SmartPhase in a fully automatic phase changer for use when an external supply is to be used that may have a different phase rotation to the internal supply. This will cause a problem with motors rotating the wrong way and other equipment affected sometimes causing a more serious problem.

For example a boat will have an on board generator supplying equipment that will be connected and operated correctly. When the boat comes into a mooring with access to shore-power it is preferable and more cost effective to shut the onboard generator down and use the shore-power. If the shore-power has a phase rotation that is different to the on-board generator and it is connected without checking then there will be a problem with equipment not operating correctly with a chance of causing a serious problem. The solution is to rewire the shore-power so that the phase rotation is the same as the on-board generator. This can be an inconvenient, difficult and sometimes hazardous operation.

**SmartPhase automatically connects the shore-power to the boat correctly every time.**

Some of the features are as follows :-

- Automatically corrects the phase rotation and connects the shore-power.
- Rugged, Reliable and efficient with a long service life with minimal maintenance.
- The control stores the phase rotation of the on-board generator so it does not have to be running to connect the shore-power correctly.
- The connection is made using carefully controlled contactors rated AC3.
- If the shore-power fails SmartPhase will disconnect and when it is reinstated and is stable for a preset period will correct the phase rotation and reconnect.
- Steel Enclosure - RAL7035 - IP66

The above sketch shows the dimensions of the SmartPhase 115A.

Connections are made to the bottom of the enclosure.

Enclosure: sheet steel - degreased, prepared and electro-statically painted with epoxy-polyester powder with a layer of approximately 90 micron.

Colour: RAL7035 - Ingress: IP66

- SmartPhase is an automatic switch that will correct the phase rotation of an incoming supply and connect it to the load. SmartPhase has a particular application on boats that visit different moorings and make use of the available shore-power.

All the equipment on the boat operates from the on-board generator without a problem. However if the boat is moored where shore-power is available then this will be connected to the boat. Unfortunately there is no guarantee that the shore-power is connected with the same phase rotation as the on-board generator.

If the boat is connected to the shore-power and the phase rotation is incorrect it will cause a problem and maybe damage. This means that the phase rotation of the shore-power has to be established by testing and the connection re-wired if it is incorrect.

This can be inconvenient, difficult and sometimes hazardous.

SmartPhase tests the shore-power and makes an automatic connection with the correct phase rotation for the boat.
The on-board generator is connected into the connectors labelled “On-board generator 3Ø + N” in the SmartPhase enclosure. This is not a full power connection and can be fused at 3 Amps. When this is live the control analyses the phase rotation and stores it in non-volatile memory. Whenever the input is live the control will update the information. Because the information on the phase rotation of the on-board generator is stored in memory the generator does not have to be running when the shore-power is connected.

The shore-power is connected into the connectors labelled “Shore-power input 3Ø + N” in the SmartPhase enclosure. The output to the on-board load is connected into the connectors labelled “Shore-power output 3Ø + N”.

When the shore-power is connected and switched on the control compares the phase rotation with the stored information of the phase rotation of the on-board generator. If the phase rotation is correct the shore-power is connected directly through to the on-board load by Contactor1.

If the phase rotation of the shore-power is not correct it is corrected and switched through to the on-board load by Contactor2.

If the shore-power fails or becomes disconnected then both Contactor1 and Contactor2 will be switched off. When the shore-power is reinstated and stable for five seconds the process described above will be repeated and the shore-power automatically reconnected to the load with the correct phase rotation.

**Switching**

Contactors 1 & 2 are carefully controlled to virtually eliminate the chatter that can be caused by the low quality shore-power sometimes experienced.

**Shore-power Specification**

The shore-power is analysed by the control and is deemed to be of usable quality if certain levels of stability are met and if all three phases are above 70% of the nominal voltage. If the criteria are met the shore-power will be connected through SmartPhase to the on-board load with the correct phase rotation.

If the shore-power goes outside the pre-programmed specification the control will immediately switch off Contactors 1 & 2 disconnecting the on-board load.

When the shore-power returns to within the pre-programmed specification and is stable for 5 seconds SmartPhase will reconnect the on-board load with the correct phase rotation.

**Conclusion**

SmartPhase is fully automatic and will connect the shore-power with the correct phase rotation. It is a fit and forget unit that will give many years of trouble free operation. It has been designed and built to operate reliably and efficiently in marine conditions.

**Models and Specification**

**Shore-power**

<table>
<thead>
<tr>
<th>Voltage</th>
<th>400VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>50/60Hz</td>
</tr>
<tr>
<td>Phases</td>
<td>3Ø + N</td>
</tr>
<tr>
<td>Low volts cut-off</td>
<td>280 VAC</td>
</tr>
<tr>
<td>Current</td>
<td></td>
</tr>
<tr>
<td>SmartPhase115</td>
<td>115 Amp</td>
</tr>
<tr>
<td>SmartPhase225</td>
<td>225 Amp</td>
</tr>
<tr>
<td>SmartPhase330</td>
<td>330 Amp</td>
</tr>
</tbody>
</table>