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RGK400SA RGK420SA

GB

STAND-ALONE GENERATING SET CONTROLLERS

INSTRUCTION MANUAL

CAUTION!
- Read this manual before use and installation.
- This equipment must be installed by qualified personnel according to applicable standards in order to prevent injury or damage to property.
- *Before any maintenance operation on the device, disconnect power from all measuring and power supply inputs.*

- *The manufacturer cannot be held responsible for electrical safety in case of improper use of the equipment.*
- *The products illustrated herein are subject to alteration and changes without prior notice. Descriptions and specifications are therefore not contractually binding.*
- *A circuit breaker must be included in the electrical installation of the building. This must be installed near the equipment and within easy of the operator. It must be marked as the disconnecting device of the equipment: IEC/ EN 61010-1 § 6.12.2.1.*
- *Clean the equipment with a soft cloth; do not use abrasive products, liquid detergents or solvents.*

Introduction

The RGK400SA and RGK420SA controllers implement state-of-the-art functions for use with manual control (stand-alone) generating sets. The RGK400SA incorporates front panel buttons for switching the controller on and off and starting and stopping the generator. On the RGK420SA, this function is performed by a key switch on the front panel.
Advanced features like a wide LCD display, optical port on the front panel, expandability by means of rear module and programming using NFC technology make these controllers state-of-the-art in their field.

Description

- Controller for stand-alone generating sets.
- Compact housing for standard 96x96 mm panel cut-out, with 110x110mm front frame.
- Versions:
    - RGK400SA – 4 buttons on front panel: switching on-off by button.
    - RGK420SA – 3 buttons + 3-position key lock (OFF-ON-REM) on front panel, with key removable in positions OFF and REM (remote).
- Remote start input for switching the controller on and off and for starting the genset engine.
- 1 expansion slot for EXP series modules.
- White backlit LCD icon display, with extended temperature range.
- Simultaneous display of 3 selectable quantities, 2 in large characters with bar graph and 1 in alphanumeric form.
- Alarms and protections displayed by:
    - Generic alarm symbol
    - Specific alarm icon
    - Alarm code
    - Description in selected language
- Parameter and alarm messages in 5 languages (ENG-ITA-FRA-SPA-DEU).
- 3 Ph+N, 480 VAC rated generator voltage measuring input.
- 1 ph current input.
- 6 digital inputs, including
    - 4 standard digital inputs
    - 1 digital or resistive analog input
    - 1 remote start input
- 5 * 2A protected static outputs arranged in two groups of 2+3 outputs, with separate common terminals.
- EXP1040 expansion module to add:
    - 2 digital or resistive analog inputs (total 8 inputs).
    - 2 protected 2A static outputs (total 7 outputs).
- 12 or 24 VDC power supply (indifferent), protected against reversed polarity.
- Genset engine speed monitoring by W/AC/Pick-up/Frequency.
- Maintenance interval management.
- Optional front panel gasket (code EXP8005) for IP65 protection of RGK400.
- NFC interface for wireless programming from smart device (smartphone or tablet).
- Optical interface on front panel for programming and maintenance.
- Compatible with *SAM1 app*, *NFC app* and *Xpress* remote configuration and control software.

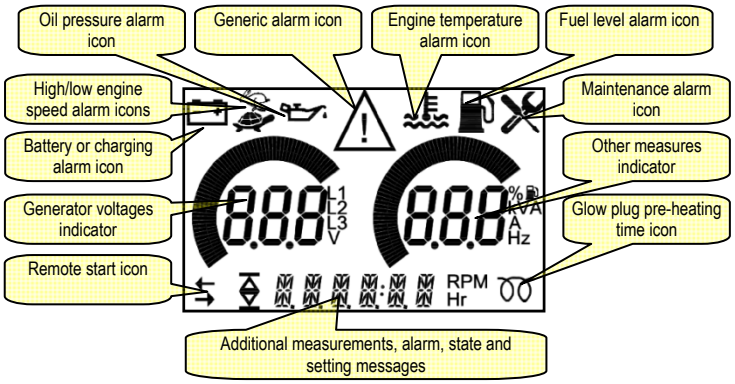
RGK400SA

RGK420SA

Functions of front panel buttons and controls

▼ ▲ buttons - For scrolling the display and selecting menu options.
START button - Starts the engine.
STOP button (RGK400SA) - Stops the engine (short press) - Switches the controller on and off (long press).
Key in OFF position (RGK420SA) - Stops the engine and switches the controller off. The key can be removed in this position.
Key in ON position (RGK420SA) - Switches the controller on. The key cannot be removed in this position.
Key in REM position (RGK420SA) - Transfers controller switching and engine starting to the INP6 / REM.STA input. The key can be removed in this position.

Display indications



Navigating the display pages

- Press the ▼ button to scroll through the left indicator measurements. The following measurements are displayed in rotation:
  - Mean phase-to-phase voltage
  - Phase-to-phase voltages
  - Phase-to-neutral voltages
- Press the ▲ button to scroll through the right indicator measurements. The following measurements are displayed in rotation:
  - Frequency
  - Current
  - Power output
  - Fuel level (if enabled)
  - Oil pressure (if enabled)
  - Engine temperature (if enabled)
  - Battery voltage
- The numeric indicator at the bottom of the display normally shows engine working hours, but pressing the ▲ button switches it to RPM display.
- Certain measurements may not be displayed, depending on controller setup and connections to the generating set.
- The user can specify a default configuration, in which the display appears when the controller is powered on and to which it returns if no buttons are pressed for a given time.
- To set up these functions, see the *P01 – Utility* menu.

Switching on and starting up (RGK400SA)

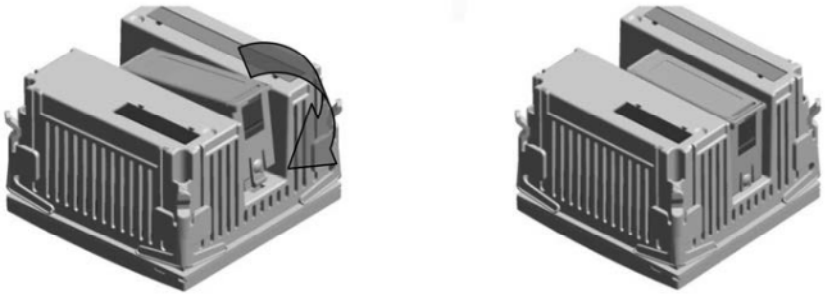
- To switch on the controller when battery power is present at the terminals, press and hold the STOP button for 1 seconds. The device switches on and performs a self-test. The model and revision number appear on the display.
- With the controller switched on but before the motor is started, the pressure/temperature/battery charging icons indicate the state of the corresponding sensors.
- To start the engine, press the START button for 1 second. The controller runs the engine start procedure but makes only one start attempt. If this attempt fails and you wish to try again, press the START button again.
- To stop the engine, press the STOP button for 1 second. The controller performs an engine cooling cycle (if required) and then runs the engine stop procedure.
- To switch off the controller, press and hold the STOP button for 3 seconds. The engine is stopped, then the controller switches off. If an engine cooling cycle is needed, the controller only switches off at the end of this, after the engine has stopped. During the cooling cycle, the display reads out a countdown of the time to engine shutdown. If you wish to stop the engine immediately, press the STOP button again during the cooling cycle.
- If the remote starting input is used, closing its circuit to ground switches on the controller and starts the engine, making multiple attempts if necessary.
- Opening the circuit stops the engine and switches off the controller, leaving it a state of zero battery consumption.

Switching on and starting up (RGK420SA)

- To switch on the controller when battery power is present at the terminals, turn the key switch to the ON position. The device switches on and performs a self-test. The model and revision number appear on the display.
- With the controller switched on but before the motor is started, the pressure/temperature/battery charging icons indicate the state of the corresponding sensors.
- To start the engine, press the START button for 1 second. The controller runs the engine start procedure but makes only one start attempt. If this attempt fails and you wish to try again, press the START button again.
- To stop the engine, turn the key switch back to the OFF position. The controller performs an engine cooling cycle (if required) and then runs the engine stop procedure. The controller switches off at the end of the engine stop procedure.
- The remote start input is disabled when the key switch is in OFF or ON position.
- With the key switch in REM position (even with the key removed), starting and stopping via the remote input is enabled. Closing the remote starting circuit to ground switches on the controller and starts the engine, making multiple attempts if necessary.
- Opening the remote starting circuit, stops the engine and switches off the controller, leaving it a state of zero battery consumption.

Expandability

- Thanks to its expansion bus, the RGK4...SA can be expanded with additional modules of the EXP... series.
- The RGK400SA and RGK420SA support the EXP1040 expansion module, which provides additional 2 inputs and outputs.
- Program at least one of the resources which the module will make available (for instance, assign the analog input AIN2 to fuel level).
- To install the module, proceed as shown in the figure, with the controller switched off:



- The next time the controller is switched on, it automatically recognises the expansion module and makes the new resources available.

Inputs and outputs

- The inputs and outputs are identified by a code and a sequential number. For example, the digital inputs are named INPx, where x is the input number. Similarly, the digital outputs are named OUTx.
- The input/output numbering is a sequential numbering from the top down.

CODE	DESCRIPTION	BASE	EXP
INPx	Digital inputs	1…6	7...8
OUTx	Digital outputs	1…5	6…7

User alarms (UAx)

- The user can define up to 2 programmable alarms (UA1…UA2).
- The following can be established for each alarm:
  - the *source*, i.e. the condition that generates the alarm;
  - the *text* of the message that appears on the display when the alarm condition occurs;
  - the *properties* of the alarm (as for standard alarms), i.e. how it interacts with the genset controller.
- If the alarm is displayed following activation of an external digital input, then the source must be an INPx.
- The user can define a freely programmable message to appear on the display.
- Properties for user alarms can be defined using the same method applied to normal alarms. In other words, users can decide whether a given alarm must stop the engine, sound the siren, activate the generic alarm output etc. See the *Alarm* chapter.
- Multiple simultaneous alarms are displayed in sequence.
- Use the specific command in the Commands menu to reset a programmed alarm with memory.
- See the settings menu to define alarms.

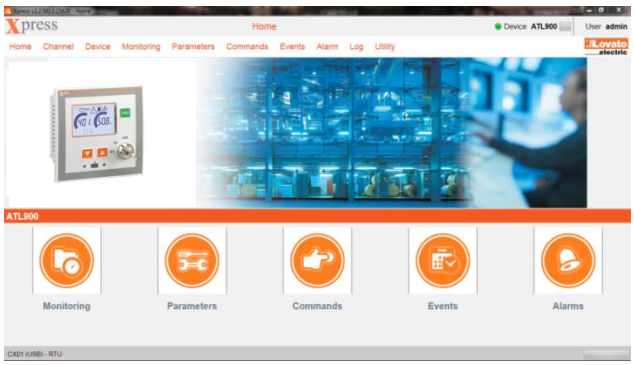
IR programming port

- The parameters of the RGK4...SA may be configured via the front panel optical port using the IR-USB CX01 programming dongle or the IR-Wi-Fi CX02 dongle.
- Simply insert the connectors of the CX... dongle in the sockets of the port on the front panel to obtain mutual recognition of the devices, indicated by the green LINK LED lighting on the programming dongle.

USB CX01 and Wi-Fi CX02 programming dongles

Setting parameters from a PC

- *Xpress* configuration and control software can be used to transfer setup parameters (previously set) from the RGK4...SA to a PC hard disk and vice versa.
- Parameter transfer from a PC to the RGK4...SA may be partial, i.e. only the parameters of specified menus will be transferred.



Parameter setting from smartphone or tablet via Wi-Fi

- It is possible to establish a wireless connection to the RGK4..SA using the *LOVATO Electric SAM1 app*, available for Android or iOS tablets and smartphones, and the CX02 accessory.
- The app can be used to view alarms, send commands, read measurements, set parameters, download events and send collected data via e-mail.

Parameter setting from a smartphone or tablet via NFC

- The *LOVATO Electric NFC app* for Android devices (smartphones and tablets) lets you program parameters in a simple and intuitive way, with no need for connection cables. This method even works with the RGK4...SA switched off.
- Preprogrammed parameters can be transmitted to the RGK4...SA controller simply by resting a smart device on the front panel.
- Pre-requisites for functioning:
  - The smart device must support NFC protocol and the NFC function must be active and not locked.
  - If the RGK4...SA is switched on, the genset engine must be stopped.
  - If an advanced password is set (see P03.03), this must be known, or access will not be possible.
  - It is best to have the app pre-loaded on the smart device. If it is not, proceed to the next step anyway. You will be routed automatically to the on-line store's installation site.
  - Rest the smart device on the front panel of the RGK4..SA controller, more or less in the position shown alongside. Hold it in position for a few seconds until you hear a beep. The app runs automatically and the parameters are loaded and displayed.
  - Parameter menus are accessed and parameters changed in exactly the same way as for the other apps described previously.
  - Make all the changes you need then press the *Send* button and hold the smart device in touch with the front panel of the RGK4...SA controller again. The new parameters are transferred to the RGK4...SA controller. A reset is required to make them active. This operation is shown by the NFC wording appearing on the display of the RGK4...SA controller.

Automatic acquisition of rpm/W ratio

- To acquire this ratio, the W signal must be connected and rated engine speed must be set in the setup menu.
- With the engine running at normal speed, press and hold the START and ▲ buttons.
- Wait a few seconds until the RPM appears on the display, then release the buttons.
- The W/RPM ratio is calculated and memorised.

Main menu

- To access the main menu, press the ▲ and ▼ buttons simultaneously with the engine stopped.
- This provides access to the following functions:

FUNCTION	DISPLAY
Password setting (if enabled – see P03)	PAS
Access to the SETUP menu	SETUP
Access to the Commands menu	CMD
Information	INFO
Total engine working hours	ENG.TOT
Maintenance (if enabled – see P17.01)	MAINT
Rental hours (if enabled – see P17.02)	RENT
Exit from main menu	EXIT

- Select the required function by pressing ▲ and ▼ .
- Press START to confirm.

Setting parameters (setup) from the front panel

- To access the parameter programming (setup) menu:
  - Engine must be stopped.
  - From the normal measurement display, press ▲ and ▼ simultaneously for 2 sec to enter the *Main menu*.
  - While SETUP is shown, press START.

- The first menu is shown (P01) with its scrolling description.
- Select the desired menu from the list below using ▲ and ▼ and confirm with START.
- The first parameter of the selected menu is shown, with its scrolling description.
- Select the desired parameter in the menu using ▲ and ▼ and confirm with START.
- The present setting of the parameter is shown. Change the value using ▲ and ▼ . Confirm the value with START. Display goes back to parameter selection.
- Press simultaneously ▲ and ▼ for a short time to go back to menu selection or for 2 sec to save settings and quit setup (in this case the unit restarts).

Code	MENU	DESCRIPTION
P01	UTILITY	Language, brightness, display pages, etc.
P02	GENERAL	System specifications
P03	PASSWORD	Access code setup
P04	CONFIGURATIONS	Multiple programmable configurations
P05	BATTERY	Battery parameters
P06	ACOUSTIC ALARMS	Control of internal buzzer and external siren
P07	ENGINE SPEED	Engine speed sensors and parameters
P08	OIL PRESSURE	Oil pressure sensors and parameters
P09	COOLANT TEMPERATURE	Engine temperature sensors and parameters
P10	FUEL LEVEL	Fuel level sensors and parameters
P11	ENGINE START	Engine start cycle parameters
P12	GENERATOR VOLTAGE CONTROL	Generator voltage parameters
P13	GENERATOR PROTECTION	Alternator protection functions
P14	DIGITAL INPUTS	Programmable digital input functions
P15	DIGITAL OUTPUTS	Programmable digital output functions
P17	MISCELLANEOUS	Miscellaneous functions, e.g. maintenance etc.
P18	USER ALARMS	User programmable alarms
ALA	ALARMS TABLE	Alarm enabling and effect

Parameter table

P01 – UTILITY		UoM	Default	Range
P01.01	Language		ENG	ENG ITA FRA ESP DEU
P01.02	Display backlight brightness high	%	100	0-100
P01.03	Display backlight brightness low	%	25	0-50
P01.04	Low backlight brightness delay	sec	180	5-600
P01.05	Return to default measurements	sec	300	OFF / 10-600
P01.06	Default left indicator measurement		V sum	V sum VL1-L2 VL2-L3 VL3-L1 VL1 VL2 VL3
P01.07	Default right indicator measurement		Hz	Hz A kVA %Fuel Oil Pr Temp V batt
P01.08	Shutdown delay (RGK400SA only)	min	OFF	OFF/1-1440

P01.01 – Display text language selection.
P01.02 – High display backlight adjustment.
P01.03 – Low display backlight adjustment.
P01.04 – Delay before switching to low display backlight.
P01.05 – Delay before returning to default page display when no button is pressed. If set to OFF, the last manually selected page remains on the display.
P01.06 – Default left measurement displayed on power up and after reset delay.
P01.07 – Default right measurement displayed on power up and after reset delay.
P01.08 – If a value in minutes is set, the controller switches off automatically after this time when in STOP mode.

P02 - GENERAL		UoM	Default	Range
P02.01	CT primary	A	5	1-10000
P02.02	CT secondary	A	5	1-5/OFF
P02.03	Use of VT		OFF	OFF-ON
P02.04	VT primary	V	100	50-50000
P02.05	VT secondary	V	100	50-500
P02.06	Phase sequence check		OFF	OFF

				L1-L2-L3 L3-L2-L1

P02.01 – Value for current transformer primary. Example: with CT 800/5 set 800.
P02.02 – Value for phase current transformer secondary. Example: with CT 800/5 set 5. OFF= no display of the current.
P02.03 – Use of voltage transformers (VT) on the generator voltage measuring inputs.
P02.04 – Primary value of voltage transformers, if used.
P02.05 – Secondary value of voltage transformers, if used.
P02.06 – Phase sequence control enabling. OFF = no control. Direct = L1-L2-L3. Inverted = L3-L2-L1. Note: The corresponding alarms must also be enabled.

P03 - PASSWORD		UoM	Default	Range
P03.01	Enable passwords		OFF	OFF-ON
P03.02	User level password		1000	0-9999
P03.03	Advanced level password		2000	0-9999
P03.04	Remote access password		OFF	OFF/1-9999

P03.01 – If set to OFF, password management is deactivated; access to settings and the Commands menu is free.
P03.02 – If P03.01 is set ON, specify here the sequence needed to obtain user level access. See the Password protected access chapter.
P03.03 – As for P03.02, but referred to Advanced level access.
P03.04 – If set to a numeric value, this represents the code to be sent over the serial line before remote commands can be transmitted.

P04 – MISCELLANEOUS (CNFn, n=1...2)		UoM	Default	Range
P04.n.01	Rated voltage	V	400	50-50000
P04.n.02	Connection type		L1-L2-L3-N	L1-L2-L3-N L1-L2-L3 L1-N-L2 L1-N
P04.n.03	Type of voltage control		L-L	L-L L-N L-L + L-N
P04.n.04	Rated current	A	5	1-10000
P04.n.05	Rated frequency	Hz	50	50 60
P04.n.06	Rated engine speed	RPM	1500	750-3600
P04.n.07	Rated apparent power	kVA	Aut	Aut / 1-10000

Note: This menu is divided into 2 sections, referring to the two configurations CNF1...CNF2. See the section on variable configuration management.
P04.n.01 - Rated generator voltage. Always set phase-to-phase voltage for polyphase systems.
P04.n.02 - Choice of connection type: three-phase with/without neutral, two-phase or single-phase.
P04.n.03 - Voltage checks on phase-to-phase voltages, phase voltages or both.
P04.n.04 - Rated generator current. Used to set protection thresholds in percentages.
P04.n.05 - Rated generator frequency.
P04.n.06 - Rated engine speed (RPM).
P04.n.07 - Rated apparent power of generator.

P05 - BATTERY		UoM	Default	Range
P05.01	Rated battery voltage	V	Aut	Aut / 12 / 24
P05.02	MAX voltage threshold	%	130	110-140%
P05.03	MIN voltage threshold	%	75	60-130%
P05.04	MIN/MAX voltage delay	sec	10	0-120

P05.01 - Rated battery voltage. If set to AUT, nominal battery voltage is automatically recognized during power-up.
P05.02 - MAX battery voltage alarm threshold.
P05.03 - MIN battery voltage alarm threshold.
P05.04 - MIN and MAX battery alarm delay.

P06 - ACOUSTIC ALARMS		UoM	Default	Range
P06.01	Siren sound mode on alarm		Timed	OFF Keypad Timed Repeated
P06.02	Sound activation time on alarm	sec	30	OFF/1-600
P06.03	Sound activation time before starting	sec	OFF	OFF / 1-600
P06.04	Acoustic signalling device		SIREN	OFF SIREN

P06.01 - OFF = siren deactivated. Keypad = Siren sounds continuously until cancelled by pressing a button on the front panel. Timed = Siren sounds for the time specified in P06.02. Repeated = Siren sounds for the time in P06.02, pauses for three times this value, and then repeats cyclically.
P06.02 - Acoustic signal activation time on alarm.
P06.03 - Acoustic signal activation time before engine starts.
P06.04 - Acoustic signalling device enabling.

P07 – ENGINE SPEED		UoM	Default	Range
P07.01	Engine speed measurement source		W/Pick-Up	OFF Freq-Gen. W/Pick-Up
P07.02	RPM / W - pick-up ratio		1.000	0.001-50.000
P07.03	MAX speed threshold	%	110	80-120
P07.04	MAX speed alarm delay	sec	3.0	0.5-60.0
P07.05	MIN speed threshold	%	90	80-100
P07.06	MIN speed alarm delay	sec	5	0-600

P07.01 - Selection of source from which engine speed measurement is obtained. OFF = speed not measured or displayed. Freq. Gen = RPM calculated from frequency of generator. Rated frequency corresponds to rated speed. W / Pick-up = RPM calculated from the frequency of the W/Pick-up/AC signal from the permanent magnet battery charging alternator, referred to the RPM/W (Pick-up) ratio set in the next parameter.
P07.02 - Ratio between RPM and frequency of the W or pick-up signal. Can be set manually or acquired automatically using the following procedure: From the engine speed page, with the engine running at rated speed, press START and AUT (viceversa if in AUT mode) and hold for 5 seconds. The system acquires the current speed as rated speed, and uses the current frequency of W to calculate the value of parameter P07.02.
P07.03 - P07.04 - Threshold and delay for high engine speed alarm.
P07.05 - P07.06 - Threshold and delay for low engine speed alarm.

P08 – OIL PRESSURE		UoM	Default	Range
P08.01	Source of measurement		OFF	OFF INP1 AN2 AN3
P08.02	Resistive sensor type		VDO	VDO VEGLIA DATCON MURPHY
P08.03	Resistive sensor offset	Ohm	0	-30.0 - +30.0
P08.04	Unit of measure for pressure		bar	bar psi
P08.05	MIN pressure pre-alarm	(bar/psi)	3.0	0.1-180.0
P08.06	MIN pressure alarm threshold	(bar/psi)	2.0	0.1-180.0

P08.01 - Specifies the source of the oil pressure measurement. OFF = analog measurement not used. The INP1 terminal is used as programmable digital input. INP1 = measurement taken from resistive sensor with analog input to INP1 terminal. AN2-AN3 = measurement taken from resistive sensor with analog input to expansion module EXP1040 terminals.
P08.02 - If a resistive sensor is used, the relevant curve must be selected. Curves can also be set freely using *Xpress* software.
P08.03 - If a resistive sensor is used, this parameter lets you add or subtract an offset in Ohm from the set curve, for example to compensate for cable length. This value can be set without entering the setup, using the rapid function in the *Commands menu*, which displays measurements while performing calibration.
P08.04 - Selection of unit of measure for oil pressure.
P08.05 - P08.06 – The minimum oil pressure pre-alarm and alarm thresholds respectively. See the corresponding alarms.

P09 – COOLANT TEMPERATURE		UoM	Default	Range
P09.01	Source of measurement		OFF	OFF INP1 AN2 AN3
P09.02	Resistive sensor type		VDO	VDO VEGLIA DATCON MURPHY
P09.03	Resistive sensor offset	Ohm	0	-30.0 - +30.0
P09.04	Unit of measure for temperature		°C	°C °F
P09.05	MAX temperature pre-alarm	°	90	20-300
P09.06	MAX temperature alarm threshold	°	100	20-300
P09.07	MIN temperature alarm threshold	°	OFF	OFF/20-300
P09.08	Load transfer temperature	°	OFF	OFF/20-300
P09.09	Temperature sensor alarm delay	min	OFF	OFF / 1 – 60

P09.01 - Specifies the source of the coolant temperature measurement. OFF = analog measurement not used. INP1 = measurement taken from resistive sensor with analog input to INP1 terminal. AN2 – AN3 = measurement taken from the analog inputs of the optional expansion module EXP1040.
P09.02 - If a resistive sensor is used, the relevant curve must be selected. Curves can also be set freely using *Xpress* software.
P09.03 - If a resistive sensor is used, this parameter lets you add or subtract an offset in Ohm from the set curve, for example to compensate for cable length. This value can be set without entering the setup, using the rapid function in the Commands menu, which displays measurements while performing calibration.
P09.04 - Selection of unit of measure for temperature.
P09.05 - P09.06 – The maximum coolant temperature pre-alarm and alarm thresholds respectively. See the corresponding alarms.
P09.07 - Determines the minimum coolant temperature alarm threshold. See the corresponding alarms.
P09.08 - If engine temperature exceeds this threshold (engine hot), load is transferred after 5s instead of after the normal load detection time set in P12.05. If engine temperature is under this threshold (engine cold) load is transferred after the time set here.
P09.09 - Resistive temperature sensor fault alarm delay.

P10 – FUEL LEVEL		UoM	Default	Range
P10.01	Source of measurement		INP1	OFF INP1 AN2 AN3
P10.02	Resistive sensor type		VDO	VDO VEGLIA DATCON MURPHY
P10.03	Resistive sensor offset	Ohm	0	-30.0 - +30.0
P10.04	MIN fuel level pre-alarm	%	20	0-100
P10.05	MIN fuel level	%	10	0-100

P10.01 - Specifies the source of the fuel level measurement. OFF = analog measurement not used. The INP1 terminal is used as programmable digital input. INP1 = measurement taken from resistive sensor with analog input to INP1 terminal. AN2 – AN3 = measurement taken from the analog inputs of the optional expansion module EXP1040.
P10.02 - If a resistive sensor is used, the relevant curve must be selected. Curves can also be set freely using *Xpress* software.
P10.03 - If a resistive sensor is used, this parameter lets you add or subtract an offset in Ohm from the set curve, for example to compensate for cable length. This value can be set without entering the setup, using the rapid function in the Commands menu, which displays measurements while performing calibration.
P10.04 – P10.05 - The fuel level pre-alarm and alarm thresholds respectively. See the corresponding alarms.

P11 – ENGINE START		UoM	Default	Range
P11.01	Engine start threshold determined by voltage of battery charging alternator.	VDC	10.0	OFF/3.0-30
P11.02	Engine start threshold determined by generator voltage.	%	25	OFF/10-100
P11.03	Engine start threshold determined by generator frequency.	%	30	OFF/10-100
P11.04	Engine start threshold determined by engine speed.	%	30	OFF/10-100
P11.05	Glow plug pre-heating time	sec	OFF	OFF/1-600
P11.06	Fuel pre-heating off temperature	°	OFF	OFF/20-300
P11.07	Fuel pre-heating timeout	sec	OFF	OFF/1-900
P11.08	Time between Fuel valve and start	sec	1.0	0.1-30.0
P11.09	Number of starting attempts		5	1-30
P11.10	Duration of starting attempts	sec	5	1-60
P11.11	Pause between starting attempts	sec	5	1-60
P11.12	Pause between interrupted starting attempt and next attempt	sec	OFF	OFF/1-60
P11.13	Alarm disabled time after starting	sec	8	1-120
P11.14	Engine overspeed alarm disabled time after starting	sec	8	0-300
P11.15	Decelerated functioning time	sec	OFF	OFF/1-600
P11.16	Deceleration end temperature	°	OFF	OFF/20-300
P11.17	Cooling time	sec	120	1-3600
P11.18	Stop magnet time	sec	OFF	OFF/1-60
P11.19	Gas valve delay	sec	OFF	OFF/1-60
P11.20	Priming time	sec	OFF	OFF/1-60
P11.21	Choke time	sec	OFF	OFF/1-60
P11.22	Choke off threshold	%	5	OFF/1-100
P11.23	Number of attempts with choke		2	1-10
P11.24	Choke start mode		Consecutive	Consecutive Alternating
P11.25	Fuel solenoid valve mode		Normal	Normal Continuous
P11.26	Glow plug functioning mode		Normal	Normal +Start +Cycle
P11.27	Stop magnet functioning mode		Normal	Normal Pulse No pause

P11.01 – Battery charging alternator voltage threshold for determining motor running (D+). If the alternator does not have a D+ output, this parameter must be disabled.
P11.02 – Generator voltage threshold for determining motor running (VAC).
P11.03 – Generator frequency threshold for determining motor running.
P11.04 – 'W' speed or pick-up signal threshold or AC from permanent magnet alternator threshold for determining motor running.
P11.05 – Glow plug pre-heating time before engine start.
P11.06 – Engine temperature over which fuel pre-heating is deactivated.
P11.07 – Maximum fuel pre-heating time.
P11.08 – Time between opening of fuel valve and activation of starter motor.
P11.09 – Total number of automatic engine start attempts.
P11.10 – Duration of engine start attempts.
P11.11 – Pause between one engine start attempt during which no engine running signal is detected and next start attempt.
P11.12 – Pause between one engine start attempt interrupted by false start and next start attempt.
P11.13 – Time for which alarms are disabled immediately after engine start. Used for alarms active when engine is running. *Example: minimum oil pressure*.
P11.14 – As above, with particular reference to engine overspeed alarms.
P11.15 – Energisation time for output programmed with *Decelerator* function.
P11.16 – Engine temperature over which decelerated functioning is disabled.
P11.17 – Maximum cooling cycle time. *Example: time which elapses between disconnection of load from the genset and the actual stopping of the engine*.
P11.18 – Energisation time for output programmed with *Stop magnet* function.
P11.19 – Time between activation of *Start* output (starter motor) and activation of output programmed with *Gas valve* function.
P11.20 – Energisation time for output programmed with *Priming* function.
P11.21 – Energisation time for output programmed with *Choke* function.
P11.22 – Percentage of rated generator voltage over which the output programmed as *Choke* is de-energised.
P11.23 – Number of start attempts with *Choke on*.
P11.24 – Choke control mode for gasoline engines. Consecutive = all start attempts are made with choke on. Alternating = start attempts alternate between choke on and choke off.
P11.25 – Control mode for *Fuel solenoid valve* output: Normal = the *fuel solenoid valve* relay is deactivated during pauses between start attempts. Continuous = the *Fuel solenoid valve* relay remains activated during pauses between start attempts.
P11.26 – Control mode for *Glow plug pre-heating* output: Normal = the G*low-plug* output is energised for the set time before the first start attempt. +Start = The *Glow-plug* output remains energised during the start attempt. +Cycle = The *Glow-plug* output remains energised throughout the entire start cycle.
P11.27 – Control mode for *Stop magnet* output: Normal = the *Stop magnet* output is energised during the stop phase and remains activated for the set time after the engine has actually stopped. Pulse = the *Stop magnet* output is activated only for a timed pulse. No pause = the S*top magnet* output is de-energised during pauses between one start attempt and the next. During the stop phase, the S*top magnet* output remains energised until the end of the set time.

P12 – GENERATOR VOLTAGE CONTROL		UoM	Default	Range
P12.01	MIN voltage threshold	%	80	70-100
P12.02	MIN voltage delay	sec	5	0-600
P12.03	MAX voltage threshold	%	115	100-130 / OFF
P12.04	MAX voltage delay	sec	5	0-600
P12.05	Delay for return of generator within thresholds	sec	20	1-9999
P12.06	MIN/MAX threshold hysteresis	%	3.0	0.0-5.0
P12.07	MAX asymmetry threshold	%	15	OFF / 5-25
P12.08	MAX asymmetry delay	sec	5	0-600
P12.09	MAX frequency threshold	%	110	100-120/OFF
P12.10	MAX frequency delay	sec	5	0-600
P12.11	MIN frequency threshold	%	90	OFF/80-100
P12.12	MIN frequency delay	sec	5	0-600
P12.13	Generator voltage control mode		INT	OFF INT EXT
P12.14	Generator low voltage alarm delay	sec	240	1-600
P12.15	Generator high voltage alarm delay	sec	10	1-600

P12.01 – Percentage value of minimum voltage alarm threshold.
P12.02 – Minimum voltage alarm delay.
P12.03 – Percentage value of maximum voltage alarm threshold (can be disabled).
P12.04 – Maximum voltage alarm delay.
P12.05 –Delay after which generator voltage is considered within thresholds.
P12.06 – Percentage hysteresis for returning voltage within thresholds, calculated with respect to set minimum and maximum values.
P12.07 – Maximum phase asymmetry threshold, referred to rated voltage.
P12.08 – Asymmetry alarm delay.
P12.09 – Maximum frequency alarm threshold (can be disabled).
P12.10 – Maximum frequency alarm delay.
P12.11 – Minimum frequency alarm threshold (can be disabled).
P12.12 – Minimum frequency alarm delay.
P12.13 – OFF = Generator control disabled. INT = Generator voltage controlled by the RGK4...SA. EXT = Generator voltage controlled by external device. A programmable input with the *External generator control* function can be connected to the external generator control device.
P12.14 – *Low generator voltage* alarm delay.
P12.15 – *High generator voltage* alarm delay.

P13 – GENERATOR PROTECTION		UoM	Default	Range
P13.01	Maximum current alarm threshold.	%	OFF	100-500/OFF
P13.02	Maximum current alarm delay	sec	4.0	0.0-60.0
P13.03	Short circuit alarm threshold	%	OFF	100-500/OFF
P13.04	Short circuit alarm delay	sec	0.02	0.00-10.00
P13.05	Maximum current restore time	sec	60	0-5000

P13.01 – Percentage threshold referred to rated current for alarm *A31 Maximum generator current*.
P13.02 – Delay for alarm in previous parameter.
P13.03 – Percentage threshold referred to rated current for alarm *A32 Generator short circuit*.
P13.04 – Delay for alarm in previous parameter.
P13.05 – Delay for restoring current to within threshold set in P13.01.

P14 – PROGRAMMABLE DIGITAL INPUTS (INPn, n=1…8)		UoM	Default	Range
P14.n.01	INPn input function		(miscellaneous)	(see *Input functions table*)
P14.n.02	Function index (x)		OFF	OFF / 1…99
P14.n.03	Contact type		NO	NO/NC
P14.n.04	Closing delay	sec	0.05	0.00-600.00
P14.n.05	Opening delay	sec	0.05	0.00-600.00

Note: This menu is divided into 8 sections referring to the 8 possible digital inputs INP1…INP8 that the RGK4..SA controller can manage. Inputs INP1 to INP6 refer to the corresponding terminals on the controller while inputs INP7 and INP8 refer to the inputs provided by the EXP1040 expansion module, used as digital inputs.
P14.n.1 – Selection of corresponding input function (see *Programmable input function table*).
P14.n.2 – Index associated with the function programmed by the previous parameter (if relevant). *Example: If the input function is set to execution of Commands menu Cxx and this input must execute command C.07 in the Commands menu, then P18.n.02 must be set to 7.*
P14.n.3 – Contact type selection: NO normally open or NC normally closed.
P14.n.4 – Selected input contact closing delay.
P14.n.5 – Selected input contact opening delay.

P15 – PROGRAMMABLE DIGITAL OUTPUTS (OUT1…7)		UoM	Default	Range
P15.n.01	OUTn output function		(miscellaneous)	(See *Output functions table*)
P15.n.02	Function index (x)		1	OFF / 1…99
P15.n.03	Normal/reverse output		NOR	NOR / REV

Note: This menu is divided into 7 sections referring to the 7 possible digital outputs OUT1…OUT7 that the RGK4..SA controller can manage. Outputs OUT1 to OUT5 refer to the corresponding terminals on the controller while outputs OUT6 and OUT7 refer to the outputs provided by the EXP1040 expansion module.
P15.n.1 – Selection of corresponding output function (see *Programmable output function table*).
P15.n.2 – Index associated with the function programmed by the previous parameter (if relevant). Example: If the output function is set to *Alarm Axx* and this output must be energised when alarm A31 occurs, then P19.n.02 must be set to 31.
P15.n.3 – Sets the output state when the associated function is not active: NOR = output de-energised, REV = output energised.

P17 - MISCELLANEOUS		UoM	Default	Range
P17.01	Maintenance interval	h	OFF	OFF/1-99999
P17.02	Rental hours pre-set	h	OFF	OFF/1-99999
P17.03	Maximum kVA alarm threshold	%	OFF	OFF/5-250
P17.04	Maximum kVA alarm delay	sec	0	0-9999
P17.05	Generator switch feedback delay	sec	5	1-60

P17.01 – This defines the programmed maintenance interval, expressed in hours. If set to OFF, the maintenance interval is deactivated.
P17.02 – Number of rental hours to be pre-set in counter by command C05 Rental hours pre-set.
P17.03…P17.04 – Threshold and delay for alarm A34 Generator kVA threshold exceeded.
P17.05 – Delay for A36 alarm.

P18 – USER ALARMS (UAn, n=1…2)		UoM	Default	Range
P18.n.01	Alarm source		OFF	OFF INPx OUTx
P18.n.02	Channel no. (x)		1	OFF / 1…99
P18.n.03	Text		UAn	(text - 16 characters)

Note: This menu is divided into 2 sections for defining user alarms UA1 and UA2.
P18.n.01 – Defines the digital input or internal variable the activation of which generates the user alarm.
P18.n.02 – Number of channel referred to the previous parameter.
P18.n.03 – Free text that will appear in the alarm window.

Example: User alarm UA2 must be generated by the closing of input INP5 and must display the 'Doors open' message.
In the case, set menu section 2 (for alarm UA2) as follows:
P18.2.01 = INPx
P18.2.02 = 5
P18.2.03 = 'Doors open'

Programmable input functions

Function	Description
Disabled	Input disabled.
Configurable	Freely configurable by the user.
Oil pressure	Digital sensor for low engine oil pressure.
Engine temperature	Digital sensor for maximum engine coolant temperature
Fuel level	Digital sensor for low fuel level
Emergency stop	When open, generates *A23 Emergencyy stop* alarm. Not needed if +COM1 is used with incorporated input.
Remote stop	Stops engine from remote point.
Off load remote start	Starts the engine remotely without transferring load to the generator. The signal must be maintained for as long as the engine needs to run. On deactivation of the signal, the engine begins its stop cycle.
On load remote start	Starts the engine remotely and connects load to the generator. The signal must be maintained for as long as the engine needs to run. On deactivation of the signal, the engine begins its stop cycle.
Start without stop	Starts the engine remotely and does not stop it in the event of an alarm. The signal must be maintained for as long as the engine needs to run. On deactivation of the signal, the engine begins its stop cycle.
Generator protection	Generator protection tripped signal from external device.
Remote control lock	Locks control and write operations via serial port. Data reading remains possible.
Setup lock	Prevents access to the programming (setup) menu.
External GEN control	Generator voltage control signal from external device. If active, indicates voltage within thresholds.
Enabling of load transfer to generator	OK to transfer load to generator.
GEN switch feedback	Alarm *A36 Generator switch fault* is generated in the event of discrepancy between the control output and the actual state.
Keypad lock	Locks functioning of front panel, excluding page navigation buttons.
Genset and keypad lock	Locks functioning of the generating set and keypad.
Radiator coolant level	Alarm *A40 Radiator coolant low* is generated when input is activated..
Siren OFF	Disables the siren.
Breaker state alarm	With the input OFF, starting is prevented and alarm *A41 Breaker closed* is triggered. This function is used in manual control mode when the generator's remote breaker is not used and a manually operated breaker is used instead. This function is needed to be sure that no load is connected before the generator starts. In AUT mode, when the input is ON, starting is prevented and alarm *A42 Breaker open* is activated. This function is needed to avoid starting the generator and wasting fuel without a load.
Alarm inhibit	When active, disables alarms for which the *Inhibit* property is active.
Reset alarms	Resets retaining alarms the cause of which has ceased.
Commands menu C(xx)	Executes the command defined by the index parameter (xx).
Simulate STOP button	Closing the input is equivalent to pressing the button.
Simulate START button	Closing the input is equivalent to pressing the button.
Configuration selection	Selects one of the two possible configurations. See menu *P04 Multiple configurations*.
Water in fuel	Generates alarm *A47 Water in fuel.*

Programmable output functions

Function	Description
Disabled	Output disabled.
Configurable	Freely configurable by the user.
Close generator switch	Close generator remote switch command.

Starter motor	Energise starter motor.
Fuel solenoid valve	Energise the fuel solenoid valve.
Global alarm	Output activated in the presence of any alarm with the *Global alarm* property activated.
Mechanical fault	Output activated if at least one alarm with this property is enabled.
Electrical fault	Output activated if at least one alarm with this property is enabled.
Siren	Powers the acoustic warning siren.
Decelerator	Commands deceleration in the start phase. Energised as soon as the engine starts, for the set maximum duration.
Accelerator	Opposite to the previous function
Stop magnet	Output energised to stop the engine.
Glow plugs	Activation of glow plug pre-heating prior to engine start.
Gas valve	Controls the gas delivery solenoid valve. Opens after a delay with respect to the energisation of the starter motor and closes early with respect to the stop command.
Choke	Choke for starting gasoline engines.
Gasoline start valve	Injects gasoline to start gas fuelled engines. The gasoline start relay is energised in parallel with the gas solenoid valve only during the first engine start attempt.
Engine running	Energised when engine is running.
Engine cooling	Energised when engine is in cooling cycle.
Pre-heating valve	Controls the fuel pre-heating valve. See the descriptions of parameters P11.06 and P11.07.
Alarms A01-Axx	Output energised when alarm Axx is active (xx=1…alarm number).
Alarms UA1..UA2	Output energised when alarm UAx is active (x=1…2).

Alarms

CODE	DESCRIPTION	DESCRIPTION OF ALARM
A01	Engine temperature pre-alarm (analog sensor)	Occurs if engine temperature rises above the pre-alarm threshold set in P09.05.
A02	Engine temperature high (analog sensor)	Occurs of engine temperature rises above the alarm threshold set in P09.06.
A03	Analog temperature sensor fault	Occurs if the resistive temperature sensor is in open circuit (disconnected).
A04	Engine temperature high (digital sensor)	Occurs if engine overtemperature is signalled by activation of the digital input programmed for this function.
A05	Engine temperature low (analog sensor)	Occurs if engine temperature falls below the alarm threshold set in P09.07.
A06	Oil pressure pre-alarm (analog sensor)	Occurs if engine oil pressure falls below the pre-alarm threshold set in P08.05.
A07	Oil pressure low (analog sensor)	Occurs if engine oil pressure falls below the alarm threshold set in P08.06.
A08	Analog pressure sensor fault	Occurs if the resistive pressure sensor is in open circuit (disconnected).
A09	Oil pressure low (digital sensor)	Occurs if low oil pressure is signalled by activation of the digital input programmed for this function.
A10	Digital pressure sensor fault	Occurs if the engine has stopped for over one minute, but the oil pressure sensor has not closed its contacts to signal no oil pressure. It is assumed that the sensor is disconnected.
A11	Fuel level pre-alarm (analog sensor)	Occurs if fuel level falls below the pre-alarm threshold set in P10.04.
A12	Fuel level low (analog sensor)	Occurs if fuel level falls below the alarm threshold set in P10.05.
A13	Analog fuel level sensor fault	Occurs if the resistive fuel level sensor is in open circuit (disconnected).
A14	Fuel level low (digital sensor)	Occurs if low fuel level is signalled by activation of the digital input programmed for this function.
A15	Battery voltage high	Occurs if battery voltage remains above the threshold set in P05.02 for longer than the time set in P05.04.
A16	Battery voltage low	Occurs if battery voltage remains below the threshold set in P05.03 for longer than the time set in P05.04.
A17	Battery discharged	Occurs if engine start attempts have reduced battery voltage below the minimum threshold.
A18	Battery charging alternator fault	Occurs if the engine is running (generator voltage and/or frequency or 'W / pick-UP' signal detected) but the battery charging alternator signal (D+) remains under the engine running voltage threshold set in P11.01 for more than 4 seconds.
A19	"W / pick-up" signal fault	Occurs if speed control is enabled and the engine is running (battery charging alternator signal or generator voltage and/or frequency signal detected) but no 'W / pick-up' engine speed signal is detected within 5 seconds.
A20	"W / pick-up" low engine speed	Occurs if the engine is running (battery charging alternator signal or generator voltage and/or frequency signal detected) and is not decelerated, but the 'W / pick-up' engine speed signal remains under the threshold set in P07.05 for the time set in P07.06.
A21	"W / pick-up" high engine speed	Occurs if the 'W / pick-up' engine speed signal remains over the threshold set in P07.03 for the time set in P07.04.
A22	Start failure	Occurs if the engine has not started after the set number of start attempts.
A23	Emergency stop	Occurs if power is removed from the terminal +COM1 or if a digital input programmed to function as 'Emergency stop' is activated.
A24	Unexpected engine stop	Occurs after the alarm activation delay if the engine stops of its own accord, without the controller having commanded the shut-down.
A25	Stop failure	Occurs if the engine has not stopped 65 seconds after the beginning of the stop cycle.
A26	Generator frequency low	Occurs if the engine is running but the frequency of the generator remains below the threshold set in P12.11 for the time set in P12.12.
A27	Generator frequency high	Occurs if the frequency of the generator remains above the threshold set in P12.09 for the time set in P12.10.
A28	Generator voltage low	Occurs if the engine is running but the voltage of the generator remains below the threshold set in P12.01 for the time set in P12.14.
A29	Generator voltage high	Occurs if the voltage of the generator remains above the threshold set in P12.03 for the time set in P12.15.
A30	Generator voltage asymmetry	Occurs if asymmetry between the generator phases exceeds the threshold set in P12.07 for the time set in P12.08.
A31	Generator maximum current	Occurs if current from the generator exceeds the percentage threshold set in P13.01 for the time set in P13.02. If this alarm occurs, wait for the reset time set in P13.05 before resetting it.
A32	Generator short circuit	Occurs if current from the generator exceeds the percentage threshold set in P13.03 for the time set in P13.04.
A33	External generator protection tripped	If programmed, occurs if the digital input contact for the generator's external thermal protection device closes while the genset is running.
A34	Generator power threshold exceeded	Occurs if power from the generator exceeds the percentage threshold set in P17.03 for the time set in P17.04.
A35	Generator phase sequence wrong	Occurs if the detected phase sequence does not correspond to that programmed.
A36	Generator switch fault	Occurs after the time set in P17.05 if a discrepancy is detected between the state of the controller output and that of the feedback input for the generator switch / breaker.
A37	Maintenance request	Occurs when the hours of the maintenance interval reach zero. See menu M17. Use the Commands menu to reset functioning hours and reset the alarm.

A38	System error (5V)	Occurs if an internal error occurs in the RGK4...SA controller. Contact Technical Support.
A39	Rental time finished	Occurs when rental hours reach zero. Use the Commands menu to reset rental hours and reset the alarm.
A40	Radiator coolant low.	Occurs if the coolant level falls below the minimum.
A41	Manual breaker closed.	Occurs during local engine starting if the state of the input programmed as *Breaker state alarm* is detected as inactive.
A42	Manual breaker open.	Occurs during remote engine starting or engine starting and running if the state of the input programmed as *Breaker state alarm* is detected as active.
A46	Configuration change not possible	Occurs if the position of the digital inputs for the 2 selectable configurations has been changed, but the conditions for implementing the change do not exist (e.g. engine running).
A47	Water in fuel	Occurs if the contact signals the presence of water in the fuel.
UA1 ... UA2	User alarm	The user alarm is generated by the activation of the variable or input assigned to it in menu M18.

Alarm table

COD	DESCRIPTION	Enabled	Retained	Glob. Al.	M.Fault Mec.	E.Fault Elect.	Siren	Engine stop	Cooling	Motor Run	Inhibit.	No LCD
A01	Engine temperature warning (analog sensor)			●			●			●		
A02	High engine temperature (analog sensor)		●	●	●		●	●		●		
A03	Analog temperature sensor fault		●	●	●		●			●		
A04	High engine temperature (digital sensor)	●	●	●	●		●	●		●		
A05	Low engine temperature (analog sensor)			●			●					
A06	Oil pressure prealarm (analog sensor)			●			●			●		
A07	Low oil pressure (analog sensor)		●	●	●		●	●		●		
A08	Analog pressure sensor fault		●	●	●		●					
A09	Low oil pressure (digital sensor)	●	●	●	●		●	●		●		
A10	Digital pressure sensor fault	●	●	●	●		●					
A11	Fuel level prealarm (analog sensor)			●			●					
A12	Fuel level low (analog sensor)			●			●					
A13	Analog level sensor fault		●	●	●		●					
A14	Fuel level low (digital sensor)	●		●			●					
A15	High battery voltage.	●	●	●	●		●					
A16	Low battery voltage	●	●	●	●		●					
A17	Inefficient battery	●	●	●	●		●					
A18	Battery alternator fault	●	●	●	●		●	●		●		
A19	"Pick-up/W" signal fault		●	●	●		●			●		
A20	"Pick-up/W" engine speed low		●	●	●		●			●		
A21	"Pick-up/W" engine speed high		●	●	●		●	●		●		
A22	Starting failed	●	●	●	●		●	●				
A23	Emergency stopping	●	●	●		●	●	●				
A24	Unexpected stop	●	●	●	●		●	●				
A25	Engine stopping failure	●	●	●	●		●	●				
A26	Low generator frequency	●	●	●	●	●	●	●	●			
A27	High generator frequency	●	●	●	●	●	●	●				
A28	Low generator voltage	●	●	●		●	●	●	●			
A29	High generator voltage	●	●	●		●	●	●	●			
A30	Generator voltages asymmetry		●	●		●	●	●	●			
A31	Max. generator current	●	●	●		●	●	●	●			
A32	Generator short-circuit	●	●	●		●	●	●	●			
A33	Generator external protection intervention	●	●	●		●	●	●	●			
A34	Generator power threshold exceeded	●	●	●		●	●	●	●			
A35	Generator phase sequence error		●	●		●	●	●	●			
A36	Generator contactor anomaly	●	●	●		●	●					
A37	Maintenance request	●	●	●			●					
A38	System Error	●										
A39	Rent hours expired			●			●	●	●			
A40	Radiator coolant level low	●	●	●	●		●	●	●			
A41	Manual circuit breaker closed		●	●		●	●	●				
A42	Manual circuit breaker open		●	●		●	●	●				
A46	Cannot change configuration	●	●	●		●	●					
A47	Water in fuel	●	●	●	●		●	●				
UA1	UA1											
UA2	UA2											

Commands menu

CODE	COMMAND	ACCESS LEVEL	DESCRIPTION
C01	Reset maintenance interval	User	Resets the maintenance alarm and resets the maintenance hour count to the set value.
C02	Reset partial engine hour count	User	Resets the engine's partial hour count.
C03	Reset total engine hour count	Advanced	Resets the engine's total hour count.
C04	Set engine hour count	Advanced	Sets the engine's total hour count to a determined value.
C05	Reset rental hour count	Advanced	Reset's the engine's rental hour counter to the set value.

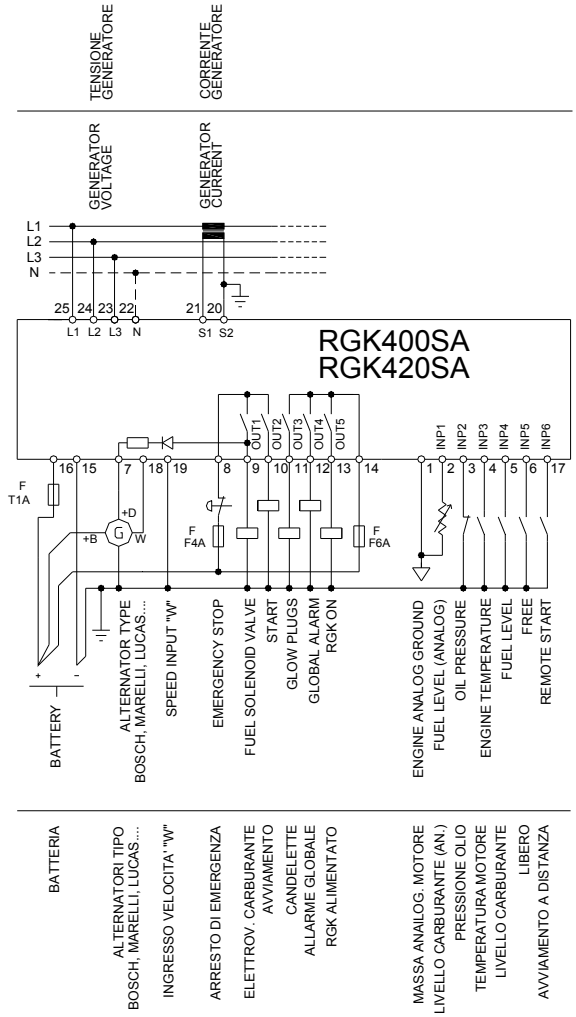
C06	Restore default parameters	Advanced	Resets all parameters to their default values.
C07	Save parameters to backup memory	Advanced	Saves a copy of all current parameter settings to backup memory for future use.
C08	Load parameters from backup memory	Advanced	Loads the parameter settings saved in backup memory as active values.
C09	Purge solenoid valve	Advanced	Energises the fuel solenoid valve without starting the engine. The output remains active for max 5 minutes or until the OFF button is pressed.
C10	Force I/O	Advanced	Enables test mode so that all outputs can be energised manually. *Caution!* *The installer is entirely responsible for controlling outputs in this mode.*
C11	Adjust resistive sensor offset	Advanced	Calibrates resistive sensors by adding/subtracting a value in Ohms to the resistance measured by them, to compensate for cable length or resistance offsets. Calibration is made possible by displaying the measured value in engineering quantities.

Installation

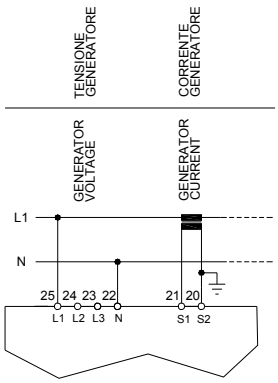
- The RGK4...SA controller is designed to be flat panel mounted. With correct installation and the optional seal, the RGK400SA controller achieves a front protection rating of IP65.
- Insert the controller in the hole in the panel, making sure that the seal, if present, is correctly positioned between the panel and controller's casing.
- On the inside of the panel, proceed as shown in the figures below to fit the four fixing clips, taking care to slide the clips all the way towards the front panel.

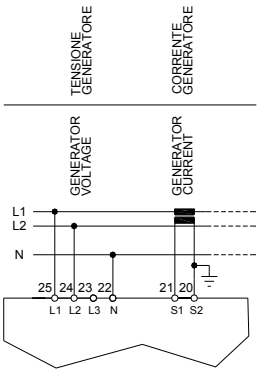
- To make the electric connections, refer to the connection diagrams shown in the relevant section and to the requirements listed in the technical characteristics table.

Generic connection diagram for three phase generating sets with pre-excited battery charging alternator

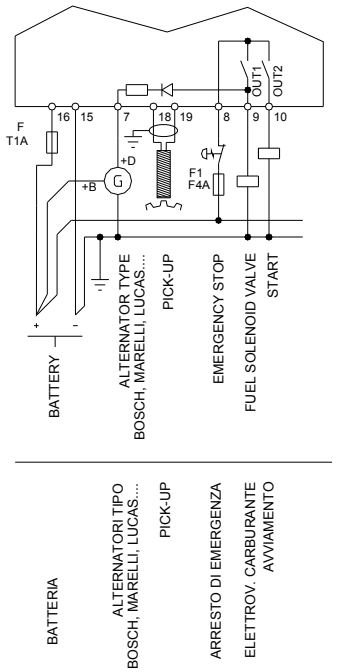


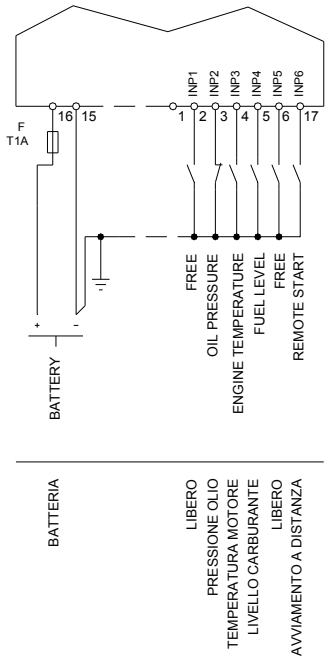
Connection diagram for single phase generating sets	Connection diagram for two phase generating sets



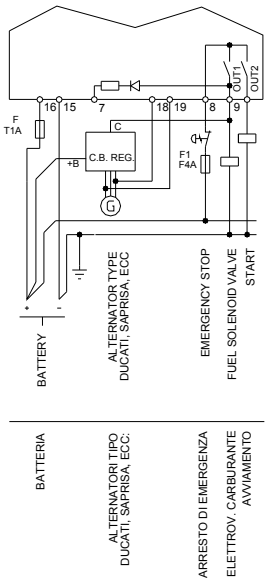


Connection diagram for generating sets with speed detection by pick-up	INP1 used as digital input

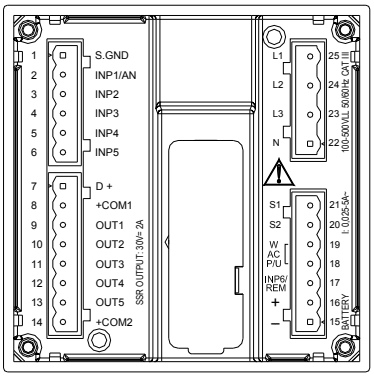




Connection diagram for generating sets with permanent magnet battery charger	

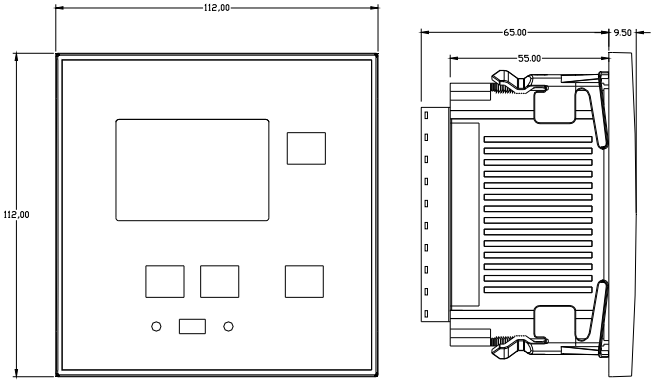


Layout of terminals

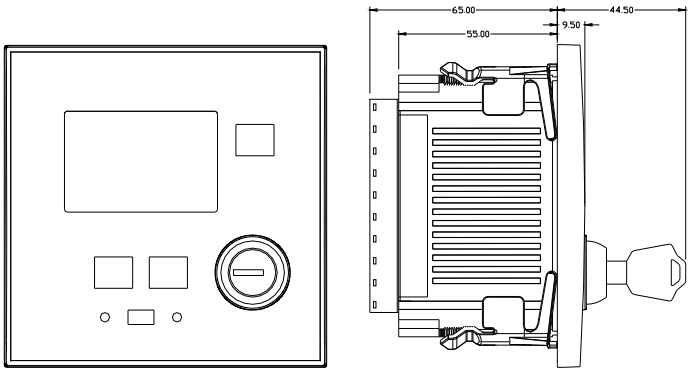


Physical dimensions

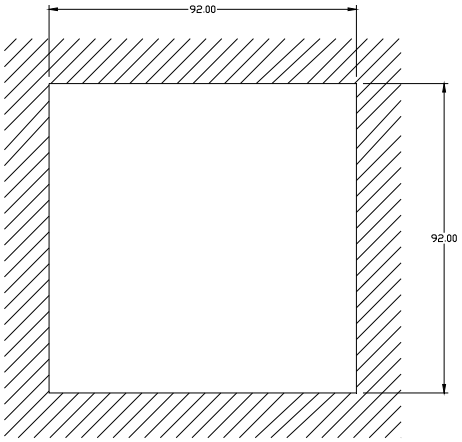
RGK400SA



RGK420SA



Panel holes



AC power: terminals 15, 16	
Rated battery voltage	12 or 24 V = indifferently
Maximum current draw	200 mA @ 12 V = and 180 mA @24 V=
Maximum drawn/dissipated power	2 W
Operating range	7.5…33 V=
Minimum starting voltage	4.5 V=
Current in OFF mode – INP6 closed (RGK400SA only)	<50 mA at 28 V=
Current in OFF mode	<20 µA at 28 V=
Digital inputs: terminals 3 - 6	
Input type	negative
Input current	≤6 mA
Low input signal	≤1.0 V
High input signal	≥3.4 V
Input signal delay	≥50 ms
Remote start input / INP6: terminal 17	
Input type	negative
Input current	≤10 mA (24 V=)
Low input signal	≤1.0 V
Input signal delay	≥50 ms
Emergency stop input: terminal 8	
Input type	Positive (outputs OUT 1 and 2 common)
Input current	≤8 mA 24 V and 4 mA 12 V
Low input signal	≤3.0 V
High input signal	≥5.0 V
Input signal delay	≥0 ms
Analog input / INP1: terminal 2	
Fuel level sensor Current Measurement range Configured as digital input - INP1 Low input resistance High input resistance	 3 mA = Max 0-1500 Ω <300 Ω >600 Ω
Analog ground voltages	-0.5 - +0.5 V=
"W"/AC/PICK-UP speed input: terminals 18,19	
Input type	AC coupling
Voltage range	2-75 Vpp
Frequency range	40-10000 Hz
Input impedance	>100 KΩ
Pre-excited battery charging alternator 500 rpm input: terminal 7	
Operating range	0-33 V=
Max input current	<1 mA
Max voltage at +D terminal	12 or 24 VDC (battery voltage)
Excitation current	240 mA at 12 V= or 120 mA at 24 V=
Generator voltmetric input: terminals 22-25	
Max rated Ue voltage	480 V~ L-L (277 V~ L-N)
Measurement range	50-576 V~ L-L (333 V~ L-N)
Frequency range	45-65 Hz
Measurement type	True root mean square (TRMS)
Measurement input impedance	> 0.5 MΩ L-N > 1.0 MΩ L-L
Connection method	Single phase, two phase, three phase line with or without neutral
Amperometric inputs: terminals 20 - 21	
Rated current Ie	1 A~ or 5 A~
Measurement range	for 5 A scale: 0.050 – 6 A~ for 1 A scale: 0.050 – 1.2 A~
Input type	Shunt from an external current transformer (low voltage) 5 A max.
Measurement type	Root mean square (RMS)
Overload capacity	+20%
Overload peak	50 A for 1 second
Rated burden	<0.6 VA
Measurement accuracy	
Generator voltage	±0.25 % f.s. ±1digit
Static outputs OUT1 and OUT 2 (voltage + battery outputs): terminals 9, 10	
Output type	2 x 1 NO + COM1 common terminal
Rated voltage	12-24 V= from battery
Rating	2A DC1 per output
Protections	Overload and short circuit
Static outputs OUT3 and OUT 5 (voltage + battery outputs): terminals 11, 12, 13	
Output type	3 x 1 NO + COM2 common terminal
Rated voltage	12-24 V= from battery
Rating	2A DC1 per output
Protections	Overload and short circuit

Insulation voltage	
Rated insulation voltage Ui	500 V~
Rated impulse withstand voltage Uimp	6.5 kV
Operating frequency withstand voltage	3.5 kV
Ambient conditions	
Operating temperature	-30 - +70°C
Storage temperature	-30 - +80°C
Relative humidity	<80% (IEC/EN 60068-2-78)
Maximum degree of ambient pollution	2
Overvoltage category	3
Measurement category	III
Climate sequence	Z/ABDM (IEC/EN 60068-2-61)
Shock resistance	15 g (IEC/EN 60068-2-27)
Vibration resistance	0.7 g (IEC/EN 60068-2-6)
Connections	
Terminal types	Extractable
Cable cross section (min. & max.)	0.2-2.5 mmq (24÷12 AWG)
UL use data Cable cross section (min. & max.)	0.75 - 2.5 mm² (18-12 AWG)
Tightening torque	0.56 Nm (5 Lbin)
Enclosure	
Version	Flat panel mounted
Material	Polycarbonate
Front protection rating RGK400SA RGK420SA	IP20 at terminals IP40 at front panel IP65 at front panel with optional gasket IP40 at front panel
Weight	400 g
Type-approvals and conformity	
Type-approvals	cULus pending, EAC pending
Conformity to standards	IEC/EN 61010-1, IEC/EN 61010-2-030, IEC/EN 61326-1 UL508 and CSA C22.2-N°14
UL Marking	Use 60°C/75°C copper (CU) conductor only AWG Range: 18 - 12 AWG stranded or solid Field Wiring Terminals Tightening Torque: 4.5 lb.in Flat panel mounting on a Type 1 or 4X enclosure (RGK400SA only)

Manual revision history

Rev	Date	Notes
00	21/05/2016	First revision