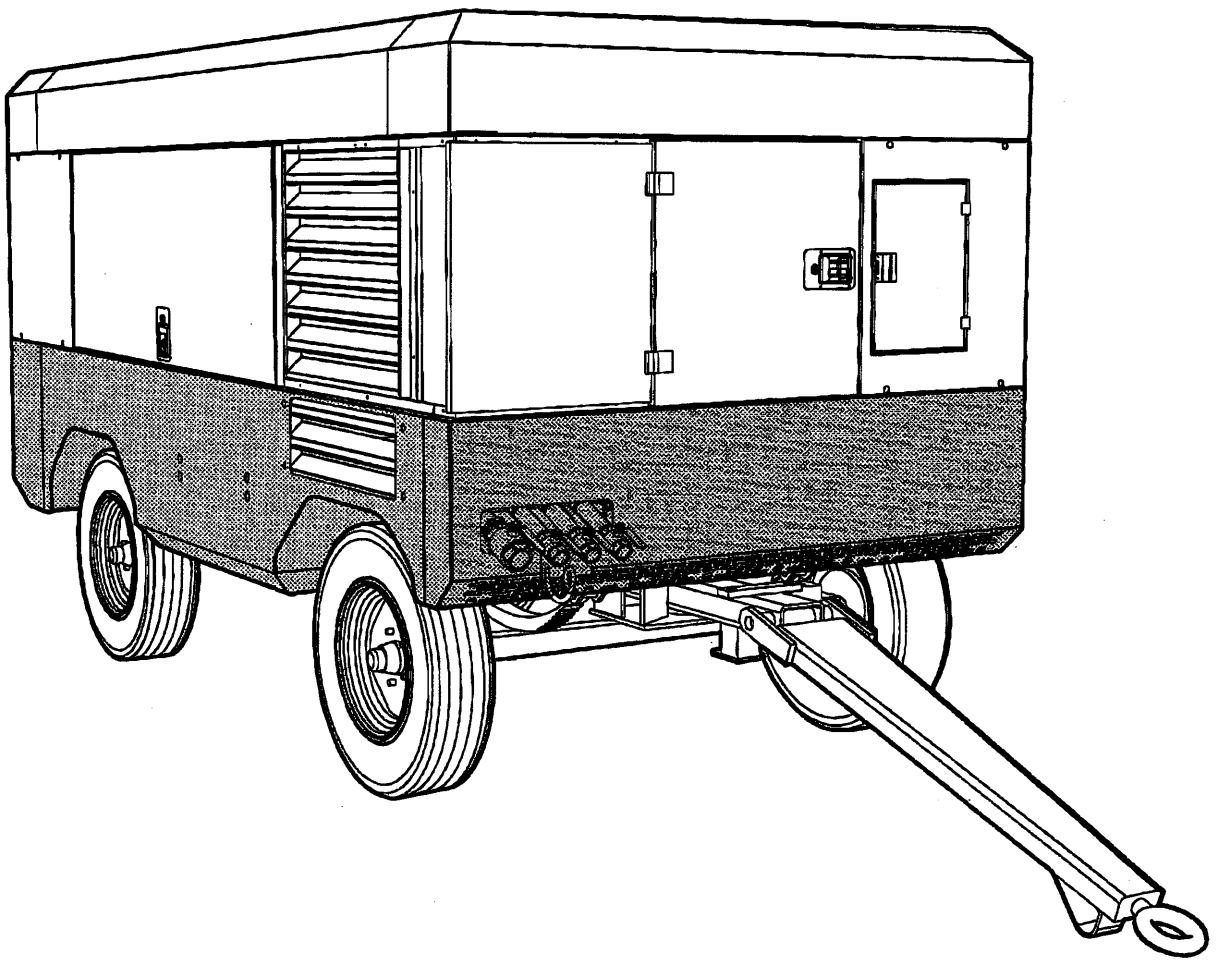
INGERSOLL-RAND®

9/215, 9/230, 9/255, 9/300, 10/170, 12/170, 12/235, 17/235, 21/215
HP600, VHP600, XP750, XP800, VHP825, XP900, XP1060, XHP760, XHP825

OPERATION AND MAINTENANCE MANUAL



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

Caterpillar	SERIAL No: 880001 ->
Deutz	SERIAL No: 870001 ->

C.P.N. : 89304802 GB
DATE : JANUARY 2000

Machine models represented in this manual may be used in various locations worldwide. Machines sold and shipped into European common market countries requires that the machine display the EC 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

EC DECLARATION OF CONFORMITY WITH EC DIRECTIVES

98/37/EC, 93/68/EEC, 89/336/EEC

WE,

INGERSOLL–RAND COMPANY LIMITED
STANDARD PRODUCTS DIVISION
SWAN LANE
HINDLEY GREEN
WIGAN WN2 4EZ
UNITED KINGDOM

DECLARE THAT, UNDER OUR SOLE RESPONSIBILITY FOR MANUFACTURE AND SUPPLY, THE PRODUCT(S)

9/215, 9/230, 9/255, 9/300, 10/170, 12/170, 12/235, 17/235, 21/215, HP600, VHP600, XP750, XP800, VHP825, XP900, XP1060, XHP760, XHP825

TO WHICH THIS DECLARATION RELATES, IS (ARE) IN CONFORMITY WITH THE PROVISIONS OF THE ABOVE DIRECTIVES USING THE FOLLOWING PRINCIPAL STANDARDS.

EN29001, EN292, EN60204–1, EN1012, EN50081, EN50082

ISSUED AT HINDLEY GREEN ON 01/01/2000 BY H.SEDDON, QUALITY ASSURANCE MANAGER.

H. SEDDON

1 CONTENTS & ABBREVIATIONS

CONTENTS

ABBREVIATIONS & SYMBOLS

####	Contact Ingersoll–Rand for serial number
–>####	Up to Serial No.
####–>	From Serial No.
*	Not illustrated
†	Option
WDG	Generator option
AR	As required
D	Germany
DK	Denmark
E	Spain
F	France
GB	Great Britain
I	Italy
N	Norway
NL	Netherlands
P	Portugal
S	Sweden
SF	Finland
F.H.R.G.	Fixed height running gear
V.H.R.G.	Variable height running gear

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

Nothing contained in this document is intended to extend any promise, warranty or representation, expressed or implied, regarding the Ingersoll–Rand 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 Ingersoll–Rand 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) This machine must not be used in USA/Canada. (Where EC certification is not valid, and other certification will be required.)

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 Ingersoll–Rand.
. 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 Ingersoll–Rand Service departments.

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

Ingersoll–Rand 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 Ingersoll–Rand 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.

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

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.
Use of the machine where there is any actual or foreseeable risk of hazardous levels of flammable gases or vapours.
Use of the machine fitted with non Ingersoll–Rand approved components / lubricants / fluids.
Use of the machine with safety or control components missing or disabled.

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

DEXRON is a registered trademark of General Motors Corporation.

EXTENDED LIMITED AIREND WARRANTY

Ingersoll–Rand Portable Compressor Division is pleased to announce the availability of extended limited airend warranty. Announcement of the extended warranty coincides with the introduction of Pro–Tec ™ Compressor Fluid. Pro–Tec ™ Compressor Fluid is an amber coloured fluid specially formulated for Portable Compressors and is being provided as the factory filled fluid for all machines.

All machines have the standard airend warranty – *The earlier of 24 months from shipment to, or the accumulation of 4000 hours of service by the initial user*.

The warranty against defects will include replacement of the complete Airend, provided the original Airend is returned assembled and unopened.

The optional limited warranty is the earlier of 60 months from shipment to, or the accumulation of 10,000 hours of service. The optional warranty is limited to defects in major components (rotors, housings, gears and bearings), and is automatically available when the following conditions are met:

1. The original airend is returned assembled and unopened.

2. Submissions of proof that Ingersoll–Rand fluid, filters and separators have been used. Refer to the Operation and Parts manual for the correct fluids, filters and separator elements required.

3. Submissions of proof that maintenance intervals have been followed.

3 FOREWORD

WARRANTY	TIME	*BARE AIREND	**AIREND COMPONENTS
STANDARD	2YRS / 4,000HRS	100% PARTS & LABOUR	100% PARTS & LABOUR
OPTIONAL	5YRS / 10,000HRS	100% PARTS & LABOUR	0%

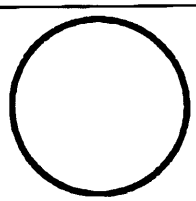
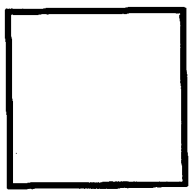
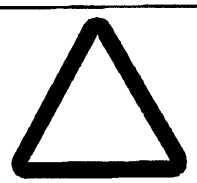
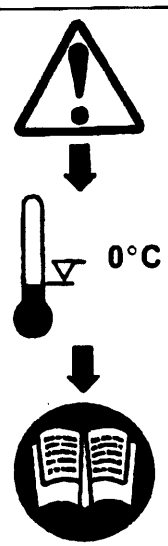
*BARE AIREND – pertains to major airend parts (rotors, housings, gears and bearings).

**AIREND COMPONENTS – pertains to auxiliary attachments to the bare airend (drive coupling, seals, pumps, valves, tubes, hoses, fittings and filter housing).

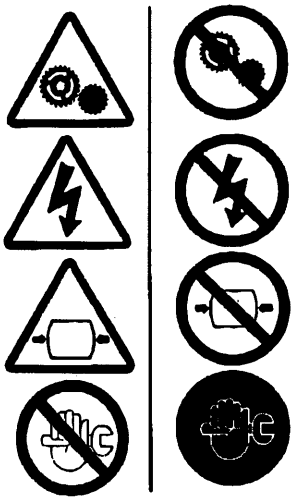
Pro–Tec™ Compressor Fluids are available from your local Ingersoll–Rand branch or distributor.

Where climatic conditions dictate that the other Ingersoll–Rand Compressor Fluids (XHP505 or Performance 500) must be used, the extended warranty will apply if the above conditions are met.

GRAPHIC FORM AND MEANING OF ISO SYMBOLS

		
Prohibition / Mandatory	Information / Instructions	Warning
 WARNING: Electrical shock risk.	 WARNING – Pressurised vessel.	 WARNING – Hot surface.
 WARNING – Pressure control.	 WARNING – Corrosion risk.	 WARNING – Air/gas flow or Air discharge.
 WARNING – Pressurised component or system.	 WARNING – Hot and harmful exhaust gas.	 WARNING – Maintain correct tyre pressure. (Refer to the **GENERAL INFORMATION** section of this manual).
 WARNING – Flammable liquid.	 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.

5 ISO SYMBOLS



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.

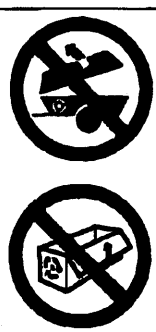
Do not breathe the compressed air from this machine.

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

Do not stack.

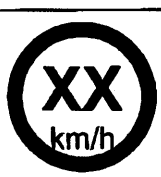
Do not operate the machine without the guard being fitted.

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.

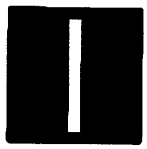
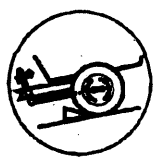
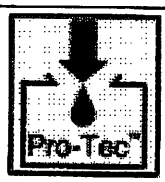
Do not open the service valve before the airhose is attached.

Use fork lift truck from this side only.

Emergency stop.

Tie down point

ISO SYMBOLS 6

 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, handrake and wheel chocks.	 Contains asbestos.
 **Compressor oil filling**		

7 SAFETY

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

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.

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 accidently be pressurised / over pressurised by another.

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

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.

Materials

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

AVOID INHALATION

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

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

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

AVOID INGESTION, SKIN CONTACT AND INHALATION OF FUMES

Components of a non–metallic fibrous material may contain small quantities of white asbestos. When handling, dismantling or assembling these components, the following must be observed:

- *Always operate in a well ventilated area.*
- *Dispose of waste in a sealed container.*
- *Use water to damp down dust.*
- *Avoid inhalation of dust particles.*

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.

Battery

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

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

Radiator

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

Engine starting fluid (ether)

Use and recharge system only with suppliers instructions and replacement parts.

Some machines are fitted with an ether cold starting aid.

AVOID INGESTION, INHALATION, HOT SURFACES AND NAKED LIGHTS

Transport

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

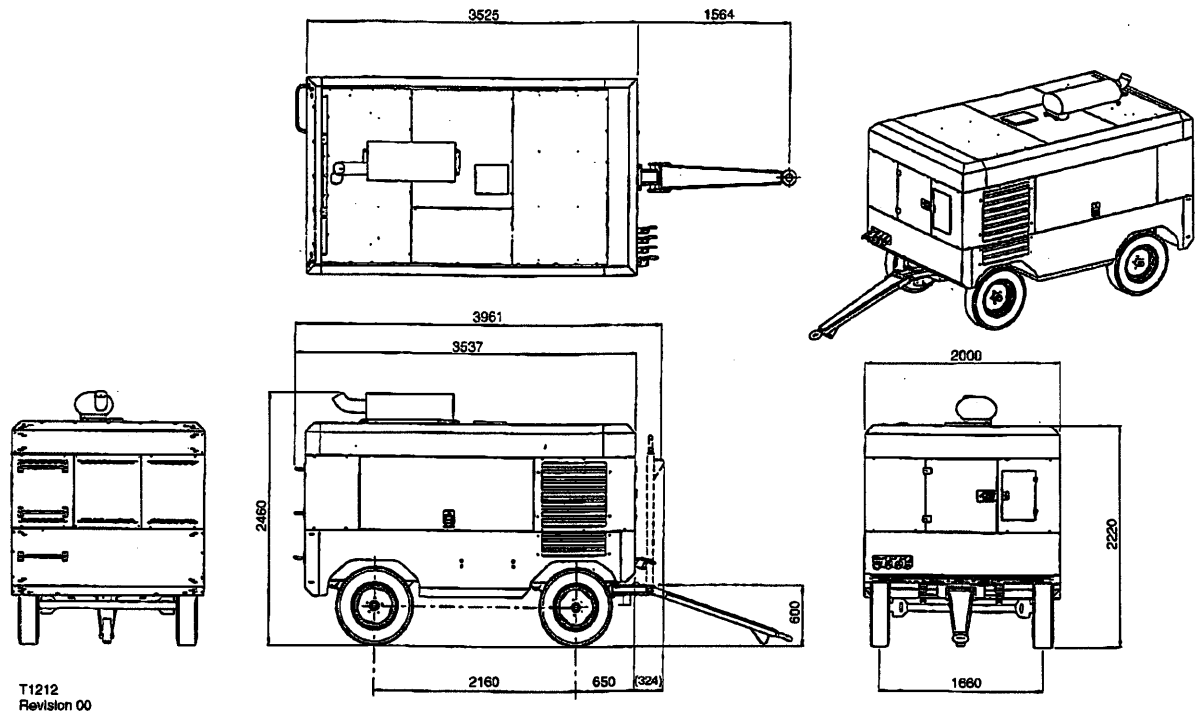
When loading or transporting machines ensure that the towing vehicle, its size, weight, towing hitch and electrical supply are all suitable to provide safe and stable towing at speeds either, up to the legal maximum for the country in which it is being towed or, as specified for the machine model if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

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.

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

9 GENERAL INFORMATION



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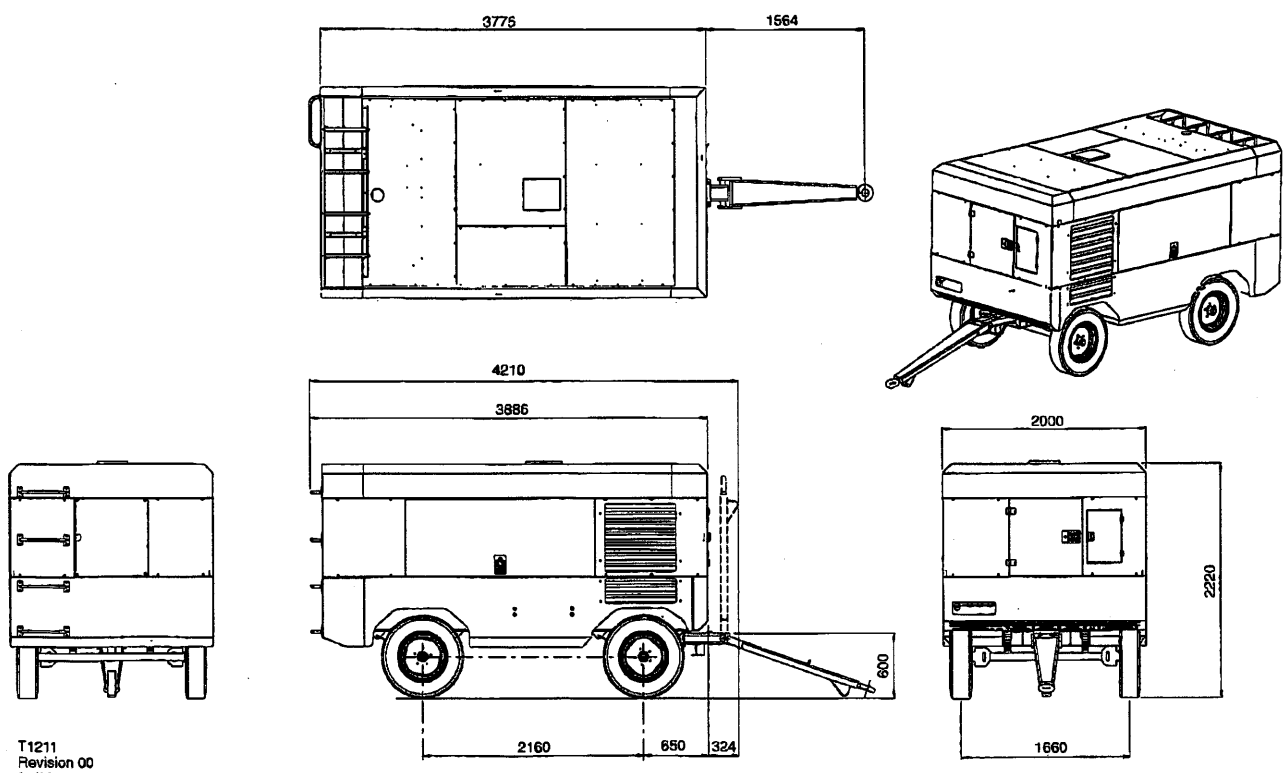

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'W'

MODEL		10/170 HP600	12/170 VHP600	9/215 XP750	9/230 XP800	12/235 VHP825	9/255 XP900	9/300 XP1060	21/215 XHP760	17/235 XHP825
COMPRESSOR										
Actual free air delivery.	m^3/min/ cfm	17,1/ 600	17,1/ 600	21,5/ 750	22,8/ 800	23,3/ 825	25,6/ 900	29,9/ 1060	21,5/ 760	23,3/ 825
Normal operating discharge pressure.	psi/bar/ kPa	150/10,3/ 1030	175/12/ 1200	125/8,6/ 860	125/8,6/ 860	175/12/ 1200	125/8,6/ 860	125/8,6/ 860	300/21/ 2100	250/17,2/ 1724
Maximum allowable pressure	psi/bar/ kPa	170/11,7/ 1170	190/13,1/ 1310	145/10/ 1000	145/10/ 1000	190/13,1/ 1310	145/10/ 1000	145/10/ 1000	350/24/ 2400	350/24/ 2400
Safety valve setting	psi/bar/ kPa	217/15/ 1500	217/15/ 1500	217/15/ 1500	217/15/ 1500	217/15/ 1500	217/15/ 1500	217/15/ 1500	362/25/ 2500	362/25/ 2500
Maximum pressure ratio (absolute)		8:1	8:1	8:1	8:1	8:1	8:1	8:1	18:9:1	18:9:1
Operating ambient temperature range	°C	–10/+52	–10/+52	–10/+52	–10/+52	–10/+52	–10/+52	–10/+52	–10/+52	–10/+52
Maximum discharge temperature	°C	120	120	120	120	120	120	120	120	120
COMPRESSOR										
Cooling system.		Oil Injection								
Oil capacity.	Litre	70	70	70	70	70	70	70	75	75
Maximum oil system temperature	°C	120	120	120	120	120	120	120	120	120
Maximum oil system pressure	psi/bar/ kPa	217/15/ 1500	217/15/ 1500	217/15/ 1500	217/15/ 1500	217/15/ 1500	217/15/ 1500	217/15/ 1500	362/25/ 2500	362/25/ 2500
LUBRICATING OIL SPECIFICATION (for the specified ambient temperatures).		**SEE NOTE – 1**								
ENGINE										
Type/model.		10/170 HP600 DEUTZ BF6M101 3 ECP	12/170 VHP600 CATER– PILLAR 3306 ATAAC	9/215 XP750 DEUTZ BF6M101 3 ECP	9/230 XP800 CATER– PILLAR 3306 ATAAC	12/235 VHP825 CATER– PILLAR 3306 ATAAC	9/255 XP900 CATER– PILLAR 3306 ATAAC	9/300 XP1060 CATER– PILLAR 3306 ATAAC	21/215 XHP760 CATER– PILLAR 3306 ATAAC	17/235 XHP825 CATER– PILLAR 3306 ATAAC
Number of cylinders / Displacement	/Litre	6/7,1	6/10,5	6/7,1	6/10,5	6/10,5	6/10,5	6/10,5	6/10,5	6/10,5
Oil capacity.	Litre	19	24	19	24	24	24	24	24	24
Speed at full load.	Rev min^{-1}	2000	1800	2000	1800	1800	1800	1800	1800	1800
Speed at idle.	Rev min^{-1}	1200	1200	1200	1200	1200	1200	1200	1300	1300
Electrical system.	V DC	24	24	24	24	24	24	24	24	24
Power available at rated speed	KW	170	187	170	187	224	224	250	250	250
Fuel tank capacity.	Litre	550	550	550	550	550	550	550	550	550
Coolant capacity	Litre	46	48	46	48	48	48	48	48	48
Max. gross weight	kg	4500	4800	4500	4800	4800	4800	4800	–	–
Shipping weight	kg	4000	4300	4000	4300	4300	4300	4300	–	–

11 GENERAL INFORMATION

NOTE – 1

ABOVE –23°C
Recommended: Pro–Tec™
Approved: SAE 10W, API CF–4/CG–4

BELOW –23°C
Mandatory: IR Performance 500

Ingersoll–Rand Pro–Tec™ compressor fluid is factory–fitted, for use at all ambient temperatures above –23°C.

NOTE: Warranty may be extended only by continuous use of Pro–Tec™ and Ingersoll–Rand 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 Ingersoll–Rand oil filters installed. When this has been completed, the following oils are approved:

a) for ambient temperatures above –23°C, SAE 10W, API CF–4/CG–4

b) for ambient temperatures below –23°C, I–R Performance 500 only.

SOUND LEVEL DATA ('W' model)

A) To Pneurop code PN8NTC2.
Equivalent continuous sound pressure level.*

. Rated load	83 dB(A)
. No load	81 dB(A)

(Operator position :–1m from machine)

B) In compliance with 86/188/EEC.

Average sound pressure level at 10m to 79/113/EEC.*	74 dB(A)

(*Machine only :– at maximum load in open site conditions)

Shipping weight.	4800 kg
Maximum gross weight.	5200 kg
Maximum horizontal towing force.	4714 kgf

WHEELS AND TYRES – SITE RUNNING GEAR

Number of wheels.	4
Tyre size.	750x16x6PR
Tyre pressure.	3,5 bar (50 lbf in^{-2})

TOWING SPEED

Maximum towing speed	30 km h^{-1} (20 mile h^{-1})

Further information may be obtained by request through Ingersoll–Rand 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.

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.).

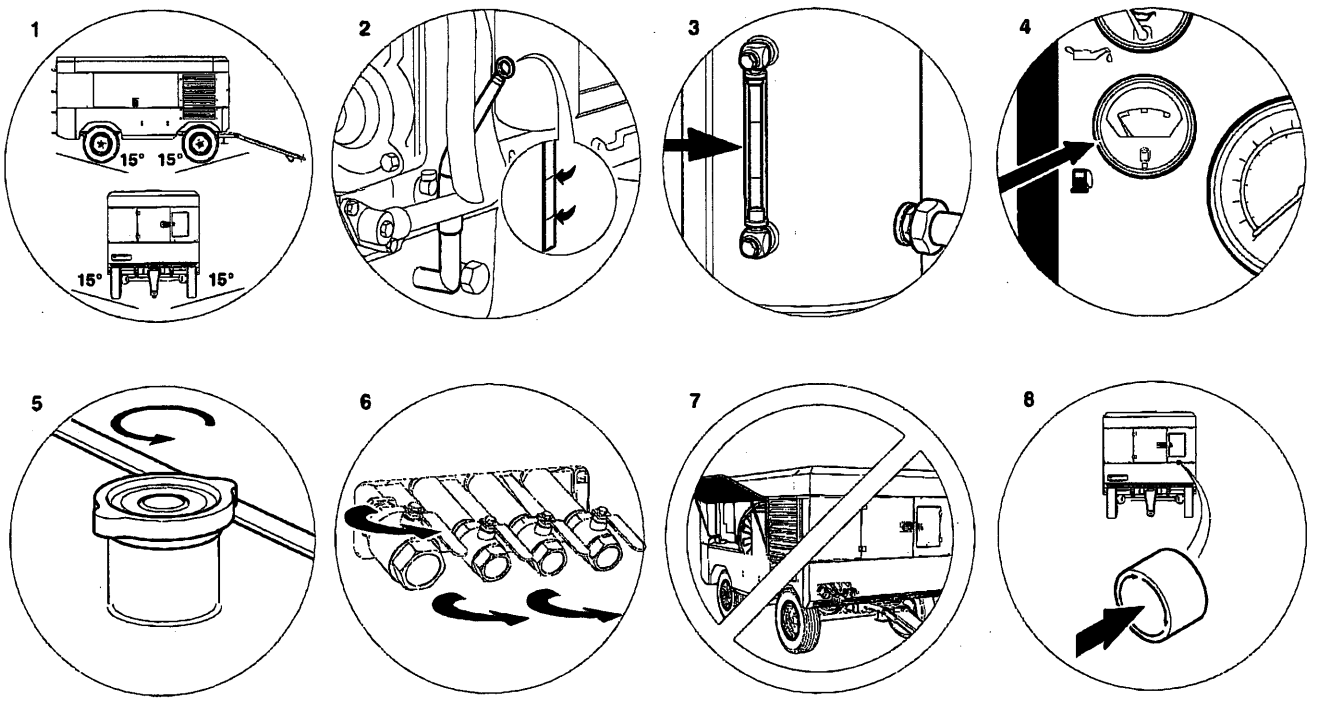
Adequate clearance needs to be allowed around and above the machine to permit safe access for specified maintenance tasks.

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.

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 accidently be pressurised / over pressurised by another.



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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.

13 OPERATING INSTRUCTIONS

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 a No. 2–D diesel fuel oil with a minimum octane number of 45 and a sulphur content not greater than 0,5%.*

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.*

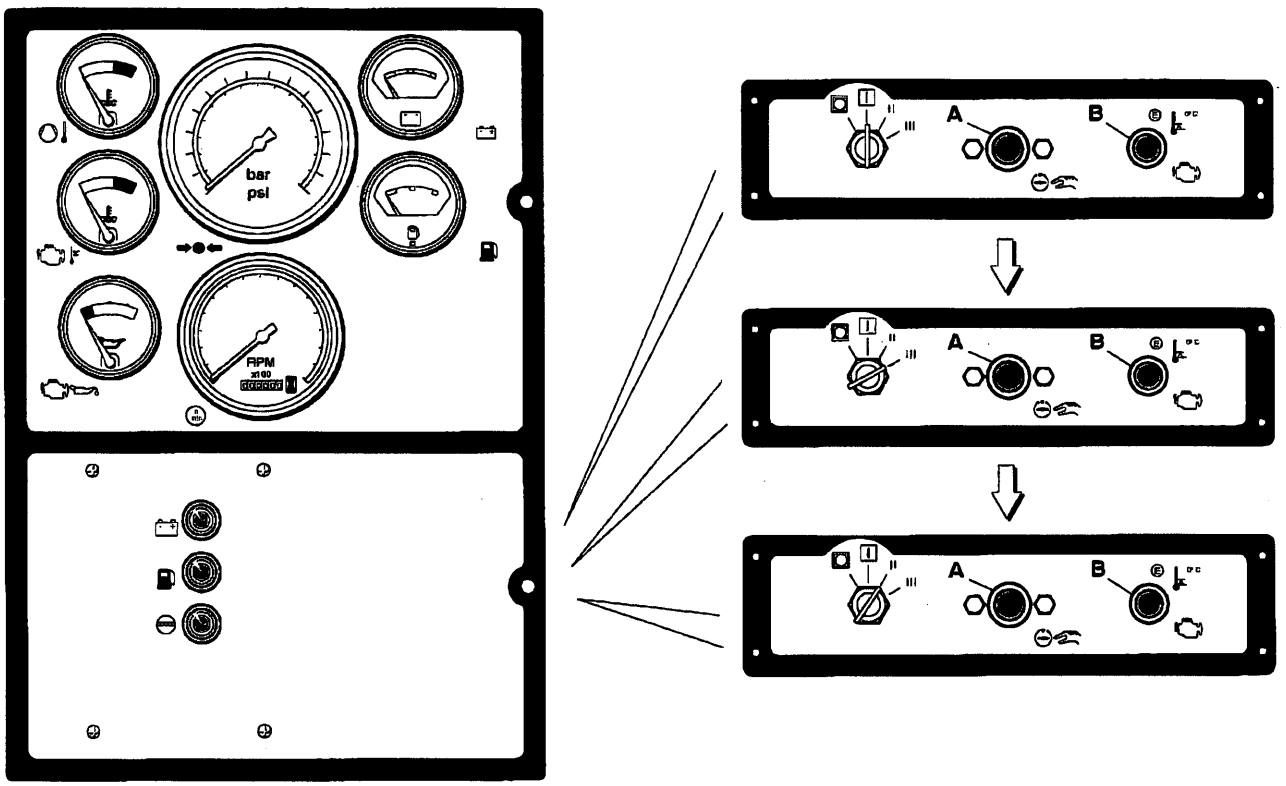
5. Check the radiator coolant level (with the unit level).

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

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.*

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

8. Close the manual relief valve adjacent to the regulator.



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STARTING THE MACHINE

Ensure emergency stop button is reset.

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

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

Heater light–Deutz

. Turn the key switch to position 2 until the warning light **B** extinguishes.

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

. Release to position *2* when the engine starts and the engine oil pressure gauge indicates green. The engine will now be running at a reduced speed.

NOTE: In order to allow the machine to start at a reduced load, a valve, which is operated by a button located on the instrument panel, is incorporated in the regulation system. (The valve automatically returns to the start position when the machine is switched off and air pressure relieved from the system).

. Allow the engine to reach its operating temperature – then press the button (**A**).

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

COLD WEATHER STARTING (CATERPILLAR)

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.

This Caterpillar engined machine is fitted with an ether cold starting aid. (Ether must not be used on the Deutz engined machine)

WARNING: Do not use any liquid except Ether when refilling the cold start device.

WARNING: Ether is highly flammable, do not store in open or unmarked containers. When handling or storing ether, ensure that there is adequate ventilation, no smoking, no naked lights and no inhalation of ether fumes.

In cold weather the following procedure should be adhered to:

. Turn the keyswitch to position *3*, (Engine start position) and simultaneously press the control button (**B**) (Ether cold start). The measured amount of ether is then metered into the engine.

. Release to position *2* when the engine starts and the engine oil pressure gauge indicates green.

. Allow the engine to reach its operating temperature – then press the button (**A**).

***CAUTION:** If the engine does not start, repeat the above procedure after waiting for a minimum of one minute.*

15 OPERATING INSTRUCTIONS

If the engine fails to start, refer to the *MAINTENANCE* section of this manual, and to the *ENGINE MANUFACTURER'S MANUAL*..

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

STOPPING THE MACHINE

. Close the service valve.

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

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

NOTE: As soon as the engine stops, the automatic blowdown valve will relieve all pressure from the system,except for the discharge pipe / manifold area. This area should be depressurised by opening the discharge valve, keeping clear of any airflow from it.

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

WARNING: When relieving system pressure by means of the service valve(s), a small amount of pressure will remain in the system. No maintenance work should be carried out whilst this situation exists. This pressure may be relieved by *slowly* operating the manual *blowdown* valve.

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, **PRESS THE EMERGENCY STOP SWITCH ON THE FRONT OF THE MACHINE AND ENSURE THAT IT ENGAGES IN DEPRESSED POSITION.**

RE-STARTING AFTER AN EMERGENCY

Disengage emergency stop control from engaged (depressed) position.

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

. Low water level

. Low fuel level.

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

DECOMMISSIONING

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

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

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

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

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

PERIOD	ITEM	MAINTENANCE
Daily	*Oil level.*	Check and refill as required.
	Radiator.	Refer to the *Engine Manufacturer's Manual.*
	Air filter(s).	Clean the dust collector box(es).
	Fuel tank.	Refill to prevent condensation.
	Emergency stop.	Test the operation of the device.
Weekly/50 hours	*Safety shutdown system.*	Check the electrical connections.
	Engine.	Refer to the *Engine Manufacturer's Manual.*
	Compressor oil filter.	Replace after the first 50 hours from new.
	Fan drive belt(s).	Check for correct tension and excessive wear. Re–tension/replace as necessary.
Monthly/150 hours	*Oil cooler.*	Check for the build up of foreign matter. Clean if necessary by blowing out with air or pressure wash.
	Radiator / Charge air cooler	Check for the build up of foreign matter. Clean if necessary by blowing out with air or pressure wash.
	Compressor oil filter.	Replace after the first 150 hours from new.
	Hoses.	Inspect.
	Running gear.	Apply grease to the steering linkage grease points.
3 months/250 hours	*Safety shutdown system.*	Test the operation of the switches.
	Safety valve.	Operate the safety valve manually to verify that the valve mechanism is functioning correctly and that a small amount of air is released.
	Running gear.	Check the bolts securing the running gear to the chassis and re–tighten where necessary (Refer to the *TORQUE SETTING TABLE* in this manual). Reset the tab washer. Check and adjust the brakes and brake cables. Adjust and grease the linkages.
3, 6, 30 months/250, 500, 2500 hours	*Engine.*	Refer to the *Engine Manufacturer's Manual.*
6 months/500 hours	*Compressor oil filter.*	Replace.
	Hoses.	Inspect.
	Scavenge line.	Clean if necessary.
	Fan drive belt(s).	Check tension and belt condition
	Pressure system.	Inspect all components for damage, deterioration or leaks. Replace as necessary.
	Wheel bearings.	Pack with grease.
1 year/1000 hours	*Air filter elements.*	Replace.
	Safety shutdown system.	Test the operation of the switches.
	Compressor oil.	Replace.
	Pressure gauge.	Remove from the machine and check the calibration. Replace if necessary.
	Pressure regulator.	Check that the regulator functions correctly.
1 year/1000 hours or as defined by local or national legislation	*Separator tank.*	Fully inspect all external surfaces, welds and fittings. Report any excessive corrosion, mechanical or impact damage, leakage or other deterioration.
2 years/2000 hours	*Safety valve.*	Remove from the machine and check for the correct operating pressure. Adjust as necessary.
	Separator element.	Replace.
4 years/4000 hours	*Hoses.*	Replace.
6 years/6000 hours or as defined by local or national legislation.	*Separator tank.*	Remove the cover plate and any necessary fittings. Clean the interior thoroughly and inspect all internal surfaces and welds.
As required.	*Separator element.*	Replace if damaged.
	Battery.	Clean and grease the terminals.
	Fuel filter water separator.	Refer to the *Engine Manufacturer's Manual.*
	Cooling system.	Add anti–freeze and inhibitors.

17 MAINTENANCE

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.

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

THIS PRESSURE MUST BE RELIEVED BY CAREFULLY:

(a) DISCONNECTING ANY DOWNSTREAM EQUIPMENT.

(b) OPENING THE DISCHARGE VALVE TO ATMOSPHERE.

(USE HEARING PROTECTION IF NECESSARY).

. the machine cannot be started accidently 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 accidently 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, jewellery, 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 engine water temperature switch
- High discharge air temperature switch
- Low water level switch.
- Low fuel level switch.

Low engine oil pressure switch.

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.
  Replace the switch.

Temperature switch(es).

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

- Start the machine.
- Disconnect each switch in turn. The machine should shutdown.
- Re–connect the switch.

NOTE: Do not press the load button.

High engine 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 100°C.

High discharge air temperature switch

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

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

Low water level switch.

The low water level switch should be tested annually by draining approximately 10 litres of water from the radiator via the drain plug. The low water level light should then illuminate when the key switch is turned to position *1*.

***CAUTION:** Do not drain water from the radiator whilst the machine is running.*

Low fuel level switch.

Test the fuel level switch by removing the wire connected to the 'W' terminal on the fuel level switch in the fuel tank and touching the disconnected wire to earth. The machine should stop and the indicator lamp will illuminate. Reconnect the wire. The switch may also be tested by running the machine low on fuel.

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

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

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

Inspection

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

Reassembly

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

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

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

Replace the drop–tube and 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 AIR CHARGE COOLER

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.

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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 ELEMENT

The air filter should be inspected regularly (refer to the *SERVICE/MAINTENANCE CHART*) and the element replaced when the restriction indicator shows red or every 1000 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.

The safety element should be renewed every 3000 hours or every third change of the main element, whichever comes first.

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.

If the safety element is to be renewed, thoroughly clean the interior of the filter housing prior to removing the safety element.

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.

***CAUTION:** If inspection reveals damage to the main element, the safety element **must** be replaced.*

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.

Secure the element in the housing by hand tightening the nut.

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

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

NOTE: In the event that a new filter element is not readily available, the element can be re-used after cleaning. In this case the following procedure must be carried out:

Clean the element by directing a jet of clean, dry compressed air, no more than 5 bar, at an angle of 45 degrees to the outside of the element. Carefully blow any dust from each fold of the element.

Compressed air cleaning is only recommended when a new element is not available.

***CAUTION:** Safety elements must not be cleaned and re-used.*

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 bolt in the fan hub has not loosened. If, for any reason, it becomes necessary to remove the fan or re-tighten the fan mounting bolt, 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).

Removing air from the fuel system

If it is suspected that air is present in the fuel system, then, with the machine stopped proceed as follows:

CAT ENGINED MACHINES ONLY:-

Refill the fuel tank. Loosen the fuel injector nuts. Operate the hand pump located on the engine and observe fuel being pumped out. Continue pumping until a constant flow of fuel is emitted from the loose connections and contains no air bubbles.

Tighten the loose connections and nuts and prime with the hand pump until the fuel pressure gauge pointer (located on the engine) is in the green sector.

DEUTZ ENGINED MACHINES:-

Never try to bleed the fuel system by loosening the fuel injector pipes.

Manually refill the fuel pre filter and operate starter.

FUEL FILTER WATER SEPARATOR

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

CHARGE COOLER PIPEWORK:-

Inspect all hoses and clips on the charge cooler pipe work.

Engine damage will occur if the charge cooling system leaks.

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.

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.

LUBRICATION

The engine is initially supplied with engine oil sufficient for a nominal period of operation (for more information, consult The *Engine Manufacturer's 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 Manufacturer's Manual.*

ENGINE LUBRICATING OIL SPECIFICATION

Refer to the *Engine Manufacturer's Manual.*

ENGINE OIL FILTER ELEMENT

The engine oil filter element should be changed at the engine manufacturer's recommended intervals. Refer to the *Engine Manufacturer's 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 INGERSOLL-RAND Pro-Tec™ oil for use at all ambient temperatures above -23°C.

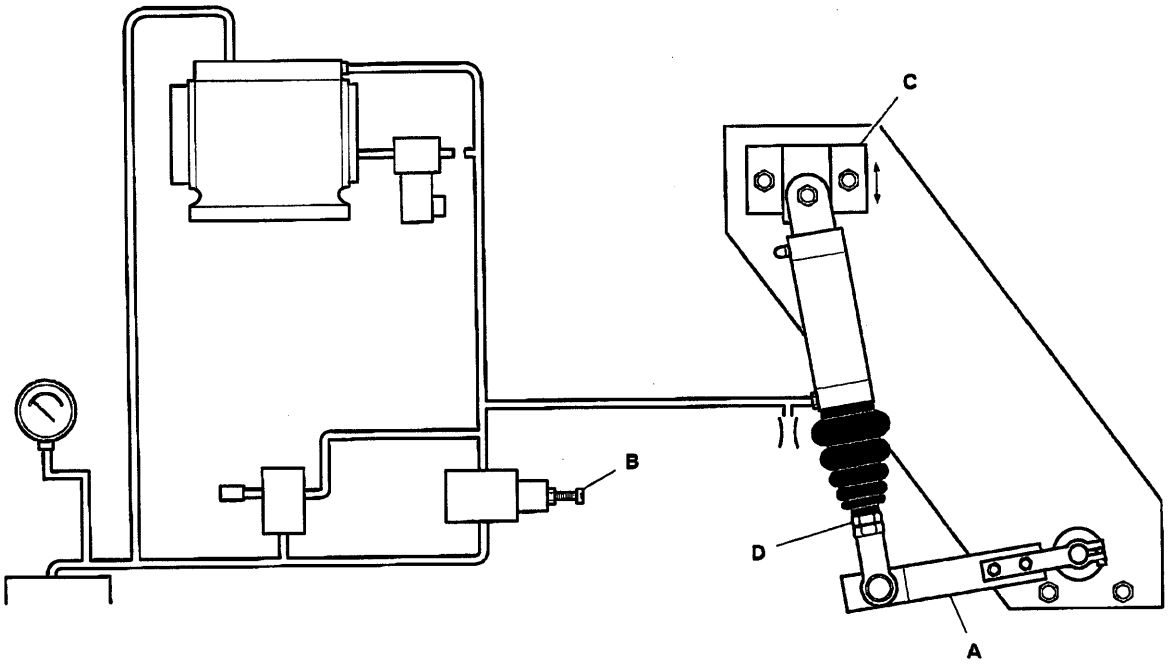
COMPRESSOR OIL FILTER ELEMENT

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.*

21 MAINTENANCE



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9/215 9/230 9/255 9/300 10/170 12/170 12/235 XP750 XP800 XP900 XP1060 HP600 VHP600 VHP825

SPEED AND PRESSURE REGULATION ADJUSTMENT
9/215 9/230 9/255 10/170 12/170 12/235

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).

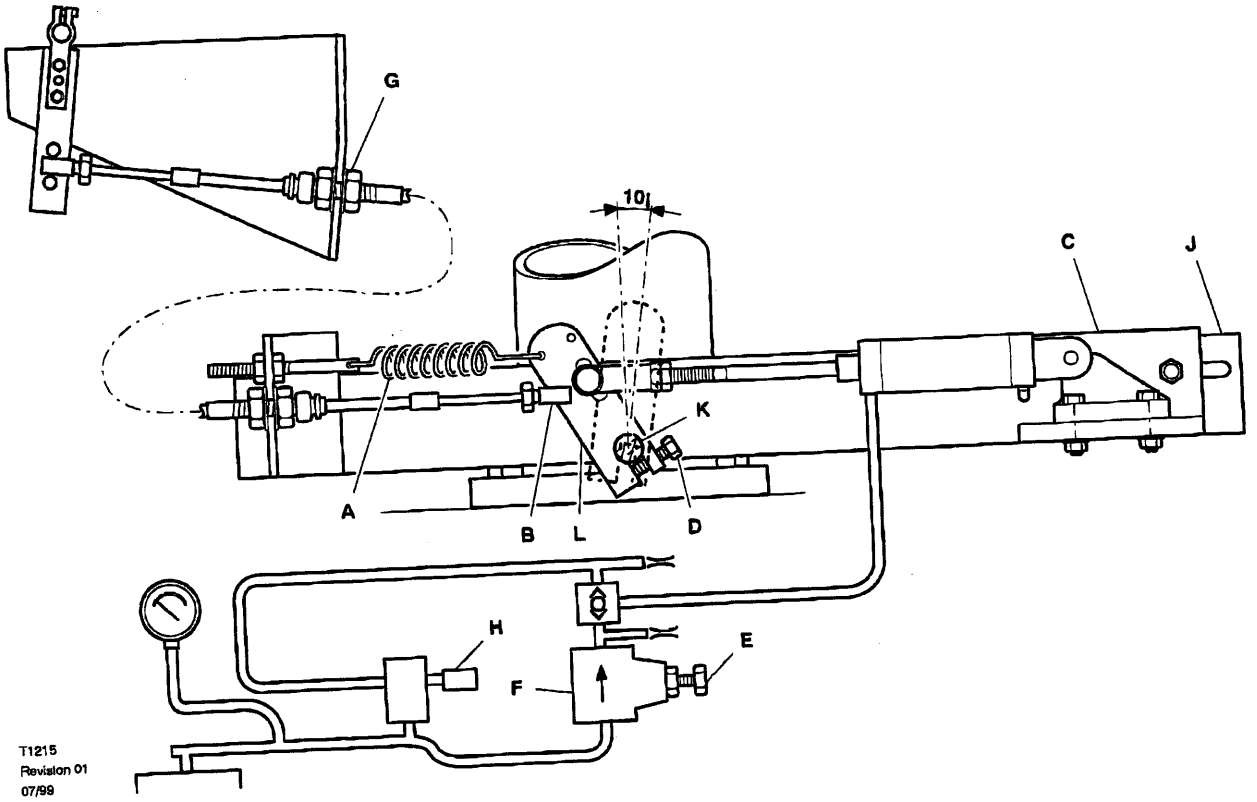
Inspect the throttle arm **'A'** on the engine governor to see that it is extended in the full speed position when the engine is running at *full-load* speed and the service valve is fully open. (Refer to the *GENERAL INFORMATION* section of this manual).

Adjust the service valve on the outside of the machine to maintain normal operating discharge pressure (refer to *GENERAL INFORMATION*). without the throttle arm moving from the full speed position. If the throttle arm moves away from the full speed position before normal operating discharge pressure is attained, then turn the adjusting screw **'B'** clockwise to increase the pressure. Optimum adjustment is achieved when the throttle arm just moves from its full speed position and the pressure increases slightly.

Adjust the idle speed by moving bracket **'C'**. Adjust full speed by means of the ball joint **'D'**.

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

***CAUTION:** Never allow the idle pressure to exceed maximum allowable pressure (refer to GENERAL INFORMATION).*



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XHP825 XHP760

SPEED AND PRESSURE REGULATION ADJUSTMENT
17/235 21/215

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

Refer to the diagram above.

With the unit stopped, disconnect ballast spring **'A'** and unclip the ball joint **'B'** from the butterfly lever. Loosen the two screws securing bracket **'C'** to main bracket **'J'**.

Loosen screw **'D'** and rotate the butterfly valve pivot shaft **'K'** fully clockwise until the valve is closed. Position lever **'L'** approximately 10° after vertical and tighten screw **'D'**.

Keep the butterfly lever in the closed position and with the the air cylinder fully contracted tighten the screws holding bracket **'C'** to the main bracket **'J'**.

Allow the cylinder to return to its extended position and reconnect the ballast spring **'A'** and the control cable ball joint **'B'**.

***IMPORTANT:** Ensure all components are aligned and move freely.*

Start engine: Note receiver pressure. Warm up pressure should be 3,5–5,0 bar (50–70 p.s.i.).

To increase the warm up pressure, turn the air cylinder rod in an anti–clockwise direction to open the butterfly valve.

To reduce warm up pressure, turn air cylinder rod in clockwise direction to close butterfly valve.

When the engine is warmed up, press the 'Load' button **'H'** to commence normal regulation.

Set pressure by adjusting the screw **'E'** on the pressure regulator **'F'**. Turn the screw clockwise to increase pressure and anticlocwise to reduce pressure.

With the machine at unloaded pressure set idle speed using cable locknuts **'G'**.

To adjust top speed ensure the machine is running in a loaded condition.

To increase speed screw ball joints at the ends of the cable outwards.

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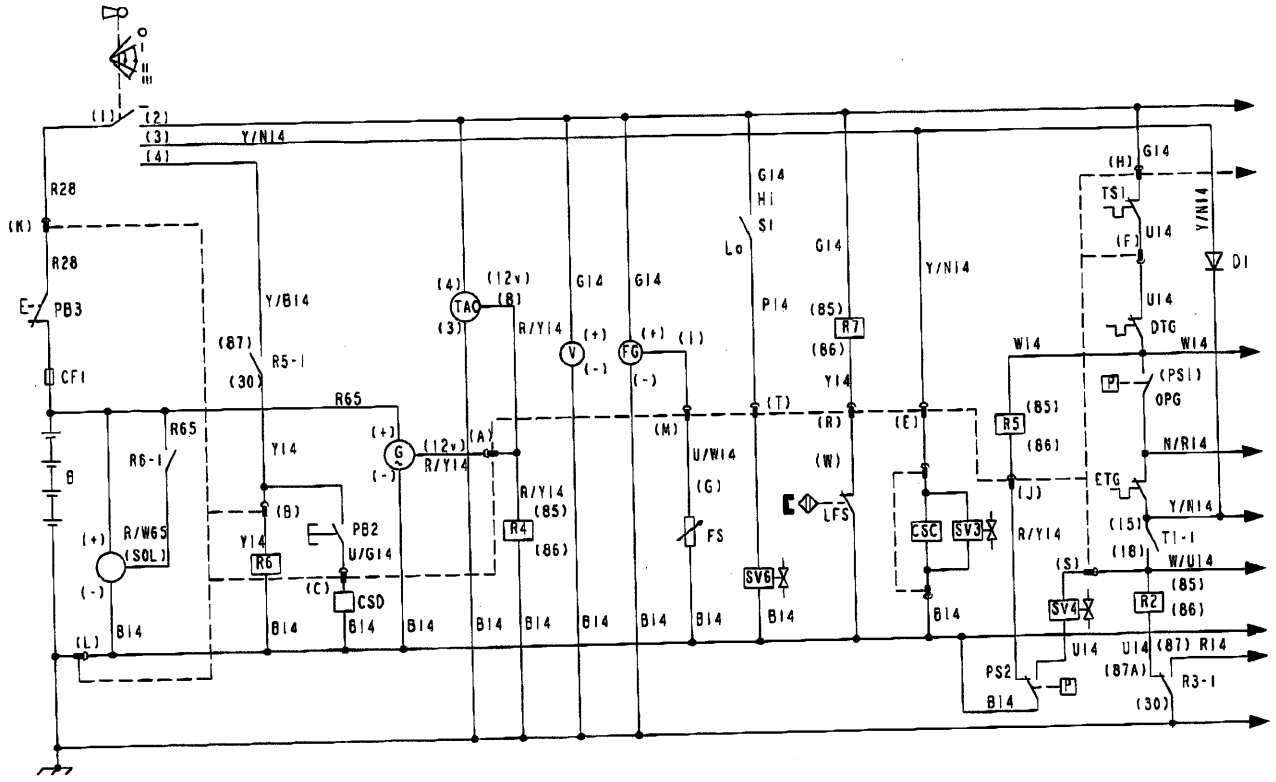
TORQUE VALUES

	ft lbf	Nm
Air Cylinder to bracket	18–22	24–30
Airend to engine	44–54	59–73
Air intake valve to airend	158–192	214–260
Axles to springs	80–90	108–122
Discharge pipe to airend	87–105	118–142
Discharge pipe to separator tank	87–105	118–142
Drive pins to flywheel	140–160	190–217
Exhaust manifold	31–39	42–53
Fan hub to engine pulley	28–34	38–46
Lifting bail to frame	234–286	316–387
Mounting bracket to airend	234–286	316–387
Pintle box to frame	126–154	170–208
Resilient mount to frame	126–154	170–208
Separator tank cover	158–192	214–260
Separator tank to frame	52–64	70–86
Exhaust silencer to bracket	45–55	61–74
Spring shackles to frame	126–154	170–208
Starter motor terminals	11–13	15–18
Wheel nuts	180–220	243–297



CATERPILLAR

89302863–A

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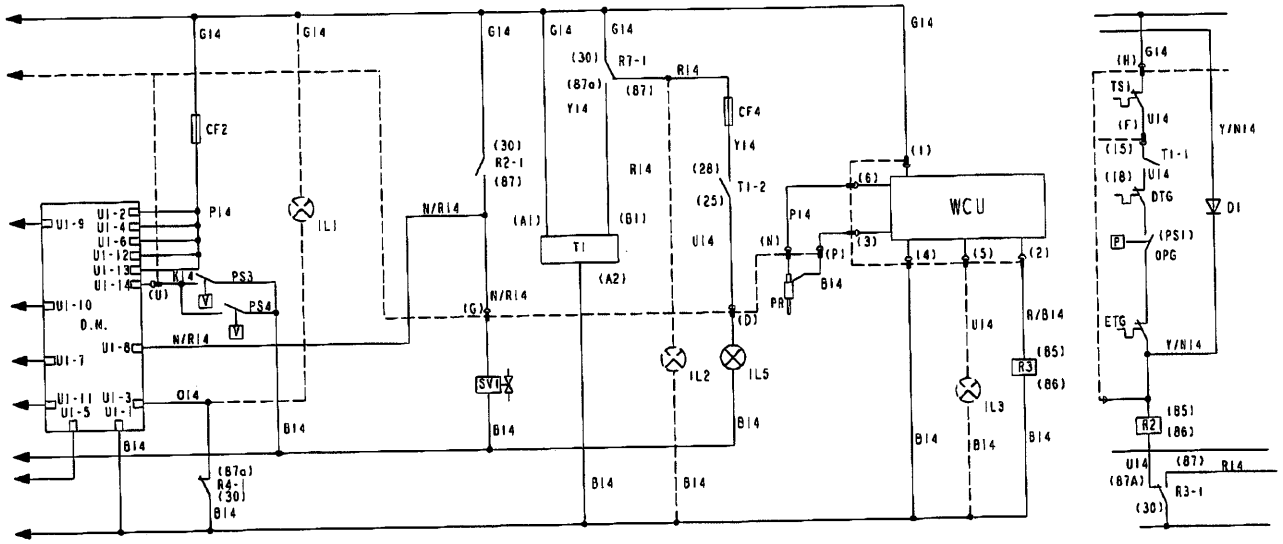
09/99

KEY

A	Fuel relay contact R7–1 shown for machine for use with lamps IL1, IL2, IL3
B	Battery 24 Volt
CF1	Control fuse (backup) 7,5A
CF2	Control fuse 5A (Option) (diagnostic module)
CF4	Control fuse 5A (Option)
CSD	Cold start device
CSC	Cold start compressor (Option)
DM	Diagnostic module (Option)
DTG	Gauge, discharge temperature
ETG	Gauge, engine temperature
FG	Gauge, fuel
FS	Sender unit, fuel gauge
G	Alternator
h	Hour meter
IL1	Lamp, No – charge (Option)
IL2	Lamp, low fuel (Option)
IL3	Lamp, low water (Option)
IL5	Beacon, flashing (Option)
LFS	Switch, low fuel level
M	Starter motor
PB2	Pushbutton, cold start
PB3	Pushbutton, Emergency stop

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

25 MACHINE SYSTEMS



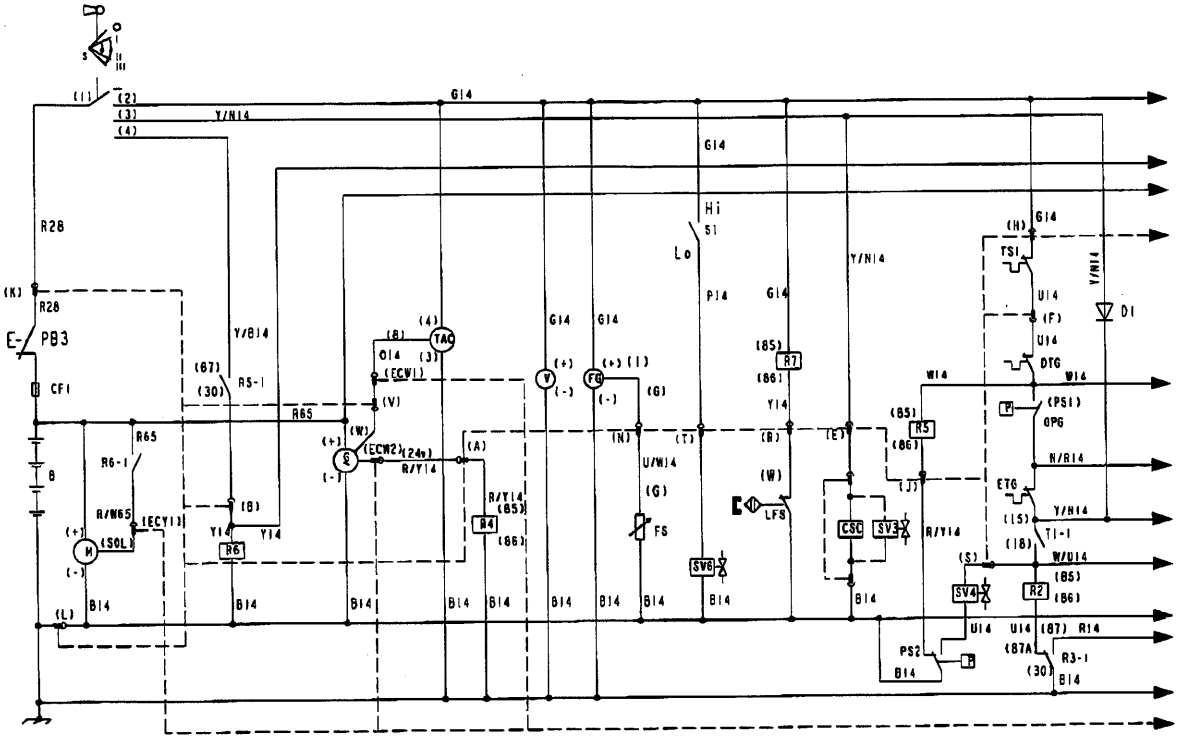
CATERPILLAR

89302863–B
Revision
09/99

KEY

PR	Probe, low water level
PS1	Gauge, oil pressure
PS2	Air pressure switch
PS3	Restricted filter switch (Option)
PS4	Restricted filter switch (Option)
R2	Relay, safety shut-down (24V)
R3	Relay, low water level (24V)
R4	Relay, alternator charge (12V)
R5	Relay, start inhibit (24V)
R6	Relay, engine start (24V)
R7	Relay, low fuel shutdown (24V)
S	Key–switch
S1	Dual pressure switch (Option)
SV1	Solenoid, engine stop
SV3	Solenoid, cold start (Option)
SV4	Start aid solenoid (Option)
SV6	Dual pressure solenoid (Option)
T1	Timer, Low fuel (Option)
TAC	Tachometer
TB1	Terminal block 1, 9way 5A
TB2	Terminal block 2, 7way 5A (Option)
TS1	Switch, temperature (separator tank)
V	Voltmeter
WCU	Water level control module

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



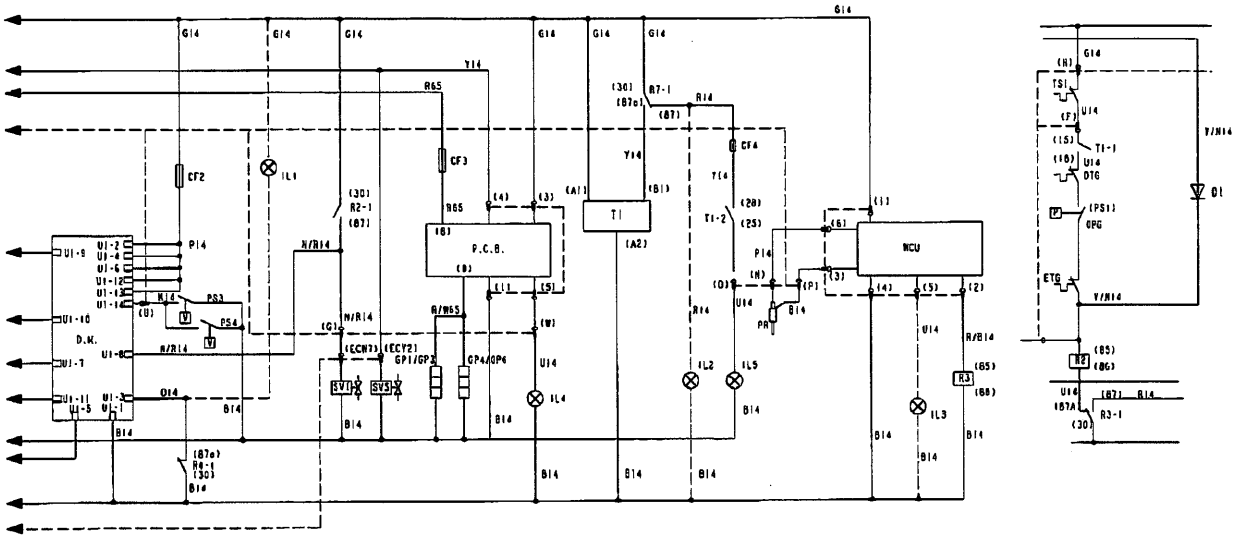
DEUTZ 89302871–A
Revision
09/99

KEY

A	Fuel relay contact R7–1 shown for machine for use with lamps IL1, IL2, IL3
B	Battery 24 Volt
CF1	Control fuse (backup) 7,5A
CF2	Control fuse 5A (Option) (diagnostic module)
CF3	Fuse, cold start
CF4	Control fuse 5A (Option)
CSC	Cold start compressor (Option)
DM	Diagnostic module (Option)
DTG	Gauge, discharge temperature
ECW	Engine connector block (White)
ECY	Engine connector block (Yellow)
ETG	Gauge, engine temperature
FG	Gauge, fuel
FS	Sender unit, fuel gauge
G	Alternator
GP1–6	Glow plugs
h	Hour meter
IL1	Lamp, No – charge (Option)
IL2	Lamp, low fuel (Option)
IL3	Lamp, low water (Option)
IL4	Lamp, cold start (PCB)
IL5	Beacon, flashing (Option)
LFS	Switch, low fuel level
M	Starter motor

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

27 MACHINE SYSTEMS



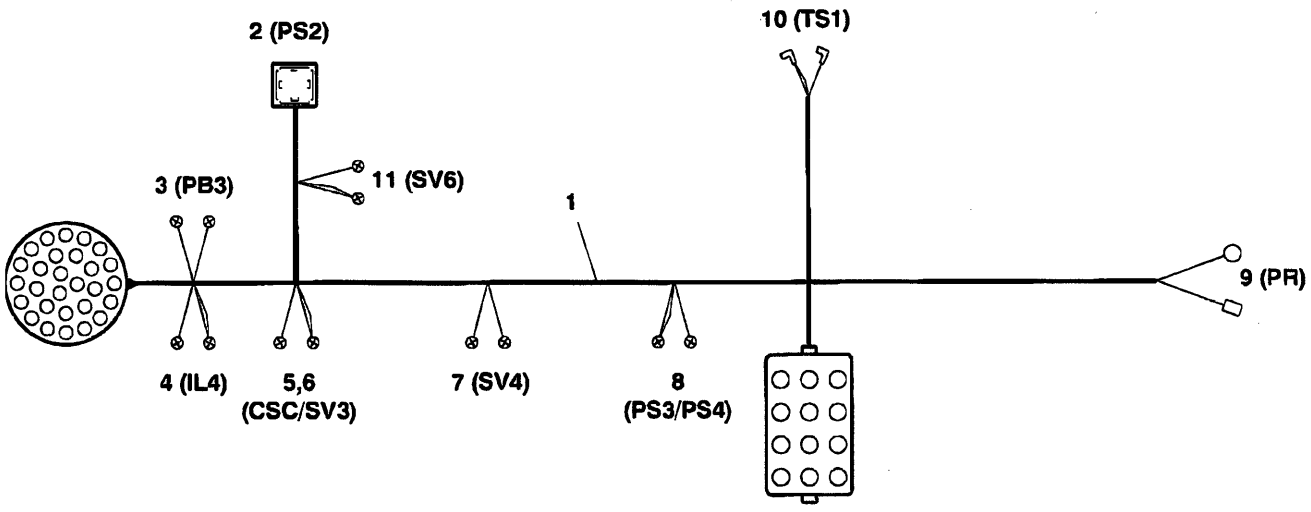
DEUTZ

89302871–B
Revision
09/99

KEY

PB3	Pushbutton, Emergency stop
PCB	Power control box (cold start)
PR	Probe, low water level
PS1	Gauge, oil pressure
PS2	Air pressure switch
PS3	Restricted filter switch (Option)
PS4	Restricted filter switch (Option)
R2	Relay, safety shut-down (24V)
R3	Relay, low water level (24V)
R4	Relay, alternator charge (24V)
R5	Relay, start inhibit (24V)
R6	Relay, engine start (24V)
R7	Relay, low fuel shutdown (24V)
S	Key–switch
S1	Dual pressure switch (Option)
SV1	Solenoid, engine stop
SV3	Solenoid, cold start (Option)
SV4	Start aid solenoid (Option)
SV5	Excess fuel solenoid
SV6	Dual pressure solenoid (Option)
T1	Timer, Low fuel (Option)
TAC	Tachometer
TB1	Terminal block 1,10 way 5A
TB2	Terminal block 2, 7way 5A (Option)
TS1	Switch, temperature (separator tank)
V	Voltmeter
WCU	Water level control module

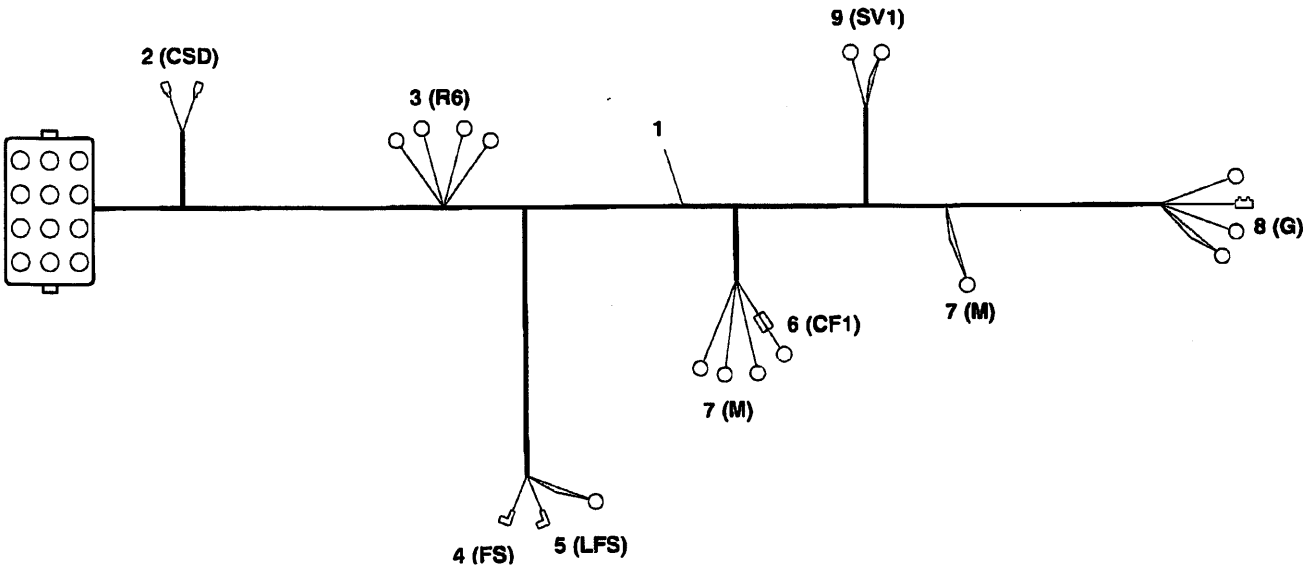
B	Black
G	Green
K	Pink
LG	Light green
N	Brown
O	Orange
P	Purple
R	Red
S	Grey
U	Blue
W	White
Y	Yellow



89285191
Revision
01/99

	KEY
1	Harness
2	Air pressure switch (PS2)
3	Pushbutton, Emergency stop (PB3)
4	Flashing light (IL4) (Option)
5	Cold start compressor (CSC) (Option)
6	Solenoid, cold start (SV3) (Option)
7	Start aid solenoid (SV4) (Option)
8	Restricted filter switches (PS3/PS4) (Option)
9	Probe, low water level (PR)
10	Switch, temperature (TS1) (separator tank)
11	Dual pressure solenoid (SV6) (Option)

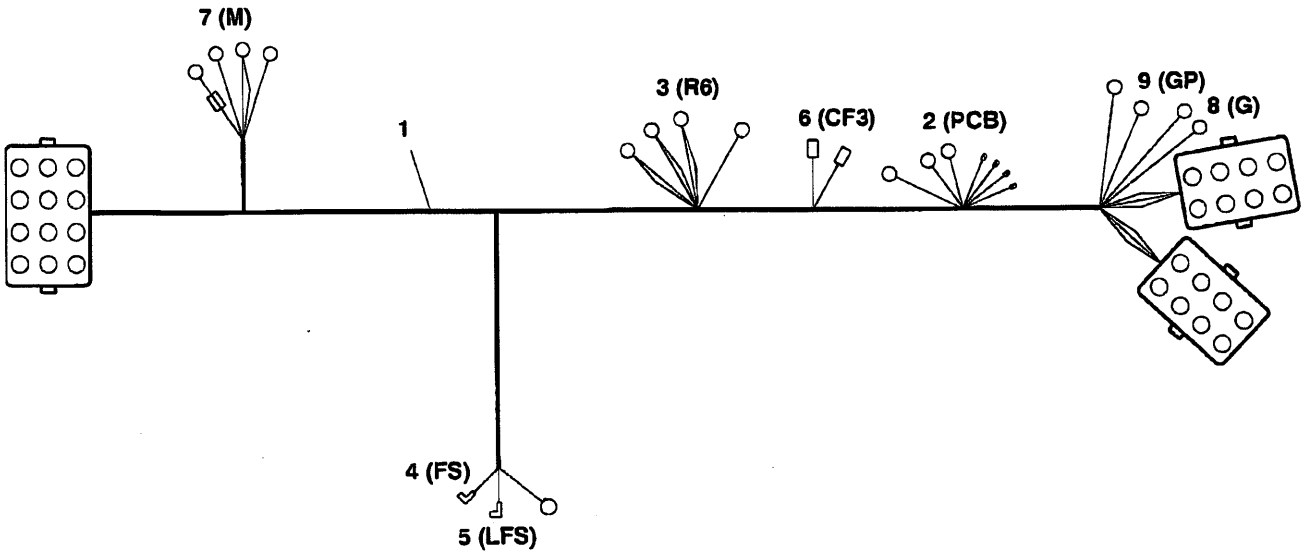
29 MACHINE SYSTEMS



CATERPILLAR

89285209
Revision
01/99

	KEY
1	Harness
2	Cold start device (CSD) (Option)
3	Relay, engine start (24V)(R6)
4	Sender unit, fuel gauge (FS)
5	Switch, low fuel level (LFS)
6	Fuse, standard blade 7,5A (CF1)
7	Starter motor (M)
8	Alternator (G)
9	Solenoid, engine stop (SV1)

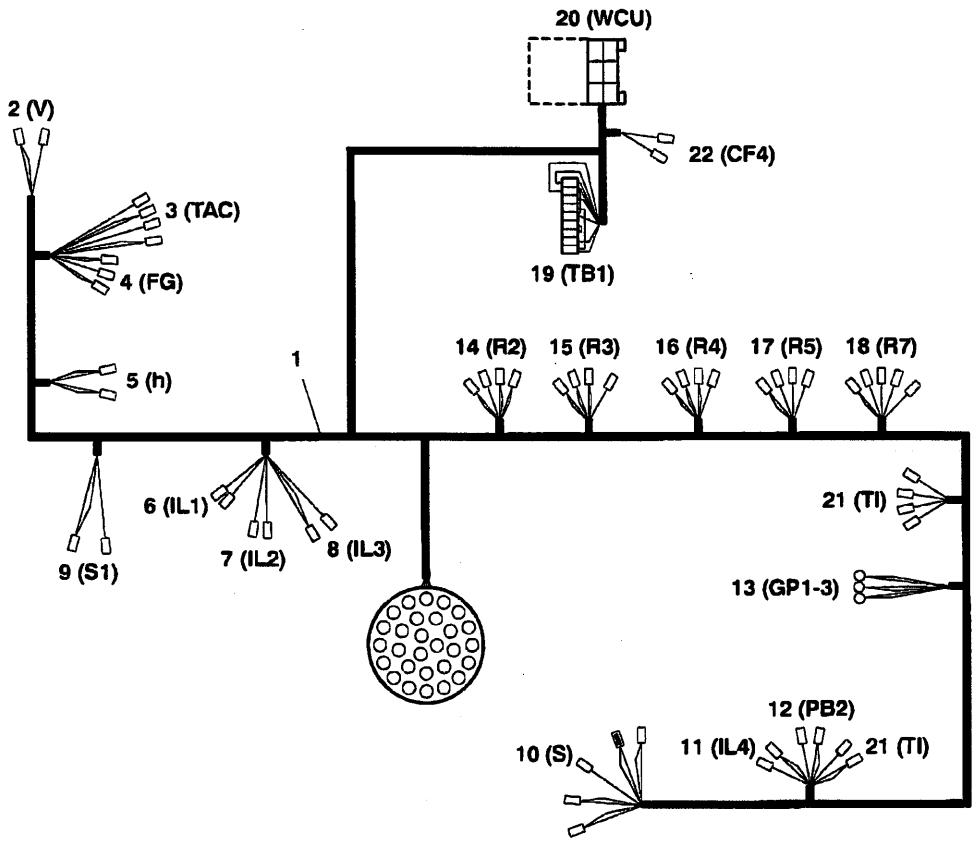


DEUTZ

89285217
Revision
0 /9

	KEY
1	Harness
2	Cold start device (PCB)
3	Relay, engine start (24V) (R6)
4	Sender unit, fuel gauge (FS)
5	Switch, low fuel level (LFS)
6	Fuse, cold start (CF3)
7	Starter motor (M)
8	Alternator (G)
9	Glow plugs (GP)

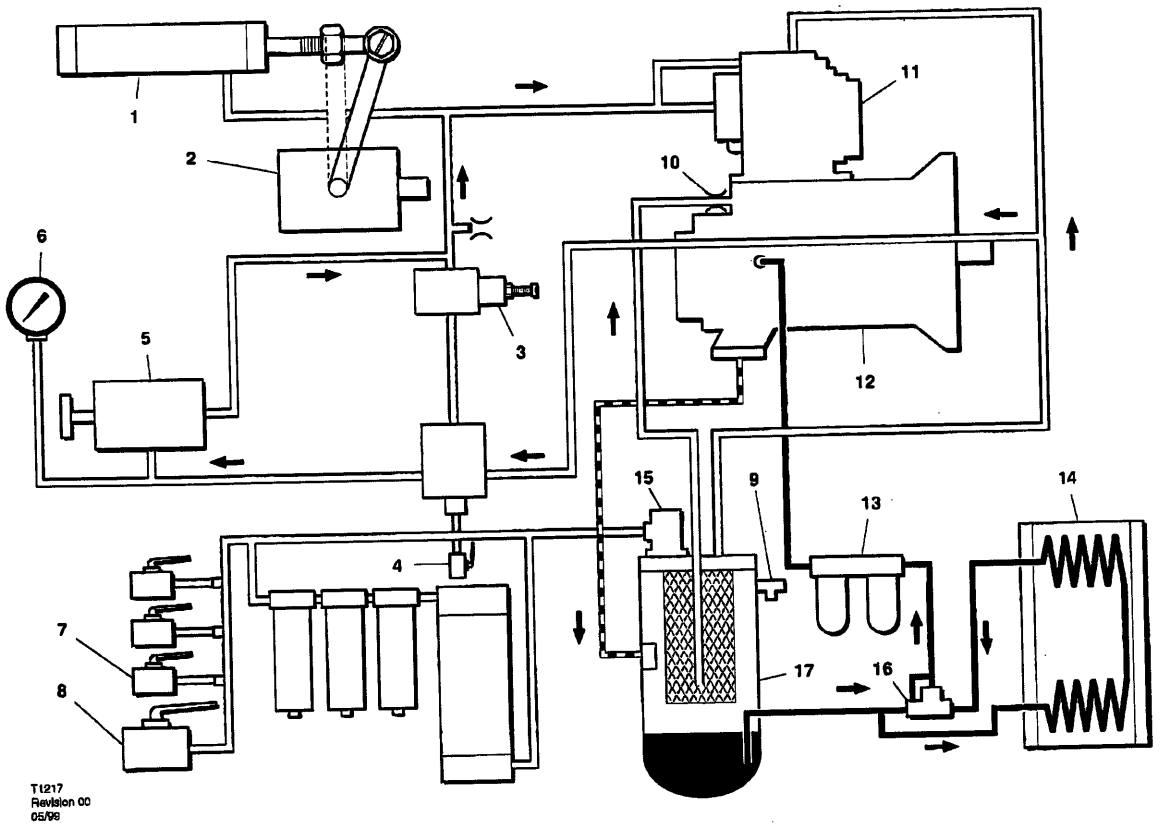
31 MACHINE SYSTEMS



89302855
Revision
09/99

KEY

1	Harness, instrument panel
2	Voltmeter (V)
3	Tachometer (TAC)
4	Gauge, fuel (FG)
5	Hour meter (h)
6	Lamp, No – charge (IL1) (Option)
7	Lamp, low fuel (IL2) (Option)
8	Lamp, low water (IL3) (Option)
9	Dual pressure switch (S1) (Option)
10	Key–switch (S)
11	Lamp, cold start (PCB) (IL4) (Option)
12	Pushbutton, cold start (PB2) (Option)
13	Ground point (GP1–3)
14	Relay, safety shut-down (24V) (R2)
15	Relay, low water level (24V) (R3)
16	Relay, alternator charge (12V – CAT)(R4) (24V – DEUTZ)(R4)
17	Relay, start inhibit (24V)(R5)
18	Relay, low fuel shutdown (24V) (R7)
19	Terminal block 1, 7way 5A (TB1)
20	Water level control module (WCU)
21	Timer, Low fuel (Option) (T1)
22	Control fuse 5A (Option) (CF4)

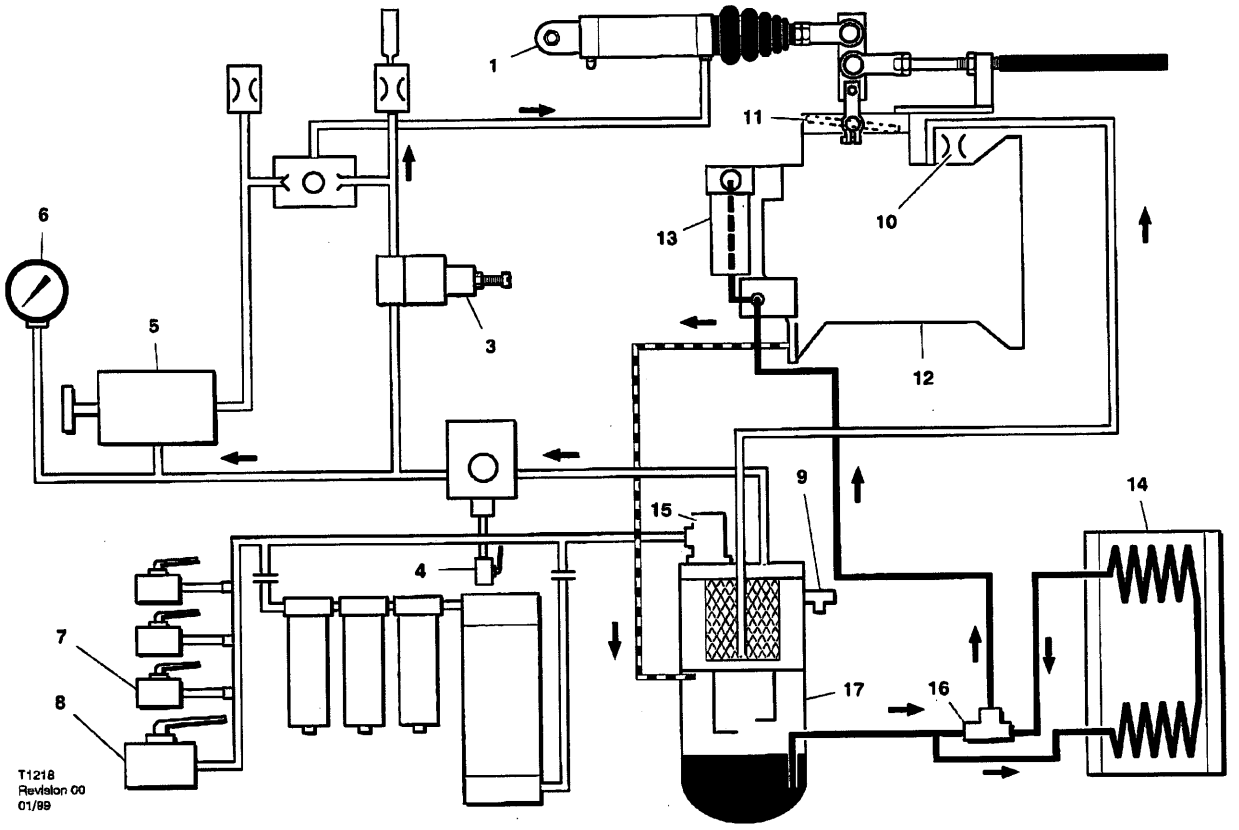


9/215 9/230 9/255 9/300 10/170 12/170 12/235
XP750 XP800 XP900 XP1060 HP600 VHP600 VHP825

	KEY
1	Air cylinder
2	Engine fuel pump
3	Pressure regulator
4	Manual blowdown valve
5	Run valve
6	Discharge pressure gauge
7	Ball valve $1^1/_4$"
8	Ball valve $2^1/_2$"
9	Safety valve
10	Scavenger orifice
11	Unloader valve
12	Compressor
13	Oil filter
14	Oil cooler
15	Minimum pressure valve
16	Oil bypass valve
17	Separator tank

Air
Oil
Air/oil

33 MACHINE SYSTEMS



17/235 21/215
XHP825 XHP760

	KEY
1	Air cylinder
2	Engine fuel pump
3	Pressure regulator
4	Manual blowdown valve
5	Run valve
6	Discharge pressure gauge
7	Ball valve $1^1/_4$"
8	Ball valve 2"
9	Safety valve
10	Scavenger orifice
11	Unloader valve
12	Compressor
13	Oil filter
14	Oil cooler
15	Minimum pressure valve
16	Oil bypass valve
17	Separator tank

Air
Oil
Air/oil

FAULT	CAUSE	REMEDY
No reaction from instrument panel when key turned to (I) position.	*Emergency stop actuated.*	Reset emergency stop button.
	Batteries not connected.	Connect batteries.
	Fuse at starter motor 'blown'.	Replace fuse.
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.
	Fuel starvation.	Pump the fuel manually until the fuel pressure gauge shows green.
	Relay failed.	Replace the relay.
	Engine throttle arm not in 'run' position.	Check the speed cylinder and stop position.
	Faulty stop solenoid	Check the stop solenoid
Engine stops while in service or is reluctant to start.	*Low fuel level.*	Fill fuel tank and bleed air from fuel system if necessary. (Refer to *MAINTENANCE SECTION*). Fill fuel tank and bleed air from fuel system if necessary. (Refer to *MAINTENANCE SECTION*).
	Safety shut-down system in operation.	Check the safety shut-down switches.
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).
	Low water level	Check if the low water lamp is extinguished.
	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.	*Low water level*	Check the level and replenish if necessary.
	Blocked radiator.	Stop the machine and clean the cooling fins with compressed air or steam. Use reduced pressure for cleaning the fins.
	Reduced cooling air from fan.	Check the fan and the drive belts. Check for any obstruction inside the cowl.
	Faulty thermostat	Check the thermostat and replace if necessary.
Engine speed too high.	*Incorrect throttle arm setting.*	Check the engine speed setting.
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*"
Leaking oil seal.	*Improperly fitted oil seal.*	Replace the oil seal.

Refer also to the *Engine Manufacturer's Manual.*

35 FAULT FINDING

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.
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 Ingersoll–Rand recommended oil.
	Defective by-pass valve.	Check the operation of the element and replace if necessary.
	Recirculation of cooling air.	Move the machine to avoid recirculation.
	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.
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).
Machine goes to full pressure when started.	*Inlet valve set incorrectly. (17/235, 21/215)*	Refer to *SPEED AND PRESSURE REGULATION ADJUSTMENT* in the *MAINTENANCE* section of this manual. *(17/235, 21/215)*
	Faulty load valve.	Replace the valve.
Machine fails to load when the load button is pressed.	*Faulty load valve.*	Replace the valve.