Installation, Operation, and Maintenance Manual

TONKAFLO* SS5500, SS8500, SS12500, SS24000
Medium pressure TONKAFLO* pumps with D or G bearing frames

WATER TECHNOLOGIES

VEOLIA

System Part No.: 1115631

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Document information

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Rev.	Date	Description	Initials
A	7-Apr-2025	New document. Veolia branded.	SB

NOTICE

This manual must be retained with the TONKAFLO pump for future reference.

If the product or system is sold or transferred to another owner, or if the existing owner relocates and leaves the product or system behind, ensure that this manual and related documents are supplied to the new owner.

Veolia Water Technologies
veoliawatertechnologies.com

Preface

About this manual

This Installation, Operation, & Maintenance Manual (“Manual”), includes warnings and guidance required to safely install, operate, and maintain the Veolia TONKAFLO pump. Before installing, operating, and maintaining the TONKAFLO pump, the owner and its employees, contractors and agents (collectively, the “Owner”) must read and fully understand the IOM Manual and any supplemental supporting materials and additions/modifications of the Manual that were provided separately.

If the Owner does not fully understand the information provided in the Manual, or if the Owner perceives there to be ambiguities or uncertainties with any part of the installation, operation, or maintenance of the TONKAFLO pump, do not proceed with installation, operation, or maintenance until you have contacted Veolia for additional information and clarification.

Contact information can be found in *1.2.2 Contact information*.

FAILURE TO READ AND FULLY UNDERSTAND THE MANUAL AND TO SEEK ADDITIONAL INFORMATION FROM VEOLIA WHEN QUESTIONS OR UNCERTAINTIES ARE PERCEIVED TO ARISE BEFORE INSTALLATION, OPERATION, AND MAINTENANCE COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH, BROKEN OR DAMAGED PARTS/EQUIPMENT, AND/OR WATER QUALITY ISSUES AND RESULTING HARM.

If the content of this Manual is altered or sections or items are omitted during a reproduction (by the owner), in whole or in part, and instructions or definitions within the reproduction result in personal injury to those who follow the altered instructions, the burden of responsibility for personal injury falls solely on the party who affects the reproduction.

Deviations or modifications of this Manual suggested by Veolia field personnel or other employees do not supersede the Manual unless stated in writing by Veolia.

If owners are interested in requesting and purchasing professional installation, operation, maintenance, inspection and training services for its products, contact their Veolia representative.

This Manual applies generally to all TONKAFLO pumps and, as a result, could contain instructions, statements and information about installations, uses, operations or other features that may not apply to all TONKAFLO pumps. To purchase a customized package applicable to your product, contact Veolia.

Proprietary information

This Manual discloses information in which Veolia has proprietary rights and is disclosed in confidence.

It is to be used solely for the purpose for which it is supplied and returned upon request. This Manual and such information is not to be reproduced, transmitted, disclosed or used otherwise in whole or in part without the written authorization of Veolia. The information contained in these documents may also be controlled by export control laws in applicable countries. Unauthorized export or re-export is prohibited.

ISO safety symbols are used under license. When printed in black and white, these images represent modified versions of the symbols.

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Disclaimer

This Manual may include original manufacturer's literature. This Manual and literature should provide complete and accurate information to meet your operating and/or service requirements based on the information available at the time of publication. However, Veolia assumes no responsibility for the technical content of the original manufacturer's literature.

The information in this Manual and literature may not cover all operating details or variations, or provide for all conditions in connection with installation, operation, and maintenance. If questions arise that are not answered specifically in this Manual, contact the Veolia Service Department.

Veolia reserves the right to make engineering refinements that may not be reflected in this Manual. The material in this Manual and literature is for informational purposes and is subject to change without notice.

This Manual is not intended to modify, amend or otherwise change the terms and conditions pursuant to which the TONKAFLO pump was purchased, nor be construed as containing or otherwise giving rise to express or implies warranties, each of which are hereby disclaimed. Refer to the warranty information in the contract pursuant to which the Veolia product was purchased.

Service information

It is recommended that owners complete the following fields upon receiving the system. This information will be helpful when requesting service and support.

System provider information

System provider:	
Contact:	
Phone:	
Fax:	
Email:	

System information

Installation date:	
Model number*:	
Serial number*:	

** Model and serial number information can be found on the nameplate located on the system's electrical panel.*

Management system certification

For a copy of the applicable Veolia management system certification, see the following page or pages.

Current issue date:	23 December 2024	Original approval(s):
Expiry date:	22 November 2027	ISO 9001 - 28 December 1999
Certificate identity number:	10661637	ISO 14001 - 8 January 2004

Certificate of Approval

This is to certify that the Management System of:

VEOLIA Water Technologies & Solutions

3600 Horizon Boulevard, Trevose, PA, 19053, United States

has been approved by LRQA to the following standards:

ISO 9001:2015, ISO 14001:2015

Approval number(s): ISO 9001 – 0011964, ISO 14001 – 00023378

This certificate is valid only in association with the certificate schedule bearing the same number on which the locations applicable to this approval are listed.

The scope of this approval is applicable to:
Research & Development, Sales, Onsite Product and Application Support, Commercial Operations, Customer Care, Design, Engineering, Project Management, Procurement, Manufacturing, Assembly, Warehousing, Installation, Commissioning, Laboratory Analysis, Remote Technical Support, Field Service and Support, Remote Monitoring, Diagnostics and Analytics, Water Treatment Equipment, Mobile Water Treatment Equipment, Pilot Equipment, Operation and Maintenance of Water Treatment Plants, Biosolids Treatment, Analytical Laboratory Process Control Instruments, Distribution of Analytical Reagents and Reference Standards, Manufacture and Distribution of Water Treatment Chemicals as Applicable to the Following Industries: Chemical Processing, Facilities, Refining, Food & Beverage, Microelectronics, Metals & Mining, Municipal, Pharma & Life Sciences, Power, Pulp & Paper, Upstream Oil & Gas and others in need of Water and Process Treatment Solutions.

David Derrick

Regional Director, UKAM

Issued by: LRQA Limited

ANAB
ANSI National Accreditation Board
ACCREDITED
ISO/IEC 17021-1
MANAGEMENT SYSTEMS CERTIFICATION BODY

Issued by: LRQA Limited, 1 Trinity Park, Bickenhill Lane, Birmingham B37 7ES, United Kingdom

Certificate Schedule

Location	Activities
Ashland, VA 10991 Leadbetter Road, Ashland, VA, 23005, United States	**ISO 9001:2015** Laboratory Analysis, Pilot Equipment and Warehousing.
Bellevue, WA 3006 Northup Way, Suite 200, Bellevue, WA, 98004, United States	**ISO 9001:2015** Sales, Onsite Product and Application Support, Commercial Operations, Design, Engineering, Project Management, Procurement, Installation, Commissioning, Field Service and Support, Water Treatment Equipment and Biosolids Treatment.
Richmond 4880 Cox Road, Suite 101, Glen Allen, VA, 23060, United States	**ISO 9001:2015** Research & Development, Sales, Onsite Product and Application Support, Commercial Operations, Customer Care, Design, Engineering, Project Management, Procurement, Installation, Commissioning, Field Service and Support, Water Treatment Equipment, and Biosolids Treatment.
Oakville, Canada 3239 Dundas Street West, Oakville, L6M 4B2, Canada	**ISO 9001:2015** Research & Development, Sales, Onsite Product and Application Support, Commercial Operations, Customer Care, Design, Engineering, Project Management, Procurement, Manufacturing, Warehousing, Installation, Commissioning, Remote Technical Support, Field Service and Support, Remote Monitoring, Diagnostics and Analytics, Water Treatment Equipment, Mobile Pilot Water Treatment Equipment, Operation and Maintenance of Water Treatment Plants, and Biosolids Treatment.

ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17021-1 MANAGEMENT SYSTEMS CERTIFICATION BODY

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Contents

1 Introduction

1.1 Safety and note statements

Throughout this manual, statements are included in the text to highlight safety hazards, notices, and general notes. All personnel must acknowledge these when working on plant or equipment. Examples of these types of statements are:

DANGER	
ISO symbol	**{Hazard}** {Statement that warns of a specific danger or radiation hazard that may present the threat of death.}

WARNING	
ISO symbol	**{Hazard}** {Statement that warns of a potential hazard that could cause serious injury.}

CAUTION	
ISO symbol	**{Hazard}** {Statement that warns of a potential hazard or calls attention to an unsafe practice that presents a lesser threat of injury.}

NOTICE	
ISO symbol	{Statement that warns of a hazard to equipment or a hazard that does not present a danger to personnel.}

NOTE: *{Statement that highlights important information about the plant, about equipment use, or procedural advice.}*

TIP: *{Statement that highlights a way to make a procedure easier to perform.}*

1.2 Service and support

This section provides information regarding the various support services offered by Veolia Water Technologies. All service bulletins associated with this system are to be inserted at the end of this section.

1.2.1 Available services

Veolia delivers a comprehensive range of services beyond system design and installation. Contact the Service Department to inquire about the following services:

- InSight remote monitoring support and data analysis
- site visits and component audits
- training programs
- 24/7 technical support
- additional operator training
- emergency call-out support
- OEM components and consumable products inventory
- Operation & Maintenance agreements
- plant commissioning, optimization, and upgrades
- system controls support
- component calibration and preventive maintenance planning.

1.2.1.1 InSight remote monitoring

InSight is an automated service that captures and stores plant data in the cloud. This data is then transformed into meaningful information, providing the knowledge needed to optimize plant processes. With InSight, operators and selected personnel from Veolia can assess trends and detect problems quickly, allowing them to take action to avoid operational interruptions.

Available in a variety of ways (web, mobile, email), the information provided by InSight makes it easier to monitor the plant and follow Veolia best

practices. InSight users can review historical and current plant performance, helping them to ensure maximum membrane life and asset utilization. Additionally, the automated data collection feature reduces the tedious work of entering and reporting operator-collected data, including data required for membrane warranties.

It tracks cleans, production, gives guidance on time for membrane replacement and much more. Digital files (likely through Scada) are recommended if InSight is not used.

Contact Veolia for additional information regarding InSight.

1.2.1.2 Site visits

Veolia service professionals are on-hand for both emergency service calls (call-outs) and planned service visits. Areas of plant operation that they can assist with include instrument calibration, preventive maintenance planning, process monitoring, and programming modifications. Contact the service department and ask them to develop a service plan tailored to this system.

Emergency call-outs are invoiced based on the field services labor rate sheet, which can be obtained by contacting Veolia.

1.2.1.3 Training

Customized training packages are available. Contact Veolia for more information.

1.2.2 Contact information

To contact Veolia for TONKAFLO pump service or support, see the following information:

Address: (Minnetonka office) 5951 Clearwater Drive, Minnetonka, MN 55343-8995

Phone: 952-933-2277

Fax: 952-933-0141

Toll free: 1-800-848-1750

email: technicalsupport@veolia.com

1.2.2.1 Ordering parts

To order parts, the following information is necessary:

- Pump model number (see pump label).
- Pump serial number (see pump label).
- Other nameplate information such as operating temperature, materials of construction, or material code and type of mechanical seal.
- Motor horsepower, motor frame size, and enclosure specification.
- Part name.
- Part number.
- Quantity desired.
- Specific materials of construction, if any.

1.2.3 TONKAFLO service policy - liquid ends

NOTICE	
	For motor service, motors must be sent to the nearest authorized motor service center for repair, replacement and warranty disposition.
	Field service of the liquid end, with the exception of mechanical seal replacement, is not recommended.

The maintenance manual was written to assist customers in performing minor maintenance in the field on TONKAFLO pumps. Proper maintenance ensures longer pump life and minimizes down time.

TONKAFLO pumps are manufactured to make field repairs on the mechanical seal a quick and easy process. Bearing frame overhauls may be done by the customer, a local maintenance shop, or the factory. If repair at the factory is desired, perform the following:

1. Call Veolia for a Return Goods Authorization (RGA) number.
2. Send the complete pump, without motor, to the factory.

For motor problems, such as worn out motor bearings, it is recommended that maintenance be done at a local motor repair shop.

If a liquid end is damaged by running the pump dry, inadequate flow, excessive deadheading, cavitation, or other reasons, contact a TONKAFLO distributor certified for service or return the pump without motor to the factory for repair.

The pump has an oil-lubricated bearing frame between the pump liquid end and the motor.

To return an oil-lubricated bearing frame pump to the factory, Veolia requires the whole unit (pump liquid end, bearing frame, and motor adapter) less the motor and flexible coupling pieces. If the motor adapter is not returned, Veolia will connect a new motor adapter to the repaired pump liquid end/bearing frame and the client will be billed for it.

If a new bearing frame needs to be attached to the pump liquid end to perform a test, it will be shipped with the repaired liquid end of the pump and the client will also be billed for it.

1.2.4 TONKAFLO pump repair procedure

If a pump needs repair:

1. Contact Veolia's Customer Service Center for pricing and the procedure for placing a pump repair order.This information and forms to be filled and can be found online at https://pumptools.watertechnologies.com/PumpRepair.
2. When contacting Veolia's Customer Service Center, have the original sales order or invoice available.

All equipment must be shipped to Veolia with the freight prepaid by the customer.

Call the Customer Service Center with any questions or issues concerning freight claims and a representative will discuss the situation.

All materials to be returned must be rendered into a non-hazardous condition prior to shipping.

Returns can be handle in either of the following ways:

- Send in the pump for repair and return.
- Purchase a new pump and, when desired, send the defective pump to the factory for repair and return.

1.2.5 Motor warranty

Motors must be sent to the nearest authorized motor service center for repair, replacement, and warranty disposition.

1.2.5.1 Liquid end pump warranty

Warranty information can be found in the sales quote or invoicing information. Contact Veolia or technical support for more information.

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2 Safety

2.1 About this section

This section includes:

- general safety procedures and best practices, including those related to personal and environmental safety. They follow the Occupational Safety and Health Administration (OSHA) standards. However, it is the responsibility of the operator to follow their company policy regarding rules and regulations.
- safety information specific to the system, including how to work safely with or around the equipment.

This manual does not supersede safety information in the manufacturer's instructions (where provided) for specific components.

DANGER

Not to be Serviced by Users

Only qualified and certified personnel shall perform work on the TONKAFLO pump.

WARNING

Read the manual

The operator must read and fully understand all instructions in this manual before using this system. Failure to follow safety guidelines or instructions could result in severe personal injury or death, broken or damaged parts/equipment, and/or water quality issues and resulting harm.

CAUTION	
	**General Hazard** The measures and procedures outlined in this manual do not address all of the safety concerns associated with operating this system, and do not take the place of a properly designed and implemented facility safety program. It is the end user's responsibility to establish appropriate safety and health practices and ensure that they are implemented.
	**General Hazard** Veolia typically works with transportation carriers who understand the equipment and how to secure it properly. If transportation is required, work with Veolia to develop a procedure for transport.

2.2 Personal safety

The following sections provide general guidelines regarding personal safety and cleanliness. Refer to local codes and regulations for more detailed information.

2.2.1 Personal protective equipment

The equipment listed here constitutes the minimum scope of protective gear that must be available to all operators. National and local codes and regulations may require the use of additional equipment beyond what is mentioned below.

Perform a Personal Protective Equipment (PPE) assessment before starting work to determine what PPE are required for the job. Once the PPE are identified, they must be worn during the duration of the job task to protect the employee from any potential hazards that can be caused while performing work.

2.2.1.1 Head and facial protection

At all times while in the plant operating area, wear a hard hat and safety glasses with side shields.

When handling chemicals or working near pressurized lines, (air and liquid), wear gloves and a full face shield.

When exposed to noise levels that exceed 80 dB, wear adequate hearing protection.

2.2.1.2 Hand and foot protection

When working with chemicals, or membranes coated with chemicals, wear chemical-resistant gloves.

When working near thermal or puncture hazards, wear puncture-resistant gloves (example: leather).

At all times while in the plant operating area, wear safety boots with crush-resistant toe caps.

2.2.2 Walking and working surfaces

Slips, trips and falls remain one of the most common causes of employee injury in the workplace. It is important to adequately maintain walking and working surfaces, and take precautions such as housekeeping and wearing proper shoes. Avoid ladder use if possible but, if necessary, observe proper ladder use. Watch for grating clips. Clips should keep grating pieces together and flat to avoid trip and fall hazards.

2.2.3 Temperature extremes

Heat illness becomes a special concern during hot weather due to the body's inability to cool itself during high temperatures and humidity. Take precautions such as hydrating the body with water, wearing light-colored clothing, and working in the shade if possible. Employees who feel lightheaded, nauseous, fatigued, or otherwise unwell must immediately stop work.

NOTE: *Feeling thirsty is a late sign of dehydration. Drink plenty of fluids like water in both hot and cold climates.*

Exposure to freezing and cold temperatures for extended periods of time may cause serious health problems such as trench foot, frostbite, dehydration, hypothermia and death in extreme cases. Employees working outside in the winter months and those working in walk-in freezers are especially vulnerable. Take precautions such as dressing in warm layers, taking frequent short breaks in warm dry shelters to allow the body to warm up, avoiding exhaustion or fatigue to preserve energy, and drinking warm beverages (avoid caffeine).

2.2.4 Fall protection

A fall protection system is required when working in a position where the possibility of falling more than four (4) feet (1.2 m) is present. Wear an approved safety harness in accordance with national and local safety requirements. The harness safety line must not allow the person to fall more than 0.6 m (2 ft) before arresting the fall *(similar to OSHA Standard*

1910.140), and the harness anchor points must be adequate to support a falling person. It is illegal to use railings as fall protection anchors, for both arrest and restraint, unless they are engineered for that purpose. The standard railings supplied by Veolia with membrane tanks must not be used as anchors.

***NOTE:** If a travel restraint frame is supplied, it is to be used for fall restraint only, not fall arrest.*

2.3 Safety on site

The following sections provide information regarding general site safety and proper conduct during various procedures that may be performed onsite. This information is not intended to replace or override national or local codes and regulations.

Hold pre-job inspections and meetings before each shift to discuss safety concerns before working.

2.3.1 General precautions

The following list provides general recommendations intended to ensure the safety of personnel working in and around the system operating area:

- Ensure that all personnel have been made familiar with the proper operating procedures described in this manual and in the manufacturers' instructions for specific components (example: pumps, valves) *(see A Appendix: Project documents)*. In particular, emphasize procedures related to the handling of acidic or caustic chemicals, as well as the maintenance of pressurized lines or components with rotating parts.
- Ensure that safety shower and eyewash stations are operational and located within 10 seconds travel-time of areas where chemicals will be used (10 seconds travel time is generally considered equivalent to 15 m (50 ft) across an unobstructed path).

- Consider installing an alarm (visible and audible throughout the plant operating area) that will activate if an emergency shower or eye wash station is used.
- Follow lockout/tagout (LOTO) rules and training for situations where the uncontrolled release of energy could occur.
- When preparing to perform maintenance on pipes or tubing, ensure that all connected lines are either isolated or emptied in accordance with all relevant local government, industry, and facility regulations.
- Follow Confined Space entry rules and training when entering tanks, pits, vaults and other areas not designed for human occupancy *(see 2.4.2 Entering confined spaces)*.
- Personnel engaged in a procedure where the possibility of severe injury could be high (example: entering a confined space, lockout/tagout) must work under the supervision of a colleague prepared to provide assistance if required *(see 2.4 High-risk procedures)*.
- Ensure that all machine and equipment guards and other coverings are securely installed before activating either a specific component or the system as a whole.
- Keep up with all preventive maintenance schedules provided in both this manual and in the manufacturer's instructions for individual components (example: pumps, valves) *(see A Appendix: Project documents)*.
- Install spray curtains or acrylic shields around all chemical skids and ensure that eyewash stations and showers are available nearby in case of a chemical spray or leak.
- Ensure that chemical-resistant protective clothing is worn by all personnel working near acidic or caustic substances (corrosives), or components that may contain these substances.
- Ensure that all personnel working with hazardous chemicals are properly trained and familiar with both government and plant-specific safety requirements, as well as the Safety Data Sheets (SDSs) for those chemicals.

- Ensure that areas where chemicals will be handled are well lit and areas will not obstruct safe handling of the chemicals.
- Personnel engaged in a procedure they do not feel properly trained for must stop work immediately and seek advice from a supervisor.

2.3.2 Safety inspections

It is recommended that the following checks and inspections be completed before starting up the system for the first time:

Check or inspection	[X]
Know where evacuation meeting zones are located.	
Test all safety showers and eye wash stations.	
Identify the location of the nearest First Aid kit.	
Ensure that all chemical flange guards are fitted properly.	
Post contact information for emergency services in a highly visible location.	
Ensure that all operators, coworkers, and visitors are familiar with applicable safe workplace practices and regulations.	
Confirm all pump shutoff and emergency stop switch locations.	
Ensure that all couplings and connectors have been tightened according to the required torque values.	
Confirm that all components are properly tagged.	
Ensure that there is adequate space and lighting around all components for viewing of correct operation and maintenance activities.	

Check or inspection	[X]
Store all required chemical protective gear near the chemical skids and in a clean, dry place. This includes, but is not limited to, full-face shields, rubber suits, and gloves.	
Ensure all components are clean and undamaged.	
Ensure that a system for maintaining up-to-date operating records is in place.	
Ensure that guidelines are in place to prevent operating temperatures from exceeding permitted limits.	
Ensure that adequate ventilation and air-quality monitoring measures have been installed and are operating, as applicable and in accordance with all relevant national and local government, industry, and facility regulations. Mechanical ventilation, such as fans, may be required.	

2.3.3 Electrical and thermal hazards

DANGER	
	**Not to be Serviced by Users** Only qualified personnel must perform installation and maintenance procedures for electrical components.
	**Electrical Hazard** Avoid wetting control cabinets and electrical systems. Risk of short circuit.

SERVICING ENERGIZED COMPONENTS: Even with the power switch in the OFF position, certain components inside a control panel or other electrical device may remain energized. No service work can be performed until the power supply to the device is first disconnected and equipment is verified as unenergized before touching it with hands or tools *(see 2.4.1 Locking out components)*.

HEATED SURFACES: Areas on certain components, such as pumps, can become heated to the point where contact with skin will inflict severe burns. Ensure that all safety guards and other protective measures are in place, including proper labeling. Familiarize personnel working with or around such components with the relevant manufacturer's instructions *(see A Appendix: Project documents)*.

2.3.4 Mechanical hazards

TRAINING AND EQUIPMENT: Before working with any mechanical component or chemical, operators must be fully trained and equipped with all necessary protective equipment, as outlined in the relevant manufacturer's instructions *(see A Appendix: Project documents)*.

GENERAL: When operating machines, take the following precautions to limit failures, maintenance work, and production shutdowns:

- Do not short-circuit safety devices and force limiters.
- Do not force the operation of machines.
- Do not use the emergency stop buttons unless there is actually an emergency. Follow shutdown procedures.
- Do not operate machines without fluid.
- To avoid the fouling of mechanisms and to facilitate, maintenance work, keep equipment clean.
- Operate valves as slowly as possible to avoid water hammer phenomena, which could cause pipes to explode.

PUMPS: When working with or around pumps, take the following precautions:

- Before performing maintenance, isolate (lock out) and drain all piping connected to a pump.
- Before performing maintenance, turn off power to a pump and complete all lockout procedures and permits required by government and plant-specific regulations *(see 2.4.1 Locking out components)*, as well as any

included in the manufacturer's instructions *(see A Appendix: Project documents)*.

- After completing maintenance, replace any guards, interlock switches, or other safety components removed during the procedure.
- Personnel working on pumps used to transfer chemicals must be familiar with the safe-handling procedures associated with the chemicals involved. Refer to the applicable SDSs and company procedures for appropriate safe-handling instructions.
- When working with diaphragm pumps used to transfer chemicals, be aware that some media may remain within the pump's diaphragm chamber even after the pump has been drained. This media can be hazardous to people.

COUPLINGS: During installation, ensure that all couplings have been tightened according to the required torque values. Also, inspect the tightness of all couplings on a regular basis and inspect for leaks regularly. For more information regarding torque values for a specific coupling, refer to the manufacturer's instructions *(see A Appendix: Project documents)*.

TIP *For systems equipped with Straub couplings, torque values for each coupling are provided on a decal applied to the coupling itself.*

WARNING	
	**Risk of Explosive Rupture or Violent Release** Failure to tighten a coupling according to the manufacturer's required torque values may result in an explosive rupture or violent release. Following installation, inspect all couplings for tightness as part of the regular preventive maintenance process.

2.3.5 Chemical hazards

Working with chemicals poses a number of potential safety hazards. Although direct contact with chemicals can pose a hazard, many chemicals

give off vapors that also pose a health risk. In addition, events can occur that lead to contaminate off-gassing, which can cause hazardous conditions, posing a threat to personnel or equipment.

It is recommended that airborne concentrations of chemical contaminates be assessed regularly to ensure permissible exposure limits are not exceeded.

Many chemicals are considered dangerous. It is important to pay attention to labels and SDS information, and to know how to identify and handle them.

DANGER	
	**Chemical Hazard** Some chemicals are considered noxious or irritants. Some examples are citric acid, 38% sodium acid sulfite (sodium bisulfite), and ammonia.
	**Corrosive Chemical Hazard** Some chemicals are considered corrosive. Some examples are sodium hydroxide solution, citric acid, hydrochloric acid, and sodium hypochlorite.
	**Toxic Chemical Hazard** Some chemicals are considered toxic. Some examples are gaseous and liquid chlorine.
	**Environmental Hazard** Some chemicals are harmful to the environment. Some examples are ammonia, sodium hypochlorite, sodium hydroxide solution, acids, and gaseous and liquid chlorine.

CAUTION	
	**Chemical Hazard** Many chemicals give off vapors that pose a health risk.
	**Wear appropriate PPE** Always wear appropriate Personal Protective Equipment (PPE) and avoid breathing chemical mist, vapors, or dusts. Refer to the chemical SDS for guidance on appropriate PPE.

SDSs: Retain all SDSs for chemicals purchased from suppliers or manufacturers other than Veolia and file them alongside those that may have been provided by Veolia *(see A Appendix: Project documents)*.

TRAINING: Before working with any chemical, operators must be fully trained and equipped with all necessary protective equipment, as outlined in the relevant manufacturer's instructions. *(see A Appendix: Project documents)*

CHEMICAL FUMES: Ensure chemical vapors, fumes, mists, and dusts are properly ventilated. If venting to the outside with a risk of freezing, ensure venting lines are heat-traced. In addition, ensure chemical vapors are neutralized in accordance with local facility, industry, and government regulations and permits. Refer to the SDS for more information.

BIOLOGICAL HAZARDS: Working with wastewater and water treatment processes frequently generate airborne biological hazards. Take precautions and follow company guidelines, and avoid "gas and dust clouds" as they may be biological gases, vapors, or aerosols.

2.3.6 Pinch and fall hazards

DANGER	
	**Rotating Parts Hazard** Exposed rotating parts can catch clothing, fingers, or tools and cause severe personal injury or death.

ROTATING COMPONENTS: Before operating components with rotating parts or other possible pinch hazards, ensure that all shields, guards, and emergency stop switches are in place.

FALL HAZARDS: Fall hazards include any situation where the possibility of either personnel or equipment falling from a significant height (approximately 1.2 m (4 ft)) is present. The possibility of falling onto dangerous equipment is also considered a fall hazard. Ensure that personnel exposed to this risk are secured using a fall-protection harness and that all fall-protection equipment involved is stored and handled in a way that prevents it from being cut, exposed to chemicals, or otherwise damaged. *(similar to OSHA Standard 29 CFR 1910.140)* *(see 2.2.1 Personal protective equipment)*.

2.3.7 Noise hazards

Extended exposure to excessive noise levels can be harmful to human hearing. When the possibility of exposure to noise levels above 80 dB is present (systems with large motors, fans, and so on may be above regulatory limits), use adequate hearing protection at all times. The general guidance is, if someone needs to raise their voice to communicate with another person about three (3) feet (one meter) away, a more comprehensive noise evaluation may be required. Guidance for hearing protection is based on an eight (8) hour possible exposure period.

Impulse or sudden noise levels in excess of the peak exposure standard of 140 dB(C) are considered to be hazardous and capable of causing immediate hearing damage. Single or double hearing protection is required when working in areas where levels are above the OSHA permissible exposure limit (PEL). Consult **https://www.osha.gov** (Standard 29 CFR 1910) for additional guidance.

Once the equipment is installed, perform a noise study to determine if hearing protection is required. If unsure of noise levels, encourage operators to use adequate hearing protection at all times.

2.3.8 Pressure and rupture hazards

Some pumps and compressors are capable of pressurizing lines to as much as 1,000 psi (69 bar), and the danger of an explosion due to

overpressurization may arise if proper operating procedures are not observed.

All pressure-regulating devices, such as relief valves, must be checked regularly according to manufacturer's instructions *(see A Appendix: Project documents)*.

Tubing used to convey pressurized air, such as actuated valve air lines (typically operated at 80 psi (5.5 bar)), must be regularly inspected for cracks. Unintended air line leaks must be repaired promptly.

2.3.9 Environmental hazards

The Veolia commitment to environmental management is to establish systems that meet or exceed environmental standards in all activities. It is the Owner's responsibility to ensure that the environment is protected by taking ownership and enforcing environmental laws and regulations according to federal and local jurisdictions.

Learn about Owner waste disposal methods to assist in recycling and waste disposal efforts. Minimize waste generation when possible.

2.4 High-risk procedures

DANGER	
	**Follow the Manual** The following procedures pose a significant risk to personnel involved. The possibility of severe injury or death will be significant if the instructions provided below, as well as in all relevant local government, industry, and facility regulations, are not followed.
	**Not to be Serviced by Users** Only qualified, trained, and approved personnel shall perform high-risk procedures.

Procedures that are considered "high-risk" must be controlled by detailed protocols and must be performed only by properly trained personnel. The specific tasks and training involved with a high-risk procedure will vary

between systems and must be developed in accordance with all local government, industry, and facility regulations.

The following list of common high-risk procedures is provided only as a guideline and is neither specific to this system nor comprehensive:

- Working with energized electrical equipment.
- Work that requires one or more components to be locked-out and tagged out *(see 2.4.1 Locking out components)*.
- Entering confined spaces *(see 2.4.2 Entering confined spaces)*.
- Working at a significant height or over dangerous equipment.
- Breaking chemical and/or steam lines.
- Hydrostatic testing.

The following sections provide additional information regarding common high-risk procedures but are not intended to be comprehensive nor to override local regulations.

2.4.1 Locking out components

Components need to be locked out or tagged out to help prevent:

- contact with a hazard where safeguarding devices need to be temporarily bypassed, removed, or deactivated
- the unintended release of hazardous energy (stored energy)
- the unintended startup or motion of equipment, machinery, or processes.

WARNING	
	**General Hazard** All relevant local guidelines and procedures must be observed.
	**Not to be Serviced by Users** Only operators qualified to work with the device must perform a lockout procedure.
	**Lock Out / Tag Out Equipment** Locks and lockout tags must be applied before performing the lockout procedure and must be removed only after work has been completed and by the person who applied them.
	**Equipment Hazard** Never bypass or disable an interlock.

2.4.2 Entering confined spaces

WARNING	
	**Confined Space** Only operators trained to work in confined spaces shall enter them or attempt to perform work in them.

Any area characterized by one or more of the following features must be considered a confined space:

- the possible or likely accumulation of hazardous gases, vapors, dust, fumes, biological contaminants, or the space where creation of an oxygen-deficient or flammable atmosphere may occur
- a space not designed for human occupancy

- access is gained through a restricted entry as a result of design, orientation, or location. Internal structures like piping may make leaving the area difficult.

Veolia strongly recommends that any personnel required to enter a confined space first complete an official confined space entry training program.

2.5 Safety Data Sheets (SDS)

The Globally Harmonized System (GHS) is an internationally adopted system for the classification and labeling of hazardous chemicals. Safety Data Sheets (SDSs) are an essential component of the GHS and are intended to provide information about a substance or mixture for use in workplace chemical management.

SDSs are summary documents that provide information about the hazards of a product or chemical and advice about safety precautions for safe handling, use, and storage. When authorities adopt GHS for their own chemical hazard communication system, they often issue their own GHS regulations or GHS standards. This can vary by jurisdiction and some countries may have set additional requirements on some sections of GHS SDSs.

For chemicals supplied by Veolia, the latest SDSs can be found at **https://www.watertechnologies.com/msds**.

If the chemicals are not Veolia branded products, the SDS is provided by the manufacturer or supplier of the product.

Print these sheets and keep them near the system, readily accessible to all users on every shift of work. They must be reviewed by all users, including emergency responders, to communicate information on these hazards. They must be reviewed at the beginning of the initial job assignment and again if there is a change to the chemical formula or the process the chemical is used in. The information contained in the SDS provides guidance to help workers who handle hazardous chemicals to become familiar with the format and understand the contents of the SDSs. The SDS includes information such as the properties of each chemical; the physical, health, and environmental health hazards; protective measures; and safety precautions for handling, storing, and transporting the chemical. The

improper handling, storage, and disposal of materials involved with this system may result in costly equipment damage and injuries.

If there are any questions concerning these chemical products and the information contained on a specific SDS, contact the manufacturer *(see A Appendix: Project documents)*. Veolia will not be held responsible for incorrect or missing information.

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3 Overview and design

3.1 About this section

This section provides an overview of the system and its design. It describes how the system works, how water flows through the system, and what the system parameters are.

3.2 Design and theory of operation

This section provides a general description of the TONKAFLO pump, including its primary components, design, and theory of operation.

NOTICE	
	Operating this system in a manner that deviates substantively from the Veolia instructions and best practices may render the warranty null and void. If an alternate mode of operation (example: revised cleaning frequency) is being considered, contact Veolia to request warranty approval before making any changes *(see 1.2 Service and support)*.

3.3 System design parameters

The instructions provided in this manual refer to the medium capacity SS5500, SS8500, SS12500, and SS24000 Series pumps with D- and G-Bearing frames.

The TONKAFLO Pumps SS Series has been designed for reliable service in many types of pumping applications. The materials of construction make these pumps suitable for many chemical and pure water applications. Their unique modular design allows the user to choose the number of stages that most closely match the desired performance and, thereby, achieve the highest pumping efficiency.

The TONKAFLO Pumps SS Series covers a flow range of 20 to 300 gpm (4.5 to 68 m^3/hr) with single unit pressures up to 225 psig (15.5 barg).

The capacity and discharge pressures can be increased by operating pumps in parallel or series. When operating in series, a maximum discharge pressure of 1,000 psig (69 barg) may be achieved with high pressure

construction on the downstream pump. With inlet pressure greater than 200 psig (13.8 barg), optional high-pressure mechanical seals should be used.

Table 3.1 - Pump design capacities

SS Series	60 Hz 3500 rpm	50 Hz 2900 rpm	
Model	**Range gpm (m^3/h)**	**Range gpm (m^3/h)**	**Max. efficiency**
SS5500	20 to 75 (4.5 to 17.0) @ 3500 rpm	15 to 65 (3.4 to 14.8) @ 2900 rpm	60%
SS8500	30 to 110 (6.8 to 25.0) @ 3500 rpm	20 to 90 (4.5 to 20.4) @ 2900 rpm	64%
SS12500	40 to 190 (9.1 to 43.1) @ 3500 rpm	35 to 160 (79 to 36.3) @ 2900 rpm	62%
SS24000	80 to 300 (18.2 to 68.1) @ 3500 rpm	65 to 250 (14.8 to 56.8) @2900 rpm	61%
Operating temperature for standard steel stages [Note]			
Maximum recommended operating temperature		125°F (52°C)	

Note: The temperature stated in this table is for design flow and pressure. The maximum recommended temperature is stated on the pump case. For high temperature applications, contact Veolia.

NOTICE

To prevent excessive heat buildup, ensure adequate flow through the pump at all times.

Table 3.2 - Maximum developed boost pressure

SS series	60 Hz		50 Hz	
Model	Stages	Developed pressure - psig (barg)	Stages	Developed pressure - psig (barg)
SS5500	8	225 (16.2)	12	235 (16.2)
SS8500	8	200 (13.8)	12	210 (14.9)
SS12500	4	115 (7.9)	6	120 (8.3)
SS24000	4	100 (6.9)	4	95 (6.6)

3.3.1 Pump nomenclature

Table 3.3 - Pump name definitions

Example model SS5504G	Example model SS24004D-50
SS = materials of construction	SS = materials of construction
55 = series 5500	240 = series 24000
04 = number of stages	04 = number of stages
G = bearing frame	D = bearing frames
	50Hz = 50 Hertz operation

3.3.2 Standard construction materials

Wetted castings, pump shaft, and casing are 316 stainless steel. Impellers and diffusers are Norylexcept SS24000 series diffusers which are 316SS. The mechanical seal has a carbon rotating face and a ceramic stationary face. The secondary sealing element of the mechanical seal is Buna-N. The mechanical seal is a Crane Type 21. The O-rings and discharge bearings are Buna-N.

3.3.3 Standard construction materials

Special elastomers like ethylene propylene (EPDM), Viton, and Teflon are available. Contact Veolia for more information.

3.3.4 Special liquids

For liquids other than water, aqueous solutions at elevated temperatures, or corrosive solutes, contact Veolia for compatibility.

* Viton and Teflon are trademarks of E.I. DuPont de Nemours and Company, Inc.

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4 Installation

4.1 About this section

All operators must read and understand the information outlined in this section before attempting any of the tasks or procedures discussed in it.

CAUTION	
	**General Hazard** Do not make any modifications (example: wiring into the electrical cabinet) or incorporate additional tools to the system (example: piping, external mechanical devices, anything else that connects to the system) that are outside of system specifications without first consulting with Veolia.

4.2 Initial requirements

NOTE: *The tanks provided in these pretreatment kits are not ASME code stamped, CRN certified, and do not adhere to Mexican standard NOM-020-STPS-2011.*

The following must be available before installation begins:

APPLICABLE DRAWINGS: The Piping and Instrumentation Diagram (P&ID), General Arrangement (GA), and Electrical drawings will be needed during installation *Appendix: Drawings and BOMs (see A Appendix: Project documents)*.

WATER: Water introduced into the system during installation must be free of particulates.

ELECTRICITY: Veolia is not responsible for supplying power to the system.

4.3 Initial setup

All pumps are tested at the factory prior to shipment to ensure they meet requirements for the order.

Check the pump upon receipt for possible damage due to shipping. Report any damage to the carrier immediately.

4.3.1 Location

Install the TONKAFLO pump as close as possible to the source of the liquid to be pumped. It is ideal for the pump to be fed from an overhead reservoir or from a supply line under positive pressure.

NOTICE	
	The TONKAFLO pump must have positive pressure at the inlet.

The NPSHR curve shows the minimum positive head required at the inlet for a given operating capacity.

If the feedwater source is remote or located several feet away, it may be necessary to install a transfer pump on the line to ensure the fluid is pressurized sufficiently for the pump.

4.3.2 Foundation

The foundation for the motor and pump must be sufficiently rigid and substantial to prevent any significant vibration of the pump during its operation.

Mount the pump rigidly at the bearing frame base to a steel skid or concrete pad. Adjust the bracket at the discharge end of the pump so that the pump case is supported in a strain-free manner.

The pump mounting is to be horizontal and the pump leveled within 1/16 in/ft (4.5 mm/meter) both in the axial and side-to-side directions. The pump case and flat boss on the bearing frame are the best reference for leveling.

NOTICE	
	Do not force the pump case into a horizontal position.

Table 4.1 - Limits of leveling

Case length	Level within	
≤4 ft	1/16 in/ft	5.2 mm/meter
4 ft to 8 ft	1/32 in/ft	2.6 mm/meter
> 8 ft	1/42 in/ft	2.0 mm/meter

4.4 Installing the flexible coupling

If the pump has been supplied with the motor installed, the coupling is properly installed.

If the pump has not been supplied as an assembled unit:

1. Install the coupling flange on the motor shaft. Do not tighten the set screws until after the pump and motor are assembled.
2. Install the flexible coupling sleeve onto the pump coupling flange and assemble the pump and motor.
3. Adjust the gap between the coupling flanges to the values shown in *Table 4.2 - Coupling Gap Specifications* within +1/16 to 0 in. (+1.5 to 0 mm).

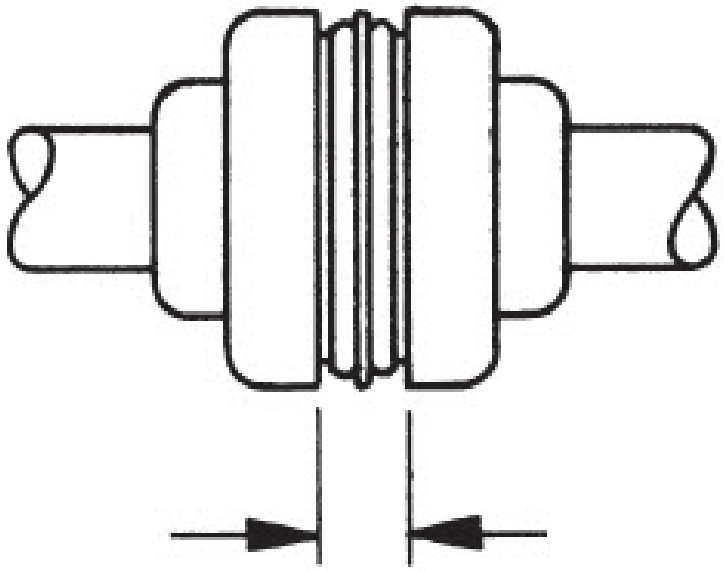


Figure 4.1 - Gap between flanges

Table 4.2 - Coupling Gap Specifications

Coupling Size	Gap	
6	7/8 in	22.2 mm
7	1 in	25.4 mm
8	1 -1/8 in	28.6 mm
9	1 - 7/16 in	36.5 mm
10	1 - 5/8 in	41.3 mm

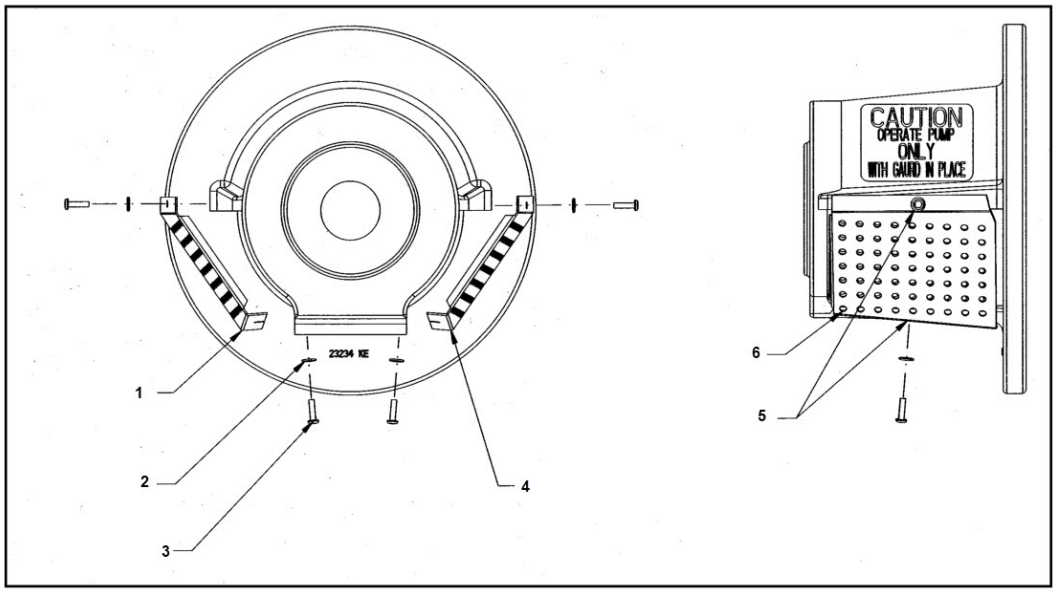
4.4.1 Coupling guards

Coupling guards are available for all TONKAFLO pumps. Check plant safety requirements.

WARNING

Safety warning

Re-install and securely fasten the coupling guard before operating the pump or motor. Never operate the pump without having the coupling guard securely fastened.



1. Right guard (stamped with "R")
2. Lockwasher (4 PL)
3. #10 screw (4 PL)
4. Left guard (stamped with "L")
5. Use guard as template, mark location of hole, drill and tap #10-32UMF (4 PL)
6. (Optional both sides) Use this hole to mount guard if lower hole is not accessible

Figure 4.2 - Coupling guard installation

4.5 Installing the piping

The following sections describe the piping connections required for the TONKAFLO pump.

4.5.1 Orient the inlet housing

The pump inlet housing is designed for either upright, or left/right horizontal positioning.

The pump is shipped with the inlet in the upright position. To orient it in the left or right horizontal position:

1. Remove the four (4) bolts holding the suction (inlet) housing to the bearing frame.
2. Rotate the housing 90º, then, replace the four (4) bolts and tighten. Ensure the faces of the bearing frame and inlet are coincident during this operation.
3. To prime the pump for installation and prior to startup, vent any trapped air by removing the pipe plug at the top of the pump inlet housing.

4.5.2 Piping specifications

Ensure the suction (pump inlet) piping is of ample size, installed in direct runs, and has a minimum of bends and restrictions to minimize pressure loss and to help ensure sufficient suction pressure to avoid cavitation. When possible, keep the suction pipe short.

Ensure the suction (inlet) pipe size immediately ahead of the pump inlet is sufficiently sized so the pressure available at the pump suction (inlet) exceeds the Net Positive Suction Head (NPSHR) required by the pump. The suction (inlet) piping is outlined in *Table 4.3 - Suction inlet specifications*.

Table 4.3 - Suction inlet specifications

Pump model	Piping size - inlet
SS5500, SS8500, SS12500, SS24000	4 in. (10.2 cm) for flows greater than 170 gpm (38.6 m^3h) 3 in. (7.6 cm) for flows 100 - 170 gpm (22.7 - 38.6 m^3h) 2.5 in. (6.4 cm) for flows 60 - 100 gpm (13.6 - 22.7 m^3h) 2 in. (5.1 cm) for flows 60 gpm (13.6 m^3h) or less

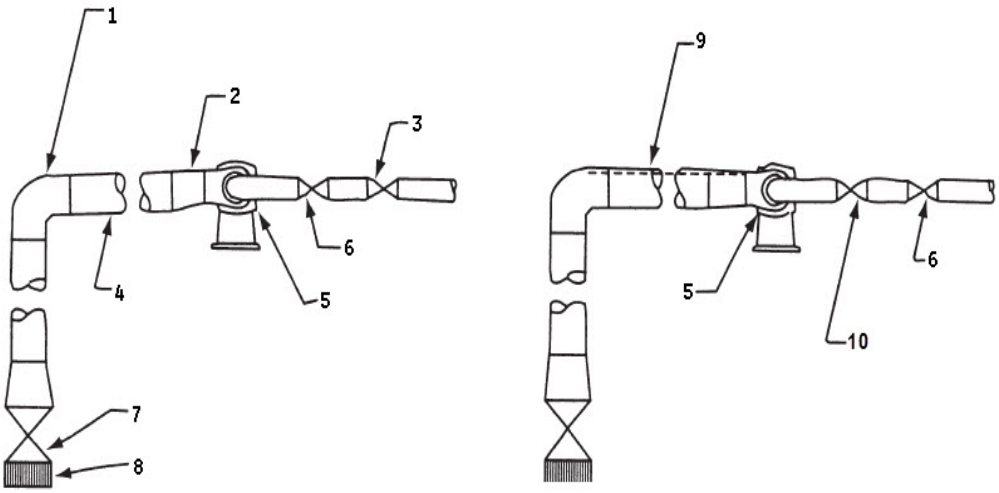
For most pump applications, it is recommended that the pipe size selected results in frictional line loss of 3 psig/100 ft (0.21 barg/30.5 m) or less for

suction lines, and 10 psig/100 ft (0.69 barg/30.5 m) or less for discharge lines. A larger pipe size reduces the frictional line loss.

Design the pump inlet piping to avoid areas where air may be trapped and accumulated. These air pockets tend to disrupt pump priming at startup.

To avoid air pockets, keep the suction piping free of high points. Taper suction pipe size changes just ahead of the pump, and use eccentric reducers.

When the pump operates with a suction lift, ensure the suction pipe slopes upward to the pump from the source of supply, as detailed in *Figure 4.3 - Suction lift piping diagram correct (left) and incorrect (right)*.



1: Long radius elbow	6: Check valve
2: Eccentric reducer (if used)	7: Foot valve (if used)
3: Control shutoff valve	8: Strainer
4: Suction pipe (slopes upward)	9: Air pocket created because line does not slope upward and eccentric reducer not used
5: Pump	10: Do not use a control/shutoff valve

Figure 4.3 - Suction lift piping diagram correct (left) and incorrect (right)

Provisions must be made for priming the pump. To maintain pump prime, use a feed valve with an opening at least as large as the inlet piping.

Alternatively, use a shutoff valve on the discharge line and a vacuum pump to draw air out of the pump and suction line.

When pumping liquid from a tank, the suction line must be submerged enough so air is not drawn into the suction line to form a vortex. To prevent a vortex from forming, increase the size of the inlet pipe to reduce the velocity from forming. If necessary, consult the pump curve to reference the NPSHR. Contact Veolia for more information.

Hot liquids within the temperature range of the pump must have sufficient positive head to prevent vaporization at the impeller inlet. Contact Veolia for NPSHA requirements of the pump for specific applications.

Never throttle the pump on the suction side.

After installation, test the suction line with water and at least 30 psig (2.1 barg) to detect any leaks.

Size the discharge piping to properly handle the maximum flow and pressure developed by the pump. Discharge piping recommendations are outlined in *Table 4.3 - Suction inlet specifications*.

4.5.2.1 Bypass piping for multi-stage pumps

Maintain sufficient flow through a multi-stage pump to prevent the pump from overheating. Low flow rates result in excessive energy accumulation and heat buildup in the pump. Minimum recommended flows are shown in Pump design capacities.

A bypass pipe, that is, a pipe from the discharge piping back to the source of liquid supply or suction line, may be needed to ensure that the pump operation is within the specified flow range. It is recommended that the connection of a bypass pipe to the suction line be at least 24 in. (61 cm) away from the pump inlet.

4.5.3 Suction screen (strainer)

A TONKAFLO pump is a precision multi-stage centrifugal pump with close tolerances to provide maximum efficiency.

It is good practice to install a 30 mesh or finer screen (available as an accessory), or a cartridge filter, in the suction line, to collect any foreign objects or large particles. Size the screen or filter to induce a minimal pressure drop.

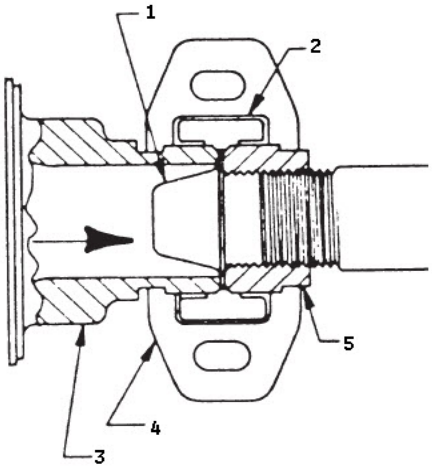
Do not operate the pump with a restricted suction line (inlet) flow. Maintain a positive gauge pressure at the pump inlet (downstream from the filter or screen). A clogged screen or filter results in a greater pressure drop.

Always use a low pressure alarm or shut-off switch located between the screen or filter and the pump in conjunction with a suction line screen or filter.

4.5.4 Discharge screen (strainer)

A 30 mesh screen (available as an accessory) located in the discharge piping protects the process fluid should the pump be damaged due to improper operation or other causes.

The installation of the discharge screen is shown in *Figure 4.4 - Discharge screen installation diagram*.



1: Discharge screen
2: Gasket
3: Pump discharge casting
4: Clamp, Victaulic type
5: Pipe adapter

Figure 4.4 - Discharge screen installation diagram

4.5.5 Pump piping connections

The standard model TONKAFLO pumps have grooved ends, as shown in *Figure 4.4 - Discharge screen installation diagram*, to accept Victaulic-type couplings. The couplings with 1000 psi (69 bar) working pressure rating are

available as an accessory and include a standard Buna-N gasket. Other gasket materials such as Viton or ethylene propylene (EPDM) are available. Consult Veolia for details.

Thoroughly lubricate the coupling gasket before installation. Glycerin is recommended.

NOTICE

Petroleum grease, though suitable for most gasket materials, is not compatible with EPDM.

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5 Operation

5.1 About this section

For detailed information regarding specific components included in this system, such as valves or instrumentation, refer to the manufacturer's instructions *(see A Appendix: Project documents)*.

5.2 Priming the pump

NOTICE	
	The inlet piping and pump must be filled with liquid (primed) before startup.
	If prime is lost, shut off the pump immediately to avoid overheating and possible damage to the internals of the liquid end.
	Do not run the pump with a closed discharge for more than one (1) minute as the liquid can heat up very quickly and exceed the maximum operating temperatures, causing irreversible damage to the wetted internal parts of the liquid end.
	Never run the pump dry.

If the pump is below the liquid source or connected to a positive pressure source, the pump may be primed from that source.

If the pump is above the liquid source, fill the pump and supply line with liquid from an external source.

To adequately protect a TONKAFLO pump from running dry, the following controls are recommended:

- pressure switches
- flow switches
- temperature switches.

5.3 Pump rotation

When initially connecting to the power source, confirm that the motor wiring and available line voltage are the same. If they are not the same, or within 10%, DO NOT OPERATE THE MOTOR. Contact Veolia for assistance.

A motor starter is required for all three-phase motors. If required, contact Veolia for assistance.

Install the proper size of wire between the power source and the motor controls/starter, and between the starter and the motor. To determine the correct wire size, refer to the motor installation manual or local electrical codes.

Connect the wires as shown on the motor wiring diagram located on the inside of the motor junction box cover or on the nameplate label.

NOTICE	
	If a three-phase motor is wired incorrectly, it causes the pump shaft to rotate in the wrong direction. This results in low pressure (about 1/4 to 1/2 of normal) and flow (about 1/2 of normal). A motor starter or VFD is required for all three-phase motors.

5.3.1 Electrical grounding

Connect the ground wire to an earth ground following local electrical codes.

Check the continuity of the ground connection to the junction box using an volt-ohm meter.

5.3.2 Three-phase power imbalance

Current imbalance should not exceed 5% of the average three-phase current. To calculate the current imbalance:

1. Measure the current through each of the three legs.
2. Average the three current measurements together.
3. Determine the difference between the current in each leg and the average of all three legs.
4. Take the difference with the largest value and divide it by the average current. Multiply by 100 to obtain the current imbalance percentage.
5. If the current imbalance is greater than 5%, change the leads and re-test. If changing the leads does not correct the problem. the source of the imbalance must be located and corrected.

For more information on current imbalance, refer to the motor operation manual.

5.4 Pre-start checks

Before starting three-phase motors:

1. Prime the pump before applying power, to prevent damage.
2. Apply power for one (1) second to check the direction of the motor shaft rotation. The motor shaft turns in a clockwise direction as viewed from the motor end. The direction of rotation for three-phase motors may be reversed by interchanging any two leads.

5.5 Initial operation

With the pump primed and the pump rotation checked, the pump is ready to operate.

Upon startup, check that the correct boost pressure is obtained at design flow.

If prime was not achieved, reprime as necessary.

6 Maintenance

6.1 About this section

This section outlines:

- the procedures and chemicals used to clean and maintain the system as a whole, as applicable.
- general preventive maintenance that addresses the system as a whole. This section does not cover the entire scope of work required to keep the system operating at peak efficiency.

TIP: *For detailed preventive maintenance information regarding specific components (example: pumps, valves), refer to the instructions provided by that component's manufacturer* *(see A Appendix: Project documents)**.*

CAUTION	
	**Not to be Serviced by Users** Only qualified and certified electricians shall perform electrical work (example: verifying that electrical equipment is performing properly, taking malfunctioning electrical equipment out of operation, verifying earth-ground bonding, and fixing electrical equipment).

6.2 Preparing for maintenance or service

Before performing maintenance, test the following for proper functioning:

- all safety critical switches (example: interlocks)
- any pressure gauges that will be used
- applicable pressure relief valves.

6.2.1 Locking out and tagging out equipment

When a machine or a piece of equipment is being prepared for maintenance or service, it often contains some form of hazardous energy (example:

chemical, electrical, hydraulic, mechanical, pneumatic, thermal, or other source of energy) that could be released and cause harm. Follow proper lockout/tagout (LOTO) procedures to control hazardous energy and protect workers from harm.

LOTO is one part of a larger workplace energy control program that includes established procedures for using locks and tags, training workers, and periodic reviews and inspections.

In general, there are six (6) steps to a LOTO procedure that the authorized employee must follow:

1. **PREPARATION:** Investigate and gain a complete understanding of all types of hazardous energy that might be controlled, the specific hazard, and how to control that energy.
2. **SHUTDOWN:** Shut down the machine or equipment that will be serviced or maintained and inform any employees who will be affected by the shutdown.
3. **ISOLATION:** Isolate the machine or equipment from any source of energy (example: turn off power at a breaker, shut down a valve) based on the operator's experience with the equipment.
4. **LOCKOUT/TAGOUT:** Lock and tag out the machine. Attach lockout and/or tagout devices to each energy-isolating device in such a way that it stays in a "safe" position and cannot be moved to the unsafe position except by the person who placed it in the "safe" position, and if tagged out, includes a tag that indicates the name of the person who performed the lockout, as well as additional information.
5. **STORED ENERGY CHECK:** Look for any hazardous energy or residual energy that has been stored within the machine. At this time, the residual energy must be relieved, disconnected, restrained, or made non-hazardous in some other way.
6. **ISOLATION VERIFICATION:** Double-check that all steps above were performed correctly, the machine is isolated and fully de-energized, and that it is now safe to work on the machine.

When the system is locked out and tagged out, it is ready for service or maintenance. When the system is ready to be put back into service, remove the lockout and tag out devices and then start the system again in a safe way.

6.2.2 Securing the electrical cabinet

Before the electrical cabinet is opened, verify that energy to the cabinet and interlocks are off.

6.3 TONKAFLO pumps field maintenance

DANGER

Potential Injury

Disconnect the power source before attempting any type of field service. Failure to do so may result in serious injury or death.

WARNING

Electrical Hazard

Disconnect power before starting troubleshooting or maintenance.

6.3.1 Mechanical seal leakage

If liquid is leaking from the hole on the bottom, or the holes on either side of the bearing frame near the inlet, the mechanical seal may need to be replaced.

With new pumps, pumps with new mechanical seals, or pumps that have been dormant for long periods, the seal faces may not be completely seated and a slight leakage occurs. If this leakage continues for more than 60 seconds, remove the discharge piping and tap the pump shaft using a wooden dowel to seat the seal.

CAUTION

General Hazard

Be careful not to damage the pump shaft.

If the leak persists, the mechanical seal is damaged and needs to be replaced. Contact Veolia for replacement information.

6.3.2 Removing and installing the liquid end assembly

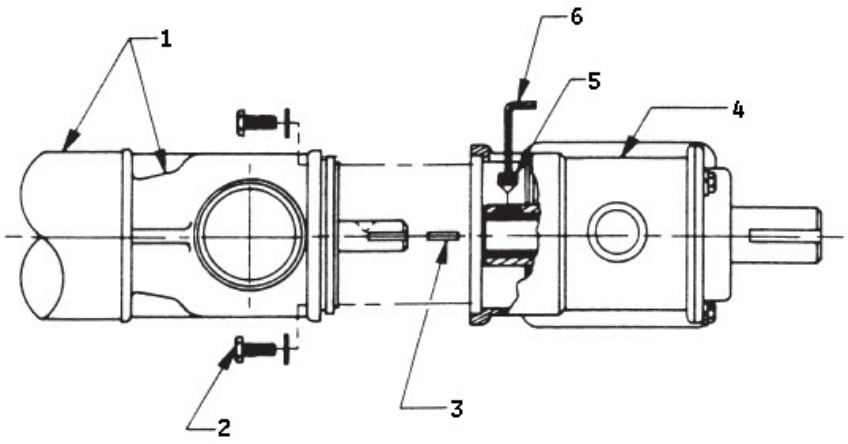
6.3.2.1 Removing the liquid end assembly

It is necessary to remove the liquid end assembly to replace the mechanical seal, or perform maintenance work on the pump bearing frame.

The liquid end may be removed from the bearing frame without removing the bearing frame from the bedplate or other mounting.

To remove the liquid end assembly:

1. Remove the four (4) 3/8-in. bolts and lock washers connecting the liquid end assembly to the liquid end adapter.



1: Liquid end assembly
2: Bolts (4)
3: Pump shaft key
4: Bearing frame assembly
5: Set screw
6: 3/16 in. hex wrench

Figure 6.1 - Separation of liquid end assembly from bearing frame

2. Insert a 3/16 in. Allen (hex) wrench in one of the access holes on either side of the bearing frame toward the liquid end. Rotate the pump shaft until the Allen wrench slips into the set screw. Remove the set screw.
3. Loosen the clamp on the discharge end of the pump case .

The proper lifting method to remove or install the liquid end assembly is illustrated in *Figure 6.2 - Proper lifting method for liquid end assembly*.

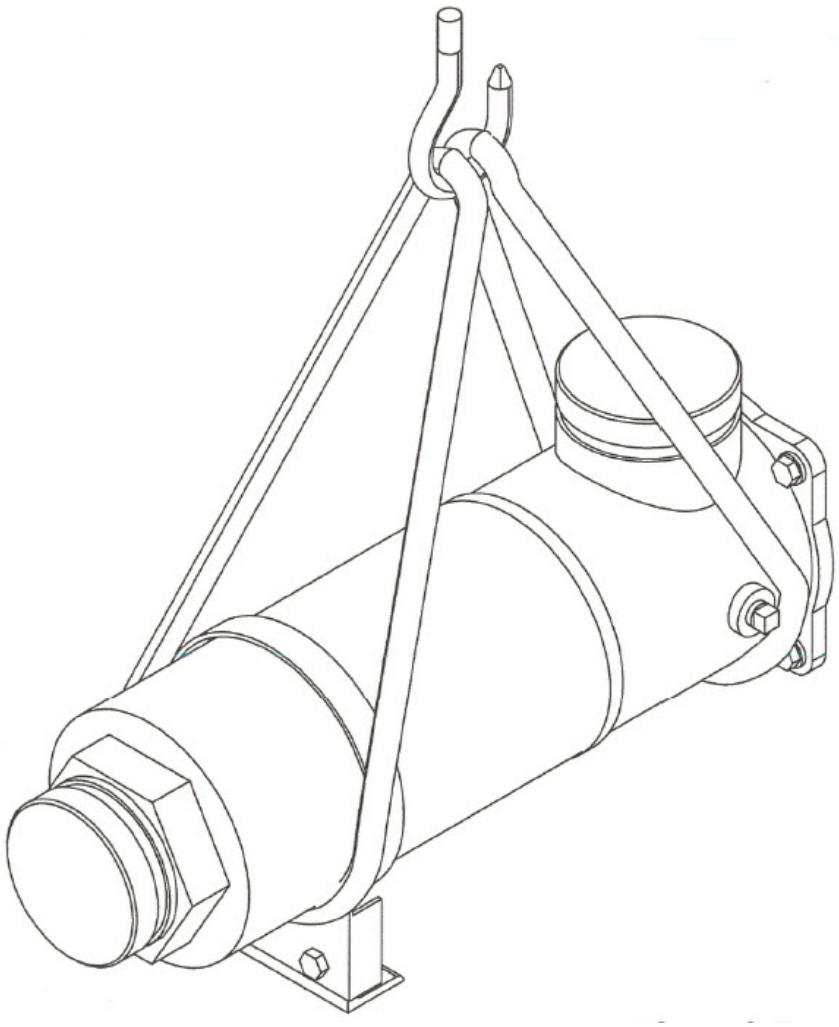


Figure 6.2 - Proper lifting method for liquid end assembly

6.3.2.2 Installing the liquid end assembly

To install the liquid end assembly:

1. Place the shaft key in the pump shaft key way and be sure it is fully seated.
2. Check that the anti-seize compound is on the exposed pump shaft where it engages with the bearing frame shaft. If not, coat the pump shaft with a small amount of an anti-seize compound (Never-Seez or Anti-Seize). The anti-seize compound is used to prevent corrosion, galvanic pitting, rust, and seizure. These compounds are available from the factory or local industrial supply house.
3. Align the keyed pump shaft with the bore of the bearing frame shaft, and insert the pump shaft such that the key on the pump shaft fits into the key way on the bearing frame shaft. Then, push until the castings come together.
4. Fasten together the inlet casting, mechanical seal holder, and bearing frame assembly with the four (4) 3/8 in. bolts and lock washers. Refer to *Figure 6.1 - Separation of liquid end assembly from bearing frame 6.3.2 Removing and installing the liquid end assembly* and *Figure 6.3 - Removing the mechanical seal* for correct placement of parts.
5. After fastening the inlet casting to the bearing frame assembly, line up the set screw hole in the bearing frame shaft with the access hole in the bearing frame by rotating the flexible coupling. Place the set screw in the bearing frame shaft.
6. Through the opening in the discharge casting, push on the end of the pump shaft with a wooden dowel to seat the shaft , then tighten the set screw.

6.3.3 Replacing the mechanical seal

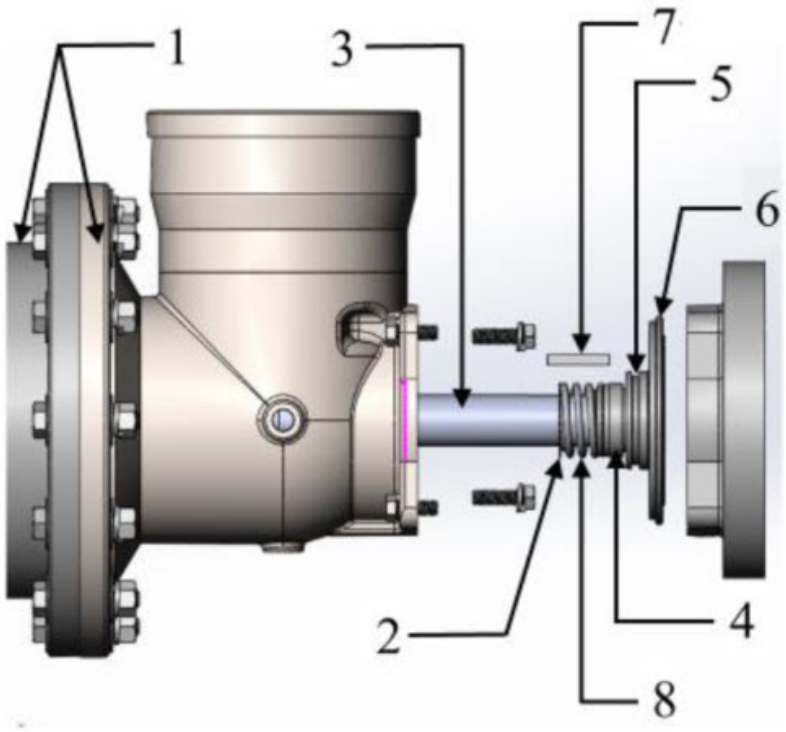
To replace the mechanical seal, the following tools are required:

- one (1) 3/16 in. Allen (hex) wrench to remove the bearing frame shaft set screw

- water based lubricant
- scour pad

To remove the mechanical seal, follow these steps:

1. Remove the liquid end assembly *(see 6.3.2.1 Removing the liquid end assembly)*.
2. Remove the pump shaft key and slide the mechanical seal holder off the pump shaft (see *Figure 6.3 - Removing the mechanical seal*).



1: Liquid end assembly	5: O-ring
2: Retaining ring - Do Not Remove	6: Seal holder
3: Pump shaft	7: Pump shaft key
4: Seal seat, stationary	8: Seal rotary assembly

Figure 6.3 - Removing the mechanical seal

3. Remove the rotary portion (spring, washer, and face assembly) of the seal assembly from the pump shaft by rotating and pulling the rotary

portion until it slides off the pump shaft.

NOTICE

If prying is required, do not damage the pump shaft or inlet housing where the seal holder seals (see *Figure 6.3 - Removing the mechanical seal*).

4. When installing a new mechanical seal, do not cut the rubber bellows when sliding over the shaft key way. Perform the following steps:
    a. To protect the rubber bellows from damage, deburr the set screw dimple and shaft key way, and wrap thin plastic tape over the shaft key way.
    b. Wrap 1-1/4 turns to cover the end of the key way opposite the shaft end.
    c. With some overlap, continue to wrap the tape until the key way is covered to the end of the pump shaft.
5. Lubricate the round surface of the pump shaft with soapy water, glycerin, or a water based lubricant.
6. After lubrication, install the rotary portion of the new seal by placing it onto the pump shaft and carefully rotating and pushing the rotary portion down the pump shaft until it is lightly seated against the spring. Remove the tape.
7. Remove the stationary portion of the mechanical seal from the cavity in the seal holder (see *Figure 6.3 - Removing the mechanical seal*).
8. Lubricate the O-ring with a water based lubricant on the outside of the new stationary seat. Install the stationary portion into the seal holder cavity. Make sure the stationary portion is fully seated. Lightly lubricate the ground surface of the stationary seat with a water based lubricant.

9. Examine the O-ring on the mechanical seal holder and, if the O-ring is damaged, replace it with a new one. A new O-ring is included with the factory-supplied mechanical seal kit. Be sure to lubricate with a water based lubricant before installing.
10. Place the mechanical seal holder containing the new stationary seat onto the pump shaft and slide it down the shaft until fully engaged with the inlet casing.

NOTICE

Take care not to damage the stationary seat when sliding the assembly over the pump shaft.

11. Install the liquid end assembly onto the bearing frame assembly *(see 6.3.2.2 Installing the liquid end assembly)*.

6.3.4 High-pressure mechanical seal replacement

High-pressure mechanical seals have the same basic design as standard mechanical seals. Replace them using the same procedure outlined in *6.3.3 Replacing the mechanical seal6.3.3 Replacing the mechanical seal*.

6.3.5 Bearing frame lubrication for D- and G- bearing frame pumps

Lubrication for motors below 5 Hp is generally not required. For larger motors, lubrication intervals vary between manufacturers but generally every 2,000 hours. Contact Veolia for lubrication advice.

The operating temperature of the grease-lubricated bearing frames used on Tonkaflo pumps varies depending on the boost pressure of the pump. As a general rule, G- bearing frames operate within a temperature range of 150°to 200°F (66°to 93°C). The D-Bearing frame operates within a temperature range of 160°to 220°F (71°to 104°C). During operation, the bearing frame feels hot to the touch. A new bearing frame runs cooler after 24 hours of operation.

6.3.5.1 Relubrication interval

The bearings were lubricated at the factory. Do not add grease when putting a new pump into service. Regrease the bearing frame every relubrication interval or once a year, whichever occurs first.

Table 6.1 - Bearing lubrication intervals

Pump model range	60Hz Relubrication interval (hours)	50Hz Relubrication interval (hours)
5502G - 5506G 5507D - 5510D	1000 500	1000 500
8502G - 8505G 8506D - 8510D	1000 500	1000 500
12502G 12503D - 12506D	1000 500	1000 1000
24002D - 24004D	500	1000

Note: Relubrication interval information on label on pump bearing frame.

6.3.5.2 Grease type for D- and G- bearing frames

Use Lubriplate EMB grease in G- and D-Bearing frames. Lubriplate EMB (NLGI Grade 2) has a lithium/polymer base with anti-wear and extreme pressure additives that effectively reduce the operating temperature of the bearing frame during continuous operation.

6.3.5.3 Greasing procedure

There are two (2) pressure plugs (zerk position 1 & 3) and one (1) grease fitting (zerk position 2) on the bearing frame. When using the pump in a horizontal motor position, remove the pressure plugs and add grease only through the center grease fitting (zerk position 2).

When using the pump in a vertical motor position, remove the pressure plug and add grease through the grease fitting at zerk position 2 and zerk position 3 for Vertical Motor UP (VMU) or zerk position 2 and zerk position 1 for Vertical Motor Down (VMD).

6.3.5.4 Quantity of grease for relubrication interval

Remove a pressure plugs and add approximately 20 grams (3/4 ounce) through the center grease fitting (zerk position 2). Approximately 15 shots from a hand operated cartridge grease gun.

NOTICE	
	20 grams (3/4 ounce) is equivalent to approximately fifteen squeezes from a hand-operated grease gun. 8 grams (1/4 ounce) is equivalent to approximately four to five squeezes from a hand operated grease gun.
	DO NOT OVER GREASE. Should the bearing frame become so full of grease that it exits from the vent holes WHILE ADDING grease, disassemble and clean the bearing frame. Over greasing may cause bearing frame to fall.

Horizontally mounted pumps

Remove the pressure plugs and add approximately 20 grams (3/4 ounce) through the center grease fitting (zerk 2) .

Vertically mounted pumps

Remove the pressure plugs and add 20 grams (3/4 ounce) through the center grease fitting (zerk 2) and 8 grams (1/4 ounce) through the upper grease fitting (zerk position 3) for VMU or (zerk position 1) for VMD.

6.3.6 Disassembling the motor and motor adapter from the bearing frame

Unfasten four bolts and lock washers that secure the adapter to the motor and remove the motor. Remove the four 5/16-inch bolts from the motor adapter and separate the motor adapter from the bearing frame.

6.3.7 Disassembling G-bearing frame pumps

To disassemble the G-bearing pumps:

1. Remove the liquid end assembly *(see 6.3.2 Removing and installing the liquid end assembly)*.
2. Remove the motor and motor adapter from the bearing frame *(see 6.3.6 Disassembling the motor and motor adapter from the bearing frame)*.
3. Remove the four (4) 5/16-inch bolts connecting the liquid end adapter to the bearing frame. Remove the liquid end adapter.

6.3.7.1 Bearing frame overhaul

To overhaul the bearing frame:

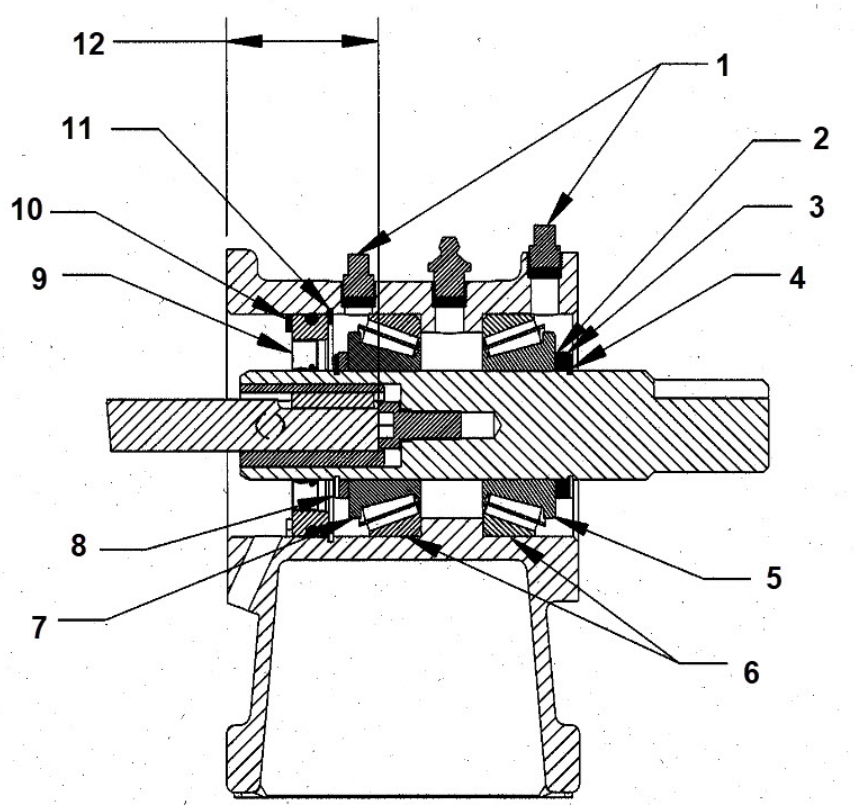
1. Remove the grease seal holder from the liquid end side of the bearing frame. Insert two (2) 6-32 bolts into the threaded holes, then grip the bolts with a pair of pliers and work the seal holder out.
2. Remove retaining ring #4, the shims, and backup washer.
3. Place the bearing frame in a press. Press on the motor end of the shaft to remove the shaft assembly from the bearing frame. Bearing cone #2, which is either a slip fit or press fit bearing, slides off the shaft when it is pressed out of the bearing frame. Bearing cone #1 remains on the shaft. It is not necessary to remove the backup retaining ring #1 behind the grease seal holder to remove the shaft assembly.
4. Clean and repack with grease bearing cone #1 while it is still on the shaft. Removal of bearing cone #1 should not occur unless replacement is necessary. To remove the cone, use a press to press the bearings off the shaft.
5. Inspect the bearing cups and cones for any rough surface conditions and replace both cup and cone when necessary. Pitted and galled rollers and/or bearing cups indicate replacement is necessary. Very light marks around each roller may occur during “break-in period” from

the bearing cage. This is not a problem and bearing replacement is not necessary.

6. If the bearing cup(s) are to be removed, remove retaining ring #1 first.

NOTICE	
	Do not damage the bearing frame.

7. To remove the bearing cup(s) from the bearing frame, use a brass or soft steel rod and hammer to knock them out. Inspect both grease seals (i.e., motor adapter and bearing frame grease seals) and replace if the seals are no longer pliable or if they are leaking.



1: Pressure plugs
2: Shims
3: Washer #2
4: Retaining ring #4
5:G frame
6: Bearing cone #2
7: Bearing cups
8: Bearing cone #1
9: Retaining ring #5
10: Grease seal
11: Retaining ring
12: Retaining ring #1
13: 1.900 +.010

Figure 6.4 - G- bearing frame pumps

6.3.8 Assembling the G- bearing frame pumps

To assemble the G- Bearing Frame Pumps:

1. If removed, press new bearing cup(s) into the bearing frame, making sure they are fully seated. When using a new bearing cone, replace both cup and cone as a set.

2. Pack grease into both bearings using Lubriplate EMB referred to in *6.3.5.4 Quantity of grease for relubrication interval*.
3. If removed, press bearing cone #1 onto the shaft, holding the bearing square while starting. Make sure that washer #1 behind retaining ring #2 is in place. Check the correct check set-up by placing the shaft into the frame and measuring the 0.16-inch (4.1 mm) recess.
4. With the shaft placed in the bearing frame, press on the second bearing cone, holding it square while starting. Press until the bearing cone is fully seated against the bearing cup and there is not end play.
5. Install the backup washer#2, the shim pack, and the retaining ring, making sure the flat side of the retaining ring is away from the shims. Press the shaft to force bearing #2 back against the shim pack.
6. Check the end play of the shaft:
    a. Grasp the shaft on the motor side of the bearing frame while turning the shaft as far as it will go.
    b. Hold the shaft in place to prevent axial movement.
    c. Zero out and place the dial indicator on the motor.
    d. Push the shaft back toward the motor side of the bearing frame, and observe the movement on the dial indicator. The end play should read 0.003 - 0.0006-inch (0.07 - 0.15 mm) on the dial indicator.
    e. Repeat Step D two to three times to verify end play accuracy.

NOTICE	
	End play of 0.006-inch (0.15 mm) or less is difficult to read by hand. Veolia recommends using a dial indicator to measure end play. Noticeable end play means additional shimming is required. Reshim as necessary, making sure bearing cone #2 is pressed back against that shim pack before taking the measurement.

7. Examine the rubber O-ring on the outside of the grease seal holder. If it is damaged, replace it with a new one. Be sure the O-ring is well lubricated with grease.
8. Lubricate the lip of the grease seal with grease. Press the grease seal into the grease seal holder.
9. Reinstall the grease seal backup retaining ring #1.
10. Press the grease seal assembly into the bearing frame until seated on the retaining ring.

NOTICE	
	Be sure the face of the grease seal holder with the threaded holes is exposed and is not facing the bearings.

11. Check the 1.90 ± 0.01-inch (48.26 ± 0.25 mm) depth dimension using a depth gauge or parallel bars and dial caliper. Remove the bolt using a 3/16-inch (Hex) wrench (supplied with the pump), and add or remove shims as needed. Retighten the bolt.
12. Reinstall the motor adapter and motor *(see 6.3.11 Assembling the motor adapter and motor to the bearing frame)*.
13. Add grease as noted in *6.3.5 Bearing frame lubrication for D- and G-bearing frame pumps*.

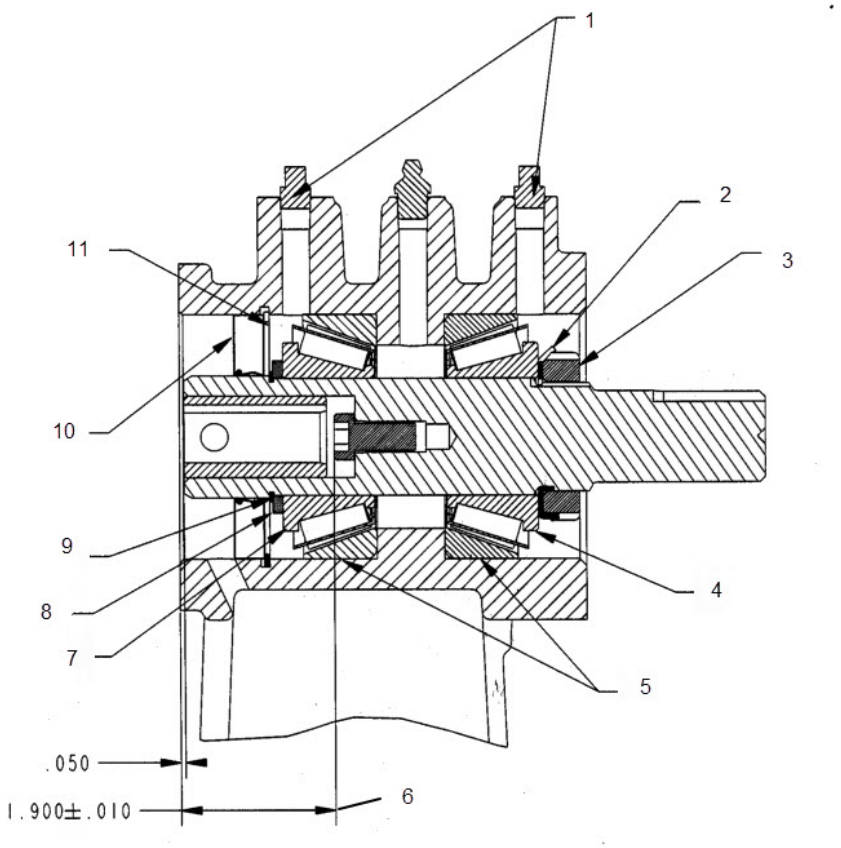
6.3.8.1 Reinstalling the liquid end

To reinstall the liquid end:

1. Replace mechanical seal if necessary *(see 1.0.1 Replacing the mechanical seal)*.
2. Check that the key is fully seated in the pump shaft key way.
3. Check that anti-seize compound is on the exposed pump shaft where it engages with the bearing frame shaft. If not, coat the pump shaft with a small amount of anti-seize compound (for ex. Never-Seez or 30 Anti-Seize). The anti-seize compound prevents corrosion, galvanic pitting, rust and seizure and will aid in shaft removal at a later date. These compounds are available from Veolia or local industrial supply house.
4. Align the keyed pump shaft with the bore of the bearing frame shaft and insert the pump shaft so that the key on the pump shaft fits into the key way on the bearing frame shaft. Push until castings come together.
5. Fasten together the inlet casting, mechanical seal holder, and the bearing frame assembly with the four 5/16-inch bolts and lock washers.
6. Through the opening in the discharge casting, push or carefully tap the end of the pump shaft to be sure the pump shaft is properly seated in the bearing frame. For tapping the pump shaft, insert a blunt wooden dowel or similar material that will not damage the end of the pump shaft. Tap until the pump shaft is properly seated. The shaft stops when it is properly seated. On G-Bearing frame pumps, install and tighten the cone point set screw *(see 6.3.2 Removing and installing the liquid end assembly)*.
7. Reinstall the pump*(see 4 Installation)*

6.3.9 Disassembling D-bearing frame pumps

There are stages to disassembling the D-bearing frame pumps. The construction of the pump is shown in *Figure 6.5 - D-bearing frame pumps*.



1: Pressure plug
2: Lockwasher
3: Nut
4: Bearing cone #2
5: Bearing cups
6: This dimension applies to both D and G bearing frames
7: Bearing cone #1
8: Washer
9: Retaining ring #2
10: Bearing seal
11: Retaining ring #1

Figure 6.5 - D-bearing frame pumps

6.3.9.1 Disassembling the liquid end from bearing frame

To disassemble the liquid end from the bearing frame, follow the instructions provided in *6.3.2.1 Removing the liquid end assembly*.

6.3.9.2 Disassembling the motor and motor adapter from the bearing frame

Unfasten four bolts and lock washers that secure the adapter to the motor and remove the motor. Remove the six 3/8-inch bolts from the motor adapter and separate the motor adapter from the bearing frame.

6.3.9.3 Bearing Frame Overhaul

For details on the construction of the pump, see *Figure 6.5 - D-bearing frame pumps*

To overhaul the bearing frame:

1. Remove nut and lock washer from bearing frame shaft. To remove the nut, place a 3/8-inch bolt into the set screw hole in the shaft to hold the shaft while unthreading the bolt.
2. Place the bearing frame in a press. Simultaneously press out the grease seal and remove bearing cone #2 by pressing on the motor end of the bearing frame shaft. After the grease seal is removed, continue pressing to remove the shaft assembly from the bearing frame. Bearing cone #1 will remain on the shaft. Only remove bearing cone #1 from the shaft when replacement is necessary. The backup retaining ring behind the grease seal does not have to be removed to remove the shaft assembly.
3. Clean the bearings and bearing frame of all grease.
4. Clean and repack with grease bearing cone #1 while it is still on the shaft. Removal of bearing cone #1 should not occur unless replacement is necessary. To remove the cone, use a press to press the bearings off the shaft.
5. Inspect the bearing cups and cones for any rough surface conditions and replace both cup and cone when necessary. Pitted and galled rollers and/or bearing cups indicate replacement is necessary. Very light marks around each roller may occur during “break-in period” from the bearing cage. This is not a problem and bearing replacement is

not necessary.

6. If the bearing cup(s) are to be removed, remove retaining ring #1 first.

NOTICE	
	Do not damage the bearing frame.

7. To remove the bearing cup(s) from the bearing frame, use a brass or soft steel rod and hammer to knock them out. Inspect both grease seals (i.e., motor adapter and bearing frame grease seals) and replace if the seals are no longer pliable or if they are leaking.
8. Inspect both grease seals (motor adapter and bearing frame grease seals) and replace them if the seals are no longer pliable or if they are leaking.
9. Check the 5/32-inch and 1.900-inch (4 mm and 48 mm) recess for the D-Bearing frame as shown in *Figure 6.5 - D-bearing frame pumps*.

6.3.10 Assembling the D-bearing frame pump

To assemble the D-bearing frame pump:

1. Pack grease into both bearings using Lubriplate EMB referred to in *6.3.5.4 Quantity of grease for relubrication interval*.
2. If removed, press bearing cone #1 onto the shaft, holding the bearing frame while starting. Make sure the washer behind retaining ring #2 has been replaced. To check the correct setup, place the shaft into the frame and measure the 0.050 - inch (1.27 mm) recess *(see Figure 6.5 - D-bearing frame pumps)*.
3. With the shaft placed in the bearing frame, press on the second bearing cone, holding it square while starting. Press until the bearing cone is fully seated against the bearing cup and there is no end play.

4. Reinstall the lock washer and lock nut. Hand tighten the lock nut and lightly set a tank on the lock washer into the slot on the lock nut. If desired, insert a 3/8-16 UNC x 3-inch bolt through a side port in the bearing frame and into the set screw hole in the end of the bearing frame shaft when tightening the lock nut.
5. Using a press, force bearing cone #2 back against the tanged lock washer by pressing on the end of the shaft. This sets the bearing so the shaft end play may be checked.
6. Check the end play of the shaft:
    a. Grasp the shaft on the motor side of the bearing frame while turning the shaft as far as it will go. This ensures that the bearing cone is completely seated in the bearing ring.
    b. Hold the shaft in place to prevent axial movement.
    c. Zero out and place the dial indicator on the motor.
    d. Push the shaft back toward the motor side of the bearing frame, and observe the movement on the dial indicator. The end play should read 0.003 - 0.006 - inch (0.08 - 0.15 mm) on the dial indicator.
7. Repeat Step 4 two - three times to verify end play accuracy.

NOTICE

End play of 0.006-inch (0.15 mm) or less is difficult to read by hand. Veolia recommends using a dial indicator to measure end play.

Noticeable end play means additional shimming is required. Reshim as necessary, making sure bearing frame #2 is pressed back against that shim pack before taking the measurement.

8. Reinstall the grease seal making sure it is well lubricated with grease.
9. Check the 1.900 ± 0.010-inch (48 ± 0.254 mm) dimension shown in *Figure 6.5 - D-bearing frame pumps*. Re-shim the low profile socket head cap screw as needed.
10. Assemble the motor adapter and motor to the bearing frame *(see 6.3.11 Assembling the motor adapter and motor to the bearing frame)*.
11. Add grease to the bearing frame *(see 6.3.5 Bearing frame lubrication for D- and G- bearing frame pumps)*.

6.3.10.1 Reinstalling the liquid end

To reinstall the liquid end:

1. Replace the mechanical seal if necessary *(see 1.0.1 Replacing the mechanical seal)*.
2. Check to see that key is fully seated in the pump shaft key way.
3. Check to see that anti-seize compound is on the exposed pump shaft where it engages with the bearing frame shaft. If not, coat the pump shaft with a small amount of anti-seize compound (for ex. Never-Seez or 30 Anti-Seize). The anti-seize compound prevents corrosion, galvanic pitting, rust and seizure and will aid in shaft removal at a later date. These compounds are available from Veolia or local industrial supply house.
4. Align the keyed pump shaft with the bore of the bearing frame shaft and insert the pump shaft so that the key on the pump shaft fits into the key way on the bearing frame shaft. Push until castings come together.
5. Fasten together the inlet casting, mechanical seal holder, and the bearing frame assembly with four (4) 5/16-inch bolts and lock washers.
6. Line up the set screw hole in the bearing frame shaft with the access hole in the bearing frame. Place the set screw in the bearing frame shaft. Through the opening in the discharge casting, push on the end

of the pump shaft with a wooden dowel to seat the shaft in the bearing frame. Tighten the set screw.

NOTICE

The rubber couplings must not be pressed tightly between the two flanges: 1/32 - 1/16-inch (0.79 - 1.59 mm) of end play is required.

7. Tighten the set screws on the motor shaft flange.
8. Reinstall the pump *(see 4 Installation)*.

6.3.11 Assembling the motor adapter and motor to the bearing frame

To assemble the motor adapter and motor to D- and G-bearing frames:

1. Attach the motor adapter to the bearing frame using four (4) 5/16inch bolts and lock washers for the G-Bearing frame and six (6) bolts and lock washers for the D-Bearing frame.
2. Position the flexible coupling flange so it is flush with the end of the bearing frame shaft, and tighten the set screws.

NOTICE

For D-bearing frame pumps with shorter shafts)12TC 0r 184TC frame mootors), etend the coupling flange beyond the end of the bearing frame shaft by 1/8 - 3/16 inch (3 - 4mm)

3. Slip the rubber coupling in place and engage with the flange.
4. Place the second flexible coupling flange on the motor shaft. Be sure the set screws are positioned so that they may be tightened through the opening in the adapter when the motor is installed. Do not tighten the set screws at this stage.

5. Install the motor and bolt it to the adapter with four (4) 1/2-inch bolts and lock washers.
6. Tighten the set screws on the motor shaft flange.

6.3.12 Maintenance during long-term storage

While the pump is in storage, ensure that the following maintenance tasks are performed regularly, as applicable:

- Rotate the pump shaft by hand (under 15 rpm) for approximately 10 rotations every three(3) months.
- Cover all liquid ends (inlet and discharge ports).
- Add grease to the motor as recommended by the motor manufacturer during long term storage.
- Change the oil in the pump every nine (9) months and prior to the pump returning to operation.
- Lubricate grease pumps with 10 grams of lubricant every six (6) months.
- Perform a general inspection of all stored components. Check for signs of condensation, rust, and extensive dust accumulation.
- Check for any damage that may have been caused by nearby activity, such as construction.

In addition to the general instructions provided above, ensure that the manufacturer's instructions for each individual component (example: valves, instrumentation) are also followed *(see A Appendix: Project documents)*.

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7 Troubleshooting

7.1 About this section

This section provides information regarding some of the most common issues and frequently asked questions related to this system and its associated components.

Several training courses related to troubleshooting techniques and skills are available upon request. For more information, contact Veolia *(see 1.2 Service and support)*.

7.2 General precautions

CAUTION	
	**General Hazard** Failure to observe the following precautions may result in injury or damage to the system.
	**General Hazard** Proper Personal Protective Equipment (PPE) must be used when carrying out troubleshooting activities involving hazardous materials or situations. Procedures must be developed by the end user to address potential hazards and the PPE required for those situations.

NOTICE	
	Address any questions about the cause or response to a system problem to Veolia field services. Completed daily operating logsheets will be necessary to help determine the cause.

Observe the following precautions at all times while attempting to resolve issues with the system:

- When working with a system or component that contains stored energy (example: a pressurized line, a VFD panel with a residual electric

charge), ensure that the energy has been discharged from all associated components and piping before beginning work. For example, when working with valves connected to compressed air lines, the line must be fully disconnected from the valve before work may begin. Simply actuating the valve does not sufficiently depressurize the line.

- All routine troubleshooting must be performed according to the safety regulations and instructions specified by the component's manufacturer. Read all relevant safety information provided in the manufacturer's instructions before attempting repairs *(see A Appendix: Project documents)*.
- Wear suitable protective equipment when working with pumps, piping, or other components that may have contained caustic or acidic chemicals.

In the event of a contradiction between information provided in this section and that supplied by the manufacturer, the manufacturer’s information will always take precedence.

Always use the manufacturer's literature for troubleshooting instructions for specific components *(see A Appendix: Project documents)*.

CAUTION	
	**Equipment Hazard** Do not change system operating parameters to address any problem where the cause cannot be identified. This may serve to mask operating problems and damage equipment.

7.3 Troubleshooting guidelines

This section provides general troubleshooting guidelines and information related to operation of the TONKAFLO Pumps .

The tables in *7.3.1 Troubleshooting possible issues* provides a quick-reference guide to help identify causes for common issues associated with pump operation.

7.3.1 Troubleshooting possible issues

Table 7.1 - Low flow

Potential cause	Solution
Inlet/discharge restricted	Pipe the pump inlet to induce minimal pressure drops through piping diameter changes, elbows, instrumentation, and so on. Never throttle TONKAFLO pumps at the inlet. Check the screen or filter for obstructions.
Foot valve not operating correctly	Check the vendor literature supplied for troubleshooting the foot valve.
Air leak in inlet piping	Fluid motion in the inlet piping may draw air into the pump if the piping is not sealed properly. Look for visible air bubbles in the discharge line.
Air leak in mechanical seal	Check the mechanical seal. Replace if necessary.

Potential cause	Solution
Inlet suction lift too high	If TONKAFLO pumps are "lifting" or "pulling" fluid from a tank, they must be fed with positive pressure as specified by the $NPSH_R$ curve. This may be accomplished either through a positive head from the tank or incorporating a transfer pump.
Pump shaft rotating in reverse	Ensure the motor is spinning in the proper direction. Reverse two of the leads, if necessary.
Pump not primed adequately	Prime the pump by filling all inlet piping, including the pump, with the process fluid.
Inlet strainer/filter plugged	Check for debris clogging the inlet screen or filter.
Discharge throttling valve closed (pump deadhead)	Ensure the discharge valve is open enough to keep the pump running on the performance curve based on the operating frequency.

Table 7.2 - Motor runs hot or stops

Potential cause	Solution
Motor not wired correctly	Confirm the circuit is wired for three-phase power and the motor is grounded.
Bad or loose connection	With the circuit de-energized, check for continuity with an ohmmeter.
Motor exceeds rated amp draw	Check the amp draw through each leg leading to the motor using an ammeter. The readings should not exceed the service factor multiplied by the rated amps (FLA), as shown on the motor nameplate.

Potential cause	Solution
Excessive ambient temperature	Provide air exchange into the ambient environment surrounding the motor. Condition the ambient environment to provide proper cooling of the motor.
Heater size too small in motor heater	Measure the current draw to verify it is below the trip setting. Increase the heater size or adjust the trip setting to correspond to the service factor multiplied by the FLA rating shown on the motor nameplate.
Binding rotation in the pump shaft	Confirm sufficient inlet pressure into the suction side of the pump. Confirm bearings are properly lubricated in the bearing frame. Remove foreign objects ingested by the pump. Confirm pump is operating in its flow range based on operating frequency.
Bearings not adequately lubricated	Perform frame bearing maintenance as described in *6 Maintenance*. Clean and purge foreign objects from bearing frame breather vent. Send to Veolia for repair.
Specific gravity or viscosity of liquid higher than design conditions	TONKAFLO pumps are designed to pump water. Contact Veolia for liquids other than water.
Three-phase current imbalance	Ensure the three legs of the three phase power are balanced within ± 5% of each other.

Table 7.3 - Motor does not run

Potential cause	Solution
Blown fuse or tripped circuit breaker or overload heater voltage different	Verify a fuse has not blown, a circuit breaker has not been tripped and the heater has not overloaded. Check the breaker for the controls. The wiring, switches, and starter must be inspected for possible damage prior to starting.
Motor too hot	Allow the motor to cool.
Motor voltage connection and line	Ensure the voltage to the motor is wired across the proper voltage. The required voltage is indicated on the motor label.
Bad connection	With the circuit de-energized, check for continuity with an ohmmeter.
Motor not wired correctly	Confirm the circuit is wired for three-phase power and the motor is grounded.
Shutoff controls disabling circuit	Check safety shutoff circuitry to make sure the necessary circuit bypasses are in place to start the motor.

Table 7.4 - Low pressure

Potential cause	Solution
Pump not adequately primed	Prime the pump by filling all inlet piping, including the pump, with the process fluid.
Air leak in inlet piping	Fluid motion in the inlet piping may draw air into the pump if the piping is not sealed properly. Look for visible air bubbles in the discharge line.
Excessive flow	Ensure the pump is operating within the flow range specified by the pump performance summary table or the performance curve included with the pump based on operating frequency.

Potential cause	Solution
Clogged suction line filter or screen	Check for debris clogging the inlet screen or filter.
Pump shaft rotating in reverse	Ensure the motor is spinning in the proper direction. Reverse two of the leads, if necessary.
Foot valve not operating correctly	Check the manufacturer literature supplied for troubleshooting the foot valve.

Table 7.5 - Pump vibration

Potential cause	Solution
Pump shaft bent	Send to Veolia for repair.
Improper mounting/leveling	Confirm the pump liquid end and the motor are firmly secured to a bedplate or other rigid structure and that the pump and motor are not misaligned.
Ingestion of foreign object	Remove inlet and discharge spools and clean screens of debris. Send to Veolia for repair.

Potential cause	Solution
Starved suction (cavitation)	TONKAFLO pumps must be fed with positive pressure as noted on the $NPSH_R$ curve. Check for obstructions, constrictions, high points, or clogged filters ahead of the pump.
Worn bearings	Perform bearing frame maintenance as described in *6 Maintenance*. Send to Veolia for repair
Motor out of balance	Confirm bedplate/base of pump and motor is secure. Perform pump and motor alignment as described in *4 Installation*. Perform maintenance on motor as per manufacturer's recommendations. Adjust and tighten couplings. Adjust sleeve gap. Contact Veolia for assistance.
Operating off the performance curve	TONKAFLO pumps must operate in the flow range specified by the pump performance curve based on operating frequency.

Table 7.6 - Pump leaking

Potential cause	Solution
Mechanical seal needs replacing	Replace the mechanical seal as described in *6 Maintenance*. Send to Veolia for repair.
O-rings in pump casing damaged	Contact Veolia to arrange the return of the pump for repair.
Oil seals need replacing	Perform bearing frame maintenance as described in *6 Maintenance*. Send to Veolia for repair.

Potential cause	Solution
Piping not sealed correctly	Seal threaded fittings with Teflon tape. Ensure gaskets are properly sealed in the Vitaulic or flanged fittings.
Vent/breather dirty or plugged	Clean vent on bearing frame. Replace vent on bearing frame. Send to Veolia for repair.

A Appendix: Project documents

Standard Model Parts List - 1115631

Item #	Part Description	D* Series	G** Series
1	Liquid End Assembly		
2	Mechanical Seal, 5/8-inch Diameter		
	Standard, 200 psig (13.8 barg)	1113515	1113515
	High-Pressure, 300 psig (20.7 barg)	1113497	1113497
	High-Pressure, 400 psig (27.6 barg)	1113516	1113516
3	O-ring, Mechanical seal holder	1114284	1114284
4	Mechanical seal holder	1120703	1120703
5	Liquid end adapter	1120574	1120573
6	Grease seals		
	Motor adapter	1120047	1120047
	Bearing frame	1120255	1120255
7	Retaining ring, bearing frame, housing	1114309	1120753
8	Pressure relief plug	1120578	112058
9	Washer	1120252	1120057
10	Bearing frame	1120358	1120800
11	Grease fitting	1120060	1120060
12	Shims		
	0.005-inch (0.13 mm)	---	1120058
	0.007-inch (0.18 mm)	---	1120059
13	Lock washer, tanged	1120263	---
14	Lock nut, left hand thread	1117029	---
15	Motor adapter	1120359	1120026
16	Machine bolt, hex, adapter to motor		
	1/2-inch-13UNC x 1-1/4-inch long	1113973	1113973
	5/16-inch-18UNC x 1-inch long	---	1110985
17	Lock washer		
	5/16-inch	1112256	1112256
	3/8-inch	1110012	1110012
	1/2-inch	1113104	1113104
18	Flexible coupling flange, motor shaft		
	1-1/8-inch Bore, Size 6J	1120094[1]	1120094
	1-3/8-inch Bore, Size 6J	1120095[2]	---
	1-5/8-inch Bore, Size 6J	1114333[3]	---
	1-5/8-inch Bore, Size 7S	1114334[4]	---
19	Flexible coupling sleeve		
	Size 6JE	1120306	1120306
	Size 7S	1121705[4]	---

Standard Model Parts List - 1115631

Item #	Part Description	D* Series	G** Series
20	Flexible coupling flange, bearing frame shaft, 1-1/8-inch bore		
	Size 6J	1120094	1120094
	Size 7S	1121705[4]	---
21	Coupling key for bearing frame	1120063	1120063
22	Machine bolt, he, liquid end & motor adapters to bearing frame		
	5/16-inch - 28UNC x 1-inch long	1110985[3]	---
	5/16-inch - 28UNC x 1-1/4-inch long	---	1113102
	3/8-inch - 16UNC x 1-1/2-inch long	1112250[4]	---
23	Bearing frame shaft assembly	1120325	1120688
24	O-ring, bearing frame	1114471	---
25	Bearing, cup & cone	1120491	1120093
26	Shims	1120321	1120321
27	Cap screw, 3/8-inch 16NC low profileadapter to motor	1113676	1113676
28	Retainng ring, bearing frame shaft	1120259	1120055
29	O-ring, grease seal holder	---	1120051
30	Grease seal holder	---	1120046
31	Set screw	1113769	1113769
32	Machine bolt, hex, inlet to adapter, 3/8-inch - 16NC x 1-1/4-inch	1110984	1110984
33	Plug inlet	1115055	1115055
34	Pump shaft key	1120062	1120062

Notes:

D*	D All D-Bearing Frame Pumps (5500D-, 8500D-, 12500D-, and 24000D-Series)
G**	All G-Bearing Frame Pumps (5500G-, 8500G-, 12500G-Series)
1	For use with 182TC or 184TC frame motors.
2	For use with 213TC or 215TC frame motors.
3	For use with 254TC or 256TC frame motors.
4	For use with 25 Hp 256TC frame motor model 24004D-60-Hz only.

Accessories - Standard Models

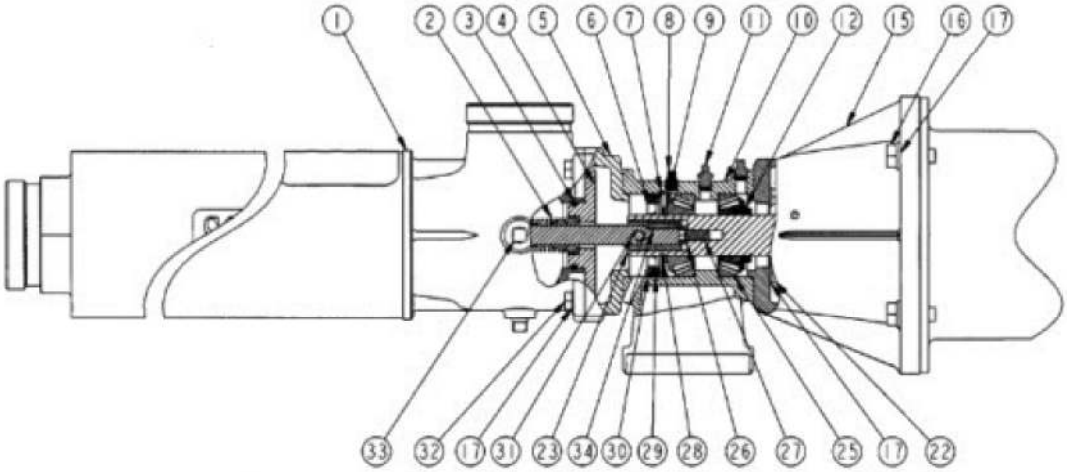
	Part Description	D* series	G* series
	Never-Seez	1120110	1120110
	Bearing frame assembly	1120327	112040
	Mechanical seal kit		
	- standard (< 200 psig, 13.8 barg)	1121215	1121215
	- high pressure (< 300 psig, 20.7 barg)	1120312	1120312
	- high pressure (< 400 psig, 27.6 barg)	1120477	1120477
	Allen wrench, 3/16-inch	1113770	1113770
	Victaulic adapters		
	- 3-inch x 3-inch MNPT, 316SS	1120590	1113653
	- 3-inch x 2-inch FNPT, 316SS	1120587	1120587
	- 3-inch x 1-1/2-inch FNPT, 316SS	1120588	1120588
	- 4-inch x 4-inch MNPT, 316SS (24000 series inlet only)	1122067	---
	Victaulic Coupling Clamp		
	- 3-inch	1114373	1114373
	- 4-inch (24000 series inlet only)	1115161	---
	Pump discharge screen	1120501	1120501
	Retaining ring pliers for mechanical seal replacement	1120108	1120108
	Bearing frame cap for belt drive	1120547	1120546
	Coupling guard kit	1239454	---

Notes:

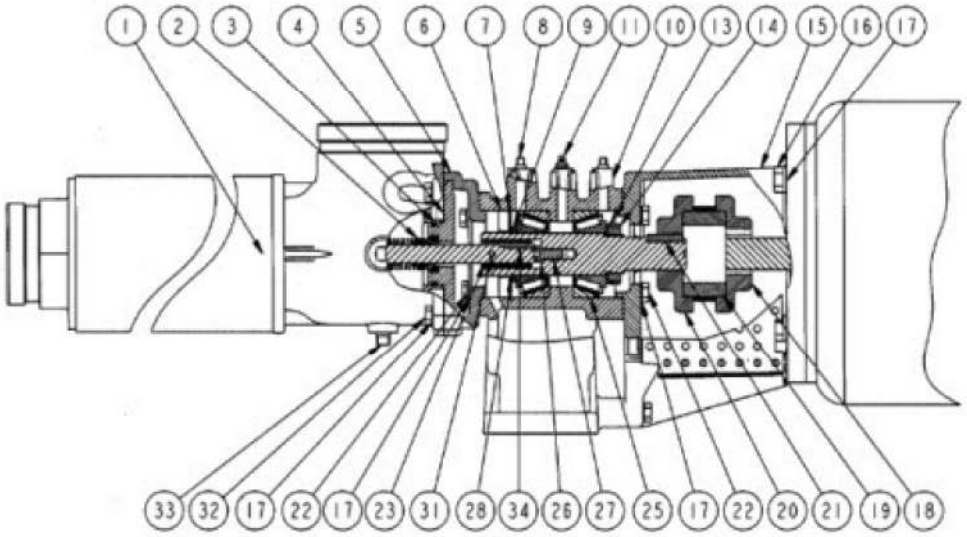
D* D All D-Bearing Frame Pumps (5500D-, 8500D-, 12500D-, and 24000D-Series)

G** All G-Bearing Frame Pumps (5500G-, 8500G-, 12500G-Series)

Cutaway drawings



G-bearing frame pumps



D-bearing frame pumps

Recommended Spare Parts - 1115631

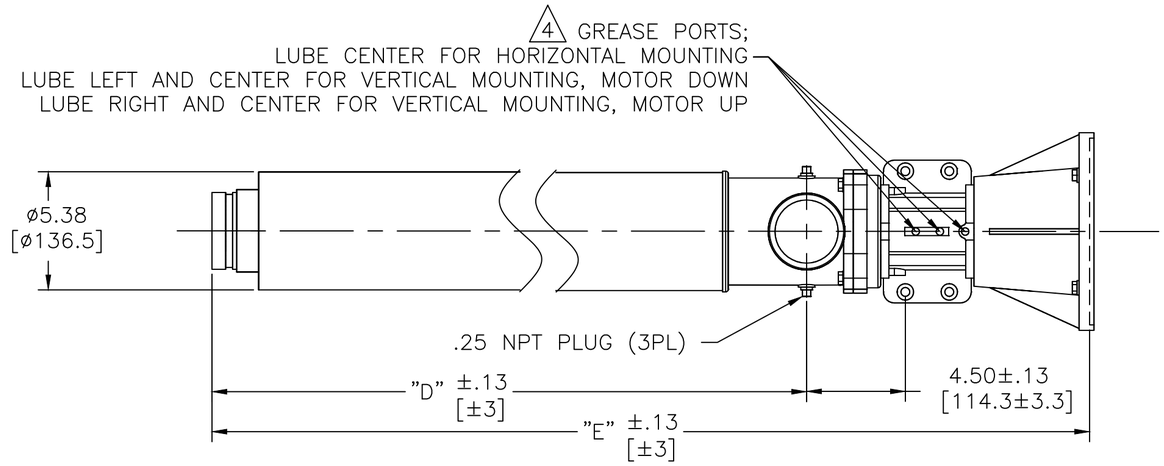
Spare parts for standard TONKAFLO pumps with type D bearing frame

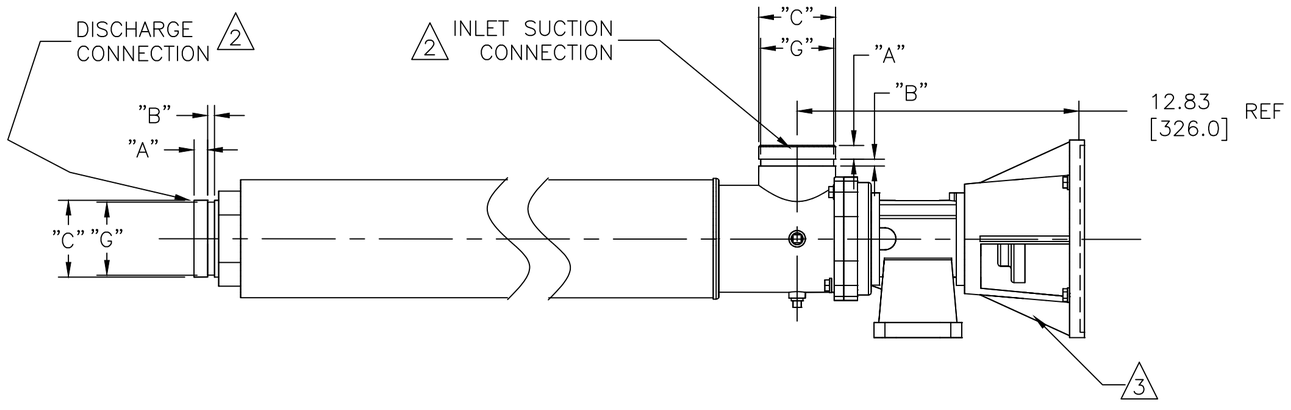
Part Description	Part #	Quantity
5/8-inch standard Type 21, BF501C1 mechanical seal kit, inlet pressure <200 psig (<13.8 barg). Includes O-ring for standard seal holder.	1121215	1
Bearing frame grease seal	1120255	1
Bearing frame/motor adapter grease seal	1120256	1
O-ring for bearing frames	1120256	1
Bearing cup and cone	1120491	2
Bearing frame housing - retaining rings	1114309	1
Bearing frame shaft - retaining rings	1120259	1
Special grease, Lubriplate EMB (14 1/2 oz tube)	1121576	1
Bearing frame shaft bolt shims	1120321	2
Lock washer, multi-tanged	1120263	1
Installation, Operation, and Maintenance manual for SS5500, SS8500, SS12500, and SS24000 series high-pressure pumps with D and G bearing frames	Available on the pump tools website	1
Pump shaft key	1120062	1
Bearing frame washer behind retaining ring #2	1120252	1
Bearing frame shaft set screw	1113769	1
Bearing frame grease fitting	1120060	2
Lock nut - left handed thread	1117029	1
Bearing frame shaft bolt, for pump shaft adjustment	1113676	1
Pressure relief plug - red cap	1120578	1
Coupling flange motor, 1 3/8 inch bore	1120095	1
Coupling sleeve 6JE size for D bearing frame pumps	1120306	1
Coupling flange pump 1 1/8 inch bore	1120094	2
Coupling key, for bearing frame	1120063	1
Bearing frame cap assembly with oil seal DD (for belt driven pumps)	1120547	1
Coupling flange motor 1 5/8 inch bore	1114334*	1
Coupling sleeve	1121702*	1
Coupling flange pump 1 1/8 inch bore	1121705*	1

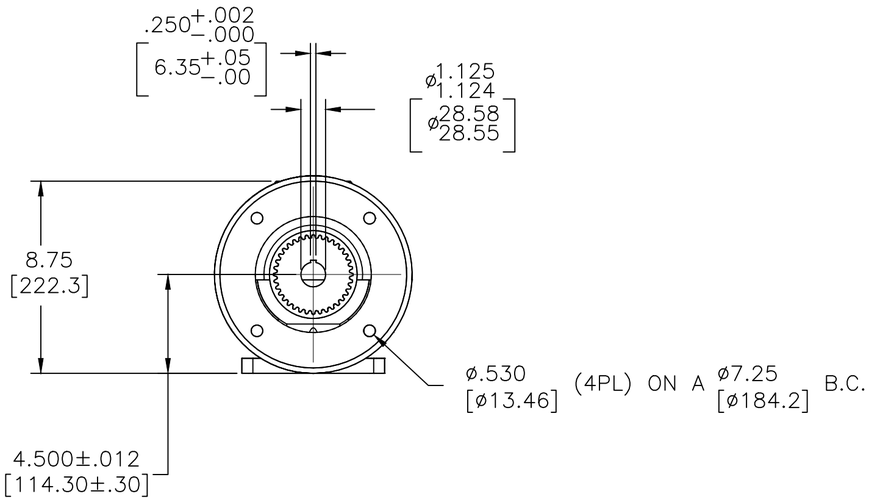
* For use with 25HP, 256TC frame motor model 24004D-60H only

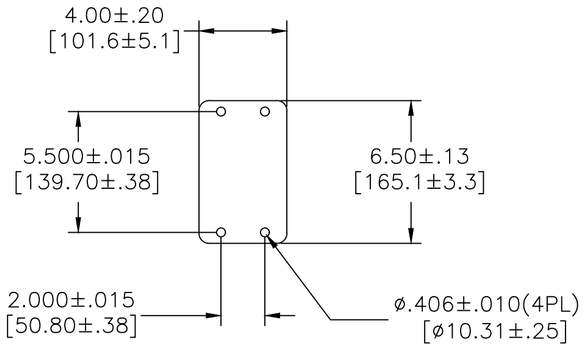
Spare parts for standard TONKAFLO pumps with type G bearing frame

Part Description	Part #	Quantity
5/8-inch, type 21, BF_{50} 1C1-316SS mechanical seal kit - inlet pressure ≤200 psig (13.8 bar), includes O-ring for standard seal holder	1121215	1
Bearing frame grease seals	1120047	2
O-ring for bearing frame grease seal holder	1120051	1
Grease seal holder	1120046	1
Bearing cup and cone	1120093	2
Bearing frame shaft shims (2 at 0.005 inch, 4 at 0.007 inch, 1 at 0.120 inch)	1121060	2
Bearing frame shaft - retaining ring	1120055	1
Bearing frame grease, Lubriplate EMB (14.5 ounce tube)	1121576	1
Installation, Operation, and Maintenance manual for SS5500, SS8500, SS12500, and SS24000 series high-pressure pumps with D and G bearing frames	Available on the pump tools website	1
Pressure relief plug	1120578	2
Bearing frame washer behind retaining ring #5 (0.120 inch)	1120057	1
Bearing frame retaining ring	1120753	1
Bearing frame shaft set screw	1113769	1
Pump shaft key	1120062	1
Coupling key	1120063	1
Coupling flanges for G bearing frame pumps	1120094	2
Coupling sleeve for G bearing frame pump	1120306	1
Bearing frame cap with oil seal assembly GD (for belt driven pumps)	1120546	1
Bearing frame grease fitting	1120060	2
Bearing frame shaft bolt shims	1120321	2
Bearing frame shaft bolt	1113676	1









VICTAULIC® DIMENSIONS STANDARD 3" CONNECTIONS		
ITEM	INCHES	MILLIMETERS
"A"	.625±.031	15.88±.78
"B"	.312±.031	7.94±.78
"C"	3.500±.031	88.90±.78
"G"	3.344 +.000 −.018	84.94 +.00 −.46

MODELS		"D"		"E"	
60HZ	50HZ	INCHES	[MM]	INCHES	[MM]
SS5503G	SS5503G	14.49	368	27.32	694
SS5504G/8504G	SS5504G/8504G	16.46	418	29.29	744
SS5505G	SS5505G	18.43	468	31.26	794
SS5506G	SS5506G	20.40	518	33.23	844
	SS5508G	24.35	618	37.18	944
SS8503G	SS8503G	14.49	368	27.32	694
SS12502G	SS12502G	14.69	373	27.52	699

NOTES:

1. DIMENSIONS ARE IN INCHES [MILLIMETERS].
2. PUMP INLET AND DISCHARGE CONNECTIONS MATE WITH 3–INCH VICTAULIC TYPE CLAMPED UNIONS. PUMP INLET MAY BE ROTATED IN 90° INCREMENTS.
3. PUMP AND MOTOR ADAPTER WILL ACCEPT NEMA 182TC, 184TC FRAME ELECTRIC MOTORS AND A WOODS FLEXIBLE COUPLING. THE FLANGE IS TO BE FLUSH WITH THE END OF THE PUMP SHAFT. FOR BELT DRIVE PUMPS THE BEARING FRAME SHAFT EXTENDS 1.75 INCH BEYOND THE END OF THE BEARING FRAME HOUSING WITH MOTOR ADAPTER REMOVED.
4. SEE PUMP INSTRUCTIONS P/N 1116531 FOR ADDITIONAL INFORMATION ON INSTALLATION, STARTUP, AND MAINTENANCE.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
E	VEOLIA REBRANDING	140586	HP	NL	NL	09 Jan 23
D	SUEZ REBRANDING	131562	TG	SR	MS	20 Sep 18
C	REDRAWN ON ACAD	3334	PFM	BJW		03 Mar 98
B	ADDED NOTE #4	-	PAS	WRM	-	20 Nov 84

TOLERANCES UNLESS NOTED
DECIMALS .X .1 .XX .03 .XXX .010
ANGLES 2°
FRAC

VEOLIA

CUSTOMER INFORMATION

DWG, TF, OUTLINE

SS5500/8500/12500 "G" SERIES PUMP

DRAWING NUMBER 1121041
REVISION E
REF.:-
DOC. OWNER:-
PROJECT NO.
PART/MATERIAL NO.
SCALE 3/16" = 1"
SIZE C
SHEET 1 OF 1

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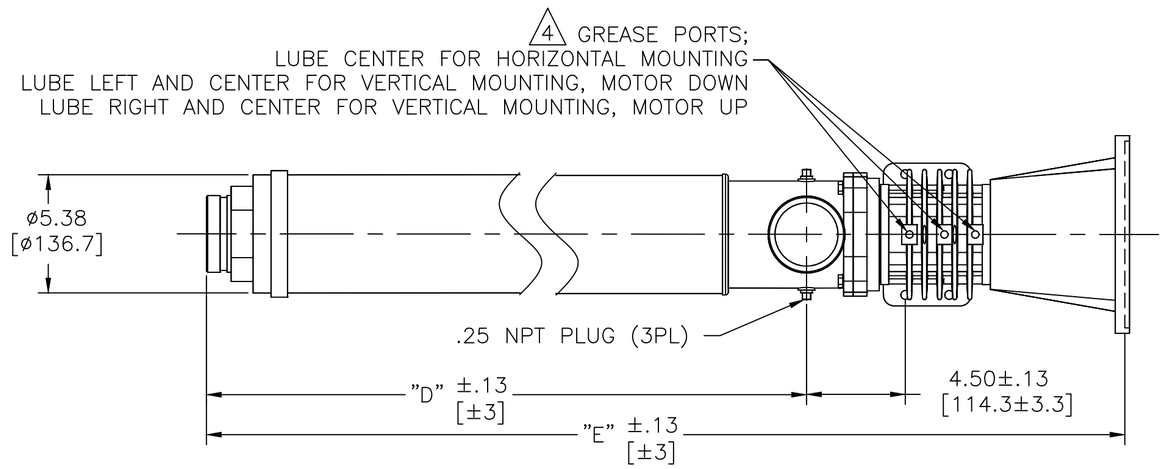

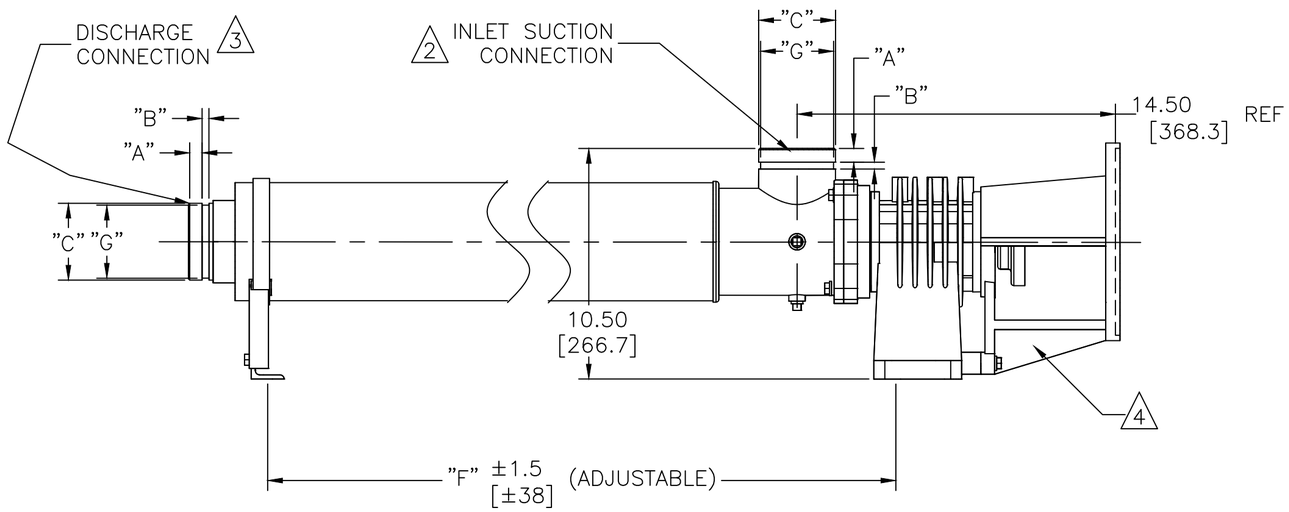

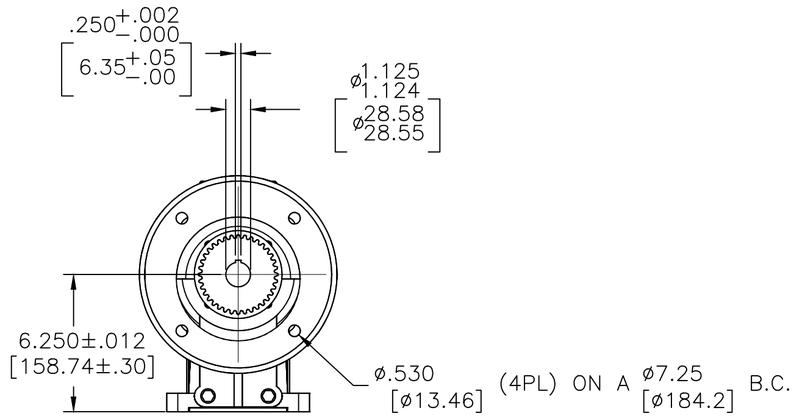

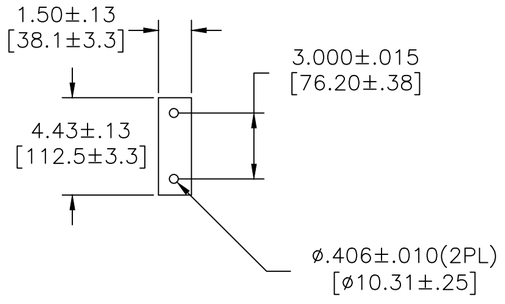

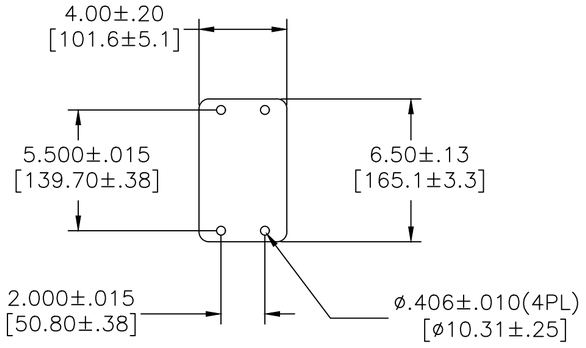

VICTAULIC® DIMENSIONS STANDARD 3" CONNECTIONS		
ITEM	INCHES	MILLIMETERS
"A"	.625±.031	15.88±.78
"B"	.312±.031	7.94±.78
"C"	3.500±.031	88.90±.78
"G"	3.344 +.000 −.018	84.94 +.00 −.46

MODELS		"D"		"E"		"F"	
60HZ	50HZ	INCHES	[MM]	INCHES	[MM]	INCHES	[MM]
SS5508D/8508D	SS5508D	24.35	618	38.85	987	24.0	609
	SS5512D/8512D	32.24	818	46.74	1187	32.0	812
SS8506D	SS8506D	20.40	518	34.90	886	20.0	508
SS12503D	SS12503D	17.73	450	32.23	819	17.2	437
SS12504D	SS12504D	20.78	527	35.28	896	20.2	514
	SS12506D	26.87	682	41.37	1051	26.2	666

NOTES:

1. DIMENSIONS ARE IN INCHES [MILLIMETERS].
2. PUMP INLET AND DISCHARGE CONNECTIONS MATE WITH 3–INCH VICTAULIC TYPE CLAMPED UNIONS. PUMP INLET MAY BE ROTATED IN 90° INCREMENTS.
3. PUMP AND MOTOR ADAPTER WILL ACCEPT NEMA 213/215/254/256TC FRAME ELECTRIC MOTORS AND A WOODS FLEXIBLE COUPLING. THE FLANGE IS TO BE FLUSH WITH THE END OF THE PUMP SHAFT. FOR BELT DRIVE PUMPS THE BEARING FRAME SHAFT EXTENDS 1.75 INCH BEYOND THE END OF THE BEARING FRAME HOUSING WITH MOTOR ADAPTER REMOVED.
4. SEE PUMP INSTRUCTIONS P/N 1116531 FOR ADDITIONAL INFORMATION ON INSTALLATION, STARTUP, AND MAINTENANCE.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
H	VEOLIA REBRANDING	140586	HP	NL	NL	09 Jan 23
G	SUEZ REBRANDING	131562	TG	SR	MS	20 Sep 18
F	REDRAWN ON ACAD	3334	PFM	BJW	-	03Mar98
E	ADD/DELETE MODELS	--	MJO	WRM	-	14Feb92

TOLERANCES UNLESS NOTED
DECIMALS: .X .1, .XX .03, .XXX .010
ANGLES 2°
FRAC

VEOLIA

CUSTOMER INFORMATION

DWG, TF, OUTLINE

SS5500/8500/12500 "D" SERIES PUMP

DRAWING NUMBER	REVISION
1121042	H

REF.: -
DOC. OWNER:-

PROJECT NO.	PART/MATERIAL NO.	SCALE	SIZE	SHEET
		3/16" = 1"	C	1 OF 1

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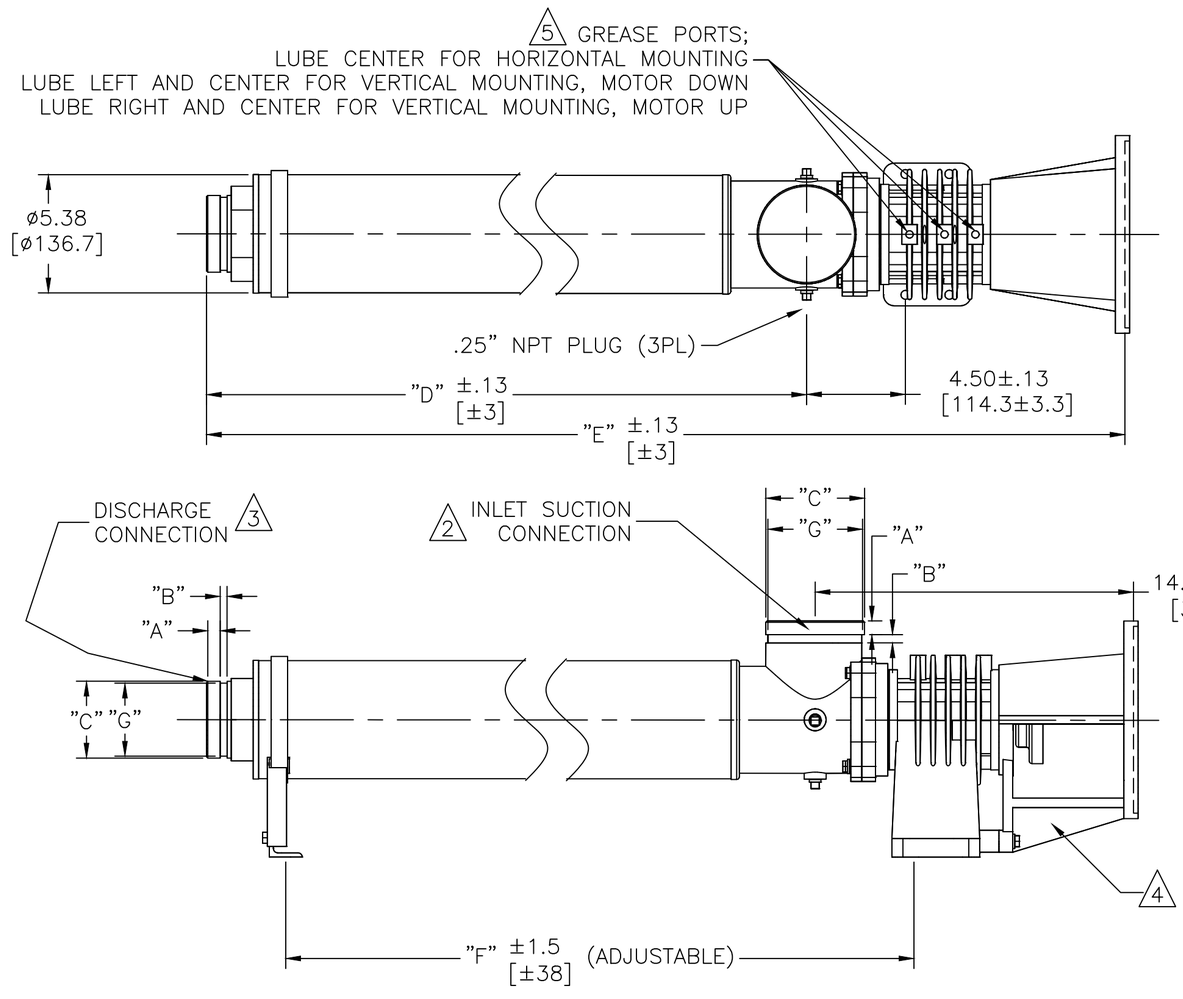

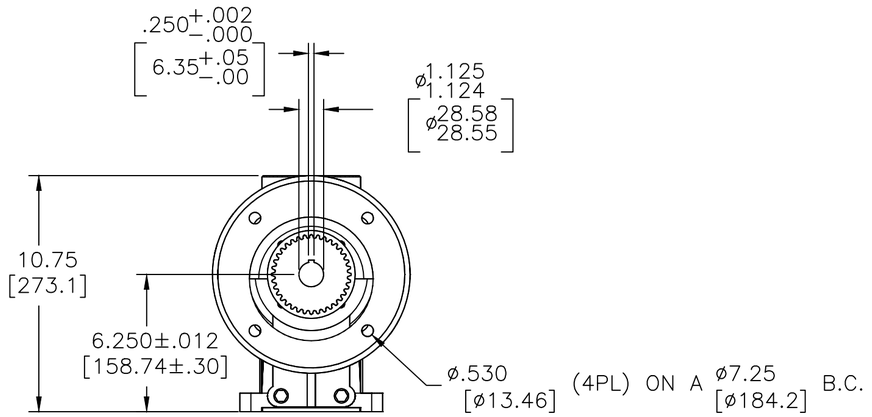

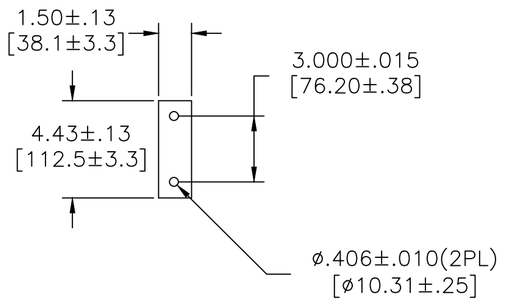

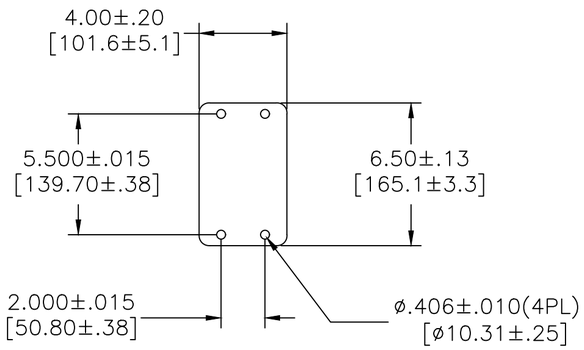

VICTAULIC® DIMENSIONS STANDARD 3" DISCHARGE CONNECTIONS		
ITEM	INCHES	MILLIMETERS
"A"	.625±.031	15.88±.78
"B"	.375±.031	9.53±.78
"C"	$3.500^{+.045}_{-.031}$	$88.90^{+1.14}_{-.78}$
"G"	$3.334^{+.000}_{-.020}$	$84.68^{+.00}_{-.51}$

VICTAULIC® DIMENSIONS STANDARD 4" INLET CONNECTION		
ITEM	INCHES	MILLIMETERS
"A"	.625±.031	15.88±.78
"B"	.375±.031	9.53±.78
"C"	$4.500^{+.063}_{-.031}$	$114.30^{+1.60}_{-.78}$
"G"	$4.334^{+.000}_{-.020}$	$110.08^{+.00}_{-.51}$

	MODELS	"D"		"E"		"F"	
60HZ	50HZ	INCHES	[MM]	INCHES	[MM]	INCHES	[MM]
SS24002D	SS24002D	16.08	408	30.79	782	NO SUPPORT	
SS24003D	SS24003D	20.38	517	35.09	891	20.00	508
SS24004D	SS24004D	24.68	626	39.39	1000	24.25	616

NOTES:

1. DIMENSIONS ARE IN INCHES [MILLIMETERS].
2. PUMP INLET CONNECTIONS MATE WITH 4–INCH VICTAULIC TYPE CLAMPED UNIONS. PUMP INLET MAY BE ROTATED IN 90° INCREMENTS.
3. PUMP DISCHARGE CONNECTIONS MATE WITH 3–INCH VICTAULIC TYPE CLAMPED UNIONS.
4. PUMP AND MOTOR ADAPTER WILL ACCEPT NEMA 213TC, 215TC, 254TC, 256TC FRAME ELECTRIC MOTORS AND A WOODS FLEXIBLE COUPLING. FLANGE IS TO BE MOUNTED FLUSH WITH THE END OF THE PUMP SHAFT, FOR BELT DRIVE PUMPS, THE BEARING SHAFT EXTENDS 1.75" BEYOND THE END OF THE BEARING FRAME HOUSING WITH MOTOR ADAPTER REMOVED.
5. SEE PUMP INSTRUCTIONS P/N 1116531 FOR ADDITIONAL INFORMATION ON INSTALLATION, STARTUP, AND MAINTENANCE.

REV	DESCRIPTION	ECO	DWN	APPR	APPR	DATE
D	VEOLIA REBRANDING	140586	HP	NL	NL	09 Jan 23
C	SUEZ REBRANDING	131562	TG	SR	MS	20 Sep 18
B	REDRAWN ON ACAD	3334	PFM	BJW	-	16 Feb 98
A	ADD Ø.406	-	RLH	-	-	04 May 94

TOLERANCES UNLESS NOTED
DECIMALS .X .1 .XX .03 .XXX .010
ANGLES 2° FRAC

VEOLIA

CUSTOMER INFORMATION

DWG, TF, OUTLINE

SS24000 "D" SERIES PUMP

DRAWING NUMBER: 1122833 REVISION: D

REF.: - DOC. OWNER:-

PROJECT NO. | PART/MATERIAL NO. | SCALE: 3/16" = 1" | SIZE: C | SHEET: 1 OF 1

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