

**LIVE CT TESTER**



**RED PHASE INSTRUMENTS**

**590F**

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## **BRIEF**

The 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.

Combined they are capable of testing the CT ratio and phase accuracy on an active or live power network.

The 590F has optional configurations for either High Voltage (HV) or Low Voltage (LV) line systems. A chosen 590F clamp on CT or (Clip-on) is specifically calibrated for use with the chosen line voltage and current to an accuracy of 0.05%.

The 590F HV Clip-on CT's come with a metal case which houses an optical data interface. The HV Clip-on and the case are mounted on to a 2.2 metre hot stick which allows for high voltage isolation to just over 100kV line to ground. Higher insulation voltage hot sticks may be used but must be specified.

For line voltages to 600V the LV Clip-on CT's are used, a hot stick is not necessary but care must be taken when placing the Clip-on onto the line.

Electronic compensation is applied to all measurements to greatly improve the Clip-on CT's accuracy over a wide operating range, typically 50A to 1400A.

## 1.0. FEATURES

### 1.1. Accuracy and range

As mentioned the 590F comes in various voltage and current ranges. Please see section 1.2 below for the available options.

The chosen CT Clip-on and its measurement accuracy is application dependent.

It is important for the operator to know their application and to let Red Phase know at which voltage and current range they would like to measure the CT's live.

### 1.2. Clip-On types

The 590F kit can be purchased in 3 forms:

Combined HV and LV kit.

HV kit only.

LV kit only.

- A) **590FK** is a HV + 2 x LV Clip-on CT kit which is comprised of the 590F1 + 590F2. Primary Ranges: 75A – 1400A & 100A - 2500A. Secondary current as measured by 590G/G-V2 is: 0.06A – 7.2A.
- B) **590F1** is a HV Clip-on CT with a primary range of: 75A – 1400A. The Clip-on comes together with a Hot-Stick, a cable reel and an electronic compensation circuit case which also translates the Clip-on CT measurement to an optical signal. This signal is sent via a fibre optic cable to another converter at the bottom of the hot stick which changes the signal from an optical one to an electrical one known as RS-485. This signal then travels to the 590G-V2 via a 100 metre 4 twisted pair cable reel. The secondary current as measured by the 590G-V2 is: 0.06A – 7.2A. Clip-on jaw width is: 50mm



- C) **590F2** is a LV, 415 to 600V primary Clip-on CT. The compensation circuit for the low voltage clamps is placed inside the 590G-V2 CT Tester.

The operator may choose one of two Low Voltage Clip-on types below:



Jaw Size: 85mm  
Primary range of: 150 — 2500A.  
Secondary current as measured by the 590G-V2 is: 0.06A – 7.2A.



Jaw Size: 50mm  
Primary range of: 100 — 750A.  
Secondary current as measured by the 590G-V2 is: 0.06A – 7.2A.

LV Clip-on CT's connect directly to the 590G-V2 and are electronically compensated for maximum accuracy.

- D) **590F3** is a HV Clip-on CT with a primary range of: 5 — 100A. It is isolated from the operator with the use of a hot stick. It is also attached to a compensation case as with the 590F1.



Inner Jaw width/diameter is 12 to 20mm.

Please note that the same Clip-On may be used with lower voltage, low current systems but this must be specified by the operator.

The chosen Clip-on CT is always matched to a particular 590G / G-V2, since it is calibrated with that particular 590G/G-V2 Model.

The Clip-on may be supplied with a new 590G-V2, or it may be retrofitted to an existing 590G or G-V2 unit.

For retrofitting, the 590G / G-V2 unit must be returned to the factory for additional circuitry and wiring to be added.

## 2.0. APPLICATION

### 2.1. In use

In situations where access to the CT secondary circuit is quite removed from a Clip-on such as the 590F1 for example, one operator must connect the secondary lead from the 590G-V2 to the CT and then enter in the C.T. test data. Another operator must hoist the 590F1 onto the HV line.

From this point it will then take about one minute for the 590F1 to auto range and compensate correctly after which it will begin to send the measurements to the 590G-V2.

### 2.2. Measurements

The 590G-V2 unit will perform an initial test to ensure the polarity is correct and that the ratio error is not excessive, ( as compared with data entered ). Afterwards a full 10 measurements are made and an average current ratio and phase error displayed.

*Please note that live measurement results are solely based on the customer load at the time of the test and does not cover other ratio errors at other load variations.*

## 3.0. SPECIFICATIONS

### 3.1. Measurement Accuracy

The 590F1 and F2 have a default class of 0.5 as Specified by the Clip-On Manufacturer:  
Northern Design Electronics Ltd.

Red Phase electronically compensate each Clip-On to attain a better than +/- 0.1% current ratio and +/- 5' phase error over the specified ranges of 5 to 2500 Amps, Clip-on dependent.

### 3.2. Battery & Charging

The 590F1 contains a Clip signal case which has an internal 12V / 1.2Ah battery.

The 590F1 has a charging socket and it connects to a switch mode charge unit when required using the plug and lead provided.

The charger unit can, in turn, be connected to a mains plug pack with 12V output.

It can also be connected to either a 12V or 24V car battery, which is convenient for charging while in a vehicle.

Maximum charging current is 0.5A to full capacity, then a trickle charge of 5mA is maintained.

A fully charged battery is typically good for 30 tests. A spare battery plus charging lead is supplied with the kit for emergency changeover.

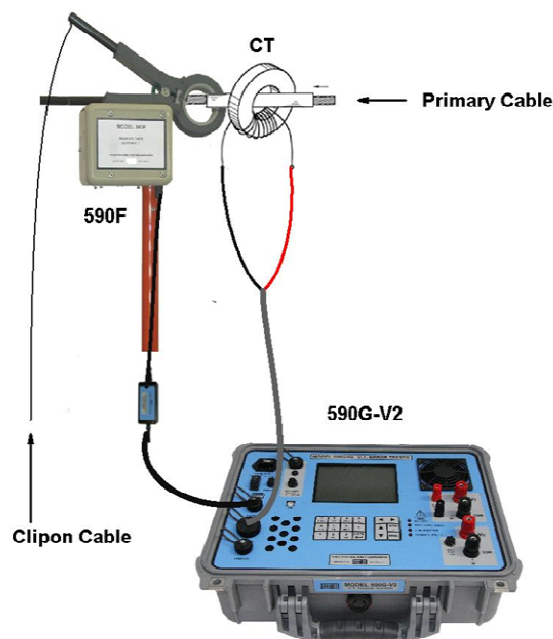
The battery supply is switched on with a recessed pushbutton, shown by a LED. The supply is required for on line "Live" measurements.

### 3.3. Hot Stick

The standard hot stick is a telescopic type which is 2.2 metres long when extended.

It is tested to 100kV.

An adjustable clamp is fitted to allow tilting of the 590F1 or F3 case and Clip-on.



### 3.4. Operating Temperature

0 to +40°C.

### 3.5. Size & Weight in Transit case

590FK kit: 560mm X 480mm X 560mm.

Total weight of 590FK Kit in Transit case: 21kg.  
Hot Stick is separate.

### 3.6. Transit case

The kit is supplied in a custom made transit case. The heaviest kit is a combined HV and LV kit, weighing 26kg when the 100 metre cable drum is included.

## 4.0. INCLUDED ACCESSORIES

- Secondary cable

With 590F1, 590F3 or 590FK kit

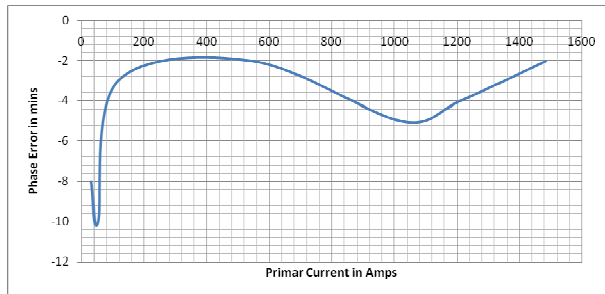
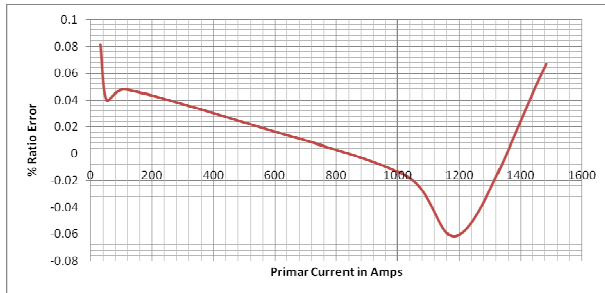
- RS 485 to fibre optic interface
- 2.2 metre hot-stick
- Switch mode battery charger
- 100 metre RS 485 cable with reel

## 5.0. 590F SERIES CLIP-ON TEST RESULTS

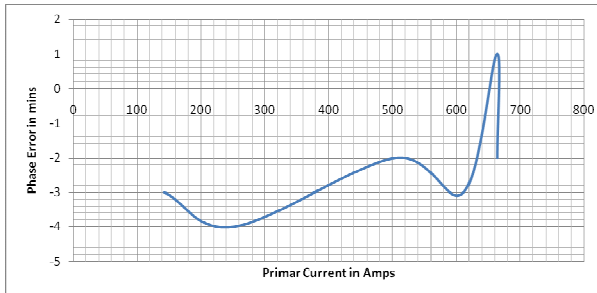
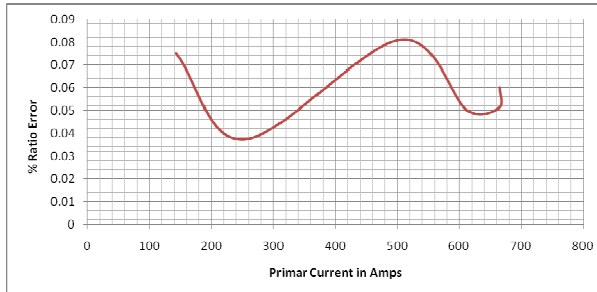
### 5.1. 590F1 Clip-on test results

#### Clip-On % ratio error accuracy and phase characteristics

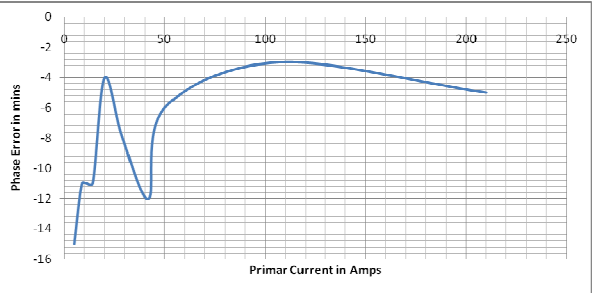
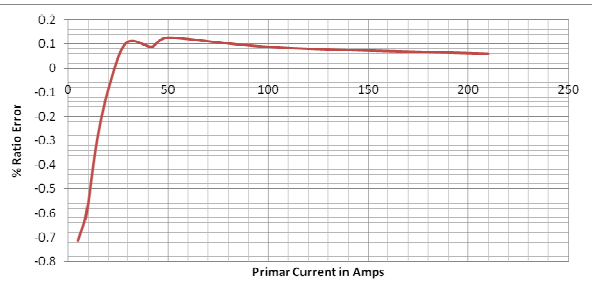
#### Test on a 1200/5 CT with F1 Clip-On



#### Test on a 750/5 CT with F1 Clip-On



#### Test on a 240/5 CT with F1 Clip-On

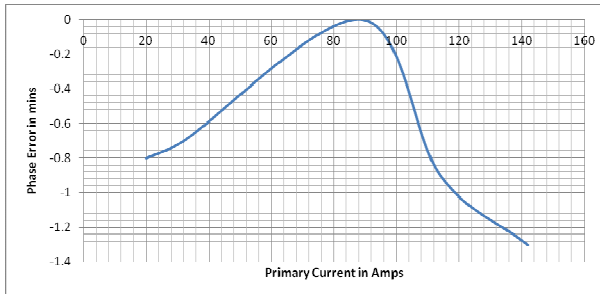
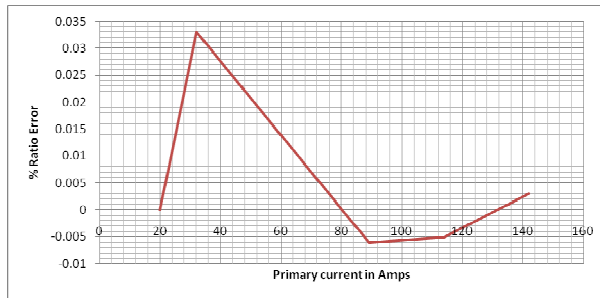


Test plots across the various CT ratio types reveal that the 590F1 Clip-On will maintain a better than +/-0.1% ratio accuracy from 75 Amps to over 1400 Amps

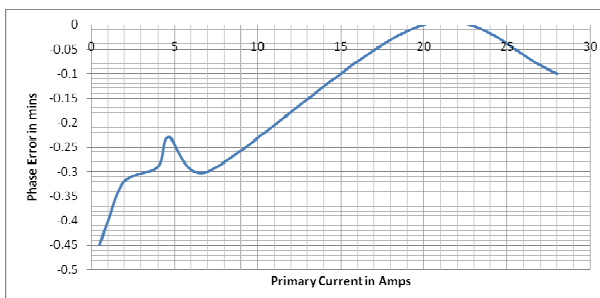
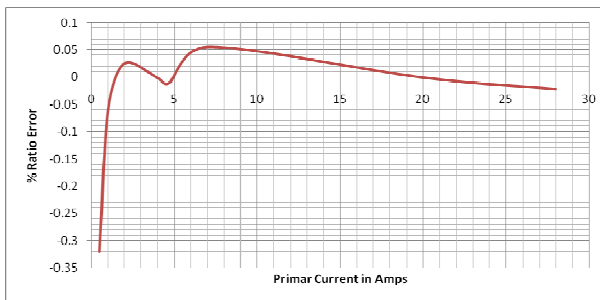
## 5.2. 590F3 Clip-on test results

### HV Clip-On % ratio error accuracy and phase characteristics

#### Test on a 100/5 CT with F3 Clip-On



#### Test on a 25/5 CT with F3 Clip-On



Test plots above reveal that 590F3 HV Clip-On will maintain a better than +/-0.1% ratio accuracy from 5 Amps to over 100 Amps.