



BRÜDER SP5000

Owner's manual and user handbook

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Introduction

Thank you for your purchase of a Brüder SP5000 portable diesel compressor. We trust you will be happy with your new machine and we are confident that it will give you many years of reliable service.

Our SP5000 compressor was originally developed in response to the growing need for a dependable, tough, and practical diesel air compressor for use in Australia's harsh agricultural environment. We've taken this highly successful DNA, added safety and user-friendliness features, and made it available for our non-agricultural customers.

The key advantage of a Brüder air compressor is that it is purpose-built for work in high-temperature climates. Its turbo-charged Kubota diesel engine is housed in an insulated cabinet which helps to maintain a good operating temperature. The hot exhaust and radiator are in a separate partition under the cabinet, keeping the engine cool with fresh air coming in from the rear. The exhaust exits vertically from the top, which – unlike some other air compressors – is less likely to pose a fire hazard when parked on combustible materials.

You'll find features that make the SP5000 really stand out when servicing the machine;

- Side mounted outlets and controls
- Single-piece steel canopy on gas struts
- Spin on filters
- Standard Kubota engine spares

Other key features to make a difference include;

- 3-year warranty on compressor and engine
- Battery isolator
- Heavy duty off-road trailer with a spare as standard
- 70 litre diesel tank for extended run time
- Intelligent electronic engine protection system.

If you have not yet filled out your warranty registration card, we advise you to complete this at your earliest convenience. Doing so helps us to help you in case of a warranty claim, product recall or any other issue. Your details will always be kept secure and will be held in accordance with our privacy policy.

This manual is to be kept in an accessible (i.e. printed) form near the machine at all times. It contains information, safety directions and instructions that will ensure the maximum use and service life of your machine.

The USB supplied contains a copy of this manual, spare daily check sheets and other printable files. If you require any electronic copies sent, please contact your dealer or Brüder Australia.

Quick start guide

Before starting

1. Install the machine on a level floor (maximum allowed slope in longitudinal and transverse axis is 15°) and secure it against movement (pull the handbrake, where fitted, or use wheel chocks).
2. Check the engine oil level according to the instructions in the handbook.
3. Check the separator oil level. Check there is no leaking in the oil circuit. Check that all outlet plugs, and the filling nozzle of the separator vessel are tightened.
4. Check the coolant level (the machine must be positioned horizontally).
5. Check the fuel filter (drain the water out, if full, so that the filter contains only diesel fuel).
6. Check the fuel level in the fuel tank.
7. Check the air filter indicator (see chapter 'Maintenance' of the handbook).
8. Open the outlet valves to relieve the pressure. Then close the valves again.
9. Close all covers and doors on the machine.

When refuelling

Switch off the engine,
Do not smoke,
Do not use naked lights,
Keep diesel fuel away from hot surfaces,
Wear appropriate personal protective equipment.

WARNING!

Use diesel fuel only! Biodiesel or its mixture with diesel may cause engine damage. Use of biodiesel will void the manufacturer's guarantee!

Do not overfill either the engine or the compressor with oil.

To maintain long working life of the machine it is very important to follow the instructions from this handbook, especially when the machine is new. It is not recommended to operate the machine at maximum load during the first 50 hours.

WARNING!

Do not operate the machine with its bonnet/covers open. This may cause the machine to overheat and the operators will be exposed to higher levels of noise and fumes.

Do not open bonnet/cover while machine is in operation. Damage to exhaust rain cover will occur.

Do not move or otherwise manipulate the machine when it is in operation.

WARNING!

Before putting the machine into operation after a longer shutdown (more than 6 months), please consult your service handbook for information.

Starting the machine

All normal start functions can be operated with an ignition key or switch, where fitted.

1. Fully close the outlet valves.
2. Turn the key or switch to the ON position and check that the lubrication and battery recharge indicators are lit.
3. The fuel pump will engage, and the screen will be illuminated. Wait until the computer has completed its startup process (approximately 5 seconds) and check that no error codes are displayed.
4. Press the green start (I) button and wait while the machine begins the pre-start sequence including the glow time. The machine will start itself and idle for ~30 seconds to warm up, then rev to produce full pressure (as indicated on the gauge).
5. Do not open outlet valves on compressor until engine start and warm up sequence is complete. When the engine starts, oil and battery recharge indicators should be off.
6. Open the outlet valves as needed. The machine is now ready to operate.

Stopping the machine

NOTE

These are general instructions to stop the machine. More detailed instructions to your compressor type can be found on the digital copy of this handbook on the USB provided.

1. Close the outlet valves one by one.
2. Allow the machine to run the unloader for a short period of time to reduce the engine temperature and to drain off the excessive oil from the separator insert.
3. Press the red button (O) once and wait. The machine will run on for approximately 30 seconds. Once it has turned itself off, turn the key or switch to the off position to stop the fuel pump and auxiliary systems.
5. During maintenance, etc. disconnect the battery and close the compressed air outlet valves (disconnect the hoses) if the machine is connected to a compressed air distribution system or receiver/tank.

WARNING!

Do not stop the machine when loaded or operating with open valves.

WARNING!

After stopping the machine, never release overpressure by opening the outlet valves. There is a danger that foamed oil could get into the outlet valves.

WARNING!

Never leave the machine idle with overpressure in the system.

NOTE

Once the machine stops the unloader valve relieves the pressure automatically. If the unloader valve fails, the pressure must be released through the outlet valves and the failure must be fixed.

Emergency shutdown

In case of emergency, turn the switch to the OFF position. It is vital to follow the instructions in 'Re-starting' after an emergency shutdown in the digital version of this handbook before re-starting the machine after an emergency shutdown.

Scope of use

Typical use

The SP5000 is a versatile machine for production of high-volume compressed air, which can then be used in many situations including pre-coat blast and surface prep, road construction (road scabblers, pavement breakers, and hammers), onsite mining operations, and even temporary backup air for production and assembly lines. While the machine was originally designed for (one of compressed air's most demanding) task of grain harvest machinery blowdown in an agricultural setting, where high ambient temperature and dusty conditions will stop or damage other similar machines, the Brüder SP5000 has been designed in such a way that it withstands the rigours of this task and is well regarded in that industry. We have used features such as advanced airflow routing, an effective heat-resistant firewall, large radiators, and electronic engine management systems to optimise operations in high ambient temperature. While these features are aimed for success in agriculture, they do have benefits across the board.















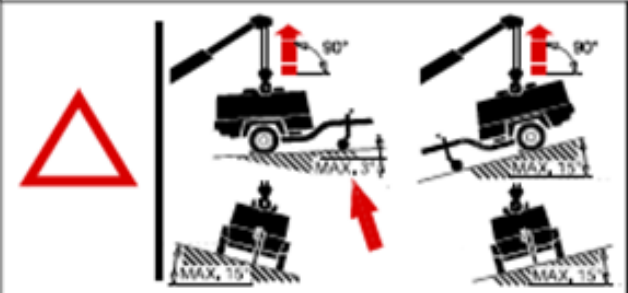
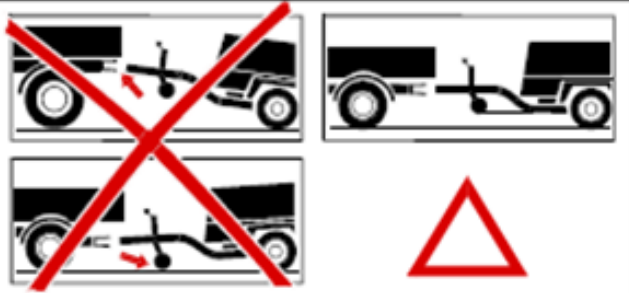
Troubleshooting

Problem	Cause	Solution
The compressor produces a low amount of air.	Regulation system soiling.	Clean the regulation system, contact the manufacturer's service partner.
The compressor does not reach the appropriate air pressure.	An intake valve does not work properly.	Check the intake valve.
The engine does not rev up.	Speed control soiling.	Clean the speed control, contact the manufacturer's service partner.
The machine runs up heavily.	Compressor under pressure.	Check the intake valve.
	Low ambient temperature.	Heat up the machine, consider change of oil type.
	Dense oil.	Change oil, check the oil type.
The machine turns off before the demanded pressure is reached.	Temperature protection.	Contact the manufacturer's service partner.
The machine turns off due to high oil temperature.	Insufficient oil volume.	Refill the compressor oil.
	Oil filter soiled.	Change the oil filter.
	Oil cooler soiled.	Clean the oil cooler.
	High ambient temperature.	Consider changing the machine location.
	Defective temperature switch.	Contact the manufacturer's service partner.
Safety valve leaking.	Separator insert soiled.	Change the separator insert.
	Defective safety valve.	Contact the manufacturer's service partner.
	An intake valve does not work properly	Contact the manufacturer's service partner.
Oil in compressed air.	Clogged oil drawing off.	Clean the oil drawing off plug.
	Defective separator insert.	Change the separator insert.
The intake valve works properly, but the air delivery is low.	Suction filter is soiled.	Change the suction filter insert.
	The intake valve does not operate smoothly.	Clean the intake valve, contact the manufacturer's service partner.
	Leakages in the intake valve or in the whole system.	Seal the elements, contact the manufacturer's service partner.

This table serves for a customer's basic orientation when a problem with the machine or its parts appears. Problems leading to the machine shutting down are signalled on a control board display. When a problem appears, please contact the manufacturers service partner immediately.

Safety labels

Make sure that all the protective covers of the machine are installed and closed before starting the machine.

 <p>Do not start! Read operation and maintenance manual before starting.</p>	 <p>Attention! Hot surface.</p>
 <p>Attention! Read operation and maintenance manual before starting service work.</p>	 <p>Attention! Do not stand on valves and other parts of the pressure system.</p>
 <p>Attention! Do not operate the compressor while door or covers are open.</p>	 <p>Attention! Do not open the outlet valve before air hoses are connected.</p>
 <p>Attention! Hot gases.</p>	 <p>Attention! High pressure.</p>
 <p>DIESEL</p> <p>Fuel filling point.</p>	 <p>Trída / Class API CH -4 - ACEA E5</p> <p>Engine oil filling point.</p>
 <p>VDL 46</p> <p>Compressor oil filling point.</p>	 <p>Coolant filling point.</p>
 <p>Lifting point.</p>	 <p>Anchoring point.</p>
 <p>Diagram showing load capacity limits (MAX. 3T, MAX. 15T) and lifting angles (90°).</p>	 <p>Diagram showing prohibited towing configurations (marked with a red X) and a warning triangle.</p>

General description

Contents of this Operation and maintenance handbook are property of Brüder Australia. This handbook is altered and updated regularly for each production series and it may not be copied without written permission.

The producer does not assume responsibility for errors occurring from this translation.

This Handbook contains all information necessary for routine operation and maintenance of the machine. More detailed information and procedures for larger repairs are not included in this Handbook but they are available at authorized service partners of Brüder Australia.

There may appear to be minor inconsistencies between the Handbook and the actual machine due to improvements of the machine. Ask your dealer if you have any questions or problems.

The machine design complies with relevant EU regulations. This CE Declaration of Conformity will lose its validity in case of any non-approved modification of individual machine parts and components.

All parts, accessories, piping, hoses, and connections through which the compressed air flows should be;

- of guaranteed quality and approved by the manufacturer for intended use,
- approved for the nominal pressure level at least equal to machine maximum operation pressure,
- usable in contact with compressor oil and coolant,
- delivered together with the Handbook for installation and safe operation of the machine.

You will be provided with all details concerning suitability of individual parts use by selling and servicing centres of Brüder Australia.

The use of non-original spare parts, fluids and lubricants given in the Spare Parts Catalogue could lead to the situation, for which Brüder Australia cannot bear any responsibility. In such a case Brüder Australia does not take any responsibility for potential damage.

Read the Handbook carefully before operating the machine to fully understand its operation and maintenance requirements.

Guarantee this Operation and maintenance handbook is always at disposal directly by the machine.

Guarantee the maintenance personnel are always professionally trained and acquainted with instructions for operation and maintenance.

Make sure the operating personnel is acquainted with all safety signs and instructions for machine operation before putting it into operation or under maintenance.

Make sure all protective covers are installed and shut before putting the machine into operation.

A weekly visual check must be made on all fasteners/fixing screws securing mechanical parts. Notably, safety-related parts such as a coupling hitch, drawbar components, road-wheels, and a lifting bail should be checked for absolute security.

All components which are loose, damaged, or out of order must be repaired without delay.

Warranty conditions

The manufacturer or its authorised service centre provides all warranty and after-warranty service.

If necessary, please contact the manufacturer or its authorized service centre where you will be provided with all necessary information and recommendations.

Warranty does not cover;

- Damage caused by incompetent operation and maintenance carried out in contrast with instructions in this Operation and Maintenance Handbook,
- Damage caused by incompetent transport, manipulation (car accident) and storage,
- Damage caused by the machine operation in extremely aggressive surroundings,
- Consumable materials (filter and separator inserts, V-belts, etc.),
- Air end damage caused by corrosion or oil degradation influenced by omission of required inspections.

Warranty is void;

- If filter inserts, separator inserts and other materials have not been replaced in intervals prescribed in the Handbook,
- If the machine has been used for other purposes than those defined in the Handbook,
- If damage has been caused by improper location of the machine in relation to cooling air supply and drain,
- If other than prescribed fuels and oils have been used,
- If other than original spare parts have been used,
- If seals have been damaged,
- If the Service Booklet of the machine has not been presented to service engineers during a guarantee inspection or if prescribed operations have not been logged to the Handbook,
- If the machine breakdown has not been caused by a defect due to workmanship,
- If there has been an intervention carried out on the machine construction,
- If the machine has been repaired by other subjects than the manufacturer or its authorised service centre,
- If the machine has been handed over another owner without a technical inspection carried out by the manufacturer or its authorised service centre,
- If prescribed guarantee inspections have not been carried out on time and have not been logged to this Service Booklet with a coupon sent to the manufacturer,
- If a claim has not been lodged in writing at the latest on the 10th day following the day a defect occurred,
- If damage has been caused by a third person because of insufficient safety precautions,
- If the machine has not been put into operation, operating personnel have not been trained by the manufacturer's authorised service centre and this has not been logged to the Service Booklet,
- If the registration card has not been filled in.

Technical Parameters

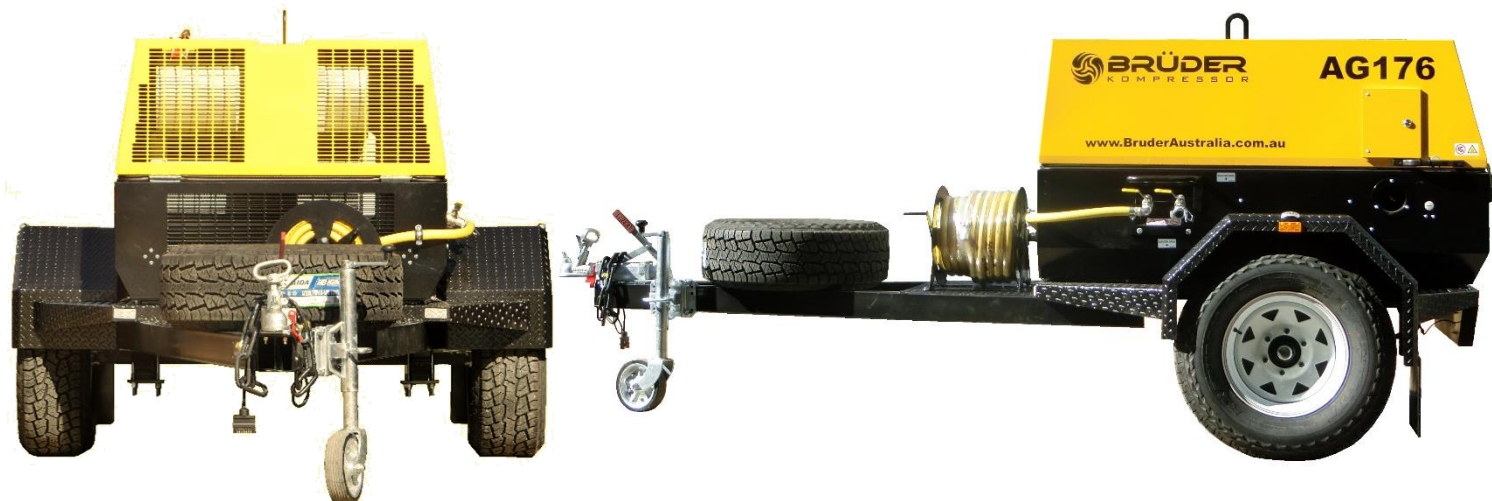
Compressor		SP5000 (7 bar)	SP5000 (10 bar)
Air end		B100	B100
Nominal capacity	[m ³ /min]	5	3.8
Nominal overpressure	[bar]	7	10
Safety valve setting	[bar]	10	12.5
Ambient temperature	[°C]	-10 to +50	-10 to +50
Max outlet temperature	[°C]	110	110
Cooling system		Oil injection	Oil injection
Compressor oil filling volume	[Litres]	7.2	7.2
Max oil system temperature	[°C]	110	110
Max oil system pressure	[bar]	8.6	11.6
Outlet valves		2 x G3/4" BSP	2 x G3/4" BSP

Engine		
Type/Model		Kubota 1505-T
Cylinders		4
Load speed	[rpm]	3000
Idle speed	[rpm]	1500 ± 50
Oil filling volume	[Litres]	6.7
Fuel tank volume	[Litres]	70
Coolant filling volume	[Litres]	4
Battery	[V/Ah]	12/44

Noise emissions		
Sound power level L _{WA}	[dB(A)/pW]	98
Sound pressure level L _{PA}	[dB(A)/20 µPa]	78

Undercarriage		Basic	Deluxe
Max transport speed	[km/h]	110	110
Total mass	[kg]	750	990
Max mass on axle	[kg]	750	990
Total length	[mm]	2800	3580
Total width	[mm]	1650	1690
Total height (includes lift eye)	[mm]	1520	1550
Wheel		14x5.5 Sunraysia	15x7 Ranger
Tyre		185R14LT	235/75/15 L/T
Suspension		4 leaf Spring	Off-Road Leaf Spring
Coupling		50mm ball	50mm ball
Spare tyre		No	Yes
Brakes		None	Mechanical disc
Tyre Pressure	[kPa/psi]	450/65	450/65
Able to be road registered		Yes	Yes

Deluxe trailer



Skid mount (AG176 shown)



Detailed user guide

Safety system

Consists of:

- Low engine oil pressure switch,
- High air end discharge temperature switch,
- High engine coolant temperature switch,
- Alternator / drive belt failure circuit.

Low engine oil pressure switch

At three-month intervals, test the engine oil pressure switch circuit as follows:

- Start the machine.
- Run the machine at idle speed.
- Disconnect the switch connector. Short-circuit the contacts in the connector. The machine should shut down (after 2 second delay).

At twelve-month intervals, test the engine oil pressure switch circuit as follows:

- Remove the switch from the machine.
- Connect the switch to an independent low pressure supply (either air or oil).
- The switch should be switch off at 1.0 bar.
- Reinstall the switch.

Temperature switches

At three-month intervals, test the temperature switch circuits as follows:

- Start the machine.
- Run the machine at idle speed.
- Disconnect the switch connectors one by one. Short-circuit contacts in the connector. The machine should shut down (after 2 second delay).
- Reconnect the switches.

High air end discharge temperature switches

At twelve-month intervals, test the air end discharge temperature switches by removing them from the machine and immersing in a bath of heated oil. The switch should be switch off at $110 \pm 5^{\circ}\text{C}$. Reinstall the switches.

High engine coolant temperature switch

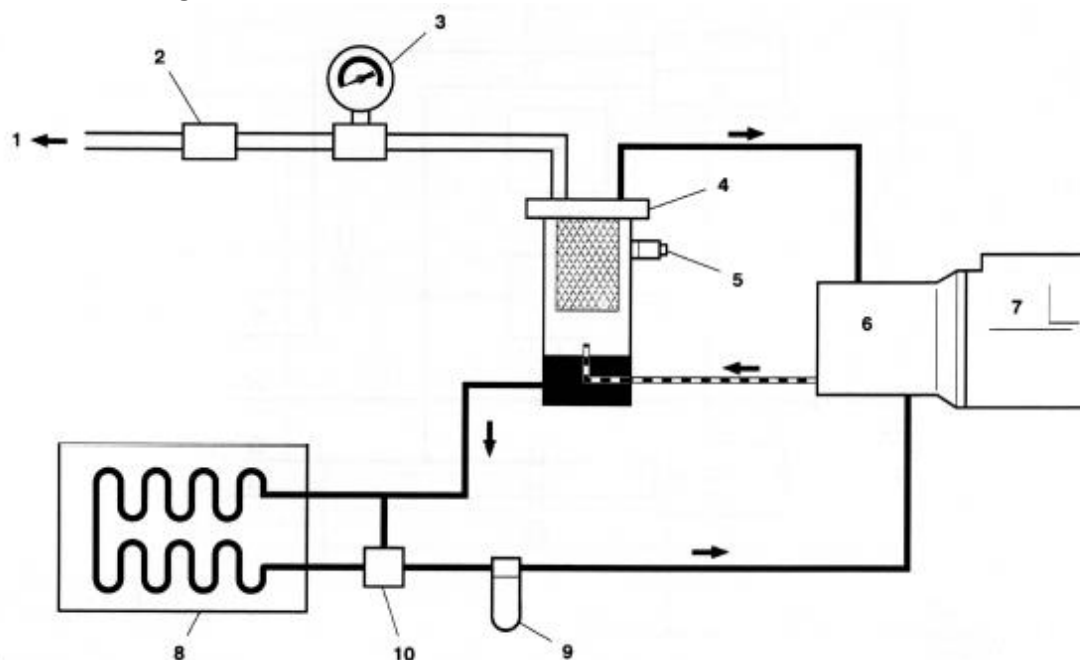
At twelve-month intervals, test the engine coolant temperature switch removing it from the machine and immersing in a bath of heated oil. The switch should be switch off at $110 \pm 3^{\circ}\text{C}$. Reinstall the switch.

Alternator / drive belt failure circuit

Test the circuit before each machine start as follows:

1. Turn the key to ON position and check that the recharge indicator is on.
2. Complete the machine starting sequence.
3. The recharge indicator should switch off.

Functional diagram



Explanatory notes

1	air outlet	6	air end
2	nozzle / min. pres. valve	7	engine
3	manometer	8	oil cooler
4	separator tank	9	oil filter
5	safety valve	10	thermostat

oil

air

Description of the intended use

Compressed air can be dangerous when used improperly! Before any operation, maintenance, or machine repairs – the pressure system should be completely empty (free from over-pressure). Besides this, the machine shall be secured against accidental starting.

Guarantee the machine will be operated on nominal pressure only and the compressor operating personnel are acquainted with this instruction. Pressure level of compressed air equipment connected to the machine must be at least the same as the machine nominal pressure level.

WARNING!

Under no circumstances is compressed air allowed to be used for direct human respiration!

WARNING!

Compressed air can cause serious injury or death. Relieve overpressure before removing filler plugs/caps, fittings or covers.

WARNING!

Residual air pressure in the air system can cause serious injury or death. Always carefully vent the air supply line to tools or valves before any maintenance.

Output air contains a small amount of compressor oil. For this reason, it is necessary to verify the compatibility of all used equipment connected to the compressed air source.

If compressed air flows into a closed space, it is necessary to provide cooling of the air.

All personnel should always wear proper protective clothes when working with compressed air.

All pressure loaded parts including the pressure hoses should be tested regularly. No signs of damage should be observed, and all parts should be used in conformance with instructions for their use and/or for their intended purpose. Avoid contact with compressed air.

The safety valve on the oil separator should be tested regularly according to given instructions.

When the machine is stopped, compressed air can flow back into the compressor system from devices or systems downstream of the machine, unless the service valve is closed. Install a back pressure valve at the machine outlet valves to avoid reverse flow in the event of an unexpected shut-down when the outlet cocks are open.

Disconnected air hoses whip and can cause serious injury or death. Always attach a safety flow restrictor to each hose according to safety rules.

The supposed ways of the machine use are presented below. If the machine should be used in an unusual way or in an unusual surroundings, please contact the manufacturer.

This machine has been designed and supplied for use under following conditions only:

- Compressing the usual air that does not contain any additional gases, vapours, or additives,
- The machine will be operated at temperatures shown in the section *Technical Specifications* on page 11,
- The machine will be operated in conformance with this Operation and maintenance handbook.

Warnings against improper use

Due to machine design, it is not possible to use the machine at locations where danger of explosion exists. If the machine is to be operated in such places, all local rules, standards, and regulations must be fulfilled by adding of suitable supplementary devices, such as gas detectors, combustion products removal, safety valves, etc. to eliminate all risks.

WARNING!

Air discharged from this machine may contain carbon monoxide or other contaminants which will cause serious injury or death. Do not breathe this air.

The machine produces loud noise with its doors open or a service valve vented. Extended exposure to loud noise can cause hearing loss. Always wear hearing protectors when the doors are open, or the service valve is vented.

WARNING!

Never inspect or service the machine without previous disconnection of battery cables to prevent accidental starting of the machine.

Do not use petroleum products (solvents or fuels) under high pressure as this can penetrate the skin and result in serious illness. Wear eye protection while cleaning the machine with compressed air to prevent eye injury.

Rotating fan blades can cause serious injury. Do not operate the machine without a fan guard installed.

Avoid contact with hot surfaces (an engine exhaust manifold and piping an air receiver and air discharge piping, etc.).

Never use volatile substances (e. g. ether) as a starting aid.

Never operate the machine with guards, covers or screens removed. Keep hands, hair, clothing, tools, etc. away from moving parts.

The machine is not allowed to be used:

- as a direct supply of pressurised air for respiration purposes,
- for indirect human consumption without suitable air filtration and purity check,
- out of temperature range specified in the general information section of this handbook,
- in surroundings containing explosive gases or vapours,
- in areas with no reliable device for combustion products removal,
- with accessories, components, lubricants, and coolants not recommended by Bruder Australia,
- for operation without the integral safety and control features.

Assembly, installation, and connection instructions

If more than one compressor is connected to pneumatic equipment at the same time, every machine should be equipped with a non-return flap valve to avoid back flow through the outlet valves into the machine.

Instructions relating to installation and assembly for reducing noise or vibrations

The compressor body is equipped with noise absorption panels used for noise control. The machine cannot be operated without these noise absorption panels.

The machine was designed to reduce all risks caused by vibrations to the lowest level.

Instructions for the putting into service and usage of the machinery commissioning

After obtaining of the machine and before putting it in into service, it is important to adhere strictly to the instructions given in the *Before starting* section (page 17).

Make sure that the operating personnel read and understand the rules and follow the instructions given in this handbook before the machine operation or maintenance.

Before towing of the machine, make sure the tyre pressures are correct (see bottom of chart in *Undercarriage* section on page 12) and that the handbrake – if equipped – works properly (see section *Wheel brake adjustment* on page 29).

Before towing of the machine in reduced visibility conditions, make sure that the lights work properly (where installed).

Make sure all packaging and transport materials are removed.

Make sure that the correct tow hitch, lifting, or binding devices are used when the machine is transported or lifted.

When choosing the working position of the machine, be sure that there is sufficient ventilation system for cooling and exhaust fumes and required minimal working space is observed (wall, ceiling, etc.).

Adequate clearance needs to be allowed around and above the machine to permit safe access for operation and maintenance.

The air inlet should be secured against any free objects sucked into it.

Make sure that the machine is positioned on a stable foundation. Any risk of movement should be removed by suitable means, especially it is necessary to avoid straining of outlet piping system.

Attach the battery cables to the battery clamps and tighten them securely. Attach the positive pole (+) cable before attaching the negative pole (-) cable.

WARNING!

Nominal pressure of all air pressure equipment installed in or connected to the machine must be equal or greater than nominal pressure of the machine. All materials used must be compatible with the compressor oil (see *Compressor oil specification* on page 27).

WARNING!

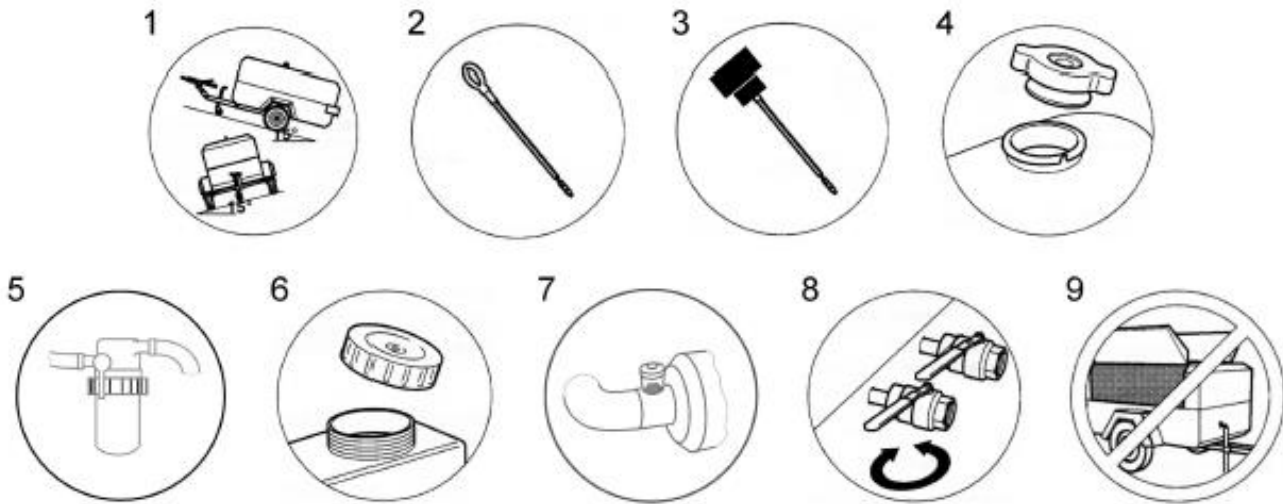
If more than one compressor is connected to one common air pressure device simultaneously, make sure back pressure valves and control valves are installed, so that one machine cannot accidentally be pressurised/over pressurised by another.

WARNING!

If flexible discharge hoses carry more than 7 bar pressure, then it is recommended that safety binding is used on the hoses ends.

Before starting

1. Install the machine on a level floor (max. allowed slope in longitudinal and transverse axis is 15°) and secure it against movement (pull the handbrake, use wheel chocks).
2. Check the engine oil level according to the instructions in the handbook.
3. Check the separator oil level. Check there is no leaking in the oil circuit. Check that all outlet plugs and a filling nozzle of the separator vessel are tightened.
4. Check the coolant level (the machine is positioned horizontally).
5. Check the fuel filter (opt. drain water so that the filter contains only fuel).
6. Check the diesel oil level in the fuel tank.
7. Check the air filter indicator (see chapter *Air filter* on page 25).
8. Open the outlet valves to relieve the pressure. Then close the valves again.
9. Close all covers/doors of the machine.



When starting or operating the machine in temperatures below 0°C, make sure that the operation of the control system, the unloader valves, the safety valve, and the engine are not damaged by ice or snow and that inlet and outlet pipes and drains are clear of ice and snow.

Starting the machine

WARNING!

Never use volatile substances (e. g. ether) as a starting aid!

All compressor functions are controlled by the embedded controller.

1. Fully close all outlet valves.
2. Turn the key to switch on the controller.
3. Check, if the controller does not indicate any error or warning on screen, make sure that ALARM light is not on.
4. Press the green START button to start the machine.
5. Compressor starts the heating procedure and starts after given delay.
6. After warming up the pressure-control is activated, and the compressor delivers the air.
7. Open the outlet valves, the machine works in automatic mode.

All compressor parameters are displayed on the controller LCD during the operation. To list between the screens, press UP or DOWN buttons. The meaning of the icons is explained in the table in the *Controller buttons and functions* section on page 67.

NOTE

Some of the sensors might not be connected on all types, in this case these values will not be displayed. ENGINE TEMPERATURE and OIL PRESSURE readouts are displayed as O or I to indicate normal operation. If an issue is detected, WRN will display instead and/or the engine will automatically shut down.

NOTE

For smooth operation of the machine, allow the engine to warm up. Do not operate the engine at full load immediately after it starts up. This will shorten the service life of the machine.

At temperature below 0°C or if there are difficulties during the initial start-up:

- 1. Open the outlet valves fully, with no hoses connected.
- 2. Complete the starting procedure.
- 3. Close the outlet valves once the engine runs evenly.

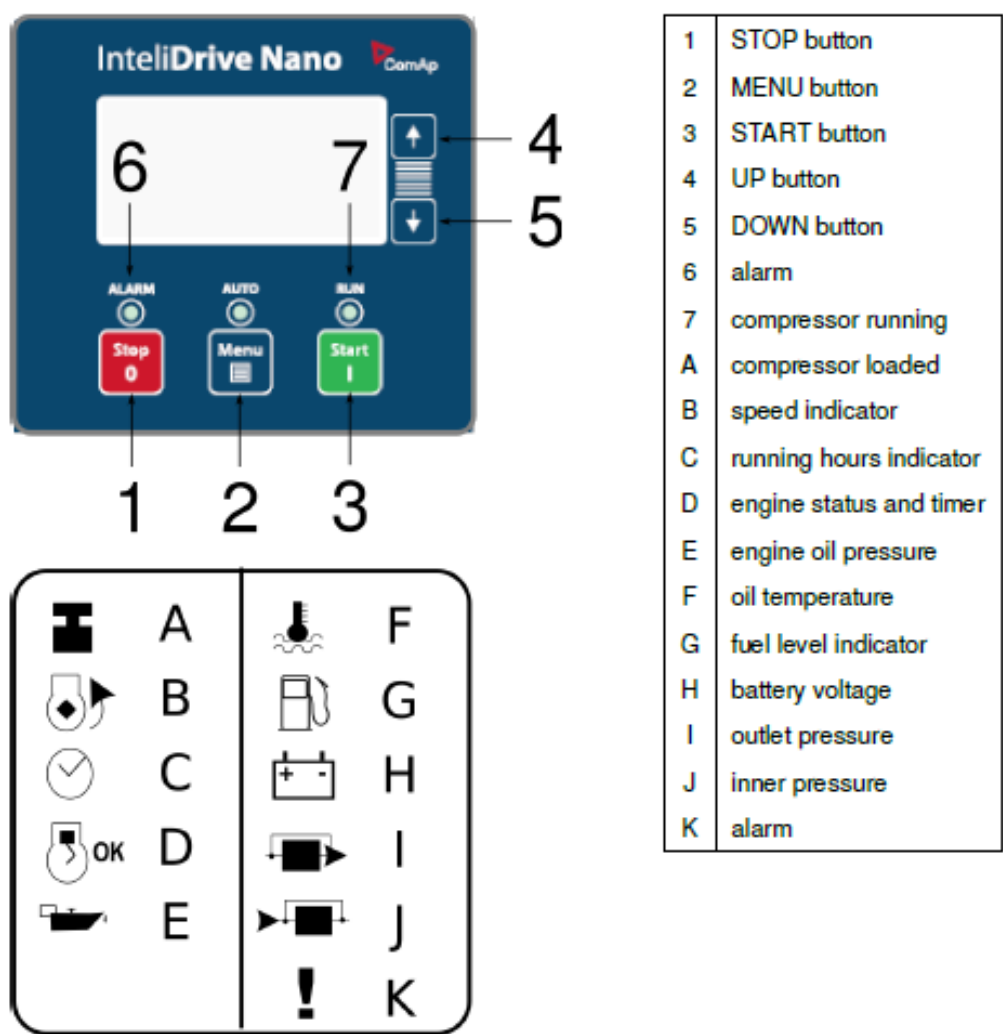
The machine should not be operated with the outlet valves opened for a long period of time. Allow the engine to reach operating temperature. When operating temperature is reached, the engine can be safely operated at full load.

WARNING!

Always disconnect the battery when starting the machine with alternative energy source!

NOTE

Always wear hearing protection when the machine is operated while the air is flowing from the open outlet valves.



Basic control panel design

Stopping the machine

1. Close the outlet valves one by one.
2. Press the red STOP button (1).
3. The compressor will close the suction regulator (unload), de-compress and cool down. After the given delay, the machine stops.
4. After the machine stops, you can switch off the main key.
5. During maintenance, etc. disconnect the battery and close the compressed air outlet valves (disconnect the hoses) if the machine is connected to the compressed air distribution system.

WARNING!

In an emergency, the machine can be stopped by switching off the main key. This is not recommended for regular operation; the compressor can be damaged permanently.

WARNING!

Do not stop the machine when loaded or operating with open valves.

WARNING!

After stopping the machine, never release overpressure by opening the outlet valves. There is a danger that foamed oil could get into the outlet valves.

WARNING!

Never leave the machine idle with overpressure in the system.

NOTE

Once the engine stops, the unloader valve relieves the pressure automatically. If the unloader valve fails, the pressure must be released through outlet valves and the failure must be fixed.

Emergency shut-down

In case of emergency, turn the switch to 0 (OFF) position.

Re-starting after an emergency shut-down

After an emergency shut-down, find and solve the problem before an attempted re-start.

If the machine has been switched off for safety reasons, make sure the machine can be operated safely before an attempted re-start.

Before re-starting the machine, follow the instructions in section *Before starting* and *Starting the machine* on page 17.

Machine monitoring

1. Periodically check the oil and air circuit integrity as well as the engine filling circuit.
2. Check the air operation overpressure. Its value must not exceed the set pressure limit.
3. Check the fuel level in the fuel tank.
4. No warning lights may flash during the machine operation.
5. With outlet valves closed the engine speed should decrease to no-load level once the operation overpressure has been reached.

The machine should shut-down under these conditions:

- Low engine oil pressure,
- High air end discharge temperature,
- High engine coolant temperature.

WARNING!

Provide adequate oil flow rate at low temperatures, never allow the outlet overpressure to fall below 3.5 bar.

WARNING!

The machine is over pressure during operation! There is a danger of injury when improperly handled.

WARNING!

All covers should be closed during the machine operation!

All covers should be closed when the machine is operated or transported on public roads. Rear triangle reflectors must be always visible.

Operation in hard climatic conditions

Operation during the winter season:

1. Check the electrolyte level and the battery capacity.
2. Use the engine oil designed for use in winter.
3. Use the diesel oil designed for use in winter.
4. For low temperatures under -5°C consult the manufacturer due to the suitable compressor and engine oil use.

Operation at permanently increased temperatures:

1. Pay attention to regular cleaning of heat exchange surfaces of the coolers.
2. Consult the manufacturer due to the suitable compressor oil use.

Operation in an extremely dusty environment:

1. Pay special attention to regular cleaning of heat exchange surfaces of the coolers.
2. Check the air intake filter regularly.
3. Reduce exchange intervals of the oil filter and the compressor and engine air filters.
4. Reduce exchange intervals of oil fillings according to the manufacturer's recommendation.

Information about the residual risks

Following materials which, if used improperly, can be harmful to health have been used to build and operate the machine:

- Compressor oil,
- Engine oil,
- Preservation grease,
- Anti-corrosive coatings,
- Diesel fuel,
- Battery electrolyte.

Prevent contact of these materials with skin and do not inhale the vapours!

After contact with eyes, immediately flush them with running water for at least 5 minutes.

After contact with skin, wash it immediately.

In cases of ingestion, seek medical help immediately.

If excessive amount of the substance is inhaled, seek medical help immediately.

Never give fluids to a victim in convulsions, try to induce vomiting.

These safety instructions are taken from manufacturers of these substance.

Instructions on the protective measures

Battery

Batteries contain caustic liquids and produce corrosive and explosive gases. When working with a battery, personal protective equipment should always be used.

If electrolyte is splashed on skin or clothing, wash it immediately with plenty of water.

If electrolyte is splashed in eyes, flush them with large amounts of water and seek medical help immediately.

Do not use naked flames.

Never attempt to boost a frozen battery, as it could explode.

If boosting a battery, mind the correct polarity. Make sure the connections are solid. First attach the positive (+) clamp of the booster cable. Remove the booster cables in the reverse order.

Essential characteristics of tools

All parts, accessories, piping, hoses, and connections through which the compressed air flows should be:

- Of guaranteed quality and approved by the manufacturer,
- Approved for the nominal pressure level at least equal to machine maximum operation pressure,
- Usable in contact with compressor oil and coolants,
- Delivered together with the Handbook for installation and safe operation.

You will be provided with details regarding suitability of individual parts by Bruder sales and service centres upon request.

The conditions in which the machinery meets the requirement of stability

Principles set forth in the following text and stated in enclosed Operation instructions are very important for safety of operation personnel working on disassembly, adjustment, and maintenance of the undercarriage and braking system. Parts of the text referring to operation with a brake are not valid for an undercarriage with no brake installed.

WARNING!

The machine standing on a slope should always be secured with wheel chocks.

NOTE

The undercarriage VIN code is stamped on the A-Frame bar opposite the jockey wheel.

Parking

Before you detach the machine, lower the jockey wheel. A portable compressor should be braked by moving the hand brake lever (if fitted) into the second utmost position overcoming the force effect of the spring cartridge.

Use wheel chocks to prevent spontaneous movement of the machine. Before long-term storage (e.g. in winter) it is suitable to reduce loading of the tyres with blocks put under the axle at two points below the spring hangars.

Instructions with a view to ensuring that transport, handling and storage operations can be made safely

Machine transport

Make sure only proper lifting and fastening points are used when loading or transporting the machine.

When loading or transporting the machine, make sure only prescribed lifting and towing devices with minimal allowed force and speed suitable for the machine mass and transport speed are used.

Certain models of Bruder Compressors (with some options) may be equipped with transport fuel level indicator, which shows maximal allowed fuel level for road transport. The user is in this case obliged to ensure that the fuel level is lower than this indicator while transporting the machine.

WARNING!

Always check the fuel level before the transport. The fuel level must not be higher than the maximum transporting level. If the fuel level is higher, the volume can be reduced by the fuel valve. The producer shall not be responsible for any damage, which arise from transporting the vehicle with higher fuel volume.

Before towing of the machine make sure that:

- Tyres and suspension devices are functional,
- Machine covers are closed properly,
- All other parts of the machine are fastened properly,
- Brakes and lights are functional and comply with traffic regulations,
- Safety chains are coupled to vehicle with appropriate rated D-shackles,
- All undercarriage operation instructions listed below are followed.

Coupling the tow bar with suspension eye

1. Lower the coupling onto the towing vehicle's 50mm tow ball using the jockey wheel. When the coupling is firmly seated on the tow ball, allow the handle to spring down and lock it in place with a safety clip.
2. Raise the jockey wheel.
3. Put the electric plug into the socket of the towing vehicle and check the electrical function of the whole set of the towing vehicle and the compressor.

4. Couple the safety chains to the towing vehicle using approved fasteners.
5. Check if the manual lock of the hand brake (where fitted) is not engaged.

WARNING!

During coupling/uncoupling of the machine from the towing vehicle and before/during every transport, mind the operating personnel safety and follow the traffic regulations.

Long term storage preparation

If the machine is to be kept unused in a storage for a longer period of time, follow these instructions and place the machine to a dry dust free place:

- If the machine is to be stored outside, put it into a temporary shelter. If left uncovered, the machine could corrode.
- Start the machine at least once a week to make sure oil gets to all internal machine parts.

If it is not possible to start the machine once a week, follow these instructions:

1. Drain the engine oil to a suitable container. Pour new oil to the engine to clean its inside. Run the machine engine for a short period of time. Drain the engine oil again.
2. Recharge the battery and disconnect the ground conductor. Remove the battery from the machine and store it in a dry place. (Recharge the battery at least once a week.)
3. Drain all the coolant and fuel from the machine.
4. Grease moving parts, such as speed governor and the throttle lever.
5. Seal the engine, air suction, exhaust, and other openings with plastic foil to prevent humidity and dust from getting into the machine.
6. Carry out necessary repairs and keep the machine ready to use.
7. Refill the coolant, engine oil and fuel and start the machine at least once in 3 months during its storage.

Decommissioning

Parts of the machine classified as dangerous waste should be disposed according to waste legislation:

- Engine oil and compressor oil,
- Battery including electrolyte,
- Oil, air, and fuel filters,
- Other oil contaminated parts.

Parts classified as special waste which should be recycled or given to certified authority for disposal:

- Cables, wires and other electrical equipment,
- Tyres and other rubber and plastic parts,
- Heat isolating materials made of mineral fibres.

Description of the adjustment and maintenance operations

Waste products

During the machine operation following waste products result:

- Brake shoe dust, exhaust fumes
- Condensate

WARNING!

Do not breathe these substances!

Condensate should be stored and disposed according to applicable laws.

Pay attention to ensure sufficient ventilation of exhaust fumes and access of air for the cooling system.

The following materials which, if used improperly, can be harmful to health have been used to build the machine:

- Compressor oil,
- Engine oil,
- Preservation grease,
- Anti-corrosive coatings,
- Diesel oil,
- Battery electrolyte.

WARNING!

Prevent contact of these materials with skin and do not inhale the vapours!

After contact with eyes, immediately flush them with running water for at least 5 minutes.

After contact with skin, wash it immediately.

In cases of ingestion, seek medical help immediately.

When inhaled excessive amount of the substance, seek medical help immediately.

Never give fluids to a victim in convulsions, try to induce vomiting.

These safety instructions are taken from manufacturers of these substance.

Do not operate the machine inside a building without sufficient ventilation. Do not inhale exhaust fumes when working with or near the machine.

This machine contains substances such as oil, diesel oil, antifreeze, brake fluid, oil/air filters and batteries. Special measures should be taken during maintenance and repairs. These substances should be disposed according to local regulations.

Exchange of suspension equipment

For coupling to the towing vehicle, it is possible to use interchangeable front part of a tow bar - an eye Ø40 mm (or Ø50 mm) or a hitch ISO 50 mm.

WARNING!

According to the valid Technical approval the exchange of this part can be carried out by the manufacturer or its authorised workshop only. For the exchange only prescribed connecting materials should be used and the prescribed tightening torques should be kept. New self-securing nuts should be used for every exchange.

Oil scavenge line

The oil scavenge line goes from a jet in the separator tank to a screwed fitting in the air end.

During maintenance, check the jet, valve, piping, and potential oil presence in the outlet air.

During maintenance, check that the scavenge line is clean and nothing blocks the oil flow. A clogged or obstructed oil scavenge line results in increased content of compressor oil in the outlet air.

Compressor oil filter

Recommended service intervals can be found in the maintenance table.

Removal

WARNING!

Before removing the filter, make sure the machine is stopped and pressured air has been relieved from the system. (see paragraph *Stopping the machine* on page 19).

Clean the outer body of the filter and remove it by screwing it anticlockwise. Use a filter wrench, if necessary, to remove the filter.

Inspection

Check the filter insert.

WARNING!

If there is preservative coating, shellac or other varnish present in the filter body, compressor oil can be impaired, and the filter should be replaced immediately. See paragraph *Lubrication* on page 28.

Assembly

Clean the filter bearing area.

Spread oil on the new filter gasket and screw the new filter clockwise until the new filter gasket fits in the filter bearing area.

When the gasket fits in the bearing area, tighten the filter cartridge by turning it 3/4 turn with a filter wrench.

After the oil filter is completely reassembled, check for any oil leakage while running the machine.

WARNING!

Start the machine (see section *Before starting* and *Starting the machine* on page 17) and check for leakage before putting the machine back to operation.

Oil separator insert

If the oil and air filters are serviced properly, the oil separator insert does not require any regular maintenance.

If it is necessary to replace the insert, follow these instructions:

Removal

WARNING!

Before removing the insert, make sure the machine is stopped and pressured air has been relieved from the system (see paragraph *Stopping the machine* on page 19).

Disconnect all hoses and tubes from the separator tank flange. Remove the draw off tube from the separator tank flange and then remove the flange. Remove the oil separator insert.

Inspection

Check the oil separator insert. Check all hoses and tubes, replace them if necessary.

Assembly

Clean the jet/draw off tube and the insert gasket surface. Attach the new separator insert.

WARNING!

Do not remove a clamp/staple from the antistatic gasket. It serves to ground any possible static electric charge. Do not use sealing materials which could influence electric conductivity.

Fit the flange, mind the gasket, and tighten the screws crosswise to recommended torque (see *Tightening torques* table on page 31).

Fit the flange with the draw off tube including the filter, reconnect the hoses and tubes to the flange.

Change compressor oil (see the *Compressor oil* section on page 27).

WARNING!

Start the machine (see paragraphs *Before starting* and *Starting the machine* on page 17) and check for leakage before putting the machine back to operation.

Oil and water cooler

If grease, oil, and impurities accumulate on the outer oil and water cooler surface, their efficiency is reduced. It is recommended to clean the oil and water cooler with the compressed air stream from the outer side of the cooler once a month (it is possible to use incombustible detergent). This should remove the accumulated grease, oil, and impurities from the cooler, which would therefore efficiently conduct the heat from oil and water away.

WARNING!

Hot coolant could cause serious injury. When adding coolant or antifreeze, stop the engine for at least one minute before opening the cooler cap. Use gloves to protect your hands. Slowly loosen the tank cap and wipe any released fluid with a cloth. Do not open the tank cap until the excessive fluid does not flow away and the cooling system is not fully unpressurised.

WARNING!

Follow the instructions of the antifreeze manufacturer for refilling or releasing the antifreeze. It is recommended to use personal protective equipment and avoid skin and eye contact with the antifreeze.

Compressor drive

Power transmission from the engine to the air end is provided by a toothed belt.

Maximum belt bending (Gates Power Grip GT2 / 600-8MGT-30) in the middle of its traction strand should be 7.5 mm under pressure of 49.2 to 56.3N (79.5 to 84.9 Hz).

Maximum belt bending (Contitech Synchroforce CXPIIHDT1280-8M-30) should be 80.7 to 89.3

Check the belt bending according to the maintenance intervals (see *Maintenance schedule* on page 32).

Use a tightening screw to tighten the belt.

Alternator belt

Use a tightening screw to tighten the alternator belt.

Use a tightening screw to set the belt bending to approx. 5 mm when the belt is pushed down by a thumb. Secure the alternator.

After finishing the work, it is necessary to reinstall all protective covers. Before putting into operation, make sure all covers work properly.

Air filter

Air filter should be checked periodically (see *Maintenance schedule* on page 32) and the insert should be replaced, when the soiling indicator is red – or after every 6 months (100 hours) – whichever occurs sooner. The dust collector should be cleaned daily (more often in dusty environment) and should not be filled more than to one half of its content.

Removal

WARNING!

Never remove the filter when the machine is running.

Clean the filter outer body and remove the filter by unscrewing the nut. Some models will have a clamp system.

Inspection

Check that the filter insert is not cracked, breached, or otherwise damaged. The inspection can be carried out by holding it up to light source, or by passing a lamp inside.

Check that the gasket on the insert edge is not damaged.

Assembly

Fit the new insert into the filter body ensuring that the gasket seats properly.

Reset the soiling indicator.

Fit the dust collector, make sure it is positioned correctly.

Check that the filter clamps are tight before starting the machine.

Ventilation

Always check that the air inlets and outlets are clean, and the air passage is not blocked.

WARNING!

Never clean the machine interior with compressed air.

Cooling fan

Check periodically that the fan mounting bolts in the fan hub are not loosened.

If it is necessary to remove the fan or re-tighten the fan mounting bolts, secure the bolts with an industrial thread locking compound designed for this purpose. Tighten the bolts to the torque value shown in the *Tightening torques* table on page 31.

The fan belt(s) condition and tension should be checked regularly.

Fuel system

The fuel tank should be filled daily or every eight hours. To minimise condensation in the fuel tank(s), it is recommended to refill the tank after each machine shut-down or at the end of each working day. At six-month intervals drain any sediment or condensate that may have accumulated in the tank(s) through the drain screw.

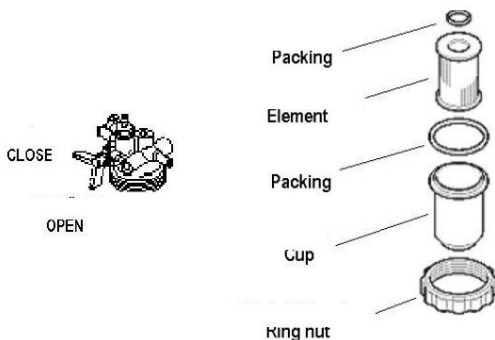
Fuel filter

The fuel filter should be replaced at intervals recommended by the engine manufacturer (see *Fuel* in the *Periodic service* section on page 48).

Fuel filter water separator

The fuel filter water separator contains a filter insert which should be replaced at regular intervals (see *Maintenance schedule* on page 32).

1. Turn the lever to cut off the fuel flow.
2. Loosen the ring nut to remove the cup, remove the element.
3. Clean the cup, fit a new element in and mount a new packing to the ring nut.
4. After mounting the cup with the element inserted into the body, securely fasten it with the ring nut.
5. Open the fuel flow.



Fuel filter water separator assembly

Hoses

To keep the engine at peak efficiency, all components of the engine air intake system should be checked periodically. At the recommended intervals (see *Maintenance schedule* on page 32), check all the intake tubing and all flexible hoses used in the air, oil, and fuel system.

Periodically check the piping for cracks, leaks, etc. and replace damaged parts immediately.

Electrical system

WARNING!

Always disconnect the battery cables before any maintenance or repairs.

Check the safety shut-down system switches and the control board devices for evidence of soiling, arcing and corrosion. Clean if necessary.

Check the mechanical operation of the electronic components.

Check the security of switches and relays connectors, as well as nuts and screws, which could be loosened because of temperature and corrosion.

Check the components and wiring for signs of overheating, such as discolouration, burnt cables, parts deformation, acrid smell, and blistered paint.

Battery

Keep the battery contacts and cable clamps clean and lightly coated with petroleum jelly to prevent corrosion.

The retaining clamp should be kept tight enough to prevent the battery from moving.

When there is a fear of temperature dropping below -15°C (5°F), detach the battery from the machine, and keep it indoors in a safe area to be reinstalled just before the next operation.

Pressure system

It is necessary to check the system outer surfaces (from the air end to the outlet valves) including hoses, tubes, tube fittings and the separator tank for visible signs of mechanical damage, excessive corrosion, abrasion, leakage and chafing after every 200 operating hours, or 12 months (whichever is sooner). Any suspicious part should be replaced before the machine is put back into operation.

Compressor oil

See *Maintenance schedule* on page 32 section for service intervals.

NOTE

If the machine has been operated in severe conditions or has suffered long shut-down periods, more frequent service intervals are required.

WARNING!

Never, under any circumstances, remove any oil drain or filler plugs of the compressor oil system without being sure that the machine is stopped, and the system has been completely relieved from overpressure (see *Stopping the machine* on page 19).

Remove the drain plug(s) to completely drain the separator tank, the oil system including the piping and the oil cooler. Collect the used oil in a suitable container.

Replace the drain plug(s) and make sure that each one is securely tightened.

NOTE

If the oil is being drained immediately after the machine operation, most of the sediments will be dispersed in the oil therefore drain more easily.

WARNING!

Some of the oil mixtures are incompatible and their usage results in varnish, shellac, or coating damage.

Compressor oil specification

VDL4	VDL6	SYN4
Mineral Oil	Mineral Oil	Synthetic Oil
DIN51506 VDL46	DIN51506 VDL68	DIN51506 VDL46
-10°C to +40°C	0°C to +46°C	-10°C to +50°C

WARNING!

Always consult the manufacturer for possible use of the other type of compressor oil!

NOTE

For operation in highly demanding environment, the manufacturer recommends high-performance or bio-degradable oils which do not contaminate the environment.

WARNING!

The manufacturer is not responsible for damage caused by using the incorrect oil or by not following the recommended intervals for oil refilling!

Speed and pressure control adjustment

In common operation, no regulation adjustment is necessary. If needed, follow these instructions (here for 7 bar overpressure):

- Start the machine (see Starting the machine on page 17).
- Check the throttle lever on the engine governor. It should be in the full speed position when the engine is running at full load and the outlet valves are fully opened.
- Set and keep 7 bar overpressure by adjusting the outlet valves at full engine speed. If the speed is decreasing before 7 bar is reached, turn the regulation bolt clockwise to increase the overpressure, otherwise turn the regulation bolt counter-clockwise to decrease the overpressure. Optimal adjustment is achieved when the speed starts falling at 7.2 bar.
- Close the outlet valves. The engine will slow down to idle speed.

WARNING!

Never allow the overpressure on the gauge to exceed the maximum overpressure, otherwise the safety valve will open.

Engine

See Kubota engine manual is supplied together with every portable compressor (page 35).

Lubrication

The engine is supplied with engine oil filling sufficient for the nominal period of operation (for more information consult the Operation and maintenance handbook of the engine).

WARNING!

Always check the oil level before a new machine is put into operation.

If, for any reason, is necessary to drain the machine, it must be re-filled with new oil before it is put into operation.

Engine oil

Engine oil should be changed at intervals recommended by the engine manufacturer (see *Periodic service* in the Kubota engine manual on page 48).

Engine oil specification

Viscosity	See <i>Engine oil</i> section of the Kubota engine manual on page 53)
Class:	API CH-4 / ACEA E5

Engine oil filter

The oil filter should be replaced at intervals recommended by the engine manufacturer (see *Engine oil* section of the Kubota engine manual on page 53)

Inspection of the alternator belt tension

Adjust the tension by gradually loosening the alternator fastening bolt.

When the maintenance is finished, it is necessary to re-install or protective covers back into their original position.

Check the covers function before starting the machine.

Running gear / wheels

NOTE

Before every trip, a visual walk-around is advised. Check the wheel nuts are tight, lights are working, and a wheel change kit (spare tyre, jack, and appropriate wheel wrench) is accessible.

WARNING!

Do not exceed the recommended Gross Vehicle Mass (the combined weight of trailer and load) with any trailer.

Lifting jacks should only be used under the axle.

Check wheel bearings, wheel bolts, U-bolts, shackle bolts, and coupling bolts at least monthly. Tighten as required. Check the trailer chassis and drawbar for any signs of structural damage, fatigue, cracks in members or welds. Should any damage or cracking be present then repairs must be carried out immediately prior to using the trailer and by qualified personnel.

The bolts securing the running gear to the chassis should be checked periodically for tightness (see the intervals on the *Maintenance schedule* on page 32) and re-tightened if necessary, see the *Tightening torques* table on page 31.

Wheel bearings

Wheel bearings should be packed with grease every 6 months. The grease type should conform to specification.

Tyre pressures

The required tyres pressure is specified in *Technical specifications* on page 11.

Brakes – if fitted

Check and adjust the brake linkage at 850 km and then every 5000 km or 3 months (whichever occurs sooner) to compensate any stretch of the adjustable cables. Check and adjust the wheel brakes to compensate the wear.

Wheel brake adjustment

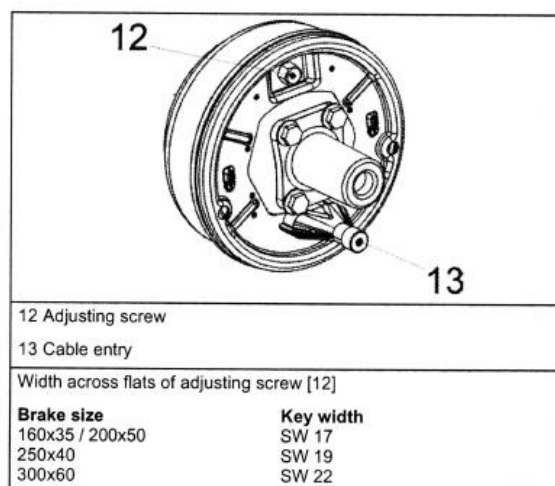
Make sure that the handbrake lever is fully released and that the coupling head is fully extended. Each wheel brake must be adjusted in turn whilst rotating the wheel in the forward towing direction.

NOTE

Brake design and style may vary according to region – see your dealer or Brüder Australia for details.

Drum brake adjustment

- Tighten adjusting screw [12] clockwise until the wheel locks.
- Loosen adjusting screw [12] anti-clockwise (approx. 1/2 turn) until the wheel can be moved freely.
- Slight dragging noises that do not impede the free movement of the wheel are permissible.
- This adjustment procedure must be carried out as described on both wheel brakes.
- When the brake has been adjusted accurately the actuating distance is approximately 5-8 mm on the cable [11].



WARNING!

Check the wheel nut torque 30 kilometres after refitting the wheels, see the *Tightening torques* table on page 31.

Running gear warranty conditions

1. All new trailers are covered by a 2-year structural warranty.
2. The warranty entitles the original purchaser from the date of purchase and covers the chassis and drawbar from fatigue and has a guarantee for a period of two year's use.
3. The manufacturer retains the right to repair or replace any part covered, which in the opinion of the manufacturer is defective due to faulty material or workmanship, provided that the trailer has been operated in accordance with the manufacturer's safety and user guide.
4. All warranty repairs must be performed during normal business hours at the manufacturer's business address, or at an approved workshop with the prior approval of the manufacturer.
5. Unauthorised repairs completed by other manufacturers/fabricators or non-qualified personnel are not covered under this warranty.
6. This warranty only covers a trailer if it has been used and maintained in accordance with the manufacturers' safety and user guide.
7. This warranty does not apply to any trailer that has been;
 - a. Subject to misuse, neglect, accident, or alteration by any person.
 - b. Damaged or destroyed by fire, flood, act of God or other inevitable accident.
 - c. Hired to any person or persons.
8. This warranty does not cover;
 - a. Any trailer parts or accessories that were not supplied by the manufacturer.
 - b. Paint, rust, wheels and tyres, general consumables e.g. bearings, brakes, lights etc.
 - c. Other items deemed to be consumable.
9. All 3rd party parts, or accessories supplied are provided with the manufacturer warranty terms and conditions. Those parts and accessories include but are not lined to; jockey wheels, toolboxes etc
10. Any issues with parts or accessories must be dealt with directly between the customer and that specific parts or accessories manufacturer.

Tightening torques

	Nm min	Nm max	Ft lb min	Ft lb max
Air end - transmission (engine)	39	47	28.8	34.7
Air filter holder	22	27	16.2	19.9
Clamp - exhaust	12	15	8.8	11.1
Baffle - frame	12	15	8.8	11.1
Discharge manifold - frame	39	47	28.8	34.7
Drive pins - engine flywheel	77	93	56.8	68.6
Drop leg	72	85	53.1	62.7
Engine/transmission (air end) - frame (chassis)	73	78	53.8	57.5
Exhaust flange - manifold	23	28	17.0	20.6
Fan cover	12	15	8.8	11.1
Fan - hub	16	20	11.8	14.7
Lifting bail bracket - frame	29	35	21.4	25.8
Radiator/cooler - baffle	9	11	6.6	8.1
Trailer - frame	63	69	46.5	50.9
Separator tank cover	40	50	29.5	36.9
separator tank - frame	18	22	13.3	16.2
Wheel nuts	50	80	36.9	59.0

Maintenance schedule

Maintenance Schedule	1st check	Daily	Every month	3 months	6 months	1 year	2 years	3 years	4 years	5 years
Max running hours	5	-	-	50	75	100	-	-		
Compressor oil	IR	I			R					
Compressor oil filter	IR				R					
Transmission oil	I	I								
Oil/fuel/coolant leakage	I	I								
Indicators	I	I								
Lubricator	I	I								
Wheels (nuts, fitment)	I	I	I							
Scavenger orifice	I	I			C					
Separator tank	I	I				P				
Suction valve	I	I								
Lights		I								
Tow hitch		I								
Tyre pressures	I		I							
Brakes, linkage	I					I				
Auto shut-down system			I							
Safety valve			I					TR		
Undercarriage			A							
Undercarriage bolts				I						
Joints, covers				I						
Discs (bearings, gaskets)					I					
Exhaust piping					I					
Pressure system					I					
Pump filter					C					
Separator insert					R					
Emergency thermostat					T			R		
Emergency shut-down						T				
Manometer						I				
Pressure regulator						I				
Air end belt						IA	R			
Elm. valves							R			
Min. pressure valve (service kit)							R			
Pressure transducer							R			
Engine oil	R	I			R					
Engine oil filter	R				R	R				
Air filter	I	I	C			R				
Fuel filter	I	I	C			R				
Coolant	I	I				TA		R		
Cooler	I	I				C				
Fuel tank		I				C				
Hoses and clamps	I			I			I	R		
Battery (electrolyte, cables)	I			I			IR			
Alternator/fan belt	I		I	IA		R		R		
Glowing							I			TR

Maintenance Schedule (cont'd)	1 st check	Daily	Every month	3 months	6 months	1 year	2 years	3 years	4 years	5 years
Fuel injection								C	C	TR
Turbo charger								I	C	
Valve lash								I		
Pump (including lubrication)								IA		
Engine Thermostat								T		
After cooler									I	
Alternator									I	
Starter									I	

Key:	I	Inspect	T	Test
	R	Replace	C	Clean
	A	Add/Adjust	P	Inspect (protocol)

For more information see the corresponding chapter of this handbook.

WARNING!

Before any maintenance or repairs, stop the machine, secure it against accidental starting (battery isolator) and release the pressure. Follow all safety instructions including those for any tools/equipment used.

NOTE

Every compressor is supplied with the service booklet where it is recommended to log all operations performed during maintenance. Warranty inspections, regular service operations and repairs carried out by Brüder service and/or its agents should be logged in the book as well (page 72).

Always use appropriate protective equipment. Notably when operating the machine with its cover open (not generally advised) (a check-up, adjusting, etc.) use hearing protection.

- It is not allowed to carry out any modifications to the compressor unit and notably to the air end without knowledge of the manufacturer or the service organization.
- When cleaning the parts, detergents must not get into the machine inner circuit. Keep the machine clean and prevent contamination of the inner pressure circuit.
- Protect the electrical parts against excessive humidity.
- After finishing the repairs, operation parameter settings and safety equipment including detectors and sensors must be checked.

NOTE

The manufacturer does not take responsibility for any damages and injuries caused by ignoring given operation or safety instructions during operation, check-ups, maintenance or repairs including those not mentioned in this Handbook but generally accepted for used machines and other devices.

Maintenance

This section refers to various components which require periodic maintenance and replacement.

The service/maintenance table specifies operation descriptions and intervals when maintenance should be carried out. Specifications and specific service or maintenance requirements for the engine can be found in the Kubota engine manual on page 41.

Compressed air can be dangerous if handled improperly. Before any operation, make sure the machine is not under pressure and cannot be started accidentally.

If the automatic depressurisation system fails, pressure should be relieved manually by the operating personnel.

Appropriate personal protective equipment should be used.

Make sure the operating personnel are adequately trained, qualified, and acquainted with the maintenance manuals.

Before maintenance

Before any maintenance operations, make sure that:

1. Air pressure is fully discharged and the machine is disconnected from the air pressure system. Wait for the automatic depressurisation system to relieve all air pressure.
2. Relieve the overpressure from the separator tank and the discharge tubes by opening the outlet valves. Stay out from the air stream while the overpressure is being discharged.
3. The machine should be secured against accidental starting. Label the machine with a warning sign/lock-out tag or use suitable equipment to prevent the machine from starting.
4. All residual electrical power sources (mains and battery) should be isolated and disconnected.

Minimal pressure valve

This overpressure should be relieved carefully by:

1. Disconnecting of the attached device(s),
2. Opening the outlet valves to the atmosphere (use hearing protection if necessary).

Before removing of covers

Before opening or removing of covers to work inside the machine, make sure that:

- When working inside the machine, be aware of reduced protection level and other risks, including hot surfaces and intermittently moving components.
- The machine should be secured against accidental starting. Label the machine with a warning sign/lock-outs or use suitable equipment to prevent the machine from starting.

Maintenance on a running machine

Before any maintenance on a running machine, make sure that:

- The work carried out is limited to only those tasks which require the machine to run.
- The work carried out with safety protection devices disabled or removed is limited to only those tasks which require the machine to be running with safety protection devices disabled or removed.
 - Be aware of all possible risks (e. g. pressurised and live components, removed panels, covers or guards, extreme temperatures, air inflow and outflow, intermittently moving components, safety valve outlet, etc.)
- Appropriate personal protective equipment is used.
- Secure loose clothing, jewellery, long hair, etc.
- Visibly display a warning sign "Maintenance work in progress".

Maintenance completion

For maintenance completion and before operating the machine, make sure that:

- The machine has been tested adequately.
- All safety and protective devices have been reinstalled.
- All panels have been reinstalled, covers and doors have been closed.
- Dangerous materials have been properly stored and disposed.

Kubota engine manual

You are now the proud owner of a KUBOTA Engine. This engine is a product of KUBOTA quality engineering and manufacturing. It is made of fine materials and under a rigid quality control system. It will give you long, satisfactory service. To obtain the best use of your engine, please read this manual carefully. It will help you become familiar with the operation of the engine and contains many helpful hints about engine maintenance. It is KUBOTA's policy to utilize as quickly as possible every advance in our research. The immediate use of new techniques in the manufacture of products may cause some small parts of this manual to be outdated. KUBOTA distributors and dealers will have the most up-to-date information. Please do not hesitate to consult with them.

SAFETY FIRST

This symbol, the industry's "Safety Alert Symbol", is used throughout this manual and on labels on the machine itself to warn of the possibility of personal injury. Read these instructions carefully. It is essential that you read the instructions and safety regulations before you attempt to assemble or use this unit.

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Indicates a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, MAY result in minor or moderate injury.

IMPORTANT

Indicates that equipment or property damage could result if instructions are not followed.

NOTE

Gives helpful information.

SAFE OPERATION

Careful operation is your best insurance against an accident. Read and understand this section carefully before operating the engine. All operators, no matter how much experience they may have, should read this and other related manuals before operating the engine or any equipment attached to it. It is the owner's obligation to provide all operators with this information and instruct them on safe operation.

Be sure to observe the following for safe operation.

Observe safety instructions



Read and understand carefully this operator's manual and labels on the engine before attempting to start and operate the engine.

Learn how to operate and work safely. Know your equipment and its limitations. Always keep the engine in good condition.

Before allowing other people to use your engine, explain how to operate and have them read this manual before operation.

- DO NOT modify the engine. Unauthorized modifications to the engine may impair the function and/or safety and affect engine life. If the engine does not perform properly, consult your local Kubota Engine Distributor first.



Wear safe clothing and personal protective equipment (PPE)



- DO NOT wear loose, torn, or bulky clothing around the machine that may catch on working controls and projections or into fans, pulleys, and other moving parts causing personal injury.
- Use additional safety items-PPE, e.g. hard hat, safety protection, safety goggles, gloves, etc., as appropriate or required.
- DO NOT operate the machine or any equipment attached to it while under the influence of alcohol, medication, or other drugs, or while fatigued.
- DO NOT wear radio or music headphones while operating the engine.

Check before starting & operating the engine

- Be sure to inspect the engine before operation. Do not operate the engine if there is something wrong with it.
- Repair it immediately.
- Ensure all guards and shields are in place before operating the engine. Replace any that are damaged or missing.
- Check to see that you and others are a safe distance from the engine before starting.
- Always keep the engine at least 3 feet (1 meter) away from buildings and other facilities.
- DO NOT allow children or livestock to approach the machine while the engine is running.
- DO NOT start the engine by shorting across starter terminals. The machine may start in gear and move. Do not bypass or defeat any safety devices.

Keep the engine and surroundings clean



- Be sure to stop the engine before cleaning.
- Keep the engine clean and free of accumulated dirt, grease and trash to avoid a fire. Store flammable fluids in proper containers and cabinets away from sparks and heat.
- Check for and repair leaks immediately.
- DO NOT stop the engine without idling; Allow the engine to cool down, first. Keep the engine idling for about 5 minutes before stopping unless there is a safety problem that requires immediate shut down.

Safe handling of fuel and lubricants - keep away from fire



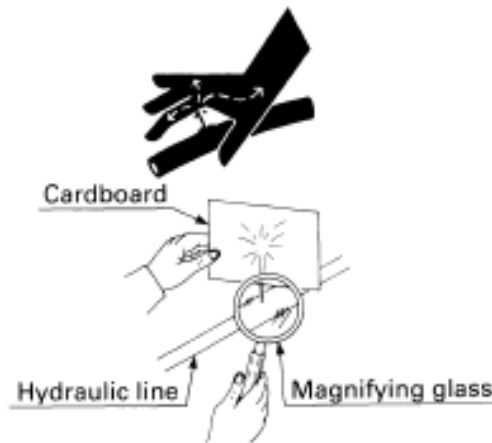
- Always stop the engine before refuelling and/or lubricating.
- DO NOT smoke or allow flames or sparks in your work area. Fuel is extremely flammable and explosive under certain conditions.
- Refuel at a well ventilated and open place. When fuel and/or lubricants are spilled, refuel after letting the engine cool down.
- DO NOT mix gasoline or alcohol with diesel fuel. The mixture can cause a fire or severe engine damage.
- Do not use unapproved containers e.g. buckets, bottles, jars. Use approved fuel storage containers and dispensers.

Exhaust gases & fire prevention



- Engine exhaust fumes can be very harmful if allowed to accumulate. Be sure to run the engine in a well ventilated location and where there are no people or livestock near the engine.
- The exhaust gas from the muffler is very hot. To prevent a fire, do not expose dry grass, mowed grass, oil or any other combustible materials to exhaust gas. Keep the engine and muffler clean at all times.
- To avoid a fire, be alert for leaks of flammable substances from hoses and lines. Be sure to check for leaks from hoses or pipes, such as fuel and hydraulic fluid by following the maintenance check list.
- To avoid a fire, do not short across power cables and wires. Check to see that all power cables and wirings are in good condition. Keep all electrical connections clean. Bare wire or frayed insulation can cause a dangerous electrical shock and personal injury.

Escaping fluid



- Relieve all pressure in the air, the oil and the cooling systems before disconnecting any lines, fittings or related items.
- Be cautious of possible pressure relief when disconnecting any device from a pressurized system that utilizes pressure. DO NOT check for pressure leaks with your hand. High pressure oil or fuel can cause personal injury.
- Escaping fluid under pressure has sufficient force to penetrate skin causing serious personal injury.
- Fluid escaping from pinholes may be invisible. Use a piece of cardboard or wood to search for suspected leaks: do not use hands and body. Use safety goggles or other eye protection when checking for leaks.
- If injured by escaping fluid, see a medical doctor immediately. This fluid can produce gangrene or severe allergic reaction.

Cautions against burns & battery explosion



- To avoid burns, be cautious of hot components, e.g. muffler, muffler cover, radiator, hoses, engine body, coolants, engine oil, etc. during operation and after the engine has been shut off.



- DO NOT remove the radiator cap while the engine is running or immediately after stopping. Otherwise hot water will spout out from the radiator. Wait until the radiator is completely cool to the touch before removing the cap. Wear safety goggles.
- Be sure to close the coolant drain valve, secure the pressure cap, and fasten the pipe band before operating. If these parts are taken off, or loosened, it will result in serious personal injury.
- The battery presents an explosive hazard. When the battery is being charged, hydrogen and oxygen gases are extremely explosive.
- DO NOT use or charge the battery if its fluid level is below the LOWER mark. Otherwise, the component parts may deteriorate earlier than expected, which may shorten the service life or cause an explosion. Immediately, add distilled water until the fluid level is between the UPPER and LOWER marks.



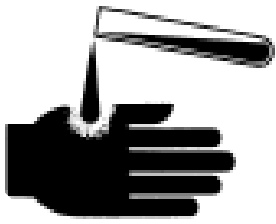
- Keep sparks and open flames away from the battery, especially during charging. DO NOT strike a match near the battery.
- DO NOT check the battery charge by placing a metal object across the terminals. Use a voltmeter or hydrometer.
- DO NOT charge a frozen battery. There is a risk of explosion. When frozen, warm the battery up to at least 16°C (61°F).

Keep hands and body away from rotating parts



- Be sure to stop the engine before checking or adjusting the belt tension and cooling fan.
- Keep your hands and body away from rotating parts, such as the cooling fan, V-belt, fan drive pulley or flywheel. Contact with rotating parts can cause severe personal injury.
- DO NOT run the engine without safety guards. Install safety guards securely before operation.

Anti-freeze & disposal of fluids



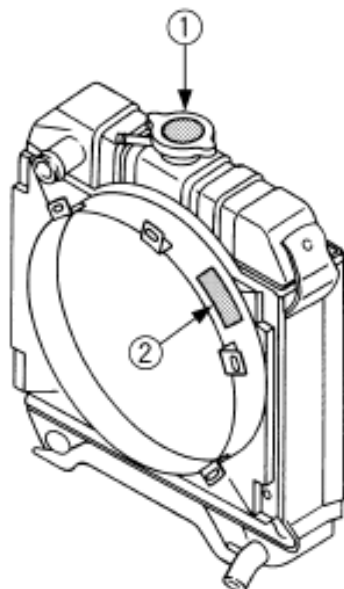
- Anti-freeze contains poison. Wear rubber gloves to avoid personal injury. In case of contact with skin, wash it off immediately.
- DO NOT mix different types of Anti-freeze. The mixture can produce a chemical reaction causing harmful substances. Use approved or genuine KUBOTA Antifreeze.
- Be mindful of the environment and the ecology. Before draining any fluids, determine the correct way to dispose of them. Observe the relevant environmental protection regulations when disposing of oil, fuel, coolant, brake fluid, filters, and batteries.
- When draining fluids from the engine, place a suitable container underneath the engine body.
- DO NOT pour waste onto the ground, down a drain, or into any water source. Dispose of waste fluids according to environmental regulations.

Conducting safety checks & maintenance



- When inspecting the engine or servicing, place the engine on a large flat surface. DO NOT work on anything that is supported only by lift jacks or a hoist.
- Always use blocks or the correct stands to support the engine before servicing.
- Disconnect the battery from the engine before conducting service. Put a "DO NOT OPERATE!" tag on the key switch to avoid accidental starting.
- To avoid sparks from an accidental short circuit always disconnect the battery's ground cable (-) first and reconnect it last.
- Be sure to stop the engine and remove the key when conducting daily and periodic maintenance, service, and cleaning.
- Check or conduct maintenance after the engine, coolant, muffler, or muffler cover have cooled off completely.
- Always use the appropriate tools and fixtures. Verify that they are in good condition before performing any service work. Make sure you understand how to use them before service.
- Use ONLY correct engine barring techniques for manually rotating the engine. DO NOT attempt to rotate the engine by pulling or prying on the cooling fan and V-belt. This practice can cause serious personal injury or premature damage to the cooling fan and belt.
- Replace fuel pipes and lubricant pipes with their hose clamps every 2 years or earlier whether they are damaged or not. They are made of rubber and age gradually.
- When servicing is performed together by two or more persons, take care to perform all work safely.
- Keep a first aid kit and fire extinguisher handy at all times.

Care of warning and caution labels



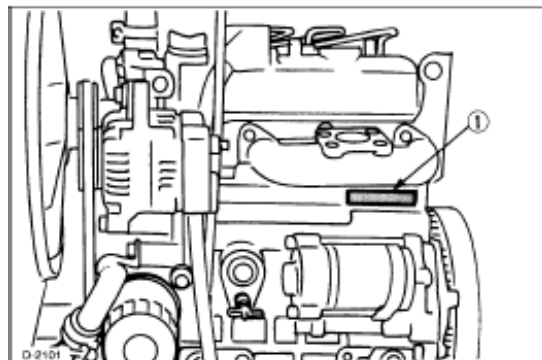
Part No.19077-8724-1 or 16667-8724-1
(55mm in diameter) (37mm in diameter)



Part No. TA040-4957-1
Stay clear of engine
fan and fan belt.

1. Keep warning and caution labels clean and free from obstructing material.
2. Clean warning and caution labels with soap and water, dry with a soft cloth.
3. Replace damaged or missing warning and caution labels with new labels from your local KUBOTA dealer.
4. If a component with warning and caution label(s) affixed is replaced with a new part, make sure the new label(s) is (are) attached in the same location(s) as the replaced component.
5. Mount new warning and caution labels by applying to a clean dry surface and pressing any bubbles to the outside edge.

SERVICING OF THE ENGINE



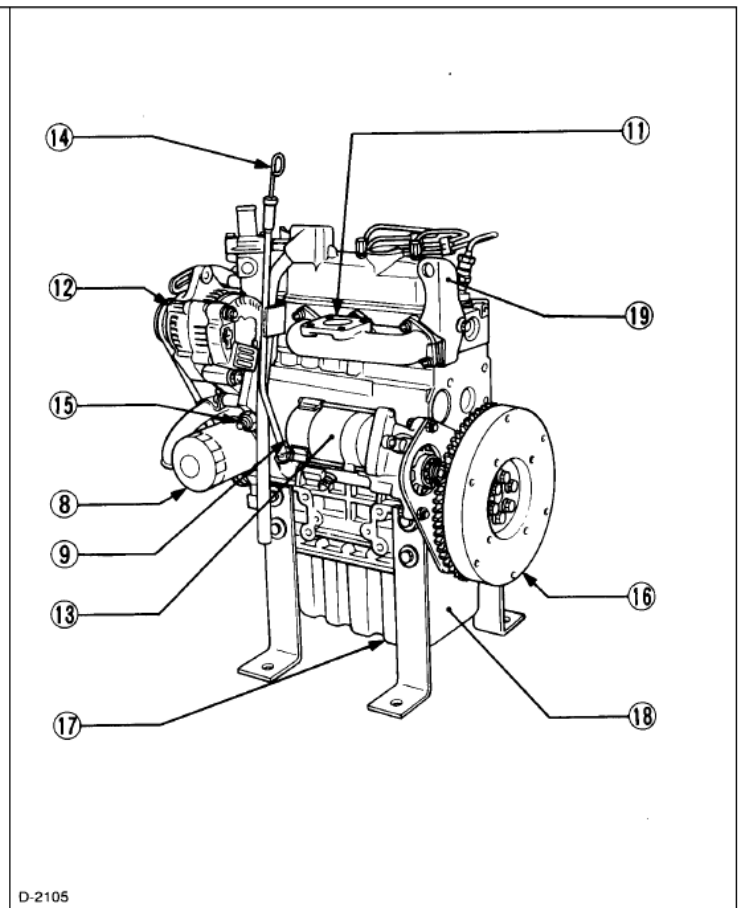
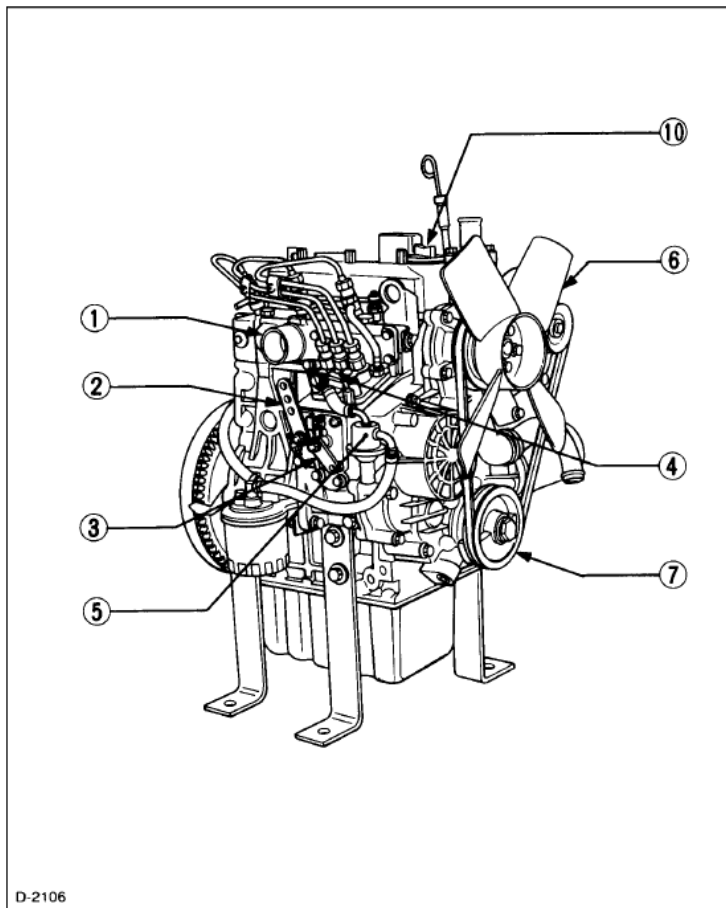
(1) Engine serial number

Your dealer is interested in your new engine and has the desire to help you get the most value from it. After reading this manual thoroughly, you will find that you can do some of the regular maintenance yourself. However, when in need of parts or major service, be sure to see your KUBOTA dealer.

For service, contact the KUBOTA Dealership from which you purchased your engine or your local KUBOTA dealer. When in need of parts, be prepared to give your dealer the engine serial number.

Locate the serial number now and record them in the space provided in the *Service logbook* on page 72.

NAMES OF PARTS



- (1) Intake manifold
- (2) Speed control lever
- (3) Engine stop lever
- (4) Injection pump
- (5) Fuel feed pump
- (6) Cooling fan
- (7) Fan drive pulley
- (8) Oil filter cartridge
- (9) Water drain cock
- (10) Oil filler plug
- (11) Exhaust manifold
- (12) Alternator
- (13) Starter
- (14) Oil level gauge
- (15) Oil pressure switch
- (16) Flywheel
- (17) Oil drain plug
- (18) Oil pan
- (19) Engine hook

PRE-OPERATION CHECK

Break-in

During the engine break-in period, observe the following by all means:

1. Change engine oil and oil filter cartridge after the first 50 hours of operation (See *Engine oil in Periodic service* section on page 48).
2. When ambient temperature is low, operate the machine after the engine has been completely warmed up.

Daily check

To prevent trouble from occurring, it is important to know the conditions of the engine well. Check it before starting.

CAUTION

To avoid personal injury:

- Be sure to install shields and safeguards attached to the engine when operating.
- Stop the engine at a flat and wide space when checking.
- Keep dust or fuel away from the battery, wiring, muffler, and engine to prevent a fire.

Check and clear them before operating every day. Pay attention to the heat of the exhaust pipe or exhaust gas so that it cannot ignite flammable materials.

Item		Ref. page
1. Parts that had trouble in previous operation		-
2. By walking around the machine	(1) Oil or water leaks	44, 55
	(2) Engine oil level and contamination	55
	(3) Amount of fuel	48
	(4) Amount of coolant	55
	(5) Dust in air cleaner dust cap	25
	(6) Damaged parts and loosened bolts and nuts	-
3. By inserting the key into the starter switch	(1) Proper functions of meters and pilot lamps; no stains on these parts	-
	(2) Proper functions of glow lamp timer	-
4. By starting the engine	(1) Colour of exhaust fumes	45
	(2) Unusual engine noise	45

OPERATING THE ENGINE

Starting the engine (normal)

CAUTION

- To avoid personal injury:
- Do not allow children to approach the machine while the engine is running.
- Be sure to install the machine on which the engine is installed, on a flat place.
- Do not run the engine on gradients.
- Do not run the engine in an enclosed area. Exhaust gas can cause air pollution and exhaust gas poisoning.
- Keep your hands away from rotating parts (such as fan, pulley, belt, flywheel etc.) during operation.
- Do not operate the machine while under the influence of alcohol or drugs.
- Do not wear loose, torn, or bulky clothing around the machine. It may catch on moving parts or controls, leading to the risk of accident. Use additional safety items, e.g. hardhat, safety boots or shoes, eye and hearing protection, gloves, etc., as appropriate or required.
- Do not wear radio or music headphones while operating engine.
- Check to see if it is safe around the engine before starting.

- Reinstall safeguards and shields securely and clear all maintenance tools when starting the engine after maintenance.

See the operating manual *Starting the machine* section on page 17.

Do not use ether or any starting fluid for starting the engine, or a severe damage will occur.

If the oil pressure lamp should be still on, immediately stop the engine and check;

- If there is enough engine oil.
- If the engine oil has dirt in it.
- If the wiring is faulty.

IMPORTANT

- If the glow lamp should redden too quickly or too slowly, immediately ask your KUBOTA dealer to check and repair it.
- If the engine does not catch or start at 10 seconds after the starter switch is set at "STARTING", wait for another 30 seconds and then begin the engine starting sequence again. Do not allow the starter motor to run continuously for more than 10 seconds.

Checks during operation

While running, make the following checks to see that all parts are working correctly.

Radiator cooling water (Coolant)

WARNING!

To avoid personal injury, do not remove radiator cap until coolant temperature is well below its boiling point. Then loosen cap slightly to the stop position, to relieve any pressure, before removing cap completely.

If the water temperature warning lamp lights up or overflow of steam or water from the overflow pipe does not stop, stop loading and let the engine cool down by idling for at least 5 minutes. Allow the engine to cool down gradually, stop the engine and proceed to the next inspection and maintenance work according to the *Radiator* section on page 55.

Check items:

1. Check to see if there is any coolant leak;
2. Check to see if there is any obstacle around the cooling air inlet or outlet;
3. Check to see if there is any dirt or dust between radiator fins and tube;
4. Check to see if the fan belt is too loose;
5. Check to see if radiator water pipe is clogged; and
6. Check to see if anti-freeze is mixed to a 50/50% mix of water and anti-freeze.

Oil pressure lamp

The lamp lights up to warn the operator that the engine oil pressure has dropped below the prescribed level. If this should happen during operation or should not go off even after the engine is accelerated more than 1000rpm, immediately stop the engine and check the following:

1. Engine oil level (see *Engine oil* in the *Maintenance* section on page 53).

Fuel

CAUTION

To avoid personal injury:

- Fluid escaping from pinholes may be invisible. Do not use hands to search for suspected leaks; Use a piece of cardboard or wood instead. If injured by escaping fluid, see a medical doctor at once. This fluid can produce gangrene or a severe allergic reaction.
- Check any leaks from fuel pipes or fuel injection pipes. Use eye protection when checking for leaks.

Be careful not to empty the fuel tank. Otherwise air may enter the fuel system, requiring fuel system bleeding (see *Fuel* in the *Maintenance* section on page 48).

Colour of exhaust

While the engine is run within the rated output range:

- The colour of exhaust remains colourless.
- If the output slightly exceeds the rated level, exhaust may become a little coloured with the output level kept constant.
- If the engine is run continuously with dark exhaust emission, it may lead to trouble with the engine.

Immediately stop the engine if

- The engine suddenly slows down or accelerates.
- Unusual noises suddenly develop.
- Exhaust fumes suddenly become very dark.
- The oil pressure lamp or the water temperature alarm lamp lights up.

Reversed engine revolution and remedies

CAUTION

To avoid personal injury:

- Reversed engine operation can make the machine reverse and run it backwards. It may lead to serious trouble.
- Reversed engine operation may make exhaust gas gush out into the intake side and ignite the air cleaner; It could catch fire.

Reversed engine revolution must be stopped immediately since engine oil circulation is cut quickly, leading to serious trouble.

How to tell when the engine starts running backwards

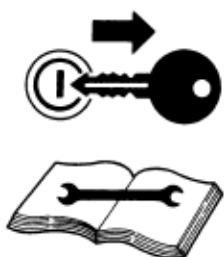
1. Lubricating oil pressure drops sharply. Oil pressure warning light, if used, will light.
2. Since the intake and exhaust sides are reversed, the sound of the engine changes, and exhaust gas will come out of the air cleaner.
3. A louder knocking sound will be heard when the engine starts running backwards.

Remedies

1. Immediately stop the engine – press the red STOP button twice, or turn the engine off with the key or switch.
2. After stopping the engine, check the air cleaner, intake rubber tube and other parts and replace parts as needed.

MAINTENANCE

CAUTION



To avoid personal injury:

- Be sure to conduct daily checks, periodic maintenance, refuelling or cleaning on a level surface with the engine shut off and remove the key.
- Before allowing other people to use your engine, explain how to operate, and have them read this manual before operation.
- When cleaning any parts, do not use gasoline but use regular cleanser.
- Always use proper tools, that are in good condition. Make sure you understand how to use them, before performing any service work.
- When installing, be sure to tighten all bolts lest they should be loose. Tighten the bolts by the specified torque.



- Do not put any tools on the battery, or battery terminals may short out. Severe burns or fire could result. Detach the battery from the engine before maintenance.
- Do not touch muffler or exhaust pipes while they are hot; Severe burns could result.

Service intervals

Observe the following for service and maintenance.

Interval	Item	Ref. page	Note
Every 50 hours	Check of fuel pipes, hoses, and clamp bands	50	5
	Change of engine oil	53	6, 7
Every 100 hours	Cleaning of air cleaner element	58	1, 5
	Cleaning of fuel filter	26	
	Check of fan belt tension	60	
Every 200 hours	Check of radiator hoses and clamp bands	50	
	Replacement of oil filter cartridge	54	6
	Check of intake air line	-	5
Every 400 hours	Replacement of fuel filter cartridge	52	5
Every 500 hours	Removal of sediment in the fuel tank	-	
	Cleaning of water jacket (radiator interior)	57	
	Replacement of fan belt	60	
Every year	Replacement of air cleaner element	58	2, 5
	Check of damage in electric wiring and loose connections	-	
Every 800 hours	Check of valve clearance	-	
Every 1500 hours	Check of fuel injection nozzle injection pressure	-	3, 5
Every 3000 hours	Check of turbo charger	-	3, 5
	Check of injection pump	-	3, 5
	Check of fuel injection timer	-	3, 5
Every 2 years	Change of radiator coolant (L.L.C.)	55	
	Replacement of radiator hoses and clamp bands	50	
	Replacement of fuel pipes and clamp bands	-	3, 5
	Replacement of intake air line	-	4, 5

Notes	
1	Air cleaner must be cleaned more often in dusty conditions than in normal conditions
2	After cleaning 6 times
3	Consult your local KUBOTA dealer for this service
4	Replace only if necessary
5	After 50 hours of operation
6	These items are registered as emission related critical parts by KUBOTA in the U.S. EPA nonroad emission regulation. As the engine owner, you are responsible for the performance of the required maintenance on the engine according to the above instruction. Please see the warranty statement in detail.
7	Changing interval of engine oil depends on the conditions in the table on the following page:

Models	Oil pan depth	
	Above 125 mm (4.9")	Below 101mm (4.0")
All models	200 hours	150 hours
Initial	50 hours	

* 101mm oil pan depth is optional.

** Standard replacement interval

- API service classification: above CD grade
- Ambient temperature: below 35°C (95°F)

NOTE

Lubricating oil

With the emission control now in effect, the CF-4 and CG-4 lubricating oils have been developed for use of a low sulphur fuel on on-road vehicle engines. When an off-road vehicle engine runs on a high-sulphur fuel, it is advisable to employ the CF, CD or CE lubricating oil with a high total base number. If the CF-4 or CG-4 lubricating oil is used with a high-sulphur fuel, change the lubricating oil at shorter intervals.

- Lubricating oil recommended when a low-sulphur or high-sulphur fuel is employed.

O: Recommended X: Not recommended

		Fuel		
		Low sulphur	High sulphur	Remarks
Lubricating oil class	CF	O	O	TBN≥10
	CF-4	O	X	
	CG-4	O	X	

PERIODIC SERVICE

Fuel

Fuel is flammable and can be dangerous. You should handle fuel with care.

CAUTION

To avoid damage or personal injury:

- Do not mix gasoline or alcohol with diesel fuel. This mixture can cause an explosion.
- Be careful not to spill fuel during refuelling. If fuel should spill, wipe it off at once, or it may cause a fire.
- Do not fail to stop the engine before refuelling. Keep the engine away from the fire.
- Be sure to stop the engine while refuelling or bleeding and when cleaning or changing fuel filter or fuel pipes. Do not smoke when working around the battery or when refuelling.
- Check the above fuel systems at a well ventilated and wide place.
- When fuel and lubricant are spilled, refuel after letting the engine cool off.
- Always keep spilled fuel and lubricant away from engine.

Fuel level check and refuelling

1. Check to see that the fuel level is above the lower limit of the fuel level gauge.
2. If the fuel is too low, add fuel to the upper limit. Do not overfill.

No.2-D is a distillate fuel oil of lower volatility for engines in industrial and heavy mobile service. (SAE J313 JUN87)
Grade of Diesel Fuel Oil According to ASTM D975.

Flash Point, °C (°F)	Water and Sediment, volume %	Carbon Residue on, 10 percent Residuum, %	Ash, weight %
Min	Max	Max	Max
52 (125)	0.05	0.35	0.01

Distillation Tempera- tures, °C(°F) 90% Point		Viscosity Kinematic cSt or mm ² /s at 40°C		Viscosity Saybolt, SUS at 100°F		Sul- fur, weight %	Cop- per Strip Corro- sion	Cetane Num- ber
Min	Max	Min	Max	Min	Max	Max	Max	Min
282 (540)	338 (640)	1.9	4.1	32.6	40.1	0.50	No. 3	40

The cetane number is required not to be less than 45.

- Be sure to use a strainer when filling the fuel tank, or dirt or sand in the fuel may cause trouble in the fuel injection pump.
- For fuel, always use diesel fuel. You are required not to use alternative fuel, because its quality is unknown, or it may be inferior in quality. Kerosene, which is very low in cetane rating, adversely affects the engine. Diesel fuel differs in grades depending on the temperature.
- Be careful not to let the fuel tank become empty, or air can enter the fuel system, necessitating bleeding before next engine start.

Air bleeding the fuel system

CAUTION

To avoid personal injury:

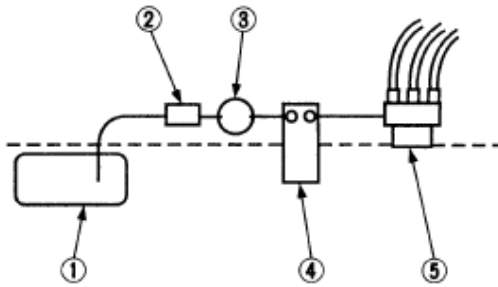
- Do not bleed a hot engine as this could cause fuel to spill onto a hot exhaust manifold creating a danger of fire.

Air bleeding of the fuel system is required if;

- After the fuel filter and pipes have been detached and refitted;
- After the fuel tank has become empty; or
- Before the engine is to be used after a long storage.

Procedure

1. For fuel tanks that are lower than the injection pump. The fuel system must be pressurized by the fuel system electric fuel pump.
 2. If an electric fuel pump is not used, you must manually actuate the pump by lever to bleed.
 3. The primary fuel filter 3 must be on the pressure side of the pump if the fuel tank is lower than the injection pump.
 4. Loosen air vent plug of the fuel filter a few turns.
 5. Screw back the plug when bubbles do not come up anymore.
 6. Open the air vent plug on top of the fuel injection pump.
 7. Retighten the plug when bubbles do not come up anymore.
- Tighten air vent plug of the fuel injection pump except when bleeding, or it may stop the engine suddenly.



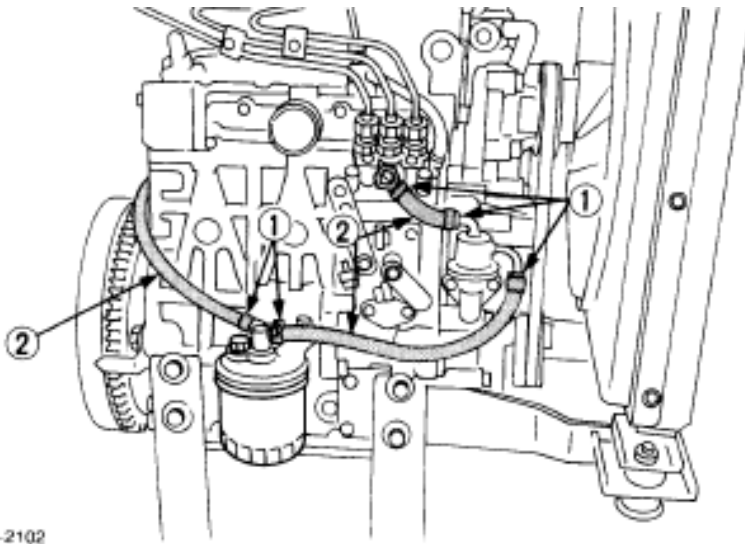
- (1) Fuel tank below injection pump
(2) Pre-filter
(3) Electric or Mechanical pump
(4) Main Filter
(5) Injection pump

Check of fuel pipes and clamp bands

CAUTION

To avoid personal injury:

- Check or replace the fuel pipes after stopping the engine. Broken fuel pipes can cause fires. Check the fuel pipes every 50 hours of operation.
1. If the clamp band is loose, apply oil to the screw of the band, and tighten the band securely.
 2. If the fuel pipes, made of rubber, become worn out, replace them and the clamp bands every two years.
 3. If the fuel pipes and clamp bands are found worn or damaged before two years' time, replace, or repair them at once.
 4. After replacement of the pipes and bands, air-bleed the fuel system.
- When the fuel pipes are not installed, plug them at both ends with clean cloth or paper to prevent dirt from entering. Dirt in the pipes can cause fuel injection pump malfunction.



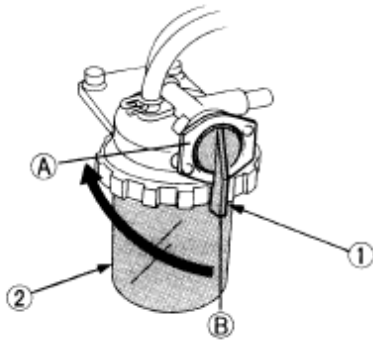
D-2102

- (1) Clamp band
- (2) Fuel pipe

Cleaning of fuel filter

Every 100 hours of operation, clean the fuel filter in a clean place to prevent dust intrusion.

1. Close the fuel filter lever.

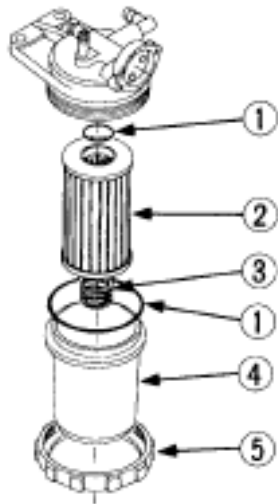


F-7736

- (1) Fuel filter lever
- (2) Fuel filter pot
- (A) "OFF"
- (B) "ON"

2. Remove the top cap, and rinse the inside with diesel fuel.
3. Take out the element, and rinse it with diesel fuel.
4. After cleaning, reinstall the fuel filter, keeping out of dust and dirt.
5. Air-bleed the injection pump.

- Entrance of dust and dirt can cause a malfunction of the fuel injection pump and the injection nozzle. Wash the fuel filter cup periodically.



F.7065

(1) O ring

(2) Filter element

(3) Spring

(4) Filter bowl

(5) Screw ring

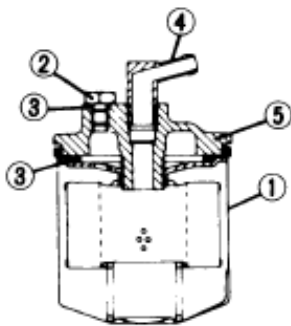
Replacement of fuel filter cartridge

1. Replace the fuel filter cartridge with a new one every 400 operating hours.

2. Apply fuel oil thinly over the gasket and tighten the cartridge into position by hand-tightening only.

3. Finally, vent the air.

- Replace the fuel filter cartridge periodically to prevent wear of the fuel injection pump plunger or the injection nozzle, due to dirt in the fuel.



(1) Fuel filter cartridge

(2) Air vent plug

(3) O ring

(4) Pipe joint

(5) Cover

Engine oil

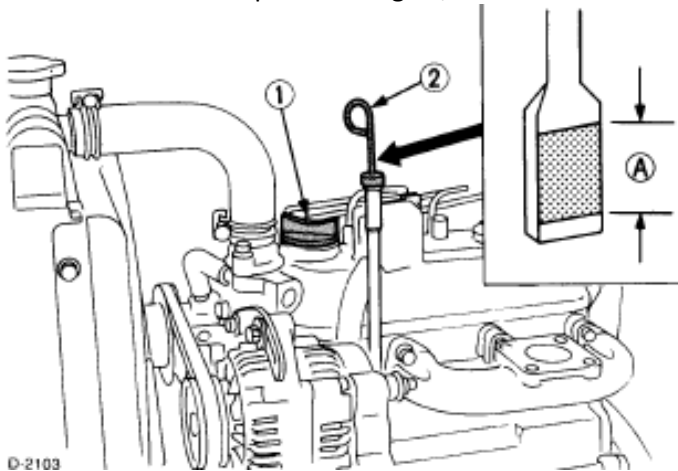
CAUTION

To avoid personal injury:

- Be sure to stop the engine before checking and changing the engine oil and the oil filter cartridge.
- Do not touch muffler or exhaust pipes while they are hot; Severe burns could result. Always stop the engine and allow it to cool before conducting inspections, maintenance, or for a cleaning procedure.
- Contact with engine oil can damage your skin. Put on gloves when using engine oil. If you come in contact with engine oil, wash it off immediately.
- Be sure to inspect the engine, locating it on a level place. If placed on gradients accurately, oil quantity may not be measured.

Checking oil level and adding engine oil

1. Check the engine oil level before starting or more than 5 minutes after stopping the engine.
2. Remove the oil level dipstick, wipe it clean and reinstall it.
3. Take the oil level dipstick out again, and check the oil level.



(1) Oil filler plug

(2) Oil level dipstick

[Inset]

(A) Engine oil level within this range is proper.

4. If the oil level is too low, remove the oil filler plug, and add new oil to the prescribed level.
5. After adding oil, wait more than 5 minutes and check the oil level again. It takes some time for the oil to drain down to the oil pan.

Engine oil quantity (standard oil pan): 6.7 Litres (1.77 U.S. gals)

IMPORTANT:

Engine oil should be MIL-L-2104C or have properties of API classification CD grades or higher. Change the type of engine oil according to the ambient temperature.

Above 25°C	SAE30	or SAE10W-30, SAE15W-40
-10°C to 25°C	SAE10W40	or SAE15W-40
below -10°C	SAE10W-30	

When using oil of different brands from the previous one, be sure to drain all the previous oil before adding the new engine oil.

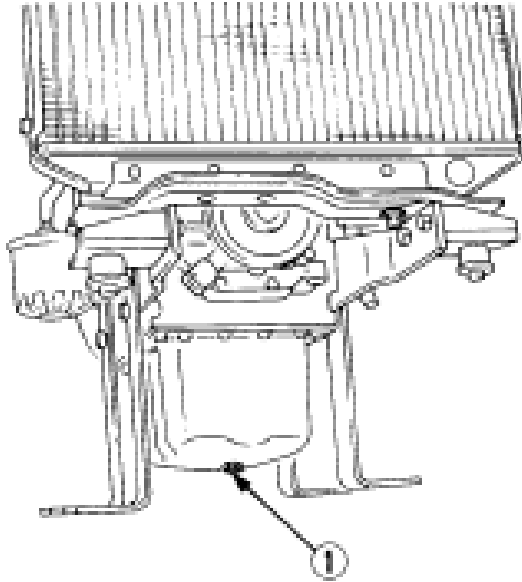
Change of engine oil

CAUTION

To avoid personal injury:

- Be sure to stop the engine before draining engine oil.
- When draining engine oil, place some container underneath the engine and dispose it according to local regulations.
- Do not drain oil after running the engine. Allow engine to cool down sufficiently.

1. Change oil after the initial 50 hours of operation and every 200 hours thereafter.
2. Remove the drain plug at the bottom of the engine and drain all the old oil. Drain oil will drain easier when the oil is warm.



B-141110

1) Oil drain plug

3. Add new engine oil up to the upper limit of the oil level dipstick.

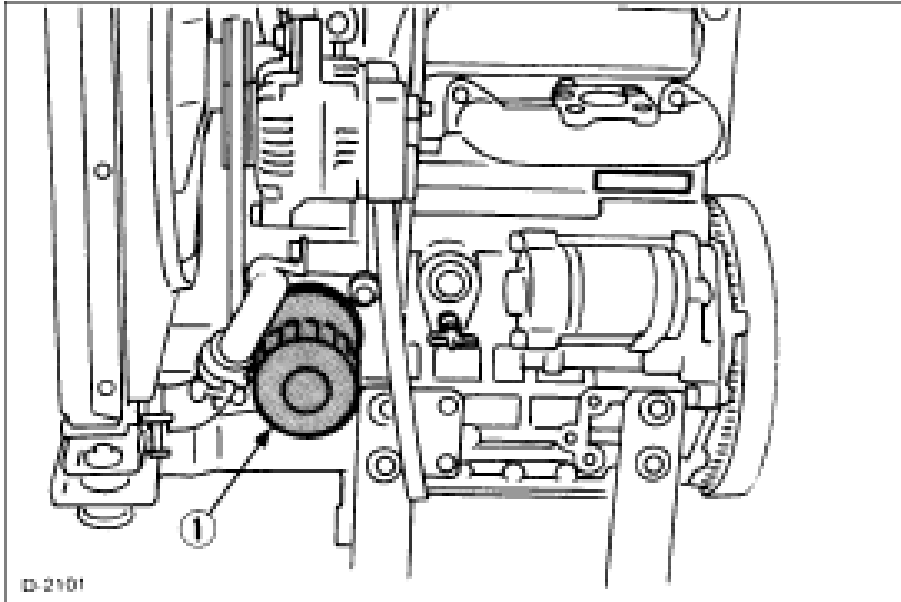
Replacement of oil filter cartridge

CAUTION

To avoid personal injury:

- Be sure to stop the engine before changing the oil filter cartridge.
- Allow engine to cool down sufficiently, oil can be hot and cause burns.

1. Replace the oil filter cartridge after the initial 50 hours of operation and every 200 hours thereafter.
2. Remove the old oil filter cartridge with a filter wrench.
3. Apply a film of oil to the gasket for the new cartridge.
4. Screw in the cartridge by hand. When the gasket contacts the seal surface, tighten the cartridge by hand. Using a filter wrench will result in overtightening.



(1) Oil filter cartridge

Remove with a filter wrench (Tighten with your hand)

5. After the new cartridge has been replaced, the engine oil level normally decreases a little. Thus, run the engine for a while and check for oil leaks through the seal before checking the engine oil level. Add oil if necessary.

- Wipe off any oil sticking to the machine completely.

Radiator

Coolant will last for one day's work if filled all the way up before operation. Make it a rule to check the coolant level before every operation.

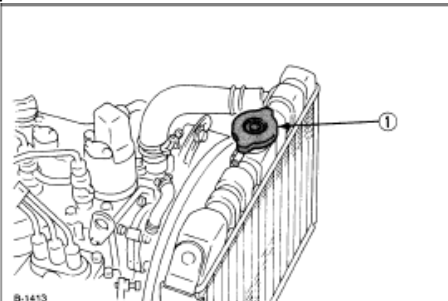
WARNING

To avoid personal injury:

- Do not stop the engine suddenly, stop it after about 5 minutes of unloaded idling.
- Work only after letting the engine and radiator cool off completely (more than 30 minutes after it has been stopped).
- Do not remove the radiator cap while coolant is hot. When cool to the touch, rotate cap to the first stop to allow excess pressure to escape. Then remove cap completely. If overheats should occur, steam may gush out from the radiator or reserve tank; Severe burns could result.

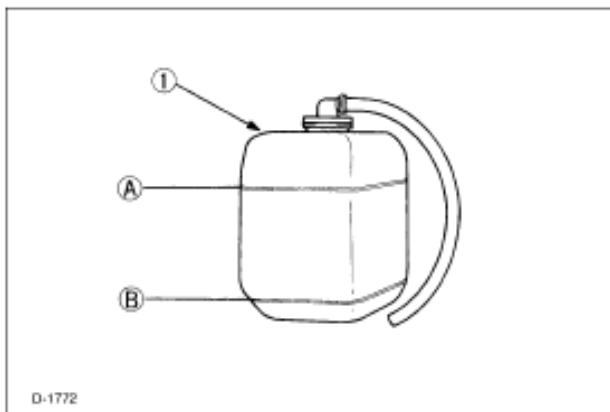
Checking coolant level, adding coolant

1. Remove the radiator cap after the engine has completely cooled, and check to see that coolant reaches the supply port.



(1) Radiator pressure cap

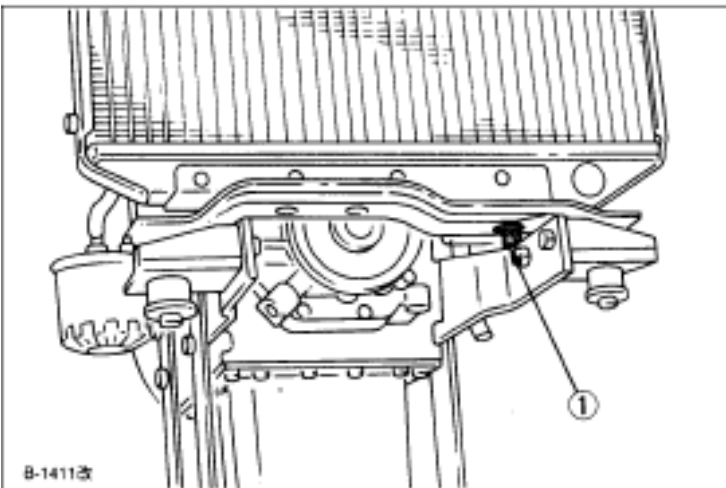
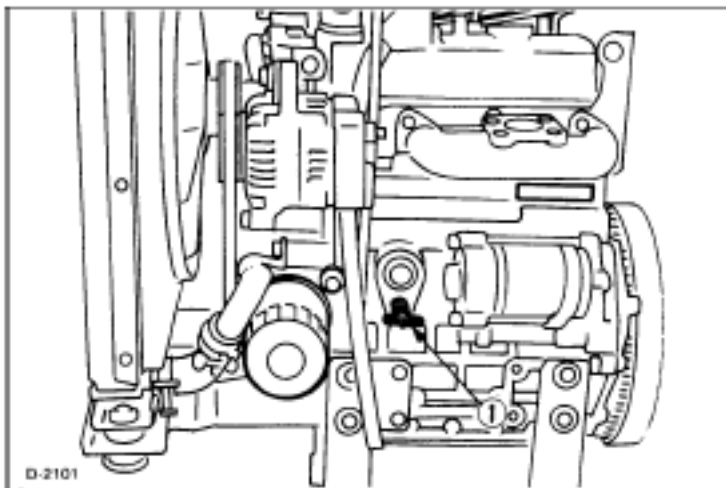
2. If the radiator is provided with a reserve tank, check the coolant level of the reserve tank. When it is between the "FULL" and "LOW" marks, the coolant will last for one day's work.



(1) Reserve tank
 (A) "FULL"
 (B) "LOW"

3. When the coolant level drops due to evaporation, add water only up to the full level.

4. Check to see that two drain cocks; one is at the crankcase side and the other is at the lower part of the radiator as figures below.



(1) Coolant drain valve

- If the radiator cap has to be removed, follow the caution and securely retighten the cap.
- If coolant should be leak, consult your local KUBOTA dealer.
- Make sure that muddy or sea water does not enter the radiator.
- Use clean, fresh water and 50% anti-freeze to fill the recovery tank.
- Do not refill reserve tank with coolant over the "FULL" level mark.

- Be sure to close the radiator cap securely. If the cap is loose or improperly closed, coolant may leak out and decrease quickly.

Change of radiator coolant (L.L.C.)

1. To drain coolant, always open both drain valves and simultaneously open the radiator cap as well. With the radiator cap kept closed, a complete drain of water is impossible.
2. Remove the overflow pipe of the radiator pressure cap to drain the reserve tank.
3. Prescribed coolant volume 5.0 Litres (1.32 U.S. gallons)
4. An improperly tightened radiator cap or a gap between the cap and the seat quickens loss of coolant.
5. Coolant (Anti-freeze)

Season	Coolant
All seasons	Pure water and anti-freeze (See "Anti-freeze" in RADIATOR section.)

- Coolant quantities shown are for standard radiators.

Remedies for quick decrease of coolant

1. Check any dust and dirt between the radiator fins and tube. If any, remove them from the fins and the tube.
2. Check the tightness of the fan belt. If loose, tighten it securely.
3. Check the internal blockage in the radiator hose. If scale forms in the hose, clean with the scale inhibitor or its equivalent.

Replacement of radiator hoses and clamp bands

CAUTION

To avoid personal injury:

Be sure to check radiator hoses and hose clamps periodically. If radiator hose is damaged or coolant leaks, overheats or severe burns could occur.

Check to see if radiator hoses are properly fixed every 200 hours of operation or 6 months, whichever comes first.

1. If hose clamps are loose or water leaks, tighten hose clamp securely.
 2. Replace hoses and tighten hose clamps securely, if radiator hoses are swollen, hardened, or cracked.
- Replace hoses and hose clamp every 2 years, or earlier, if checked and found that hoses are swollen, hardened, or cracked.

Precaution at overheating

Take the following actions in the event the coolant temperature is nearly or more than the boiling point, what is called "Overheating". Take these actions if the engine's alarm buzzer sounds or the alarm lamp lights up.

1. Stop the engine operation in a safe place and keep the engine unloaded idling.
2. Do not stop the engine suddenly. Stop it after about 5 minutes of unloaded idling.
3. If the engine stalls within about 5 minutes of running under no load, immediately leave and keep yourself away from the machine. Do not open the hood and any other part.
4. Keep yourself and others well away from the engine for further 10 minutes or while the steam blown out.
5. Checking that there gets no danger such as burn, get rid of the causes of overheating according to the manual, see *Troubleshooting* on page 62. Then restart the engine.

Cleaning radiator core (outside)

If dust is between the fin and tube, wash it away with running water.

Do not clean radiator with firm tools such as spatulas or screwdrivers. They may damage specified fin or tube. It can cause coolant leaks or decrease cooling performance.

Anti-freeze

CAUTION

To avoid personal injury:

- When using anti-freeze, put on some protection such as rubber gloves (Antifreeze contains poison.).
- If Antifreeze is ingested, induce vomiting immediately and seek medical attention.
- If anti-freeze comes into contact with the skin or clothing, wash it off immediately.
- Do not mix different types of antifreeze. The mixture can produce chemical reaction causing harmful substances.
- Anti-freeze is extremely flammable and explosive under certain conditions. Keep fire and children away from antifreeze.
- When draining fluids from the engine, place some container underneath the engine body.
- Do not pour waste onto the grounds, down a drain, or into any water source.
- Also, observe the relevant environmental protection regulations when disposing of anti-freeze.

Always use a 50/50 mix of long-life coolant and clean, soft water in KUBOTA engines.

Contact KUBOTA concerning coolant for extreme conditions.

1. Long-life coolant (hereafter LLC) comes in several types. Use ethylene glycol (EG) type for this engine.
2. Before employing LLC-mixed cooling water, flush the radiator with fresh water. Repeat this procedure 2 or 3 times to clean up the radiator and engine block from inside.
3. Mixing the LLC: Premix 50% LLC with 50% clean, soft water. When mixing, stir it up well, and then fill into the radiator.
4. The procedure for the mixing of water and antifreeze differs according to the make of the antifreeze. Refer to SAE J1034 standard, more specifically also to SAE J814c.

Vol % Anti- Freeze	Freezing point		Boiling point*	
	°C	°F	°C	°F
50	-37	-34	108	226

**At 1.013×10^5 Pa (760 mmHg) pressure (atmospheric). A higher boiling point is obtained by using a radiator pressure cap which permits the development of pressure within the cooling system.*

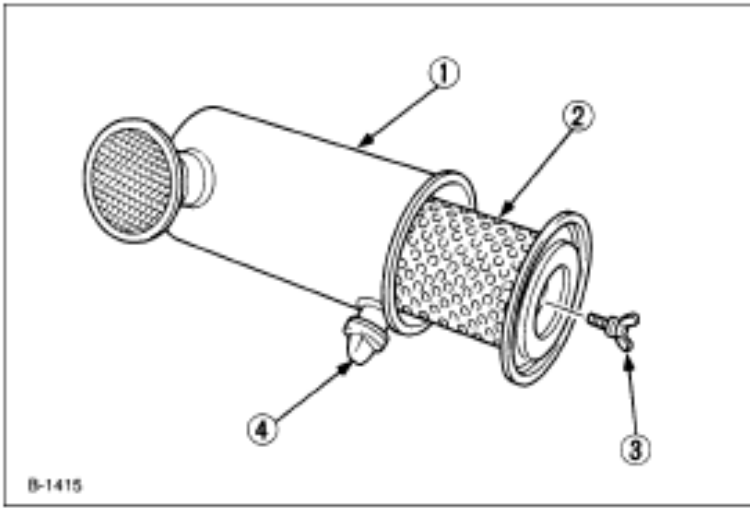
5. Adding the LLC

- (1) Add only water if the coolant level reduces in the cooling system by evaporation.
 - (2) If there is a coolant leak, add the LLC of the same manufacturer and type in the same coolant percentage.
- *Never add any long-life coolant of different manufacturer (Different brands may have different additive components, and the engine may fail to perform as specified).
6. When the LLC is mixed, do not employ any radiator cleaning agent. The LLC contains anti-corrosive agent. If mixed with the cleaning agent, sludge may build up, adversely affecting the engine parts.
 7. Kubota's genuine long-life coolant has a service life of 2 years. Be sure to change the coolant every 2 years.
 - The above data represent industry standards that necessitate a minimum glycol content in the concentrated anti-freeze.

Air cleaner

Since the air cleaner employed on this engine is a dry type, never apply oil to it.

1. Open the evacuator valve once a week under ordinary conditions - or daily when used in a dusty place. This will get rid of large particles of dust and dirt.
2. Wipe the inside air cleaner clean with cloth if it is dirty or wet.
3. Avoid touching the element except when cleaning.
4. When dry dust adheres to the element, blow compressed air from the inside turning the element. Pressure of compressed air must be under 205kPa (2.1kgf/cm², 30psi).
5. When carbon or oil adheres to the element, soak the element in detergent for 15 minutes, then wash it several times in water, rinse with clean water and dry it naturally.
6. After the element is fully dried, inspect the inside of the element with a light, and check if it is damaged or not (referring to the instructions on the label attached to the element).
7. Replace the element every year or every 6 cleanings.



(1) Air cleaner body

(2) Element

(3) Wing bolt

(4) Evacuator valve

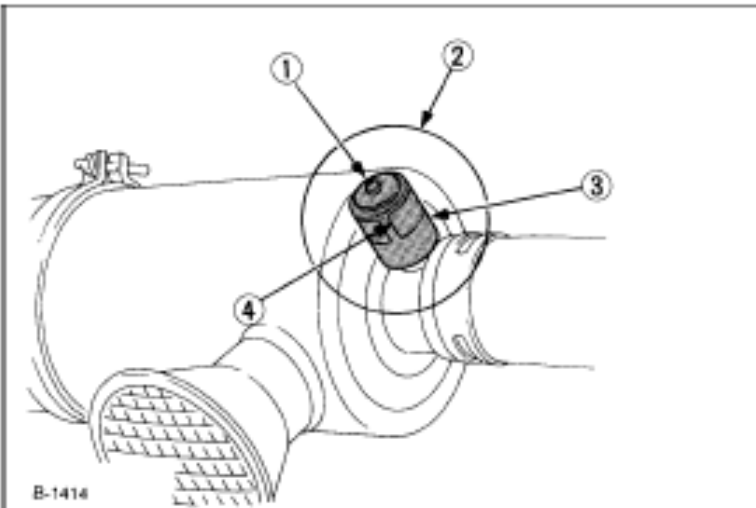
- Make sure the wing bolt for the element is tight enough. If it is loose, dust and dirt may be sucked in, wearing down the cylinder liner and piston ring earlier, and thereby resulting in poor power output.
- Do not over service the air cleaner element. Over servicing may cause dirt to enter the engine causing premature wear. Use the dust indicator as a guide on when to service.

Evacuator valve

Open the evacuator valve once a week under ordinary conditions - or daily when used in a dusty place - to get rid of large particles of dust and dirt.

Dust indicator (optional)

If the red signal on the dust indicator attached to the air cleaner is visible, the air cleaner has reached the service level. Clean the element immediately, and reset the signal with the "RESET" button.



(1) "RESET" button

(2) Dust indicator

(3) Service level

(4) Signal

Electric wiring

CAUTION

To avoid personal injury:

- Shorting of electric cable or wiring may cause a fire.
- Check to see if electric cables and wiring are swollen, hardened, or cracked.
- Keep dust and water away from all power connections. Loose wiring terminal parts make bad connections. Be sure to repair them before starting the engine.

Damaged wiring reduces the capacity of electrical parts. Change or repair damaged wiring immediately.

Fan belt

Adjusting fan belt tension

CAUTION

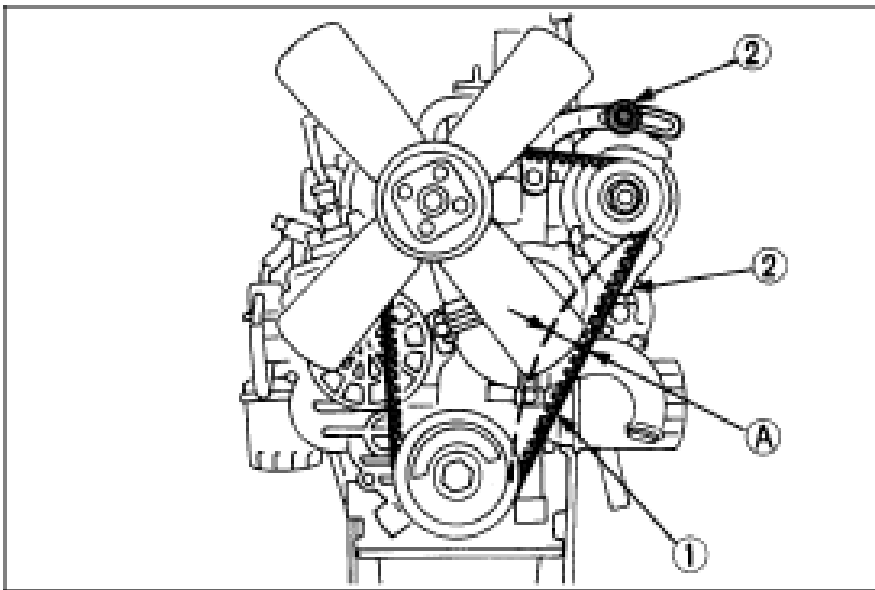
To avoid personal injury:

- Be sure to stop the engine and remove the key before checking the belt tension.
- Be sure to reinstall the detached safety shield after maintenance or checking.

Proper fan belt tension is achieved with a deflection of between 7 to 9 mm (0.28 to 0.35 in.) when the belt is pressed in the middle of the span.

1. Stop the engine and remove the key.
2. Apply moderate thumb pressure to belt between pulleys.
3. If tension is incorrect, loosen the alternator mounting bolts and, using a lever placed between the alternator and the engine block, pull the alternator out until the deflection of the belt falls within acceptable limits.
4. Replace fan belt if it is damaged.

- If belt is loosened or damaged and the fan is damaged, it could result in overheats or insufficient charging. Correct or replace belt.



(1) Fan belt

(2) Bolt and nut

(A) 7 to 9 mm (0.28 to 0.35 in.) (under load of 10kgf (22.1 lbs))

CARRIAGE AND STORAGE

Carriage

CAUTION

To avoid personal injury:

- Fix the engine securely to prevent falling during operation.
- Do not stand near or under the engine while carrying it.
- The engine is heavy. In handling it, be very alert to not get your hands and body caught in.

1. Use mechanical assistance such as an engine crane when carrying the engine, or injury could result. Support the engine securely with rope, chains, or slings to avoid falling while carrying it.
2. When lifting the engine, put the hook securely to metal fittings attached to the engine. Use strong hook and fittings enough to hang the engine.

Storage

CAUTION

To avoid personal injury:

- Do not clean the machine with engine running.
- To avoid the danger of exhaust fume poisoning, do not operate the engine in a closed building without proper ventilation.
- When storing the engine just after running, let the engine cool off. Before storing the engine for more than a few months, remove any dirt on the machine, and:

1. Drain the coolant in the radiator. Open the valve at the bottom of the radiator and remove the pressure cap to drain water completely. Leave the valve open. Hang a note written "No water" on the pressure cap. Since water may freeze when the temperature drops below 0°C (32°F), it is very important that no water is left in the machine.
2. Remove dirty engine oil, fill with new oil, and run the engine for about 5 minutes to let the oil penetrate to all the parts.
3. Check all the bolts and nuts and tighten if necessary.
4. Remove the battery from the engine, adjust the electrolyte level, and recharge it. Store the battery in a dry and dark place.
5. When the engine is not used for a long period of time, run it for about 5 minutes under no load every 2-3 months to keep it free from rust. If the engine is stored without any running, moisture in the air may condense into dew over the sliding parts of the engine, resulting in rust there.
6. If you forget to run the engine for longer than 5-6 months, apply enough engine oil to the valve guide and valve stem seal and make sure the valve works smoothly before starting the engine.
7. Store the engine in a flat place and remove the key from engine.
8. Do not store the engine in a place where has flammable materials such as dry grass or straw.
9. When covering the engine for storage, let engine and muffler cool off completely.
10. Operate the engine after checking and repairing damaged wirings or pipes, and clearing flammable materials carried by mice and rodents.

TROUBLESHOOTING

If the engine does not function properly, use the following chart to identify and correct the cause.

When it is difficult to start the engine

Cause	Counter measures
Fuel is thick and does not flow.	Check the fuel tank and fuel filter. Remove water, dirt, and other impurities.
	As all fuel will be filtered by the filter, if there should be water or other foreign matters on the filter, clean the filter with kerosene.
Air or water mixed in fuel system	If air is in the fuel filter or injection lines, the fuel pump will not work properly. To attain proper fuel injection pressure, check carefully for loosened fuel line coupling, loose cap nut, etc.
	Loosen joint bolt stop fuel filter and air vent screws of fuel injection pump to eliminate all the air in the fuel system.
Thick carbon deposits on orifice of injection nozzle.	This is caused when water or dirt is mixed in the fuel. Clean the nozzle injection piece, being careful not to damage the orifice.
	Check to see if nozzle is working properly or not. If not, install a new nozzle.
Engine oil becomes thick in cold weather and engine cranks slow.	Change grade of oil according to the weather (temperature.)

When output is insufficient

Cause	Counter measures
Carbon stuck around orifice of nozzle piece	Clean orifice and needle valve, being very careful not to damage the nozzle orifice.
	Check nozzle to see if good. If not, replace with new parts.
Fuel is insufficient	Check fuel system.
Overheating of moving parts	Check lubricating oil system.
	Check to see if lubricating oil filter is working properly.
	Filter element deposited with impurities would cause poor lubrication. Change element.
Air cleaner is dirty	Clean the element every 100 hours of operation, or more often in dusty environments.
Injection pump wear	Do not use poor quality fuel as it will cause wear of the pump. Only use No. 2-D diesel fuel.

When engine suddenly stops

Cause	Counter measures
Lack of fuel	Check the fuel tank and refill the fuel, if necessary.
	Also check the fuel system for air or leaks.
Bad nozzle	If necessary, replace with a new nozzle.
Moving parts are overheated due to shortage of lubrication oil or improper lubrication.	Check amount of engine oil with oil level gauge.
	Check lubricating oil system.
	Every second oil change, oil filter cartridge should be replaced.

When colour of exhaust is especially bad

Cause	Counter measures
Fuel is of extremely bad quality	Select good quality fuel. Use No. 2-D diesel fuel only.
Nozzle is bad	If necessary, replace with new nozzle.

When engine must be stopped immediately

Cause	Counter measures
Colour of exhaust suddenly turns dark	Check the fuel injection system, especially the fuel injection nozzle.
Bearing parts are overheated	Check the lubricating system.
Oil lamp lights up during operation	Check the lubricating system.
	Check the function of the relief valve in the lubricating system.
	Check the pressure switch.
	Check filter base gasket.

When engine overheats

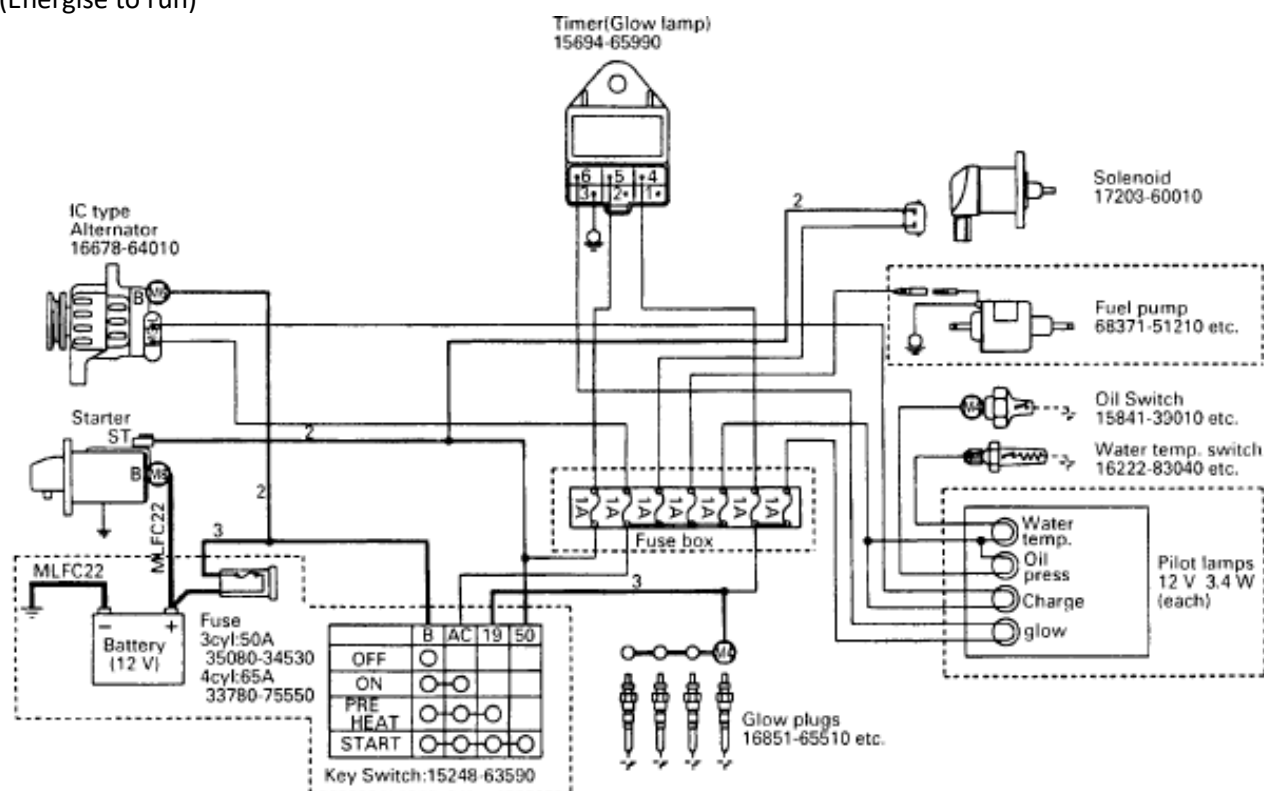
Cause	Counter measures
Engine oil insufficient	Check oil level. Replenish oil as required.
Fan belt broken or elongated	Change belt or adjust belt tension.
Coolant insufficient	Replenish coolant.
Excessive concentration of anti-freeze	Add water only or change to coolant with the specified mixing ratio.
Radiator net or radiator fin clogged with dust	Clean net or fin carefully.
Inside of radiator or coolant flow route corroded	Clean or replace radiator and parts.
Thermostat defective	Check thermostat and replace if necessary.
Temperature gauge or sensor defective	Check temperature with thermometer and replace if necessary.
Overload running	Reduce load.
Head gasket defective or water leakage	Replace parts.
Unsuitable fuel used	Drain, clean all fuel system parts, use the correct fuel.

SPECIFICATIONS

Type		Vertical, water-cooled, 4-cycle diesel engine
Number of cylinders		4
Bore and stroke	mm	78 x 78.4
Total displacement	cm ³	1498
Combustion chamber		Spherical Type (E-TVCS)
SAE NET Intermittent	kW / rpm	31.3 / 3000
H.P. (SAEJ1349)	HP / rpm	42.0 / 3000
SAE NET Continuous	kW / rpm	27.2 / 3000
H.P. (SAEJ1349)	HP / rpm	36.5 / 3000
Maximum bare speed	rpm	3200
Minimum bare idling speed	rpm	800-900
Order of firing		1-3-4-2
Direction of rotation		Counter-clockwise (viewed from flywheel side)
Injection pump		Bosch MD Type Mini Pump
Injection pressure		13.73 MPa (140 kgf/cm ² , 1991 psi)
Injection timing (Before T.D.C.)		18°
Compression ratio		23.5 : 1
Fuel		Diesel Fuel No. 2 (ASTM D975)
Lubricant (API classification)		Above CD grade
Dimensions Length x Width x Height	mm	591.3 x 439.2 x 613.7
Dry weight	kg	114
Starting system		Cell starter (with glow plug)
Starting motor		12 v, 1.2 kW
Charging generator		12 v, 360 W
Recommended battery capacity		12 v, 70 AH, equivalent
Specifications are subject to change without notice		

WIRING DIAGRAM

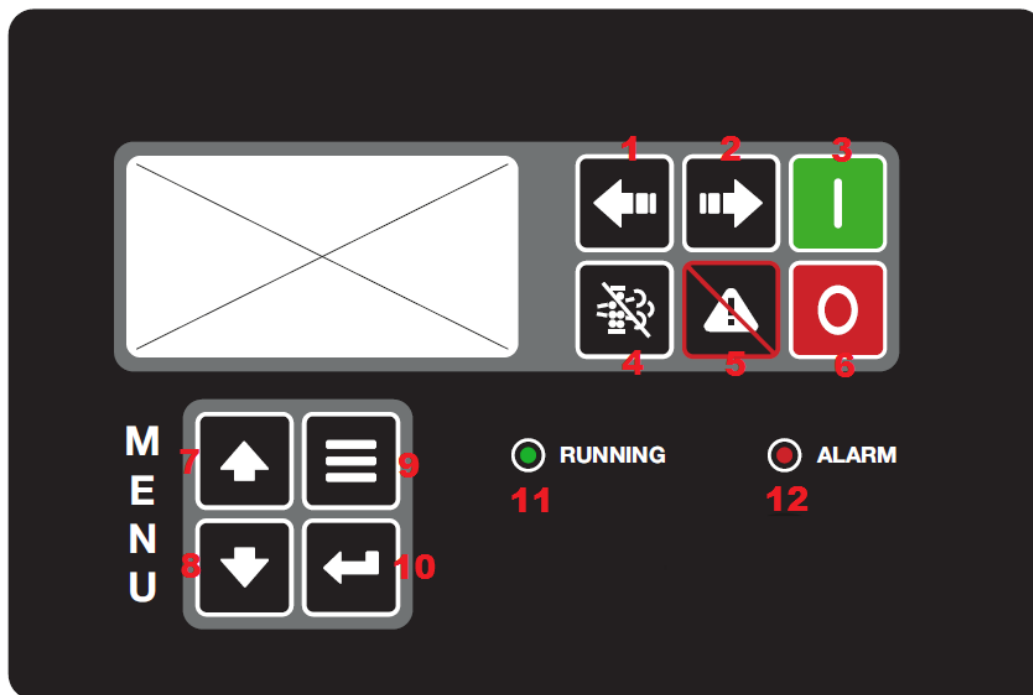
KEA/SAE standard (Energise to run)



- ★ The parts boxed in [] are reference, NOT equipped for standard engine spec.
- ★ Non marked wire dia. is 0.8~1.25 mm².

SP5000 Compressor Controller

Controller buttons and functions



	1	LEFT button. Use this button to move left or to change the mode. The button can change the mode only if the main screen with the indicator of currently selected mode is displayed. Standard mode of operation is MAN.
	2	RIGHT button. Use this button to move right or to change the mode. The button can change the mode only if the main screen with the indicator of currently selected mode is displayed. Standard mode of operation is MAN.
	3	START button. Works in MAN mode only. Press this button to initiate the start sequence of the engine.
	4	Aftertreatment button. Instant access to aftertreatment setting – inhibit and force regeneration. Not used on AG176.
	5	FAULT RESET button. Use this button to acknowledge alarms and deactivate the horn output. Inactive alarms will disappear immediately and status of active alarms will be changed to “confirmed” so they will disappear as soon as their reasons dismiss.
	6	STOP button. Works in MAN mode only. Press this button to initiate the stop sequence of the engine. Pressing repeatedly during Cooling immediately stops the engine.
	7	UP button. Use this button to move up or increase value.
	8	DOWN button. Use this button to move up or decrease value.
	9	PAGE button. Use this button to switch over display pages (Values / Setpoints / History)
	10	ENTER button. Use this button to finish editing a setpoint or moving right in the history page.
	11	Indicator of running engine.
	12	Indicator of active alarm – warning or shutdown.

Normal use – startup

Normal startup is achieved by turning the compressor on (as described in the section *Starting the machine* on page 17), and pressing the green START button once only. The compressor will not immediately start but will initiate a pre-set glow sequence and warm up. It is advised not to press any other buttons while this is happening.

When the compressor first starts, it will be in warm up mode. The outlet valves must remain closed during this time. When the machine is warmed up, the compressor revs will increase temporarily before dropping back down. At this time the compressor is ready for use.

Normal use – shut-down

To stop the compressor, first allow it to run for around 5 minutes with both outlet valves fully closed to cool down, especially after heavy use or in high temperature.

Press the red STOP button once only. The screen will show “COOLING DOWN” instead of “RUNNING” but no other changes will be observed. The engine is in a cool-down sequence (equivalent to a turbo-timer) which is pre-set and exists to protect the engine from damage.

When the engine is stopped, switch off with the key to stop the fuel pump and auxiliary systems. If the compressor is going into an extended period of no use, see *Long term storage preparation* on page 22.

Changing parameters

The SP5000 compressor controller is configured for typical use in agricultural/harvest applications. For other applications, or in different climates, other settings may be more suitable.

These instructions refer to the ComAp IntelliDrive compressor controller. Some compressors have a different controller; in this case refer to Brüder Australia to obtain the latest instructions.

When navigating the menu options, a right arrow (>) will be displayed to indicate the selected line. Use the UP and DOWN arrows to change the selection, and the ENTER button to open that option.

To change any engine parameters, you will require the password. Contact Brüder for more information (you may need your serial number).

1. On the home screen (default), press the PAGE button.



1. Operation mode of the engine
2. Indication: "L" = Access lock, "!" = active Alarm
3. Status of the engine
4. AIN1 - Oil Pressure
5. AIN2 - (Engine Temperature)
6. Run Hours
7. Engine RPM

2. Select Engine Params and press ENTER.
3. Select engine parameter you need to change, and press ENTER.
4. Adjust the value to the required value using the UP and DOWN buttons, then press ENTER to set.

Changing the prestart time:

This is the glow time before startup in seconds. Maximum recommended value is 60 in very cold conditions (battery level may be compromised with longer glowing times). Typical prestart time is 15-25 seconds.

Changing the warmup (idle) time:

The warmup sequence after initial starting, allows the engine to get to a running temperature before the compressor can be used. Recommended idle time is between 30 and 60 seconds.

Changing the cooling time:

The cooling time serves a critical function of ensuring the engine will not be shut down while hot, which could lead to loss of coolant, compressor oil foaming over and other machine damage. It is highly recommended to leave this at 120 seconds or more to ensure the engine and separator oil has sufficient time to cool.

Changing the next service time alarm:

Shows the hours until the next service. See *Maintenance schedule* on page 32 for default values. In extreme conditions, shorten the service intervals.

Historical records

1. Press the PAGE button (9) until the History menu is indicated.
2. Press the ENTER button to access the history.
3. Use button UP or DOWN buttons to select requested History line – see Reason, Date and Time.
4. Press ENTER button (10) to go-on line to right – see recorded values.
5. Use page button (9) to go back to Measurement screen.

Faults/alarms

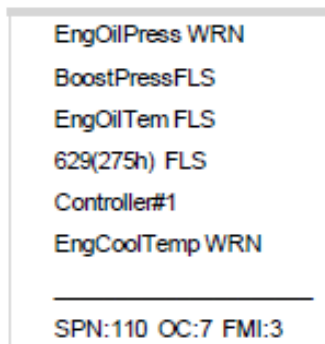
When an alarm is current, the red alarm light will be illuminated. Assess the reason for the alarm and fix the problem before continuing. To acknowledge an existing alarm that has not resulted in a machine shutdown, press the FAULT RESET button (5).

ECU Alarm List

Diagnostic messages are read from ECU and displayed in this second alarm list.

The following image shows displaying of ECU alarms in the second alarm list. The additional information for the row selected by cursor is on the last row (SPN, OC and FMI codes).

If the verbal description of alarm is not available, the SPN (decimal and hexadecimal) is displayed.

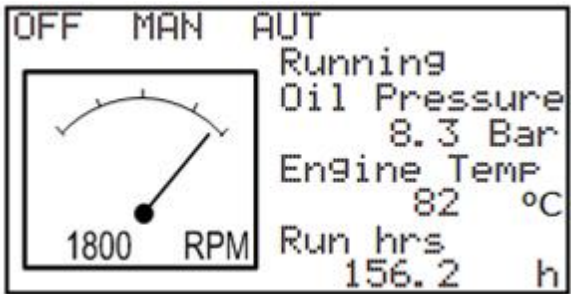


Note: For FMI = 0 and 1, WRN is displayed. For other FMI codes, FLS is displayed.

Alarm list

Alarm list displays active or inactive alarms occurred on controller. Controller automatically switches to the Alarm list screen when any new Alarm appears, but from Main measure screen only.

Display screens and pages structure



Main values

SpeedReq Abs	800	RPM
Ubat	24.3	V
D+	5.7	V
Timer text	No timer	
Timer val	0	s
Running Timer	12.6	h
DPF1 Soot Load	25	%
DEF Level	40	%

Engine values

ECU AlarmList	
>*ThrottlePos	
*EngOil Press	
*000589(0024Dh)	
*CrankcasePress	
*Fuel Temp	
*RatedEngSpeed	
FC 51 UC 5 FMI 1	

ECU alarm list

Fuel Level	93	%
PumpSuction	278	kPa
PumpDischar	1320	kPa
PumpFlow	43	L/s
BIN	10000	
BOUT	11001	

Analog and binary inputs / outputs values

Run hrs	156.2	h
Num starts	168	
NextServTim	26	h
Day Hours	5.5	h
DayCons	156	L
TripCons	256	L
Total 1	456789	-

Statistics

```
AlarmList          9
*Sd Engine Temp
*Wrn Engine Temp
*Wrn Fuel Level
*Sd Fuel Level
*Wrn Batt Volt
*Emergency Stop
*SprinklerActive
```

Alarm list

Setpoints screen:

```
Password
Basic Settings
Comms Settings
Engine Params
Engine Protect
ATT Settings
Date/Time
```

Setpoint groups

```
  No. Reason
>    0 FlsFuel level
   -1 FlsOil Pressure
   -2 Remote Off set
   -3 Emergency stop
   -4 Switched On
   -5 Sd Stop fail
14:10:42 27/11/2015
```

History log

Service and maintenance logbook

After first use, complete the following checklist to ensure smooth operation. If any issues are presented in this initial check, please contact Brüder Australia immediately.

Note some key information in this area of your Handbook so you do not have to locate it while on the phone to support staff, should anything go wrong.

Purchase date:

Compressor serial number:

Engine serial number:

First Check/Max 5 hours	Date	Completed (initial)
Item	Instruction	
Compressor oil	Inspect/Replace	
Compressor oil filter	Inspect/Replace	
Transmission oil	Inspect	
Oil/fuel/coolant leakage	Inspect	
Indicators	Inspect	
Lubricator	Inspect	
Wheels (nuts, fitment)	Inspect	
Scavenger orifice	Inspect	
Separator tank	Inspect	
Suction valve	Inspect	
Tyre pressures	Inspect	
Brakes, linkage	Inspect	
Engine oil	Replace	
Engine oil filter	Replace	
Air filter	Inspect	
Fuel filter	Inspect	
Coolant	Inspect	
Cooler	Inspect	
Hoses and clamps	Inspect	
Battery (electrolyte, cables)	Inspect	
Alternator/fan belt	Inspect	
Notes		

Daily checks

Before every day's operation, go through and check against the following lists. Enter the date and hours run at the top of the column and go down putting check marks against every item as it is checked. If any issues are presented during one of these daily checks, have them resolved before next use. When you need more pages, please print more from the supplied file on the USB, or contact Brüder Australia.

Daily checks	Instruction	Date:	Hours run:	Date:	Hours run:
Compressor oil	Inspect				
Transmission oil	Inspect				
Oil/fuel/coolant leakage	Inspect				
Indicators	Inspect				
Lubricator	Inspect				
Wheels (nuts, fitment)	Inspect				
Scavenger orifice	Inspect				
Separator tank	Inspect				
Suction valve	Inspect				
Lights	Inspect				
Tow hitch	Inspect				
Engine oil	Inspect				
Air filter	Inspect				
Fuel filter	Inspect				
Coolant	Inspect				
Cooler	Inspect				
Fuel tank	Inspect				
Notes					

Daily checks	Instruction	Date:	Hours run:	Date:	Hours run:
Compressor oil	Inspect				
Transmission oil	Inspect				
Oil/fuel/coolant leakage	Inspect				
Indicators	Inspect				
Lubricator	Inspect				
Wheels (nuts, fitment)	Inspect				
Scavenger orifice	Inspect				
Separator tank	Inspect				
Suction valve	Inspect				
Lights	Inspect				
Tow hitch	Inspect				
Engine oil	Inspect				
Air filter	Inspect				
Fuel filter	Inspect				
Coolant	Inspect				
Cooler	Inspect				
Fuel tank	Inspect				
Notes					

Daily checks	Instruction	Date:	Hours run:	Date:	Hours run:
Compressor oil	Inspect				
Transmission oil	Inspect				
Oil/fuel/coolant leakage	Inspect				
Indicators	Inspect				
Lubricator	Inspect				
Wheels (nuts, fitment)	Inspect				
Scavenger orifice	Inspect				
Separator tank	Inspect				
Suction valve	Inspect				
Lights	Inspect				
Tow hitch	Inspect				
Engine oil	Inspect				
Air filter	Inspect				
Fuel filter	Inspect				
Coolant	Inspect				
Cooler	Inspect				
Fuel tank	Inspect				
Notes					

Monthly checks

Every month, go through the following checks to ensure operation of the compressor is not compromised. Enter the date in the top column and checks down the page. When more pages are needed, they can be printed from the file supplied on the USB, or contact Brüder Australia.

Monthly checks	Instruction	Date
Wheels (nuts, fitment)	Inspect	
Tyre pressures	Inspect	
Auto shut-down system	Inspect	
Safety valve	Inspect	
Undercarriage	Inspect	
Auto shut-down system	Inspect	
Safety valve	Inspect	
Undercarriage	Adjust	
Air filter	Clean	
Fuel filter	Clean	
Alternator/fan belt	Inspect	
Notes		

Monthly checks	Instruction	Date
Wheels (nuts, fitment)	Inspect	
Tyre pressures	Inspect	
Auto shut-down system	Inspect	
Safety valve	Inspect	
Undercarriage	Inspect	
Auto shut-down system	Inspect	
Safety valve	Inspect	
Undercarriage	Adjust	
Air filter	Clean	
Fuel filter	Clean	
Alternator/fan belt	Inspect	
Notes		

Monthly checks	Instruction	Date
Wheels (nuts, fitment)	Inspect	
Tyre pressures	Inspect	
Auto shut-down system	Inspect	
Safety valve	Inspect	
Undercarriage	Inspect	
Auto shut-down system	Inspect	
Safety valve	Inspect	
Undercarriage	Adjust	
Air filter	Clean	
Fuel filter	Clean	
Alternator/fan belt	Inspect	
Notes		

Monthly checks	Instruction	Date
Wheels (nuts, fitment)	Inspect	
Tyre pressures	Inspect	
Auto shut-down system	Inspect	
Safety valve	Inspect	
Undercarriage	Inspect	
Auto shut-down system	Inspect	
Safety valve	Inspect	
Undercarriage	Adjust	
Air filter	Clean	
Fuel filter	Clean	
Alternator/fan belt	Inspect	
Notes		

Quarterly checks

Quarterly checks/Max 50 hours	Instruction	Date	Hours run
Undercarriage bolts	Inspect		
Joints, covers	Inspect		
Hoses and clamps	Inspect		
Battery (electrolyte, cables)	Inspect		
Alternator/fan belt	Inspect/Adjust		
Notes			

Quarterly checks/Max 50 hours	Instruction	Date	Hours run
Undercarriage bolts	Inspect		
Joints, covers	Inspect		
Hoses and clamps	Inspect		
Battery (electrolyte, cables)	Inspect		
Alternator/fan belt	Inspect/Adjust		
Notes			

Annual checks/Max 75 hours	Instruction	Date	Hours run
Compressor oil	Replace		
Compressor oil filter	Replace		
Scavenger orifice	Clean		
Discs (bearings, gaskets)	Inspect		
Exhaust piping	Inspect		
Pressure system	Inspect		
Pump filter	Clean		
Separator insert	Replace		
Emergency thermostat	Test		
Engine oil	Replace		
Engine oil filter	Replace		
Notes			

Annual checks/Max 100 hours	Instruction	Date	Hours run
Separator tank	Inspect (protocol)		
Brakes, linkage	Inspect		
Emergency shut-down	Test		
Manometer	Inspect		
Pressure regulator	Inspect		
Air end belt	Inspect/Adjust		
Engine oil filter	Replace		
Air filter	Replace		
Fuel filter	Replace		
Coolant	Test/Adjust		
Cooler	Clean		
Fuel tank	Clean		
Alternator/fan belt	Replace		
Notes			

2 years	Instruction	Date	Hours run
Air end belt	Replace		
Elm. valves	Replace		
Min. pressure valve (service kit)	Replace		
Pressure transducer	Replace		
Hoses and clamps	Inspect		
Battery (electrolyte, cables)	Inspect/Replace		
Glow Plugs	Inspect		
Notes			

3 years	Instruction	Date	Hours run
Safety valve	Test/Replace		
Emergency thermostat	Replace		
Coolant	Replace		
Hoses and clamps	Replace		
Alternator/fan belt	Replace		
Fuel injection	Clean		
Turbo charger	Inspect		
Valve lash	Inspect		
Pump (including lubrication)	Inspect/Adjust		
Engine Thermostat	Test		
Notes			

4 years	Instruction	Date	Hours run
Fuel injection	Clean		
Turbo charger	Clean		
After cooler	Inspect		
Alternator	Inspect		
Starter	Inspect		
Notes			

5 years	Instruction	Date	Hours run
Glow plugs	Test/Replace		
Fuel injection	Test/Replace		
Notes			