



590J DATASHEET

UNIVERSAL C.T. AND FULL LOAD P.T. TESTER



REDPHASE INSTRUMENTS

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KEY FEATURES:

- **PORTABLE AND LIGHTWEIGHT FOR TESTING P.T.s AND C.T.s TO 0.02% ACCURACY 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 500kV/110V UNDER SELECTABLE FULL OR NO LOAD CONDITIONS.**
- **FULL LOAD P.T. TEST SIMULATES THE VARIOUS APPLICATION VOLTAGE LEVELS AND LOAD 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 Model 590J is a modestly priced, lightweight field portable instrument designed to audit P.T. and C.T. installations in a utility system. The Model 590J is used for many routine workshop tests, as well as field testing, to an accuracy of 0.02%. It is optimised for testing metering C.T.s, but can also test protection C.T.s for current and phase error at normal burden.

1.2. C.T. Ratio Error Measurement

The traditional method of testing of C.T.s using primary injection is very costly. The Model 590J tests a C.T. by measuring the turns ratio and the 50Hz/60Hz admittance of the C.T. secondary winding. These tests require the C.T. to be offline for only a few minutes. From these tests the performance of the C.T. is automatically calculated to typically within 0.02% for 5 injection points customizable to 400% of rated current and at a chosen PF above 0.5. These nominal primary load levels for testing can be customized by the user at any time.

1.2.1 Protection C.T. Measurements

Most elements covering protection C.T.s under IEC60044-1 and IEC 60044-6 standards have been implemented in the 590J. Standard and specialized transient C.T types can be tested for excitation beyond 10kV. Depending on insulation.

1.3. P.T. Ratio Error Measurement (No Load)

The Model 590J 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 a variety of P.T.s up to 500kV rating has established that a reduced energization level will give results valid to within 0.02% in nearly all cases under no load conditions

1.3.1 Full Load P.T. Testing – up to 2 windings

The 590J can test a P.T.'s ratio under varying voltage and load conditions as outlined in elements of the IEC60044-2 standard.

A typical test would occur at the following test points:

120% of V
100% of V
80% of V

- Test points above are customizable by operator.
- Power factor is selectable between 0.8 & unity.
- Test is performed at 25 & 100% of rated burden.

Note: PT test can only be performed within the ratio limits outlined in section 3.1.

1.4. Burden Measurement

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

1.5. Admittance Measurement

A C.T. can be checked at minimal cost by performing a 1.6kHz admittance test with the 590J. The result is stored and then referred to when future Live admittance tests are performed by the Model 505B Live C.T. 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 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 tests are carried out at 51Hz or 61Hz and the micro-processor control locks on to the 51Hz signal only. The software extrapolates the 51Hz or 61Hz test results for an actual 50Hz or 60Hz performance.

2.2. Interface

The alphanumeric keyboard on the front panel can be used to enter information about the item to be tested. Above the keyboard is a backlit 6 inch graphic LCD screen which displays the keyed information and final test results.

2.3. 590J Case

The Model 590J 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 also provided as standard for transportation. Purpose built from ABS plastic, it is foam lined and offers suitable protection for the 590J during transportation to and from site. The case has room for test leads and accessories.

2.3.2. Case Sizes (L x W x H)

590J case: 420mm X 350mm x 210mm.
Transit case: 630mm X 270mm X 520mm

2.3.3. Weight

590J: ~9kgs
Transit case: ~6kgs
Test leads & accessories: ~3kgs



3.0. OPERATING RANGES

3.1. Measurable P.T. Test ranges

No load voltage ratio only

- Maximum ratio 510kV / 110V
- Minimum ratio 0.24kV / 100V
- VA rating from 1 to 300VA.

Full Load ratio testing

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

3.2. Measurable C.T. Test ranges

Maximum ratio	60,000/5 or 12,000/1
Minimum ratio	2.5/5 or 1/1
VA RATING 1A Secondary	Typically 150VA.
VA RATING 5A Secondary	Typically 300VA.
Selectable % Primary I	1% to 400%.
Selectable % BURDEN	10% to 100%
Selectable PF	0.5 to 1.0

The 590J computes the C.T. performance at the selected PF.

C.T. TYPES: Single and multiple primary turn, parallel winding compensation, composite core.

3.2.1 Protection C.T. Measured Parameters

- Turns Ratio
- Ratio Error at rated up to 30x overload current
- Winding Resistance
- Accuracy Limiting Voltage
- Composite Error
- Instrument security factor
- Remanence flux factor
- Knee Point

The protection CT types that the 590J is expected to commonly test are:

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

3.3. Admittance measurement range

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

3.4. C.T. Burden measurement range

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

To achieve this the 590J typically injects 0.5A up to a limit of 25V to determine the C.T. burden value

3.5. P.T. Secondary burden range

100V / 110V	0 to 300VA
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4.0. MEASUREMENT ACCURACY

4.1. C.T. Ratio accuracy

Ratio Ranges	Ratio Accuracy
2.5/5 to 10,000/5	0.02%. Typical
10,000/5 to 20,000/5	0.05%. Typical
20,000/5 to 60,000/5	0.1% Typical

%Injection Range s	Ratio Accuracy
5% to 120%	0.02%
120% to 200%	0.03% to 0.05%
200% to 400%	0.05% to 0.1%

4.2. C.T. Phase error accuracy

5 to 120% Primary I:	2 min
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4.3. Winding Resistance Accuracy

Accuracy	1 mΩ + 1 %
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4.4. External Burden

Resolution to	50 mΩ + 1 %
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4.5. P.T. Turns ratio measurement accuracy

No Load - ratio test at a fixed voltage .

Ratio Ranges	Ratio Accuracy
0.24kV/100V to 330kV/110V	0.02%
330kV/110V to 500kV/110V	0.03%

Full Load - simulation of varying application voltages and load conditions as per elements of IEC60044-2.

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

-No Load-	-Full Load-
To 2 min.	To 5 min.

5.0. PROTECTION FEATURES.

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

6.0. SUPPLY & CONSUMPTION

Mains Supply	85 - 264 VAC, 50/60Hz
Standby Power:	30W
Input Power:	280W Steady State
Output Power:	280W Steady State 2.7kW Peak
Output Current:	3A r.m.s. 15A peak
Output Voltage Max	
- For Metering	150Vac r.m.s.
- For Protection CT's	120Vac r.m.s.

7.0. ADDITIONAL FEATURES

Auto class assessment of metering CT's to 0.1 class.

Batch testing.

Test points customizable for any burden from 0 to 100% and customizable injection test points from 0% to 400%.

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 is electronically robust and electrically immune to highly energized electrical sources.

8.0 CE COMPLIANCE & CERTIFICATIONS

LVD Compliance Assessed against **EN 61010-1:2010**

In accordance with: **2006/95/EC LVD**

EMC Compliance Assessed against **EN 61326-1:2013**

In accordance with: **2004 / 108 / EC**

9.0. TEST PROCEDURE FOR P.T.s

9.1. Isolate the P.T. primary side, and connect it to VA and COM terminals of 590J.

9.2. Isolate the P.T. secondary side, and connect it to 590J "VB" and "COM" terminals.

9.3. 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 LCD display
All test results can be stored for later download to a PC or laptop.

10.0. TEST PROCEDURE FOR C.T.s.

10.1. 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.

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

10.3. 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.

10.4. Test results are displayed on the LCD at various current injection points such as: 120%, 100%, 50%, 20% and 5% and at both 100%VA and 25%VA burden. At the end of the test various options are available including saving the test results.

10.5. After the 50Hz / 60Hz C.T. test, a 1.6kHz admittance test may be carried out if required. This will measure the complex admittance of the secondary for storage in memory.

10.6 To complete testing of the P.T. and / or C.T. installation, the 590J may be connected to the P.T. or 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.

11.0. 590J CONNECTIONS

USB Port

Type A: For download of results data to USB Flash Memory.

Type B: For results download to a PC using a Terminal Program such as Hyper-Terminal or Terra Term. and...

Type B connection is also used to upgrade 590J system software.

Clip-On 1 and Clip-On 2 connectors
Not applicable to 590J.

Printer

Connector for optional thermal printer

VA & VB Injection / Sense Terminals

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

Mains

IEC connector.

12.0. ACCESSORIES INCLUDED

12.1. Secondary C.T. cable and accessories

Cable	Length
1 x Secondary cable :	8m



Secondary Cable Termination leads included



12.2. Primary C.T. cable and accessories

Cable	Length
1 x Primary cable :	8m



Primary Cable Termination leads included



Other cables included	
1 x USB cable	1.8m

Please note:
Existing accessory cables are also used for testing P.T.s.

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.