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Frequency Response Analyzers for Stability Analysis and Power Electronics Performance Testing



Product Features

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Since 1979, Venable Instruments has been focused on one goal: bringing the most versatile, full-featured frequency response analyzers to customers in industries where precise testing and measurement tools for power electronics design is critical. Over 35 years of continual research and development has created the widest range of scalable frequency response analyzers to meet your company's current requirements, while providing a cost-effective growth path for future innovation. Venable Instruments is a proven leader in aerospace, automotive, energy, computer technology, academia, government research applications and virtually any industry requiring the highest standards in power supply and stability testing for repeatable and accurate results.

Pioneer of Integrated Isolation

All Venable instruments have a built-in floating oscillator and channel isolation to 600Vpk, eliminating the need for additional injection transformers or voltage reduction probes that are required with other frequency response analyzers. Connecting ancillary components increases the probability for more points of failure during the testing process, or worse, faulty results. Reliable and efficient by design, Venable frequency response analyzers provide a direct connection to your DUT (Device Under Test), eliminating the need for additional external boxes and cables required with other instruments.

Modular, Scalable Design for Simplified, Cost-Effective Upgrades

Venable is the only manufacturer with its enclosure and internal architecture purposely designed for fast and cost-effective upgrades. While a 2-channel FRA may meet your needs today, increased testing requirements or new engineering projects may necessitate higher frequency range, more channels, which could mean a costly new instrument purchase. Not with Venable! Venable instruments are fully scalable, with a modular design that easily upgrades from 2, 3 to 4 channels, increased upper frequency from 5, 20 to 40MHz, or add a digital option to characterize the feedback loop of a digitally controlled power supply.

Technical Support and Engineering Services

As the manufacturer, Venable Instruments provides all post-sales support for technical and application questions, with repairs and upgrades through our highly experienced engineering and laboratory personnel. Our team can troubleshoot issues remotely, often eliminating returns for repair, which can cause costly testing interruption and delays. In addition, Venable offers power supply testing services in our lab – contact Venable for more information.

17025/Z540.1 Level II Calibration

The 17025/Z540.1 Standard calibration certification is a requirement of most companies adhering to ISO 9001 Standards within their production facility. Venable is one of the only frequency response analyzer manufacturers that offers calibration to these higher standards, including before and after data, in an ISO/IEC 17025:2005 Accredited Laboratory.

Wide Range of Operating System Support

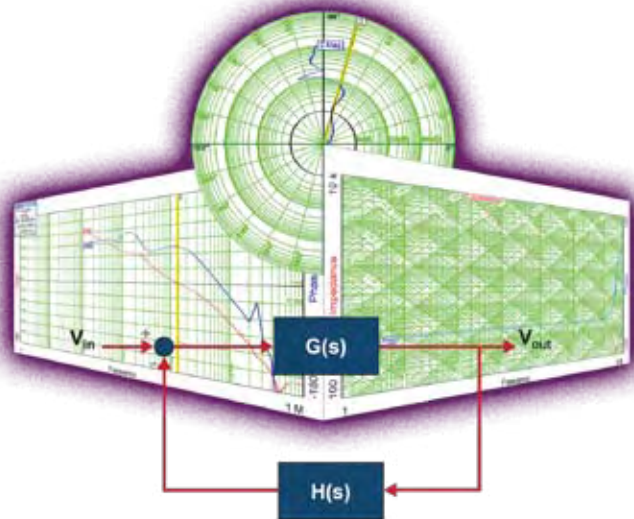
All Venable instruments with the current version of *Stability Analysis™* Software supports Microsoft® Windows® XP Service Pack 3 and Windows® 7, 8 and 10.

Lease-to-Own and Rental Options

Short-term need or budget constraints? Venable's inventory of rental instruments, and affordable lease-to-own options, provide a quick, stopgap solution to keep your projects on schedule.

Warranty and Extended Warranties

Venable provides a standard one year warranty which covers any defects in material or workmanship on new instruments. Venable also offers 3 and 5 year extended warranties to provide further investment protection.



“The world’s leading technology firms rely on Venable solutions to make their companies profitable and competitive.”

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The Venable Family of High Performance Frequency Response Analyzers

All **Venable Frequency Response Analyzers** combine the latest analog and digital technology with advanced DSP to provide versatile test, measurement and analysis of power supply stability for mission-critical environments. Each single, comprehensive hardware and software system performs many sophisticated test functions, with all Venable models supporting an expanded frequency of 10 μ Hz to 40MHz, with oscillator and channels isolated to 600Vpk, the highest in the test and measurement industry.

350c Series

The **Venable Model 350c** is the 3-channel successor of the original workhorse Model 350a/b that launched in 1986 and established Venable Instruments as a market leader. The contemporary 350c Series incorporates a 3rd channel, allowing the user to measure more transfer functions simultaneously with one sweep, such as source and load impedance. The 350c is the only frequency response analyzer in the industry that can measure absolute phase, using a reference channel.



6300 Series

The **Venable Model 6300 Series** is our popular 2-channel hardware/software system supplying the same functionality as all Venable Frequency Response Analyzers, with the 6300 leading the industry with more integrated testing and measurement capabilities than any other instrument in its class.



7400 Series

The **Venable Model 7400 Series** is the top of the line in Venable performance, supplying 4-channels for increased testing, measurement and analysis functionality. Originally designed for measuring 3-phase AC impedance and source and load simultaneously, the Model 7400 is a robust solution for organizations requiring high availability for high volume and/or simultaneous testing.



8800 Series

The **Venable Model 8800 Series** is the first in our family of digital testing and measurement instruments. The analyzer utilizes the digital interface 'Sync' signal to provide synchronization between analog and digital hardware. The Model 8800 performs simultaneous analysis on both analog input channels and the digital target processor, reliably capturing all data. **Versatile by design, the Model 8800 digital interface can be disabled, via software, to use the analyzer in a standard 2-channel, analog only configuration.**



Accessories

Extended testing and measurement capabilities are made possible with Low Frequency (LF) and General Purpose (GP) Bodes, RLC and IOZ options. Venable offers the only RLC that measures component impedance, and the only IOZ that measures power supply impedance, with 50A or 100A capabilities.

Venable *Stability Analysis*[™] Software The Next Generation Software from the Creator of K-Factor

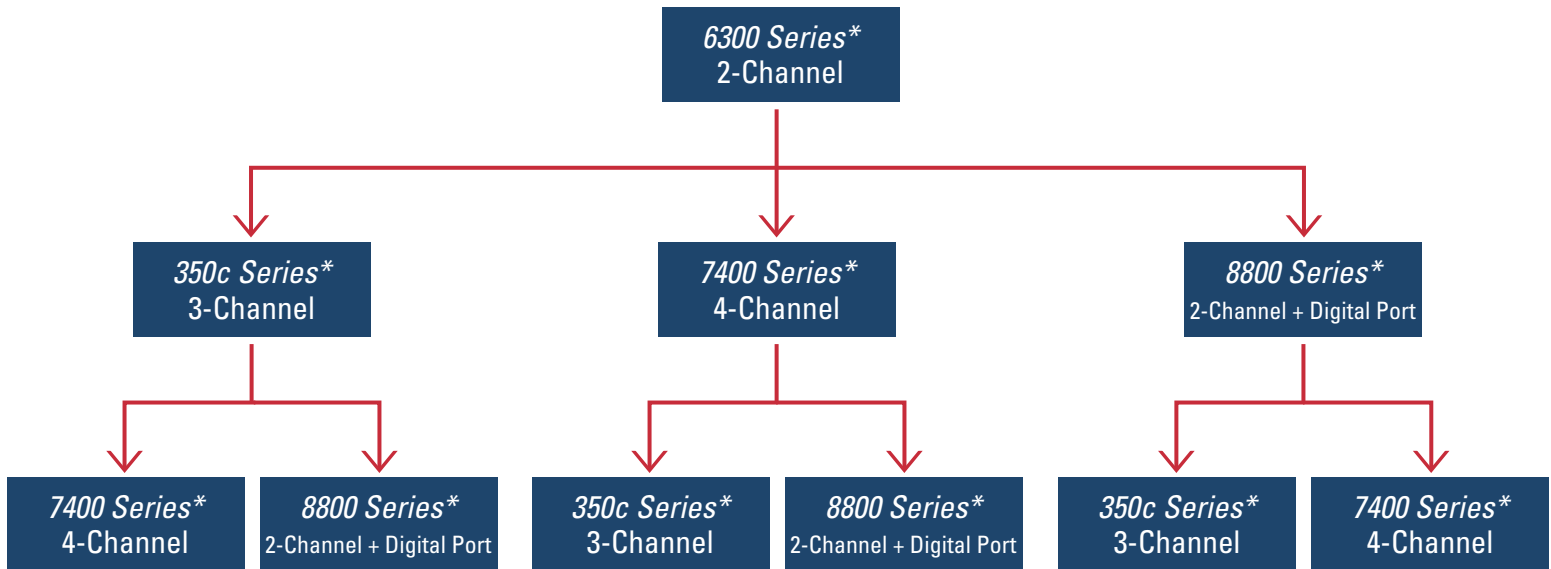
In 1983, Venable launched the renowned K-Factor[™] Software*, still in use by many instrument manufacturers today. Venable has elevated the original software with its innovative *Stability Analysis*[™] program. Go straight from measurement to design with *Stability Analysis*[™], as its dynamic functionality eliminates lengthy manual value calculations and guesswork. Compensation amplifier synthesis capability, or coefficients for digital power supplies, enables user to achieve the exact feedback loop bandwidth and phase margin desired on the first try. Other enhanced benefits include:

- Venable *Stability Analysis*[™] is the only software that can change sweep parameters during a sweep
- Venable *Stability Analysis*[™] is the only software that can easily transfer data between different types of plots
- Venable *Stability Analysis*[™] is the only software capable of reading component values directly off the plot with reactance plotting
- Venable *Stability Analysis*[™] is the only software that can measure a digital power stage with our 8800 Digital Frequency Response Analyzer
- Venable pioneered the ability to export data to and from other applications, such as Excel[®] and MATLAB[®]
- Overlay multiple tests on one plot to dynamically compare data
- A simple SPICE-like program for modeling the AC frequency response of circuits
- Graph types supported are voltage vs. frequency (log-log), gain phase vs. frequency (semilog), and reactance vs. frequency (log-log with lines for constant capacitance and inductance).
- Venable Reader[™] software enables users to share Venable plots and graphs (.ven files) with customers and colleagues, including limited editing capabilities.

*Venable, H. Dean. "The K Factor: A New Mathematical Tool for Stability Analysis and Synthesis." Proc. Powercon 10. 1983. San Diego, CA. pp. H1-1 to H1-12

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Instrument Investment Protection with Complete Scalability from Venable



*All Venable FRAs offer multiple frequency options, ranging from 10μHz to 5, 20 and 40MHz models, with input channels protected to 600Vpk.

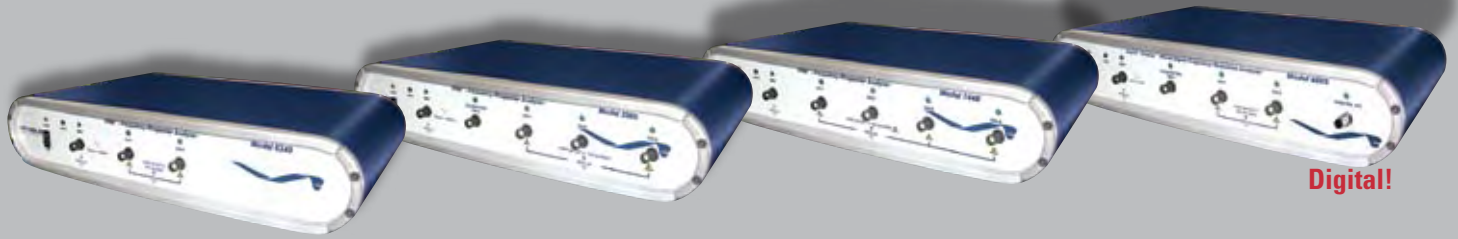
**Easily add more power, more channel connections,
with dozens of upgrade options.**

Frequently used Applications for Venable FRAs

- Measure the DC gain and open loop bandwidth, including numeric display of phase and gain margins, of any amplifier or power supply.
- Automatically compensate feedback loops for the exact loop bandwidth and phase margin you want on the first try.
- Perform any kind of math requirement on transfer functions, such as add, subtract, multiply and divide, or the same functions with one transfer function and a number or time delay. Functions can also subtract time delays from the test data.
- Model the frequency response of any circuit. Overlay model and test results to quickly and easily determine the accuracy of a model.
- Measure input/output impedance and conducted susceptibility (ability to reject input noise at a power IOZ supply output) on any system.
- Measure the transfer function of any piece of loop.
- Mathematically combine model results and measurements. For example, measure a part that is typically more difficult to model, such as the power circuitry, then model a part that is easier, like the error amplifier. Then, manipulate the model until you achieve the overall results that you require.
- Measure impedance versus frequency of components, including converting the data into actual circuit values. For example, read the capacitance, internal resistance, and internal inductance of any capacitor directly in component values.
- Measure the transfer function of any passive or active filter, the resonant characteristics of crystals, and exotic loops such as phased-lock loops.
- Measure the DC resistance, open circuit inductance, leakage inductance, self-resonant frequency, and winding capacitance of any transformer or inductor.

Product Comparison Charts

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Digital!

Item	Model 6305/20/40	Model 350c-5/20/40	Model 7405/20/40	Model 8805/20/40
System Frequency Range:	10uHz to 5/20/40MHz (Square wave to 1MHz)	10uHz to 5/20/40MHz (Square wave to 1MHz)	10uHz to 5/20/40MHz (Square wave to 1MHz)	10uHz to 5/20/40MHz (Square wave to 1MHz)
Generator Waveforms	sine, square	sine, square	sine, square	sine, square
Generator Amplitude AC	1mV to 10Vpk	1mV to 10Vpk	1mV to 10Vpk	1mV to 10Vpk
Generator Amplitude DC	±10V, 10mV step	±10V, 10mV step	±10V, 10mV step	±10V, 10mV step
Generator modes	single frequency, log/lin sweep, sweep with software controlled steps	single frequency, log/lin sweep, sweep with software controlled steps	single frequency, log/lin sweep, sweep with software controlled steps	single frequency, log/lin sweep, sweep with software controlled steps
Generator output config.	Floating to ±600Vpk	Floating to ±600Vpk	Floating to ±600Vpk	Floating to ±600Vpk
Oscillator "servo"	software controlled dynamic amplitude monitoring and on-the-fly adjustment	software controlled dynamic amplitude monitoring and on-the-fly adjustment	software controlled dynamic amplitude monitoring and on-the-fly adjustment	software controlled dynamic amplitude monitoring and on-the-fly adjustment
Analyzer Channels	2, isolated, floating to ±600Vpk	3, isolated, floating to ±600Vpk	4, isolated, floating to ±600Vpk	2, isolated, floating to ±600Vpk and digital interface port
Measurement Technique	narrowband DFT	narrowband DFT	narrowband DFT	narrowband DFT
Integration Method	1-9999 cycles 20msec -100Ksec time	1-9999 cycles 20msec -100Ksec time	1-9999 cycles 20msec -100Ksec time	1-9999 cycles 20msec -100Ksec time
Input coupling	dc with automatic offset cancellation	dc with automatic offset cancellation	dc with automatic offset cancellation	dc with automatic offset cancellation
Input Range	10mVpk to 500Vpk in 11 ranges	10mVpk to 500Vpk in 11 ranges	10mVpk to 500Vpk in 11 ranges	10mVpk to 500Vpk in 11 ranges
Max. Input	500Vpk	500Vpk	500Vpk	500Vpk
Input Isolation: chassis	±600Vpk	±600Vpk	±600Vpk	±600Vpk
Meas. Power Supply I/O Impedance	Yes with IOZ option, 50A or 100A	Yes with IOZ option, 50A or 100A	Yes with IOZ option, 50A or 100A	Yes with IOZ option, 50A or 100A
Display	Windows®-based graphics; scalable and easy to read gain/phase/impedance plots	Windows®-based graphics; scalable and easy to read gain/phase/impedance plots	Windows®-based graphics; scalable and easy to read gain/phase/impedance plots	Windows®-based graphics; scalable and easy to read gain/phase/impedance plots
Stability Analysis and loop optimization	Proprietary K-Factor based, application specific software, menu-driven algorithms for flexible analysis, manipulation, and calculation of data (RLC, IOZ optional).	Proprietary K-Factor based, application specific software, menu-driven algorithms for flexible analysis, manipulation, and calculation of data (RLC, IOZ optional).	Proprietary K-Factor based, application specific software, menu-driven algorithms for flexible analysis, manipulation, and calculation of data (RLC, IOZ optional).	Proprietary K-Factor based, application specific software, menu-driven algorithms for flexible analysis, manipulation, and calculation of data (RLC, IOZ optional).
Other Software	N/A	N/A	N/A	Target processor supporting source code, plus examples for supported processors
OS Support	Windows® XP SP3, 7, 8, 10	Windows® XP SP3, 7, 8, 10	Windows® XP SP3, 7, 8, 10	Windows® XP SP3, 7, 8, 10
Technical Support	Total system by factory engineers: hardware, software, applications	Total system by factory engineers: hardware, software, applications	Total system by factory engineers: hardware, software, applications	Total system by factory engineers: hardware, software, applications
Warranty	Standard 12 month warranty, parts and labor; optional multi-year extended warranty available	Standard 12 month warranty, parts and labor; optional multi-year extended warranty available	Standard 12 month warranty, parts and labor; optional multi-year extended warranty available	Standard 12 month warranty, parts and labor; optional multi-year extended warranty available
Additional Measurement Options	Component test; I/O Impedance (to 100A), low-freq PFC, RLC, range of Bode Boxes, Rack Mount Kit Available	Component test; I/O Impedance (to 100A), low-freq PFC, RLC, range of Bode Boxes, Rack Mount Kit Available	Component test; I/O Impedance (to 100A), low-freq PFC, RLC, range of Bode Boxes, Rack Mount Kit Available	Component test; I/O Impedance (to 100A), low-freq PFC, RLC, range of Bode Boxes, Rack Mount Kit Available
17025/Z540.1 Calibration	traceable 17025 or Z540.1, 1/yr recommended but not necessary	traceable 17025 or Z540.1, 1/yr recommended but not necessary	traceable 17025 or Z540.1, 1/yr recommended but not necessary	traceable 17025 or Z540.1, 1/yr recommended but not necessary
PC Interface	USB 2.0, IEEE-488 standard	USB 2.0, IEEE-488 standard	USB 2.0, IEEE-488 standard	USB 2.0, IEEE-488 standard
Power Requirements	90 to 264V, 48 to 62Hz, 30VA	90 to 264V, 48 to 62Hz, 30VA	90 to 264V, 48 to 62Hz, 30VA	90 to 264V, 48 to 62Hz, 30VA
Physical description	17w x 10d x 3.5"h, 14lbs.	17w x 10d x 3.5"h, 14lbs.	17w x 10d x 3.5"h, 14lbs.	17w x 10d x 3.5"h, 14lbs.

About Us

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With its corporate offices located in the states capital of Austin, Texas, USA,

Venable Instruments is part of a distinctive community where technology, academia, entrepreneurialism and the environment merge to create a melting pot of ideas and innovation. Located in the scenic Hill Country of Central Texas, Austin is considered the Silicon Hills of technology, with offices for many global companies, as well as being the launchpad for many successful business endeavors.



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