



Single Genset Controller

SGC 120/121



1. Introduction

| | |
|---|---|
| 1.1 About SGC 120/121..... | 4 |
| 1.2 Key functions..... | 4 |
| 1.3 Product overview..... | 4 |
| 1.4 Passwords..... | 5 |
| 1.5 Overview of controller buttons..... | 6 |
| 1.6 Legal information..... | 7 |

2. Safety instructions

| | |
|--------------------------------------|---|
| 2.1 General safety instructions..... | 8 |
| 2.2 Electrical safety..... | 8 |
| 2.3 In operation safety..... | 8 |

3. Technical specifications

| | |
|--|----|
| 3.1 Terminals..... | 9 |
| 3.2 Power supply..... | 9 |
| 3.3 Genset voltage and frequency measurements..... | 10 |
| 3.4 Genset current measurements..... | 10 |
| 3.5 Mains voltage and frequency measurement..... | 10 |
| 3.6 Digital inputs..... | 11 |
| 3.7 Analogue resistive sensor inputs..... | 11 |
| 3.8 Analogue inputs used as digital inputs..... | 12 |
| 3.9 Analogue voltage/current input..... | 12 |
| 3.10 Magnetic pick-up (MPU) input..... | 13 |
| 3.11 Digital outputs..... | 13 |
| 3.12 Rotary actuator outputs (SGC 121 only)..... | 13 |
| 3.13 D+ Charger alternator..... | 14 |
| 3.14 Sensor common point..... | 14 |
| 3.15 Communication ports..... | 14 |

4. Installation

| | |
|----------------------------------|----|
| 4.1 Dimensions..... | 15 |
| 4.2 Mounting in panel..... | 15 |
| 4.3 Terminal details..... | 16 |
| 4.4 Typical wiring diagrams..... | 18 |

5. Monitoring mode

| | |
|--------------------------|----|
| 5.1 Monitoring mode..... | 20 |
|--------------------------|----|

6. Configuration mode

| | |
|------------------------------------|----|
| 6.1 Configuration mode..... | 22 |
| 6.2 Configurable parameters..... | 22 |
| 6.2.1 Configurable parameters..... | 22 |
| 6.2.2 Module..... | 23 |
| 6.2.3 Digital inputs..... | 24 |
| 6.2.4 Analogue inputs..... | 25 |
| 6.2.5 Outputs..... | 28 |
| 6.2.6 Timers..... | 28 |
| 6.2.7 Generator..... | 29 |
| 6.2.8 Mains..... | 31 |
| 6.2.9 Engine..... | 32 |
| 6.2.10 Maintenance..... | 36 |

| | |
|--|-----------|
| 6.2.11 Rotary actuator (SGC 121 only)..... | 36 |
| 6.2.12 Password ID..... | 38 |
| 6.3 Digital input source selection..... | 38 |
| 6.4 Digital output source selection..... | 38 |
| 7. Running modes | |
| 7.1 Auto mode..... | 41 |
| 7.2 Manual mode..... | 43 |
| 8. Alarms | |
| 8.1 Alarms..... | 44 |
| 9. Modbus communication protocol | |
| 9.1 About the Modbus communication protocol..... | 47 |
| 9.2 Modbus connection details..... | 47 |
| 9.3 Modbus functions..... | 47 |
| 10. Modbus communication settings | |
| 10.1 Modbus communication settings..... | 48 |
| 10.2 Register map (function code 03)..... | 49 |
| 10.3 Register map (function code 16)..... | 55 |
| 11. Engine communication (SGC 120 only) | |
| 11.1 Introduction to engine communication..... | 56 |
| 11.2 Default settings..... | 56 |
| 11.3 Supported engines..... | 56 |
| 11.4 Engine values on the display..... | 56 |
| 11.5 Engine communication settings..... | 57 |
| 11.6 Generic J1939..... | 58 |
| 11.7 Wiring..... | 59 |
| 12. CAN communication (SGC 120 only) | |
| 12.1 About the CAN communication protocol..... | 60 |
| 12.2 CAN communication structure..... | 60 |
| 12.3 CAN packet structure..... | 70 |
| 13. Troubleshooting | |
| 13.1 Troubleshooting..... | 71 |

1. Introduction

1.1 About SGC 120/121

This document presents information necessary for operating DEIF's SGC 120/121 genset controllers.

SGC 120/121 are modern genset controllers with user friendly HMI and full graphics LCD. The controllers come with a highly versatile software. Extensive inputs and outputs support a wide variety of industry standard features in diesel/gasoline genset applications.

SGC 121 includes electronic governing for engines with mechanical fuel systems. With a rotary actuator as add-on for air/fuel charge control, SGC 121 can perform electronic governing of the engine within ISO 8528 class G3 limits.

The DEIF Smart Connect software offers flexibility to configure each individual input and output for a specific function or application. All parameters can also be configured on the genset controller.

1.2 Key functions

- Genset controller with configurable inputs:
 - Five digital inputs
 - Four analogue inputs (configurable as digital inputs)
- Six digital outputs
- Auto, Manual and Remote start/stop modes for 1-phase and 3-phase gensets
- RPM sensing using frequency and MPU
- Supports Auto exercise mode
- Real time clock-based event logs
- PC connectivity via USB port
- RS-485 and CAN ports
- Configurable fuel theft alarm
- Backlit full graphics display
- Integrated electronic governor controller (SGC 121 only)

1.3 Product overview

Following table gives a brief overview of SGC 120/121 features:

| Features | Specifications |
|---|----------------|
| Digital switch input | 5 |
| Analogue resistive inputs | 3 |
| Analogue current/voltage input | 1 |
| Mains voltage input (AMF) | Yes |
| DG alternator voltage input, D+ charging alternator I/O | Yes |
| DG alternator current input | Yes |
| Engine speed input via MPU | Yes |
| Digital outputs | 6 |
| Real Time Clock for event logs and Auto exercise mode | Yes |
| USB I/O port for laptop access | Yes |

| Features | Specifications |
|--|----------------|
| EEPROM for extended event logs OR regional languages | Yes |
| CANbus Engine Interface | Yes |
| RS-485 Interface for Modbus | Yes |
| DC battery supply voltage (with -32 V reverse protection) | 8 to 28 V |
| Operating temperature range | -20 to 65 °C |
| Protection class with gasket (included) | IP65 |
| Warning auto clear enable/disable | Yes |
| Fuel reference selection input | Yes |
| On the fly mode change when engine is healthy/engine off | Yes |
| Analogue 0-5 V input for Speed bias input for E-gov from Load sharing module | Yes* |
| E-gov actuator output | Yes* |

*Note: SGC 121 only.










1.4 Passwords

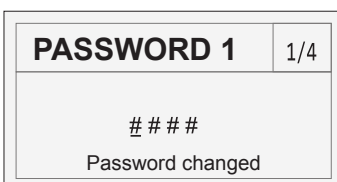
The controller is protected from set-up changes with a four digit password.

There are two password levels:

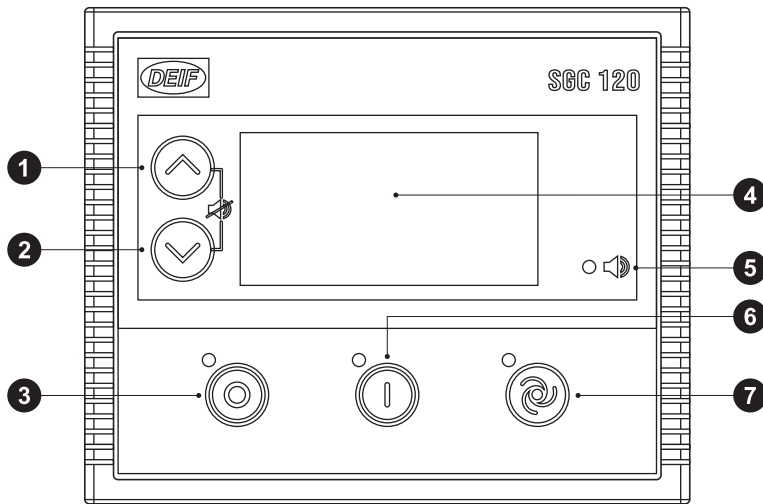
| Level | Access | Factory setting |
|-------|------------------------------|-----------------|
| 1 | Full access (read and write) | 0123 |
| 2 | Limited access (read) | 1234 |

The passwords can be changed on the controller:

1. Go to Configuration mode.
2. Log on with password level 1.
3. Use the *Up*  and *Down*  buttons to go to Misc Settings, select with the Start  button.
4. Use the *Up*  and *Down*  buttons to go to the password to be changed, select with the Start  button.
5. Use the *Up*  and *Down*  buttons to choose the first digit for the new password, select with the Start  button.
6. Repeat for the next three digits.
7. When all four digits are chosen, the display shows



1.5 Overview of controller buttons



1. Menu navigation up button
2. Menu navigation down button
3. Stop/Config button
4. Display
5. Alarm LED
6. Start button
7. Mode selection button

Button functions

| In Mode | Button input | Function |
|---------------------------------|-------------------------------|---|
| Manual | Start | Starts the engine |
| Manual | Auto | Enters Auto mode |
| | Stop | Stops the engine |
| | Stop (long press) | Enters Configuration mode |
| | Down + Stop (long press) | Enters Programming mode |
| Auto | Stop | Stops the engine and enters Manual mode |
| Manual Auto Configuration | Up Down | Scrolls through the views/parameters |
| Manual Auto | Up + Down (during Alarm view) | Acknowledges and clears the alarm |
| Configuration | Start | Selects/saves the parameter |
| Configuration | Up + Down (long press) | Enters the Event log page |
| Configuration | Stop (long press) | Back to Manual mode |
| Deep sleep | Any Key (for min. 1 s) | Back to Manual mode |
| Event log | Up + Down (long press) | Back to Configuration mode |
| Programming | Up + Down (long press) | Enters Manual mode |

1.6 Legal information

Warranty



WARNING

The controller is not to be opened by unauthorised personnel. If the controller is opened anyway, the warranty will be lost.

Disclaimer

DEIF takes no responsibility for installation or operation of the generator set. If there is any doubt about how to install or operate the engine/generator controlled by the SGC controller, the company responsible for the installation or the operation of the set must be contacted.

DEIF A/S reserves the right to change any of the contents of this document without prior notice.

The English version of this document always contains the most recent and up-to-date information about the product. DEIF does not take responsibility for the accuracy of translations, and translations might not be updated at the same time as the English document. If there is a discrepancy, the English version prevails.

Copyright

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2. Safety instructions

2.1 General safety instructions

This document includes important instructions that should be followed during installation and maintenance of the controller.

Installation and maintenance must only be carried out by authorised personnel, and always in accordance with all applicable state and local electrical codes. Efficient and safe operation of the controller can be acquired only if the equipment is correctly operated, configured and maintained.

The following notations found in this document can indicate potentially hazardous conditions to the operator, service personnel or the equipment.

NOTE Highlights an essential element of a procedure to ensure correctness.



CAUTION

Indicates a procedure or practice, which could result in damage or destruction of equipment, if not strictly observed.



WARNING

Indicates a procedure or practice, which could result in injuring personnel or loss of life, if not followed correctly.

2.2 Electrical safety

- Electric shock can cause severe personal injury or death.
- Ensure that the genset is grounded before performing any installation or service.
- Generators produce high electrical voltages, and direct contact with it can cause fatal electrical shock. Prevent contact with terminals, bare wires, connections, etc., while the generator and related equipment are running. Do not tamper with interlocks.
- To handle the maximum electrical current, the wires used for electrical connections and wirings must be of appropriate size.

2.3 In operation safety

- Before installing the controller, ensure that all power voltage supplies are positively turned off at the source. Disconnect the generator's battery cables and remove the panel fuse to prevent accidental start up. Disconnect the cable from the battery post, indicated by a NEGATIVE, NEG, or (–) first. Reconnect the negative cable last. Failure to do so will result in hazardous and possibly fatal electrical shock.
- Remove the electric power supply before removing the controller or touching other electrical parts.
- Use extreme caution when working on electrical components. High voltage can cause injury or death.
- With floors of metal or concrete, use rubber insulation mats placed on dry wood platforms when working near the generator or other electrical equipment.
- Do not wear damp clothing (particularly wet shoes) or allow skin surface to be damp when handling electrical equipment.
- Do not operate any electrical device or wires while standing in water, while barefoot, or while hands or feet are wet. It may result in severe electrical shock.
- Do not wear jewellery. Jewellery can cause a short circuit within electrical contacts and cause shock or burning.

In case of an accident caused by electric shock, immediately shut down the electrical power source. If this is not possible, try to release the victim from the live conductor. Avoid direct contact with the victim. Use a non-conducting object (for example a rope or a wooden stick) to release the victim from the live conductor. If the victim is unconscious, apply first aid and get immediate medical help.

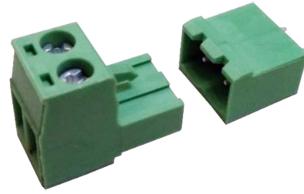
3. Technical specifications

3.1 Terminals

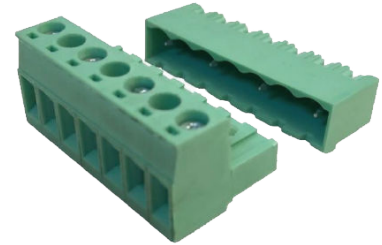
The SGC 120/121 uses three types of terminal blocks:



Connectors of 3.5 mm pitch



Connectors of 5.08 mm pitch



Connectors of 10.16 mm pitch

Table 3.1 Terminals

| Connector type | Pitch | Male (on controller)* | Female (mating part)* | Quantity |
|----------------|----------|-----------------------|-----------------------|----------|
| 4-pin | 3.5 mm | 5441294 | 5441430 | 2 |
| 6-pin | 3.5 mm | 5441317 | 5449283 | 1 |
| 8-pin | 3.5 mm | 5441320 | 5441456 | 1 |
| 10-pin | 3.5 mm | 5443962 | 5449306 | 1 |
| 2-pin | 5.08 mm | 5447353 | 5441980 | 1 |
| 4-pin | 10.16 mm | 5474274 | 5453499 | 2 |

*Note: Phoenix (Phoenix Contact (I) Pvt. Ltd.)

3.2 Power supply

| Category | Specification |
|--|--|
| Controller terminals | 1 (Ground) 2 (Battery or DC+) |
| Supply voltage range | Nominal voltage: 12/24 V DC Operating range: 8 to 28 V DC |
| Cranking drop out period | 50 ms |
| Maximum reverse voltage protection | -32 V DC |
| Measurement accuracy (battery voltage) | ±1 % full scale |
| Resolution | 0.1 V |
| Maximum current consumption | ~ 200 mA, 12/24 V DC (excluding the current load for the DC and rotary actuator's outputs) |
| Standby current consumption LCD backlight off) | 124 mA, 12 V DC 123 mA, 24 V DC |
| Deep sleep current | 20 mA, 12/24 V DC |

3.3 Genset voltage and frequency measurements

| Category | Specifications |
|--------------------------|--|
| Controller terminals | 27 (Neutral) 28 (L3) 29 (L2) 30 (L1) |
| Measurement type | True RMS |
| Phase-to-neutral voltage | 32 to 300 V AC RMS |
| Phase-to-phase voltage | 32 to 520 V AC RMS |
| Voltage accuracy | ±1 % of full scale for phase-to-neutral ±2 % of full scale for phase-to-phase |
| Voltage resolution | 1 V AC RMS for phase-to-neutral 2 V AC RMS for phase-to-phase |
| Frequency range | 5 to 75 Hz |
| Frequency accuracy | 0.25 % of full scale |
| Frequency resolution | 0.1 Hz |

NOTE For single phase applications, it is mandatory to connect the genset phase and neutral cables to the genset controller's phase L1 and neutral terminals.

3.4 Genset current measurements

| Category | Specifications |
|-------------------------------------|--|
| Controller terminals | 39 and 40 (for phase L1) 37 and 38 (for phase L2) 35 and 36 (for phase L3) |
| Measurement type | True RMS |
| Maximum CT secondary current rating | Nominal: -/5 A CT |
| Burden | 0.25 VA |
| Measurement accuracy | ±1.4 % of nominal |

NOTE Follow the recommended phase sequence while connecting the current transformer (CT)

3.5 Mains voltage and frequency measurement

| Category | Specifications |
|--------------------------|--|
| Controller terminals | 31 (Neutral) 32 (L3) 33 (L2) 34 (L1) |
| Measurement type | True RMS |
| Phase-to-neutral voltage | 32 to 300 V AC RMS |
| Phase-to-phase voltage | 32 to 520 V AC RMS |
| Voltage accuracy | ±2 % of full scale for phase-to-neutral ±2.5 % of full scale for phase-to-phase |

| Category | Specifications |
|----------------------|--|
| Voltage resolution | 1 V AC RMS for phase-to-neutral 2 V AC RMS for phase-to-phase |
| Frequency range | 5 to 75 Hz |
| Frequency accuracy | 0.25 % of full scale |
| Frequency resolution | 0.1 Hz |

NOTE For single phase applications, it is mandatory to connect the mains phase and neutral cables to the genset controller's phase L1 and neutral terminals.

3.6 Digital inputs

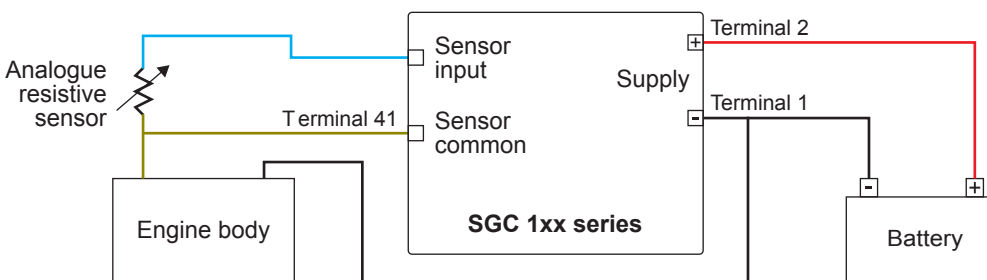
| Category | Specifications |
|-------------------------------|--|
| Controller terminals | 10, 11, 12, 21, 22 |
| Number of inputs | 5 |
| Type | Negative sensing (connect to ground for activation) |
| Software configurable options | Low Lub Oil Pressure (LLOP) Switch, High Water Temperature, and more (see Controller overview , Configurable parameters in the User manual for more details). |

3.7 Analogue resistive sensor inputs

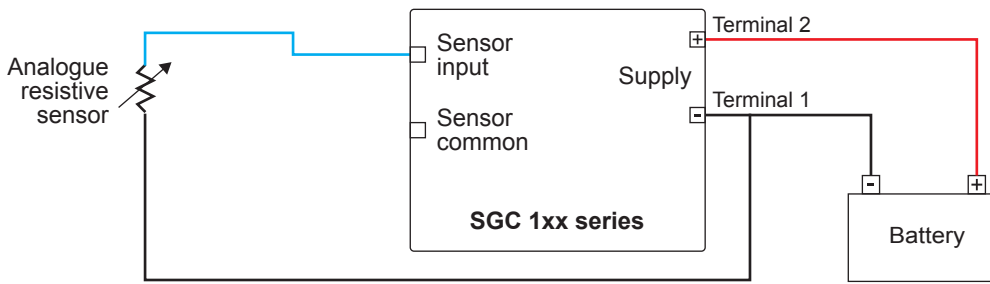
| Category | Specifications |
|------------------------|--|
| Controller terminals | 24 (Engine temperature) 25 (Fuel level sensor) 26 (Oil pressure) |
| Number of inputs | 3 |
| Type | Ratio-metric sensing |
| Range | 10 to 5000 Ω (terminal 24 and 25) 10 to 1000 Ω (terminal 26) |
| Open circuit detection | Above 1.5 k Ω (terminal 24 and 25) Above 5.5 k Ω (terminal 26) |
| Measurement accuracy | ± 2 % of full scale (up to 1000 Ω) |
| Connection method | Connect the sensor output terminals between the genset controller terminal and the battery ground terminal |

SCP connection

SCP connections for Analogue inputs 1 to 4*:

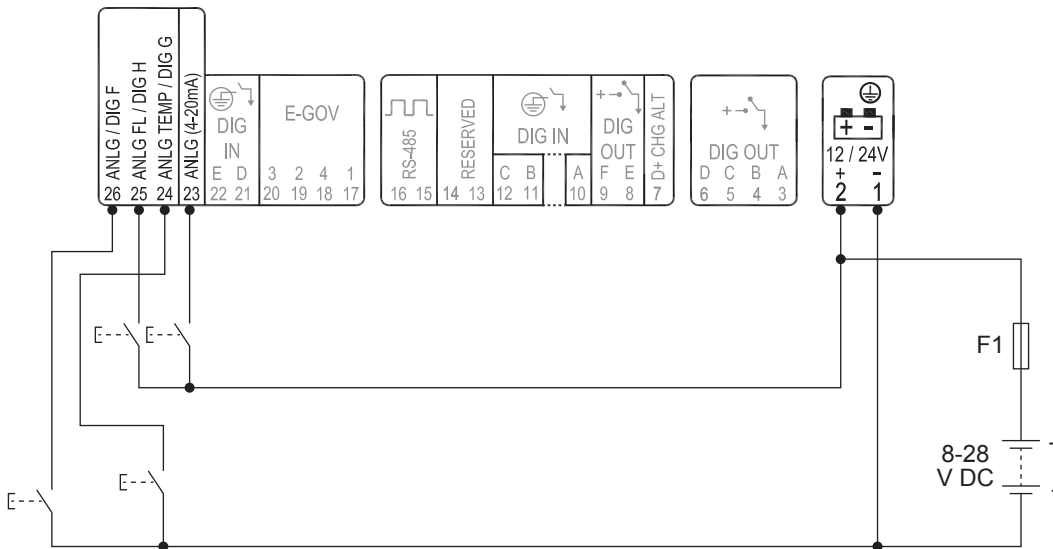


*SCP connections for Analogue input 2 used as *Fuel level sensor* with the reference configured as *Battery Negative*



3.8 Analogue inputs used as digital inputs

Analogue inputs can be used as digital inputs when wired as shown.



3.9 Analogue voltage/current input

| Category | Specifications |
|---------------------|---|
| Controller terminal | 23 |
| Measurement type | Analogue voltage/current sensing |
| Range | 0 to 5 V DC 4 to 20 mA |
| Accuracy | ±2 % of full scale voltage ±1.25 % of full scale current |
| Resolution | 0.1 V 0.1 mA |

3.10 Magnetic pick-up (MPU) input

| Category | Specifications |
|---------------------|-----------------------|
| Controller terminal | 42 |
| Measurement type | Single ended |
| Frequency range | 10 to 10 kHz |
| Input voltage range | 200 mV to 45 V AC RMS |

The Magnetic pick-up (MPU) is an inductive sensor fitted on the engine flywheel for the engine speed sensing. The output of the MPU is a sine-wave signal.

3.11 Digital outputs

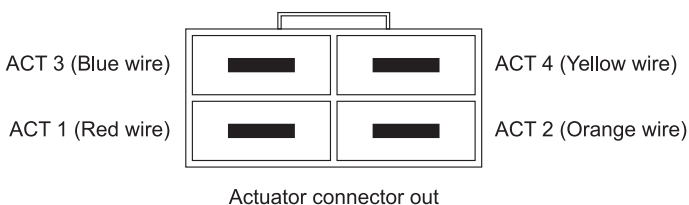
| Category | Specifications |
|-------------------------------|---|
| Controller terminals | 3, 4, 5, 6, 8, 9 |
| Number of outputs | 6 |
| Type | DC outputs |
| Maximum current rating | Max. per output: 500 mA Total max.: 1 A |
| Software configurable options | Start relay, Fuel relay and many more (see Controller overview , Configurable parameters for more details). |

- NOTE**
- Do not connect the starter motor relay and the stop solenoid directly to the controller's output terminals.
 - Genset and mains contactor latching relays should be compiled against 4 kVA surge as per IEC-61000-4-5 standard.

3.12 Rotary actuator outputs (SGC 121 only)

| Category | Specifications |
|---------------------|---------------------|
| Controller terminal | 17, 18, 19 and 20 |
| Type | Stepper motor drive |
| Max. current | 1 A |

The actuator outputs are used only for the Rotary actuator, if installed. The Rotary actuator is a 4-wire actuator that is used for creating an electronic governing application in case of a mechanical fuel system engine. In diesel engines, the Rotary actuator's shaft output gets mechanically connected to the stop lever or the throttle lever of an in-line or rotary fuel injection pump. In case of petrol or natural gas engines, the Rotary actuator's shaft output gets connected to the throttle/charge control valve.



It is recommended to follow the connection details of the Rotary actuator connector and SGC 121.

3.13 D+ Charger alternator

| Category | Specifications |
|---------------------|--|
| Controller terminal | 7 |
| Voltage range | 0 to V_{BATT} $V_{BATT} = 8$ to 28 V DC |
| Excitation | PWM (power limited to 3 W, 12 V/250 mA) |
| Accuracy | ± 1 % of full scale |

The charge fail is a combined input and output terminal. When the genset starts, the terminal provides controlled power output to excite the charging alternator. After the excitation is successfully done, the controller reads the charging alternator's output voltage for monitoring its health. The action for charge fail is configurable.

3.14 Sensor common point

| Category | Specifications |
|---------------------|-------------------------|
| Controller terminal | 41 |
| Range | ± 2 V |
| Accuracy | ± 2 % of full scale |

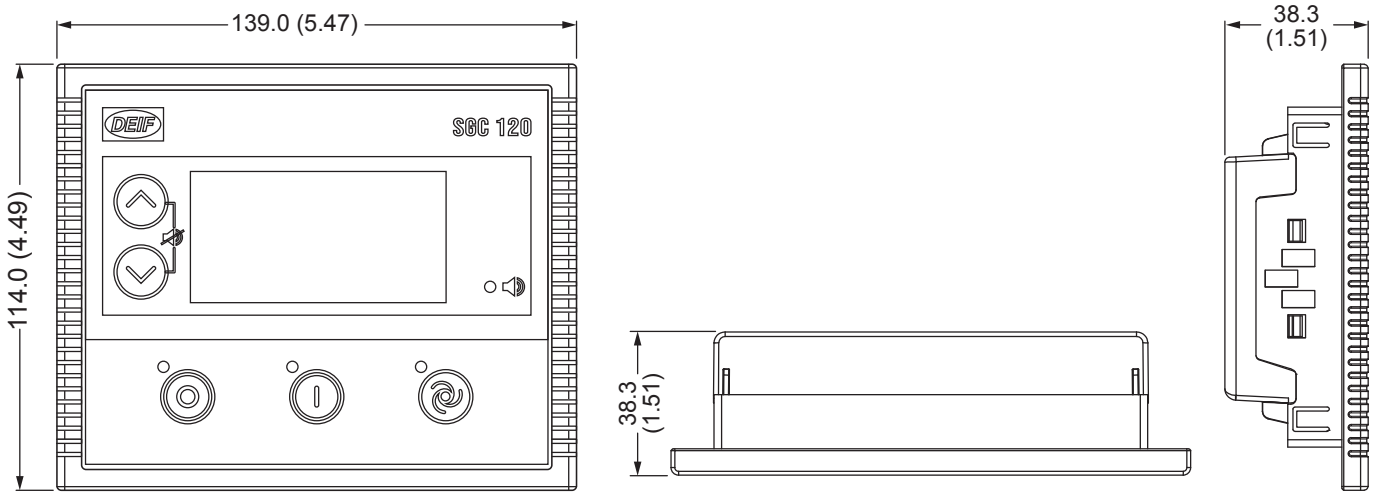
NOTE The sensor common point (SCP) terminal 41 of the controller should be directly connected to an electrically sound point on the engine body. This point on the engine body should serve as a common reference point for all analogue sensors such as those for measuring lube oil pressure, engine temperature and fuel level. The electrical cable used for the connection should not be shared with any other electrical connection. Such a wiring practice is strongly recommended to ensure that there is negligible potential difference, if any, between the engine body and the controller's SCP terminal, and, predictable and accurate analogue sensor measurements are always available in a wide variety of field conditions.

3.15 Communication ports

| Category | Specifications |
|---|--|
| USB | USB 2.0 type B for connection to PC with DEIF Smart Connect software. |
| RS-485 Serial Port | Half Duplex Max. Baud Rate 115200 Data connection 2-wire Termination resistor of 120 Ω between output terminals A and B (internally mounted) Common mode operating range and bus pin fault protection up to ± 70 V Maximum distance of line is 200 m |
| Controller terminals for RS-485 | 15 and 16 |
| CAN (SGC 120 only) | Baud rate: 250 kbps Packet size: 8 bytes Termination resistor of 120 Ω is provided |
| Controller terminals for CAN (SGC 120 only) | 13 and 14 |

4. Installation

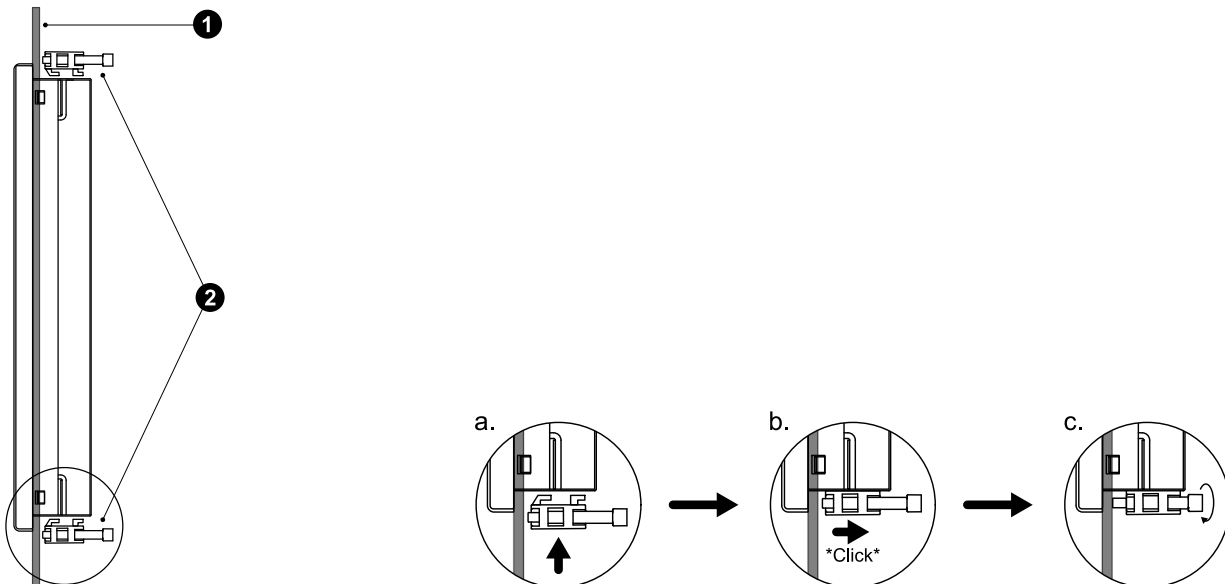
4.1 Dimensions



| | Length | Height | Depth |
|---------------|--------------------|--------------------|-----------------------------------|
| Controller | 139.0 mm (5.47 in) | 114.0 mm (4.49 in) | 38.3 mm (1.51 in) |
| Panel cut-out | 118.0 mm (4.65 in) | 93.0 mm (3.66 in) | Tolerance: ± 0.3 mm (0.01 in) |

4.2 Mounting in panel

To mount the controller into the panel, use the fixing clips provided along with the controller.



1. Panel surface.
2. Mounting clips.

- a. Insert the mounting clips into the slots on the controller.
- b. Press the mounting clips backwards until they "click" in place.
- c. Turn the screws to tighten the mounting clips (max. torque: 0.19 Nm).

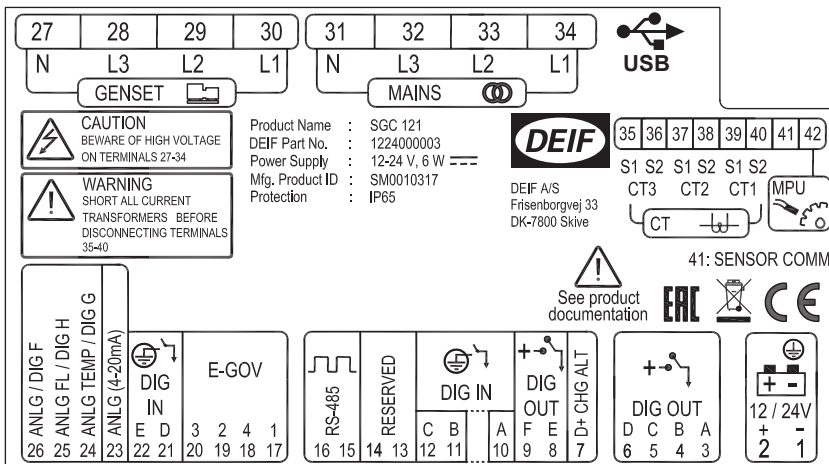


CAUTION

Over-tightening the screw may damage the controller casing.

4.3 Terminal details

Rear view of the controllers with terminal details.



| Terminal | Text | Description | Phoenix connector |
|----------|------------|---------------------------------------|-------------------|
| 1 | GND | Power ground | 5441980 |
| 2 | BATT + | Power supply positive | |
| 3 | DIG OUT A | DC output - A | |
| 4 | DIG OUT B | DC output - B | |
| 5 | DIG OUT C | DC output - C | 5441430 |
| 6 | DIG OUT D | DC output - D | |
| 7 | D+ CHG ALT | Input for charging alternator control | |
| 8 | DIG OUT E | DC output - E | |
| 9 | DIG OUT F | DC output - F | 5441223 |
| 10 | DIG IN A | Input from switch A | |
| 11 | DIG IN B | Input from switch B | |
| 12 | DIG IN C | Input from switch C | |
| 13 | CAN H | CAN High | |
| 14 | CAN L | CAN Low | 5441249 |
| 15 | RS-485 B | RS-485 B | |
| 16 | RS-485 A | RS-485 A | |

| Terminal | Text | Description | Phoenix connector |
|----------|---------------------|---|-------------------|
| 17 | GOV_ACT-OUT1 | Output for actuator (SGC 121 only) | 5447560 |
| 18 | GOV_ACT-OUT4 | Output for actuator (SGC 121 only) | |
| 19 | GOV_ACT-OUT2 | Output for actuator (SGC 121 only) | |
| 20 | GOV_ACT-OUT3 | Output for actuator (SGC 121 only) | |
| 21 | DIG_IN D | Input from switch D | |
| 22 | DIG_IN E | Input from switch E | |
| 23 | ANLG_I_IN (SGC 120) | Analogue input 4 to 20 mA | |
| | ANLG_IN (SGC 121) | Analogue input 4 to 20 mA/2.5 ±2 V | |
| 24 | ANLG_IN ENG_TEMP | Analogue input from Engine temperature sensor | |
| 25 | ANLG_IN FUEL_LEVEL | Analogue input from Fuel level sensor | |
| 26 | ANLG_IN LOP | Analogue input from Lube oil pressure sensor | |
| 27 | GEN_V-IN NTRL | Voltage input from Generator Neutral | 5453499 |
| 28 | GEN_V-IN L3 | Voltage input from Generator phase L3 | |
| 29 | GEN_V-IN L2 | Voltage input from Generator phase L2 | |
| 30 | GEN_V-IN L1 | Voltage input from Generator phase L1 | |
| 31 | MAINS_V-IN NTRL | Voltage input from Mains Neutral | |
| 32 | MAINS_V-IN L3 | Voltage input from Mains phase L3 | |
| 33 | MAINS_V-IN L2 | Voltage input from Mains phase L2 | |
| 34 | MAINS_V-IN L1 | Voltage input from Mains phase L1 | |
| 35 | GEN_CT-IN L3 1 | CT input 1 from Generator phase L3 | 5441252 |
| 36 | GEN_CT-IN L3 2 | CT input 2 from Generator phase L3 | |
| 37 | GEN_CT-IN L2 1 | CT input 1 from Generator phase L2 | |
| 38 | GEN_CT-IN L2 2 | CT input 2 from Generator phase L2 | |
| 39 | GEN_CT-IN L1 1 | CT input 1 from Generator phase L1 | |
| 40 | GEN_CT-IN L1 2 | CT input 2 from Generator phase L1 | |
| 41 | SCP | Sensor common point | |
| 42 | MPU-IN | MPU Input | |

4.4 Typical wiring diagrams

Figure 4.1 SGC 120 typical wiring

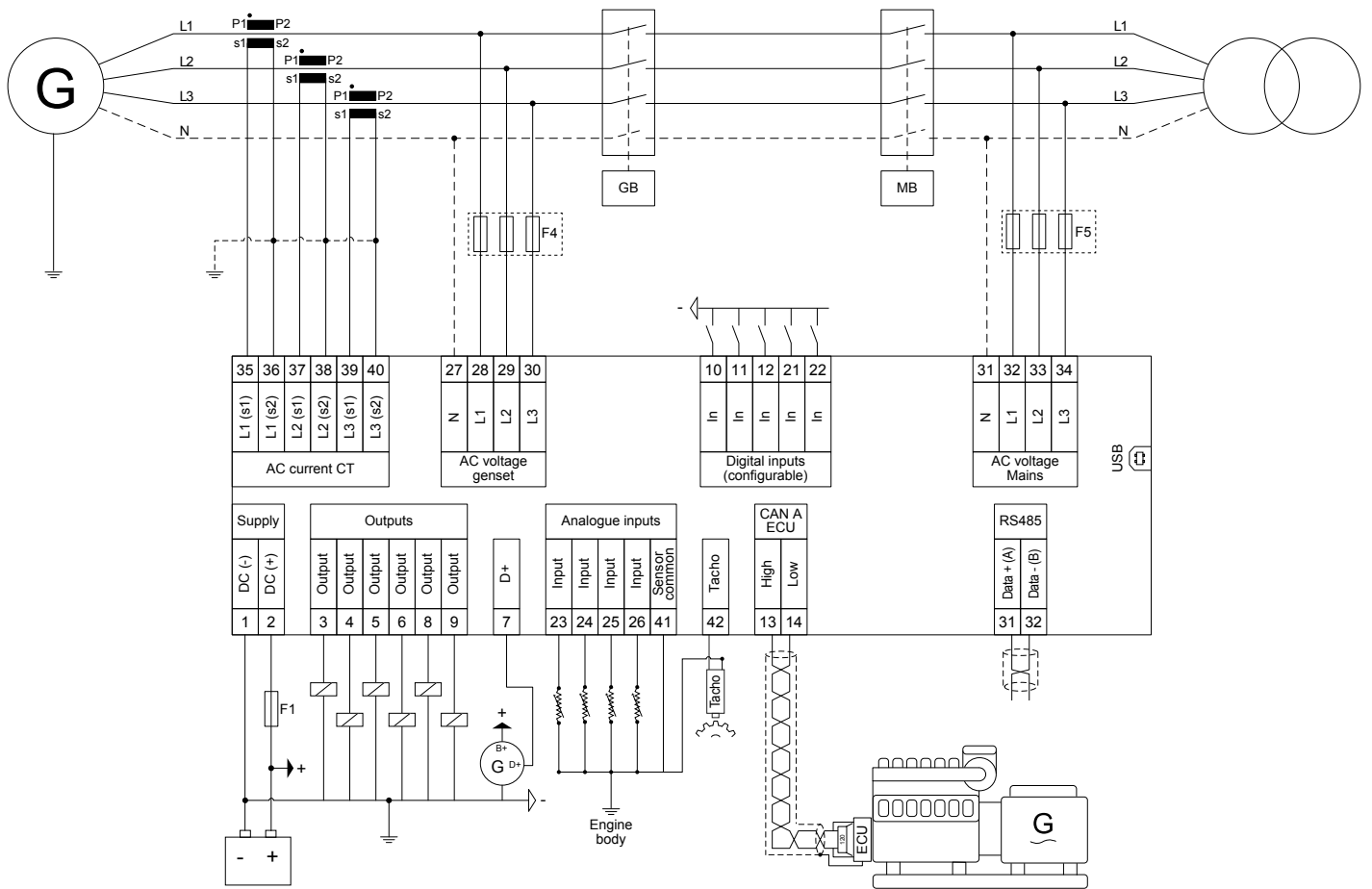
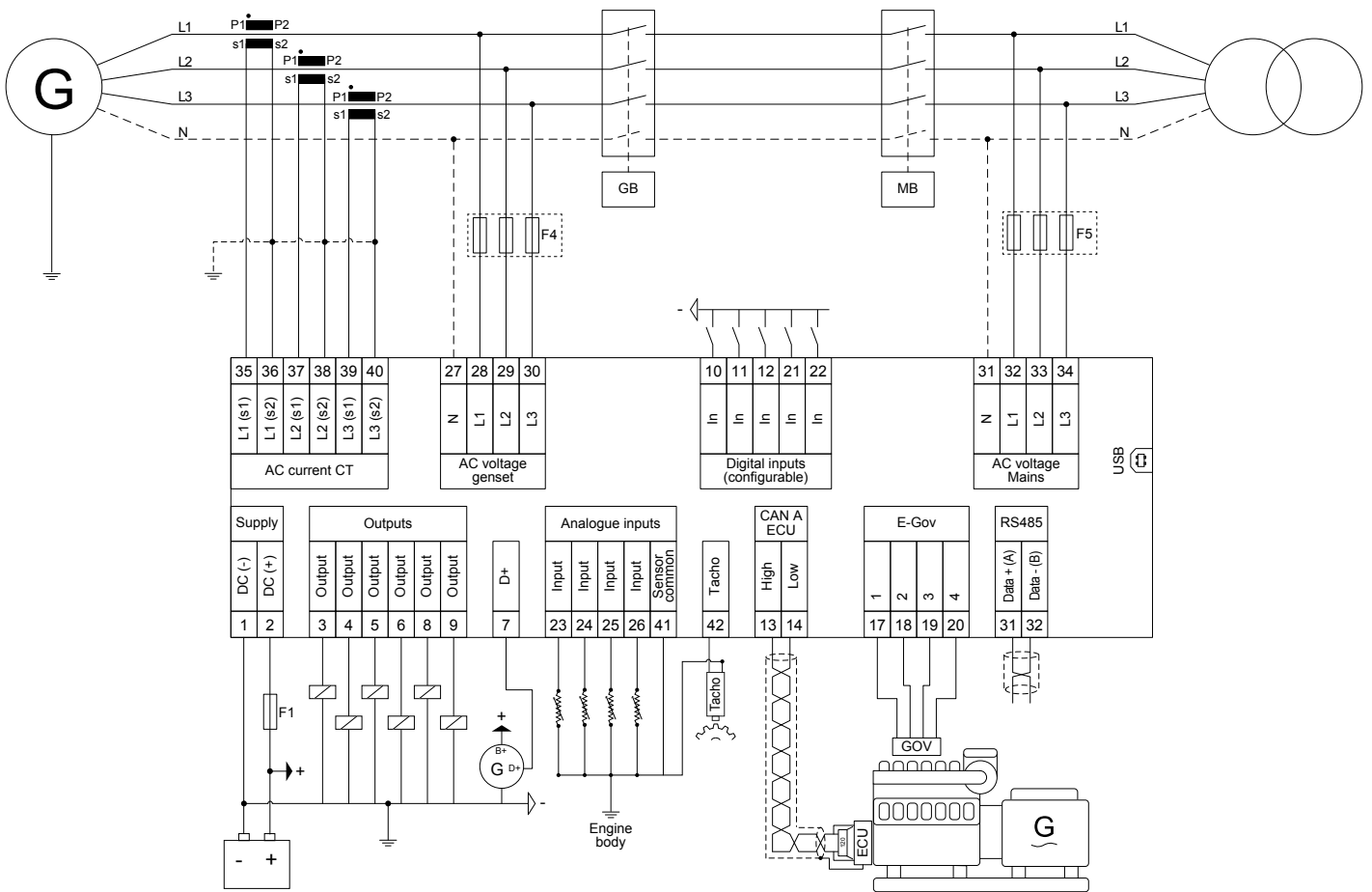


Figure 4.2 SGC 121 typical wiring





- NOTE**
- Wiring diagrams are examples. Use the application's wiring diagram during installation.
 - Genset and mains contactor latching relays should be compiled against 4 kV surge as per IEC-61000-4-5 standard.
 - Relay cards used with the controller should be protected against reverse battery voltages.
 - Analogue input 2 used for *Fuel level sensor* can be wired with the reference to *Battery Negative*, see **Specifications, Analogue resistive sensor inputs**.
 - Communication ports for CAN (terminals 13 and 14) and RS-485 (terminals 31 and 32) have built-in 120 Ω resistors.
 - If a digital output is connected to a relay, the relay must include freewheeling diodes.


5. Monitoring mode

5.1 Monitoring mode


In Monitoring mode, the display views shift automatically after a pre-defined time. This delay time can be configured in the configuration menu.

The views can also be changed manually with the *Up*  and *Down*  buttons.


Engine status and operating mode

| | |
|---|---------------|
|  | STATUS |
| Engine off - ready | |
| Manual Mode | |


Manual mode

| | |
|---|---------------|
|  | STATUS |
| Engine off - ready | |
| Auto | |


Auto mode

| | |
|---|--------------------|
|  | GEN VOLTAGE |
| L1 245 V | L1-L2 424 V |
| L2 245 V 50.0 Hz | L2-L3 427 V |
| L3 247 V | L1-L3 427 V |


Generator voltage

| | |
|---|-------------------|
|  | LOAD POWER |
| 2.1 kVA | L1 0.7 kVA |
| | L2 0.7 kVA |
| | L3 0.7 kVA |


Load power¹

| | |
|---|----------------------|
|  | LOAD APP. PWR |
| 2.1 kVA | L1 0.7 kVA |
| | L2 0.7 kVA |
| | L3 0.7 kVA |


Load apparent power¹

| | |
|---|------------------------|
|  | LOAD REACT. PWR |
| 0.0 kVAr | L1 0.0 kVAr |
| | L2 0.0 kVAr |
| | L3 0.0 kVAr |


Load reactive power¹

| | |
|---|-----------------------|
|  | GEN PWR FACTOR |
| 1.00 PF | PF - L1 1.00 |
| | PF - L2 1.00 |
| | PF - L3 1.00 |


Generator power factor¹

| | |
|---|-------------------|
|  | GEN ENERGY |
| \$ | 1.9 kWh |
| | 2.0 kVAh |
| | 0.1 kVArh |



Generator energy

| | |
|---|---------------------|
|  | LOAD CURRENT |
| L1 | 2.9 A |
| L2 | 2.9 A |
| L3 | 2.9 A |



Load current¹

| | |
|---|----------------------|
|  | MAINS HEALTHY |
| L1 244 V | L1-L2 421 V |
| L2 243 V 49.9 Hz | L2-L3 425 V |
| L3 248 V | L1-L3 429 V |



Mains status

| | |
|---|------------------|
|  | ENG SPEED |
|  | 1497 RPM |



Engine speed

| | |
|---|---------------------|
|  | ENG RUN TIME |
|  | 1 Hrs 29min |
| | STARTS 57 |
| | TRIPS 9 |



Engine run time

| | |
|---|--------------------|
|  | ENG BATTERY |
|  | 12.9 V |



Engine battery voltage


| | |
|---|-----------------|
|  | ENG TEMP |
|  | 35 °C |
| | 94 °F |


Engine temperature²

| | |
|---|-----------------------|
|  | ENG LUB OIL PR |
|  | 10.0 bar |
| | 145 psi |

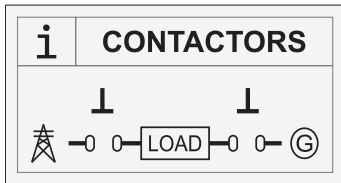
Engine lube oil pressure²

| | |
|---|---------------------|
|  | ENG REM FUEL |
|  | 100 % |

| | |
|---|------------------------|
|  | AUTO EXERCISE 1 |
| FREQ: DAILY | |
| NEXT RUN: | |
| | AT 10:00 Hrs |
| | FOR 03:25 Hrs |

| | |
|---|------------------------|
|  | AUTO EXERCISE 2 |
| FREQ: DAILY | |
| NEXT RUN: | |
| | AT 20:00 Hrs |
| | FOR 10:00 Hrs |

Engine fuel balance²



Contactor status⁴

Auto Exercise 1³



Alarms (example)

Auto Exercise 2³



Product info

¹ L2 and L3 phases are only visible if the controller is configured for a 3-phase genset.

² The display is only visible if the corresponding sensor is configured.

³ The display is only visible if the event is enabled in the controller's configuration.

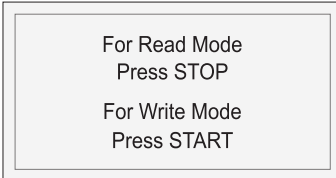
⁴ The display is only visible if the output related to genset and mains contactors are configured.



6. Configuration mode

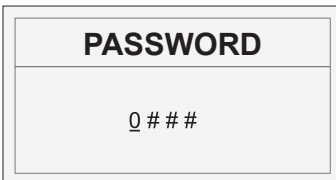
6.1 Configuration mode





To configure the controller, follow these steps:

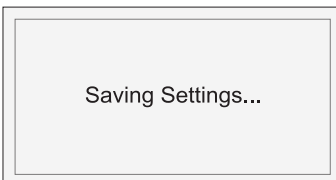
1. Press and hold the *Stop/Config*  button for at least three seconds.
2. The display shows



3. To see the configuration, press the *Stop/Config*  button. To change the configuration, press the *Start*  button.
4. The display shows



5. To enter the the four digit password:
 - Scroll through the digits with the *Up*  and *Down*  buttons.
 - Select a digit with the *Start*  button.
6. To leave the Configuration mode, press and hold the *Stop/Config*  button.
7. Until the configuration is saved, the display shows



6.2 Configurable parameters

6.2.1 Configurable parameters

The tables give an overview of configurable parameters.

Level 1 (table titles) and Level 2 texts are shown twice:

- DEIF Smart Connect software: Normal sentence case, for example Power on Mode.
- Controller display: Capital case in brackets, for example (POWER ON MODE)

6.2.2 Module

Table 6.1 General (GENERAL)

| Level 2 | Range |
|---|--------------------|
| Profile name | Profile 1 |
| Power on Mode (POWER ON MODE) | Manual Auto |
| Power on Lamp Test (POWER ON LAMP TEST) | Enable Disable |
| Deep Sleep Mode (DEEP SLEEP MODE) | Enable Disable |
| Auto-Clear Warning Alarm (AUTO CLEAR WARNINGS) | Enable Disable |
| Language (LANGUAGE SUPPORT) | English Chinese |

Table 6.2 Display (DISPLAY)

| Level 2 | Range |
|--------------------------------------|-------------------|
| Contrast (CONTRAST) | 0 to 100 % |
| Power Save Mode (POWER SAVE MODE) | Enable Disable |

Table 6.3 Communication (RS485 COMM)

| Level 2 | Range |
|-----------------------------------|---|
| Communication Mode (COMM MODE) | None Modbus |
| Slave ID (MODBUS SLAVE ID) | 1 to 247 |
| Baudrate (BAUDRATE) | 1200 2400 4800 9600 19200 38400 57600 115200 |
| Parity Bit (PARITY) | None Even Odd |

Table 6.4 Auto Exercise – Event 1 (AUTO EXERCISE – 1)

| Level 2 | Range |
|---------------------------------------|-------------------|
| Auto Exercise (EVENT 1) | Enable Disable |
| Event Occurrence (EVENT OCCURENCE) | Daily Weekly |

| Level 2 | Range |
|----------------------------------|---|
| | Monthly |
| Event Day (EVENT DAY) | Daily: Runs every day Weekly: Sunday to Saturday Monthly: 1 to 28 |
| Start Time (START TIME) | 00:00 to 23:59 hour |
| Duration (GEN ON DURATION) | 00 hr 01 min. to 99 hr 59 min. |
| Load Transfer (LOAD TRANSFER) | Enable Disable |

Table 6.5 Auto Exercise – Event 2 (AUTO EXERCISE – 2)

| Level 2 | Range |
|---------------------------------------|---|
| Auto Exercise (EVENT 2) | Enable Disable |
| Event Occurrence (EVENT OCCURENCE) | Daily Weekly Monthly |
| Event Day (EVENT DAY) | Daily: Runs every day Weekly: Sunday to Saturday Monthly: 1 to 28 |
| Start Time (START TIME) | 00:00 to 23:59 hour |
| Duration (GEN ON DURATION) | 00 hr 01 min. to 99 hr 59 min. |
| Load Transfer (LOAD TRANSFER) | Enable Disable |

6.2.3 Digital inputs

Table 6.6 Digital Input # (DIG IN #)

| Level 2 | Range |
|----------------------------|--|
| Source (SOURCE) | See Digital input source selection in this document |
| Name (NAME) | Auxiliary Input # |
| Polarity (POLARITY) | Close to Activate Open to Activate |
| Action (ACTION) | None Notification Warning Electrical Trip Shutdown |
| Activation (ACTIVATION) | Never From Engine Start From Monitoring On |

| Level 2 | Range |
|--|-----------|
| | Always |
| Activation Delay (ACTIVATION DELAY) | 0 to 60 s |

6.2.4 Analogue inputs

Table 6.7 Analogue Input 1 (ENG TEMP / DIG G)

| Level 2 | Range |
|--|--|
| Use Input As (SENSOR SELECTION) | Not used Digital Input G Anlg In Eng Temp |
| (Digital) Source ((DIG) SOURCE) | See Digital input source selection in this document |
| Name (NAME) | Auxiliary Input G |
| (Digital) Polarity ((DIG) POLARITY) | Close to Activate Open to Activate |
| (Digital) Action ((DIG) ACTION) | None Notification Warning Electrical Trip Shutdown |
| (Digital) Activation ((DIG) ACTIVATION) | Never From Engine Start From Monitoring On Always |
| (Digital) Activation Delay ((DIG) ACTIVATION DELAY) | 1 to 60 s |
| (ETS) Circuit Fault Action (OPEN CKT ALARM) | None Notification Warning Electrical Trip Shutdown |
| (ETS) Engine Temperature Sensor Calibration Table | Resistance: 0 to 1000 Ω Temperature: 25 to 300 °C |

Table 6.8 Analogue Input 2 (FUEL LVL / DIG H)

| Level 2 | Range |
|--|--|
| Use Input As (SENSOR SELECTION) | Not used Digital Input H Fuel Level Sensor |
| (Digital) Source ((DIG) SOURCE) | See Digital input source selection in this document |
| Name (NAME) | Auxiliary Input H |
| (Digital) Polarity ((DIG) POLARITY) | Close to Activate Open to Activate |
| (Digital) Action | None |

| Level 2 | Range |
|--|--|
| ((DIG) ACTION) | Notification Warning Electrical Trip Shutdown |
| (Digital) Activation ((DIG) ACTIVATION) | Never From Engine Start From Monitoring On Always |
| (Digital) Activation Delay ((DIG) ACTIVATION DELAY) | 1 to 60 s |
| (FLS) Low Fuel Level Shutdown (SHUTDOWN) | Enable Disable |
| (FLS) Shutdown Threshold (SHUTDOWN THRESHOLD) | 0 to 78 % |
| (FLS) Low Fuel Level Notification (NOTIFICATION) | Enable Disable |
| (FLS) Notification Threshold (NOTIFICATION THRESHOLD) | 2 to 80 % |
| (FLS) Fuel Tank Capacity (FUEL TANK SIZE) | 2 to 1000 litre |
| (FLS) Fuel Theft Warning (FUEL THEFT ALARM) | Enable Disable |
| (FLS) Fuel Theft Alarm Threshold (FUEL LVL THRESH) | 1 to 100 % per hour |
| (FLS) Circuit Fault Action (OPEN CKT ALARM) | None Notification Warning Electrical Trip Shutdown |
| (FLS) Fuel Sensor Reference (FUEL LVL REF) | Battery Negative Engine Body |
| (FLS) Fuel Level Sensor Calibration Table | Resistance: 0 to 1000 Ω Fuel level: 0 to 100 % |

Table 6.9 Analogue Input 3 (LOP / DIG F)

| Level 2 | Range |
|--|--|
| Use Input As (SENSOR SELECTION) | Not used Digital Input F Lube Oil Pressure |
| (Digital) Source ((DIG) SOURCE) | See Digital input source selection in this document |
| Name (NAME) | Auxiliary Input F |
| (Digital) Polarity ((DIG) POLARITY) | Close to Activate Open to Activate |
| (Digital) Action ((DIG) ACTION) | None Notification Warning Electrical Trip |

| Level 2 | Range |
|--|--|
| | Shutdown |
| (Digital) Activation ((DIG) ACTIVATION) | Never From Engine Start From Monitoring On Always |
| (Digital) Activation Delay ((DIG) ACTIVATION DELAY) | 1 to 60 s |
| (LOP) Circuit Fault Action (OPEN CKT ALARM) | None Notification Warning Electrical Trip Shutdown |
| (LOP) Lube Oil Pressure Sensor Calibration | Resistance: 10 to 100 Ω Pressure: 1.0 to 10.0 bar |

Table 6.10 Analogue Input 4 (LOP/DIG I)

| Level 2 | Range |
|--|--|
| Use Input As (SENSOR SELECTION) | Not used Digital Input I S4 Sensor (4-20 mA LOP) |
| (Digital) Source ((DIG) SOURCE) | See Digital input source selection in this document |
| Name (NAME) | Auxiliary Input I |
| (Digital) Polarity ((DIG) POLARITY) | Close to Activate Open to Activate |
| (Digital) Action ((DIG) ACTION) | None Notification Warning Electrical Trip Shutdown |
| (Digital) Activation ((DIG) ACTIVATION) | Never From Engine Start From Monitoring On Always |
| (Digital) Activation Delay ((DIG) ACTIVATION DELAY) | 1 to 60 s |
| (LOP) Low Level Shutdown (SHUTDOWN) | Enable Disable |
| (LOP) Low Level Shutdown Threshold (SHUTDOWN THRESHOLD) | 0.0 to 9.8 bar |
| (LOP) Low Level Warning (WARNING) | Enable Disable |
| (LOP) Low Level Warning Threshold (WARNING THRESHOLD) | 0.2 to 10.0 bar |
| (LOP) Circuit Fault Action (OPEN CKT ALARM) | None Notification Warning Electrical Trip |

| Level 2 | Range |
|--|--|
| | Shutdown |
| (LOP) Lube Oil Pressure Sensor Calibration | Current: 4 to 20 mA Pressure: 0.0 to 10.0 bar |

6.2.5 Outputs

Table 6.11 Outputs # (OUT #)

| Level 2 | Range |
|----------------------------------|---|
| Source (SOURCE) | See Digital output source selection in this document |
| On Activation (ON ACTIVATION) | Energise De-energise |

6.2.6 Timers

Table 6.12 Cranking (CRANKING TIMERS)

| Level 2 | Range |
|--|--------------|
| Crank Hold Time (CRANK HOLD TIME) | 1 to 15 s |
| Crank Rest Time (CRANK REST TIME) | 2 to 60 s |
| Manual Start Delay (MANUAL START DELAY) | 0 to 300 s |
| Auto Start Delay (AUTO START DELAY) | 0 to 43200 s |

Table 6.13 General (GENERAL TIMER)

| Level 2 | Range |
|---|-------------|
| Safety Monitoring Delay (SAFETY MONITOR DELAY) | 10 to 60 s |
| Mains Detect Delay (MAINS DETECT DELAY) | 1 to 300 s |
| Alternator Detect Delay (ALT DETECT DELAY) | 1 to 30 s |
| Warm-Up Delay (WARM-UP DELAY) | 0 to 60 s |
| Return To Mains Delay (RETN-TO-MAINS DELAY) | 0 to 600 s |
| Engine Cooling Time (ENG COOL TIME) | 0 to 300 s |
| Stop Action Time (STOP ACTION TIME) | 10 to 120 s |
| Additional Stopping Time (ADDN STOPPING TIME) | 0 to 120 s |
| Load Transfer Delay | 0 to 60 s |

| Level 2 | Range |
|--|--------------|
| (LOAD TRANSFER DELAY) | |
| Power Save Mode Delay (PWR SAVE MODE DELAY) | 5 to 1800 s |
| Screen Changeover Time (SCRN CHNGOVER TIME) | 1 to 1800 s |
| Deep Sleep Mode Delay (DEEP SLP MODE DELAY) | 5 to 1800 s |
| Sounder Alarm Time (SOUNDER ALARM TIMER) | 1 to 300 s |
| Auto Exit Config Mode (AUTO EXIT CNFG MODE) | 10 to 1800 s |

6.2.7 Generator

Table 6.14 Alternator configuration (ALT CONFIG)

| Level 2 | Range |
|---|--|
| Alternator Present (ALT PRESENT) | Yes No |
| Number of Poles (NUMBER OF POLES) | 2/4/6/8 |
| AC system (ALT AC SYSTEM) | 1 phase 3 phase |
| Min Healthy Voltage (MIN HEALTHY VOLT) | 50 to 350 V phase-neutral |
| Min Healthy Frequency (MIN HEALTHY FREQ) | 10 to 75 Hz |
| Phase Reversal Detection (PHASE REVERSAL DETECT) | Enable Disable |
| Phase Reversal Action (PHASE REVERSAL ACTION) | None Notification Warning Electrical Trip Shutdown |
| Auto Load Transfer (AUTO LOAD TRANSFER) | Enable Disable |

Table 6.15 Voltage Monitoring (VOLT MONITOR)

| Level 2 | Range |
|---|---------------------------|
| Under-voltage Shutdown (UNDER VOLT SHUTDOWN) | Enable Disable |
| Under-voltage Shutdown Threshold (UV SHUTDOWN THRESH) | 50 to 295 V phase-neutral |
| Under-voltage Warning (UNDER VOLT WARNING) | Enable Disable |
| Under-voltage Warning Threshold (UV WARNING THRESHOLD) | 55 to 300 V phase-neutral |

| Level 2 | Range |
|--|----------------------------|
| Over-voltage Shutdown (OVER VOLT SHUTDOWN) | Enable Disable |
| Over-voltage Shutdown Threshold (OV SHUTDOWN THRESH) | 105 to 350 V phase-neutral |
| Over-voltage Warning (OVER VOLT WARNING) | Enable Disable |
| Over-voltage Warning Threshold (OV WARNING THRESHOLD) | 100 to 345 V phase-neutral |

Table 6.16 Frequency Monitoring (FREQ MONITOR)

| Level 2 | Range |
|---|-------------------|
| Under-frequency Shutdown (UNDER FREQ SHUTDOWN) | Enable Disable |
| Under-frequency Shutdown Threshold (UF SHUTDOWN THRESH) | 10.0 to 59.0 Hz |
| Under-frequency Warning Enable (UNDER FREQ WARNING) | Enable Disable |
| Under-frequency Warning Threshold (UF WARNING THRESHOLD) | 11.0 to 60.0 Hz |
| Over-frequency Shutdown Enable (OVER FREQ SHUTDOWN) | Enable Disable |
| Over-frequency Shutdown Threshold (OF SHUTDOWN THRESH) | 26.0 to 75.0 Hz |
| Over-frequency Warning Enable (OVER FREQ WARNING) | Enable Disable |
| Over-frequency Warning Threshold (OF WARNING THRESHOLD) | 25.0 to 74.0 Hz |

Table 6.17 Current Monitoring (CURRENT MONITOR)

| Level 2 | Range |
|---|--|
| CT Ratio (LOAD CT RATIO) | 0 to 8000 / 5 |
| Over-current Action (OVER CURR ACTION) | None Notification Warning Electrical Trip Shutdown |
| Over-current Threshold (OVER CURR THRESHOLD) | 5 to 10000 A |
| Over-current Delay (OVER CURR DELAY) | 1 to 600 s |
| CT Correction Factor | 0.900 to 1.100 |
| CT Location (CT LOCATION) | On Alt Output Cable On Load Cable |

Table 6.18 Load Monitoring (LOAD MONITOR)

| Level 2 | Range |
|---|--|
| Generator Rating (GEN RATING) | 0 to 8000 kW |
| Overload Action (OVERLOAD ACTION) | None Notification Warning Electrical Trip Shutdown |
| Overload Threshold (OVERLOAD THRESHOLD) | 50 to 150 % |
| Overload Monitoring Delay (OVERLOAD MON DELAY) | 1 to 600 s |
| Unbalanced Load Action (UNBAL LOAD ACTION) | None Warning Electrical Trip Shutdown Notification |
| Unbalanced Load Threshold (UNBAL LOAD THRESHOLD) | 5 to 200 % |
| Unbalanced Load Delay (UNBAL LOAD DELAY) | 1 to 600 s |

6.2.8 Mains

Table 6.19 Configuration (MAINS CONFIG)

| Level 2 | Range |
|--|----------------------|
| Mains Monitoring (MAINS MONITORING) | Enable Disable |
| Mains AC System (MAINS AC SYSTEM) | 1 phase 3 phase |
| Phase Reversal Detection (PHASE REVERSAL DETECT) | Enable Disable |
| Phase Reversal Action (PHASE REVERSAL ACTION) | None Notification |
| Partial Healthy Detection (MAINS PARTIAL HEALTHY) | Enable Disable |

Table 6.20 Voltage Monitoring (VOLT MONITOR)

| Level 2 | Range |
|------------------------------|---------------------------|
| Under-voltage (UV ENABLE) | Enable Disable |
| (UV) Trip (UV TRIP) | 50 to 298 V phase-neutral |
| (UV) Return (UV RETURN) | 52 to 300 V phase-neutral |
| Over-voltage (OV ENABLE) | Enable Disable |

| Level 2 | Range |
|----------------------------|----------------------------|
| (OV) Return (OV RETURN) | 100 to 348 V phase-neutral |
| (OV) Trip (OV TRIP) | 102 to 350 V phase-neutral |

Table 6.21 Frequency Monitoring (FREQ MONITOR)

| Level 2 | Range |
|--------------------------------|-------------------|
| Under-frequency (UF ENABLE) | Enable Disable |
| (UF) Trip (UF TRIP) | 10.0 to 59.0 Hz |
| (UF) Return (UF RETURN) | 11.0 to 60.0 Hz |
| Over-frequency (OF ENABLE) | Enable Disable |
| (OF) Return (OF RETURN) | 25.0 to 74.0 Hz |
| (OF) Trip (OF TRIP) | 26.0 to 75.0 Hz |

6.2.9 Engine

Table 6.22 Crank Disconnect (CRANK DISCONN)

| Level 2 | Range |
|---|-------------------|
| Start Attempts (START ATTEMPTS) | 1 to 9 |
| Disconnect on Oil Pressure Sensor (DISCONN ON LOP SENS) | Enable Disable |
| Monitor Pressure Sensor Before Crank (MON LLOP BEF CRANK) | Enable Disable |
| Pressure Sensor Monitoring Threshold (DISCONN LOP SENS) | 0.5 to 10.0 bar |
| Monitor Pressure Switch Before Crank (MON LOP BEF CRANK) | Enable Disable |
| Disconnect on Oil Pressure Switch (DISCONN ON LLOP SW) | Enable Disable |
| Pressure Switch Transient Time (LLOP SW TRANS TIME) | 0.0 to 3.0 s |
| Crank Disconnect At Alt Frequency (ALT FREQUENCY) | 10 to 70 Hz |
| Crank Disconnect At Engine Speed (ENGINE SPEED) | 150 to 4000 RPM |
| Disconnect On Charging Alt Voltage (DISC ON CHG ALT VOLT) | Enable Disable |
| Charging Alt Disconnect Volt Threshold (CHG ALT THRESHOLD) | 5.0 to 30.0 V |

Table 6.23 Speed Monitoring (SPEED MONITOR)

| Level 2 | Range |
|--|--|
| Engine Speed Sense Source (SPEED SENSE SOURCE) | Alternator frequency Magnetic Pickup W-Point Frequency |
| Flywheel Teeth (Magnetic Pickup) | 1 to 300 |
| W-Point Frequency@ 1500 | 0 to 500 |
| Under-speed Shutdown (UNDER SPEED SHUTDOWN) | Enable Disable |
| Under-speed Threshold (UNDER SPEED THRESH) | 0 to 3600 RPM |
| Under-speed Delay (UNDER SPEED DELAY) | 1 to 60 s |
| Over-speed Threshold (OVER SPEED THRESH) | 700 to 4000 RPM |
| Over-speed Delay (OVER SPEED DELAY) | 1 to 20 s |
| Gross Over-speed Threshold (GROSS OS THRESHOLD) | 100 to 200 % |

Table 6.24 Battery Monitoring (BATTERY MONITOR)

| Level 2 | Range |
|---|--|
| Low Battery Voltage Action (LOW VOLT ACTION) | None Notification Warning Electrical Trip Shutdown |
| Low Battery Voltage Threshold (LOW VOLT THRESHOLD) | 8.0 to 31.0 V |
| Low Battery Voltage Delay (LOW VOLT DELAY) | 5 to 1800 s |
| High Battery Voltage Action (HIGH VOLT ACTION) | None Notification Warning Electrical Trip Shutdown |
| High Battery Voltage Threshold (HIGH VOLT THRESHOLD) | 9.0 to 32.0 V |
| High Battery Voltage Delay (HIGH VOLT DELAY) | 5 to 1800 s |

Table 6.25 Charging Alternator Monitoring (CHARGE ALT MON)

| Level 2 | Range |
|--|--|
| Charging Alternator Fail Action (FAIL ACTION) | None Notification Warning Electrical Trip |

| Level 2 | Range |
|--|---------------|
| | Shutdown |
| Charging Alternator Fail Threshold (FAIL THRESHOLD) | 0.0 to 35.0 V |
| Charging Alternator Fail Delay (FAIL DELAY) | 5 to 60 s |

Table 6.26 Preheating (PREHEAT)

| Level 2 | Range |
|--|-------------------|
| Pre-heat Timer (PREHEAT TIMER) | 1 to 900 s |
| Engine Temperature (ENG TEMP EN) | Enable Disable |
| Engine Temperature Threshold (ENG TEMP LIMIT) | 10 to 300 °C |

Table 6.27 Engine Control Unit (ECU) (SGC 120 Only)

| Level 2 | Range |
|----------------------------------|--|
| Engine Type | None Generic J1939 Scania Volvo Iveco Deutz - MVR MTU Cummins |
| Measurements from the ECU | |
| Lube Oil Pressure | Enable Disable |
| Coolant Temperature | Enable Disable |
| Engine Speed | Enable Disable |
| Running Hours | Enable Disable |
| Battery Voltage | Enable Disable |
| Controls To ECU | |
| Speed | Enable Disable |
| Engine Requested Speed | 500 to 4000 |
| Start/Stop | Enable Disable |
| Preheat | Enable Disable |
| ECU Communication Failure | |
| Action | None |

| Level 2 | Range |
|--|---|
| | Notification Warning Electrical Trip Shutdown |
| Activation | Never From Engine Start From Monitoring On Always While Fuel Relay ON |
| Activation Delay | 1 to 60 s |
| Communication Setup | |
| SGC Source Address | 0 to 253 |
| ECU Source Address | 0 to 253 |
| ECU Diagnostic Lamps (Amber, Red, Malfunction, Protect) | |
| Action | None Notification Warning Electrical Trip Shutdown |
| Activation | Never From Engine Start From Monitoring On Always |
| Activation Delay | 0 to 60 s |

Table 6.28 Lube Oil Pressure (LOP)

| Level 2 | Range |
|--------------------|-------------------|
| Low Level Shutdown | Enable Disable |
| Shutdown Threshold | 0.0 to 9.8 Bar |
| Low Level Warning | Enable Disable |
| Warning Threshold | 0.2 to 10.0 Bar |

Table 6.29 Engine Coolant Temperature (ENG COOL TEMP)

| Level 2 | Range |
|---------------------|-------------------|
| High Level Shutdown | Enable Disable |
| Shutdown Threshold | 27 to 300 °C |
| High Level Warning | Enable Disable |
| Warning Threshold | 25 to 298 °C |

6.2.10 Maintenance

Table 6.30 Maintenance (MAINT ALARM)

| Level 2 | Range |
|--|---------------------------------|
| Alarm Action (ACTION) | None Notification Warning |
| Due At Engine Hours (DUE AT ENGINE HOURS) | 10 to 65000 hours |
| Alarm Due Date (ALARM DUE DATE) | dd/mm/yyyy |

6.2.11 Rotary actuator (SGC 121 only)

Table 6.31 General (GENERAL)

| Level 2 | Range |
|--|---|
| Actuator Application (ACTUATOR APPLN) | As E-Governor As Start/Stop Device |
| Actuator Speed (ACTUATOR SPEED) | 1 to 10 x 25 Hz |
| Actuator Direction (ACTUATOR DIRECTION) | Clockwise to Stop Anti clockwise to stop |
| Governing Mode (GOVERNING MODE) | Fixed Speed Variable Speed |

Table 6.32 Engine Start Strategy (ENG START STRGY)

| Level 2 | Range |
|---|-----------------|
| Cranking Steps (CRANKING STEPS) | 50 to 5000 |
| Initial Low Speed Delay (INIT LOW SPEED DELAY) | 0 to 180 s |
| Initial Low Speed (INIT LOW SPEED) | 500 to 1800 RPM |
| PID Trigger Speed (PID TRIGGER SPEED) | 20 to 2800 RPM |
| Ramp Up Time (RAMP UP TIME) | 1 to 180 s |
| PID On Time (PID ON TIME) | 1 to 180 s |

Table 6.33 Generator EGov Config (GEN EGOV CNFG)

| Level 2 | Range |
|--|---------------------------------------|
| Set Speed Selection (SET SPEED SELECTION) | Fixed (0 % Droop) Load Based Droop |
| (LBD) Droop (DROOP) | 0 to 4 % |

| Level 2 | Range |
|--|-----------------|
| Target Speed (TARGET SPEED) | 500 to 4000 RPM |
| Proportional Gain (Kp) (PROPORTIONAL GAIN) | 0 to 1000 |
| Integral Gain (Ki) (INTEGRAL GAIN) | 0 to 2000 |
| Derivative Gain (Kd) (DERIVATIVE GAIN) | 0 to 1000 |
| Friction Setoff (FRICTION SETOFF) | 0 to 1000 |
| Gain Schedule Trigger (GAIN SCHEDULE TRIGGER) | 0.0 to 100.0 % |
| Loading Factor (LOADING FACTOR) | 0 to 1000 |
| Unloading Factor (UNLOADING FACTOR) | 0 to 1000 |

Table 6.34 Engine EGov Config (ENG EGOV CNFG)

| Level 2 | Range |
|--|-----------------|
| Target Speed (TARGET SPEED) | 500 to 4000 RPM |
| Proportional Gain (Kp) (PROPORTIONAL GAIN) | 0 to 1000 |
| Integral Gain (Ki) (INTEGRAL GAIN) | 0 to 2000 |
| Derivative Gain (Kd) (DERIVATIVE GAIN) | 0 to 1000 |
| Friction Setoff (FRICTION SETOFF) | 0 to 1000 |
| Gain Schedule Trigger (GAIN SCHEDULE TRIGGER) | 0.0 to 100.0 % |
| Loading Factor (LOADING FACTOR) | 0 to 1000 |
| Unloading Factor (UNLOADING FACTOR) | 0 to 1000 |

Table 6.35 Start/Stop Device Config (STR/STP DEV CNFG)

| Level 2 | Range |
|----------------------------------|----------|
| Running Steps (RUNNING STEPS) | 0 to 500 |

6.2.12 Password ID

Table 6.36 ID

| Level 1 | Level 2 | Range |
|--------------|---------|-----------------|
| (PASSWORD 1) | #### | Numbers: 0 to 9 |
| (PASSWORD 2) | #### | Numbers: 0 to 9 |

6.3 Digital input source selection

| No. | Input source |
|-----|---------------------------------|
| 1 | Not used |
| 2 | User Configured |
| 3 | Low Fuel Level Switch |
| 4 | Low Lube Oil Pressure Switch |
| 5 | High Engine Coolant Temp Switch |
| 6 | Low Water Level Switch |
| 7 | Emergency Stop |
| 8 | Remote Start/Stop |
| 9 | Simulate Start |
| 10 | Simulate Stop |
| 11 | Simulate Auto |
| 12 | Close Gen/Open Mains Switch |
| 13 | Close Mains/Open Gen Switch |
| 14 | Simulate Mains |
| 15 | V-Belt Broken Switch |

6.4 Digital output source selection


| No. | Output source |
|-----|------------------------|
| 1 | Disable |
| 2 | Sounder Alarm |
| 3 | Battery Over Volt |
| 4 | Battery Under Volt |
| 5 | Charge Alt Shutdown |
| 6 | Charge Alt Warning |
| 7 | Close Gen Contactor |
| 8 | Close Mains Contac |
| 9 | Mains Failure |
| 10 | Common Alarm |
| 11 | Common Electrical Trip |
| 12 | Common Shutdown |

| No. | Output source |
|-----|-----------------------------|
| 13 | Common Warning |
| 14 | Cooling Down |
| 15 | Dig In A |
| 16 | Dig In B |
| 17 | Dig In C |
| 18 | Dig In D |
| 19 | Dig In E |
| 20 | Dig In F (Anlg In LOP 1) |
| 21 | Dig In G (Anlg In Eng Temp) |
| 22 | Dig In H (Anlg In Fuel LVL) |
| 23 | Dig In I (Anlg In LOP 2) |
| 24 | Emergency Stop |
| 25 | Stop Solenoid |
| 26 | Fail To Start |
| 27 | Fail To Stop |
| 28 | Fuel Relay |
| 29 | Gen Available |
| 30 | L1 Phase OV Shutdown |
| 31 | L1 Phase UV Shutdown |
| 32 | L2 Phase OV Shutdown |
| 33 | L2 Phase UV Shutdown |
| 34 | L3 Phase OV Shutdown |
| 35 | L3 Phase UV Shutdown |
| 36 | Gen Over Current |
| 37 | High Engine Coolant Temp |
| 38 | Low Fuel LVL |
| 39 | Low LOP |
| 40 | Mains High Volt |
| 41 | Mains Low Volt |
| 42 | Oil Pressure Open Circuit |
| 43 | Open Gen Contactor |
| 44 | Open Mains Contactor |
| 45 | Over Freq Shutdown |
| 46 | Over Speed Shutdown |
| 47 | Gross Over Speed Shutdown |
| 48 | Start Relay |
| 49 | Temp Sensor Open Circuit |
| 50 | Under Freq Shutdown |
| 51 | Under Speed Shutdown |

| No. | Output source |
|-----|-----------------|
| 52 | Maintenance Due |
| 53 | Stop Mode |
| 54 | Auto Mode |
| 55 | Manual Mode |
| 56 | Preheat Output |

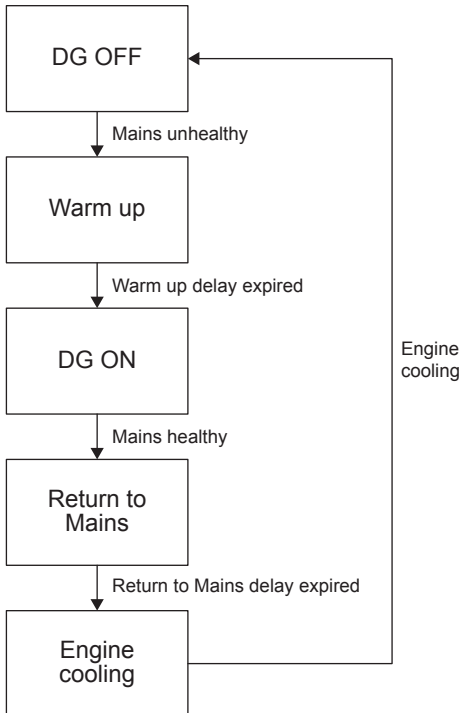
7. Running modes

7.1 Auto mode

Select Auto mode with the *Mode selection*  button. In Auto mode the controller can be used in following configurations:

- Automatic Mains Failure (AMF)
- Remote start/stop
- Exercise mode

Automatic Mains Failure (AMF) mode

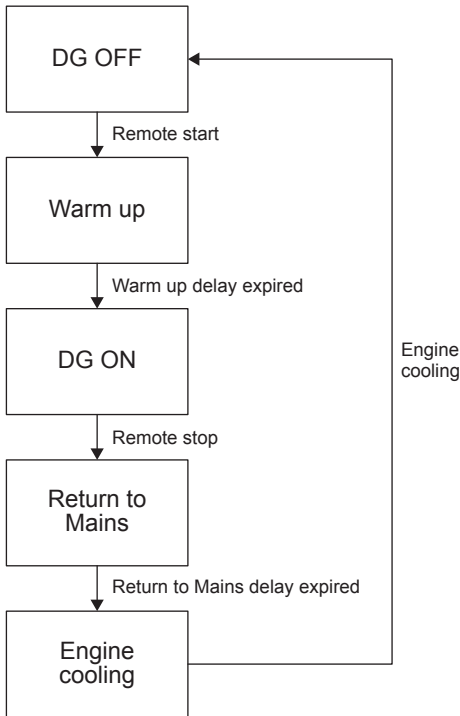


AMF mode is activated when Exercise mode is disabled, and Mains monitoring is enabled.

If the mains is healthy, the genset remains in Stop mode. If the mains is unhealthy for longer than the Mains detect delay time, the controller sends a Start command and the genset starts according to the Start sequence. When the genset loading voltage and frequency are above the Minimum healthy thresholds, the Warm-up delay timer starts. At the end of the Warm-up delay, the Load transfer delay starts and the genset latches.. Engine running hours increase while the genset runs. The running hours stop increasing when a Stop command is received. During genset running mode, if the mains is found healthy, the Return to mains delay timer starts. If the mains is found unhealthy during the Return to mains delay, the genset continues to run. At the end of the Return to mains delay, if mains is still healthy, the genset contactor opens and the mains contactor latches after the Load transfer delay. After opening the genset contactor, Engine cooling time starts. At the end of Engine cooling time, the controller initiates the Stop sequence by giving the Stop command.

If the mains voltage recovers or any stop command or shutdown alarm occurs during the Crank time, the controller will not send a start command. To start the genset again, all the alarms must be cleared manually.

Remote start/stop mode



To use the Remote start/stop mode, configure one of the digital input as Remote start/stop (Latched type input) and set the controller to Auto mode.

In Remote start/stop mode, the genset can be commanded to start and stop by activating the pre-configured Remote start/stop input. If the Remote start command is received, the controller sends a Start command and the genset starts according to the Start sequence. When the genset loading voltage and frequency are above the Minimum healthy thresholds, the Warm-up delay timer starts. At the end of the Warm-up delay, the Load transfer delay starts and the genset latches. Engine running hours increases while the genset runs. The running hours stop increasing when a Stop command is received.


When the Remote stop command is received the controller opens the genset contactor, and the Engine cooling time starts. At the end of the Engine cooling time, the controller initiates the Stop sequence by giving a Stop command.

Do not enable Mains monitoring and Remote start/stop configuration simultaneously.

Exercise Mode

Two scheduled sequences to start and stop the genset can be configured with SGC 120/121.

Exercise mode occurs when the controller is in Auto mode with no shutdown or warning alarms. In this mode, load transfer on mains/genset is configurable. Scheduled sequences can be configured to repeat daily, weekly or monthly.

- If the controller is in Auto mode, Exercise mode runs at the scheduled time for preset DG ON duration time. The controller exits Exercise mode if the DG ON duration time expires or if the *Stop/Config*  button is pressed during a scheduled sequence.
- If the controller is in Manual mode when the scheduled sequence begins, the genset will not start. If the controller is switched to Auto mode during the Exercise, the genset will start and run for the remaining scheduled time.
- The genset controller will not respond to a Remote start command in Exercise mode.
- In AMF mode, if the mains is unhealthy or cut off, or when the genset is running in Exercise mode, the genset first runs the Exercise mode and then the AMF mode. Load is transferred to the genset, even if Load transfer is disabled in Exercise mode. The genset stops when the mains becomes healthy.
- If both exercises are scheduled at the same time, the Start time for second exercise is increased by one minute.





Deep sleep mode

Deep sleep mode is a useful feature to extend the battery lifetime. This is done by suspending normal functions of the controller, and place the it in the lowest power consumption state. The controller maintains the status and alarms it had before Deep sleep mode. When the controller wakes up, normal operations are resumed automatically.

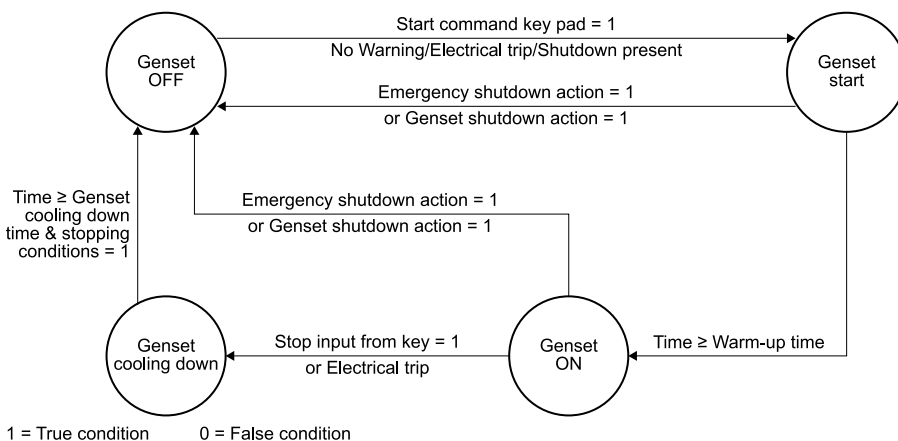
The controller goes to Deep sleep mode when there is no user interaction for the preset Deep sleep mode delay. The controller does not go to Deep sleep mode under the following conditions:

- In Auto (AMF, Remote start/stop and Exercise) modes
- Mains monitoring is enabled, and mains contactor configured as output
- Modbus communication is enabled

To wake the controller from Deep sleep mode, press:

- *Stop/Config*  button
- *Start*  button
- *Mode selection*  button
- *Acknowledge*  button

7.2 Manual mode



8. Alarms

8.1 Alarms

With SGC 120/121 it is possible to configure several Shutdown/Electrical trip, Warning and Notification alarms, for example Low oil pressure shutdown, Overload warning, and more.

An alarm occurs when the pre-configured parameter is out of preset level. The Alarm LED flashes and the Sounder alarm activates (if configured). The controller shows the alarm names on the Alarms display and the nature of alarm on Engine status display.

To acknowledge the alarms, press the *Up*  and *Down*  buttons simultaneously.

All alarms are activated from Engine ON, for example after crank disconnect, or Monitoring ON, for example after the Safety monitoring timer expires, or Always. The controller does not send the start command if Warning, Electrical trip or Shutdown alarms are left unacknowledged.

Alarm types

| No. | Alarm actions | Description |
|-----|-----------------|---|
| 1 | Shutdown | Load is taken off from the genset and the genset is immediately stopped by skipping the Engine cooling time. |
| 2 | Electrical trip | Load is taken off from the genset, the Engine cooling timer begins, after which the genset is stopped. |
| 3 | Warning | Warning alarms draw the operator's attention to an undesirable condition without affecting the genset's operation. The genset cannot be started without acknowledging the Warning alarms |
| 4 | Notification | The controller shows the message on the display. The genset start/stop operation is not affected. |

Alarms and their causes

| No. | Alarms | Causes/Indication | Actions |
|-----|----------------------------|---|--|
| 1 | Low Oil Pressure (Sensor) | Indicates that the oil pressure measured is below the preset threshold. | Shutdown Warning |
| | Low Oil Pressure (Switch) | Indicates that the oil pressure measured is low through switch. | Shutdown Warning Electrical Trip Notification |
| 2 | High Oil Pressure (Sensor) | Indicates that the oil pressure measured is above the preset threshold. | Warning |
| | High Oil Pressure (Switch) | Indicates that the oil pressure measured is high through switch. | Warning |
| 3 | High Eng Temp (sensor) | Indicates that the engine temperature is above the preset threshold. This condition is detected only when engine is on. | Shutdown Warning |
| | High Eng Temp (Switch) | Indicates that the engine temperature measured is high through switch. | Shutdown Warning Electrical Trip Notification |

| No. | Alarms | Causes/Indication | Actions |
|-----|-----------------------------------|---|--|
| 4 | Low Fuel level (Sensor) | Indicates that the amount of fuel level is below the preset threshold. This condition is detected only when engine is on. | Shutdown Warning |
| | Low Fuel level (Switch) | Indicates that the amount of fuel level measured is low through switch. | Shutdown Warning Electrical Trip Notification |
| 5 | Low Water Level (Switch) | Indicates that radiator water level is below the preset threshold. | Shutdown Warning Electrical Trip Notification |
| 6 | Auxiliary input/User defined name | Configured auxiliary input has triggered longer than preset duration. | Shutdown Warning Electrical Trip Notification |
| 7 | Anlg LOP Ckt Open | The oil pressure sensor is not detected (circuit open). | Shutdown Warning Electrical Trip Notification |
| 8 | Engine Temp Ckt Open | The temperature sensor is not detected (circuit open). | Shutdown Warning Electrical Trip Notification |
| 9 | Fuel Level Ckt Open | The fuel level sensor is not detected (circuit open). | Shutdown Warning Electrical Trip Notification |
| 10 | Fuel Theft | The fuel consumption has exceeded the preset threshold. | Warning |
| 11 | Emergency Stop | Configured as digital input has triggered longer than preset or when an immediate shutdown is required. | Shutdown |
| 12 | Fail To Stop | It is detected that genset is still running after sending stop command. | Shutdown |
| 13 | Fail To Start | Indicates that genset has not started after the preset number of start attempts. | Shutdown |
| 14 | L1 Phase Over Voltage | Indicates that genset (L1) phase voltage has exceeded the preset over-voltage threshold. | Shutdown Warning |
| 15 | L2 Phase Over Voltage | Indicates that genset (L2) phase voltage has exceeded the preset over-voltage threshold. | Shutdown Warning |
| 16 | L3 Phase Over Voltage | Indicates that genset (L3) phase voltage has exceeded the preset over-voltage threshold. | Shutdown Warning |
| 17 | L1 Phase Under Voltage | Indicates that genset (L1) phase voltage has fallen below preset under-voltage threshold. | Shutdown Warning |
| 18 | L2 Phase Under Voltage | Indicates that genset (L2) phase voltage has fallen below preset under-voltage threshold. | Shutdown Warning |
| 19 | L3 Phase Under Voltage | Indicates that genset (L3) phase voltage has fallen below preset under-voltage threshold. | Shutdown Warning |
| 20 | DG Phase Reversal | Alternator phase sequence (L1-L2-L3) is not correct. | Shutdown Warning Electrical Trip Notification |

| No. | Alarms | Causes/Indication | Actions |
|-----|-------------------------|--|--|
| 21 | Over Frequency | Indicates that genset output frequency has exceeded the preset threshold. | Shutdown Warning |
| 22 | Under Frequency | Indicates that genset output frequency has fallen below the preset threshold. | Shutdown Warning |
| 23 | Over Current | Indicates that genset current has exceeded the preset threshold. | Shutdown Warning Electrical Trip Notification |
| 24 | Over Load | Indicates that the measured kW load rating has exceeded the preset threshold. | Shutdown Warning Electrical Trip Notification |
| 25 | Unbalanced Load | Load on any phase is greater or less than other phases by a threshold value. | Shutdown Warning Electrical Trip Notification |
| 26 | Over Speed | Indicates that genset speed has exceeded the preset overspeed threshold. The genset will shut down after Overspeed delay. | Shutdown |
| 27 | Gross Over Speed | Indicates that genset speed has exceeded the preset Gross overspeed threshold. The genset will shut down immediately without any delay. | Shutdown |
| 28 | Under Speed | The engine speed has fallen below the preset RPM. | Shutdown |
| 29 | Extended Over Load Trip | Indicates that there was 100 % load on the genset for one hour in the time interval of 12 hours. | Electrical trip |
| 30 | Charge Fail | The charge alternator voltage has dropped below the preset threshold. | Shutdown Warning Electrical Trip Notification |
| 31 | V-Belt Broken Switch | Indicates that there is a failure of the V-belt, which is driving the charging alternator. | Shutdown Warning Electrical Trip Notification |
| 32 | Battery Under Voltage | The battery voltage has fallen below the preset threshold. | Shutdown Warning Electrical Trip Notification |
| 33 | Battery Over Voltage | The battery voltage has exceeded the preset threshold. | Shutdown Warning Electrical Trip Notification |
| 34 | Filter maintenance | Indicates that engine running hours has exceeded the preset hours limit or maintenance due date has occurred and filter servicing is required. | Warning Notification |
| 35 | Mains Phase Reversal | Indicates the mains unhealthy condition. | Notification |

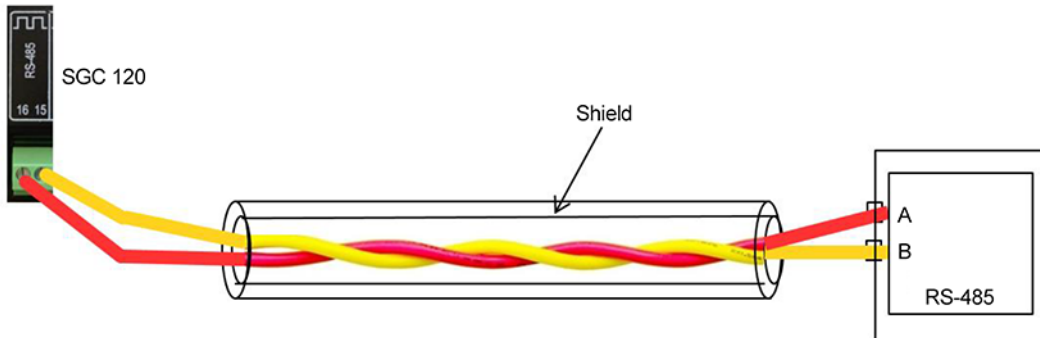
9. Modbus communication protocol

9.1 About the Modbus communication protocol

SGC 120/121 supports a custom protocol based on the standard Modbus over an RS-485 layer. operates in a slave mode and responds to commands received from an external Modbus master.

9.2 Modbus connection details

The transmission mode used by SGC 120/121 is Modbus RTU (not Modbus ASCII). The byte format for communication is 1 start bit, 8 data bits, no parity bits and 1 stop bit, Cyclic Redundancy Check (CRC).



Precautions

- Find the slave ID from the SMPS and configure the same ID in the controller.
- Enable the controller in the configuration of the SMPS after hardware connections are made.
- Connect the controller terminals 16 and 15 to the SMPS terminals A and B.
- Use a two-core shielded cable for connection.
- Use different colour wires for terminals 16 and 15 for easy detection and connection.
- Route the wires properly ensuring they do not get short with any other wires.
- Do not use multi strand wires for the connection.

9.3 Modbus functions

This genset controller operates as a Modbus slave that responds to certain commands (or functions, as defined by Modbus standard) received from the Modbus master in appropriate format. Supported functions and respective command-response structure is as shown below. If the command received from the Modbus master is other than the three functions mentioned below, an exception message is generated.

| Function code | Modbus name | Description |
|---------------|------------------------|---|
| 03 | Read holding register | Reads one or more 16-bit registers from the slave device read/write location. |
| 16 | Write holding register | Writes one or more 16-bit registers to the slave device. |

10. Modbus communication settings

10.1 Modbus communication settings

RS-485 communication settings

- Slave ID: 1 to 247
- Baud rate: 1200/2400/4800/9600/19200/38400/57600/115200 bps
- Parity: None/Even/Odd
- Stop bit: 1, 2
- Recommended polling frequency: 50 Hz
- No response timeout: 250 ms

Command from Modbus master for Function 16

| Byte | Field | Remarks |
|---------|--|---|
| 0 | Slave address | As configured in the controller. |
| 1 | Function code (0x10) | |
| 2 | First register address - high byte | 16-bit register address, register address map is described in the Register map. |
| 3 | First register address - low byte | |
| 4 | Number of registers to write - high byte | Number of registers to write must be between 1 to 255 |
| 5 | Number of registers to write - low byte | |
| 6 | Number of data bytes to follow (n) | |
| 7 | Value at first register | |
| ... | ... | |
| 6+n | Value at last register | |
| 7+n/8+n | Error check CRC | |

Normal response from SGC 120/121 slave for Function 16

| Byte | Field | Remarks |
|------|---|---|
| 0 | Slave address | As configured in the controller. |
| 1 | Function code (0x10) | |
| 2 | First register address - high byte | 16-bit register address, register address map is described in the Register map. |
| 3 | First register address - low byte | |
| 4 | Number of registers written - high byte | Number of registers that have been written. |
| 5 | Number of registers written - low byte | |
| 6/7 | Error check CRC | |

Command from Modbus master for Function 3

| Byte | Field | Remarks |
|------|------------------------------------|---|
| 0 | Slave address | As configured in the controller. |
| 1 | Function code (0x3) | |
| 2 | First register address - high byte | 16-bit register address, register address map is described in the Register map. |
| 3 | First register address - low byte | |

| Byte | Field | Remarks |
|------|---|--|
| 4 | Number of registers to read - high byte | Number of registers to read must be between 1 to 255 |
| 5 | Number of registers to read - low byte | |
| 6/7 | Error check CRC | |

Normal response from SGC 120/121 slave for Function 3

| Byte | Field | Remarks |
|-----------|----------------------------|---|
| 0 | Slave address | As configured in the controller. |
| 1 | Function code (0x03) | |
| 2 | Byte count (n) | Equals to number of registers to be read times two. 8-bit even number between 2 to 250. |
| 3 | First register - high byte | Number of registers that have been written. |
| 4 | First register - low byte | |
| ... | ... | |
| 1+n | Last register - high byte | |
| 2+n | Last register - low byte | |
| 3+2n/4+2n | Error check CRC | |

10.2 Register map (function code 03)

| Register address | Parameter | Scale factor | Unit/ Interpretation | Bits/Sign |
|------------------|--------------------------------|--------------|----------------------|-----------|
| 0 | Protocol revision | - | - | Unsigned |
| 1 | Generator L1-N voltage | 0.1 | V | Unsigned |
| 2 | Generator L2-N voltage | 0.1 | V | Unsigned |
| 3 | Generator L3-N voltage | 0.1 | V | Unsigned |
| 4 | Generator L1-L2 voltage | 0.1 | V | Unsigned |
| 5 | Generator L2-L3 voltage | 0.1 | V | Unsigned |
| 6 | Generator L3-L1 voltage | 0.1 | V | Unsigned |
| 7 | Generator L1 frequency | 0.1 | Hz | Unsigned |
| 8 | Generator L2 frequency | 0.1 | Hz | Unsigned |
| 9 | Generator L3 frequency | 0.1 | Hz | Unsigned |
| 10 | Generator power factor L1 | 0.01 | -- | Unsigned |
| 11 | Generator power factor L2 | 0.01 | -- | Unsigned |
| 12 | Generator power factor L3 | 0.01 | -- | Unsigned |
| 13 | Generator average power factor | 0.01 | -- | Unsigned |
| 14 | Mains L1-N voltage | 0.1 | V | Unsigned |
| 15 | Mains L2-N voltage | 0.1 | V | Unsigned |
| 16 | Mains L3-N voltage | 0.1 | V | Unsigned |
| 17 | Mains L1-L2 voltage | 0.1 | V | Unsigned |
| 18 | Mains L2-L3 voltage | 0.1 | V | Unsigned |
| 19 | Mains L3-L1 voltage | 0.1 | V | Unsigned |

| Register address | Parameter | Scale factor | Unit/ Interpretation | Bits/Sign |
|------------------|--------------------------------------|--------------|----------------------|-----------|
| 20 | Mains L1 frequency | 0.1 | Hz | Unsigned |
| 21 | Mains L2 frequency | 0.1 | Hz | Unsigned |
| 22 | Mains L3 frequency | 0.1 | Hz | Unsigned |
| 23 | Load L1 current | 0.1 | A | Unsigned |
| 24 | Load L2 current | 0.1 | A | Unsigned |
| 25 | Load L3 current | 0.1 | A | Unsigned |
| 26 | Load L1 watts | 0.1 | kW | Unsigned |
| 27 | Load L2 watts | 0.1 | kW | Unsigned |
| 28 | Load L3 watts | 0.1 | kW | Unsigned |
| 29 | Load total watts | 0.1 | kW | Unsigned |
| 30 | Percentage Load | 1 | Lit | Unsigned |
| 31 | Load L1 VA | 0.1 | kVA | Unsigned |
| 32 | Load L2 VA | 0.1 | kVA | Unsigned |
| 33 | Load L3 VA | 0.1 | kVA | Unsigned |
| 34 | Load total VA | 0.1 | kVA | Unsigned |
| 35 | Load L1 var | 0.1 | kvar | Unsigned |
| 36 | Load L2 var | 0.1 | kvar | Unsigned |
| 37 | Load L3 var | 0.1 | kvar | Unsigned |
| 38 | Load total var | 0.1 | kvar | Unsigned |
| 39-40 | Generator cumulative energy | 0.1 | kWh | Unsigned |
| 41-42 | Generator cumulative apparent energy | 0.1 | kVAh | Unsigned |
| 43-44 | Generator cumulative reactive energy | 0.1 | kvarh | Unsigned |
| 45-46 | Mains cumulative energy | 0.1 | kWh | Unsigned |
| 47-48 | Mains cumulative apparent energy | 0.1 | kVAh | Unsigned |
| 49-50 | Mains cumulative reactive energy | 0.1 | kvarh | Unsigned |
| 51 | Oil pressure | 0.1 | bar | Unsigned |
| 52 | Coolant temperature | 0.1 | °C | Unsigned |
| 53 | Fuel level | 0.1 | % | Unsigned |
| 54* | Fuel level in lit | 1 | -- | -- |
| 55* | Charge alternator voltage | 1 | V | Unsigned |
| 56* | Battery voltage | 0.1 | V | Unsigned |
| 57* | Engine speed | 1 | RPM | Unsigned |
| 58* | No of starts | 1 | -- | Unsigned |
| 59* | No of trips | 1 | -- | Unsigned |
| 60-61* | Eng run hrs | 1 | Hrs | Unsigned |
| 62* | Eng run min | 1 | Min | Unsigned |
| 63* | Mains run hrs | 1 | Hrs | Unsigned |
| 64* | Mains run min | 1 | Min | Unsigned |

Alarm status

| Register address | Parameter | Scale Factor | Unit/ Interpretation | Bits/Sign |
|------------------|---------------------------|--------------|----------------------|-------------|
| | Alarm 1 | | | |
| 65* | Low oil pressure | -- | -- | 13/16-16/16 |
| | High coolant temperature | -- | -- | 9/16-12/16 |
| | Low fuel level | -- | -- | 5/16-8/16 |
| | Water level switch | -- | -- | 1/16-4/16 |
| | Alarm 2 | | | |
| 66* | Underspeed | -- | -- | 13/16-16/16 |
| | Overspeed | -- | -- | 9/16-12/16 |
| | Fail to start | -- | -- | 5/16-8/16 |
| | Fail to stop | -- | -- | 1/16-4/16 |
| | Alarm 3 | | | |
| 67* | Reserved | -- | -- | 13/16-16/16 |
| | Reserved | -- | -- | 9/16-12/16 |
| | Generator low frequency | -- | -- | 5/16-8/16 |
| | Generator high frequency | -- | -- | 1/16-4/16 |
| | Alarm 4 | | | |
| 68* | Generator high current | -- | -- | 13/16-16/16 |
| | Generator overload | -- | -- | 9/16-12/16 |
| | Unbalanced load | -- | -- | 5/16-8/16 |
| | Emergency stop | -- | -- | 1/16-4/16 |
| | Alarm 5 | | | |
| 69* | Charge alternator failure | -- | -- | 13/16-16/16 |
| | Maintenance | -- | -- | 9/16-12/16 |
| | Reserved | -- | -- | 5/16-8/16 |
| | Reserved | -- | -- | 1/16-4/16 |
| | Alarm 6 | | | |
| 70* | Battery low voltage | -- | -- | 13/16-16/16 |
| | Battery high voltage | -- | -- | 9/16-12/16 |
| | Temperature circuit open | -- | -- | 5/16-8/16 |
| | Reserved | -- | -- | 1/16-4/16 |
| | Alarm 7 | | | |
| 71 | Fuel theft | -- | -- | 13/16-16/16 |
| | Magnetic pick up fault | -- | -- | 9/16-12/16 |
| | Oil pressure open circuit | -- | -- | 5/16-8/16 |
| | Auxiliary input I | -- | -- | 1/16-4/16 |

| Register address | Parameter | Scale Factor | Unit/ Interpretation | Bits/Sign |
|------------------|----------------------------|--------------|----------------------|-------------|
| 72 | Alarm 8 | | | |
| | Auxiliary input A | -- | -- | 13/16-16/16 |
| | Auxiliary input B | -- | -- | 9/16-12/16 |
| | Auxiliary input C | -- | -- | 5/16-8/16 |
| | Auxiliary input D | -- | -- | 1/16-4/16 |
| 73 | Alarm 9 | | | |
| | Auxiliary input E | -- | -- | 13/16-16/16 |
| | Auxiliary input F | -- | -- | 9/16-12/16 |
| | Auxiliary input G | -- | -- | 5/16-8/16 |
| | Auxiliary input H | -- | -- | 1/16-4/16 |
| 74 | Alarm 10 | | | |
| | Gen L1 phase low volt | -- | -- | 13/16-16/16 |
| | Gen L1 phase high volt | -- | -- | 9/16-12/16 |
| | Gen L2 phase low volt | -- | -- | 5/16-8/16 |
| | Gen L2 phase high volt | -- | -- | 1/16-4/16 |
| 75 | Alarm 11 | | | |
| | Gen L3 phase low volt | -- | -- | 13/16-16/16 |
| | Gen L3 phase high volt | -- | -- | 9/16-12/16 |
| | DG phase rotation | -- | -- | 5/16-8/16 |
| | Mains phase rotation | -- | -- | 1/16-4/16 |
| 76 | Alarm 12 | | | |
| | Fuel level open circuit | -- | -- | 13/16-16/16 |
| | V belt broken | -- | -- | 9/16-12/16 |
| | Reserved | -- | -- | 5/16-8/16 |
| | High oil pressure detected | -- | -- | 1/16-4/16 |

Table 10.1 *Interpretation of alarm status results

| Value of Register | Interpretation |
|-------------------|------------------------------|
| 0 | Alarm disabled |
| 1 | Alarm not active |
| 2 | Warning alarm active |
| 3 | Shutdown alarm active |
| 4 | Electrical trip alarm active |
| 5 | Notification |
| 6-14 | Reserved |
| 15 | Unimplemented |

Input and output status

| Register address | Parameter | Scale Factor | Unit/ Interpretation | Bits/Sign |
|------------------|---------------------------------|--------------|----------------------|-----------|
| 77 | Input/output diagnostics | | | |
| | Digital input A | -- | -- | 16/16 |
| | Digital input B | -- | -- | 15/16 |
| | Digital input C | -- | -- | 14/16 |
| | Digital input D | -- | -- | 13/16 |
| | Digital input E | -- | -- | 12/16 |
| | Digital input F | -- | -- | 11/16 |
| | Digital input G | -- | -- | 10/16 |
| | Digital input H | -- | -- | 9/16 |
| | Digital input I | -- | -- | 8/16 |
| | Digital output A | -- | -- | 7/16 |
| | Digital output B | -- | -- | 6/16 |
| | Digital output C | -- | -- | 5/16 |
| | Digital output D | -- | -- | 4/16 |
| | Digital output E | -- | -- | 3/16 |
| | Digital output F | -- | -- | 2/16 |
| | Unimplemented | -- | -- | 1/16 |

| Register address | Parameter | Scale Factor | Unit/ Interpretation | Bits/Sign |
|------------------|-------------------------|--------------|---|-------------|
| 78 | DG status | | | |
| | SGC mode | | Config (1) Run (0) | 16/16 |
| | Mains healthy/unhealthy | -- | True (1) False (0) | 15/16 |
| | DG operation mode | -- | Scheduler-110 Cyclic-111 Auto-101 Manual-100 | 14-12/16 |
| | Load on Mains | | True (1) False (0) | 11/16 |
| | Load on DG | -- | True (1) False (0) | 10/16 |
| | Current DG status | -- | Running Stopped | 9/16 |
| | DG stopped normally | -- | True (1) False (0) | 8/16 |
| | DG stopped with fault | | True (1) False (0) | 7/16 |
| | DG fail to start | -- | True (1) False (0) | 6/16 |
| | Gen available | | True (1) False (0) | 5/16 |
| | Common shut down | -- | True (1) False (0) | 4/16 |
| | Common electric trip | -- | True (1) False (0) | 3/16 |
| | Common warning | -- | True (1) False (0) | 2/16 |
| | Common notification | -- | True (1) False (0) | 1/16 |
| 79 | Current time stamp | -- | Min Sec | Hexadecimal |
| 80 | Current time stamp | | Week day Hour | Hexadecimal |
| 81 | Current time stamp | | Month Day | Hexadecimal |
| 82 | Current time stamp | | Year | Unsigned |

Table 10.2 Example of Time stamp settings

| Register address | Time | Hexadecimal | Decimal |
|------------------|----------|-------------|----------------------|
| 79 | Min | 0x1215 | Min = 0x12 18 |
| | Sec | | Sec = 0x15 21 |
| 80 | Week day | 0x0414 | Week day = 0x04 4 |
| | Hour | | Hour = 0x0E 14 |

| Register address | Time | Hexadecimal | Decimal | |
|------------------|-------|-------------|--------------|------|
| 81 | Month | 0x0402 | Month = 0x04 | 4 |
| | Day | | Day = 0x02 | 2 |
| 82 | Year | - | - | 2020 |

The time stamp is 14:18.21, Thursday, 02/04-2020.

10.3 Register map (function code 16)

Register map (function code 16)

| Register offset | Description | Note | Bits/Sign |
|-----------------|------------------------|--|-----------|
| 0 | DG mode change command | SGC STOP KEY (0x01) SGC START KEY (0x02) SGC AUTO KEY (0x04) SGC ACK KEY (0x40) | Unsigned |

11. Engine communication (SGC 120 only)

11.1 Introduction to engine communication

Engine communication enables the SGC controller to communicate with different engine types over CAN bus. Some engine types only allows the SGC to read information from the engine's ECU, while other types also makes it possible to regulate and transmit different commands to the ECU.

Engine communication protocols are typically based on the SAE J1939 standard. It is a very comprehensive standard, and just a small part is relevant for engine communication.

See the ECU user manuals for the ECU protocol technical description and details of each communication value.

Other engines and controllers

For engines and controllers not listed in this document, contact DEIF.

11.2 Default settings

The SGC controller is delivered with a set of default settings for engine communication. These settings are not necessarily correct for the specific engine/generator set. Check all the settings before running the engine/generator set.

11.3 Supported engines

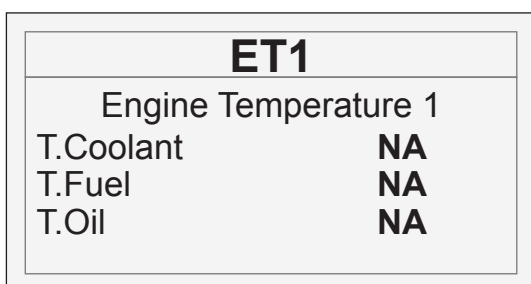
The SGC controller uses the J1939 protocol to communicate with these engines:

| Manufacturer | SGC can write commands |
|---------------|------------------------|
| Generic J1939 | Yes |
| Cummins | Yes |
| Deutz - EMR | Yes |
| Iveco | Yes |
| MTU | Yes |
| Scania | Yes |
| Volvo Penta | Yes |

11.4 Engine values on the display

You can configure the SGC controller to show values from the ECU on the display.

Figure 11.1 Display example

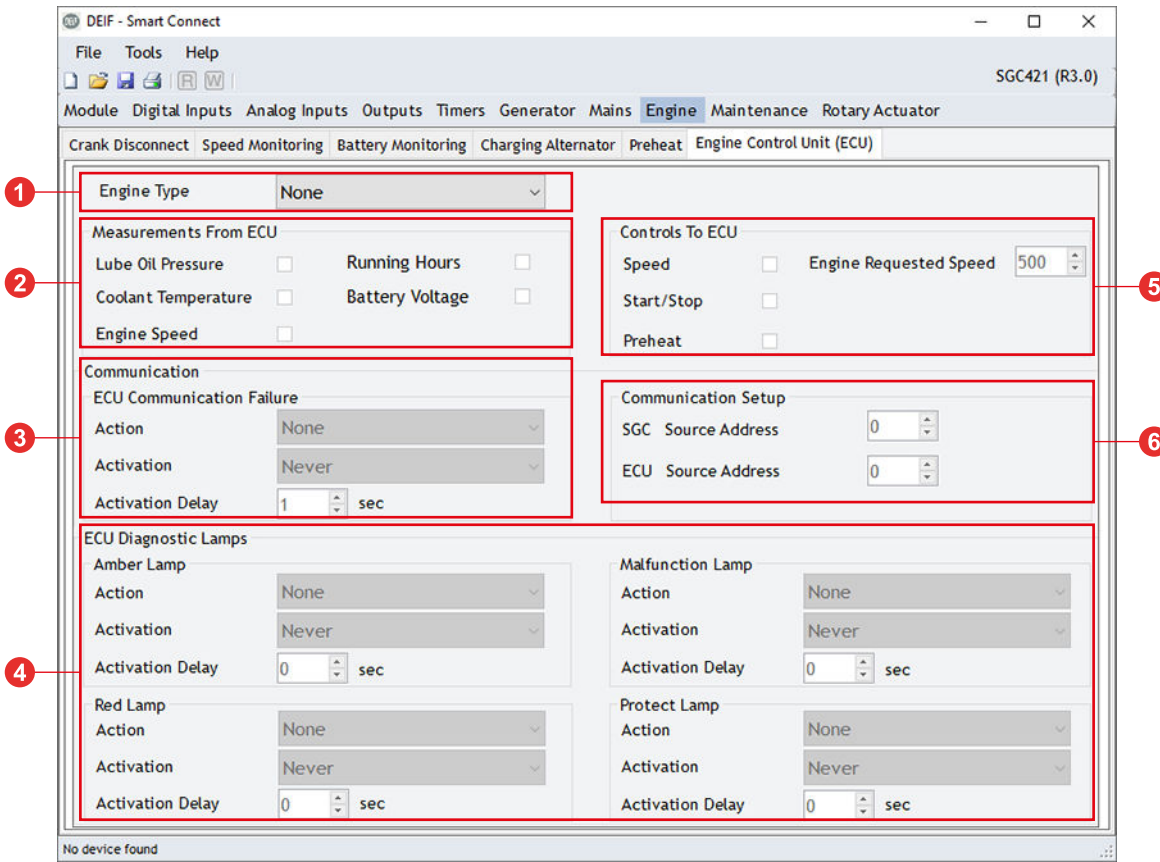


| ET1 | |
|----------------------|----|
| Engine Temperature 1 | |
| T.Coolant | NA |
| T.Fuel | NA |
| T.Oil | NA |

11.5 Engine communication settings

Use the DEIF Smart Connect software to configure engine communication in the SGC controller.

Open DEIF Smart Connect and connect to the SGC controller, then select **Start > Engine > Engine Control unit (ECU)** for the engine communication settings window.



| No. | Function |
|-----|---|
| 1 | Select the engine type from the drop-down list. |
| 2 | Select types of measurements from the engine/ECU. |
| 3 | Configure the settings for the ECU communication failure alarm. |
| 4 | Configure the settings for the diagnostic lamps on the ECU <ul style="list-style-type: none"> • Amber lamp • Red lamp • Malfunction lamp • Protect lamp See the specific documentation for the engine/ECU for more information. |
| 5 | Select the actions that SGC controls for the engine/ECU <ul style="list-style-type: none"> • Engine speed • Engine start/stop • Engine preheat |
| 6 | Configure source addresses for the SGC controller and the engine/ECU. See the specific documentation for the engine/ECU for information about the source address. |

11.6 Generic J1939

Basic information

- Engine controller/type: Any controller which uses generic J1939.
- DEIF Smart Connect: Select Generic J1939.
- Complies with the J1939 standard.
- Baud rate: 250 kb/s



Warnings and shutdowns

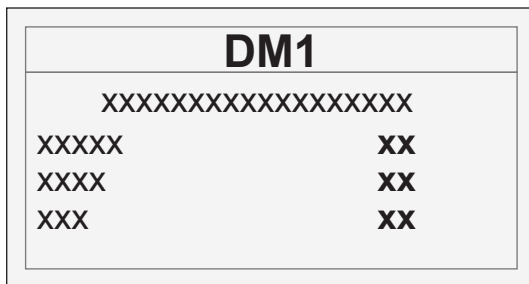
These standard warnings and shutdowns are supported:

- EIC yellow lamp
- EIC red lamp
- EIC malfunction
- EIC protection

Displaying alarms

The display can show J1939 diagnostic messages DM1 (active alarms) and DM2 (historic alarm log list). You can acknowledge these alarms from the display unit. For some engines, the display has a special alarm display (see the specific engine type).



Press the *Down*  button for 4 seconds to see the alarm log. By default, the alarm log shows the DM1 (active alarms). To see the historical alarm list, use *Down*  button to select DM2.



Alarm log DM1 shows active alarms



Alarm log DM2 shows historic alarms

- Scroll through the alarm list with the *Up*  and *Down*  buttons.
- **oc##**: Shows how many times a specific alarm has occurred.
- **CLRALL**: Press ENTER to clear the entire alarm log list. For safety reasons, this requires the master password.



NOTE

If the controller has no translation text for an SPN diagnostic number, Text N/A is shown. For information about particular SPN numbers, see the engine manufacturer's documentation. Alternatively, see SAE J1939-71 for a general description.

J1939 write commands

| Command | Description |
|----------------|---|
| Speed control | The CAN bus ID for speed control is 0xC000003. J1939 TSC1 (transmission rate is 10 ms). |
| EIC start/stop | This is a more advanced function than the standard J1939 Start/Stop commands. See the M-Logic commands for details. If the M-Logic command is enabled, the SGC can also send the standard J1939 start/stop command. The controller determines whether to start or stop the engine. The decision is based on the SGC's inputs, logic and calculations. |

TSC1 SA Torque Speed Control

Torque Speed Control 1 (TSC1) is the speed control signal from the SGC to the ECU. For known protocols, the SGC uses the expected source address when TSC1 SA is -1 (default value). You can configure the controller for a specific source address (the range is 0 to 255). Ask the engine manufacturer to verify the TSC1 source address.

11.7 Wiring



More information

See the **Installation** chapter for more information about wiring.

12. CAN communication (SGC 120 only)

12.1 About the CAN communication protocol

SGC 120 supports a CAN based protocol, which is used to read measurement values, status of alarms and derived calculations (such as cumulative power), as well as to send mode change and start/stop commands to the controller.

Connection details:

- Baud rate used for communication is 250 kbps
- ID of the controller is fixed to 0x01
- ID scheme for CAN communication is Standard ID (not extended ID)
- Packet size used for communication is 8 bytes

12.2 CAN communication structure

The controller continuously broadcasts measurement values, status of alarms and commands, and derived calculations. Additionally, a set of commands can be sent to the controller. Response to the commands is a part of the data that is broadcast.

Communication structure, page 0

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|------------------------|--------------|------|-----------|
| 0 | Protocol revision | - | - | Unsigned |
| 1 | Generator L1-N voltage | 1 | V | Unsigned |
| 2 | Generator L2-N voltage | 1 | V | Unsigned |

Communication structure, page 1

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|-------------------------|--------------|------|-----------|
| 3 | Generator L2-L3 voltage | 1 | V | Unsigned |
| 4 | Generator L1-L2 voltage | 1 | V | Unsigned |
| 5 | Generator L3-N voltage | 1 | V | Unsigned |

Communication structure, page 2

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|-------------------------|--------------|------|-----------|
| 6 | Generator L3-L1 voltage | 1 | V | Unsigned |
| 7 | Generator L2 frequency | 1 | Hz | Unsigned |
| 8 | Generator L1 frequency | 1 | Hz | Unsigned |

Communication structure, page 3

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|---------------------------|--------------|------|-----------|
| 9 | Generator power factor L2 | 1 | - | Unsigned |
| 10 | Generator L3 frequency | 1 | Hz | Unsigned |
| 11 | Generator power factor L1 | 1 | - | Unsigned |

Communication structure, page 4

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|--------------------------------|--------------|------|-----------|
| 12 | Mains L1-N voltage | 1 | V | Unsigned |
| 13 | Generator power factor L3 | 1 | - | Unsigned |
| 14 | Generator average power factor | 1 | - | Unsigned |

Communication structure, page 5

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|---------------------|--------------|------|-----------|
| 15 | Mains L1-L2 voltage | 1 | V | Unsigned |
| 16 | Mains L2-N voltage | 1 | V | Unsigned |
| 17 | Mains L3-N voltage | 1 | V | Unsigned |

Communication structure, page 6

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|---------------------|--------------|------|-----------|
| 18 | Mains L1 frequency | 1 | Hz | Unsigned |
| 19 | Mains L2-L3 voltage | 1 | V | Unsigned |
| 20 | Mains L3-L1 voltage | 1 | V | Unsigned |

Communication structure, page 7

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|--------------------|--------------|------|-----------|
| 21 | Load L1 current | 1 | A | Unsigned |
| 22 | Mains L2 frequency | 1 | Hz | Unsigned |
| 23 | Mains L3 frequency | 1 | Hz | Unsigned |

Communication structure, page 8

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|-----------------|--------------|------|-----------|
| 24 | Load L1 watts | 1 | kW | Unsigned |
| 25 | Load L2 current | 1 | A | Unsigned |
| 26 | Load L3 current | 1 | A | Unsigned |

Communication structure, page 9

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|------------------|--------------|------|-----------|
| 27 | Load total watts | 1 | kW | Unsigned |
| 28 | Load L2 watts | 1 | kW | Unsigned |
| 29 | Load L3 watts | 1 | kW | Unsigned |

Communication structure, page 10

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|-----------------|--------------|------|-----------|
| 30 | Load L2 VA | 1 | kVA | Unsigned |
| 31 | Percentage Load | 10 | kW | Unsigned |
| 32 | Load L1 VA | 1 | kVA | Unsigned |

Communication structure, page 11

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|---------------|--------------|------|-----------|
| 33 | Load L1 VAR | 1 | kvar | Unsigned |
| 34 | Load L3 VA | 1 | kVA | Unsigned |
| 35 | Load total VA | 1 | kVA | Unsigned |

Communication structure, page 12

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|----------------|--------------|------|-----------|
| 36 | Load L2 VAR | 1 | kvar | Unsigned |
| 37 | Load L3 VAR | 1 | kvar | Unsigned |
| 38 | Load total VAR | 1 | kvar | Unsigned |

Communication structure, page 13

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|-----------------------------|--------------|------|-----------|
| 39-40 | Generator cumulative energy | 0.1 | kWh | Unsigned |

Communication structure, page 14

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|--------------------------------------|--------------|------|-----------|
| 41-42 | Generator cumulative apparent energy | 0.1 | kVAh | Unsigned |

Communication structure, page 15

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|--------------------------------------|--------------|-------|-----------|
| 43-44 | Generator cumulative reactive energy | 0.1 | kvarh | Unsigned |

Communication structure, page 16

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|-------------------------|--------------|------|-----------|
| 45-46 | Mains cumulative energy | 0.1 | kWh | Unsigned |

Communication structure, page 17

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|----------------------------------|--------------|------|-----------|
| 47-48 | Mains cumulative apparent energy | 0.1 | kVAh | Unsigned |

Communication structure, page 18

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|----------------------------------|--------------|-------|-----------|
| 49-50 | Mains cumulative reactive energy | 0.1 | kvarh | Unsigned |
| 51 | Oil pressure | 1 | bar | Unsigned |

Communication structure, page 19

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|---------------------|--------------|------|-----------|
| 52 | Fuel in lit | 1 | l | Unsigned |
| 53 | Coolant temperature | 1 | °C | Unsigned |
| 54 | Fuel level | 1 | % | Unsigned |

Communication structure, page 20

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|---------------------------|--------------|------|-----------|
| 55 | Charge alternator voltage | 1 | V | Unsigned |
| 56 | Battery voltage | 1 | V | Unsigned |
| 57 | Engine speed | 1 | RPM | Unsigned |

Communication structure, page 21

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|--------------|--------------|------|-----------|
| 58 | No of starts | 1 | - | Unsigned |
| 59 | No of trips | 1 | - | Unsigned |
| 60 | Eng run hrs | 1 | hrs | Unsigned |

Communication structure, page 22

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|---------------|--------------|------|-----------|
| 61 | Eng run min | 1 | min | Unsigned |
| 62 | Mains run hrs | 1 | hrs | Unsigned |
| 63 | Mains run min | 1 | min | Unsigned |

Communication structure, page 23

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|-------------------------------------|--------------|---|-------------|
| | Alarm 1 | | | |
| 64 | Low oil pressure | - | E-0001/0001 W-0010/0010 S-0011/0011 | 3/16-16/16 |
| | High coolant temperature | - | E-0001/0001 W-0010/0010 S-0011/0011 | 9/16-12/16 |
| | Radiator water level/low fuel level | - | E-0001/0001 N-0101/0101S-0 011/0011 | 5/16-8/16 |
| | Water level switch | - | E-0001/0001 N-0101/0101 W-0010/0010 E-0100/0100 S-0011/0011 | 1/16-4/16 |
| | Alarm 2 | | | |
| 65 | Under speed | - | E-0001/0001 S-0011/0011 | 13/16-16/16 |
| | Over speed | - | E-0001/0001 S-0011/0011 | 9/16-12/16 |
| | Fail to start | - | E-0001/0001 S-0011/0011 | 5/16-8/16 |
| | Fail to stop | - | E-0001/0001 S-0011/0011 | 1/16-4/16 |

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|-------------------------|--------------|---|-------------|
| 66 | Alarm 3 | | | |
| | Reserved | - | 1111 | 13/16-16/16 |
| | Reserved | - | 1111 | 9/16-12/16 |
| | Generator low frequency | - | E-0001/0001 W-0010/0010 S-0011/0011 | 5/16-8/16 |
| | Generator high | - | E-0001/0001 W-0010/0010 S-0011/0011 | 1/16-4/16 |

Communication structure, page 24

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|---------------------------|--------------|---|-------------|
| 67 | Alarm 4 | | | |
| | Generator high current | - | E-0001/0001 N-0101/0101 W-0010/0010 E-0100/0100 S-0011/0011 | 13/16-16/16 |
| | Generator overload | | E-0001/0001 N-0101/0101 W-0010/0010 E-0100/0100 S-0011/0011 | 9/16-12/16 |
| | Unbalanced load | - | E-0001/0001 N-0101/0101 W-0010/0010 E-0100/0100 S-0011/0011 | 5/16-8/16 |
| | Emergency stop | - | E-0001/0001 S-0011/0011 | 1/16-4/16 |
| 68 | Alarm 5 | | | |
| | Charge alternator failure | - | E-0001/0001 N-0101/0101 W-0010/0010 E-0100/0100 S-0011/0011 | 13/16-16/16 |
| | Maintenance | - | E-0001/0001 N-0101/0101 W-0010/0010 | 9/16-12/16 |
| | Reserved | - | 1111 | 5/16-8/16 |
| | Reserved | - | 1111 | 1/16-4/16 |

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|--------------------------|--------------|---|-------------|
| 69 | Alarm 6 | | | |
| | Battery low voltage | - | E-0001/0001 N-0101/0101 W-0010/0010 E-0100/0100 S-0011/0011 | 13/16-16/16 |
| | Battery high voltage | - | E-0001/0001 N-0101/0101 W-0010/0010 E-0100/0100 S-0011/0011 | 9/16-12/16 |
| | Temperature circuit open | - | E-0001/0001 N-0101/0101 W-0010/0010 E-0100/0100 S-0011/0011 | 5/16-8/16 |
| | Reserved | - | 1111 | 1/16-4/16 |

Communication structure, page 25

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|------------------------|--------------|---|-------------|
| 70 | Alarm 7 | | | |
| | Fuel theft | - | - | 13/16-16/16 |
| | Magnetic pick up fault | - | E-0001/0001 S-0011/0011 | 9/16-12/16 |
| | Oil pressure circuit | - | E-0001/0001 N-0101/0101 W-0010/0010 E-0100/0100 S-0011/0011 | 5/16-8/16 |
| | Auxiliary input I | - | E-0001/0001 N-0101/0101 W-0010/0010 E-0100/0100 S-0011/0011 | 1/16-4/16 |

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|-------------------|--------------|---|-------------|
| 71 | Alarm 8 | | | |
| | Auxiliary input A | | E-0001/0001 N-0101/0101 W-0010/0010 E-0100/0100 S-0011/0011 | 13/16-16/16 |
| | Auxiliary input B | | E-0001/0001 N-0101/0101 W-0010/0010 E-0100/0100 S-0011/0011 | 9/16-12/16 |
| | Auxiliary input C | | E-0001/0001 N-0101/0101 W-0010/0010 E-0100/0100 S-0011/0011 | 5/16-8/16 |
| | Auxiliary input D | | E-0001/0001 N-0101/0101 W-0010/0010 E-0100/0100 S-0011/0011 | 1/16-4/16 |
| 72 | Alarm 9 | | | |
| | Auxiliary input E | - | E-0001/0001 N-0101/0101 W-0010/0010 E-0100/0100 S-0011/0011 | 13/16-16/16 |
| | Auxiliary input F | - | E-0001/0001 N-0101/0101 W-0010/0010 E-0100/0100 S-0011/0011 | 9/16-12/16 |
| | Auxiliary input G | - | E-0001/0001 N-0101/0101 W-0010/0010 E-0100/0100 S-0011/0011 | 5/16-8/16 |
| | Auxiliary input H | - | E-0001/0001 N-0101/0101 W-0010/0010 E-0100/0100 S-0011/0011 | 1/16-4/16 |

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|----------------------------|--------------|---|-------------|
| 73 | Alarm 10 | | | |
| | Gen L1 phase low volt | - | E-0001/0001 W-0010/0010 S-0011/0011 | 13/16-16/16 |
| | Gen L1 phase high volt | - | E-0001/0001 W-0010/0010 S-0011/0011 | 9/16-12/16 |
| | Gen L2 phase low volt | - | E-0001/0001 W-0010/0010 S-0011/0011 | 5/16-8/16 |
| | Gen L2 phase high volt | - | E-0001/0001 W-0010/0010 S-0011/0011 | 1/16-4/16 |
| 74 | Alarm 11 | | | |
| | Gen L3 phase low volt | - | E-0001/0001 W-0010/0010 S-0011/0011 | 13/16-16/16 |
| | Gen L3 phase high volt | - | E-0001/0001 W-0010/0010 S-0011/0011 | 9/16-12/16 |
| | DG phase rotation | - | E-0001/0001 N-0101/0101 W-0010/0010 E-0100/0100 S-0011/0011 | 5/16-8/16 |
| | Mains phase rotation | - | E-0001/0001 N-0101/0101 | 1/16-4/16 |
| 75 | Alarm 12 | | | |
| | Fuel level open circuit | - | E-0001/0001 N-0101/0101 W-0010/0010 E-0100/0100 S-0011/0011 | 13/16-16/16 |
| | V belt broken | - | E-0001/0001 N-0101/0101 W-0010/0010 E-0100/0100 S-0011/0011 | 9/16-12/16 |
| | Extended overload trip | - | E-0001/0001 S-0011/0011 | 5/16-8/16 |
| | High oil pressure detected | - | E-0001/0001 W-0010/0010 | 1/16-4/16 |

Communication structure, page 27

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|---------------------------------|--------------|------|-----------|
| 76 | Input/output diagnostics | | | |
| | Digital input A | - | 1/0 | 16/16 |
| | Digital input B | - | 1/0 | 15/16 |
| | Digital input C | - | 1/0 | 14/16 |
| | Digital input D | - | 1/0 | 13/16 |
| | Digital input E | - | 1/0 | 12/16 |
| | Digital input F | - | 1/0 | 11/16 |
| | Digital input G | - | 1/0 | 10/16 |
| | Digital input H | - | 1/0 | 9/16 |
| | Digital input I | - | 1/0 | 8/16 |
| | Digital output A | - | 1/0 | 7/16 |
| | Digital output B | - | 1/0 | 6/16 |
| | Digital output C | - | 1/0 | 5/16 |
| | Digital output D | - | 1/0 | 4/16 |
| | Digital output E | - | 1/0 | 3/16 |
| | Digital output F | - | 1/0 | 2/16 |
| | Unimplemented | - | - | 1/16 |

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|-------------------------|--------------|---|-----------|
| 77 | DG status | | | |
| | Controller mode | - | Config (1) Run (0) | 16/16 |
| | Mains healthy/unhealthy | - | True (1) False (0) | 15/16 |
| | DG operation mode | - | Scheduler-110 Cyclic-111 Auto-101 Manual-100 | 14-12/16 |
| | Load on Mains | - | True (1) False (0) | 11/16 |
| | Load on DG | - | True (1) False (0) | 10/16 |
| | Current DG status | - | Running Stopped | 9/16 |
| | DG stopped normally | - | True (1) False (0) | 8/16 |
| | DG stopped with fault | - | True (1) False (0) | 7/16 |
| | DG fail to start | - | True (1) False (0) | 6/16 |
| | Gen available | - | True (1) False (0) | 5/16 |
| | Common shutdown | - | True (1) False (0) | 4/16 |
| | Common electric trip | - | True (1) False (0) | 3/16 |
| | Common warning | - | True (1) False (0) | 2/16 |
| | Common notification | - | True (1) False (0) | 1/16 |

Communication structure, page 28

| Register offset | Value | Scale factor | Unit | Bits/Sign |
|-----------------|---------------------------|--------------|------|-----------|
| 78-81 | Current time stamp | | | |

Structure of broadcast message

| Byte no. | Byte contents |
|----------|------------------------------|
| 0 | Page ID |
| 1 | Data at offset 0 - high byte |
| 2 | Data at offset 0 - low byte |
| 3 | Data at offset 1 - high byte |
| 4 | Data at offset 1 - low byte |
| 5 | Data at offset 2 - high byte |
| 6 | Data at offset 2 - low byte |
| 7 | Reserved |

Structure of command message

| Byte no. | Byte contents |
|----------|--------------------|
| 0 | Command ID |
| 1 | Command parameters |
| 2 | Reserved |
| 3 | Reserved |
| 4 | Reserved |
| 5 | Reserved |
| 6 | Reserved |
| 7 | Reserved |

12.3 CAN packet structure


Structure of command message received over CAN:

| Command ID | Description | Command parameter (each of 1 Bytes) | Bits/ Sign |
|------------|-------------------------------|---|------------|
| 1 | Start/Stop command | 0x01 - Start DG 0x02 - Stop DG Command status is updated in status register | Unsigned |
| 2 | Operating mode change command | 0x01 - Toggle the current mode of operation between Auto mode and Manual mode Auto mode operates the DG remotely Manual mode operates the DG through key-press events | Unsigned |

13. Troubleshooting

13.1 Troubleshooting

General troubleshooting

| Fault | Action |
|--|---|
| The controller does not power ON. | <ul style="list-style-type: none"> • Check the battery voltage. • Check the fuse on the battery supply. • Check continuity between battery positive and controller terminal 2. • Check continuity between battery ground and controller terminal 1. |
| The controller display freezes or hangs up. | <ul style="list-style-type: none"> • Reset the controller power. |
| The controller fails to crank-start the engine. | <ul style="list-style-type: none"> • Check the battery voltage. • Enter the Configuration mode in the controller and verify the configuration for the Start output. Check that the Start output is working correctly by measuring its output voltage. • Enter the Configuration mode in the controller and verify the configuration of the Crank disconnect method. Verify the configuration of the LLOP Switch polarity. Ensure that the lube oil pressure switch and sensor are working OK. Check their wiring. |
| The Emergency Stop alarm is shown without the Emergency Stop is activated. | <ul style="list-style-type: none"> • Check if the Emergency stop switch is working OK, including the wiring. • Enter the Configuration mode in the controller and verify the configuration of the Emergency stop polarity. |
| The controller generates unnecessary Shutdown alarms or Warning alarms. | <ul style="list-style-type: none"> • Check the respective switch, sensor and wiring. • Enter the Configuration mode in the controller and verify the respective threshold configuration. |
| The controller shows Charge Fail alarm. | <ul style="list-style-type: none"> • To check if the controller's charging alternator terminal is working: <ul style="list-style-type: none"> ◦ Disconnect the charging alternator wiring to the controller's terminal 7. ◦ Short terminal 7 to the ground through a DC ammeter. ◦ Crank-start the engine. ◦ The DC ammeter should indicate the current in the range of 200 to 400 mA for ~30 seconds. ◦ If yes, the controller's charging alternator terminal is working OK. • Disconnect and re-connect the charging alternator ind connection to the controller's terminal 7. • Check if the charging alternator is working OK. |
| The controller shows Error C03. | <p>Error C03 can occur if the controller is disconnected from the PC during a configuration.</p> <ol style="list-style-type: none"> 1. Press and hold the <i>Stop/Config</i>  button during a power cycle to reset the controller. 2. Re-send the configuration file. |
| The controller sends a Crank-start command immediately after power on. | <ul style="list-style-type: none"> • Ensure that the controller's output terminal is not directly connected to the starter relay. The controller's output should be given to an intermediate relay which should in-turn power the starter relay. The controller can get permanently damaged and will need to be replaced if this precaution is not taken. • Check start-relay connection with the suitable controller terminal. • Enter the Configuration mode in the controller and verify the configuration for Start mode and the Start relay output polarity. |

| Fault | Action |
|---|---|
| The engine runs, but the controller shows genset to be OFF. | <ul style="list-style-type: none"> Check if the MPU signal (if used), and main alternator voltage signal (L1 phase) are received by the controller terminals. Check if the LOP and LLOP are working OK. Check the wiring to the controller. |
| The controller shows incorrect PF value or kW or load current. | <ul style="list-style-type: none"> Check wiring of the respective alternator phase voltage and the CT to the controller. Check the CT ratio (if kW or current reading is faulty). |
| The controller shows incorrect mains voltage or incorrect main alternator voltage. | <ul style="list-style-type: none"> Check the wiring of the respective phase to the controller. If the problem is not resolved, replace the controller and try again. |
| The controller shows incorrect reading for any of LOP, fuel level or temperature sensors. | <ul style="list-style-type: none"> Check the respective sensor and its wiring. Enter the Configuration mode in the controller and verify the calibration for the respective sensor in the configuration. |

Auto mode troubleshooting

| Fault | Action |
|---|---|
| The controller does not start the engine when a Remote start command is sent from an external device. | <ul style="list-style-type: none"> Check the wiring of the Remote start signal to the controller's respective digital input terminal. Enter the Configuration mode in the controller and verify the configuration for the Remote start digital input terminal. Check that the controller is in Auto mode. Check for Mains monitoring disabled and Site mode disabled. |
| Controller does not stop engine even when a Remote stop command is sent from an external device. | <ul style="list-style-type: none"> Check the wiring of the Remote stop signal to the controller's respective digital input terminal. Enter the Configuration mode in the controller and verify the configuration for the Remote stop digital input terminal. Check that the controller is in Auto mode. |
| While in Auto mode, the controller sends a Start command even if the Mains is present. | <ul style="list-style-type: none"> Check the wiring of the mains L1, L2 and L3 phase to the controller's respective input terminal. Enter the Configuration mode in the controller and verify the configuration for the Mains monitoring. |

SGC 121 only troubleshooting

| Fault | Action |
|---|---|
| <p>The governor actuator chatters even after the engine stops.</p> <p>The controller shows genset ON while genset is at rest.</p> <p>Fail to stop alarm when genset is at rest.</p> | <ul style="list-style-type: none"> Enter Configuration mode in the controller and verify the configuration for the LLOP and LOP. Also check the wiring. Ensure that Mains voltage wiring is not connected by mistake to the controller's genset voltage terminals. |
| <p>The controller does not maintain the target RPM.</p> <p>The engine RPM is not stable or engine hunts.</p> <p>The controller cranks the engine but does not start the engine.</p> | <ul style="list-style-type: none"> Check that the mechanical linkage assembly is OK. Enter Configuration mode in the controller and verify the configuration for GOVERNOR. Check the PID control gains. Check that the actuator moves to full throttle position when the engine is cranked. |