

## 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 C 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
<b>WPS20/S</b>	20kVA/16kW	22kVA/17.6kW

Ratings at 0.8 power factor.

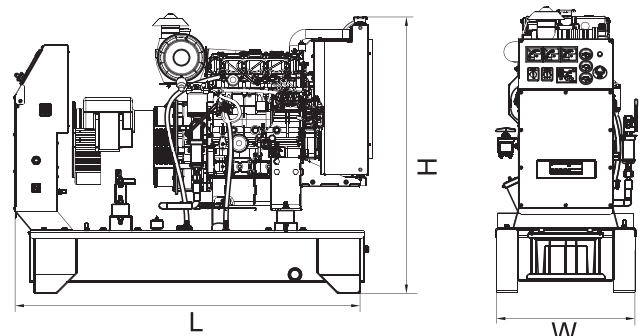
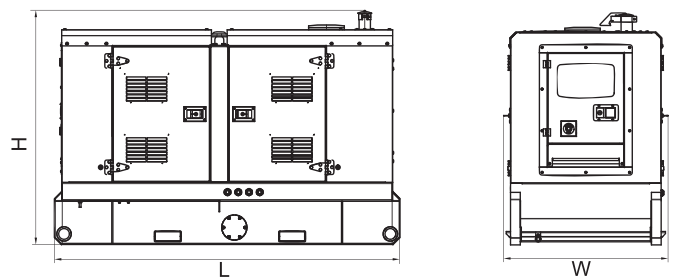
### Ratings and Performance Data

<b>Engine Make &amp; Model:</b>	404A-22G1	
<b>Alternator Model:</b>	ECP28-M/4	
<b>Alternator Brand:</b>	MECC	
<b>Control System:</b>	PLC-920 / PLC-7420	
<b>Noise Level @7m:</b>	/	
<b>Circuit Breaker Type:</b>	/	
<b>Frequency &amp; Phase:</b>	50Hz & 3PH	
<b>Engine Speed: RPM</b>	1500	
<b>Structure Type:</b>	<b>WPS20</b>	D
	<b>WPS20/S</b>	R
<b>Fuel Tank Capacity: L</b>	<b>WPS20</b>	90
	<b>WPS20/S</b>	100
<b>Fuel Consumption: l/hr (100% Load)</b>	<b>Prime</b>	/
	<b>Standby</b>	/

### Dimensions and Weights

Generating Set Model	Length (L) mm (in)	Width (W) mm (in)	Height (H) mm (in)	Dry kg (lb)	Wet kg (lb)
<b>WPS20</b>	1558	600	1215	543	/
<b>WPS20S</b>	2142	865	1369	940	/

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



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/ECCU: 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.

## Engine model: 404A-22G1

### Cooling system

#### Radiator

-face area... ..0.167 m<sup>2</sup>  
 -rows and materials ... ..2 rows, Aluminium  
 -matrix density and material... ..14.5 fins per inch, Aluminium  
 -width of matrix... ..334.2 mm  
 -height of matrix... ..500.0 mm  
 -pressure cap setting... ..90 kPa  
 Estimated cooling air flow reserve... ..0.125 kPa

#### Fan

-diameter... ..320 mm  
 -drive ratio... ..1.25:1  
 -number of blades... ..6  
 -material... ..Plastic  
 -type... ..Pusher

#### Coolant

Total system capacity  
 -with radiator... ..7.0 litres  
 -without radiator... ..3.6 litres  
 Maximum top tank temperature... ..112°C  
 Temperature rise across engine... ..7.5°C  
 Max. permissible external system resistance... ..TBA kPa  
 Thermostat operation range... ..82 - 95°C  
 Recommended coolant:  
 Recommended coolant: 50% anti freeze / 50% water. For complete details of recommended coolant specifications, refer to the Operation and Maintenance Manual for this engine model.

#### Duct allowance

Maximum additional restriction (duct allowance) to cooling airflow and resultant minimum airflow		
Ambient clearance 50% Glycol	Duct allowance Pa	m <sup>3</sup> /sec
53°C	0	0.67
46°C	125	0.49

### Electrical system

-alternator... ..15 amps, 12V  
 -starter motor... ..2 kW, 12V  
 Minimum cranking speed... ..150 rev/min

#### Cold start recommendations

Minimum starting temperature °C	Grade of engine lubricating oil	Battery specifications			
		BS3911 Cold start amps	SAEJ537 Cold cranking amps	Number of batteries needed	Commercial ref number
0	20W	540	740	1	647
-15	10W	540	740	1	647
-20	5W	600	780	1	655

Note: Additional information for battery and cable limits can be found in Chapter 6 of the 400 Engine Sales Manual..

### Exhaust system

Maximum back pressure... ..10.2 kPa  
 Exhaust outlet size... ..42 mm

### Fuel system

Type of injection... ..Indirect injection  
 Fuel injection pump... ..Cassette type  
 Fuel injector... ..Pintle nozzle  
 Nozzle opening pressure... ..14.7 MPa  
 Max. particle size... ..25 microns

#### Fuel lift pump

-type... ..mechanical (camshaft driven)  
 -flow/hour... ..63 litres/hr  
 -pressure... ..10 kPa  
 Maximum suction head... ..0.8 m  
 Maximum static pressure head... ..3.0 m  
 Governor type... ..Mechanical

#### Fuel specification

USA Fed Off Highway - EPA2D 89.330-96  
 Europe Off Highway - CEC RF-06-99

Note: For further information on fuelspecifications and restrictions, refer to the OMM Fuels section for this engine model.

#### Fuel consumption

Power rating%			
g/kWh (litres/hr)			
110	100	75	50
244 (6.1)	237 (5.3)	238 (4.0)	258 (2.9)

### Induction system

#### Maximum air intake restriction

-clean filter... ..3.0 kPa  
 -dirty filter... ..6.4 kPa  
 -air filter type... ..Dry element type

### Lubrication system

#### Lubricating oil capacity

Max. sump capacity... ..10.6 litres  
 Min. sump capacity... ..8.9 litres  
 Maximum engine operating angles  
 -front up, front down, right side or left side... ..35° continuous

#### Lubricating oil pressure

-relief valve opens... ..352 - 448kPa  
 Min. oil pressure... ..120 kPa  
 -at maximum no-load speed... ..TBA  
 Oil flow at rated speed... ..109 litres/min  
 Normal oil temperature... ..125°C

#### Recommended SAE viscosity

A single or multigrade oil must be used which conforms API-CH-4 or ACEA E5.



**Alternator model: ECP28-M/4**

Electrical Characteristics										
Frequency	Hz	50				60				
Voltage (series star)	V	380	400	415	440	415	440	460	480	
Rated power class H	kVA	20	20	20	18	21	23	24	24	
	kW	16	16	16	14,4	16,8	18,4	19,2	19,2	
Rated power class F	kVA	18,5	18,5	18,5	17	19	20	22	22	
	kW	14,8	14,8	14,8	13,6	15,2	16	17,6	17,6	
Regulation with	DSR	±1 % with any power factor and speed variations between -5% +30%								
Insulation class		H								
Execution		Brushless								
Stator winding		12 ends								
Rotor		without damping cage								
Efficiencies class H	4/4	%	87,3	87,4	87,1	86,9	88,8	89,3	89,4	89,5
(see graph. for details)	3/4	%	87,5	87,8	87,5	87,4	88,9	89,1	89,3	89,5
	2/4	%	85,5	85,6	85,6	85,5	87,2	87,3	87,4	87,5
	1/4	%	83,1	83	82,8	82,3	85,1	85,1	85,1	85

Reactances (f. l.cl. F)	Xd		199,4	180	167,2	133,9	210,7	205,3	196,0	180
	Xd'		18,61	16,8	15,61	12,50	19,67	19,16	18,29	16,8
	Xd''		10,64	9,6	8,92	7,14	11,24	10,95	10,45	9,6
	Xq		86,4	78	72,5	58,0	91,3	89,0	84,9	78
	Xq'		86,4	78	72,5	58,0	91,3	89,0	84,9	78
	Xq''		24,4	22	20,4	16,4	25,8	25,1	24,0	22
	$\alpha$		15,96	14,4	13,38	10,71	16,86	16,42	15,68	14,4
	X <sub>0</sub>		3,66	3,3	3,07	2,45	3,86	3,76	3,59	3,3
Short Circuit Ratio	Kcc		0,53	0,62	0,87	1,45	0,41	0,48	0,53	0,62
Time Constants	Td'		0,044							
	Td''		0,014							
	Tdo'		0,85							
	$\alpha$		0,012							
Short Circuit Current Capacity	%		>300				>320			
Excitation at no load	Amp.	0,4	0,5	0,6	0,8	0,3	0,35	0,4	0,5	
Excitation at full load	Amp.	1,4	1,5	1,7	1,9	1,2	1,3	1,4	1,5	
Overload (long-term)	%	1 hour in a 6 hours period 110% rated load								
Overload per 20 sec.	%	300								
Stator Winding Resistance (20°C)	Ω	0,198								
Rotor Winding Resistance (20°C)	Ω	1,396								
Exciter Resistance (20 °C)	Ω	Rotor : 0,417				Stator : 10,60				
Heat dissipation at f.l.cl.H	W	2328	2307	2370	2171	2119	2205	2277	2253	
Telephone Interference		THF < 2%				TIF < 45				
Radio interference		EN61000-6-3 EN61000-6-1. For others standards apply to factory								
Waveform Distors.(THD) at f. load	LL/LN %	2 / 2								
Waveform Distors.(THD) at no load	LL/LN %	3,6 / 3,5								

Mechanical characteristics									
Protection		IP 23 (other protection on request)							
DE bearing		6309-2RS							
NDE bearing		6207-2RS							
Weight of wound stator assembly	kg	41							
Weight of wound rotor assembly	kg	22,2							
Weight of complete generator	kg	118							
Maximun overspeed	rpm	2250							
Unbalanced magnetic pull at f.l.cl.F	kN/mm	3,8							

WPS20 / WPS20S

# Control System PLC-920 (Optional)

Multiphase Power PLC-920 generator controllers integrating digital, intelligent and network techniques are used as the automatic control systems for diesel generators. It can carry out functions including pre-alarm, warning & electrical trip, fail monitoring and controls etc.

## FEATURES

- Parameter configuration via RS-232 serial communication;
- Log last 50 events & alarm information with measured values;
- Statistics records;
- Remote start/stop;
- Speed sensing from alternator voltage or magnetic pickup;
- Configurable 3 inputs and 6 outputs;
- ECU powers, ECU stop, STOP or fuel solenoid selection;
- Automatic transfer switching control and engine control;
- Adjustable start, load and stop timers.



## SPECIFICATION

- Dimensions: 111mm\*81mm\*61mm
- Protection: IP65 at front panel
- Operating temperature: -20 °C to 70 °C
- Max. Operating current is 360mA
- Sender measurement: 0 to 1300 ohm
- Panel cut-out: 81mm\*70mm
- Weight: approximately 0.3kg
- DC battery supply voltage: 8 to 32Vdc
- CT secondary: 5A
- Accuracy: 1%FS, resolution: 1 ohm

## FUNCTION

- Pre-Alarm
- Engine temperature
- Oil pressure
- Over/under voltage
- Over/under frequency
- Over/under speed
- Warning & Electrical trip
- Over current
- Short circuit
- Error
- Over/under speed
- Speed loss
- Battery low
- Battery high
- Maintenance
- Over current
- Short circuit
- Engine stop
- Can bus
- Charge alternator
- Fail monitoring
- Emergency stop
- Multiple engage fail
- Failed to start
- Low oil pressure
- High temperature
- Speed failure
- Voltage
- Charging fail
- Shutdown
- Warning
- Controls
- Fuel and stop solenoid
- ECU power and stop
- Starter motor
- Automatic generator start
- Preheat
- External alarm horn
- Engine cooling
- Idle mode

## Control System function list

MODEL	PLC-920	PLC-7420
<b>General Accessory</b>		
AVR	●	●
Electronic Governing	×	×
Glow plug control	●	●
Cycle Cranking	●	●
(MODBUS) Networking	×	●
Fault History	●	●
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	●	●
<b>Measurement and Instrumentation</b>		
<b>Engine</b>		
Oil pressure	●	●
Water Temperature	●	●
Engine Speed	●	●
Hours Run	●	●
Number of Starts	●	●
Battery Voltage	●	●
Coolant Temperature	●	●
3Phase-L Voltage&Frequency	●	●
3phase Current	●	●
Frequency	●	●
kWh	●	●
Apparent Power	●	●
Active Power and Reactive Power	●	●
Power Factor	●	●
Per PhasekW, MWr	●	●
Per Phase kVA	●	●
Phase Voltage	●	●
Output Power	×	●
<b>Mains Expression</b>		
Grid Line Voltage	×	●
Grid Phase Voltage	×	●
Grid Frequency	×	●
<b>Shutdown Protection and Indication</b>		
<b>Engine</b>		
Low Fuel Level	●	●
High Fuel Level	×	○
Low Oil Pressure	●	●
High Water Temperature	●	●
Failure to Stop	●	●
Failure to Start	●	●
Controllable start circles/times	×	●
Overspeed	●	●
<b>Alternator</b>		
Under&Over Voltage	●	●
Under&Over Frequency	●	●
Overcurrent	●	●
Earth Leakage	○	○
Reverse Power	×	×
Reverse kW	×	×
<b>Threshold Warning/Indication</b>		
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	●	●
<b>Paralleling Capability</b>		
Earth Leakage	○	○
Synchroscope(Independent Bus)	×	×
Active and Reactive Power Control	×	×
Synchroscope(Shared Bus)	×	×
Synchronization Detector	×	×
Peak Lopping	×	×
<b>Power Transfer Function</b>		
Automatic Transfer	○	●
Hard Closed Transition	●	●
Soft Closed Transition	×	×
Gen/Mains Breaker	×	●
Gen/Mains Breaker Status Protection	×	●
Speed/Voltage Control	×	×
Power Indication	×	●
Fuel&Solenoid Valve Control	●	●
Starter Control	●	●
Preheating	○	○
Mains Transfer Switch (Standard)	×	●
Mains Transfer Switch (Emergency)	×	●
<b>Environment</b>		
Operating Temperature (-40 °C-70 °C)	●	●
Ambient Temperature (-25 °C-45 °C)	●	●
Humidity ≤80%	●	●
<b>Monitoring Function</b>		
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 4 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	●	●

# Control System

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

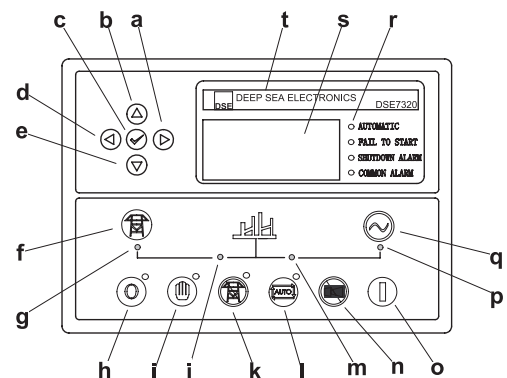
## PLC-7420

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 automatically shut 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



**Control Panel**

- 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

## Optional

Engine	Alternator	Generator Set	Fuel System	Canopy
<ul style="list-style-type: none"> <li>• Water Jacket Preheater</li> <li>• Oil Preheater</li> </ul>	<ul style="list-style-type: none"> <li>• Winding Temperature Measuring Instrument</li> <li>• Alternator Preheater</li> <li>• PMG</li> <li>• Anti-damp and anti-corrosion treatment</li> <li>• Anti-condensation heater</li> </ul>	<ul style="list-style-type: none"> <li>• Tools with the machine</li> </ul>	<ul style="list-style-type: none"> <li>• Low fuel level alarm</li> <li>• Automatic fuel feeding system</li> <li>• Fuel T-valves</li> </ul>	<ul style="list-style-type: none"> <li>• Trailer</li> </ul>
Lubricating System	Exhaust System	Cooling System	Control Panel	Voltages
<ul style="list-style-type: none"> <li>• Oil with the machine</li> </ul>	<ul style="list-style-type: none"> <li>• Protection board from hotness</li> </ul>	<ul style="list-style-type: none"> <li>• Front heat protection</li> <li>• Coolant (-30°C)</li> </ul>	<ul style="list-style-type: none"> <li>• Remote control panel</li> <li>• PLC-920</li> <li>• PLC-7420</li> <li>• ATS</li> </ul>	<ul style="list-style-type: none"> <li>• 415/240V</li> <li>• 400/230V</li> <li>• 380/220V</li> <li>• 220/127V</li> <li>• 200-115V</li> </ul>

