MULTIPHASE POWER

EP Series

# WPS1000 / WPS1000S

## Features:

- Excitation system: self-excited (AREP and PMG are optional)
- ATS (automatic transfer switch) receptacle
- Lockable battery isolator switch
- Stainless galvanized zinc plates with strong corrosion resistance
- Vibration isolators between the engine/alternator and base frame
- Integrated wiring design
- Base fuel tank for at least 8 hours running
- Equipped with an industrial muffler
- Engine oil pump
- 50℃ radiator
- Top lifting and steel base frame with forklift holes
- Drainage for fuel tank
- Complete protection functions and safety labels
- IP54 (soundproof sets), IP56 (control system)
- Water jacket preheater, oil heater and double air cleaner, etc. are available.

### Output Ratings

| Generating Set Model | Prime | Standby |
|---|---|---|
| WPS1000/S | 1000kVA/800kW | 1100kVA/880kW |

Ratings at 0.8 power factor.

### Ratings and Performance Data

| | | |
|---|---|---|
| Engine Make & Model: | | 4008TAG2A |
| Alternator Model: | | LSA49.1L11 |
| Alternator Brand: | | Leroy Somer |
| Control System: | | PLC-8610 / PLC-7420 |
| Noise Level@7m: | | / |
| Circuit Breaker Type: | | / |
| Frequency & Phase: | | 50Hz & 3PH |
| Engine Speed: RPM | | 1500 |
| Structure Type: | WPS1000 | A |
| | WPS1000S | C |
| Fuel Tank Capacity: L | WPS1000 | / |
| | WPS1000S | 1150 |
| Fuel Consumption: l/hr (100% Load) | Prime | / |
| | Standby | / |

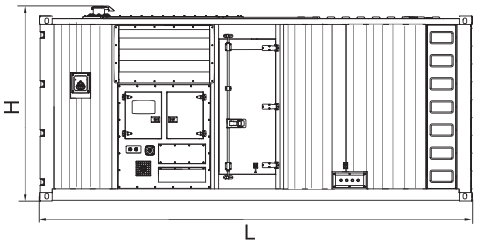
**Also available in the following voltages:** 415/240V-380/220V-220/127V-200/115V;
**ESP:** Standby Power Standby duty, operation under variable load, without over load;
**PRP:** Prime Power-Continuous duty operation, under variable load 24/24h-10% over load permissible 1 hour/12 hours;
**The data is only for your reference but not for use of sales.**

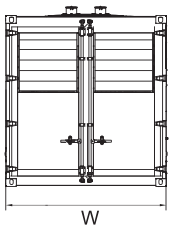
**M:** Mechanical speed governor, E/ECU: Electronic speed governor;
**NA:** Naturally aspirated, TC: Turbocharged, TCA: Turbocharged and air-air aftercooled. TCW: Water-cooled Turbocharged;
**The weights are approximate and without fuel.**

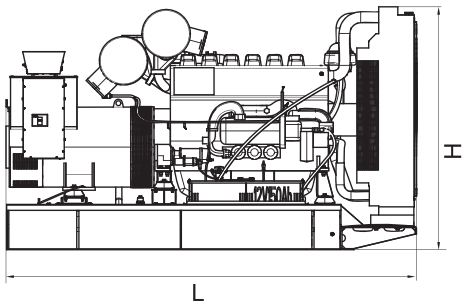
### Dimensions and Weights

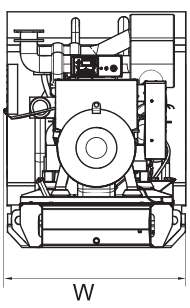
| Generating Set Model | Length (L) mm (in) | Width (W) mm (in) | Height (H) mm (in) | Dry kg (lb) | Wet kg (lb) |
|---|---|---|---|---|---|
| WPS1000 | 4566 | 2046 | 2279 | 6264 | / |
| WPS1000S | 6058 | 2438 | 2728 | 11760 | / |

Dry = With Lube Oil  Wet = With Lube Oil and Coolant



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# WPS1000 / WPS1000S

## Engine model: 4008TAG2A

## Cooling system

Recommended coolant: 50% inhibited ethylene glycol or 50% inhibited propylene glycol and 50% clean fresh water. For combined heat and power systems and where there is no likelihood of ambient temperature below 10 °C, then clean 'soft' water may be used, treated with 1% by volume of Perkins inhibitor in the cooling system.
Nominal jacket water pressure in crankcase. ... ... ... ... ... 170 kPa
The following is a guide based on ambient air conditions of 50 °C on a Perkins supplied radiator.

### Total coolant capacity

Engine only ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... .48 litres
ElectropaK (engine/radiator):
-tropical . ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ...149 litres
-temperate. ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ...143 litres
Pressure cap setting . ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ..69 kPa
Fan ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... Incorporated in radiator
Diameter:
-tropical . ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... 1400 mm (pusher)
-temperate. ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... 1214 mm (pusher)
Ambient cooling clearance (open ElectropaK Prime power) based on air temperature at fan 3 °C above ambient.
Maximum additional restriction (duct allowance) to cooling airflow (Prime power applications) and resultant minimum airflow.

| | Ambient clearance 50% glycol | Duct allowance mm $H_20$ | Min airflow $m^3$/min |
|---|---|---|---|
| 4008TAG1A - Tropical | 50 °C | 20 | 1248 |
| 4008TAG1A - Temperate | 41 °C | 24 | 1095 |
| 4008TAG2A - Tropical | 50 °C | 18 | 1350 |
| 4008TAG2A - Temperate | 35 °C | 25 | 1095 |

Coolant pump speed. ... ... ... ... ... ... ... ... ... ... ..1,4 x e rev/min
Method of drive . ... ... ... ... ... ... ... ... ... ... ... ... ... .. Gear driven
Maximum static pressure head on pump above engine crank centre line . ... ... ... ... ... ... ... ... ... ... ... ... ... 7 m
Maximum external permissible restriction to coolant pump flow . ... ... ... ... ... ... ... ... ... ... ... ... ... ... ..20 kPa
Thermostat operating range.. ... ... ... ... ... ... ... ... ... ... ... ...71-85 °C
Shutdown switch setting ... ... ... ... ... ... ... ... ... ... ... .101 °C rising
Coolant immersion heater capacity... ... ... ... ... ... ... ... ... 4 kW x 1

| Jacket cooling water data | Units | |
|---|---|---|
| Coolant flow 4008TAG1A/2A | l/s | 10 |
| Coolant exit temperature (max) | °C | 98 |
| Coolant entry temperature (min) | °C | 70 |
| Coolant entry temperature (max) | °C | 86 |

## Induction system

**Maximum air intake restriction of engine:**
-clean filter... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... . 127 mm $H_2O$
-dirty filter. ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ..380 mm $H_2O$
-air filter type ... ... ... ... ... ... ... ... ... ... ... ... ... ..5001-00-00 MF&T

## Lubrication system

Recommended lubricating oil to conform with the specification of API CG4

### Lubricating oil capacity

-sump maximum. ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... . 153 litres
-sump minimum.. ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... . 127 litres
Lubricating oil temperature maximum to bearings . ... ... ... .105 °C

### Lubricating oil pressure

-at 80 °C temperature to bearing gallery (minimum) .. ... 0,34 MPa

### Normal operating angles

Front and rear. ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... 5°
Side tilt ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... .. 10°

## Fuel system

Recommended fuel to conform to:
... ... ... ... ... ... ... ... ... ... ... . BS2869 1998 Class A2 or BS EN590
Type of injection system ... ... ... ... ... ... ... ... ... .Direct injection
Fuel injection pump ... ... ... ... ... ... ... ... ... Combined unit injector
Fuel injector ... ... ... ... ... ... ... ... ... ... ... ... Combined unit injector
Fuel injector opening pressure.. ... ... ... ... ... ... ... ... ... ... ...234 bar
Fuel lift pump . ... ... ... ... ... ... ... ... ... ... ... ... ... Tuthill TCH 1-054
Delivery/hour at 1500 rev/min ... ... ... ... ... ... ... ... ... ..660 litres
Heat retained in fuel to tank... ... ... ... ... ... ... ... ... ... ... . 4,5 kW
Temperature of fuel at lift pump to be less than. ... ... ... ... ... 58 °C
Fuel lift pump pressure .. ... ... ... ... ... ... ... ... ... ... ... ...300 kPa
Fuel lift pump maximum suction head ... ... ... ... ... ... ... ... ... 2,5 m
Fuel lift pump maximum pressure head ...See Installation Manual
Fuel filter spacing... ... ... ... ... ... ... ... ... ... ... ... ... ...10 microns
Governor type ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... Electronic
Torque at the governor output shaft... ... ... ... ... ... ... ... 0,917 kgm
Static injection timing . ... ... ... ... ... ... ... See engine number plate
Tolerance on fuel consumption.. ... ... ... ... ... To ISO 8528-1 1993

## Exhaust system

### Maximum back pressure for total system.

4008TAG1A. ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ...947 mm $H_20$
4008TAG2A. ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ...816 mm $H_20$
Exhaust outlet flange size ... ... ... ... ... ... ... ... ... ... 2 x 152 mm
For recommended pipe sizes, refer to the Installation Manual.

## Electrical system

Type ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ..Insulated return
Alternator. ... ... ... ... ... ... ... ... ... ... ... 24 volts with integral regulator
Alternator output.. ... ... ... ... 40 amps at 28 volts at 20 °C ambient
Starter motor ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ...24 volts
Starter motor power. ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... 8,2 kW
Number of teeth on flywheel ... ... ... ... ... ... ... ... ... ... ... ... ... .190
Number of teeth on starter motor ... ... ... ... ... ... ... ... ... ... ...12
Minimum cranking speed (0 °C).. ... ... ... ... ... ... ... ... 120 rev/min
Pull-in current of starter motor solenoid .. ... ... 30 amps at 24 volts
Hold-in current of starter motor solenoid. ... ... ..9 amps at 24 volts
Engine stop solenoid... ... ... ... ... ... ... ... ... ... ... ... ... ...24 volts
Pull-in current of stop solenoid ... ... ... ... ... ... 60 amps at 24 volts
Hold-in current of stop solenoid... ... ... ... ... ...1,1 amps at 24 volts

EP Series

# WPS1000 / WPS1000S

## Alternator model: LSA49.1L11

### SPECIALLY ADAPTED FOR APPLICATIONS

The LSA 49.1 alternator is designed to be suitable for typical generator applications, such as: backup, standard production, cogeneration, marine applications, rental, telecommunications, etc.

### COMPLIANT WITH INTERNATIONAL STANDARDS

The LSA 49.1 alternator conforms to the main international standards and regulations:
IEC 60034, NEMA MG 1.22, ISO 8528, CSA, CSA/UL, marine regulations, etc.
It can be integrated into a CE marked generator.
The LSA 49.1 is designed, manufactured and marketed in an ISO 9001 environment.

### TOP OF THE RANGE ELECTRICAL PERFORMANCE

- Class H insulation.
- Standard 6-wire re-connectable winding, 2/3 pitch, type no. 6.
- Voltage range 50 Hz : 380V - 400V - 415V and 220V - 230V - 240V ,
- Voltage range 60 Hz : 380V - 416V - 440V - 480V and 220 V - 240 V.
- High efficiency and motor starting capacity.
- Other voltages are possible with optional adapted windings :
  - 50 Hz : 440 V (no. 7), 500 V (no. 9), 600 V (no. 22 or 23), 690 V (no. 10 or 52)
  - 60 Hz : 380 V and 416 V (no. 8), 600 V (no. 9).
- THD Total harmonic distortion < 4% (full load).
- R 791 interference suppression conforming to standard EN 55011 group 1 class B standard for European zone (CE marking).

### EXCITATION AND REGULATION SYSTEM SUITED TO THE APPLICATION

| | Excitation system | | Regulation options | | | | |
|---|---|---|---|---|---|---|---|
| **Voltage regulator** | **AREP** | **PMG** | Current transformer for paralleling | **R 726** Mains paralleling | **R 731** 3-phase sensing | **R 734** 3-phase sensing mains paralleling unbalanced | Remote voltage potentiometer |
| **R 450** | **Std** | **Option** | √ | √ | √ | √ | √ |
| **D 510** | **Optional** | **Optional** | √ | Included | Included | **contact factory** | √ |

Voltage regulator accuracy +/- 0.5%. √ : possible mounting

### PROTECTION SYSTEM SUITED TO THE ENVIRONMENT

- The LSA 49.1 is IP 23.
- Standard winding protection for clean environments with relative humidity ≤ 95 %, including indoor marine environments.

Options : - Filters on air inlet : derating 5%.
- Filters on air inlet and air outlet (IP 44) derating 10%.
- Winding protections for harsh environments and relative humidity greater than 95%.
- Space heaters.
- Thermal protection for winding.

### REINFORCED MECHANICAL STRUCTURE USING FINITE ELEMENT MODELLING

- Standard direction of rotation : clockwise when looking at the drive end view (engine side).
- Compact and rigid assembly to better withstand generator vibrations.
- Steel frame.
- Cast iron flanges and shields.
- Twin-bearing and single-bearing versions designed to be suitable for engines on the market.
- Half-key balancing.
- Regreasable bearings.
- Standard direction of rotation : clockwise when looking at the drive end view (for anti-clockwise, derate the machine by 5%).

### ACCESSIBLE TERMINAL BOX PROPORTIONED FOR OPTIONAL EQUIPMENT

- Easy access to the voltage regulator and to the connections.
- Possible clusion of accessories for paralleling, protection and measurement.
- Connection bar for reconnecting voltage .

MULTIPHASE POWER

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## WPS1000 / WPS1000S

# Control System

# PLC-7420

PLC-7420 is an advanced control module based on micro-processor, containing all necessary functions for protection of the genset and the breaker control. It can monitor the mains supply, breaker control. and automatically start the engine when the mains is abnormal. Accurately measure various operational parameters and display all values and alarms information on the LCD. In addition, the control module can automaticallyshut down the engine and indicate the engine failure.

## FEATURES

- Microprocessor control, with high stability and credibility
- Monitoring and measuring operational parameters of the mains supply and genset
- Indicating operation status, fault conditions, all parameters and alarms
- Multiple protections; multiple parameters display, like pressure, temp. etc.
- Manual, automatic and remote work mode selectable
- Real time clock for time and date display, overall runtime display, 250 log entries
- Overall power output display
- Integral speed/frequency detecting, telling status of start, rated operation, overspeed etc.
- Communication with PC via RS485 OR RS232 interface, using MODBUS protocol

a Button (next page)

b Button (increase value / previous item)

c Button (accept)

d Button (previous page)

e Button (decrease value / next item)

f Button (transfer the load to the mains supply, when in Manual mode only)

g Mains supply available LED

h Stop / Reset button

i Manual button (Manual control mode)

j Mains supply on load LED

k Test button (Test mode) l Auto button (Auto mode)

m Genset on load LED n Mute/Lamp test button

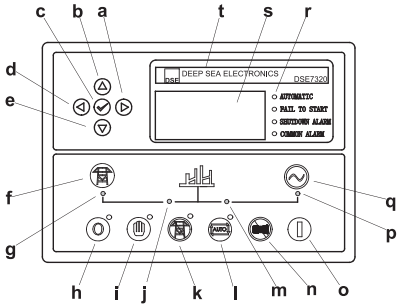
o Start button (Manual) p Genset available LED

q Button (transfer the load to the genset, when in Manual mode only)

r Alarm LED (4 alarm items)

s LCD display

t Control module name




Control Panel

## Control System function list

| | | MODEL | PLC-8610 | PLC-7420 |
|---|---|---|---|---|
| General accessory | | AVR | ● | ● |
| | | Electronic Governing | ● | × |
| | | Glow plug control | ● | ● |
| | | Cycle Cranking | ● | ● |
| | | ( MODBUS ) Networking | ● | ● |
| | | Fault History | ● | ● |
| Operator Interface | | manual start/stop | ● | ● |
| | | Auto/remote start | ● | ● |
| | | Regular Test | ● | ● |
| | | Auto operation LED | ● | ● |
| | | Manual operation LED | ● | ● |
| | | Common Shutdown LED | ● | ● |
| | | Common warning LED | ● | ● |
| | | Fail to start LED | ● | ● |
| | | Emergency stop(local) | ● | ● |
| | | Alphanumeric screen | ● | ● |
| | | Remote start input active LED | ● | ● |
| | | Alarm reset | ● | ● |
| Measurement and Instrumentation | Engine | Oil pressure | ● | ● |
| | | Water Temperture | ● | ● |
| | | Engine Speed | ● | ● |
| | | Hours Run | ● | ● |
| | | Number of Starts | ● | ● |
| | | Battery Voltage | ● | ● |
| | | Coolant Temperature | ● | ● |
| | Alternator | 3Phase-L Voltage&Frequency | ● | ● |
| | | 3phase Current | ● | ● |
| | | Frequency | ● | ● |
| | | kWh | ● | ● |
| | | Apparent Power | ● | ● |
| | | Active Power and Reactive Power | ● | ● |
| | | Power Factor | ● | ● |
| | | Per PhasekW, kWr | ● | ● |
| | | Per Phase kVA | ● | ● |
| | | Phase Voltage | ● | ● |
| | | Output Power | ● | ● |
| | Mains Expression | Grid Line Voltage | ● | ● |
| | | Grid Phase Voltage | ● | ● |
| | | Grid Frequency | ● | ● |
| Shutdown Protection and Indication | Engine | Low Fuel Level | ● | ● |
| | | High Fuel Level | ○ | ○ |
| | | Low Oil Pressure | ● | ● |
| | | High Water Temperature | ● | ● |
| | | Failure to Stop | ● | ● |
| | | Failure to Start | ● | ● |
| | | Controlable start circles/times | ● | ● |
| | | Overspeed | ● | ● |
| | Alternator | Under&Over Voltage | ● | ● |
| | | Under&Over Frequency | ● | ● |
| | | Overcurrent | ● | ● |
| | | Earth Leakage | ○ | ○ |
| | | Reverse Power | ● | × |
| | | Reverse kWr | ● | × |
| Threshold Warning&Indication | | Low Oil Pressure | ● | ● |
| | | Low Water Temperature | ○ | ○ |
| | | High Water Temperature | ● | ● |
| | | Low Water Level | ● | ● |
| | | Low/High Battery Voltage | ● | ● |
| | | Failure to Charge | ● | ● |
| | | Overcurrent | ● | ● |
| | | Overload | ● | ● |
| | | Genset Under/Over Voltage | ● | ● |
| | | Genset Under/Over Frequency | ● | ● |
| | | under/over Speed | ● | ● |
| | | High Engine Temperature | ● | ● |
| | | Earth Leakage | ● | ● |
| Paralleling Capability | | Synchroscope(Independent Bus) | ● | × |
| | | Active and Reactive Power Control | ● | × |
| | | Synchroscope(Shared Bus) | ● | × |
| | | Synchronization Dector | ● | × |
| | | Peak Lopping | ○ | × |
| Power Transfer Function | | Automatic Transfer | ● | ● |
| | | Hard Closed Transition | ● | ● |
| | | Soft Closed Transtion | ● | × |
| | | Gen/Mains Breaker | × | ● |
| | | Gen/Mains Breaker Status Protection | × | ● |
| | | Speed/Voltage Control | ● | × |
| | | Power Indication | ● | ● |
| | | Fuel&solenoid Valve Control | ● | ● |
| | | Startor Control | ● | ● |
| | | Preheating | ○ | ○ |
| | | Mains Transfer Switch (Standard) | ● | ● |
| | | Mains Transfer Switch (Emergency) | ● | ● |
| Environment | | Operating Temperature (-40℃-70℃) | ● | ● |
| | | Ambient Temperature (-25℃-45℃) | ● | ● |
| | | Humidity≤80% | ● | ● |
| Monitoring Function | | Grid Over/Under Voltage Control | ● | ● |
| | | Grid Over/Under Frequency Control | ● | ● |
| | | Remote Start Output(Load/No-load) | ● | ● |
| | | Optional Relay Output | ● | ● |
| | | Remote Telecom Control with All Functions | ● | ● |
| | | Engine Instrument Monitoring | ● | ● |
| | | Alternator Output Instrument Monitoring | ● | ● |
| | | Connection Point with All-around Setting For 6 Users | ● | ● |
| | | 3 Users Input Connection Point | ● | ● |
| | | LCD Light Control of Low Light Operation Environment | ● | ● |
| | | Safe PIN Code | ● | ● |
| | | RS232/485 Interface | ● | ● |
| | | Language Selection | ● | ● |
| | | Multi-Language Function | ● | |

● Standard ○ Optional × Impossible

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# WPS1000 / WPS1000S

# Control System

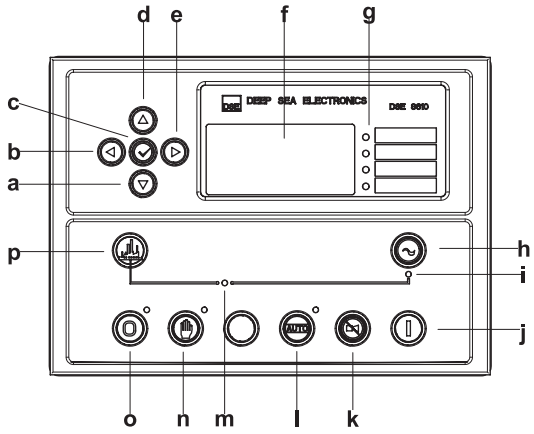
**Digital, intelligent control system allows easier operation.**

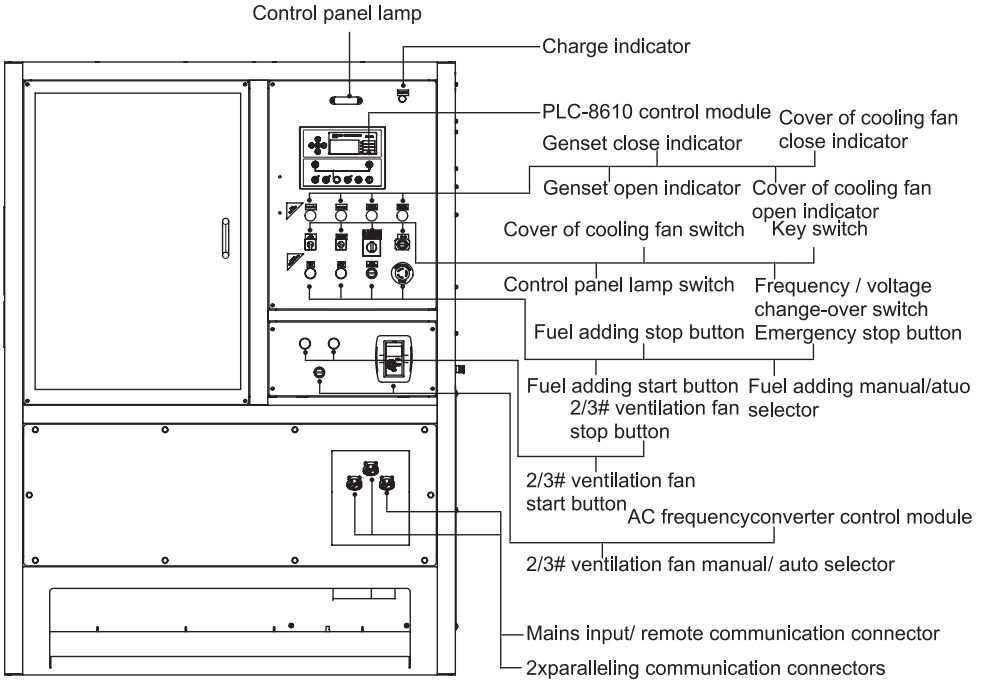
## FEATURES

- Microprocessor control, with high stability and credibility
- Monitoring and measuring operational parameters of the genset
- Indicating operation status, fault conditions, all parameters and alarms
- Multiple protections; multiple parameters display, like pressure, temp. etc.
- Manual, automatic and remote work mode selectable
- RS232 & RS485 can be used at the same time
- Real time clock for time and date display, overall runtime display, 250 log entries

# PLC-8610 (Optional)

PLC-8610 is a microprocessor based control unit containing all necessary functions for protection of the genset and the breaker control. Furthermore, it contains all necessary three-phase measuring circuits and presents all values and alarms on the LCD display. The module has the function of load sharing which enables the module to share the active load (kW) equally when operating in parallel with other gensets. The load sharing is performed so each genset takes a portion of the load that is calculated in percent according to the nominal power.




a Decrease value next item
b Previous page
c Accept
d Increase value previous item
e Next page
f LCD display
g Four alarm LEDs
h Close genset
i Genset available LED
j Manual start
k Mute alarm / lamp test
l Auto mode (with LED)
m Genset breaker on LED
n Manual mode (with LED)
o Stop / reset (with LED)
p Open genset

# Optional

| Engine | Alternator | Generator Set | Fuel System | Canopy |
|---|---|---|---|---|
| • Water Jacket Preheater<br>• Oil Preheater | • Winding Temperature Measuring Instrument<br>• Alternator Preheater<br>• PMG<br>• Anti-damp and anti-corrosion treatment<br>• Anti-condensation heater | • Tools with the machine | • Low fuel level alarm<br>• Automatic fuel feeding system<br>• Fuel T-valves | |

| Lubricating System | Exhaust System | Cooling System | Control Panel | Voltages |
|---|---|---|---|---|
| • Oil with the machine | • Protection board from hotness | • Front heat protection<br>• Coolant (-30°C) | • Remote control panel<br>• PLC-8610<br>• PLC-7420<br>• ATS | • 415/240V<br>• 400/230V<br>• 380/220V<br>• 220/127V<br>• 200-115V |

The following lists are optional by the needs of customers.

## Engine Model: 4008TAG2A

**Minor Repair / 1000 hrs optional**

| No. | Part Name | Part No. | Qty | Remark |
|---|---|---|---|---|
| 1 | Fuel Filter | SE429B/4 | 6 | |
| 2 | Oil Filter | SE111B | 6 | |
| 3 | Air Filter | S551/4 | 5 | |
| 4 | BELT | 541/398 | 1 | |
| 5 | SEAL - ROCKER BOX COVER | SE478 | 8 | |
| 6 | GASKET - CYLINDER HEAD | SE2H | 8 | |
| 7 | THERMOSTAT | SE573/1 | 2 | |
| 8 | FRONT OIL SEAL | 554/126 | 1 | |
| 9 | SEAL - REAR END OIL | 554/127 | 1 | |