



Powerland Generators, Unit 44 Heming Road, Washford Industrial Estate, Redditch  
Worcestershire B98 0DP

TEL: +44 (0)1527 514518 FAX: +44 (0) 1527 510175 E-MAIL: keith@powerland.co.uk

WEB-SITE: [www.powerland.co.uk](http://www.powerland.co.uk)

## Scope of Supply

F.A.O

TEL:

EMAIL:

( 11 x pages) 2011

### SC 8619 RO (14)

**1 x 2500kva (Standby) 2300kva (Prime Power)  
Broadcrown Generator**

#### ***MTU Prime Rated Generating Set- Unlimited Time Running***

Broadcrown diesel driven Model BCM2300P capable of developing 2300 kVA, 1840 kW at 0.8 power factor, 3 phase, 4 wire, 50 Hz prime power rating (duty defined by the engine manufacturer as the power available for an unlimited number of hours per annum in a variable load application. Variable load should not exceed a 70% average of the Prime Power rating. A 10% overload capability is available for a period of 1 hour within a 12hour period of operation. This is at a rotational speed of 1500r/min under NTP ambient conditions.

**MTU 16V4000G63**, 16 cylinder, vee form exhaust gas turbocharged, water cooled industrial diesel engine having a typical load acceptance capability of 1100 kWe that may be applied in a single step when the engine is up to normal operating temperatures. Any quoted load acceptance figures are not to be misconstrued as a guarantee of performance and are advised as a technical guide only, in accordance with engine manufacturers published literature and data (actual figures can be measured and documented at works test if requested at time of order. The works test results shall take precedence over any other quoted data) complete with the following ancillary equipment:-

Standard duty air filters to BS.1701.

Standard manufacturer's lube and fuel oil filters.

Set mounted lubricating oil cooler(s), cooled by the Jacket Water circuit.

Engine supplied control module, providing engine control in addition to the following shutdowns:

- a) Low oil pressure.
- b) High jacket water temperature.
- c) Engine overspeed.

Fuel pump shutdown solenoid, energised to run.

Standard manufacturers high capacity lub oil sump, complete with drain plug/extended lub oil drains terminating via a shut off valve at the generator bedplate.

Thermostatically controlled engine jacket water heaters are supplied to each engine bank, the operating temperatures are pre-set and non-adjustable for optimum cold start performance and economic use. In addition isolation valves are fitted as standard either side of the engine heater, this allows the heater elements to be replaced without the need for a complete drain down of the engine cooling system

## **ALTERNATOR**

### **High Voltage Machine rated at 2300KVA/11KV.**

Newage 8 Series, twin bearing, IP22, brushless, screen protected, revolving field, self exciting, self regulating alternator, insulated to Class F and limited to Class H temperature rises and fitted with manufacturers standard top mounted terminal box housing set rated terminals for connection of nominally rated flexible load cabling by Broadcrown and wound for a supply of 11,000 V, 3 phase, 4 wire, 50 Hz at a rotational speed of 1500r/min.

The machine is designed to comply fully with the requirements of BS.5000 Part 40 - BS.4999 and with radio suppression equipment to BS EN 55014.

The output voltage is maintained within  $\pm 0.5\%$  from no load to full load including cold to hot variations at any power factor between 0.8 lagging and unity by means of a solid state voltage control unit and inclusive of a speed variation of  $4\frac{1}{2}\%$ .

Permanent magnetic generator (PMG excitation) is standard.

The following items are included on the alternator:

Quaderature droop kit to allow parallel operation with other alternators.

Power factor controller to allow parallel operation with the mains supply.

Anti-condensation heater.

## **ENGINE WATER COOLING SYSTEM**

The items indicated are supplied per generating set unless stated otherwise.

Mounted on the base frame immediately in front of the engine shall be a vertical, temperate duty radiator, complete with a pusher fan driven, personnel guards and flange for connection to a flexible duct.

**A fuel cooler is mounted in the radiator air flow to cool the return fuel to the common tank.**

The radiator is complete with additional items, designed for protection of the generating set and ease of servicing and maintenance. These are as follows:

- Low coolant level sensor for the 'Low coolant' alarm.
- Sight glass for header tank content, complete with fill level indication.
- Semi rotary hand pump to allow for filling of the radiator from ground level.
- Low level drain valve for ease of coolant replacement.

## **GENERATOR ASSEMBLY**

The baseframe is fully welded, heavy duty parallel flanged channel for engine and alternator mounting and incorporates suitable lifting arrangements. It has undergone a full stress analysis to create a design which gives maximum strength and minimum baseframe weight.

Spring type anti-vibration mountings would be supplied for installation between frame and plant room floor.

Small wiring around the engine is tri rated LSF, ferruled, fitted with crimped terminals and fitted into a pre-designed flexible conduit for protection. Wiring is terminated via a 'plug in' type coupling directly into the Generator Control Panel.

## **ENGINE STARTING SYSTEM**

Engine is complete with:-

**Dual 24V D.C. axial starter motors are incorporated on each engine.**

Each starter motor powered by a single set of lead acid batteries, sized for 6 attempt starts of 10 seconds duration at 15°C, mounted on a tray near the engine.

**Dual** mains operated automatic float charger and controls are mounted in the control panel to maintain the batteries at optimum condition.

The starting cycle in terms of duration of engagement, frequency of repeat attempts, etc., is controlled via the main engine control module in the generator control panel.

## **GENERATOR CONTROL & INSTRUMENTATION PANEL**

### *Individual Mains and Generator Circuit Breaker Control*



This panel contains an integrated generator controller that combines all the necessary control, protection and instrumentation for a generator set in one compact unit. The base unit, IG-CU, can be used for Manual/Remote start ('Semi-Automatic') and Automatic Mains Failure (AMF or 'Fully-Automatic') control, monitoring the mains and controlling both mains and generator changeover breakers as necessary. Expansion modules are available that plug onto the back of the controller to allow synchronising and load control, enhanced communications and load management as well as expanding the input and output capabilities of the controller.

The standard base unit provides comprehensive electrical and engine metering on a graphical LCD screen, and user friendly operation means that the various alarm and control settings can be easily adjusted or set up without the need for a PC or other configuration device. The following metering is provided:

Generator: V, A (including neutral), Hz, kW, pf, kVA, kVA<sub>r</sub>, kWh, kVA<sub>r</sub>h

Engine: rpm, Oil Pressure, Water Temperature, Fuel Level, hours run, start counter, service due, battery volts

Mains: V, Hz

Comprehensive protection includes:

Generator: Overload, Over Current (IDMT), Over/Under Voltage, Over/Under Frequency, Current Imbalance, Neutral Current (e.g. for core balance CT connection), Voltage Imbalance, Phase rotation.

Engine: Water Temperature (2 stage), Oil Pressure (2 stage), Fuel Level (2 stage), Over speed, Battery Voltage alarm

Mains: Over/Under Voltage, Over/Under Frequency, Voltage Imbalance, Phase Rotation.

The control panel configurable analogue inputs (default VDO match oil pressure, water temperature, fuel level), configurable binary inputs, configurable binary outputs (some of these are required for default functions e.g. starter/fuel control, Circuit Breaker feedback etc).

A 100+ record data log/history file records alarm and control events, as well as periodic data capture when the generator is running. As well as recording the type of event and the time it occurred, all measured parameters, such as voltage, engine temperature, kW and I/O status, are recorded to enable easier diagnosis of any fault or to view trends when the generator is running.

There is also a service interval timer that initiates a warning when the next engine service is due.

A built in RS232 data port enables connection to a PC, either directly or over a modem, without the need for a proprietary 'dongle' or protocol converter. Once connected, the software supplied with the controller can be used to provide full remote control and monitoring of the controller, as well as making setting up easier than it already is. Set up parameters, meter readings and the history file can be saved as standard Microsoft Excel or Word documents.

The ModBus protocol is supported to allow third party software applications to easily communicate with the Inteligen via RS232, or RS485 / RS422 using serial interface converters.

Should a fault or warning event occur the controller can dial a number to connect to a remote computer running the supplied remote monitoring software to alert a service centre operator to the event. Alternatively if a GSM (mobile phone) modem is used a text message alert of a fault or warning can be sent to up to 3 different mobile phones. Text messages can also be sent to the controller to request metering information, change settings, or even perform commands such as starting/stopping the generator, resetting faults etc. A message is returned by the controller to provide the requested data or confirm that the command has been successful.

Remote communication via an ethernet (TCP/IP) connection can also be achieved using a internet bridge module.

#### *Power Control Module*

**A plugin module that fixes to the back of the Controller. It provides the following hardware interfaces:**

To Engine speed controller –for synch & load control.

To Alternator AVR –, for direct voltage matching & pf control.

Additional configurable binary inputs.

Additional configurable binary outputs (can be configured as up/down voltage or speed control for use with motorised potentiometers or direct to digital AVRs etc instead of direct analogue control).

The power control module enables a single controller equipped generator to automatically synchronise and parallel with the mains. This allows no break transfer of the load for on-load testing or on restoration of the mains following a mains failure. It also allows peak lopping applications to be easily achieved, either for fixed generator power or mains import/export control. Additional metering includes Mains kW, Mains KVA<sub>r</sub>, Mains pf. Generator Neutral current is replaced by Mains current (measured in the 'blue' or third phase), a graphical 360° synchroscope is also included. Additional protection includes Reverse Power and Fail to Synch.

### ***Door Mounted Control***

- Off/Man/Auto/Test indicated from LCD altered by pushbutton scrolling on control module fascia.
- Start and stop pushbuttons on control module fascia.
- Fault reset pushbutton on control module fascia.
- Manual mains and generator breaker operation on control module fascia.
- Horn (where supplied) mute pushbutton on control module fascia.
- Menu scrolling and selection pushbuttons on control module fascia.
- Emergency stop pushbutton - lockable in off (This is our basic form of set isolation - O&M manual is to advise disconnection of batteries before performing maintenance tasks.)

### **Auxiliary Equipment**

- Engine heater controls with miniature circuit breaker for isolation with auxiliary output to alarm if in off position\*.
- Mains operated battery charger with miniature circuit breaker for isolation with auxiliary output to alarm if in off position\*.
- Alternator heater controls with miniature circuit breaker for isolation with auxiliary output to alarm if in off position\*.
- Commissioning and maintenance 230 V AC supply for Laptop Programmer

### **Instrumentation** indicated from LCD initiated by pushbutton scrolling

- Engine Speed rpm
- Engine temperature
- Oil pressure.
- Hours run
- Start counter
- Service due counter
- Battery volts

### **Metering** indicated from LCD initiated by pushbutton scrolling

- Generator Voltage. Ph – Ph & Ph - N

- Generator Current L1, L2, L3
- Generator Frequency
- Generator kWe Total, L1, L2 & L3
- Generator Power factor Total, L1, L2 & L3
- Generator kVA Total, L1, L2 & L3
- Generator kVAr Total, L1, L2 & L3
- Generator kVArh
- MainsVoltage. Ph – Ph & Ph - N
- Mains Frequency
- Mains kW
- Mains KVAr
- Mains pf.

**Engine protection warning** indicated from the LCD on control module

- Low oil pressure
- High engine (water) temperature
- Battery voltage alarm\*
- Maintenance attention required (initiated by any feature highlighted with an asterix \*)

**Engine protection shutdown** indicated from the LCD reset pushbutton on control module

- Low oil pressure
- High engine (water) temperature
- Overspeed
- Battery voltage alarm\*
- Fail to start (after 3 attempts)
- ECU (Engine Control Unit) fault where applicable - The ECU fault shall be displayed and maybe reset from the control module) J1939 CANBUS or modbus interface available on some engine applications.

**Generator protection shutdown** indicated from the LCD reset pushbutton on control module

- Under/over volts
- Under/over frequency
- Overcurrent (instantaneous)
- Overcurrent (IDMT)
- Over load
- Current imbalance
- Voltage imbalance
- Phase rotation
- Reverse Power
- Fail to synchronise

**Mains Fail Parameters** indicated from the LCD reset pushbutton on control module

- Under/over volts
- Under/over frequency
- Voltage imbalance
- Mains fail timers

- Mains restore timers
- Manual restore option

**Indication** from the LCD or control module LED

- Generator Available
- Not in Auto\*

**Remote control/indication**

- Generator Breaker control – volt free
- Mains Breaker control – volt free
- Generator Running– volt free
- Shutdown - volt free

Operates on a minimum of the following faults

- Low Oil Pressure Shutdown
  - High Coolant Temperature Shutdown
  - Fail To Start
  - Overspeed
  - Low Coolant Level
  - ECU fault, Engine Control Unit Shutdown (dependant on engine type used)
  - Under/over volts
  - Under/over frequency
  - Overcurrent (instantaneous)
  - Overcurrent (IDMT)
  - Over load
  - Earth Fault
  - Current imbalance
  - Voltage imbalance
  - Phase rotation
  - Reverse Power
  - Fail to synchronise
  - Emergency Stop
  - Fire Valve Operated
- Fire Valve Operated – volt free
  - Automatic Selected – volt free
  - Warning, Maintenance attention required - volt free

Operates on a minimum of the following faults

- Low Oil Pressure Alarm
- High Coolant Temperature Alarm
- Low Battery Volts
- High Battery Volts
- Battery Charger miniature circuit breaker off
- Engine Heater miniature circuit breaker off
- Alternator Heater miniature circuit breaker off.

Additional Items included

- 1 - Fully automatic mains operated battery charger, complete with on/off switch, fuses, designation labels, etc.
- 1 - Emergency stop push button.
- 1 - Analogue charge ammeter.
- 1 - Set of engine jacket water heater controls, complete with on/off control switch, fuses, designation labels, etc.
- 1 - Volt free contact module providing the following volt free contacts:
  - a) Low Fuel

The control panel has been constructed in accordance with Broadcrown standards including coloured wiring with alphabetical identification labels, legends and complete with incoming and outgoing generator/switchboard interface terminals. Others will provide all external interconnecting wiring and cabling from the genset.

The panel is complete with all necessary internal small wiring to Broadcrown standard colours, miniature circuit breakers and designation labels.

### **Common Section**

- 1 - GE Fanuc Common Section PLC providing the following:
  - a) Control and status monitoring of up to 2 remote Generator Circuit Breakers (supplied by others) plus 2 x outgoing breakers.
  - b) Mains failure sequences control, including timers, receipt of mains failure signals, etc.
- 1 - Annunciator giving the following status indications:
  - a) Generator circuit breaker open – per generating set.
  - b) Generator circuit breaker closed – per generating set.
  - c) PLC fault.
  - d) Mains failure x 2.
- 1 - Set of PLC re-programmable timers for the following:
  - a) Mains failure delay.
  - b) Mains return delay.

### **Signals from elsewhere**

From Fuel System

- Bulk Tank Bund Leak - volt free
- Bulk Tank High Level - volt free
- Bulk Tank Contents – 4-20mA

From Switchboard

- Generator on load - volt free

The panel has been constructed in accordance with Broadcrown standards including small wiring colours, designation labels, legends and complete with incoming and outgoing generator/switchboard interface terminals. All external interconnecting wiring and cabling, e.g. set-panel would be by others.

### **EXHAUST SYSTEM**

The silencers are of mild steel construction and finished in a heat resistant coating.

The primary silencer is 2.5 m long x 1.1m diameter.

The secondary silencer roof mounted is 6.0 m long x 1.3m.

### **FINISH**

The engine, alternator and baseframe etc. are finished with two coats of primer and two coats of air drying enamel to Broadcrown standard colours, which are as follows:

Engine: RAL 1006 Maize Yellow.

Radiator & Baseframe: Satin Finish Black.

### **MANUALS**

Total of 5 No. contract specific (In Broadcrown standard format) Operating and Maintenance manual including illustrated spares manual for the engine and alternator and schematic layout of the engine control system will be supplied in CD format as standard.

### **DRAWINGS**

Total of 5 copies of the following drawings will be supplied for information only:-

General Arrangement of the generator.

General Arrangement of the control panel.

Electrical Schematics of engine/panel wiring.

### **QUALITY ASSURANCE/ASSOCIATION AFFILIATION**

**AMPS ( A.B.G.S.M.)**

Broadcrown Ltd. is a member of AMPS, which incorporates the A.B.G.S.M. and abides by its Codes of Practice.

**QUALITY ASSURANCE**

Broadcrown is a BS.EN ISO 9001-2000 Certified Company, covering the manufacture, works testing, installation and commissioning of diesel generating equipment.

**PRICE FOR ABOVE PACKAGE IS:**

**Please Enquire – Keith 07831 871515**

***PAYMENT TERMS***

100% prior to shipment

***WARRANTY:***

*12 Months / 1000 Hrs (whichever comes first)*

***The Buyer is to Arrange Own Shipping: The Seller Will Load Onto Buyers Transport.***