

Atlas Copco Instruction Manual



Instruction Manual
for AC Generators
English

QES 9-11 Kd ESF

QES 14-16 Kd ESF

QES 20-25 Kd S3A ESF

QES 30-35 Kd S3A ESF

QES 40-50 Kd S2/S3A ESF

D1105-E2BG

D1703M-BG

V2403M-BG

V3300DI

V3800DI-T

Atlas Copco

QES 9-14-20-30-40 Kd S3A/S2 ESF - 50Hz
QES 11-16-25-35-50 Kd S3A/S2 ESF - 60 Hz

Instruction Manual for AC Generators

Instruction manual5

Circuit diagrams 115

Original instructions

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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 trouble free 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 on-site 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 On-site generators (with earthing pin):

Earth the generator as well as the load properly.

16b On-site 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 deceleration 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 a unit is to be backed up by a towing vehicle, disengage the overrun brake mechanism (if it is not an automatic mechanism).

4 In case of transporting a non-trailer unit on a truck, fasten it to the truck by attaching straps via fork lift slots, via the holes in the frame at the front and back or via the lifting beam. To prevent damage, never put straps on the roof surface of the unit.

5 Never exceed the maximum towing speed of the unit (mind the local regulations).

6 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.

7 To lift heavy parts, a hoist of ample capacity, tested and approved according to local safety regulations, shall be used.

8 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.

9 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.

10 Never leave a load hanging on a hoist.

11 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.

12 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.

13 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.

14 The electrical connections shall correspond to local codes. The machines shall be earthed and protected against short circuits by fuses or circuit breakers.

15 Never connect the generator outlets to an installation which is also connected to a public mains.

16 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.

17 Before transportation of the unit, switch off all the circuit breakers.

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 The unit has parts of which the temperature can be in excess of 80 °C (176 °F), and which may be accidentally touched by personnel when opening the machine during or just after operation. Insulation or safety guards protecting these parts shall not be removed before the parts have cooled down sufficiently, and must be re-installed before operating the machine. As it is not possible to insulate or protect all hot parts by guards (e.g. exhaust manifold, exhaust turbine), the operator / service engineer must always be aware not to touch hot parts when opening a machine door.
- 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 reduces 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 tightening 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.
- 28 When operating the generator in Remote or Auto mode, observe all relevant local legislation.

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 test run, 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

When servicing batteries, always wear protecting clothing and glasses.

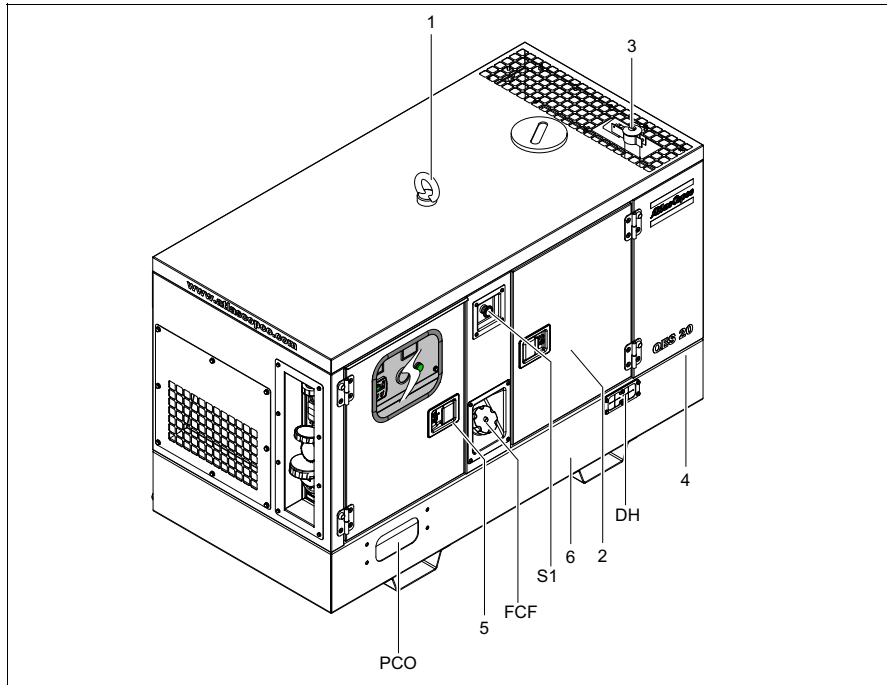
- 1 The electrolyte in batteries is a sulphuric acid solution which is fatal if it hits your eyes, and which can cause burns if it contacts your skin. Therefore, be careful when handling batteries, e.g. when checking the charge condition.
- 2 Install a sign prohibiting fire, open flame and smoking at 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.

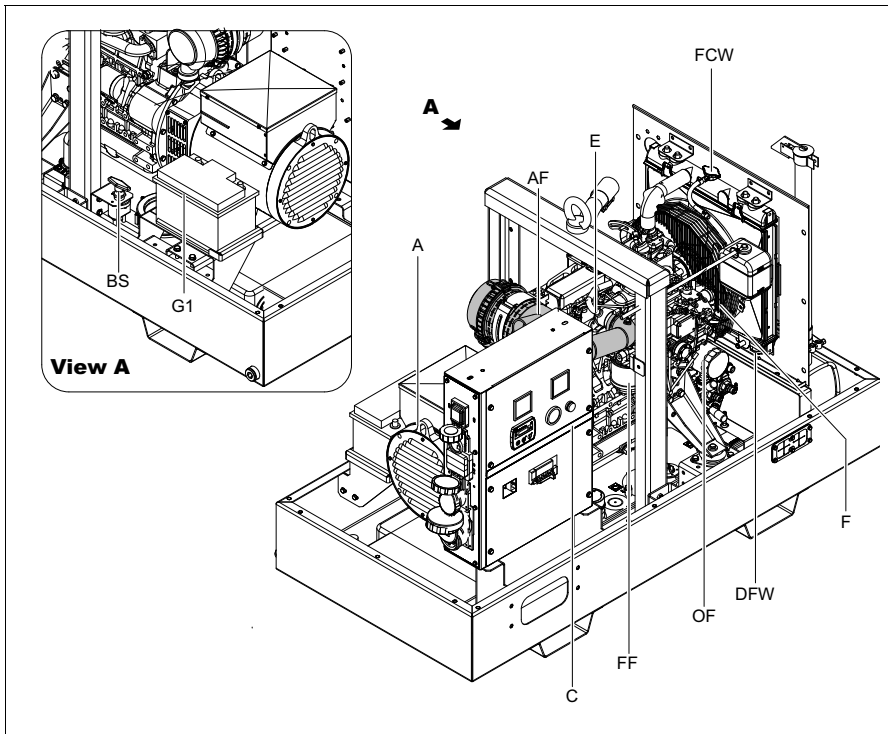
2 Main parts

2.1 General description

The QES 9-14-20-30-40 and QES 11-16-25-35-50 are AC generators, built for continuous running at sites where no electricity is available or as stand-by in cases of interruption of the mains. The QES 9-14-20-30-40 generators operate at 50 Hz, 400/380/415V 3ph and 230V 1ph. The QES 11-16-25-35-50 generators operate at 60 Hz, 208/220/380V 3ph and 240V 2ph. The QES 9-14-20-30-40 and QES 11-16-25-35-50 generators are driven by a fluid-cooled diesel engine, manufactured by KUBOTA. An overview of the main parts is given in the diagram below. Some parts of the unit might differ, depending on the version.



- | | |
|-----|---|
| 1 | Lifting beam |
| 2 | Side doors |
| 3 | Engine exhaust |
| 4 | Data plate |
| 5 | Door, access to control and indicator panel |
| 6 | Galvanized frame with forklift slots |
| DH | Drain and access hole |
| FCF | Filler cap fuel |
| PCO | Power cable output |
| S1 | Emergency stop |



- A Alternator
- AF Air filter
- BS Battery switch
- C Cubicle
- DFW Drain flexible cooling water
- E Engine
- F Fan
- FCW Filler cap cooling water
- FF Fuel filter
- G1 Battery
- OF Oil filter

2.2 Markings

Markings provide instructions and information. They also warn of hazards. For convenience and safety, keep all markings in legible condition, replacing them when damaged or missing. Replacement markings are available from the factory.

A brief description of all markings provided on the generator is given hereafter. The precise location of all markings can be found in the parts manual of this generator.



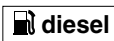
Indicates the presence of electric shock hazards. Enclosures marked with these symbols should only be opened by trained or instructed people.



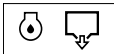
Indicates that these parts can become very hot during operation (e.g. engine, cooler, etc.). Always make sure that these parts are cooled down before touching them.



Indicates the sound power level in accordance with Directive 2000/14/EC (expressed in dB (A)).



Indicates that the generator may be refueled with diesel fuel only.



Indicates the drain for the engine oil.



Indicates the drain for the coolant.



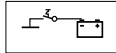
Indicates the drain plug for the engine fuel.



Use PAROIL E only.



Indicates that the alternator should not be cleaned with high pressurised water.



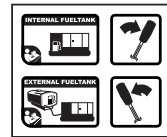
Indicates the battery switch.



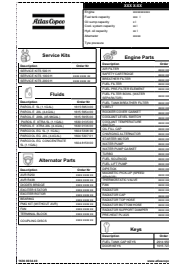
Indicates that the unit may start automatically and that the instruction book has to be consulted prior to use.



Read the instruction manual before using the lifting eye.



Indicates the 3-way valve.



Indicates the different service packs, liquids and critical parts. These parts can be ordered to the factory.

2.3 Mechanical features

The mechanical features described in this chapter are standard provided on this generator. For all other mechanical features, see chapter “Overview of the mechanical options” on page 67.

2.3.1 Engine and alternator

The alternator is driven by a fluid-cooled diesel engine. The engine’s power is transmitted through a direct disc coupling.

The generator houses a single bearing alternator with a dedicated voltage regulator.

The synchronous brushless alternator has Class H rotor and stator windings in an IP23 housing.

2.3.2 Cooling system

The engine is provided with a water cooler. The cooling air is generated by a fan, driven by the engine.

2.3.3 Safety devices

The engine is equipped with low oil pressure and high coolant temperature shut-down switches.

2.3.4 Bodywork

The alternator, the engine, the cooling system, etc. are enclosed in a sound-insulated bodywork that can be opened by means of side doors (and service plates).

The generator can be lifted by using the lifting eye integrated in the bodywork (roof). To be able to lift the QES 9-14-20-30-40 / QES 11-16-25-35-50 by means of a forklift, rectangular slots are provided in the frame.

The earthing rod, connected to the generator’s earth terminal is located at the bottom of the frame on the outside.

2.3.5 Control panel

The control panel grouping volt and amp meters, control switch etc., is placed at the rear end.

2.3.6 Data plate and serial number

The generator is furnished with a data plate showing the product code, the unit number and the power output (see chapter “Data plate” on page 114).

The serial number is located on the right-hand front side of the frame.

2.3.7 Drain plugs and filler caps

The drain holes for the engine oil, the coolant and the plug for the fuel, are located and labelled on the frame. The fuel drain plug is located at the front, the others at the service side.

The drain flexible for engine oil can be brought to the outside of the generator through the drain hole.



The drain hole can also be used to guide external fuel tank connections. When connecting an external fuel tank, use the 3-way valves. Refer to chapter “External fuel tank connection (with/without quick couplings)”.

The filler cap for the engine coolant is accessible via an opening in the roof. The fuel filler cap is located in the side panel.

2.3.8 Spillage free skid

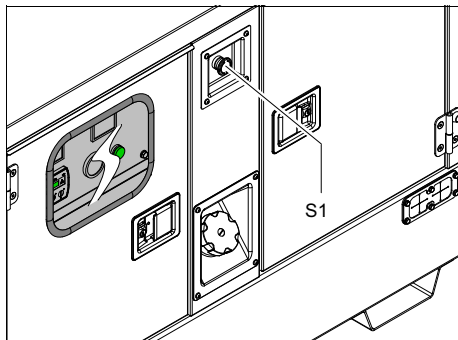
A Spillage free skid with forklift slots allows the customer to transport the generator easily with a forklift. It avoids accidental spilling of engine fluids and thus helps to protect the environment.

The leaking fluid can be removed via drain holes, secured by drain plugs. Tighten the plugs firmly and check for leakages. When removing the leaking fluid, observe all relevant local legislation.

2.4 Electrical features

The electrical features described in this chapter are standard provided on this generator. For all other electrical features, see chapter “Overview of the electrical options” on page 62.

2.4.1 Emergency stop



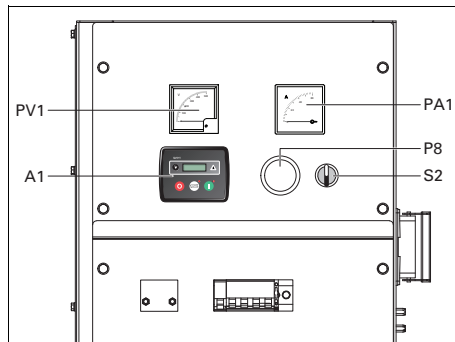
S1Emergency stop button

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.

2.4.2 Qc1011™ control and indicator panel

To operate the generator, the QES 9-14-20-30-40 / QES 11-16-25-35-50 control panel contains a Qc1011™ controller. The controller will carry out all necessary tasks to control and protect the generator, which allows operation in many different applications.

General description Qc1011™ control panel



A1 Qc1011™ display

PA1Ammeter

PV1 Voltmeter

P8.....Fuel level gauge

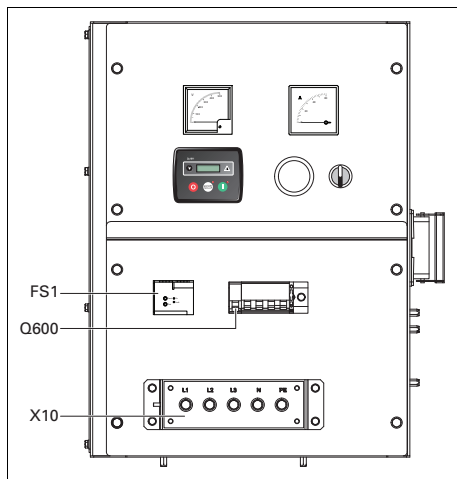
S2.....ON/OFF switch

Position O: No voltage is supplied to the Qc1011™ module, the generator will not start.

Position I: Voltage is supplied to the Qc1011™ module, it is possible to start up the generator.

2.4.3 Output terminal board

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



Q600... Main circuit breaker

Interrupts the power supply to X10 when a short-circuit occurs at the load side, or when the earth leak detector (30 mA) or the overcurrent protection (QES 9-11: 16 A, QES 14-16: 20 A, QES 20-25: 32 A, QES 30-40: 40 A, QES 40-50: 63A) is activated or when the shunt trip is energized. It must be reset manually after eliminating the problem.

X10 Main power supply (400 V AC)

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

FS1 Earth leak detector

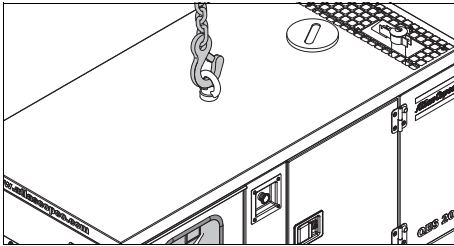
Detects and indicates an earth fault current and activates the main circuit breaker Q600. The detection level can be set at 0.03 A fixed with instantaneous trip but can also be adjusted between 0.1 A and 30 A with time delayed (0 - 4.5 sec) trip. FS1 has to be reset manually after eliminating the problem (Reset button) and has to be tested monthly (by pushing the Test button).

3 Installation and connection

3.1 Lifting

The lifting eye, to lift the generator by means of a hoist, is integrated in the bodywork and easily accessible from the outside. The recesses in the roof have guiding rods at both sides.

When lifting the generator, the hoist has to be placed in such a way that the generator, which must be placed level, will be lifted vertically.

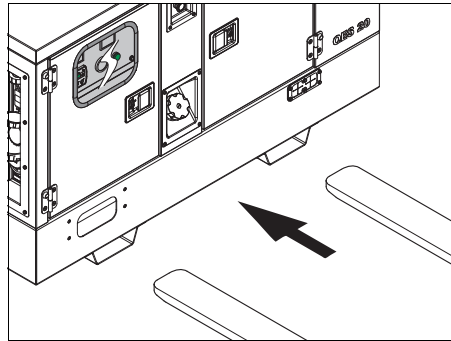


Never use the guiding rods to lift the generator.



**Lifting acceleration and deceleration must be kept within safe limits (max. 2 g).
Helicopter lifting is not allowed.**

To be able to lift the generator by means of a forklift, rectangular slots are provided at the bottom of the frame.



3.2 Installation

3.2.1 Indoor installation

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.



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

3.2.2 Outdoor installation

- 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.
- Locate the rear end of the generator upwind, away from contaminated wind streams and walls. Avoid recirculation of exhaust air from the engine. This causes overheating and engine power decrease.

- 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.
- Check that the cable end of the earthing rod is connected to the earth terminal.



The generator is wired for a TN-system to IEC 364-3, i.e. one point in the power source directly earthed - in this case the neutral. The exposed conductive parts of the electric installation must be directly connected to the functional earth. If operating the generator in another power system, e.g. an IT-system, other protective devices required for these types must be installed. In any case only a qualified electrician is authorized to remove the connection between the neutral (N) and earth terminals in the terminal box of the alternator.

3.3 Connecting the generator

3.3.1 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.

3.3.2 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), at 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
2,5	22	25	21
4	30	33	28
6	38	42	36
10	53	57	50
16	71	76	67
25	94	101	88
35	114	123	110
50	138	155	138
70	176	191	170
95	212	228	205

The lowest acceptable wire section and the corresponding maximum cable or conductor length for multiple core cable or H07 RN-F, at rated current (20 A), for a voltage drop e lower than 5% and at a power factor of 0.80, are respectively 2.5 mm² and 144 m. In case electric motors must be started, oversizing the cable is advisable.

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

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

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)

3.3.3 Connecting the load

3.3.3.1 Site distribution panel

If 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.

3.3.3.2 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 a 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.

4 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.

At each start-up and at any time a new load is connected, the earthing and protections (GB trip and earth leakage relay) of the generator must be verified. Earthing must be done either by the earthing rod or, if available, by an existing, suitable earthing installation. The protective system against excessive contact voltage is not effective unless a suitable earthing is made.

4.1 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 water 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 water vapor in a nearly empty tank from condensing.
- Drain leaking fluid from the frame.
- Check the vacuum indicator of the air filter. If the red part shows completely, replace the filter element.
- Press the dust evacuator of the air filter to remove dust.
- Check the generator for leakage, tightness of wire terminals, etc. Correct if necessary.
- Check that circuit breaker Q600 is switched off.
- Check that no circuit breakers have tripped and that the emergency stop is in the OUT position.
- Check that the load is switched off.
- Check that the earth fault protection (FS1) has not tripped (reset if necessary).

4.2 Operating and setting Qc1011™

4.2.1 Manual operation

NOTE: If a digital input configured to 'panel lock' is active, changing operating modes will not be possible. Viewing the instruments and event logs is NOT affected by panel lock.

Manual mode allows the operator to start and stop the genset manually and, if required, change the state of the load switching devices. Manual mode is active when the STOP button is pressed.

4.2.1.1 Waiting in manual mode

To begin the starting sequence, press the START button.

- If 'protected start' is disabled, the start sequence begins immediately.
- If 'Protected Start' is enabled, the MANUAL mode icon is displayed to indicate manual mode and the manual LED flashes.

The START button must be pressed once more to begin the start sequence.

4.2.1.2 Starting sequence

NOTE: There is no start delay in this mode of operation.

1. The fuel relay is energized and the engine is cranked.

NOTE: If the unit has been configured for CAN, compatible ECUs will receive the start command via CAN.

2. If the engine fails to fire during this cranking attempt then the starter motor is disengaged for the crank rest duration after which the next start attempt is made.

Should this sequence continue beyond the set number of attempts, the start sequence will be terminated and the display shows the FAIL TO START icon.

3. When the engine fires, the starter motor is promptly disengaged.

Speed detection is factory configured to be derived from the main alternator output frequency but can additionally be measured from a magnetic pickup mounted on the flywheel (selected by PC using the 3000 series configuration software).

Additionally, rising oil pressure can be used to disconnect the starter motor (but cannot detect underspeed or overspeed).

NOTE: If the unit has been configured for CAN, speed sensing is via CAN.

4. After the starter motor has disengaged, the 'Safety On' timer activates, allowing Oil Pressure, High Engine Temperature, Underspeed, Charge Fail and any delayed Auxiliary fault inputs to stabilize without triggering a fault.

4.2.1.3 Engine running

In manual mode, the load is not transferred to the generator unless a 'loading request' is made.

A loading request can come from a number of sources.

- Activation of an auxiliary input that has been configured to remote start on load
- Activation of the built-in exercise scheduler if configured for 'on load' runs.

NOTE: The load transfer signal remains inactive until the Oil Pressure has risen. This prevents excessive wear on the engine.

Once the load has been transferred to the generator, it will not be automatically removed.

To manually transfer the load back to the mains either:

- Press the AUTO mode button to return to automatic mode. The set will observe all auto mode start requests and stopping timers before beginning the Auto mode stopping sequence.
- Press the STOP button.
- Deactivation of an auxiliary input that has been configured to remote start on load.

4.2.1.4 Stopping sequence

In manual mode, the set will continue to run until either:

- The STOP button is pressed. The set will immediately stop
- The AUTO button is pressed. The set will observe all auto mode start requests and stopping timers before beginning the Auto mode stopping sequence.

4.2.2 Automatic operation

NOTE: If a digital input configured to 'panel lock' is active, changing module modes will not be possible. Viewing the instruments and event logs is NOT affected by panel lock.

Activate Auto Mode by pressing the AUTO push button.

The AUTO mode icon is displayed to indicate Auto Mode operation, if no alarms are present.

Auto mode will allow the generator to operate fully automatically, starting and stopping as required with no user intervention.

4.2.2.1 Waiting in auto mode

If a starting request is made, the starting sequence will begin.

Starting requests can be from the following sources:

- Activation of an auxiliary input that has been configured to remote start
- Activation of the built-in exercise scheduler.

4.2.2.2 Starting sequence

1. To allow for 'false' start requests, the start delay timer begins.

Should all start requests be removed during the start delay timer, the unit will return to a stand-by state.

2. If a start request is still present at the end of the start delay timer, the fuel relay is energized and the engine will be cranked.

NOTE: If the unit has been configured for CAN, compatible ECUs will receive the start command via CAN.

3. If the engine fails to fire during this cranking attempt then the starter motor is disengaged for the crank rest duration after which the next start attempt is made.

Should this sequence continue beyond the set number of attempts, the start sequence will be terminated and the display shows the FAIL TO START icon.

4. When the engine fires, the starter motor is promptly disengaged. Speed detection is factory configured to be derived from the main alternator output frequency but can additionally be measured from a magnetic pickup mounted on the flywheel (selected by PC using the 3000 series configuration software).
5. Additionally, rising oil pressure can be used to disconnect the starter motor (but cannot detect underspeed or overspeed).

NOTE: If the unit has been configured for CAN, speed sensing is via CAN.

6. After the starter motor has disengaged, the 'Safety On' timer activates, allowing Oil Pressure, High Engine Temperature, Underspeed, Charge Fail and any delayed Auxiliary fault inputs to stabilize without triggering a fault.

4.2.2.3 Engine running

Once the engine is running and all starting timers have expired, the animated ENGINE RUNNING icon is displayed on the Qc1011™. The generator will be placed on load if configured to do so.

NOTE: The load transfer signal remains inactive until the Oil Pressure has risen. This prevents excessive wear on the engine.

If all start requests are removed, the stopping sequence will begin.

4.2.2.4 Stopping sequence

The return delay timer operates to ensure that the starting request has been permanently removed and isn't just a short-term removal. Should another start request be made during the cooling down period, the set will return on load.

If there are no starting requests at the end of the return delay timer, the load is removed from the generator to the mains supply and the cooling timer is initiated.

The cooling timer allows the set to run off load and cool sufficiently before being stopped. This is particularly important where turbochargers are fitted to the engine.

After the cooling timer has expired, the set is stopped.

4.2.3 Checks during operation

Regularly carry out following checks:

- Check the analogue meters (PV1-PA1) and the controller display 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. Refer to chapter “Preventing low loads”.

- Check, by means of the generator gauges, that the voltage between the phases is identical and that the rated current is not exceeded.
- When single-phase loads are connected to the generator output terminals, keep all loads well-balanced.
- If circuit breakers have tripped during operation, switch off the load and stop the generator. Check and, if necessary, decrease the load.

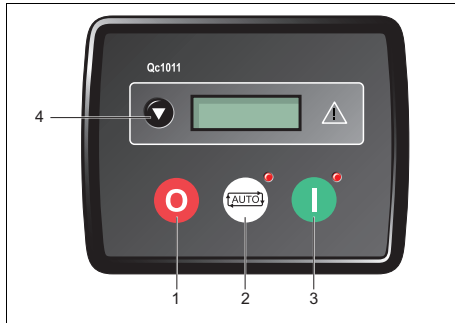


The generator’s doors may only remain opened for short periods during operation, to carry out checks for example.

4.2.4 Setting the Qc1011™

4.2.4.1 Push button and LED functions

Following push buttons are used on the Qc1011™:



1



STOP: Is used to activate **Stop/Reset/Manual** mode. When pressing the STOP button, the generator will unload, the fuel supply de-energises and the engine shuts down. Pressing the STOP button will also clear any alarm conditions for which the triggering criteria have been removed.

2



AUTO: Is used to activate **Auto** mode. This mode allows the module to control the function of the generator automatically.

3



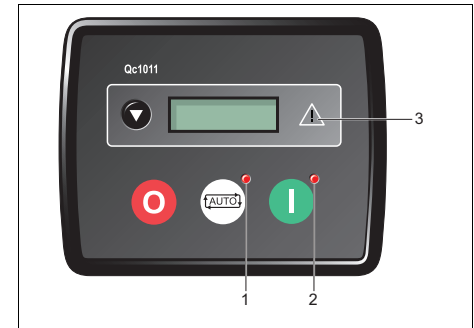
START: Is used to crank the engine.

4



SCROLL: Is used to scroll the display to show the various instruments.

Following LEDs are used on the Qc1011™:



1

Auto

LED indicates that the unit is in Auto Mode.

2

Start

LED indicates that the unit is in Manual/Start Mode.

3

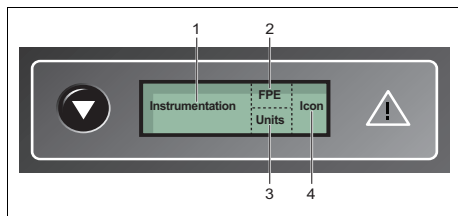
Alarm

LED indicates that an alarm is present. The exact alarm is shown on the display.

4.2.4.2 Module display

General

The Qc1011™ graphical display shows the generator instrumentation and alarm conditions. It is segmented into areas for instrumentation, unit, alarm icons and for Front Panel Editor (FPE) use.



- 1 | Instrumentation
- 3 | FPE
- 3 | Units
- 4 | Mode icon

It is possible to scroll to display the different pages of information by repeatedly pushing the scroll button.

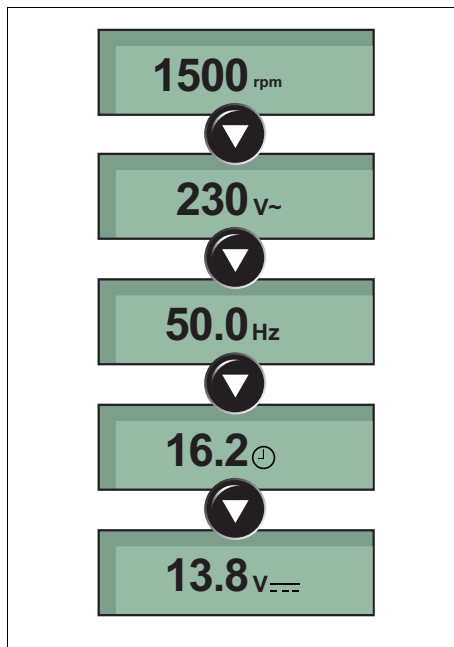
Once a page has been selected, it will remain on the LCD display until the user selects a different page. After an extended period of inactivity, the module will revert to the Status page.

When scrolling manually, the display will automatically return to the Status page if no buttons are pressed for the duration set in the configurable LCD Page Timer.

If an alarm becomes active while viewing the Status page, the display shows the Alarms page to draw the operator's attention to the alarm condition.

Page overview

This is the order of pages displayed:



Icon overview

Display	Description
	Appears when a timer is active, for example cranking time, crank rest etc.
	Appears when the engine is at rest and the unit is in stop mode.
	Appears when the engine is at rest and the unit is in auto mode.
	Appears when the engine is at rest and the unit is waiting for a manual start.
	When there are no alarms present, an animated icon is displayed to indicate the engine is running.
	Appears when a USB connection is made to the controller.
	Appears when the unit is in the front panel editor
	Appears if either the configuration file or engine file becomes corrupted.

Back light

The back light will be on if the unit has sufficient voltage while the unit is turned on. When the unit is cranking the back light is turned off.

4.2.4.3 Protections

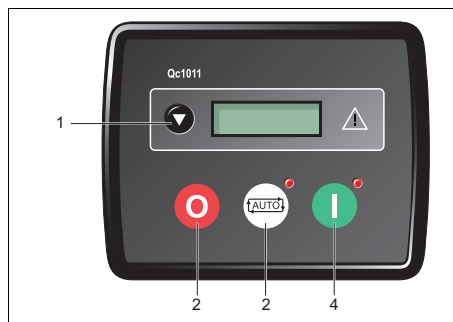
When an alarm is present, the alarm LED will illuminate, if configured. The LCD display will show an icon to indicate the failure.

For an overview of all controller alarms, see chapter “Solving Qc1011™ controller alarms” on page 56.

4.2.4.4 Front panel configuration

This configuration mode allows the operator limited customising of the way the module operates.

Use the module’s navigation buttons to traverse the menu and make value changes to the parameters.

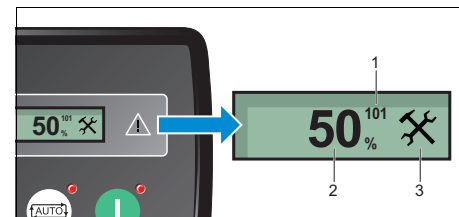


- 1 | Accept
- 2 | Next page
- 3 | Decrease value / next item
- 4 | Increase value / next item

Accessing the Front Panel Editor (FPE)

Press the STOP and AUTO button simultaneously to enter the editor mode.

The display shows the FPE configuration mode icon and the first parameter.



- 1 | Parameter number
- 2 | Current value
- 3 | Configuration mode icon

Editing a parameter

1. Enter the editor mode by pressing the STOP and AUTO button simultaneously.
2. Press the STOP button to select the required page.
3. Press the START (+) button to select the next parameter or the AUTO (-) button to select the previous parameter within the current page.
4. When the parameter to be edited is displayed, press the DOWN (Accept) button.
The value begins to flash.
5. Press the START (+) or AUTO (-) button to adjust the value to the required setting.
6. Press the DOWN (Accept) button to save the current value.
The value ceases flashing.
7. Press and hold the DOWN (Accept) button to save and exit the editor.
The configuration icon is removed from the display.



When adjusting values in the FPE, pressing and holding the AUTO button will cover the full range of settings of a parameter being adjusted (min to max) in less than 20 seconds.



The editor automatically exits after 5 minutes of inactivity to ensure security.

5 Maintenance

5.1 Maintenance schedules


5.1.1 Maintenance schedule for QES 9 and QES 11



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	50 hrs after initial start-up	Every 250 hours	Every 500 hours	Every 1000 hours	Yearly
Service pak	-	-	-	TBA*	TBA*	-
<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>						
Drain water from fuel filter	x					
Check/Fill fuel level (3)	x					
Empty air filter vacuator valves	x					
Check air intake vacuum indicators	x					
Check engine oil level (if necessary top up)	x					
Check coolant level	x					
Check control panel for alarms and warnings	x					
Check on abnormal noise	x					
Check function of coolant heater (option)				x		x
Replace air filter element (1)				x		x
Check/Replace safety cartridge					x	x
Change engine oil (2) (6)		x	x	x	x	x
Replace engine oil filter (2)		x	x	x	x	x

Maintenance schedule	Daily	50 hrs after initial start-up	Every 250 hours	Every 500 hours	Every 1000 hours	Yearly
Service pak	-	-	-	TBA*	TBA*	-
Replace fuel (primary)filter(s) (5)				x	x	x
Inspect/Adjust fan/alternator belt		x	x	x	x	x
Replace fan/alternator belt					x	x
Measure alternator insulation resistance (11)					x	x
Test Earth Leakage Relay (12)				x	x	x
Check emergency stop (12)				x	x	x
Clean radiator (1)				x	x	x
Check for obstructions on crankcase breather system / filter and hoses	x					
Drain condensate and water from spillage-free frame or catch basin (8)				x	x	x
Check for leaks in engine-, air-, oil-, or fuel system				x	x	x
Inspect/Replace hoses and clamps				x	x	x
Check electrical system cables for wear					x	x
Check/Test glow plugs - grid heater					x	x
Check torque on critical bolt connections					x	x
Check electrolyte level and terminals of battery (10)				x	x	x
Analyse coolant (4) (7)				x	x	x
Check external fuel connection (option)					x	x
Grease locks and hinges				x	x	x
Check rubber flexibles (9)					x	x
Drain/Clean fuel tank water and sediment (1) (13)				x	x	x
Adjust engine inlet and outlet valves (2)		x			x	x
Check fuel injectors (2)					x	

Maintenance schedule	Daily	50 hrs after initial start-up	Every 250 hours	Every 500 hours	Every 1000 hours	Yearly
Service pak	-	-	-	TBA*	TBA*	-
Check engine protective devices					X	X
Inspect starter motor					X	X
Inspect turbocharger					X	X
Inspect water pump					X	X
Inspect charging alternator					X	X
Inspection by Atlas Copco service technician				X	X	X
		Generators in stand-by 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.				

Maintenance schedule	Daily	50 km after initial start-up	Every 500 km	Every 1000 km	Yearly
Check tyre pressure		x	x	x	x
Check tyres for uneven wear					x
Check torque of wheel nuts		x		x	x
Check coupling head	x			x	x
Check height of adjusting facility	x				x
Check towbar handbrake lever spring actuator, reversing lever, linkage and all movable parts for ease of movement	x	x	x	x	x
Grease coupling head, towbar bearings at the housing of the overrun brake		x		x	x
Check brake system (if installed) and adjust if necessary		x		x	x
Oil or grease brake lever and moving parts such as bolts and joints		x		x	x
Grease sliding points on height adjusting parts				x	x
Check safety cable for damage				x	x
Check Bowden cable on height adjustable connection device for damage				x	x
Lubricate torsion bar axle trailing arm				x	x
Check brake lining wear					x
Change wheel hub bearing grease					x
Check/Adjust lateral play of wheel bearing (conventional bearing)			x	x	x
Check hub cap for firm seating				x	x


Notes:

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

TBA* = to be announced


- (1) More frequently when operating in a dusty environment.
- (2) Refer to engine operation manual.
- (3) After a days work.
- (4) Yearly is only valid when using PARCOOL. Change coolant every 5 years.
- (5) Gummed or clogged filters means fuel starvation and reduced engine performance. Reduce service interval in heavy duty application.
- (6) See chapter “Engine oil specifications”.
- (7) The following part numbers can be ordered from Atlas Copco to check on inhibitors and freezing points:
 - 2913 0028 00: refractometer
 - 2913 0029 00: pH meter
- (8) See chapter “Before starting”.
- (9) Replace all rubber flexibles every 5 years, according to DIN20066.
- (10) See chapter “Battery care”.
- (11) See chapter “Measuring the alternator insulation resistance”.
- (12) The function of this protection should be tested minimum on every new installation.
- (13) Water in fuel tank can be detected by means of 2914 8700 00. Drain fuel tank when water is detected.

5.1.2 Maintenance schedule for QES 14-20-30-40 and QES 16-25-35-50

 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	50 hrs after initial start-up	Every 500 hours	Every 1000 hours	Yearly
Service pak	-	-	TBA*	TBA*	-
<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>					
Drain water from fuel filter	x				
Check/Fill fuel level (3)	x				
Empty air filter vacuator valves	x				
Check air intake vacuum indicators	x				
Check engine oil level (if necessary top up)	x				
Check coolant level	x				
Check control panel for alarms and warnings	x				
Check on abnormal noise	x				
Check function of coolant heater (option)			x		x
Replace air filter element (1)			x		x
Check/Replace safety cartridge				x	x
Change engine oil (2) (6)		x	x	x	x
Replace engine oil filter (2)			x	x	x
Replace fuel (primary)filter(s) (5)			x	x	x
Inspect/Adjust fan/alternator belt		x	x	x	x
Replace fan/alternator belt				x	x
Measure alternator insulation resistance (11)				x	x

Maintenance schedule	Daily	50 hrs after initial start-up	Every 500 hours	Every 1000 hours	Yearly
Service pak	-	-	TBA*	TBA*	-
Test Earth Leakage Relay (12)			x	x	x
Check emergency stop (12)			x	x	x
Clean radiator (1)			x	x	x
Check for obstructions on crankcase breather system / filter and hoses	x				
Drain condensate and water from spillage-free frame or catch basin (8)			x	x	x
Check for leaks in engine-, air-, oil-, or fuel system			x	x	x
Inspect/Replace hoses and clamps			x	x	x
Check electrical system cables for wear				x	x
Check/Test glow plugs - grid heater				x	x
Check torque on critical bolt connections				x	x
Check electrolyte level and terminals of battery (10)			x	x	x
Analyse coolant (4) (7)			x	x	x
Check external fuel connection (option)				x	x
Grease locks and hinges			x	x	x
Check rubber flexibles (9)				x	x
Drain/Clean fuel tank water and sediment (1) (13)			x	x	x
Adjust engine inlet and outlet valves (2)		x		x	x
Check fuel injectors (2)				x	
Check engine protective devices				x	x
Inspect starter motor				x	x
Inspect turbocharger				x	x
Inspect water pump				x	x
Inspect charging alternator				x	x

Maintenance schedule	Daily	50 hrs after initial start-up	Every 500 hours	Every 1000 hours	Yearly
Service pak	-	-	TBA*	TBA*	-
Inspection by Atlas Copco service technician			x	x	x
		Generators in stand-by 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.			

Maintenance schedule	Daily	50 km after initial start-up	Every 500 km	Every 1000 km	Yearly
Check tyre pressure		x	x	x	x
Check tyres for uneven wear				x	x
Check torque of wheel nuts		x		x	x
Check coupling head	x			x	x
Check height of adjusting facility	x				x
Check towbar handbrake lever spring actuator, reversing lever, linkage and all movable parts for ease of movement	x	x	x	x	x
Grease coupling head, towbar bearings at the housing of the overrun brake		x		x	x
Check brake system (if installed) and adjust if necessary		x		x	x
Oil or grease brake lever and moving parts such as bolts and joints		x		x	x
Grease sliding points on height adjusting parts				x	x
Check safety cable for damage				x	x
Check Bowden cable on height adjustable connection device for damage				x	x
Lubricate torsion bar axle trailing arm				x	x
Check brake lining wear					x
Change wheel hub bearing grease					x
Check/Adjust lateral play of wheel bearing (conventional bearing)			x	x	x
Check hub cap for firm seating				x	x

Notes:

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

TBA* = to be announced

- (1) More frequently when operating in a dusty environment.
- (2) Refer to engine operation manual.
- (3) After a days work.
- (4) Yearly is only valid when using PARCOOL. Change coolant every 5 years.
- (5) Gummed or clogged filters means fuel starvation and reduced engine performance. Reduce service interval in heavy duty application.
- (6) See chapter “Engine oil specifications”.
- (7) The following part numbers can be ordered from Atlas Copco to check on inhibitors and freezing points:
 - 2913 0028 00: refractometer
 - 2913 0029 00: pH meter
- (8) See chapter “Before starting”.
- (9) Replace all rubber flexibles every 5 years, according to DIN20066.
- (10) See chapter “Battery care”.
- (11) See chapter “Measuring the alternator insulation resistance”.
- (12) The function of this protection should be tested minimum on every new installation.

- (13) Water in fuel tank can be detected by means of 2914 8700 00. Drain fuel tank when water is detected.

5.1.3 Use of maintenance schedule

The maintenance schedule contains a summary of the maintenance instructions. Read the respective section before taking maintenance measures.

When servicing, replace all disengaged packing, e.g. gaskets, O-rings, washers.

For engine maintenance refer to Engine Operation Manual.

The maintenance schedule has to be seen as a guideline for units operating in a dusty environment typical to generator applications. Maintenance schedule can be adapted depending on application, environment and quality of maintenance.

5.1.4 Use of service paks

Service Paks include all genuine parts needed for normal maintenance of both generator and engine. Service Paks minimize downtime and keep your maintenance budget low.

The order number of the Service Paks are listed in the Atlas Copco Parts list (ASL). Order Service Paks at your local Atlas Copco dealer.

5.2 Preventing low loads

5.2.1 General

All engine parts are designed with tolerances to allow work under full load conditions. When operating at low load, these tolerances allow more lube oil to pass between valve guides, stems, liners and pistons due to the lower engine temperatures.

Lower combustion pressure has an influence on the piston ring operation and the combustion temperature. Low boost pressure will cause oil leakage over the turbo shaft seal.

5.2.2 Risks of low load operation

- Cylinder glazing: the cylinder bore troughs become filled with lacquer, displacing oil and thus preventing correct ring lubrication.
- Bore polishing: the bore surface becomes polished, all peaks and most troughs become worn away, also preventing correct ring lubrication.
- Heavy carbon buildup: on pistons, piston ring grooves, valves and turbo charger. Carbon buildup on pistons can cause seizure when later operating at full load.
- High oil consumption: prolonged no-load/low load operation of the engine may cause it to blue/gray smoke at low rpm with an associated increase in oil consumption

- Low combustion temperature: this will result in insufficiently burnt fuel, which will cause diluting of the lube oil. Also, unburnt fuel and lube oil can enter the exhaust manifold and eventually leak out through joints in the exhaust manifold.
- Risk for fire

5.2.3 Best practices

Reduce the low load periods to a minimum. This should be achieved by adequately sizing the unit for the application.

It is recommended that a unit is always used with a load > 30% of nominal. Corrective actions should be taken if due to circumstances this minimum load capacity cannot be obtained.

Operate the unit at full load capacity after any low load operating period. Therefore, connect the unit periodically to a load bank. Increase the load in steps of 25% every 30 minutes and allow the unit to run for 1 hour in full load condition. Gradually return the unit to the operating load.

The interval between load bank connections may vary according to the conditions present on site and the amount of load. However, a rule of thumb is to connect a unit to a load bank after every maintenance operation.

If the engine is installed as a stand-by generator, then it should be operated at full load for at least 4 hrs/year. If periodic tests are performed on a regular basis without load, these should not exceed 10 min. Full load tests help to clean out the carbon deposits in the engine and exhaust system and evaluate the engine's performance. To avoid potential problems during the test, load should be gradually increased.

In rental applications (where the load is often an unknown factor) units should be tested at full load after each rental job or every 6 months, whichever comes first.

For more info, please contact your Atlas Copco Service Center.



When a failure occurs and is deemed due to low load operation, the repairs fall outside warranty coverage.

5.3 Alternator maintenance procedures

5.3.1 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 and terminal L1 and generate a voltage of 500 V. The scale must indicate a resistance of at least 5 M Ω .

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

5.4 Engine maintenance procedures

Refer to the engine's operator manual for full maintenance, including instructions for changing the oil and coolant and replacing the fuel, oil and air filters.

5.4.1 Engine oil level check

Consult the Engine Operation Manual for the oil specifications, viscosity recommendations and oil change intervals. For intervals, see chapter "Maintenance schedules" on page 32.

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

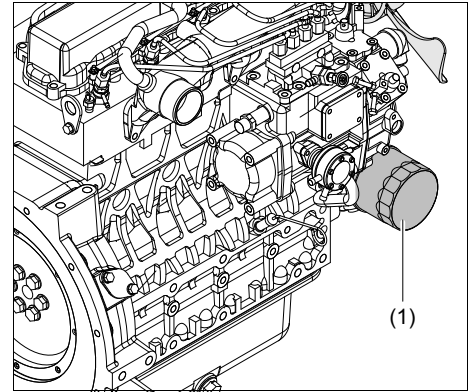
5.4.2 Engine oil and oil filter change



Hot oil and hot surfaces can cause burns.

Check for oil pressure and oil leaks, and repair or replace the oil filter (1) if necessary.

Change the oil filter cartridge simultaneously at every replacement of engine oil.



Observe all relevant environmental and safety precautions.

- Place an appropriate drain pan under the oil drain flexible.
- Remove the drain plug from the oil drain flexible to drain the oil.
- Replace the seal of the drain plug.
- Install and tighten the drain plug on the oil drain flexible.
- Unscrew the oil filter element from the adapter head.

- Clean the adapter head sealing surface. Lightly oil the gasket of the new element and screw the latter onto the adapter head until the gasket is properly seated, then tighten with both hands.



Never leave spilled liquids such as fuel, oil, water and cleansing agents in or around the generator.

- Top up the engine oil level.
- Run the engine for 1 minute and check the oil level.

5.4.3 Coolant check

5.4.3.1 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.



**Long service intervals
5-year drain interval to minimize
service costs (when used in
accordance with the instructions).**

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.

5.4.3.2 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 chapter “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.

5.4.3.3 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.

5.4.4 Air filter check



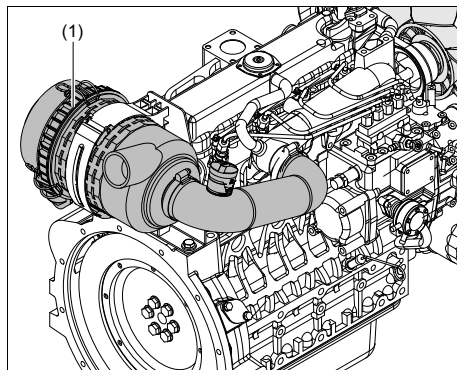
The Atlas Copco air filters are specially designed for the application.

Using only genuine parts will prolong engine life and avoid breakdowns.

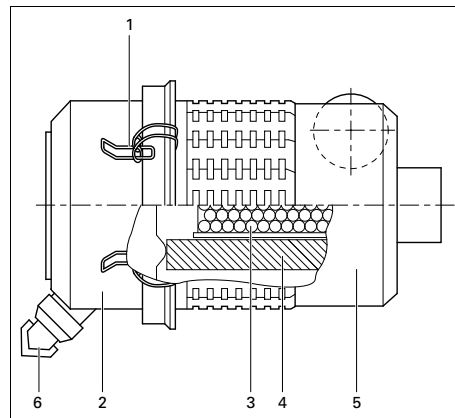
Never run the generator without air filter element.



The engine must be stopped before cleaning or performing any maintenance activity to the air filter (1).



5.4.4.1 Main parts



- | | |
|---|------------------|
| 1 | Snap clips |
| 2 | Dust trap |
| 3 | Safety cartridge |
| 4 | Filter element |
| 5 | Filter housing |
| 6 | Dust evacuator |

5.4.4.2 Recommendation

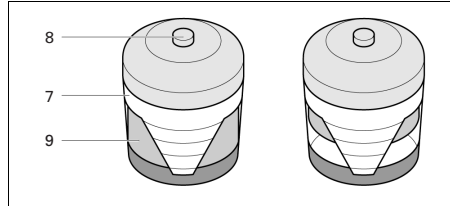
- New elements must be inspected for tears or punctures before installation.
- Discard the filter element (4) when damaged.
- In heavy duty applications it is recommended to install a safety cartridge which can be ordered with part no.: 2914 9307 00.
- A dirty safety cartridge (3) is an indication of a malfunctioning air filter element (4). Replace the element and the safety cartridge in this case.
- The safety cartridge (3) cannot be cleaned.

5.4.4.3 Cleaning the dust trap

To remove dust from the dust trap (2), clean it with a dry rag.

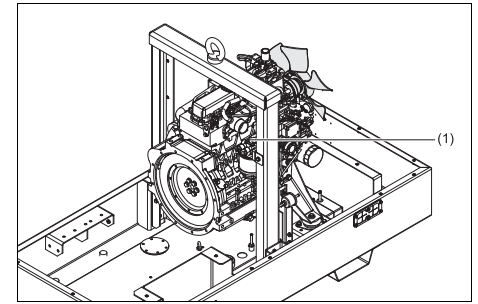
5.4.4.4 Replacing the air filter element

- Release the snap clips (1) and remove the dust trap (2). Clean the trap.
- Remove the element (4) from the housing (5).
- Reassemble in reverse order of dismantling.
- Inspect and tighten all air intake connections.
- Reset the vacuum indicator.



- 7 | Air filter contamination indicator
- 8 | Reset button
- 9 | Yellow indicator

5.4.5 Replacing fuel filter element



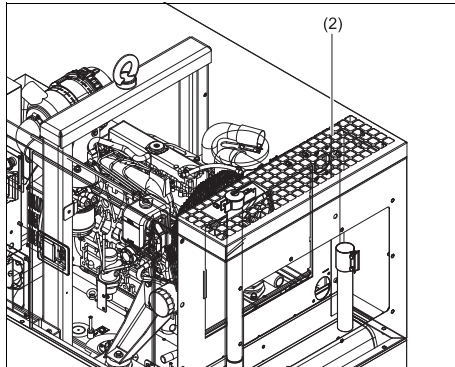
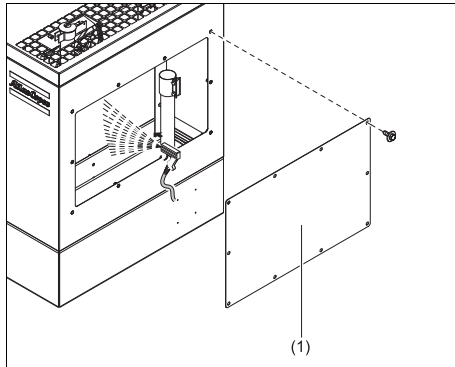
Replacing the filter element:

- Unscrew the filter element (1) from the adapter head.
- Clean the adapter head sealing surface. Lightly oil the gasket of the new element and screw the latter onto the header until the gasket is properly seated, then tighten with both hands.
- Check for fuel leaks once the engine has been restarted.

5.5 Adjustments and service procedures

5.5.1 Cleaning coolers

Keep the engine water cooler clean to maintain the cooling efficiency



- Remove the service plate at the front of the unit (1) to get access to the engine water cooler (2).



Remove any dirt from the coolers with a fibre brush. Never use a wire brush or metal objects.

- Steam cleaning in combination with a cleansing agent may be applied.



To avoid damaging the coolers, angle between jet and coolers should be approx. 90°.

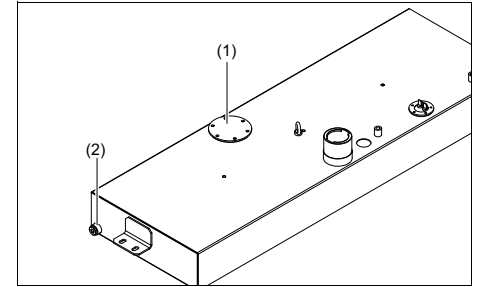
Protect the electrical and controlling equipment, air filters, etc. against penetration of moisture. Make sure to not steam clean the alternator.

- Re-install the service plate.



Never leave spilled liquids such as fuel, oil, water and cleansing agents in or around the generator.

5.5.2 Cleaning the fuel tank



Observe all relevant environmental and safety precautions.

- Place an appropriate drain pan under the drain plug of the fuel tank.
- Remove the flange (1) and the drain plug (2).
- Slope the unit. approx. 15° to remove all fuel, dirt and water.
- Clean the fuel tank and fix the drain plug and flange handtight.



Never leave spilled liquids such as fuel, oil, water and cleansing agents in or around the generator.

- Refill the fuel tank with clean fuel.

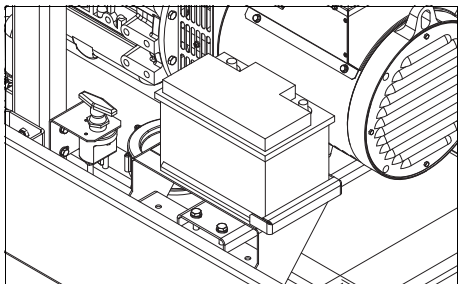
5.5.3 Battery care



Before handling batteries, read the relevant safety precautions and act accordingly.

If the battery is still dry, it must be activated as described in chapter “Activating a dry-charged battery”.

The battery must be in operation within 2 months from being activated; if not, it needs to be recharged first.



5.5.3.1 Electrolyte



Read the safety instructions carefully.

Electrolyte in batteries is a sulphuric acid solution in distilled water.

The solution must be made up before being introduced into the battery.

5.5.3.2 Activating a dry-charged battery

- Take out the battery.
- Battery and electrolyte must be at equal temperature above 10°C.
- Remove cover and/or plug from each cell.
- Fill each cell with electrolyte until the level reaches 10 to 15 mm above the plates, or to the level marked on the battery.
- Rock the battery a few times so that possible air bubbles can escape; wait 10 minutes and check the level in each cell once more; if required, add electrolyte.
- Refit plugs and/or cover.
- Place the battery in the generator.

5.5.3.3 Recharging a battery

Before and after charging a battery, always check the electrolyte level in each cell; if required, top up with distilled water only. When charging batteries, each cell must be open, i.e. plugs and/or cover removed.



Use a commercial automatic battery charger according to its manufacturer’s instructions.

Apply with preference the slow charging method and adjust the charge current according to the following rule of thumb: battery capacity in Ah divided by 20 gives safe charging current in Amp.

5.5.3.4 Make-up distilled water

The amount of water evaporating from batteries is largely dependant on the operating conditions, i.e. temperatures, number of starts, running time between start and stop, etc...

If a battery starts to need excessive make-up water, this points to overcharging. Most common causes are high temperatures or a too high voltage regulator setting.

If a battery does not need any make-up water at all over a considerable time of operation, an undercharged battery condition may be caused by poor cable connections or a too low voltage regulator setting.

5.5.3.5 Periodic battery service

- Keep the battery clean and dry.
- Keep the electrolyte level at 10 to 15 mm above the plates or at the indicated level; top up with distilled water only. Never overfill, as this will cause poor performance and excessive corrosion.
- Record the quantity of distilled water added.
- Keep the terminals and clamps tight, clean, and lightly covered with petroleum jelly.
- Carry out periodic condition tests. Test intervals of 1 to 3 months, depending on climate and operating conditions, are recommended.
- If doubtful conditions are noticed or malfunctions arise, keep in mind that the cause may be in the electrical system, e.g. loose terminals, voltage regulator maladjusted, poor performance of generator, etc...

5.6 Engine consumable specifications

5.6.1 Engine fuel specifications

For fuel specifications, please contact your Atlas Copco Customer Center.

5.6.2 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 -10°C and 50°C	PAROIL E or PAROIL E Mission Green
between -25°C and 50°C	PAROIL Extra



Never mix synthetic with mineral oil.

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.

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.

PAROIL Extra

PAROIL Extra is a synthetic ultra high performance diesel engine oil with a high viscosity-index. Atlas Copco PAROIL Extra is designed to provide excellent lubrication from start-up in temperatures as low as -25°C (-13°F).

	Litre	US gal	Imp gal	cu.ft	Order number
can	5	1.3	1.1	0.175	1630 0135 01
can	20	5.3	4.4	0.7	1630 0136 01

PAROIL E

PAROIL E is a mineral based high performance diesel engine oil with a high viscosity-index. Atlas Copco PAROIL E is designed to provide a high level of performance and protection in standard ambient conditions as from -10°C (14°F).

	Litre	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	209	55.2	46	7.32	1615 5955 00

PAROIL E Mission Green

PAROIL E Mission Green is a mineral based high performance diesel engine oil with a high viscosity-index. Atlas Copco PAROIL E Mission Green is designed to provide a high level of performance and protection in standard ambient conditions as from -10°C (14°F).

	Litre	US gal	Imp gal	cu.ft	Order number
can	5	1.3	1.1	0.175	1630 0471 00
can	20	5.3	4.4	0.7	1630 0472 00
barrel	209	55.2	46	7.32	1630 0473 00

5.6.3 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.

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.

PARCOOL EG

	Liter	US gal	Imp gal	cu.ft	Order number
can	5	1.3	1.1	0.175	1604 5308 01
can	20	5.3	4.4	0.7	1604 5307 02

PARCOOL EG CONCENTRATE

	Liter	US gal	Imp gal	cu.ft	Order number
can	5	1.3	1.1	0.175	1604 8159 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.

6 Checks and trouble shooting



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 Checks

6.1.1 Checking voltmeter PV1

- Put a voltmeter in parallel with voltmeter PV1 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.

6.1.2 Checking ammeter PA1

- Measure during the load, by means of a clamp-on probe, the outgoing current in the third phase (L3).
- Compare the measured current with the current indicated on ammeter PA1. Both readings should be the same.



Ammeter PA1 and voltmeter PV1 are only provided on 1ph and 3 ph units.

6.2 Engine troubleshooting

The table below gives an overview of the possible engine problems and their possible causes.

The starter motor turns the engine too slowly

- Battery capacity too low.
- Bad electrical connection.
- Fault in starter motor.
- Wrong grade of lubricating oil.

The engine does not start or is difficult to start

- Starter motor turns engine too slowly.
- Fuel tank empty.
- Fault in fuel control solenoid.
- Restriction in a fuel pipe.
- Fault in fuel lift pump.
- Dirty fuel filter element.
- Air in fuel system.
- Fault in atomisers.
- Cold start system used incorrectly.
- Fault in cold start system.
- Restriction in fuel tank vent.
- Wrong type or grade of fuel used.
- Restriction in exhaust pipe.

Not enough power

- Restriction in a fuel pipe.
- Fault in fuel lift pump.
- Dirty fuel filter element.
- Restriction in air filter/cleaner or induction system.
- Air in fuel system.
- Fault in atomisers or atomisers of an incorrect type.
- Restriction in fuel tank vent.
- Wrong type or grade of fuel used.
- Restricted movement of engine speed control.
- Restriction in exhaust pipe.
- Engine temperature is too high.
- Engine temperature is too low.

Misfire

- Restriction in a fuel pipe.
- Fault in fuel lift pump.
- Dirty fuel filter element.
- Air in fuel system.
- Fault in atomisers or atomisers of an incorrect type.
- Fault in cold start system.
- Engine temperature is too high.
- Incorrect valve tip clearances.

The pressure of the lubricating oil is too low

- Wrong grade of lubricating oil.
- Not enough lubricating oil in sump.
- Defective gauge.
- Dirty lubricating oil filter element.

High fuel consumption

- Restriction in air filter/cleaner or induction system.
- Fault in atomisers or atomisers of an incorrect type.
- Fault in cold start system.
- Wrong type or grade of fuel used.
- Restricted movement of engine speed control.
- Restriction in exhaust pipe.
- Engine temperature is too low.
- Incorrect valve tip clearances.

Black exhaust smoke

- Restriction in air filter/cleaner or induction system.
- Fault in atomisers or atomisers of an incorrect type.
- Fault in cold start system.
- Wrong type or grade of fuel used.
- Restriction in exhaust pipe.
- Engine temperature is too low.

- Incorrect valve tip clearances.
- Engine overload.

Blue or white exhaust smoke

- Wrong grade of lubricating oil.
- Fault in cold start system.
- Engine temperature is too low.

The engine knocks

- Fault in fuel lift pump.
- Fault in atomisers or atomisers of an incorrect type.
- Fault in cold start system.
- Wrong type or grade of fuel used.
- Engine temperature is too high.
- Incorrect valve tip clearances.

The engine runs erratically

- Fault in fuel control.
- Restriction in a fuel pipe.
- Fault in fuel lift pump.
- Dirty fuel filter element.
- Restriction in air filter/cleaner or induction system.
- Air in fuel system.
- Fault in atomisers or atomisers of an incorrect type.

- Fault in cold start system.
- Restriction in fuel tank vent.
- Restricted movement of engine speed control.
- Engine temperature is too high.
- Incorrect valve tip clearances.

Vibration

- Fault in atomisers or atomisers of an incorrect type.
- Restricted movement of engine speed control.
- Engine temperature is too high.
- Fan damaged.
- Fault in engine mounting or flywheel housing.

The pressure of the lubricating oil is too high

- Wrong grade of lubricating oil.
- Defective gauge.

The engine temperature is too high

- Restriction in air filter/cleaner or induction system.
- Fault in atomisers or atomisers of an incorrect type.
- Fault in cold start system.
- Restriction in exhaust pipe.
- Fan damaged.
- Too much lubricating oil in sump.
- Restriction in air or coolant passages of radiator.

Crankcase pressure

- Restriction in breather pipe.
- Vacuum pipe leaks or fault in exhaust.

Bad compression

- Restriction in air filter/cleaner or induction system.
- Incorrect valve tip clearances.

The engine starts and stops

- Dirty fuel filter element.
- Restriction in air filter/cleaner or induction system.
- Air in fuel system.

The engine shuts down after approx. 15 sec.

- Bad connection towards oil pressure switch/coolant temperature switch

6.3 Alternator troubleshooting

<i>Symptom</i>	<i>Possible cause</i>	<i>Corrective action</i>
<i>Alternator gives 0 Volt</i>	Blown fuse.	Replace fuse.
	No residual voltage.	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 resistance and compare with values mentioned in the alternator manual.
<i>Low voltage at no load</i>	Voltage potentiometer out of setting.	Reset voltage.
	Intervention of protection.	Check frequency/voltage regulator.
	Winding failure.	Check windings.
<i>High voltage at no load</i>	Voltage potentiometer out of setting.	Reset voltage.
	Failed regulator.	Substitute regulator.
<i>Lower than rated voltage at load</i>	Voltage potentiometer out of setting.	Reset voltage potentiometer.
	Intervention by protection.	Current too high, power factor lower than 0.8; speed lower than 10% of rated speed.
	Failed regulator.	Substitute regulator.
	Rotating bridge failure.	Check diodes, disconnect cables.
<i>Higher than rated voltage at load</i>	Voltage potentiometer out of setting.	Reset voltage potentiometer.
	Failed regulator.	Substitute regulator.
<i>Unstable voltage</i>	Speed variation in engine.	Check regularity of rotation.
	Regulator out of setting.	Regulate stability of regulator by acting on STABILITY potentiometer.

6.4 Solving Qc1011™ controller alarms

6.4.1 General

When an alarm is present, the alarm LED will illuminate, if configured. The LCD display will show an icon to indicate the failure.

Warnings

Warnings are non-critical alarm conditions and do not affect the operation of the generator system, they serve to draw the operators attention to an undesirable condition.











Warning alarms are self-resetting when the fault condition is removed. The icon will appear steady in the display.











Shutdowns

Shutdowns are critical alarm conditions that stop the engine and draw the operator's attention to an undesirable condition.

Shutdown alarms are latching. The fault must be removed and the button pressed to reset the module. The icon will appear flashing in the display.

6.4.2 Alarm icon overview

	Auxiliary inputs	Auxiliary inputs can be user configured and will display the message as written by the user.
	Fail to start	The engine has not fired after the preset number of start attempts.
	Fail to stop	The module has detected a condition that indicates that the engine is running when it has been instructed to stop.  ‘Fail to Stop’ could indicate a faulty oil pressure sensor. If the engine is at rest, check the oil sensor wiring and configuration.
	Low oil pressure warning	The module detects that the engine oil pressure has fallen below the low oil pressure pre-alarm setting level after the Safety On timer has expired.
	Engine high temperature	The module detects that the engine coolant temperature has exceeded the high engine temperature pre-alarm setting level after the Safety On timer has expired.
	Under speed	The engine speed has fallen below the underspeed pre-alarm setting.
	Over speed	The engine speed has risen above the overspeed pre-alarm setting.
	Charge failure	The auxiliary charge alternator voltage is low as measured from the W/L terminal.
	Low fuel level	The level detected by the fuel level sensor is below the low fuel level setting.

	Battery under voltage / Battery over voltage	The DC supply has fallen below or risen above the low/high volts setting level.
	Generator under voltage	The generator output voltage has fallen below the pre-set pre-alarm setting after the Safety On timer has expired.
	Generator over voltage	The generator output voltage has risen above the pre-set pre-alarm setting.
	Under frequency	The generator output frequency has fallen below the pre-set pre-alarm setting after the Safety On timer has expired.
	Over frequency	The generator output frequency has risen above the pre-set pre-alarm setting.
	CAN ECU warning / CAN ECU shutdown	The engine ECU has detected an alarm – Check the engine light. Contact the Engine Manufacturer for support.
	CAN data fail	The module is configured for CAN operation and does not detect data on the engine CAN datalink.
	Emergency stop	The emergency stop button has been depressed. This is a failsafe (normally closed to battery positive) input that will immediately stop the set, should the signal be removed. Removal of the battery positive supply from the emergency stop input will also remove DC supply from the Fuel and Start outputs of the controller.  The Emergency Stop positive signal must be present otherwise the unit will shutdown.
	Magnetic pickup failure	Pulses are no longer being detected from the magnetic pickup probe.



Internal memory error

Either the configuration file or engine file memory is corrupted. Contact your supplier for assistance.

7 Storage of the generator

7.1 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 silica gel 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, with a plastic bag.

7.2 Preparing for operation after storage

Before operating the generator again, remove the wrapping, VCI paper and silica gel bags and check the generator thoroughly (go through the checklist "Before starting" on page 24).

- 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.

8 Disposal

8.1 General

When developing products and services, Atlas Copco tries to understand, address, and minimize the negative environmental effects that the products and services may have, when being manufactured, distributed, and used, as well as at their disposal.

Recycling and disposal policy are part of the development of all Atlas Copco products. Atlas Copco company standards determine strict requirements.

Selecting materials the substantial recyclability, the disassembly possibilities and the separability of materials and assemblies are considered as well as the environmental perils and dangers to health during the recycling and disposal of the unavoidable rates of not recyclable materials.

Your Atlas Copco generator consists for the most part of metallic materials, that can be remelted in steelworks and smelting works and that is therefore almost infinite recyclable. The plastic used is labelled; sorting and fractioning of the materials for recycling in the future is foreseen.



This concept can only succeed with your help. Support us by disposing professionally. By assuring a correct disposal of the product you help to prevent possible negative consequences for environment and health, that can occur with an inappropriate waste handling.

Recycling and re-usage of material helps to preserve natural resources.

8.2 Disposal of materials

Dispose contaminated substances and material separately, according to local applicable environmental legislation.

Before dismantling a machine at the end of its operating lifetime drain all fluids and dispose of according the applicable local disposal regulations.

Remove the batteries. Do not throw batteries into the fire (explosion risk) or into the residual waste. Separate the machine into metal, electronics, wiring, hoses, insulation and plastic parts.

Dispose all components according to the applicable disposal regulations.

Remove spilled fluid mechanically; pick up the rest with absorbing agent (for example sand, sawdust) and dispose it according the applicable local disposal regulations. Do not drain into the sewage system or surface water.

9 Options available

9.1 Circuit diagrams

The engine control circuit diagrams and the power circuit diagrams for the standard QES 9-14-20-30-40 and QES 11-16-25-35-50 units, for the units with options and for the units with combined options are:

Circuit 1ph

<i>Unit</i>	<i>Circuit</i>
QES 9-11 Kd	1636 0050 77
QES 14-20-30-40/16-25-30-50 Kd	1636 0050 25

Circuit 2ph

<i>Unit</i>	<i>Circuit</i>
QES 9-11 Kd	1636 0053 37
QES 14-20-30-40/16-25-30-50 Kd	1636 0049 62

Circuit 3ph

<i>Unit</i>	<i>Circuit</i>
QES 9-11 Kd	1636 0051 72
QES 14-20-30-40/16-25-30-50 Kd	1636 0048 31

9.2 Overview of the electrical options

The following electrical options are available:

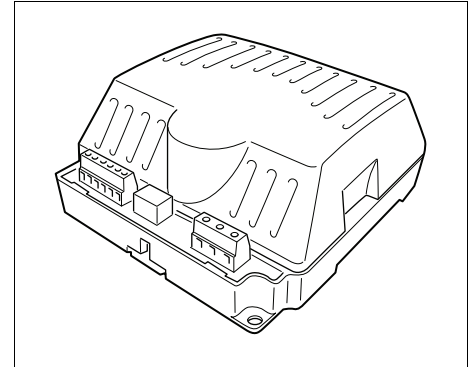
- Automatic battery charger
- Battery switch
- Engine coolant heater
- Single phase
- Dual phase
- Outlet sockets (S) - 3-phase
- IT-relay

9.3 Description of the electrical options

9.3.1 Automatic battery charger

The 2 Amp battery chargers have been designed to be permanently connected to a battery, keeping it charged to maximum capacity. The charger will continue to operate during cranking and running. It can accept multiple AC voltage connections.

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



The battery charger provides multi-stage intelligent charging:

- Constant current: maximum current available during charge recovery phase
- Constant voltage
- Chargers automatically return to float mode when charging is complete

It also offers full protection:

- Reverse polarity protection, short circuit protection and current limiting
- Automatic recovery after the removal of fault conditions

To use the battery charger:

- Provide connector X4 with external power:
 - terminals for inlet supply: 832 - 835
 - terminals for outlet: 6 - 7

9.3.2 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.

9.3.3 Engine coolant heater

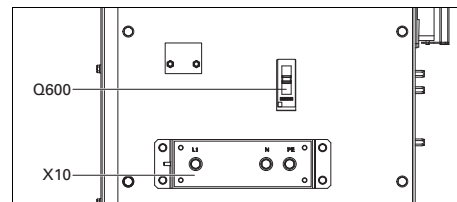
To make sure that the engine can start and accept load immediately, an external cooling water heater (1000 W, 240 V) is provided which keeps the engine temperature between 38°C and 49°C.

9.3.4 Single phase



Only available for 50 Hz units.

The single phase option provides single phase output voltage (e.g. 230 V).



X10 Main power supply (230 V AC)

Terminals L1, N and PE (= earthing), hidden behind the control panel door.

Q600... Circuit breaker for single phase operation

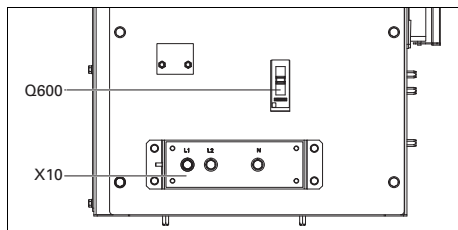
Interrupts phases L1 and N towards X10 when a short-circuit occurs at the load side or when the overcurrent protection (QES 9: 32 A, QES 14: 40 A, QES 20: 63 A, QES 30: 100 A, QES 40: 125 A) is activated. It must be reset manually after eliminating the problem.

9.3.5 Dual phase



Only available for 60 Hz units.

The dual phase option provides two phase output voltage (e.g. 240/120 V).



X10..... Main power supply (240/120 V AC)

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

Q600... Circuit breaker for dual phase operation

Interrupts phases L1, L2 and N towards X10 when a short-circuit occurs at the load side or when the overcurrent protection (QES 11: 32 A, QES 16: 50 A, QES 25: 100 A, QES 35: 100 A, QES 50: 160 A) is activated. It must be reset manually after eliminating the problem.

9.3.6 Outlet sockets (S) - 3-phase

A brief description of all outlet sockets and circuit breakers provided on the generator is given hereafter:

XS1..... 3-phase outlet socket (400/480 V AC)

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

XS2..... 3-phase outlet socket (400/480 V AC)

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

XS3..... 1-phase outlet socket (230/240 V AC)

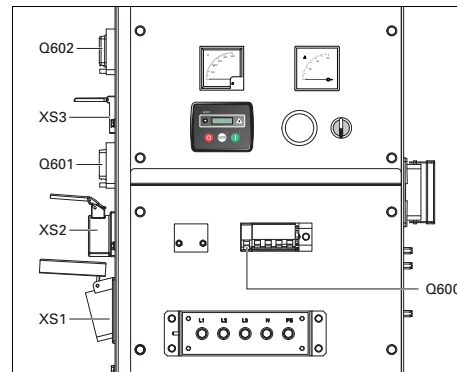
Provides phase L1, neutral and earthing.

Q601... Circuit breaker for XS2

Interrupts the power supply to XS2 when a short-circuit occurs at the load side, or when the overcurrent protection (16 A) is activated. When tripped, Q601 interrupts the three phases towards XS2. It can be reset after eliminating the problem.

Q602... Circuit breaker for XS3

Interrupts the power supply to XS3 when a short-circuit occurs at the load side, or the overcurrent protection (16 A) is activated. When tripped, Q602 interrupts phase L1 and the neutral towards XS3. It can be reset after eliminating the problem.



Circuit breaker Q600 does not only interrupt the power supply towards X10, but also towards XS1, XS2 and XS3.

Make sure to switch on circuit breakers Q600, Q601 and Q602 after starting the generator when power is supplied by means of XS1, XS2 or XS3.

9.3.7 Outlet sockets (S) - 1-phase

A brief description of all outlet sockets and circuit breakers provided on the generator is given hereafter:

XS2..... 1-phase outlet socket (230 V AC)

Provides phase L1, neutral and earthing.

XS3..... 1-phase outlet socket (230 V AC)

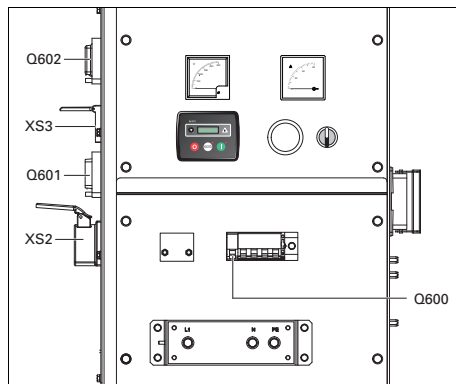
Provides phase L1, neutral and earthing.

Q601... Circuit breaker for XS2

Interrupts the power supply to XS2 when a short-circuit occurs at the load side, or when the overcurrent protection (16 A) is activated. When tripped, Q601 interrupts the three phases towards XS2. It can be reset after eliminating the problem.

Q602... Circuit breaker for XS3

Interrupts the power supply to XS3 when a short-circuit occurs at the load side, or when the overcurrent protection (16 A) is activated. When tripped, Q602 interrupts the three phases towards XS3. It can be reset after eliminating the problem.



Circuit breaker Q600 does not only interrupt the power supply towards X10, but also towards XS2 and XS3. Make sure to switch on circuit breakers Q600, Q601 and Q602 after starting the generator when power is supplied by means of XS2 or XS3.

9.3.8 IT-relay



Not available for 60 Hz units.

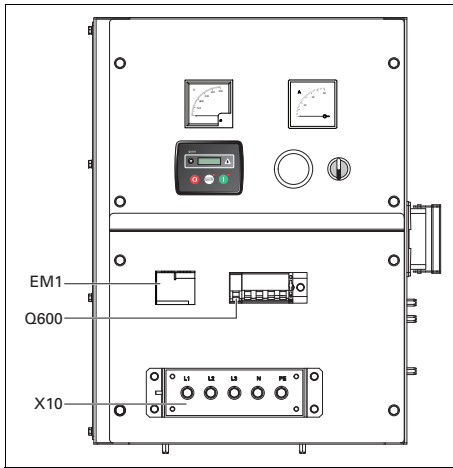
The generator is wired for an IT network i.e. no supply lines of the power supply are directly earthed. A failure in insulation resulting in a too low insulation resistance, is detected by the insulation monitoring relay.



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 k Ω)



X10 Main power supply (400 V AC)

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

EM1 Insulation monitoring relay

Checks the insulation resistance and activates Q600 when the insulation resistance is too low.

Q600... Circuit breaker for X10

Interrupts the power supply X10 when a short-circuit occurs at the load side, or when the overcurrent protection is activated. When activated, Q600 interrupts the three phases towards X10. It must be reset manually after eliminating the problem.

9.4 Overview of the mechanical options

The following mechanical options are available:

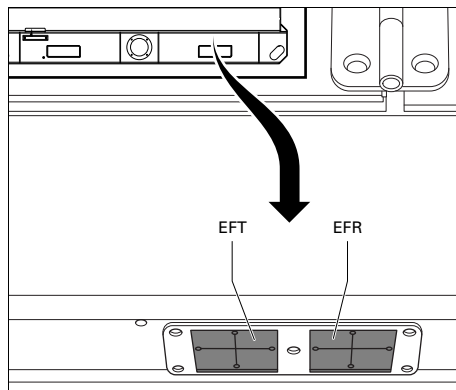
- External fuel tank connection (with/without quick couplings)
- Undercarriage (axle, towbar, towing eyes)
- Oil drain pump
- Galvanized skid with forklift slots
- Hot parts protection (CE compliance)
- Rotating parts protection (CE compliance)
- Special colour

9.5 Description of the mechanical options

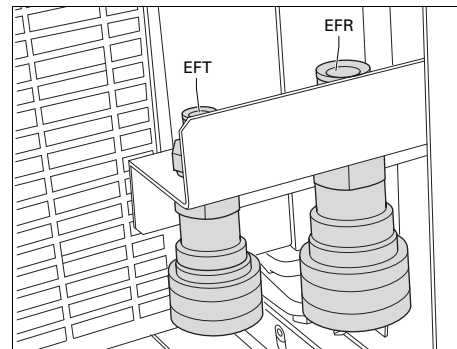
9.5.1 External fuel tank connection (with/without quick couplings)

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

View outside



View inside

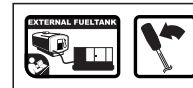


EFT | External fuel tank feed connection
EFR | External fuel tank return connection

When using this option, make sure to connect the fuel supply line as well as the fuel return line. Connections to fuel lines ought to be air-tight to prevent air from entering the fuel system. Turn the handle of 3-way valve to desired condition.



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



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

9.5.2 Oil drain pump

The oil drain pump facilitates oil change.

9.5.3 Undercarriage (axle, towbar, towing eyes)

The undercarriage is equipped with an adjustable or fixed towbar with DIN-eye, AC-eye, IT-eye, GB-eye, NATO-eye or ball coupling and with road signalisation which is approved by EC legislation.

When using this option

- Make sure that the towing equipment of the vehicle matches the towing eye before towing the generator.
- Never move the generator while electrical cables are connected to the unit.
- Always apply the hand brake when parking the generator.
- Leave enough space for operation, inspection and maintenance (at least 1 meter at each side).

To maintain the undercarriage

- Check the tightness of the towbar bolts, the axle bolts and the wheel nuts at least twice a year and after the initial 50 hours of operation.
- Grease the wheel axle suspension bearings, the drawbar to the steering gear shaft and the spindle of the brake handle at least twice a year. Use ball bearing grease for the wheel bearings and graphite grease for the drawbar and spindle.
- Check the brake system twice a year.
- Check the condition of the vibration dampers twice a year.
- Repack the wheel hub bearings once a year using grease.

9.5.4 Galvanized skid with forklift slots

To be able to lift the generator by means of a forklift, a galvanized skid with rectangular slots is provided.

9.5.5 Hot parts protection (CE compliance)

The hot parts protection shields hot parts of the genset (turbo and exhaust system) to reduce the risk of burns.

9.5.6 Rotating parts protection (CE compliance)

The rotating parts protection shields rotating parts of the genset.

10 Technical specifications

10.1 Technical specifications for QES 9 and QES 11 units

10.1.1 Readings on gauges

<i>Gauge</i>	<i>Reading</i>	<i>Unit</i>
Ammeter L3 (PA1)	Below max. rating	A
Voltmeter (PV1)	Below max. rating	V

10.1.2 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

10.1.3 Specifications of the engine/alternator/unit

		QES 9 400/230V - 3ph	QES 9 380/220V - 3ph	QES 9 415/240V - 3ph	QES 9 230V - 1ph
<i>Reference conditions</i> 1)	Rated frequency	50 Hz	50 Hz	50 Hz	50 Hz
	Rated speed	1500 rpm	1500 rpm	1500 rpm	1500 rpm
	Generator service duty	PRP	PRP	PRP	PRP
	Absolute air inlet pressure	1 bar(a)	1 bar(a)	1 bar(a)	1 bar(a)
	Relative air humidity	30%	30%	30%	30%
	Air inlet temperature	25°C	25°C	25°C	25°C
<i>Limitations</i> 2)	Maximum ambient temperature	50°C	50°C	50°C	50°C
	Altitude capability	3000 m	3000 m	3000 m	3000 m
	Maximum relative air humidity	85%	85%	85%	85%
	Minimum starting temperature unaided	-10°C	-10°C	-10°C	-10°C
	Minimum starting temperature with cold start equipment (optional)	-25°C	-25°C	-25°C	-25°C

<i>Performance data</i> 2) 3) 4) 5)	Rated active power (PRP)	7.2 kW	7.2 kW	7.2 kW	6.7 kW
	Rated apparent power (PRP)	9.0 kVA	9.0 kVA	9.0 kVA	6.7 kVA
	Rated voltage line to line	400 V	380 V	415 V	230 V
	Rated current 3ph	13.0 A	13.7 A	12.5 A	29.1 A
	Performance class (acc.ISO 8528-5:1993)	G2	G2	G2	G2
	Single step load acceptance	100%	100%	100%	100%
		7.2 kW	7.2 kW	7.2 kW	N/A
	Frequency droop	N/A	N/A	N/A	N/A
	Fuel consumption at no load (0%)	0.69 kg/h	0.69 kg/h	0.69 kg/h	N/A
	Fuel consumption at 50% load	1.33 kg/h	1.33 kg/h	1.33 kg/h	N/A
	Fuel consumption at 75% load	1.80 kg/h	1.80 kg/h	1.80 kg/h	N/A
	Fuel consumption at full load (100%)	2.07 kg/h	2.07 kg/h	2.07 kg/h	N/A
	Specific fuel consumption (at full load, 100%)	0.288 kg/kWh	0.288 kg/kWh	0.288 kg/kWh	N/A
	Fuel autonomy at full load with standard tank (PRP)	22.9 h	22.9 h	22.9 h	NA
	Max. oil consumption at full load	0.02 l/h	0.02 l/h	0.02 l/h	0.02 l/h
	Maximum sound power level (Lw) complies with 2000/14 EC	N/A	N/A	N/A	N/A
	Capacity of fuel tank	55 l	55 l	55 l	55 l
	Single step load capability	7.2 kW	7.2 kW	7.2 kW	6.7 kW
		100%	100%	100%	100%
	<i>Application data</i>	Mode of operation	PRP	PRP	PRP
Site		land use	land use	land use	land use
Operation		single	single	single	single
Start-up and control mode		manual/automatic	manual/automatic	manual/automatic	manual/automatic
Start-up time		unspecified	unspecified	unspecified	unspecified
Mobility/Config. acc. to ISO 8528-1:1993 (optional)		transportable/D mobile/E	transportable/D mobile/E	transportable/D mobile/E	transportable/D mobile/E
Mounting		fully resilient	fully resilient	fully resilient	fully resilient
Climatic exposure		open air	open air	open air	open air

<i>Alternator 4)</i>	Standard	IEC34-1 ISO 8528-3	IEC34-1 ISO 8528-3	IEC34-1 ISO 8528-3	IEC34-1 ISO 8528-3	
	Make	MeccAlte	MeccAlte	MeccAlte	MeccAlte	
	Model	ECP3-1LN/4	ECP3-1LN/4	ECP3-1LN/4	ECP3-2L	
	Rated output, class H temp. rise - 3ph rating type acc. ISO 8528-3	11 kVA 125/40°C	11 kVA 125/40°C	11 kVA 125/40°C	9 kVA 125/40°C	
	Degree of protection (IP index acc. NF EN 60-529)	IP 23	IP 23	IP 23	IP 23	
	Insulation stator class	H	H	H	H	
	Insulation rotor class	H	H	H	H	
	Number of wires	12	12	12	12	
	<i>Engine 4)</i>	Standard	ISO 3046 ISO 8528-2	ISO 3046 ISO 8528-2	ISO 3046 ISO 8528-2	ISO 3046 ISO 8528-2
		Type KUBOTA	D1105-EBG2	D1105-EBG2	D1105-EBG2	D1105-EBG2
Rated net output (PRP) rating type acc. ISO 3046-7		8.4 kW ICXN	8.4 kW ICXN	8.4 kW ICXN	8.4 kW ICXN	
Coolant		coolant	coolant	coolant	coolant	
Combustion system		indirect injection	indirect injection	indirect injection	indirect injection	
Aspiration		natural aspirated	natural aspirated	natural aspirated	natural aspirated	
Number of cylinders		3	3	3	3	
Swept volume		1.12 l	1.12 l	1.12 l	1.12 l	
Speed governing		mechanical	mechanical	mechanical	mechanical	
Capacity of oil sump - initial fill		5.1 l	5.1 l	5.1 l	5.1 l	
Capacity of cooling system		3.1 l	3.1 l	3.1 l	3.1 l	
Electrical system		12 Vdc	12 Vdc	12 Vdc	12 Vdc	
Maximum permissible load factor of PRP during 24h period		100%	100%	100%	100%	
<i>Power circuit</i>	Circuit-breaker					
	Number of poles	4	4	4	2	
	Thermal release It (thermal release is higher at 25°C)	16 A	16 A	16 A	32 A	
	Magnetic release Im	C curve	C curve	C curve	C curve	

Unit

Fault current protection				
Residual current release IDn	0.030-30 A	0.030-30 A	0.030-30 A	0.030-30 A
Insulation resistance (optional)	1-200 kOhm	1-200 kOhm	1-200 kOhm	1-200 kOhm
Outlet sockets (optional)				
	domestic (1x) (optional) 2p + PE 16 A 230 V			domestic (1x) (optional) 2p + PE 16 A 230 V
	CEE form (1x) 3p + N + PE 16 A 400 V			CEE form (1x) 2p + PE 16 A 230V
	CEE form (1x) 3p + N + PE 32 A 400 V			
Dimensions (LxWxH)	1.75x0.84x1.12 m	1.75x0.84x1.12 m	1.75x0.84x1.12 m	1.75x0.84x1.12 m
Weight net mass	600 kg	600 kg	600 kg	600 kg

		QES 11 208/120 V - 3ph	QES 11 220/127 V - 3ph	QES 11 240/120 V - 2ph	QES 11 380/220 V - 3ph
<i>Reference conditions</i> 1)	Rated frequency	60 Hz	60 Hz	60 Hz	60 Hz
	Rated speed	1800 rpm	1800 rpm	1800 rpm	1800 rpm
	Generator service duty	PRP	PRP	PRP	PRP
	Absolute air inlet pressure	1 bar(a)	1 bar(a)	1 bar(a)	1 bar(a)
	Relative air humidity	30%	30%	30%	30%
	Air inlet temperature	25°C	25°C	25°C	25°C
<i>Limitations 2)</i>	Maximum ambient temperature	50°C	50°C	50°C	50°C
	Altitude capability	3000 m	3000 m	3000 m	3000 m
	Maximum relative air humidity	85%	85%	85%	85%
	Minimum starting temperature unaided	-10°C	-10°C	-10°C	-10°C
	Minimum starting temperature with cold start equipment (optional)	-25°C	-25°C	-25°C	-25°C
<i>Performance data</i> 2) 3) 4) 5)	Rated active power (PRP)	TBD	TBD	TBD	TBD
	Rated apparant power (PRP)	TBD	TBD	TBD	TBD
	Rated voltage line to line	TBD	TBD	TBD	TBD
	Rated current 3ph	TBD	TBD	TBD	TBD
	Performance class (acc.ISO 8528-5:1993)	TBD	TBD	TBD	TBD
	Single step load acceptance	TBD	TBD	TBD	TBD
	Frequency droop	TBD	TBD	TBD	TBD
	Fuel consumption at no load (0%)	TBD	TBD	TBD	TBD
	Fuel consumption at 50% load	TBD	TBD	TBD	TBD
	Fuel consumption at 75% load	TBD	TBD	TBD	TBD
	Fuel consumption at full load (100%)	TBD	TBD	TBD	TBD
	Specific fuel consumption (at full load, 100%)	TBD	TBD	TBD	TBD
	Fuel autonomy at full load with standard tank (PRP)	TBD	TBD	TBD	TBD
	Max. oil consumption at full load	TBD	TBD	TBD	TBD
	Maximum sound power level (Lw) complies with 2000/14 EC	TBD	TBD	TBD	TBD

<i>Application data</i>	Capacity of fuel tank	TBD	TBD	TBD	TBD	
	Single step load capability	TBD	TBD	TBD	TBD	
		TBD	TBD	TBD	TBD	
	Mode of operation	PRP	PRP	PRP	PRP	
	Site	land use	land use	land use	land use	
	Operation	single	single	single	single	
	Start-up and control mode	manual/automatic	manual/automatic	manual/automatic	manual/automatic	
	Start-up time	unspecified	unspecified	unspecified	unspecified	
	Mobility/Config. acc. to ISO 8528-1:1993 (optional)	transportable/D mobile/E	transportable/D mobile/E	transportable/D mobile/E	transportable/D mobile/E	
	Mounting	fully resilient	fully resilient	fully resilient	fully resilient	
Climatic exposure	open air	open air	open air	open air		
Status of neutral (TT or TN) (optional)	earthed	earthed	earthed	earthed		
<i>Alternator 4)</i>	Standard	IEC34-1 ISO 8528-3	IEC34-1 ISO 8528-3	IEC34-1 ISO 8528-3	IEC34-1 ISO 8528-3	
	Make	MeccAlte	MeccAlte	MeccAlte	MeccAlte	
	Model	ECP3-1LN/4	ECP3-1LN/4	ECP3-1LN/4	ECP3-2L	
	Rated output, class H temp. rise - 3ph rating type acc. ISO 8528-3	9.0 kVA 125/40°C	9.0 kVA 125/40°C	9.0 kVA 125/40°C	6.7 kVA 125/40°C	
	Degree of protection (IP index acc. NF EN 60-529)	IP 23	IP 23	IP 23	IP 23	
	Insulation stator class	H	H	H	H	
	Insulation rotor class	H	H	H	H	
	Number of wires	12	12	12	12	
	<i>Engine 4)</i>	Standard	ISO 3046 ISO 8528-2	ISO 3046 ISO 8528-2	ISO 3046 ISO 8528-2	ISO 3046 ISO 8528-2
		Type KUBOTA	D1105-EBG2	D1105-EBG2	D1105-EBG2	D1105-EBG2
Rated net output (PRP) rating type acc. ISO 3046-7		8.4 kW ICXN	8.4 kW ICXN	8.4 kW ICXN	8.4 kW ICXN	
Coolant		coolant	coolant	coolant	coolant	
Combustion system		indirect injection	indirect injection	indirect injection	indirect injection	
Aspiration		natural aspirated	natural aspirated	natural aspirated	natural aspirated	
Number of cylinders		3	3	3	3	

	Swept volume	1.12 l	1.12 l	1.12 l	1.12 l
	Speed governing	mechanical	mechanical	mechanical	mechanical
	Capacity of oil sump - initial fill	5.1 l	5.1 l	5.1 l	5.1 l
	Capacity of cooling system	3.1 l	3.1 l	3.1 l	3.1 l
	Electrical system	12 Vdc	12 Vdc	12 Vdc	12 Vdc
	Maximum permissible load factor of PRP during 24h period	100%	100%	100%	100%
<i>Power circuit</i>	Circuit-breaker				
	Number of poles	4	4	4	2
	Thermal release I _t (thermal release is higher at 25°C)	16 A	16 A	16 A	32 A
	Magnetic release I _m	C curve	C curve	C curve	C curve
	Fault current protection				
	Residual current release I _{Dn}	0.030-30 A	0.030-30 A	0.030-30 A	0.030-30 A
	Insulation resistance (optional)	1-200 kOhm	1-200 kOhm	1-200 kOhm	1-200 kOhm
	Outlet sockets (optional)				
		domestic (1x) (optional) 2p + PE 16 A 230 V			
		CEE form (1x) 3p + N + PE 16 A 400 V			
	CEE form (1x) 3p + N + PE 32 A 400 V				
<i>Unit</i>	Dimensions (LxWxH)	1.75x0.84x1.12 m	1.75x0.84x1.12 m	1.75x0.84x1.12 m	1.75x0.84x1.12 m
	Weight net mass	600 kg	600 kg	600 kg	600 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.

ESP: Emergency Standby Power is defined as the maximum power available during a variable electrical power sequence, under the stated operating conditions, for which a generating set is capable of delivering in the event of a utility power outage or under test conditions for up to 200h of operation per year, with the maintenance intervals and procedures being carried out as described by the manufacturers. The permissible average power output (P_{pp}) over 24h of operation shall not exceed 70% of the ESP unless otherwise agreed by the engine manufacturer.

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 as indicated in the Technical Specifications above.

- 5) Specific mass fuel used: 0.86 kg/l.

Derating

Height (m)	Temperature (°C)											
	0	5	10	15	20	25	30	35	40	45	50	
0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
500	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
1000	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
1500	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
2000	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
2500	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
3000	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
3500	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
4000	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

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

10.2 Technical specifications for QES 14 and QES 16 units

10.2.1 Readings on gauges

<i>Gauge</i>	<i>Reading</i>	<i>Unit</i>
Ammeter L3 (PA1)	Below max. rating	A
Voltmeter (PV1)	Below max. rating	V

10.2.2 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

10.2.3 Specifications of the engine/alternator/unit

		QES 14 400/230V - 3ph	QES 14 380/220V - 3ph	QES 14 415/240V - 3ph	QES 14 230V - 1ph
<i>Reference conditions</i> 1)	Rated frequency	50 Hz	50 Hz	50 Hz	50 Hz
	Rated speed	1500 rpm	1500 rpm	1500 rpm	1500 rpm
	Generator service duty	PRP	PRP	PRP	PRP
	Absolute air inlet pressure	1 bar(a)	1 bar(a)	1 bar(a)	1 bar(a)
	Relative air humidity	30%	30%	30%	30%
	Air inlet temperature	25°C	25°C	25°C	25°C
<i>Limitations</i> 2)	Maximum ambient temperature	50°C	50°C	50°C	50°C
	Altitude capability	3000 m	3000 m	3000 m	3000 m
	Maximum relative air humidity	85%	85%	85%	85%
	Minimum starting temperature unaided	-10°C	-10°C	-10°C	-10°C
	Minimum starting temperature with cold start equipment (optional)	-25°C	-25°C	-25°C	-25°C
<i>Performance data</i> 2) 3) 4) 5)	Rated active power (PRP)	11 kW	11 kW	11 kW	10.4 kW
	Rated apparant power (PRP)	13.8 kVA	13.8 kVA	13.8 kVA	10.4 kVA
	Rated voltage line to line	400 V	380 V	415 V	230 V

	Rated current 3ph	19.9 A	20.9 A	19.2 A	45.2 A
	Performance class (acc.ISO 8528-5:1993)	G2	G2	G2	
	Single step load acceptance	11 kW	11 kW	11 kW	
		100%	100%	100%	
	Frequency droop	isochroneous	isochroneous	isochroneous	isochroneous
	Fuel consumption at no load (0%)	1.17 kg/h	1.17 kg/h	1.17 kg/h	
	Fuel consumption at 50% load	1.77 kg/h	1.77 kg/h	1.77 kg/h	
	Fuel consumption at 75% load	2.39 kg/h	2.39 kg/h	2.39 kg/h	
	Fuel consumption at full load (100%)	2.98 kg/h	2.98 kg/h	2.98 kg/h	
	Specific fuel consumption (at full load, 100%)	0.270 kg/kWh	0.270 kg/kWh	0.270 kg/kWh	
	Fuel autonomy at full load with standard tank (PRP)	15.9 h	15.9 h	15.9 h	
	Max. oil consumption at full load	0.02 l/h	0.02 l/h	0.02 l/h	0.02 l/h
	Maximum sound power level (Lw) complies with 2000/14 EC	87.9 dB(A)	87.9 dB(A)	87.9 dB(A)	
	Capacity of fuel tank	55 l	55 l	55 l	55 l
	Single step load capability	11 kW	11 kW	11 kW	
		100%	100%	100%	100%
<i>Application data</i>	Mode of operation	PRP	PRP	PRP	PRP
	Site	land use	land use	land use	land use
	Operation	single	single	single	single
	Start-up and control mode	manual/automatic	manual/automatic	manual/automatic	manual/automatic
	Start-up time	unspecified	unspecified	unspecified	unspecified
	Mobility/Config. acc. to ISO 8528-1:1993 (optional)	transportable/D mobile/E	transportable/D mobile/E	transportable/D mobile/E	transportable/D mobile/E
	Mounting	fully resilient	fully resilient	fully resilient	fully resilient
	Climatic exposure	open air	open air	open air	open air
	Status of neutral (TT or TN) (optional)	earthed	earthed	earthed	earthed
	Status of neutral (IT) (optional)	insulated	insulated	insulated	insulated
<i>Alternator 4)</i>	Standard	IEC34-1	IEC34-1	IEC34-1	IEC34-1
		ISO 8528-3	ISO 8528-3	ISO 8528-3	ISO 8528-3
	Make	MeccAlte	MeccAlte	MeccAlte	MeccAlte
	Model	ECP3-3L/4	ECP3-3L/4	ECP3-3L/4	ECP28-S/4

Engine 4)

Rated output, class H temp. rise - 3ph rating type acc. ISO 8528-3	15 kVA 125/40°C	15 kVA 125/40°C	15 kVA 125/40°C	11.5 kVA 125/40°C
Degree of protection (IP index acc. NF EN 60-529)	IP 23	IP 23	IP 23	IP 23
Insulation stator class	H	H	H	H
Insulation rotor class	H	H	H	H
Number of wires	12	12	12	12
Standard	ISO 3046 ISO 8528-2	ISO 3046 ISO 8528-2	ISO 3046 ISO 8528-2	ISO 3046 ISO 8528-2
Type KUBOTA	D1703M-BG	D1703M-BG	D1703M-BG	D1703M-BG
Rated net output (PRP) rating type acc. ISO 3046-7	12.8 kW ICXN	12.8 kW ICXN	12.8 kW ICXN	12.8 kW ICXN
Coolant	coolant	coolant	coolant	coolant
Combustion system	indirect injection	indirect injection	indirect injection	indirect injection
Aspiration	natural aspirated	natural aspirated	natural aspirated	natural aspirated
Number of cylinders	3	3	3	3
Swept volume	1.7 l	1.7 l	1.7 l	1.7 l
Speed governing	electronic	electronic	electronic	electronic
Capacity of oil sump - initial fill	8 l	8 l	8 l	8 l
Capacity of cooling system	9 l	9 l	9 l	9 l
Electrical system	12 Vdc	12 Vdc	12 Vdc	12 Vdc
Maximum permissible load factor of PRP during 24h period	100%	100%	100%	100%
Circuit-breaker				
Number of poles	4	4	4	2
Thermal release I _t (thermal release is higher at 25°C)	20 A	20 A	20 A	50 A
Magnetic release I _m	C curve	C curve	C curve	C curve
Fault current protection				
Residual current release ID _n	0.030-30 A	0.030-30 A	0.030-30 A	0.030-30 A
Insulation resistance (optional)	1-200 kOhm	1-200 kOhm	1-200 kOhm	1-200 kOhm

Power circuit

Unit

Outlet sockets (optional)	domestic (1x) (optional) 2p + PE 16 A 230 V			domestic (1x) (optional) 2p + PE 16 A 230 V
	CEE form (1x) 3p + N + PE 16 A 400 V			CEE form (1x) 2p + PE 16 A 230V
	CEE form (1x) 3p + N + PE 32 A 400 V			
Dimensions (LxWxH)	1.75x0.84x1.12 m	1.75x0.84x1.12 m	1.75x0.84x1.12 m	1.75x0.84x1.12 m
Weight net mass	668 kg	668 kg	668 kg	668 kg

		QES 16 208/120V - 3ph	QES 16 220/127V - 3ph	QES 16 240/120V - 2ph	QES 16 380/220 V - 3ph
Reference conditions 1)	Rated frequency	60 Hz	60 Hz	60 Hz	60 Hz
	Rated speed	1800 rpm	1800 rpm	1800 rpm	1800 rpm
	Generator service duty	PRP	PRP	PRP	PRP
	Absolute air inlet pressure	1 bar(a)	1 bar(a)	1 bar(a)	1 bar(a)
	Relative air humidity	30%	30%	30%	30%
	Air inlet temperature	25°C	25°C	25°C	25°C
Limitations 2)	Maximum ambient temperature	50°C	50°C	50°C	50°C
	Altitude capability	3000 m	3000 m	3000 m	3000 m
	Maximum relative air humidity	85%	85%	85%	85%
	Minimum starting temperature unaided	-10°C	-10°C	-10°C	-10°C
	Minimum starting temperature with cold start equipment (optional)	-25°C	-25°C	-25°C	-25°C
Performance data 2) 3) 4) 5)	Rated active power (PRP)	12.8 kW	13.3 kW	12.0 kW	13.2 kW
	Rated apparant power (PRP)	16.0 kVA	16.6 kVA	12.0 kVA	16.5 kVA
	Rated voltage line to line	208 V	220 V	240 V	380 V
	Rated current 3ph	44.4 A	43.6 A	50.0 A	25.1 A
	Performance class (acc.ISO 8528-5:1993)	G2	G2		
	Single step load acceptance	100%	100%		
		12.8 kW	13.3 kW		
	Frequency droop	isochronous	isochronous	isochronous	isochronous
	Fuel consumption at no load (0%)	1.18 kg/h	1.18 kg/h		
	Fuel consumption at 50% load	2.25 kg/h	2.25 kg/h		
	Fuel consumption at 75% load	2.87 kg/h	2.87 kg/h		
	Fuel consumption at full load (100%)	3.76 kg/h	3.76 kg/h		
	Specific fuel consumption (at full load, 100%)	0.283 kg/kWh	0.283 kg/kWh		
	Fuel autonomy at full load with standard tank (PRP)	12.6 h	12.6 h		
	Max. oil consumption at full load	0.02 l/h	0.02 l/h	0.02 l/h	0.02 l/h
	Maximum sound power level (Lw) complies with 2000/14 EC	89.9 dB(A)	89.9 dB(A)		

<i>Application data</i>	Capacity of fuel tank	55 l	55 l	55 l	55 l
	Single step load capability	12.8 kW	13.3 kW		
		100%	100%	100%	100%
	Mode of operation	PRP	PRP	PRP	PRP
	Site	land use	land use	land use	land use
	Operation	single	single	single	single
	Start-up and control mode	manual/automatic	manual/automatic	manual/automatic	manual/automatic
	Start-up time	unspecified	unspecified	unspecified	unspecified
	Mobility/Config. acc. to ISO 8528-1:1993 (optional)	transportable/D	transportable/D	transportable/D	transportable/D
	Mounting	mobile/E	mobile/E	mobile/E	mobile/E
<i>Alternator 4)</i>	Mounting	fully resilient	fully resilient	fully resilient	fully resilient
	Climatic exposure	open air	open air	open air	open air
	Status of neutral (TT or TN) (optional)	earthed	earthed	earthed	earthed
	Standard	IEC34-1	IEC34-1	IEC34-1	IEC34-1
		ISO 8528-3	ISO 8528-3	ISO 8528-3	ISO 8528-3
	Make	MeccAlte	MeccAlte	MeccAlte	MeccAlte
	Model	ECP3-3L/4	ECP3-3L/4	ECP28-S/4	ECP28-S/4
	Rated output, class H temp. rise - 3ph	16 kVA	18 kVA	12 kVA	17 kVA
	rating type acc. ISO 8528-3	125/40°C	125/40°C	125/40°C	125/40°C
	Degree of protection (IP index acc. NF EN 60-529)	IP 23	IP 23	IP 23	IP 23
<i>Engine 4)</i>	Insulation stator class	H	H	H	H
	Insulation rotor class	H	H	H	H
	Number of wires	12	12	12	12
	Standard	ISO 3046	ISO 3046	ISO 3046	ISO 3046
		ISO 8528-2	ISO 8528-2	ISO 8528-2	ISO 8528-2
	Type KUBOTA	D1703M-BG	D1703M-BG	D1703M-BG	D1703M-BG
	Rated net output (PRP)	15.1 kW	15.1 kW	15.1 kW	15.1 kW
	rating type acc. ISO 3046-7	ICXN	ICXN	ICXN	ICXN
	Coolant	coolant	coolant	coolant	coolant
	Combustion system	indirect injection	indirect injection	indirect injection	indirect injection
Aspiration	natural aspirated	natural aspirated	natural aspirated	natural aspirated	
Number of cylinders	3	3	3	3	

	Swept volume	1.71	1.71	1.71	1.71
	Speed governing	electronic	electronic	electronic	electronic
	Capacity of oil sump - initial fill	8 l	8 l	8 l	8 l
	Capacity of cooling system	9 l	9 l	9 l	9 l
	Electrical system	12 Vdc	12 Vdc	12 Vdc	12 Vdc
	Maximum permissible load factor of PRP during 24h period	100%	100%	100%	100%
<i>Power circuit</i>	Circuit-breaker				
	Number of poles	4	4	3	4
	Thermal release I _t (thermal release is higher at 25°C)	40 A	40 A	50 A	25 A
	Magnetic release I _m	C curve	C curve	C curve	C curve
	Fault current protection				
	Residual current release I _{Dn}	0.030-30 A	0.030-30 A	0.030-30 A	0.030-30 A
	Insulation resistance (optional)	1-200 kOhm	1-200 kOhm	1-200 kOhm	1-200 kOhm
	Outlet sockets (optional)				
		domestic (1x) (optional) 2p + PE 16 A 230 V			
		CEE form (1x) 3p + N + PE 16 A 400 V			
	CEE form (1x) 3p + N + PE 32 A 400 V				
<i>Unit</i>	Dimensions (LxWxH)	1.75x0.84x1.12 m	1.75x0.84x1.12 m	1.75x0.84x1.12 m	1.75x0.84x1.12 m
	Weight net mass	668 kg	668 kg	668 kg	668 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.

ESP: Emergency Standby Power is defined as the maximum power available during a variable electrical power sequence, under the stated operating conditions, for which a generating set is capable of delivering in the event of a utility power outage or under test conditions for up to 200h of operation per year, with the maintenance intervals and procedures being carried out as described by the manufacturers. The permissible average power output (P_{pp}) over 24h of operation shall not exceed 70% of the ESP unless otherwise agreed by the engine manufacturer.

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 as indicated in the Technical Specifications above.

- 5) Specific mass fuel used: 0.86 kg/l.

*Derating factor (%)
(PRP at 50Hz, 400V)*

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

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

10.3 Technical specifications for QES 20 and QES 25 units

10.3.1 Readings on gauges

<i>Gauge</i>	<i>Reading</i>	<i>Unit</i>
Ammeter L3 (PA1)	Below max. rating	A
Voltmeter (PV1)	Below max. rating	V

10.3.2 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

10.3.3 Specifications of the engine/alternator/unit

		<i>QES 20 400/230V - 3ph</i>	<i>QES 20 380/220V - 3ph</i>	<i>QES 20 415/240V - 3ph</i>	<i>QES 20 230V - 1ph</i>
<i>Reference conditions</i> 1)	Rated frequency	50 Hz	50 Hz	50 Hz	50 Hz
	Rated speed	1500 rpm	1500 rpm	1500 rpm	1500 rpm
	Generator service duty	PRP	PRP	PRP	PRP
	Absolute air inlet pressure	1 bar(a)	1 bar(a)	1 bar(a)	1 bar(a)
	Relative air humidity	30%	30%	30%	30%
	Air inlet temperature	25°C	25°C	25°C	25°C
<i>Limitations</i> 2)	Maximum ambient temperature	50°C	50°C	50°C	50°C
	Altitude capability	3000 m	3000 m	3000 m	3000 m
	Maximum relative air humidity	85%	85%	85%	85%
	Minimum starting temperature unaided	-10°C	-10°C	-10°C	-10°C
	Minimum starting temperature with cold start equipment (optional)	-25°C	-25°C	-25°C	-25°C
<i>Performance data</i> 2) 3) 4) 5)	Rated active power (PRP)	16 kW	16 kW	16 kW	15.4 kW
	Rated apparant power (PRP)	20.0 kVA	20.0 kVA	20.0 kVA	15.4 kVA
	Rated voltage line to line	400 V	380 V	415 V	230 V

	Rated current 3ph	28.9 A	30.4 A	27.9 A	67.0 A	
	Performance class (acc.ISO 8528-5:1993)	G2	G2	G2		
	Single step load acceptance	100%	100%	100%		
		16 kW	16 kW	16 kW		
	Frequency droop	isochroneous	isochroneous	isochroneous	isochroneous	
	Fuel consumption at no load (0%)	1.329 kg/h	1.329 kg/h	1.329 kg/h		
	Fuel consumption at 50% load	2.731 kg/h	2.731 kg/h	2.731 kg/h		
	Fuel consumption at 75% load	3.361 kg/h	3.361 kg/h	3.361 kg/h		
	Fuel consumption at full load (100%)	4.237 kg/h	4.237 kg/h	4.237 kg/h		
	Specific fuel consumption (at full load, 100%)	0.270 kg/kWh	0.270 kg/kWh	0.270 kg/kWh		
	Fuel autonomy at full load with standard tank (PRP)	10.9 h	10.9 h	10.9 h		
	Max. oil consumption at full load	0.02 l/h	0.02 l/h	0.02 l/h	0.02 l/h	
	Maximum sound power level (Lw) complies with 2000/14 EC	89.2 dB(A)	89.2 dB(A)	89.2 dB(A)		
	Capacity of fuel tank	55 l	55 l	55 l	55 l	
	Single step load capability	16 kW	16 kW	16 kW		
		100%	100%	100%	100%	
<i>Application data</i>	Mode of operation	PRP	PRP	PRP	PRP	
	Site	land use	land use	land use	land use	
	Operation	single	single	single	single	
	Start-up and control mode	manual/automatic	manual/automatic	manual/automatic	manual/automatic	
	Start-up time	unspecified	unspecified	unspecified	unspecified	
	Mobility/Config. acc. to ISO 8528-1:1993 (optional)	transportable/D mobile/E	transportable/D mobile/E	transportable/D mobile/E	transportable/D mobile/E	
	Mounting	fully resilient	fully resilient	fully resilient	fully resilient	
	Climatic exposure	open air	open air	open air	open air	
	Status of neutral (TT or TN) (optional)	earthed	earthed	earthed	earthed	
	Status of neutral (IT) (optional)	insulated	insulated	insulated	insulated	
	<i>Alternator 4)</i>	Standard	IEC34-1	IEC34-1	IEC34-1	IEC34-1
			ISO 8528-3	ISO 8528-3	ISO 8528-3	ISO 8528-3
		Make	MeccAlte	MeccAlte	MeccAlte	MeccAlte
Model		ECP28-M/4	ECP28-M/4	ECP28-M/4	ECP28-2L/4A	

Engine 4)

Rated output, class H temp. rise - 3ph rating type acc. ISO 8528-3	20 kVA 125/40°C	20 kVA 125/40°C	20 kVA 125/40°C	16.5 kVA 125/40°C
Degree of protection (IP index acc. NF EN 60-529)	IP 23	IP 23	IP 23	IP 23
Insulation stator class	H	H	H	H
Insulation rotor class	H	H	H	H
Number of wires	12	12	12	12
Standard	ISO 3046 ISO 8528-2	ISO 3046 ISO 8528-2	ISO 3046 ISO 8528-2	ISO 3046 ISO 8528-2
Type KUBOTA	V2403M-BG	V2403M-BG	V2403M-BG	V2403M-BG
Rated net output (PRP) rating type acc. ISO 3046-7	18.8 kW ICXN	18.8 kW ICXN	18.8 kW ICXN	18.8 kW ICXN
Coolant	coolant	coolant	coolant	coolant
Combustion system	indirect injection	indirect injection	indirect injection	indirect injection
Aspiration	natural aspirated	natural aspirated	natural aspirated	natural aspirated
Number of cylinders	4	4	4	4
Swept volume	2.4 l	2.4 l	2.4 l	2.4 l
Speed governing	electronic	electronic	electronic	electronic
Capacity of oil sump - initial fill	9 l	9 l	9 l	9 l
Capacity of cooling system	9 l	9 l	9 l	9 l
Electrical system	12 Vdc	12 Vdc	12 Vdc	12 Vdc
Emission compliance	EU stage IIIA	EU stage IIIA	EU stage IIIA	EU stage IIIA
Maximum permissible load factor of PRP during 24h period	100%	100%	100%	100%
Circuit-breaker				
Number of poles	4	4	4	2
Thermal release I _t (thermal release is higher at 25°C)	32 A	32 A	32 A	63 A
Magnetic release I _m	C curve	C curve	C curve	C curve
Fault current protection				
Residual current release I _{DN}	0.030-30 A	0.030-30 A	0.030-30 A	0.030-30 A
Insulation resistance (optional)	1-200 kOhm	1-200 kOhm	1-200 kOhm	1-200 kOhm

Power circuit

Unit

Outlet sockets (optional)	domestic (1x) (optional) 2p + PE 16 A 230 V			domestic (1x) (optional) 2p + PE 16 A 230 V
	CEE form (1x) 3p + N + PE 16 A 400 V			CEE form (1x) 2p + PE 16 A 230V
	CEE form (1x) 3p + N + PE 32 A 400 V			
Dimensions (LxWxH)	1.75x0.84x1.12 m	1.75x0.84x1.12 m	1.75x0.84x1.12 m	1.75x0.84x1.12 m
Weight net mass	720 kg	720 kg	720 kg	720 kg

		QES 25 208/120V - 3ph	QES 25 220/127V - 3ph	QES 25 240/120V - 2ph	QES 25 380/220 V - 3ph
Reference conditions 1)	Rated frequency	60 Hz	60 Hz	60 Hz	60 Hz
	Rated speed	1800 rpm	1800 rpm	1800 rpm	1800 rpm
	Generator service duty	PRP	PRP	PRP	PRP
	Absolute air inlet pressure	1 bar(a)	1 bar(a)	1 bar(a)	1 bar(a)
	Relative air humidity	30%	30%	30%	30%
	Air inlet temperature	25°C	25°C	25°C	25°C
Limitations 2)	Maximum ambient temperature	50°C	50°C	50°C	50°C
	Altitude capability	3000 m	3000 m	3000 m	3000 m
	Maximum relative air humidity	85%	85%	85%	85%
	Minimum starting temperature unaided	-10°C	-10°C	-10°C	-10°C
	Minimum starting temperature with cold start equipment (optional)	-25°C	-25°C	-25°C	-25°C
Performance data 2) 3) 4) 5)	Rated active power (PRP)	16.8 kW	18.4 kW	17.0 kW	19.5 kW
	Rated apparant power (PRP)	21 kVA	23.0 kVA	17.0 kVA	24.4 kVA
	Rated voltage line to line	208 V	220 V	240 V	380 V
	Rated current 3ph	58.3 A	60.4 A	70.8 A	36.2 A
	Performance class (acc.ISO 8528-5:1993)	G2	G2		
	Single step load acceptance	100%	100%		
		16.8 kW	18.4 kW		
	Frequency droop	isochronous	isochronous	isochronous	isochronous
	Fuel consumption at no load (0%)	1.82 kg/h	1.82 kg/h		
	Fuel consumption at 50% load	3.14 kg/h	3.14 kg/h		
	Fuel consumption at 75% load	4.08 kg/h	4.08 kg/h		
	Fuel consumption at full load (100%)	5.14 kg/h	5.14 kg/h		
	Specific fuel consumption (at full load, 100%)	0.268 kg/kWh	0.268 kg/kWh		
	Fuel autonomy at full load with standard tank (PRP)	9.2 h	9.2 h		
	Max. oil consumption at full load	0.03 l/h	0.03 l/h	0.03 l/h	0.03 l/h
	Maximum sound power level (Lw) complies with 2000/14 EC	89.2 dB(A)	89.2 dB(A)		

<i>Application data</i>	Capacity of fuel tank	55 l	55 l	55 l	55 l
	Single step load capability	16.8 kW	18.4 kW		
		100%	100%	100%	100%
	Mode of operation	PRP	PRP	PRP	PRP
	Site	land use	land use	land use	land use
	Operation	single	single	single	single
	Start-up and control mode	manual/automatic	manual/automatic	manual/automatic	manual/automatic
	Start-up time	unspecified	unspecified	unspecified	unspecified
	Mobility/Config. acc. to ISO 8528-1:1993 (optional)	transportable/D	transportable/D	transportable/D	transportable/D
	Mounting	mobile/E	mobile/E	mobile/E	mobile/E
<i>Alternator 4)</i>	Mounting	fully resilient	fully resilient	fully resilient	fully resilient
	Climatic exposure	open air	open air	open air	open air
	Status of neutral (TT or TN) (optional)	earthed	earthed	earthed	earthed
	Standard	IEC34-1	IEC34-1	IEC34-1	IEC34-1
		ISO 8528-3	ISO 8528-3	ISO 8528-3	ISO 8528-3
	Make	MeccAlte	MeccAlte	MeccAlte	MeccAlte
	Model	ECP28-M/4	ECP28-M/4	ECP28-2L/4A	ECP28-2L/4A
	Rated output, class H temp. rise - 3ph	21 kVA	23 kVA	17 kVA	25 kVA
	rating type acc. ISO 8528-3	125/40°C	125/40°C	125/40°C	125/40°C
	Degree of protection (IP index acc. NF EN 60-529)	IP 23	IP 23	IP 23	IP 23
<i>Engine 4)</i>	Insulation stator class	H	H	H	H
	Insulation rotor class	H	H	H	H
	Number of wires	12	12	12	12
	Standard	ISO 3046	ISO 3046	ISO 3046	ISO 3046
		ISO 8528-2	ISO 8528-2	ISO 8528-2	ISO 8528-2
	Type KUBOTA	V2403M-BG	V2403M-BG	V2403M-BG	V2403M-BG
	Rated net output (PRP)	22.1 kW	22.1 kW	22.1 kW	22.1 kW
	rating type acc. ISO 3046-7	ICXN	ICXN	ICXN	ICXN
	Coolant	coolant	coolant	coolant	coolant
	Combustion system	indirect injection	indirect injection	indirect injection	indirect injection
<i>Aspiration</i>	Aspiration	natural aspirated	natural aspirated	natural aspirated	natural aspirated
	Number of cylinders	4	4	4	4

<i>Power circuit</i>	Swept volume	2.4 l	2.4 l	2.4 l	2.4 l
	Speed governing	electronic	electronic	electronic	electronic
	Capacity of oil sump - initial fill	9 l	9 l	9 l	9 l
	Capacity of cooling system	9 l	9 l	9 l	9 l
	Electrical system	12 Vdc	12 Vdc	12 Vdc	12 Vdc
	Emission compliance	EU stage IIIA	EU stage IIIA	EU stage IIIA	EU stage IIIA
	Maximum permissible load factor of PRP during 24h period	100%	100%	100%	100%
	Circuit-breaker				
	Number of poles	4	4	3	4
	Thermal release I _t (thermal release is higher at 25°C)	63 A	63 A	100 A	40 A
	Magnetic release I _m	C curve	C curve	4 x I _n	C curve
	Fault current protection				
	Residual current release I _{Dn}	0.030-30 A	0.030-30 A	0.030-30 A	0.030-30 A
	Insulation resistance (optional)	1-200 kOhm	1-200 kOhm	1-200 kOhm	1-200 kOhm
Outlet sockets (optional)	domestic (1x) (optional) 2p + PE 16 A 230 V				
	CEE form (1x) 3p + N + PE 16 A 400 V				
	CEE form (1x) 3p + N + PE 32 A 400 V				
<i>Unit</i>					
Dimensions (LxWxH)	1.75x0.84x1.12 m	1.75x0.84x1.12 m	1.75x0.84x1.12 m	1.75x0.84x1.12 m	
Weight net mass	720 kg	720 kg	720 kg	720 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.

ESP: Emergency Standby Power is defined as the maximum power available during a variable electrical power sequence, under the stated operating conditions, for which a generating set is capable of delivering in the event of a utility power outage or under test conditions for up to 200h of operation per year, with the maintenance intervals and procedures being carried out as described by the manufacturers. The permissible average power output (P_{pp}) over 24h of operation shall not exceed 70% of the ESP unless otherwise agreed by the engine manufacturer.

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 as indicated in the Technical Specifications above.
- 5) Specific mass fuel used: 0.86 kg/l.

Derating factor (%)
(PRP at 50Hz, 400V)

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

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

10.4 Technical specifications for QES 30 and QES 35 units

10.4.1 Readings on gauges

<i>Gauge</i>	<i>Reading</i>	<i>Unit</i>
Ammeter L3 (PA1)	Below max. rating	A
Voltmeter (PV1)	Below max. rating	V

10.4.2 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

10.4.3 Specifications of the engine/alternator/unit

		<i>QES 30 400/230V - 3ph</i>	<i>QES 30 380/220V - 3ph</i>	<i>QES 30 415/240V - 3ph</i>	<i>QES 30 230V - 1ph</i>
<i>Reference conditions</i> 1)	Rated frequency	50 Hz	50 Hz	50 Hz	50 Hz
	Rated speed	1500 rpm	1500 rpm	1500 rpm	1500 rpm
	Generator service duty	PRP	PRP	PRP	PRP
	Absolute air inlet pressure	1 bar(a)	1 bar(a)	1 bar(a)	1 bar(a)
	Relative air humidity	30%	30%	30%	30%
	Air inlet temperature	25°C	25°C	25°C	25°C
<i>Limitations 2)</i>	Maximum ambient temperature	50°C	50°C	50°C	50°C
	Altitude capability	3000 m	3000 m	3000 m	3000 m
	Maximum relative air humidity	85%	85%	85%	85%
	Minimum starting temperature unaided	-10°C	-10°C	-10°C	-10°C
	Minimum starting temperature with cold start equipment (optional)	-25°C	-25°C	-25°C	-25°C
<i>Performance data</i> 2) 3) 4) 5)	Rated active power (PRP)	23.8 kW	23.8 kW	23.8 kW	22.3 kW
	Rated apparant power (PRP)	29.8 kVA	29.8 kVA	29.8 kVA	22.3 kVA
	Rated voltage line to line	400 V	380 V	415 V	230 V

	Rated current 3ph	42.9 A	45.2 A	41.3 A	97.0 A
	Performance class (acc.ISO 8528-5:1993)	G1	G1	G1	
	Single step load acceptance				
	Frequency droop	isochroneous	isochroneous	isochroneous	isochroneous
	Fuel consumption at no load (0%)	1.50 kg/h	1.50 kg/h	1.50 kg/h	
	Fuel consumption at 50% load	3.26 kg/h	3.26 kg/h	3.26 kg/h	
	Fuel consumption at 75% load	4.76 kg/h	4.76 kg/h	4.76 kg/h	
	Fuel consumption at full load (100%)	5.90 kg/h	5.90 kg/h	5.90 kg/h	
	Specific fuel consumption (at full load, 100%)	0.243 kg/kWh	0.243 kg/kWh	0.243 kg/kWh	
	Fuel autonomy at full load with standard tank (PRP)	15.3 h	15.3 h	15.3 h	
	Max. oil consumption at full load	0.03 l/h	0.03 l/h	0.03 l/h	0.03 l/h
	Maximum sound power level (Lw) complies with 2000/14 EC	90.8 dB(A)	90.8 dB(A)	90.8 dB(A)	
	Capacity of fuel tank	105 l	105 l	105 l	105 l
	Single step load capability	23.8 kW	23.8 kW	23.8 kW	
		100%	100%	100%	100%
<i>Application data</i>	Mode of operation	PRP	PRP	PRP	PRP
	Site	land use	land use	land use	land use
	Operation	single	single	single	single
	Start-up and control mode	manual/automatic	manual/automatic	manual/automatic	manual/automatic
	Start-up time	unspecified	unspecified	unspecified	unspecified
	Mobility/Config. acc. to ISO 8528-1:1993 (optional)	transportable/D mobile/E	transportable/D mobile/E	transportable/D mobile/E	transportable/D mobile/E
	Mounting	fully resilient	fully resilient	fully resilient	fully resilient
	Climatic exposure	open air	open air	open air	open air
	Status of neutral (TT or TN) (optional)	earthed	earthed	earthed	earthed
	Status of neutral (IT) (optional)	insulated	insulated	insulated	insulated
<i>Alternator 4)</i>	Standard	IEC34-1	IEC34-1	IEC34-1	IEC34-1
		ISO 8528-3	ISO 8528-3	ISO 8528-3	ISO 8528-3
	Make	MeccAlte	MeccAlte	MeccAlte	MeccAlte
	Model	ECP28-VL/4	ECP28-VL/4	ECP28-VL/4	ECP32-2S/4

Engine 4)

Rated output, class H temp. rise - 3ph rating type acc. ISO 8528-3	30 kVA 125/40°C	30 kVA 125/40°C	30 kVA 125/40°C	23.5 kVA 125/40°C
Degree of protection (IP index acc. NF EN 60-529)	IP 23	IP 23	IP 23	IP 21
Insulation stator class	H	H	H	H
Insulation rotor class	H	H	H	H
Number of wires	12	12	12	12
Standard	ISO 3046 ISO 8528-2	ISO 3046 ISO 8528-2	ISO 3046 ISO 8528-2	ISO 3046 ISO 8528-2
Type KUBOTA	V3300DI	V3300DI	V3300DI	V3300DI
Rated net output (PRP) rating type acc. ISO 3046-7	27 kW ICXN	27 kW ICXN	27 kW ICXN	27 kW ICXN
Coolant	coolant	coolant	coolant	coolant
Combustion system	direct injection	direct injection	direct injection	direct injection
Aspiration	natural aspirated	natural aspirated	natural aspirated	natural aspirated
Number of cylinders	4	4	4	4
Swept volume	3.3 l	3.3 l	3.3 l	3.3 l
Speed governing	electronic	electronic	electronic	electronic
Capacity of oil sump - initial fill	13 l	13 l	13 l	13 l
Capacity of cooling system	7.5 l	7.5 l	7.5 l	7.5 l
Electrical system	12 Vdc	12 Vdc	12 Vdc	12 Vdc
Emission compliance	EU stage IIIA	EU stage IIIA	EU stage IIIA	EU stage IIIA
Maximum permissible load factor of PRP during 24h period	100%	100%	100%	100%
Power circuit				
Circuit-breaker				
Number of poles	4	4	4	3
Thermal release I _t (thermal release is higher at 25°C)	40 A	40 A	40 A	100 A
Magnetic release I _m	C curve	C curve	C curve	3 x I _n
Fault current protection				
Residual current release I _{DN}	0.030-30 A	0.030-30 A	0.030-30 A	0.030-30 A
Insulation resistance (optional)	1-200 kOhm	1-200 kOhm	1-200 kOhm	1-200 kOhm

Unit

Outlet sockets (optional)	domestic (1x) (optional) 2p + PE 16 A 230 V			domestic (1x) (optional) 2p + PE 16 A 230 V
	CEE form (1x) 3p + N + PE 16 A 400 V			CEE form (1x) 2p + PE 16 A 230V
	CEE form (1x) 3p + N + PE 32 A 400 V			
Dimensions (LxWxH)	2.2 x 0.94 x 1.27 m	2.2 x 0.94 x 1.27 m	2.2 x 0.94 x 1.27 m	2.2 x 0.94 x 1.27 m
Weight net mass	945 kg	945 kg	945 kg	945 kg

		QES 35 208/120V - 3ph	QES 35 220/127V - 3ph	QES 35 240/120V - 2ph	QES 35 380/220 V - 3ph
Reference conditions 1)	Rated frequency	60 Hz	60 Hz	60 Hz	60 Hz
	Rated speed	1800 rpm	1800 rpm	1800 rpm	1800 rpm
	Generator service duty	PRP	PRP	PRP	PRP
	Absolute air inlet pressure	1 bar(a)	1 bar(a)	1 bar(a)	1 bar(a)
	Relative air humidity	30%	30%	30%	30%
	Air inlet temperature	25°C	25°C	25°C	25°C
Limitations 2)	Maximum ambient temperature	50°C	50°C	50°C	50°C
	Altitude capability	3000 m	3000 m	3000 m	3000 m
	Maximum relative air humidity	85%	85%	85%	85%
	Minimum starting temperature unaided	-10°C	-10°C	-10°C	-10°C
	Minimum starting temperature with cold start equipment (optional)	-25°C	-25°C	-25°C	-25°C
Performance data 2) 3) 4) 5)	Rated active power (PRP)	26.4 kW	27.3 kW	24.0 kW	27.1 kW
	Rated apparent power (PRP)	33.0 kVA	34.1 kVA	24.0 kVA	33.9 kVA
	Rated voltage line to line	208 V	220 V	240 V	380 V
	Rated current 3ph	91.6 A	89.2 A	100 A	51.5 A
	Performance class (acc.ISO 8528-5:1993)	G2	G2		
	Single step load acceptance	100%	100%		
		26.4 kW	27.3 kW		
	Frequency droop	isochronous	isochronous	isochronous	isochronous
	Fuel consumption at no load (0%)	2.05 kg/h	2.05 kg/h		
	Fuel consumption at 50% load	4.15 kg/h	4.15 kg/h		
	Fuel consumption at 75% load	5.50 kg/h	5.50 kg/h		
	Fuel consumption at full load (100%)	6.87 kg/h	6.87 kg/h		
	Specific fuel consumption (at full load, 100%)	0.245 kg/kWh	0.245 kg/kWh		
	Fuel autonomy at full load with standard tank (PRP)	13.1 h	13.1 h		
	Max. oil consumption at full load	0.04 l/h	0.04 l/h	0.04 l/h	0.04 l/h
	Maximum sound power level (Lw) complies with 2000/14 EC	94.4 dB(A)	94.4 dB(A)		

<i>Application data</i>	Capacity of fuel tank	105 1	105 1	105 1	105 1
	Single step load capability	26.4 kW	27.3 kW	24.0 kW	27.1 kW
		100%	100%		
	Mode of operation	PRP	PRP	PRP	PRP
	Site	land use	land use	land use	land use
	Operation	single	single	single	single
	Start-up and control mode	manual/automatic	manual/automatic	manual/automatic	manual/automatic
	Start-up time	unspecified	unspecified	unspecified	unspecified
	Mobility/Config. acc. to ISO 8528-1:1993 (optional)	transportable/D	transportable/D	transportable/D	transportable/D
<i>Alternator 4)</i>	(optional)	mobile/E	mobile/E	mobile/E	mobile/E
	Mounting	fully resilient	fully resilient	fully resilient	fully resilient
	Climatic exposure	open air	open air	open air	open air
	Status of neutral (TT or TN) (optional)	earthed	earthed	earthed	earthed
	Standard	IEC34-1	IEC34-1	IEC34-1	IEC34-1
		ISO 8528-3	ISO 8528-3	ISO 8528-3	ISO 8528-3
	Make	MeccAlte	MeccAlte	MeccAlte	MeccAlte
	Model	ECP28-VL/4	ECP28-VL/4	ECP32-2S/4	ECP32-2S/4
	Rated output, class H temp. rise - 3ph	33 kVA	36 kVA	24 kVA	35 kVA
rating type acc. ISO 8528-3	125/40°C	125/40°C	125/40°C	125/40°C	
Degree of protection (IP index acc. NF EN 60-529)	IP 23	IP 23	IP 21	IP 21	
Insulation stator class	H	H	H	H	
Insulation rotor class	H	H	H	H	
Number of wires	12	12	12	12	
<i>Engine 4)</i>	Standard	ISO 3046	ISO 3046	ISO 3046	ISO 3046
		ISO 8528-2	ISO 8528-2	ISO 8528-2	ISO 8528-2
	Type KUBOTA	V3300DI	V3300DI	V3300DI	V3300DI
	Rated net output (PRP)	30.7 kW	30.7 kW	30.7 kW	30.7 kW
	rating type acc. ISO 3046-7	ICXN	ICXN	ICXN	ICXN
	Coolant	coolant	coolant	coolant	coolant
	Combustion system	direct injection	direct injection	direct injection	direct injection
	Aspiration	natural aspirated	natural aspirated	natural aspirated	natural aspirated
	Number of cylinders	4	4	4	4

	Swept volume	3.3 l	3.3 l	3.3 l	3.3 l
	Speed governing	electronic	electronic	electronic	electronic
	Capacity of oil sump - initial fill	13 l	13 l	13 l	13 l
	Capacity of cooling system	7.5 l	7.5 l	7.5 l	7.5 l
	Electrical system	12 Vdc	12 Vdc	12 Vdc	12 Vdc
	Emission compliance	EU stage IIIA	EU stage IIIA	EU stage IIIA	EU stage IIIA
	Maximum permissible load factor of PRP during 24h period	100%	100%	100%	100%
<i>Power circuit</i>	Circuit-breaker				
	Number of poles	4	4	3	4
	Thermal release I _t (thermal release is higher at 25°C)	100 A	100 A	100 A	50 A
	Magnetic release I _m	3 x I _n	3 x I _n	3 x I _n	C curve
	Fault current protection				
	Residual current release I _{Dn}	0.030-30 A	0.030-30 A	0.030-30 A	0.030-30 A
	Insulation resistance (optional)	1-200 kOhm	1-200 kOhm	1-200 kOhm	1-200 kOhm
	Outlet sockets (optional)	domestic (1x) (optional) 2p + PE 16 A 230 V			
		CEE form (1x) 3p + N + PE 16 A 400 V			
		CEE form (1x) 3p + N + PE 32 A 400 V			
<i>Unit</i>	Dimensions (LxWxH)	1.75x0.84x1.12 m	1.75x0.84x1.12 m	1.75x0.84x1.12 m	1.75x0.84x1.12 m
	Weight net mass	720 kg	720 kg	720 kg	720 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.
ESP: Emergency Standby Power is defined as the maximum power available during a variable electrical power sequence, under the stated operating conditions, for which a generating set is capable of delivering in the event of a utility power outage or under test conditions for up to 200h of operation per year, with the maintenance intervals and procedures being carried out as described by the manufacturers. The permissible average power output (P_{pp}) over 24h of operation shall not exceed 70% of the ESP unless otherwise agreed by the engine manufacturer.
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 as indicated in the Technical Specifications above.
- 5) Specific mass fuel used: 0.86 kg/l.

*Derating factor (%)
(PRP at 50Hz, 400V)*

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

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

10.5 Technical specifications for QES 40 and QES 50 units

10.5.1 Readings on gauges

<i>Gauge</i>	<i>Reading</i>	<i>Unit</i>
Ammeter L3 (PA1)	Below max. rating	A
Voltmeter (PV1)	Below max. rating	V

10.5.2 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

10.5.3 Specifications of the engine/alternator/unit

		<i>QES 40 400/230V - 3ph</i>	<i>QES 40 380/220V - 3ph</i>	<i>QES 40 415/240V - 3ph</i>	<i>QES 40 230V - 1ph</i>
<i>Reference conditions</i> 1)	Rated frequency	50 Hz	50 Hz	50 Hz	50 Hz
	Rated speed	1500 rpm	1500 rpm	1500 rpm	1500 rpm
	Generator service duty	PRP	PRP	PRP	PRP
	Absolute air inlet pressure	1 bar(a)	1 bar(a)	1 bar(a)	1 bar(a)
	Relative air humidity	30%	30%	30%	30%
	Air inlet temperature	25°C	25°C	25°C	25°C
<i>Limitations</i> 2)	Maximum ambient temperature	50°C	50°C	50°C	50°C
	Altitude capability	3000 m	3000 m	3000 m	3000 m
	Maximum relative air humidity	85%	85%	85%	85%
	Minimum starting temperature unaided	-10°C	-10°C	-10°C	-10°C
	Minimum starting temperature with cold start equipment (optional)	-25°C	-25°C	-25°C	-25°C
<i>Performance data</i> 2) 3) 4) 5)	Rated active power (PRP)	33.6 kW	33.6 kW	33.6 kW	31.9 kW
	Rated apparant power (PRP)	42.0 kVA	42.0 kVA	42.0 kVA	31.9 kVA
	Rated voltage line to line	400 V	380 V	415 V	230 V

Rated current 3ph	60.6 A	63.8 A	58.4 A	138.7 A
Performance class (acc.ISO 8528-5:1993)	G1	G1	G1	
Single step load acceptance				
Frequency droop	isochroneous	isochroneous	isochroneous	isochroneous
Fuel consumption at no load (0%)	1.59 kg/h (S3A)/ 1.85 kg/h (T2)	1.59 kg/h (S3A)/ 1.85 kg/h (T2)	1.59 kg/h (S3A)/ 1.85 kg/h (T2)	
Fuel consumption at 50% load	4.60 kg/h (S3A)/ 4.09 kg/h (T2)	4.60 kg/h (S3A)/ 4.09 kg/h (T2)	4.60 kg/h (S3A)/ 4.09 kg/h (T2)	
Fuel consumption at 75% load	6.51 kg/h (S3A)/ 6.17 kg/h (T2)	6.51 kg/h (S3A)/ 6.17 kg/h (T2)	6.51 kg/h (S3A)/ 6.17 kg/h (T2)	
Fuel consumption at full load (100%)	8.47 kg/h (S3A)/ 7.58 kg/h (T2)	8.47 kg/h (S3A)/ 7.58 kg/h (T2)	8.47 kg/h (S3A)/ 7.58 kg/h (T2)	
Specific fuel consumption (at full load, 100%)	0.246 kg/kWh (S3A)/ 0.223 kg/kWh (T2)	0.246 kg/kWh (S3A)/ 0.223 kg/kWh (T2)	0.246 kg/kWh (S3A)/ 0.223 kg/kWh (T2)	
Fuel autonomy at full load with standard tank (PRP)	10.7 h (S3A)/ 11.9 h (T2)	10.7 h (S3A)/ 11.9 h (T2)	10.7 h (S3A)/ 11.9 h (T2)	
Max. oil consumption at full load	0.04 l/h	0.04 l/h	0.04 l/h	0.04 l/h
Maximum sound power level (Lw) complies with 2000/14 EC	90.4 dB(A)	90.4 dB(A)	90.4 dB(A)	
Capacity of fuel tank	105 l	105 l	105 l	105 l
Single step load capability	33.6 kW 100%	33.6 kW 100%	33.6 kW 100%	100%
<i>Application data</i>				
Mode of operation	PRP	PRP	PRP	PRP
Site	land use	land use	land use	land use
Operation	single	single	single	single
Start-up and control mode	manual/automatic	manual/automatic	manual/automatic	manual/automatic
Start-up time	unspecified	unspecified	unspecified	unspecified
Mobility/Config. acc. to ISO 8528-1:1993 (optional)	transportable/D mobile/E	transportable/D mobile/E	transportable/D mobile/E	transportable/D mobile/E
Mounting	fully resilient	fully resilient	fully resilient	fully resilient
Climatic exposure	open air	open air	open air	open air
Status of neutral (TT or TN) (optional)	earthed	earthed	earthed	earthed

<i>Alternator 4)</i>	Status of neutral (IT) (optional)	insulated	insulated	insulated	insulated
	Standard	IEC34-1 ISO 8528-3	IEC34-1 ISO 8528-3	IEC34-1 ISO 8528-3	IEC34-1 ISO 8528-3
	Make	MeccAlte	MeccAlte	MeccAlte	MeccAlte
	Model	ECP32-3S/4	ECP32-3S/4	ECP32-3S/4	ECP32-1L/4
	Rated output, class H temp. rise - 3ph rating type acc. ISO 8528-3	42.5 kVA 125/40°C	42.5 kVA 125/40°C	42.5 kVA 125/40°C	33.0 kVA 125/40°C
	Degree of protection (IP index acc. NF EN 60-529)	IP 21	IP 21	IP 21	IP 21
	Insulation stator class	H	H	H	H
	Insulation rotor class	H	H	H	H
	Number of wires	12	12	12	12
	<i>Engine 4)</i>	Standard	ISO 3046 ISO 8528-2	ISO 3046 ISO 8528-2	ISO 3046 ISO 8528-2
Type KUBOTA		V3800DI-T-E3BG (S3A)/	V3800DI-T-E3BG (S3A)/	V3800DI-T-E3BG (S3A)/	V3800DI-T-E3BG (S3A)/
		V3800DI-T-E2BG (T2)	V3800DI-T-E2BG (T2)	V3800DI-T-E2BG (T2)	V3800DI-T-E2BG (T2)
Rated net output (PRP) rating type acc. ISO 3046-7		38 kW ICXN	38 kW ICXN	38 kW ICXN	38 kW ICXN
Coolant		coolant	coolant	coolant	coolant
Combustion system		direct injection	direct injection	direct injection	direct injection
Aspiration		turbo charged	turbo charged	turbo charged	turbo charged
Number of cylinders		4	4	4	4
Swept volume		3.8 l	3.8 l	3.8 l	3.8 l
Speed governing		electronic	electronic	electronic	electronic
Capacity of oil sump - initial fill		13 l	13 l	13 l	13 l
Capacity of cooling system		7.5 l	7.5 l	7.5 l	7.5 l
Electrical system		12 Vdc	12 Vdc	12 Vdc	12 Vdc
Emission compliance		EU stage IIIA/ EU stage II	EU stage IIIA/ EU stage II	EU stage IIIA/ EU stage II	EU stage IIIA/ EU stage II
Maximum permissible load factor of PRP during 24h period		100%	100%	100%	100%

<i>Power circuit</i>	Circuit-breaker				
	Number of poles	4	4	4	3
	Thermal release I_t (thermal release is higher at 25°C)	63 A	63 A	63 A	125 A
	Magnetic release I_m	C curve	C curve	C curve	3 x I_n
	Fault current protection				
	Residual current release I_{Dn}	0.030-30 A	0.030-30 A	0.030-30 A	0.030-30 A
	Insulation resistance (optional)	1-200 kOhm	1-200 kOhm	1-200 kOhm	1-200 kOhm
	Outlet sockets (optional)				
		domestic (1x) (optional) 2p + PE 16 A 230 V			domestic (1x) (optional) 2p + PE 16 A 230 V
		CEE form (1x) 3p + N + PE 16 A 400 V			CEE form (1x) 2p + PE 16 A 230V
	CEE form (1x) 3p + N + PE 32 A 400 V				
<i>Unit</i>	Dimensions (LxWxH)	2.2 x 0.94 x 1.27 m	2.2 x 0.94 x 1.27 m	2.2 x 0.94 x 1.27 m	2.2 x 0.94 x 1.27 m
	Weight net mass	1015 kg	1015 kg	1015 kg	1015 kg

		QES 50 208/120V - 3ph	QES 50 220/127V - 3ph	QES 50 240/120V - 2ph	QES 50 380/220V - 3ph
<i>Reference conditions</i> 1)	Rated frequency	60 Hz	60 Hz	60 Hz	60 Hz
	Rated speed	1800 rpm	1800 rpm	1800 rpm	1800 rpm
	Generator service duty	PRP	PRP	PRP	PRP
	Absolute air inlet pressure	1 bar(a)	1 bar(a)	1 bar(a)	1 bar(a)
	Relative air humidity	30%	30%	30%	30%
	Air inlet temperature	25°C	25°C	25°C	25°C
<i>Limitations 2)</i>	Maximum ambient temperature	50°C	50°C	50°C	50°C
	Altitude capability	3000 m	3000 m	3000 m	3000 m
	Maximum relative air humidity	85%	85%	85%	85%
	Minimum starting temperature unaided	-10°C	-10°C	-10°C	-10°C
	Minimum starting temperature with cold start equipment (optional)	-25°C	-25°C	-25°C	-25°C
<i>Performance data</i> 2) 3) 4) 5)	Rated active power (PRP)	39.6 kW	39.8 kW	33.5 kW	39.8 kW
	Rated apparant power (PRP)	49.5 kVA	49.8 kVA	33.5 kVA	49.8 kVA
	Rated voltage line to line	208 V	220 V	240 V	380 V
	Rated current 3ph	137.4 A	130.7 A	139.6 A	75.7 A
	Performance class (acc.ISO 8528-5:1993)	G1	G1		
	Single step load acceptance				
	Frequency droop	isochroneous	isochroneous	isochroneous	isochroneous
	Fuel consumption at no load (0%)	1.97 kg/h	1.97 kg/h		
	Fuel consumption at 50% load	5.18 kg/h	5.18 kg/h		
	Fuel consumption at 75% load	7.30 kg/h	7.30 kg/h		
	Fuel consumption at full load (100%)	9.47 kg/h	9.47 kg/h		
	Specific fuel consumption (at full load, 100%)	0.237 kg/kWh	0.237 kg/kWh		
	Fuel autonomy at full load with standard tank (PRP)	9.5 h	9.5 h		
	Max. oil consumption at full load				
	Maximum sound power level (Lw) complies with 2000/14 EC	91.1 dB(A)	91.1 dB(A)		

<i>Application data</i>	Capacity of fuel tank	105 1	105 1	105 1	105 1
	Single step load capability	39.6 kW	39.8 kW		
		100%	100%		
	Mode of operation	PRP	PRP	PRP	PRP
	Site	land use	land use	land use	land use
	Operation	single	single	single	single
	Start-up and control mode	manual/automatic	manual/automatic	manual/automatic	manual/automatic
	Start-up time	unspecified	unspecified	unspecified	unspecified
	Mobility/Config. acc. to ISO 8528-1:1993 (optional)	transportable/D	transportable/D	transportable/D	transportable/D
<i>Alternator 4)</i>	(optional)	mobile/E	mobile/E	mobile/E	mobile/E
	Mounting	fully resilient	fully resilient	fully resilient	fully resilient
	Climatic exposure	open air	open air	open air	open air
	Status of neutral (TT or TN) (optional)	earthed	earthed	earthed	earthed
	Standard	IEC34-1	IEC34-1	IEC34-1	IEC34-1
		ISO 8528-3	ISO 8528-3	ISO 8528-3	ISO 8528-3
	Make	MeccAlte	MeccAlte	MeccAlte	MeccAlte
	Model	ECP32-3S/4	ECP32-3S/4	ECP32-1L/4	ECP32-1L/4
	Rated output, class H temp. rise - 3ph	50 kVA	51 kVA	33.5 kVA	50 kVA
rating type acc. ISO 8528-3	125/40°C	125/40°C	125/40°C	125/40°C	
Degree of protection (IP index acc. NF EN 60-529)	IP 21	IP 21	IP 21	IP 21	
Insulation stator class	H	H	H	H	
Insulation rotor class	H	H	H	H	
Number of wires	12	12	12	12	
<i>Engine 4)</i>	Standard	ISO 3046	ISO 3046	ISO 3046	ISO 3046
		ISO 8528-2	ISO 8528-2	ISO 8528-2	ISO 8528-2
	Type KUBOTA	V3800DI-T-E2BG	V3800DI-T-E2BG	V3800DI-T-E2BG	V3800DI-T-E2BG
	Rated net output (PRP)	42 kW	42 kW	42 kW	42 kW
	rating type acc. ISO 3046-7	ICXN	ICXN	ICXN	ICXN
	Coolant	coolant	coolant	coolant	coolant
	Combustion system	direct injection	direct injection	direct injection	direct injection
	Aspiration	turbo charged	turbo charged	turbo charged	turbo charged
	Number of cylinders	4	4	4	4

<i>Power circuit</i>	Swept volume	3.8 l	3.8 l	3.8 l	3.8 l
	Speed governing	electronic	electronic	electronic	electronic
	Capacity of oil sump - initial fill	13 l	13 l	13 l	13 l
	Capacity of cooling system	7.5 l	7.5 l	7.5 l	7.5 l
	Electrical system	12 Vdc	12 Vdc	12 Vdc	12 Vdc
	Emission compliance	EU stage II	EU stage II	EU stage II	EU stage II
	Maximum permissible load factor of PRP during 24h period	100%	100%	100%	100%
	Circuit-breaker				
	Number of poles	4	4	3	4
	Thermal release I _t (thermal release is higher at 25°C)	160 A	160 A	160 A	100 A
	Magnetic release I _m	3 x I _n	3 x I _n	3 x I _n	3 x I _n
	Fault current protection				
	Residual current release I _{Dn}	0.030-30 A	0.030-30 A	0.030-30 A	0.030-30 A
	Insulation resistance (optional)	1-200 kOhm	1-200 kOhm	1-200 kOhm	1-200 kOhm
<i>Unit</i>	Outlet sockets (optional)	domestic (1x) (optional) 2p + PE 16 A 230 V			
		CEE form (1x) 3p + N + PE 16 A 400 V			
		CEE form (1x) 3p + N + PE 32 A 400 V			
	Dimensions (LxWxH)	1.75x0.84x1.12 m	1.75x0.84x1.12 m	1.75x0.84x1.12 m	1.75x0.84x1.12 m
	Weight net mass	720 kg	720 kg	720 kg	720 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.

ESP: Emergency Standby Power is defined as the maximum power available during a variable electrical power sequence, under the stated operating conditions, for which a generating set is capable of delivering in the event of a utility power outage or under test conditions for up to 200h of operation per year, with the maintenance intervals and procedures being carried out as described by the manufacturers. The permissible average power output (P_{pp}) over 24h of operation shall not exceed 70% of the ESP unless otherwise agreed by the engine manufacturer.

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 as indicated in the Technical Specifications above.
- 5) Specific mass fuel used: 0.86 kg/l.

Derating factor (%)
(PRP at 50Hz, 400V)

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

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

10.6 Conversion list of SI units into British units

1 bar	=	14.504 psi
1 g	=	0.035 oz
1 kg	=	2.205 lbs
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 m ³ /min	=	35.315 cfm
1 mbar	=	0.401 in wc
1 N	=	0.225 lbf
1 Nm	=	0.738 lbf.ft
$t_{°F}$	=	$32 + (1.8 \times t_{°C})$
$t_{°C}$	=	$(t_{°F} - 32)/1.8$

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

10.7 Data plate

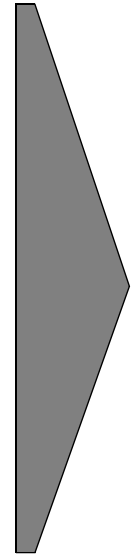
The data plate is a rectangular label with a double-line border. At the top, it reads "GRUPOS ELECTROGENOS EUROPA S.A." (1). Below this, there is a large empty box labeled "MASA (Kg)" (2). The main body of the plate is a table with the following fields:

GENERATOR SET	ISOXXXX	MODEL
FN		HZ.XXX
SN	COP Y	KVA.XXX
PN	COP Y	KW.XXX
VN	Y	V.XXX
IN	Y	A.XXX
Cos ph xx		XXXX
S/N ESFXXXX	Manuf. year	XXXX
1636 0029 44	MADE IN XXXX	

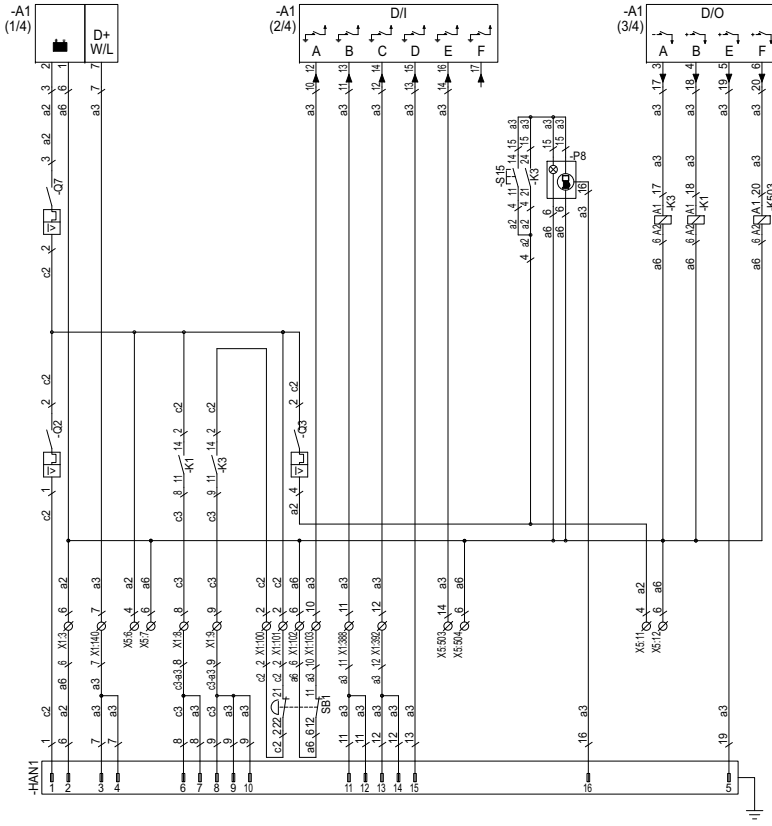
At the bottom left is the CE mark (16). At the bottom right, it reads "GRUPOS ELECTROGENOS EUROPA S.A. Poligono Pinarco II, Parcela 20 50450 Pined (Zaragoza) SPAIN" (17).

- 1 Name of manufacturer
- 2 Maximum permitted total weight of the vehicle
- 3 Machine type
- 4 Mode of operation
- 5 Model number
- 6 Frequency
- 7 Apparent power - PRP
- 8 Active power - PRP
- 9 Nominal rated voltage
- 10 Nominal rated current
- 11 Generator class
- 12 Manufacturing year
- 13 Winding connections
- 14 Power factor
- 15 Serial number
- 16 EEC mark in accordance with Machine Directive 89/392E
- 17 Address of manufacturer

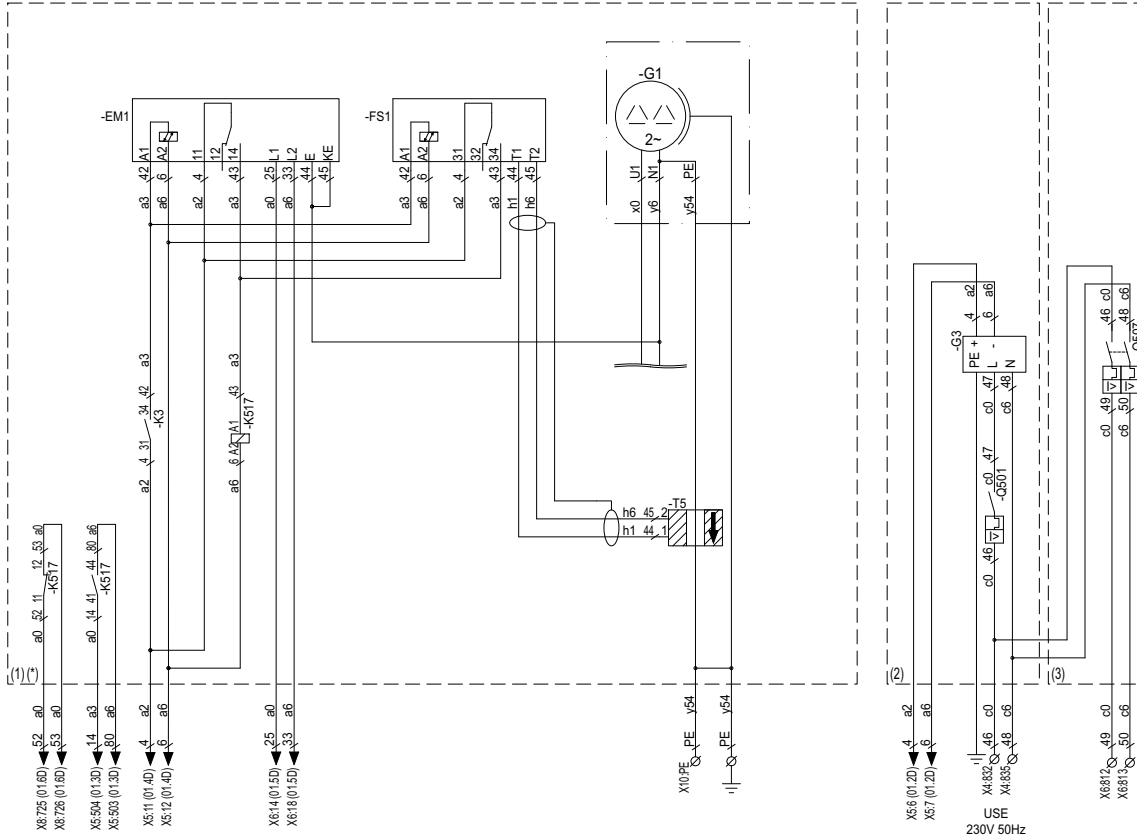
Circuit diagrams

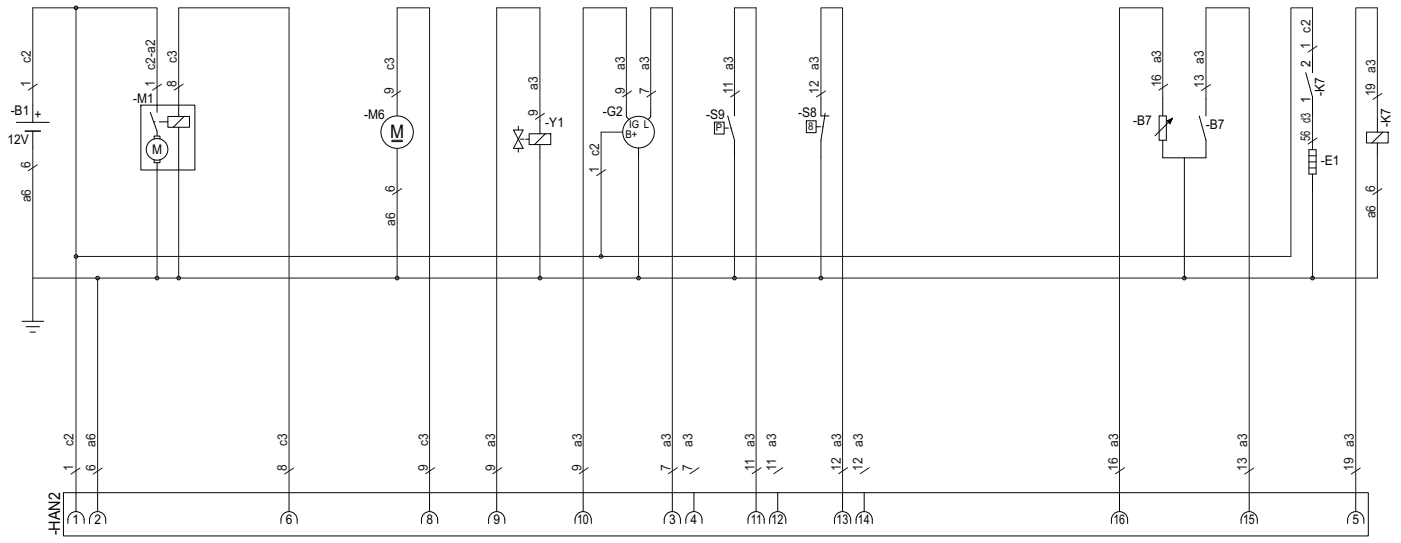


1636 0050 77/01
Applicable for QES 9- Single phase



(*) CONNECTION UNDER VOLTAGE COIL WITHOUT DIFERENTIAL
 (**) CONNECTION UNDER VOLTAGE COIL WITH DIFERENTIAL

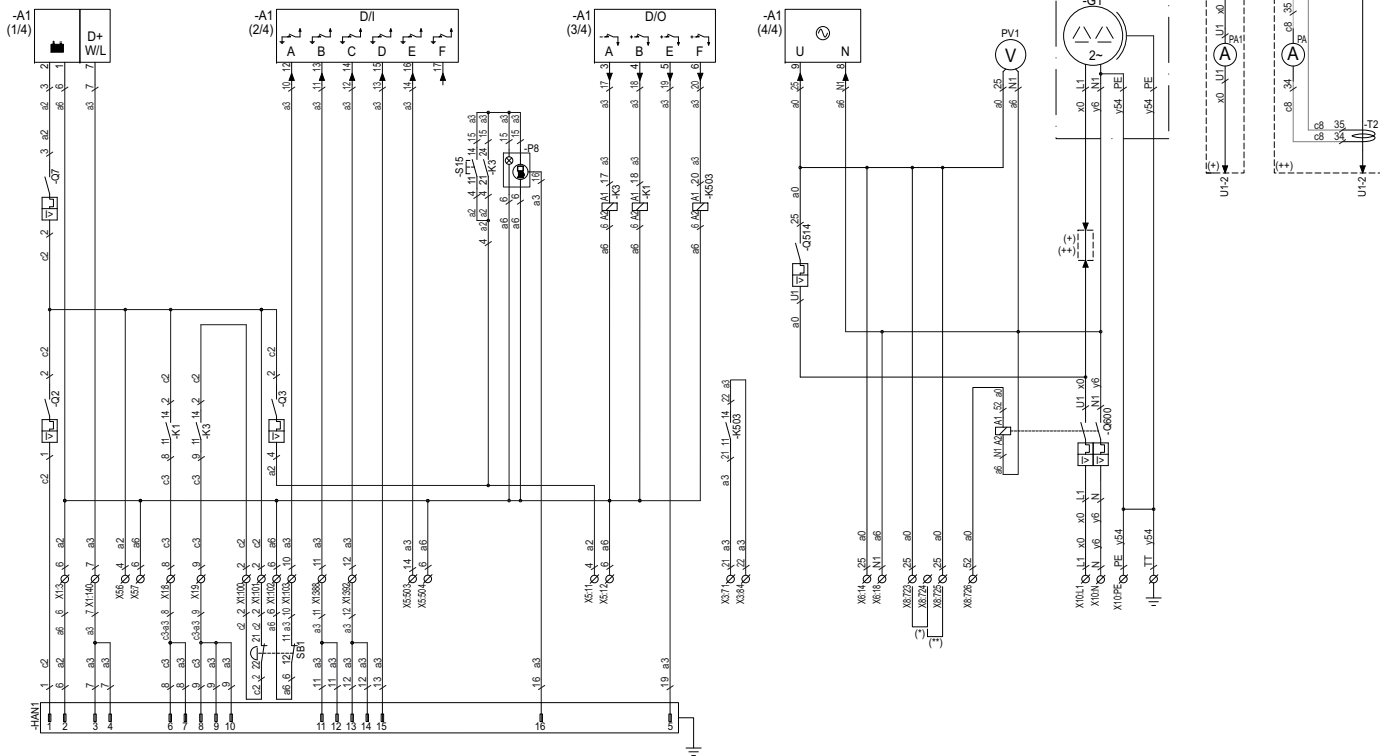




A1	Control module Qc1011	X1	Control terminals - DC
B1	Battery	X3	Customer terminals - DC
B7	Fuel level sensor	X4	Customer terminals - AC
B11	Speed sensor	X5	Options terminals - DC
E1	Glow plugs	X6	Options terminals - AC
EM1	IT-Relay (O)	X8	Configuration terminals - AC
FS1	Earth leakage relay (O)	X10	Power terminal box - AC
G2	Charging alternator	Y1	Fuel solenoid
G3	Battery charger (O)		
HAN1	Industrial connector 16+TT	(O)	Optional
K1	Relay 12V 1C - Crank		
K3	Relay 12V 3C - Fuel relay		
K503	Relay 12V 1C - Close generator		
K517	Relay 12V 2C - Earth leakage (O)		
M1	Starter		
M6	Fuel pump		
PA1	Ammeter		
PV1	Voltmeter		
Q2	Circuit breaker - 1P 32A		
Q3	Circuit breaker - 1P 6A		
Q7	Circuit breaker - 1P 2A		
Q501	Circuit breaker - 1P 6A (O)		
Q507	Circuit breaker - 2P 6A (O)		
Q514	Circuit breaker - 1P 2A		
Q600	Circuit breaker - 2P (general)		
S1	Emergency stop - 1NC/1NO		
S8	Coolant temperature switch		
S9	Oil pressure switch		
S10	Coolant temperature sensor		
T5	Toroid (O)		

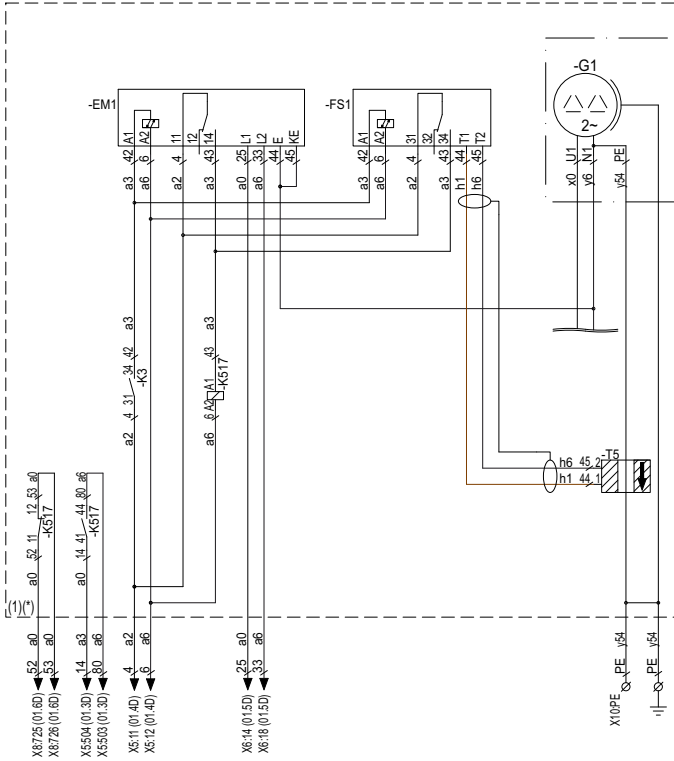
1636 0050 25/01

Applicable for QES 14-20-30-40 - Single phase

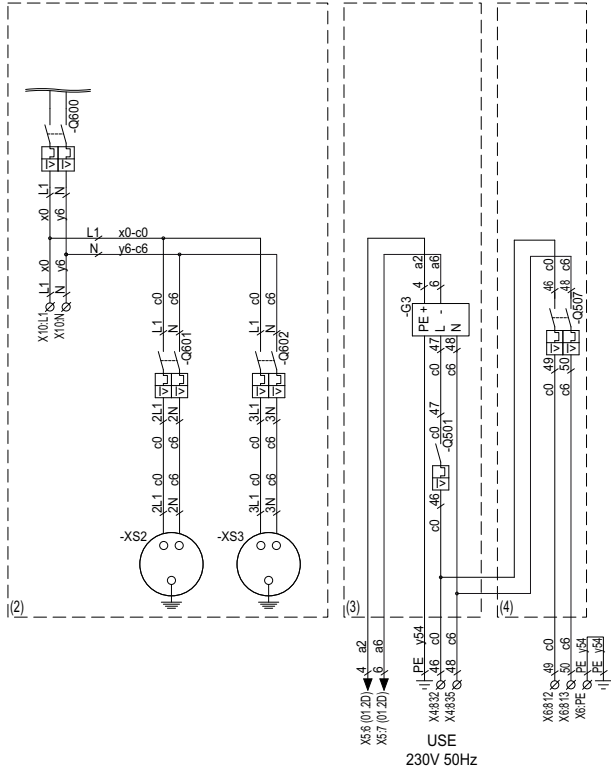


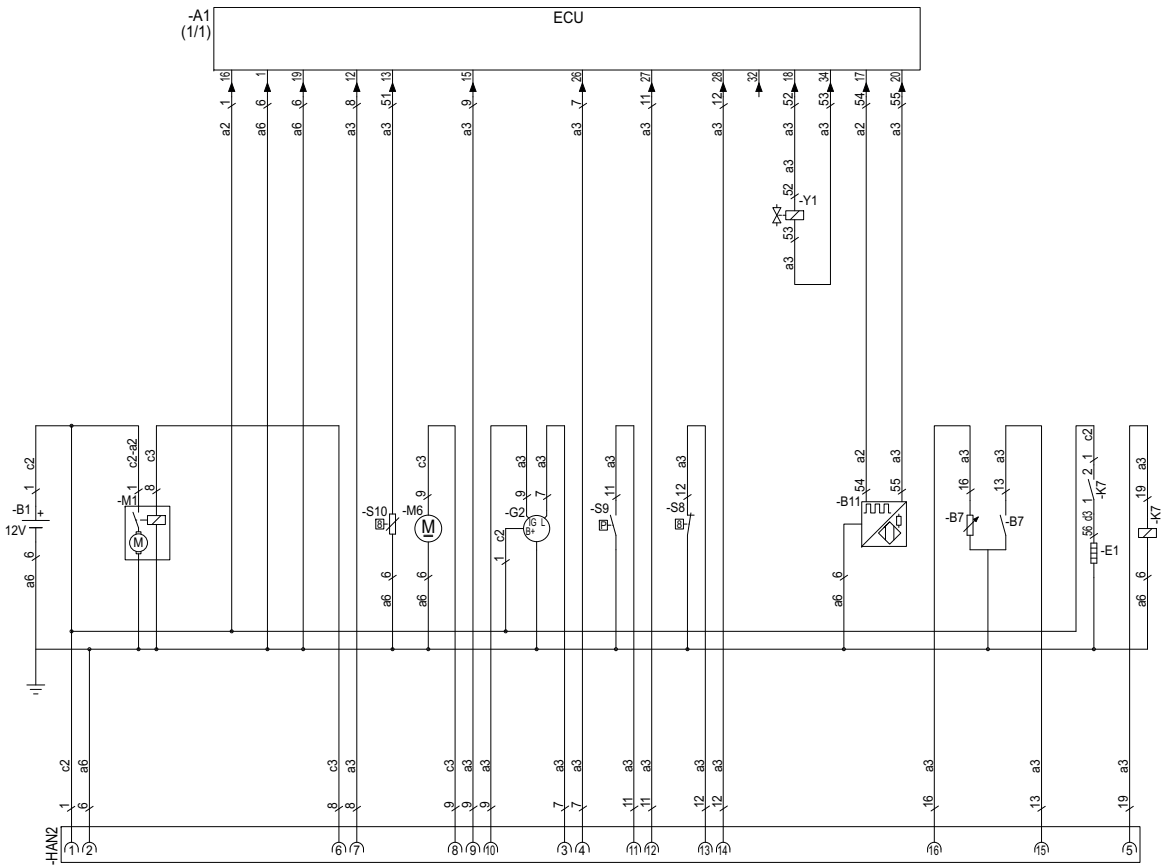
(*) CONNECTION UNDER VOLTAGE COIL WITH OUT DIFFERENTIAL
 (***) CONNECTION UNDER VOLTAGE COIL WITH DIFFERENTIAL

(+) DIRECT CURRENT METER TO CIRCUIT BREAKER UNTIL 50A
 (++) CURRENT METER AND CURRENT TRANSFORMER CIRCUIT BREAKER FROM 63A



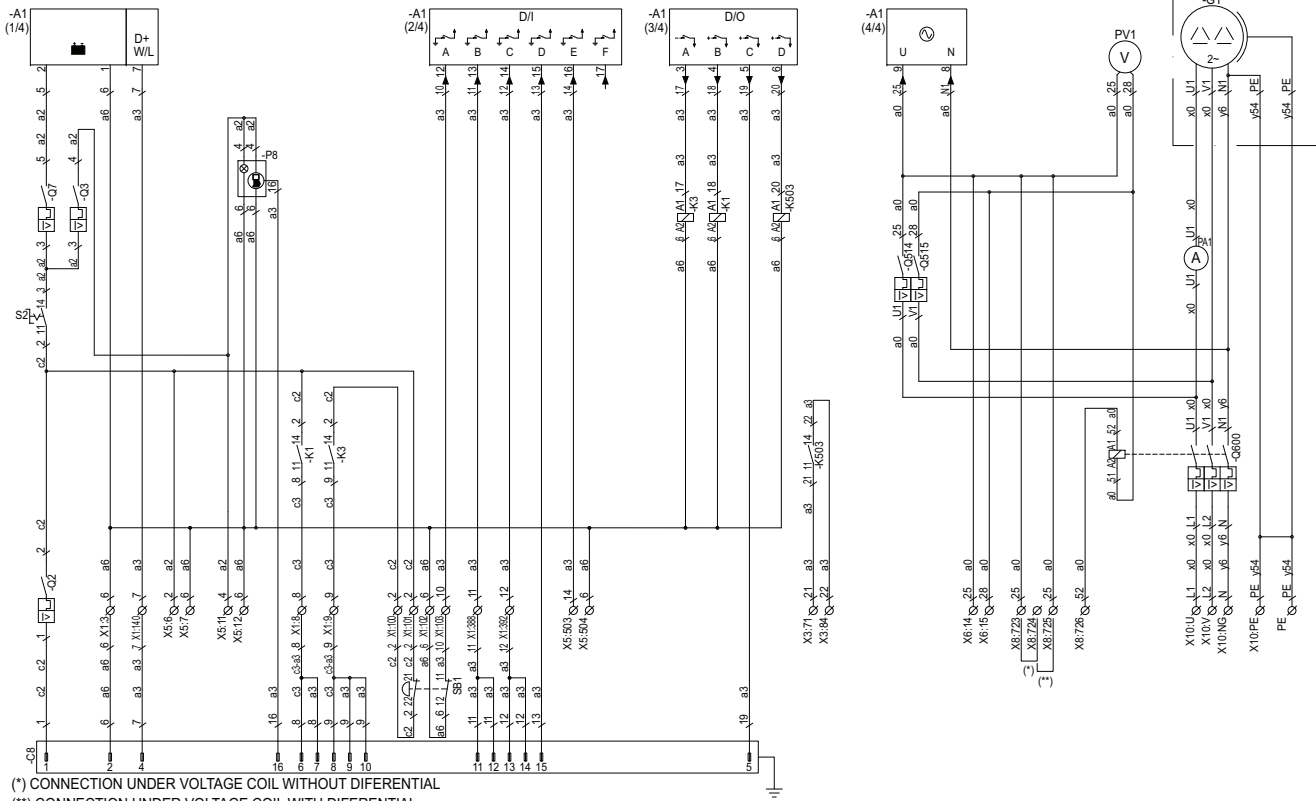
(*) EL-RELAY AND IT-RELAY CAN'T BE TOGETHER





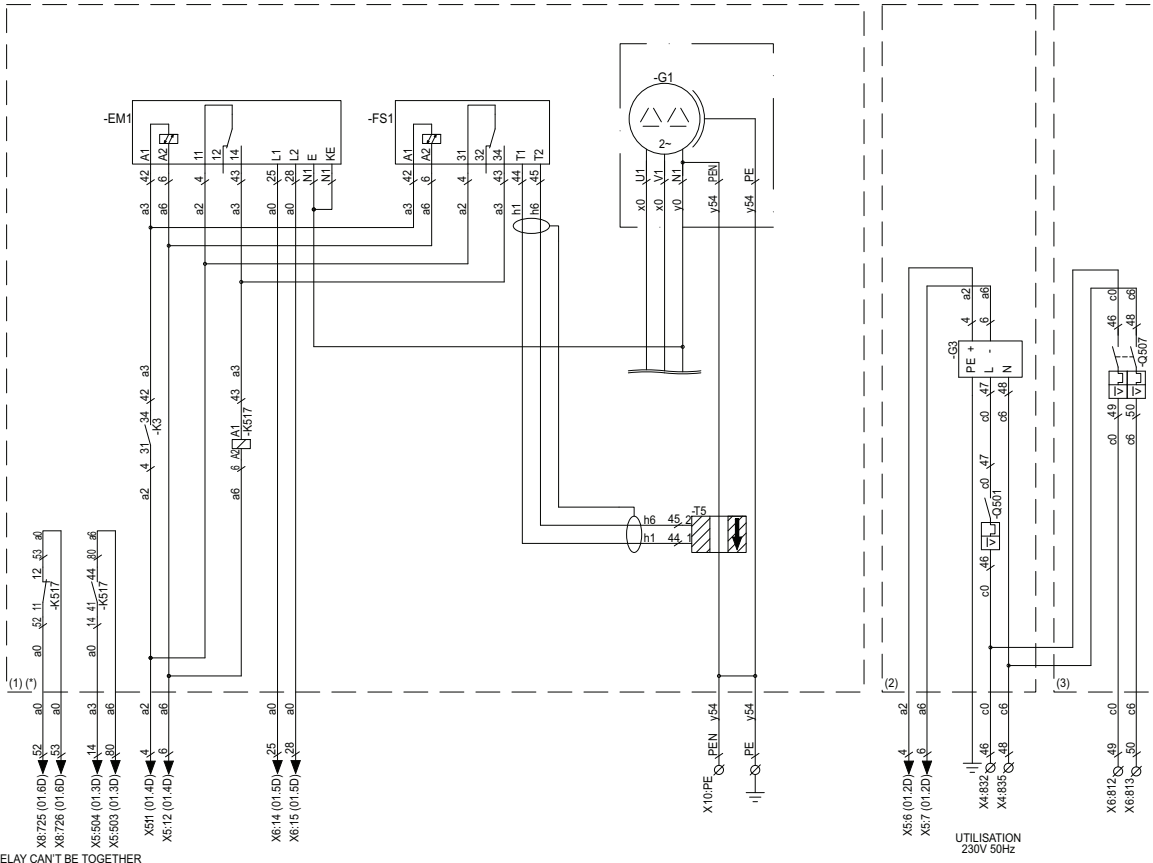
A1	Control module Qc1011	S10	Coolant temperature sensor
B1	Battery	T2	Electrical current transformer
B7	Fuel level sensor	T5	Toroid (O)
B11	Speed sensor	X1	Control terminals - DC
E1	Glow plugs	X3	Customer terminals - DC
EM1	IT-Relay (O)	X4	Customer terminals - AC
FS1	Earth leakage relay (O)	X5	Options terminals - DC
G2	Charging alternator	X6	Options terminals - AC
G3	Battery charger (O)	X8	Configuration terminals - AC
HAN1	Industrial connector 16+TT	X10	Power terminal box - AC
K1	Relay 12V 1C - Crank	Y1	Fuel solenoid
K3	Relay 12V 3C - Fuel relay	(O)	Optional
K503	Relay 12V 1C - Close generator		
K517	Relay 12V 2C - Earth leakage (O)		
M1	Starter		
M6	Fuel pump		
PA1	Ammeter		
PV1	Voltmeter		
Q2	Circuit breaker - 1P 10A		
Q3	Circuit breaker - 1P 6A		
Q7	Circuit breaker - 1P 2A		
Q501	Circuit breaker - 1P 6A (O)		
Q507	Circuit breaker - 2P 6A (O)		
Q514	Circuit breaker - 1P 2A		
Q600	Circuit breaker - 2P (general)		
Q601	Circuit breaker - 2P 16A		
Q602	Circuit breaker - 2P 16A		
S1	Emergency stop - 1NC/1NO		
S8	Coolant temperature switch		
S9	Oil pressure switch		

1636 0053 37/02
Applicable for QES 11- Dual phase



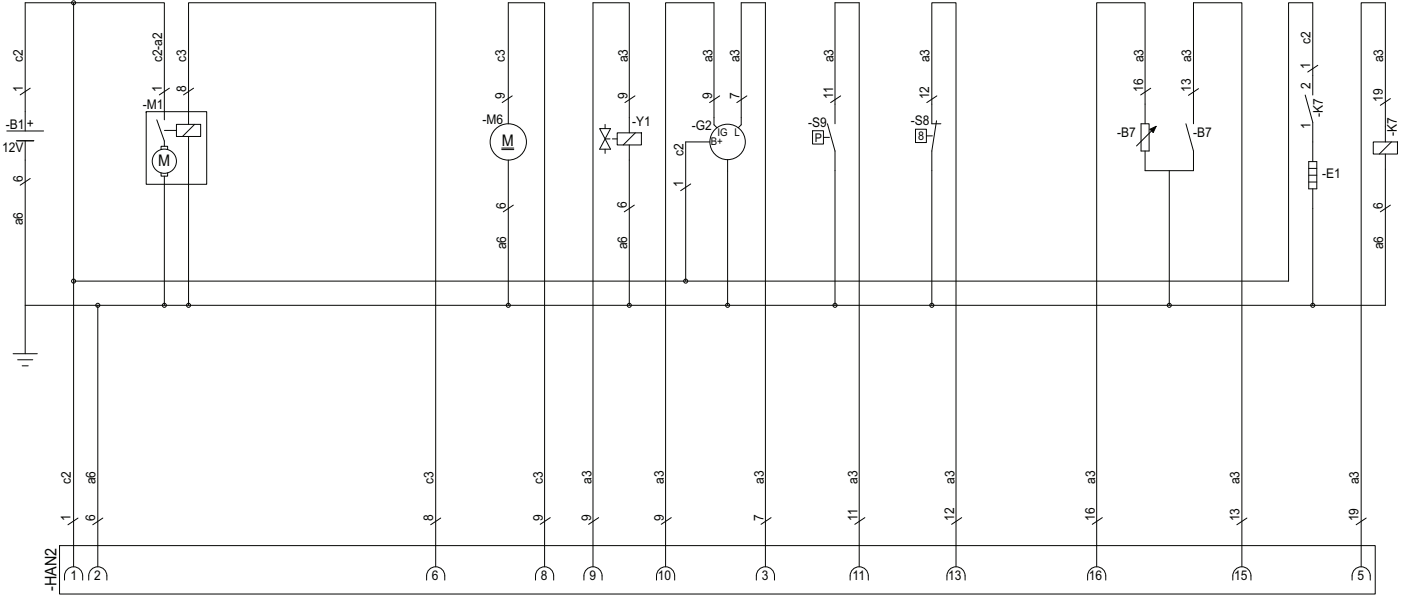
(*) CONNECTION UNDER VOLTAGE COIL WITHOUT DIFFERENTIAL

(**) CONNECTION UNDER VOLTAGE COIL WITH DIFFERENTIAL



(*) EL-RELAY AND IT-RELAY CAN'T BE TOGETHER

UTILISATION
230V 50Hz

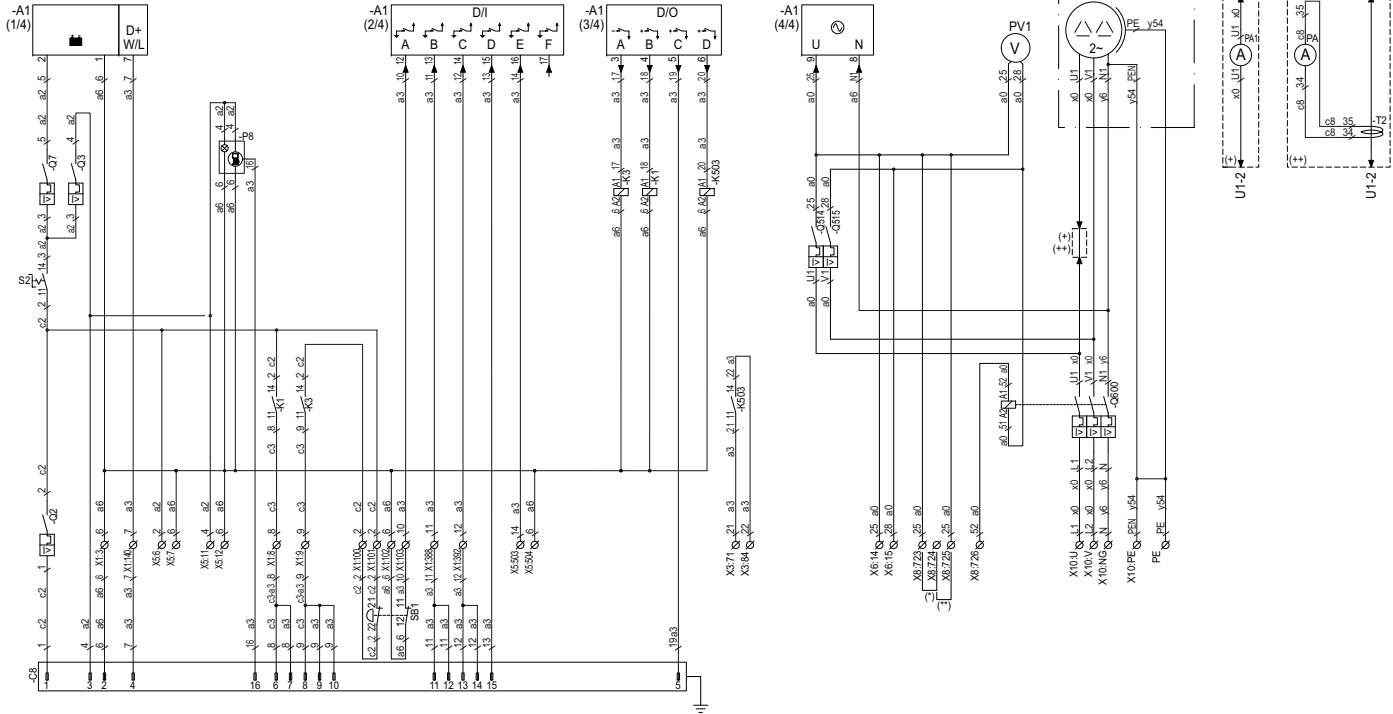


A1	Control module Qc1011
B1	Battery
B7	Fuel level sensor
B11	Speed sensor
C8	Industrial connector 16+TT
E1	Glow plugs
EM1	IT-Relay (O)
FS1	Earth leakage relay (O)
G2	Charging alternator
G3	Battery charger (O)
K1	Relay 12V 1C - Crank
K3	Relay 12V 3C - Fuel relay
K503	Relay 12V 1C - Close generator
K517	Relay 12V 2C - Earth leakage (O)
M1	Starter
M6	Fuel pump
Q2	Circuit breaker - 1P 32A
Q3	Circuit breaker - 1P 6A
Q501	Circuit breaker - 1P 6A (O)
Q507	Circuit breaker - 2P 6A (O)
Q514	Circuit breaker - 1P 2A
Q515	Circuit breaker - 1P 2A
Q600	Circuit breaker - 3P (general)
Q7	Circuit breaker - 1P 2A
S1	Emergency stop - 1NC/1NO
S8	Coolant temperature switch
S9	Oil pressure switch
S10	Coolant temperature sensor
T2	Electrical current transformer
T5	Toroid (O)

X1	Control terminals - DC
X3	Customer terminals - DC
X4	Customer terminals - AC
X5	Options terminals - DC
X6	Options terminals - AC
X8	Configuration terminals - AC
X10	Power terminal box - AC
Y1	Fuel solenoid
(O)	Optional

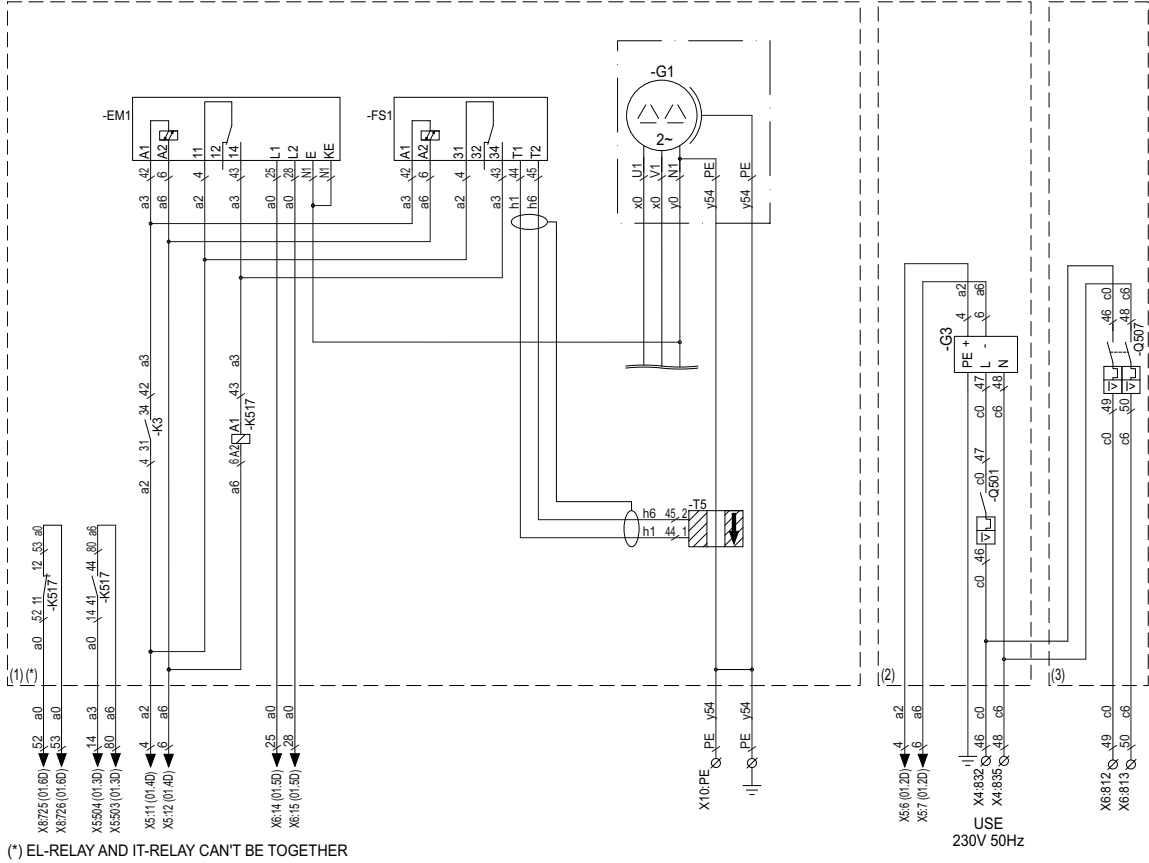
1636 0049 62/02

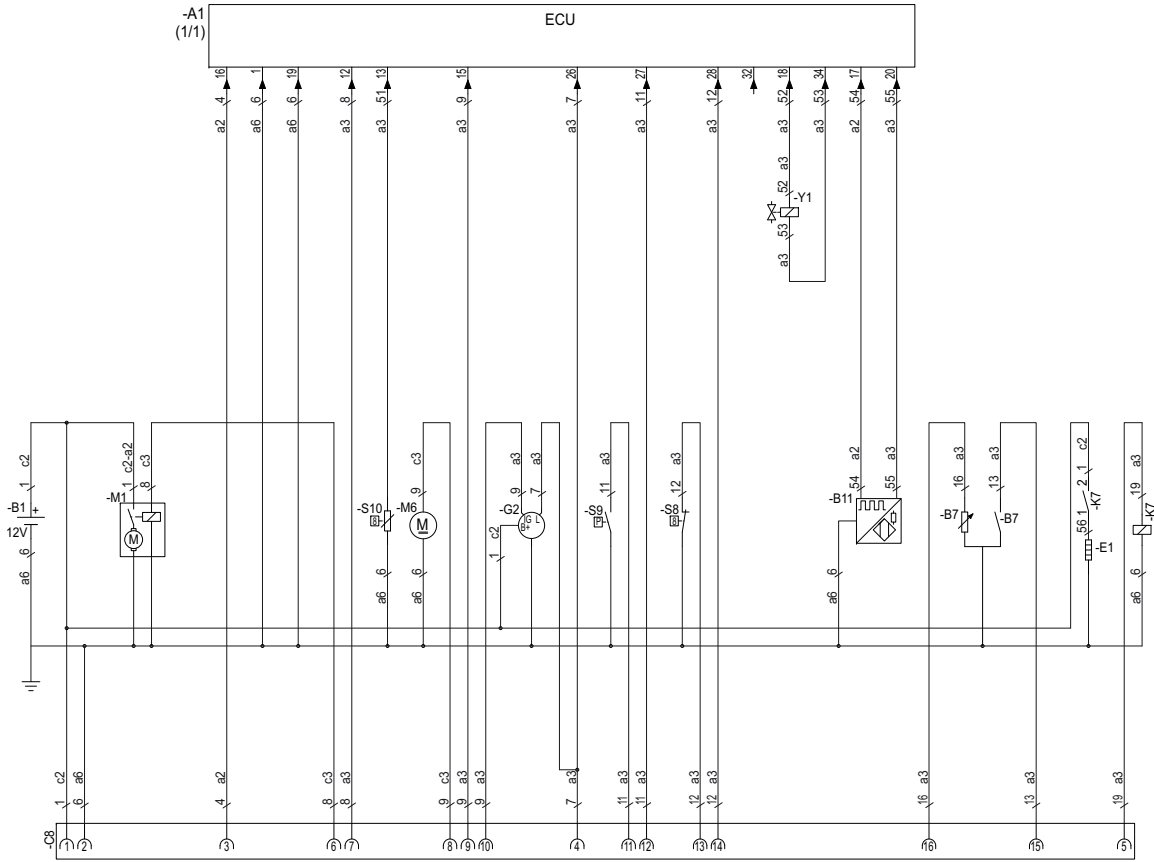
Applicable for QES 16-25-35-50 - Dual phase



(*) CONNECTION UNDER VOLTAGE COIL WITH OUT DIFERENTIAL
 (**) CONNECTION UNDER VOLTAGE COIL WITH DIFERENTIAL





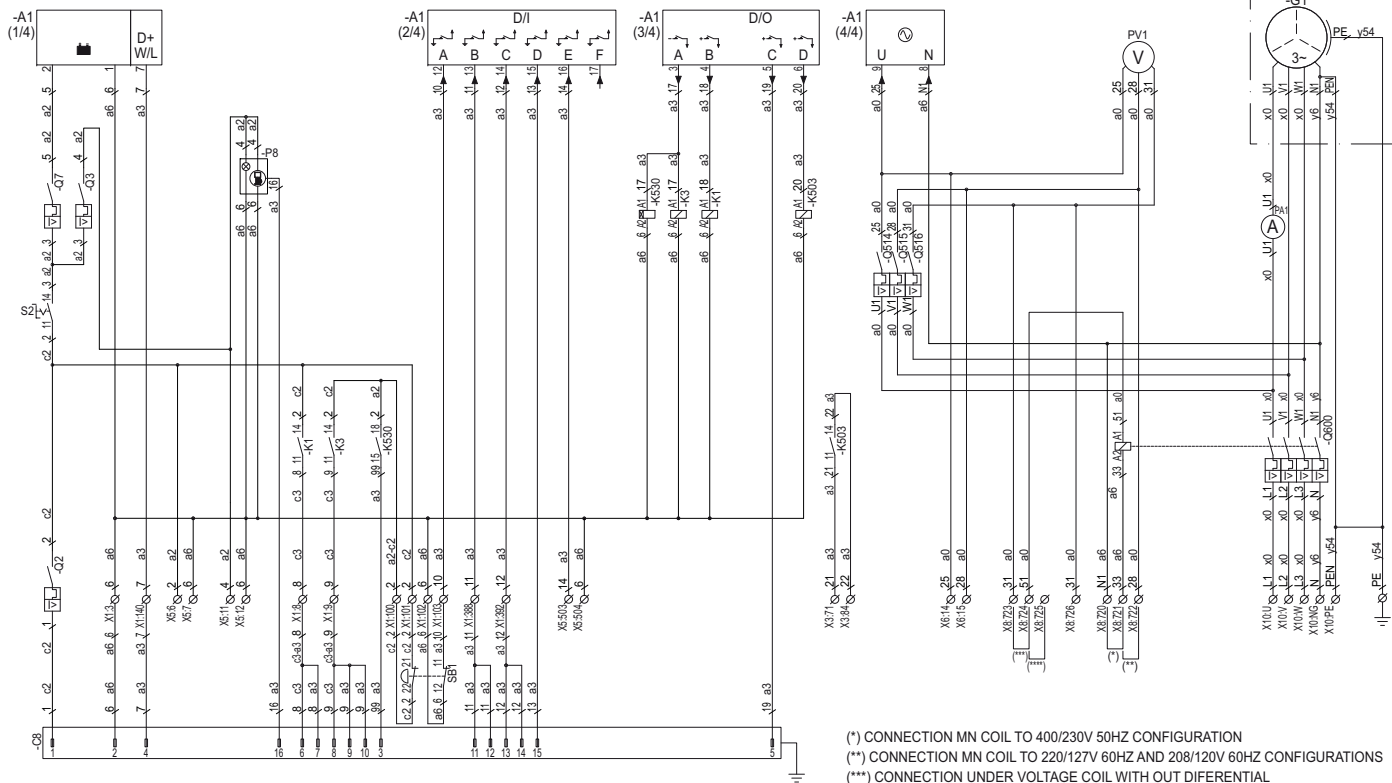


A1	Control module Qc1011
B1	Battery
B7	Fuel level sensor
B11	Speed sensor
C8	Industrial connector 16+TT
E1	Glow plugs
EM1	IT-Relay (O)
FS1	Earth leakage relay (O)
G2	Charging alternator
G3	Battery charger (O)
K1	Relay 12V 1C - Crank
K3	Relay 12V 3C - Fuel relay
K503	Relay 12V 1C - Close generator
K517	Relay 12V 2C - Earth leakage (O)
M1	Starter
M6	Fuel pump
Q2	Circuit breaker - 1P 10A
Q3	Circuit breaker - 1P 6A
Q501	Circuit breaker - 1P 6A (O)
Q507	Circuit breaker - 2P 6A (O)
Q514	Circuit breaker - 1P 2A
Q515	Circuit breaker - 1P 2A
Q600	Circuit breaker - 3P (general)
Q7	Circuit breaker - 1P 2A
S1	Emergency stop - 1NC/1NO
S2	OFF/ON switch
S8	Coolant temperature switch
S9	Oil pressure switch
S10	Coolant temperature sensor
T2	Electrical current transformer

T5	Toroid (O)
X1	Control terminals - DC
X3	Customer terminals - DC
X4	Customer terminals - AC
X5	Options terminals - DC
X6	Options terminals - AC
X8	Configuration terminals - AC
X10	Power terminal box - AC
Y1	Fuel solenoid
(O)	Optional

1636 0051 72/01

Applicable for QES 9-11 - Triple phase

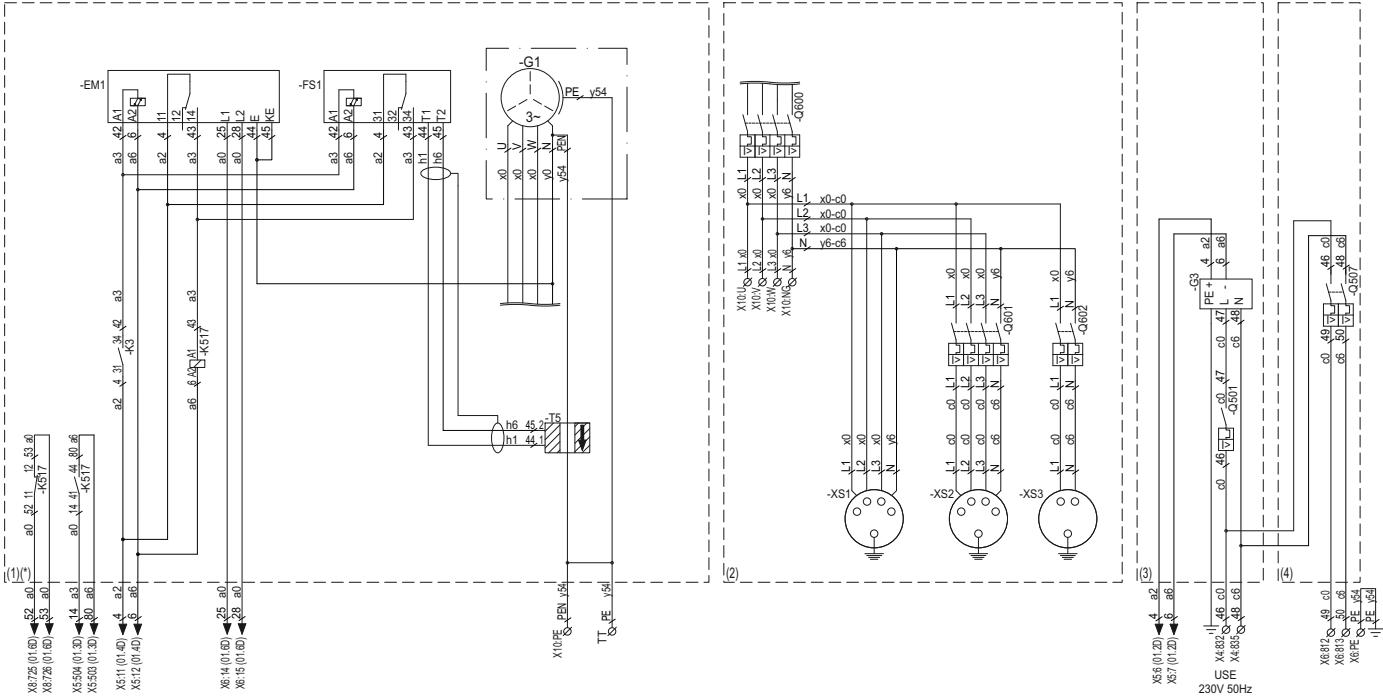


(*) CONNECTION MN COIL TO 400/230V 50HZ CONFIGURATION

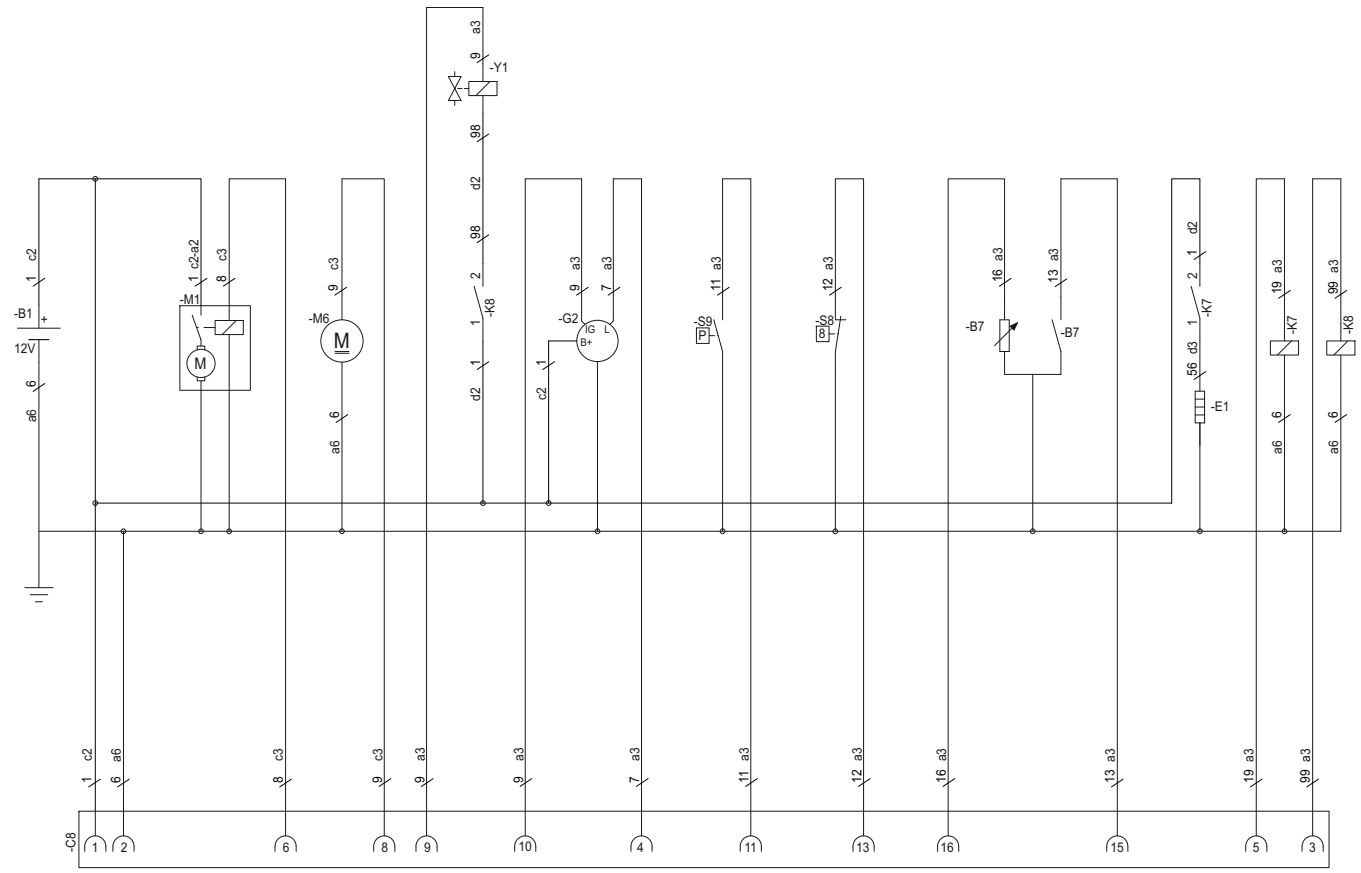
(**) CONNECTION MN COIL TO 220/127V 60HZ AND 208/120V 60HZ CONFIGURATIONS

(***) CONNECTION UNDER VOLTAGE COIL WITH OUT DIFFERENTIAL

(****) CONNECTION UNDER VOLTAGE COIL WITH DIFFERENTIAL

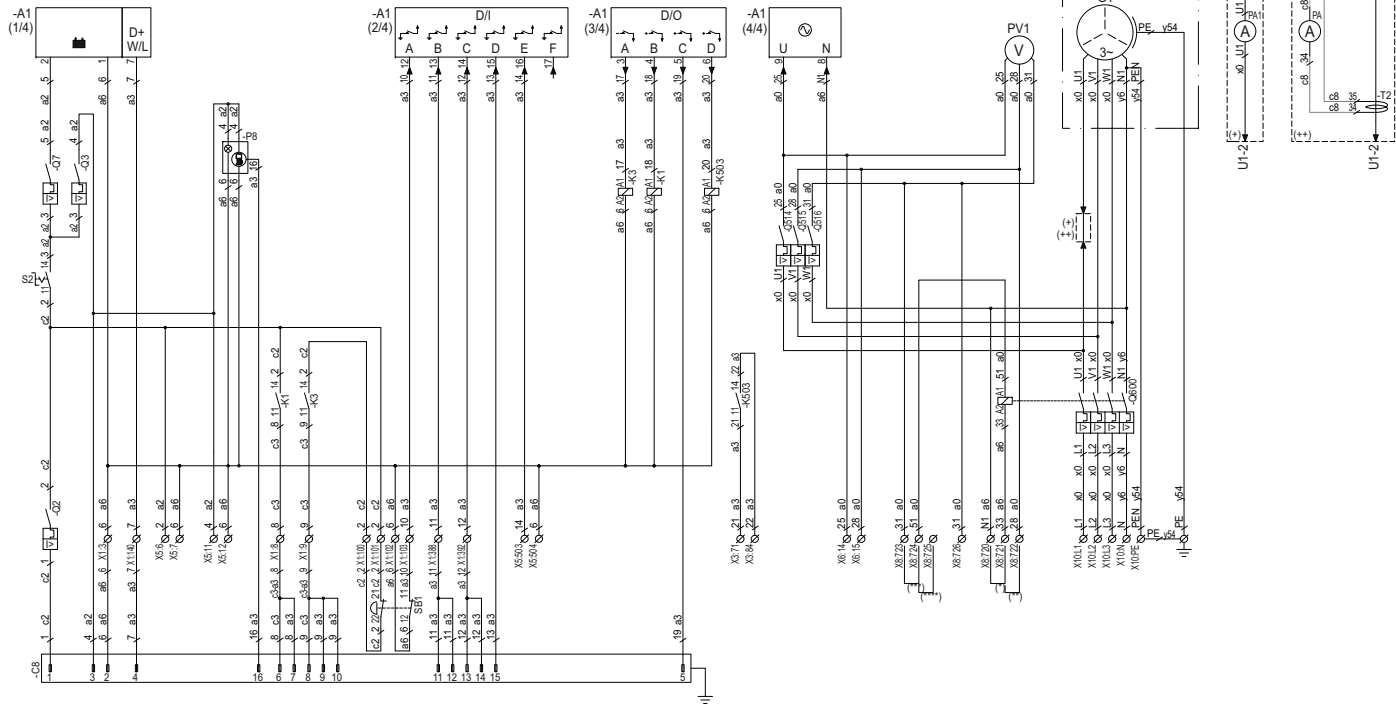


(*) EL-RELAY AND IT-RELAY CAN'T BE TOGETHER



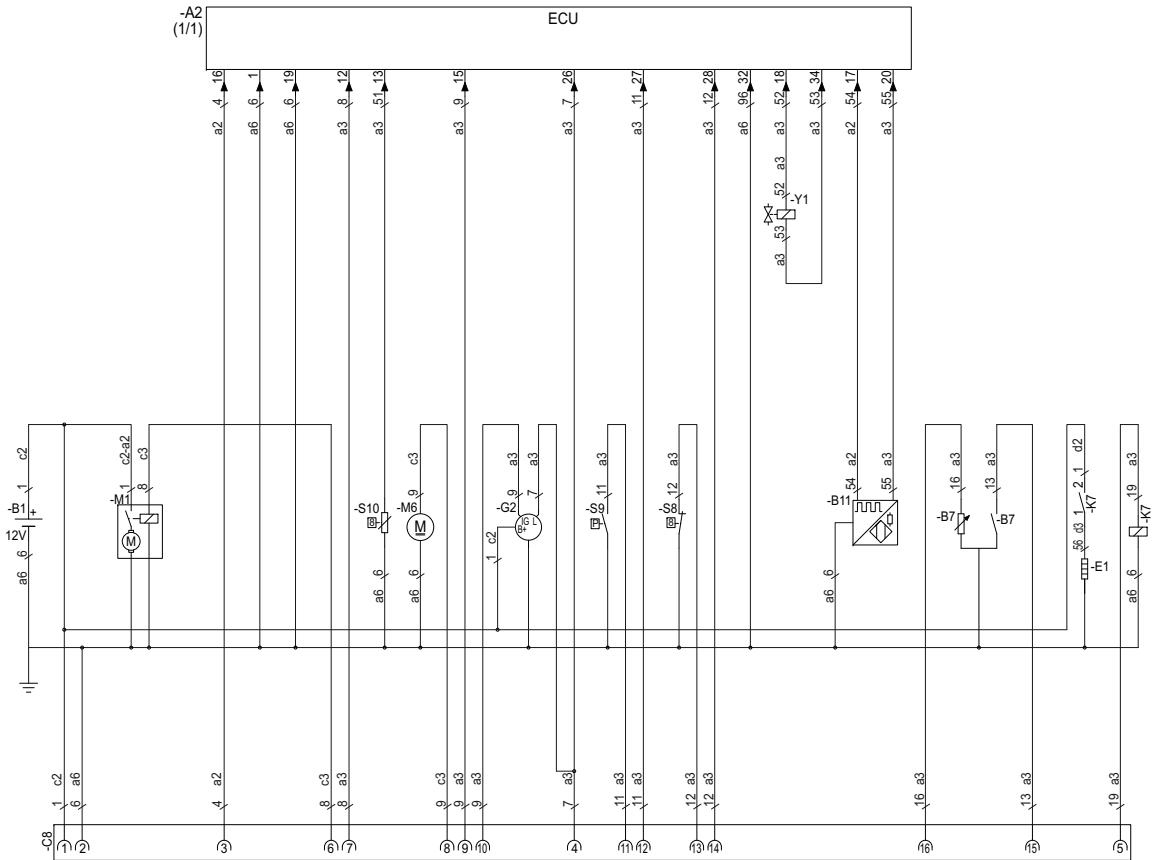
A1	Control module Qc1011	S8	Coolant temperature switch
B1	Battery	S9	Oil pressure switch
B7	Fuel level sensor	S10	Coolant temperature sensor
B11	Speed sensor	T2	Electrical current transformer
C8	Industrial connector 16+TT	T5	Toroid (O)
E1	Glow plugs	X1	Control terminals - DC
FS1	Earth leakage relay (O)	X3	Customer terminals - DC
FS1	IT-relay (O)	X4	Customer terminals - AC
G2	Charging alternator	X5	Options terminals - DC
G3	Battery charger (O)	X6	Options terminals - AC
K1	Relay 12V 1C - Crank	X8	Configuration terminals - AC
K3	Relay 12V 3C - Fuel relay	X10	Power terminal box - AC
K503	Relay 12V 1C - Close generator	XS1	Socket CEE full A 3P+N+T (O)
K517	Relay 12V 2C - Earth leakage (O)	XS2	Socket CEE 16A 3P+N+T (O)
K530	Timmer 12V 1C - Pull	XS3	Socket 16A 2P+T (O)
M1	Starter	Y1	Fuel solenoid
M6	Fuel pump	(O)	Optional
PA1	Ammeter		
PV1	Voltmeter		
Q2	Circuit breaker - 1P 10A		
Q3	Circuit breaker - 1P 6A		
Q501	Circuit breaker - 1P 6A (O)		
Q507	Circuit breaker - 2P 6A (O)		
Q514	Circuit breaker - 1P 2A		
Q515	Circuit breaker - 1P 2A		
Q600	Circuit breaker - 3P (general)		
Q601	Circuit breaker - 4P 16A (O)		
Q602	Circuit breaker - 2P 16A (O)		
Q7	Circuit breaker - 1P 2A		
S1	Emergency stop		

1636 0048 31/03
Applicable for QES 14-16-20-25-30-35-40-50 - Triple phase



- (*) CONNECTION MN COIL TO 400/230V 50HZ CONFIGURATION
- (**) CONNECTION MN COIL TO 220/127V 60HZ AND 208/120V 60HZ CONFIGURATIONS
- (***) CONNECTION UNDER VOLTAGE COIL WITH OUT DIFFERENTIAL
- (****) CONNECTION UNDER VOLTAGE COIL WITH DIFFERENTIAL

- (+) DIRECT CURRENT METER TO CIRCUIT BREAKER UNTIL 50A
- (++) CURRENT METER AND CURRENT TRANSFORMER CIRCUIT BREAKER FROM 63A



A1	Control module Qc1011	S1	Emergency stop
A2	ECU	S2	OFF/ON switch
B1	Battery	S8	Coolant temperature switch
B7	Fuel level sensor	S9	Oil pressure switch
B11	Speed sensor	S10	Coolant temperature sensor
C8	Industrial connector 16+TT	T2	Electrical current transformer
E1	Glow plugs	T5	Toroid (O)
FS1	Earth leakage relay (O)	X1	Control terminals - DC
FS1	IT-relay (O)	X3	Customer terminals - DC
G2	Charging alternator	X4	Customer terminals - AC
G3	Battery charger (O)	X5	Options terminals - DC
K1	Relay 12V 1C - Crank	X6	Options terminals - AC
K3	Relay 12V 2C - Fuel relay	X8	Configuration terminals - AC
K503	Relay 12V 1C - Close generator	X10	Power terminal box - AC
K517	Relay 12V 2C - Earth leakage (O)	XS1	Socket CEE full A 3P+N+T (O)
M1	Starter	XS2	Socket CEE 16A 3P+N+T (O)
M6	Fuel pump	XS3	Socket 16A 2P+T (O)
PA1	Ammeter	Y1	Fuel solenoid
PV1	Voltmeter	(O)	Optional
Q2	Circuit breaker - 1P 10A		
Q3	Circuit breaker - 1P 6A		
Q501	Circuit breaker - 1P 6A (O)		
Q507	Circuit breaker - 2P 6A (O)		
Q514	Circuit breaker - 1P 2A		
Q515	Circuit breaker - 1P 2A		
Q516	Circuit breaker - 1P 2A		
Q600	Circuit breaker - 4P (general)		
Q601	Circuit breaker - 4P 16A (O)		
Q602	Circuit breaker - 2P 16A (O)		
Q7	Circuit breaker - 1P 2A		

Following documents are provided with this unit:

- Test Certificate
- EC Declaration of Conformity:

EC DECLARATION OF CONFORMITY

1 We, Grupos Electrogenos Europa S.A., declare under our sole responsibility, that the product

2 Machine name : **Power Generator**

3 Commercial name :

4 Serial number :

5 Which falls under the provisions of the article 12.2 of the EC Directive 2006/42/EC on the approximation of the laws of the Member States relating to machinery, is in conformity with the relevant Essential Health and Safety Requirements of this directive.

The machinery complies also with the requirements of the following directives and their amendments as indicated.

6 Directive on the approximation of laws of the Member States relating to	7 Harmonized and/or Technical Standards used	8 Att'mnt
9 Machinery safety	2006/42/EC EN ISO 12100-1 EN ISO 12100-2 UNE EN 12601	
10 Electromagnetic compatibility	2004/108/EC EN 61000-6-2 EN 61000-6-4	
11 Low voltage equipment	2006/95/EC EN 60034 EN 60204-1 EN 60439	
12 Outdoor noise emission	2000/14/EC ISO 3744	

13 The harmonized and the technical standards used are identified in the attachments hereafter

14 Grupos Electrogenos Europa, S.A. is authorized to compile the technical file

15 Conformity of the specification to the Directives	16 Conformity of the product to the specification and by implication to the directives	
17 Issued by	Product Engineering	Manufacturing
18 Name		
19 Signature		

20 Place , Date *Muel (Zaragoza), Spain*

Grupos Electrogenos Europa, S.A. A company within the Atlas Copco Group

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Polígono Platanillo II, Parcela 20	Fax: +34 902 110 318	
50450 Muel ZARAGOZA		
Spain	For info, please contact your local Atlas Copco representative	
www.atlas-copco.com		

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Form 1000000005
Rev 01, 2014-02-09

– Outdoor Noise Emission
Directive 2000/14/EC:

Outdoor Noise Emission Directive 2000/14/EC

1. Conformity assessment procedure followed : Full Quality Assurance

2. Name and address of the notified body : Notified body number 0499
SNCH, Société Nationale de Certification
et d'Homologation
L-5201 Sandweiler

3. Measured sound power level : dB(A)

4. Guaranteed sound power level : dB(A)

5. Electric power : kW

Grupos Electrógenos Europa, S.A. A company within the Atlas Copco Group

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Form 160003307
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