Fristam
Mixing & Blending Experts

Instruction and Maintenance Manual: Powder Mixer (Original Instructions)

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1 Introduction

1.1 Description

This operator's manual describes all sizes, models and versions of the Fristam PM Powder Mixer.

Information on the model, size, version and accessories applicable to your powder mixer can be found on the rating plate on your powder mixer and in the order-related documents.

Fristam's Powder Mixer provides quick, high-performance blending of wet and dry ingredients into a fluid stream. What makes Fristam's Powder Mixer unique is its proven pump and blender system that is efficient and easy to use.

The FZX Liquid Ring Pump creates consistent suction at the bottom of the funnel to prevent plugging and maintain powder rate, even as viscosity increases.

The rotor-stator design of the FS Series Shear Blender eliminates unblended product and prevents lumps and masses for consistent batch-to-batch repeatability.

More information on the Fristam Powder Mixer can be found online at:
https://www.fristam.com/pm

1.2 Safety

This instruction and maintenance manual shall be read and completely understood prior to operation of the powder mixer. The manual should be kept available at the powder mixer installation location.

All applicable local/national regulations and laws shall be followed.

All work described herein may only be performed by qualified personnel.

Personal protective equipment (PPE) such as hearing protection may be required.

Despite inherent safe design measures, some amount of residual risk will remain. Throughout the manual these risks will be pointed out.

1.3 Caution

Begin all pump maintenance operations by disconnecting the energy source to the pump. Observe all lockout/tagout procedures as outlined by ANSI/ASSP Z244.1 and OSHA 1910.147 to prevent accidental start-up and injury.

1.4 Manufacturer Information

Fristam Pumps USA
2410 Parview Road
Middleton, WI 53562 USA

Telephone: +1 (608) 831-5001

E-mail: fristam@fristampumps.com

1.5 Scope of Supply

The package includes the following items:

- Powder Mixer Frame (Table)
- Removable Funnel
- Optional: rectangular offset hopper, vibrator, screen, lid, level probe, BBU adapter, jug rinse, etc.
- Liquid Ring Pump type Fristam FZX or Double Screw Pump type Fristam FDS
- Shear Blender or Pump type Fristam FS or FSI
- Piping system with valves, inline sight glass, pressure gauges and connections
- Optional: actuated valve(s), FS bypass
- Control cabinet with switches, buttons and indicator lights
- Optional: VFD, Vortec cooler, dry contacts

1.6 Scope of Documentation

Documentation includes the following items:

- This operator's manual
- FZX Liquid Ring Pump or FDS Twin Screw Pump manual
- FS Shear Blender manual
- Circuit diagram for control panel
- Vibrator motor manual (optional)
- VFD brief manual (optional)
- Powder Mixer spec sheet
- FZX Liquid Ring Pump spec sheet
- FS Shear Blender spec sheet
- Customer requested documentation (complete list available upon request)

Documentation shipped with the Powder Mixer is typically located in a packet in the funnel and/or control panel cabinet. Please read this information before installing and operating the powder mixer.

Replacement documentation can be obtained from Fristam Pumps USA and/or downloaded from the following website.

https://www.fristam.com/pm

1.7 General Information

Please read this operator's manual completely before using the powder mixer and keep it available at the mixer installation location.

Heed the applicable national regulations of the owner's country and the company's work and safety regulations.

All work described here may only be performed by qualified experts with caution.

Danger of contamination: Heed legal and operational safety regulations when pumping or filling dangerous media.

1.8 Display Conventions

List items are preceded by dots:

- Part 1
- Part 2

Handling instructions that must be performed in a specified order are numbered:

1. Step 1
2. Step 2

Handling instructions that do not need to be performed in a specified order are preceded by triangular bullets:

- Δ Action
- Δ Action

1.8.1 Safety Instructions

A safety instruction with the signal word "Danger" indicates personal hazards causing death or serious injury.

A safety instruction with the signal word "Warning" indicates personal hazards that may lead to death or serious injury.

A safety instruction with the signal word "Caution" indicates personal hazards that may lead to mild to moderate injuries.

NOTICE

A safety instruction with the signal word “Notice” warns of the possibility of material damage.

2 Safety

2.1 Intended Use

The standard PM powder mixer version is designed for use in the food, beverage, dairy, personal care, pharmaceutical and biotechnology industries.

The PM powder mixer is designed for blending liquid base media with powder or liquid additive media. In its standard use, the powder mixer is designed for batch mode with individual powder bags. Continuous operation utilizing conveying equipment is possible with additional engineering and equipment.

Each PM powder mixer is configured according to customer requirements. The seal materials in the pumps have been selected for the respective media.

Supply and pumping of the base medium must be done in compliance with the maximum temperatures and pressures specified for the given powder mixer version and size.

The pump flow direction for the self-priming pump is fixed. The FZX pump can generate a vacuum in the suction line.

The PM powder mixer may only be used under the operating conditions specified in the customer's order. See the attached Order-Related Documents. For other operating conditions, please contact Fristam.

2.2 Predictable Misuse

- The standard PM powder mixer versions may not be used in explosive atmospheres.
- Introduction and pumping of foreign objects in the mix can block and destroy the pipes, valves or shear blender.
- Pumping of base media or powders other than those specified can destroy pipes, valves or pumps. The seal materials (elastomers) and the pumps have been selected for specific base media and mixtures. See the Order-Related Documents.
- Pumping of powders other than those specified or incorrect mixing ratios can clog the pipes, valves or pumps. For uninterrupted operations, the maximum allowable particle size of the powder must not be exceeded.

2.3 System Specific Safety Instructions

⚠ DANGER

Impermissible Pressure or Temperature Range

Personal injury and material damage from leakage or bursting of pumps or pipes and valves.

- Δ Maintain the pump, pipe and valve pressures within the specified pressure ranges. See the operator's manuals for the pumps.
- Δ Maintain the pump and pipe temperatures within the specified temperature ranges. See the operator's manuals for the pumps.

⚠ DANGER

Hot Equipment Surface

Contact burns from touching the pipes.

- Δ Check the temperature before touching the pipes.
- Δ Only touch the pipes if you are wearing suitable protection.

⚠ DANGER

Noise Generated by Running Powder Mixer

Permanent hearing damage. The A-weighted sound pressure level of the powder mixer can be greater than 80 dBA.

- Δ Always wear ear protection in the vicinity of the running powder mixer.
- Δ The local noise exposure regulations must be complied with.
- Δ See the noise emission values for the pumps in the attached operator's manuals.

⚠ DANGER

Danger of Crushing When Moving Powder Mixer on Casters

Foot injuries from being run over by casters.

- Δ Wear safety shoes.

⚠ DANGER

Cold Firefighting Water on Hot Pump

Material damage from bursting of pump.

- Δ Do not cool the pump down excessively when extinguishing a fire.

⚠ DANGER

Unsuitable Working Height or Direction

Danger of injury when working on raised table.

- Δ Lift the powder bag using a suitable aid.

- Δ Place a working platform beside the table and use it.
- Δ Work on the side of the table designated for this purpose.

2.4 Labels

- Δ Do not alter or remove the labels on the powder mixer or pumps.
- Δ Immediately replace damaged or lost labels with ones that are true to the originals.

2.4.1 Safety Labels

"Do not remove guard" Indicates that the guards on the pump must not be removed during operation.

2.5 Noise Emissions

The owner of the Powder Mixer must determine the respective sound pressure level for the base media used and instruct and protect personnel accordingly.

⚠CAUTION

Noise Generated by Running Pump

Hearing damage.

- Δ The local noise exposure regulations must be complied with. For noise emission values for the pumps, please see the pump operator's manuals.

⚠CAUTION

Noise Generated by Running Vibratory Motor

Hearing damage.

Wear ear protection when using the powder mixer with pumps or shakers with specified sound pressure levels of greater than 80 dBA. See Chapter 10.1.2, "Noise Emissions," and the operator's manual for the vibratory motor.

2.6 Disposal

- Δ Follow the instructions in the operator's manuals for the powder mixer components.

2.6.1 Disposal of Transportation Package

- Recycle the transportation package.

2.6.2 Disposal of Grease

- Dispose of grease and objects saturated with grease in an environmentally friendly manner in accordance with applicable regulations.

2.6.3 Disposal of Lubricating Oil

- Dispose of oil and objects saturated with oil in an environmentally friendly manner in accordance with applicable regulations.

2.6.4 Disposal of Powder Mixer

1. Carefully clean the powder mixer. Dispose of residues in an environmentally friendly manner in accordance with applicable regulations.
2. Dismantle the powder mixer into its constituent parts.
3. Dispose of the components in an environmentally friendly manner in accordance with applicable regulations.

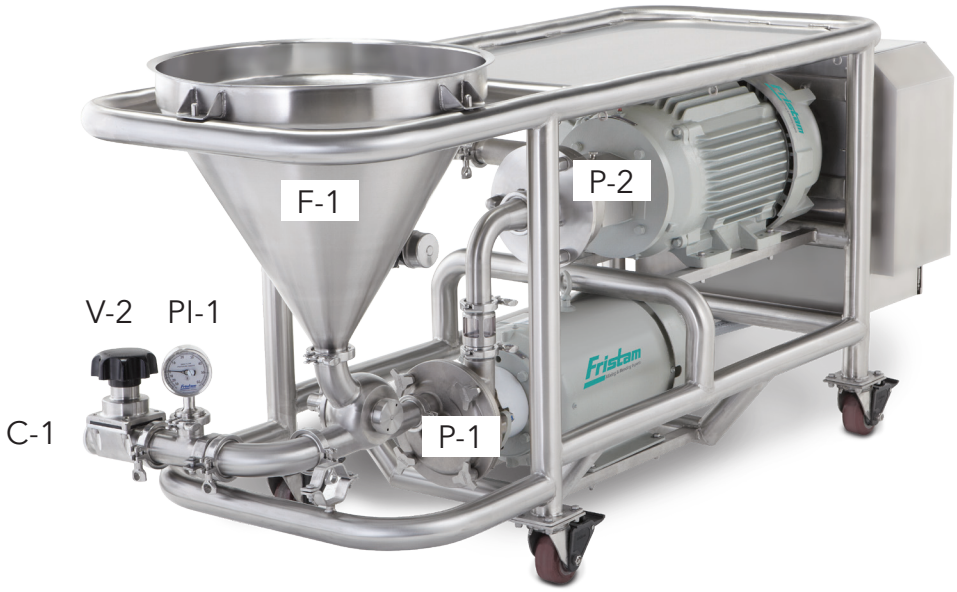
2.6.5 End-Of-Life Disposal

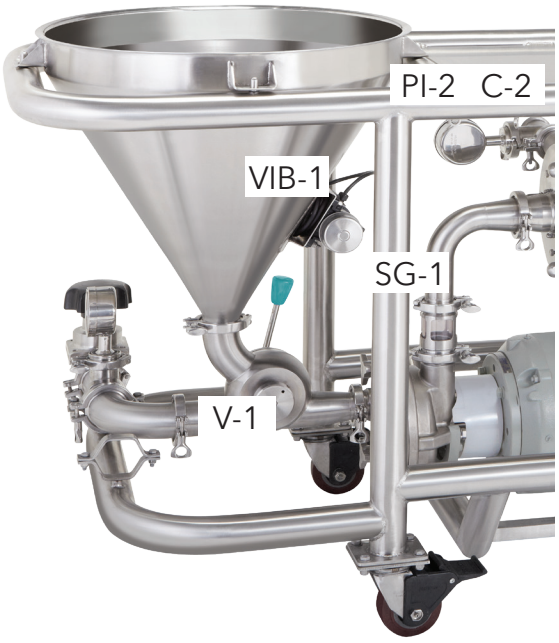
At the end of its life, our products should be recycled according to local guidelines.

3 Design and Function

3.1 Principles of Design

The key components of a PM Powder Mixer are a pump (P-1), a shear blender (P-2), a liquid control valve (V-2), a powder control valve (V-1), a pressure indicator (PI-1), a funnel and a control cabinet. The components are mounted to a frame with a table top. The entire system is mounted on casters or adjustable legs.





No.	Part
C-1	Inlet Connection
V-2	Liquid Control Valve
PI-1	Inlet Vacuum Gauge
V-1	Powder Control Valve
P-1	Pump
SG-1	Sight Glass
P-2	Shear Blender
PI-2	Discharge Pressure Gauge
F-1	Funnel
VIB-1	Funnel Vibrator
C-2	Outlet Connection

3.2 Funnel

Dry and liquid ingredients are poured into the removable funnel, where they are then routed to the base fluid in the pipes. The funnel is sealed in the lower region by the powder control valve (V-1). Optional items include: vibratory motor, screen, CIP cover, protective cover, etc.

- Electric funnel vibrator
- Pneumatic funnel vibrator
- Funnel screen
- Funnel cover
- CIP funnel cover
- Spray ball
- Rectangular hopper
- BFM fitting lid for BBU
- High and/or low level sensors

3.3 Pipes

The pipes include connections, valves and the sight glass. Standard valves are supplied with hand levers. Actuators are available for all valves.

The premix, made up of the base fluid and the inducted powder and/or liquid, is formed in the pipe region between liquid control valve V-2 and pump P-1.

The homogeneous end product is formed in the shear blender P-2 upstream of the discharge-side connection.

3.3.1 Valves

The manual valves in the base version are set as follows:

Butterfly valves: depress thumb button and rotate to desired position.

Diaphragm valves: rotate bonnet to desired position.

Arc valve: pull handle out lengthwise and rotate to desired position.

3.3.2 Variants of Powder Control Valve V1

- Manual Arc Valve
- Pneumatic Arc Valve (open/closed)
- Pneumatic Arc Valve with Positioner (0 – 100%)
- Manual Butterfly Valve

- Pneumatic Butterfly Valve (open/closed)

3.3.3 Variants of Liquid Control Valve V2

- Manual Diaphragm Valve
- Pneumatic Diaphragm Valve with Positioner (0 – 100%)
- Manual Butterfly Valve

3.4 Pumps

3.4.1 FZX Liquid Ring Pump

For simple applications with highly soluble powders, like sugar or salt, only the FZX liquid ring pump is needed to induct your solids.

Please locate the information in the FZX documentation.

https://www.fristam.com/fzx

3.4.2 FDS Double Screw Pump

The Fristam FDS allows the powder mixer to handle a wide range of viscosities, up to 1,000,000 cps. Products can begin at lower viscosities and the FDS will maintain consistent suction as the product concentrations and viscosities climb past the point where traditional pumps would fail. Please locate the information in the FDS documentation.

https://www.fristam.com/fds

3.4.3 FS Shear Blender/Pump

As an inline blender, the Fristam FS blends products quickly and consistently. The Shear Blender's rotor-stator design eliminates unblended product and prevents lumps and masses in product for consistent, repeatable results. The FS can also be installed into your existing batch tank process line to refine your mix, simply and affordably.

Please locate the information in the FS Documentation.

https://www.fristam.com/fs

3.5 Control Panel

The powder mixer is controlled via the attached control panel. A circuit diagram is included with the PM documentation.

In some cases, the powder mixer is sold without a control panel and will be controlled by an external system.

No.	Element	Function
1	FS On Button	Starts FS Motor & Light Indicates Running
2	FS Off Button	Stops FS Motor
3	FZX On Button	Starts FZX Motor & Light Indicates Running
4	FZX Off Button	Stops FZX Motor
5	VFD Control Pad (Optional)	Allows for changing VFD parameters
6	FZX Amp Readout	Indicates current amp draw of FZX
7	Main Switch	Disconnects power to Control Panel
8	Emergency Stop Button	Quickly disconnects power to control panel
9	Vibrator Control Switch (Optional)	Starts and stops electric vibrator motor

3.6 Vibratory Motor (Optional)

The vibratory motor causes the funnel to vibrate and facilitates uniform powder flow to the bottom of the funnel.

3.7 Funnel Screen (Optional)

The funnel screen helps to improve powder flow and prevents clumping in the funnel. It catches clumps higher up in the funnel, where they can be broken up manually.

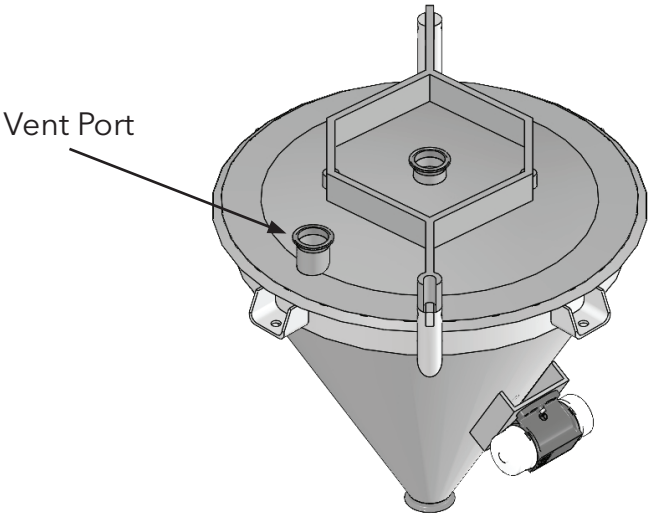
The screen may also help to prevent foreign materials from falling in the PM.

3.8 Funnel Lid (Optional)

The funnel lid is used primarily to contain product from splashing out of the funnel, especially during CIP.

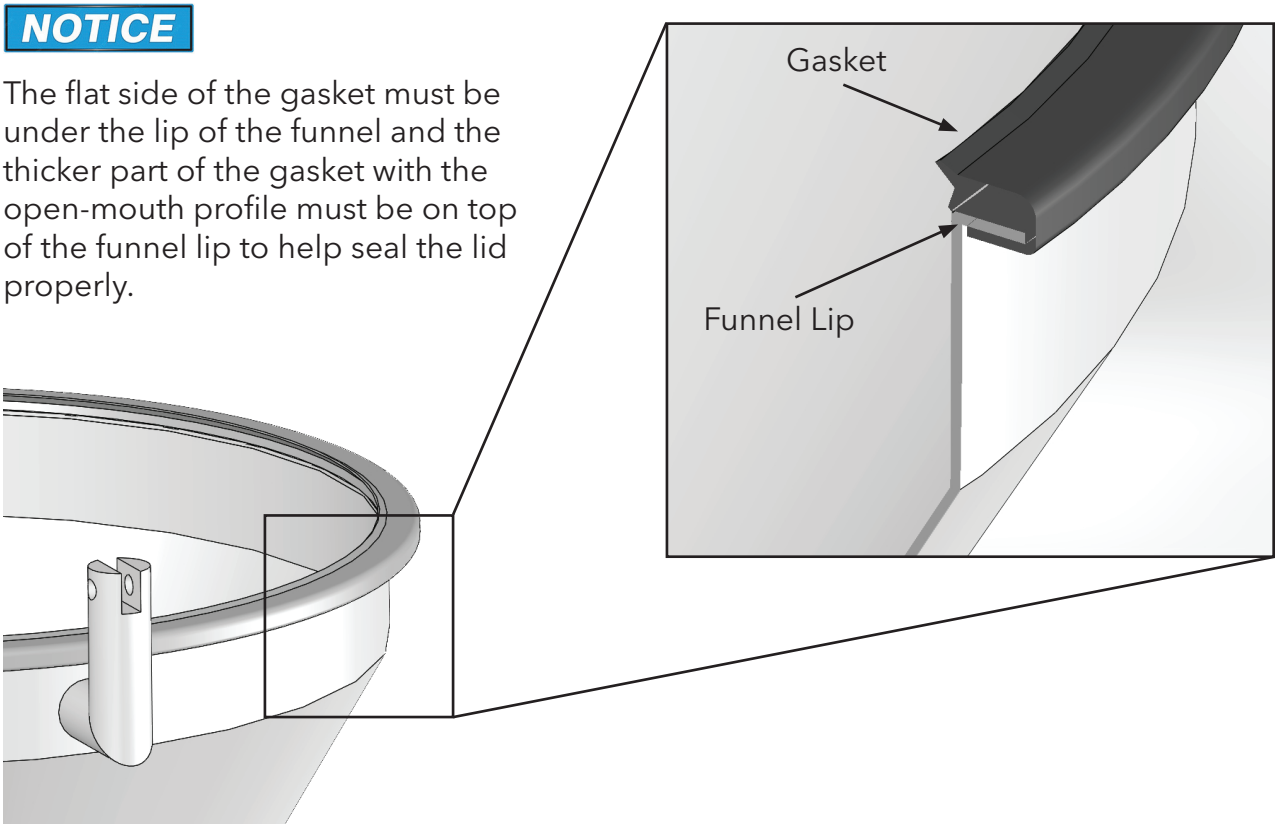
NOTICE

The funnel must be vented during operation and CIP. When using a lid on the funnel, the vent port must be open.



NOTICE

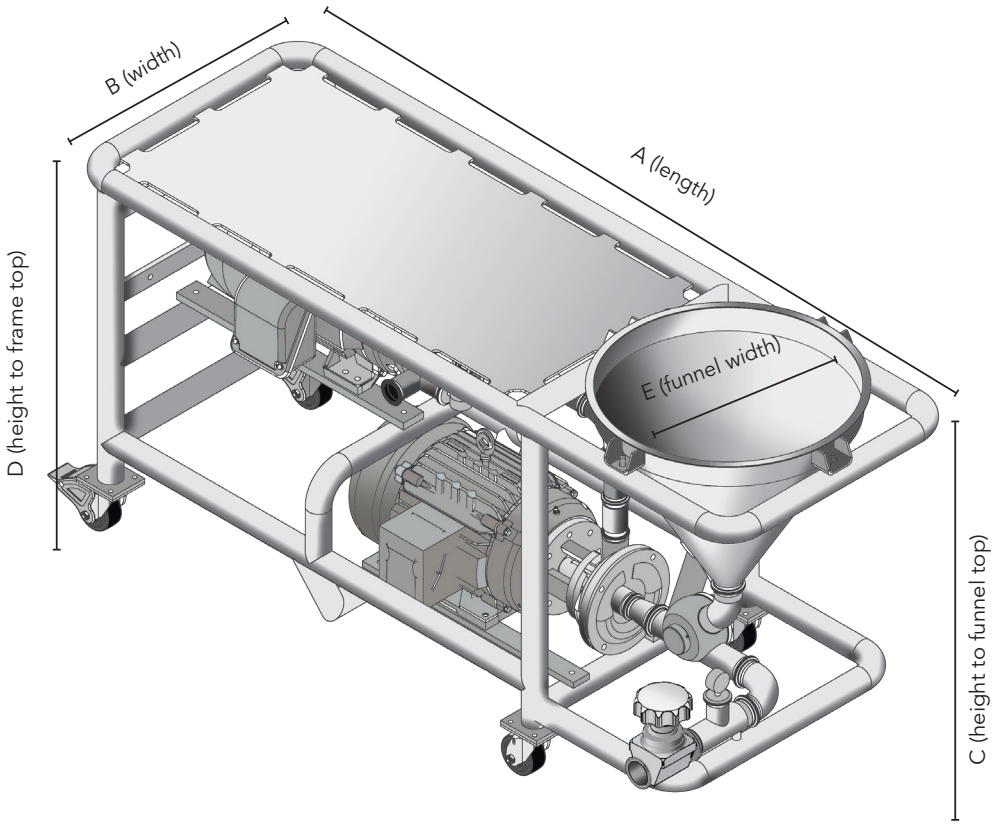
The flat side of the gasket must be under the lip of the funnel and the thicker part of the gasket with the open-mouth profile must be on top of the funnel lip to help seal the lid properly.



3.9 Sizes and Standard Equipment

The following versions of the powder mixer are available.

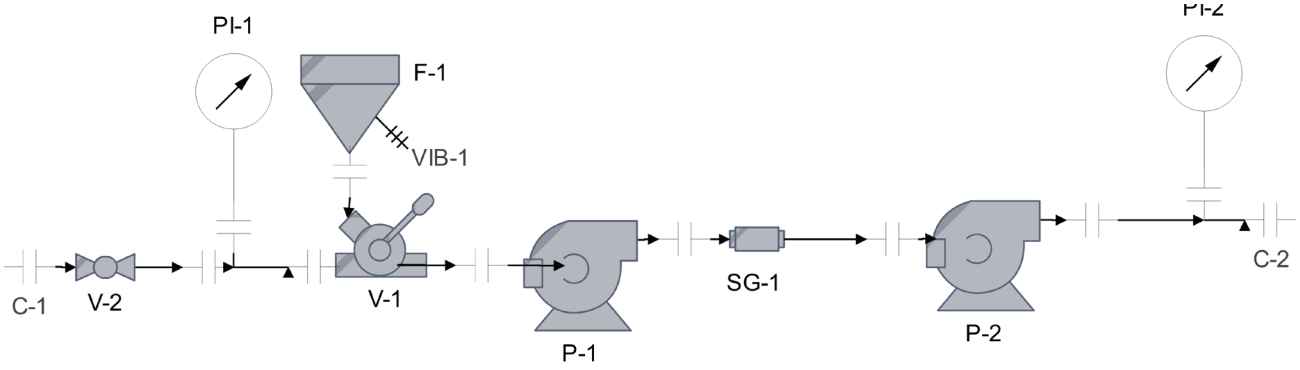
Depending on the application, other combinations of pumps and connections can be used. The dimensions of the pipes and the connections may need to be adjusted for the viscosity of the end product.



Model	FZX Model	FS Model	Inlet	Outlet	A	B	C	D	E
01-10	2010	712	1.5 (3.8)	1.5 (3.8)	56 (142)	30 (76.2)	36.5 (92.7)	34 (86.4)	12 (30.5)
10-52	2100	3522	2 (5.1)	2 (5.1)	71 (180)	30.5 (77.5)	40.5 (103)	38 (96.5)	24 (61)
15-52	2150	3532	2 (5.1)	2 (5.1)	71 (180)	30.5 (77.5)	41.5 (105)	38 (96.5)	24 (61)
20-53	2200	3532	2.5 (6.4)	2.5 (6.4)	83 (211)	30.5 (77.5)	41.5 (105)	39 (99.1)	24 (61)
25-53	2250	3532	2.5 (6.4)	2.5 (6.4)	83 (211)	30.5 (77.5)	41.5 (105)	39 (99.1)	24 (61)
2-52	FDS 2	3522	2 (5.1)	2 (5.1)	83 (211)	30.5 (77.5)	41.5 (105)	39 (99.1)	24 (61)
3-53	FDS 3	3532	3 (7.6)	2 (5.1)	104 (264)	35 (89)	45.8 (116)	43.2 (110)	24 (61)
All dimensions are in inches (centimeters).									

3.10 Hydraulic Diagrams

3.10.1 Recirculation from Atmospheric Tank



No.	Part
C-1	Inlet Connection
V-2	Liquid Control Valve
PI-1	Inlet Vacuum Gauge
V-1	Powder Control Valve
P-1	Pump
SG-1	Sight Glass
P-2	Shear Blender
PI-2	Discharge Pressure Gauge
F-1	Funnel
VIB-1	Funnel Vibrator
C-2	Outlet Connection

3.11 Function

The PM powder mixer is a system in which powder or liquid ingredients (e.g. sugar, milk, cocoa powder, thickeners, oil, flavoring, etc.) are introduced into or dispersed in a base fluid.

The liquid ring or double screw pump draws the base liquid from a tank and conveys it through a short pipe to the shear blender. If the pump is throttled at the suction side via the throttling valve, a vacuum (of up to 10" Hg) is built up between the throttling valve and the pump. This is where the funnel with the inlet for the ingredients is located.

The vacuum causes, for example, powder or liquid to be drawn directly into the fluid stream. First, this still inhomogeneous premix reaches the pump, where it is premixed. The premix is then pumped to the shear blender, where the remaining clumps are completely broken up due to the high turbulence at tip speeds of up to 30 m/s.

4 Transportation

Transportation may only be performed by trained personnel. The powder mixer may be moved using approved lifting devices suitable for the weight/size of the powder mixer. Improperly securing the powder mixer may result in injury from falling, tipping, or unsecured parts. Dimensional information is available for download at www.fristam.com/usa. Weight information is based on motor selection and is available upon request.

4.1 Safety Instructions

⚠WARNING

Rolling on Sloping Site

Injuries from being crushed or run over, material damage.

- Δ Ensure that the powder mixer is placed on a level surface.
- Δ Lock the casters.
- Δ Additionally secure the frame for operation.
- Δ Falling or Unsecured Parts
- Δ Danger of injury from impact or crushing.
- Δ Only use suitable means of conveyance and hoists. Information on powder mixer weight can be found in the “Order-Related Documents”.
- Δ Before moving the powder mixer, secure it to prevent it from slipping.
- Δ Secure pipes and attachment parts and check screwed connections.
- Δ Contamination, Impact, and Moisture
- Δ Damage to pipes, valves and pumps.
- Δ Remove the protective film just prior to installation.
- Δ Remove the pipe fitting covers just prior to connection to the pipes.

4.2 Moving with Industrial Truck

Preparation

- Δ Ensure that the powder mixer is on the correct pallet and adequately secured.

Procedure

1. Pick up the pallet with the forks on the industrial truck.
2. Carefully move the pallet to the designated location and set down.

4.3 Moving with Crane

⚠WARNING

Falling Parts

Death from crushing, pinching of extremities, material damage.

- Δ Only use hoists that are designed for the total weight of the powder mixer.

5 Storage

5.1 Safety Instructions

Follow the instructions in the operator's manuals for the powder mixer components.

5.2 Storage Conditions

Store the powder mixer as follows:

- Dry, in low humidity
- Protected against frost and heat, optimally at a temperature of 65°F to 80°F (20°C to 25°C)
- Ventilated
- Dust-free

5.3 Mothballing of the Powder Mixer

If intended to be stored for longer than six months, the powder mixer must be mothballed. Heed the following:

- Before mothballing, completely remove the shaft seals on the pumps and store separately.
- Open the valves.
- Follow the instructions in the operator's manuals for the powder mixer components.

5.4 Recommissioning

After mothballing and before recommissioning, check the pumps' connections, seals, bearings and oil levels.

6 Installation

Remove the packaging materials and protective films. Inspect the powder mixer after unpacking. Remove any foreign objects in the funnel or the pipes.

6.1 Safety Instructions

⚠WARNING

Unstable Installation

Severe crush injuries, material damage.

- Δ Tighten screws to the specified tightening torque.
- Δ Use a torque wrench or an impact driver with adjustable torque.

6.2 Installation Location

- For standard powder mixers, the installation location must meet the following requirements:
- Non-explosive atmosphere
- Dust-free environment and device for discharge of dust or aerosol-containing air
- Ambient temperature: 0°F – 100°F
- Moisture and salt contents in ambient air: The values are given in the operator's manuals for the pump motors
- Foundation sized adequately for the system weight
- Horizontal and level installation surface
- Adequate installation surface strength for powder mixer mass
- Installation clearances given in the operator's manuals for the pumps
- Adequate clearance for maintenance work
- Adequate air supply for pump cooling

6.3 Reduction of Noise and Vibration

Operating the powder mixer and pumps within their intended design range will aid in reducing the noise to acceptable levels.

6.3.1 Primary Measures

- Avoid excessively low or very high flow rates.
- Avoid cavitation of the pumps.
- Maintain good piping practices.
- Only operate the vibratory motor intermittently.
- Operate the powder mixer pumps in their optimum working ranges.
- Decouple the suction and discharge lines from vibrations.
- Support lines.
- Align lines.
- Use vibration dampers.

6.3.2 Secondary Measures

- Take structural measures such as the following:
- Add acoustic panels
- Install housing around powder mixer

6.4 Powder Mixer Fixation

1. Set up the powder mixer at the installation location. Lock the locks on the casters (if present) or secure the frame with chocks.
2. Ground the frame to dissipate electrostatic charge.
3. Position hose lines to ensure they cannot be damaged.

6.5 Installation of Pipes

⚠WARNING

Electrostatic Charge Buildup

Electric Shock

- Ground the pipes and the pump
- Ground the powder mixer

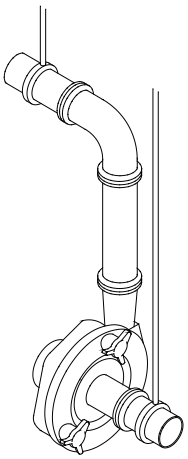
Lay and connect pipes as follows:

Keep the pipe resistance as low as possible: Avoid unnecessary installation of valves, elbows, and abrupt pipe transitions.

- Design pipe cross section so that no unnecessary pressure losses or cavitation occur in the suction and inlet areas.
- Install a shut-off valve in the discharge line.

- Design the suction lines to be as short as possible.
- Always lay the suction lines so that they are continuously rising toward the pump unit. Rule out the possibility of air pockets and dips in the pipes.
- Lay and connect the pipes to ensure that no stresses are applied to the connections.
- Secure pipes to ceilings, walls or floors using pipe clamps.
- Align pipes flush with pump connections using a bracket.
- Maximum performance and trouble-free operation require adherence to good piping practices.
- Ensuring proper piping support and alignment at both the suction inlet and discharge outlet can help prevent serious damage to the pump housing (Figure PI-1).

Figure PI-1



- Avoid abrupt transitions in the piping system (Figure PI-2).
- Avoid throttling valves in the suction piping.
- Keep suction lines as short and direct as possible.
- Ensure that the NPSH available in the system is greater than NPSH required by the pump.
- Avoid sump areas where sediments may collect (Figure PI-3).
- Avoid the formation of air pockets in the piping (Figure PI-4).
- Avoid abrupt closure of shut-off valves, as it may cause hydraulic shock which can cause severe damage to the pump and system.
- Avoid elbows in the suction line if possible. When necessary they should be located 5 pipe diameters away from the pump inlet, and have a bend radius greater than 2 pipe diameters (Figure PI-5).
- Check valves in discharge line should be a minimum of 5 ft. away from the pump outlet (Figure PI-5).

Figure PI-3

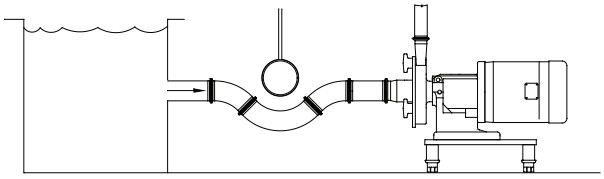


Figure PI-2

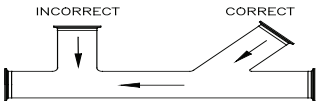


Figure PI-4

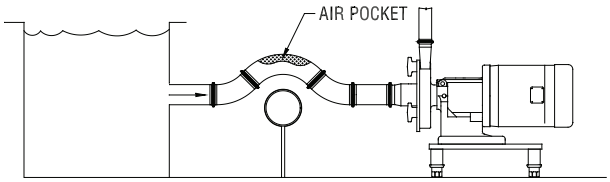
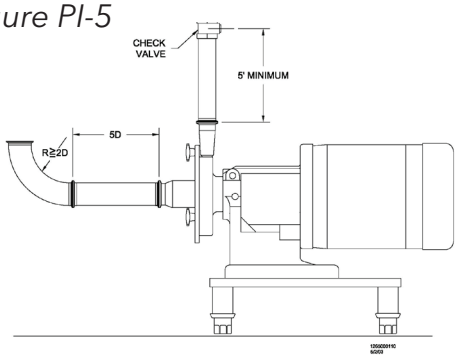


Figure PI-5



6.6 Supply System Connection

The following connections are standard on the suction and discharge sides in sanitary clamp:

Model(s)	Suction	Discharge
01-10	1.5″	1.5″
10-52 / 10-00	2″	2″
15-52 / 15-00	2″	2″
20-53	2.5″	2″
25-53	2.5″	2″
35-00	3″	3″
40-00	3″	3″
2-52 FDS	2″	2″
3-53 FDS	3″	2″

6.7 Hydraulic Connection

The hydraulic connection is adapted to machine size, project specification, or customer requirements (see order confirmation).

6.7.1 Suction Side Connection

A slight head pressure is required on the suction side to ensure free inflow of the base fluid into the powder mixer. The hydrostatic pressure from the supply tank should be approximately 0.1 – 5 psig. Excessive pressure can be difficult to dissipate with the throttling valve.

- If a feed pump is required, only use a pump with a steep curve and control it with a VFD.

6.7.2 Discharge Side Connection

The discharge pressure from the powder mixer must be minimized. For this reason, the discharge line cross section must be as large and the line length as short as possible. The standard version of the powder mixer can generate a maximum back pressure of 10 – 15 psig, depending on the pump models, for optimum powder induction.

- If additional components (e.g., heat exchangers or filters) that generate a significant pressure loss are added to the circuit, the operator should install an additional pump downstream of the powder mixer.

6.8 Connection of Power Supply

An electrical schematic that is specific to each Powder Mixer is supplied with the control panel.

Follow electrical requirements listed on the electrical schematic.

6.9 Checking Direction of Rotation of Pumps

Pumps supplied with a VFD (variable frequency drive) will be programmed to spin in the correct direction.

NOTICE

Damage to Pumps. Damage to seals.

The pumps must not be run dry.

1. Close throttling valve V2
2. Open powder control valve V1
3. Fill the funnel with water until the pipes are filled
   - Water will be visible in the sight glass
   - The mechanical seals will now be wetted with water, as required
4. Turn on the FZX liquid ring pump briefly (for a few seconds) and turn it off again. Check if the direction of rotation is correct. It should match the arrow sticker on the fan guard of the motor. See the instruction manual of the pump for more information.
5. Turn on the FS shear blender briefly (for a few seconds) and turn it off again. Check if the direction of rotation is correct. It should match the arrow sticker on the fan guard of the motor. See the instruction manual of the pump for more information.
6. If the motors are running in the wrong direction, switch any two of the incoming electrical legs.

6.10 Cleaning

Only use cleaning agents that comply with the hygiene guidelines for the respective base and additive media.

Thoroughly clean the powder mixer, liquid ring pump, shear blender and piping system before initial use.

Always clean the Powder Mixer after each use. If the pumps are not properly cleaned, product residues can clog the mechanical seals and cause damage at the next startup.

⚠CAUTION

Danger of crushing; irritation of the eyes, skin and respiratory tract

Avoid contact with cleaning solutions or vapors from cleaning agents.

- Use caution when opening the powder control valve V1 or any pump drains.
- Wear safety shoes.
- Wear safety glasses, gloves, and a rubber apron.

6.10.1 Pump & Powder Mixer Cleaning

1. Connect piping and hoses.
2. Close powder control valve V1.
3. Close liquid control valve V2.
4. Close any drain valves (if present).
5. Fill the connected tank with cleaning media.
6. Open tank outlet.
7. Open liquid control valve V2.
8. Wait until the cleaning media has reached the pumps.
9. Turn on both pumps.
10. Circulate as needed.

6.10.2 Pump Cleaning with CIP System

If a CIP system is available, the powder mixer can be connected to it and cleaned. Follow guidelines and regulations for the specific industry and location. Some ingredients and products will require cleaning beyond the capabilities of CIP.

Throttle liquid control valve V2 must be fully opened and powder control valve V1 and all drain valves must be closed during cleaning with a CIP system.

The table and the funnel must be cleaned manually according to operational guidelines. Completely dry the funnel after cleaning.

6.10.3 Cleaning the Funnel

Completely dry the funnel after cleaning.

There are three typical methods for cleaning the Fristam Powder Mixer: COP Funnel, Manual Clean Funnel and CIP Funnel. During the cleaning process, the arc valve should be actuated open and closed once per minute.

6.10.3.1 Manually Cleaning the Funnel

Powder Mixer piping is run in the typical CIP process and the funnel is filled and cleaned manually by hand, while still attached to the Powder Mixer. The funnel can be opened and the contents drained or drawn into the fluid stream as needed during cleaning.

6.10.3.2 COP Funnel

Powder Mixer piping is run in the typical CIP process and the funnel is removed for cleaning. The arc valve can be cleaned with a jumper in place connecting the funnel port to the CIP line.

6.10.3.3 CIP Funnel

Powder Mixer piping is run in the typical CIP process and the funnel is cleaned in place using a spray ball. For this scenario, Fristam will provide the funnel with a gasketed lid and a spray ball. The process for cleaning the funnel is similar to cleaning a tank. The CIP system should alternate between cleaning the inlet piping and cleaning the funnel. Do not clean both at the same time.

While cleaning the piping, the funnel valve should remain closed.

While cleaning the funnel, the inlet piping should remain closed. Follow the recommendations of the spray ball supplier for flow rate and pressure.

6.10.4 Cleaning the Arc Valve

The arc valve is CIP-designed. For proper cleaning, feed CIP through both inlet ports and actuate the valve once per minute when cleaning the funnel connection.

EHEDG cleaning procedure:
1. Flush with cold water
2. Clean with 1.0% (w/v) solution at ~63°C for 10 min
3. Flush with cold water

Flow rate: 1.5 m/s (independent of pipe diameter). Timing and solution may vary by product; customers must validate their own procedure.

7 Operation

NOTICE

Damage to Pumps

Damage to mechanical seals by product residue.

Clean the powder mixer after each use.

NOTICE

Damage to Pumps

Damage to mechanical seals.

The pumps on the Powder Mixer may not be run dry.

⚠CAUTION

Danger of crushing, foot injuries, and irritation of the eyes, skin, and respiratory tract from contact with dust or aerosols.

- Wear safety shoes and protective clothing.
- Wear a dust mask if necessary.
- Watch video at Fristam.com: https://www.fristam.com/pm

7.1 Turning on the Powder Mixer

1. Pull the emergency stop button out.
2. Switch the main power supply to “On.”

7.2 Starting the Powder Mixer

7.2.1 Preparation

⚠CAUTION

Danger of Crushing, Severing of Extremities

Wedging of fingers in metering valve.

Do not reach into the funnel.

1. Ensure the powder control valve is closed.
2. Open all valves in lines prior to the Powder Mixer.
3. Fully open the Liquid Control Valve. Liquid should now flow from the tank to the Powder Mixer. The liquid will be visible in the sight glass.

7.2.2 Mixing: Recirculation with Gravity Feed

1. Push the green "Start" button for the FZX Liquid Ring Pump or FDS Positive Displacement pump. This will begin recirculating the fluid.
2. Push the green "Start" button for the FS Shear Blender.
3. Begin closing the Liquid Control Valve until the Vacuum Gauge displays between 5" and 10" Hg vacuum. This ensures adequate vacuum below the funnel.
4. Open the powder control valve briefly to check for suction and to evacuate any residual water from cleaning or leakage.
5. Fill the funnel with powder.
6. Carefully open the powder control valve. For powders that hydrate or swell, open the powder control valve partially so the powder will be inducted slowly.
7. Continue dumping powder into the funnel until all powder has been added.
8. Once the funnel is empty, close the powder control valve to prevent air from being inducted into your product.
9. Recirculate your product as needed for further blending or hydration.

7.2.3 Mixing: Stuffing Pump

1. Start the stuffing pump.
2. Push the green "Start" button for the FZX Liquid Ring Pump or FDS Positive Displacement pump. This will begin recirculating the fluid.
3. Push the green "Start" button for the FS Shear Blender.
4. Allow flow to stabilize in the loop.
5. Reduce Hz on the stuffing pump until suction gauge is at or around zero psig.
6. Begin closing the Liquid Control Valve until the Vacuum Gauge displays between 5" and 10" Hg vacuum. This ensures adequate vacuum below the funnel.
7. Open the powder control valve briefly to check for suction and to evacuate any residual water from cleaning or leakage.
8. Fill the funnel with powder.
9. Carefully open the Powder Control Valve.
10. For powders that hydrate or swell, open the powder control valve partially so the powder will be inducted slowly.

11. Continue dumping powder into the funnel until all powder has been added.
12. Once the funnel is empty, close the powder control valve to prevent air from being inducted into your product.
13. Recirculate your product as needed for further blending or hydration.
14. Once the funnel is open, ignore reading from vacuum gauge. The seal is broken to atmosphere at this point and readings are not helpful. If you need to check vacuum level, close powder control valve and adjust liquid control valve.

7.3 Monitoring Operation

1. Monitor the quality of the premix through the sight glass. Check the air content and the particle size of the homogenized product.
2. If there is insufficient powder flow, close valve V2 further to increase the vacuum. Ensure however that there is sufficient liquid flow to prevent the pumps from becoming clogged.
3. A decrease in suction with increasing product stream viscosity can be compensated to a certain extent by opening the liquid control valve V2 further.
4. As soon as all powder has been taken in from the hopper, close the metering valve V1 to prevent air from entering the mixture.
5. If necessary, top up the hopper with powder. Repeat the steps in 7.2.2.

7.4 Stopping the Powder Mixer

1. Ensure the funnel valve is fully closed and the handle is seated in the notch.
2. Push the red “Stop” button for the FS Shear Blender.
3. Push the red “Stop” button for the FZX Liquid Ring Pump or FDS Positive Displacement Pump.

7.5 Turning Off the Powder Mixer

Switch the main power supply to “Off”.

NOTICE

Damage to Pumps

Always clean the Powder Mixer after turning off.

7.6 Recommended Set Points

7.6.1 Starting Valve Positions

- Sugar or salts: 100% open
- Starch or cocoa: 50% open
- Gums: 10-20% open

7.6.2 Induction Pump Speed

- If using the FZX Liquid Ring Pump, the pump must be run at 2500 rpm or faster during powder induction

7.6.3 Funnel Vibrator Usage

- Only start the vibrator once the funnel is open to prevent packing.
- Use vibrator intermittently as needed to help keep the powder flowing.

8 Precautionary Instructions

8.1 Safety Instructions

⚠CAUTION

Hot Surfaces

Contact burns from touching the pumps or pipes. Pumping of hot media can cause the pumps and pipes to become very hot.

- Check the temperature before touching the pump(s) or pipes.
- Only touch the pump(s) or pipes if you are wearing suitable gloves.

⚠CAUTION

Dust Generated by Clogged Funnel

Irritation of respiratory tract from inhalation of dust or aerosol.

- Do not allow the funnel to overflow.
- Do not bend over the funnel.
- Wear a dust mask.

9 Maintenance

For information on maintenance intervals, please see Chapter 10.5, “Maintenance Intervals.”

9.1 Safety Instructions

⚠CAUTION

Rotating Parts

Personal injury and material damage.

- Before removing the coupling guard and the guard plate, turn off the pump motor and prevent it from being able to be turned on accidentally.

⚠CAUTION

Uncontrolled Outflow of Liquids

Personal injury and material damage from acid burns, poisoning, and contamination. Before performing maintenance or cleaning work on the Powder Mixer:

- Close the suction and discharge lines.
- Completely empty the pipes before opening.
- Before opening the pump, completely empty the pump casing.

⚠CAUTION

Rapid Cooling of Pipes or Pumps

Tension cracks.

- Do not rapidly cool the pipes or pumps.

⚠CAUTION

Use of Hard Driving Tools

Scratching of polished surfaces.

- For polished surfaces, use a copper socket wrench.

9.2 Replacement Parts

Use of replacement parts that are not approved by Fristam can lead to serious personal injury and material damage. If you have any questions regarding approved replacement parts, please contact Fristam.

Fristam registers all shipped Powder Mixers. For ordering Fristam replacement parts, you require the following information:

1. Order number
2. Serial number of Powder Mixer (see nameplate on Powder Mixer frame)
3. Serial number of FS, FZX or FDS pump (see nameplate or numbers stamped into pump housing)
4. Replacement part number and/or description (see spec sheet and/or maintenance manual diagrams)

9.2.1 Serial Number Spec Sheet Lookup

Serial numbers can be looked up on the Fristam website:

https://portal.fristampumps.com/serial

9.3 FS Shear Blender Maintenance

- Locate maintenance manual at: https://www.fristam.com/fs
- Use maintenance manual: 1050000216

9.4 FZX Liquid Ring Pump Maintenance

- Locate maintenance manual at: https://www.fristam.com/fzx
- Use maintenance manual: 1050000033

9.5 FDS Twin Screw Pump Maintenance

- Locate maintenance manual at: https://www.fristam.com/fds
- Use maintenance manual: 1050000303

9.6 Arc Valve Repair

- Locate OEM manufacturer information:

https://www.fristam.com/wp-content/uploads/2022/11/LIAG-Instructions-Venturi-Valve_USA-2021.pdf

10 Appendix

10.1 Specifications

Detailed specifications for the Powder Mixer are given separately in the system documentation.

10.1.1 Tightening Torques

See all recommended torques in the individual component manuals.

10.1.2 Noise Emissions

The noise emissions are dependent on the pumps used, the use of a funnel vibrator and the size and fill level of the funnel.

The specified values apply to operation of the Powder Mixer at the best efficiency point with ambient water (please also see pump characteristic curves and specification in the attached operator's manuals).

The noise level can differ greatly at other operating points, temperatures and products.

Model	Noise level (dBA)
01-10	80
10-52	81
15-52	81
20-53	82
25-53	82
10-00	81
15-00	81
20-00	82
25-00	82
35-00	84
40-00	87
2-52 (FDS)	81
3-53 (FDS)	82

10.2 Performance Overview

PM	Max. Flow Rate	Max. Induction Rate lbs/min (kg/min)			
Model	GPM (m^3/hr)	Sugar/Salt	Starch/ WPC/Cocoa	Pectin	Carbopol/ Xanthan
01-10	15 (3)	30 (15)	20 (10)	5 (1)	5 (1)
10-52	50 (11)	100 (45)	65 (30)	20 (10)	10 (5)
15-52	90 (20)	175 (80)	115 (50)	35 (15)	20 (10)
20-53	125 (28)	225 (100)	150 (70)	45 (20)	25 (10)
25-53	150 (34)	300 (135)	200 (90)	60 (25)	30 (15)
35-53*	250 (57)	500 (225)	335 (150)	100 (45)	50 (25)
40-53*	300 (68)	600 (270)	400 (180)	120 (55)	60 (25)
2-52	75 (17)	150 (70)	100 (45)	30 (15)	15 (5)
3-53	125 (28)	225 (100)	151 (70)	45 (20)	23 (10)
*Due to size constraints, the FZX is mounted in the table and the FS is separate					

10.2.1 Pump Combination

The specific combination of suction pump and shear blender is dependent on the application type. Other motor outputs may be required.

10.2.2 Shear Blender Output

The required output is dependent on the properties of the end product and the process parameters:

- Concentration of end product
- Temperature of base medium
- Dissolution properties of powder
- Viscosity of end product
- Diameter of tubing
- Length of tubing

10.2.3 Dissolution Properties of Powder

The viscosity of the premix below the funnel is higher than the viscosity of the end product. There is an over-concentration of powder in this pipe section. The reason for the high viscosity is the additional friction caused by the crystals that are not yet dissolved. In the example of granulated sugar, this results in higher motor output requirements for the shear blender.

10.3 Lubricants

Only use food-grade lubricants.

10.4 Maintenance Log

Problem	Possible Cause	Solution

10.5 Maintenance Intervals

Refer to the operator's manuals for the pumps, motors and components.

10.6 Replacement Parts

Use of replacement parts that are not approved by Fristam can lead to serious personal injury and material damage. If you have any questions regarding approved replacement parts, please contact Fristam.

Fristam registers all shipped powder mixers. For ordering Fristam replacement parts, you require the following information:

1. Serial number of powder mixer (see rating plate on powder mixer frame)
2. For pump: pump serial number (see rating plate or number stamped into pump)
3. For blender: blender serial number (see rating plate or number stamped into blender)

Using the serial numbers above, you can find a replacement part list at:
https://portal.fristampumps.com/serial

10.7 EC Declaration of Conformity

See following page.

EC Declaration of Conformity

The manufacturer: Fristam Pumps
2410 Parview Road
Middleton, WI 53562
USA

hereby declares that the following product (pump with motor):

- Centrifugal pump types: FPR, FPX, FP, FZX, FM, FPH/FPHP, FS
- Positive displacement pump types: FKL

conforms to the requirements of the Machinery Directive (2006/42/EC).

The machine also complies with all requirements of the Low Voltage Directive (2006/95/EC) and the EMC Directive (2004/108/EC).

The following harmonized standards have been applied:

- DIN EN 809 Pumps and pump units for liquids – Common safety requirements
- DIN EN 12100 Safety of machinery – General principles for design – Risk assessment and risk reduction

Authorized person responsible for the compilation of the technical file:

Duane Ehlke / Vice President of Operations
2410 Parview Road
Middleton, WI 53562

Date: 2014-5-9

EG Declaration of Incorporation

The manufacturer: Fristam Pumps
2410 Parview Road
Middleton, WI 53562
USA

hereby declares that the following product (pump without motor):

- Centrifugal pump types: FPR, FPX, FP, FZX, FM, FPH/FPHP, FS
- Positive displacement pump types: FKL

are partly completed machines in accordance with the Machinery Directive (2006/42/EC) Annex II B.

The above mentioned products meet the relevant general health and safety requirements laid down in Annex I of the above Directive.

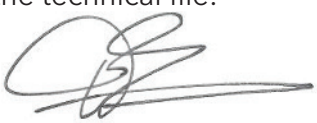
The above named partly completed machines must not be put into service until the final machinery into which they are to be incorporated has been declared in conformity with the provisions of the Machinery Directive (2006/42/EC).

The above products comply with the following standards:

- DIN EN 809 Pumps and pump units for liquids – Common safety requirements
- DIN EN 12100 Safety of machinery – General principles for design – Risk assessment and risk reduction

On request, the manufacturer shall forward the special documentation of the partly completed machine in electronic format to the relevant state authorities. The special technical documentation relating to the machine according to Annex VII B has been compiled.

Authorized person responsible for the compilation of the technical file:



Duane Ehlke / Vice President of Operations
2410 Parview Road
Middleton, WI 53562
Date: 2014-5-9

Operating The Powder Mixer

www.fristam.com/pm

Notice of Terms, Warranty Provisions Including Disclaimers, Claims and Limitation of Liability

Prices and all terms and conditions of sale are established in current price sheets and are subject to change without notice. All orders are subject to acceptance by Fristam Pumps USA, Limited Partnership.
Each Fristam Pumps item is warranted to be free from manufacturing defects for a period of one (1) year from the date of shipment, providing it has been used as recommended and in accordance with recognized piping practice, and providing it has not been worn out due to severe service, such as encountered under extremely corrosive or abrasive conditions.

This warranty is expressly in lieu of any other warranties expressed or implied, including but not limited to, any implied warranty of merchantability or fitness for particular purpose. All other warranties whatsoever, expressed or implied by law or otherwise, are hereby excluded.

All claims must be in writing and must be mailed or delivered by purchaser within thirty (30) days after purchaser learns of the facts upon which such claim is based. Any claim not made in writing and within the time period specified above shall be deemed waived.

Purchaser's sole and exclusive remedy and Fristam Pumps' maximum liability for claims arising hereunder or for negligence for any and all losses and damages resulting from any cause shall be either the repair or replacement of defective items or, at Fristam Pumps' option, the refund of the purchase price for such items. In no event, including in the case of a claim for negligence, shall Fristam Pumps be liable for incidental or consequential damages, including loss of profits.

No person, including any representative employee or agent of Fristam Pumps is authorized to assume on behalf of Fristam Pumps any liability or responsibility in addition to or different from that described in this provision. Any and all representations, promises, warranties or statements that are in addition to or different from the terms of this provision are of no force or effect.

If any provision of this Notice is held to be invalid, such provision shall be severed and the remaining provisions shall continue to be in force.

End-of-Life Disposal
At the end of its life, our products should be recycled according to local guidelines.

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Part #: 1050000270
Drawing #: 1250000033
Updated: 8/20/2026

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