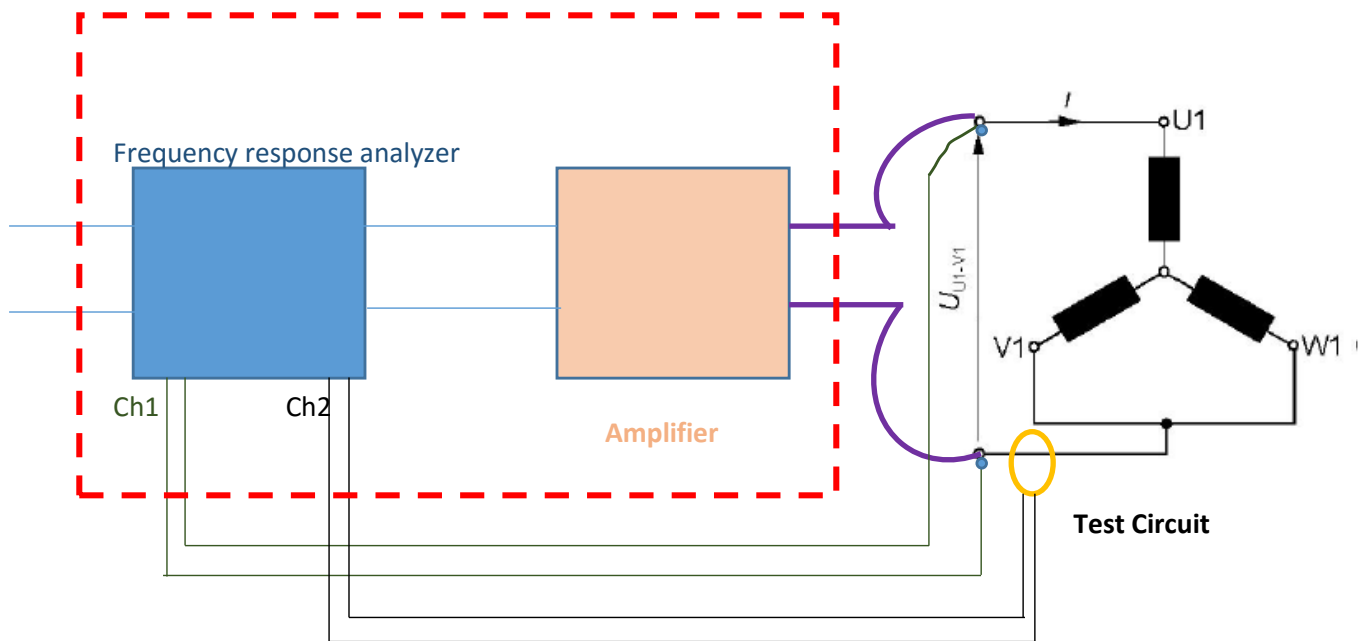


Frequency Response Analyser with compatible Amplifier and firmware

Doc No: BC815-01/FRA Rev.06



Configuration of Frequency Response Analyzer and Amplifier for required data

(Above circuit represents connection for one typical parameter measurement)

Application: Machine winding frequency response analysis [Magnitude and Phase response characteristics. (Standard referred: IEEE STD 115:1987)]

Frequency Response Analyser shall use built in waveform generator to produce required frequency sine wave, which is amplified to the required current level using the Amplifier and connected to test circuit. Amplifier shall have current controllable feature for controlling the amplified output current of the Amplifier.

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SPECIFICATIONS

Frequency Response Analyzer shall use inbuilt signal generator	
Measurement	Magnitude, Gain (CH1/CH2, CH2/CH1), Gain (dB), offset gain (dB), phase(°)
Frequency Range	(1milli Hz to1 Kilo Hz) or better
Gain Accuracy in dB	0.5dB or better <50Hz 0.3dB or better <1kHz
Phase Accuracy	0.5°<1Hz Or better 0.6°<1kHz Or better
Speed	Up to 10 reading per second or better
Measurement	In phase, quadrature, Tan ϕ , Magnitude, phase, in-phase ratio, rms, rms ratio
Frequency Range	(1milli Hz to 1 Kilo Hz) or better
Accuracy (AC)	0.5% reading +50uV<1 Hz Or better 0.1% reading +50uV<1kHz Or better
L C R Meter	
Functions	L,C,R (AC), Q, Tan Delta, Impedance, Phase- Series or Parallel Circuit
Basic Accuracy	0.1% + Shunt Tolerance
Sweep Capability	All AC functions
Signal Generator	
Type	Fully isolated 10Vrms output protected to minimum 100Vpk. Or better
Frequency	(1milli Hz to1 Kilo Hz) or better
Waveforms	Sine, Square, Triangle, Sawtooth
Accuracy	Frequency $\pm$ 0.5% or better Amplitude $\pm$ 5% or better
Differential Inputs	2 Isolated inputs 100VpK or better
Connectors	Isolated BNC
Coupling	AC or DC
Ranging	Auto or Manual
Input Impedance	1M Ohm or better

FRA shall have impedance analysis option

Frequency Range	(1milli Hz to 1 Kilo Hz) or better
Measurement Parameters	L, C, R, Z, phase, QF, Tan(δ), Series and Parallel circuit
Measurement Ranges	100nH to 10H, 1pF to 1000uF, 1m Ω to 500m Ω or better
Basic Accuracy	0.5% < 1kHz or better

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Probes	Minimum 4 probes
Cables	Output, RS232, Power cord
Software	1.Comprehensive synchronized control on instrument and data acquisition controller. 2.Gain, Phase measurements must be possible along with display of these parameters on Bode & Complex plane. 3. Measurements shall be exported to .csv or .xls or any other standard format using software.[Magnitude Vs Frequency ,Phase Vs Frequency plot data] 4.Software shall compatible to Windows XP, Windows 7, Windows 10 version loaded PCs
Commination ports	Standard LAN, GPIB , RS232
Documentation	Calibration Certificate, User Manual

Data log	
Functions	Min 4 measured functions, user selectable
Memory	RAM or Non-Volatile memory up to 5,000 records Min. or better

Display	Colour TFT, LED backlit
Operating Temperature	5 to 40°C ambient temperature, 20 to 90% non-condensing RH
Warranty	Minimum 2 Years

AMPLIFIER

Shall amplify the signal from frequency generator (AC signal of 1 milli Hz to 1kHz).

Voltage rating: 0 to 20V or better

Current from amplifier shall be controllable and

Current adjustment range: 0 to 40A rms or better

Input supply : 1-Ph AC 230V $\pm$ 10% ,50Hz $\pm$ 5% supply, Or 3-Ph AC 415V $\pm$ 10% , 50Hz $\pm$ 5% supply

Output : 1-Ph, AC with 1 milli Hz to 1 kHz of adjustable current levels

Warranty : Minimum 2 years

Documentation: Calibration Certificate, User Manual

Output Stability: Voltage: 0.1% or better in the specified frequency range

Current: 0.1% or better in the specified frequency range

Noise : <500mV or better

Safety: CE Compliant

Demo of FRA and Amplifier: Demo, configuration as per test circuit is required within 2 weeks of supply at BHEL

Delivery: BHEL R&D Stores, Hyderabad

Frequency Response Analyser with compatible Amplifier and firmware

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Technical Compliance Sheet

Pg No.1

BHEL Specifications		Vendor Compliance
Frequency Response Analyzer shall use inbuilt signal generator		
Measurement	Magnitude, Gain (CH1/CH2/, CH2/CH1), Gain (dB), offset gain (dB), phase(°)	
Frequency Range	(1milli Hz to1 Kilo Hz) or better	
Gain Accuracy in dB	0.5dB or better <50Hz 0.3dB or better <1kHz	
Phase Accuracy	0.5°<1Hz Or better 0.6°<1kHz Or better	
Speed	Up to 10 reading per second or better	
Measurement	In phase, quadrature, Tanø, Magnitude, phase, in-phase ratio, rms, rms ratio	
Frequency Range	(1milli Hz to 1 Kilo Hz) or better	
Accuracy (AC)	0.1% reading +50uV<1 Hz Or better 0.1% reading +50uV<1kHz Or better	
L C R Meter		
Functions	L,C,R (AC), Q, Tan Delta, Impedance, Phase- Series or Parallel Circuit	
Basic Accuracy	0.1% + Shunt Tolerance	
Sweep Capability	All AC functions	
Signal Generator		
Type	Fully isolated 10Vrms output protected to minimum 100Vpk. Or better	
Frequency	(1milli Hz to1 Kilo Hz) or better	
Waveforms	Sine, Square, Triangle, Sawtooth	
Accuracy	Frequency $\pm 0.5\%$ or better Amplitude $\pm 5\%$ or better	
Differential Inputs	2 Isolated inputs 100VpK or better	
Connectors	Isolated BNC	
Coupling	AC or DC	
Ranging	Auto or Manual	
Input Impedance	1M Ohm or better	
FRA shall have impedance analysis option		
Frequency Range	(1milli Hz to 1 Kilo Hz) or better	
Measurement Parameters	L, C, R, Z, phase, QF, Tan(δ), Series and Parallel circuit	
Measurement Ranges	100nH to 10H, 1pF to 1000uF, 1m Ω to 500m Ω or better	
Basic Accuracy	0.5% < 1kHz or better	
Probes	Minimum 4 probes	

Frequency Response Analyser with compatible Amplifier and firmware

Doc No: BC815-01/FRA Rev.06

Technical Compliance Sheet		Pg No.2
BHEL Specifications		Vendor Compliance
Cables	Output, RS232 connection, Power cord as required	
Software	1. Comprehensive synchronized control on instrument and data acquisition controller. 2. Gain, Phase measurements must be possible along with display of these parameters on Bode & Complex plane. 3. Measurements shall be exported to .csv or .xls or any other standard format using the software. 4. Software shall compatible to Windows XP, Windows 7, Windows 10 version OS loaded PCs	
Communication ports	Standard LAN, GPIB , RS232	
Data Log		
Functions	Min 4 measured functions, user selectable	
Memory	RAM or Non-Volatile memory up to 10,000 records Min. or better	
Display	Colour TFT, LED backlit	
Temperature	5 to 40°C ambient temperature, 20 to 90% non-condensing RH	
Warranty	Minimum 2 Years	
Amplifier		
Shall amplify signal from frequency generator (AC signal of 1 milli Hz to 1kHz).		
Voltage rating	0 to 20V or better	
Current adjustment range	0 to 40A rms or better and controllable	
Input supply	1-Ph AC 230V $\pm$ 10% ,50Hz $\pm$ 5% supply, Or 3-Ph AC 415V $\pm$ 10% , 50Hz $\pm$ 5% supply	
Output	1-Ph, AC with 1 milli Hz to 1 kHz of adjustable current levels	
Documentation	Calibration Certificate, User Manual, Test Certificate	
Output Stability	1.Voltage: 0.1% or better in the specified frequency range 2.Current: 0.1% or better in the specified frequency range 3.Noise : <500mV or better	
Warranty	Minimum 2 years	
Safety	CE Compliant	
Cables	Amplifier input cables(3 metre) and output cables (10 metre) , Power cord(1Ph or 3Ph – 10 metre length)	
Demo	Configuration and Demo within 15 Days from supply of equipment at BHEL	