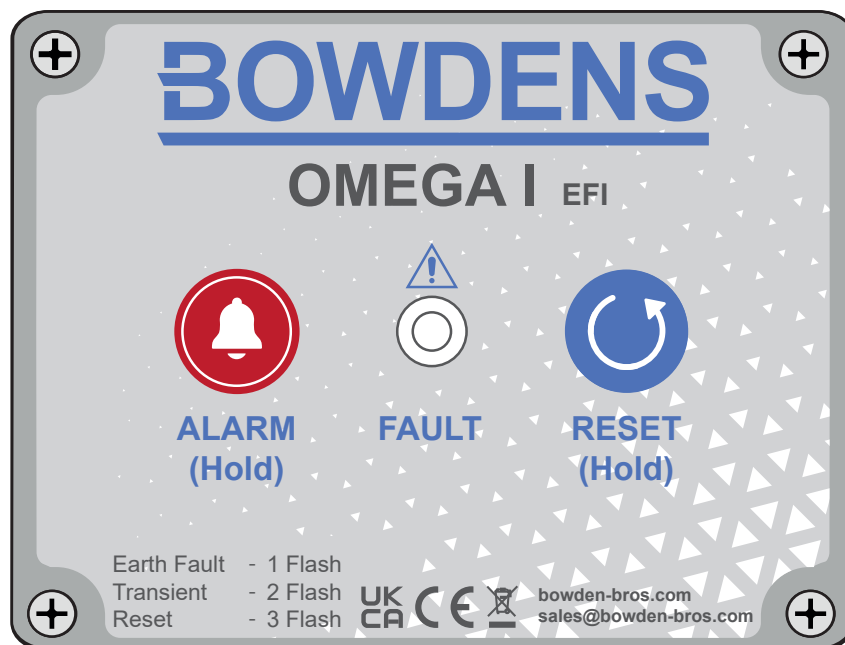


# **BOWDENS**

## **OMEGA I EFI**



## **EARTH FAULT INDICATOR FOR UNDERGROUND CABLE NETWORKS**

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## 1.0 OVERVIEW

The Omega EFI is an HV fault indicator designed to locate earth faults on cable networks with high accuracy and integrity. It will flash a bright LED under fault condition, and has the option of a flag indicator as well. It will reset automatically on a timed reset. The Omega relay 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 weather and environmental conditions when installed externally. The efi is fully EMC tested to ensure compliance with the required standards for the CE and UK CA mark. It is also tested for immunity against Power Frequency Magnetic Fields, an onerous test to EN61000-4-8 to ensure perfect immunity to high magnetic fields during fault conditions. The relay is driven from a remote 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

### TRIP LEVEL

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 50msecs) is over the EFI will respond to any 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 Amps so between the limits 25 to 45 Amps, using a standard 60:1 ratio split or solid core C/T.

### RESET : TIMED - MANUAL – REMOTE

There are four methods of resetting the relay:

1. Timed Reset: The red LED will flash for either three or six hours (user settable) 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.
4. LV Reset: The relay can be reset from a local LV source (see Power Supply 3.0)

### OUTPUT RELAY

The Omega efi 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 un-latches when the unit times out and resets.

### MANUAL BUTTONS

Press and hold the alarm button for three seconds: the red LED will flash every four secs. When the reset button is pressed for three seconds, the red LED will flash three times before resetting.

### 3.0 POWER SUPPLY

The Omega efi can be powered either by battery or from an LV power source.

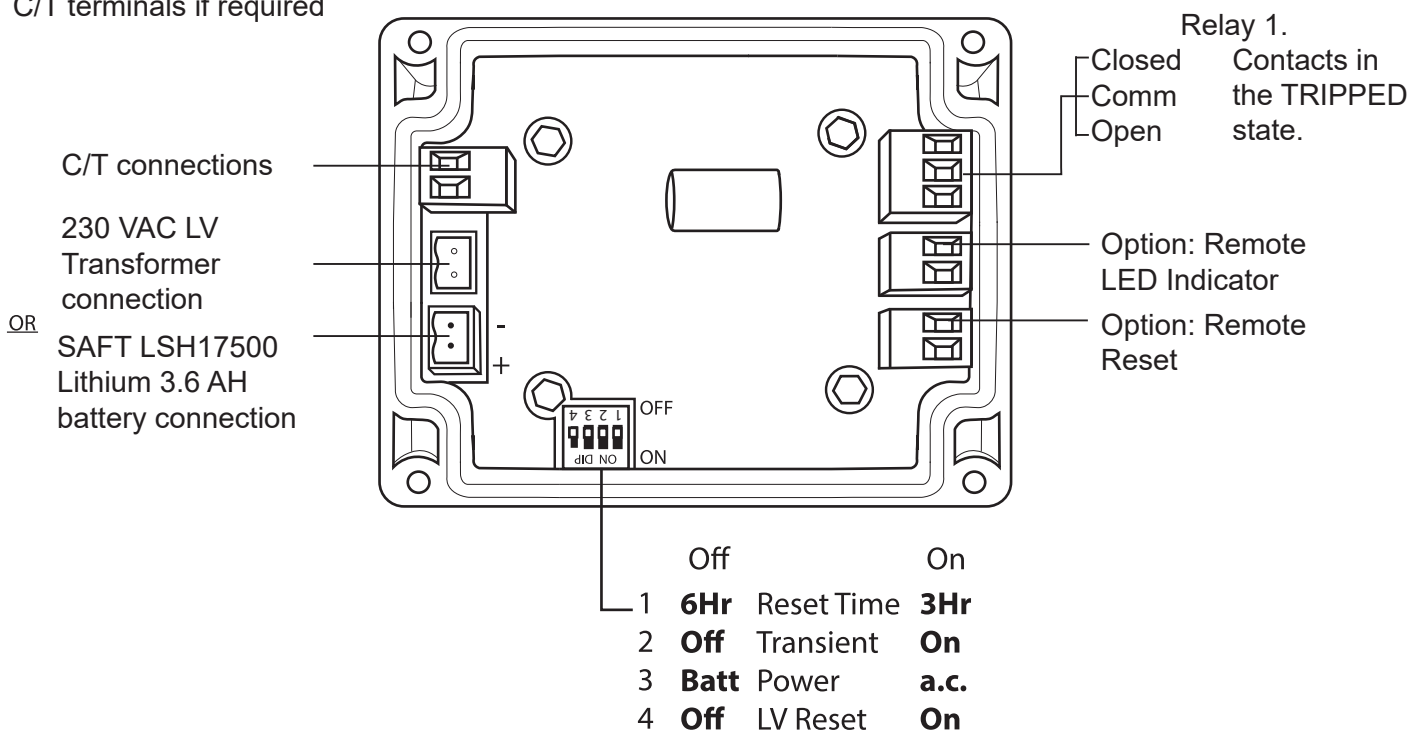
**BATTERY:** The Omega efi is powered from a SAFT LS17500 Lithium cell rated at 3.6AH. The battery is supplied with terminal ferrules pre-attached, so can be plugged directly into the terminal block, and is secured to the base of the EFI enclosure. Each battery is labelled for date, and can be easily 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. The connection is NOT polarity sensitive.

Independent computer modelling confirms that for an average demand of 44mAH 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. It is possible to have the LV reset feature with a battery powered unit, but this does require both battery and LV transformer and makes for a more expensive option.

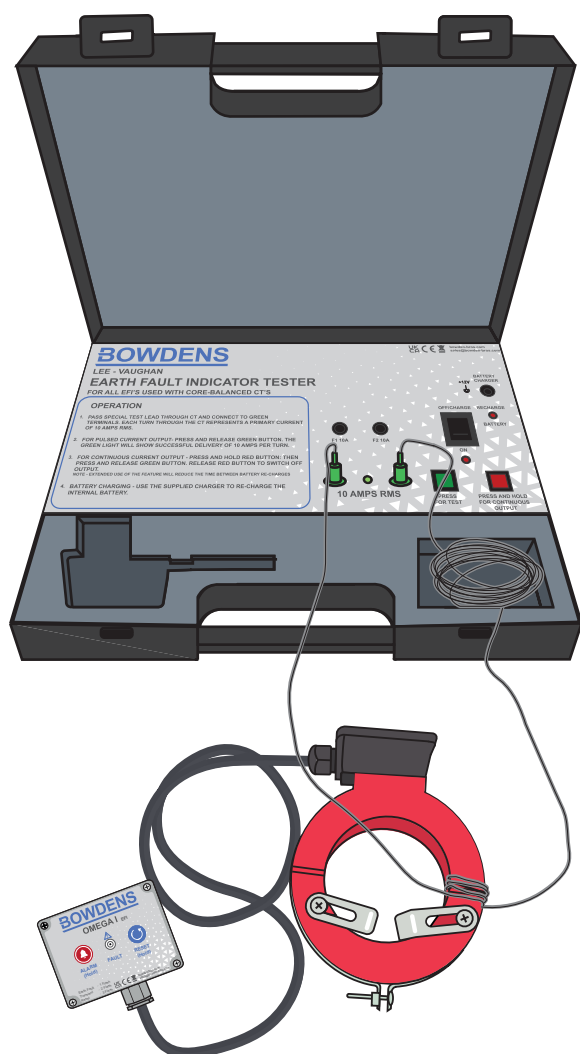
**LV POWER SOURCE:** The Omega efi can be powered from the local LV power supply 220/240v 50Hz using the mini LV transformer housed in the back box. The LV cable can be brought into the enclosure via a gland and terminated on the transformer. The LV power source will charge the super capacitors which will allow the Omega efi to operate during its trip cycle before the power is restored. It can also be used to reset the alarm.

### 4.0 CONNECTIONS

Resistor placed across  
C/T terminals if required



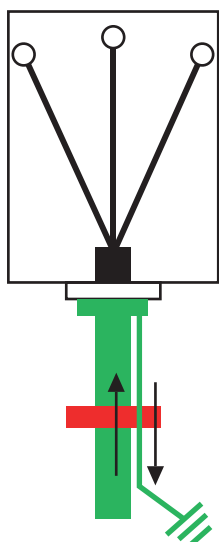
## 5.0 TESTING OF INSTALLATION



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.

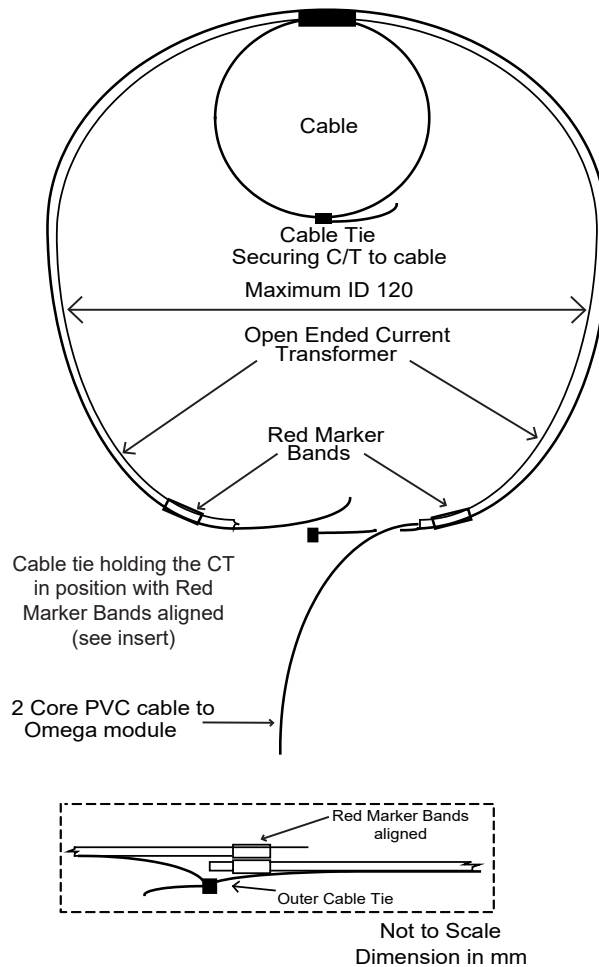
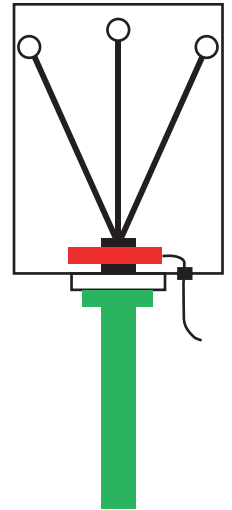
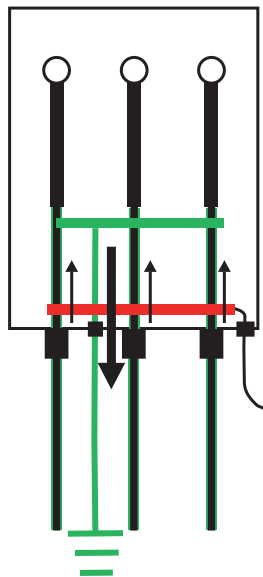
## 6.0 CURRENT TRANSFORMER INSTALLATION

The Omega efi 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 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  $-55^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  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.

Depending upon the C/T used and the power source for the efi, a resistor will be required to be applied across the C/T input terminals in parallel with the internal burden resistor.

<b>OMEGA Battery Powered</b>	<b>OMEGA LV Powered</b>	<b>C/T Configuration</b>
Fit 82R resistor for 45-50A trip level Farnell 2401725	No Resistor for 45-50A trip level	Single Band C/T 1000:1
No Resistor for 60 A trip level	No Resistor for 90A trip level	3 x Band C/Ts commoned
Fit 2R resistor for 45-50A trip level Farnell 2401706	Fit 4R resistor for 45-50A trip level Farnell 9467459	1 : 50 C/T
Fit 18R resistor for 45-50A trip level Farnell 2401706	Fit 34R resistor for 45-50A trip level Farnell 9467459	1 : 500 C/T
Fit 30R resistor for 45A trip level	Fit 1000R resistor for 45A trip level	3 x 500 C/Ts commoned

If in doubt refer to the Bowdens Office for further advice.

## 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 3 or 6 hours +/- 5 mins (user selectable)

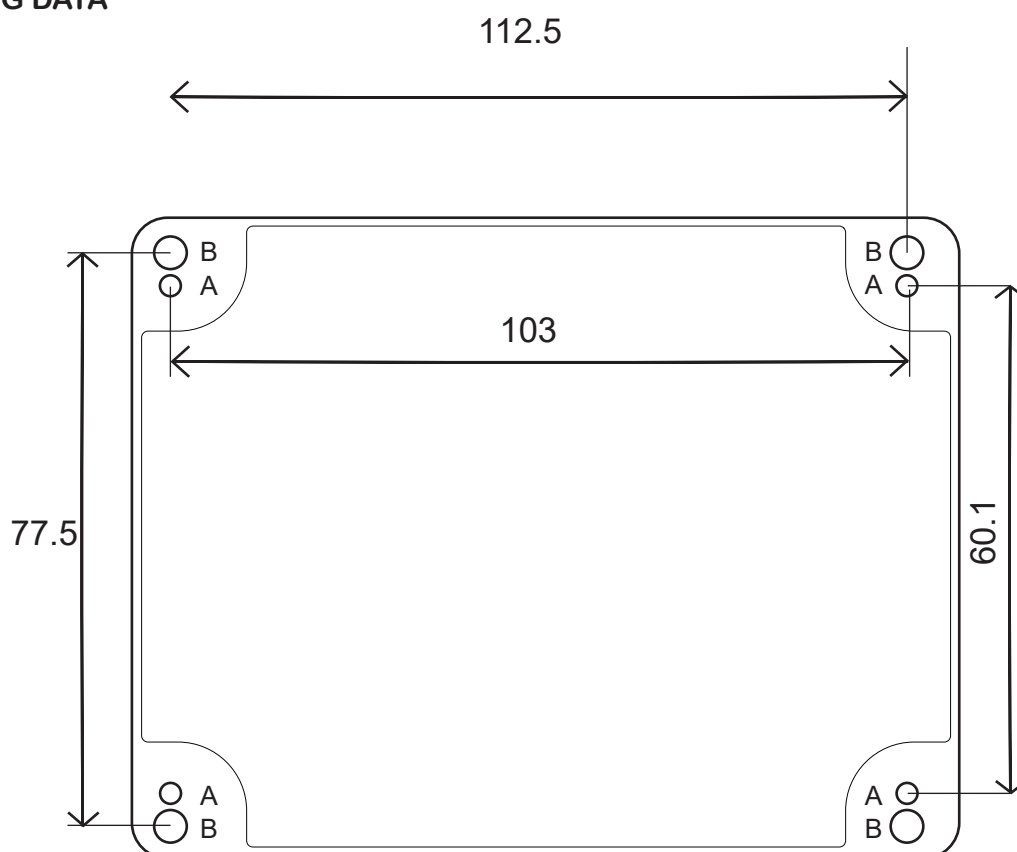
Output relay: Changeover relay - common / NO / NC  
110V dc / 125V ac. 1 Amp. 30 Watt maximum.

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 base

Holes 4mm diameter

Distances between centres

Dimensions in mm

Not to scale

### HOLES B

Recessed screw holes for securing OMEGA front panel

## Location of Fixing Holes in Back Box

The Omega efi can be secured with 4mm screws through the mounting holes 'A' in the back box, as detailed in the sketch. Alternatively the front lid can be panel mounted with a suitable cut-out using fixing holes 'B'

VERSION 3.0

RELEASE 21.02.25

ECO Reference
ECO0219