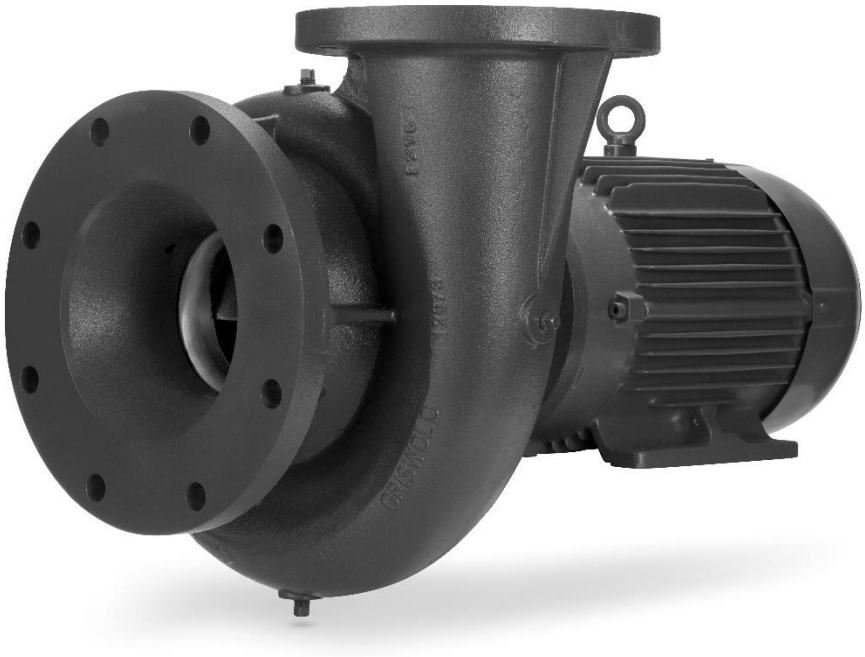
IOM

INSTALLATION, OPERATION
& MAINTENANCE MANUAL

850 SERIES

INDUSTRIAL WATER PUMPS



PSG a DOVER company

Where Innovation Flows

GRISWOLD

TABLE OF CONTENTS

INTRODUCTION

Forward

This manual is intended to assist those who are involved with the installation, operation and maintenance of a Griswold 850 Series pump. These instructions should be reviewed in their entirety and should be thoroughly understood prior to installation, operation or maintenance on the pumping unit. If there are any questions, contact either Griswold Pump Company or your local authorized Griswold representative prior to proceeding.

Safety

Failure to read and comply with installation, operation and maintenance instructions will void the responsibility of the manufacturer and may result in bodily injury or equipment damage.

This manual should be kept as a part of the permanent records for the pump and should be readily accessible as a reference to anyone working on the pumping unit.

These pumps have been designed for safe and reliable operation when properly used and maintained in accordance with instructions contained in this manual. A pump is a pressure containing device with rotating parts that can be hazardous. Operators and maintenance personnel must realize this and follow safety measures. Griswold Pump Company shall not be liable for physical injury, damage or delays caused by a failure to observe the instructions in this manual.

Throughout this manual the words **WARNING**, **CAUTION**, and **NOTE** are used to indicate procedures or situations, which require special operator attention.

Operating procedure, practice, etc., which if not followed could result in personal injury or loss of life.

Operating procedure, practice, etc., which if not followed could result in damage or destruction of equipment.

NOTE:

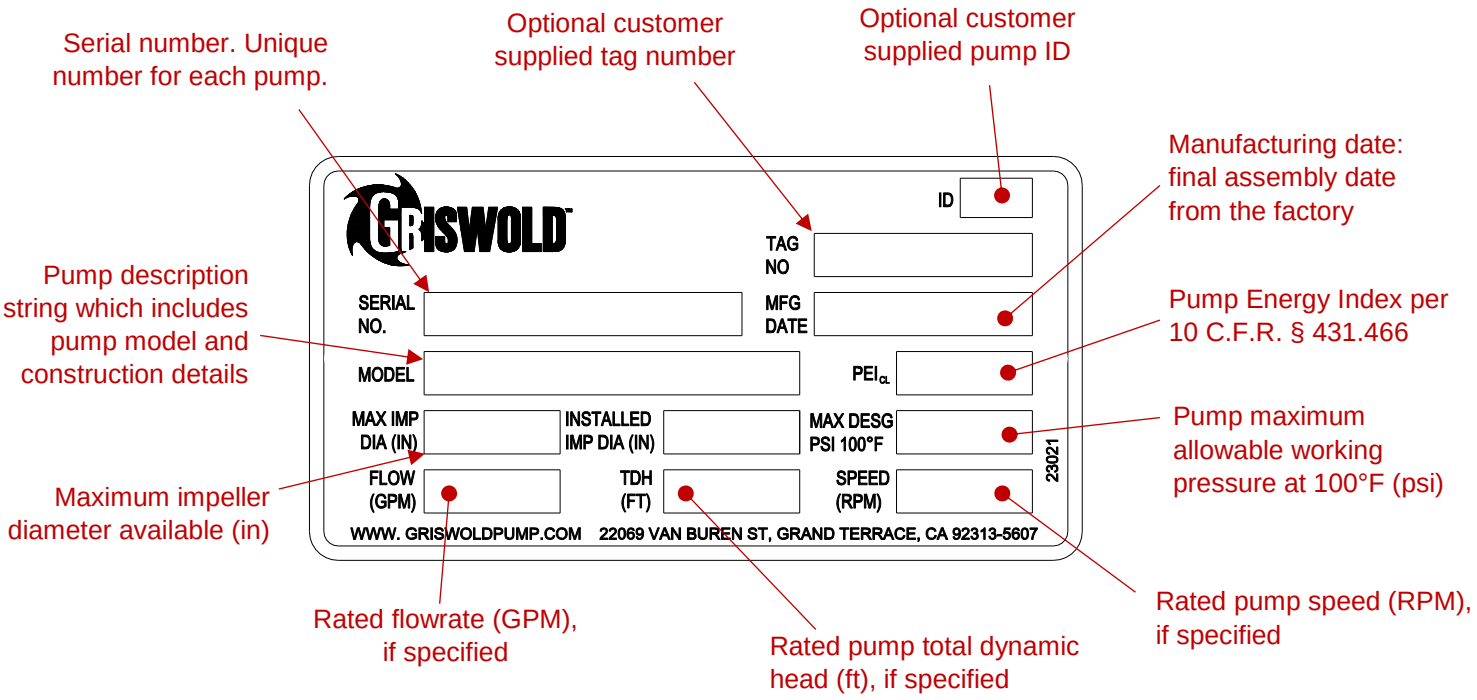
Indicates special instructions which are important but not related to hazards.

General Safety

- Do not allow pump, piping or other components containing water to freeze. Freezing may damage the components, leading to possible injury or flooding
- Periodically inspect pump and associated components
- Wear safety glasses when working on pumps
- Keep work area clean, uncluttered and with adequate lighting
- Ensure pump and components cannot roll or fall over, possibly causing bodily injury or property damage
- Allow all system and pump components to cool before handling
- Disconnect and lock out power before servicing the pump
- Check explosion risk before spark inducing work, such as welding, using electric power tools, grinders, etc

PRODUCT DESCRIPTION

The Griswold 850 Series pump is a centrifugal single-stage close-coupled pump which is also offered as a frame-mounted pump. The pump has a back pull-out design, meaning that it is possible to remove the pump back-end without disturbing the case and piping, which can facilitate easier maintenance of the pump. The casings are of a single-casting design with an end-suction tangential-discharge configuration. The close coupled pumps are designed to bolt onto standard JM and JP motor frames.



Each pump will be supplied with a factory installed nameplate. See the figure for a description of each nameplate field.

TRANSPORTATION AND STORAGE

Receiving and Handling the Pump

- Upon receipt, a thorough inspection should be made of the pump and related equipment. If materials are not received in good condition or there are shortages, make a notation of the damage and/or shortage on both the receipt and the freight bill. Submit any claims to the transportation company promptly! A documentation package is included with the pump shipment. Do not discard these materials. Put them in a safe place for easy reference.

- Crush hazard. Care should be taken when unloading and handling the pump, especially with regards to rigging and lifting. Failure to properly lift and support the equipment can result in physical injury and/or equipment damage.
- Lifting devices (such as eyebolts, slings, etc.) must be properly rated for the entire load being lifted.
- Care should be taken so that the load is stable and that excessive stresses are not transferred to a single lifting point (such as trying to lift the pump assembly by the motor eye-bolt alone).

Storage

If pumps are to be stored prior to installation, they should be kept in a clean, dry environment. Depending upon the duration of the storage, it may be necessary to apply preservatives and to perform routine maintenance such as regularly rotating shafts to prevent flat spots from forming on the bearings in both the pump and driver. If pumps are to be stored for more than 4-6 months prior to installation and/or start-up, follow recommendations listed below. Storage for more than 4-6 months will require pumps to be prepared for long-term storage. Preservative treatment should be added to the power frame to aid against condensation and rust (if applicable). Treatment shall be similar to Royal Purple VP Preservative Oil #10. All machine surfaces that are not painted or not of corrosion resistant material shall be coated with a light coat of machine oil or grease. The pump and motor shaft should be turned several rotations every 3 months or less and left 90 degrees from the original position. Store in a dry protected location insuring that flange covers are left in place and all openings are plugged. Similarly, if the pump is to be installed and then started at a later date, it may be advisable to protect the pump during the idle time, especially if it's to be exposed to the elements.

INSTALLATION

Trouble-free operation of a pump begins with proper installation with particular attention being paid to the pump location, pump mounting and piping attachments.

Location

The pump location should be clean, dry, well ventilated, properly drained and allow room for maintenance and inspection.

Locate the pump as near to the liquid source as practical. Make the pipe runs as short and straight as possible, especially if suction lift is required.

Piping

Suction Piping

Avoid attaching an elbow directly to the pump suction as this causes non-uniform fluid velocities to enter the impeller eye.

If a gate valve must be used in the suction line, locate it so that its stem extends horizontally or downward. This will help to eliminate air pockets and leakage of air through the valve packing. If a foot valve is required to keep the pump primed, the cross-sectional areas of its passageways should be 1-1/4 to 2 times the area of the suction pipe. A strainer, if required, should have 3 to 4 times the area of the suction pipe; otherwise, excessive friction loss will be caused. If the pump is being installed in an NSF 50 application, the pump suction line should include an NSF 50 conforming strainer.

It is especially important that suction piping, on pumps that operate at a high suction lift, be absolutely free from leaks. If air is drawn in the suction line through any leaks, the pump capacity will be reduced and serious difficulties in maintaining prime may result. When the suction line draws liquid from an open sump, its lower end should be submerged sufficiently in such a way that air is not drawn into the line by vortex action. A flared suction bell placed on the end of a vertical suction line will help to compensate for lack of submergence. A square steel plate attached to the suction pipe, or a square floating collar around the vertical pipe, will also help to suppress vortex action.

Verify that the installation has adequate net positive suction head available (NPSHa) by comparing it to the net positive suction head required (NPSHr) of the pump. Estimating the NPSHa by merely considering the standing water level is inadequate since friction losses through the piping and fittings are generally significant and must be incorporated into the NPSHa calculation. Short, simple and large diameter suction piping with few fittings reduces suction pressure losses and aids in delivering adequate NPSHa to the pump.

Discharge Piping

Although discharge piping is not as critical as suction piping, care should be exercised in sizing and laying pipe in order to avoid unnecessary frictional losses. As in suction piping, the number of fittings should be minimized and abrupt changes in direction and size of piping should be avoided.

A gate valve should be installed in the discharge line; it will be of assistance when priming the pump and will permit service to be performed on the pump without needing to drain the discharge line and any connected vessels. It is advisable to install a check valve in the discharge line between the pump and gate valve in a system operating at high discharge heads and with a foot valve on the suction line. The check valve protects the pump from pressure surges which occur when the pump is stopped. In pressure systems without a foot valve, the check valve prevents reverse rotation of the pump and loss of pressure in the discharge line if the pump stops. For systems with very high discharge heads (above 80 psi), a non-slam check valve should be used.

Foundation and Installation

Close-coupled pumps are assembled into a rigid unit which requires a minimum amount of preparation for mounting. Nevertheless, this type of pump should be bolted down securely, otherwise it is possible to shift position during operation which could impose high stresses to the unit and cause premature failure.

There are two primary ways to mount the pump: bolting the pump assembly straight onto a foundation (such as concrete), or installing a baseplate onto the foundation and installing the pump assembly onto the baseplate.

The general requirements of the foundation are:

- The foundation must be a rigid support for the unit and be able to absorb loads imposed on the unit and any type of vibration
- It is absolutely necessary to provide a flat, horizontal mounting surface. A flat foundation is required to prevent strain and distortion when tightening the foundation bolts.
- The foundation must weigh at least 2-1/2 times the weight of the pump unit

In the case of installing the pump onto a foundation (such as concrete):

- In order to be able to take advantage of the back pull-out design of the Griswold 850 Series pumps, it is recommended to install some type of female threaded inserts into the foundation for hold-down bolting. This will allow the user to remove the hold-down bolts and pull the pump back away from the casing, which may not be feasible if the unit is bolted down to the foundation through studs which are bonded into the foundation.

In the case of installing the pump with a baseplate:

- A sleeve type anchor bolt can be utilized, whereby the anchor bolts are inserted in pipes or sleeves having a diameter of 2 or 2

1/2 times the bolt diameter. These sleeves will permit slight adjustments of bolts to compensate for inaccuracies in location of bolts or base-plate holes. The bolts are held at the lower end of sleeves by means of large washers.

- The foundation should be sturdy enough to support the weight of the pump without deflection or vibration and large enough to exceed the length and width dimensions of the base plate by 3 or 4 inches.
- The top surface of the foundation should be fairly rough and irregular, so that grout will adhere to it properly.
- Set pumping unit on unfinished foundation, using metal shims having a total thickness of 1 to 1-1/2 inches under the edge of the base near each foundation bolt. Bases which are long and narrow should be supported by additional shim stacks and anchors at the mid-point. Wedges should be leveled so the base clears the foundation by 3/4 to 1 inch.

COMMISSIONING, STARTUP AND OPERATION

Start-Up

- Do not operate the pump below minimum flow or with the suction or discharge valves completely closed
- Always disconnect and properly lock out driver power when performing any installation or maintenance tasks on the pump
- Operating the pump in reverse direction can result in pump damage. Verify motor rotation is in the same direction as the arrow on the pump case

Prime the Pump
Do not run the pump dry.

Centrifugal pumps must be primed (filled with liquid) before pumping starts. For pumps that are not self-priming, the suction line and pump need to be completely filled with fluid before the pump can operate properly.

Make sure that the pump body and suction piping are full of liquid before starting the pump. If the system does not automatically flood the pump and suction piping, manual priming will be required.

For pumping systems fitted with a foot valve on the end of the suction line, the easiest way to prime the pump is to fill the suction line and pump to establish a liquid level 1 or 2 feet above the top of the pump case. Any air trapped in the pump case should be allowed to escape by removing the top plug until a steady stream of liquid flows from the opening.

After flooding the pump:

- Turn the pump shaft by hand to allow any air trapped within the impeller to escape
- Wait several minutes for air to escape from any horizontal runs of suction pipe
- Replace plug(s)

Starting the Pump

Before starting the pump, open the suction valve fully and be sure that the pump is fully primed.

1. Slightly open the discharge valve
2. Start the pump driver. Listen for any untoward noise and check for any significant vibration or indications of binding. If any of these are observed, the pump should be stopped immediately and a thorough check of the installation should be made to determine the cause. Correct any fault(s) prior to re-starting the pump.
3. As soon as the driver is at full speed (within a few seconds), gradually open the discharge valve until the pump reaches the desired flowrate
4. Check a discharge or differential pressure gauge to ensure that the pump is operating properly
5. Check the mechanical seal. There should be no visible leakage
6. If the pump fails to reach the expected flow and pressure, stop the driver, prime the pump again and restart the driver

Operating Precautions

- Do not allow the pump to be subjected to pressures that are higher that the nameplate

maximum allowable working pressure (MAWP)
- Do not allow the pump the be subjected to temperatures greater than the maximum allowable working temperature (MAWT)
- If altering the pump flowrate by increasing system resistance (e.g. by adjusting a valve), always throttle the flow on the discharge side of the pump. Throttling on the suction side of the pump will decrease the NPSHa for the pump and can cause pump damage.
- Do not overload the driver, which can damage the driver and create unexpected heat generation. A common scenario is excessive power draw due to a change in the system which allows the pump flowrate to exceed the rated conditions
- Do not operate the pump with a flowrate less than the indicated minimum flowrate
- Do not subject the pump to freezing conditions. Freezing may damage the components, leading to possible injury or flooding.

MAINTENANCE

Bolt Torques

Recommended bolt torques for both hex head and socket head cap screws

Screw Size	Recommended Torque
3/8 - 16 UNC	35 ft-lbs
1/2 - 13 UNC	85 ft-lbs
5/8 – 11 UNC	165 ft-lbs

Disassembly to Replace Mechanical Seal

- Disconnect and lock out power to the driver
- Close necessary valves and drain the pump
- Flush the pump if necessary
- Remove the case bolts and separate the case and bracket. Since the pump is of a back pull-out design, the pump back-end (with the bracket) can be pulled from the case while leaving the case bolted to the piping. Alternatively, case can simply be removed from the bracket and set aside (e.g. if the pump is being disassembled on a work bench).
- Remove old O-ring and discard
- Holding the impeller stationary, remove the impeller screw and impeller washer
- Remove the impeller
- If present, remove the impeller spacer
- Remove the mechanical seal spring
- Remove the bracket. The rotating seal will slide off during this process.
- Push stationary seal assembly out of bracket

Installing Mechanical Seal

- Inspect shaft sleeve. If the outer surface is damage, it may create a leak path under the new rotating seal. Replace if necessary
- If replacing sleeve, discard existing sleeve O-ring(s). Clean shaft and apply a thin film of assembly oil / grease. Install new sleeve with new O-ring(s). If the sleeve has a rectangular notch, align the notch with the shaft keyway
- Clean the seal bore of the bracket
- Carefully press the new stationary seal assembly into the bracket bore. Be careful not to chip or damage the brittle seal face. It is recommended to cover the seal face with a softer material (e.g. cardboard, plastic) during this process
- Reinstall the bracket to the motor, taking great care not to damage the stationary mechanical seal face by letting it come into contact with the motor shaft
- Apply a thin film of assembly oil / grease to the inner diameter of the rotating seal and the outer diameter of the shaft sleeve and install the rotating seal assembly onto the sleeve, polished face first. Be sure that enough oil / grease is present to allow the seal to slide. Place the spring onto the back of the rotating seal assembly and apply pressure until the rotating mechanical seal assembly slides to make contact with the stationary seal face.
- If applicable, install impeller spacer
- Place impeller key into the shaft keyway and slide it back
- Apply a thin layer of assembly grease / oil to the shaft and install impeller, pushing it back (which will compress the mechanical seal spring)

- Install the impeller screw and impeller washer
- Install new O-ring to the bracket in preparation for case assembly
- Install the pump back-end into the case and install and tighten case screws. Always tighten screws in a sequence that resembles a star-pattern

Wear Ring Replacement

Any stationary wear ring(s) are replaceable. When rings are worn so that diametric clearance between the impeller and the wear ring exceed the values shown below, it is recommended to replace the wear ring.

Note: the most significant impact to running a pump with increased wear ring clearances in a reduction in pump efficiency and a lesser reduction in differential head.

Ring ID (in.)		Maximum Recommended Diametric Clearance (in.)
From	To (and including)	
2	3	0.028
3	4	0.032
4	5	0.035
5	6	0.038
6	7	0.042
7	8	0.045
8	9	0.048

To replace a wear ring:

- Disassemble the pump to gain access to the wear ring (see previous instructions for disassembly)
- Remove the wear ring. If the back-side of the wear ring is accessible, it might be hammered out. Otherwise the wear ring may need to be cut in one or more places to be removed.
- Clean the wear ring bore
- Install the new ring by gently tapping with a relatively soft hammer or block. Tap around the circumference of the ring, ensuring that the ring is being driven in squarely. Chilling the ring in a freezer beforehand will aid in installation

TROUBLESHOOTING

Problem	Possible Cause	Remedy
No liquid delivered	Pump not primed	Re-prime pump, check that suction line is full of liquid
	Suction line obstructed	Remove obstruction
	Impeller clogged	Remove obstruction
	Wrong direction of rotation	Check rotation, change if necessary
	Foot valve or suction pipe has inadequate submergence	Check suction source for vortexing, correct as necessary
	Suction lift too high	Review/revise level on suction
Pump does not produce rated flow or head	Air leak through gasket	Replace gasket, tighten connections
	Air leak through stuffing box	Inspect packing/mechanical seal, add pressurized flush if necessary
	Impeller partially clogged	Remove obstruction
	Inadequate suction head	Review/revise design
	Worn or damaged impeller	Inspect/replace as necessary
	Wrong direction of rotation	Check rotation, change if necessary
Pump starts then stops pumping	Pump improperly primed	Re-prime pump
	Air or vapor in suction line	Review/revise suction piping to eliminate air pockets
	Air leak in suction line	Check gaskets, repair leak
Pump is noisy or vibrates	Partial impeller clog/imbalance	Remove obstruction
	Broken or bent impeller or shaft	Replace as necessary
	Foundation not rigid	Tighten hold-down bolts
	Suction and/or discharge piping not anchored correctly	Review design, modify as necessary
	Pump cavitation	Review suction system, correct problem(s)
Seal leakage	Shaft sleeve scored, ridged	Replace as necessary
	Worn mechanical seal	Replace as necessary
	Rotating seal face is not contacting stationary seal face	Inspect shaft sleeve and ensure that the rotating mechanical seal assembly can slide
Excessive power required	Actual head lower than design	Throttle discharge valve slightly, trim impeller. Review design
	Liquid heavier than expected	Review design
	Rotating parts binding	Check pump internals

NOTES

PSG
22069 Van Buren Street
Grand Terrace, CA 92313-5651 USA
P: +1 (909) 512-1262
psgdover.com

Where Innovation Flows