FLUKE®

Solar Energy Resources

PV Electricians, Solar Installers, Comissioning Technicians, and O&M Technicians and Managers

Fluke™ Solar Tools

1.800.561.8187 www.itm.com information@itm.com

Solar End-Users

PV Electrician

The PV Electrician installs, maintains, and repairs PV systems, ensuring they are properly connected to electrical grids and function efficiently. They follow safety protocols, comply with regulations, and provide customer support for system operation and maintenance.

Solar Technician/Installer

Solar Technicians are responsible for assembling, installing, and maintaining solar installations on rooftops and other structures. Technicians regularly service and maintain existing systems and troubleshoot equipment deficiencies and malfunctions.

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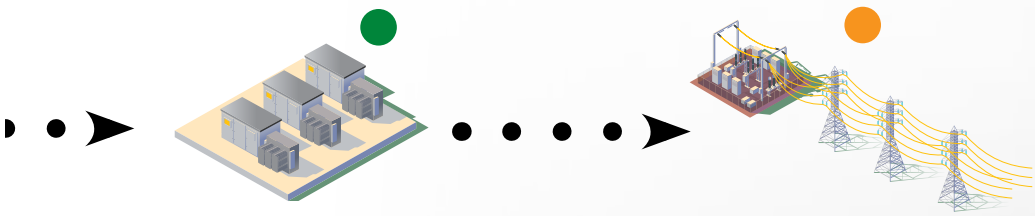
Commissioning Technician

The Commissioning Technician designs the wiring and installation of the PV system to ensure the system will be installed to produce reliable and consistent power levels. They also ensure that the system is installed in compliance to relevant electrical and building standards.

O&M Manager

The owner's representative, the Operations Manager will coordinate all maintenance activities and ensure the system is functioning optionally and producing reliable and consistent energy.

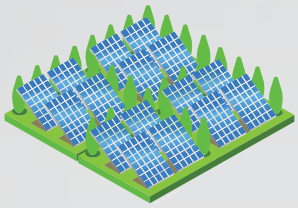


Fluke Solar Tools

Solar Application

Solar Modules

A single photovoltaic cell contains semiconductors that can convert sunlight into electricity. PV cells only generate a limited amount of energy, numerous cells are connected to create a single solar module.



Working together, multiple solar cells generate higher voltage, and therefore more energy. Photovoltaic cells are the primary component that makes up a solar module, while solar panels are a vital component that makes up a solar installation.

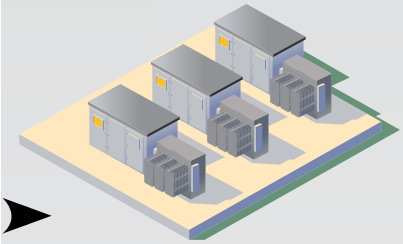
Combiner Boxes

A solar combiner box combines the output of numerous strings of PV modules for connection to the inverter. Generally, it houses fuses that protect each string of modules.

Current measurements and calculations are crucial to establishing whether the PV arrays are operating correctly.

Inverters

Solar modules generate DC electricity, and inverters are required to convert that electricity from DC to AC in order to make a connection to the utility grid.



It is crucial to regularly check the inverter's operating DC input voltage and current level and, on the AC side, the inverter's output voltage and frequency, to ensure that the inverters are operating properly.

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Battery Storage

Healthy batteries should maintain a capacity above 90% of the manufacturer's rating. Most manufacturers recommend replacing the battery if its capacity falls below 80%.

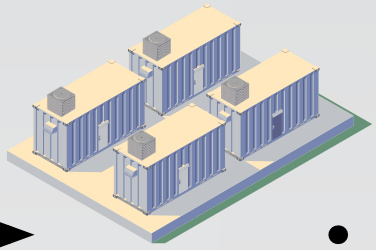
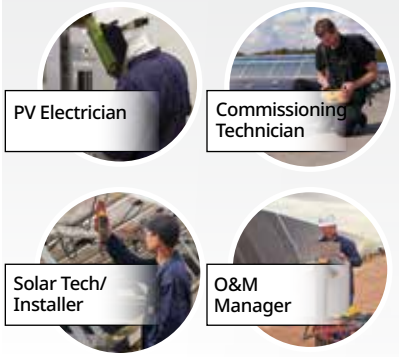
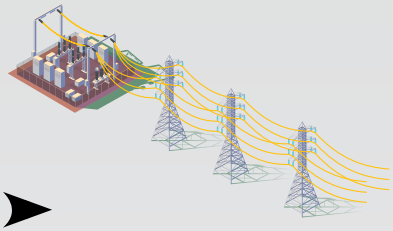


Plate degradation, sustained high temperatures or an increase in resistance of more than 20% compared to the baseline or previous measurement are key signs of failure and require regular testing to ensure optimal performance and prevent downtime.



Substation and Transmission

The electrical substation is the key interface between the utility grid and renewable installations.



All substations require a comprehensive maintenance program including the testing of transformers, circuit breakers, batteries and chargers, relays and isolating circuit switches.

Fluke Solar Tools

Solar Tools

Recommended Accessory
1500V Solar Test Leads

PVA-1500 Series is FPC Eligible

PremiumCare
Uptime Protection by FLUKE

PVA-1500 Series PV Analyzer, I-V Curve Tracer

Designed for assessing and optimizing solar PV system performance, the **Fluke PVA-1500 Series** provides reliable and detailed performance data through high precision testing, aiding in the early identification of issues to enhance output and longevity. Featuring high throughput I-V curve tracing, an intuitive user interface, and comprehensive measurement capabilities, the **PVA-1500** supports commissioning, operations, maintenance, and troubleshooting of PV arrays by offering quick analysis and baseline data for future performance comparisons. It measures I-V and P-V curves, as well as key parameters like Isc, Voc, Imp, Vmp, Pmax, fill factor, and performance factor. The system interfaces with a tablet or laptop, facilitating efficient data display and storage. The **PVA-1500HE2** excels with high-efficiency modules and in high-temperature environments. The SolSensor™ Wireless PV Reference Sensor provides essential irradiance, temperature, and tilt data, ensuring accurate I-V curve measurements under varied conditions. Data captured by the PVA is analyzed using the Data Analysis Tool (DAT), which compiles and visualizes key parameters, flags anomalies, and generates comprehensive reports. Training on using the PVA is available through Fluke on-demand.

- Measures and displays I-V curves up to 1500V and 30A, including on high efficiency modules (PVA-1500HE2)
- Sweep-to-sweep delay of 9 seconds to measure 3.5MW in <1hr
- Wireless interfaces for faster setup, safer work environment, and freedom of movement during PV troubleshooting
- Automates data management, analysis, and reporting

BEST SUITED FOR MODULES, COMBINER BOXES, INVERTERS

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Comparison of Fluke I-V Curve Tracers

	SMFT-1000 see page 8	PVA-1500T2	PVA-1500HE2
Multifunction Capability	•	—	—
I-V Curve Capability	•	•	•
Sweep Time	< 40 seconds	< 9 seconds	< 9 seconds
Module Efficiency	Up tp 19% / 20 A DC	Up to 19% / 30 A DC Above 19% / 10 A DC	Above 19% / 30 A DC

PVA-1500T2

PVA-1500HE2

Fluke Solar Tools

PTIA 2022
AWARD WINNER

SMFT-1000 is FPC Eligible

PremiumCare
Uptime Protection by FLUKE

SMFT-1000 Solar Tools Kit: Fluke Multifunction PV Tester and Performance Analyzer, I-V Curve Tracer

Designed for PV professionals, the **Fluke SMFT-1000 Multifunction Tester** ensures optimal power output and safety of PV systems up to 1000 V DC, conforming to IEC 62446-1 standards, with I-V curve tracing and seamless data analysis via TruTest™ Software.

- Open-circuit voltage (VOC) measurement at the PV module/string up to 1000 V DC
- Short-circuit (ISC) current measurement at the PV module/string up to 20 A DC
- On-location I-V curve results compares manufacturer I-V curve data to measured data on the analyzer screen
- Accurately measures modules with an efficiency of up to approximately 19%

BEST SUITED FOR MODULES, COMBINER BOXES, INVERTERS

FLUKE®

Fluke TruTest™ Solar Data Management and Reporting Software

Cover all your certification and documentation needs through the modern, fast and reliable software platform of TruTest™. Compatible with the Fluke SMFT-1000 Multifunction PV Tester and Performance Analyzer, **TruTest™ Software** allows you to quickly and easily import measurement results directly from your solar multifunction tester to computer, organize and analyze the data, compare individual asset data against previous measurements imported and provide a comprehensive and visual client report.

- Quickly create inspections and reports compliant with IEC 62446-1 and other directives
- I-V curve analysis with easy pass/fail visuals; see changes in I-V curve over multiple site visits
- Compare site data to previous site data to see changes over time
- A free 60-day demo version of TruTest™ is available for download on fluke.com. Purchase a software key to unlock the Lite or Advanced version.

TruTest

Fluke Solar Tools

Solar Tools

Fluke 283 FC/PV True-RMS CAT III 1500 V Solar Digital Multimeter and Wireless Current Clamp

Whether you're working with a utility-scale solar photovoltaic (PV) array, wind power, electric railways, or data centers, the **Fluke 283 FC Digital Multimeter and a 283 FC True-RMS Wireless Current Clamp** has been engineered to enhance safety and increase productivity while giving you accurate, reliable, and repeatable results. This digital multimeter and current clamp combo meets the safety requirements for test equipment (IEC 61010-2-032) corresponding to the overvoltage category level of the PV array electrical installation (IEC 61730-1). Combine these with CAT III 1500 V / CAT IV 1000 V rated TL175-HV Premium Silicone Test Leads, CAT III 1500 V MC4 connectors and you've got a comprehensive frontline troubleshooting solution that offers safe and accurate voltage measurement for troubleshooting everything from the inverters, combiners, strings of modules, or individual modules.

- Highly accurate voltage measurements for precise frontline troubleshooting
- Current measurements up to 60 A AC/DC for safely troubleshooting individual strings of modules with greater accuracy (when using a283 FC wireless current clamp)
- Visual and audio polarity indicators help prevent accidental module wiring issues
- User-defined limit gauge helps you make quick go/no-go troubleshooting decisions
- Save and log measurements to internal memory and view them on your mobile device via Fluke Connect™

BEST SUITED FOR MODULES, COMBINER BOXES, INVERTERS

TLPV1 is Included
shown with TLPV-UTOOL

FLUKE®

Fluke IRR2-BT Irradiance Meter Pro, Solar Site Surveyor

This meter communicates wirelessly with the SMFT-1000 Multifunction to produce a highly accurate I-V curve instantly, making it easy to determine if a PV system is operating as designed **Fluke IRR2-BT Irradiance Meter Pro** also includes a convenient mounting bracket to secure the meter to the edge of a panel.

- 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 mounting bracket for accurate irradiance and temperature readings at the panel

BEST SUITED FOR MODULES

Fluke Ti480 PRO Thermal Imager

When conducting preventative maintenance routines in harsh conditions there is no margin for error. The **Fluke Ti480 PRO Infrared Camera** is designed for use in the toughest industries, with heightened resolution and thermal sensitivity to ensure you get accurate results the first time.

- Increased sensitivity to visualize temperature differences
- Get 4x the pixel data with SuperResolution, which captures multiple images and combines them to create a 1280 x 960 image
- Quickly and easily take notes in the field with IR-PhotoNotes™ and voice annotations
- Save time by wirelessly syncing images directly from your camera to the Fluke Connect® system for easy readability in direct sunlight

BEST SUITED FOR MODULES, COMBINER BOXES, INVERTERS, BATTERY STORAGE, ELECTRICAL SUBSTATION AND TRANSMISSION

Fluke Solar Tools

Solar Tools

Fluke 393 FC Clamp Meter

If you need to conduct measurements in high voltage dc environments, such as with solar arrays and uninterruptible power supplies, the **Fluke 393 FC Clamp Meter** is the tool for you.

- Measure safely with this CAT III 1500 V certified clamp meter
- Thin jaw for access to cables in crowded combiner boxes
- Sturdy IP54 rating for outdoor use
- Work efficiently with dc power measurement, audio polarity, and visual continuity

PTIA 2022 AWARD WINNER

BEST SUITED FOR MODULES, COMBINER BOXES, INVERTERS

Recommended Accessory
TLPV1 and TLPV-UTOOL

Fluke 87V MAX Industrial Multimeter

The **Fluke 87V MAX Industrial Multimeter** is the preferred troubleshooting solution for professional technicians worldwide, providing the features you need to troubleshoot and repair electrical systems with unparalleled reliability, accuracy, and the ruggedness you expect from Fluke.

- Identify complex signal problems fast with analog bar graph
- Captures intermittents as fast as 250 µS with Peak Capture
- Supports accurate measurements on VFDs using a low-pass filter
- Built to highest safety standards

BEST SUITED FOR COMBINER BOXES, INVERTERS, BATTERY STORAGE

FLUKE®

ii910 is FPC Eligible

PremiumCare

Uptime Protection by FLUKE®

Fluke ii910 Acoustic Imager

With an expanded frequency detection of range up to 100 kHz the **Fluke ii910 Precision Acoustic Imager** enables you to visually see partial discharge problems, even in their earliest stages. Spot problems before they occur to minimize downtime, save on energy costs, and prevent catastrophic failures.

- Safely detect PD from up to 120 m in distance
- Use the built-in PDQ mode to capture, track, and analyze the severity and type of partial discharge
- Capture images and videos with one button for easy reporting. Combine with PDQ data to generate comprehensive reports

BEST SUITED FOR ELECTRICAL SUBSTATION AND TRANSMISSION

Fluke BT521 Battery Analyzer

Ideal for troubleshooting, maintenance, and performance of individual stationary batteries and battery banks used in critical back-up applications.

- Key measurements include internal battery resistance, DC and AC voltage, DC and AC current, ripple voltage, frequency, and temperature
- Sequence measurement mode allows for automatic or manual sequence testing of battery strings with automatic measurement storage without requiring a button press to save each time
- Comprehensive logging automatically captures all measured values for on-the-go analysis
- Intuitive user interface, compact design, and rugged construction for optimum performance, test results, and reliability

BEST SUITED FOR BATTERY STORAGE

Fluke Solar Tools

Solar Tools

1777 is FPC Eligible

PremiumCare

Uptime Protection by FLUKE

Fluke 1777 Power Quality Analyzer

With **Fluke 1777**, you'll never miss a critical power quality event—from fast transients up to 8 kV, harmonics up to 30 kHz, dips and swells, as well as the voltage, current, and power measurements that enable you to characterize your electrical system.

- High-speed voltage transient capture
- Included full power quality and electrical energy analyzer functionality
- At-a-glance "Advanced Power Quality Health" summary screen with graphical representation
- Highest safety rating in the industry: 1000 V CAT III/ 600 V CAT IV

BEST SUITED FOR INVERTERS, BATTERY STORAGE, ELECTRICAL SUBSTATION AND TRANSMISSION

Fluke 125B Industrial ScopeMeter

Automatically capture, view, and analyze complex waveforms with the **Fluke 125B Industrial ScopeMeter**. One truly integrated tool, putting the functions of an oscilloscope, multimeter and high-speed recorder into one, easy-to-use instrument.

- Dual-input digital oscilloscope and multimeter in a ScopeMeter™ test tool
- Features Connect-and-View™ trigger simplicity for hands-off operation
- Includes IntellaSet™ technology to automatically and intelligently adjust numerical readouts based on measured signals
- Provides a dual-input waveform and meter reading recorder for trending data over extended periods

BEST SUITED FOR INVERTERS, ELECTRICAL SUBSTATION AND TRANSMISSION

FLUKE®

Fluke Norma 6004+ Portable Power Analyzer

The **Fluke Norma 6004+** Portable Power Analyzer gives more freedom than ever before to conduct accurate measurements in any environment, whether in the lab or in the field. Measure at the load to discover how the equipment operates under real-world conditions, with real-world variables.

- Measure voltage, current, active power, reactive power, apparent power, power factor, and harmonics with associated values
- Get accurate, precise results with 0.1% measurement accuracy and a 500 kHz bandwidth
- Highly portable 3.5 kg weight and a 10-hour battery life to take precision power measurements almost anywhere
- Measure mechanical parameters including speed and torque to discover the electrical to mechanical efficiency of the load under a variety of typical operating modes

BEST SUITED FOR INVERTERS, BATTERY STORAGE, ELECTRICAL SUBSTATION AND TRANSMISSION

Fluke 1748 Three-Phase Power Quality Logger

The **Fluke 1748 Three-Phase Power Quality Logger** is the best tool to troubleshoot, quantify energy usage, and analyze power distribution systems in a fast, easy, and safe way.

- Measure key power quality parameters including harmonics and inter-harmonics, unbalance, flicker, and rapid voltage changes
- Measure with premium accuracy to the rigorous IEC 61000-4-30 Class A Edition 3 standard
- One-touch reporting to create standardized reports using the included Fluke Energy Analyze Plus Software

BEST SUITED FOR INVERTERS, BATTERY STORAGE, ELECTRICAL SUBSTATION AND TRANSMISSION

Fluke Solar Tools

Solar Tools

Fluke 1625-2 Earth Ground Tester

The **Fluke 1625-2 Earth Ground Tester** measures loop resistance using only clamps or stakes or one of each. The stakeless method eliminates the dangerous and time-consuming job of disconnecting parallel grounds and finding suitable locations for auxiliary ground stakes so earth ground tests can be performed even in places without access to soil.

- Perform testing with or without stakes
- Use the stakeless method to test earth ground resistance anywhere
- Features automatic frequency control to minimize the effect of interference

BEST SUITED FOR INVERTER BOXES, BATTERY STORAGE, ELECTRICAL SUBSTATION AND TRANSMISSION

Fluke 1537 Insulation Resistance Tester

Perform preventative maintenance tasks faster, easier and safer than ever before with the **Fluke 1537 Insulation Resistance Tester**.

- User-selectable voltages of 250 V-2500 V
- Up to 500 GΩ insulation resistance measurement
- Short circuit current up to 5mA for fast, stable measurements
- Automatically calculate PI and DAR
- Perform 1,300+ insulation tests on a single charge

BEST SUITED FOR SOLAR ARRAYS, INVERTERS, BATTERY STORAGE, ELECTRICAL SUBSTATION AND TRANSMISSION

FLUKE®

FLUKE CONNECT

Fluke 1630-2 Earth Ground Clamp

The **Fluke 1630-2 FC Earth Ground Clamp** measures loop resistance for multi-grounded systems using the dual-clamp jaw, eliminating the need to disconnect parallel grounds or find suitable locations for auxiliary test stakes. Ground tests can be performed inside buildings, on power pylons, or anywhere you don't have access to soil to place auxiliary test stakes.

- Earth ground AC leakage current measurement
- Use the stakeless method to test earth ground resistance anywhere
- Logging measurements
- Alarm threshold
- Band-pass filter
- Fluke Connect™ wireless system

BEST SUITED FOR INVERTER BOXES, BATTERY STORAGE, ELECTRICAL SUBSTATION AND TRANSMISSION

Fluke 1587 FC Insulation Multimeter

The **Fluke 1587 FC Insulation Multimeter** performs fast and accurate insulation tests with advanced functions including ramp voltage, polarity index, dielectric absorption ratio and dielectric discharge testing.

- Automatically calculate Polarity index (PI) and Dielectric absorption ratio (DAR)
- Safety first: connect the insulation tester, then monitor test measurements remotely
- Document the job quickly by seeing and sharing insulation resistance test results wirelessly via your smartphone comprehensive reports

BEST SUITED FOR COMBINER BOXES, INVERTER BOXES

Fluke Solar Tools

Solar Accessories

Fluke PV Module Lift™

The **Fluke PV Module Lift™** is designed to safely and quickly transport a PV module to a roof, streamlining the installation process of solar panels. This innovative tool enables you to lift solar modules to the roof with ease and precision, making installation faster, safer, and more efficient. With its compact design and simple operation, Module Lift is ideal for both residential and commercial solar installations. It eliminates the need for heavy lifting and reduces the risk of damage to the panels and the roof.

- Reduces fatigue and increases safety
- Enables installers to meet OSHA ladder safety standards
- Sets up in less than 5 minutes by one person
- Lightweight, rugged, reliable
- Available with a 60’ rope or 80’ rope

FLUKE®

Fluke TLPV-UTOOL Solar PV Connector Unlocking Tool

Designed to quickly disconnect solar PV connectors, the **Fluke TLPV-UTOOL** works with Fluke TLPV1 test leads that have Staubli MC4 connectors. The tool's unique hinge design allows for unlocking in both parallel and perpendicular configurations, providing versatility in various installation scenarios.

Fluke TLPV1 MC4 to 4mm Test Lead Set

Ensure safe measurements on PV modules with the **Fluke TLPV1** test leads. Compatible with 4 mm sheathed banana plugs, these leads are Ideal for Staubli MC4-connected modules.

Fluke TL175-HV CAT III 1500 V TwistGuard™ Test Leads

The **Fluke TL175-HV CAT III 1500 V TwistGuard™ Test Leads** are designed specifically for solar and other applications requiring higher voltage testing and measurement. These leads are engineered for use by solar technicians, commercial, and industrial electricians, and meet the stringent CAT III 1500 V and CAT IV 1000 V safety standards. They feature patented TwistGuard™ technology and the WearGuard™ lead wire wear indicator for enhanced safety and durability.

Fluke Solar Tools

Reduce unplanned expenses and get the most out of your tools with Fluke Premium Care

When you invest in the best equipment in the industry, you want your money to go as far as possible. Fluke Premium Care provides coverage above and beyond your tool's original product warranty, so you don't need to worry about unexpected downtime caused by damaged test equipment, accessories, or tools in need of calibration or repair.

Fluke Premium Care is available in both a Standard and Gold level with one-year or three-year plan options so you can choose the plan that is right for you.

	Standard Warranty	Premium Care Standard	Premium Care Gold
Repair manufacturing defects	✓	✓	✓
Accidental damage and repair		✓	✓
Replacement of damaged accessories		✓	✓
Annual calibration or performance check		✓	✓
Expedited calibration and repair		✓	✓
Priority tech support		✓	✓
Software updates		✓	✓
Expedited shipping		✓	✓
Loaner equipment			✓

PremiumCare

Uptime Protection by FLUKE

Repair manufacturing defects
Ensuring that your equipment functions as intended maintains accuracy and reliability, thereby reducing downtime and ensuring the longevity of your Fluke product.

Accidental damage and repair
Avoid costly repairs and rest easy knowing your test tool is covered in the event it gets damaged.

Replacement of damaged accessories
Accessories that originally shipped with your unit, like batteries, power adapters, probes and cables, and have been qualified as defective by our technicians will be replaced, free of charge.

Annual calibration or performance check
Ensure your test tool is providing accurate results and adheres to the recommended maintenance schedule by leaving it in the hands of our experts.

Expedited calibration and repair
Your calibration or repair will be expedited with priority next-on-bench service and shipping so you can get back to your work faster.

Expedited shipping
Accelerates the shipping process, reducing the time your equipment spends in transit, while minimizing the overall turnaround time to ensure that your Fluke product is back in your hands and operational as quickly as possible.

Software updates
Maintain peak performance with firmware updates that ensure your tool remains reliable and up to date, automatically applied during equipment calibration.

Priority tech support
Ensures prompt assistance and resolution of technical issues, minimizing downtime by quickly addressing any problems or concerns with your Fluke equipment.

Loaner equipment
Never be without your tool. With a Gold Premium Care plan, we'll send a loaner tool for as long as the repair takes.