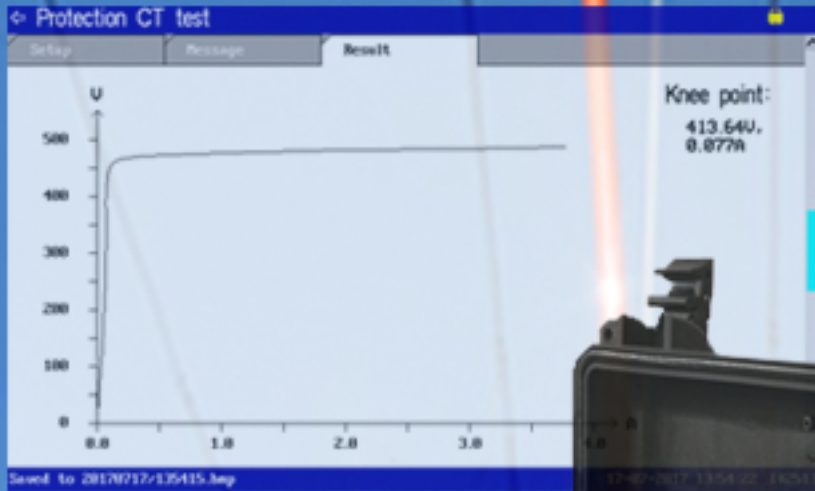




# 590J-V2 DATASHEET C.T. / P.T. TESTER



Manual test

IEC60044-1 CL 0.1-1	CL 0.5
At 100%VA:	
120%: -0.047%, +0.76'	-0.017%, +0.71' ✓
100%: -0.054%, +1.00'	-0.018%, +0.80' ✓
80%: -0.080%, +1.24'	-0.024%, +2.04' ✓
60%: -0.100%, +1.23'	-0.026%, +3.14' ✓
	-0.022%, +3.95' %

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Standard PT test

IEC60044-2	CL: 0.5
At 100%VA:	
120%V: -0.285%, -12.77'	✓
100%V: -0.286%, -12.74'	✓
80%V: -0.289%, -12.72'	✓

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# REDPHASE INSTRUMENTS

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## **KEY FEATURES:**

- **PORTABLE AND LIGHTWEIGHT FOR TESTING P.T.s AND C.T.s DOWN TO AN ACCURACY OF 0.02% BUT TYPICALLY LESS THAN 0.05% OFFLINE IN THE FIELD WITH PRIMARY SIDE VOLTAGE/CURRENT OUT OF SERVICE. BOTH 50Hz AND 60Hz VERSIONS.**
- **TESTS FOR C.T. CURRENT AND PHASE ERROR FROM 2.5/5 UP TO 60,000/5 or 12,000/1.**
- **TESTS P.T. TURNS RATIO AND PHASE ERROR, FROM 1kV/100V UP TO 330kV/110V UNDER SELECTABLE FULL OR NO LOAD CONDITIONS.**
- **FULL LOAD P.T. TEST SIMULATES THE VARIOUS APPLICATION VOLTAGE LEVELS AND BURDEN CONDITIONS AS PER ELEMENTS OF THE IEC 60044-2 STANDARD. USER MAY ALSO CUSTOMIZE APPLICATION TEST POINTS TO SUIT ADOPTED STANDARDS OR NEW REQUIREMENTS.**
- **CALCULATES OVERALL C.T. ERRORS UNDER LOAD FROM ADMITTANCE MEASUREMENT ON SECONDARY WINDING. (DOES NOT REQUIRE EXPENSIVE PRIMARY CURRENT INJECTION TESTING.)**
- **CALCULATES OFFLINE ADMITTANCE AT 1.6kHz. THIS CAN PROVIDE A BLUEPRINT TO BE USED AS A REFERENCE FOR FUTURE ROUTINE LIVE C.T. TESTS WITH RED PHASE MODEL 505B.**  
*The model 505B carries out live Admittance tests rapidly during normal operation with the primary 50/60Hz current present; Does not interrupt supply.*
- **MEASURES THE BURDEN OF C.T. AND P.T. SECONDARY CIRCUITS TO ENSURE C.T. AND P.T. NOT OVERLOADED**
- **AUTOMATIC DEMAGNETIZATION OF CT.**
- **USER IS ABLE TO CREATE THEIR OWN SET OF CT INJECTION AND BURDEN TEST POINTS.**
- **CT BATCH TESTING POSSIBLE ON MEASUREMENT C.T's.**
- **IS ABLE TO STORE UP TO 1000 C.T. AND P.T. RECORDS EACH.**
- **ABLE TO PROVIDE INTELLIGENT CLASS (PASS OR FAIL) RESULTS ASSESSMENT AND ALSO PROVIDE BEST CLASS FIT DETERMINATION.**
- **ABLE TO DOWNLOAD RESULTS TO A USB FLASH DEVICE OR PC.**
- **PROVIDES FOR EXCITATION OF STANDARD AND TRANSIENT PROTECTION C.T.s.**
- **GRAPHICAL PRESENTATION OF EXCITATION CURVE ALSO AVAILABLE.**

## **1.0. APPLICATIONS**

### **1.1. Where it is used**

The 590J-V2 is a lightweight field instrument which employs an indirect injection method to simulate voltage, current and burden levels in P.T. and C.T. audits to accurately determine an instrument transformer's ratio and phase error within a utility metering or protection system.

The 590J-V2 is also suited to routine workshop tests that require quick, repetitive and accurate measurements of C.T. & P.T. ratio and excitation characteristics under varying burden conditions.

### **1.2. C.T. Ratio Error Measurement**

The 590J-V2 can measure the ratio error of either a 1 Amp or 5 Amp metering C.T. within 0.02% to 0.05% of rating across simulated levels of rated current as below.

120% of I

100% of I

80% of I     **I** : indicates primary rated current

50% of I

20% of I

1% of I

- Up to six (6) levels of rated current as above can be customized for a test
- Test can also be performed at up to five (5) different levels of burden
- Power Factor is selectable from 0.5 to unity

### **1.3. Protection C.T. Measurements**

Most elements covering protection C.T.s under IEC60044-1, IEC 60044-6 and IEC 61869-2 standards have been implemented in the 590J-V2.

### **1.4. P.T. Ratio Error Measurement (No Load)**

The 590J-V2 will test the turns ratio of a single phase inductive P.T. at reduced energization with its own internal solid state voltage source. Tests on P.T.s up to 500kV rating has established that a reduced energization level will achieve ratio error results valid to 0.02% under no burden and / or load conditions.

#### **1.4.1 Full Load P.T. Testing**

The 590J-V2 can test a P.T.'s ratio & phase angle error under simulated input voltage and burden conditions in accordance with elements outlined in the IEC60044-2 standard.

A typical test may occur at the following points:

120% of V

110% of V

100% of V

90% of V

80% of V

- Up to five (5) voltage points as above can be customized for test by the operator
- Tests are performed at 25% and 100% of rated burden
- Power factor is selectable from 0.8 & unity

### **1.5. Burden Measurement**

The metering circuit burden can be measured by connecting the C.T. or P.T. secondary circuit to the Model 590J-V2. It will check that the C.T. or P.T. is not overloaded under normal service conditions.

### **1.6. Admittance Measurement**

A C.T. can be checked at minimal cost by performing a 1.6kHz admittance test with the 590J-V2. The result is stored and then referred to when future Live admittance tests are performed by the Model 505B Live C.T. Admittance Tester.

The admittance of a C.T. is a very sensitive indicator of shorted turns and other common faults which can cause metering errors of 1 to 20% which can be easily overlooked for years.

## **2.0. HARDWARE FEATURES**

### **2.1. Power Source**

The Model 590J-V2 has an internal solid state voltage source to test P.T.s and C.T.s. The source can generate up to 160V at 50Hz or 60Hz, and 2V at 1.6kHz.

To avoid spurious results caused by 50Hz or 60Hz pickup from nearby equipment, the metering C.T. tests are carried out at 51Hz or 61Hz. The software then extrapolates the 51Hz or 61Hz test results for the actual 50Hz or 60Hz performance.

### **2.2. 590J-V2 interface**

- **Alphanumeric keyboard** on front panel used to enter information about CT or PT
- **Colour TFT screen**, 7 inch with back light
- **Type A, USB** slot, used for record download and firmware upgrade.
- **Type B, USB** slot used for factory debug purpose only
- **Bluetooth**, optional wireless feature for record download to PC, tablet or phone  
- *supports Android only*

### **2.3. 590J-V2 Case**

The Model 590J-V2 uses an injection moulded plastic case which is robust and hard wearing. It has an internal aluminium chassis and an aluminium front panel with a reverse screened "Lexan" polycarbonate finish.

#### **2.3.1. Transit Case**

A transit case is provided for transportation. Made from ABS plastic, it is foam lined and offers protection for the 590J-V2 during transportation. The case has room for test leads and accessories.

#### **2.3.2. Case Sizes (L x W x H)**

590J-V2 case: 420mm X 350mm x 210mm.

Transit case: 630mm X 270mm X 520mm

#### **2.3.3. Weight**

590J-V2: ~8kgs

Transit case: ~6kgs

Test leads & accessories: ~3kgs

### 3.0. MEASUREABLE CT RANGES

#### 3.1. Metering C.T. measureable test ranges

- Maximum ratio: 60K:5 or 12K:1
- Minimum ratio: 2.5:5 or 1:1
- 1Amp VA rating: To 150VA
- 5Amp VA rating: To 300VA
- Selectable %  $I_{primary}$ : 1% to 400%.
- Selectable % burden: 10% to 100%
- Selectable PF: 0.5 to 1.0
- Sec winding resistance: > 1k $\Omega$

#### 3.2. Metering C.T. measurable parameters

- Turns ratio
- Ratio error
- Ratio correction factor
- Phase error
- Winding resistance
- 50Hz or 60Hz admittance
- Knee point
- Instrument Security Factor

#### 3.3. Metering C.T. Ratio accuracy

Ratio Ranges	Ratio Accuracy
2.5/5 to 10,000/5	0.02% to 0.05%
10,000/5 to 20,000/5	0.05% to 0.08%
20,000/5 to 60,000/5	0.08% to 0.15%
%Injection Ranges	Ratio Accuracy
5% to 120%	0.02% to 0.03%
120% to 200%	0.03% to 0.05%
200% to 400%	0.05% to 0.1%

Note: At 1% of injection, ratio accuracy range is: 0.05% to 0.1%

#### 3.4. Protection C.T. measurable parameters

- Turns ratio
- Ratio error at rated and 30x  $I_{primary}$  rating
- Winding resistance at 25°C and 75°C
- Unsaturated Inductance
- Accuracy Limiting Voltage and Factor
- Accuracy Limiting Current
- Kssc, Symmetrical s/c current factor
- Ktd, Transient dimensioning factor
- Kr, Remanence flux factor
- Composite Error
- Knee Point

Testable protection CT standards:

IEC61869-2	
IEC60044-1	EC60044-6
5P	TPX
10P	TPY
PX	TPZ
PR	TPS

#### 3.5. Admittance measurement range

50 or 60Hz	100uS to 100mS + 0.5%
1.6kHz	100uS to 50mS. + 0.5%

#### 3.6. C.T. Burden measurement range

1A Type	0 to 25 Ohms / 25VA
5A Type	0 to 12 Ohms / 300VA

#### 3.7. C.T. Phase error accuracy

1 to 120% of  $I_{primary}$ : 2 min

#### 3.8. Winding Resistance Accuracy

Accuracy 1 m $\Omega$  + 1 %

#### 3.9. External Burden

Resolution to 50 m $\Omega$  + 1 %

### 4.0. MEASUREABLE PT RANGES

#### 4.1. Un burdened / no load P.T. Test range

- Maximum ratio: 330kV / 110V
- Minimum ratio: 0.24kV / 100V
- VA rating: 1 to 300VA.

#### 4.2. Burden based / full load P.T. Test range

- Maximum ratio: 330kV / 110V
- Minimum ratio: 1kV / 100V
- VA rating: 1 to 300VA
- Prim winding res: 40K $\Omega$

#### 4.3. P.T. Burden measurement range

100V or 110V 0 to 300VA

#### 4.4. No Load, P.T. Turns ratio accuracy *Un burdened ratio test at a fixed voltage*

Ratio Ranges	Ratio Accuracy
0.24kV/100V to 330kV/110V	0.02% TO 0.05%
330kV/110V to 500kV/110V	0.05% TO 0.1%

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#### 4.5. Full Load - IEC60044-2 test

*Simulation of applied voltage and burden conditions as per standard.*

Ratio Ranges	Ratio Accuracy
1kV/100V to 100kV/110V	0.1%
100kV/110V to 330kV/110V	0.1% to 0.2%

Accuracy based on burden to 100VA maximum.

#### 4.6. P.T. Phase error accuracy

Without Burden	With burden
To 2 min.	To 5 min.

### 5.0. PROTECTION FEATURES

- Fuse for Mains input,
- Flashing LED when terminals are live.
- Buzzer to indicate error conditions.

### 6.0. SUPPLY & CONSUMPTION

V<sub>Supply Nominal range</sub>: 110 - 250 Vac, 50/60Hz

V<sub>Supply Max range</sub>: 85 - 264 Vac, 50/60Hz

*(note: Nominal input supply range is the recommended input supply range for proper operation)*

Standby Power: 30W

Output Power: 280W Steady State  
2.7kW Peak

Output Current: 3A r.m.s. 15A peak

#### Output Voltage Max:

- Metering C.T.'s 120Vac r.m.s.
- Protection CT's 120Vac r.m.s.

## 7.0. OPERATING ENVIRONMENT

Operating Temperature: 0 to 45°C Ambient

Relative Humidity: to 90%

### IP Category:

Lid Closed: IP 64

Lid Open: IP 30

## 8.0 ADDITIONAL FEATURES

- Auto class assessment of metering CT's
- Batch testing.
- Live C.T. testing with 590F accessory
- Dual winding P.T. junction box
- Thermal printer accessory available

590J-V2 also comes with PC Windows Test Report software for C.T.'s and P.T.'s with easy to understand results format



### Noise Immunity:

The 590J-V2 is electronically robust and electrically immune to highly energized electrical sources.

## 9.0. TEST PROCEDURE FOR P.T.s

1. Isolate the P.T. primary side, and connect it to VA and COM terminals of 590J-V2.
2. Isolate the P.T. secondary side, and connect it to 590J-V2 "VB" and "COM" terminals.
3. Key in P.T. test data including:
  - Primary voltage
  - Secondary voltage
  - VA rating and
  - Serial number.

Start the test.

The voltage and phase error results are given on the large Colour LCD display

All test results can be stored for later download to a USB flash memory.

## 10.0. TEST PROCEDURE FOR C.T.s.

i. Isolate the C.T. primary side. Use a length of cable to place one turn through the window of the C.T. and connect it to "VB" and "COM" terminals of 590J-V2.

ii. Isolate the C.T. secondary side, and using the 4 wire test lead supplied with the 590J-V2 and connect the secondary to the group of four terminals marked "VA" and "COM".

iii. Input test data for the C.T. should include Primary current; Secondary current; VA rating; PF; % burden ; accuracy class; Model No. and serial number. Optionally the operator may run a nameplate guess with an Auto Ratio test.

iv. Test results are displayed on the LCD at various current injection points such as: 120%, 100%, 50%, 20% and 5% and at up to 5 different burden levels. At the end of the test various options are available including saving the test results.

v. To complete testing of the C.T. installation, the 590J-V2 may be connected C.T. metering circuit and a burden test of this circuit may be performed. This will indicate if the instrument transformer is operating within its rated burden range.

vi. After the 50Hz / 60Hz C.T. test, a 1.6kHz admittance test of the C.T. may be carried out if required. This will measure the complex admittance of the C.T. which can be stored and used as a blueprint for comparison with a live admittance test some time in future.

## 11.0. 590J-V2 CONNECTIONS

**VA Connection:** 4 wire Kelvin connection

**VA Connection:** 2 wire sense connection

**USB Type A:** For software upgrades and test result download to USB Flash Memory.

**USB Type B:** Special function only.

### AUX 1 connector

Auxiliary connector for custom purposes

### Clipon 1 and Clipon 2 connectors

For use with 590F live CT test accessories or PT Junction Box

### Printer

Connector for optional thermal printer

### VA & VB Injection and Sense Terminals

C.T. / P.T. primary and secondary connection terminals.

**Mains IEC connector**

## 12.0. ACCESSORIES INCLUDED

### VA cable and accessories

**VA Cable** **Length**  
1 x 4 to 2 wire Kelvin cable : 8m



VA Cable Termination leads / accessories



### VB cable and accessories

**VB Cable** **Length**  
1 x 2 wire cable : 8m



VB Cable Termination leads / accessories



**Please note:**  
Existing cables and accessories can also be used for testing P.T.s.

## 13.0. ACCESSORIES NOT INCLUDED

### 590F Live CT ratio testing accessories

**High Voltage:** Optically isolated clamp used to measure up to 1200 Amps on 100kV lines.



Optically isolated current clamp on the end of an insulated hotstick

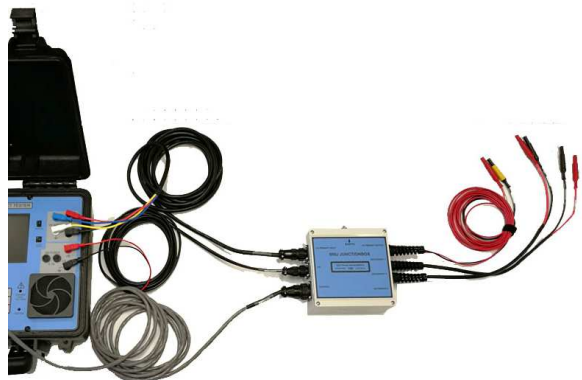
**Low Voltage :** Two clamps provided to measure current from 100 to 2400 Amps at up to 600 Vac.



### Dual Winding P.T. junction box

A junction box accessory may be used with the 590J-V2 to minimize cable handling during an inductive PT test.

All necessary cables and accessories are provided with the junction box.



Every care has been taken to ensure that the above data is correct at the time of printing. Always refer to the latest data sheet when purchasing. RED PHASE INSTRUMENTS reserves the right to alter specifications without notice.