California Instruments RS Series

90–540 kVA

150–400 V

0–1500 / Phase

≋	208	230	400
	480		

ETHERNET USB GPIB RS232

Overview

- **High Power AC and DC Power Source**
  Programmable AC and DC power for frequency conversion and product test applications
- **Expandable Power Levels**
  Available output power of 90 kVA per unit and multi-unit configurations for power requirements up to 540 kVA and above
- **Arbitrary & Harmonic Waveform Generation**
  User defined voltage waveform and distortion programming
- **Regenerative, bidirectional "Green" Power Solution**
  Automatic crossover between Source and Sink power mode offers regenerative capabilities in AC, AC+DC and DC modes. Regenerate up to 100% of the rated output power back to the utility grid during sink mode operation. (-SNK option)
- **Remote Control**
  Standard RS232, USB, IEEE with optional LAN and External Drive interfaces are available for automated and hardware in-the-loop test applications.

Introduction
The RS Series consists of multiple high power AC and DC power systems that provide controlled AC and DC output for ATE and product test applications.

This high power AC and DC test system covers a wide spectrum of AC and DC power applications at an affordable cost. Using state-of-the-art PWM switching techniques, the RS series combines compactness, robustness and functionality in a compact floor-standing chassis, no larger than a typical office copying machine. This higher power density has been accomplished without the need to resort to elaborate cooling schemes or additional installation wiring. Simply roll the RS unit to its designated location (using included casters), plug it in, and the RS series is ready to work for you.

Simple Operation
The RS Series can be operated completely from its menu driven front panel controller. A backlit LCD display shows menus, setup data, and read-back measurements. IEEE-488, RS232C, USB and LAN remote control interfaces and instrument drivers for popular ATE programming environments are available. This allows the RS Series to be easily integrated into an automated test system.

For advanced test applications, the programmable controller version offers full arbitrary waveform generation, time and frequency domain measurements, and voltage and current waveform capture.

Configurations
The RS90 delivers up to 90 kVA of AC or AC + DC power. In DC mode, 50% of the AC power level is available.

For higher power requirements, the RS180, RS270, RS360, RS450 and RS540 models are available. Available reconfigurable RS models (-MB designation) provide multiple controllers which allow separation of the high power system into individual RS90 units for use in separate applications. This ability to reconfigure the system provides an even greater level of flexibility not commonly found in power systems.

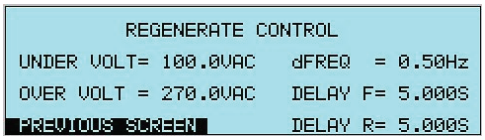
Product Evaluation and Test
Increasingly, manufacturers of high power equipment and appliances are required to fully evaluate and test their products over a wide range of input line conditions. The built-in output transient generation and read-back measurement capability of the RS Series offers the convenience of a powerful, and easy to use, integrated test system.

AMETEK
Programmable Power
9250 Brown Deer Road
San Diego, CA 92121-2267
USA

AMETEK® PROGRAMMABLE POWER

Regenerative, bidirectional "Green" Power Solution

The RS Series features the ability to both source and sink current, i.e. bi-directional current flow. The RS amplifier is designed to reverse the phase relationship between the AC input voltage and current in order to feed power back onto the utility grid. This mode of operation is particularly useful when testing grid-tied products that feed energy back onto the grid. Static Power Converters such as grid-tied and off-grid photovoltaic inverters are tested for frequency variations, voltage transients, DC injection and harmonic susceptibility.



Programming sink (-SNK) mode operation

Avionics

With an output frequency range to 819 Hz (or 1000 Hz with -HF option), the RS Series is well suited for aerospace applications. Precise frequency control and accurate load regulation are key requirements in these applications. The IEEE-488 remote control interface and SCPI command language provide for easy integration into existing ATE systems. The RS Series eliminates the need for several additional pieces of test equipment, saving cost and space. Instrument drivers for popular programming environments such as National Instruments LabView™ are available to speed up system integration.

Regulatory Testing

As governments are moving to enforce product quality standards, regulatory compliance testing is becoming a requirement for a growing number of manufacturers. The RS Series is designed to meet AC source requirements for use in compliance testing such as IEC 61000, 3-2, 3-3, 3-11, 3-12, to name a few.

Choice of voltage ranges

The RS Series includeds 150V and 300V line to neutral. These models provide 3 phase output capability of 260 Vac or 520 Vac line to line respectively.

For applications requiring more than 300 V L-N (or 520 V L-L), the optional -HV output transformer provides an additional 400 V L-N and 693 V L-L output range for use in AC mode only. For custom applications the XV option is availible and is user defined and offers up to 600VL-N (1,038VL-L)

High Crest Factor

With a crest factor of up to 3.6, the RS Series AC source can drive difficult nonlinear loads with ease. Since many modern products use switching power supplies, they have a tendency to pull high repetitive peak currents. The RS90 can deliver up to 720 Amps of repetitive peak current (150 V AC range) per phase to handle high crest factor three phase loads.

Remote Control

Standard RS232C USB & IEEE-488 along with optional LAN remote control interfaces allow programming of all instrument functions from an external computer. The popular SCPI command protocol is used for programming.

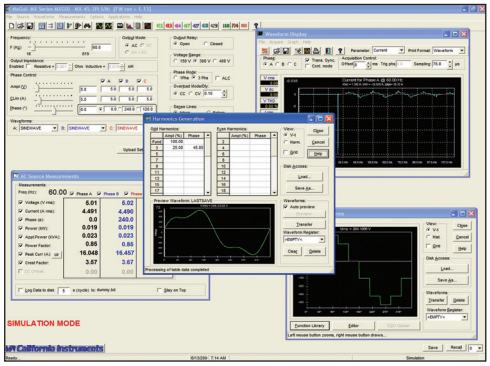
Optional External Drive (EXTD) allows external analog signal control of the source while in AC operation, essentially turning the source into a high bandwidth amplifier. Most common applications include hardware in the loop (HIL) simulation of power plants, hybrid electric vehicles and most recently renewable energy generation and their effect on the utility grid. Reference EXTD white paper for additional performance details by visiting our website.

Application Software

Windows® application software is included. This software provides easy access to the power source's capabilities without the need to develop any custom code. The following functions are available through this GUI program:

- Steady state output control (all parameters)
- Create, run, save, reload and print transient programs
- Generate and save harmonic waveforms.
- Generate and save arbitrary waveforms.
- Measure and log standard measurements
- Capture and display output voltage and current waveforms.
- Measure, display, print and log harmonic voltage and current measurements.
- Display IEEE-488, RS232C, USB and LAN bus traffic to and from the AC Source to help you develop your own test programs.

1.Requires PC running Windows 7, XP™ or Windows 2000™ / 2007.



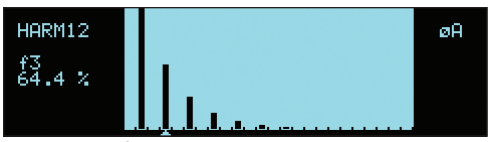
Harmonic Waveform Generation

Using the latest DSP technology, the RS Series programmable controller is capable of generating harmonic waveforms to test for harmonics susceptibility. The Windows Graphical User Interface program can be used to define harmonic waveforms by specifying amplitude and phase for up to 50 harmonics. The waveform data points are generated and downloaded by the GUI to the AC source through the remote interface. Up to 200 waveforms can be stored in nonvolatile memory and given a user defined name for easy recall.

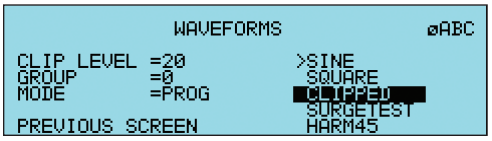
All RS Series configurations offer three phase waveform generation, allowing independent phase anomalies to be programmed. It also allows simulation of unbalanced harmonic line conditions.

Arbitrary Waveform Generation

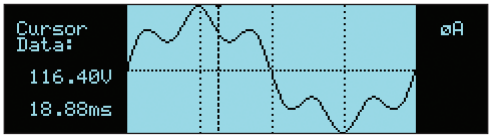
Using the provided GUI program or custom software, the user also has the ability to define arbitrary AC waveforms. The arbitrary waveform method of data entry provides an alternative method of specifying AC anomalies by providing specific waveform data points. The GUI program provides a catalog of custom waveforms and also allows real-world waveforms captured on a digital oscilloscope to be downloaded to one of the many AC source's waveform memories. Arbitrary waveform capability is a flexible way of simulating the effect of real-world AC power line conditions on a unit under test in both engineering and production environments.



Harmonic waveform, Fund., 3rd, 5th, 7th, 9th, 11th and 13th.



Two hundred user defined waveforms.



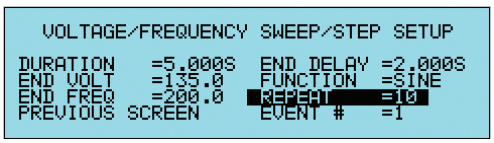
Harmonically distorted waveform.

RS Series - AC and DC Transient Generation

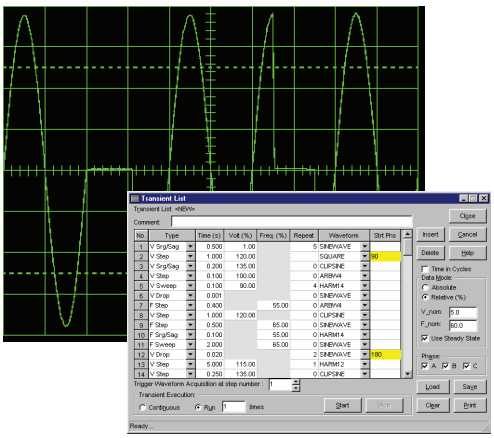
The RS Series controller has a powerful AC and DC transient generation system that allows complex sequences of voltage, frequency and waveshapes to be generated. This further enhances the RS's capability to simulate AC line conditions or DC disturbances. When combined with the multiphase arbitrary waveform capabilities, the AC and DC output possibilities are truly exceptional. Transient generation is controlled independently yet time synchronized on all three phases. Accurate phase angle control and synchronized transient list execution provide unparalleled accuracy in positioning AC output events.

Transient programming is easily accomplished from the front panel where clearly laid out menu's guide the user through the transient definition process.

The front panel provides a convenient listing of the programmed transient sequence and allows for transient execution Start, Stop, Abort and Resume operations. User defined transient sequences can be saved to non-volatile memory for instant recall and execution at a later time. The included Graphical User Interface program supports transient definitions using a spreadsheet-like data entry grid. A library of frequently used transient programs can be created on disk using this GUI program.



Transient List Data Entry from the front panel.

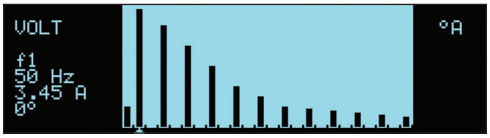


Transient List Data Entry in GUI program.

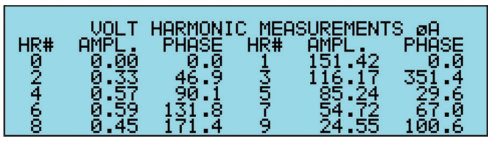
RS Series - Measurement and Analysis
The RS Series is much more than a programmable AC, DC or AC+DC power source. It also incorporates an advanced digital signal processor based data acquisition system that continuously monitors all AC source and load parameters. This data acquisition system forms the basis for all measurement and analysis functions. These functions are accessible from the front panel and the remote control interface for the RS Series

Conventional Measurements [All controllers]
Common AC and DC measurement parameters are automatically provided by the data acquisition system. These values are displayed in numeric form on the front panel LCD display. The following measurements are available: Frequency, Vrms, Irms, Ipk, Crest Factor, Real Power (Watts), Apparent Power (VA) and Power Factor.

Harmonic Analysis
The RS Series provides detailed amplitude and phase information on up to 50 harmonics of the fundamental voltage and current (up to 16 kHz). Harmonic content can be displayed in both tabular and graphical formats on the front panel LCD for immediate feedback to the operator. Alternatively, the included GUI program can be used to display, print and save harmonic measurement data. Total harmonic distortion of both voltage and current is calculated from the harmonic data.



Absolute amplitude bar graph display of current harmonics with cursor positioned at the fundamental (RS90 Display).

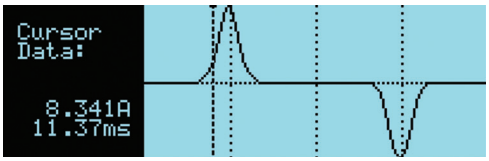

VOLT HARMONIC MEASUREMENTS øA

HR#	AMPL.	PHASE	HR#	AMPL.	PHASE
0	0.00	0.0	1	151.42	0.0
2	0.33	46.9	3	116.17	351.4
4	0.57	90.1	5	85.24	29.6
6	0.59	131.8	7	54.72	67.0
8	0.45	171.4	9	24.55	100.6

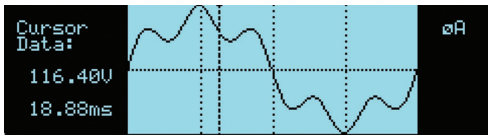
Voltage harmonic measurement table display in absolute values (RS90 Display)

Waveform Acquisition
The measurement system is based on real-time digitization of the voltage and current waveforms using a 4K deep sample buffer. This time domain information provides detailed information on both voltage and current waveshapes. Waveform acquisitions can be triggered at a specific phase angle or from a transient program to allow precise positioning of the captured waveform with respect to the AC source output.

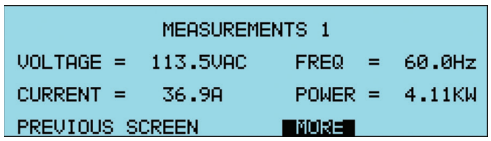
The front panel LCD displays captured waveforms with cursor readouts. The included GUI program also allows acquired waveform data to be displayed, printed, and saved to disk.



Acquired Current waveform (RS90 Display).



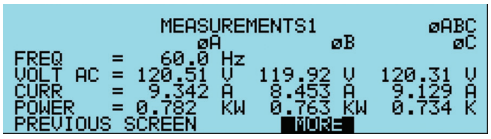
Acquired Voltage waveform (RS90 Display).


MEASUREMENTS 1

VOLTAGE =	113.5VAC	FREQ =	60.0Hz
CURRENT =	36.9A	POWER =	4.11KW

PREVIOUS SCREEN MORE

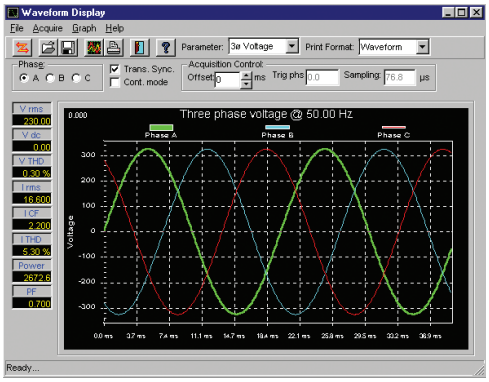
Measurement data for single phase (RS90 Display).


MEASUREMENTS1 øABC

	øA	øB	øC
FREQ =	60.0 Hz		
VOLT AC =	120.51 V	119.92 V	120.31 V
CURR =	9.342 A	8.453 A	9.129 A
POWER =	0.782 KW	0.763 KW	0.734 K

PREVIOUS SCREEN MORE

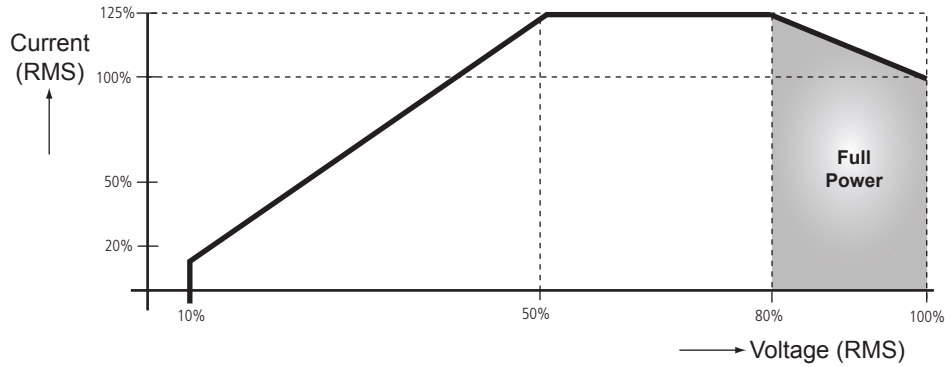
Measurement data for all three phases (RS90 Display).



Acquired three phase voltage waveforms display on PC.

Operating Modes	
RS90 Version	AC, DC and AC+DC
AC Mode Output	
Frequency	Range: 16.00-819.0 Hz, -LF Option: 16.00-500.0 Hz, -HF Option: 16.00-905 Hz (supplemental specifications apply above 819 Hz). Resolution: 0.01 Hz: 16.00 - 81.91 Hz, 0.1 Hz: 82.0 Hz - 819.1 Hz, 1 Hz: 820-905 Hz, SNK 16-500Hz, EXTD 16-819Hz
Phase Outputs	3 Phase, Neutral Floating, Coupling DC (except -HV and -XV Opition)
Total Power	RS90: 90kVA, RS180: 180kVA, RS270: 270kVA, RS360: 360kVA, RS450: 450kVA, RS540: 540kVA. Please consult factor for power levels above 540kVA
Load Power Factor	0 to unity at full output current
AC Mode Voltage	
Voltage Ranges	Range / V Low / V High AC / 0-150 V / 0-300 V AC+DC / 0-150 V / 0-300 V Load Regulation: < 0.25 % FS DC to 100 Hz, < 0.5 % FS 100 Hz to 819 Hz Line Regulation: < 0.1% FS for 10 % line change
External Sense	Voltage drop compensation (5% Full Scale)
Harmonic Distortion (Linear)	Less than 0.5% from 16 - 66 Hz, Less than 1% from 66 - 500 Hz, Less than 1.25% above 500 Hz
DC Offset	< 20 mV
Load Regulation	0.25% FS @ DC - 100 Hz, 0.5% FS > 100 Hz
External Amplitude Modulation	Depth: 0 - 10 %, Frequency: DC - 2 KHz
Voltage slew rate	200 µs for 10% to 90% of full scale change into resistive load, 0.5V / µSec
AC Mode Current	
Steady State AC Current @ FS V	Model / RS90 / RS180 / RS270 / RS360 / RS450 / RS540 V Low / 200A / 400A / 600A / 800A / 1000A / 1200A V High / 100A / 200A / 300A / 400A / 500A / 600A per phase / per phase / per phase / per phase / per phase / per phase Note: Constant power mode provides increased current at reduced voltage. See chart below
Peak Repetitive AC Current	Up to 3.6 x rms current at full scale voltage
Programming Accuracy	Voltage (rms): ± 0.3 Vrms, Frequency: ± 0.01 % of programmed value, Current Limit: - 0 % to + 5 % of programmed value + 1A, Phase: < 0.5° + 0.2°/ 100 Hz with balanced load
Programming Resolution	Voltage (rms): 100 mV, Frequency: 0.01 Hz from 16 - 81.91 Hz, 0.1 Hz from 82.0 - 819 Hz, Current Limit: 0.1 A, 3 phase mode, 1.0 A, 1 phase mode, Phase: 0.1°

Constant Power AC Mode - Available Max. AC Current



Note: Specifications are subject to change without notice. Specifications are warranted over an ambient temperature range of 25°± 5° C. Unless otherwise noted, specifications are per phase for a sinewave with a resistive load and apply after a 30 minute warm-up period. For three phase configurations, all specifications are for L-N. Phase angle specifications are valid under balanced load conditions only.

RS Series : Specifications

Measurement

Measurements - Standard (AC Measurements)

Parameter	Frequency	RMS Voltage	RMS Current	Peak Current	VA Power	Real Power	Power Factor (>0.2kVA)
Range	16.00 - 820.0Hz	0-400V	0 - 300A	0 - 800 Amps	0–90KVA	0–90KW	0.00-1.00
Accuracy* (±)	0.01% +0.01Hz	0.05V+0.02%,<100Hz 0.1V+.02%,100-820Hz	0.5A+0.2%,<100Hz 0.5A+0.5%, 100-500Hz 0.5A+1.0%,>500Hz	0.5A+0.2%,<100Hz 0.5A+0.5%, 100-500Hz 0.5A+1.0%, > 500Hz	90VA+0.2%, <100Hz 90VA+0.5%, 100-500Hz 90VA+1.0%, >500Hz	90W+0.2%, <100Hz 90W+0.5%, 100-500Hz 90W+1.0%, >500Hz	0.01, <100Hz 0.02, 100-820Hz
Resolution*	0.01 to 81.91Hz 0.1 to 500Hz 1Hz above 500Hz	0.01V	0.01A	0.01A	10VA	10W	0.01

* Note: Accuracy specifications are valid above 100 counts. For current and power measurements, specifications apply from 2% to 100% of measurement range. Current and Power range and accuracy specifications are two times for RS180.

Measurements - Harmonics

Parameter	Range	Accuracy* (±)	Resolution
Frequency Fundamental	16.00 - 820 Hz	0.03% + 0.03 Hz	0.01 Hz
Frequency harmonics			
RS90 RS180 RS270 RS360 RS450 RS540			
	32.00 Hz – 16 KHz	0.03% + 0.03 Hz	0.01 Hz
RS90-3Pi			
	32.00 Hz – 48 KHz	0.03% + 0.03 Hz	0.01 Hz
Phase	0.0 - 360.0°	2° typ.	0.5°
Voltage	Fundamental	0.75V	0.01V
Harmonic 2 - 50	0.75V + 0.3% + 0.3%/kHz	0.01V	
Current	Fundamental	0.5A	0.1A
Harmonic 2 - 50	0.15A + 0.3% + 0.3%/kHz	0.1A	

Note: For current measurements, specifications apply from 2% to 100% of measurement range.

DC Mode Output

Power	Maximum DC Power at full scale of DC voltage range. RS90: 45kW, RS180: 90kW, RS270: 135kW, RS360: 180kW, RS450: 225kW, RS540: 270kW
Voltage Ranges	Range: Low (0 - 200 V), High (0 - 400 V)
Output Accuracy	± 1 Vdc
Load Regulation	< 0.25 % FS
Line Regulation	< 0.1% FS or 10 % line change
Ripple	< 2 Vrms Lo Range, < 3 Vrms Hi Range

DC Mode AC+DC Mode

Model	RS90	RS180	RS270	RS360	RS450	RS540
V Low	100A	200A	300A	400A	500A	600A
V High	50A	100A	150A	200A	250A	300A
	per phase	per phase	per phase	per phase	per phase	per phase

Note: Constant power mode provides increased current at reduced voltage. See chart on previous page

Current Limit	Programmable from 0 A to max. current for selected range

AC+DC Mode Output

Output Power	Maximum current and power in AC+DC mode is same as DC mode

Protection

Over Load	Constant Current or Constant Voltage mode
Over Temperature	Automatic shutdown

System Interface

Inputs	Remote shutdown, External Sync, Clock/Lock
Outputs	Function Strobe / Trigger out, Clock/Lock

Remote Control

IEEE-488 Interface	IEEE-488 (GPIB) talker listener. Subset: AH1, C0, DC1, DT1, L3, PP0, RL2, SH1, SR1, T6, IEEE-488.2 SCPI Syntax
RS232C Interface	9 pin D-shell connector (Supplied with RS232C cable)
LAN (option)	Ethernet Interface: 10BaseT, 100BaseT, RJ45
USB	Version: USB 1.1; Speed: 460 Kb/s maximum
Output Relay	Push button controlled or bus controlled output relay

Waveforms

Waveform Types	Std: Sine, Pi: Sine, Square, Clipped sine, User defined
User defined waveform storage	Four groups of 50 user defined arbitrary waveforms of 1024 points for a total of 200. One group can be active at a time

AC Input

Voltage	Must be specified at time of order. All inputs are L-L, 3ø, 3 wire + Gnd. 208 ± 10% VAC, 230 ± 10% VAC, 400 ± 10% VAC, 480 ± 10% VAC
Line Voltage (3 phase, 3 wire + ground (PE))	208 VLL ±10%, 230 VLL ±10%, 400 VLL ±10%, 480 VLL ±10%

Line VA

RS90	RS180	RS270	RS360	RS450	RS540
112 KVA	225 KVA	300 KVA	412KVA	525 KVA	637 KVA
350 ARMS @ 187 VLL	Each RS90 chassis requires its own AC service.				
314 ARMS @ 207 VLL	Total Line currents are 2 x RS90	Total Line currents are 3 x RS90	Total Line currents are 4 x RS90	Total Line currents are 5 x RS90	Total Line currents are 6 x RS90
180 ARMS @ 360 VLL					
150 ARMS @ 432 VLL					

Line Frequency	47 - 63 Hz
Efficiency	85 % (typical) depending on line and load
Power Factor	0.95 (typical) / 0.99 at full power.

Inrush Current

RS90	RS180	RS270	RS360	RS450	RS540
460 Apk @ 208 VLL	Each RS90 chassis requires its own AC service.	Each RS90 chassis requires its own AC service.	Each RS90 chassis requires its own AC service.	Each RS90 chassis requires its own AC service.	Each RS90 chassis requires its own AC service.
440 Apk @ 230 VLL					
264 Apk @ 400 VLL					
220 Apk @ 480 VLL	Total Line currents are 2 x RS90	Total Line currents are 3 x RS90	Total Line currents are 4 x RS90	Total Line currents are 5 x RS90	Total Line currents are 6 x RS90

Hold-Up Time	>10ms
Isolation Voltage	2200 VAC input to output, 1350 VAC input to chassis

AC Service

Inputs/Outputs	Rear Panel Access
Regulatory	IEC61010, EN50081-2, EN50082-2, CE EMC and Safety Mark requirements
EMI	CISPR 11, Group1 , Class A
Connectors	AC Input and Output terminal blocks behind rear panel access cover. IEEE-488 (GPIB) connector behind rear panel access cover. 9 pin D-Shell RS232C connector*, behind rear panel access cover. Remote voltage sense terminal block behind rear panel access cover. System Interface Connector, DB-37 behind rear panel access cover. *RS232 DB9 to DB9 cable supplied

Physical Dimensions

RS90 Dimensions	Height: 76" (1930 mm) , Width: 32.0" (812mm), Depth: 40.0" (1016mm),
RS90 Weight	Net: 2250 lbs / 748 Kg approximately, Shipping: 2500 lbs / 785 Kg approximately
Chassis	RS90: Casters and forklift openings
Vibration and Shock	Designed to meet NSTA project 1A transportation levels. Units are shipped in wooden crate with forklift slots
Air Intake/Exhaust	Forced air cooling, front air intake, rear exhaust
Operating Humidity	0 to 95 % RAH, non condensing
Temperature	Operating: 0-35* (30*C max is CP mode), Storage -20 tp +85*C

-MB Option

Model	AC Output Power	Phase Outputs	AC/DC Voltage Range	Controller
RS180-3Pi-MB	180kVA	3	150/200 & 300/400	2 x RS90
RS270-3Pi-MB	270kVA	3	150/200 & 300/400	3 x RS90
RS360-3Pi-MB	360kVA	3	150/200 & 300/400	4 x RS90
RS450-3Pi-MB	450kVA	3	150/200 & 300/400	5 x RS90
RS540-3Pi-MB	540kVA	3	150/200 & 300/400	6 x RS90

Reconfigurable systems can be separated into stand-alone MX45-3Pi models or combined for higher power levels.

Steady State AC RMS Current in Regeneration Mode (-SNK Option)

Model		RS90	RS180	RS270	RS360	RS450	RS540
AC Mode	V Lo	200A	400A	600A	500A	1000A	1200A
	V Hi	100A	200A	300A	400A	500A	600A
		per phase	per phase	per phase	per phase	per phase	per phase
V High	V Lo	100A	200A	300A	400A	500A	600A
	V Hi	50A	100A	150A	200A	250A	300A
		per phase	per phase	per phase	per phase	per phase	per phase

Storage

Non Volatile Mem. storage	16 instrument setups, 200 user defined waveforms

Unit Protection	
Input Over current	In-line fast acting fuses. Circuit breaker for LV supply.
Input Over voltage	Automatic shutdown.
Input Over voltage Transients	Surge protection to withstand EN50082-1 (IEC 801-4, 5) levels.
Output Over current	Adjustable level constant current mode with programmable set point.
Output Short Circuit	Peak and RMS current limit.
Over temperature	Automatic shutdown
System Specification	
External Modulation	0 to 10%
Synchronization Input	Isolated TTL input for external frequency control.
Trigger Input	External trigger source input.
Trigger Output	400 µs pulse for voltage or frequency change Isolated TTL output Output reverts to Function strobe frequency change. Isolated TTL output. Output reverts to Function strobe when not uses as Trig Out. This function is mutually exclusive with the Function Strobe output.
Function Strobe	Active for any voltage or frequency program change. 400 µs pulse for voltage or frequency change.
Output Status	Monitors status of output relay. SELV Isolated TTL output.

Model
Refer to table shown for model numbers and configurations.

Supplied with
User/Programming Manual and Software on CD ROM. RS232C serial cable.

Input Voltage Settings
Specify input voltage (L-L) setting for each RS system at time of order:

208 Configured for 208 V ±10 % L-L, 4 wire input.
230 Configured for 230 V ±10 % L-L, 4 wire input.
380 Configured for 380V +/- 10% L-L, 4 Wire Input
400 Configured for 400 V ±10 % L-L, 4 wire input.
480 Configured for 480 V ±10 % L-L, 4 wire input

Standard Model Options
Specify output range on standard models. All range values shown are Line to Neutral.

-150 Configured for 150 V AC and 200 V DC output ranges.
-300 Configured for 300 V AC and 400 V DC output ranges.
-411 *IEC 1000-4-11 test firmware.
-LF Limits maximum frequency to 500
-FC Hz. Modifies output frequency control to ± 0.25%
-LAN EthernetInterface.
-413 *IEC 1000-4-13 Harmonics & Interharmonics test firmware.
-HV Adds 400 V L-N (AC-only output range.)
-HF Increases max. frequency to 905 Hz.
-XV Adds other AC-only output range. Consult factory.
-LKM Clock/Lock Master
-LKS Clock/Lock Auxiliary
-WHM Watt-Hour Measurement option.
-SNK Bidirectional auto source and sink mode. Offers up to 100% power sink capability.
-SNK-DC Sink DC current mode.
-EXTD External Drive allows external signal control.

Avionics Test Routine Options

-ABD ABD0100.1.8 Test Option. -Rev. D-E
-AMD Airbus AMD24 Test -Rev. A-C
-A350 Airbus Test Software -Rev A-C
-B787 Boeing 787 Test Software -Rev A-C additional
-704 Mil Std 704 A - F test - firmware/ software.
-160 RTCA/DO-160D, DO-160E, and EUROCAE test firmware.

* Note: Reference the Avionics Test User Manual P/N 4994-971 for a complete listing of performance capabilities.

Packaging and Shipment

All RS systems are packaged in re-usable protective wooden crates for shipment.