Operation & Maintenance Manual

Original Instructions

Eliminator Trailer Jetter

903-1312

Read the Health and Safety Manual before operating any equipment. Failure to do so could cause serious injury or death.

Operation & Maintenance Manual for:

UNIT: Eliminator Trailer Jetter

ISSUE DATE: 6/20

ISSUE No: 5

AMENDMENTS

Change	Changes	Date	Signature
1	NEW ADDITION	01/17	TWC
2	Lugnuts safety & update warranty policy	10/19	JJ
3	Minor updates. Added part number	5/20	GT
4	Updated tires	6/20	GT
5	Updated manual to code	6/20	GT

1. Introduction & Contents

1.1. Contents

1.2. Introduction

Please ensure that you read this Operation & Maintenance Manual in conjunction with the Health & Safety Manual before operation.

Within this manual, the health and safety risks are highlighted with specific symbols. These will be referenced to sections within the Health and Safety Manual which you are required to read. The sections to refer to in the manual will be labelled at the end of the highlighted statement (Ex. H&S Section 2). There are three symbols that will be used to differentiate the levels of severity. They are as follows:

-  : This is the symbol for **CAUTION**. This means that if an accident were to happen, it would cause minor to moderate injury.
-  : This is the symbol for **WARNING.** This means that if an accident were to happen, it could result in a serious injury or possible death.
-  : This is the symbol for **DANGER**. This means that if an accident were to happen, it will result in death or serious injury. This will only be shown for the most extreme cases.

It is imperative that these symbols are paid attention to as to avoid any sort of injury.

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 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 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.

 **CAUTION**! Always follow the recommended operating procedures. Do not misuse the equipment as this could result in injury or mechanical breakdown!

1.3. Scope of this Manual

This manual provides operation, maintenance, and safety instructions for the Jetter. Where the Jetter 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 HARBEN INC**,** their approved agents, or at least competent automotive engineers.

1.4. The Trailer Jetter

Harben® high pressure jetters and systems have been designed to the highest standards. It is important that you take time to read the information provided here so that you understand how to make the most of the equipment and use it in accordance with the instructions. Harben® jetters are powerful pieces of industrial equipment and should only be operated by competent users who understand that serious injury or death can occur through misuse.

The Jetters described in this operation and maintenance manual are intended to be used for high-pressure water jetting and pumping applications.

They will remove soft blockages, tree roots and hard scale, liquefying fats and restoring drain flow by blasting high pressure water through a drain nozzle connected to the end of a high-pressure hose. Some models can be fitted with jump jets kits to increase the effective cleaning distance.

Harben trailer Jetters use diesel or gasoline engines to power a high-pressure water pump up to 4,000 psi and up to 18 gpm.

Additional accessories can be purchased from Harben®, such as: floor cleaners, jetting guns and jet pumps which extend the range of work that can be carried out with the jetter. Safety information relating to individual accessories is provided later in this section.

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 Jetter.

Section 4 Operation

This section describes the recommended operating procedures for the Jetter.

Section 5 Routine Maintenance

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

Section 6 Fault Finding

Fault diagnosis tables for the pump, engine and ancillaries.

Section 7 Harben P-Type Pump

Details of the pump and gearbox assembly.

Section 8 Circuit diagrams/Electrical Details

This section includes the Hydraulic and water circuits of the Jetter.

Section 9 Diesel Engine

This section provides part details of the diesel engine.

Section 10 Parts list / Spares / Auxiliary Components

How to identify and order spares / auxiliary components.

Section 11 Service Documents

Service logbook and checklist.

Section 12 Warranty & Certification

This section explains the warranty information for the trailer.

Section 13 Tire Safety

This section provides information on maintenance and safety of the tires on the trailer.

Section 14 Health & Safety

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

2. Scope of Supply

2.1. Scope of Supply

Unit:	Eliminator Trailer Jetter

2.2. Pump Assembly

Figure 2.1 defines the components of the Jetter assembly as follows:

The Pratissoli KE24 high pressure pump is driven by an industrial gasoline engine.

The engine drives the pump via a 2.25:1 reduction tooth belt which reduces the pump rpm down to the correct shaft speed.

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

The water is directed by a divert valve, to a hydraulically driven hose reel with up to 300 feet of ½" hose, or at low pressure 'dumped' back to tank.

The system is protected from over pressurization by an unloader valve which, when over pressurized, diverts water back to the tank.

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

The water tank is fitted with a low-level shut down switch. Once the tank level drops below this the engine will be shut down. This is to prevent the pump from running dry, as this will cause major damage which is not covered under warranty.

2.3. Detailed Drawings

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

The pump is detailed in Section 7.

Details of other parts and assemblies are included at Section 10.

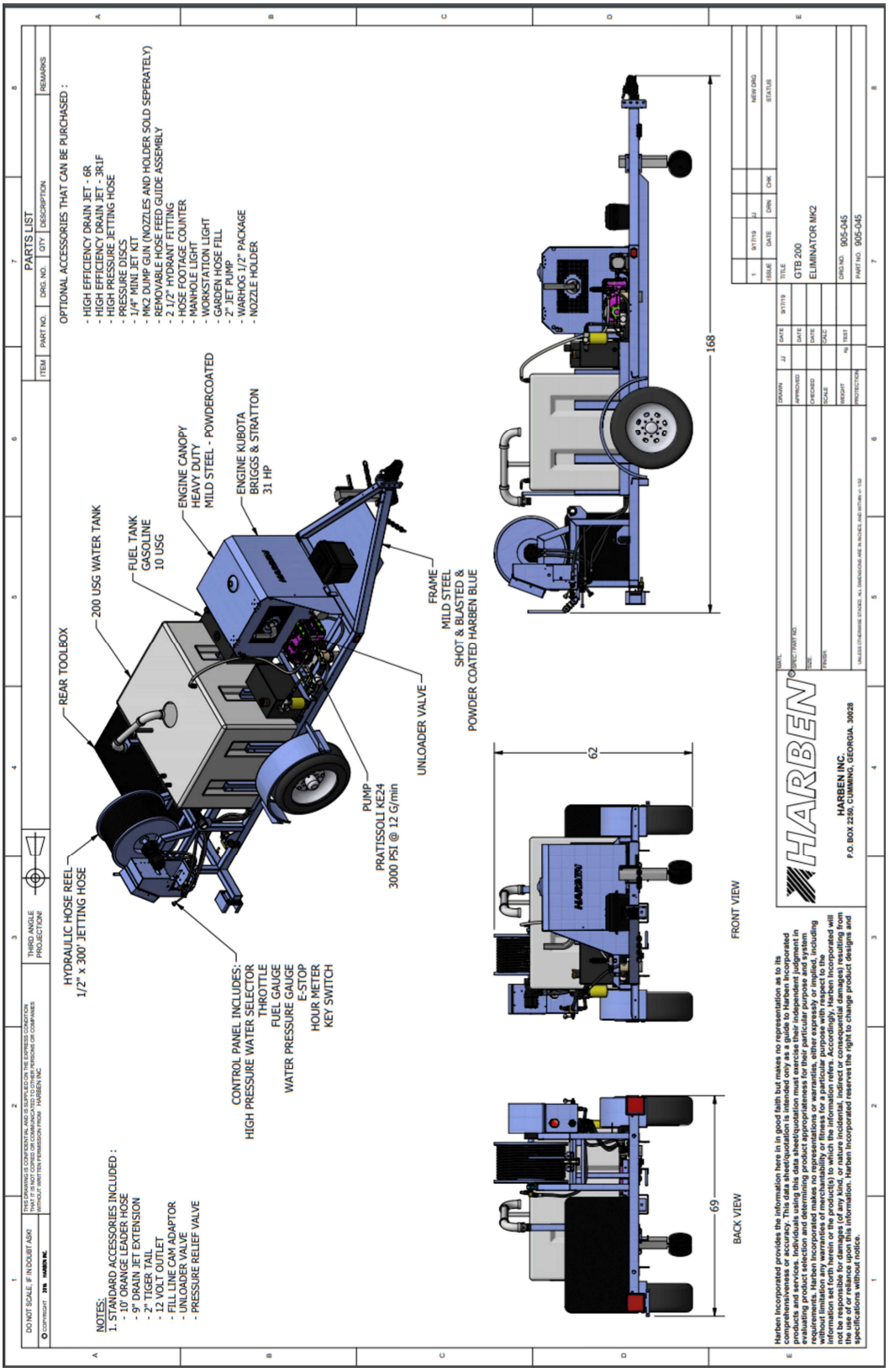


Fig. 2.1 - Eliminator Components

3. Technical Data

3.1. Technical Data

3.1.1. Pump Data

Pump Type	Pratissoli KE 24 (See Section 7)
Pump width	16” approx.
Pump length	14” approx.
Inlet	G1” (1” BSP)
Outlet	G1/2” (1/2” BSP)
Shaft dia	30 mm
Shaft length	80 mm
Cylinder options	3
Power rating (nominal)	25 hp
Shaft speed	1450 rpm
Maximum pressure	Up to 3000 psi (210 bar)
Max flow rate	Up to 11 USG/min (45 lpm)
Crankcase lubrication	Fully immersed
Oil capacity	0.5 USG
Weight	80 lb

3.1.2. Main Components

Engine	903670 Briggs & Stratton 31 HP (31Hp @ 3600 rpm)
Pump	067770 Pratissoli KE24

3.1.3. Ancillaries

Water tank	903492 200 gal capacity
Supply filter	042134 Hypro line strainer / 170 micron mesh
Monitoring & control	Standard engine controller and throttle
Pressure control and safety	012096 Pressure Gauge 903625 Unloader Valve

3.1.4. Services Required

Mains water supply	Positive head capable of delivering greater than 12 USG/min *Note: Water pH value of 5 to 9 is recommended.*

3.2. Technical Description

3.2.1. Primary Components

The primary components of the Jetter are illustrated in Figure 2.1 which are as follows:

- A prime mover in the form of an industrial gasoline engine which drives a Pratisolli KE24 high pressure pump.
- The pump can produce high pressure water up to 3000 psi.
- A hydraulic driven hose reel with up to 300 feet of single wire braid high pressure hose with either a nozzle or gun attachment to deliver the high-pressure water to the work application.
- Plastic 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 pressure valve directs high pressure water to the main jetting hose or diverts it back to the tank.
- The control panel which includes the engine controller, pressure gauge, throttle, high pressure selector, & hydraulic hose reel controls.
- A Hypro 80-micron mesh inline strainer is fitted to the suction line between the tank and the pump inlet.

  NOTICE: 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 will cause the pump to cavitate.

3.2.2. Engine Monitoring

Engine hours run are monitored on the engine control panel.

4. Operation

4.1. Operating Conditions

Operators of water jetting equipment should be fully conversant with the 'Industry Best Practices 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.

Please ensure that you read this Operation & Maintenance Manual in conjunction with the Health & Safety Manual before operation.

4.2. Daily Checks

- pump oil level
- water filter cleanliness
- engine oil level
- tank water level

4.3. Pre-start Checks & Procedures

1. ⚠ **WARNING!** In cold weather check that machine is not frozen before starting (see Antifreeze section). Only operate the machine in a well-ventilated area. **(H&S Sections 3 and 7)**
2. Only operate the machine in a well-ventilated area. **(H&S Sections 3, 8, 9, and 12)**
3. Ensure the vehicle is parked on a level surface, and the hand brake is applied. **(H&S Sections 3, 11, and 13)**
4. To fill water tank, connect water supply to the hydrant fitting on the street side of the trailer. (NOTICE: To comply with water authority bylaws never fill the tank by putting a hose directly inside). The water will fill the tank via an appropriate filling point.
   Overfilling the tanks will overload the trailer axle(s) and could make it dangerous. (H&S Sections 3 and 13)
5. Feed off the hose reel approximately 10 feet of high-pressure hose. **Do not fit the nozzle or gun at this point! (H&S Section 3, 6, and 16)**
6. ⚠ **WARNING!** Inspect hose before using. Damaged hose can lead to serious injury if put under pressure. **(H&S Section 3, 6, and 16)**

4.4. Starting the Engine

1. Ensure the high-pressure selector is in the 'return to tank' position.
2. Ensure the engine speed is set to idle.
3. Turn the ignition key to the 1st position to energise.

4. Pull the choke out. (This may not be required if the engine has been used and is already hot).
5. Turn the key to the 2nd position to start the engine.
6. After approximately 5 seconds push the choke back in.
7. If there are any warning lights on the engine controller switch of the engine and consult Section 6 – Fault Finding or the engine manual supplied with the Jetter.
8. Water will now be circulating through the high-pressure selector, and back to the tank.

4.5. Operating the Jetter

1. ⚠ **CAUTION!** Fit the correctly sized nozzle to the high-pressure hose. **Engine should not be running**. Potential injury can occur if a nozle is being put on the end of a hose. **(H&S Sections 3 and 6)**
2. Insert the nozzle approximately 6 feet into the drain before diverting the water through the main jetting hose. **(H&S Section 3, 6, 14, and 16)**
3. Once inserted, move the high-pressure selector to the 'pressure' position. Water will now be diverted to the main jetting hose.
4. To increase engine speed, rotate the throttle counterclockwise.
5. Adjust the engine speed until the desired pressure is reached.
   NOTICE: DO NOT EXCEED THE MAXIMUM OPERATING PRESSURE OF 3000 PSI. IF YOU DO SO YOU RUN THE RISK OF INJURY, AND DAMAGE TO EQUIPMENT.
6. Once you have completed your jetting work and area ready to retrieve the nozzle decrease the engine speed to idle. The unit will be running at around 700 psi. It is recommended that you rewind your hose while under some sort of pressure. A tightly wound hose that is re-energized could crush the drum of the reel. **(H&S Section 3 and 6)**
7. Rewind hose. Once the orange leader hose becomes visible from the pipe, divert the water back to the tank, and continue to fully rewind the hose. Remove nozzle and secure hose to adapter for "travel mode".
8. Switch off the machine as required.

NOTICE: There will still be high pressure water retained in the main jetting hose. After you have moved the high-pressure selector valve to the 'return to tank' position, pull the trigger of the gun to depressurize.

NOTICE: If the pressure is significantly below 3000 psi then the nozzle is worn and should be replaced

4.6. Operating the Jetter with a ‘Dry Shut’ Gun

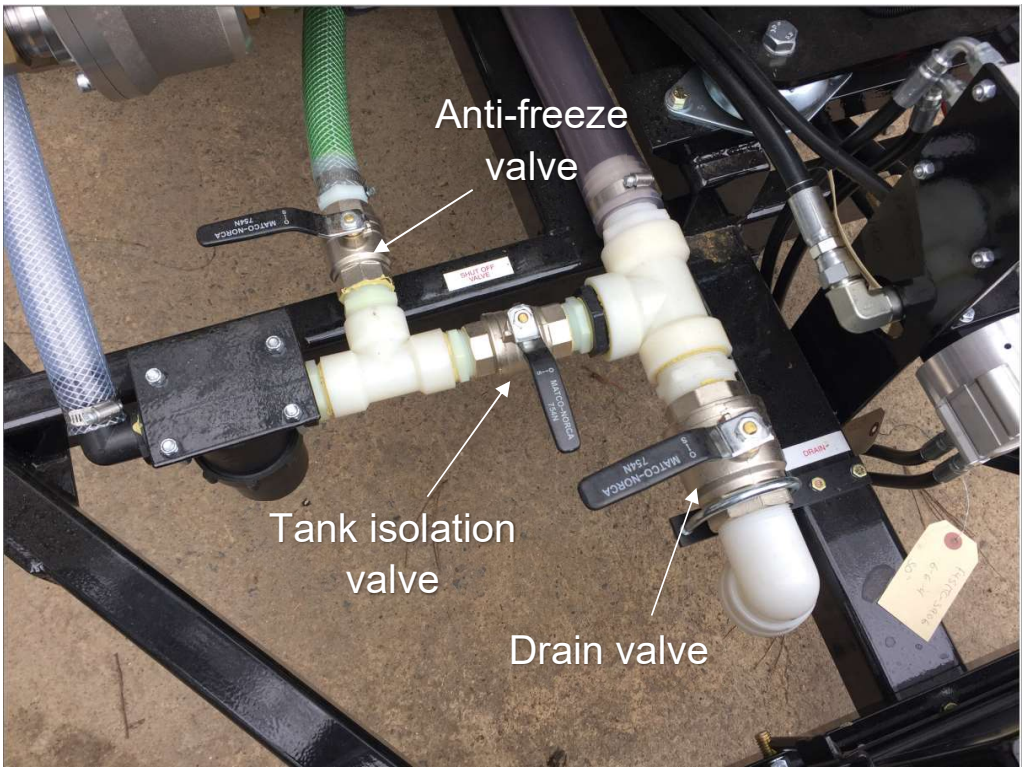
This Jetter is fitted with an unloader valve, meaning it can be used for ‘dry shut’ operation, allowing the operator to use a dry shut gun and not waste any water through dumping to the ground. **(H&S Section 3 and 20)**

1. Follow steps in Section 4.4 to start the Jetter.
2. Fit a dry shut gun to the end of the hose, ensuring it has a correctly sized nozzle fitted.
3. Without pulling the trigger, move the high-pressure selector to the ‘Pressure’ position. Water will now be diverted through the unloader valve and back to the tank.
4. Pull the trigger of the gun. The unloader valve will now close and will divert water to the gun.
5. Observe the pressure on the gauge.
6. Once you have finished the jetting operation move the selector valve to the ‘return to tank’ position and slow the engine speed.
7. Switch engine off.

4.7. Frost Precautions

During periods when there is a risk of freezing, the following precautions should be taken: **(H&S Section 3 and 7)**

4.7.1. To Antifreeze the Machine (with an antifreeze kit fitted)



1. Fill the antifreeze tank with a 50:50 mix of antifreeze and water.
2. Ensure there is enough water in the main tank to allow the pump to run. (i.e. the level is above the height of the low level shut-down switch.
3. Remove any nozzle/gun attachment from the jetting hose and connect to the 3-way valve below the hose reel.
4. Move the three-way valve to the vertical position (dump to tank)
5. Move the high-pressure selector valve is in the ‘pressure’ position.
6. Close the tank isolation valve and open the antifreeze valve.
7. Start the engine and run at idle speed. Antifreeze will be drawn into the pump and water from the hose will be dumped into the tank.
8. Once you can see antifreeze flowing through the dump line into the main tank, move the three-way valve to the horizontal position, which will return to the antifreeze tank.
9. Briefly move the high-pressure selector to the ‘return to tank’ position. This is to fill the dump line with antifreeze.
10. Switch of the engine.
11. Leave the three-way valve, antifreeze valve and tank isolation valve in their current positions.
12. Drain the main water tank.

4.7.2. To De-Antifreeze the Machine (with an antifreeze kit fitted)

1. Fill the water tank.
2. Close the antifreeze valve and open the tank isolation valve.
3. With the hose still attached to the three-way valve and dumping back to the antifreeze tank (horizontal position), start the engine and run at idle.

4. As soon as you see water flowing back through the return line, move the three-way valve to the vertical position and dump back into the main tank.
5. The Jetter is now ready to use for normal operation.

4.7.3. To Antifreeze the Machine (without an antifreeze kit fitted)

1. Pour into the water tank a 50:50 mix of antifreeze and water.
2. Ensure there is enough in the water tank to allow the pump to run. (i.e. the level is above the height of the low level shut-down switch.
3. Remove any nozzle/gun attachment from the jetting hose.
4. Connect the hose to the return line below the hose reel.
5. Move the high-pressure selector valve to the ‘pressure’ position.
6. Start the engine and run at idle speed. Antifreeze will be drawn into the pump and water from the hose will be dumped into the tank.
7. Briefly move the high-pressure selector to the ‘return to tank’ position and back. This is to fill the dump line with antifreeze.
8. Once you can see antifreeze flowing through the return line into the main tank, switch off the engine.

4.7.4. To De-Antifreeze the Machine (without an antifreeze kit fitted)

1. Fill the water tank.
2. Place the hose into a container to collect the antifreeze in the hose.
3. Start the engine and run at idle speed.
4. As soon as you see water flowing out of the main hose, switch the machine off.
5. The Jetter is now ready to use for normal operation.

5. Routine Maintenance

Table 1 provides a basic guide to routine maintenance requirements for the various components of the Jetter.

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

5.1. Maintenance Procedures

Prior to use / Daily / After 8 hours running	• Check inlet water filter element (Ref Para 5.2) • Check engine oil level on dip stick (Ref section 9) • Visual check for hose damage/water leaks & for any cracks in frame/chassis etc. • Check ignition and warning lamp operation
Weekly / every 24 hours running	• Visually inspect Jetter for security checking for any loose, damaged, or missing parts. • Check air filter cleanliness (Ref section 9) • Check engine fuel water trap for contamination (Ref section 9)
3 months / 50 hours	• First service contact Harben Inc.
6 months / 150 hours	• Inspect tanks and fittings for leaks, thoroughly clean & flush through (with hot water more than 158°F) • Tighten any loose joints • Grease the hydraulic hose reel bearing blocks • Check condition of 12volt start battery • Grease battery terminals for protection • Check alternator belt
Yearly / 300 hours	• Intermediate service of engine, gearbox and pump required (Contact Harben Inc.) • Closely inspect the structural integrity of the framework for signs of stress and cracking • Check hydraulic filter gauge. If it reads in the red replace the filter and oil (Shell Tellus 22) • Carry out detailed inspection of pipes, hoses and fittings. • Dismantle, clean & lube the hydraulic diverter valve
2 yearly / 600 hours	• Major service of engine, gearbox and pump required (Contact Harben Inc.) • Replace the pump inlet/delivery valves • Check wiring terminals/connections and continuity of electrical earth.

Table 1 Recommended Routine Maintenance

For a detailed guide to pump maintenance and overhaul procedures refer to Section 7.

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

5.2. Daily Maintenance

The following must be completed daily with the Jetter switched **OFF**. **(H&S Section 11)**

1. Check condition of inlet water filter & element. Clean or replace. (Harben part no. 042-134)

Unscrew the bowl to remove the mesh (Harben part no. 903-245). Take precautions so as not to lose the sealing ring (Harben part no. 903-300).

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

3. ⚠ **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. **(H&S Sections 3 and 6)**

With the Jetter **running:**

1. Make further inspection for leaks. If a leak is observed, shut down immediately and report the leak to a supervisor or manager.
2. Check all lugnuts on both tires and torque to approximately 90 lbs / ft.

3. The green wheel lug indicators should be pointing in the right direction.

6. 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 6.3 overleaf for convenience.

Also covered at 6.3 overleaf is a diagnosis of selector valve problems

6.1. 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.1 as follows:

Note: Your engine control panel may differ from that shown. For a more detailed guide to engine fault finding consult the engine manual supplied with your Jetter.

6.2. Equipment Fault Finding

Problem	Possible Cause	Recommended Action
Low system pressure	• Worn or incorrect size of cutting nozzle • Engine speed slow • Leaks from hose, pipes, and connections • Blocked inlet filter • Inlet hose to long • Loss of water through dump line of selector valve or gun when high pressure selected • Loss of water through dump line of remote-control kit, if fitted	• Replace the old jetting Nozzle with a new one • Adjust to correct speed • Check the connections for tightness, replace if needed • Clean or replace element • Shorten hose length • Check seats and seals • Check seats and seals
High system pressure	• Blocked nozzle, selector valve or gun • Incorrect nozzle size • Incorrect bore size • Engine speed high • Crushed delivery hose • Two-gun choke left in gun when operating as single gun unit	• Clean the items and flush out the delivery line • Replace the nozzle • Replace the hose • Adjust to correct speed • Replace if necessary • Replace with standard choke
Low water level	• Blocked or dirty pre-filters • Faulty ball valve assembly • Wrong seat in ball valve assembly • Low inlet pressure	• Clean or replace elements • Replace if necessary • Replace the seat if necessary • Increase pressure
Pump not running evenly (also refer to pump faults)	• Air in water • Air in crankcase oil • Worn drive coupling • Faulty inlet or delivery valve • Valve nut over tightened	• Water bleed pump • Oil bleed pump • Replace flexible elements and examine coupling • Check valve condition • Check tightness of inlet & delivery nut
Burst disc failure or safety relief valve operating (also refer to high system pressure)	• Incorrect burst disc • Incorrect valve setting • Faulty valve • Faulty or fatigued burst disc	• Replace with correct disc • Check certificate/setting • Repair or replace if required • Replace with new disc

6.3. Pump Fault Finding

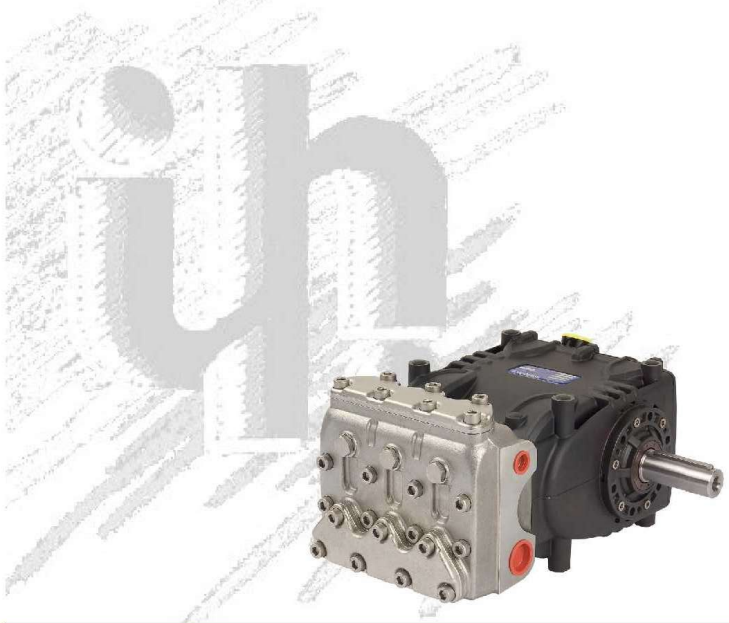
Problem	Possible Cause	Recommended Action
• Mixing of oil and water in crankcase • Loss of pressure • Pump not running evenly	• Worn or damaged delivery valves. • Damaged filter element allowing debris to jam delivery valve	• Check all delivery valves – replace as necessary • Check all diaphragms – replace as necessary • Replace oil • Check filters – replace as necessary
• 1 Loss of crankcase oil through high pressure hose • Loss of pump pressure • Pump not running evenly	• Inlet restriction may have been caused through: ○ Blocked filters ○ Kinked inlet hose ○ Worn or damaged inlet valves ○ Excessive inlet hose length • Pump has been frozen	• Clear restriction • Check inlet valves – replace as necessary • Check diaphragms – replace as necessary • Replenish oil
• Mixing of oil and water in crankcase	• Diaphragm failure (may have been through fatigue from excessive running hours)	• Check all diaphragms – replace as necessary

6.4. Selector Fault Finding

Problem	Possible Cause	Recommended 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.

Serie KE

Pratissoli



Manuale uso e manutenzione
Use and Maintenance Manual
Manuel d'utilisation et d'entretien
Betriebs- und Wartungsanleitung
Manual de Uso y mantenimiento
Manual de uso e manutenção
Руководство по эксплуатации и техническому обслуживанию
使用和保养手册
دليل الاستخدام والصيانة

Table of Contents

HARBEN

1 INTRODUCTION

This manual describes the instructions for use and maintenance of the KE pump and should be carefully read and understood before using the pump.
Proper pump operation and duration depend on the correct use and maintenance.
Interpump Group disclaims any responsibility for damage caused by negligence or failure to observe the standards described in this manual.
Upon receipt, verify that the pump is intact and complete. Report any faults before installing and starting the pump.

2 DESCRIPTION OF SYMBOLS

Read the contents of this manual carefully before each operation.

Warning Sign

Read the contents of this manual carefully before each operation.

Danger Sign
Danger of electrocution.

Danger Sign
Wear a protective mask.

Danger Sign
Wear protective goggles.

Danger Sign
Put on protective gloves before each operation.

Danger Sign
Wear appropriate footwear

3 SAFETY

3.1 General safety warnings

Improper use of pumps and high pressure systems as well as non-compliance with installation and maintenance standards can cause serious damage to people and/or property.
Anyone assembling or using high pressure systems must possess the necessary competence to do so, knowing the characteristics of the components that will assemble/use and take all precautions necessary to ensure maximum safety in all conditions of use. In the interest of safety, both for the Installer and the Operator, no reasonably applicable precaution should be omitted.

3.2 Essential safety in the high pressure system

1. The pressure line must always be provided with a safety valve.
2. High pressure system components, particularly for systems that operate primarily outside, must be adequately protected from rain, frost and heat.
3. The electrical control system must be adequately protected against sprays of water and must meet specific regulations in force.
4. The high pressure pipes must be properly sized for maximum operating pressure of the system and always and only used within the operating pressure range specified by the Manufacturer of the pipe itself. The same rules should be observed for all other auxiliary systems affected by high pressure.
5. The ends of high pressure pipes must be sheathed and secured in a solid structure, to prevent dangerous whiplash in case of bursting or broken connections.
6. Appropriate protective casing must be provided in pump transmission systems (couplings, pulleys and belts, auxiliary power outlets).

3.3 Safety during work

The room or area within which the high pressure system operates must be clearly marked and prohibited to unauthorised personnel and, wherever possible, restricted or fenced. Personnel authorised to access this area should first be instructed how to operate within this area and informed of the risks arising from high pressure system defects or malfunctions.
Before starting the system, the Operator is required to verify that:

1. The high pressure system is properly powered, see chapter 9 par. 9.5.
2. The pump suction filters are perfectly clean; it is appropriate to include a device indicating the clogging level on all devices.
3. Electrical parts are adequately protected and in perfect condition.
4. The high pressure pipes do not show signs of abrasion and the fittings are in perfect order.

Any fault or reasonable doubt that may arise before or during operation should be promptly reported and verified by qualified personnel. In these cases, pressure should be immediately cleared and the high pressure system stopped.

3.4 Rules of conduct for the use of lances

1. The operator must always place his safety and security first, as well as that of others that may be directly affected by his/her actions, or any other assessments or interests. The operator's work must be dictated by common sense and responsibility.
2. The operator must always wear a helmet with a protective visor, waterproof gear and wear boots that are appropriate for use and can ensure a good grip on wet floors.

Note: *appropriate clothing will protect against sprays of water but not from direct impact with jets of water or very close sprays. Additional protections may therefore be necessary in certain circumstances.*

3. It is generally best to organise personnel into teams of at least two people capable of giving mutual and immediate assistance in case of necessity and of taking turns during long and demanding operations.
4. The work area jet range must be absolutely prohibited to and free from objects that, inadvertently under a pressure jet, can be damaged and/or create dangerous situations.
5. The water jet must always and only be pointed in the direction of the work area, including during preliminary tests or checks.
6. The operator must always pay attention to the trajectory of debris removed by the water jet. Where necessary, suitable guards must be provided by the Operator to protect anything that could become accidentally exposed.
7. The operator should not be distracted for any reason during work. Workers needing to access the operating area must wait for the Operator to stop work on his/her own initiative, after which they should immediately make their presence known.
8. It is important for safety that all team members are always fully aware of each other's intentions in order to avoid dangerous misunderstandings.

9. The high pressure system must not be started up and run under pressure without all team members in position and without the Operator having already directed his/her lance toward the work area.

3.5 Safety during system maintenance

1. High pressure system maintenance must be carried out in the time intervals set by the manufacturer who is responsible for the whole group according to law.
2. Maintenance should always be performed by trained and authorised personnel.
3. Assembly and disassembly of the pump and the various components must only be carried out by authorised personnel, using appropriate equipment in order to prevent damage to components, in particular to connections.
4. Always only use original spare parts to ensure total reliability and safety.

4 PUMP IDENTIFICATION

Each pump has an identification label, see pos. ① of Fig. 1 which shows:

- Pump model and version
- Serial number
- Max revs
- Absorbed power HP - kW
- Pressure bar - P.S.I.
- Flow rate l/min - Gpm

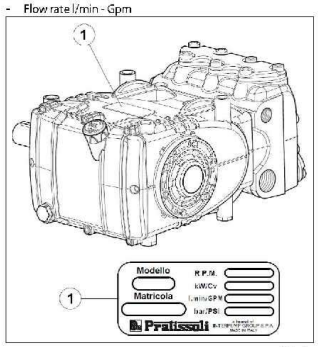


Fig. 1

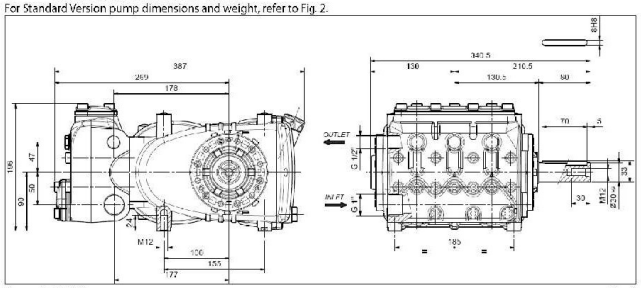
Model, version and serial number must always be indicated when ordering spare parts

5 TECHNICAL CHARACTERISTICS

Model	Rpm	Flow rate		Pressure		Power	
		l/min	Gpm	bar	psi	kW	HP
KE 20	1450	30	7.9	300	4350	18.4	25
KE 22	1450	37	9.8	250	3620	18.4	25
KE 24	1450	45	11.9	210	3050	18.4	25
KE 28H KE 28H-F	1450	61	16.1	150	2170	18.4	25
KE 30H	1450	70	18.5	130	1885	18.4	25
KE 36H	1450	100	26.4	100	1450	18.4	25

6 DIMENSIONS AND WEIGHT

For Standard Version pump dimensions and weight, refer to Fig. 2.



Dry weight 36 kg.

Fig. 2

7 OPERATING INSTRUCTIONS

The KE pump has been designed to operate with filtered water (see par. 9.7) and at a maximum temperature of 40°C.
Other liquids can be used only upon approval by the ***Technical*** or ***Customer Service Departments***.

7.1 Water temperature

The maximum permissible water temperature is 40°C. However, the pump can be used with water up to a temperature of 60°C, but only for short periods. In this case, it is best to consult the ***Technical*** or ***Customer Service Departments.***

7.2 Maximum pressure and flow rate

The rated specifications stated in our catalogue are the max. that can be obtained by the pump. **Independently** of the power used, the maximum pressure and rpm indicated in the specification label can never be exceeded unless upon prior authorisation by our ***Technical*** or ***Customer Service Departments.***

7.3 Minimum rotating speed

Any rotating speed other than that indicated in the performance table (see chapter 5) must be expressly authorised by our ***Technical*** or ***Customer Service Departments.***

7.4 Brands and types of oils recommended

The pump is supplied with oil suitable for room temperatures from 0°C to 30°C.
Some types of recommended oil are indicated in the following table, these oils have additives to increase corrosion resistance and fatigue resistance (DIN 51517 part 2).
Alternatively you can also use Automotive Gear SAE 85W-90 oil for gearing lubrication.

Manufacturer	Lubricant
Agip	AGIP ACER220
ARAL	Aral Degol BG 220
BP	BP Energol HLP 220
Castrol	CASTROL HYSPIN VG 220 CASTROL MAGNA 220
DEA	Falcon CL220
elf	ELF POLYTELIS 220 REDUCTELF SP 220
Esso	NUTO 220 TERESSO 220
FINA	FINA CIRKAN 220
FUCHS	RENOLIN 212 RENOLIN DTA 220
Mobil	Mobil DTE Oil BB
Shell	Shell Tellus ÖI C 220
SRS	Wintershall Ersolon 220 Wintershall Wiolan CN 220
TEXACO	RANDO HD 220
TOTAL	TOTAL Cortis 220

Check the oil level and top up if necessary.
Using the oil dipstick pos. ①, Fig. 3.
The correct checking of the oil level is made with the pump not running, at room temperature. The oil change must be made with the pump at working temperature, removing: the oil dipstick, pos. ①, and then the plug pos. ②, Fig. 3.
The oil check and change must be carried out as indicated in the table in Fig. 14 chapter 11.
The quantity required is ~ 2 litres.

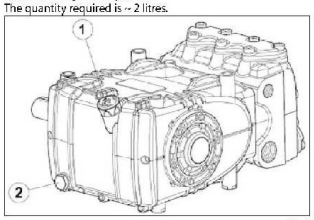
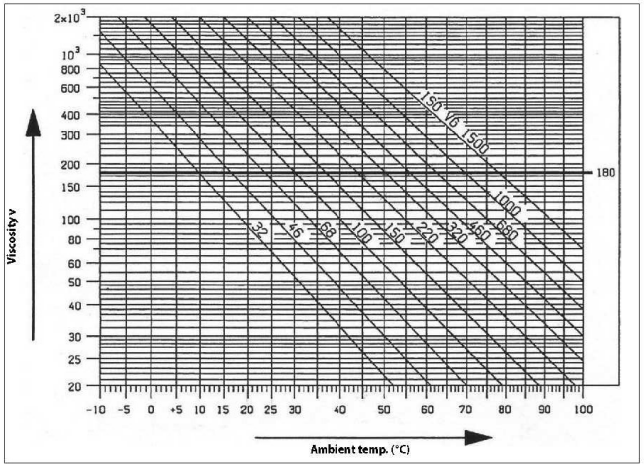


Fig. 3

In any case the oil must be changed at least once a year, as it is degraded by oxidation.

For a room temperature other than between 0°C - 30°C, follow the instructions in the following diagram, considering that oil must have a minimum viscosity of 180 cSt.
Viscosity / Room Temperature diagram
mm²/s = cSt



The used oil must be placed in a suitable container and disposed of in special centres. It absolutely should not be discarded into the environment.

8 PORTS AND CONNECTIONS

The KE series pumps (see Fig. 4) are equipped with:
① 2 "IN" inlet ports 1" Gas.
Line connection to any of the two ports is indifferent for proper pump functioning. The unused ports must be hermetically closed.
② 2 "OUT" outlet ports 1/2" Gas.
③ 3 service ports 1/4" Gas; usually used for the pressure gauge.

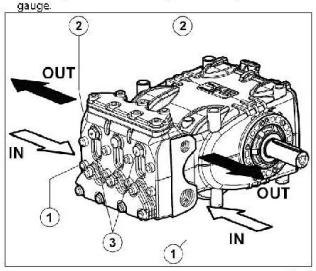


Fig. 4

9 PUMP INSTALLATION

9.1 Installation

The pump must be fixed horizontally using the M12 threaded support feet. Tighten the screws with a torque of 80 Nm.
The base must be perfectly flat and rigid enough as not to allow bending or misalignment on the pump coupling axis/transmission due to torque transmitted during operation.
The unit cannot be fixed rigidly to the floor but must interposed with vibration dampers.
For special applications contact the ***Technical*** or ***Customer Service Departments.***

⚠ **Replace the oil filling hole closing service plug (red) positioned on the rear casing cover. Check the correct quantity with the oil dipstick.**
The oil dipstick must always be reachable, even when the unit is assembled.

⚠ **The pump shaft (PTO) should not be rigidly connected to the propulsion unit.**
The following types of transmission are recommended:

- Hydraulics by flange, for proper application consult with our ***Technical*** or ***Customer Service Departments.***
- V-belts.
- Cardan-shaft (comply with manufacturer's Max. recommended working angles).
- Flexible joint.

9.2 Rotation direction

The rotation direction is indicated by an arrow located on the casing near the drive shaft.
From a position facing the pump head, the rotation direction will be as in Fig. 5.

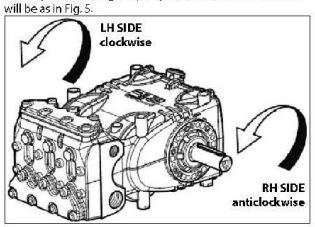


Fig. 5

9.3 Version change

The pump version is defined as right when:
Observing the pump facing the head side, the pump shaft must have a PTO shank on the right side.
The pump version is defined as left when:
Observing the pump facing the head side, the pump shaft must have a PTO shank on the left side.
Note. The version shown in Fig. 5 is right.

⚠ **The version can only be modified by trained and authorised personnel and carefully following the instructions below:**

1. Separate the hydraulic part from the mechanical part as indicated in chapter 2 par. 2.2.3 of the ***Repair manual.***
2. Turn the mechanical part 180° and reposition the rear casing cover in such a way that the oil dipstick is turned upward. Reposition the lifting bracket and relative hole closing plugs in the upper part of the casing. Finally, properly reposition the specification label in its housing on the casing.

⚠ **Make sure that the lower casing draining holes in correspondence with the pistons are open and not closed from the plastic plugs provided for the previous version.**

3. Unite the hydraulic part to the mechanical part as indicated in the ***Repair manual.***

9.4 Hydraulic connections

In order to isolate the system from vibrations produced by the pump, it is advisable to make the first section of the duct adjacent to the pump (both suction and outlet) with flexible piping. The consistency of the suction section must be such as to prevent deformations caused by vacuums produced by the pump.

9.5 Pump supply

A positive head of at least 0.20 metres is required for the best volumetric efficiency.

⚠ **For negative prevalence contact our *Technical* or *Customer Service Departments.***

9.6 Suction line

For a smooth operation of the pump, the suction line should have the following characteristics:

1. Minimum internal diameter as indicated in the graph in par. 9.9 and in any case equal to or exceeding that of the pump head.

⚠ Localised restrictions should be avoided along the run of the duct, as these can cause load losses resulting in cavitation. Avoid 90° elbow bends, connections with other piping, constrictions, counterslopes, inverted U- curves and T-connections.

2. With a layout that is set in such a way to prevent cavitation.
3. Completely airtight and constructed to ensure sealing over time.
4. Prevent that pump stopping causes emptying, even partial.
5. Do not use 3 or 4-way hydraulic fittings, adapters, swivel joints, etc. as they could jeopardise pump performance.
6. Do not install Venturi tubes or injectors for detergent suction.
7. Avoid use of base valves or other types of unidirectional valves.
8. Do not recirculate by-pass valve discharge directly into suction.
9. Provide for proper guards inside the tank to prevent that water flow from the bypass and the tank supply line can create vortexes or turbulence near the pump supply pipe port.

9.7 Filtration

1 filter must be installed on the pump suction line, positioned as indicated in Fig. 6 and Fig. 6/a.

With a manually activated control valve

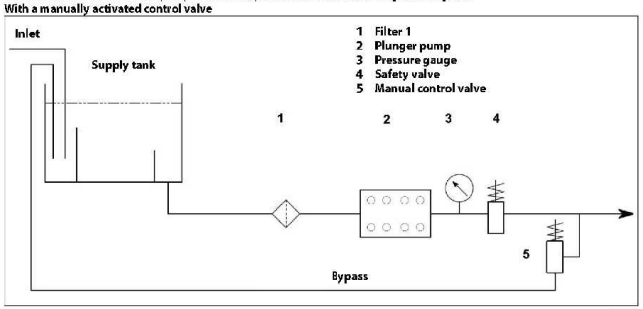


Fig. 6

With a pneumatically activated control valve

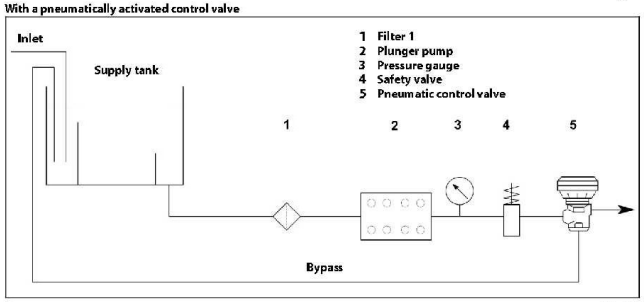


Fig. 6/a

The filter must be installed as close as possible to the pump, it must be easily inspected and must have the following characteristics:

1. Minimum flow rate at least 3 times the nominal flow rate of the pump.
2. Inlet/outlet port diameters no smaller than the inlet port diameter of the pump.
3. Filtration grade between 200 and 360 µm.

For smooth pump operation, regular filter cleaning is necessary, planned according to the actual use of the pump in relation to the quality of water used and actual clogging conditions.

9.8 Outlet line

For the correct laying of the outlet line, the following installation rules must be followed:

1. The internal diameter of the pipe must be sufficient to ensure correct fluid velocity, see graph in par. 9.9.
2. The first section of the line connected to the pump outlet must be a flexible hose, in order to isolate the vibrations produced by the pump of the rest of the system.
3. Use high pressure pipes and fittings to ensure high safety margins in all operating conditions.
4. The outlet line must always be provided with a Max. pressure valve.
5. Use pressure gauges suitable to withstand pulsating loads typical of the plunger pumps.
6. During the design stage, keep in mind the line load losses which result in a drop in pressure during use with respect to the pressure measured on the pump.
7. For those applications where pulses produced by the pump on the outlet line may prove harmful or unwanted, install a pulsation dampener of sufficient size.

9.9 Calculation of the internal diameter of the duct pipes

To determine the internal diameter of the duct, refer to the following diagram:

Suction duct

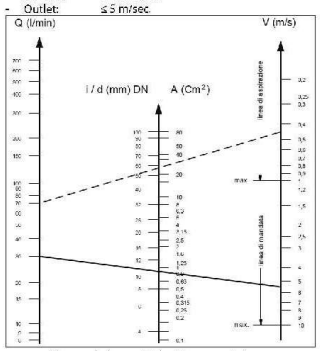
With a flow rate of ~ 70 l/min and a water velocity of 0.45 m/sec. The graph line joining the two scales meets the central scale showing the diameters, corresponding to a value of ~ 60 mm.

Outlet duct

With a flow rate of ~ 30 l/min and a water velocity of 5.5 m/sec. The graph line joining the two scales meets the central scale showing the diameters, corresponding to a value of ~ 10 mm.

Optimal speeds:

- Suction: ≤ 0.5 m/sec.
- Outlet: ≤ 5 m/sec.



The graph does not take into account pipe resistance, valves, load loss produced by the length of the ducts, the viscosity of the liquid pumped or the temperature itself.
If necessary, contact our ***Technical*** or ***Customer Service Departments.***

9.10 V-belt transmission

The pump can be controlled by a V-belt system.
For this pump model, we recommend use of 2 XPB belts (16.5x13 serrated). Use an XPC profile only for long durations.
Both the characteristics and transmissible power of each belt can be verified in the diagram in Fig. 7, in relation to the number of rpm normally declared by the manufacturer.
Minimum duct pulley diameter (on pump shaft): ≥ 160 mm.
The radial load on the shaft must not exceed 3000 N (value necessary for Layout definition). The transmission is considered adequate if the load is applied to a maximum distance **a=30 mm** from the shaft shoulder (P.T.O) as shown in Fig. 10.

For dimensions differing from those specified above, contact our ***Technical*** or ***Customer Service Departments.***

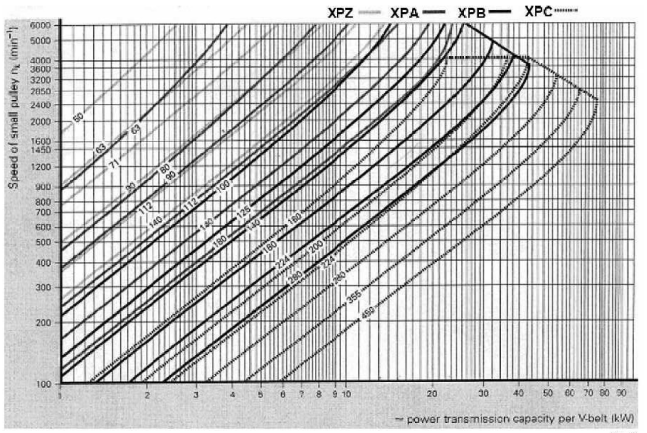


Fig. 7

9.11 Transmission definition

To prevent irregular radial loads on the shaft and the relative bearing, follow these directions:

a) Use pulleys with V-belts with the size of the groove required/recommended by the manufacturer of belt used. In the absence of directions, follow Fig. 8 and the table in Fig. 9.

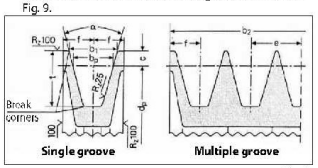


Fig. 8

Dimensions (in mm)

Belt section as per DIN 7753 part 1 and B.S. 3790		DIN symbol symbol B.S./ISO		XPB/SPB SPB	XPC/SPC SPC
Belt section as per DIN 2215 and B.S. 3790		DIN symbol symbol B.S./ISO		17 B	22 C
Pitch width			b_w	14.0	19.0
Increased grooving width $b_1 \approx$		$\alpha = 34°$		18.9	26.3
		$\alpha = 38°$		19.5	27.3
			c	8.0	12.0
Distance between grooving			e	23 ± 0.4	31 ± 0.5
			f	14.5 ± 0.8	20.0 ± 1.0
Increased grooving depth			t_{min}	22.5	31.5
α	34°	by primitive diameter	d_w	from 140 to 190	from 224 to 315
	38°	narrow-section V-belts DIN 7753 part 1		> 190	> 315
α	34°	by primitive diameter	d_w	from 112 to 190	from 180 to 315
	38°	classic section V-belts DIN 2215		> 190	> 315
Tolerance for $\alpha = 34°-38°$				± 1°	± 30'
Pulleys for b2 by grooving number z b2 = (z-1) e + 2 f			1	29	40
			2	52	71
			3	75	102
			4	98	133
			5	121	164
			6	144	195
			7	167	226
			8	190	257
			9	213	288
			10	236	319
			11	259	350
			12	282	381
Minimum pulley diameter must be respected. Do not use laminated V-belts.					

Fig. 9

b) Use high performance belts – for example **XPB** instead of **SPB** – as a lower quantity of belts for the same transmitted power may be necessary and a consequent shorter resulting distance compared to the shaft shoulder (P.T.O) "a" of Fig. 10.

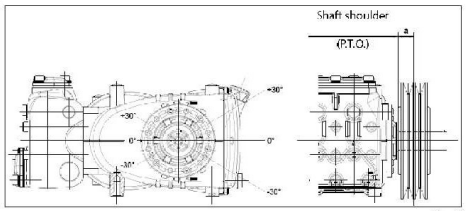


Fig. 10

c) Pull the belts according to manufacturer instructions. Excessive pulling can cause reduced bearing life and wear out the pulley prematurely. Pulling depends on different variables as indicated in par. 9.12.

d) Belt length has a natural tolerance ≥ ± 0.75%. For this reason, the 2 belts must be purchased as a pair.

e) Follow the direction of the belt pull as shown in Fig. 9 for other needs, contact our ***Technical*** or ***Customer Service Departments.***

f) Take care of the alignment of the driving pulley and driven pulley grooves.

9.12 Definition of static pull to apply on belts

Static pull depends on:

a) The wheelbase between the two pulleys (belt length).
b) The load due to static pull of the belt.
c) The number of belts.
d) The winding angle of the smallest pulley.
e) Average speed.
f) Etc.

The diagram in Fig. 11 for belts with an XPB profile in relation to the wheelbase indicates the correct tensioning Tc (belt sag with a dynamometer load of 71 N.

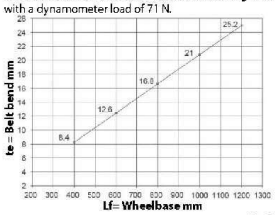
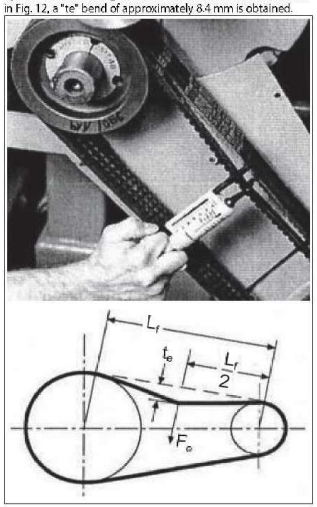


Fig. 11

Conclusion: with a wheelbase of 400 mm and with a dynamometer, loading the belt branch with 75 N as indicated in Fig. 12, a "te" bend of approximately 8.4 mm is obtained.



Lf = Wheelbase
te = Belt bend
Fe = 75 N Dynamometer load

Fig. 12

Note$_1$ Unless otherwise stated by the supplier of the belts, control of proper pull and its relative re-tensioning should be performed after no less than 30 minutes of motion necessary for the normal adjustment of the belts. Best performance and durability will be achieved with proper tensioning.

Note$_2$ In case of necessity or for routine maintenance, never replace a single belt but the complete set.

9.13 Transmission of power from the second PTO

Upon request, Standard KE pumps can be supplied with an auxiliary PTO on the opposite side to the drive (Transmission of power from the second PTO).

Transmission can be carried out:

- By means of the V-belts.
- By means of the joint.

By means of the V-Belts, withdrawable Max Torque is:
20 Nm which corresponds to:
2.3 HP at 800 rpm;
4.1 HP at 1450 rpm.

By means of the joint, withdrawable Max Torque is:
40 Nm which corresponds to:
4.6 HP at 800 rpm;
8.2 HP at 1450 rpm.

⚠ By means of the V-belt, the transmission is considered suitable if: belt pull is applied at a max distance of 18 mm with from the bend shaft shoulder (see Fig. 13). Min diameter of pulley to be used = Ø 100 mm.

⚠ With transmission by means of the joint, pay particular attention to perfect alignment so that no transverse forces are generated on the pump shaft.

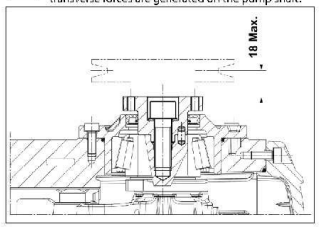


Fig. 13

⚠ For applications differing from those specified above, contact our ***Technical*** or ***Customer Service Departments.***

10 START-UP AND OPERATION

10.1 Preliminary checks

Before start-up, ensure that:

The suction line is connected and pressurised (see par. 9.4 - 9.5 - 9.6) the pump must never run dry.

1. The suction line ensures a hermetic seal over time.
2. Any shut-off valves between the supply source and the pump are fully open. The outlet line during is free discharge, to permit air present in the pump head to come out quickly and therefore favour fast priming.
3. All suction and outlet fittings and connections are properly tightened.
4. The coupling tolerances on the pump/transmission axis (half-joint misalignment, Cardan joint tilt, belt pulling, etc.) remain within limits required by the transmission manufacturer.
5. Oil in the pump casing is at level, verified with a dipstick (pos. ①, Fig. 14) and exceptionally with a level indicator (pos. ②, Fig. 14).

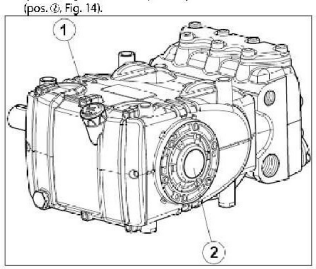


Fig. 14

In case of prolonged storage or long-term inactivity, check proper functioning of the suction and outlet valves.

10.2 Start-up

1. At first start-up, verify that the rotation direction and the supply pressure are correct.
2. Start-up the pump without any load.
3. Check that the supply pressure is correct.
4. Check that the rotation rpm during operation does not exceed the nominal rpm of the pump.
5. Let the pump run for a period of no less than 3 minutes, before putting it under pressure.
6. Before each pump stop, reset pressure by means of the control valve or with any relieving devices and reduce to a minimum rpm (activation with combustion motors).

11 PREVENTIVE MAINTENANCE

For pump reliability and efficiency, comply with maintenance intervals as shown in the table of Fig. 15.

PREVENTIVE MAINTENANCE	
Every 500 hours	**Every 1000 hours**
Check oil level	Change oil
	Check / Replace*: Valves Valve seats Valve springs Valve guides
	Check / Replace*: H.P. seals L.P. seals

Fig. 15

* To replace, follow instructions contained in the ***Repair manual.***

12 PUMP STORAGE

12.1 Long-term inactivity

If the pump is started for the first time after a long period from the date of shipment, before operation check the oil level, inspect the valves as specified in chapter 10, then follow described start-up procedures.

12.2 Method for filling pump with anti-corrosion emulsion or anti-freeze solution

Method for filling pump with anti-corrosion emulsion or anti-freeze solution using an external diaphragm pump based on the layout shown in par. 9.7, between pos. ① and pos. ② of Fig. 6 and Fig. 6/a:

- In place of the service tank, use a suitable container containing the solution to be pumped.
- Close the filter drainage, if open.
- Make sure that the hoses to be used are clean inside and spread grease on their connections.
- Connect the high pressure exhaust pipe to the pump.
- Connect the suction pipe to the diaphragm pump.
- Connect the suction pipe between the pump head and the diaphragm pump.
- Fill the service container with solution/emulsion.
- Insert the free ends of the suction pipes and the high pressure exhaust pipe inside the container.
- Switch on the diaphragm pump.
- Pump the emulsion until it exits from the high pressure exhaust pipe.
- Continue pumping for at least another minute.
- Stop the pump and remove the previously connected pipes.
- Clean, grease and plug the connections on the pump head.

The characteristics of the emulsion can be strengthened if necessary by adding, for example, Shell Donax.

13 PRECAUTIONS AGAINST FROST

Follow the instructions in Chapter 12 in areas and times of the year at risk of frost (see par. 12.2).

In the presence of ice, do not run the pump for any reason until the circuit has been fully defrosted, in order to avoid serious damage to the pump.

14 GUARANTEE CONDITIONS

The guarantee period and conditions are contained in the purchase agreement.

The guarantee will in any case be invalidated if:

a) The pump is used for purposes other than for those agreed upon.
b) The pump is fitted with an electric or combustion motor with performance exceeding those indicated in the table.
c) Safety devices are decalibrated or disconnected.
d) The pump is used with accessories or parts not supplied by Interpump Group.
e) Damage has been caused by:
   1) improper use
   2) failure to follow maintenance instructions
   3) any use different from that described in the operating instructions
   4) lack of sufficient flow rate
   5) defective installation
   6) improper positioning or sizing of pipes
   7) unauthorised design modifications
   8) cavitation.

15 OPERATING FAULTS AND THEIR POSSIBLE CAUSES

The pump does not produce any noise upon start-up:
- The pump is not primed and is running dry.
- No suction water.
- Valves are blocked.
- The outlet line is closed and does not allow air present in the pump head to come out.

The pump pulsates irregularly:
- Air suction.
- Insufficient supply.
- Bends, elbow bends, fittings along the suction line are choking the passage of liquid.
- The suction filter is dirty or too small.
- The booster pump, where installed, is supplying insufficient pressure or flow rate.
- The pump is not primed for insufficient head or the outlet is closed during priming.
- The pump is not primed due to valve jamming.
- Worn valves.
- Worn pressure seals.
- Imperfect functioning of the pressure control valve.
- Problems on the transmission.

The pump does not supply the nominal flow rate/ excessive noise:
- Insufficient supply (see various causes as above).
- The number of rpms is less than the nominal rate;
- Excessive leakage of the pressure control valve.
- Worn valves.
- Excessive leakage of the pressure seals.
- Cavitation due to:
  1) Improper sizing of suction ducts/undersized diameters.
  2) Insufficient flow rate.
  3) High water temperature.

The pressure supplied by the pump is insufficient:
- Use (nozzle) is or has become higher than the capacity of the pump.
- The number of rpms is insufficient.
- Excessive leakage of the pressure seals.
- Imperfect functioning of the pressure control valve.
- Worn valves.

The pump is overheated:
- The pump is working in pressure excess or the number of rpms is higher than the nominal rate.
- Oil in the pump casing is not at level or not the recommended type as detailed in chapter 7 (see par. 7.4).
- Excess belt tension or joint or pulley alignment is incorrect.
- Excessive pump tilt during operation.

Vibrations and shock to pipes:
- Air suction.
- Imperfect functioning of the pressure control valve.
- Valve malfunction.
- Non-uniformity in the transmission motion.

ENGLISH

KIT RICAMBIO – SPARE KIT

		KE20	KE22	KE24	KE28H	KE30H	KE36H
A	Kit tenute pompanti – Plunger packing kit	KIT 2002	KIT 2004	KIT 2006	KIT 2008	KIT 2010	KIT 2133
B	Kit valvole aspirazione – In valves kit	KIT 2000			KIT 2030		
C	Kit valvole mandata – Out valves kit	KIT 2001					
D	Kit tenute complete – Complete seals kit	KIT 2003	KIT 2005	KIT 2007	KIT 2009	KIT 2011	KIT 2134
E	Kit bronzine bielle – Conrod bushing kit	KIT 2156 - 2157 (+0,25) - 2158 (+0,50)					

Pratissoli

KE20 KE22
KE24 KE28H
KE30H KE36H

POS	CODE CODICE	DESCRIPTION DESCRIZIONE	KIT	NR. PCS.
1	70.0100.22	CARTER POMPA		1
2	91.3477.00	CUSCINETTO RULLI CON. 33207		2
3	90.3915.00	OR D. 80,60x2,62 NBR 70SH 3318	D	2
4	70.2200.91	SPESSORE DI RASAMENTO 0,1 mm.		-
	70.2203.91	SPESSORE DI RASAMENTO 0,25 mm.		
5	90.0755.00	ANELLO SEEGER D. 45 (Z-45)	D	1
6	70.2118.01	SPIA LIVELLO OLIO		1
7	90.3877.00	OR D. 39,34x2,62 NBR 70SH	D	1
8	70.1501.22	COPERCHIO CUSCINETTO LATO SPIA		1
9	99.1854.00	VITE M06X15 5931 8.8 ZINC		20
10	90.3833.00	OR D. 13,95x2,62 NBR 70SH	D	1
11	98.2100.50	TAPPO G3/8x13 TE22 ZINC.		1
12	98.2115.00	TAPPO CON ASTA D. 21,5x70		1
13	70.1600.22	COPERCHIO CARTER		1
14	90.3942.00	OR D. 190,17x2,62 NBR 70SH	D	1
15	98.2006.00	TAPPO PER FORO D. 15		5
16	99.3123.00	VITE SERRAGGIO BIELLA M8x1x42		5
17	70.0200.35	ALBERO A GOMITI C.23		1
18	91.4900.00	LINGUETTA 8h9x7x70 UNI 6604/A		1
19	70.1500.22	COPERCHIO CUSCINETTO LATO PTO		1
20	90.1668.00	ANELLO RAD. D. 35x52x7 VITON	D	1
22	70.0600.15	GUIDA PISTONE		3
23	97.7420.00	SPINOTTO D. 18x36		3
24	90.1677.00	ANELLO RAD. D. 36x47x6/7,5	D	3
25	96.7099.00	ROSETTA D. 10x45x1		3
26	70.0400.09	PISTONE D. 20x52		3
	70.0401.09	PISTONE D. 22x52		
	70.0402.09	PISTONE D. 24x52		
	70.0403.09	PISTONE D. 28x52		
	70.0404.09	PISTONE D. 30x52		
	70.0405.09	PISTONE D. 36x52		
27	90.3584.00	OR D. 10,82x1,78 NBR 90SH 2043	D	3
28	70.2241.35	VITE FISSAGGIO PISTONE		3
29	70.1200.36	TESTATA PER PISTONE D. 20		1
	70.1220.36	TESTATA PER PISTONE D. 20 - NPT		
	70.1201.36	TESTATA PER PISTONE D. 22-24		
	70.1221.36	TESTATA PER PISTONE D. 22-24 - NPT		
	70.1249.36	TESTATA PER PISTONE D. 28-30		
	70.1250.36	TESTATA PER PISTONE D. 28-30 - NPT		
	70.1247.36	TESTATA PER PISTONE D. 36		
	70.1248.36	TESTATA PER PISTONE D. 36 - NPT		
30	90.3625.00	OR D. 50,52x1,78 NBR 70SH	A-D	3
31	70.2900.70	ANELLO DI FONDO D. 20		3
	70.2901.70	ANELLO DI FONDO D. 22		

POS	CODE CODICE	DESCRIPTION DESCRIZIONE	KIT	NR. PCS.
31	70.2902.70	ANELLO DI FONDO D. 24		3
	70.2903.70	ANELLO DI FONDO D. 28		
	70.2904.70	ANELLO DI FONDO D. 30		
	70.2912.70	ANELLO DI FONDO D. 36		
32	90.2698.00	ANELLO TEN. A.T. D. 20x28x5,5 P	A-D	3
	90.2713.00	ANELLO TEN. A.T. D. 22x30x5,5 P	A-D	
	90.2737.00	ANELLO TEN. A.T. D. 24x32x5,5 P	A-D	
	90.2750.00	ANELLO TEN. A.T. D. 28x36x5,5 P	A-D	
	90.2760.00	ANELLO TEN. A.T. D. 30x38x5,5 P	A-D	
	90.2798.00	ANELLO TEN. A.T. D. 36x44x5,5 P	A-D	
33	70.2150.70	ANELLO INTERMEDIO D. 20		3
	70.2151.70	ANELLO INTERMEDIO D. 22		
	70.2152.70	ANELLO INTERMEDIO D. 24		
	70.2153.70	ANELLO INTERMEDIO D. 28		
	70.2154.70	ANELLO INTERMEDIO D. 30		
	70.2224.70	ANELLO INTERMEDIO D. 36		
34	90.2704.00	ANELLO "RESTOP" 20x36x5,5/2	A-D	3
	90.2730.00	ANELLO "RESTOP" 22x36x5,5/2	A-D	
	90.2743.00	ANELLO "RESTOP" 24x36x5/2,2	A-D	
	90.2755.00	ANELLO "RESTOP" 28x45x8,5/4	A-D	
	90.2774.00	ANELLO "RESTOP" 30x45x8/4,5	A-D	
	90.2919.00	ANELLO "RESTOP" 36x48x8/3	A-D	
35	90.2716.00	ANELLO TEN. A.T. 20x36x7,5/4,5 HP	A-D	3
	90.2725.00	ANELLO TEN. A.T. 22x36x7/4,5 HP	A-D	
	90.2745.00	ANELLO TEN. A.T. 24x36x6/4 HP	A-D	
	90.2758.00	ANELLO TEN. A.T. 28x45x8,5/6 HP	A-D	
	90.2770.00	ANELLO TEN. A.T. 30x45x7,5/4,5 HP	A-D	
	90.2920.00	ANELLO TEN. A.T. 36x49x6/3,5 HP	A-D	
36	70.1100.51	ANELLO DI TESTA PISTONE D. 20	D	3
	70.1101.51	ANELLO DI TESTA PISTONE D. 22	D	
	70.1102.51	ANELLO DI TESTA PISTONE D. 24	D	
	70.1103.51	ANELLO DI TESTA PISTONE D. 28	D	
	70.1104.51	ANELLO DI TESTA PISTONE D. 30	D	
	71.1102.51	ANELLO DI TESTA PISTONE D. 36	D	
37	99.3816.00	VITE M10X110 5931 8.8 ZINC		8
38	99.3571.00	VITE M10X25 5931 12.9 G321A-M		14
39	70.2100.36	COPERCHIO VALVOLE		2
40	70.2115.70	TAPPO VALVOLE ASP./ MAND. - KE 20-22-24		6
	70.2116.70	TAPPO VALVOLE ASP./ MAND. - KE H 28-30-36		
41	90.5130.00	ANELLO ANTIEST. D. 32,4x36,5x1,5	D	5
42	90.3655.00	OR D. 29,82x2,62 NBR 70SH	D	12
43	36.2297.51	GUIDA VALVOLA ASP./ MAND. - KE 20-22-24		6
	36.2247.25	GUIDA VALVOLA ASP./ MAND. - KE H 28-30-36		
44	94.7401.00	MOLLA Dm. 12x17 - KE 20-22-24		3

POS	CODE CODICE	DESCRIPTION DESCRIZIONE	KIT	NR. PCS.
45	36.2209.65	VALVOLA SFERICA - KE 20-22-24		6
	36.2210.75	VALVOLA SFERICA - KE H 28-30-36		
46	36.2038.66	SEDE VALVOLA ASP./ MAND.		6
47	90.5178.00	ANELLO ANTIEST. D. 31x35,5x1,5	D	5
48	36.7134.01	GR. VALV. MAND. - KE 20-22-24	C	3
49	94.7457.00	MOLLA Dm. 11,4x20		3
	94.7450.00	MOLLA Dm. 15x27,5		3
50	90.3595.00	OR D. 10,82x1,78 NBR 90SH - KE 20-22-24 KE H 28-30	D	3
	90.3823.00	OR D. 13,95x2,62 NBR 90SH - KE H 36	D	
51	98.2247.00	TAPPO G1/4x13 NICKEL - KE 20-22-24 KE H 28-30		3
	98.2099.00	TAPPO G3/8x13 NICKEL - KE H 36		
52	36.7133.01	GR. VALV. ASP. - KE 20-22-24	B	3
55	70.0305.01	BIELLA COMPLETA		3
56	36.2101.51	GUIDA INTERNA PER VALVOLA		6
57	70.2225.51	TAPPO CARTER		6
58	71.2259.51	CAPPUCCIO TAPPO CARTER		3
59	90.9220.00	SEMIBOCC. TESTA BIELLA - SUP.	E	3
	90.9221.00	SEMIBOCC. TESTA BIELLA S. +0,25	E	
	90.9222.00	SEMIBOCC. TESTA BIELLA S. +0,50	E	
60	90.9223.00	SEMIBOCC. TESTA BIELLA - INF.	E	3
	90.9224.00	SEMIBOCC. TESTA BIELLA I. +0,25	E	
	90.9225.00	SEMIBOCC. TESTA BIELLA I. +0,50	E	
61	90.9100.00	BOCCOLA PIEDE BIELLA		3
74	36.7143.01	GR. VALV. ASP./ MAND. - KE H 28-30-36	B-C	6
		CON FLANGIA "A" – WITH DIRECT DRIVE FLANGE		
62	99.3004.00	VITE M08X30 5931 8.8 ZINC		6
63	10.0673.20	FLANGIA MOT. IDRAULICO TIPO A		1
		MOTORE IDR. SAE-B – SAE-B HYDR. MOTOR DRIVE		
75	98.2050.00	TAPPO PER FORO D. 15		2
64	99.3135.00	VITE M08X45 5931 12.9 G321		6
65	10.0755.47	ELEMENTO ELASTICO GIUNTO DL 46		1
66	10.7430.01	GIUNTO ELASTICO D. 30x25,4		1
67	10.0752.20	FLANGIA MOT. IDR. SAE-B		1
		PDF AUSILIARIA – AUXILIARY PTO		
9	99.1854.00	VITE M06X16 5931 8.8 ZINC		6
18	91.4900.00	LINGUETTA 8h9x7x70 UNI 6604/A		1
19	70.1500.22	COPERCHIO CUSCINETTO LATO PTO		1
20	90.1568.00	ANELLO RAD. D. 35x52x7 VITON		1
68	70.0205.35	ALBERO A GOMITI C.23 DX PTO		1
69	97.6152.00	SPINA D. 5x10		1
70	70.2234.54	DISPOSITIVO DOPPIA PTO S.70		1
71	96.7160.00	ROSETTA D. 12X18X1 DIN988		1
72	99.4295.00	VITE M12X35 5931 12.9 G321		1
		CON SISTEMA FLUSHING – FLUSHING SYSTEM		
73	70.1251.35	TESTATA D. 28-30 - FLUSHING		1

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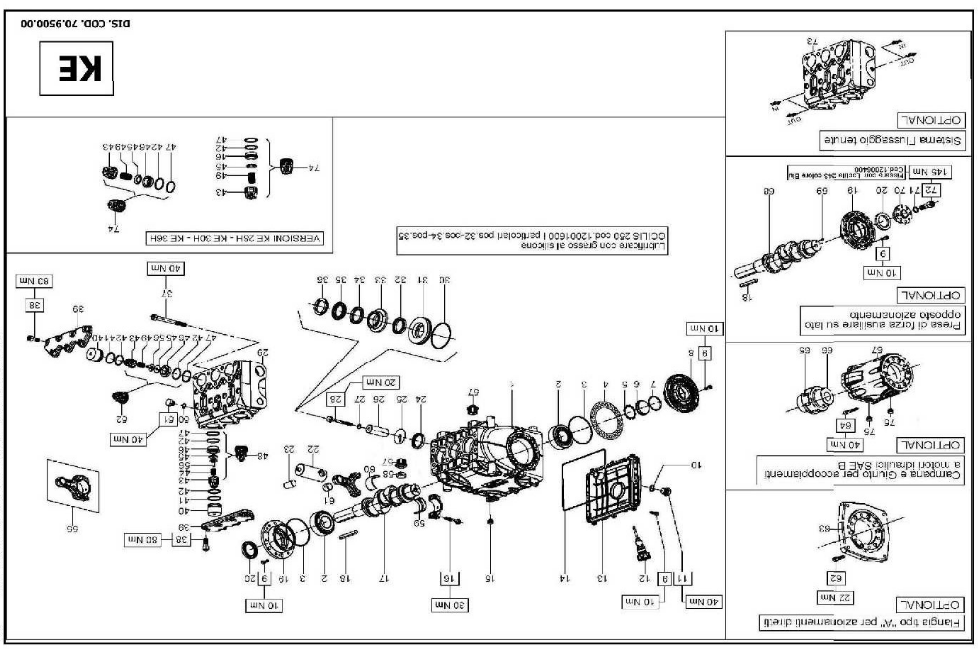
16 EXPLODED DRAWING AND PARTS LIST



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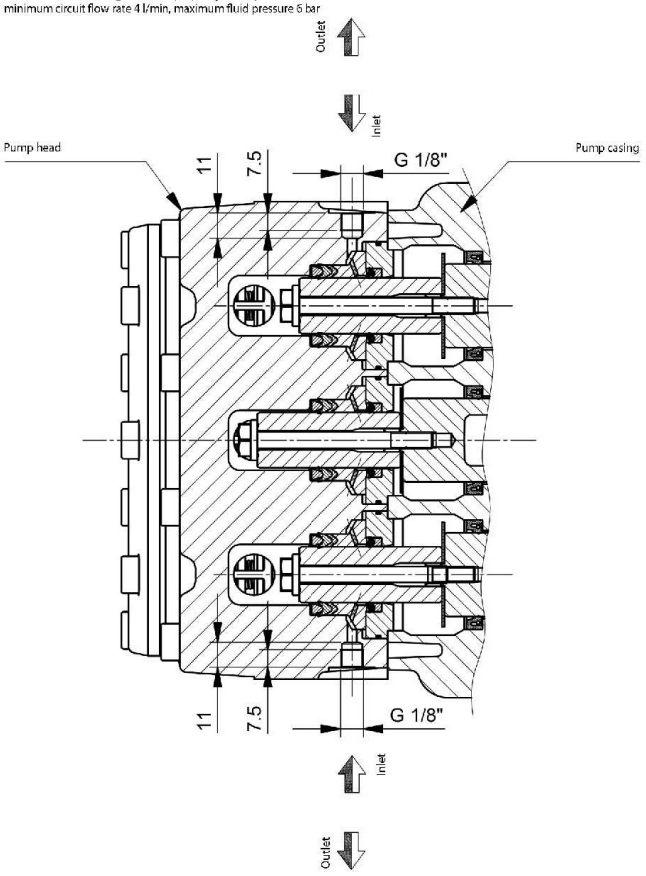
ENGLISH

17 FLUSHING CIRCUIT DIAGRAM OF USE

Adhere to the following values for proper system operation:
minimum circuit flow rate 4 l/min, maximum fluid pressure 6 bar



18 DECLARATION OF INCORPORATION

DECLARATION OF INCORPORATION
(In accordance with Annex II of European Directive 2006/42/EC)

The manufacturer **INTERPUMP GROUP S.p.A. - Via E. Fermi, 25 - 42049 - S. ILARIO D'ENZA - Italy DECLARES** that the product identified and described as follows:

Name:	Pump
Type:	Reciprocating plunger pump for high pressure water
Trademark:	INTERPUMP GROUP
Model:	70 KE series

Is found to comply with the Machinery Directive 2006/42/EC
Standards applied: UNI EN ISO 12100:2010 - UNI EN 809:2000

The pump identified above meets all the essential safety and health protection requirements as listed in section 1 of Annex I of the Machinery Directive:
1.1.2 - 1.1.3 - 1.1.5 - 1.3.1 - 1.3.2 - 1.3.3 - 1.3.4 - 1.5.4 - 1.5.5 - 1.6.1 - 1.7.1 - 1.7.2 - 1.7.4 - 1.7.4.1 - 1.7.4.2 and the relevant technical documentation has been compiled in accordance with Annex VII B.

In addition, the manufacturer undertakes to make available, following a reasoned request, a copy of the relevant technical pump documentation in the manner and terms to be defined.

The pump should not be put into service until the plant to which the pump is to be incorporated has been declared in accordance with the provisions of the relevant directives and/or standards.

Person authorized to compile the technical file — Name: Maurizio Novelli
Address: INTERPUMP GROUP S.p.a. - Via E. Fermi, 25 - 42049 - S. ILARIO D'ENZA (RE) - Italy

Person authorized to draw up the declaration: CEO Ing. Paolo Marinsek

Reggio Emilia - December 2012

Signed:

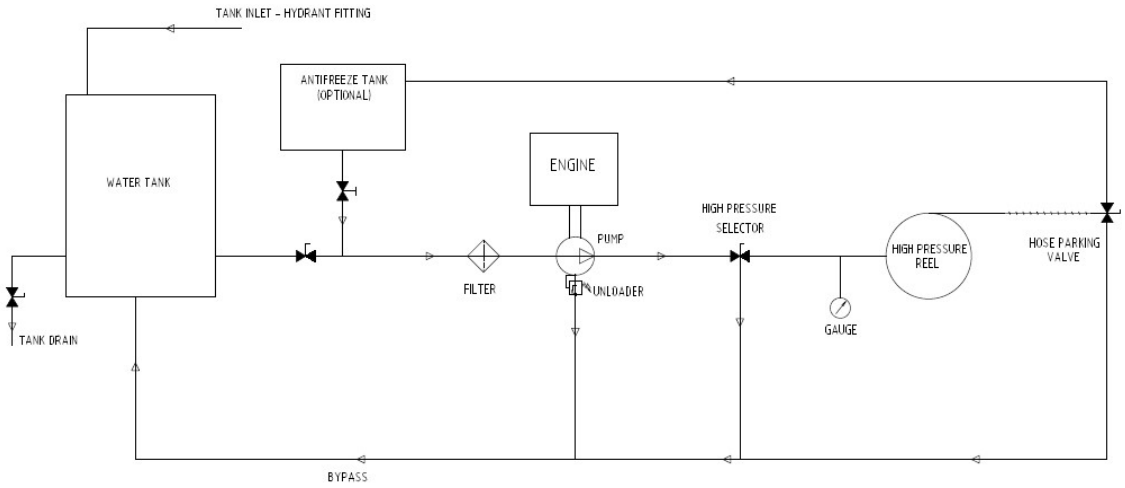
HARBEN®


Pratissoli
Cod. 70980003/4 - Cod.IE 2860000023/4 - 26/08/2014 - 2219
Pratissoli
A brand of INTERPUMP GROUP S.p.A.
42049 S.Ilario—Reggio Emilia (Italy)
Tel. +39-0522-904311
Fax +39-0522-904444
E-mail : info@pratissolipompe.com
http://www.pratissolipompe.com
INTERPUMP GROUP
AZIENDA CON SISTEMA DI GESTIONE QUALITÀ CERTIFICATO DA DNV = ISO 9001 =

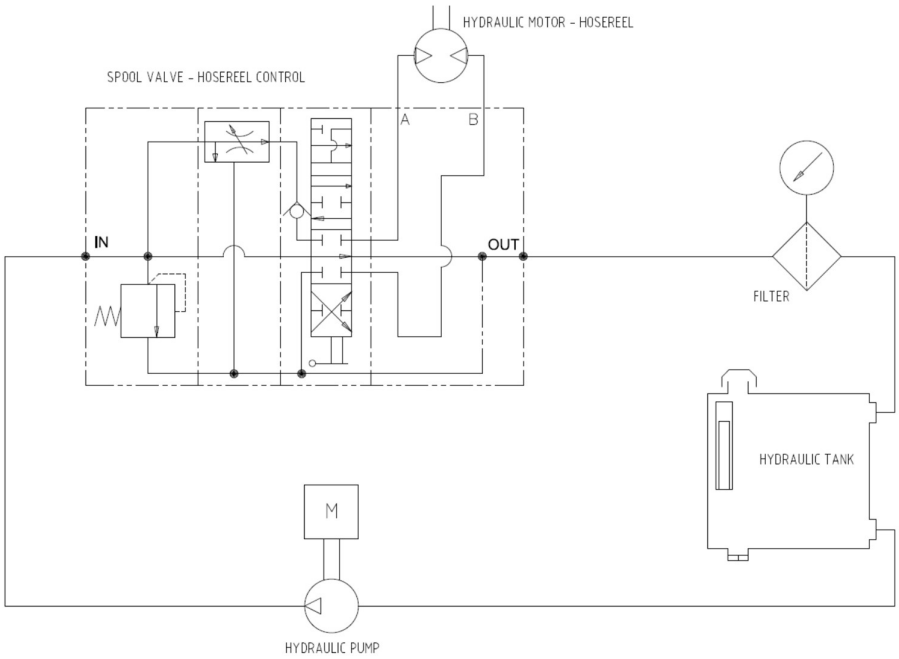
8. Circuit Diagrams

For wiring diagrams relating to the engine, refer to your engine handbook supplied with your Jetter.

8.1. Water Circuit for Eliminator



8.2. Hydraulic Circuit for Eliminator



9. Engine

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

10. Parts List / Spares

10.1. 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.

10.2. Ordering Spare Parts

Order spare parts from:

HARBEN®

Harben Inc.

2010 Ronald Reagan Blvd.

Cumming GA 30041

Tel. (770) 889-9535 - Fax. (770) 887-9411

email: sales@harben.com

www.harben.com

10.3. Routing Maintenance / Consumable Items

See **Section 5**

10.4. Consumable Components

See **Section 5**

10.5. Parts List

The parts list below details the common parts for your Eliminator trailer Jetter. For parts relating to the engine, or for details of optional extras fitted to your unit, contact either your distributer, or Harben Inc.

Part No.	Description	Qty
016278	PULLEY 8MM PITCH 30MMWIDE 40 GROVE TYPE TDP3	1
016281	BUSH TAPERLOCK 1 1/8" SHAFT	1
016397	BELT DRIVE KIT - HYDRAULIC PUMP - ELIMINATOR	1
016500	PULLEY 90 x 30 x 8FENNER 043K0090	1
016501	BELT 30 x 8 x 960FENNER 285K0096	1
018005	VALVE SPOOL HYD FLOW CONTROL CV1185 (SEE NOTES)	1
021017	SELECTOR VALVE P PUMP	1
023011S	PARKER H.P. SWIVEL JOINT WITH 1 X 903 058 ADAPTOR	1
023097	ADAPTOR 1/4" NPTM x #6 JICM	1
033010	SEAL DOWTY 1/2"	5
033013	SEAL DOWTY 3/8"	4
033015	SEAL DOWTY 1"	1
041021	PLUG SQUARE HEAD 1/4"	1
041044	PLUG SQUARE HEAD 1/2"	2
042134	POLYPROPYLENE 1 1/4"FPTSTRAINER	1
043057	DUMP DIFFUSER	3
043177	MALE PIPE x HOSE BARB2 x 2 NYLON ONLY	2
043201	MALE PIPExHOSE BARB1 1/4" NYLON ONLY	3
055024	HOSE 1/2" ID NYLOBRAID	12
061027	LABEL "HARBEN"	1
061093	VINYL CUSTOM DECAL	1
061434	LABEL "E-STOP" SELF ADHESIVE	1
061496	LABEL HIGHLY FLAMMABLE	1
061497	LABEL NO SMOKING	1
067770	PUMP PRATISSOLI KE24	1
067906	HYDRAULIC PUMP & BEARING KIT- ELIMINATOR	1
071367	E STOP TWIST TO RELEASE including NC ACTUATOR 78-3724 78-3732	1
071412	FLOAT SWITCH	1
900111	ADAPTOR 1/2" NPTM x 1/2" NPTM	1
900113	ELBOW 3/4"MALEx1/2"MALE	1
900114	ELBOW 1/2"MALEx7/8"JICM	1
900144	10GTX-S	1
900146	ADAPTOR 1/4" NPTF x #6 JICM	1
900186	TEE 1/2" MALE/FMALE/FMALE	1
900207	ELBOW 1/2"Mx1/2"FEMALE	1
900225	BARBED FITTING 90 DEGREE ELBOW 1/4"HOSE x 1/4NPT	1
900226	LOCK RING 2"	2
900231	LOCK RING 1 1/4"	1
900247	INSERT FOR HOSE 7/8"-14JIC F SWVL x 1/2"OD 90DEG	4
900282	ELBOW 3/4"NPTM x #8JICM	1

900293	ADAPTOR 1/2"NPTM x 7/8"JICF	1
900295	ADAPTOR 1/2"BSPM x #10JICM	3
900300	ELBOW 1/2"NPTM x #8JICM	1
900302	BOLT M12 x 25MM ZINC	4
900303	LOCK WASHER M12 PACK 100 TAX EXEMPT	6
900334	ELBOW PVC 2" FEMALE x FEMALE	2
900338	ADAPTOR 3/8" BSP - #8 JIC M x M	4
900339	ADAPTOR ELBOW #8 JIC MALE x SWIVEL FEMALE	1
900435	PLUG 1 1/4"	1
903001	9" DRAIN JET EXTENSION	1
903058	ADAPTOR 1/2" NPTM x #10 JICM	1
903093	PRESSURE GAUGE 10000PSI PANEL MOUNT	1
9031017	GAS STRUT ELIMINATOR CANOPY 100 LBS	2
9031029	HOSE ASSY 451TC-3906-8-8-6 X 59"	2
9031042	LABEL 'WARNING - UNBLOCKING PIPES'	1
9031043	LABEL 'WARNING - NEVER PLACE YOUR HANDS NEAR LEAKS'	1
9031044	LABEL 'WARNING - ALWAYS WINTERIZE'	1
9031045	LABEL 'SAFETY FIRST'	1
9031046	LABEL 'CAUTION - HOT SURFACE'	1
9031047	LABEL 'NEVER ALLOW ANTIFREEEZE'	1
9031048	LABEL 'WARNING - DO NOT OPERATE WITH CANOPY OPEN'	1
9031049	LABEL 'DANGER - WATER JETS CAN CAUSE FATAL INJURIES'	1
9031050	LABEL 'WARNING - JETTER HOSES'	1
9031051	LABEL 'WARNING - PPE'	1
9031052	LABEL 'WARNING - DRAIN JET EXTENSION'	1
903111	1 1/4" MALE PIPE x 1 1/4" FEMALE PIPE 90 PVC ELBOW	1
9031196	SAFETY LABEL SET RED WHITE SQUARE GAS UNITS	1
9031201	GREEN LUG NUT WHEEL NUT INDICATOR 13/16	16
903124	I.D. PLATE FOR TRAILER	1
9031307	LABEL "CAUTION" NOZZLES MAY OVER PRESSURE REV ENGINE SLOWLY	1
903134	HOLE PLUG	2
903137	H78 x15 LOAD RANGE D ON 6 ON 5.5 WHITE SPOKE WHEEL	2
903148	HOSE CLAMP # 32	2
903151	CLAMP HOSE #04	2
903152	ADAPTOR ASSY 2" TO 3/4"GH	1
903153	ALUMINUM QUICK COUPLING 2" PART A	1
903167	U-BOLT 2" PIPE	1
903172	TEE 1 1/4" B1140	2
903175	CLAMP HOSE #20	4
903178	CLAMP HOSE #08	8
903190	R8NC08-HY0808MP-08BPF-10 10 LEADER HOSE MxF	1
903197	BARBED FITTING 1/2" HOSE x 1/2 FEMALE PIPE	2
903208	FILTER HEAD & ELEMENT	1
903224	BULKHEAD 1 1/4" TxT	1
903225	1 1/4 SCH 80PVC NIPPLE 2 INCH	4

903238	VALVE BALL 1 1/4"	2
903239	2" TIGERTAIL WITH RING & ROPE	1
903241	WIRING HARNESS 25 FOOT	1
903259	15FT THROTTLE CABLE	1
903358	BATTERY 775DT	1
903389	ELBOW 1 1/4" MALE TO BARB	1
903433	1 3/4 EXHAUST CAP DT100	1
903434	EXHAUST CLAMP 1 7/8"	1
903439	VELVAC VENTED GAS CAP2"F/M PIPE THREAD W/CHAIN (FUEL CAP)	1
903491	SWITCH BREAKAWAY ELEC BRK	1
903492	TANK WATER 200GAL LOAF	1
903520	12V OUTLET & CAP	1
903597	PLUG 7 WAY	1
903604	REDUCER 1 1/4" x 1"	1
903620	AMBER INDICATOR LIGHT 1/2" MOUNTING HOLE	1
903625	VALVE UNLOADER 21/4000	1
903627	STANDOFF 10-32 x 1" ALUMSALES TAX EXEMPT	1
903629	CABLE CHOKE 15FT	1
903630	PLUG 1/2"BSP ELIMINATOR	1
903631	PLUG 1"BSP ELIMINATOR	1
903633	ELBOW 45 DEG 1 1/4"	2
903637	PLATE PUMP MOUNT TENSION BLACK POWDER COATED	1
903641	SWITCH KEY	1
903642	HARNESS WIRING	1
903643	MUFFLER	1
903644	AXLE HARBEN SPEC ELECBRAKE TORFLEX #11	1
903645	HANDLE CANOPY ELIMINATOR	1
903646	HINGE CANOPY ELIMINATOR	2
903647	BATTERY BOX 11" x 6 3/4" x 8"	1
903648	LABEL BURN HAZARD ELIMNTR	1
903651	FENDER 9" x 32"	2
903653	BUMPER W/WASHER 60D SBR	3
903654	HOOD LATCH BLACK SALES TAX EXEMPT	2
903655	HOOD CATCH KEEPER 36-KSALES TAX EXEMPT	2
903657	ENGINE COVER BRACE	1
903663	PLUMBING SUPPORT BRACKET BLACK POWDER COATED	1
903664	HOUR METER	1
903670	ENGINE 31HP BRIGGS AND STRATTON	1
903672	HEAT SHIELD FOR CABLES	1
903719	LED TAILLIGHT L/H	1
903720	LED TAILLIGHT R/H	1
903722	LED AMBER MARKER LIGHT	4
903769	HOSE ASSY 451TC-3906-8-8-6 x 95"	1
903784	ENCLOSED ADJUSTABLE DRAW LATCH	1
903789	HOSE ASSY 471TC 3906-10-10-8 x 62"	1
903816	FULTON JACK F2 1600LBS	1

903818	LED MULTI MOUNT AMBER STROBE LIGHT	1
903834	HOSE ASSY F471TC-3906-10-10-8-28	1
903857	HOSE ASSY 451TC-0606-8-8-6 x 115"	1
903868	471TC-3906-1010-8 x 120"	1
903898	3/8" Low Permeable Fuel Line	5
903907	HOSE ASSY 471TC-3906-6-6-4 X 13 1/2"	1
903909	HOSE ASSY 451TC-3906-8-8-6 X 68"	2
903915	HYDRAULIC MOTOR FOR ELILMINATOR	1
903916	FUEL GAUGE 12V	1
903982	KIT PARTS ELIMINATOR	1
904008	HOSE FEED GUIDE ASSEMBLY STANDARD E180 (PAINTED BLACK)	1
904031	FRAME GTB ELIMINATOR MK2	1
904032	HYDRAULIC REEL KIT - ELIMINATOR MK2	1
A020055	TAPER LOCK BUSH 2517/30MM	1
Z094	ANTI-SIPHON BRACKET POWDER COATED BLACK	1
Z1023	ELIMINATOR 1 3/4" EXHAUST PIPE	1
Z1113	SHIPPING STAND LONG TUBE	1
Z1115	SHIPPING STAND CIRCLE	1
Z771	TANK GASOLINE ALUMINUM - ELIMINATOR	1
Z772	TANK HYDRAULIC SMALL - ELIMINATOR	1
Z773	HYDRAULIC PUMP BRACKET - ELIMINATOR MK2	1
Z795A	CANOPY ELIMINATOR MK2	1
Z801	CANOPY SUPPORT - ELIMINATOR MK2	1
Z854	GAS STRUT BRACKET - ELIMINATOR	2

11. Service Documents

11.1. Service Checklist

SERVICE CHECK LIST

HARBEN®

Serial Number -

Unit Number -

Sht 1 of 2

Date -

Engineer -

Hours Run -

ESR -

I - Intermediate service **Y - Yearly service** **R - Customer request**

	Engine	I	Y	R
1	Check oil level			
2	Change oil			
3	Change oil filter			
4	Clean air filter			
5	Change air filter			
6	Change fuel filter			
7	Clean water trap			
8	Check coolant level & A/F mix			
9	Inspect radiator			
10	Inspect hoses			
11	Check fan belt			
12	Check engine mounts			
13	Check exhaust			
14	Check throttle cable			
15	Check for leaks			

	Gearbox	I	Y	R
16	Check oil level			
17	Change oil			
18	Check for leaks			

	Pump	I	Y	R
20	Check valves (Inlet/delivery)			
21	Replace valves (Inlet/delivery)			
22	Check diaphragms			
23	Replace diaphragms			
24	Change oil			
25	Check hoses/fittings			
26	Check working pressure			
27	Check working temp			
28	Check smooth running			
29	Change Burst Disc (Must be changed every 6 months)			
30	Set Safety Relief Valve (Must be set by manufacturer/authorised agent and reset/certificated every six months)			
30	Check main pressure gauge			
31	Check burst disc fitted			
32	Check jump jet operational			
33	Pressure gauge reading correctly			

	Hydraulics	I	Y	R
34	Check oil level			
35	Change oil			
36	Change filter			
37	Inspect hoses			
38	Inspect reel			
39	Grease reel bearings			
40	Check reel mountings			
41	Check operation			
42	Check for leaks			

	Electrics/Controls	I	Y	R
43	Check battery			
44	Check/grease terminals			
45	Check charge system			
46	Check wiring connections			
47	Test/check operations			
48	Test remote control unit			

	Vanpack frame	I	Y	R
49	Check for cracks/damage			
50	Check fixing bolts & brackets			
51	Check safety straps			

	Trailer	I	Y	R
52	Check for cracks/damage			
53	Check wheels/tyres/pressure			
54	Check brake operation			
55	Check lights/reflectors			
56	Check tow hitch/lubricate			
57	Check safety cable			
58	Check jockey wheel condition			

	Gun & Lance	I	Y	R
59	Check for leaks on pressure			
60	Check for damage			
61	Check operation			
62	Check jets are correct			

	Water tank	I	Y	R
63	Clean water filter			
64	Change water filter			
65	Check hoses & fittings			
66	Check tank security			
67	Check tank integrity			
68	Check A/Freeze			
69	Check inlet ball valve			

	OMO Foot pedal	I	Y	R
70	Check cable & plugs			
71	Test operation			
72	Check safety button			

	Pressure Hose	I	Y	R
73	Check for wear / damage			
74	cuts / tears			
75	Braiding showing			
76	Any joins in single length			
77	Fittings in good order			
78	Leader hose satisfactory			

	Hot Wash	I	Y	R
79	Check fuel pump pressure			
80	Clean fuel filter			
81	Check swirl plate adjustment			
82	Check electrode gap			
83	Check air flow			
84	Check thermostat operation			
85	Check low water level switch			
86	Check unloader valve			
87	Check burner is running clean			

	Remote Control	I	Y	R
88	Check handset operation			
89	Check Antenna			

	Other	I	Y	R
90	Test emergency stop button			
91	Check safety decals visible			
92	Check ID plate condition			
93	Clean & tidy appearance			

I	Intermediate Service
Y	Yearly Service
R	At Request of Customer

NA - Not applicable, A - Adjusted, √ - Satisfactory, R - Repair required, O - Observation

Note - If 'Adjusted' or 'Repair required' please describe issue on sht 2

11.2. Service Logbook

Unit Log Book

HARBEN®

Serial Number -

Unit Number -

Date of Manufacture -

Sht 2 of 2

Date ....

Engineer ....

Type of Service ....

Service Stamp

Service carried out by: ....

Date ....

Engineer ....

Type of Service ....

Service Stamp

Service carried out by: ....

Date ....

Engineer ....

Type of Service ....

Service Stamp

Service carried out by: ....

Date ....

Engineer ....

Type of Service ....

Service Stamp

Service carried out by: ....

Date ....

Engineer ....

Type of Service ....

Service Stamp

Service carried out by: ....

Date ....

Engineer ....

Type of Service ....

Service Stamp

Service carried out by: ....

Date ....

Engineer ....

Type of Service ....

Service Stamp

Service carried out by: ....

Type of service - Itermediate, Yearly

12. Warranty

12.1. Warranty of New Products:

Equipment manufactured and supplied by Harben is warranted to be free from defects in materials and workmanship for a period one year or 2000 operating hours, whichever occurs soonest, from the date of shipping from our factory.

Our standard warranty covers both the parts and labor necessary to correct any such defects when repairs are carried out by us or by one of our authorised service centers.

To obtain warranty service, you should notify the Harben service department in writing within the warranty period, and they will direct you to your nearest service center. If the defect is covered by the warranty, we will repair or replace, at our option, the defective equipment, without charge for labor or materials.

Our warranty is limited to the original retail purchaser and is not transferable. We assume no responsibility for damage due to accident, neglect, abuse, tampering or misuse, or damage from repairs or alterations by others. This warranty does not cover damage to the equipment resulting from the use of non-genuine spare parts.

12.2. Warranty of Major Components:

The warranty for the Harben “P” Style pump is five years or 2000 hours, whichever occurs soonest, when used in the sewer and drain cleaning industry. The warranty is two years or 2000 hours, whichever occurs soonest, when used in all other industries. Wearable parts within the “P” Pump are warranted for 90 days. These parts are:

- Inlet and Delivery valves
- Diaphragms

Engines – Please see the engine manual that came with your machine.

Poly Tanks – All poly tanks are warranted for three years for material and workmanship.

Trailer Axles – Warranty is for two years. Please see axle manual that came with your machine for exact details.

Harben Trailer Frame – Warranty is for one year covering material and workmanship.

In Order to Make A Claim:

1. You must be the original purchaser of the machine in which the part(s) were originally installed.

2. You must notify us or our authorized service agent that you wish to make a warranty claim. When requested you must return the faulty part(s) clearly labelled and carriage paid along with the unit/pump serial number and any other information that we may reasonable request.

3. All components must have been installed and maintained in accordance with good industry practice and any specific recommendations we made, including those in our maintenance schedule that is supplied with your machine.

4. We will replace, at the customers cost, any part(s) returned for warranty inspection. When our inspection has been completed, we will advise if the parts(s) are covered by our warranty policy and if they are we will credit your account for the cost of the new part(s), minus taxes and shipping charges.

5. Our warranty does not cover travel charges, down time, or consequential losses.

6. No part(s) will be considered for replacement under warranty if it is subject to any of the following reasons for exclusion.

• Used for a purpose for which it is not designed

• Applied to a use which has not been approved by Harben

• Subject to misuse, negligence, lack of maintenance or accident

• Repaired or altered in any way which, in our judgement, may adversely affect its performance and reliability

• Considered as fair wear and tear

Provision of this warranty shall not apply to any Harben 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 Harben Inc; or
- Subject to misuse, negligence, lack of maintenance or accident; or
- Repaired or altered in any way so as, in the judgement of Harben Inc, to adversely affect its performance and reliability; or
- Normal wear and tear

12.3. 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.

All products manufactured, supplied, or installed for use at work are tested before they leave our factory and are supplied with adequate instructions for their proper use. Further copies of these instructions are available from us upon request.

13. Tire Safety

13.1. Tire Information

The tires installed on the E180 and E-Series trailers are made by Kendra. The specs and warranty information are in the manufacturer's manual supplied with this handbook. Information for this tire can be found on the placard placed on the side of the trailer. This placard includes the following:

- Front, Rear, and Spare Tire Size
- Cold Tire Pressure
- Max Cargo Weight
- Gross Axle Weight Rating (GAWR)
- Gross Vehicle Weight Rating (GVWR)
- VIN number
- Trailer Model number

The tire size, maximum tire pressure, and load limit for the tire are also displayed on the sidewall of each tire.

13.2. Tire Maintenance

Along with the components in the Jetter, the tires need regular maintenance. Listed below are a few measures that can be used to help maintain the tires. **(H&S Section 21)**

- **Tire Pressure** – Always keep the tire at the cold tire pressure listed by the tire manufacturer. Internal air pressure will increase as the tire temperature increases which can cause over inflation if the cold pressure is too high. If the pressure becomes too high, press the valve stem until the correct pressure is reached.
- **Tire Tread** - Tire tread is very essential to any tire. If the tread is below 1/16 of an inch, it needs to be replaced. Tread indicators on the bottom of the tire will show when it needs to be replaced. They are in the in the bottom of the tread grooves and if they are even with the outside of the tread, the tire needs to be replaced. Make sure that the spare is the same size as the tires on the trailer.
- **Tire Balance** – Tires need to be aligned and balanced to prevent any sort of shaking and vibrations that the trailer could experience. Having both of these done will help preserve the life of the tire.
- **Tire Repair** – Plugging a hole and patching the area around it is a simple option if there is a puncture in the tire. This can only be performed if the hole is in the tread and not in the sidewall. If it is beyond this repair option, the spare will need to be put on and the tire must be replaced.

13.3. Tire Safety

To help prevent any accidents, a few steps can be performed before moving the trailer. **(H&S Section 21)**

- Check the pressure in each tire. Accurate cold tire pressure can only be measured if the trailer has sat for longer than three hours.
- Inspect the tire for any foreign objects that may be in the tire or around the tire.
- Make each valve has a cap and that they are on tight.
- Examine the tire for any uneven wear patterns on the tread and.
- Do not go over the maximum trailer capacity listed on the placard.

While driving, drive slowly over potholes and avoid curbs and foreign objects in the road.

13.4. Trailer Component and Safety

13.4.1 Breakaway Cable

Mounted on the trailer behind the hitch is a breakaway cable. If the cable is removed, the trailer brakes will immediately activate. Ensure that the breakaway cable is always intact and working. It needs to be checked daily.

13.4.2 Electronic Brakes

This trailer contains electronic brakes on the axle(s). They are linked to the towing vehicle once the whip is plugged in. The strength of the brakes can be adjusted if the towing vehicle has an electric trailer brake controller in the vehicle. See the axle manufacturer's manual in the documentation pack for further details and maintenance information.

13.4.3 Trailer Hitch

Before attaching the trailer, the towing vehicle's hitch must be inspected for defects and be capable to tow the weight of the trailer. Make sure all connections are made before moving.

13.4.4 Trailer Lights

The trailer lights are linked to the towing vehicle once the whip is plugged in. This includes running lights down the sides and back, turn signals, and brake lights. These need to be inspected every time the trailer moves.

13.5. Reporting Safety Defects

If you believe that your vehicle has a defect which could cause a crash or could cause injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying Harben® Inc.

If NHTSA receives similar complaints, it may open an investigation, and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you, your dealer, or Harben® Inc.

To contact NHTSA, you may call the Vehicle Safety Hotline toll-free at 1-888-327-4236 (TTY: 1-800-424-9153); go to http://www.safercar.gov; or write to:

Administrator
NHTSA
400 Seventh Street, SW.
Washington, DC 20590

You can also obtain other information about motor vehicle safety from http://www.safercar.gov.