



DATA SHEET

SGC 410

Single Genset Controller



1. Product description	
1.1 About SGC 410.....	3
1.2 Product overview.....	3
1.3 Overview of controller buttons.....	4
2. Safety instructions	
2.1 General safety instructions.....	5
2.2 Electrical safety.....	5
2.3 In operation safety.....	5
3. Alarms	
3.1 Alarms.....	6
4. Technical specifications	
4.1 Electrical specifications.....	10
4.1.1 Power supply.....	10
4.1.2 Genset voltage and frequency measurements.....	10
4.1.3 Genset current measurements.....	11
4.1.4 Earth leak measurements.....	11
4.1.5 Digital inputs.....	11
4.1.6 Analogue resistive sensor inputs.....	11
4.1.7 Analogue inputs used as digital inputs.....	12
4.1.8 Site battery inputs.....	12
4.1.9 Magnetic pick-up (MPU) input.....	13
4.1.10 D+ Charger alternator.....	13
4.1.11 Sensor common point.....	13
4.1.12 Communication ports.....	14
4.1.13 Digital outputs.....	14
4.2 Terminal details.....	15
4.3 Approvals.....	17
4.4 Dimensions.....	17
5. Legal information	
5.1 Legal information.....	18

1. Product description

1.1 About SGC 410

SGC 410 is a modern genset controller with user friendly HMI, full graphics LCD, and a highly versatile software. Extensive inputs and outputs support a wide variety of industry standard features in diesel/gasoline genset applications.

SGC 410 offers Site battery monitoring which significantly reduces fuel consumption. The controllers support Shelter temperature monitoring, Auto (Remote start /stop, Cyclic and Exercise mode), Manual and Test modes.

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 controller.

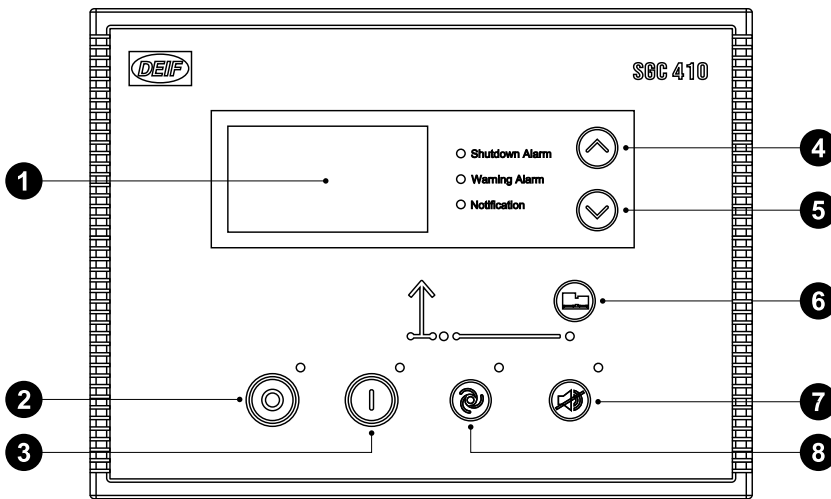
The powerful micro controller in SGC 410 supports a range of complex features, for example:

- LCD display
- True RMS voltage and current monitoring
- RS-485 base communication
- Monitoring of engine and alternator parameters
- Configurable inputs and outputs for a wide range of functions

1.2 Product overview

Features	Specifications
Digital switch input	9
Analogue resistive inputs	5
Analogue current/voltage inputs	2
Differential input (± 60 V DC) for Site battery voltage	Yes
DG alternator voltage input, D+ charging alternator I/O	Yes
Digital outputs	7
Event logs	Yes
USB port for PC based configuration	Yes
RS-485 for Modbus communication	Yes
Operating battery supply voltage (with -32 V reverse protection)	8 to 32 V DC
Operating temperature range ($^{\circ}$ C)	-20 to 65
Protection class with gasket (included)	IP65
Warning auto clear enable/disable	Yes
Fuel reference selection input	Yes

1.3 Overview of controller buttons



1. Display
2. Stop/Config button
3. Start button
4. Menu navigation up button
5. Menu navigation down button
6. Genset contactor latching button
7. Acknowledge button
8. Mode selection button

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. Alarms

3.1 Alarms

When a Shutdown alarm occurs the controller commands the genset to stop. The controller does not send the start command if the Shutdown alarm is not acknowledged.

When an Electrical trip alarm occurs, the controller opens the genset contactor and then commands the genset to stop. The controller does not send the start command if the Electrical trip alarm is not acknowledged.

If the Warning alarm occurs while the genset runs, the controller does not send the stop command. But if the Warning alarm is not acknowledged when the genset is stopped, the genset cannot be started.

If Auto warning clear is enabled, the Warning alarms are automatically cleared when the conditions that triggered the alarm are cleared.

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.	None Shutdown Warning
	Low Oil Pressure (Switch)	Indicates that the oil pressure measured is low through switch.	None Shutdown Warning Electrical Trip Notification
2	LOP Res Sensor - Ckt Open	The oil pressure sensor is not detected (circuit open).	None Shutdown Warning Electrical Trip Notification
3	High Eng Temp (sensor)	Indicates that the engine temperature is above the preset threshold. This condition is detected only when engine is on.	None Shutdown Warning
	High Eng Temp (Switch)	Indicates that the engine temperature measured is high through switch.	None Shutdown Warning Electrical Trip Notification
4	Eng Temp - Ckt Opn	The temperature sensor is not detected (circuit open).	None

No.	Alarms	Causes/Indication	Actions
			Shutdown Warning Electrical Trip Notification
5	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.	None Shutdown Warning
	Low Fuel level (Switch)	Indicates that the amount of fuel level measured is low through switch.	None Shutdown Warning Electrical Trip Notification
	Fuel level - Ckt Open	The fuel level sensor is not detected (circuit open).	None Shutdown Warning Electrical Trip Notification
6	Fuel Theft	The fuel consumption has exceeded the preset threshold.	Warning
7	Low Water Level Switch	Indicates that radiator water level is below the preset threshold.	None Shutdown Warning Electrical Trip Notification
8	Shelter Temp - Ckt Open	Shelter temperature sensor is not detected (circuit open).	Notification
9	Aux S2 - Ckt Open	Auxiliary sensor S2 is not detected (circuit open).	None Shutdown Warning Electrical Trip Notification
10	Auxiliary Input (for example, Aux_A - P)/user defined name	Configured auxiliary input has triggered longer than the preset duration.	None Shutdown Warning Electrical Trip Notification
11	Emergency Stop	When emergency stop switch is pressed and 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 the preset under-voltage threshold.	Shutdown Warning
18	L2 Phase Under Voltage	Indicates that genset (L2) phase voltage has fallen below the preset under-voltage threshold.	Shutdown Warning

No.	Alarms	Causes/Indication	Actions
19	L3 Phase Under Voltage	Indicates that genset (L3) phase voltage has fallen below the preset under-voltage threshold.	Shutdown Warning
20	DG Phase Reversed	Alternator phase sequence (L1-L2-L3) is not correct.	None Shutdown Warning Electrical Trip Notification
21	Mains Phase Reversed	Mains is in unhealthy condition.	None Notification
22	Over Frequency	Indicates that genset output frequency has exceeded the preset threshold.	Shutdown Warning
23	Under Frequency	Indicates that genset output frequency has fallen below the preset threshold.	Shutdown Warning
24	Over Current	Indicates that genset current has exceeded the preset threshold.	None Shutdown Warning Electrical Trip Notification
25	Over Load	Indicates that the measured kW load rating has exceeded the preset threshold.	None Shutdown Warning Electrical Trip Notification
26	Unbalanced Load	Load on any phase is greater or less than other phases by a threshold value.	None Shutdown Warning Electrical Trip Notification
27	Over Speed	Indicates that genset speed has exceeded the preset overspeed threshold. Genset will shut down after Overspeed delay.	Shutdown
28	Gross Over Speed	Indicates that genset speed has exceeded the preset Gross overspeed threshold. Genset will shut down immediately without any delay.	Shutdown
29	Under Speed	The engine speed has fallen below the preset RPM.	Shutdown
30	Charge Fail	The charge alternator voltage has dropped below the preset threshold.	None Shutdown Warning Electrical Trip Notification
31	Battery Under Voltage	The battery voltage has fallen below the preset threshold.	None Shutdown Warning Electrical Trip Notification
32	Battery Over Voltage	The battery voltage has exceeded the preset threshold.	None Shutdown Warning Electrical Trip Notification
33	High Oil Press Detected	Lube oil pressure is detected above the crank disconnect threshold when the engine is off.	Warning

No.	Alarms	Causes/Indication	Actions
34	Maintenance Due	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	Battery Charger Fail	Indicates the battery is not getting charged by the charger.	None Shutdown Warning Electrical Trip Notification
36	Smoke Fire	Controller has detected smoke / fire through its digital input.	None Shutdown Warning Electrical Trip Notification
37	Aux S2/user defined name	Auxiliary sensor S2's threshold being crossed.	None Shutdown Warning Electrical Trip Notification

4. Technical specifications

4.1 Electrical specifications

4.1.1 Power supply

Category	Specification
Controller terminals	1 (Ground) 2 (Battery or DC+)
Supply voltage range	Nominal voltage: 12/24 VDC Operating range: 8 to 32 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 outputs)
Standby current consumption	180 mA, 12 V DC 140 mA, 24 V DC

4.1.2 Genset voltage and frequency measurements

Category	Specifications
Controller terminals	54 (Neutral) 55 (L3) 56 (L2) 57 (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 ±1.5 % 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.

4.1.3 Genset current measurements

Category	Specifications
Controller terminals	43 and 42 (for phase L1) 45 and 44 (for phase L2) 47 and 46 (for phase L3)
Measurement type	True RMS
Maximum CT secondary current rating	5 A
Burden	0.25 VA
Measurement accuracy	±1.4 % of nominal

4.1.4 Earth leak measurements

Category	Specifications
Controller terminals	48 and 49
Measurement type	True RMS
Maximum CT secondary current rating	5 A
Burden	0.25 VA
Measurement accuracy	±1.4 % of nominal

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

4.1.5 Digital inputs

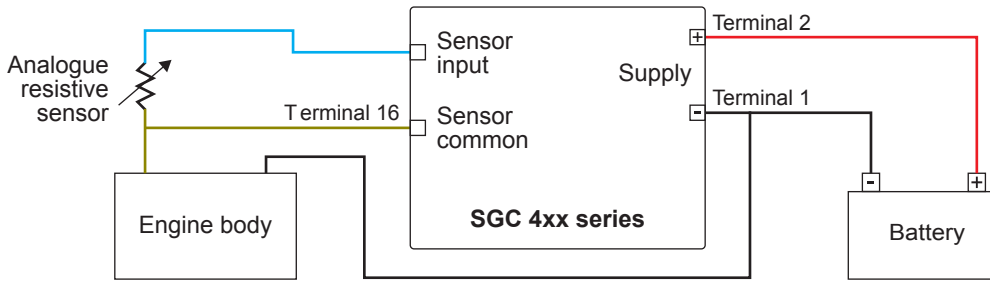
Category	Specifications
Controller terminals	33, 34, 35, 36, 37, 38, 39, 40, 41
Number of inputs	9
Type	Negative sensing (connect to ground for activation)
Software configurable options	Emergency stop, Remote start/ stop, and more (see Controller overview , Configurable parameters in the User manual for more details).

4.1.6 Analogue resistive sensor inputs

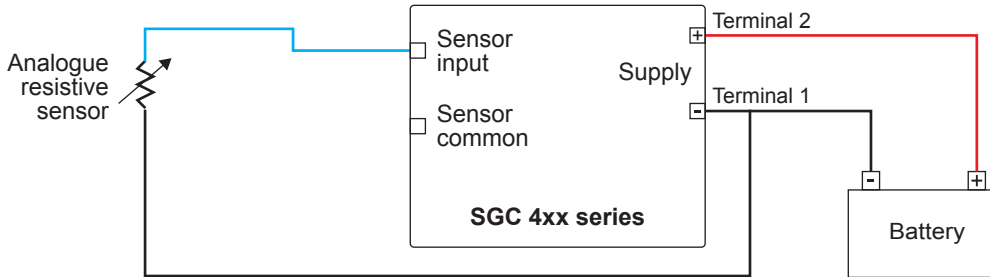
Category	Specifications
Controller terminals	11 (Oil pressure) 12 (Fuel) 13 (Temperature) 14 (Aux 1) 15 (Aux 2)
Number of inputs	5
Type	Ratio-metric sensing
Range	10 to 5000 Ω
Open circuit detection	Above 5.5 k Ω
Measurement accuracy	±2 % of full scale (up to 1000 Ω)

SCP connection

SCP connections for Analogue inputs 1 to 4*:

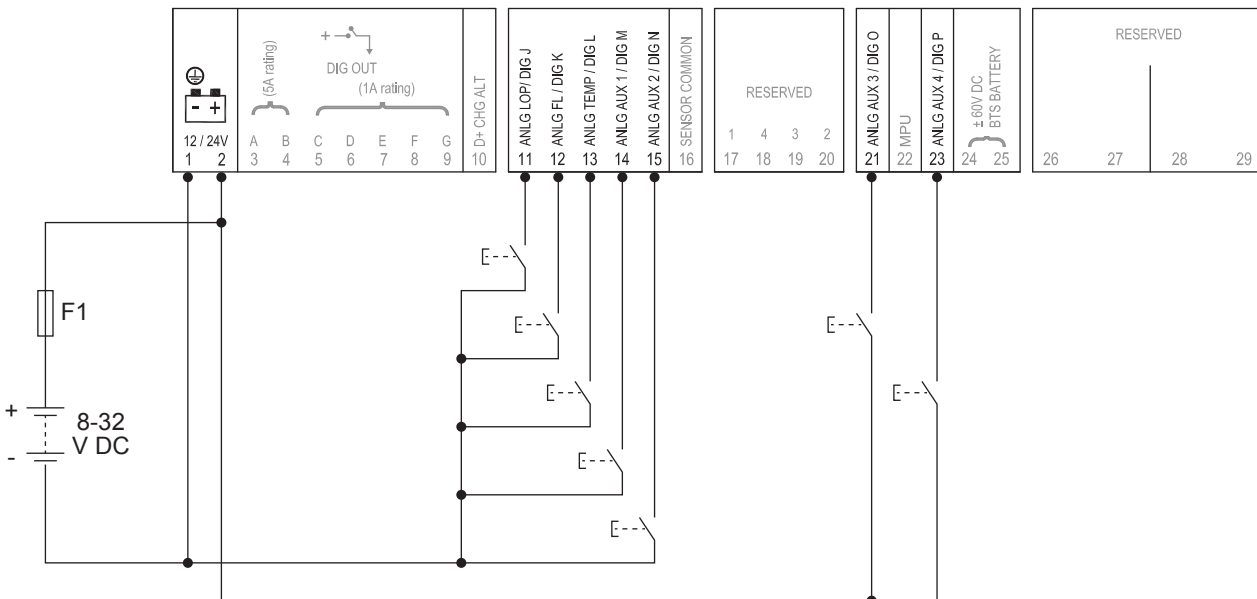


*SCP connections for Analogue input 2 used as *Fuel level sensor* with the reference configured as *Battery Negative*



4.1.7 Analogue inputs used as digital inputs

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



4.1.8 Site battery inputs

Category	Specifications
Controller terminals	24, 25
Number of inputs	2
Type	Differential
Range	±60 V

Category	Specifications
Resolution	0.1 V
Accuracy	±2 % of full scale

Site battery run hours

In this feature, controller calculates the run hours for which the site runs on the battery backup. Site battery run hours are incremented only when both the mains and genset contactors are not latched and when site battery voltage is greater than low battery voltage threshold.

4.1.9 Magnetic pick-up (MPU) input

Category	Specifications
Controller terminal	22
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.

4.1.10 D+ Charger alternator

Category	Specifications
Controller terminal	10
Voltage range	0 to V_{BATT} $V_{BATT} = 8$ to 32 V DC
Excitation	PWM (power limited to 3 W, 12 V/250 mA, 24 V/125 mA)
Accuracy	±2 % 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.

4.1.11 Sensor common point

Category	Specifications
Controller terminal	16
Range	±2 V
Accuracy	±2 % of full scale

The sensor common point (SCP) terminal 16 must be connected directly to an electrically sound point on the engine body. This point serves as a common reference point for all analogue sensors. The electrical cable used for the connection must not be shared with any other electrical connection. This wiring practice is strongly recommended to ensure that there is negligible potential difference between the engine body and the controller's SCP terminal, and that predictable and accurate analogue sensor measurements are always available in a wide variety of field conditions.

4.1.12 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 is provided between output terminals A and B Common-mode operating range Maximum distance of line is 200 m
Controller terminals	30 (GND) 31 (A) 32 (B)
CAN	Baud rate: 250 kbps Packet size: 8 bytes Termination resistor of 120 Ω is provided
Controller terminals for CAN	58 and 59

- NOTE**
- The RS-485 port on the controller supports a protocol based on Modbus.
 - Use two core shielded twisted pair cable for Modbus RS-485 connection.
 - Terminal 30 should be connected to master's isolated ground only.
 - Keep terminal 30 connection open if shielded cable is not available.
 - Do not connect terminal 30 to the negative battery terminal (DC -).

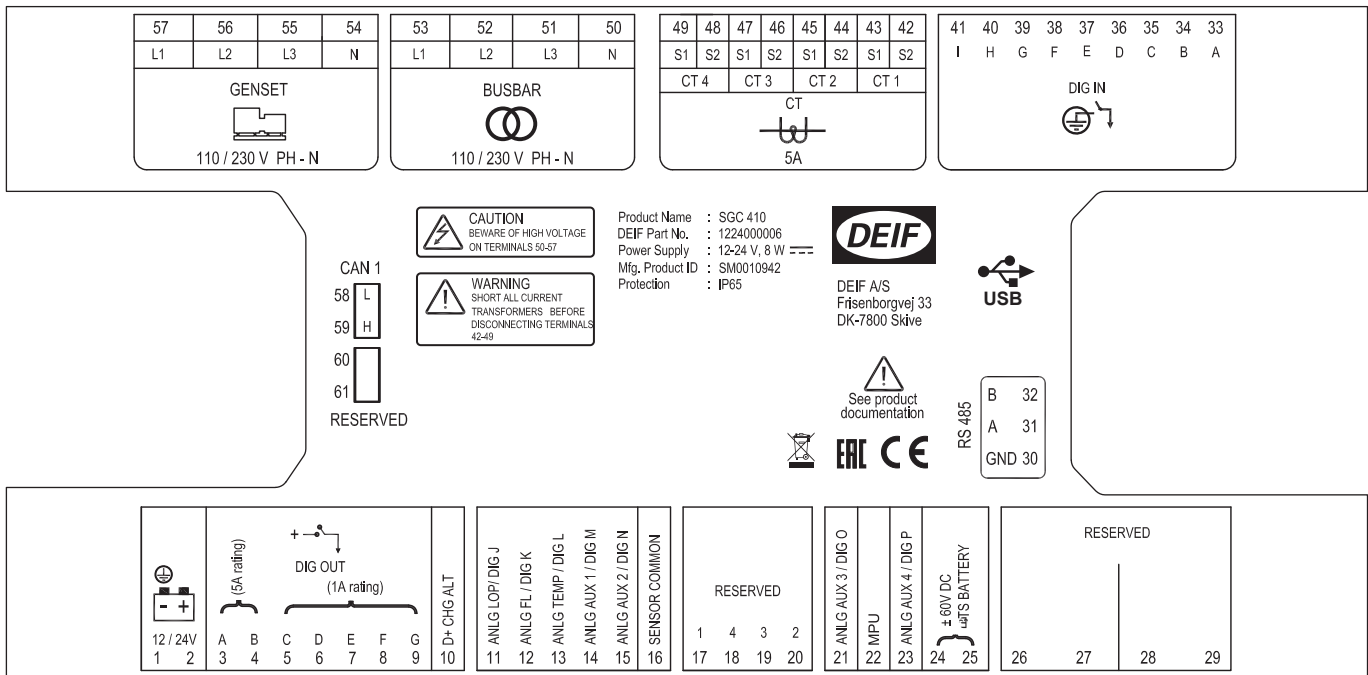
4.1.13 Digital outputs

Category	Specifications
Controller terminals	3, 4, 5, 6, 7, 8, 9
Number of outputs	7
Type	DC outputs
Maximum current rating	5 A (3 and 4) 1 A (5, 6, 7, 8, 9)
Software configurable options	Start relay, Fuel relay, Close genset contactor, Stop solenoid and many more (see Controller overview, Configurable parameters in the User manual for more details).

- NOTE**
- Do not connect the Starter motor relay and the Stop solenoid directly to the controller's output terminals. It is recommended to connect terminals 3 and 4 to Start and Stop.
 - Genset contactor latching relays should be compiled against 4 kVA surge as per IEC-61000-4-5 standard.

4.2 Terminal details

Rear view of the controller with terminal details.



Terminal	Text	Description	Connector
1	GND	Power ground	BCP-508-10GN
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	
6	DIG OUT D	DC output - D	
7	DIG OUT E	DC output - E	
8	DIG OUT F	DC output - F	
9	DIG OUT G	DC output - G	
10	D+ CHG ALT	Input for charging alternator control	
11	ANLG LOP / DIG J	Analogue input from Lube Oil Pressure Sensor/ Digital Input J	BCP-508-6GN
12	ANLG FUEL LEVEL / DIG K	Analogue input from Fuel Level Sensor/Digital Input K	
13	ANLG ENG TEMP / DIG L	Analogue input from Engine Temperature Sensor/ Digital Input L	
14	ANLG AUX 1 / DIG M	Analogue input auxiliary/Analogue input from Shelter Temperature Sensor/Digital Input M	
15	ANLG AUX 2 / DIG N	Analogue input auxiliary/Digital Input N	
16	SCP	Sensor common point	

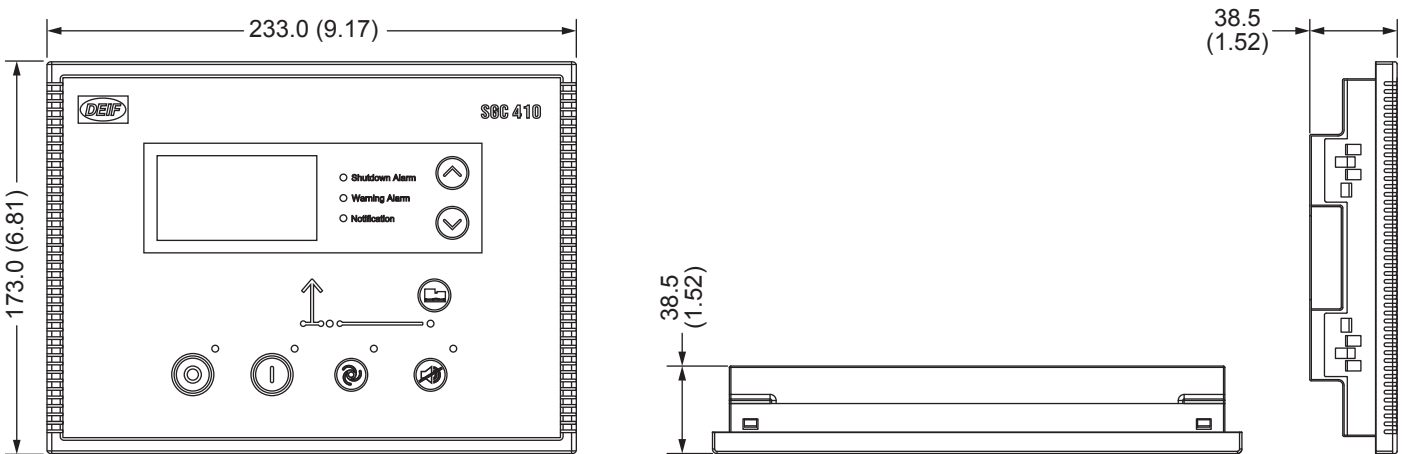
Terminal	Text	Description	Connector
17	Reserved	-	N/A
18	Reserved	-	
19	Reserved	-	
20	Reserved	-	
21	ANLG AUX 3/DIG 0	Analogue input auxiliary/0-5 V/4-20 mA (LOP)/ Digital Input O	BCP-508-5GN
22	MPU	Input from engine speed sensor (Inductive)	
23	ANLG AUX 4/DIG P	Analogue input auxiliary/0-5 V/4-20 mA/Digital Input P	
24	Site BATT I/P	Input 1 from Site battery	
25	Site BATT I/P	Input 2 from Site battery	
26	Reserved	-	N/A
27	Reserved	-	
28	Reserved	-	
29	Reserved	-	
30	RS 485 GND	RS-485 GND	BCP-508-3GN
31	RS 485 A	RS-485 A	
32	RS 485 B	RS-485 B	
33	DIG IN A	Input from switch A	BCP-508-9GN
34	DIG IN B	Input from switch B	
35	DIG IN C	Input from switch C	
36	DIG IN D	Input from switch D	
37	DIG IN E	Input from switch E	
38	DIG IN F	Input from switch F	
39	DIG IN G	Input from switch G	
40	DIG IN H	Input from switch H	
41	DIG IN I	Input from switch I	
42	GEN CT IN L1-2	CT input 2 from Phase L1	BCP-508-8GN
43	GEN CT IN L1-1	CT input 1 from Phase L1	
44	GEN CT IN L2-2	CT input 2 from Phase L2	
45	GEN CT IN L2-1	CT input 1 from Phase L2	
46	GEN CT IN L3-2	CT input 2 from Phase L3	
47	GEN CT IN L3-1	CT input 1 from Phase L3	
48	GEN CT IN EL2	CT input 2 from Earth Leakage	
49	GEN CT IN EL1	CT input 1 from Earth Leakage	

Terminal	Text	Description	Connector
50	Reserved	-	BCP-508-7GN-4PA
51	Reserved	-	
52	Reserved	-	
53	Reserved	-	
54	GEN V N	Voltage input from Gen Neutral	
55	GEN V L3	Voltage input from Gen L3	
56	GEN V L2	Voltage input from Gen L2	
57	GEN V L1	Voltage input from Gen L1	BCP-508-4GN
58	CAN L (Reserved)	CAN Low	
59	CAN H (Reserved)	CAN High	
60	Reserved	-	
61	Reserved	-	

4.3 Approvals

Standards	
CE	<ul style="list-style-type: none"> Comply to the EU Low Voltage Directive: EN 61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements Comply to the EU EMC directive EN 61000-6-2, 4

4.4 Dimensions



Dimensions	
Dimensions	Length: 233.0 mm (9.17 in) Height: 173.0 mm (6.81 in) Depth: 38.5 mm (1.52 in)
Panel cut-out	Length: 219.0 mm (8.62 in) Height: 158.0 mm (6.22 in) Tolerance: ± 0.3 mm (0.01 in)

5. Legal information

5.1 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.

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