

## Fluke 393 FC CAT III 1500 V True-rms Solar Clamp Meter, IRR1-SOL Irradiance Meter and MC4 Test Leads

Ideal for PV installations and IV curve tracing

The 393 FC CAT III 1500 V True-rms Clamp Meter with iFlex is an industrial clamp meter designed for solar photovoltaic (PV) installation technicians and maintenance professionals who work in high voltage dc environments. Safely connect the MC4 test leads to the clamp meter to validate voltage and current from individual panels or a series of panels in a PV array. The inline capabilities of the MC4 PVLEAD3 leads allow the system to remain online and generating power while testing without needing to pierce the line. Use the IRR1-SOL to obtain the amount of solar irradiance necessary to calculate the IV curve of the power output. Validate that the panel or string of panels are outputting the correct voltage.



### Features

#### 393 FC Solar Clamp Meter

- Measure safely with CAT III 1500 V rated clamp meter
- Thin jaw for access to cables in crowded combiner boxes

- View voltage and current simultaneously with the meter's dual display
- IP54 rated meter, ideal for work outdoors including PV panel testing
- DC power measurement, showing readings in kVA
- Logging and reporting of test results via Fluke Connect software

#### **IRR1-SOL Irradiance Meter**

- Measure solar irradiance, ambient and PV module temperature, array orientation and tilt angles
- Make instantaneous measurements to determine the watts per square meter solar irradiation, required by IEC 62446-1 standard
- High contrast LCD with large numbers for easy readability in direct sunlight
- Includes convenient carry case with shoulder strap

#### **Pomona MC4 Leads**

- Connects to test tools that accept 4 mm banana plugs, including the 393 FC
- Ensures safe current and voltage measurements on PV modules and systems
- Ensures safe DC power measurements on Photovoltaic (PV) modules and systems
- Creates connection between solar panel and inverter for troubleshooting and maintenance of PV systems
- For use in regular tests and measurements on PV panels
- Connect measuring devices to PV power station, to set and troubleshoot PV panels
- Complies to CAT III 1000V / CAT IV 600V, 20A ratings in accordance to IEC / EN 61010-031

### **Included with Product**


- Fluke 393 FC CAT III 1500 V TRMS clamp meter
- Test leads, CAT III 1500 V rated, right angle plugs, with safety caps
- iFlex 18 inch flexible current probe
- TPAK magnetic hanging strap
- Premium carrying case
- 3-year warranty
- FLK-IRR1-SOL Solar Irradiance Meter
- FLK80PR-IRR External Temperature Probe with Suction Cup
- C250 Carrying Case with Shoulder Strap
- (4) AA Alkaline Batteries (installed)
- User Manual
- Pomona PVLEAD1 MC4 to 4 mm Test Lead Set
- Pomona PVLEAD3 MC4 Solar Clamp Test Lead Set

### **Basic Product Specifications**

#### **393 FC Solar Clamp Meter General Specifications**

Maximum voltage between any terminal and earth ground

AC	1000 V
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DC	1500 V																
Batteries	2 AA IEC LR6 alkaline																
Display	Dual display with backlight																
Auto Power Off	20 minutes																
<b>Electrical</b>																	
Accuracy	Accuracy is specified for 1 year after calibration, at operating temperatures of 18 °C to 28 °C, relative humidity at 0 % to 75 %. Accuracy specifications take the form of: $\pm$ ([% of Reading] + [Number of Least Significant Digits]).																
Temperature Coefficients	Add 0.1 x specified accuracy for each °C > 28 °C or < 18 °C																
<b>AC Current: Jaw</b>																	
Range	999.9 A																
Resolution	0.1 A																
Accuracy	2 % + 5 digits (10 Hz to 100 Hz)																
	2.5 % + 5 digits (100 Hz to 500 Hz)																
Crest Factor (50/60 Hz)	2.5 @600.0 A																
	3.0 @500.0 A																
	1.42 @999.9 A																
	Add 2 % for C.F. >2																
<b>AC Current: Flexible Current Probe</b>																	
Range	999.9 A																
	2500 A																
Resolution	0.1 A ( $\leq$ 999.9 A)																
	1 A ( $\leq$ 2500 A)																
Accuracy	3 % RD + 5 digits (10 Hz to 500 Hz)																
Crest Factor (50/60 Hz)	2.5 @1400 A																
	3.0 @1100 A																
	1.42 @2500 A																
	Add 2 % for C.F. >2																
Position Sensitivity	 <table border="1"> <thead> <tr> <th>Distance from Optimum</th> <th>i2500-10 Flex</th> <th>i2500-18 Flex</th> <th>Error</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>0.5 in (12.7 mm)</td> <td>1.4 in (35.6 mm)</td> <td><math>\pm</math>0.5 %</td> </tr> <tr> <td>B</td> <td>0.8 in (20.3 mm)</td> <td>2.0 in (50.8 mm)</td> <td><math>\pm</math>1.0 %</td> </tr> <tr> <td>C</td> <td>1.4 in (35.6 mm)</td> <td>2.5 in (63.5 mm)</td> <td><math>\pm</math>2.0 %</td> </tr> </tbody> </table>	Distance from Optimum	i2500-10 Flex	i2500-18 Flex	Error	A	0.5 in (12.7 mm)	1.4 in (35.6 mm)	$\pm$ 0.5 %	B	0.8 in (20.3 mm)	2.0 in (50.8 mm)	$\pm$ 1.0 %	C	1.4 in (35.6 mm)	2.5 in (63.5 mm)	$\pm$ 2.0 %
	Distance from Optimum	i2500-10 Flex	i2500-18 Flex	Error													
	A	0.5 in (12.7 mm)	1.4 in (35.6 mm)	$\pm$ 0.5 %													
	B	0.8 in (20.3 mm)	2.0 in (50.8 mm)	$\pm$ 1.0 %													
C	1.4 in (35.6 mm)	2.5 in (63.5 mm)	$\pm$ 2.0 %														
Measurement uncertainty assumes centralized primary conductor at optimum position, no external electrical or magnetic field, and within operating temperature range.																	
<b>DC Current</b>																	
Range	999.9 A																
Resolution	0.1 A																
Accuracy	2 % RD + 5 digits (when using the ZERO (B) function to compensate for offsets)																
<b>AC Voltage</b>																	
Range	600.0 V																
	1000 V																
Resolution	0.1 V ( $\leq$ 600.0 V)																
	1 V ( $\leq$ 1000 V)																
Accuracy	1 % RD + 5 digits (20 Hz to 500 Hz)																

<b>DC Voltage</b>	
Range	600.0 V
	1500 V
Resolution	0.1 V ( $\leq 600.0$ V)
	1 V ( $\leq 1500$ V)
Accuracy	1 % RD + 5 digits
<b>mV dc</b>	
Range	500.0 mV
Resolution	0.1 mV
Accuracy	1 % RD + 5 digits
<b>Amps Frequency: Jaw</b>	
Range	5.0 Hz to 500.0 Hz
Resolution	0.1 Hz
Accuracy	0.5 % RD + 5 digits
Trigger Level	5 Hz to 10 Hz, $\geq 10$ A
	10 Hz to 100 Hz, $\geq 5$ A
	100 Hz to 500 Hz, $\geq 10$ A
<b>Amps Frequency: Flexible Current Probe</b>	
Range	5.0 Hz to 500.0 Hz
Resolution	0.1 Hz
Accuracy	0.5 % RD + 5 digits
Trigger Level	5 Hz to 20 Hz, $\geq 25$ A
	20 Hz to 100 Hz, $\geq 20$ A
	100 Hz to 500 Hz, $\geq 25$ A
<b>Voltage Frequency</b>	
Range	5.0 Hz to 500.0 Hz
Resolution	0.1 Hz
Accuracy	0.5 % RD + 5 digits
Trigger Level	5 Hz to 20 Hz, $\geq 5$ V
	20 Hz to 100 Hz, $\geq 5$ V
	100 Hz to 500 Hz, $\geq 10$ V
<b>DC Power</b>	
Range	600.0 kVA (600.0 V dc range)
	1500 kVA (1500 V dc range)
Resolution	0.1 kVA
	1 kVA
Accuracy	2 % RD + 2.0 kVA
	2 % RD + 20 kVA
<b>Resistance</b>	
Range	600.0 $\Omega$
	6000 $\Omega$
	60.00 k $\Omega$
Resolution	0.1 $\Omega$ ( $\leq 600.0$ $\Omega$ )

	1 $\Omega$ ( $\leq 6000 \Omega$ )
	0.01 k $\Omega$ ( $\leq 60.00 \text{ k}\Omega$ )
Accuracy	1 % RD + 5 digits
<b>Capacitance</b>	
Range	100.0 $\mu\text{F}$
	1000 $\mu\text{F}$
Resolution	0.1 $\mu\text{F}$ ( $\leq 100.0 \mu\text{F}$ )
	1 $\mu\text{F}$ ( $\leq 1000 \mu\text{F}$ )
Accuracy	1 % RD + 5 digits
Inrush Trigger Level	5 A
<b>Mechanical</b>	
Size (L x W x H)	281 mm x 84 mm x 49 mm
Weight (with batteries)	520 g
Jaw Opening	34 mm
Flexible Current Probe Diameter	7.5 mm
Flexible Current Probe Cable Length (head to electronics connector)	1.8 m
<b>Environmental</b>	
Operating Temperature	-10 °C to 50 °C
Storage Temperature	-40 °C to 60 °C
Operating Humidity	Non condensing (<10°C)
	$\leq 90$ % RH (at 10 °C to 30 °C)
	$\leq 75$ % RH (at 30 °C to 40 °C)
	$\leq 45$ % RH (at 40 °C to 50 °C)
Operating Altitude	2000 m
Storage Altitude	12,000 m
Ingress Protection (IP) Rating	IEC 60529: IP54 non-operating
<b>Electromagnetic Compatibility (EMC)</b>	
International	IEC 61326-1: Portable, Electromagnetic Environment, IEC 61326-2-2 CISPR 11: Group 1, Class A Group 1: Equipment has intentionally generated and/or uses conductively-coupled radio frequency energy that is necessary for the internal function of the equipment itself. Class A: Equipment is suitable for use in all establishments other than domestic and those directly connected to a low-voltage power supply network that supplies buildings used for domestic purposes. There may be potential difficulties in ensuring electromagnetic compatibility in other environments due to conducted and radiated disturbances. Caution: This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.
Korea (KCC)	Class A equipment (Industrial Broadcast & Communications Equipment) Class A: Equipment meets requirements for industrial electromagnetic wave equipment and the seller or user should take notice of it. This equipment is intended for use in business environments and not to be used in homes.
USA (FCC)	47 CFR 15 subpart B. This product is considered an exempt device per clause 15.103.
<b>Safety</b>	
General	IEC 61010-1, Pollution Degree 2
Measurement	IEC 61010-2-032: CAT III 1500 V / CAT IV 600 V
	IEC 61010-2-033: CAT III 1500 V / CAT IV 600 V
<b>Wireless Radio</b>	
Radio frequency certification	FCC ID: T68-FBLE, IC: 6627A-FBLE

Wireless Radio Frequency Range	2400 MHz to 2483.5 MHz
Output Power	<100 mW

<b>IRR1-SOL Irradiance Meter General Specifications</b>	
<b>Irradiance</b>	
Measuring Range	0 to 1400 W/m <sup>2</sup>
Resolution	1 W/m <sup>2</sup>
Measuring Accuracy	± (5 % + 5 Digit)
<b>Temperature Measurement</b>	
Measuring Range	-22 °F to 212 °F (-30 °C to 100 °C)
Resolution	0.2 °F (0.1 °C) / 1 °F @>100 °F
Measuring Accuracy	±2 °F (±1 °C) @ 14 °F to 167 °F (-10 °C to 75 °C), ±4 °F (±2 °C) @ -22 °F to 14 °F (-30 °C to -10 °C) and 167 °F to 212 °F (75 °C to 100 °C)
<i>Note: Temperature measurement response time: ~30 sec.</i>	
<b>Inclination Angle</b>	
Measuring Range	-90° to +90°
Resolution	0.1°
Measuring Accuracy	± 1.5° @ -50° to +50°, ±2.5° @ -85° to -50° and +50° to +85°, ±3.5° @ -90° to -85° and +85° to +90°
<b>Compass</b>	
Measuring Range	0° to 360°
Resolution	1°
Measuring Accuracy	±7°
<i>Note:</i> a) Measurements valid for device inclination between -20° and +20° to horizontal. Outside that range on LCD will be shown "---". b) Result is referred to magnetic north.	
<b>Temperature</b>	
Operating Temperature IRR1-SOL	-20 °C to 50 °C (humidity <80%), noncondensing
Operating Temperature 80PR-IRR	-30 °C to +100 °C
Storage Temperature	-30 °C to 60 °C (humidity <80%)
Altitude	0 m to max. 2000 m
<b>Electromagnetic Compatibility (EMC)</b>	
International	IEC 61326-1: Portable Electromagnetic Environment CISPR 11: Group 1, Class A Group 1: Equipment has intentionally generated and/or uses conductively-coupled radio frequency energy that is necessary for radio frequency energy that is necessary for the internal function of the equipment itself. Class A: Equipment is suitable for use in all establishments other than domestic and those directly connected to a low voltage power supply network that supplies buildings used for domestic purposes. There may be potential difficulties in ensuring electromagnetic compatibility in other environments due to conducted and radiated disturbances. Caution: This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.
Korea (KCC)	Class A Equipment (Industrial Broadcasting & Communication Equipment) Class A: Equipment meets requirements for industrial electromagnetic wave equipment and the seller or user should take notice of it. This equipment is intended for use in business environments and not to be used in homes.
USA (FCC)	47 CFR 15 subpart B. This product is considered an exempt device per clause 15.103.
<b>Protection</b>	
IP Protection	IP40

<b>Power Supply &amp; Battery Life</b>	
Batteries	4 AA Alkaline Batteries
Battery Life (typical)	50 hours (≤9000 readings)
Auto Power Off	30 minutes
<b>Dimensions</b>	
L x W x H	5.90 x 3.14 x 1.37 in (150 x 80 x 35 mm)
Weight	0.5 lb (231 g)

<b>PVLEAD1 and PVLEAD3 MC4 Solar Clamp Test Lead Set General Specifications</b>		
	<b>PVLEAD1 MC4 to 4mm Test Lead Set</b>	<b>PVLEAD3 MC4 Solar Clamp Meter Test Lead Set</b>
Contact	Brass, Nickel Plated	Brass, Nickel Plated
Length	60"	36", 12"
Voltage	CAT III 1000V, CAT IV 600V	CAT III 1000V, CAT IV 600V
Current	20 amp	20 amp
Standards	IEC 61010-031	IEC 61010-031