



POLYPHASE METER TESTER WITH 100A PHANTOM LOAD

689B DATASHEET

Parameters

Wiring: 3 phase, 3 wire delta

Code: 100A Phantom

range = 240V

44.08V

0.02A @ +24.22°

4.35W @ 0.91PF

0.77VA

1.96VAR

0.02Hz

Import power is +Ve

g phase is -Ve

4.66V

0.04A @ +149.95°

9.21W @ 0.87PF

0.64VA

33VAR



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REDPHASE INSTRUMENTS

Contents	Section	Page
Application	1.0	3
Main Features	2.0	3
Model 689B Specification	3.0	4
Supply Voltages	3.1	4
Measured Voltage Ranges	3.2	4
Current Ranges	3.3	4
For CT Meters	3.3.1	4
For Direct Connected Meters	3.3.2	4
Current Source	3.4	4
Temperature Range	3.5	4
Hi-Pot and Insulation Test	3.6	4
Clip On CT Measuring ranges	3.7	4
Size and Weight	3.8	4
Test Leads	3.9	4-5
Accuracy	4.0	5
Real Energy WH	4.1	5
VARH Energy	4.2	5
Frequency Range	4.3	5
Temperature Range	4.4	5
Use of Clip On C.T.s with 689B	4.5	5
Other measurements	4.6	5
User Features	5.0	5-6
Ordering Information and Accessories	6.0	6
Voltage Ranges	6.1	6
Accessories Supplied	6.2	6

1.0. Application

The Model 689B is a full digital and analogue meter tester, with a microprocessor to carry out most measurements to within $\pm 0.1\%$, however it will also calculate meter errors to an accuracy of 0.03% to 0.05% when performing real energy measurements.

The 689B also has a 3 phase switch mode current source for providing a current load up to 100 Amps to a meter when a customer load is not present. This is known as the phantom load..

Designed to measure Direct and C.T. connected meters.

- To test direct connected meters to 100A there are 6 large 6mm safety sockets on the front panel.
- Testing C.T. meters to 10A is done using the multi pin "CURRENT" socket on the front panel.

The "PHANTOM/CUSTOMER" switch on the front panel allows switching from a phantom test to a customer load test of C.T. meters without disturbing the wiring.

Three Model 3028 clip on C.T.'s allow testing of direct connected single phase or polyphase meters without disconnecting the wiring to the meter or interrupting supply to the customer. The clip on C.T.s have a phase and ratio accuracy of 0.2% .

Incorporated in this instrument is a powerful digital signal processor, a separate microprocessor and a large colour graphics display.

Up to 1000 test records can be stored in internal memory which can be uploaded to a USB flash drive.

The USB flash drive also allows the operator to download diagnostic data and upgrade system firmware if required.

The chassis of the 689B is fitted in a rugged Pelican transit case using rubber mounts to protect it against rough handling in the field. The case has carry handles at both ends and the top for ease of transport.

2.0. Main Features

The 689B can test any Direct connected or C.T. meter including 2 phase 240V and 2 phase 415V direct connected meters.

A special set of test leads and adaptors is used for direct connected meters. The 689B has large 6mm safety sockets on the front panel. A set of adaptors with a M6 male thread and 6mm socket are inserted into the bottom screw hole of a meter terminal.

M6 threads are used in the terminals of L&G meters and most EMAIL meters. Other meters use M6, but alternative threads can be supplied.

The test leads are terminated at both ends with 6mm plugs that are inserted into the 6mm sockets and adaptors. The voltage connections are made to the "VOLTAGE" socket and IEC socket on the front panel.

The 689B can be used with 3 high accuracy clip on C.T.s. They give combined phase and ratio errors of less than 0.2% from 1A to 118A. This is much less error than standard clip on C.T.s, and makes them suitable for accurate meter testing.

With clip on C.T.s the customer supply may remain active during testing of direct connected meters.

Using clip on C.T.s it's easy to test at the meter and at the power pole, checking if hidden wiring between the two is diverting power. This is a useful way of ensuring that customers are billed correctly and that energy wastage is minimised.

C.T. meters are connected using the multi-pin "CURRENT" and "VOLTAGE" sockets on the front panel. A set of test leads is provided for this. The current source can provide up to 10A for injection into the meter, or the meter can be tested using the customer load.

The 689B will automatically calculate the test result, using a standard hand-switch or photocell pickup supplied with the 689B.

The 7 inch colour graphics screen can display voltage and current vectors, phase currents, phase voltages, power factors and other measured or selected parameters.

Over 1000 results can be stored, reviewed and/or downloaded to a USB flash drive for analysis.

3.0. 689B Specification

3.1. Supply Voltages

The 689B has a switch mode power supply which allows it to operate from 55V to 260V single phase.

In addition there is a switch mode current source that can operate from 110V to 240V. At 240V it can deliver up to 100A, and at 110V which is typical for C.T. meters, it can deliver up to 10A.

There is an IEC plug in the test lead set for connection to the meter installation. If required, the IEC plug can be connected to a 240V GPO with a standard power cord.

3.2. Voltage Ranges

The 689B auto-ranges under microprocessor control. The nominal measuring ranges are:

- 3 phase, 3 wire delta: 60V/110V/240V
- 3 phase, 4 wire star: 110V/240V/415
- Single phase: 120V/240V

3.3. Current Measuring Ranges

3.3.1. For C.T. Meters

The "CURRENT" socket on the front panel is used with a dedicated current test lead for connecting to C.T. meters.

Measuring ranges: 10A; 2.5A; 0.625A; 0.125A
Thermal limit: 10A.

3.3.2. For Direct Connected Meters

The 6mm sockets on the front panel are used for connection to direct connected meters via high current cables.

Measuring ranges: 100A; 25A; 6.25A; 1.25A.
Thermal limit: 100A.

3.4. Current Source / Phantom Source

- Maximum output for a Direct connected meter is 100A continuous.

Note: The maximum current that can be reached depends on the impedance of the meter current coil.

- Maximum output for a C.T. meter is 10A

The phase angle can be varied over +/-180deg. Output distortion varies with the current level and impedance of the load.

Typically it is less than 3% THD. At high outputs

near 100A this can rise to 5%.

For all practical purposes the distortion does not significantly affect measurement accuracy.

3.5. Temperature Range

Operating temp range is -5°C to 45°C.

The storage temp range is -10°C to 50°C.

The display is specified for 0°C to 40°C.

Outside this range it may have poor legibility.

RH Relative Humidity, non condensing: 0 to 90%

A fan is fitted inside the chassis to minimise heat build up.

3.6. HI-POT & Insulation Test

All 100A current and voltage inputs to ground are rated at 2kV at 50Hz for 2 minutes.

Insulation of any inputs to ground is rated at 2Mohm at 500VDC for 1 minute.

Note that the 10A current inputs have a switched connection to earth for safe use with C.T.s that are also earthed at one side. They cannot be hi-pot tested.

3.7. Clip on C.T. Measuring Ranges

The Model 3028 clip on C.T.'s supplied with the 689B are compensated for by circuits in the 689B for increased accuracy.

Their measuring ranges are:

- 10A range: 0 to 11.8A
- 100A range: 0 to 118A

The clip on automatically auto-ranges under control of the microprocessor.

To prevent spurious switching between ranges, hysteresis is used for increasing and decreasing current.

Hysteresis is between 11.8A, and 9.5A .

3.8. Size and Weight

The 689B is housed in a rugged Pelican case.

Size is 57cm X 32cm X 32cm

Weight is 19kg..

3.9. Test Leads

The Direct 100A heavy current test leads are 1.5 metres long. This set includes a hybrid combination of 2 metre voltage leads and a 2 metre IEC plug with inline an switch.

For C.T. meter testing a separate 2.5 metre current and voltage lead is supplied along with a 3 metre IEC lead which includes an inline switch.

4.0. Accuracy

4.1. Real Energy Wh

Accuracy of real energy measurement in Wh under the following conditions:

Voltage input 80% to 110% of nominal range.

100A current input 1.5A to 100A.

10A current input 0.15A to 10A.

Accuracy:

0.03% for PF 0.86 lead to 0.86 lag

0.1% for PF 0.86 lead to 0.5 lag

For currents 0.25A to 1.25A, or 0.025A to 0.15A:

Accuracy:

0.05% for PF 0.86 lead to 0.86 lag

0.1% for PF 0.86 lead to 0.5 lag

4.2. VARH Energy

Accuracy of VARH energy measurement under the following conditions:

Voltage input 80% to 110% of nominal range.

Power factor 0.86 lead to 0.5 lag.

100A current input 1.5A to 100A.

10A current input 0.15A to 10A.

Accuracy is 0.15%.

For currents 0.25A to 1.25A, or 0.025A to 0.15A:

Accuracy is 0.2%.

4.3. Frequency range

The frequency range for specified accuracy is:

47Hz – 53Hz for 50Hz mains supply

57Hz – 63Hz for 60Hz mains supply

4.4. Temperature Range -for specified accuracy

- 0deg C to 45deg C.

4.5. Use of Clip On C.T.s with 689B

When ordered the 689B comes with a set of three Model 3028 clip on C.T. clamps which are matched and calibrated for that particular 689B model .

Provided the correct set of matched clip on C.T.s is used, the accuracy of the 689B is not degraded by the use of these clamps.

Note that the clip on C.T. must be in good and clean condition with the mating core faces not damaged, and not subject to influence factors that can affect the performance of the clamp.

4.6. Other Measurements

The Model 689B can display measurements of various parameters as follows:

Voltage: Accuracy is +/- 0.2% of full scale in any range.

Current: Accuracy is +/- 0.2% of full scale in any range.

Power: Accuracy is +/-0.3% of full scale in any range.

Power factor: Accuracy is +/- 2% of full scale.

Phase angle: Accuracy is +/- 2 deg.

Frequency: Accuracy is +/- 0.1%.

5.0. User Features

The 689B has a keypad on the front panel for entering numeric information, and a 7 inch backlit graphic display above the keyboard.

The software is comprehensive, however any operator can become familiar with it after only a few hours training and then start meter testing.

The software contains a number of menus arranged for choosing all the meter test data. Each menu appears on the screen in sequence. From each menu a choice is made by the operator keying a number. Numeric information is entered for such items as meter constant and test current.

← Meter test setup →

1) Meter ID:	DEF
2T) Accuracy class:	0.5%
3T) Wiring config:	3 phase, 4 wire star
4T) Meter const unit:	Imp/kWh
5) Meter constant:	266.7
6T) Test mode:	10A Phantom
7T) Test selection:	Test once only
8T) Input method:	Pulse input
9) Test duration:	3 pulses

F1) To meter test

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← Meter test →

Test	Results
Wiring: 3 phase, 4 wire star Mode: 10A Phantom	
Test once only 7) Change injection current/phase	
1) Start meter test	8) Start injection
2) Stop meter test	9) Stop injection
Input method: Timer input	
243.83V 4.03A @ +21.25°	242.81V 4.08A @ +141.53°
244.83V 4.04A @ +151.03°	

Check MODE switch is in correct position.

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At the end of the data entry the meter is ready for testing. The operator presses the hand-switch button down at the first disc spot and counts the number of revs for the test.

At the end of the test the operator releases the hand-switch button. The test result is immediately calculated by the software and displayed. The previous test result is also displayed, so a direct comparison can be made if needed to verify accuracy and consistency.

Instead of a hand-switch it is possible to use photocells, LED pick-ups or test leads connected to pulsing outputs. The input method is selectable via the menu system.

For phantom load tests the operator keys a magnitude and phase angle for the level of injection current required.



6.0. Ordering Information and Accessories

6.1. Voltage Ranges

Nominal measured voltage input ranges for typical European system:

63.5V; 110V; 240V; 415V.

These voltage apply to either star or delta metering installations.

The 689B can be ordered with other nominal voltages if required.

6.2. Accessories Supplied

- 1 X Model 689B Meter Tester.
- 1 X Voltage test lead for C.T. meters.
- 1 X Power Supply Test Lead for connecting to CT test block with 4mm sockets.
- 1 X 10A test lead for C.T. meters.
- 1 X 100A meter test lead set (Includes IEC plug and voltage lead).
- 3 X 100A Clamp CT's: 1 Red, 1 Blue, 1 White.
- 1 X Carry case for test leads and accessories.
- 1 X Model 3001 Hand-switch.
- 1 X Model 3027B pickup for electronic meters.
- 1 X Model 3038 photocell for disc meters.
- 1 X Operating Manual.
- 1 set of spare 5A, (5x20mm) fuses.
- 1 set of M5 and M6 Meter Adaptors:
- 2 Red, 2 White, 2 Blue and 1 Black.



Ferraris Disc Pick up



LED Pickup



Hand Switch