

BOWDENS

RR MKIII EFI



EARTH FAULT INDICATOR FOR UNDERGROUND CABLE NETWORKS

1.0 OVERVIEW

The EFI RR MKIII is an HV fault indicator designed to locate earth faults on cable networks with high accuracy and integrity. It will flash a bright LED in fault condition and reset automatically on a timed reset. The EFI Model RR MKIII is an upgrade to the highly successful RR MKII but with improved electronics to enhance performance and especially battery longevity. It retains the high level of immunity to external magnetic influences which minimises any false indications due to stray currents. The unit consists of a small polycarbonate box, which is fully water spray and dust proof to IP65. The electronic circuit board within the module is conformal coated using two layers to provide protection from onerous weather and environmental conditions in an external location. The EFI is fully EMC tested to ensure compliance with the required standards for the UK CA and CE mark. It is also tested to an onerous Power Frequency Magnetic Field test to EN61000-4-8 to ensure perfect immunity to high magnetic fields during fault conditions in both the tripped and reset operating modes. The EFI relay is driven from a core balance C/T located either around the three phase incoming cable, so long as there is an insulated gland between the cable and the switchgear, or within the dry cable termination box.

2.0 OPERATION

Fault current on the cable network generates a proportional voltage at the C/T secondary output, which, if above a pre-set threshold will trigger the processor. This starts a timer during which any signals are suppressed, this is to allow magnetising inrush or capacitive currents on the HV network to dissipate. Once this time delay (nominal 40msecs) is over the EFI will respond to any primary current above the pre-set trip threshold, and will start the bright red LED flashing. The trip level is set at a nominal 35 Amps +/- 10% using a standard 60: 1 ratio split or solid core C/T. The trip level can be specified by the customer for factory setting between the limits 20 to 50 Amps.

RESET : TIMED - MANUAL – REMOTE

There are three methods of resetting the relay:

1. Timed Reset: red LED will flash for either three or six hours (user selectable) before it resets.
2. Manual Reset: There are two manual buttons on the front face of the relay, one to put the unit into alarm and another to reset the alarm.
3. Remote Reset: an external signal between 6 – 30V ac or dc can be applied to the reset terminals for a minimum of 10 secs to reset the EFI.

OUTPUT RELAY

The RR MKIII incorporates a three pin terminal block with latching changeover relay (Common/NO/NC) which provides volt free contacts for external telecoms interface. The relay latches when the red LED starts to flash, and unlatches when the unit times out and resets.

MANUAL BUTTONS

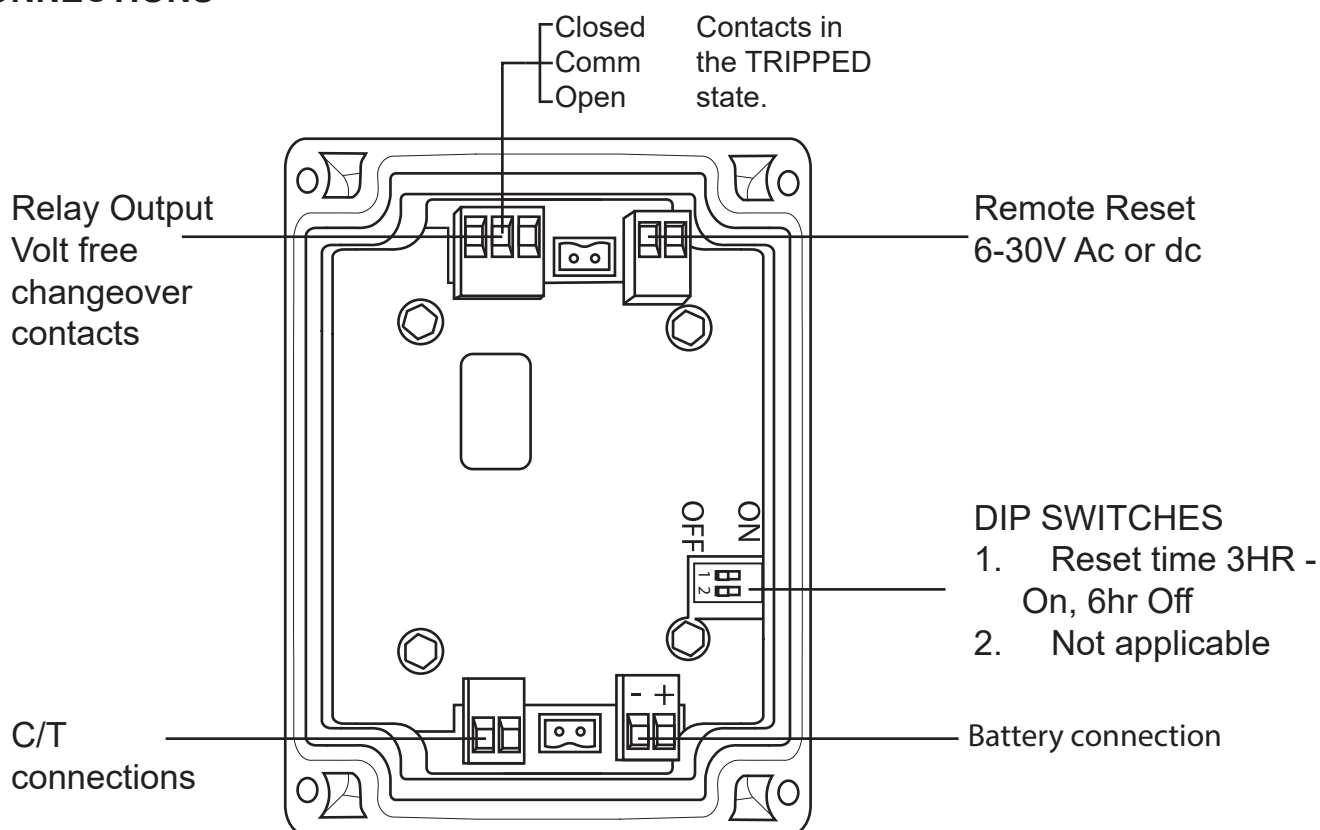
Press the alarm button: the red LED will start to flash every four secs. When the reset button is pressed, the red LED will flash before resetting.

3.0 POWER SUPPLY

The EFI RR MKIII is powered from a SAFT LS17500 Lithium cell rated at 3.6AH. The battery is supplied with terminal connector pre-attached, so can be plugged directly into the terminal block. It is secured to the base of the EFI enclosure. Each battery is labelled for date, and can be easily changed. When connecting the battery it is important to connect one wire at a time, leaving the insulated cover on the other ferrule to ensure the battery is not shorted.

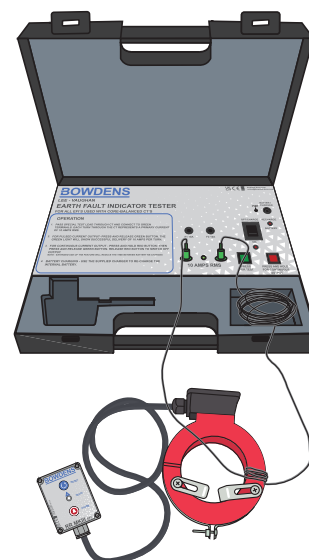
Independent computer modelling confirms that for an average demand of 44mA per annum with one trip lasting for six hours each month, and allowing for a 5% natural leakage, (which accounts for a high temperature repartition) the battery life on the battery is >15 years.

4.0 CONNECTIONS



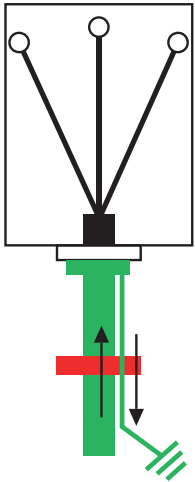
5.0 TESTING OF INSTALLATION

The complete EFI installation should be tested following installation, and at service intervals to ensure correct operation. Bowdens manufacture a mobile Injection Tester which makes this task easy. The test cable can be wrapped around the C/T generating 10 Amps per turn, so with five turns the EFI should trip at 50 Amps, but not on three turns for 30 Amps. The relay can be tested using the manual ALARM button, and can be RESET also.



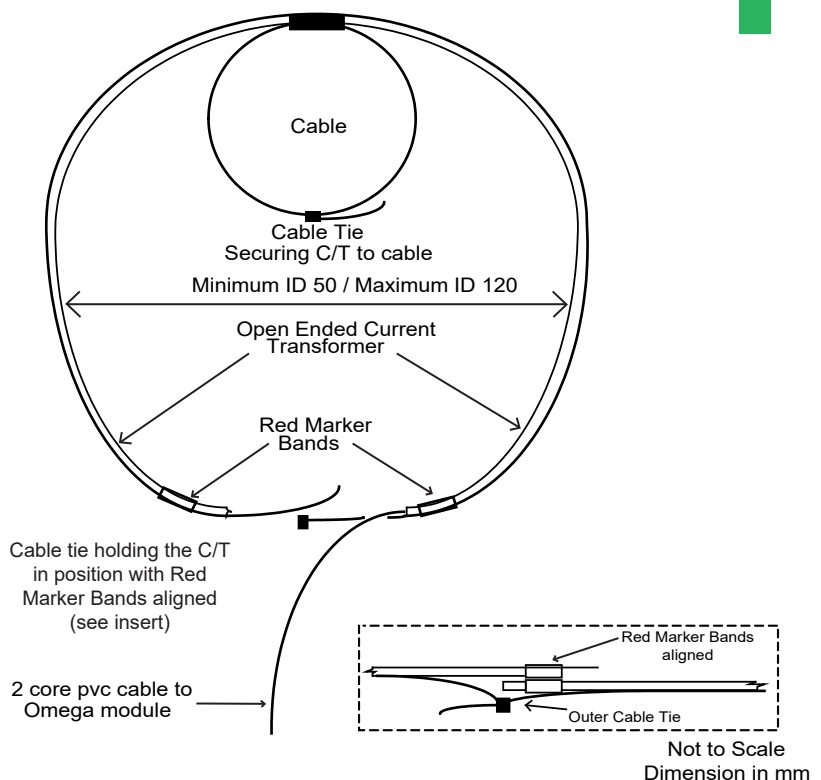
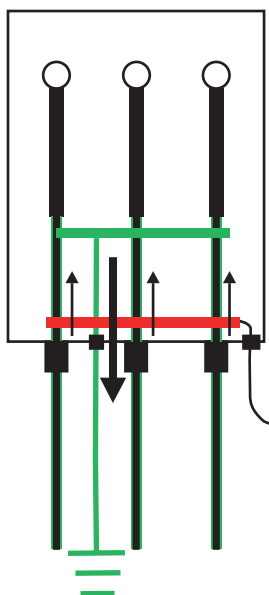
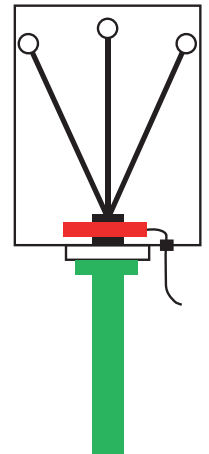
6.0 CURRENT TRANSFORMER INSTALLATION

The EFI RR MKIII is compatible with both standard 60:1 ratio cast resin core balance C/T, or the Bowdens band sensor C/T, both of which can be installed externally on the incoming cable, or within the dry cable termination box. The earthing requirements must be observed to allow any sheath current to be cancelled by returning the earth path back through the C/T (see diagrams).



Traditional external cast resin C/T installation. Insulated gland at entry to cable box. An earth braid needs to be soldered to the earth termination and brought back through the C/T to cancel the earth fault flowing in the cable sheath.

Sheath earth terminates at insulated gland and so the C/T can be installed in the base of the cable box where it will detect only out of balance caused by earth fault flowing in one phase.



BAND SENSOR C/T

The EFI RR MKIII is now compatible with the band sensor C/T. The 1000:1 ratio C/T is encapsulated in flexible polyolefin tubing with a thermoplastic adhesive inner liner. The inner liner melts when the material is shrunk to seal and encapsulate the internal components of the band C/T offering environmental protection. The polyolefin tubing has an operating temperature range of -55°C to +85°C and performs well on exposure to UV.

The flexible band sensor C/T can be produced up to 1.3 metres in length, so it can be used to encompass three phase conductors (see diag) within the cable box, making it very adaptable.

C/T RESISTOR SELECTION.

The RR MKIII is designed to work with either:

60:1 DSPT DKM1246 Split core CT BATTERY POWERED (RR)

60:1 DSPT/NB DKM1251 Split core CT BATTERYLESS (NB)

7.0 TYPE TESTING

Electro Magnetic Compatibility

Conformity Testing to Council Directive to 2014/30/EU

Emissions: EN55 022 & EN61000-3-2 EN61000-3-3

Immunity: EN61 326 (class A) - EN61000-4-2 to EN61000-4-6 & EN61000-4-11

Power Frequency Magnetic Field

Immunity to EN 61000-4-8 REFERENCING PROCEDURE: MAG-01B

Short Circuit Testing

Immunity to maximum voltage at C/T input on saturation.

Low Voltage Directive

Conformity Testing to Council Directive 2014/35/EU

Environmental

Enclosure testing to IP65 with additional accelerated tests to freeze/thaw cycle, humidity and salt spray.

Temperature Testing:

Temperature cycle testing between -20°C to +70°C

8.0 ROUTINE TESTING

Functional testing is carried out on 100% of all manufactured units before shipping.

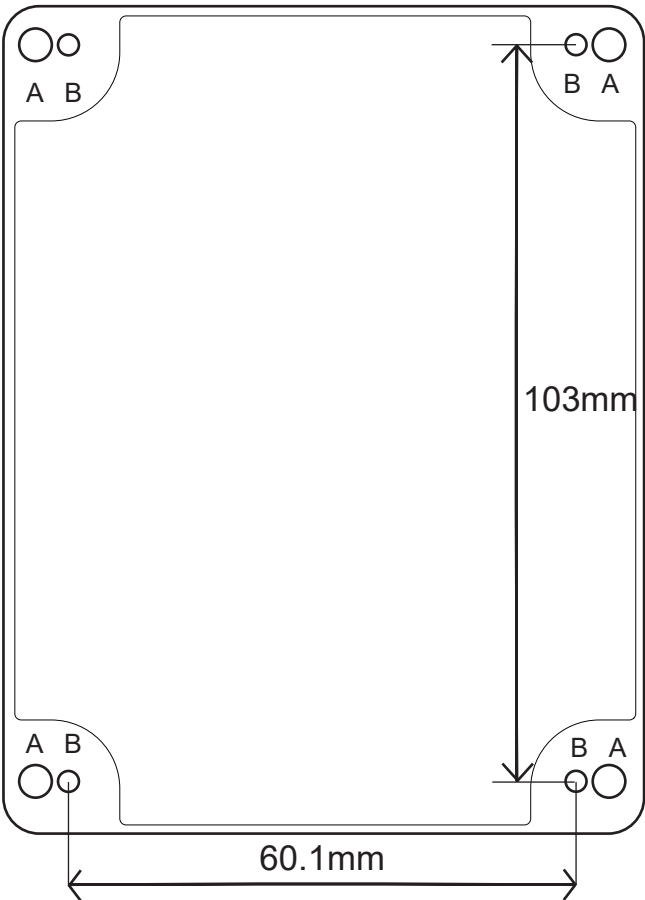
9.0 SPECIFICATION

Indication:	Bright red LED
Trip Level:	Standard Nominal – 35 Amps +/- 10 Amps
Battery/Longevity:	SAFT LS17500 - 15 years at average temp of 20°C
Trip Delay:	Nominal 40msecs +/- 15%
Reset Time:	Standard three or six hours +/- 5 mins (user selectable)
Output relay:	Changeover relay - common / NO / NC 110V dc / 125V ac. 1 Amp. 30 Watt maximum.
Reset Signal:	6 to 30V a.c or d.c applied for 10 secs.
Temperature Range:	-20°C to +70°C
Enclosure:	Polycarbonate – IP65

10.0 MOUNTING DATA

HOLES ‘A’
Corner fillet holes for
fixing OMEGA back box
Holes 4mm diameter

HOLES ‘B’
Recessed screw holes for
securing OMEGA front
panel



VERSION 2.1

RELEASE 20.03.25

ECO Reference
ECO0219
ECO0224