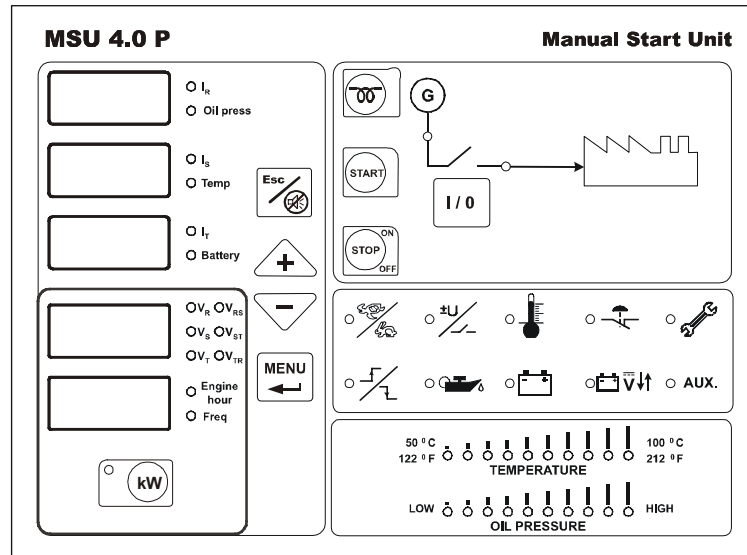


# MSU 4.0P MANUAL START UNIT

## USER MANUAL

### V1.21

(MSU 4.0 P version 3)



## DESCRIPTION

MSU 4.0 P is a microcontroller based generator control unit that is used to start and stop the genset manually. The device is designed to run, watch over the system parameters to maintain fail-safe operation. MSU 4.0P contains digital displays providing functions of most analog displays needed in generator panels.

## FUNCTIONS

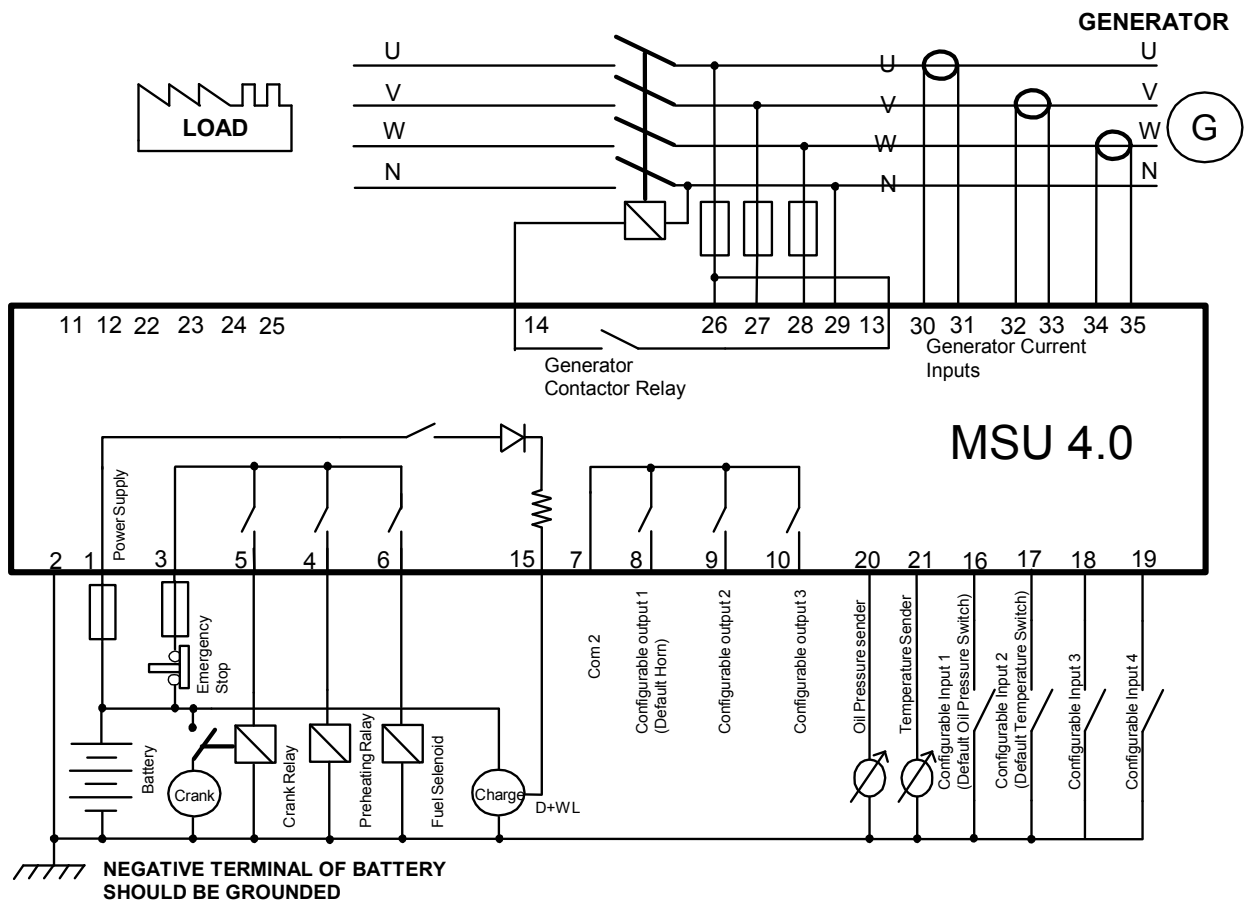
- Manual engine starting and stopping
- Manuel and automatic contactor control
- True RMS voltage and current measurements
- KW measurement
- Generator malfunction sensing
- Pre-heating
- Cost effective digital measurement displays
- Recording of last 10 failure
- Engine hour measurement and periodic service time warning
- Analog engine temperature and oil pressure measurement capability
- Battery saving through sleep mode
- Adjustable operating modes and timings via parameter menu
- Analog bar graph, engine temperature and oil pressure displays
- Adjustable measurement calibrations
- Low-cost applications

**INPUT / OUTPUTS**

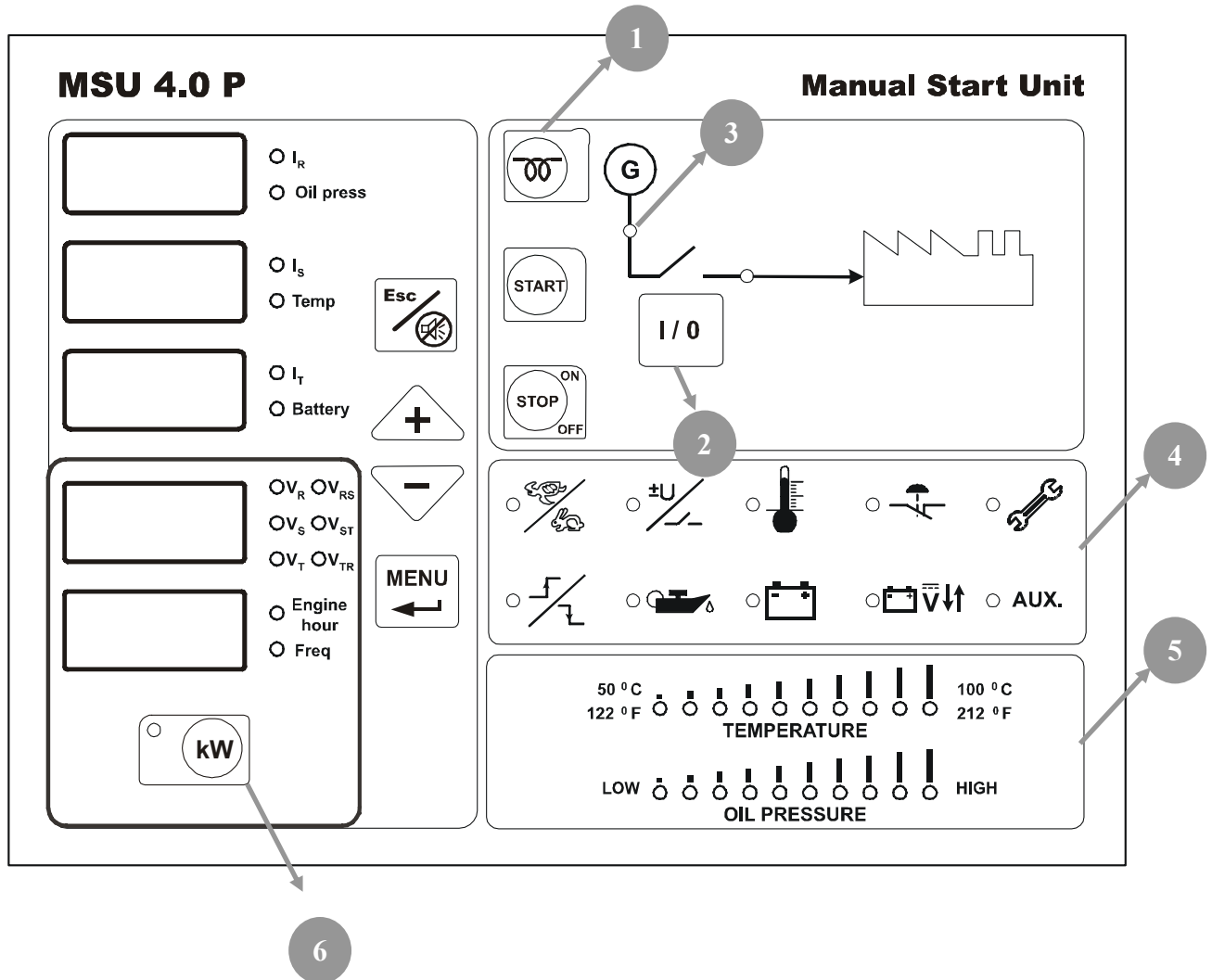
- 3 phase mains and generator voltage inputs
- 3 phase generator current inputs
- 12 or 24 V battery supply input
- Oil pressure and temperature analog inputs
- Charge alternator input
- Cranking relay output
- Preheat relay output
- Fuel solenoid relay output
- Generator contactor relay output
- Alarm relay output
- 2 programmable auxiliary relay output
- 2 programmable auxiliary input

**ALARMS**

- Engine start/stop failure
- Under/over speed failure
- Under/over voltage failure
- Over current failure
- Battery under/over voltage failure
- High temperature failure
- Charge fail warning
- Low oil pressure failure
- Periodic service time warning
- Auxiliary failure

**MSU 4.0 CONNECTION DIAGRAM**

## FRONT PANEL



**Preheat Button (1):** When genset doesn't start in cold weathers, engine can be preheated with this button. Button function can be set, as "button must be held down to preheat "or" preset preheat time when you press button. Preheat button can be used in manual mode and when engine is not running.

**Start Button:** This button is used to start genset. Panel will stop cranking when it detects engine-running signals. Button function can be set as "button must be held down to crank" or "preset cranking time when you press button" in parameter menu. Start button can be used in manual mode and when engine is not running. Panel will display "Str" message during cranking.

**Stop Button:** This button is used to stop the genset. When this button pressed first time, the panel switches the engine to cooling mode. If you pressed second time genset stops immediately. Second function of this button is when you press more than 3 seconds panel will switch to off mode.

**Generator Contactor (2):** This button is used to transfer load to genset. When genset is running this button can be used. Led lamp above the button shows contactor status. When the led lamp is lit, contactor is closed. To close the contactor, the engine must be running and engine stabilization time must have been passed. If the device is set to "automatic starting mode", the contactor is closed automatically.

**Generator Status LED (3):**

- It is off, if engine isn't running.
- It is on, if engine is running
- It is blinking, if genset is in engine stabilization, cooling or stopping. These topics will be explained later.

**Alarm Led Lamps (4):** From the upper left corner, high and low generator speed, high and low generator voltage, high coolant temperature, over current and service alarms. From lower left corner start and stop failure, low oil pressure, charge failure, battery voltage failure and auxiliary alarms. Detailed description will be given in the following chapters.

**Oil Pressure and Coolant Temperature bar graphs (5):** In order let the user see the oil pressure and coolant temperature at a glance, as much as digitally, these values can also be seen in bar graphs. In temperature bar graph temperature can be seen from 50° C/ 112 °F to 100 °C/212 °F. In oil press bar graph, oil press can be seen from oil pressure failure level to maximum oil press sender level.

**Display LEDs:** These LEDs are in the right side of numerical displays. LEDs indicate meaning of the value in the displays. Values in the displays can be changed by up, down and menu buttons.

**kW Button (6):** This button is used to display the output power of the generator in lowest two screens on the panel.

**Esc Button:** This button has multiple tasks. These are listed below,

- In alarm condition, first press stops the horn and second press clears the alarm.
- It is used to exit parameter menu. For this process button must be held down 3 seconds.
- In the process of changing parameter when you enter invalid values you can cancel by this button.

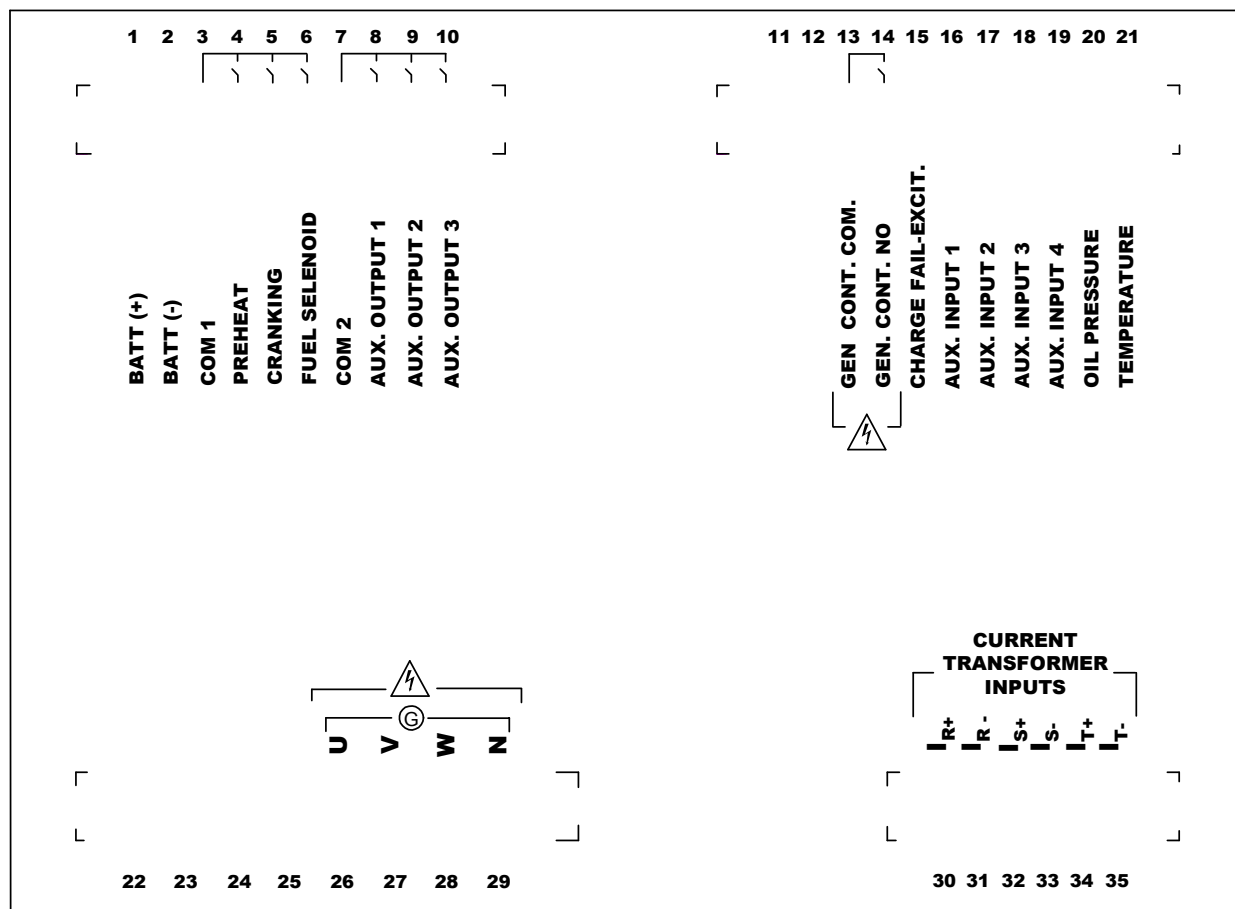
**Menu Button (Enter):** This button has multiple tasks. These are listed below.

- It is used to select the values in the numerical displays. When you press first time led will blink on the right of the display that is in selection mode. If you press up and down buttons before stop blinking you can change the value shown in display. If the display that is wanted its mode to be changed is different you can press menu button to move the blinking led and change the display in selection mode.
- If you press this button 3 seconds, you will enter the parameter menu.
- You can change the active digit. After all active digits are set last press will write value to parameter memory. Detailed information will be given in parameters section.

**Up, Down Buttons (+, -):** This button has two tasks. These are listed below.

- It is used to select the values in the numerical displays. When you press first time led will be lit on the right of the display that is in selection mode. If you press second time you can change the value of display that is in selection mode.
- In parameter menu you can press menu button to change selected parameter. You can change the number of active digit.

## REAR PANEL



## CONNECTIONS

Terminal No	Terminal Name	Description
1	Bat (+)	Battery positive. Voltage must be between 9- 30 V
2	Bat (-)	Battery negative. Battery negative must be connected to earth.
3	Com 1	Common terminal of preheat, fuel solenoid and cranking relays.
4	Preheat	Preheat relay
5	Cranking (Starting)	Cranking (starting) relay.
6	Fuel Solenoid	Fuel or stop solenoid relay. Operating mode must be selected from parameter menu.
7	Com 2	Common terminal of auxiliary relay 1,2,3
8,9,10	Aux. Output 1,2,3	Multiple function auxiliary relay outputs. Auxiliary output 1 is default horn output.
11	Not used.	
12	Not used.	
13 HIGH VOLTAGE	Gen Cont. Com.	Input terminal of generator contactor relay. Line U of generator can be connected to this terminal

<b>14 HIGH VOLTAGE</b>	Gen Cont. NO	Output terminal of generator contactor relay. This output is connected to generator contactor.
<b>15</b>	Charge Fail Excit.	Warning lamp output of charge alternator must be connected here. In the cranking excitation current is supplied to charge alternator over 150 ohm resistor.
<b>16</b>	Aux. Input 1	Multiple function auxiliary input. These inputs are activated if it is connected to battery negative. If oil sender that have both sender and switch function is used, switch terminal must be connected to this terminal. Suitable configuration must be set for this input to use it as oil pressure switch input. If this input is used for auxiliary input. Alarm will be shown as A1 in the display at the same time with auxiliary led indication.
<b>17</b>	Aux. Input 2	Multiple function auxiliary input. These inputs are activated if it is connected to battery negative. If temperature sender that have both sender and switch function is used, switch terminal must be connected to this terminal. Suitable configuration must be set for this input to use it as temperature switch input. If this input is used for auxiliary input. Alarm will be shown as A2 in the display at the same time with auxiliary led indication.
<b>18</b>	Aux. Input 3	Multiple function auxiliary input. These inputs are activated if it is connected to battery negative. If this input is used for auxiliary input. Alarm will be shown as A3 in the display at the same time with auxiliary led indication.
<b>19</b>	Aux. Input 4	Multiple function auxiliary input. These inputs are activated if it is connected to battery negative. If this input is used for auxiliary input. Alarm will be shown as A4 in the display at the same time with auxiliary led indication.
<b>20</b>	Oil Pressure	If oil sender that have both sender and switch function is used, sender terminal must be connected to this terminal. If oil sender that has single oil pressure switch output, switch output must be connected to this input. Suitable configuration must be set for this input to use it as oil pressure switch or sender input.
<b>21</b>	Temperature	If temperature sender that have both sender and switch function is used, sender terminal must be connected to this terminal. If temperature sender that has single temperature switch output, switch output must be connected to this input. Suitable configuration must be set for this input to use it as temperature switch or sender input.
<b>22,23,24,25</b>	Not used.	
<b>26,27,28,29 HIGH VOLTAGE</b>	Generator Line and Neutral Inputs	Generator lines and neutral are connected to these terminals.

<b>30,31,32,33 34,35</b>	Curent Transformer Inputs	Secondary side of current transformer must be connected here. Each transformer must be connected separately.
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**Note: Battery negative must be connected to earth**

## STARTING OF GENERATOR

To run generator, start button is pressed in engine rest condition. If automatic start is selected in parameter menu starter motor is engaged and if it fails to start to engine at first attempt panel wait for cranking rest time and try to start engine several times that is defined in parameter menu. If it fails to start engine “start and stop failure” occurs. If manual start is selected in parameter menu start button must be hold down to engage starter motor. When start button is released starter motor is disengaged. After engine start, engine stabilization time is waited. During this time generator voltage, frequency, oil pressure etc. generator and engine alarms are delayed for engine stabilization. At the end of the stabilization time engine and generator alarms are activated. Alternator contactor delay is activated after engine stabilization time. Alternator contactor delay is used to permit engine alarms, generator voltage and frequency alarms to occur before generator contactor closes. So load doesn’t encounter subsequent generator contactor close and open because of sudden stopping alarm after engine start. After alternator contactor delay, generator contactor is closed. Generator contactor button can be used to control generator contactor during engine running period. If operator want stop engine, stop button must be pressed once. Engine enters in cooling period. When operator presses stop button twice in cooling mode or cooling period expires, engine is stopped immediately.

## PANEL RUNNING PHASES

- 1. Generator is still:** In this condition engine running signals must be absent. These are oil pressure, charging alternator warning lamp signal, generator voltage and frequency. In this mode panel doesn’t react to engine running signals.
- 2. PreHeating:** In cold weathers preheating of engine can be necessary. Engine must be still during preheating. If parameter “preheating time” is not zero, preheating is accomplished before starting process by panel.
- 3. Cranking:** In this stage engine is cranking. All engine signals must be absent and engine must be still before cranking. If one of the engine signals are detected before cranking, panel switch to start and stop alarm. Panel will show which signal is detected with engine start stop alarm. If oil pressure signal is detected before cranking panel will wait for it to decrease to zero. If “before cranking oil pressure delay” is elapsed and oil pressure is not zero panel will switch to start and stop alarm. In cranking stage all engine signals, alternator frequency, alternator voltage, charge alternator voltage and oil pressure is controlled. If one of the signals is detected, Panel detects engine is running, crank disconnects and switch to engine stabilization time. Generator status led starts to blink. During cranking, “Str” message is shown in the display. Oil pressure can rise before engine running so when oil pressure is detected, crank disconnected after “crank disconnect oil pressure delay”.

4. **Stabilization:** After generator running signals detected panel waits for engine signals to stabilize. After engine stabilization time, all alarms are activated.
5. **Running:** After stabilization time genset is in running condition. If generator contactor mode is selected automatic in parameter menu. Alternator contactor time is waited and alternator contactor is closed. Operator can close the generator contactor by generator contactor button. In running mode generator status led is lit.
6. **Cooling:** If operator presses stop button once generator is switched to cooling period and engine is cooled during “cooling time”. During this time engine status led is blinking. After cooling process generator is switched to stopping condition.
7. **Stopping:** After cooling stage, generator switches to stopping stage. If fueling system is operating solenoid, operating solenoid is de-energized. If fueling system is stop solenoid. Solenoid energizes until engine stops. If one of the engine running signals is detected stopping period doesn’t ends. Alternator frequency and voltage, charge alternator warning lamp signal and oil pressure must be absent. If panel detects engine signals after “fail to stop delay” panel will switch to start stop alarm.
8. **Generator shutdown:** Generator is stopped because of a red alarm. Generator cannot be started if alarm is not cleared.

## ALARMS

Alarms are divided to red and yellow alarms. Yellow alarms are for warning purposes and don’t stop the generator. Red alarms are serious and if occur generator contactor is opened and generator is stopped immediately.



**High and low speed (RED ALARM):** If alternator frequency is higher than “generator over frequency failure” or is lower than “generator under frequency failure” “ panel switches to this alarm. Alarm is activated after “generator frequency failure delay”.



**High and low alternator voltage (RED ALARM):** If alternator voltage is higher than “generator over voltage failure” or is lower than “generator under voltage failure” “ panel switches to this alarm. Alarm is activated after “generator voltage failure delay”



**High coolant temperature (RED ALARM):** If temperature that is read from temperature sender is higher than “high coolant temperature level” or if temperature switch sends alarm to panel. Panel switches to high coolant temperature alarm.



**Over current failure (RED ALARM):** If currents values read from current transformers is higher than “over current level”. Generator contactor is opened and generator switches to cooling. After cooling stage generator stops. Alarm is activated if condition continues for “over current alarm delay”



**Periodic service:** When periodic service time elapsed after last periodic service. Alarm is displayed. Only service personnel can reset alarm.



**Fail to start stop:** If this alarm occurs that means panel couldn’t start or stop engine. All engine signals must be absent and engine must be still before cranking. If one of the engine signals is detected, before cranking, panel switch to start and stop alarm. Panel will show which signal is detected with engine start stop alarm.

If oil pressure signal is detected before cranking panel will wait for it to decrease to zero. If “before cranking oil pressure delay” is elapsed and oil pressure is not zero panel will switch to start and stop alarm. In automatic and test modes if generator couldn’t be started after user defined crank attempts, panel switches to fail to start stop alarm. In engine stopping stage if panel still detects engine signals after “fail to stop delay”. Panel switches to fail to start stop alarm. Alarm led lamps indicates which engine signal is still present and causes fail to start stop alarm.



**Low oil pressure (RED ALARM):** If oil pressure that is read from oil pressure sender is lower than “low oil pressure level” or if oil pressure switch sends alarm to panel. Panel switches to low oil pressure alarm.



**Charge Failure (YELLOW ALARM):** If charge voltage read from charge alternator warning lamp terminal decreases, panel switches to this alarm. This alarm doesn’t stop generator.



**Battery high and low voltage (YELLOW ALARM):** If battery voltage is higher than “battery high alarm level” or is lower than “battery low alarm level” panel switches to this alarm. This alarm doesn’t stop engine.

**AUX.**

**Auxiliary input (YELLOW or RED ALARM):** When an auxiliary input alarm occur. This led is lit and A1, A2, A3 or A4 message is written to display. A1 means auxiliary input1 alarm.

**Emergency stop:** If auxiliary input is adjusted for emergency stop and user presses emergency stop button. “StP” message is shown in the display, generator contactor opens and engine stops immediately. To clear this alarm user must pull emergency stop button and clear the alarm.

**Sensor failure:** If cable connected to sender terminal of oil pressure and temperature senders breaks. Sensor failure alarm is given. For oil pressure sender “oSn” message and for coolant temperature sender “tSn” message is shown in the display. Alarm is activated if condition continues for “Sensor failure delay”. If “analog oil pressure sender usage” and “analog coolant temperature sender usage” parameters are set to 0, sender will be used for display purposes and no alarm is given in sensor failure condition.

**EEProm Failure:** When this alarm occurs “EEP” message is written to display and you must call service. Genset mustn’t be started.

## PARAMETER MENU

To enter parameter menu, menu button must held down for 3 seconds. Password screen is displayed. Parameter menu contains 3 separate sections. These are operator, technician and calibration parameters sections. You can give separate password to these sections and enter to these sections by its passwords. In parameter section leftmost digit starts to blink. If you press up and down buttons you can increase and decrease the value shown in the blinking digit. If you want to proceed to digit at one-step right menu button must be pressed. You can adjust this digit up and down buttons and then you press menu button again. If you are in the rightmost digit and you have adjusted this digit, you can complete password entering by pressing menu button. You can exit menu by holding esc button for 3 second. When you enter the parameter menu at the first row of display “P0” (first parameter number) is shown. At the

second row of display value of parameters is shown. If you want to proceed to other parameters you can use up and down buttons (P0,P1,P2...). Maximum parameter number is depends on your entered password (operator, technician or calibration). If you want to change parameter, menu button must be pressed at the selected parameter. At the third row parameter value is displayed and first digit of value blinks. Changing process is same as password entering process. By pressing menu button at last blinking digit new value is recorded. If you want cancel entering process you can press esc key. In return to factory defaults parameters when you press menu button NO message displayed if you press up and down buttons message will switch to YES and NO messages if you press menu button, when selection is YES, parameters will be returned to factory defaults. If you press NO process is cancelled. Each return to factory defaults, return its own section to factory defaults (operator, technician, calibration). If you want exit menu you can press down esc button for 3 second.

### MSU 4.0P PARAMETERS

No	Parameter	Setting Range	Default Value
<b>Operator Parameters</b>			
P0	Operator menu password	0-999	000
P1	Temperature unit	0: Celsius 1: Fahrenheit	0
P2	Crank attempts	1 – 9	3
P3	Cranking time	3-60 sec	7 sec
P4	Cranking pause time	3-60 sec	10 sec
P5	Manuel cranking type	0: Start button must be held down to crank 1: Automatic start	1
P6	Preheating type	0: Preheat button must be hold down to preheat 1: Automatic preheat	0
P7	Generator contactor mode	0: Contactor is closed automatically 1: Contactor is closed manually	0
P8	Auxiliary input 1 function	0: Input disabled 1: Yellow alarm (always active) 2: Yellow alarm (active from starting) 3: Yellow alarm (active from engine stabilization time) 4: Red alarm (always active) 5: Red alarm (active from starting) 6: Red alarm (active from engine stabilization time) 7: Remote start 8: Emergency stop 9: Cabinet thermostat alarm	0
P9	Auxiliary input 2 function	Same as auxiliary input 1	0
P10	Auxiliary input 3 function	Same as auxiliary input 1	0
P11	Auxiliary input 4 function	Same as auxiliary input 1	0
P12	Auxiliary input 1 activation method	0: Close to activate 1: Open to activate	0
P13	Auxiliary input 2 activation method	Same as auxiliary input 1	0
P14	Auxiliary input 3 activation method	Same as auxiliary input 1	0
P15	Auxiliary input 4 activation method	Same as auxiliary input 1	0

P16	Auxiliary output 1 function	0: Output disabled 1: Engine running 2: Yellow alarm 3: Red alarm 4: Common alarm 5: Horn 6: Panel is ON mode	5
P17	Auxiliary output 2 function	Same as auxiliary output 1	0
P18	Auxiliary output 3 function	Same as auxiliary output 1	0
P19	Auxiliary output 1 activation method	0: De-Energize 1: Energize	1
P20	Auxiliary output 2 activation method	Same as auxiliary output 1	1
P21	Auxiliary output 3 activation method	Same as auxiliary output 1	1
P22	Sensor failure delay	1-5 sec	2
P23	Alternator contactor delay	0-90 sec	5 sec
P24	Preheat time	0-300 sec	0 sec
P25	Generator voltage failure delay	2-20 sec	3 sec
P26	Generator frequency failure delay	2-20 sec	5 sec
P27	Horn time	0-900 sec	30 sec
P28	Current failure mode	0: Disabled 1: Enabled	1
P29	Crank disconnect on charge signal	0: Disabled 1: Enabled	1
P30	Crank disconnect on generator voltage	20V-500V	165V
P31	Generator under voltage failure	46V-500V	170 V
P32	Generator over voltage failure	46V-500V	270 V
P33	Generator under frequency failure	10-75 hz	47 hz
P34	Generator over frequency failure	10-75 hz	54 hz
P35	Last 10 failure		
P36	Return to operator factory defaults	Yes / No	
<b>Technician Parameters</b>			
P37	Technician menu password	0-999	000
P38	Analog Oil sender type	0: Analog oil sender disabled 1: Analog Endiksan type 2: Analog Olcusan (VDO 7 Bar) type 3: Analog Olcusan (VDO 10 Bar) type 4: Analog Olcusan (VDO 80 PSI) type 5: Analog VDO 5 Bar	2
P39	Oil switch type	0: Oil switch disabled 1: Normally closed for low pressure 2: Normally open for low pressure	1
P40	Low oil pressure level	0 – 4 bar	1.5 bar
P41	Analog temperature sender type	0: Not used 1: Analog Endiksan type 2: Analog Olcusan (VDO 120 C) type 3: Analog Volvo type	2
P42	Digital temperature switch type	0: Not used 1: Digital open for high temperature 2: Digital closed for high temperature	2

P43	Analog oil pressure sender usage	0: Only for indication 1: For indication and control	1
P44	Analog coolant temperature sender usage	0: Only for indication 1: For indication and control	1
P45	Fueling system	0: Operating solenoid 1: Stop solenoid	0
P46	Charging alternator	0: Charging alternator isn't present 1: Charging alternator is present	1
P47	Crank disconnect alternator frequency	10-30 hz	20 hz
P48	Crank disconnect oil pressure	0.5 – 3.0 bar	1.5 bar
P49	Crank disconnect oil pressure delay	1-30 sec	2 sec
P50	Before cranking oil pressure delay	1-10 sec	2 sec
P51	Cooling Time	0-600 sec	120 sec
P52	Fail to stop delay	4-120 sec	30 sec
P53	Engine stabilization time	2-60 sec	10 sec
P54	Engine protection delay after stopping	1-60 sec	3 sec
P55	Current transformer primary	5-900 A	100 A
P56	Parameter menu current multiplier	0: x1 mode 1: x10 mode	0
P57	Over current level	1-990 A	100
P58	Over current alarm delay	2-30 sec	5 sec
P59	High coolant temperature level	80 C – 140 C (176 – 284 F)	100 C (212 F)
P60	Battery low alarm level	0-40 V	10.0
P61	Battery high alarm level	0-40 V	32.0
P62	Customer code		
P63	Periodic service time	10-5000	250
P64	Engine hour adjustment	0.0 - 99999.0 hour	0
P65	Clear last ten alarm	Yes/ No	
P66	Clear periodic service alarm	Yes/ No	
P67	Return to technician factory defaults	Yes/ No	
<b>Calibration Parameters</b>			
P68	Calibration menu password	0-999	000
P69	Generator Vr gain	0.01-9.99	1.42
P70	Generator Vs gain	0.01-9.99	1.42
P71	Generator Vt gain	0.01-9.99	1.42
P72	Generator Ir gain	0.01-9.99	3.43
P73	Generator Is gain	0.01-9.99	3.43
P74	Generator It gain	0.01-9.99	3.43
P75	Battery Voltage gain	0.01-9.99	0.54
P76	Generator Vr offset	-29,+29 V	0
P77	Generator Vs offset	-29,+29 V	0
P78	Generator Vt offset	-29,+29 V	0
P79	Battery voltage offset	-9.9,+9.9	0.8
P80	Oil pressure offset	-9.9,+9.9	0.0
P81	Temperature offset	-9,+9	0
P82	Generator Ir offset	-0.99, +0.99 (for 5 A )	0.00
P83	Generator Is offset	-0.99, +0.99 (for 5 A )	0.00
P84	Generator It offset	-0.99, +0.99 (for 5 A )	0.00

P85	Mains contactor control in off mode	Yes/No
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### PARAMETER DESCRIPTIONS

No	Parameters	Description
<b>Operator Parameters</b>		
P0	Operator menu password	Operator password can be changed by this parameter
P1	Temperature unit	This parameter selects coolant temperature unit shown in the display. According to selected unit “high coolant temperature level“ is adjusted.
P2	Cranking attempts	Number of cranking during starting in automatic, test and manual modes.
P3	Cranking time	Cranking time during automatic cranking
P4	Cranking pause time	Interval between two cranking period in automatic and test modes.
P5	Manuel cranking type	If this parameter selected ”0”, operator must hold down start button pressed during cranking period. If this parameter selected “1” panel will perform cranking for “cranking time” when start button is pressed. If engine doesn’t run, panel tries to run engine several times that is selected in parameter “Cranking attempts”. Crank is disconnected automatically when panel detects engine-running signals.
P6	Preheating type	If this parameter selected ”0”, operator must held down preheat button pressed during preheating period. If this parameter selected “1” panel will perform preheating for “Preheat time”.
P7	Generator Contactor Mode	If this parameter is selected “0” generator contactor is closed automatically after successful engine start. If selected “1” generator contactor must be closed manually.
P8	Auxiliary input 1 function	<p>It selects function of auxiliary input</p> <ul style="list-style-type: none"> <li>• Auxiliary input can be adjusted as <b>red or yellow alarm</b>. Activation time can be “always active, active from engine starting or active from engine stabilization time”. When input activates auxiliary input led lit and A1.A2,A3 or A4 message is shown according to activated auxiliary input number.</li> <li>• When <b>remote start input</b> is activated generator starts and generator contactor closes. If input deactivated generator contactor opens, engine enters cooling period and then generator stops. Remote start is active only in automatic mode.</li> <li>• If <b>emergency stop</b> button is pressed, generator opens generator contactor and stops immediately. Panel show “StP” message in the display. To clear emergency stop alarm, emergency stop button must be pulled back and alarm clear button must be pressed.</li> </ul>

		<ul style="list-style-type: none"> <li>• <b>Cabin thermostat</b> function is used in cabinet type generators. Panel doesn't control this input for 2 minute after engine start. After 2 minute if input is still active panel gives alarm, open generator contactor, cools engine then stop generator.</li> </ul> <p><b>If oil pressure sender that has both sender and switch is used, switch terminal must be connected to this input and this parameter is disabled.</b></p>
P9	Yedek giriş 2 fonksiyonu	<p>Functions are same as auxiliary input 1</p> <p><b>If coolant temperature sender that has both sender and switch is used, switch terminal must be connected to this input and this parameter is disabled.</b></p>
P10	Auxiliary input 3 function	Functions are same as auxiliary input 1
P11	Auxiliary input 4 function	Functions are same as auxiliary input 1
P12	Auxiliary input 1 activation method	If this parameter is 0, input will be activated when it is connected to battery negative. If this input is 1, input will be activated, when input is disconnected from battery negative.
P13	Auxiliary input 2 activation method	Same as auxiliary input 1
P14	Auxiliary input 3 activation method	Same as auxiliary input 1
P15	Auxiliary input 4 activation method	Same as auxiliary input 1
P16	Auxiliary output 1 function	<p>This parameter select the functions of auxiliary output 1</p> <ul style="list-style-type: none"> <li>• <b>Engine running:</b> If engine running signal generator voltage, frequency or charge alternator warning lamp voltage is detected this output will be activated.</li> <li>• <b>Yellow alarm:</b> If yellow alarm occurs, this output is activated.</li> <li>• <b>Red alarm:</b> If red alarm occurs, this output is activated.</li> <li>• <b>Common Alarm:</b> If yellow or red alarm occurs, this output is activated.</li> <li>• <b>Horn:</b> If horn is activated. This output will close and open by intervals of 1 second.</li> <li>• <b>Panel is ON mode:</b> If panel is in ON mode. This output will be activated.</li> </ul>
P17	Auxiliary output 2 function	Same as auxiliary output 1
P18	Auxiliary output 3 function	Same as auxiliary output 1
P19	Auxiliary output 1 activation method	If this parameter is selected as 0, when output is activated output relay de-energizes. At startup when you supply battery to panel this relay energizes and when output is activated relay energizes. If this parameter is selected as 1, when output activates, output relay energizes.
P20	Auxiliary output 2 activation method	Same as auxiliary output 1
P21	Auxiliary output 3 activation method	Same as auxiliary output 1

P22	Sensor failure delay	If Connection to the oil pressure and temperature senders breaks. After sensor failure delay panel give sensor alarm.
P23	Alternator contactor delay	In automatic and test modes after engine stabilization time alternator contactor delay is waited and alternator contactor closes.
P24	Preheat time	This parameter defines, in automatic preheating, how long preheating continues.
P25	Generator voltage failure delay	When generator voltages are out of voltage limits, a voltage alarm is given after “generator voltage failure delay”.
P26	Generator frequency failure delay	When generator frequency is out of frequency limits, high low speed alarm is given after “generator frequency failure delay”.
P27	Horn time	If horn output is activated. After “horn time” horn is deactivated. If parameter is “0”, horn isn’t deactivated until pressing alarm reset button.
P28	Current failure mode	This parameter defines that alternator current alarms is enabled or disabled.
P29	Crank disconnect on charge signal	If this parameter is enabled. Crank is disconnected when charge alternator voltage rises. (Approx. 7 V)
P30	Crank disconnect on generator voltage	If alternator voltage rises to the voltage level defined in this parameter, Crank is disconnected.
P31	Generator under voltage failure	If generator voltage fall below this limit under over voltage alarm occur. Failure occurred after generator voltage failure delay
P32	Generator over voltage failure	If generator voltage exceeds this limit under over voltage alarm occur. Failure occurred after generator voltage failure delay
P33	Generator under frequency failure	If generator frequency fall below this limit under over speed alarm occur. Failure occurred after generator frequency failure delay
P34	Generator over frequency failure	If generator frequency exceeds this limit under over speed alarm occur. Failure occurred after generator frequency failure delay
P35	Last 10 failure	Last ten alarms are recorded in the panel memory. There alarm can be controlled by this parameter.
P36	Return to operator factory defaults	When you select “YES” and press menu key operator parameters is returned to factory defaults
<b>Technician Parameters</b>		
P37	Technician menu password	Technician password can be changed by this parameter
P38	Analog oil sender type	Analog oil pressure sender type can be selected from this parameter. If genset has only digital oil switch, and this parameter is adjusted to “0” oil switch input is transferred to analog oil pressure sender input.
P39	Oil switch type	Oil pressure switch type can be selected from this parameter.
P40	Low oil pressure failure	If oil pressure fall below this limit. Oil pressure failure alarm is activated.

P41	Analog temperature sender type	Analog coolant temperature sender can be selected from this parameter. If genset has only digital coolant temperature switch, and this parameter is adjusted to "0" coolant temperature switch input is transferred to analog temperature sender input.
P42	Digital temperature switch type	Analog coolant temperature sender can be selected from this parameter.
P43	Analog Oil pressure usage	If analog sender is used for display purposes only. Generator doesn't control this analog value. Value read from sender is used only for display purposes. No sensor alarm is given if sensor cable breaks. Display shows "0" if analog sender isn't connected. If this parameter is selected as "For indication and control" panel show measured value from analog sender and use it as engine running signal. "oSn" oil sender alarm is given in case of wire break.
P44	Analog temperature sensor usage	If analog sender is used for display purposes only. Generator doesn't control this analog value. Value read from sender is used only for display purposes. No sensor alarm is given if sensor cable breaks. Display shows "0" if analog sender isn't connected. If this parameter is selected as "For indication and control" panel show measured value from analog sender and use it as engine running signal. "tSn" temperature sender alarm is given in case of wire break.
P45	Fueling system	Fueling system is can be adjusted as operating or stop solenoid.
P46	Charging alternator	If parameter is adjusted as "0". Charge alternator failure doesn't occur and crank doesn't disconnect by charge alternator.
P47	Crank disconnect alternator frequency	In cranking if alternator frequency exceeds this limit crank disconnected.
P48	Crank disconnect oil pressure	In cranking if oil pressure exceed this limit and stay high, after "crank disconnect oil pressure delay" crank disconnected.
P49	Crank disconnect oil pressure delay	In cranking if oil pressure rise, after "crank disconnect oil pressure delay" crank disconnected.
P50	Before cranking oil pressure delay	If oil pressure is high before cranking this delay is waited. If oil pressure is fall down cranking begins. If oil pressure doesn't fall panel give fail to start stop alarm.
P51	Cooling Time	Parameter contains how long cooling period continue
P52	Fail to stop delay	In stopping period, parameter defines how long panel will wait for engine to stop before giving fail to start stop alarm.
P53	Engine stabilization time	When generator starts all engine alarms will be delayed for engine stabilization time. During this time all values read from sensors stabilize (Alternator voltage, frequency, charge alternator warning lamp voltage and oil pressure).
P54	Engine protection delay after stopping	In stopping period after panel detected all engine running signals absent, panel will wait an additional protection delay This is necessary for engine to stop completely before next engine start. <b>Do not decrease this value if not necessary.</b>

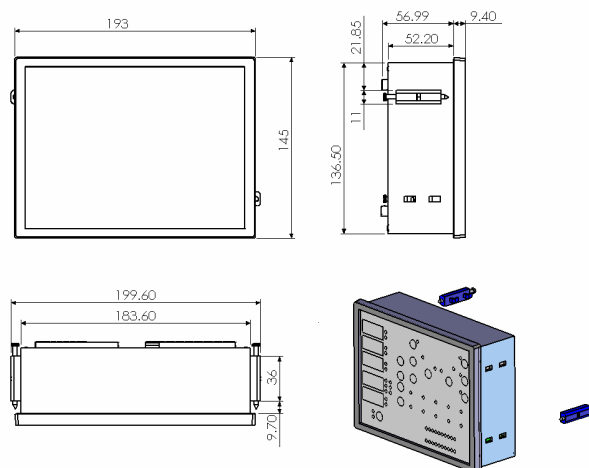
P55	Current transformer primary	This parameter contains current transformer primary value. If Current transformer primary is more than 999 you must change parameter menu current multiplier to x10 mode.
P56	Parameter menu current multiplier	If this parameter is made x10, Parameter "P62: current transformer primary" and "P64: over current level" are multiplied by 10. You must use this parameter if values are bigger than 999. For example for 2500:5 current transformer and 2000 Amp over current level. After setting parameter menu current multiplier x10, you must set current transformer primary as 250 and over current level 200.
P57	Over current level	If measured alternator current exceeds value that parameter contains. Over current alarm will be given.
P58	Over current alarm delay	If over current condition occur more than over current alarm delay. Panel will give over current alarm.
P59	High coolant temperature level	If engine coolant temperature exceeds the value that this parameter contain. Panel will give high coolant temperature alarm. This parameter must be entered according to parameter temperature unit.
P60	Battery low alarm level	If battery voltage falls below voltage level that parameter contains battery high low alarm will be given.
P61	Battery high alarm level	If battery voltage exceeds voltage level that parameter contains battery high low alarm will be given.
P62	Customer Code	It gives customer code of panel.
P63	Periodic service time	This parameters selects After how many running hour periodic service alarm will be given
P64	Engine hour adjustment	Engine hour is adjusted by this parameter.
P65	Clear last ten alarm	When you select "YES" and press menu key last ten failure is cleared.
P66	Clear periodic service alarm	When you select "YES" and press menu key, periodic service alarm is cleared and service time is reset
P67	Return to technician factory defaults	When you select "YES" and press menu key technician parameters is returned to factory defaults
<b>Calibration Parameters</b>		
P68	Calibration menu password	Calibration menu password adjustment
P69	Generator Vr gain	Generator line R voltage gain calibration.
P70	Generator Vs gain	Generator line S voltage gain calibration.
P71	Generator Vt gain	Generator line T voltage gain calibration.
P72	Generator Ir gain	Generator line R current gain calibration.
P73	Generator Is gain	Generator line S current gain calibration.
P74	Generator It gain	Generator line T current gain calibration.
P75	Battery Voltage gain	Battery voltage gain calibration.
P76	Generator Vr offset	Generator line R voltage offset calibration.
P77	Generator Vs offset	Generator line S voltage offset calibration.
P78	Generator Vt offset	Generator line T voltage offset calibration.
P79	Battery voltage offset	Battery voltage offset calibration.
P80	Oil pressure offset	Oil pressure offset calibration.
P81	Temperature offset	Coolant temperature offset calibration.
P82	Generator Ir offset	Generator line R current offset calibration.

P83	Generator Is offset	Generator line S current offset calibration.
P84	Generator It offset	Generator line T current offset calibration.
P85	Return to calibration factory defaults	When you select “YES” and press menu key calibration parameters is returned to factory defaults

## SPECIFICATIONS

<b>Power Supply</b>	9-35 VDC 140 mA (all relays are de-energized)
<b>Ambient Temperature</b>	-10°C / +70°C
<b>Relative Humidity</b>	%10-%95 non-condensing
<b>Relay outputs</b>	For cranking, fuel solenoid, preheating and auxiliary outputs max. 12V/24VDC 6 A, For mains and generator contactor relays max. 250VAC/10 A
<b>Voltage measurement</b>	20-300VAC
<b>Frequency measurement</b>	1-99 Hz
<b>Current measurements</b>	.../5 A current inputs (current transformer should be used)
<b>Connection</b>	Screw socket
<b>Measurement Accuracy</b>	Phase voltages : + / - %2 Frequency : + / - 0.1Hz Phase currents : + / - %2
<b>Charge Excitation Current</b>	80mA @ 12VDC 160mA@ 24VDC
<b>Housing</b>	High temperature proof PPO GF %20
<b>Protection Class</b>	IP 52 (Front side)
<b>Weight</b>	600 gr. (aprox.)
<b>Dimensions (WxHxD)</b>	192x144x62 mm
<b>Panel Cut Out</b>	186x138 mm
<b>Mounting Installation</b>	Front panel mounted with rear metal screw fixings Max. allowable mounting panel thickness 3mm

## DIMENSIONS AND MOUTING



Dimensions in mm