Technical Datasheet for Product: PTS-1-SR Spectral Response System

Product Description:

Main Features:
- **I-V Tracer (Maximum I and V to be specified).**
- **Spectral Response (SR) (between 300nm and 2,500 nm)**

This system includes either a 150W Xenon or 250W QTH light source, a monochromator to tune the light source, and the necessary probes to attach to your sample. A source meter used as an active load permits operating the test cell at various load conditions, including short-circuit, compensating for a series resistor required to sense the current produced by the modulated monochromatic light. This sensed current plus a reference signal at the frequency of the light modulation are both fed into the precision lock-in amplifier to allow measurement of the photocurrent generated by the modulated monochromatic light.

The PTS-1 features all the software required for I-V Curves and Spectral Response measurements. Main parameters of these measurements are displayed by the software, including the most important graphs typically required by researchers and the industry. For the industry, our software development group offers to develop whatever is required to meet demand.

The geometry of the light from the Monochromator is controlled to illuminate only a small section of the solar cell (typically 3mm diameter), ensuring that 100% of the monochromatic irradiance contributes to the output signal. NOTE: Spot size must be smaller than the 5mm diameter reference detector.

The PTS-1 system includes a SCIRUNSR I-V-Test measurement system, precision lock-in amplifier and system software. The software controls the Monochromator, source meter and lock-in amplifier to automatically measure the I-V characteristics and SR versus wavelength, plotting the result(s) on screen and outputting calculated results, including Voc, Isc, Pmax, Fill Factor, plus the raw measurements to a standard file format.

Additionally, the PTS-1 can be upgraded with optional light tight sample chamber, vertical adjustment components, sliding sample holder, and thermal control (either cooling or heating) for the sample holder. While these additions are not required for operation of the system, including them will ease your operation of the system.

Calibration/Measurement Notes:

Specification	Value
Monochromatic Light Source	150W Xenon Arc Lamp or 250W Quartz Tungsten Halogen Lamp
Total Power of White Light in Monochromatic Light Source	125 mW
Direction of Monochromatic Light Output	Downward (upward optional)
Monochromatic Spot Size	Adjustable diameter: 2-5mm Optional mask for 1mm x 4mm rectangle
Working Distance	150mm
Wavelength Range	300-2500nm
Coupling Optics	Fused quartz
Reference Detector	Calibrated broadband pyroelectric
Photocurrent Measurement Range	1pA-1μA
Signal Acquisition	Chopper (1-200 Hz) with two-phase digital Stanford SR800 series Lock-in Amplifier
Software	MS Windows Based
Software Measurements	IV curves and SR
Computer	Preconfigured host computer with software and PCI boards installed
System Dimensions	36" x 20" x 22" (91.5cm x 50.8cm x 55.9cm)
Sample Enclosure Cell Positioning	Adjustable dual cell holder
Sample Holder Maximum Cell Size	2" x 2" (5cm x 5cm)
Sample Enclosure Dimensions	18.4" x 10.3" x 17.5" (46.7cm x 26.2cm x 44.5cm)
Standards	ASTM 927-05 standard for photovoltaic testing. Will meet IEC and JIS standards on request.
Light Source (150W Xenon Arc Lamp)	
Lamp Power	150W
Lamp Type	Xenon arc lamp, ozone free
Lamp DC Voltage	18V
Lamp Current	8.5A
Lamp Luminous Flux	2900lm
Lamp Luminous Intensity	290cd
Lamp Average Luminance	200cd/mm^2
Lamp Arc Size	0.5 x 1.6mm
Lamp Average Life	3000h

Lamp Length	4.91mm
Lamp Overall Length	5.72mm
Housing Reflector Type	Spherical
Housing Collection Optics	Fused quartz
Power Supply Input Voltage	115VAC / 240VAC
Power Supply Input Current	2A / 1A
Power Supply Input Frequency	60Hz / 50Hz
Power Supply Power Consumption	240W
Power Supply Ambient Operating Temperature	0 - 40°C (32°F – 104°F)
Power Supply Weight	7.5 kg (16.5 lbs)
Power Supply Stability	<0.5%
Light Source (250W Quartz Tungsten Halogen Lamp)	
Lamp Power	250W
Lamp Type	Quartz Tungsten Halogen
Socket	G6.35
DC Voltage	24V
Luminous Flux	10000lm
Arc Size	7 x 3.5mm
Average Life	50h
Housing Reflector Type	Spherical
Housing Collection Optics	Fused quartz
Power Supply Input Voltage	110 - 120VAC / 220 - 240VAC
Power Supply Input Current	6A / 3A
Power Supply Input Frequency	60Hz / 50Hz
Power Supply Power Consumption	640W
Power Supply Ambient Operating Temperature	0 - 70°C (32°F – 104°F)
Power Supply Weight	10 kg (22 lbs)
Power Supply Stability	<0.5%
Monochromator	
Optical Layout	Czerny-Turner
Path Length	250mm Asymmetric
Grating Turret	Motorized Triple Grating Turret
Grating 1	1200l/mm, blazed at 400nm
Grating 2	1200l/mm, blazed at 750nm
Grating 3	600l/m, blazed at 1600nm
Adjustable Bandpass	0.2 – 10nm
Repeatability	≤ ±0.1nm
Accuracy	≤ ±0.2nm
Mechanics	Direct drive stepper motor
Communication	RS-232
Dispersion at Output Port	4nm/mm

Slits	Automated motorized bilaterally adjustable slits
Slit Width	0-6 mm (in 10µm steps)
Slit Height	0-10 mm, 10-20 mm, or 20-30 mm
Order Sorting Filter Wheel	
Filter Wheel Type	Motorized, axial driven
Number of Filter Slots	6
Filter Size	1" diameter
Filter 1 Cut-on Wavelength	200nm
Filter 2 Cut-on Wavelength	300nm
Filter 3 Cut-on Wavelength	500nm
Filter 4 Cut-on Wavelength	900nm
Filter 5 Cut-on Wavelength	1600nm
Communication	USB
IV Tester	
Sourcemeter	Keithley 2400
Maximum Electrical Power Reading	20W
Compatible Solar Simulator Type	Continuous illumination
Parameters Measured By Software	V_{oc}, I_{sc}, V_{max}, P_{max}, V_{oc} slope, R_p, FF
Additional Software Features	Records date and time of measurement, displays message if error occurs
Data Format	Raw data and curve generation. Each dataset is saved in a separate ASCII file.
Maximum Voltage	200V
Maximum Current	1A
Voltage Accuracy	0.015%
Current Accuracy	0.22%
Voltage Resolution	100µV
Current Resolution	10µA
Measurement Time Period for 100 IV Points	44 seconds
Communication	RS-232
Reference Detector	
Diameter	5mm
Type	Broadband pyroelectric
Calibration Range	300-2500nm
Lock-in Amplifier	
Model	Stanford SR800 series
Frequency Range	0.001Hz to 102.4 kHz
Minimum Dynamic Reserve	100 dB

Minimum Stability	<5 ppm/°C
Minimum Phase Resolution	0.01
Automatic Adjustment of Parameters	Gain, phase, dynamic reserve, and offset
Communication	RS-232
Motorized Chopper	
Motor Type	DC servo motor
Apertures	2
Frequency	1-200 Hz
Input Power	115VAC @ 60Hz or 230VAC @ 50Hz, single phase
Option: Temperature Controlled Vacuum Chuck	
Model	SCC4
Maximum Sample Size/Cold Plate Size	9" x 9" (23cm x 23cm) Larger sizes available on request
Minimum Cell Size Held by Vacuum Chuck	1.5" x 1.5" (4cm x 4cm)
Temperature Controlled/Sensing Range	-10°C to 80°C
Sample Temperature Sensing Tolerance	±0.1°C
Material	Brass Plated Tin Copper Plate Optional Gold or Nickel Coating Optional
Vacuum Requirement	150 mm Hg
Weight	6 kg (13 lbs)
Option: Vacuum Pump for Solar Cell Chuck	
Sciencetech Model	VP-600
Pump Type	Vacuum / Pressure Diaphragm Pump (Oil Free)
Motor Type	Permanent Split Capacitor
Duty Cycle	Continuous
Stages	Dual / Parallel
Maximum Vacuum	220VAC Model: 24" Hg 115VAC Model: 25.5"Hg
Free Air	220VAC Model: 1.8 cfm (51 L/min) 115VAC Model: 2.2 cfm (62.3 L/min)
Maximum Pressure	60 psi
Noise Rating	68 dB

Horsepower	1/4 HP
Operating Voltage	220VAC / 50Hz or 115VAC / 60Hz
Current	220VAC Model: 2.0 A 115VAC Model: 3.6A
Dimensions (L x W x H)	11 $^{13}/_{16}$" x 5 $^{1}/_{2}$" x 10 $^{1}/_{4}$" (30cm x 14cm x 31cm)
Connection	Port Size: $^{1}/_{4}$ NPT(F) Hose Barb on Gauge: $^{3}/_{8}$"
Maximum Temperature	38°C (100°F)
Weight	13.2 kg (29.1 lbs)
Included Accessories	Gauges, Regulators, and Adjustable Relief Valve
Contained within PTS System	No
Option: Chiller for Solar Cell Chuck	
Sciencetech Model	TC-2000
Chiller Type	Air Cooled Refrigeration System
Temperature Range	-10°C to 80°C
Cooling Capacity	250W / 853 BTU at 20°C
Heating Capacity	230VAC Model: 2 kW / 6829 BTU at 20°C 115VAC Model: 1.2 kW / 4097 BTU at 20°C
Precision	±0.1°C
Operating Voltage	230VAC / 50Hz or 115VAC / 60Hz
Pump	Force Pump
Pump Flow Rate	15 lpm
Maximum Pressure	4.4 psi (300 mbar)
Reservoir Capacity	2.8 L
Dimensions (L x W x H)	16.5" x 9" x 25"
Weight	30 kg (66 lbs)
Temperature Setting	Digital
Communication	USB (Optional)
Low-level Shutoff	Yes
Connection	8-mm and 12-mm Hose Barb Fittings with Clamps for

	External Connections
Certification	CE
Contained within PTS System	No

Optional Components:
Temperature controlled vacuum chuck with probes
Temperature controller
Vacuum pump

Technical Drawings and Photographs: