

**Instruction Manual
for AC Generators**

QAX 12 - 20 - 30 Dd

**Instruction Manual
for AC Generators**

QAX 12 - 20 - 30 Dd

Instruction manual 5

Circuit diagrams 51

Warranty and Liability Limitation

Use only authorized parts.

Any damage or malfunction caused by the use of unauthorized parts is not covered by Warranty or Product Liability.

The manufacturer does not accept any liability for any damage arising for modifications, additions or conversions made without the manufacturer's approval in writing.

Copyright 2006, Atlas Copco Airpower n.v., Antwerp, Belgium.

Any unauthorized use or copying of the contents or any part thereof is prohibited.

This applies in particular to trademarks, model denominations, part numbers and drawings.

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

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

Contents

1 Safety precautions for portable generators	6	5 Storage of the generator	30
2 Leading particulars	10	5.1. Storage	30
2.1. Main parts	10	5.2. Preparing for operation after storage	30
2.2. General description	11	6 Checks and troubleshooting	30
2.3. Bodywork	11	6.1. Checking voltmeter P4.....	30
2.4. Markings.....	12	6.2. Checking ampmeter P1	30
2.5. Drain plugs	12	6.3. Alternator trouble shooting	31
2.6. Control and indicator panel Qc1001™	13	6.4. Engine trouble shooting.....	31
2.7. Spillage free	19	7 Options available for QAX 12 - 20 - 30 Dd units	33
2.8. Outlet sockets (S).....	19	7.1. Circuit diagrams.....	33
3 Operating instructions	20	7.2. Overview of the electrical options.....	33
3.1. Installation.....	21	7.3. Description of the electrical options.....	33
3.2. Connecting the generator	21	7.4. Overview of the mechanical options.....	34
3.3. Before starting	22	7.5. Description of the mechanical options	34
3.4. Operating Qc1001™	22	8 Technical specifications	40
4 Maintenance	23	8.1. Technical specifications of the QAX 12 Dd.....	40
4.1. Maintenance schedule	23	8.2. Technical specifications of the QAX 20 Dd.....	43
4.2. Use of service paks.....	24	8.3. Technical specifications of the QAX 30 Dd.....	46
4.3. Preventive maintenance schedule for the generator.....	24	8.4. Torque values	48
4.4. Engine oil specifications	24	8.5. Conversion list of SI units into British units	49
4.5. Engine oil level check	25	8.6. Dataplate	49
4.6. Engine coolant specifications	25		
4.7. Coolant check.....	26		
4.8. Adjustments & service procedures	27		

1 Safety precautions for portable generators

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

1.1 Introduction

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

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

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

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

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

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

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

Skill level 1: Operator

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

Skill level 2: Mechanical technician

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

Skill level 3: Electrical technician

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

Skill level 4: Specialist from the manufacturer

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

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

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

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

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

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

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

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

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

1.2 General safety precautions

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

1.3 Safety during transport and installation

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

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

Helicopter lifting is not allowed.

It is strictly forbidden to dwell or stay in the risk zone under a lifted load. Never lift the unit over people or residential areas. Lifting acceleration and retardation shall be kept within safe limits.

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

1.4 Safety during use and operation

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

- 17 Remember that where there is visible dust, the finer, invisible particles will almost certainly be present too; but the fact that no dust can be seen is not a reliable indication that dangerous, invisible dust is not present in the air.
- 18 Never operate the generator in excess of its limits as indicated in the technical specifications and avoid long no-load sequences.
- 19 Never operate the generator in a humid atmosphere. Excessive moisture causes worsening of the generator insulation.
- 20 Do not open electrical cabinets, cubicles or other equipment while voltage is supplied. If such cannot be avoided, e.g. for measurements, tests or adjustments, have the action carried out by a qualified electrician only, with appropriate tools, and ascertain that the required bodily protection against electrical hazards is applied.
- 21 Never touch the power terminals during operation of the machine.
- 22 Whenever an abnormal condition arises, e.g. excessive vibration, noise, odour, etc., switch the circuit breakers to OFF and stop the engine. Correct the faulty condition before restarting.
- 23 Check the electric cables regularly. Damaged cables and insufficient 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.

1.5 Safety during maintenance and repair

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

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

1.6 Tool applications safety

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

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

1.7 Battery safety precautions

Batteries

When servicing batteries, always wear protecting clothing and glasses.

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

2 Leading particulars

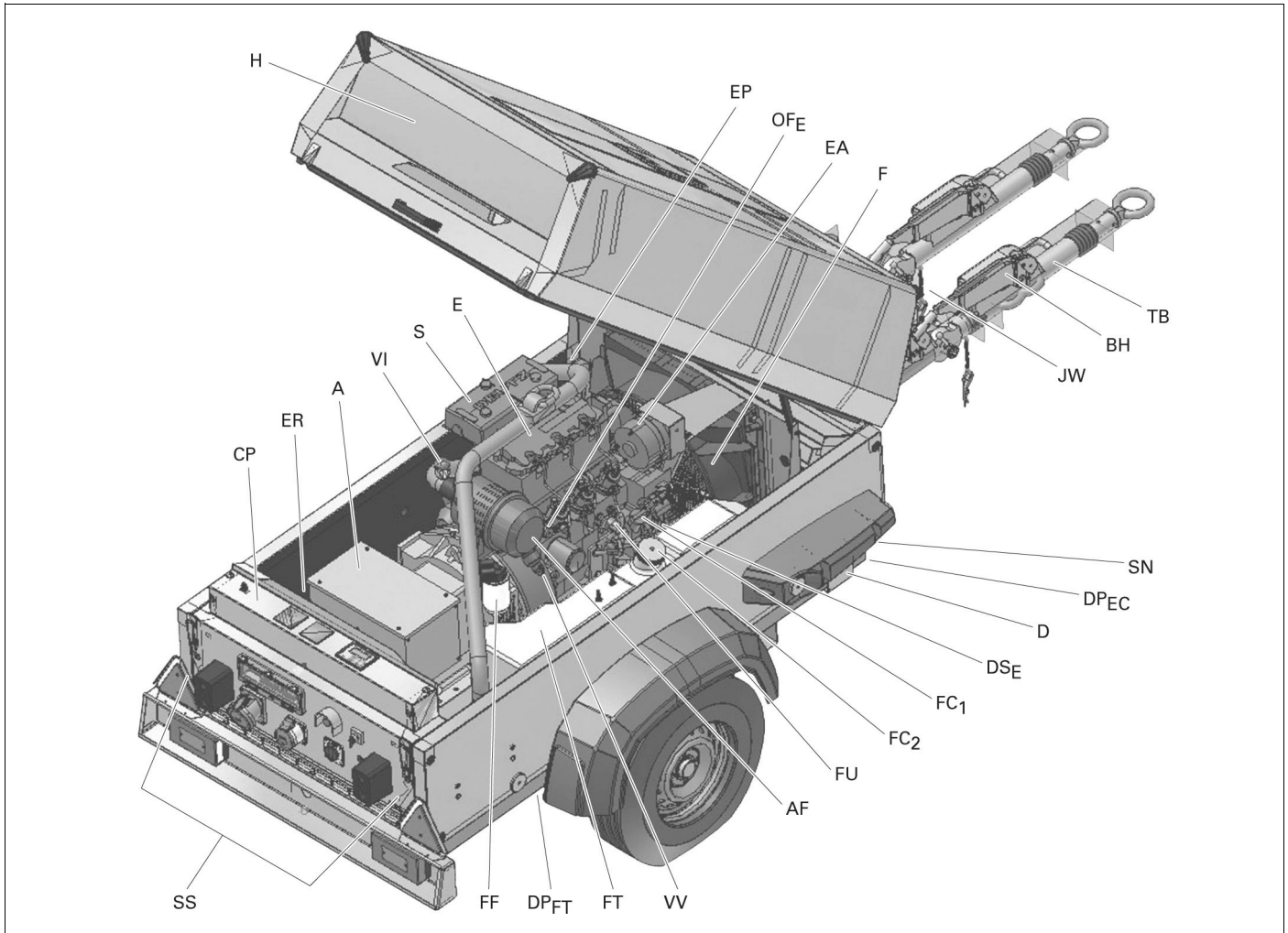
2.1 Main parts

The QAX 12 - 20 - 30 Dd is an AC generator, built for continuous running at sites where no electricity is available.

The QAX 12 Dd operates at 50 Hz and 230 V - 1 ph or 400 V - 3 ph.
The QAX 20 - 30 Dd operates at 50 Hz and 400 V - 3 ph.

The QAX 12 - 20 - 30 Dd generator is driven by an oil-cooled diesel engine, manufactured by DEUTZ.

An overview of the main parts is given in the diagram below:



A	Alternator	FC ₁	Filler cap (engine oil)
AF	Air filter	FC ₂	Filler cap (fuel tank)
BH	Brake handle	FF	Fuel filter
CP	Control panel	FT	Fuel tank
D	Data plate	FU	Fuel pump
DP _{EC}	Drain plug engine oil cooler	H	Hood
DP _{FT}	Drain plug fuel tank	JW	Jockey wheel
DS _E	Engine oil level dipstick	OF _E	Oil filter (engine)
DV	Dust evacuation	S	Starting motor
E	Engine	SN	Serial number
EA	Alternator	SS	Sockets and safeties
EP	Exhaust pipe	TB	Towbar
ER	Earthing rod	VI	Vacuum indicator
F	Fan		

2.2 General description

2.2.1 Engine

The alternator is driven by an oil-cooled diesel engine. The engine's power is transmitted through a direct disc coupling.

2.2.2 Alternator

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.

Only for QAX 12 - 20 Dd

The auxiliary windings of the alternator allow overloading to easily start electrical motors.

2.2.3 Cooling system

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

2.2.4 Safety devices

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

2.2.5 Frame and axle

The generator/engine unit is supported by rubber buffers in the frame.

As an option the unit can be equipped with an adjustable or fixed towbar, an overrun and parking brake and towing eyes type AC, DIN, ball, GB, IT, NATO (for options see "Undercarriage (axle, towbar, towing eyes)" on page 34).

The braking system consists of an integrated parking brake and overrunbrake. When driving backwards the overrunbrake is not engaged automatically.

2.2.6 Lifting eye

A lifting eye is accessible when the small door at the top of the unit is unlocked.

2.2.7 Control panel

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

2.2.8 Data plate

The generator is furnished with a data plate showing the product code, the unit number and the power output (see "Dataplate" on page 49).

2.2.9 Serial number

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

2.3 Bodywork

The bodywork has openings at the shaped front and rear end for the intake and outlet of cooling air and a hood for maintenance and service operations.

The alternator, the engine, the cooling system, etc. are enclosed in a sound-insulated bodywork that can be opened at the rear end by means of stirrups.

To be able to lift the QAX 12 - 20 - 30 Dd by means of a forklift, rectangular holes are provided in the frame.

The earthing rod, to be connected to the generator's earth terminal is located inside the generator.

2.4 Markings

A brief description of all markings provided on the QAX is given hereafter.



Instruction book label.



Indicates that the engine exhaust is a hot and harmful gas, which is toxic in case of inhalation. Always make sure that the unit is operated outside or in a well-ventilated room.



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 that the generator may be refuelled 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.



Indicates the drain for the coolant + drain frame.



Use 15W40 oil only.



Indicates the different earthing connections on the generator.



Indicates the lifting eye of the generator.



Indicates that the lifting eye may NOT be used! Applies when genset is mounted on a lighting tower.



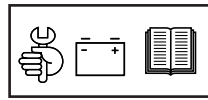
Indicates that the alternator should not be cleaned with high pressurised water.



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



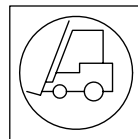
Read the instruction manual before using the lifting eye.



Read the instruction manual before working on the battery.



Do not open the hood when genset is running.



Indicates the forklift slots.

Atlas Copco		XXXXXXXXXXXXXXXXXX
	SERVICE PACK	XXXXXXXXXXXXXXXXXX
	Engine oil	PAROIL 15W40
	Engine coolant	PARCOOL EG

Indicates the partnumbers of the different service packs and of the engine oil. These parts can be ordered to the factory.

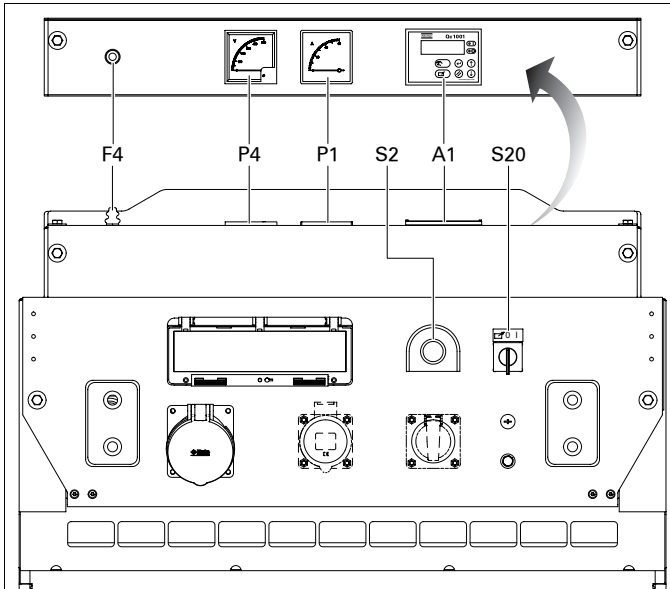
2.5 Drain plugs

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

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

2.6 Control and indicator panel Qc1001™

The control and indicator panel is located on a panel at the back of the unit. This panel allows easy access to the parts mounted behind it.



A1..... Qc1001™ display

F4Fuse

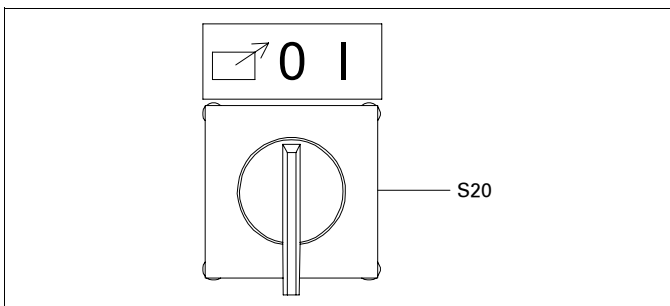
The fuse activates when the current from the battery to the engine control circuit exceeds its setting. The fuse can be reset by pushing the button.

S2.....Emergency stop button

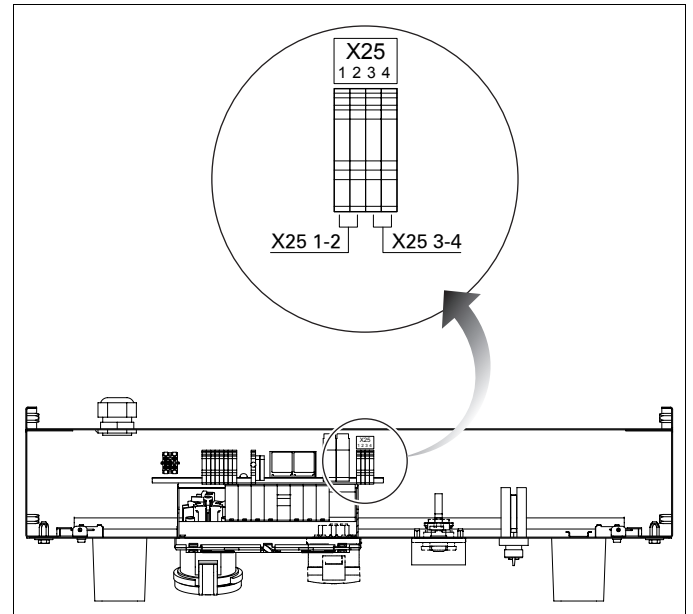
Push the button to stop the generator in case of an emergency. When the button is pressed, it must be unlocked, by turning it anti-clockwise, before the generator can be restarted.

S20....Remote/ON/OFF switch

To start up the unit (locally or remote).



2.6.1 Remote start connections



X25 1-2.. Remote start signal input

X25 3-4.. Plant contactor output



Refer to the circuit diagrams for the correct connection.

2.6.2 Generator gauges

P1Ammeter (for the QAX 12 - 20 Dd)

- 1-phase: Indicates the outgoing current in the first phase (L1).
- 3-phase: Indicates the outgoing current in the third phase (L3).

P4Voltmeter (for the QAX 12 - 20 Dd)

Indicates the voltage between L1 and L2.

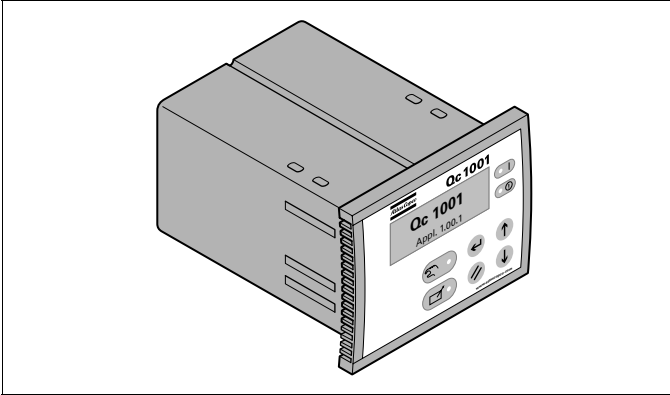
P1Ammeter (for the QAX 30 Dd)

Indicates the outgoing current in the first phase (L1).

P4Voltmeter (for the QAX 30 Dd)

Indicates the voltage between L2 and L3.

2.6.3 Qc1001™ Module



The Qc1001™ module is located inside the control panel. This control module will carry out all necessary tasks to control and protect a generator, regardless of the use of the generator.

This means that the Qc1001™ module can be used for several applications.

2.6.4 Pushbutton and LED functions

Following pushbuttons are used on the Qc1001™



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



UP: Is used to scroll through the display information. This button is also active in Configuration Mode.



DOWN: Is used to scroll through the display information. This button is also active in Configuration Mode.



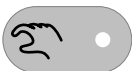
When **UP** & **DOWN** are pressed at the same time for 3s, Configuration Mode will be entered (see page 18).



BACK: Is used to leave/enter the Warnings pop-up window, to leave the Configuration Mode and to leave menu's without change.

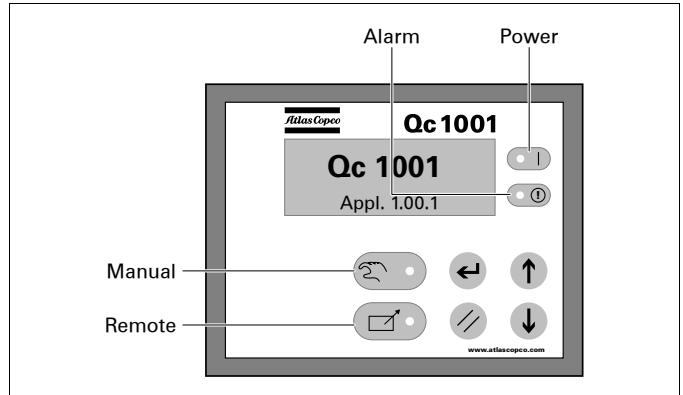


REMOTE MODE: The LED indicates if the gen-set is put in Remote Mode.



MANUAL MODE: The LED indicates if the gen-set is put in Manual Mode.

Following LEDs are used on the Qc1001™



Power	Green LED indicates that the unit is powered up.
Manual	Green LED indicates that the Manual Mode is selected.
Remote	Green LED indicates that the Remote Mode is selected.
Alarm	Flashing red LED indicates that a shutdown is present. Continuous red LED indicates a warning. The exact warning/shutdown is shown at the display.

2.6.5 Qc1001™ Menu Overview

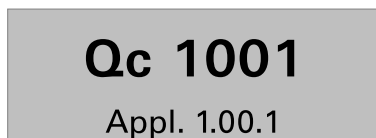
At Qc1001™, the LCD will show following information:

- in **Normal** condition (scroll through the information using **UP** and **DOWN**):
 - Status (eg: preheat, crank, run, cooldown, extended stop, ...)
 - Running hours
 - Battery Voltage
 - Service Timer 1
 - Service Timer 2
 - Generator Frequency
- in **Warning** condition (scroll through the information using **UP** and **DOWN**):
 - a list of all active Warnings
- in **Shutdown** condition:
 - the cause of shutdown

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

If a Special status comes up, the Status Display is shown.
 If a Warning comes up, the Warning Display is shown.
 If a Shutdown comes up, the Shutdown Display is shown.

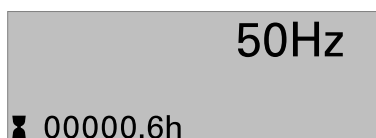
View 0



This view will show the ASW version number.

When there has been no button activity for three minutes, the display will return to the Default View.

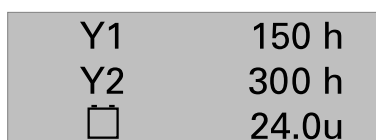
View 1 (Qc1001™-Default Display)



The frequency value is centered in the top-right corner area.

The running hours value is at the bottom-left corner. The service timer indication(s) are shown in the bottom-right corner when the service timer(s) have run out. They will disappear when the service timer(s) have been resetted.

View 5 (Service Timers and Battery Voltage)

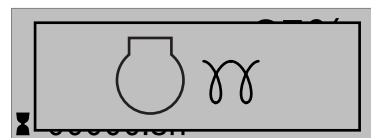


The service timer indications count upwards and give an alarm when the configured value is reached.

Resetting of the Service Timers is possible through a display Configuration Menu.

View 10 (reserved for normal English text)

Status Display (pop-up window)



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

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

These special statuses are:

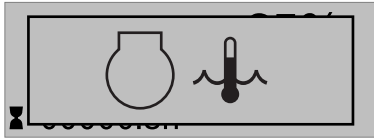
PREHEAT	
START OFF	
COOLDOWN	
EXTENDED STOP TIME	
DIAGNOSTIC	

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

If a Warning comes up, the Warning Display is shown.

If a Shutdown comes up, the Shutdown Display is shown.

Warning Display (pop-up window)



In case a Warning occurs, a pop-up window will automatically be entered for as long as the warning is active, no matter which view is active. The warning icons will be shown (together with a continuous lit alarm LED at the fascia), which is centered at the display. The Warning Display can always be left or entered again by pushing the BACK button.

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

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

If a Shutdown comes up, the Shutdown Display is shown.

List of possible warnings:

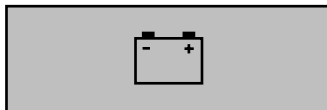
LOW OIL PRESSURE



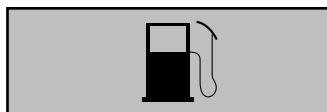
HIGH COOLANT TEMPERATURE



CHARGING ALTERNATOR



LOW FUEL LEVEL
(only for QAX 12 - 20)



LOW COOLANT LEVEL
(only for QAX 12 - 20)



GENERATOR OVERVOLTAGE



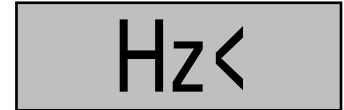
GENERATOR UNDERVOLTAGE



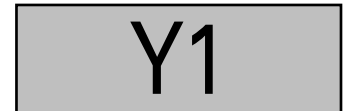
GENERATOR OVERFREQUENCY



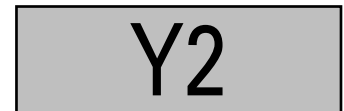
GENERATOR UNDERFREQUENCY



SERVICE TIMER 1



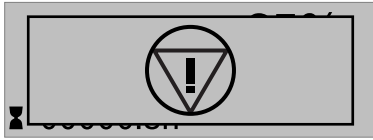
SERVICE TIMER 2



ALARM



Shutdown Display (pop-up window)



In case a Shutdown occurs, a pop-up window will automatically be entered, no matter which view is active.

This pop-up window will stay present until the unit is put in OFF.

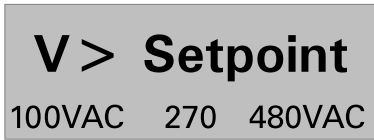
The shutdown icon will be shown (together with a flashing alarm LED at the fascia), which is centered at the display.

List of possible shutdowns:

LOW OIL PRESSURE	
HIGH COOLANT TEMPERATURE	
CHARGING ALTERNATOR	
LOW FUEL LEVEL <i>(only for QAX 12 - 20)</i>	
LOW COOLANT LEVEL <i>(only for QAX 12 - 20)</i>	
GENERATOR OVERVOLTAGE	
GENERATOR UNDERVOLTAGE	
GENERATOR OVERFREQUENCY	
GENERATOR UNDERFREQUENCY	

SERVICE TIMER 1	
SERVICE TIMER 2	
ALARM	
EMERGENCY STOP	
START FAILURE	
STOP FAILURE	

Configuration Mode View



The Configuration Menu's are pre-programmed!

The Configuration Mode is entered by detection of activation of pushbuttons UP and DOWN at the same time for 3s.

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

By entering the configuration mode, pushbuttons MANUAL, REMOTE are disposed of their normal operations and won't perform any functionality.

Menu's shown on the LCD in Configuration Mode:

- Language selection
- Diagnostics Menu
- Running hours adjust

- Service Timer 2 reset
- Service Timer 1 reset
- Start Prepare Time
- Unit Menu
- Unit Type



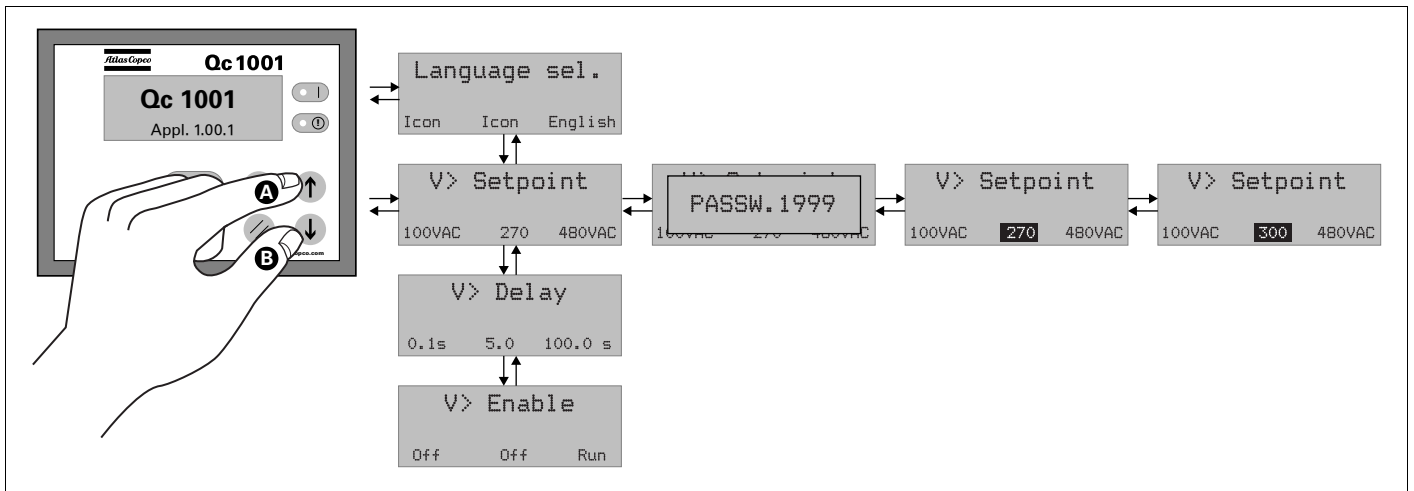
Unit type 4 for QAX 12 - 20 - 30 Dd !

- Generator Underfrequency: failclass, enable, delay, setpoint
- Generator Overfrequency: failclass, enable, delay, setpoint
- Generator Undervoltage: failclass, enable, delay, setpoint
- Generator Overvoltage: failclass, enable, delay, setpoint

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

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

This is the described menu flow (push A and B together for 3 seconds):



2.6.6 Fail classes

All the activated alarms of the Qc1001™ have their own pre-defined fail class.

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

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

2.6.7 Event Log

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

Events are:

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

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

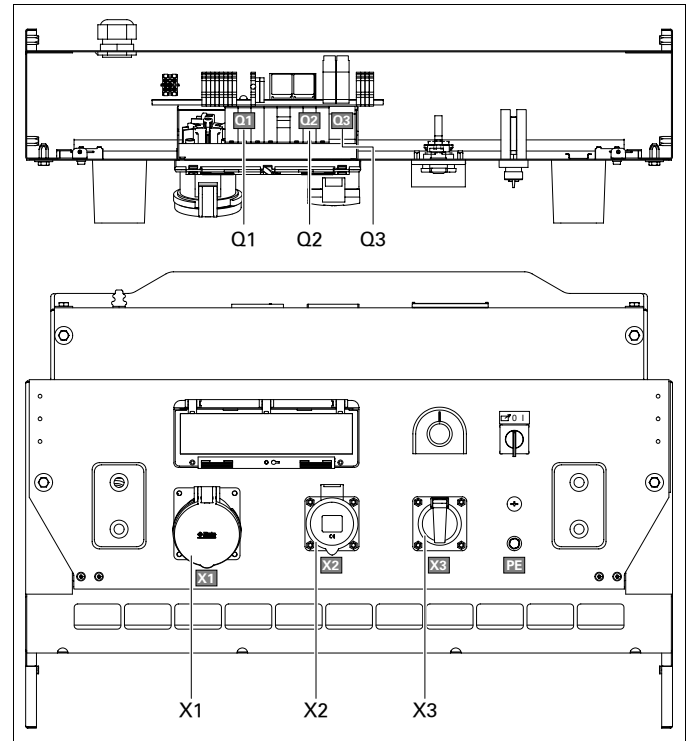
The events can only be read by means of the QcUSW.

2.7 Spillage free

With spillage free, it is possible to drain the frame using the drain plugs.

2.8 Outlet sockets (S)

2.8.1 Outlet sockets for QAX 12 Dd 1-phase units



The Outlet sockets application provides the following outlet sockets and circuit breakers:

X1..... 1-phase outlet socket (230 V AC)

Provides phases L, neutral and earthing.

X2..... 1-phase outlet socket (230 V AC)

Provides phases L, neutral and earthing.

X3..... 1-phase outlet socket (230 V Y)

Provides phase L, neutral and earthing.

Q1..... Main circuit breaker and minimum voltage relay

Interrupts the power supply to X1 when a short-circuit occurs at the load side or the overcurrent protection (50 A) is activated or when the shunt trip is energized. It must be reset manually after eliminating the problem.

Q2..... Circuit breaker for X2

Interrupts the power supply to X2 when a short-circuit occurs at the load side, or when the overcurrent protection (32 A) is activated. When activated, Q2 interrupts the three phases towards X2. It can be activated again after eliminating the problem.

Q3..... Circuit breaker for X3

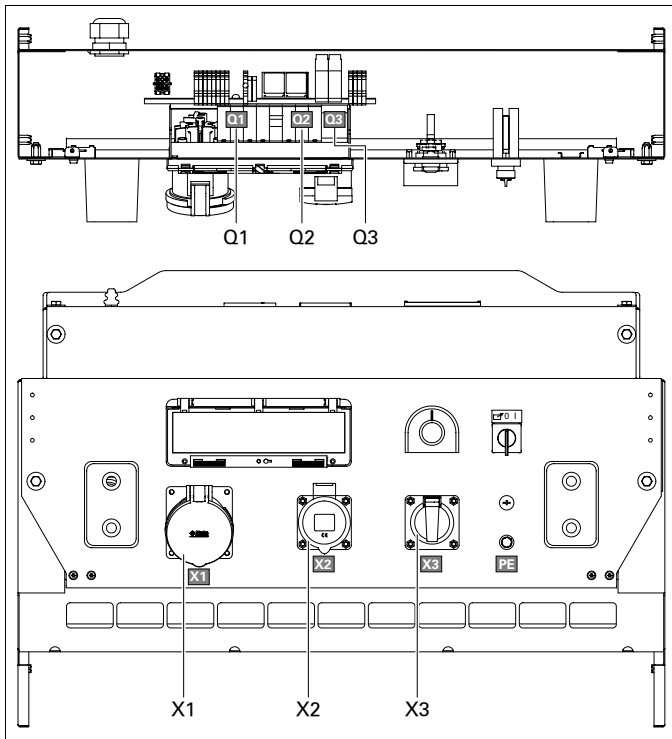
Interrupts the power supply to X3 when a short-circuit occurs at the load side, or when the earth leak detector (30 mA), or when the overcurrent protection (16 A) is activated. When activated, Q3 interrupts phase L3 and the neutral towards X3. It can be activated again after eliminating the problem.



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

Make sure to switch on circuit breakers Q1, Q2 and Q3 after starting the generator when power supply is done by means of X2 or X3.

2.8.2 Outlet sockets for QAX 12 - 20 - 30 Dd 3-phase units



The Outlet sockets application provides the following outlet sockets and circuit breakers:

X1..... 3-phase outlet socket (400 V Y)

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

X2..... 3-phase outlet socket (400 V Y)

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

X3..... 1-phase outlet socket (230 V Y)

Provides phase L3, neutral and earthing.

Q1 Main circuit breaker and minimum voltage relay

Interrupts the power supply to X1 when a short-circuit occurs at the load side or the overcurrent protection (QAX 12: 20 A, QAX 20: 32 A, QAX 30: 50 A) is activated or when the shunt trip is energized. It must be reset manually after eliminating the problem.

Q2 Circuit breaker for X2

Interrupts the power supply to X2 when a short-circuit occurs at the load side, or when the overcurrent protection (QAX 12 - 20: 16 A, QAX 30: 32 A or 16 A) is activated. When activated, Q2 interrupts the three phases towards X2. It can be activated again after eliminating the problem.

Q3 Circuit breaker for X3

Interrupts the power supply to X3 when a short-circuit occurs at the load side, or when the earth leak detector (30 mA), or when the overcurrent protection (16 A) is activated. When activated, Q3 interrupts phase L3 and the neutral towards X3. It can be activated again after eliminating the problem.



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

Make sure to switch on circuit breakers Q1, Q2 and Q3 after starting the generator when power supply is done by means of X2 or X3.

3 Operating instructions



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

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

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

At each start-up and at any time a new load is connected, the earthing 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.

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.

3.1 Installation

- Place the generator on a horizontal, even and solid floor.
- Protect the generator against dust and rain if it is operated outside.
- Check that the engine exhaust is not directed towards people. If the generator is operated indoors, install an exhaust pipe of sufficient diameter to duct the engine exhaust towards the outside. Check for sufficient ventilation so that the cooling air is not recirculated. If necessary, consult Atlas Copco.
- Leave enough space for operation, inspection and maintenance (at least 1 meter at each side).
- Check that the inner earthing system is in compliance with the local legislation.
- Check the tightness of the bolts and nuts.
- Install the earthing rod as near as possible to the generator and measure its diffusion resistance (max. 1 kΩ) in order not to have a contact voltage higher than 25 V at 30 mA leakage current.
- Check that the cable end of the earthing rod is connected to the earth terminal.

3.2 Connecting the generator

3.2.1 Precautions for non-linear and sensitive loads



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

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

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

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

3.2.2 Quality, minimum section and maximum length of cables

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

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

Wire section (mm ²)	2.5	4	6	10	16	25	35	50	70	95
Max. current (A)										
Multiple core	22	30	38	53	71	94	114	138	176	212
Single core	25	33	42	57	76	101	123	155	191	228
H07 RN-F	21	28	36	50	67	88	110	138	170	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)

3.2.3 Connecting the load

- Check whether frequency, voltage and current comply with the ratings of the generator.
- Provide for the load cable, without excessive length, and lay it out in a safe way without forming coils.


3.3 Before starting

- Before initial start-up, prepare battery for operation if not already done.
- 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 vacuum indicator of the air filter. If the red part shows completely, replace the filter element.
- Press the vacuator valve of the air filter to remove dust.
- Check the generator for leakage, tightness of wire terminals, etc. Correct if necessary.
- Check that fuse F4 is not activated and that the emergency stop is in the OUT position.
- Check that the load is switched off.
- Check that circuit breaker Q1 is switched off.


3.4 Operating Qc1001™

3.4.1 Starting Qc1001™

To start up the unit locally, proceed as follows:


- Switch on the battery switch.
- Switch off circuit breaker Q1. This is not necessary when a plant contactor is installed between Q1 and the load.
- Put the starter switch in position . The unit starts a preheating cycle which takes 12 seconds.
- After the preheating period, the unit will start. The starting attempt will take maximum 12 seconds.
- Switch on circuit breaker Q1 in case no contactor is installed.

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

- Put the starter switch in position .
- Switch on circuit breaker Q1.
- Put the remote start/stop switch in position start. The unit starts a preheating cycle which takes 12 seconds.
- After the preheating period, the unit will start. The starting attempt will take maximum 12 seconds.

3.4.2 During operation Qc1001™

Following points should be carried out regularly:

- Check the engine gauges and the lamps for normal readings.
-  **Avoid to let the engine run out of fuel. If it happened, priming will speed up the starting.**
- Check for leakage of oil, fuel or coolant.
- Avoid long low-load periods (< 30%). In this case, an output drop and higher oil consumption of the engine could occur.
- Check, by means of the generator gauges, that the voltage between the phases is identical and that the rated current in the third phase (L3) is not exceeded (only for QAX 12 - 20 Dd).
- When single-phase loads are connected to the generator output terminals, keep all loads well-balanced (only for QAX 12 - 20 Dd).
- Check, by means of the current gauge that the rated current in the first phase (L1) is not exceeded (only for QAX 30 Dd).

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




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

3.4.3 Stopping Qc1001™

To stop the unit locally, proceed as follows:

- Switch off the load.
- Switch off circuit breaker Q1.
- Let the engine run for about 5 minutes.
- Stop the engine by putting the starter switch in position O.
- Lock the side doors and the door of the indicators and control panel to avoid unauthorized access.

To stop the unit when the starter switch is in position , proceed as follows:

- Switch off the load.
- Stop the engine by putting the remote start/stop switch in position stop or by putting the starter switch in position O.
- Cooldown period default 15 sec.
- Lock the side doors and the door of the indicators and control panel to avoid unauthorized access.

4 Maintenance

4.1 Maintenance schedule



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	Small	Normal
		every 500 hours	every 1000 hours/yearly
Service pak	-	2912 4397 05	2912 4398 06 (QAX 12 - 30 Dd) 2912 4399 06 (QAX 20 Dd)
Engine oil level	Check		
Fuel filter water drain	Drain		
Air filter vacuum indicator	Check		
Electrolyte level and terminals of battery		Check	Check
Tyre pressure		Check	Check
Leaks in oil- or fuel system		Check	Check
Oil cooler		Clean	Clean
Torque of wheel nuts		Check	Check
Brake system (if installed)		Check/Adjust	Check/Adjust
Door hinges			Grease
Coupling head and all its moving parts / shaft			Grease
Joints of height adjustment adjustable towbar		Check	Grease
Shutdown switches			Check
Fan V-belt (2)		Check	Replace
Fuel tank			Clean
Air filter element (1)		Replace	Replace
Safety cartridges (1)			Replace
Engine oil (2) (3) (4)		Replace	Replace
Engine oil filter (2)		Replace	Replace
Fuel filter (2) (5)		Replace	Replace
Pre fuel filter (2) (5)		Replace	Replace
Engine inlet and outlet valves (2)		Adjust	Adjust
Condition of vibration dampers	Check	Check	Check
Alternator insulation resistance (*)		Measure	Measure
Fixation of hoses, cables and pipes		Check	Check
Inspection by Atlas Copco Service technician			

Notes:

- (1) More frequently when operating in a dusty environment.
- (2) Refer to the Deutz operation manual.
- (3) 500 hours only valid when using PAROIL 15W40.
- (4) Also drain engine oil from engine oil cooler.
- (5) In case of poor fuel quality, replace fuel filter more frequently.



Keep the bolts of the housing, the lifting eye, the towbar and the axle securely tightened. Refer to “Technical specifications” on page 40 and to “Torque values” on page 48.

4.2 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.

4.3 Preventive maintenance schedule for the generator

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

When servicing, replace all disengaged packings, 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.

4.3.1 Engine maintenance

Refer to the engine's operator manual for full maintenance schedule. See also "Lifting beam" on page 39.

4.3.2 (*) 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 1 MΩ.

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

4.4 Engine oil specifications



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

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

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

Engine	Type of lubricant
between -15°C and 40°C	PAROIL 15W40
between -25°C and 30°C	PAROIL 5W30



Never mix synthetic with mineral oil.

Remark:

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

After doing the complete change procedure to synthetic oil, run the unit for a few minutes to allow good and complete circulation of the synthetic oil.

Then drain the synthetic oil again and fill again with new synthetic oil. To set correct oil levels, proceed as in normal instruction.

4.4.1 Specifications PAROIL

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

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

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

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

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

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

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

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

PAROIL prevents Soot build-up.

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

4.4.2 PAROIL 5W30 and PAROIL 15W40

Synthetic engine oil PAROIL 5W30

PAROIL 5W30 is a Synthetic ultra high performance diesel engine oil with a high viscosity- index. Atlas Copco PAROIL 5W30 is designed to provide excellent lubrication from start-up in temperatures as low as -25°C.

	Liter	US gal	Imp gal	cu.ft	Order number
can	5	1.3	1.1	0.175	1604 6060 00
barrel	210	55.2	46	7.35	1604 6059 00

Mineral engine oil PAROIL 15W40

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

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

4.5 Engine oil level check

See “Adjustments & service procedures” on page 27.

4.6 Engine coolant specifications



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

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

It is strongly recommended to use Atlas Copco branded coolant.

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

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

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



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

4.6.1 Specifications PARCOOL EG

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

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

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

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

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

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

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

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

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

4.7 Coolant check

4.7.1 Monitoring coolant condition

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

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

Visual check

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

pH measurement

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

Glycol concentration measurement

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



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

4.7.2 Topping up of coolant

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

4.7.3 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.

4.8 Adjustments & service procedures

4.8.1 Engine oil level check



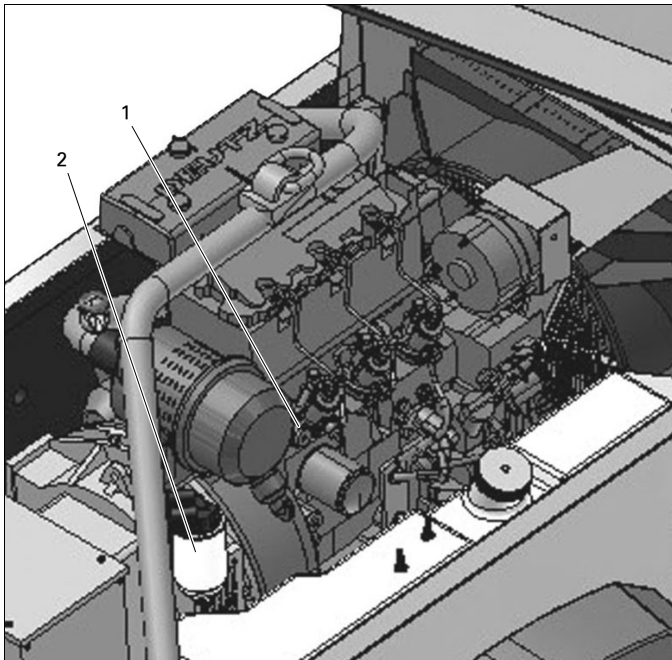
Never mix oils of different brands or types.
Use only non-toxic oils where there is a risk of inhaling delivered air.

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

For intervals, see “Maintenance schedule” on page 23.

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

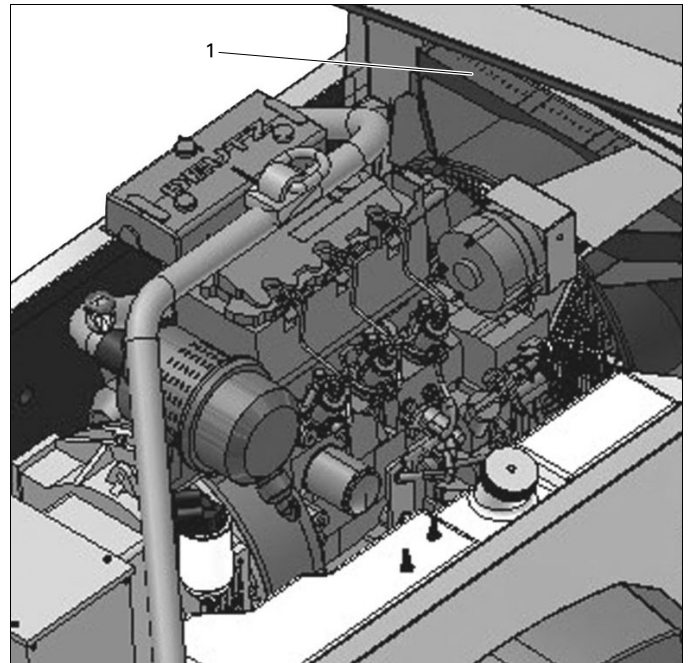
4.8.2 Oil and oil filter change



- 1 | Oil filter (engine)
- 2 | Fuel filter

For further details, see “Preventive maintenance schedule for the generator” on page 24.

4.8.3 Cleaning coolers



- Keep the oil-cooler (1) clean to maintain the cooling efficiency.
- The fan side surface of engine oil cooler is accessible by removing the fan cowl upper part.
- The opposite surface of engine oil cooler is accessible by removing the centre part of the front baffles.



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.

- Close the service door(s).



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

4.8.4 Cleaning fuel tank



Observe all relevant environmental and safety precautions.

- Place an appropriate drain pan under the drainplug of the fuel tank.
- Remove the drain plug.
- Lift the towbar (see “Towing instructions” on page 37) and tilt the generator approx. 15° to remove all fuel, dirt and water.
- Clean the fuel tank and fix the drain plug 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.

4.8.5 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 section “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.

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.

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.

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.

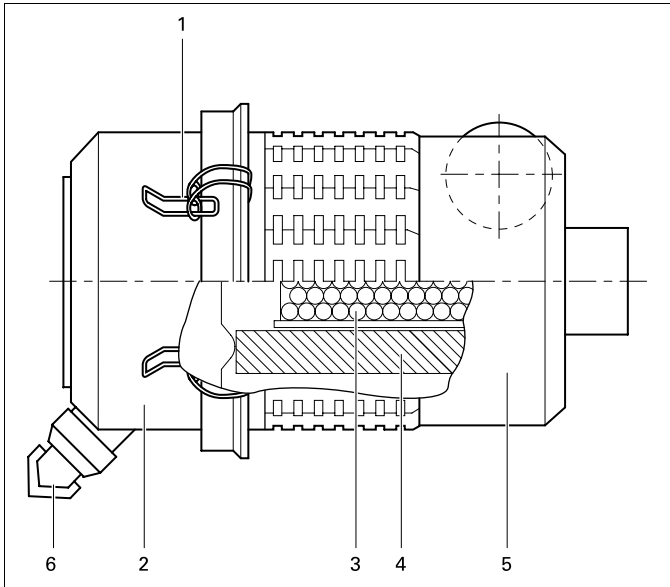
Apply with preference the slow charging method and adjust the charge current according to the following rule of thumb: battery capacity in Ah divided by 20 gives safe charging current in Amp.

Battery maintenance

- 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.
- Keep the terminals and clamps tight, clean, and lightly covered with petroleum jelly.

4.8.6 Air filter engine

Main parts



- 1 | Snap clips
- 2 | Dust trap
- 3 | Safety cartridge (option)
- 4 | Filter element
- 5 | Filter housing
- 6 | Vacuator valve

Recommendation



The Atlas Copco air filters are specially designed for the application. The use of non-genuine air filters may lead to severe damage of engine and/or alternator. Never run the generator without air filter element.

- New elements must also be inspected for tears or punctures before installation.
- Discard the 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. Replace the element and the safety cartridge in this case.
- The safety cartridge cannot be cleaned.

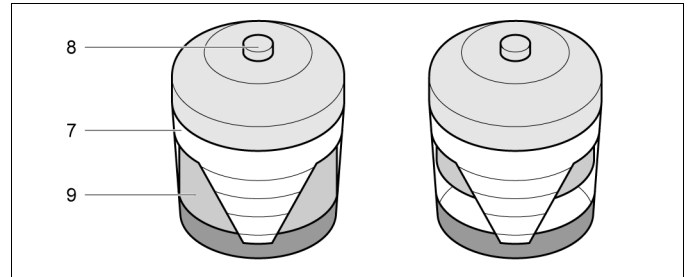
Cleaning the dust trap

To remove dust from the dust trap pinch the vacuator valve (6) several times.

Replacing the air filter element

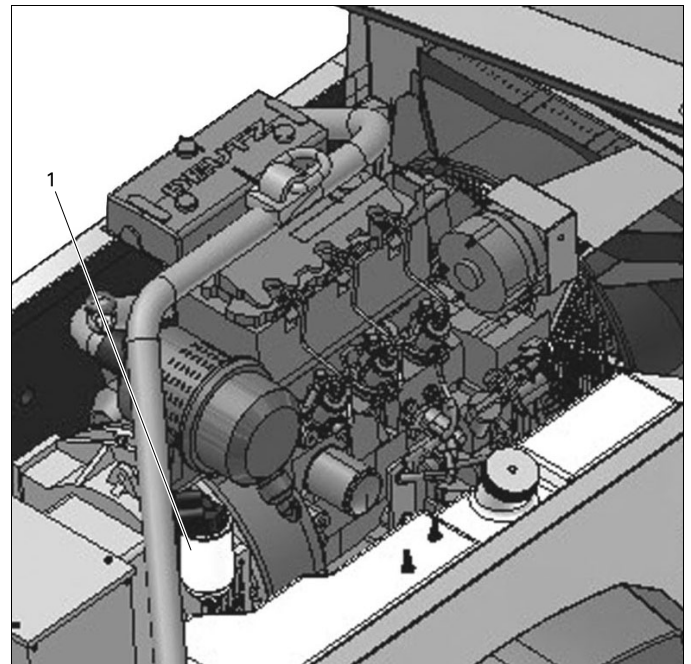
- Release the snap clips (1) and remove the dust trap (2). Clean the trap.
- Remove the element (4) from the housing (5).
- Reassemble in reverse order of dismantling.

- Inspect and tighten all air intake connections.
- Reset the vacuum indicator.



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

4.8.7 Fuel system



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.

4.8.8 Liability

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.

5 Storage of the generator

5.1 Storage

- Store the generator in a dry, frost-free room which is well ventilated.
- Run the engine regularly, e.g. once a week, until it is warmed up. If this is impossible, extra precautions must be taken:
 - Consult the engine's operator manual.
 - Remove the battery. Store it in a dry, frost-free room. Keep the battery clean and its terminals lightly covered with petroleum jelly. Recharge the battery regularly.
 - Clean the generator and protect all electrical components against moisture.
 - Place 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.

5.2 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 22).

- Consult the engine's operator manual.
- Check that the insulation resistance of the alternator exceeds 1 M Ω .
- Replace the fuel filter and fill the fuel tank. Vent the fuel system.
- Reinstall and connect the battery, if necessary after being recharged.
- Submit the generator to a test run.

6 Checks and troubleshooting



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

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

6.1 Checking voltmeter P4

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

6.2 Checking ammeter P1

- Measure during the load, by means of a clamp-on probe, the outgoing current in the third phase (L3) for the QAX 12 - 20 Dd 3-phase and the outgoing current in the first phase (L1) for the QAX 12 Dd 1-phase and QAX 30 Dd 3-phase.
- Compare the measured current with the current indicated on ammeter P1. Both readings should be the same.

6.3 Alternator trouble shooting

Symptom	Possible cause	Corrective action
<i>Alternator does not excite</i>	Blown fuse.	Replace fuse.
	Insufficient residual voltage.	Increase the speed by 15%.
	No residual voltage.	For an instant apply on the + and – terminals of the electronic regulator a 12 V battery voltage with a 30 Ω resistor in series respecting the polarities.
<i>After being excited alternator does not excite</i>	Connections are interrupted.	Check connection cables as per attached drawings.
<i>Low voltage at no load</i>	Voltage potentiometer out of setting.	Reset voltage potentiometer.
	Intervention of protection.	Check rpm.
	Winding failure.	Check windings.
<i>High voltage at no load</i>	Voltage potentiometer out of setting.	Reset voltage potentiometer.
	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 Engine trouble shooting

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.

7 Options available for QAX 12 - 20 - 30 Dd units

7.1 Circuit diagrams

The engine control circuit diagrams and the power circuit diagrams for the standard QAX units, for the units with options and for the units with combined options are:

Unit	Power circuit	Engine control circuit
QAX 12 Dd - 1-phase	9822 0997 12	-
QAX 12 - 20 Dd - 3-phase	9822 0997 01	-
QAX 30 Dd - 3-phase	9822 0997 11	-
QAX 12 - 20 - 30 Dd - Qc1001™	-	9822 0997 83

7.2 Overview of the electrical options

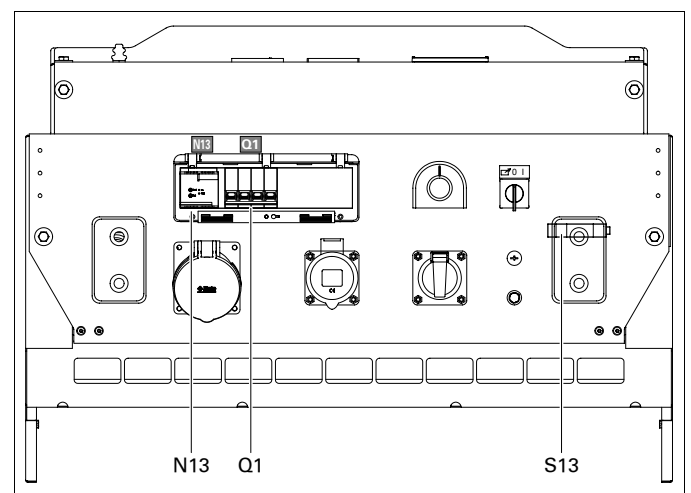
The following electrical options are available:

- Earth leakage relay
- IT-relay
- Single phase socket (only for the QAX 30 Dd)
- Middle socket 16 A or 32 A (only for the QAX 30 Dd)

7.3 Description of the electrical options

7.3.1 Earth leakage relay

The Earth relay option provides a detector that will trip the main circuit breaker Q1 when an earth fault current is detected.



N13....Earth leak detector

Detects and indicates an earth fault current and activates the main circuit breaker Q1. The detection level can be set at 30 mA fixed with instantaneous trip but can also be adjusted between 0.1 A and 1 A with time delayed (0 - 0.5 sec) trip. N13 has to be reset manually after eliminating the problem (reset button marked R). It can be overridden by means of the earth leak switch (S13, labelled IΔN) but has to be tested monthly by pushing test button T13.

Q1 Main circuit breaker

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

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

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

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

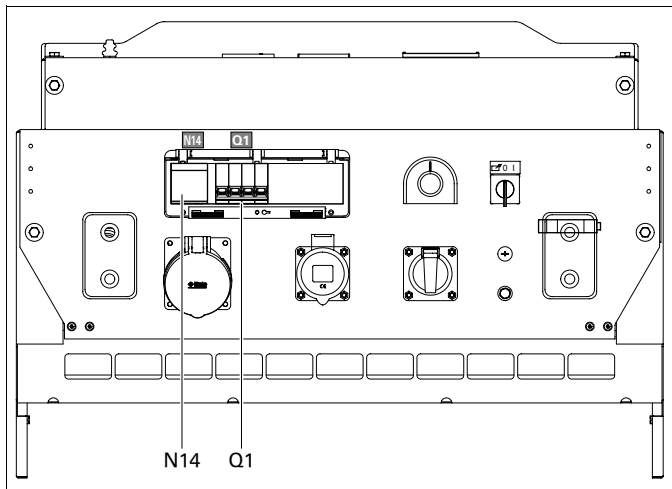


Position O will only be used in conjunction with an external earth fault protection unit (e.g. integrated in a distribution board).

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

7.3.2 IT-relay

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



N14 ... Insulation monitoring relay

Checks the insulation resistance and activates Q1 when the insulation resistance is too low. It can be reset by pushing the reset button.

Q1 Main circuit breaker



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

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

7.4 Overview of the mechanical options

The following mechanical options are available:

- Undercarriage (axle, towbar, towing eyes)
- Lifting beam
- Lighting tower erection instruction

7.5 Description of the mechanical options

7.5.1 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 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.

Parking, towing and lifting instructions

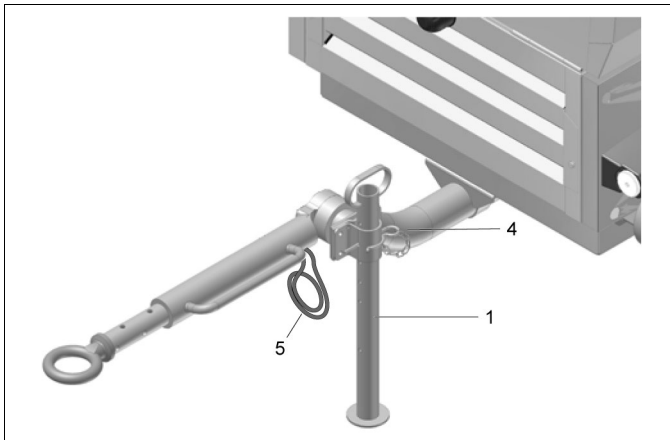


The operator is expected to apply all relevant safety precautions, including those mentioned on page 6 to page 9 of this book.

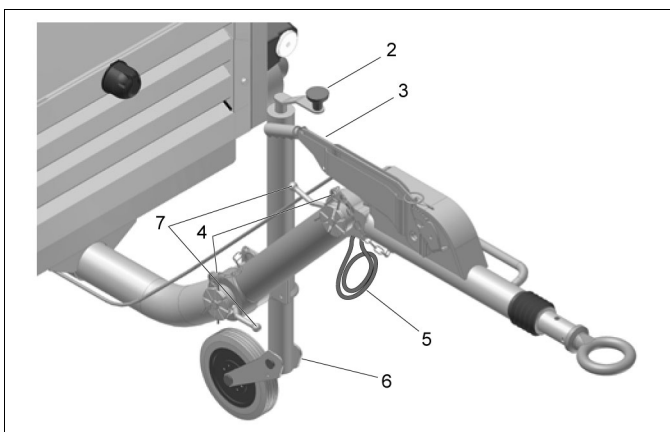
- Before putting the generator in to use, check the brake system as described in the section “Brake adjustment” on page 36.
- After the first 100 km travel:
 - Check and retighten the wheel nuts and towbar bolts to the specified torque. See section “Height adjustment (with adjustable towbar)” on page 38 and “Torque values” on page 48.
 - Check “Brake adjustment” on page 36.

Parking instructions

Non-adjustable towbar with standard support leg without brakes:



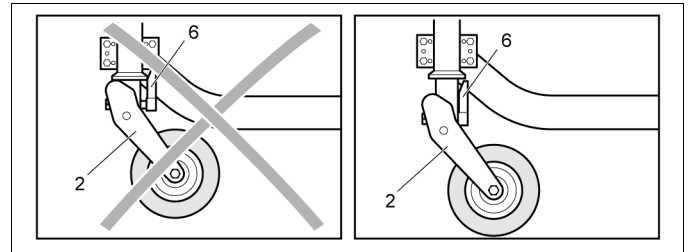
Adjustable towbar with jockey wheel and brakes:



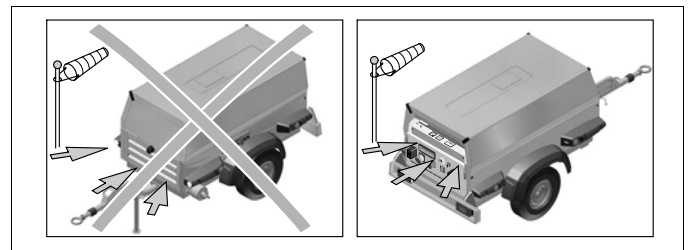
When parking a generator, secure support leg (1) or jockey wheel (2) to support the generator in a level position. Be sure that the jockey wheel (2) is blocked by the blocking pin (6).

Apply parking brake by pulling parking brake handle (3) upwards. Place the generator as level as possible; however, it can be operated temporarily in an out-of-level position not exceeding 15°. If the generator is parked on sloping ground, immobilize the generator by placing wheel chocks (available as option) in front of or behind the wheels. Locate the rear-end of the generator upwind, (see figure below), away from contaminated wind-streams and walls. Avoid recirculation of exhaust air from the engine. This causes overheating and engine power decrease.

Parking position of jockey wheel:



Rear-end of generator upwind:



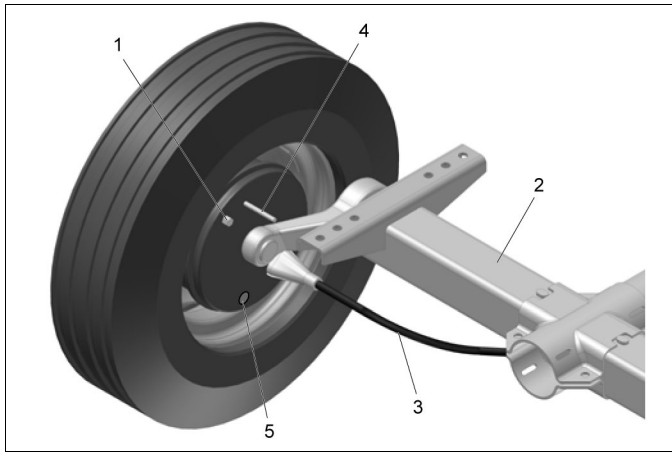
Brake adjustment



Before jacking up the generator, connect it to a towing vehicle or attach a weight of minimum 50 kg to the towbar.

Brake shoe adjustment

Check the thickness of the brake lining. Remove both black plastic plugs (5), one on each wheel. When the brake lining has been worn to a thickness of 1 mm or less, the brake shoes have to be replaced. After inspection and/or replacement re-insert both plugs.



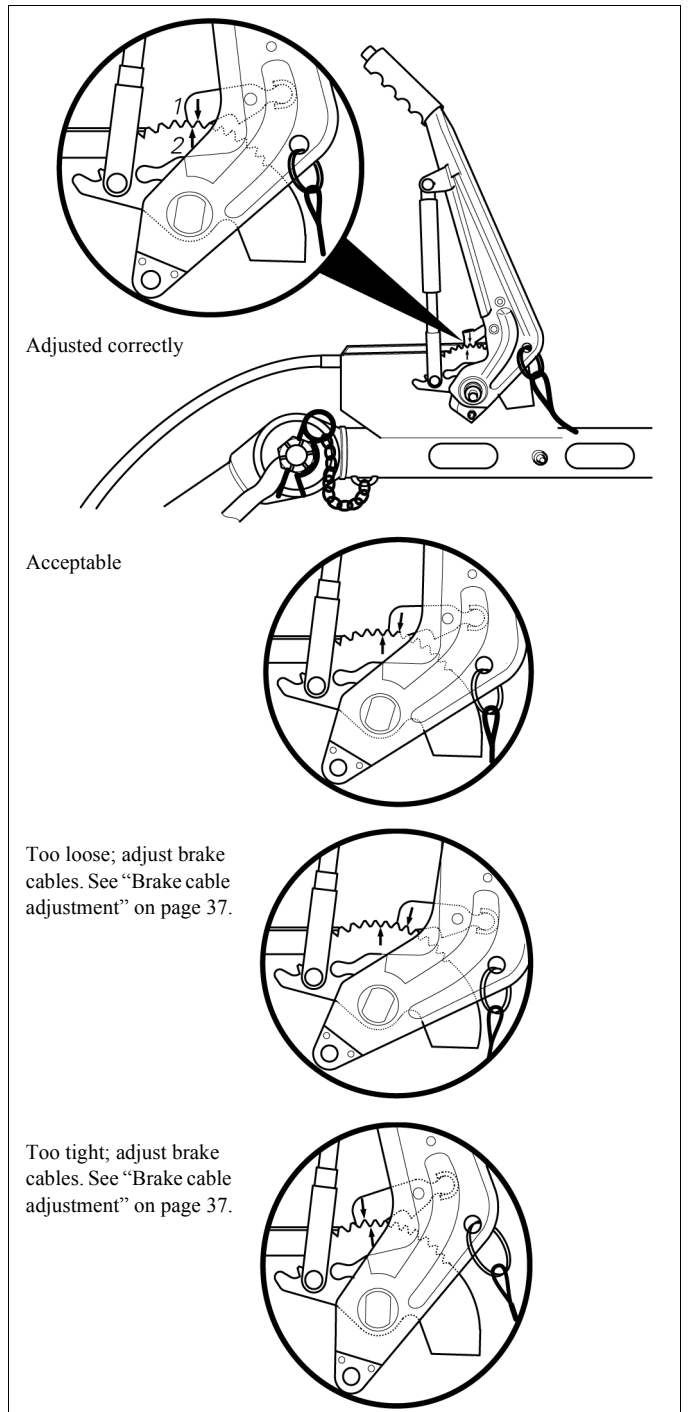
- 1 | Adjusting bolt
- 2 | Axle
- 3 | Braking cable
- 4 | Pin 4 mm
- 5 | Plug

- Brake shoe adjustment re-establishes the brake lining-to-drum clearance and compensates for lining wear.
- Lift and support the generator. Make sure that all brakes are off (overrunbrake and hand brake lever). The brake cables must be free from tension. Lock the swivel cams of the wheel brake from the outside by means of a pin 4 mm (4) through the hole as shown in the figure above.
- Turn the adjusting bolt (1) clockwise with a wrench till the wheel locks up. Center the brake shoes by actuating the parking brake several times.
- Turn the adjusting bolt anti-clockwise until the wheel is running free in direction of travel (approx. 1 full turn of the adjusting bolt).
- Check the position of the equalizer (see "Brake cable adjustment" on page 37) with the parking brake actuated.
- Perpendicular position of equalizer = identical clearance of wheel brakes.
- Re-adjust the brake shoes, if necessary.
- To test, slightly apply the parking brake and check identical brake torque on left and right side.
- Remove locking pin (4). Remove clearance from brake cables.
- Check all lock nuts (see "Brake cable adjustment" on page 37).

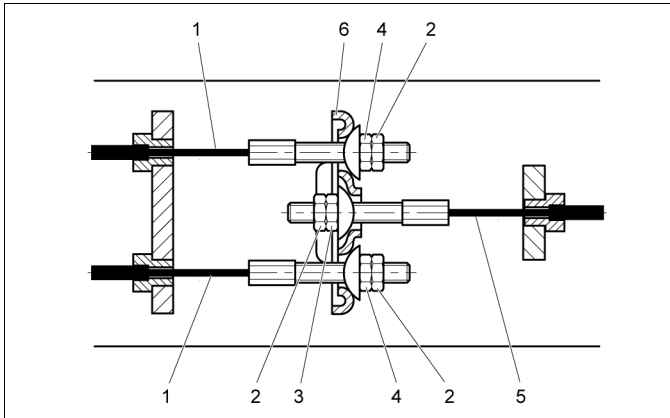
Test procedure of brake cable adjustment

- Check if the towing eye rod of the overrun brake mechanism is in the outmost position.
- Check if the adjustable towbar (= option) is in the actual towing position.
- Apply the hand brake lever.
- Push the generator a few centimeters backwards so that the brake lever is automatically pulled further up.

Check the position of the arrow marking 1 at the catch lock in combination with the arrow marking 2 at the toothed sector, according to the figure below.



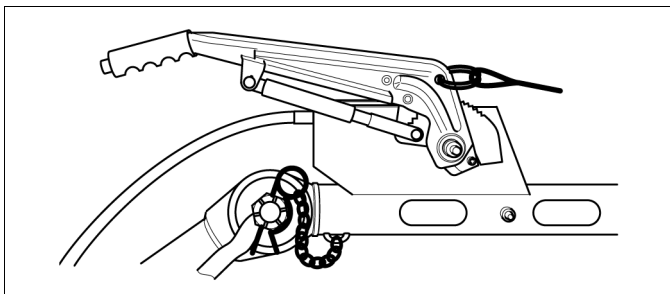
Brake cable adjustment



- 1 Brake cable
- 2 Lock nut
- 3 Adjusting nut
- 4 Brake cable nut
- 5 Main brake cable
- 6 Equalizer

- With the towing eye pulled out in the outmost position and the hand brake lever in the downward position (see figure below), loosen the lock nuts (see figure above). Turn adjusting nuts and brake cable nuts clockwise until there is no slack in the brake mechanism. The equalizer must remain perpendicular to main brake cable (see figure above).
- Apply the hand brake lever several times and repeat the adjustment. Tighten the nuts with their lock nuts (see figure above). Remove the jack and the blocks.

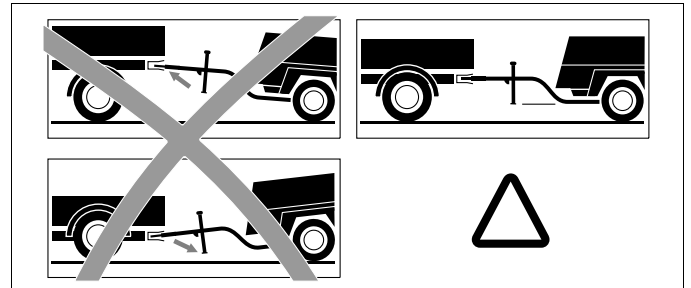
Road test the generator and brake several times. Check brake shoe and brake cable adjustment and if necessary adjust.



Towing instructions



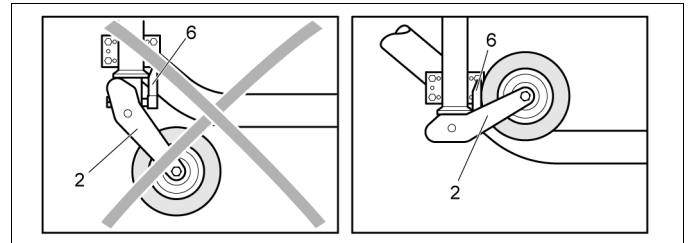
Before towing the generator, ensure that the towing equipment of the vehicle matches the towing eye or ball connector, and ensure that the hood is closed and locked properly.



For both non-adjustable - and adjustable towbar, the towbar should be as level as possible and the generator and towing eye end in a level position.

Push the hand brake lever (3) completely downwards and connect breakaway cable (5) to the vehicle. Secure jockey wheel (2) or support leg (1) in the highest possible position. The jockey wheel is prevented from turning (see "Parking instructions" on page 35).

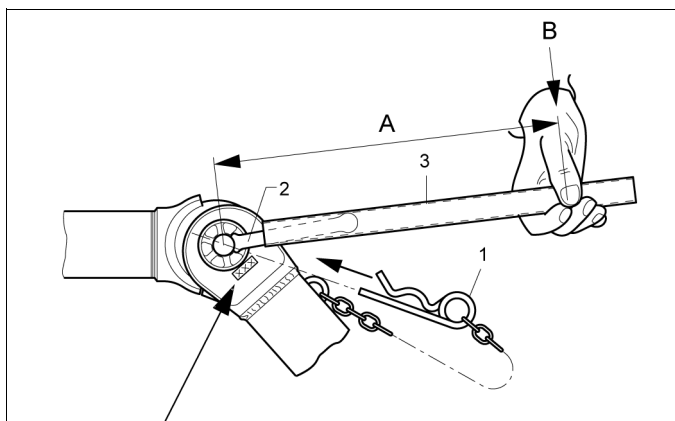
Towing position of jockey wheel:



Height adjustment (with adjustable towbar)



Before towing the generator, make sure that the joints of the towbar are secured with maximum strength without damaging the towbar. Be sure that there is no clearance between the teeth of the joints. For specific instruction see below!



X X X	M_A [Nm]	A [mm]	B [N]
ZV 2000	250-300	600	420-500
ZV 2500	350-400	600	580-660

- Remove spring pin (1).
- Release locking nut (2) with support tools (extension tube 3).
- Adjust required height of the towbar.
- Tighten locking nut (2) by hand first.
- Secondly tighten locking nut (2) with a tightening torque corresponding to table (see table above). With an extension tube (3) (A corresponding to table) and handforce (B corresponding to table) easy tightening is possible.
- Fix locking nut (2) with spring pin (1).



Height adjustment should be undertaken on levelled ground and in coupled condition.

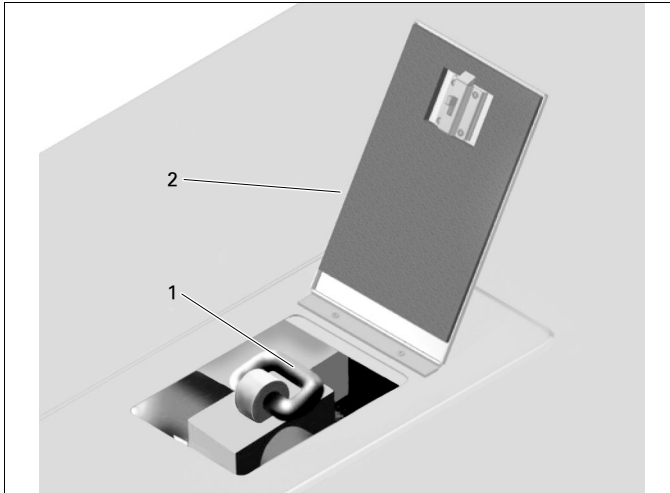
When readjusting, make sure that the front point of the towbar is horizontal to the coupling point.

Before starting a trip, make sure that the adjustment shaft is secure, so that the stability and safety is guaranteed while driving. If necessary tighten the locking nut (2) corresponding to table.

7.5.2 Lifting beam

Lifting instruction generator

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. Keep lifting acceleration and retardation within safe limits.



Preferably use the lifting eye (1) after opening the small door (2).



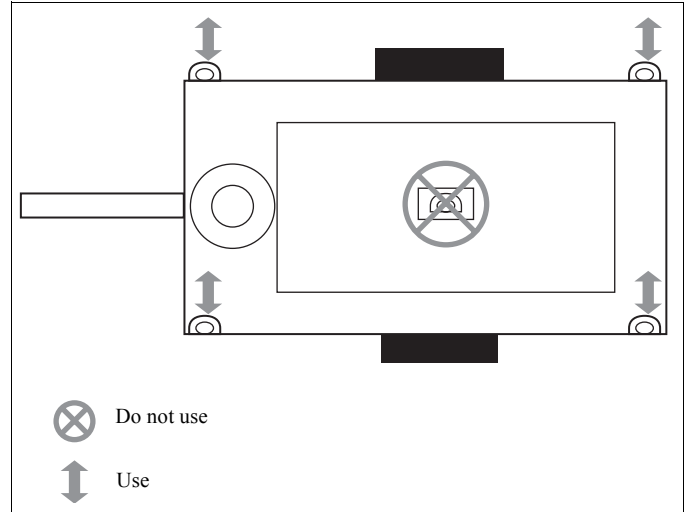
Lifting acceleration and retardation must be kept within safe limits (max. 2 g). Helicopter lifting is not allowed.

Certain engine maintenance might require to remove the lifting beam, for example when adjusting the engine valves. When reinstalling the lifting beam it is required to torque the bolts with a value of 40 Nm \pm 10.

Lifting instruction for generators mounted on a lighting tower



When the genset is mounted on a lighting tower it is NOT permitted to use the lifting eye for lifting of the assembly. Instead use the 4 lifting hooks situated at the corners of the lighting tower undercarriage. Ignoring these instructions may lead to damage and personal injury!



7.5.3 Lighting tower erection instruction

The Lighting tower option provides an undercarriage (frame, axle and towbar) and 6 halogen projectors of 1500 W each. The lighting tower is very useful for construction sites where no electricity nor lighting is available.

Before raising the tower, unlock the mast retainer and extend the four stabilizers at the corners. Level the unit to assure maximum stability. Before moving the unit, lower the mast and secure it on the transport frame. Then retract and secure the stabilizers. To switch the lamps on, plug the connector of the power supply cables towards the lamps in outlet socket X3 of the generator.

To maintain the lighting tower

- Refer to the maintenance instructions mentioned in the chapter dealing with the Undercarriage option.
- Check the condition of the tower, the tightness of its bolts and the fixation of the elevation cable at least twice a year.



Do not use the handles on the lighting tower for towing or lifting the generator.