

## EAOM-72F

*Automatic Generator Start Controller with Metering, Flat Type*

## EAOM-72F SOFT

*PC Communication Software for Programming and Remote Monitoring*

- Automatic engine start / stop
- Automatic shutdown on fault condition
- LED status and fault indication
- Alternator voltage and frequency measurement and monitoring
- Battery voltage measurement and monitoring
- Simple push-button controlled operation
- Over / under speed warning and shutdown
- Remote start / stop input
- Three user configurable inputs
- Three Resistive Sender Inputs
- Provides charge alternator excitation current
- Two configurable outputs
- Speed sensing from alternator frequency or magnetic pickup
- Fully programmable
- RS-232 communication port
- Standard modem communication

**- Monitors**

- |                                |                     |
|--------------------------------|---------------------|
| Three phase alternator voltage | Engine temperature  |
| Three phase current input      | Fuel level          |
| Alternator power               | Battery voltage     |
| Alternator frequency           | Engine running time |
| Engine speed                   | Error indication    |
| Oil pressure                   | Program parameters  |

**- Controls**

- |                                |                                    |
|--------------------------------|------------------------------------|
| Engine fuel supply or stopping | Automatic generator start and stop |
| Starter motor                  | Preheat                            |
| Alarm horn                     |                                    |

**- Fail Monitoring**

- |                               |                          |
|-------------------------------|--------------------------|
| Alternator Voltage, Frequency | Engine Start             |
| Engine Speed                  | Charge Generator Voltage |
| Engine Temperature            | Emergency Stop           |
| Oil Pressure                  | Maintenance Due          |

## EU DECLARATION OF CONFORMITY

**Manufacturer's Name** : EMKO ELEKTRONIK A.S.  
**Manufacturer's Address** : DOSAB, Karanfil Sk., No:6,  
16369 Bursa, TURKEY

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The manufacturer hereby declares that the product:

**Product Name** : Electrical control equipment for generating sets  
**Type Number** : EAOM-72F  
**Product Category** : Electrical equipment for measurement, control and laboratory use

Conforms to the following directives :

2006 / 95 / EC The Low Voltage Directive

2004 / 108 / EC The Electromagnetic Compatibility Directive

has been designed and manufactured to the following specifications:

EN 61000-6-4:2007 EMC Generic Emission Standard for Industrial Environments

EN 61000-6-2:2005 EMC Generic Immunity Standard for Industrial Environments

EN 61010-1:2001 Safety Requirements for electrical equipment for measurement, control and laboratory use

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### When and Where Issued

25<sup>th</sup> February 2011

Bursa-TURKEY

### Authorized Signature

Name : Serpil YAKIN

Position : Quality Manager

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## 1. Introduction

### 1.1 General Specifications

These products provide control and protection in the operation of a generator set. The units allow starting and stopping of the engine and indicates status and fault conditions. The unit monitors:

- Engine temperature
- Oil pressure
- Fuel level
- Charge generator voltage
- Engine speed
- Alternator output (voltage and frequency)
- Alternator current and power

It controls:

- Engine fuel supply or engine stopping, via external solenoid
- Starter motor via external relay
- Automatic generator start and stop
- Alarm horn
- Preheat (configurable relay feature)

A four-digit, seven-segment display provides extensive monitoring of unit and alternator parameters, including:

- Alternator output voltage and frequency
- Engine RPM
- Battery voltage
- Engine running time
- Load current and power
- Oil pressure value
- Coolant system temperature
- Fuel tank level value
- Error indication
- Program parameters

The unit is extensively programmable through the front panel, with password protection on two levels. Operational parameters can also be monitored and controlled from a PC via a built-in RS-232 port.

In the event that the engine fails to start on the first attempt, the attempt will be repeated a programmed number of times or until successful.

If a fault is detected, the unit shuts down the engine and indicates the failure by flashing a relevant fault LED.

Remote start / stop and emergency stop inputs provide for remote control of the engine.

Three user defined configurable failure inputs are included that sound an external horn, flash indicators on the panel and can be programmed to stop the engine.

### 1.2 Warranty

EMKO Elektronik warrants that the equipment delivered is free from defects in material and workmanship. This warranty is provided for a period of two years. The warranty period starts from the delivery date. This warranty is in force if duty and responsibilities which are determined in warranty document and instruction manual performs by the customer completely.

### 1.3 Maintenance

Repairs should only be performed by trained and specialized personnel. Cut power to the device before accessing internal parts.

Do not clean the case with hydrocarbon-based solvents (Petrol, Trichlorethylene etc.). Use of these solvents can reduce the mechanical reliability of the device. Use a cloth dampened in ethyl alcohol or water to clean the external plastic case.

## 2. Installation



**Before beginning installation of this product, please read the instruction manual and warnings below carefully.**

A visual inspection of this product for possible damage occurred during shipment is recommended before installation. It is your responsibility to ensure that qualified mechanical and electrical technicians install this product.

If there is danger of serious accident resulting from a failure or defect in this unit, power off the system and separate the electrical connection of the device from the system.

Keep the power off until all of the wiring is completed so that electric shock and trouble with the unit can be prevented.

### 2.1 Unit Configuration

The unit can be programmed using the buttons and LED display on the front panel or PC Software.

### 2.2 Panel Mounting

The unit is designed for panel mounting. Fixing is by four screw fixings. (See Figure 2.1)

1- Insert the unit in the panel cut-out from the front.

2- Insert the fixings in the slotted at the corners of the unit and tighten the fixing screws to secure the unit against the panel.



**During the equipment is putted in hole on the metal panel while mechanical installation some metal burrs can cause injury on hands, you must be careful.**

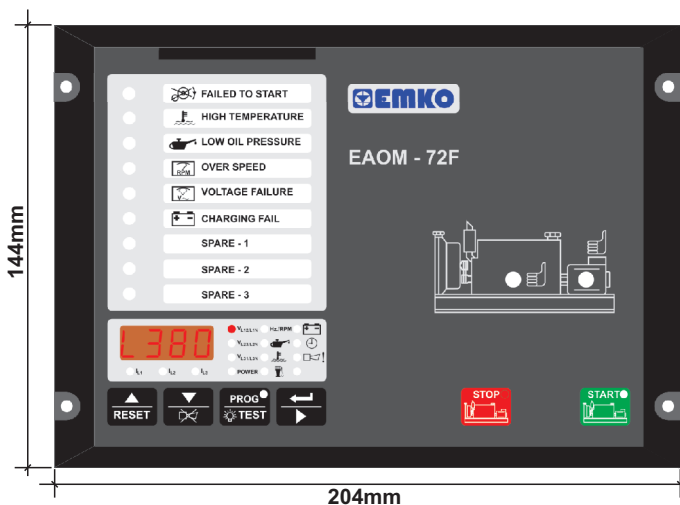


Figure 2.1 Front View

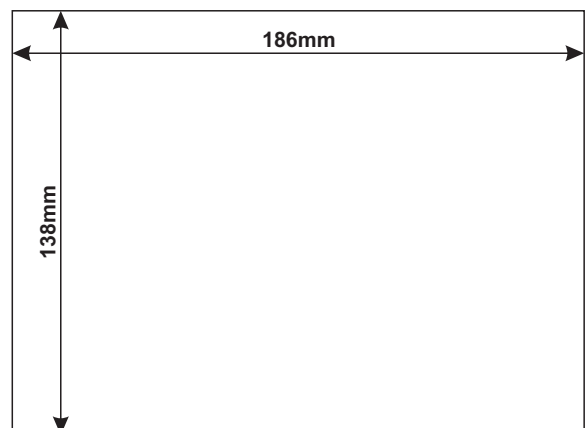
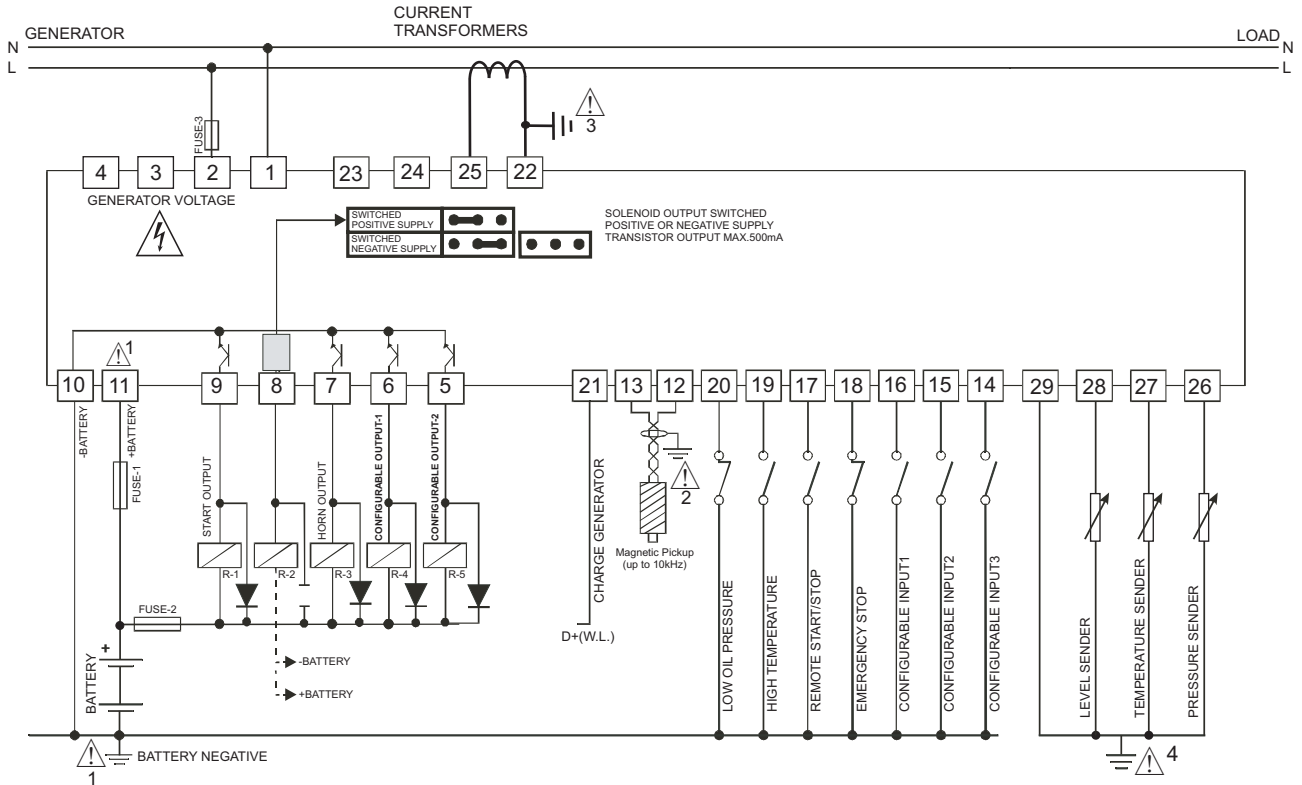


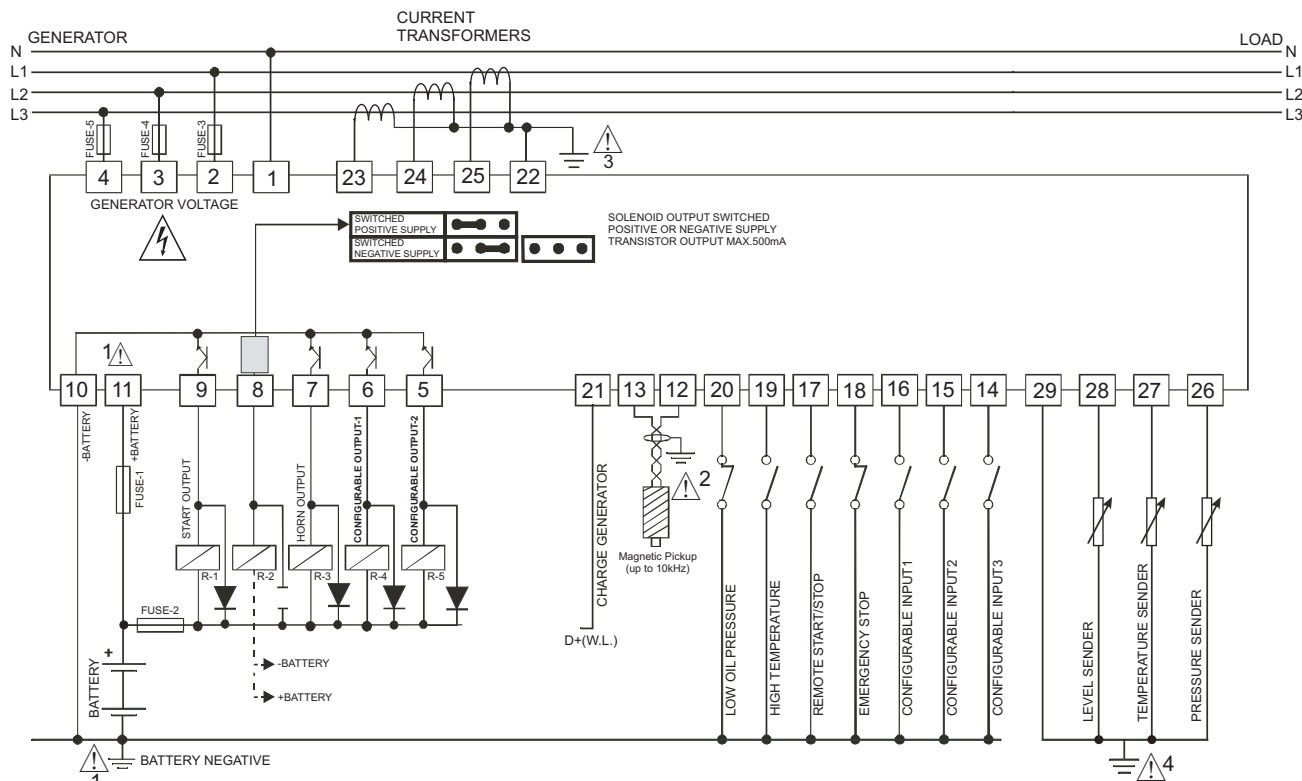
Figure 2.2 Panel Cut-Out

### 3. Electrical Connection

#### 3.1 1-Phase Connections Schematic



#### 3.2 3-Phase Connections Schematic

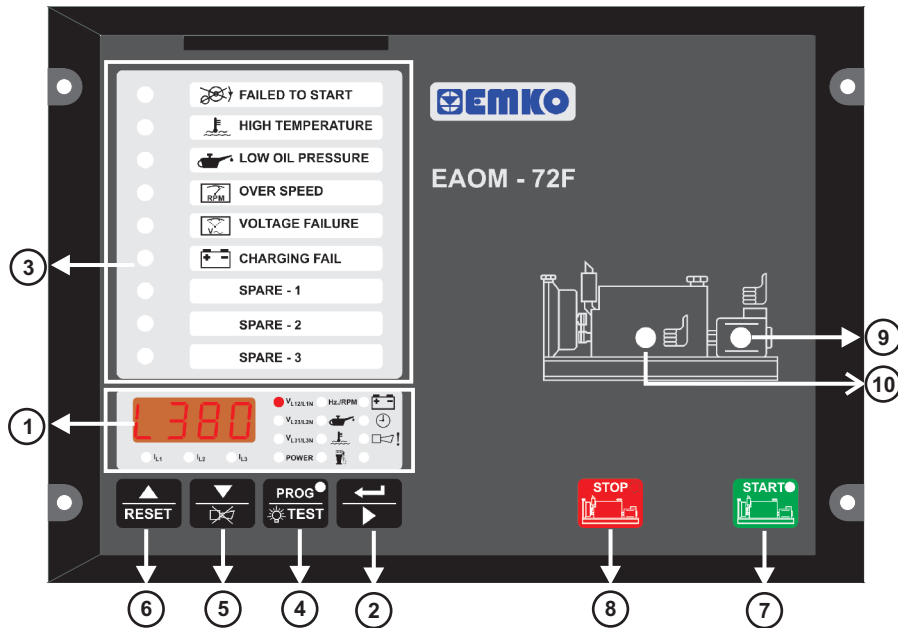


FUSE-1, FUSE-3, FUSE-4, FUSE-5    1A. T  
 FUSE-2    2A. T



- 1- Connect the unit as shown in the appropriate diagram above. Be sure to connect the battery supply the right way round and battery negative should be grounded. The connectors can be unplugged from the rear of the unit to facilitate connection.
- 2- Screened cable must be used for connecting the Magnetic Pickup, ensuring that the screen is grounded at one end ONLY.
- 3- Secender side of the current transformer must be connected to the earth point on the engine body.
- 4- The senders side common must be connected to the earth point on the engine body.

## 4. Front Panel Description and Error Messages



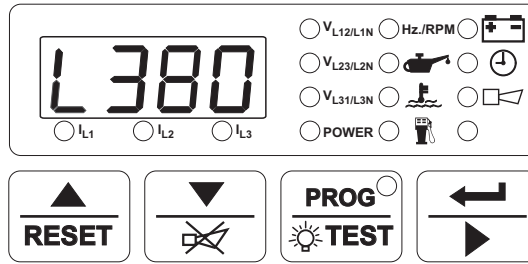
Number	Comment
1	Four-digit, seven-segment LED display. This displays the selected parameter from the list alongside. Use the Display scroll button (2) to select which parameter is to be displayed, as indicated by the adjacent LEDs.
2	The Display Scroll Button is used to step through all of the measured parameters.
3	Failure indicators – These LEDs flash continually in the event of a fault.
4	Programming / Lamp Test. Lights all the LEDs and segments on the panel so that you can see if any are not working. Holding the button pressed for five seconds puts the unit into Programming mode.
5	Down/Silence Alarm. Silences the audible alarm. The Decrement (down arrow) button is used in Programming mode as detailed in Section 5 Parameters.
6	Up/Reset. Restores unit operation after it has latched in a fault condition. The Increment (up arrow) function is used in Programming mode as detailed in Section 5 Parameters.
7	Start button. Starts the engine. A green LED in the corner shows that the button has been pressed
8	Stop button. Stops the engine. A red LED in the corner shows that the button has been pressed.
9	Alternator LED. The green LED illuminates to indicate that alternator output is available and within the defined operating limits.
10	Engine running LED. The green LED illuminates when the engine is running.

### Error Messages and Explanations :

- EStP** - Emergency Stop
- bAT1** - Low Battery Voltage
- bAT2** - Weak Battery Alarm
- bAT3** - High Battery Voltage Alarm
- ocr** - Over Current Failure
- Serv** - Routine maintenance due
- LOPr** - Low Oil Pressure
- HiEtE** - High Coolant Temperature Alarm
- LoFL** - Low Fuel Level Alarm

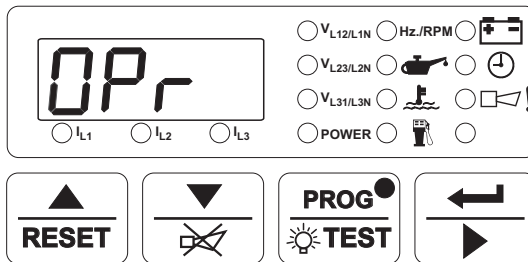
## 5. Accessing To The Parameters

### Operation Screen



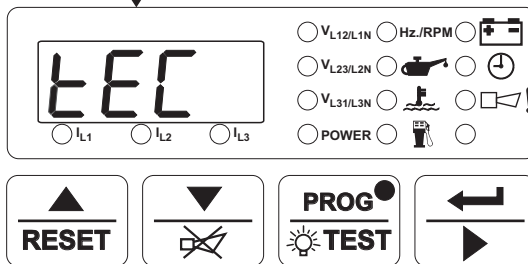
When button is pressed, all leds and digits are energised, because prog button is also used as test button. Continue to press the prog button for 5 seconds, Operator Menu Entering screen is shown and prog led lights on.

### Operator Menu Entering Screen



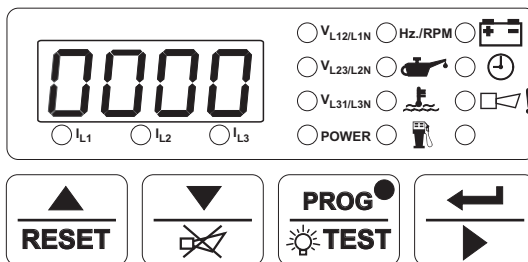
When button is pressed for 10 seconds, technician menu entering screen is shown.

### Technician Menu Entering Screen



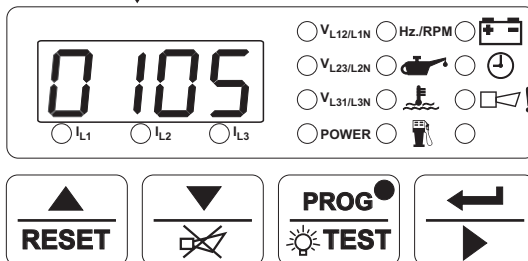
When button is pressed, technician password entering screen is shown.

### Technician Password Entering Screen



Change the password with and buttons

### Technician Password Entering Screen

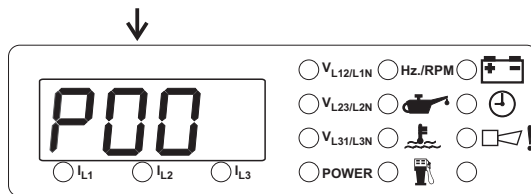


After entering the password, press the button for confirming the password and accessing to the first parameters of technician parameters.



**NOTE :** If no operation is performed for 20 seconds, the device exits from the programming mode and turns to the main operation screen.

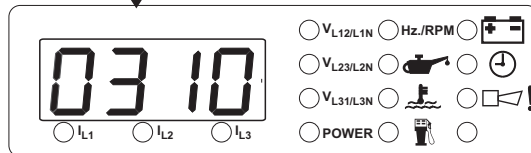
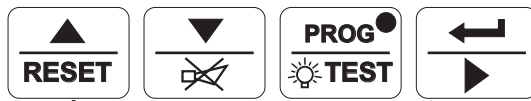


Press  button for accessing to the **P00** Value

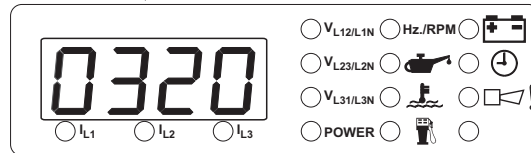
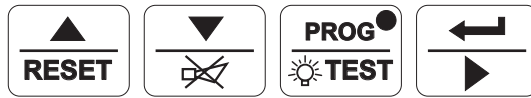


**Alternator Voltage Lower Limit Parameter**


Change the **P00** parameter with  and  buttons

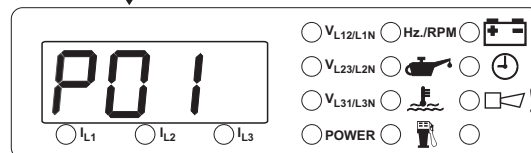
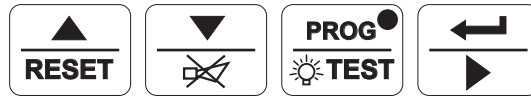


**Alternator Voltage Lower Limit Value**




**Alternator Voltage Lower Limit Value**

Press  button for saving the **P00** value and accessing to the **P01** Parameter



**Alternator Voltage Upper Limit Parameter**

**NOTE :** Other technician paramaters can be accessed as explained for **P00**  
For exiting from programming mode, press 

**NOTE :** If no operation is performed for 20 seconds, the device exits from the programming mode and turns to the main operation screen.

## 6. Parameters

The unit is extensively programmable through the front panel and via PC software.

No	Definition of Parameter	Min	Max	Default	Unit
P00	Alternator Voltage Lower Limit	60	600	300	V <sub>~</sub>
P01	Alternator Voltage Upper Limit	60	600	440	V <sub>~</sub>
P02	Speed Lower Limit	30.0	75.0	47.0	Hz
P03	Speed Upper Limit	30.0	75.0	53.0	Hz
P04	Battery Voltage Lower Limit	7.2	24.0	8.0	V <sub>---</sub>
P05	Battery Voltage Upper Limit	12.0	32.0	30.0	V <sub>---</sub>
P06	Over Current Limit	1	9999	1000	A
P07	Periodic Maintenance Hour Set Value	0	9999	0	Hour
P08	Periodic Maintenance Hour Reset	Press 'Silence Alarm' button to reset			
P09	Horn Duration (0 = Continuous)	0	999	60	Second
P10	Preheat Time	0	99	10	Second
P11	Phase Type Selection	1/2/3/Series Delta		3	
P12	Nominal Alternator Frequency	50.0/60.0		50.0	Hz
P13	Nominal Speed	500	5000	3000	RPM
P14	Tooth Number	1	1000	100	
P15	Current Transformer Ratio	1	2000	500	
P16	Speed Sensing Input Selection	0-Alternator Signal 1-Magnetic Pick-up		1	
P17	Stop / Fuel Solenoid Selection	Stop / Fuel		Fuel	
P18	Stop Magnet Energising Time	0	99	20	Second
P19	Remote Start Time Delay	0	60	10	Second
P20	Remote Stop Time Delay	0	60	5	Second
P21	Engine started signal	0=No, 1=Yes			
	P21.0 Charge Generator	0/1		1	
	P21.1 Speed	0/1		0	
	P21.2 Alternator Voltage	0/1		1	
	P21.3 Oil Pressure	0/1		0	
P22	Battery Voltage Weak Limit	6.0	14.4	7.0	V <sub>---</sub>
P23	Battery Voltage Weak Control Time	1	99	3	Second
P24	Alternator voltage limit for crank disconnection	40	360	300	V <sub>~</sub>
P25	Speed Limit For Crank Disconnection	20.0	45.0	40.0	Hz
P26	Number Of Starting Attempts	1	10	3	
P27	Starting Attempt Duration	5	99	5	Second
P28	Oil Pressure Bypass Time	0	99	30	Second
P29	Warm-up Time Delay	0	99	10	Second
P30	Control on Delay / Fast Loading Selection	0=Control on Delay 1=Fast Loading		0	Second
P31	Control On Delay	0	99	10	Second
P32	Alternator Voltage Fault Control Delay	0.0	10.0	5.0	Second
P33	Speed Fault Control Delay	0.0	10.0	5.0	Second
P34	Engine Cooling Time(0 = disable)	0	99	3	Minute
P35	Engine Running Time Reset	Enter technician password to reset time to '0' (zero)			

No	Definition of Parameter	Min	Max	Default	Unit
P36	Configurable Failure Input-1	0	4	0	
	0 - Status				
	1 - Fire switch				
	2 - Only horn temporary				
	3 - Only horn permanent				
P37	Configurable Failure Input-2	0	4	0	
	0 - Status				
	1 - Fire switch				
	2 - Only horn temporary				
	3 - Only horn permanent				
P38	Configurable Failure Input-3	0	4	0	
	0 - Status				
	1 - Fire switch				
	2 - Only horn temporary				
	3 - Only horn permanent				
P39	Observing Time of Configurable Failure Inputs				
	P39.0 - For Configurable Failure Input-1				
	0 - Observation Continuously	0	1	0	
	1 - Observation While Engine Running				
	P39.1 - For Configurable Failure Input-2				
	0 - Observation Continuously	0	1	0	
	1 - Observation While Engine Running				
P40	Configurable Output-1	0	16	0	
	0 - Alarm out				
	1 - Engine running				
	2 - Load permit				
	3 - Preheat				
	4 - Over speed				
	5 - Over current				
6 - Low fuel level					
7 - High temperature					
8 - Low oil pressure					
9 - Maintenance due					
10 - Failed to start					
11 - Over / under speed					
12 - Voltage failure					
13 - Charging failure					
14 - Low battery value					
15 - High battery voltage					
16 - Weak battery					

No	Definition of Parameter	Min	Max	Default	Unit
P41	Configurable Output-2	0	16	0	
	0 - Alarm out				
	1 - Engine running				
	2 - Load permit				
	3 - Preheat				
	4 - Over speed				
	5 - Over current				
	6 - Low fuel level				
	7 - High temperature				
	8 - Low oil pressure				
	9 - Maintenance due				
	10 - Failed to start				
	11 - Over / under speed				
	12 - Voltage failure				
	13 - Charging failure				
	14 - Low battery value				
	15 - High battery voltage				
	16 - Weak battery				
P42	Oil Pressure Switch / Sender Selection	0-Switch 1-Sender		0	
P43	Pressure Lower Limit	0.0	99.9	42.6	
P44	Pressure Configuration	0	2	1	
	0 - Disable the analog input				
	1 - Pre-alarm				
	2 - Shut down				
P45	Temperature Upper Limit	0	300	176	
P46	Temperature Configuration	0	2	1	
	0 - Disable the analog input				
	1 - Pre-alarm				
	2 - Shut down				
P47	Level Lower Limit	0	300	75	
P48	Level Configuration	0	2	1	
	0 - Disable the analog input				
	1 - Pre-alarm				
	2 - Shut down				
P49	Operator Password	0	9990	0	
P50	Technician Password	0	9990	0	

## 7. Specifications

<b>Equipment Use</b>	: Electrical control equipment for generating sets
<b>Housing&amp; Mounting</b>	: 144mmx204mmx37mm (including connectors) plastic housing for panel mounting
<b>Panel Cut-Out</b>	: 138mmx186mm
<b>Protection</b>	: NEMA4X (IP65 at front panel, IP20 at rear side)
<b>Weight</b>	: Approximately 0.7 kg
<b>Environmental Ratings</b>	: Standard, indoor at an altitude of less than 2000 meters with non-condensing humidity.
<b>Operating/Storage Temperature</b>	: -25 °C to +70 °C / -40 °C to +85 °C
<b>Operating/Storage Humidity</b>	: 90 % max. (None condensing)
<b>Installation Overvoltage Category</b>	: II appliances, portable equipment
<b>Pollution Degree</b>	: II, normal office or workplace, none conductive pollution
<b>Mode of Operation</b>	: Continuous
<b>Supply Voltage(---)</b>	: 8-32 V---
<b>Supply Voltage Measurement</b>	: 8-32 V---, accuracy:1% FS, resolution : 0.1 V---
<b>Generator Voltage Measurement</b>	: Single phase, 2 wire 35 to 300 VL-N ~ Single phase, 3 wire 35 to 300 VL-N ~ Three phase, 4 wire 35 to 300 VL-N ~
<b>Measurement Accuracy</b>	: 1% of range (Voltage and Current) 2% of range (Resistive)
<b>Cranking Dropouts</b>	: Battery voltage can be 0V--- for max. 100msn during cranking (battery voltage should be at least nominal voltage before cranking)
<b>Generator Speed Measurement</b>	: From alternator or magnetic pickup
<b>Alternator Frequency Range</b>	:10-110 Hz. (@35-300 VL-N---)
<b>Magnetic Pickup Freq. Range</b>	:35 Hz - 10 kHz (@3-35 Volts peak)
<b>Load Current Measurement</b>	: Via three current transformer inputs 0-5A~
<b>Analogue Resistive Sender Input Range</b>	: 10 to 650Ω
<b>Communication Interface</b>	: RS-232 serial communication
<b>Contact Sensing Input</b>	: Emergency Stop (NC), Oil pressure switch (NC), Temperature switch (NO), Remote start / stop input (NO), Configurable input 1 (NO), Configurable input 2 (NO), Configurable input 3 (NO)
<b>Output</b>	: Start Output (500mA transistor output), Fuel Output (500mA transistor output), Alarm Output (500mA transistor output),Configurable Output-1 (500mA transistor output), Configurable Output-2 (500mA transistor output)
<b>Led Display</b>	: Voltage L1-L2, Voltage L1-N, Voltage L2-L3, Voltage L2-N, Voltage L3-L1, Voltage L3-N, L1 current, L2 current, L3 current, Fuel tank level value, Generator KVA output, Error indication, Engine RPM, Program parameters, Alternator frequency (Hz), Battery voltage (V---), Engine running time, Oil pressure value, Coolant system temperature
<b>Failure Indicators</b>	: Engine Start, Low Oil Pressure, High Engine Temperature, Over Speed, Generator Voltage, Charging Fail, User Configurable Input 1, User Configurable Input 2, User Configurable Input 3
<b>Status Indicators</b>	: Engine Start, Engine Stop, Engine Running, Generator ready to take the load
<b>Information Alarms</b>	: Emergency stop, Low battery voltage, High battery voltage, Weak battery alarm, Routine maintenance due, Over current failure, Low oil pressure, High temperature alarm, Low fuel level
<b>Approvals</b>	: GOST-R, C €