

# QFW Series



High Efficiency Lightweight 2 and 4 Pole Generators  
(3MW–135MW)

The consequences of global climate change have increased the importance of energy conservation and environmental protection.

As one of the world's leading suppliers of electrical motors and generators, PPI Engineering Ltd have actively pursued improvements in generator efficiency and optimised the other performance characteristics of the QFW series of generators.

The QFW series of synchronous generators incorporate many years of experience applied in conjunction with the world's leading design and manufacturing technology.

This new range of generators demonstrates a considerable improvement in efficiency, light weight, low noise and high levels of mechanical protection. The range is designed for ease of installation and maintenance, making a significant contribution to energy conservation and environmental protection.

## FEATURES

### HIGH EFFICIENCY

The efficiency has been significantly improved by 0.2-0.5% with an optimised electrical design, internal cooling circuit and special rotor construction to reduce the mechanical, iron and copper losses.

### LIGHT WEIGHT AND COMPACT DESIGN

Top mounted water cooler and end shield bearings make the machine more compact and reduce the weight, simplifying and reducing the cost of installation.

## APPLICATIONS

The equipment is suitable for use in the following sectors: Oil and Gas (Onshore and Offshore) • Petrochemical • Biomass Power Generation • Energy



### BETTER MECHANICAL PROTECTION, SUITABLE FOR DIRECT OUTDOOR APPLICATION.

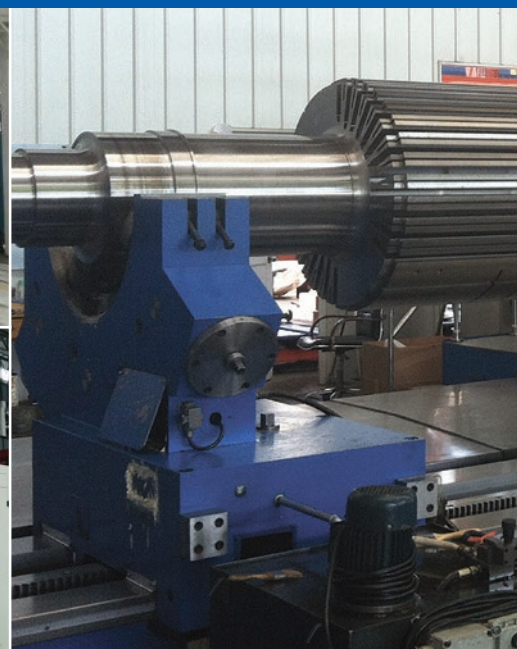
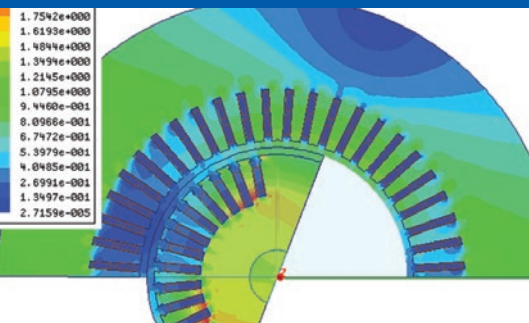
Mechanical protection of IP56 can be provided as standard in order to prevent contamination when the machine operates in dirty or wet site conditions. This ensures a long, reliable and stable life with a minimum of maintenance.

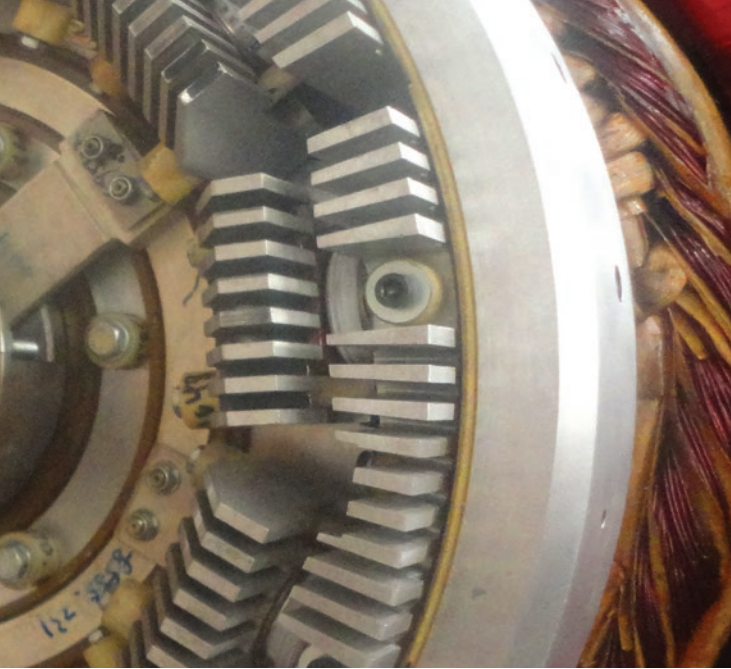
### LOW NOISE AND VIBRATION

Noise and vibration is controlled to World Class levels, less than 85dBA MSPL and 30µm displacement.

### EXPLOSION PROTECTION

The generators can be supplied incorporating the latest explosion technology in both non-sparking and pressurised designs.





## DESIGN

The range has been designed in the UK and is a product of hundreds of man years of experience, coupled with the latest design and manufacturing technology including the use of 3D modelling, Ansys, Ansoft and ARMD to support the design.

## PERFORMANCE

The performance characteristics of the range (efficiency, vibration, noise, weight) have been optimised.

For example, measures include low loss silicon steel, non-magnetic pressure plates, updated stator windings and insulation systems.

High efficiency low noise axial fan designs have been used to considerably improve the efficiency.

## MECHANICAL

The shaft train lateral, torsional characteristics and the natural frequencies of the complete machine have been analysed with the help of Ansys and ARMD.

These detailed design reviews have ensured the generator design is more compact, with a very low vibration signature under all operating conditions.

## CUSTOMER FRIENDLY DESIGN

Customer friendly features such as improved heater arrangements, jacking oil panels, large auxiliary terminal boxes, line and neutral cubicles make the generators look more pleasing to the eye and ensure easy access for installation and maintenance.

## COOLING OPTIONS FOR DIFFERENT APPLICATIONS

CACW, CACA, Air Ducted and Filter Ventilated options available.

## VPI (VACUUM PRESSURE IMPREGNATION)

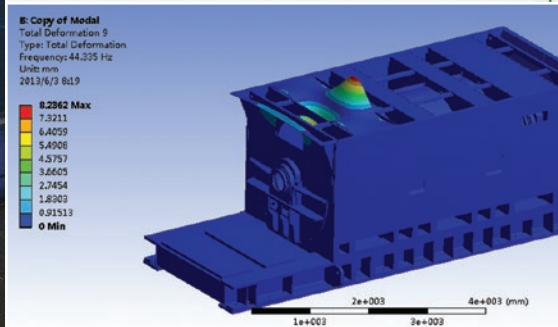
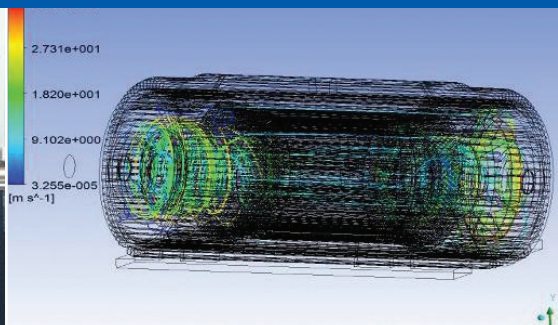
For 4 pole generators, both stator and rotor are VPI treated to provide a reliable insulation system for long life and trouble free operation.

For 2 pole generators the stator coil is half bar fully pressed including the overhang, which provides reliable performance and ease of maintenance.

## MAINTENANCE FREE ROTOR EARTH FAULT DETECTOR

Non contact infra-red earth fault detection is used, instead of traditional earthing brushes. This avoids the problems associated with carbon brush wear, reducing maintenance work and contamination on the surface of the insulation system.

ergy from Waste • Marine • Combined Cycle and Residual Heat • Solar Power Generation • Mobile Power Generation • Gas and Steam Turbines.



## MANUFACTURING

### The generator consists of stator, rotor, cooling system, excitation system and bearings:

- Cooler is mounted on top of the stator forming a closed system with internal fans and cooling elements.
- Cooling system can be supplied as CACW, CACA, duct ventilated or open or filter ventilated.
- 2 off end shield mounted sleeve bearings supplied as standard.
- 3 bearings with bedplate will be required if double shaft ends specified.
- A 3 stage brushless excitation system is supplied as standard. This includes permanent magnet generator (PMG), main exciter and rotating rectifier assembly.
- Static excitation can be provided as an option.
- Main and lineside cubicles, excitation control panel, synchronisation and protection panels can all be provided as options.

### STATOR

#### The generator stator is fabricated as per ASME standards and the performance is analysed using ANSYS to ensure an optimised lightweight structure.

- Stator core is made from high quality silicon steels and built using the latest technologies to optimise the insulation system performance, improve the copper slot fill and generator efficiency.

- Stator coils are made from half or diamond coils and transposed either in the connections or using roebel transpositions to reduce losses and improve efficiency.
- Stator coils are made from high quality insulation materials automatically taped and fully impregnated to ensure a high integrity winding.

### ROTOR

#### The rotors are either cylindrical or salient pole design.

- Rotor shaft is made from a one piece high performance steel forging, precisely machined using world class machining cells.
- Rotor end cap is made from a stress corrosion resistant non magnetic steel forging. This also reduces flux leakage and losses. A damper ring under the end cap provides damping and is in contact with full length slot wedges and damper slot wedges.
- Rotor copper is made of silver copper alloy wrapped with high quality Class H insulation. The winding is brazed using resistance welding equipment to ensure high integrity joints.
- Axial fans made of high strength aluminum alloy are fitted at both ends of the rotor. The fans incorporate the latest design technology to ensure maximum airflow combined with low noise levels.

## TESTING

- Testing facilities are all accredited to national and international standards.
- All generators from 3–135MW can be fully type tested with advanced testing facilities including Variable Voltage, Variable Frequency Drives.
- All tests can be carried out to IEC, NEMA, API and IEEE standards.

## PRODUCT SPECIFICATION

3MW–135MW (2 pole)

3MW–60MW (4 pole)

50Hz or 60Hz

Up to 15kV

CACW, CACA, Air Duct, Open and Filter Ventilated

Mechanical protection to IP56



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