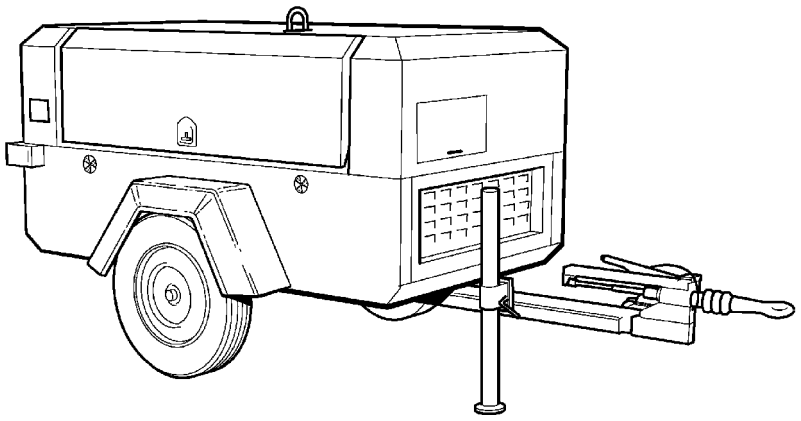
Doosan Infracore
Portable Power

7/72

OPERATION AND MAINTENANCE MANUAL
Original Instruction



This manual contains important safety information and must be made available to personnel who operate and maintain this machine.

7/72	SERIAL No :	542000 ->

46624235_en_A_09/13

Machine models represented in this manual may be used in various locations world-wide. Machines sold and shipped into European Union Territories require that the machine display the CE Mark and conform to various directives. In such cases, the design specification of this machine has been certified as complying with EC directives. Any modification to any part is absolutely prohibited and would result in the CE Certification and marking being rendered invalid. A declaration of that conformity follows:

CE

DOOSAN

[1] **EC Declaration of Conformity**

[2] Original declaration

[3] **We:**
Doosan International USA, Inc
1293 Glenway Drive
Statesville
North Carolina 28625-9218
USA

[4] **Represented in EC by:**
Doosan Trading Limited
Block B, Swords Business Campus
Swords
Co. Dublin
Ireland

[5] **Hereby declare that, under our sole responsibility the product(s)**

[6] Machine description: Portable Screw Compressor

[7] Machine Model: 7/20; 7/26E; 7/31E; 7/41; 7/51; 7/71; 12/56; 7/72; 7/120; 9/110; 10/105; 14/85; 7/170; 10/125; 14/115; 12/150; 9/270; 9/300; 12/235; 17/235; 21/215; 9/275; 9/305; 12/250; 17/240; 21/220

[8] Commercial name: 7/20; 7/26E; 7/31E; 7/41; 7/51; 7/71 ; 12/56; 7/72; 7/120; 9/110; 10/105; 14/85; 7/170; 10/125; 14/115; 12/150; 9/270; 9/300; 12/235; 17/235; 21/215; 9/275; 9/305; 12/250; 17/240; 21/220

[9] VIN / Serial number: U N 5

[10] **is (are) in conformity with the relevant provisions of the following EC Directive(s)**

[11] 2006/42/EC The Machinery Directive
[12] 2004/108/EC The Electromagnetic Compatibility Directive
[13] 2000/14/EC The Noise Emission Directive
[14] 97/23/EC The Pressure Equipment Directive
[15] 2009/105/EC The Simple Pressure Vessels Directive
[16] 97/68/EC The emission of engines for no-road mobile machinery
[31] 2006/95/EC The Low Voltage Equipment Directive
[17] and their amendments

[18] **Conformity with the Noise Emission Directive 2000/14/EC**

[19] Directive 2000/14/EC, Annex VI, Part I
[20] Notified body: AV Technology, Stockport, UK. Nr 1067

[21] Machine		[23] Measured sound power level	[24] Guaranteed sound power level	[21] Machine		[23] Measured sound power level	[24] Guaranteed sound power level
[22] Type	kW			[22] Type	kW		
7/20	17,5	**96L_{WA}**	**97L_{WA}**	**12/150**	164	**99L_{WA}**	**99L_{WA}**
7/26E	21,3	**97L_{WA}**	**98L_{WA}**	**7/170; 10/125; 14/115**	126,5	**98L_{WA}**	**99L_{WA}**
7/31E	25,9	**97L_{WA}**	**98L_{WA}**				
7/41	35	**98L_{WA}**	**98L_{WA}**	**9/270; 9/300; 12/235**	224	**100L_{WA}**	**100L_{WA}**
7/51	50,2	**98L_{WA}**	**98L_{WA}**				
7/71; 12/56	59,2	**97L_{WA}**	**99L_{WA}**	**17/235; 21/215**	255	**100L_{WA}**	**100L_{WA}**
7/72	52,5	**96L_{WA}**	**98L_{WA}**	**9/275**	227	**99L_{WA}**	**100L_{WA}**
7/120; 9/110; 10/105; 14/85	93	**98L_{WA}**	**99L_{WA}**	**9/305; 12/250; 17/240; 21/220**	254	**99L_{WA}**	**100L_{WA}**

[25] **Conformity with the Pressure Equipment directive 97/23/EC**

[26] We declare that this product has been assessed according to the Pressure Equipment Directive 97/23/EC and, in accordance with the terms of this Directive, has been excluded from the scope of this Directive. It may carry "CE" marking in compliance with other applicable EC directives.

Jan Moravec
[27] Engineering Manager
[28] Issued at Dobris, Czech Republic
[29] Date

[30] **The technical documentation for the machinery is available from:**
Doosan Infracore Portable Power EMEA, Dreve Richelle 167, B-1410 Waterloo, Belgium

Portable Power

Portable Power

ABBREVIATIONS & SYMBOLS

####	Contact the company for serial number
->####	Up to Serial No.
####->	From Serial No.
*	Not illustrated
†	Option
AR	As required
HA	High ambient machine
F.H.R.G.	Fixed height running gear
V.H.R.G.	Variable height running gear
SECU	Small electronic control unit

bg	Bulgarian
cs	Czech
da	Danish
de	German
el	Greek
en	English
es	Spanish
et	Estonian
fi	Finnish
fr	French
hu	Hungarian
it	Italian
lt	Lithuanian
lv	Latvian, Lettish
mt	Maltese
nl	Dutch
no	Norwegian
pl	Polish
pt	Portuguese
ro	Romanian
ru	Russian
sk	Slovak
sl	Slovenian
sv	Swedish
zh	Chinese

The contents of this manual are considered to be proprietary and confidential and should not be reproduced without the prior written permission of the company.

Nothing contained in this document is intended to extend any promise, warranty or representation, expressed or implied, regarding the products described herein. Any such warranties or other terms and conditions of sale of products shall be in accordance with the standard terms and conditions of sale for such products, which are available upon request.

This manual contains instructions and technical data to cover all routine operation and scheduled maintenance tasks by operation and maintenance staff. Major overhauls are outside the scope of this manual and should be referred to an authorised service department.

The design specification of this machine has been certified as complying with EC directives. As a result:

(a) Any machine modifications are strictly prohibited, and will invalidate EC certification.

(b) A unique specification for USA/Canada is adopted and tailored to the territory.

All components, accessories, pipes and connectors added to the compressed air system should be:
. of good quality, procured from a reputable manufacturer and, wherever possible, be of a type approved by the company.
. clearly rated for a pressure at least equal to the machine maximum allowable working pressure.
. compatible with the compressor lubricant/coolant.
. accompanied with instructions for safe installation, operation and maintenance.

Details of approved equipment are available from the company service departments.

The use of repair parts / lubricants / fluids other than those included within the approved parts list may create hazardous conditions over which the company has no control. Therefore the company cannot be held responsible for equipment in which non-approved repair parts are installed.

The company reserves the right to make changes and improvements to products without notice and without incurring any obligation to make such changes or add such improvements to products sold previously.

The intended uses of this machine are outlined below and examples of unapproved usage are also given, however the company cannot anticipate every application or work situation that may arise.

IF IN DOUBT CONSULT SUPERVISION.

This machine has been designed and supplied for use only in the following specified conditions and applications:
. Compression of normal ambient air containing no known or detectable additional gases, vapours. or particles
. Operation within the ambient temperature range specified in the *GENERAL INFORMATION* section of this manual.

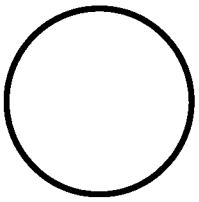
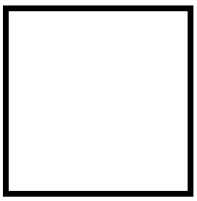
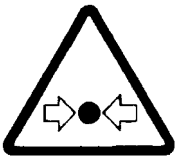
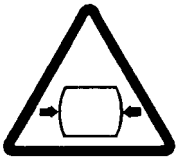
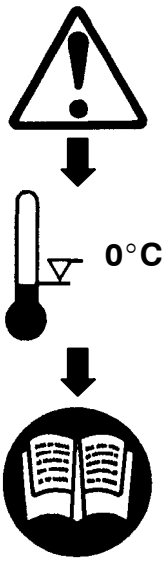
. Generation of electricity at 110v (1ph) with centre tap earth, 230v (1ph), 230v (3ph) and 400v (3ph) / 230v (1ph) nominal at 50 Hertz. (WDG)

The use of the machine in any of the situation types listed in table 1:-
a) Is not approved,
b) May impair the safety of users and other persons, and
c) May prejudice any claims made.

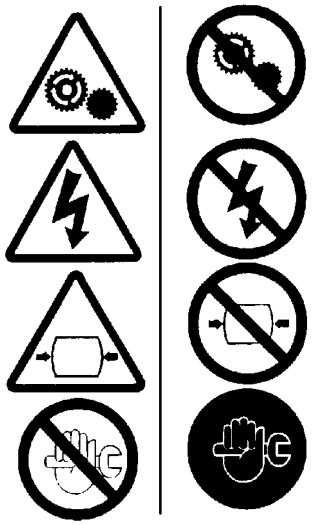
TABLE 1
Use of the machine to produce compressed air for: a) direct human consumption b) indirect human consumption, without suitable filtration and purity checks.
Use of the machine outside the ambient temperature range specified in the *GENERAL INFORMATION SECTION* of this manual.
This machine is not intended and must not be used in potentially explosive atmospheres, including situations where flammable gases or vapours may be present.
Use of the machine fitted with non approved components / lubricants / fluids.
Use of the machine with safety or control components missing or disabled.
Use of the machine for storage or transportation of materials inside or on the enclosure except when contained within the toolbox.
GENERATOR
Use of the generator to supply load(s) greater than those specified.
Use of unsafe or unserviceable electrical equipment connected to the generator.
Use of electrical equipment: (a) Having incorrect voltage and/or frequency ratings. (b) Containing computer equipment and/or similar electronics.

The company accepts no responsibility for errors in translation of this manual from the original English version.

GRAPHIC FORM AND MEANING OF ISO SYMBOLS

		
Prohibition / Mandatory	**Information / Instructions**	**Warning**
		
WARNING: Electrical shock risk.	**WARNING - Pressurised component or system.**	**WARNING - Hot surface.**
		
WARNING - Pressure control.	**WARNING - Corrosion risk.**	**WARNING - Air/gas flow or Air discharge.**
		
WARNING - Pressurised vessel.	**WARNING - Hot and harmful exhaust gas.**	**WARNING - Flammable liquid.**
		
WARNING - Maintain correct tyre pressure. (Refer to the **GENERAL INFORMATION** section of this manual).	**WARNING - Before connecting the tow bar or commencing to tow consult the operation and maintenance manual.**	**WARNING - For operating temperature below 0°C, consult the operation and maintenance manual.**

4 DECALS



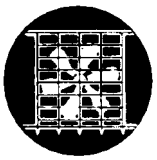
WARNING - Do not undertake any maintenance on this machine until the electrical supply is disconnected and the air pressure is totally relieved.

WARNING - Consult the operation and maintenance manual before commencing any maintenance.

Do not breathe the compressed air from this machine.

Do not remove the Operating and Maintenance manual and manual holder from this machine.

Do not stack.



Do not operate the machine without the guard being fitted.

Do not stand on any service valve or other parts of the pressure system.

Do not operate with the doors or enclosure open.

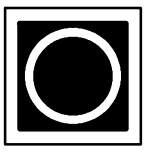
Do not use fork lift truck from this side.

Do not exceed the trailer speed limit.

No naked lights.

Do not open the service valve before the airhose is attached.

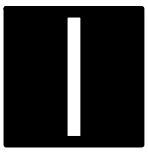
Use fork lift truck from this side only.



Emergency stop.

Tie down point

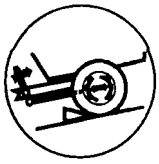
Lifting point.



On (power).

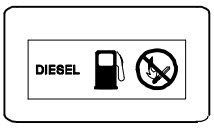
Off (power).

Read the Operation and Maintenance manual before operation or maintenance of this machine is undertaken.



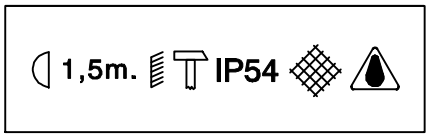
When parking use prop stand, handbrake and wheel chocks.

Compressor oil filling

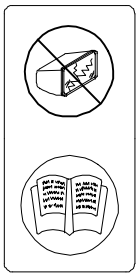


Diesel fuel
No open flame.

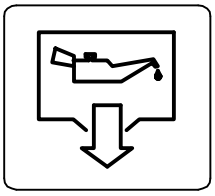
Parking brake.



Rough Service Designation.
Wet Location Operation.



Replace any cracked protective shield.



Oil drain.

Look for these signs on machines, which point out potential hazards to the safety of you and others. Read and understand thoroughly. Heed warnings and follow instructions. If you do not understand, inform your supervisor.

⚠ DANGER

Red background
Indicates the presence of a hazard which WILL cause serious injury, death or property damage, if ignored.

⚠ CAUTION

Yellow background
Indicates the presence of a hazard which WILL or can cause injury or property damage, if ignored.

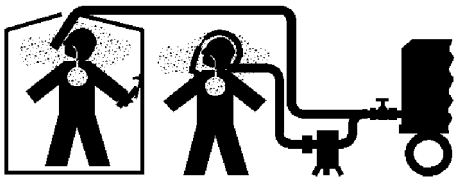
⚠ WARNING

Orange background
Indicates the presence of a hazard which CAN cause serious injury, death or property damage, if ignored.

NOTICE

Blue background
Indicates important set-up, operating or maintenance information.

⚠ DANGER

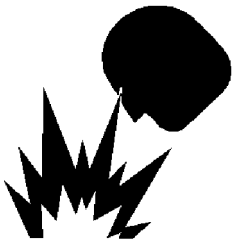


Air discharged from this machine can contain carbon monoxide or other contaminants which will cause serious injury or death.
Do not breathe this air.

⚠ WARNING

Trapped air pressure. Can cause serious injury or death.

Close service valve and operate tool to vent trapped air before performing any service.



⚠ WARNING

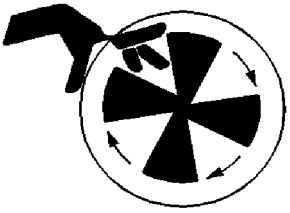
Hot pressurized fluid.
Can cause serious burns.

Do not open radiator while hot.

⚠ WARNING

Rotating Fan Blade.
CAN cause serious injury.

Do NOT operate with guard removed.



⚠ WARNING

Improper operation of this equipment. CAN cause serious injury or death.

Read Operator's Manual supplied with this machine before operation or servicing.

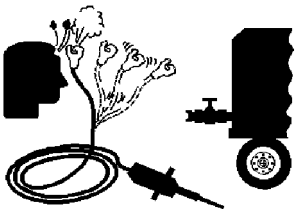
Modification or alteration of this machine. CAN cause serious injury or death.

Do NOT alter or modify this machine without the express written consent of the manufacturer.

⚠ WARNING

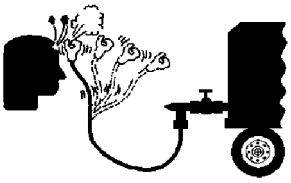
Trapped air pressure. Can cause serious injury or death.

Close service valve and operate tool to vent trapped air before performing any service.

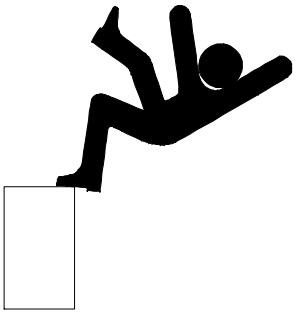


⚠ WARNING

Disconnected Air Hoses Whip. CAN cause serious injury or death.
When using air tools attach safety device (OSHA Valve) at source of air supply for each tool.



WARNING



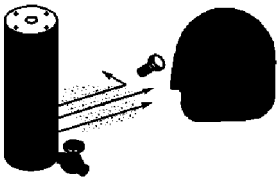
Falling off machine. CAN cause serious injury or death.

Access Lifting Bail from inside machine.

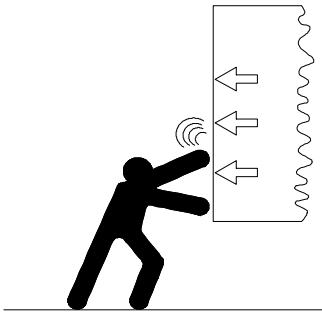
⚠ WARNING

High pressure air. Can cause serious injury or death.

Relieve pressure before removing filler plugs/ caps, fittings or covers.



WARNING

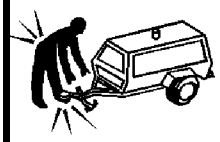


Door under pressure CAN cause serious injury.

Use both hands to open door when machine is running.

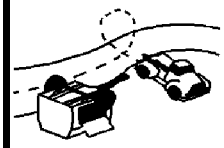
XX
km/h

⚠ WARNING



Collapsing propstand.
Can cause serious injury.

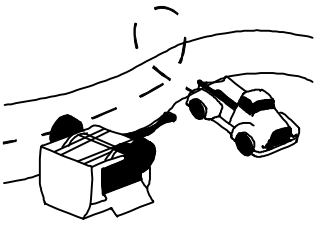
Clamp propstand securely



Excessive towing speed.
Can cause serious injury or death.
Do NOT exceed 65 mph (105 km/hr)

For Highway Towable Units.

WARNING



Excessive Towing Speed. CAN cause
serious injury or death.
Do NOT Tow on Highway.
Do NOT exceed 20 mph (32 km/h)

For Non-Highway Towable Machines

WARNINGS
Warnings call attention to instructions which must be followed precisely to avoid injury or death.

CAUTIONS
Cautions call attention to instructions which must be followed precisely to avoid damaging the product, process or its surroundings.

NOTES
Notes are used for supplementary information.

General Information

Never operate unit without first observing all safety warnings and carefully reading the operation and maintenance manual shipped from the factory with this machine.

Ensure that the operator reads and *understands* the decals and consults the manuals before maintenance or operation.

Ensure that the Operation and Maintenance manual, and the manual holder, are not removed permanently from the machine.

Ensure that maintenance personnel are adequately trained, competent and have read the Maintenance Manuals.

Make sure that all protective covers are in place and that the canopy/doors are closed during operation.

The specification of this machine is such that the machine is not suitable for use in flammable gas risk areas. If such an application is required then all local regulations, codes of practice and site rules must be observed. To ensure that the machine can operate in a safe and reliable manner, additional equipment such as gas detection, exhaust spark arrestors, and intake *(shut-off)* valves may be required, dependant on local regulations or the degree of risk involved.

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

All components which are loose, damaged or unserviceable, must be rectified without delay.

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

This machine produces loud noise with the doors open or service valve vented. Extended exposure to loud noise can cause hearing loss. Always wear hearing protection when doors are open or service valve is vented.

Never inspect or service unit without first disconnecting battery cable(s) to prevent accidental starting.

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 unit with compressed air to prevent debris from injuring eye(s).

Rotating fan blade can cause serious injury. Do not operate without guard in place.

Use care to avoid contacting hot surfaces (engine exhaust manifold and piping, air receiver and air discharge piping, etc.).

Ether is an extremely volatile, highly inflammable gas. When it is specified as a starting aid, use sparingly. DO NOT USE ETHER IF THE MACHINE HAS GLOW PLUG STARTING AID OR ENGINE DAMAGE WILL RESULT.

Never operate unit with guards, covers or screens removed. Keep hands, hair, clothing, tools, blow gun tips, etc. well away from moving parts.

Compressed air

Compressed air can be dangerous if incorrectly handled. Before doing any work on the unit, ensure that all pressure is vented from the system and that the machine cannot be started accidentally.

Ensure that the machine is operating at the rated pressure and that the rated pressure is known to all relevant personnel.

All air pressure equipment installed in or connected to the machine must have safe working pressure ratings of at least the machine rated pressure.

If more than one compressor is connected to one common downstream plant, effective check valves and isolation valves must be fitted and controlled by work procedures, so that one machine cannot accidentally be pressurised / over pressurised by another.

Compressed air must not be used for a direct feed to any form of breathing apparatus or mask.

High Pressure Air can cause serious injury or death. Relieve pressure before removing filler plugs/caps, fittings or covers.

Air pressure can remain trapped in air supply line which can result in serious injury or death. Always carefully vent air supply line at tool or vent valve before performing any service.

The discharged air contains a very small percentage of compressor lubricating oil and care should be taken to ensure that downstream equipment is compatible.

If the discharged air is to be ultimately released into a confined space, adequate ventilation must be provided.

When using compressed air always use appropriate personal protective equipment.

All pressure containing parts, especially flexible hoses and their couplings, must be regularly inspected, be free from defects and be replaced according to the Manual instructions.

Avoid bodily contact with compressed air.

The safety valve located in the separator tank must be checked periodically for correct operation.

Whenever the machine is stopped, air will flow back into the compressor system from devices or systems downstream of the machine unless the service valve is closed. Install a check valve at the machine service valve to prevent reverse flow in the event of an unexpected shutdown when the service valve is open.

Disconnected air hoses whip and can cause serious injury or death. Always attach a safety flow restrictor to each hose at the source of supply or branch line in accordance with OSHA Regulation 29CFR Section 1926.302(b).

Never allow the unit to sit stopped with pressure in the receiver-separator system.

Materials

The following substances *may* be produced during the operation of this machine:
. brake lining dust
. engine exhaust fumes

AVOID INHALATION

Ensure that adequate ventilation of the cooling system and exhaust gases is maintained at all times.

The following substances are used in the manufacture of this machine and *may* be hazardous to health if used incorrectly:

. anti-freeze
. compressor lubricant
. engine lubricant
. preservative grease
. rust preventative
. diesel fuel
. battery electrolyte

AVOID INGESTION, SKIN CONTACT AND INHALATION OF FUMES

Should compressor lubricant come into contact with the eyes, then irrigate with water for at least 5 minutes.

Should compressor lubricant come into contact with the skin, then wash off immediately.

Consult a doctor if large amounts of compressor lubricant are ingested.

Consult a doctor if compressor lubricant is inhaled.

Never give fluids or induce vomiting if the patient is unconscious or having convulsions.

Safety data sheets for compressor and engine lubricants should be obtained from the lubricant supplier.

Never operate the engine of this machine inside a building without adequate ventilation. Avoid breathing exhaust fumes when working on or near the machine.

This machine may include such materials as oil, diesel fuel, antifreeze, brake fluid, oil/air filters and batteries which may require proper disposal when performing maintenance and service tasks. Contact local authorities for proper disposal of these materials.

Battery

Batteries contain corrosive liquid and produce explosive gas. Do not expose to naked lights. Always wear personal protective clothing when handling. When starting the machine from a slave battery ensure that the correct polarity is observed and that connections are secure.

DO NOT ATTEMPT TO SLAVE START A FROZEN BATTERY SINCE THIS MAY CAUSE IT TO EXPLODE.

Exercise extreme caution when using booster battery. To jump battery, connect ends of one booster cable to the positive (+) terminal of each battery. Connect one end of other cable to the negative (-) terminal of the booster battery and other end to a ground connection away from dead battery (to avoid a spark occurring near any explosive gases that may be present). After starting unit, always disconnect cables in reverse order.

Radiator

Hot engine coolant and steam can cause injury. Ensure that the radiator filler cap is removed with due care and attention.

Do not remove the pressure cap from a HOT radiator. Allow radiator to cool down before removing pressure cap.

Generator sets

The generator set is designed for safety in use. However, the responsibility for safe operation rests with those who install, use and maintain it. The following safety precautions are offered as a guide, which, if conscientiously followed, will minimise the possibility of accidents throughout the useful life of this equipment.

Emergency Stop Controls

Important Note:- In addition to the key operated emergency stop control on the main control panel, a second control is provided at the socket control panel in the event of electrical hazards associated with generator operation. Use this second control to immediately isolate all electrical power to all sockets, then use the key control to stop the engine.

Operation of the generator must be in accordance with recognised electrical codes and local health and safety codes.

The generator set should be operated by those who have been trained in its use and delegated to do so, and who have read and understand the operator's manual. *Failure to follow the instructions, procedures and safety precautions in the manual may increase the possibility of accidents and injuries.*

Do not start the generator set unless it is safe to do so. Do not attempt to operate the generator set with a known unsafe condition. Fit a danger notice to the generator set and render it inoperative by disconnecting the battery and disconnecting all ungrounded conductors so others who may not know of the unsafe condition will not attempt to operate it until the condition is corrected.

An earth point is provided beneath the socket outlets.

The generator set should only be used with the earth point connected directly to the general earth/ground mass. An earth spike kit is available as an optional extra for this purpose (refer to the *parts catalogue*).

WARNING: DO NOT OPERATE THE MACHINE UNLESS IT HAS BEEN SUITABLY EARTHED.

Generator sets must be connected to the load only by trained and qualified electricians who have been delegated to do so, and when required by applicable regulations, their work should be inspected, and accepted by the inspection agency having authority, prior to attempting to operate the generator set.

Do not make contact with electrically energised parts of the generator set and/or interconnecting cables or conductors with any part of the body or with any non-insulated conductive object.

Make sure the generator set is effectively grounded in accordance with all applicable Regulations prior to attempting to make or break load connections and prior to attempting operation.

Do not attempt to make or break electrical connections to generator sets standing in water or on wet ground.

Prior to attempting to make or break electrical connections at the generator set, stop the engine, disconnect the battery and disconnect and lock out the ungrounded conductors at the load end.

Keep all parts of the body and any hand-held tools or other conductive objects, away from exposed live parts of the generator set engine electrical system. Maintain dry footing, stand on insulating surfaces and do not contact any other portion of the generator set when making adjustments or repairs to exposed live parts of the generator set engine electrical system.

Replace the generator set terminal compartment cover as soon as connections have been made or broken. Do not operate the generator set without the terminal cover secured firmly in place.

Close and lock all access doors when the generator set is left unattended.

Do not use extinguishers intended for Class A or Class B fires on electrical fires. Use only extinguishers suitable for class *BC* or class *ABC* fires.

Keep the towing vehicle or equipment carrier, generator set, connecting cables, tools and all personnel at least 3 metres from all power lines and buried power cables, other than those connected to the generator set.

Attempt repairs only in clean, dry, well lighted and ventilated areas.

Connect the generator set only to loads and/or electrical systems that are compatible with its electrical characteristics and that are within it's rated capacity.

Transport

When loading or transporting machines ensure that the specified lifting and tie down points are used.

When loading or transporting machines ensure that the towing vehicle, its size, weight, towing hitch and electrical supply are all suitable to provide safe and stable towing at speeds either, up to the legal maximum for the country in which it is being towed or, as specified for the machine model if lower than the legal maximum.

Ensure that the maximum trailer weight does not exceed the maximum gross weight of the machine (by limiting the equipment load), limited by the capacity of the running gear.

Note:
Gross mass (on data plate) is for the basic machine and fuel only, excluding any fitted options, tools, equipment and foreign materials.

Before towing the machine, ensure that:-

- the tyres and towing hitch are in a serviceable condition.
- the canopy is secure.
- all ancillary equipment is stored in a safe and secure manner.
- the brakes and lights are functioning correctly and meet necessary road traffic requirements.
- break-away cables/safety chains are connected to the towing vehicle.

The machine must be towed in a level attitude (the maximum permissible drawbar angle is between 0° and +5° from horizontal) in order to maintain correct handling, braking and lighting functions. This can be achieved by correct selection and adjustment of the vehicle towing hitch and, on variable height running gear, adjustment of the drawbar.

To ensure full braking efficiency, the front (towing eye) section must always be set level.

When adjusting variable height running gear:-

- Ensure front (towing eye) section is set level
- When raising towing eye, set rear joint first, then front joint.
- When lowering towing eye, set front joint first, then rear joint.

After setting, fully tighten each joint by hand and then tighten further to the next pin. Refit the pin.

When parking always use the handbrake and, if necessary, suitable wheel chocks.

Make sure wheels, tyres and tow bar connectors are in safe operating condition and tow bar is properly connected before towing.

Safety chains / connections and their adjustment

The legal requirements for the joint operation of the breakaway cable and safety chains are as yet unidentified by 71/320/EEC or UK regulations. Consequently we offer the following advice / instructions.

Where brakes only are fitted:

a) Ensure that the breakaway cable is securely coupled to the handbrake lever and also to a substantial point on the towing vehicle.

b) Ensure that the effective cable length is as short as possible, whilst still allowing enough slackness for the trailer to articulate without the handbrake being applied.

Where brakes and safety chains are fitted:

a) Loop the chains onto the towing vehicle using the towing vehicle hitch as an anchorage point, or any other point of similar strength.

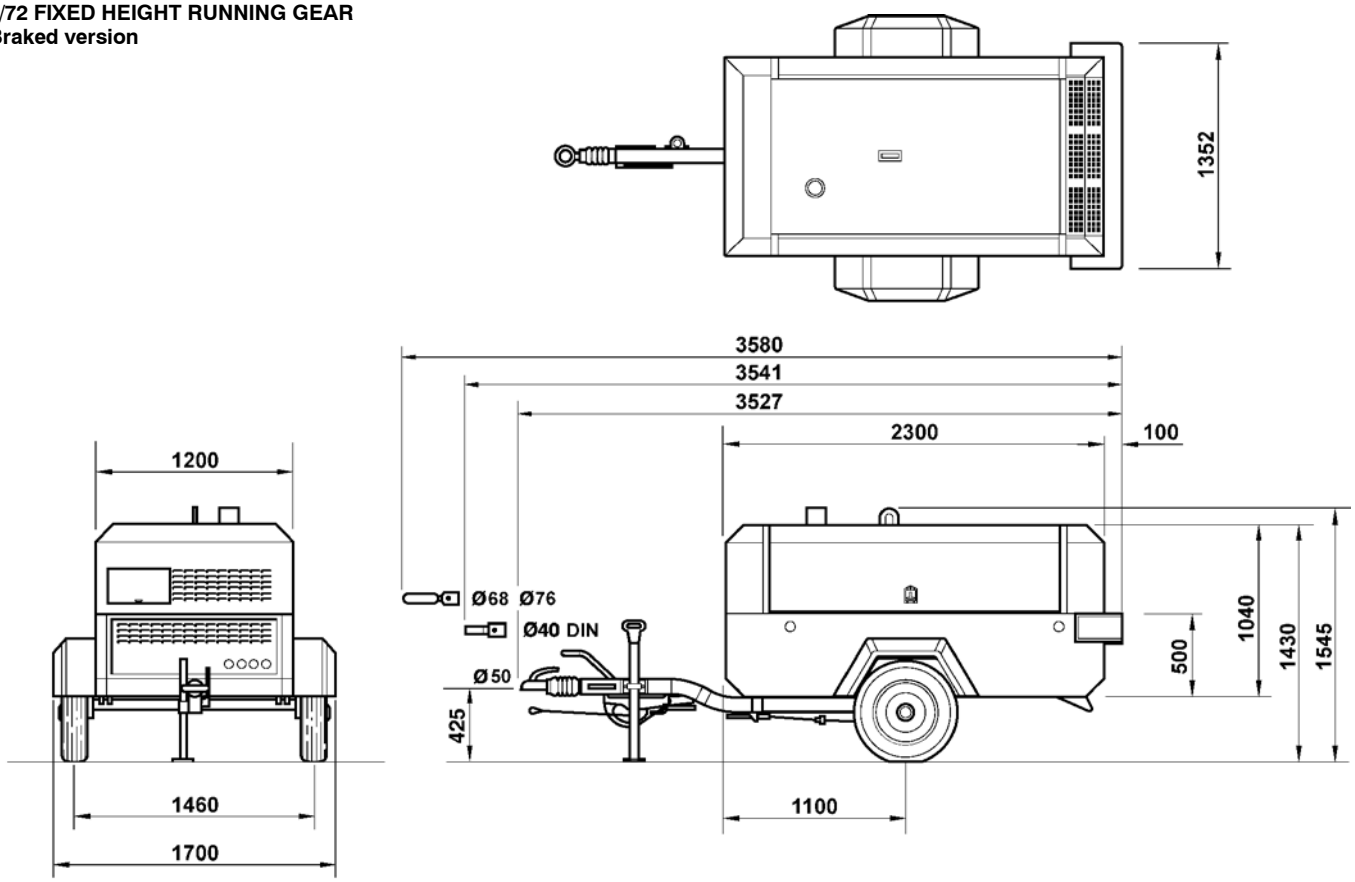
b) Ensure that the effective chain length is as short as possible whilst still allowing normal articulation of the trailer and effective operation of the breakaway cable.

Where safety chains only are fitted:

a) Loop the chains onto the towing vehicle using the towing vehicle hitch as an anchorage point, or any other point of similar strength.

b) When adjusting the safety chains there should be sufficient free length in the chains to allow normal articulation, whilst also being short enough to prevent the towbar from touching the ground in the event of an accidental separation of the towing vehicle from the trailer.

7/72 FIXED HEIGHT RUNNING GEAR
Braked version



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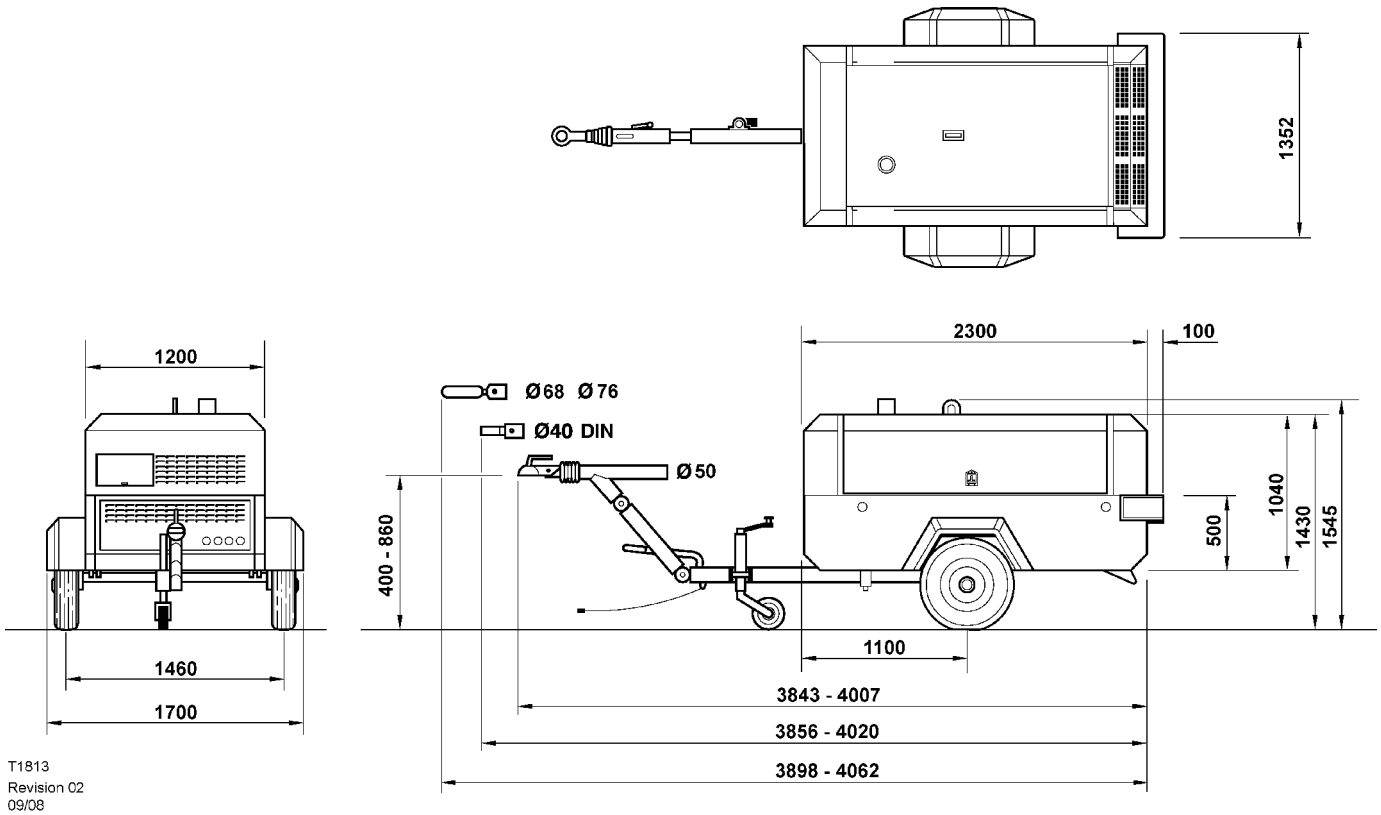
7/72 VARIABLE HEIGHT RUNNING GEAR
Braked version



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Revision 02
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COMPRESSOR

Actual free air delivery.	6,8 m^3 min^{-1} (240 CFM)
Normal operating discharge pressure.	7 bar (100 PSI)
Maximum allowable pressure.	8,6 bar (125 PSI)
Safety valve setting.	10 bar (145 PSI)
Maximum pressure ratio (absolute).	7,5 : 1
Operating ambient temperature. CE regions High ambient temp.	 -10°C TO +46°C (14°F TO 115°F) -10°C TO +52°C (14°F TO 126°F)
Maximum discharge temperature.	120°C (248°F)
Cooling system.	Oil injection
Oil capacity.	12,5 litres (3,3 US GAL)
Maximum oil system temperature.	120°C (248°F)
Maximum oil system pressure.	8,6 bar (125 PSI)

LUBRICATING OIL SPECIFICATION
(for the specified ambient temperatures).

ABOVE -23°C(-9°F)
Recommended: PRO-TEC
Approved: SAE 10W, API CF-4/CG-4

PRO-TEC compressor fluid is factory-fitted, for use at all ambient temperatures above -23°C(-9°F).

NOTE: Warranty may be extended only by continuous use of PRO-TEC and Doosan oil filters and separators.

No other oil/fluids are compatible with PRO-TEC.

No other oils/fluids should be mixed with PRO-TEC because the resulting mixture could cause damage to the airend.

In the event that PRO-TEC is not available and / or the end user needs to use an approved single grade engine oil, the complete system including separator / receiver, cooler and pipework must be flushed clear of the first fill fluid and new Doosan oil filters installed.
When this has been completed, the following oils are approved:

for ambient temperatures above -23°C (-9°F),
SAE 10W, API CF-4/CG-4

Safety data sheets can be obtained on request from your Doosan dealership.

For temperatures outside the specified ambient range, consult the company.

ENGINE

Type/model.	4TNV98T
Number of cylinders.	4
Oil capacity.	10,5 litres (2,8 US GAL)
Speed at full load.	2350 revs min^{-1}
Speed at idle.	1700 revs min^{-1}
Electrical system.	12V negative earth
Power available at 2350 revs min^{-1}	52,5kW (70,4 HP)
Fuel tank capacity	118 litres (31,2 US GAL)
Oil specification	Refer engine section
Coolant capacity	11 litres (2,9 US GAL)

INFORMATION ON AIRBORNE NOISE (CE regions)

- The A-weighted emission sound pressure level

83 dB(A), uncertainty 1 dB(A)

- The A-weighted emission sound power level

98 dB(A), uncertainty 1 dB(A)

The operating conditions of the machinery are in compliance with ISO 3744:1995 and EN ISO 2151:2004

FIXED HEIGHT RUNNING GEAR
Braked version

Shipping weight.	1347kg (2970 lbs)
Maximum weight.	1600kg (3520 lbs)
Maximum horizontal towing force.	1578 kgf (3479 lbs)
Maximum vertical coupling load (nose weight).	100 kgf (220 lbs)

VARIABLE HEIGHT RUNNING GEAR
Braked version

Shipping weight.	1390kg (3064 lbs)
Maximum weight.	1600kg (3520 lbs)
Maximum horizontal towing force.	1578 kgf (3479 lbs)
Maximum vertical coupling load (nose weight).	100 kgf (220 lbs)

WHEELS AND TYRES

Number of wheels.	2 x $5^1/_2$ J
Tyre size.	185 R14
Tyre pressure.	4,5 bar (65 PSI)

Further information may be obtained by request through the customer services department.

COMMISSIONING

Upon receipt of the unit, and prior to putting it into service, it is important to adhere strictly to the instructions given below in *PRIOR TO STARTING.*

Ensure that the operator reads and *understands* the decals and consults the manuals before maintenance or operation.

Ensure that the position of the *emergency stop* device is known and recognised by its markings. Ensure that it is functioning correctly and that the method of operation is known.

Running gear drawbar - Machines are shipped to some areas with the drawbar removed. Fitting involves four nuts / bolts to secure the drawbar to the axle and two bolts to fit the drawbar to the front of the machine with the saddle and spacer block.

Support the front of the machine, fit the wheel chocks to stop the machine moving and attach the drawbar. Refer to the torque value table in the *MAINTENANCE* section of this manual for the correct torque values.

CAUTION:
This is a safety critical procedure. Double check the torque settings after assembly

Fit the propstand and coupling. Remove the supports and set the machine level.

Before towing the unit, ensure that the tyre pressures are correct (refer to the *GENERAL INFORMATION* section of this manual) and that the handbrake is functioning correctly (refer to the *MAINTENANCE* section of this manual). Before towing the unit during the hours of darkness, ensure that the lights are functioning correctly (where fitted).

Ensure that all transport and packing materials are discarded.

Ensure that the correct fork lift truck slots or marked lifting / tie down points are used whenever the machine is lifted or transported.

When selecting the working position of the machine ensure that there is sufficient clearance for ventilation and exhaust requirements, observing any specified minimum dimensions (to walls, floors etc.).

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

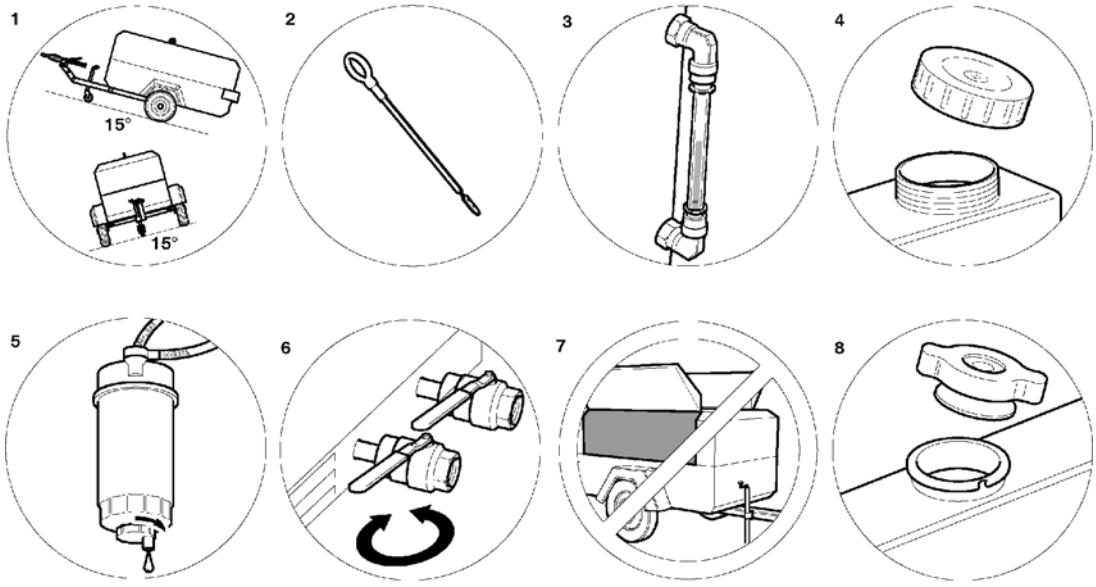
Ensure that the machine is positioned securely and on a stable foundation. Any risk of movement should be removed by suitable means, especially to avoid strain on any rigid discharge piping.

Attach the battery cables to the battery(s) ensuring that they are tightened securely**.** Attach the negative cable before attaching the positive cable.

WARNING: All air pressure equipment installed in or connected to the machine must have safe working pressure ratings of at least the machine rated pressure, and materials compatible with the compressor lubricant (refer to the *GENERAL INFORMATION* section).

WARNING: If more than one compressor is connected to one common downstream plant, effective check valves and isolation valves must be fitted and controlled by work procedures, so that one machine cannot accidentally be pressurised / over pressurised by another.

WARNING: If flexible discharge hoses are to carry more than 7 bar pressure then it is recommended that safety retaining wires are used on the hoses.



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Revision 00
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PRIOR TO STARTING

1. Place the unit in a position that is as level as possible. The design of the unit permits a 15 degree lengthways and sideways limit on out of level operation. It is the engine, not the compressor, that is the limiting factor.

When the unit has to be operated out of level, it is important to keep the engine oil level near the high level mark (with the unit level).

CAUTION: *Do not overfill either the engine or the compressor with oil.*

2. Check the engine lubrication oil in accordance with the operating instructions in the *Engine Operator's Manual.*

3. Check the compressor oil level in the sight glass located on the separator tank.

4. Check the diesel fuel level. A good rule is to top up at the end of each working day. This prevents condensation from occurring in the tank.

CAUTION: *Use only specified diesel fuels (see engine section for details).*

CAUTION: *When refueling:-*
- *switch off the engine.*
- *do not smoke.*
- *extinguish all naked lights.*
- *do not allow the fuel to come into contact with hot surfaces.*
- *wear personal protective equipment.*

5. Drain the fuel filter water separator of water, ensuring that any released fuel is safely contained.

6. Open the service valve(s) to ensure that all pressure is relieved from the system. Close the service valve(s).

7. ***CAUTION:*** *Do not operate the machine with the canopy/doors in the open position as this may cause overheating and operators to be exposed to high noise levels.*

8. Check the radiator coolant level (with the unit level).

Check the air restriction indicator(s). Refer to the *MAINTENANCE* section of this manual.

When starting or operating the machine in temperatures below or approaching 0°C, ensure that the operation of the regulation system, the unloader valve, the safety valve, and the engine are not impaired by ice or snow, and that all inlet and outlet pipes and ducts are clear of ice and snow.

AIR HOSE RESTRAINT INSTALLATION

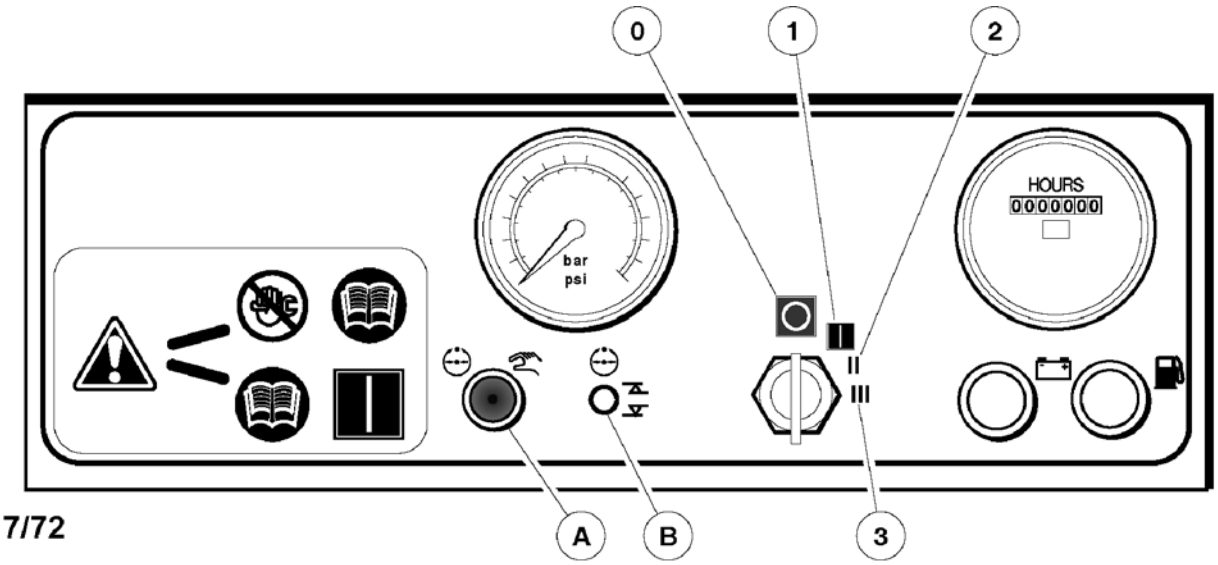
Safety devices such as hose restraints (whipchecks) must be used to prevent hose whipping if a connection fails. Whipchecks are to be constructed of woven stainless steel, galvanized steel wire rope or chain with a minimum strength adequate for the supplied pressure and hose diameter. Whipchecks must be fastened to suitable mounting points or shackles.

The mounts and/or shackles are to be of the same or greater strength as the whipchecks. An engineer should be consulted about suitability of whipchecks, mounts, mounting points, shackles and fittings as well as strength rating of materials. Whipchecks must be used at the hose origination, termination and each hose to hose connection.

Hoses can fail in areas other than at connecting points and require daily inspection of the hoses for:

- *Cuts, cracks or kinks*
- *Weakened clamps due to rust and corrosion*
- *Damaged connections*
- *Deformity*
- *Incorrect or incompatible components or fittings*
- *Any visual damage*

Hoses must be selected that are rated for the application as to the maximum pressure and temperature to be encountered as well as compatible with the materials being conveyed inside the hose. Hoses must be compatible with the compressor oil.



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STARTING THE MACHINE

WARNING: Under no circumstances should volatile liquids such as Ether be used for starting this machine.

All normal starting functions are incorporated in the key operated switch.

- Turn the key switch to position *2* and hold for max 15 seconds to allow the air inlet heater to reach working temperature.
- Turn the key switch to position *3* (engine start position).
- Release to position *2* when the engine starts.
- Release to position *1* when the alternator charge light is extinguished.

At temperatures below 0°C or if there is difficulty starting first time:

- Open the service valve fully, with no hose connected.
- Complete starting sequence above.
- Close service valve as soon as engine runs freely.
- Do not allow machine to run for long periods with service valve open.
- .Allow the engine to reach operating temperature. Then press button (A) when fitted.
- At this point in the operation of the machine it is safe to apply full load to the engine.

NOTE: Wear hearing protection at all times when the engine is started with the service valve open and air is flowing from the valve.

DUAL PRESSURE WHEN FITTED

Machines which operate in excess of 7 bar can optionally be fitted with a dual pressure switch (B). This switch selects between 7 bar and the machine rated pressure, cfm remains nominally constant.

Starting and stopping are unaffected by the selection and during normal running the selector switch may be safely operated. Precaution must be taken to ensure that downstream equipment is rated to suit the available pressure.

The pressure guage indicates which setting has been selected.

STOPPING THE MACHINE

- Close the service valve.
- Allow the machine to run unloaded for a short period of time to reduce the engine temperature.
- Turn the start switch to the *0* (off) position.

NOTE: As soon as the engine stops, the automatic blowdown valve will relieve all pressure from the system.

If the automatic blowdown valve fails to operate, then pressure must be relieved from the system by means of the service valve(s).

CAUTION: *Never allow the machine to stand idle with pressure in the system.*

EMERGENCY STOPPING

In the event that the unit has to be stopped in an emergency, **TURN THE KEY SWITCH LOCATED ON THE INSTRUMENT PANEL TO THE *0* (OFF) POSITION.**

RE-STARTING AFTER AN EMERGENCY

If the machine has been switched off because of a machine malfunction, then identify and correct the fault before attempting to re-start.

If the machine has been switched off for reasons of safety, then ensure that the machine can be operated safely before re-starting.

Refer to the *PRIOR TO STARTING* and *STARTING THE UNIT* instructions earlier in this section before re-starting the machine.

MONITORING DURING OPERATION

Should any of the safety shut-down conditions occur, the unit will stop. These are:

- Low engine oil pressure
- High air discharge temperature
- High engine water temperature
- Alternator drive belt failure.
- .Low engine fuel level.

CAUTION: *To ensure an adequate flow of oil to the compressor at low temperature, never allow the discharge pressure to fall below 3,5 bar.*

DECOMMISSIONING

When the machine is to be permanently decommissioned or dismantled, it is important to ensure that all hazard risks are either eliminated or notified to the recipient of the machine. In particular:-

. Do not destroy batteries or components containing asbestos without containing the materials safely.

. Do not dispose of any pressure vessel that is not clearly marked with its relevant data plate information or rendered unusable by drilling, cutting etc.

. Do not allow lubricants or coolants to be released into land surfaces or drains.

. Do not dispose of a complete machine without documentation relating to instructions for its use.

LONG TERM STORAGE RECOMMENDATIONS (6 months or more)

Spare Airends

• Long-term storage of airends should include filling the airend with the standard compressor fluid, PRO-TEC, XHP605 or XHP405. Upon installation of the airend, drain the storage oil from the airend and proceed with the installation, assuring fresh oil is poured into the intake prior to start up.

Portable Compressors

• Airend - Remove the intake connection and pour the airend intake full with Doosan compressor fluid PRO-TEC, XHP605 or XHP405. Reconnect the intake connection.

• Engine cooling system - Treat with rust inhibitor and drain. Check with engine dealer for further recommendations.

• Compressor Oil Filter/s- fill with Doosan compressor fluid PRO-TEC, XHP605 or XHP405.

• Seal all opening with waterproof tape.

• Place a desiccant in the exhaust pipes, engine and compressor air intake pipes.

• Loosen tension on belts, fan, airend, etc.

• Block axles so tyres are off ground and do not support any weight.

• Disconnect battery cables.

• Drain fuel system.

SHORT TERM STORAGE

Machines that stand idle for extended periods of time greater than 30 days:

• Start and operate the machine every 30 days. Operate long enough to allow the engine and compressor to reach operating temperature.

• Open and close the service valve to exercise machine from full load to idle RPM.

• Drain fuel tank to remove any water.

• Drain water from fuel water separator.

COMPRESSOR MOUNTING

Portable compressors, which are modified to remove the running gear and mount the compressor directly to trailers, truck beds or frames, etc. may experience failure of the enclosure, frame, and/or other components.

It is necessary to isolate the compressor package from the carrier base with a flexible mounting system. Such a system must also prevent detachment of the package from the carrier base in the event the isolators fail.

Contact your Portable Power representative for flexible mounting kits.

Warranty does not cover failures attributable to mounting of the compressor package to the carrier base unless it is a Portable Power provided system.

NOTE: The maintenance schedule in this manual describes the service intervals that should be followed for normal applications of this compressor. This page may be reproduced and used as a checklist by service personnel.

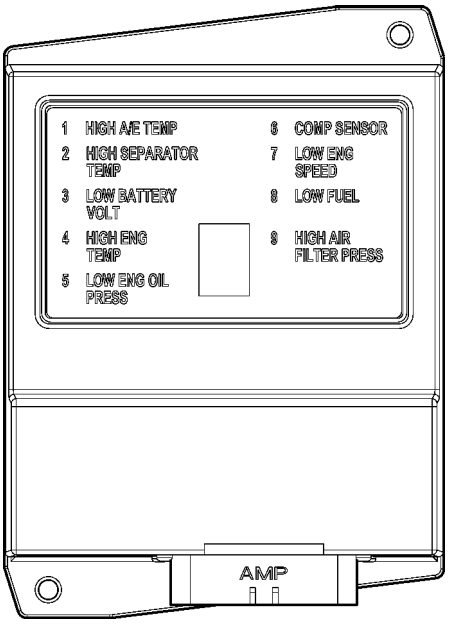
In more severe applications such as sandblasting, quarry drilling, well drilling, and oil and gas drilling, more frequent service intervals will be required to ensure long component life.

Dust and dirt, high humidity, and high temperatures will affect lubricant life and service intervals for components such as inlet air filters, oil separation elements and oil filters.

Small Electronic Control Unit (SECU)

Display Panel

The SECU display panel is arranged as shown below. A description of each diagnostic indicator is as follows:



1. **High A/E Temp:** Indicates shutdown due to high compressor temperature.

2. **High Separator Temp:** Indicates shutdown due to high temperature at separator tank discharge.

3. **Low Battery Voltage:** Alarm indicator. Indicates battery or charging system requires service.

4. **High Engine Coolant Temp:** Indictes shutdown due to high engine water temperature.

5. **Low Engine Oil Pressure:** Indicates shutdown due to low engine oil pressure.

6. **Compressor Sensor Failure:** Indicates pressure sensor malfunction. Compressor will not start.

7. **Low Engine Speed:** Indicates shutdown due to low engine speed.

8. **Low Fuel Level:** Indicates shutdown due to low fuel level. (Optional)

9. **Restricted Air Filter:** Alarm indicator. Indicates engine/compressor air inlet filters need service. (Optional).

A. **Engine Communication Error:** Engine Model was not recognized. Compressor will start and operate with a 1700-2300 rpm range.

C. **CAN Communication Error:** CAN communication failure.

A or C could also be displayed when the Emergency Stop Button (optional) remains pressed before starting. Engine will not start (crank) in that case.

E. Generator Enable Switch Error: Generator enable switch on the control panel remains ON before starting. See also section Options - generator option. Engine will not start (crank) at that case.

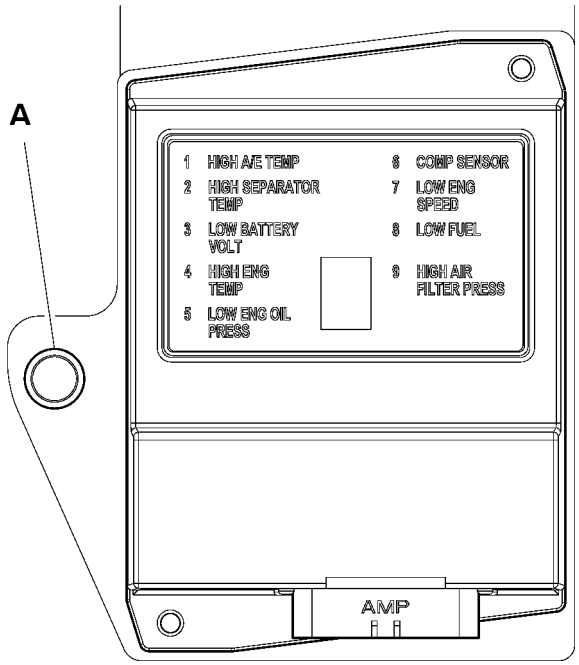
Normal Conditions:

-. **Center Bar Blinking:** Compressor is ready to start (no faults).

H. **Crank Signal Detected:** Displayed while start switch is in the pre-heat or crank position.

During SECU/power up, the 8 digit lights to check the display. Next the display will step through the 3 digit software revision number.

Engine Diagnostic Codes:



A. - Engine Failure Lamp

- Failure Flashes can be read on the Engine Failure Lamp when the on/off power switch is 'ON' or when the unit is running.
- The Engine Failure Lamp is located behind the front end panel (see figure).
- The Failure Lamp is luminated for 2 seconds when the ECU is powered on.
- A lamp flash duration of 0.5 second is a 'Short' flash.
- A lamp flash duration of 1.5 seconds is a 'Long' flash.
- A failure flash sequence of '1 Long and 3 Short' would be displayed by flashing the lamp one time with a duration of 1.5 seconds and three times with a duration of 0.5 seconds.
- When two or more failures have occurred simultaneously, the failure lamp will pause for 3 seconds between flash sequences.
- Failure flash sequences continuously repeat with 3 second pauses between flash sequences until the failure is corrected.

Failure	Failure Flashes	Remark
Coolant temperature sensor failure	4 Short	
Speed sensor failure	6 Short	
Rack position sensor failure	7 Short	
Rack actuator failure	8 Short	
CAN communication	1 Long and 2 Short	
EGR valve failure	1 Long and 3 Short	
CSD solenoid valve failure	1 Long and 4 Short	
Main relay failure	1 Long and 6 Short	
Rack actuator relay failure	1 Long and 7 Short	
ECU temperature alarm	2 Long and 5 Short	ECU temp > 221°F
Coolant temperature alarm	3 Long and 6 Short	Coolant temp > 230°F
ECU failure	4 Long and 1 Short	
Power supply voltage	2 Long and 3 Short	
5V Sensor circuit	2 Long and 4 Short	
Speed sensor	6 Long	
Overspeed error	9 Long	
Oil pressure switch	2 Long and 1 Short	

MAINTENANCE SCHEDULE

	Initial 500 miles / 850 km	Daily	Weekly	Monthly	6 Monthly. 500 hrs	12 Monthly. 1000 hrs	2000 hrs	5000 hrs
Compressor Oil Level		C						
Engine Oil Level		C						
*Coolant Level		C						
Gauges / Lamps		C						
*Air Cleaner Service Indicators		C						
Fuel Tank (Fill at end of day)		C			D			
*Fuel / Water Separator Drain		C						
Oil Leaks		C						
Fuel Leaks		C						
Coolant Leaks		C						
Drain Water From Fuel Filters		D						
Radiator Filler Cap		C						
Air Cleaner Precleaner Dumps			C					
Fan / Alternator Belts			C					
Generator Drive Belt			C					
Battery Connections / Electrolyte			C					
Tyre Pressure and Surface			C					
*Wheel Lug Nuts				C				
Hoses (Oil, Air, Intake, etc.)				C				
Automatic Shutdown System				C				
Air Cleaner System				C				
Compressor Oil Cooler Exterior				C				

*Disregard if not appropriate for this particular machine.

(1) or 3000 miles/5000km whichever is the sooner

(2) or as defined by local or national legislation

C = Check (adjust, clean or replace as necessary)

CBT = Check before towing.

CR = Check and report

D = Drain

G = Grease

R= Replace

T = Test

W I = or when indicated if earlier.

Refer to specific sections of the operator's manual for more information.

NOTE: 500 and 1000 hour intervals are meant to be repeated at every 500 or 1000 hours. Other intervals only to be performed at hours indicated.

NOTE: All fluid and filter intervals are valid for near perfect conditions only. High ambient temperatures - high dust concentration - high humidity as well as using lower grade oils and fuels will require a decrease in maintenance intervals.
Contact your Doosan Infracore Portable Power dealer for more information or assistance in determining the optimum intervals for your application.

MAINTENANCE SCHEDULE

	Initial 500 miles / 850 km	Daily	Weekly	Monthly	6 Monthly. 500 hrs	12 Monthly. 1000 hrs	2000 hrs	5000 hrs
*Engine Rad / Oil Cooler Exterior				C				
Fasteners, Guards				C				
Primary Air Cleaner Elements						R/WI		
Secondary Air Cleaner Elements							R/WI	
*Fuel/Water Separator Element					R			
Secondary Fuel Filter					R			
Final Fuel Filter					R			
*Injection Nozzle Check							C	
Engine Oil Filter					R			
Engine Oil Change					R			
Engine Valve Lash								C/A
Compressor Oil					R			
Compressor Oil Filter					R			
*Water Pump Grease.						R		
Oil Separator Element						R		
*Feed Pump Strainer Cleaning						C		
*Engine Coolant					C	R		
*Wheels (Bearings, Seals, etc.)					C			
Shutdown Switch Settings						T		
Scavenger Orifice & Related Parts						C		
Lights (running, brake, & turn)		CBT						
Pintle Eye Bolts		CBT						
*Brakes	C				C			
*Brake linkage	C							

*Disregard if not appropriate for this particular machine.

(1) or 3000 miles/5000km whichever is the sooner

(2) or as defined by local or national legislation

C = Check (adjust, clean or replace as necessary)

CBT = Check before towing.

CR = Check and report

D = Drain

G = Grease

R= Replace

T = Test

W I = or when indicated if earlier.

Refer to specific sections of the operator's manual for more information.

NOTE: 500 and 1000 hour intervals are meant to be repeated at every 500 or 1000 hours. Other intervals only to be performed at hours indicated.

NOTE: All fluid and filter intervals are valid for near perfect conditions only. High ambient temperatures - high dust concentration - high humidity as well as using lower grade oils and fuels will require a decrease in maintenance intervals.
Contact your Doosan Infracore Portable Power dealer for more information or assistance in determining the optimum intervals for your application.

MAINTENANCE SCHEDULE

	Initial 500 miles / 850 km	Daily	Weekly	Monthly	6 Monthly. 500 hrs	12 Monthly. 1000 hrs	2000 hrs	5000 hrs
Emergency stop		T						
Fasteners		C						
Running gear linkage	C			G/C				
Running gear bolts(1)					C			
Safety valve					C			
Scavenge line					C			
Pressure system					C			
Pressure gauge						C		
Pressure regulator						C		
Separator tank (2) exterior						C/R		
Lubricator (Fill)		C						
Engine Air Inlet Shutdown Valve						C		

	2 Yrs	4 Yrs	6 Yrs	
Safety valve	C			
Hoses		R		
Separator tank (2) interior			C	

*Disregard if not appropriate for this particular machine.

(1) or 3000 miles/5000km whichever is the sooner

(2) or as defined by local or national legislation

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NOTE: 500 and 1000 hour intervals are meant to be repeated at every 500 or 1000 hours. Other intervals only to be performed at hours indicated.

NOTE: All fluid and filter intervals are valid for near perfect conditions only. High ambient temperatures - high dust concentration - high humidity as well as using lower grade oils and fuels will require a decrease in maintenance intervals.
Contact your Doosan Infracore Portable Power dealer for more information or assistance in determining the optimum intervals for your application.

ROUTINE MAINTENANCE

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

The *SERVICE/MAINTENANCE CHART* indicates the various components' descriptions and the intervals when maintenance has to take place. Oil capacities, etc., can be found in the *GENERAL INFORMATION* section of this manual.

For any specification or specific requirement on service or preventative maintenance for the engine, refer to the *Engine Manufacturer's Manual*.

Compressed air can be dangerous if incorrectly handled. Before doing any work on the unit, ensure that all pressure is vented from the system and that the machine cannot be started accidentally.

If the automatic blowdown fails to operate, then pressure must be gradually relieved by operating the manual blowdown valve. Suitable personal protective equipment should be worn.

Ensure that maintenance personnel are adequately trained, competent and have read the Maintenance Manuals.

Prior to attempting any maintenance work, ensure that:-

. all air pressure is fully discharged and isolated from the system. If the automatic blowdown valve is used for this purpose, then allow enough time for it to complete the operation.

. the discharge pipe / manifold area is depressurised by opening the discharge valve, whilst keeping clear of any airflow from it.

MINIMUM PRESSURE VALVE - WHEN FITTED

NOTE: Pressure will always remain in the part of the system between the minimum pressure valve and the discharge valve after operation of the auto blowdown valve.

This pressure must be relieved by carefully:

(a) Disconnecting any downstream equipment.

(b) Opening the discharge valve to atmosphere.

(Use hearing protection if necessary).

. the machine cannot be started accidentally or otherwise, by posting warning signs and/or fitting appropriate anti-start devices.

. all residual electrical power sources (mains and battery) are isolated.

Prior to opening or removing panels or covers to work *inside* a machine, ensure that:-

. anyone entering the machine is aware of the reduced level of protection and the additional hazards, including hot surfaces and intermittently moving parts.

. the machine cannot be started accidentally or otherwise, by posting warning signs and/or fitting appropriate anti-start devices.

Prior to attempting any maintenance work on a *running* machine, ensure 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.

. all hazards present are known (e.g. pressurised components, electrically live components, removed panels, covers and guards, extreme temperatures, inflow and outflow of air, intermittently moving parts, safety valve discharge etc.).

. appropriate personal protective equipment is worn.

. loose clothing, jewelry, long hair etc. is made safe.

. warning signs indicating that *Maintenance Work is in Progress* are posted in a position that can be clearly seen.

Upon completion of maintenance tasks and prior to returning the machine into service, ensure that:-

. the machine is suitably tested.

. all guards and safety protection devices are refitted.

. all panels are replaced, canopy and doors closed.

. hazardous materials are effectively contained and disposed of.

PROTECTIVE SHUTDOWN SYSTEM

Comprises:

. Low engine oil pressure switch

. High discharge air temperature switch

. High engine water temperature switch

. Alternator/drive belt failure circuit.

. Low engine fuel level switch.

Engine fault codes

. Coolant temperature sensor failure

. Speed sensor failure

. Rack position sensor failure

. Rack actuator failure

. CAN communication

. EGR valve failure

. CSD solenoid valve failure

. Main relay failure

. Rack actuator relay failure

. ECU temperature alarm

. Coolant temperature alarm

. ECU failure

. Power supply voltage

. 5V Sensor circuit

. Speed sensor

. Overspeed error

. Oil pressure switch

Low engine oil pressure switch.

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

. Start the machine.

NOTE: Do not press the load button.

. Remove a wire from one terminal of the switch. The machine should shutdown.

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

. Remove the switch from the machine.

. Connect it to an independent low pressure supply (either air or oil).

. The switch should operate at 1,0 bar.

. Refit the switch.

Temperature switch(es).

At three month intervals, test the temperature switch circuit(s) as follows:

. Start the machine.

NOTE: Do not press the load button.

. Disconnect each switch in turn. The machine should shutdown.

. Re-connect the switch.

High discharge air temperature switch(es).

At twelve month intervals, test the air discharge temperature switch(es) by removing it from the machine and immersing in a bath of heated oil. The switch should operate at 120°C. Refit the switch.

High water temperature switch

At twelve month intervals, test the water temperature switch by removing it from the machine and immersing in a bath of heated oil. The switch should operate at 105°C. Refit the switch.

Alternator/drive belt failure circuit.

At twelve month intervals test the alternator drive belt failure circuit as follows:

. Remove the drive belt from the machine.

. Turn the key switch to position *1*, the alternator charge light will illuminate.

. Turn the key switch to position *3* (engine start position).

. The machine should shutdown when the key switch is returned to position *1*.

Low engine fuel level switch.

At three month intervals, test the low engine fuel level switch circuit as follows:

. Start the machine.

NOTE: Do not press the load button.

. Disconnect the switch, the machine should shutdown.

. Re-connect the switch.

At twelve month intervals, test the low engine fuel level switch by removing and operating the float manually.

CAUTION: *Never remove or replace switches when the machine is running.*

SCAVENGE LINE

The scavenge line runs from the combined orifice/drop tube in the separator tank, to the orifice fitting located in the airend.

Examine the orifice, check valve and hoses at every service or in the event of oil carryover into the discharge air.

It is good preventative maintenance to check that the scavenge line and tube are clear of any obstruction each time the compressor lubricant is changed as any blockage will result in oil carryover into the discharge air.

COMPRESSOR OIL FILTER

Refer to the *MAINTENANCE CHART* in this section for the recommended servicing intervals.

Removal

WARNING: Do not remove the filter(s) without first making sure that the machine is stopped and the system has been completely relieved of all air pressure. (Refer to *STOPPING THE UNIT* in the *OPERATING INSTRUCTIONS* section of this manual).

Clean the exterior of the filter housing and remove the *spin-on* element by turning it in a counter-clockwise direction.

Inspection

Examine the filter element.

CAUTION: *If there is any indication of the formation of varnishes, shellacs or lacquers on the filter element, it is a warning that the compressor lubricating and cooling oil has deteriorated and that it should be changed immediately. Refer to LUBRICATION later in this section.*

Reassembly

Clean the filter gasket contact area and install the new element by screwing in a clockwise direction until the gasket makes contact with the filter housing. Tighten a further $^{1}/_{2}$ to $^{3}/_{4}$ of a revolution.

CAUTION: *Start the machine (refer to PRIOR TO STARTING and STARTING THE UNIT in the OPERATING INSTRUCTIONS section of this manual) and check for leakage before the machine is put back into service.*

COMPRESSOR OIL SEPARATOR ELEMENT

Normally the separator element will not require periodic maintenance provided that the air and oil filter elements are correctly maintained.

If, however, the element has to be replaced, then proceed as follows:

Removal

WARNING: Do not remove the filter(s) without first making sure that the machine is stopped and the system has been completely relieved of all air pressure. (Refer to *STOPPING THE UNIT* in the *OPERATING INSTRUCTIONS* section of this manual).

Disconnect all hoses and tubes from the separator tank cover plate. Remove the drop-tube from the separator tank cover plate and then remove the cover plate. Remove the separator element.

Inspection

Examine the filter element. Examine all hoses and tubes, and replace if necessary.

Reassembly

Thoroughly clean the orifice/drop tube and filter gasket contact area before reassembly. Install the new element.

WARNING
Do not remove the staple from the anti-static gasket on the separator element since it serves to ground any possible static build-up. Do not use gasket sealant since this will affect electrical conductance.

Reposition the cover plate, taking care not to damage the gasket, and replace the cover plate screws tightening in a *criss-cross* pattern to the recommended torque (refer to the *TORQUE SETTING TABLE* later in this section).

Engage the adaptor in the cover plate with the drop-tube integral with the filter, reconnect all hoses and tubes to the separator tank cover plate.

Replace the compressor oil (refer to *LUBRICATION* later in this section).

CAUTION: *Start the machine (refer to PRIOR TO STARTING and STARTING THE UNIT in the OPERATING INSTRUCTIONS section of this manual) and check for leakage before the machine is put back into service.*

COMPRESSOR OIL COOLER AND ENGINE RADIATOR

When grease, oil and dirt accumulate on the exterior surfaces of the oil cooler and radiator, the efficiency is impaired. It is recommended that each month the oil cooler and radiator be cleaned by directing a jet of compressed air, (carrying if possible a non-flammable cleaning solvent) over the exterior core of the cooler/radiator. This should remove any accumulation of oil, grease and dirt from the exterior core of the cooler so that the entire cooling area can radiate the heat of the lubricating and cooling oil/water into the air stream.

WARNING: Hot engine coolant and steam can cause injury. When adding coolant or antifreeze solution to the engine radiator, stop the engine at least one minute prior to releasing the radiator filler cap. Using a cloth to protect the hand, slowly release the filler cap, absorbing any released fluid with the cloth. Do not remove the filler cap until all excess fluid is released and the engine cooling system fully depressurised.

WARNING: Follow the instructions provided by the antifreeze supplier when adding or draining the antifreeze solution. It is advisable to wear personal protective equipment to prevent skin and eye contact with the antifreeze solution.

AIR FILTER ELEMENTS

The air filter should be inspected regularly (refer to the *SERVICE/MAINTENANCE CHART*) and the element replaced when the restriction indicator shows red or every 6 Months (500 hours), whichever comes first. The dust collector box(es) should be cleaned daily (more frequently in dusty operating conditions) and not allowed to become more than half full.

Removal

CAUTION: *Never remove and replace element(s) when the machine is running.*

Clean the exterior of the filter housing and remove the filter element by releasing the nut.

Inspection

Check for cracks, holes or any other damage to the element by holding it up to a light source, or by passing a lamp inside.

Check the seal at the end of the element and replace if any sign of damage is evident.

Reassembly

Assemble the new element into the filter housing ensuring that the seal seats properly.

Reset the restriction indicator by depressing the rubber diaphragm.

Assemble the dust collector box parts, ensuring that they are correctly positioned.

Before restarting the machine, check that all clamps are tight.

VENTILATION

Always check that the air inlets and outlets are clear of debris etc.

CAUTION: *NEVER clean by blowing air inwards.*

COOLING FAN DRIVE

Periodically check that the fan mounting bolts in the fan hub have not loosened. If, for any reason, it becomes necessary to remove the fan or re-tighten the fan mounting bolts, apply a good grade of commercially available thread locking compound to the bolt threads and tighten to the torque value shown in the *TORQUE SETTING TABLE* later in this section.

The fan belt(s) should be checked regularly for wear and correct tensioning.

FUEL SYSTEM

The fuel tank should be filled daily or every eight hours. To minimise condensation in the fuel tank(s), it is advisable to top up after the machine is 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).

FUEL FILTER WATER SEPARATOR

If the fuel filter water separator contains a filter element it should be replaced at regular intervals (see the *SERVICE/MAINTENANCE CHART*).

HOSES

All components of the engine cooling air intake system should be checked periodically to keep the engine at peak efficiency.

At the recommended intervals, (see the *SERVICE/MAINTENANCE CHART*), inspect all of the intake lines to the air filter, and all flexible hoses used for air lines, oil lines and fuel lines.

Periodically inspect all pipework for cracks, leaks, etc. and replace immediately if damaged.

ELECTRICAL SYSTEM

WARNING: Always disconnect the battery cables before performing any maintenance or service.

Inspect the safety shutdown system switches and the instrument panel relay contacts for evidence of arcing and pitting. Clean where necessary.

Check the mechanical action of the components.

Check the security of electrical terminals on the switches and relays i.e. nuts or screws loose, which may cause local hot spot oxidation.

Inspect the components and wiring for signs of overheating i.e. discolouration, charring of cables, deformation of parts, acrid smells and blistered paint.

BATTERY

Keep the battery terminals 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.

PRESSURE SYSTEM

At 500 hour intervals it is necessary to inspect the external surfaces of the system (from the airend through to the discharge valve(s)) including hoses, tubes, tube fittings and the separator tank, for visible signs of impact damage, excessive corrosion, abrasion, tightness and chafing. Any suspect parts should be replaced before the machine is put back into service.

TYRES/TYRE PRESSURE

See the *GENERAL INFORMATION* section of this manual.

RUNNING GEAR/WHEELS

Check the wheel nut torque 20 miles (30 kilometres) after refitting the wheels. Refer to the *TORQUE SETTING TABLE* later in this section.

Lifting jacks should only be used under the axle.

The bolts securing the running gear to the chassis should be checked periodically for tightness (refer to the *SERVICE/MAINTENANCE CHART* for frequency) and re-tightened where necessary. Refer to the *TORQUE SETTING TABLE* later in this section.

BRAKES

Check and adjust the brake linkage at 500 miles (850Km) then every 3000 miles (5000Km) or 3 months (whichever is the sooner) to compensate for any stretch of the adjustable cables. Check and adjust the wheel brakes to compensate for wear.

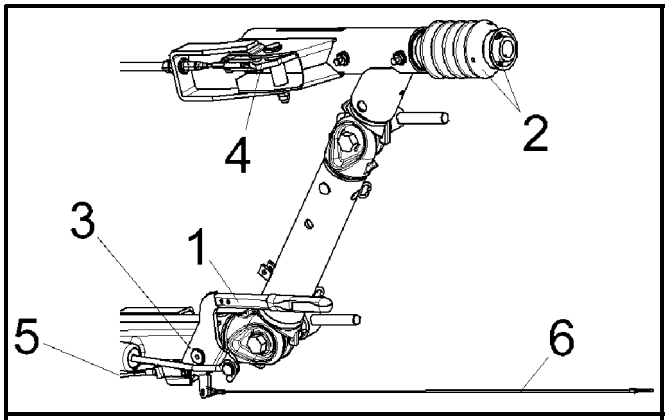
Adjusting the overrun braking system (KNOTT Running Gear)

1: Preparation

Jack up the machine

Disengage the handbrake lever [1].

Fully extend the draw bar [2] on the overrun braking system.



1 Handbrake lever

2 Draw bar and bellows

3 Handbrake lever pivot

4 Transmission lever

5 Brake cable

6 Breakaway Cable

Requirements:

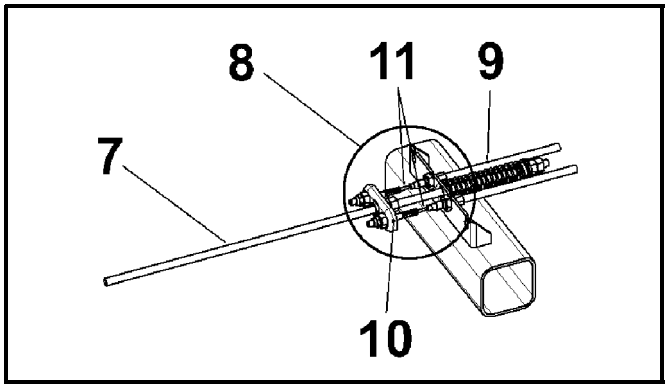
During the adjustment procedure always start with the wheel brakes.

Always rotate the wheel in the direction of forward movement.

Ensure that an M10 safety screw is fitted to the handbrake pivot.

The brake actuators must not be pre-tensioned - if necessary loosen the brake linkage [7] on the brake equalisation assembly [8].

Check that brake actuators and cables [11] operate smoothly.



7 Brake linkage

8 Equalisation assembly

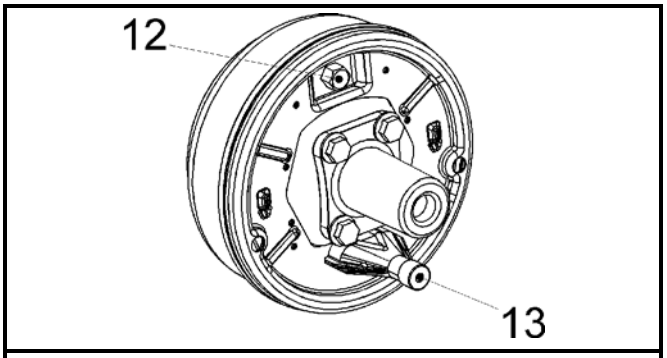
9 Compression spring

10 Equaliser plate

11 Cable

CAUTION
The compression spring [9] must only be lightly pre-tensioned and when operating must never touch the axle tube.
Never adjust the brakes at the brake linkage [7].

2. Brake Shoe Adjustment



12 Adjusting screw

13 Cable entry

Width across flats of adjusting screw [12]

Brake size	**Key width**
160x35 / 200x50	SW 17
250x40	SW 19
300x60	SW 22

Tighten adjusting screw [12] clockwise until the wheel locks.

Loosen adjusting screw [12] anti-clockwise (approx. ½ 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 5-8mm on the cable [11]

3: Compensator assembly adjustment

Variable Height models

Fit an M10 safety screw to the handbrake pivot.

Disconnect the handbrake cable [5] at one end.

Pre-adjust brake linkage [7] lengthways (a little play is permissible) and re-insert the cable [5], adjusting it to give a small amount of play.

Remove the M10 safety screw from the handbrake pivot.

All Models

Engage the handbrake lever [1] and check that the position of the equaliser plate [10] is at right angles to the pulling direction. If necessary correct the position of the equaliser plate [10] on the cables [11].

The compression spring [9] must only be slightly pre-tensioned and when engaged must not touch the axle tube.

4: Brake linkage adjustment

Adjust the brake linkage [7] lengthways without pre-tension and without play in the transmission lever [4].

Readjustment

Engage the handbrake lever [1] forcefully a number of times to set the brake.

Check the alignment of the equalisation assembly [8], this should be at right angles to the pulling direction

Check the play in the brake linkage [7]

If necessary adjust the brake linkage [7] again without play and without pre-tensioning

There must still be a little play in cable [5] (Variable Height Only)

Check the position of the hand brake lever [1]. The start of resistance should be approximately 10-15mm above the horizontal position.

Check that the wheels move freely when the handbrake is disengaged.

Final test

Check the fastenings on the transmission system (cables, brake equalisation system and linkage).

Check the handbrake cable [5] for a small amount of play and adjust if necessary (Variable height only)

Check the compression spring [9] for pre-tensioning.

Test run

If necessary carry out 2-3 test brake actions.

Test brake action

Check the play in brake linkage [7] and if necessary adjust the length of brake linkage [7] until there is no play.

Apply the handbrake while rolling the machine forward, travel of the handbrake lever up to 2/3 of maximum is allowed.

Re-adjusting the overrun braking system (KNOTT Running Gear)

Re-adjustment of the wheel brakes will compensate for brake lining wear. Follow the procedure described in *2: Brake Shoe Adjustment*.

Check the play in the brake linkage [7] and re-adjust if necessary.

Important
Check the brake actuators and cables [11]. The brake actuators must not be pre-tensioned.
Excessive operation of the handbrake lever, which may have been caused by worn brake linings, must not be corrected by re-adjusting (shortening) the brake linkage [7]

Re-adjustment

The handbrake lever [1] should be engaged forcefully several times to set the braking system.
Check the setting of the brake equalisation assembly [8], which should be at right angles to the pulling direction.
Check the play in the brake linkage [7] again, ensuring that there is no play in the brake linkage and that it is adjusted without pre-tension
Check the position of the hand brake lever [1], cable [5] (with little play) and the compression spring [9] (only slight pre-tension). The start of resistance of the handbrake lever should be approximately 10-15mm above the horizontal position.

Final test

Check the fastenings on the transmission system (cables, brake equalisation system and linkage)

Apply the handbrake while rolling the machine forward, travel of the handbrake lever up to 2/3 of maximum is allowed.

Check the handbrake cable [5] for a small amount of play and adjust if necessary (Variable height only)

Check the compression spring [9] for slight pre-tensioning.

CAUTION: *Check the wheel nut torque 20 miles (30 kilometres) after refitting the wheels (Refer to the TORQUE SETTING TABLE later in this section).*

LUBRICATION - GENERAL INFORMATION

Lubrication is an essential part of preventive maintenance, affecting to a great extent the useful life of the compressor. Different lubricants are needed and some components require more frequent lubrication than others. Therefore, it is important that the instructions regarding types of lubricants and the frequency of their application be explicitly followed. Periodic lubrication of the moving parts reduces to a minimum the possibility of mechanical failures.

The Maintenance Schedule shows those items requiring regular service and the interval in which they should be performed. A regular service program should be developed to include all items and fluids. These intervals are based on average operating conditions. In the event of extremely severe (hot, cold, dusty or wet) operating conditions, more frequent lubrication than specified may be necessary.

All filters and filter elements for air and compressor oil must be obtained through Portable Power to assure the proper size and filtration for the compressor.

Compressor Oil Change

These compressors are normally furnished with an initial supply of oil sufficient to allow operation until the first service interval indicated in the Maintenance Schedule. If a compressor has been completely drained of all oil, it must be refilled with new oil before it is placed in operation. Refer to specifications in the Portable Compressor Fluid Chart.

NOTE: Some oil types are incompatible when mixed and result in the formation of varnishes, shellacs, or lacquers which may be insoluble. Such deposits can cause serious troubles including clogging of the filters.

Where possible, do NOT mix oils of different types and avoid mixing different brands. A type or brand change is best made at the time of a complete oil drain and refill.

If the compressor has been operated for the time/hours indicated in the Maintenance Schedule, it should be completely drained of oil. If the compressor has been operated under adverse conditions, or after long periods in storage, an earlier change may be necessary as oil deteriorates with time as well as by operating conditions.

CAUTION: *In most severe applications such as sandblasting, quarry drilling, well drilling, and oil and gas drilling, more frequent service intervals will be required to ensure long component life.*

WARNING : High pressure air can cause severe injury or death from hot oil and flying parts. Always relieve pressure before removing caps, plugs, covers or other parts from pressurized air system. Ensure that the air pressure gauge reads zero (0) pressure and ensure there is no air discharge when opening the manual blowdown valve.

An oil change is good insurance against the accumulation of dirt, sludge, or oxidized oil products.

Completely drain the separator tank, piping, and cooler. If the oil is drained immediately after the compressor has been run for some time, most of the sediment will be in suspension and, therefore, will drain more readily. However, the oil will be hot and care must be taken to avoid contact with the skin or eyes.

After the compressor has been completely drained of all old oil, close the drain valves and/or plugs and install new oil filter elements. Add oil in the specified quantity at the filler plug. Tighten the filler plug and run the compressor to circulate the oil. Check the oil level. DO NOT OVERFILL.

NOTE: Portable Power provides compressor oil specifically formulated for Portable Compressors and requires the use of these fluids in order to obtain extended limited airend warranty.

LUBRICATION

The engine is initially supplied with engine oil sufficient for a nominal period of operation (for more information, consult the Engine section of this manual).

CAUTION: *Always check the oil levels before a new machine is put into service.*

If, for any reason, the unit has been drained, it must be re-filled with new oil before it is put into operation.

ENGINE LUBRICATING OIL

The engine oil should be changed at the engine manufacturer's recommended intervals. Refer to the Engine section of this manual.

ENGINE LUBRICATING OIL SPECIFICATION

Refer to the Engine section of this manual.

ENGINE OIL FILTER ELEMENT

The engine oil filter element should be changed at the engine manufacturer's recommended intervals. Refer to the Engine section of this manual.

COMPRESSOR LUBRICATING OIL

Refer to the *SERVICE/MAINTENANCE CHART* in this section for service intervals.

NOTE: If the machine has been operating under adverse conditions, or has suffered long shutdown periods, then more frequent service intervals will be required.

WARNING: DO NOT, under any circumstances, remove any drain plugs or the oil filler plug from the compressor lubricating and cooling system without first making sure that the machine is stopped and the system has been completely relieved of all air pressure (refer to *STOPPING THE UNIT* in the *OPERATING INSTRUCTIONS* section of this manual).

Completely drain the receiver/separator system including the piping and oil cooler by removing the drain plug(s) and collecting the used oil in a suitable container.

Replace the drain plug(s) ensuring that each one is secure.

NOTE: If the oil is drained immediately after the machine has been running, then most of the sediment will be in suspension and will therefore drain more readily.

CAUTION: *Some oil mixtures are incompatible and result in the formation of varnishes, shellacs or lacquers which may be insoluble.*

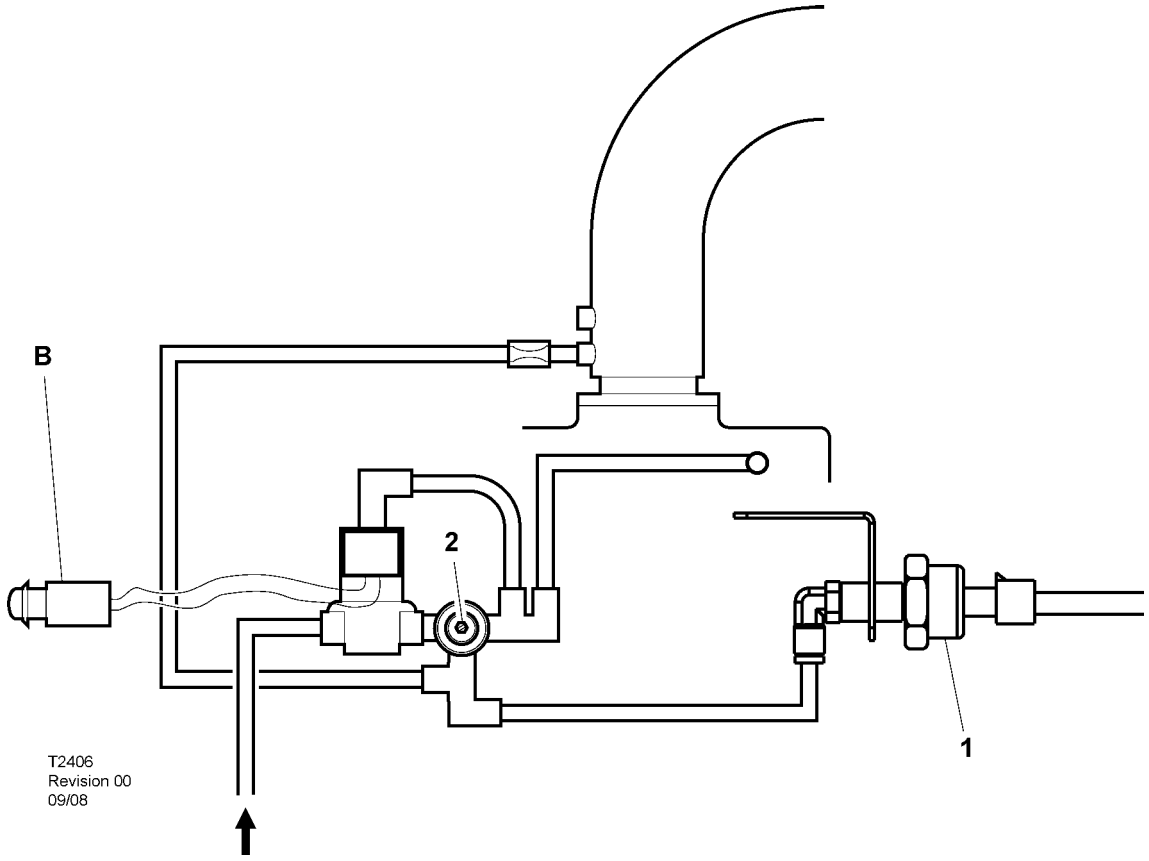
NOTE: Always specify PRO-TEC oil for use at all ambient temperatures above -23°C.

COMPRESSOR OIL FILTER ELEMENT

Refer to the *SERVICE / MAINTENANCE CHART* in this section for service intervals.

RUNNING GEAR WHEEL BEARINGS

Wheel bearings should be packed with grease every 6 months. The type of grease used should conform to specification *MIL-G-10924.*



SPEED AND PRESSURE REGULATION ADJUSTMENT

Normally, regulation requires no adjusting, but if correct adjustment is lost, proceed as follows:

Refer to the diagram above.

1: Pressure transducer
2: Adjusting screw
B: Push After Warm-up button

At the Pressure Regulator loosen the jam nut and turn screw counterclockwise until tension is no longer felt at the screw. Then, turn screw clockwise one full turn.

Close the service valve.

Start the machine (Refer to *STARTING INSTRUCTIONS* in the *OPERATING INSTRUCTIONS* section of this manual*).*

Press button (B) - Push After Warm-up (Refer to STARTING INSTRUCTIONS in the OPERATING INSTRUCTIONS section of this manual) when fitted.

The unit should speed up and then unload (and drop back to IDLE). With the unit unloaded (service valve is fully closed), turn the adjusting screw on the pressure regulator clockwise until the discharge pressure gauge indicates 8.6 bar (7/72).

Open the service valve fully. Check the engine speed up to full RPM, then adjust the service valve to maintain 7 bar (7/72) - see pressure gauge on the control panel.

If the engine speed falls down before 7 bar (7/72) pressure is attained, then turn the adjusting screw clockwise to increase the pressure. Optimum adjustment is achieved when the engine speed just falls down from full speed and the pressure gauge reads 7.2 bar (7/72).

Lock adjusting screw by the jam nut.

Close the service valve. The engine will slow to idle speed.

CAUTION: *Never allow the idle pressure to exceed 8,6bar (7/72) on the pressure gauge, otherwise the safety valve will operate.*

TORQUE VALUES

	ft lbf	Nm
Airend to engine	29-35	39-47
Air filter to bracket	16-20	22-27
Autella clamp to exhaust	9-11	12-15
Baffle to frame	9-11	12-15
Blowdown solenoid valve	21-26	28-35
Discharge manifold to frame	29-35	39-47
Drive pins to engine flywheel	57-69	77-93
Drop Leg	53-63	72-85
Engine/airend to chassis	54-58	73-78
Euro-Loc adaptor to separator tank	58-67	78-91
Exhaust flange to manifold	17-21	23-28

	ft lbf	Nm
Fan guard	9-11	12-15
Fan to hub	12-15	16-20
Lifting bail bracket to engine	29-35	39-47
Oil pipe (-12jic)	71-88	96-119
Radiator/Cooler to baffle	9-11	12-15
Running gear front to chassis	63-69	82-93
Running gear rear to chassis	63-69	82-93
Running gear drawbar to axle	29-35	39-47
Separator tank cover	40-50	54-68
Separator tank to frame	18-22	24-30
Service pipe (-20jic)	106-133	143-180
Sight glass	40-50	54-68
Wheel nuts	62-70	85-95

COMPRESSOR LUBRICATION

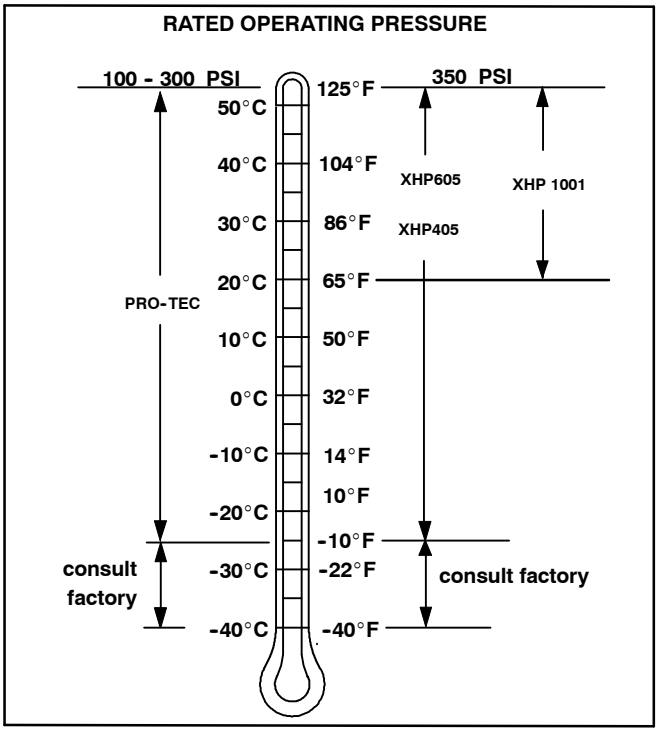
Portable Compressor Fluid Chart

Refer to these charts for correct compressor fluid required. Note that the selection of fluid is dependent on the design operating pressure of the machine and the ambient temperature expected to be encountered before the next oil change.

Note: Fluids listed as "preferred" are required for extended warranty.

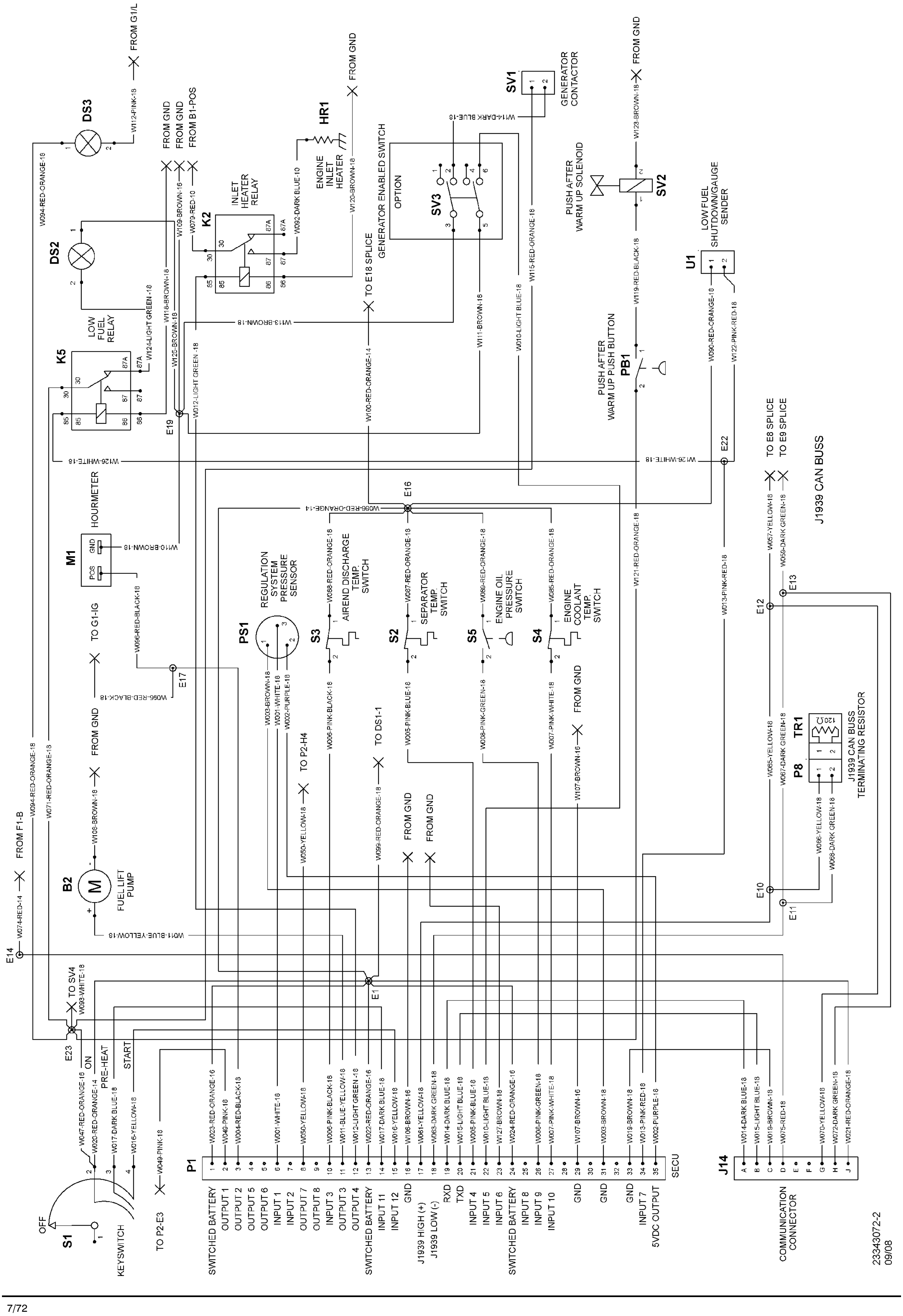
Compressor oil carryover (oil consumption) may be greater with the use of alternative fluids.

Design Operating Pressure	Ambient Temperature	Specification
100 psi to 300 psi	-10°F to 125°F (-23°C to 52°C)	Preferred: **PRO-TEC** Alternate: ISO Viscosity Grade 46 with rust and oxidation inhibitors, designed for air compressor service
350 psi	-10°F to 125°F (-23°C to 52°C)	Preferred: **XHP 605** Alternate: **XHP 405** ISO Viscosity Grade 68 Group 3 or 5 with rust and oxidation inhibitors designed for air compressor service.
	65°F to 125°F (18°C to 52°C)	Preferred: **XHP 605** **XHP1001**

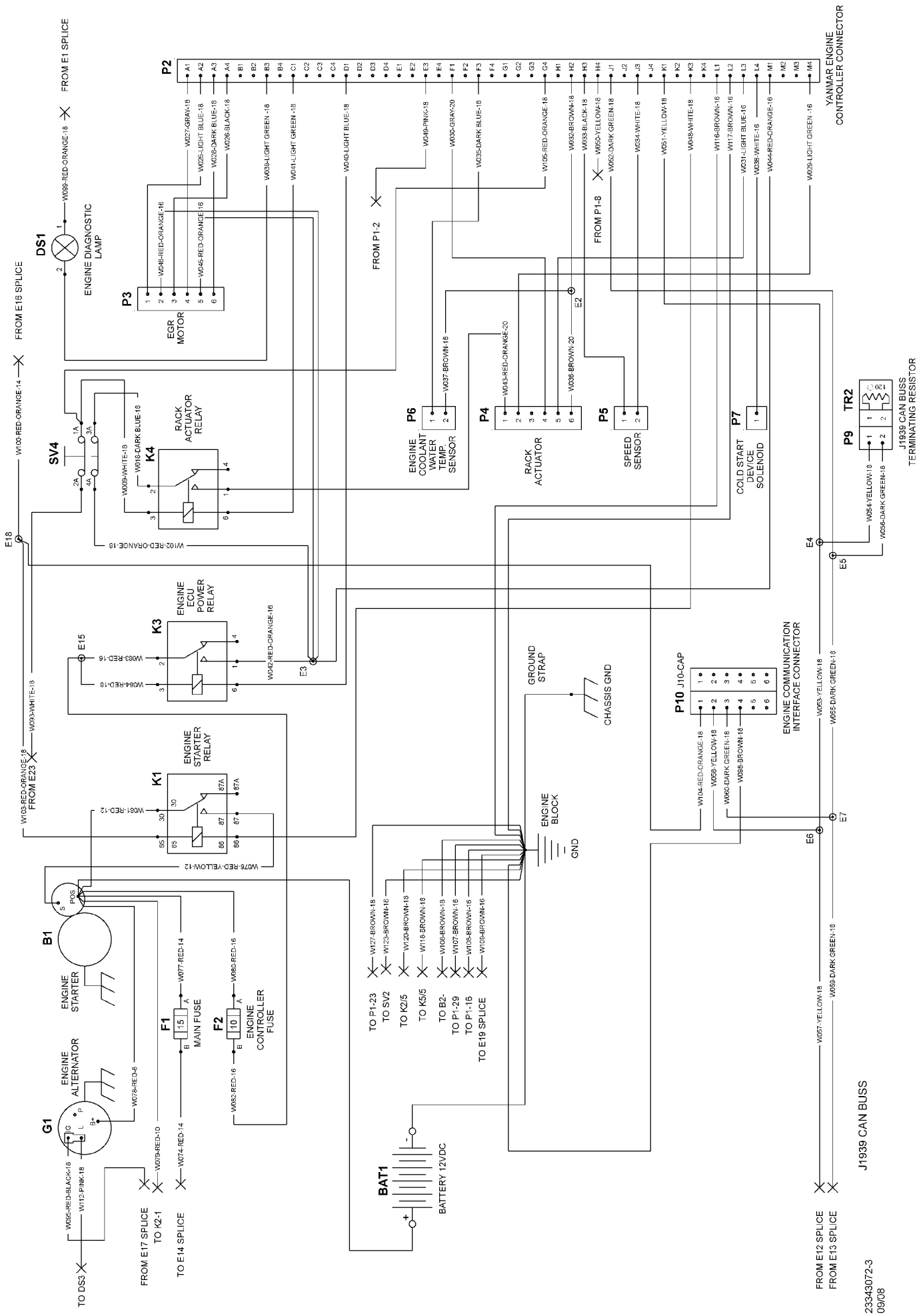


Preferred Doosan Fluids - Use of these fluids with original Doosan branded filters can extend airend warranty. Refer to operator's manual warranty section for details or contact your Portable Power representative.

Doosan Preferred Fluids	1 gal. (3.8 Litre)	5 gal. (19.0 Litre)	55 gal. (208.2Litre)	220 gal. (836 litre)
PRO-TEC	-	89292973	89292981	22082598
XHP 605	-	22252076	22252050	22252068
XHP 1001	-	35612738	35300516	-
XHP 405	-	22252126	22252100	22252118



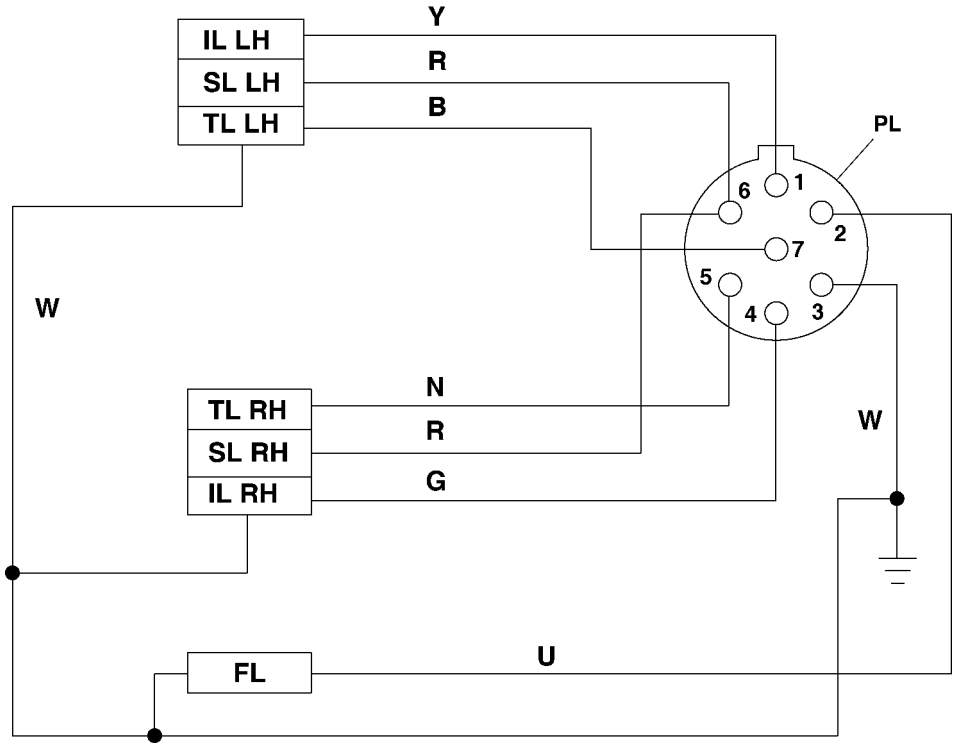
DS3
DS2
LOW FUEL RELAY
K5
INLET HEATER RELAY
K2
HR1
ENGINE INLET HEATER
FROM GND
FROM G1/L
FROM B1-POS
TO E18 SPLICE
GENERATOR ENABLED SWITCH
OPTION
SV3
SV1
GENERATOR CONTACTOR
PUSH AFTER WARM UP SOLENOID
SV2
U1
LOW FUEL SHUTDOWN/GAUGE SENDER
PUSH AFTER WARM UP PUSH BUTTON
PB1
E19
E22
E16
TO E8 SPLICE
TO E9 SPLICE
J1939 CAN BUSS
HOURMETER
M1
TO G1-IG
E17
PS1
REGULATION SYSTEM PRESSURE SENSOR
S3
AIREND DISCHARGE TEMP. SWITCH
S2
SEPARATOR TEMP. SWITCH
S5
ENGINE OIL PRESSURE SWITCH
S4
ENGINE COOLANT TEMP. SWITCH
TO P2-H4
TO DS1-1
E13
E12
P8
TR1
J1939 CAN BUSS TERMINATING RESISTOR
FROM F1-B
B2
FUEL LIFT PUMP
E10
E11
E14
TO SV4
E1
E23
ON
PRE-HEAT
START
OFF
S1
KEYSWITCH
TO P2-E3
P1
SWITCHED BATTERY
OUTPUT 1
OUTPUT 2
OUTPUT 5
OUTPUT 6
INPUT 1
INPUT 2
OUTPUT 7
OUTPUT 8
INPUT 3
OUTPUT 3
OUTPUT 4
SWITCHED BATTERY
INPUT 11
INPUT 12
GND
J1939 HIGH (+)
J1939 LOW (-)
RXD
TXD
INPUT 4
INPUT 5
INPUT 6
SWITCHED BATTERY
INPUT 8
INPUT 9
INPUT 10
GND
GND
GND
INPUT 7
5VDC OUTPUT
SECU
J14
COMMUNICATION CONNECTOR
23343072-2
09/08


P2
YANMAR ENGINE CONTROLLER CONNECTOR
DS1
ENGINE DIAGNOSTIC LAMP
FROM E1 SPLICE
FROM E16 SPLICE
P3
EGR MOTOR
FROM P1-2
FROM P1-8
SV4
K4
RACK ACTUATOR RELAY
P6
ENGINE COOLANT WATER TEMP. SENSOR
P4
RACK ACTUATOR
P5
SPEED SENSOR
P7
COLD START DEVICE SOLENOID
P9
TR2
J1939 CAN BUSS TERMINATING RESISTOR
K3
ENGINE ECU POWER RELAY
K1
ENGINE STARTER RELAY
GROUND STRAP
CHASSIS GND
P10 J10-CAP
ENGINE COMMUNICATION INTERFACE CONNECTOR
ENGINE BLOCK
GND
B1
ENGINE STARTER
G1
ENGINE ALTERNATOR
F1
15
MAIN FUSE
F2
10
ENGINE CONTROLLER FUSE
BAT1
BATTERY 12VDC
J1939 CAN BUSS
TO DS3
FROM E17 SPLICE
TO K2-1
TO E14 SPLICE
TO P1-23
TO SV2
TO K2/5
TO K5/5
TO B2-
TO P1-29
TO P1-16
TO E19 SPLICE
FROM E12 SPLICE
FROM E13 SPLICE
23343072-3
09/08

KEY

B1	Engine Starter
B2	Fuel Lift Pump
BAT1	Battery 12VDC
DS1	Engine Diagnostic Lamp
DS2	Low Fuel Lamp
DS3	No Charge Lamp
F1	Main Fuse
F2	Engine ECU Fuse
G1	Engine Alternator
HR1	Engine Inlet Heater
J14	Communication Connector
K1	Engine Starter Relay
K2	Inlet Heater Relay
K3	Engine ECU Power Relay
K4	Rack Actuator Relay
K5	Low Fuel Relay
M1	Hourmeter
P1	SECU - Small Electronic Control Unit
P2	Yanmar Engine ECU
P3	EGR Valve
P4	Rack Actuator
P5	Speed Sensor
P6	Engine Coolant Temperature Sensor
P7	Cold Start Device Solenoid
P8/TR1	CAN BUSS Terminating Resistor
P9/TR2	CAN BUSS Terminating Resistor
P10	Engine ECU Interface Communication Connector
PB1	Push After Warm up Button
PS1	Regulation System Pressure Sensor
S1	Keyswitch
S2	Separator Temperature Switch
S3	Airend Discharge Temperature Switch
S4	Engine Coolant temperature switch
S5	Engine Oil Pressure Switch
SV1	Generator Contactor
SV2	Push After Warm up Solenoid
SV3	Generator Enable Switch (Option)
SV4	Emergency Stop Button (Option)
U1	Low Fuel Shutdown Switch

SCHEMATIC DIAGRAM FOR EUROPEAN CE LIGHTING SYSTEM - 7 PINS



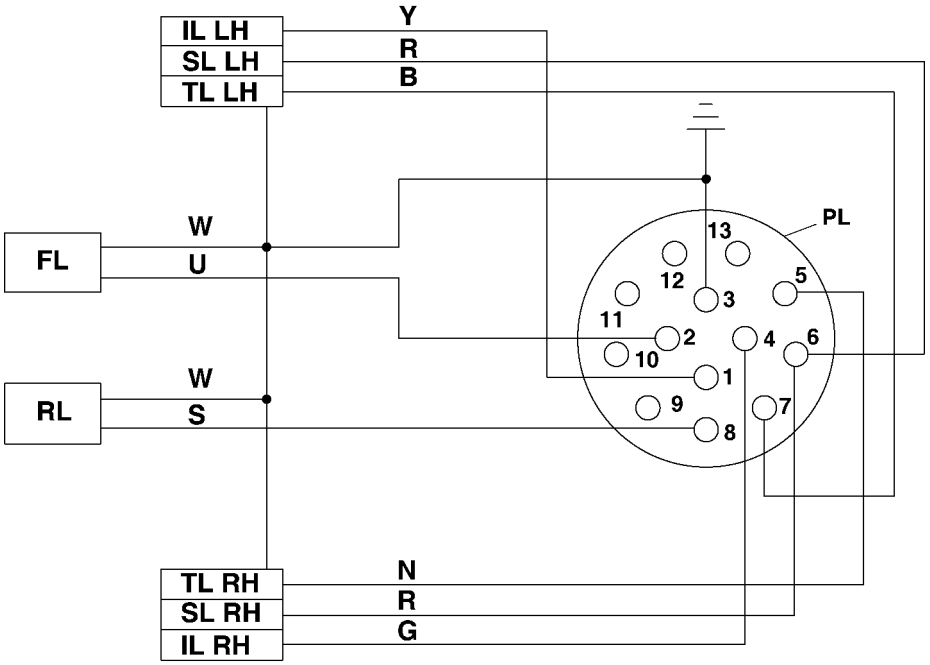
T2404
Revision 00
09/08

KEY

IL LH	Indicator light - left hand
IL RH	Indicator light - right hand
FL	Fog light
SL LH	Stop light - left hand
SL RH	Stop light - right hand
TL LH	Tail light - left hand
TL RH	Tail light - right hand
PL	Plug

B	Black
G	Green
K	Pink
N	Brown
O	Orange
P	Purple
R	Red
S	Grey
U	Blue
W	White
Y	Yellow

SCHEMATIC DIAGRAM FOR EUROPEAN CE LIGHTING SYSTEM - 13 PINS REVERSE LIGHT

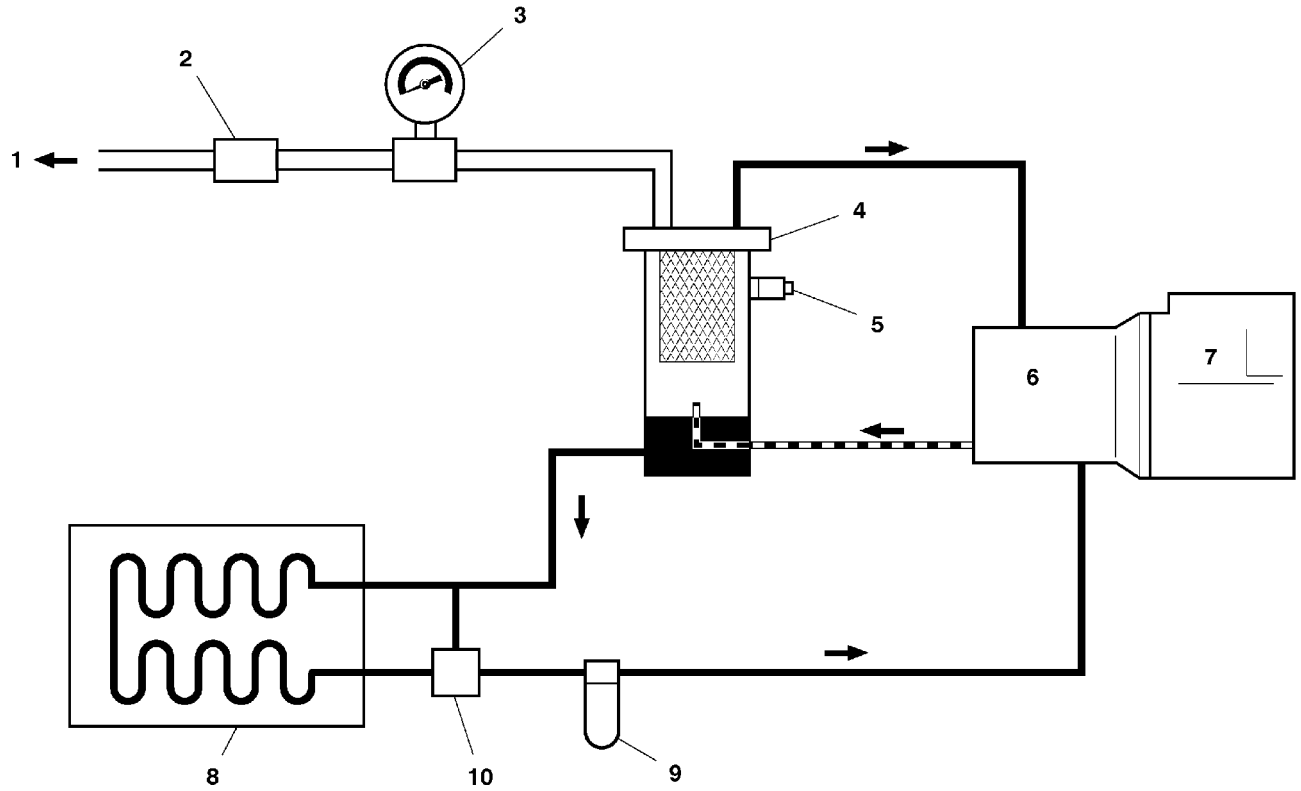


T2405
Revision 00
09/08

KEY

IL LH	Indicator light - left hand
IL RH	Indicator light - right hand
FL	Fog light
RL	Reverse light
SL LH	Stop light - left hand
SL RH	Stop light - right hand
TL LH	Tail light - left hand
TL RH	Tail light - right hand
PL	Plug

B	Black
G	Green
K	Pink
N	Brown
O	Orange
P	Purple
R	Red
S	Grey
U	Blue
W	White
Y	Yellow



T1815
Revision 00
07/00

	KEY		
1	Air discharge	**8**	Oil cooler
2	Sonic orifice (restricts flow)	**9**	Oil filter
3	Pressure gauge	**10**	Thermostatic valve (Where fitted)
4	Separator tank		
5	Safety valve		Air
6	Compressor		Oil
7	Engine		Air/oil

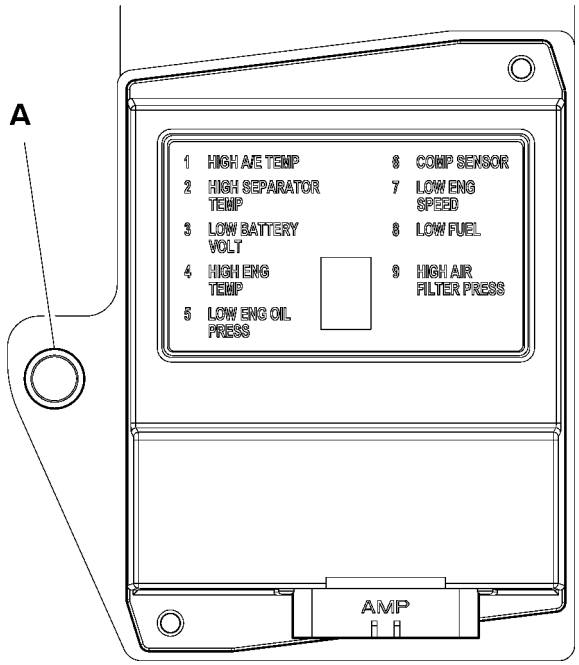
FAULT	CAUSE	REMEDY
Engine fails to start.	*Low battery charge.*	Check the fan belt tension, battery and cable connections.
	Bad earth connection.	Check the earth cables, clean as required.
	Loose connection.	Locate and make the connection good.
	Fuel starvation.	Check the fuel level and fuel system components. Replace the fuel filter if necessary.
	Relay failed.	Replace the relay.
	Engine control not in 'run' position.	Check the pressure transducer.
Engine starts but stalls when the switch returns to position *I*.	*Electrical fault*	Test the electrical circuits.
	Low engine oil pressure.	Check the oil level and the oil filter(s).
	Faulty relay	Check the relays.
	Faulty key-switch	Check the key-switch.
Engine starts but will not run or engine shuts down prematurely.	*Electrical fault.*	Test the electrical circuits.
	Low engine oil pressure.	Check the oil level and oil filter(s).
	Safety shut-down system in operation.	Check the safety shut-down switches.
	Fuel starvation.	Check the fuel level and fuel system components. Replace the fuel filter if necessary.
	Switch failure.	Test the switches.
	High compressor oil temperature.	Check the compressor oil level and oil cooler. Check the fan drive.
	Water present in fuel system.	Check the water separator and clean if required.
	Faulty relay.	Check the relay in the holder and replace if necessary.
Engine Overheats.	*Reduced cooling air from fan.*	Check the fan and the drive belts. Check for any obstruction inside the cowl.
Engine speed too high.	*Faulty regulator valve.*	Check the regulation system.

FAULT	CAUSE	REMEDY
Engine speed too low.	*Incorrect throttle arm setting.*	Check the throttle setting.
	Blocked fuel filter.	Check and replace if necessary.
	Blocked air filter.	Check and replace the element if necessary.
	Faulty regulator valve.	Check the regulation system.
	Premature unloading.	Check the regulation and the operation of the pressure transducer.
Excessive vibration.	*Engine speed too low.*	See "*Engine speed too low*"

Refer also to the *engine section of this manual and the engine diagnostic codes.*

FAULT	CAUSE	REMEDY
Air discharge capacity too low.	*Engine speed too low.*	Check the pressure transducer and air filter(s).
	Blocked air cleaner.	Check the restriction indicators and replace the element(s) if necessary.
	High pressure air escaping.	Check for leaks.
	Incorrectly set regulation system.	Reset the regulation system. Refer to *SPEED AND PRESSURE REGULATION ADJUSTMENT* in the *MAINTENANCE* section of this manual.
Compressor overheats.	*Low oil level.*	Top up the oil level and check for leaks.
	Dirty or blocked oil cooler.	Clean the oil cooler fins.
	Incorrect grade of oil.	Use Doosan recommended oil.
	Recirculation of cooling air.	Move the machine to avoid recirculation.
	Faulty temperature switch.	Check the operation of the switch and replace if necessary.
	Reduced cooling air from fan.	Check the fan and the drive belts. Check for any obstruction inside the fan cowl.
Excessive oil present in the discharge air.	*Blocked scavenge line.*	Check the scavenge line, drop tube and orifice. Clean and replace.
	Perforated separator element.	Replace the separator element.
	Pressure in the system is too low.	Check the minimum pressure valve or sonic orifice.
Safety valve operates.	*Operating pressure too high.*	Check the setting and operation of the regulator valve piping.
	Incorrect setting of the regulator.	Adjust the regulator.
	Faulty regulator.	Replace the regulator.
	Inlet valve set incorrectly.	Refer to *SPEED AND PRESSURE REGULATION ADJUSTMENT* in the *MAINTENANCE* section of this manual.
	Loose pipe/hose connections.	Check all pipe/hose connections.
	Faulty safety valve.	Check the relieving pressure. Replace the safety valve if faulty. **DO NOT ATTEMPT A REPAIR.**
Oil is forced back into the air filter.	*Incorrect stopping procedure used*	Always employ the correct stopping procedure. Close the discharge valve and allow the machine to run on idle before stopping.
	Faulty inlet valve.	Check for free operation of the inlet valve(s).
	Faulty discharge check valve.	Remove the valve from the discharge pipe and check the operation.
Machine goes to full pressure when started.	*Inlet valve set incorrectly.*	Refer to *SPEED AND PRESSURE REGULATION ADJUSTMENT* in the *MAINTENANCE* section of this manual.
Machine fails to load when the load button is pressed.	*Faulty load solenoid.*	Replace the solenoid. Check the electrical circuit by feeling for movement whilst depressing the load button.

Engine Diagnostic Codes:



A. - Engine Failure Lamp

- Failure Flashes can be read on the Engine Failure Lamp when the on/off power switch is 'ON' or when the unit is running.
- The Engine Failure Lamp is located behind the front end panel (see figure).
- The Failure Lamp is luminated for 2 seconds when the ECU is powered on.
- A lamp flash duration of 0.5 second is a 'Short' flash.
- A lamp flash duration of 1.5 seconds is a 'Long' flash.
- A failure flash sequence of '1 Long and 3 Short' would be displayed by flashing the lamp one time with a duration of 1.5 seconds and three times with a duration of 0.5 seconds.
- When two or more failures have occurred simultaneously, the failure lamp will pause for 3 seconds between flash sequences.
- Failure flash sequences continuously repeat with 3 second pauses between flash sequences until the failure is corrected.

Failure	Failure Flashes	Remark
Coolant temperature sensor failure	4 Short	
Speed sensor failure	6 Short	
Rack position sensor failure	7 Short	
Rack actuator failure	8 Short	
CAN communication	1 Long and 2 Short	
EGR valve failure	1 Long and 3 Short	
CSD solenoid valve failure	1 Long and 4 Short	
Main relay failure	1 Long and 6 Short	
Rack actuator relay failure	1 Long and 7 Short	
ECU temperature alarm	2 Long and 5 Short	ECU temp > 221°F
Coolant temperature alarm	3 Long and 6 Short	Coolant temp > 230°F
ECU failure	4 Long and 1 Short	
Power supply voltage	2 Long and 3 Short	
5V Sensor circuit	2 Long and 4 Short	
Speed sensor	6 Long	
Overspeed error	9 Long	
Oil pressure switch	2 Long and 1 Short	

LUBRICATOR

SAFETY

WARNING: Ensure that the lubricator filler cap is re-tightened correctly after replenishing with oil.

WARNING: Do not replenish the lubricator oil, or service the lubricator without first making sure that the machine is stopped and the system has been completely relieved of all air pressure (Refer to *STOPPING THE UNIT* in the *OPERATING INSTRUCTIONS* section of this manual).

CAUTION: *If the nylon tubes to the lubricator are disconnected then ensure that each tube is re-connected in its original location.*

GENERAL INFORMATION

Oil capacity: 2 litres

Oil specification:
Refer to the *Tool Manufacturer's Manual*.

OPERATING INSTRUCTIONS

COMMISSIONING

Check the lubricator oil level and fill as necessary.

PRIOR TO STARTING

Check the lubricator oil level and replenish as necessary.

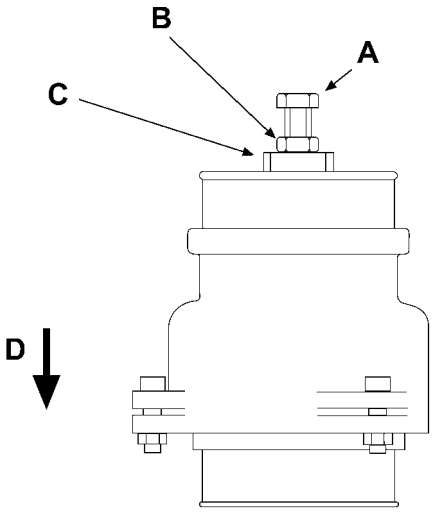
MAINTENANCE

Check the lubricator oil level and replenish as necessary.

FAULT FINDING

FAULT	CAUSE	REMEDY
No oil flow.	*Incorrect connection.*	Reverse the nylon tube connections to the lubricator.

CHALWYN VALVE



A Adjuster

B Locknut

C Hold with spanner when adjusting

D Air flow

ADJUSTMENT

Once the Chalwyn valve is installed, adjustment of the overspeed trip setting is carried out using the adjuster and locknut (refer to diagram). Basically rotating the adjuster clockwise will increase the engine speed at which automatic shut down occurs.

1. Start engine. Slowly accelerate. Note speed at which shut down occurs.

2. Remove hose at air inlet to Chalwyn valve to expose the adjuster and locknut (see diagram).

3. Release locknut. Turn adjuster clockwise one turn. Tighten locknut.

4. Refit inlet hose to Chalwyn valve.

5. Start engine. Slowly accelerate. Note speed at which shut down occurs.

6. Repeat the above steps '2' to '5' until the first setting at which the engine does not shut down at high idle speed (i.e. maximum throttle, no load).

Then either:
a) Use the results of shut down speed versus adjuster setting as a calibration check to make a final adjustment to give the required setting (typically 10% to 15% over high idle).

or
b) If a very precise setting is not required, turn the adjuster a further one turn clockwise to take the shut down above high idle speed by a suitable margin. When using this setting procedure it may be found that the engine occasionally shuts down during the normal operation. If so, turn the adjuster clockwise by a further one half turn.

7. Ensure the adjuster locknut is fully tightened.
(Use a thread lock adhesive on the locknut threads.)

NOTES:
Turbocharged Engines - When setting up a valve on a turbocharged engine using the preceding method, it may be found that at high power outputs, the engine will shut down at a lower speed than required. If this occurs, further small adjustments in steps of one half turn clockwise should be made until the problem is eliminated.

Jammed Valve - If in the course of adjusting the valve it jams on its seat, release by turning CLOCKWISE viewed from adjuster end of valve.

MAINTENANCE

Three monthly

1. Disconnect intake pipework and release the valve from any support brackets etc. to allow it to be removed.

2. Inspect the valve internally for cleanliness. If necessary, clean in paraffin or white spirit taking normal precautions. Dry the valve thoroughly.

3. Check there is no excessive wear and that the valve moves smoothly over its complete operating stroke. DO NOT LUBRICATE.

4. Refit valve. Check valve setting based on the 'Adjustment' instructions given herein.

NOTE: The three monthly routine maintenance period requirement is dependent on the operating conditions to which the equipment is exposed and, by experience, may need to be varied.

AFTERCOOLER AND WATER SEPARATOR

OPERATING INSTRUCTIONS

The compressed air exits the separator tank through the top cover piping, and will then travel into the aftercooler inlet side.

The aftercooler is cooled by the incoming compressor package air.

The compressed air and condensate (water with a small amount of compressor lubricant) exits the aftercooler and enters the moisture separator, where most of the condensate is removed.

At the bottom of the moisture separator a strainer and constant-bleed orifice is fitted, which are sized to allow the maximum flow of condensate while minimising compressed air loss.

A second condensate drain valve is mounted on the aftercooler body, this valve will open on machine shutdown thereby allowing any remaining condensate in the aftercooler to drain. This is to prevent cooler damage at freezing temperatures.

These drains are plugged through the compressor frame and will expel condensation to atmosphere. Should site contamination by this condensate be prohibited, the user can connect an additional section of drain hose and route into an allowed drain point.

MAINTENANCE

Daily Maintenance:
Verify, during full-load (maximum compressed air delivery) that condensate can be seen to drain from the water separator drain hose.

Weekly Maintenance:
. Verify that the piping from the orifice purge points are not clogged.
. Clean the inside of the water separator housing.

Water separator maintenance:
. With engine stopped, ensure pressure is relieved from air system.
. Remove any hose connected to the water separator housing. Inspect fittings and hoses for any blockage. Clean ifnecessary.
. Remove and clean the water separator float.

PRIMARY AND SECONDARY FILTER MAINTENANCE

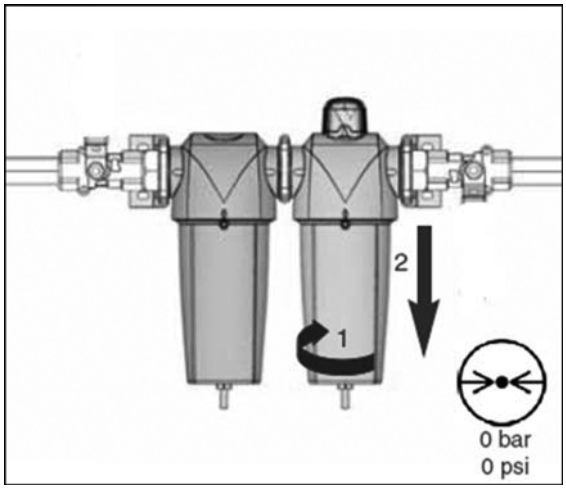


FIGURE 1.

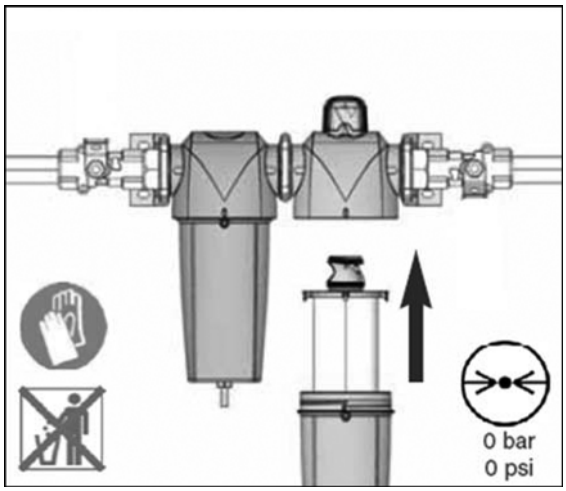


FIGURE 2.

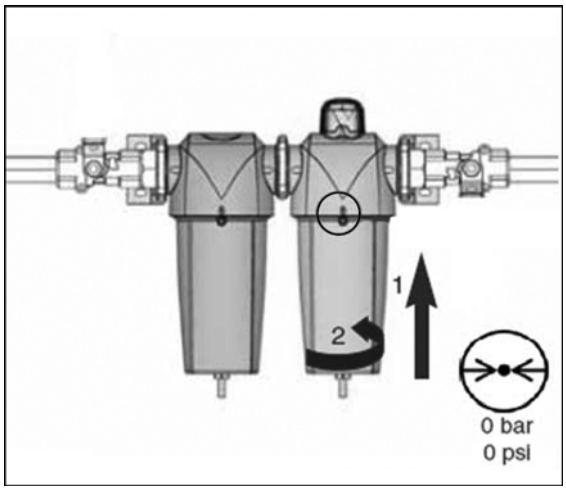


FIGURE 3.

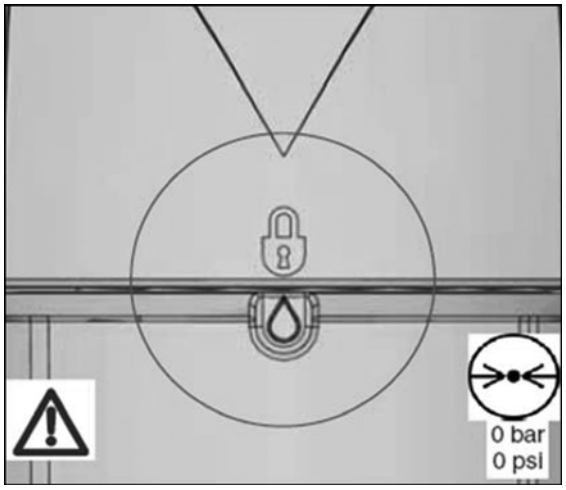


FIGURE 4.

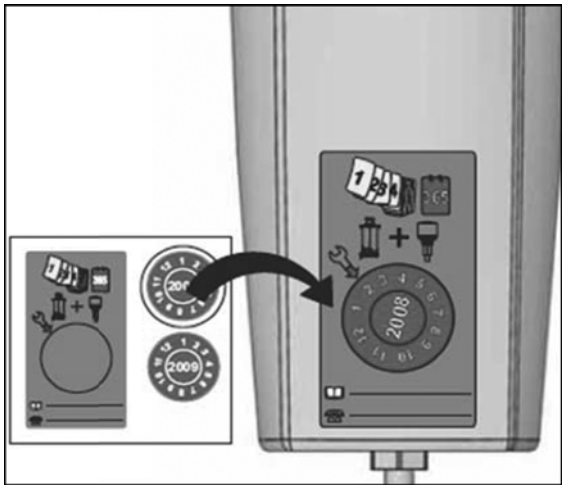


FIGURE 5.

WATER SEPARATOR MAINTENANCE

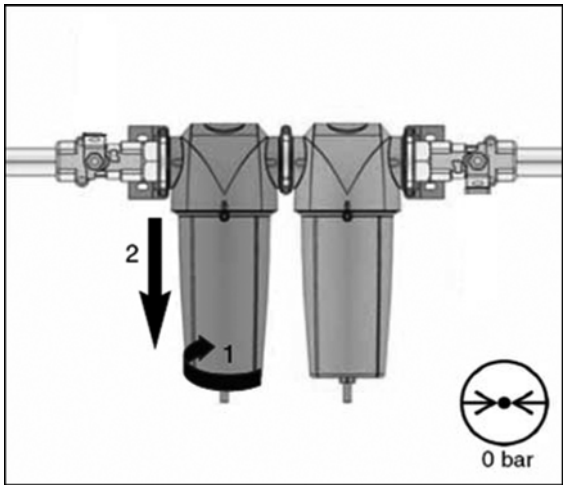


FIGURE 1.

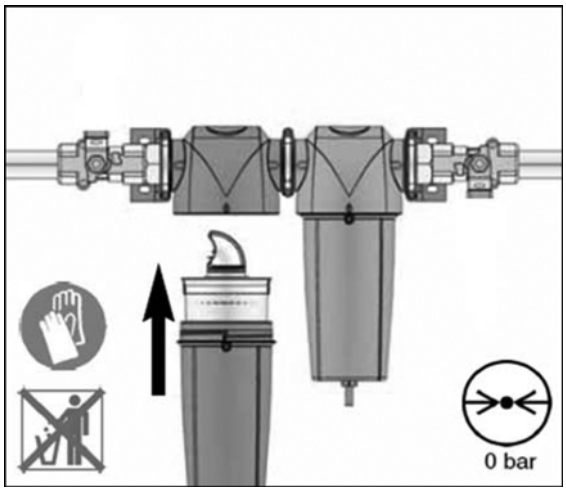


FIGURE 2.

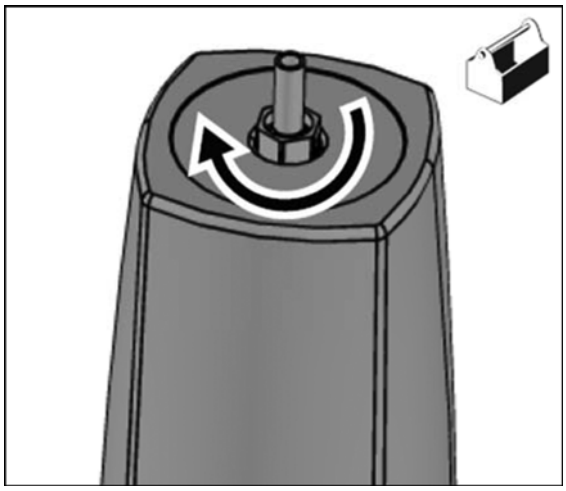


FIGURE 3.

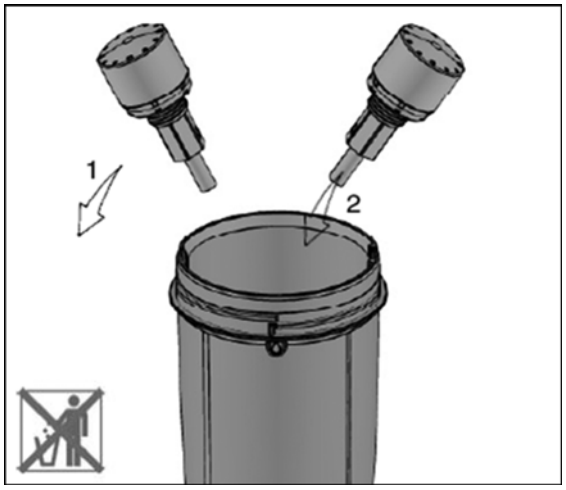


FIGURE 4.

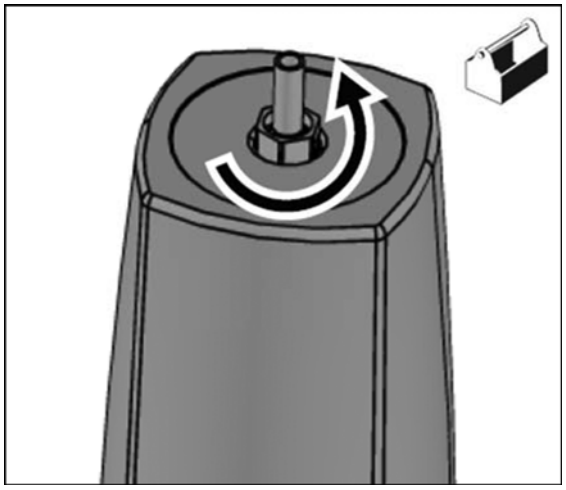


FIGURE 5.

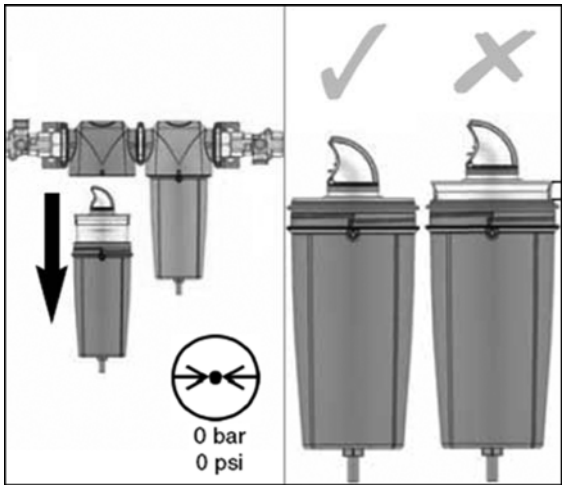


FIGURE 6.

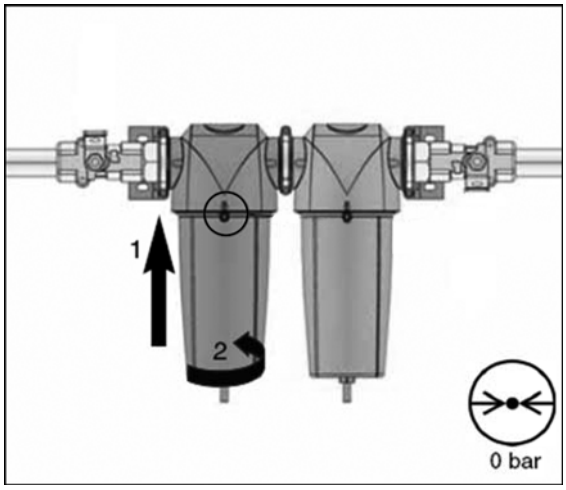


FIGURE 7.

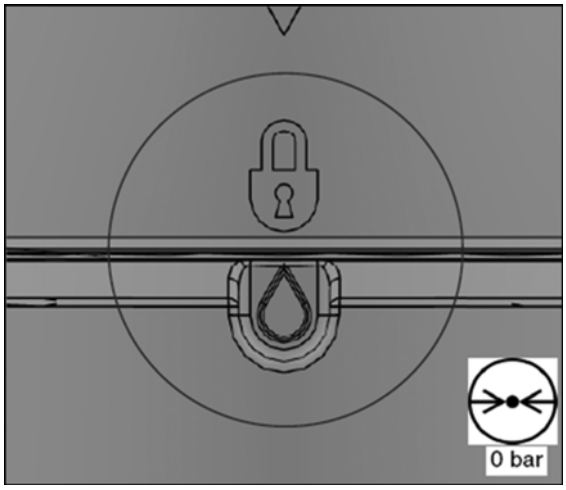


FIGURE 8.

SAFETY

CAUTION: *The compressor regulation system is adjusted to maintain regulated pressure at the separator tank. DO NOT adjust regulation to provide full regulation pressure at the service valve when the IQ System is enabled. This will result in operation at excessive horsepower levels, causing overheating, reduced engine life, and reduced airend life.*

CAUTION: *Excessively restricted filter elements may cause an increase in the amount of aerosol water and oil carryover, which could result in damage to downstream equipment. Normal service intervals should not be exceeded.*

CAUTION: *Blockage of the condensate will result in flooding of the vessels. If flooding occurs, excessive condensate may enter the air stream and could result in damage to downstream equipment.*

NOTICE: Do not operate at temperatures less that 2°C (35°F).

GENERATOR
(WDG)

SAFETY

Refer to the *SAFETY SECTION* in this manual.

GENERAL INFORMATION

Rated output.	4,8 kW @ 0,8 Power factor (PF) lagging
Rated voltage	110V 1ph or 230V 1ph or 230V 3ph or 400V 3ph + 230V 1ph @ 3000 revs min^{-1}
Voltage regulation	+/- 6%
Maximum continuous output	6 kVA @ 0,8 PF
Rotor type	Brushless (110/230V 1ph)
Rotor type	Rotating armature with sliprings (230V 3ph / 400V 3ph + 230V 1ph)

De-rating factors at 0.8 pf continuous load:

Air in temp 20°C	Continuous
Air in temp 30°C	5,7 KVA @ 0.8 p.f continuous
Air in temp 46°C	4,5 KVA @ 0.8 p.f continuous

De-rating factors for intermittent load:

Air in temp 20-35°C,55 mins/hr @ 0.8, 5 mins off load
Air in temp 35-40°C,50 mins/hr @ 0.8, 10 mins off load
Air in temp 40°C + ,45 mins/hr @ 0.8, 15 mins off load

Socket outlets:

110V 1ph & 230V 1ph	1 x 32 amperes 2 x 16 amperes
230V 3ph	1 x 16 amperes
400V 3ph + 230V 1ph	400V 3ph = 1 x 16 amperes 230V 1ph = 2 x 16 amperes

Earth leakage protection is provided by a single residual current device. Miniature circuit breakers (MCB) are fitted to provide both overcurrent and short circuit protection for the generator.

Each socket outlet is protected by a spring loaded weather-proof cover.

OPERATING INSTRUCTIONS

A mode selector switch is provided to switch the machine between compressor and generator mode.

CAUTION: *Do not start or stop the machine with the compressor/generator mode switch in the* ***Generator*** *position. Engine starting/cranking is prevented in this mode - see also "Operating Instructions - SECU section".*

When the switch is moved to Generator position, the machine control unit SECU will give a signal to the engine to maintain full/rated speed. At this engine speed the generator will run at its correct speed to maintain rated voltage with rated frequency.

When the switch is returned back to Compressor position, the engine will maintain the speed via pressure regulator valve and pressure transducer according to the air demand.

When connecting electrical equipment to any of the socket outlets, it is recommended that the appropriate MCB is in the *OFF* position before making the connection, switching the MCB to the *ON* position immediately prior to using the equipment.

PRIOR TO STARTING (GENERATOR)
(WDG)

If the generator should become exposed or saturated with moisture/water deposits, it must be safely dried off before attempting to make any part or conductor electrically live. This should be done by wiping away excess water, then running the engine with no electrical loads connected, until the generator is completely dry.

Ensure all persons concerned are suitably competent with electrical installations.

Ensure that there is a safe working procedure which has been issued by supervisory personnel, and that it is understood by all persons concerned with the operation of the generator.

Ensure that the safety procedure to be applied is based on the appropriate national regulations.

Ensure that the safety procedure is followed at al times.

Ensure that suitable guidance codes are available to indicate safe working practices, and any hazards to avoid.

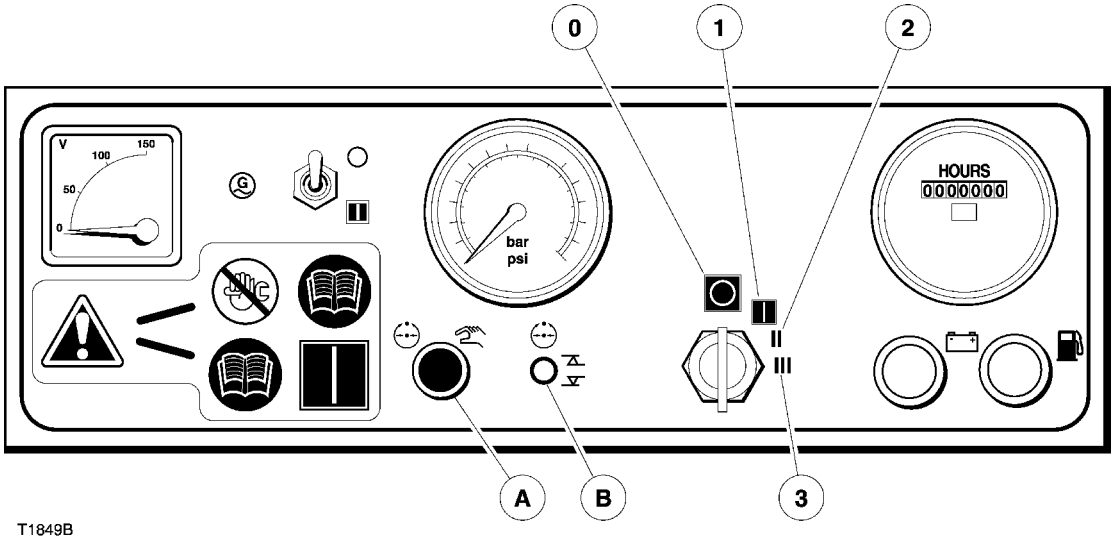
Before starting the engine and switching in the generator load, ensure that :-

. The system has been inspected and earthed.

. No persons are in a hazardous position.

. Any warnings necessary have been suitably displayed (where applicable).

Ensure compressor / generator mode switch is set to compressor.



T1849B
Revision 00
01/03

STARTING THE MACHINE

WARNING: Under no circumstances should volatile liquids such as Ether be used for starting this machine.

CAUTION: *Do not start or stop the machine with the compressor/generator mode switch in the* ***Generator*** *position. Engine starting/cranking is prevented in this mode - see also "Operating Instructions - SECU section".*

All normal starting functions are incorporated in the key operated switch.

. Turn the key switch to position *2* and hold for 15 seconds max to allow the air inlet heater to reach working temperature.

. Turn the key switch to position *3* (engine start position).

. Release to position *2* when the engine starts.

. Release to position *1* when the alternator charge light is extinguished.

At temperatures below 0°C or if there is difficulty starting first time:

. Open the service valve fully, with no hose connected.

. Complete the starting sequence above.

. Close the service valve as soon as the engine runs freely.

. Do not allow the machine to run for long periods with the service valve open.

. Allow the engine to reach its operating temperature. Then press button A when fitted.

. At this point in the operation of the machine it is safe to apply full load to the engine.

NOTE: Wear hearing protection at all times when the engine is started with the top open and air is flowing from the valve.

STOPPING THE MACHINE

. Close the service valve.

. Allow the machine to run unloaded for a short period of time to reduce the engine temperature.

. Turn the start switch to the *0* (off) position.

NOTE: As soon as the engine stops, the automatic blowdown valve will relieve all pressure from the system.

If the automatic blowdown valve fails to operate, then pressure must be relieved from the system by means of the service valve(s).

CAUTION: *Never allow the machine to stand idle with pressure in the system.*

EMERGENCY STOPPING

In the event that the unit has to be stopped in an emergency, **TURN THE KEY SWITCH LOCATED ON THE INSTRUMENT PANEL TO THE *0* (OFF) POSITION.**

RE-STARTING AFTER AN EMERGENCY

If the machine has been switched off because of a machine malfunction, then identify and correct the fault before attempting to re-start.

If the machine has been switched off for reasons of safety, then ensure that the machine can be operated safely before re-starting.

Refer to the *PRIOR TO STARTING* and *STARTING THE UNIT* instructions earlier in this section before re-starting the machine.

MONITORING DURING OPERATION

Should any of the safety shut-down conditions occur, the unit will stop. These are:

. Low engine oil pressure

. High air discharge temperature

. High engine oil temperature.

. Alternator/drive belt failure circuit.

. Low engine fuel level.

CAUTION: *To ensure an adequate flow of oil to the compressor at low temperature, never allow the discharge pressure to fall below 3,5 bar.*

DECOMMISSIONING

When the machine is to be permanently decommissioned or dismantled, it is important to ensure that all hazard risks are either eliminated or notified to the recipient of the machine. In particular:-

. Do not destroy batteries or components containing asbestos without containing the materials safely.

. Do not dispose of any pressure vessel that is not clearly marked with its relevant data plate information or rendered unusable by drilling, cutting etc.

. Do not allow lubricants or coolants to be released into land surfaces or drains.

. Do not dispose of a complete machine without documentation relating to instructions for its use.

MAINTENANCE

General

Ensure all electrical equipment is properly maintained and controlled.

Ensure all earth connections are secure and regularly maintained.

Earth leakage circuit breaker (ELCB)

The earth leakage circuit breaker must be mechanically tested daily by pushing the test button with the machine in its *no load* condition. The ELCB should trip to the *off* (down) position.

The earth leakage circuit breaker should also be tested every 3 months. A proprietary test meter should be used to induce live to earth preset flow at each socket outlet. This current flow will produce the required earth fault check. The test should be conducted in accordance with appropriate national standards.

Instruments and controls

A Voltmeter is provided to indicate the output voltage.

Miniature circuit breakers provide over-current protection. In the event of excess current the appropriate circuit breaker will trip to the *OFF* position
.

Note: The current trip rating is quoted at a nominal 40°C ambient temperature.

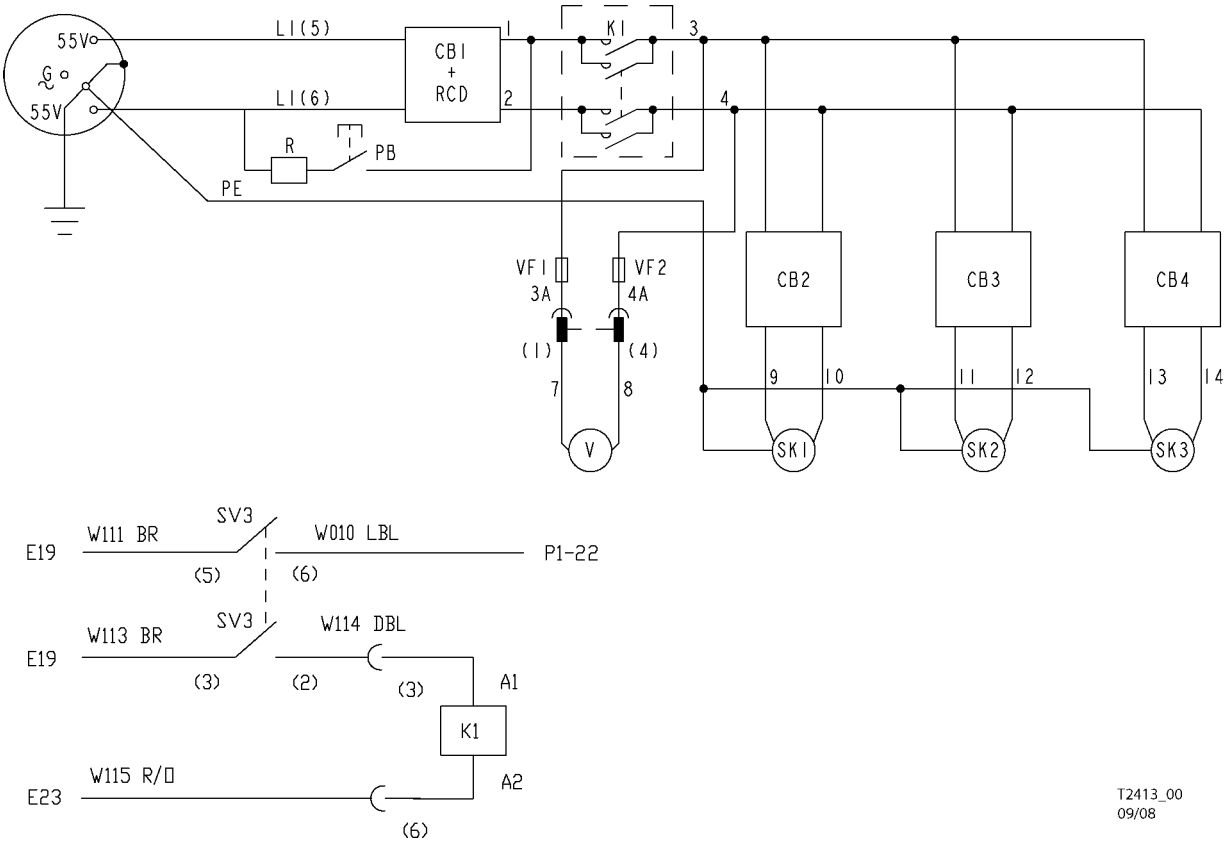
An earth leakage circuit breaker provides additional protection in the event of a leakage to earth in excess of 30 milliamperes on the connected appliance or in the connections to the generator.

For alternator maintenance refer to Mecc Alte operation and maintenance manual.

FAULT FINDING

FAULT	CAUSE	REMEDY
No output.	*Load plugs not fitted into socket outlets correctly*.	Ensure that the load plugs are fitted correctly into the socket outlets.
No output.	*Loose connection.*	Remove end cover and terminal box lid and check for loose connections. Rectify the fault as necessary.
	Faulty rectifier.	Check the rectifier bridge which is located inside the rear housing.
	Faulty capacitor.	Check the capacitors.
	The No load voltage is low but increases when a load is applied.	Check the capacitors and associated wiring.
	The No load voltage falls when a load is applied.	Check the capacitors and associated wiring.
	Loss of residual magnetic field	Refer to Mecc Alte maintenance manual
No output.	*Output winding(s) damaged.*	Measure the voltage across the winding(s). Replace the generator if damaged.
	Field winding damaged.	Replace the generator.
Generator fails to provide maximum output.	*Engine is not running at full speed.*	Check the engine speed with a tachometer. Consult the company if the engine is found to be running slow (Refer to section 4 *General Information*).
	Drive belt is not tensioned correctly.	Re-tension the drive belt.
	Drive pulley is loose on the drive shaft.	Check the drive pulley and tighten as required.
The output voltage collapses when a load is connected.	*Overload condition.*	Check and reset each circuit breaker. If the condition persists then investigate the cause and rectify the fault as necessary. (see also '*Circuit breaker trips*')
	Short circuit.	Check for a short circuit and rectify the fault as necessary.
	Incorrect wiring.	Check the wiring and rectify the fault as necessary.
Circuit breaker trips.	*Overload condition.*	Check and reset each circuit breaker. If the condition persists then investigate the cause and rectify the fault as necessary. (see also '*Circuit breaker trips*')
	Short circuit.	Check for a short circuit and rectify the fault as necessary.
	Fault in appliance.	Check the appliance and rectify the fault as necessary.
A circuit breaker fails to re-set whilst the machine running.	*Circuit breaker latching mechanism faulty.*	Repair or replace as necessary.
Refer to *Engine Manufacturer's manual* and *Mecc Alte manufacturer's manual*		

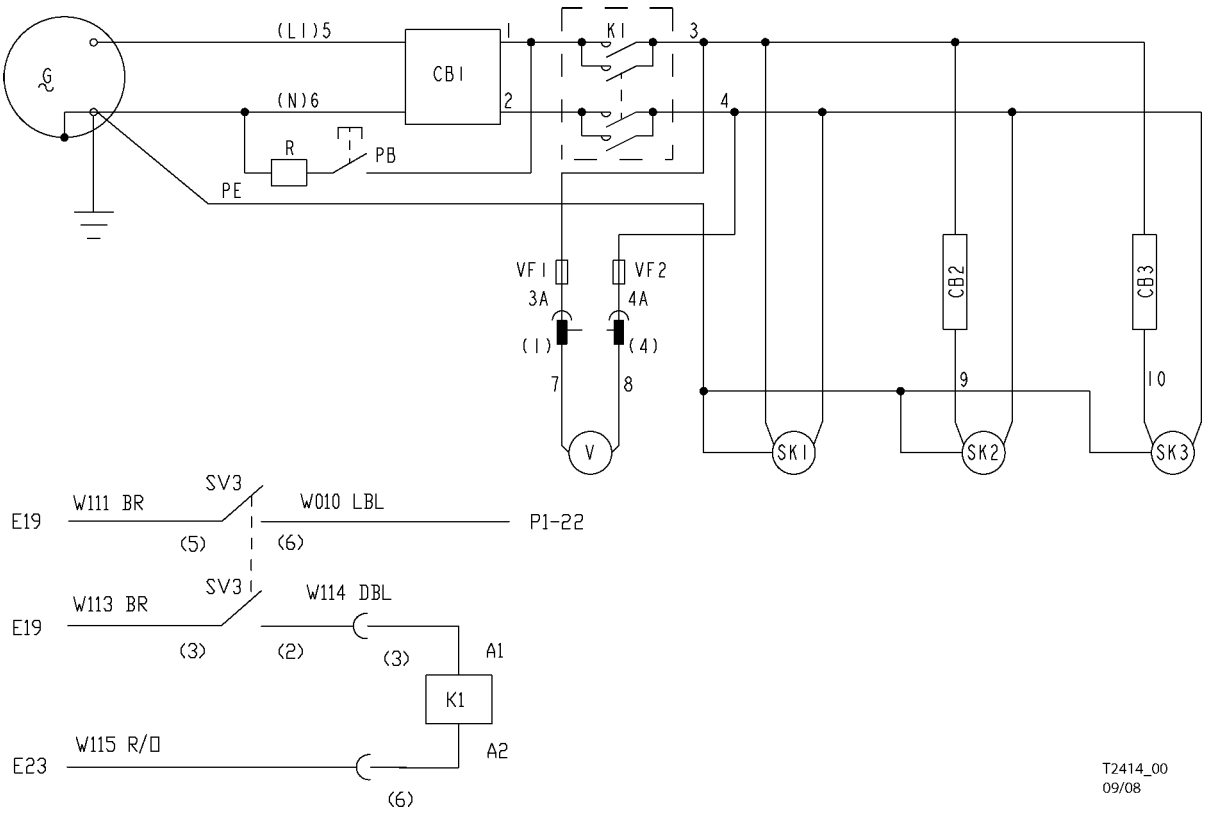
A.C. Electrical Power Schematic Diagram. 115V 1 - phase.



KEY

CB1	Circuit breaker 63A
CB2	Circuit breaker 32A
CB3	Circuit breaker 16A
CB4	Circuit breaker 16A
G	Alternator
K1	Contactor
PB	Pushbutton
PE	Protective earth conductor
R	Resistor
SK1	Socket outlet 32A
SK2	Socket outlet 16A
SK3	Socket outlet 16A
SV3	Switch, generator
V	Voltmeter
VF1	Fuse Voltmeter
VF2	Fuse Voltmeter

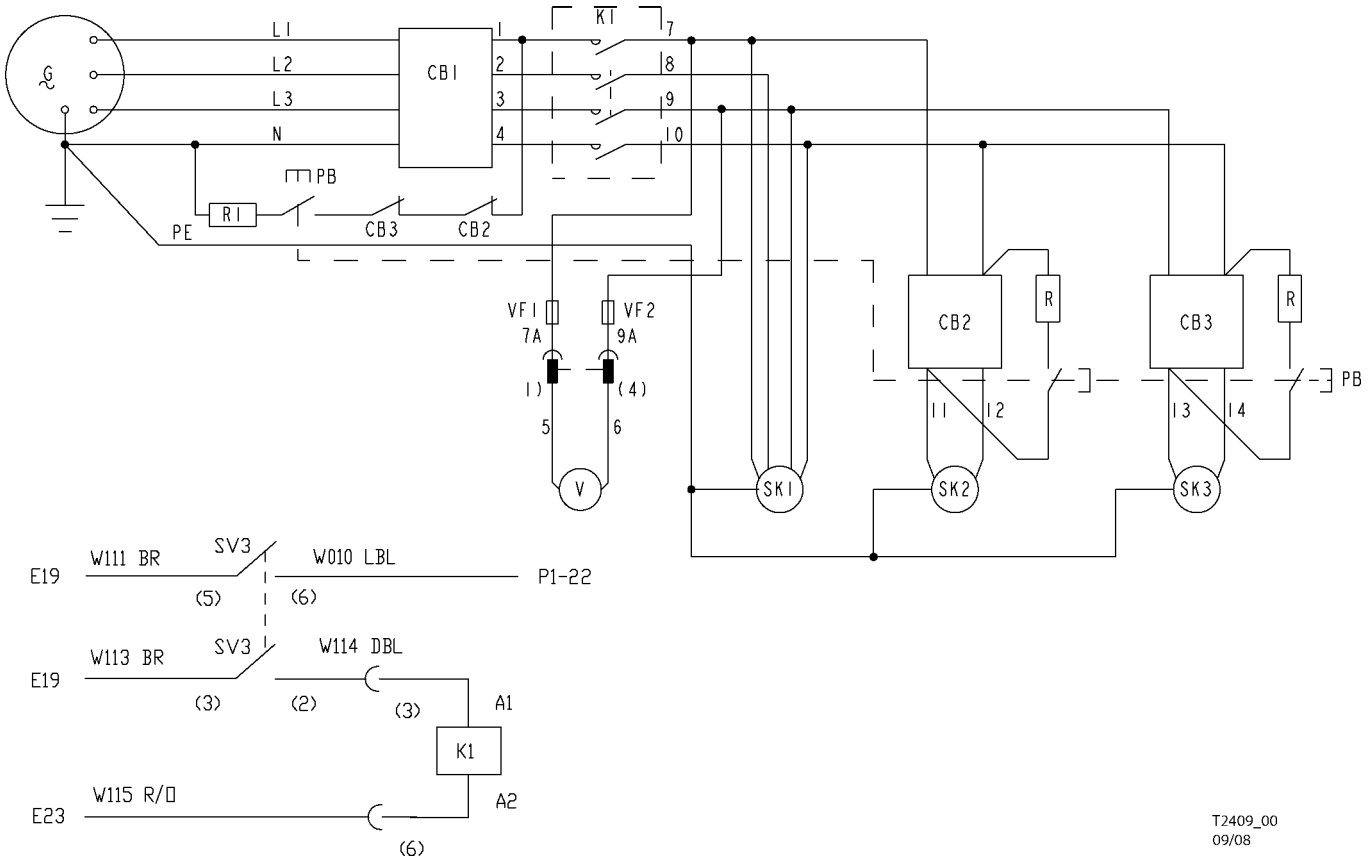
A.C. Electrical Power Schematic Diagram. 230V 1 - phase.



KEY

CB1	Circuit breaker 32A	**R**	Resistor
CB2	Circuit breaker 16A	**SK1**	Socket outlet 32A
CB3	Circuit breaker 16A	**SK2**	Socket outlet 16A
G	Alternator	**SK3**	Socket outlet 16A
K1	Contactor	**SV3**	Switch, generator
PB	Pushbutton	**V**	Voltmeter
PE	Protective earth conductor	**VF1**	Fuse Voltmeter
		VF2	Fuse Voltmeter

A.C. Electrical Power Schematic Diagram. 400/230V 3 - phase.



KEY

CB1	Circuit breaker 16A
CB2	Circuit breaker 10A
CB3	Circuit breaker 10A
G	Alternator
K1	Contactor
PB	Pushbutton
PE	Protective earth conductor
R	Resistor
R1	Resistor
SK1	Socket outlet 16A
SK2	Socket outlet 16A
SK3	Socket outlet 16A
SV3	Switch, generator
V	Voltmeter
VF1	Fuse Voltmeter
VF2	Fuse Voltmeter

4TNV98T ENGINE

CONTENTS

ENGINE - General Information

In order to get the fullest use and benefit from your engine, it is important that you operate and maintain it correctly. This Manual is designed to help you do this.

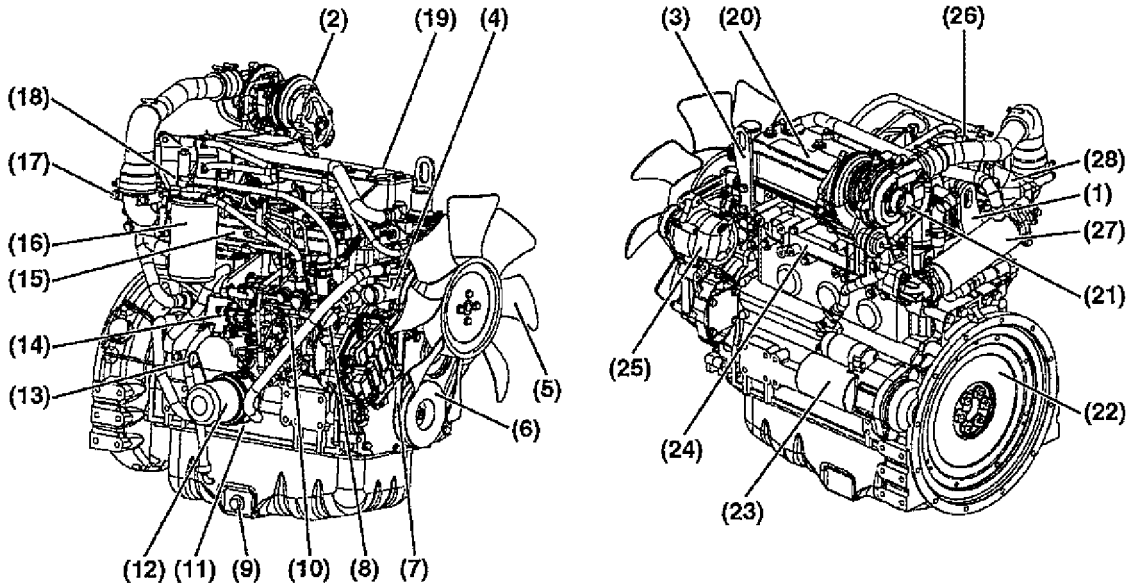
Please read this Manual carefully and follow its operating and maintenance recommendations. This will ensure many years of trouble-free and economical engine operation.

Should your engine require servicing, please contact your nearest branch or distributor.

All information, illustrations, and specifications contained in this Manual are based on the latest product information available at the time of publication.

The company reserves the right to make changes in this Manual at any time without prior notice.

DIESEL ENGINE Engine External View



1. Lifting eye (Flywheel end)
2. Turbocharger
3. Lifting eye (Engine cooling fan end)
4. Engine coolant pump
5. Cooling fan
6. Crank shaft V-pulley
7. V-belt
8. Filler port (engine oil)
9. Drain plug (engine oil)
10. Fuel injection pump
11. Engine oil cooler
12. Engine oil filter
13. Dipstick (engine oil)
14. Eco-governor
15. Intake manifold
16. Fuel filter
17. Fuel oil inlet
18. Fuel return to fuel tank
19. Filler port (Engine oil)
20. Rocker arm cover
21. Air intake port (From air cleaner)
22. Flywheel
23. Starter motor
24. Exhaust manifold
25. Alternator
26. EGR valve
27. EGR cooler
28. EGR pipe

EPA CERTIFIED ENGINE DATA and SPECIFICATIONS

Engine model name		4TNV98T
Engine type		Vertical inline water cooled diesel engine
Combustion type		Direct injection
Aspiration		Turbocharged
No. of cylinders - bore x stroke. mm		4-98 x 110
Engine displacement L		3.319
Compression ratio		18.1:1
Firing order		1 -3 - 4 - 2
Exhaust emission control system		Fuel injection nozzles, fuel injector pump
Governor		Electronic
Specified fuel		Diesel fuel (ISO 8217 DMX, BS2869 A1/A2) No. 2-3, No. 1-D, ASTM D975-94
Starter (V-kW)		12-2.3
Alternator (V-A)		12-60
Specified engine oil (API grade) (SAE grade)		CI-4+ (15W40)
Coolant volume (Engine only) L		4.2
Engine dry weight kg		275
	Overall length mm	719
Engine dimensions	Overall width mm	508
	Overall height mm	717
Nozzle injection pressure MPa		21.6

ENGINE IDENTIFICATION

Serial No Location

The engine serial number is stamped on engine name plate on top of rocker cover.

Confirmation of Engine Number

It is advisable to quote the engine serial number together with the machine serial number, as it is required when you contact the company branch or distributor for repair, service or parts ordering.

CAUTION: Conduct confirmation of engine serial number with the engine stopped. To avoid being injured, do not check it, while the engine is still hot.

ENGINE AFTER SERVICE

Please feel free to contact your dealer for periodical inspection and maintenance.

Doosan Genuine Parts

Genuine Doosan parts are identical with those used in the engine production, and accordingly, they are warranted.

Genuine Doosan parts are supplied by your branch or distributor.

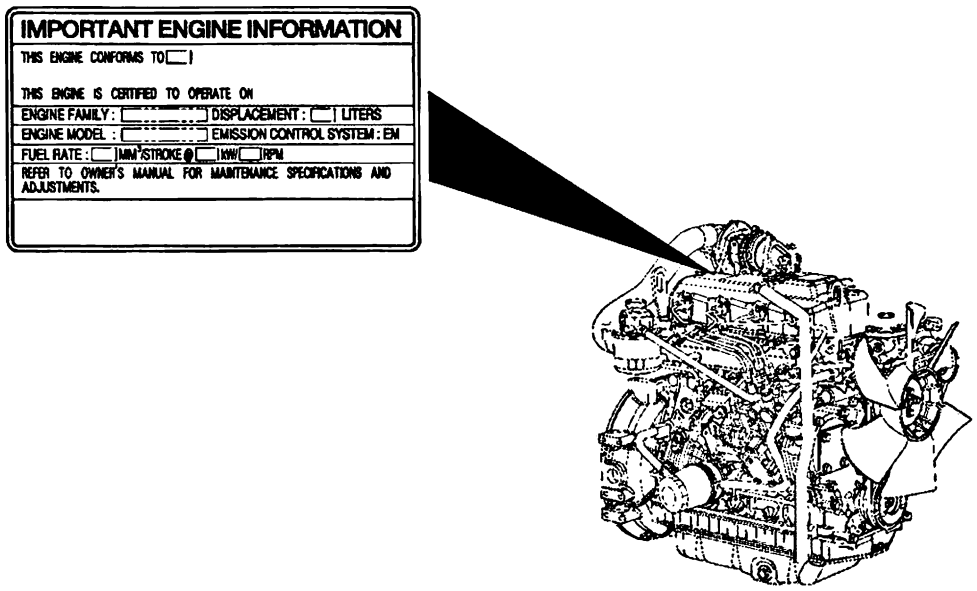
Please ensure that only genuine Doosan parts, lubricants and fluids are used for service and/or repair.

ENGINE LABEL (FOR EPA)

Emission control label is attached on the “top of rocker arm cover.”

The location of emission control label attached on the engine may vary depending on the engine specification

The following is the sample of a label required for engine emission control information, along with location.



FUEL

Fuel Selection

The following properties are required of the diesel fuel.

Must have high cetane value., (45 or greater)

The sulfur content must not exceed 0.5% by volume. A higher sulfur content fuel may cause sulfuric acid corrosion in the cylinders of the engines.

NEVER mix kerosene, used engine oil, or residual fuels with the diesel fuel.

Water and sediment in the fuel should not exceed 0.05% by volume.

Keep the fuel tank and fuel-handling equipment clean at all times.

Poor quality fuel can reduce engine performance and/or cause engine damage.

Fuel additives are not recommended. Some fuel additives may cause poor engine performance. Consult your Portable Power representative for more information.

Ash content not to exceed 0.01% by volume.

Carbon residue content not to exceed 0.35% by volume. Less than 0.1% is preferred.

Total aromatics content should not exceed 35% by volume. less than 30% is preferred.

PAH (polycyclic aromatic hydrocarbons) content should be below 10% by volume.

Metal content of Na, Mg, Si, and AI should be equal to or lower than 1 mass ppm. (Test analysis method JPI-5S-44-95).

Lubricity: Wear mark of WS1.4 should be Max. 01018 in (460 um) at HFRR test.

Diesel fuel should comply with the specifications listed in the table below. The table lists several worldwide specifications for diesel fuels.

Diesel Fuel Specification	Location
No. 2-D, No. 1-D, ASTM D975-94	USA
EN590:96	European Union
ISO 8217 DMX	International
BS (BRITISH STANDARD) BS2869-A1 or A2	United Kingdom
JIS K2204 Grade No. 2	Japan
KSM-2610	Korea
GB252	China

FUEL REQUIREMENTS

Notice: The fuel injection pump, injector or other parts of the fuel system and engine can be damaged if you use any fuel or fuel additive other than those specifically recommended by Doosan.

NOTE: If any fuel other than the one specified is used, engine operation will be impaired. Engine failure or malfunction resulting from use of such improper fuel will not be warranted by Doosan.

To help avoid fuel system or engine damage, please read the following:

Do not use diesel fuel which has been contaminated with engine oil. Besides causing engine damage, such fuel can also affect emission control. Before using any diesel fuel, check with the fuel supplier to see if the fuel has been mixed with engine oil.

Your engine is designed to use either Number 1-D or Number 2-D diesel fuel. However, for better fuel economy, use Number 2-D diesel fuel whenever possible. At temperatures less than -7°C, (20°F), Number 2-D fuel may pose operating problems (see “Cold Weather Operation” which follows). At colder temperatures, use Number 1-D fuel (if available) or use a “winterized” Number 2-D (a blend of Number 1-D and Number 2-D). This blended fuel is usually called Number 2-D also, but can be used in colder temperatures than Number 2-D fuel which has not been “winterized.”

Check with the fuel supplier to be sure you get the properly blended fuel.

NOTICE: Do not use home heating oil or gasoline in your diesel engine; either may cause engine damage.

Handling of the Fuel.

Any fuel containing dust particles or water might cause engine failure.

Therefore, the following must be observed.

Take care to protect the fuel from ingress of dust particles or water when filling the fuel tank.

If refueling is done from an oil drum directly, ensure that it has been kept stationary to allow any dust, sediment or water to settle at the bottom. Do not draw fuel direct from the bottom of the drum to prevent pickup of any settled foreign material.

Always fully fill the fuel tank. Drain the sedimented particles in the fuel tank frequently.

Water in Fuel

During refueling, it is possible for water (and other contaminants) to be pumped into your fuel tank along with the diesel fuel. This can happen if a fuel provider does not regularly inspect and clean its fuel tanks, or receives contaminated fuel from its supplier(s). To protect your engine from contaminated fuel, there is a fuel filter system on the engine which allows you to drain excess water.

CAUTION: *The water/diesel fuel mixture is flammable, and could be hot. To avoid personal injury and/or property damage, do not touch the fuel coming from the drain valve, and do not expose the fuel to open flames or sparks.*

Be sure you do not overfill the fuel tank. Heat (such as from the engine) can cause the fuel to expand. If the tank is too full, fuel could be forced out. This could lead to a fire and the risk of personal injury and/or equipment damage.

Biocides

In warm or humid weather, fungus and/or bacteria may form in diesel fuel if there is water in the fuel.

NOTICE: Fungus or bacteria can cause fuel system damage by plugging the fuel lines, fuel filters or injector. They can also cause fuel system corrosion.

If fungus or bacteria has caused fuel system problems, you should have your authorized dealer correct these problems. Then, use a diesel fuel biocide to sterilize the fuel system (follow the biocide manufacturer‘s instructions). Biocides are available from your dealer, service stations, parts stores and other automotive places. See your authorized dealer for advice on using biocides in your area and for recommendations on which biocides you should use.

Smoke Suppressants

The use of a smoke suppressant additive is not allowed because of the greater possibility of stuck rings and valve failure, resulting from excessive ash deposits.

LUBRICANT.

The quality of engine oil can affect engine performance, startability and engine life.

Use of unsuitable engine oil will result in piston ring, piston and cylinder seizure and accelerate surface wear causing increased oil consumption, lowered output and, finally engine failure. To avoid this, use the specified engine oil.

1) Engine Oil Selection
PRO-TEC

2) Oil Viscosity

Engine oil viscosity affects engine startability, performance, oil consumption, wear and the potential for seizure, etc. Always ensure that lubricants with the correct viscosity for the operating temperature are used. Refer to fig 12.

NOTE

Using a mixture of different brands or quality of oils will adversely affect the original oil quality; therefore, never mix different brand or different type oils.

Do not use API, CA, CB grade and reconstituted engine oil.

Engine damage due to improper maintenance, or using oil of the improper quality and/or viscosity, is not covered by the warranty.

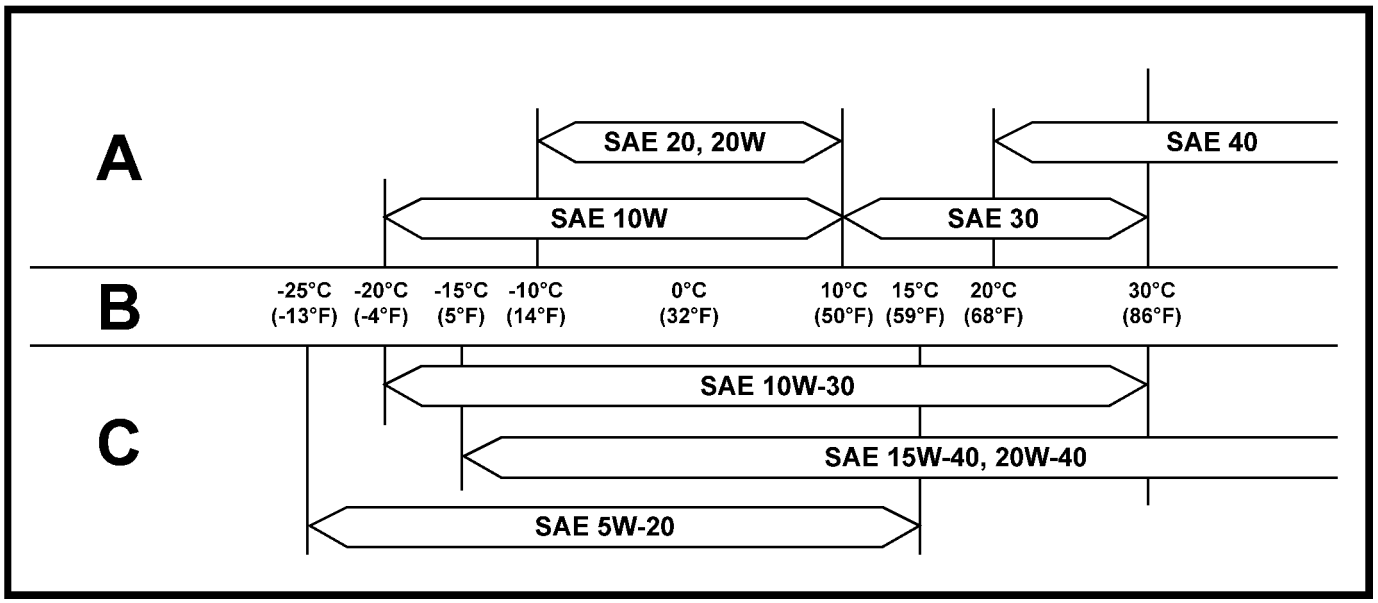


Fig. 12

A. (Single - grade)

B. Ambient Temperature

C. (Multi - grade)

COOLANT

All Doosan portable compressor engines are factory filled with a 50/50 Ethylene glycol base antifreeze/water mix. which provides protection to -33°C (-27°F).

IMPORTANT:

- *Be sure to add Long Life Coolant Antifreeze (LLC) to soft water. In cold season, the LLC is especially important. Without LLC, cooling performance will decrease due to scale and rust in the cooling water line. Without LLC, cooling water will freeze and expand to break the cooling line.*
- *Be sure to use the mixing ratios specified by the LLC manufacturer for your temperature range.*
- *Do not mix different types (brand) of LLC, chemical reactions may make the LLC useless and engine trouble could result.*
- *Replace the cooling water every once a year.*

***CAUTION**: When handling Long Life Coolant Antifreeze, wear protective rubber gloves not to contact with it. If contact with the eyes or skin should occur, wash with clean water.*

ENGINE OPERATION

Engine Exhaust Gas Caution (Carbon Monoxide)

CAUTION

Do not breathe exhaust gas because it contains carbon monoxide, which by itself has no color or odor. Carbon monoxide is a dangerous gas. It can cause unconsciousness and can be lethal.

Do not run the engine in confined areas (such as garages or next to a building). Keep the exhaust tailpipe area clear of snow and other material to help reduce the buildup of exhaust gases under the equipment. This is particularly important when parked in blizzard conditions.

CHECK BEFORE OPERATION

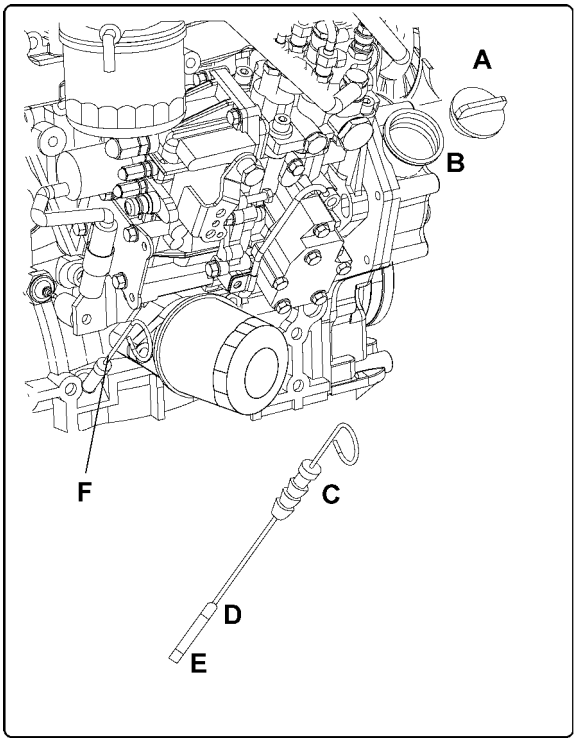
CAUTION: *For safety reasons, conduct the inspection with the engine stopped.*

Engine Oil Level.

Place the engine or the machine on a level surface

Remove the dipstick, wipe it with a cloth. Insert it fully and take it out gently again.

Check the oil level against the marks on the dipstick. The oil level must be between the upper level mark and the lower level mark as illustrated.



A. Filler cap

B. Filler port (engine oil)

C. Dipstick

D. Upper limit

E. Lower limit

F. Dipstick

Remove filler cap (yellow coloured) on the rocker arm cover side of engine.

Fill with engine oil up to the upper limit on the dipstick.

Manually tighten the filler cap. Do not use a tool such as pliers to tighten it.

Engine oil pan capacity (oil pan) (L) - 10.2 (10.8 quarts).

A certain period of time is required before the engine oil completely flows down from the oil filler to the crankcase. Wait at least ten minutes before checking the oil level.

NOTE: Take care to avoid engine oil being splashed on the fan drive belt because it causes belt slippage or slackness.

CAUTION: *When adding oil, take care not to spill it. If you spill oil on the engine or equipment, wipe it properly, to prevent the risk of fire and personal injury and/or equipment damage.*

Fan Belt Check

Check the fan belt for tension and abnormalities.

When the belt is depressed 7 - 10 mm with the thumb (about 100N [10 kg] pressure) midway between the fan pulley and alternator pulley, the belt tension is correct.

If the belt tension is too high, it will result in alternator failure.

A loose belt will cause belt slippage which may result in a damaged belt, abnormal noise, poor battery charging and engine overheating.

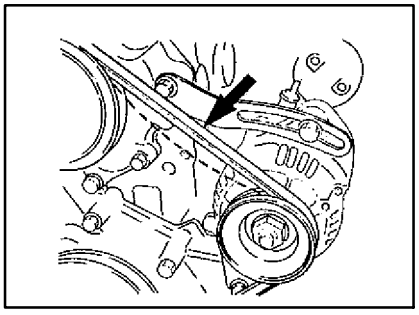


Fig. 16

Coolant Level Check

The coolant level must be between “MAX COLD” and “MIN” marks on the reserve tank depending on the temperature of the engine. Check and ensure that the level is correct.

CAUTION: *When removing the radiator filler cap, while the engine is still hot, cover the cap with cloth, then turn it slowly to gradually release the internal steam pressure. this will prevent anyone from being scalded by hot steam spurting out from the filler neck.*

Add coolant mixed to the correct ratio: 50/50 ethylene glycol/water.

Radiator Cap Condition

After the replenishment of the coolant, install the radiator filler cap. Make sure the cap is securely installed.

Battery Cable Connection

Check the battery cable connections for looseness or corrosion. A loosened cable connection will result in hard engine starting or insufficient battery charge. The battery cables must be tightened securely. Never reverse “+” and “–” terminals when reconnecting cables after disconnection. Even a short period of reverse connection will damage the electrical parts.

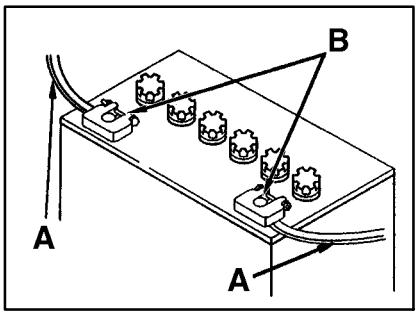


Fig. 17

A Battery cable

B Connections

Battery Electrolyte level

The amount of electrolyte in the batteries will be reduced after repeated discharge and recharge. Check the electrolyte level in the batteries, replenish with a commercially available electrolyte such as distilled water, if necessary. The battery electrolyte level checking procedure will vary with battery type. NOTICE: Do not replenish with dilute sulphuric acid in the daily service.

CAUTION:

When inspecting the batteries, be sure to stop the engine first.

As dilute sulphuric acid is used as electrolyte, be careful not to contaminate your eyes, hands, clothes, and metals with the electrolyte. If it gets in your eye, wash with a large amount of water at once, then seek medical advice.

As highly flammable hydrogen gas is released from the batteries, do not create a spark or allow any naked flame near the batteries.

When handling such metallic articles as tools near the batteries, be sure not to contact the "+" terminal because the compressor body is "-" and a dangerous short circuit might result.

When disconnecting the terminals, start with "-" terminal. When connecting them, connect the "-" terminal last.

Fuel level

Check the remaining fuel oil level in the fuel tank and re-fuel if necessary.

CHECKS AND OPERATION AFTER START-UP

Check after the Engine Start-up

Check the following items in the engine warming-up operation.

Engine noise and exhaust smoke color -

Listen to the engine and, if any abnormal noise is heard, check to determine the cause.

Check the fuel combustion condition by observing the exhaust smoke color. The exhaust smoke color after engine warm-up and at no-load condition should be colorless or light blue.

Black or white smoke indicates incorrect combustion.

Note: *After start-up from cold the engine might be noisier and the exhaust smoke color darker than when it has warmed up. However this condition will disappear after warm up.*

Leakage in the systems -

Check the following items:

Lubrication oil leakage -

Check the engine for oil leaks, paying particular attention to oil filter and oil pipe joints.

Fuel leakage -

Check the fuel injection pump, fuel lines and fuel filter for leakage.

Coolant leakage -

Check the radiator and water pump hose connections and the water drain cock on the cylinder block for leakage.

Exhaust smoke or gas leakage.

Checking coolant level

The coolant level could drop because any mixed air is expelled in about 5 minutes after the engine started.

Stop the engine, remove radiator cap, and add coolant.

CAUTION: *Hot steam can rush out and you could get burnt if the radiator cap is removed when the engine is hot. Cover the radiator cap with a thick cloth and loosen the cap slowly to reduce the pressure, then remove the cap.*

OPERATION AND CARE OF A NEW ENGINE

Your engine is carefully tested and adjusted in the factory, however, further run-in is necessary. Avoid any harsh engine operation within the initial 100 operating hours.

Do not operate the unit at full load until the engine is warmed-up.

Do not allow the engine to run unloaded for extended periods so as to minimise the risk of cylinder bore glazing.

During operation, pay attention to the following points if the engine shows any sign of abnormalities.

(1) Engine Oil Pressure - The engine oil pressure is monitored by a switch that will stop the engine if the pressure falls below a pre-set value.
If the oil pressure gauge shows below 30 psi or if the reading fluctuates continually, stop the engine and check the oil level. If the level is correct, contact your local Doosan branch or dealer to establish the cause.

(2) Coolant Temperature - The engine performance will be adversely affected if engine coolant temperature is too hot or too cold. The normal coolant temperature is 75 to 85°C (167 to 185°F).

Overheating

CAUTION:

If you see or hear escaping steam or have other reason to suspect there is a serious overheat condition, stop the engine immediately.

If the Engine Coolant Temperature gauge (where fitted) shows an overheat condition, or you have reason to suspect the engine may be overheating, take the following steps:

- Close the service valve to reduce the load.
- Let the engine run at normal idle speed for two or three minutes. If the engine coolant temperature does not start to drop, turn off the engine and proceed as follows:

CAUTION: *To help avoid being burned -*

- *Do not open the canopy or door if you see or hear steam or engine coolant escaping. Wait until no steam or engine coolant can be seen or heard before opening the engine canopy or door.*
- *Do not remove the radiator filler cap if the engine coolant in the reserve tank is boiling. Also do not remove the radiator filler cap while the engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if either cap is taken off too soon.*

If no steam or engine coolant can be seen or heard, open the canopy or door. If the engine coolant is boiling, wait until it stops before proceeding. The engine coolant level should be between the "MAX COLD" and "MIN" marks on the reserve tank.

Make sure the fan belt is not broken, or off the pulley, and that the fan turns when the engine is started. If the engine coolant level in the reserve tank is low, look for leaks at the radiator hoses and connections, radiator, and water pump. If you find major leaks, do not run the engine until these problems have been corrected. If you do not find a leak or other problem, WAIT UNTIL THE ENGINE HAS COOLED DOWN then carefully add engine coolant to the reserve tank.

(Engine coolant is a mixture of ethylene glycol antifreeze and water. See "Engine Care in cold season" for the proper antifreeze and mixture.)

CAUTION: *To avoid being burned, do not spill antifreeze or engine coolant on the exhaust system or hot engine parts. Under some conditions the ethylene glycol in engine coolant is combustible.*

If the engine coolant level in the reserve tank is at the correct level but there is still an indication of an overheat condition and no cause was found, please consult your local Doosan branch or dealer.

Overcooling

Operating the engine at low coolant temperature will not only increase the oil and fuel consumption but also will lead to premature parts wear which may result in engine failure. Ensure that the engine reaches normal operating temperature 75 to 85°C (167 to 185°F) within ten minutes of starting.

(3) Hourmeter

This meter indicates the machine operation hours. Make sure that the meter is always working during engine operation. Periodical machine maintenance is scheduled on the operation hours indicated on the hourmeter.

(4) Liquid and Exhaust Smoke Leakage

Make regular checks for lubricant, fuel, coolant and exhaust smoke leakage.

(5) Abnormal Engine Noise

In the event of any abnormal engine noise, please consult your local Doosan branch or dealer.

(6) State of the Exhaust Smoke

Check for any abnormal exhaust smoke color.

ENGINE STOPPING

(1) Close service valves.

(2) Before stopping the engine, cool down the engine by operating it at reduced load about three minutes. In this period, check the engine noise for abnormalities.

LONG TERM STORAGE

If the equipment is to be out of operation for an extended period, it should be started at least once per week and run on load for about 15 minutes after it has reached normal operating temperature.

If this is not possible,

- Do not drain the cooling water
- Clean dust or oil from the engine extension
- Either fill completely or drain the fuel tank
- Grease accelerator joints and electrical connections
- Disconnect the negative battery terminal

ENGINE MAINTENANCE

Inspection after initial 50 hours operation

(1) Replacing the engine oil and engine oil filter (1st time)

When the engine oil is still hot, be careful with a splash of engine oil which may cause burns. Cool the engine to replace engine oil until the engine oil becomes warm. It is most effective to drain the engine oil while the engine is still warm.

In early period of use, the engine oil gets dirty rapidly because of the initial wear of internal parts. Replace the engine oil earlier.

Engine oil filter should also, be replaced when the engine oil is replaced.

Engine oil and engine oil filter replacing procedures are as follows:

Remove the oil filler cap to drain easily while draining the engine oil.

1) Prepare a waste oil container collecting waste oil.

2) Loosen the drain plug using a wrench (customer procured) to drain the engine oil.

3) Securely tighten the drain plug after draining the engine oil.

4) Turn the engine oil filter counter-clockwise using a filter wrench (customer procured) to remove It.

5) Clean the engine oil filter mounting face.

6) Moisten the new engine oil filter gasket with the engine oil and install the new engine oil filter manually turning it clockwise until it comes into contact with the mounting surface, and tighten it further to 3/4 of a turn with the filter wrench.

Tightening torque: 19.6∼23.5N•m (2.0∼2.4kgf•m)

Applicable engine oil filter Part No.	CCN 22226351

7) Fill with the new engine oil until it reaches the specified level as explained in OPERATION section.

8) Warm up the engine by running for 5 minutes while checking any oil leakage.

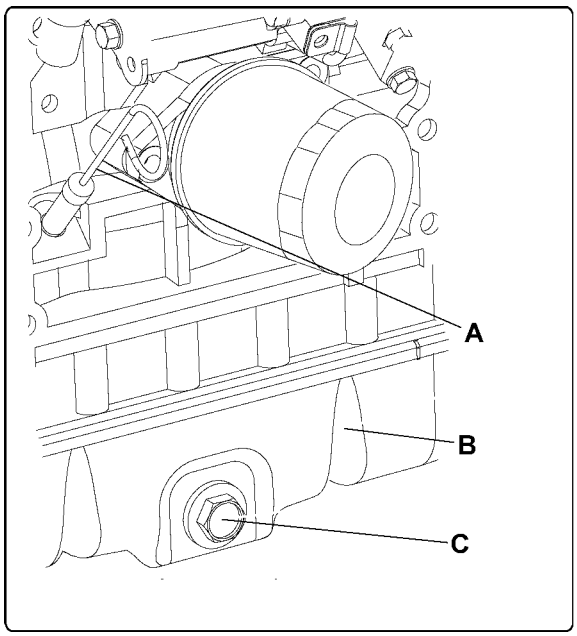
9) Stop the engine after warming up and leave it stopping for about 10 minutes to recheck the engine oil level with dipstick and replenish the engine oil. If any oil is spilled, wipe it away with a clean cloth.

10)Resume engine oil and filter changes at 250 hour intervals (with non Doosan fluids) or 500 hour intervals with Doosan PRO-TEC engine fluid and filters.

NOTE: The use of genuine Doosan oil and filters will qualify for extended warranty coverage. Refer to Warranty Section of the manual.

PRO-TEC Engine Fluid Part No. 54480918 (1 gallon).

IMPORTANT:
Do not overfill the oil pan with engine oil. Be sure to keep the specified level between upper and lower limit on the dipstick.

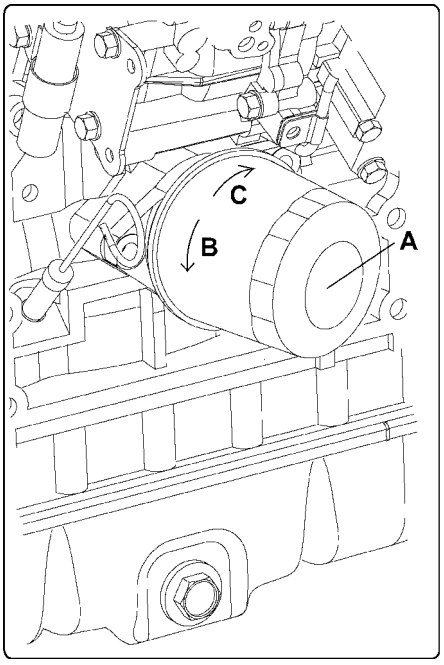


The location depends on the engine installed on the machine unit

A. Dipstick

B. Oil pan

C. Drain plug



A. Engine oil filter

B. Loosen

C. Tighten

(2) Draining of the oil/water separator

Draining Water from Fuel Filter/separator.

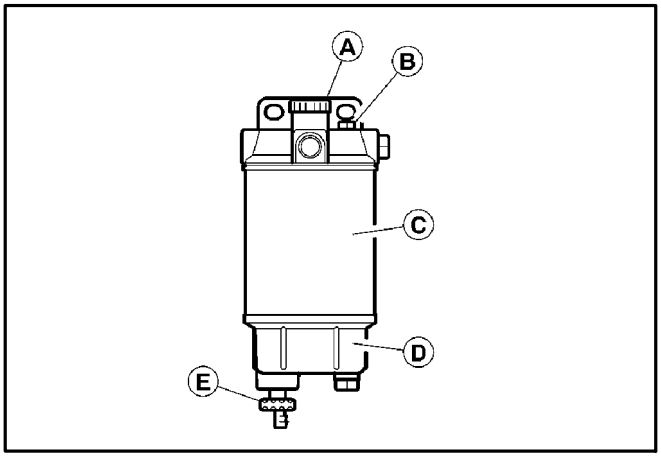
The fuel filter/separator is provided to allow water to be drained from the fuel system. Water is heavier than fuel so any water contained in the system will collect in the bottom of the bowl.

The clear bowl 'D' should be checked on a daily basis and if water is present, it should be drained from the separator.

Place a suitable container under the separator to prevent any spillage inside the machine.

Slacken the drain valve 'E' until water drains from the vent tube.

When all the water has been evacuated, tighten the drain valve 'E' and follow the "fuel system air bleeding" procedure below.



Fuel System Air Bleeding

The entry of air into the fuel system will cause difficult engine starting or engine malfunction.

When carrying out service procedures such as emptying the fuel tank, draining the filter/separator, and changing the fuel filter element be sure to bleed air from the fuel system.

To activate the "automatic air-bleeding system", turn the key switch to the "ON" position and energize the electromagnetic pump" to bleed the air.

Air bleeding method:

When the "starter switch" is set to the "ON" position to activate the electromagnetic pump, fuel is forced to the fuel valve of each injection pump and then to the leak-off pipe of each injector nozzle, so that any air in the fuel system bleeds off automatically to the fuel tank.

NOTE:
Although the fuel system can bleed air automatically when the key switch is in the "ON" position, air can also be manually bled by use of the primer pump facility in the filter/separator assembly.
By unscrewing the plastic primer pump head 'A' and stroking it up and down, any air bubbles in the system will be purged back to the fuel tank. When this has been completed, the pump head must be screwed back into the filter/separator assembly.

Start the engine and visually check the fuel system for leaks.

Replacing fuel filter

Replace the fuel filter at specified intervals before it is clogged with dust to adversely affect the fuel flow. Also, replace the fuel filter after the engine has fully been cooled.

1) Remove the fuel filter using a filter wrench (customer procured). When removing the fuel filter, hold the bottom of the fuel filter with a piece of rag to prevent the fuel oil from dropping. If you spill fuel, wipe such spillage carefully.

2) Clean the filter mounting surface and slightly apply fuel oil to the gasket of the new fuel filter.

3) Install the: new fuel filter manually turning until it comes into contact with the mounting surface, and tighten it further to 1/2 at a turn, using a filter wrench. Tightening torque: 11.8∼15.6N•m(1.2∼1.6kgf•m).

Applicable fuel filter Part No.	CCN 16539462

4) Bleed the fuel system. Refer to Inspection at 50 hours.

IMPORTANT:
Be sure to use genuine Doosan part (super fine mesh filter). Otherwise, it results in engine damage, uneven engine performance and shorter engine life.

Changing oil/water separator element.

***NOTE*:**
The cartridge and bowl contain fuel. Take care not to spill it during disassembly and reassembly.

The fuel filter/separator also provides primary filtration and the element 'C' should be changed every 500 operating hours or 6 months, whichever comes first.

Change procedure:

Unscrew the element 'C' from the head taking care not to spill fuel inside the machine. Drain any fuel within into a suitable container, then unscrew the clear bowl 'D' from the element.

Discard the old element into a suitable container.

Remove the old 'O' ring from the bowl 'D' and install the new one supplied with the element. Apply a light coat of clean engine oil to the 'O' ring and screw the bowl 'D' onto the new element 'C'.

Using a clean cloth, wipe the sealing face of the filter/separator head to ensure correct seating of the sealing ring.

Fill the element/bowl assembly with clean fuel oil then apply a light coat of clean engine oil to the new element seal ring.

Screw the new element onto the head firmly by hand.

Follow the "fuel system air bleeding" procedure.

Inspection every 1000 hours operation

(1) Replacing cooling water

Cooling water contaminated with rust or water scale reduces the cooling effect. Even when antifreeze agent (LLC) is mixed, the cooling water gets contaminated due to deteriorated ingredients. Replace the cooling water at least Once a year.

1) Remove the header tank cap.

2) Remove the bottom radiator hose of the radiator and drain the cooling water.

3) After draining the cooling water, reconnect the hose.

4) Fill radiator and engine with cooling water via the header tank.

CAUTION:
Wait until the temperature goes down before draining the Cooling water. Otherwise, hot water may splash to cause scalding.

(2) Adjusting intake / exhaust valve clearance

As this adjustment requires specialized knowledge and skill, consult your Portable Power dealer. The adjustment is necessary to maintain the correct timing for the opening and closing of valves. Neglecting the adjustment will cause the engine to run noisily and result in poor engine performance and other damage.

Inspection every 1500 hours operation

(1) Inspect, Clean and Test Fuel Injectors

As the adjustment requires specialized knowledge and skill, consult your Portable Power dealer. This adjustment is needed to obtain the optimum injection pattern for full engine performance.

(2) Inspect Turbocharger (Blower Wash as Necessary)

Turbo charger service is required by the EPA/ARB every 1500 hours. Your authorized Portable Power dealer or distributor will inspect and blower wash the unit if necessary.

(3) Inspect, Clean and Test EGR Valve

The EGR valve is a key component for cleaning exhaust gas.

To prevent the valve from deteriorating in exhaust gas recirculation performance due to carbon accumulation, inspect, clean and test the valve at least every 1500 hours. Consult your local Portable Power dealer for this service.

(4) Inspect and Clean EGR Lead Valve

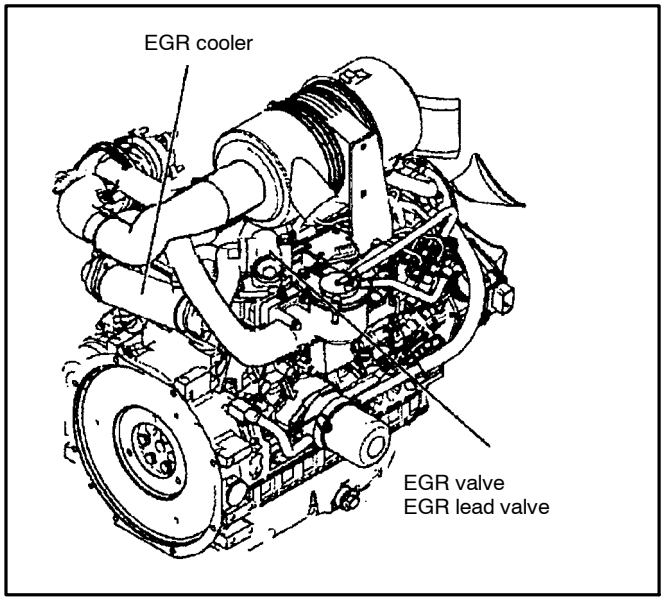
The EGR lead valve is located in the passage of recirculated gas.

To prevent carbon accumulation in or clogging of the lead valve, inspect and clean the lead valve at regular intervals. Consult your local Portable Power dealer for this service.

(5) Clean EGR Cooler

The EGR cooler is apt to be contaminated with rust and scale that deteriorate the cooling performance. Carbon accumulation in the exhaust gas passage of the cooler hinders circulation of exhaust gas, resulting in deterioration in exhaust gas cleanup performance.

To prevent such a problem, clean the cooler at least every 1500 hours. Consult your local Portable Power dealer for this service.



(6) Inspect Crankcase Breather System

Proper operation of the crankcase breather system is required to maintain the emission requirements of the engine. The EPA/ARB requires that you have the crankcase breather system inspected every 1500 hours. See your authorized Portable Power dealer or distributor for this service.

Inspection every 2000 hours operation

(1) Flushing the cooling system and checking the cooling system parts

As this maintenance requires specialized knowledge and skill, consult your Portable Power dealer. Rust and water scale will accumulate in the cooling system through many hours of operation. This lowers the engine cooling effect.

(2) Checking and replacing fuel hoses and cooling water hoses

As this maintenance requires specialized knowledge and skill, consult your Portable Power dealer. Regularly check the rubber hoses of the fuel system and cooling water system. If cracked or degraded, replace them with new one. Replace the rubber hoses at least every 2 years.

(3) Lapping the intake and exhaust valves

As this maintenance requires specialized knowledge and skill, consult your Portable Power dealer. The adjustment is necessary to maintain proper contact of the valves and seats.

(4) Checking and adjusting the fuel injection timing

As this maintenance requires specialized knowledge and skill, consult your Portable Power dealer.

(5) Checking and adjusting the EPA emission related parts.

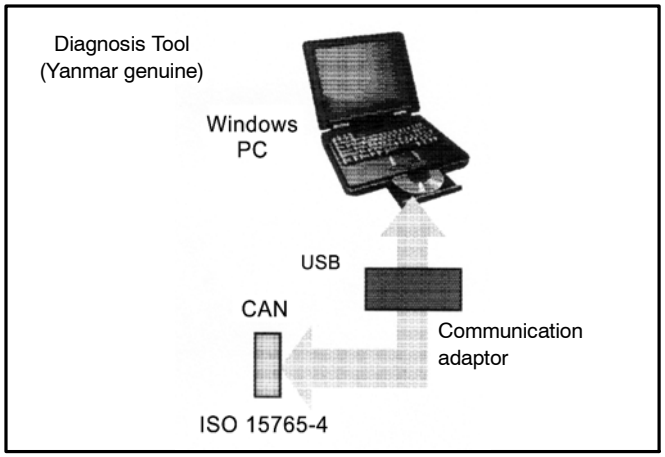
The inspection and servicing require specialized knowledge and techniques. Consult your Portable Power dealer or distributor.

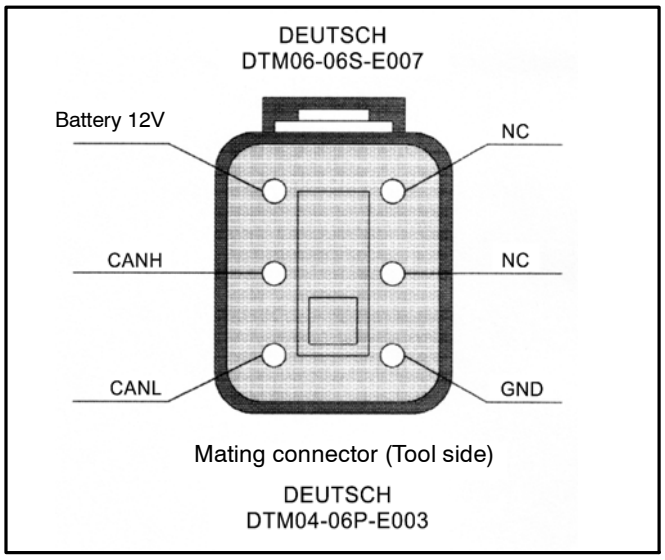
EPA allows to apply maintenance schedule for emission related parts as follows:

Diagnosis Tool

A connector is provided at an end of the harness of the driven machine so that the diagnosis tool can be loaded with data from the E-ECU.

When the fuel injection pump is replaced, data in the E-ECU must also be replaced for accomodating the new pump. When the EECU is replaced, the fuel injection data in the existing unit must be migrated to the new unit. The diagnosis tool can be used for the data replacement or migration. Contact your local Portable Power dealer for replacement of the fuel injection pump or E-ECU.





This item contains a simple troubleshooting. When a failure takes place on your engine, diagnose the cause referring this troubleshooting. Should the cause of failure not be detected or you are unable to manage the failure, consult your machine supply source or nearest company engine service outlet.

Engine does not start	Starter does not turn.	Battery discharged	
		Bad cable connections.	
		Starter or starter switch failure.	
		Safety relay failure.	
	Starter turns but engine does not fire.	No fuel injection.	No fuel in the fuel tank.
			Clogged fuel filter element.
			Air in the fuel system.
			Control rack is stuck at no fuel position.
		Fuel is injected but engine does not fire.	Incorrect preheating operation.
			Faulty air heater.
			Incorrect injection timing.
			Low cylinder compression pressure.
	Engine fires but stalls immediately.	Air in the fuel system.	

A connector is provided at an end of the harness of the driven machine so that the diagnosis tool can be loaded with data from the E-ECU.

Unstable engine running	Unstable low idling	Crack in injection pipe.	
		Injection nozzle failure.	
		Uneven compression pressure between cylinders.	
	Incorrect high idle speed adjustment.	Software/Electronic malfunction.	
	Engine hunting in medium speed range.	Software/Electronic malfunction.	
	Engine malfunction in high speed range.	Insufficient fuel supply.	Air in the fuel system
			Clogged fuel filter element
			Piping failure (squeezed/restricted etc.)
		Uneven fuel injection amount between cylinders.	
		Incorrect valve clearance adjustment.	
		Deteriorated valve spring.	
	Engine speed stuck at high idle.	Engine control restriction or seizure.	
Engine overheat.	Cooling system defect	Insufficient coolant volume.	
		Fan belt slippage.	
		Thermostat malfunction.	
		Radiator filler cap malfunction.	
		Cooling system interior fouled.	
		Radiator clogged.	
	Improper servicing	Engine over-loaded.	
		Air cleaner element clogged.	
		Insufficient airflow/restriction.	
		Restricted coolant flow (high concentration of antifreeze, etc.)	
Low oil pressure	Lack of oil	Oil leakage	
		High oil consumption	
	Wrong oil	Wrong type and viscosity.	
	High coolant temperature.	Over heat.	
	Clogged filter and strainer.	Clean and/or replace.	
	Worn bearings and oil pump.	Replace.	
	Faulty relief valve.	Replace.	

Low engine output	Incorrect injection pump adjustment	Incorrect injection timing	Too far advanced.
			Too far retarded.
		Injection nozzle malfunction	Incorrect injection pressure.
			Incorrect spray condition.
		Insufficient fuel supply to the injection pump	Lack of fuel in tank.
			Air in injection pump.
			Fuel filter clogged.
			Overflow valve malfunction.
		Governor malfunction	Incorrect engine control adjustment.
			Deteriorated governor spring.
	Low cylinder compression pressure	Cylinder compression leakage	Incorrect valve clearance adjustment.
			Injector nozzle misalignment.
			Cylinder bore wear.
		Insufficient air intake volume.	Air cleaner clogged.
			Restricted air flow.
Excessive oil consumption	Incorrect oil	Wrong selection of type and viscosity.	
		Too much oil quantity.	
	Engine burning oil	Faulty piston rings/damaged cylinder bores.	
		Faulty valve stem seal.	
	Oil leakage	Damaged seal / Damaged turbocharger seal	
		Loose joints/gaskets.	
		Improper installation of filter and piping.	
Excessive fuel consumption	Fuel leakage	Damaged seals.	
		Improper component installation or tightening.	
	Excessive injection volume.	Injection pump defective.	
	Excessive mechanical loads		

Improper exhaust	Excessive black smoke	Clogged air cleaner.
		Damaged injector nozzle.
		Faulty EGR Valve.
		Injection timing incorrect.
		Excessive injection volume.
		Incorrect fuel.
	Excessive white smoke	Water mixing in fuel.
		Low compression pressure.
		Injection timing incorrect.
		Low coolant temperature.
		Faulty turbocharger.
Battery over discharge	Low electrolyte level	Crack in battery body.
		Natural consumption.
	Charging failure	Loose or damaged belt.
		Faulty alternator.
		Damaged wiring or contact failure.
	Excessive electrical loads	Insufficient battery capacity for the application.