



Safety  
Supplement

EnviroGear  
E and G Series  
Internal Gear Pumps



Where Innovation Flows

[envirogearpump.com](http://envirogearpump.com)



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## INTRODUCTION:

This Safety Supplement applies to all E Series and G Series pumps and provides instructions for safe installation, operation, inspection and maintenance. Failure to follow these instructions could result in severe personal injury, including death and/or substantial product and/or property damage. This document is a supplement to the Installation, Operation and Maintenance Manual and provides additional cautions and warnings related to CE & ATEX. It is important to refer to the IOM for additional information regarding specific products. The standard operating instructions must be observed in addition to the information found in this document.

When pumps are used in potentially explosive or ATEX-classified areas, additional measures are required to ensure that the equipment is properly installed, operated and maintained. This includes:

- Maintaining the pump as per the instructions provided in the IOM to prevent any preventable failures and reduce hazards
- Inhibiting spark and/or heat generation
- Stopping explosive mixtures from building up
- Monitoring the pump temperature in order to keep it below the rated temperature of the equipment
- Monitoring the pump's fluid temperature in order to keep the fluid from vaporizing
- Preventing process-fluid leaks
- Operating the pump only within the manufacturer's recommended service conditions

The pump unit must be installed and operated as per its intended use. The bare pump and all auxiliary equipment, electrical and non-electrical, must comply with the most current European Directive requirements.

The latest IOM can be found at [www.envirogearpump.com](http://www.envirogearpump.com) or can be obtained by contacting your local EnviroGear Sales Representative.

## SAFETY DEFINITIONS:

The terms CAUTION, WARNING, ELECTRICAL HAZARD, and ATEX are used throughout the instruction manual to identify instructions that require particular attention by the operators and/or maintenance personnel. Where these terms are highlighted in the Safety Supplement and the Installation, Operation, and Maintenance Manual, they need to be complied with.



**CAUTION:** This term identifies a hazardous condition, which may result in moderate injury and/or equipment damage.

Example: ALWAYS bolt pumps down to a secure surface that is both level and flat. During operation, unwanted movement of the pump could occur.



**WARNING:** This term identifies a hazardous condition, which may result in serious injury, death and/or equipment damage.

Example: NEVER operate pump without safety devices installed. Operating a pump without the safety devices may result in personnel injury and/or equipment damage.



**ELECTRICAL HAZARD:** This term identifies a hazardous condition, which may result in the possibility of electrical risks if directions are not followed.

Example: ALWAYS disconnect power supply before performing installation or maintenance procedures.



**ATEX:** Any instructions directly trailing the "Ex" symbol must be fully adhered to when this equipment is installed in a potentially explosive environment. If these instructions are not abided by, bodily injury and/or damage to equipment may occur.

Example: DO NOT operate the pump without any liquid. Even when it is done for a short and/or intermittent period, dry-running a pump can damage the pump's internal components, thereby resulting in the generation of heat and/or sparks.

An EnviroGear representative can be contacted to address any questions relating to these instructions or equipment modifications.

The actual ATEX classification of the pump will be engraved on the nameplate. An example of an ATEX equipment marking is shown here below:

### ATEX/CE Nameplate: E Series

Assembled & Tested in the U.S.A

EnviroGear PUMPS CE Ex II 2G Ex h IIB T4...T2 Gb X

SERIAL NO.  MFG DATE.

ITEM NO.

DESC.

22069 Van Buren Street, Grand Terrace, CA 92313-5607 (909) 422-1730 www.psgdover.com/envirogear  
U.S. PATENT NO. 7137793; 7183683; 7549205; 10,240,600

**WARNING**  
This pump contains powerful permanent magnets that can cause serious injury. Read IOM before doing any service work.

**Magnetic Field:**  
Can disrupt medical implants such as pacemakers. Implant wearers should remain minimum of 1ft (0.3m) away from pump and 3ft (1m) away from disassembled magnets.

**Pinch Point:**  
Inner and outer magnets strongly attract each other which can crush and cut.

TGXX

### ATEX/CE Nameplate: G Series

Assembled & Tested in the U.S.A

EnviroGear PUMPS CE Ex II 2G Ex h IIB T2...T1 Gb X

SERIAL NO.  MFG DATE.

ITEM NO.

DESC.

22069 Van Buren Street, Grand Terrace, CA 92313-5607  
(909) 422-1730 www.psgdover.com/envirogear

TGXX

**ATEX Temperature Class Designation Table:**

| Temperature Class | Max. Surface Temp | Max. Fluid Temp |               |
|-------------------|-------------------|-----------------|---------------|
|                   |                   | E Series        | G Series      |
| T1                | 450°C (842°F)     | 260°C (500°F)   | 450°C (842°F) |
| T2                | 300°C (572°F)     | 220°C (428°F)   | 300°C (572°F) |
| T3                | 200°C (392°F)     | 135°C (275°F)   | 170°C (338°F) |
| T4                | 135°C (275°F)     | 70°C (158°F)    | 70°C (158°F)  |
| T5                | 100°C (212°F)     | Consult Factory | 35°C (95°F)   |
| T6                | 85°C (185°F)      | Consult Factory | 20°C (68°F)   |

**Torque Table:**

| Model  | Cast Iron           |                      | Carbon Steel        |                      | Stainless Steel     |                      |
|--------|---------------------|----------------------|---------------------|----------------------|---------------------|----------------------|
|        | Max. Speed (R.P.M.) | Max. Torque (ft-lbf) | Max. Speed (R.P.M.) | Max. Torque (ft-lbf) | Max. Speed (R.P.M.) | Max. Torque (ft-lbf) |
| G1-2   | 1750                | 20                   | 1750                | 26.9                 | 1200                | 65.2                 |
| G1-4   | 1750                | 29.5                 | 1750                | 31.1                 | 1200                | 82.9                 |
| G1-24  | 780                 | 118                  | 780                 | 187.4                | 520                 | 156.7                |
| G1-32  | 780                 | 139.8                | 780                 | 201                  | 520                 | 178.6                |
| G1-55  | 640                 | 271.3                | 640                 | 365.8                | 420                 | 327.2                |
| G1-69  | 520                 | 315.3                | 520                 | 418                  | 420                 | 365.7                |
| G1-82  | 640                 | 395.4                | 640                 | 472                  | 520                 | 404.4                |
| G1-133 | 520                 | 781.6                | 520                 | 844.5                | 350                 | 743.3                |
| G1-222 | 520                 | 1013.8               | 520                 | 1196.6               | 350                 | 1040                 |
| E1-2   | 1800                | 35                   | 1800                | 35                   | 1200                | 32.47                |
| E1-4   | 1800                | 44.9                 | 1800                | 44.9                 | 1200                | 39.9                 |
| E1-24  | 780                 | 112.11               | 780                 | 112.11               | 640                 | 94.17                |
| E1-32  | 780                 | 136.35               | 780                 | 136.35               | 640                 | 112.35               |
| E1-55  | 640                 | 294.03               | 640                 | 294.03               | 520                 | 254.03               |
| E1-69  | 640                 | 334.03               | 640                 | 334.03               | 520                 | 284.03               |
| E1-82  | 640                 | 374.03               | 640                 | 374.03               | 520                 | 314.03               |
| E1-133 | 520                 | 1053.6               | 520                 | 1053.6               | 520                 | 1053.06              |
| E1-222 | 520                 | 1050.3               | 520                 | 1050.3               | 520                 | 1050.3               |
| V2-55  | 420                 | 129.9                |                     |                      |                     |                      |
| V2-133 | 350                 | 284.7                |                     |                      |                     |                      |
| V2-254 | 280                 | 501.5                |                     |                      |                     |                      |
| V2-423 | 280                 | 757.8                |                     |                      |                     |                      |

## E-Series

### X = SPECIAL OPERATING CONDITIONS

Maximum permissible limit temperatures, depending on the respective equipment features.

Pumps with:

| Overview O-Rings          | °C/°F     |
|---------------------------|-----------|
| Viton                     | 204 / 400 |
| FEP-encapsulated Viton    | 204 / 400 |
| FEP-encapsulated Silicone | 260 / 500 |
| Kalrez                    | 260 / 500 |

| Overview Magnets                            | °C/°F     |
|---|-----------|
| M6L, M7L (N-I-B Neodymium-Iron-Boron)       | 135 / 275 |
| M6M, M7M (S-C inner mags, N-I-B outer mags) | 190 / 375 |
| M6H, M7H (S-C Samarium-Cobalt)              | 260 / 500 |

| Internal Clearance Temperature Ratings | °C/°F     |
|--|-----------|
| Standard (A, B, C)                     | 149 / 300 |
| High-Temperature (D, E, F)             | 260 / 500 |

(Please see the E Series IOM chapter on *Temperature Ratings*)



**WARNING:** When combining different features, the lowest permissible maximum temperature always applies.

**G-Series**
**X = SPECIAL OPERATING CONDITIONS**

Maximum permissible limit temperatures, depending on the respective equipment features.

Pumps with:

| Material (External) | Model   | °C  |
|---------------------|---|-----|
| Stainless Steel     | G1-2 / G1-4 / G1-24 / G1-32 / G1-55 / G1-69 / G1-82 / G1-133 / G1-222 | 260 |
| Carbon Steel        | G1-82 / G1-133 / G1-222   | 260 |
|                     | G1-2 / G1-4 / G1-24 / G1-32 / G1-55 / G1-69                           | 343 |
| Cast Iron           | G1-82 / G1-133 / G1-222   | 260 |
|                     | G1-2 / G1-4 / G1-24 / G1-32 / G1-55 / G1-69                           | 343 |

Depending on the set end clearance dimensions between the rotor / idler and the head of the gear pump of the G series, the viscosity of the pumped medium, the material and size of the pump, there are additional temperature restrictions which have pay attention to (refer to the *End-Clearance Adjustment* area of the G Series IOM, Section 5 Reassembly).



**ATTENTION:** The lowest permissible maximum temperature always applies.



**GENERAL:****WARNING / ATEX**

- o Gear pumps pose many safety and hazardous concerns. It is important to identify these hazards and incorporate all reasonable safety and operational precautions to prevent injury, damage, etc. EnviroGear is not responsible and cannot be held liable for any bodily injury and/or damage resulting from a failure to adhere to the instructions and requirements of this manual and the IOM that is shipped with the equipment.

**WARNING / ATEX**

- o Gear pumps are both positive displacement pumps and pressure vessels, and if not operated properly can be hazardous to personnel, other equipment, and/or the environment. Do not exceed the maximum fluid-housing pressure. Over-pressurizing any equipment above its design limits can cause the equipment to fail without warning, as the result of a rupture or explosion of the pressure boundary of the pump. This reaction can result in personal injury and/or death. It can also result in property and/or environmental damage. It is the user's responsibility to ensure that the equipment is not pressurized above its designed limits.

**WARNING / ATEX**

- o In any positive-displacement pump system, a reliable pressure protection device must be used in the discharge piping to avoid a dangerous pressure increase, which could cause the pump or any component in the discharge piping to burst, which could result in serious injury. A pump-mounted integral relief valve is not intended to be used in this manner.

**NOTE:** The pump-mounted integral relief valve should never be relied upon for system protection.

**WARNING**

- o E Series pumps contains powerful permanent magnets that can cause serious injury. Read the appropriate section of the IOM before doing any service work.

**WARNING**

- o The magnetic field in E Series pumps can disrupt medical implants, such as pacemakers. Implant wearers should remain a minimum of 0.3 m (1 ft.) away from pump and 1 m (3 ft.) away from disassembled magnets.

**WARNING**

- o During operation the pump surface temperature can exceed 140°F (60°C). Allow for proper cooling before any handling.

**WARNING**

- o Inner and outer magnets in E Series pumps strongly attract each other, which can crush and cut.

**WARNING**

- o Magnets inside E Series pumps the pump can damage electronic equipment or magnetic media.

**WARNING / ATEX**

- o Magnetic eddy currents present in E Series pumps generate heat in the canister. The pump is designed with an internal cooling path to limit the temperature rise. This internal cooling path will not work if the pump is run dry, run in reverse, or the cooling path becomes blocked. If these conditions may occur, even for a short period, condition monitoring is required, such as with a temperature probe.

**WARNING / ATEX**

- o The pumped fluid may be a safety and/or environmental hazard. It is likely to have high temperature and/or pressure. Additionally, it may also be toxic, corrosive to tissue, flammable, water reactive, acidic, oxidizing, explosive and/or feature other hazards. It is important to determine what hazards the pumped fluid poses to personnel, equipment and the environment and to eliminate the possibility of exposure.


**WARNING / ATEX**

- o There is a risk of fire and/or explosion if certain conditions exist. These conditions include, but are not limited to, the following:
  - Pumping flammable fluids (in some cases, an additional risk may be created by vapors or gases resulting when the process fluid escapes by leaking, component failure or improper maintenance);
  - Product used in flammable atmospheres (flammable atmospheres can be caused by the presence of gases, dusts or vapors);
  - Placement of flammable materials near product.


**WARNING / ATEX**

- o NEVER handle magnets in an explosive environment. Handling of magnets can generate a spark. Perform all maintenance outside an explosive environment. The magnets are coated with epoxy to reduce the likelihood of a spark. Particular care in handling should occur if this coating is gone.


**WARNING / ATEX**

- o Temperature monitoring is required for applications in explosive environments (ATEX) to ensure the surface temperature does not exceed the maximum allowable surface temperature. Temperatures should be monitored on the canister and head.
- o All magnet housings are sold with a temperature port for monitoring the canister temperature. The temperature port is shown in the IOM.
- o Any location on the head is appropriate for surface temperature monitoring. Equipment for monitoring head surface temperature is not provided by EnviroGear.
- o The head temperature does not need to be monitored if the pump is equipped with a head jacket or full pump jacket.


**WARNING / ATEX**

- o Cooling systems for head jackets and full-pump jackets must be routinely monitored and maintained to ensure they are properly cooling the pump. This includes monitoring the coolant temperature and ensuring

there are no closures or restrictions in the flow path. If the cooling system fails, the surface temperature of the pump may rise to dangerous levels.


**WARNING / ATEX**

- o Power monitoring is required for applications in explosive environments (ATEX) to ensure the surface temperature does not exceed the maximum allowable surface temperature. Power monitoring can determine if a pump failure has occurred and will automatically shut down the system. Power-monitoring equipment can include torque meters, amp meters, power meters, etc. Power monitors should be set based on normal pump operation and should automatically shut down the system if the limit is exceeded.


**WARNING / ATEX**

- o Applications in which oxygen is entrained within the fluid are not suitable for these units because they create an explosive environment inside of the pump.


**WARNING / ATEX**

- o Be aware of the hazards associated with the specific application and confirm that the application's environment conforms to all applicable laws, regulations and codes.


**WARNING / ATEX**

- o Do not use the product if there is any doubt about the safety of the application.


**WARNING / ATEX / ELECTRICAL**

- o Mechanical operation and flowing fluids can generate static electricity. Groundable products are required for all potentially flammable or explosive applications to prevent static spark. The pump, piping, valves, containers and other equipment must be grounded. Periodic inspection of the ground connection should be performed to ensure the equipment is properly grounded.


**WARNING / ATEX**

- o The surface temperature of the equipment must be kept below the ignition temperature of any potential explosive atmosphere. The surface temperature is affected by the temperature of the fluid being pumped and the energy added by the pump and application (e.g., recirculation of process media). The end-user must ensure that the process media and equipment's maximum temperature are acceptable for the environment.


**WARNING / ATEX**

- o Electrical products have special considerations when used in explosive environments. Ensure electrical products possess the correct rating for the intended application.


**WARNING / ATEX**

- o Gear pumps are not designed to pass solids. Solids immersed in the pumped fluid are not allowed.


**WARNING / ATEX**

- o When abrasive fluids are being pumped, additional heat may be generated in the pump.


**WARNING / ATEX**

- o Application pressures and temperatures, product maximum pressures and an acceptable factor of safety should all be considered when selecting suction and discharge piping and hoses. Consult the product IOM or your local distributor for further information.


**WARNING / ATEX**

- o Pumps shall not be operated with a blocked suction or discharge line and the operator must incorporate all reasonable safety and operational protocols to prevent this situation from occurring. If the pumps are operated with a blocked suction or discharge line, even for short or intermittent periods, the pumped fluid can superheat and/or over-pressurize

causing the pump to fail and resulting in a catastrophic explosion. Additionally, a blocked discharge line will increase the surface temperature of the pump.


**WARNING / ATEX**

- o The pump IOM specifically defines how to store, install, disassemble and maintain the pump units. If the client or its representative does not follow these instructions, a safety concern may exist and damage to the equipment may occur. EnviroGear has field service personnel that can be contracted to assist with commissioning, de-commissioning, maintaining and troubleshooting the equipment, if the customer or its representative is unfamiliar with installing, operating and/or maintaining gear pumps.


**WARNING / ATEX**

- o Ensure all operators are properly trained and employ safe storage, installation, operation and maintenance practices as outlined in the Safety Supplement and the IOM for the specific product.


**WARNING**

- o ALWAYS wear the appropriate personal protective equipment (PPE) and/or safety equipment during installation, operation, inspection and maintenance of pumps, pump components, and pump auxiliary equipment. Use caution to avoid contact with process fluids, and other chemicals. All personnel must review the Material Safety Data Sheet (MSDS) for all process and cleaning fluids and follow all handling instructions.
  - For eye protection, safety glasses (with side shields) must be worn when working with hazardous fluids or when the pump is in operation;
  - For complete face protection, a safety shields must be worn when working with hazardous fluids;
  - For ear protection, proper hearing protection must be worn. Pump noise can exceed 75 dBA under certain operating conditions;
  - For hand and finger protection, heavy-duty work gloves must be worn when working

with sharp components or hazardous fluids or when the pump is in operation;

- For hand and finger protection, insulated work gloves must be worn when handling hot components such as bearings in a hot service or when utilizing a bearing heater to install or remove bearings;
- For foot and toe protection, steel-toed boots or shoes must be worn when handling heavy parts, tools, equipment, etc.;
- It is ultimately the operator's responsibility to utilize all personal protective equipment that is required to safely work on and around the pump, its components and its operational fluid.



### WARNING / ELECTRICAL HAZARD / ATEX

- o Always ensure that the product is stored, installed, operated, inspected and maintained per the IOM and the applicable local laws, regulations and codes. Not all products are compliant to all regulatory standards. Consult your local distributor for models that meet your regulatory requirements.

## INSTALLATION:



### WARNING

- o ALWAYS verify that the model received matches the purchase order and/or specification sheet.



### WARNING / ELECTRICAL HAZARD / ATEX

- o ALWAYS ensure electrical connections are installed according to Installation, Operation and Maintenance Manual and local laws, regulations and codes.



### WARNING / ATEX

- o ALWAYS check the motor wiring during installation and prior to operation of the pump in order to confirm that the motor is rotating in the correct direction. The motor should be bumped without the coupling spacer installed to confirm that it is rotating in the correct direction. Running the motor in

the wrong direction may result in equipment damage and/or heat generation.



### WARNING / ELECTRICAL HAZARD

- o ALWAYS disconnect power supply before performing installation or maintenance procedures.



### WARNING / ELECTRICAL HAZARD

- o ALWAYS protect all electrical connections from exposure to the environment and fluids.



### WARNING / ATEX

- o ALWAYS check the chemical compatibility of all wetted components, including elastomers, with all process and cleaning fluids to minimize the risk of dangerous chemical reactions.
- o Chemical compatibility can change with process fluid concentration and temperature.
- o Check the temperature limits for all components, including the elastomers.
- o Maximum temperature and pressure limits are based upon mechanical stress only. Certain chemicals will significantly reduce the maximum safe operating temperature and/or pressure.



### WARNING / ATEX

- o ALWAYS use appropriately certified equipment for the area classification the pump will be operated in in order to prevent the generation of heat and/or sparks:
  - The motor, reducer, and all other auxiliary components must be certified for the environment they are operating in, especially when it is classified as **"potentially explosive"** or **ATEX**.
  - The coupling, coupling guard, and all other auxiliary components must be certified for the environment they are operating in, especially when it is classified as **"potentially explosive"** or **ATEX**. Non-sparking type couplings and coupling guards should be utilized for an ATEX classified environment.



**WARNING / ATEX**

- o ALWAYS check for free rotation of the shaft before startup. If the pump does not rotate freely, the pump must be serviced. Ensure there is no rubbing between the stationary components and the shaft assembly. If there is rubbing the pump must be serviced to ensure excessive temperature rise will not occur.


**CAUTION**

- o ALWAYS bolt pumps down to a secure surface that is both level and flat. During operation, unwanted movement of the pump could occur.



**WARNING / ATEX**

- o ALWAYS flush products thoroughly before installation to reduce the possibility of process-fluid contamination, debris or chemical reaction.


**CAUTION**

- o ALWAYS ensure that the equipment piping is designed and manufactured to minimize piping strain. The piping layout should also take into account the pump's thermal growth for services where the process fluid temperatures are high. Imposing high piping strains on the pump case may cause physical injury and/or result in warping of the pump components, pump and driver misalignment, and other form damage to the equipment, including premature bearing failure.



**WARNING / ATEX**

- o ALWAYS follow the detailed procedures provided in the pump's IOM for aligning the shaft. Similarly, the coupling manufacturer's Installation Operation, and Maintenance Manual must be utilized for properly installing and maintaining the coupling and spacer. Not following the manufacturer's instructions can result in significant equipment damage, generation of sparks and heat, and/or premature wear of the rotating pump components along with the seals, bearings, etc.

**OPERATION:**


**WARNING / ATEX**

- o ALWAYS check the condition of the bearings, maintain them as per the manufacturers' recommendations and the instructions supplied in the IOM. Replace damaged bearings in order to prevent bearing failures, damage to pump components and the generation of heat and/or sparks.



**WARNING / ATEX**

- o DO NOT utilize the pump for another service without prior approval from EnviroGear. Operating a pump for a different service than intended may result in personal injury and/or equipment damage.


**WARNING**

- o NEVER operate the pump without safety devices installed. Operating a pump without the safety devices may result in personal injury and/or equipment damage.



**WARNING / ATEX**

- o NEVER energize the pump motor without the correct coupling guard properly installed. Operating a pump without a coupling guard may result in personnel injury and/or equipment damage. Operating a pump with a coupling guard that is not properly installed may result in generation of sparks.



**CAUTION / ATEX**

- o DO NOT operate the pump without any liquid. Even when it is done for a short and/or intermittent period, dry-running a pump can damage the pump's internal components, thereby resulting in the generation of heat and/or sparks.



**WARNING / ATEX**

- o DO NOT operate the pump above the speed defined in the IOM. Doing so can result in equipment damage and/or an increase in the surface temperature of the pump.


**WARNING / ATEX**

- o ALWAYS reference the ATEX temperature table for guidelines on the process-fluid temperature limits. Process-fluid temperature can affect the surface temperature of the pump. The process-fluid temperature should never exceed the rated temperature for the appropriate ATEX level.


**WARNING / ATEX**

- o DO NOT operate the pump in reverse rotation. If a pump is operated in reverse rotation, it may cause the fluid and pump to overheat and the stationary and rotating components to come in contact. Running the pump in reverse rotation may result in personnel injury, damage to equipment, and contamination or leakage to the environment.


**WARNING / ATEX**

- o DO NOT operate the pump with an obstructed discharge line (i.e., a closed discharge valve) in order to prevent equipment damage and/or an increase in the surface temperature of the pump.


**WARNING**

- o DO NOT operate the pump with an obstructed suction line (i.e., a closed suction valve or a dirty strainer basket) in order to prevent equipment damage.

**MAINTENANCE:**

**WARNING / ELECTRICAL HAZARD**

- o ALWAYS lock out power to the driver before performing pump maintenance and when the unit is not in operation to avoid accidentally running the driver in order to prevent personal injury and/or equipment damage.


**WARNING / ATEX**

- o NEVER handle magnets in an explosive environment. Handling of magnets can generate a spark. Perform all maintenance outside an explosive environment.


**WARNING**

- o The inner magnets on the back of the rotor assembly on E Series pumps are strongly attracted to the outer magnets in the outer drive assembly. During the separation process, there will be a strong force of up to 136 kg (300 lbs.) trying to pull them back together, which can create a powerful pinch point.


**WARNING**

- o ALWAYS completely decontaminate pumps handling toxic and/or hazardous fluids prior to removal from the system. All applicable government, industry and company regulations, procedures and requirements must be followed in order to properly decontaminate the pumps and dispose their waste. Ensure all necessary precautions are taken, including the use of Personal Protective Equipment (PPE), to prevent any physical injury during the decontamination of the pump and/or system.


**WARNING**

- o ALWAYS isolate the equipment from the system and ensure that the pump's internal pressure has been relieved prior to disassembling the pump in order to prevent any physical injuries. This can be achieved by opening any vent connections or by disconnecting piping spools (suction, discharge, etc.).


**WARNING / ATEX**

- o ALWAYS check for free rotation of the shaft during maintenance. If the pump does not rotate freely, the pump must be serviced. Ensure there is no rubbing between the stationary components and the shaft assembly. If there is rubbing the pump must be serviced to ensure excessive temperature rise will not occur.


**CAUTION**

- o ALWAYS let the pump cool down prior to handling or working on it in order to prevent any physical injuries.

**WARNING**

- o ALWAYS use the appropriate lifting device (eyebolt, spreader bar, sling, etc.) with the correct rating to properly secure and lift equipment to avoid serious physical injury and/or equipment damage. The pump, individual pump components and pump auxiliaries can be heavy and cumbersome to lift.

**WARNING / ATEX**

- o NEVER apply heat to the pump's liquid end to facilitate the removal of any components. when disassembling the pump. Doing so can cause trapped liquid to expand rapidly and explode, thereby resulting in personal injury and/or equipment damage.

**WARNING**

- o ALWAYS ensure that only new fasteners, or fasteners that are undamaged and corrosion-free, and are of the proper size and material, are used and tightened as per the pump's IOM requirements and instructions in order to prevent personal injury and/or equipment damage.

## Where Innovation Flows



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