

## Mixing & Blending

**FS**  
Shear Blender



**Powder Mixer**



Fristam Pumps...  
Performance You've Come to Expect

# Fristam Powder Mixer

## How It Works

- 1** The FZX pump draws the base fluid out of the receive tank and transfers it through a short pipe to the Powder Mixer.
- 2** When the FZX pump is throttled at the suction side by the liquid control valve, a strong vacuum is generated in the “Y” pipe below the funnel.
- 3** This vacuum draws powder or liquid directly into the fluid flow. As this mixture passes through the FZX pump, mixing begins to take place.
- 4** The FZX then pumps this premix through the FS Shear Blender where any remaining lumps are eliminated by high turbulent action.
- 5** The product mixture is pumped from the powder mixer to a batch tank or another process tank.

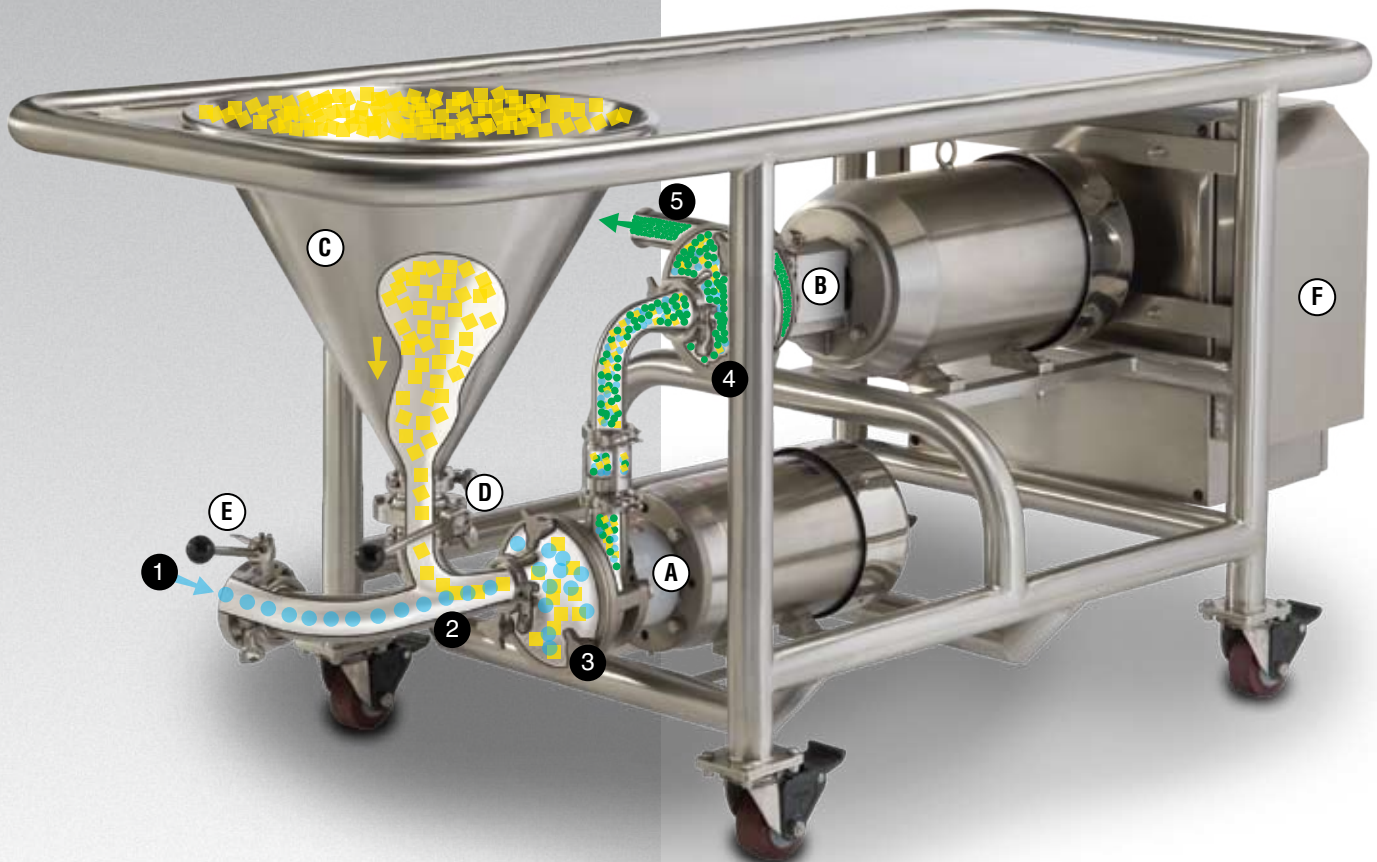
Fristam’s Powder Mixer provides quick, high-performance blending of wet and dry ingredients into a fluid stream. What makes Fristam’s Powder Mixer unique is its proven pump and blender system that’s efficient and easy to use.

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.

The Powder Mixer consists of the following main components:

- Ⓐ Fristam FZX self-priming liquid ring pump
- Ⓑ Fristam FS Shear Blender
- Ⓒ Powder induction funnel
- Ⓓ Powder control valve
- Ⓔ Liquid control valve
- Ⓕ Control Panel



# Powder Mixer Applications

## Product Applications

### Dairy:

Chocolate Milk  
Cottage Cheese Dressing  
Ice Cream Mix  
Yogurt  
Sour Cream  
Eggnog  
Pudding

### Food:

Olive Oil/Water Emulsion  
Salsa & Hot Sauce  
Ketchup & Mustard  
Vegetable Oil Refining  
Mayonnaise  
Salad Dressing

### Beverage:

Orange Juice  
Mineral Water  
Green Tea  
Vegetable Juice

### Personal Care:

Shampoo/Conditioner  
Toothpaste  
Lotion/Cream  
Mouthwash

### Non-Sanitary:

Biodiesel  
Paintballs  
Fertilizer

## Ingredient Applications

Aloe Vera	Honey
Aspartame	Non-Fat Dry Milk (NFDM)
Beeswax	Pectin
Calcium Carbonate	Salt
Carbopol®	Sodium Citrate
Carrageenan	Starch
Chocolate Powder	Sugar
Citric Acid	Vanilla
Crystal Sugar	Vegetable Oil
Egg Powder	Whey Protein Concentrate
Gelatin	Xanthan Gum

## Pharmaceutical Applications

The Fristam Powder Mixer is ideally suited for bio-pharmaceutical applications. Both the FZX pump and the FS Blender are used in pharmaceutical processes around the world. Bio-pharm applications include: tablet coatings; cough syrup and other syrups; and topical ointments, lotions, and creams.

Also, Fristam Pumps offers the most comprehensive testing, documentation, and certification packages in the industry.



# Better Than Batch Mixers and Funnel/Pump Combinations



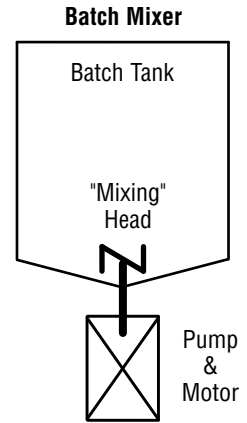
**Batch Mixer**



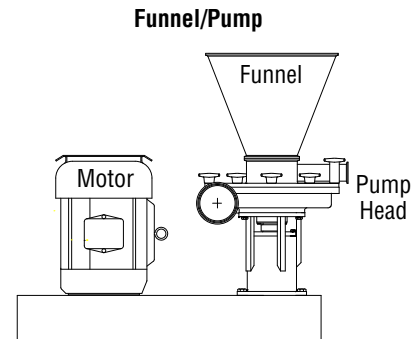
**Fristam Powder Mixer**

Example photo: Casein (Milk Protein)

	Batch Mixer	Fristam Powder Mixer
Mixing Quality	Product can clump or stick to the side of the tank, causing some of the powder to never pass through the agitator.	All of the product passes through the FS Shear Blender at a controlled concentration, ensuring a complete mix.
Process Time	Process time is measured in hours.	Powders can be wetted and dispersed on the first pass through the Powder Mixer. This can reduce process time by up to 95%.
Batch Size	Batch size is limited to the size of the tank, and larger tanks are more expensive.	As an inline blending system, the batch size is infinite.
Cleaning	Batch tanks can be difficult to clean, because CIP spray may not always fully clean the shaft and mixing head.	The FS Shear Blender and FZX Liquid Ring pump can both be Cleaned In Place.



	Funnel/Pump	Fristam Powder Mixer
Mixing Method	It uses turbulent agitation to "mix" product.	An actual mixing head blends the product consistently.
Flow	It relies on gravity/vortex/Venturi effect to force powder into liquid, which can plug as viscosity increases.	The FZX Liquid Ring pump creates steady suction that allows for consistent flow, even as viscosity increases.
Maintenance	It uses bearings and belts, which require regular maintenance and replacement.	Standard C-Face motors and strong shafts require less maintenance.



# Components and Options

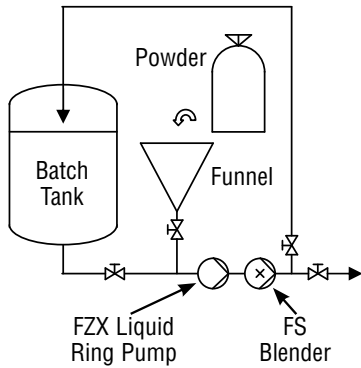
The Fristam Powder Mixer is manufactured specifically for each order. Its dimensions and configuration are fully customizable.

## Customized Solutions

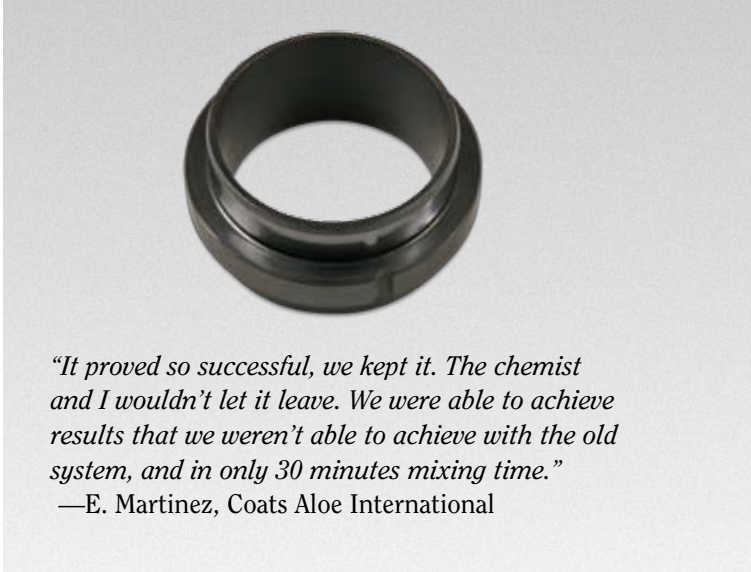
- Powder Mixer Table: 304 stainless steel, 32 Ra wetted surfaces, wheels  
Options: 316L stainless steel, adjustable legs
- Control Panel: Bench Tested, Removable For Service  
Options: VFD, NEMA 4X, remote mounting, UL Listing, PLC, valve control, vibration control
- Funnel: 24" concentric funnel  
Options: vibrator, screen, lid
- Valves: butterfly  
Options: ball, arc, single seat regulating
- Other Options: casing drain, double seals on pumps, adaption to bulk bag feeder



Process: Powder Induction



Induction Rate (lbs/min)		Liquid Flow	FZX Pump		FS Shear Blender	
Powders (Sugar, NFDM, etc.)	Thickeners (pectin, gums)	GPM	Model	HP	Model	HP
50-105	2-4	30-65	2100	5-7.5	3522	10-15
105-175	2-6	65-110	2150	7.5-10	3532	20-25
160-220	4-9	100-140	2200	10-15	3532	20-25
200-285	9-15	120-175	2250	15-20	3542	30-50
240-325	11-23	150-200	2250	15-20	3552	50-60
325-600	15-40	200-375	2400	50-60	3552	60-75



## No Risk Trial

Fristam can do on-site trials with your product. For only a nominal fee, Fristam will put our Powder Mixer to work for you, so you can see the amazing results for yourself.

- Fully operational Powder Mixer
- Factory-trained technician onsite
- Expert process guidance

*"It proved so successful, we kept it. The chemist and I wouldn't let it leave. We were able to achieve results that we weren't able to achieve with the old system, and in only 30 minutes mixing time."*

—E. Martinez, Coats Aloe International

# FS Shear Blender

Fristam's FS Series Shear Blender for inline mixing, blends products quickly and consistently. Compared to conventional methods, the Shear Blender shortens processing times significantly. The Shear Blender's rotor-stator design eliminates unblended product and prevents lumps and masses in product for consistent, repeatable results.

The FS Series can be used to blend, emulsify, disperse, dissolve, texturize and reduce the particle size of a wide range of products, from simple to demanding applications. The series uses standard seals and housings for easy maintenance and inventory savings.

**4 heads**

**8 models (low and high speed)**

**For product viscosities in excess of 30,000 cps**

**Tip speeds up to 44 m/s**

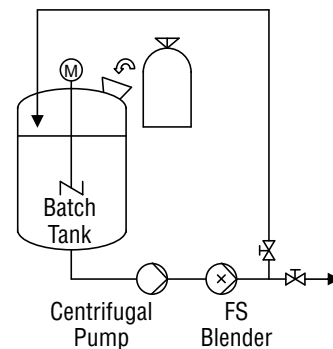
**Manufactured in the U.S.A.**

## Features for the FS

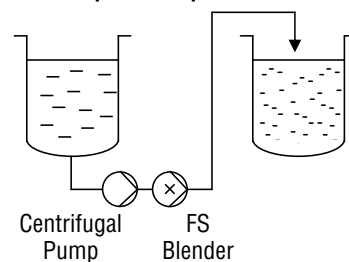
- Improves product texture
- Reduces processing time
- Economical to operate and maintain
- Low maintenance design for continuous duty and CIP



### Process: Finish/Supplemental Mixing



### Process: Liquid-to-Liquid Emulsification



## Easy Maintenance

Fristam's FS Series sanitary blender, designed for easy maintenance and less parts inventory, retains the standard established with our high performance centrifugal and positive displacement pumps.

FS Series blenders reduce maintenance time and effort. Designed with a front pullout seal, the FS allows production personnel to service the pump in place—processors no longer need to pull pumps out of line to change seals.

Additionally, no special tools are required to service FS Blenders. They have fewer parts, so processors have less maintenance parts to stock. Two seal sizes fit the entire FS line.

Fully CIP'able, the design of the FS meets the most stringent sanitary standards. Its fully balanced internal seal performs at virtually any pressure. An optional stainless steel flange provides corrosion resistance.

## Rotor/Stator Options for Diverse Applications

### Pyramid Teeth

Pyramid teeth are suited for longer, stringier particles (e.g. plant/vegetable matter).

### Larger Gap Teeth

Increased channel width between rows of teeth allow for greater flow on products requiring less shear (e.g. sugar, more soluble powders).

### Fewer Teeth

Fewer rows of teeth reduce shear for products requiring more gentle product handling (e.g. cosmetics).

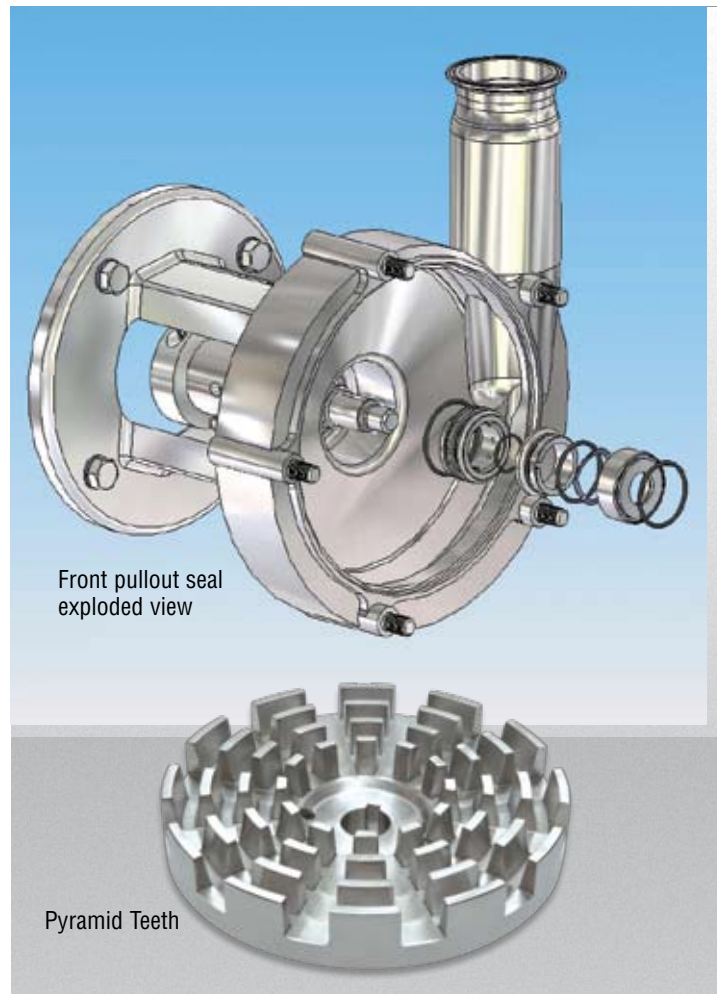
## Flexibility

### Standard Rotor-Stator

Using a Variable Frequency Drive (VFD) to change the shear rate, the FS can be used on a variety of applications.

### Additional Rotor-Stator

Several different applications could be run on the same FS Shear Blender with only simple, two-minute switch-outs of different rotor-stator types.



# FSI Shear Pump

Fristam's FSI Series Shear Pump is an impeller-style version of the Fristam FS Series Shear Blender. For applications requiring both pumping and mixing, Fristam's FSI has an integrated impeller that provides high flow rates while still mixing your product.

**4 heads**

**8 models (low and high speed)**

**For product viscosities in excess of 30,000 cps**

**Manufactured in the U.S.A.**

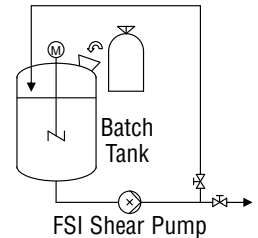
## Pump and Blender in One

The FSI Shear Pump can replace a centrifugal pump to provide additional blending during a recirculation or transfer process. The FSI can also replace a pump and blender combination in many other processes, including finish/supplemental mixing.

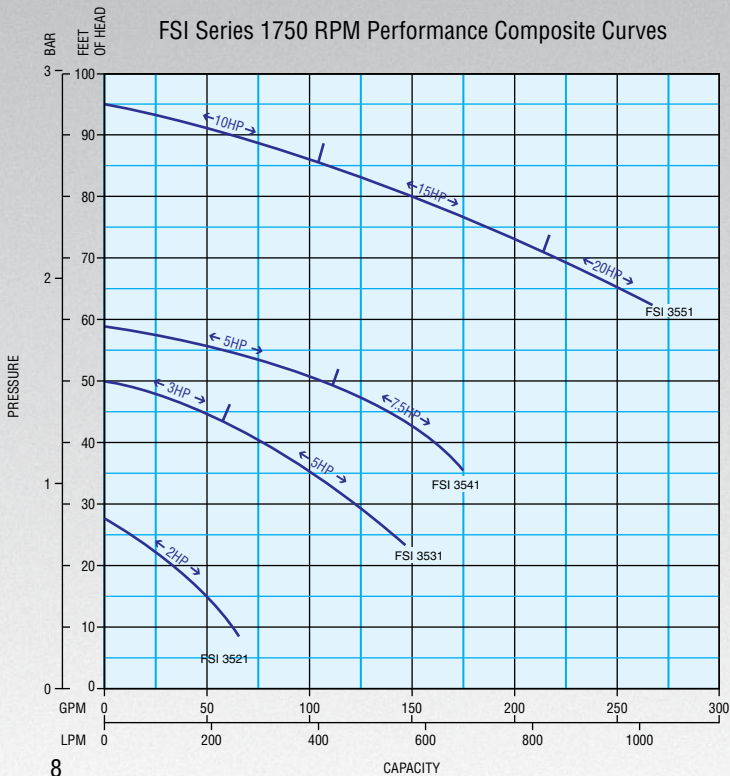
## Typical Applications

- Reconstituting powder (e.g. milk)
- Smoothing finished product (e.g. yogurt)
- Neutralizing and washing biodiesel

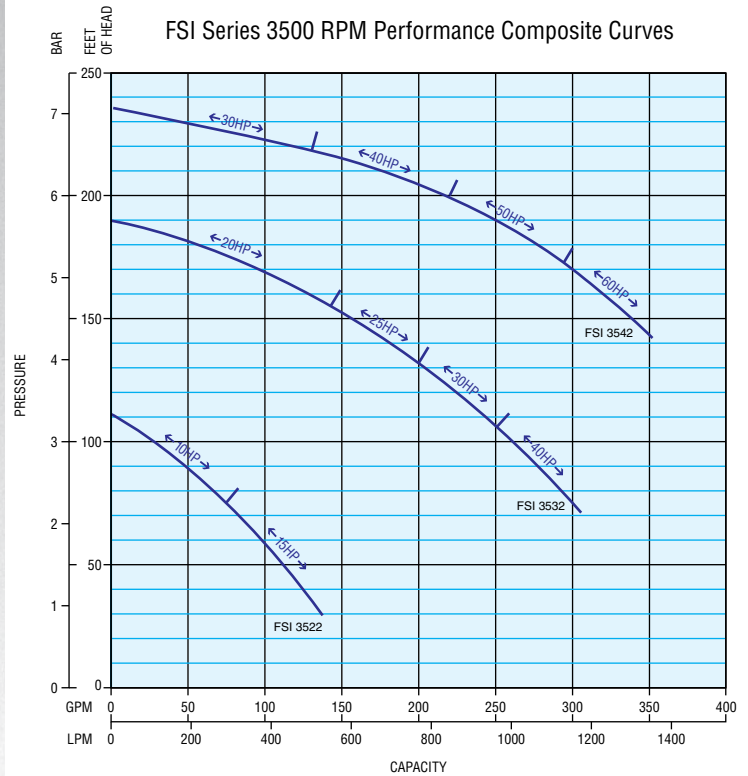
### Process: Finish/Supplemental Mixing



FSI Series 1750 RPM Performance Composite Curves



FSI Series 3500 RPM Performance Composite Curves



# FZX Liquid Ring Pump

## Self-priming for Complete Evacuation

This sanitary liquid ring pump provides new capabilities for handling products with entrained air. By using a specially designed impeller and housing, the FZX maintains its prime when other pumps become air bound. This feature makes the FZX more efficient for complete evacuation of tanks and lines during normal process or CIP.

## How It Works

Fristam's FZX pumps liquids with entrained air or gas. Its impeller has an enclosed ring with flat blades that create individual chambers. As the impeller rotates counterclockwise, the liquid is drawn into one of the chambers through the inlet of the pump. Here, the volute chamber in the housing and cover increases in depth, drawing in more product. As the chamber rotates beyond the inlet port the volute reaches its maximum depth.

When the chamber is no longer exposed to the inlet, it seals itself with surface tension from the tight clearances between the impeller and housing, creating a liquid ring. This liquid ring is what allows the pump to be self-priming, even with entrained air in the product.

As the chamber continues to rotate, the velocity of the product increases, which builds force. When the chamber overlaps the discharge port, the volute in the housing and cover decreases in depth. This builds pressure and, along with the rotational energy, forces the product out the discharge port. The chamber then continues to rotate back around to the inlet port again and the process is repeated.

**5 pump heads**

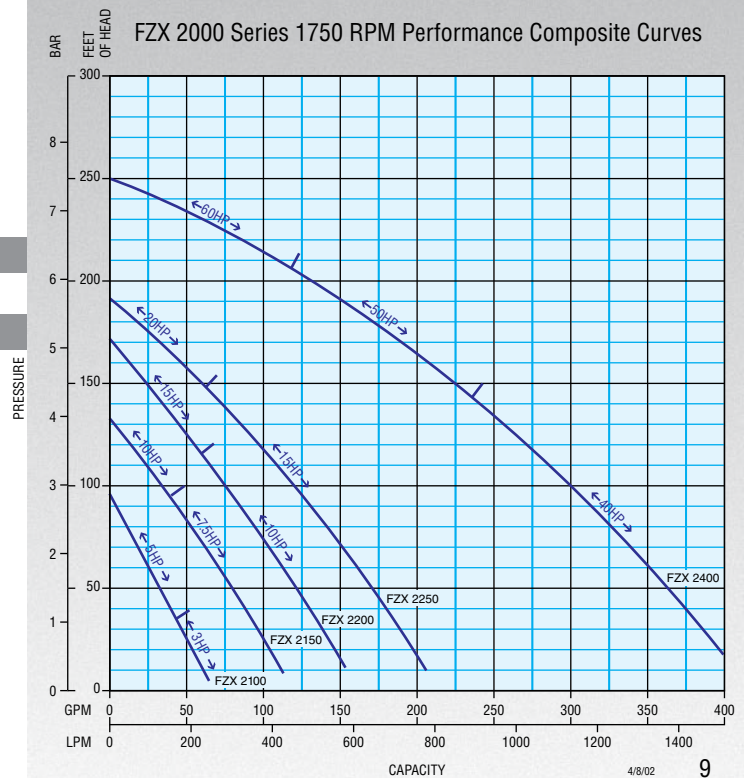
**5 models (low speeds)**

**For product viscosities in excess of 5,000 cps**

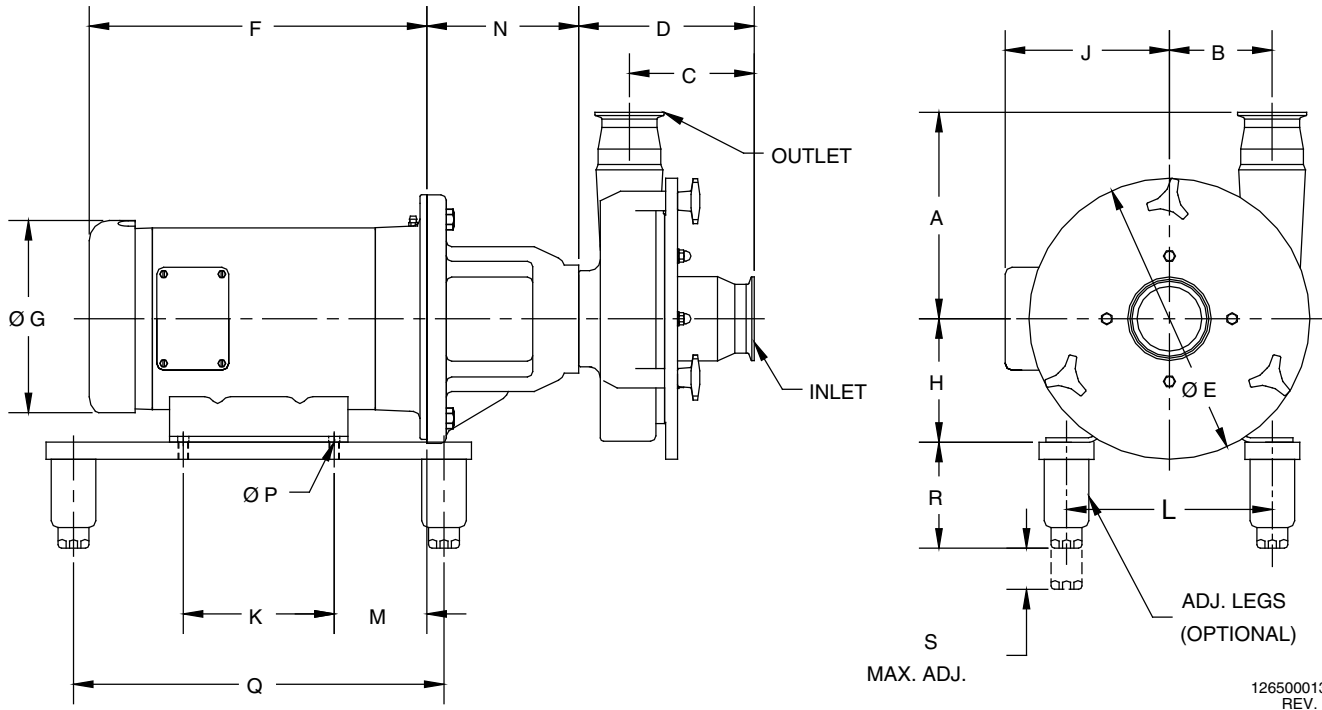
**Manufactured in the U.S.A.**

## Typical Applications

- CIP return
- Pumping aerated products
- Complete emptying of tanks (tanker unloading)
- Lifting products from drums and sumps
- Texturizing sour cream (replacing homogenizer valves)
- Pumping shear sensitive products such as: cream, liquid eggs, yeast, and sour cream



# FS Dimensional Drawings



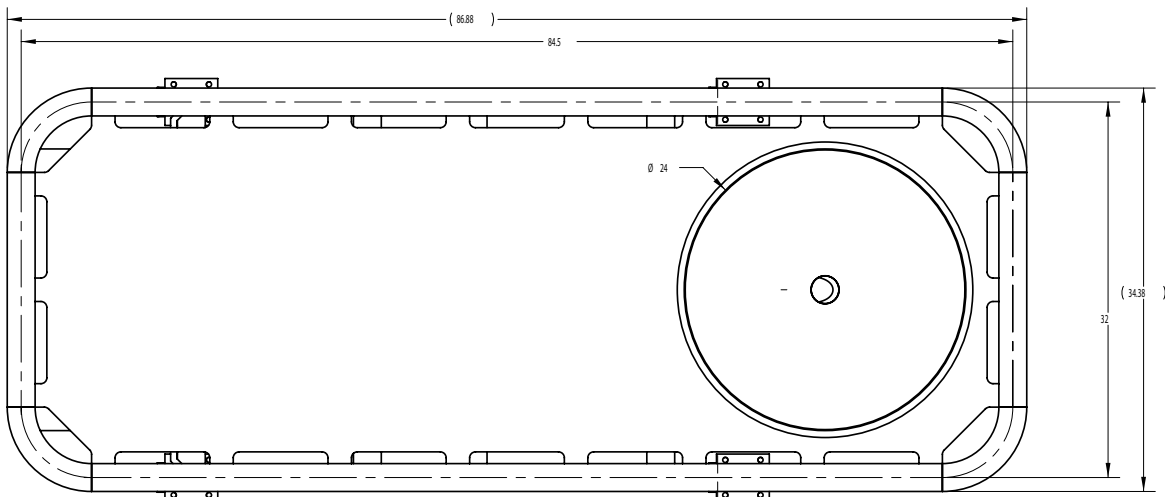
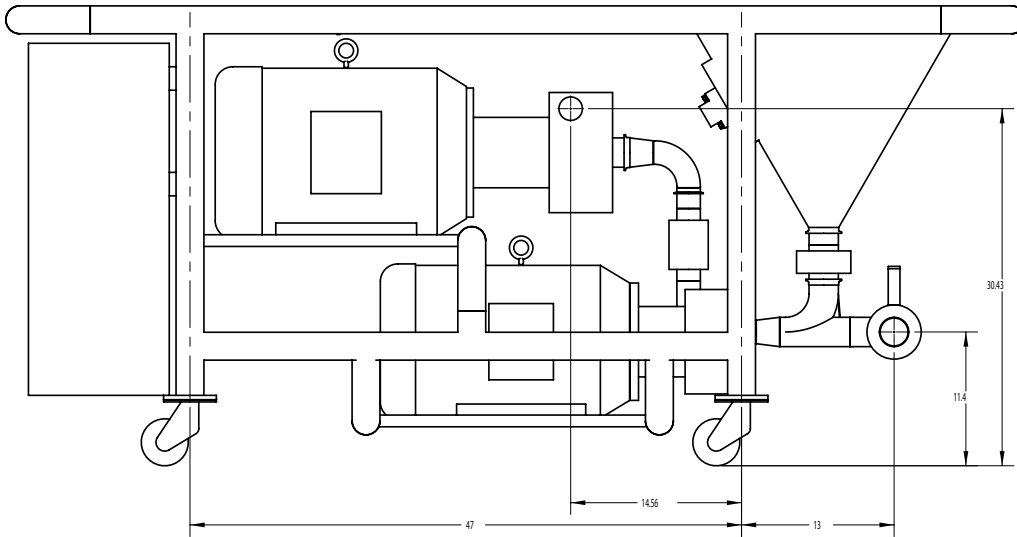
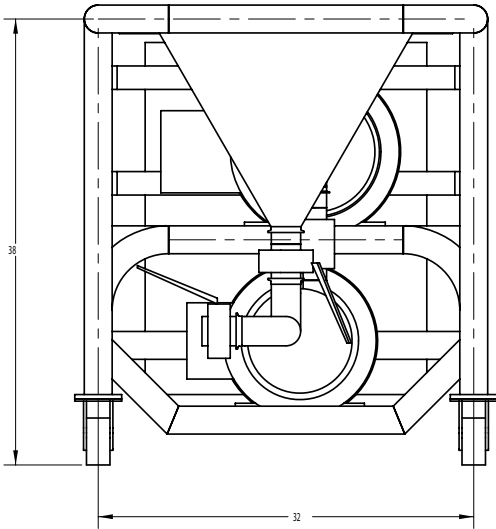
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PUMP MODEL	INLET	OUTLET	DIMENSIONS IN MILLIMETERS (INCHES)				
			A	B	C	D	ØE
FS 3521 / 3522	2.5"	2"	190 (7.48)	80 (3.15)	118 (4.64)	162 (6.38)	230 (9.06)
FS 3531 / 3532	2.5"	2"	191 (7.52)	95 (3.74)	115.5 (4.55)	162 (6.38)	260 (10.24)
FS 3541 / 3542	3"	2.5"	211 (8.31)	115 (4.53)	118 (4.64)	162 (6.38)	290 (11.42)
FS 3551 / 3552	3"	2.5"	231 (9.09)	140 (5.51)	119 (4.68)	168 (6.61)	350 (13.78)

MOTOR HP	MOTOR	DIMENSIONS IN MILLIMETERS (INCHES)												
		1750 RPM	3500 RPM	FRAME	F	ØG	H	J	K	L	M	N	ØP	Q
1 HP	1.5 HP	143TC	281 (11.06)	183 (7.19)	89 (3.50)	133 (5.22)	102 (4.00)	140 (5.50)	70 (2.75)	120 (4.72)	8.7 (11/32)	343 (13.50)		
1.5 HP		145TC	281 (11.06)	183 (7.19)	89 (3.50)	133 (5.22)	102 (4.00)	140 (5.50)	70 (2.75)	120 (4.72)	8.7 (11/32)	343 (13.50)		
2 HP	2 HP	145TC	281 (11.06)	183 (7.19)	89 (3.50)	133 (5.22)	102 (4.00)	140 (5.50)	70 (2.75)	120 (4.72)	8.7 (11/32)	343 (13.50)		
	3 HP	182TC	313 (12.31)	183 (7.19)	114 (4.50)	132 (5.21)	140 (5.50)	191 (7.50)	89 (3.50)	169 (6.65)	10.3 (13/32)	343 (13.50)		
3 HP		182TC	348 (13.69)	183 (7.19)	114 (4.50)	132 (5.21)	140 (5.50)	191 (7.50)	89 (3.50)	169 (6.65)	10.3 (13/32)	343 (13.50)		
	5 HP	184TC	347 (13.68)	216 (8.50)	114 (4.50)	152 (5.97)	140 (5.50)	191 (7.50)	89 (3.50)	169 (6.65)	10.3 (13/32)	343 (13.50)		
5 HP		184TC	386 (15.18)	216 (8.50)	114 (4.50)	152 (5.97)	140 (5.50)	191 (7.50)	89 (3.50)	169 (6.65)	10.3 (13/32)	343 (13.50)		
	7.5 HP	184TC	386 (15.18)	216 (8.50)	114 (4.50)	152 (5.97)	140 (5.50)	191 (7.50)	89 (3.50)	169 (6.65)	10.3 (13/32)	343 (13.50)		
7.5 HP		213TC	388 (15.27)	263 (10.34)	133 (5.25)	189 (7.46)	140 (5.50)	216 (8.50)	108 (4.25)	169 (6.65)	10.3 (13/32)	343 (13.50)		
10 HP	10 HP	215TC	388 (15.27)	263 (10.34)	133 (5.25)	189 (7.46)	140 (5.50)	216 (8.50)	108 (4.25)	169 (6.65)	10.3 (13/32)	343 (13.50)		
	15 HP	215TC	436 (17.15)	263 (10.34)	133 (5.25)	189 (7.46)	140 (5.50)	216 (8.50)	108 (4.25)	169 (6.65)	10.3 (13/32)	343 (13.50)		
15 HP		254TC	447 (17.59)	263 (10.34)	159 (6.25)	225 (8.88)	210 (8.25)	254 (10.00)	121 (4.75)	169 (6.65)	13.5 (17/32)	343 (13.50)		
	20 HP	256TC	491 (19.34)	263 (10.34)	159 (6.25)	225 (8.88)	254 (10.00)	254 (10.00)	121 (4.75)	169 (6.65)	13.5 (17/32)	394 (15.50)		
20 HP		256TC	499 (19.66)	336 (13.25)	159 (6.25)	239 (9.42)	254 (10.00)	254 (10.00)	121 (4.75)	169 (6.65)	13.5 (17/32)	394 (15.50)		
25 HP		284TC	436 (17.15)	263 (10.34)	133 (5.25)	189 (7.46)	140 (5.50)	216 (8.50)	108 (4.25)	179 (7.05)	10.3 (13/32)	343 (13.50)		
	25 HP	284TSC	447 (17.59)	263 (10.34)	159 (6.25)	225 (8.88)	210 (8.25)	254 (10.00)	121 (4.75)	179 (7.05)	13.5 (17/32)	343 (13.50)		
30 HP		286TC	491 (19.34)	263 (10.34)	159 (6.25)	225 (8.88)	254 (10.00)	254 (10.00)	121 (4.75)	179 (7.05)	13.5 (17/32)	394 (15.50)		
	30 HP	286TSC	499 (19.66)	336 (13.25)	159 (6.25)	239 (9.42)	254 (10.00)	254 (10.00)	121 (4.75)	179 (7.05)	13.5 (17/32)	394 (15.50)		
40 HP		324TSC	491 (19.34)	263 (10.34)	159 (6.25)	225 (8.88)	254 (10.00)	254 (10.00)	121 (4.75)	179 (7.05)	13.5 (17/32)	394 (15.50)		
50 HP		326TSC	499 (19.66)	336 (13.25)	159 (6.25)	239 (9.42)	254 (10.00)	254 (10.00)	121 (4.75)	179 (7.05)	13.5 (17/32)	394 (15.50)		

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# Powder Mixer Dimensional Drawings



# Fristam Worldwide Contact Details

## North America/South America

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Noisy-le-Sec-Cedex

#### Germany

Fristam Pumpen  
F. Stamp KG (GmbH & Co)  
Hamburg

#### Great Britain

Fristam Pumps (UK) Ltd.  
Hailsham

#### India

Fristam Pumps (India) Pvt. Ltd.  
Pune

#### Italy

Fristam Italia S.r.l.  
Gallarate

#### Japan

Fristam Pumps Japan Co. Ltd.  
Tokyo

#### Netherlands

Fristam B.V.  
Elst (gld)

#### New Zealand

Fristam Pumps Ltd.  
Auckland

#### Peoples Republic of China

Fristam Pumps (Shanghai) Co. Ltd.  
Shanghai

#### Poland

Fristam Polska Sp.z.o.o.  
Warsaw

#### Russian Federation

Fristam Pumpen 000  
Moscow

#### Scandinavia

Fristam Pumper A/S

#### South/East Asia

Fristam Pumps (S.E.A.)  
Pte. Ltd.  
Singapore

#### Spain/Portugal

Fristam Iberica S.L.  
Porqueres (Girona)

## Fristam's Commitment

Fristam Pumps manufactures the sturdiest products in the industry. Our design reduces repair/replacement cost, downtime and energy consumption, and therefore provides high lifetime value. Fristam is one of the most accessible equipment companies in the world. Fristam's dedication and quality service do not end with your initial purchase. An international network of manufacturing facilities, sales offices and distribution supports Fristam's commitment to customer satisfaction.

## 3-A, GMP, U.S.D.A., F.D.A., ISO and EHEDG

Fristam complies with and supports regulatory standards. Fristam products meet all applicable industry standards for performance, cleanliness and design. As a registered ISO 9001:2000 company, Fristam is committed to consistent quality products.

