Operation & Maintenance Manual

Original Instructions

4010 EA Jetter

Harben Inc.

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Part No. 903-1581

Operation & Maintenance Manual for:

UNIT: 4010 EA Jetter

ISSUE DATE: 5/23

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AMENDMENTS

Change	Changes	Date	Signature
1	NEW MANUAL	5/3/23	JB

Section 1 – Introduction & Contents

1.1. Contents

1.2. Introduction

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

WARNING

Warnings are given where failure to observe the instruction could result in injury or death to persons.

CAUTION

Cautions are given where a failure observe the instruction could result in damage to the pump or to associated equipment.

Notices

Carefully read the notices of this manual because they give important information concerning safe installation, use and maintenance; familiarize 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.

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, 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 motorers.

1.4. The 4010 EA Jetter

Harben drain jetters have been designed to the highest standards so that they will work safely and reliably for many years. It is important that you take time to read the information provided in this operation and maintenance manual so that you understand how to make the most of the jetter and how to use it safely. 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 in drain and sewer systems from 2” up to 18” diameter.

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 electric jetters use electric motors to power a high-pressure water pump up to 6,000 psi and 18 gpm.

Additional accessories can be purchased from Harben Inc, such as floor cleaners, jetting guns and jet pumps which extend the range of work that can be carried out with the jetter. Separate details are available on request.

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 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 jetter.

Section 6 Routine Maintenance

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

Section 7 Fault Finding

Fault diagnosis tables for the pump, motor 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 and water circuits of the jetter.

Section 10 Electric motor

This section provides part details of the electric motor.

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:	4010 EA Jetter

2.2. Pump Assembly

The General Arrangement drawing No. 905-020, defines the components of the Unit assembly as follows:

The pump is driven by a 30hp 3 phase motor.

The motor directly drives the pump at 1175rpm.

Water is fed through the inlet from a mains supply into a metal header tank. The tank supplies the pump with water via an 80-micro mesh filter.

The motor is controlled by the starter allowing the user to switch the pump on and off. When the motor is running the green run light will illuminate.

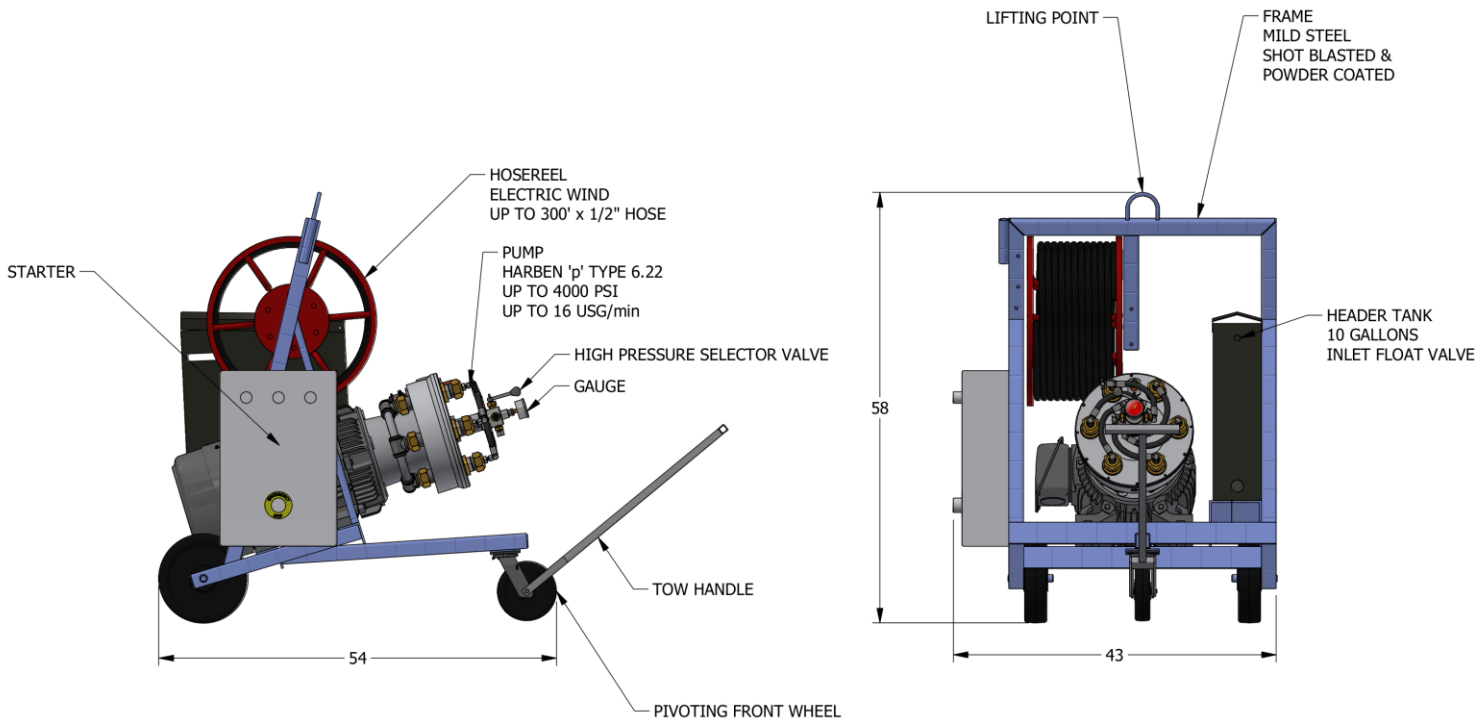
The unit is fitted with a UL300 unloader which allows the user to run the pump up to a pressure of 4000psi.

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.



DRAWING REVISION HISTORY			
ISSUE	DATE	DRN	STATUS
1	1/17/18	TWC	NEW DRG
2	5/3/23	JB	050323/A

P.O. BOX 2250, CUMMING, GEORGIA. 30028	DRN Jared Brand	DATE 5/3/2023	TITLE UNIT 4010 EA ELECTRIC TROLLEY 4000 PSI @ 10 G/MIN	MATL N/A
HARBEN HIGH PRESSURE WATER TECHNOLOGY			PART NO. 905-020	PART REV. 1
			DRG. NO. 905-020-2	
UNLESS OTHERWISE STATED, ALL DIMENSIONS ARE IN INCHES, AND WITHIN +/- 1/32				SHEET 1 OF 1

Fig. 2.1 – 4010 EA Primary Components

3. Section 3 - Technical Data

3.1. Technical Data

3.1.1. Pump Data

Pump Type	Harben 'P' Type 6 22 (See Section 8)
Pump diameter	16" approx.
Pump length	15" approx.
Inlet	1 ¼" dia.
Outlet	G1/2" (1/2" BSP)
Shaft diameter	30 mm
Shaft length	65 mm
Cylinder options	4
Power rating (nominal)	30 hp
Plunger diameter	22 mm
Shaft speed	1175 rpm
Maximum pressure	Up to 4000 psi (275 bar)
Max flow rate	Up to 10 USG/min (60 lpm)
Crankcase lubrication	Fully immersed
Oil capacity	1.58 USG
Weight	176 lb.
Recommended crankcase oil	Shell Morlina 150 or Tellus 150 (see section 6)
Max inlet temperature	77°F

3.1.2. Main Components

Motor	30 HP TECO-WESTINGHOUSE ELECTRIC MOTOR
Pump	0200012ABC Harben P Type 6 22

3.1.3. Ancillaries

Water tank	10 gal capacity
Supply filter	042134 Hypro line strainer / 80 micron mesh
Monitoring & control	30 HP MAG STARTER WITH MET
Pressure control and safety	012096 GAUGE PRESSURE 10000 PSI SCREW IN

3.1.4. Services Required

Mains water supply	Positive head capable of delivering greater than 10 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 electric motor which drives a Harben P Type high pressure pump.
- The pump is capable of producing high pressure water up to 4000 psi.
- Metal 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, maximizing 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.
- A Hypro 80 micron 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 will cause the pump to cavitate)

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:

WARNING

Warnings are given where failure to observe the instruction could result in injury or death to persons.

CAUTION

Cautions are given where a failure observe the instruction could result in damage to the pump or to associated equipment.

All procedures and recommendations in this manual must be strictly adhered to by operators of the jetter, 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.

For a comprehensive list of general safety warnings relating to the operation of high-pressure water jetting equipment refer to **Section 4.6**.

- 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

WARNING

High pressure jetting can be extremely dangerous if it is not properly controlled by fully trained personnel.

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

- **'Recommended Practices for the Use of High-Pressure Waterjetting Equipment' (Code of Practice) - *Issued by The WaterJet Technology Association (WJTA)***

Copies of the Code of Practice are available from Harben Inc.

Supervisors and operators should always 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 Harben Inc. 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 Harben Inc.

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 job hazard analysis must be completed to analyze which PPE must be worn. For more information visit osha.gov

A full range of PPE is available from Harben Inc.

4.6. General Safety Warnings

1. Never use high pressure jetting equipment that has not been regularly serviced according to manufacturer's specifications.
2. Always carry out the manufacturers recommended daily checks to your jetting unit before turning it on.
3. When water jetting equipment is used to clean sewers and drains that are contaminated with hazardous substances it is possible these may be entrained in the resulting aerosol and inhaled by the operator. Consider using a respirator.
4. Never start the jetter frozen. Operating jetting equipment while frozen could cause high speed ice bullets to be ejected from the jetter hose upon machine start up.
5. Never start jetting a drain, sewer or pipe unless the jet nozzle is safely inside the drain and pointing in the direction that you intend it to travel.
6. When drain jetting a drain, sewer or pipe with an inside diameter that is not small enough to prevent the hose from turning back on itself, a drain jet extension (a piece of straight rigid tube equivalent to the pipe diameter) should be fitted between the end of the hose and the nozzle.
7. Always consider the use of a safety leader hose at the beginning of the main jetting hose to alert operators when the jet nozzle is nearing the manhole entrance.
8. Always consider the use of a tiger tail hose feed guide to protect the jetting hose from abrasion and prevent premature failure.
9. Be aware that high pressure hoses can generate static electricity which may need to be controlled when working in hazardous areas.
10. When jetting drains or sewers, if there is a danger to the general public from hoses laying across sidewalks, they must be covered in such a way as to protect against injury from hose failure and tripping hazards.
11. Before starting work, check and ensure the drain jets have no blocked holes or nozzles as this may cause the pumping system to over pressurize which could result in burst disc failure or bursting the jetting hose.
12. Never attempt to unblock a fully choked drain or pipe before considering the consequence of releasing the blockage and having a plan to deal with it. e.g., flooding, material ejection, drain nozzle ejection.
13. Never attempt to clean drains or pipes in one pass because this could lead to debris build up behind the jet nozzle causing a pressure build up in the drainage system. Be aware that a pressure build up in the drain or pipe could cause the jet nozzle to be ejected at speed back towards the operator.
14. Never enter the manhole to either place the jet nozzle into or extract it from the drain entrance unless the required confined space regulations have been met.

15. Never work in a manhole with a radio remote control transmitter that is not classified for use in such areas.
16. Never use the hydraulic hose reel facility as a winch to retract a jetting hose that has become stuck in the drain or pipe. Damage to the hose could be caused that will make subsequent hose failure more likely.
17. Never allow jetting hoses to become kinked and always remove from service any jetting hose with an outer cover that has worn through to the reinforcing braid.
18. Never use the high-pressure jetting hose for any purpose other than sewer, drain or pipe cleaning e.g., winching vehicles or other plant.
19. Never use jetting nozzles and/or accessories that have not been calibrated for the jetting machine pump performance as this could cause rapid over pressurization catching operators unaware.
20. Never attempt to clean a drain or pipe with a nozzle that has more forward force than rear force. It could be ejected back toward the operator causing injury.
21. Never attempt to clean a drain or pipe with a chain flail type jet that has unequal chain lengths as this could lead to severe vibration and high-pressure hose failure.
22. When using a venturi jet pump to remove fluid from a flooded manhole never place your fingers into the pump inlet as they could be trapped by the vacuum and injured.
23. When using a venturi jet pump to remove fluid from a flooded manhole always secure the free end of the pump hose securely and ensure adequate drainage is in place to deal with high volumes of pumped water.
24. Never use a dry shut type foot control valve on a jetting machine that does not have a pressure unloader valve as this could result in burst disc failure or bursting the jetting hose.
25. Never use a dry shut type jetting gun valve on a jetting machine that does not have a pressure unloader valve as this could result in burst disc failure or bursting the jetting hose.
26. When using a dry shut type system be aware that high pressure can be retained in the jetting hose even after the machine has been shut down. Always discharge pressure in a safe manner after machine shut down.
27. Never point the gun at anyone as injury from high pressure water will occur if the jet stream comes into contact with body parts.
28. Never work on a slippery surface because the reaction force of the jetting gun could cause you to become unstable and lose your footing.
29. Never work from a ladder as the reaction force of the jetting gun could cause the ladder to fall backwards from the working area causing possible injury.

30. Never work from scaffolding unless it is designed, erected and managed by competent persons and it is adequately secured to prevent is being pushed over by gun reaction forces.
31. When using the jetting gun to clean hard surfaces be aware that splash back could contain hard debris travelling at speed.
32. When using the jetting gun to clean contaminated surfaces be aware that splash back could contain dangerous contaminants.
33. Never use the jetting gun to clean a surface that could be damaged or penetrated by the water pressure unless that is the desired effect.
34. Never use a high-pressure jetting gun to clean down PPE whilst you or others are still wearing it as serious injury and death could result.
35. When using a jetting gun or nozzle to clean at floor level wear suitable protective footwear.
36. Always ensure that an adequate area is cordoned off around the working zone so that flying debris and contamination cannot injure passers-by.
37. Be aware that the use of water jet guns fitted with oscillating or rotating heads tend to produce higher hand arm vibration levels than simple fixed head jets.
38. Never use a high-pressure jetting gun to wash or cool down livestock as serious injury and death could result.
39. Never use ANYTHING other than a pressure disc in the holder. A pressure disc is designed to burst for a reason. Use of anything else may over pressurize the pump and cause personal injury.
40. The number of operators required to carry out the water jetting task must be decided after performing a job hazard analysis but always consider having a nozzle operator to perform the jetting task and a pump operator to control the machine and act as a safety lookout.

HIGH PRESSURE WATER JETTING CAN BE DANGEROUS OR EVEN FATAL IF THE PROPER PRECATIONS ARE NOT TAKEN. DON'T BECOME A STATISTIC!

4.8. High Pressure Water Hoses

4.8.1. 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.

4.8.2. 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.

4.9. Reaction Forces or "Back Thrust" (where applicable)

It is a mandatory requirement to carry out a job hazard analysis 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 hose's fittings and gun. Harben Inc. can offer assistance with this process if required.

It is not recommended that any one person be required to withstand a back thrust of more than 1/3rd of their bodyweight for an extended period of time. For example, an operator weighing 160 lbs. should not handle a back thrust of more than 53 lbs. for extended periods.

WARNING

Water jetting accessories can generate high back thrusts that can fatigue operators and may lead to them tripping or falling with the potential for serious injury. To avoid physically stressing the operator always rotate tasks to allow adequate rest periods.

4.10. 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.

WARNING

Do not start the pump until the complete high-pressure system has completely thawed out.

4.11. 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!
- Always consider using a safety shroud to provide the operator with greater protection in the event of a hose burst.

WARNING

High pressure water jet! Grip lance with both hands. Never direct jet of water towards people or animals.

WARNING

High pressure water can be extremely dangerous do not leave plant unattended!

4.12. 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.

4.13. 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.

4.14. 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.

4.15. Replacement Parts

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

4.16. Performance

- Never exceed the maximum rated pressure or motor speed.

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

4.17. Pressure Safety Device

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

4.18. Exposure to Vibration

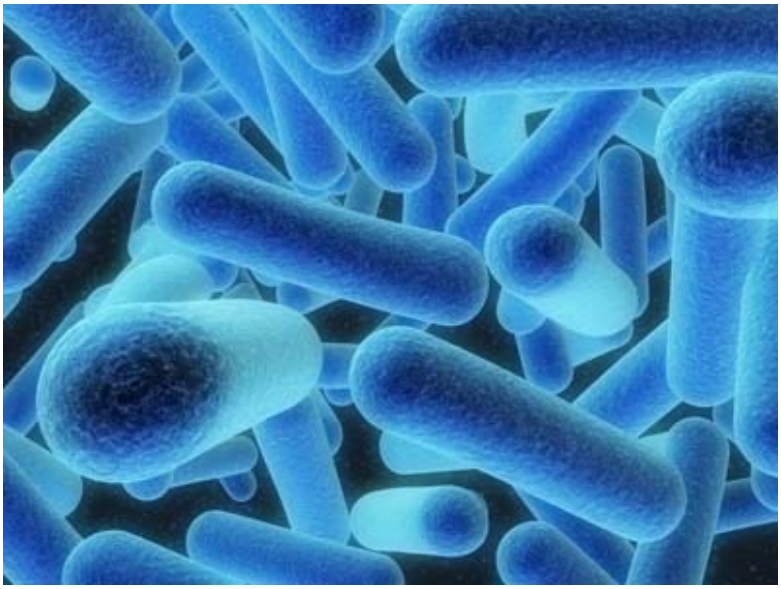
- The use of 'Jump or Pulse Jets' in drain cleaning applications may expose the operator to vibration levels in excess of the exposure limits action value if the jetting hose is handled. Water jetting hose should not be handled whilst the 'Jump or Pulse Jet' is in operation.

WARNING

Handling the jetting hose with the Jump Jet switched on for 15 minutes per day could subject operators to maximum exposure allowable in an 8-hour working shift. Increased exposure is likely to exceed the exposure action value and a health surveillance program will be required (see below).

If exposures are likely to exceed the exposure action value an action plan of controls to limit exposures must be provided and acted on. Operators regularly receiving a hand-arm vibration exposure above the exposure action value must be included in a health surveillance program to monitor for signs of hand-arm vibration syndrome. Always keep hands warm and dry under all circumstances. It is good practice to maintain a record of employee's exposure to vibration over their working life.

4.19. 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 68°F and will not survive above 140°F; water temperatures between 70°F and 113°F being optimum for growth. The bacteria may remain dormant in water temperatures between 43°F and 68°F, 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 favorable 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 68°F, 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 158°F).

5. Section 5 – Operation

5.1. 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.

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
- water filter cleanliness
- tank water level

CAUTION

If the unit has previously been in operation for more than 100 hours, other routine maintenance checks may need to be carried out. Refer to Section 6.

5.3. Pre-start Checks & Procedures

1. Ensure an adequate water supply is available. The water temperature should not be greater than 70°C
2. Connect a water supply to the tank inlet and fill the tank. *(See Fig 1).* The tank is fitted with a float valve; it will shut off the supply once the tank is full, and open again when the water level begins to fall.
3. Ensure the power supply is connected.
4. Ensure all delivery hoses are unrestricted.
5. Ensure the jetting hose / lance is away from any persons.
6. Feed off the hose reel approximately 10 feet of high-pressure hose. **Do not fit the nozzle or gun at this point!**

5.4. Control panel layout and function

5.5. Running the motor

1. Press the green button to turn on.
2. Press the red button to turn off.

5.6. Running the Jetter

1. With the motor running, and the water being diverted back to the tank, fit the required nozzle to the end of the hose and tighten securely.
2. Insert the nozzle approximately 6 feet into the drain before diverting the water through the main jetting hose.
3. Once inserted, move diverter selector handle from dump to high pressure position. Water will now be diverted to the main jetting hose.
   DO NOT EXCEED THE MAXIMUM OPERATING PRESSURE OF 4000 PSI. IF YOU DO SO YOU RUN THE RISK OF INJURY, AND DAMAGE TO EQUIPMENT.
4. Once you have completed your jetting work and are ready to retrieve the nozzle, 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.
5. 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.

6. Section 6 - 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 motor turned off and when cold.

6.1. Maintenance Procedures

Prior to use / Daily / After 8 hours running	• Check inlet water filter element (Ref Para 6.3) • Visual check for hose damage/water leaks & for any cracks in frame/chassis etc.
Weekly / every 24 hours running	• Visually inspect jetter for security checking for any loose, damaged or missing parts.
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 in excess of 70 degrees C) • Tighten any loose joints
Yearly / 300 hours	• Closely inspect the structural integrity of the framework for signs of stress and cracking • Carry out detailed inspection of pipes, hoses and fittings.
2 yearly / 600 hours	• 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 <u>Section 8</u>.

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

6.2. Daily Maintenance

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

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

2. 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).

3. 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 jetter **running:**

4. 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 Chart

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 (liters)			
Number of Cylinders			
3-cyl	4-cyl	6-cyl	8-cyl
6.5	6.0	5.75	5.0

6.4. Burst Discs

When carrying out any maintenance/overhaul of the pump, always ensure the correct burst disc for its working pressure is fitted. The available burst discs are as follows:

Color 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 (6000 psi)
Black	011047	345 bar (5000 psi)
Orange	011107	415 bar (6000 psi)

(Burst disc holder showing “White” burst disc)

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. Fault finding - Pump

Problem	Possible Cause	Recommended Action
Low system pressure	• Leaks from hose, pipes and connections • 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	• Check the connections for tightness, replace if needed • Clean or replace element. • Shorten hose length • Check seats and seals
High system pressure	• Excessive pressure in pressure lin	• Release pressure using Pressure Control Valve
Low water level	• Tank empty	• Fill if necessary
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 problem)	• Incorrect burst disc • Blocked jet • Faulty unloader	• Check burnt disc • Check certificate/setting • Check jet • Check unloader operation

7.2. Pump Fault Finding

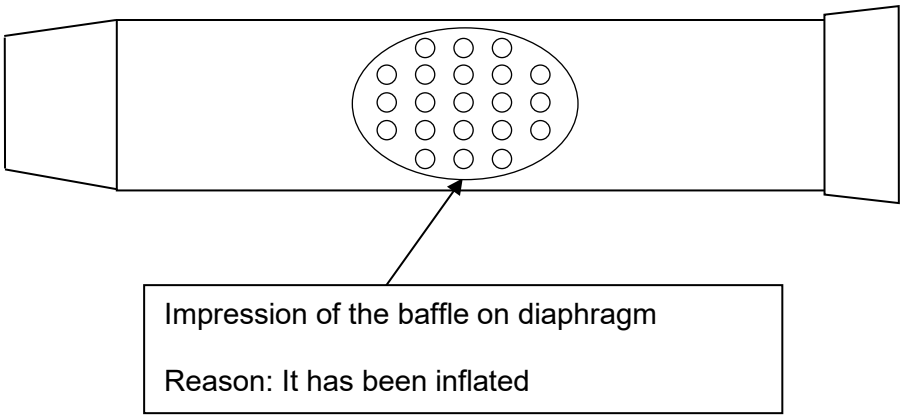
Problem	Possible Cause	Recommended Action
• Mixing of oil and water in crankcase • Loss of pressure • Pump not running evenly	• Worn or damaged delivery valves • Damaged filter element allowing debris to jam delivery valve	• Check all delivery valves – replace as necessary • Check all diaphragms – replace 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

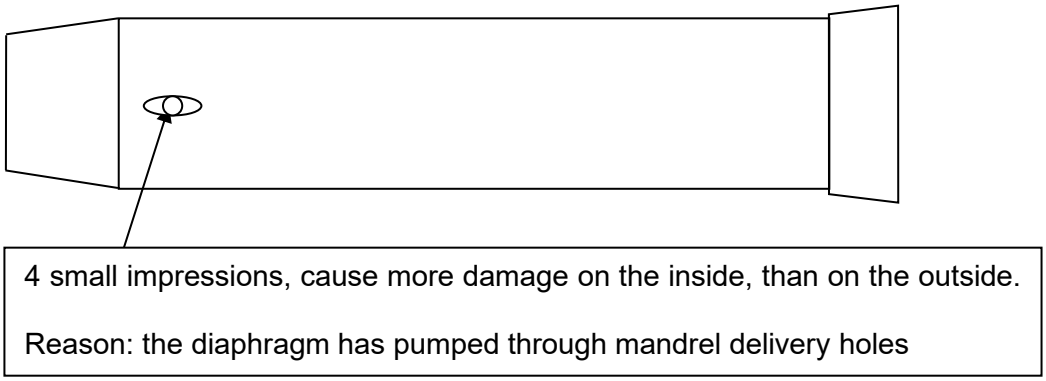
• Mixing of oil and water in crankcase	• Diaphragm failure (may have been through fatigue from excessive running hours)	• Check all diaphragms – replace as necessary

Distinguishing features of failure on diaphragm

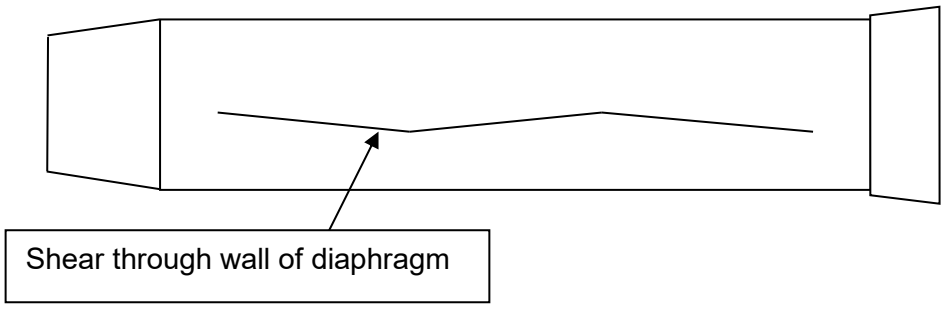
A



B



C

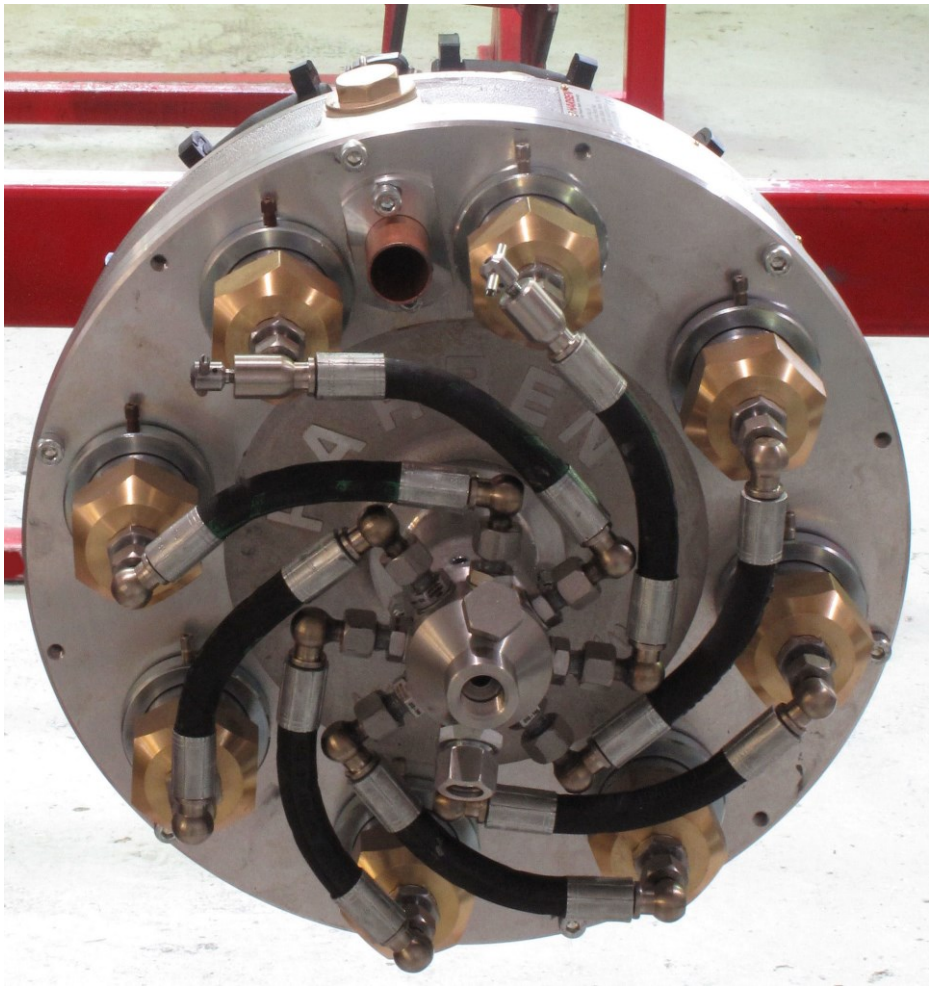


7.3. Selector Fault Finding

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 – Pump

Refer to the **P Type Service Manual** Part No. 061352 included with your jetter.



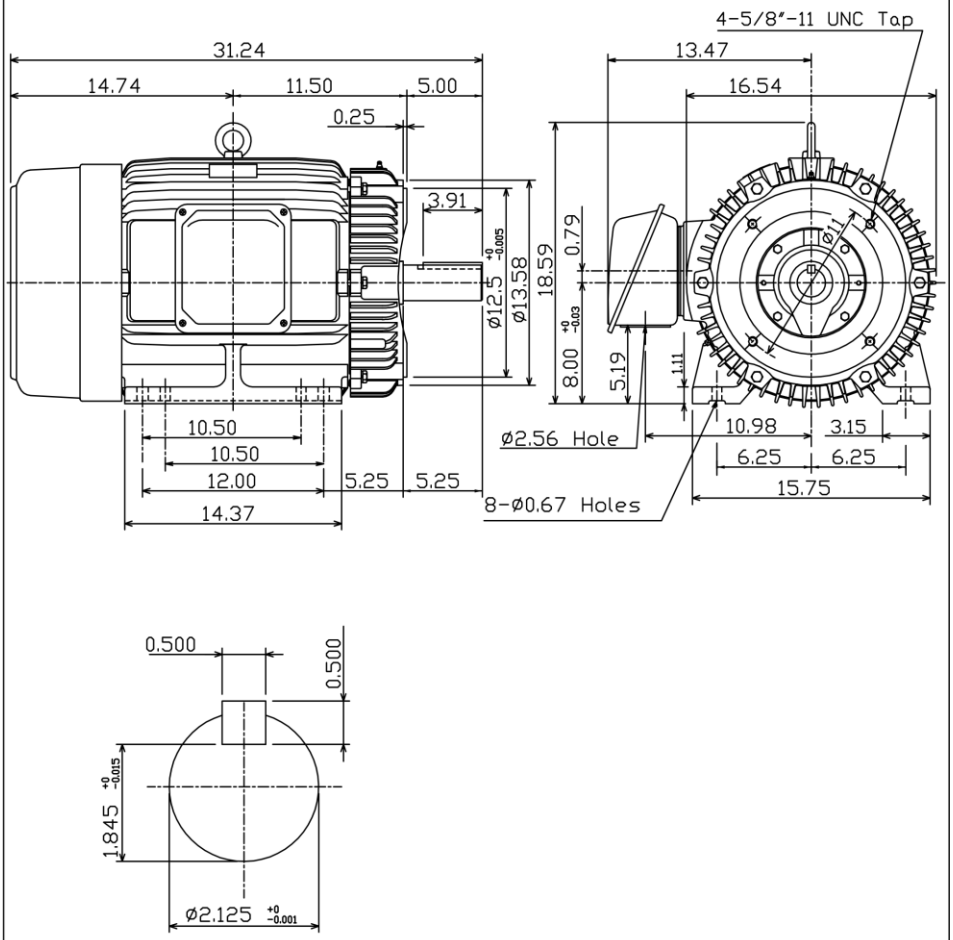
9. Section 9 – Motor

DATE JUNE 27, 2011	OUTLINE DIMENSIONS	MOTOR TYPE: AEHH8P-CF
CAT. #: NP0306C	3-PHASE INDUCTION MOTOR	FRAME NO. 326TC

Pole	HP	kW	Hz	VOLT	Syn.Speed r/min(rpm)
6	30	22.4	60	230/460	1200

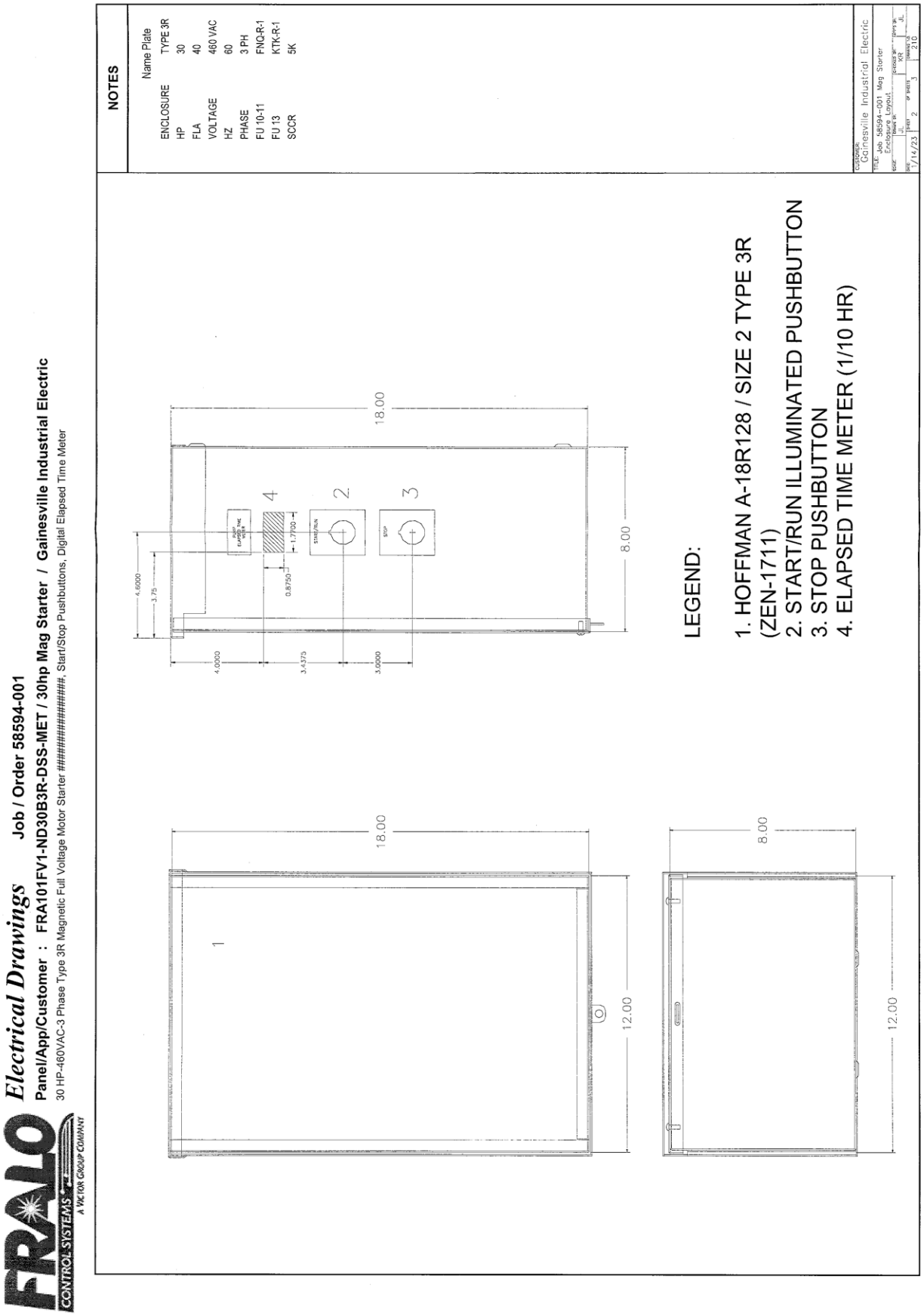
Ins	Rating	Dimension in	Approx Weight	Bearings
F	CONT.	inch	699 lbs	DE: 6312 NDE: 6212

Totally Enclosed Fan-Cooled Type. Squirrel-cage Rotor.



DWN.	K.L.KUO	04-21-11	TECO Westinghouse	DWG NO. 31049J357400
CHKD.	K.L.KUO	04-21-11		
APPD.	M.C.TSAI	04-21-11		

10. Section 10 - Starter

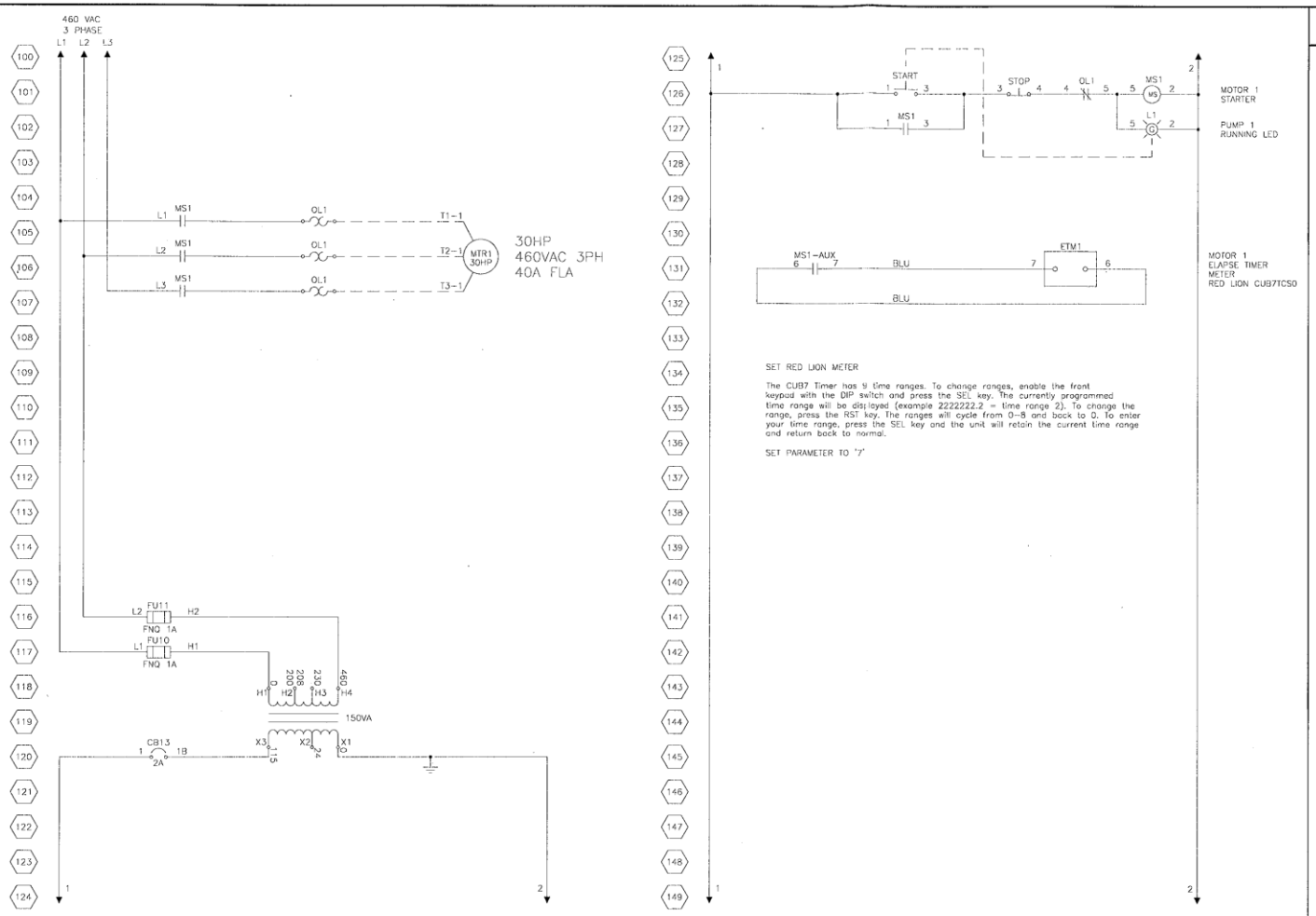


Electrical Drawings

Job / Order 58594-001

Panel/App/Customer : FRA101FV1-ND30B3R-DSS-MET / 30hp Mag Starter / Gainesville Industrial Electric

30 HP-460VAC-3 Phase Type 3R Magnetic Full Voltage Motor Starter ################, Start/Stop Pushbuttons, Digital Elapsed Time Meter



NOTES

Name Plate

ENCLOSURE	TYPE 3R
HP	30
FLA	40
VOLTAGE	460 VAC
HZ	60
PHASE	3 PH
FU 10-11	FNQ-R-1
FU 13	KTK-R-1
SCCR	5K

CUSTOMER: Gainesville Industrial Electric

TITLE: Job 58594-001 Mag Starter FRA101FV1-ND30B3R-MET-R

DRAWN BY:	CHECKED BY:	APP'D BY:
JL	KR	JL

DATE	SHEET	OF SHEETS	DRAWING #
1/18/23	1	3	220

FRALO CONTROL SYSTEMS
A VICTOR GROUP COMPANY

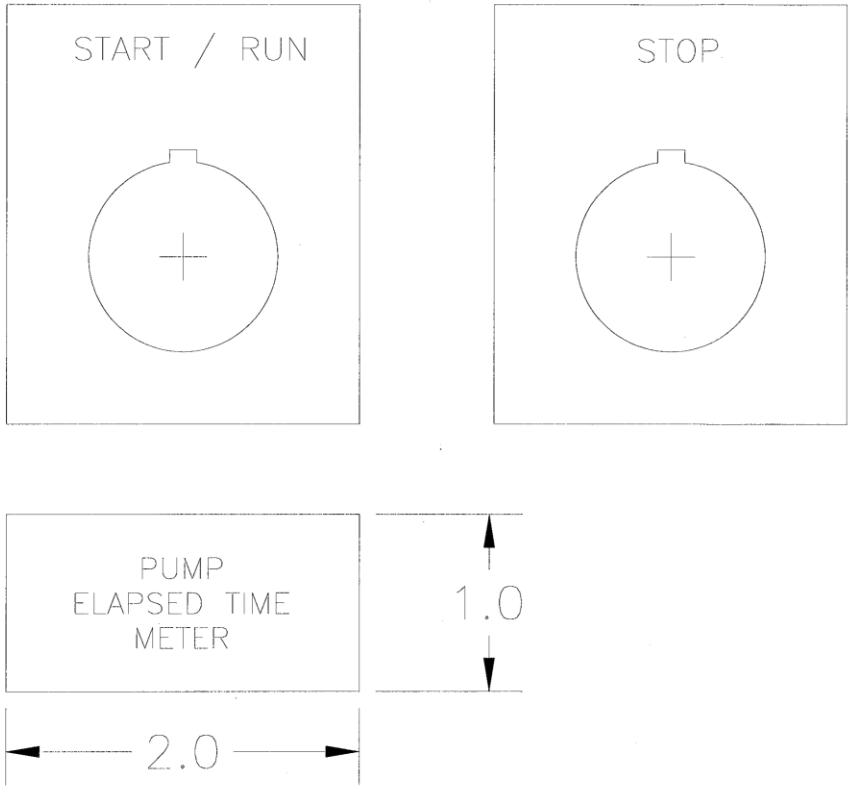
Electrical Drawings

Job / Order 58594-001

Panel/App/Customer : FRA101FV1-ND30B3R-DSS-MET / 30hp Mag Starter / Gainesville Industrial Electric

30 HP-460VAC-3 Phase Type 3R Magnetic Full Voltage Motor Starter ################, Start/Stop Pushbuttons, Digital Elapsed Time Meter

FRALO STANDARD 22.5MM PILOT DEVICE TAGS
MAKE 1 SET



NOTES

CUSTOMER: Gainesville Industrial Electric			
TITLE: Job 58594-001 Mag Starter Tag			
SCALE:	DRAWN BY: JL	DESIGNED BY: KR	APP'D BY: JL
DATE: 1/18/23	SHEET 3 OF SHEETS 3	DRAWING NO. 210	

HARBEN HIGH PRESSURE WATER TECHNOLOGY

Hammond Power Solutions Inc.

HPS IMPERATOR™ Industrial Control Transformer Accessory Kits Instructions

Patent Pending **Literature Code: PHAK1**

The ***HPS IMPERATOR™*** series of machine tool industrial molded control transformers are available with standard secondary fuse kits or optional accessories such as primary fuse kits and optional finger guard kits. This accessory kits instruction sheet details the standard and optional accessories available and examples of detailed assembly drawings.

If you have any questions regarding what accessories are available or are having any difficulty correctly installing these accessories, please contact HPS customer service or technical support in the U.S. at 1-866-705-4684 or in Canada at 1-888-798-8882.

Standard and Optional Accessory Kits Available

Standard Secondary Fuse Kits - supplied with each ***HPS IMPERATOR™*** transformer up to 1500VA (excluding PH750PG, PH1000PG, PH750MLI and PH1000MLI)

Kit P/N	Parts Included in Kit
SFK1	2 fuse clips, 2 mtg. screws, 4 voltage links, PHAK1 instruction sheet
SFK2	2 fuse clips, 2 mtg. screws, 6 voltage links, PHAK1 instruction sheet
SFK3	2 fuse clips, 2 mtg. screws, 6 voltage links, PHAK1 instruction sheet
SFK4	2 fuse clips, 2 mtg. screws, 2 voltage links, PHAK1 instruction sheet
SFK5	2 fuse clips, 2 mtg. screws, 2 voltage links, PHAK1 instruction sheet
SFK6	2 fuse clips, 2 mtg. screws, 3 voltage links, PHAK1 instruction sheet
SFK7	2 fuse clips, 2 mtg. screws, 3 voltage links, PHAK1 instruction sheet

Optional Primary Fuse Kits

Kit P/N	Applicable P/N Suffix's	Applicable VA Size	Parts Included in Kit
PFK1	AJ, AR, MQMJ, QR, SP, PG, PP	50, 75, 100	4 fuse clips, 4 mtg. screws, PHAK1 instruction sheet
PFK2	AJ, AR, MQMJ, QR, SP, PG, PP	150, 250	4 fuse clips, 4 mtg. screws, PHAK1 instruction sheet
PFK3	AJ, AR, MQMJ, QR, SP, PG, PP	350 to 1500	4 fuse clips, 4 mtg. screws, PHAK1 instruction sheet
PFK4	MBMH, MEMX, MGJ, MLI	50	4 fuse clips, 4 mtg. screws, 1 jumper, 1 finger guard, PHAK1 instruction sheet
PFK5	MBMH, MEMX, MGJ, MLI	75	4 fuse clips, 4 mtg. screws, 1 jumper, 1 finger guard, PHAK1 instruction sheet
PFK5	MEMX, MGJ, MLI	100	4 fuse clips, 4 mtg. screws, 1 jumper, 1 finger guard, PHAK1 instruction sheet
PFK6	MBMH	100	4 fuse clips, 4 mtg. screws, 1 jumper wire, PHAK1 instruction sheet
PFK6	MBMH, MEMX, MGJ, MLI	150, 250	4 fuse clips, 4 mtg. screws, 1 jumper wire, PHAK1 instruction sheet
PFK7	MBMH, MEMX, MGJ, MLI	350 to 1500	4 fuse clips, 4 mtg. screws, 1 jumper wire, PHAK1 instruction sheet
N/A	N/A	2000 to 5000	

Optional Unfused Finger Guard Kits

Kit P/N	Applicable P/N Suffix's	Applicable VA Size	Parts Included in Kit
FG1	AJ, AR, MQMJ, MEMX, QR, SP, PG, PP	50	1 finger guard (unfused), PHAK1 instruction sheet
FG2	MBMH, MGJ, MLI	50	1 finger guard (unfused), PHAK1 instruction sheet
FG2	All	75	1 finger guard (unfused), PHAK1 instruction sheet
FG2	All (excluding PH100MBMH)	100	1 finger guard (unfused), PHAK1 instruction sheet
	refer to FG3, FG4 or FG5 below	*150 to 1500*	
N/A	All	2000 to 5000	

Optional Fused Finger Guard Kits

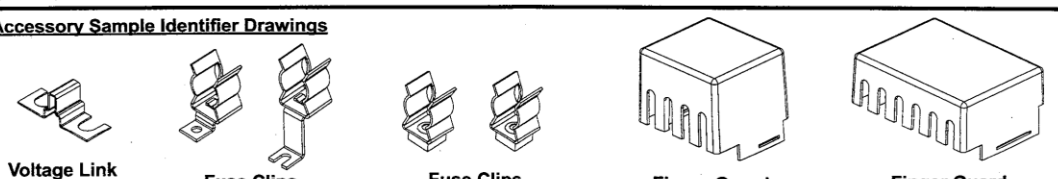
Kit P/N	Applicable P/N Suffix's	Applicable VA Size	Parts Included in Kit
FGF1	AJ, AR, MQMJ, MEMX, QR, SP, PG, PP	50	1 finger guard (fused), PHAK1 instruction sheet
FGF2	MBMH, MGJ, MLI	50	1 finger guard (fused), PHAK1 instruction sheet
FGF2	All	75	1 finger guard (fused), PHAK1 instruction sheet
FGF2	All (excluding PH100MBMH)	100	1 finger guard (fused), PHAK1 instruction sheet
FG3	MBMH	100	1 finger guard, PHAK1 instruction sheet
FG3	All	150	1 finger guard, PHAK1 instruction sheet
FG3	AJ, AR, MQMJ, MEMX, QR, SP, PG, PP	250	1 finger guard, PHAK1 instruction sheet
FG4	MBMH, MGJ, MLI	250	1 finger guard, PHAK1 instruction sheet
FG4	All	350, 500	1 finger guard, PHAK1 instruction sheet
FG4	AJ, AR, MQMJ, QR, SP, PP	750	1 finger guard, PHAK1 instruction sheet
FG5	MBMH, MEMX, MGJ, MLI, PG	750	1 finger guard, PHAK1 instruction sheet
FG5	All	1000, 1500	1 finger guard, PHAK1 instruction sheet
N/A	All	2000 to 5000	

Note: Maximum allowable current rating on all primary/secondary fuse kits is 30 Amps.

Important Installation Notes:

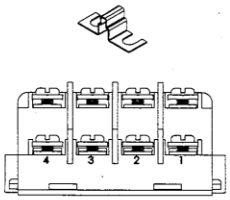
1) Torque all terminal screws between 12 to 14 inch-lbs.
2) For all bare wire connections, the recommended wire size range is: 18 AWGto 14 AWG for solid wire and 14 AWG for stranded. A ring or spade connector must be used if using a wire size outside the range listed above.
3) Ensure mounting screws used for installation (screws not supplied), are properly sized for transformer weight and mounting application.
4) When mounting fuse clips, remove the appropriate captive washer screw(s) from terminal block and install fuse clip(s) and new terminal screw(s).
5) For connection details, please refer to wiring instructions supplied with your HPS IMPERATOR machine tool industrial control transformer.
6) Primary and secondary fuse kits are not suitable for *branch circuit* applications!

Accessory Sample Identifier Drawings

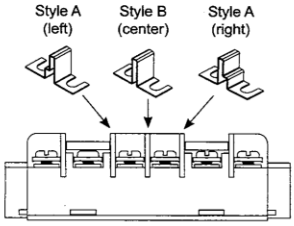


Voltage Link | Fuse Clips (for 50, 75 and 100VA) | Fuse Clips (for 150VA to 1500VA) | Finger Guard (for 50, 75 and 100VA) | Finger Guard (for 150VA to 1500VA)

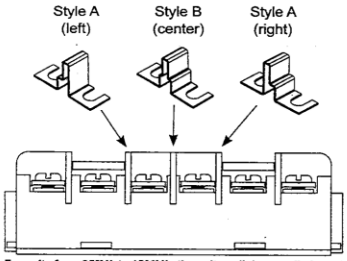
Sample Assembly Drawings for Voltage Link Installation



For units from 50VA to 100VA, the voltage links supplied can be installed between any two primary or secondary terminal bays. Please refer to PHWD1 or PHWD2 Instruction sheet included with your transformer for connection for details.

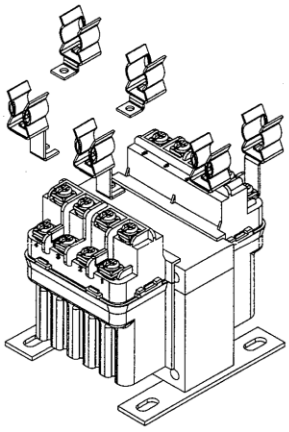


For units from 150VA to 250VA, the voltage links supplied must be installed between the primary or secondary terminal bays as indicated above Please refer to PHWD1 or PHWD2 instruction sheet included with you transformer for connection details.

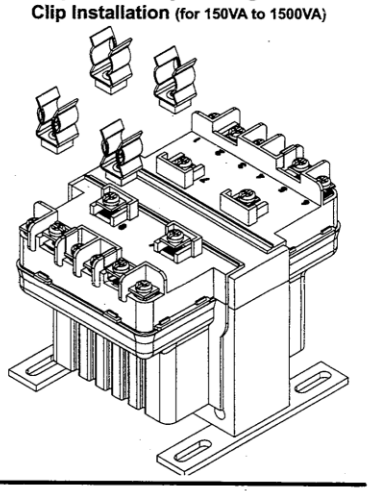


For units from 350VA to 1500VA, the voltage links supplied must be installed between the primary or secondary terminal bays as indicated above Please refer to PHWD1 or PHWD2 instruction sheet included with you transformer for connection details.

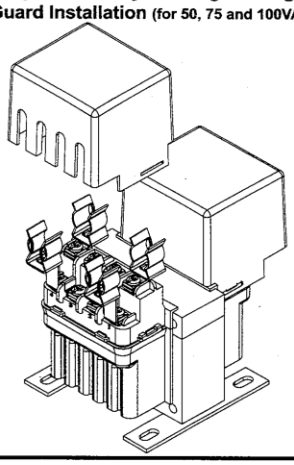
Sample Assembly Drawing for Fuse Clip Installation (for 50, 75 and 100VA)



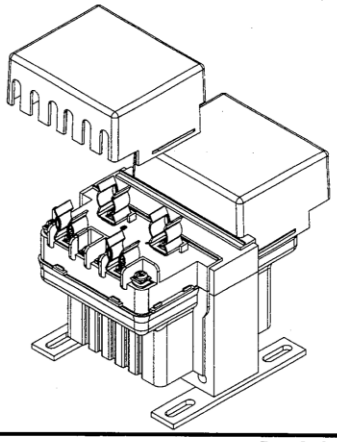
Sample Assembly Drawing for Fuse Clip Installation (for 150VA to 1500VA)



Sample Assembly Drawing for Finger Guard Installation (for 50, 75 and 100VA)



Sample Assembly Drawing for Finger Guard Installation (for 150VA to 1500VA)



Issue Date: December 2007 Revision #: 8

Page 2 of 2

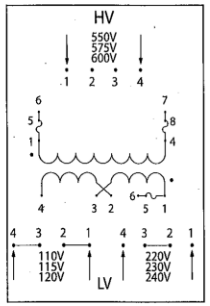
Hammond Power Solutions Inc.

HPS IMPERATOR®
Industrial Control Transformer Wiring Diagrams

Literature Code: PHWD1

The ***HPS IMPERATOR®*** series of machine tool industrial molded control transformers are available in many standard offerings. This wiring hook-up instruction sheet refers to all standard ***HPS IMPERATOR®*** series part number suffixes. (Note: standard secondary fuse kits (not installed) supplied with each transformer unless otherwise indicated; field installed primary fuse kits sold separately; fuses not available from HPS.)
If you have any questions regarding these wiring diagrams or are having any difficulty correctly installing our transformers, please contact HPS customer service or technical support in the U.S. at 1-866-705-4684 or in Canada at 1-888-798-8882.

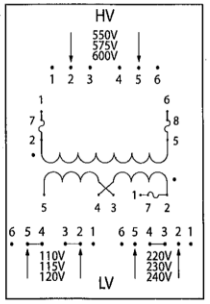
HPS IMPERATOR® Series - Wiring Schematic Drawings



PH***AJ Schematic for 50, 75 and 100VA Units

High Voltage (HV) (Primary Volts)	Install Supplied Jumpers/ Links Between Terminals	Supply Lines Connect To	Install Fuse Clips To
600 575 550	None	1, 4	Unfused
600 575 550	None	6, 7	1-5, 4-8

Low Voltage (LV) (Secondary Volts)	Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
120 115 110	3-4, 1-2	1, 4	Unfused
240 230 220	2-3	1, 4	Unfused
120 115 110	3-4, 1-2	4, 6	1-5
240 230 220	2-3	4, 6	1-5



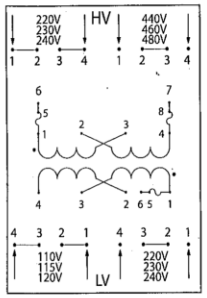
PH***AJ Schematic for 150VA to 1500VA Units

High Voltage (HV) (Primary Volts)	Install Supplied Jumpers/ Links Between Terminals	Supply Lines Connect To	Install Fuse Clips To
600 575 550	None	2, 5	Unfused
600 575 550	None	1, 6	2-7, 5-8

Low Voltage (LV) (Secondary Volts)	Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
120 115 110	4-5, 2-3	2, 5	Unfused
240 230 220	3-4	2, 5	Unfused
120 115 110	4-5, 2-3	1, 5	2-7
240 230 220	3-4	1, 5	2-7

Issue Date: April 2009 rev5

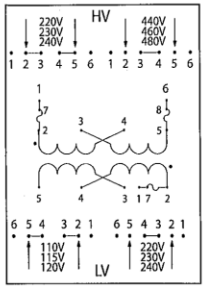
HPS IMPERATOR® Series - Wiring Schematic Drawings continued



PH***MQMJ Schematic for 50, 75 and 100VA Units

High Voltage (HV) (Primary Volts)	Install Supplied Links Between Terminals	Supply Lines Connect To	Install Fuse Clips To
240 230 220	1-2, 3-4	1, 4	Unfused
480 460 440	2-3	1, 4	Unfused
240 230 220	1-2, 3-4	6, 7	1-5, 4-8
480 460 440	2-3	6, 7	1-5, 4-8

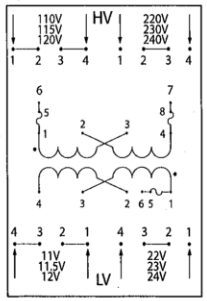
Low Voltage (LV) (Secondary Volts)	Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
120 115 110	3-4, 1-2	1, 4	Unfused
240 230 220	2-3	1, 4	Unfused
120 115 110	3-4, 1-2	4, 6	1-5
240 230 220	2-3	4, 6	1-5



PH***MQMJ Schematic for 150VA to 1500VA Units

High Voltage (HV) (Primary Volts)	Install Supplied Links Between Terminals	Supply Lines Connect To	Install Fuse Clips To
240 230 220	2-3, 4-5	2, 5	Unfused
480 460 440	3-4	2, 5	Unfused
240 230 220	2-3, 4-5	1, 6	2-7, 5-8
480 460 440	3-4	1, 6	2-7, 5-8

Low Voltage (LV) (Secondary Volts)	Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
120 115 110	4-5, 2-3	2, 5	Unfused
240 230 220	3-4	2, 5	Unfused
120 115 110	4-5, 2-3	1, 5	2-7
240 230 220	3-4	1, 5	2-7

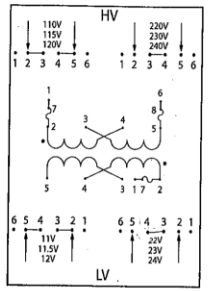


PH***PG Schematic for 50, 75 and 100VA Units

High Voltage (HV) (Primary Volts)	Install Supplied Links Between Terminals	Supply Lines Connect To	Install Fuse Clips To
120 115 110	1-2, 3-4	1, 4	Unfused
240 230 220	2-3	1, 4	Unfused
120 115 110	1-2, 3-4	6, 7	1-5, 4-8
240 230 220	2-3	6, 7	1-5, 4-8

Low Voltage (LV) (Secondary Volts)	Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
12 11.5 11	3-4, 1-2	1, 4	Unfused
24 23 22	2-3	1, 4	Unfused
12 11.5 11	3-4, 1-2	4, 6	1-5
24 23 22	2-3	4, 6	1-5

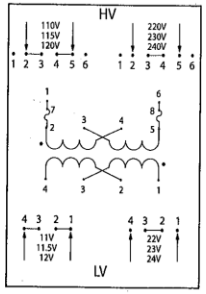
HPS IMPERATOR® Series - Wiring Schematic Drawings continued



PH***PG Schematic for 150VA to 500VA Units

High Voltage (HV) (Primary Volts)			Install Supplied Links Between Terminals	Supply Lines Connect To	Install Fuse Clips To
120	115	110	2-3, 4-5	2, 5	Unfused
240	230	220	3-4	2, 5	Unfused
120	115	110	2-3, 4-5	1, 6	2-7, 5-8
240	230	220	3-4	1, 6	2-7, 5-8

Low Voltage (LV) (Secondary Volts)			Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
12	11.5	11	4-5, 2-3	2, 5	Unfused
24	23	22	3-4	2, 5	Unfused
12	11.5	11	4-5, 2-3	1, 5	2-7
24	23	22	3-4	1, 5	2-7

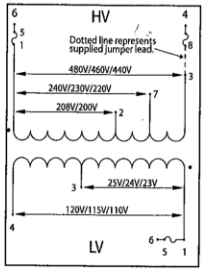


PH***PG Schematic for 750VA and 1000VA Units

High Voltage (HV) (Primary Volts)			Install Supplied Links Between Terminals	Supply Lines Connect To	Install Fuse Clips To
120	115	110	2-3, 4-5	2, 5	Unfused
240	230	220	3-4	2, 5	Unfused
120	115	110	2-3, 4-5	1, 6	2-7, 5-8
240	230	220	3-4	1, 6	2-7, 5-8

Low Voltage (LV) (Secondary Volts)			Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
12	11.5	11	3-4, 1-2	1, 4	Unfused
24	23	22	2-3	1, 4	Unfused

Note: secondary fuse clips not available on PH750PG or PH1000PG.

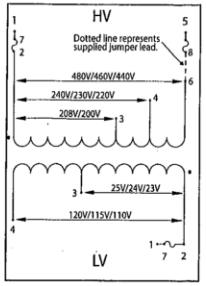


PH***MLI Schematic for 50, 75 and 100VA Units

High Voltage (HV) (Primary Volts)			Install Supplied Jumpers Between Terminals	Supply Lines Connect To	Install Fuse Clips To
480	460	440	None	1, 3	Unfused
240	230	220	None	1, 7	Unfused
	208	200	None	1, 2	Unfused
480	460	440	3-8	6, 4	1-5, 4-8
240	230	220	8-7	6, 4	1-5, 4-8
	208	200	2-8	6, 4	1-5, 4-8

Low Voltage (LV) (Secondary Volts)			Install Supplied Jumpers Between Terminals	Load Lines Connect To	Install Fuse Clips To
120	115	110	None	1, 4	Unfused
25	24	23	None	1, 3	Unfused
120	115	110	None	4, 6	1-5
25	24	23	None	3, 6	1-5

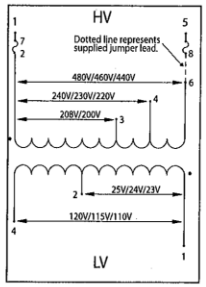
HPS IMPERATOR® Series - Wiring Schematic Drawings continued



PH***MLI Schematic for 150VA to 500VA Units

High Voltage (HV) (Primary Volts)			Install Supplied Jumpers Between Terminals	Supply Lines Connect To	Install Fuse Clips To
480	460	440	None	2, 6	Unfused
240	230	220	None	2, 4	Unfused
	208	200	None	2, 3	Unfused
480	460	440	8-6	1, 5	2-7, 5-8
240	230	220	4-8	1, 5	2-7, 5-8
	208	200	3-8	1, 5	2-7, 5-8

Low Voltage (LV) (Secondary Volts)			Install Supplied Jumpers Between Terminals	Load Lines Connect To	Install Fuse Clips To
120	115	110	None	2, 4	Unfused
25	24	23	None	2, 3	Unfused
120	115	110	None	1, 4	2-7
25	24	23	None	1, 3	2-7

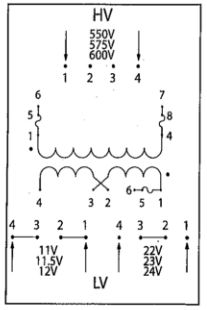


PH***MLI Schematic for 750VA and 1000VA Units

High Voltage (HV) (Primary Volts)			Install Supplied Jumpers Between Terminals	Supply Lines Connect To	Install Fuse Clips To
480	460	440	None	2, 6	Unfused
240	230	220	None	2, 4	Unfused
	208	200	None	2, 3	Unfused
480	460	440	8-6	1, 5	2-7, 5-8
240	230	220	4-8	1, 5	2-7, 5-8
	208	200	3-8	1, 5	2-7, 5-8

Low Voltage (LV) (Secondary Volts)			Install Supplied Jumpers Between Terminals	Load Lines Connect To	Install Fuse Clips To
120	115	110	None	1, 4	Unfused
25	24	23	None	1, 2	Unfused

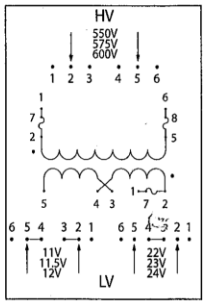
Note: secondary fuse clips for 24V tap not available on the PH750MLI or PH1000MLI units.



PH***AR Schematic for 50, 75 and 100VA Units

High Voltage (HV) (Primary Volts)			Install Supplied Jumpers/ Links Between Terminals	Supply Lines Connect To	Install Fuse Clips To
600	575	550	None	1, 4	Unfused
600	575	550	None	6, 7	1-5, 4-8

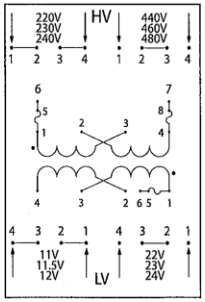
Low Voltage (LV) (Secondary Volts)			Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
12	11.5	11	3-4, 1-2	1, 4	Unfused
24	23	22	2-3	1, 4	Unfused
12	11.5	11	3-4, 1-2	4, 6	1-5
24	23	22	2-3	4, 6	1-5



PH***AR Schematic for 150VA to 500VA Units

High Voltage (HV) (Primary Volts)			Install Supplied Jumpers/ Links Between Terminals	Supply Lines Connect To	Install Fuse Clips To
600	575	550	None	2, 5	Unfused
600	575	550	None	1, 6	2-7, 5-8

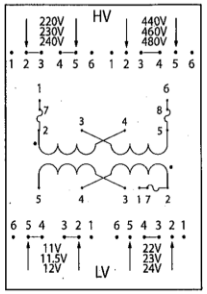
Low Voltage (LV) (Secondary Volts)			Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
12	11.5	11	4-5, 2-3	2, 5	Unfused
24	23	22	3-4	2, 5	Unfused
12	11.5	11	4-5, 2-3	1, 5	2-7
24	23	22	3-4	1, 5	2-7



PH***QR Schematic for 50, 75 and 100VA Units

High Voltage (HV) (Primary Volts)			Install Supplied Links Between Terminals	Supply Lines Connect To	Install Fuse Clips To
240	230	220	1-2, 3-4	1, 4	Unfused
480	460	440	2-3	1, 4	Unfused
240	230	220	1-2, 3-4	6, 7	1-5, 4-8
480	460	440	2-3	6, 7	1-5, 4-8

Low Voltage (LV) (Secondary Volts)			Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
12	11.5	11	3-4, 1-2	1, 4	Unfused
24	23	22	2-3	1, 4	Unfused
12	11.5	11	3-4, 1-2	4, 6	1-5
24	23	22	2-3	4, 6	1-5

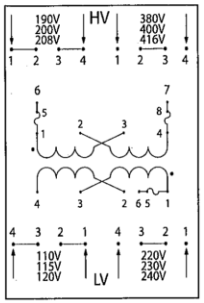


PH***QR Schematic for 150VA to 500VA Units

High Voltage (HV) (Primary Volts)			Install Supplied Links Between Terminals	Supply Lines Connect To	Install Fuse Clips To
240	230	220	2-3, 4-5	2, 5	Unfused
480	460	440	3-4	2, 5	Unfused
240	230	220	2-3, 4-5	1, 6	2-7, 5-8
480	460	440	3-4	1, 6	2-7, 5-8

Low Voltage (LV) (Secondary Volts)			Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
12	11.5	11	4-5, 2-3	2, 5	Unfused
24	23	22	3-4	2, 5	Unfused
12	11.5	11	4-5, 2-3	1, 5	2-7
24	23	22	3-4	1, 5	2-7

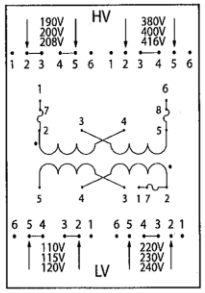
HPS IMPERATOR® Series - Wiring Schematic Drawings continued



PH***SP Schematic for 50, 75 and 100VA Units

High Voltage (HV) (Primary Volts)			Install Supplied Links Between Terminals	Supply Lines Connect To	Install Fuse Clips To
208	200	190	1-2, 3-4	1, 4	Unfused
416	400	380	2-3	1, 4	Unfused
208	200	190	1-2, 3-4	6, 7	1-5, 4-8
416	400	380	2-3	6, 7	1-5, 4-8

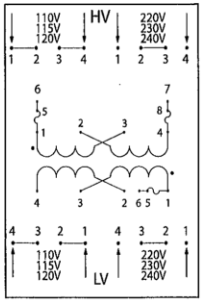
Low Voltage (LV) (Secondary Volts)			Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
120	115	110	3-4, 1-2	1, 4	Unfused
240	230	220	2-3	1, 4	Unfused
120	115	110	3-4, 1-2	4, 6	1-5
240	230	220	2-3	4, 6	1-5



PH***SP Schematic for 150VA to 1000VA Units

High Voltage (HV) (Primary Volts)			Install Supplied Links Between Terminals	Supply Lines Connect To	Install Fuse Clips To
208	200	190	2-3, 4-5	2, 5	Unfused
416	400	380	3-4	2, 5	Unfused
208	200	190	2-3, 4-5	1, 6	2-7, 5-8
416	400	380	3-4	1, 6	2-7, 5-8

Low Voltage (LV) (Secondary Volts)			Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
120	115	110	4-5, 2-3	2, 5	Unfused
240	230	220	3-4	2, 5	Unfused
120	115	110	4-5, 2-3	1, 5	2-7
240	230	220	3-4	1, 5	2-7

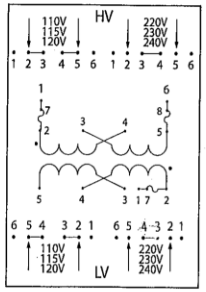


PH***PP Schematic for 50, 75 and 100VA Units

High Voltage (HV) (Primary Volts)			Install Supplied Links Between Terminals	Supply Lines Connect To	Install Fuse Clips To
120	115	110	1-2, 3-4	1, 4	Unfused
240	230	220	2-3	1, 4	Unfused
120	115	110	1-2, 3-4	6, 7	1-5, 4-8
240	230	220	2-3	6, 7	1-5, 4-8

Low Voltage (LV) (Secondary Volts)			Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
120	115	110	3-4, 1-2	1, 4	Unfused
240	230	220	2-3	1, 4	Unfused
120	115	110	3-4, 1-2	4, 6	1-5
240	230	220	2-3	4, 6	1-5

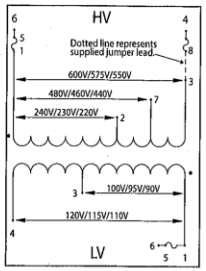
HPS IMPERATOR® Series - Wiring Schematic Drawings continued



PH***PP Schematic for 150VA to 1500VA Units

High Voltage (HV) (Primary Volts)	Install Supplied Links Between Terminals	Supply Lines Connect To	Install Fuse Clips To
120 115 110	2-3, 4-5	2, 5	Unfused
240 230 220	3-4	2, 5	Unfused
120 115 110	2-3, 4-5	1, 6	2-7, 5-8
240 230 220	3-4	1, 6	2-7, 5-8

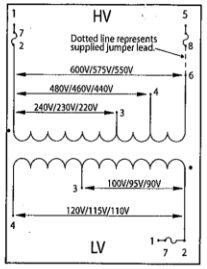
Low Voltage (LV) (Secondary Volts)	Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
120 115 110	4-5, 2-3	2, 5	Unfused
240 230 220	3-4	2, 5	Unfused
120 115 110	4-5, 2-3	1, 5	2-7
240 230 220	3-4	1, 5	2-7



PH***MBMH Schematic for 50 and 75VA Units

High Voltage (HV) (Primary Volts)	Install Supplied Jumpers Between Terminals	Supply Lines Connect To	Install Fuse Clips To
600 575 550	None	1, 3	Unfused
480 460 440	None	1, 7	Unfused
240 230 220	None	1, 2	Unfused
600 575 550	3-8	6, 4	1-5, 4-8
480 460 440	8-7	6, 4	1-5, 4-8
240 230 220	2-8	6, 4	1-5, 4-8

Low Voltage (LV) (Secondary Volts)	Install Supplied Jumpers/ Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
120 115 110	None	1, 4	Unfused
100 95 90	None	1, 3	Unfused
120 115 110	None	4, 6	1-5
100 95 90	None	3, 6	1-5

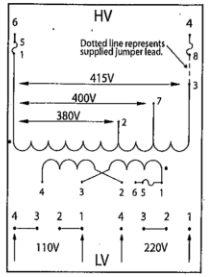


PH***MBMH Schematic for 100VA to 1500VA Units

High Voltage (HV) (Primary Volts)	Install Supplied Jumpers Between Terminals	Supply Lines Connect To	Install Fuse Clips To
600 575 550	None	2, 6	Unfused
480 460 440	None	2, 4	Unfused
240 230 220	None	2, 3	Unfused
600 575 550	8-6	1, 5	2-7, 5-8
480 460 440	4-8	1, 5	2-7, 5-8
240 230 220	3-8	1, 5	2-7, 5-8

Low Voltage (LV) (Secondary Volts)	Install Supplied Jumpers/ Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
120 115 110	None	2, 4	Unfused
100 95 90	None	2, 3	Unfused
120 115 110	None	1, 4	2-7
100 95 90	None	1, 3	2-7

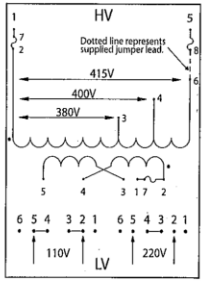
HPS IMPERATOR® Series - Wiring Schematic Drawings continued



PH***MEMX Schematic for 50, 75 and 100VA Units

High Voltage (HV) (Primary Volts)	Install Supplied Jumpers Between Terminals	Supply Lines Connect To	Install Fuse Clips To
415	None	1, 3	Unfused
400	None	1, 7	Unfused
380	None	1, 2	Unfused
415	3-8	6, 4	1-5, 4-8
400	8-7	6, 4	1-5, 4-8
380	2-8	6, 4	1-5, 4-8

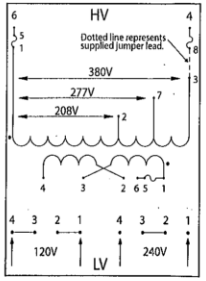
Low Voltage (LV) (Secondary Volts)	Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
110	3-4, 1-2	1, 4	Unfused
220	2-3	1, 4	Unfused
110	3-4, 1-2	4, 6	1-5
220	2-3	4, 6	1-5



PH***MEMX Schematic for 150VA to 1000VA Units

High Voltage (HV) (Primary Volts)	Install Supplied Jumpers Between Terminals	Supply Lines Connect To	Install Fuse Clips To
415	None	2, 6	Unfused
400	None	2, 4	Unfused
380	None	2, 3	Unfused
415	8-6	1, 5	2-7, 5-8
400	4-8	1, 5	2-7, 5-8
380	3-8	1, 5	2-7, 5-8

Low Voltage (LV) (Secondary Volts)	Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
110	4-5, 2-3	2, 5	Unfused
220	3-4	2, 5	Unfused
110	4-5, 2-3	1, 5	2-7
220	3-4	1, 5	2-7



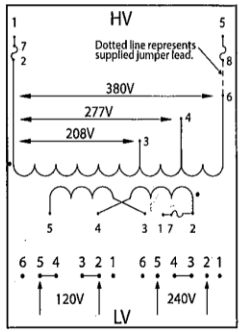
PH***MGJ Schematic for 50, 75 and 100VA Units

High Voltage (HV) (Primary Volts)	Install Supplied Jumpers Between Terminals	Supply Lines Connect To	Install Fuse Clips To
380	None	1, 3	Unfused
277	None	1, 7	Unfused
208	None	1, 2	Unfused
380	3-8	6, 4	1-5, 4-8
277	8-7	6, 4	1-5, 4-8
208	2-8	6, 4	1-5, 4-8

Low Voltage (LV) (Secondary Volts)	Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
120	3-4, 1-2	1, 4	Unfused
240	2-3	1, 4	Unfused
120	3-4, 1-2	4, 6	1-5
240	2-3	4, 6	1-5

HPS IMPERATOR® Series - Wiring Schematic Drawings continued

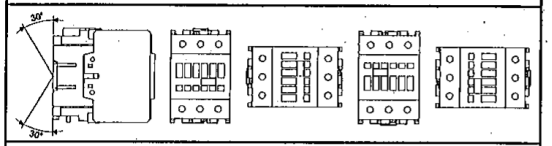
PH***MGJ Schematic for 150VA to 1000VA Units



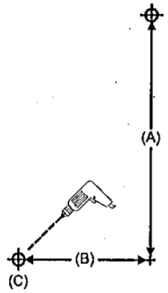
High Voltage (HV) (Primary Volts)	Install Supplied Jumpers Between Terminals	Supply Lines Connect To	Install Fuse Clips To
380	None	2, 6	Unfused
277	None	2, 4	Unfused
208	None	2, 3	Unfused
380	8-6	1, 5	2-7, 5-8
277	4-8	1, 5	2-7, 5-8
208	3-8	1, 5	2-7, 5-8

Low Voltage (LV) (Secondary Volts)	Install Supplied Links Between Terminals	Load Lines Connect To	Install Fuse Clips To
120	4-5, 2-3	2, 5	Unfused
240	3-4	2, 5	Unfused
120	4-5, 2-3	1, 5	2-7
240	3-4	1, 5	2-7

Mounting Positions
Posiciones de Montaje
Posições de Montagem



Screw fixing / Fijación por tornillo / Fixação por parafuso



	A	B	C
Cat. 300-S09... S25	2-7/8 in. 73mm	1-3/8 in. 35mm	1/8 in. 3,5mm
Cat. 300-S32... S40	3-7/64 in. 79mm	1-49/64 in. 45mm	1/8 in. 3,5mm
Cat. 300-S50... S105	3-35/64 in. 90mm	2-13/64 in. 56mm	1/8 in. 3,5mm

Snap on DIN rail fixing 35mm to DIN EN 50022
Fijación per rieles DIN 35mm EN 50022
Fixação por trilho 35mm DIN EN 50022

Operating Temperature: -25 to +55 / -13 to +131 °C / °F
Temperatura de funcionamiento: -25 to +55 / -13 to +131 °C / °F
Temperatura de operação: -25 to +55 / -13 to +131 °C / °F

Maximum Cross Section and Tightening Torque Connection
Sección Máxima y Torque de Conección
Seção Máxima e Torque de Conexão

Stranded/Solid 60°/75°C Wire	Cat. 300-S09...S105 Main Terminals							
	S09...S25		S32...S40		S50...S80		S95...S105	
	IEC	UL	IEC	UL	IEC	UL	IEC	UL
mm² / AWG	0,6...6	20...10	-	-	-	-	-	-
mm² / AWG	-	-	1...16	18...6	1,5...35	16...2	1,5...50	16...1
mm / in	8,5	5/16	10	3/8	13	1/2	15	9/16
Torque Nm / lb-in	1...1,7	8,8...15	2,5...3	22,1...26,6	4...6	35,4...53,1	5...6,5	44,3...57,5
Screwdriver	Philips nr. 2		Philips nr. 2		Allen 4mm		Allen 4mm	

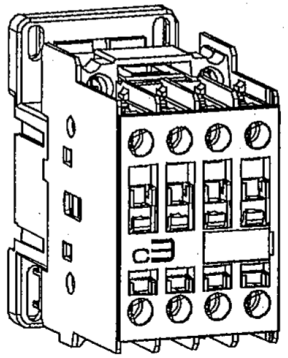
Stranded/Solid 60°/75°C Wire	Cat. 300-S09...S105 Coil Bobbin / Auxiliary							
	Coil Bobbin (A1–A2)		Built-In Aux. (13–14 NO, 21–22 NC)		300-SFA		300-SSA	
	IEC	UL	IEC	UL	IEC	UL	IEC	UL
mm² / AWG	1...6	18...10	1...6	18...10	1...6	18...10	1...6	18...10
mm² / AWG	1...4	18...12	1...4	18...12	1...4	18...12	1...4	18...12
mm / in	8	5/16	8,5	5/16	8,5	5/16	9	11/32
Torque Nm / lb-in	1,13	10	1,13	10	1,13	10	1,13	10
Screwdriver	Philips nr. 2		Philips nr. 2		Philips nr. 2		Philips nr. 2	

c3controls®

P.O. Box 496
Beaver, PA 15009
USA
724.775.7926
www.c3controls.com

Contactor Installation Instructions
Instrucciones de Instalación de Contactores
Instruções de Instalação de Contatores

(Series 300-S09... S105)



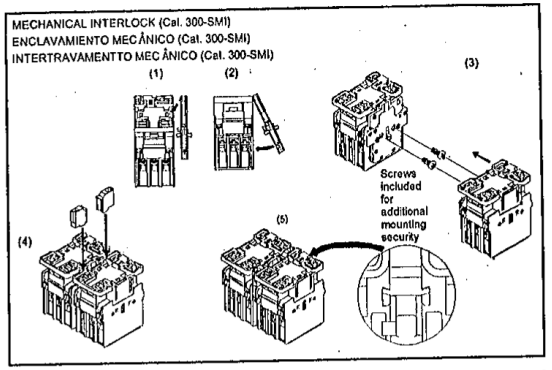
CONTACTORS/CONTACTORES/CONTATORES
Series 300-S09... S105

WARNING:
- Disconnect power before proceeding with any work on this equipment.
- Installation and maintenance by technical personnel only.
- Install products in accordance with the operation instructions and the NEC (U.S. National Electrical Code) regulations or local applicable codes and standards.

AVERTISSEMENT:
- Débranchez le pouvoir(la puissance) avant la suite de n'importe quel travail sur cet équipement.
- Installation et maintien par personnel technique seulement.
- Installez des produits conformément aux instructions d'opération et le NEC (le Code Électrique national américain) des règlements ou des codes applicables locaux et des normes.

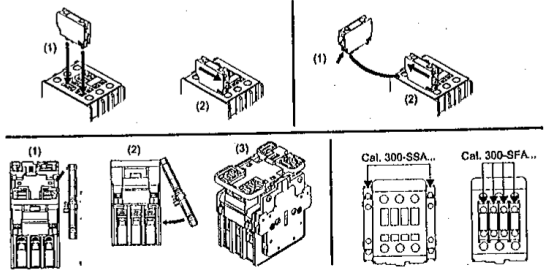
ATENCIÓN:
- Desconectar de la red eléctrica antes de hacer cualquier trabajo en este equipamiento.
- Recomiendase instalación por profesional calificado.
- Respetar normas nacionales y locales.
- Producto destinado a la utilización en instalciónes eléctricas de baja tensión.

ATENÇÃO:
- Desconecte da rede elétrica antes de proceder qualquer trabalho neste equipamento.
- Somente profissionals qualificados podem efetuar a instalação e manutenção.
- Obedecer normas nacionais, estaduais, locais e instruções de operação.



Instantaneous auxiliary contact blocks
Bloques de contacto auxiliares
Blocos de contatos auxiliares

	Maximum contacts Máximo contactos Máximo de contatos
Cat. 300-S09... S25	4
Cat. 300-S30... S40	6
Cat. 300-S50... S105	8



Short Circuit Current Protection

USA/Canada
Suitable for use on a circuit capable of delivering not more than XXX rms symmetrical amperes. Use fuses only.

Cat. 300-...	XXX = 5,000 for S09...S40 XXX = 10,000 for S50...S105 Max. Fuse Class RK5 600V max.	XXX = 100,000 Max. Class J 600V max.
S09	30 A	25 A
S12	30 A	25 A
S18	60 A	40 A
S25	60 A	40 A
S32	60 A	50 A
S40	60 A	60 A
S50	100 A	90 A
S65	125 A	100 A
S80	150 A	125 A
S95	200 A	175 A
S105	200 A	175 A

IEC 60947-4-1 / EN 60947-4-1
Ue ≤ 690 V

Cat. 300-...	gL/gG max. Type 1	gL/gG max. Type 2
S09	50 A	25 A
S12	50 A	35 A
S18	63 A	35 A
S25	63 A	50 A
S32	100 A	63 A
S40	125 A	80 A
S50	200 A	100 A
S65	200 A	125 A
S80	200 A	125 A
S95	250 A	160 A
S105	250 A	200 A

	Auxiliary Location	gL/gG max.
IEC 60947-5-1	Built-In	10 A
	300-SFA	10 A
	300-SSA	10 A
	300-SMEI	10 A

Product Installation Data can be downloaded from our website, www.c3controls.com

Thank You for choosing c3controls®

IL100133
REV 13

11. Section 11 – Parts List / 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 motor etc., refer to the relevant parts in this manual.

11.2. Ordering Spare Parts

Order spare parts from:

HARBEN
HIGH PRESSURE WATER TECHNOLOGY

Harben Inc.

2010 Ronald Reagan Blvd.

Cumming GA 30041

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

email: sales@harben.com

www.harben.com

11.3. Routing Maintenance / Consumable Items

See **Section 6**

11.4. Consumable components

See **Section 6**

11.5. Parts List

The parts list below details the common parts for your 4010 EA jetter. For parts relating to the motor, or for details of optional extras fitted to your unit, contact either your distributor, or Harben Inc.

11.5.1. Manual

Component	Description	Qty.
011156	ELBOW RUBBER 1 1/4" INLET	1
011157	TUBE SUPPORT 1 1/4" INLET	1
012096	GAUGE PRESSURE 10000 PSI SCREW IN	1
013027	BRASS FILLER PLUG 1” BSMP	1
013039	CONNECTOR 1/2"BM x 1/2"BM	1
013041	EXPANSION CHAMBER	1
020019	PUMP 6CYL 22MM BRASS NUT SELECTOR VALVE	1
021027	BELL HOUSING NEMA L326TC	1
023011S	H.P. SWIVEL JOINT 90 DEGREE WITH 1 X 903-058 ADAPTER	1
023093	PART 4 NEUPEX B140SAME AS 480.009.327	1
033010	SEAL DOWTY 1/2"	1
033015	SEAL DOWTY 1"	1
042047	PLASTEX WHEEL	2
042134	POLYPROPYLENE 1 1/4"FPTSTRAINER	1
042157	TANK & LID WATER GALV	1
043031	SWIVEL CASTOR	1
043057	DUMP DIFFUSER	1
043108	LABEL OPERATING ELECTRIC	1
043201	MALE PIPExHOSE BARB1 1/4" NYLON ONLY	1
051089	PLATE DIFFUSER BAFFLE	1
061027	LABEL “HARBEN”	1
061093	VINYL CUSTOM DECAL	1
900116	ADAPTOR 1/2"Fx1/2”F SWIVEL	1
900151	REDUCER 1/2"Mx1/4"F	1
900205	WASHER 1” PACK OF 10	4
900206	COTTER PIN 1/8” x 2”	2
900250	LOCK RING 3/4"	1
903050	HOSE ASSY DTL PUMP/REEL	1
903069	HOSE REEL MANUAL REWIND WITH CRANK LESS JOINT W/PIN LOCK 1/2” IN/OUT	1
903077	MACHINED 903-467 COUPLING FOR 30 HP ELECTRIC MOTOR	1
903083	MOTOR 30HP ELECTRIC 1200RPM HARBEN SPEC	1
903086	14HSK320F NON-COMBO SZ3N3R SSO/L ST-ST STARTER	1
903088	CONNECTOR SHC-1043 1"CORD	3
903089	LOCKWASHER 1"	2
903124	I.D. PLATE FOR TRAILER	1
903131	ADAPTOR 3/4" GH/PIPE SWVL	1

903144	ROBERT 3/4" FLOAT VALVEWITH STEM AND FLOAT BALL	1
903149	CLAMP HOSE #28	1
903150	CLAMP HOSE #16	1
903175	CLAMP HOSE #20	1
903178	CLAMP HOSE #08	2
903190	1/2" x 10’ ORANGE LEADER HOSE R8NC08-HY0808MP-08BPF-10	1
903197	BARBED FITTING 1/2" HOSEx 1/2 FEMALE PIPE	2
903224	BULKHEAD 1 1/4" TxT	1
903225	1 1/4 SCH 80PVC NIPPLE 2 INCH	1
903239	2” TIGERTAIL WITH RING AND ROPE	1
903294	SPLIT BOLT CONNECTOR #8	3
9031452	6/4 SOOW WIRE CORED 6 GAUGE 4 CONDUCTOR FOR 30HP UNIT 10 FOOT LONG	1
904056	FRAME 4010 EA 6-22 PUMP	1

12. Service Documents

12.1. Service Checklist

SERVICE CHECK LIST	HARBEN HIGH PRESSURE WATER TECHNOLOGY
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

12.2. Service Logbook

Harben Unit Log Book	HARBEN HIGH PRESSURE WATER TECHNOLOGY
Serial Number -	
Unit Number -	
Date of Manufacture -	*Sht 1 of 2*

Date ……………………………………………
Official Harben Stamp and Signature
Engineer ……………………………………
Please state if other
Type of Service …………………………… Service provider used ……………………………………………………

Date ……………………………………………
Official Harben Stamp and Signature
Engineer ……………………………………
Please state if other
Type of Service …………………………… Service provider used ……………………………………………………

Date ……………………………………………
Official Harben Stamp and Signature
Engineer ……………………………………
Please state if other
Type of Service …………………………… Service provider used ……………………………………………………

Date ……………………………………………
Official Harben Stamp and Signature
Engineer ……………………………………
Please state if other
Type of Service …………………………… Service provider used ……………………………………………………

Date ……………………………………………
Official Harben Stamp and Signature
Engineer ……………………………………
Please state if other
Type of Service …………………………… Service provider used ……………………………………………………

Date ……………………………………………
Official Harben Stamp and Signature
Engineer ……………………………………
Please state if other
Type of Service …………………………… Service provider used ……………………………………………………

Date ……………………………………………
Official Harben Stamp and Signature
Engineer ……………………………………
Please state if other
Type of Service …………………………… Service provider used ……………………………………………………

Type of service - Itermediate, Yearly	*FLOW 0322 Iss 1*

Section 12 – Warranty

12.3. Warranty of New Products:

Equipment manufactured and supplied by Harben Inc. is warrantied to be free from defects in materials and workmanship.

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

The warranty period for new products is one year or 2000 hours, whichever occurs soonest from date of shipping from our factory.

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

For all products not manufactured by Harben Inc, the warranty period is one year. The following exceptions to the one-year warranty period are listed below.

12.4. 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 warrantied for 90 days. These parts are:

- Inlet and Delivery valves
- Diaphragms

Motors – Please see the motor manual that came with your machine.

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

Harben DSK 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 these components were originally installed.
2. You must notify Harben Inc. with the pump serial number and any substantiation which may include, but is not limited to, the return of parts that we may reasonably request.
3. All components must have been installed and maintained in accordance with good industry practice and any specific Harben recommendations, including those in Harben's maintenance schedule that is supplied with your machine.
4. Harben will replace, at the customer's cost, any part returned for warranty. Once inspection has been completed and the part deemed to be warranted, Harben Inc. will credit your account for amount of the new part, minus taxes and shipping charges.
5. Harben Inc.'s warranty <u>DOES NOT</u> cover travel charges or downtime.

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

12.5. 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 damage. 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.