Delivering Test Solutions Reliably for 40 years.

Since 1976 power companies have relied on test solutions from Red Phase Instruments to provide assessment data of vital electrical and utility infrastructure.

A trusted quality manufacturer, our equipment is built to withstand the rigours of continual field work and long term use by service personnel.

With some products still in service after 25+ years we are a constant and reliable utility partner that provides quality test equipment and engineering services at the most technical level.

With an approachable attitude, Red Phase Instrument’s technical staff are easy to reach, providing utilities with the confidence that assistance and advice is a phone call away.
INSTRUMENTATION
**C.T. TESTING**

Model: 590G-V2  
Type: Metering CT Tester and PT ratio tester  
Rating: 110 to 250Vac or 12Vdc, 50VA

The 590G-V2 is a CT test instrument which employs a secondary injection method, first pioneered by Red Phase Instruments, to test the ratio and phase accuracy of a Current or Potential Transformer under simulated burden conditions.

The 590G-V2 can also be used in conjunction with the 590F and/or the 590M to test a CT’s ratio and phase error on line or “live” avoiding the need to shutdown a power network.

Also when used with the 590D-1 accessory the 590G-V2 is able to measure inductive PT ratio and phase error under under voltage load and burden based conditions in accordance with elements of IEC standards.

**C.T. & P.T. TESTING**

Model: 590J-V2  
Type: CT and Inductive PT tester  
Supply: 110 to 250Vac

A truly portable instrument transformer test unit. Able to perform the following offline tests:

- Metering CT ratio and phase errors under burden conditions and in accordance with existing and/or user defined CT class accuracies or test points along with standards such as IEC 61869-2.
- Protection CT Testing.
- Inductive PT testing under burden and varying load voltage conditions as per IEC 61869-3.
- Muti-Tap CT test option available

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metering CT Accuracy</td>
<td>0.1 Class</td>
</tr>
<tr>
<td>Protection CT</td>
<td>Standard and Transient</td>
</tr>
<tr>
<td>Inductive PT’s</td>
<td>To 330KV</td>
</tr>
</tbody>
</table>
Model 590F is a broad term used to describe the measurement abilities of a series of clamp on CT models used in conjunction with our popular offline CT tester called the 590G-V2 or the new 590J-V2. Combined they are capable of testing a metering CT’s ratio and phase accuracy on an active, “live” power network thus avoiding shutdowns and customer down time.

### CT CLAMP ON ACCESSORIES

<table>
<thead>
<tr>
<th>Type</th>
<th>Current Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>590F1 HV optically isolated including hotstick</td>
<td>75A to 1400A</td>
</tr>
<tr>
<td>590F2-50ID LV</td>
<td>150 to 2500 Amps</td>
</tr>
<tr>
<td>590F2-85ID LV</td>
<td>100 to 750 Amps</td>
</tr>
<tr>
<td>590F3 HV optically isolated including hotstick</td>
<td>5 to 100 Amps</td>
</tr>
</tbody>
</table>
The 590M is a current injection source that can be employed together with a 590F Clamp on CT and the 590G-V2 or 590J-V2 tester.

During a live CT test the 590M, controlled by the 590G-V2 or 590J-V2, automatically adjusts the primary current level through an in-circuit CT by adding or subtracting the current required to attain the desired test point current level. Once at the desired test point, the 590G-V2 and the 590F automatically calculate the ratio and phase error before adjusting the CT primary current to the next desired test point or current level.

The admittance of a current transformer or CT provides a direct indication of its core energy loss characteristic. This core energy loss is a reflection of the CT’s ability to translate current and phase information accurately. The field portable 505B instrument can measure these core losses quickly providing the operator with a picture of a live CT’s operational status while in-circuit.

The Live VA burden of the CT’s metering loop can also be measured from the test block or at the CT secondary terminals.

### LIVE C.T. TESTING

**Model:** 590M  
**Type:** CT test accessory  
**Supply:** 240Vac  
**Rating:** 200VA

### SOURCE

- **Maximum Current**: Up to 200 Amps  
- **Operating Current**: Up to 100 Amps  
- **Auto Current Adjust**: Via 590G-V2 or J-V2  
- **Manual Current Adjust**: Ampere Turns

### CT ADMITTANCE TESTING

**Model:** 505B  
**Type:** Online 1.6kHz CT Admittance Tester  
**Supply:** Battery powered

- **Max Admittance Range**: Up to 50mS  
- **50/60Hz current range**: 0 to 10 Amps  
- **5 Amp burden range**: 0 to 100VA
Since 2007 the 590K has been used to determine a CVT’s ratio and phase error under simulated test conditions which closely match its online performance.

With multiple test points to choose from the 590K offers a true look at a CVT’s performance under varying burden and load voltage conditions in accordance with IEC 60044-5 and IEC 61869-5.

The 590K is not a simple ratio name plate comparator. It is a first in its class truly portable CVT test platform trusted by field service and laboratory personnel globally.

### C.V.T. TESTING

**Model:** 590K  
**Type:** Capacitor Voltage Transformer tester  
**Supply:** 84 to 265Vac, 50 or 60Hz

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVT Test Range</td>
<td>To 550KV</td>
</tr>
<tr>
<td>Ratio Accuracy Metering</td>
<td>From 0.05%</td>
</tr>
<tr>
<td>Ratio Accuracy Protection</td>
<td>From 0.15%</td>
</tr>
<tr>
<td>Output Voltage</td>
<td>0 - 3KV</td>
</tr>
<tr>
<td>Burden Range</td>
<td>To 500VA</td>
</tr>
<tr>
<td>Measurable Windings</td>
<td>Up to three</td>
</tr>
</tbody>
</table>

**INSTRUMENTATION**

Bogota, Colombia
Red Phase Instruments design and manufacture rugged, quality earth testing and measurement equipment. Constantly innovating we are developing an ever increasing portfolio of products that will assist earthing professionals with the assessment of an electrical installations integrity.

Product areas

*Current Injection Equipment*: Assessing the performance of an electrical installation's earthing / grounding system under current fault conditions can only be performed with a current injection source. This frequency adjustable current source simulates a lower level, (off frequency), current fault in and around an electrical installation. This induced current will produce various potentials throughout the test site and these can be measured using a similarly tuned multimeter.

*Lightning impedance*: To measure the impedance of an earthed structure under lightning impulse conditions requires being able to simulate or imitate the spectral response of the impulse. Our instrument allows for two shaped current impulses to be applied to a structure such as a pylon tower footing to determine a Direct impedance path measurement and an Electrode Impedance measurement analogous to a Fall of Potential test at low frequency.

*Grid / Ground Bonding*: The bonding integrity between electrical equipment and the earth grid to which it is connected can be compromised over time due to weather induced changes in soil chemistry and at times equipment handling. A reliable indictaor of a metallic structure's grid bond can be determined with a continuity test at both D.C. and alternating D.C. levels.
The 4061 injection source injects current into an earth/ground loop at a pre-selected frequency from 40Hz to 200Hz.

The 4061 has 7 impedance tap settings to closely match typical earth loop impedances from 2Ω up to 128Ω. The 4061 automatically selects the most closely matched tap to the earth loop impedance so that as much power as possible is injected into the test loop at a constant rate. This gives the operator confidence that the clearest and most unambiguous results will be measured during potential and current branch tests. For earth or ground loop impedances outside the 4061’s existing impedance range, the power transferred into the test loop will be less than maximum but still sufficient for testing most small and medium subs or stations. Optionally the operator may consider our larger and more powerful 1.8kVA and 8kVA injection systems for larger or more inductively challenging environments which the test loop may be subject to.

The 4061 comes with an on board Web Server and data modem giving the operator the flexibility of remote control and status monitoring via their mobile phone or tablet. Also an in-built GPS feature together with our tunable multimeters allows the operator to take current branch phase angle readings without the need for a separate phase reference cable.

Whilst using the 4061 in a Fall of Potential set up, typical measurements taken by an operator with a tunable multimeter on-site would be:
1. Step & Touch Potentials
2. Transfer potentials
3. Touch Potential
4. Return current branches
5. Ground / Earth potential rise

### Technical Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage Input Range</td>
<td>85 to 264 VAC</td>
</tr>
<tr>
<td>Output Power</td>
<td>200VA</td>
</tr>
<tr>
<td>Output Voltage Max</td>
<td>160VAC</td>
</tr>
<tr>
<td>Selectable Frequency Range</td>
<td>40Hz to 200Hz</td>
</tr>
<tr>
<td>Seven Earth / Ground Loop</td>
<td>From 2Ω at 10A</td>
</tr>
<tr>
<td>Transformer Impedance Taps</td>
<td>to 128Ω at 1.25A</td>
</tr>
<tr>
<td>GPS Phase Synch</td>
<td>Available</td>
</tr>
<tr>
<td>Remote Control</td>
<td>via Web Server</td>
</tr>
</tbody>
</table>
CURRENT INJECTION

Model: 4062
Type: 1.5kVA to 1.8kVA Current Injection Unit
Supply: 85-264Vac, 50 or 60Hz

The 4062 is a switch mode current injection source that is used with the Model 4063 shown below to inject a true AC current at a selectable frequency into an earth/ground loop. Feedback control from the 4063 indicates to the 4062 what adjustment to the voltage magnitude is required to maintain the chosen RMS current.

The 4062 comes with a GPS for injection signal synchronization together with an on board web server & 4G/LTE modem for remote injection status monitoring and control.

Output Power Max: 1800 VA
Selectable Frequency Range: 40 Hz to 70 Hz
GPS Phase Synch: Yes
Remote Control: via Web Server

CURRENT INJECTION

Model: 4063
Type: 1.8kVA Coupling Transformer
Supply: Powered via 4062

The 4063 galvanically isolates the 4062 from the earth loop.

To maximize output power, the 4063 has multiple output voltage and current taps to achieve the optimum impedance match between the load and the 4062.

Note: The 4063 is designed for continuous operation at 1.8kVA.

Input Voltage: 180 V AC nominal
Output Voltage Max: 600 V AC
No. of Transformer Taps**: Eight, from 1 Ω at 42 A to 200 Ω at 3 A

**: 4063 transformer output taps can be customized
**CURRENT INJECTION**

**Model:** 4041  
**Type:** 8kVA Current Injection Unit  
**Supply:** 3-phase, 300-430Vac, 50 or 60Hz

The 4041 is a switch mode current injection source that is used with the Model 4043 shown below to inject a current at a selectable frequency into an earth loop. A feedback control loop from the 4043 indicates to the 4041 what adjustment to the voltage magnitude is required to maintain the chosen RMS current.

The 4041 comes with a GPS add-on feature which, together with our tunable multimeters allows the operator to take current branch phase angle readings without the need for a separate phase reference cable.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Power</td>
<td>8000VA</td>
</tr>
<tr>
<td>Selectable Frequency Range</td>
<td>40Hz to 70Hz</td>
</tr>
<tr>
<td>GPS Phase Synch</td>
<td>Available</td>
</tr>
</tbody>
</table>

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**CURRENT INJECTION**

**Model:** 4043  
**Type:** 8kVA Coupling Transformer  
**Supply:** Powered via 4041

The 4043 galvanically isolates the 4046 from the earth loop. To maximize the output current, the 4043 has multiple output voltage and current taps to achieve the optimum impedance match between the load and the 4046.

Note: The 4043 is designed for continuous operation at 8kVA.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltage</td>
<td>350V AC nominal</td>
</tr>
<tr>
<td>Output Voltage Max</td>
<td>800V AC</td>
</tr>
<tr>
<td>No. of Transformer Taps **</td>
<td>Eight, from 1 Ω at 90A to 80 Ω at 10A</td>
</tr>
</tbody>
</table>

** ** : 4043 transformer output taps can be customized
EARTH / GROUND SYSTEM TESTING

MULTIMETER
Model: 4031-R and 4031-L
Type: Tunable Multimeter
Supply: Internal 3.7V lithium battery, rechargeable

Voltage Input Range: 200 Volts
Current Input Range: 200 & 300 Amps
Selectable Frequency Range: 40Hz to 70Hz
GPS Phase Synch: Available
Record Download: Via USB

MULTIMETER
Model: 4025E
Type: Tunable Multimeter
Supply: 6V Rechargeable sealed lead acid battery

Voltage Input Range: 800 Volts
Current Input Range: 200 & 300 Amps
Selectable Frequency Range: 40Hz to 70Hz
GPS Phase Synch: Available
Record Download: Via USB
Current Input: Lemo & Flex Lem

The 4031 is a truly portable series of frequency selective multi-meters, purpose built for the detection of a tuned AC signal generated by Red Phase Current Injection equipment.

The 4031 is able to measure the following parameters easily and accurately which are important for the safety of both the general public and utility personnel:
- Step and touch voltages
- Fall of Potential (3 and 4 point)
- Current branching with cable-less phase synch

The 4031 comes with either a Lemo rogowski current input, 4031-R, or a Flex Lem rogowski current input, 4031-L.

The 4025E is a frequency selective multimeter purpose built for the detection of a tuned AC signal generated by Red Phase Current Injection equipment.

The 4025E is able to measure the following parameters easily and accurately which are important for the safety of both the general public and utility personnel:
- Step and touch voltages
- Fall of Potential (3 and 4 point)
- Current branching with cable-less phase synch
The lightning impulse impedance test instrument is used to measure the impulse ground impedance of a transmission pylon footing or other grounded structures without the need to disconnect the overhead ground conductor.

Portable and battery operated, the 4051 tests a grounded or earthed structure's lighting impedance by applying a selected impulse profile signal at up to 32A directly to the Pylon footing. The resulting peak load current and voltage is measured and the impedance figure is determined from this.

The chart at right shows the impedance results of 20 tower footings against soil resistivity using a standard 3 point fall of potential set up. The impedance tests performed were:
- A 128Hz low frequency test
- 8 / 20μS impulse test indicated by:
- 10 / 350μS impulse test indicated by:
Up to 5 further impulse profiles are available on the 4051 upon request.

Pylon footing impedance per tower in Ohms

- Low frequency 128Hz test indicated by:
- 8 / 20μS impulse test indicated by:
- 10 / 350μS impulse test indicated by:

Pulse Current Output 0.5A to 32 A
Maximum Pulse Voltage 800V
Impedance Range 0.5 Ω to 300 Ω
GRID BONDING TESTER

Model: ECT-4
Type: Continuity Meter for metallic ground or grid bonded structures
Supply: External Lithium battery pack

The Model ECT-4 is used to test the continuity of connections of bonded structures within an earthed or grounded system such as a substation. Such structures include the electrical equipment itself and peripheral elements such as the equipment guards and the sub or station’s fencing.

The ECT-4 comes with a 10m/33ft and 100m/330ft extension cable allowing the operator to move the test probe to multiple test points around the grid. To extend, further extensions can be ordered in multiples of 100 metres or 330 feet. When running on its external power source it can last over 5 hours from full charge. To maintain battery integrity the unit has a battery status indicator and a low battery shutdown feature.

Other features:
The ECT-4 has a rugged ergonomic pistol grip probe for easy handling. The stainless steel probe pins rotate and retract when pressed onto a bonded metallic structure, making for easier connection to metal through corroded and painted surfaces. The probe’s LCD display provides voltage, current and resistance data during tests and 3 push buttons allow the operator to adjust the test modes and change the current ranges.

Operating Current Modes:
- Forward D.C.: Continuous
- Reverse D.C.: Continuous
- Pulsed Cycle: Forward and Reverse

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**Output Voltage:** Battery 14.4 Vdc

50Hz and 60Hz rejection 100dB

**Selectable Current Levels** 1 A, 2A and 3 Amps

**Accuracy** ± 0.05% w.r.t. full scale

**Resistance Resolution** 10 uΩ from 0 to 0.2 Ω

**Resistance Resolution** 100 uΩ from 0.2 Ω to 4.0 Ω

**Output Current Accuracy** ± 2%

**Current Stability** < 10ppm / second
The function of a revenue meters is to provide energy usage information to a utility. This information can be used to manage costs, profits and the energy resources amongst its generation, transmission, distribution and wholesale customers.

Correct energy consumption readings are crucial to managing this properly and thus regular calibration or meter audits are a necessary part of maintaining a meter’s accuracy.

Since 1976 Red Phase Instruments have helped utilities all over the world with revenue meter test equipment and calibration solutions. Take a look at our portfolio of meter testing and calibration products.
**METER TESTER**

Model: 471  
Type: Single Phase Meter Tester with 30A current source  
Supply: Mains or meter powered, 100 - 270V, 50 or 60Hz

- Input voltage ranges: 70V and 270V.  
- Output current settings: 0.5, 1, 1.5, 2, 3, 5, 10, 15, 20, 30A.  
- PF settings: 1.0, 30 deg lag, 60 deg lag. Tolerance +/-5%

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**SINGLE PHASE TESTER**

Robust single phase KWh meter test unit with a 30 Amp Phantom load current source.  
Built to last, the 471 is not a solid state unit, hence far more fault tolerant than switch mode types.  
It has the following ranges:

- Input voltage ranges: 70V and 270V.  
- Output current settings: 0.5, 1, 1.5, 2, 3, 5, 10, 15, 20, 30A.  
- PF settings: 1.0, 30 deg lag, 60 deg lag. Tolerance +/-5%

- Energy Measurement Accuracy: 0.05%  
- Displayed Voltage Accuracy: 1%  
- Frequency resolution/accuracy: 0.1Hz  
- Phase Angle accuracy: ±1 degree

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**POLY-PHASE**

Model: 691  
Type: 19” Bench Mount Polyphase Reference Standard  
Supply: Meter powered, 50Hz or 60Hz

- Real Energy Accuracy: 0.05%  
- Voltage Accuracy: 1%  
- Voltage Ranges: 60V, 120V, 240V, 480V  
- Current Accuracy: 0.01 Amp  
- Current inputs: 10 & 100 Amp

Model 691 is packaged in a 19” style bench-top case with all connections on the front panel for use in Meter test benches.  
It has inputs for comparison with another poly-phase standard or 3 separate single phase standards for verifying calibration accuracy.
The 689B is a combined WH Meter Tester and 100A phantom load or current source. It can inject up to 3 x 100A into direct connected meters via an integrated switch mode source. It also has a 10A injection circuit for testing CT operated meters.

The colour display shows the information needed in typical meter testing operations. Up to 1000 test records can be stored for later downloading to USB. Screen shots directly to USB can also be made.

All the accessories needed to test disc and electronic meters are supplied.

Automatic test feature available for multiple tests.

Colour Graphics display

Windows based Auto Test script generator software

Supplied free, the Automatic test script generator software allows the operator to create a Fixed Wire test script containing up to 200 individual meter tests with varying test points and operating parameters.
PHANTOM LOADS

ADJUSTABLE CURRENT SOURCES FOR WH METERS

Model : 462J
Type : CT Meter Current Source
Supply : Meter Test Block

The 462J is designed for use with any field meter test set such as the 679E to test polyphase C.T. meters. It can be powered from the metering test block, and will test nominal 240V, 3 phase, 4 wire star connected L.V. meters or nominal 63.5V star connected H.V. meters. It can also test nominal 110V, 3 phase, 3 wire delta connected meters. The 3 current outputs are variable from 0 to 100% in 1A and 10 A ranges in coarse (10%) and fine (1%) increments. Phase angle/power factor settings are available from 60º LEAD to 90º LAG in 15º increments.

Model : 467B-30
Type : 200VA Current Source
Supply : Meter Test Block

This three phase phantom load is perfect for use in energizing CT or Direct connected meters for commissioning or routine testing.

The 467B-30 can deliver up to 200VA per phase and the operator is able to linearly adjust the current injection amplitude from zero to full scale. Shrouded safety plugs and sockets are used to connect the cables to the front panel.

The input required is 240V/415V 3 phase, 4 wire and this is protected with a 3 pole circuit breaker.

Model : 472
Type : Current and Voltage Source
Supply : Meter Test Block

The 472 is a bench mount 3 phase, 4 wire 240V/415V 50Hz & earth current and voltage source. Output configuration is swichable from star to delta.

- 3 phase, 4 wire star 240V / 415V nominal.
- Max 0.7A, 160VA. Output controlled by 3 variacs adjustable from 0 - 110%.
- 3 phase, 3 wire delta 110V nominal.

The output of VA and VC terminals is 110V nominal w.r.t. N terminal.
Partial Discharge Testing

An electrical event such as a high voltage spark occurring across a portion of an insulating medium between two electrodes is called Partial Discharge.

Partial discharge can at times be seen and heard in free air such as with a coronal glow on a power line insulator. However, the most common forms of partial discharge are not visible nor audible and occur within and around solid or fluid insulators which separate conductive zones from each other.

Partial discharge by its nature does not get better and is therefore an obvious pre-cursor to a high voltage equipment’s eventual breakdown. Hence monitoring PD strength is one of the most effective forms of equipment diagnosis and maintenance.

Detection of PD can be done in a number of ways as the discharge signal can manifest itself in a variety of forms. Electric, electromagnetic, acoustic and ultrasonic.
PARTIAL DISCHARGE ANALYSIS

PD TESTER
Model: SUD-300
Type: Ultrasonic PD Detector
Supply: Battery

The SUD-300 is an ultrasonic detection and measurement instrument developed specifically to be used in the detection of Partial Discharge signals which have manifested in the inaudible ultrasonic frequency range. A lightweight field instrument, it can locate, quantify and display the region of PD activity and its intensity in decibels and also translate the ultrasonic signal into the audio range to assist PD intensity detection.

This sophisticated ultrasonic detection system couples digital signal processing, image acquisition and powerful software to present the operator with a comprehensive signal analysis from which a sensible and cost-effective equipment fault mitigation or replacement strategy can be determined and implemented.
Partial discharge location detection in a high voltage switch cabinet

Switch cabinets contain high voltage elements such as break or make, control and protection equipment.

These elements are susceptible to mechanical and insulation discharge problems.

The PDT-120 is used extensively in the detection and location of PD in switch cabinet rooms using TEV probe detection methods as shown below.

To determine the effectiveness of the PDT-120 for yourself please contact Red Phase Instruments for a practical demonstration at a HV location of your choice.

PD TESTER
Model: PDT - 120
Type: Partial Discharge Tracker
Supply: Battery

Dual channel Partial Discharge locator with a colour touch screen interface for easy parameter adjustment and visual feedback. As standard it comes with two TEV or Capacitor coupled high frequency sensors and a hybrid TEV and ultrasonic sensor, contact type.

Other optional sensors that have been purpose designed for use with the PDT-120 are our airborne ultrasonic and high bandwidth HFCT sensors. Combined they provide a powerful and flexible PD analysis tool with the ability to determine PD location using varied sensing methods.

For ease of transportation the PDT-120 PD locator comes in its own carry case and separate accessories bag. The carry case is ergonomically designed and comes with a neck strap for portability during field use.
**PHASOR METER**

Model: 633  
Type: Phasor Meter  
Supply: Mains

This instrument demonstrates the properties of phasors and real & imaginary number notation for students and engineers alike.

The 633 gives the phase displacement and magnitude of the parameter being investigated. It has 50 and 500V ranges and 1 and 10A current range including a 500V range reference voltage input.

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**WATT & PHASOR METER**

Model: 632A  
Type: Watt and Phase Angle Meter  
Supply: Mains

With voltage ranges of 50V, 160V and 500V and three current input ranges of: 1 Amp, 3.2 AMPS and 10 Amps this instrument has proven invaluable as a desktop tool for utilities world wide as well as an excellent laboratory teaching asset in educational institutes.

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**PHASE ANGLE METER**

Model: 597C  
Type: Phase Angle Meter  
Supply: Mains

With voltage, direct current or current via clamp on CT the 597C is able to measure phase angle to an accuracy of 0.1 deg over a voltage range of 10V to 500V and 50mA to 50Amps via direct current measurement.

The clamp on CT option allows measurement of currents up to 500Amps.
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