



DOBLE PROTECTION TESTING

F8

MODULAR POWER SYSTEM SIMULATORS



CONFIGURABLE INSTRUMENTS FOR AUTOMATED PROTECTION AND SECONDARY DEVICE TESTING

F8 HARDWARE PLATFORM

Relay testing is not easy. The job demands knowledge that takes years to acquire in a field where generations of protection and control (P&C) technologies come into play at once. Continual change is the only certainty.

People who test relays today can handle the ever-widening technical requirements of their jobs with the capabilities that only the F8 hardware platform makes possible.



F8 componentry is modular and advanced, allowing configurations of F8200 and F8300 Power System Simulators suited to applications ranging from calibrating electromechanical relays to testing digital schemes at the cutting edge of P&C automation.





INNOVATIVE

A design that suits laboratory and field environments equally. LED rings that give visual indications of source and I/O status.

ADAPTABLE

Field replaceable voltage, current, and logic I/O modules that can be combined around your requirements.



INTEGRATED

Embedded network time and communication protocol support for conventional and IEC 61850-based protection schemes. Enhancements in Protection Suite™ and Doble RTS™ that support your existing test procedures. Relay, IED, recloser, transducer, and meter testing versatility.

SUSTAINABLE

Ongoing hardware releases on the F8 platform seamlessly and economically advance F8200 and F8300 Power System Simulators in step with changing P&C technologies.



CHASSIS

Integrated framework for versatility and modularity

Configuring your ideal F8 power system simulator begins with either of two thoughtfully designed chassis. Each includes a Command Module and a 90 W battery simulator. The F8 modules you select are easy to remove and replace at your discretion and blanks (F8710) are available for safe operation of your test set if using it with any empty module slots.

Beyond modularity, F8 chassis offer versatility. With sizes and specs equally suited to laboratory and field environments, the choice is yours whether to order them with special brackets and hardware for installing in 19" racks or with corner-and-edge protective bumpers and accessories for carrying and transporting them between job sites. For convenience with either use case, power on/off is found at both the rear (if portable) and front (if rack mounted) of your F8 test instruments.



F8200

A four-module, compact design.



F8300

A seven-module design for expanded capabilities.

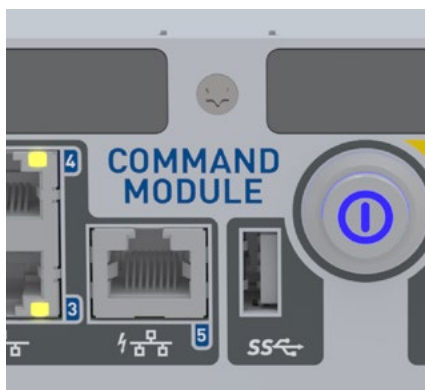


F8 Chassis Technical Data

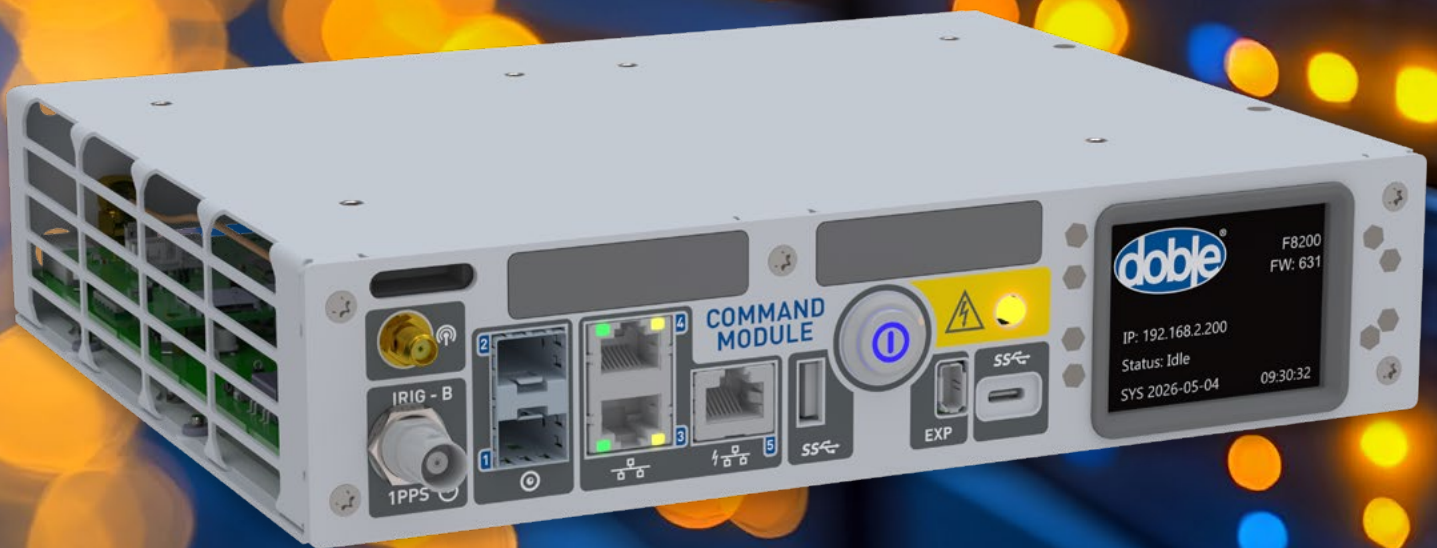
Power Supply	Power Supply Range	100 V _{AC} to 240 V _{AC} (-10/+25 V)
	Power Supply Frequency	50/60 Hz ±3 Hz
	Maximum System Power Available	120 V _{AC} / 1800 W 240 V _{AC} / 3200 W
	Maximum Amplifier Power Available	120 V _{AC} / 1600 W 240 V _{AC} / 1600 W
Battery Simulator	Range	6 V _{DC} to 300 V _{DC}
	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 - F8200	W: 17.25" (43.8 cm) H: 5.25" (13.3 cm) D: 13" (33 cm)
	Frame Weight - F8200	13 lbs. (5.9 kg)
	Size - F8300	W: 17.25" (43.8 cm) H: 7.75" (19.7 cm) D: 13" (33 cm)
	Frame Weight - F8300	22 lbs. (10 kg)

Note: Models F8200 and F8300 have protective bumpers; models F8200R and F8300R have hardware for mounting in 19" racks.

The power on/off button located on the front of the Command Module adds convenience when using rack-mounted F8 instruments, toggling the mains power switch that is located at the back of the chassis next to the power cable connection.



The **Command Module** is a multifunctional system control interface that is included with each F8 chassis. Features network, time synchronization, and control connectivity, as well as a display screen where you can see communication, sources, and version information. All functions execute from parameters configured in Protection Suite and RTS software. Firmware options are available that enable GOOSE (**F8860**), sampled values (**F8870**), or both GOOSE and sampled values combined (**F8850**) for IEC 61850-compliant digital testing.



F8 Command Module Technical Data

Communications	SFP	Ports 1 and 2 Copper/fiber selectable 1 Gbps each
	Ethernet	Ports 3, 4, and 5 Port 5 PoE at 30 W (54 V) 10/100/1000 Mbps each
	USB	1 x 3.0 Type C
Time Synchronization	PPS	NTP (Network Time Protocol) GNSS (Global Navigation Satellite Systems): GPS, QZSS, GLONASS, BeiDou
	IRIG-B	Modulated B120 Unmodulated B000
	PTP	1588 v.2 Power Profile as timeTransmitter or timeReceiver IEC 61850-9-3 Power Utility Profile as timeReceiver only
	SNTP	IP v.4 and IP v.6 Networks
IEC 61850	Performance	Type 1A Class P2/3 (IEC 61850-5)
	Certifications	IEC 61850 Edition 2 with Amendment 1 Parts 6, 7-1, 7-2, 7-3, 7-4, 8-1, 9-2, and IEC 61869 First Edition Part 9 Conformance Blocks: 9a: GOOSE publish 9b: GOOSE subscribe 11a: Sampled Values publish 13a: Time Sync SNTP 13b: Time Sync PTP Certificates available upon request.
	VLAN Support	Selectable priority and VLAN-ID
	Publishing - Sampled Values	IEC 61850 9-2 Amendment 1 (includes IEC 61869-9 and 9-2 LE profiles) 12 streams 64 sources* *The maximum of 12 streams cannot contain more than the maximum of 64 total available sources. Apply sources in your test cases in consideration of the following: • For 61869-9, maximum of 24 sources per stream. • For 9-2 LE, fixed quantity of 8 sources per stream. • I/O expends only one source regardless of quantity of analog and/or digital I/O signals.
	Publishing - GOOSE / R-GOOSE	> 1024 configurable virtual outputs (128 messages)
	Subscribing - GOOSE / R-GOOSE	1024 configurable virtual inputs
Other	Future Use	1 x USB 3.0 Type A (on/off selectable)
		1 x EXP Port
General	Display (LCD)	Diagnostics at boot up Instrument model Firmware version IP address Instrument status Battery Simulator status USB Port information Time and time synchronization source System upgrade information status Error messages
	Firmware Options	F8850 GOOSE and Sampled Values F8860 GOOSE F8870 Sampled Values
	Weight	2.25 lbs. (1.02 kg)



HD (High Density) Logic I/O Modules (F8704) have eight I/O ports that work with dual-pin adapter cables that accept 4 mm plugs of standard test leads. This unique connectivity enables polarity-based contact monitoring resulting in fewer I/O ports being necessary for recloser testing since positive and negative voltage differentials can be detected in a single connection.

For transducer and Class 2 meter testing, each port offers pulse counting and Port 8 provides DC input for meter testing..

The color-programmable LED rings indicate port assignments during test setup, turn off as tests begin, then turn back on if an input is triggered.

HD Logic I/O Modules are compatible with **F5851-series Recloser and Sectionalizer Test Cables**, the **F6071 Infrared Optical Sensor** (for meter testing), the **F6072 Visible Light Optical Sensor** (for meter testing), and the **F6073 Meter Disk Sensor** (for testing meters and transducers).



F8 HD Logic I/O Module Technical Data

Common Input/Output		# I/O		
		LD Module	4	
		HD Module	8	
		Range	0 to 300 V _{AC} / 424 V _{DC}	
		Maximum Voltage Input	±500 V _{peak}	
		Maximum Current Input	8 A	
		Input Impedance	720 kΩ	
		Response Time		
		LD Module	< 100 μs	
HD Module	42 μs max pickup / dropout			
		Max Make/Break Current	8 A	
		Threshold Sense	0 - ±300 V _{AC} / 0 - ±424 V _{DC} (Programmable)	
DC Metering		Inputs		
		LD Module	Port 4	
		HD Module	Port 8	
		Range	0 - ±10 V _{DC} / 0 - ±20 mA _{DC}	
		Accuracy - Voltage		
		LD Module	< 0.05 % of range guaranteed	
		HD Module	< 0.05 % of range guaranteed	
		Accuracy - Current		
		LD Module	< 0.05 % of range guaranteed	
		HD Module	< 0.05 % of range guaranteed	
		Counters	Inputs	
			LD Module	Port 4
			HD Module	Ports 1 - 8
Max Counting Frequency	100 kHz			
Threshold Voltage	1 V			
Voltage Hysteresis	1 V			
Max Input Voltage	±40 V			
Isolation				
LD Module	SELV			
HD Module	SELV ±500 V _{peak}			
		Frequency	33 kHz	
		Pulse Width	> 60 μs	
Connection		Lighted Ports	Color-programmable LED rings	
		LD Module	4 mm Banana	
		HD Module	Two-socket ports with adapter cables to 4 mm Banana	
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)	



HVA VOLTAGE MODULE

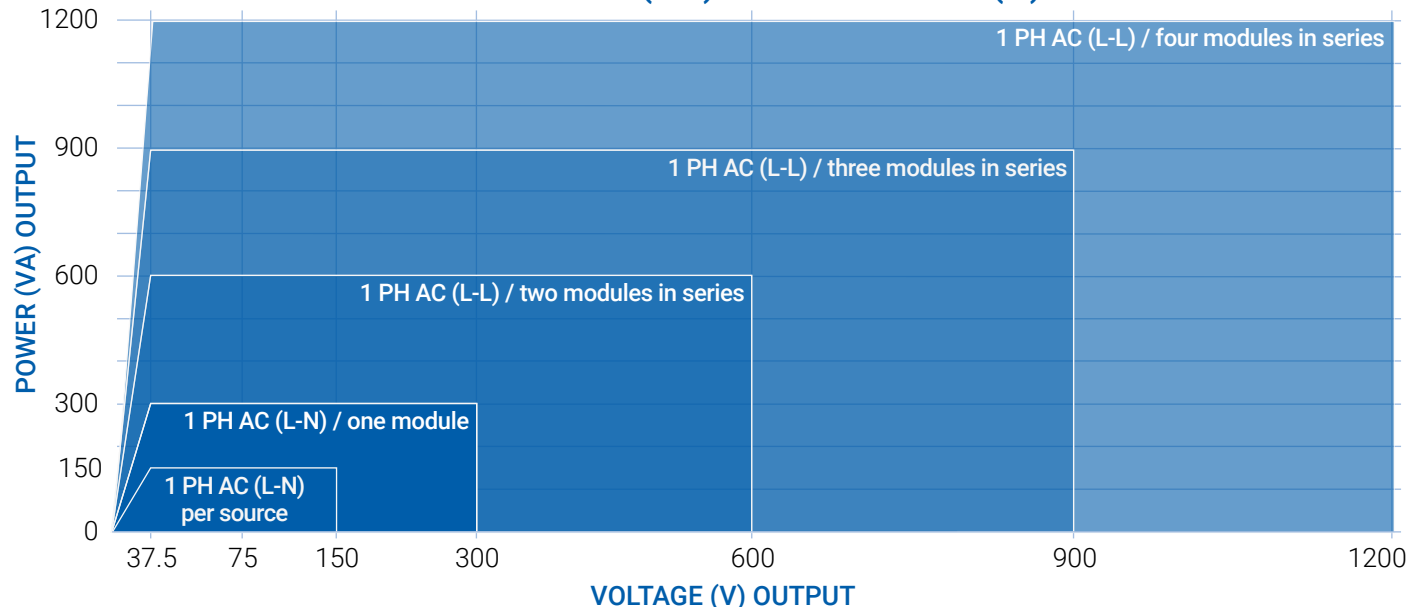
Two voltage sources with programmable LED rings

HVA (High VA) Voltage Modules

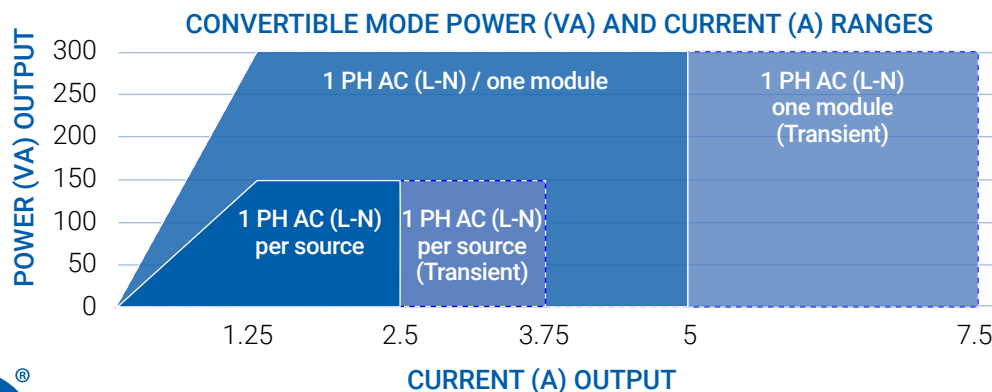
(F8701) provide two 150 V sources at 150 VA or one 300 V source at 300 VA when the sources are connected in parallel which is set internally through configuration instead of external lead changes. For safety and to prevent hardware damage, HVA Voltage Modules automatically stop operating and the LEDs turn red when sensing short circuit conditions.



CONTINUOUS POWER (VA) AND VOLTAGE (V) RANGES



Use **Convertible Mode** to produce high-VA/low-range current sources which can also be configured in parallel or series for providing high compliance voltage in multiple ranges for testing high-burden relay elements.



F8 HVA Voltage Module Technical Data

Power	Outputs	2
	Range	37.5 V, 75 V, 150 V, 300 V
	Accuracy (50 Hz / 60 Hz @ 20 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 424 V at 300 W 1 x 212 V at 300 W 1 x 106 V at 300 W 2-phase DC (L-N) 2 x 212 V at 150 W 2 x 106 V at 150 W 2 x 53 V at 150 W
Frequency	Bandwidth	3 kHz
	Range	Sine Signals Harmonic, Inter-harmonic, Transient
	Accuracy (50 Hz / 60 Hz) @ 20 to 30 °C @ -20 to 50 °C	1 kHz (DC) 3 kHz (DC), derates 50 % at 10 kHz bandwidth 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)

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 (30 seconds)	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 (30 seconds)	2 x 3.75 A at 150 VA
	1-phase DC	5 A at 300 W
Accuracy	2-phase DC	2.5 A at 150 W
	20 Hz to 60 Hz and 20 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°

HVA CURRENT MODULE

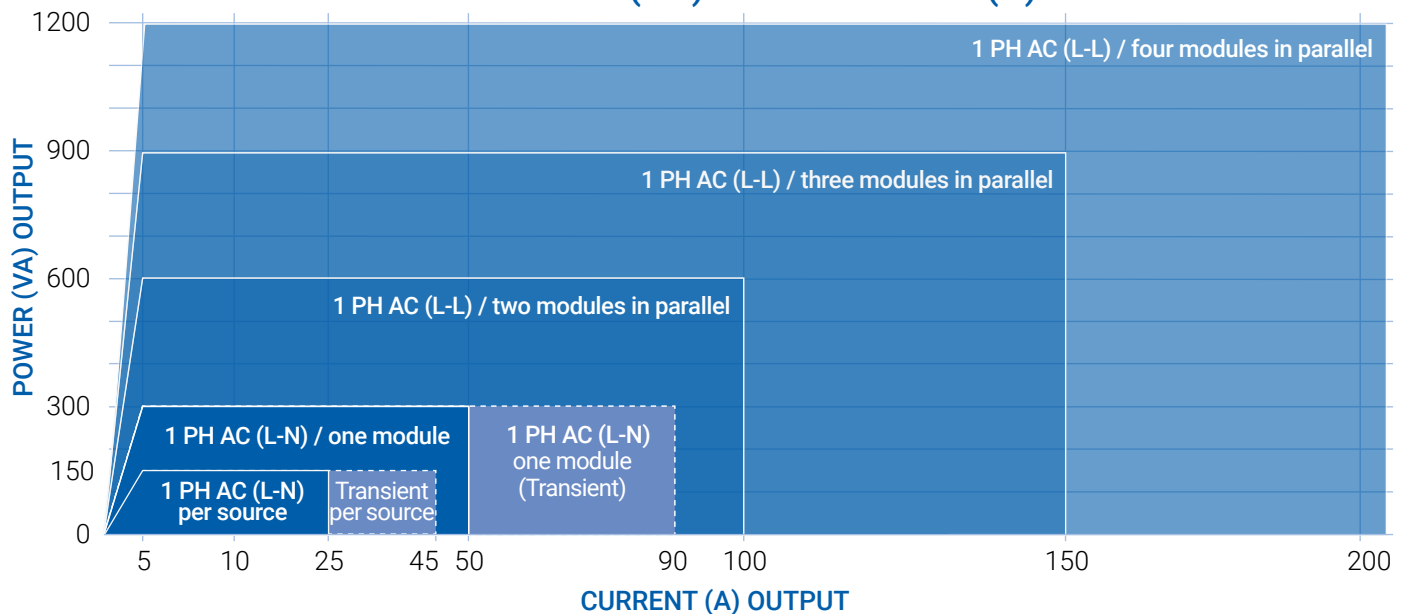
Two current sources with programmable LED rings



HVA (High VA) Current Modules (F8702) provide 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 the range up to 90 A at 300 VA for 30 seconds. DC output is 50 A.

For safety and to prevent hardware damage, HVA Voltage Modules automatically stop operating and the LEDs turn red when sensing open circuit conditions.

CONTINUOUS POWER (VA) AND CURRENT (A) RANGES



HVA CURRENT MODULE TECHNICAL DATA

Power	AMPLIFIER RANGES					
		Amps	Time	Volt-Amperes	Compliance Voltage	Output Voltage
Power	Single Source	5 A	Continuous	150 VA	27.5 V _{rms} , 40 V _{peak}	30 V _{rms}
		10 A	Continuous	150 VA	27.5 V _{rms} , 40 V _{peak}	15 V _{rms}
		25 A	Continuous	150 VA	27.5 V _{rms} , 40 V _{peak}	6 V _{rms}
		45 A	Transient (30 seconds)	150 VA	27.5 V _{rms} , 40 V _{peak}	5 V _{rms}
	Sources in Parallel	10 A	Continuous	300 VA	27.5 V _{rms} , 40 V _{peak}	30 V _{rms}
		20 A	Continuous	300 VA	27.5 V _{rms} , 40 V _{peak}	15 V _{rms}
		50 A	Continuous	300 VA	27.5 V _{rms} , 40 V _{peak}	6 V _{rms}
		90 A	Transient (30 seconds)	300 VA	27.5 V _{rms} , 40 V _{peak}	5 V _{rms}
	Sources in Series	5 A	Continuous	300 VA	55 V _{rms} , 80 V _{peak}	60 V _{rms}
		10 A	Continuous	300 VA	55 V _{rms} , 80 V _{peak}	30 V _{rms}
		25 A	Continuous	300 VA	55 V _{rms} , 80 V _{peak}	12 V _{rms}
		45 A	Transient (30 seconds)	300 VA	55 V _{rms} , 80 V _{peak}	10 V _{rms}
	DC	25 A at 150 W (single source)				
		50 A at 300 W (both sources)				
	Accuracy (50 Hz / 60 Hz @ 20 to 30 °C) ¹			±0.15 % of reading + 0.05 % of range		
	Resolution			1 mA		
Frequency	Bandwidth			DC - 3 kHz		
	Range			1 kHz (DC)		
	Sine Signals			3 kHz (DC), derates 50 % at 10 kHz bandwidth		
	Harmonic, Inter-harmonic, Transient					
	Accuracy (50 Hz / 60 Hz) @ 20 to 30 °C @ -20 to 50 °C			1.5 ppm 10 ppm		
	Resolution			1 mHz		
Phase	Range			-360° to +360°		
	Accuracy (50 Hz / 60 Hz)			< 0.05°		
	Resolution			0.01°		
General	THD (50 Hz / 60 Hz) ²			0.23 %		
	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 Accuracy (50 Hz / 60 Hz @ 20 to 30 °C) < 2.0 A = 0.09 % reading + 0.1 % range

² THD (50 Hz / 60 Hz) > 2.5 A / 1 Ohm @ 20 kHz bandwidth, 0.07 % test measurement uncertainty to be added

CONFIGURE YOUR IDEAL TEST SET

The F8 platform lets you decide chassis and module combinations that make sense for your unique testing requirements. These popular configurations showcase the flexibility of F8200 and F8300 Power System Simulators for a range of protection testing applications:



F8200

Electromechanical and Numerical Relay Testing:

- 1 x HVA Voltage module
- 2 x HVA Current modules
- 1 x HD Logic I/O module

Single-phase Testing and 3-phase Directional Voltage Simulations:

- 2 x HVA Voltage modules
- 1 x HVA Current module
- 1 x HD Logic I/O module

Digital/Hybrid Scheme Testing:

- 4 x HD Logic I/O modules

Single-phase High Current Testing:

- 3 x HVA Current modules
- 1 x HD Logic I/O module



F8300

3-phase Differential and Distance Testing:

- 3 x HVA Voltage modules
- 3 x HVA Current modules
- 1 x HD Logic I/O module

Generation Protection Scheme Testing:

- 4 x HVA Voltage modules
- 2 x HVA Current modules
- 1 x HD Logic I/O module

Transformer Differential and Transmission Protection Scheme Testing:

- 2 x HVA Voltage modules
- 3 x HVA Current modules
- 2 x HD Logic I/O modules

3-phase and Phase-to-Phase Transformer Protection Testing:

- 2 x HVA Voltage modules
- 2 x HVA Current modules
- 3 x HD Logic I/O modules

3-phase Transformer Differential and Transmission Protection Testing:

- 2 x HVA Voltage modules
- 4 x HVA Current modules
- 1 x HD Logic I/O module



F8 CONTROL AND TEST AUTOMATION

Protection Suite and Doble RTS software support F8 test sets using your existing test procedures to keep your process intact while you take advantage of new features that take your testing further.



Protection Suite

New versions feature an intuitive interface for efficient F8 instrument setup and support exclusive releases that grow the F8 platform, such as the Advanced State Simulation test module (v.5.3 and later) which offers tools that expand system testing of digital schemes that are based on IEC 61850.

Doble RTS

Realistic images that match configurations applied to F8 instruments, and a powerful IEC 61850 interface (v.7.3 and later) that streamlines digital test setup without altering Library or System routines, showcase simplicity that supports time savings and productivity on the F8 platform.



ACCESSORIES

Included

Sets of cables, leads and fittings plus bags per each chassis and module.



Chassis and Command Module Accessories



HVA Voltage / HVA Current Module Accessories



HD Logic I/O Module Accessories



Module and Accessory Bags



Optional

Extend your F8 test cases and protect your instruments during storage and transport.



F5851-series Recloser and
Sectionalizer Test Cables



F6071 Infrared Optical Sensor
for meter testing



F6072 Visible Light Optical Sensor
for meter testing



F8895 Satellite Receiver Antenna



F6073 Meter Disk Sensor
for testing meters and transducers



Shipping Trunk (903-0273)



Travel Case (903-0274)



F8

MODULAR POWER SYSTEM SIMULATORS



- Four-module F8200 and seven-module F8300 chassis available
- Field-replaceable logic I/O, voltage, and current modules with LED rings for clarity and safety
- Designed for easy portability or mounting in 19" racks
- Backward compatible with existing Protection Suite test plans and RTS routines
- Supports conventional and IEC 61850 digital testing

Learn more about the F8 Series [here](#). To request a demo, speak with your Doble representative.



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Doble is an ISO 9001 & ISO/IEC 17025 & 17034 Certified Company.
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