2. Specifications

All specifications are for a single i or iX series chassis and 25 ± 5°C sine wave output with a resistive load unless noted otherwise.

2.1 Electrical

2.1.1 Input

Parameter	**3001i & Ix**	**5001i & iX**
Line Voltage:	208-240 ±10% VAC, single phase	208-240 V_{LL} ±10%, (Standard) 400-440 V_{LL} ±10%, (-400) 400-480 V_{LL} ±10%, (-400) 3 phase, 3 wire + ground
Line VA:	5000VA	8000VA
Line Current:	25 A RMS max. (Per Box)	23 A RMS max. at 208-240 VAC 12 A RMS max. at 400-440 VAC and 400-480 VAC (Per Box)
Line Frequency:	50-60 Hz ±10%	
Efficiency:	80% (typical) depending on line and load	
Power Factor:	0.7 (typical)	0.9 (typical)
Inrush Current:	100 A_{pk} for 100 μs	100 A_{pk} for 100 μs at 208-240V 50 A_{pk} for 100 μs at 400-440 VAC and 400-480 VAC
Hold-Up Time:	15 ms	
Isolation Voltage:	2200 VAC input to output 1350 VAC input to chassis	

2.1.2 Output

(ALL SPECIFICATIONS ARE FOR AC AND DC UNLESS NOTED OTHERWISE)

Output Parameter	**i Series**	**iX Series**
Modes:	AC, DC	AC, DC, AC+DC
Voltage:		
Ranges (L-N):		
AC Mode	Low: 0 - 135 VAC / High: 0 - 270 VAC 0 - 150 VAC / High: 0 - 300 VAC	
DC Mode	Low: 0 - 135 VDC / High: 0 - 270 VDC 0 - 150 VDC / High: 0 - 300 VDC	
AC+DC Mode iX Models only.	AC: Low: 0 - 150 V / High: 0 - 300 V DC Offset: Low 0 - 150 V / High; 0 - 250 V	
Programming Resolution:		
AC Mode	0.1 V	
DC Mode	0.1 V	
AC+DC Mode	AC: 01. V DC Offset: 0.01 V < 0.5 V 0.1 V 0.6 - 25 V 1 V > 25 V	
Voltage Accuracy:		
AC mode	±0.5% of range, 16 to 400 Hz.	±0.5% of range, 16 to 400 Hz.
DC mode	±0.5% of range	±0.5% of range
DC offset (AC+DC mode)		±5% of range ± 0.1 VDC.< 25VDC ±5% of range ± 1 VDC.> 25VDC
Voltage Distortion [1]: (linear load)	1% max THD at 50/60 Hz 2% max THD at 400 Hz	1% max THD at 50/60 Hz 2% max THD at 400 Hz
Load Regulation:	± 0.5% DC to 100 Hz ± 2.2% to 500 Hz (135 range) ± 0.6% to 500 Hz (270 range)	± 0.5% DC to 100 Hz. ± 2.2% to 500 Hz (135/150 range) ± 0.6% to 500 Hz (270/300 range)
Line Regulation:	0.1% for 10% input line change	0.1% for 10% input line change
Power: (per phase, either range, at full scale voltage)		
3001, 9003i/iX	3000 VA AC, 2100 W DC	3000 VA AC, 2100 W DC
5001, 15003i/iX	5000 VA AC, 3500 W DC	5000 VA AC, 3500 W DC
10001i/iX	10000 VA AC, 7000 W DC	10000 VA AC, 7000 W DC

[1] The distortion specification for the 3001i and iX is valid for an input voltage range of 197-264 V.

Output Parameter	i Series	iX Series
15001i/iX	15000 VA AC, 10500 W DC	15000 VA AC, 10500 W DC
Current, maximum rms amps per phase:		
3001i/iX	22.2, 135 VAC range 11.1, 270 VAC range	22.2, 135 VAC range 20.0, 150 VAC range 11.1, 270 VAC range 10.0, 300 VAC range
	15.5, 135 VDC range 7.77, 270 VDC range	15.5, 135 VDC range 14.0, 150 VDC range 7.77, 270 VDC range 7.00, 300 VDC range
Current, maximum rms amps per phase:		
5001, 15003i/iX per phase	37.0, 135 VAC range 18.5, 270 VAC range	37.0, 135 VAC range 33.3, 150 VAC range 18.5, 270 VAC range 16.7, 300 VAC range
	25.0, 135 VDC range 11.7, 270 VDC range	25.9, 135 VDC range 23.3, 150 VDC range 12.95, 270 VDC range 11.69, 300 VDC range
10001i/iX	74.0, 135 VAC range 37.0, 270 VAC range	74.0, 135 VAC range 66.7, 150 VAC range 37.0, 270 VAC range 33.3, 300 VAC range
	51.8, 135 VDC range 25.9, 270 VDC range	51.8, 135 VDC range 46.6, 150 VDC range 25.9, 270 VDC range 23.3, 300 VDC range

Output Parameter	i Series	iX Series
15001i/iX	111, 135 VAC range 55.5, 270 VAC range	111, 135 VAC range 100, 150 VAC range 55.5, 270 VAC range 50.0, 300 VAC range
	77.7, 135 VDC range 38.8, 270 VDC range	77.7, 135 VDC range 70.0, 150 VDC range 38.8, 270 VDC range 35.0, 300 VDC range
(Derated linearly from 50% of voltage to 10% of specified current at 5% of voltage range) Note: For the iX series, the current output in the AC & DC mode is equal to the current in the AC mode if the DC voltage is less than 20% of the fullscale voltage. It is equal to the DC current for DC voltages more than 20% of fullscale		

Output Parameter	**i Series**	**iX Series**
Current Limit	programmable 0 to 100% of range for all ranges	
Frequency Range:	16.00 - 81.91 Hz (0.01 Hz resolution) 81.0 - 500.0 Hz (0.1 Hz resolution)	
Frequency Accuracy:	±0.01% of programmed value	
DC Offset Voltage:	Less than 20 mV with linear load.	
Output Impedance		
Range:	n/a	R_{min} to 1000 mΩ L_{min} to 1000 μH
Resolution:	n/a	4 mΩ 4 μH
Accuracy:	n/a	± 2% F.S. at 796 μH and 400 mΩ
Output Noise: (20 kHz to 1 MHz)	400 mVrms max, 135 V range, 800 mVrms max, 270 V range	<250 mV rms (typ), <500 mV rms (max)
Peak Rep AC Current:		
3001i/iX 5001i/iX 9003i/iX 15003i/iX	110 A for 135 V range, 92 A for 270 V range	110 A for 135 V range, 100 A for 150 V range, 92 A for 270 V range, 83 A for 300 V range
10001i/iX	220 A for 135 V range, 184 A for 270 V range	220 A for 135 V range, 200 A for 150 V range, 184 A for 270 V range, 166 A for 300 V range
15001i/iX	330 A for 135 V range, 276 A for 270 V range	330 A for 135 V range, 300 A for 150 V range, 276 A for 270 V range, 249 A for 300 V range
Crest Factor:	Up to 5:1	Up to 5:1

2.1.3 Measurements (i series)

Parameter	Range	Accuracy (±)	Resolution
Frequency	16.00 - 99.99 Hz 100.0 - 500.0 Hz	0.02 Hz 0.2 Hz	0.01 Hz 0.1 Hz
Rms Voltage	0 - 300 Volts	0.5V	0.01 Volt
Rms Current	0 - 40 Amps	0.5A	0.001 Amp
Peak Current	0 - 119 Amps	0.5A	0.001 Amp
VA Power	0 - 6.000 kVA	0.2 kVA	0.001 kVA
Real Power	0 - 6.000 kW	0.05 kW	0.001 kW
Power Factor (>0.2kVA)	0 - 1.00	0.02	0.01
Current and Power Accuracy specifications are times ten for 10001i and 15001i. For 10001i and 15001i, resolution decreases by factor of 10, ranges for current and power increases by factor of ten.			

2.1.4 AC Measurements (iX series)

Parameter	Range	Accuracy (±)	Resolution
Frequency	16.00 - 500.0 Hz	0.01% + 0.01 Hz	0.01 to 81.91 Hz 0.1 to 500 Hz
RMS Voltage	0 - 300 Volts	0.05V + 0.02%, <100 Hz 0. 1V + 0.02%, 100-500 Hz	0.01 Volt
RMS Current	0 - 40 Amps	0.05A + 0.02%, <100 Hz 0. 1A + 0.02%, 100-500 Hz	0.001 Amp
Peak Current	0 - 119 Amps	0.05A + 0.02%, <100 Hz 0. 1A + 0.02%, 100-500 Hz	0.001 Amp
VA Power	0 - 6.000 kVA	0.01kVA + 0.02%, <100 Hz 0. 02kVa + 0.02%, 100-500 Hz	0.001 kVA
Real Power	0 - 6.000 kW	0.005kW + 0.02%, <100 Hz 0.01kW + 0.02%, 100-500 Hz	0.001 kW
Power Factor (>0.2kVA)	0 - 1.00		0.01

2.1.5 DC Measurements (iX series)

Parameter	Range	Accuracy (±)	Resolution
Voltage	0 – 300 Volts	0.1 Volts	0.01 Volt
Current	0 – 40 Amps	0.01 Amps	0.001 Amp
Power	0 – 6.000 kW	0.05 kW	0.001 kW
Current and Power Accuracy specifications are times two for 10001iX and times three for 15001iX. For 10001iX and 15001iX, resolution decreases by factor of 10, ranges for current and power increases by factor of three.			

2.1.6 Harmonic Measurements (iX series)

Parameter	Range	Accuracy (±)	Resolution
Frequency fundamental	16.00 - 500 Hz	0.01% + 0.01 Hz	0.01 Hz
Frequency harmonics	32.00 Hz - 19.5 kHz	2° typ.	0.5°
Voltage	Fundamental	0.25V	0.01V
	Harmonic 2 - 50	0.25V + 0.1% + 0.1%/kHz	0.01V
Current	Fundamental	0.05A	0.01A
	Harmonic 2 - 50	0.05A + 0.1% + 0.1%/kHz	0.01A
Accuracy specifications are times three for three phase mode. Harmonics frequency range in three phase mode is 32 Hz - 6.67 kHz. Resolution decreases by factor of 10 for 10001iX and 15001iX.			

2.1.7 System Specification

Parameter	Specification
External Modulation:	0 to 10%
Synchronization Input:	Isolated TTL input for external frequency control. Requires 5V at 5 ma for logic high.
Trigger Output:	400 μs pulse for voltage or frequency change. Isolated output that requires a pull-up resistor, 22K Ω, to + 5 VDC.
Non volatile memory storage:	8 complete instrument setups and transient lists, 32 events per list.
Waveforms	Sine (i series) Sine, square, clipped, user defined (iX series)

Parameter	Specification
Transient	Voltage: drop, step, sag, surge, sweep
	Frequency: step, sag, surge, sweep
	Voltage and Frequency: step, sweep
IEEE-488 Interface:	SH1, AH1, T6, L3, SR1, RL2, DC1, DT1 IEEE 488.2 and SCPI Response time is 10 ms (typical)
RS232C Interface:	Bi-directional serial interface 9 pin D-shell connector Handshake: CTS, RTS Data bits: 7, 8 Stop bits: 1,2 Baud rate: 9600, 19200, 38400 IEEE 488.2 and SCPI
Current Limit Modes:	Two selectable modes of operation. Constant current and constant voltage with hold-off time and trip.
Function Strobe	Isolated open collector output available between pin 31 (High) and pin 14 (Low) of the System Interface connector (J22). Negative going pulse on any programmed voltage or frequency change. Function strobe output can be reassigned as trigger output when running list transients. This output requires a external DC supply and pull-up resistor.
Remote Inhibit	Also referred to as Remote On/Off. Digital input available on pin 36 and pin 27 (D-Common) of the System Interface connector (J22). The Remote inhibit input can be used to open the output relay. The output relay state is not latching so will return to the closed state when the input is removed.

2.1.8 Unit Protection

Input Overcurrent:	Circuit breaker with shunt trip control.
Input Overvoltage:	Automatic shunt trip of input circuit breaker.
Input Overvoltage Transients:	Surge protection to withstand EN50082-1 (IEC 801-4, 5) levels.
Output Overcurrent:	Adjustable level constant current mode with a maximum set point between 0% and 10% above programmed value.
Output Short Circuit:	Peak and rms current limit.
Overtemperature:	Automatic shutdown.

2.2 Mechanical

Parameter	Specification
Dimensions:	19” (483 mm) wide x 7” (178 mm) high x 24” (610 mm) deep chassis size which is available in a rack mount or stand-alone configuration.
Unit Weight:	61 lb. (28 kg)
Material:	Aluminum chassis, panels and cover.
Finish:	Light textured painted external surfaces. Front and rear panels semi-gloss polyurethane color no. 26440 (medium gray) Top, bottom and sides semi-gloss polyurethane color no. 26622 (light gray).
Cooling:	Fan cooled with air intake on the sides and exhaust to the rear.
Internal Construction:	Modular sub assemblies.
Rear Panel Connections:	(see section 3 for description of connections) Input terminal block with cover Output terminal block with cover Remote voltage sense terminal block System interface (not for table top use, use only in rack enclosed systems) Clock and Lock (not for table top use, use only in rack enclosed systems) RS232 GPIB

2.3 Environmental

Parameter	Specification
Operating Temp:	0 to +40 °C.
Storage Temp:	-40 to +85 °C.
Altitude:	<2000m
Relative Humidity:	80% maximum for temperatures up to 31°C decreasing linearly to 50% at 40°C.
Installation/Over voltage Category:	II
Pollution Degree:	2
Indoor Use Only	
Vibration:	Designed to meet NSTA 1A transportation levels.

Parameter	Specification
Shock:	Designed to meet NSTA 1A transportation levels.

2.4 Regulatory

Electromagnetic Emissions and Immunity:	Designed to meet EN50081-2 and EN50082-2 European Emissions and Immunity standards as required for the “CE” mark.
Acoustic Noise:	65 dBA maximum at 0% to 50% load, 75 dBA maximum greater than 50% load to 100% load. Measured at one meter.
Safety:	Designed EN61010-1 European safety standards as required for the “CE” mark.

2.5 Front Panel Controls

Controls:	
Shuttle knob:	Allows continuous change of all values including output calibration and range change.
Decimal keypad:	A conventional decimal keypad facilitates quick entry of numerical values such as voltage, current limit, etc. The large blue enter key will make the value you enter effective. Using the SET key allows the user to preset all parameter values and update them all at once by pressing the Enter key.
Up/down arrow keys:	A set of up and down arrow keys is used to move the cursor position in all menus. This allows quick selection of the desired function or parameter.
Function keys:	Measure key will display most measurement values. Program key will show all program parameters. Output on/off key for output relay control. Phase key will switch display to show program and measured values for each phase.
Displays:	
LCD graphics display:	A large high contrast LCD display with backlight provides easy to read guidance through all setup operations. An adjustable viewing angle makes it easy to read from all practical locations.
Status indicators:	Large and bright status indicators inform the user of important power source conditions. The Remote lamp informs the user that the unit is under remote control. The Overload lamp indicates that excessive current is being drawn at the output. The Over temperature lamp illuminates when internal heat sink temperatures are too high. The Hi Range indicator is lit any time the unit is switched to high output voltage range. The Output On/Off indicator is on when the power source output relays are closed.

2.6 Special Features, Options and Accessories

Programmable Impedance.	Output impedance programming available on models 3001iX, 5001iX, 9003iX and 15003iX only.
Parallel Operation:	Up to three units can be paralleled in a single-phase configuration (with one master controller and one or two slave units). (10001iX and 15001iX).
Three Phase Output:	Three units (all with single-phase controllers) can be connected in a three-phase configuration using CLOCK and LOCK connections. Requires –LKM option in master and –LKS option in auxiliary units. Recommended is use of 9003iX, 15003iX or 30003iX three phase system however.
Rack Mount/Handles Version:	Available rack mounting kit with slides and handles. Handles also available as a separate option.
Controller:	Programmable controller front panel assembly.
Output Relay:	Standard output relay feature to isolate AC source from the load.
Output On/Off:	The output relay can be used to quickly disconnect the load. A green status indicator displays the status of the output relay.
Three-Phase Output 9003iX/15003Ix	Three power sources with one controller in the Phase A power source. The one controller controls all three outputs.
15003iX – LKM/-LKS	Three power sources each with a controller for 3-phase output
- 704	Mil Std 704D & E test firmware. Mil Std 704A, B, C, & F test software. Note: Requires use of CIGui32 Windows application software provided on CD ROM CIC496.
- 160	RTCA/DO-160C test firmware
- 411	IEC 1000-4-11 test firmware
- 413	IEC 1000-4-13 test firmware
-ABD	Airbus ABD0100.1.8 Test firmware. Note: Requires use ofCIGui32 Windows application software provided on CD ROM CIC496.
- LNS	Line sync option to synchronize output frequency to input mains line frequency
-MODE-iX	Available for 9003iX and 15003iX configurations only. Switches output configurations between single-phase and three-phase mode of operation. Note that programmable impedance function on systems with –MODE-iX option is only available when in 3 phase mode.
- RMS	Rack mount slides
-OMNI-1-18i	Single phase lumped reference impedance network of IEC1000-3-3 Flicker test
-OMNI-1-37i	Single phase lumped reference impedance network of IEC1000-3-3 Flicker test – High current.
-OMNI-3-18i	Three phase lumped reference impedance network of IEC1000-3-

	3 Flicker test
-OMNI-3-37i	Three phase lumped reference impedance network of IEC1000-3-3 Flicker test – High current.
-TI	Function strobe break out box. Function strobe / Trigger Output connection break out box. Provides BNC output with internal 9Vdc pull up for connection to external equipment such as oscilloscope. Compatible with 3001i/iX and 5001i/iX. Refer to section 3.6.5.
-TIS	Function strobe break out box for systems. Function strobe / Trigger Output connection break out box. Provides BNC output with internal 9Vdc pull up for connection to external equipment such as oscilloscope. Compatible with multi-chassis i/iX Series configurations. Refer to section 3.6.5.