BLAKLEY ELECTRICS

CASE STUDY
DATA SHEET

Assemblies for the Maintenance of Offshore Wind Turbines

When a major offshore wind farm operator decided to upgrade the maintenance facilities on an array of 60 turbines installed off the English / Scottish border, they approached the Blakley Electrics Project Team to discuss possible options. Following discussions, it was decided that the best overall solution would be achieved through a combination of fixed equipment to be installed on every turbine and transportable equipment to be moved with each maintenance team from turbine to turbine. All of the equipment was project specific and overleaf are drawings of the main assemblies and how they interconnect. The equipment supplied comprised of:

Fixed Assembly, 400 / 415V

Fixed Equipment

(i) an external fixed socket / termination assembly providing a 415V 3 wire interlocked socket to supply a 1:1 ratio transformer and a fixed 400V TP&N connection point to a 400/230V Power Cluster.

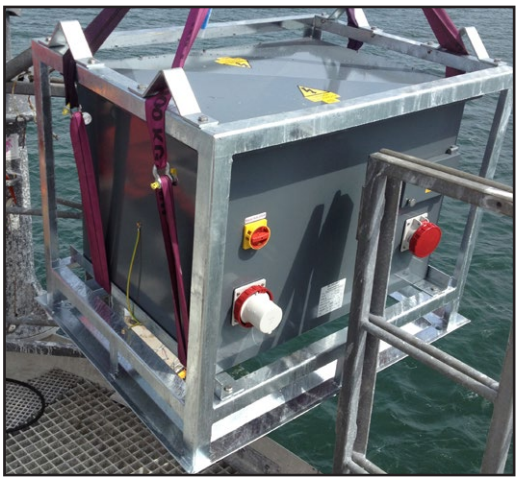
(ii) a 400/230V Power Cluster for installation within the turbine, to feed mains voltage equipment and RLV transformers.

Transportable Equipment

(i) a 15 kVA 1:1 ratio transformer with a 400V TP&N output (the available supply on each turbine was 415V 3 wire only).

(ii) a 10 kVA transformer, 400:110V, to provide a Reduced Low Voltage supply for power tools and temporary lighting

(iii) extension leads to travel with the transportable equipment



Transportable 15kVA Transformer in Crash Frame

Although all of the equipment was project specific, the 15 kVA 1:1 ratio transformers were by far the most challenging items to design and manufacture. Despite their weight and size, the transformers had to be suitable for transporting from turbine to turbine, protected against damage in transit and be suitable to operate for extended periods in the harshest of conditions (when in use and when being transported). To address these issues, transformers were housed in purpose built, IP55 enclosures, mounted within heavy duty, galvanized crash frames incorporating fork lift pockets and crane lifting points. To ensure a long life in an exposed, off-shore environment, the transformer enclosures were made from heavy gauge mild steel and flame sprayed in molten zinc prior to painting. This finishing system results in an expected enclosure life of 10 to 20 years without excessive maintenance.

The transformers were designed to be moved by fork lift or hoisted by crane using the lifting brackets built into the crash frame or via slings. The lifting brackets have been independently type tested and assigned a Safe Working Load of 500kgs each i.e. the arrangement can lift 2000kgs in total. Whilst the transformer assemblies are very heavy (230kgs each) the lifting arrangement is more than capable of handling the weight.

To minimise damage in handling, transportable items do not incorporate input cables. Instead, appliance inlets (fixed plugs) are fitted, which can be quickly connected to the fixed sockets in the turbine via ready made extension leads. The use of extension leads also reduces the overall weight of individual assemblies.

Power Cluster feeding a 10kVA Transformer

Please see over the page for drawings of the main assemblies and how they interconnect.

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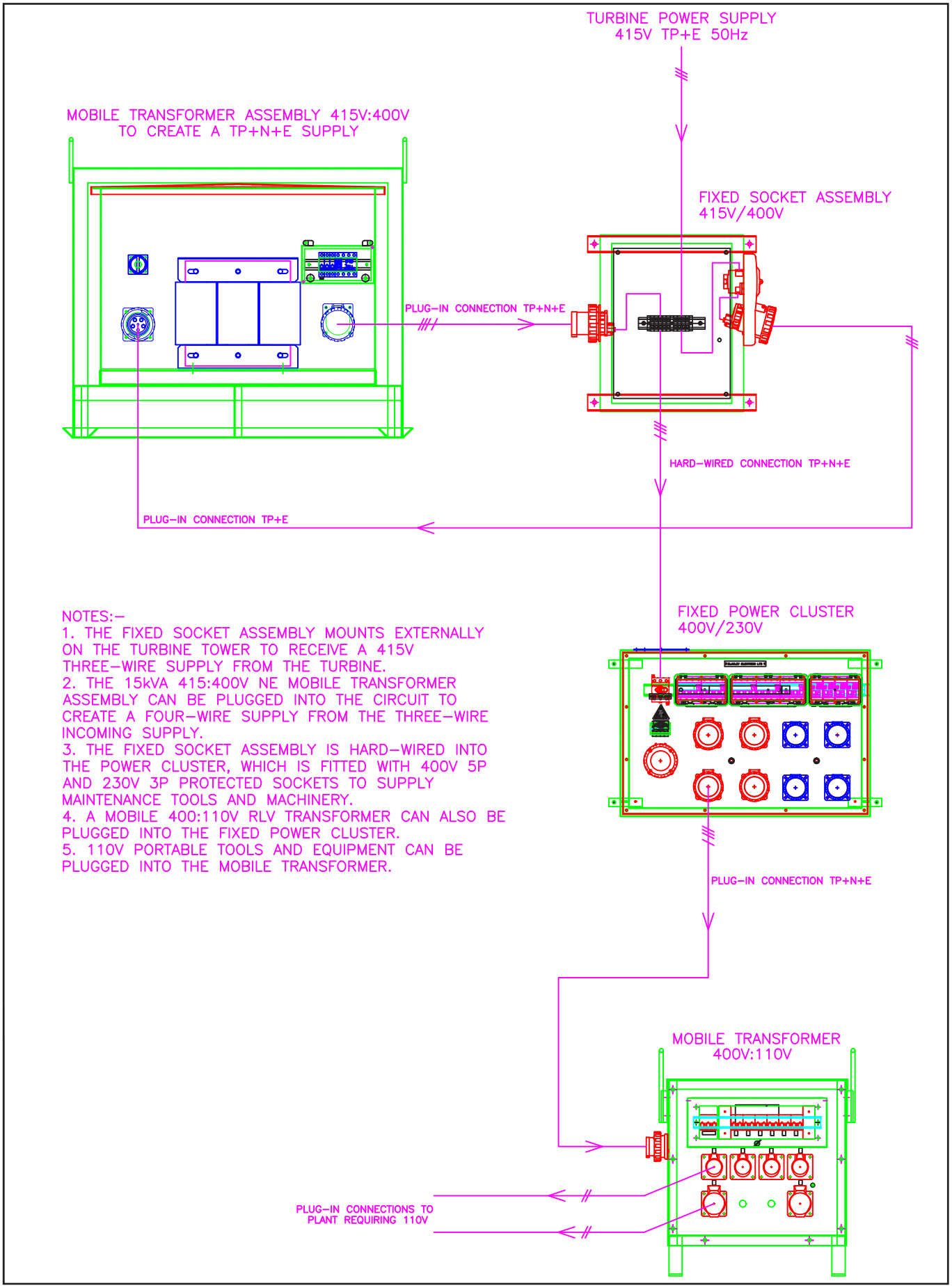
Interconnection of Fixed Distribution and Transportable Transformers for Wind Turbine Maintenance



NOTES:–

1. THE FIXED SOCKET ASSEMBLY MOUNTS EXTERNALLY ON THE TURBINE TOWER TO RECEIVE A 415V THREE–WIRE SUPPLY FROM THE TURBINE.
2. THE 15kVA 415:400V NE MOBILE TRANSFORMER ASSEMBLY CAN BE PLUGGED INTO THE CIRCUIT TO CREATE A FOUR–WIRE SUPPLY FROM THE THREE–WIRE INCOMING SUPPLY.
3. THE FIXED SOCKET ASSEMBLY IS HARD–WIRED INTO THE POWER CLUSTER, WHICH IS FITTED WITH 400V 5P AND 230V 3P PROTECTED SOCKETS TO SUPPLY MAINTENANCE TOOLS AND MACHINERY.
4. A MOBILE 400:110V RLV TRANSFORMER CAN ALSO BE PLUGGED INTO THE FIXED POWER CLUSTER.
5. 110V PORTABLE TOOLS AND EQUIPMENT CAN BE PLUGGED INTO THE MOBILE TRANSFORMER.