	PA-001-0422
●High withstand voltage BNC adapter (T-branch)	PC-001-4503
●High withstand voltage BNC cable	PC-002-3347
●High withstand voltage extension BNC cable	PC-007-0364
●Replacement printer paper (ten rolls)	PC-007-0382
●Loop gain measuring adapter clip cable (for replacement)	PC-007-1922

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 MΩ, 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 (±0.5%), phase ±0.3° Outside the range above: Gain ±0.15 dB (±15%), phase ±1° (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, ±(1.0000E - 9 to 9.9999E + 9) when linear Phase: Any 360° in ±360.00° a, b: 0, ±(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)

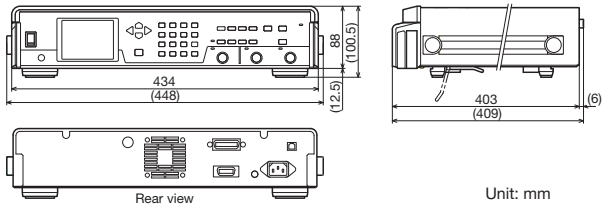
Other

Setting memory	10
Interface	GPIB, 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 ±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°C, 5 to 85% relative humidity (Absolute humidity of 1 to 25 g/m³ 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

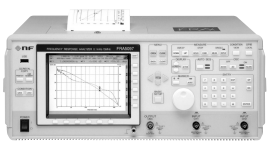


Unit: mm

※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: ±0.3°
- 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 9, 2007.

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