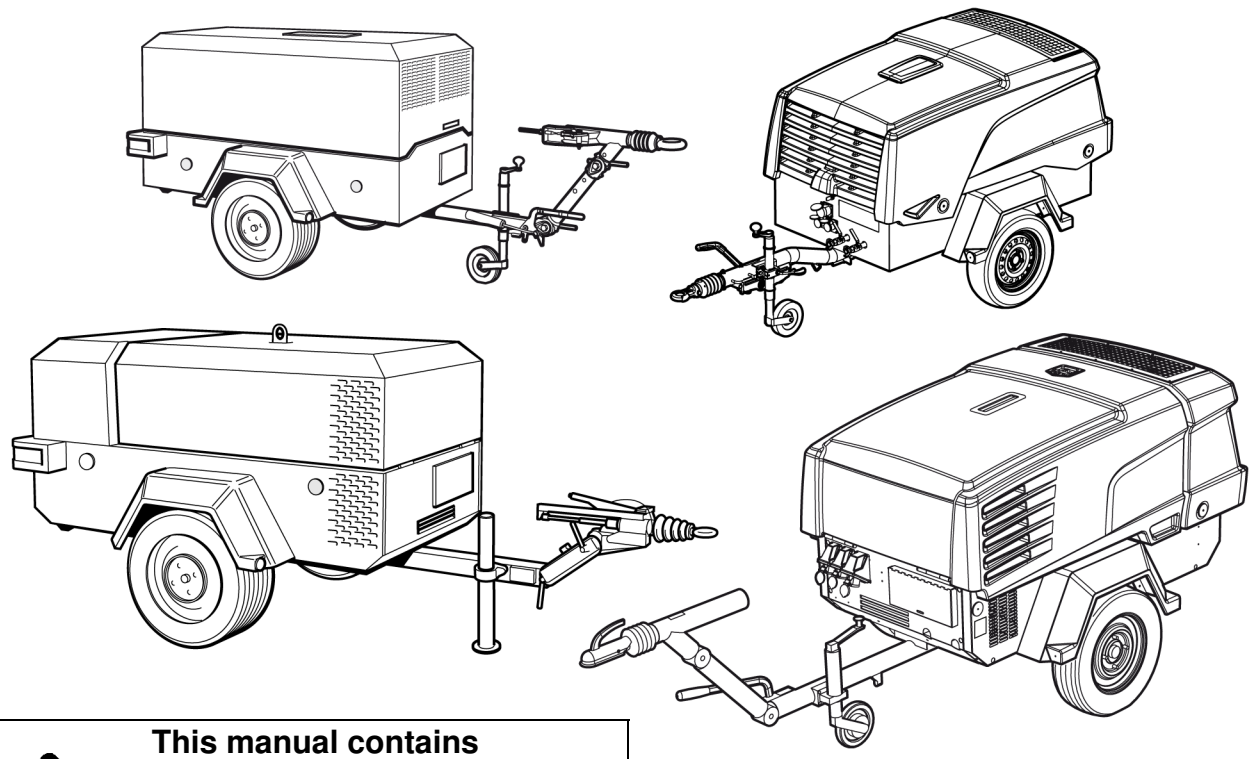
DOOSAN

Portable Power

7/26E, 7/31E, 7/41

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.

7/26E	SERIAL No : 109600 -109999
7/31E	SERIAL No : 323300 - 324999
7/41	SERIAL No : 433500 - 439000

46671281_en_B_06/18

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; 7/53 ; 7/73-10/53; 7/124-10/104; 10/124-14/114; 14/84; 7/204; 10/1[illegible]

8) Commercial name: 7/20; 7/26E; 7/[illegible] 14/114; 14/84; 7/204; 10/1[illegible]

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)	2014/30/EU	The Electromagnetic Compatibility Directive
13)	2000/14/EC	The Noise Emission Directive
14)	2014/68/EU	The Pressure Equipment Directive
15)	2014/29/EU	The Simple Pressure Vessels Directive
16)	97/68/EC	The emission of engines for no-road mobile machinery
31)	2014/35/EU	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, Warrington, 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$_{WA}$**	**7/124-10/104**	97	**98L$_{WA}$**	**99L$_{WA}$**
7/26E	21,3	**97L$_{WA}$**	**98L$_{WA}$**	**10/124-14/114**	122		
7/31E	25,9	**97L$_{WA}$**	**98L$_{WA}$**	**14/84**	97		
7/41	35	**98L$_{WA}$**	**98L$_{WA}$**	**7/204; 10/174; 12/154; 14/144**	168	**98L$_{WA}$**	**99L$_{WA}$**
7/53	36	**97L$_{WA}$**	**98L$_{WA}$**				
7/73-10/53	55	**96L$_{WA}$**	**98L$_{WA}$**	**9/274**	226	**99L$_{WA}$**	**100L$_{WA}$**
				9/304; 12/254; 17/244; 21/224	247	**99L$_{WA}$**	**100L$_{WA}$**

25) **Conformity with the Pressure Equipment directive 2014/68/EU**

26) We declare that this product has been assessed according to the Pressure Equipment Directive 2014/68/EU 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

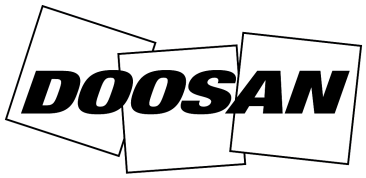
27) Engineering Director

28) Issued at Dobris, Czech Republic

29) Date

30) **The technical documentation for the machinery is available from:**
Doosan Bobcat EMEA s.r.o. (DBEM), U Kodetky 1810, 263 12 Dobris, Czech Republic

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

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

2 FOREWORD

The contents of this manual are considered to be proprietary and confidential to 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.

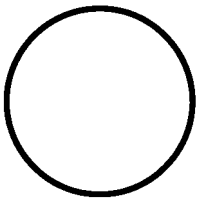
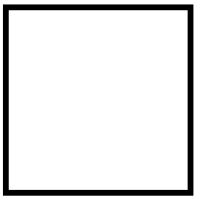
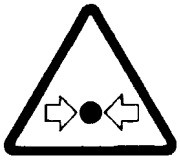
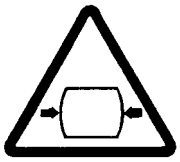
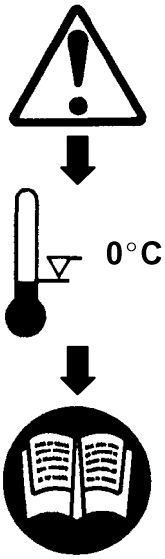
The use of the machine in any of the situation types listed in table 1:-

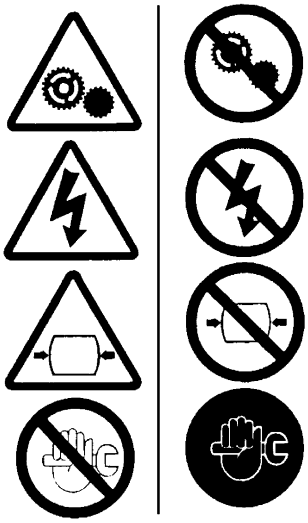
a Is not approved,
b) May impair the safety of users and other persons, and
c) May prejudice any claims made against the company.

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.**



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.

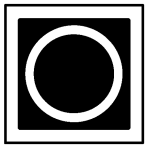
Do not use fork lift truck from this side.

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.

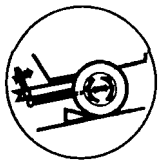
Tie down point

Lifting point.

On (power).

Off (power).

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

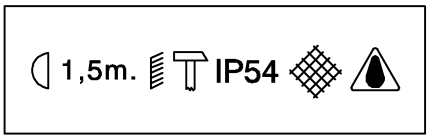


When parking use prop stand, handbrake and wheel chocks.

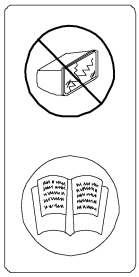
Compressor oil filling

Diesel fuel.
No open flame.

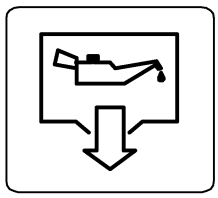
Parking brake.



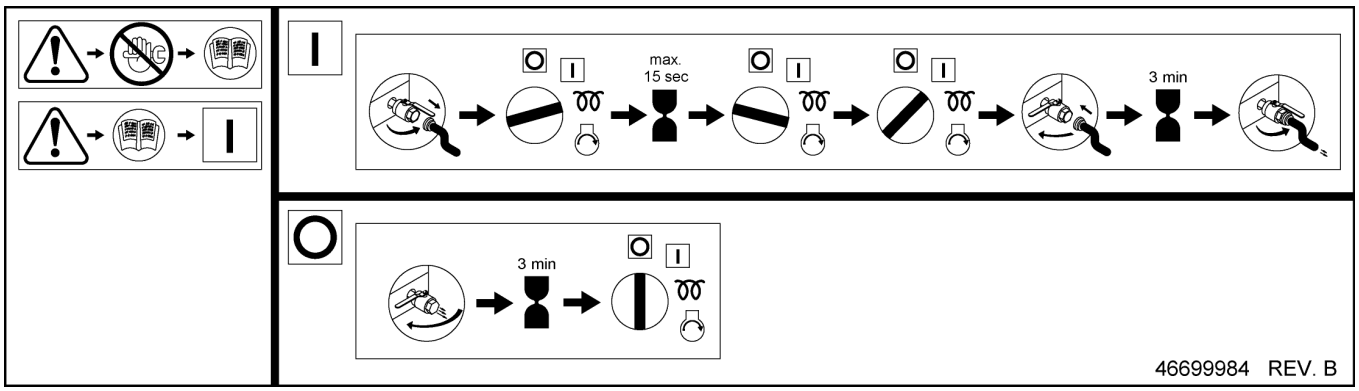
Rough Service Designation.
Wet Location Operation.



Replace any cracked protective shield.



Oil drain.



Start sequence

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:

- 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 physician if large amounts of compressor lubricant are ingested.

Consult a physician 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

A battery contains sulfuric acid and can give off gases which are corrosive and potentially explosive. Avoid contact with skin, eyes and clothing. In case of contact, flush area immediately with water.

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 permissable 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.

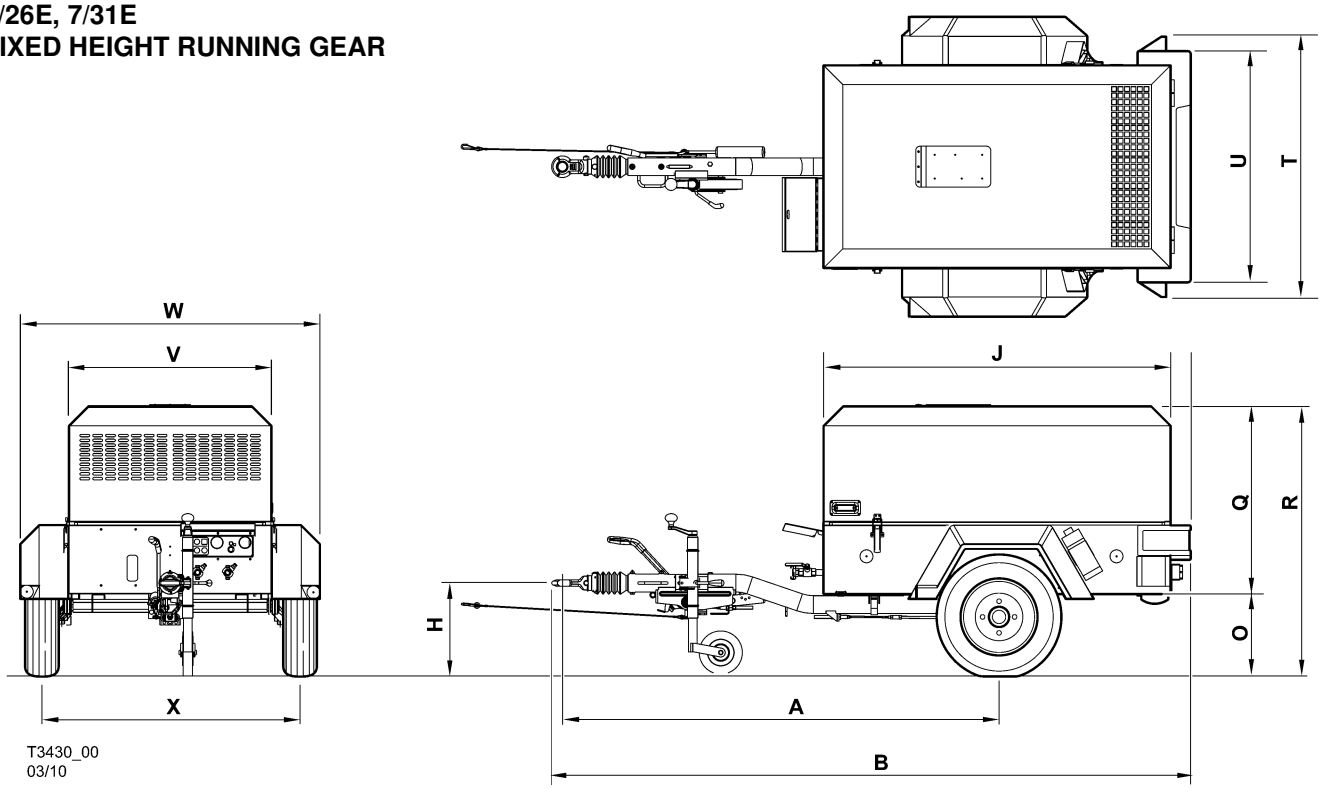
b) Ensure that the effective chain length is as short as possible whilst still allowing normal articulation of the trailer and effective operation of the breakaway cable.

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.

7/26E, 7/31E
FIXED HEIGHT RUNNING GEAR



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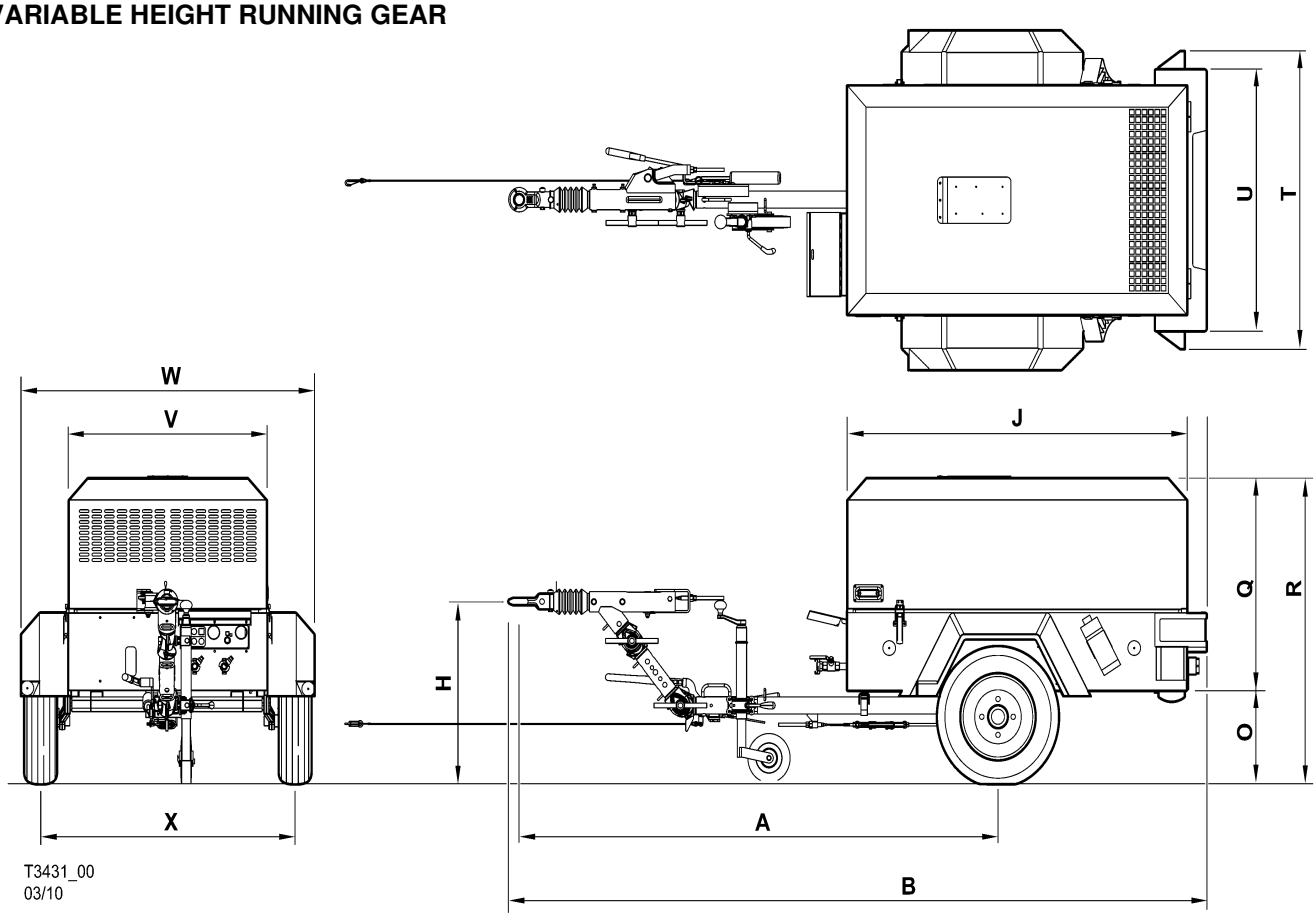
7/26E, 7/31E
VARIABLE HEIGHT RUNNING GEAR



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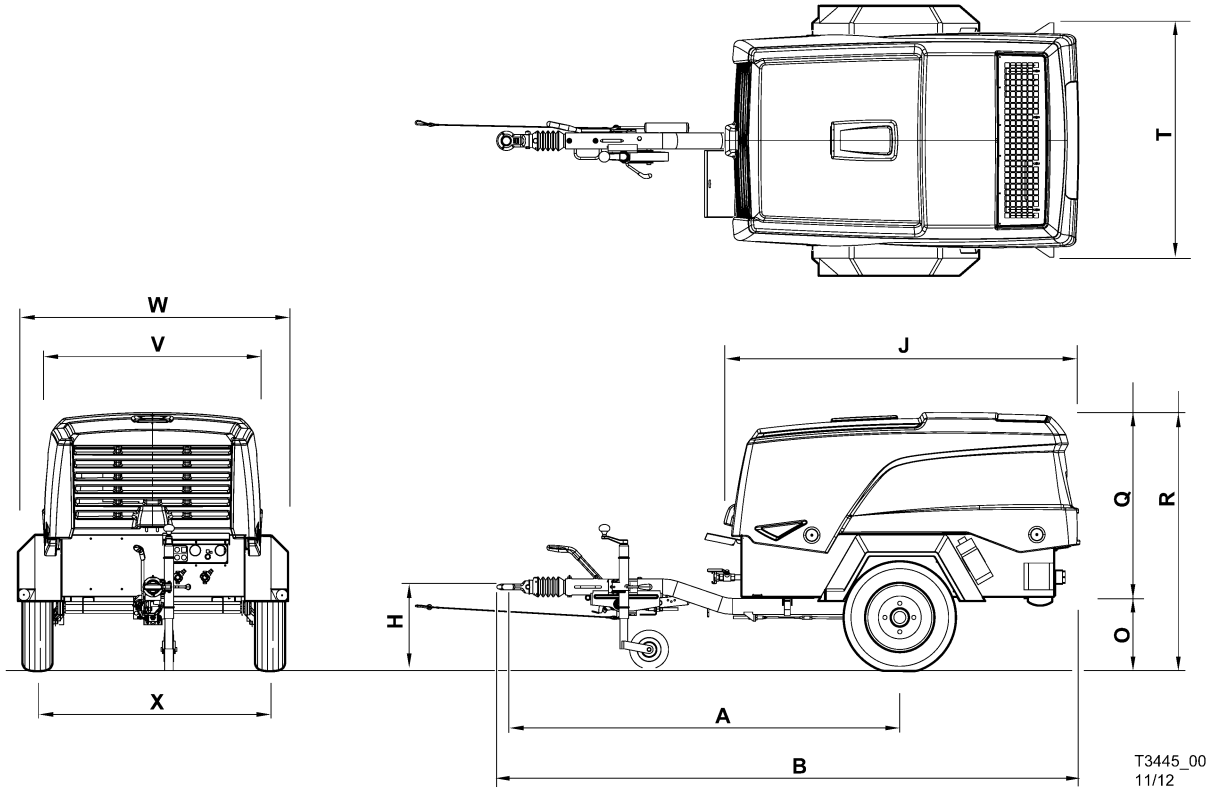
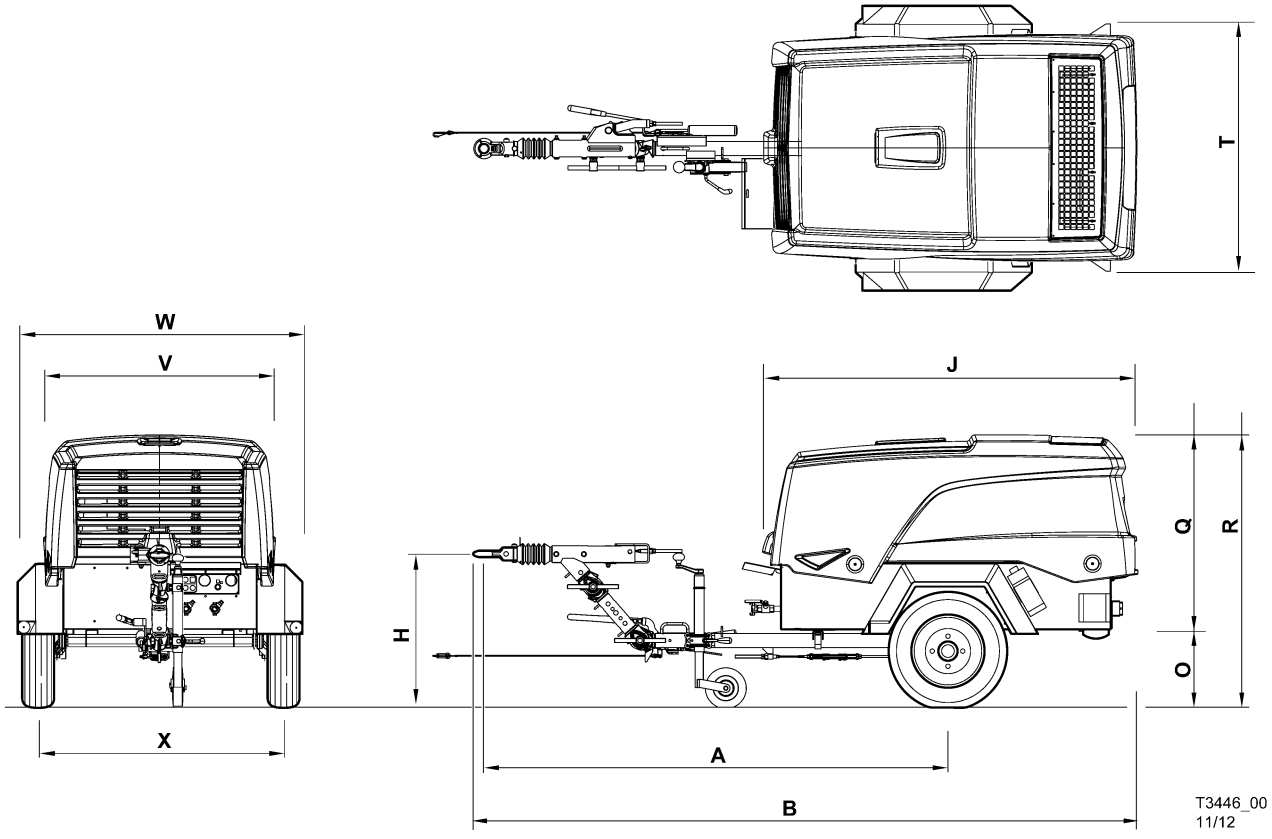
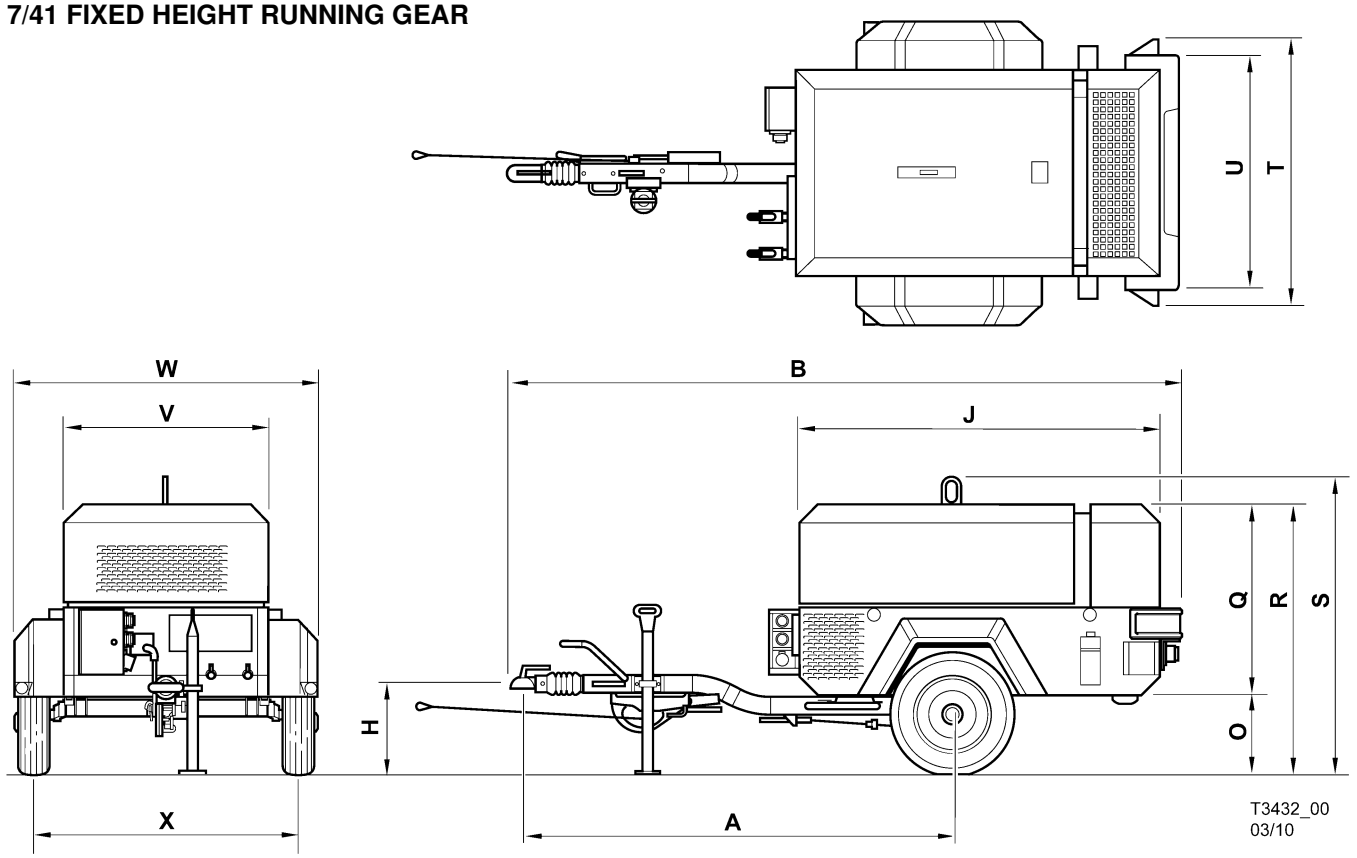
7/26E+, 7/31E+
FIXED HEIGHT RUNNING GEAR



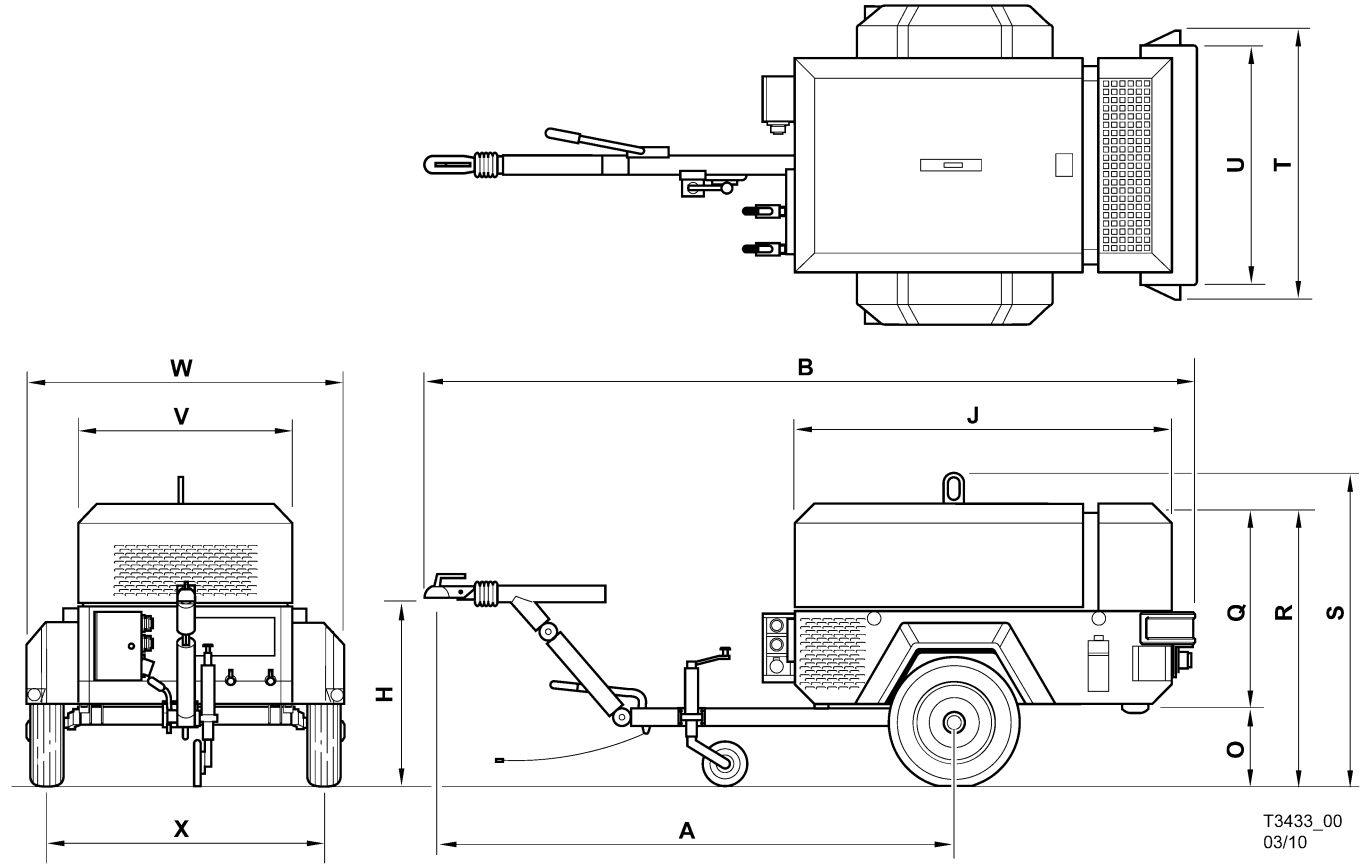
7/26E+, 7/31E+
VARIABLE HEIGHT RUNNING GEAR



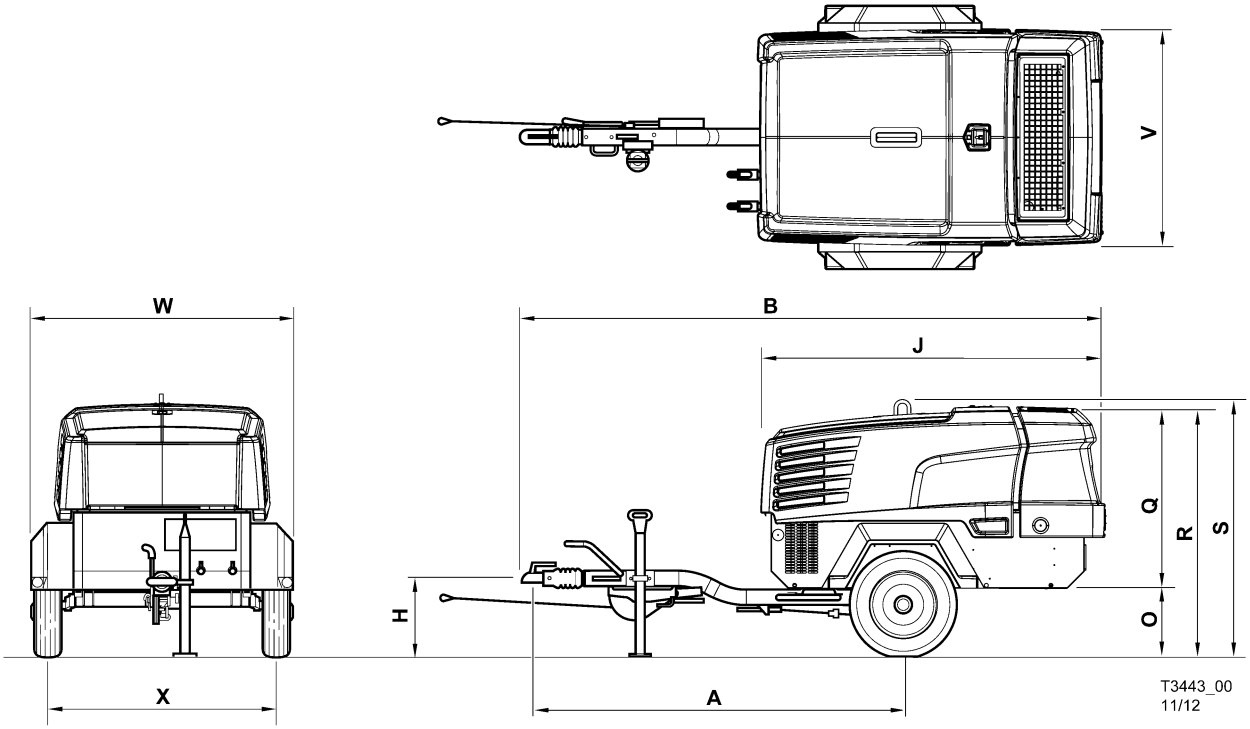
7/41 FIXED HEIGHT RUNNING GEAR



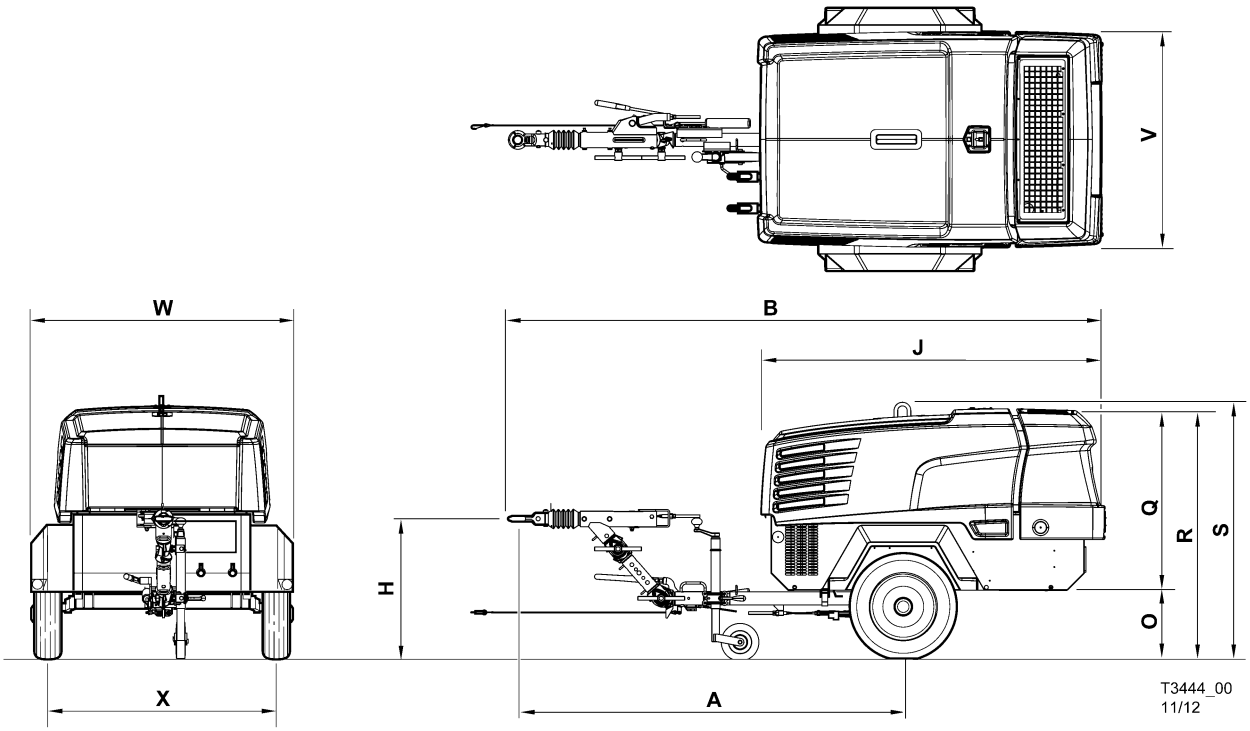
7/41 VARIABLE HEIGHT RUNNING GEAR



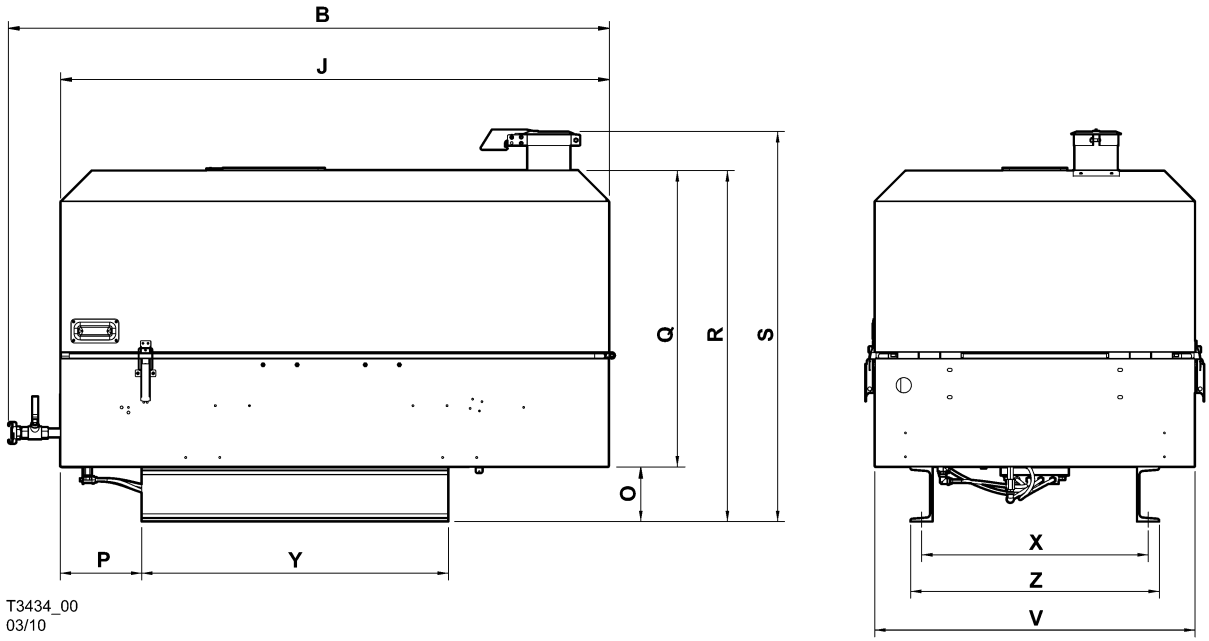
7/41+ FIXED HEIGHT RUNNING GEAR



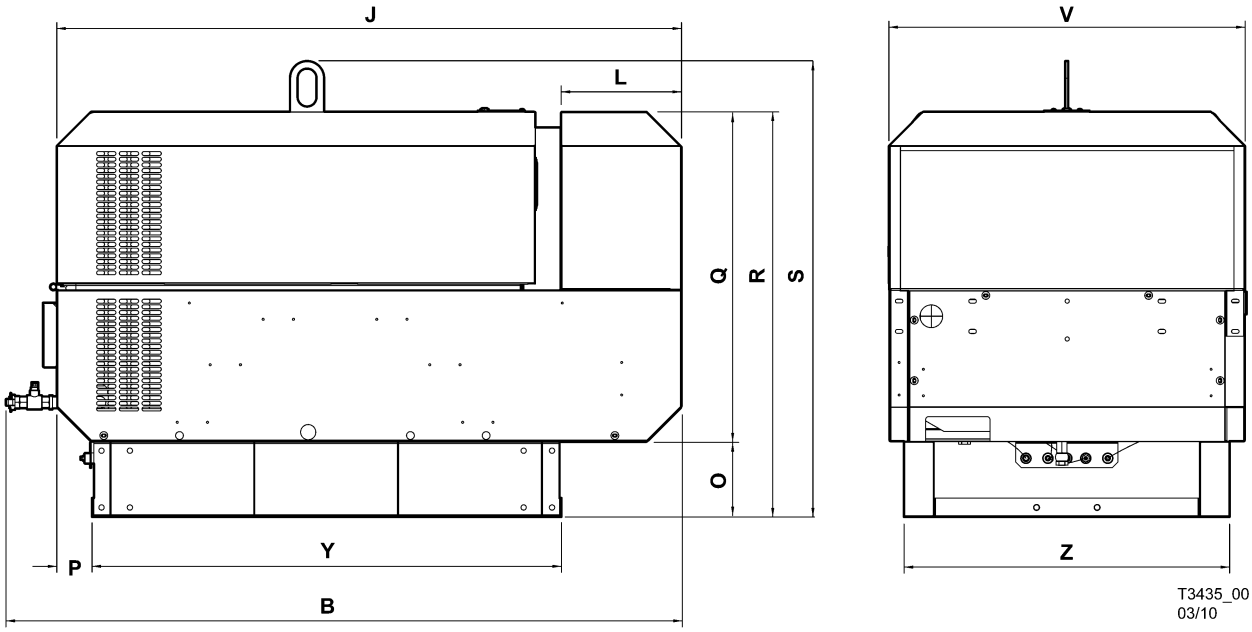
7/41+ VARIABLE HEIGHT RUNNING GEAR



7/26E, 7/31E SHIPPING SKID



7/41 PERMANENT SKID



		A	B	H	J.	O	P	Q	R	S	T	U	V.	W	X	Y	Z
		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
1	**7/26E 7/31E fixed height - unbraked**	1807 MIN 1823 MAX.	2713 MIN 2766 MAX.	405	1610	365		870	1235		1226	1072	940	1390	1205		
2	**7/26E+ 7/31E+ fixed height - unbraked**	1787 MIN 1803 MAX.	2733 MIN 2786 MAX.	405	1835	320		995	1315		1226		1115	1390	1195		
3	**7/26E 7/31E fixed height - braked**	1996 MIN 2012 MAX.	2942 MIN 2955 MAX.	405	1610	365		870	1235		1226	1072	940	1390	1205		
4	**7/26E+ 7/31E+ fixed height - braked**	1996 MIN 2012 MAX.	2942 MIN 2995 MAX.	405	1835	320		995	1315		1226		1115	1390	1205		
5	**7/26E 7/31E variable height - unbraked**	1935 MIN 2130 MAX.	2869 MIN 3077 MAX.	405 MIN 782 MAX.	1610	365		870	1235		1226	1072	940	1390	1205		
6	**7/26E+ 7/31E+ variable height - unbraked**	1962 MIN 2154 MAX.	2908 MIN 3137 MAX.	310 MIN 685 MAX.	1835	320		995	1315		1226		1115	1390	1195		
7	**7/26E 7/31E variable height - braked**	2198 MIN 2334 MAX.	3195 MIN 3368 MAX.	405 MIN 720 MAX.	1610	365		870			1226	1072	940	1390	1205		
8	**7/26E+ 7/31E+ variable height - braked**	2198 MIN 2334 MAX.	3235 MIN 3408 MAX.	400 MIN 720 MAX.	1835	320		995	1315		1315		1115	1390	1205		
9	**7/26E 7/31E fixed height - extended**	2408 MIN 2424 MAX.	3314 MIN 3367 MAX.	405	1610	365		870	1235		1226	1072	940	1390	1205		
10	**7/26E+ 7/31E+ fixed height - extended**	2408 MIN 2424 MAX.	3354 MIN 3407 MAX.	406	1835	320		995	1315		1226		1115	1390	1205		
11	**7/26E 7/31E permanent skid**		1764		1610	200	59	870	1030				940		665	1545	745
12	**7/26E 7/31E shipping skid**		1764		1610	150	374	870	1020				940		665	650	715
13	**7/41 fixed height below 750 kg**	1980 MIN 1996 MAX.	2990 MIN 3040 MAX.	415	1650	350		870	1230	1354	1220	1072	940	1390	1205		
14	**7/41 fixed height below 900 kg**	1910 MIN 1930 MAX.	2999 MIN 3052 MAX.	450	1650	365		870	1235	1369	1220	1072	940	1390	1205		
15	**7/41+fixed height below 750 kg**	1980 MIN 1996 MAX.	3000 MIN 3050 MAX.	415	1808	350		970	1330	1354	1220	1138	1138	1390	1205		
16	**7/41+ fixed height below 900 kg**	1910 MIN 1930 MAX.	3009 MIN 3062 MAX.	450	1808	365		970	1335	1369	1220	1138	1138	1390	1205		
17	**7/41 variable height below 750 kg**	2135 MIN 2316 MAX.	3145 MIN 3365 MAX.	400 MIN 820 MAX.	1650	365		870	1235	1369	1220	1072	940	1390	1205		
18	**7/41 variable height below 900 kg**	2260 MIN 2440 MAX.	3322 MIN 3577 MAX.	405 MIN 840 MAX.	1650	365		870	1235	1369	1220	1072	940	1390	1205		
19	**7/41+variable height below 750 kg**	2135 MIN 2316 MAX.	3155 MIN 3370 MAX.	405 MIN 820 MAX.	1808	365		970	1335	1369	1220	1138	1138	1390	1205		
20	**7/41+variable height below 900 kg**	2260 MIN 2440 MAX.	3332 MIN 3587 MAX.	405 MIN 840 MAX.	1808	365		970	1335	1369	1220	1138	1138	1390	1205		
21	**7/41 permanent skid**		1787		1650	200	93	870	1070	1204			940		780	1230	860
22	**7/41 shipping skid**		1787		1650	150	338	870	1070	1204			940		780	650	830
23	**7/41 fixed height below 750 kg BB**	1980 MIN 1996 MAX.	2990 MIN 3040 MAX.	415	1650	350		972	1335	1470	1220	1072	940	1390	1205		
24	**7/41+ fixed height below 750 kg BB**	1980 MIN 1996 MAX.	3000 MIN 3050 MAX.	415	1808	350		1075	1425	1470	1220	1138	1138	1390	1205		
25	**741 fixed height extended**	2360 MIN 2380 MAX.	3449 MIN 3502 MAX.	450	1650	365		870	1235	1369	1220	1072	940	1390	1205		

COMPRESSOR

Actual free air delivery. (7/26E)	2,5 m^3 min^{-1} (90 CFM)
Actual free air delivery. (7/31E)	3,0 m^3 min^{-1} (105 CFM)
Actual free air delivery. (7/41)	4,0 m^3 min^{-1} (140 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. (7/26E, 7/31E)	7,0 litres (1,8 US GAL)
Oil capacity. (7/41)	8,0 litres (2,1 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:

a) 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
7/26E

Type/model.	Yanmar 3TNV82A
Number of cylinders.	3
Oil capacity.	5,5 litres
Speed at full load.	2800 revs min^{-1}
Speed at idle.	1700 revs min^{-1}
Electrical system.	12V negative earth
Power available at 2800 revs min^{-1}	21,2kW (28,5 HP)
Fuel tank capacity	50 litres (11US GAL)
Oil specification	Refer engine section
Coolant capacity	5 litres (1,3) US GAL

ENGINE
7/31E

Type/model.	Yanmar 3TNV88
Number of cylinders.	3
Oil capacity.	6,7 litres (1,8 US GAL)
Speed at full load.	2800 revs min^{-1}
Speed at idle.	1800 revs min^{-1}
Electrical system.	12V negative earth
Power available at 2800 revs min^{-1}	26kW (34,8 HP)
Fuel tank capacity	50 litres (11,0 US GAL)
Oil specification	Refer engine section
Coolant capacity	5,0 litres (1,3 US GAL)

ENGINE
7/41

Type/model.	Yanmar 4TNV88
Number of cylinders.	4
Oil capacity.	7,4 litres (1,9) US GAL
Speed at full load.	2800 revs min^{-1}
Speed at idle.	1500 revs min^{-1}
Electrical system.	12V negative earth
Power available at 2800 revs min^{-1}	35kW (47,0 HP)
Fuel tank capacity	40 litres(10,6 US GAL)
Oil specification	Refer engine section
Coolant capacity	7,8 litres (2 US GAL)

INFORMATION ON AIRBORNE NOISE (CE regions)

- The A-weighted emission sound pressure level

. 84 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
Unbraked version
7/26E, 7/31E

Shipping weight.	735 kg (1621 lbs)
Maximum weight.	750 kg (1653 lbs)
Maximum horizontal towing force.	7,12 kN (1600 lbs)
Maximum vertical coupling load (nose weight).	75 kg (165 lbs)

VARIABLE HEIGHT RUNNING GEAR
Unbraked version
7/26E, 7/31E

Shipping weight.	735 kg (1621 lbs)
Maximum weight.	750 kg (1653 lbs)
Maximum horizontal towing force.	7,12 kN (1600 lbs)
Maximum vertical coupling load (nose weight).	75 kg (165 lbs)

FIXED HEIGHT RUNNING GEAR
Braked version
7/26E, 7/31E

Shipping weight.	745 kg (1643 lbs)
Maximum weight.	750 kg (1653 lbs)
Maximum horizontal towing force.	7,2 kN (1619 lbs)
Maximum vertical coupling load (nose weight).	75 kg (165 lbs)

VARIABLE HEIGHT RUNNING GEAR
Braked version
7/26E, 7/31E

Shipping weight.	745 kg (1643 lbs)
Maximum weight.	750 kg (1653 lbs)
Maximum horizontal towing force.	7,2 kN (1600 lbs)
Maximum vertical coupling load (nose weight).	75 kg (165 lbs)

FIXED HEIGHT RUNNING GEAR
Braked version, 02 Category
7/41

Shipping weight.	815 kg (1797 lbs)
Maximum weight.	900 kg (1984 lbs)
Maximum horizontal towing force.	12,1 kN (2720 lbs)
Maximum vertical coupling load (nose weight).	90 kgf (198 lbs)

VARIABLE HEIGHT RUNNING GEAR
Braked version, 02 Category
7/41

Shipping weight.	835 kg (1841 lbs)
Maximum weight.	900 kg (1984 lbs)
Maximum horizontal towing force.	12,1 kN (2720 lbs)
Maximum vertical coupling load (nose weight).	90 kgf (198 lbs)

FIXED HEIGHT RUNNING GEAR
Braked version, light 01 Category
7/41

Shipping weight.	750 kg (1653 lbs)
Maximum weight.	750 kg (1653 lbs)
Maximum horizontal towing force.	7,2 kN (1618 lbs)
Maximum vertical coupling load (nose weight).	75 kgf (165 lbs)

VARIABLE HEIGHT RUNNING GEAR
Braked version, light 01 Category
7/41

Shipping weight.	750 kg (1653 lbs)
Maximum weight.	750 kg (1653 lbs)
Maximum horizontal towing force.	12,1 kN (2720 lbs)
Maximum vertical coupling load (nose weight).	75 kgf (165 lbs)

WHEELS AND TYRES

Number of wheels. **7/26E, 7/31E, 7/41**	2 x $4^1/_2$ J x 13
Tyre size. **7/26E, 7/31E, 7/41**	155 R13
Tyre pressure. **7/26E, 7/31E**	2,4 bar (35 PSI)
Tyre pressure. **7/41 750kg** **7/41 900kg**	 2,4 bar (35 PSI) 2,7 bar (39 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.

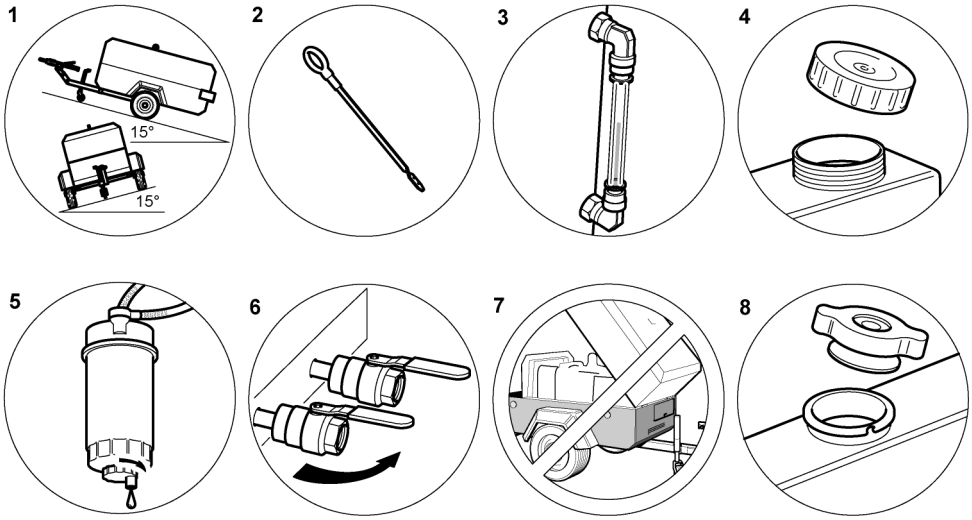
Ensure that the machine is positioned securely and on a stable foundation. Any risk of movement should be removed by suitable means, especially to avoid strain on any rigid discharge piping.

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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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)*

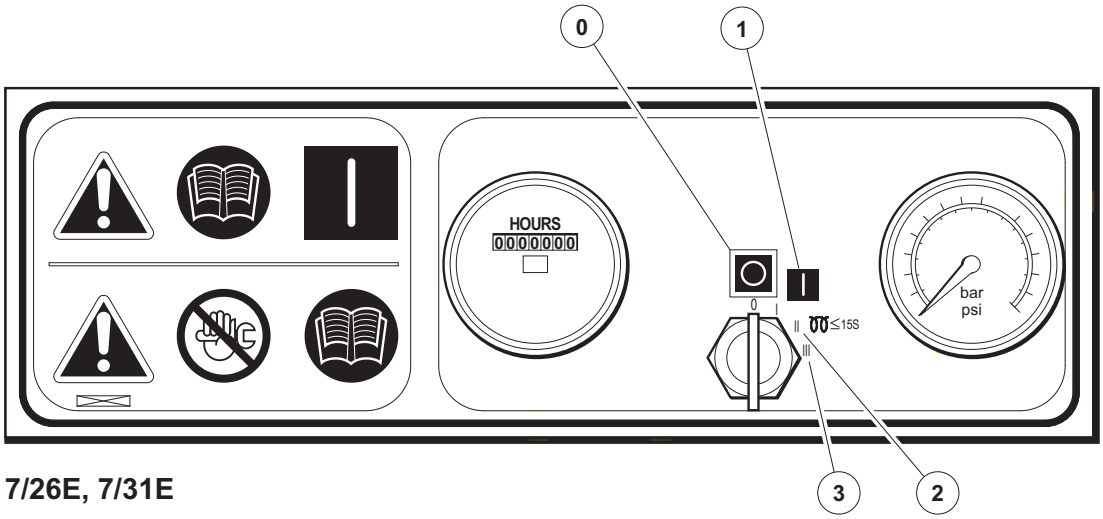
CAUTION: *When refuelling:*
- *switch off the engine.*
- *do not smoke.*
- *extinguish all naked lights.*
- *do not allow the fuel to come into contact with hot surfaces.*
- *wear personal protective equipment.*

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. Leave the service valve(s) open.

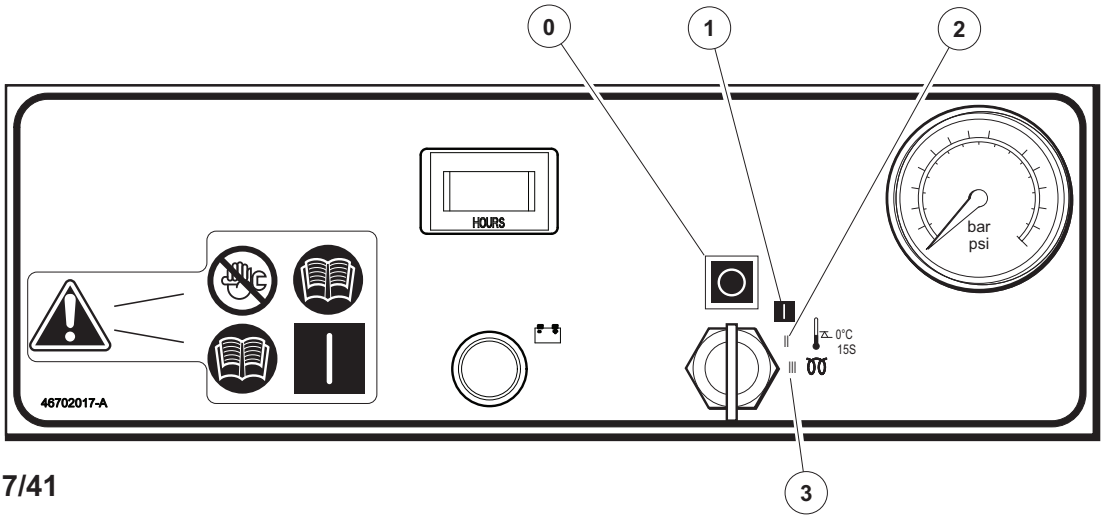
7. ***CAUTION:*** *Do not operate the machine with the canopy/doors in the open position as this may cause overheating and operators to be exposed to high noise levels.*

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

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.



7/26E, 7/31E



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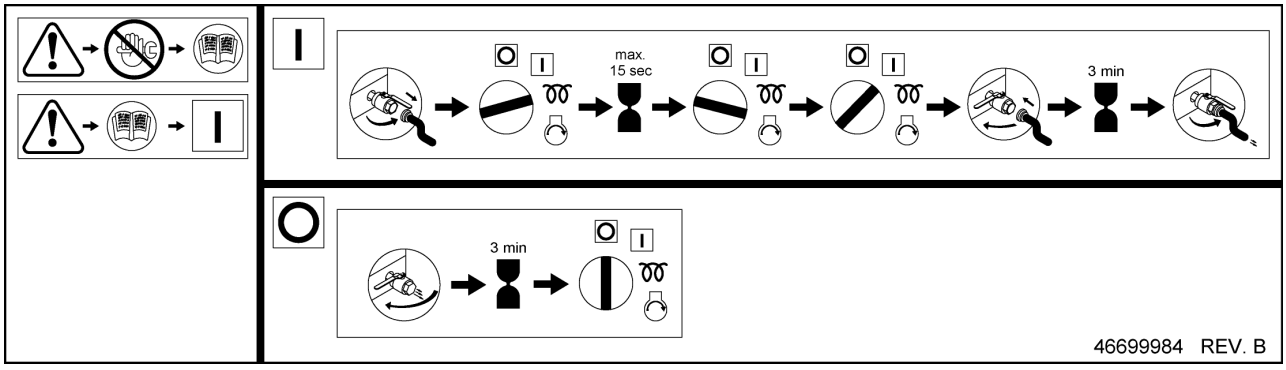

STARTING THE MACHINE

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.

1. Open the service valve fully, with no hose connected.
2. Turn the key switch to position *2* and hold for max 15 seconds to allow the air inlet heater to reach working temperature.
3. Turn the key switch to position *3* (engine start position).
4. Release to position *2* when the engine starts.
5. Release to position *1* when the alternator charge light is extinguished.
6. Close service valve as soon as engine runs freely.
7. Do not allow machine to run for long periods with service valve open.
8. Allow the engine to reach operating temperature.
9. 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 when the service valve is open and air is flowing from the valve.*

STOPPING THE MACHINE

1. Close the service valve.
2. Allow the machine to run unloaded for a short period of time to reduce the engine temperature.
3. 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.

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 SCHEDULE

	Initial 500 miles /850 km	Daily	Weekly	Monthly	3 Monthly. 250 hrs.	6 Monthly. 500 hrs	12 Monthly. 1000 hrs
Compressor Oil Level		C					
Engine Oil Level		C					
*Radiator 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					
Drain Water From Fuel Filters		D					
Coolant Leaks		C					
Radiator Filler Cap		C					
Air Cleaner Precleaner Dumps			C				
Fan/Alternator Belts			C				
Generator Drive Belt			C				
Battery Connections/Electrolyte			C				
Tire 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			
*Engine Rad/Oil Cooler Exterior				C			
Fasteners, Guards					C		
Air Cleaner Elements						R/WI	

*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.

	Initial 500 miles /850 km	Daily	Weekly	Monthly	3 Monthly. 250 hrs.	6 Monthly. 500 hrs	12 Monthly. 1000 hrs	18 Monthly. 1500 hrs
*Fuel/Water Separator Element						R		
Compressor Oil Filter Element						R		
Compressor Oil						R		
Engine Oil Change						R		
Engine Oil Filter						R		
*Water Pump Grease.							R	
*Wheels (Bearings, Seals, etc.)						C		
*Engine Coolant						C	R	
Fuel Filter Element						R		
*Injection Nozzle Check								C
Shutdown Switch Settings							T	
Scavenger Orifice & Related Parts							C	
Oil Separator Element							R	
*Feed Pump Strainer Cleaning.							C	
Coolant Replacement							R	
*Valve Clearance Check							C	
Lights (running, brake, & turn)		CBT						
Pintle Eye Bolts		CBT						
*Brakes	C				C			
*Brake linkage	C							
Emergency stop		T						
Fasteners		C						
Running gear linkage				G				
Safety valve					C			
Running gear bolts(1)					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.

	Initial 500 miles /850 km	Daily	Weekly	Monthly	3 Monthly. 250 hrs.	6 Monthly. 500 hrs	12 Monthly. 1000 hrs
Scavenge line						C	
Pressure system						C	
Engine breather element							C
Pressure gauge							C
Pressure regulator							C
Separator tank (2) exterior							CR
Lubricator (Fill)		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

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

CBT =check before towing.

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W I =or when indicated if earlier.

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

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.

c) (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 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.

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.

For 7/26E and 7/31E models, replace element O-ring in every reassembly.

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 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.

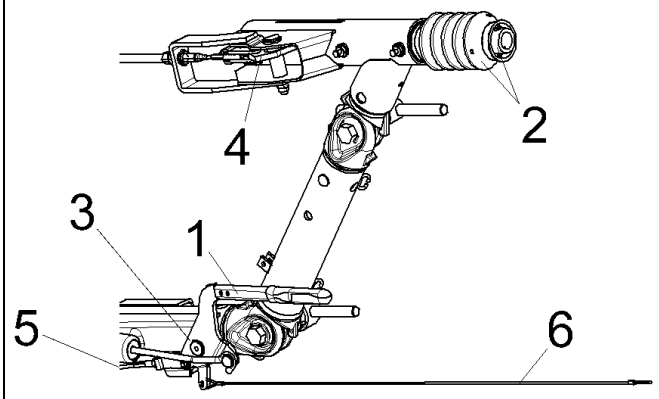
Adjusting the overrun braking system

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:

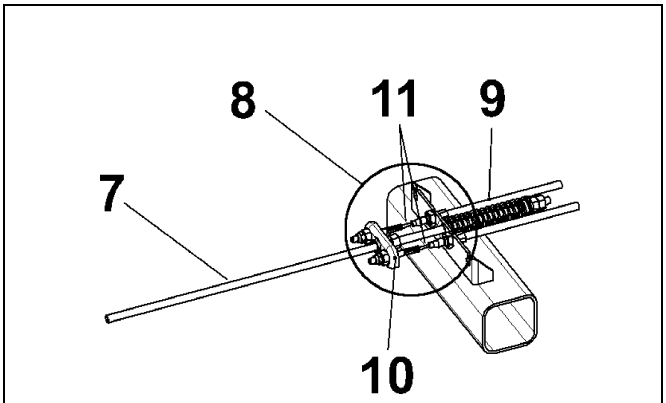
During the adjustment procedure always start with the wheel brakes.

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].

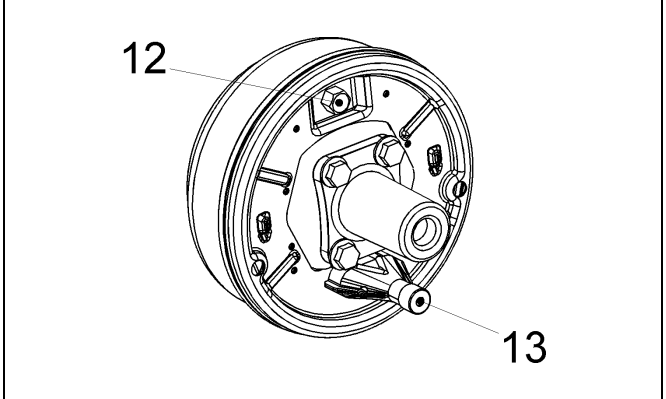
Check that brake actuators and cables [11] operate smoothly.



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 model

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

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).*
Periodically check the drawbar and axle to frame bolts for correct torque. Should any of the threaded frame inserts appear damaged then replace immediately with the right insert.

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*.

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.*

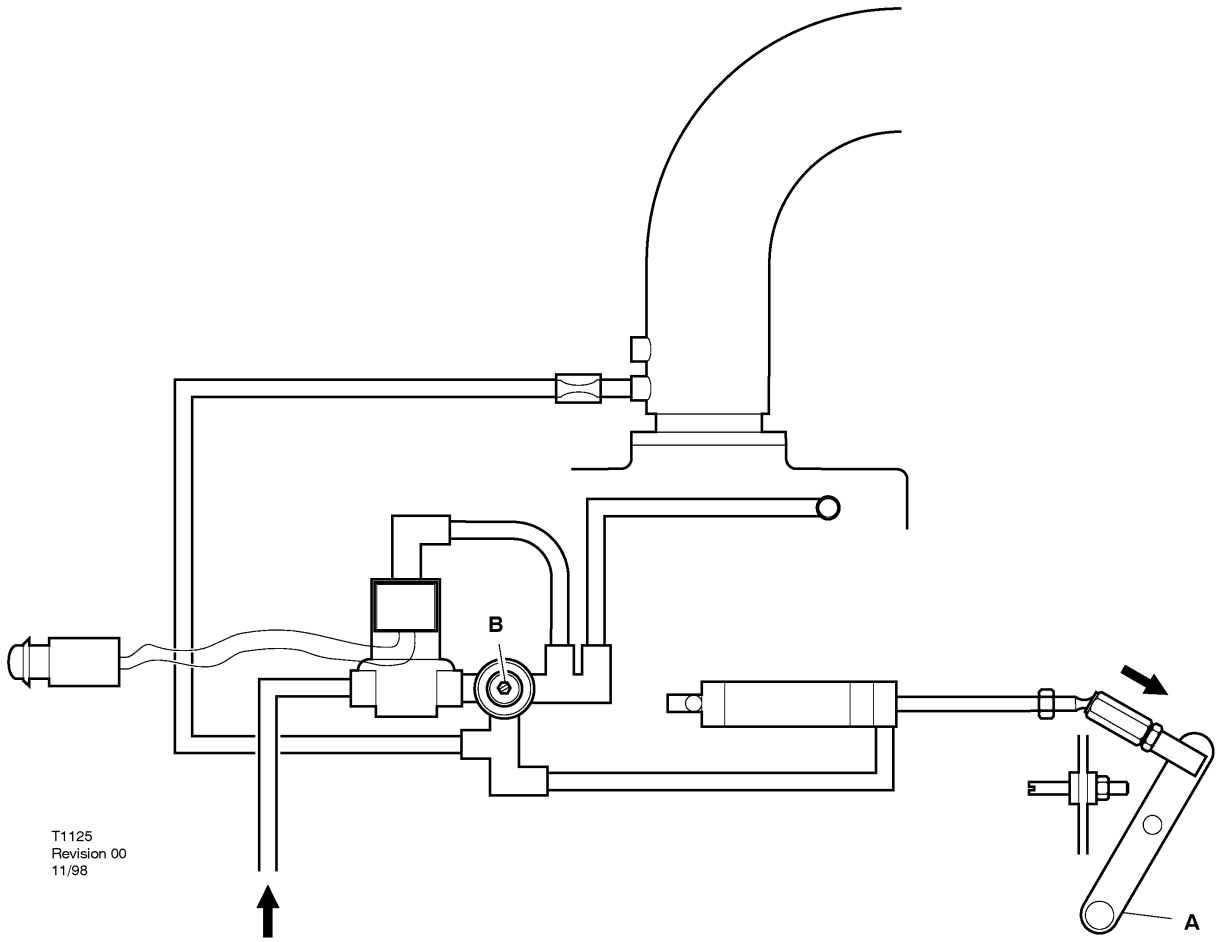
NOTE: Always specify PRO-TEC oil for use at all ambient temperatures above -23°C.

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.

A: Throttle arm

B: Adjusting screw

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

Inspect the throttle arm on the engine governor to see that it is extended in the full speed position when the engine is running at full-load speed and the service valve is fully open. (Refer to the *GENERAL INFORMATION* section of this manual).

Adjust the service valve on the outside of the machine to maintain 7 bar without the throttle arm moving from the full speed position. If the throttle arm moves away from the full speed position before 7 bar is attained, then turn the adjusting screw clockwise to increase the pressure. Optimum adjustment is achieved when the throttle arm just moves from its full speed position and the pressure gauge reads 7,2 bar.

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

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

TORQUE SETTING TABLE

	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
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

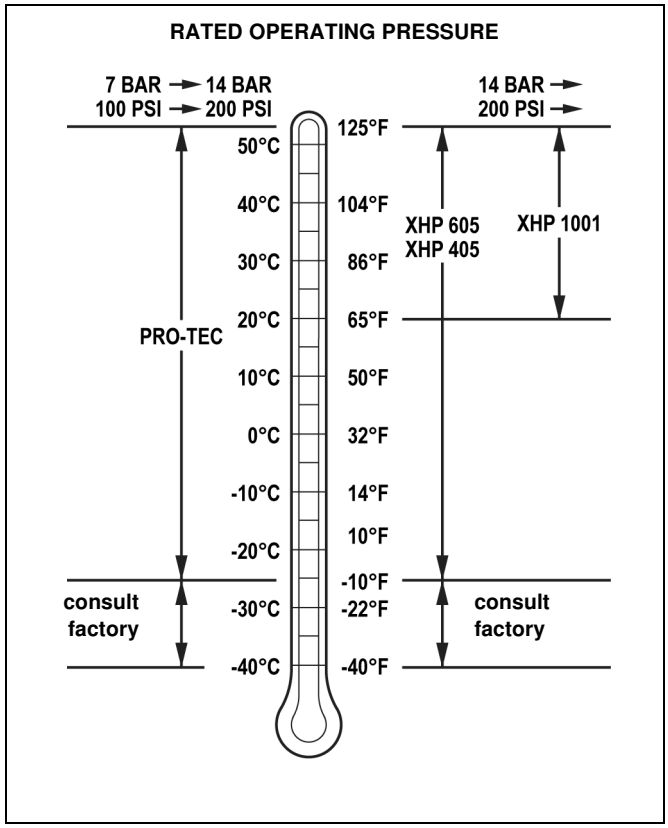
Portable Compressor Fluid Chart

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.

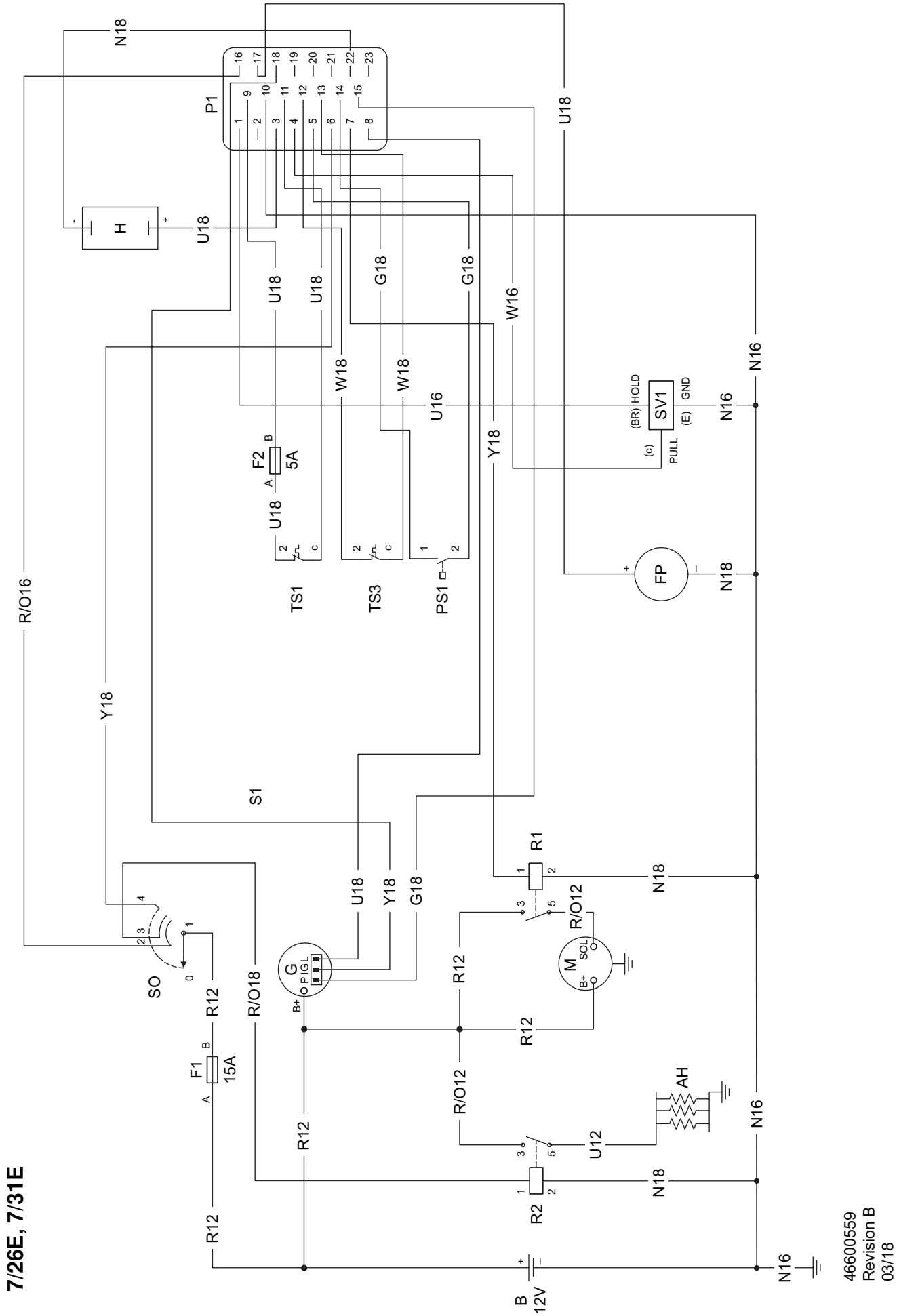
Design operating pressure	Ambient temperature	Compressor oil specification
7 bar to 14 bar (100 psi to 200 psi)	-23°C to 52°C (-10°F to 125°F)	Preferred: **PRO-TEC** Alternate: ISO Viscosity Grade 46 with rust and oxidisation inhibitors, designed for air compressor service.
14 bar and above (200 psi and above)	-23°C to 52°C (-10°F to 125°F)	Preferred: **XHP 605** Alternate: **XHP 405** ISO Viscosity Grade 68 Group 3 or 5 with rust and oxidisation inhibitors, designed for air compressor service.
	18°C to 52°C (65°F to 125°F)	Preferred: **XHP 605** **XHP 1001**



Doosan preferred fluids - the 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		
PRO-TEC engine oil	46652105 (20.0 Litres)	46652106 (208.0 Litres)
Stage 3B and 4 engine oil	46551222 (20.0 Litres)	46551223 (208.0 Litres)
PRO-TEC compressor oil	89292973 (20.0 Litres)	89292981 (208.0 Litres)
XHP 605 compressor oil	22252076 (19.0 Litres)	22252050 (208.2 Litres)
XHP 1001 compressor oil	-	35300516 (208.2 Litres)
XHP 405 compressor oil	22252126 (19.0 Litres)	22252100 (208.2 Litres)

Note: Stage 3B & Stage 4 engines are required to use CJ-4/ACEA E9 engine oil only, failure to do so will result in engine after treatment damage. Please read the engine manual for more details.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P1
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F2
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TS1
TS3
PS1
SV1
HOLD
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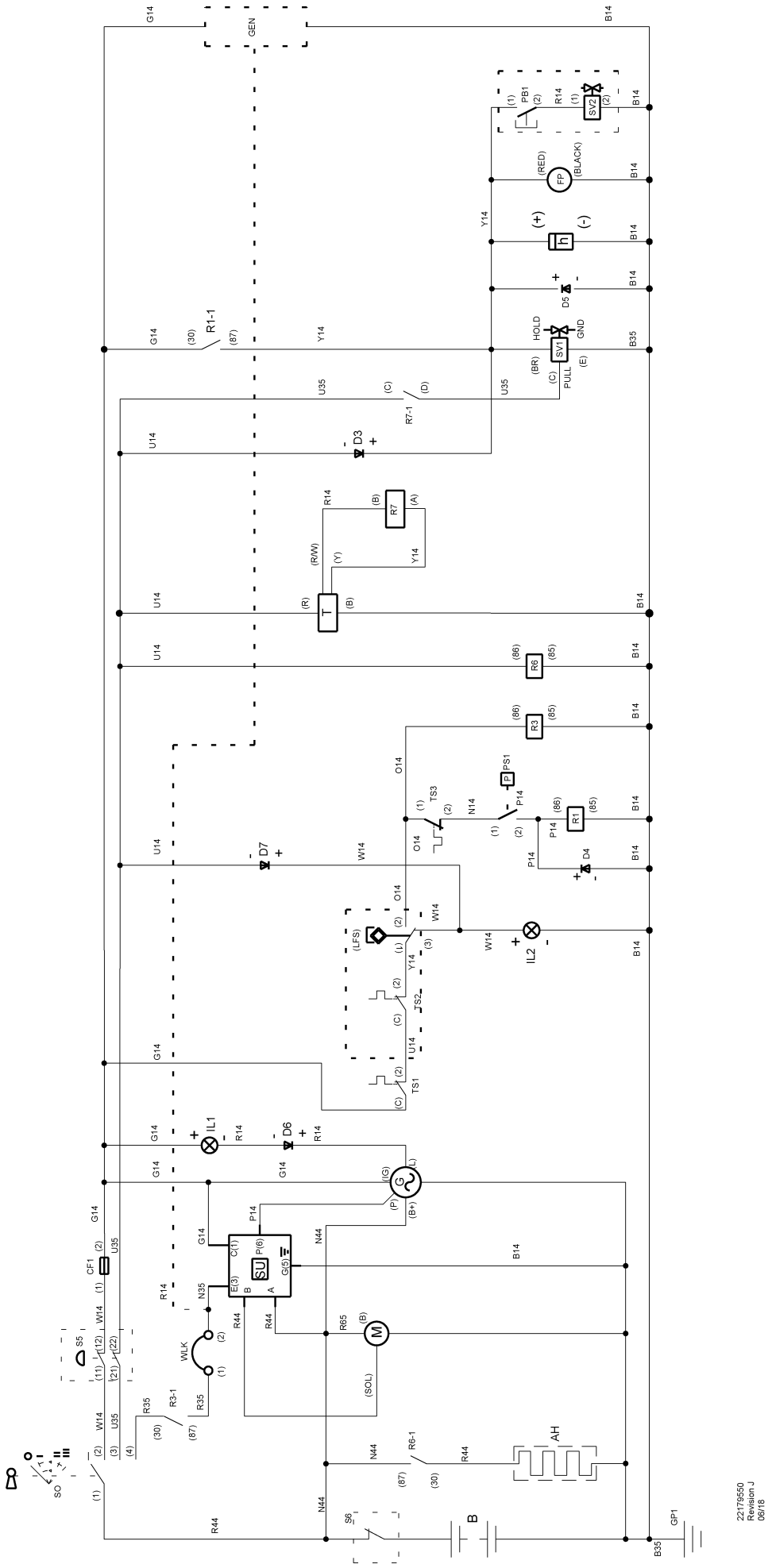
M
SOL
AH
R1
R2
B
12V
N18
U18
G18
W18
W16
U16
Y18
R/O16
R/O18
R/O12
R12
U12
N16

KEY

AH	Air heater
B	Battery 12V
F1	Fuse 25A
F2	Fuse 5A
G	Alternator 12V
H	Hourmeter
LFS	Switch, low fuel (Option)
LED1	High air temperature, airend
LED2	High water temperature, engine
LED3	Low oil pressure, engine
LED4	Low fuel
LED5	No charge
M	Starter motor
P1	Connector, minicontroller
P2	Connector, minicontroller (Option)
PS1	Engine oil pressure switch
R2	Engine heater relay 7/26E 108475->
7/31E 319789->
R3	Relay, crank
SO	Key-switch
SV1	Solenoid, fuel
TS1	High air temperature switch (airend)
TS3	High water temperature switch (engine)

B	Black
G	Green
N	Brown
O	Orange
R	Red
U	Blue
W	White
Y	Yellow


7/41
GEN
R1-1
R7-1
D3
D5
D7
D6
D4
R7
R6
R3
R1
T
PB1
SV2
SV1
FP
HOLD
PULL
GND
PS1
TS3
TS2
TS1
IL1
IL2
(LFS)
WLK
S5
S6
CF1
SU
M
(SOL)
AH
R3-1
R6-1
B
GP1
SO
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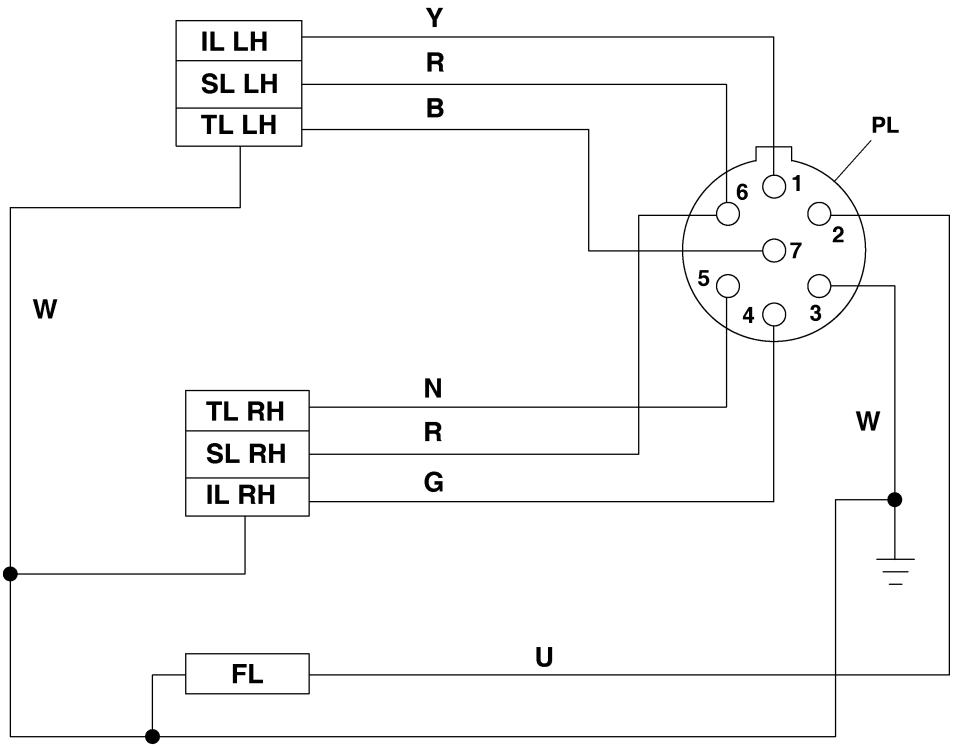
KEY

B	Battery 12V
CF1	Control fuse 5A
D1-7	Diode, blocking
G	Alternator 12V
GEN	Generator (Option)
AH	Air heater
h	Hourmeter
IL1	Lamp, No - charge
IL2	Lamp, low fuel
LFS	Switch, low fuel level (Option)
M	Starter motor
PB1	Pushbutton, load / unload (Option)
PS1	Engine oil pressure switch
R1	Relay, control / shut–down
R3	Relay, crank
R6	Relay, air heater
R7	Relay, fuel solenoid
SO	Key-switch
SV1	Solenoid, fuel
SV2	Solenoid, load / unload(Option)
TS1	High air temperature switch (airend)
TS2	High air temperature switch (discharge)(Option)
TS3	High water temperature switch (engine)
WLK	Link
T	Timer
SU	Safety unit
FP	Fuel pump

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

SCHEMATIC DIAGRAM FOR EUROPEAN CE LIGHTING SYSTEM - 7 PINS



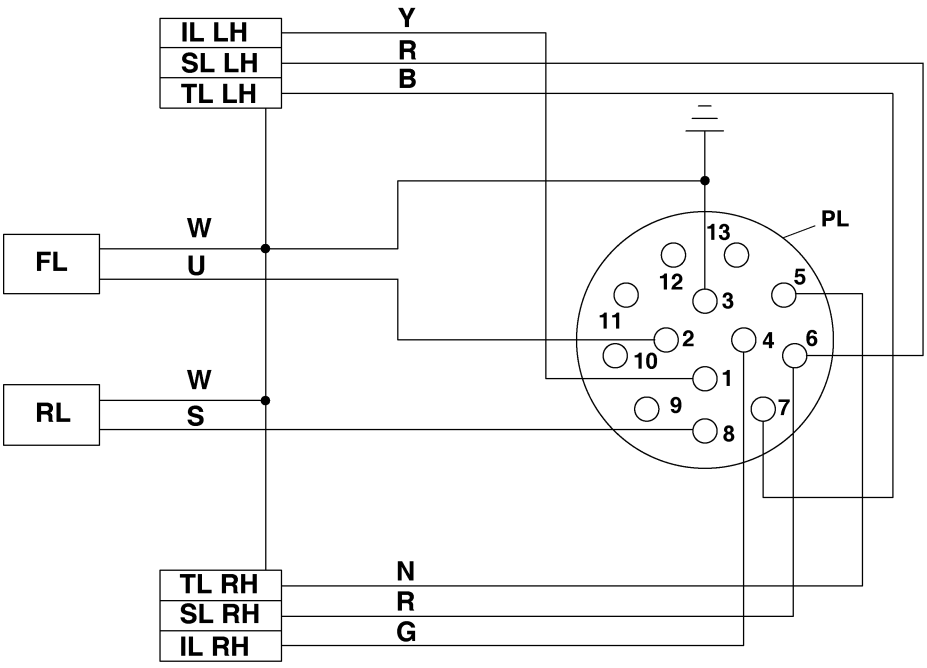
T2404
Revision 00
09/08

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, STEEL CANOPY OPTION



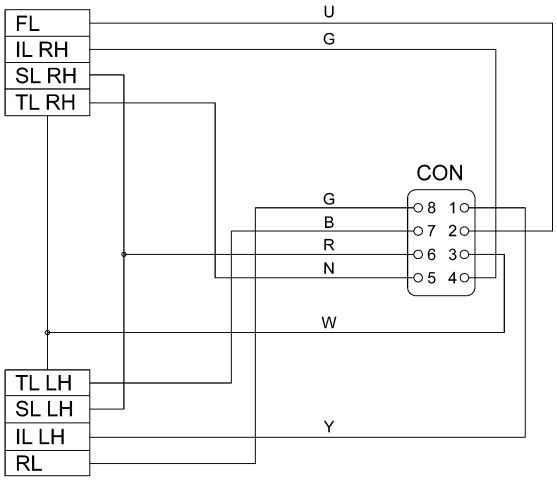
T2405
Revision 00
09/08

KEY

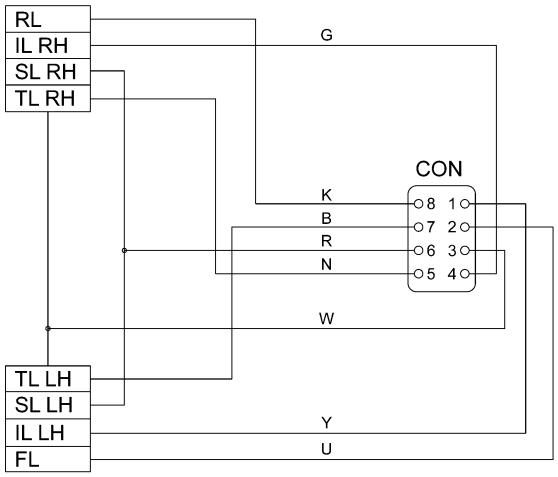
IL LH	Indicator light - left hand
IL RH	Indicator light - right hand
FL	Fog light
RL	Reverse light
SL LH	Stop light - left hand
SL RH	Stop light - right hand
TL LH	Tail light - left hand
TL RH	Tail light - right hand
PL	Plug

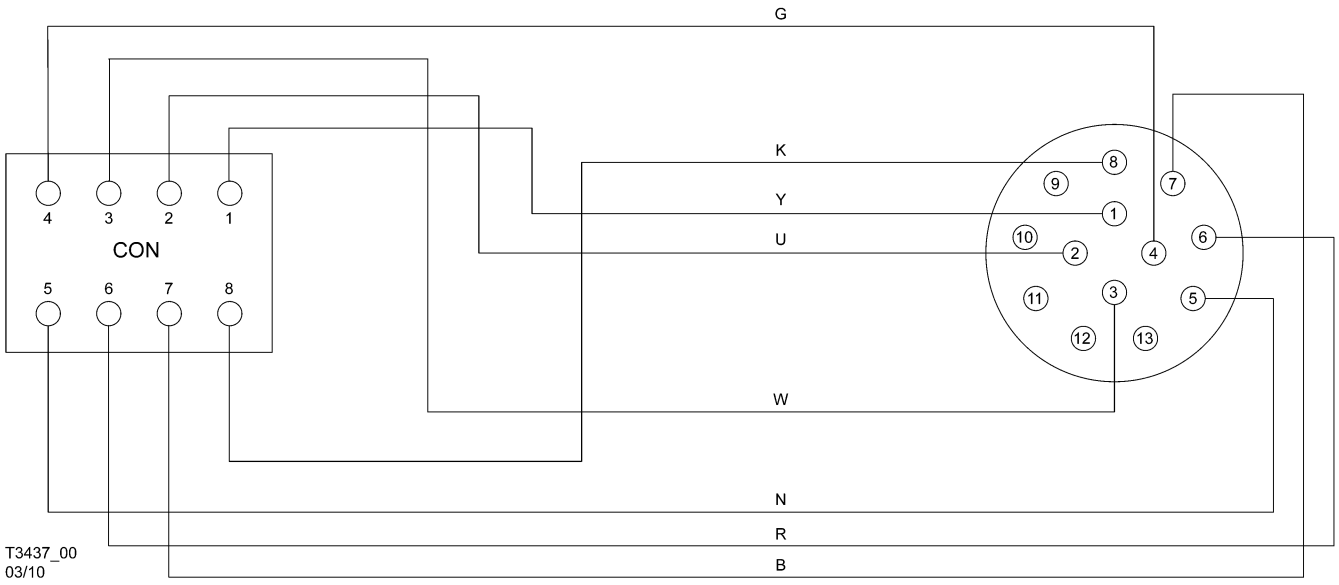
B	Black
G	Green
K	Pink
N	Brown
O	Orange
P	Purple
R	Red
S	Grey
U	Blue
W	White
Y	Yellow

Schematic Diagram for European UK Lighting System: 13 pin reverse light, polymer canopy option.



Schematic Diagram for European Continental Lighting System: 13 pin reverse light, polymer canopy option.



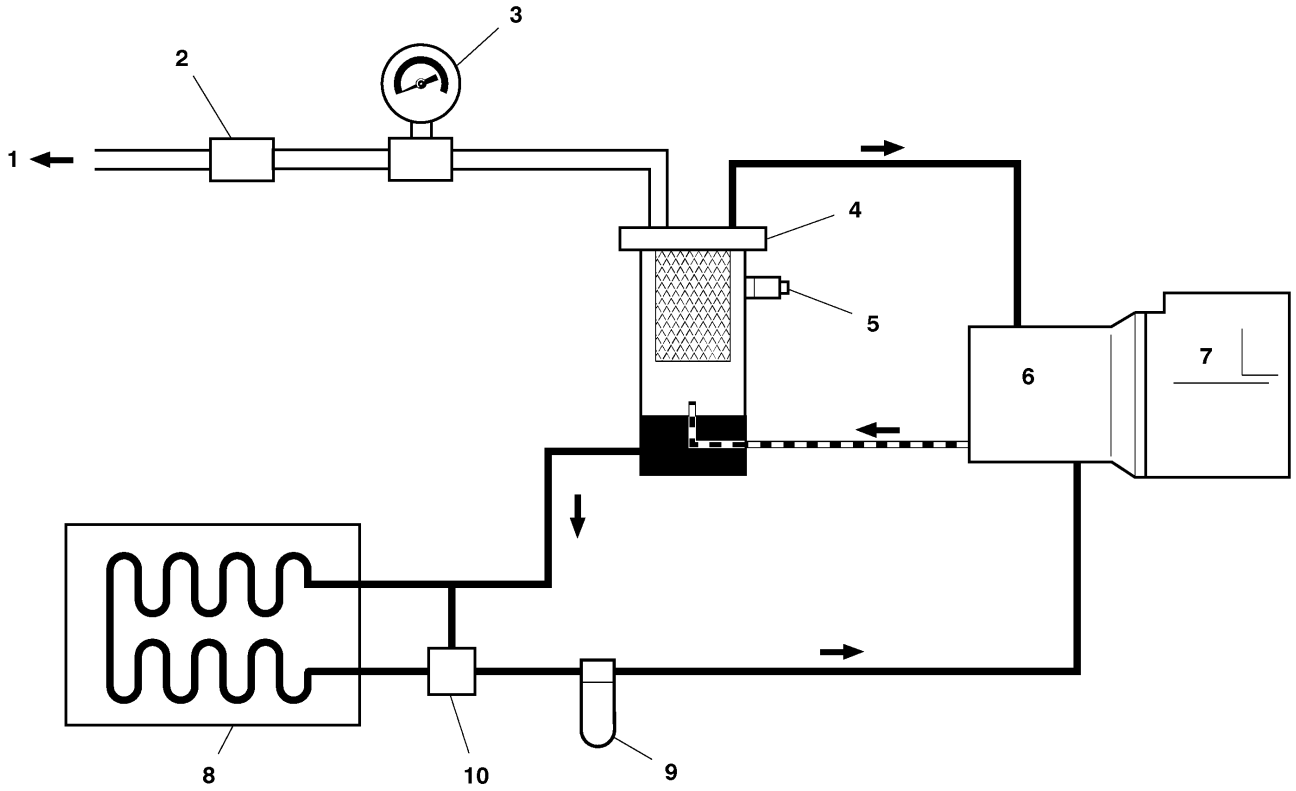


SCHEMATIC DIAGRAM FOR EUROPEAN CE LIGHTING SYSTEM

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
CON	Rear view of the connector

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

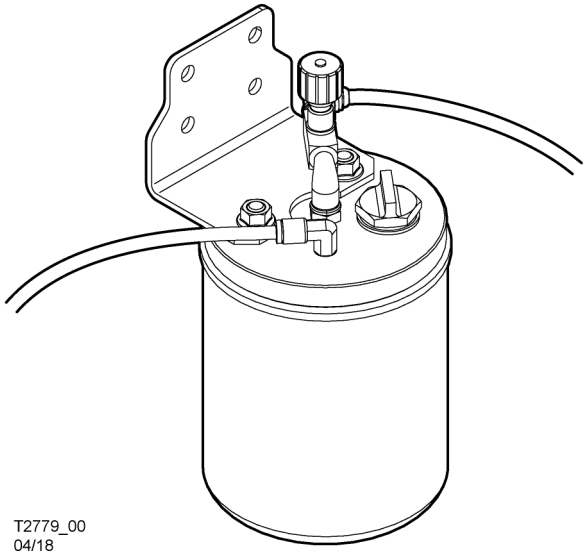
KEY

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

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 speed cylinder and stop position.
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.	*Incorrect throttle arm setting.*	Check the engine speed setting.
	Faulty regulator valve.	Check the regulation system.
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 air cylinder.
Excessive vibration.	*Engine speed too low.*	See "*Engine speed too low*"
Refer also to the *engine section of this manual.*		
Air discharge capacity too low.	*Engine speed too low.*	Check the air cylinder 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.

FAULT	CAUSE	REMEDY
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.

OPTION - LUBRICATOR



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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 fill as necessary.

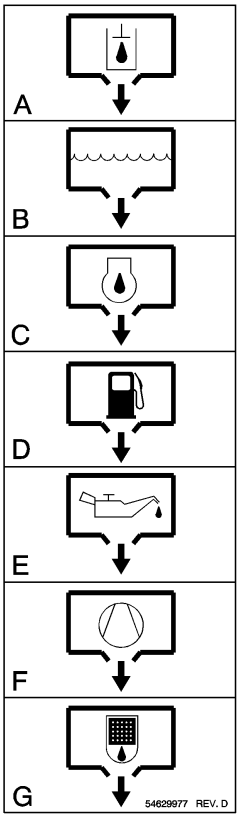
MAINTENANCE

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.

OPTION - BUNDED BASE



DESCRIPTION

This machine can be fitted with bund equipment to contain leakages and spillages, which occur within the machine enclosure.

The bund will contain all fluids normally installed in the machine, plus an additional 10%.

When fitted with bund, the machine must only be operated when level. Rain water dropping through the top discharge grille on the canopy is contained at the rear inner space of the machine and must be drained daily. This space is sealed from the front inner space of the machine.

Drains for engine coolant, engine oil and compressor oil are located at the front of the machine.

A drain for the rear space of the unit is located at the rear left side behind the left hand fender.

DRAINING OF CONTAMINATED FLUIDS

Contaminated fluid must be removed by authorized personnel only. Captured fluids can be drained from the bund by removing the plug or uncoupling the flexible pipe secured at the left side of the machine. The plug must be re-sealed after draining. The flexible pipe must be re-secured after draining.

DRAINAGE OF MACHINE FLUIDS

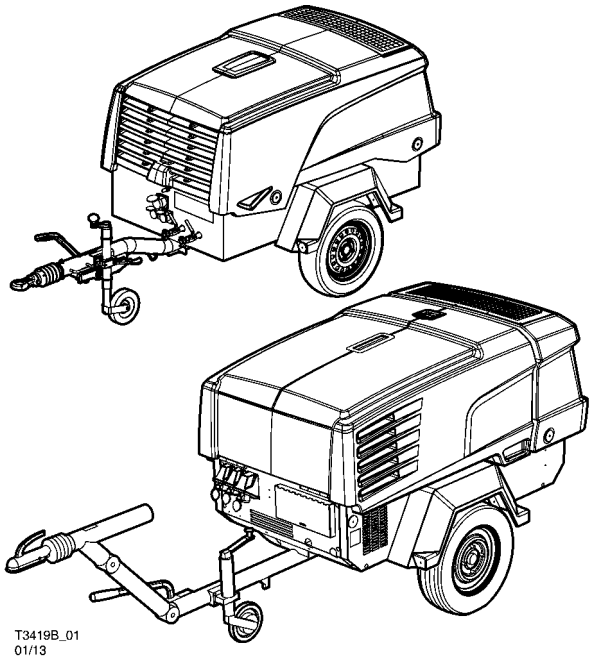
During maintenance operations drain machine fluids using the drain ports indicated.

Remove fuel tank to drain.

WARNING: Major leakages or spillages must be drained before the machine is towed.

WARNING: The rear space of the unit must be drained daily of any rainwater. Check and ensure correct tilt angle is attained during draining.

OPTION - POLYMER CANOPY



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GENERAL INFORMATION

Both hinged and fixed canopies are made of Linear Low Density Polyethylene - LLDP.

Use only cleaning agents suitable for LLDP material. “PVC Cleaner” is recommended.

Never use cleaning agents which can cause chemical damage of the canopy surface.

Never use sharp cleaning tools or abrasive cleanings agents. They may cause scratches or other mechanical damage of the canopy surface.

Temperatures above 80C may cause heat damage of the canopy.

Do not expose the units with polymer canopy option to temperatures above 80C.

The inner surface of the polymer canopy is covered with a heat protective surface. This protects the canopy from heat generated within the machine, especially engine exhaust. Removal or failure of this heat protection may cause canopy heat damage.

Do not use high pressure water jet cleaning directly at the decals area. It may cause damage or removal of the decals.

OPTION - GENERATOR

SAFETY

Refer to the SAFETY SECTION in this manual.

GENERAL INFORMATION (6,5 kVA - 7/26E, 7/31E, 7/41)

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

De-rating factors for intermittent load:

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

GENERAL INFORMATION (8,5 kVA - 7/31E, 7/41)

Rated output	6,8 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	8,5 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℃	Continuous
Air in temp 30℃	8,1 KVA @ 0.8 p.f continuous
Air in temp 46℃	6,4 KVA @ 0.8 p.f continuous

De-rating factors for intermittent load:

Air in temp 20-35℃,55 mins/hr @ 0.8, 5 mins off load
Air in temp 35-40℃,50 mins/hr @ 0.8, 10 mins off load
Air in temp 40℃ + ,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.*

When the switch is in the *Generator* position the normally-open solenoid valve switches to the closed position and air in the line to the engine speed control cylinder vents to the atmosphere via the solenoid exhaust port. This causes the cylinder to move to its maximum speed position. The engine will now maintain maximum speed as the air line from the pressure regulator valve to the solenoid valve is now closed.

When the switch is returned to the *Compressor* position, the solenoid valve is de-energised thus returning it to its normally open position. The engine speed cylinder would then respond via the pressure regulator valve 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)

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.

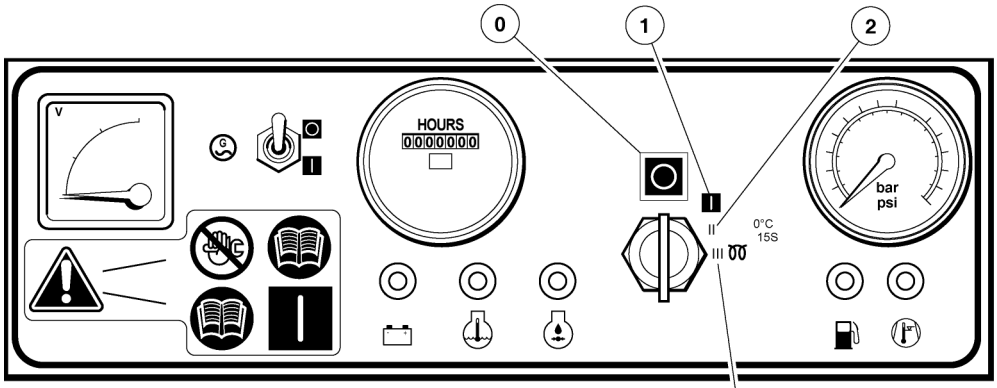
Ensure that the safety procedure is followed at al times.

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

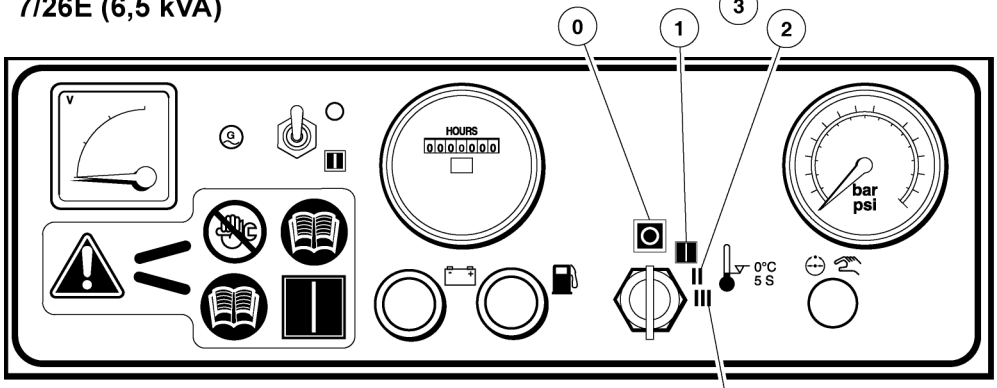
Before starting the engine and switching in the generator load, ensure that :-

- The system has been inspected and earthed.
- No persons are in a hazardous position.
- Any warnings necessary have been suitably displayed (where applicable).

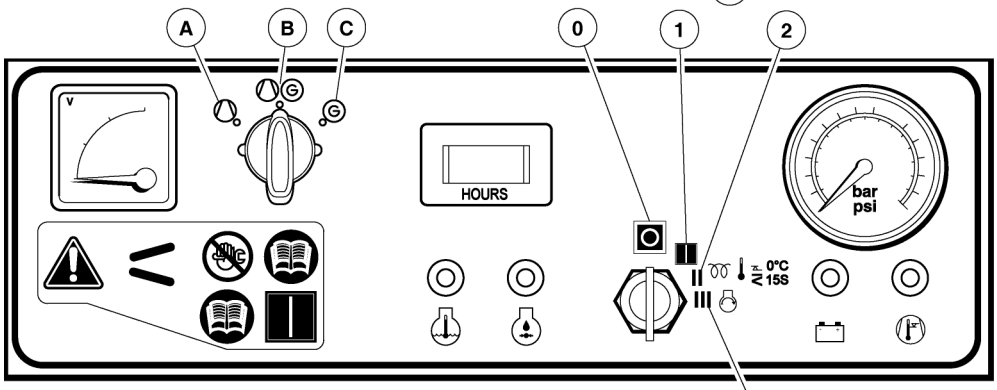
Ensure compressor / generator mode switch is set to compressor.



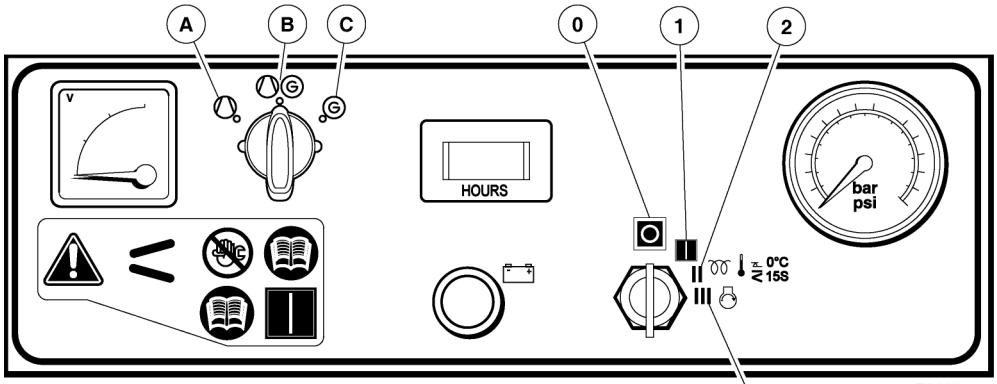
7/26E (6,5 kVA)



7/31E, 7/41 (230V, 230/400V 6,5 kVA)



7/31E (110V 8,5 kVA)



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7/41 (110V 8,5 kVA)

Key to compressor / generator mode switch

A	Selects operation of compressor only.
B	Selects operation of compressor and generator together.
C	Selects operation of generator only.

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 or the compressor/ generator position.*

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

1. Turn the key switch to position *1*, the alternator charge light will illuminate.
2. Turn the key switch to position *3* (engine start position).
3. Release to position *2* when the engine starts.
4. Release to position *1* when the alternator charge light is extinguished.

NOTE: *7/31E and 7/41 machines equipped with an 8,5kVA single phase 110V generator have a three mode selector switch:*
Position A selects operation of the compressor only.
Position B selects operation of the compressor and generator together.
Position C selects operation of the generator only.

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

1. Close the service valve.
2. Allow the machine to run unloaded for a short period of time to reduce the engine temperature.
3. 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.

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.

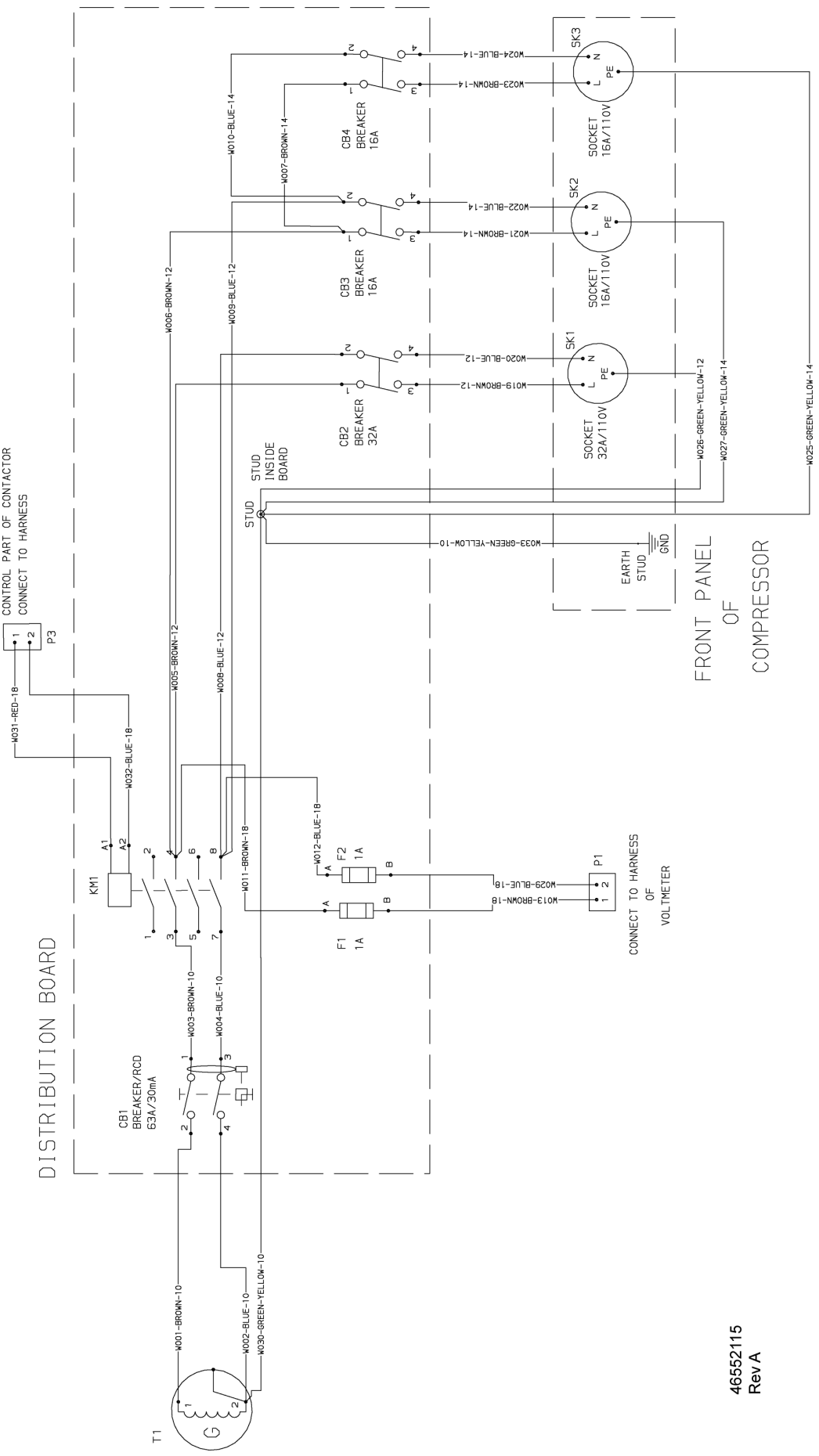
For alternator maintenance refer to Mecc Alte operation and maintenance manual.

FAULT FINDING

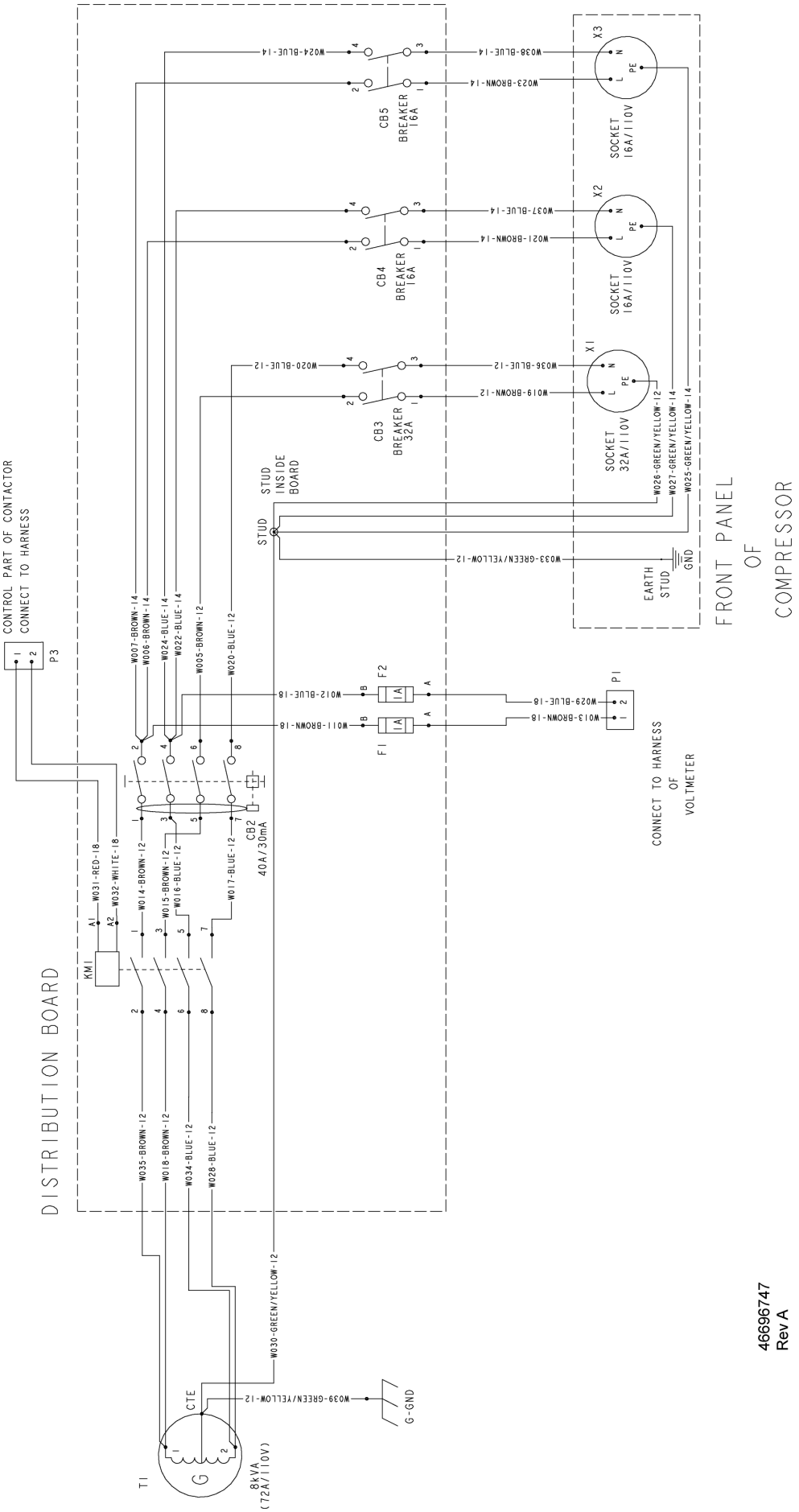
FAULT	CAUSE	REMEDY
No output.	*Load plugs not fitted into socket outlets correctly.*	Ensure that the load plugs are fitted correctly into the socket outlets.
No output.	*Loose connection.*	Remove end cover and terminal box lid and check for loose connections. Rectify the fault as necessary.
	Faulty rectifier.	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.

FAULT	CAUSE	REMEDY
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*		

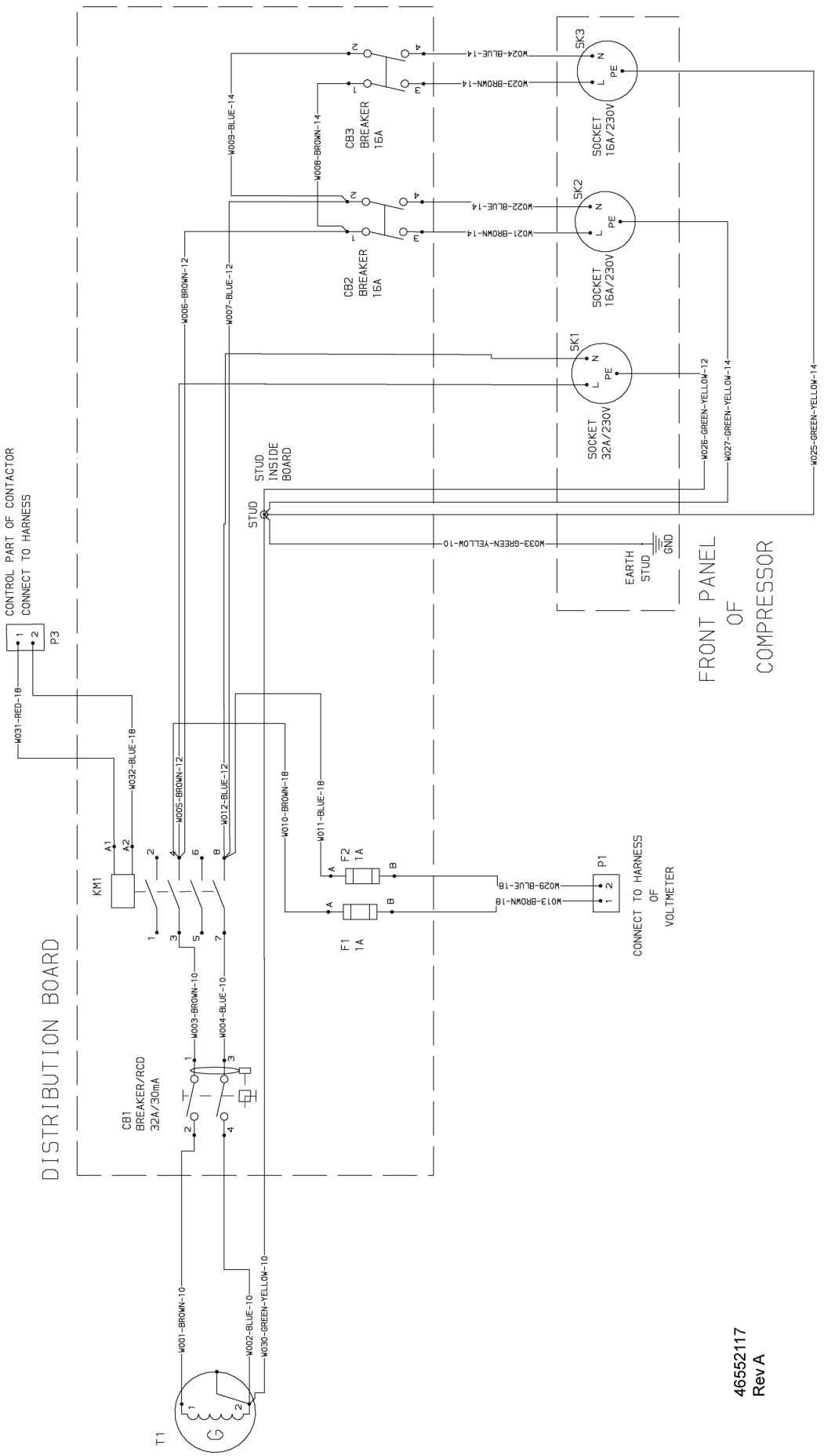
A.C. Electrical Power Schematic Diagram. 7/26E (110V 6kVA)



A.C. Electrical Power Schematic Diagram. 7/31E, 7/41 (110V 8,5kVA)

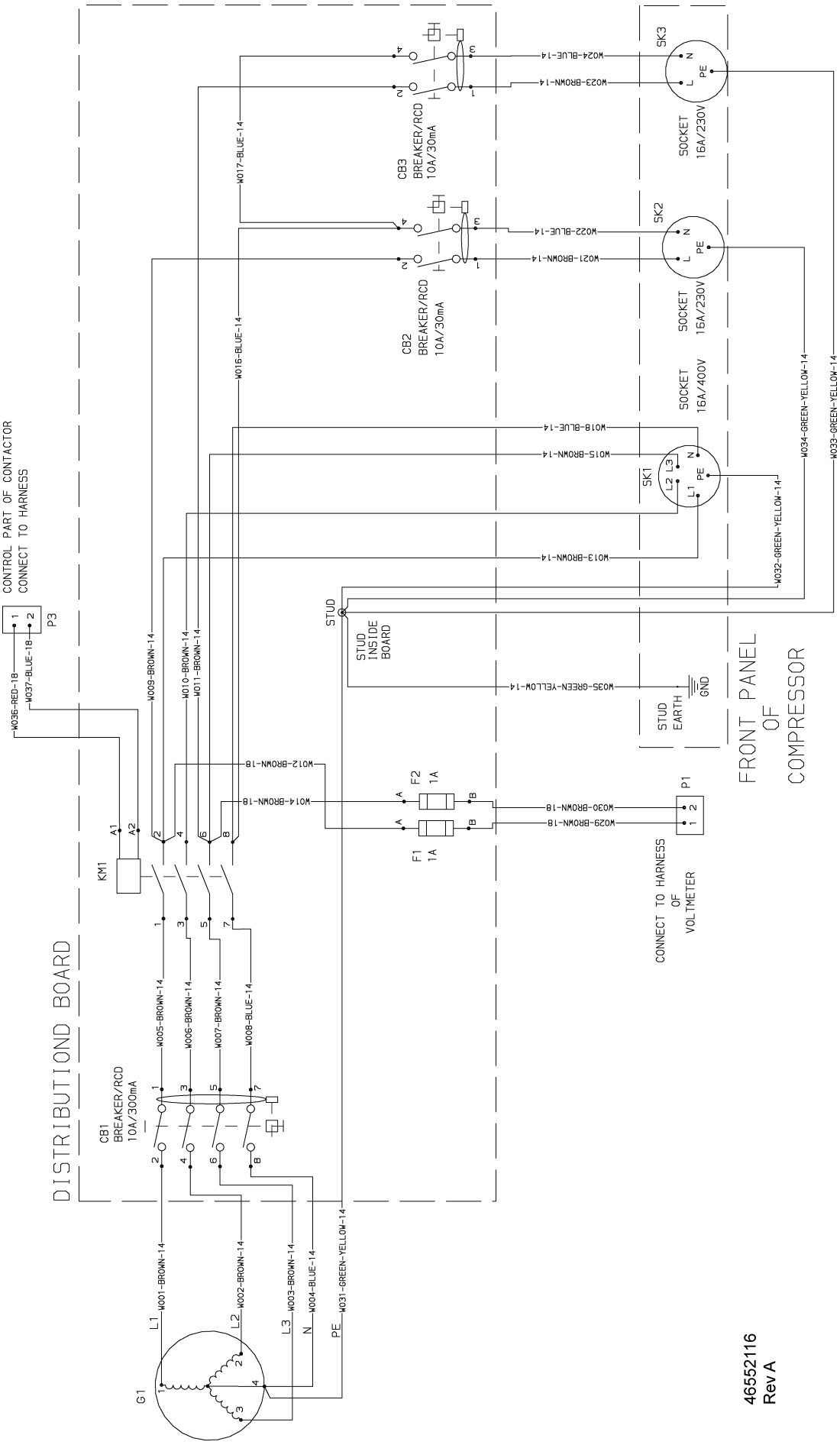


A.C. Electrical Power Schematic Diagram. 7/26E, 7/31E, 7/41 (230V 6kVA)



46552117
Rev A

A.C. Electrical Power Schematic Diagram. 7/26E, 7/31E, 7/41 (400/230V)



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Rev A

OPTION - COLD START for -30°C

DESCRIPTION

The cold start option serves to improve starting conditions in winter operation at ambient temperatures from -10°C to -30°C. For this purpose the unit is equipped with an independent coolant heater.

SAFETY

Compressor

With regard to the possibility of the regulation system freezing at ambient temperatures below 0°C, pay attention to the required warm up time. Do not apply full load to the engine at ambient temperatures below -10°C before completing the warm up time.

Coolant heater

The heater **must not** be operated in the following situations:

- In filling stations and tank stock.
- In places where explosive vapors or dust may build up (e.g. near fuel, coal, wood dust or cereal stores).
- In enclosed rooms (e.g. garages), not even via the timer.

The heater **must not:**

- be exposed to temperatures of more than 120°C (storage temperature), otherwise the electronics may suffer permanent damage.

The heater **must:**

- be operated at the nominal voltage specified on the rating plate.
- be disabled by removing the fuse if smoke develops, if unusual noises are heard or if there is a smell of fuel. The heater must not be restarted until the unit has been checked by trained personnel.
- be operated at least once per month for 10 minutes, with the engine cold.
- be inspected by a specialist at the beginning of the winter season or earlier.

GENERAL INFORMATION
(differences for Cold start -30°C)

Compressor

Operating ambient temperature.-30_C TO +46_C (-22_F TO 115_F)

Oil capacity (7/26E), (7/31E)7,5 litres (2 US GAL)

Oil capacity (7/41)8,5 litres (2,25 US GAL)

LUBRICATING OIL SPECIFICATION
(for the specified ambient temperatures).

Above -30°C (-22°F)

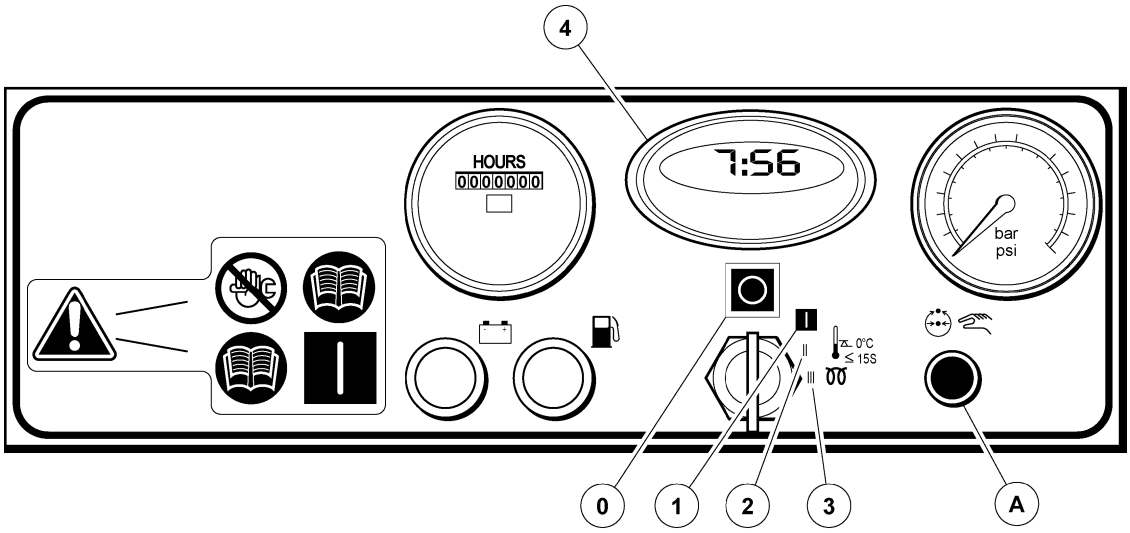
Compressor - approved:
Mobil ATF SHC, SAE 10W

Engine - approved:
Mobil Delvac 1 5W-40, SAE 5W-30, API CD, CF, CF-4, CI-4

FUEL SPECIFICATION

-10°C to -20°C (14°F to -4°F
Required: EN 590: 1996 Grade 1

-20°C to -30°C (-4°F to -22°F
Required: EN 590: 1996 Grade 2



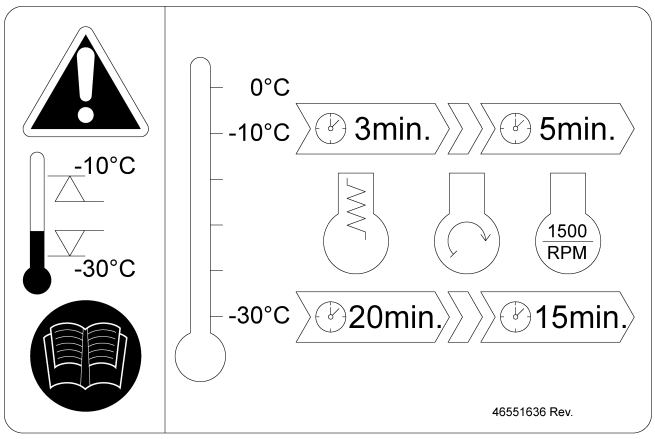
T2410CS_00
03/10

OPERATING INSTRUCTIONS
(differences for Cold start -30°C (-22°F))

Starting the machine
(At ambient temperature -10°C to -30°C (14°F to -22°F))

- Read carefully the Operation and maintenance instructions Thermo Top E and the Operation instruction of the Timer 1533 before operating the heater.
- Switch on the coolant heater via the Timer 1533 (4). The heater start can be done automatically at the pre-set time on the Timer 1533 (4).
- Warm up the engine for at least 10 to 20 minutes depending on the ambient temperature (-10°C to -30°C (14°F to -22°F)).
- Open the service valve fully, with no hose connected.
- Turn the key switch to position 2 and hold for 15 to 20 seconds to allow the air inlet heater to reach working temperature.
- Turn the key switch to position 3 (engine start position). Hold in this position for no longer than 20 seconds. If the engine does not fire wait 30 seconds before the next start attempt.
- Release to position 2 when the engine starts.
- Close service valve as soon as engine runs freely.
- Do not allow machine to run for long period with service valve open
- Switch of the coolant heater. Do not allow the coolant heater to run together with the engine
- Let the engine run at idle speed for at least 5 minutes for -10°C (14°F) ambient temperature, to 15 minutes for -30°C (-22°F) ambient temperature
- After this warm up period it is safe to apply full load to the engine. Use button A “Push after warm up” on the instrument panel to load the engine (Optional)
- The cold start option is equipped with a temperature sensor on the separator cover which does not allow the machine to apply full engine load until the temperature exceeds -10°C (14°F)

DECALS



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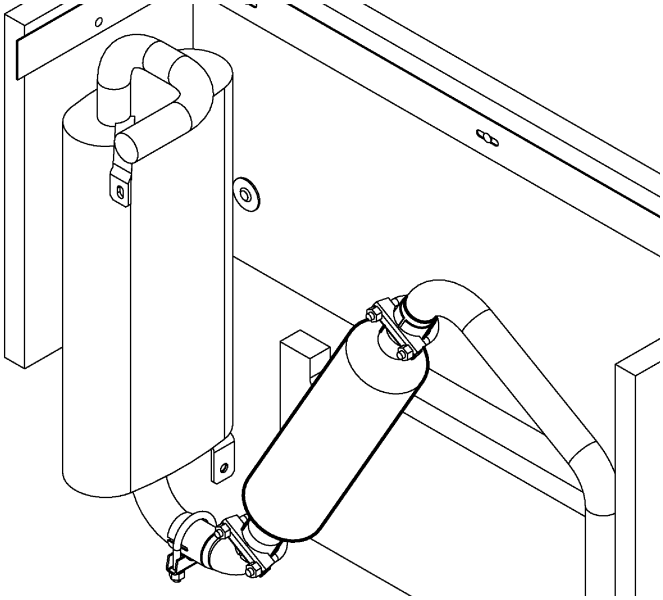
03/10

Warm up before loading engine
(For ambient temperature -10°C to -30°C (14°F to -22°F))

OPTION - SPARK ARRESTOR



DESCRIPTION

Diesel Engine exhaust spark arrestors are a key safety feature for both hazardous area and lower risk diesel engine applications where a stray spark may cause ignition of combustible material. Virtually all legislation regarding the operation of a diesel engine in a hazardous area includes a mandatory requirement to fit a tested and approved exhaust spark arrestor.

MAINTENANCE

Daily: Examine the spark arrestor for any sign of gas leakage, cracks or significant areas of damage, i.e. dents of more than a few millimetres in depth.

Three Monthly: Remove spark arrestor. Tap with a soft mallet to loosen any internal deposits and shake out. Also by shaking check for any loose internal baffles.

Six Monthly (or 1500 hours operation, whichever is sooner): Examine the exhaust discharge in darkness whilst repeatedly loading and accelerating the engine. If any sparks are observed, the spark arrestor is not suitable for further use.

NOTE: Ensure adequate ventilation if this check is carried out in an enclosed area.

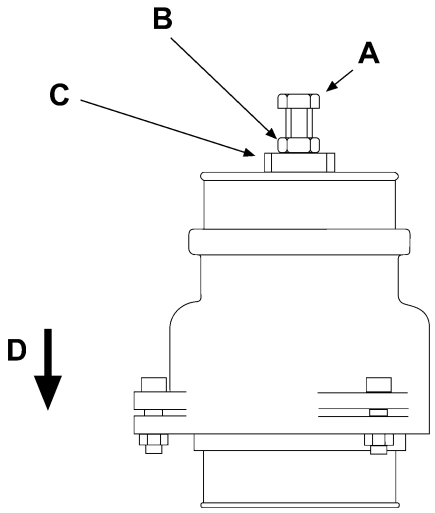
NOTE: The engine must not be put back into service until any problems identified by the above checks are rectified.

OPTION - OVERSPEED (CHALWYN) VALVE

DESCRIPTION

Chalwyn valves provide emergency overspeed shutdown protection for diesel engines and are the most effective way of preventing a runaway situation. The valves completely block the engine air intake system, cutting off an uncontrolled external fuel source and the air required to keep the engine running.

OPERATING INSTRUCTIONS



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. Basically rotating the adjuster clockwise will increase the engine speed at which automatic shutdown occurs.

1. Start engine. Slowly accelerate. Note speed at which shutdown occurs.
2. Remove hose at air inlet to Chalwyn valve to expose the adjuster and locknut.
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 shutdown 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.

Then either:

A. Use the results of shutdown 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 shutdown 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.

MAINTENANCE

Three Monthly:

1. Disconnect the 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 that there is no excessive wear and that the valve moves smoothly over its complete operating stroke. DO NOT LUBRICATE.
4. Refit the valve. Check valve setting.

NOTE: The recommended routine maintenance period is three months. This period is dependent on the operating conditions of the engine and, by experience, may need to be varied.

NOTE: 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 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.

Insufficient Adjustment - should there be insufficient adjustment available to set the required overspeed trip-point, the outlet locknut should be released and the outlet adjuster rotated anticlockwise by four turns. The outlet locknut should then be treated with a thread lock adhesive and security tightened. Further adjustment to the inlet adjuster as per above instructions is then continued.

3TNV82A, 3TNV88, & 4TNV88 ENGINES

CONTENTS

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.

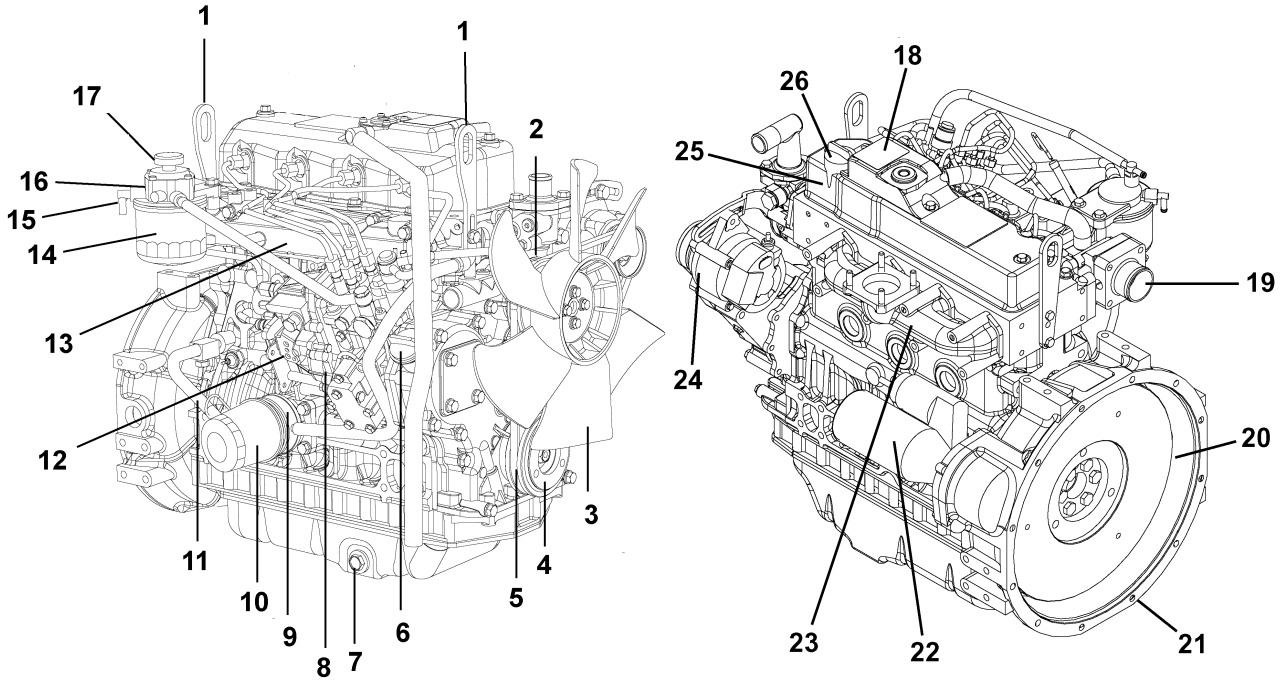
All information, illustrations, and specifications contained in this Manual are based on the latest product information available at the time of publication.

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

This manual covers both 3 and 4 cylinder naturally aspirated engines.

The pictures contained within are for guidance only and might not reflect the physical characteristics of each individual engine covered.

DIESEL ENGINE Engine External View - Model



1. Lifting eye
2. Cooling water pump
3. Cooling fan
4. Crank shaft V-pulley
5. V-belt
6. Filler port (engine oil)
7. Drain plug (engine oil)
8. Fuel injection pump
9. Engine oil cooler (4TNV88)
10. Engine oil filter
11. Dipstick (engine oil)
12. Governor lever
13. Intake manifold
14. Fuel filter
15. Fuel oil inlet
16. Fuel filter mounting with fuel priming pump
17. Fuel priming pump
18. Engine name plate
19. Air intake port
20. Flywheel
21. Flywheel housing
22. Starter motor
23. Exhaust manifold
24. Alternator
25. Rocker arm cover
26. Filler port (engine oil)

Model: 3TNV82A

Engine model name		3TNV82A
Engine type		Vertical inline water cooled diesel engine
Combustion type		Direct injection
No. of cylinders - bore x stroke. mm		3-82x84
Engine displacement L		1.331
Compression ratio		19.2:1
Firing order		1 - 3 - 2
Exhaust emission control system		Fuel injection nozzles, fuel injector pump
Governor		Mechanical type
Injection nozzles		Hole type
Specified fuel		Diesel fuel (ISO 8217 DMA, BS2869 A1/A2)
Starter (V-kW)		12-1.2
Alternator (V-A)		12-40
Specified engine oil (API grade) (SAE grade)		(CD,CF) (10W-30 or 15W-40)
Coolant volume (Engine only) L		1.8
Engine dry weight kg		128
	Overall length mm	528
Engine dimensions	Overall width mm	489
	Overall height mm	565
Valve clearance (cold) mm		0.2 ±0.05
Nozzle injection pressure MPa		21.6
Injection timing B.T.D.C. at 2.5mm cam lift		18° ±1

ENGINE IDENTIFICATION

Serial No Location

The engine serial number is stamped on engine name plate on top of rocker cover. See illustration on page 61

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 by.

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.

Model: 3TNV88

Engine model name		3TNV88
Engine type		Vertical inline water cooled diesel engine
Combustion type		Direct injection
No. of cylinders - bore x stroke. mm		3-88x90
Engine displacement L		1.642
Compression ratio		19.1:1
Firing order		1 - 3 - 2
Exhaust emission control system		Fuel injection nozzles, fuel injector pump
Governor		Mechanical type
Injection nozzles		Hole type
Specified fuel		Diesel fuel (ISO 8217 DMA, BS2869 A1/A2)
Starter (V-kW)		12-1.2
Alternator (V-A)		12-40
Specified engine oil (API grade) (SAE grade)		(CD,CF) (10W-30 or 15W-40)
Coolant volume (Engine only) L		2.0
Engine dry weight kg		155
	Overall length mm	564
Engine dimensions	Overall width mm	486
	Overall height mm	622
Valve clearance (cold) mm		0.2 ±0.05
Nozzle injection pressure MPa		21.6
Injection timing B.T.D.C. at 2.5mm cam lift		18° ±1

ENGINE IDENTIFICATION

Serial No Location

The engine serial number is stamped on engine name plate on top of rocker cover. See illustration on page 61

Confirmation of Engine Number

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ENGINE AFTER SERVICE

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Doosan Genuine Parts

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Model: 4TNV88

Engine model name		4TNV88
Engine type		Vertical inline water cooled diesel engine
Combustion type		Direct injection
No. of cylinders - bore x stroke. mm		4-88x90
Engine displacement L		2.19
Compression ratio		19:1
Firing order		1 - 3 - 4 - 2
Exhaust emission control system		Fuel injection nozzles, fuel injector pump
Governor		Mechanical type
Injection nozzles		Hole type
Specified fuel		Diesel fuel (ISO 8217 DMA, BS2869 A1/A2)
Starter (V-kW)		12-1.4
Alternator (V-A)		12-40
Specified engine oil (API grade) (SAE grade)		(CD,CF) (10W-30 or 15W-40)
Coolant volume (Engine only) L		2.7
Engine dry weight kg		170
	Overall length mm	658
Engine dimensions	Overall width mm	498.5
	Overall height mm	618
Valve clearance (cold) mm		0.2 ±0.05
Nozzle injection pressure MPa		21.6
Injection timing B.T.D.C. at 2.5mm cam lift		19.5° ±1

ENGINE IDENTIFICATION

Serial No Location

The engine serial number is stamped on engine name plate on top of rocker cover. See illustration on page 61

Confirmation of Engine Number

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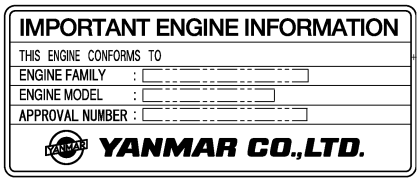
EC EMISSION CONTROL LABEL: ENGINE LABEL

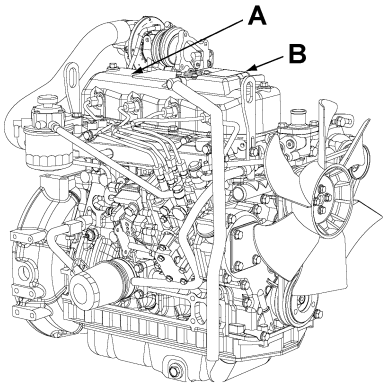
Emission control label is attached on the "top of the rocker arm cover"

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



(97/68/EC Directive label)

- Label location:



A. Emission control information label (4TNV88)

B. Emission control information label (On rocker arm cover exhaust side) (3TNV82A, 3TNV88A)

DIESEL FUEL

Diesel Fuel Specifications

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

Diesel Fuel Specification	Location
NO. 2-D, NO. 1-D, ASTM 0975-94	USA
EN590:96	European Union
IS0 8217 DMX	International
BS 2869-A1 or A2	United Kingdom
JIS K2204 Grade No. 2	Japan
KSM-2610	Korea
GB252	China

ADDITIONAL TECHNICAL FUEL REQUIREMENTS

- The fuel cetane number should be equal to 45 or higher.
- The sulphur content must riot exceed 0.05% by volume. Less than 0.05% is preferred.

  For electronically controlled engines 4TNV84T-Z, 4TNV98-2, 4TNV98-E, and 4TNV98T-2, it is mandatory to use fuel that does not contain 0.05% or more sulphur content.

  In general, using a high sulphur fuel may possible result in corrosion inside the cylinder.
- Bio-Diesel fuels. *See Bio-Diesel Fuels.*
- NEVER mix kerosene. used engine oil, or residual fuels with the diesel fuel.
- The 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 Yanmar representative for more information.
- The ash content must not exceed 0.01% by volume.
- The carbon residue content must not exceed 0.35% by volume. Less than 0.1% is preferred.
- The total aromatics content should not exceed 35% by volume. Less than 30% is preferred.
- The PAH (polycyclic aromatic hydrocarbons) content should be below 10% by volume.
- The metal content of Na, Mg, Si, and Al should be equal to or lower than 1 mass ppm. (Test analysis method JPI-5S-44-95)
- Lubricity: The wear mark of WS1.4 should be Max. 0.018 in (460 m) at HFRR test.

BIO-DIESEL FUELS

In Europe and in the United States. as well as some other countries, non-mineral oil based fuel resources such as RME (Rapeseed Methyl Ester) and SOME (Soybean Methyl Ester), collectively known as FAME (Fatty Acid Methyl Esters), are being used as extenders for mineral oil derived diesel fuels.

Yanmar approves the use of bio-diesel fuels that do not exceed a blend of 5% (by volume) of FAME with 95% (by volume) of approved mineral oil derived diesel fuel. Such bi-diesel fuels are known in the marketplace as B5 diesel fuels.

These B5 diesel fuels must meet certain requirements.

1 The bio-fuels must meet the minimum specifications for the country in which they are used.
   - In Europe, bio-diesel fuels must comply with the European Standard EN1 4214.
   - In the United States, bio-diesel fuels must comply with the American Standard ASTM D6751.

2 Bio-fuels should be purchased only from recognized and authorized diesel fuel suppliers.

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.

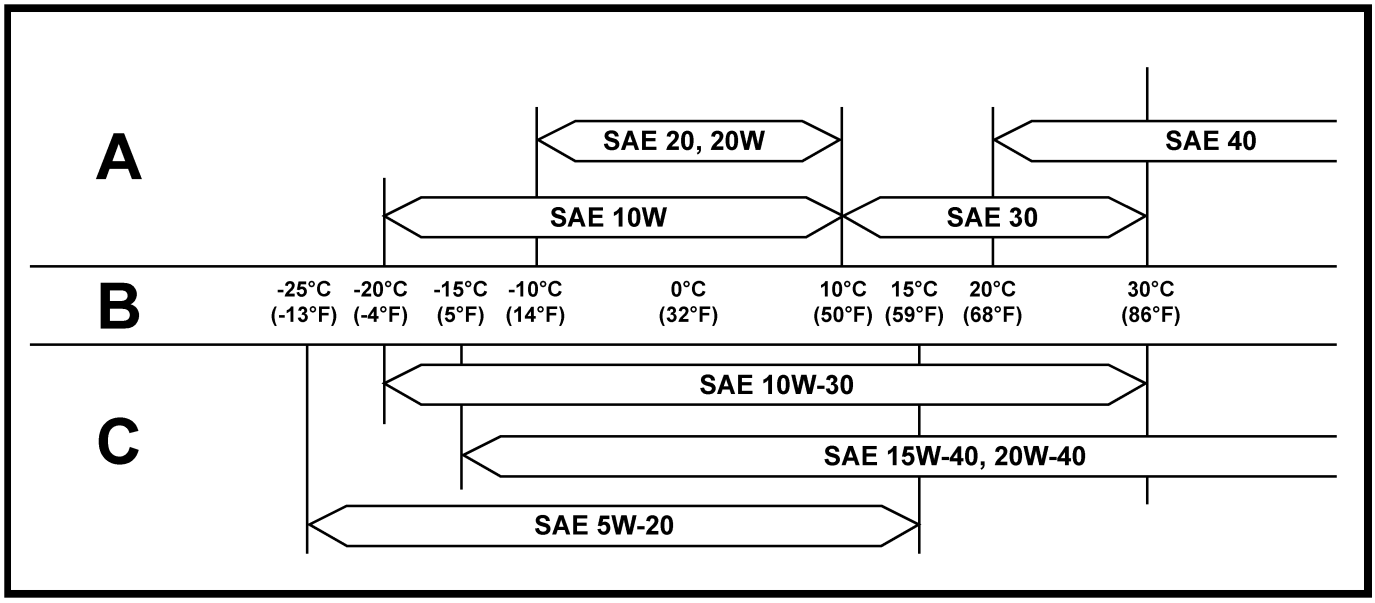


Fig. 12

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℃ (-27℉)

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

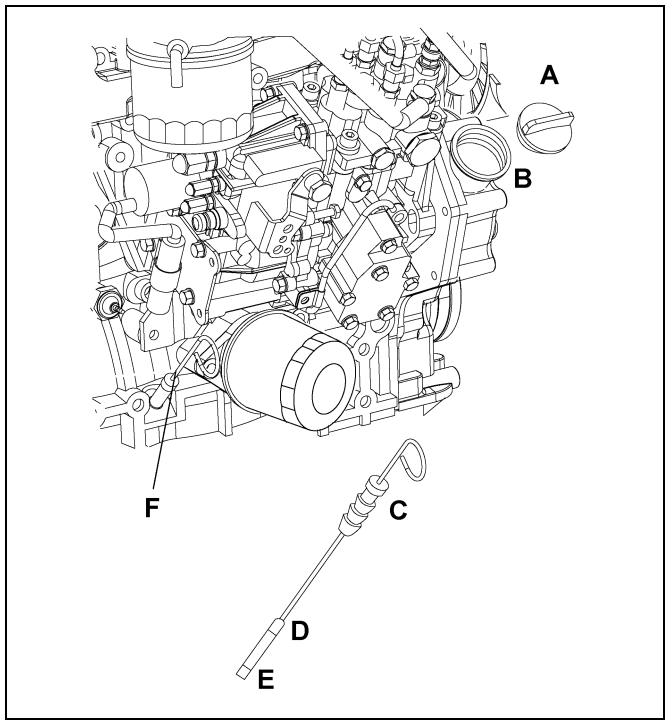
CAUTION: For safety reasons, conduct the inspection with the engine stopped.

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.

Table of oil pan capacities.

Engine oil pan capacity (oil pan) (L)	
3TNV82A	5.5
3TNV88	6.7
4TNV88	7.4

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 100 N [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.

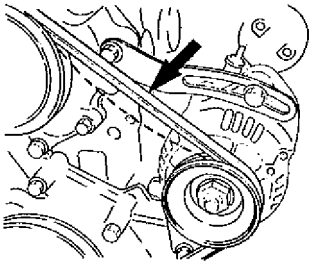


Fig. 16

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.

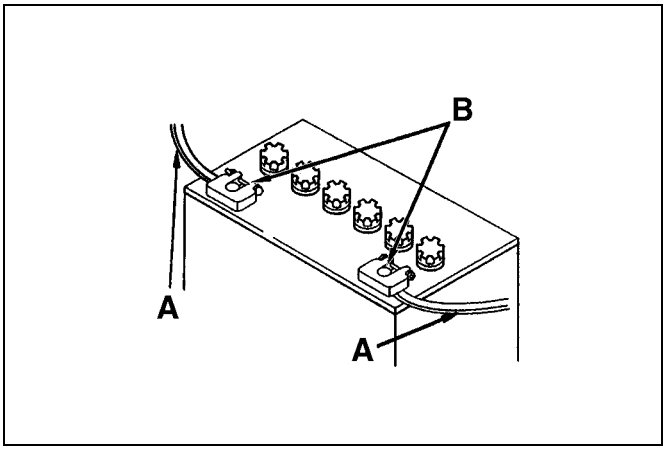


Fig. 17
A. Battery cable
B. Connections

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 sulfuric 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.

(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℃ (167 to 185℉).

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 gage (where fitted) shows an overheat condition, or you have reason to suspect the engine may be overheating, take the following step:

- 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℃ (167 to 185℉) 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

70 ENGINE MAINTENANCE SCHEDULE

When performing the following items, the daily inspection items should also be carried out.

IMPORTANT:

Establish a periodic check plan according to the operating conditions and make sure to conduct checks at specified intervals. Otherwise, malfunctioning may occur to shorten the engine life.

*As special knowledge and skill are required for items marked with "**D**", consult your local branch or distributor.*

"**C**": Check "**R**": Replace "**D**": Contact your dealer

System	Check item	Daily	Periodic inspection interval				
			Every 50 hours	Every 250 hours	Every 500 hours	Every 1000 hours	Every 2000 hours
Fuel oil	Fuel tank oil level check and refill	C					
	Draining from fuel tank		C				
	Draining from oil / water separator		C				
	Cleaning oil / water separator				C		
	Fuel filter replacement				R		
Engine oil	Engine oil level	C					
	Engine oil replacement		R 1st time		R 2nd & after		
	Engine oil filter replacement						
Cooling water	Check & addition cooling	C					
	Radiator fin checking & cleaning			C			
	Cooling fan V-belt checking & adjusting		C 1st time	C 2nd & after			
	Cooling water replacement					R or every 1 year	
	Cooling water path flushing & maintenance						D
Rubber hoses	Fuel & cooling water pipe replacement						D or every 2 years
Operating system	Governor lever & accelerator check & adjust	C		C			
Intake and exhaust	Air cleaner element cleaning & replacement			C	R		
Electrical equipment	Battery electrolyte check and recharging		C				
Cylinder head	Adjust intake *I* exhaust valve clearance					D	
	Lapping intake *I* exhaust valve seats						D
Fuel valve pump *	Check fuel injection valve pressure & adjust					D	
	Check *&* adjust fuel injection pump						D

* The specific emissions related parts for the EPA/ARB regulations

Note:

* This is a recommended maintenance. The failure to perform this maintenance item will not nullify the emission warranty or limit recall liability prior to the completion engine useful life. The company, however, urges that recommended maintenance service is performed at the indicated intervals.

EXPLANATION OF MAINTENANCE SCHEDULE

The following is a brief explanation of the services listed in the preceding Engine Maintenance schedule.

1.	**Oil level.**	Check that the oil level is between the max. and the min. level marks. Add oil to the max. level mark if it is below the min. level. If it is above the max. level mark, drain oil until the max. level is reached.
2.	**Engine oil replacement**	Change at 500 hours or 6 months, whichever comes first.
3.	**Oil filter element replacement**	Change at 500 hours or 6 months, whichever comes first.
4.	**Fuel leakage**	Replace any damaged or malfunctioning parts which could cause leakage.
5.	**Draining water in fuel filter/ separator.**	Drain off water in the fuel filter/separator bowl.
6.	**Fuel filter element replacement**	Replace both primary (filter/separator) and secondary elements at 500 hours or 6 months whichever come first.
7.	**Injection nozzle check**	Check injection opening pressure and spray condition. (This is a recommended maintenance item L). Consult your local branch or distributor.
8.	**Coolant level.**	Check coolant level and add coolant if necessary.
9.	**Coolant leakage check**	Replace any damaged or malfunctioning parts which could cause leakage.
10.	**Radiator filler cap fitting condition**	The radiator cap must be installed tightly and sealing correctly.
11.	**Fan belt tension check**	Check and adjust fan belt deflection. Look for cracks, fraying and wear. Replace if necessary.
12.	**Coolant temperature**	Normal running temperature is 75 to 85°C (167 to 185°F). Check and repair the cooling system if temperature is abnormal.
13.	**Coolant replacement**	Change coolant at intervals of 1000 hours or 12 months, whichever comes first.
14.	**Radiator external face cleaning**	Check monthly. Clean at intervals of 250 hours or 3 months, whichever comes first. In very dusty environments, more frequent cleaning might be necessary.
15.	**Cooling system circuit cleaning**	Clean at intervals of 1000 hours or 12 months, whichever comes first.
16.	**Radiator filling cap function check**	Check radiator pressure cap periodically for proper operation. Consult your local branch or distributor.
17.	**Battery electrolyte level check**	Replenish with distilled water if necessary.
18.	**Battery cleaning**	Clean the terminals
19.	**Battery charge condition**	If cranking speed is too slow to start the engine, charge the battery.
20.	**Air filter element replacement**	Change element at 500 hrs or sooner if the restriction indicator shows red.
21.	**Cylinder compression pressure**	Consult your local dealer or distributor
22.	**Valve clearance check**	Check and adjust every 1000 hours. Consult your local dealer or distributor

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)

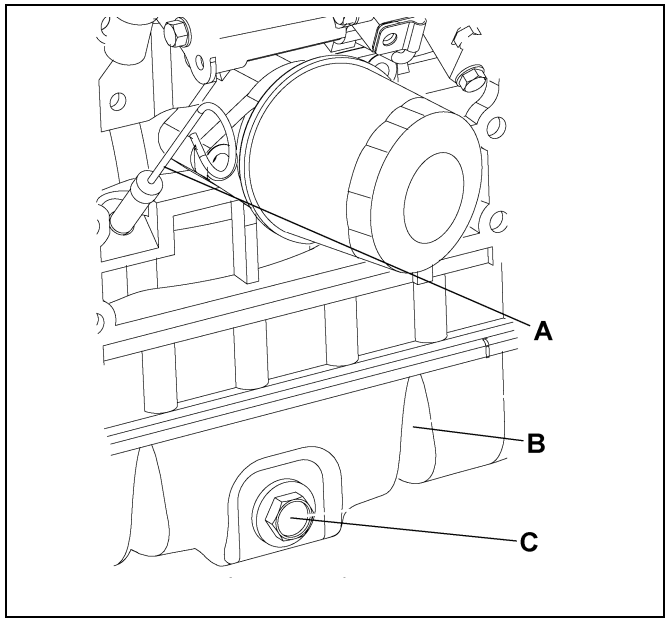
Applicable engine oil filter Part No.	
All engines	CCN 15897630

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

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.

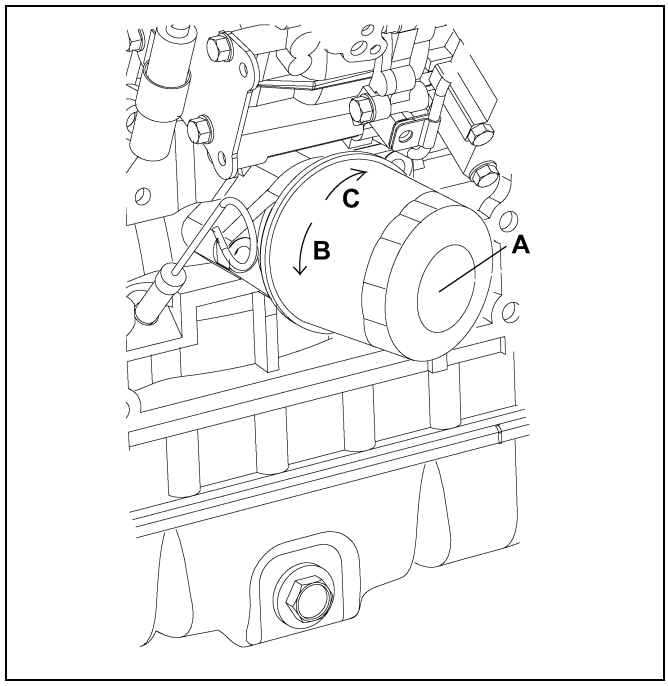
8) Warm up the engine by running for 5 minutes while checking any oil leakage.

9) Stop the engine after warming up and leave it stopping for about 10 minute 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.



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) Checking and adjusting cooling fan V-belt

When there is not enough tension in the V-belt, the V-belt will slip making it impossible for the alternator to generate power and cooling water pump and cooling fan will not work causing the engine to overheat. Check and adjust the V-belt tension (deflection) in the following manner.

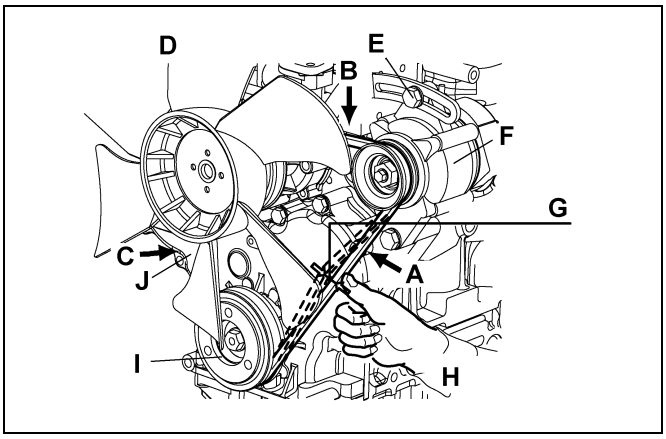
1) Press the V-belt down with your thumb [approx. 98N(10kgf)]. at the middle of the V-belt span to check the tension (deflection).

Available positions to check and adjust the V-belt tension (deflection) are at the A, B and C showing with the arrow direction as shown illustration right.

You may choose a position whichever you can most easily carry out the check and adjustment on the machine unit.

The specified deflection to be measured at each position should be as follows:

A	B	C
10~14mm	7~10mm	9~13mm



D. Radiator fan
E. Set bolt
F. Alternator
G. Deflection
H. Press with thumb
I. Crankshaft V-pulley
J. V-belt

2) If necessary, adjust the V-belt tension (deflection). To adjust the V-belt tension, loosen the set bolt and move the alternator to tighten the V-belt.

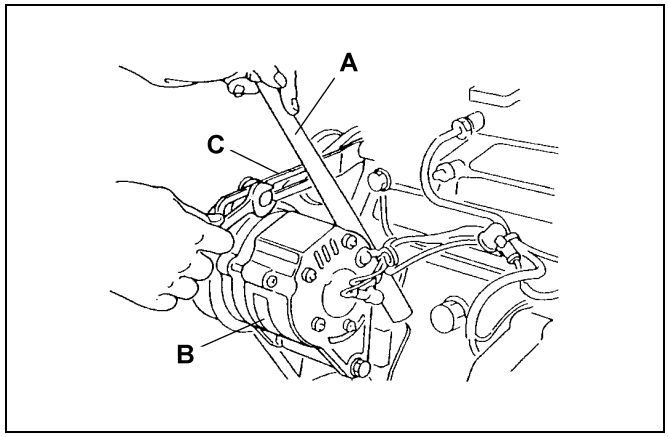
3) Visually check the V-belt for cracks, oiliness or wear. If any , replace the V-belt with new one.

• "New, V-belt" refers to a V-belt which has been used less than 5 minutes on a running engine.

• "Used V-belt" refers to a V-belt which has been used on a running engine for 5 minutes or more.

Install the new V-belt adjusting the deflection to the value in the table below according to the above manner. After adjusting. run the engine for 5 minutes end readjust the deflection to the value in the table above.

A	B	C
8~12mm	5~8mm	7~11mm



(Adjusting the V-belt tension)

A. Adjust the V-belt tension by prying with a wooden bar

B. Alternator

C. Adjusting bracket

Use of genuine Doosan fan belt

Always use genuine Doosan fan belts as they provide high driving ability and long operating durability. Use of non-Doosan fan belts could result in premature belt wear or belt elongation leading to engine overheating or excessive belt noise.

CAUTION: To help avoid being injured, check and adjust the fan belt tension with engine stopped.

Inspection every 50 hours operation

(1) Draining of the fuel tank (NOT 7/26E, 7/31E)

1) Prepare a waste oil container.

2) Remove the drain plug of the fuel tank to drain (water, dust ,etc.) from the fuel tank bottom.

3) Drain until fuel with no water and dust flow out. Then tighten the drain plug firmly.

(2) Draining of the oil/water separator

Draining Water from Fuel Filter/separator.

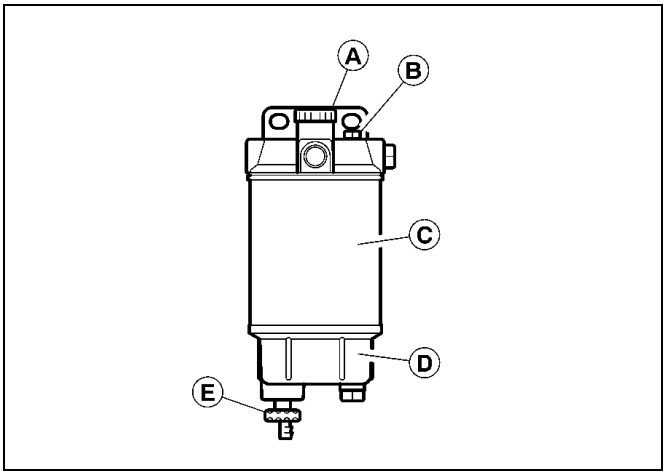
The fuel filter/separator is provided to allow water to be drained from the fuel system. Water is heavier than fuel so any water contained in the system will collect in the bottom of the bowl.

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.

Governor Control Seals

As the governor is precisely adjusted, most of the controls are sealed, please do not break them. Should any adjustment be necessary, contact your local Doosan branch or distributor.

NOTE: The company will not accept any warranty claim on an engine with broken governor seals.

(3) Inspection of battery

Fire due to electric short-circuit

- Make sure to turn off the battery switch or disconnect the negative cable (-) before inspecting the electrical system. Failure to do so could cause short-circuiting and fires.
- Always disconnect the (-) Negative battery cable first before disconnecting the battery cables from battery. An accidental “Short circuit” may cause damage, fire and or personnel injury.

And remember to connect the (-) Negative battery cable (back onto the battery) LAST.

Proper ventilation of the battery area

- Keep the area around the battery Well ventilated, paying attention to keep away any fire source. During operation or charging, hydrogen gas is generated from the battery and can be easily ignited.

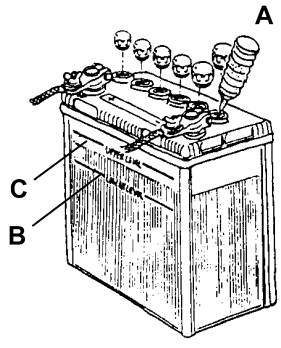
Do not come in contact with battery electrolyte

- Pay sufficient attention to avoid your eyes. or skin from being in contact with the fluid. The battery electrolyte is dilute sulfuric acid and causes burns. Wash it off immediately with a large amount of fresh water if you get any on you.

- Clean the battery terminals
- Check the level of fluid in the battery.

When the amount of fluid nears the lower limit, fill with battery fluid (available in the market) to the upper limit. If operation continues with insufficient battery fluid, the battery life is shortened, and the battery may overheat and explode.

- Battery fluid tends to evaporate more quickly in the summer, and the fluid level should be checked earlier than the specified times.
- If the engine cranking speed is so slow that the engine does not start up, recharge the battery.
- If the engine still will not start after charging, replace the battery.
- Remove the battery from the battery mounting of the machine unit after daily use if letting the machine unit leave in the place that the ambient temperature could drop at -15℃ or less. And store the battery in a warm place until the next use the unit to start the engine easily at low ambient temperature.



OPTION

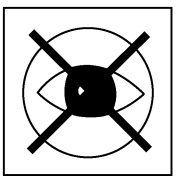
Follow the instructions an precautions in the manual from the battery maker.

A. Battery fluid
B. Lower limit
C. Upper limit

Inspection every 250 hours operation

(1) Checking and cleaning radiator fins.

Beware of dirt from air blowing

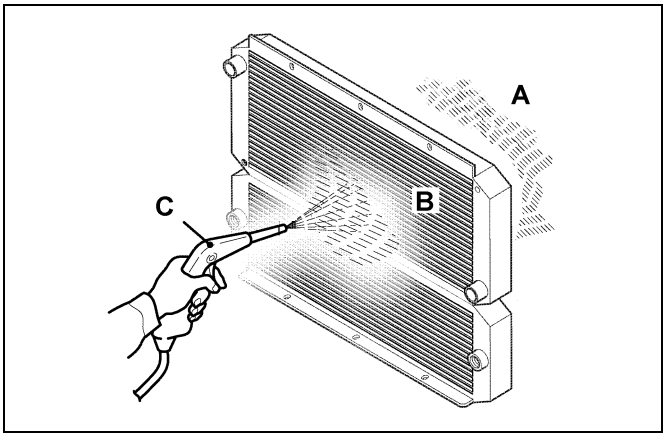


• Wear-protective equipment such as goggles to protect your eyes when blowing compressed air. Dust or flying debris can hurt eyes.

Dirt and dust adhering on the radiator fins reduce the cooling performance, causing overheating. Make it a rule to check the radiator fins daily and clean as needed.

• Blow off dirt and dust from fins and periphery with compressed air [0.19MPa (2kgf/cm2) or less] not to damage the fins with compressed air.

• If contaminated heavily, apply detergent, thoroughly clean and rinse with tap water shower.



A. Dust, dirt.
B. Radiator fins
C. Air blow

IMPORTANT: *Never use high pressure water or air from close by fins or never attempt to clean using a wire brush. Radiator fins can be damaged.*

(2) Checking the governor lever and accelerating device.

The governor lever and accelerating devices (accelerating lever, pedal. etc.) of the machine unit are connected by a fixed linkage to a pneumatic actuator. If the linkage becomes loose, the deviation in the position may result and make operation unsafe. Check the linkage connections for excess play. For adjustment of linkage see compressor operation section.

Governor Control Seals

As the governor is precisely adjusted, most of the controls are sealed, please do not break them. Should any adjustment be necessary, contact your local Doosan branch or distributor.

NOTE: The company will not accept any warranty claim on an engine with broken governor seals.

(3) 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.	
All engines	CPN 15892747

4) Bleed the fuel system. Refer to section 2 of inspection at 50 hours.

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

(4) 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. see "inspection after every 50 hours operation" section 2.

(5) Air cleaner element inspection

AIR INTAKE SYSTEM

Air cleaner

Engine performance and life vary with the air intake conditions.

A dirty air cleaner element reduces the amount of intake air, causing reduced engine output and possible engine damage.

Also, a damaged element leads to abrasion of cylinders and valves, resulting in increased oil consumption, reduced output and shortened engine life.

INSPECT THE CONDITION OF THE ELEMENT.

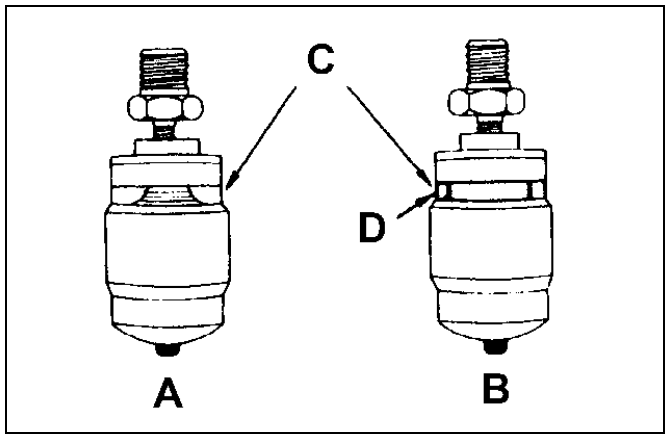


Fig. 32
A Normal
B Clogged
C Indicator
D Red signal

Air cleaner with dust indicator

This indicator is attached to the air cleaner. When the air cleaner element is clogged, air intake resistance becomes greater and the dust indicator signal turns to red indicating the element needs to be changed.

When the signal turns to red, replace the element. Then press the dust indicator button to reset the indication.

(6) Checking and adjusting cooling fan V-belt (2nd time and after)

Check and adjust the cooling fan V-belt tension every 250 hours operation from 2nd time and on.

See “inspection after initial 50 hours” section (2)

Inspection every 500 hours operation

(1) Replacing the engine oil and engine oil filter (2nd time and after)

Replace the engine oil every 500 hours operation from 2nd time and on. Replace the engine oil filter at the same time. Refer to 50 hour inspection, section (1).

(2) Replacing the air cleaner element

Air cleaner

Engine performance and life vary with the air intake conditions.

A dirty air cleaner element reduces the amount of intake air, causing reduced engine output and possible engine damage.

Also, a damaged element leads to abrasion of cylinders and valves, resulting in increased oil consumption, reduced output and shortened engine life.

Replace the air cleaner element every 500 hours, even if it is not damaged or dirty. When replacing the element, clean the inside of the air cleaner case. If the unit has an air cleaner with double elements, do not remove the inner element. If the engine output is still reduced (or the dust indicator still actuates) when the outer element has been replaced, replace the inner element.

(3) 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.	
All engines	CPN 15892747

4) Bleed the fuel system. Refer to section 2 of inspection at 50 hours.

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

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.

Beware of scalding by hot water

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

(2) Checking and adjusting the fuel injection valve

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

3) Adjusting intake / exhaust valve clearance

As this adjustment requires specialized knowledge and skill, consult your 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 2000 hours operation

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

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

And for the engine oil cooler (4TNV98T), they quickly deteriorate the engine oil.

Cooling system parts: radiator, cooling water pump, thermostat, cylinder block, cylinder head, oil cooler (4TNV98T).

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

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

Checking and adjusting the EPA emission related parts.

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

EPA allows to apply maintenance schedule for emission related parts as follow.

-	Check Fuel Valve Nozzle and clean	Adjust, cleaning and repair of Fuel injection Pump and Fuel Valve Nozzle.
kW % 130	1500 hours of use and at 1500-hour intervals thereafter	3000 hours of use and at 3000-hour intervals thereafter

78 ENGINE TROUBLESHOOTING

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.	Engine stop solenoid malfunction.
			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 stop solenoid not fully returned.
	Engine fires but stalls immediately.	Air in the fuel system.	
		Incorrect low idle speed adjustment.	

Unstable engine running	Unstable low idling	Crack in injection pipe.	
		Injection nozzle failure.	
		Engine stop solenoid return failure.	
		Uneven compression pressure between cylinders.	
	Incorrect high idle speed adjustment.	Incorrect control lever adjustment.	
		Governor internal malfunction.	
	Engine hunting in medium speed range.	Governor spring deteriorated.	
	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.	
		Deteriorated governor spring.	
		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.		
	Worn bearings and oil pump.		
	Faulty relief valve.		

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.
		Wrong injector nozzle.
		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.

GENERAL

This publication, which contains an illustrated parts breakdown, has been prepared as an aid in locating those parts which may be required in the maintenance of the unit. All of the compressor parts, listed in the parts breakdown, are manufactured with the same precision as the original equipment. For the greatest protection always insist on genuine Doosan parts for your compressor.

NOTICE

Doosan can bear no responsibility for injury or damages resulting directly from the use of non-approved repair parts.

Doosan Infracore service facilities and parts are available worldwide.

There are Authorised Distributors or Company Sales offices in principal cities of many countries.

Special order parts may not be included in the manual. Contact Doosan Parts Department with the unit serial number for assistance with these special parts.

DESCRIPTION

The illustrated parts breakdown illustrates and lists the various assemblies, subassemblies and detailed parts which make up this particular machine. This covers the standard models and the more popular options that are available.

A series of illustrations show each part distinctly and in location relative to the other parts in the assembly. The part number, the description of the part and the quantity of parts required are shown on each illustration or on adjacent page. The quantities specified are the number of parts used per one assembly and are not necessarily the total number of parts used in the machine. Where no quantity is specified the quantity is assumed to be one.

Each description of a part is based upon the "noun first" method, i.e., the identifying noun or item name is always the first part of the description. The noun name is generally followed by a single descriptive modifier. The descriptive modifier may be followed by words or abbreviations such as upper, lower, inner, outer, front, rear, RH, LH, etc. when they are essential.

In referring to the rear, the front or to either side of the unit, always consider the **drawbar end** of the unit as the **front**. Standing at the rear of the unit facing the drawbar (front) will determine the right and left sides.

FASTENERS

Both SAE/inch, ISO/metric hardware have been used in the design and assembly of these units. In the disassembly and reassembly of parts, extreme care must be taken to avoid damaging threads by the use of wrong fasteners. In order to clarify the proper usage and for exact replacement parts, all standard fasteners have been identified by part number, size and description. This will enable a customer to obtain fasteners locally rather than ordering from the factory. These parts are identified in tables that will be found at the rear of the parts illustrations. Any fastener that has not been identified by both part number and size is a specially engineered part that must be ordered by part number to obtain the exact replacement part.

MARKINGS AND DECALS

NOTICE

Do not paint over safety warnings or instructional decals. If safety warning decals become illegible, immediately order replacements from the factory.

Part numbers for original individual decals and their mounting locations are shown within Parts List Section. These are available as long as a particular model is in production.

HOW TO USE PARTS LIST

a. Turn to Parts List.

b. Locate the area or system of the compressor in which the desired part is used and find illustration page number.

c. Locate the desired part on the illustration by visual identification and make note of part number and description.

HOW TO ORDER

The satisfactory ordering of parts by a purchaser is greatly dependent upon the proper use of all available information. By supplying your nearest sales office, autonomous company or authorised distributor, with complete information, you will enable them to fill your order correctly and to avoid any unnecessary delays.

In order that all avoidable errors may be eliminated, the following instructions are offered as a guide to the purchaser when ordering replacement parts:

a. Always specify the model number of the unit as shown on the general data decal attached to the unit.

b. Always specify the serial number of the unit. THIS IS IMPORTANT. The serial number of the unit will be found stamped on a plate attached to the unit. (The serial number on the unit is also permanently stamped in the metal of the frame side rail.)

c. Always specify the number of the parts list publication.

d. Always specify the quantity of parts required.

e. Always specify the part number, as well as the description of the part, or parts, exactly as it is given on the parts list illustration.

In the event parts are being returned to your nearest sales office, autonomous company or authorised distributor, for inspection or repair, it is important to include the serial number of the unit from which the parts were removed.

TERMS AND CONDITIONS ON PARTS ORDERS

Acceptance: Acceptance of an offer is expressly limited to the exact terms contained herein. If purchaser's order form is used for acceptance of an offer, it is expressly understood and agreed that the terms and conditions of such order form shall not apply unless expressly agreed to by Doosan Company ("Company") in writing. No additional or contrary terms will be binding upon the Company unless expressly agreed to in writing.

Taxes: Any tax or other governmental charge now or hereafter levied upon the production, sale, use or shipment of material and equipment ordered or sold is not included in the Company's price and will be charged to and paid for by the Purchaser.

Shipping dates shall be extended for delays due to acts of God, acts of Purchaser, acts of Government, fires, floods, strikes, riot, war, embargo, transportation shortages, delay or default on the part of the Company's vendors, or any other cause beyond the Company's reasonable control.

Should Purchaser request special shipping instruction, such as exclusive use of shipping facilities, including air freight when common carrier has been quoted and before change order to purchase order can be received by the Company, the additional charges will be honoured by the Purchaser.

Warranty: The Company warrants that parts manufactured by it will be as specified and will be free from defects in materials and workmanship. The Company's liability under this warranty shall be limited to the repair or replacement of any part which was defective at the time of shipment provided Purchaser notifies the Company of any such defect promptly upon discovery, but in no event later than three (3) months from the date of shipment of such part by the Company. The only exception to the previous statement is the extended warranty as it applies to the special airend exchange program.

Repairs and replacements shall be made by the Company F.O.B. point of shipment. The Company shall not be responsible for costs of transportation, removal or installation.

Warranties applicable to material and equipment supplied by the Company but wholly manufactured by others shall be limited to the warranties extended to the Company by the manufacturer which are able to be conveyed to the Purchaser.

Delivery: Shipping dates are approximate. The Company will use best efforts to ship by the dates specified; however, the Company shall not be liable for any delay or failure in the estimated delivery or shipment of material and equipment or for any damages suffered by reason thereof.

The company makes no other warranty or representation of any kind whatsoever, expressed or implied, except that of title, and all implied warranties, including any warranty of merchantability and fitness for a particular purpose, are hereby disclaimed.

Limitation of Liability:

The remedies of the Purchaser set forth herein are exclusive, and the total liability of the Company with respect to this order whether based on contract, warranty, negligence, indemnity, strict liability or otherwise, shall not exceed the purchase price of the part upon which such liability is based.

The Company shall in no event be liable to the Purchaser, any successors in interest or any beneficiary of this order for any consequential, incidental, indirect, special or punitive damages arising out of this order or any breach thereof, or any defect in, or failure of, or malfunction of the parts hereunder, whether based upon loss of use, lost profits or revenue, interest, lost goodwill, work stoppage, impairment of other goods, loss by reason of shutdown or non-operation, increased expenses of operation or claims of customers of Purchaser for service interruption whether or not such loss or damage is based on contract, warranty, negligence, indemnity, strict liability or otherwise.

AIREND EXCHANGE PROGRAM

Doosan offers an airend exchange program to benefit portable compressor users.

Your nearest sales office, autonomous company or authorised distributor must first contact the Parts Service Department at the factory at which your portable air compressor was manufactured for further instructions.

For parts, service or information regarding your local distributor (Europe, Middle East, Africa) please contact:

Facility:

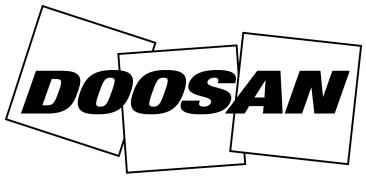
Doosan Bobcat EMEA s.r.o. (DBEM),

U Kodetky 1810, 263 12 Dobris,

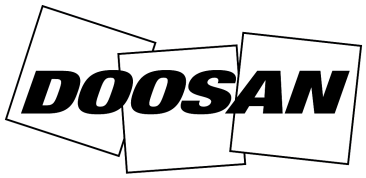
Czech Republic

Website:

www.doosanportablepower.eu



Portable Power



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Doosan Bobcat EMEA s.r.o
U Kodetky 1810
263 12 Dobříš
Czech Republic