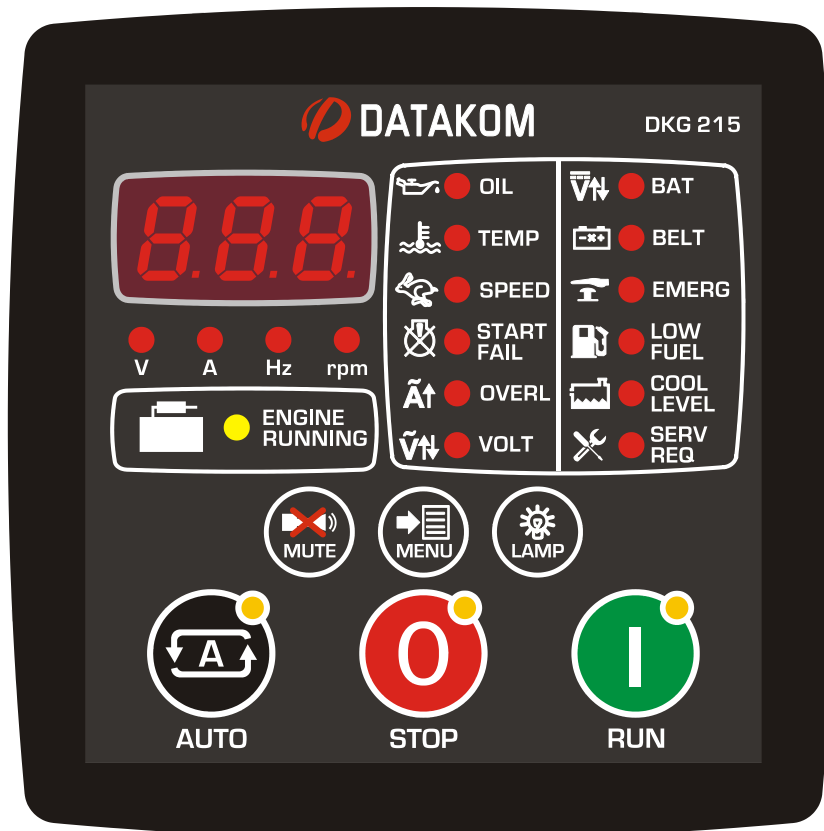# DKG-215 MANUAL AND REMOTE START UNIT

FEATURES

Manual and remote starting and stopping
Zero power consumption at rest
Engine control mode available
Generator protection
Built in alarms and warnings
1 phase genset voltage input
1 phase genset CT input
Magnetic Pickup input
Engine oil pressure measurement
Engine coolant temperature measurement
Engine fuel level measurement
Genset active power measurement (single phase)
Genset power factor measurement (single phase)
Periodic maintenance request indicator
Engine hours run counter
Event logging
Statistical counters

Front panel configurable
100+ adjustable parameters
Logic level serial port
Optional RS-232 adapter
Free MS-Windows Remote monitoring SW:
    -monitoring
    -download of parameters
LED displays
Configurable analogue inputs: 3
Configurable digital inputs: 5
Digital outputs: 5
Survives cranking dropouts
Sealed front panel
Plug-in connection system for easy replacement
Small dimensions (96x96x53mm)
Low cost

TABLE OF CONTENTS

1. INSTALLATION

1.1 Introduction to the Control Panel

The unit is a control and protection panel used in gensets. It shows the measured values on its displays. The unit is designed to provide user friendliness for both the installer and the user. Programming is usually unnecessary, as the factory settings have been carefully selected to fit most applications. However programmable parameters allow the complete control over the generating set. Programmed parameters are stored in a Non Volatile Memory and thus all information is retained even in the event of complete loss of power.

The measured parameters are:
Gen voltage phase L1 to neutral
Gen current phase L1
Gen frequency
Gen KW phase L1
Gen power factor phase L1
Battery voltage
Engine rpm
Coolant temperature
Oil pressure
Fuel level

1.2 Mounting the Unit

The unit is designed for panel mounting. The user should not be able to access parts of the unit other than the front panel.

Mount the unit on a flat, vertical surface. The unit fits into a standard panel meter opening of 91x91 millimeters. Before mounting, remove the connectors from the unit, then pass the unit through the mounting opening. The unit will be maintained in its position by the mounting brackets. Screw gently in the fixing screws.

> ⚠️ **Engine body must be grounded for correct operation of the unit, otherwise incorrect voltage and frequency measurements may occur.**

The output of the current transformer shall be 5 Amperes. The input current rating of the current transformers may be selected as needed (between 10/5 and 9000/5 amps). Current transformer outputs shall be connected by separate cable pairs from each transformer, to related inputs. Never use common terminals or grounding. The power rating of the transformer should be at least 5 VA. It is recommended to use 1% precision transformers.

If analogue senders (e.g. temperature or oil pressure) are connected to the unit, it is not possible to use auxiliary displays, otherwise the unit may be destroyed. If temperature or oil pressure displays are already present on the generator control panel, do not connect the senders to the unit. The unit is factory programmed for VDO type senders. However different types of senders are selectable via programming menu. Please check the programming section.

The programmable digital inputs are compatible with both **'normally open'** and **'normally closed'** contacts, switching either to **BAT-** or **BAT+**.

The charge alternator connection terminal provides also the excitation current, thus it is not necessary to use an external charge lamp.

1.3 Wiring the Unit

WARNING: THE UNIT IS NOT FUSED.
Use external fuses for Generator phase: L1, Battery positive:
BAT(+).
Install the fuses as nearly as possible to the unit in a
place easily accessible for the user.
The fuse rating should be 6 Amps.

WARNING: ELECTRICITY CAN KILL
ALWAYS disconnect the power BEFORE
connecting the unit.The fuse rating should be 6 Amp

1) *ALWAYS remove the plug connectors when inserting wires*
   with a screwdriver.
2) *ALWAYS refer to the National Wiring Regulations when*
   conducting installation.
3) *An appropriate and readily accessible set of disconnection*
   devices (e.g. automatic fuses) MUST be provided as part of the
   installation.
4) *The disconnection device must NOT be fitted in a flexible cord.*
5) *The building mains supply MUST incorporate appropriate*
   short-circuit backup protection (e.g. a fuse or circuit breaker)
   of High Breaking Capacity (HBC, at least 1500A).

2. INPUTS AND OUTPUTS

SERIAL DATA: This connector provides logic level serial data input and output for various purposes like remote monitoring and remote programming. In order to connect to a PC, an RS-232 adapter module is needed.

Term	Function	Technical data	Description
1	L1	Generator phase input, 0-300V-AC	Connect the generator phase to this input. The generator phase voltage upper and lower limits are programmable.
2	GENERATOR NEUTRAL	Input, 0-300V-AC	Neutral terminal for the generator phases.

Term	Function	Technical data	Description
3	CURR_U+	Current transformer inputs, 5A-AC	Connect the generator current transformer terminals to these inputs. Do not connect the same current transformer to other instruments otherwise a unit fault will occur. Connect each terminal of the transformer to the unit's related terminal. Do not use common terminals. Do not use grounding. Correct polarity of connection is vital. If the measured power is negative, then change the polarity of each 3 current transformers. The secondary winding rating shall be 5 Amperes. (For ex. 200/5 Amps).
4	CURR_U-		
5	PROGRAM LOCK	Input	If this input is connected to Battery negative, then Program mode entry will be disabled.
6	EMERGENCY STOP SW.	Digital inputs	These inputs have programmable characteristics selected via the program menu. Each input may be driven by a '**normally closed**' or '**normally open**' contact, switching either **battery+** or **battery-**. The effect of the switch is also selectable from a list. See **PROGRAMMING** section for more details.
7	LOW FUEL LEVEL SWITCH		
8	LOW COOLANT LEVEL SW.		
9	HIGH TEMP SWITCH		
10	LOW OIL PRESSURE SW.		

Term	Function	Technical data	Description
11	REMOTE START	Input	In **AUTO** mode, the battery positive voltage applied to this input will cause the engine to run. If the unit is not in AUTO mode, this signal will turn on the unit, but the engine will not run.
12	BATTERY POSITIVE	+12 or 24VDC	The positive terminal of the DC Supply shall be connected to this terminal. The unit operates on both 12V and 24V battery systems.
13	MAGNETIC PICKUP	Inputs, 1-30V 0-10KHz	Connect the magnetic pickup signal to these inputs.
14	MAGNETIC PICKUP		
15	GROUND	O VDC	Power supply negative connection.

Term	Function	Technical data	Description
16	**RELAY-3 (PREHEAT)**	Output 1A/28VDC	This digital output has programmable function, selectable from a list.
17	**RELAY-2 (ALARM)**	Output 1A/28VDC	This digital output has programmable function, selectable from a list.
18	**RELAY-1 (STOP RELAY)**	Output 1A/28VDC	This digital output has programmable function, selectable from a list.
19	**START RELAY**	Output 1A/28VDC	This digital output controls the engine cranking.
20	**FUEL RELAY**	Output 1A/28VDC	This digital output is used for fuel solenoid control. It is internally connected to terminal **21** for supplying the charge alternator's excitation current.
21	**CHARGE**	Input and output	Connect the charge alternator's **D+** terminal to this terminal. This terminal will supply the excitation current and measure the voltage of the charge alternator.
22	**OIL PRESSURE SENDER**	Input, 0-5000 ohms	Analogue oil pressure sender connection. Do not connect the sender to other devices. The input has programmable characteristics and connects to any kind of sender.
23	**COOLANT TEMP. SENDER**	Input, 0-5000 ohms	Analogue high temperature sender connection. Do not connect the sender to other devices. The input has programmable characteristics and connects to any kind of sender.
24	**FUEL LEVEL SENDER**	Input, 0-5000 ohms	Analogue fuel level sender connection. Do not connect the sender to other devices. The input has programmable ohm value.

3. DISPLAYS

3.1 Led Displays

The unit has 20 LEDs, grouped as below:

Function	Color	Description
GENERATOR	Yellow	The LED will flash when the generator is running. It turns on when genset contactor output function is active (genset ready for load).
AUTO-OFF-RUN	Yellow	The LED will turn on when the related operating mode is selected.
SERVICE REQUEST	Red	Engine periodic maintenance request indicator. It turns on when the preset engine hours or time duration after previous service has elapsed.
ALARM GROUP	Red	If a warning condition has occurred, the related led flashes. If a fault condition resulting to the engine shutdown has occurred, the related alarm led turns on steadily. The alarms work on a first occurring basis. The occurrence of a fault will disable other faults of lower or equal priority.
UNIT GROUP	Red	This group indicates the unit of the value displayed in the digital display. By default, the unit displays the genset frequency. Different values may be scrolled by pressing the **MENU** key.

3.2 Digital Display

The unit has a three digit seven segment display. It shows:
- Measured parameters,
- Parameter names,
- Service counters,
- Program parameters.

The navigation between different screens in a group is made with the **MENU** button. When the MENU key is pressed, the parameter name will be displayed.
By pressing the MENU key, below values may be displayed:

- generator phase L1 to neutral voltage
- generator phase-L1 current
- generator frequency
- generator cosΦ phase L1
- generator active power phase L1
- oil pressure (bar)
- coolant temperature (ºC)
- fuel level (%)
- battery voltage

Holding the **MENU** button pressed for 1 second makes the display to switch to the service counters group:
- total engine hours,
- engine hours to service,
- time to service.

4. ALARMS AND WARNINGS

Alarms indicate an abnormal situation in the generating set are divided into 2 priority levels:

1- **ALARMS:** These are the most important fault conditions and cause:
- The related alarm led to turn on steadily,
- The engine to be stopped immediately,
- The **Horn**, **Alarm** and **Alarm+Warning** output functions to become active.

2- **WARNINGS:** These conditions cause:
- The related alarm led to flash,
- The **Horn** and **Alarm+Warning** output functions to become active.

If the **ALARM MUTE** button is pressed, the Horn output function will be deactivated; however the existing alarms will persist and disable the operation of the genset.

Alarms operate in a first occurring basis:
-If an alarm is present, following alarms and warnings will not be accepted,
-If a warning is present, following warnings will not be accepted.

Alarms may be of LATCHING type following programming. For latching alarms, even if the alarm condition is removed, the alarms will stay on and disable the operation of the genset.

The existing alarms may be canceled by pressing one of the operating mode buttons (**AUTO / RUN / STOP**).

Most of the alarms have programmable trip levels. See the programming chapter for user adjustable alarm limits.

LOW OIL PRESSURE: Set if a signal is detected at the Low Oil Pressure Switch input or the oil pressure value measured from the sender is below the programmed limit. **Warning** (**P_13**) and **alarm** (**P_14**) limits are separately programmable for the oil pressure sender input. This fault will be monitored with holdoff timer (**P_23**) delay after the engine is running. Also if the oil pressure switch is open at the beginning of a start attempt, then the engine will not be started and the oil pressure led will flash. When the oil pressure switch closes, normal operation will be resumed.

HIGH ENGINE TEMPERATURE: Set if a signal is detected at the High Temperature Switch input or the coolant temperature value measured from the sender is above the programmed limit. **Warning** (**P_15**) and **alarm** (**P_16**) limits are separately programmable for the temperature sender input.

OVER / UNDER SPEED: Set if the generator frequency is outside programmed limits (overspeed/Underspeed). This fault will be monitored with holdoff timer (**P_23**) delay after the engine is running. Different low and high limits for warning and alarm are separately programmable. (**P_06/P_07/P_08/P_09**)

FAIL TO START: Set if the engine is not running after programmed number of start attempts. (**P_31**)

OVERLOAD: Set if the genset phase current goes over the **Overcurrent Limit (P_02)** or if the genset phase active power (KW) measured on phase-L1 goes over the **Excess Power (P_03)** limit for **Overcurrent / Excess Power Timer (P_24)**. If the current and power go below the limits before expiration of the timer then no alarm will be set. If the **Overcurrent Limit (P_02)** or **Excess Power (P_03)** limit is set to zero then the corresponding check will be omitted.

LOW / HIGH VOLTAGE: Set if any of the generator phase voltages goes outside programmed limits (**P_04/P_05**). This fault will be monitored with holdoff timer (**P_23**) delay after the engine is running.

LOW / HIGH BATTERY: Set if the battery voltage goes outside programmed limits. During engine cranking this fault is not monitored. Warning level for low battery voltage (**P_10**) and both warning (**P_11**) and alarm (**P_12**) levels for high battery voltage are programmable.

BELT BROKEN: Set if a charge alternator failure (or broken belt) occurs. This fault condition may result to a **warning** or **alarm** following programming. (**P_34**)

EMERGENCY STOP: Set if a signal is detected at the emergency stop input.

LOW FUEL LEVEL: Set if a signal is detected at the Low Fuel Level Switch input or the fuel level measured from the sender is below the programmed limit. **Warning** (**P_17**) and **alarm** (**P_18**) limits are separately programmable for the fuel level sender input.

LOW COOLANT LEVEL: Set if a signal is detected at the Low Coolant Level input.

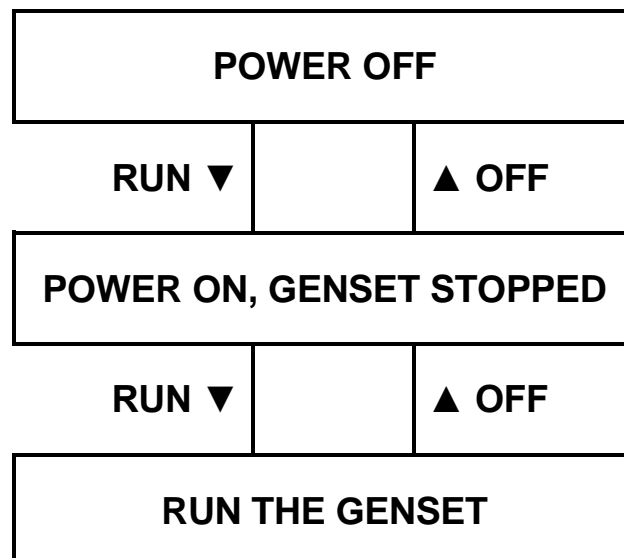**SERVICE REQUEST:** Please rewiev chapter 6.6

5. MODES OF OPERATION

The unit will power-up when the front panel **RUN** button is pressed. It will turn-off if the **STOP** button is pressed. If no key is pressed it will power down automatically after approximately 4 minutes. If needed, the automatic power-down feature may be disabled with the program parameter **P_37**.

When the unit is powered up, if the **RUN** button is pressed again, then the genset will run. When the engine is running the **GENERATOR** led will flash. When the genset is ready for load, it will turn on steadily. If the **STOP** button is pressed the genset will stop, but the unit will stay powered-up. If the **STOP** button is pressed again or no key is pressed during 4 minutes then it will power-down automatically.

If an alarm occurs during any operation status, the genset will stop and the related alarm led will turn on steadily. The unit will not power down until the alarm is cancelled with the **STOP** button.

If **AUTO** mode is selected, then the **REMOTE START** (**11**) input is enabled. It does not need any programming. Please check chapter 6.1 for the remote start operation.

```
┌─────────────────────────────────────┐
│            POWER OFF                 │
└─────────────────────────────────────┘
       RUN ▼            ▲ OFF
┌─────────────────────────────────────┐
│      POWER ON, GENSET STOPPED        │
└─────────────────────────────────────┘
       RUN ▼            ▲ OFF
┌─────────────────────────────────────┐
│          RUN THE GENSET              │
└─────────────────────────────────────┘
```

6. OTHER FEATURES

6.1 Engine Control Mode

The unit offers the possibility of engine speed protection through the magnetic pickup input, instead of genset frequency. This option enables the control of a diesel engine without alternator.

The engine control mode is entered by setting the parameter **P_42=1**.

When **P_42=1**, the speed protection program parameters (**P_06** to **P_09**) apply to the engine rpm, instead of the genset frequency.

In engine control mode, when the engine runs, the display switches automatically to rpm mode. However all measurements can be visualized by pressing the **MENU** button.

The engine rpm is displayed with 3 digits, in 10 rpm steps. As an example, 1500 rpm is displayed as 1.50 (x1000 rpm).

The engine cranking is cut at **512 rpm**. Crank cutting with oil pressure and charge alternator are also available via parameters **P_40** and **P_41**.

In engine control mode, genset voltage and current inputs can be left open. However these inputs can be connected and measured as well. Voltage and overload checks are still performed following parameter setting (P_02, P_03, P_04, P-05).

Below parameters must be programmed to adequate values in engine control mode:

P_04=0 (genset voltage low limit)
P_06=low rpm shutdown limit
P_07=low rpm warning limit
P_08=high rpm warning limit
P_09=high rpm shutdown limit
P_40=as desired
P_41=as desired

6.2 Remote Start Operation

The unit offers the possibility of **REMOTE START** mode of operation. The **REMOTE START** (**11**) input is enabled only in **AUTO** mode and does not need any programming.

The **REMOTE START** signal is always the battery positive voltage. Due to the **zero power at rest** structure, power should be supplied to this input in order to wake-up the unit.

⚠️ **Do not connect a voltage greater than the battery positive to this input, otherwise permanent damage to the unit may occur.**

The **REMOTE START** signal is equivalent to 2 successive depressions of the **RUN** button. This means that, upon arrival of the **REMOTE START** signal the unit:
-will power up
-will run the engine

6.2 Sender type Selection

The unit has the ability to adapt to any type of oil pressure and temperature senders. The commonly used standard sender characteristics are recorded in memory and selectable from a list. However non standard senders may also be used by entering their characteristics to the table.

Oil Pressure Sender Type Selection:
The oil pressure sender is selected using parameter **P_19**. The selectable sender types are:
0: The sender characteristics are defined in table using parameters **P_83** to **P_94**.
1: VDO 0-7 bars (10-180 ohms)
2: VDO 0-10 bars (10-180 ohms)
3: DATCON 0-7 bars (240-33 ohms)

Temperature Sender Selection:
The temperature sender is selected using parameter **P_20**. The selectable sender types are:
0: The sender characteristics are defined in table using parameters **P_95** to **P_106**.
1: VDO
2: DATCON DAH type
3: DATCON DAL type

6.3 Engine Heating Operation

Especially on engines without a body heater, or with a failing one, it may be desired that the genset should not take the load before reaching a suitable temperature. The unit offers 2 different ways of engine heating.

1. Timer controlled heating:
This operation mode is selected when the parameter **P_33** is set to **0**. In this mode, the engine will run during parameter **P_28**, and then the genset contactor output function will become active.

2. Timer and temperature controlled heating:
This operation mode is selected when the parameter **P_33** is set to **1**. In this mode, at first the engine will run during parameter **P_28**, then it will continue to run until the measured coolant temperature reaches the limit defined in parameter **P_22**. When the requested temperature is reached, the genset contactor output function will become active.This operation mode may be used as a backup to the engine body heater. If the engine body is warm the heating will be skipped.

6.5 Crank Cutting Options

The unit cuts cranking automatically when at least one of below conditions are met:

- Genset frequency greater than 10.0 Hz
- Genset voltage greater than 80 volts
- Engine rpm greater than 511 rpm.

Additionally crank cutting with oil pressure and charge alternator voltage are available:

P_40=1 Crank is cut when oil pressure is established, detected either from sender or switch input.
P_41=1 Crank is cut when charge alternator voltage is above 8 Volts.

Thus the total numbers of resources for crank cutting is 6.

6.6 Service Request Display

This led is designed to help the periodic maintenance of the genset to be made consistently.

The periodic maintenance is basically carried out after a given engine hours (for example 200 hours), but even if this amount of engine hours is not fulfilled, it is performed after a given time limit (for example 12 months).

> ⚠️ **The SERVICE REQUEST led has no effect on the genset operation.**

The unit has both programmable engine hours and maintenance time limit. The engine hours is programmable with 50-hour steps (**P_35**), the time limit is programmable between with 1 month steps (**P_36**). If any of the programmed values is zero, this means that the parameter will not be used. For example a maintenance period of 0 months indicates that the unit will request maintenance only based on engine hours, there will be no time limit. If the engine hours is also selected as 0 hours this will mean that the SERVICE REQUEST display will be inoperative.

When the engine hours **OR** the time limit is over, the **SERVICE REQUEST** led (red) will start to flash. **To turn off the led, and reset the service period, press together the ALARM MUTE and LAMP TEST keys for 5 seconds.** The display will show "**SER**".

The remaining engine hours and the remaining time limit are kept stored in a non-volatile memory and are not affected by power supply failures.

The remaining time and engine hours to service may be checked via the statistics menu selected by pressing the **MENU** key for **1 second**.

When the MENU key is pressed the display will show "**HtS**" (hours to service). When the MENU key is released it will show the first 3 digits of the engine hours to service. When the MENU key is pressed again, the display will show "**HtS**" (hours to service). When the MENU key is released it will show the last 3 digits of the engine hours to service.

When the MENU key is pressed the display will show "**ttS**" (time to service). When the MENU key is released it will show the first 3 digits of the remaining days to service. When the MENU key is pressed again, the display will show "**ttS**" (time to service). When the MENU key is released it will show the last 3 digits of the remaining days to service.

6.7 Engine Hour Meter

The unit features a non-erasable incremental engine hour meter. The hour meter information is kept in a non-volatile memory and is not affected by power supply failures.

The engine hours may be displayed via the statistics menu selected by pressing the **MENU** key for **1 second**.

When the MENU key is pressed the display will show "**EnH**" (engine hours). When the MENU key is released it will show the first 3 digits of the engine hours. When the MENU key is pressed again, the display will show "**EnH**" (engine hours). When the MENU key is released it will show the last 3 digits of the engine hours.

6.8 Remote Monitoring and Programming

Thanks to its serial port, the unit offers the remote monitoring and programming feature.

The serial port has logic level outputs and is connected to the PC or modem with below RS-232 adapter and cable.

The adapter-cable assembly is available at Datakom.

The RAINBOW remote monitoring and programming PC software may be downloaded from **www.datakom.com.tr** internet site.

The RAINBOW software allows the visualization and recording of all measured parameters. The recorded parameters may then be analyzed graphically and printed. The software also allows the programming of the unit and the storage of the program parameters to PC or the downloading of stored parameters from PC to the unit.

7. STATISTICAL COUNTERS

The unit provides a set of non resettable incremental counters for statistical purposes.

The counters consist on:

-total engine cranks,
-total genset runs,
-total genset on load.

These counters are kept in a non-volatile memory and are not affected from power failures.

The statistical counters are only displayed on the PC screen using the remote monitoring and programming software. They can not be displayed on the unit.

8. MAINTENANCE

DO NOT OPEN THE UNIT !

There are NO serviceable parts inside the unit.

Wipe the unit, if necessary with a soft damp cloth. Do not use chemical agents

9. PROGRAMMING

The program mode is used to program the timers, operational limits and the configuration of the unit.

To **enter the program mode**, press the **MENU** button for 5 seconds. The program mode is only allowed if the **PROGRAM LOCK** input (terminal_5) is left open. If this input is tied to **GROUND**, the program value modification will be disabled to prevent unauthorized intervention. It is advised to keep the **PROGRAM LOCK** input tied to **GROUND**.

The program mode will not affect the operation of the unit. Thus programs may be modified anytime, even while the genset is running.

In program mode, when the **MENU** key is pressed the display will show the program parameter number, when the **MENU** key is released the display will show the program parameter value. The first program number is "**P00**"

Each depression of the **MENU** key will cause the display to switch to the next program parameter. If the **MENU** key is hold pressed, the program numbers will increase by steps of 10. After the last parameter, the display switches back to the first parameter. The displayed parameter value may be increased or decreased using "▲" and "▼" keys. If these keys are hold pressed, the program value will be increased/decreased by steps of 10.

Program parameters are kept in a non-volatile memory and are not affected from power failures.

To **exit the program mode** press one of the mode selection keys. If no button is pressed during 1 minute the program mode will be cancelled automatically.

Pgm	Definition	Unit	Std Val	Description
0	Current Transformer Primary	A	500	This is the rated value of the current transformer. The secondary of the transformer will be 5 Amps. For values over 990A use 10% of the value. These values will be displayed as K-Amperes. (for ex. 1.85KA) Values under 100A may be used by multiplying with 10 in order to enable the current display with 0.1A precision. (for ex: 35.7A)
1	Current Transformer Decimal Point		0	This parameter determines the display range of current and active power: 0: 000-999 1: 0.00-9.99 2: 00.0-99.9
2	Overcurrent Limit	A	0	If the current goes above this limit, during the period defined in **P_24** an **OVERLOAD** alarm will be generated. Enter this information with the same format as parameter P_00. If the parameter is set to 0 then the Overcurrent checking is skipped.
3	Excess Power Limit	KW	0	If the active power measured on phase-U goes above this limit, during the period defined in **P_24,** an **OVERLOAD** alarm will be generated. Enter this information with the same format as parameter P_00. If the parameter is set to 0 then the Excess Power checking is skipped.
4	Gen. Voltage Low Limit	V	180	If the generator phase voltage goes under this limit when feeding the load, this will generate a **VOLTAGE** alarm and the engine will stop.
5	Gen. Voltage High Limit	V	270	If the generator phase voltage goes over this limit when feeding the load, this will generate a **VOLTAGE** alarm and the engine will stop.

Pgm	Definition	Unit	Std Val	Description
6	Low Speed Alarm	Hz / rpm	30	If the genset frequency goes under this limit, a **SPEED** alarm will be generated and the engine will stop. This alarm will be monitored after delay defined in **P_23** when the engine runs. If **P_42=1** then rpm/10 will be used instead of frequency.
7	Low Speed Warning	Hz / rpm	40	If the genset frequency goes under this limit, a **SPEED** warning will be generated. This warning will be monitored after delay defined in **P_23** when the engine runs. If **P_42=1** then rpm/10 will be used instead of frequency.
8	High Speed Warning	Hz / rpm	54	If the genset frequency goes over this limit, a **SPEED** warning will be generated. This warning will be monitored after delay defined in **P_23** when the engine runs. If **P_42=1** then rpm/10 will be used instead of frequency.
9	High Speed Alarm	Hz / rpm	57	If the genset frequency goes over this limit, a **SPEED** alarm will be generated and the engine will stop. This alarm will be monitored after delay defined in **P_23** when the engine runs. If **P_42=1** then rpm/10 will be used instead of frequency.
10	Low Battery Voltage Warning	V	9.0	If the battery voltage falls below this limit, this will generate a **BATTERY** warning.
11	High Battery Voltage Warning	V	31.0	If the battery voltage goes over this limit, this will generate a **BATTERY** warning.
12	High Battery Voltage Alarm	V	33.0	If the battery voltage goes over this limit, this will generate a **BATTERY** alarm and the engine will stop.
13	Low Oil Pressure Warning	Bar	1.5	If the oil pressure measured from the analog input falls below this limit, this will generate an **LOW OIL PRESSURE** warning. This input will be monitored after delay defined in **P_23** when the engine runs.
14	Low Oil Pressure Alarm	Bar	1.0	If the oil pressure measured from the analog input falls below this limit, this will generate an **LOW OIL PRESSURE** alarm. This input will be monitored after delay defined in **P_23** when the engine runs.
15	High Temperature Warning	ºC	90	If the coolant temperature measured from the analog input goes over this limit, this will generate a **HIGH ENG. TEMP.** warning.
16	High Temperature Alarm	ºC	98	If the coolant temperature measured from the analog input goes over this limit, this will generate a **HIGH ENG.TEMP.** alarm and the engine will stop.
17	Low Fuel Warning	%	20	If the fuel level measured from the analog input falls below this limit, this will generate a **LOW FUEL** warning.
18	Low Fuel Alarm	%	10	If the fuel level measured from the analog input falls below this limit, this will generate a **LOW FUEL** alarm and the engine will stop.

Pgm	Definition	Unit	Std Val	Description
19	Oil pressure sender type	-	1	This parameter selects the oil pressure sender type. **0:** Non standard sender. The sender characteristics are defined in table using parameters **P_83** to **P_94**. **1:** VDO 0-7 bars (10-180 ohms) **2:** VDO 0-10 bars (10-180 ohms) **3:** DATCON 0-7 bars (240-33 ohms)
20	Temperature sender type	-	1	This parameter selects the temperature sender type: **0:** The sender characteristics are defined in table using parameters **P_95** to **P_106**. **1:** VDO **2:** DATCON DAH type **3:** DATCON DAL type
21	Hysteresis Voltage	V	8	This parameter provides the genset voltage limits with a hysteresis feature in order to prevent faulty decisions. For example, when the genset voltage is present, the genset voltage low limit will be used as the programmed low limit **P_04**. When the genset fails, the low limit will be used as **P_04+P_21**. It is advised to set this value to 8 volts.
22	Engine Heating Temperature	ºC	50	If it is requested that the engine runs without load until reaching a certain temperature, this parameter defines the temperature.
23	Holdoff timer	sec	8	This parameter defines the delay after the engine runs and before the fault monitoring is enabled.
24	Overcurrent / Excess Power / Frequency Timer	sec	3	This is the period between the current or active power goes over the limits **(P_02/P_03)** and **OVERLOAD** alarms occurs. This is also the period between the frequency goes out of the limits (**P_06/P_09)** and **SPEED FAULT** alarm occurs.
25	Preheat timer	sec	1	This is the time after the fuel solenoid is energized and before the genset is started. During this period the **PREHEAT** output function will be active.
26	Start Timer	sec	6	This is the maximum start period. Starting will be automatically cancelled if the genset fires before the timer.
27	Wait between Starts	sec	10	This is the waiting period between two start attempts.
28	Engine Heating Timer	sec	3	This is the period used for engine heating following the program parameter **P_33**.
29	Cooling Timer	min	1.0	This is the period that the generator runs for cooling purpose after the unloading.
30	Stop Timer	sec	10	This is the maximum time duration for the engine to stop. During this period the STOP output function is active.
31	Start Attempts	-	3	This is the maximum number of start attempts.

Pgm	Definition	Unit	Std Val	Description
32	Horn Timer	sec	30	This is the period during which the **HORN** output function is active. If the period is set to 0, this will mean that the period is unlimited.
33	Engine Heating Type	-	0	This parameter defines the engine heating method. The genset will not take the load before engine heating is completed. **0:** engine is heated during the period defined by the **Engine Heating Timer (P_28)**. **1:** engine is heated until the coolant temperature reaches the temperature defined by **Engine Heating Temperature (P_22)** and at least during the period defined by the **Engine Heating Timer (P_28)**.
34	Charge input alarm	-	0	**0:** The charge input generates **BELT** warning, and does not stop the engine. **1:** The charge input generates **BELT** alarm, and stops the engine.
35	Maintenance Period (Engine Hours)	hours	50	The **SERVICE REQUEST** led indicator will turn on after this quantity of engine hours from the last service. If the period is set to '0' no **SERVICE REQUEST** will be generated depending on engine hours.
36	Maintenance Period (Months)	month	6	The **SERVICE REQUEST** led indicator will turn on after this amount of time from the last service. If the period is set to '0' no **SERVICE REQUEST** will be indicated depending on time
37	Disable auto power_off	0	0	**0:**if there is no alarm, the unit powers down 4 minutes after engine stop. **1:**the unit does not power_down.
38	Fuel Level Sender Ohms	ohms	180	Fuel level sender max resistance. 180 ohms and 300 ohms senders are common.
39	Crank Teeth count	-	60	This is the number of pulses generated by the magnetic pickup sensing unit in one turn of the flywheel.
40	Crank Stop with Oil Pressure	-	0	**0:** no crank stop with oil pressure **1:** cranking is stopped when oil presure switch is open or the oil pressure measured is above shutdown limit.
41	Crank Stop with Charge	-	0	**0:** no crank stop with charge input **1:** cranking is stopped when the charge alternator voltage is established.
42	Speed protection on MPU	-	-	**0:** speed protections on frequency **1:** speed protections on rpm
43	Unused	-	-	
44	Unused	-	-	
45	Unused	-	-	
46	Unused	-	-	
47	Unused	-	-	
48	Unused	-	-	
49	Unused	-	-	

The parameters P_050 to P_052 define the functions of digital outputs. The unit has 5 digital outputs and 3 of them have programmable functions. The fixed function outputs are Fuel and Start.

The function of a programmable output may be selected from the below list.

DIGITAL OUTPUT FUNCTİON LIST

Pgm	Description	Std
50	RELAY-1 function	03
51	RELAY-2 function	01
52	RELAY-3 function	07

00	Fuel		24	Oil sender alarm
01	Horn		25	Temp sender alarm
02	Start		26	Speed alarm
03	Stop		27	Start fail alarm
04	Genset Contactor		28	Belt alarm
05	-		29	Overload alarm
06	Choke		30	Voltage alarm
07	Preheat		31	Battery High alarm
08	Shutdown alarm		32	Oil switch warning
09	Warning		33	Temp switch warn.
10	Alarm+Warning		34	Coolant level warn.
11	-		35	Low fuel sw warn.
12	-		36	Emerg Stop warn.
13	-		37	-
14	Genset Voltage OK		38	-
15	Service Request		39	-
16	Oil switch alarm		40	Oil sender warning
17	Temp switch alarm		41	Temp sender warn.
18	Coolant level alarm		42	Speed warning
19	Low fuel sw. alarm		43	Fail to Stop
20	Emerg.Stop alarm		44	Belt warning
21	-		45	Battery low warning
22	-		46	Fuel Sender Warn.
23	-		47	Battery high warn.

Parameters from P_53 to P_82 program the functions of the digital inputs. The programmable properties of digital inputs are:
-action to be taken upon arrival of the fault signal (alarm, warning,etc...),
-when the fault monitoring will be enabled,
-latching of the fault signal,
-contact type (NO/NC)
-switching (bat+, bat-)
-response delay

LOW OIL PRESSURE SWITCH INPUT

Pgm	Description	Std	
53	Operation	0	**0:** Alarm (the engine stops and horn output operates)) **2:** Warning (the horn output operates) **3:** No operation
54	Fault monitoring	1	**0:** Always **1:** After holdoff timer
55	Latching	1	**0:** Non latching **1:** Latching
56	Contact type	0	**0:** Normally open **1:** Normally closed
57	Switching	0	**0:** Battery negative **1:** Battery positive
58	Response delay	1	**0:** No delay **1:** Delayed (4sec)

HIGH TEMPERATURE SWITCH INPUT

Pgm	Description	Std	
59	Operation	0	**0:** Alarm (the engine stops and horn output operates)) **2** Warning (the horn output operates) **3** No operation
60	Fault monitoring	0	**0:** Always **1:** After holdoff timer
61	Latching	1	**0:** Non latching **1:** Latching
62	Contact type	0	**0:** Normally open **1:** Normally closed
63	Switching	0	**0:** Battery negative **1:** Battery positive
64	Response delay	1	**0:** No delay **1:** Delayed (4sec)

LOW COOLANT LEVEL SWITCH INPUT

Pgm	Description	Std	
65	Operation	0	**0:** Alarm (the engine stops and horn output operates)) **2:** Warning (the horn output operates) **3:** No operation
66	Fault monitoring	0	**0:** Always **1:** After holdoff timer
67	Latching	1	**0:** Non latching **1:** Latching
68	Contact type	0	**0:** Normally open **1:** Normally closed
69	Switching	0	**0:** Battery negative **1:** Battery positive
70	Response delay	1	**0:** No delay **1:** Delayed (4sec)

LOW FUEL LEVEL SWITCH INPUT

Pgm	Description	Std	
71	Operation	0	**0:** Alarm (the engine stops and horn output operates)) **2:** Warning (the horn output operates) **3:** No operation
72	Fault monitoring	0	**0:** Always **1:** After holdoff timer
73	Latching	1	**0:** Non latching **1:** Latching
74	Contact type	0	**0:** Normally open **1:** Normally closed
75	Switching	0	**0:** Battery negative **1:** Battery positive
76	Response delay	1	**0:** No delay **1:** Delayed (4sec)

EMERGENCY STOP INPUT

Pgm	Description	Std	
77	Operation	0	**0:** Alarm (the engine stops and horn output operates)) **2:** Warning (the horn output operates) **3:** No operation
78	Fault monitoring	0	**0:** Always **1:** After holdoff timer
79	Latching	0	**0:** Non latching **1:** Latching
80	Contact type	0	**0:** Normally open **1:** Normally closed
81	Switching	0	**0:** Battery negative **1:** Battery positive
82	Response delay	0	**0:** No delay **1:** Delayed (4sec)

Parameters from P_83 to P_94 define the ohm-bar characteristics of the oil pressure sender. The sender characteristics will be defined using maximum 6 points. The values should be entered in the increasing order of ohm values. For unused points, ohm values should be entered as 0. An example table is given below. The sensor characteristics used in this table are:

0.0 bar.......240 ohms
1.0 bar........218 ohms
5.0 bar........153 ohms
10.0 bar......103 ohms

Pgm	Description	Unit	Value
83	Point_1 resistor	ohm	103
84	Point_1 pressure	bar	10.0
85	Point_2 resistor	ohm	153
86	Point_2 pressure	Bar	5.0
87	Point_3 resistor	Ohm	218
88	Point_3 pressure	Bar	1.0
89	Point_4 resistor	Ohm	240
90	Point_4 pressure	Bar	0.0
91	Point_5 resistor	Ohm	0
92	Point_5 pressure	Bar	0.0
93	Point_6 resistor	Ohm	0
94	Point_6 pressure	bar	0.0

Parameters from P_95 to P_106 define the ohm-degrees characteristics of the temperature sender. The sender characteristics will be defined using maximum 6 points. The values should be entered in the increasing order of ohm values. For unused points, ohm values should be entered as 0. An example table is given below. The sensor characteristics used in this table are:

38 ºC........342 ohms
82 ºC..........71 ohms
104 ºC........40 ohms
121 ºC........30 ohms

Pgm	Description	Unit	Value
95	Point_1 resistor	ohm	30
96	Point_1 temperature	ºC	121
97	Point_2 resistor	ohm	40
98	Point_2 temperature	ºC	104
99	Point_3 resistor	ohm	71
100	Point_3 temperature	ºC	82
101	Point_4 resistor	ohm	342
102	Point_4 temperature	ºC	38
103	Point_5 resistor	ohm	0
104	Point_5 temperature	ºC	0
105	Point_6 resistor	ohm	0
106	Point_6 temperature	ºC	0

10. TROUBLESHOOTING

AC voltage or frequency displayed on the unit are not correct:

-Check engine body grounding, it is necessary.
-The error margin of the unit is +/- 3 volts.
-If there are faulty measurements only when the engine is running, there may be a faulty charging alternator or voltage regulator on the engine. Disconnect the charging alternator connection of the engine and check if the error is removed.
-If there are faulty measurements only when mains are present, then the battery charger may be failed. Turn off the rectifier fuse and check.

KW and cosΦ readings are negative although the Amp readings are correct:

-The current transformer is connected with reverse polarity. Change the CT polarity.

⚠️   **Short circuit the outputs of unused Current Transformers.**

When the engine is to run the unit energizes the fuel solenoid, but does not start and OIL PRESSURE led flashes:

The unit is not supplied with battery (-) voltage at the oil pressure input.
-Oil pressure switch not connected.
-Oil pressure switch connection wire cut.
-Oil pressure switch faulty.
-Oil pressure switch closes too lately. If oil pressure switch closes, the unit will start. Optionally oil pressure switch may be replaced.

The engine does not run after the first start attempt, then the unit does not start again and OIL PRESSURE led flashes:

-The oil pressure switch closes very lately. As the unit senses an oil pressure, it does not start. When oil pressure switch closes the unit will start. Optionally the oil pressure switch may be replaced.

The engine starts to run but the unit gives START FAIL alarm and then the engine stops:

-The generator phase voltage is not connected to the unit. Measure the AC voltage between terminals **L1** and **Generator Neutral** at the rear of the unit while the engine is running. A fuse protecting the generator phases may be failed. A misconnection may be occurred. If everything is OK, turn all the fuses off, and then turn all the fuses on, starting from the DC supply fuse. Then test the unit again.

The unit is late to remove engine cranking:

-The generator voltage rises lately. Also the generator remnant voltage is below 20 volts. The unit removes starting with the generator frequency, and needs at least 20 volts to measure the frequency. If this situation is to be avoided, the only solution is to add an auxiliary relay. The coil of the relay will be between BATTERY (-) and charging alternator D+ terminal. The normally closed contact of the relay will be connected serially to the unit's START output. So the starting will also be removed when the D+ pulls to battery positive.

<u>**The unit is inoperative:**</u>

Measure the DC-supply voltage between terminals 12 and 15 at the rear of the unit. If OK, turn all the fuses off, then turn all the fuses on, starting from the DC supply fuse. Then test the unit again.

<u>**Programming mode can not be entered:**</u>

The program lock input disables programming mode entry. Disconnect the program lock input from battery negative before modification. Do not forget to make this connection again to prevent unauthorized program modifications.

11. DECLARATION OF CONFORMITY

The unit conforms to the EU directives
-2006/95/EC (low voltage)
-2004/108/EC (electro-magnetic compatibility)
Norms of reference:
EN 61010 (safety requirements)
EN 61326 (EMC requirements)

The CE mark indicates that this product complies with the European requirements for safety, health environmental and customer protection.

12. TECHNICAL SPECIFICATIONS

Alternator voltage: 15 to 300 V-AC (Ph-N)
Alternator frequency: 0-100 Hz.
Current input: from current transformer, .../5A. Max load 0.7VA
Digital inputs: input voltage 0 - 30 V-DC. Internally connected to battery positive via 4700 ohm resistor.
Analog inputs: Resistor input 0 to 5000 ohms connected to the battery negative. Sources 10 mA when closed to battery negative.
Magnetic pickup input: 1-30V-AC, 0 to 10 KHz.
Measurement category: CAT II
Air category: Pollution degree II
DC Supply range: 9.0 V-DC to 33.0 V-DC
Cranking dropouts: survives 0 V for 100ms
Typical standby current: 0 mA-DC
Maximum operating current: 100 mA-DC (digital outputs open)
Digital outputs: 1A / 28 V. Negative pulling protected semiconductor outputs.
Charge alternator excitation current: 150 mA-DC minimum.
Serial port: Logic levels. 2400 bauds, no parity, 1 bit stop.
Operating temperature range: -20°C to +70°C (-4 °F to +158 °F)
Storage temperature range: -30°C to +80°C (-22 °F to +176 °F)
Maximum humidity: 95%, non-condensing
IP protection: IP65 from front panel, IP30 from the rear
Dimensions: 96 x 96 x 53mm (WxHxD)
Panel Cut-out dimensions: 91 x 91mm minimum.
Mounting: Front panel mounted with rear retaining plastic brackets
Weight: 170 g (approx.)
Case material: High temperature, self extinguishing ABS (UL94-V0)

13. CONNECTION DIAGRAM

DATAKOM Electronics Ltd.
Tel: +90-216-466 84 60   Fax: +90-216-364 65 65   e-mail: datakom@datakom.com.tr   http: www.datakom.com.tr

- 24 -