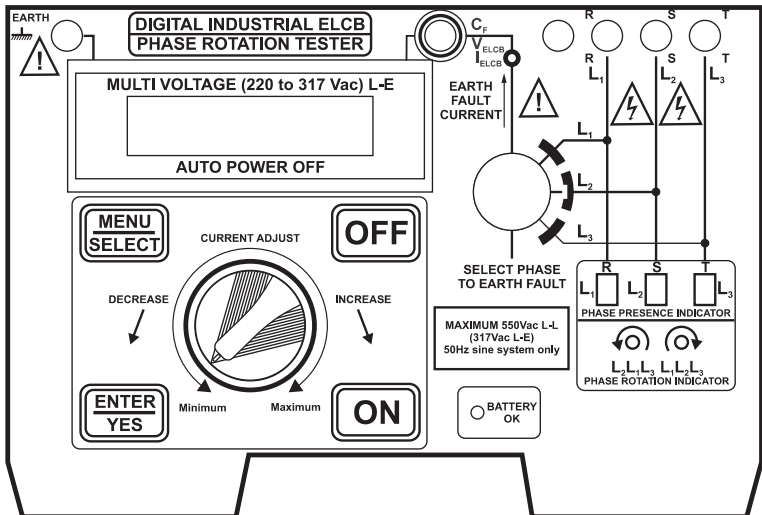


# INDUSTRIAL DIGITAL EARTH LEAKAGE CIRCUIT BREAKER and 3 PHASE ROTATION TESTER



## INSTRUCTION MANUAL

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## 1. Safety Rules

**CAUTION**



**RISK OF ELECTRIC SHOCK**

This tester has been designed with your safety in mind. However, no design can completely protect against incorrect use. Electrical circuits can be dangerous and/or lethal when lack of caution or poor safety practices are used.

Do not carry out field measurements on either the power system grounding, during periods of forecast lightning activity, in areas that encompass the station being measured or of the power network connected to the station being measured. In the event that lightning occurs, stop all testing and isolate any temporarily installed test spikes.

Preparations for testing of power system grounding can leave personnel vulnerable to exposure caused by faults at or fed from the system under test, transferred potentials from remote test grounds, and inadvertent line energisations.

While the probability of the occurrence of one of these events is low, personnel safety will, nevertheless, be enhanced by the following:

When working near high tension systems rubber gloves and shoes should be worn.

Work on clean, dry crushed rock or an insulating blanket.

Avoid bare hand to hand contact between the tester and extended test leads.

When using the tester with test leads, ensure that they are safe and properly authorized

Disconnect the tester from any external circuit when changing the batteries.

**CAUTION****READ THE MANUAL**

Follow the instructions in the Manual for every measurement. Read and understand the general instructions before attempting to use this tester.

## 2. Safety Check

Before using the tester check the condition of the batteries. This is done by switching the tester ON.

If the BAT OK led does not light up, the battery need replacing. Battery and fuse replacement are described later in this user's manual.

When changing the battery, fuses, or removing the cover to access the internal circuitry, always disconnect the test leads.

When replacing the fuse use only the type specified, 5 X 20mm, 1.0A, fuse, and insert correctly into the fuse holder.

Double check the switch setting, and lead connections before making measurements.

## 3. Don't Touch

Don't touch exposed wiring, connections or other "Live" parts of an electrical circuit. If in doubt, check the circuit first for voltage before touching it.

Do not use cracked or broken test leads.

**THIS INSTRUMENT SHOULD ONLY BE USED BY A COMPETENT, SUITABLY TRAINED PERSON.**

**REMEMBER****SAFETY IS NO ACCIDENT****CAUTION RISK OF ELECTRIC SHOCK****CAUTION READ THE MANUAL****4. General Description**

This Test Instrument is a **combined** 3 Phases Presence and Rotation Indicator combined with a 3 Phases Industrial Earth Leakage Tester.

When utilized as a 3 Phase Presence and Rotation Indicator, the instrument does not use the batteries and can still be utilized if the batteries are not present or if the batteries are too low.

The 3 phase Presence and Rotation Indicator which is inside the meter, takes it's power from the circuit under test.

The Earth Leakage can be utilized on a Single Phase (up to 317Vac Line to Earth) or a **3 Phase Powered System** (550V Line to Line or Phase to Phase) with a protective Earth conductor.

The Earth Leakage requires batteries.

When utilized on a single phase, ensure correct connection between Line and Earth before using the tester.

When utilized on a **3 Phase Powered System**, the instrument is then utilized as a 3 Phases Presence and Rotation Indicator and a Earth leakage tester (selecting which phase to Earth will be utilized for the ELCB test).

When utilized on a 3 Phases Powered System, this instrument is a rotary field indication instrument which display all three phases by lighting up it's corresponding Lamp. It display the rotation (clockwise or anti-clockwise) on a LED.

To test the tripping time or the tripping current of a Eathr Leakage Circuit Breaker, make sure to connect the earth wire.

This instrument represents the quickest and easiest way for servicing, repairing and electrical maintenance of 3 phase system with earth leakage.

With this equipment, you can, before connecting Load to Supply: On the supply side; Quickly verify the presence of the three Phases on a 3 Phases Power System. Confirm the Phase Rotation on a Powered 3 Phase System. Test the Tripping (disconnection) current and time of the protections.

## 5. Brief Product Description

This 3 Phases Rotation and Earth Leakage Tester has 4 test leads which connects to the 4 mm female sockets on the tester.

These Test leads are color coded.

- R(L1) = Red which connects to R on the tester.
- S(L2) = White which connects to S on the tester.
- T(L3) = Blue which connects to T on the tester.
- T(L3) = Blue which connects to T on the tester.
- Earth = Green which connects to Earth on the tester.

On the other side of the test leads are the probes, also color coded.

**The Phase Presence Indicator** has three neon lamps which are the Phase Presence indicators;

- Neon Lamp for Individual Phase Presence Indication = R(L1)
- Neon Lamp for Individual Phase Presence Indication = S(L2)
- Neon Lamp for Individual Phase Presence Indication = T(L3)

Please note that any of these Neon lamp will only start to light up if more than 100Vac is present between any 2 phases.

**The Phase Rotation Indicator** has;

A LED to display clockwise rotary direction L1L2L3.

A LED to display counter clockwise L2L1L3.

**The Earth Leakage Tester** comprise of the Phase Selector, which permit the selection to connect Phase 1 ( L1 or R ) to the earth Leakage tester, or Phase 2 ( L2 or S), or phase 3 (L3 or T).

The Industrial Earth Leakage Tester injects a fault current between one of the phase and earth.

When utilized to test on a single phase system, the 3 Phase Presence and rotation features and indications must be disregarded. The Selector Switch must be on the R position, and the R(L1) phase is connected to the Phase(Line), the green socket to Earth. Neutral wire is not utilized in the testing of the Earth leakage Circuit Breaker.

## 6. Operating Instructions

### **Determination of the rotary field direction and phase presence**

On a 3 Phase System, the sequence of the 3 phases determine the rotation of a 3 phase motor connected to that system.

The correct 3 Phase Sequence R(L1), S(L2), T(L3) results in a clockwise rotation of the connected motor.

Connect the Test Leads to the sockets of the Instrument, respecting the correct color. Red to R(L1), White to S(L2), Blue to T(L3).

Clip the test probes to the three mains phases, R(L1), S(L2), T(L3).

When connecting to a voltage superior to 100V AC, the corresponding neon lamp will start to glow, indicating the presence of the voltage on it's corresponding lead (L1, L2, L3 lamps).

If the LED (Right arrow) L1-L2-L3 is illuminated, clockwise rotary field is present.

If the LED(Left arrow) L2-L1-L3 is illuminated, a counter clockwise rotary field is present.

Determination of the disconnection sensitivity of the Earth Leakage Circuit Breaker

Connect the Earth lead from the tester to the Earth connection on the system. Using the rotary switch, select which phase you want to test from, connect the phases.

### **Determination of the disconnection sensitivity of the Earth Leakage Circuit Breaker**

Connect the Earth lead from the tester to the Earth connection on the system. Using the rotary switch, select which phase you want to test from, connect the phases.

Turn Instrument "ON" by pressing the "TEST-ON" button.  
The L.C.D. display will come to the following Screen.



Push Select to change Selection to Instantaneous, then Press "TEST " to accept.



Dial the Starting Current of the Instantaneous Test using the Current Adjust Knob.





Select the Positive or Negative Start Edge using the Select Button.

**Connect Leads  
to Earth & Phase**

Connect Leads to Earth and Phase.  
Testing will start Automatically when voltage is detected.

**V=317V  
I=127mA**

Test In Progress. The Voltage between leads was 317V before testing started and I=127mA

**V=317V -  
I=140mA Hold→TRP**

**TRP** = Tripped, Display on Hold  
Tripped at 140mA, on - edge of signal.

### **Determination of the disconnection time of the Earth Leakage Circuit Breaker**

Connect the Earth lead from the tester to the Earth connection on the system. Using the rotary switch, select which phase you want to test from, connect the phases.

Turn Instrument "ON" by pressing the "TEST-ON" button.  
The L.C.D. display will come to the following Screen.

→ **\* - Instantaneous  
- Time Delay**

Push Select to change Selection  
to Instantaneous, then Press "TEST" to accept.

**Dial Starting  
Current. 125mA**

Dial the Testing Current of the Instantaneous Test using the Current Adjust Knob.



Select the Positive or Negative Start Edge using the Select Button.

**Connect Leads  
to Earth & Phase**

Connect Leads to Earth and Phase. When voltage is detected, Testing will start Automatically.

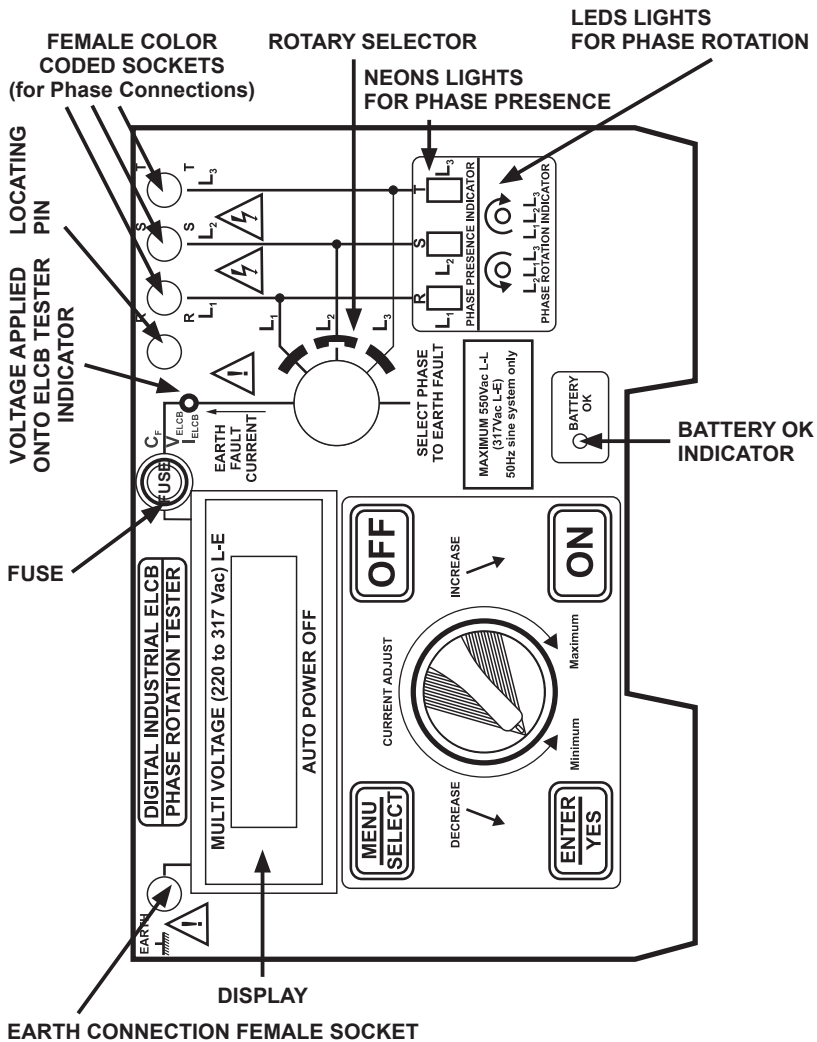
**V=317V T=4.020s  
I=125mA**

Test In Progress since 4.020s. The Voltage between leads was 317V before testing started and Constant current is 125mA.

**V=317V + T=6.435s  
I=125mA Hold→TRP**

TRP = Tripped, Display on Hold at 6.435s Tripped on + edge of signal.

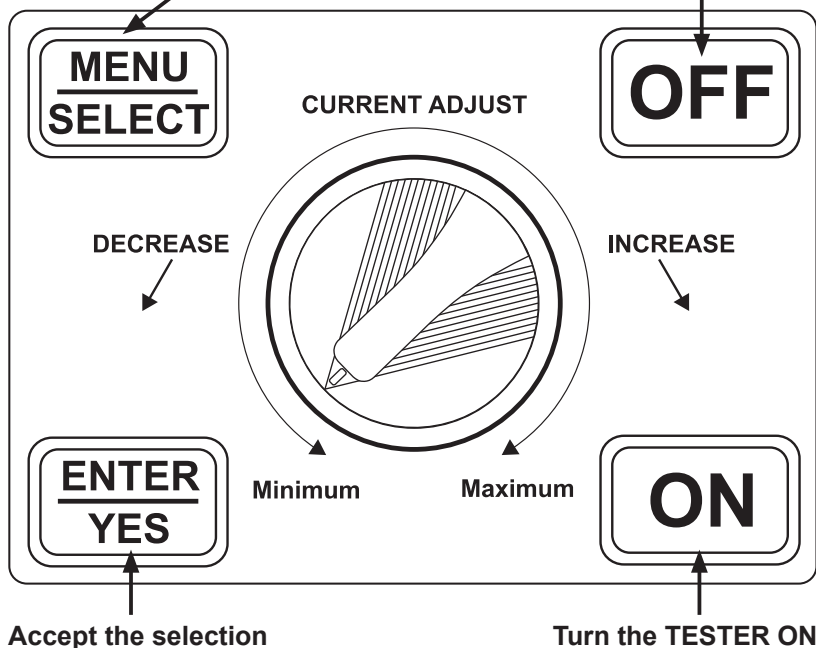
## 7. Front Panel Layout



## 8. Keypad and Main Keys

select between types of tests  
Instantaneous (checking the tripping ) current  
or  
Time Delay (checking the tripping time)

Turn the TESTER OFF



Adjust the Starting Current (Instantaneous)  
or  
Adjust the Constant Current (Time Delay)

## 9. Principle of How It Work

The tester has two separate circuits:

One is for the **3 Phase Presence and Rotation indicator**, the other is for the **Earth leakage Circuit Breaker Tester**.

The first circuit is the 3 Phase presence indicator, which is shown by the neon lamps and the three phase sequence indicator by leds.

### **3 Phase Presence and Rotation indicator:**

This circuit derive it's power from the system under test.

This circuit does not require the user of battery and is self powered through resistors.

### **3 Phase Presence Indication circuit:**

This circuit uses neon lamps to indicate if a phase is present.

These neon lamps are connected in series with a limiting resistor.

Neon lamps will lights up when the voltage across any two phases is more than 100Vac.

### **3 Phase sequence indicator circuit:**

This circuit has an analog and a digital part. The analog signals are shaped then compared to a set of references. These results are digitally compared to give the results on the indicating LEDs.

### **Earth leakage Circuit Breaker Tester**

At switch-ON, the circuit is powered up.

A low battery detection pickup circuit, with a Power On indicator LED is also present.

This LED indicate that the batteries are ok and it will lights up when the batteries are ok.

Should this led not lights up, replace the batteries.

Once the Earth Leakage Circuit Breaker is turned-ON, the first menu will indicate that the instrument is ready.

Basically, this instrument measure the voltage Line to Earth or between the selected phase to Earth.

This is not the Line to Line voltage.

The tester also has a computer controlled constant current source, from which the test fault current is taken from.

This instrument reproduce a perfect 50Hz current sinewave, wich is independant from the shape of the voltage.

## 10. Preparation For Use

### **Fuses :**

In doubt, check the fuses using a ohm meter.

Please note that the Earth Leakage Tester will not indicate any voltage, should the fuses be blown.

Should the fuse be blown, the Current Led will also not lit.

### **Test Leads :**

Check the test leads for defects or cracks. Replace if cracked or damaged. Only replace with the same type.

### **Cleaning :**

Use a damp cloth to clean the case. Do not use chemicals.

### **Batteries :**

Checking the battery is automatically done, once the tester is switched "ON". Should the battery OK led not lit, replace the batteries.

## 11. Replacing The Batteries

Prior to battery replacement always disconnect the instrument from the circuit to which it's connected.

Remove the test leads from the instrument.

Remove the back cover to access the battery compartment.

Remove all the bad batteries from the battery compartment and dispose properly of that batteries (see your local disposal facilities related to disposal of batteries).

Only replace with 8 new batteries of the following type : 1.5 V, C type.

Re-insert the (batteries) back cover onto the instrument and tighten the screw.

### **Fuses Replacement**

Unscrew the front fuse cover and replace the faulty fuse with the same type, then screw the fuse cover back into place correctly

## 12. Specifications

### ELECTRICAL

#### Determination of the Phase Presence

Nominal Voltage for Phase Presence Indication (the voltage required for the neon lamps L1, L2, L3 to lit up)..... From 100Vac to 450Vac.

Frequency Range ..... From 10Hz to 400Hz.

#### Determination of the Phases Rotary Field Direction:

Direction (the voltage required to have the direction LEDs L1-L2-L3 or L2-L1-L3 to indicates)..... From 100 to 450Vac.

Frequency Range ..... From 2Hz to 400Hz.

#### Protection

Over Load..... 550V (between all terminals).

Over Voltage ..... Class III - 450V towards ground.

### ENVIRONMENTAL

Operating temperature Range : 0°C to + 40°C

Storage Temperature : -10°C to + 50°C

#### Earth Leakage

**Current Settings** 999mAac / 50-60Hz

**Current Selection** Knob

**Phase Start Selection(\*)** 0° and 180°

**Over-Temperature Protection(\*)** Yes

**Phase Polarity Trip Indicator(\*)** Yes

**Operating Voltage ( L-E )** 220Vac to 317Vac

**(\*)Referenced to Earth**

**Timer Resolution** 1ms (Max Time = 99.99s)

**Timer Accuracy** 1ms  $\pm$ 4ms

**Current Accuracy**  $\pm$ 3%  $\pm$ 4mA

**Current Resolution** 1mA

**Voltmeter Accuracy (50Hz)** 50-350 Vac =  $\pm$ 3% $\pm$ 2V  
350-550Vac =  $\pm$ 7% $\pm$ 3V

**Voltmeter Resolution** 1V



**Batteries**

1.5V "C" x 8 batteries  
Bat OK Led = Vbat >9V

**Maximum Current Specified at 317Vac / 50Hz****CLEANING**

Clean the instrument case with an anti-static cleaner and wipe with dry cloth.

### 13. Limited Warranty

We warrant the product manufactured by us to be free from defective material or factory workmanship and agree to repair or replace this product which, under normal use and service, disclose the defect to be the fault of our manufacturing, with no charge for parts and service. If we are unable to repair or replace this product, we will make a full refund of the purchase price.

Consult the user's manual for proper instruction regarding use of this instrument.

Our obligation under this warranty is limited to repairing, replacing or making refund of this test equipment which proves to be defective within twelve months from the date of original purchase.

This warranty does not apply to any of our products which have been repaired or altered by unauthorized persons in any way so as, in our sole judgement, to injure their stability or reliability, or which have been subject to misuse, abuse, misapplication, negligence or accident or which have had the serial numbers altered, defaced or removed.

Accessories, not of our manufacture used with this product, are not covered by this warranty.

All warranties implied by law are hereby limited to a period of twelve months, and the provisions of the warranty are expressly in lieu of any other warranties expressed or implied.

The purchaser agrees to assume all liability for any damages or bodily injury which may result from the use or misuse of the product by the purchaser, or it's user, his employees, or others, and the remedies provided for in this warranty are expressly in lieu of any other liability we may have including incidental or consequential damages.

We reserve the right to discontinue models at any time, or change specification, price or design, without notice and without incurring any obligation.