

# TECH-MAG

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## Installation, Operation, Maintenance & Safety Instruction

### M Series Alloy Pumps

### Cast Alloy Sealless Mag-Drive Centrifugal Pumps



This manual contains installation, servicing, troubleshooting and maintenance for  
TECH-MAG M Series Alloy pumps.

Information that may be required regarding performance, modifications or detailed  
technical data which is not included here may be obtained from your  
TECH-MAG pump representative or the factory.

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## (2) Installation, Operation & Maintenance Manual

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## 1. SAFETY

Installation, Operation and Maintenance must be done by thoroughly qualified person nel in strict accordance with this manual and must comply with all local, state and federal codes. For your protection and the protection of others, learn and always follow the safety rules outlined in this booklet. Observe warning signs on machines and act accordingly. Form safe working habits by reading the rules and abiding by them. Keep this booklet handy and review it from time to time to refresh your understanding of the rules.



### **DANGER**

The use of the word "DANGER" always signifies an immediate hazard with a high likelihood of severe personnel injury or death if instructions, including recommended precautions, are not followed specifically.



### **WARNING**

The use of word "WARNING" signifies the presence of hazard or unsafe practices which could result in severe personal injury or death if instructions, including recommended precautions, are not followed.



### **CAUTION**

The use of the word "CAUTION" signifies possible hazards or unsafe practices which could result in minor injury, product or property damage if instructions, and recommended precautions are not followed.



### **MAGNETIC**

M Series alloy pumps are magnetic driven. The use of the word "MAGNETIC" indicates the persistent presence of a magnetic field. Such fields present immediate danger to individuals having electronic medical devices, metallic heart valves, metallic prosthetics or metallic surgical clips.

## 2. Inspection

All TECH-MAG Pumps are inspected prior to shipping and well packaged for safe transportation. Upon receipt of ST Series pumps, check for any damage which may have occurred during shipment. Notify the freight carrier and TECH-MAG Pumps immediately if damage has occurred.

## 3. Storage

If the pump is not installed immediately, it should be protected from exposure to moisture and dust. Shipping protections of the ports installed at the factory must be kept securely in place. Storage instruction provided by the motor manufacturer should be observed.

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#### 4 Installation

- 1) Locate the pump on a firm base as close to the liquid source as practical, preferably below liquid level, to be easily accessible for maintenance and inspection.
- 2) Mount the pump horizontally. If mounted vertically, the unit must be with pump end downwards, not motor.

#### 5 Operation Safety Basics

Listed below are some of basics you should keep in mind, in addition to your own company rules regarding installation, operation and maintenance.

NEVER: Start this pump without proper priming (casing must be full of liquid)

NEVER: Operate this pump with the suction or the discharge valve closed.

NEVER: Run this pump dry over a few minutes.

NEVER: Operate pump if there are signs of leakage.

NEVER: Change pump condition of service without approval by the factory or your authorized TECH-MAG representative.

NEVER: Loosen port connection while system is under pressure.

NEVER: Attempt to clean the pump while it is operating.

NEVER: Operate pump above rated temperature and pressure.

NEVER: Pump liquids containing ferromagnetic particles of any size, or substances, which will erode or chemically attack the internal parts of the pump. If in doubt, please contact your authorized representative.

NEVER: Restrict either the inlet and the discharge lines while the pump is operating. Restriction of the inlet may cause the pump to cavitate, leading to loss of efficiency and rapid wear. Reduced flow can be obtained if required by a valved branch from the discharge side of the pump back to the liquid source. If the pump is shutdown for an extended period, circulate clean water (or other suitable solvent compatible with pump materials) for several minutes, to avoid the risk of internal precipitation or crystalline formations.

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## 6 Pump Identification

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Every TECH-MAG pump has a nameplate located on the side of the adapter. It is recommended that the purchaser record the serial number and reference it when requesting information or service parts from TECH-MAG. The serial number, must be used for all correspondence and spare parts ordering.

## 7 Suction and Discharge Piping

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Piping should be supported independently of the pump and line up properly to pump ports. Suction piping should be installed with as few restrictions as possible to provide no less than the minimum NPSH as listed on the specification sheet.

The length of the suction pipe should be kept to a minimum. Suction line should be clean and/or a strainer should be installed to protect the impeller from damage by welding slag, mill scale, or other foreign particles during initial startup. In suction pipe use only a full flow valve. A pressure gauge should be installed in both the suction and discharge piping. The gauges will enable the operator to easily observe the operation of the pump, and to control if the pump is operating in conformance with the design duty point. If cavitation or other unstable operation should occur, widely fluctuation pressure will be noted.

## 8 Electrical

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# DANGER

Only a qualified electrician should make the electrical connections to the motor. Thoroughly read motor manufacturers instructions before making installation. Check motor nameplate date to be certain that all wiring, switches, starter, and overload protection are correctly sized.

Install the motor according to local electrical codes. Check all connections to motor and starting device with wiring diagram. Check voltage, phase, and frequency on motor nameplate with line circuit.

NOTE: Install a flexible electrical coupling on the motor. Allow for movement of at least 12 inches. This is necessary to service and inspect the pump.

### 9 Pump Speed

ST Pumps are designed to rotate at speed up to 4000rpm. Standard Speeds are:

| ELECTRIC MOTOR | 50Hz     | 60Hz     |
|----------------|----------|----------|
| 2 POLES        | 2900 RPM | 3500 RPM |
| 4 POLES        | 1450 RPM | 1750 RPM |

If the pump is driven at variable speed via an a.c. frequency inverter (VFD), check that the recommended limit of speed is not exceeded.

### 10 Starting

Fully open the suction valve. Pump requires a flooded suction. Open discharge valve.



## WARNING

Do not operate pump with suction or discharge valve closed. Operating pump more than a few minutes with the suction valve closed can cause bearing failure.



## CAUTION

Check driver for proper rotation. Correct rotation is counter clockwise when viewed from the pump casing.



## CAUTION

At start-up immediately check pressure gauges. If discharge pressure is not quickly reached stop the motor, check valves, reprime if necessary and attempt to restart.

Check the pump and piping to assure that there are no leaks. A suction side leak may not result in fluid leaking out when off but may still allow air to enter the suction. Should this occur flow will be reduced and will cause a possible vapor lock that could damage the pump.

11 Troubleshooting

| TROUBLE                                  | POSSIBLE CAUSE  | INVESTIGATE / CORRECTIVE ACTION  |
|--|---|--|
| No flow -No pressure at start up.        | Pump not completely filled with liquid.   | Bleed all vapor or air from port 6.<br>Allow more cool; down time if pumping low temperature fluid.<br>Check suction for air leak if suction pressure is lower than atmospheric.   |
|  | NPSH actually lower than NPSH requirement listed on specification sheet.                                  | Suction line blocked - check suction screen and valve.<br>Excessive pressure drop through suction piping.<br>Flow restricted by vapor pockets in high points of suction line.<br>Suction tank level or pressure too low.<br>Entrained air or vapor in pumped fluid.<br>NPSH reduced by presence of more volatile fluid in process fluid. |
|  | Failure of drive component, such as interconnecting shaft or impeller key, or item missing from assembly. | Disassemble and inspect.   |
|  | Reverse direction of rotation.  | NOTE: impeller and drive rotate in the same direction.   |
| Insufficient flow or head-rise.          | NPSH actually lower than NPSH requirement listed on specification sheet.                                  | Refer to solution listed under "NO flow, no pressure at start up".   |
|  | Flow too low, causing overheating of fluid resulting in internal boiling or unstable pump operation.      | Increase through-flow rate.<br>By pass part of pump discharge to supply tank.<br>Use seal cavity bypass and vent the high point of the pump to continuously increase inlet flow rate.  |
|  | Diffuser discharge partially plugged or impeller damaged by passage of solid particle                     | Clean these areas of all obstructions and restore surface to a smooth polished finish (use emery cloth or machine), free of all corrosion pitting.   |
| Driven overloaded.                       | Process fluid specific gravity or viscosity different from values shown on specification sheet.           | Check actual viscosity and specific gravity at operating temperature. Viscosity higher than ten centipoises will cause reduced head and flow and increased power consumption.  |
|  | Drive speed too low.  | Check speed against value listed on specification sheet.   |
|  | Pressure gauges of flow meters in error.  | Calibrate instrumentation.   |
|  | Fluid specific gravity or viscosity higher than values listed on specification sheet.                     | Check actual viscosity and specific gravity against value listed on specification sheet.   |
|  | Electrical failure in electric driver.  | Check circuit breaker heater size and setting.<br>Check voltage.<br>Current for each phase should be balanced within three percent.  |
|  | Mechanical failure in drive, or pump.   | Remove driver and check for freedom of rotation of pump shaft assemblies.<br>Remove fluid end and search for any mechanical failures.  |
| Excessive discharge pressure pulsations. | Insufficient NPSH.  | Refer to solution for insufficient NPSH under "No flow, no pressure at startup", above.  |

12 Maintenance And Disassembly



## WARNING

TECH-MAG Pump units contain extremely strong magnets. The use of non magnetic tools and work surface is highly recommended when possible.



## MAGNETIC

The maintenance and disassembly procedure are intended for use during standard field inspection or service. TECH-MAG pumps contain very strong magnets. The use of non-metallic work surface is highly recommended.

### A) Disassembly

In case the pump has handled hot liquids, make sure that it cools down before disassembly. The pump may have handled dangerous or toxic liquids. It is therefore necessary to wear protection for the skin and eyes. The liquid must be recovered and eliminated according to the proper procedures. In the event that the pump must be returned for inspection or reconditioning, the unit must be thoroughly drained and cleaned of any process fluid it may have contained.



## CAUTION

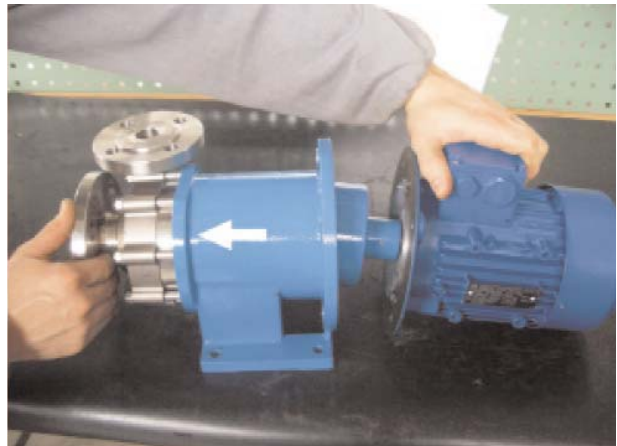
The shop area must be clean and free of any ferro-magnetic particles that will find magnets.



## MAGNETIC

Strong magnetic attraction when disassembling / assembling drive end to liquid end.

- 1) Remove bolts connecting pump and motor to foundation or base plate.
- 2) Remove hex bolts connecting pump to motor
- 3) Separate the pump from the motor and pull the driver away from the pump.





- 4) Remove hex bolts connecting the pump casing from the bracket.



- 5) Pull off the pump casing.



- 6) Pull out the internal assembly from the pump rear casing.



- 7) Remove the impeller wear ring retaining screw.



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8) Remove the impeller wear ring.



9) Remove the shaft hex nut and pull out the impeller.



10) Remove the bushing's support.



11) Remove the inner magnet hex nut.



- 12) Pull out the inner magnet from the shaft.



- 13) Pull out the key from the shaft.



- 14) Pull off the sleeve bushing from the shaft.



- 15) Remove the screws from the external magnet.



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16) Using an extractor pull off the external magnet from the motor.

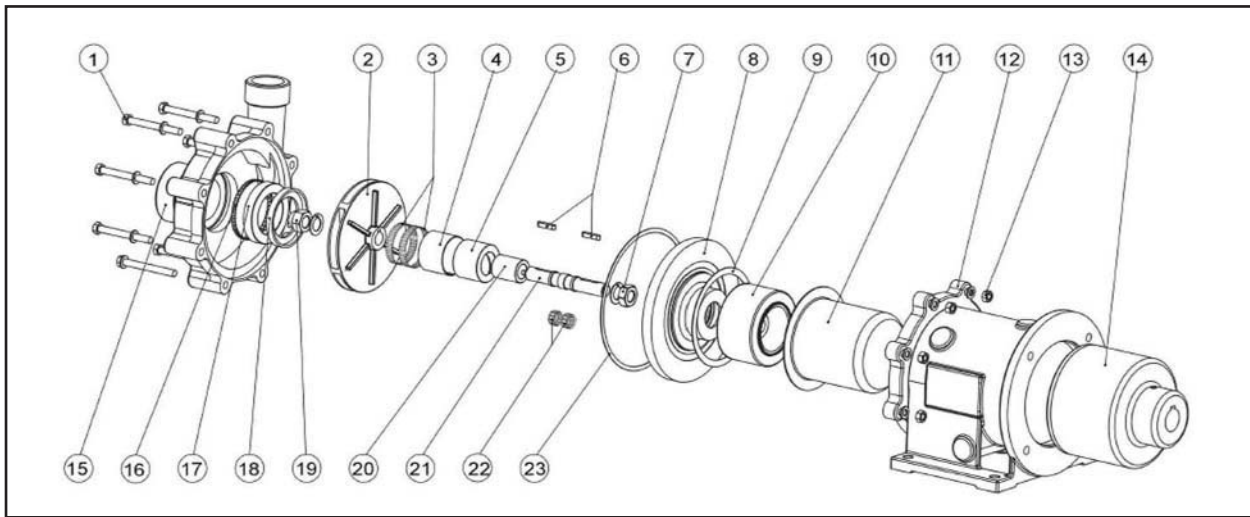
B) To re-assemble follow the above instructions in the reverse order.



## CAUTION

Thoroughly clean all parts before assembly. Make sure all parts are free of dirt, metallic particles, etc.

### 12 PUMP EXPLODED VIEW PARTS LIST



| ITEM  | DESCRIPTION             | MATERIAL       | ITEM | DESCRIPTION               | MATERIAL       |
|-------|-------------------------|----------------|------|---------------------------|----------------|
| 1, 13 | Pump Head Nuts & Bolts  | 316 SS         | 12   | Bracket                   | Carbon Steel   |
| 2     | Impeller                | 316 SS         | 14   | External Magnet <1>       | Carbon Steel   |
| 3     | Bushing Tolerance Ring  | 316 SS         | 15   | Pump Casing               | 316 SS         |
| 4     | Bushing Seat            | 316 SS         | 16   | Casing Tolerance Ring     | 316 SS         |
| 5     | Bushing                 | Special Carbon | 17   | Pump Casing Wear Ring     | Special Carbon |
| 6     | Shaft Keys              | 316 SS         | 18   | Impeller Wear Ring        | 316 SS         |
| 7     | Magnet Nut & Lockwasher | 316 SS         | 19   | Impeller Nut & Lockwasher | 316 SS         |
| 8     | Bushing Support         | 316 SS         | 20   | Sleeve Bushing            | SiC            |
| 9     | Rear Casing Gasket      | PTFE           | 21   | Shaft                     | 316 SS         |
| 10    | Internal Magnet <1>     | 316 SS         | 22   | Shaft Tolerance Rings     | 316 SS         |
| 11    | Rear Casing <2>         | 316 SS         | 23   | Pump Casing Gasket        | PTFE           |

<1> = Rare Earth Magnet Sectors

<2> = Minimum thickness 1.5 mm (0.059")

Distributed By:

APEI/TECH-MAG PUMPS

12715 210th Avenue

Bristol, WI 53104

262-857-8100 Fax 262-857-9111

www.tech-mag.com email: info@tech-mag.com