



Operation & maintenance manual

Original Instructions

004401 – Harben Cable Duct Desilter Trailer

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Section 1 – Introduction & Contents

1.1. Contents

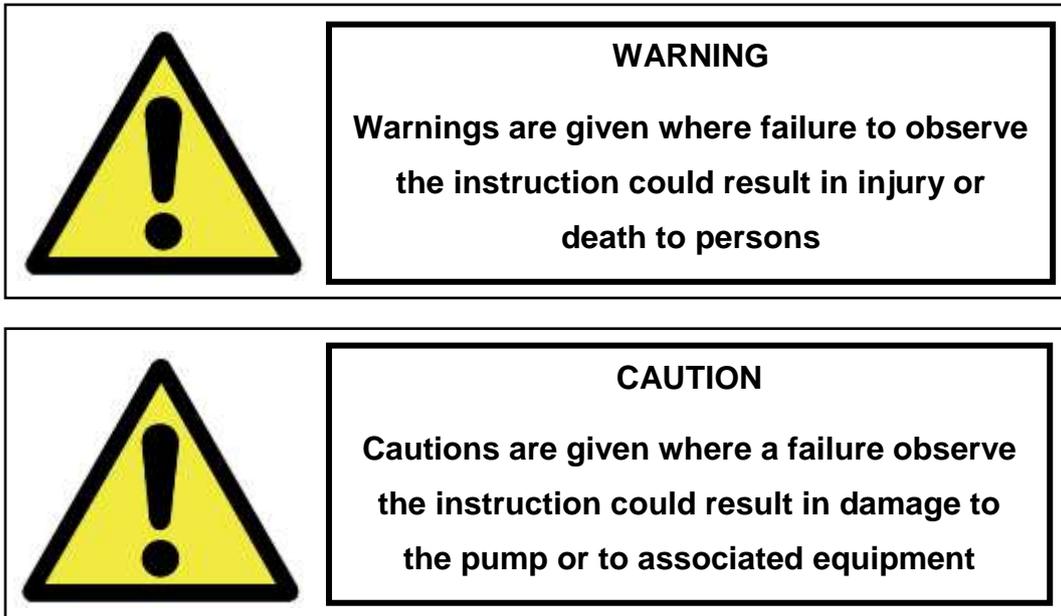
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1.2. Introduction

Read this manual before you operate, or carry out any maintenance on the High Pressure Pump set. Important safety information is highlighted as **WARNING** and **CAUTION** instructions. You must obey these instructions. The use of warnings and cautions is defined below:



Notices

Carefully read the notices of this manual because they give important information concerning safe installation, use and maintenance; familiarise yourself with the workings of the machine in order to rapidly switch it off and eliminate pressure.

This manual is an integral and essential part of the product; it will be consigned to the user in order to ensure the training/information for personnel.

The manufacturer does not assume responsibility for damage caused to persons, things or to the machine, in the case of improper use. Carefully preserve this manual for any further consultation.

Identify the model of your machine by reading the details on the identification plate. Upon delivery, inspect the machine / accessories for any damage, which may occur during transport.

IMPORTANT, Follow the recommended operating procedures at all times; do not misuse the equipment as this could result in injury or mechanical breakdown!

1.3. Scope of this manual

This manual provides operation and maintenance instructions for the trailer. Where the unit has been fitted with proprietary components, details of these are also included in this manual.

This manual is compiled to match the Scope of Supply detailed in Section 2. All specifications, descriptions and parts lists refer only to the components in the version of the unit detailed in this scope of supply.

Maintenance instructions included in this manual include:

- Routine maintenance to be carried out at specific times.
- Maintenance of the high-pressure pump.

Repairs to the pump crankcase are not considered maintenance operations as these should be undertaken only by FLOWPLANT, their approved agents, or at least competent automotive engineers.

1.4. The Trailer

The Trailer is a highly versatile mobile high-pressure water jetting unit, which offers the benefits of proven power pack and pump performance with a comprehensive range of accessories. It is plated at 1600 kgs and it has a maximum operational weight of 1500 kgs when filled with water to the maximum level allowed by the inlet float valve.

Developed for a wide range of water jetting applications, the trailer has been meticulously designed for safe and efficient use.

The options fitted to and the accessories supplied with this Trailer are detailed in

Section 2 – Scope of supply

1.5. Composition of this Manual

This manual comprises the following further sections:

Section 2 Scope of Supply

This section defines the scope of supply of the equipment in compliance with the sales order.

Section 3 Technical Data

This section contains technical information about the unit.

Section 4 Health & Safety

This section details health and safety considerations in general and specific to water jetting equipment.

Section 5 Operation

This section describes the recommended operating procedures for the unit.

Section 6 Routine Maintenance

This section details recommended routine maintenance requirements for the pump and unit.

Section 7 Fault Finding

Fault diagnosis tables for the pump, engine and ancillaries.

Section 8 Harben P Type Pump

Details of the pump and gearbox assembly.

Section 9 Circuit diagrams/Electrical Details

This section includes the Hydraulic, Water and Electrical circuits including engine controller & wiring loom.

Section 10 Diesel Engine

This section provides part details of the Yanmar diesel engine.

Section 11 Parts list / Spares / Auxiliary components

How to identify and order spares / auxiliary components.

Section 12 Service Documents

Service logbook and checklist.

Section 13 Warranty & Certification

2. Section 2 – Scope of Supply

2.1. Scope of Supply

Unit:	Harben Desilter Trailer
Machine Build Code:	004401

2.2. Pump Assembly

The General Arrangement drawing No. 004-379/3, defines the components of the Trailer assembly as follows:

The pump is driven by an industrial diesel engine.

The engine drives the pump via a 2.00:1 reduction gearbox which reduces the pump rpm down to the correct shaft speed.

Water is fed through the inlet hose reel from a mains supply into a plastic water storage tank; the tank supplies the pump with a positive head of pressure via an inline strainer that filters the water to approximately 80 microns.

(Do not fill the water tank directly, always use the inlet hose reel (in order to comply with Local Water Authority Regulations).

The 'P' Type 8 22 radial piston high-pressure diaphragm pump is driven by a Yanmar 4TNV88 4cyl industrial diesel engine through a 2.0:1 reduction gearbox.

The pump's inline selector (021-113), can direct the water at high-pressure to a hydraulically driven hose reel or at low pressure 'dumped' back to tank.

The system is protected from over pressurisation by a safety relief bursting disc.

The engine and system pressure can be monitored at the control panel situated at the rear of the van.

2.3. Detailed Drawings

Detailed drawings and parts lists for the above components are provided as follows:

The pump is detailed in Section 8.

Details of other parts and assemblies are included at Section 11.

3. Section 3 - Technical Data

3.1. Technical data

3.1.1. Pump data

Pump Type	P Type 8 22 (See Section 8)
Pump width	405 mm
Pump length	385 mm
Inlet	28.6 mm dia
Outlet	G1/2" (1/2" BSP)
Shaft dia	30 mm
Shaft length	65 mm
No. of cylinders	8
Power rating (nominal)	26 kW
Piston diameters	22 mm
Shaft speed	1250 rpm
Maximum pressure	276 bar (4000 psi)
Nominal Flow rate	55 lpm (12 Gpm)
Crankcase lubrication	Fully immersed
Oil capacity (litres)	5.0 litres
Weight (kg)	80 kg
Recommended crankcase oil	Shell Morlina 150 or Tellus 150 (see
Max inlet pressure	0.5 bar (5.0 metre head)
Max inlet temp.	25°C

3.1.2. Main Components

Engine	Yanmar 4TNV88 (2190cm ³ / 30.0 kW @2500 rpm)
Gearbox	012242 – Harben reduction 2.00:1

3.1.3. Ancillaries

Water tank	500 litres nominal capacity
Supply filter	N05105 Hypro line strainer / 80 micro mesh
Monitoring & Control	Standard engine controller and throttle
Pressure Control and Safety	013290 Gauge 700 bar 011046 burst disc white 4000 psi

3.1.4. Services required

Mains water supply	Positive head capable of delivering greater than 60 lpm.
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Note: Water pH value of 5 to 9 is recommended.

3.2. Technical Description

3.2.1. Primary Components

The primary components of the trailer is illustrated on dwg. 004-379/3 which are as follows:

- A prime mover in the form of an industrial diesel engine which drives a plunger high-pressure pump.
- The pump is capable of producing high-pressure water up to 276 bar (4000 psi)
- *Note: See above or section 8 for performance options.*
- A hydraulic driven hose reel with high-pressure hose with either a nozzle or gun attachment to deliver the high pressure water to the work application.
- Plastic Polyethylene water tank, acting as a reservoir, also ensuring the water is settled and non-turbulent, discharging a smooth uninterrupted supply, with a positive head of pressure to the inlet, maximising the full potential of the pump.
- The selector valve either directs high pressure water to the hose (valve open) or diverts water back to the tank (dump).
- The control panel which includes the engine controller, the pressure gauge, the emergency stop button.
- A Hypro 80 micro mesh inline strainer is fitted to the suction line between the tanks and the pump inlet.

Note: This is a critical component which ensures that no contaminants are drawn into the pump inlet. This filter must be inspected and cleaned daily, if it becomes blocked it could severely damage the pump

3.2.2. Engine Monitoring

Engine oil pressure and hours run are monitored on the engine control panel.

3.3. Installation details

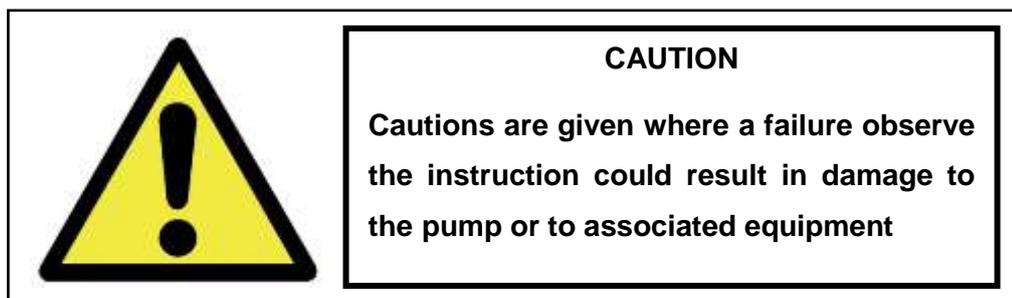
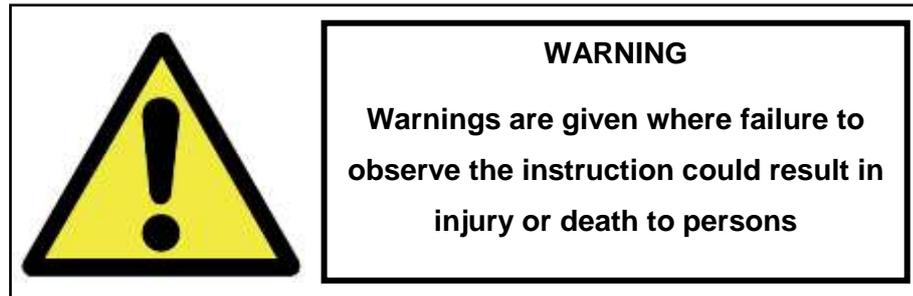
Installation Drawing No. 004-379/3 provides overall dimensions.

4. Section 4 – Health & Safety

4.1. Introduction

This section should be read in conjunction with the *WARNING* and *CAUTION* notices contained throughout this manual or any safety notices on any items of the equipment supplied.

The use of **WARNINGS** and **CAUTIONS** is defined below:



All procedures and recommendations in this manual must be strictly adhered to by operators of the unit, or by any person passing within close proximity.

All Company Safety Regulations applicable must be adhered to at all times.

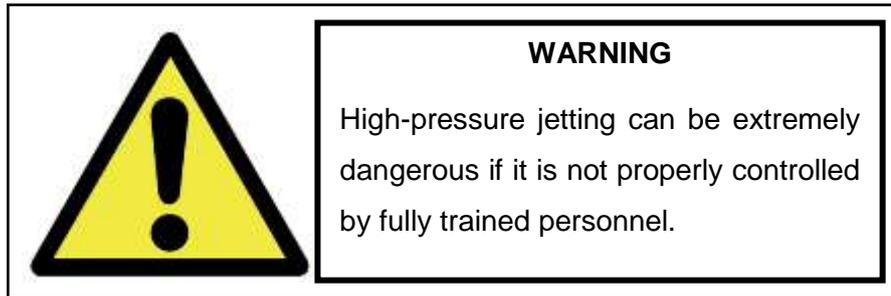
The following notes, and safety notices throughout this manual, are intended to guide the operator in the safe use and maintenance of the equipment. Whilst every effort has been made for completeness, these notes and notices must be supplemented by the knowledge, training and experience of persons carrying out their tasks.

4.2. Safety notes

Please see a list of safety notes which should be read and understood before operating the machine.

- Operating procedures throughout this manual must be adhered to. In the case of conflicting or ambiguous instructions, reference must be made to a Site Management or Safety Officer.
- Any person operating, working with, or passing near, the unit must wear the necessary Personal Protective Equipment (PPE).
- The Site Management should make available to operators or persons working with the unit, or part thereof, the appropriate technical documentation and should ensure such persons read and understand the documentation prior to commencing their duties.
- Special tools should be used where recommended in this manual.
- Prior to any maintenance or repair work being carried out, the unit, or part thereof, must be shut down and equipment isolated.
- Any maintenance requirements in this manual should be adhered to as minimum maintenance requirements. Maintenance records should be up to date at all times.
- Guards which are located within the unit must be fitted and secured in accordance with the drawings and must not be loosened or removed whilst the unit or part thereof, is operational. Should it be necessary to remove any guard for access prior to start-up of the unit, it must be re-fitted and secured before start up.
- Oils, lubricants, greases and fluids used within the unit must be in accordance with the recommendations given in this manual.
- Fully competent personnel must carry out coupling and uncoupling of the unit.

4.3. Water Jetting Equipment or High Pressure Equipment



Operators, and the employers of operators, of water jetting equipment should be trained in accordance with and be fully conversant with the;

- **'Code of practice for the use of high pressure water jetting equipment' (Code of Practice) - Issued by The Water Jetting Association (WJA)**

Copies of the Code of Practice are available from [Flowplant Group Ltd.](#)

Supervisors and Operators should at all times adhere to recommendations and instructions contained within the Code of Practice

The following Water Jetting Safety Instructions are based on the Code of Practice.

4.4. Water Jetting Safety Instructions

4.4.1. Training

All persons using high-pressure jetting equipment should be fully conversant with relevant operating instructions, safety notes and Codes of Practice. If in doubt, contact [Flowplant Group Ltd](#) for advice on operator training.

4.4.2. Supervision

All high-pressure water jetting operations should be under the control of a fully trained supervisor, who will be aware of the potential hazards to operators and passers-by.

4.4.3. Jetting Area

Warning notices, "DANGER - HIGH PRESSURE JETTING" should be displayed at all possible access points to the jetting area. Notices are available from [Flowplant Group Ltd.](#)

4.4.4. Before Starting

Before starting the unit, ensure that you, and anyone else who may be in control at any time, are fully aware of its controls and their function.

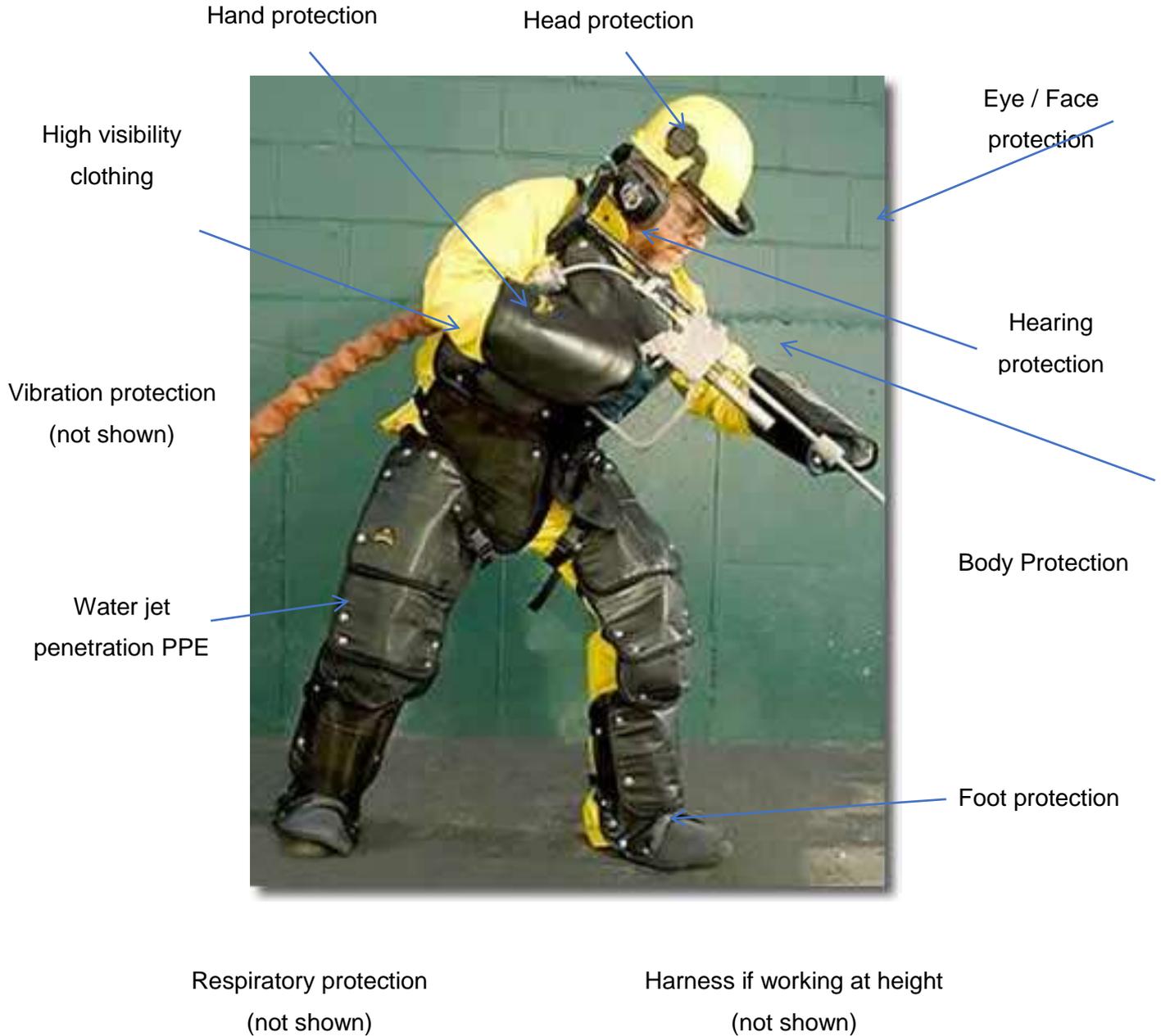
It is especially important that everyone knows how to stop the unit in case of an emergency.

Ensure that all the pre-operational checks have been completed, and that any necessary actions have been taken.

4.5. Personal Protective Equipment (PPE)

All persons using high-pressure water jetting equipment should use all necessary PPE suitable for the task being carried out. Please note PPE shown below can be supplied in various formats.

PPE for consideration: -



Please note, a site specific risk assessment must be complete to analyse which PPE must be worn.

A full range of PPE is available from [Flowplant Group Ltd.](#)

4.6. High Pressure Water Hoses

4.6.1. Standards

- BS EN 1829-2
- BS EN 853
- BS EN 854
- BS EN 855
- BS EN 856
- BS EN 857
- ISO 4413:2010
- Other as may variously come to the market

4.6.2. Hose checks

The following checks must be made at regular intervals during the unit's life span.

- High pressure jetting hoses must be checked along their entire length at the start of each shift to ensure that they are free from external damage. Hoses with exposed or broken reinforcing braid or damaged couplings and fittings may fail without warning and must be replaced immediately
- Before use check end fittings and couplings for damage to threads, sealing faces and rounding of connection nuts. Only use the correct size spanner to tighten the hose fitting. Stilsons or adjustable spanner type tools with serrated teeth must not be used.
- Hoses that have been used **must NOT be re-ended** under any circumstances - see ISO 4413:2010 section 5.4.6.5.1 section A for details.

4.6.3. Hose Markings

- All hoses with a working pressure of 350 bar or above shall be marked at a maximum spacing of 500mm with following information clearly marked: -
 - Hose manufacturers identification
 - Maximum allowable working pressure (in bar)
 - Nominal bore (eg DN12)
 - Quarter and last two digits of assembly date (e.g. 4Q09)
- In addition, all hose assemblies with a working pressure of 350 bar shall be marked with the following: -
 - Manufacturer's identification or part number
 - Maximum allowable working pressure (in bar)
 - Quarter and last two digits of assembly date (e.g. 4Q09)
 - Standard BS EN 1829-2 or the relevant British Standard.

4.6.4. Hose Use Limitations

The hoses intended use is water jetting, any other uses are strictly prohibited they include:-

- Using the hose for applications above the maximum working pressure.
- Using the hose as a towing aid
- Using the hose as a lifting or restraining device.

4.7. Reaction Forces (where applicable)

It is a mandatory requirement to carry out a risk assessment for each new application before commencing work. This must include calculating the reaction force created by the jet, taking into account; pressure, flow, nozzle coefficient of discharge and pressure drop through the hoses fittings and gun.

Should the calculation reveal a reaction force greater than 250N, for a hand held application, additional support must be provided in the form of a gimbal or similar device, otherwise the engine speed, water flow and reaction force must be reduced.

	<p style="text-align: center;">WARNING</p> <p>250N is the maximum recommended reaction force by the Code of Practice for unsupported hand held jetting guns and lances. If the equipment is capable of creating a reaction force in excess of 250N additional support must be used or the engine speed/pump flow must be reduced.</p>
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4.8. Frosty Conditions (where applicable)

If frost has occurred there may be frozen water in the hose or pump which will cause a dangerous blockage. Ice bullets could be ejected from the end of an open hose at dangerously high speed capable of causing serious injury or death.

	<p style="text-align: center;">WARNING</p> <p>Do not start the pump until the complete high-pressure system has completely thawed out</p>
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4.9. Safety Gun (where applicable)

When operating a high-pressure water gun follow these steps and make note of important warnings.

- Never point a gun or lance at anyone, even if switched off.
- When using the Gun, the jet should be fitted correctly before starting the unit. All other hose connections must be checked before attempting to start the unit.
- Do not allow children the opportunity to play with the equipment!



	<p style="text-align: center;">WARNING</p> <p>High-pressure water jet! Grip lance with both hands. Never direct jet of</p>
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	<p style="text-align: center;">WARNING</p> <p>High-pressure water can be extremely dangerous do not leave plant</p>
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The use of jetting guns with oscillating or rotating heads tend to produce higher hand arm vibration levels than simple fixed head jets. Emissions of hand-arm vibration can be high enough to generate exposures above the exposure action value in the Control of Vibration at Work Regulations 2005. Exposures above the exposure limit value are unlikely. Guidance on the Regulations can be found in HSE publication L.140 'Hand Arm Vibration – The Control of Vibration at Work Regulations 2005', also available as a download from the HSE website: www.hse.gov.uk. (see section 4.10 for information on Jump jet kits).

4.10. During Operations

- If water appears from the hose, coupling or connector, often first sighted as a fine mist, then the hose is damaged and could burst or a joint is loose or defective. STOP THE UNIT IMMEDIATELY!
- No attempt should be made to adjust any hose, coupling or connector whilst that part of the system is under pressure.

4.11. During Maintenance

- A unit undergoing maintenance should be isolated from other plant or suitably identified to ensure that it is not used inadvertently.
- Maintenance must only be carried out by skilled personnel, who are conversant with the nature and dangers of high-pressure water, of jetting safety regulations and codes of practice.

4.12. Tools

- The correct tools of the right size for the job must always be used to avoid damaging the unit and possibly making it unsafe. Adjustable tools with serrated gripping jaws should not be used.

4.13. Replacement Parts

- Only replacement parts which have been obtained from or approved by Flowplant Group Ltd are to be used when undertaking maintenance. Using any other replacement parts will normally invalidate the warranty and could be dangerous.

4.14. Performance

- Never exceed the maximum rated pressure or engine speed.

Note: The maximum engine speed quoted refers to the “High Idle Speed” at no load condition i.e. at the lowest possible pressure.

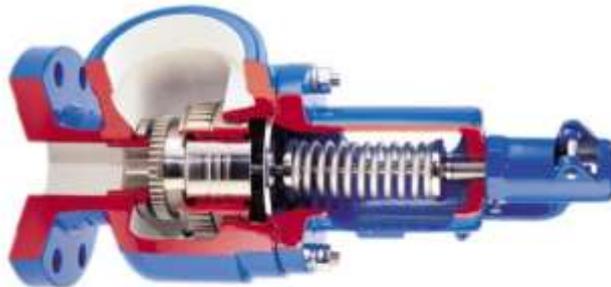
4.15. Risk of Carbon Monoxide Poisoning (Trailer only)

	<p style="text-align: center;">WARNING</p> <p>The jetting unit uses a diesel engine that <u>could</u> cause build-up of carbon monoxide gases in the vehicles storage or cab area.</p>
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Ensure van cab is fully vented after using the jetting unit.

- It is advisable to carry a carbon monoxide monitor in the rear or the vehicle and the cab of the vehicle as an early warning of any potential risks.

4.16. Pressure Safety Device



- Pressure relief valves should be checked for functionality and certified by the manufacturer or their authorised representative at least every 6 months. Pressure discs should be replaced at least every 6 months to ensure continued safe operation and only manufacturer's original replacements should be used.

4.17. Exposure to Vibration

- Please see the following extract from "The Water Jetting Association Code of Practice for the Safe Working and Use of Water Jetting in Drains and Sewers"

New edition May 2013

"The use of 'Jump or Pulse Jets' in drain cleaning applications may expose the operator to vibration levels in excess of the exposure action value and exposure limit value if the jetting hose is handled. Water jetting hose should not be handled whilst the 'Jump or Pulse Jet' is in operation."

	<p style="text-align: center;">WARNING</p> <p style="text-align: center;">Potential vibration level is 27m/s² RMS</p> <p>Operators handling the jetting hose with the Jump Jet switched on for 4 minutes per day could reach the Exposure Action Value (EAV). Further handling will reach the Exposure Limit Value (ELV) in approximately 16 minutes.</p>
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There are a number of recommendations that will reduce vibration levels and/or make operators less susceptible to HAV harm.

Do not touch the hose whilst the jump jet is in operation unless it is to avert a hazardous situation from arising.

Reducing the jetter engine speed from maximum to ½ or 2/3rd revs will decrease vibration levels.

Only use the jump jet as intended i.e. to facilitate blockage clearing or when extremely long pipe runs are encountered.

Maintain equipment in accordance with the manufacturers recommended maintenance schedule.

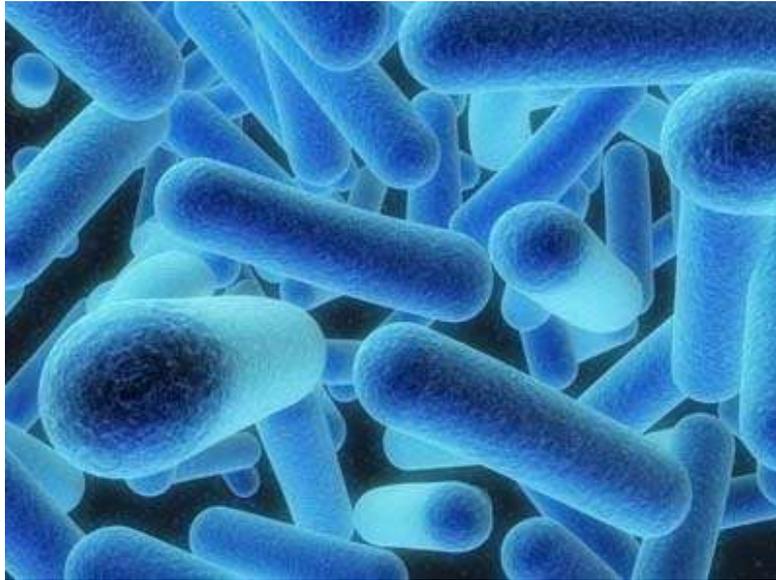
Always keep hands dry and warm at all times.

Consider wearing anti-vibration gloves in accordance with ISO 10819. (There is limited evidence that these gloves remove the harmful vibration at lower frequencies. Seek further advice from glove manufacturers)

Monitor the health of operators on a regular basis and maintain records of machine usage.

When employing any method for reducing vibration levels always conduct a risk assessment for your specific application.

4.18. Legionnaire's Disease



- The bacteria are common and are found naturally in water, usually in low numbers. The bacteria do not seem to multiply below 20°C and will not survive above 60°C; water temperatures between 20°C and 45°C being optimum for growth. The bacteria may remain dormant in water temperatures between 6°C and 20°C, multiplying when water temperatures reach a suitable level.
- The bacteria also require food to multiply such as algae, amoebae and other bacteria. The presence of scale, sediment, sludge and other material within the system may be important in creating favourable conditions for the growth of bacteria as are biofilms (a thin layer of micro-organisms which may form slime on the surfaces in contact with the water).
- As the tanks of the unit are required to be emptied after the completion of jetting operations, so that the daily checks required by the Operation & maintenance manual can be carried out, each jetting operation will be commenced with fresh water.
- In the event that the operations manual is ignored and the tanks not emptied, the risk of bacterial growth within the system would increase but the ambient temperature of the water in the tanks is likely to reach 20°C, and be maintained at that level, only in exceptional circumstances.
- To prevent a build-up of scale, sediment, sludge and other materials and reduce and associated hose and pipe work be thoroughly cleaned and flushed through at least every six months (preferably with hot water in excess of 70°C).

5. Section 5 – Operation

SAFETY AWARENESS SHEET 061-577

GENERAL H/P JETTING EQUIPMENT



Warning this equipment may constitute a potential hazard



This equipment is designed for use in High Pressure Water Jetting and could cause serious injury or death if incorrectly used.

Before commencing the use of this equipment answer the following questions.

- (a) Have you been fully trained by a qualified instructor ?
- (b) Have you read the manual ?
- (c) Do you understand the Water Jetting Association Code of Practice ?
- (d) Have you been equipped with the correct Personal Protective Equipment ?
- (e) Do you fully understand all of the equipment being used in connection with this item?
- (f) Has a risk assessment for this task been carried out ?
- (g) Is the equipment suitable for the task in hand ?
- (h) Has the working area been isolated and warning signs erected ?

If you answer **NO** to any of the above, or **do not understand any question**, you may be in breach of Health and Safety Guidelines.

Do not proceed without consulting your Health and Safety Representative.

Flowplant Group Ltd. do not accept responsibility for any event arising from incorrect or mis-use of the equipment.

Technical information, warning signs, personal protective equipment and training by qualified instructors are available from:-

Flowplant Group Ltd., Gemini House, Brunel Rd., Churchfields, Salisbury Wilts.
SP2 7PU. Tel. 01722 325424, Fax 01722 411329

5.1. Operating Conditions

Operators of water jetting equipment should be fully conversant with the 'Code of Practice for the use of high pressure water jetting equipment', hereafter referred to as 'The Code of Practice'. A copy of The Code of Practice is available upon request.

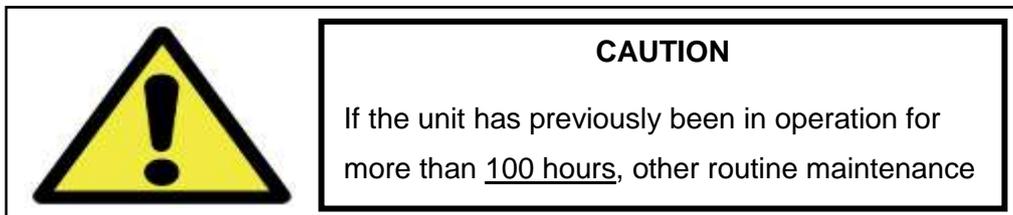
Section 4 - Health & Safety in this manual includes a synopsis of the relevant parts of The Code of Practice, which pertain to this equipment and specifically to Single Person Operation.

5.2. Daily Checks

Carry out all daily checks. Full maintenance checks are detailed in Section 6 - Routine Maintenance.

They are:

- pump oil level
- gearbox oil level
- water filter cleanliness
- engine oil level
- radiator water level
- high-pressure hose condition (see section 4.6.2)
- any loose nuts and bolts or damaged items



5.3. Pre-start Checks & Procedures

1. In cold weather check that machine is not frozen before starting (see Antifreeze section)
2. Ensure the towing vehicle and trailer hand brakes are applied.
3. Connect the water supply to the inlet hose reel (NOTE: in order to comply with water authority byelaws never fill the tank by putting a hose directly inside). The water will fill the tank via the float valve which ensures the correct tank level is maintained and the tanks are not overfilled.  **WARNING! Overfilling the tanks will overload the trailer axles and could make it dangerously unstable.**
4. Feed off the hose reel approximately 3 metres of high pressure hose. **Do not fit the nozzle or gun at this point!**

	<p style="text-align: center;">WARNING</p> <p>At any time during the starting procedure, or during normal jetting operations, an emergency shutdown can be achieved by switching off the engine with the key, or pressing the E/Stop button.</p>
---	---



Fig. 5.1 - E-Stop on control panel. Twist to release.

5.4. Starting the Engine and Setting the Operating Pressure

With two people, one at the pump set and one in charge of the nozzle or gun.

Tank water level

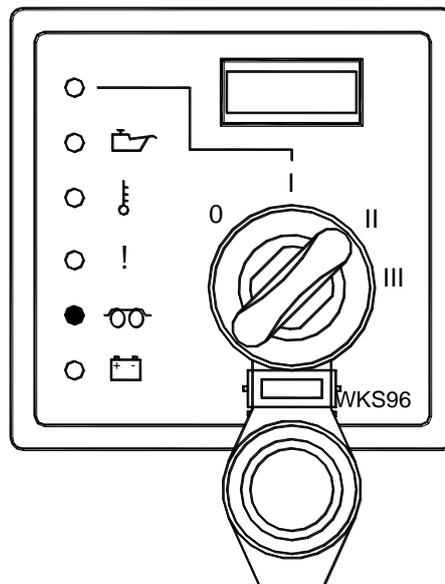
Ensure you have an adequate water supply and that the water tank is filled to the ball valve shut off level.

 **WARNING!** Overfilling the tanks will overload the trailer axles and could make it dangerously unstable.

	<p style="text-align: center;">ATTENTION</p> <p style="text-align: center;">Do not allow unfiltered water into the pump.</p>
---	---

5.4.1. Operating Starting procedure

1. Ensure selector valve is in the dump position.
2. Ensure the open ended, high pressure hose is in a safe position, preferable within sight of the operator at the control panel.
3. Ensure the engine speed is set to idle by pushing the throttle control fully inwards.
4. Ensure the emergency stop button on the control panel is unlatched, i.e. in the 'OUT' position.
5. Key switch in 'OFF' position (0).
6. Key turned to position (1), auxiliary circuits energized, LED illuminated.
7. Key turned against spring pressure to position (2), pre-heat circuit energized, LED illuminated.
8. Hold this position for 20 seconds and the key should be turned to position (3), engine crank (starter motor actuation).



Release the key when the engine starts, it will return to position (1) automatically.

9. Failure to adequately pre-heat the engine at spring position two **(2)** prior to attempting to start at spring position three **(3)** may cause premature starter motor failure due to over cranking and a flat battery. Note: The system shutdowns are automatically overridden in the initial sequence to allow to engine to normalise.
10. When the engine has started the CHARGE light [Battery symbol] on the controller should go out indicating that the alternator charge output is satisfactory (+12v min).

11. Water should now be circulating through the pump and be diverted back to the tank, with the engine running at slow speed. Allow the engine 5 minutes to warm up.
12. To divert water to the high-pressure hose, move the selector to the pressure position.

Note: The engine speed can be finely adjusted by twisting the throttle control 'anticlockwise' to increase and 'clockwise' to decrease.
13. To shut the system down, turn the key switch on the engine controller to the (0) position or in emergency situations punch the emergency stop button.

5.4.2. Checking the Operating Pressure with a Nozzle Fitted

1. Fit the correctly sized nozzle to the high-pressure hose. See section 11
2. Ensure the nozzle is secured in a safe position, preferably within sight of the operator at the control panel.
3. Start engine. See Section 5.4.1
4. Move the selector valve to the high pressure position.
5. Observe the pressure gauge mounted on the control panel and note the pressure reading.
6. Reduce the speed of the engine.
7. Move the valve to the 'dump' position.
8. Switch engine controller to position (0) to switch engine off.

Note: If the pressure is significantly lower than expected, turn the unit off and replace the nozzle with a new one as it may be worn.



WARNING

Do not exceed the maximum operating pressure of 276 bar (4000 psi) by fitting a smaller nozzle than is recommended.

This will cause the burst disc to open.

The maximum engine speed is 2500 rpm

5.5. Harben® Jump Jet

The Harben Jump Jet system is a unique and exceptionally effective addition to the Harben high pressure pump which increases the effective duct cleaning distance up to and often beyond 200m. When required the operator can switch on the Jump Jet to create a cyclic vibration in the jetting hose. The vibration travels along the entire length of the hose reducing friction between itself and the duct wall and allowing the de-silting nozzle to continue moving into the duct, cleaning as it goes.

Critically the Jump Jet allows ducts to be de-silted with pressures as low as 140 bar and only 40 l/min meaning that even with fibre optic cable in-situ there is negligible risk of causing any damage.

To operate the jump jet, open the high pressure valve at the front of the unit.

	<p style="text-align: center;">ATTENTION</p> <p>Operating the machine with the Jump Jet system turned off can increase the water pressure at the de-silter nozzle by up to 100%. Only do this when you know there is no risk of damage to in-situ fibre optic cables.</p>
--	--

5.6. Hose reel winding and unwinding

The high-pressure hose is manually unwound and hydraulically wound by an OMR315 hydraulic motor, which is driven by a gear pump from the engine P.T.O.

The motor is fitted to the hub of the hose reel. The motor speed and direction is controlled via a manually actuated spool valve.

(018-005 'Hydraulic Directional Control Valve' CV1185 c/w 110 bar relief and flow control)

The hose reel motor speed can be adjusted up and down by a flow control knob.

Pushing the lever inwards towards the pump set will wind the hose reel in.

The normal practice is to unwind the hose by hand, only drawing off the required length of hose to reach the work site and then to wind the hose back in using the hydraulic motor.

It should be remembered that the hose cannot be wound using the hydraulic motor unless the engine is running.

Therefore, when a jetting operation is finished, wind in the hose before shutting down the engine. Wind in the hose before you intend to empty the tank.

If the hose becomes stuck in the drain the hydraulic hose reel should NOT be used as a winch to try and free it and the carrying vehicle should NEVER be driven away in an attempt to drag the hose clear. This will put severe strain on the reel framework which could lead to serious damage.

Hoses that have become stuck can sometimes be pulsed free using the Harben® Jump Jet™ kit or alternatively they should be pulled free by hand.



ATTENTION

The hose should NEVER be tightly wound onto the hose reel drum when the hose is not pressurised, as might occur when the hose has become trapped. A tightly wound hose can easily crush the hose reel when it is next pressurised. If you have reason to believe that the hose may have been tightly wound onto the reel when unpressurised it should be completely unwound and then rewound loosely before pressurising.



WARNING

To avoid damaging the high-pressure hose by kinking at the connection between the hose and hose reel, always leave two to three coils of hose on the hose reel drum at all times. Kinked hoses can burst without warning!

5.7. Frost Precautions

During cold periods there is a risk of freezing overnight or when travelling on the road. Damage caused by freezing is expensive to repair and IS NOT COVERED UNDER WARRANTY. Take the following precautions to avoid frost damage:

5.7.1. To Anti-Freeze the machine with an antifreeze tank:

1. The valves to control the antifreeze procedure are located to the front of the unit. (See picture below).



2. Put the Tank Drain valve (Red) into the DRAIN position and drain the water tanks. When the tanks have drained move the valve to the SHUT OFF position.



3. Put jump jet valve into the 'off' position, see below.



4. Open the yellow valve from the tank marked ANTIFREEZE. This tank must be full of an antifreeze mixture with strength of no less than a 50/50 mix.



5. Remove the gun or any jetting nozzle from end of the hose and unreel 3m of hose.
6. Switch the selector from DUMP to HIGH PRESSURE
7. Hold the open ended hose away from the body pointing it to the ground and away from any by-standers.
8. Start the engine and run at idle speed. Water will come from the end of the high pressure hose. (Note : It may be necessary to bleed the pump if water flow is very slow)
9. After a minute or two the blue antifreeze mixture will start to come out of the high pressure hose. *IMMEDIATELY SWITCH OFF THE ENGINE.*
10. Place the end of the high pressure hose into the antifreeze tank. If the hose is clean you may remove the strainer in the tank lid to make it easier.
11. Restart the engine and allow the antifreeze to circulate. Briefly (about 2 seconds) move the selector valve from HIGH PRESSURE to DUMP and back to HIGH PRESSURE. Briefly (about 4 seconds) put the 'jump jet' valve into the 'On' position and then return to the 'Off' position. See picture below.



12. Stop the engine by switching the ignition switch off. Leave the selector on HIGH PRESSURE.
13. Manually rewind the hose back on the reel and lock in position,

5.7.2. To De-Antifreeze the machine:

1. Shut off the 2-way antifreeze valve.
2. Place the 3 way valve into the RUN Position. See picture below.



3. Re-fill the water storage tank.
4. Put jump jet valve into the 'off' position, see below.



5. Place the high-pressure hose (NO NOZZLE ATTACHED!) into the antifreeze tank.
6. Start the engine with the selector on 'HIGH PRESSURE'.
7. Pump out the antifreeze solution from the high pressure hose back into the container.
8. As the antifreeze mix reaches the top of the tank turn engine off. (Regularly check the strength of the antifreeze mixture ensuring it is at least a 50/50 mix)
9. Place the jump jet valve in the on position.
10. The machine can now be used in the normal manner.

5.7.3. To antifreeze without an antifreeze tank:

1. Prepare 50/50 antifreeze solution.
2. Remove nozzle or gun attachments from the delivery hose.
3. Lower the water level in the tanks using the drain valve immediately to right of the o/s wheel.
4. Pour antifreeze solution into the water tanks.
5. Restart the engine and run at idle, pump antifreeze solution through the high-pressure line and return line as required.

5.7.4. To de-antifreeze:

**DO NOT ATTEMPT TO JET ANY REMAINING ANTIFREEZE SOLUTION
INTO A CONTAINER**

Either;

Consider the antifreeze solution as expendable and merely refill the tank for the next jetting operation. NEVER DISPOSE OF ANTIFREEZE INTO THE DRAINAGE NETWORK!

Or

With the engine switched off, drain the pump suction line into a container by unscrewing the inline strainer bowl to the bottom left side of the pump.

Note: refer to section 8, for recommendations on bleeding the pump inlet.

SO YOU FORGOT TO TAKE PRECAUTIONS!
IF THE PUMP IS FROZEN UP - IT SHOULD ON NO ACCOUNT BE
STARTED UNTIL IT IS THOROUGHLY THAWED OUT

6. Section 6 - Routine Maintenance

Table 6.1 provides a basic guide to routine maintenance requirements for the various components of the trailer.

Warning: Maintenance should only be carried out with the engine turned off and when cold.

6.1. Maintenance Procedures

Table 1 indicates recommended routine maintenance tasks cross referenced to maintenance procedures.

Table 6.1 Recommended Routine Maintenance

	GENERAL
Prior to use / Daily / after 8 hours running	<ul style="list-style-type: none"> • In cold weather check machine is not frozen before starting • Check inlet water filter element (Ref Para 6.2) • Check engine oil level on dip stick (Ref section 10) • Check radiator water level • Visual check for hose damage/water leaks • Check emergency stop button operation • Check high-pressure hose condition • Check for any loose nuts and bolts or damaged items • Check tyre pressure 4.5 bar (65 psi)
Weekly / 24 hours	<ul style="list-style-type: none"> • Visually inspect the machine for safety, checking for any loose, damaged or missing parts. • Check air filter cleanliness (Ref section 10) • Check fuel filter for contamination (Ref section 10)
Three monthly / 50 hours	<ul style="list-style-type: none"> • First service contact Flowplant • Replace Pump Oil (only required for first service only)
Six Monthly / 100 hours	<ul style="list-style-type: none"> • Inspect tanks and fittings for leaks • Tighten any loose joints • Check condition of 12 volt start battery • Grease battery terminals for protection • Grease the hydraulic hose reel bearing blocks
Yearly / 200 hours	<ul style="list-style-type: none"> • Intermediate service of engine, gearbox and pump required (Contact Flowplant) • Closely inspect the structural integrity of the framework for signs of stress and cracking • Carry out detailed inspection of pipes, hoses and fittings. • Check unloader valve operation.
Two Yearly / 400 hours	<ul style="list-style-type: none"> • Major service of engine, gearbox and pump required (Contact Flowplant) • Check wiring terminals/connections and continuity of electrical earth.

For a detailed guide to pump maintenance and overhaul procedures refer to [Section 8](#).

For routing engine maintenance please refer to the engine handbook supplied with the unit.

6.2. Daily Maintenance

The following must be completed daily with the trailer switched **OFF**.

1. Check condition of inlet water filter & element. Clean or replace. (Flowplant part no. N05105)

Unscrew the bowl to remove the mesh (Flowplant part no. N06021). Take precautions so as not to lose the sealing ring (Flowplant part no. N05108).



Fig. 6.1 - Inlet Filter

2. Visually inspect all hoses for signs of chaffing or leaks. Report any damage immediately to supervisor or manager.



WARNING

Water at high pressure jetting from a damaged hose or hose connector can cause serious injury. Do not attempt to repair or secure any hose while the high pressure pump is running.

With the machine **running**:

3. Make further inspection for leaks. If a leak is observed, shut down immediately and report the leak to a supervisor or manager.

6.3. Pump Lubricating Oil

Manufacturer	Type
ESSO	Nuto H150
GULF	LP 150
MOBIL	DTE Extra Heavy
ROC	Kiron 150
TEXACO	Rando HD 150
BP	Energol HLP 150
AGIP	OSO 105
SHELL	Tellus/Morlina 150
CENTURY OIL	PWLM
PETROFINA	Hydran 51
CASTROL	Hyspin AWS 150

Oil Capacity (litres)			
Number of Cylinders			
3-cyl	4-cyl	6-cyl	8-cyl
6.5	6.0	5.75	5.0

6.4. Burst Discs

Colour Code	Part Number	For Maximum Working Pressure
Yellow	011019	125 bar (1800 psi)
Blue	011020	140 bar (2000 psi)
Red	011021	175 bar (2500 psi)
Purple	011022	210 bar (3000 psi)
Green	011045	240 bar (3500 psi)
White	011046	275 bar (4000 psi)
Black	011047	345 bar (5000 psi)
Orange	011107	415 bar (6000 psi)



Fig. 6.2 Burst disc holder showing 'white' burst disc

Pressure discs should be replaced at least every 6 months to ensure continued safe operation and only manufacturer's original replacements should be used.

If Pressure relief valves are fitted these should be checked for functionality and certified by the manufacturer or their authorised representative at least every 6 months.

7. Section 7 – Fault Finding

Most of the problems experienced during jetting operations are likely to be caused by the pump or the associated hoses.

These types of problems are covered in the pump fault finding chart, which is repeated at 7.3 overleaf for convenience.

Also covered at 7.3 overleaf is a diagnosis of selector valve problems.

7.1. Shutdown Problems

Most problems which can cause the unit to shutdown will be indicated by one of the fault lamps on the engine controller See fig. 7.1 as follows:

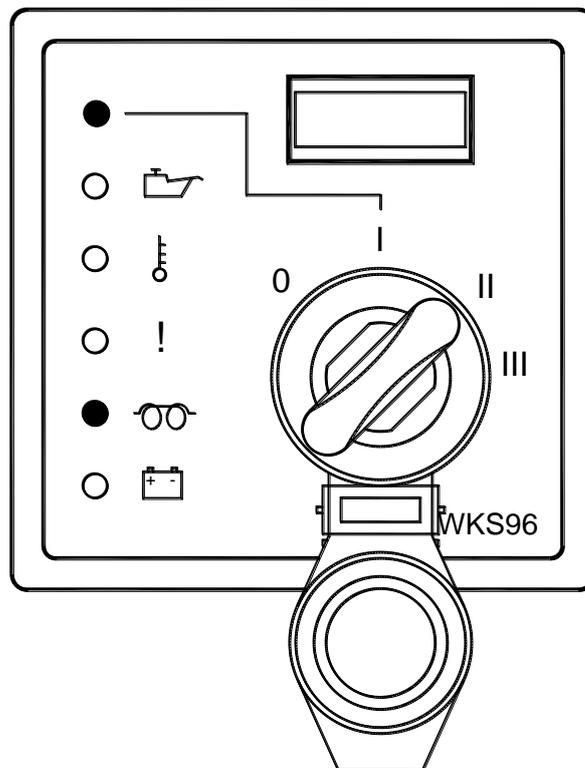
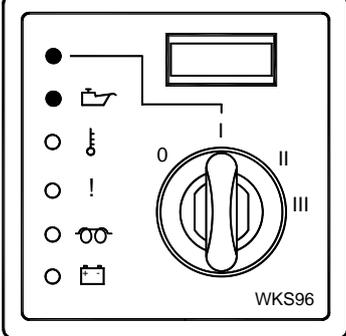
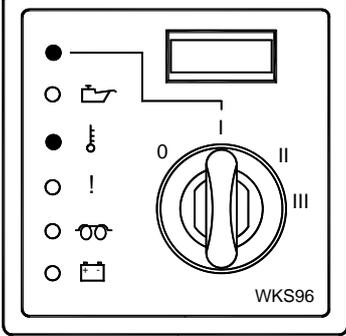
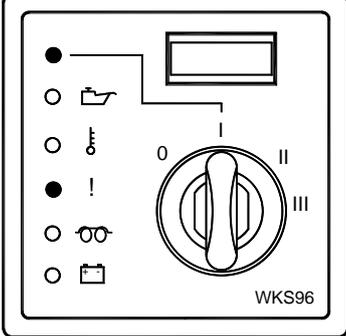
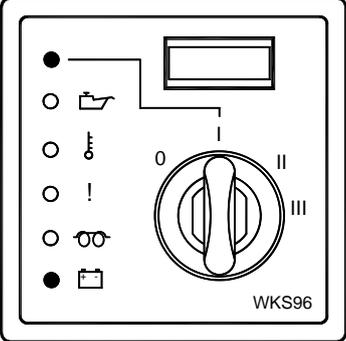


Fig. 7.1 – Yanmar TNV Series WKS96 controller

Note: The table below indicates potential problems and suggests an appropriate course of action.

Lamps	Condition	Solution
 <p>WKS96</p>	<p>Low oil pressure shutdown.</p>	<p>Check and replace switch if faulty.</p> <p>Check the oil pressure, if the pressure is low</p> <p>Refer to the handbook for further advice.</p>
 <p>WKS96</p>	<p>Water/coolant temperature shutdown.</p>	<p>Check and replace switch if faulty.</p> <p>Check the water temp in the radiator, if the temp is very hot.</p> <p>Refer to the engine handbook for further advice.</p>
 <p>WKS96</p>	<p>Emergency stop button in</p>	<p>Twist to release the button.</p> <p><i>Note: The engine will not start in this condition, do not continue to crank the engine, as this will damage the starter due to over cranking!</i></p>

	<p>Charge warning indication, normal when engine is not running.</p>	<p>Check the alternator 'V' belt tension, tighten the belt if it is slack and slipping.</p> <p>Check the connecting terminals to the alternator.</p> <p>Check the engine idle speed, reset if necessary.</p> <p>Refer to engine handbook for further advice.</p>
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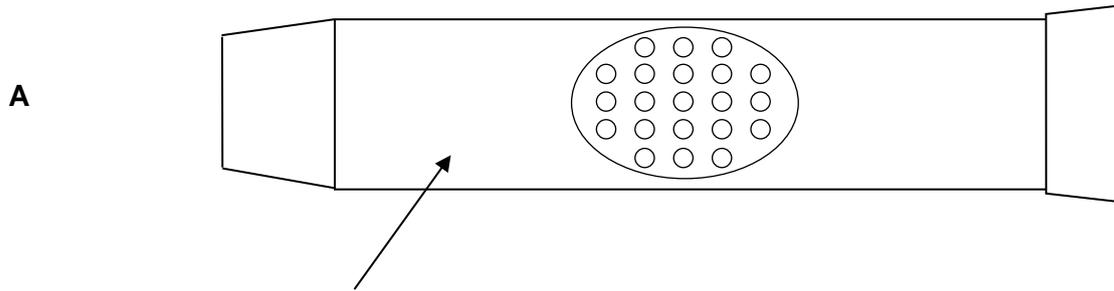
7.2. Equipment Fault Finding

Problem	Possible Cause	Recommended Action
Low system pressure	<ol style="list-style-type: none"> 1 Worn or incorrect size of cutting nozzle. 2 Engine speed slow. 3 Leaks from hose. Pipes and connections. 4 Blocked inlet filter. 5 Inlet hose too long. 6 Loss of water through dump line of selector valve or gun when high-pressure selected. 7 Loss of water through dump line of remote control kit, if fitted. 	<p>Replace the old jetting Nozzle with a new one.</p> <p>Adjust to correct speed.</p> <p>Check the connections for tightness, replace if needed</p> <p>Clean or replace element.</p> <p>Shorten hose length.</p> <p>Check seats and seals.</p> <p>Check seats and seals.</p>
High System Pressure	<ol style="list-style-type: none"> 1 Blocked nozzle, selector valve or gun. 2 Incorrect nozzle size. 3 Incorrect bore size. 4 Engine speed high. 5 Crushed delivery hose. 6 Two gun choke left in gun when operating as single gun unit. 	<p>Clean the items and flush out the delivery line.</p> <p>Replace the nozzle.</p> <p>Replace the hose.</p> <p>Adjust to correct speed.</p> <p>Replace if necessary.</p> <p>Replace with standard choke.</p>
Low Water Level	<ol style="list-style-type: none"> 1 Blocked or dirty pre-filters. 2 Faulty ball valve assembly. 3 Wrong seat in ball valve assembly. 4 Low inlet pressure. 	<p>Clean or replace elements.</p> <p>Replace if necessary.</p> <p>Replace the seat if necessary.</p> <p>Increase pressure.</p>
Pump Not Running Evenly (also refer to pump faults).	<ol style="list-style-type: none"> 1 Air in water. 2 Air in crankcase oil. 3 Worn drive coupling. 4 Faulty inlet or delivery valve. 5 Valve nut over tightened. 	<p>Water bleed pump.</p> <p>Oil bleed pump.</p> <p>Replace flexible elements and examine coupling.</p> <p>Check valve condition.</p> <p>Check tightness of inlet & delivery nut</p>
Burst Disc failure or Safety Relief Valve Operating (also refer to high system pressure problem).	<ol style="list-style-type: none"> 1 Incorrect burst disc. 2 Incorrect valve setting. 3 Faulty Valve. 4 Faulty or fatigued burst disc. 	<p>Replace with correct disc.</p> <p>Check certificate/setting.</p> <p>Repair or replace if required.</p> <p>Replace with new disc.</p>

7.3. Pump Fault Finding

Problem	Possible Cause	Recommended Action
1 Mixing of Oil and Water in crankcase 2 Loss of pressure 3 Pump not running evenly	1 Worn or damaged delivery valves. 2 Damaged filter element allowing debris to jam delivery valve.	1 Check all delivery valves – replace as necessary. 2 Check all diaphragms – replace as necessary. 3 Replace oil. 4 Check filters – replace as necessary.
1 Loss of crankcase oil through high pressure hose 2 Loss of pump pressure 3 Pump not running evenly	1 Inlet restriction may have been caused through; <ul style="list-style-type: none"> a. Blocked filters b. Kinked inlet hose c. Worn or damaged inlet valves d. Excessive inlet hose length 2 Pump has been frozen	1 Clear restriction. 2 Check inlet valves – replace as necessary. 3 Check diaphragms – replace as necessary. 4 Replenish oil.
1 Mixing of Oil and Water in Crankcase	1 Diaphragm failure (may have been through fatigue from excessive running hours).	1 Check all diaphragms – replace as necessary.

DISTINGUISHING FEATURE OF FAILURE ON DIAPHRAGM



Impression of the baffle on diaphragm

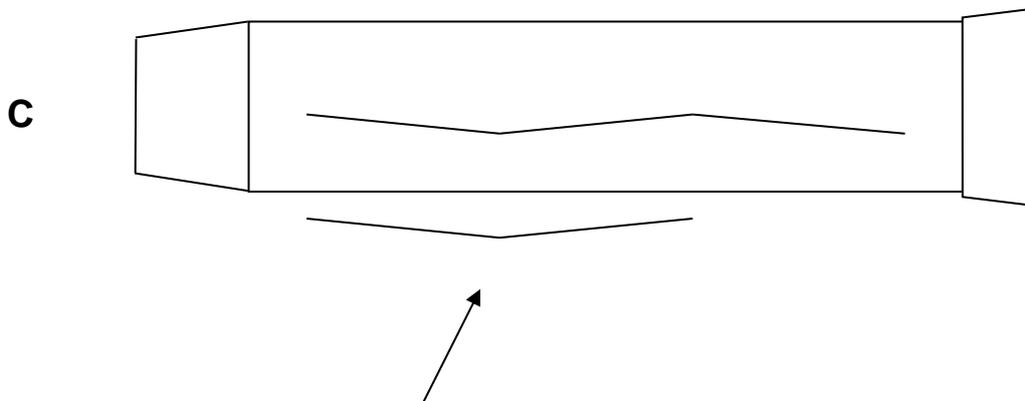
Reason: It has been inflated

DISTINGUISHING FEATURE OF FAILURE ON DIAPHRAGM



4 small impressions, cause more damage on the inside, than on the outside. Reason: the diaphragm has pumped through mandrel delivery holes.

DISTINGUISHING FEATURE OF FAILURE ON DIAPHRAGM



SHEAR THROUGH WALL OF DIAPHRAGM

7.4. Selector Fault Finding (see section 8)

Selector problem	Cause	Action
Loss of pressure and flow is down.	Water leaking through the worn seat back to tank.	Replace the seats and the plug if also damaged.
If water leaks along spindle and past lever.	O-ring and back up ring failure along shaft.	Replace O-ring and back up ring 013-021 & 023-001.
Water leaking along the gland nut thread.	Leaking selector seal.	Replace seal 012-095.

8. Section 8 – P Type Pump

Refer to the P Type Pump Service Manual, part no. 061-352, included with the unit.

9. Section 9 – Circuit Diagrams

The following circuit diagrams are included in this section:

9.1 Hydraulic circuit – 061-558

This provides details of the units hydraulic circuit, the function of which is to power a hydraulic motor driven hose reel, winding high-pressure hose in or out whilst carrying out drain cleaning or other high pressure water jetting applications.

9.2 Water Circuit

This provides details of the water circuit, starting with the supply and ending with the delivery to the jetting application.

9.3 Wiring Diagram For Yanmar 4TNV88 Engine – RDG 6682

This provides details of the wiring for the Yanmar TNV series engine and WKS 96 engine controller.

9.1. Hydraulic Circuit – 061-588

DO NOT SCALE
IF IN DOUBT ASK !

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ISSUE ARE TO BE DESTROYED.

018005 VALVE HYDRAULIC SPOOL CV1185

048016A OMR 315 HYDRAULIC MOTOR

N05798 HYDRAULIC FILTER (U.C.C. MX1518.102) RETURN FILTER

085229 HYD OIL TANK 10L PLASTIC

043018

SIGHT LEVEL 5"

069363 HYDRAULIC PUMP/6.SCC/REV / SAE A / 9 TOOTH 16/32 ACW ROTATION (SINISTRO)

4TNE88 2500 min^{-1}

M 1:1

ISS	13/03/04	DC	NEW DRG
ISS	DATE	DRN	CHK
ISS	DATE	DRN	STATUS

LEADERS IN CLEANING TECHNOLOGY

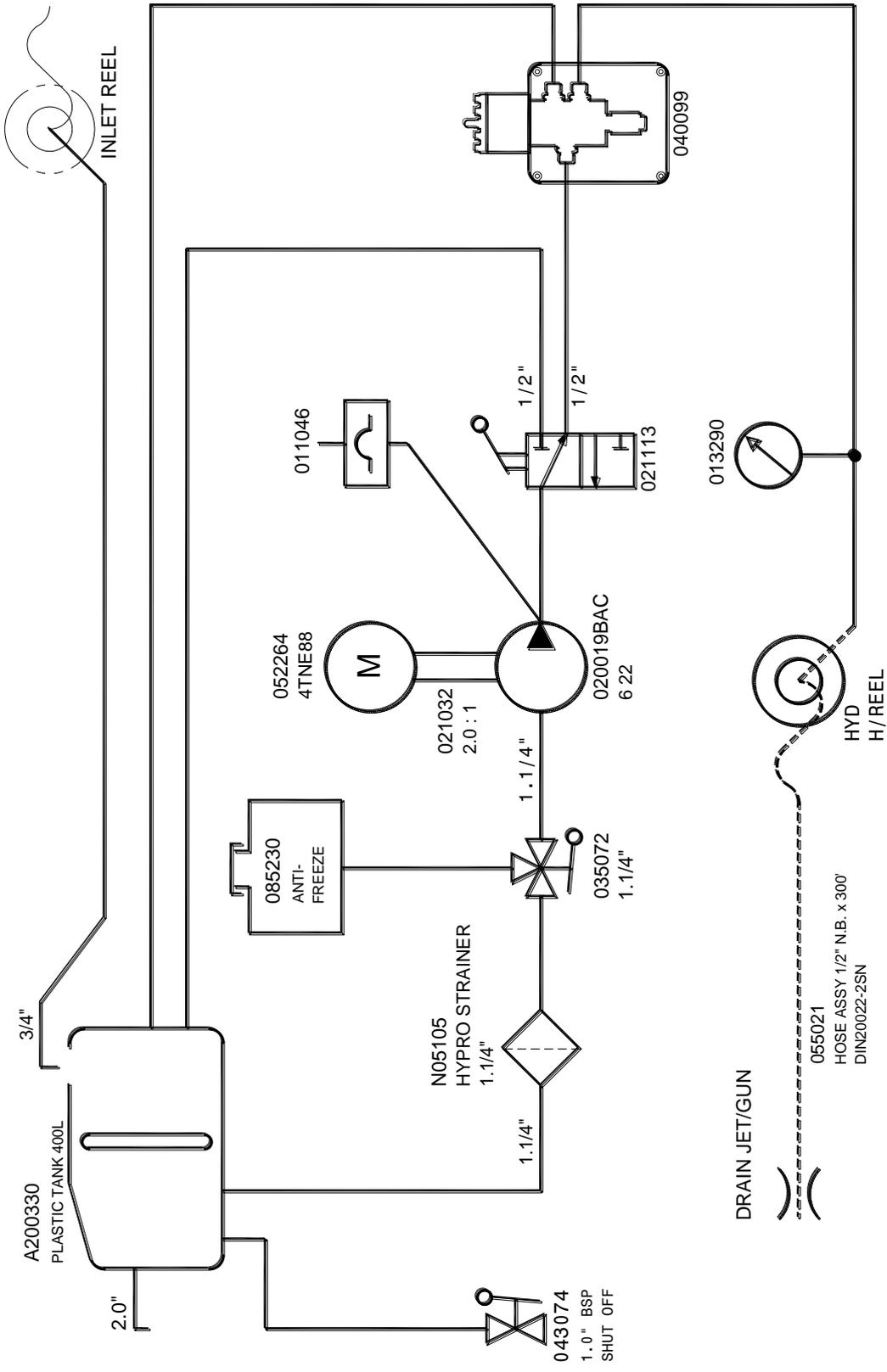
Flowplant Manufacturing Ltd.
West Road, Churchfields, Salisbury, Wiltshire, SP2 7UD
England.
Tel: (01722) 325424 Fax: 01722 411329

TITLE
HYDRAULIC CIRCUIT
4.012 6 22 - 4 TNE88
FOR 004285 V/PACK

DRG NO.	061-558/4.1
PART NO.	061558

WEIGHT	N/A	KG	USED ON	004285	MATL	DRAWN	D CLARK	DATE	13/03/04
FINISH	SPEC B		TEST			CHECKED		DATE	
HEAT TREATMENT	PROTECTION		SIZE			APPROVED		DATE	
SUPERSEDES/ SUPERSEDED BY			CALC		HEAT TREATMENT	PROTECTION		SCALE	1:1

9.2. Water Circuit



10. Section 10 – Diesel Engine

A copy of the Diesel Engine Manufacturer's Operators Handbook is supplied with this equipment.

11. Section 11 - Parts Lists / Spares

11.1. Introduction

This section includes advice on obtaining spare parts.

To identify consumable items and service kits you require you should use the information in this section. To identify components for the pump or engine etc, refer to the relevant parts in this manual.

11.2. Ordering Spare Parts

Order spare parts from:



Flowplant Group Ltd

Gemini House, Brunel Road, Churchfields Industrial Estate

Salisbury, Wiltshire, UK, SP2 7PU

Tel. +44 (0)1722 325424 – Fax. +44 (0)1722 411329

sales@flowplant.com

www.flowplant.com

11.3. Routine Maintenance / Consumable Items

See section 6

11.4. Parts List

Component	Description	Qty
011046	PRESSURE DISC WHITE 4000 PSI	11
011156	ELBOW INLET MANIFOLD (1 1/4" INLET)	1
011157	TUBE SUPPORT 1 1/4" INLET HOSE P PUMP	1
012184	ADAPTOR PLATE SAE4-SAE5 HATZ, YANMAR, ISUZU	1
013014	ADAPTOR 1/4" BSP M x 1/4" BSP M 415 BAR	1
013039	ADAPTOR 1/2" BSP M x 1/2" BSP M 415 BAR C-TXT	3
013046	ADAPTOR 3/4" BSP M x 1/2" BSP M 345 BAR	1
013054	HOSE CLIP DIA 30-50 JCS HI-TORQUE S/S	1
013224	ADAPTOR BHEAD 1/2" BSPM x 1/2" BSPM 415BAR C/W LNUT	1
013266	SEAL DOWTY 1 1/4" BSP SELF CENTERING	25
013290	GAUGE PRESSURE 10000 PSI C/W RESTRICTOR	1
013349	CLIP "R"	6
013375	LOCKNUT 1 1/4" BSP UPVC	4
013813	SCREW THREAD CUTTING PAN HEAD TORX DRIVE 6.0 mm x 16 mm ZINC PLATED	4
013853	SCREW SET HEX HD M12-1.75 100 LG ZINC PLATED	2
014153	REFLECTOR SIDE MARKER (EEC APPROVED) SCREW ON TYPE	4
016136	COUPLING E140 PT10 YANMAR 3TNE78/4TNE78 7.5" SAE	1
016266	AV MOUNT CAPTIVE TRANSIT CTM633512/2 FRONT (RADIATOR END)	2
016267	AV MOUNT CAPTIVE TRANSIT CTM633512/6 REAR (FLYWHEEL END)	2
018005	VALVE SPOOL HYD FLOW CONTROL CV1185 (SEE NOTES)	1
020041AAB LB	PUMP BARE SHAFT P 8 X 22 EN57 4000PSI LARGE BEARINGS	1
021020	BELL HOUSING PERKINS MACHINED	1
021032	GEARBOX HARBEN 2.0:1	1
021059	SELECTOR ASSEMBLY INLINE 1/2" BSP	1
021087	ADAPTOR 1/4" PRESSURE GAUGE STAINLESS STEEL 700 BAR	1
021090	ADAPTOR 3/4" BSPM x 3/8" BSPM 415 BAR	2
023011	ANGLE SWIVEL JOINT 90 DEG 1/2" BSP M/M 415BAR	1
023025	INSERT FOR HOSE SWAGED 1/2" BSP FEM	1
023030	INSERT FOR HOSE SWAGED 3/4" BSP FEM	1
023041	O CLIP 3/4"	4
023047	HOSE CLIP DIA 30-40 JCS HI-GRIP S/S	12
023082	INSERT HOSE 3/8" BSP 90 DEG FEMALE	2
023088	COUPLING Pt1 B140 O'SIZE FLEX BORE 30 KEY 8	1
023093	COUPLING PART 4 B140 BORE 30MM KEY 8MM MACHINED	2
0231046	CROSS 1 1/4" BSP F/F/F/F LOW PRESSURE GALVANISED	1
023148	INSERT FOR HOSE SWAGED 1/2" BSP 90 DEG FEM	2
023362	ADAPTOR 1/2" BSP M x 7/8"-14 JIC M 415BAR	1
023363	ADAPTOR 3/4" BSP M x 7/8"-14 JIC M 345 BAR	1
023379	ADAPTOR BHEAD 1 1/4" BSPM x 1 1/4" BSPM 210 BAR C/W NUT	1
023569	PIN CANOPY RETAINER	6
023847	ADAPTOR 1.1/4" BSP M/F SWIV 2B/20 210 BAR	1

028004	FRAME HYD HOSE REEL DTW	1
028032	CLAMP BATTERY DTW	1
028037	GUIDE HOSE FEED ASSY DTB	1
028098A	SILENCER PERKINS 3152 DTW SELF COLOUR	1
028202	FLANGE ADAPTOR EXHAUST DTB YANMAR C-TXT	1
031330	HANDWHEEL PLASTIC TAPPED M12 (GUN HOLDER, HOVERVAC)	2
031431	ROTARY JOINT GUARD	1
032088	CLAMP FORWARD HANDLE MARK 2 GUN MACHINED	4
032194	ADAPTOR 3/4" BSP M x 1/2" BSP F FIXED 900BAR S/S	1
033005	ADAPTOR 3/8" BSP M x 3/8" BSP M 415 BAR	4
033006	ADAPTOR 1/2" BSP M x 3/8" BSP M 415 BAR ZN	6
033010	SEAL BONDED 1/2" BSP 400-825-4490-41 448 BAR SELF CENTRALISING	17
033013	SEAL BONDED 3/8" BSP 400-823-4490-41 492 BAR SELF CENTRALISING	4
033014	SEAL BONDED 3/4" BSP 400-827-4490-41 420 BAR SELF CENTRALISING	5
033058	HOSE ASSY 1/2" 00.81m STR/ELB 1/2" BSPF EN 853 2SN	1
035072	VALVE 1 1/4" BSP T PORT 375 PSI FIG 2000 S/R TYPE 98 ALBION	1
035077A	POLY FLOAT 6" X 5/16"	1
035210	VALVE BALL FLOAT VALVE 3/4" HP 300 PSI (WITH BRASS LOCK NUTS)	1
041029	GROMMET 25.4M/M BLACK PVC BLANK	2
041029	GROMMET 25.4M/M BLACK PVC BLANK	2
041031	GROMMET CABLE RB3466TPR CTEXT	1
041031	GROMMET CABLE RB3466TPR CTEXT	3
041034	STUDDING M10 ZINC PLATED [PER 1.5 METRE] c-txt	1
0421743	THROTTLE BRACKET FOR YANMAR TNV ENGINE	1
0421803	INSTRUMENT SUPPORT PANEL DTB II YANMAR	1
0421804	FRONT SUPPORT WATER TANKS DTB II	1
0421805	SUPPORT HOSEREEL O/S DTB II	1
0421806	SUPPORT HOSEREEL N/S DTB II	1
0421807	PANEL INNER WING DTB II	2
0421810	ENGINE FOOT REAR YANMAR 4TNV88 (SHORT - FLYWHEEL END)	2
0421812	FRONT SUPPORT ARM (O/S) TANK DTB 500	1
0421813	FRONT SUPPORT ARM (N/S) TANK DTB 500	1
0421823	MOUNT BALLCOCK DTB 500	1
0421856	SUPPORT BRACKET EXHAUST 4TNV	1
0421873	FUEL PUMP/RELAY SUPPORT DTB 500	1
0421892	LABEL BRACKET DTB500	1
0421938	SUPPORT FOOT ENGINE FRONT YANMAR 4TNV (LONG - RADIATOR END)	2
0422487	BRACKET DTB500 NUMBER PLATE	1
0422537	DTB500 VALANCE NEARSIDE	1
0422546	DTB500 VALANCE OFFSIDE	1
0422547	BRACKET FRONT LIGHT DTB500	2
0422633	LIGHT MOUNTING BRACKET - OFFSIDE - DTB500	1
0422634	LIGHT MOUNTING BRACKET - NEARSIDE - DTB500	1
0422658	REAR TRIANGLE - DTB500	2
0422659	REAR TRIANGLE SPACER	2

043018	CAP HYD/FUEL TANK	2
043061	HOSE CLIP DIA 9.5-12 JCS HI-GRIP S/S	8
043139	GROMMET BLACK RIBBED 80 x 40	2
043156	WHEEL FITTED 185R 13 C6 WITH 5 1/2 JX13 RIM	2
043196	ELBOW 90 DEG. THREADED 1 1/4" BSPF UPVC	4
043222	INSERT HOSE 1 1/4"BSPM X 32 MM DIA HOSETAIL UPVC	11
043235	ADAPTOR FLANGED 1 1/4"BSPM X 1 1/4" BSPM UPVC	5
044440	CHASSIS DTB500 TYPE APPROVED TRAILER	1
048005	BEARING HOSE REEL HYD P TYPE	1
048010	SPACER 30MM LG HOSE FEED GUIDE HYD REEL P TYPE	1
048016A	MOTOR HYDRAULIC DANFOSS OMR 315	1
048103	TUBE WATER OUTLET FOR HYDRAULIC HOSE REEL N15-142 AND 048-110	1
048110	HOSEREEL DRUM P TYPE BOLTED FLANGE	1
051557	THROTTLE CABLE/TWIST LOCK/6 FT/RDB/ BPP 1004/6'0"	1
052312	ENGINE YANMAR 4TNV88-DSA	1
053002	EXHAUST CLAMP 1 7/8"	2
053155	EXHAUST TAILPIPE	1
053175	HOSE FUEL 8MM ID	3
055024	HOSE 1/2" P.V.C. CLEAR BRAIDED [PER METRE] HDPVC12	2
055063	HOSE 1 1/4" HELIFLEX [PER METRE]	8
055175	HOSE ASSY 3/8" 00.38M STR/ELB 3/8"BSPF EN 853 2SN	2
055182	HOSE ASSY 3/8" 02.07M STR/ELB 3/8"BSPF EN 853 2SN	2
055207	HOSE ASSY 1/2" 2.6M STR/ELB 1/2" BSPF EN 853 2SN	1
055288	HOSE ASSY 3/8" 0.60m ELB/ELB 3/8" BSPF EN 853 2SN	1
059102	WATER TANK DTB 250 LTRS YELLOW	2
061033	SPACER PACKING D.T.T.	6
061067	WASHER SEATING FOR 1/4"BSP GAUGE	1
061088	SCREW SELF TAPPING 1/2" x 8 STEEL PAN HEAD	8
061352	MANUAL P-PUMP/ HI LIFT	1
061663	LABEL OPERATING PROCEDURE DRAIN ASSY DTB500	1
061829	STATUTORY LABEL PLATE TRAILER	1
069363	HYDRAULIC PUMP/ 6.5CC/REV /SAE A/ 9 TOOTH 16/32	1
071001	BATTERY 12V HEAVY DUTY TYPE 644	1
071008	REFLECTOR TRIANGLE	2
0711021	13 PIN PLUG ADAPTOR, 13 PIN TRAILER 7 PIN CAR 0-695-69	1
0711029	LIGHT REAR COMBINATION INDICATOR/TAIL/STOP 151BAR	2
0711031	LIGHT REGISTRATION LED 12V BRITAX L868.00LDV	2
0711032	LIGHT FOG LED 12/24VDC 81FM	1
0711033	LIGHT REVERSE LED 12/24VDC 81WM	1
0711036	LIGHT/REFLECTOR FRONT LED 12/24VDC 44WME	2
0711040	PVC CABLE GROMMET 9MM MAX. CABLE, 15MM HOLE DIAM.	4
071989	CABLE TRAILER 13 CORE GTW131	6
071130	LEAD BATTERY 1600mm POSITIVE 12V	1
071141	LEAD BATTERY 610mm NEGATIVE 12v	1
071367	E STOP TWIST TO RELEASE including NC ACTUATOR 78-3724 78-3732	1

071988	PLUG 13 PIN TRAILER P13PN	1
071992	CABLE TRAILER 2 CORE BROWN AND WHITE TTW1.0BRW 2 X 1MM SQ	8
073069	HEAT SHRINKABLE SLEEVING 9.5MM BORE (RS398-177)	1
078417	EXTENDED HEX NUT M8	1
078773	OUTER FLANGE HOSE REEL	1
081159	COUPLING KFG20 KNOTT 2000KG	1
081184	AXLE DTB500 1600KG BRAKE 250/40 A/R AQC1600T4139DADF CTX	1
081192	LOOSE WHEEL NUT INDICATORS 19MM (PACK OF 100)	8
082114	CANOPY PLASTIC DTB TRAILER	1
082133	RAINFLAP DTM/DTB500 530241.007	2
082137	JOCKEY WHEEL TO SUIT KFG20 DTB 500	1
082143	NUMBER PLATE MOUNTING BRACKET	1
085341	TANK FUEL PLASTIC DTB500 MK2 40L	1
085263	HYDRAULIC TANK DTB500	1
105204	BRACKET FOR HYD SELECTOR HV39	1
A030376	LID, SCREW INSPECTION COVER(6)BLACK.	1
A041024	SCREW CAPSCREW M10 X 50MM LONG SOCKET HD	2
A060574	FITTING TEE 1 1/4" BSP FEMALE UPVC	1
N01496	ELBOW 1/2-1/2 BSP MxF 90 COMPACT FORGED 415BAR	1
N01518	INSERT 1/2"BSP F 90 DEG COMPACT (PUSH IN) ZINC 415 BAR	1
N05105	LINE STRAINER 1 1/4" (HYPRO)	1
N05114	SIGHT GLASS 10"	2
N05116	SIGHT LEVEL GAUGE 5116/7	1
N05386	LINK HOSE E 1/4" R2AT X 8 1/2" COMPACT ELB/ELB	1
N05798	HYDRAULIC FILTER (U.C.C. MX1518.102) RETURN FILTER	1
023381	ADAPTOR BHEAD 3/8" BSPM X1/2"BSPM 415BAR C/W LNUT	1
061877	OPERATORS QUICK REFERENCE SAFETY GUIDE (TRAILERS)	1
061577	SAFETY AWARENESS SHEET FOR GENERAL H/P JETTING EQUIPMENT	1
061886	USB MANUALS	1
061880	PEEL AWAY SAFETY STICKER	1

12. Section 12 – Service Documents

12.1. Service Checklist

SERVICE CHECK LIST												
Serial Number -												
Unit Number -										Sht 1 of 2		
Date -					Engineer -							
Hours Run -					ESR -							
I - Intermediate service				Y - Yearly service				R - Customer request				
Engine				Hydraulics				Water tank				
	I	Y	R		I	Y	R		I	Y	R	
1				34	Check oil level				63	Clean water filter		
2				35	Change oil				64	Change water filter		
3				36	Change oil filter				65	Check hoses & fittings		
4				37	Clean air filter				66	Check tank security		
5				38	Change air filter				67	Check tank integrity		
6				39	Change fuel filter				68	Check A/Freeze		
7				40	Clean water trap				69	Check Inlet ball valve		
8				41	Check coolant level & A/F mix				OMO Foot pedal			
9				42	Inspect radiator							
10				Electrics/Controls				70	Check cable & plugs			
11								71	Test operation			
12				43	Check fan belt				72	Check safety button		
13				44	Check engine mounts				Pressure Hose			
14				45	Check exhaust							
15				46	Check throttle cable							
				47	Check for leaks				73	Check for wear / damage		
				Gearbox				74	outs / tears			
				48	Test/check operations				75	Brading showing		
								76	Any joins in single length			
16				Vanpack frame				77	Fittings in good order			
17				49	Check oil level				78	Leader hose satisfactory		
18				50	Check for cracks/damage				Hot Wash			
				51	Check fixing bolts & brackets							
				Pump				79	Check fuel pump pressure			
				Trailer				80	Clean fuel filter			
20				52	Check valves (Inlet/delivery)				81	Check swrl plate adjustment		
21				53	Replace valves (Inlet/delivery)				82	Check electrode gap		
22				54	Check diaphragms				83	Check air flow		
23				55	Replace diaphragms				84	Check thermostat operation		
24				56	Change oil				85	Check low water level switch		
25				57	Check hoses/fittings				86	Check unloader valve		
26				58	Check working pressure				87	Check burner is running clean		
27				Gun & Lance				Remote Control				
28												
29					Change Burst Disc (Must be changed every 6 months)							
30				59	Set Safety Relief Valve (Must be set by manufacturer/authorised agent and reset/certificated every six months)				88	Check handset operation		
30				60	Check main pressure gauge				89	Check Antenna		
31				61	Check burst disc fitted				Other			
32				62	Check jump jet operational							
33					Pressure gauge reading correctly				90	Test emergency stop button		
I	Intermediate Service								91	Check safety decals visible		
Y	Yearly Service								92	Check ID plate condition		
R	At Request of Customer								93	Clean & tidy appearance		

NA - Not applicable, A - Adjusted, √ - Satisfactory, R - Repair required, O - Observation
 Note - If 'Adjusted' or 'Repair required' please describe issue on sht 2

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12.2. Service Logbook

Flowplant Unit Log Book		
Serial Number -		<i>Sht 1 of 2</i>
Unit Number -		
Date of Manufacture -		
Date	Official Flowplant Stamp and Signature	<div style="border: 2px solid red; width: 100px; height: 50px; margin: 0 auto;"></div>
Engineer		
Type of Service	Please state if other Service provider used	
Date	Official Flowplant Stamp and Signature	<div style="border: 2px solid red; width: 100px; height: 50px; margin: 0 auto;"></div>
Engineer		
Type of Service	Please state if other Service provider used	
Date	Official Flowplant Stamp and Signature	<div style="border: 2px solid red; width: 100px; height: 50px; margin: 0 auto;"></div>
Engineer		
Type of Service	Please state if other Service provider used	
Date	Official Flowplant Stamp and Signature	<div style="border: 2px solid red; width: 100px; height: 50px; margin: 0 auto;"></div>
Engineer		
Type of Service	Please state if other Service provider used	
Date	Official Flowplant Stamp and Signature	<div style="border: 2px solid red; width: 100px; height: 50px; margin: 0 auto;"></div>
Engineer		
Type of Service	Please state if other Service provider used	
Date	Official Flowplant Stamp and Signature	<div style="border: 2px solid red; width: 100px; height: 50px; margin: 0 auto;"></div>
Engineer		
Type of Service	Please state if other Service provider used	
Type of service - Intermediate, Yearly		<i>FLOW 0322 Iss 1</i>

Flowplant Unit Log Book		
Serial Number -		<i>Sht 2 of 2</i>
Unit Number -		
Date of Manufacture -		
Date	Official Flowplant Stamp and Signature	<div style="border: 2px solid red; width: 100px; height: 50px; margin: 0 auto;"></div>
Engineer		
Type of Service	Please state if other Service provider used	
Date	Official Flowplant Stamp and Signature	<div style="border: 2px solid red; width: 100px; height: 50px; margin: 0 auto;"></div>
Engineer		
Type of Service	Please state if other Service provider used	
Date	Official Flowplant Stamp and Signature	<div style="border: 2px solid red; width: 100px; height: 50px; margin: 0 auto;"></div>
Engineer		
Type of Service	Please state if other Service provider used	
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Engineer		
Type of Service	Please state if other Service provider used	
Date	Official Flowplant Stamp and Signature	<div style="border: 2px solid red; width: 100px; height: 50px; margin: 0 auto;"></div>
Engineer		
Type of Service	Please state if other Service provider used	
Date	Official Flowplant Stamp and Signature	<div style="border: 2px solid red; width: 100px; height: 50px; margin: 0 auto;"></div>
Engineer		
Type of Service	Please state if other Service provider used	
Type of service - Intermediate, Yearly		<i>FLOW 0322 Iss 1</i>

13. Section 13 – Warranty

13.1. Warranty of new products:

Equipment manufactured and supplied by Flowplant is warranted to be free from defects in materials and workmanship.

The warranty includes both parts and labour necessary to correct any such defects.

The warranty period for new products is twelve months from date of despatch from our factory.

We shall repair or, at our option, replace free of charge any product, part(s) or component(s) manufactured by Flowplant which fail due to faulty manufacture or material within the warranty period.

13.2. Warranty of spare parts:

The warranty for new spare parts is six months from date of despatch on materials and workmanship.

The warranty for reconditioned spare parts is 90 days from date of despatch on materials and workmanship.

Provided always that:

- They are returned to Flowplant for inspection (carriage paid), along with a copy of the original part(s) sale invoice (where necessary); and
- All terms agreed by Flowplant for payment of such goods have been complied with; and
- If a defect/failure is discovered before the expiration of the warranty, notification must be given to the Flowplant service department immediately
- Any claim hereunder is made within 30 days of the date of discovery of the defect/failure.

Provision of this warranty shall not apply to any Flowplant product which has been:

- Used for a purpose for which it is not designed for; or
- Applied to a use which has not been approved by Flowplant; or

- Subject to misuse, negligence, lack of maintenance or accident; or
- Repaired or altered in any way so as, in the judgement of Flowplant, to adversely affect its performance and reliability

13.3. Limitations of warranty:

The new product and spare parts warranty is limited to defects in material or workmanship of the product. It does not cover loss of time, inconvenience, property damage or any consequential damages. Repair or replacement of the product is your exclusive remedy.

Our liability under this clause shall be in lieu and to this exclusion of any warranty or conditions implied or expressed by law as to the quality or fitness for purpose of any goods supplied hereunder PROVIDED THAT nothing in this clause shall operate so as to exclude liability for death or personal injury arising from the negligence of the company or its employees.

Our obligations as aforesaid shall constitute the full extent of our liability in respect of any loss or damage sustained by the purchaser whether caused by any breach of this contract or by our negligence or otherwise and we shall not be liable to make good or pay for loss of use of the goods, loss of revenue, loss of profit or goodwill or any direct or consequential losses howsoever caused and the purchaser undertakes to indemnify us against any such claims against us by third parties.

In order to comply with the provision of the Health and Safety at work etc. Act 1974 in respect of articles manufactured, supplied or installed for use at work we test all our products before they leave our factory and supply them with adequate instructions for their proper use. Further copies of these instructions are available from us upon request.