AC Power Systems
FCS Series

High Power AC System

Controllable POWER for Test Applications

- **Front Panel Configurable for Single- or Multi-Phase Operation**
  System characteristics may be re-configured to meet changing test needs
- **Voltage and Frequency Programmable Over IEEE-488 Bus**
  Standard world power & avionics test parameters computer programmable
- **Full Power Line Disturbance Simulation Available**
  Test for dropouts, transients and other power quality parameters
- **Drives Non-Linear Loads and High Peak In-Rush Current Input Stages**
  Full output power at 0 to 1 power factor, peak current up to 375 A at 18 kVA

FCS Series Features:

- **Simulate Non-Standard AC Line Conditions**
  Test to international power and avionics standard specifications
- **Measure Load Parameters Without Additional Equipment**
  Provide full measurement capability, including current harmonic analysis
- **Typically Greater than 85 % Efficiency**
  Generates less heat and consumes less input power
- **Stable, Low-Center-of-Gravity Packaging**
  System can be easily and safely moved between applications

Flexibility for all Applications: 18 kVA to 54 kVA

The FCS Series is based on an 18 kVA cabinet. Two or three cabinets may be combined to form either 36 kVA or 54 kVA systems. Units are field configurable, with factory assistance when required.

Control for all FCS units is from the front panel or a computer bus (IEEE-488) through one master cabinet. Several controller options provide choices ranging from local to sophisticated computer programmable control (see page 3).

For Avionics applications, automatic test sequencing of MIL-STD-704D and RTCA/DO-160C or D are available options. A wide variety of output voltage options allow maximum current and power at the required output voltage.

New Technology Improves Design Efficiency

Direct coupled, pulse-width-modulated control architecture makes the FCS Series extremely efficient. This architecture permits packaging in a relatively small, low-center-of-gravity cabinet. Unlike previous precision power systems, the FCS can be moved safely and easily between applications. The FCS Series operates from 3-phase input power, with input voltage from 208 V to 480 V (±10%) line to line. The poly-phase input transformer splits the input power for 12-pulse rectification, greatly reducing peak input current and providing power factor correction.

The combination of poly-phase rectification and efficient amplifier technology significantly reduces electricity costs when compared with similar products.

California Instruments

Choose the Power That's Right for Your Line

Model	Total Power @ 35° C	Output (Phase)	Single Phase Amps 135 V range RMS	Peak*	3-Phase Amps RMS/Ph
FCS-18**	18,000 VA	1/3	133	375	44.4
FCS-36[1]	36,000 VA	1/3	266	750	88.8
FCS-54[1]	54,000 VA	1/3	400	1125	133.0

* Peak in-rush drive capability (repetitive).
** For lower power levels, contact factory for alternative product information.
Note: All systems are factory configured for 1- or 3-phase.

Select the Controller that Offers the Right Level of Programmability and Reporting

Three basic controllers are available for use with the FCS Series. The -M, -P and -PT install directly into the front panel. All controllers, except the -M, feature IEEE-488 programming and fully independent measurement capability.

Full Programmability (-P or -PT)

All setup parameters and measurement functions are programmable over the IEEE-488 bus. A translator VXIbus module may be used to operate the system from a VXI-based controller. The programmable controllers' talker/listener capability permits both operational status interrogation as well as totally independent measurements of load parameters. These measurements may be recalled over the computer bus, or displayed on the front panel.

Type -M is the basic controller, offering local setup of voltage, frequency and current limit. This controller also features analog program control of the output voltage.

Type -P is the standard programmable controller which uses true RMS sensing to provide highly regulated steady-state or transient conditions.

Type -PT uses a real-time servo control loop to reproduce real-world line disturbance waveforms. This controller is a good choice for testing DC power supplies and microprocessor-based products where operation during distortion - such as clipping - may require critical evaluation. -PT also can be programmed to initiate transients in either time or cycles.

Measurement Functions

Both -P and -PT controllers make available reports on a full range of measurements, via front-panel display or over the bus:

Voltage Output
Range: 0.0 to 400 volts
Resolution: 0.1 volt
Accuracy: 0.5% FS

Phase Angle
Range: 0 to 360 degrees
Resolution: 0.1 degree
Accuracy: ± 2 degrees

Frequency
Range: 45 to 99.99 Hz
Resolution: 0.01 Hz
Accuracy: ± 0.02 Hz
Range: 100 to 499.9 Hz
Resolution: 0.1 Hz
Accuracy: ± 0.2 Hz
Range: 500 to 999.9 Hz
Resolution: 0.1 Hz
Accuracy: ± 0.5 Hz
Range: 1000 to 1200 Hz
Resolution: 1 Hz
Accuracy: ± 10 Hz

Current Output
Range: 0 to 400 amps
Resolution: 0.1 amp
Accuracy: 1% FS

True Power/Apparent Power
Range: 54 kW
Resolution: 0.01 kW
Accuracy: 1% FS

Power Factor: 0 to 1

Note 1: For applications requiring 45KVA and above, refer also to the California Instruments MX Series

Specification	Programmable -P	Programmable -PT	Manual -M
Controller Type	Programmable controller	Fast Transient controller	Manual control oscillator
Voltage			
Range	0 - 135 V L-N Optional ranges available to 400 V See back page for range options	0 - 135 V L-N Optional ranges available to 400 V See back page for range options	Variable pot control Optional ranges available to 400 V Option -RPV for 0-FS control using 0 - 10 VDC input.
Accuracy	± 0.270V from 5 V to 135 V @ 25° C ± 1° C	±1 % FS from 5 % FS to FS Constant line, load and temperature @ 25° C ± 1° C	Variable control Analog meter readback
Load Regulation	TRMS Sense: ± 0.1 % FS no load to full load	- 0.5 % FS from 45 Hz to 100 Hz - 2.0 % FS from 100 Hz to 440 Hz - 3.0 % FS from 440 Hz to 550 Hz	± 0.1 % from 45 Hz to 1.2 kHz
Line Regulation	± 0.1 % FS for ± 10 % line change	± 2 % of full output for a ± 10 % line change	± 0.1 % of full output for a ± 10 % line change
Stability	± 0.05 % FS over 24 hours at constant line and load; 25° C	± 0.015 % FS per 1000 hours at constant line and load; 25° C	± 0.015 % FS per 1000 hours at constant line and load; 25° C
Initial value	5.0 VRMS (field selectable)	0 VRMS	N/A
Settling time	16 msec, no-load from 5 V to within 2 % of final value; 16 msec, full load from 5 V to within 15 % of final value	0.5 msec	N/A
Programmable THD	N/A	0 - 20 % THD clipped sine 1 % resolution	N/A
Amplitude Modulation	N/A	0 to 10 VRMS generates 0 to 11 % amplitude modulation of output voltage. 45 Hz to 1200 Hz input	0 to 10 VRMS generates 0 to 11 % amplitude modulation of output voltage.
Frequency			
Range	17 Hz to 1200 Hz (17 - 45 Hz; refer to supplemental specification)	17 Hz to 550 Hz (17 - 45 Hz; refer to supplemental specification)	17 Hz to 1200 Hz (17 - 45 Hz; refer to supplemental specification)
Resolution	0.01 Hz; 45.00 Hz to 99.99 Hz 0.1 Hz; 100.0 Hz to 999.9 Hz 1 Hz; 1000 Hz to 1200 Hz	0.01 Hz; 45.00 Hz to 99.99 Hz 0.1 Hz; 100.0 Hz to 550.0 Hz	3 digits
Accuracy	± 0.005 % of programmed value	± 0.005 % of programmed value	± 0.005 % of set value
Initial value	Any within range. Default 60 Hz	Any within range. Default 60 Hz	Setting
External Sync Input	TTL level	TTL level	N/A
Phase			
Range	Phase B and/or C relative to phase A: 0 to ± 360° in 0.5° increments	Phase B and/or C relative to phase A: 0 to ± 360° in 0.5° increments	N/A
Accuracy	± 3 °	± 3 °	± 3 °
Current			
Programmable Limit	Adjustable trip	Adjustable trip	Adjustable foldback with recovery
Measurements			
Voltage	resolution 0.1 Volt, accuracy 0.5 % FS, range 0 - 400 V		N/A
Current	resolution 0.1 Amp, accuracy 1.0 % FS, range 0 - 400 ARMS		N/A
Power	resolution 0.01 kW, accuracy 1.0 % FS, range 0 - 54 KW		N/A
Phase angle	resolution 0.1°, accuracy ± 2°, range 0 - 360 °		N/A
Power Factor	range 0.000 to 0.001		N/A
Frequency	resolution four decades, accuracy ± 0,02 Hz to 99.99 Hz, ± 0.2 Hz to 500.0 Hz, ± 0.5 Hz to 999.9 Hz, ± 10 Hz to 1200 Hz		N/A
Apparent Power	resolution 0.01 kVA, accuracy 1.0 % FS, range 0 - 54 KVA		N/A

Note 1 One of these three controller types must be specified when ordering an FCS power system.

Specifications:

All FCS Models

Line Input

Range: 47 Hz to 63 Hz
208, 240, 380, 415, 480 V (±10%), L-L, 3-phase (65 amps, full load, nominal per 18 kVA @ 208 V)

Protection

Overcurrent
Short Circuit
Overvoltage
Sense line fault
Input under-voltage/phase loss
Digital controller shuts down system (with any fault)
Overtemperature

Programmable Functions

- Voltage
- Frequency
- Current Limit
- Phase Angles
- Ramp/Sweep of Voltage or Frequency
- THD (-PT only)
- Surge
- Dropout
- Brownout
- All events have 0.001 Sec resolution

Front Panel Indicators:

Power
Overtemperature
Overload
Analog volt meter
Input circuit breaker
Module fault

Connectors:

Input on rear junction box
Output on rear junction box

Note: *Remote Sense Connections are via rear terminal block.*

Options

Output Transformers:

-HV1: (0-156 V output L-N)
-HV2: (0-270 V output L-N)
-HV3: (0-312 V output L-N)
-HV4: (0-400 V output L-N)
-HV5; (0-156/312 V output L-N)
-HV6: (0-200/400 V output L-N)

Notes:

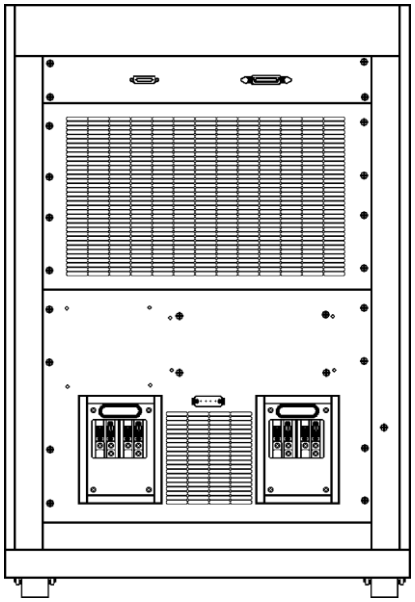
1) With options -HV1 through -HV4 an additional 135 V range is available if the -PRC option is ordered.
3) All -HV options: Load regulation with -PT or -HGA Controller is 0.75% at 60 Hz and 2.5% at 400 Hz.

-704: MIL-STD-704E test routines built into ROM. Requires HV2 output transformer and -PT programmable controller.
-160: RTCA/DO-160D test routines built into ROM. Requires HV2 output transformer and -PT programmable controller.
-RPV: Controls output amplitude with 0-10 V DC signal. Manual controller only.
-OR: Output Relays. Required on multi cabinet systems.
-MODE: 1ø/3ø Programmable. (single cabinet system only)
-PRC: Programmable Range Change.

Mechanical Specifications

Per 18 kVA cabinet:

Height:	45 in (114.4 cm)
Width:	30 in (76.2 cm)
Depth:	36 in (91.5 cm)
Weight:	750 lb (340 kg) (excl HV option)



FCS-18 Rear Panel

Ordering Information

When ordering, please specify:

- Output default frequency (60 Hz if not specified)
- Output voltage range initialization if HV option. (specify High or Low)
- Input voltage.

Order Example

FCS	-18	-1PT	-HV2	-704
Series	Power	Controller Type	Option	Option