ASSEMBLY, OPERATING AND MAINTENANCE INSTRUCTIONS

ICS Mill Master Sump Pumps

Manual for Metal and Rubber Wet Ends:

ICSHDMM2SP, ICSHDMM3SP, ICSHDMM4SP, ICSHDMM6SP & ICSHDMM8SP

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SAFETY

ICS Wear Group Inc. Heavy Duty Mill Master (HDMM) sump pumps have been designed for safe and reliable operation. A pump is a pressure-containing device with rotating parts that could be hazardous. Operators and maintenance personnel must realize this and follow the necessary safety measures. All statutory requirements relating to this equipment must be complied with at all times and site safety procedures strictly adhered to.

ICS shall not be liable for damage or delays caused by a failure to observe either the instructions in this manual or the usual industry safety procedures.

All statutory requirements relating to this equipment must be complied with at all times.

Do not apply heat to the impeller hub or inlet eye to assist removal of the impeller. Heat application may result in the impeller shattering, resulting in injury or equipment damage.

Do not operate the pump with zero or very low flowrate for an extended period of time. Failure to observe this warning may result in overheating of the pump and vaporization of the pumped fluid. With generation of very high pressures, serious injury to personnel or damage to equipment may result.

Prior to fitting drive belts or couplings, check the drive motor rotation. Incorrect motor rotation may cause personnel injury or equipment damage.

Do not feed very hot or very cold fluid into a pump at ambient temperature. Thermal shock may result in wet-end pump parts fracturing.

All ICS pumps must be treated as both an item of rotating machinery and a pressure vessel. All relevant safety precautions and procedures for this equipment should be observed during pump installation, operation and maintenance.

Where auxiliary equipment is associated with the pump (ie. motors, drive belts, drive couplings, speed reducers, variable speed drives, etc), all relevant instruction manuals should be consulted and recommended procedures implemented during install, operation and maintenance of the pump system.

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1. INTRODUCTION

This manual is applicable for ICSHDMM sump pumps from the 2,3,4,6 & 8. they feature a wide choice of replaceable abrasion resistant metal or molded elastomer casing liners and impellers, which are all interchangeable within a common casing assembly.

These pumps are of heavy-duty construction, designed for partial submerged mounting in pits or sumps. They are greatly suited for continuous pumping of highly abrasive slurries in the Mining, Chemical and General Process Industries. They feature an unlined casing design, characterized by design simplicity, minimum number of parts and light weight overall.

Important design features of the ICS High Performance Sump Pumps include:

- Robust shafts
- Heavy duty bearing assemblies
- Heavy duty screw thread impeller attachment
- Through-bolt design throughout
- Replaceable casing components
- No submerged bearings

ICS Heavy Duty Mill Master Sump Pumps (HDMMSP) can be supplied with either standard duty or heavy-duty bearing assemblies. Standard duty bearing assemblies are satisfactory for the majority of sump pump applications. However, for extreme operating conditions involving high bearing loading, the heavy-duty bearing assembly yields a longer bearing life.

2. IDENTIFICATION OF PARTS

Each ICS pump part has a distinguished part number for reference. Parts with the same name have the same basic part number, regardless of pump size. For example, the impeller for every ICSHDMM Pump has the reference ** IMP, the starts represent size for example.

Additional letters and numbers are added before and after the basic part number to denote a component of a particular pump. For example, part number ICSMM4SPIMP identifies the Impeller to fit the ICSHDMM4SP Pump.

Refer to the component diagram of the appropriate size of ICS Pump for complete identification and description of component parts. Part names and basic part numbers are used in assembly instructions throughout this manual.

It is recommended that the correct component names and part numbers be used at all times to avoid incorrect parts being supplied. The pump serial number should also be quoted if any doubt exists in referencing part numbers.

3. BEARING ASSEMBLY – MAINTENANCE AND LUBRICATION

The bearing assembly is assembled and maintained by ICS maintenance personnel prior to shipping. It is recommended that grease used for lubricating the rolling bearings should have the following characteristics:

Lithium soap base grease with EP additives and oxidation inhibitors

N.L.G.I. Consistency No.	2
Drop Point	>170°C
Work Penetration 25°C A.S.T.M.	265-295

Recommended Grease: Mobil 1, Castrol EPL2 or equivalent

4. PUMP ASSEMBLY INSTRUCTIONS

Reference to a Component Diagram for the particular pump being assembled will be of assistance in following the instructions outlined in the following sections.

All parts dismantled during pump overhaul should be inspected to assess suitability for reuse, and identification of new parts should be checked. Parts suitable for reuse should be cleaned and painted. Matching faces should be free of rust, dirt and burrs, and have a coating of anti-seize compound applied prior to assembly.

Small fasteners should be replaced, and all threads coated with graphite grease before assembly. Replacement of all rubber seals is recommended during major overhauls, as these tend to deteriorate with use. Exposure to direct and continuous sunlight will accelerate material degradation.

4.1 - FRAME ASSEMBLY

ICSHDMM Sump Pumps may be fitted with either standard duty or heavy-duty vertical bearing assemblies.

4.1.1- Heavy Duty Bearing Assembly – Fitting Upper Strainer, Column and Mounting Plate (Ref Fig.1&2)

For Pump Sizes: 2SP, 3SP, 4SP, 6SP, 8SP

I. Fully assemble Bearing Assembly (MMSPBAU)

II. If upper mesh strainer (MMSTR) to be fitted – Fit Strainer (MMSTR) inside drive-end of Column (MMCOL) and slide to the other end, with end of Strainer resting on end flange of Column. Intake openings of Column should be fully covered by Strainer mesh.

III. If rubber or cast metal upper Strainers are to be fitted, in lieu of mesh Strainers These will need to be fitted at a later stage in the assembly. (refer Section 4.3)

IV. Fit Bearing Assembly to Column (MMCOL), ensuring that they are aligned as indicated in Figure 2. Carefully note the orientation of the Grease Nipples.

V. Fit four Spacers (MMSPA) between Bearing Assembly feet, and top flange of Column (MMCOL). Fit Column Bolts and tighten evenly

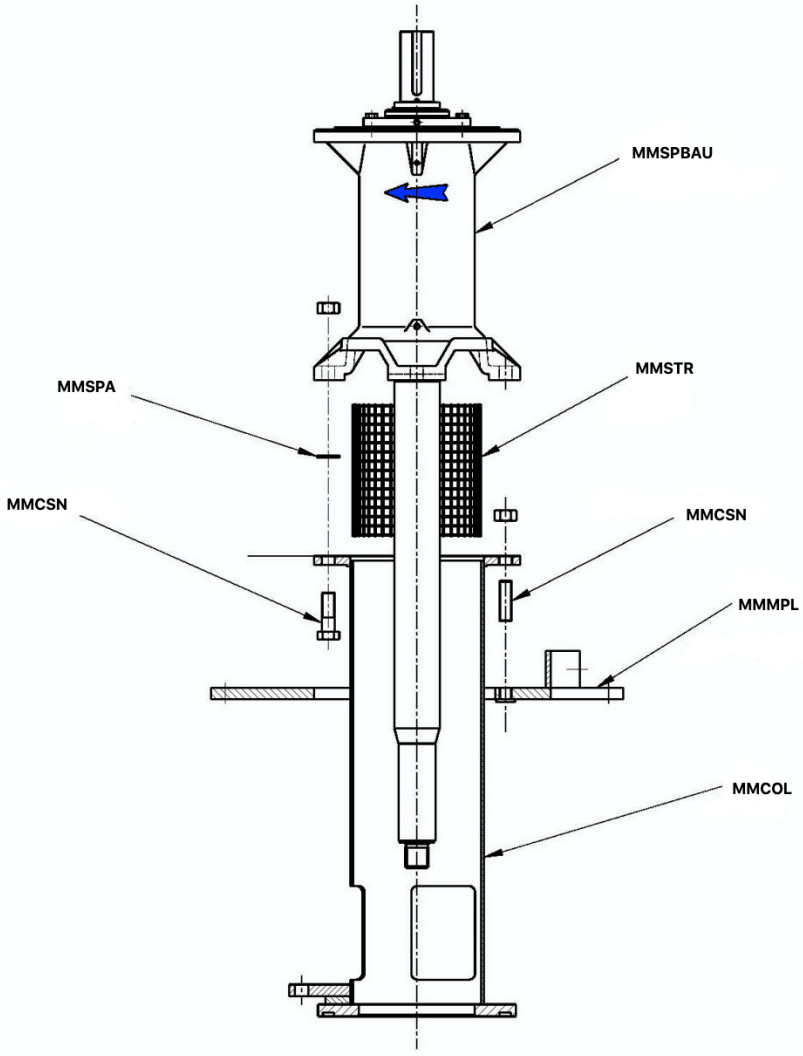
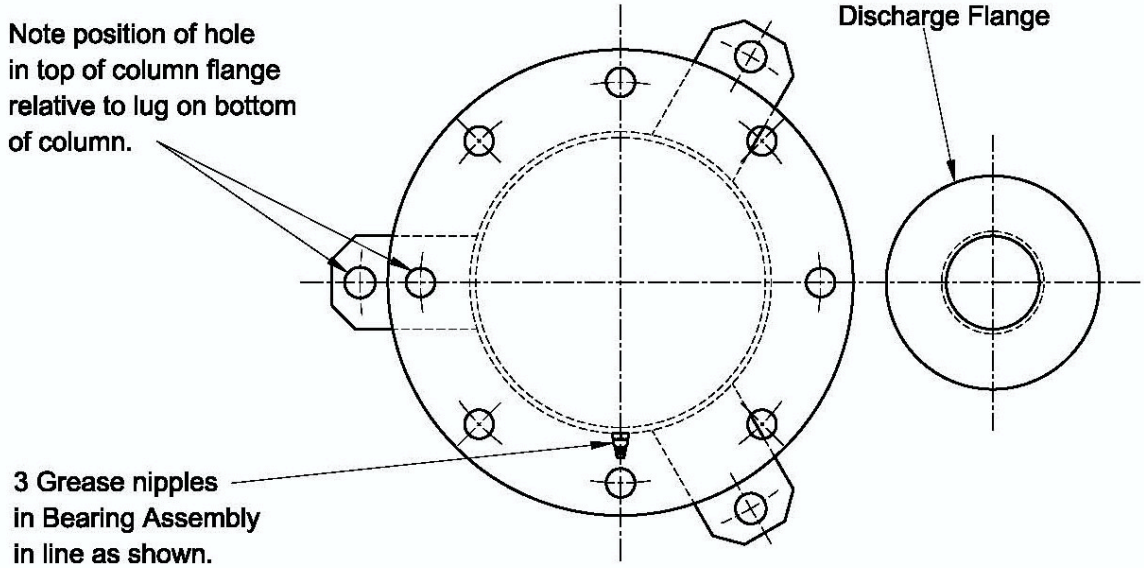


Figure 1 - Frame Assembly



STANDARD COMPONENTS ORIENTATION
VIEWED FROM DRIVE END

Figure 2 - ICS Mill Master Sump Pump Birds eye view Drive End

4.2 - PUMP CASING ASSEMBLY

4.2.1 Fitting Back Liner, Impeller, Casing and Suction Strainer (Ref Fig 3)

It is recommended that the partially assembled unit be inverted for assembly of pump casing components, by supporting the assembly on a hoist with the impeller end upwards

I. Fit Back Liner Seal (MMVLS) to matching grooved in end face of Column (MMCOL)

II. Place Back Liner (MMSPFPLI) over impeller end of Shaft and engage Liner spigot with bore of Column end face, ensuring that the Back Liner contacts the Seal evenly

III. Fit Impeller O-Ring (MMIOR) to groove on end of Shaft. Apply heavy grease to O-Ring groove to hold the O-Ring which seals against the back face of the impeller

IV. Apply anti-seize compound liberally to Shaft thread

V. Select the appropriate Impeller required for the pump assembly, and fit as follows:

   a. Place impeller (thread up) on a flat surface, apply anti-seize compound to thread and screw Impeller to Shaft

   b. Fit Shaft Key (MMSFK) in Shaft keyway at drive-end and bolt Shaft Wrench (SFW) to Shaft over key. While holding Shaft with Wrench and turning impeller with a bar between vanes, firmly screw Impeller to Shaft – DO NOT OVERTIGHTEN

VI. Fit Lower Strainer (MMSTR-L) to Casing (MMCAS) and bolt together using Intake Flange Bolts.

VII. Using a hoist, lift Casing and position on end of Column, with orientation as shown in Figure 3. Check that the Impeller turns freely, without contacting the Casing surfaces. If necessary, add or remove Spacers (MMSPA) between Column flange and Bearing Assembly. Fit three Column Bolts to fasten Casing to Column flange and evenly tighten.

NOTE: Column bolts should be tightened only sufficiently to compress MMVLS and bring Casing and end face of Column into contact.

DO NOT OVERTIGHTEN COLUMN BOLTS

VIII. Double check impeller turns freely without contacting Casing surfaces. Adjust Spacers between Column flange and Bearing Assembly if required.

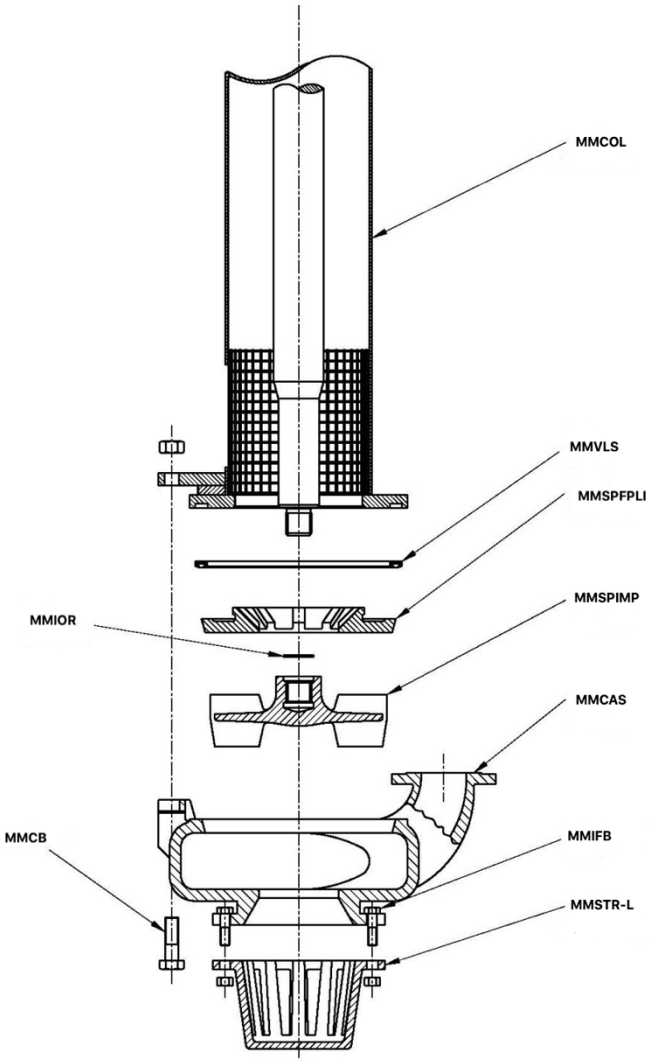


Figure 3 - Pump Casing Assembly

4.3-MISCELLANEOUS FITTINGS

4.3.1 Discharge Fitting (Ref Fig 4&5)

I. Position pump horizontally with discharge pipe upwards

II. Apply contact cement to face of Discharge Pipe Gasket (MMDPG) and to end face of Casing discharge flange. Fit Gasket to Casing Discharge.

III. Fit Discharge Pipe (MMDSP) and secure with Discharge Pipe Bolts. Tighten bolts.

IV. Only sump pumps with Standard Duty, Type V Bearing Assembly Refer Figure 4. Fit U-Bolt (UB) around top end of Discharge Pipe (MMDSP) with ends projecting through matching holed in Discharge Pipe Support (MMDPS). Fit two nuts and tighten firmly to secure Mill Master Discharge Pipe to Mill Master Discharge Pipe Support.

NOTE: Only Sump Pump with Heavy Duty Type V Bearing Assembly Refer Figure 5. Fit Discharge Pipe Retaining Screw and Nut to fasten top end of Discharge Pipe to Mounting Plate. Tighten nuts firmly.

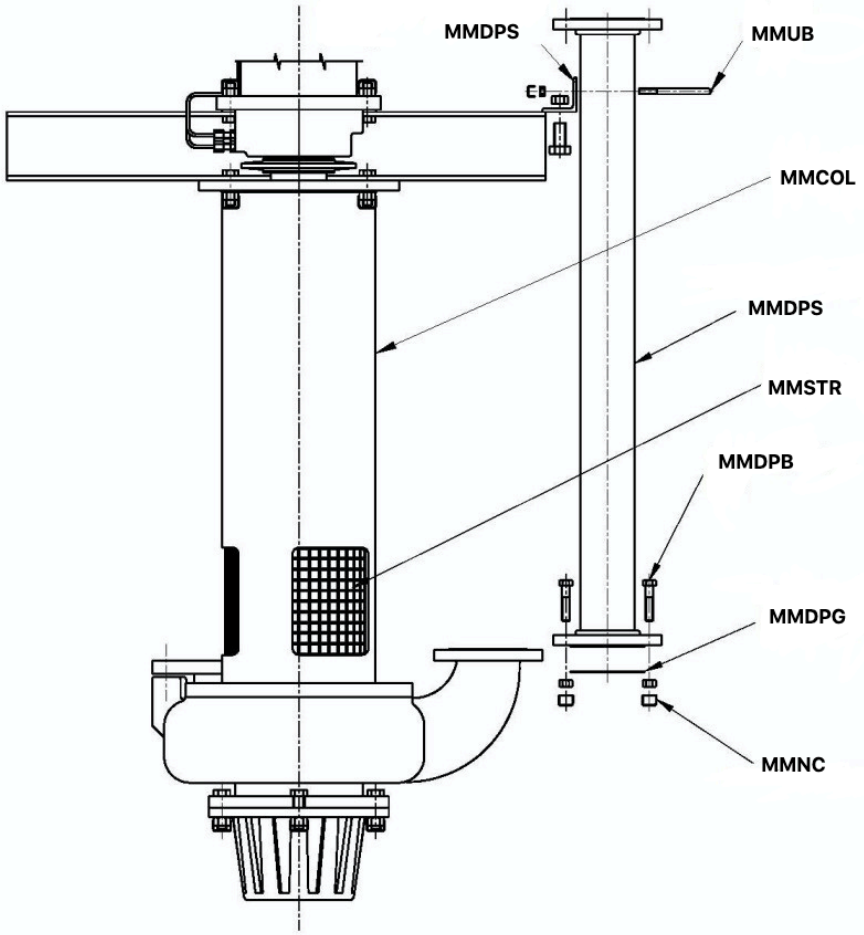


Figure 4 - Discharge Fitting

V. All type HDPSP Sump Pumps – Refer Fig 4 & 5

a. If rubber (MMSTRRR) or metal upper strainers (MMSTRCrWI28) are to fitted in lieu of rubber strainers described in Fig.4 or Fig.5 – Fit three (3) Upper Strainers (MMSTR) by bending the rubber strainer slightly, and fit into cut-out in Column so that the four Strainer lugs clip into sides of Column cut-out, and hold Strainer firmly.

b. If applicable, fit Suction Pipe (MMSSP) with or without Lower Strainer (MMSTR) according to requirements

c. Fit rubber Nut Covers (MMNC) to all external nuts to prevent fouling of threads with slurry.

The pump assembly is now substantially complete, and ready for fitting of drive components

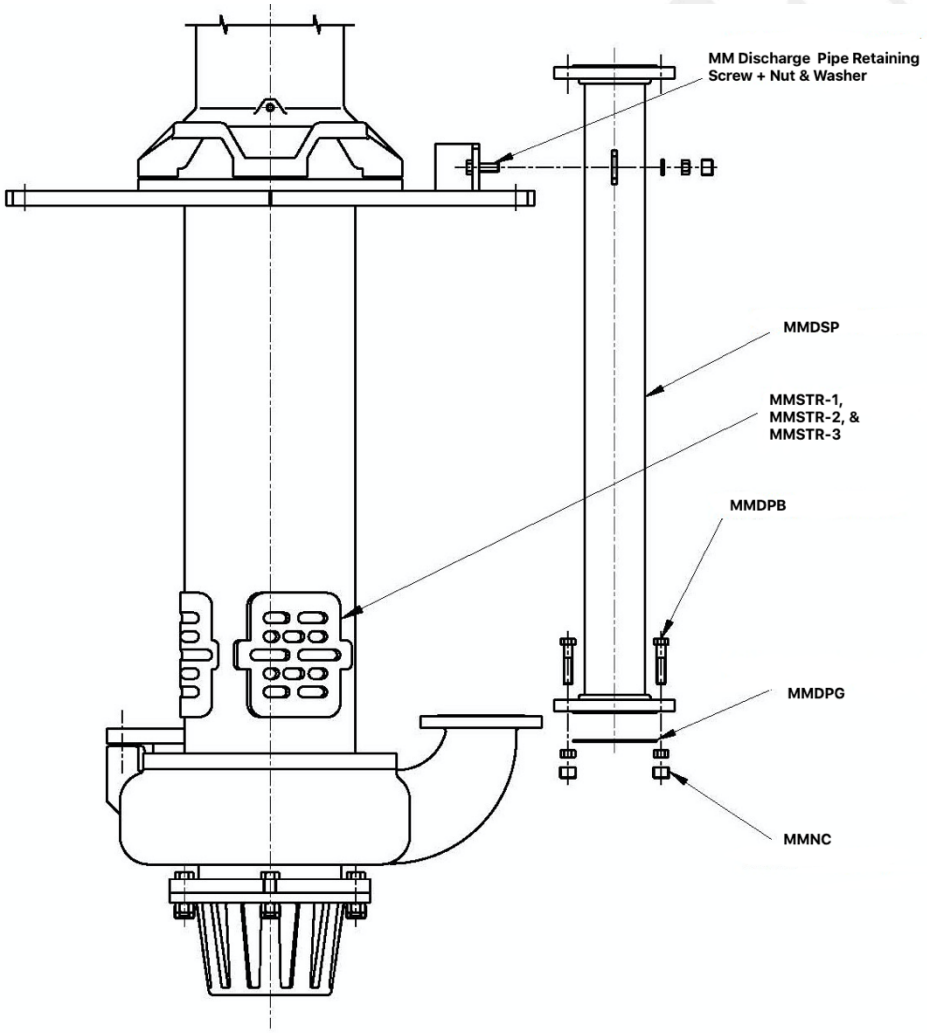


Figure 5 - Miscellaneous Fittings

5. IMPELLER ADJUSTMENT

No provision is made for periodic adjustment of Impeller end clearances in ICSHDPSP Sump Pumps. During assembly of the pump, Spacers are fitted between the Bearing Housing and Column upper flange to provide ample Impeller end clearances in the Casing, and compensate for manufacture tolerances.

When wear of the Impeller and Casing progresses such that it reduces pump performance to an unsatisfactory level, the pump Casing should be dismantled and worn parts replaced.

6. DISMANTLING PUMP AND IMPELLER REMOVAL

The procedure for dismantling the pump is generally the reverse of that described for pump assembly. Impeller access requires Casing (MMCAS) removal. This may be removed after hoisting the pump from the sump to give access to the wet-end.

Impellers are fitted to Shafts with a right-hand screw thread attachment on all ICSHDMMSP pumps.

Impeller removal generally involves applying an impulsive torque loading to the Impeller while separately restraining the Shaft from rotation.