

Instruction Manual
for AC Generators
QAS 125-150 Volvo

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for AC Generators**

QAS 125-150 Volvo

Instruction manual 5

Circuit diagrams 71



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Congratulations on the purchase of your AC generator. It is a solid, safe and reliable machine, built according to the latest technology. Follow the instructions in this booklet and we guarantee you years of troublefree operation. Please read the following instructions carefully before starting to use your machine.

While every effort has been made to ensure that the information in this manual is correct, Atlas Copco does not assume responsibility for possible errors. Atlas Copco reserves the right to make changes without prior notice.

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1 Safety precautions for portable generators

To be read attentively and acted accordingly before towing, lifting, operating, performing maintenance or repairing the generator.

1.1 Introduction

The policy of Atlas Copco is to provide the users of their equipment with safe, reliable and efficient products. Factors taken into account are among others:

- the intended and predictable future use of the products, and the environments in which they are expected to operate,
- applicable rules, codes and regulations,
- the expected useful product life, assuming proper service and maintenance,
- providing the manual with up-to-date information.

Before handling any product, take time to read the relevant instruction manual. Besides giving detailed operating instructions, it also gives specific information about safety, preventive maintenance, etc.

Keep the manual always at the unit location, easy accessible to the operating personnel.

See also the safety precautions of the engine and possible other equipment, which are separately sent along or are mentioned on the equipment or parts of the unit.

These safety precautions are general and some statements will therefore not always apply to a particular unit.

Only people that have the right skills should be allowed to operate, adjust, perform maintenance or repair on Atlas Copco equipment. It is the responsibility of management to appoint operators with the appropriate training and skill for each category of job.

Skill level 1: Operator

An operator is trained in all aspects of operating the unit with the push-buttons, and is trained to know the safety aspects.

Skill level 2: Mechanical technician

A mechanical technician is trained to operate the unit the same as the operator. In addition, the mechanical technician is also trained to perform maintenance and repair, as described in the instruction manual, and is allowed to change settings of the control and safety system. A mechanical technician does not work on live electrical components.

Skill level 3: Electrical technician

An electrical technician is trained and has the same qualifications as both the operator and the mechanical technician. In addition, the electrical technician may carry out electrical repairs within the various enclosures of the unit. This includes work on live electrical components.

Skill level 4: Specialist from the manufacturer

This is a skilled specialist sent by the manufacturer or its agent to perform complex repairs or modifications to the equipment.

In general it is recommended that not more than two people operate the unit, more operators could lead to unsafe operating conditions. Take necessary steps to keep unauthorized persons away from the unit and eliminate all possible sources of danger at the unit.

When handling, operating, overhauling and/or performing maintenance or repair on Atlas Copco equipment, the mechanics are expected to use safe engineering practices and to observe all relevant local safety requirements and ordinances. The following list is a reminder of special safety directives and precautions mainly applicable to Atlas Copco equipment.

Neglecting the safety precautions may endanger people as well as environment and machinery:

- endanger people due to electrical, mechanical or chemical influences,
- endanger the environment due to leakage of oil, solvents or other substances,
- endanger the machinery due to function failures.

All responsibility for any damage or injury resulting from neglecting these precautions or by non-observance of ordinary caution and due care required in handling, operating, maintenance or repair, also if not expressly mentioned in this instruction manual, is disclaimed by Atlas Copco.

The manufacturer does not accept any liability for any damage arising from the use of non-original parts and for modifications, additions or conversions made without the manufacturer's approval in writing.

If any statement in this manual does not comply with local legislation, the stricter of the two shall be applied.

Statements in these safety precautions should not be interpreted as suggestions, recommendations or inducements that it should be used in violation of any applicable laws or regulations.

1.2 General safety precautions

- 1 The owner is responsible for maintaining the unit in a safe operating condition. Unit parts and accessories must be replaced if missing or unsuitable for safe operation.
 - 2 The supervisor, or the responsible person, shall at all times make sure that all instructions regarding machinery and equipment operation and maintenance are strictly followed and that the machines with all accessories and safety devices, as well as the consuming devices, are in good repair, free of abnormal wear or abuse, and are not tampered with.
 - 3 Whenever there is an indication or any suspicion that an internal part of a machine is overheated, the machine shall be stopped but no inspection covers shall be opened before sufficient cooling time has elapsed; this to avoid the risk of spontaneous ignition of oil vapour when air is admitted.
 - 4 Normal ratings (pressures, temperatures, speeds, etc.) shall be durably marked.
 - 5 Operate the unit only for the intended purpose and within its rated limits (pressure, temperature, speeds, etc.).
 - 6 The machinery and equipment shall be kept clean, i.e. as free as possible from oil, dust or other deposits.
 - 7 To prevent an increase in working temperature, inspect and clean heat transfer surfaces (cooler fins, intercoolers, water jackets, etc.) regularly. See the maintenance schedule.
 - 8 All regulating and safety devices shall be maintained with due care to ensure that they function properly. They may not be put out of action.
 - 9 Pressure and temperature gauges shall be checked regularly with regard to their accuracy. They shall be replaced whenever outside acceptable tolerances.
 - 10 Safety devices shall be tested as described in the maintenance schedule of the instruction manual to determine that they are in good operating condition.
 - 11 Mind the markings and information labels on the unit.
 - 12 In the event the safety labels are damaged or destroyed, they must be replaced to ensure operator safety.
 - 13 Keep the work area neat. Lack of order will increase the risk of accidents.
 - 14 When working on the unit, wear safety clothing. Depending on the kind of activities these are: safety glasses, ear protection, safety helmet (including visor), safety gloves, protective clothing, safety shoes. Do not wear the hair long and loose (protect long hair with a hairnet), or wear loose clothing or jewellery.
 - 15 Take precautions against fire. Handle fuel, oil and anti-freeze with care because they are inflammable substances. Do not smoke or approach with naked flame when handling such substances. Keep a fire-extinguisher in the vicinity.
- 16a Portable generators (with earthing pin):**
Earth the generator as well as the load properly.
- 16b Portable generators IT:**
Note: This generator is built to supply a sheer alternating current IT network.
Earth the load properly.

1.3 Safety during transport and installation

To lift a unit, all loose or pivoting parts, e.g. doors and towbar, shall first be securely fastened.

Do not attach cables, chains or ropes directly to the lifting eye; apply a crane hook or lifting shackle meeting local safety regulations. Never allow sharp bends in lifting cables, chains or ropes.

Helicopter lifting is not allowed. It is strictly forbidden to dwell or stay in the risk zone under a lifted load. Never lift the unit over people or residential areas. Lifting acceleration and retardation shall be kept within safe limits.

- 1 Before towing the unit:
 - check the towbar, the brake system and the towing eye. Also check the coupling of the towing vehicle,
 - check the towing and brake capability of the towing vehicle,
 - check that the towbar, jockey wheel or stand leg is safely locked in the raised position,
 - ascertain that the towing eye can swivel freely on the hook,
 - check that the wheels are secure and that the tyres are in good condition and inflated correctly,
 - connect the signalisation cable, check all lights and connect the pneumatic brake couplers,
 - attach the safety break-away cable or safety chain to the towing vehicle,
 - remove wheel chocks, if applied, and disengage the parking brake.
- 2 To tow a unit use a towing vehicle of ample capacity. Refer to the documentation of the towing vehicle.
- 3 If the unit is to be backed up by the towing vehicle, disengage the overrun brake mechanism (if it is not an automatic mechanism).
- 4 Never exceed the maximum towing speed of the unit (mind the local regulations).
- 5 Place the unit on level ground and apply the parking brake before disconnecting the unit from the towing vehicle. Unclip the safety break-away cable or safety chain. If the unit has no parking brake or jockey wheel, immobilize the unit by placing chocks in front of and/or behind the wheels. When the towbar can be positioned vertically, the locking device must be applied and kept in good order.
- 6 To lift heavy parts, a hoist of ample capacity, tested and approved according to local safety regulations, shall be used.
- 7 Lifting hooks, eyes, shackles, etc., shall never be bent and shall only have stress in line with their design load axis. The capacity of a lifting device diminishes when the lifting force is applied at an angle to its load axis.
- 8 For maximum safety and efficiency of the lifting apparatus all lifting members shall be applied as near to perpendicular as possible. If required, a lifting beam shall be applied between hoist and load.
- 9 Never leave a load hanging on a hoist.
- 10 A hoist has to be installed in such a way that the object will be lifted perpendicular. If that is not possible, the necessary precautions must be taken to prevent load-swinging, e.g. by using two hoists, each at approximately the same angle not exceeding 30° from the vertical.
- 11 Locate the unit away from walls. Take all precautions to ensure that hot air exhausted from the engine and driven machine cooling systems cannot be recirculated. If such hot air is taken in by the engine or driven machine cooling fan, this may cause overheating of the unit; if taken in for combustion, the engine power will be reduced.
- 12 Generators shall be stalled on an even, solid floor, in a clean location with sufficient ventilation. If the floor is not level or can vary in inclination, consult Atlas Copco.
- 13 The electrical connections shall correspond to local codes. The machines shall be earthed and protected against short circuits by fuses or circuit breakers.
- 14 Never connect the generator outlets to an installation which is also connected to a public mains.
- 15 Before connecting a load, switch off the corresponding circuit breaker, and check whether frequency, voltage, current and power factor comply with the ratings of the generator.

1.4 Safety during use and operation

- 1 When the unit has to operate in a fire-hazardous environment, each engine exhaust has to be provided with a spark arrestor to trap incendiary sparks.
- 2 The exhaust contains carbon monoxide which is a lethal gas. When the unit is used in a confined space, conduct the engine exhaust to the outside atmosphere by a pipe of sufficient diameter; do this in such a way that no extra back pressure is created for the engine. If necessary, install an extractor. Observe any existing local regulations. Make sure that the unit has sufficient air intake for operation. If necessary, install extra air intake ducts.
- 3 When operating in a dust-laden atmosphere, place the unit so that dust is not carried towards it by the wind. Operation in clean surroundings considerably extends the intervals for cleaning the air intake filters and the cores of the coolers.
- 4 Never remove a filler cap of the cooling water system of a hot engine. Wait until the engine has sufficiently cooled down.
- 5 Never refill fuel while the unit is running, unless otherwise stated in the Atlas Copco Instruction Book (AIB). Keep fuel away from hot parts such as air outlet pipes or the engine exhaust. Do not smoke when fuelling. When fuelling from an automatic pump, an earthing cable should be connected to the unit to discharge static electricity. Never spill nor leave oil, fuel, coolant or cleansing agent in or around the unit.
- 6 All doors shall be shut during operation so as not to disturb the cooling air flow inside the bodywork and/or render the silencing less effective. A door should be kept open for a short period only e.g. for inspection or adjustment.
- 7 Periodically carry out maintenance works according to the maintenance schedule.
- 8 Stationary housing guards are provided on all rotating or reciprocating parts not otherwise protected and which may be hazardous to personnel. Machinery shall never be put into operation, when such guards have been removed, before the guards are securely reinstalled.
- 9 Noise, even at reasonable levels, can cause irritation and disturbance which, over a long period of time, may cause severe injuries to the nervous system of human beings.
When the sound pressure level, at any point where personnel normally has to attend, is:
 - below 70 dB(A): no action needs to be taken,
 - above 70 dB(A): noise-protective devices should be provided for people continuously being present in the room,
 - below 85 dB(A): no action needs to be taken for occasional visitors staying a limited time only,
 - above 85 dB(A): room to be classified as a noise-hazardous area and an obvious warning shall be placed permanently at each entrance to alert people entering the room, for even relatively short times, about the need to wear ear protectors,
 - above 95 dB(A): the warning(s) at the entrance(s) shall be completed with the recommendation that also occasional visitors shall wear ear protectors,
 - above 105 dB(A): special ear protectors that are adequate for this noise level and the spectral composition of the noise shall be provided and a special warning to that effect shall be placed at each entrance.
- 10 Insulation or safety guards of parts the temperature of which can be in excess of 80°C and which may be accidentally touched by personnel shall not be removed before the parts have cooled to room temperature.
- 11 Never operate the unit in surroundings where there is a possibility of taking in flammable or toxic fumes.
- 12 If the working process produces fumes, dust or vibration hazards, etc., take the necessary steps to eliminate the risk of personnel injury.
- 13 When using compressed air or inert gas to clean down equipment, do so with caution and use the appropriate protection, at least safety glasses, for the operator as well as for any bystander. Do not apply compressed air or inert gas to your skin or direct an air or gas stream at people. Never use it to clean dirt from your clothes.
- 14 When washing parts in or with a cleaning solvent, provide the required ventilation and use appropriate protection such as a breathing filter, safety glasses, rubber apron and gloves, etc.
- 15 Safety shoes should be compulsory in any workshop and if there is a risk, however small, of falling objects, wearing of a safety helmet should be included.
- 16 If there is a risk of inhaling hazardous gases, fumes or dust, the respiratory organs must be protected and depending on the nature of the hazard, so must the eyes and skin.

- 17 Remember that where there is visible dust, the finer, invisible particles will almost certainly be present too; but the fact that no dust can be seen is not a reliable indication that dangerous, invisible dust is not present in the air.
- 18 Never operate the generator in excess of its limits as indicated in the technical specifications and avoid long no-load sequences.
- 19 Never operate the generator in a humid atmosphere. Excessive moisture causes worsening of the generator insulation.
- 20 Do not open electrical cabinets, cubicles or other equipment while voltage is supplied. If such cannot be avoided, e.g. for measurements, tests or adjustments, have the action carried out by a qualified electrician only, with appropriate tools, and ascertain that the required bodily protection against electrical hazards is applied.
- 21 Never touch the power terminals during operation of the machine.
- 22 Whenever an abnormal condition arises, e.g. excessive vibration, noise, odour, etc., switch the circuit breakers to OFF and stop the engine. Correct the faulty condition before restarting.
- 23 Check the electric cables regularly. Damaged cables and insufficient lightening of connections may cause electric shocks. Whenever damaged wires or dangerous conditions are observed, switch the circuit breakers to OFF and stop the engine. Replace the damaged wires or correct the dangerous condition before restarting. Make sure that all electric connections are securely tightened.
- 24 Avoid overloading the generator. The generator is provided with circuit breakers for overload protection. When a breaker has tripped, reduce the concerned load before restarting.
- 25 If the generator is used as stand-by for the mains supply, it must not be operated without control system which automatically disconnects the generator from the mains when the mains supply is restored.
- 26 Never remove the cover of the output terminals during operation. Before connecting or disconnecting wires, switch off the load and the circuit breakers, stop the machine and make sure that the machine cannot be started inadvertently or there is any residual voltage on the power circuit.
- 27 Running the generator at low load for long periods will reduce the lifetime of the engine.

1.5 Safety during maintenance and repair

Maintenance, overhaul and repair work shall only be carried out by adequately trained personnel; if required, under supervision of someone qualified for the job.

- 1 Use only the correct tools for maintenance and repair work, and only tools which are in good condition.
- 2 Parts shall only be replaced by genuine Atlas Copco replacement parts.
- 3 All maintenance work, other than routine attention, shall only be undertaken when the unit is stopped. Steps shall be taken to prevent inadvertent starting. In addition, a warning sign bearing a legend such as "work in progress; do not start" shall be attached to the starting equipment. On engine-driven units the battery shall be disconnected and removed or the terminals covered by insulating caps. On electrically driven units the main switch shall be locked in open position and the fuses shall be taken out. A warning sign bearing a legend such as "work in progress; do not supply voltage" shall be attached to the fuse box or main switch.
- 4 Prior to stripping an engine or other machine or undertaking major overhaul on it, prevent all movable parts from rolling over or moving.
- 5 Make sure that no tools, loose parts or rags are left in or on the machine. Never leave rags or loose clothing near the engine air intake.
- 6 Never use flammable solvents for cleaning (fire-risk).
- 7 Take safety precautions against toxic vapours of cleaning liquids.
- 8 Never use machine parts as a climbing aid.
- 9 Observe scrupulous cleanliness during maintenance and repair. Keep away dirt, cover the parts and exposed openings with a clean cloth, paper or tape.
- 10 Never weld on or perform any operation involving heat near the fuel or oil systems. Fuel and oil tanks must be completely purged, e.g. by steam-cleaning, before carrying out such operations. Never weld on, or in any way modify, pressure vessels. Disconnect the alternator cables during arc welding on the unit.
- 11 Support the towbar and the axle(s) securely if working underneath the unit or when removing a wheel. Do not rely on jacks.
- 12 Do not remove any of, or tamper with, the sound-damping material. Keep the material free of dirt and liquids such as fuel, oil and cleansing agents. If any sound-damping material is damaged, replace it to prevent the sound pressure level from increasing.
- 13 Use only lubricating oils and greases recommended or approved by Atlas Copco or the machine manufacturer. Ascertain that the selected lubricants comply with all applicable safety regulations, especially with regard to explosion or fire-risk and the possibility of decomposition or generation of hazardous gases. Never mix synthetic with mineral oil.
- 14 Protect the engine, alternator, air intake filter, electrical and regulating components, etc., to prevent moisture ingress, e.g. when steam-cleaning.
- 15 When performing any operation involving heat, flames or sparks on a machine, the surrounding components shall first be screened with non-flammable material.
- 16 Never use a light source with open flame for inspecting the interior of a machine.
- 17 When repair has been completed, the machine shall be barred over at least one revolution for reciprocating machines, several revolutions for rotary ones to ensure that there is no mechanical interference within the machine or driver. Check the direction of rotation of electric motors when starting up the machine initially and after any alteration to the electrical connection(s) or switch gear, to check that the oil pump and the fan function properly.
- 18 Maintenance and repair work should be recorded in an operator's logbook for all machinery. Frequency and nature of repairs can reveal unsafe conditions.
- 19 When hot parts have to be handled, e.g. shrink fitting, special heat-resistant gloves shall be used and, if required, other body protection shall be applied.
- 20 When using cartridge type breathing filter equipment, ascertain that the correct type of cartridge is used and that its useful service life is not surpassed.
- 21 Make sure that oil, solvents and other substances likely to pollute the environment are properly disposed of.
- 22 Before clearing the generator for use after maintenance or overhaul, submit it to a testrun, check that the AC power performance is correct and that the control and shutdown devices function correctly.

1.6 Tool applications safety

Apply the proper tool for each job. With the knowledge of correct tool use and knowing the limitations of tools, along with some common sense, many accidents can be prevented.

Special service tools are available for specific jobs and should be used when recommended. The use of these tools will save time and prevent damage to parts.

1.7 Battery safety precautions

Batteries

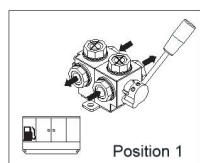
When servicing batteries, always wear protecting clothing and glasses.

- 1 The electrolyte in batteries is a sulphuric acid solution which is fatal if it hits your eyes, and which can cause burns if it contacts your skin. Therefore, be careful when handling batteries, e.g. when checking the charge condition.
- 2 Install a sign prohibiting fire, open flame and smoking at the post where batteries are being charged.
- 3 When batteries are being charged, an explosive gas mixture forms in the cells and might escape through the vent holes in the plugs. Thus an explosive atmosphere may form around the battery if ventilation is poor, and can remain in and around the battery for several hours after it has been charged. Therefore:
 - never smoke near batteries being, or having recently been, charged,
 - never break live circuits at battery terminals, because a spark usually occurs.
- 4 When connecting an auxiliary battery (AB) in parallel to the unit battery (CB) with booster cables: connect the + pole of AB to the + pole of CB, then connect the - pole of CB to the mass of the unit. Disconnect in the reverse order.

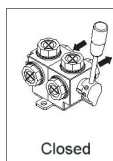
2.5 External fuel tank connection

The external fuel tank connection allows to bypass the internal fuel tank and to connect an external fuel tank to the unit.

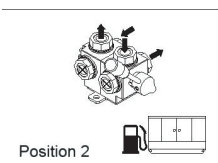
Make sure to connect the fuel supply line as well as the fuel return line. Connections to fuellines ought to be air-tight to prevent air from entering the fuel system.



Position 1: Indicates that the fuel supply line to the engine is connected to the internal fuel tank.



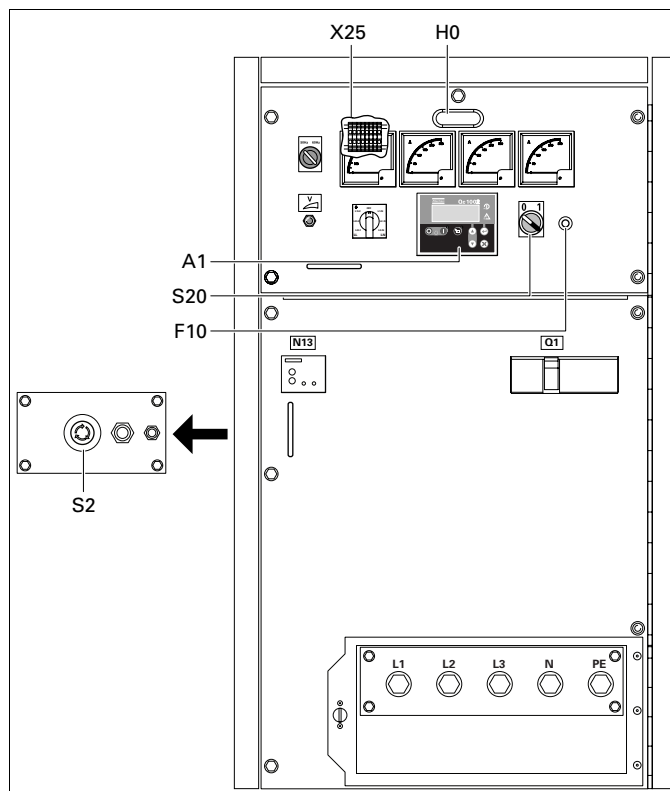
Position closed: Indicates that the fuel supply line to the engine is closed.



Position 2: Indicates that the fuel supply line to the engine is connected to the external fuel tank.

2.6 Control and indicator panel Qc1002™

2.6.1 General description Qc1002™ control panel



A1..... Qc1002™ display

F10.... Fuse

The fuse activates when the current from the battery to the engine control circuit exceeds its setting. The fuse can be reset by pushing the button.

H0..... Panel light

S2..... Emergency stop button

Push the button to stop the generator in case of an emergency. When the button is pressed, it must be unlocked, before the generator can be restarted. The emergency stop button can be secured in the locked position with the key, to avoid unauthorized use.

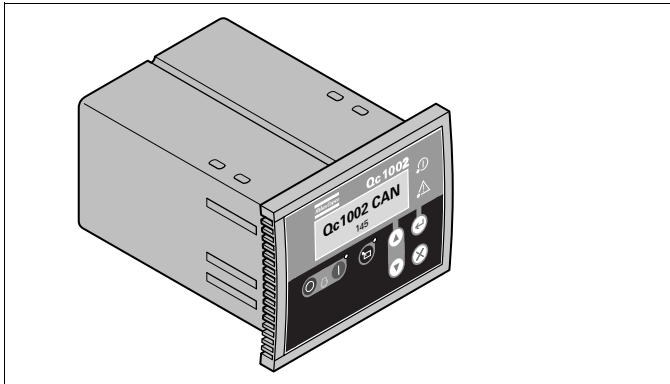
S20.... ON/OFF switch

Position O: No voltage is applied to the Qc1002™ module, the generator will not start.

Position I: Voltage is applied to the Qc1002™ module, it is possible to start up the generator.

X25.... Terminal strip

2.6.2 Qc1002™ Module



The Qc1002™ module is located inside the control panel. This control module will carry out all necessary tasks to control and protect a generator, regardless of the use of the generator.

This means that the Qc1002™ module can be used for several applications.

2.6.3 Pushbutton and LED functions

Following pushbuttons are used on the Qc1002™



ENTER: Is used to select and confirm changed settings in the Parameter list.



UP: Is used to scroll through the display information and to adjust parameter value upwards.



DOWN: Is used to scroll through the display information and to adjust parameter value downwards.



BACK: Is used to leave the Alarm pop-up window, to leave the Parameter list and to leave menu's without change.



REMOTE MODE: Is used to activate the remote mode. The LED indicates if the gen-set is put in Remote Mode.

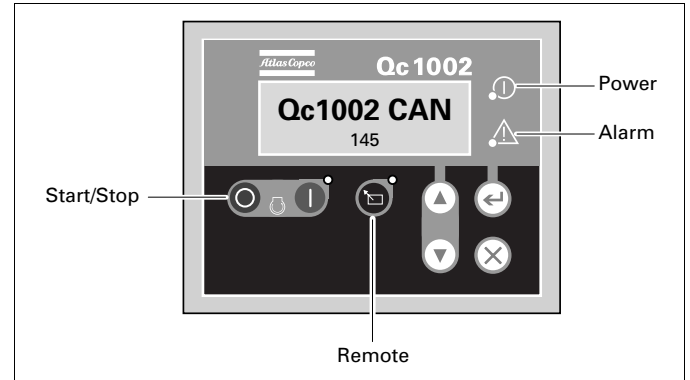


START: Is used to start the unit in Manual Mode.



STOP: Is used to stop the unit in Manual or Remote Mode (without cooldown). When the unit is stopped with the STOP button in Remote mode, it will automatically go to Manual Mode.

Following LEDs are used on the Qc1002™



Power

Green LED indicates that the unit is powered up.

Remote

Green LED indicates that the Remote Mode is selected.

Start/Stop

Green LED indicates that the engine is running.

Alarm

Flashing red LED indicates that an alarm is present. A continuous red LED indicates that the alarm has been acknowledged by the user. The exact alarm is shown on the display.

2.6.4 Qc1002™ Menu Overview

At Qc1002™, the LCD will show following information:

- in **Normal** condition (scroll through the information using **UP** and **DOWN**):
 - Status (eg: preheat, crank, cooldown, extended stop time, ...) (pop-up: this display is only shown when a Special status comes up)
 - Controller type & version
 - Parameter list
 - Alarm list
 - LOG list
 - Service Timer 1 & Service Timer 2
 - Battery Voltage
 - Coolant temperature
 - Oil pressure
 - RPM (speed)
 - Fuel level
 - Voltage - frequency - running hours
- in **Alarm** condition (scroll through the information using **UP** and **DOWN**):
 - a list of all active Alarms

It's possible to scroll through the views, using the **UP** and **DOWN** buttons. The scrolling is continuous.

If a Special status comes up, the Status Display is shown.
If an Alarm comes up, the Alarm Display is shown.

Controller type and version display

Qc1002 CAN

v1.00.0

This view shows the controller type and the ASW version number.

Parameter display

Parameter

This view shows a number of Parameter settings and gives access to them.

An overview is given in “Parameter list” on page 15.

Alarm list display

Alarm List

0 Alarm(s)

This view shows the number of active alarms and gives access to them.

An overview is given in “Alarm Display (pop-up window)” on page 17.

LOG list display

LOG List

This view shows the alarm memory and gives access to it.

An overview is given in “LOG list” on page 18.

Service timer 1 & Service timer 2 display

Service 1

Service 2

59h

59h

This view shows both Service timers. The service timer indication is shown when service time has run out. It can be removed by resetting the timers or acknowledging the Service timer indication.

The service timer indications count upwards and give an alarm when the set value is reached.

Resetting the Service Timers can be done through the Parameter display.

Battery Voltage display

Battery

13.2 V

00168.1h

This view shows the Battery voltage and the running hours.

Coolant temperature display

Water

62°C

00168.1h

This view shows the Coolant temperature and the running hours.

See also “Parameter list” on page 15 for selection between °C and °F.

Oil pressure display

Oil

4.0bar

00168.1h

This view shows the Oil pressure and the running hours.

See also “Parameter list” on page 15 for selection between bar and psi.

Fuel level display

Fuel

75%

00168.1h

This view shows the Fuel level and the running hours.

Voltage - frequency - running hours display

400V

50Hz

00168.1h

This view shows the voltage, frequency and running hours.

Engine speed display

RPM

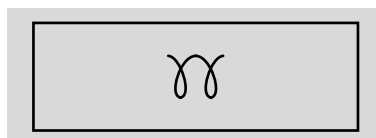
1500

00168.1h

This view shows the engine speed and running hours.

2.6.5 Qc1002™ Menu Description

Status Display (pop-up window)

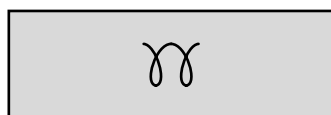


In case special statuses are entered, a pop-up window will automatically be entered for as long as the status is active.

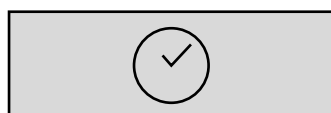
The background screen is not updated when the status pop-up window is active.

These special statuses are:

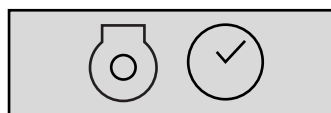
PREHEAT



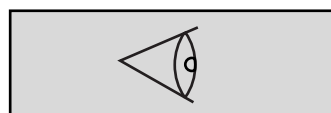
START OFF/
EXTENDED STOP
TIMER



COOLDOWN



DIAGNOSTIC



If a special status has elapsed, the active view will be entered again automatically.

If an Alarm comes up, the Alarm Display is shown.

Parameter list

The Parameter Menu's are pre-programmed!

A password will be asked for when an attempt to change a setting is about to be done (user password = 2003).

By entering the parameter list, pushbutton REMOTE is disposed of its normal operations and will not perform any functionality.

Menu's shown on the Parameter list LCD:

- Running hours adjust

This menu is used to adjust the amount of running hours. The running hours can only be raised, not lowered.

- Unit Type



Unit type 7 for QAS 125-150 Volvo!

- Service Timer 2 reset

- Service Timer 1 reset

These menus are used to reset the service timers. When a service timer alarm occurs and is acknowledged, the service timer will be reset automatically.

- Diagnostics Menu

This menu is used to power up the engine electronics without starting the engine. When this setting is switched 'on', electric power will be supplied to the engine electronics after half a minute delay. The unit can not be started as long as this parameter is switched 'on'.

- Unit Menu

This menu is used to select whether temperature and pressure should appear in °C/bar or °F/psi.

- Language selection

Icons is the default factory set language, but 6 other languages can be selected: English, French, German, Italian, Spanish and Cyrillic (Russian). All information in the Parameter List display is always in English.

- Generator Underfrequency: failclass, enable, delay, setpoint

- Generator Overfrequency: failclass, enable, delay, setpoint

- Generator Undervoltage: failclass, enable, delay, setpoint

- Generator Overvoltage: failclass, enable, delay, setpoint

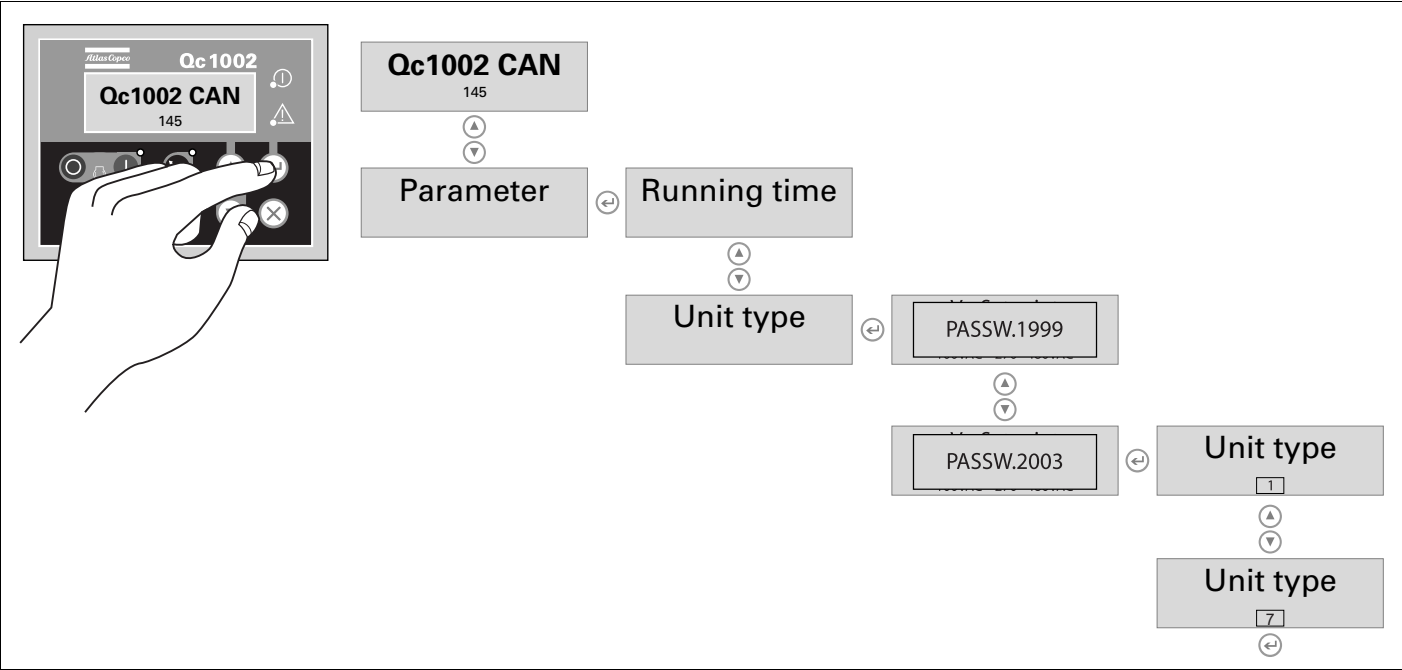
- Engine CAN communication

This menu is used to select the type of engine electronics, the Qc1002™ controller should communicate with via the Canbus.

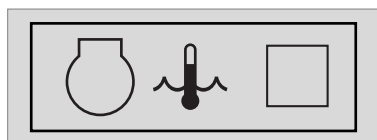
It's possible to scroll between configuration menu's by using the pushbuttons UP and DOWN.

Pushing the ENTER button activates the configuration menu which is shown at the display.

This is the described menu flow for changing the unit type:



Alarm Display (pop-up window)



In case an Alarm occurs, a pop-up window will automatically be displayed for as long as the alarm is active, no matter which view is active. The flashing red alarm LED will light up. The alarm icons will be shown together with an acknowledgement check-box. Push the ENTER button to acknowledge the alarm. When the alarm has been acknowledged, a V-marking will appear in the check-box and the red alarm LED will light up continuously.



An alarm should always be acknowledged before solving the problem that causes the alarm.

The Alarm Display can always be left by pushing the BACK button.

If more than one alarm comes up, it's possible to scroll through the alarm messages with the UP and DOWN pushbuttons. The newest alarm will be placed at the bottom of the list (meaning that the older alarm stays at the display when a newer alarm comes up).

If one or more than one alarm is present, an arrow at the right of the display will be shown.

Following general groups of Alarms exist:

- Warning: Alarm LED lights up + Alarm pop-up appears on the display + Alarm relay is empowered (if configured)
- Trip of GB: 'Warning' actions + Generator Contactor opens
- Trip and Stop: 'Trip of GB' actions + unit stops after Cooldown
- Shutdown: 'Trip of GB' actions + unit stops immediately

List of possible alarms:

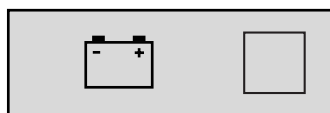
LOW OIL PRESSURE



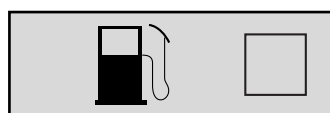
HIGH COOLANT TEMPERATURE



CHARGING ALTERNATOR



LOW FUEL LEVEL



LOW COOLANT LEVEL



GENERATOR OVERVOLTAGE



GENERATOR UNDERVOLTAGE



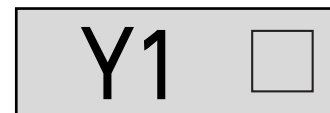
GENERATOR OVERFREQUENCY



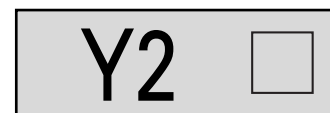
GENERATOR UNDERFREQUENCY



SERVICE TIMER 1



SERVICE TIMER 2



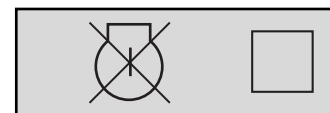
ENGINE ALARM



EMERGENCY STOP



START FAILURE



STOP FAILURE



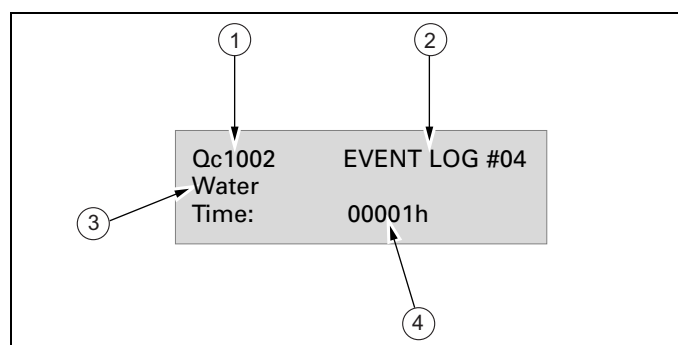
LOG list

The unit will keep an event log of the latest 30 events.

Events are:

- shutdowns
- service timer 1/2 reset
- unit type changes

Together with each event, the running hours at the time of the event will be stored.



1	Controller type	3	Event
2	Event number	4	Running hours

2.6.6 Remote start operation

Installation wirings:

- X25.1 & X25.2 to be wired for the remote start switch.
- X25.3 & X25.4 to be wired for the remote contactor (open/close).

2.6.7 Fail classes

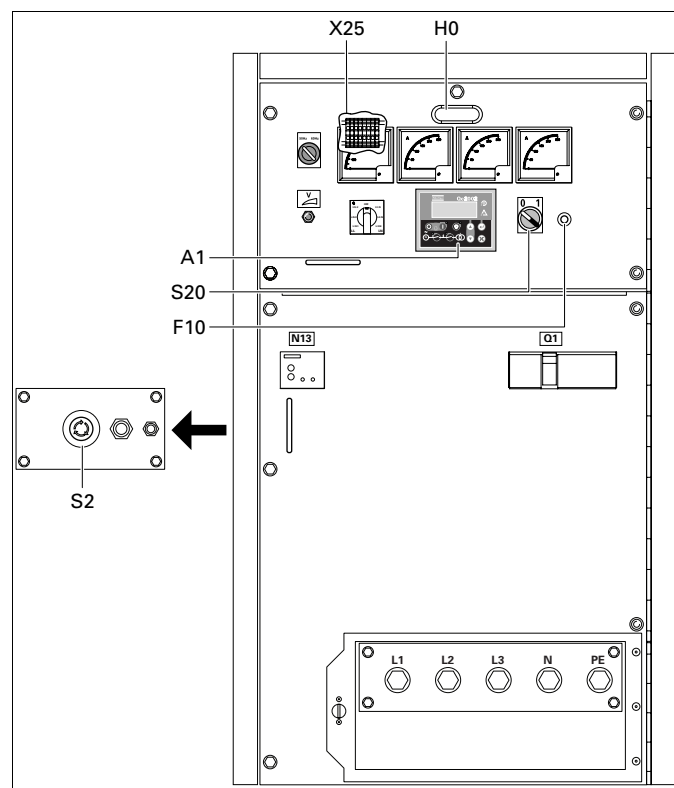
All the activated alarms of the Qc1002™ have their own pre-defined fail class.

All alarms are enabled according to one of these three statuses:

- disabled alarm, no supervision of alarm (OFF)
- enabled alarm, supervision of alarm all the time (ON)
- running alarm, only supervision when the machine is running (RUN)

2.7 Control and indicator panel Qc2002™

2.7.1 General description Qc2002™ control panel



A1..... Qc2002™ display

F10..... Fuse

The fuse activates when the current from the battery to the engine control circuit exceeds its setting. The fuse can be reset by pushing the button.

H0..... Panel light

S2..... Emergency stop button

Push the button to stop the generator in case of an emergency. When the button is pressed, it must be unlocked, before the generator can be restarted. The emergency stop button can be secured in the locked position with the key, to avoid unauthorized use.

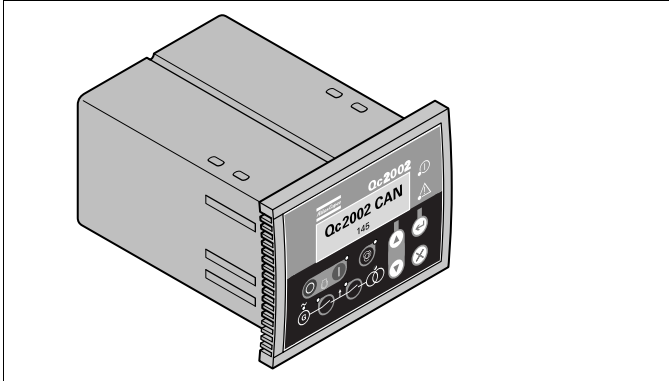
S20 ON/OFF switch

Position O: No voltage is applied to the Qc2002™ module, the generator will not start.

Position I: Voltage is applied to the Qc2002™ module, it is possible to start up the generator.

X25.... Terminal strip

2.7.2 Qc2002™ Module



The Qc2002™ module is located inside the control panel. This control module will carry out all necessary tasks to control and protect a generator, regardless of the use of the generator.

This means that the Qc2002™ module can be used for several applications.

2.7.3 Pushbutton and LED functions

Following pushbuttons are used on the Qc2002™



ENTER: Is used to select and confirm changed settings in the Parameter list.



UP: Is used to scroll through the display information and to adjust parameter value upwards.



DOWN: Is used to scroll through the display information and to adjust parameter value downwards.



BACK: Is used to leave the Alarm pop-up window, to leave the Parameter list and to leave menu's without change.



AUTOMATIC: Is used to put the unit in Manual or Automatic Operation.



START: Is used to start the unit in Manual Operation.



STOP: Is used to stop the unit in Manual or Automatic Operation (without cooldown). When the unit is stopped with the STOP button in Automatic Operation, it will automatically go to Manual Operation.

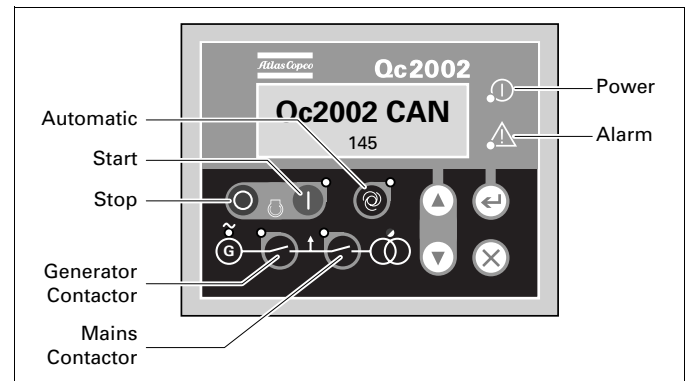


MAINS CONTACTOR: Is used to open or close the Mains contactor, if the Qc2002™ is in Manual Operation.



GENERATOR CONTACTOR: Is used to open or close the Generator contactor, if the Qc2002™ is in Manual Operation

Following LEDs are used on the Qc2002™



Power

Green LED indicates that the unit is powered up.

Automatic

Green LED indicates that the Qc2002™ is in Automatic Operation.

Start/Stop

Green LED indicates that the Qc2002™ receives running feedback (via the W/L input, via the RPM value at the Canbus, or via the AC frequency).

**Generator
contactor**

Green LED indicates that the voltage and the frequency of the alternator are within certain limits for a certain time. It will be possible to close the Generator Contactor (both in Island and in AMF mode), if the Mains contactor is open.

**Mains
contactor**

Green LED indicates that it is possible to close the Mains Contactor (only in AMF mode), if the Generator contactor is open.

Alarm

Flashing red LED indicates that an alarm is present. A continuous red LED indicates that the alarm has been acknowledged by the user. The exact alarm is shown on the display.

2.7.4 Qc2002™ Menu Overview

At Qc2002™, the LCD will show following information:

- in **Normal** condition (scroll through the information using **UP** and **DOWN**):
 - Status (eg: preheat, crank, cooldown, extended stop time, ...) (pop-up: this display is only shown when a Special status comes up)
 - Line voltages of the generator
 - Controller type & version
 - Parameter list
 - Alarm list
 - LOG list
 - Service Timer 1 & Service Timer 2
 - Battery Voltage
 - RPM (speed)
 - Coolant temperature
 - Oil pressure
 - Fuel level
 - kWh counter
 - Power factor, the frequency of the generator and the frequency of the mains
 - Line voltage, frequency and active power of the generator
 - Active, reactive and apparent power of the generator
 - Generator currents
 - Phase voltages of the mains
 - Line voltages of the mains
 - Phase voltages of the generator
- in **Alarm** condition (scroll through the information using **UP** and **DOWN**):
 - a list of all active Alarms

It's possible to scroll through the views, using the **UP** and **DOWN** buttons. The scrolling is continuous.

If a Special status comes up, the Status Display is shown.
If an Alarm comes up, the Alarm Display is shown.

Line voltages generator display

G L1-L2	400V
G L2-L3	400V
G L3-L1	400V

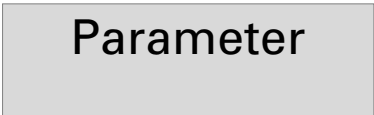
This view shows the line voltages of the generator.

Controller type and version display



This view shows the controller type and the ASW version number.

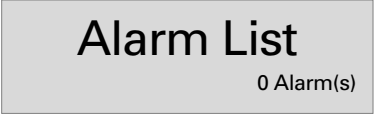
Parameter display



This view shows a number of Parameter settings and gives access to them.

An overview is given in “Parameter list” on page 23.

Alarm list display



This view shows the number of active alarms and gives access to them.

An overview is given in “Alarm Display (pop-up window)” on page 26.

LOG list display



This view shows the alarm memory and gives access to it.

An overview is given in “LOG list” on page 27.

Service timer 1 & Service timer 2 display

Service 1	59h
Service 2	59h

This view shows both Service timers. The service timer indication is shown when service time has run out. It can be removed by resetting the timers or acknowledging the Service timer indication.

The service timer indications count upwards and give an alarm when the set value is reached.

Resetting the Service Timers can be done through the Parameter display.

Battery voltage display

Battery	13.2 V
00168.1h	

This view shows the battery voltage and the running hours.

RPM display

RPM	0
00168.1h	

This view shows the engine speed and the running hours.

Coolant temperature display

Water	62°C
00168.1h	

This view shows the Coolant temperature and the running hours.

See also “Parameter list” on page 23 for selection between °C and °F.

Oil pressure display

Oil	4.0bar
00168.1h	

This view shows the Oil pressure and the running hours.

See also “Parameter list” on page 23 for selection between bar and psi.

Fuel level display

Fuel	75%
00168.1h	

This view shows the Fuel level and the running hours.

kWh counter display

E	4860kWh
---	---------

This view shows the kWh counter.

Power factor - frequency generator - frequency mains display

PF	0.00
G f L1	50Hz
M f L1	50Hz

This view shows the PF, the frequency of the generator and the frequency of the mains (M f L1: only in AMF mode).

One line voltage - frequency - active power display

G L1-L2	400V
G f L1	50Hz
P	80kW

This view shows one line voltage, frequency and active power of the generator.

Active - reactive - apparent power display

P	80kW
Q	0kVAr
S	80kVA

This view shows the active, reactive and apparent power of the generator.

Generator current display

G I1	100A
G I2	100A
G I3	100A

This view shows the generator current.

Phase voltages mains display

M L1-N	230V
M L2-N	230V
M L3-N	230V

This view shows the phase voltages of the mains (is only shown in AMF mode).

Line voltages mains display

M L1-L2	400V
M L2-L3	400V
M L3-L1	400V

This view shows the line voltages of the mains (is only shown in AMF mode).

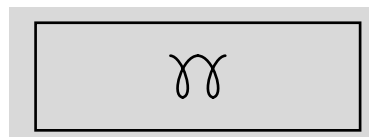
Phase voltages generator display

G L1-N	230V
G L2-N	230V
G L3-N	230V

This view shows the phase voltages of the generator.

2.7.5 Qc2002™ Menu Description

Status Display (pop-up window)

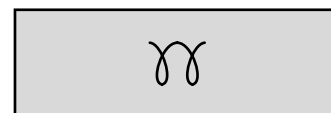


In case special statuses are entered, a pop-up window will automatically be entered for as long as the status is active.

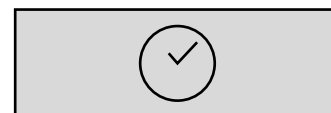
The background screen is not updated when the status pop-up window is active.

These special statuses are:

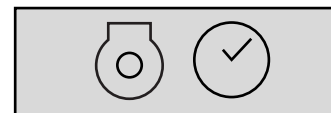
PREHEAT



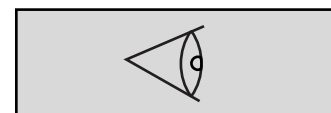
START OFF/
EXTENDED STOP
TIMER



COOLDOWN



DIAGNOSTIC



If a special status has elapsed, the active view will be entered again automatically.

If an Alarm comes up, the Alarm Display is shown.

Parameter list

The Parameter Menu's are pre-programmed!

A password will be asked for when an attempt to change a setting is about to be done (user password = 2003).

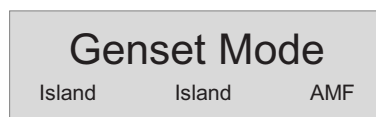
By entering the parameter list, pushbutton AUTOMATIC is disposed of its normal operations and will not perform any functionality.

It's possible to scroll between configuration menu's by using the pushbuttons UP and DOWN.

Pushing the ENTER button activates the configuration menu which is shown at the display.

Menu's shown on the Parameter list LCD:

Genset mode



This menu is used to change the mode of the machine. In the Qc2002™ module 2 application modes can be selected:

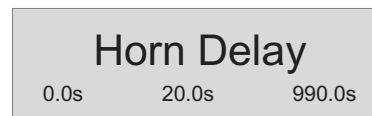
Island operation

- This operation type is selected for local/remote start applications, without the Mains (= stand-alone).
 - Combined with Manual Operation mode = Local Start operation. The sequences start / stop / close Generator Contactor / open Generator Contactor can be activated manually.
 - Combined with Automatic Operation mode = Remote Start operation.
- The remote start signal can be given with an external switch. After the generator has been started, the Generator Contactor will close automatically.
- Installation wirings for Remote Start operation: wire the RS switch between X25.9 & X25.10.

Automatic Mains Failure (AMF) operation

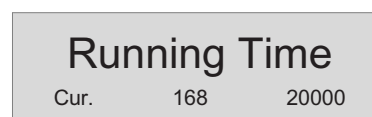
- This application is only possible in combination with the Auto mode. If the Manual Operation mode is selected the AMF operation will NOT function!
- When the Mains exceeds the defined voltage / frequency limits for a defined delay time, the generator will take over the load automatically.
- When the mains is restored within the defined limits for a defined time, the generator will unload before disconnecting and switching back to the Mains.
- The generator will then go into cooldown and stop.
- Installation wirings: we refer to circuit diagram 9822 0993 06/04 for the correct connections

Horn delay



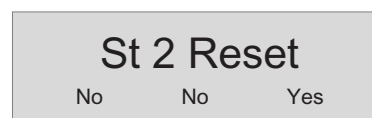
This menu is used to set the delay, how long the general alarm relay stays energized (if present). If set to 0.0s, the general alarm relay will stay energized continuously.

Running hours adjust

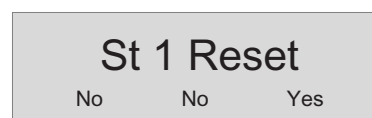


This menu is used to adjust the amount of running hours. The running hours can only be raised, not lowered.

Service timer 2 reset

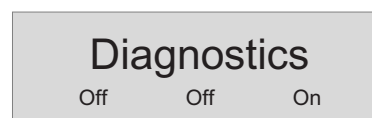


Service timer 1 reset



These menus are used to reset the service timers. When a service timer alarm occurs and is acknowledged, the service timer will be reset automatically.

Diagnostics menu



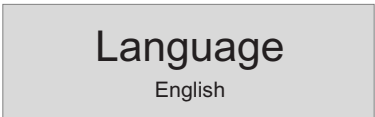
This menu is used to power up the engine electronics without starting the engine. When this setting is switched 'on', electric power will be supplied to the engine electronics after half a minute delay. The unit can not be started as long as this parameter is switched 'on'.

Unit menu



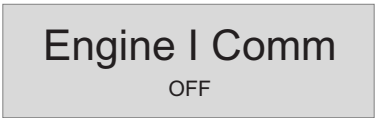
This menu is used to select the units into which pressures and temperatures will be shown.

Language selection



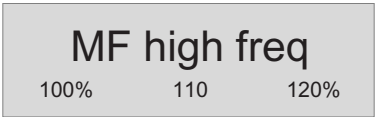
Icons is the default factory set language, but 6 other languages can be selected: English, French, German, Italian, Spanish and Cyrillic (Russian). All information in the Parameter List display is always in English.

Engine CAN communication



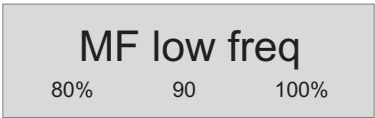
This menu is used to select the type of engine electronics, the Qc2002™ controller should communicate with via the Canbus.

MF high frequency



This menu is used to set the maximum limit for the mains frequency, in % of the nominal frequency (in AMF-Auto).

MF low frequency



This menu is used to set the minimum limit for the mains frequency, in % of the nominal frequency (in AMF-Auto).

M frequency delay



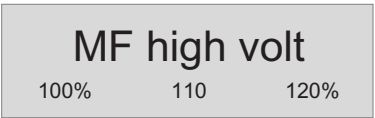
This menu is used to set the delay, which defines how long the mains frequency has to be back within the limits before there will be switched from generator to mains again (in AMF-Auto). During this delay, the Mains LED flashes in green.

MF frequency delay



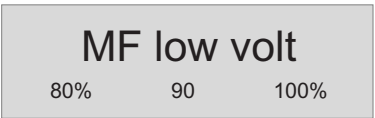
This menu is used to set the delay, which defines how long the mains frequency may be above the max limit or below the min limit before there will be switched from mains to generator (in AMF-Auto). During this delay, the Mains LED flashes in red.

MF high voltage



This menu is used to set the maximum limit for the mains voltage, in % of the nominal voltage (in AMF-Auto).

MF low voltage



This menu is used to set the minimum limit for the mains voltage, in % of the nominal voltage (in AMF-Auto).

M voltage delay



This menu is used to set the delay,, which defines how long the mains voltage has to be back within the limits before there will be switched from generator to mains again (in AMF-Auto). During this delay, the Mains LED flashes in green.

MF voltage delay

MF volt delay		
1.0s	2.0	990.0s

This menu is used to set the delay, which defines how long the mains voltage may be above the max limit or below the min limit before there will be switched from mains to generator (in AMF-Auto). During this delay, the Mains LED flashes in red

Overvoltage enable

> Volt	enable	
Enable	enable	disable

Overvoltage failclass

> Volt	FC	
warning	warning	shutdown

Overvoltage delay

> Volt	Delay	
0	1	99

Overvoltage setpoint

> Volt	SP	
0	450	999

Undervoltage enable

< Volt	enable	
Enable	enable	disable

Undervoltage failclass

< Volt	FC	
warning	warning	shutdown

Undervoltage delay

< Volt	Delay	
0	1	99

Undervoltage setpoint

< Volt	SP	
0	450	999

Overfrequency enable

> Freq	enable	
Enable	enable	disable

Overfrequency failclass

> Freq	FC	
warning	warning	shutdown

Overfrequency delay

> Freq	Delay	
0	1	99

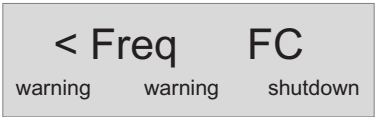
Overfrequency setpoint

> Freq	SP	
0	38	70

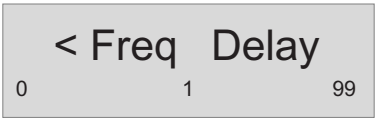
Underfrequency enable

< Freq	enable	
Enable	enable	disable

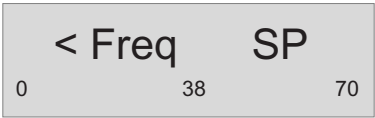
Underfrequency failclass



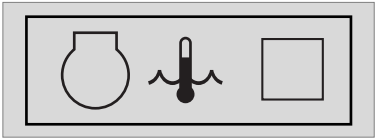
Underfrequency delay



Underfrequency setpoint



Alarm Display (pop-up window)



In case an Alarm occurs, a pop-up window will automatically be displayed for as long as the alarm is active, no matter which view is active. The flashing red alarm LED will light up. The alarm icons will be shown together with an acknowledgement check-box. Push the ENTER button to acknowledge the alarm. When the alarm has been acknowledged, a V-marking will appear in the check-box and the red alarm LED will light up continuously.



An alarm should always be acknowledged before solving the problem that causes the alarm.

The Alarm Display can always be left by pushing the BACK button.

If more than one alarm comes up, it's possible to scroll through the alarm messages with the UP and DOWN pushbuttons. The newest alarm will be placed at the bottom of the list (meaning that the older alarm stays at the display when a newer alarm comes up).

If one or more than one alarm is present, an arrow at the right of the display will be shown.

Following general groups of Alarms exist:

- Warning: Alarm LED lights up + Alarm pop-up appears on the display + Alarm relay is empowered (if configured)
- Trip of GB: 'Warning' actions + Generator Contactor opens
- Trip and Stop: 'Trip of GB' actions + unit stops after Cooldown
- Shutdown: 'Trip of GB' actions + unit stops immediately

List of possible alarms:

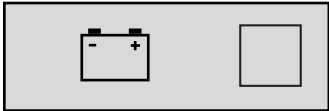
LOW OIL PRESSURE



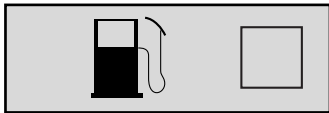
HIGH COOLANT TEMPERATURE



CHARGING ALTERNATOR



LOW FUEL LEVEL



LOW COOLANT LEVEL



GENERATOR OVERVOLTAGE



GENERATOR UNDERVOLTAGE



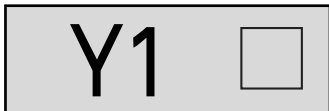
GENERATOR OVERFREQUENCY



GENERATOR UNDERFREQUENCY



SERVICE TIMER 1



SERVICE TIMER 2



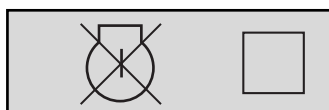
ENGINE ALARM



EMERGENCY STOP



START FAILURE



STOP FAILURE



HZ/V FAILURE



OIL LEVEL



OIL TEMPERATURE



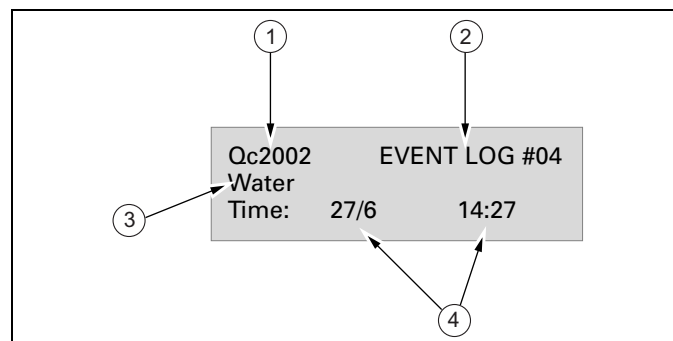
LOG list

The unit will keep an event log of the latest 30 events.

Events are:

- shutdowns
- service timer 1/2 reset

Together with each event, the real time of the event will be stored.



1	Controller type	3	Event
2	Event number	4	Date and hour of the event

2.7.6 Fail classes

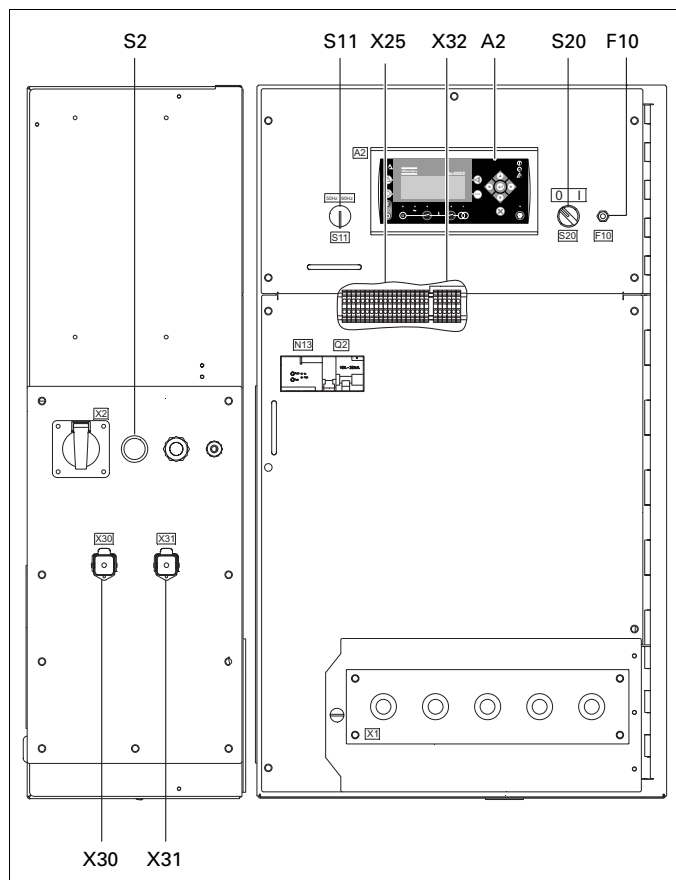
All the activated alarms of the Qc2002™ have their own pre-defined fail class.

All alarms are enabled according to one of these three statuses:

- disabled alarm, no supervision of alarm (OFF)
- enabled alarm, supervision of alarm all the time (ON)
- running alarm, only supervision when the machine is running (RUN)

2.8 Control and indicator panel Qc4002™

2.8.1 General description Qc4002™ control panel



A2..... Qc4002™ display

F10.... Fuse

The fuse (10 A) activates when the current from the battery to the engine control circuit exceeds its setting. The fuse can be reset by pushing the button.

S2..... Emergency stop button

Push the button to stop the generator in case of an emergency. When the button is pressed, it must be unlocked, before the generator can be restarted. The emergency stop button can be secured in the locked position with the key, to avoid unauthorized use.

S11.... Frequency selector switch (50 Hz/60 Hz)

Allows to choose the frequency of the output voltage: 50 Hz or 60 Hz.



Changing the output frequency is only allowed after shutdown.

S20.... ON/OFF switch

Position O: No voltage is applied to the Qc4002™ module, the generator will not start.

Position I: Voltage is applied to the Qc4002™ module, it is possible to start up the generator.

X25.... Connection block

Inside the cubicle. Allows customer connections.



Refer to circuit diagram for the correct connection.

X30.... Connector X30

Connector for communication with other generators with Qc4002™ when paralleling.

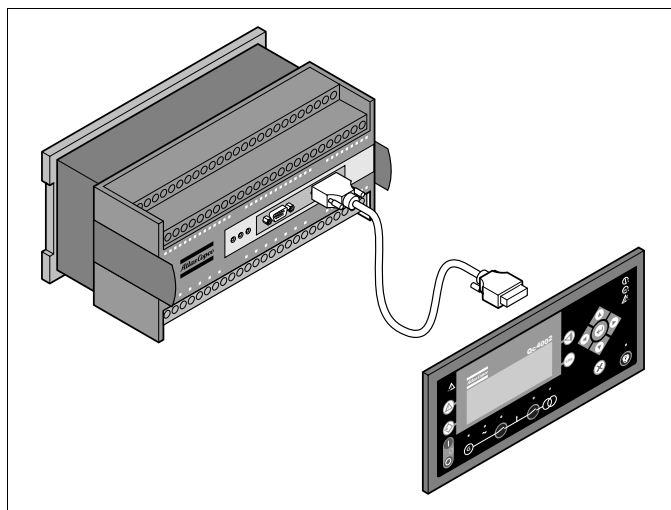
X31.... Connector X31

Connector for communication with other generators with Qc4002™ when paralleling.

X32.... Connector X32

Connector for PMS communication with other generators with Qc4002™ when paralleling.

2.8.2 Qc4002™ Module



The Qc4002™ module is located inside the control panel, and communicates with a display unit, located in front of the control panel. This control module will carry out all necessary tasks to control and protect a generator, regardless of the use of the generator.

This means that the Qc4002™ module can be used for several applications.

2.8.3 Pushbutton and LED functions

Following pushbuttons are used on the Qc4002™



INFO: Shifts the display 3 lower lines to show the alarm list.



JUMP: Enters a specific menu number selection. All settings have a specific number attached to them. The JUMP button enables the user to select and display any setting without having to navigate through the menus.



START: Start of the gen-set if 'SEMI-AUTO' or 'MANUAL' is selected.



STOP: Stop of the gen-set if 'SEMI-AUTO' or 'MANUAL' is selected.



GB: Manual activation of close breaker and open breaker sequence if 'SEMI-AUTO' is selected.



MB: Manual activation of close breaker and open breaker sequence if 'SEMI-AUTO' is selected.



VIEW: Shifts the first line displaying in the setup menus.



LOG: Displays the LOG SETUP window where you can choose between the Event, Alarm and Battery logs. The logs are not deleted when the auxiliary supply is switched off.



BACK: Jumps one step backwards in the menu (to previous display or to the entry window).



MODE: Changes the menu line (line 4) in the display to mode selection.



SEL: Is used to select the underscored entry in the fourth line of the display.



UP: Increases the value of the selected set point (in the setup menu). In the daily use display, this button function is used for scrolling the View lines in S1 or the second line (in the setup menu) displaying of generator values.



DOWN: Decreases the value of the selected set point (in the setup menu). In the daily use display, this button function is used for scrolling the View lines in S1 or the second line (in the setup menu) displaying of generator values.

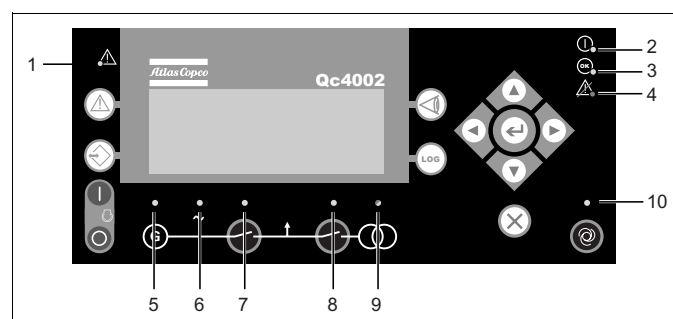


LEFT: Moves the cursor left for manoeuvring in the menus.



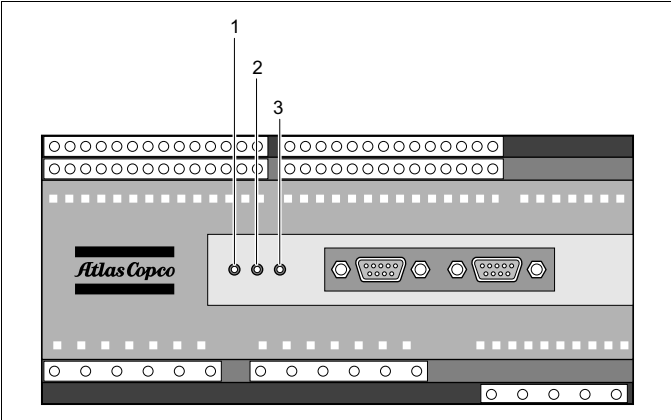
RIGHT: Moves the cursor right for manoeuvring in the menus.

Following LEDs are used on the Qc4002™



1	Alarm	LED flashing indicates that unacknowledged alarms are present. LED fixed light indicates that ALL alarms are acknowledged.
2	Power	LED indicates that the auxiliary supply is switched on.
3	Self check OK	LED indicates that the self check is OK.
4	Alarm inhibit	Please refer to 'Alarm inhibit' in the chapter 'Additional functions'.
5	Run	LED indicates that the generator is running.
6	Generator voltage	LED green light indicates that the voltage/frequency is present and OK.
7	(GB) ON	LED green light indicates that the generator breaker is closed. LED yellow light indicates that the generator breaker has received a command to close on a black BUS, but the breaker is not yet closed due to interlocking of the GB. LED is flashing orange if the 'Spring load time' signal from the breaker is missing.
8	(MB) ON	LED indicates that the mains breaker is closed.
9	Mains voltage	LED is green, if the mains is present and OK. LED is red at a measured mains failure. LED is flashing green when the mains returns during the 'mains OK delay' time.
10	Auto	LED indicates that auto mode is selected.

The main Qc4002™ control unit includes 3 LEDs



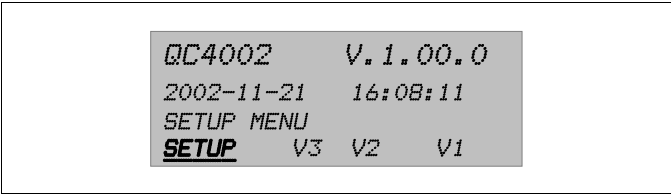
- 1 Power Green LED indicates that the voltage supply is switched on.
- 2 Self check OK Green LED indicates that the unit is OK.
- 3 Alarm inhibit Green LED indicates that the inhibit input is ON.

2.8.4 Qc4002™ Menu Overview

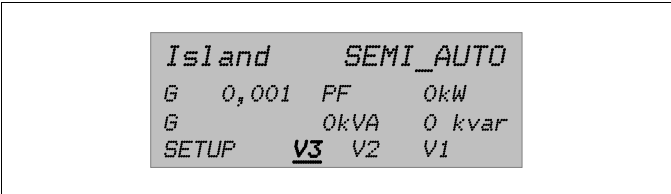
Main View

The display has 4 different lines. The information on these lines can change, depending on which view is used. There are 4 different main views possible: SETUP / V3 / V2 / V1.

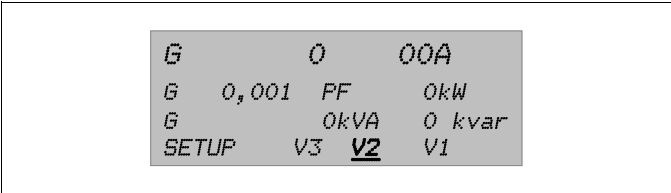
Setup view:



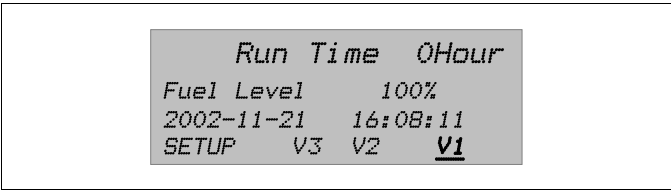
V3 view:



V2 view:



V1 view:



The user can scroll through these views with the scroll buttons:

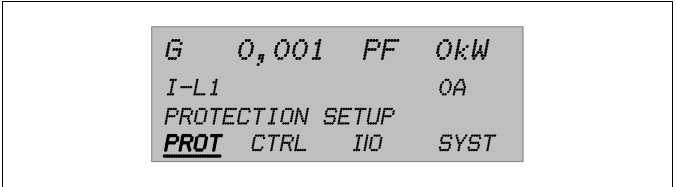
- The SETUP view shows the module name, the software version, the date and the time.
- The V3 view shows the application type and the mode, and some generator measurements. During synchronisation the V3 view will show a synchronoscope in the first line.
- The V2 view shows some generator measurements.
- In the V1 view the user can scroll up and down to 15 configurable screens showing different measurements of the generator, the bus and the Mains.

SETUP menu

The control and protection parameters can be programmed according the application. This can be done by scrolling through the setup menu to the appropriate parameter. Each parameter has a specific channel number and is listed in one of the 4 main SETUP menus:

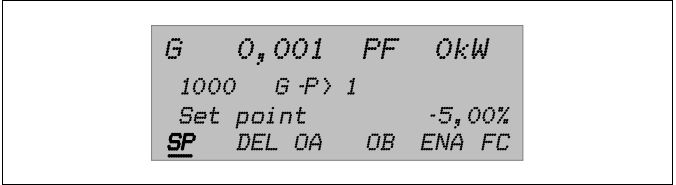
- Protection Setup (PROT): Channels from 1000 to 1999 (steps of 10)
- Control Setup (CTRL): Channels from 2000 to 2999 (steps of 10)
- Input/Output Setup (I/O): Channels from 3000 to 5999 (steps of 10)
- System Setup (SYST): Channels from 6000 and up (steps of 10)

If you select SETUP then you get the following view:



The fourth line is the entry selection for the Menu system. If the SEL button is pressed, the menu indicated with an underscore will be entered.

If PROT is selected, the following view will appear (example of parameter):



For a protective function the first entry shows the “Generator reverse power (G -P> 1)” setting.

Scrolling down will give all the protection parameters.

- The first line shows some generator data.
- The second line shows the channel number and the name of the parameter.
- The third line shows the value of a set point of this parameter.

- The fourth line shows the different possible set points. In this example:

SP	SET POINT, the alarm set point is adjusted in the set point menu. The setting is a percentage of the nominal values.
DEL	DELAY, the timer setting is the time that must expire from the alarm level is reached until the alarm occurs.
OA	OUTPUT A, a relay can be activated by output A.
OB	OUTPUT B, a relay can be activated by output B.
ENA	ENABLE, the alarm can be activated or deactivated. ON means always activated, RUN means that the alarm has run status. This means it is activated when the running signal is present.
FC	FAIL CLASS, when the alarm occurs the unit will react depending on the selected fail class.

The user can scroll to these choices and select one choice with the SEL button.

After selection of SP the following view will be visible:

```
G  0,001  PF  OkW
ENTER PASSWORD  2003
ENTER
```

If the correct password is entered, the following view appears:

```
G  0,001  PF  OkW
1001  G -P> 1
-50,0,,, -5,0,,, 0,0%
RESET      SAVE
```

Now the user can change the SP of parameter “G -P> 1”. This can be done with the scroll buttons. Then the user has to select SAVE to save the new settings.

To exit the user has to press the BACK button several times, until the main view appears.

The JUMP button

Instead of navigating through the entire menu, the user can jump directly to the required parameter, if he knows the channel number of that specific parameter.

If the JUMP button is pushed the password view will appear. Not all parameters can be changed by the end-user. The required password level for each parameter is given in the set point list.

The following menus can only be reached using the JUMP button:

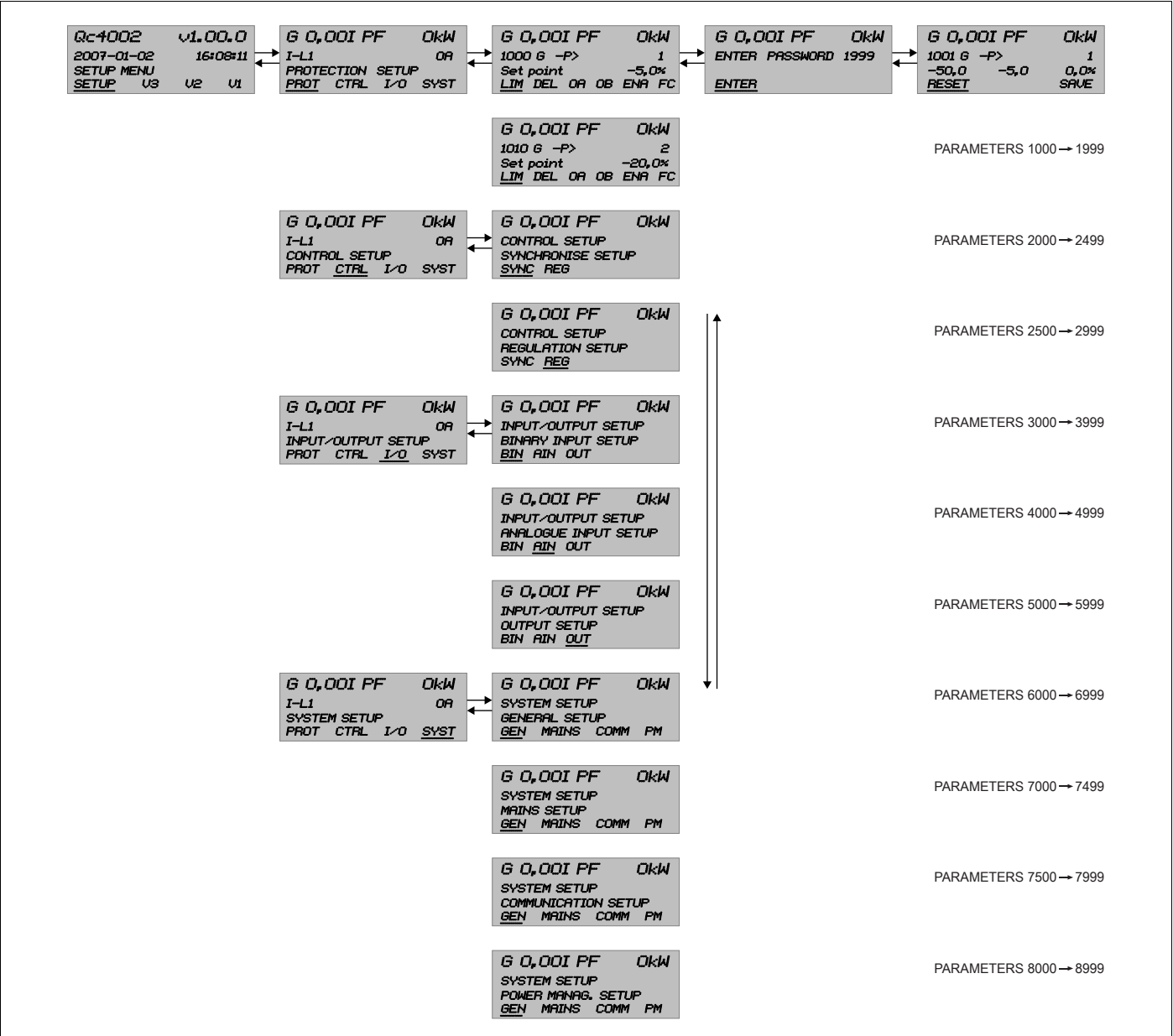
- 9000 Software version
- 9020 Service port
- 911X User password

Level 2 and Level 3 passwords can only be set through the Atlas Copco Utility Software' PC Software.

- 9120 Service menu
- 9130 Single/Split/Three phase
- 9140 Angle comp. BB/G

Use the up and down buttons to change the settings and the SEL button to store the new setting.

This is the described menu flow:



The menu flow is similar in the CONTROL SETUP, I/O SETUP and SYSTEM SETUP.



For more details on the Setup menu we refer to the Qc4002™ User manual.

Protection setup: overview of parameters (for correct values refer to controller)

1000	G -P> 1t	Customer Level
1001	Setpoint	-5%
1002	Delay	20s.
1003	Output A	Not Used
1004	Output B	Not Used
1005	Enable	Off
1006	Failclass	Warning

1010	G -P> 2	Service Level
1011	Setpoint	-20%
1012	Delay	5s.
1013	Output A	Not Used
1014	Output B	Not Used
1015	Enable	On
1016	Failclass	Trip+Stop

1030	G I>1	Customer Level
1031	Setpoint	110%
1032	Delay	60s.
1033	Output A	Not Used
1034	Output B	Not Used
1035	Enable	On
1036	Failclass	Warning

1040	G I>2	Service Level
1041	Setpoint	120%
1042	Delay	30s.
1043	Output A	Not Used
1044	Output B	Not Used
1045	Enable	On
1046	Failclass	Trip+Stop

1050	G I>3	Customer Level
1051	Setpoint	115%
1052	Delay	10s.
1053	Output A	Not Used
1054	Output B	Not Used
1055	Enable	Off
1056	Failclass	Warning

1060	G I> 4	Customer Level
1061	Setpoint	120%
1062	Delay	5s.
1063	Output A	Not Used
1064	Output B	Not Used
1065	Enable	Off
1066	Failclass	Trip+Stop

1130	G I>>1	Customer Level
1131	Setpoint	150%
1132	Delay	2s.
1133	Output A	Not Used
1134	Output B	Not Used
1135	Enable	Off
1136	Failclass	Trip+Stop

1140	G I>>2	Customer Level
1141	Setpoint	200%
1142	Delay	0.5s.
1143	Output A	Not Used
1144	Output B	Not Used
1145	Enable	Off
1146	Failclass	Trip+Stop

1150	G U>1	Customer Level
1151	Setpoint	110%
1152	Delay	5s.
1153	Output A	Not Used
1154	Output B	Not Used
1155	Enable	On
1156	Failclass	Warning

1160	G U>2	Master Level
1161	Setpoint	120%
1162	Delay	1s.
1163	Output A	Not Used
1164	Output B	Not Used
1165	Enable	On
1166	Failclass	Shutdown

1170	G U<1t	Customer Level
1171	Setpoint	90%
1172	Delay	10s.
1173	Output A	Not Used
1174	Output B	Not Used
1175	Enable	On
1176	Failclass	Warning

1180	G U<2	Service Level
1181	Setpoint	80%
1182	Delay	5s.
1183	Output A	Not Used
1184	Output B	Not Used
1185	Enable	On
1186	Failclass	Trip+Stop

1190	G U<3	Customer Level
1191	Setpoint	95%
1192	Delay	5s.
1193	Output A	Not Used
1194	Output B	Not Used
1195	Enable	Off
1196	Failclass	Warning

1200	G voltage trip	Service Level
1201	Type	Phase-Phase

1210	G f>1	Customer Level
1211	Setpoint	110%
1212	Delay	5s.
1213	Output A	Not Used
1214	Output B	Not Used
1215	Enable	On
1216	Failclass	Warning

1220	G f>2	Master Level
1221	Setpoint	120%
1222	Delay	1s.
1223	Output A	Not Used
1224	Output B	Not Used
1225	Enable	On
1226	Failclass	Shutdown

1230	G f>3	Customer Level
1231	Setpoint	105%
1232	Delay	5s.
1233	Output A	Not Used
1234	Output B	Not Used
1235	Enable	Off
1236	Failclass	Warning

1240	G f<1	Customer Level
1241	Setpoint	90%
1242	Delay	10s.
1243	Output A	Not Used
1244	Output B	Not Used
1245	Enable	On
1246	Failclass	Warning

1250	G f<2	Service Level
1251	Setpoint	80%
1252	Delay	5s.
1253	Output A	Not Used
1254	Output B	Not Used
1255	Enable	On
1256	Failclass	Trip+Stop

1260	G f<3	Customer Level
1261	Setpoint	95%
1262	Delay	5s.
1263	Output A	Not Used
1264	Output B	Not Used
1265	Enable	Off
1266	Failclass	Warning

1270	BB U>1	Customer Level
1271	Setpoint	103%
1272	Delay	10s.
1273	Output A	Not Used
1274	Output B	Not Used
1275	Enable	Off
1276	Failclass	Warning

1280	BB U>2	Customer Level
1281	Setpoint	105%
1282	Delay	5s.
1283	Output A	Not Used
1284	Output B	Not Used
1285	Enable	Off
1286	Failclass	Warning

1290	BB U>3	Customer Level
1291	Setpoint	105%
1292	Delay	5s.
1293	Output A	Not Used
1294	Output B	Not Used
1295	Enable	Off
1296	Failclass	Warning

1300	BB U<1	Customer Level
1301	Setpoint	97%
1302	Delay	10s.
1303	Output A	Not Used
1304	Output B	Not Used
1305	Enable	Off
1306	Failclass	Warning

1310 BB U<2 Customer Level

1311	Setpoint	95%
1312	Delay	5s.
1313	Output A	Not Used
1314	Output B	Not Used
1315	Enable	Off
1316	Failclass	Warning

1320 BB U<3 Customer Level

1321	Setpoint	97%
1322	Delay	10s.
1323	Output A	Not Used
1324	Output B	Not Used
1325	Enable	Off
1326	Failclass	Warning

1330 BB U<4 Customer Level

1331	Setpoint	95%
1332	Delay	5s.
1333	Output A	Not Use
1334	Output B	Not Used
1335	Enable	Off
1336	Failclass	Warning

1340 BB voltage trip Service Level

1341	Type	Phase Phase
------	------	-------------

1350 BB f>1 Customer Level

1351	Setpoint	103%
1352	Delay	10s.
1353	Output A	Not Used
1354	Output B	Not Used
1355	Enable	Off
1356	Failclass	Warning

1360 BB f>2 Customer Level

1361	Setpoint	105%
1362	Delay	5s.
1363	Output A	Not Used
1364	Output B	Not Used
1365	Enable	Off
1366	Failclass	Warning

1370 BB f>3 Customer Level

1371	Setpoint	105%
1372	Delay	5s.
1373	Output A	Not Used
1374	Output B	Not Used
1375	Enable	Off
1376	Failclass	Warning

1380 BB f<1 Customer Level

1381	Setpoint	97%
1382	Delay	10s.
1383	Output A	Not Used
1384	Output B	Not Used
1385	Enable	Off
1386	Failclass	Warning

1390 BB f<2 Customer Level

1391	Setpoint	95%
1392	Delay	5s.
1393	Output A	Not Used
1394	Output B	Not Used
1395	Enable	Off
1396	Failclass	Warning

1400 BB f<3 Customer Level

1401	Setpoint	97%
1402	Delay	10s.
1403	Output A	Not Used
1404	Output B	Not Used
1405	Enable	Off
1406	Failclass	Warning

1410 BB f<4 Customer Level

1411	Setpoint	95%
1412	Delay	5s.
1413	Output A	Not Used
1414	Output B	Not Used
1415	Enable	Off
1416	Failclass	Warning

1420 Δf/Δt (ROCOF) Customer Level

1421	Setpoint	5Hz/s.
1422	Delay	6 per.
1423	Output A	Not Used
1424	Output B	Not Used
1425	Enable	Off
1426	Failclass	Trip MB

1430 Vector jump Customer Level

1431	Setpoint	10deg.
1432	Output A	Not Used
1433	Output B	Not Used
1444	Enable	Off
1455	Failclass	Trip MB

1450 G P>1 Customer Level

1451	Setpoint	110%
1452	Delay	60s.
1453	Output A	Not Used
1454	Output B	Not Used
1455	Enable	On
1456	Failclass	Warning

1460 G P>2 Service Level

1461	Setpoint	120%
1462	Delay	30s.
1463	Output A	Not Used
1464	Output B	Not Used
1465	Enable	On
1466	Failclass	Trip+Stop

1470 G P>3 Customer Level

1471	Setpoint	100%
1472	Delay	10s.
1473	Output A	Not Used
1474	Output B	Not Used
1475	Enable	Off
1476	Failclass	Warning

1480 G P>4 Customer Level

1481	Setpoint	110%
1482	Delay	5s.
1483	Output A	Not Used
1484	Output B	Not Used
1485	Enable	Off
1486	Failclass	Warning

1490 G P>5 Customer Level

1491	Setpoint	100%
1492	Delay	10s.
1493	Output A	Not Used
1494	Output B	Not Used
1495	Enable	Off
1496	Failclass	Warning

1500 Unbalance curr. Customer Level

1501	Setpoint	30%
1502	Delay	10s.
1503	Output A	Not Used
1504	Output B	Not Used
1505	Enable	On
1506	Failclass	Warning

1510 Unbalance volt. Customer Level

1511	Setpoint	10%
1512	Delay	5s.
1513	Output A	Not Used
1514	Output B	Not Used
1515	Enable	On
1516	Failclass	Warning

1520 G -Q> Customer Level

1521	Setpoint	50%
1522	Delay	10s.
1523	Output A	Not Used
1524	Output B	Not Used
1525	Enable	On
1526	Failclass	Warning

1530 G Q> Customer Level

1531	Setpoint	50%
1532	Delay	10s.
1533	Output A	Not Used
1534	Output B	Not Used
1535	Enable	On
1536	Failclass	Warning

Control setup: overview of parameters

Synchronisation

2000	Sync. type	Customer Level
2001	Type	<i>Dynamic Sync.</i>

2020	Dynamic sync.	Service Level
2021	Δf Max	<i>0.3Hz</i>
2022	Δf Min	<i>0.0Hz</i>
2023	ΔU Max	<i>5%</i>
2024	t GB	<i>75ms</i>
2025	t MB	<i>75ms</i>

2030	Static sync.	
2031	Δf Max	<i>0.10Hz</i>
2032	ΔU Max	<i>5%</i>
2033	Angle	<i>10.0deg.</i>
2034	Close delay	<i>1s.</i>

2040	f sync. control	Service Level
2041	Kp	<i>10.00</i>
2042	Ti	<i>5.00s.</i>
2043	Td	<i>0.00s.</i>

2060	Phase control	Service Level
2061	Kp	<i>0.50</i>
2062	Ti	<i>5.00s.</i>
2063	T	<i>0.00s.</i>

2110	Sync. blackout	Service Level
2111	Δf Max	<i>3.0Hz</i>
2112	ΔU Max	<i>5%</i>

2120	Sync. window	Customer Level
2121	Setpoint	<i>+/-15%</i>
2122	Delay	<i>0.5s.</i>
2123	Output A	<i>Not Used</i>
2124	Output B	<i>Not Used</i>
2125	Enable	<i>Off</i>

2130	GB sync failure	Customer Level
2131	Delay	<i>60s.</i>
2132	Output A	<i>Not Used</i>
2133	Output B	<i>Not Used</i>
2134	Enable	<i>On</i>
2135	Failclass	<i>Warning</i>

2140	MB sync failure	Customer Level
2141	Delay	<i>60s.</i>
2142	Output A	<i>Not Used</i>
2143	Output B	<i>Not Used</i>
2144	Enable	<i>On</i>
2145	Failclass	<i>Warning</i>

2150	Phase seq error	Customer Level
2151	Output A	<i>Not Used</i>
2152	Output B	<i>Not Used</i>
2153	Failclass	<i>Warning</i>

2160	GB open fail	Service Level
2161	Delay	<i>2s.</i>
2162	Output A	<i>Not Used</i>
2163	Output B	<i>Not Used</i>
2164	Enable	<i>On</i>
2165	Failclass	<i>Warning</i>

2170	GB close fail	Service Level
2171	Delay	<i>2s.</i>
2172	Output A	<i>Not Used</i>
2173	Output B	<i>Not Used</i>
2174	Enable	<i>On</i>
2175	Failclass	<i>Warning</i>

2180	GB pos. fail	Master Level
2181	Delay	<i>1s.</i>
2182	Output A	<i>Not Used</i>
2183	Output B	<i>Not Used</i>
2184	Enable	<i>On</i>
2185	Failc	<i>Warning</i>

2200	MB open fail	Service Level
2201	Delay	<i>2s.</i>
2202	Output A	<i>Not Used</i>
2203	Output B	<i>Not Used</i>
2204	Enable	<i>On</i>
2205	Failclass	<i>Warning</i>

2210	MB close fail	Service Level
2211	Delay	<i>2s.</i>
2212	Output A	<i>Not Used</i>
2213	Output B	<i>Not Used</i>
2214	Enable	<i>On</i>
2215	Failclass	<i>Warning</i>

2220	MB pos. fail	Master Level
2221	Delay	<i>1</i>
2222	Output A	<i>Not Used</i>
2223	Output B	<i>Not Used</i>
2224	Enable	<i>On</i>
2225	Failclass	<i>Warning</i>

2240	Sep. sync. relay	Customer Level
2241	GB	<i>Not Used</i>
2242	MB	<i>Not Used</i>

2250	Close bef. exc.	Customer Level
2251	Setpoint	<i>400rpm</i>
2252	Delay	<i>5.0s.</i>
2253	Output A	<i>Not Used</i>
2254	Enable	<i>Off</i>

2260	Breaker seq.	Customer Level
2261	Break	<i>Close GB</i>
2262	Delay	<i>5.0s.</i>
2263	Rpm OK	<i>1450rpm</i>

2270	Cl.bef.exc.fail	Customer Level
2271	Delay	<i>5.0s.</i>
2272	Output A	<i>Not Used</i>
2273	Output B	<i>Not Used</i>
2274	Enable	<i>Off</i>
2275	Failclass	<i>Warning</i>

Regulation

2510	f control	Customer Level	2620	Power ramp down	Customer Level	2680	AVR reg. fail	Customer Level
2511	Kp	7.50	2621	Ramp	10%/s.	2681	Deadband	30%
2512	Ti	1.00s.	2622	Breaker Open	5%	2682	Delay	60s.
2513	Td	0.25s.	2630	Deload error	Customer Level	2683	Output A	Not Used
2530	P control	Customer Level	2631	Delay	20s.	2684	Output B	Not Used
2531	Kp	7.50	2632	Output A	Not Used	2740	Delay reg.	Customer Level
2532	Ti	1.00s.	2633	Output B	Not Used	2741	Delay	3s.
2533	Td	0.25s.	2634	Enable	On	2742	Output A	Not Used
2540	P load sh. ctrl	Customer Level	2635	Failclass	Warning	2743	Output B	Not Used
2541	Kp	7.50	2640	U control	Customer Level	2744	Enable	On
2542	Ti	1.00s.	2641	Kp	3.00	2780	Reg. output	Service Level
2543	Td	0.25s.	2642	Ti	2.00s.	2781	GOV	Analog
2544	Pw	10%	2643	Td	0.00s.	2782	AVR	Analog
2550	Analogue GOV	Customer Level	2650	Q control	Customer Level	2900	f - Regulation	Customer Level
2551	Offset	50%	2651	Kp	3.00	2901	Type	Internal
2560	GOV reg. fail	Customer Level	2652	Ti	2.00s.	2902	Droop	0%
2561	Deadband	30%	2653	Td	0.00s.	2903	EA-	98%
2562	Delay	60s.	2660	Q load sh. ctrl	Customer Level	2904	EA+	102%
2563	Output A	Not Used	2661	Kp	3.00	2905	EP-	0.0mA
2564	Output B	Not Used	2662	Ti	2.00s.	2905	EP+	20.0mA
2610	Power ramp up	Customer Level	2663	Td	0.00s.	2910	U - Regulation	Customer Level
2611	Ramp	10%/	2664	Qw	10%	2911	Type	Internal
2612	Point	10%	2670	Analogue AVR offset	Customer Level	2912	Droop	0%
2613	Delay	0s.	2671	Offset	50%	2913	EA-	95%
						2914	EA+	105%
						2915	EP-	-20.0mA
						2915	EP+	20.0mA

I/O setup: overview of parameters

Binary input setup

3**0	Dig. input ***	Customer Level	3410	Dig. Input	Customer Level	3490	Emergency stop	Master Level
3**1	Delay	10s.	3411	Wirebreak	Off	3491	Delay	0s.
3**2	Output A	Not Used	3412	Delay	10s.	3492	Output A	Not Used
3**3	Output B	Not Used	3413	Output A	Not Used	3493	Output B	Not Used
3**4	Enable	Off	3414	Output B	Not Used	3494	Enable	On
3**5	Failclass	Warning	3415	Enable	Off	3495	Failclass	Shutdown
3**6	High Alarm	On (N/O)	3416	Failclass	Warning			
** = 00, 01, 02, 03, 04, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 43, 45, 46, 47, 48			3420	Dig. Input	Customer Level			
3400	Dig. Input	Customer Level	3421	Wirebreak	Off			
3401	Wirebreak	Off	3422	Delay	10s.			
3402	Delay	10s.	3423	Output A	Not Used			
3403	Output A	Not Used	3424	Output B	Not Used			
3404	Output B	Not Used	3425	Enable	Off			
3405	Enable	Off	3426	Failclass	Warning			
3406	Failclass	Warning						

Analogue input setup

41*0 4-20mA 102.* Customer Level

41*1	Setpoint	10mA
41*2	Delay	10s.
41*3	Output A	Not Used
41*4	Output B	Not Used
41*5	Enable	Off
41*6	Failclass	Warning
41*7	High Alarm	On

* = 2, 3

42*0 4-20mA 105.* Customer Level

42*1	Setpoint	10mA
42*2	Delay	10s.
42*3	Output A	Not Used
42*4	Output B	Not Used
42*5	Enable	Off
42*6	Failclass	Warning
42*7	High Alarm	On

* = 5, 6

43*0 4-20mA 108.* Customer Level

43*1	Setpoint	10mA
43*2	Delay	10s.
43*3	Output A	Not Used
43*4	Output B	Not Used
43*5	Enable	Off
43*6	Failclass	Warning
43*7	High Alarm	On

* = 8, 9

41*0 V DC 102.* Customer Level

41*1	Setpoint	20VDC
41*2	Delay	10s.
41*3	Output A	Not Used
41*4	Output B	Not Used
41*5	Enable	Off
41*6	Failclass	Warning
41*7	High Alarm	On

* = 4, 5

42*0 V DC 105.* Customer Level

42*1	Setpoint	20VDC
42*2	Delay	10s.
42*3	Output A	Not Used
42*4	Output B	Not Used
42*5	Enable	Off
42*6	Failclass	Warning
42*7	High Alarm	On

* = 7, 8

44*0 V DC 108.* Customer Level

44*1	Setpoint	20VDC
44*2	Delay	10s.
44*3	Output A	Not Used
44*4	Output B	Not Used
44*5	Enable	Off
44*6	Failclass	Warning
44*7	High Alarm	On

* = 0, 1

41*0 PT 102.* Customer Level

41*1	Setpoint	80°C
41*2	Delay	5s.
41*3	Output A	Not Used
41*4	Output B	Not Used
41*5	Enable	Off
41*6	Failclass	Warning
41*7	High Alarm	On

* = 6, 7

4**0 PT 105.* Customer Level

4**1	Setpoint	80°C
4**2	Delay	5s.
4**3	Output A	Not Used
4**4	Output B	Not Used
4**5	Enable	Off
4**6	Failclass	Warning
4**7	High Alarm	On

** = 29, 30

44*0 PT 108.* Customer Level

44*1	Setpoint	80°C
44*2	Delay	5s.
44*3	Output A	Not Used
44*4	Output B	Not Used
44*5	Enable	Off
44*6	Failclass	Warning
44*7	High Alarm	On

* = 2, 3

41*0 VDO oil 102.* Customer Level

41*1	Setpoint	4,0bar
41*2	Delay	5s.
41*3	Output A	Not Used
41*4	Output B	Not Used
41*5	Enable	Off
41*6	Failclass	Warning
41*7	High Alarm	Off

* = 8, 9

43*0 VDO oil 105.* Customer Level

43*1	Setpoint	4,0bar
43*2	Delay	5s.
43*3	Output A	Not Used
43*4	Output B	Not Used
43*5	Enable	Off
43*6	Failclass	Warning
43*7	High Alarm	Off

* = 1, 2

44*0 VDO oil 108.* Customer Level

44*1	Setpoint	4,0bar
44*2	Delay	5s.
44*3	Output A	Not Used
44*4	Output B	Not Used
44*5	Enable	Off
44*6	Failclass	Warning
44*7	High Alarm	Off

* = 4, 5

42*0 VDO water 102.* Customer Level

41*1	Setpoint	100°C
41*2	Delay	5s.
41*3	Output A	Not Used
41*4	Output B	Not Used
41*5	Enable	Off
41*6	Failclass	Warning
41*7	High Alarm	On

* = 0, 1

43*0 VDO water 105.* Customer Level

43*1	Setpoint	100°C
43*2	Delay	5s.
43*3	Output A	Not Used
43*4	Output B	Not Used
43*5	Enable	Off
43*6	Failclass	Warning
43*7	High Alarm	On

* = 3, 4

44*0 VDO water 108.* Customer Level

44*1	Setpoint	80°C
44*2	Delay	5s.
44*3	Output A	Not Used
44*4	Output B	Not Used
44*5	Enable	Off
44*6	Failclass	Warning
44*7	High Alarm	On

* = 6, 7

42*0 VDO fuel 102.* Customer Level

42*1	Setpoint	10%
42*2	Delay	10s.
42*3	Output A	Not Used
42*4	Output B	Not Used
42*5	Enable	Off
42*6	Failclass	Warning
42*7	High Alarm	Off

* = 2, 3

43*0 VDO fuel 105.* Customer Level

43*1	Setpoint	10%
43*2	Delay	10s.
43*3	Output A	Not Used
43*4	Output B	Not Used
43*5	Enable	Off
43*6	Failclass	Warning
43*7	High Alarm	Off

* = 5, 6

44*0 VDO fuel 108.* Customer Level

44*1	Setpoint	10%
44*2	Delay	10s.
44*3	Output A	Not Used
44*4	Output B	Not Used
44*5	Enable	On
44*6	Failclass	Warning
44*7	High Alarm	Off

* = 8, 9

4240	W. fail 102	Customer Level
4241	Output A	<i>Not Used</i>
4242	Output B	<i>Not Used</i>
4243	Enable	<i>Off</i>
4244	Failclass	<i>Warning</i>

4370	W. fail 105	Customer Level
4371	Output A	<i>Not Used</i>
4372	Output B	<i>Not Used</i>
4373	Enable	<i>Off</i>
4374	Failclass	<i>Warning</i>

4500	W. fail 108	Customer Level
4501	Output A	<i>Not Used</i>
4502	Output B	<i>Not Used</i>
4503	Enable	<i>Off</i>
4504	Failclass	<i>Warning</i>

4510	Overspeed 1	Service Level
4511	Setpoint	<i>110%</i>
4512	Delay	<i>2s.</i>
4513	Output A	<i>Not Used</i>
4514	Output B	<i>Not Used</i>
4515	Enable	<i>On</i>
4516	Failclass	<i>Shutdown</i>

4520	Overspeed 2	Customer Level
4521	Setpoint	<i>120%</i>
4522	Delay	<i>1s.</i>
4523	Output A	<i>Not Used</i>
4524	Output B	<i>Not Used</i>
4525	Enable	<i>Off</i>
4526	Failclass	<i>Shutdown</i>

4530	Crank failure	Customer Level
4531	Setpoint	<i>50rpm</i>
4532	Delay	<i>2s.</i>
4533	Output A	<i>Not Used</i>
4534	Output B	<i>Not Used</i>

4540	Run feedb. fail	Customer Level
4541	Delay	<i>2s.</i>
4542	Output A	<i>Not Used</i>
4543	Output B	<i>Not Used</i>
4544	Enable	<i>Off</i>
4545	Failclass	<i>Warning</i>

4550	MPU wirebreak	Customer Level
4551	Output A	<i>Not Used</i>
4552	Output B	<i>Not Used</i>
4553	Enable	<i>Off</i>
4554	Failclass	<i>Warning</i>

4560	Hz/V failure	Service Level
4561	Delay	<i>30s.</i>
4562	Output A	<i>Not Used</i>
4563	Output B	<i>Not Used</i>
4564	Enable	<i>On</i>
4565	Failclass	<i>Warning</i>

4570	Start failure	Service Level
4571	Output A	<i>Not Used</i>
4572	Output B	<i>Not Used</i>
4573	Failclass	<i>Shutdown</i>

4580	Stop failure	Service Level
4581	Delay	<i>30s.</i>
4582	Output A	<i>Not Used</i>
4583	Output B	<i>Not Used</i>
4584	Enable	<i>On</i>
4585	Failclass	<i>Warning</i>

4960	U< aux. term. 1	Customer Level
4961	Setpoint	<i>9V</i>
4962	Delay	<i>30s.</i>
4963	Output A	<i>Not Used</i>
4964	Output B	<i>Not Used</i>
4965	Enable	<i>On</i>
4966	Failclass	<i>Warning</i>

4970	U> aux. term. 1	Customer Level
4971	Setpoint	<i>15V</i>
4972	Delay	<i>2s.</i>
4973	Output A	<i>Not Used</i>
4974	Output B	<i>Not Used</i>
4975	Enable	<i>On</i>
4976	Failclass	<i>Warning</i>

4980	U< aux. term.98	Customer Level
4981	Setpoint	<i>9V</i>
4982	Delay	<i>30s.</i>
4983	Output A	<i>Not Used</i>
4984	Output B	<i>Not Used</i>
4985	Enable	<i>On</i>
4986	Failclass	<i>Warning</i>

4990	U> aux. term.98	Customer Level
4991	Setpoint	<i>15V</i>
4992	Delay	<i>2s.</i>
4993	Output A	<i>Not Used</i>
4994	Output B	<i>Not Used</i>
4995	Enable	<i>On</i>
4996	Failclass	<i>Warning</i>

Output setup

5**0	Relay **	Customer Level
5**1	Function	<i>Alarm</i>
5**2	Off Delay	<i>5s.</i>

** = 00, 01, 02, 03, 04, 05, 06, 11, 12, 13, 14

5780	AOut 66 limits	Service Level
5781	Min. Limit	<i>2mA</i>
5782	Max. Limit	<i>20mA</i>

5790	AOut 71 limits	Service Level
5781	Min. Limit	<i>-25mA</i>
5782	Max. Limit	<i>+25mA</i>

5**0	** output *	Service Level
5**1	Analog Output	<i>Disabled</i>
5**2	Analog Output	<i>Disabled</i>
5**3	Type	<i>4-20mA</i>
5**4	Max.	<i>***</i>
5**5	Min.	<i>***</i>

** = 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95

5980	Governor output	Service Level
5981	Transducer	<i>66</i>

5990	AVR output	Service Level
5991	Transducer	<i>71</i>

System setup: overview of parameters

General setup

6000	Nom. settings		Customer Level
	6001	Frequency	50Hz
	6002	Power	150kW
	6003	Current	215A
	6004	Voltage	400V
	6005	Speed	1500rpm
6010	Nom. settings 2		Customer Level
	6011	Frequency	60Hz
	6012	Power	178kW
	6013	Current	215A
	6014	Voltage	480V
	6015	Speed	1800rpm
60*0	Nom. settings *		Customer Level
	60*1	Frequency	**Hz
	60*2	Power	***kW
	60*3	Current	***A
	60*4	Voltage	***V
	60*5	Speed	****rpm
** = 00, 01, 02, 03			
6040	G transformer		Service Level
	6041	U Primary	440V
	6042	U Secondary	440V
	6043	I Primary	300A
	6044	I Secondary	5A
6050	BB settings p		Customer Level
	6051	U Primary	440V
	6052	U Secondary	440V
6070	Gen-set mode		Customer Level
	6071	Type	Island
6080	Language		Customer Level
	6081	Type	English Qc
6100	Counters		Master Level
	6101	Abs. Run Hours	0
	6102	Abs. Th. Run Hours	0
	6103	GB Operations	0
	6104	MB Operations	0
	6105	kWh Reset	Off
	6106	Start Attempts	0
61*0	Service timer *		Service Level
	61*1	Run Hours	500h
	61*2	Days	365
	61*3	Failclass	Warning
	61*4	Output A	Not Used
	61*5	Enable	On
	61*6	Reset	Off
* = 1, 2			
6130	Alarm horn		Customer Level
	6131	Delay	20s
6160	Run status		Customer Level
	6161	Delay	5s.
	6162	Output A	Not Used
	6163	Output B	Not Used
	6164	Enable	Off
	6165	Failclass	Warning
6170	Running detect.		Customer Level
	6171	Number of Teeth	0
	6172	Run. detect type	EIC
	6173	Run. detection	800rpm
	6174	Remove starter	700rpm
6180	Starter		Customer Level
	6181	Start prepare	0s.
	6182	Ext. start prepare	0s.
	6183	Start ON time	12s.
	6184	Start OFF time	12s.
6190	Start attempts		Customer Level
	619 1	Setpoint	3
6210	Stop		Customer Level
	6211	Cooldown	60s.
	6212	Ext. stop time	5s.
6220	Hz/V OK		Customer Level
	6221	Timer	5s.
6230	GB control		Customer Level
	6231	GB Close Delay	1s.
	6232	GB Load Time	2s.
6260	Power derate		Customer Level
	6261	Input	EIC
	6262	Start Derate @	105 C
	6263	Derate Slope	5%/ C
	6264	Enable	Off
	6265	Derate Limit	75%
6280	Int. comm. fail		Customer Level
	6281	Output A	Not Used
	6282	Output B	Not Used
	6283	Enable	On
	6284	Failclass	Warning
6320	Engine heater		Customer Level
	6321	Setpoint	40 C
	6322	Output A	Not Used
	6323	Input Type	MI 102
	6324	Hysteresis	3 C
	6325	Enable	Off
6330	Engine heater 1		Customer Level
	6331	Setpoint	30 C
	6332	Delay	10s.
	6333	Output A	Not Used
	6334	Output B	Not Used
	6335	Enable	Off
	6336	Failclass	Warning
6380	Load share output		Customer Level
	6381	Setpoint	4V
6390	Load share type		Customer Level
	6391	Type	Adjustable
6400	Master clock		Customer Level
	6401	Start Hour	8h
	6402	Stop Hour	8h
	6403	Difference	20s.
	6404	Compensation	0,1Hz
	6405	Enable	Off
6410	Battery test		Customer Level
	6411	Setpoint	8V
	6412	Delay	20s.
	6413	Type	Power Supply
	6414	Output A	Not Used
	6415	Enable	Off
	6416	Failclass	Warning
6420	Auto batt. test		Customer Level
	6421	Enable	Off
	6422	Day	Monday
	6423	Hours	10h
	6424	Weeks	52
	6425	Relay	Start Relay
6460	Max. ventilation		Customer Level
	6461	Setpoint	90 C
	6462	Output A	Not Used
	6463	Hysteresis	5 C
	6464	Enable	Off
64*0	Max. vent. *		Customer Level
	64*1	Setpoint	95 C
	64*2	Delay	1s.
	64*3	Output A	Not Used
	64*4	Output B	Not Used
	64*5	Enable	Off
	64*6	Failclass	Warning
* = 7, 8			
6490	Sum/Win time		Customer Level
	6491	Enable	Off
6500	Blk. swbd error		Customer Level
	6501	Delay	1s.
	6502	Parallel	Off
	6503	Output A	Not Used
	6504	Output B	Not Used
	6505	Enable	Off
	6506	Failclass	Warning
6510	Stp. swbd error		Customer Level
	6511	Delay	1s.
	6512	Output A	Not Used
	6513	Output B	Not Used
	6514	Enable	Off
	6515	Failclass	Warning

6540 Not in auto Customer Level

6541	Delay	20s.
6542	Output A	Not Used
6543	Output B	Not Used
6544	Enable	Off
6545	Failclass	Warning

6550 Fuel pump logic Customer Level

6551	Setpoint 1	20%
6552	Setpoint 2	80%
6553	Fill Check Delay	60s.
6554	Output A	Not Used
6555	Measuring Input	MI 108
6556	Failclass	Warning

66*0 Start/Stop Cmd * Customer Level

66*1	Enable	Off
66*2	Type	Stop
66*3	Day	Mo-Tu-We-Th-Fr-Sa-Su
66*4	Hour	10h
66*5	Minute	10

* = 0, 1, 2, 3, 4, 5, 6, 7

Mains setup

7000 Mains power Customer Level

7001	Day setting	750kW
7002	Night setting	1000kW
7003	Transducer range max.	1500kW
7004	Transducer range min.	-1500kW

7010 Daytime period Customer Level

7011	Start Hour	8h
7012	Start Minute	0'
7013	Stop Hour	16h
7014	Stop Minute	0'

7020 Start generator Customer Level

7021	Setpoint	80%
7022	Timer	10s.
7023	Minimum load	5%

7030 Stop generator Customer Level

7031	Setpoint	60%
7032	Timer	30s.

7040 Test Customer Level

7041	Setpoint	50%
7042	Timer	300s
7043	Return mode	Auto
7044	Type	Simple

7050 Fixed power test Customer Level

7051	Power	50%
7052	Power Factor	0,98.

7060 U mains failure Customer Level

7061	Fail Delay	2s.
7062	Mains OK Delay	60s.
7063	U<	90%
7064	U>	110%
7065	Mains Fail Control	Start + Open MB

7070 f mains failure Customer Level

7071	Fail Delay	2s.
7072	Mains OK Delay	60s.
7073	f<	95%
7074	f>	105%

7080 MB control Customer Level

7081	Mode shift	Off
7082	MB close delay	1s.
7083	Backsync	Off
7084	Sync to mains	On
7085	Breaker type	MB
7086	MB load time	1s.

Communication setup

7500 Comm. control Service Level

7501	Power	Off
7502	Frequency	Off
7503	Voltage	Off
7504	PF	Off
7505	Reactive power	Off

7510 Ext. comm. Customer Level

7511	ID	1
7512	Speed	9600
7513	Mode	RTU

7520 Ext. comm. error Customer Level

7521	Timer	10s.
7522	Output A	Not Used
7523	Output B	Not Used
7524	Enable	Off
7525	Failclass	Warning

7530 Int. comm. Customer Level

7531	ID	1
7532	Fail mode	Manual
7533	FC missing all units	Warning
7534	FC fatal Can error	Warning
7535	FC any DG missing	Warning
7536	FC any mains missing	Warning

7540 CAN I/F 1 Service Level

7541	Type	Engine
------	------	--------

7550 CAN I/F 2 Service Level

7551	Type	PMS
------	------	-----

7560 Engine I/F Service Level

7561	Type	EMR
------	------	-----

7570 EI comm. error Customer Level

7571	Timer	0s.
7572	Output A	Not Used
7573	Output B	Not Used
7574	Enable	Off
7575	Failclass	Warning

7580 EIC warning Customer Level

7581	Timer	0s.
7582	Output A	Not Used
7583	Output B	Not Used
7584	Enable	Off
7585	Failclass	Warning

7590 EIC shutdown Customer Level

7591	Timer	1s.
7592	Output A	Not Used
7593	Output B	Not Used
7594	Enable	On
7595	Failclass	Shutdown

7600 EIC overspeed Customer Level

7601	Setpoint	1900rpm
7602	Timer	1s.
7603	Output A	Not Used
7604	Output B	Not Used
7605	Enable	On
7606	Failclass	Shutdown

7610 EIC coolant T1 Customer Level

7611	Setpoint	100°C
7612	Timer	5s.
7613	Output A	Not Used
7614	Output B	Not Used
7615	Enable	Off
7616	Failclass	Warning

7620 EIC coolant T2 Customer Level

7621	Setpoint	110°C
7622	Timer	5s.
7623	Output A	Not Used
7624	Output B	Not Used
7625	Enable	Off
7626	Failclass	Warning

7630 EIC oil press. 1 Customer Level

7631	Setpoint	2bar
7632	Timer	5s.
7633	Output A	Not Used
7634	Output B	Not Used
7635	Enable	Off
7636	Failclass	Warning

7640 EIC oil press. 2 Customer Level

7641	Setpoint	1bar
7642	Timer	5s.
7643	Output A	Not Used
7644	Output B	Not Used
7645	Enable	Off
7646	Failclass	Warning

Power management setup: overview of parameters

8000	Load dep. start	Customer Level
8001	Setpoint	100kW
8002	Timer	10s.
8003	Minimum load	20kW

8010	Load dep. stop	Customer Level
8011	Setpoint	180kW
8012	Timer	30s.

8020	PMS config.	Customer Level
8021	DG's available	1
8022	Mains available	No mains
8023	PMS active	Off
8024	Start/Stop	Local
8025	Command Unit	On

8030	Priority select	Customer Level
8031	Priority	Manual
8032	Multistart set 1	Auto calculation
8033	Minimum running set 1	1
8034	Multistar configuration	Set 1
8035	Multistart set 2	Start 16 DG's
8036	Minimum running set 2	1

80*0	Number of IDs	Customer Level
80*1	ID1	On
80*2	ID2	Off
80*3	ID3	Off
80*4	ID4	Off
80*5	ID5	Off
80*6	ID6	Off

* = 4, 5, 6, 7

8**0	Priority	Customer Level
8**1	P1	1
8**2	P2	2
8**3	P3	3
8**4	P4	4
8**5	P5	5
8**6	Tx	Off

* = 08, 09, 10

8110	Running hours	Customer Level
8111	Priority adjustment	175h
8112	Type	Absolute hours
8113	Reset relative counter	Off

8120	Ground relay	Customer Level
8121	Output A	Not used
8122	Output B	Not used
8123	Enable	Off

8140	Stop non-con. DG	Customer Level
8141	Timer	60s.

8170	Fuel optimize	Customer Level
8171	Setpoint	80%
8172	Swap setpoint	200kW
8173	Timer	10s.
8174	Hours	175h
8175	Enable	Off

82*0	Avail. power*	Customer Level
82*1	Setpoint	1000kW
82*2	Timer	10s.
82*3	Output A	Not used
82*4	Output B	Not used
82*5	Enable	Off

* = 2, 3, 4, 5, 6

2.8.5 Passwords

Changing different parameters requires different password levels. Some parameters cannot be changed by the end-customer because of safety reasons.

There are 4 different password levels:

- No password
- User password (default setting 2003)
- Service password
- Master password

Once the password has been entered, the user can change all the accessible set points.

The user can change the User password (go with JUMP button to channel 9116).

2.8.6 Fail Classes

All the activated alarms of the module are configured with a fail class. The fail class defines the category of the alarm and the subsequent action. 6 different fail classes can be used:

Engine running

Fail Class	Action						
	Alarm horn relay	Alarm display	Deload	GB Trip	MB trip	Gen-set cooling down	Gen-Set stop
1. Alarm	x	x					
2. Warning	x	x					
3. Trip of GB	x	x		x			
4. Trip & Stop	x	x	(x)	x		x	x
5. Shutdown	x	x		x			x
6. Trip of MB	x	x			x		

Engine stopped

Fail Class	Action		
	Block engine start	Block MB sequence	Block GB sequence
1. Alarm	x		
2. Warning			
3. Trip of GB	x		x
4. Trip & Stop	x		x
5. Shutdown	x		x
6. Trip of MB		x	

All alarms can be disabled or enabled as following:

- OFF: disabled alarm, inactive supervision.
- ON: enabled alarm.

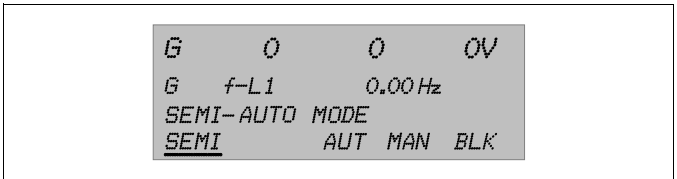
2.8.7 Languages

English is the default language ex-factory.

2.8.8 Standard modes

The unit has four different running modes and one block mode. The required mode can be selected via the MODE puhbutton. Repeat pushing the button until the required mode appears on the display, then press SEL to select or BACK to cancel.

This screen appears when pressing the MODE puhbutton.



Auto mode

In this mode the Qc4002™ controls the gen-set and the circuit breakers (generator breaker GB and mains breaker MB) automatically according to the operational state.

Semi-Auto mode

In semi-auto mode the operator has to initiate all sequences. This can be done via the pushbutton functions, modbus commands or digital inputs. When started in semi-automatic mode, the gen-set will run at nominal values.

Test mode

Enables the user to test the generator on a regular basis. The generator will follow a predefined sequence of actions.

In this mode it is possible to perform the following tests:

- Simple test
- Load test
- Full test

Manual mode

When manual mode is selected, the gen-set can be controlled with digital inputs.



MAN mode cannot be selected, when AUTO mode is selected. To go from AUTO to MAN it is necessary to go to SEMI-AUTO to make MAN available.

Block mode

When the block mode is selected, the unit is locked for certain actions. This means that it cannot start the gen-set or perform any breaker operations.

To change the running mode from the display, the user will be asked for a password before the change can be made. It is not possible to select 'block mode' when running feedback is present.

The purpose of the block mode is to make sure that the gen-set does not start for instance during maintenance work. If the digital inputs are used to change the mode, then it is important to know that the input configured to block mode is a constant signal. So, when it is ON the unit is in a blocked state, and when it is OFF, it returns to the mode it was in before block mode was selected.

2.8.9 Diagnostics menu

This diagnostics menu can be entered via channel 6700. This menu is used for engine diagnostics situations.

If diagnostics is selected in this menu, the fuel solenoid relay output will be de-energized for 30 seconds (to make sure that the unit is completely stopped), and then gets energized again. Then engine diagnostics can take place.

To leave this status, disable diagnostics in channel 6700, or press stop, or start the machine (not during the first 30 s.).

2.8.10 Standard applications

In the Qc4002™ module 9 application types can be selected. A combination of each application type with the running mode results in a specific application.

Gen-set mode	Running mode				
	Auto	Semi	Test	Man	Block
Automatic Mains Failure (no back sync.)	X	(X)	X	X	X
Automatic Mains Failure (with back sync.)	X	(X)	X	X	X
Island operation	X	X		X	X
Fixed power/base load	X	X	X	X	X
Peak shaving	X	X	X	X	X
Load take over	X	X	X	X	X
Mains power export	X	X	X	X	X
Multiple gen-sets, load sharing	X	X		X	X
Multiple gen-sets, power management	X	(X)	X	X	X

Depending on the application the user has to connect extra wirings to terminal blocks X25. These terminal blocks can be found inside the control box on a DIN-rail. We refer to the circuit diagram 9822 8077 10/01 for the correct connections.

Island operation

This application is possible in combination with SEMI-AUTO mode or AUTO mode. The internal real time clock timer can only be used in AUTO

This operation type is selected for installations with one or more generators, but always without the Mains (= stand-alone). In practice up to 16 generators can be installed in parallel.

Installation wirings

- Terminals X25.10/X25.11 have to be linked. The module always needs a feedback signal from the Mains Breaker MB. In Island mode there is no MB in the system. In this case the MB opened signal is simulated with this link.
- The busbar sensing lines have to be wired to the corresponding control module inputs.
Place bridges between:
 - X25.33 (L1) => X25.3
 - X25.34 (L2) => X25.4
 - X25.35 (L3) => X25.5
 - X25.36 (N) => X25.6
 (The bus bar = power cables between GB and load).
- For Remote Start operation: wire the RS switch between X25.9 & X25.10.
- For Paralleling applications with other generators: see "Paralleling" section to set up generator for paralleling.

Automatic Mains Failure (AMF) operation

This application is only possible in combination with the AUTO mode. If the SEMI-AUTO mode is selected the AMF operation will NOT function!

The unit automatically starts the gen-set and switches to generator supply at a mains failure after an adjustable delay time.

- AMF no back synchronisation:

When the mains returns, the unit will switch back to mains supply and cool down and stop the gen-set. The switching back to mains supply is done without back synchronisation when the adjusted 'Mains OK delay' has expired.

- AMF with back synchronisation:

When the mains returns, the unit will synchronise the mains breaker to the busbar when the 'Mains OK delay' has expired. Then the gen-set cools down and stops.

Installation wirings

- The link between X25.10/X25.11 has to be removed.
- Mains breaker feedback lines have to be wired to X25.10/X25.11/X25.12.
- Mains breaker control lines have to be wired to X25.13/X25.14/X25.15/X25.16. These terminals are voltage free contacts. The power for the MB has to be supplied by the customer (24 Vdc/230 Vac) (max. contact rating K11, K12 = 250 V/16 A).
- Make sure the connections between X25.33 & X25.3, X25.34 & X25.4, X25.35 & X25.5, X25.36 & X25.6 are removed.
- The Mains sensing lines L1/L2/L3/N have to be wired to terminals X25.3/X25.4/X25.5/X25.6.
- If back synchronisation is enabled, all settings for paralleling set up (see "Paralleling") must be verified also.

Peak Shaving (PS) operation

This application is normally used in combination with the AUTO mode. Installation with the Mains.

The generator will start up when the mains imported power (measured through an optional Power Transducer = PT) exceeds a defined level. The generator will synchronise with the bus, and will take load until the defined allowable mains imported power level is reached.

When the mains imported power decreases below the defined mains imported power level for a defined time, the generator will unload and disconnect from the bus. Then the generator will go into cool down.

Installation wirings

- The link between X25.10/X25.11 has to be removed.
- Mains breaker feedback lines have to be wired to X25.10/X25.11/X25.12.
- Mains breaker control lines have to be wired to X25.13/X25.14/X25.15/X25.16. These terminals are voltage free contacts. The power for the MB has to be supplied by the customer (24 Vdc/230 Vac) (max. contact rating K11, K12 = 250 V/16 A).
- The Mains sensing lines L1/L2/L3/N have to be wired to terminals X25.3/X25.4/X25.5/X25.6.
- Make sure the connections between X25.33 & X25.3, X25.34 & X25.4, X25.35 & X25.5, X25.36 & X25.6 are removed.
- Power Transducer lines have to be wired to X25.21 (input) and X25.22 (GND).
- Verify all settings for paralleling set up (see "Paralleling").

Fixed Power (FP) operation

This application is possible in combination with SEMI-AUTO mode or AUTO mode. Normally it is used in combination with SEMI-AUTO mode in installations with the Mains. The internal real time clock timer can only be used in AUTO mode.

The generator will deliver a defined fixed power to the load or to the Mains.

Installation wirings

- The link between X25.10/X25.11 has to be removed.
- Mains breaker feedback lines have to be wired to X25.10/X25.11/X25.12.
- Mains breaker control lines have to be wired to X25.13/X25.14/X25.15/X25.16. These terminals are voltage free contacts. The power for the MB has to be supplied by the customer (24 Vdc/ 230 Vac) (max. contact rating K11, K12 = 250 V/16 A)
- The Mains sensing lines L1/L2/L3/N have to be wired to terminals X25.3/X25.4/X25.5/X25.6.
- Make sure the connections between X25.33 & X25.3, X25.34 & X25.4, X25.35 & X25.5, X25.36 & X25.6 are removed.
- Verify all settings for paralleling set up (see "Paralleling").

Load Take Over (LTO) operation

This application is normally used in combination with SEMI-AUTO mode or AUTO mode in installations with the Mains.

The purpose of the load take over mode is to transfer the load imported from the mains to the gen-set for operation on generator supply only.

The generator will start-up, synchronise and take over the load from the Mains gradually, before opening the Mains Breaker. To know if the load is completely taken over from the mains, an optional Power Transducer is necessary.

Installation wirings

- The link between X25.10/X25.11 has to be removed.
- Mains breaker feedback lines have to be wired to X25.10/X25.11/X25.12.
- Mains breaker control lines have to be wired to X25.13/X25.14/X25.15/X25.16. These terminals are voltage free contacts. The power for the MB has to be supplied by the customer (24 Vdc/230 Vac) (max. contact rating K11, K12 = 250 V/16 A).
- The Mains sensing lines L1/L2/L3/N have to be wired to terminals X25.3/X25.4/X25.5/X25.6.
- Make sure the connections between X25.33 & X25.3, X25.34 & X25.4, X25.35 & X25.5, X25.36 & X25.6 are removed.
- Power Transducer lines have to be wired to X25.21 (input) and X25.22 (GND).
- Verify all settings for paralleling set up (see “Paralleling”).

Mains power export (MPE) operation

This application is possible in combination with SEMI-AUTO mode or AUTO mode. The internal real time clock timer can only be used in AUTO mode. Installation is with the Mains.

The mains power export mode can be used to maintain a constant level of power through the mains breaker. The power can be exported to the mains or imported from the mains, but always at a constant level.

Installation wirings

- The link between X25.10/X25.11 has to be removed.
- Mains breaker feedback lines have to be wired to X25.10/X25.11/X25.12.
- Mains breaker control lines have to be wired to X25.13/X25.14/X25.15/X25.16. These terminals are voltage free contacts. The power for the MB has to be supplied by the customer (24 Vdc/ 230 Vac) (max. contact rating K11, K12 = 250 V/16 A)
- The Mains sensing lines L1/L2/L3/N have to be wired to terminals X25.3/X25.4/X25.5/X25.6.
- Make sure the connections between X25.33 & X25.3, X25.34 & X25.4, X25.35 & X25.5, X25.36 & X25.6 are removed.
- Power Transducer lines have to be wired to X25.21 (input) and X25.22 (GND).
- Verify all settings for paralleling set up (see “Paralleling”).

Multiple gen-sets with load sharing

In this application the units are enabled to share the active and reactive load equally in percentage of the nominal power. The load sharing is active when each gen-set is running in island mode and the generator breaker is closed.

Multiple gen-sets with power management (PMS)

PMS (= Power Management System) is a system that will automatically start & stop generators based on the actual load dependency. This will be done through a PMS communication between the different units connected.

PMS applications are always in combination with AUTO mode. If the SEMI-AUTO mode is selected, the PMS operation will NOT function! The Qc4002™ controllers from the gensets need to be programmed as PMS in AUTO mode. When a Qc Mains controller is installed this needs to be programmed in the application that is required (AMF, LTO, FP, MPE) and AUTO mode.



By programming the parameters in AUTO mode, the generator can start up immediately. It is recommended to place the generator in SEMI-AUTO mode while programming all the PMS parameters !

Installations are possible with stand-alone generators or with the Mains (extra Qc4002™ Mains is then needed). A number of Qc4002™ units are being used in the power management application, i.e. one for each mains breaker (Qc4002™ mains controller), if installed, and one for each generator (Qc4002™ genset controller). All units communicate by means of an internal CANbus connection.

In an application with PMS it is important to program correctly the Start & Stop signals between the different generators because of the following reasons:

- The maximum load step needs to be programmed in the Qc4002™ controllers. This never may exceed the power reserve of the running generators. Otherwise the gensets will go in overload with a sudden max. load increase before the next generator is started up and connected to the busbar.
- To prevent the gensets to run in a start - stop loop.

The start signal is the value of the maximum required load step.

The stop signal is the value when the generator should be stopped automatically.

Example: Installation with 3 gensets

G1 = 300 kW; G2 = 200 kW; G3 = 200 kW.

- Start signal is set at 90 kW (maximum load step < 90 kW).
Start signal if:
Total Power needed > (total available power of running gensets -set point start signal).
 - Only G1 is running; at 210 kW load (300 kW - 90 kW) => G2 will be started.
 - G1 & G2 are running; at 410 kW load (200 kW + 300 kW - 90 kW) => G3 will be started.
- Stop signal is set at 100 kW and priority is set as (high) G1 > G2 > G3 (low).

Stop signal if:

Total Power needed < (Total available power of running gensets - Power of generator with lowest priority - set point stop signal).

- G1 & G2 & G3 are running; at 400 kW (700 kW - 200 kW - 100 kW) => G3 will be stopped.
- G1 & G2 are running; at 200 kW (500 kW - 200 kW - 100 kW) => G2 will be stopped.

The priority on starting & stopping the generators can be chosen on priority settings or on the amount of running hours. In manual mode the start & stop sequence is determined by the chosen priority between the generators. The generator with the lowest priority will start as the latest genset and will stop as first. If running hours are chosen as priority the start & stop sequence will be defined based on the actual running hours of the different generators. The lowest running hours will get the highest priority.



When paralleling generators with PMS, it is no longer necessary to use the analogue load sharing lines. This will be done through the PMS communication lines. Use a screened CAN communication cable with a maximum total distance of 200 meters. Do not connect the cable screen to the ground! Use a 120 Ohm resistor at both end controllers of the PMS.



For more information on this option, see User Manual Qc4002™.

2.8.11 Paralleling

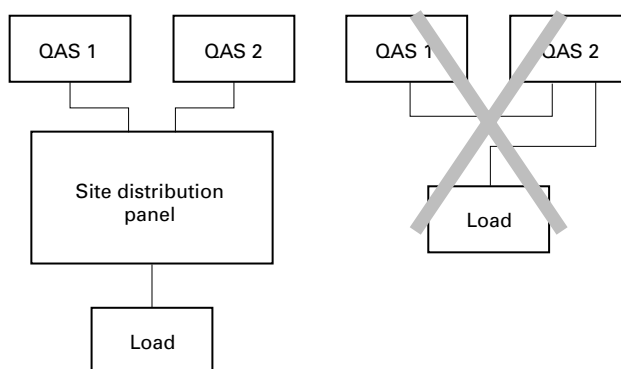
Prior to starting parallel operation of two generators, following connections need to be made:

- Connect the communication cable between the generators (sockets X30 & X31).

Each dedicated generator or SAPE has two of these connections, to enable paralleling more than two generators.

- Connect the load with the generator.

Go via the site distribution panel (to be installed by the customer) to connect the generator(s) and/or the SAPE unit(s) with the load. Always connect generator with the load, and never directly with second generator.



CORRECT

WRONG



When paralleling, make sure to disable the Earth leakage relay by putting switch S13 into off position.

2.8.12 Overview of applications

Installations with only 1 generator		
Application type	Mode	Comments
Island operation	SEMI-AUTO mode	= Local start
	AUTO mode	= Remote start
AMF operation	(SEMI-AUTO mode)	AMF operation will not function properly!
	AUTO mode	= Emergency start @ Mains Failure
Peak shaving	SEMI-AUTO mode	Only with Power Transducer (*)
	AUTO mode	Only with Power Transducer (*)
Fixed Power	SEMI-AUTO mode	
	AUTO mode	
Load Take Over	SEMI-AUTO mode	Only with Power Transducer (*)
	AUTO mode	Only with Power Transducer (*)
Mains Power Export	SEMI-AUTO mode	Only with Power Transducer (*)
	AUTO mode	Only with Power Transducer (*)

(*) A Power Transducer is a device that measures the actual power of the mains and which translates this into a 4...20 mA signal towards the Qc4002™ module. For details, please contact Atlas Copco.

Installations with more generators		
Application type	Mode	Comments
Island operation	SEMI-AUTO mode	= Manual paralleling between generators
	AUTO mode	= Remote paralleling between generators
AMF operation	(SEMI-AUTO mode)	AMF operation will not function properly!
	AUTO mode	PMS + Qc4002™ Mains module (**)
Peak shaving	SEMI-AUTO mode	PMS + Qc4002™ Mains module (**)
	AUTO mode	PMS + Qc4002™ Mains module (**)
Fixed Power	SEMI-AUTO mode	PMS + Qc4002™ Mains module (**)
	AUTO mode	PMS + Qc4002™ Mains module (**)
Load Take Over	SEMI-AUTO mode	PMS + Qc4002™ Mains module (**)
	AUTO mode	PMS + Qc4002™ Mains module (**)
Mains Power Export	SEMI-AUTO mode	PMS + Qc4002™ Mains module (**)
	AUTO mode	PMS + Qc4002™ Mains module (**)
Power Management System	(SEMI-AUTO mode)	PMS + Qc4002™ Mains module (**)
	AUTO mode	PMS + Qc4002™ Mains module (**)

(**) The power management system (PMS) allows communication between the Qc4002™ modules over CAN-bus. It has a fully intelligent system, which will start/load/stop the generator according to the actual load and to the status of each generator. The installation can contain up to 16 Qc4002™ modules. If the Mains is included in the installation, then an extra Qc4002™ module is required. The installation can be monitored and controlled via the PMS Software Package. For details on this application, please contact Atlas Copco.

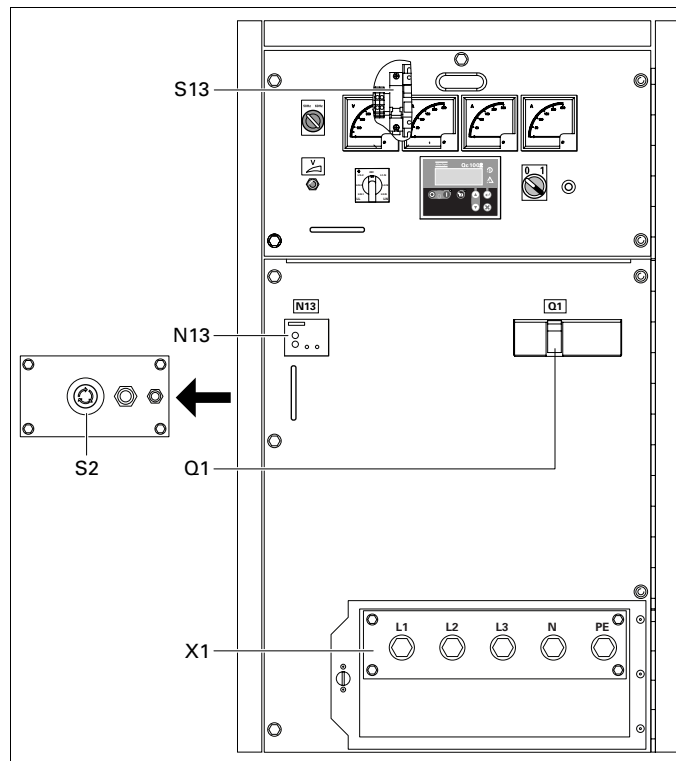


- Each installation has to be prepared and reviewed very carefully before start-up. Wrong or incomplete wirings can damage the installation brutally!
- Each application requires a specific combination of the following parameters:
 - Auto / Semi-auto / Test / Manual / Block mode
 - Island / AMF / PS / FP / LTO / MPE / PMS application type (in AUTO mode PS / FP / LTO can be combined with AMF).
 - Back synchronising enabled/disabled (parameter channel 7080)

Wrong parameter settings can damage the installation brutally!
- To be able to start up in cold conditions, parameter 6181 (Start prepare) can be changed to a higher value to have some preheating. Do not put this value above 60 seconds to avoid any possible damage.
- For more information on the Qc4002™ module and its applications, we refer to the Qc4002™ User Manual. If you need more assistance, please contact Atlas Copco.

2.9 Output terminal board (TB)

The cubicle provides a terminal board for more easy connection of cables. It is situated below the control and indicator panel.



N13 ... Earth leakage relay

Detects and indicates an earth fault current and activates the main circuit breaker Q1. The detection level can be set at 30 mA fixed with instantaneous trip but can also be adjusted between 30 mA and 250 mA with time delayed (0 - 1 sec) trip. N13 has to be reset manually after eliminating the problem (reset button marked R). It can be overridden by means of the earth leak switch (S13, labelled IAN) but has to be tested monthly by pushing test button T13.

S2..... Emergency stop button

Push the button to stop the generator in case of an emergency. When the button is pressed, it must be unlocked, by turning it anti-clockwise, before the generator can be restarted. The emergency stop button can be secured in the locked position with the key, to avoid unauthorized use. When the emergency button is pressed the control module needs to be reset.

S13.... Lock-out switch for earth fault protection (N13)

This switch is located inside the cubicle and is labelled IAN.

Position O: No de-energising of the main circuit breaker Q1 when an earth fault occurs.

Position 1: De-energising of the main circuit breaker Q1 when an earth fault occurs.

Q1 Circuit breaker for X1

Interrupts the power supply X1 when a short-circuit occurs at the load side, or when the overcurrent (QAS 125: 180 A / QAS 150: 215 A) protection is activated. When activated, Q1 interrupts the three phases towards X1. It must be reset manually after eliminating the problem.

X1..... Main power supply

Terminals L1, L2, L3, N (= neutral) and PE (= earthing), behind a small transparent door.



Position O on switch S13 will only be used in conjunction with an external earth fault protection unit (e.g. integrated in a distribution board) or when the generator is used in parallel.

The earth fault protection on the single phase outlet socket is not affected by the switch S13.

If S13 is in position O, proper earthing is of the utmost importance for the safety of the user. Eliminating any earth fault protection can lead to serious injury or even death for anybody touching the unit or the load.

2.10 Battery switch

The battery switch is situated inside the sound-insulated bodywork. It allows to open or to close the electrical connection between the battery and the engine circuits.



Never turn the battery switch to OFF during operation.

2.11 Spillage free skid

A spillage free skid with forklift slots allows the customer to transport the generator easily with a forklift.

It avoids accidental spilling of engine fluids.

3 Operating instructions



In your own interest, always strictly observe all relevant safety instructions.

Do not operate the generator in excess of the limitations mentioned in the Technical Specifications.

Local rules concerning the setting up of low voltage power installations (below 1000 V) must be respected when connecting site distribution panels, switch gear or loads to the generator.

3.1 Installation



For information about indoor installation, consult your local Atlas Copco dealer.

- Place the generator on a horizontal, even and solid floor. The generator can operate in a slant position not exceeding 15° (in both senses: front/rear and left/right).
- The generator should be kept with the doors closed, in order to avoid the ingress of water and dust. Dust ingress reduces the lifetime of filters and may reduce your generator's performance.
- Check that the engine exhaust is not directed towards people. If the generator is operated indoors, install an exhaust pipe of sufficient diameter to duct the engine exhaust towards the outside. Check for sufficient ventilation so that the cooling air is not recirculated. If necessary, consult Atlas Copco.
- Leave enough space for operation, inspection and maintenance (at least 1 meter at each side).
- Check that the inner earthing system is in compliance with the local legislation.
- Use coolant for the engine cooling system. Refer to the Engine instruction book for the proper coolant mixture.
- Check the tightness of the bolts and nuts.
- Install the earthing rod as near as possible to the generator and measure its diffusion resistance (max. 1 kΩ) in order not to have a contact voltage higher than 25 V at 30 mA leakage current.
- Check that the cable end of the earthing rod is connected to the earth terminal.

3.2 Connecting the generator

3.2.1 Precautions for non-linear and sensitive loads



Non-linear loads draw currents with high contents in harmonics, causing distortion in the wave form of the voltage generated by the alternator.

The most common non-linear, 3-phase loads are thyristor/rectifier-controlled loads, such as convertors supplying voltage to variable speed motors, uninterruptable power supplies and Telecom supplies. Gas-discharge lighting arranged in single-phase circuits generate high 3rd harmonics and risk for excessive neutral current.

Loads most sensitive to voltage distortion include incandescent lamps, discharge lamps, computers, X-ray equipment, audio amplifiers and elevators.

Consult Atlas Copco for measures against the adverse influence of non-linear loads.

3.2.2 Quality, minimum section and maximum length of cables

The cable connected to the terminal board of the generator must be selected in accordance with local legislation. The type of cable, its rated voltage and current carrying capacity are determined by installation conditions, stress and ambient temperature. For flexible wiring, rubber-sheathed, flexible core conductors of the type H07 RN-F (Cenelec HD.22) or better must be used.

The following table indicates the maximum allowable 3-phase currents (in A), in an ambient temperature of 40°C, for cable types (multiple and single core PVC insulated conductors and H07 RN-F multiple core conductors) and wire sections as listed, in accordance with VDE 0298 installation method C3. Local regulations remain applicable if they are stricter than those proposed below.

Wire section (mm ²)	Max. current (A)		
	Multiple core	Single core	H07 RN-F
25	94	101	88
35	114	123	110
50	138	155	138
70	176	191	170
95	212	228	205
120	245	273	239
150	282	314	275
185	323	358	313
240	379	421	371
300	429	477	428

The lowest acceptable wire section and the corresponding maximum cable or conductor length for multiple core cable or H07 RN-F, at rated current, for a voltage drop e lower than 5% and at a power factor of 0.80, are respectively 120 mm² and 370 m. In case electric motors must be started, oversizing the cable is advisable.

The voltage drop across a cable can be determined as follows:

$$e = \frac{\sqrt{3} \cdot I \cdot L \cdot (R \cdot \cos \varphi + X \cdot \sin \varphi)}{1000}$$

e = Voltage drop (V)

I = Rated current (A)

L = Length of conductors (m)

R = Resistance (Ω/km to VDE 0102)

X = Reactance (Ω/km to VDE 0102)

3.2.3 Connecting the load

Site distribution panel

If optional outlet sockets are provided, they must be mounted on a site distribution panel supplied from the terminal board of the generator and in compliance with local regulations for power installations on building sites.

Protection



For safety reasons, it is necessary to provide an isolating switch or circuit breaker in each load circuit. Local legislation may impose the use of isolating devices which can be locked.

- Check whether frequency, voltage and current comply with the ratings of the generator.
- Provide for the load cable, without excessive length, and lay it out in a safe way without forming coils.
- Open the door of the control and indicator panel and the transparent door in front of the terminal board X1.
- Provide the wire ends with cable lugs suited for the cable terminals.
- Loosen the cable clamp and push the wire ends of the load cable through the orifice and clamp.
- Connect the wires to the proper terminals (L1, L2, L3, N and PE) of X1 and tighten the bolts securely.
- Tighten the cable clamp.
- Close the transparent door in front of X1.

3.3 Before starting

- With the generator standing level, check the engine oil level and top up if necessary. The oil level must be near to, but not exceed the high mark on the engine oil level dipstick.
- Check the coolant level in the expansion tank of the engine cooling system. The coolant level must be near to the FULL mark. Add coolant if necessary.
- Drain any coolant and sediment from the fuel pre-filter. Check the fuel level and top up if necessary. It is recommended to fill the tank after the day's operation to prevent coolant damp in a nearly empty tank from condensing.
- Check the vacuum indicator of the air filter. If the red part shows completely, replace the filter element.
- Press the vacuator valve of the air filter to remove dust.
- Check the generator for leakage, tightness of wire terminals, etc. Correct if necessary.
- Check that circuit breaker Q1 is switched off.
- Check that fuse F10 has not tripped and that the emergency stop is in the OUT position.
- Check that the load is switched off.
- Check that the earth fault protection (N13) has not tripped (reset if necessary).


3.4 Operating Qc1002™

3.4.1 Starting Qc1002™

To start up the unit locally, proceed as follows:

- Switch on the battery switch.
- Switch off circuit breaker Q1. This is not necessary when a plant contactor is installed between Q1 and the load.
- Put the starter switch S20 in position I (ON). Voltage is applied to the Qc1002™ module.
- The unit can be started manually by pressing the START button on the Qc1002™ module.
- The unit starts a preheating cycle which takes 12 seconds.
- After the preheating period, the unit will start. The starting attempt will take maximum 12 seconds.
- Switch on circuit breaker Q1 in case no contactor is installed.

To start up the unit from a remote location, proceed as follows:

- Put the starter switch S20 in position I (ON). Voltage is applied to the Qc1002™ module.
- The unit can be started from a remote location by pressing the remote mode button  on the Qc1002™ module.
- Switch on circuit breaker Q1.
- Put the remote start/stop switch in position start.
- The unit starts a preheating cycle which takes 12 seconds.
- After the preheating period, the unit will start. The starting attempt will take maximum 12 seconds.

3.4.2 During operation Qc1002™

Following points should be carried out regularly:

- Check the engine gauges and the lamps for normal readings.



Avoid to let the engine run out of fuel. If it happened, priming will speed up the starting.

- Check for leakage of oil, fuel or coolant.
- Avoid long low-load periods (< 30%). In this case, an output drop and higher oil consumption of the engine could occur.
- Check, by means of the generator gauges, that the voltage between the phases is identical and that the rated current in the third phase (L3) is not exceeded.
- When single-phase loads are connected to the generator output terminals, keep all loads well-balanced.

If circuit breakers are activated during operation, switch off the load and stop the generator. Check and, if necessary, decrease the load.




The generator's doors may only remain opened for short periods during operation, to carry out checks for example.

3.4.3 Stopping Qc1002™

To stop the unit locally, proceed as follows:

- Switch off the load.
- Switch off circuit breaker Q1.
- Let the engine run for about 5 minutes.
- Stop the engine by using the STOP button on the Qc1002™ module.
- Put the starter switch S20 in position O (OFF) to shut down the voltage apply towards the Qc1002™ module.
- Lock the side doors and the door of the indicators and control panel to avoid unauthorized access.

To stop the unit when the Qc1002™ module is in position , proceed as follows:

- Switch off the load.
- Stop the engine by putting the remote start/stop switch in position stop or by using the STOP button on the Qc1002™ module. When the unit is stopped with the STOP button in Remote mode, it will automatically go to Manual Mode.
- Put the starter switch S20 in position O (OFF) to shut down the voltage apply towards the Qc1002™ module.
- Lock the side doors and the door of the indicators and control panel to avoid unauthorized access.

3.5 Operating Qc2002™

3.5.1 Starting Qc2002™

To start up the unit locally, proceed as follows:


- Switch on the battery switch.
- Switch off circuit breaker Q1. This is not necessary when a plant contactor is installed between Q1 and the load.
- Put the starter switch S20 in position I (ON). Voltage is applied to the Qc2002™ module.
- The unit can be started manually by pressing the START button on the Qc2002™ module.
- The unit starts a preheating cycle which takes 12 seconds.
- After the preheating period, the unit will start. The starting attempt will take maximum 12 seconds.
- Switch on circuit breaker Q1 in case no contactor is installed.

To start up the unit from a remote location, proceed as follows:

- Put the starter switch S20 in position I (ON). Voltage is applied to the Qc2002™ module.
- Switch on circuit breaker Q1.
- For remote start:
 - Put the unit in Island mode. Push the AUTOMATIC button. Use an external switch to start the machine.
- or
- Put the unit in AMF mode. Push the AUTOMATIC button. The machine will start automatically when Mains fails.
- The unit starts a preheating cycle which takes 12 seconds.
- After the preheating period, the unit will start. The starting attempt will take maximum 12 seconds.

3.5.2 During operation Qc2002™

Following points should be carried out regularly:

- Check the engine gauges and the lamps for normal readings.
-  **Avoid to let the engine run out of fuel. If it happened, priming will speed up the starting.**
- Check for leakage of oil, fuel or coolant.
 - Avoid long low-load periods (< 30%). In this case, an output drop and higher oil consumption of the engine could occur.
 - Check, by means of the generator gauges, that the voltage between the phases is identical and that the rated current in the third phase (L3) is not exceeded.
 - When single-phase loads are connected to the generator output terminals, keep all loads well-balanced.

If circuit breakers are activated during operation, switch off the load and stop the generator. Check and, if necessary, decrease the load.



The generator's doors may only remain opened for short periods during operation, to carry out checks for example.

3.5.3 Stopping Qc2002™

To stop the unit, proceed as follows:

- Switch off the load.
- Switch off circuit breaker Q1.
- Let the engine run for about 5 minutes.
- Stop the engine by using the STOP button on the Qc2002™ module.
- Put the starter switch S20 in position O (OFF) to shut down the voltage apply towards the Qc2002™ module.
- Lock the side doors and the door of the indicators and control panel to avoid unauthorized access.

To stop the unit when the Qc2002™ module is in AUTOMATIC operation mode, proceed as follows:

- Switch off the load.
- For remote start:
 - When operating in Island mode, use the external switch to stop the machine.
 - When operating in AMF mode, the machine will automatically stop when the Mains returns.



When the unit is stopped with the STOP button in Automatic operation, it will automatically go to Manual Mode.

- Cooldown period default 15 sec.
- Put the starter switch S20 in position O (OFF) to shut down the voltage apply towards the Qc2002™ module.
- Lock the side doors and the door of the indicators and control panel to avoid unauthorized access.

3.6 Operating Qc4002™

3.6.1 Starting Qc4002™

- Turn the battery switch to ON.
- Turn the S20 button to the ON position, this will activate the Qc4002™ Controller.
- Select the correct application type and the correct mode on the Qc4002™ module (see “Overview of applications” on page 47 for the possible selections).
- Make the correct wirings and program the applicable parameters (see “Standard applications” on page 43 for more details).
- When in SEMI-AUTO mode, use the START button to start-up the generator. The GB button cannot be used to close the generator breaker.
- When in AUTO mode, the generator will start-up automatically and close the contactors depending on the selected application.



The START button, the GB-close button and the MB-close button cannot be used in AUTO mode.

3.6.2 During operation Qc4002™

Following points should be carried out regularly:

- Check the display for normal readings.



Avoid letting the engine run out of fuel. If this happens, priming will speed up the starting.

- Check for leakage of oil, fuel or cooling water.
- Avoid long low-load periods (< 30%). In this case, an output power drop and higher oil consumption of the engine could occur. It is recommended to operate the generator at full load capacity immediately after any low load operating period.
- When single-phase loads are connected to the generator output terminals, keep all loads well-balanced.



Never turn the battery switch to OFF during operation.

If circuit breaker Q1 trips off during operation, switch off the load and stop the generator. Check and, if necessary, decrease the load.

3.6.3 Stopping Qc4002™

- When in SEMI-AUTO mode, use the STOP button to stop the generator. The GB button will work to open the GB.
- When in AUTO mode, the STOP and GB button will not function. The generator shuts down automatically depending on the selected application



If you want to stop the generator manually, use the S20 button or the emergency stop button.

4 Maintenance

4.1 Maintenance schedule for QAS 125-150 Volvo



Before carrying out any maintenance activity, check that the start switch is in position O and that no electrical power is present on the terminals.

Maintenance schedule	Daily	Initially Every 50 hours	Small Every 500 hours	Normal Every 1000 hours	Yearly Every 2000 hours
Service pak	-	-	2912 6363 05	2912 6379 06	2912 6380 07
<i>For the most important subassemblies, Atlas Copco has developed service kits that combine all wear parts. These service kits offer you the benefits of genuine parts, save on administration costs and are offered at reduced price, compared to the loose components. Refer to the parts list for more information on the contents of the service kits.</i>					
Coolant level	Check	Check	Check	Check	Check
Tension and condition of drive belt(s)		Check	Check	Check	Replace
Radiator and intercooler fins		Check/Clean	Check/Clean	Check/Clean	Check/Clean
Fuel pre-filter/Water separator	Check/Drain	Check/Drain	Check/Drain	Replace/Drain	Replace/Drain
Fuel filter element				Replace	Replace
Fuel injectors					Check
Oil level in sump	Check	Check	Check	Check	Check
Oil pressure on gauge	Check	Check	Check	Check	Check
Lubrication oil			Change	Change	Change
Oil filter(s)			Replace	Replace	Replace
Crankcase pressure				Check	Check
Vacuum indicator	Check	Check	Check	Check	Check
Air cleaner and dust bowl		Clean	Clean	Clean	Clean
Air filter element (1)			Replace	Replace	Replace
Safety cartridge					Replace
Turbocharger impeller and housing					Clean/Inspect
Fan hub bearings					Lubricate
Oil, fuel and water leaks		Check	Check	Check	Check
Mechanical links (e.g. fuel solenoid link)			Grease	Grease	Grease
Valve clearance		(3)			Check/Adjust
Level battery electrolyte (2)		Check	Check	Check	Check
Condition of vibration dampers		Check	Check	Check	Check
Alternator insulation resistance (See (*) Measuring the alternator insulation resistance)		Measure	Measure	Measure	Measure
Tightness of nuts and bolts		Check			Check
Door hinges and locks		Grease			Grease
Fixation of hoses, cables and pipes				Check	Check
Inspection by Atlas Copco Service technician		Generators in standby application have to be tested on a regular basis. At least once a month the engine should run for one hour. If possible a high load (> 30%) should be applied so that the engine reaches its operating temperature.			

Notes:

In highly dusty environments, these service intervals do not apply. Check and/or replace filters and clean radiator on a regular basis.

- (1) More frequently when operating in a dusty environment. Evacuate dust from the airfilter valve daily.
- (2) A Service Bulletin (ASB) dealing elaborately with batteries and due care is available on request.
- (3) After first initial 500 running hours it is required to check/adjust the valve clearance. When opening the rocker cover it is necessary to replace the gasket. This gasket can be ordered with AC partnumber 2914 9585 00.

4.2 Engine maintenance

Refer to the engine's operator manual for full maintenance schedule.

4.3 (*) Measuring the alternator insulation resistance

A 500 V megger is required to measure the alternator insulation resistance.

If the N-terminal is connected to the earthing system, it must be disconnected from the earth terminal. Disconnect the AVR.

Connect the megger between the earth terminal PE and terminal L1 and generate a voltage of 500 V. The scale must indicate a resistance of at least 5 MΩ.

Refer to the alternator operating and maintenance instructions for more details.

4.4 Engine oil specifications



It is strongly recommended to use Atlas Copco branded lubrication oils.

High-quality, mineral, hydraulic or synthesized hydrocarbon oil with rust and oxidation inhibitors, anti-foam and anti-wear properties is recommended.

The viscosity grade should correspond to the ambient temperature and ISO 3448, as follows:

Engine	Type of lubricant
between -15°C and 40°C	PAROIL 15W40
between -25°C and 40°C	PAROIL 5W40



Never mix synthetic with mineral oil.

Remark:

When changing from mineral to synthetic oil (or the other way around), you will need to do an extra rinse.

After doing the complete change procedure to synthetic oil, run the unit for a few minutes to allow good and complete circulation of the synthetic oil. Then drain the synthetic oil again and fill again with new synthetic oil. To set correct oil levels, proceed as in normal instruction.

4.4.1 Specifications PAROIL

PAROIL from Atlas Copco is the ONLY oil tested and approved for use in all engines built into Atlas Copco compressors and generators.

Extensive laboratory and field endurance tests on Atlas Copco equipment have proven PAROIL to match all lubrication demands in varied conditions. It meets stringent quality control specifications to ensure your equipment will run smoothly and reliably.

The quality lubricant additives in PAROIL allow for extended oil change intervals without any loss in performance or longevity.

PAROIL provides wear protection under extreme conditions. Powerful oxidation resistance, high chemical stability and rust-inhibiting additives help reduce corrosion, even within engines left idle for extended periods.

PAROIL contains high quality anti-oxidants to control deposits, sludge and contaminants that tend to build up under very high temperatures.

PAROIL's detergent additives keep sludge forming particles in a fine suspension instead of allowing them to clog your filter and accumulate in the valve/rocker cover area.

PAROIL releases excess heat efficiently, whilst maintaining excellent bore-polish protection to limit oil consumption.

PAROIL has an excellent Total Base Number (TBN) retention and more alkalinity to control acid formation.

PAROIL prevents Soot build-up.

PAROIL is optimized for the latest low emission EURO -3 & -2, EPA TIER II & III engines running on low sulphur diesel for lower oil and fuel consumption.

4.4.2 PAROIL 5W40 and PAROIL 15W40

Synthetic engine oil PAROIL 5W40

PAROIL 5W40 is a Synthetic ultra high performance diesel engine oil with a high viscosity- index. Atlas Copco PAROIL 5W40 is designed to provide excellent lubrication from start-up in temperatures as low as -25°C.

	Liter	US gal	Imp gal	cu.ft	Order number
can	5	1.3	1.1	0.175	1604 6060 01
barrel	210	55.2	46	7.35	1604 6059 01

Mineral engine oil PAROIL 15W40

PAROIL 15W40 is a mineral based high performance diesel engine oil with a high viscosity- index. Atlas Copco PAROIL 15W40 is designed to provide a high level of performance and protection in standard ambient conditions as from -15°C.

	Liter	US gal	Imp gal	cu.ft	Order number
can	5	1.3	1.1	0.175	1615 5953 00
can	20	5.3	4.4	0.7	1615 5954 00
barrel	210	55.2	46	7.35	1615 5955 00

4.5 Engine oil level check

Consult the Engine Operation Manual for the oil specifications, viscosity recommendations and oil change intervals.

For intervals, see section “Maintenance schedule” on page 53.

Check engine oil level according to the instructions in the Engine Operation Manual and if necessary top up with oil.

4.6 Engine oil and oil filter change

See section “Maintenance schedule” on page 53.

4.7 Engine coolant specifications



Never remove the cooling system filler cap while coolant is hot.

The system may be under pressure. Remove the cap slowly and only when coolant is at ambient temperature. A sudden release of pressure from a heated cooling system can result in personal injury from the splash of hot coolant.

It is strongly recommended to use Atlas Copco branded coolant.

The use of the correct coolant is important for good heat transfer and protection of liquid-cooled engines. Coolants used in these engines must be mixtures of good quality water (distilled or de-ionised), special coolant additives and if necessary freeze protection. Coolant that is not to manufacturer's specification will result in mechanical damage of the engine.

The freezing point of the coolant must be lower than the freezing point that can occur in the area. The difference must be at least 5°C. If the coolant freezes, it may crack the cylinder block, radiator or coolant pump.

Consult the engine's operation manual and follow the manufacturer's directions.



Never mix different coolants and mix the coolant components outside the cooling system.

4.7.1 Specifications PARCOOL EG

PARCOOL EG is the only coolant that has been tested and approved by all engine manufacturers currently in use in Atlas Copco compressors and generators.

Atlas Copco's PARCOOL EG extended life coolant is the new range of organic coolants purpose designed to meet the needs of modern engines. PARCOOL EG can help prevent leaks caused by corrosion. PARCOOL EG is also fully compatible with all sealants and gasket types developed to join different materials used within an engine.

PARCOOL EG is a ready to use Ethylene Glycol based coolant, premixed in an optimum 50/50 dilution ratio, for antifreeze protection guaranteed to -40°C.

Because PARCOOL EG inhibits corrosion, deposit formation is minimized. This effectively eliminates the problem of restricted flow through the engine coolant ducts and the radiator, minimizing the risk for engine overheating and possible failure.

It reduces water pump seal wear and has excellent stability when subjected to sustained high operating temperatures.

PARCOOL EG is free of nitride and amines to protect your health and the environment. Longer service life reduces the amount of coolant produced and needing disposal to minimise environmental impact.

	Liter	US gal	Imp gal	cu.ft	Order number
can	5	1.3	1.1	0.175	1604 5308 00
can	20	5.3	4.4	0.7	1604 5307 01
barrel	210	55.2	46	7.35	1604 5306 00

To ensure protection against corrosion, cavitation and formation of deposits, the concentration of the additives in the coolant must be kept between certain limits, as stated by the manufacturer's guidelines. Topping up the coolant with water only, changes the concentration and is therefore not allowed.

Liquid-cooled engines are factory-filled with this type of coolant mixture.

4.8 Coolant check

4.8.1 Monitoring coolant condition

In order to guarantee the lifetime and quality of the product, thus to optimise engine protection, regular coolant-condition-analysis is advisable.

The quality of the product can be determined by three parameters.

Visual check

- Verify the outlook of the coolant regarding colour and make sure that no loose particles are floating around.

pH measurement

- Check the pH value of the coolant using a pH-measuring device.
- The pH-meter can be ordered from Atlas Copco with part number 2913 0029 00.
- Typical value for EG = 8.6.
- If the pH-level is below 7 or above 9.5, the coolant should be replaced.

Glycol concentration measurement

- To optimise the unique engine protection features of the PARCOOL EG the concentration of the Glycol in the water should be always above 33 vol.%.
- Mixtures with more than 68 vol.% mix ratio in water are not recommended, as this will lead to high engine operating temperatures.
- A refractometer can be ordered from Atlas Copco with part number 2913 0028 00.



In case of a mix of different coolant products this type of measurement might provide incorrect values.

4.8.2 Topping up of coolant

- Verify if the engine cooling system is in a good condition (no leaks, clean,...).
- Check the condition of the coolant.
- If the condition of the coolant is outside the limits, the complete coolant should be replaced (see section “Replacing the coolant”).
- Always top-up with PARCOOL EG.
- Topping up the coolant with water only, changes the concentration of additives and is therefore not allowed.

4.8.3 Replacing the coolant

Drain

- Completely drain the entire cooling system.
- Used coolant must be disposed or recycled in accordance with laws and local regulations.

Flush

- Flush twice with clean water. Used coolant must be disposed or recycled in accordance with laws and local regulations.
- From the Atlas Copco Instruction book, determine the amount of PARCOOL EG required and pour into the radiator top tank.
- It should be clearly understood that the risk for contamination is reduced in case of proper cleaning.
- In case a certain content of ‘other’ coolant remains in the system, the coolant with the lowest properties influences the quality of the ‘mixed’ coolant.

Fill

- To assure proper operation and the release of trapped air, run the engine until normal engine operation temperature is reached. Turn off the engine and allow to cool.
- Recheck coolant level and add if necessary.

5 Storage of the generator

5.1 Storage

- Store the generator in a dry, frost-free room which is well ventilated.
- Run the engine regularly, e.g. once a week, until it is warmed up. If this is impossible, extra precautions must be taken:
 - Consult the engine's operator manual.
 - Remove the battery. Store it in a dry, frost-free room. Keep the battery clean and its terminals lightly covered with petroleum jelly. Recharge the battery regularly.
 - Clean the generator and protect all electrical components against moisture.
 - Place silicagel bags, VCI paper (Volatile Corrosion Inhibitor) or another drying agent inside the generator and close the doors.
 - Stick sheets of VCI paper with adhesive tape on the bodywork to close off all openings.
 - Wrap the generator, except the bottom, in a plastic bag.

5.2 Preparing for operation after storage

Before operating the generator again, remove the wrapping, VCI paper and silicagel bags and check the generator thoroughly (go through the checklist "Before starting" on page 50).

- Consult the engine's operator manual.
- Check that the insulation resistance of the generator exceeds 5 MΩ.
- Replace the fuel filter and fill the fuel tank. Vent the fuel system.
- Reinstall and connect the battery, if necessary after being recharged.
- Submit the generator to a test run.

6 Checks and troubleshooting



Never perform a test run with connected power cables. Never touch an electrical connector without a voltage check.

When a failure occurs, always report what you experienced before, during and after the failure. Information with regard to the load (type, size, power factor, etc.), vibrations, exhaust gas colour, insulation check, odours, output voltage, leaks and damaged parts, ambient temperature, daily and normal maintenance and altitude might be helpful to quickly locate the problem. Also report any information regarding the humidity and location of the generator (e.g. close to sea).

6.1 Checking voltmeter P4

- Put a voltmeter in parallel with voltmeter P4 on the control panel.
- Check that the read-out of both voltmeters is the same.
- Stop the generator and disconnect one terminal.
- Check that the internal resistance of the voltmeter is high.

6.2 Checking ammeters P1, P2 and P3

- Measure by means of a clamp-on probe the current, during the load.
- Compare the measured current with the current indicated on the ammeter. Both readings should be the same.

6.3 Alternator troubleshooting

Symptom	Possible cause	Corrective action
<i>Alternator gives 0 Volt</i>	Blown fuse. No residual voltage.	Replace fuse. Excite the alternator by applying a 12V battery voltage with a 30 Ω resistor in series on the + and - terminals of the electronic regulator, respecting the polarities
<i>After being excited the alternator still gives 0 Volt.</i>	Connections are interrupted.	Check connection cables, measure winding resistances and compare with values mentioned in the alternator manual.
<i>Low voltage at no load</i>	Voltage potentiometer out of setting. Intervention of protection. Winding failure.	Reset voltage. Check frequency/voltage regulator. Check windings.
<i>High voltage at no load</i>	Voltage potentiometer out of setting. Failed regulator.	Reset voltage. Substitute regulator.
<i>Lower than rated voltage at load</i>	Voltage potentiometer out of setting. Intervention by protection. Failed regulator. Rotating bridge failure.	Reset voltage potentiometer. Current too high, power factor lower than 0.8; speed lower than 10% of rated speed. Substitute regulator. Check diodes, disconnect cables.
<i>Higher than rated voltage at load</i>	Voltage potentiometer out of setting. Failed regulator.	Reset voltage potentiometer. Substitute regulator.
<i>Unstable voltage</i>	Speed variation in engine. Regulator out of setting.	Check regularity of rotation. Regulate stability of regulator by acting on STABILITY potentiometer.

6.4 Engine troubleshooting

Refer to the engine's operator manual for the engine troubleshooting. An extensive Engine troubleshooting manual is available at Volvo Penta. For more information contact Volvo Penta.

7 Options available for QAS 125-150 Volvo units

7.1 Circuit diagrams

The engine control circuit diagrams and the power circuit diagrams for the standard QAS 125-150 Volvo units, for the units with options and for the units with combined options are:

<i>Unit</i>	<i>Power circuit</i>	<i>Engine control circuit</i>
QAS 125-150 Qc1002™	9822 0993 00	9822 0993 05
QAS 125-150 Qc2002™	9822 0993 00	9822 0993 06
QAS 125-150 Qc4002™	9822 0993 08	9822 0993 08
QAS 125-150 Dual voltage	9822 0993 01	

7.2 Overview of the electrical options

The following electrical options are available:

- Automatic battery charger
- Engine coolant heater
- Outlet sockets (S)
- Dual voltage (DV)
- Dual frequency
- “Electricité de France” (EDF)
- IT-relay
- Integrated spark arrestor
- Air inlet shut-off valve
- Cosmos

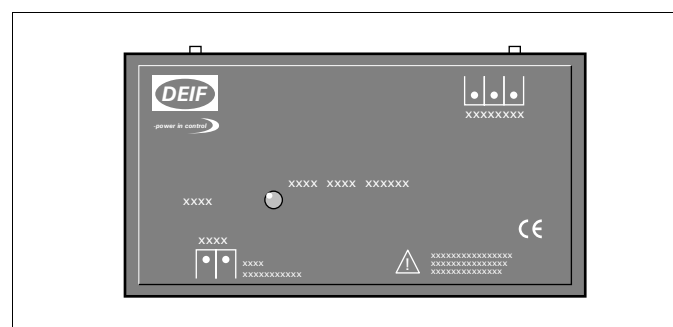
7.3 Description of the electrical options

7.3.1 Automatic battery charger

The automatic battery charger charges the battery completely and is disconnected once the unit starts up.

Besides the output terminals (secondary side) the automatic battery charger has a trim potentiometer for setting of the output voltage. By means of an insulated slotted screwdriver or adjusting pin the output voltage can be set in the range.

The LED on the front indicates that the unit is operational.



Setting:

- Lower output voltage = counterclockwise rotation
- Higher output voltage = clockwise rotation

To use the battery charger:

- Provide the X25 connector, located at the side of the output terminal board, with external power to use the automatic battery charger.

7.3.2 Engine coolant heater

To make sure that the engine can start and accept load immediately, an external cooling water heater (2000 W, 240 V) is provided which keeps the engine temperature between 38°C and 49°C.

7.3.3 Outlet sockets (S)

The Outlet sockets option provides the following extra outlet sockets and circuit breakers:

Q1 Circuit breaker for X1

Interrupts the power supply X1 when a short-circuit occurs at the load side, or when the overcurrent protection is activated. When activated, Q1 interrupts the three phases towards X1. It must be reset manually after eliminating the problem.

Q2 Circuit breaker for X2

Interrupts the power supply to X2 when a short-circuit occurs at the load side, or when the overcurrent protection (16 A) is activated. When activated, Q2 interrupts one phase (L3) towards X2. It can be activated again after eliminating the problem.

Q3 Circuit breaker for X3

Interrupts the power supply to X3 when a short-circuit occurs at the load side, or when the overcurrent protection (125 A) is activated. When activated, Q3 interrupts the three phases towards X3. It can be activated again after eliminating the problem.

Q4 Circuit breaker for X4

Interrupts the power supply to X4 when a short-circuit occurs at the load side, or when the overcurrent protection (63 A) is activated. When activated, Q4 interrupts the three phases towards X4. It can be activated again after eliminating the problem.

Q5 Circuit breaker for X5

Interrupts the power supply to X5 when a short-circuit occurs at the load side, or when the overcurrent protection (32 A) is activated. When activated, Q5 interrupts the three phases towards X5. It can be activated again after eliminating the problem.

Q6 Circuit breaker for X6

Interrupts the power supply to X6 when a short-circuit occurs at the load side, or when the overcurrent protection (16 A) is activated. When activated, Q6 interrupts the three phases towards X6. It can be activated again after eliminating the problem.

X1..... Main power supply (400/480 V AC)

Terminals L1, L2, L3, N (= neutral) and PE (= earthing), hidden behind the control panel door and behind a small transparent door.

X2..... Socket 16 A Rim earthing

Provides lines L3, N (= neutral) and PE (= earthing).

Socket 16 A Pin earthing

Provides lines L3, N (= neutral) and PE (= earthing).

Socket 16 A CEE earthing

Provides lines L3, N (= neutral) and PE (= earthing).

X3..... 3-phase outlet socket

Provides phase L1, L2, L3, neutral and earthing.

X4..... 3-phase outlet socket

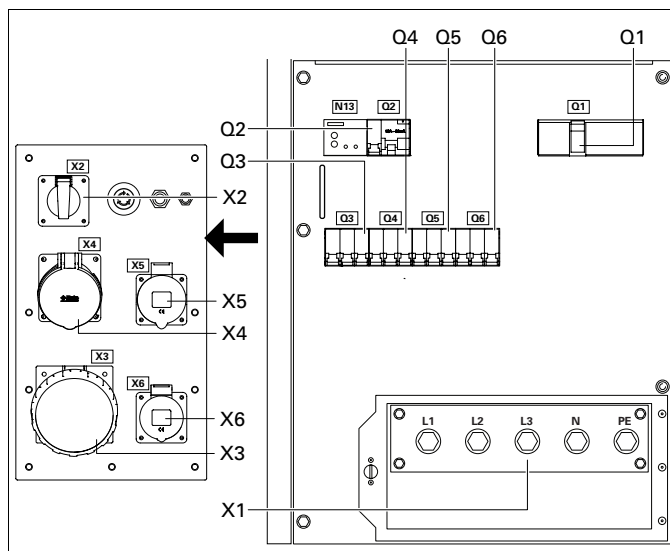
Provides phase L1, L2, L3, neutral and earthing.

X5..... 3-phase outlet socket

Provides phase L1, L2, L3, neutral and earthing.

X6..... 3-phase outlet socket

Provides phase L1, L2, L3, neutral and earthing.



Circuit breaker Q1 does not only interrupt the power supply towards socket X1 but also towards X2, X3, X4, X5 and X6.

Make sure to switch on circuit breakers Q1, Q2, Q3, Q4, Q5 and Q6 after starting the generator when power supply is done by means of X2, X3, X4, X5 and X6.

7.3.4 Dual voltage (DV)

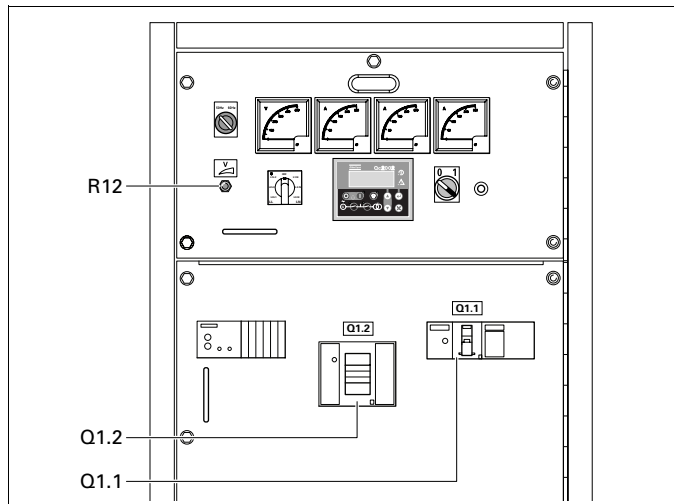
The generator can run in two different modes:

3 phase, lower voltage

When using this selection, the generator provides a 230 V output voltage.

3 phase, higher voltage

When using this selection, the generator provides a 400/480 V output voltage.



Q1.1... Circuit breaker for low voltage, high current

Interrupts the low voltage power supply towards X1 when a short-circuit occurs at the load side or when the overcurrent protection (QAS 125: 315 A/QAS 150: 375 A) is activated. It must be reset manually after eliminating the problem.

Q1.2... Circuit breaker for high voltage, low current

Interrupts the high voltage power supply towards X1 when a short-circuit occurs at the load side or when the overcurrent protection (QAS 125: 180 A/QAS 150: 215 A) is activated. It must be reset manually after eliminating the problem.

R12.... Output voltage adjust potentiometer

Allows to adjust the output voltage.



AMF operation is not possible with a dual voltage generator.

Depending on which mode the generator is running in, circuit breaker Q1.1 or Q1.2 will be operational.

Circuit breakers Q1.1 and Q1.2 cannot be switched on at the same time. This is prevented by means of the auxiliary voltage selection relays S10b and S10c (refer to the circuit diagram).

The selection between the two modes is done by means of S10.

S10.... Output voltage selection switch

Allows to select a 3 phase high output voltage or a 3 phase low output voltage. Selector switch S10 is located on the alternator.

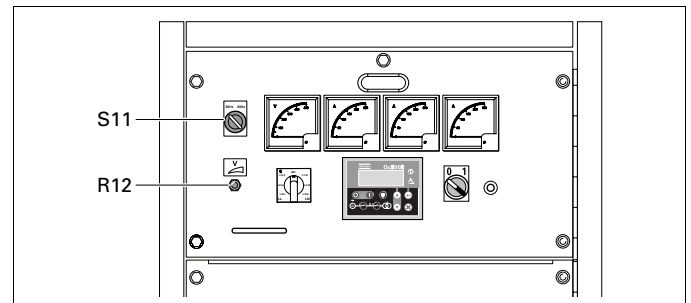


Changing the output voltage is only allowed after shutdown.

After changing the output voltage by means of the selection switch S10, adjust the output voltage by means of potentiometer R12 to the required value.

7.3.5 Dual frequency

The Dual frequency option allows the unit to work at 50 Hz or at 60 Hz with an accuracy of constant load. The frequency selection is done by means of switch S11.



S11.... Frequency selector switch (50 Hz/60 Hz)

Allows to choose the frequency of the output voltage: 50 Hz or 60 Hz.

R12.... Voltage adjust potentiometer

Allows to adjust the output voltage



Changing the output voltage is only allowed after shutdown.

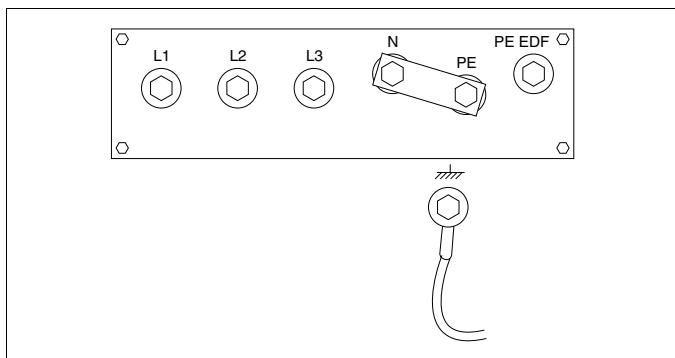
After changing the output frequency, adjust the output voltage by means of potentiometer R12 to the required value.



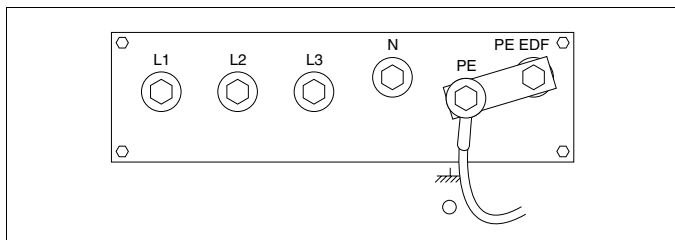
The dual frequency option is not possible in combination with dual voltage or 3-phase sockets.

7.3.6 “Electricité de France” (EDF)

When the EDF-option is installed, the unit operates as a standard unit when the neutral and the PE terminals are connected to each other (see figure below). In this case, an earth leakage at the side of the generator or at the side of the load will switch off the circuit breaker.



When EDF-option is installed, the unit operates as EDF-unit when the earthing, the PE and the PE EDF terminals are connected to each other (see figure below). In this case, an earth leakage at the side of the generator will switch off the circuit breaker. An earth leakage at the side of the load will not switch off the circuit breaker.



Changing the operation mode from standard unit to EDF-unit or vice versa has to be carried out by a qualified person from “Electricité de France”.

7.3.7 IT-relay

The generator is wired for an IT network i.e. no supply lines of the power supply are directly earthed. A failure in insulation resulting in a too low insulation resistance, is detected by the insulation monitoring relay.

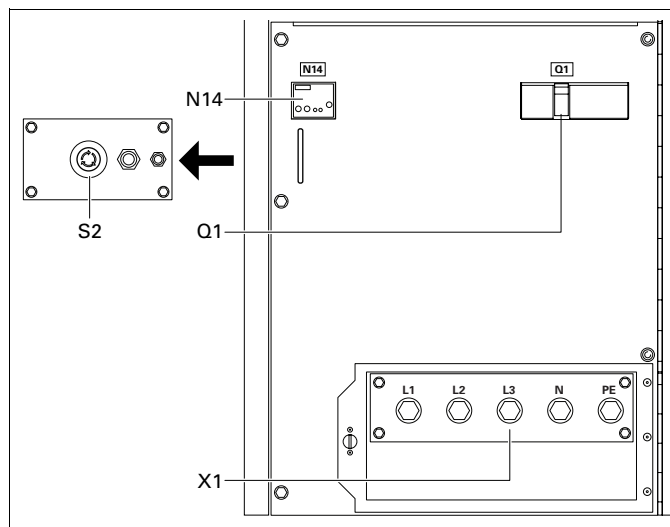


The generator shall not be operated with other networks (such as TT or TN). Doing so will cause tripping of the insulation monitoring relay.

The generator is wired for an IT network i.e. no supply lines of the power supply are directly earthed. A failure in insulation resulting in too low an insulation resistance, is detected by the insulation monitoring relay.

At each start-up and any time a new load is connected, the insulation resistance must be verified. Check for the correct setting of the insulation monitoring relay (factory set at 13 kΩ).

Connect the earthing according the local legislation.



Q1 Circuit breaker for X1

Interrupts the power supply X1 when a short-circuit occurs at the load side, or when the overcurrent protection (QAS 125: 180 A/ QAS 150: 215 A) is activated. When activated, Q1 interrupts the three phases towards X1. It must be reset manually after eliminating the problem.

X1..... Main power supply (400/480 Vac)

Terminals L1, L2, L3, N (= neutral) and PE (= earthing), hidden behind the control panel door and behind a small transparent door.

N14 ... Insulation monitoring relay

Checks the insulation resistance and activates Q1 when the insulation resistance is too low.

S2..... Emergency stop button

Push the button to stop the generator in case of an emergency. When the button is pressed, it must be unlocked, by turning it anti-clockwise, before the generator can be restarted. The emergency stop button can be secured in the locked position with the key, to avoid unauthorized use.

7.3.8 Integrated spark arrestor

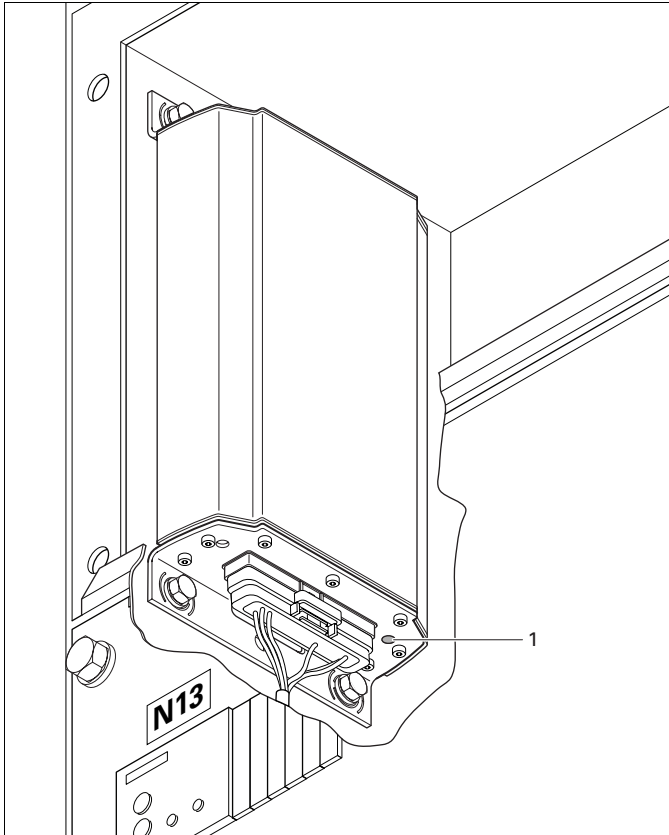
The integrated spark arrestor option is included in the refinery equipment pack.

7.3.9 Air inlet shut-off valve

The engine air inlet shut-off valve option is included in the refinery equipment pack. It will prevent over-speeding of the engine due to combustible gases being traced within the normal engine air intake.

7.3.10 COSMOS™ retrofit kit

COSMOS™ is a web-based global remote monitoring system that electronically tracks every aspect of equipment from its location to its operating parameters. The Cosmos system can send e-mails or SMS messages to the contractor or owner in real time, with all critical and non-critical events and data involving your compressors and generators. It allows optimal servicing.



When starting up the generator, the green Power Led (1) of the Cosmos module will light up when the installation has been carried out correctly.

For information about COSMOS™, consult your local Atlas Copco dealer.

7.4 Overview of the mechanical options

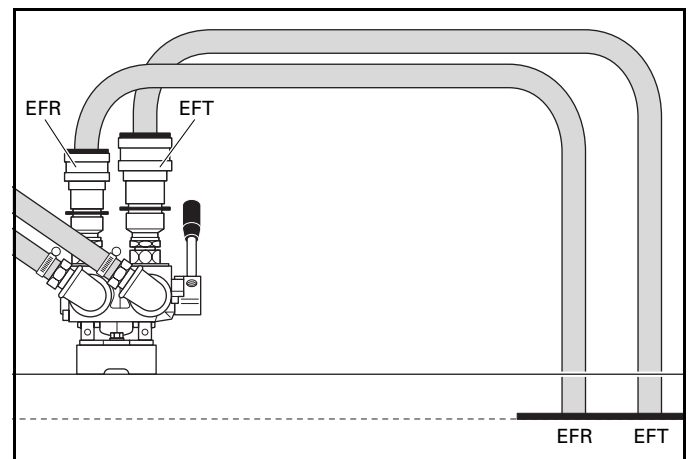
The following mechanical options are available:

- Quick couplings
- Skid fueltank
- Undercarriage (axle, towbar, towing eyes)

7.5 Description of the mechanical options

7.5.1 Quick couplings

The option Quick couplings allows to bypass the internal fueltank and to connect an external fueltank to the unit.



EFT		External fuel tank connection
EFR		External fuel tank return connection

Make sure that:

- the big size coupling is used for the inlet.
- the small size coupling is used for the outlet.



An extra clamp needs to be used to guide the fuellines.

8 Technical specifications

8.1 Technical specifications for QAS 125 Volvo

8.1.1 Readings on gauges

<i>Gauge</i>	<i>Reading</i>	<i>Unit</i>
Ammeter L1-3 (P1-3)	Below max. rating	A
Voltmeter (P4)	Depends upon selector switch	V

8.1.2 Settings of switches

<i>Switch</i>	<i>Function</i>	<i>Activates at</i>
Engine oil pressure	Shut down	0.5 bar
Engine coolant temperature	Shut down	103°C

8.1.3 Specifications of the engine/alternator/unit

		<i>50 Hz</i>	<i>60 Hz</i>
<i>Reference values</i> 1) 4)	Rated frequency	50 Hz	60 Hz
	Rated speed	1500 rpm	1800 rpm
	Generator service duty	PRP	PRP
	Absolute air inlet pressure	100 kPa	100 kPa
	Relative air humidity	30%	30%
	Air inlet temperature	25°C	25°C
<i>Limitations</i> 2)	Maximum ambient temperature	50°C	50°C
	Altitude capability	4000 m	4000 m
	Relative air humidity maximum	85%	85%
	Minimum starting temperature unaided	-15°C	-15°C
	Minimum starting temperature with heater (optional)	-25°C	-25°C
<i>Performance data</i> 2) 3) 4) 5) 6)	Rated active power (PRP) 3 phase	100 kW	108 kW
	Rated power factor (lagging) 3 phase	0.8	0.8
	Rated apparent power (PRP) 3 phase	125 kVA	135 kVA
	Rated apparent power (PRP) 3 phase, lower voltage (optional)	125 kVA	-
	Rated voltage 3 phase line to line	400 V	480 V
	Rated voltage 3 phase line to line, lower voltage (optional)	230 V	-
	Rated current 3 phase	180.4 A	162.4 A
	Rated current 3 phase, lower voltage (optional)	313.8 A	-
	Performance class (acc. to ISO 8528-5:1993)	G2	G2
	Single step load acceptance (0-PRP)	75%	90%
	Frequency droop	isochronous	isochronous
	Fuel consumption at 0% load	3.65 kg/h	6.38 kg/h
	Fuel consumption at 50% load	13.00 kg/h	15.75 kg/h
	Fuel consumption at 75% load	18.39 kg/h	21.35 kg/h
	Fuel consumption at full load (100%)	24.00 kg/h	27.74 kg/h
	Specific fuel consumption at full load (100%)	0.240 kg/kWh	0.277 kg/kWh
	Fuel autonomy at full load	11.0 h	9.4 h
	Max. oil consumption at full load (PRP)	0.1 l/h	0.1 l/h
	Max. sound power level (LWA @ 75% PRP load) measured according to 2000/14/EC OND	97 dB(A)	-
	Capacity of fuel tank	313 l	313 l
	Single step load capability (0-PRP)	100%	100%
<i>Application data</i>	Mode of operation	PRP	PRP
	Site	land use	land use
	Operation	single/parallel	single/parallel
	Start-up and control mode	manual/auto	manual/auto
	Start-up time	unspecified	unspecified
	Mobility/Config. acc. to ISO 8528-1:1993	transportable/D	transportable/D
	optional	mobile/E	mobile/E
	Mounting	fully resilient	fully resilient
	Climatic exposure	open air	open air
	Degree of protection (cubicle)	IP54	IP54
	Status of neutral	earthed	earthed

<i>Alternator</i>	Standard	IEC 34-1 ISO 8528-3	IEC 34-1 ISO 8528-3
	Make	MECC ALTE	MECC ALTE
	Model	ECP 34 1L/N	ECP 34 1L/N
	Rated output, class H temp. rise	130 kVA	156 kVA
	Rating type acc. ISO 8528-3	“BR” 125/40°C	“BR” 125/40°C
	Degree of protection	IP21	IP21
	Insulation class stator	H	H
	Insulation class rotor	H	H
	Number of wires	12	12
<i>Engine</i>	Standard	ISO 3046 ISO 8528-2	ISO 3046 ISO 8528-2
	Type VOLVO	TAD730 GE	TAD730 GE
	Rated net output	113 kW	115 kW
	Rating type acc. ISO 3046-7	ICXN	ICXN
	Coolant	water	water
	Combustion system	direct injection	direct injection
	Aspiration	turbocharged intercooled	turbocharged intercooled
	Number of cylinders	6	6
	Swept volume	7.15 l	7.15 l
	Speed governing	electronic EDC IV	electronic EDC IV
	Capacity of oil sump	23 l	23 l
	Capacity of cooling system	27 l	27 l
	Electrical system	12 Vdc	12 Vdc
	Emission compliance	EU STAGE II	EU STAGE II
<i>Power circuit</i>	Circuit-breaker, 3 phase		
	Number of poles	4	4
	Thermal release It	250 A	250 A
	Magnetic release Im	3..10xIn	3..10xIn
	Circuit-breaker, 3 phase, lower voltage (optional)		
	Number of poles	3	3
	Thermal release It	400 A	400 A
	Magnetic release Im	3..10xIn	3..10xIn
	Fault current protection		
	Residual current release IDn	0.030-30 A	0.030-30 A
	Insulation resistance	10-100 kOhm	10-100 kOhm
	Outlet sockets (optional)		
		domestic (1x) 2p + E 16 A/230 V	
		CEE form (1x) 3p + N + PE 16 A/400 V	
		CEE form (1x) 3p + N + PE 32 A/400 V	
		CEE form (1x) 3p + N + PE 63 A/400 V	
		CEE form (1x) 3p + N + PE 125 A/400 V	
<i>Unit</i>	Dimensions (L x W x H)	3378 x 1180 x 1618 mm	3378 x 1180 x 1618 mm
	Weight net mass	2178 kg	2178 kg
	Weight wet mass	2486 kg	2486 kg

Notes

- 1) Reference conditions for engine performance to ISO 3046-1.
- 2) See derating diagram or consult the factory for other conditions.
- 3) At reference conditions unless otherwise stated.
- 4) Rating definition (ISO 8528-1):
 LTP: Limited Time Power is the maximum electrical power which a generating set is capable of delivering (at variable load), in the event of a utility power failure (for up to 500 hours per year of which a maximum of 300 hours is continuous running). No overload is permitted on these ratings. The alternator is peak continuous rated (as defined in ISO 8528-3) at 25°C.
 PRP: Prime Power is the maximum power available during a variable power sequence, which may be run for an unlimited number of hours per year, between stated maintenance intervals and under the stated ambient conditions. A 10% overload is permitted for 1 hour in 12 hours. The permissible average power output during a 24h period shall not exceed the stated load factor of 70%.
- 5) Specific mass fuel used: 0.86 kg/l.

Derating table (in %, 100% is declared power at "Performance data")

Height (m)	Temperature (°C)										
	0	5	10	15	20	25	30	35	40	45	50
0	100	100	100	100	100	100	100	100	100	90	85
500	100	100	100	100	100	100	100	100	100	90	85
1000	100	100	100	100	100	100	100	100	100	90	85
1500	90	90	90	90	90	90	90	90	90	85	80
2000	85	85	85	85	85	85	85	85	85	80	75
2500	80	80	80	80	80	80	80	80	80	75	70
3000	75	75	75	75	75	75	75	75	75	65	60
3500	65	65	65	65	65	65	65	65	65	60	55
4000	60	60	60	60	60	60	60	60	60	55	50

For use of generator outside these conditions, please contact Atlas Copco.

8.2 Technical specifications for QAS 150 Volvo

8.2.1 Readings on gauges

<i>Gauge</i>	<i>Reading</i>	<i>Unit</i>
Ammeter L1-3 (P1-3)	Below max. rating	A
Voltmeter (P4)	Depends upon selector switch	V

8.2.2 Settings of switches

<i>Switch</i>	<i>Function</i>	<i>Activates at</i>
Engine oil pressure	Shut down	0.5 bar
Engine coolant temperature	Shut down	103°C

8.2.3 Specifications of the engine/alternator/unit

		<i>50 Hz</i>	<i>60 Hz</i>
<i>Reference values</i>			
1) 4)	Rated frequency	50 Hz	60 Hz
	Rated speed	1500 rpm	1800 rpm
	Generator service duty	PRP	PRP
	Absolute air inlet pressure	100 kPa	100 kPa
	Relative air humidity	30%	30%
	Air inlet temperature	25°C	25°C
<i>Limitations</i>			
2)	Maximum ambient temperature	50°C	50°C
	Altitude capability	4000 m	4000 m
	Relative air humidity maximum	< 85%	< 85%
	Minimum starting temperature unaided	-15°C	-15°C
	Minimum starting temperature with heater (optional)	-25°C	-25°C
<i>Performance data</i>			
2) 3) 4) 5) 6)	Rated active power (PRP) 3 phase	120 kW	132 kW
	Rated power factor (lagging) 3 phase	0.8	0.8
	Rated apparent power (PRP) 3 phase	150 kVA	165 kVA
	Rated apparent power (PRP) 3 phase, lower voltage (optional)	150 kVA	-
	Rated voltage 3 phase line to line	400 V	480 V
	Rated voltage 3 phase line to line, lower voltage (optional)	230 V	-
	Rated current 3 phase	216.5 A	198.5 A
	Rated current 3 phase, lower voltage (optional)	376.5 A	-
	Performance class (acc. to ISO 8528-5:1993)	G2	G2
	Single step load acceptance (0-PRP)	60%	75%
	Frequency droop	isochronous	isochronous
	Fuel consumption at 0% load	3.44 kg/h	6.02 kg/h
	Fuel consumption at 50% load	14.37 kg/h	17.41 kg/h
	Fuel consumption at 75% load	20.50 kg/h	23.80 kg/h
	Fuel consumption at full load (100%)	27.13 kg/h	31.36 kg/h
	Specific fuel consumption at full load (100%)	0.226 kg/kWh	0.238 kg/kWh
	Fuel autonomy at full load	10.0 h	8.3 h
	Max. oil consumption at full load (PRP)	0.1 l/h	0.1 l/h
	Max. sound power level (LWA @ 75% PRP load) measured according to 2000/14/EC OND	97 dB(A)	-
	Capacity of fuel tank	313 l	313 l
	Single step load capability (0-PRP)	100%	100%
<i>Application data</i>			
	Mode of operation	PRP	PRP
	Site	land use	land use
	Operation	single/parallel	single/parallel
	Start-up and control mode	manual/auto	manual/auto
	Start-up time	unspecified	unspecified
	Mobility/Config. acc. to ISO 8528-1:1993	transportable/D	transportable/D
	optional	mobile/E	mobile/E
	Mounting	fully resilient	fully resilient
	Climatic exposure	open air	open air
	Degree of protection (cubicle)	IP54	IP54
	Status of neutral	earthed	earthed

<i>Alternator</i>	Standard	IEC 34-1 ISO 8528-3	IEC 34-1 ISO 8528-3
	Make	MECC ALTE	MECC ALTE
	Model	ECP 34 2L/N	ECP 34 2L/N
	Rated output, class H temp. rise	150 kVA	180 kVA
	Rating type acc. ISO 8528-3	“BR” 125/40°C	“BR” 125/40°C
	Degree of protection	IP21	IP21
	Insulation class stator	H	H
	Insulation class rotor	H	H
<i>Engine</i>	Number of wires	12	12
	Standard	ISO 3046	ISO 3046
	Type VOLVO	ISO 8528-2	ISO 8528-2
	Rated net output	TAD731 GE	TAD731 GE
	Rating type acc. ISO 3046-7	132 kW	140 kW
	Coolant	ICXN	ICXN
	Combustion system	water	water
	Aspiration	direct injection	direct injection
		turbocharged	turbocharged
		intercooled	intercooled
	Number of cylinders	6	6
	Swept volume	7.15 l	7.15 l
	Speed governing	electronic	electronic
		EDC IV	EDC IV
	Capacity of oil sump	23 l	23 l
<i>Power circuit</i>	Capacity of cooling system	27 l	27 l
	Electrical system	12 Vdc	12 Vdc
	Emission compliance	EU STAGE II	EU STAGE II
	Circuit-breaker, 3 phase		
	Number of poles	4	4
	Thermal release It	250 A	250 A
	Magnetic release Im	3..10xIn	3..10xIn
	Circuit-breaker, 3 phase, lower voltage (optional)		
	Number of poles	3	3
	Thermal release It	400 A	400 A
	Magnetic release Im	3..10xIn	3..10xIn
	Fault current protection		
	Residual current release IDn	0.030-30 A	0.030-30 A
	Insulation resistance	10-100 kOhm	10-100 kOhm
	Outlet sockets (optional)		
		domestic (1x)	
		2p + E	
		16 A/230 V	
		CEE form (1x)	
		3p + N + PE	
		16 A/400 V	
		CEE form (1x)	
		3p + N + PE	
		32 A/400 V	
		CEE form (1x)	
		3p + N + PE	
		63 A/400 V	
		CEE form (1x)	
		3p + N + PE	
		125 A/400 V	
<i>Unit</i>	Dimensions (L x W x H)	3378 x 1180 x 1618 mm	3378 x 1180 x 1618 mm
	Weight net mass	2224 kg	2224 kg
	Weight wet mass	2532 kg	2532 kg

Notes

- 1) Reference conditions for engine performance to ISO 3046-1.
- 2) See derating diagram or consult the factory for other conditions.
- 3) At reference conditions unless otherwise stated.
- 4) Rating definition (ISO 8528-1):
LTP: Limited Time Power is the maximum electrical power which a generating set is capable of delivering (at variable load), in the event of a utility power failure (for up to 500 hours per year of which a maximum of 300 hours is continuous running). No overload is permitted on these ratings. The alternator is peak continuous rated (as defined in ISO 8528-3) at 25°C.
PRP: Prime Power is the maximum power available during a variable power sequence, which may be run for an unlimited number of hours per year, between stated maintenance intervals and under the stated ambient conditions. A 10% overload is permitted for 1 hour in 12 hours. The permissible average power output during a 24h period shall not exceed the stated load factor of 70%.
- 5) Specific mass fuel used: 0.86 kg/l.

Derating table (in %, 100% is declared power at "Performance data")

Height (m)	Temperature (°C)										
	0	5	10	15	20	25	30	35	40	45	50
0	100	100	100	100	100	100	100	100	100	90	85
500	100	100	100	100	100	100	100	100	100	90	85
1000	100	100	100	100	100	100	100	100	100	90	85
1500	95	95	95	95	95	95	95	95	95	85	80
2000	90	90	90	90	90	90	90	90	90	80	75
2500	80	80	80	80	80	80	80	80	80	75	70
3000	75	75	75	75	75	75	75	75	75	65	60
3500	70	70	70	70	70	70	70	70	70	65	60
4000	60	60	60	60	60	60	60	60	60	55	50

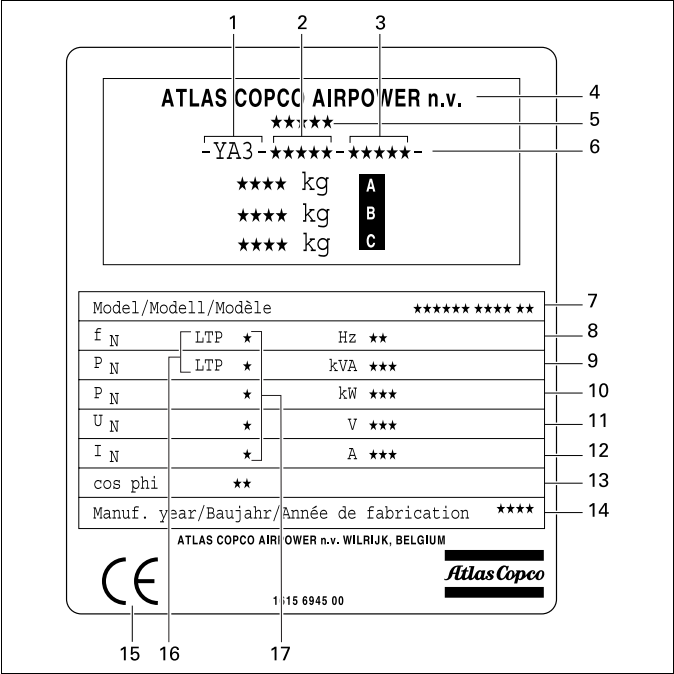
For use of generator outside these conditions, please contact Atlas Copco.

8.3 Conversion list of SI units into British units

1 bar	=	14.504 psi
1 g	=	0.035 oz
1 kg	=	2.205 lb
1 km/h	=	0.621 mile/h
1 kW	=	1.341 hp (UK and US)
1 l	=	0.264 US gal
1 l	=	0.220 imp gal (UK)
1 l	=	0.035 cu.ft
1 m	=	3.281 ft
1 mm	=	0.039 in
1 m³/min	=	35.315 cfm
1 mbar	=	0.401 in wc
1 N	=	0.225 lbf
1 Nm	=	0.738 lbf.ft
t°F	=	32 + (1.8 x t°C)
t°C	=	(t°F - 32)/1.8

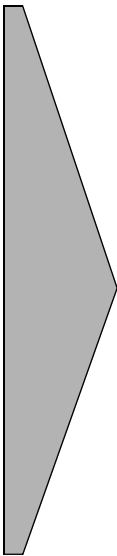
A temperature difference of 1°C = a temperature difference of 1.8°F.

8.4 Dataplate



- A Maximum permitted total weight of the vehicle
- B Maximum permitted front axle load
- C Maximum permitted rear axle load
- 1 Company code
- 2 Product code
- 3 Unit serial number
- 4 Name of manufacturer
- 5 EEC or national type approved number
- 6 Vehicle identification number
- 7 Model number
- 8 Frequency
- 9 Apparent power - PRP
- 10 Active power - PRP
- 11 Nominal rated voltage
- 12 Nominal rated current
- 13 Power factor
- 14 Manufacturing year
- 15 EEC mark in accordance with Machine Directive 89/392E
- 16 Mode of operation
- 17 Winding connections

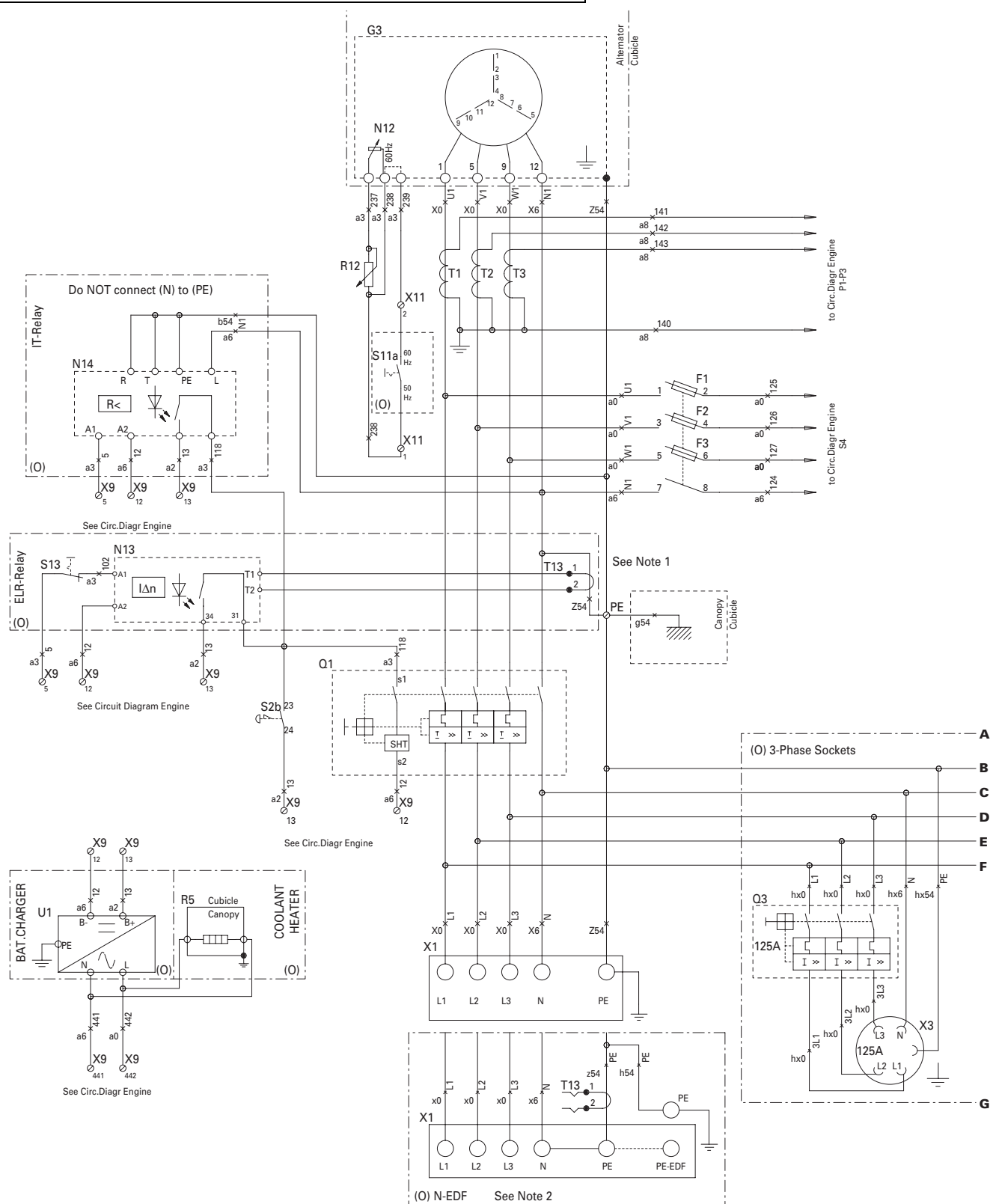
Circuit diagrams



CIRCUIT DIAGRAM

9822 0993 00/02

Applicable for QAS 125-150 Volvo - Power Circuit



CIRCUIT DIAGRAM

Legend

Wire size :

Colour code :

aa = 0.5 mm ²	0 = black
a = 1 mm ²	1 = brown
b = 1.5 mm ²	2 = red
c = 2.5 mm ²	3 = orange
d = 4 mm ²	4 = yellow
e = 6 mm ²	5 = green
f = 10 mm ²	6 = blue
g = 16 mm ²	7 = purple
h = 25 mm ²	8 = grey
i = 35 mm ²	9 = white
j = 50 mm ²	54 = green/yellow
k = 70 mm ²	
l = 95 mm ²	
n = 150 mm ²	
hx = 25 mm ² EPR-CSP to BS6195 4C	
ix = 35 mm ² EPR-CSP to BS6195 4C	
kx = 70 mm ² EPR-CSP to BS6195 4C	
lx = 95 mm ² EPR-CSP to BS6195 4C	
mx = 120 mm ² EPR-CSP to BS6195 4C	
nx = 150 mm ² EPR-CSP to BS6195 4C	

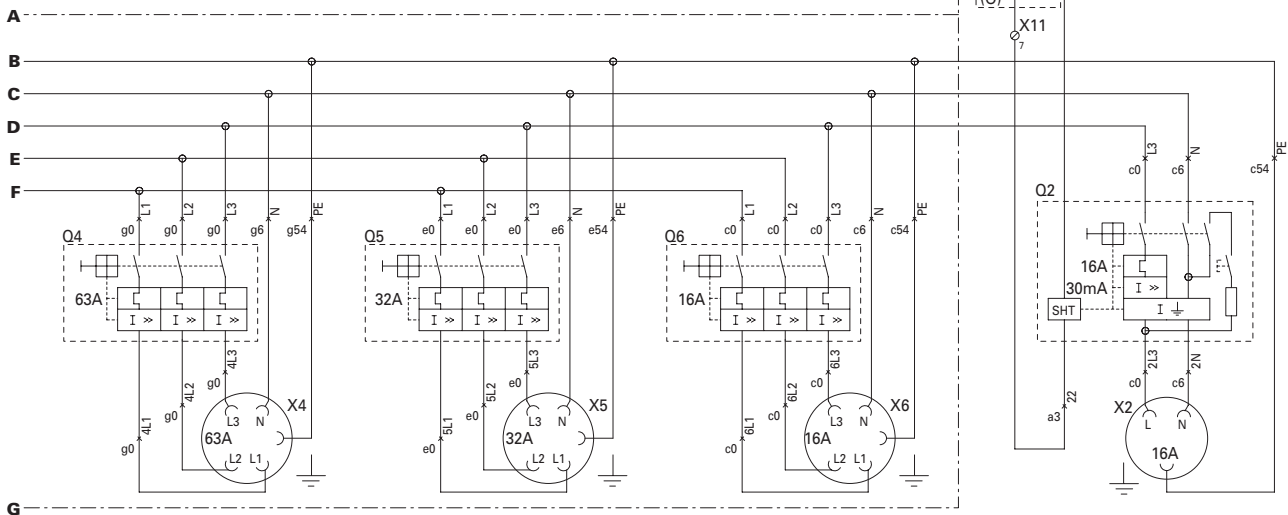
	Q1	T1-3	P1-3	Wire size	
				X	Z
QAS125	180A	300/5A	0-300A	k	i
QAS150	215A	300/5A	0-300A	l	j
QAS200	290A	400/5A	0-400A	kx	ix
QAS250	360A	400/5A	0-400A	lx	jx
QAS325	470A	600/5A	0-600A	nx	kx

I_o has to be set at a value between 3.5 and 4 times I_r.

Notes

Note 1: The PE-N connection has to be made at the alternator-side of main Circuit Breaker Q1.

Note 2: With "TB EDF", do NOT connect (N) to (PE) at Q1. T13 is to be mounted on the (PE)-conductor, instead of on the PE-N connection in the cubicle.

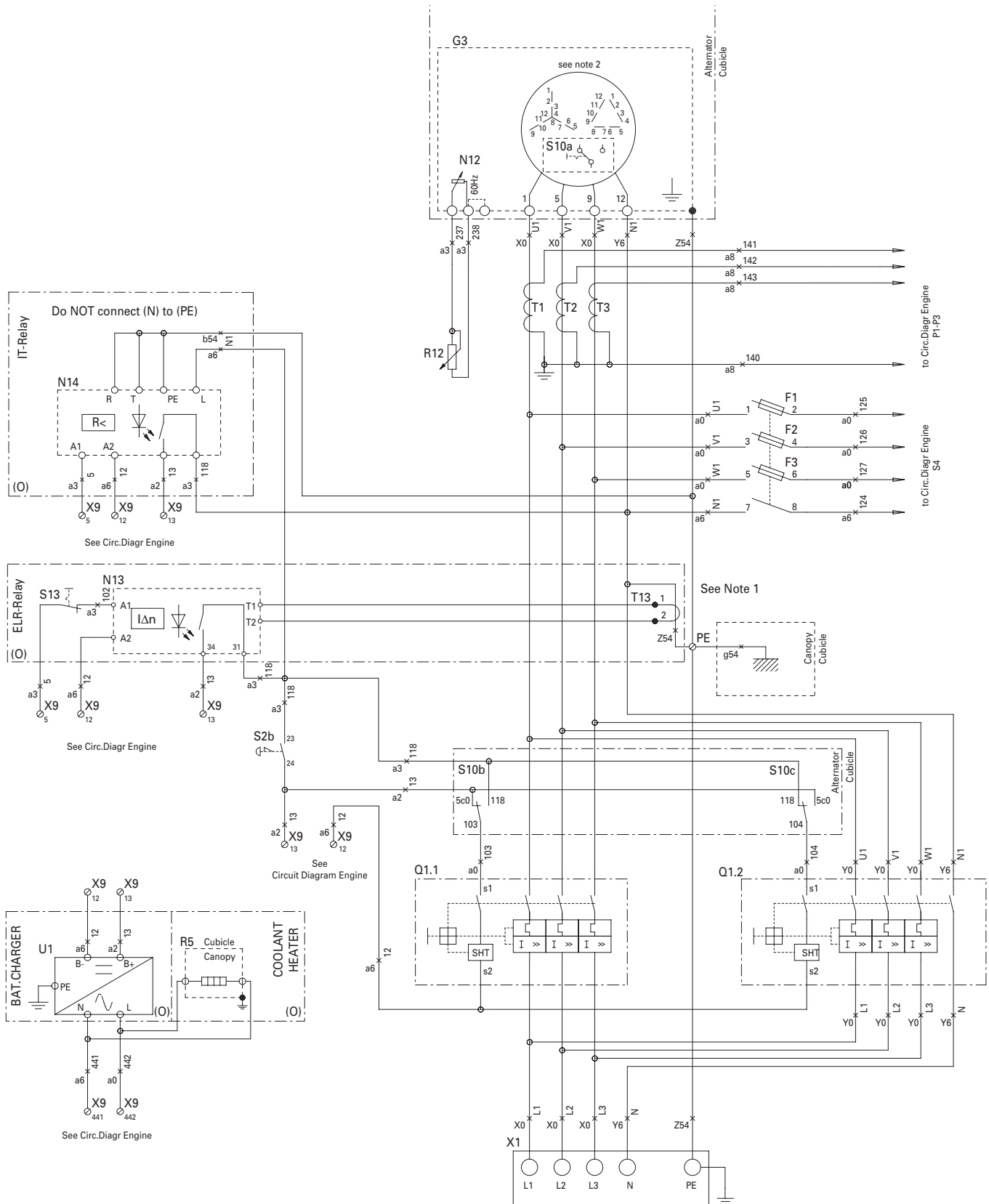


F1-3	Fuse 4 A	R5	Coolant heater	X2	Outlet socket (16 A - 1-phase)
G3	Alternator	R12	Voltage adjustment potentiometer	X3	Outlet socket (125 A - 3-ph+N+PE)
N12	Automatic voltage regulator	S2b	Emergency stop	X4	Outlet socket (63 A - 3-ph+N+PE)
N13	Earth leakage relay		(S2a: see Engine Circuit)	X5	Outlet socket (32 A - 3-ph+N+PE)
N14	IT-Relay	S11a,b	Selector switch 50Hz/60Hz	X6	Outlet socket (16 A - 3-ph+N+PE)
Q1	Main circuit breaker		(S11c: see Engine Circuit)	X9	Terminal strip (See Engine Circuit)
Q2	Circuit breaker (16 A - 1phase)	S13	Earth relay lock-out switch	X11	Terminal strip (See Engine Circuit)
Q3	Circuit breaker (125 A - 3phase)	T1-3	Current transformer	X25	Terminal strip
Q4	Circuit breaker (63 A - 3phase)	T13	Torus earth relay		
Q5	Circuit breaker (32 A - 3phase)	U1	Static battery conditioner	(O)	Optional equipment
Q6	Circuit breaker (16 A - 3phase)	X1	Terminal board		

CIRCUIT DIAGRAM

9822 0993 01/02

Applicable for QAS 125-150 Volvo - Dual voltage



CIRCUIT DIAGRAM

	Q1.1	Q1.2	T1-3	P1-3	Wire size		
					<u>X</u>	<u>Y</u>	<u>Z</u>
QAS 125	315A	180A	400/5A	0-400A	lx	k	l
QAS 150	375A	215A	400/5A	0-400A	lx	l	l

Legend

Wire size :

Colour code :

aa = 0.5 mm ²	0 = black
a = 1 mm ²	1 = brown
b = 1.5 mm ²	2 = red
c = 2.5 mm ²	3 = orange
d = 4 mm ²	4 = yellow
e = 6 mm ²	5 = green
f = 10 mm ²	6 = blue
g = 16 mm ²	7 = purple
h = 25 mm ²	8 = grey
i = 35 mm ²	9 = white
j = 50 mm ²	54 = green/yellow
k = 70 mm ²	
l = 95 mm ²	
lx = 95 mm ² EPR-CSP to BS61954C	
mx = 120 mm ² EPR-CSP to BS61954C	

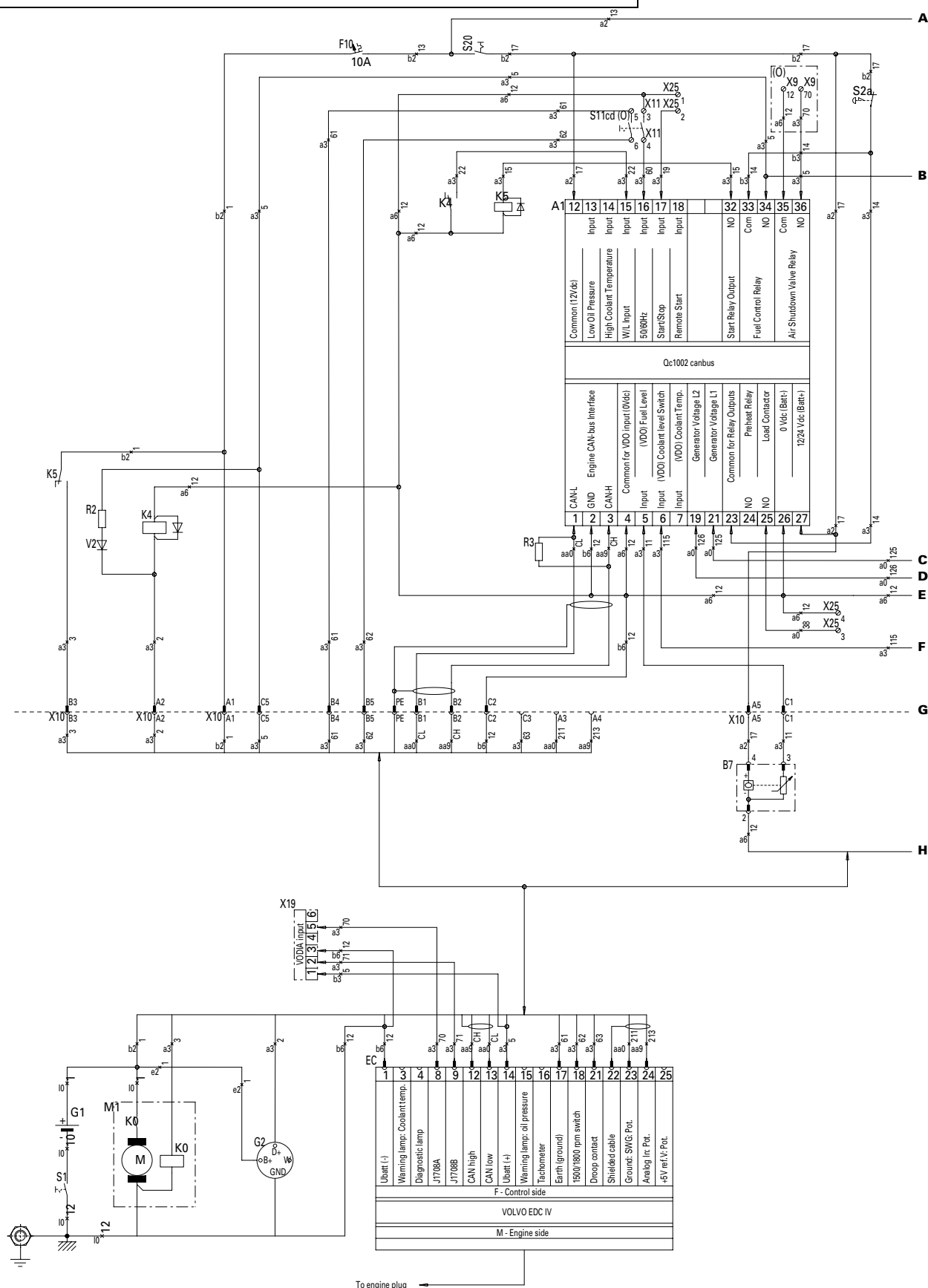
Notes

- Note 1: The PE-N connection has to be made at the alternator-side of main Circuit Breaker Q1.
- Note 2: 3ph higher voltage : connect 2-3 ; 6-7 ; 10-11 ; 4-8-12(N)
 3ph lower voltage : connect 12-1 ; 2-3 ; 4-5 ; 6-7 ; 8-9 ; 10-11

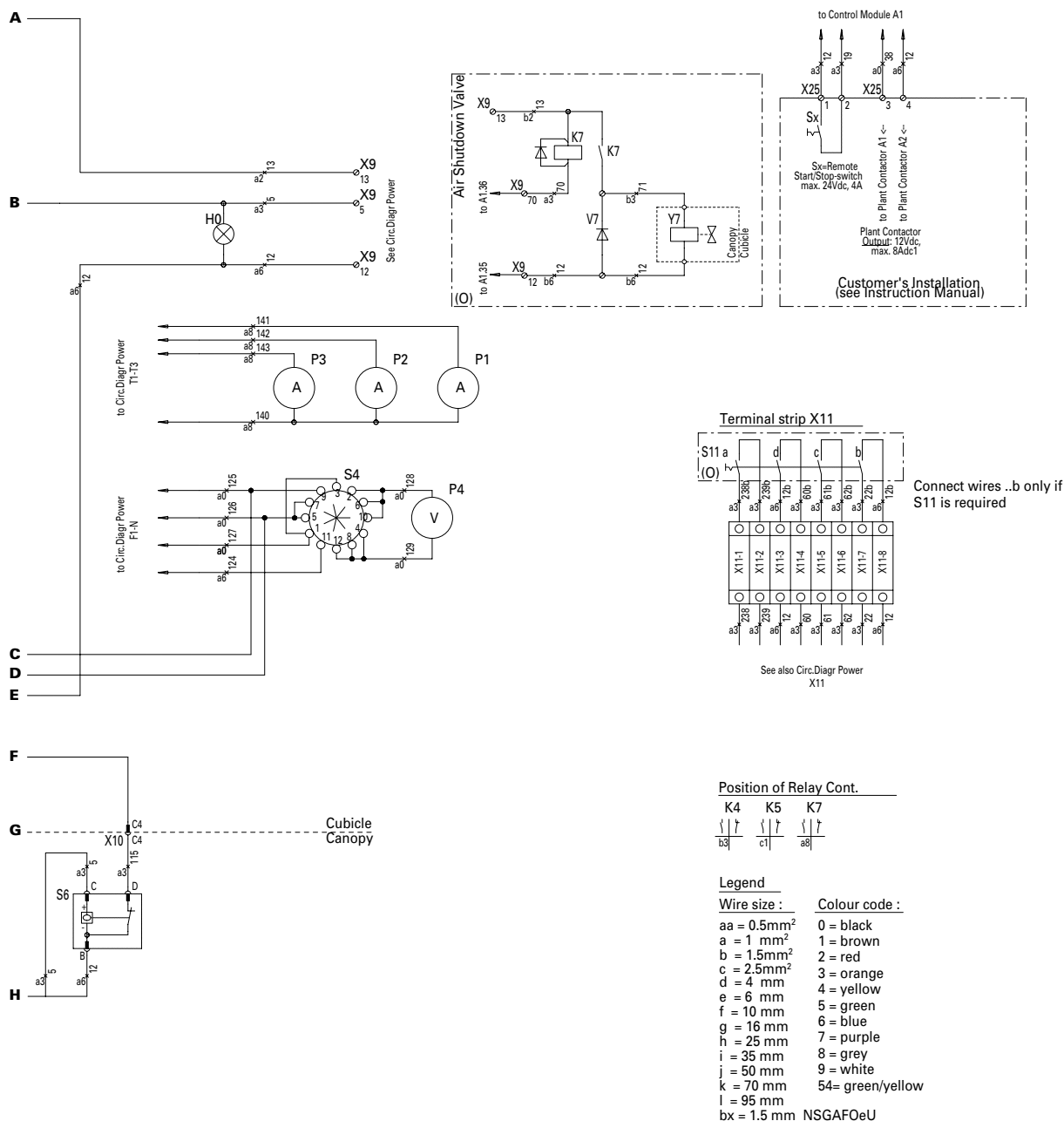
F1-3	Fuse 4 A	R5	Coolant heater	T1-3	Current transformer
G3	Alternator	R12	Voltage adjustment potentiometer	T13	Torus earth relay
N12	Automatic voltage regulator	S2b	Emergency stop	U1	Static battery conditioner
N13	Earth leakage relay		(S2a: see Engine Circuit)	X1	Terminal board
N14	IT-Relay	S10a,b,c	Supply voltage switch	X9	Terminal strip (See Engine Circuit)
Q1.1	Circuit breaker (low voltage)		(S10d: see Engine Circuit)	X25	Terminal strip
Q1.2	Circuit breaker (high voltage)	S13	Earth relay lock-out switch	(O)	Optional equipment

CIRCUIT DIAGRAM

9822 0993 05/02

Applicable for QAS 125-150 Volvo - Qc1002™, Engine Circuit

CIRCUIT DIAGRAM

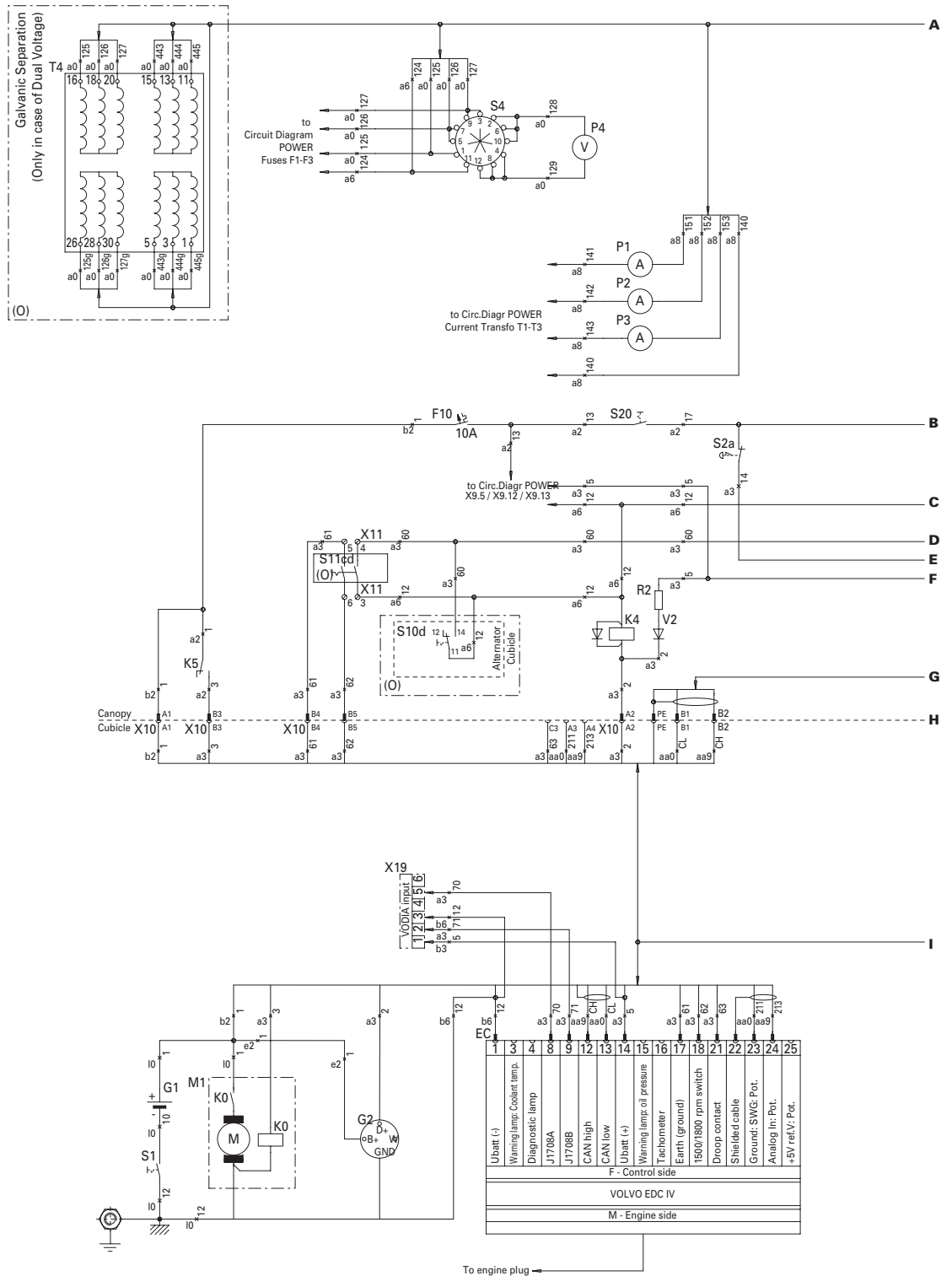


A1	Control module (configure in UNIT-type 7)	M1	Starter motor	S20	ON/OFF-switch
B7	Fuel level sensor	P1-3	Amperemeter	V2	Diode
EC	Engine controller	P4	Voltmeter	V7	Free-wheeling diode Y7(O)
F10	Fuse	R2	Excitation resistor 47 Ohm	X9	Terminal strip (See Power Circuit)
G1	Battery 12 V	R3	Resistor 120 Ohm	X10	15-pole connector
G2	Charging alternator	S1	Battery switch	X11	Terminal strip (See Power Circuit)
H0	Panel light	S2a	Emergency stop button (S2b: see Power Circuit)	X19	Motor diagnostic plug
K0	Starter solenoid	S4	Voltmeter change-over switch	X25	Terminal strip
K4	W/L-invertor relay	S6	Coolant level switch	Y7	Air inlet shutdown valve (O)
K5	Starter relay	S11c,d	Selector switch 50/60Hz (S11a,b: see Power Circuit)	(O)	Optional equipment
K7	Auxiliary relay for Y7 (O)				

CIRCUIT DIAGRAM

9822 0993 06/04

Applicable for QAS 125-150 Volvo - Qc2002™, Engine Circuit

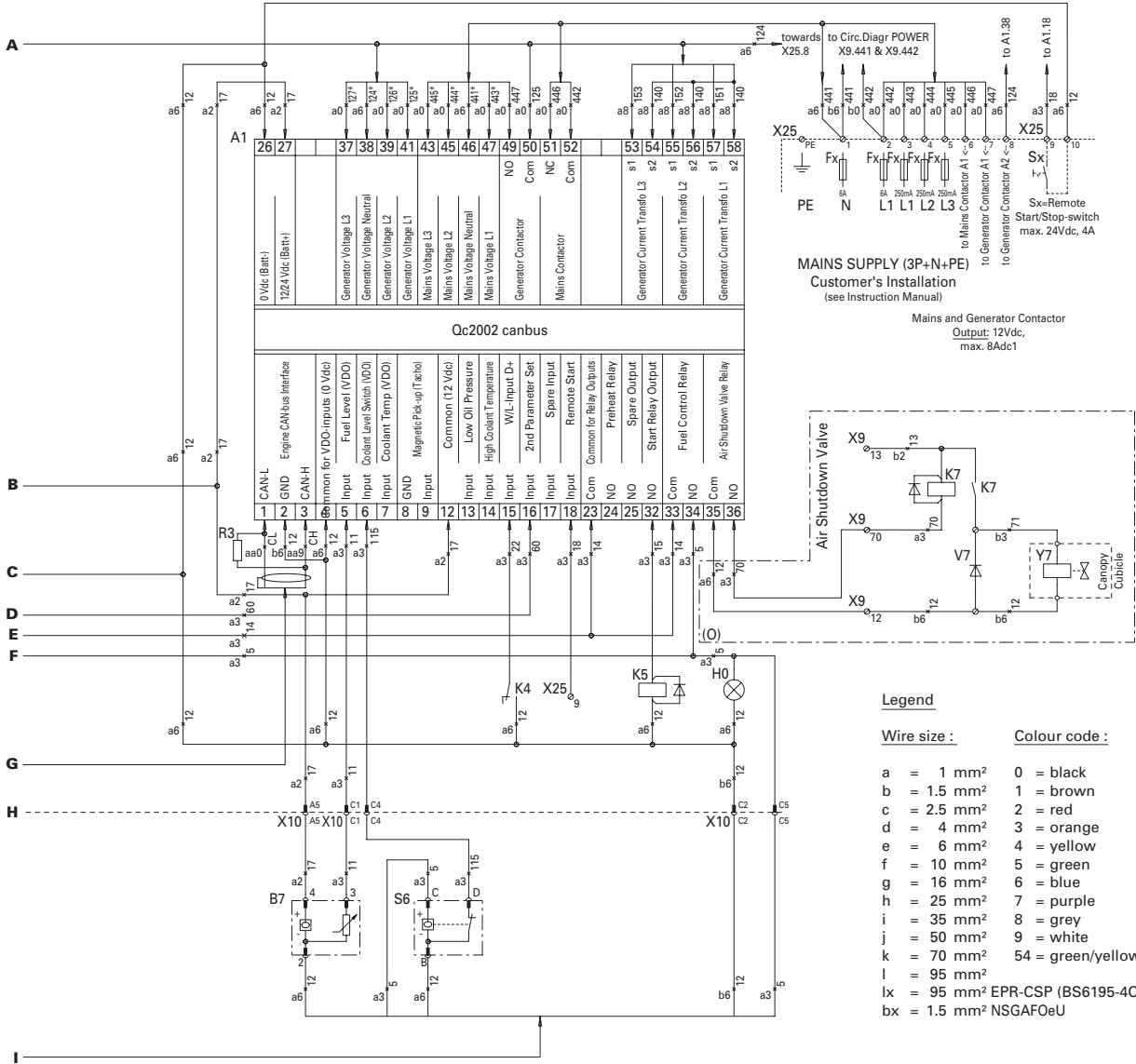


A1	Generator control unit	H0	Panel light	P1-3	Amperemeter
B7	Fuel level sensor	K0	Starter solenoid	P4	Voltmeter
EC	Engine controller	K4	W/L-invertor relay	R2	Excitation resistor 47 Ohm
F10	Fuse 10 A DC	K5	Starter relay	R3	Resistor 120 Ohm
G1	Battery 12 Vdc	K7	Auxiliary relay for Y7 (O)	S1	Battery switch
G2	Charging alternator	M1	Starter motor		

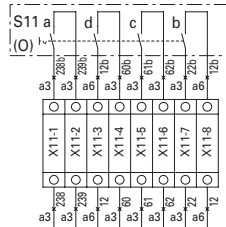
CIRCUIT DIAGRAM

* In case of Dual Voltage:

- 1) Connect wires XXXg from galvanic separation to A1:
125g to A1-41 443g to A1-47
126g to A1-39 444g to A1-45
127g to A1-37 445g to A1-43
- 2) Remove wires 124 from A1-38 and 441 from A1-46



Terminal strip X11



Connect wires ..b only if S11 is required

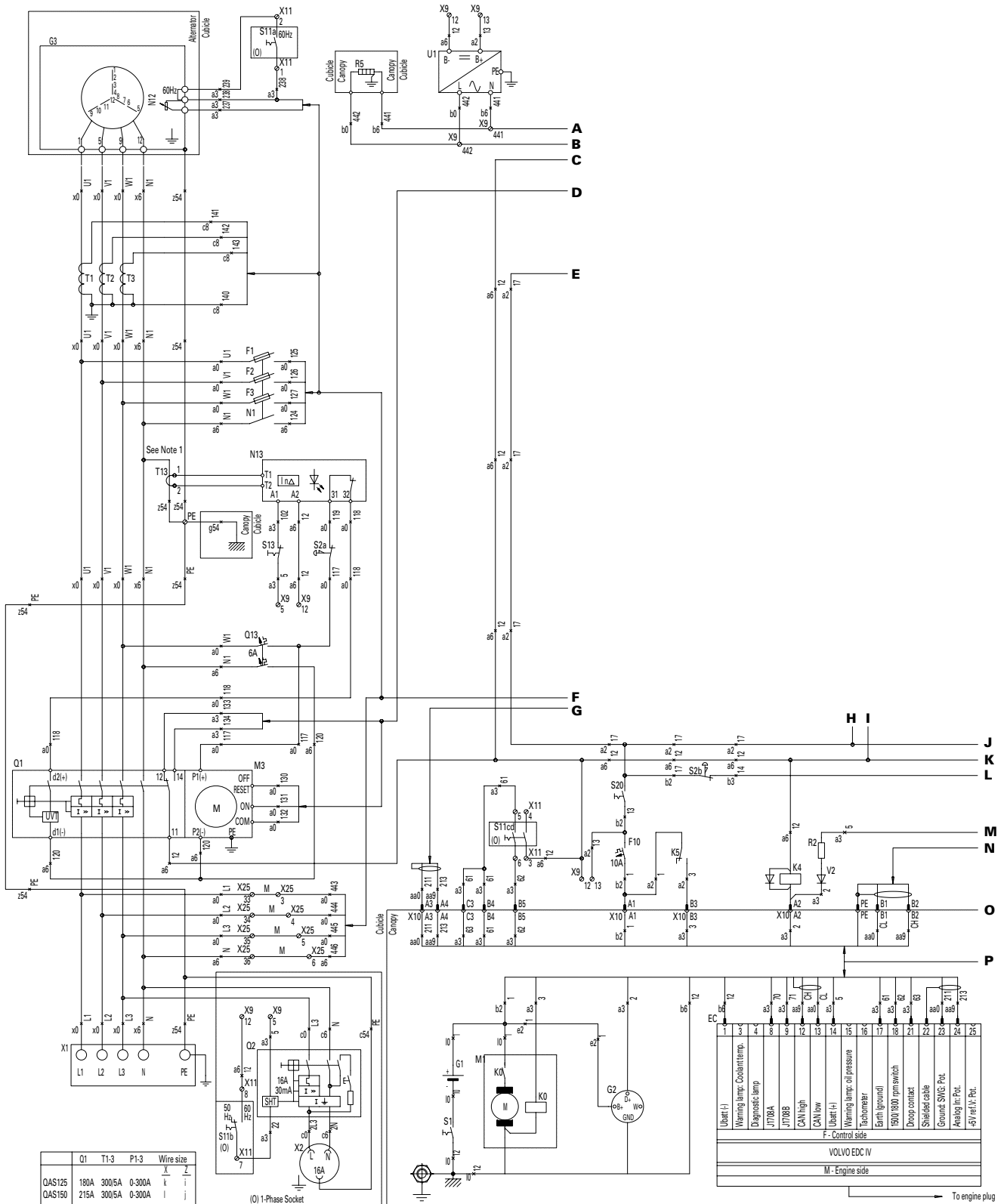
See also Circ.Diagr Power X11

S2a	Emergency stop (S2b: see Power Circuit)	S20	ON/OFF-switch	X10	15-Pole connector wire harness
S4	Voltmeter change-over switch	T4	Galvanic separation	X11	Terminal strip (See Power Circuit)
S6	Coolant level switch	V2	Excitation diode	X19	Motor diagnostic plug
S10d	Supply voltage switch	V7	Free-wheeling diode Y7(O)	X25	Customer's terminal strip
S11c,d	Selector switch 50/60Hz	X9	Terminal strip (See Power Circuit)	Y7	Air inlet shutdown valve (O)
				(O)	Optional equipment

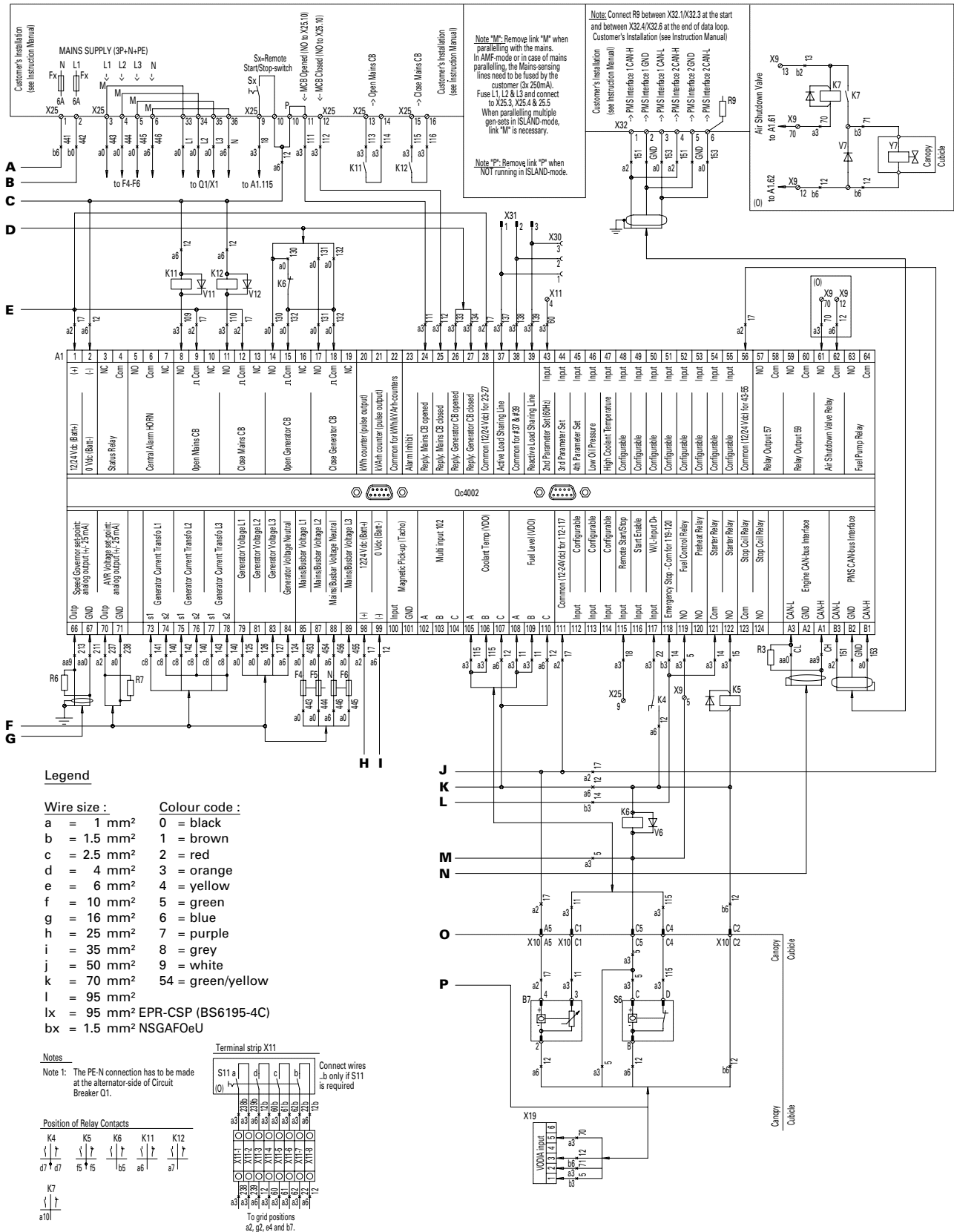
CIRCUIT DIAGRAM

9822 0993 08/00

Applicable for QAS 125-150 Volvo - Qc4002™, Engine & Power Circuit



CIRCUIT DIAGRAM



CIRCUIT DIAGRAM

9822 0993 08/00

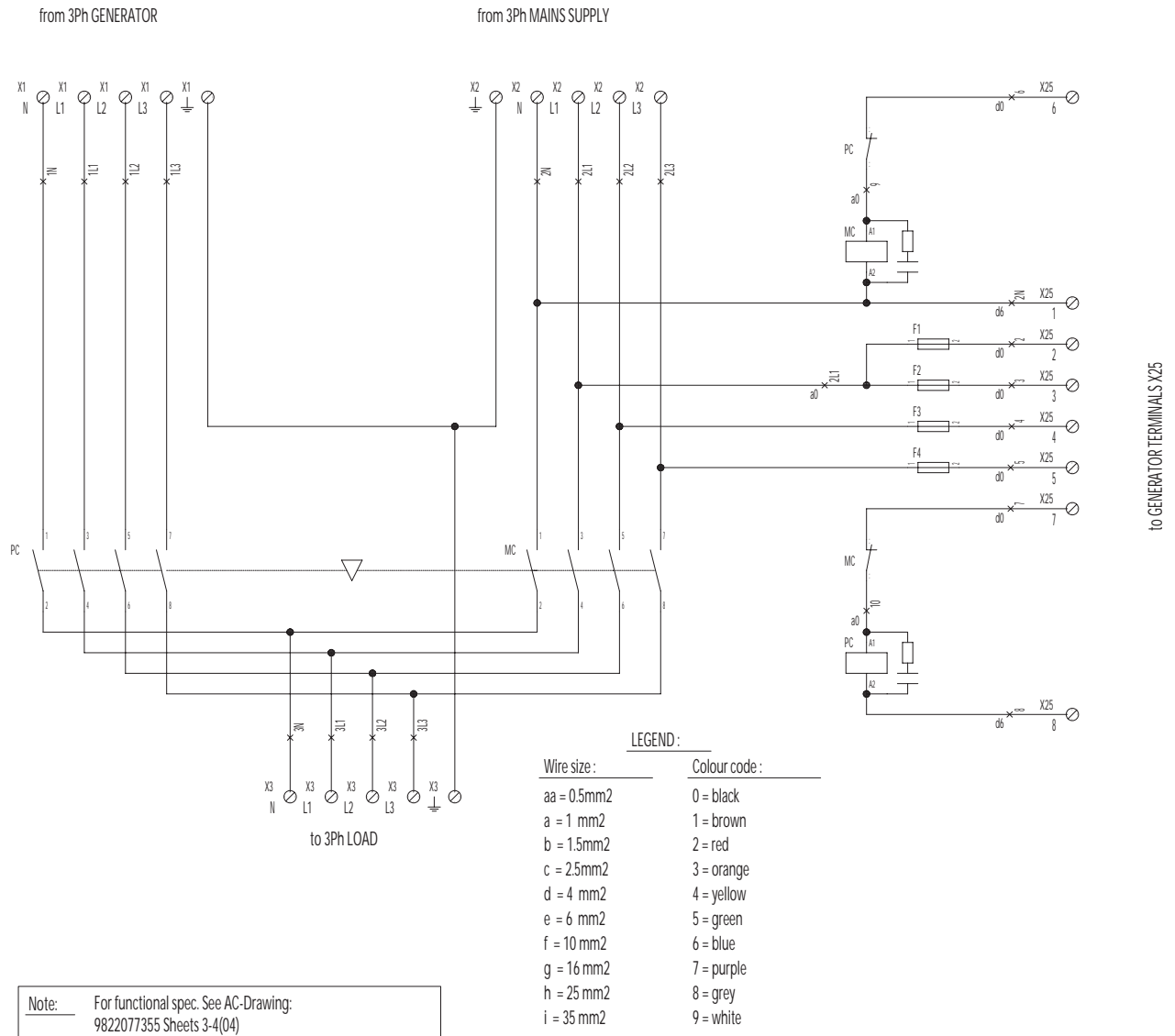
Applicable for QAS 125-150 Volvo - Qc4002™, Engine & Power Circuit

A1	Generator control unit	M3	Motor drive for Q1	T1-3	Current transformers
A2	LCD display	N12	Automatic voltage regulator	T13	Torus earth leakage
B7	Fuel level sensor	N13	Earth leakage relay	U1	Battery charger
EC	Engine controller	Q1	Circuit breaker	V2	Excitation diode
F1-6	Fuse 250mA	Q2	Circuit breaker (16A+diff)	V6	Free-wheeling diode K6
F10	Fuse 10A DC	Q13	Circuit breaker 6 Ai	V7	Free-wheeling diode Y7 (O)
G1	Battery 12Vdc	R2	Excitation resistor 47 ohm	V11, V12	Free-wheeling diode K11, K12
G2	Charging alternator	R5	Coolant heater (O)	X1	Terminal board
G3	Alternator	R6	Resistor 150 Ohm (speed adj)	X2	Socket outlet (16A+1phase)
K0	Starter solenoid	R7	Resistor 180 Ohm (volt adj)	X9	Terminal strip
K4	W/L-invertor relay	R9, R10	Resistor 120 Ohm (PMS CAN-bus)	X10	Connector wire harness
K5	Starter relay	S1	Battery switch	X11	Terminal strip
K6	Fuel solenoid relay	S2	Emergency stop	X25	Customer's terminal strip
K7	Auxiliary relay for Y7 (O)	S6	Coolant level switch	X30-31	Connector load sharing
K11	Auxiliary relay open MCB	S11c,d	Selector switch 50/60Hz	X32	PMS interface terminals
K12	Auxiliary relay close MCB	S13	Earth leakage disable-switch	Y7	Air inlet shutdown valve (O)
M1	Starter motor	S20	ON/OFF-switch	(O)	Optional equipment

CIRCUIT DIAGRAM

9822 8077 10/01

Applicable for QAS 125-150 Volvo - COC-kit



F1-4	Fuse
MC	Contactors mains supply
PC	Contactors generator
X1-3	Terminal strip
X25	Terminal strip

