



# Laboratory Scale Mixers



# The Silverson Principle

**For over 75 years Silverson has specialized in the manufacture of quality high shear mixers for processing and manufacturing industries worldwide.**

With customers in over 150 countries, and serving industries as diverse as food, pharmaceuticals, cosmetics, luboils and petrochemicals, Silverson has become the world leader in the field of high shear mixing. Time after time, companies specify Silverson mixers as the “standard” equipment for their manufacturing process.

The key to this success is based on the professionalism and commitment Silverson shows to each of its customer’s needs. Whether supplying machines from its standard range of mixers or designing equipment specifically to meet an individual customer’s requirements, quality is guaranteed.

With a customer base that includes many of the world’s largest companies, Silverson is constantly at the forefront of new technologies. Developing and applying new high shear mixing techniques to meet these needs, Silverson has the experience, knowledge and commitment to both quality and service to solve today’s mixing needs and those of the future.

A truly international company, Silverson is represented by a network of associated companies, distributors and agents in over 50 countries, serving North America, Europe, Asia, Australasia, South America and Africa.

# Why Silverson?

## Speed

The exceptionally rapid Silverson mixing action substantially reduces process times compared with conventional agitators and mixers and can reduce mixing times by up to 90%.

## Versatility

The advantage of the Silverson approach to mixing is that any one machine can perform the duties that in the past may have required several different pieces of process equipment. This unrivaled versatility allows any machine to perform the widest range of mixing applications:

- **Blending** - A homogeneous product is rapidly produced when blending liquids of similar or greatly varying viscosities, eliminating problems such as stratification.
- **Emulsifying and homogenizing** - Emulsions (typically in the range of 0.5 to 5 microns) can be easily achieved.
- **Disintegration** - All Silverson rotor/stator mixers can disintegrate matter of animal, vegetable, mineral or synthetic origin in a single operation.
- **Particle size reduction** - Uniformly mill both solid and semi-solid materials into either solution or fine suspension.
- **Gelling and solubilizing** - The high shear action of the Silverson rotor/stator can rapidly disperse gums, alginates, C.M.C., carbopols, etc., resulting in an agglomerate-free solution within minutes.

# How the Silverson Works

The advantages of Silverson's high shear rotor/stator mixer over simple conventional stirrers or agitators stem from the multistage mixing/shearing action as materials are drawn through the specially designed Silverson workhead - the heart of every machine.



## Stage 1

The high-speed rotation of the rotor blades within the precision-machined mixing workhead exerts a powerful suction, drawing liquid and solid materials upwards from the bottom of the vessel and into the center of the workhead.



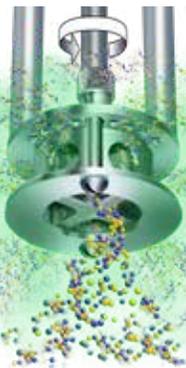
## Stage 2

Centrifugal force then drives materials towards the periphery of the workhead where they are subjected to a milling action in the precision clearance between the ends of the rotor blades and the inner wall of the stator.



## Stage 3

This is followed by intense hydraulic shear as the materials are forced, at high velocity, out through the perforations in the stator and circulated into the main body of the mix.



## Stage 4

The materials expelled from the head are projected radially at high speed towards the sides of the mixing vessel. At the same time, fresh material is continually drawn into the workhead maintaining the mixing cycle. The effect of the horizontal (radial) expulsion and suction into the head is to set up a circulation pattern that minimizes aeration caused by disturbance of the liquid's surface.

# Interchangeable Heads and Screens

A comprehensive range of workheads and screens is available for all Silverson rotor/stator mixers. These easily interchangeable workheads offer great versatility by allowing any machine to be adapted to perform a wide range of mixing operations including emulsifying, homogenizing, disintegrating, dissolving, dispersing, blending, particle size reduction and de-agglomerating. Changing from one head or screen to another is quick and simple.



## General Purpose Disintegrating Head

This is the most versatile of all the heads, giving an exceptionally vigorous mixing action. Ideal for general mixing applications, its uses also include the disintegration of solids and the preparation of gels and thickeners, suspensions, solutions and slurries.



## Slotted Disintegrating Head

For the disintegration of fibrous materials such as animal and vegetable tissue, as well as the disintegration and solubilization of “elastic” materials such as rubbers and polymers.



## Square Hole High Shear Screen™

Provides exceptionally high shear rates ideal for the rapid size reduction of soluble and insoluble granular solids. It is also suitable for the preparation of emulsions and fine colloidal suspensions.



## Standard Emulsor Head and Emulsor Screen

Suitable for liquid/liquid preparations and especially useful for all emulsions. Emulsor screens are available in fine and medium perforations.



## Axial Flow Head

This special head expels materials vertically upwards and is used where aeration needs to be minimised. It may also be used to maintain heavy insoluble solids in constant circulation.

# L5M-A

The Silverson L5M-A is ideal for all routine laboratory work, research and development, QA analysis and small scale production in all industries.

The multifunctional L5M-A features touch pad control with digital tachometer, programmable integral timer and amperage display, all accessed via the Mode button. The unit can be supplied with a "Data Logger" program allowing monitoring of speed and power draw over time. This level of instrumentation is invaluable for applications where process validation and reproducibility are required.

## Standard Assembly (Two Arm)

The L5M-A is supplied complete with a General Purpose Disintegrating Head, Square Hole High Shear Screen, Standard Emulsor Screen and Axial Flow Head.

Slotted Disintegrating Heads, Fine Emulsor Screen, Pump Heads and other special heads are available as optional extras.

Capacity - depending on viscosity - up to 12 liters. Mixing unit dimensions – length 290mm (11 1/2"), width 57mm (2 1/4").



#1 rated  
laboratory  
mixer

30,000  
units in use  
worldwide

# Mixing Assemblies

## Tubular Mixing Assemblies

A series of interchangeable tubular mixing units suitable for use in narrow-necked containers are available, with capacities from 1 - 500ml.

### 1" tubular

Capacity, depending on viscosity, 50ml up to 500ml.

### 3/4" tubular

Capacity, depending on viscosity, 20ml up to 250ml.

### 5/8" micro

Capacity, depending on viscosity, 5ml up to 50ml.

### 3/8" mini-micro

Capacity, depending on viscosity, 1ml up to 10ml.



## Duplex Assembly

The Duplex comprises two workheads facing in opposite directions. The upper head pulls materials down from the surface of the mix, and provides a coarse disintegrating action, while the lower head draws material up from the base of the mixing container, further reducing particle size to accelerate solubilization or suspension.

This combined use of two workheads makes the Duplex ideal for high viscosity mixes and applications where light or buoyant material (powders, rubbers and polymers, etc.) needs to be drawn down from the surface of a mix and rapidly dispersed.



## Ultramix

The Silverson Ultramix is designed for applications that are beyond the capabilities of a conventional agitator or stirrer but do not necessarily require the intense high shear of a Silverson rotor/stator mixer.



## In-Line Mixing Assembly

The In-Line assembly fits onto the model L5 Series Laboratory range and converts it into an In-Line mixer/homogenizer.

The centrifugal action of the rotor in the high shear rotor/stator workhead generates a non-positive pumping action which gives a throughput on low viscosity liquids of approximately 20 liters/minute, reducing as the viscosity increases.

The In-Line assembly is suitable for use at atmospheric pressure only. It is not recommended for use on abrasive, corrosive or flammable materials.



# Specialized Mixers

## Model L2/Air (Compressed Air)

Suitable for use in Explosion Hazard areas. The L2/Air is powered by a 0.25 hp, 6000 rpm variable speed air motor. The L2/Air will accept all L5 Series mixing assemblies. Supplied with a manually operated adjustable bench stand.



## Sealed Unit

The Silverson Sealed Unit laboratory mixer is designed for mixing sterile or hazardous materials and for working under a vacuum.

Processing can be carried out under conditions of absolute safety, since the mechanical seal protects sterile materials from airborne contamination and eliminates the risk of hazardous materials escaping into the surrounding atmosphere.

The Sealed Unit features a Quick-Release mechanism permitting use with a wide range of mixing assemblies.

### Mixing Vessels

Glass vessels with capacities from 7ml up to 1 liter are available. Stainless steel vessels are available with volumes from 1 - 10 liters.

### Operation Under Vacuum

Special sealed mixing assemblies are available for operation under vacuum.



# Pilot Scale Mixers

## AX Series

This series of mixers are designed for small-scale production in pilot plants, research institutes, hospital pharmacies, etc. Light and easily operated, AX series models have a capacity of up to 50 liters.



## Model AX5

The AX5 features touch pad controls and is compatible with Silverson's "DataLogger" system.

### Motor

Powerful 1 hp (0.75 kW) 110 volt single phase motor (220 volt optional) 50/60 Hz.

### Speed Control

Infinitely variable speed control. Nominal maximum speed 6000 rpm.

### Electric Rise & Fall Stand

The unit features an integral rise and fall stand with touch pad controls.

## Model AX60

The Model AX60 features a fixed speed 1 hp 3 phase motor. TEFC, washdown duty and explosion-proof motors are available. Variable speed available via an inverter as an optional extra.

More powerful motors allowing a maximum speed of up to 6000 rpm are also available.

## Model AX/Air

The Model AX/Air is powered by an intrinsically safe compressed air motor suitable for use in Explosion Hazard areas.

### Stands

Manual or electric rise and fall stands are available for use with the AX60 and AX/Air models.

# Technical Specifications

## Controls & Instrumentation

	L5M-A	Sealed Unit	L2 Air	AX60	AX5	AX Air
Touch Pad Control	●	●			●	
Tachometer	●	●			●	
Programmable Timer	●	●			●	
Ammeter	●	●			●	
DataLogger	○	○			○	

## Materials

Wetted Parts: 316L Stainless	●	●	●	●	●	●
Body: Nylon Coated Stainless	●	●			●	
Body: Stainless Steel	○	○	○	○	○	○

## Motor

	1 hp (0.75kW)	1 hp (0.75kW)	0.25 hp (0.18kW)	Various Motors	1 hp (0.75kW)	0.5hp (0.375kW)
Single Phase	●	●			●	
3 Phase				●		
Variable Speed	●	●	●	○	●	●
Nominal Maximum Speed RPM	10,000	8,000	6,000	up to 6,000	6,000	3,600

## Stand

Electric Rise & Fall	●	●		○	●	
Manual Stand			●	○		●

● Standard ○ Optional

# Verso

## Pilot Scale In-Line Mixer

The Silverson Verso is a bench top In-Line mixer ideal for laboratory or pilot scale applications. The unit offers excellent reproducibility when scaling up and provides an accurate and easy means of forecasting the performance of larger In-Line mixers under full-scale working conditions.

The Verso is equipped with a digital tachometer, ammeter and programmable timer, invaluable for applications where process validation and reproducibility are required. It is also compatible with the Silverson "DataLogger" program.

### Features

- Touch pad control panel
- Powerful 1 hp (0.75 kW) motor with infinitely variable speed control
- Single or multistage interchangeable workheads available
- Self-pumping
- Maximum operating pressure 150 psi (10 bar)
- 0.75" Tri-clamp inlet/outlet connections
- Single mechanical shaft seal
- All wetted parts are in grade 316L stainless steel
- Sanitary construction
- Vessel package available, comprising vessel, stand, valve and pipework

### Advantages

- Eliminates agglomerates and fish eyes
- Creates stable emulsions and suspensions
- Reduces particle size
- Rapidly dissolves solids
- Accelerates reactions
- Aeration free
- No bypassing



# Specialized Mixers

## Verso UHS

An Ultra-Sanitary version of the standard model, the Verso UHS is designed for stringent applications in the Pharmaceutical and Biotechnology industries as well as Food, Cosmetics and other clean industries.

It features Silverson-designed Ultra-Sanitary single mechanical shaft seals and can be converted to double mechanical shaft seals.



## Verso-HV

The Verso-HV is designed for mixing higher viscosity products. It incorporates the same unique and innovative 'pumping rotor' design as the production scale HV In-Line mixers. This substantially increases its self-pumping capacity, allowing it to process products such as gels, creams, sauces and gum solutions on a laboratory scale.

The Verso-HV also provides simple and accurate means of scaling up to Silverson's production scale UHS-HV mixers.



## FMX5 Powder/Liquid Mixer

The new Silverson FMX5 is a laboratory scale version of the Flashmix powder/liquid mixer (see page 39). It provides a simple, effective and hygienic means of powder/liquid mixing on a laboratory scale and is capable of handling higher viscosity mixes.

The FMX5 is supplied with a 1 liter stainless steel powder feed hopper. Other types of hopper, e.g., a profiled version to assist with the flow of cohesive powders are available.

The FMX5 is suitable for small scale manufacturing and offers an accurate and easy means of predicting the performance of production scale Flashmix models in the laboratory, streamlining the scale-up process.



# Technical Specifications

## Materials of Construction

	Verso	Verso UHS	Verso HV	FMX5
Wetted Parts: 316L Stainless	●	●	●	●
Wetted Parts: Special Materials	○	○	○	○
Elastomers: Viton	●	●	●	●
Elastomers: EPDM	○	○	○	○
Elastomers: FFKM			○	○
Elastomers: Other	○	○	○	○
Operating Pressure*	150 psi (10 bar)	150 psi (10 bar)	150 psi (10 bar)	150 psi (10 bar)

\*Higher pressure units available on request

## Motor

TEFC	●	●	●	●
Other - Stainless, Explosion-Proof/ATEX	○	○	○	○

## Inlet/Outlet Connections

Tri-Clamp	●	●	●	●
Flange	○	○	○	○
Other e.g., RJT, SMS, etc.	○	○	○	○

## Sealing

Single Mechanical	●		●	●
Ultra-Sanitary Single/Double Mechanical		●	○	○
Special Seal Arrangements		○	○	○

## Workheads

Single Stage	●	●	●	●
Multistage	○	○		

● Standard ○ Optional

# Silverson Service

## Experience and Know-How

Silverson has been the leader in High Shear Mixing technology for over 75 years and has built up a detailed knowledge of mixing process requirements. This accumulated knowledge enables our technical staff and sales representatives to clearly identify a client's needs and recommend the type of mixer most suited to provide an efficient and economical solution.

## Extensive Test Facilities

Available for the use of all clients, Silverson operates dedicated test facilities equipped with a wide range of laboratory and production scale machines where customers may test new products and discuss their applications with our technical staff. If preferred, Silverson mixers can be provided for on-site trials to allow evaluation under actual production conditions.

## Customization

Increasingly today's process manufacturers require equipment to be designed to meet their own particular needs. Silverson has a positive approach and flexibility which allows mixers to be custom designed and built to suit individual users' specific requirements.

## Worldwide Support

A truly international company, Silverson is represented by a network of associated companies, distributors and agents in over 50 countries, serving Europe, North America, Asia, Australasia, South America and Africa.

## Installation

Silverson offers expert advice and, if required, can assist with and supervise installation and start up.

## After-sales service

With over 75 years of experience, Silverson realizes the importance their customers place on reliable and rapid back-up service. Our large stock of manufactured parts enables us to despatch most standard spares the same day they are ordered.

# Some of Our Clients



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