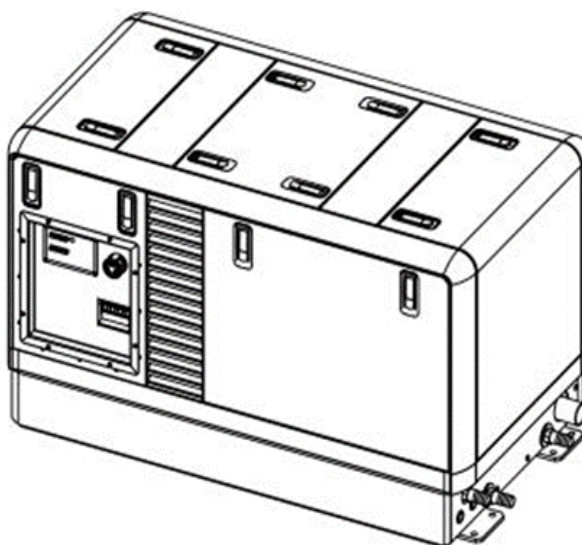




## USER MANUAL

# **W-SQ-Pro**

**15kVA • 18kVA**  
**1500 RPM**



Mobile diesel generating set 230/400V-50Hz  
1phase / 3phase, Digital Diesel Control

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# 1 INTRODUCTION

## 1.1 GENERAL

The W-SQ-Pro 15 and W-SQ-Pro 18 Mobile Diesel Generating sets are manufactured and marketed by WhisperPower.

It is important to read this manual before installing and operating the generating set. Both safety and durability rely very much on the correct identification, installation and a good understanding of ratings, features, design, maintenance and operation procedures.

The information, specifications, illustrations and statements contained within this publication are given with our best intentions and are believed to be correct at the time of going to releasing this document.

All of the specifications, provisions and instructions contained in this manual apply solely to standard versions of the W-SQ-Pro 15 and W-SQ-Pro 18 generating set.

This manual is valid for the following models:

Generator Description
W-SQ Pro 15 230- 400 V / 50 Hz 1phase / 3phase / Stage-V, 1500rpm, Mobile
W-SQ-Pro 18 230- 400V / 50 Hz, 1phase / 3phase / Stage-V, 1500rpm, Mobile

See 1.5 for identification of the generator set. For other models see other manuals available on our website: [www.whisperpower.com](http://www.whisperpower.com).

Our policy is one of continued development and we reserve the right to amend any technical information without prior notice.

Whilst every effort is made to ensure the accuracy of the particulars contained within this publication neither the manufacturer, distributor, or dealer in any circumstances shall be held liable for any inaccuracy or the consequences thereof.



### WARNING

A warning symbol draws attention to special warnings, instructions or procedures which, if not strictly observed, may result in damage or destruction of equipment, severe personal injury or loss of life.



### DANGER

This danger symbol refers to electric danger and draws attention to special warnings, instructions or procedures which, if not strictly observed, may result in electrical shock which will result in severe personal injury or loss of life.



### DANGER

Realize that people are not used to have 230 / 400 Volt available on a mobile/land application. Put warning signs on wall sockets and on junction boxes. Instruct non-regular users of the vehicle. Warn maintenance personnel of garages that do service on the vehicle.

## 1.2 SERVICE AND MAINTENANCE

Regular service and maintenance should be carried out according to the directions in this manual. For service and maintenance one can appeal to the manufacturer or the dealers.

## 1.3 GUARANTEE

WhisperPower guarantees that this generating set has been built according to good workmanship, according to the specifications in this manual and according to European Community safety regulations.

During production and prior to delivery, all of our generating sets are tested and inspected.

The well functioning of this generating set is subject to guarantee. The period and conditions of this guarantee are laid down in the general conditions of delivery as registered with the Chamber of Commerce and Industries for the North of the Netherlands number 01120025 and are available on request. The guarantee period is two years, limited to 1000 running hours. Some aspects of our guarantee scheme are given here in more detail:

Guarantee does not cover failures that are caused by misuse, neglect or a faulty installation.

Example 1. Faulty installation:

Overtemperature of the engine or alternator is the most common cause of problems with mobile generating sets. These problems are caused by poor circulation of the cooling liquid due to wrong routing of the pipes to the radiator: bents will capture air bubbles causing "air-locks" blocking the circulation of the liquid. Other examples of installation problems are hot air circulation into the radiator

and the radiator fan sucking exhaust gasses into the radiators.

The generator and other parts should be protected against the influences of the weather and splashing water (with dirt and salt) below the vehicle. Refer to the installation manual for instructions but remember these are for guidance only as many factors influence the installation of a generator. The final responsibility will always be with the owner to ensure a safe and compliant installation. If in doubt, ask!

#### Example 2: Misuse:

Long term running with no load or too little load can cause the exhaust to get choked with soot or carbon. Cleaning the exhaust is not covered by guarantee.

#### Example 3: Neglect

WhisperPower generators have an optional for an auto start/stop mode or interval mode.

WhisperPower cannot be held responsible for damage caused by the unattended running generator.

Guarantee means that faulty parts are repaired or replaced free of charge. If necessary, the whole generator unit will be exchanged. Labour necessary to complete repairs on board a vessel executed by an authorized service engineer is covered but is limited to a reasonable number of hours and reasonable rates in relation to the actual repair work that has to be done.

Travel expenses and travel hours are not covered. Also not covered is the labour required to take a generator out of a vehicle or for reinstallation. There is no cover for labour needed to get access to the generator, for example to remove equipment or parts of the vehicle body etc.

Goods to be delivered under guarantee will be invoiced. Only after the faulty goods are returned will the invoice be credited. Payment in advance may be required or guaranteed by credit card. If after the faulty goods are returned, it is indicated that the failure was not covered by guarantee a credit will not be issued. For example, if a Printed Circuit Board is returned with clear damage caused by seawater, guarantee will be refused.

Freight costs to deliver spares by normal mail or carriers is covered under guarantee. Special services like express mail, overnight delivery etc. are not covered. Taxes and duties are not covered. For shipments to remote areas any additional costs incurred over normal carriage will be invoiced to the customer.

The cost for returning faulty goods is not covered under guarantee.

If any problem arises which could be subject of guarantee, procedures should be followed as described in the guarantee conditions, unauthorized repairs could lead to further damage and violate the guarantee conditions.



Should work take place, which is not in accordance with the guidelines, instructions and specifications contained in this user's manual and the supplementary installation manual, then damage may occur and the generating set may not fulfil its specifications. In all these cases the guarantee may become invalid. Use original spare parts only!

## 1.4 LIABILITY

WhisperPower cannot be held responsible for damage, injuries or casualties which are the result of operation of the generating set in specific conditions which brings dangers which could not be foreseen, or could be avoided by additional measures. WhisperPower does not accept liability for damage due to use of the generator, possible errors in the manuals and the results thereof.

### Automatic start/stop

**WhisperPower cannot be held responsible for damage caused by the unattended running generator using the auto-start/stop mode or interval mode.**

## 1.5 IDENTIFICATION

### General

Before using this generating set it is very important to identify the set correctly. To communicate for service or ordering parts it is also essential to correctly identify the generating set. Also for the daily operation of the generating set it is necessary that the operator knows the correct specifications.

#### 1.5.1 Identification plate

All required identification data are on the identification plate.

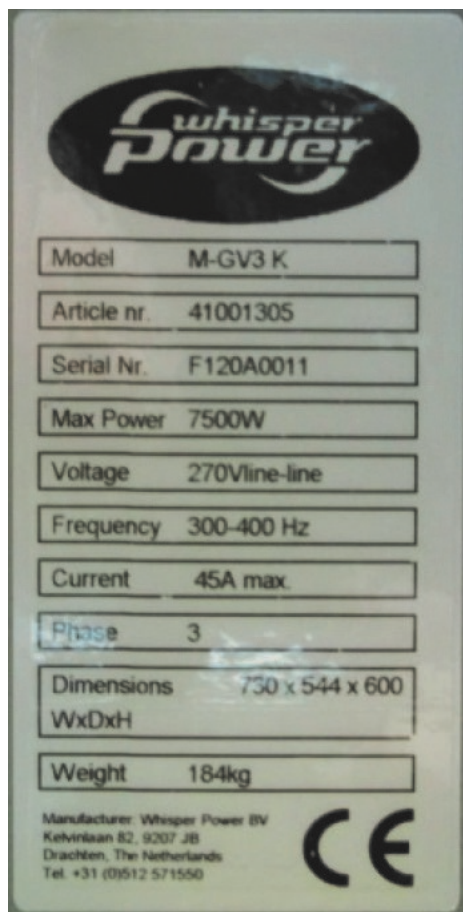
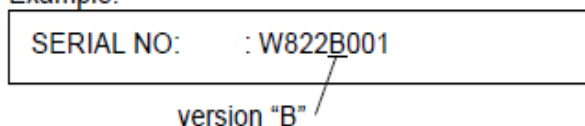


Fig. 1: Identification plate.

- 1 The identity of the generating set is given by the SERIAL NUMBER.

Example:



When this number is available the manufacturer can trace the specifications of the generating set. On the identification plate are also some basic features of the set:

## 2 POWER

The identification plate gives the nominal maximum continuous load in kVA (= kW) calculated with power factor one. When calculating a load, one should always take into account the power factor or  $\cos \phi$  of this load. The power should never exceed the nominal power as shown on the identification plate. Power is rated at an ambient temperature of 25°C. For higher temperatures the generating set has to be derated. To drive the radiator fan (230 V or 230/400 V fan) output could be taken from power generated by the genset. In

that case net power will be less than specified on the identification plate

## 3 VOLTAGE shows the nominal voltage.

This voltage should be within the specified tolerance at the nominal frequency and a balanced load. The W-SQ-Pro 15 and W-SQ-Pro 18 1 and 3 phase alternators can be connected in different configurations.

The 1 phase alternators can only be connected as 1 phase 230 volt.

The 3 phase alternators can be connected as 3 phase 230/400 volt (STAR) or as 3 phase 230 volt (DELTA). The 3-phase alternator is not designed and rated for single phase applications.

The nameplate indicates the connection as made in the factory. For changing the connection please contact WhisperPower.

BE AWARE THAT THE CONNECTIONS COULD BE RECONNECTED BY FORMER USERS.

- 4 FREQUENCY is shown in Hz and is determined by the speed of the engine (RPM). 50 Hz correlates with 1500 rpm. Whisper Power offers generators for 1800 rpm 60 Hz applications as well. When necessary a W-SQ-Pro 15 1phase and 3phase model can be build for 60 Hz applications. A 60 Hz special manual is available upon request. The Generator W-SQ-Pro 18 is not available in 60Hz version.

- 5 CURRENT shows the maximum current that is acceptable at the specified frequency, voltage and power factor. The indicated current is the current between two phases that can be taken off three times.

- 6 WEIGHT shows the net dry weight (approximately) in kg. This is without fuel, oil, cooling liquid, packing and external installation equipment

- 7 CE-marking: the "CE" symbol shows that the generating set is build according to European Community safety regulations. This includes the regulations regarding the safety of pleasure craft, safety of machinery, electric safety and electric magnetic compatibility (EMC) and other relevant directives.

Safety also relies on the installation, application and circumstances. See also the remarks in this manual under SAFETY. Before changing a factory setting you are advised to consult the manufacturer. When the generating set you have to identify is not new you have to take into account the possibility that former users may have changed the settings. Check the settings (voltage, frequency, rpm) when there is any doubt.

---

## 2 INFORMATION

### 2.1 SAFETY

When correctly installed and used in normal circumstances this generating set fulfils EC safety regulations. This generating set could be part of an installation or could be used in a way that additional regulations of the EC or other authorities have to be taken into account.



#### DANGER

Warning signs draw attention to special warnings, instructions or procedures which, if not strictly observed, may result in electrical shock which will result in severe personal injury or loss of life.



Circumstances could make it also necessary to take additional measures. Be aware of wet conditions and hazardous environments caused by explosive gases etc.

#### 2.1.1 Electrical safety



The voltage of 230 / 400 Volt generated by this generating set is dangerous and if instructions and procedures are not strictly observed may result in electrical shock which will result in severe personal injury or loss of life.



Realize that people are not used to have 230 / 400 Volt available on a vehicle. Put warning signs on wall sockets and on junction boxes. Instruct non-regular users of the vehicle. Warn maintenance personnel of garages that do service on the vehicle.

- Check all wiring at least once a year. Defects, such as loose connections, burned cables etc. must be repaired immediately.
- Do not work on the electrical system if it is still connected to a current source. Only allow changes in your electrical system to be carried out by qualified electricians.
- Connection and protection must be done in accordance with local standards.

- **Using the auto-start/stop (interval) mode the generator can start unexpectedly. When working on the electrical system, the 3 Amp digital diesel control fuse must be removed from the control panel and the battery plus cable must be removed from the battery.**



Warning signs indicate parts which could be live.

#### 2.1.2 Earth insulation failures

According to local regulations and depending on the application it could be necessary to take measures for protection against earth insulation failures.

In the standard delivery “neutral” and “ground” are not connected. To make a connection between “neutral” and “ground” could be necessary as part of a specific insulation failure protection system.



In all situations the transfer switches between shore, inverter and generator should switch both neutral (N) and all phase lines (L1, L2 and L3). Of course this is the case when using a Whisper Switch.

#### 2.1.3 Installation

Whisper generating sets are not self contained and have to be properly installed in enclosed areas. Installation includes measures to be taken to outlet exhaust fumes which contain carbon monoxide and are extremely dangerous. Carbon monoxide (CO) is an invisible odorless gas. Inhalation produces headache, nausea or death. Installation includes measures for proper ventilation, safe electric connections, safe installation of the starting battery, proper fitting of the cooling system and fuel pipes etc. Refer to the installation manual.



Do not use the generator set when the vehicle is inside a building or in other enclosed areas. Be aware using the generator in wind still conditions, when the exhaust fumes could accumulate under, around or even in the vehicle.

### 2.1.4 Operation

External moving parts like fans and V-belts are covered by the sound shield and therefore the W-SQ-Pro 15 and W-SQ-Pro 18 are very safe when the sound shield is closed.



Nevertheless take note of the signs on the generating set which show symbols in a triangle indicating danger.



When service has to be carried out while the engine is running, be aware of moving parts like V-belts.

- The generating set should be operated by authorized personnel only.
- Be aware of hot parts and especially parts of the exhaust system and the cooling system.
- If the generating set is unsafe, fit danger notices and disconnect the battery positive (+) lead so that it cannot be started until the condition is corrected.
- Do not attempt to operate the generating set with a known unsafe condition. Disconnect the battery positive (+) lead prior to attempting any repairs or cleaning inside the enclosure.
- Always consult the manual before carrying out maintenance.
- Do not change the settings without consulting the manufacturer. Keep a record of setting changes in this manual.

### 2.1.5 Fire and explosion



Fuels can be flammable. Proper handling limits the risk of fire and explosion.

- Avoid refilling the fuel tank while the engine is running. When oil or fuel is leaking do not use the generating set.
- Do not run the engine close to explosives or gasses.
- Hydrogen gas generated by charging batteries is explosive. Ensure for proper ventilation. Do not smoke or allow sparks, flames, or other sources of ignition around batteries.
- Keep a fire extinguisher on hand.

- In case of fire do not open the sound shield. To avoid serious injury or death from fire, shut down engines, generator sets and blowers. Break through the label which is indicated by **BREAK THROUGH HERE** and then immediately discharge entire contents of gaseous portable fire extinguisher through the fire extinguisher port. On the generating set this fire extinguisher port is indicated by the label as shown in figure 2.
- Poor electrical connections or using wiring which is not suited for the rated currents can cause overheating and possibly fire.

### 2.1.6 Chemicals

- Fuels, oils, coolants, and battery electrolyte can be hazardous to personnel if not treated properly. Do not swallow or have skin contact with these liquids. Do not wear clothing that has been contaminated by fuel or lubricating oil.
- Gaskets may be manufactured from asbestos. Particles of this material should not be inhaled as this may result in fatal diseases.
- On no account allow any unprotected skin to come into contact with the injector spray as the fuel may enter the blood stream with fatal results.
- Engines may be fitted with seals or O-rings manufactured from "Viton" or similar material. When exposed to abnormal high temperatures in excess of 400°C an extremely corrosive acid is produced which cannot be removed from the skin. If signs of decomposition are evident, or if in doubt, always wear disposable heavy duty gloves.

## 2.2 TRANSPORT, LIFTING AND STORAGE



When lifting the generating set avoid any risk of personal injuries, do not stand under the generating set.

- Use soft slings to avoid damage
- On the engine are two hoist eyes which can be used to take the generator out of the capsule. They can also be used to lift the complete generating set including the capsule.



- After transporting the generating set check for damage before installation.
- Long term storage can have detrimental effects on engine and alternator. The engine should be put through an engine preservation procedure. (Refer to the maintenance chapter)
- The alternator windings tend to condense. To minimize condensation, store the generating set in a dry and warm storage area.
- After removing the generating set from long term storage perform an insulation check. (Refer to the alternator maintenance paragraph for procedures)
- While the battery is stored it should be recharged every 12 weeks.

## 2.3 W-SQ-PRO 15 AND W-SQ-PRO 18

### Features

This generating set includes a diesel engine which is connected by close coupling to an alternator in a sound attenuated capsule. The set is mounted on a steel base frame and mounted securely on anti vibration mounting pads to the capsule base. All cables and hoses are guided through the capsule's sides. The set is not self contained and is only operable after proper installation using additional accessories and installation materials.

Installation accessories are listed in the installation manual and are available through the supplier of the generating set. The full automatic Digital Control is based on microprocessor technology. Several automatic start/stop functions can be programmed and monitored (refer to Digital Diesel Control User Manual).

#### 2.3.1 Remote control

The full automatic remote control panel including 15 meters cable comes as standard with the Whisper generating set.

#### 2.3.2 Documentation

Included in the delivery are:

- User manual generator
- Installation manual generator
- Manual DDC
- Test form
- Commissioning form
- 2x type plate

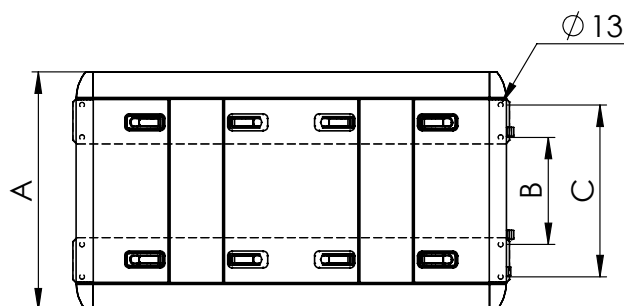
In this manual there is a list of important parts for maintenance and spare parts as well as a chapter on maintenance and problem solving.

## 2.4 COMPONENTS

### 2.4.1 Main components to identify

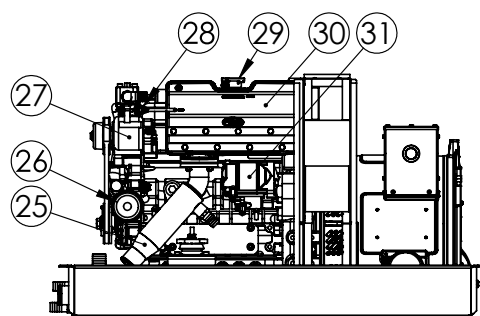
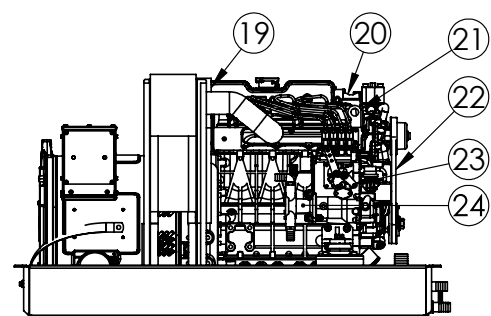
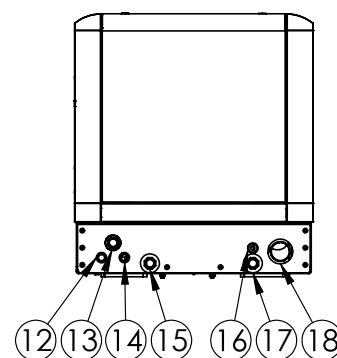
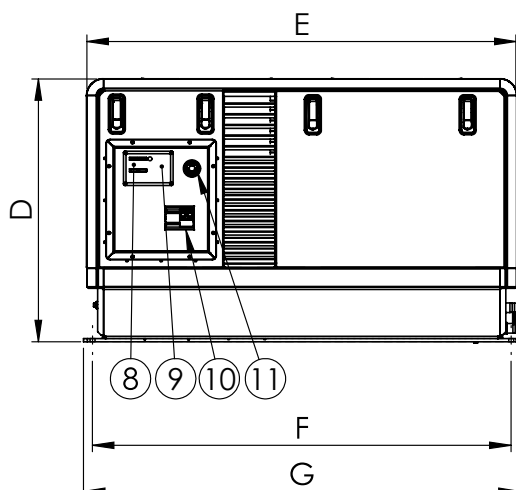
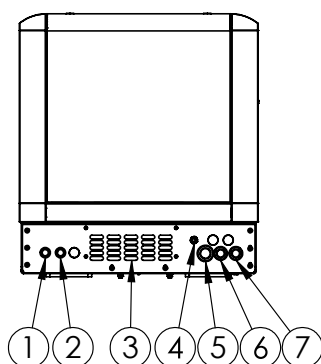
1. Battery "black" 35mm<sup>2</sup>
2. Battery "red" 35mm<sup>2</sup>
3. Air inlet
4. Earth lug M10
5. AC cable 3G 10mm<sup>2</sup> (1phase)  
AC cable 4G 6mm<sup>2</sup> (2phase)  
AC cable 5G 4mm<sup>2</sup> (3phase)
6. Communication cable
7. Fuel pump power cable
8. Fuses
9. Local Control Panel
10. Circuit breaker
11. Emergency stop \*option
12. Fuel out 8mm
13. Syphon in hose 3/4"
14. Fuel in 8mm
15. Water in hose 3/4"
16. Drain
17. Syphon out hose 3/4"
18. Exhaust  
Marine: Ø50 hose con.

## SQ- Pro 15



19. Air filter
20. Oil fill
21. Lifting eye
22. V-belt
23. Accelerator
24. Water pump
25. Exhaust
26. Oil filter
27. Dynamo
28. Temperature sensor
29. Coolant fill
30. Manifold
31. Starter motor

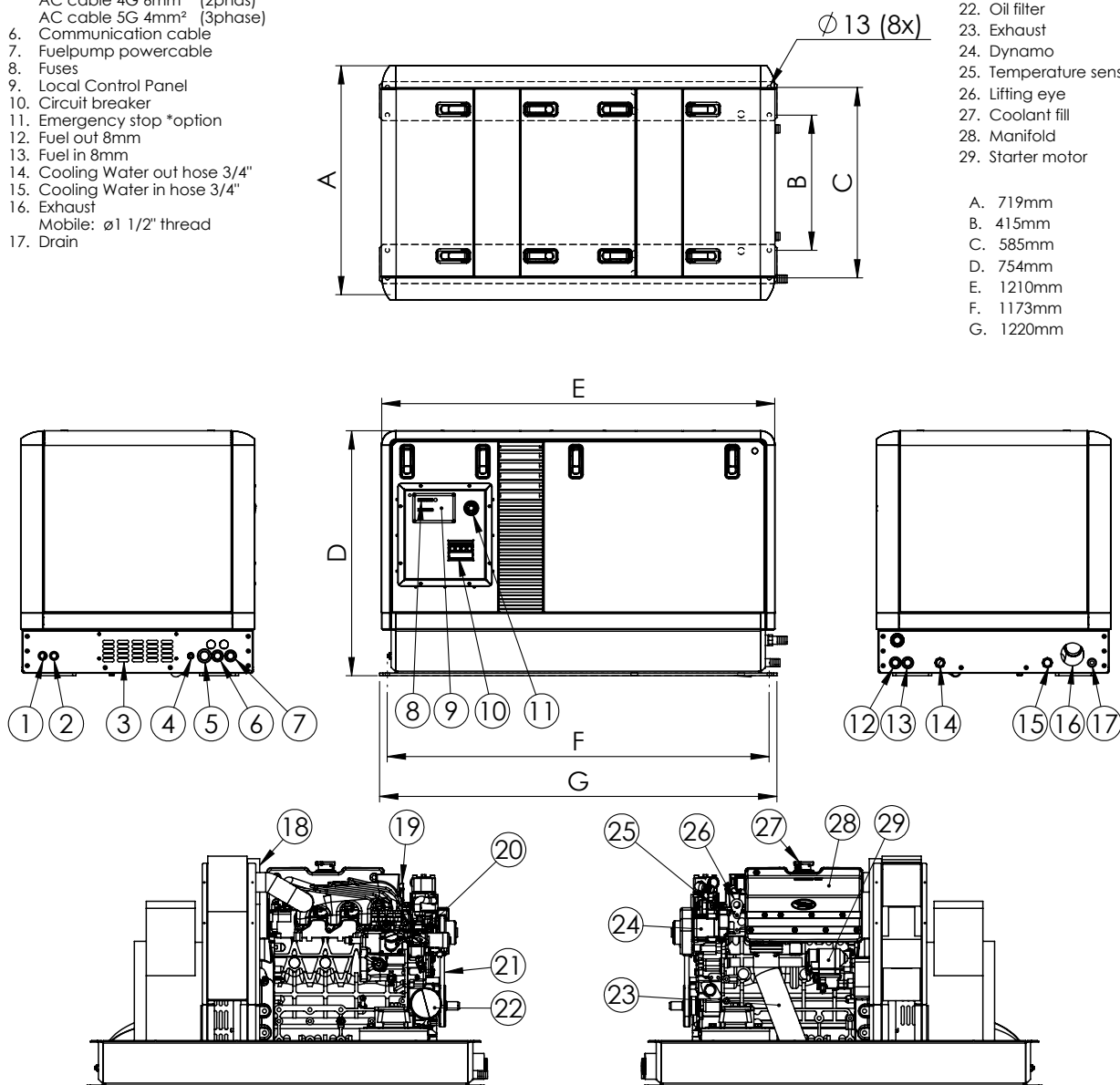
- A. 625 mm
- B. 281 mm
- C. 451 mm
- D. 690 mm
- E. 1129 mm
- F. 1098 mm
- G. 1145 mm



# SQ-Pro 18

1. Battery "black" 35mm<sup>2</sup>
2. Battery "red" 35mm<sup>2</sup>
3. Air inlet
4. Earth lug M10
5. AC cable 3G 10mm<sup>2</sup> (1phase)
6. AC cable 4G 6mm<sup>2</sup> (2phas)
7. AC cable 5G 4mm<sup>2</sup> (3phase)
8. Communication cable
9. Fuel pump power cable
10. Fuses
11. Local Control Panel
12. Circuit breaker
13. Emergency stop \*option
14. Fuel out 8mm
15. Fuel in 8mm
16. Cooling Water out hose 3/4"
17. Cooling Water in hose 3/4"
18. Exhaust
19. Dynamo
20. Temperature sensor
21. Lifting eye
22. Coolant fill
23. Manifold
24. Starter motor

18. Air filter
19. Oil fill
20. Accelerator
21. V-belt
22. Oil filter
23. Exhaust
24. Dynamo
25. Temperature sensor
26. Lifting eye
27. Coolant fill
28. Manifold
29. Starter motor



#### 2.4.2 Generator control panel

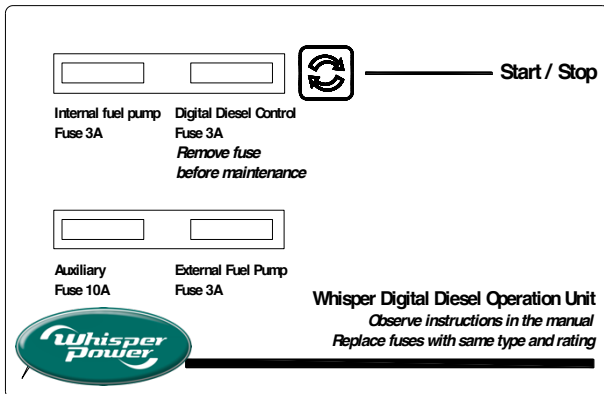


Fig: 2 Control panel.

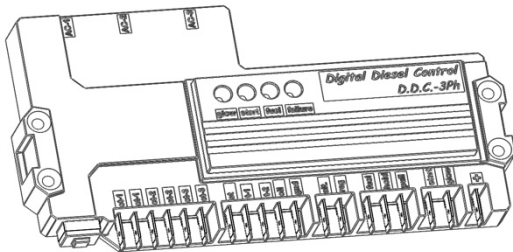
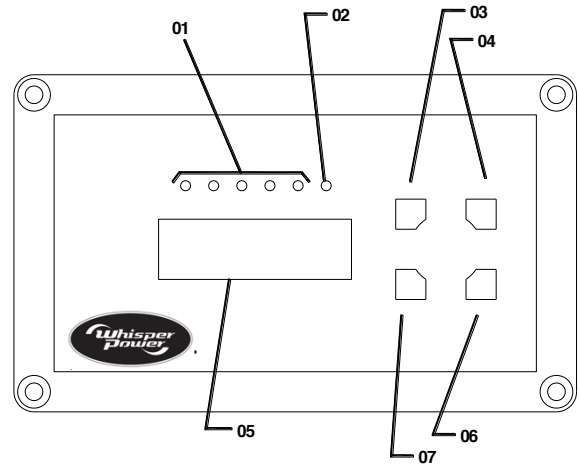


Fig. 3: Digital Diesel Control unit

#### 2.4.3 Remote control panel



- 01 Generator load indicator
- 02 Failure LED
- 03 Start button
- 04 Stop button
- 05 Display
- 06 Select button
- 07 Set button

Fig. 4: Digital Diesel remote control panel

## 2.5 TECHNICAL INFORMATION

### 2.5.1 AC alternator

The synchronous alternator is directly coupled, one bearing, brushless, rotating field design, 6 or 12 wire (depending on the alternator model), four poles, (1500 RPM) and regulated by an Automatic Voltage Regulator (AVR). The exciter stator has a residual magnetism, which guarantees self-exciting of the generator on start-up (that thereby generates a residual voltage of about 10% nominal voltage).

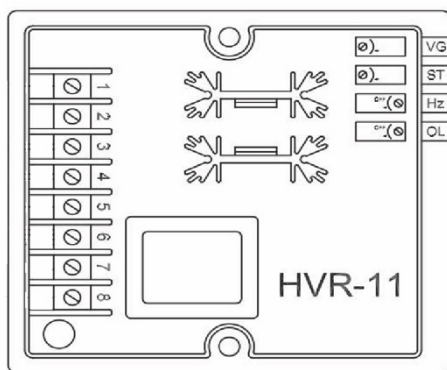


Fig. 5: Automatic Voltage Regulator (AVR)

The AVR, powered by an auxiliary circuit on the main stator, acts on the exciter stator indirectly controlling the field generated by the main rotor by means of the sequence exciter rotor - diode bridge - main rotor.

The voltage regulator controls and keeps constant the average voltage constant on one phase. The voltage setting on the AVR can be adjusted with the help of a trimmer "VG" (See par.5.3)

A frequency control progressively deactivates the machine when the drive motor speed drops below a pre-set, adjustable threshold preventing over-excitement at low operating speeds and abating the load engage effects on the engine.

The AVR works only within limits of the set frequency 50 Hz. When operating below the lower limit of  $46 \text{ Hz} \pm 1 \text{ Hz}$  the AVR will stop regulating to avoid overloading the exciter coil. When applying the generator set at 60 Hz the AVR is re-adjustable as well. To operate at 60 Hz the engine RPM and Digital Diesel Control settings must also be changed. For the USA market a dedicated manual is available for 60 Hz applications. Please refer to the WhisperPower service center for specific instructions to convert the generating set to 60 Hz. It is not possible to take off the full power from the W-SQ-Pro 15 3phase by reconnecting the alternator to single phase (or dual voltage 60 Hz). WhisperPower offers dedicated single phase and dual voltage 60 Hz generators.

The AVR, power comes from 6 or 12 wires (depending on the alternator model) that can be connected in Star or Delta

arrangements to take off different voltages. For 3phase 230/400V, the alternator should be connected in a Star arrangement. For 3phase 230V, the wires should be connected in a Delta arrangement. For 1phase 230V, the wires should be connected in series arrangement.

Further technical data on the connections of the alternator can be found in drawings and diagrams in this manual. See section 2.5.17 (6 wires) or section 2.5.18 (12 wires).

### 2.5.2 Engine

The W-SQ-Pro 15 and W-SQ-Pro 18 generating set are based on the Kubota V1505 and V2203 4 cylinder 4 stroke diesel engine. The engine is indirectly injected. The engine is liquid cooled and the coolant is cooled by a radiator. The engine has been specially adapted for the WhisperPower application and is very different from the standard engine supplied for industrial applications!

### 2.5.3 Digital Diesel Control system Fig. 3

The standard electrical engine control system is 12 Volt negative earth, non earth return (ungrounded) is available as option. Check your identification data to determine which system is applied. The system is designed according to the "energize to run" system. The Digital Diesel Control is a very advanced microprocessor based full automatic system. Besides automatic start the system offers many monitoring options. Refer to the separate Digital Diesel Control user's manual. The Digital Diesel Control is located in the electrical cabinet.

### 2.5.4 Battery charger

On the engine is an alternator generating 50 Amp 12V. This current is rectified to charge the battery. The voltage is regulated at  $\pm 14.4\text{V}$ .

### 2.5.5 Alarms and shut down

In the event of malfunctioning this will be indicated by the failure light, details will be shown on the display and the engine will be shut down. There are three functions guarded: oil pressure, coolant temperature and alternator temperature.

All alarm switches are closed when no malfunction occurs. A contact is cut in the event of an alarm. This means that the generating set will not work when the alarm switches are broken or there is a loose wire. The system therefore is intrinsically safe. The panel will display details about the alarm.

### 2.5.6 Monitoring

Refer to the operating of the Digital Diesel Control.

### 2.5.7 Control Fig. 2

The generating set can be operated by push buttons on the panel on the alternator or by the remote control. By pushing the START button the control system is activated and will

start the engine automatically. Pushing the STOP button will stop the engine and the electrical system will be deactivated.

#### 2.5.8 Remote control Fig. 4

All wiring connections from the remote control to the board are made by plug in connectors.

An intermediate communication cable is in the standard supply. If necessary, an optional longer 8 wire communication cable can be connected if the standard length does not suit the required distance. Numerous remote control units can be put in parallel by using the connectors on the back of the units. The WhisperPower generating sets can be connected to a WhisperPower Touch panel. On this panel a complete WhisperPower system including the generator can be monitored and controlled. (Refer to the manual of the WhisperPower Touch panel for more information)

#### 2.5.9 Hour counter

The remote control offers several timer functions that helps to schedule maintenance.

#### 2.5.10 Load indicator

On the remote control the load will be indicated on the display and by the LED-bar. The load is measured by a current transformer on the alternator.

#### 2.5.11 Fuel specification

The engine must only be used with diesel fuel oil which conforms to the standards for use in modern diesel engines. Fuel free from water and contaminants is of the utmost importance.

#### 2.5.12 Oil information

##### 1 Specification:

The oil must fulfil the specifications written in the maintenance chapter. The Kubota engine must be run on heavy duty lubricating oil meeting the requirements of API class CD, CF or CF\_4.



It is very important to use the correct oil specification. Very often local oil suppliers recommend a higher class, because they assume that a higher class is allowed. This is not the case. One should not follow these recommendations. Using the wrong specification will cause high oil consumption.

##### 2 Oil viscosity:

We recommend a multigrade oil 15W40.

##### 3 Oil capacity:

Excluding the oil filter, the content of the crankcase is 5.2 l. Including the oil filter it is 5.7 l. Note that the engine may contain some residual oil due to testing at the factory.

While filling, check the lubricating oil level by means of the engine oil dipstick. Do not overfill with oil as this may have a detrimental effect on engine performance.

##### 4 Oil pressure

- Minimum at idle 98 kPa (1 kg. /cm<sup>2</sup> - 14psi) (1 bar).
- Normal at  $\pm 350$  kPa (3.5 kg. /cm<sup>2</sup> - 50 psi) (3.5 bar).

#### 2.5.13 Cooling liquid

The engine is cooled by cooling liquid. The capacity of this system depends on the size of the radiator piping and other parts in the cooling system.



Always use coolant which is compatible with aluminum components of the cooling system. Do not mix coolants with different kinds of chemical compound, as this may cause congelation of the coolant. In case of doubt refresh the content of the entire cooling system.

We recommend not using water but cooling liquid that is marketed for the use in combustion engines. Cooling liquid protects the engine against frost to minus 25° C. Also it protects the engine block against corrosion. Initially one can fill the engine via the filling cap on the exhaust manifold. Fill up till the level is just below the filling cap. Additional filling of engine cooling system has to be done via the expansion tank. When the engine is on temperature the liquid will expand and the redundant liquid will be pressed into the expansion tank. This tank has to be filled up till the mark. On the tank is an overflow connection. This connection can be used to connect an open hose to drain the overflow of the cooling liquid to outside the vehicle.

When cooling liquid is not available clean fresh water could be used with an additive of anti-freeze. When using water with anti-freeze the right mixture has to be calculated according to the information of the supplier of the anti-freeze.

The cooling liquid in the engine is pressurized. A high-pressure hose connects the manifold to the expansion tank.

## 2.5.14 Technical data W-SQ Pro 15

**GENERAL**

Model	W-SQ-Pro 15, 1 phase or 3 phase, mobile applications
RPM 50Hz (60Hz)	1500/1800
Alternator	1 phase or 3 phase synchronous (air cooled)
Engine	Kubota diesel, model V1505
Number of cylinders	4
Displacement (L)	1.5
Bore X stroke	78x78.4 mm
Combustion air consumption	1.8 m <sup>3</sup> /min.
Continuous power engine	11 kW
Cooling system	By means of a radiator.
Fuel lift pump engine	electric pump (12 V DC), additional pump available upon request
Starting battery (optional)	55 Ah 12V
Fuel consumption	0.5 / 3.1 liter/hour, load dependent
Control	Digital Diesel Control including automatic start/stop

**ELECTRICAL SPECIFICATIONS**

Output voltage	230/400V 50 Hz alternating current (AC) three phase, re-connectable to three phase 230V
Output rating	12 kVA = 12kW at power factor cos phi = 1
Voltage tolerance	± 2% (balanced load)
Frequency tolerance	± 1% (electronic governor)
Alternator	Air cooled, brushless, four pole, 6 or 12 wire, synchronous
Voltage regulation:	AVR

**MECHANICAL SPECIFICATIONS**

Supply includes	Sound shield with steel base, mounted on rubber anti vibration mounts. (Generator set without sound shield is optional)
Dimensions L x W x H	1145 x 625 x 690 Mm
Color	Black + White RAL 9010
Weight	410 kg including sound shield
Angular operation continuous	20 degrees
Standard supplies	Digital remote panel (+15 m cable), fuel filter, fuel lift pump, user and installation manuals
Available as option:	Installation kits, non earth return (ungrounded), spare part kits

## 2.5.15 Technical data W-SQ Pro 18

### GENERAL

Model	W-SQ-Pro 18, 1 phase or 3 phase, mobile applications
RPM 50Hz (60Hz)	1500/1800
Alternator	1 phase or 3 phase synchronous (air cooled)
Engine	Kubota diesel, model V2203
Number of cylinders	4
Displacement (L)	1758 cm <sup>3</sup>
Bore X stroke	78x78.4 mm
Combustion air consumption	1.8 m <sup>3</sup> /min.
Continuous power engine	14 kW
Cooling system	By means of a radiator.
Fuel lift pump engine	electric pump (12 V DC), additional pump available upon request
Starting battery (optional)	80 Ah 12V
Fuel consumption	0.5 / 3.1 liter/hour, load dependent
Control	Digital Diesel Control including automatic start/stop

### ELECTRICAL SPECIFICATIONS

Output voltage	230/400V 50 Hz alternating current (AC) three phase, re-connectable to three phase 230V
Output rating	14 kVA = 14kW at power factor cos phi = 1
Voltage tolerance	± 2% (balanced load)
Frequency tolerance	± 1% (electronic governor)
Alternator	Air cooled, brushless, four pole, 6 or 12 wire, synchronous
Voltage regulation:	AVR

### MECHANICAL SPECIFICATIONS

Supply includes	Sound shield with steel base, mounted on rubber anti vibration mounts. (Generator set without sound shield is optional)
Dimensions L x W x H	1220 x 719 x 754 Mm
Color	Black + White RAL 9010
Weight	495 kg including sound shield
Angular operation continuous	20 degrees
Standard supplies	Digital remote panel (+15 m cable), fuel filter, fuel lift pump, user and installation manuals
Available as option:	Installation kits, non earth return (ungrounded), spare part kits



## 2.6 WIRING CODES AND COLORS

### WIRING COLOURS W-SQ-PRO 15 1 & 3PHASE - MOBILE

Description	Cable number	Color	Cross section	3 phase only
Starter motor > Alternator	1	Red	10 mm <sup>2</sup>	
Battery > starter motor	1	Red	35 mm <sup>2</sup>	
Starter motor > DDC	1	Red	36 mm <sup>2</sup>	
Starter motor > LCP	1	Black	1,5 mm <sup>2</sup>	
Generator EXC- > AVR M1	3	Black	1,5 mm <sup>2</sup>	
Generator EXC+ > AVR M3	4	Black	1,5 mm <sup>2</sup>	
AVR M3 > AVR M4	5	Black	1,5 mm <sup>2</sup>	
Generator WT > AVR WT	6	Black	1,5 mm <sup>2</sup>	
Generator YL > AVR M5	7	Black	1,5 mm <sup>2</sup>	
Generator BK > AVR M6	8	Black	1,5 mm <sup>2</sup>	
Generator GN > AVR M6	9	Black	1,5 mm <sup>2</sup>	
Measuring Coil T1:S1> DDC ct1	10	Red	2,5 mm <sup>2</sup>	
Measuring Coil T1:S2> DDC ct1	11	Black	2,5 mm <sup>2</sup>	
Measuring Coil T2:S1> DDC ct2	12	Red	2,5 mm <sup>2</sup>	3 phase only
Measuring Coil T2:S2> DDC ct2	13	Black	2,5 mm <sup>2</sup>	
Measuring Coil T3:S1> DDC ct3	14	Red	2,5 mm <sup>2</sup>	
Measuring Coil T3:S2> DDC ct3	15	Black	2,5 mm <sup>2</sup>	
Fuel Pump + > LCP	17	Black	1,5 mm <sup>2</sup>	
Generator R > DDC hold	18	White	1,5 mm <sup>2</sup>	Gen. D+
DDC hold > Bridge Rectifier	18	Green	1,5 mm <sup>2</sup>	
Bridge Rectifier > Fuel Solenoid hold	18	Green	1,5 mm <sup>2</sup>	
Bridge Rectifier > Fuel Solenoid pull	19	Pink	2,5 mm <sup>2</sup>	
DDC pull > Bridge Rectifier -	19	Pink	2,5 mm <sup>2</sup>	
Fuel Pump - > LCP	20	Black	1,5 mm <sup>2</sup>	
DDC gnd > LCP	20	Black	1,5 mm <sup>2</sup>	
Ground > LCP	20	Black	1,5 mm <sup>2</sup>	
LCP > Temp Switch Exhaust	20	Black	1,5 mm <sup>2</sup>	
LCP > Temp Switch Coolant	20	Black	1,5 mm <sup>2</sup>	
Ground > battery	20	Black	35 mm <sup>2</sup>	
DDC start > Starter motor -	21	Black	2,5 mm <sup>2</sup>	
Alternator L > DDC alt	23	Orange	1,5 mm <sup>2</sup>	
DDC gl > Glow Plugs	24	Black	6 mm <sup>2</sup>	
DDC reg > LCP	37	Black	1,5 mm <sup>2</sup>	
DDC start > LCP	38	Black	1,5 mm <sup>2</sup>	
DDC fuel > LCP	39	Black	1,5 mm <sup>2</sup>	
Temp Switch Exhaust > DDC t2	46	Blue/Green	1,5 mm <sup>2</sup>	
Temp Switch Coolant > DDC t1	47	Blue	1,5 mm <sup>2</sup>	
Oil Pressure Switch > DDC oil	48	Violet	1,5 mm <sup>2</sup>	
LCP j7 > LCP j18	49	Black	1,5 mm <sup>2</sup>	
Generator L1-1 > Circuit Breaker -1	L1-1	Brown	16 mm <sup>2</sup>	
Generator L1-1 > DDC ac1	L1-1	Brown	1,5 mm <sup>2</sup>	
Generator N-1 > Contact-2	N-1	Blue	16 mm <sup>2</sup>	
DDC ac1 > Generator-N	N-1	Blue	1,5 mm <sup>2</sup>	
Contact-2 > Circuit Breaker-3	N-1	Blue	16 mm <sup>2</sup>	
Contact-3 > Generator pe	Pe-1	Green/Yellow	16 mm <sup>2</sup>	
Generator U > Circuit Breaker-1	L1-1	Brown	6 mm <sup>2</sup>	3 phase only
Generator U > DDC ac1	L1-1	Brown	1,5 mm <sup>2</sup>	
Generator V > DDC ac2	L2-1	Black	1,5 mm <sup>2</sup>	

Generator V > Circuit Breaker-3	L2-1	Black	6 mm <sup>2</sup>	
Generator W > Circuit Breaker-5	L3-1	Grey	6 mm <sup>2</sup>	
Generator W > DDC ac3	L3-1	Grey	1,5 mm <sup>2</sup>	
Generator N > DDC ac3	N-1	Blue	1,5 mm <sup>2</sup>	
Generator N > Contact-4	N-1	Blue	6 mm <sup>2</sup>	
Contact-4 > Circuit Breaker-7	N-1	Blue	6 mm <sup>2</sup>	
Generator N > DDC ac1	N-1	Blue	1,5 mm <sup>2</sup>	
Generator N > DDC ac2	N-1	Blue	1,5 mm <sup>2</sup>	
Contact-5 > Generator pe	PE-1	Green/Yellow	6 mm <sup>2</sup>	

DDC=Digital Diesel Control Unit

LCP=Local Control Panel

AVR = Electronic Regulation Generator

Description	Cable number	Color	Cross section	3 phase only
Starter Motor > Alternator +	1	Red	10 mm <sup>2</sup>	
Battery > Starter Motor +	1	Red	35 mm <sup>2</sup>	
Starter Motor + > DDC +	1	Red	6 mm <sup>2</sup>	
Starter Motor + > LCP j4	1	Red	2,5 mm <sup>2</sup>	
Generator EXC- > AVR m1	3	Black	1,5 mm <sup>2</sup>	
Generator EXC + > AVR m3	4	Black	1,5 mm <sup>2</sup>	
AVR m3 > AVR m4	5	Black	1,5 mm <sup>2</sup>	
Generator wt > AVR m4	6	Black	1,5 mm <sup>2</sup>	
Generator yl > AVR m5	7	Black	1,5 mm <sup>2</sup>	
Generator bk > AVR m6	8	Black	1,5 mm <sup>2</sup>	3 phase only
Generator gn > AVR m6	9	Black	1,5 mm <sup>2</sup>	
Measuring Coil T1:S1 > DDC ct1	10	Red	2,5 mm <sup>2</sup>	
Measuring Coil T1:S2 > DDC ct1	11	Black	2,5 mm <sup>2</sup>	
Measuring Coil T2:S1 > DDC ct2	12	Red	2,5 mm <sup>2</sup>	
Measuring Coil T2:S2 > DDC ct1	13	Black	2,5 mm <sup>2</sup>	
Measuring Coil T3:S1 > DDC ct3	14	Red	2,5 mm <sup>2</sup>	Gen. D+
Measuring Coil T3:S2 > DDC ct3	15	Black	2,5 mm <sup>2</sup>	
Fuel Pump + > LCP j20	17	Black	1,5 mm <sup>2</sup>	
Alternator R > Vandal resistant Switch-no	18	Black	1 mm <sup>2</sup>	
Alternator R > DDC hold	18	White	1,5 mm <sup>2</sup>	
DDC hold > ECU V2203-15	18	White	1 mm <sup>2</sup>	
DDC hold > ECU V2203-16	18	White	1 mm <sup>2</sup>	Marine Only
DDC ground > LCP j12	20	Black	1,5 mm <sup>2</sup>	
Ground > LCP j17	20	Black	4 mm <sup>2</sup>	
ECU V2203-1 > LCP j11	20	Black	1 mm <sup>2</sup>	
ECU V2203-19 > LCP j16	20	Black	1 mm <sup>2</sup>	
LCP > Temp Switch Exhaust	20	Blue/Pink	1 mm <sup>2</sup>	
LCP > Pickup-1	20	Black	1 mm <sup>2</sup>	
LCP > Temp Switch Coolant	20	Brown/Black	1 mm <sup>2</sup>	
LCP > Coolant Temp Sensor-2	20	Red/Green	1 mm <sup>2</sup>	
Fuel Pump - > LCP j10	20	Black	1,5 mm <sup>2</sup>	
Ground > Battery -	20	Black	35 mm <sup>2</sup>	
DDC start > Starter Motor s	21	Yellow	2,5 mm <sup>2</sup>	
Alternator I > DDC alt	23	Orange	1,5 mm <sup>2</sup>	
DDC alt > ECU V2203-26	23	Black	1 mm <sup>2</sup>	
DDC gl > Glow Plugs	24	Brown	6 mm <sup>2</sup>	

ECU V2203-34 > Governor-2	32	Yellow	1 mm <sup>2</sup>	
ECU V2203-18 > Governor-1	33	Grey	1 mm <sup>2</sup>	
Coolant Temp Sensor-1 > ECU V2203-13	34	Red	1 mm <sup>2</sup>	
Pickup-2 > ECU V2203-17	35	Green	1 mm <sup>2</sup>	
Pickup-3 > ECU V2203-20	36	Pink	1 mm <sup>2</sup>	
DDC reg > LCP j19	37	Black	1,5 mm <sup>2</sup>	
DDC st > LCP j22	38	Red/Green	1 mm <sup>2</sup>	
DDC fuel > LCP j21	39	Grey	1,5 mm <sup>2</sup>	
Vandal resistant Switch + > LCP j5	41	Black	1 mm <sup>2</sup>	3 phase only
LCP j5 > Vandal resistant Switch-C	41	Black	1 mm <sup>2</sup>	
Vandal resistant Switch - > ECU V2203-9	45	Black	1 mm <sup>2</sup>	
Temp Switch Exhaust > DDC t-2	46	Blue/Green	1 mm <sup>2</sup>	
Temp Switch Coolant > DDC t-1	47	Blue	1 mm <sup>2</sup>	
Oil Pressure Switch > DDC oil	48	Violet	1 mm <sup>2</sup>	
LCP-j7 > LCP-j18	49	Black	1,5 mm <sup>2</sup>	
Generator L > DDC ac1	L1-1	Brown	1,5 mm <sup>2</sup>	
Generator L > Circuit Breaker-1	L1-1	Brown	16 mm <sup>2</sup>	
Generator N > Contact-3	N-1	Blue	16 mm <sup>2</sup>	
Generator N > DDC ac1	N-1	Blue	1,5 mm <sup>2</sup>	
Contact-3 > Circuit Breaker-3	N-1	Blue	16 mm <sup>2</sup>	
Contact-4 > Generator PE	PE-1	Green/Yellow	16 mm <sup>2</sup>	

DDC = Digital Diesel Control Unit

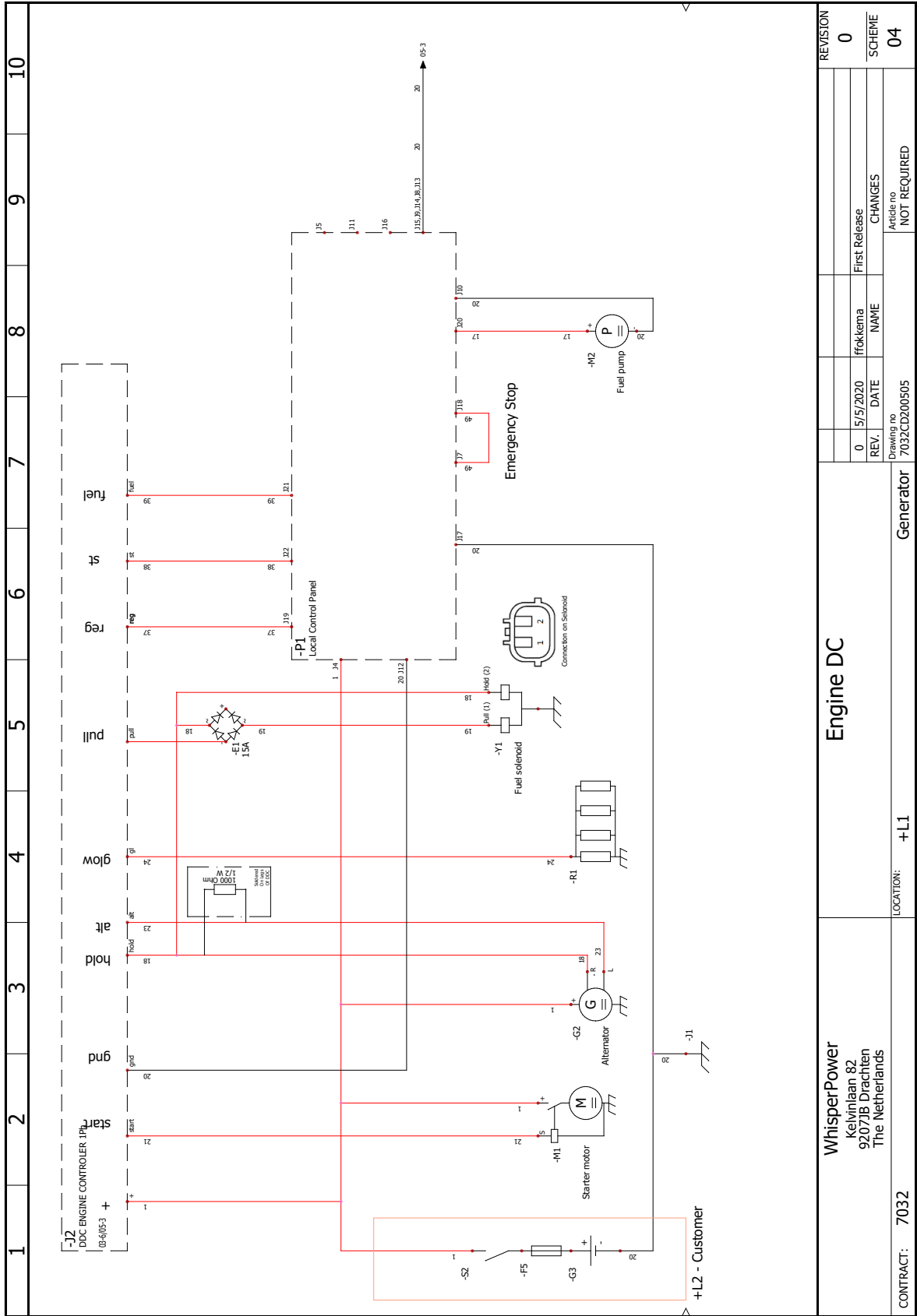
LCP = Local Control Panel

ECU = Engine Control Unit (Kubota)

AVR = Electronic Regulation Generator



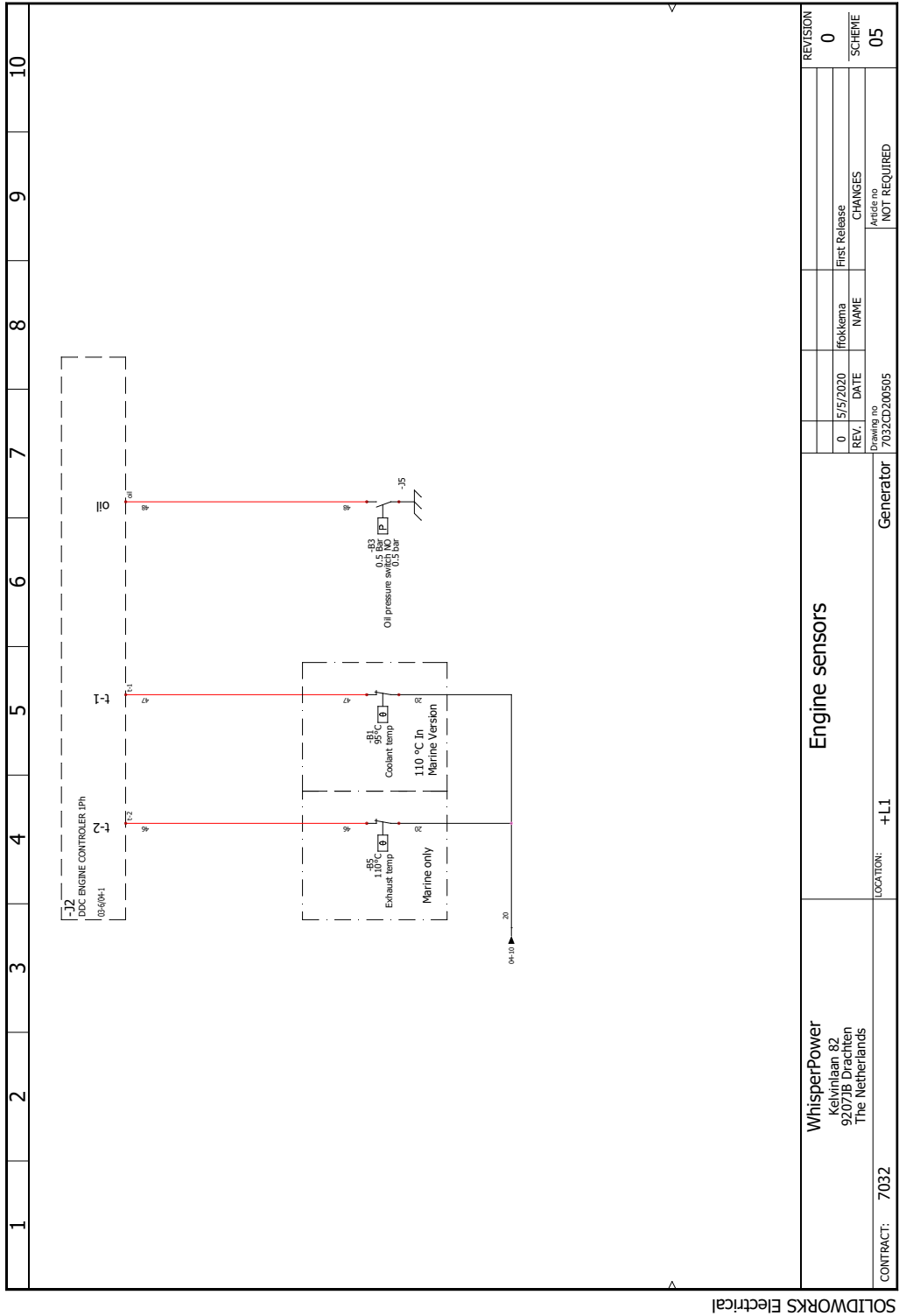
## 2.6.2 Lay out control wiring W-SQ PRO 15 1-Phase Kubota

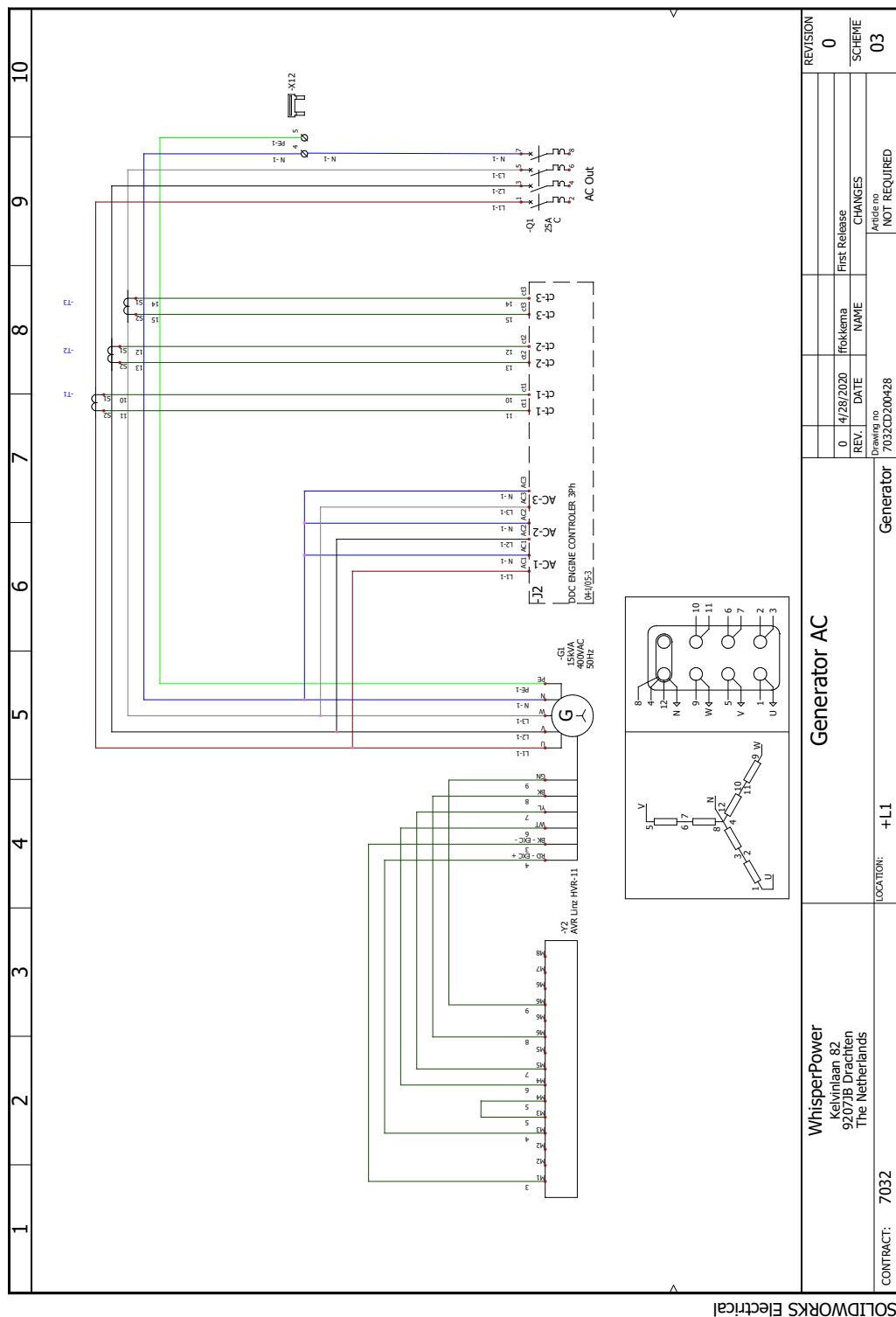


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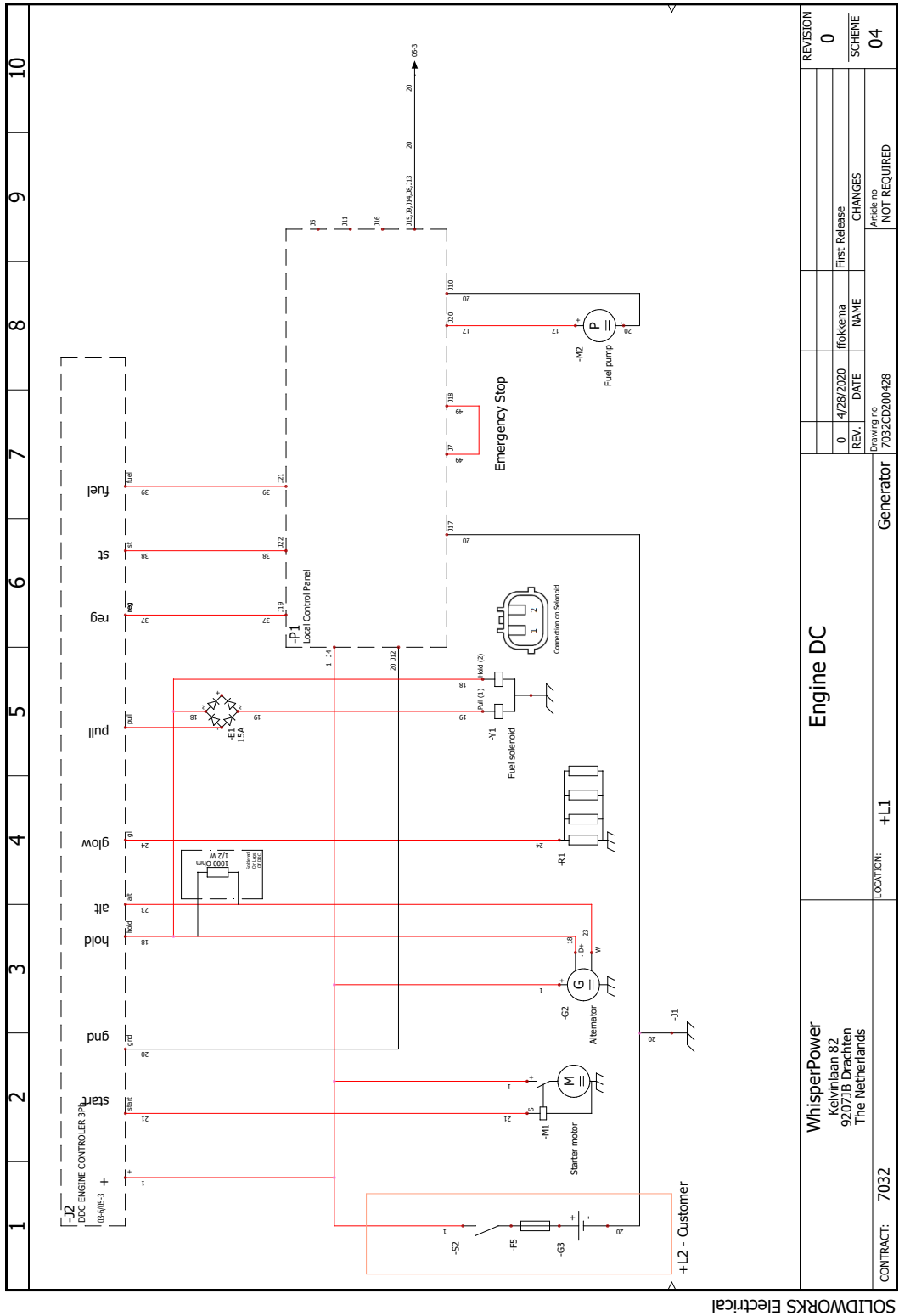


2.6.3 Lay out control wiring W-SQ PRO 15 1-Phase Kubota



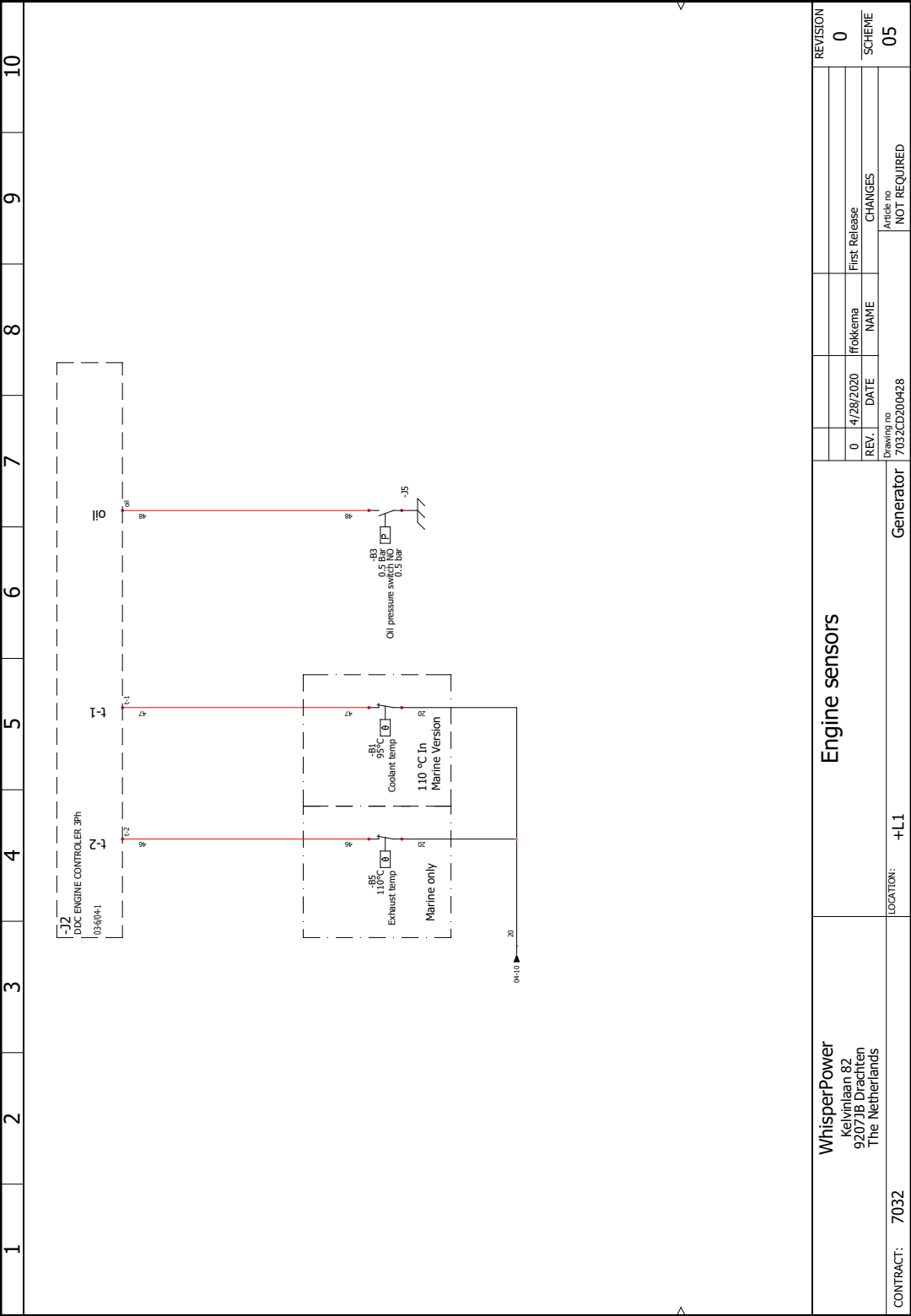


2.6.6 Lay out control wiring W-SQ PRO 15 3-Phase Kubota

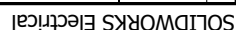




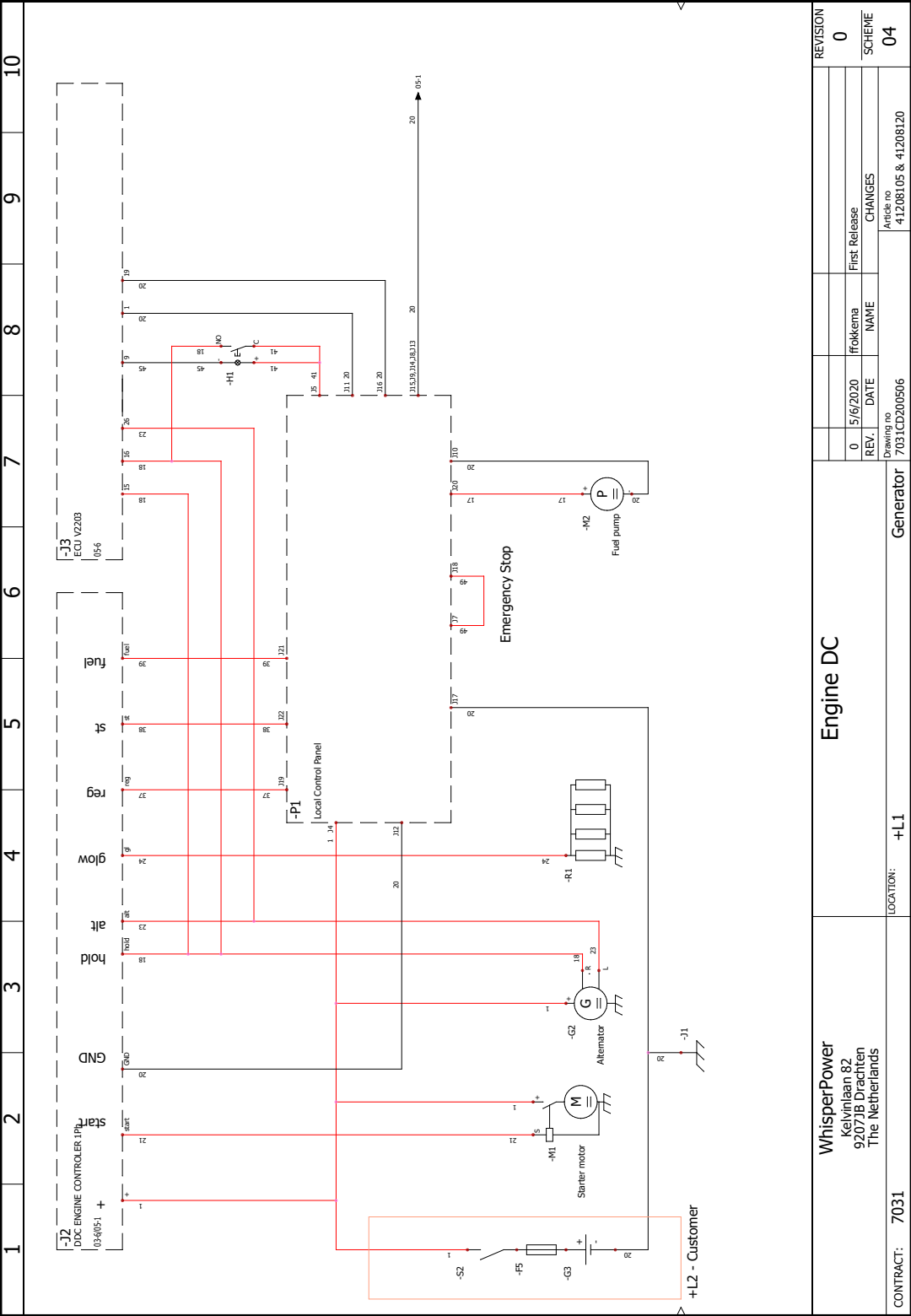
2.6.7 Lay out control wiring W-SQ PRO 15 3-Phase Kubota



## 26

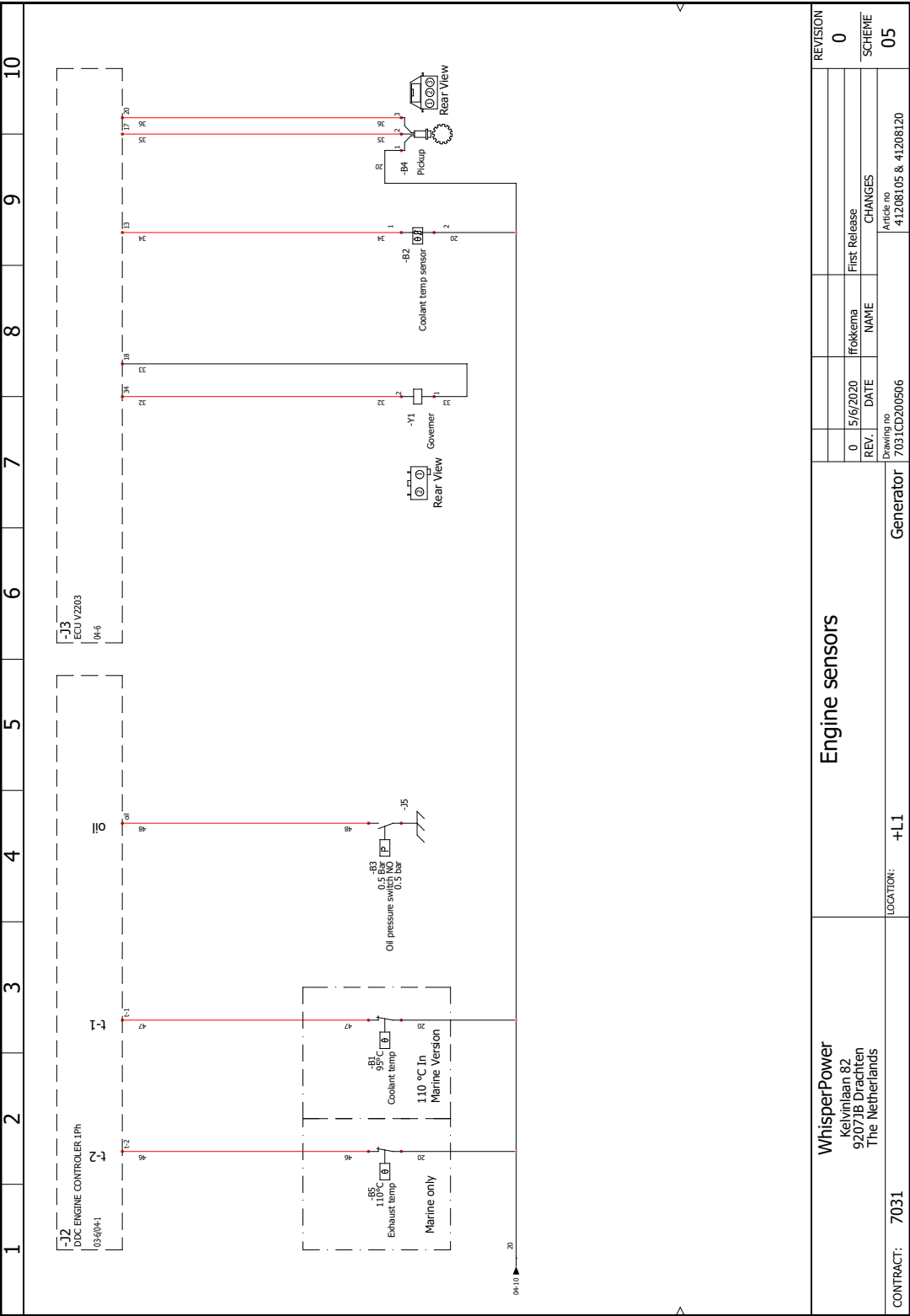


2.6.9 Lay out control wiring W-SQ PRO 18 1-Phase Kubota



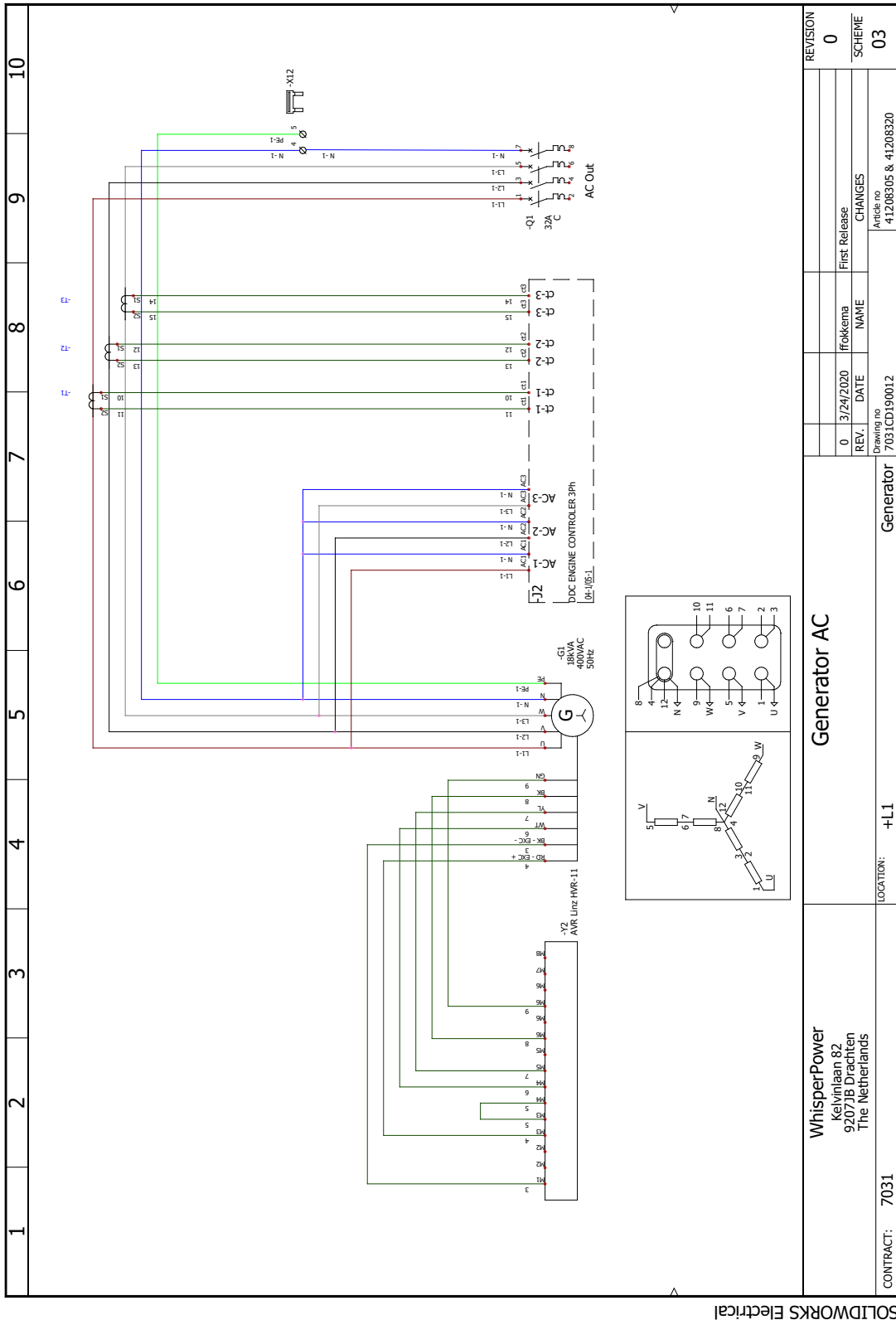
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WhisperPower		Kelvinlaan 82		9207JB Drachten		The Netherlands		0	
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								CHANGES	
								04	
								Article no	
								41208105 & 41208120	
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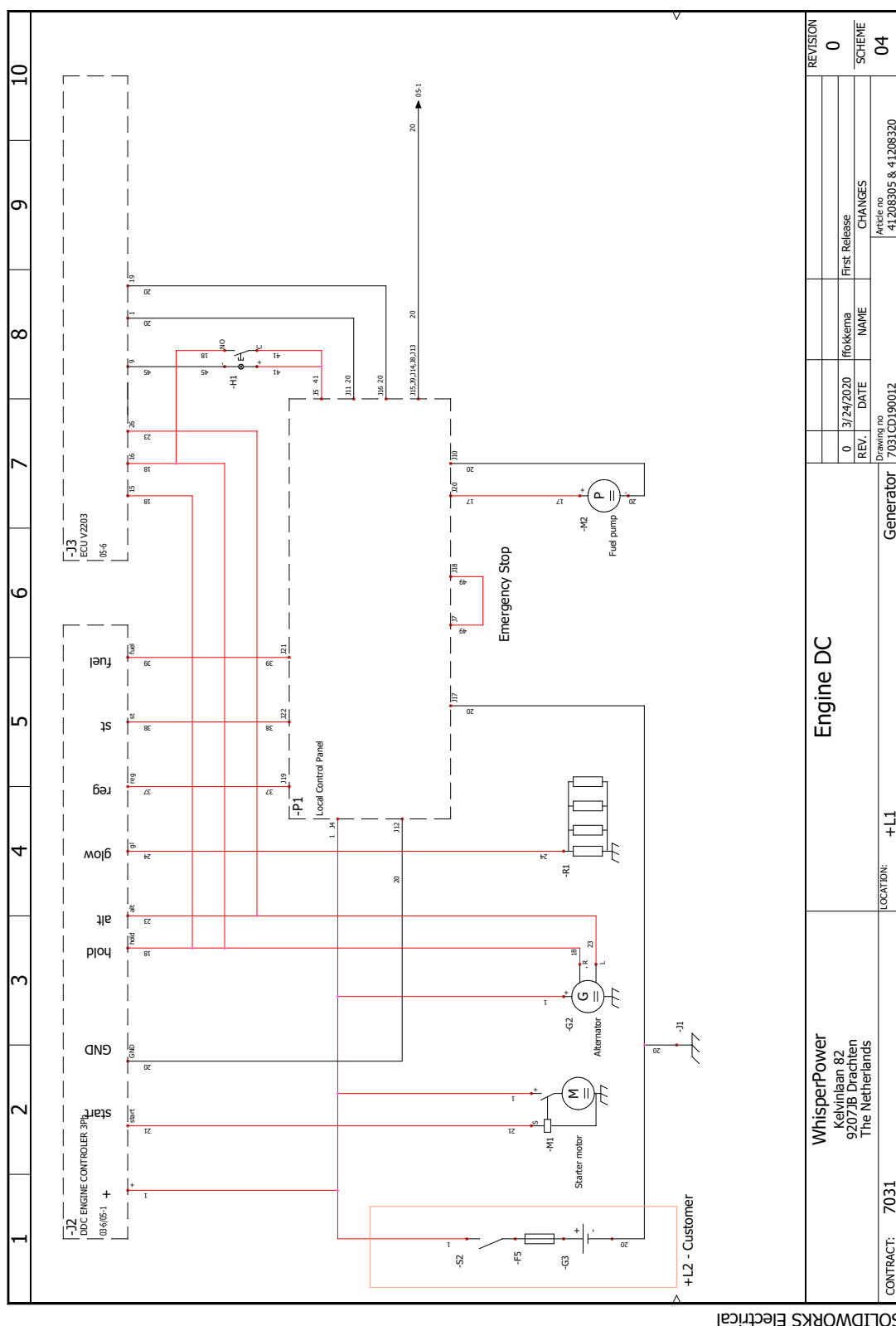
# 2.6.10 Lay out control wiring W-SQ PRO 18 1-Phase Kubota



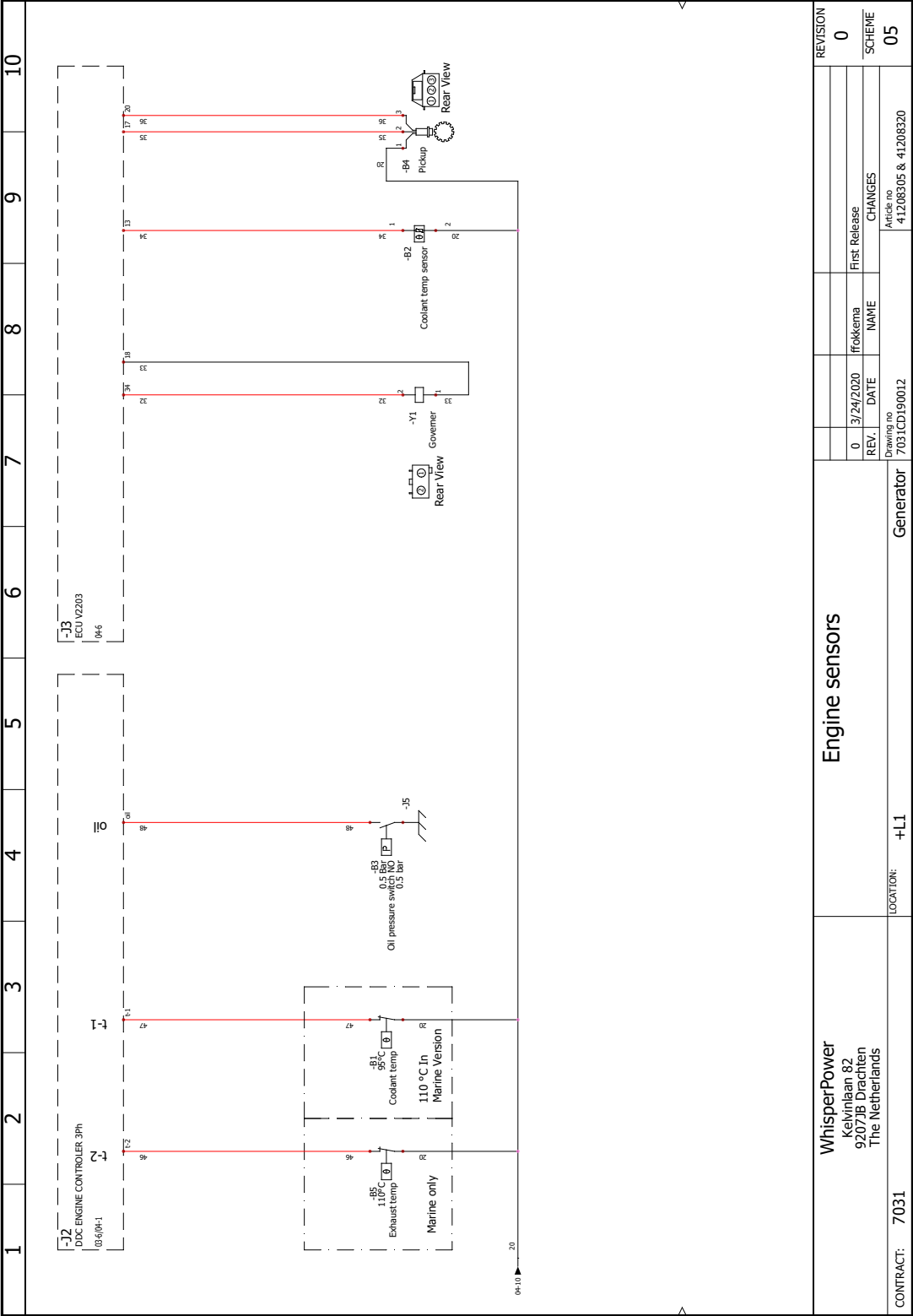
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## 2.6.11 Lay out control wiring W-SQ PRO 18 3-Phase Kubota





2.6.13 Lay out control wiring W-SQ PRO 18 3-Phase Kubota



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## 2.6.14 Electrical diagrams radiator fan connection

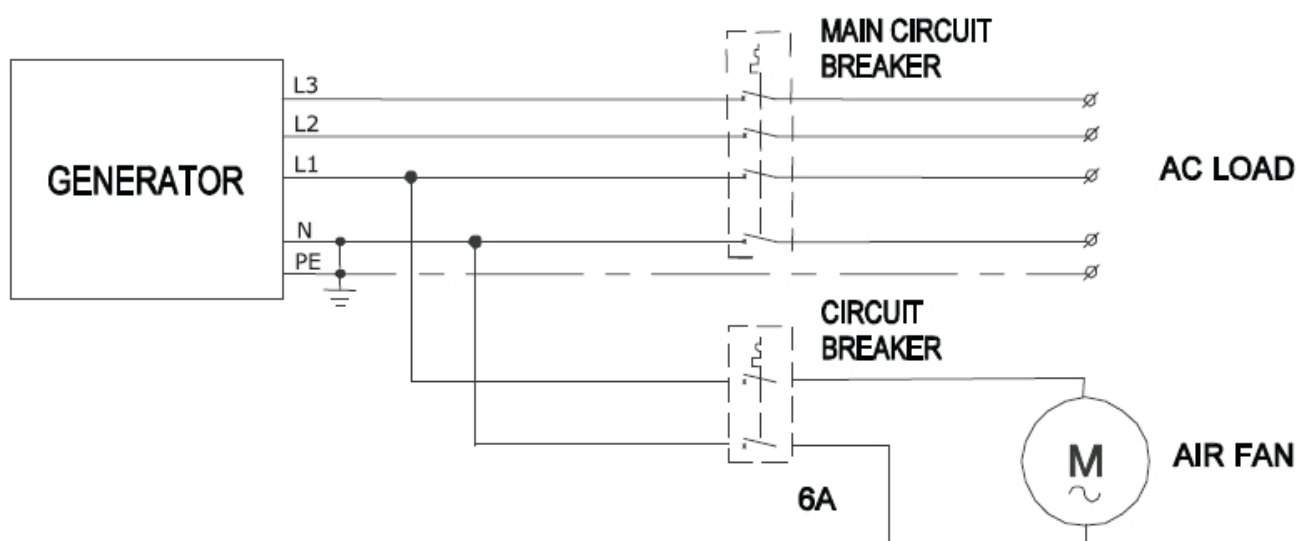


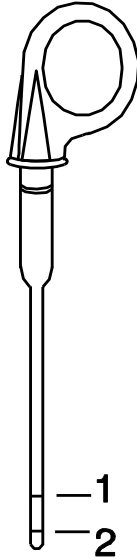
Fig. 6: Electrical diagram for standard fan control using a 230 Volt AC radiator fan



## 3 OPERATION

### 3.1 GENERAL

The generating set is operational after full installation and filling up with: fuel, engine lubricating oil and cooling liquid, connecting the battery to earth and connecting the digital remote control panel.



- 1 Maximum oil level
- 2 Minimum oil level

Fig. 7:

### 3.2 OPERATING INSTRUCTIONS

#### 3.2.1 Summarized operating instructions (daily use)

Routine "pre-start" checks:

- 1 Check oil level (refer to fig. 7).
- 2 Check cooling system (coolant level).
- 3 Power source selector switch (off/external power/generator power). Switch to power source switch "OFF" or switch off all consumers in the usual way. If an external WhisperPower Switch is installed, this operates automatically.
- 4 Switch on battery switch (when installed).
- 5 Fuel valve: open.

Starting:

Push the start button on the control panel (fig.2), to initiate the full automatic starting procedure. You can monitor the procedure on the display. In operation checks:

- 1 Check for abnormal noise or vibration
- 2 Check the voltage
- 3 Power source selector switch (off/external power/generator power). Switch to power source generator. If an external Whisper Switch is installed, this operates automatically.

- 4 Before loading the generating set up to maximum, have it run warm. Continuous load should be restricted to 70 % of maximum load.

Stopping generator:

- 1 Switch off all electrical devices (consumers). If the generating set has been running under full load for a longer period, do not shut it down abruptly. Reduce the electrical load to about 30% of the rated load and let it run for approx. 5 minutes.
- 2 Press the STOP button.
- 3 Switch to another AC power source, if available. If an external WhisperPower Switches installed, this is done automatically.

#### 3.2.2 Extended operating instructions

Check when starting the first time or after a longer period of rest:

- 1 If there is any damage caused by transport or installation.
- 2 Check if the installation conforms to the installation instructions.
- 3 Ensure the generating set is free to turn without obstruction.
- 4 Check all hoses and hose connections for leaks.
- 5 Check all cables and cable end terminal connections.
- 6 Check the engine and generator mounting bolts.

Routine "pre-start" checks:

- 1 Check engine oil level.

The generator switches off in the event of insufficient oil-pressure. Even when the oil level is too low the oil pressure can be high enough. Do not run the generator with the oil level below the lowest mark on the dipswitch, because a smaller volume of oil will become contaminated considerably quicker than a larger volume. Therefore we recommend daily oil-checks. Check oil level prior to starting the engine or at least 5 minutes after the engine has stopped.

- 2 Check coolant in the expansion tank.
- 3 Check for leakages.
- 4 If no External WhisperPower Switches used: Switch main Power Source Selector switch to "OFF" or switch off all devices.
- 5 Switch on the battery switch.

#### Starting the generator:

By pushing the start button briefly the electric system is activated, the fuel lift pump starts pumping and the starting procedure will begin (by pushing the Stop button the system is deactivated).

The first time starting up or after running out of fuel it could be necessary to prime the fuel system. (Refer to bleeding fuel system instructions in the maintenance chapter).

A restart protection prevents starting the engine when it is already running, which could cause damage.

#### Checks once the generator is in operation:

- 1 Check for abnormal noise or vibration.
- 2 Check the voltage.
- 3 Power source selector switch (off/external power/generator power). Switch to power source generator. If an external WhisperPower Switch is installed, this operates automatically.  
Before loading the generating set up to maximum, have it run warm. The first 50 hours of running the continuous load should be restricted to 70 % of maximum load. Running for long periods at no load or light load in the first 50 hours can cause cylinder glazing and high oil consumption.

#### Engine load during longer operation:

Please ensure that the generating set is not overloaded. Overloading occurs when the electrical load (demand) is so high that the generator cannot be turned around properly by the diesel engine. Overloading causes the engine to run rough, while using oil and excessive fuel and producing soot by the exhaust. The engine can even stop.

The generator should therefore only be loaded at the maximum rated power for short periods (2-3 hours) only! The high peak current is meant for the ability to start electrical devices that need a high current for starting especially electric motors and compressors (from a still stand state).

In order to prolong the generating set's life expectancy, the nominal electrical demand on the system should be about 70% or the rated generating set's maximum load. Please note this when switching on your electrical devices! Nevertheless, the W-SQ12 is designed so as not to overheat, even under extreme conditions.

Do not run the generator for very long periods at no load or at very low load. When this is necessary do load the generator at least one hour in 10 hours for minimum 70%. Long term running at too low load will cause the exhaust to be choked by carbon.



Never remove the battery while the engine is running or any electrical cable while the battery is connected in the circuit. Only disconnect the battery with the engine stopped and all switches in "OFF" position

#### Stopping the generating set:

- 1 Avoid stopping of the generator abruptly after a long period of operation at high load! Doing so, you avoid unnecessary thermal load to your generating set!  
Act as follows:  
Prior to switching off the generating set, decrease the generator load (i.e. turn off most electrical users) and let the generator run at low load for approx. 5 minutes to allow the engine to get properly cool (the influent coolant must flow through the system in order to cool the engine).  
If the generator is operating in a hot environment and you do not act as given above, the excessive heat in the engine can trip the "high temp" alarms. In that case, a restart of the engine is not possible for some time. It is also recommended to switch off electrical users prior to stopping the generator because of the voltage drop that occurs as the engine comes to a halt. Such voltage drops may cause damage to electric motors, compressors (in refrigerators or air conditioners etc.).
- 2 Press the STOP button.
- 3 Switch to another 230 / 400 Volt power source, if available. If an external WhisperPower switch is installed, this is done automatically.

## 4 MAINTENANCE

### 4.1 ALTERNATOR

The alternator does not require any maintenance. Periodic inspection and cleaning are recommended, depending on environmental conditions.

However, when the alternator has been idle for a long period attention to winding condition is recommended. The condition of windings can be assessed by measurement of insulation resistance to earth (see section 5.3.5, Meggering). All bearings are greased for life and not regreasable.

### 4.2 ENGINE

#### 4.2.1 Preliminary instructions

All regular maintenance can be carried out when the enclosure is open. When oil and dirt has gathered in the enclosure measures have to be taken to avoid spilling oil and polluting the environment.

The first service on the engine should be carried out after 50 hours of its life and after a major overhaul. In the first 50 hours the engine should receive special attention:

Long periods of light or no load running in the first 50 hours may lead to cylinder glazing and high oil consumption.



For the same reason it is of the greatest importance to use the right oil specification

The first time starting up or after running out of fuel it could be necessary to prime the fuel system.

#### 4.2.2 Bleeding fuel lines

The system is self bleeding. The first time starting up or after running out of fuel it could be necessary to prime the fuel system.

- 1 Ensure there is sufficient fuel.
- 2 Release the fuel bleed screw (1). See fig. 8.
- 3 Push the start button activating the electric system and activating the fuel pump. When more time is needed to bleed, push "start" and hold on the local control panel (so not on the remote panel) Hold as long as necessary to bleed the system.
- 4 Retighten the fuel bleed screw (1) when no further air bubbles are expelled.

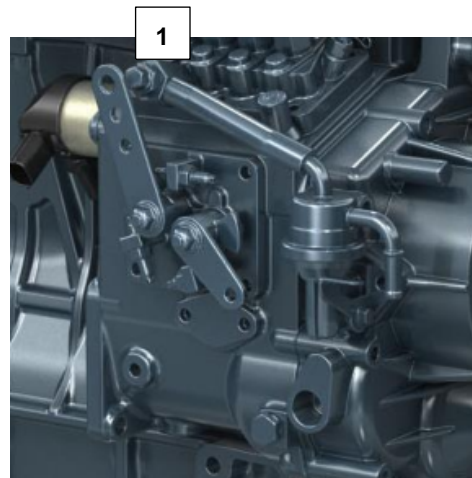


Fig. 8: Bleeding fuel lines 1 = Fuel bleeding screw

#### 4.2.3 Valve clearance

When the engine is in cold condition both valves (inlet and outlet) should have a clearance between 0.25 mm. The adjustment has to be done at TDC (refer to § 5.4.2).

#### 4.2.4 Replacing fuel filter

Filter change depends on contamination of the fuel, but should be done however, at least every 300 running hours. Before changing the filter, clamp off the supply line. Remove the hoses from filter and attach them on the new filter again. The arrow on the filter housing indicates the direction of the flow. A clogged filter results in a lack of output of the generating set.

#### 4.2.5 Replacing oil filter

The oil filter of the SQ-Pro 18 is on the service side. With the SQ-Pro 15, the filter is on the non-service side. Replacement has to be executed according to the schedule in this manual. Drain the oil using a sump pump and put some tissues under the filter.

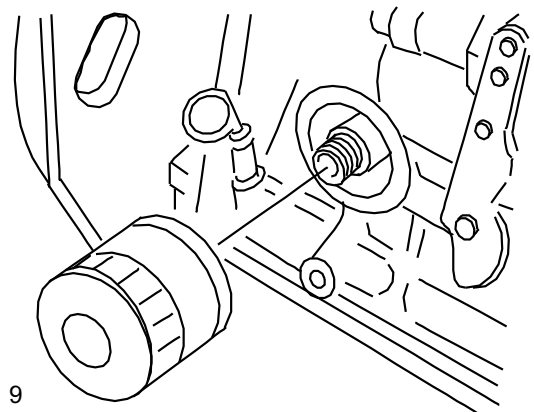


Fig. 9

A smear of oil has to be put on the seal of the filter before fitting the filter. The filter should be fastened by hand: when the rubber touches the metal turn 3/4 further.

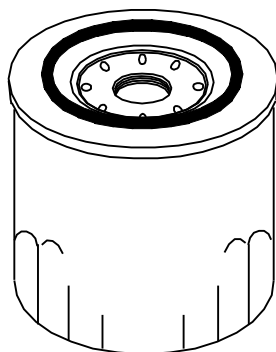


Fig. 10

#### 4.2.6 Readjustment V-belt

The alternator bracket allows for readjust of the V-belt. Deflections should be 10 mm (refer to fig. 11)

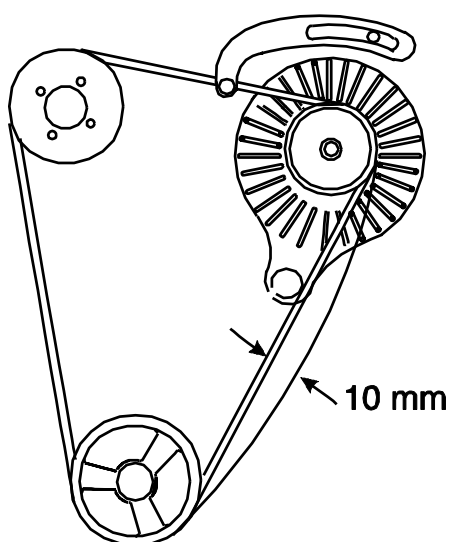


Fig. 11

#### 4.2.7 Air filter element

The interval for cleaning the air filter element (figure 12) strongly depends on environmental conditions. Check the condition of the element at least every 500 running hours, but at least every six months.

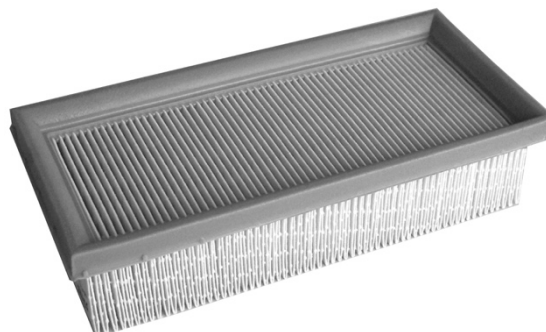


Fig. 12: Air filter element

### 4.3 REGULAR MAINTENANCE

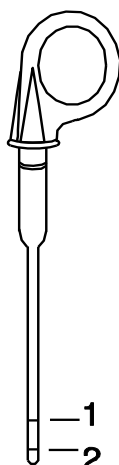
#### CHECK DAILY:

- Oil level (see fig. 13)

Make sure the oil level is never below the mark. Do not add oil when the level is still above the mark.

- 1 Minimum oil level
- 2 Maximum oil level

Fig. 13:



#### CHECK DAILY:

- Level cooling liquid
- Hoses for loose connections or deterioration.

#### AFTER FIRST 50 HOURS:

- Change oil and replace the oil filter.  
Have the engine run until it is on temperature and stop it. Replace the oil filter. Drain oil by the sump pump into a suitable retainer and fill up with fresh oil. Start the engine again and have it run for 5 minutes. Stop the engine again and pause for a few minutes to let the oil gather in the crankcase. Check the level again and add oil when necessary.
- Check and tighten nuts, bolts, and unions, paying particular attention to the fuel system.
- Observe the exhaust at the normal full load. The exhaust must be free from soot. Do not allow the engine to run with a dirty exhaust without investigating the cause as this may result in an expensive breakdown.
- Check and readjust V-belt.
- Check the electrical connections.

#### EVERY 150 HOURS:

- Change oil.
- Check the battery acid level (not applicable when WhisperPower batteries are used).
- Check battery terminals for corrosion
- Check and readjust V-belt

#### EVERY 300 HOURS:

- Replace the oil filter.
- Replace the fuel filter  
Replacement depends on the condition of the fuel. We recommend replacement every 300 hours. Isolate the fuel supply and change the element.

#### EVERY 500 HOURS:

- Check the air strainer element and the air filter element.

#### EVERY 1000 HOURS:

- Replace the V-belt.
- Retighten the cylinder head bolts and adjust the valve clearance. (Refer to § 5.4.2).
- Check and clean the radiators

#### EVERY 2000 HOURS:

- Check lubricating oil pressure
- Clean and check or replace fuel injector nozzles and check injection pressure.
- Check the air filter element:
- The air is taken in via the cover on the alternator. Below this cover is a spongy material which filters the air and holds some electrical components which are cooled by the inlet air. This filter does not require regular maintenance. Only in very dusty circumstances this filter should be cleaned. The spongy material can be washed in solvent or replaced.



When the generator set runs less than 100 hours a year the oil should be changed yearly

#### 4.3.1 Maintenance schedule

Check oil level	daily
Check the level of the cooling liquid	daily
Change oil and oil filter	after first 50 hours
Check and tighten nuts, bolts, etc.	after first 50 hours
Check exhaust	after first 50 hours
Check and readjust V-belt	after first 50 hours
Check electrical connections	after first 50 hours
Change oil	150 hours
Check battery	150 hours
Check and readjust V-belt replace impeller	150 hours
Replace oil filter	300 hours
Replace fuel filter	300 hours
Check the air strainer element	500 hours
Check the air filter element	500 hours
Replace the V-belt	1000 hours
Retighten cylinder head bolts and readjust valve clearance	1000 hours
Check and clean radiators	1000 hours
Check lubricating oil pressure	2000 hours
Check injector and injection pressure	2000 hours
Replace or clean the air filter element	2000 hours

#### 4.3.2 Putting out of service

When not using the generating set for a longer period it is recommended to execute an engine preservation procedure.

- 1 Clean the engine.
- 2 Loosen the fuel suction pipe and fuel return and put them in a can with preservation diesel fuel. Start the engine and run the engine warm.
- 3 Drain the hot engine oil and refill with preservation oil.
- 4 Stop the engine.
- 5 The coolant can stay in the engine
- 6 Disconnect the battery and store it in a place free of frost and dry and charge it regularly.
- 7 Close inlet- and outlet openings with tape.
- 8 Protect the generating set against the influences of bad weather conditions.

This method of preservation will be sufficient for 6 months. Repeat steps 2, 3, and 4, every 6 months. Change oil before using the engine again.

## 5 TROUBLE SHOOTING

### 5.1 ALTERNATOR/ ELECTRICAL FAULTS



Beware of parts which are live!



Remove 3 Amp. Fuse in the control panel while working on the generator to prevent the engine from starting

A failure code is displayed when a hardware failure at the generator is detected

#### General

If any problem should occur, check basic conditions and examine all external wiring, switch gear and circuit breakers. Also check if measuring instruments give the correct value. If in doubt, measure directly on the alternator terminals with an independent instrument. These

measurements should only be carried out by an experienced electrician

If during these measurements the engine immediately stops after starting and an error code is displayed at the remote control panel ("AC VOLTAGE"), one can start the generator by means of a "service start" at the service menu (see paragraph "service start" of the user's manual of the Digital Diesel Control). By doing this, the generator will keep running for 2 minutes before it stops. This offers you the possibility to carry out measurements to investigate the cause of the failure.

If the bottom speed is set at too low a frequency, the generator may be damaged. On the other hand too high a frequency can cause voltage drops with high loads.

When the problem is in the RPM refer to the engine fault finding paragraph.

Digital Diesel Control system will help to indicate failures and display causes.

<b>Failure code</b>	<b>Problem</b>
<b>COMMUNICATION</b>	Communication error between the remote DDC panel end the generator
<b>LOW START BAT</b>	Starter battery voltage too low
<b>ALTERNATOR</b>	No output battery charging voltage
<b>AC-ALTERN. TEMP</b>	AC-alternator temperature is too high
<b>WATER TEMP</b>	Coolant temperature is too high
<b>OIL PRESSURE</b>	Oil pressure failure
<b>AC VOLTAGE</b>	Generator AC output voltage is either too high or too low
<b>HIGH CURRENT</b>	Generator is in overload
<b>FREQUENCY</b>	Output frequency of the generator is too low
<b>ECU FAILURE</b>	When the red light is blinking (see fig 14) refer to table page 40 (SQ-Pro 18 only)

Fig. 14 ECU red light

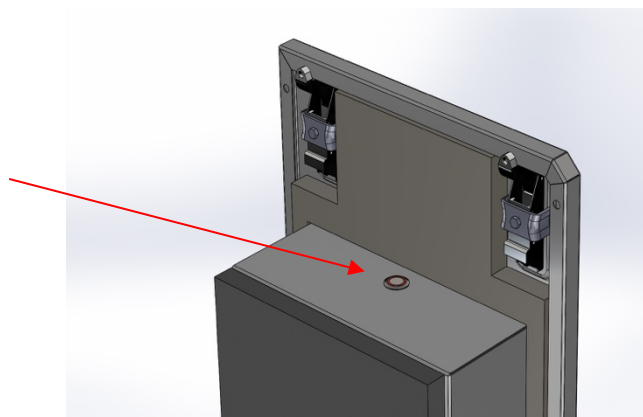



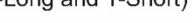
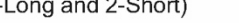

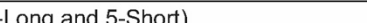





Table ECU signal pattern, these patterns can be read out on the red light of fig 14

**Engine speed cannot be controlled.**

Blinking Pattern of Glow Lamp	Cause	Refer to Checking
(1-Long and 1-Short)  3EEAAAB1P005A	Overrunning (more than 115 %)	Actuator
(1-Long and 3-Short)  3EEAAAB1P007A	Defect of alternator	Alternator
(1-Long and 4-Short)  3EEAAAB1P008A	Coolant temperature is abnormal	Water temperature sensor
(2-Long and 1-Short)  3EEAAAB1P010A	Abnormality of speed sensor	Speed sensor
(2-Long and 2-Short)  3EEAAAB1P011A	Actuator malfunction	Actuator
(2-Long and 4-Short)  3EEAAAB1P012A	Disconnection of water temperature sensor	Water temperature sensor
(2-Long and 5-Short)  3EEAAAB1P013A	Short circuit of water temperature sensor	Water temperature sensor
(2-Long and 6-Short)  3EEAAAB1P014A	Disconnection of alternator L Terminal	Alternator L Terminal
(2-Long and 7-Short)  3EEAAAB1P015A	Excess voltage	Battery
(2-Long and 8-Short)  3EEAAAB1P016A	Short circuit (option)	(Option parts)



## 5.1.1 Trouble shooting table alternator

PROBLEM	CAUSE	SOLUTION
No output (Voltage)	<ul style="list-style-type: none"> <li>• Circuit breaker "off" or faulty fuse.</li> <li>• Faulty use of the AVR.</li> </ul>	Check switches and fuses and measure directly on the alternator to exclude external causes. Check fuse of the AVR.
	<ul style="list-style-type: none"> <li>• Low engine RPM.</li> </ul>	Check the engine RPM and adjust (refer to special procedures).
	<ul style="list-style-type: none"> <li>• Loss of residual magnetism.</li> </ul>	Check the residual magnetism and flash the alternator (refer to special procedures).
	<ul style="list-style-type: none"> <li>• Faulty AVR.</li> </ul>	Check by independent excitation if the problem is in the AVR or in the windings and replace AVR if necessary (see special procedures).
Generator output voltage too low when no load is on it (less than 225V between phase and neutral).	<ul style="list-style-type: none"> <li>• Engine is not reaching the rated RPM.</li> </ul>	Refer to special procedures to readjust RPM.
	<ul style="list-style-type: none"> <li>• Faulty AVR. When slightly too low, adjustment could be necessary.</li> </ul>	Try to readjust AVR. Check by independent excitation if the problem is in the AVR or in the windings and replace AVR if necessary (see special procedures).
	<ul style="list-style-type: none"> <li>• Defective diode</li> </ul>	Check the diode in the rotor and replace (refer to special procedures).
Generator output voltage too low under load (less than 225V between phase and neutral). In no load condition it is OK.	<ul style="list-style-type: none"> <li>• Unbalanced load; check the voltage of the other phases. When the voltages are different this is caused by an unbalanced load.</li> </ul>	Bring load in balance. When slightly out of balance, remove the sense wires to the phase with the highest load and check if the voltage on the other phases is not too high.
	<ul style="list-style-type: none"> <li>• Engine is not reaching the rated RPM. Possibly too much load or engine problems (lack of fuel).</li> </ul>	Switch off a load; (part off) consumers See to engine RPM problems.
	<ul style="list-style-type: none"> <li>• Faulty AVR or readjustment necessary.</li> </ul>	Try to readjust the voltage. Check by independent excitation if the problem is in the AVR or in the windings and replace AVR if necessary (see special procedures).
Generator output voltage too high with load, (more than 235V between phase and neutral) in no load condition it is OK.	<ul style="list-style-type: none"> <li>• Unbalanced load</li> </ul>	Bring load in balance. When slightly out of balance, remove the sense wires to the phase with the highest load and check if the voltage on the other phases is not too low.
Generator voltage fluctuates.	<ul style="list-style-type: none"> <li>• Disturbances on the electrical system/ user side.</li> </ul>	Check if electrical load is fluctuating.
	<ul style="list-style-type: none"> <li>• AVR reacts on fluctuating load.</li> </ul>	Do not apply strong fluctuating loads.
	<ul style="list-style-type: none"> <li>• Engine runs irregularly.</li> </ul>	When engine runs irregularly refer to section: "Engine runs irregularly".
Generator is not able to start an electric motor	If the generator is unable to supply enough power to start an AC electric motor, this is usually because this motor draws too much current during starting.	Check the electric motor's current draw required for starting. This should not exceed the rated generator peak output current. This could be remedied by using a "soft-start". Inquire at your nearest WhisperPower dealer or directly at the manufacturer, WhisperPower in the Netherlands.

## 5.2 ENGINE FAULTS



Remove 3 Amp. fuse in the control panel while working on the generator to prevent the engine from starting.

### General

Most electrical problems relating to Voltage or Frequency are due to wrong engine speed. Note that RPM and Hz are basically the same.

Use the problem solving table to find the cause of a wrong engine speed. When there is no obvious cause one can adjust the RPM (refer to special procedures).

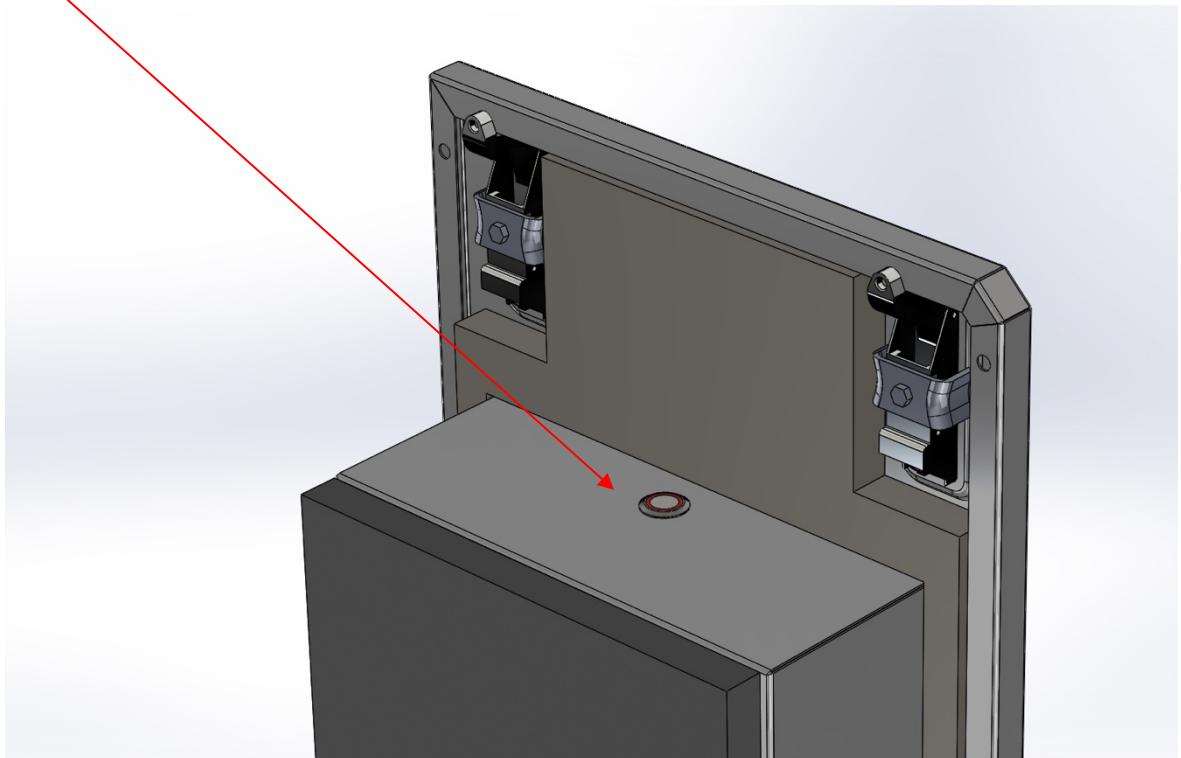
When the engine is not cranking well, starting problems almost always originate from battery problems or poor battery cable connections.

When the engine is cranking, well starting problems almost always originate from lack of fuel or air bubbles in the fuel pipes.

A failure code is displayed when a hardware failure at the generator is detected.

<b>Failure code</b>	<b>Problem</b>
<b>COMMUNICATION</b>	Communication error between the DDC remote panel and the generator
<b>LOW START BAT</b>	Starter battery voltage too low
<b>ALTERNATOR</b>	No output battery charging voltage too
<b>AC-ALTERN. TEMP</b>	AC-alternator temperature is high (generators for mobile applications only)
<b>WATER TEMP</b>	Coolant temperature is too high
<b>OIL PRESSURE</b>	Oil pressure failure
<b>AC VOLTAGE</b>	Generator AC output voltage is either too high or too low
<b>HIGH CURRENT</b>	Generator is in overload
<b>FREQUENCY</b>	Output frequency of the generator is too low
<b>ECU FAILURE</b>	When the red light is blinking (see fig 15) refer to table page 40 (SQ-Pro 18 only)

Fig. 15 ECU red light



## Trouble shooting table engine

PROBLEM	CAUSE	SOLUTION
Diesel engine fails to crank, the starter makes clicking noises, or the engine cranks very slowly.	<ul style="list-style-type: none"> <li>Almost certainly this is an electrical problem. Display will indicate "LOW START BAT"</li> </ul>	Check the condition of the start battery and cabling. Replace if needed.
No reaction at all.	<ul style="list-style-type: none"> <li>Starter battery switched "OFF".</li> </ul>	Check position of the battery switch and switch "ON".
	<ul style="list-style-type: none"> <li>Faulty fuse on the control panel</li> </ul>	Replace fuse.
No reaction or clicking noises, or slow cranking.	<ul style="list-style-type: none"> <li>Starter battery voltage insufficient (battery too weak).</li> </ul>	Check battery voltage. Recharge the battery. Inspect battery terminals and cables for a good electrical connection (inspect against corrosion, tattered wires, etc.)
	<ul style="list-style-type: none"> <li>To thick engine lubricating oil.</li> </ul>	Change oil for a lower viscosity.
	<ul style="list-style-type: none"> <li>Wiring control system faulty</li> </ul>	During the normal starting process, the battery voltage drops to 11V (with a fully charged battery). If the voltage does not drop during starting, the electrical connection is faulty. If the battery voltage drops lower than 11V, then the battery has been internal damage.
Starter is turning engine smoothly, but engine fails to start	<ul style="list-style-type: none"> <li>Starter motor faulty.</li> </ul>	Repair the starter motor.
	<ul style="list-style-type: none"> <li>Out of fuel or faulty fuel, water in the fuel.</li> </ul>	Fill up with fuel or replace with better quality.
	<ul style="list-style-type: none"> <li>Fuel solenoid is not opening (no "click" can be heard).</li> </ul>	Check wire connections and circuitry to solenoid. (Refer to DC wiring diagram)
	<ul style="list-style-type: none"> <li>Fuel lift pump is not working.</li> <li>Fuel filter is blocked.</li> <li>Air in fuel lines.</li> </ul>	Check fuel filter and fuel lift pump: clean or replace if necessary. Bleed air from fuel system (refer to maintenance section).
	<ul style="list-style-type: none"> <li>Wrong valve clearance.</li> </ul>	Adjust valve clearance,
	<ul style="list-style-type: none"> <li>Low compression because of dirty valves.</li> </ul>	Clean valves. Take off the injection exhaust and inspect the outlet port. When little rust in the port clean the valve by taking off the valve spring and rotate until rust is removed. When the outlet port is strongly affected by rust, the exhaust system is not properly installed (refer to paragraph 5.4.3). Contact WhisperPower service department for advice.
	<ul style="list-style-type: none"> <li>Blocked injector.</li> </ul>	Have the injector tested and cleaned if necessary.
	<ul style="list-style-type: none"> <li>Loss of compression by wear out or damage</li> </ul>	Repair by WhisperPower service.
Engine runs irregularly.	<ul style="list-style-type: none"> <li>Unsuitable contaminated fuel</li> </ul>	Fill up with fuel or replace by better quality.
	<ul style="list-style-type: none"> <li>Lack of fuel.</li> </ul>	Check fuel filter and fuel lift pump: clean or replace if necessary.
	<ul style="list-style-type: none"> <li>Choked fuel filter.</li> </ul>	Check fuel filter and fuel lift pump: clean or replace if necessary.
	<ul style="list-style-type: none"> <li>Disturbances on the electrical system/ user side.</li> </ul>	Check if electrical load is fluctuating.
	<ul style="list-style-type: none"> <li>Faulty fuel lift pump.</li> </ul>	Check and repair.
	<ul style="list-style-type: none"> <li>Choked air filter.</li> <li>Lack of air.</li> </ul>	Check the air intake.

PROBLEM	CAUSE	SOLUTION
	<ul style="list-style-type: none"> <li>Choked exhaust system, exhaust blocked.</li> </ul>	Check the exhaust piping; inspect manifold inside.
	<ul style="list-style-type: none"> <li>Air in the fuel pipes</li> </ul>	Bleed air from fuel system (refer to maintenance section).
	<ul style="list-style-type: none"> <li>Faulty electronic governor</li> </ul>	Replace faulty parts.
	<ul style="list-style-type: none"> <li>Blocked injector.</li> </ul>	Have the injector tested and cleaned if necessary.
	<ul style="list-style-type: none"> <li>Wrong valve clearance.</li> </ul>	Adjust valve clearance.
	<ul style="list-style-type: none"> <li>Temporarily hunting (this will disappear when engine has run in).</li> </ul>	
	<ul style="list-style-type: none"> <li>Ongoing hunting caused by faulty electronic governor</li> </ul>	Replace faulty parts.
Engine speed drops	<ul style="list-style-type: none"> <li>Faulty electronic governor</li> </ul>	Replace faulty parts.
	<ul style="list-style-type: none"> <li>Too much oil.</li> </ul>	Drain oil to proper level
	<ul style="list-style-type: none"> <li>Lack of fuel.</li> </ul>	Check fuel supply system: fuel pump and filter.
	<ul style="list-style-type: none"> <li>Lack of intake air.</li> </ul>	Check air intake.
	<ul style="list-style-type: none"> <li>Choked exhaust system, exhaust blocked.</li> </ul>	Check the exhaust piping; inspect manifold inside
	<ul style="list-style-type: none"> <li>Generator overloaded</li> </ul>	Reduce the electrical load (switch off some consumers).
	<ul style="list-style-type: none"> <li>Defective generator (windings, bearings or other)</li> </ul>	Generator must be sent to manufacturer for repair of damaged bearing or winding.
	<ul style="list-style-type: none"> <li>Damaged engine</li> </ul>	Repair by WhisperPower service
Engine does not stop on command	<ul style="list-style-type: none"> <li>Fuel solenoid is not switching off</li> <li>Loss of control</li> </ul>	Faulty Digital Diesel Control unit. Stop the engine manually by the stop handle. Check wire connections to stop solenoid. Check solenoid valve function. Replace if necessary.
Engine exhaust smokes	<ul style="list-style-type: none"> <li>Faint blue smoke - generally the result of light load</li> </ul>	Increase load.
	<ul style="list-style-type: none"> <li>Heavy blue smoke - caused by lubricating oil: Overfull oil sump or worn cylinder bore, stuck broken or worn rings.</li> </ul>	Check the oil level. Check the compression.
	<ul style="list-style-type: none"> <li>Black smoke –incomplete combustion caused by: Overload, choked air filter, inlet temperature too high, unsuitable fuel or water in fuel.</li> </ul>	Check the fuel. Check for overload. Check the air intake.
Engine starts, but stops after 10 up to 30 seconds	<ul style="list-style-type: none"> <li>Protection system stops the engine; this can be caused by oil pressure failure, lack of cooling water. Overload, loose wire or faulty alarm switch. Digital Diesel Control will help to indicate failure.</li> </ul>	Refer to paragraph 2.5.5. and 3.2.2 for information on the alarm system. Bypassing the switches can help to confirm the failure.
Engine stops by itself	<ul style="list-style-type: none"> <li>Overload or short circuit.</li> </ul>	Switch off the consumers and test for short circuit.
	<ul style="list-style-type: none"> <li>Lack of fuel.</li> </ul>	Check fuel supply system: fuel lines, pump, filter, valves, tank level, etc.
	<ul style="list-style-type: none"> <li>Oil pressure low. (oil pressure switch tripped).</li> </ul>	Check oil level. Check engine's oil pressure and have it repaired by WhisperPower.



PROBLEM	CAUSE	SOLUTION
	<ul style="list-style-type: none"><li>Excessive heat in cooling system (thermo-switch tripped).</li><li>Lack of cooling water (exhaust switch tripped).</li><li>Impeller broken.</li><li>Cooling water blocked.</li></ul>	Check cooling liquid level in expansion tanks; check water system flow: water pump, coolant flow. Check if radiator fans work properly and switch to higher speed. Air piping system might block circulation. Almost all problems of overheating are caused by faulty installation: bents in the routing of cooling pipes that capture air bubbles (air locks) or hot air circulating back into the radiators. Refer to installation manual.
	<ul style="list-style-type: none"><li>Air or water in the fuel.</li><li>Blocked air or fuel filter.</li></ul>	Check and clean.
	<ul style="list-style-type: none"><li>Loss of compression by wear out or damage.</li></ul>	Repair by WhisperPower service.
	<ul style="list-style-type: none"><li>V-belt broken or loose.</li></ul>	Readjust or replace V-belt
	<ul style="list-style-type: none"><li>Thermostat faulty</li></ul>	Check thermostat and replace
Sooty, black exhaust.	<ul style="list-style-type: none"><li>Generator is being overloaded. Digital Diesel Control will indicate "HIGH CURRENT".</li></ul>	Check electrical load and switch off some consumers
	<ul style="list-style-type: none"><li>Insufficient intake air.</li><li>Choked air filter.</li></ul>	Check intake air paths and filter, clean and replace if necessary.
	<ul style="list-style-type: none"><li>Fuel injector faulty.</li></ul>	Replace injector.
	<ul style="list-style-type: none"><li>Valve clearance incorrect.</li></ul>	Readjust valve clearance
	<ul style="list-style-type: none"><li>Poor fuel quality.</li></ul>	Use better quality diesel.
	<ul style="list-style-type: none"><li>Poor quality lubricating oil.</li></ul>	Use better quality oil.
	<ul style="list-style-type: none"><li>Continuous running with very low load.</li></ul>	Increase load up to 70% of nominal power and have the engine run for a few hours
Loss of power	<ul style="list-style-type: none"><li>Wrong measurement. Check if the load is measured correctly. Does the Amp meter show the correct value? When calculating the load by multiplying voltage and amps this should be done by using the exact values, taking into account the power factor of the consumers. When any doubt, measure the power directly with an appropriate instrument.</li></ul>	
	<ul style="list-style-type: none"><li>Overfull oil sump.</li></ul>	Bring the oil to the correct level
	<ul style="list-style-type: none"><li>Choked fuel filter.</li></ul>	Replace the fuel filter.
	<ul style="list-style-type: none"><li>Choked air filter element.</li></ul>	Check air inlet openings; clean or replace air filter element.
	<ul style="list-style-type: none"><li>Exhaust blocked.</li></ul>	Check the exhaust system.
	<ul style="list-style-type: none"><li>Faulty fuel pump</li></ul>	Check and replace if necessary
	<ul style="list-style-type: none"><li>Injector blocked.</li></ul>	Have the injector checked.
	<ul style="list-style-type: none"><li>Loss of compression, sticking or damaged piston ring.</li></ul>	Have the compression measured. Clean or replace the rings.
	<ul style="list-style-type: none"><li>Wear out of cylinder.</li></ul>	Have the compression measured and have the engine overhauled.

PROBLEM	CAUSE	SOLUTION
Over-temperature	• Overload.	Take away the overload.
	• Low level of coolant or air in the cooling system	Fill up with coolant and release air bubbles. Check if there are air blocks in the system; refer to the installation manual
	• Broken impeller. • Radiator choked by dirt • Hot air circulation in radiator.	Check the cooling system thoroughly. Clean radiator
	• Broken or slipping V-belt.	Replace and adjust the V-belt tension.
	• Faulty thermostat	Check the thermostat or replace.

### Warnings



Generator must be shut off immediately if:

- Motor RPM suddenly rises or drops.
- Unusual noise comes from generating set.
- Exhaust gases suddenly color dark.
- Engine failure warning light is on

### Service address

If you cannot correct a problem with the aid of the malfunction table, contact your WhisperPower Service Centre or WhisperPower Netherlands for an extended service list, tel: INT +31-512-571550.

### 5.3 SPECIAL PROCEDURES ALTERNATOR

#### 5.3.1 Automatic voltage regulator

The voltage regulator has a  $\pm 1\%$  voltage precision in the machine working range with distortion free loads. The phase voltage can be adjusted by trimmer “**VG**” (see figure 25) from 185 to 290V.

A fuse protects the regulator and generator against overloads and/or faults; an inline fuse holder in one of the wires contains a fuse: rapid type 32x6,3 6,3A.

Another trimmer “**ST**” (stability) allows adapting the regulator to the generator parameters.

The regulator has been built to suppress the voltage surges on releasing the load that are below 20% at nominal load.

#### AVR SETTINGS

To select the AVR settings access the control board after removing the cover. Most adjustments are factory set to ensure satisfactory results in the operating tests on commissioning. Further adjustments may be necessary to ensure optimum operation under specific working conditions.

If the alternator has to operate at 50Hz the jumper “**J**” across the terminals marked “60Hz” has to be left in place, if it has to operate at 60Hz this jumper should be replaced. The output voltage can be changed by adjusting potentiometer “**VG**”. Take the generating set to its nominal speed and turn until the required voltage is obtained.

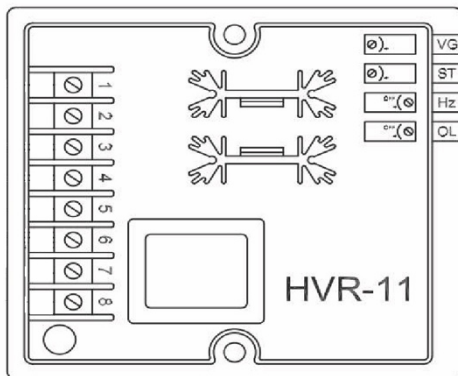


Fig. 16: Automatic Voltage Regulator (AVR)

Setting the bottom speed at 50 (60) Hz: start up rotation of the generating set adjusting it to obtain a frequency of 46 (56) Hz. Turn trimmer “**Hz**” until the voltage begins to drop. Restore nominal speed.



#### CAUTION

If the stationary speed is set at too low a frequency the generator may be damaged. On the other hand, too high a frequency can cause voltage drops with high load.

#### 5.3.2 Residual voltage check / excitation procedure (flashing)

When residual magnetism disappears there is no residual voltage. Residual magnetism can disappear after the generating set being out of service for a long period or a short circuit. This can be solved by exciting the exciter field coil directly, disconnecting the AVR first. Put 12 Volt directly over the electronic regulator terminals taking polarity into account.

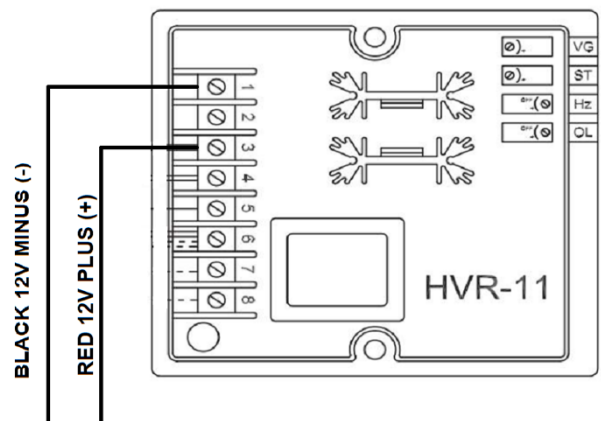


Fig. 17: Residual voltage check / excitation procedure.

When using the starter battery fuse it and limit the current with a 30 Ohm resistor. Flashing can be done while the engine is running and the wiring is connected. When a variac (variable power supply) is available one should be able to control the voltage manually.



#### CAUTION

If the starter set battery is used for exciting one must take care. A short circuit can cause heavy sparking, fire and injuries.

When external excitation does not bring back voltage, the rotating rectifier diodes should be tested and a winding resistant test should be executed.

### Testing rotary rectifier diodes

The diodes in the rotor can be checked with a multimeter. The diodes are integrated in a rectifier unit. When all diodes are faulty the alternator will not generate any voltage. When one or more diodes are faulty the alternator will produce too low voltage.

The flexible leads connected to the diodes should be disconnected at the terminal end, and the forward and reverse resistance checked. A healthy diode will indicate a very high resistance (infinity) in the reverse direction, and a low resistance in the forward direction. A faulty diode will give a full deflection reading in both directions with the test meter on the 10,000 ohms scale, or an infinity reading in both directions. In case of faulty diodes replace the rectifier unit. One can get access to the diode unit by taking off the backend cover of the alternator.

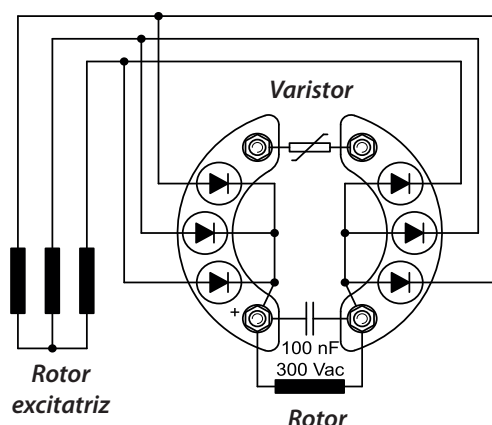


Fig.18: Rotating rectifier diodes.

### 5.3.3 Winding resistant values

If after establishing and correcting any fault on the AVR and diodes, the output is still low when separately excited, then the main rotor, stator auxiliary and exciter stator winding resistance should be checked as the fault must be in one of these windings. The respective leads must be disconnected before taking the readings.

Resistance values should be within 10% of the values given in the table below:

#### Alternator models with 6 wires

Alternator Winding resistant	SQ-Pro 15 1phase	SQ-Pro 15 3phase	SQ-Pro 18 1phase	SQ-Pro 18 3phase
Stator Windings Resistance $\Omega$	0,12	0,325	0,08	0,224
Rotor Windings Resistance $\Omega$	2,43	2,22	1,67	2,43
Exciter Stator Resistance $\Omega$	15	15	11,05	15
Exciter Rotor Resistance $\Omega$	0,72	0,72	0,32	0,72

### Meagering

One can try to measure resistance between the housing and the windings with a multimeter which should read infinity. When readings are infinity, but a fault is suspected one can do a high voltage resistance test (MEGGERING). This procedure should be carried out by an expert. The AVR should be disconnected during this test. A 500V 'Megger' or similar instrument should be used. The insulation resistance to earth of all windings should be in excess of 2 MOhm. Should the insulation resistance be less than this value, drying out the generator windings is essential. Drying out can be carried out by direct warm air (60-80°C) from a fan heater or similar apparatus into the generator air inlets or outlets.



## 5.4 SPECIAL PROCEDURES ENGINE

### 5.4.1 Setting the RPM

RPM is set by the manufacturer and should not need readjustment! The RPM of the W-SQ-Pro 18 is controlled digitally by the ECU and does not need readjustment. A throttle lever is present on the W-SQ-Pro 15. If readjustment of the throttle lever is necessary, please contact your WhisperPower Service Centre for advice.

### 5.4.2 Adjusting valve clearance and retightening the cylinder head bolts.

Both procedures have to be carried out with a cold engine. When both procedures are carried out be sure to retighten the cylinder head bolts before adjusting the valve clearance. When retightening the cylinder head bolts, drain the coolant by removing the drain plug.

Loosen the bolts slightly, remove the rocker assembly (the rocker arms, shaft, and stays) and then retighten the bolts to the specified torque in the numerical order illustrated (ref. to fig. 19).

#### V1505

Tightening torque: cylinder head bolt  $65 \pm 5\text{Nm}$   
Rocker stay tightening torque:  $23 \pm 2\text{Nm}$

#### V2203

Tightening torque: cylinder head bolt  $95 \pm 5\text{Nm}$   
Rocker stay tightening torque:  $25 \pm 2\text{Nm}$

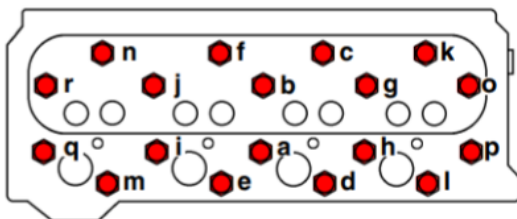


Fig. 19: Cylinder head bolts

The clearance of both (intake and exhaust) valves should be 0.25 mm in cold condition. Set the piston of the first cylinder to be adjusted to top dead center (T.D.C.) of compression stroke.

The T.D.C. of compression stroke can be found by aligning the T.D.C. mark (notch) on the crankshaft pulley with the mark on the gear case (ref. to fig. 20).

First align the T.D.C. mark for the No. 1 cylinder. Confirm that the valves do not move up or down when the crankshaft is turned about 20 degrees in normal and reverse direction of rotation.

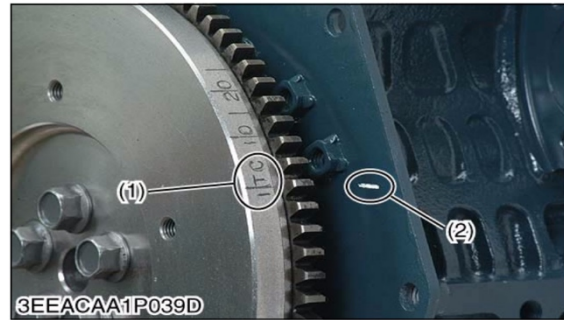


Fig. 20

#### ■ IMPORTANT

- Valve clearance must be checked and adjusted when engine is cold.
- Remove the cylinder head cover and the glow plugs.
  - Align the "1TC" mark (1) on the flywheel and alignment mark (2) on the rear end plate so that the No. 1 piston comes to the compression top dead center.
  - Check the following valve clearance marked with "☆" using a feeler gauge.
  - If the clearance is not within the factory specifications, adjust with the adjusting screw.
  - Then turn the flywheel 6.28 rad (360 °), and align the "1TC" mark (1) on the flywheel and alignment mark (2) on the rear end plate so that the No. 1 piston comes to the overlap position.
  - Check the following valve clearance marked with "☆" using a feeler gauge.
  - If the clearance is not within the factory specifications, adjust with the adjusting screw.

Number of cylinders Valve arrangement		3 cylinder		4 cylinder	
		IN.	EX.	IN.	EX.
Adjustable cylinder location of piston	When No. 1 piston is at compression top dead center	1st	☆	☆	☆
	2nd		☆	☆	
	3rd	☆			☆
	4th				
	When No. 1 piston is at overlap position	1st			
	2nd	☆			☆
	3rd		☆	☆	
	4th			☆	☆
Valve clearance		Factory spec.		0.145 to 0.185 mm 0.00571 to 0.00728 in.	

#### ■ NOTE

- The sequence of cylinder numbers is given as No. 1, No. 2, No. 3 and No. 4 starting from the gear case side.
- After adjusting the valve clearance, secure the adjusting screw with the lock nut.

(1) "1TC" Mark

(2) Alignment Mark

### 5.4.3 Disassembling instructions

It could be necessary to disassemble the generating set for repair or checks. Following instructions will help:

- 1 The design of the W-SQ-Pro 15 and W-SQ-Pro 18 makes it possible to do most repairs on the spot. The connections of the alternator are very accessible.
- 2 The sound shield can be disassembled according to exploded view below (figure 21).
- 3 To take the generating set out of the canopy, all hose and cable connections have to be taken off. The set is fixed to its base by four rubber mountings and can be loosened by removing the four nuts from the bolts of these mountings. The easiest way to get the generator out of its capsule is by lifting the set with the aid of the lifting eyes.

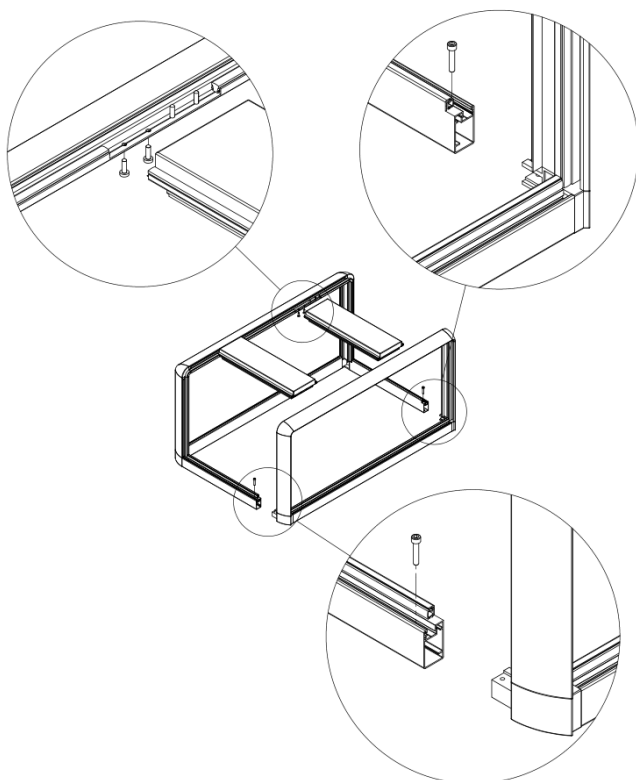


Figure 21: exploded view sound shield W-SQ Pro 15 & 18

- 4 One can take off the complete alternator housing. Before the alternator can be taken off all cables and wiring has to be taken loose first.
- 5 The rotor can be taken off by removing the bolts in flywheel and flywheel housing. See figure 22
- 6 Reassembling the generating set one should take care of alignment, cleaning the surfaces between engine and alternator and tighten the bolts crosswise and gradually.
- 7 Use Loctite 577 to seal the fittings that allow fluid to pass through which should first be cleaned and made free of oil and grease.
- 8 Test the generating set first outside its capsule and check very carefully for leakages before putting it back in its enclosure.

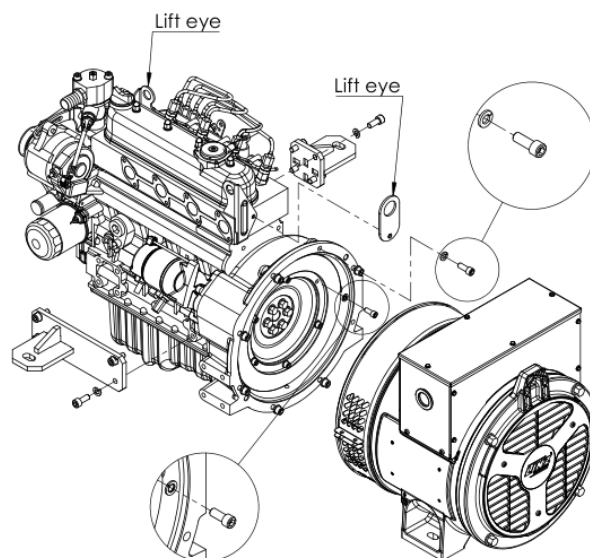


Figure 22: Mounting generator

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## 6 SPARE PARTS LIST

We recommend the following spares for service and maintenance.

- Kit A: parts for regular maintenance parts marked (\*). article no. 42401360 article no. 40201460
- Kit B: parts for maintenance + spare parts: all parts marked (\*)+(\*\*) article no. 42401361 article no. 40201461

ARTICLE NO	DESCRIPTION
40209030	Fuel filter (*)+(**)
40405120/40408120	V-belt SQ-Pro 15 / SQ-Pro 18 (*)+(**)
40405121/40406121	Oil filter SQ-Pro 15 / SQ-Pro 18 (*)+(**)
50212154	Fuse blade type 3 Amp 32V violet (*)+(**)
50212170	Fuse blade type 10 Amp 32V red (*)+(**)
50201168	Fuel pump heavy duty (**)
40403140/40406140	Glow plug SQ-Pro 15 / SQ-Pro 18 (**)
40406137/40407137	Cylinder head gasket SQ-Pro15 / SQ-Pro18 (**)
40406150/40407150	Nozzle injector SQ-Pro 15 / SQ-Pro 18, 4pcs (**)
50209212	Oil pressure switch 0,5bar (**)
40405121/40406121	Oil filter SQ-Pro15 / SQ-Pro18 (**)
40403145/40406145	Thermostat SQ-Pro 15 / SQ-Pro 18 (**)
40403138	Gasket thermostat SQ-Pro15 / SQ-Pro18 (**)
40201634	Gasket nozzle injector SQ-Pro15 / SQ-Pro18 (**)
50209243	Temperature switch 110°C M16x1.5 NC (**)

More extensive parts list on the internet: [WHISPERPOWER.COM](http://WHISPERPOWER.COM) (fast moving parts)



## MAINTENANCE LOG

first service after 50 hours:

hour counter:

remarks:

next service (every 150 hours):

hour counter:

remarks:

NOTES

[illegible]

NOTES



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[www.whisperpower.com](http://www.whisperpower.com) / [sales@whisperpower.com](mailto:sales@whisperpower.com)