

# Isolation Transformers

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

**Complete range.** Our standard transformer range covers 10, 16, 32, 50, 63 & 100 amp single phase shore capacities at 230V.

**Dedicated output.** Our larger transformers come 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 transformers are protected with a UL approved vacuum impregnated polyester varnish.



# Iso-Boost Transformers

**Voltage conversion models.** We offer transformers that select between two input tappings with 208 volt and 240 nominals - ideal for boats heading to the USA. This is an alternative to the Charles Industries Iso-Boost. Also offered is a unit with tappings at 400V and 230V allowing 230V boats to make use of 400V 3 phase supplies.



# Marine Isolation Transformers

## 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.

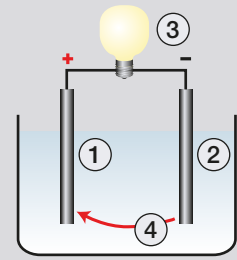
### A simple battery

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.



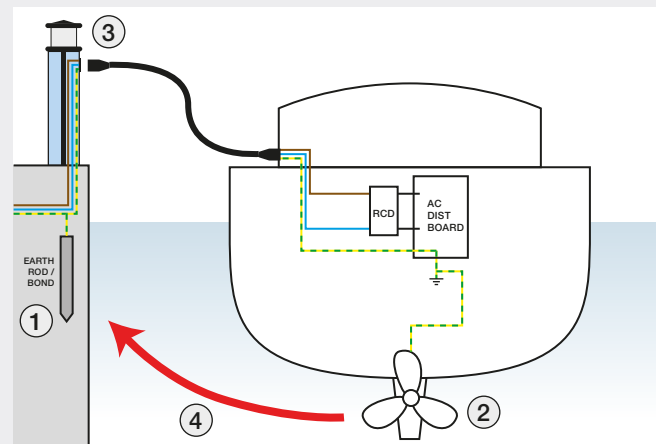
### Your boat as a battery

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

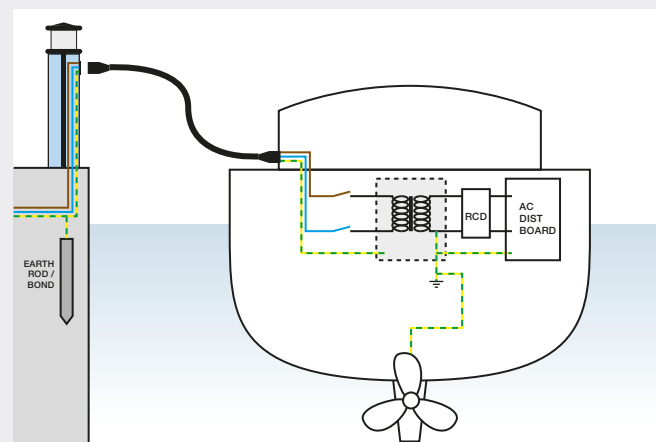
On metal-hulled boats galvanic corrosion can cause general hull corrosion as well as localised pitting - especially along the waterline. Sometimes this pitting and corrosion is localised - perhaps close to shore based metal objects. This corrosion of the hull happens despite the fitting of anodes. The 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.

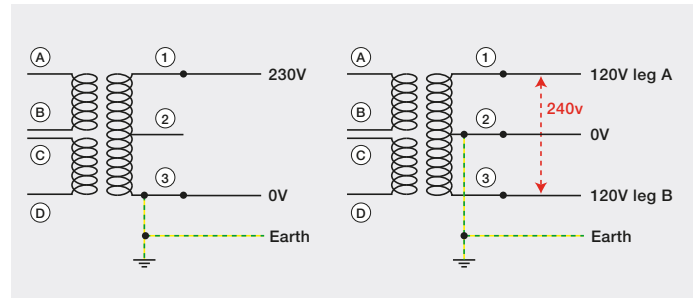
The boat gets its earth protection from the sea via the hull or ground-plate, but no circuit is formed, as the shorepower earth is not connected.



## 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.



## Single phase voltage conversion models - why would it be needed?

Shore power in most of the world is straightforward - single phase 230 volt. Shore power in the USA is available in a number of forms.

For small craft you may be offered a 110 volt hook up. This normally is limited to 30 amps of less (3.3 kW). For smaller craft we offer transformers that can be reconfigured in the following ways - 115/115, 115/230, 230/115, 230/230.

For larger, single phase, boats you are normally offered a 'split phase' supply. This consists of two legs of 120 volts and a neutral (which we don't use). The two legs of 120 volts are 180 degrees apart which, in

effect, means that they will give you a 240 volt single phase supply. For these applications we offer transformers with a 'European' output (230 volt live and neutral) and a 'USA' output (two legs of 120 volt and a neutral - also referred to as a 120-0-120 or a 120 / 240 type supply. A 240 volt supply is normally available at either 50 amps (12 kW) or 100 amps (24 kW).

For single phase boats we offer a boosting transformer that will take two legs of 208 volts from a three phase outlet and boost to 240 volts. Ideal for USA spec boats looking for an alternative to the Charles Industries Iso-Boost.

**Voltage conversion models.** We have transformers that can automatically boost or drop voltages depending on the marina supply.

### Manually configured

#### 2kW (10A @ 230V / 20A @ 115V)

Input voltage options.....115V or 230V  
Output voltage options.....115V or 230V

#### 3.6kW (16A @ 230V / 32A @ 115V)

Input voltage options.....115V or 230V  
Output voltage options.....115V or 230V

### Automatically configured / ISO-Boost

#### 3.6kW (16A @ 230V / 32A @ 115V)

Input voltage options.....115V or 230V .....Auto selection  
Output voltage options.....115V or 230V .....Select at install

#### 15kW (63A @ 240V / 63A @ 208V)

Input voltage options.....185V to 264V .....Auto selection  
Output voltage options.....240V / 120V  
(Output format available for USA or Euro systems)

#### 25kW (100A @ 230V / 63A @ 400V)

Input voltage options.....230V or 400V .....Auto selection  
Output voltage options.....240V / 120V  
(Output format available for USA or Euro systems)

**Custom Transformers** If your needs aren't covered here don't worry. We can supply a transformer to meet your specific requirements. This may be three phase delta to three phase delta or star, three phase delta to single phase or split phase or maybe a transformer to take power from two phases of a ships three phase delta supply to provide single phase at the correct voltage. We also supply auto-transformers for applications where voltage conversion, but no isolation is required.

Victron Universal Isolation Transformers				
	2kW	3.6kW	3.6kW Auto	7kW
Input voltage	115V or 230V	115V or 230V	115V or 230V (Input auto switching)	230V
Output voltage	115V or 230V	115V or 230V	115V or 230V	230V
Frequency	50Hz / 60Hz	50Hz / 60Hz	50Hz / 60Hz	50Hz / 60Hz
Input current rating	17A / 8.5A	32A / 16A	32A / 16A	32A
Soft start	Yes	Yes	Yes	Yes
Transformer type	Toroidal	Toroidal	Toroidal	Toroidal
Input device	Circuit breaker	Circuit breaker	Circuit breaker	Circuit breaker
Output device	Not applicable	Not applicable	Not applicable	Not applicable
Enclosure material	Powder coated aluminium (RAL blue 5012)	Powder coated aluminium (RAL blue 5012)	Powder coated aluminium (RAL blue 5012)	Powder coated aluminium (RAL blue 5012)
IP rating	IP 21	IP 21	IP 21	IP 21
Weight	10Kg	23Kg	24Kg	28Kg
Dimensions (H x W x D)	375 x 214 x 110	362 x 258 x 218	362 x 258 x 218	362 x 258 x 218

Energy Solutions European Isolation Transformers					
	12kW	15kW	15kW ISO-Boost	24kW	25kW ISO-Boost
Input voltage	230V	230V	208V or 230V (Input auto switching)	230V	230V or 400V (Input auto switching)
Output voltage	230V	230V	230V	230V	230V
Frequency	50Hz / 60Hz	50Hz / 60Hz	50Hz / 60Hz	50Hz / 60Hz	50Hz / 60Hz
Input current rating	50A	63A	63A	100A	100A

Energy Solutions USA Isolation Transformers					
	12kW	15kW	15kW ISO-Boost	24kW	25kW ISO-Boost
Input voltage	240V	240V	208V or 240V (Input auto switching)	240V	208V or 240V (Input auto switching)
Output voltage	240V / 120V	240V / 120V	240V / 120V	240V / 120V	240V / 120V
Frequency	50Hz / 60Hz	50Hz / 60Hz	50Hz / 60Hz	50Hz / 60Hz	50Hz / 60Hz
Input current rating	50A	63A	63A	100A	100A

Common characteristics					
Input device	Isolator				
Output device	Circuit breaker				
Enclosure material	Powder coated zintec (RAL white 9010)				
IP rating	IP 21				
Weight	123Kg	136Kg	138Kg	180Kg	185Kg
Dimensions (HxWxD)	530 x 429 x 375	530 x 429 x 375	530 x 429 x 375	730 x 440 x 550	730 x 440 x 550

Images are for illustrative purposes only and actual products and examples may differ from those shown. All details correct at time of going to press but subject to change. E & EO.