

RØI RED PHASE INSTRUMENTS

MODEL 689-V2 100A POLYPHASE METER TESTER



1.0 APPLICATION.

The Model 689-V2 is a full digital and analogue meter tester, with a microprocessor to carry out most measurements to within $\pm 0.2\%$, however it will also calculate meter errors to an accuracy of 0.05% to 0.1% when performing real energy measurements.

The 689-V2 has a 3 phase switch mode current source. For testing direct connected meters to 100A there are 6 large 6mm 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 test of C.T. meters without disturbing the wiring.

The optional Model 3028 clipon C.T.s have basic phase and ratio accuracy of 0.2%, which allows accurate testing of direct connected polyphase and single phase meters without disconnecting the meter wiring or interrupting supply to the customer.

Incorporated in this instrument is a powerful microprocessor board, and a large back-lit LCD display which has 16 lines of text.

Up to 100 test records can be stored for later downloading to a PC. The chassis of the 689-V2 is fitted in a rugged transit case using rubber mounts to protect it against rough handling in the field. There are carry handles at both ends of the case.

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2.0 MAIN FEATURES:

2.1. The 689-V2 can test any type of direct connected or C.T. meter. This includes 2 phase 240V and 2 phase 415V direct connected meters.

2.2. A special set of test leads and adaptors is used for direct connected meters. The 689-V2 has large 6mm sockets on the front panel. A set of adaptors with an M6 male thread and 6mm socket are inserted into the bottom screw hole of the meter terminal.

(M6 threads are used in the terminals of L&G meters and most EMAIL meters. Many other meters use M6, but alternative threads can be supplied on adaptors if requested).

2.3. 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.

2.4. For preference the supply to the meter is turned off before connection for a test. However, with proper safety precautions the meter can be connected for testing while live.

2.5. The 689-V2 can be used with 3 Model 3028 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.

2.6. With clip on C.T.s the customer does not have his supply disconnected during testing of direct connected meters, which is most important for good customer relations. The testing of direct connected meters is very quick and easy, so productivity is high.

2.7. Using clip on C.T.s it is easy to test at the meter and at the power pole, checking if any hidden wiring between the two is diverting power. This is a useful way of ensuring both that customers are billed correctly and that energy waste is minimised.

2.8. C.T. meters are connected using the multipin "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 on customer load.

2.9. The microprocessor automatically calculates the test result, using the standard Model 3001 hand-switch or photocell pickup supplied with the 689-V2. The large LCD display shows test results, and it also shows currents, voltages, power factor and other parameters.

Red Phase have photocell pick-ups that can be used to test disc meters and solid state meters.

2.10. The Model 689-V2 will test both disc and solid state kWh and kVarh meters.

3.0 MODEL 689-V2 SPECIFICATION.

3.1. SUPPLY VOLTAGES.

There is a switch mode power supply for the electronics that will 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 usually for C.T. meters, it can deliver up to 10A.

Both switch mode units are connected to the IEC socket on the front panel. 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. MEASURED VOLTAGE RANGES.

The 689-V2 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. (FOR TESTING C.T. METERS)

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

Measuring ranges:

10A; 2.5A; 0.625A; 0.125A.

Thermal limit: 10A.

3.4. CURRENT MEASURING RANGES. (FOR DIRECT CONNECTED METERS)

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

Measuring ranges:

100A; 25A; 6.25A; 1.25A.

Thermal limit: 100A.

3.5. CURRENT SOURCE:

The 689-V2 can continuously inject up to 100A into a direct connected meter. The maximum current that can be reached depends on the impedance of the meter current coil.

The maximum output for a C.T. meter is 10A.

The phase angle can be varied over +/-180deg.

The distortion in the current output 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:

The operating temperature range is –5deg C to 45deg C.
The storage range is –10deg C to 50deg C.
Be aware the LCD display is specified for 0deg C to 40degC operation. Outside this range it may have poor legibility.

A fan is fitted inside the chassis to minimise heat build up, although the switch mode power supply and current source are efficient and do not dissipate much heat in normal operation.

3.6. HI-POT & INSULATION TEST:

All 100A current and voltage inputs to ground are rated at 2kV, 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. CLIPON C.T. MEASURING RANGES.

The Model 3028 clipon C.T. has nominal ranges of 10A and 100A, and is compensated by circuits in the 689. The measuring ranges are:

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

The clipon automatically auto-ranges under control of the microprocessor.
To prevent spurious switching between ranges, hysteresis is used so for increasing current it switches at 11.8A, and 9.5A when decreasing.

Clipon C.T.s of higher current rating can be supplied with the Model 689, but they are not compensated.

3.8. SIZE AND WEIGHT.

The size of case is 450mm X 310mm X 330mm, and weight is 19kg with the lid attached.
The unit can be taken to site and used without the lid and the weight is then 17kg.
Note that lighter weight units can be supplied with some restrictions.

3.9. TEST LEADS:

The 100A test lead set is 1.5M long. this set includes 6 heavy current leads and both measured voltage leads 2M long and an IEC plug with inline switch that is 2M long.

For C.T. meter testing there are current and voltage leads 2.5M long and an IEC lead 3M long which includes an inline switch.

4.0. ACCURACY.

4.1. Accuracy of real energy measurement (Wh) 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 0.05%.

For currents 0.25A to 1.25A, or 0.025A to 0.15A:
Accuracy is 0.1%.

4.2. Accuracy of var energy measurement (Varh) 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. The frequency range for specified accuracy is 47Hz – 53Hz.

4.4. The temperature range for specified accuracy is 0deg C to 45deg C.

4.4. USE OF MODEL 689-V2 WITH MODEL 3028 CLIPON C.T.

It is possible to match a set of Model 3028 clipon C.T.s to a particular 689-V2 model and adjust the calibration constants for the clipons in the 689-V2 to suit. If this is done the overall error while using these clipons is kept to a minimum.

When the 689-V2 is ordered with a set of 3 Model 3028 clipon C.T.s, they are matched and calibrated for that particular 689-V2 model .
Provided the correct set of matched clipon C.T.s is used, the accuracy of the 689-V2 is not degraded by the use of the clipon C.T.s.

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

4.5. ACCURACY OF OTHER MEASUREMENTS.

The Model 689-V2 can display measurements of various parameters as follows:

Voltage: Accuracy is $\pm 0.2\%$ of full scale in any range.

Current: Accuracy is $\pm 0.2\%$ of full scale in any range.

Power: Accuracy is $\pm 0.3\%$ of full scale in any range.

Power factor: Accuracy is $\pm 2\%$ of full scale.

Phase angle: Accuracy is ± 2 deg.

Frequency: Accuracy is $\pm 0.1\%$.

5.0. FEATURES.

5.1. The 689-V2 has a keypad on the front panel for entering numeric information, and a 16 line back-lit LCD dot matrix display above the keyboard.

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

5.3. 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.

5.4. 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.

5.5. Instead of a hand-switch it is possible to use photocells, LED pick-ups or test leads connected to pulsing outputs. There are slight variations in the software to cater for all these test methods.

5.6. For phantom load tests the operator keys a magnitude and phase angle for the current injection,

6.0. ORDERING INFORMATION AND ACCESSORIES.

6.1. The 689-V2 is supplied in standard form as follows:

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 689 can be ordered with other nominal voltages.

6.2. List of Items supplied as standard with Model 689.

- 1 X Model 689-V2 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.