



Energy Solutions offer single and three phase Isolation Transformers of all capacities. The Energy Solutions standard range of Isolation Transformers offer the following features.

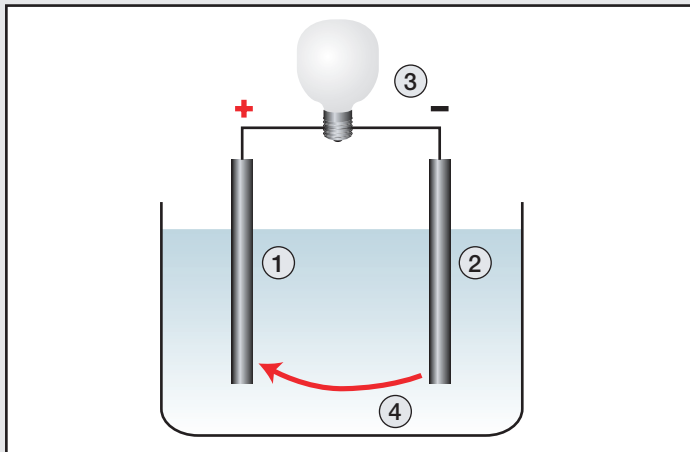
- **Complete range.** The standard transformer range covers 16, 32, 50 & 63 amp shore capacities at 230v.
- **Dual input.** Each transformer can be configured to accept 110v or 230v input.
- **Dual output.** Each transformer can be configured to provide either 120 - 0 - 120v 4 wire USA output or 0 - 230v 3 wire Euro output.
- **ABYC compliant.** All transformers are built with a screen between primary and secondary windings capable of carrying twice the full load current of the transformer. This exceeds the requirements of ABYC E-8.20.1 by 100%.
- **Lloyds compliant.** All transformers are built to comply with the requirements of LRS.
- **Resin coated.** The standard protection is a vacuum impregnated resin dip.



BACKGROUND

Bringing shorepower onto a yacht or ship offers a great deal of convenience for the owner. But it can also lead to galvanic corrosion and other problems. Good engineering practice, Lloyds rules and the Recreational Craft Directive all call for an on-board AC earth system to be bonded through to the sea. On a metal-hulled boat this is done by taking the earth to the hull, on other craft it is via a specific 'grounding' plate. In making this important safety connection you create a galvanic loop which can accelerate corrosion of the boat.

A SIMPLE BATTERY



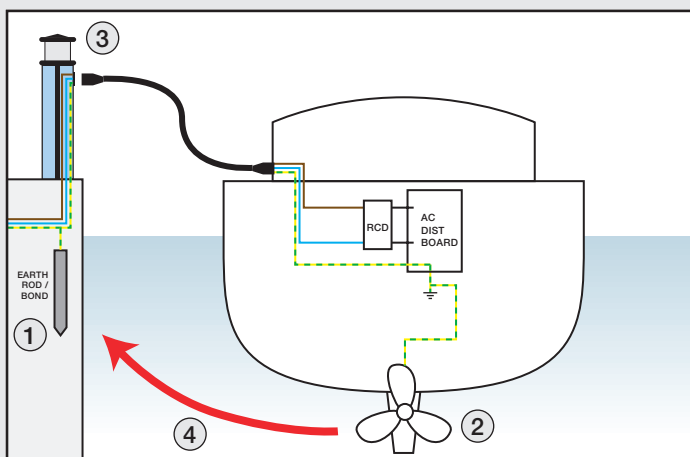
To understand how this problem is created we can look at how a simple battery operates:

[1] & [2] The positive and negative plates of a battery cell are immersed in a conductive fluid.

The relative nobility of the materials in the two plates creates a potential difference (DC voltage).

[3] & [4] By connecting a conductor between the plates a circuit is formed allowing the voltage present to drive current from the anode to the cathode and 'eroding' the anode.

YOUR BOAT AS A BATTERY



If we apply this scenario to a yacht on shorepower

[1] & [2] The hull or metallic underwater components (propeller, skin fittings, drive legs etc) of the yacht act as one battery plate with other vessels or shore based components, such as mooring piles or sheet piling, acting as the other plate.

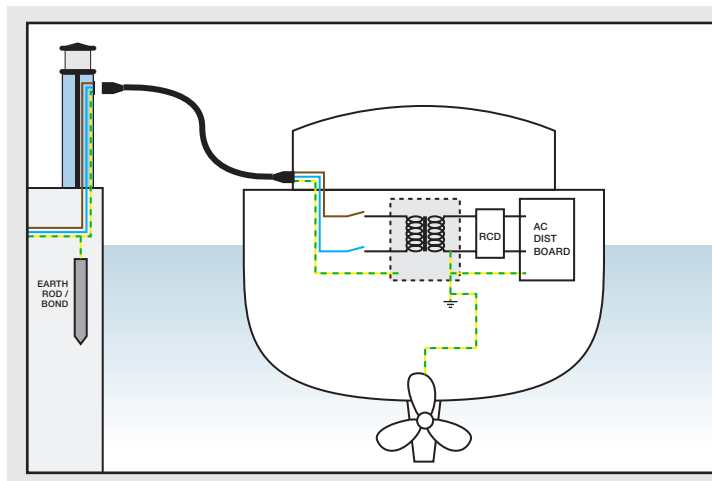
The relative nobility of the underwater component of the yacht relative to other yachts or shore structures creates a DC voltage

[3] Bringing shore-power on board creates a circuit through the earth wire on the shore lead, down to the sea via the hull or groundplate and back through the sea to the shore earth. [4] This allows the DC present to generate a galvanic current causing accelerated corrosion.

THE SYMPTOMS

On metal-hulled boats galvanic corrosion can cause general hull corrosion as well as localised pitting - especially along the waterline. Sometimes this pitting and corrosion is localised - perhaps close to shore based metal objects. This corrosion of the hull happens despite the fitting of anodes. The ships' anodes also tend to corrode at an accelerated rate. On non-metallic hulls anodes corrode at an accelerated rate and underwater metal fittings can experience corrosion despite the fitting of anodes.

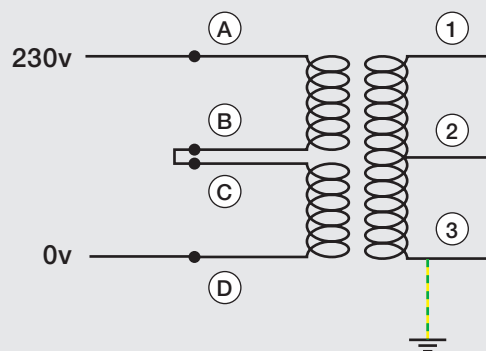
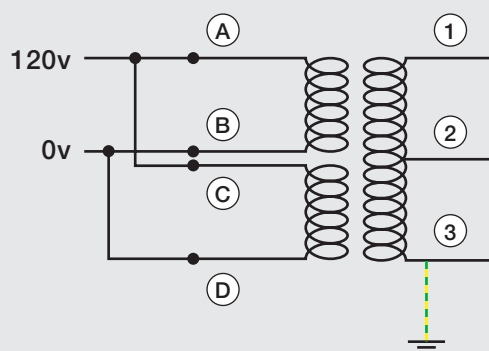
THE SOLUTION



A hull isolation transformer breaks the earth wire on the incoming shorepower. The primary (input) side of the transformer induces a voltage on the secondary (output) side. This is done with no physical connection between the shore cable and the on-board wiring - they are completely isolated from each other. The output side can then be configured to suit the electrical system on the vessel. For UK built boats this usually means that the output neutral is bonded to earth. This allows the use of single pole circuit breakers and switches. The boat gets its earth protection from the sea via the hull or groundplate, but no circuit is formed, as the shorepower earth is not connected.

INPUT VOLTAGE OPTIONS

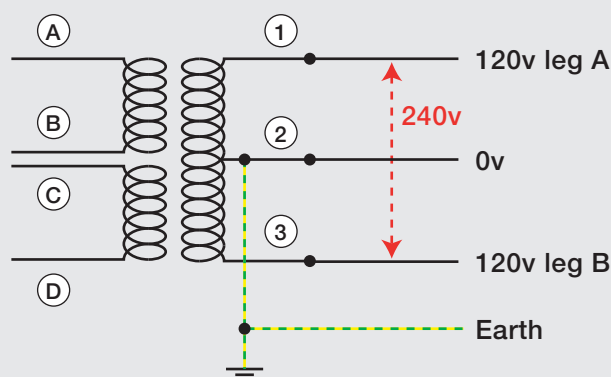
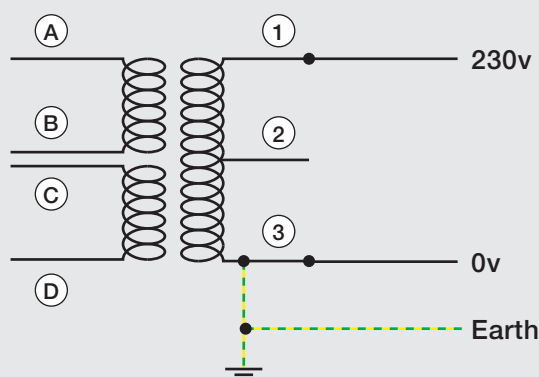
The standard range of isolation transformers from Energy Solutions offers dual input windings. These allow the transformer to be connected to either a 120-volt or 230 volt supply.



OUTPUT VOLTAGE OPTIONS

The standard output offering suits both European and USA specification boats. For European 3 wire boats only the 230-volt take off are used. For American spec boats the centre tap turns the output onto a 120 - 0 - 120 volt 4 wire specification.

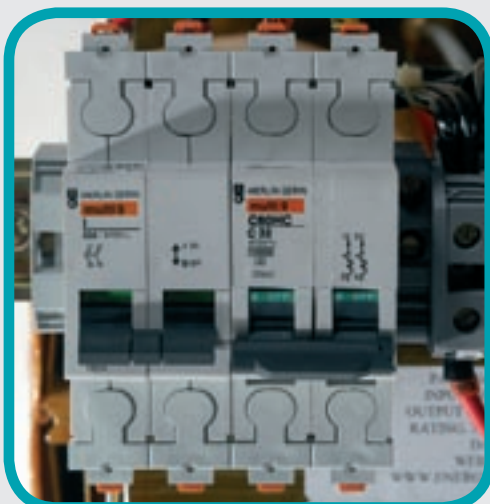
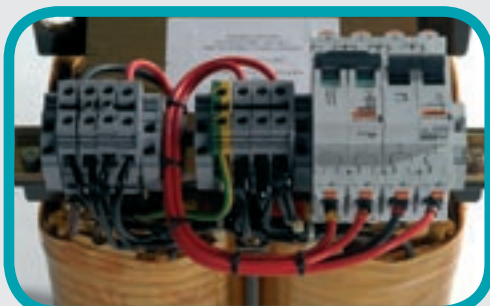
Because the transformer determines the output configuration of the power to the yacht it can 'convert' a floating supply, as seen in most European countries, to a neutral earth bonded system. It therefore eliminates the need for double pole circuit breakers and switches and eliminates the problems of reverse polarity.



SPECIFICATIONS



Output terminals (LHS) allow for 120 - 0 - 120v or 0 - 230v output.
Input terminals (RHS) allow for 120v or 230v input by series or parallel connection of input windings.



Optional input isolator and double pole output circuit breaker



Optional double dip protection on custom transformer. This is two units on a common frame for a motor yacht with two 50A shore cords.

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Non enclosed transformers:

Wide range of standard power options:

3.6 kva - 16 amp @ 230 volt (32 amp @ 120 volt)

7.5 kva - 32 amp @ 230 volt (63 amp @ 120 volt)

12.0 kva - 50 amp @ 230 volt (100 amp @ 120 volt)

15.0 kva - 63 amp @ 230 volt (125 amp @ 120 volt)

24.0 kva - 100amp @ 230 volt (200 amp @ 120 volt)

ABYC (American Boat and Yacht Council) compliant. The transformers meet the requirements of section 8.21.1.1 - 3 of the code which refers specifically to isolation transformers.

Lloyds compliant. The transformers meet the requirements of Lloyds with regards to insulation ratings and fault screens.

UL compliant. Whilst not UL approved, the transformers are built to UL standards.

Vacuum impregnated resin dip. The transformer is immersed in a resin lacquer bath inside a vacuum chamber. This forces the lacquer right through the windings to provide total protection.

Dual input windings for 120 or 230 volt shore power connections.

Dual output - can be configured for European standard (0 - 230v) or US standard (110 - 0 - 110v) output.

Options:

Soft starters can be provided to reduce the inrush current into the transformer.

Incoming kits. We can install input isolators and output circuit breakers on the transformer.

Custom Transformers. We can offer bespoke transformers to your specifications upto 250 Kva.

Enclosed and packaged transformers.

Soft starters as standard to reduce the inrush current into the transformer.

Incoming kits as standard on 12 - 24 Kva.

Powder coated zintek. Custom designed enclosure.



Dimensions:

	3.6Kva	7.5Kva	12Kva	15Kva	24Kva
H (mm)	362	362	530	530	600
W (mm)	258	258	425	425	470
D (mm)	218	218	375	375	445

POWER AT YOUR CONTROL

Hull Isolation Transformers