

# MAIN DIESEL GENERATORS

## GENERAL INFORMATION

KATO Engineering Reliance Electric manufactures the four (4) brushless revolving field synchronous alternating current generators. They are 600 KW continuous, 600 VAC, 3-phase, 60 Hertz, 0.7 lagging power factor, 1200 RPM, air cooled, drip-proof 55 degrees centigrade rise above 50 degrees centigrade ambient, self-ventilated.

The generator rotor is of salient pole construction. The brushless exciter is used to provide the excitation current to the rotating field assembly of synchronous generators of brushless design. The brushless exciter is in effect, a refinement of the conventional direct connected exciters which use brushes and commutators. The extensive brush rigging and sliding contacts are eliminated on the brushless assembly, thus parts subject to wear are eliminated and prolonged period of dependable, trouble-free operation is assured. The exciter consists of two basic component assemblies, the exciter stationary field assembly and the exciter rotor comprising the rotating exciter armature and a rotating rectifier bridge assembly.

The exciter armature and rotating rectifier bridge assembly is sleeve mounted on the shaft of the synchronous generator. Three phase exciter armature windings are wound on the exciter armature core. The rotating rectifier assembly consists of a full wave rectifier bridge made up of six semiconductor devices mounted on aluminum heat sinks. Should a failure of a rectifier occur, the defective rectifier can be easily replaced in the heat sink. However, a failure of the "avalanche" type rectifier used in the rotating rectifier bridge should rarely occur as this type will conduct without damage to the rectifier during transient voltage conditions. Heavy insulating rings separate the negative and positive components of the full wave rectifier bridge.

A high frequency exciter field assembly is used. Coil windings are wound in the insulated semi-closed core slots. A heavy removable sheet metal cover protects the entire exciter assembly.

During operation of brushless revolving field generators, the three-phase power generated in the exciter armature is applied directly to the rotating rectifier assembly. The forward polarity rectifiers mounted on one heat sink and the reverse polarity rectifiers on the other heat sink are connected to form a three-phase, full wave rectifier bridge. The rotating rectifier bridge assembly rectifies the alternating current supplied by the exciter armature.

The direct current output of the rotating rectifier bridge assembly is in turn applied to the rotating field of the generator via lead wires routed through a key-way shaped slot on the rotor shaft. Thus, the exciter armature, rotating rectifier bridge and the generator field form a single rotating assembly brush type rotating DC exciters.

Excitation current for the stationary field coils is supplied by the synchronous generator through the Generator/Engine Module (GEM).

The bearing housing has a grease fill port and drain port.

The generators are designed with a self-contained cooling system which circulates coolant air through the machine. Ambient air is drawn into the machine through louvered openings at the exciter end of the machine by a large capacity blower attached to the generator shaft. The warm air is exhausted to atmosphere through the screened opening enclosing the blower assembly.

Each generator is directly coupled to a D-398 main diesel engine. The constant frequency (1200 RPM) of the generator is controlled by the GEM and a Woodward EG-3P actuator(See Main Diesel Overview).

The output of the generator is fed to an output circuit breaker mounted in the 600 VAC switchboard. The four main generators supply power to the 600 volt switchboard. These generators can be paralleled in any combination to serve both the ship's service and propulsion loads from the common 600 volt switchboard.

## **MAIN GENERATOR AC FILTER MODULE**

### **GENERAL INFORMATION**

Mounted along side each of the Main Diesel Generator is an AC Filter Module. The function of the line-to-line AC filters are designed to prevent voltage oscillations which would result from switching of the SCR's as commutation progresses from one phase leg to the next. This effect becomes more severe as phase retard increases to the point of maximum ripple (between 60° and 90° retard, depending on the actual induction of the load), where switching change of voltage approaches peak line-to-line AC volts ( $2E_{L-L}$ ). Without these filters, overshoot would not only stress the inverse blocking capability of the cells. but ringing could occur sufficiently to switch off the cells after firing.

