DOBLE PROTECTION TESTING

DOBLE F8000 POWER SYSTEM SIMULATORS

Moving Forward in a World of Change

Protection system performance testing has entered the digital realm. Investments in protection system automation are increasing as Intelligent Electronic Device (IED) functionality continues to expand and the benefits of IEC 61850 materialize around the globe.

Using a variety of test systems and software to accommodate the multifaceted work of testing relays and IEDs invites errors, complicates troubleshooting, and produces data and results that are difficult to track.

Maintaining installed protection systems while advancing with newer technologies does not have to be complicated or disruptive to your workforce. Moving forward capably with clarity and consistency is possible. The key is equipping your team from a platform of modular protection test instruments that scale to your requirements, integrate seamlessly into your practices and remain compatible with your operations and infrastructures as they evolve.

A Complete and Integrated Protection Testing Platform

Doble F8000-series Power System Simulators have numerous configurations that provide a range of possible solutions to your specific test requirements. The F8000 platform lets you choose the capabilities and functionality that make sense for the protection applications you test.

Each F8000 instrument configuration can perform analog and digital tests and will work seamlessly with existing Protection Suite™ and Doble RTS™ test procedures. Features include:

- Chassis and module configurations for a range of test applications.
- Innovative analog ports with color-programmable LED light rings that give visual recognition of sources and logic.
- Embedded time protocol and network synchronization functions.
- Easy pairing and networking with other F8000 instruments.
- Power and logic I/O modularity combined with options for testing IEC 61850 standard-based protection schemes.
- Rugged protective bumpers for field use or mounting brackets for installing in 19" racks.

With a modular platform and state-of-the-art digital componentry, F8000-series Power System Simulators provide modern performance in versatile designs that scale to the meet the demands of any conventional or digital test scenario.

F8000 Modules: Configurations to Fit Your Needs

The F8000 hardware platform offers modules for voltage, current and logic I/O that are combined into standard instrument configurations that cover a range of protection testing requirements.

A unique feature of F8000 modules is programmable analog ports with innovative LED light rings. The engineer or test technician can assign color combinations to the LED light rings in Protection Suite and RTS software for visual recognition of sources and logic applied to F8000-series Power System Simulators.

HIGH VA CURRENT MODULE

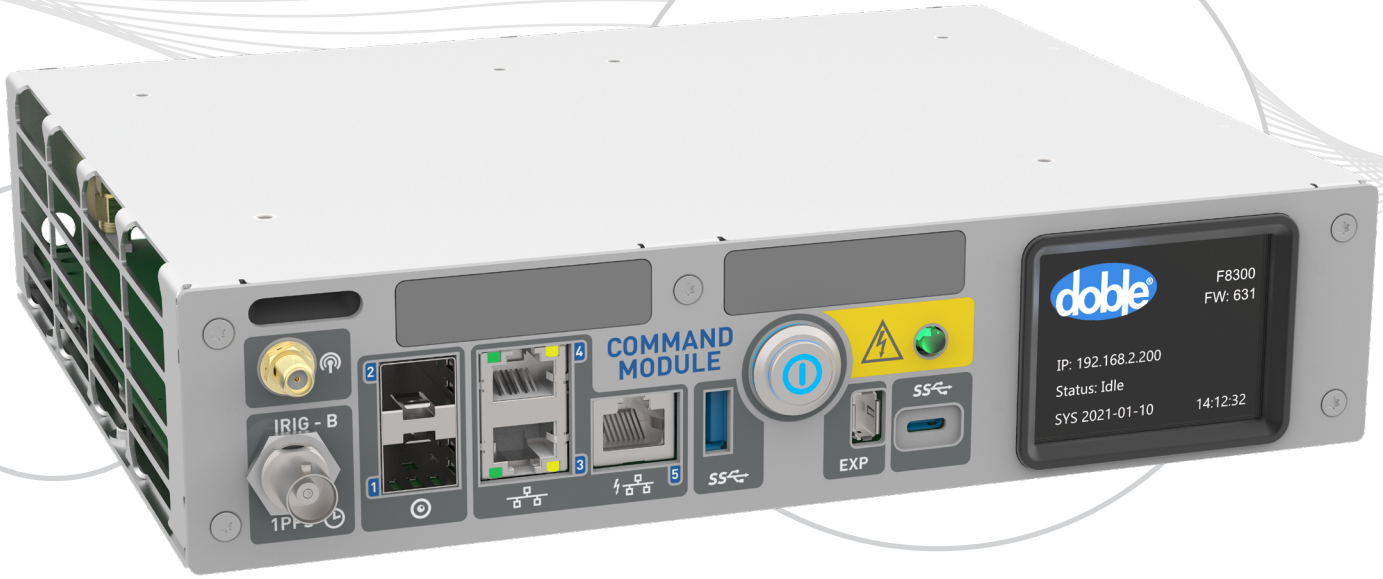
The HVA Current Module provides two 25 A sources at 150 VA each. When both sources are connected in parallel, 50 A at 300 VA continuous power is produced. Transient mode extends power and range up to 90 A at 300 VA for 30 seconds. DC output is 50 A. The LED light rings indicate the placements of test lead connections for current sources and will alert if source issues are detected.

HIGH VA VOLTAGE MODULE

The HVA Voltage Module provides two 150 V sources at 150 VA or one 300 V source at 300 VA with both channels connected in parallel. The available Convertible Mode option converts outputs of the HVA Voltage Module into high-VA/low-range current sources. The LED light rings indicate the placements of test lead connections for voltage sources and will alert if source issues are detected.

LOW-DENSITY LOGIC I/O MODULE

The Low-Density Logic I/O Module provides four pairs of programmable input/output ports with LED light rings that indicate port assignments and changes in monitored voltage, current and contact states. An optional DC Meter upgrade is available for testing transducers and Class 2 meters.



Command Module

The Command Module is embedded with each F8000-series chassis and controls all instrument operations from Protection Suite and RTS software. Communication and synchronization functions are hosted, and instrument status information is displayed. Connections to other F8000-series instruments are supported and IEC 61850 standard-based protection scheme testing options are available.

COMMUNICATIONS	3 x Ethernet ports (10/100/1000 Mbps each) 1 x 40 W Power over Ethernet (PoE) port 2 x SFP (copper & fiber) ports (1 Gbps each) 2 x USB 3.0 ports (types A & C)
TIMING	Phase voltage line synchronization Simple Network Time Protocol (SNTP)
TIME SYNCHRONIZATION	IRIG-B modulated & unmodulated IEEE 1588 / IEC 61850-9-3 Precision Time Protocol (PTP) GPS at 1 PPS
IEC 61850	Sampled Values - IEC 61869-9 & IEC 61850-9-2LE (publishing) GOOSE (publishing & subscribing)

BATTERY SIMULATOR

Each F8000-series chassis includes a battery simulator with a power range of 6 to 300 V at 90 W.

Choose Your Test Instrument: Doble F8000-series Power System Simulators

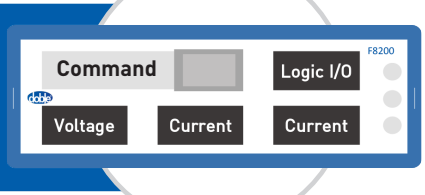
With dimensions and different combinations of modules to fit your needs, pick the F8000 chassis and module configuration that is right for you.

F8200 FOUR-MODULE TEST SET

The F8200 model Power System Simulator is available in four standard configurations and includes a Command Module and a Battery Simulator. This compact instrument is perfect for testing single-phase conventional schemes, digital protection systems and more!

F8200 Configuration 1

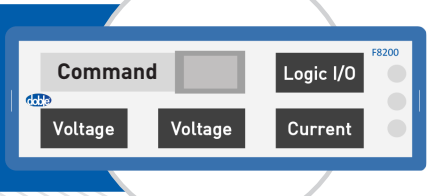
1 x LD Logic I/O
1 x HVA Voltage
2 x HVA Current



- Modern replacement of F2253
- Use for single-phase electromechanical or microprocessor relay testing

F8200 Configuration 2

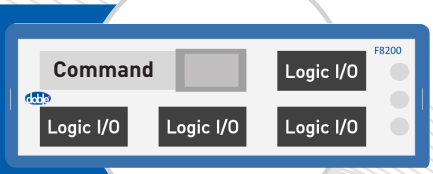
1 x LD Logic I/O
2 x HVA Voltage
1 x HVA Current



- Allows testing of 3-phase directional voltage

F8200 Configuration 3

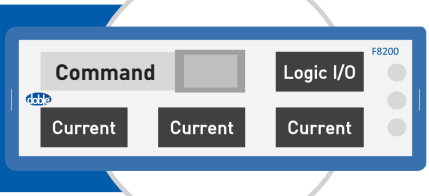
4 x LD Logic I/O



- For testing digital substations
- Hybrid digital-analog scheme testing

F8200 Configuration 4

1 x LD Logic I/O
3 x HVA Current



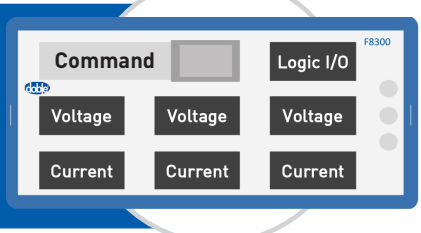
- For single or multi-phase testing
- Parallel amplifiers to inject single high-current for single-phase tests

F8300 SEVEN-MODULE TEST SET

The F8300 model Power System Simulator is available in five standard configurations and includes a Command Module and a Battery Simulator. This do-it-all, expanded instrument is ideal for three-phase and digital protection testing applications.

F8300 Configuration 1

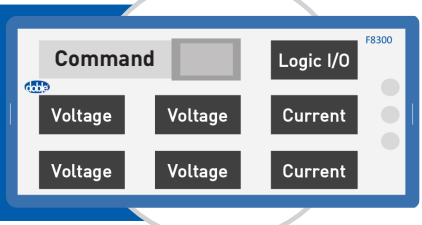
1 x LD Logic I/O
3 x HVA Voltage
3 x HVA Current



- Provides 3 phases of 300 V L-N & 6 currents
- Ideal for differential testing

F8300 Configuration 2

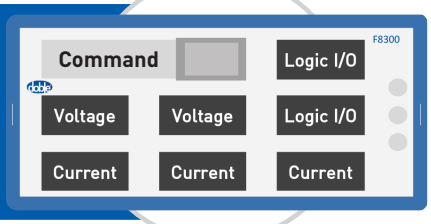
1 x LD Logic I/O
4 x HVA Voltage
2 x HVA Current



- Provides 4 phases of 150 V L-N
- Ideal for testing at generation stations

F8300 Configuration 3

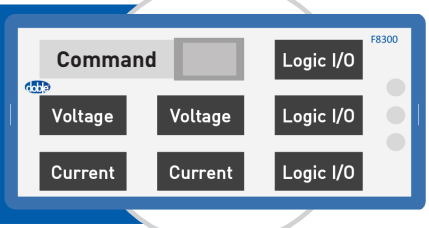
2 x LD Logic I/O
2 x HVA Voltage
3 x HVA Current



- Provides 4 phases of 150 V L-N
- Ideal for transmission testing
- 8 programmable logic I/O
- 6 currents for transformer differential
- Offers robust scheme testing

F8300 Configuration 4

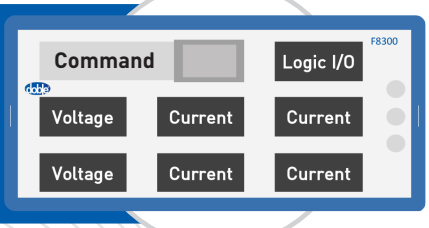
3 x LD Logic I/O
2 x HVA Voltage
2 x HVA Current



- Provides 12 logic I/O
- 4 voltages at 150 V
- 4 currents
- Ph-Ph transformer protection testing

F8300 Configuration 5

1 x LD Logic I/O
2 x HVA Voltage
4 x HVA Current



- 4 phases at 150 V for testing transmission protection
- Transformer differential testing

Enhanced Automation to Extend Your F8000 Investments

The F8000-series of instruments is fully-compatible with current and future versions of Doble protection testing software solutions. Technicians can use their existing test plans without any additional training and take advantage of the latest enhancements in Protection Suite and Doble RTS software. The combination of the F8000 platform and Doble protection testing software enables power and utility companies to seamlessly integrate and efficiently manage all digital and analog protection testing.

PROTECTION SUITE

- Includes an expansive collection of industry-proven test macros plus straightforward methods for assembling and editing test plans.
- Supports relay testers of all skill and experience levels with intuitive test creation, increased automation and highly-adaptive test techniques.
- Supports all F-series instrument configurations for any test situation—from relay calibrations to commissioning modern communication-assisted trip schemes to testing IEDs over networks based on IEC 61850 standards.

DOBLE RTS

- Robust database features standardize elements of relay testing programs and powerful automation tools increase efficiency and reduce complexity.
- Comes with an extensive relay test plan database offering more than 600 pre-written test routines; enables quick test plan modifications and sharing.
- Captures and stores important maintenance information for CTs/VTs, DC control circuitry, communication systems and more, along with consolidated reporting of history and results.

61850 TesT

- Processes multiple SCL files (ICD, IID, CID, SED, and SCD) for analyzing IEC 61850 substation configurations.
- Creates fault conditions to verify IED logic for proper control scheme coordination.
- Helps with planning testing scenarios in a laboratory or offline environment and uses saved configuration files for efficiency in the field.

DOBLE POWERBASE™

- Highly configurable central test and asset database system for protection data and records management with robust work tracking and extensive reporting features.
- Interfaces to Doble RTS and Protection Suite plus numerous third-party software products.
- Tracks any power system component and simplifies compliance audit readiness.

Visit www.doble.com/F8000 to select an F8000-series instrument configured for your specific protection testing requirements.

EXPERIENCE, KNOWLEDGE, INSIGHT YOU CAN COUNT ON.

F8000 Patents Pending

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DOBLE PROTECTION TESTING

F8000 COMMAND MODULE

Central Communication and Control of F8000 Instruments

The Command Module is embedded with each F8000-series chassis and controls all instrument operations from Protection Suite and RTS software. Communication and synchronization functions are hosted, and instrument status is displayed. Connections to other F8000-series instruments are supported and IEC 61850 standard-based protection scheme testing options are available.

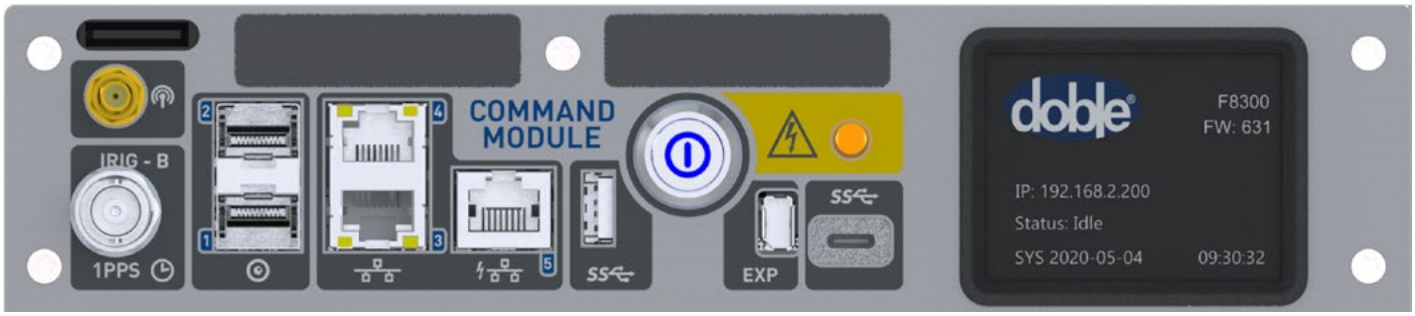
Communications
- 3 x Ethernet ports (10/100/1000 Mbps each)
- 1 x 40 W Power over Ethernet (PoE) port
- 2 x SFP (copper & fiber) ports (1 Gbps each)
- 2 x USB 3.0 ports (types A & C)

Timing
- Phase voltage line synchronization
- Simple Network Time Protocol (SNTP)

Time synchronization
- IRIG-B modulated & unmodulated
- IEEE 1588 / IEC 61850-9-3 Precision Time Protocol (PTP)
- GPS at 1 PPS

IEC 61850
- Sampled Values - IEC 61869-9 & IEC 61850-9-2LE (publishing)
- GOOSE / R-GOOSE (publishing & subscribing)

Options Available:
- F8860 GOOSE
- F8870 Sampled Values
- F8053 PTP
- F8895 Satellite Receiver Antenna



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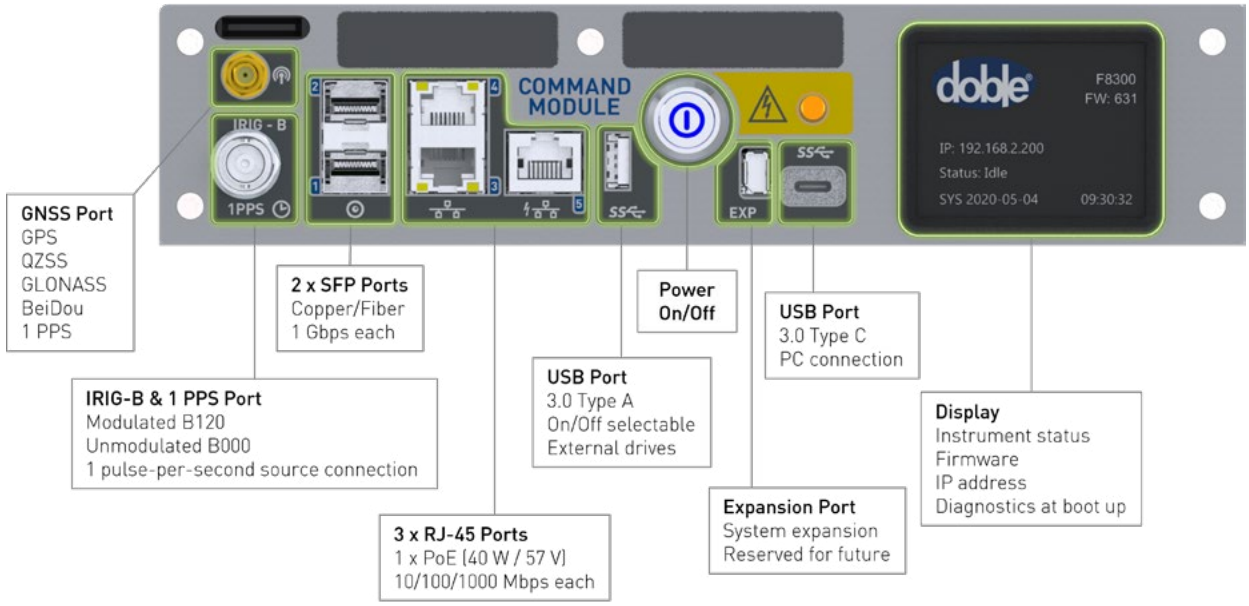
F8000 Command Module Technical Data		
Communications	Ethernet	3 ports 1 x PoE (Port 5) at 40 W (57 V) 10/100/1000 Mbps each
	USB	1 x 3.0 Type A (on/off selectable) 1 x 3.0 Type C
	SFP	2 ports Copper/fiber selectable 1 Gbps each
IEC 61850	Performance	Type 1A Class P2/3 (IEC 61850-5)
	VLAN Support	Selectable priority and VLAN-ID
	Publishing - Sampled Values	IEC 61869-9, IEC 61850-9-2LE 4 Streams
	Publishing - GOOSE / R-GOOSE	1024 configurable virtual outputs (128 messages)
	Subscribing - GOOSE / R-GOOSE	1024 configurable virtual inputs
Time Synchronization	Global Navigation Satellite Systems	GPS, QZSS, GLONASS, BeiDou, 1 PPS
	PTP	1588 v.2 Power Profile and Power Utility Profile
	IRIG-B	Modulated B120 Unmodulated B000
	SNTP	IP v.4 and IP v.6 Networks
General	Display	Diagnostics at boot up
	Ground Connection	4 mm lighted green/yellow Banana socket on side
	Weight	2.25 lbs. (1.02 kg)



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PUBLISHED: APRIL, 2023

DOBLE PROTECTION TESTING

F8000 HIGH VA CURRENT MODULE

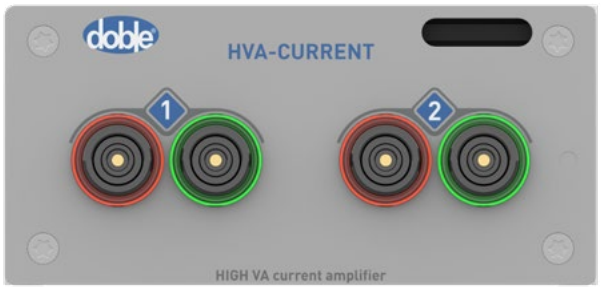
Two analog sources with intelligent LED light rings

F8000 modules take the guess work out of test connections and troubleshooting. A unique feature of F8000 modules is the programmable analog ports with innovative LED light rings. The engineer or test technician can assign color combinations to the LED light rings in Protection Suite and RTS software for visual recognition of sources and logic applied to F8000-series Power System Simulators.

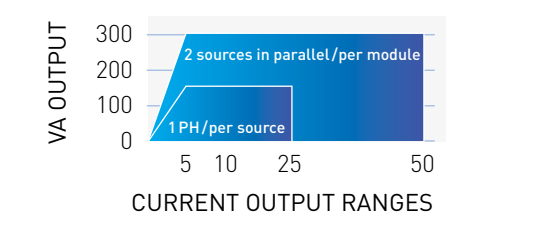
The HVA Current Module provides two 25 A sources at 150 VA each. When both sources are connected in parallel, 50 A at 300 VA continuous power is produced. Transient mode extends power and range up to 90 A at 300 VA for 30 seconds. DC output is 50 A.

Use Protection Suite and RTS software to set source configurations in the HVA Current Module and to assign colors to the LEDs. The LED light rings indicate the placements of test lead connections for current sources and will alert if source issues are detected.

For safety and to prevent hardware damage, the HVA Current Module automatically stops operating and the LEDs turn red when sensing open circuit conditions.



F8000 HVA Current Module Technical Data

Power	AMPLIFIER RANGES					
		Amps	Time	Volt-Amps	Compliance Voltage	Output Voltage
	Single	5 A	Continuous	150 VA	27.5 Vrms, 40 Vpk	30 Vrms
		10 A	Continuous	150 VA	27.5 Vrms, 40 Vpk	15 Vrms
		25 A	Continuous	150 VA	27.5 Vrms, 40 Vpk	6 Vrms
	Parallel	10 A	Continuous	300 VA	27.5 Vrms, 40 Vpk	30 Vrms
		20 A	Continuous	300 VA	27.5 Vrms, 40 Vpk	15 Vrms
		50 A	Continuous	300 VA	27.5 Vrms, 40 Vpk	6 Vrms
	Series	5 A	Continuous	300 VA	55 Vrms, 80 Vpk	60 Vrms
		10 A	Continuous	300 VA	55 Vrms, 80 Vpk	30 Vrms
		25 A	Continuous	300 VA	55 Vrms, 80 Vpk	12 Vrms
		45 A	Transient (30 seconds)	300 VA	55 Vrms, 80 Vpk	10 Vrms
	DC	25 A at 150 W (single channel) 50 A at 300 W (both channels)				
	Power Output (VA) vs. Current Output (A)					
	Accuracy (50 Hz / 60 Hz @ 20 °C to 30 °C)[2]	±0.15 % of reading + 0.05 % of range				
	Resolution	1 mA				
Frequency	Bandwidth	DC - 3 kHz				
	Range Sine Signals Harmonic, Inter-harmonic, Transient	 1 kHz (DC) 3 kHz (DC), derates 50 % at 10 kHz bandwidth				
	Accuracy (50 Hz / 60 Hz) @ 20 °C to 30 °C @ -20 °C to 50 °C	 1.5 ppm 10 ppm				
	Resolution	1 mHz				
Phase	Range	-360° to +360°				
	Accuracy (50 Hz / 60 Hz)[4]	< 0.05°				
	Resolution	0.01°				
General	THD (50 Hz / 60 Hz)[3]	0.25 %				
	Connection	4 mm Banana, lighted (LED)				
	Dimensions	W: 4 9/16 inches (11.6 cm) H: 2 3/16 inches (5.6 cm) D: 7 7/8 inches (20 cm)				
	Weight	1.9 lbs. (0.86 kg)				

[1] RLoad 0.1 - 1.0 Ohms
[2] Accuracy (50 Hz / 60 Hz @ 20 °C to 30 °C) < 2.0 A = 0.09 % reading + 0.1 % range
[3] THD (50 Hz / 60 Hz) > 2.5 A / 1 Ohm @ 20 kHz bandwidth
[4] Balanced loads

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PUBLISHED: MAY, 2023

DOBLE PROTECTION TESTING

F8000 HIGH VA VOLTAGE MODULE

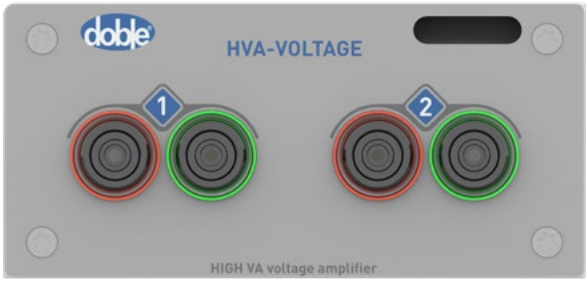
Two analog sources with intelligent LED light rings

F8000 modules take the guess work out of test connections and troubleshooting. A unique feature of F8000 modules is the programmable analog ports with innovative LED light rings. The engineer or test technician can assign color combinations to the LED light rings in Protection Suite and RTS software for visual recognition of sources and logic applied to F8000-series Power System Simulators.

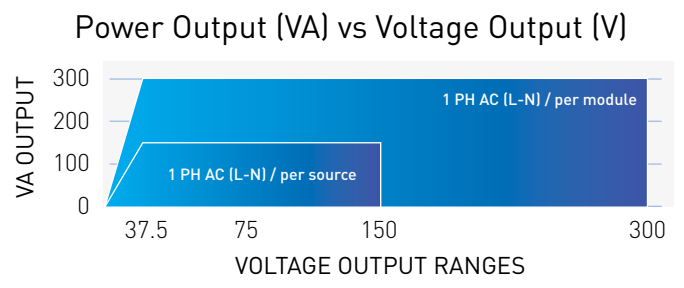
The HVA Voltage Module provides two 150 V sources at 150 VA or one 300 V source at 300 VA with both channels connected in parallel. The **F8810 Convertible Mode** option converts outputs of the HVA Voltage Module into high-VA/low-range current sources.

Use Protection Suite and RTS software to set source configurations in the HVA Voltage Module and to assign colors to the LEDs. The LED light rings indicate the placements of test lead connections for voltage sources and will alert if source issues are detected.

For safety and to prevent hardware damage, the HVA Voltage Module automatically stops operating and the LEDs turn red when sensing short circuit conditions.



F8000 HVA Voltage Module Technical Data

Power	Outputs	2
	Range	37.5 V, 75 V, 150 V, 300 V
	Accuracy (50 Hz / 60 Hz @ 20 °C to 30 °C) Guaranteed	±0.08 % of reading + 0.04 % of range
	Resolution	0.01 V
	Source Configurations	
	1-phase AC (L-N)	1 x 300 V at 300 VA 1 x 150 V at 300 VA 1 x 75 V at 300 VA 1 x 37.5 V at 300 VA
	2-phase AC (L-N)	2 x 150 V at 150 VA 2 x 75 V at 150 VA 2 x 37.5 V at 150 VA
	1-phase DC (L-N)	1 x 300 V at 300 W 1 x 150 V at 300 W 1 x 75 V at 300 W 1 x 37.5 V at 300 W
	2-phase DC (L-N)	2 x 150 V at 150 W 2 x 75 V at 150 W 2 x 37.5 V at 150 W
		
Frequency	Bandwidth	3 kHz
	Range Sine Signals Harmonic, Inter-harmonic, Transient	 1 kHz (DC) 3 kHz (DC), derates 50 % at 10 kHz bandwidth
	Accuracy (50 Hz / 60 Hz) @ 20 °C to 30 °C @ -20 °C to 50 °C	 1.5 ppm 10 ppm
	Resolution	1 mHz
Phase	Range	-360° to +360°
	Accuracy (50 Hz / 60 Hz) Guaranteed	< 0.1°
	Resolution	0.01°
General	THD + N (50 Hz / 60 Hz)	0.15 %
	Connections	4 mm Banana, lighted (LED) outputs
	Dimensions	W: 4 9/16 inches (11.6 cm) H: 2 3/16 inches (5.6 cm) D: 7 7/8 inches (20 cm)
	Weight	2.1 lbs. (0.95 kg)

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PUBLISHED: APRIL, 2023

DOBLE PROTECTION TESTING

F8000 LOW-DENSITY LOGIC I/O MODULE

Four programmable pairs with intelligent LED light rings

F8000 modules take the guess work out of test connections and troubleshooting. A unique feature of F8000 modules is the programmable analog ports with innovative LED light rings. The engineer or test technician can assign color combinations to the LED light rings in Protection Suite and RTS software for visual recognition of sources and logic applied to F8000-series Power System Simulators.

The Low-Density Logic I/O Module provides four pairs of programmable input/output ports with LED light rings that indicate port assignments and changes in monitored voltage, current and contact states.

Use Protection Suite and RTS software to set monitoring parameters in the Low-Density Logic I/O Module and to assign colors to the LEDs.

The optional **F8800 DC Metering and Transducer** upgrade enables testing of transducers and Class 2 meters.

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F8000 Logic I/O Module Technical Data			
Common Input/Output		# Outputs	4 Max. Combintation Input/Output
		Range	0 to 300 VAC / 424 VDC
		Maximum Voltage Input	±500 V Peak
		Input Impedance	720 kΩ
		Response Time	< 100 µs
		Max Make/Break Current	8 A
		Threshold Level	0 - ±300 VAC / 0 - ±424 VDC (Programmable)
DC Metering (requires F8800)		Range	0 - ±10 VDC / 0 - ±20 mADC
		Accuracy - Voltage	< 0.05 % of reading guaranteed
		Accuracy - Current	< 0.05 % of reading guaranteed
	Counters	# Inputs	2
		Max Counting Frequency	100 kHz
		Threshold Voltage	1 V
		Voltage Hesteresis	1 V
		Max Input Voltage	±40 V
		Isolation	SELV
		Frequency	33 kHz
		Pulse Width	> 60 µs
Connection		4 mm Banana, lighted (LED)	
Dimensions			W: 4 9/16 inches (11.6 cm) H: 2 3/16 inches (5.6 cm) D: 7 7/8 inches (20 cm)
Weight			1.25 lbs. (0.57 kg)

Logic I/O Module Accessory Bag

Logic I/O Module Accessories

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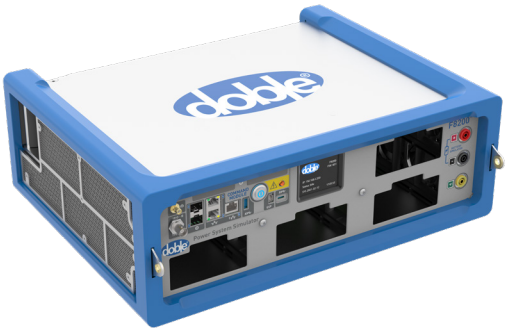
PUBLISHED: AUGUST, 2021

DOBLE PROTECTION TESTING

F8200 CHASSIS

Four-module F8000 test set frame

A compact instrument design for easy portability and rack mounting.



An F8200 model Power System Simulator is a four-module F8000-series protection test instrument available in four standard configurations of HVA Current, HVA Voltage, and Low-Density Logic I/O modules.

The embedded Command Module has state-of-the-art digital componentry that works with your existing Protection Suite and RTS test procedures for powerful simulations that include the necessary communication functions for testing modern protection schemes including architectures based on the IEC 61850 standard.

The F8200 comes with a 90 W battery simulator and can be ordered with a wrap-around protective bumper and carrying accessories, or with brackets and hardware for rack-mounting the instrument in 19" racks.

The versatility of F8000-series Power System Simulators like the F8200 let you easily scale your test capabilities to the requirements presented by your protection systems. Simply connect an F8200 to other F8000-series instruments to expand your use case possibilities.

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F8200 Chassis Technical Data		
Power Supply	Power Supply Range	100 VAC to 240 VAC (-10/+25 V)
	Power Supply Frequency	50/60 Hz ±3 Hz
	Maximum System Power Available	120 VAC / 1800 W 240 VAC / 3200 W
	Maximum Amplifier Power Available	120 VAC / 1600 W 240 VAC / 1600 W
Battery Simulator	Range	6 VDC to 300 VDC
	Power Output	90 W
	Resolution	1 V
	Output Current	1.5 A
	Max Voltage Ripple	0.2 % of range
	Accuracy	< ±5 %
Certifications	Environmental	IEC 60068-2-1 (cold storage & operating) IEC 60068-2-2 (dry heat storage & operating) IEC 60068-2-30 (damp heat storage & operating)
	Mechanical	IEC 60068-2-6 (vibration resilience) IEC 60068-2-27 (mechanical shock resilience) IEC 60068-2-64 (rotational drop resilience)
	Safety	IEC/EN 61010-1 & UL 61010-1 IEC/EN 60825-1:2014
	EMC	FCC 47 CFR Part 15, Class A (USA) ICES-001 Issue 3 ISM (Canada) EN55011:2016 AS/NZS CISPR11:2019 EN61326:2013 EN61000-6-2 EN61000-4-2/3/4/5/6/11
	Other	RoHS
Environmental	Operating Temperature	32° to 131° F (0° to 55° C)
	Storage Temperature	-58° to 185° F (-50° to 85° C)
	Humidity Range	Up to 95 % relative humidity, non-condensing
Chassis	Size	W: 17.25" (43.8 cm) H: 5.25" (13.3 cm) D: 13" (33 cm)
	Frame Weight	13 lbs. (5.9 kg)

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PUBLISHED: AUGUST, 2021

DOBLE PROTECTION TESTING

F8200-1 POWER SYSTEM SIMULATOR

Standard configuration of logic, voltage and current modules

F8000-series Power System Simulators are modular instruments configured from a versatile hardware platform that enables numerous chassis and module combinations. The compact F8200 model is a four-module instrument that is available in four standard configurations. Each unique configuration provides particular capabilities for a variety of conventional and digital protection testing applications.

Configuration 1 of the F8200 Power System Simulator includes a Command Module, a 6 - 300 VDC 90 W battery simulator, a Low-Density Logic I/O module, a High VA Voltage module, and two High VA Current modules. This F8200 configuration is designed for testing electromechanical relay schemes and single or multi-phase simulations on microprocessor-based relays.

Command Module

Displays instrument status information and provides central control from Protection Suite and Doble RTS software. IEC 61850-compliant communication and synchronization functions are hosted and connections to other F8000-series instruments are supported.

1 x Low-Density Logic I/O Module

Provides four pairs of programmable input/output ports with LED light rings that indicate port assignments and changes in monitored voltage, current and contact states. The optional **F8800 DC Metering and Transducer** upgrade enables testing of transducers and Class 2 meters.

1 x HVA Voltage Module

Provides two 150 V sources at 150 VA or one 300 V source at 300 VA with both channels connected in parallel. The **F8810 Convertible Mode** option converts outputs of the HVA Voltage Module into high-VA/low-range current sources.

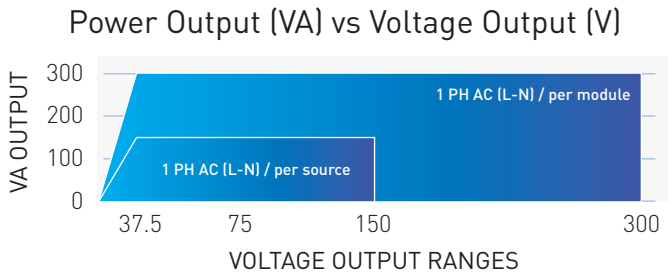
2 x HVA Current Modules

Each provides two 25 A sources at 150 VA per source. When both sources are connected in parallel, 50 A at 300 VA continuous power is produced per module. Transient mode extends power and range up to 90 A at 300 VA for 30 seconds per module. DC output is 50 A per module.

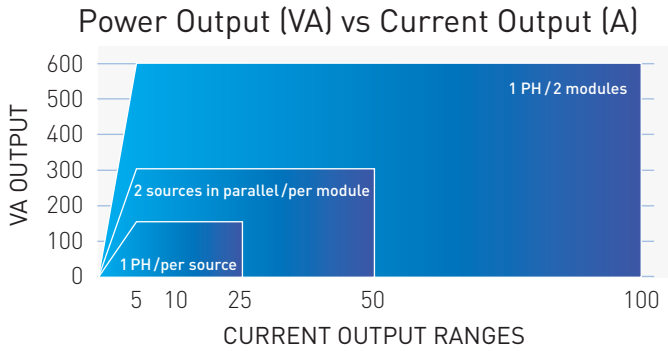
Drive this F8200 with your existing Protection Suite and RTS test procedures. The state-of-the-art digital componentry enables powerful simulations that include the necessary communication functions for testing modern protection schemes including architectures based on the IEC 61850 standard.

This F8200 can be ordered with a wrap-around protective bumper and carrying accessories, or with brackets and hardware for rack-mounting the instrument in 19" racks.

The versatility of F8000-series Power System Simulators like this F8200 model let you easily scale your test capabilities to the requirements presented by your protection systems. Simply connect this F8200 to other F8000-series instruments to expand your use case possibilities.



Voltage Module Accessories



Current Module Accessories

Instrument and Accessory Bags

Logic I/O Module Accessories

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DOBLE PROTECTION TESTING

F8200-2 POWER SYSTEM SIMULATOR

Standard configuration of logic, voltage and current modules

F8000-series Power System Simulators are modular instruments configured from a versatile hardware platform that enables numerous chassis and module combinations. The compact F8200 model is a four-module instrument that is available in four standard configurations. Each unique configuration provides particular capabilities for a variety of conventional and digital protection testing applications.

Configuration 2 of the F8200 Power System Simulator includes a Command Module, a 6 - 300 VDC 90 W battery simulator, a Low-Density Logic I/O module, two High VA Voltage modules, and one High VA Current module. This F8200 configuration is designed for testing single-phase applications and to enable simulations requiring three-phase directional voltage.

Command Module

Displays instrument status information and provides central control from Protection Suite and Doble RTS software. IEC 61850-compliant communication and synchronization functions are hosted and connections to other F8000-series instruments are supported.

1 x Low-Density Logic I/O Module

Provides four pairs of programmable input/output ports with LED light rings that indicate port assignments and changes in monitored voltage, current and contact states. The optional **F8800 DC Metering and Transducer** upgrade enables testing of transducers and Class 2 meters.

2 x HVA Voltage Modules

Each provides two 150 V sources at 150 VA or one 300 V source at 300 VA with both channels connected in parallel. The **F8810 Convertible Mode** option converts outputs of the HVA Voltage Modules into high-VA/low-range current sources.

1 x HVA Current Module

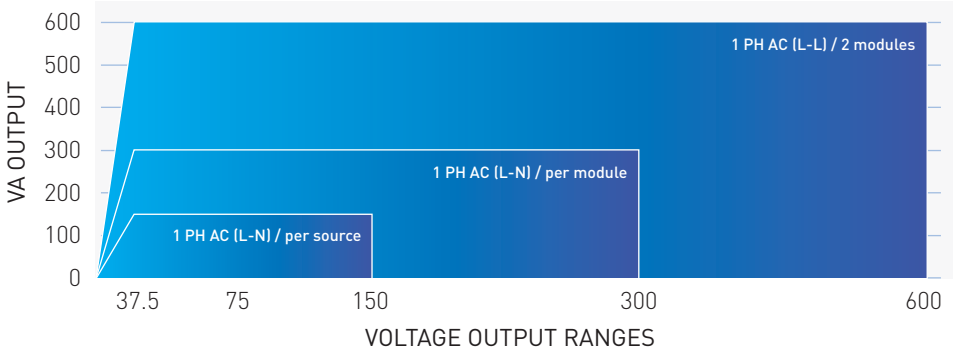
Provides two 25 A sources at 150 VA per source. When both sources are connected in parallel, 50 A at 300 VA continuous power is produced. Transient mode extends power and range up to 90 A at 300 VA for 30 seconds. DC output is 50 A.

Drive this F8200 with your existing Protection Suite and RTS test procedures. The state-of-the-art digital componentry enables powerful simulations that include the necessary communication functions for testing modern protection schemes including architectures based on the IEC 61850 standard.

This F8200 can be ordered with a wrap-around protective bumper and carrying accessories, or with brackets and hardware for rack-mounting the instrument in 19" racks.

The versatility of F8000-series Power System Simulators like this F8200 model let you easily scale your test capabilities to the requirements presented by your protection systems. Simply connect this F8200 to other F8000-series instruments to expand your use case possibilities.

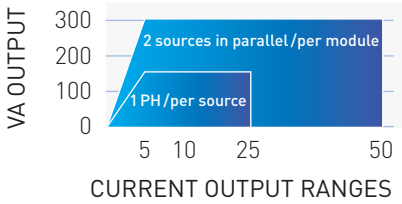
Power Output (VA) vs Voltage Output (V)



Instrument and Accessory Bags

Voltage Module Accessories

Power Output (VA) vs Current Output (A)



Logic I/O Module Accessories

Current Module Accessories

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DOBLE PROTECTION TESTING

F8200-3 POWER SYSTEM SIMULATOR

Standard configuration of logic, voltage and current modules

F8000-series Power System Simulators are modular instruments configured from a versatile hardware platform that enables numerous chassis and module combinations. The compact F8200 model is a four-module instrument that is available in four standard configurations. Each unique configuration provides particular capabilities for a variety of conventional and digital protection testing applications.

Configuration 3 of the F8200 Power System Simulator includes a Command Module, a 6 - 300 VDC 90 W battery simulator, and four Low-Density Logic I/O modules. This F8200 configuration is designed for testing digital substations and provides analog inputs and outputs that enable simulations on hybrid digital-analog schemes.

Command Module

Displays instrument status information and provides central control from Protection Suite and Doble RTS software. IEC 61850-compliant communication and synchronization functions are hosted and connections to other F8000-series instruments are supported.

4 x Low-Density Logic I/O Modules

Each provides four pairs of programmable input/output ports with LED light rings that indicate port assignments and changes in monitored voltage, current and contact states. The optional **F8800 DC Metering and Transducer** upgrade enables testing of transducers and Class 2 meters.

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Drive this F8200 with your existing Protection Suite and RTS test procedures. The state-of-the-art digital componentry enables powerful simulations that include the necessary communication functions for testing modern protection schemes including architectures based on the IEC 61850 standard.

This F8200 can be ordered with a wrap-around protective bumper and carrying accessories, or with brackets and hardware for rack-mounting the instrument in 19" racks.

The versatility of F8000-series Power System Simulators like this F8200 model let you easily scale your test capabilities to the requirements presented by your protection systems. Simply connect this F8200 to other F8000-series instruments to expand your use case possibilities.

Logic I/O Module Accessories

Instrument and Accessory Bags

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PUBLISHED: AUGUST, 2021

DOBLE PROTECTION TESTING

F8200-4 POWER SYSTEM SIMULATOR

Standard configuration of logic, voltage and current modules

F8000-series Power System Simulators are modular instruments configured from a versatile hardware platform that enables numerous chassis and module combinations. The compact F8200 model is a four-module instrument that is available in four standard configurations. Each unique configuration provides particular capabilities for a variety of conventional and digital protection testing applications.

Configuration 4 of the F8200 Power System Simulator includes a Command Module, a 6 - 300 VDC 90 W battery simulator, a Low-Density Logic I/O module, and three High VA Current modules. This F8200 configuration is designed for applications that require single-phase high current simulations.

Command Module

Displays instrument status information and provides central control from Protection Suite and Doble RTS software. IEC 61850-compliant communication and synchronization functions are hosted and connections to other F8000-series instruments are supported.

1 x Low-Density Logic I/O Module

Provides four pairs of programmable input/output ports with LED light rings that indicate port assignments and changes in monitored voltage, current and contact states. The optional **F8800 DC Metering and Transducer** upgrade enables testing of transducers and Class 2 meters.

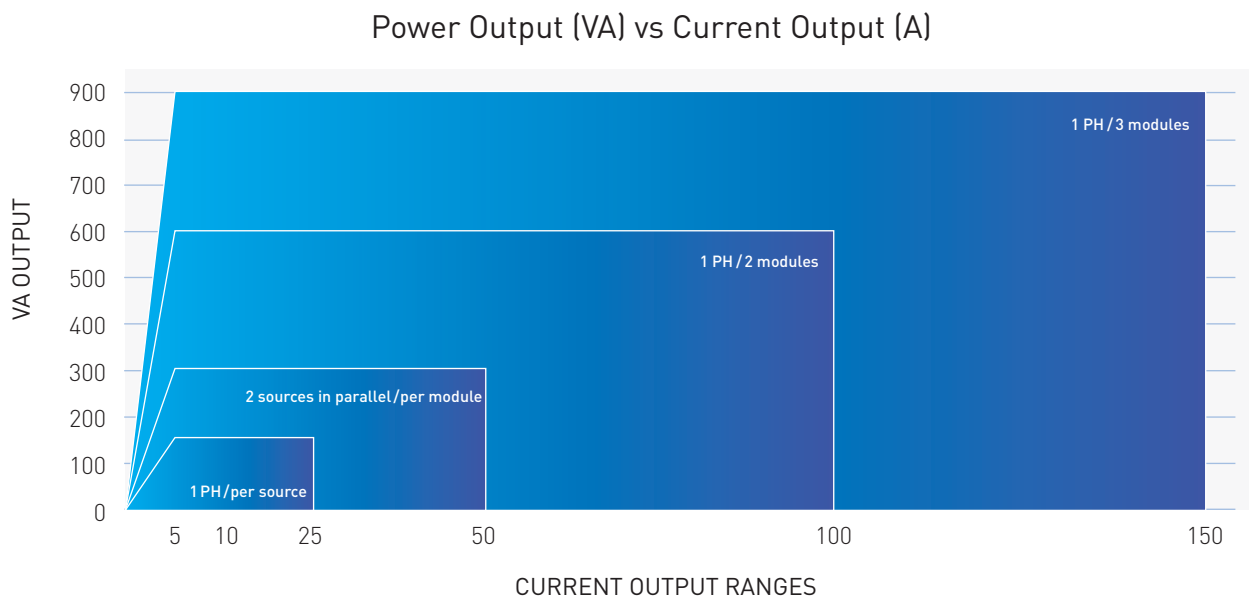
3 x HVA Current Modules

Each provides two 25 A sources at 150 VA per source. When both sources are connected in parallel, 50 A at 300 VA continuous power is produced per module. Transient mode extends power and range up to 90 A at 300 VA for 30 seconds per module. DC output is 50 A per module.

Drive this F8200 with your existing Protection Suite and RTS test procedures. The state-of-the-art digital componentry enables powerful simulations that include the necessary communication functions for testing modern protection schemes including architectures based on the IEC 61850 standard.

This F8200 can be ordered with a wrap-around protective bumper and carrying accessories, or with brackets and hardware for rack-mounting the instrument in 19" racks.

The versatility of F8000-series Power System Simulators like this F8200 model let you easily scale your test capabilities to the requirements presented by your protection systems. Simply connect this F8200 to other F8000-series instruments to expand your use case possibilities.



Logic I/O Module Accessories

Instrument and Accessory Bags

Current Module Accessories

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DOBLE PROTECTION TESTING

F8300 CHASSIS

Seven-module F8000 test set frame

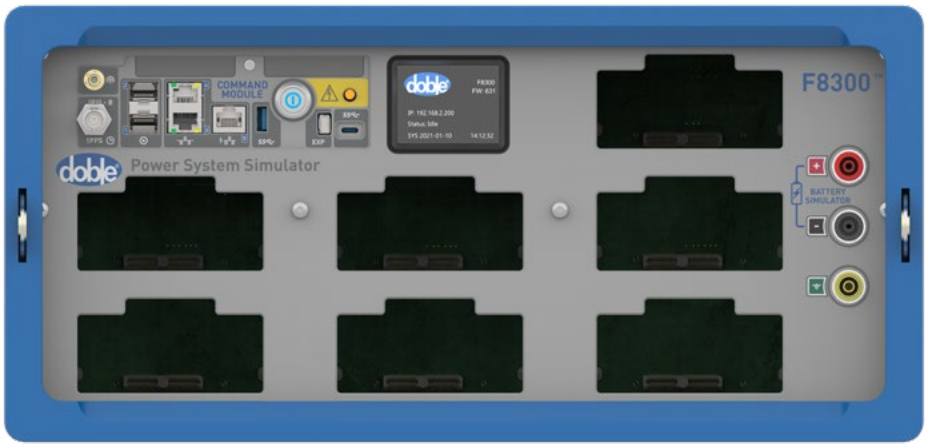
An all-in-one, three-phase protection test instrument.

An F8300 model Power System Simulator is a seven-module F8000-series protection test instrument available in five standard configurations of HVA Current, HVA Voltage, and Low-Density Logic I/O modules.

The embedded Command Module has state-of-the-art digital componentry that works with your existing Protection Suite and RTS test procedures for powerful simulations that include the necessary communication functions for testing modern protection schemes including architectures based on the IEC 61850 standard.

The F8300 comes with a 90 W battery simulator and can be ordered with a wrap-around protective bumper and carrying accessories, or with brackets and hardware for rack-mounting the instrument in 19" racks.

The versatility of F8000-series Power System Simulators like the F8300 let you easily scale your test capabilities to the requirements presented by your protection systems. Simply connect an F8300 to other F8000-series instruments to expand your use case possibilities.



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F8300 Chassis Technical Data		
Power Supply	Power Supply Range	100 VAC to 240 VAC (-10/+25 V)
	Power Supply Frequency	50/60 Hz ±3 Hz
	Maximum System Power Available	120 VAC / 1800 W 240 VAC / 3200 W
	Maximum Amplifier Power Available	120 VAC / 1800 W limited by system power 240 VAC / 3200 W
Battery Simulator	Range	6 VDC to 300 VDC
	Power Output	90 W
	Resolution	1 V
	Output Current	1.5 A
	Max Voltage Ripple	0.2 % of range
	Accuracy	< ±5 %
Certifications	Environmental	IEC 60068-2-1 (cold storage & operating) IEC 60068-2-2 (dry heat storage & operating) IEC 60068-2-30 (damp heat storage & operating)
	Mechanical	IEC 60068-2-6 (vibration resilience) IEC 60068-2-27 (mechanical shock resilience) IEC 60068-2-64 (rotational drop resilience) IEC 60529 IP20 (water and dust resistance)
	Safety	IEC/EN 61010-1 & UL 61010-1 & CSA C22.2#61010-1-12:2012 IEC/EN 60825-1:2014
	EMC	FCC 47 CFR Part 15, Class A (USA) ICES-001 Issue 3 ISM (Canada) EN55011:2016 AS/NZS CISPR11:2019 EN61326:2013 EN610000-6-2 EN610000-4-2/3/4/5/6/11
	Other	RoHS
Environmental	Operating Temperature	14° to 122° F (-10° to 50° C)
	Storage Temperature	-58° to 185° F (-50° to 85° C)
	Humidity Range	Up to 95 % relative humidity, non-condensing
Chassis	Size	W: 17.25" (43.8 cm) H: 7.75" (19.7 cm) D: 13" (33 cm)
	Frame Weight	22 lbs. (10 kg)

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PUBLISHED: APRIL, 2023

DOBLE PROTECTION TESTING

F8300-1 POWER SYSTEM SIMULATOR

Standard configuration of logic, voltage and current modules

F8000-series Power System Simulators are modular instruments configured from a versatile hardware platform that enables numerous chassis and module combinations. The expanded F8300 model is a seven-module instrument that is available in five standard configurations. Each unique configuration provides particular capabilities for a variety of conventional and digital protection testing applications.

Configuration 1 of the F8300 Power System Simulator includes a Command Module, a 6 - 300 VDC 90 W battery simulator, a Low-Density Logic I/O module, three High VA Voltage modules, and three High VA Current modules. This F8300 configuration is designed for three-phase simulations making it ideal for differential testing.

Command Module

Displays instrument status information and provides central control from Protection Suite and Doble RTS software. IEC 61850-compliant communication and synchronization functions are hosted and connections to other F8000-series instruments are supported.

1 x Low-Density Logic I/O Module

Provides four pairs of programmable input/output ports with LED light rings that indicate port assignments and changes in monitored voltage, current and contact states. The optional **F8800 DC Metering and Transducer** upgrade enables testing of transducers and Class 2 meters.

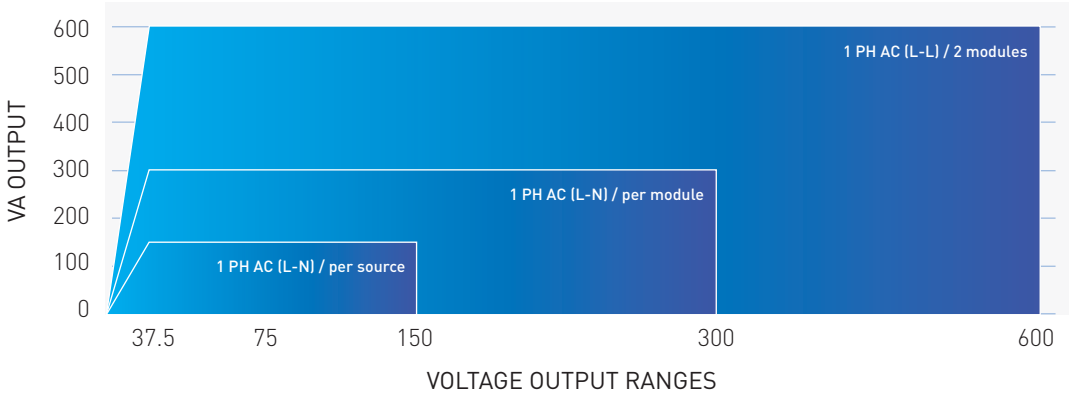
3 x HVA Voltage Modules

Each provides two 150 V sources at 150 VA or one 300 V source at 300 VA with both channels connected in parallel. The **F8810 Convertible Mode** option converts outputs of the HVA Voltage Module into high-VA/low-range current sources.

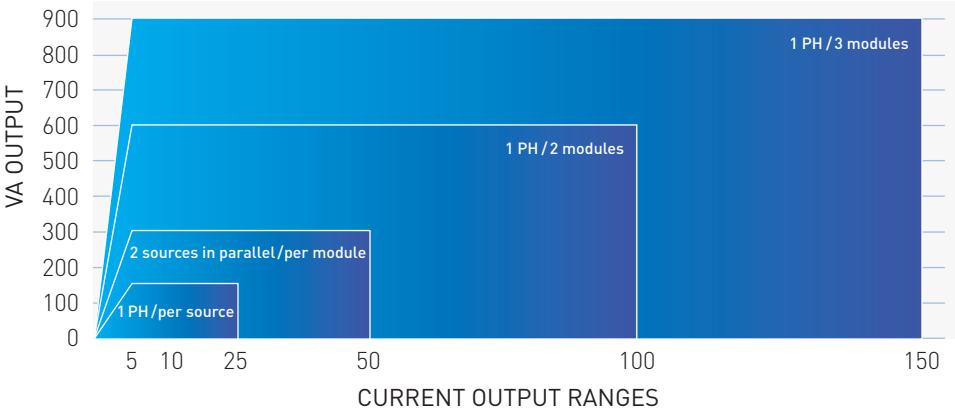
3 x HVA Current Modules

Each provides two 25 A sources at 150 VA per source. When both sources are connected in parallel, 50 A at 300 VA continuous power is produced per module. Transient mode extends power and range up to 90 A at 300 VA for 30 seconds per module. DC output is 50 A per module.

Power Output (VA) vs Voltage Output (V)



Power Output (VA) vs Current Output (A)



Drive this F8300 with your existing Protection Suite and RTS test procedures. The state-of-the-art digital componentry enables powerful simulations that include the necessary communication functions for testing modern protection schemes including architectures based on the IEC 61850 standard.

This F8300 can be ordered with a wrap-around protective bumper and carrying accessories, or with brackets and hardware for rack-mounting the instrument in 19" racks.

The versatility of F8000-series Power System Simulators like this F8300 model let you easily scale your test capabilities to the requirements presented by your protection systems. Simply connect this F8300 to other F8000-series instruments to expand your use case possibilities.

Instrument and Accessory Bags

Logic I/O Module Accessories

Voltage Module Accessories

Current Module Accessories

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DOBLE PROTECTION TESTING

F8300-2 POWER SYSTEM SIMULATOR

Standard configuration of logic, voltage and current modules

F8000-series Power System Simulators are modular instruments configured from a versatile hardware platform that enables numerous chassis and module combinations. The expanded F8300 model is a seven-module instrument that is available in five standard configurations. Each unique configuration provides particular capabilities for a variety of conventional and digital protection testing applications.

Configuration 2 of the F8300 Power System Simulator includes a Command Module, a 6 - 300 VDC 90 W battery simulator, a Low-Density Logic I/O module, four High VA Voltage modules, and two High VA Current modules. This F8300 configuration has the voltage sources necessary for simulations required by generator protection schemes.

Command Module

Displays instrument status information and provides central control from Protection Suite and Doble RTS software. IEC 61850-compliant communication and synchronization functions are hosted and connections to other F8000-series instruments are supported.

1 x Low-Density Logic I/O Module

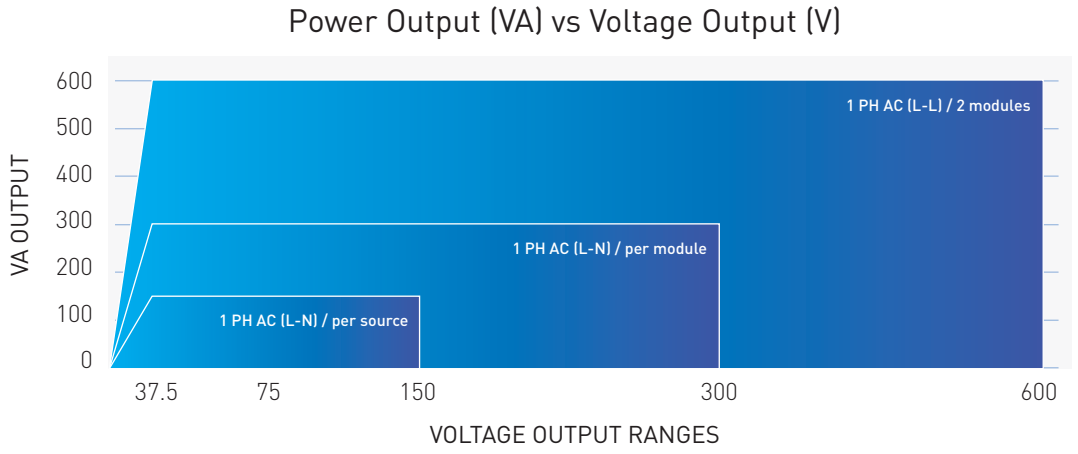
Provides four pairs of programmable input/output ports with LED light rings that indicate port assignments and changes in monitored voltage, current and contact states. The optional **F8800 DC Metering and Transducer** upgrade enables testing of transducers and Class 2 meters.

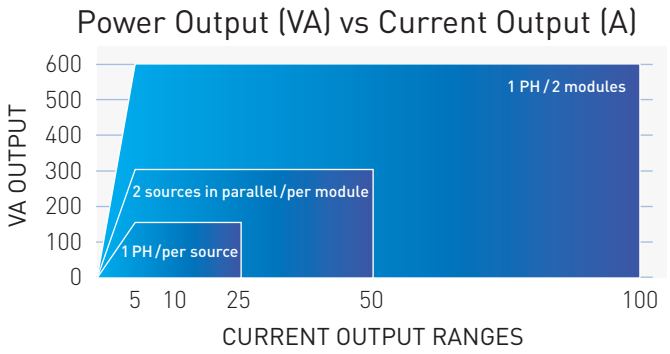
4 x HVA Voltage Modules

Each provides two 150 V sources at 150 VA or one 300 V source at 300 VA with both channels connected in parallel. The **F8810 Convertible Mode** option converts outputs of the HVA Voltage Module into high-VA/low-range current sources.

2 x HVA Current Modules

Each provides two 25 A sources at 150 VA per source. When both sources are connected in parallel, 50 A at 300 VA continuous power is produced per module. Transient mode extends power and range up to 90 A at 300 VA for 30 seconds per module. DC output is 50 A per module.





Drive this F8300 with your existing Protection Suite and RTS test procedures. The state-of-the-art digital componentry enables powerful simulations that include the necessary communication functions for testing modern protection schemes including architectures based on the IEC 61850 standard.

This F8300 can be ordered with a wrap-around protective bumper and carrying accessories, or with brackets and hardware for rack-mounting the instrument in 19" racks.

The versatility of F8000-series Power System Simulators like this F8300 model let you easily scale your test capabilities to the requirements presented by your protection systems. Simply connect this F8300 to other F8000-series instruments to expand your use case possibilities.

Instrument and Accessory Bags

Logic I/O Module Accessories

Voltage Module Accessories

Current Module Accessories

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DOBLE PROTECTION TESTING

F8300-3 POWER SYSTEM SIMULATOR

Standard configuration of logic, voltage and current modules

F8000-series Power System Simulators are modular instruments configured from a versatile hardware platform that enables numerous chassis and module combinations. The expanded F8300 model is a seven-module instrument that is available in five standard configurations. Each unique configuration provides particular capabilities for a variety of conventional and digital protection testing applications.

Configuration 3 of the F8300 Power System Simulator includes a Command Module, a 6 - 300 VDC 90 W battery simulator, two Low-Density Logic I/O modules, two High VA Voltage modules, and three High VA Current modules. This F8300 configuration offers simulations required for robust transmission scheme and transformer differential testing.

Command Module

Displays instrument status information and provides central control from Protection Suite and Doble RTS software. IEC 61850-compliant communication and synchronization functions are hosted and connections to other F8000-series instruments are supported.

2 x Low-Density Logic I/O Module

Each provides four pairs of programmable input/output ports with LED light rings that indicate port assignments and changes in monitored voltage, current and contact states. The optional **F8800 DC Metering and Transducer** upgrade enables testing of transducers and Class 2 meters.

2 x HVA Voltage Modules

Each provides two 150 V sources at 150 VA or one 300 V source at 300 VA with both channels connected in parallel. The **F8810 Convertible Mode** option converts outputs of the HVA Voltage Module into high-VA/low-range current sources.

3 x HVA Current Modules

Each provides two 25 A sources at 150 VA per source. When both sources are connected in parallel, 50 A at 300 VA continuous power is produced per module. Transient mode extends power and range up to 90 A at 300 VA for 30 seconds per module. DC output is 50 A per module.

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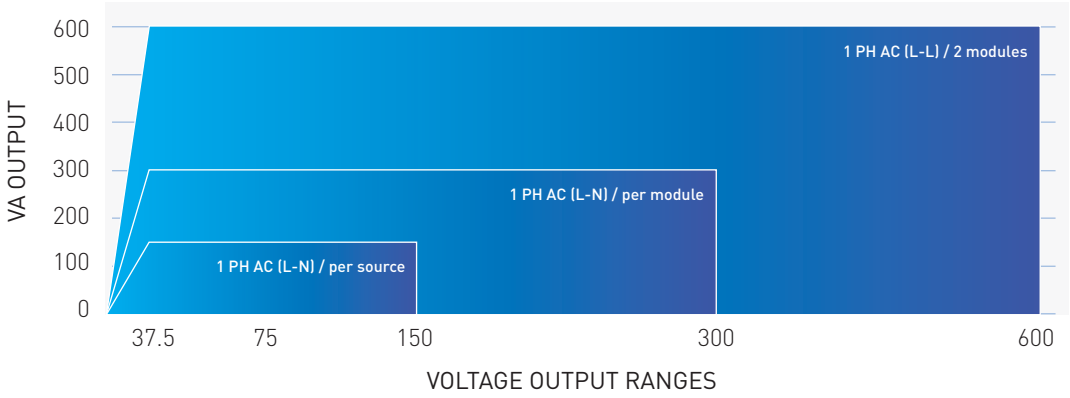
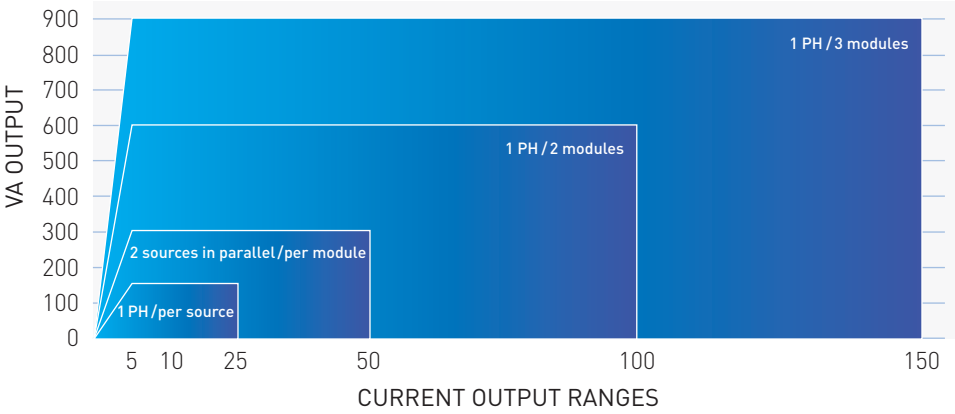


Power Output (VA) vs Current Output (A)



Drive this F8300 with your existing Protection Suite and RTS test procedures. The state-of-the-art digital componentry enables powerful simulations that include the necessary communication functions for testing modern protection schemes including architectures based on the IEC 61850 standard.

This F8300 can be ordered with a wrap-around protective bumper and carrying accessories, or with brackets and hardware for rack-mounting the instrument in 19" racks.

The versatility of F8000-series Power System Simulators like this F8300 model let you easily scale your test capabilities to the requirements presented by your protection systems. Simply connect this F8300 to other F8000-series instruments to expand your use case possibilities.

Instrument and Accessory Bags

Logic I/O Module Accessories

Voltage Module Accessories

Current Module Accessories

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PUBLISHED: AUGUST, 2021

DOBLE PROTECTION TESTING

F8300-4 POWER SYSTEM SIMULATOR

Standard configuration of logic, voltage and current modules

F8000-series Power System Simulators are modular instruments configured from a versatile hardware platform that enables numerous chassis and module combinations. The expanded F8300 model is a seven-module instrument that is available in five standard configurations. Each unique configuration provides particular capabilities for a variety of conventional and digital protection testing applications.

Configuration 4 of the F8300 Power System Simulator includes a Command Module, a 6 - 300 VDC 90 W battery simulator, three Low-Density Logic I/O modules, two High VA Voltage modules, and two High VA Current modules. This F8300 configuration offers simulations required for phase-to-phase transformer protection testing.

Command Module

Displays instrument status information and provides central control from Protection Suite and Doble RTS software. IEC 61850-compliant communication and synchronization functions are hosted and connections to other F8000-series instruments are supported.

3 x Low-Density Logic I/O Module

Each provides four pairs of programmable input/output ports with LED light rings that indicate port assignments and changes in monitored voltage, current and contact states. The optional **F8800 DC Metering and Transducer** upgrade enables testing of transducers and Class 2 meters.

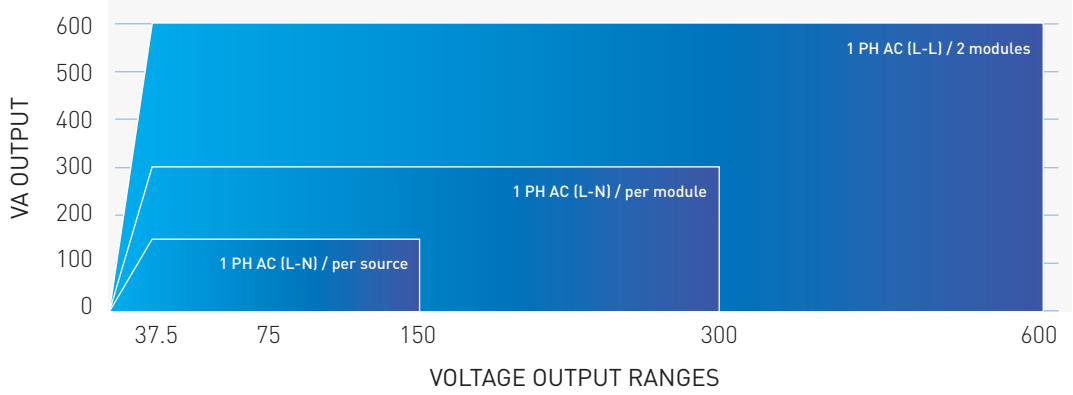
2 x HVA Voltage Modules

Each provides two 150 V sources at 150 VA or one 300 V source at 300 VA with both channels connected in parallel. The **F8810 Convertible Mode** option converts outputs of the HVA Voltage Module into high-VA/low-range current sources.

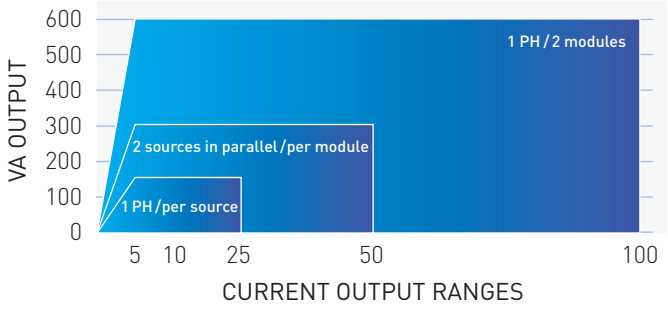
2 x HVA Current Modules

Each provides two 25 A sources at 150 VA per source. When both sources are connected in parallel, 50 A at 300 VA continuous power is produced per module. Transient mode extends power and range up to 90 A at 300 VA for 30 seconds per module. DC output is 50 A per module.

Power Output (VA) vs Voltage Output (V)



Power Output (VA) vs Current Output (A)



Drive this F8300 with your existing Protection Suite and RTS test procedures. The state-of-the-art digital componentry enables powerful simulations that include the necessary communication functions for testing modern protection schemes including architectures based on the IEC 61850 standard.

This F8300 can be ordered with a wrap-around protective bumper and carrying accessories, or with brackets and hardware for rack-mounting the instrument in 19" racks.

The versatility of F8000-series Power System Simulators like this F8300 model let you easily scale your test capabilities to the requirements presented by your protection systems. Simply connect this F8300 to other F8000-series instruments to expand your use case possibilities.

Instrument and Accessory Bags

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DOBLE PROTECTION TESTING

F8300-5 POWER SYSTEM SIMULATOR

Standard configuration of logic, voltage and current modules

F8000-series Power System Simulators are modular instruments configured from a versatile hardware platform that enables numerous chassis and module combinations. The expanded F8300 model is a seven-module instrument that is available in five standard configurations. Each unique configuration provides particular capabilities for a variety of conventional and digital protection testing applications.

Configuration 5 of the F8300 Power System Simulator includes a Command Module, a 6 - 300 VDC 90 W battery simulator, one Low-Density Logic I/O module, two High VA Voltage modules, and four High VA Current modules. This F8300 configuration offers simulations required for transformer differential and transmission protection testing.

Command Module

Displays instrument status information and provides central control from Protection Suite and Doble RTS software. IEC 61850-compliant communication and synchronization functions are hosted and connections to other F8000-series instruments are supported.

1 x Low-Density Logic I/O Module

Provides four pairs of programmable input/output ports with LED light rings that indicate port assignments and changes in monitored voltage, current and contact states. The optional **F8800 DC Metering and Transducer** upgrade enables testing of transducers and Class 2 meters.

2 x HVA Voltage Modules

Each provides two 150 V sources at 150 VA or one 300 V source at 300 VA with both channels connected in parallel. The **F8810 Convertible Mode** option converts outputs of the HVA Voltage Module into high-VA/low-range current sources.

4 x HVA Current Modules

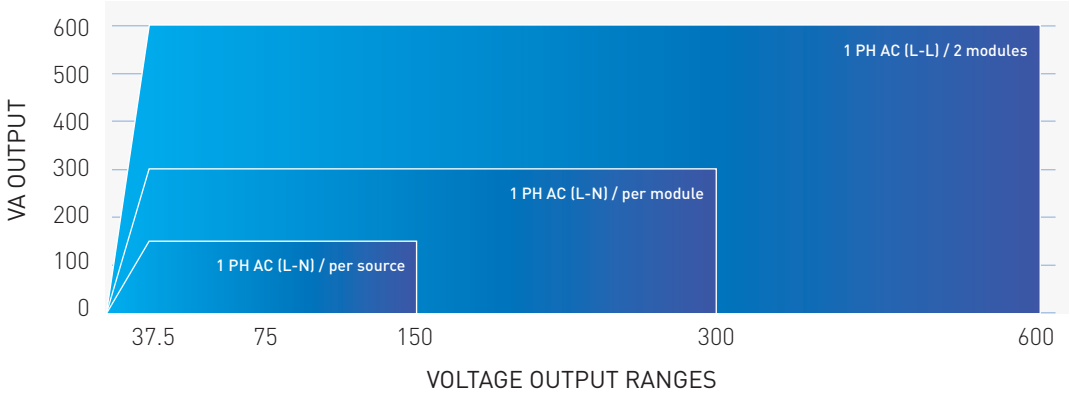
Each provides two 25 A sources at 150 VA per source. When both sources are connected in parallel, 50 A at 300 VA continuous power is produced per module. Transient mode extends power and range up to 90 A at 300 VA for 30 seconds per module. DC output is 50 A per module.

Drive this F8300 with your existing Protection Suite and RTS test procedures. The state-of-the-art digital componentry enables powerful simulations that include the necessary communication functions for testing modern protection schemes including architectures based on the IEC 61850 standard.

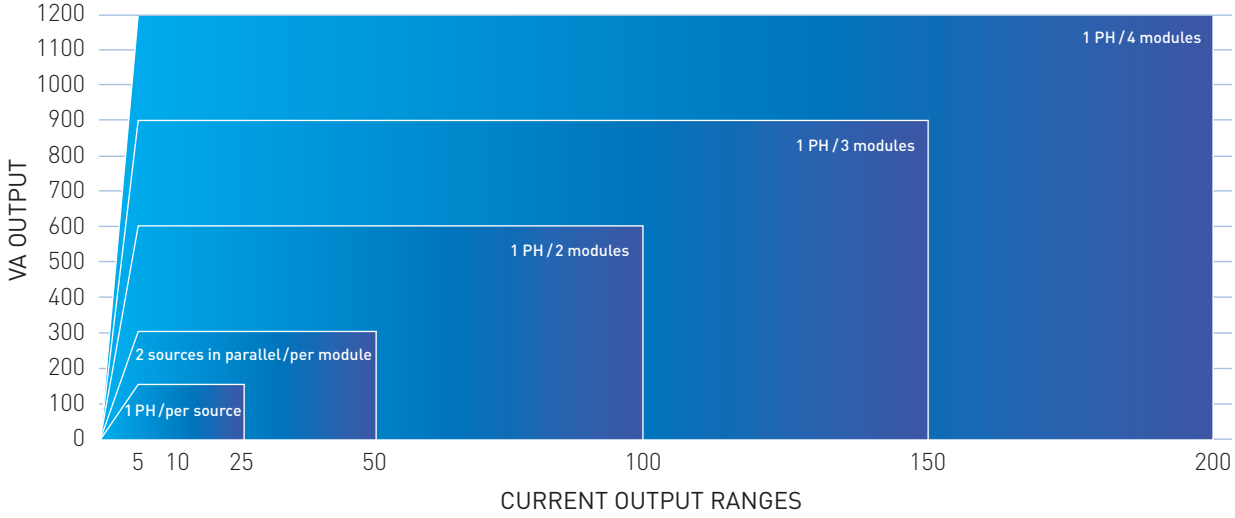
This F8300 can be ordered with a wrap-around protective bumper and carrying accessories, or with brackets and hardware for rack-mounting the instrument in 19" racks.

The versatility of F8000-series Power System Simulators like this F8300 model let you easily scale your test capabilities to the requirements presented by your protection systems. Simply connect this F8300 to other F8000-series instruments to expand your use case possibilities.

Power Output (VA) vs Voltage Output (V)



Power Output (VA) vs Current Output (A)



Instrument and Accessory Bags

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DOBLE PROTECTION TESTING

F8200 CHASSIS

Four-module F8000 test set frame

A compact instrument design for easy portability and rack mounting.

An F8200 model Power System Simulator is a four-module F8000-series protection test instrument available in four standard configurations of HVA Current, HVA Voltage, and Low-Density Logic I/O modules.

The embedded Command Module has state-of-the-art digital componentry that works with your existing Protection Suite and RTS test procedures for powerful simulations that include the necessary communication functions for testing modern protection schemes including architectures based on the IEC 61850 standard.

The F8200 comes with a 90 W battery simulator and can be ordered with a wrap-around protective bumper and carrying accessories, or with brackets and hardware for rack-mounting the instrument in 19" racks.

The versatility of F8000-series Power System Simulators like the F8200 let you easily scale your test capabilities to the requirements presented by your protection systems. Simply connect an F8200 to other F8000-series instruments to expand your use case possibilities.

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F8200 Chassis Technical Data		
Power Supply	Power Supply Range	100 VAC to 240 VAC (-10/+25 V)
	Power Supply Frequency	50/60 Hz ±3 Hz
	Maximum System Power Available	120 VAC / 1800 W 240 VAC / 3200 W
	Maximum Amplifier Power Available	120 VAC / 1600 W 240 VAC / 1600 W
Battery Simulator	Range	6 VDC to 300 VDC
	Power Output	90 W
	Resolution	1 V
	Output Current	1.5 A
	Max Voltage Ripple	0.2 % of range
	Accuracy	< ±5 %
Certifications	Environmental	IEC 60068-2-1 (cold storage & operating) IEC 60068-2-2 (dry heat storage & operating) IEC 60068-2-30 (damp heat storage & operating)
	Mechanical	IEC 60068-2-6 (vibration resilience) IEC 60068-2-27 (mechanical shock resilience) IEC 60068-2-64 (rotational drop resilience) IEC 60529 IP20 (water and dust resistance)
	Safety	IEC/EN 61010-1 & UL 61010-1 & CSA C22.2#61010-1-12:2012 IEC/EN 60825-1:2014
	EMC	FCC 47 CFR Part 15, Class A (USA) ICES-001 Issue 3 ISM (Canada) EN55011:2016 AS/NZS CISPR11:2019 EN61326:2013 EN610000-6-2 EN610000-4-2/3/4/5/6/11
	Other	RoHS
Environmental	Operating Temperature	14° to 122° F (-10° to 50° C)
	Storage Temperature	-58° to 185° F (-50° to 85° C)
	Humidity Range	Up to 95 % relative humidity, non-condensing
Chassis	Size	W: 17.25" (43.8 cm) H: 5.25" (13.3 cm) D: 13" (33 cm)
	Frame Weight	13 lbs. (5.9 kg)

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PUBLISHED: APRIL, 2023

DOBLE PROTECTION TESTING

F8810 CONVERTIBLE MODE OPTION

F8000 HVA Voltage Module Upgrade

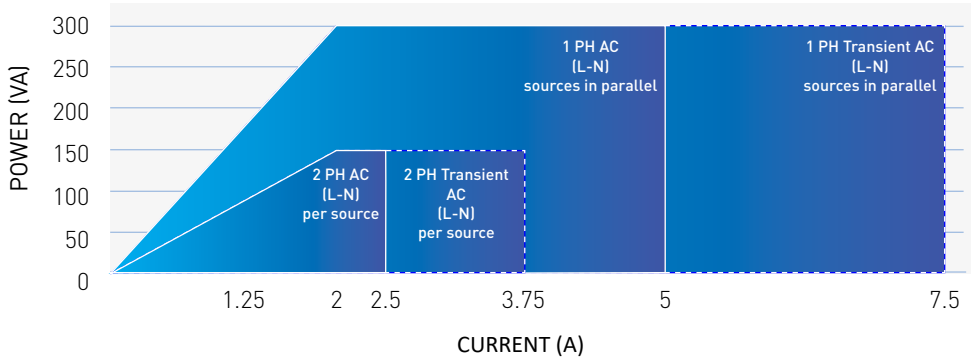
Converts outputs of F8000 HVA Voltage Module into high-VA/low-range current sources.

The **F8810 Convertible Mode** option expands your F8000-series Power System Simulator by providing extra current sources when testing high-burden relay elements or when needing high compliance voltage.

This option enables the convertible mode of your instrument's HVA Voltage Module(s) and provides multiple ranges, each capable of delivering full power during testing.

F8810 Convertible Mode Technical Data

Power	Outputs	2
	Range	1.25 A, 2.5 A, 3.75 A, 5 A, 7.5 A
	Resolution	1 mA
	Source Configurations	
	1-phase AC	1 x 5 A at 300 VA
	1-phase Transient AC	1 x 7.5 A at 300 VA
	2-phase AC	2 x 2.5 A / 75 V rms at 150 VA
	2-phase Transient AC	2 x 3.75 A at 150 VA
	1-phase DC	5 A at 300 W
	2-phase DC	2.5 A at 150 W
	CONVERTIBLE MODE POWER OUTPUT (VA) vs. CURRENT OUTPUT (A)	
Accuracy	20 Hz to 60 Hz and 20 °C to 30 °C - Guaranteed	±0.09 % of reading + 0.04 % of range
	THD + N (50 Hz / 60 Hz)	0.15 %
	Phase Angle (50 Hz / 60 Hz) - Guaranteed	<0.1°



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