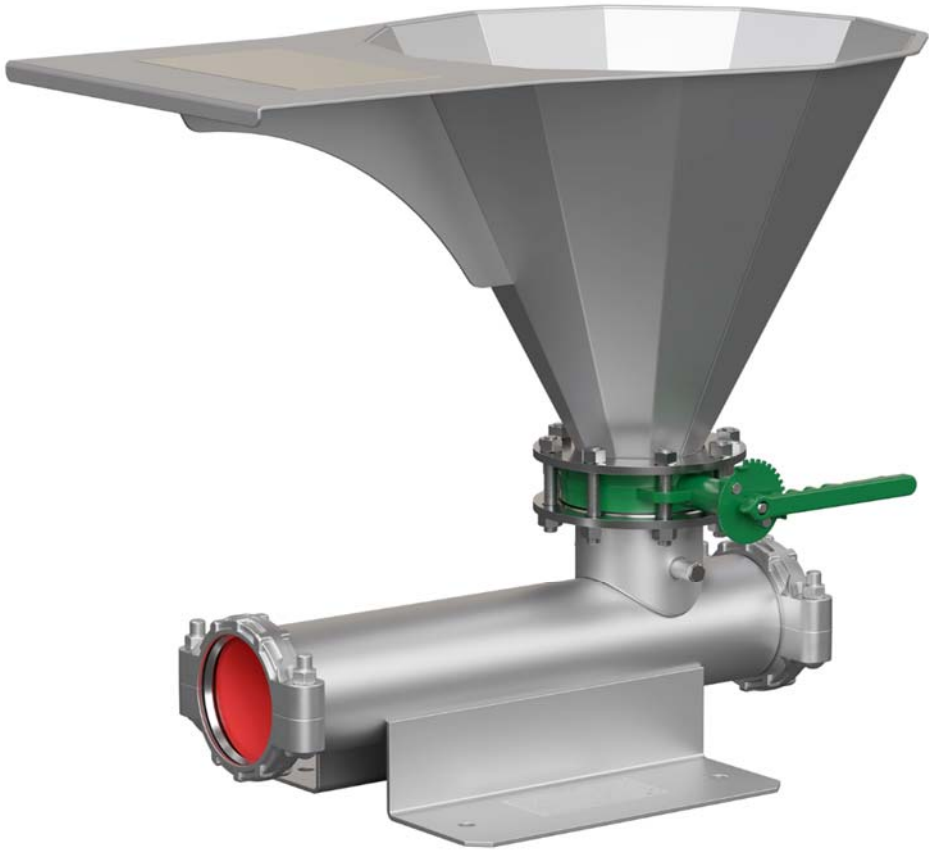
Alfa Laval Vortex Shear-Mixer SM6010

Installation and Operation Manual for models SM6010



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The instructions given in this manual are intended as a general instruction to Alfa Laval units

Alfa Laval reserves the right to make changes at any time without prior notice.

Any comments regarding possible errors and omissions or suggestions for improvement of this publication would be gratefully appreciated. Please forward this information to the address below.

If further clarification regarding this manual is required, please contact your local Alfa Laval representative.

Copies of this publication can be ordered from your local Alfa Laval Company.

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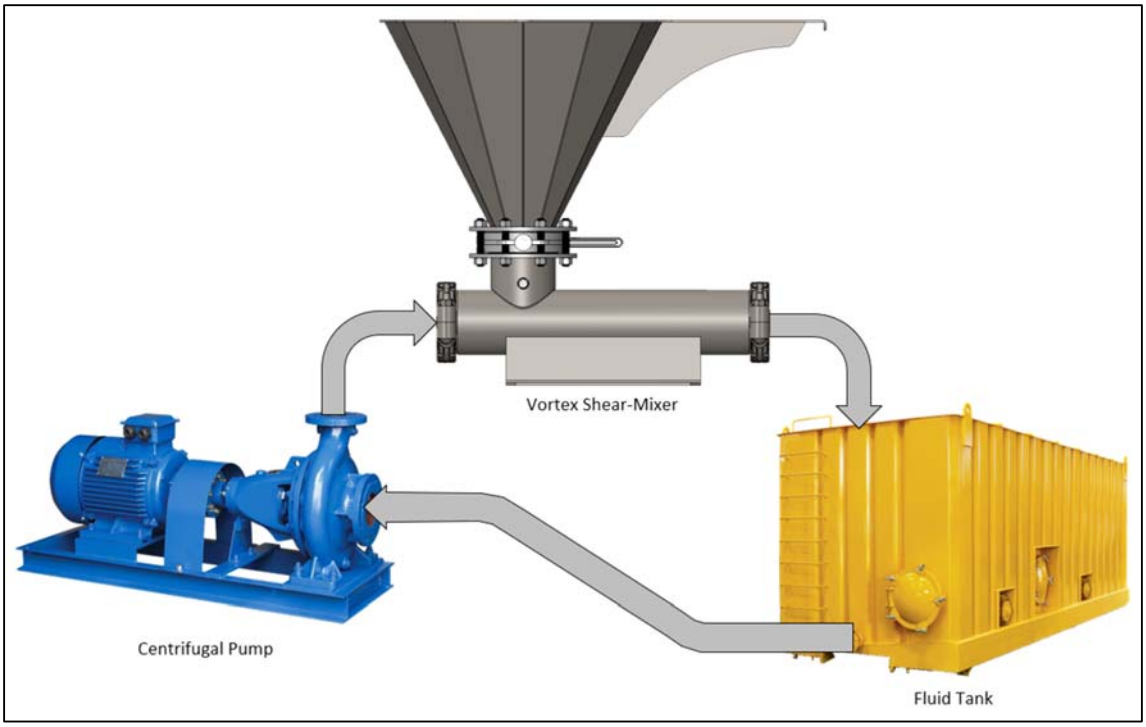
1 General Information

The Alfa Laval Vortex Shear-Mixer SM6010 is a simple, effective venturi slurry eductor combined with a stainless steel conical hopper. It has no motorized or rotating components, and relies on low pressure vacuum and dynamic, hydraulic shear to easily mix solids into fluid. It vastly outperforms other traditional venturi style mixers by offering higher additive loading rates and more complete additive mixing. Unlike traditional venturi mixers, it is exceedingly resistant to plugging and downtime.



Application:

The Alfa Laval Vortex Shear-Mixer is an advanced slurry mixing solution that reduces additive waste, mixing time and cost.

Features:

The Alfa Laval Vortex Shear-Mixer provides these key features:

- Simple robust design, no moving parts
- Low maintenance with easy to replace internals
- Highest product addition rate of any venturi slurry eductor
- Easily handles difficult to mix additives
- Reduces product waste
- High quality materials of construction

It also features exclusive advantages that lead to abundant cost savings related to both chemical additives and time:

- Dynamically shears chemical additives into the fluid
- Equipped with easily replaceable inserts
- Can be utilized in both batch or continuous mixing applications

Technical data

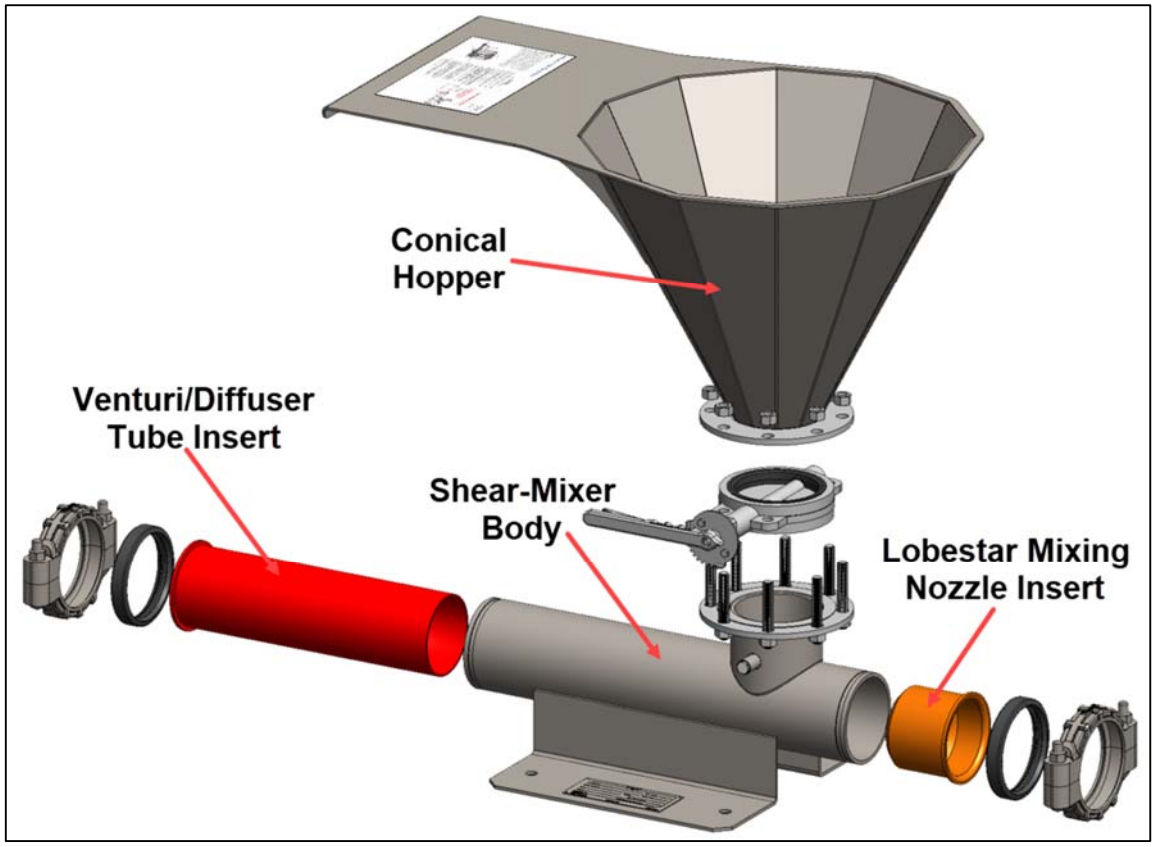
Model SM6010	
Body construction material	304SS
Hopper and Frame material	304SS
Optimum Differential Pressure Range (ΔP)	50-80 PSI
Maximum Pressure Rating	150 PSI
Operating Temperature Range	-20°F to 135°F
Approximate Weight	260 lbs {117.9kg]
Optimum Hydraulic Feed Rate in GPM*	500 gpm - 620 gpm
Maximum hydraulic flow rate	850 gpm H_2O @ 150 PSI

**Higher hydraulic feed rates can be achieved with alternative Lobestar Mixing Nozzle® inserts*

1.1 Main Components

The Shear-Mixer SM6010 consists of the following components:

- Vortex Shear-Mixer Basic
  - Lobestar Mixing Nozzle® insert
  - Venturi / diffuser tube insert
  - Shear-Mixer Body
  - Conical hopper



1.1.1 Material of Construction

Vortex Shear-Mixer BBS - Components	Material
Shear-Mixer Body	Stainless steel (304SS)
Venturi / Diffuser insert	Molded Polyurethane
Lobestar Mixing Nozzle® insert	Molded Polyurethane

Conical Hopper	Stainless steel (304SS)
Suction Valve(s)	Carbon steel
Clamps and Couplings	Stainless steel (304SS)
Coupling Gaskets	Buna

1.2 Basic Equipment

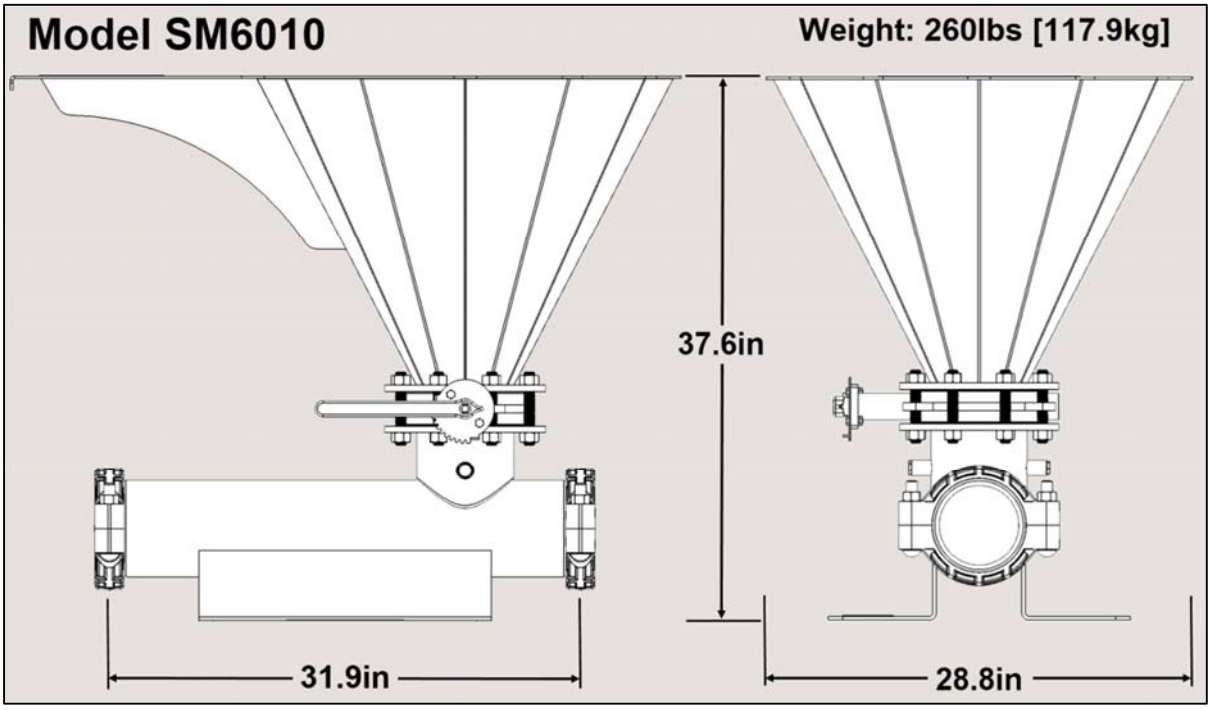
The Alfa Laval Vortex Shear-Mixer SM6010 is a 6” model that consists of a basic Shear-Mixer with base assembled together with a 6” wafer style butterfly valve and stainless steel hopper funnel with work tray.

Vortex Shear-Mixer SM6010

Additional Equipment:

A properly sized centrifugal feed pump is necessary to supply adequate motive flow for the Shear-Mixer BBS to perform as designed.

1.3 Product Dimensions



2 Safety Instruction and Warnings

Operators must read and understand the “Safety Instructions” of the respective equipment before carrying out any work on the system or before you put the system into service!

Alfa Laval will not be responsible for any breakdown of the equipment caused by the owner’s failure to follow the instructions given in this documentation.

This documentation describes the authorized way to use the equipment. Alfa Laval will take no responsibility for injury or damage if the equipment is used in any other way.

Safety Signs	
	Always use protective foot wear - Safety shoes
	Always use eye protection - Safety glasses
	Always use protective handwear - Safety gloves
	Always wear halmet
	Always wear Noise protective equipment
	Protective clothing
	Immediate STOP

The safety directions, whose non-observance may endanger the Alfa Laval product and its functioning, are specially identified as caution symbol

FAILURE TO FOLLOW THESE RULES MAY RESULT IN SEVERE PERSONAL INJURY OR PROPERTY DAMAGE

Genuine Alfa Laval parts

- Safeguard your commitment to quality by always using genuine Alfa Laval spare parts.
- The staff entrusted with the installation, operation, inspection and maintenance of the Alfa Laval Vortex Shear-Mixer BBS must be suitably qualified for handling these tasks and the area of responsibility and supervision of the staff must be precisely laid down by the user.
- In case the staff does not possesses the knowledge required, they must receive training and instruction. If necessary, Alfa Laval is available for assisting in this training.
- Furthermore, the user must ensure that the present general safety instructions as well as the contents of the operating manual for the Alfa Laval product are fully understood by its staff.

Safety precautions should always be taken to mitigate any potential injuries when operating Alfa Laval Vortex equipment. When operating the Alfa Laval Vortex Shear-Mixer take the following preventative steps:

- **ALWAYS** wear eye protection while mixing and proper PPE for chemical additions.
- **ALWAYS** take care when mixing chemical, as the Shear-Mixer creates a strong vacuum. Keep hands away from suction throat of mixer and avoid pinching hands or fingers with suction valve.
- **NEVER** exceed Shear-Mixer maximum inlet pressure.
- **NEVER** close a valve downstream of the mixer, while feed pump is running.

2.1 General Safety Regulations

- Always allow trained personnel to operate, clean, dismantle or assemble the completed system.
- NEVER work on mechanical equipment such as valves or pumps with the electric power or instrument air supply when it is ON.
- Check that voltage and frequency levels comply with labels on motors or any other electrical equipment integrated with the Shear-Mixer system.
- Apart from the present general safety directions also the special safety directions, which may apply to the specific Alfa Laval product, must be observed.

2.2 Safety Regulations during Installation

- Read and follow the Operator's manual before attempting to install or operate the modules and supporting equipment.
- Do not operate the system before installation is complete.
- Ensure all pipe lines and vessels are de-pressurized and emptied before installation, inspection, assembling and disassembling.
- The safety functions must be checked before the first start.

Transportation and lifting

- For lifting and installation of the system and/or components, follow the instructions in the "Installation Instructions"
- Use correct lifting tools with certified working load
- The parts must be lifted using the lifting points indicated or as specified in the documents.
- Make sure that the vessels are empty of water before lifting the unit.
- Lifting operations must be carried out by personnel certified for operating forklifts and/or cranes.

Drains and vents

Liquids or vapours may emerge from ventilation outlets from vessels, or from other equipment. Install the outlets in such a way that personnel or environment could not be harmed.

Make sure that the outlets are not blocked and that condensate can drain away.

2.3 Safety Regulations during Operation and Maintenance

- Do not attempt maintenance until the system has come to complete stop and check that the main power for any feed pump is SHUT OFF.
- For inspection and maintenance of any component: Strictly follow the corresponding technical documentation.

High temperature

- Parts of some equipment coming in contact with hot process liquid can cause burns if touched.
- Be careful when working near pipes, valves and equipment
- Machinery near the Shear-Mixer may heat up during its operation and users must ensure that these cannot be accidentally touched during operation or maintenance of the Shear-Mixer

Chemicals

- Safety precautions for use of chemicals: use eye protection and gloves. Avoid skin contact, eye contact and contact with clothes.
- Clean empty chemicals containers before disposal.
- If chemicals are spilled on clothes, rinse with water and dispose of clothes.
- If chemicals are spilled on the floor, rinse with water and suck remaining chemicals off with sand. Clean the spot immediately afterwards.

Electric risks

- All electrical installation work must be done by authorized personnel.
- Ensure power is off before installation, inspection, assembling and disassembling.
- Follow local regulations for electrical installation and grounding.
- Never work on electrical equipment with main power supply on.
- Before start-up it shall be checked that all connections are properly grounded (connected to the plant earth) and isolated in accordance with local regulations.
- Dangerous voltage can occur on potential free terminals in control panel with main switch turned off.

Maintenance

- For inspection and maintenance of any component: strictly follow the corresponding technical documentation.
- Ensure all pipe lines and vessels are de-pressurized and emptied before installation, inspection, assembling and disassembling.
- Never work on mechanical equipment such as valves or pumps with the electric power or instrument air supply on.

Sharp edges

- Sharp edges can cause cuts.
- Avoid placing hands into valve orifice pinch points.

Caustic agents

- Always handle cleaning liquids, lye and acid with great care and in accordance with separate instructions for those fluids.

Hazardous Area

- Cleaning, maintenance and repair work may be done only at non-explosive atmosphere
- For reasons of safety, only tools made of non-sparking material may be used when performing work in hazardous area. Note that the tools supplied by Alfa Laval with the equipment are sparking and may only be used in non-hazardous area!
- Proper warning / ex-zone detection devices must be used when executing work in potentially hazardous environment, even when the area should be non-hazardous area due to the works. All work must be stopped on sensor alarm
- All general ex-zone safety rules for the different types of ex-protection must be applied, e.g. power to the equipment under work must be switched off and secured against accidentally switch-on.

2.4 Noise Emission

- Noise emission levels for the Vortex Shear-Mixer correspond to the values for the feed pump used.

2.5 Modifications and Reconstruction

The machinery must not be altered or modified in any way if not directly approved of by Alfa Laval.

Use of original spare parts and accessories guarantee a safe operation. Use of parts from other manufacturers can lead to premature failure of the machinery, cause damage to the machine and surrounding area and jeopardize the warranty.

3 Installation Instructions

Operators must read and understand the “Installation Instructions” of the respective equipment before carrying out any installation work on the system!

It is the responsibility of the customer or by the customer appointed responsible for installation, to ensure that any person involved with the installation of this equipment follows all safety and installation instructions, and local legislation.

Work on Alfa Laval product must always be carried out only when it is at standstill. It is imperative that the procedure described in the operating manual for taking the Alfa Laval product out of operation must be observed.

3.1 Unpacking and Initial Inspection

Reception on site and unpacking

- To avoid the risk of damaging the equipment, the crates must be opened and unpacked carefully and if possible in the presence of an Alfa Laval representative.
- If during the inspection of the delivered components there are found damaged or missing items, it shall be reported to Alfa Laval immediately after the delivery has taken place.
- Alfa Laval can instruct how to repair possible damages or how to replace missing items.
- Ensure that all packing materials have been removed from the crate before starting the installation

Storage

- All equipment shall be stored indoors and kept dry and clean.

  Temperature: +10˚C / +40˚C
  Humidity: < 85%
- For long term storage always follow the maintenance instructions

Installation of interconnecting piping

- Pipe connection to be made in accordance with PID, layout drawings, isometric drawings, terminal points lists and equipment operating instructions supplied.
- Ensure that check valves and control valves are installed with correct flow direction.
- Remove valve seals upon welding to prevent heat damage.

3.2 Lifting Instructions

A properly rated forklift or crane operated by a qualified operator should be used for lifting.

Alfa Laval always recommends following the lifting procedure given in this manual to avoid damage to system.

Please refer to the General Arrangement / Equipment Layout drawings with respect to the overall dimensions and connection points.

The true module dimensions and connection points can slightly differ from the below drawing

Lifting with forklift

Shear-Mixer SM6010 is packaged on a pallet and can be lifted and moved close to its intended installation position using a properly rated forklift as illustrated below

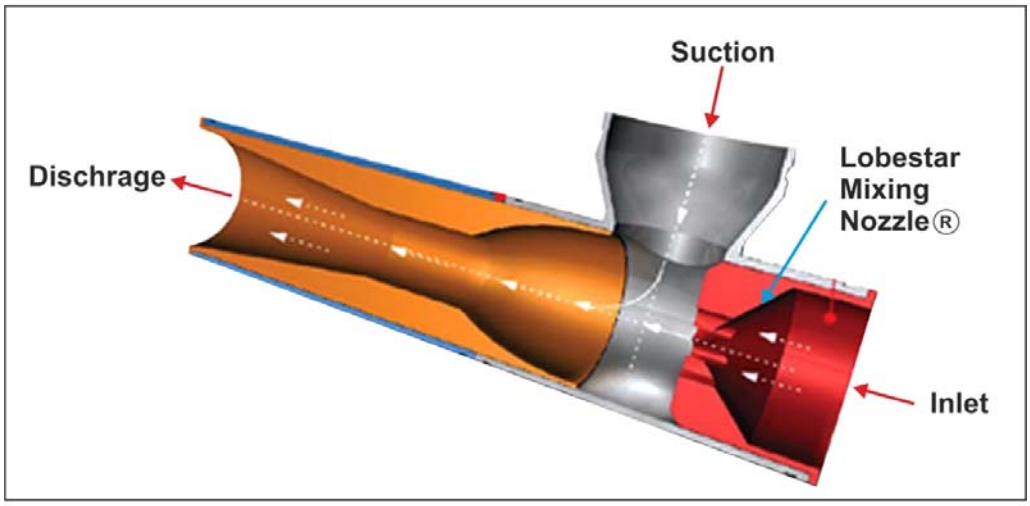
Lifting with crane

When lifting with a crane, use a properly rated set of crane forks or a properly rated set of slings and lift in accordance with site lifting regulations.

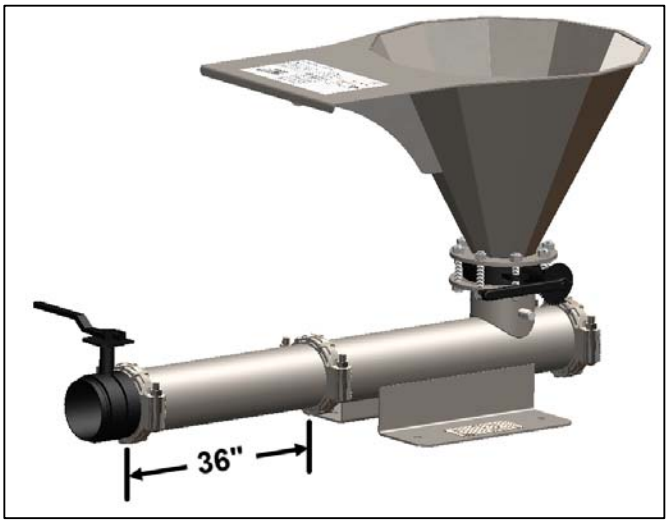
3.3 Pre-Installation Considerations

To ensure optimal performance when installing the Alfa Laval Vortex Shear-Mixer, the following considerations should be made:

- The Shear-Mixer must be oriented so the direction of motive flow is from the Lobestar Mixing Nozzle® (inlet) end to the venturi / diffuser (discharge) end as shown in the following figure. The discharge line from the centrifugal pump is connected to the Lobestar Mixing Nozzle® / inlet end. The venturi / diffuser tube (discharge) end of the Shear-Mixer is connected to the downstream line that is routed either back to the slurry mixing batch tank in a batch mixing scenario or to the next step in a continuous mixing application.



- Function of the Alfa Laval Vortex Shear-Mixer is heavily influenced by *streamlined* flow throughout the system in which the mixer is utilized. Streamlined flow is a scenario in which the flow, both upstream and downstream of the mixer, is constant and as free from turbulence or restriction as possible. In most applications streamlined flow hindrances such as elbows, fittings, and valves in the fluid circulating line are unavoidable. However, care should be taken to minimize the number of such interferences as much as possible since an abundance of these will these will diminish Shear-Mixer performance.
- Where pipe bends are necessary, long radius elbows are preferred since they are more conducive to streamlined flow.
- The Shear-Mixer should be installed close to the end of the discharge piping to reduce downstream back pressure as much as possible.
- The Shear-Mixer should be installed where the total vertical height of the discharge piping above the Shear-Mixer centerline is minimal. The ideal installation location in the piping is the highest horizontal section, which eliminates backflow when the motive fluid pump is turned off. For installations where the discharge piping rises 6 feet or more over the centerline of the Shear-Mixer, please consult with Alfa Laval technical support to insure performance will not be impacted.
- A straight pipe run of at least six (6) times the Shear-Mixer pipe diameter should be immediately downstream of the discharge end of the Shear-Mixer for optimum function. No fittings, bends, valves, etc. should be within this distance. Shear-Mixer SM6010 requires 36” of uninterrupted straight pipe immediately downstream.



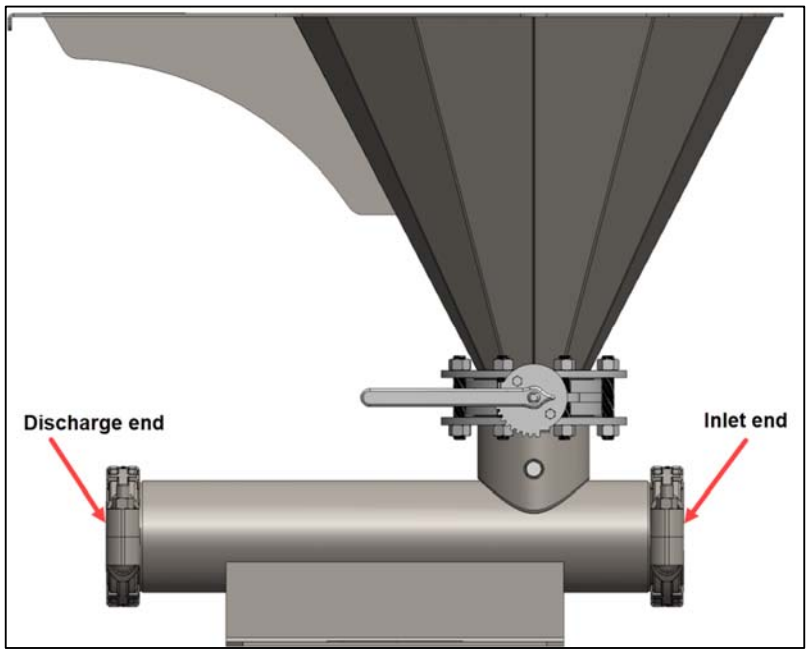
- The Shear-Mixer should be installed in a location where it sits on a level and horizontal plane.
- The discharge line inner diameter should always be as large as or larger than the Shear-Mixer pipe diameter for its entire length. Any reductions in line diameter will generate excessive back pressure and diminish or fully inhibit Shear-Mixer performance.
- Motive fluid viscosity over 200 centipoise (cP) (600 ssu) can greatly reduce the performance of the Shear-Mixer and additive flow can become unpredictable. Discharge viscosity has a major impact on performance since it is directly related to pressure losses downstream.
- The hopper valve should be closed during pump start up to prevent fluid discharge from the suction port and should be used to regulate additive and air flow into the suction during operation.
- 0 to 100 PSI pressure gauges are recommended to be mounted at the Shear-Mixer inlet and discharge, and a 0 to -30 inches of mercury vacuum gauge should be mounted at the suction inlet. Pressure gauge kits and vacuum gauges can be purchased separately. ***It is recommended to install a pressure gauge at the discharge end to see the pressure differential across the Shear-Mixer, which is a critical indicator of performance.***
- **Always** select a motive fluid pump capable of supplying steady, continuous motive flow and maintaining differential head of at least 115 PSI across the Shear-Mixer. *(In operation, the differential pressure can be determined using pressure gauges at both the Shear-Mixer inlet and discharge. The value of the inlet pressure gauge reading minus the discharge pressure gauge reading is the differential pressure.)*

NOTE

For maximum performance/efficiency, the discharge piping should have as few elbows, fittings, valves, vertical rises, etc. as possible to limit loss of head.

3.4 Installation Procedure Steps

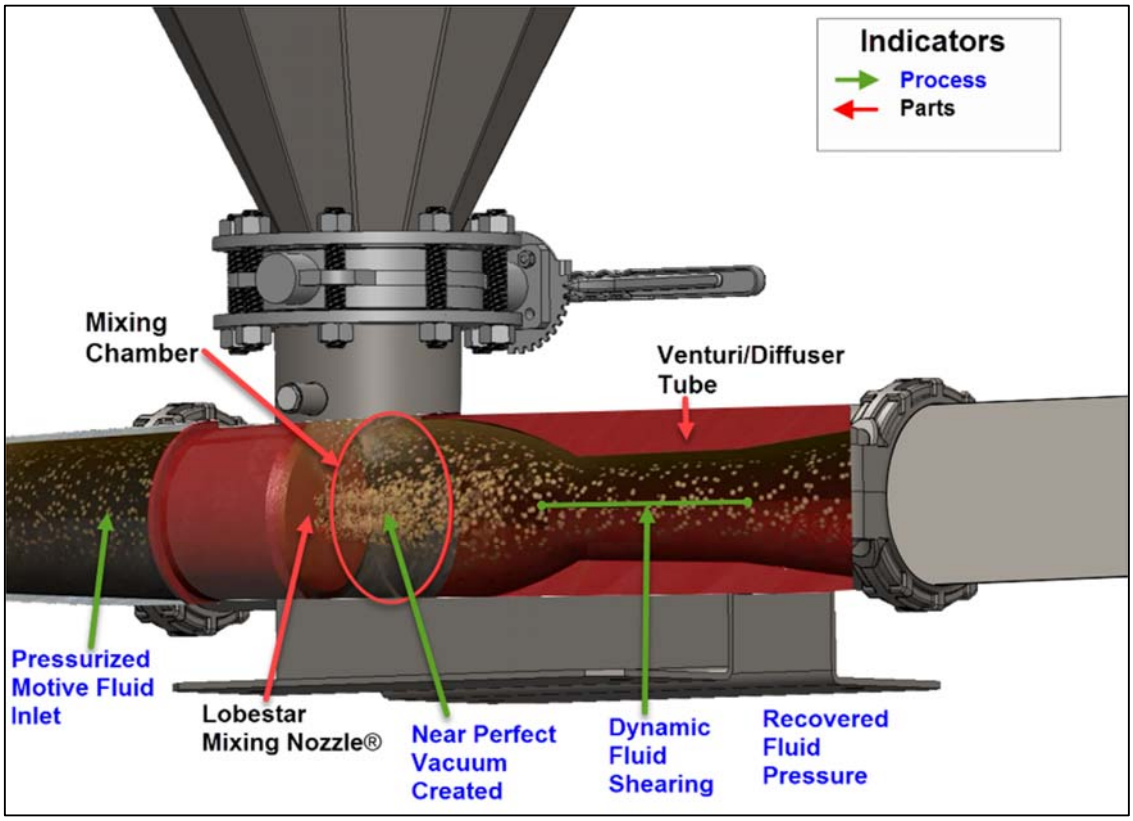
1. Prepare the flow line ends that will connect to the Shear-Mixer inlet and discharge to fit 6” grooved end pipe connections. The preparation steps for this are in **APPENDIX A**.
2. Move the Shear-Mixer into place between the prepared pipe connections with liquid flow going from the inlet end to the discharge end.



3. Connect the inlet end of the Shear-Mixer to the prepared flow line coming from the pump using the supplied grooved coupling and the steps outlined in **APPENDIX A**.
4. Connect the discharge end of the Shear-Mixer to the prepared discharge flow line using the supplied grooved coupling and the steps outlined in **APPENDIX A**.

4 Process Description

4.1 Working Principle



Pressurized motive fluid is pumped at a high rate into the inlet of the Shear-Mixer. It passes through the Lobestar Mixing Nozzle® insert, which converts pressure into velocity. The resulting pressure drop across the nozzle creates a high velocity fluid stream and generates an incredibly strong, near perfect vacuum for maximum solid or liquid additive loading. The Lobestar Mixing Nozzle® produces a unique jet stream that has a dual impact. First, it dynamically shears fluid, leading to rapid hydration of additives and uniform dispersion. Secondly, it promotes a highly-energized fluid boundary layer, which, when combined with the specialized venturi / diffuser tube, maximizes the amount of motive fluid pressure that can be recovered. This allows the mixed fluid to be transported greater distances and up higher elevations through the piping, downstream of the mixer, and back to the mud pits or batch vessel.

5 Operating Instructions

Ensure that any person involved with the operation of this system is sufficiently skilled, has the appropriate experience and has received adequate training.

Operators must read and understand the Operating Instructions of the respective equipment before start-up of the system.

Personnel not experienced with operating mixing equipment will be unable to recognize problems that may be corrected by adjusting procedures or methods. Familiarity with the equipment and competency to operate can reduce operating time and prevent downtime from resulting incorrect operation. Essential training on procedures specific to facility equipment and configuration can help provide that competency.

NOTE

The following instructions are for proper operation of the Alfa Laval Vortex Shear-Mixer only. They are intended to complement and be incorporated with your operation's existing mixing application procedures per the prevailing HSE requirements and guidelines for the specific overall operation.

The following procedures DO NOT INCLUDE instructions for peripheral mixing operations such as but not limited to dust collection or prevention, mechanical and manual lifting, chemical sack handling, hazardous material handling, PPE selection, bulk hopper volume management, or determining necessary quantities or volume of fluid additives.

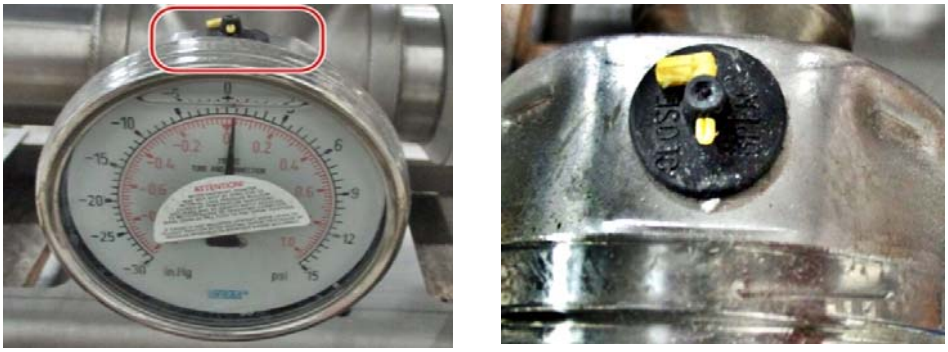
Following the operation procedures listed below and keeping a regular preventive maintenance schedule, including inspecting the entire system and replacing worn parts, will keep the Shear-Mixer BBS running reliably and efficiently.

For reliable mixing operation, ALWAYS follow the procedures in order.

5.1 Operating Procedure

Below are the Alfa Laval Vortex operation recommendations to include in existing facility procedures:

1. Include gauge reading checks before and during operation.
2. Include circulation time before, during, and after mixing chemicals.
3. Evacuate all chemical from all parts of the mixer and bulk delivery line into the mixer after completing EVERY mixing operation to clear the line and prevent plugging.

VORTEX SHEAR-MIXER BBS MIXING PROCEDURE
A. PREPARATION FOR MIXING
1. Make sure that the mixing pump is OFF, or that motive fluid flow is isolated from the Shear-Mixer.
2. Make sure there are no pipe restrictions or obstructions within the required 36” of pipe length immediately downstream from the Shear-Mixer as indicated in section 3.3 Pre-Installation Considerations
3. Insure a firm seal between the Shear-Mixer mixing chamber and the atmosphere by tightly closing the hopper valve on the Shear-Mixer suction. This prevents fluid discharge from the suction port during pump start up prior to vacuum being established.
4. Check the positions of all valves in the pump discharge and Shear-Mixer discharge piping to make sure they are correctly aligned for proper fluid circulation through the Shear-Mixer.
5. Turn on the fluid mixing pump and direct flow to only the Shear-Mixer.
6. If applicable, monitor the 0 to 100 PSI inlet and discharge pressure gauges and the 0 to -30 inches Hg vacuum gauge and make sure they are operable and registering. *If the gauges are not registering, make sure the gauge seal on the top of each gauge is in the “OPEN” position as shown below. If this does not solve the issue, please contact Alfa Laval Vortex Service.*  *Gauge seal valve on top of gauges*
7. If applicable, when the gauge readings level out, the inlet pressure gauge should read between 50 and 80 PSI, the discharge pressure gauge should read at least 50 PSI below the inlet gauge for optimum function, and the vacuum gauge should read between -25 to -30 inches Hg. If these conditions are all met, adequate motive flow and full vacuum capacity

has been established. (For optimum function, the Shear-Mixer requires a pressure differential of 50 psig from inlet to discharge)
If the inlet pressure gauge reading is less than 50 psig and/or the vacuum gauge reading is above -25" of mercury:

- *Confirm pump and motor sizing is adequate to generate the recommended minimum pressure differential of 50 psi across the Shear-Mixer*
- *Check that all downstream piping is at least the same pipe diameter as the Shear-Mixer discharge or greater*
- *Check and correct mixing operation valve line-up*
- *Check for and correct any line obstructions*
- *Reduce the overall head loss in the piping downstream of the Shear-Mixer by eliminating as much distance as possible, as well as any unnecessary bends, fittings, or valves.*
- *If the recommended pressure and vacuum strength still cannot be achieved, contact Alfa Laval Vortex Service for assistance.*

8. Slowly open the hopper valve a quarter of the way to check for vacuum, which will be indicated by the sound of rushing air going into the Shear-Mixer suction. Once it is determined that vacuum is established, close the valve.

9. Proceed to section **B. MATERIAL MIXING PROCEDURES**.

B. MATERIAL MIXING PROCEDURES

1. Fully open the hopper valve.

2. Begin gradually adding sack material by hand into the hopper. Since different additives behave differently when mixed, it is recommended to start slowly to see how well the material is induced by the Shear-Mixer. If no backflow or splash back is observed, then material can be added at faster rates. Some materials can be induced at much higher rates than others and do not require washdown assistance. Other materials such as powdered clays, powdered guar, or polymers are extremely hydrophilic and tend to clump together when wet. Such materials may need to be added at slower rates, and it is recommended to use the Radial Premixer accessory when mixing these materials.

3. Continue mixing until the intended volume of sack material is delivered to Shear-Mixer

4. To complete sack material mixing:

- Allow the line between the Shear-Mixer suction and the table hopper to clear for approximately 1 minute.
- Close the hopper valve

5. Proceed to section **C. MIXING COMPLETION PROCEDURE**.

C. MIXING COMPLETION PROCEDURE

1.	Insure the Shear-Mixer hopper valve is tightly and securely closed:
2.	Continue running pump for approximately 5 minutes to circulate fluid through the fluid circulation lines and Shear-Mixer and clear any settled or caked material. This should be done after each mixing operation to clear the line and prevent plugging.
3.	Remove motive flow to the Shear-Mixer by turning off the fluid circulating pump or diverting motive flow
4.	If isolation valves are installed in the fluid recirculation lines upstream and downstream of the Shear-Mixer, tightly and securely close them.

5.2 Troubleshooting

ITEM	PROBLEM	POTENTIAL REASON	SOLUTION
1	Hopper Backflow	Restriction in the discharge line	Purge discharge line
		Motive inlet valve partly closed	Ensure valve is fully open
		Insufficient pump pressure	• Check that pump is running correctly • Check that pump was initially sized correctly
		Viscosity too high, fluid stall	Dilute motive fluid to reduce viscosity or slow down the material feed rate
		Discharge backpressure too high	Rework discharge piping to reduce length, elbows, obstructions, and vertical rise
2	Valve Hard to Open	Not cleaned properly	Clean Mixer Hopper after mixing product
		Does not have proper lubrication	Hand grease valve rubber gaskets
			Before installing Victaulic gaskets, spray with WD-40 or equivalent
3	Loss of Suction	Insufficient pump pressure	• Check that pump is running correctly • Check that pump was initially sized correctly
		Plugged or partially plugged nozzle	Remove nozzle insert and inspect it and the Shear-Mixer mixing chamber. Remove any obstruction
		High viscosity	Dilute motive fluid to reduce viscosity or slow down the material feed rate
		plugged lines downstream	Purge discharge line
		Discharge backpressure too high	Rework discharge piping to reduce length, elbows, obstructions, and vertical rise

6 Maintenance Instructions

Introduction

To optimize system operation and minimize downtime, the system maintenance should consist of:

- **Preventive maintenance**: consists primarily of visual inspection of the equipment followed by necessary adjustments and planned periodical replacement of wear and tear parts.
- **Repairs**: unscheduled break-down of a component, often causing the system to stop. Damaged components shall be replaced of repaired.
- **Stock of recommended spare parts**: Alfa Laval recommends keeping a stock of spare parts facilitating preventive maintenance and reducing the system down time in case of unplanned bread downs.

Alfa Laval and OEM Component Spare Parts

This system consists of Alfa Laval components but also of non-Alfa Laval (sub-supplier) components integrated:

Alfa Laval Supported Components:

- (Products and associated) spare parts supported by Alfa Laval
- Alfa Laval article numbers attached to defined spare parts
- Supported by and integrated in Alfa Laval's supply chain

Original Equipment Manufacturer (OEM = sub-supplier) supported components

- (Products and associated) spare parts not supported by AL
- No AL article number - reference to OEM's spare parts catalogue
- Not supported by AL's supply chain

The recommended spare parts list does not contain all spare parts of all components; it is a limited selection of spares for one year of operation.

For the exhaustive list of spares of each component, we refer to the maintenance instructions of each individual component.

Genuine Alfa Laval Parts

- Safeguard your commitment to quality by always using genuine Alfa Laval spare parts.
- Alfa Laval cannot accept responsibility for the failure of Alfa Laval equipment with non-original spare parts. We guarantee only the quality and reliability of our products.
- It is strongly recommended that the exchange of parts is supervised by an Alfa Laval service engineer. Alfa Laval assumes no liability for damage to property or injury to personnel resulting from unauthorized installation of those parts.

6.1 Long Term Storage

When the Alfa Laval Vortex Shear-Mixer is to be stored for long periods of time, the following preventative measures should be taken:

- Wash down Shear-Mixer exterior with fresh water or mild soapy solution and a clean rag.
- Clean internals with mild soapy solution.
- Rinse off soap.
- Thoroughly dry the Shear-Mixer inside and out.
- Spray heavy coating of **WD 40 or other water dispersant oil** on all carbon steel surfaces for protection against severe seawater environment. (All non-metal parts such as urethane are non-corroding and do not need any surface protection)
- Wrap Shear-Mixer securely in paper or plastic wrap to protect from dirt
- Store in a sturdy crate out of the elements, preferably in a climate-controlled location.

6.2 Recommended Maintenance Schedule

6.2.1 Main Components

REGULAR AND SCHEDULED MAINTENANCE		
	Description	**Interval**
1	Provide and review operating instructions with all personnel responsible for the mixing application	Continuous
2.	Implement an in-between critical operation maintenance cycle to inspect the mixer and its wearable parts.	Between major jobs or critical operations
3.	Implement a six-month maintenance cycle to replace mixer nozzle and diffuser inserts with OEM parts [Quick Tune Up kit]	6 months
4.	Establish annual maintenance cycle to replace OEM wearable parts [Tune Up kit]	1 year
5.	Establish biennial [every other year] mixer overhaul to prolong equipment lifetime and performance [Overhaul Kit]	2-3 years

Consumable Parts List:

Items	Monthly	3 months	6 months	Yearly
Lobestar Mixing Nozzle® inserts			**x**	
Venturi / Diffuser Tube inserts			**x**	
Pressure and Vacuum Gauges (if applicable)				**x**
Grooved Couplings				**x**
Grooved Couplings Gaskets[1)]			**x**	
Primary Suction Valve				**x**

1) **Gaskets** Exchange as soon as a leakage is suspected.

6.2.2 Other Components

Items	Daily	Weekly	Monthly	Yearly
General visual check	√			
Control equipment			√	
Automated valves			√	
Pipes [2)]				√
Gauges and instruments			√	
Unions [3)]			√	

[2)] **Pipes / Vessels** Check for leakage. Exchange is necessary
[3)] **Unions** Check for leakage. Tighten regularly

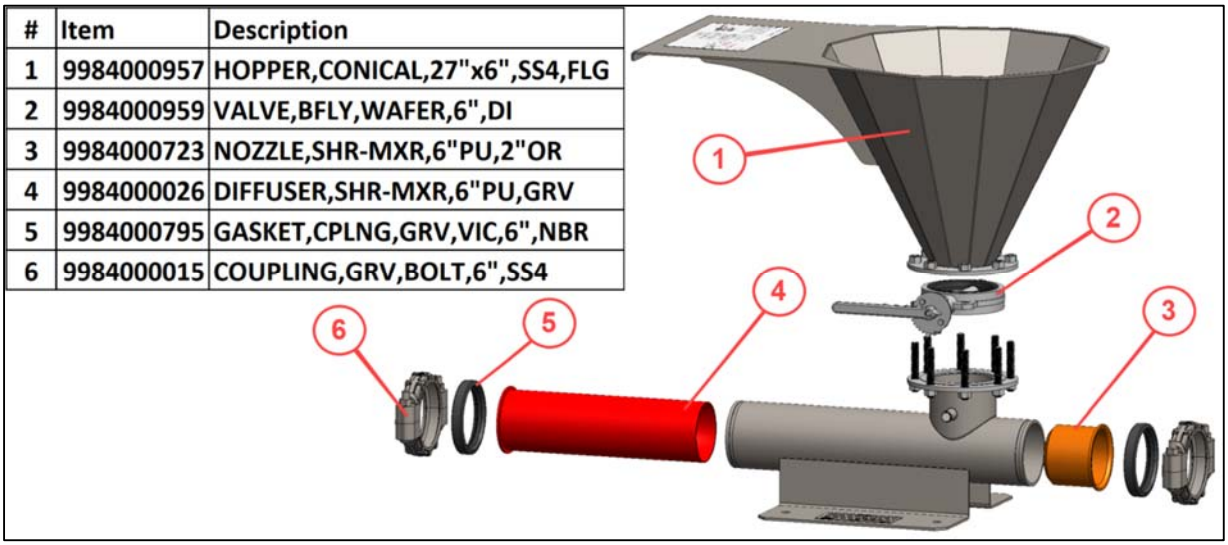
NOTE

For further information, please read the instruction and maintenance manuals issued by the manufacturer of the equipment / parts.

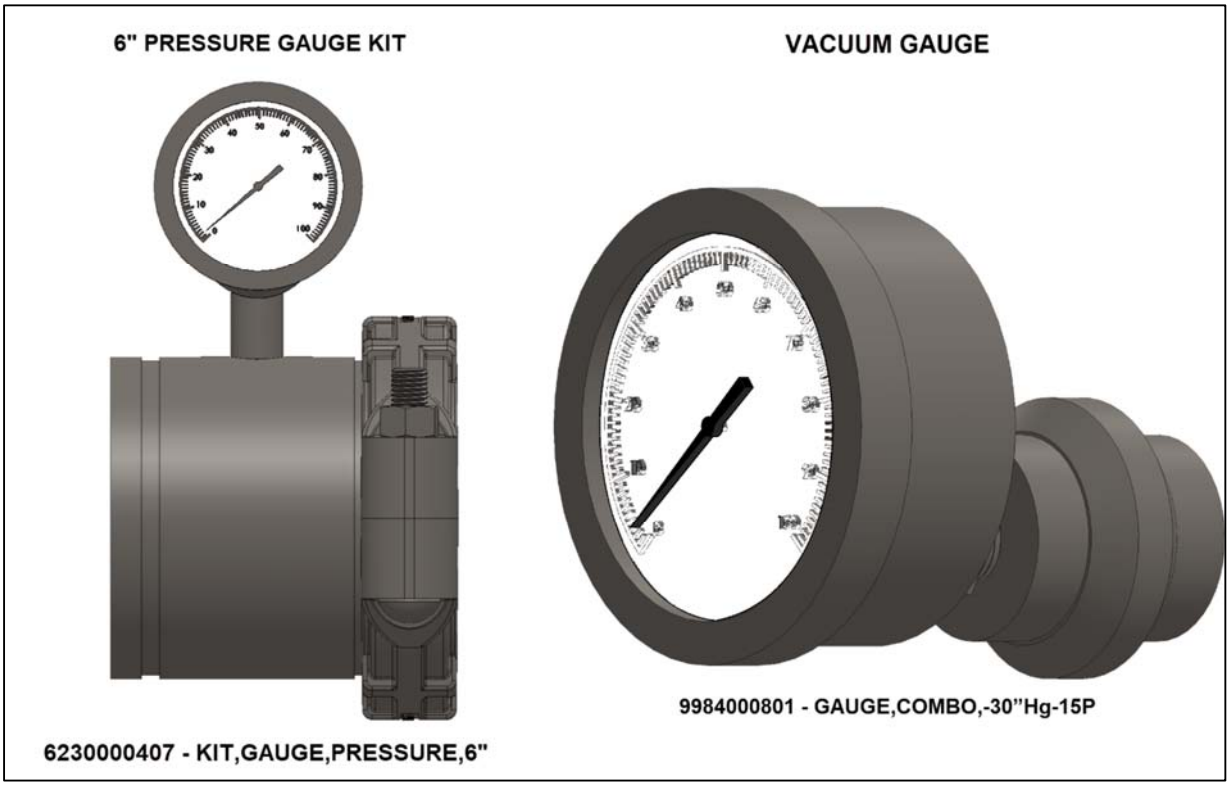
6.3 Spare Parts List & Recommended Accessories

Shear-Mixer SM6010 Parts list

#	Item	Description
1	9984000957	HOPPER,CONICAL,27"x6",SS4,FLG
2	9984000959	VALVE,BFLY,WAFER,6",DI
3	9984000723	NOZZLE,SHR-MXR,6"PU,2"OR
4	9984000026	DIFFUSER,SHR-MXR,6"PU,GRV
5	9984000795	GASKET,CPLNG,GRV,VIC,6",NBR
6	9984000015	COUPLING,GRV,BOLT,6",SS4



Shear-Mixer SM6010 Recommended Accessories



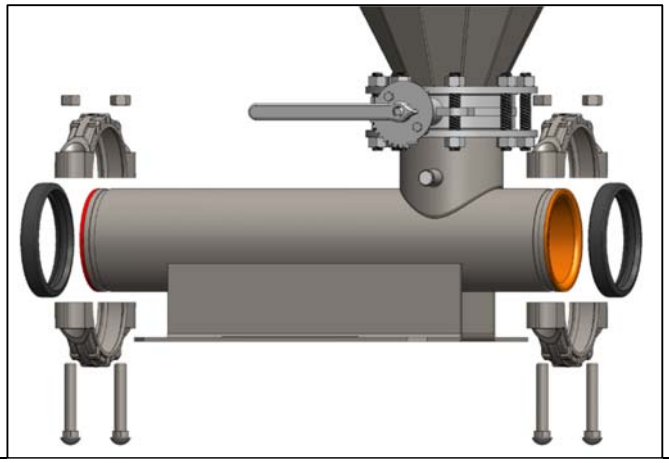
Recommended accessories sold separately

6.4 Shear-Mixer Disassembly

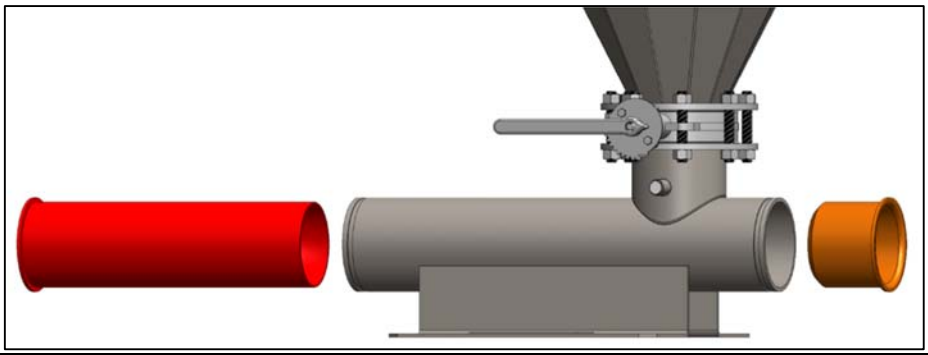
Make sure motive fluid pump is shut down and mixing line has been purged of fluid prior to disassembly.

Model SM6010 Disassembly

1. Remove grooved coupling bodies and gaskets at the inlet and discharge ends and set aside.



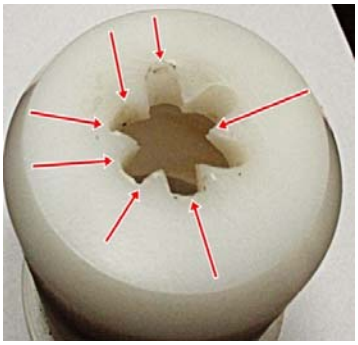
2. Remove the Lobestar Mixing Nozzle® insert and the venturi / diffuser insert from the Shear-Mixer.



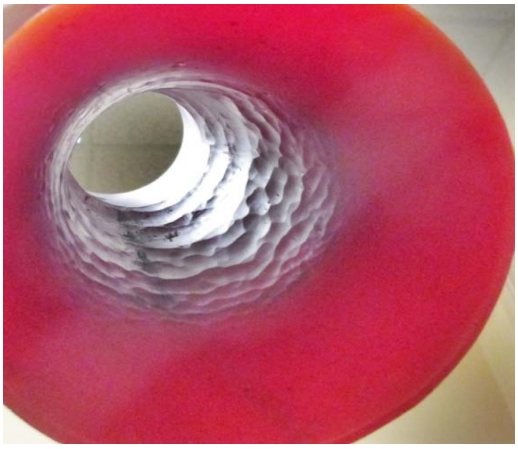
6.5 Shear-Mixer Inspection

Thoroughly clean and inspect ALL parts for damage and wear. Replace parts that are worn and/or unserviceable. See photos below for examples of damage and wear. On the following items, inspect for:

- **Lobestar Mixing Nozzle® insert**: ... squared nozzle lobes, blockages, wear grooves, wear spots inside the nozzle, damaged or worn body or lip



- **Venturi / Diffuser insert:** internal wear groove, damaged body or lip



- **Shear-Mixer body**: damage, leaks, erosion

- **Valves**: inoperable, damaged or corroded, worn seats and seals
- **Clamps**: damaged or corroded

- **Gaskets**: wear or damage, pinched or torn, dried out or cracked

- Gauges: Inoperable, damaged, cracked or broken

NOTE

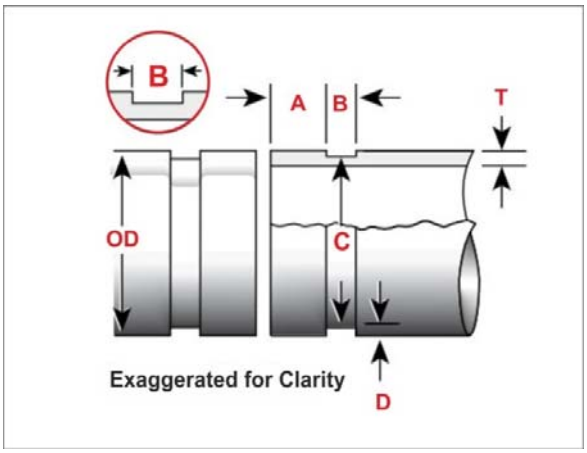
Thoroughly clean ALL parts before reassembly. The inside of bulk feed line components must be dry before reassembly!

Appendix A – Grooved End Pipe Preparation & Grooved Coupling Installation

- Read and understand all instruction before attempting to install.
- Depressurize and drain the piping system before attempting to install, remove or adjust any couplings.
- Wear safety glasses, hardhat, and foot protection.
- Failure to follow these instructions could result in serious personal injury, improper product installation, and/ or property damage

Grooved End Pipe Preparation Specifications

1	2			3	4	5		6	7
Nominal Size Inches mm	Dimensions – Inches/mm								
	Pipe Outside Diameter O.D.			A Gasket Seat ± 0.03 ± 0.76	B Grv. Width ± 0.03 ± 0.76	Groove Diameter C		D Groove Depth ref.	T Minimum Allow. Wall Thk.
	Basic	Tolerance +	Tolerance –			Basic	Tol. +0.000 +0.00		
2 50	2.375 60.3	+0.024 +0.61	-0.024 -0.61	0.625 15.88	0.344 8.74	2.250 57.15	-0.015 -0.38	0.063 1.60	0.065 1.65
3 80	3.500 88.9	+0.035 +0.89	-0.031 -0.79	0.625 15.88	0.344 8.74	3.344 84.94	-0.018 -0.46	0.078 1.98	0.083 2.11
4 100	4.500 114.3	+0.045 +1.14	-0.031 -0.79	0.625 15.88	0.344 8.74	4.334 110.08	-0.020 -0.51	0.083 2.11	0.083 2.11
6 150	6.625 168.3	+0.063 +1.60	-0.031 -0.79	0.625 15.88	0.344 8.74	6.455 163.96	-0.022 0.56	0.085 2.16	0.109 2.77



Groove Dimensions

Standard Cut Groove Specifications Notes

Groove Dimension Notes

Column 1: Nominal IPS Pipe Size

Column 2: IPS Outside Diameter

The outside diameter of cut grooved pipe shall not vary more than the tolerance listed. For IPS pipe the maximum allowable tolerance from square cut ends to 0.030”/0.76mm for ¾ - 3½”/20-90mm; 0.45”/1.14mm for 4-6”/100-150mm; and 0.060”/1.5mm for sizes 8”/200mm O.D. and above measured from true square line.

Column 3: Gasket Seat

The pipe surface shall be free from indentation, roll marks and projections from the end of the pipe to the groove to provide a leak-tight seal for the gasket. All loose paint, scale, dirt, chips, grease and rust must be removed. It is recommended that pipe be square cut. When using beveled contact Alfa Laval for details.

Column 4: Groove Width

The bottom of groove to be free of loose dirt, chips, rust and scale that may interfere with proper coupling assembly. Maximum permissible radius at bottom of groove is 0.015”/0.38mm.

Column 5: Groove Outside Diameter

The groove must be of uniform depth for the entire pipe circumference. Groove must be maintained within the “C” diameter tolerance listed.

Column 6: Groove Depth

For reference only. Groove must conform to the groove diameter “C” listed.

Column 7: Minimum Allowable Wall Thickness

This is the minimum wall thickness which may be cut grooved.

Coupling Gasket Installation

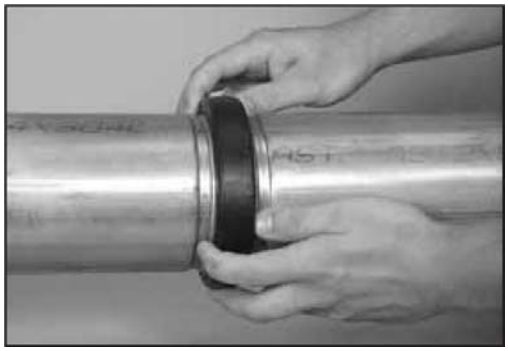
1. **Check Pipe Ends**: The outside surface of the pipe, between the groove and the pipe end, must be smooth and free from indentations, projections (including weld seams) and roll marks to ensure a leak-tight seal. All oil, grease, loose paint, dirt, and cutting particles must be removed.

2. **Check Gasket and Lubricate**: Check the gasket to make sure it is suitable for the intended service. Apply a thin coat of silicone lubricant to the gasket sealing lips and exterior.

CAUTION

- Always use a compatible lubricant to prevent the gasket from pinching/tearing during installation.
- **Failure to follow this instruction could result in joint leakage**.

3. **Position Gasket**: Position the gasket on the pipe end. Make sure the gasket does not overhang the pipe end.



4. **Join Pipe Ends:** Align and bring the two pipe ends together. Side the gasket into position and center it between the groove in each pipe end. Make sure no portion of the gasket extends into the groove in either pipe end.

Bolt Style Coupling Housing Installation

1. Install the housings over the gasket. Make sure the housings keys engage the grooves completely on both pipe ends. **NOTE:** Make sure the gasket does not become rolled or pinched while installing the housings. Failure to follow this instruction could cause damage to the gasket, resulting in joint leakage.

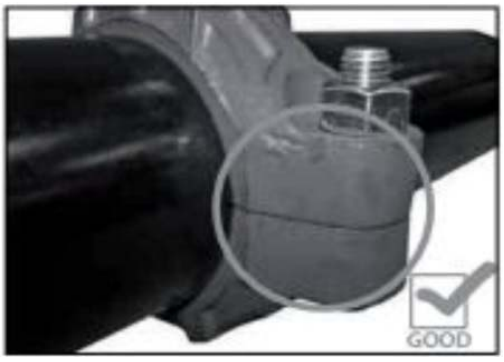
2. Install the bolts and thread a nut finger-tight into each bolt. **NOTE:** Make sure the oval neck of each bolt seats properly in the bolt hole

3. Tighten the nuts evenly by alternating sides until metal to metal contact occurs at the bolt pads. Make sure the housing key engages the grooves completely. **NOTE:** It is important to tighten the nuts evenly to prevent gasket pinching.

WARNING

- For proper assembly, the nuts must be tightened until metal-to-metal contact occurs at the bolt pads.
- Keep hands away from coupling openings during tightening.

Failure to follow these instructions could cause joint failure, serious personal injury and property damage.



Visually inspect the bolt pads at each joint to ensure metal-to metal contact is achieved.

Snap Style Coupling Housing Installation

1. Install one side of the hinged housing over the gasket, making sure the housings keys engage the grooves completely on both pipe ends. Swing the other side of the housing into position. Squeeze the housing to further center the gasket and seat the housing **NOTE:** Make sure the gasket does not become rolled or pinched while installing the housings. Failure to follow this instruction could cause damage to the gasket, resulting in joint leakage.

2. Lift the locking handle to position the nose in the cradle tab of the opposite housing.

3. Push the locking handle down firmly until the entire handle assembly contacts the coupling housing. The entire handle assembly must contact the coupling housing to ensure a properly locked joint.