HH RANGE OF HIGH HEAD CENTRIFUGAL PUMPS FOR VACUUM ASSISTED AUTOMATIC PRIMING APPLICATIONS

Types
HH 150 and HH 200
## DECLARATION OF CONFORMITY OR INCORPORATION

**FOR:**

**DYNA PRIME RANGE OF HIGH HEAD CENTRIFUGAL PUMPS FOR VACUUM ASSISTED AUTOMATIC PRIMING APPLICATIONS**

**Types - HH150 & HH200**

<table>
<thead>
<tr>
<th>Serial Number</th>
<th>AS SHOWN ON THE PUMP NAMEPLATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsible Person</td>
<td>STERLING FLUID SYSTEMS LTD.</td>
</tr>
<tr>
<td>Manufacturer</td>
<td>STERLING FLUID SYSTEMS LTD.</td>
</tr>
<tr>
<td>Registered Address</td>
<td>Theale Cross Reading Berkshire ENGLAND RG31 7SP</td>
</tr>
</tbody>
</table>

**For pumps supplied with diesel or electric motors:**

It is hereby certified that this equipment complies with the essential health and safety requirements of the 'Machinery Directive' and conforms to the relevant standards, listed below:

**Directives:**


**Harmonized Standards:**

- EN 292 Part 1 Safety of Machinery - Basic Concepts and
- Part 2 General Principles for Design
- pr EN 809: Pumps & Pump Units for Liquids - Safety Requirements
- EN 60204-1 Safety of Machinery - Electrical Equipment

**For Pumps supplied without motors:**

It is hereby certified that this equipment is intended to be incorporated into, or assembled with other machinery to constitute relevant machinery to comply with the essential health and safety requirements of the 'Council Directive 89/392/EEC - 'Machinery Directive'.

The machinery covered by this declaration must NOT be put into service until the relevant machinery into which it is to be incorporated has been declared in conformity with the provisions of the 'Council Directive 89/392/EEC - 'Machinery Directive'.

**Harmonized Standards:**

- EN 292 Part 1 Safety of Machinery - Basic Concepts and
- Part 2 General Principles for Design
- pr EN 809: Pumps & Pump Units for Liquids - Safety Requirements

**Signed:**

B Millward

(Chief Engineer - Authorized to sign on behalf of Sterling Fluid Systems Limited)

**A MEMBER OF THE STERLING FLUID SYSTEMS GROUP**
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Manufacturers Information: (Where applicable)

Introduction

This manual gives the safety, installation, operation and maintenance instructions for pumps in the ACME Dynamics, Inc. DYNA PRIME HH range of horizontal, end suction, centrifugal pumps for vacuum assisted Automatic priming applications.

Pumps may be identified by the ACME Dynamics Inc. code typically in the form 'HH150'.

This manual applies to the following pump types.

HH150 & HH200

Section 1 General Information and Safety Instructions

The products supplied by ACME Dynamics, Inc. have been designed with safety in mind. Where hazards cannot be eliminated, the risk has been minimized by the use of guards and other design features. Some hazards cannot be guarded against and the instructions below MUST BE COMPLIED WITH for safe operation. These instructions cannot cover all circumstances. YOU are responsible for using safe working practices at all times.

1.1 ACME Dynamics, Inc. products are designed for use in appropriate locations which are to be kept free of obstructions that may restrict safe access to the controls and maintenance access points.

A pump nameplate is fitted to each unit and must not be removed. Loss of this plate could make identification impossible. This in turn could affect safety and cause difficulty in obtaining spare parts. Should accidental loss or damage occur, contact ACME Dynamics, Inc. immediately.

1.2 Access to the equipment should be restricted to the personnel responsible for installation, operation and maintenance and they must be trained, adequately qualified and supplied with the appropriate tools for their respective tasks.

1.3 ACME Dynamics, Inc. requires that all personnel that are responsible for installation, operation or maintenance of the equipment, have access to and study the product instruction manual BEFORE any work is done and that they will comply with all local and industry based safety instructions and regulations.

1.4 Ear defenders should be worn where the specified equipment noise level exceeds locally defined safe levels. Safety glasses or goggles should be worn where working with pressurized systems and hazardous substances. Other personal protection equipment must be worn where local rules apply.

1.5 Do NOT wear loose or frayed clothing or jewelry that could catch on the controls or become trapped in the equipment.

1.6 Check and confirm that the manual is the relevant copy by comparing the serial number on the identification plate with that on the manual.

1.7 Note any limits to the pump application specified in the contract documentation. Operation of the equipment outside these limits will increase the risk from hazards noted below and may lead to premature and hazardous pump failure.

1.8 Clear and easy access to all controls, gauges and dials etc. MUST be maintained at all times.

1.9 IMPROPER INSTALLATION, OPERATION OR MAINTENANCE OF THIS ACME DYNAMICS INC. PRODUCT COULD RESULT IN INJURY OR DEATH.

1.10 Within the manual, safety instructions are marked with safety symbols.

Hazard
This symbol refers to general mechanical aspects of safety.
Section 2 Transport Handling and Storage Instructions

2.1 Transport

DYNA PRIME HH pumps are dispatched fully assembled. Pumps are protected against corrosion and packed for transport by normal road, rail and sea carriers.

2.2 Handling

Crushing Hazard
When lifting the pump, use lifting equipment having a safe working load rating suitable for the weight specified. Use suitable slings for lifting any pump not provided with lifting points.

The use of suitable forklift truck and four-chain crane sling equipment is recommended but locally approved equipment of suitable rating maybe used.

Fill the bearing housing with recommended oil to ensure that the shaft and bearings remain rust free.

The pump shaft should be rotated by hand at least five turns every six weeks.

For special protection of seals and seal lubricating systems, coupling and electric motors, where applicable, refer to the manufacturers' instructions in the relevant appendix.

2.3 Storage

2.3.1 Temporary Storage for up to Six Weeks

If the pump unit is not to be used immediately it should be stored carefully in a horizontal position, in a sheltered, dry location. Additional rust preventative should be applied to all unpainted carbon steel or cast iron parts, and should not be removed until final installation.

2.3.2 Long Term Storage

For exposed storage or extreme variants in atmospheric or environmental conditions, please refer to ACME Dynamics, Inc. for special storage instructions to suit the conditions applicable.

Section 3 General Description

ACME Dynamics DYNA PRIME HH pumps is a range of horizontal centrifugal pumps. The two-vane open impeller design will handle dirty water, industrial effluents, and sludge etc, including solids.

The mechanical assembly comprises a rigid shaft, supported by grease lubricated bearings with an open vane type impeller mounted in a removable bearing housing assembly. This is attached to an end suction volute casing fitted with front and rear wear plates. The bearing housing, shaft and impeller assembly can be withdrawn from the volute for maintenance without disconnection of pipework and removal of the driver provided that a spacer coupling has been fitted.

The discharge branch is positioned to give a horizontal discharge when used with a ball type non-return valve. The main pump mounting feet are positioned on the casing to provide a wide mounting with an additional foot.
at the drive end bearing position for stability. The pump has been designed for use with an automatic priming system typically one using a vacuum pump with a priming tank. As several varieties of priming may be fitted, the details and operation instructions for the particular priming system used are fully described in a separate priming system manual. Comments on priming functions in this manual apply to all priming systems in general.

The complete assembly is of a rigid construction, being intended for mounting on suitable base plate with electric motor or diesel engine driver. A suitable coupling is required to transmit the rotational drive between pump and driver.

The shaft is sealed with a pair of proprietary mechanical seals arranged in tandem fitted with a cooling/lubrication fluid system. Alternative seals can be supplied by arrangement to suit special customer requirements and the liquid being pumped.

The materials of construction are:

<table>
<thead>
<tr>
<th>Component</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impeller</td>
<td>Stainless Steel or Cast iron</td>
</tr>
<tr>
<td>Volute Casing</td>
<td>SG Cast Iron</td>
</tr>
<tr>
<td>Front Wear Plate</td>
<td>Stainless Steel or Cast iron</td>
</tr>
<tr>
<td>Cover Plate</td>
<td>Stainless Steel or Cast iron</td>
</tr>
<tr>
<td>Seal Housing</td>
<td>Aluminum</td>
</tr>
<tr>
<td>Bearing Housing</td>
<td>Cast Iron</td>
</tr>
<tr>
<td>Shaft</td>
<td>Stainless Steel</td>
</tr>
</tbody>
</table>

Nameplate details are shown on the back cover of this manual, full pump specification can be supplied on a data sheet, if requested.

Section 4 Assembly and Installation

4.2 Preparation for Mounting

Before installation, check that the pump mounting location is suitable for accepting the pump unit. Refer to Section 8, for details of pump unit dimensions to a certified General Arrangement Drawing when available.

4.3 Pump Preparation

**Abrasion and Entrapment Hazard**

Do NOT touch any moving or rotating parts. Guards are provided to prevent access to these parts, where they have been removed for maintenance they MUST be replaced before operating the equipment.

Remove packaging but leave the flange covers in place, check that the impeller rotates freely by hand by turning the shaft.

4.4 Pump Installation

It is recommended that the pump unit be fitted to the base plate before fitting the motor and coupling. The distance between shaft ends should be established to suit the coupling by reference to the manufacturer's instructions.

4.5 Shaft Alignment

To minimize the side load on the bearings and to achieve full coupling and bearing life, it is recommended that the shafts be aligned as accurately as possible i.e. well below the allowable misalignment of the coupling. Refer to the coupling manufacturer's instructions or proceed generally thus:

a) Lateral Alignment

Mount a dial gauge on the motor shaft or coupling with the gauge running on the outer, machined diameter of the pump coupling. Turn the motor shaft and note the total indicator reading.
b) Angular Alignment
Mount a dial gauge on the motor shaft or coupling to run on a face of the pump coupling as near the outside diameter as possible. Turn the motor shaft and note the total indicator reading.


c) Confirm Lateral Alignment
Mount the dial gauge on the pump shaft or coupling with the gauge running on the outer, machined diameter of the motor coupling. Turn the pump shaft and note the total indicator reading.


d) Adjustment
The motor must be shimmed and repositioned to align the shafts within the coupling manufacturer's specifications.

e) Alternative Method
If a dial gauge is not available, calipers or taper gauge may be used to measure the distance between the coupling flanges at four points around the circumference and a straight edge used to check the lateral alignment of the outer flange diameters.

ATTENTION
Shaft alignment must be checked again after the final positioning of the pump unit and connection to paperwork as this may have disturbed the pump or motor mounting positions.

4.6 Suction Paperwork
It is recommended that the pump be installed as near to the liquid source as possible

ATTENTION
Collapsible hoses must not be used on the suction side of the pump.

Any rigid pipework should be supported independently and close to the pump so that no strain is transmitted to the pump when the flange bolts are tightened. Use pipe supports at intervals necessary to provide support. When expansion joints are used in the piping system, they must be installed beyond the piping supports closest to the pump.

Install piping as straight as possible, avoiding unnecessary bends. Where necessary, use or long sweep 90 degree fittings to decrease friction losses.

Make sure that all suction piping joints are airtight. Provide pipe expansions when hot fluids are to be pumped. Where reducers are used, eccentric reducers (tapered side down) are to be fitted in horizontal suction lines and straight taper reducers in vertical discharge lines. Undulations in the pipe runs or misuse of reducers may cause the formation of air pockets in the pipe and thus prevent the efficient operation of the pump.

The suction (and discharge) pipes can be one or two sizes larger than the pump flange connections. A horizontal suction line should have a gradual rise to the pump.

A correctly sized filter or strainer must be fitted to hold back larger items.

The suction pipe work should be flushed clean to ensure that site debris is not drawn into the pump when it is commissioned.

4.7 Discharge Pipework
Pipework should be as short and straight as possible to reduce friction head loss.

A non-return valve is usually fitted to prevent the pump from excessive back pressure and reverse rotation and a discharge valve must be fitted to regulate the flow and allow for inspection and maintenance on the pump. The suction and discharge pipework must be independently supported and positioned such that no excessive forces and moments are exerted on the pump flanges.

4.8 Base plate and Foundations
The pump is designed for fitting to a substantial base plate to maintain the shaft alignment between the driver and the pump. The base plate should be securely located on level ground or mounted on foundations. The shaft alignment should be checked again before commissioning and putting the pump into operation.
Section 5 Commissioning and Operation

Abrasion and Entrapment Hazard
Do NOT touch any moving or rotating parts. Guards are provided to prevent access to these parts, where they have been removed for maintenance they MUST be replaced before operating the equipment.

5.1 Commissioning Checks

These checks must be done after first installation and after pump maintenance, which required removal of the rotating assembly.

ATTENTION
Charge the bearings with several strokes of a grease gun. Refer to Section 6.4 - Bearing Lubrication.

ATTENTION
The mechanical seals require a supply of fluid for cooling and lubrication when the pump is running dry. Check that the fluid level is between the marks on the reservoir.

ATTENTION
Failure to supply the mechanical seal with cooling or lubricating fluid may result in damage and premature failure of the pump.

Check that the rotating assembly is free to rotate by hand before connecting the power supply. Also check that the piping system has been properly connected with all joints tightened and instrumentation is in position.

When using an electric motor, connect the electrical supply to the pump unit. Momentarily switch on motor and check direction of rotation. This should be such that the pump assembly turns clockwise when viewed on the driven end. For three phase electric motors, if direction of rotation is incorrect, disconnect the supply and change over two of three supply wires.

When using a diesel engine verify that the direction of rotation of the engine is correct for the pump by reference to the engine manual.

5.2 Starting Procedure

Open any valves in the discharge pipes to prevent hydraulic lock from occurring. Start the engine or switch on the motor and allow it to build up to full operating speed.

Check that the motor is not overloading, unit is not vibrating or excessively noisy, bearings are not overheating, and that the pump is developing the correct flow and head requirements.

If the pump is operating at its normal speed, the pump should be shut down at once if any of the following defects are found:

a) Excessive vibration.
b) Motor runs hot.
c) Excessive noise from cavitation
d) Pump overheating.

Recommended corrective action for these faults is given in Section 7 Faults and Remedial Action.

5.3 During Operation

Hot Surfaces Hazard
Do NOT touch surfaces, which during normal running will be sufficiently hot to cause injury. Note that these surfaces will remain hot after the pump has stopped, allow sufficient time for cooling before maintenance. Be cautious and note that other parts of the pump may become hot if a fault is developing.
Cold Conditions Hazard
Beware of operating water pumps in temperatures below freezing point, without first checking that the pumped fluid is not frozen and the pump is free to turn. For pumps operating in cold conditions, remember to drain down the pump after stopping.

Hazardous Noise
In addition to local or site regulations for noise protection, ACME Dynamics recommend the use of Personal Ear Protection equipment in all enclosed pump rooms and particularly those containing diesel engines.

Hazardous Gases, Mists, Sprays and Leaks
Be aware of the hazards relating to the pumped fluid, especially the danger from inhalation of noxious and toxic gases, skin and eye contact or penetration. Obtain and understand the hazardous substance data sheets relating to the pumped fluid and note the recommended emergency and first aid procedures.

Periodic Checks:

- Mechanical Seals:
  A small amount of leakage may occur but significant leakage indicates seal failure and replacement is necessary.

- Bearings:
  Check the bearing temperatures do not exceed 80°C as an increase may indicate the early stages of bearing trouble.

- Noise:
  Listen for any unusual noise or an increase in normal sound level.

This may result from:

- Loose fasteners for guards and other equipment.
- Worn coupling.
- Cavitation caused by air in the liquid from leaks in the suction pipework.

- Alignment:
  Alignment should be checked after the first run and after any maintenance requiring removal or disconnection of the coupling. For detailed instructions, refer to Section 4.5 - Shaft Alignment

5.4 Stopping Procedure
Refer to the diesel engine instruction manual for the engine stopping procedure. Reduce the engine speed and stop the engine then close any valves in the discharge pipes, or switch off the electric motor and the speed will reduce quickly, when stopped turn off the discharge valve.

Section 6 Maintenance and Service

6.1 General Introduction
ACME Dynamics DYNA PRIME pumps will provide many years of trouble free service when maintained in accordance with these instructions. In the event of failure of the pump it is recommended that ACME Dynamics, Inc. Service Department be called to investigate and carry out repairs. The following instructions are given to cover the main elements of strip and rebuild but do NOT include instructions for work that MUST be done by an ACME Dynamics, Inc. Service Engineer.

The following hazards may arise during maintenance work:

Fluid Pressure Jet Hazards
Check and ensure that the pump operates at below the Maximum Working Pressure specified in the manual or on the pump nameplate and before maintenance, ensure that the pump is drained down.

Hazardous Materials
Wear a suitable mask or respirator when working with Packing and Gasket components, which contain fibrous material, as these can be hazardous when the fibrous dust is inhaled. Be cautious, if other supplier’s components have been substituted for genuine ACME Dynamics parts, these may then contain hazardous materials.

Hazardous Gases, Mists, Sprays and Leaks
Be aware of the hazards relating to the pumped fluid, especially the danger from inhalation of noxious and toxic gases, skin and eye contact or penetration. Obtain and understand the hazardous substance data sheets relating to the pumped fluid and note the recommended emergency and first aid procedures.

BEFORE ATTEMPTING ANY MAINTENANCE ON A PUMP, PARTICULARLY IF IT HAS BEEN HANDLING ANY FORM OF HAZARDOUS LIQUID, ENSURE THAT THE UNIT IS SAFE TO WORK ON. THE PUMP MUST BE FLUSHED THOROUGHLY WITH A SUITABLE CLEANSER TO PURGE AWAY ANY OF THE PUMPED...
LIQUID LEFT IN THE PUMP COMPONENTS. THIS SHOULD BE DONE BY THE PLANT OPERATOR AND A CERTIFICATE OF CLEANLINESS OBTAINED BEFORE STARTING WORK. TO AVOID ANY RISK TO HEALTH IT IS ALSO ADVISABLE TO WEAR PROTECTIVE CLOTHING AS RECOMMENDED BY THE SITE SAFETY OFFICER, ESPECIALLY WHEN REMOVING OLD PACKING THAT MAY BE CONTAMINATED.

Recommended Maintenance Schedule

For motor or engine maintenance and maintenance of the priming system (when fitted) refer to the separate operators handbooks included within the pump documentation pack.

<table>
<thead>
<tr>
<th>PERIOD</th>
<th>TASK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>Check visually for leaks.</td>
</tr>
<tr>
<td></td>
<td>Check for bearing temperature rise or increased noise.</td>
</tr>
<tr>
<td></td>
<td>Check mechanical seal oil reservoir level.</td>
</tr>
<tr>
<td></td>
<td>Check for vibration.</td>
</tr>
<tr>
<td>Weekly or 100 hours</td>
<td>Check security of all fittings.</td>
</tr>
<tr>
<td>Monthly 500 Hours</td>
<td>Charge the drive end bearings with 15gms of grease.</td>
</tr>
<tr>
<td>6 monthly or 3000 hours</td>
<td>Change mechanical seal coolant /lubricant.</td>
</tr>
<tr>
<td></td>
<td>Charge each pump end bearing with 15gms of grease.</td>
</tr>
<tr>
<td>Annually or 6000 hours</td>
<td>Check condition of impeller and wear plate.</td>
</tr>
</tbody>
</table>

The above schedule is given for guidance but site-operating conditions may override the suggested maintenance intervals. Adjustments to time scales will also have to be made if the pump is idle for long periods.

6.1 Preparation for Maintenance

Electric Shock & Accidental Starting Hazard

ISOLATE the equipment before any maintenance work is done. Switch off the main supply, remove fuses, apply lockouts where applicable and affix suitable isolation warning signs to prevent inadvertent re-connection.

For diesel driven pumps disconnect the negative battery lead to prevent inadvertent starting.

In order to avoid the possibility of maintenance personnel inhaling dangerous fumes or vapors, it is recommended that maintenance work be carried out away from the pump location by removal of the bearing housing and shaft assembly to a suitable maintenance area.

It is important to ensure the suitable lifting equipment is available and that the work is carried out in a clean area.

To ensure correct assembly of the mechanical seal, a tubular sleeve of suitable diameter to locate the seal on the shaft and to press home before fitting the support ring and circlip is recommended. Heavy-duty circlip pliers are also needed to withdraw the circlip retaining the primary seal plate.

6.3 Maintenance of Mechanical Seals

Generally there is no maintenance required on mechanical seals, but if it is required, the manufacturer’s information is given in Appendix II.

It is important to ensure that the mechanical seal coolant/lubricant level is maintained between the max & min marks on the reservoir.

If the seal lubricant is lost, it may indicate a seal failure, requiring replacement. If the seals run dry, this will lead to early seal failure.

Recommended Mechanical Seal Lubricants:

<table>
<thead>
<tr>
<th>Capacity 2 litters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobil Velocite Oil No. 6</td>
</tr>
<tr>
<td>Texaco Rando HD 10</td>
</tr>
</tbody>
</table>
6.5 Disassembly of the Pump

Refer to Section 8.4 Pump Section Drawings.

The pump is designed to allow removal of the bearing housing, shaft and impeller assembly without disconnecting the pipework. If the pump is fitted with a spacer coupling, the driver need not be removed. Remove coupling (and driver if necessary) to allow withdrawal of the pump assembly.

Removal of the Rotating assembly

Support the bearing bracket assembly and remove the bracket connecting the bearing assembly to the base plate.

Unscrew the cap screws (40) from the volute casing (26).
Remove the cover plate (13) and the bearing housing assembly (1) complete with rotor using the jacking screws (31) to separate the volute casing (26) and the bearing housing.

Move the pump rotating assembly to a clean area for further disassembly.

Removal of the Mechanical Seals

Lock the shaft to prevent rotation using the shaft key slot or the coupling, place a wooden drift against the impeller vanes at the outer diameter of the impeller and strike the drift carefully to release the impeller. Take care not to damage the impeller vanes at this stage. Unscrew and remove the impeller from the shaft.

Remove the setscrews (18) and withdraw the back wear plate (21) to expose the primary mechanical seal.

Remove the retaining circlip (9) from the shaft and carefully withdraw the rotating assembly (5) of the primary mechanical seal.

Remove the large retaining circlip (6) from the mechanical seal housing (3). Using the tapped holes provided carefully pull out the primary seal plate (4) with the seal face attached.

Remove the second retaining circlip (9) and carefully withdraw the rotating assembly (5) of the secondary mechanical seal.

Remove the nuts (35) retaining the rear cover plate (13) and carefully lift off the cover plate complete with the mechanical seal housing (3).

Note: It is expected that new mechanical seals will be fitted when the pump is dismantled to this stage. Care must be taken not to touch the sealing faces of the mechanical seal as this may affect their ability to seal properly.

The stationery elements of the seals may be removed from the seal plate and seal cover by pressing out by hand from the drive end. If the stationery element is damaged or shows signs of wear, it must be replaced.
Removal of the Shaft and Bearings

Refer to the bearing housing assembly drawing.

Unscrew the hexagon screws (13) and remove both bearing covers (4 & 5) from the bearing housing (2).

Using a press if available or a soft faced hammer or suitable drift, carefully drive the pump shaft (3) out with its bearings in the direction of the drive end, i.e. away from the pump end.

The drive end bearings (7) may be cleaned and checked without removing them from the shaft. If they need to be replaced, remove them by use of a suitable puller or by applying force to the inner ring using a drift or punch, taking care to turn the shaft such that the inner ring is kept square to the shaft until the bearing is free.

The inner ring of the non-drive end roller bearing (6) will remain on the shaft. The outer ring and roller cage may be removed from the bearing housing by applying force with a suitable punch to the outer ring, ensuring that the ring is kept square with the housing until it is free.

Pump & Drive End Bearing Specifications

<table>
<thead>
<tr>
<th>Drive End Bearings</th>
<th>SKF 7317 (Pair)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump End Bearing</td>
<td>SKF NU2217</td>
</tr>
</tbody>
</table>

If the bearings are to be re-used, ensure they are thoroughly flushed with white spirit or similar cleaning fluid, dried and protected to prevent any abrasive media from coming into contact with the races and balls. Bearings should be lightly oiled and wrapped for storage.

Check the shaft (3) for straightness by mounting between centers and measuring the run out with a dial gauge at the coupling, bearing, seal and impeller positions. The run-out should not exceed 0.08 mm in any of the positions measured.

All parts should be cleaned, inspected for damage and replaced. If pump efficiency has reduced the wear plate and impeller may be replaced, contact the ACME Dynamics, Inc. Spares and Service Departments for supply of new parts.

Removal of the front Wear Plate

Undo the nuts (16) and using the jacking screws (18), withdraw the front cover plate (22) complete with the front rubbing plate (25). Check for signs of wear and replace if damaged.

6.6 Re-assembly of the Pump

The pump unit may be re-assembled in the reverse manner to disassembling. To ensure correct and trouble free operation, care should be taken on re-assembly and the following precautions taken:

Cleanliness is important ensure that all pump components together with the working areas, are completely free of foreign matter, dirt and dust. All gasket faces are to be properly cleaned and new gaskets fitted. Gaskets should be lightly greased for assembly.

Check the locknut (8) for wear or damage and replace if necessary.

New gaskets are recommended to be fitted when reassembling the pump. Gaskets on the bearing covers are designed to compress such that the bearings are positively clamped in position.

It is recommended that only spare parts manufactured by and obtained from ACME Dynamics, Inc. be used during maintenance re-assembly of any DYNAPRIME HH range pump. The company cannot be held responsible for any failure, which may cause danger to property or health, arising from the use of spare parts manufactured and supplied by others, these will also invalidate the pump warranty.

When ordering spare parts it is essential to quote the pump serial number from the identification plate and the required part number(s) as shown in the parts list in Section 8.

If new proprietary parts such as bearings and oil seals are to be fitted, ensure they are the correct size, grade and quality.

When fitting new bearings they should be pre-
heated dry on an induction heater bar to 110°C for a short time. This will enable the bearing to be easily slid on the shaft seating and when cool will give a positive shrink fit. Always ensure bearings abut correctly against shaft shoulder.

The bearing locknut must be tightened to a torque of 350-400 NM.

Before assembly into the bearing housing, grease the bearings by packing the races on one side only with new grease and turning them several times to distribute the grease around the running surfaces. Do not fully pack the bearings with grease.

6.7 Setting the Impeller Back Clearance

Fit the mechanical seal housing (3) to the rear cover plate (13) and fit this assembly to the bearing housing assembly (1) without fitting any shims (37, 38 & 39).

Fit the back wear plate (21) and the impeller (23).

Measure the clearance between the impeller and the back wear plate in three places. Calculate the thickness of shims required reducing the clearance to between 0.25mm to 0.38mm.

Remove the impeller and the back cover assembly and insert shims (37, 38 & 39) of the required thickness.

Refit the impeller to confirm the clearance is within the tolerance required.

Remove the impeller and back wear place to allow access to fit the mechanical seals.

6.8 Installation of Mechanical Seals

Lubricate the outer surface of the stationery elements of the mechanical seal (5) with soapy water (not oil or silicone grease), ensure that they are square to the housing in the seal plate (4) or cover (3) and push home by hand, taking care not to apply excessive force or to damage the sealing surface. Check that they have been seated fully and that the sealing surface is clean and undamaged.

Lubricate the inner surface of the rotating element (5) of the secondary mechanical seal with soapy water, taking care not allow any on the sealing face.

Position the seal assembly sleeve on the shaft, taking care not to damage the sealing face, slide the rotating element down the shaft to abut the stationary sealing ring fitted in the seal housing.

Slide the seal support ring (8) down the shaft to the back of the seal and place the retaining ring (9) on the shaft behind the support ring.

Using the seal assembly tool, lightly compress the mechanical seal and locate the retaining ring in its groove on the shaft. Check that the retaining ring is correctly and fully located in its groove.

Ensure that the rotating seal face is seated against the stationary sealing face and the shaft is free to rotate before proceeding with assembly of the primary seal.

Place the primary seal ring (4) complete with the stationary seal face in the seal housing (3) and inset the retaining ring in its groove in the seal housing.

Repeat the seal assembly procedure as above for the primary mechanical seal.

Ensure that the rotating seal face is seated against the stationary seal face and the shaft is free to rotate before proceeding with assembly of the impeller.

6.9 Refitting the Impeller

Fit the back wear plate (21) and the impeller (23) ensuring that the impeller is screwed fully home and is tight. Note that the impeller will tighten in use.

Rotate the impeller and visually confirm that it runs true, check that the back clearance is as required and if not remove, clean all parts and reassemble.

Install the rotating assembly in the pump volute

6.10 Setting the Impeller Front Clearance.

If the front cover plate (22) and front rubbing plate (25) have been removed, reassemble carefully without gaskets (27, 28 & 29) and with the front rubbing plate touching the impeller.

Measure the clearance between the volute and the sealing face.
casing and the front cover plate in three places and calculate the thickness of gaskets that will be needed to ensure a clearance of .015” to .024” (.381mm to .610 mm).

Select and fit gaskets to give this clearance and assemble with nuts (19) fully tightened.

Using feeler gauges through the suction flange check the clearance between the impeller vanes and the front rubbing plate is within the tolerance allowed adjust gaskets to achieve the required clearance.
Section 7 Faults and Remedial Action

7.1 Priming System Faults

Pump Fails to Prime

Check pump drain valve is closed.
Check vacuum pump is operating,
if not rectify or replace the pump.
Disconnect vacuum hose and take a vacuum reading, refit the hose and fit vacuum gauge to the pump inlet and take another vacuum reading.

Are vacuum gauge readings the same?

YES

Check the suction hose for internal collapse.
Replace any faulty hose.
Check suction intake for blockage.
Clear blockage, using back flush where provided.
Check that the static suction lift does not exceed the pump capabilities, if so - Reposition pump closer to the liquid level.

NO

Stop pump and listen for air leaks.
Stop any air leaks found.
Remove vacuum hose and check for collapsed internal hose lining.
Replace hose if faulty.
Check air filter for blockage.
Clean housing or replace filter.
Check non return valve is seating.
Remove any debris found.
Check the mechanical seals.
Replace if leaking or faulty.

Pump runs with low flow

Check that the static suction lift does not exceed the pump capabilities, if so - Reposition pump closer to the liquid level.
Check that the delivery head is not higher than the pump capability, if so - Raise the pump if possible or install a pump with higher head rating.
Check suction intake or pipes for blockage, also check impeller for blockage.
Clear blockage, using back flush where provided.
Check non return valve is not blocked.
Remove any debris found.
Check that pump speed is correct.
Adjust driver to give correct speed.
Check the impeller for wear or damage,
Replace impeller if worn.
Check liquid viscosity and density, if greater than water, the pumped head will be reduced.

Pump surges with intermittent flow

Check that the impeller is not blocked.
Clear any impeller blockage.
Check non return valve is not blocked.
Remove any debris found.
Check for a suction air leak.
Cure air leaks as required.

If further faults are evident, refer to the following pump faultfinding tables
## 7.2 Pump Fault Finding

### POTENTIAL FAULT OR DEFECT:

<table>
<thead>
<tr>
<th>No liquid delivered.</th>
<th>Insufficient liquid delivered.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid delivered at low pressure</td>
<td>Loss of liquid after starting.</td>
</tr>
<tr>
<td>Excessive vibration.</td>
<td>Pump bearings run hotter than normal.</td>
</tr>
</tbody>
</table>

### PROBABLE CAUSES

| Speed too low. |
| Speed too high. |
| Air leak in mechanical seal. |
| Bearing grease dirty or contaminated. |
| Foundation not rigid. |
| Misalignment of pump and driver. |
| Bearing worn. |
| Rotor out of balance. |
| Shaft bent. |

### CAUSE REMEDIAL ACTION

| Speed too low. | Check that the driver is functioning correctly and running at the required speed. |
| Speed too high. | Check that the driver is functioning correctly and running at the required speed. |
| Air leak in mechanical seal. | Check seal lubricant level, check all joints, plugs and pipes in the cooling lines. Note that prolonged running without lubrication will result in damage and failure of the seal. |
| Bearing grease dirty or contaminated. | Dismantle the pump, check and clean the bearings, reassemble the pump and charge with new grease. |
| Foundation not rigid. | Ensure that the pump driver mounting bolts are tight. |
| Misalignment of pump and driver. | Check and realign the pump and driver as specified. |
| Bearings worn. | Remove the bearings, clean and inspect for damage and wear, replace as necessary. |
| Rotor out of balance. | Check the impeller for damage; replace as necessary. |
| Shaft bent. | Check shaft run-out and replace if needed. |
Section 8 Supplementary Documents

HH100 Pump

100 Dia. Delivery

23°

225

240

20

225

120

VII

185

250

225

290

65

Volute Mounting

Bearing Bracket Mounting

HH150 Pump

150 Dia. Delivery

23°

234

295

120

290

260

225

20

235

280

176

VII

200 Dia. Suction

20

225

260

325

65

Volute Mounting

Bearing Bracket Mounting

Our policy is one of continuous improvement and we reserve the right to alter specifications without giving notice.
8.2 Technical Data

8.2.1 Casing Pressure

The maximum casing pressure is 16 bar.

8.2.2 Flange Specification

The flanges are BS10 table D.

8.2.3 Direction of Rotation

The direction of rotation is clockwise when viewed on the drive end.

8.2.4 Maximum Speed

The maximum operating speed of HH pumps is 2100rpm.

8.3 Pump Cross Section Drawings

Bearing Housing Assembly for HH100 & HH150 Pumps
### Operators Instructions for DYNA PRIME HH Centrifugal Pumps

---

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---

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>PART No</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Filter Breather</td>
<td>14623</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Bearing Housing:</td>
<td>04405.123</td>
<td>1</td>
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<tr>
<td>3</td>
<td>Shaft</td>
<td>15943.375</td>
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<tr>
<td>4</td>
<td>Bearing End Cap DE</td>
<td>04493.123</td>
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<tr>
<td>5</td>
<td>Bearing Retainer NDE</td>
<td>04494.123</td>
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</tr>
<tr>
<td>6</td>
<td>Roller Bearing</td>
<td>04615</td>
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<tr>
<td>7</td>
<td>A/C Ball Bearing</td>
<td>04614</td>
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<tr>
<td>8</td>
<td>Locknut: M80 x 2</td>
<td>04708.221</td>
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<td>9</td>
<td>Circlip</td>
<td>04694</td>
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<td>10</td>
<td>Grease Nipple 90° x 1/8&quot;BSP</td>
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<td>11</td>
<td>Circlip</td>
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<td>12</td>
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<td>13</td>
<td>Screw M12 x 30</td>
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<td>14</td>
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<td>15</td>
<td>Screw M12 x 40</td>
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<td>16</td>
<td>Labyrinth Seal</td>
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<td>21</td>
<td>Direction Arrow</td>
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<td>22</td>
<td>Elbow M/F 1&quot;BSP</td>
<td>SY9209040</td>
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<td>23</td>
<td>Barrel Nipple 1/8&quot;BSP x 2&quot;</td>
<td>SY9209512</td>
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<td>24</td>
<td>Socket 1/8&quot;BSP</td>
<td>SY9209260</td>
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<td>25</td>
<td>Grease Nipple 1/8&quot;BSP</td>
<td>SY9219001</td>
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</tbody>
</table>
Pump Assembly for HH100 & HH150 Pumps

Note: This is not a true horizontal section. Some parts have been rotated in order to clarify assembly details.

Replacement parts should be obtained from ACME Dynamics, Inc. Parts Department, use of parts from unapproved suppliers will invalidate the pump warranty. When ordering spare parts please quote the pump serial number from the pump identification plate.
<table>
<thead>
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<th>ITEM</th>
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<th>Part No -HH150</th>
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<td>Pump Shaft Key</td>
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<td>Mechanical Seal Housing</td>
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<td>Mechanical Seal Plate</td>
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<td>Circlip</td>
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<td>7</td>
<td>O-Ring</td>
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<td>8</td>
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<td>Rear Cover plate</td>
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<td>05614.123</td>
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<td>Hose Adaptor for Back Prime hose</td>
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<td>15</td>
<td>Blanking Plug when Back Prime is not used</td>
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<td>16</td>
<td>Stud M12 X 30</td>
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<td>17</td>
<td>Nut M12 H/T</td>
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<td>18</td>
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<td>19</td>
<td>Screw/Set M10x50 Ht</td>
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<td>Gasket-Front &amp; Back Cover</td>
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<td>Gasket-Front &amp; Back Cover</td>
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<td>Washer:3/8&quot; Copper</td>
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<td>Screw Hex Head M10 X 60</td>
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<td>Screw/Set M10x30 Ht</td>
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<td>33</td>
<td>Stud M16 X 45 Nominal</td>
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<td>Stud M16 X 40 Nominal</td>
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<td>Nut M16 H/T</td>
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<td>Washer/Spring M16</td>
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<td>37</td>
<td>Shim</td>
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<td>Shim</td>
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<td>Screw Socket Cap M12 X 30</td>
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<td>Hose Tail:1/2&quot;Bsp X 19mm Hose</td>
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<td>Hose:3/4 Id Clear Wire Rein PVC</td>
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<td>Hose Assy, 3/4 PVC Wire Support</td>
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<td>46</td>
<td>Tee: Male, Brass Ferrule 19mm</td>
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<td>47</td>
<td>Reservoir Bottle</td>
<td>15430</td>
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<td>48</td>
<td>Cap Screw-Reservoir Bottle</td>
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<td>49</td>
<td>Mounting Plate: Reservoir Bottle</td>
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<td>50</td>
<td>Bracket: Mounting Plate</td>
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<td>Plastic Hose: 8mm Idx1.5 Wall</td>
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<td>Hose Clip 18-25mm</td>
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<td>53</td>
<td>Bolt :Hex Head M10 X 90</td>
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<td>54</td>
<td>Screw Set M10x20 Ht</td>
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<td>55</td>
<td>Washer Spring 10mm</td>
<td>SY9509807</td>
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<td>56</td>
<td>Washer 10mm Steel</td>
<td>SY9509679</td>
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</tbody>
</table>

The following items are not illustrated.

57 Elbow M1F ½"BSP
58 Cock Male ½"BSP
59 Spacer Set

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Section 9  Additional Information

9.1  Standard Metric Nut and Bolt Torque Recommendations

This information is for reference only. The user must check that the torque figures listed here are applicable to the fasteners used. Nuts and bolts should be neither under nor over tightened.

<table>
<thead>
<tr>
<th>Grade of Bolt</th>
<th>Approximate Torque (Nm) for Bolt Diameters:</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>M5</td>
</tr>
<tr>
<td>4.6</td>
<td>2.7</td>
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<tr>
<td>8.8</td>
<td>6.9</td>
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<tr>
<td>10.9</td>
<td>9.4</td>
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<tr>
<td>12.9</td>
<td>11.2</td>
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</table>

Note: These torque figures are approximate, and for unplated fasteners only. No allowance has been made for special finishes or lubricants, washers or mating surfaces.

**Bolt and Nut Grade Combinations**

<table>
<thead>
<tr>
<th>Grade of BOLT</th>
<th>4.6</th>
<th>8.8</th>
<th>10.9</th>
<th>12.9</th>
<th>Note: It is permissible to fit higher grade nuts than recommended.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade of NUT</td>
<td>4</td>
<td>8</td>
<td>12</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>

**Grade Identification**

**BOLTS & NUTS - Grade 4.6**

BS4190 (ISO272, 885, 888 & 4759/1). Grade marking is optional. Normally there will be no mark other than the ‘M’ thus:

**BOLTS - Grade 8.8**

BS 3692 (ISO272, 4759/1). Grade marking is mandatory, may also have trademarks.

**NUTS - Grade 8**

Indented marks as a clock face, dot at 12.00, bar at 8.00, indicates grade 8 nut.

**High Strength Friction Grip Bolts & Nuts**

**Maintenance Record**

<table>
<thead>
<tr>
<th>Date</th>
<th>Summary of maintenance &amp; repairs done - replacement parts fitted etc:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Installed &amp; Commissioned</td>
</tr>
</tbody>
</table>
ACME Dynamics, Inc. operate a comprehensive Spares and Service support network throughout the world, and can be contacted as follows:

**PARTS & SERVICE**

**Telephone:** (800) 622-9355

For spare parts, supply only.

For breakdowns, spare parts and, on-site fitting, pump installation and, commissioning, and service contracts.

ask for - **Parts Dept.**

ask for - **Service Dept.**

Parts & Service Office
ACME Dynamics Inc.
P. O. Box 1780
Plant City
Florida
USA
33564-1780

General Fax line: (813) 752-4580

Copies of this manual are available from the ACME Dynamics, Inc. Spares & Service Department by quoting the manual reference number W77-008E

You may enter details from your pump nameplates here for quick reference.

---

MODEL ___________________________

SERIAL # _________________________

GVW (WITH FUEL)_______________ LBS.

FUEL CAPACITY ___________ GALLONS

ASSEMBLED BY ________________

---

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