



Power Transmission Solutions

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Role of Mixers in Industry

Mixing is considered one of the most essential operations in industrial processes. In general, mixing refers to the movement and interaction of raw materials in such a way that non-uniformity within a defined system is reduced and the desired level of homogeneity is achieved.

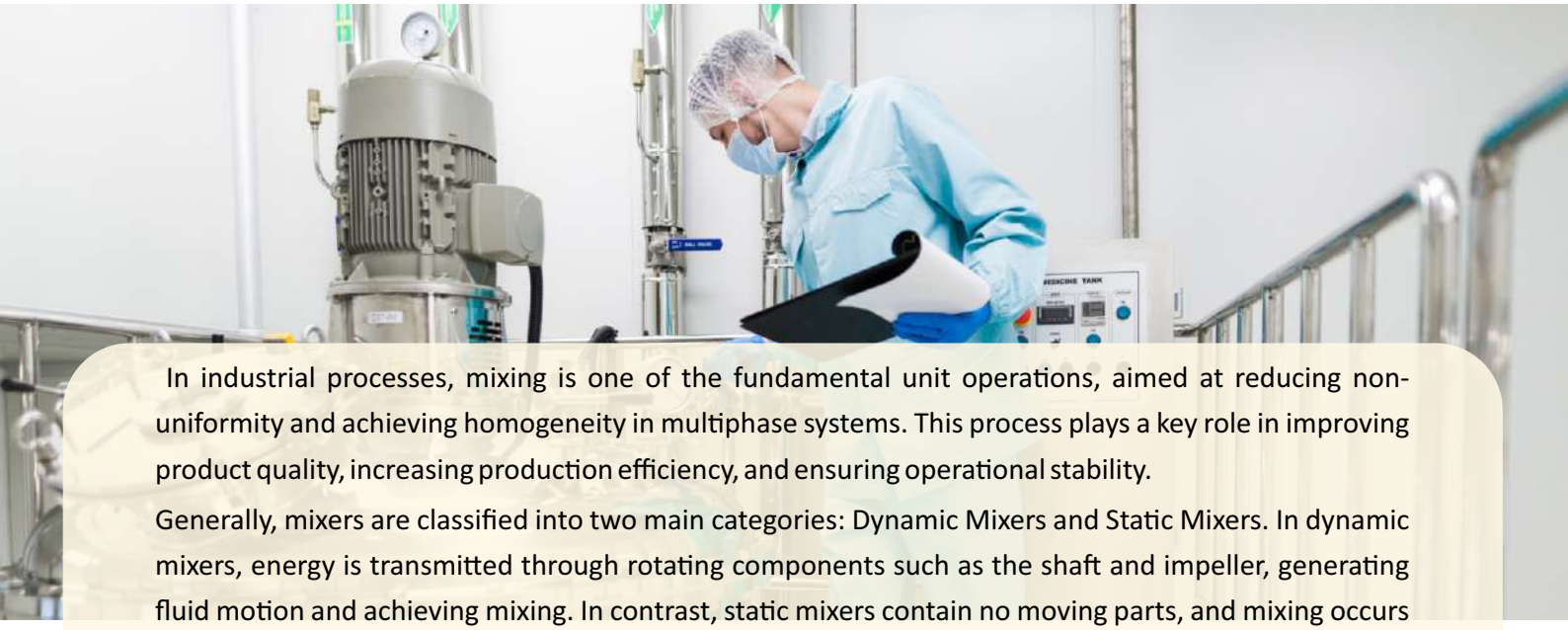
Due to the wide range of industrial processes requiring efficient mixing, industrial mixers and agitators play a critical role across numerous industries. Proper selection of a mixing system has a direct impact on product quality, process efficiency, heat transfer, chemical reactions, and operational stability.

Some of the major industries utilizing mixing systems include:

- Chemical and petrochemical industries;
- Polymer and plastics industries;
- Paint, resin, and industrial coating industries;
- Food and beverage industries;
- Pharmaceutical and medical industries;
- Cosmetic and personal care industries;
- Biotechnology industries;
- Water and wastewater treatment industry;
- Pulp and paper industries;
- Mining and mineral processing industries;
- Construction and civil industries; and
- Agricultural industries.



Classification of Mixers Based on Operating Mechanism



In industrial processes, mixing is one of the fundamental unit operations, aimed at reducing non-uniformity and achieving homogeneity in multiphase systems. This process plays a key role in improving product quality, increasing production efficiency, and ensuring operational stability.

Generally, mixers are classified into two main categories: Dynamic Mixers and Static Mixers. In dynamic mixers, energy is transmitted through rotating components such as the shaft and impeller, generating fluid motion and achieving mixing. In contrast, static mixers contain no moving parts, and mixing occurs as the fluid passes through fixed elements using its own flow energy.

In dynamic mixers, the required energy is supplied by an electric motor, whereas in static mixers, it is provided by the pressure drop along the mixer length.

Dynamic Mixers

Dynamic mixers are widely used in agitated vessels and process tanks and are applied in continuous, batch, and semi-continuous operations. Proper mixing has a direct impact on heat transfer, reaction kinetics, and overall process performance.

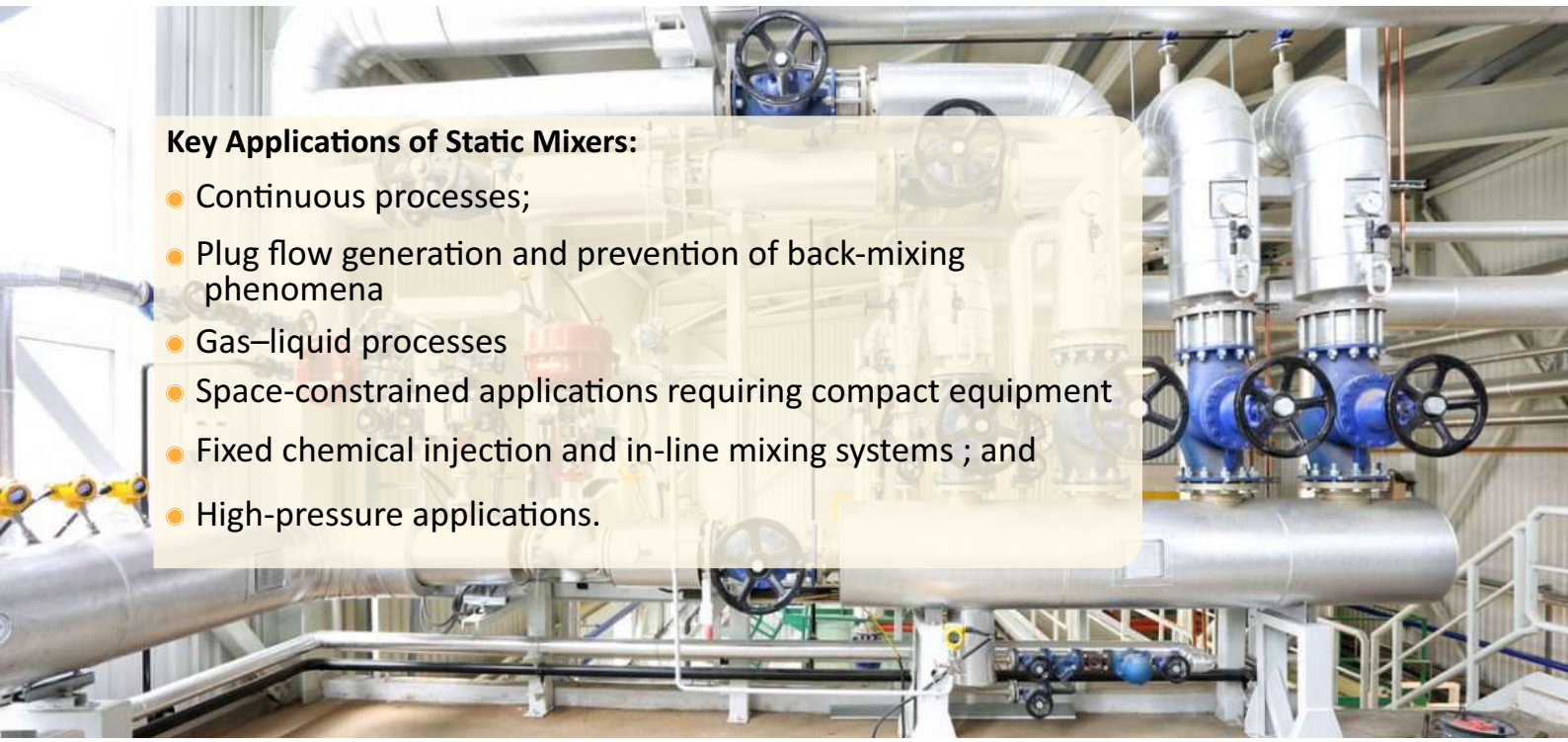
Key Applications of Dynamic Mixers:

- Blending and dilution of chemicals and additives
- Homogenization of high-viscosity fluids such as paints, resins, and polymers
- Enhancement of heat transfer via jackets or internal coils
- Solid suspension in crystallizers and chemical reactors
- Emulsion formation and stabilization (Liquid–Liquid systems)
- Gas dispersion in industrial liquid-phase processes

Static Mixers

In many industries, mixing operations are typically carried out in vessels and tanks. However, in certain applications, mixing can also be performed in pipelines, where under specific conditions, pipelines may effectively function as chemical reactors.

In such cases, the use of static mixers in pipeline systems provides an economical, compact, and efficient solution for chemical processing. This is particularly important when rapid mixing and minimum residence time are required, such as in processes involving molten polymers whose properties may change over time.



Key Applications of Static Mixers:

- Continuous processes;
- Plug flow generation and prevention of back-mixing phenomena
- Gas–liquid processes
- Space-constrained applications requiring compact equipment
- Fixed chemical injection and in-line mixing systems ; and
- High-pressure applications.

Static mixers can be designed and manufactured in a wide range of sizes, from a few millimeters to several meters. Generally, the mixers manufactured by this company are classified into three main application-based categories:

Gas–Liquid Mixing	Solid–Liquid Mixing	Liquid–Liquid Mixing	
Dissolution	Suspension	Miscible	Immiscible
Fermentation	Dissolution	Homogenization	Emulsification
Dispersion & Separation	Crystallization	Chemical Reaction	Diffusion
-	Leaching	Heat Transfer	-
-	Polymerization	Neutralization	-
-	Dispersion & Separation	-	-

Mixing Objectives

Mixing objectives vary depending on the process requirements, operating conditions, and production goals. In many industrial applications, a mixing system is expected to achieve multiple objectives simultaneously, making performance evaluation a key aspect of mixer design and selection.

All industrial equipment has a measurable performance output. For example, in an electric motor, the generated power is considered the primary output of the system. In industrial mixing applications, mixing quality and homogeneity are commonly evaluated using a statistical parameter known as the Coefficient of Variation (CoV).

Consider two materials, A and B, mixed in equal proportions. Under ideal mixing conditions, a sample taken from any location within the vessel should contain 50% material A and 50% material B. In such a case, the components are perfectly distributed throughout the mixture and the CoV approaches zero.

Mixing quality is commonly classified according to the Coefficient of Variation (CoV) as follows:

$CoV < 0.02 \longrightarrow$ Complete mixing

$0.02 < CoV < 0.05 \longrightarrow$ Normal mixing

$CoV > 0.2 \longrightarrow$ Preliminary mixing

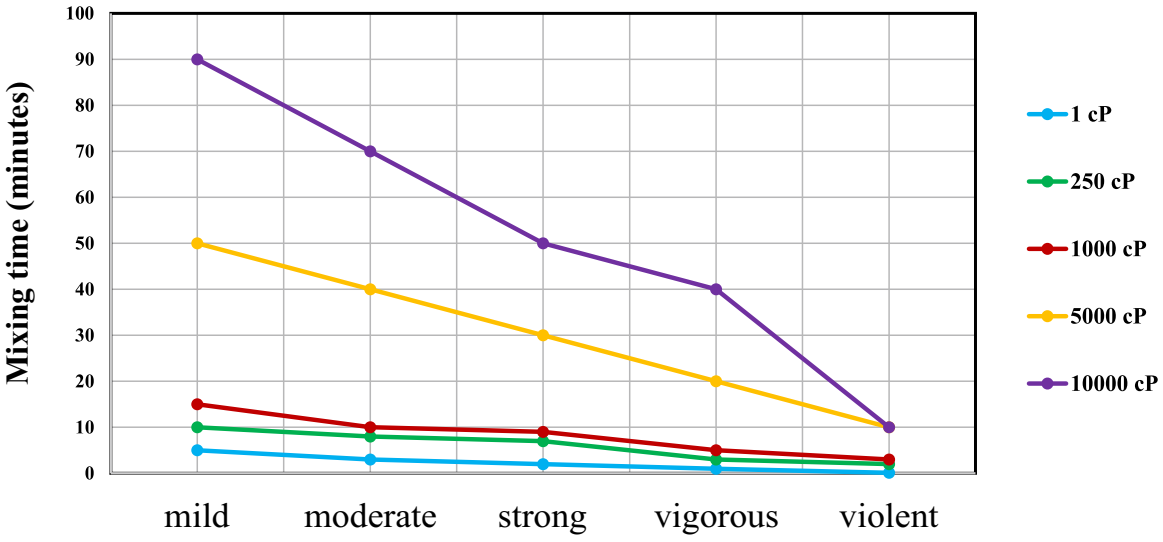


Mixing process and type of blending

Blending

Blending is one of the most common mixing processes in which two or more fluids or materials are combined to produce a uniform and homogeneous mixture.
Mixers used for liquid blending can be classified into five categories according to mixing intensity: Gentle Mixing, Moderate Mixing, Intensive Mixing, High-Intensity Mixing, and Very High-Intensity Mixing. The primary difference between these categories is the time required to achieve the desired level of homogeneity; as mixing intensity increases, mixing time decreases.
In addition to mixing intensity, fluid viscosity has a direct impact on mixing time. The following chart and table illustrate the effect of mixing intensity and fluid viscosity on the time required to achieve a homogeneous mixture.

Effect of Mixing Intensity and Fluid Viscosity on Mixing Time:



10000 cP	5000 cP	1000 cP	250 cP	1 cP	Mixing Intensity
90	50	15	10	5	Gentle
70	40	10	8	3	Moderate
50	30	9	7	2	Intensive
40	20	5	3	1	High-Intensity
10	5	3	2	0.1	Very High-Intensity

Dispersion

Dispersion is the process in which larger particles or droplets are broken down into smaller ones. This phenomenon occurs in different mixing systems depending on the phases involved.

In solid–liquid systems, dispersion involves breaking coarse solid particles into finer ones and can therefore be considered a combination of mixing and milling. In liquid–liquid systems where the phases do not mix with each other, dispersion reduces the size of dispersed-phase droplets. In gas–liquid systems, dispersion converts large gas bubbles into finer ones, increasing the contact area between phases and improving process performance.

Emulsion

An **emulsion** is a dispersed system in which one liquid is distributed as fine droplets within another immiscible liquid. When droplet size typically ranges from nanometric to micrometric scale, the system is referred to as a colloidal emulsion.

Emulsions are widely used in industrial processes and everyday products such as butter, mayonnaise, shampoo, and liquid soap, where droplet size distribution and system stability are critical to performance.



Suspension

A suspension is a process in which solid particles are dispersed in a liquid and remain suspended, with the aim of improving contact between the fluid and the solid particles.
In most processes, the purpose of suspension is to prevent particle settling. This can be achieved through processes such as crystallization, chemical reaction, or dissolution of solids in the liquid. However, in some cases, the objective is not only to prevent settling. Instead, the process may require controlled settling. For this purpose, processes such as coagulation and flocculation are used, particularly in mineral processing and water and wastewater treatment industries.

Fermentation

Fermentation is a biological process in which one or more substances are converted or decomposed into other compounds through the activity of microorganisms such as bacteria.It is one of the oldest methods of processing materials without the use of chemical agents. In wastewater treatment, for example, sludge (as a microbial medium) is converted from organic solids into harmless, water-soluble compounds.
Proper mixing is essential in this process, as poor mixing leads to instability in key parameters such as temperature, concentration, and pH.



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Agitator Design

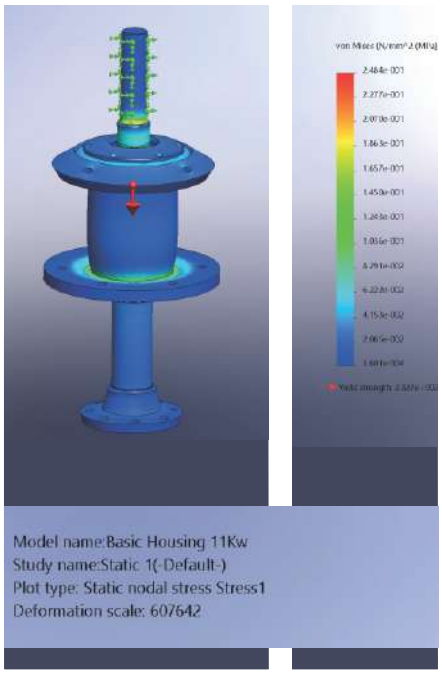
Design has always been a key factor in the development and manufacturing of industrial equipment. In the past, equipment design relied primarily on experience and trial-and-error methods. With advances in engineering knowledge and computational tools, it became possible to analyze and predict equipment performance before fabrication, significantly improving the design process.

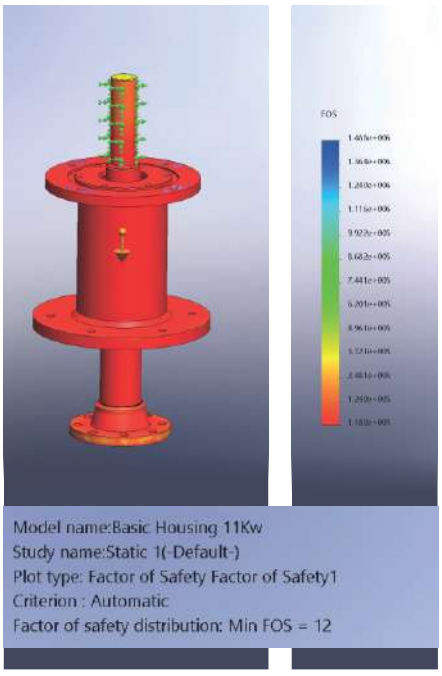
In general, industrial equipment can be classified into two main Categories:

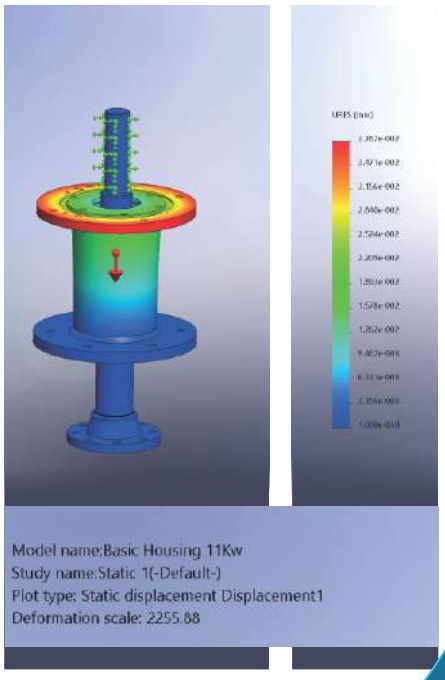
- **Static Equipment**
- **Dynamic Equipment**

Compared with static equipment, the design and analysis of dynamic equipment especially systems interacting with fluids—are considerably more complex. Flow behavior, fluid properties, equipment geometry, and operating conditions are among the many parameters that influence overall system performance. As a result, traditional methods and manual calculations alone are no longer sufficient for modern engineering design.

Today, advanced tools such as Computational Fluid Dynamics (CFD) and Finite Element Analysis (FEA) are widely used to simulate and analyze equipment behavior. These methods enable engineers to evaluate equipment performance, flow patterns, velocity distribution, mechanical stresses, and other critical parameters before fabrication, playing a key role in design optimization.









Mixer Driver Design

The mixer drive assembly typically consists of a driving unit such as an electric motor, gear motor, pneumatic motor, or other drive systems, together with a bearing arrangement. This assembly is responsible for power transmission, shaft support, and maintaining equipment stability during operation.

The housing serves as the main structural interface between the mixer assembly and the supporting structure. The design of this component is of critical importance, as all applied loads and stresses must be carefully evaluated and analyzed. Yield, bending, and shear stresses are assessed to ensure safe operation and provide an appropriate

Bearing System Design

All forces acting on the impeller and shaft are ultimately transmitted to the bearing system. Therefore, bearing selection is one of the most critical aspects of mixer design. The bearing arrangement must be capable of supporting axial, radial, and weight loads under various operating conditions.

In addition to bearing selection, the spacing between bearings plays a vital role in system performance. Increasing the distance between bearings may improve service life; however, it can also increase shaft vibration amplitudes near resonance conditions, potentially affecting bearing performance and durability.



Lubrication system

Lubrication system design, lubricant selection, sealing arrangement, and maintenance intervals are key considerations in bearing system design. The selection of the appropriate lubricant, sealing system, and maintenance schedule is determined based on operating conditions using specialized engineering tools, including SKF software.



Mixer Shaft Design

One of the most critical components of a mixer is the power transmission shaft, which must be carefully designed considering a set of mechanical and dynamic parameters.

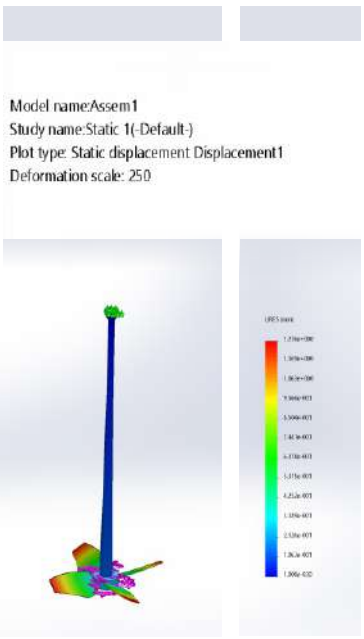
Critical Speed (Resonance) Analysis

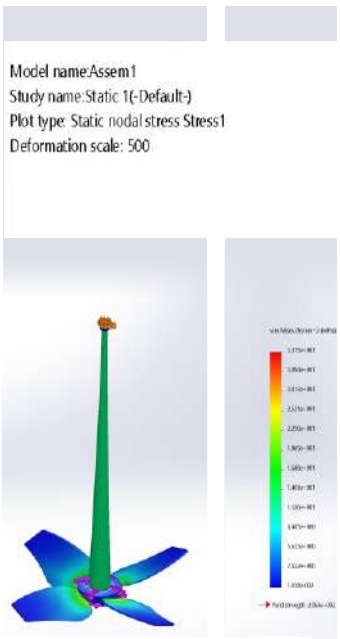
All rotating systems have well-defined natural frequencies. When the operating speed approaches these frequencies, resonance occurs, leading to a significant increase in vibration amplitude and potential damage to the equipment.

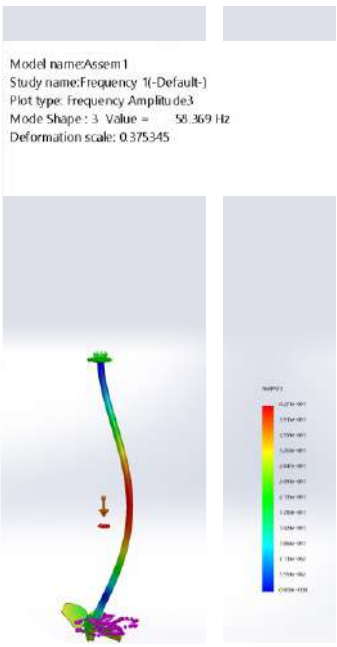
During operation, the mixer shaft is subjected to dynamic vibrations. Through frequency analysis, the critical speeds corresponding to resonance zones can be determined. In standard design practice, the operating speed is selected to maintain at least a 30% safety margin away from the first and second critical speeds to avoid resonance conditions.

Bending Stress Analysis

The rotating impeller inside the fluid generates axial and radial flow patterns, which produce hydraulic forces acting on the shaft and lead to bending stresses. Therefore, the shaft must be designed to safely withstand these loads, ensuring that bending and shear stresses remain within allowable design limits.







Shaft Deflection Analysis

All rotating equipment supported at one or more points is subject to shaft deflection due to dynamic and centrifugal forces. If the deflection remains within allowable limits, no damage occurs to the shaft; however, excessive deflection may lead to unwanted contact with sealing and bearing systems, resulting in reduced performance and shortened service life of the components.

Shaft deflection must be evaluated at critical locations, particularly at the upper section of the shaft and at the housing exit point, using engineering analysis tools to ensure it remains within acceptable limits.



Impeller design

Impeller selection and design are among the most critical aspects of mixer engineering and depend on the process requirements and fluid characteristics. For example, an impeller designed for solid suspension differs significantly from one used for emulsification or gas-liquid mixing. Therefore, proper impeller selection has a direct impact on mixing efficiency and process performance.



1- Engineering-Based Design

Industrial impellers have been developed and optimized over many years, and their performance in different applications is well established. Based on process requirements, the appropriate impeller type is selected, while parameters such as impeller diameter and rotational speed are determined according to tip speed, velocity gradient, mixing scale, and pumping capacity.

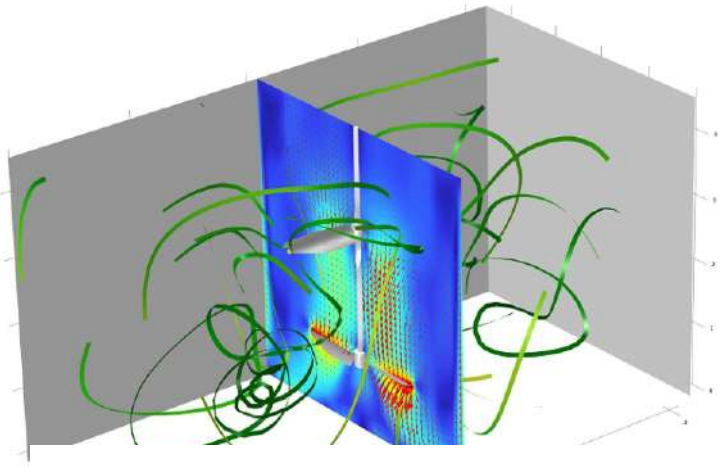
2- Experimental Testing and Scale-Up

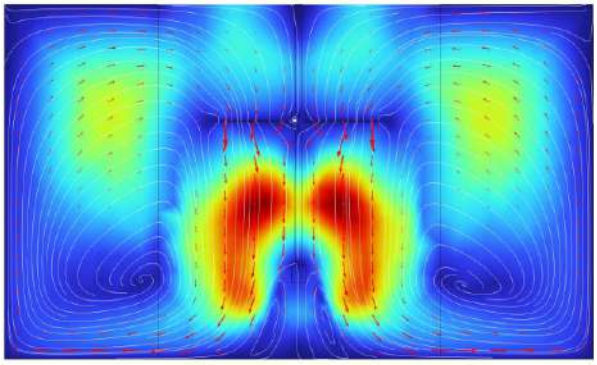
When limited information is available regarding fluid behavior, experimental testing provides the most reliable basis for impeller selection. In this approach, the process fluid is evaluated using several impeller configurations at laboratory scale. Once the desired performance is achieved, key process parameters are extracted and used for equipment scale-up and final design.



3- CFD

Computational Fluid Dynamics (CFD) is an advanced method for simulating fluid behavior and analyzing mixing processes. It enables the evaluation of flow patterns, mixing uniformity, mass transfer, heat transfer, and pressure drop before fabrication. Although CFD analysis can be time-consuming, it offers significant advantages for large-scale and complex projects.







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Quality Control System

Quality is one of the fundamental pillars of industrial design, manufacturing, and product delivery. The objective of the Quality Control System is to ensure that the final product complies with technical requirements, design standards, and customer expectations.

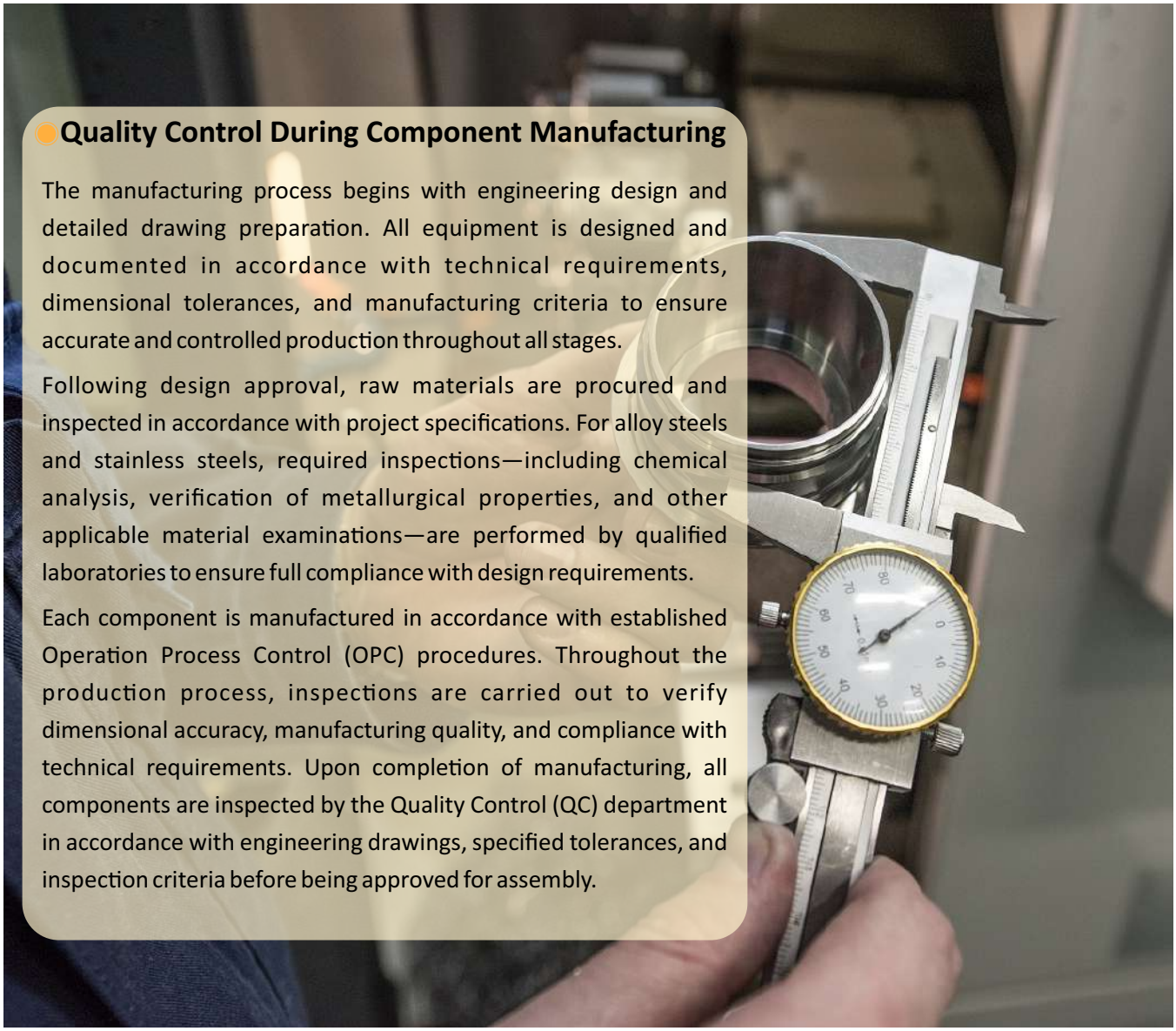
Throughout the manufacturing process, all stages—from raw material procurement to fabrication, assembly, and final inspection—are monitored and controlled to ensure the delivery of products with the highest levels of quality, reliability, and performance.



Benefits of the Quality Control System:

- Increased customer satisfaction and confidence
- Improved customer loyalty
- Greater opportunities for long-term customer relationships
- Attraction of new customers
- Strengthened market position
- Reduced warranty and after-sales service costs
- Enhanced equipment reliability and service life

Due to the diversity of products and applications, quality control criteria are defined and implemented for each product based on technical requirements, applicable standards, and customer specifications.



Quality Control During Component Manufacturing

The manufacturing process begins with engineering design and detailed drawing preparation. All equipment is designed and documented in accordance with technical requirements, dimensional tolerances, and manufacturing criteria to ensure accurate and controlled production throughout all stages.

Following design approval, raw materials are procured and inspected in accordance with project specifications. For alloy steels and stainless steels, required inspections—including chemical analysis, verification of metallurgical properties, and other applicable material examinations—are performed by qualified laboratories to ensure full compliance with design requirements.

Each component is manufactured in accordance with established Operation Process Control (OPC) procedures. Throughout the production process, inspections are carried out to verify dimensional accuracy, manufacturing quality, and compliance with technical requirements. Upon completion of manufacturing, all components are inspected by the Quality Control (QC) department in accordance with engineering drawings, specified tolerances, and inspection criteria before being approved for assembly.

Final Quality Control of Dynamic Mixers

After assembly and prior to packaging, dynamic mixers undergo a series of functional tests and final inspections. This stage represents one of the most critical phases of the quality control process, as any potential deviation related to design, manufacturing, or assembly can be identified before delivery.

Through a range of technical and performance evaluations, the Quality Control department verifies proper equipment operation, operational safety, assembly quality, and, where applicable, vibration levels. Equipment is approved for packaging and shipment only after full compliance with design requirements and quality standards has been verified.

Paint and Coating Thickness Test

The mixer housing and body are coated with polyester powder coating, providing excellent resistance against moisture, environmental conditions, and UV exposure. To ensure compliance with technical requirements, coating thickness is measured and controlled at multiple points.

For mixers in which the shaft and impeller are exposed to highly corrosive chemicals, protective coatings such as PTFE and polyethylene are applied to enhance corrosion resistance. In these cases, coating thickness is inspected and verified at critical locations to ensure proper performance.



Coating Electrical Insulation Test

For mixers equipped with coated shafts and impellers, it is essential to verify the continuity, integrity, and complete coverage of the protective coating, ensuring that no uncoated areas remain. Therefore, an electrical resistance test is performed using a Megohmmeter.

During the test, the coated shaft and impeller are immersed in a conductive solution. One electrode is connected to the metallic component, while the other is connected to the conductive medium. A test voltage is then applied, and the electrical resistance between the coating surface and the conductive environment is measured.

When the measured electrical resistance exceeds 1 megaohm (1 MΩ), the coating is considered electrically insulating and fully continuous. Resistance values above this limit indicate complete coating integrity and confirm its effectiveness in preventing fluid penetration.

If the measured resistance is below the specified limit, the component is referred for recoating or corrective action.





Shaft Runout Test

The power transmission system and alignment of rotating components are among the most critical aspects in the design and manufacturing of rotating equipment. All components must be assembled with high precision to prevent shaft runout.

Shaft runout leads to non-uniform load distribution, resulting in reduced equipment service life. Prior to commissioning, shaft runout is measured at the impeller seating area. Acceptable limits are defined according to design standards.

If the runout exceeds the allowable limit, the shaft is sent for correction, straightening, or realignment.





Bearing Temperature Test

Bearing temperature monitoring is a key method of condition monitoring in rotating equipment. Bearing defects, assembly errors, or excessive axial and radial loads may cause abnormal temperature rise.

Continuous temperature monitoring ensures proper system performance evaluation and reliability.

Vibration Test

In rotating equipment with bearing systems, a certain level of vibration is normal. However, vibration levels must remain within allowable design limits, as exceeding them may cause damage to bearings and rotating components.

After assembly, vibration is measured at bearing locations using a vibration analyzer. The test is performed under both dry and operating (fluid-contact) conditions.

Maximum allowable vibration levels are 3 mm/s in dry condition and 9 mm/s during operation. If values exceed limits, the equipment is returned for inspection and troubleshooting.



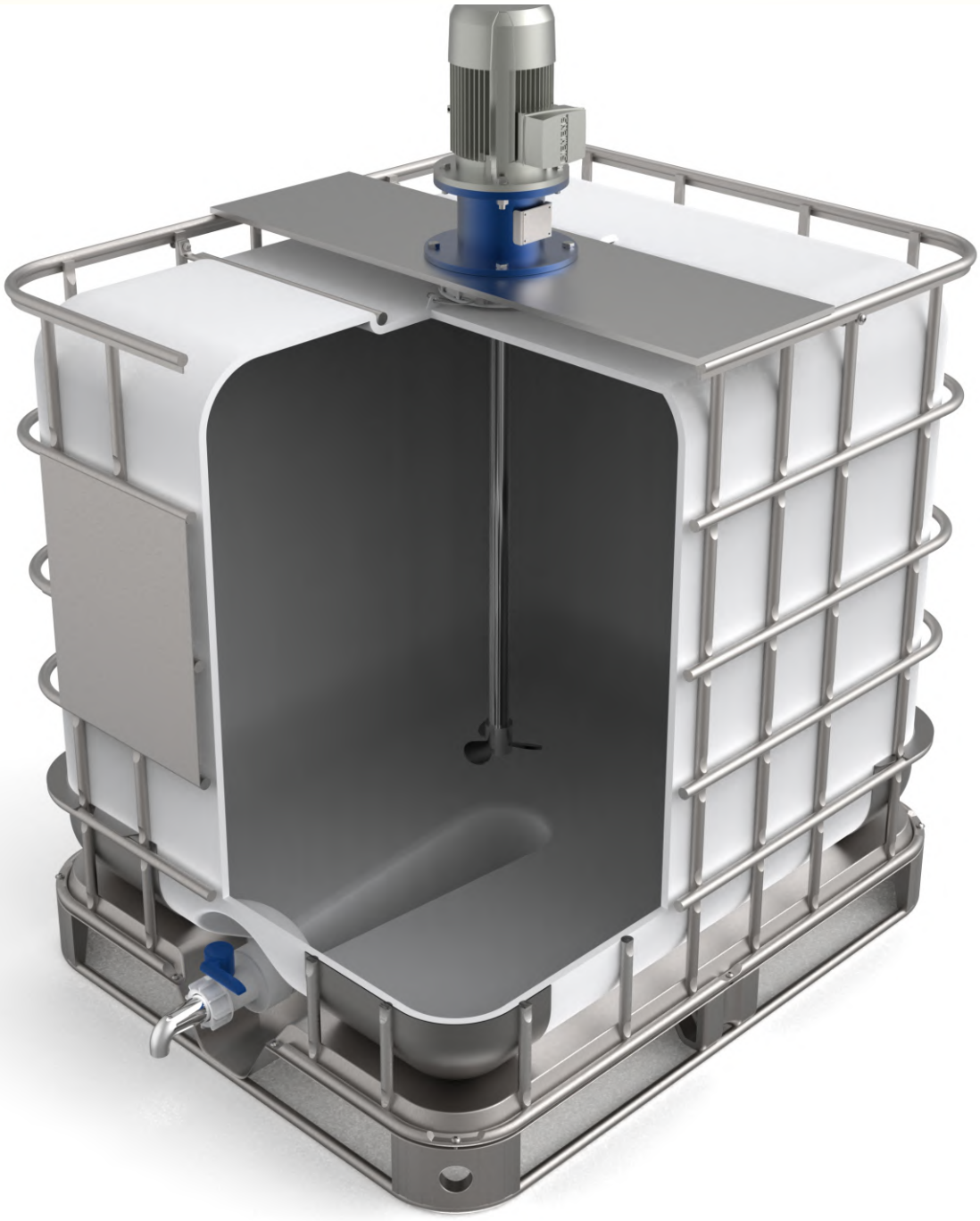


Rotational Speed Test

The mixer is designed to operate at a specific rotational speed, and the impeller diameter is selected accordingly.

Since power consumption varies with the cube of rotational speed, any deviation from the design speed can significantly affect mixer performance and motor loading. This test verifies that the actual operating speed complies with the specified design value.

Fast-Speed Mixers – FRM Series



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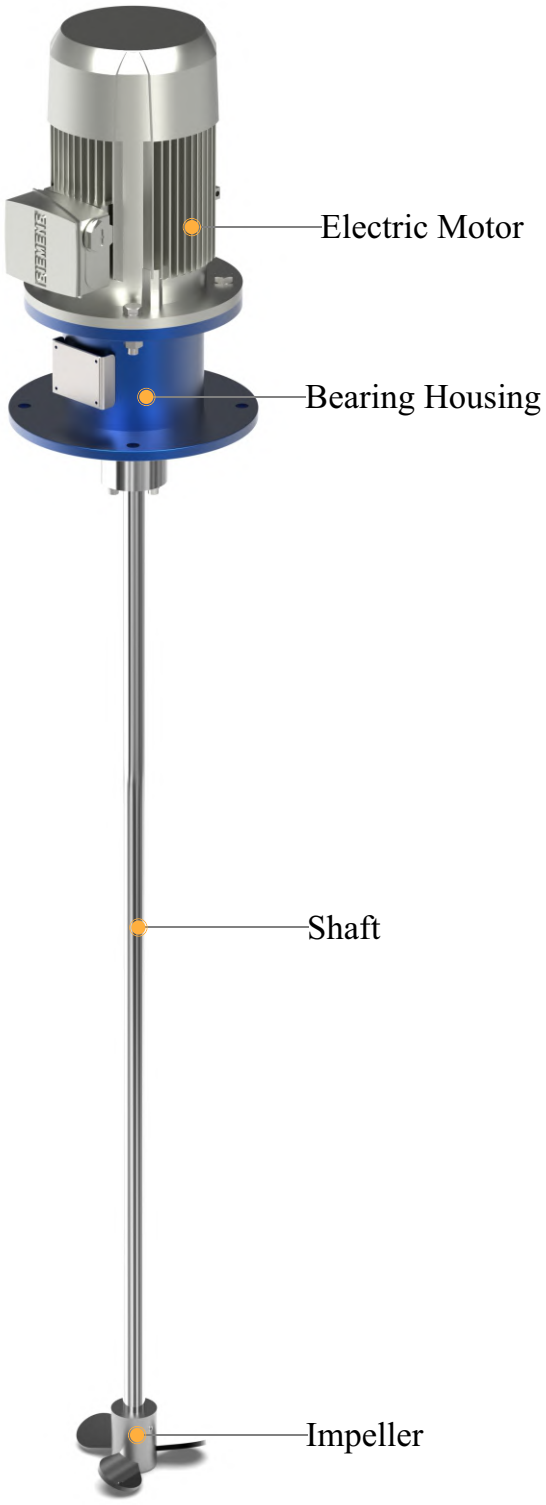
Fast-Speed Mixers – FRM Series

FRM series mixers are specifically designed for light-duty applications and for tanks with capacities ranging from 100 to 12,000 liters. The robust bearing system design, together with the use of high-strength alloy steel grade 1.6582 in the shaft support section, ensures continuous 24/7 operation with high efficiency and excellent reliability.

As the name of the series indicates, power transmission from the electric motor to the shaft and impeller is carried out directly through a direct coupling system (Direct Coupling), without the need for additional equipment such as gearboxes for speed reduction or adjustment. This design not only reduces manufacturing costs but also significantly lowers maintenance and operational requirements.

FRM mixers have been engineered to deliver cost-effective and efficient performance across a wide range of industrial processes, including dissolving, heat transfer, temperature homogenization, liquid-liquid mixing, and the production of light suspensions.

When handling highly corrosive or oxidizing fluids, optional coatings such as ETFE and PE can be provided at competitive prices to ensure enhanced durability and protection of the equipment



FRM Series Mixer Configurations

These mixers are classified, based on size and capacity, into three categories: small, medium, and large.

Mixer model	Max Shaft Diameter	Max Applicable Power	Max speed	Max Shaft Length	Max Tank Capacity
FRMS	35	0.75 KW	900-1500 RPM	1,600 mm	2,000 L
FRMM	50	1.5 KW		2,400 mm	4,000 L
FRML	75	4 KW		3,200 mm	12,000 L

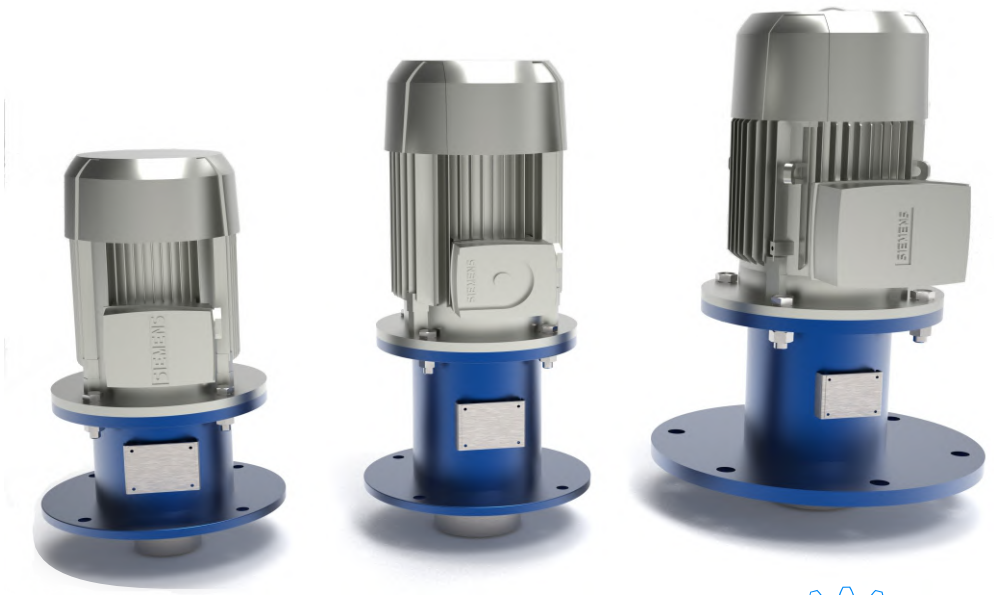
Two mounting systems are available for these mixers for installation onto the support frame:

1. Flange Mounted

For fixed mixers with no need for relocation, flange mounting is recommended. To prevent vortex formation in flange-mounted mixers, the use of baffled tanks is recommended, or alternatively, the mixer should be installed in an off-center position.

2. Clamp Mounted

For applications requiring mixer relocation, or where a dedicated mounting frame is not available, clamp mounting is recommended. This mounting system allows installation angles of up to 20 degrees, which effectively helps prevent

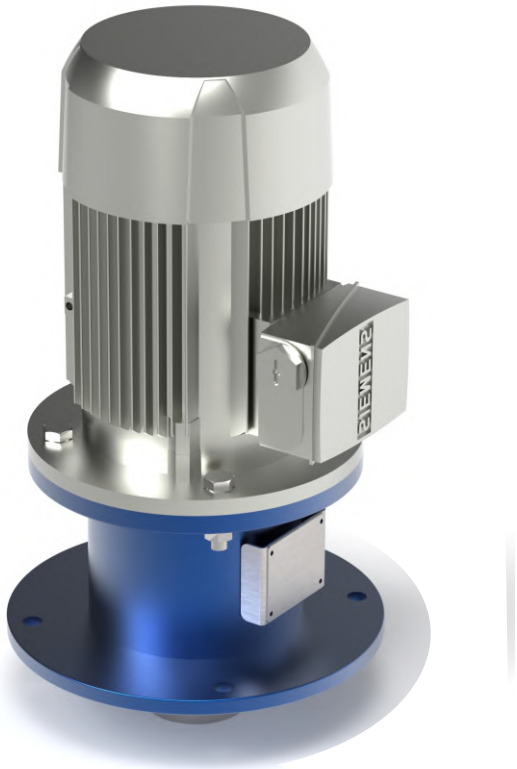


Mixer Features

Technical Data

- Suitable for small tanks and low-viscosity fluids.
- Designed with minimal vibration and low shaft runout during operation.
- Available in single-phase and three-phase configurations with various voltage ranges.
- Operating capacity: 100 to 12,000 liters.





Design Features

- Designed for stable and continuous 24/7 industrial operation.
- Economical and optimized design in terms of investment and operating costs.
- Shaft available in single-piece or two-piece design configuration.
- Housing finished with durable electrostatic powder coating.

Optional Features

- Corrosion-resistant coatings such as ETFE and PE available upon request.
- Explosion-proof (Ex-proof) motors available as an optional configuration.

FRM Series Mixer Selection Guidelines

Mixer Selection

FRM Fast Rotation Mixers

Mixer Version Indicator

S	Small
M	Medium
L	Large

Tank Capacity Indicator

A	220 Liters	E	500 Liters	I	2000 Liters
B	250 Liters	F	800 Liters	J	2500 Liters
C	300 Liters	G	1000 Liters	K	3000 Liters
D	350 Liters	H	1500 Liters	L	4000 Liters

Impeller Type Selection

1	Propeller With Zero Pitch
2	Pitched Blade Turbine
3	Saw Blade

Wet Parts Material

S4	SS 304
S6	SS 316L
S8	Super Duplex SS

Powder Coating

0	N/A
P	Polyethylene
T	ETFE

Electric Motor Selection

A	IP 55 (STANDARD)
B	EX db IIB zone1
C	EX db IIC zone1
D	EX eb IIC zone1
E	EX ec zone2

Motor Supply

1	Single PHASE 220/230 VAC
3	Three PHASE 230/400 VAC

Shaft Connection Type

DC	Direct Coupling
FC	Flange Coupling

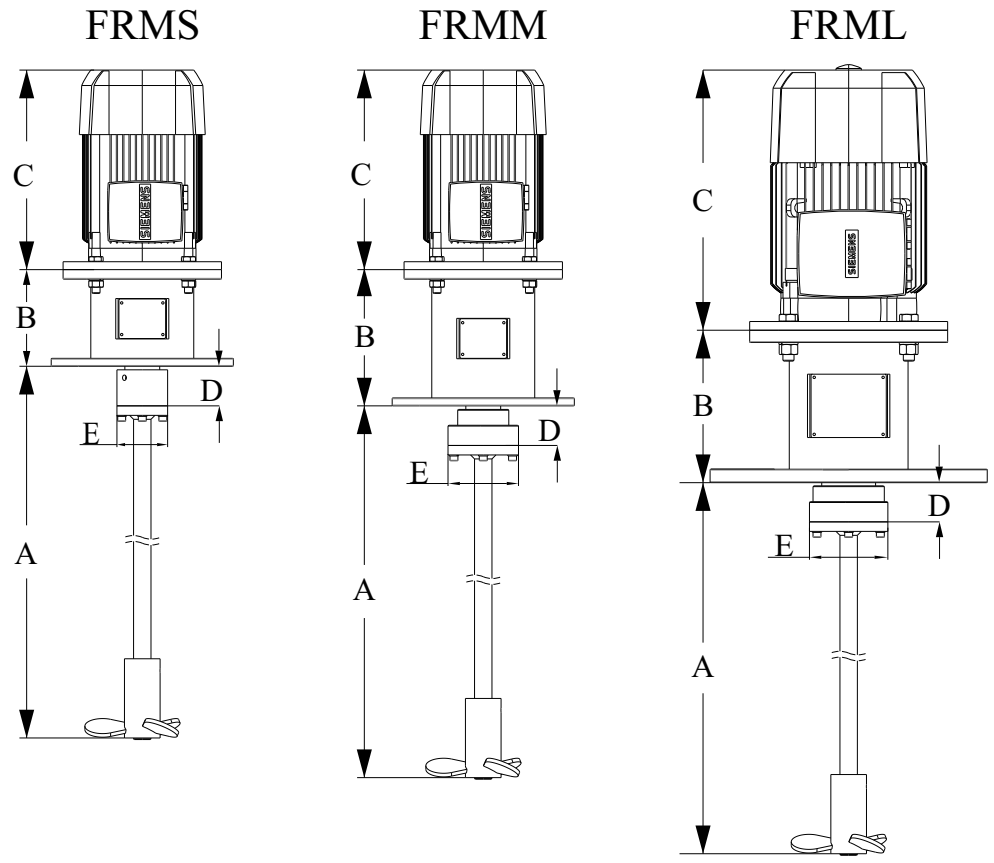
Housing Coupling Type

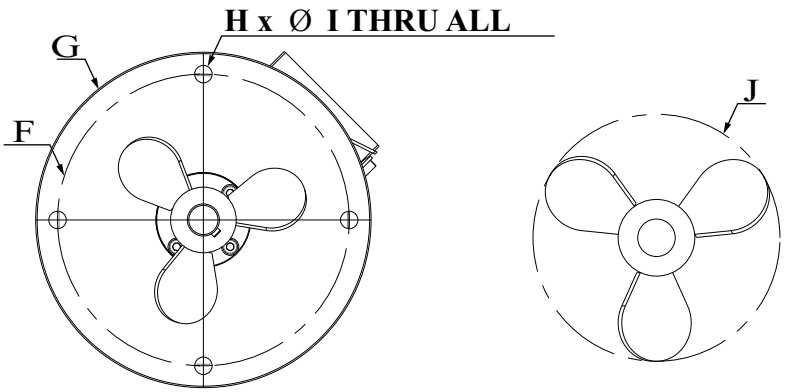
1	Flange Type
2	Clamp Type

Housing Coating

C1	Polyester
C2	Epoxy
C3	3 Layer Coating

FRM Series Mixer Dimensional Drawing





Shrink Disc Coupling

Mixer Model	Motor Frame Size	Speed Range	A	B	C	D	E	F	G	H	I	J
		RPM	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
FRMS	IEC80	1000~1500	600~1600	122	252	50	64	200	230	4	12(M10)	125~180
FRMM	IEC80		1200~2400	172	252		89	200	230	4	12(M10)	145~250
	IEC90				297							
FRML	IEC100		1500~3200	192	335		99	300	350	6	19(M16)	160~300
	IEC112				330							
	IEC132				385							

Slow Speed Mixers- SRM Series



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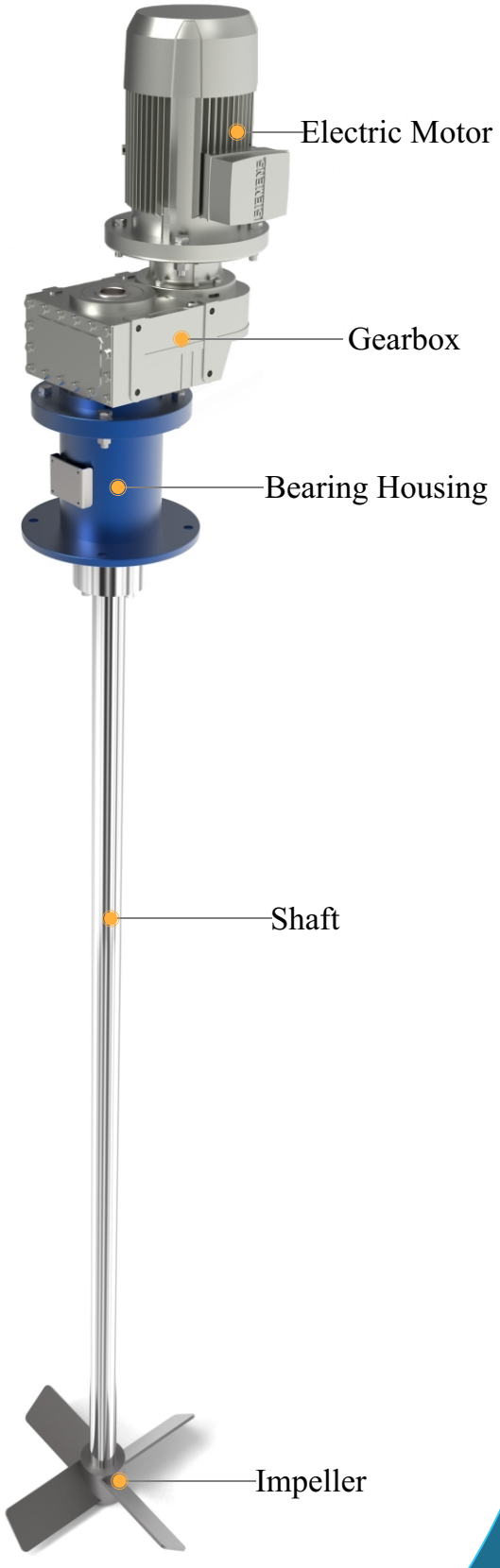
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Slow Speed Mixers (SRM)

SRM Series slow-speed mixers are engineered as reliable and cost-efficient solutions for industrial mixing applications, designed for a wide range of process duties requiring stable operation and long-term mechanical integrity.

These units are typically applied in preparation tanks with working capacities ranging from 100 to 5,000 liters, where process fluids are conditioned prior to transfer into reactors or downstream process systems. Typical applications include:

- Dilution and concentration adjustment of chemical solutions.
- Phase transformation processes (e.g., solid-to-liquid conversion).
- Conditioning for reaction, crystallization, and polymerization processes.
- Heat transfer enhancement and bulk homogenization.



Engineering Overview

The performance of the SRM Series can be evaluated from two core perspectives: mechanical integrity and process performance.

Mechanical Design Perspective

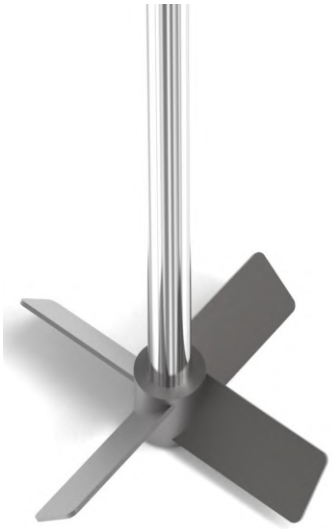
Reduced rotational speed directly contributes to extended equipment service life through:

- Extended bearing system lifetime.
- Reduced shaft and impeller wear.
- Lower mechanical and thermal stress levels during operation.
- Improved overall operational reliability.

Process Performance Perspective

- Capability to accommodate larger impeller diameters, minimizing dead zones.
- Increased pumping capacity and improved mixing homogeneity.
- Reduced risk of cavitation and associated erosion phenomena.

Mixer Features



Technical Data

- Suitable for medium to large tanks and low to medium viscosity fluids
- Operating range of 0.2 to 5 m³ tank volume
- Applicable for fluids with viscosity from 0.5 to 500 cP (Centipoise)
- Low vibration levels with minimal shaft run-out (Run-out) during operation



Design Features

- Continuous 24/7 industrial operation with extended service life
- Shaft available in single-piece (direct) or two-piece configuration
- Housing finished with high-durability oven-cured electrostatic powder coating
- Cost-optimized design with reduced capital expenditure

Optional Features

- Explosion-proof (Ex) motors available for hazardous areas upon request
- Chemical-resistant coatings (ETFE / PE), available upon request, ensuring reliable performance in corrosive fluids and severe process conditions

SRM Series Mixer Selection Guidelines

Mixer Selection

SRM Slow Rotation Mixers

Mixer Version Indicator

S Small

M Medium

Tank Capacity Indicator

A	220 Liters	E	500 Liters	I	2000 Liters
B	250 Liters	F	800 Liters	J	2500 Liters
C	300 Liters	G	1000 Liters	K	3000 Liters
D	350 Liters	H	1500 Liters	L	4000 Liters

Impeller Type Selection

1 Propeller With Zero Pitch

2 Pitched Blade Turbine

3 Saw Blade

Wet Parts Material

S4 SS 304

S6 SS 316L

S8 Super Duplex SS

Powder Coating

0 N/A

P Polyethylene

T ETFE

Electric Motor Selection

A IP 55 (STANDARD)

B EX db IIB zone1

C EX db IIC zone1

D EX eb IIC zone1

E EX ec zone2

Motor Supply

1 Single PHASE 220/230 VAC

3 Three PHASE 230/400 VAC

Shaft Connection Type

DC Direct Coupling

FC Flange Coupling

Housing Coupling Type

1 Flange Type

2 Clamp Type

Housing Coating

C1 Polyester

C2 Epoxy

C3 3 Layer Coating

Gearbox Selection

U SIEMENS

V NORD

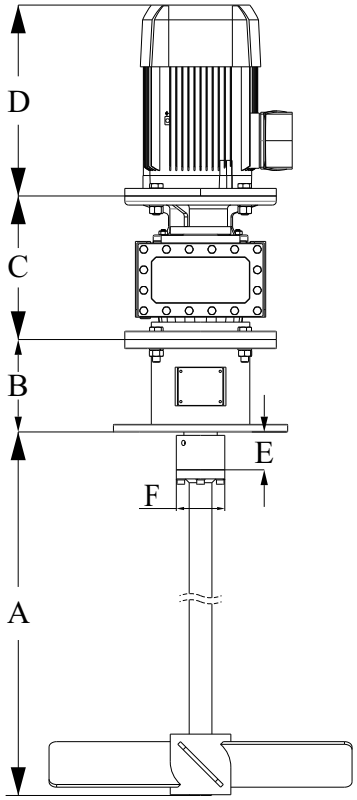
X BREVINI

Y SEW

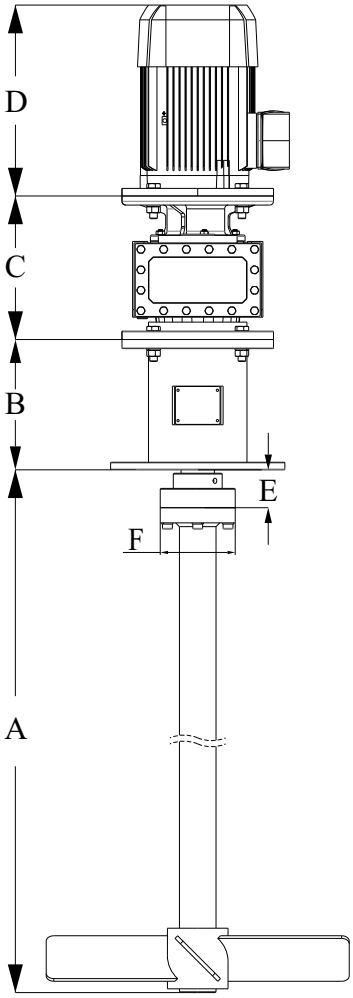
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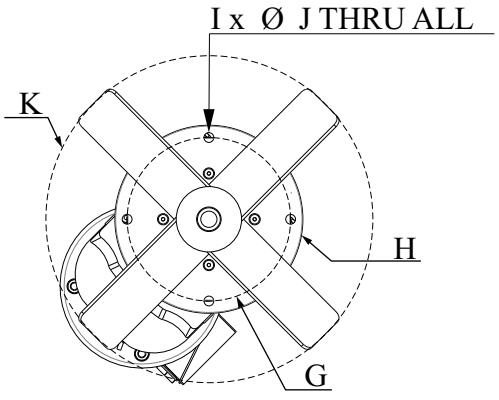
SRM Series Mixer Dimensional Drawing

SRMS



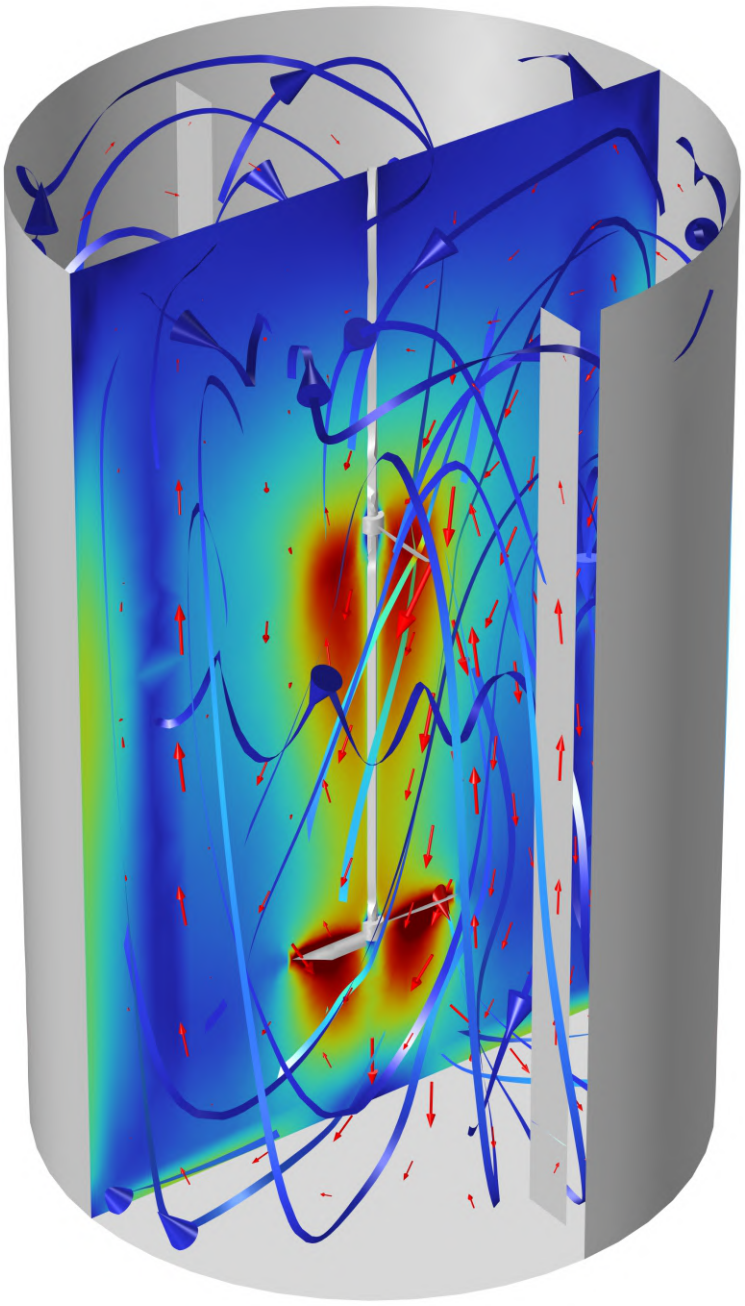
SRMM





Mixer Model	Motor Frame Size	Speed Range	A	B	C	D	E	F	G	H	I	J	K
		RPM	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
SRMS	IEC80/90/100	20 ~ 400	600~1600	122	190	252/297/335	50	64	200	230	4	12(M10)	200~400
SRMM			1200~3000	172				99					250~600

MSRM Series Slow-Speed Mixers



Power Transmission Solutions

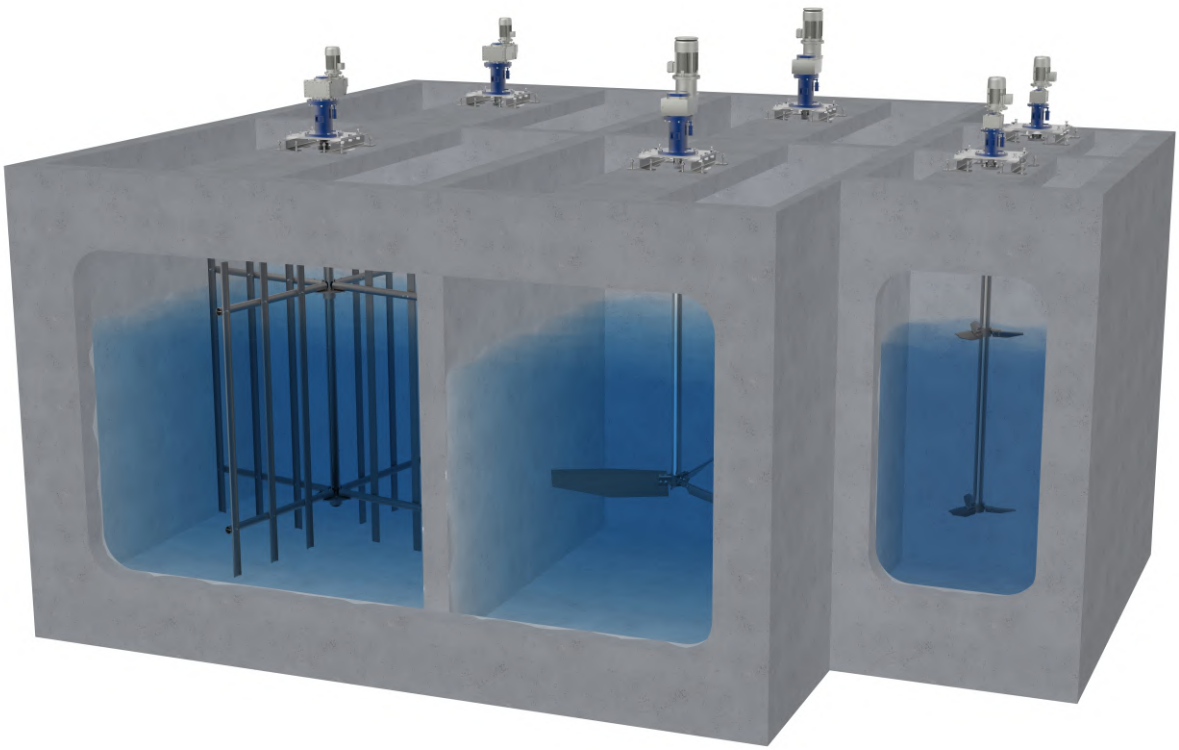
PTS Process Engineering Co

MSRM Series Slow-Speed Mixers

These mixers are designed and built to be suitable for medium to large tanks in terms of volume, and for mild to vigorous mixing in terms of intensity. They are suitable for installation on concrete and metal reactors and tanks. These mixers are designed for 24/7 operation and can continue normal operation for a long time without the need for repair and maintenance.

The MSRM series mixers are classified into three sizes: small, medium, and large.

Mixer Model	Max Shaft Diameter	Max Installable Power	Rotational Speed	Max Tank Capacity	Max Shaft Length
MSRMS	90 mm	4 KW	5-150 RPM	40,000 L	5,000 mm
MSRMM	170 mm	15 KW		80,000 L	6,000 mm
MSRML	355 mm	45 KW		200,000 L	12,000 mm



MSRM Mixer Features

Technical Data

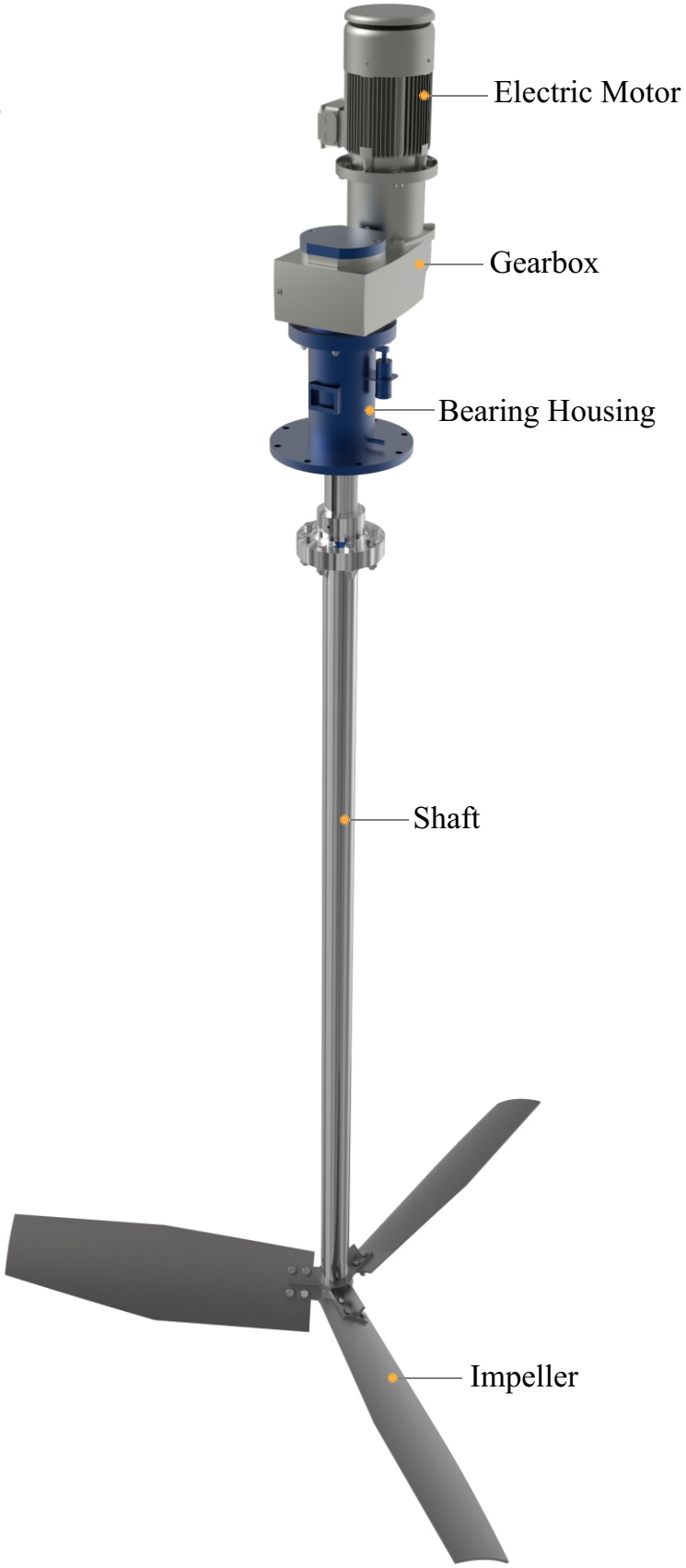
- Suitable for tank capacities up to 200 m^3
- Equipped with parallel-shaft gearboxes featuring a Service Factor greater than 2
- Utilization of hollow shafts instead of solid shafts to reduce overall equipment weight

Design Features

- Double bearing system engineered for an operating life exceeding 100,000 hours (L_{10}) .
- Protection of the gearbox against axial and radial loads.
- Use of split hubs for easier installation and maintenance.
- Optional foot bearing arrangement for increasing critical speed and suppressing shaft-end vibrations.

Operational & Economic Features

- Low capital investment cost
- Designed for stable long-term operation with minimal maintenance requirements



Advanced Radial Load Management

The mechanical design of these mixers ensures that all radial loads generated by the hydrodynamic forces of the impeller are fully absorbed and managed by the independent bearing system of the equipment. The use of reinforced bearing assemblies within a dedicated housing enhances overall dynamic stability and effectively prevents the transmission of destructive stresses and loads to the gearbox. This configuration significantly contributes to improved reliability, reduced vibration levels, and extended equipment service life.



Bi-Directional Axial Load Management

In vertical mixers, the weight of rotating components—including the shaft, impeller, and coupling—generates a downward gravitational axial load. Simultaneously, in down-pumping configurations, the hydrodynamic action of the impeller produces an opposing upward axial thrust.

The advanced axial load management system in MSRM mixers is engineered to fully absorb and neutralize both opposing axial forces. This feature eliminates the transmission of harmful loads to the gearbox, thereby extending the service life of the power transmission system, improving operational stability, and ensuring high reliability under continuous-duty operation.

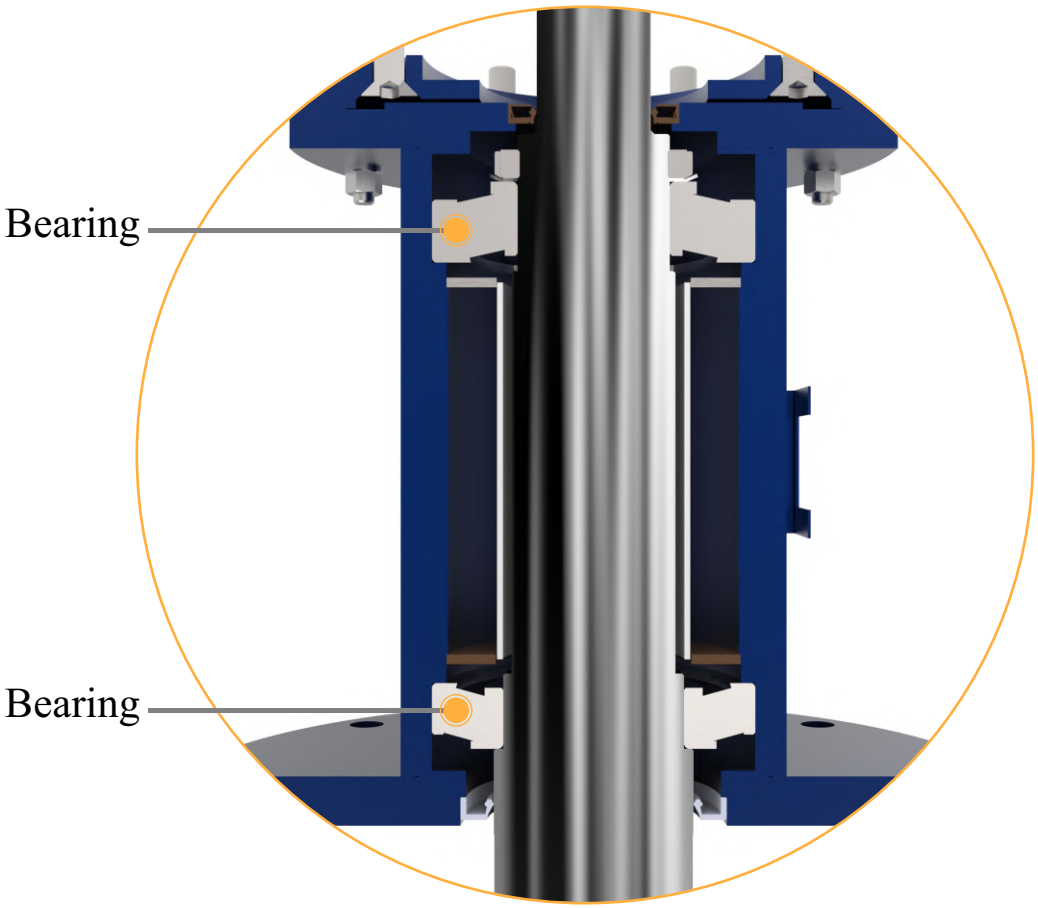
MSRM Lubrication System

The lubrication system in MSRM series mixers is designed to ensure stable bearing performance under continuous operation without the need to stop the equipment.

The grease inlet and discharge system is engineered to provide uniform and effective lubrication across all bearing points, preventing performance degradation or accumulation of spent grease.

The bearings used in this equipment are selected for a wide range of industrial operating conditions and are suitable for various process applications.

These mixers are designed for power ratings up to 45 kW, and all mechanical and hydrodynamic components are optimized based on advanced CFD and FEA analyses.



MSRM Series Mixer Selection Guidelines

Mixer Selection

MSRM Medium Range Slow Rotating Mixers

Mixer Version Indicator

S Small
M Medium
L Large

Impeller Type Selection

1 Axial Flow Impeller
2 Radial Flow Impeller

Wet Parts Material

S4 SS 304
S6 SS 316L
S7 Duplex SS
S8 Super Duplex SS

Powder Coating

0 N/A
P Polyethylene
T ETFE

Electric Motor Selection

A IP 55 (STANDARD)
B EX db IIB zone1
C EX db IIC zone1
D EX eb IIC zone1
E EX ec zone2

Motor Supply

1 Single PHASE 220/230 VAC
3 Three PHASE 230/400 VAC

Shaft Connection Type

DC Direct Coupling
FC Flange Coupling

Housing Coupling Type

1 Flange Type
2 Clamp Type

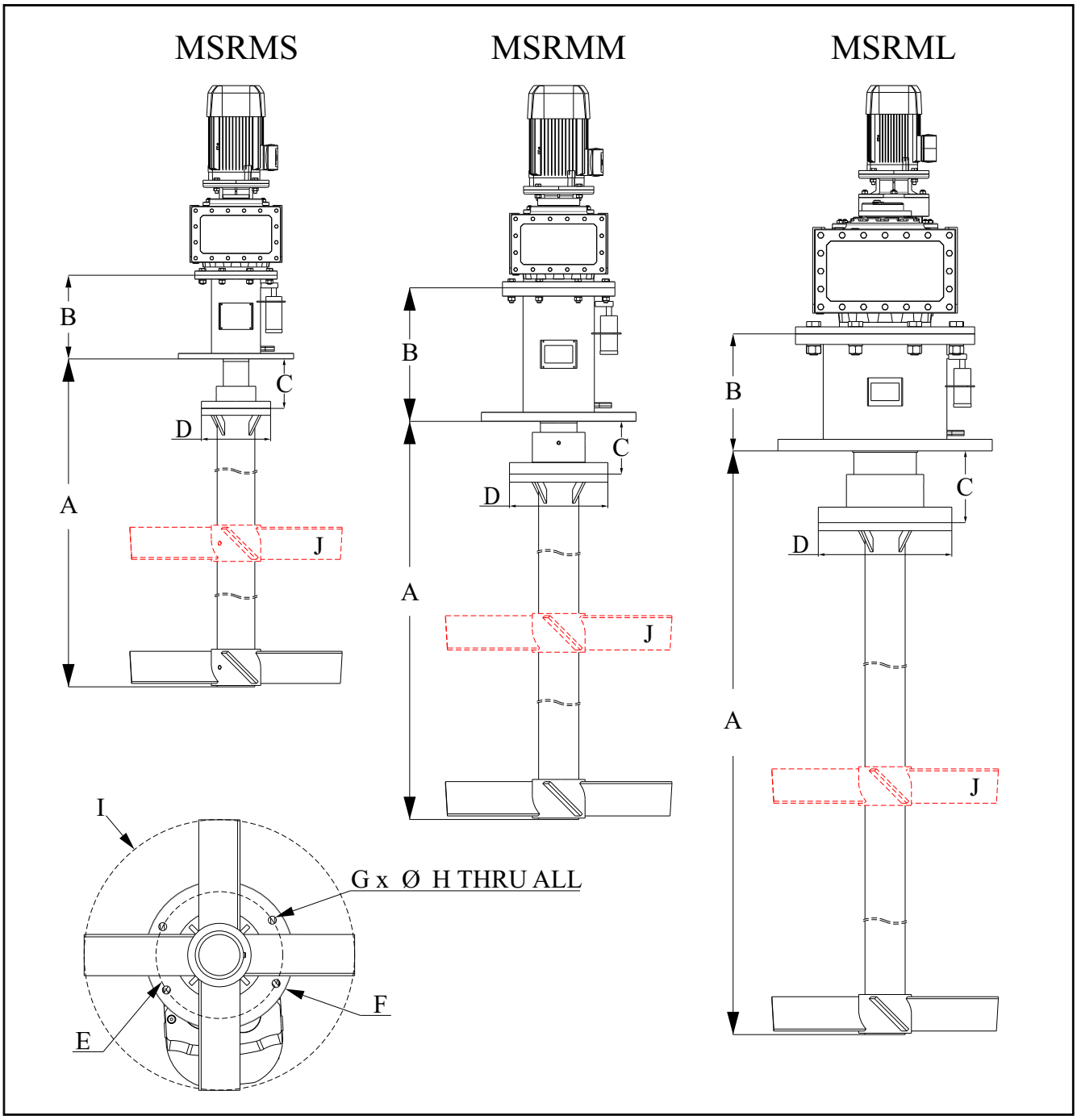
Housing Coating

C1 Polyester
C2 Epoxy
C3 3 Layer Coating

Gearbox Selection

U SIEMENS
V NORD
W BREVINI
X SEW
Y BONFIGLIOLI
Z YILMAZ

MSRM Series Mixer Dimensional Drawing



Mixer Model	Speed Range	A	B	C	D	E	F	G	H	I	J
	RPM	mm	mm	mm	mm	mm	mm	mm	mm	mm	Number Of Impellers
MSRMS	5 ~ 150	1000~5000	100~800	150	210	300	350	6	19(M16)	500~5000	1~6
MSRMM		1000~6000		150	280	400	440	8	21(M20)		
MSRML		1000~12000		204	380	540	610	8	23(M30)		

Process Slow Rotating Mixers (PSRM)



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PSRM Series Process Mixers

Process Overview

Process mixers refer to a specific type of agitators that are an integral part of one or more production processes. These mixers are typically installed on reactors and provide a homogeneous mixing environment, thereby improving the efficiency and quality of chemical reactions.

Industrial Applications

These units are widely used in oil & gas, petrochemical, food processing, and mining industries as key equipment in mixing and reaction processes

Examples of Products Produced Using Process Mixers	
Product Name	**Purpose of Mixer Installation**
HDPE Polyethylene	Suspension formation to improve polymerization process
PVC	Suspension formation to improve polymerization process
Terephthalic Acid	Oxidation process (gas–liquid mixing)
Aluminum Hydroxide	Crystallization process
Gold and Precious Metals	Suspension formation for leaching process

Process Mixers vs. Conventional Agitators



Process mixers differ from conventional agitators in several fundamental design and operational aspects, including

1- Robust mechanical design and high manufacturing quality to ensure maximum reliability and extended maintenance intervals

2- Equipped with mechanical seals to enable safe installation on pressure and vacuum-rated tanks and reactors

3-Special maintenance-friendly design allowing service operations without full disassembly of the mixer, thereby minimizing equipment downtime

4-Use of special alloys and materials to enhance resistance against corrosion and wear

5-Capability to design and manufacture large-scale, high-power heavy-duty mixers according to process requirements

Components of Process Mixers

- Electric Motor
- Speed Reducer Gearbox
- Bearing Housing
- Mechanical Seal Housing
- Coupling
- Mechanical Seal
- Power Transmission Shaft
- Impellers
- Bottom Steady Bearing

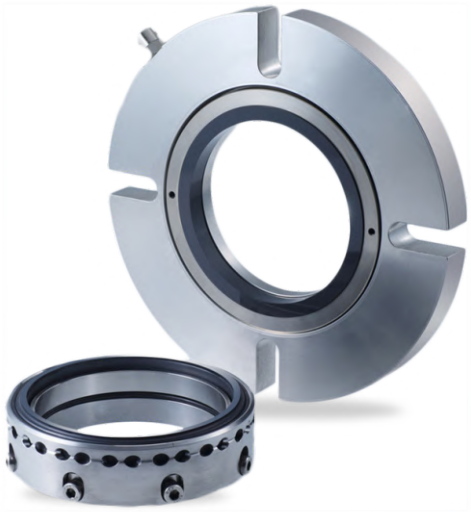




Mechanical Seals

A significant portion of process mixers is installed on vacuum or pressure reactors, where the sealing system plays a critical role in ensuring operational safety, stability, and long-term reliability.

Single Dry Running Mechanical Seal



This seal type, developed by leading manufacturers such as Burgmann, John Crane, and Fluiten, is designed for low-speed applications and specific operating conditions without external cooling systems

Specifications:

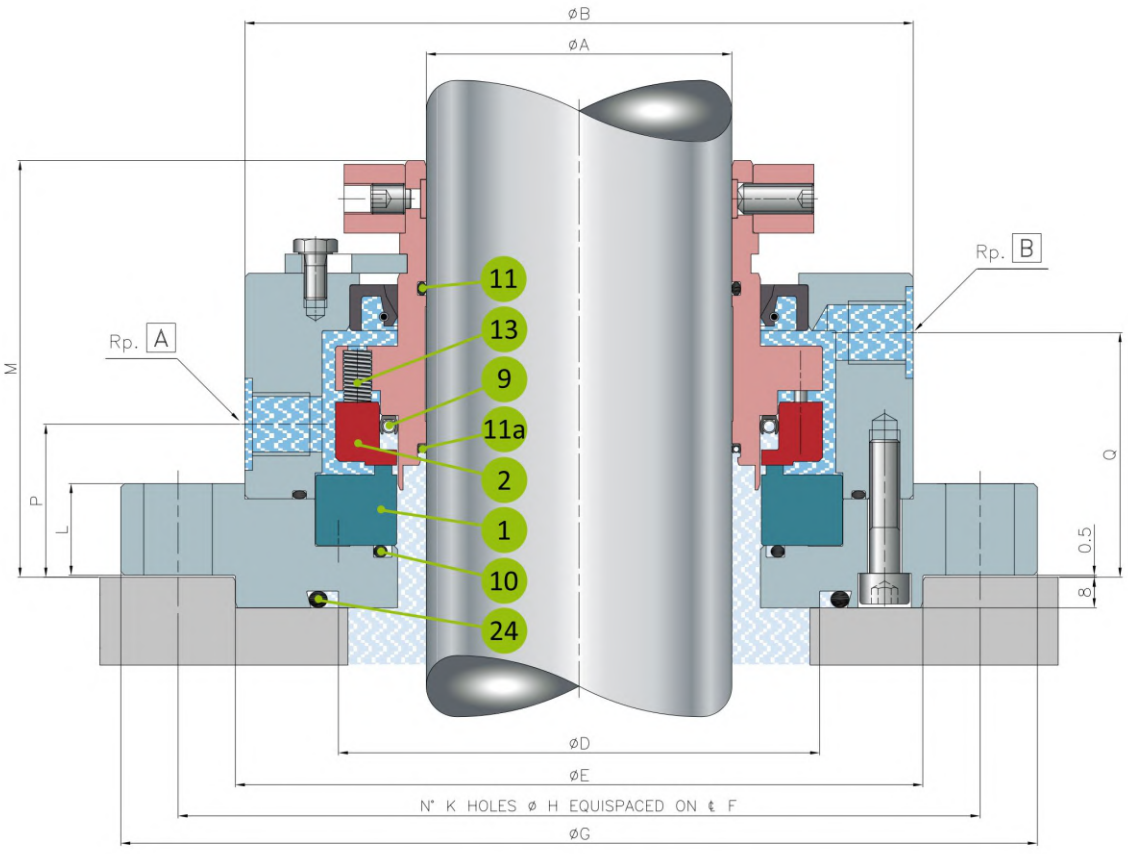
- Operating pressure range: Full Vacuum to 4 bar
- Maximum sliding speed: 3.5 m/s
- Suitable for low-speed and special operating conditions
- Serviceability: Simple design enabling fast replacement and reduced maintenance intervals
- Economic Factor: Optimized solution with minimized life cycle cost compared to liquid-lubricated seals

Single Mechanical Seal with Cooling System (Plan 23)

This mechanical seal is designed for applications requiring controlled heat removal and improved operating stability. In this configuration, the cooling fluid circulates through an internal loop at atmospheric pressure, enhancing seal performance and operational reliability

Performance specifications:

- Operating pressure range: Full Vacuum to 6 bar
- Maximum sliding speed: 5 m/s
- Extended maintenance intervals required
- Moderate cost solution compared to alternative sealing systems



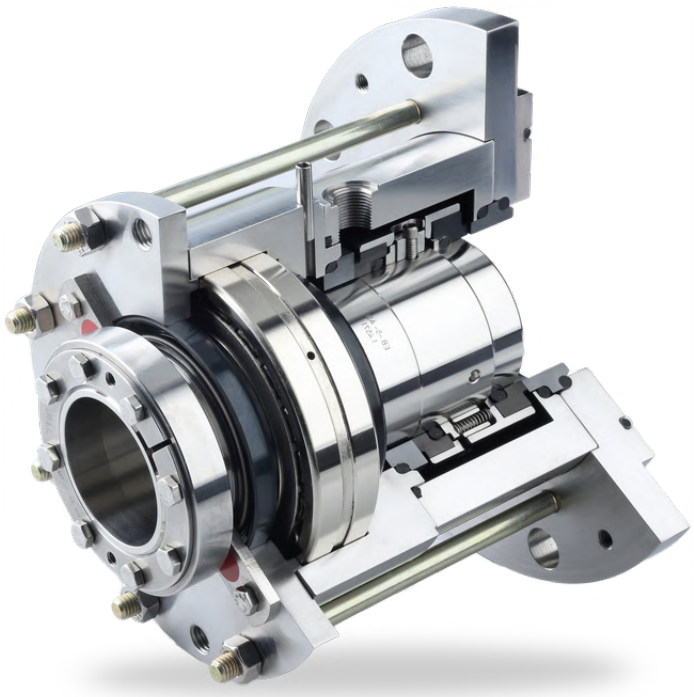
Double Mechanical Seal with Cooling System (Plan 23 / Plan 53A)

Double mechanical seals are among the most reliable and widely used sealing systems in process mixers, particularly in critical, high-pressure, and safety-sensitive applications.

In this configuration, the barrier/buffer chamber between the two seals is filled with a pressurized liquid or gas, providing both thermal control and effective prevention of process fluid leakage to the environment. This significantly enhances operational safety and equipment reliability.

Performance specifications:

- Operating pressure range: Full Vacuum to 20 bar
- Maximum sliding speed: 20 m/s
- Suitable for high-pressure and critical services
- Long-term maintenance intervals required
- High total cost compared to single seal systems



PSRM Mixer Selection

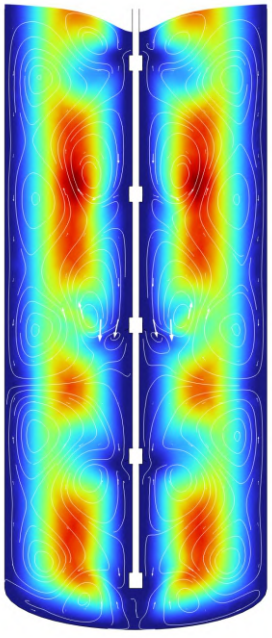
PSRM series agitators are designed and manufactured in various configurations to satisfy a wide range of process requirements and polymerization applications. General specifications of this series are presented below:

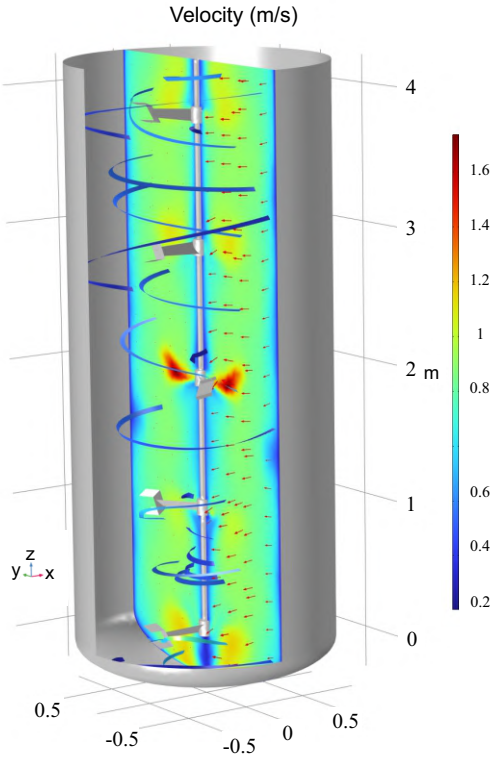
Mixer Model	Max Power Rate (Kw)	Impeller Diameter (m)	Max Shaft Length (m)	Max Number of Impellers
PSRMS	5.5	0.2 ~ 4	20	12
PSRMM	11			
PSRML	45			
PSRMVL	160			



These mixers are considered an integral part of polymerization processes and are widely utilized in the production of various polymer products.

To improve mixing efficiency and optimize reactor performance, Computational Fluid Dynamics (CFD) analysis is employed during the mixer design phase. These simulations enable optimized determination of impeller diameter, number of impellers, impeller spacing, flow patterns, and other hydrodynamic parameters.





Paddlewheel Flocculator



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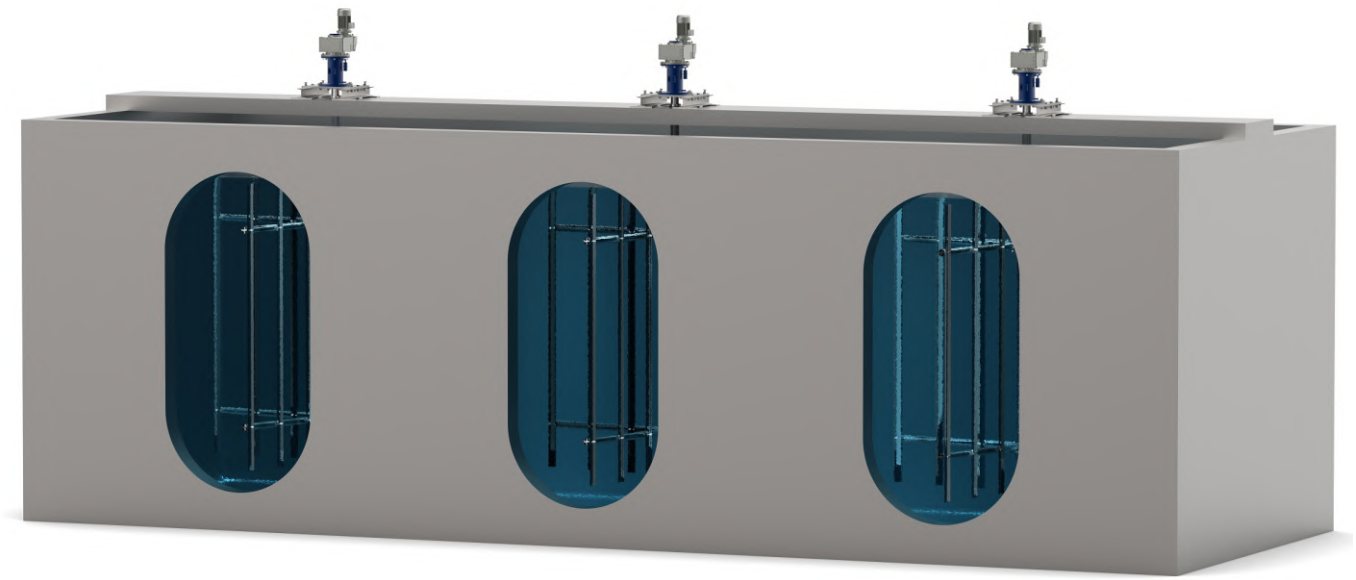
PTS Process Engineering Co

Paddlewheel Flocculator

Flocculation is a critical stage in water and wastewater treatment processes, where fine suspended particles aggregate into larger, settleable flocs through gentle and controlled mixing.

In treatment systems, microflocs are initially formed through rapid mixing. During the flocculation stage, these particles grow into larger flocs as a result of gentle hydrodynamic motion and progressive particle collisions.

Flocculation systems are generally classified into two main categories: mechanical and hydraulic systems. Mechanical methods include paddlewheel and turbine mixers, while hydraulic methods include jet pumps and aeration systems.



Paddlewheel Flocculator

Today, horizontal and vertical paddlewheel flocculation is recognized as one of the most common and effective flocculation methods in the water and wastewater treatment industry. These systems provide gentle and uniform mixing, achieving high efficiency in floc formation and suspended solids removal.

Despite higher initial capital investment and maintenance costs compared to some alternative methods, paddlewheel flocculators remain among the most reliable and widely used systems in treatment plants.

In conventional designs, paddlewheel flocculation systems are typically arranged in a three-stage configuration (three tanks in series), where the velocity gradient (G) is gradually reduced from the first stage to the final stage to provide optimal conditions for floc growth and stability.

The table below provides a general comparison of different flocculation methods

Description	Paddle Flocculation	Turbine method	Hydraulic Flocculation
Floc Size	Large & Stable	Small to medium	Very Large
Head Loss / Pressure Drop	Negligible	Moderate	Very Large
Process flexibility	High	Very High	Limited
Capital Expenditure	Medium to High	Medium	Low
Operating & Maintenance Cost	Medium	Low	Medium
Design & Construction Complexity	Relatively High	Medium	Relatively High

The company, with several years of experience in the design and manufacturing of paddlewheel flocculation systems, is fully capable of providing complete engineering services, including design, fabrication, installation, and commissioning.

Process Design

Water and wastewater treatment plants are designed based on the required Velocity Gradient and process conditions. Utilizing specialized engineering and design software, the company performs all required flocculator calculations after receiving process data and tank dimensions. These calculations include power requirement determination, gearbox selection, paddle dimensions, number of arms, paddle tip speed, and other operational parameters.

All design criteria and engineering calculations are carried out in accordance with internationally recognized standards used in the water and wastewater treatment industry.

Paddle Mechanical Design

Following completion of the process design phase, the mechanical structure of the mixer is developed by the engineering department. Prior to finalization, all critical components are evaluated using Finite Element Method (FEM) analysis. These evaluations include stress, strain, fatigue, natural frequency, deformation, and other mechanical assessments to ensure safe, stable, and reliable operation under continuous-duty conditions.

Housing Mechanical Design

The housing and bearing assembly represent one of the most critical sections of a paddlewheel flocculator and therefore require careful engineering consideration. The assembly is designed to fully absorb and withstand all radial and axial loads while ensuring stable and reliable long-term operation under continuous-duty service conditions.

The optimized housing and bearing system minimizes the transfer of mechanical stresses to the power transmission system, resulting in improved reliability, reduced maintenance costs, and extended equipment service life.

Paddle wheel mixer advantages

Process Performance

- High efficiency in large and stable floc formation
- Stable operation under continuous-duty conditions
- Precise Tip Speed control to prevent floc breakage
- Variable speed control through VFD systems



Reliability & Maintenance

- High operational reliability in long-term service
- Excellent resistance to wear and corrosion
- Low requirement for periodic maintenance
- Easy maintenance and replacement of wear parts

Design & Construction

- Available in stainless steel construction
- Engineered for continuous industrial operation

Side Entry Mixers



Power Transmission Solutions

PTS Process Engineering Co

Side Entry Mixers

These mixers, also known as Side Entry Mixers or horizontal mixers, are recognized as one of the most efficient and cost-effective solutions in various industries due to their short shaft design, high rotational speed, and high-efficiency axial flow impellers.

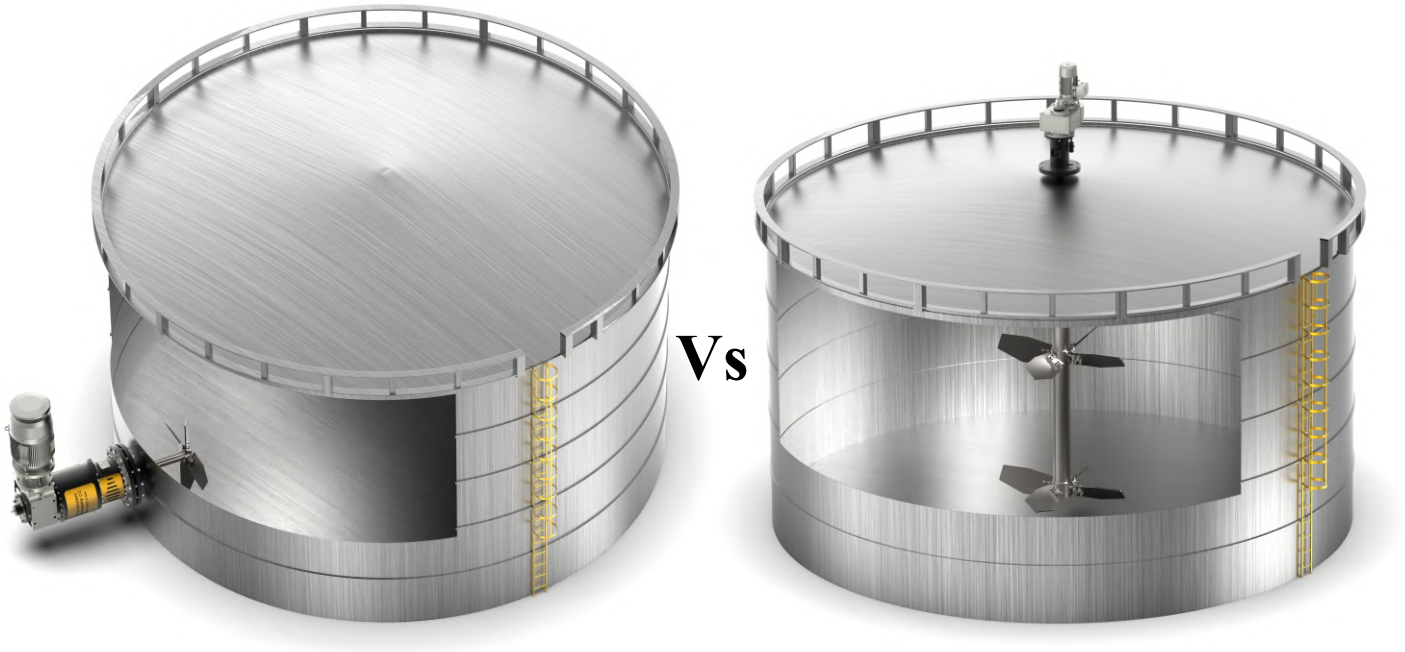


Side Entry Mixers

Side Entry Mixers are mainly used in applications requiring mixing in very large storage tanks.

1-Very Large Tanks

In many industries, particularly oil & gas, petrochemical, and food industries, storage tanks may reach diameters of up to 80 meters and heights of up to 20 meters. In such cases, the use of vertical agitators is associated with significant technical and economic limitations.



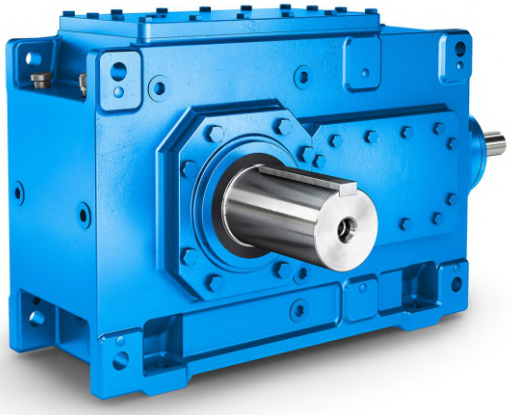
In these conditions, vertical mixing systems present the following challenges:

- **Large Impeller Diameter:**
  For optimal mixing, the impeller-to-tank diameter ratio is typically around 0.3, resulting in high inertia and increased power demand in large tanks.

- **Large shaft diameter and length:**
  Increased tank height leads to longer shafts, making deflection control and resonance avoidance more critical, often requiring larger shaft diameters or auxiliary bearings.

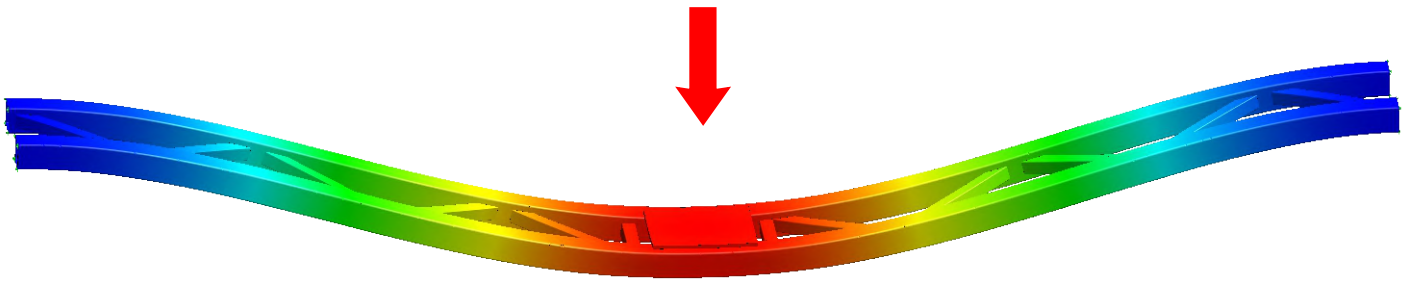
Side Entry Mixers

- **Large Gearbox Size:**
  High torque at low speed operation results in the need for large and heavy gearboxes.



- **Large Supporting Structure on tank:**
  The combined weight of shaft, impeller, and gearbox requires heavy-duty supporting structures, increasing installation complexity and cost.

Accordingly, Side Entry Mixers represent an optimized, cost-effective, and engineered solution for large tank mixing applications.

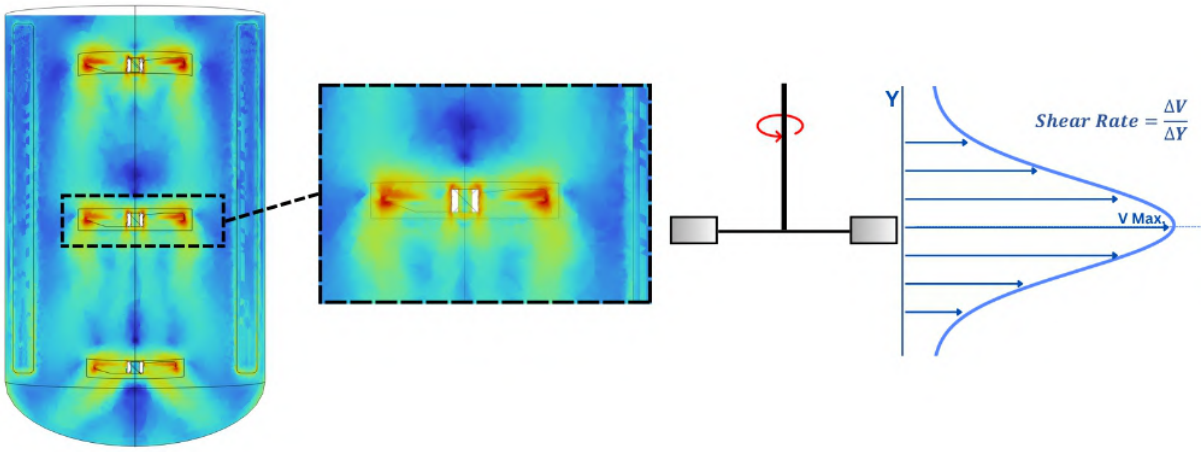


Side Entry Mixers

2-Low Requirement for Shear Stresses

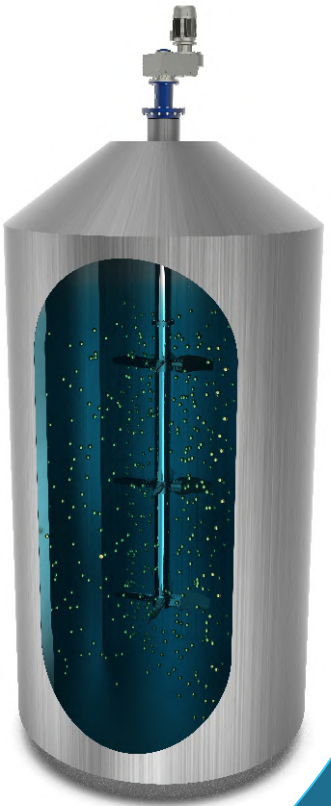
In many mixing processes, the application of shear forces is essential to accelerate the process or enable proper mixing, such as dissolving sugar in water where shear action helps break down particles and enhance dissolution. However, in processes such as fermentation, homogenization, or storage, the main objective is only to maintain uniformity within the tank contents, and high shear forces are not required.

In such applications, Side Entry Mixers represent a suitable, efficient, and cost-effective solution.



3-Suspension Process for Low Density Difference Materials

In crude oil refining industry, numerous storage tanks are operated where the main purpose of mixing is to prevent the settling of water and sludge (BS&W) inside the tank. Since the density difference between these phases and the main fluid is relatively low, Side Entry Mixers, due to their suitable hydrodynamic design, generate a uniform circulation within the tank and effectively prevent sedimentation at the tank bottom.



Main Components of Side Entry Mixers

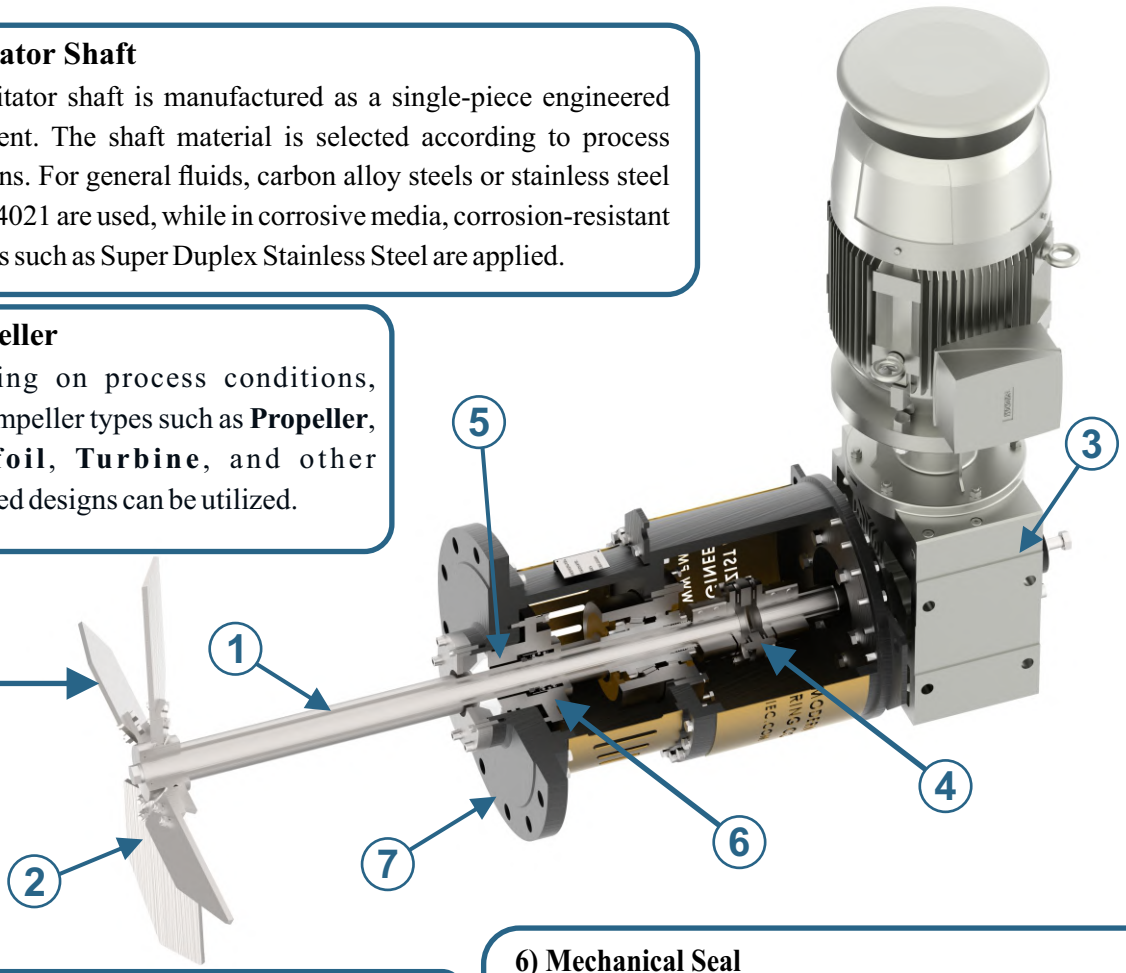


1) Agitator Shaft

The agitator shaft is manufactured as a single-piece engineered component. The shaft material is selected according to process conditions. For general fluids, carbon alloy steels or stainless steel grade 1.4021 are used, while in corrosive media, corrosion-resistant materials such as Super Duplex Stainless Steel are applied.

2) Impeller

Depending on process conditions, various impeller types such as **Propeller**, **Hydrofoil**, **Turbine**, and other specialized designs can be utilized.



3) Drive Unit

This section utilizes parallel shaft and bevel helical gearboxes to drive the mixing system.

4) Flexible Coupling

Flexible couplings are used to compensate for any geometric tolerance errors. This enhances the service life of both the gearbox and the mechanical seal.

5) Shut off Device

This mechanism allows maintenance and complete replacement of the mechanical seal while the tank remains full of process fluid and in operation (In-Service). This feature eliminates the need for process fluid draining and significantly reduces downtime and operational costs

6) Mechanical Seal

The mechanical seal used in Side Entry Mixer systems is a single mechanical seal, supplied by internationally recognized manufacturers such as John Crane (USA), Burgmann (Germany), and Fluiten (Italy).

For cooling and lubrication of the sealing system, various **API 682** standard plans can be applied. In cases where the process fluid contains suspended solids, is contaminated, operates at high temperature, or has abrasive properties, **API Plan 32** is required for flushing and cooling of the mechanical seal.

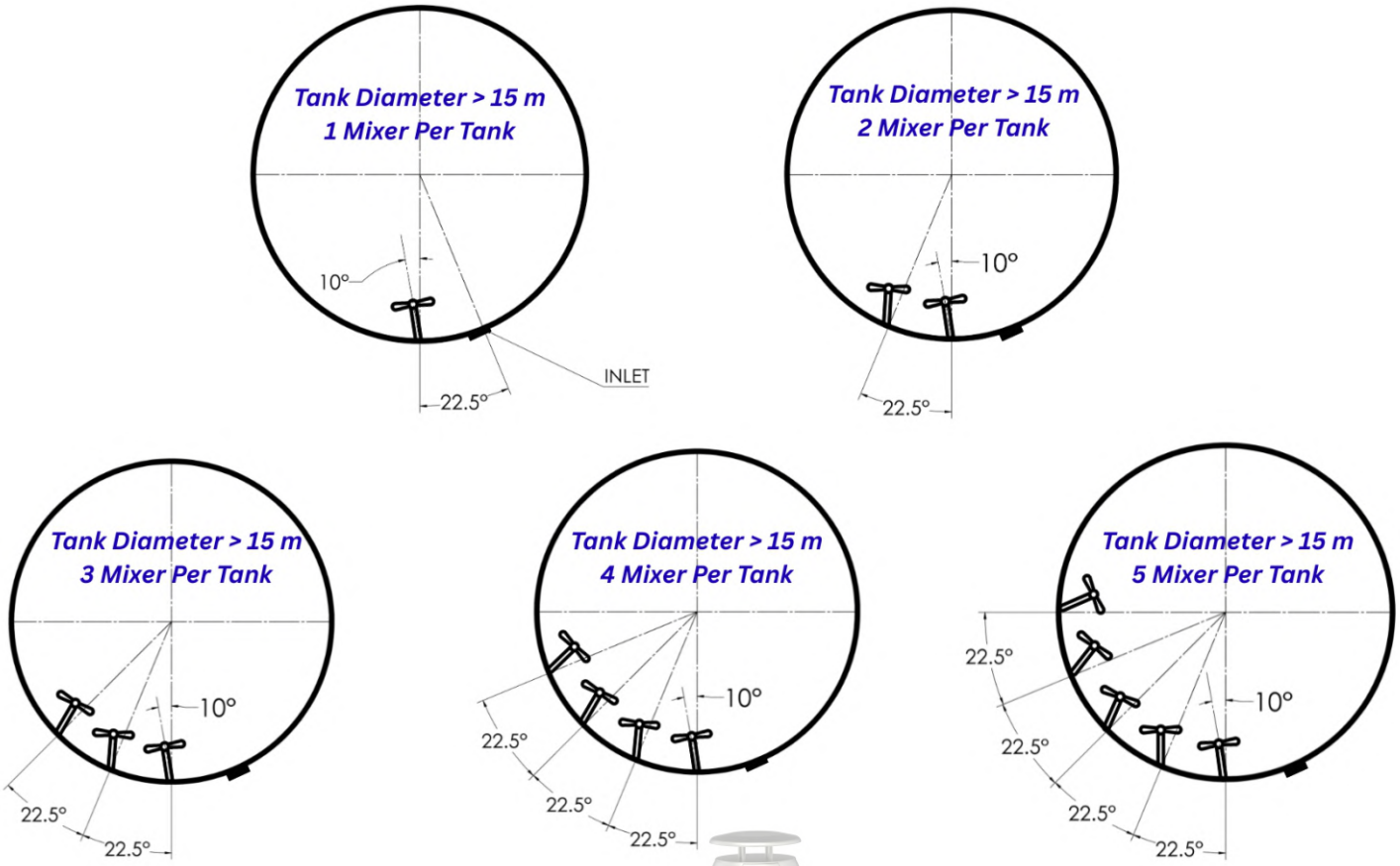
7) Mounting Flange

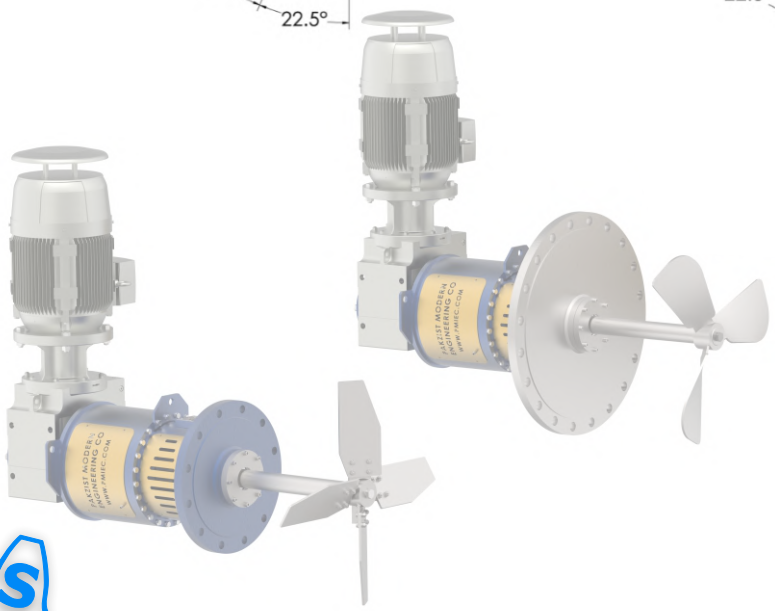
The design and manufacturing of the mixer mounting flange on the tank nozzle is performed in accordance with ASME B16.5 for sizes below 24 inches and **ASME B16.47 (Series A & B)** for sizes above 24 inches

Positioning of Side Entry Mixers

The arrangement and positioning of side entry mixers on the tank wall is a key parameter in achieving optimal system performance. The installation is designed according to tank geometry and specific angular positions.

Jet stream length and impeller **pumping capacity** are the main factors determining the required **number of mixers** for each tank.

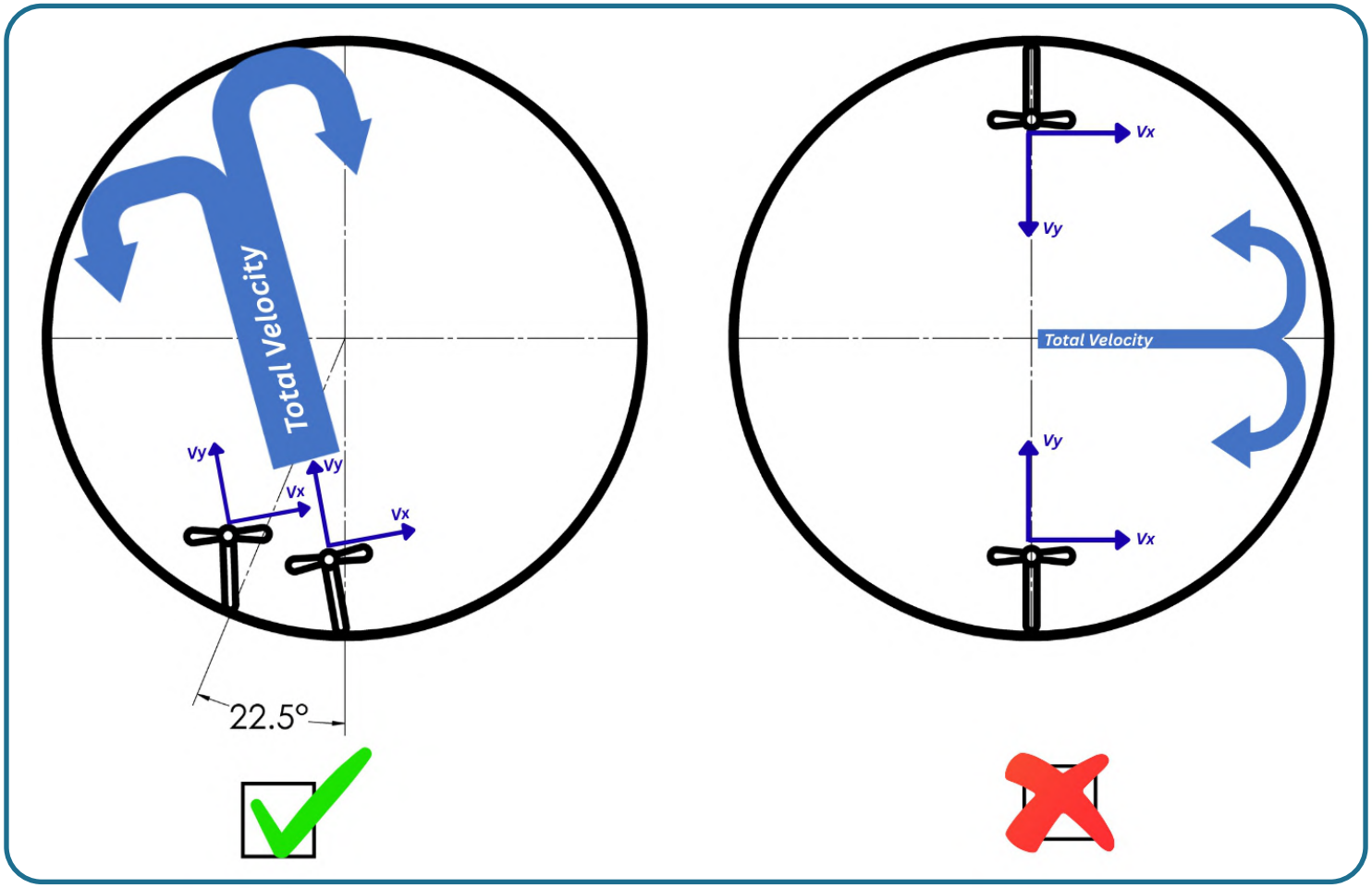


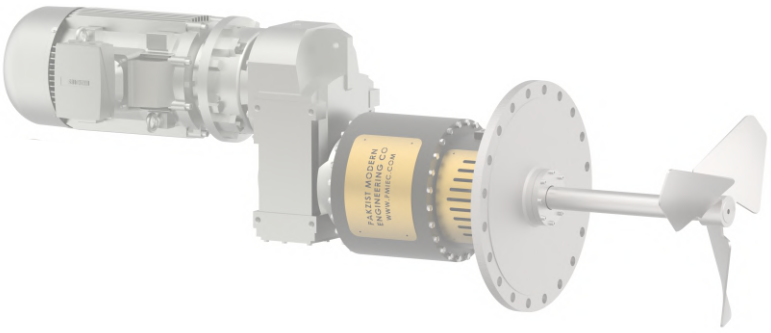


Positioning of Side Entry Mixers

As shown below, in the **optimized** side entry mixer arrangement (left image), two mixers are installed at a **22.5° angle relative to the tank radius**, resulting in aligned velocity vectors and a more effective resultant flow.

In contrast, in the **opposed arrangement** (right image), flow components cancel each other out, significantly reducing mixing efficiency.

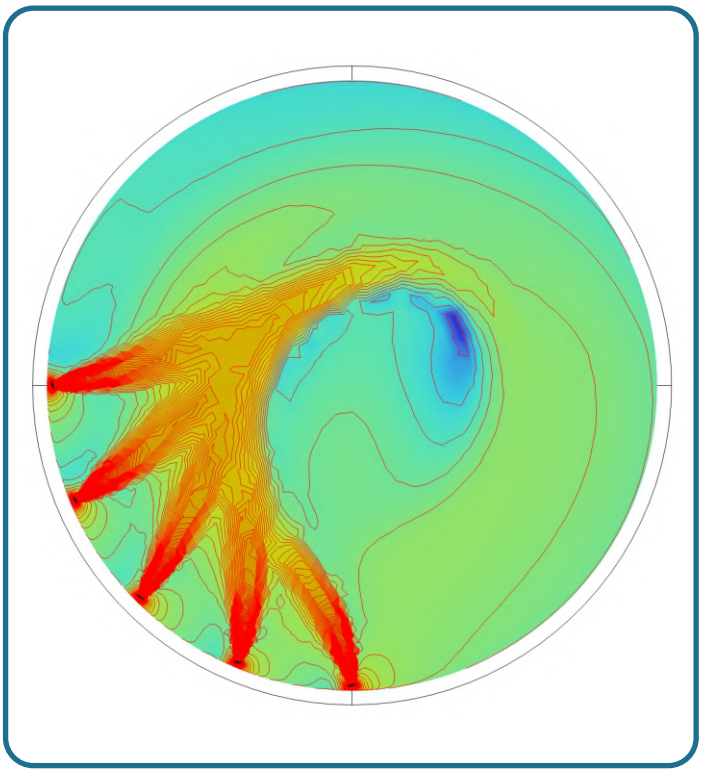


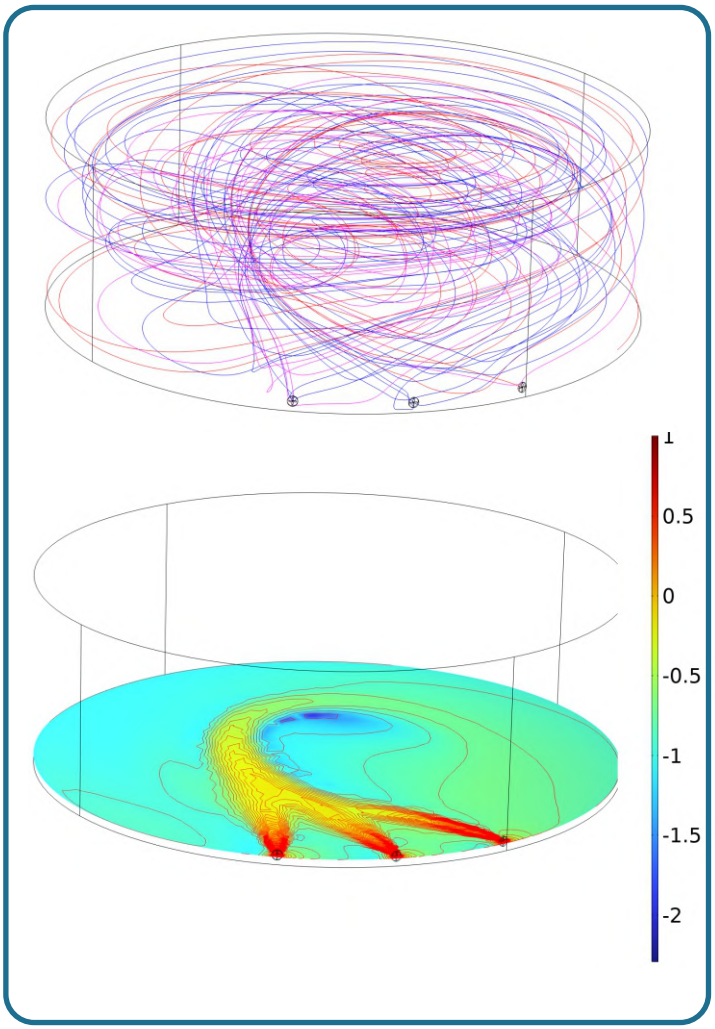


CFD Analysis

CFD simulations and analyses are performed specifically according to the process requirements and tank design, enabling the most optimized technical solution for the selection and design of side entry mixers.

These analyses provide a detailed 3D representation of fluid flow behavior and, by determining the optimal **number and orientation** of mixers, **eliminate dead zones** and ensure uniform mixing performance.



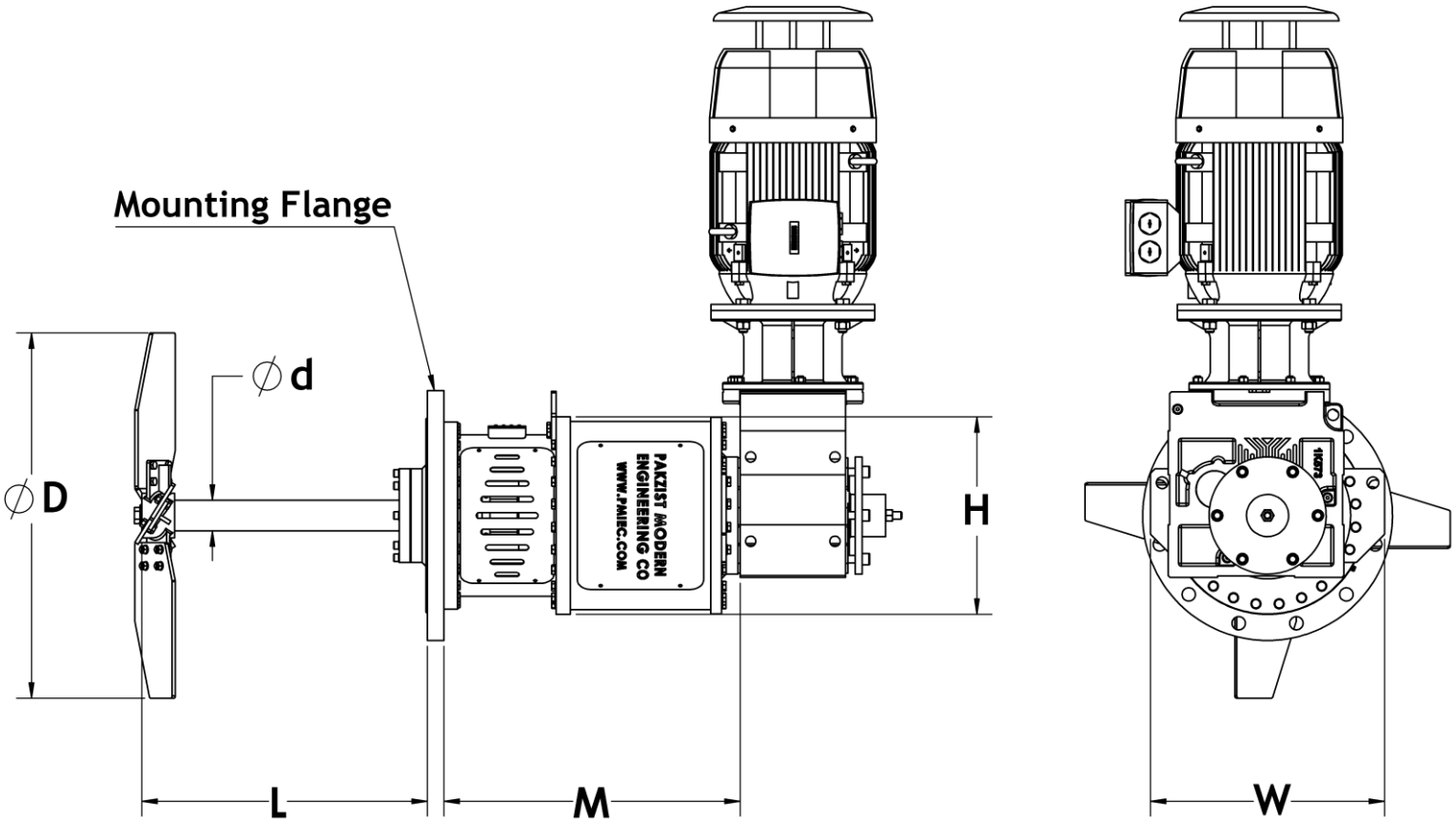


Standard Specifications of Side Entry Mixers

Side Entry mixers manufactured by this company utilize an **electric motor and industrial gearbox power transmission system**, ensuring stable operation with minimal vibration.

The use of a **geared transmission system** instead of belt and pulley drive results in higher efficiency, improved **durability**, and **easier maintenance**.

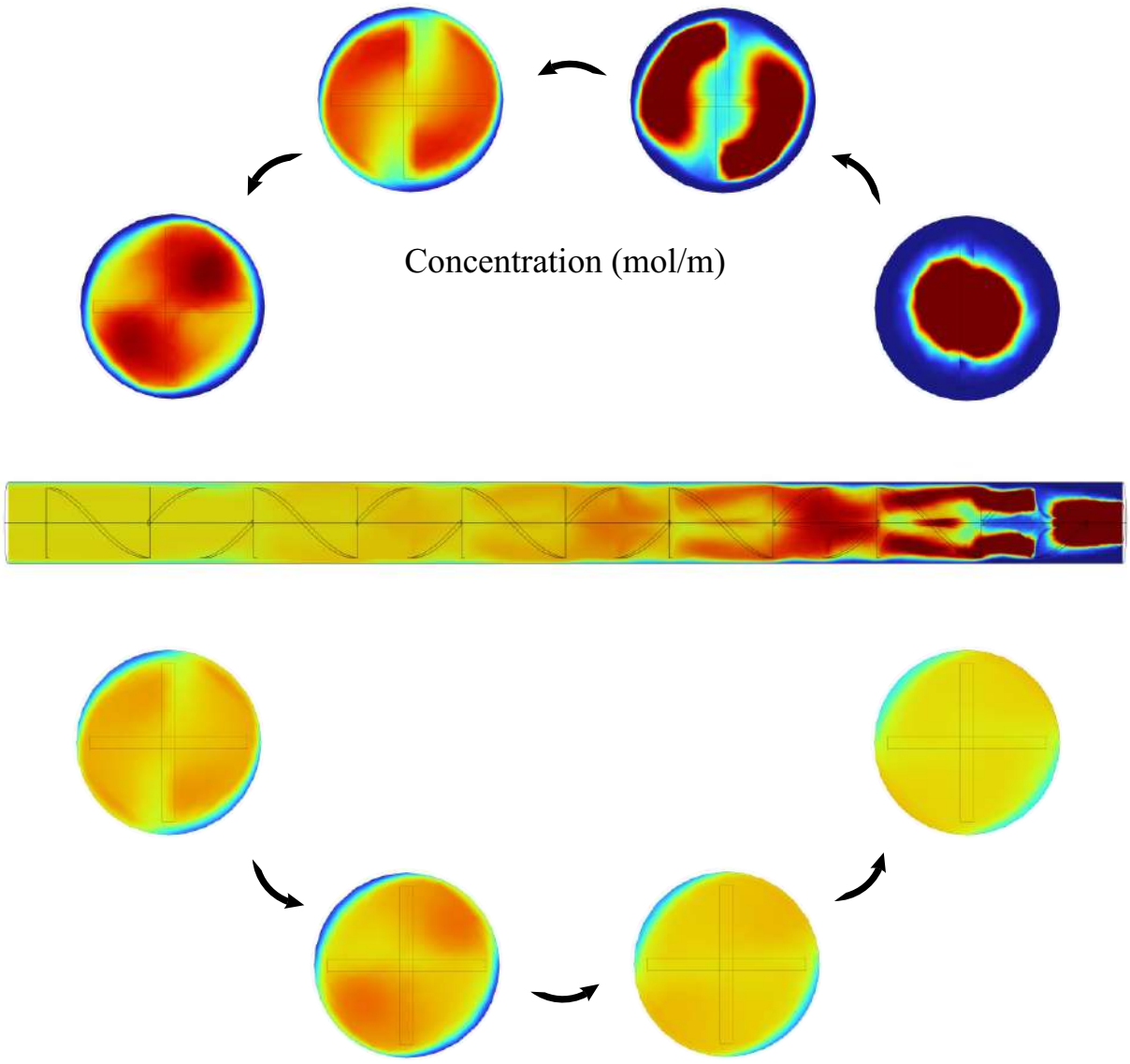
These industrial mixers are available in different models and **power ratings** depending on tank volume and process requirements



Standard Specifications of Side Entry Mixers

Category	Parameter	Symbol	SEMS	SEML
Dimensions and Mechanics	Impeller Diameter (mm)	ØD	400 ~ 800	400 ~ 800
	Shaft Length (mm)	L	400 ~ 1000	400 ~ 1000
	Overall Dimensions	MxWxH	628x500x422	688x600x505
	Shaft Diameter (mm)	Ød	65	80
	Impeller Material		SS 316L, Duplex and Super Duplex SS,CS	SS 316L, Duplex and Super Duplex SS,CS
	Mounting		Flanged	Flanged
	Angle		Fixed	Fixed
Performance	Motor Power (Kw)		5.5 ~ 22	30 ~ 55
	Speed (RPM)		200 ~ 400	200 ~ 400
	Torque (N.m)		Up to 720	Up to 1800
	Tank Turnover per Minutes		0.05 ~ 0.2	0.05 ~ 0.2
Operating Conditions	Max. Temperature (°C)		-20 ~ 55	-20 ~ 55
	Viscosity Range (cP)		Up to 1000	Up to 1000
	Max. Pressure (bar)		Up to 6	Up to 6
	Permitted Fluids		Crude oil, Fuel Oil (e.g. HFO, Diesel),Water Alcohols (e.g. Ethanol, Methanol), Wastewater or Effluent, Latex or Polymer Emulsions	
	Seal Type		Single Mechanical Seal	Single Mechanical Seal
	Maintenance lnterval		10,000 hr	10,000 hr

Introduction to Static Mixers



PTS
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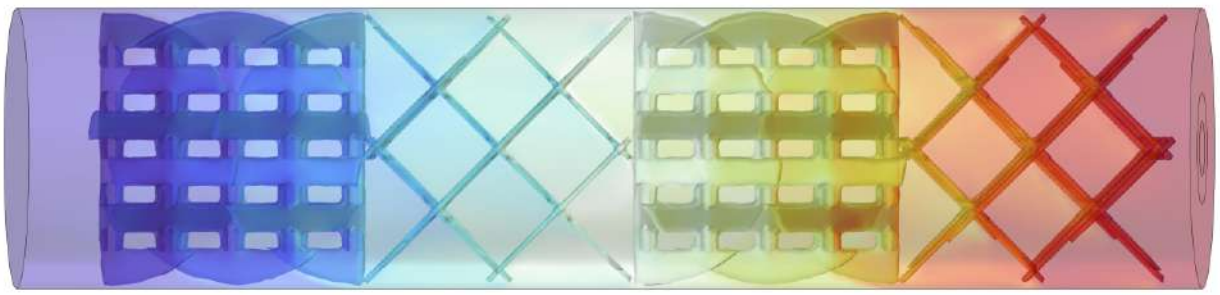
PTS Process Engineering Co

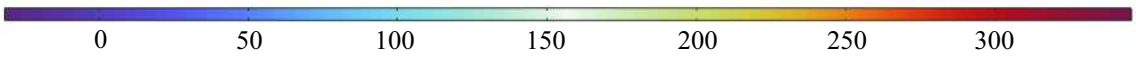
Static Mixers

In process engineering, static systems are defined in contrast to dynamic systems.

In mixing technology, static mixers are devices in which the mixing elements remain completely stationary, while the fluid passes through them driven solely by its own flow energy, resulting in efficient mixing and homogenization.

The required energy is provided by the pressure drop generated along the mixer. Depending on design and operating conditions, this pressure drop may range from a few millibars (mbar) to several tens of bars (bar).





Pressure (mbar)

In many industries, mixing operations are conventionally carried out in vessels, reactors, and tanks. However, in certain applications, mixing and even chemical reactions can take place within pipelines, effectively allowing the pipeline to function as a reactor under specific conditions.

In such cases, static mixers provide a highly efficient and cost-effective solution for chemical processing. This is particularly important in applications requiring rapid mixing and low residence time, such as molten polymer processes where time directly influences final product properties.

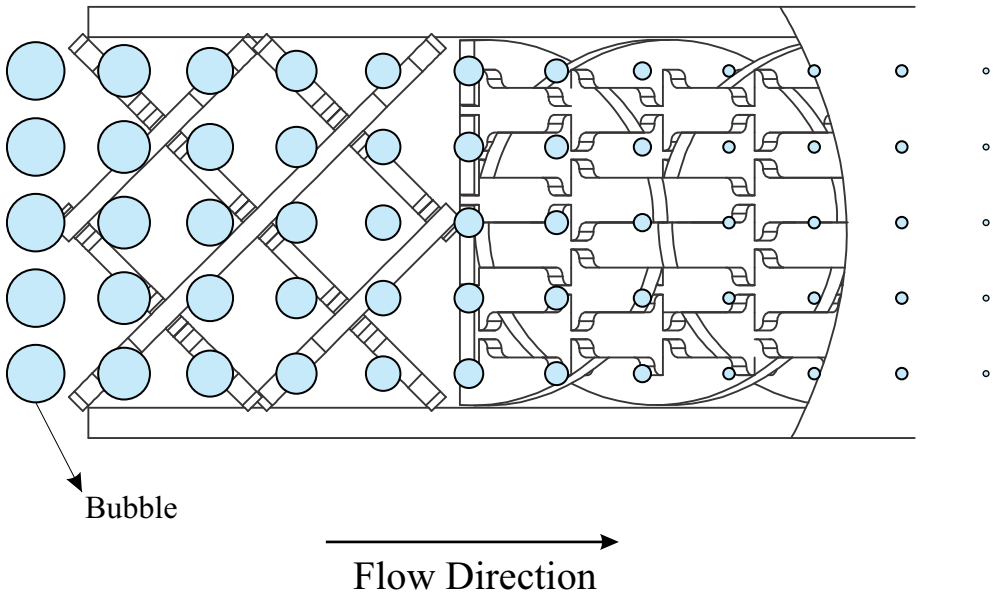
Key Applications of Static Mixers:

- **Continuous processes.** Static mixers are widely used in continuous mixing operations such as chlorine-water blending. In these applications, both streams enter the mixer simultaneously, resulting in a fully homogeneous outlet mixture..

- **Vacuum applications.** In processes such as paint and adhesive production, mixing must be performed in the absence of oxygen or other unwanted gases. Static mixers ensure stable and uniform mixing under such conditions.

- **Plug flow generation.** In heat transfer applications involving high-viscosity fluids, static mixers promote plug flow behavior and eliminate back mixing. This significantly improves heat transfer efficiency and reduces mixing time.

- **Gas–liquid processes.** In gas-related chemical processes such as carbonated beverage production, carbon dioxide is uniformly dispersed into the liquid phase, resulting in a stable and homogeneous solution.

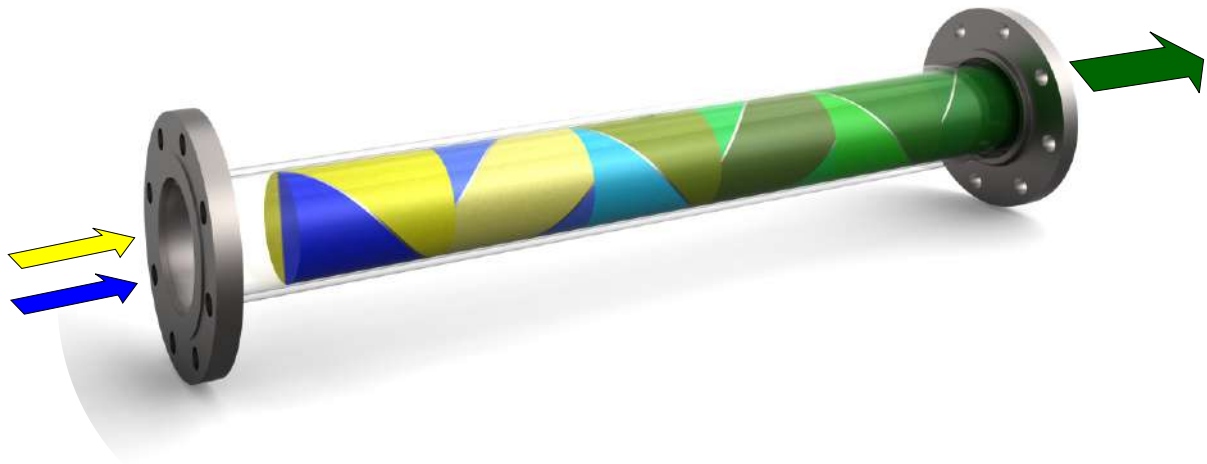


Key Applications of Static Mixers

- **High-pressure processes.** Static mixers are used in high-pressure applications such as blending different polyethylene grades in pipe production industries. Operating pressures in these processes can reach several hundred bar, while maintaining stable and uniform mixing performance.

- **Space-limited applications.** In processes such as crude oil sweetening, mixing of crude oil and sulfuric acid is carried out in pipelines at large capacities. Performing such operations in tanks would require significant space and equipment volume. Static mixers provide a compact and cost-effective solution.

- **Highly corrosive processes.** In chemical industries such as sulfuric acid production, high temperatures and aggressive chemical environments significantly increase corrosion rates. The use of polymeric or corrosion-resistant static mixers enables efficient mixing without corrosion issues and with extended service life.



Helical Static Mixer

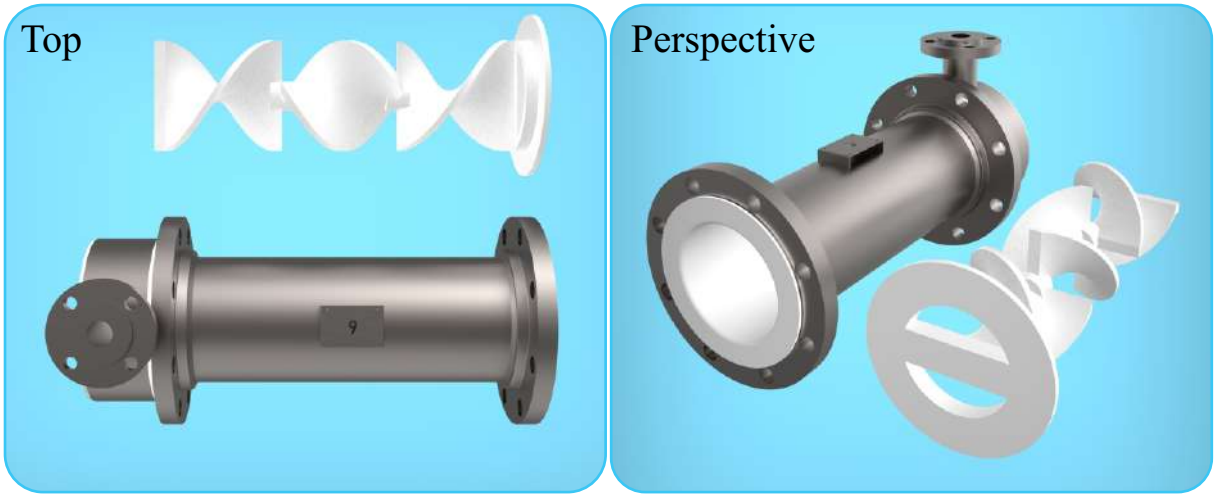


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Helical Static Mixers

Helical static mixers are widely used across various industries and are particularly suitable for fluids with medium viscosity and density. Their operation is primarily based on turbulent flow conditions (Reynolds number above 4000) and relies on three fundamental mechanisms: flow division, radial redistribution, and flow reorientation.



1- Flow Division: As the fluid passes through each element, it is split into two distinct layers. The total number of divisions after (n) elements is expressed as: **'x = 2^n'**.

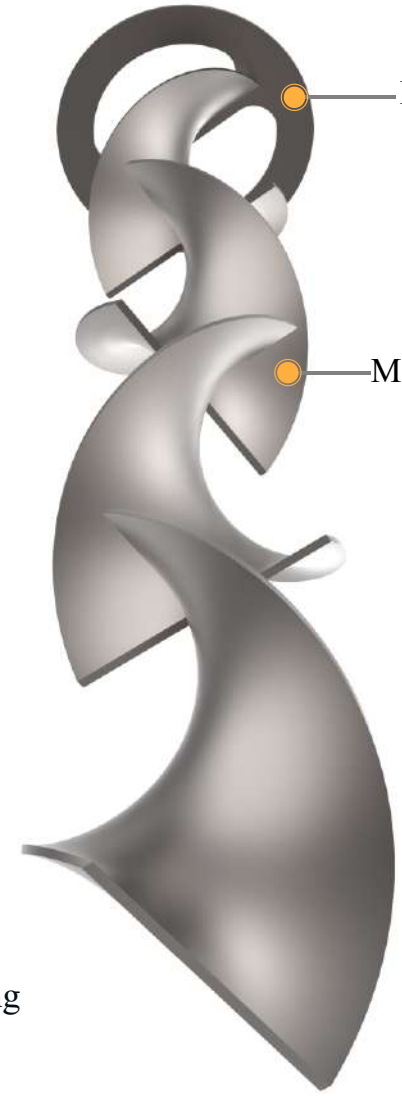
For example, in a mixer with 18 elements, the flow is divided into more than 262,144 streams, significantly increasing interfacial contact area and enhancing mixing efficiency.

2- Radial Flow Redistribution: Due to the helical geometry of the elements and the pressure drop along the mixer, the fluid is continuously transported from the center toward the wall and back to the center. This creates velocity gradients and enhances shear-driven mixing.

3- Flow Reorientation: The flow direction is rotated by approximately 90 degrees between successive elements. This continuous change in direction increases turbulence intensity and significantly improves mixing performance.

Key Applications

- Water and wastewater treatment
- Gas–liquid and liquid–liquid mixing
- Chemical reactions across low and high viscosity ranges
- Oil-in-water emulsion production
- Biodiesel production
- Antioxidant and chemical additive blending
- Inline coagulant dosing and mixing
- Viscosity adjustment processes
- pH control in process lines
- Stream homogenization for accurate sampling
- Liquid resin blending



Specifications & Features

Optional features

- Cartridge / sliding element design
- Elements manufactured from virgin PTFE
- Element coating in PE and FEP
- Provision for injection points upstream of the mixer

Available materials

- Body materials:
  - Non-metallic: GRP, GRE, HDPE, UPVC
  - Metal:CS,304 SS, 316 SS,Duplex SS, Super Duplex SS
- Flange Standards: ASME, DIN, JIS
- Flange Type: Welding Neck (WN), Slip-On (SO)



Standard Specifications of HSM Mixers

Mixer Selection

HSM Helical Static Mixers

Mixer Version Indicator

V2 Version 2

Wet Parts Material

S4	SS 304
S6	SS 316L
S4	TITANIUM
S10	HASTELLOY C-276

Mixer Size

A	1/2″	E	2″	I	6″
B	3/4″	F	3″		
C	1″	G	4″		
D	1 1/2″	H	5″		

Mixer Element Type

A	Fixed
B	Removable

####### Number Of Element

2	4		
6	8		
10	12		

######## Housing Schedule

TI	Schedule 10
TH	Schedule 40
TV	Schedule 80

######### Connection Type

0	NPT
1	ANSI 150 LBS FLANGES
2	ANSI 300 LBS FLANGES
3	Pn16, Flange (DIN2501)
4	Pn40, Flange (DIN2501)

########## Element Coat

A	N/A
B	PE Coating
C	ETFE Coating
D	FEP Coating

########### Housing Lining

1	W/O
2	Hard Rubber
3	PTFE

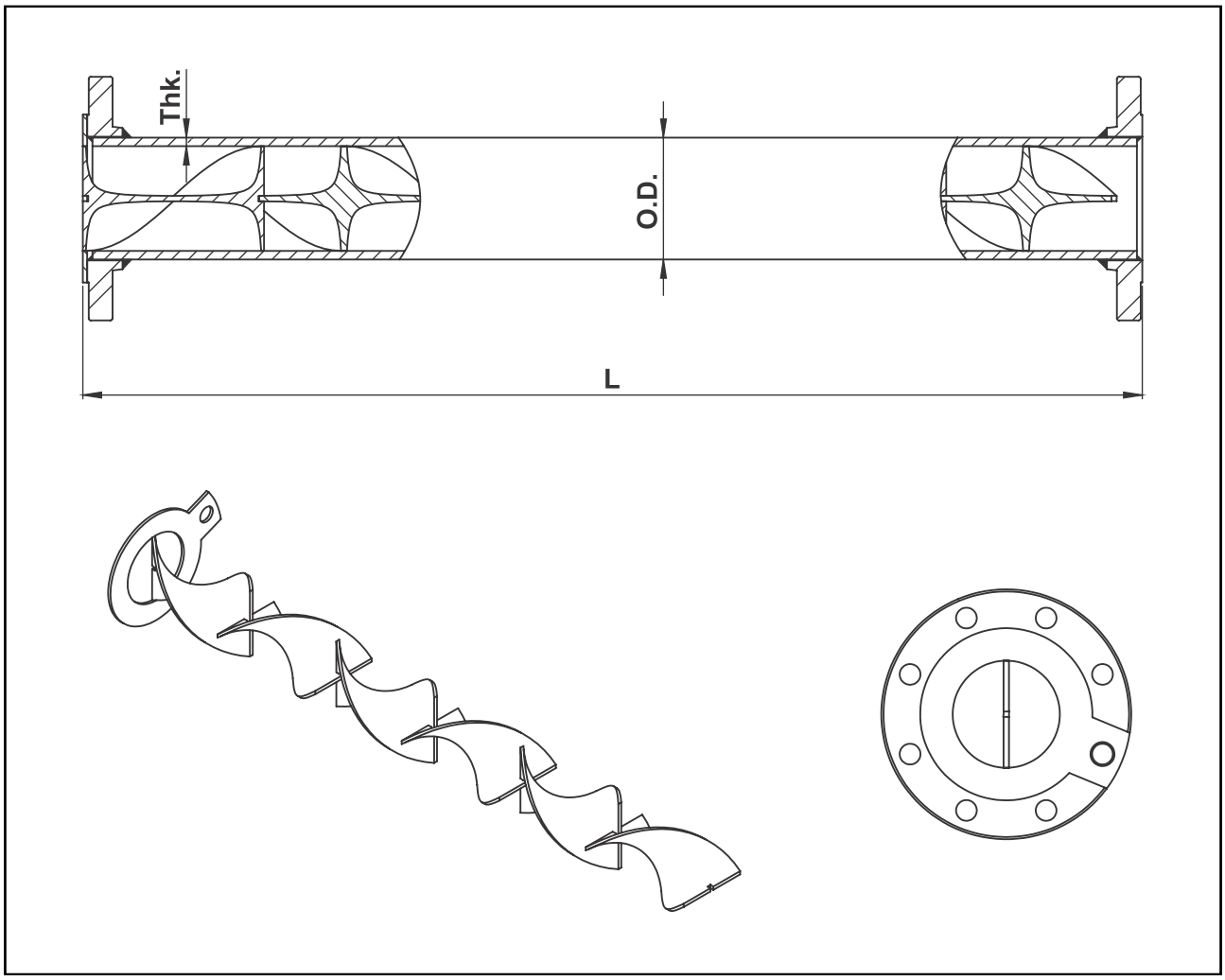
############ Number Of Injection Points

CO	W/O		
C1	1		
C2	2		
C3	3		

############# Additional Test

T1	W/O
T2	Mat. Certificate
T3	Welding TEST
T4	Pressure TEST
T5	All TEST

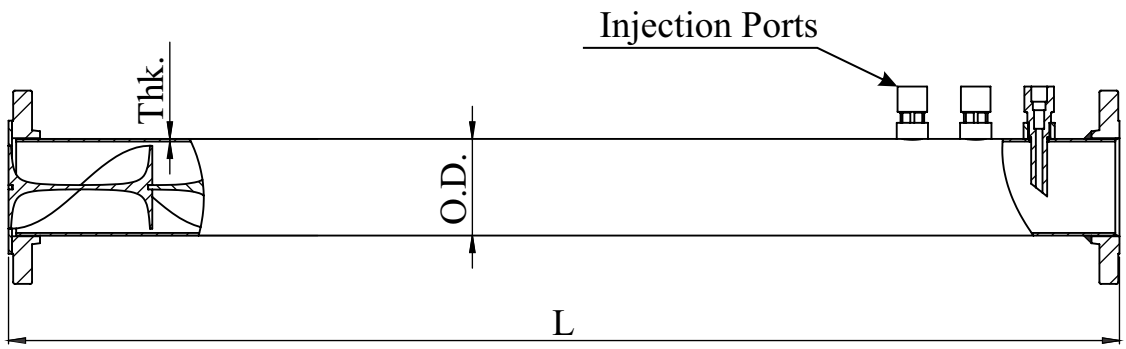
Dimensional Drawing of Helical Static With Slip On Flange



Normal Size (inch)			1/2	3/4	1	1 1/2	2	3	4	5	6
OD(mm)			21.3	26.7	33.4	48.3	60.3	88.9	114.3	141.3	168.3
HOUSING THICKNESS Thk (mm)	SCH 10		2.11	2.11	2.77	2.77	2.77	3.05	3.05	3.4	3.4
	SCH 40		2.77	2.87	3.38	3.68	3.91	5.49	6.02	6.55	7.11
	SCH 80		3.73	3.91	4.55	5.08	5.54	7.62	8.56	9.53	10.97
TOTAL LENGTH L (mm)	Element Number	2	65	85	115	155	205	295	400	430	525
		4	115	150	195	280	365	525	675	820	990
		6	160	210	275	400	520	760	980	1200	1450
		8	210	275	355	525	680	995	1290	1585	-
		10	255	335	435	645	835	1230	1595	-	-
		12	305	400	515	770	995	1460	-	-	-

- The Tolerance Of Overall Length is ± 5mm

Helical Static Mixer With Slip On Flange & Injection Quills

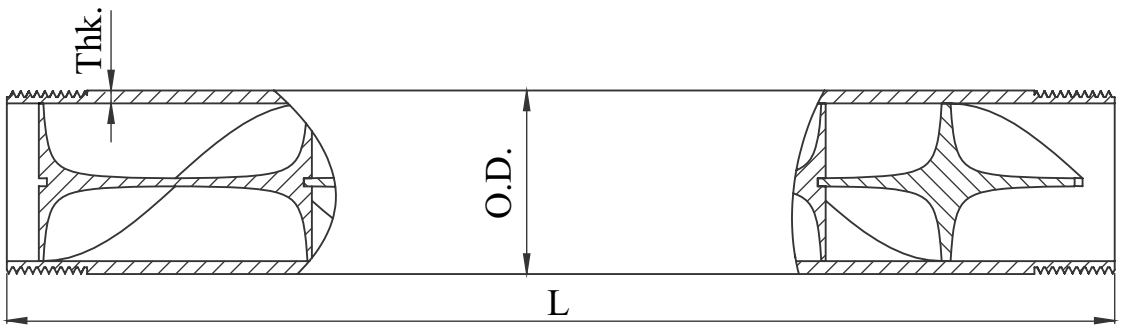


Normal Size (inch)				1/2	3/4	1	1 1/2	2	3	4	5	6
OD(mm)				21.3	26.7	33.4	48.3	60.3	88.9	114.3	141.3	168.3
Coupling Size (inch)				1.2	1.2	1.2	1.2	1.2	3.4	3.4	3.4	3.4
TOTAL LENGTH L (mm)	Element Number	2	1	165	185	215	255	305	395	500	530	625
			2	265	285	315	355	405	495	600	630	725
			3	365	385	415	455	505	595	700	730	825
		4	1	215	250	295	380	465	625	775	920	1090
			2	315	350	395	480	565	725	875	1020	1190
			3	415	450	495	580	665	825	975	1120	1290
		6	1	260	310	375	500	620	860	1080	1300	1550
			2	360	410	475	600	720	960	1180	1400	1650
			3	460	510	575	700	820	1060	1280	1500	1750
		8	1	310	375	455	625	780	1095	1390	1685	-
			2	410	475	655	725	880	1195	1490	1785	-
			3	510	575	755	825	980	1295	1590	1885	-

Injection Ports Numbers

- The Tolerance Of Overall Length is ± 5mm

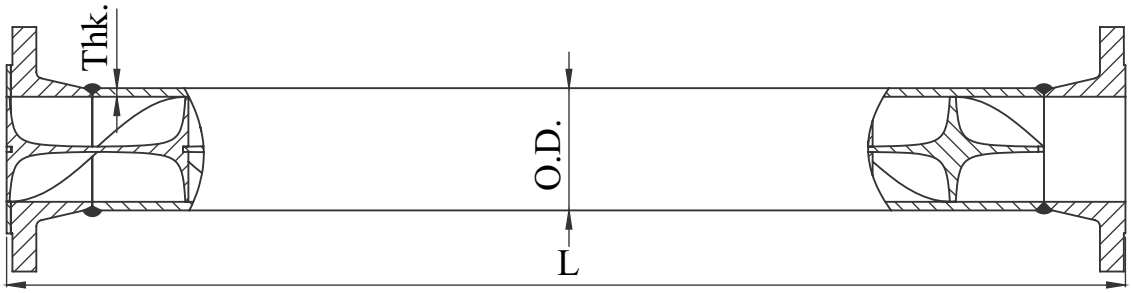
Helical Static Mixer With NPT Thread



Normal Size (inch)			1/2	3/4	1	1 1/2	2	3	4
OD(mm)			21.3	26.7	33.4	48.3	60.3	88.9	114.3
HOUSING THICKNESS Thk (mm)	SCH 10		2.11	2.11	2.77	2.77	2.77	3.05	3.05
	SCH 40		2.77	2.87	3.38	3.68	3.91	5.49	6.02
	SCH 80		3.73	3.91	4.55	5.08	5.54	7.62	8.56
TOTAL LENGTH L (mm)	Element Number	2	52	70	85	135	170	242	315
		4	100	130	165	252	325	475	622
		6	145	195	245	375	480	710	930
		8	192	258	325	498	638	945	1235
		10	240	320	405	620	795	1175	1542
		12	285	380	485	745	952	1410	1850

- The Tolerance Of Overall Length is ± 5mm

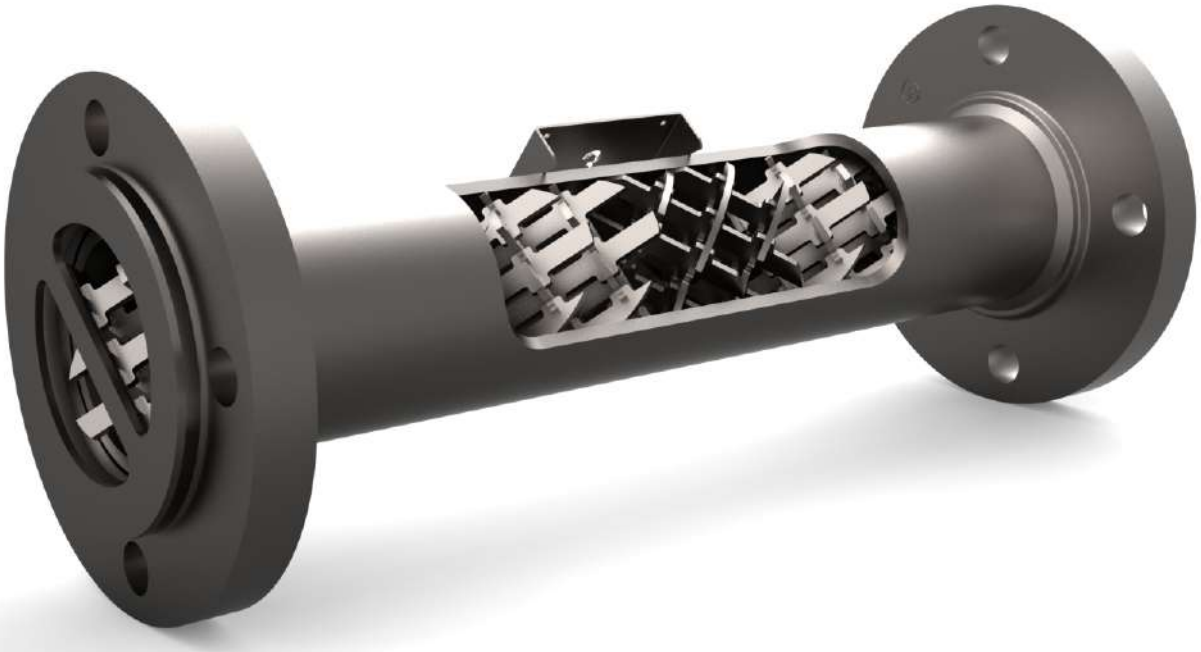
Helical Static Mixer With Welding Neck Flange



Normal Size (inch)			1/2	3/4	1	1 1/2	2	3	4	5	6
OD(mm)			21.3	26.7	33.4	48.3	60.3	88.9	114.3	141.3	168.3
HOUSING THICKNESS Thk (mm)	SCH 10		2.11	2.11	2.77	2.77	2.77	3.05	3.05	3.4	3.4
	SCH 40		2.77	2.87	3.38	3.68	3.91	5.49	6.02	6.55	7.11
	SCH 80		3.73	3.91	4.55	5.08	5.54	7.62	8.56	9.53	10.97
TOTAL LENGTH L (mm)	Element Number	2	130	160	190	235	280	375	285	535	625
		4	180	225	270	360	440	605	760	925	1100
		6	225	285	350	480	595	840	1070	1305	1550
		8	275	350	430	605	755	1075	1375	1690	-
		10	320	410	510	725	910	1310	1680	-	-
		12	370	475	590	850	1070	1540	-	-	-

- The Tolerance Of Overall Length is ± 5mm

Crossed Element Static Mixers (CESM)



Power Transmission Solutions

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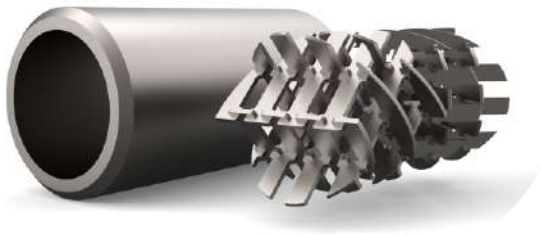
Cross Element Static Mixer (CESM)

Some of the most challenging mixing processes in industry involve fluids with significant differences in physical properties. These variations generally include:

1- Large differences in flow rate

2- Large differences in density

3- Large differences in viscosity

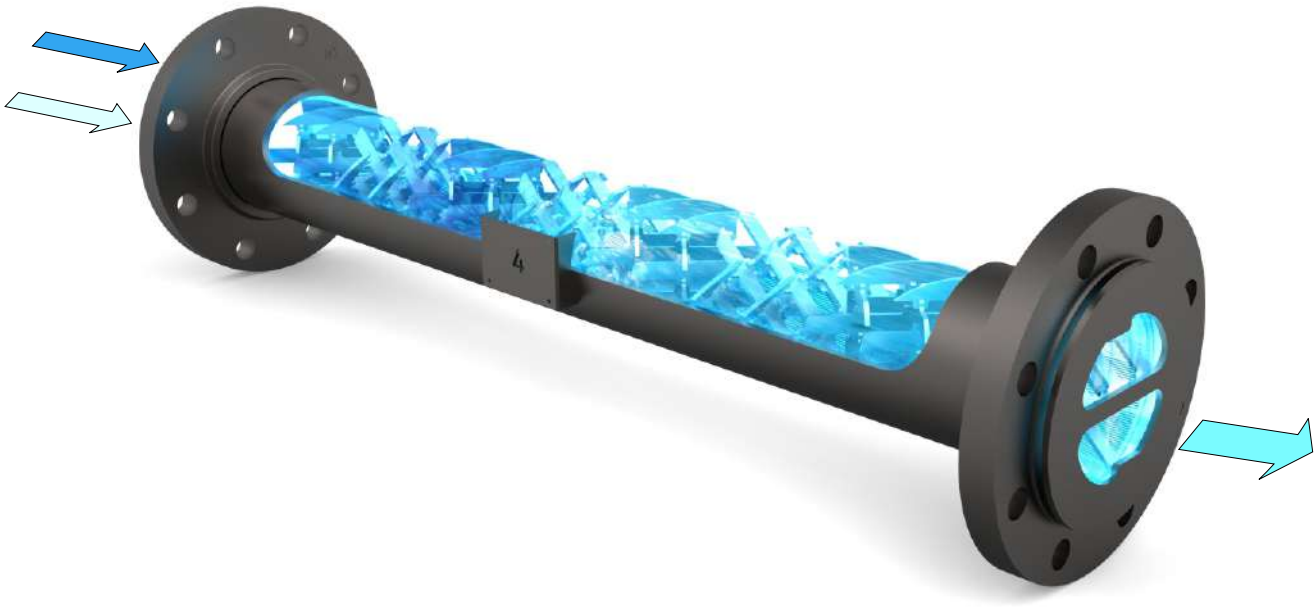


For instance, mixing fluids with similar viscosities is considerably easier than mixing fluids with highly different viscosity ranges. Under such conditions, CESM (Crossed Element Static Mixers) provide one of the most efficient solutions for achieving rapid, homogeneous, and stable mixing performance.



Cross Element Static Mixer

The operating principle of these mixers is based on continuous flow division in multiple directions and the generation of intersecting flow patterns. This mechanism significantly increases interfacial contact between fluid layers and enables efficient mixing within minimal residence time and reduced mixer length.

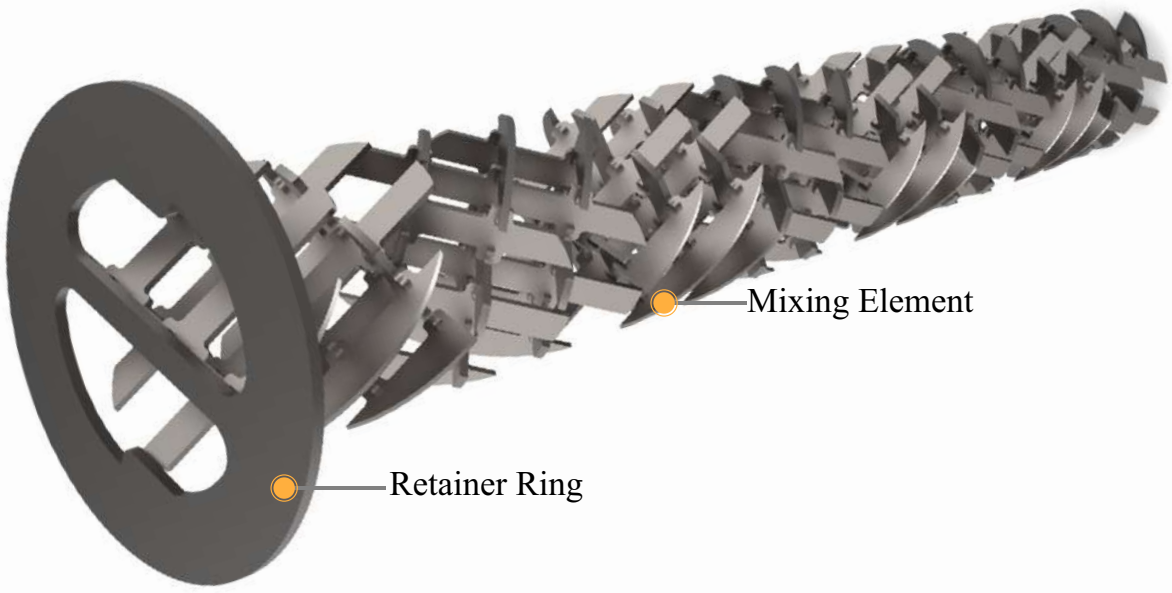


Due to the precise geometry and engineered configuration of the elements, Residence Time Distribution (RTD) is significantly improved. At the same time, the mechanical strength of the mixer is enhanced through its robust multi-joint structural design.

CESM mixers can be manufactured from a wide range of materials, including stainless steels and super alloys. In addition, the internal elements can be supplied in both welded and removable configurations.

Features of CESM Static Mixers

- Capable of mixing fluids with viscosity differences of up to one million times.
- Minimum mixer length compared to other static mixer designs
- Suitable for fluids with volumetric flow rate differences of up to one million times
- Applicable for fluids ranging from low to extremely high viscosities
- Provides exceptionally high mixing efficiency among static mixers
- Suitable for high-temperature polymer mixing applications
- Available in sizes up to 48 inches



Selection Guide for CESM Static Mixers

Mixer Selection

CESM Cross Element Static Mixer For Low Viscosities 18 Blades

Mixer Version Indicator

V2 Version 2

Housing Material

S4	SS 304	S11	HDPE
S6	SS 316L	S12	UPVC
S7	Duplex SS	S13	CS
S8	Super Duplex SS		

Mixer Size

A	1/2″	G	3″	M	12″
B	3/4″	H	4″	N	14″
C	1″	I	5″	O	16″
D	1 1/4″	J	6″	P	18″
E	1 1.2″	K	8″	Q	20″
F	2″	L	10″	R	24″

Mixer Element Type

A Fixed
B Removable

Number Of Element

2 4
6 8
10 12

Housing Schedule

TI Schedule 10
TH Schedule 40
TV Schedule 80

Connection Type

0 NPT
1 ANSI 150 LBS FLANGES
2 ANSI 300 LBS FLANGES
3 Pn6, Flange (DIN2501)
4 Pn10, Flange (DIN2501)
5 Pn16, Flange (DIN2501)
6 Pn40, Flange (DIN2501)

Element Coat

A N/A
B PE Coating
C ETFE Coating
D FEP Coating

Housing Lining

1 W/O
2 Hard Rubber
3 PTFE

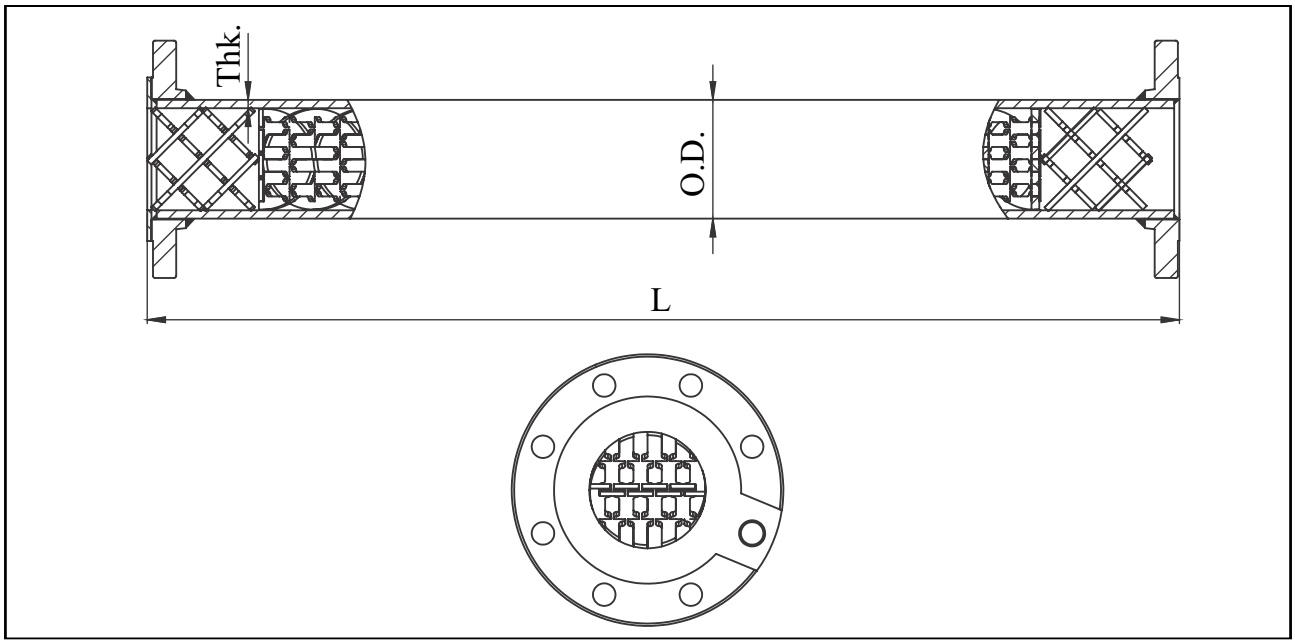
Number Of Injection Points

CO W/O
C1 1
C2 2
C3 3

Additional Test

T1 W/O
T2 Mat. Certificate
T3 Welding TEST
T4 Pressure TEST
T5 All TEST

Dimensional Drawing of CESM Static Mixer With Slip On Flange

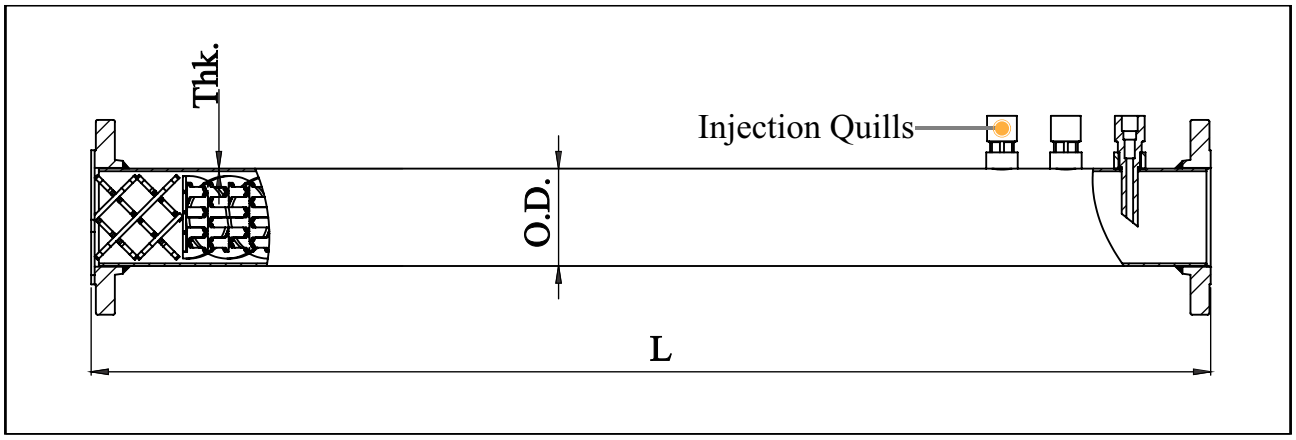


Normal Size (inch)	OD(mm)	HOUSING THICKNESS Thk (mm)			TOTAL LENGTH L (mm)					
		SCH 10/10S	SCH 40/40S	SCH 80/80S	2	4	6	8	10	12
1/2	21.3	2.11	2.77	3.73	80	80	105	135	160	195
3/4	26.7	2.11	2.87	3.91	80	95	130	175	210	250
1	33.4	2.77	3.38	4.55	80	115	165	220	270	320
1 1/2	48.3	2.77	3.68	5.08	105	180	255	335	410	500
2	60.3	2.77	3.91	5.54	120	230	330	435	425	640
3	88.9	3.05	5.49	7.62	180	330	485	640	800	950
4	114.3	3.05	6.02	8.56	230	430	650	840	1080	1300
5	141.3	3.4	6.55	9.53	285	540	820	1080	1350	1600
6	168.3	3.4	7.11	10.97	330	650	1000	1300	1650	1950
8	219.1	3.76	8.18	12.7	435	850	1300	1700	2120	2550
10	273.1	4.19	9.27	12.7	540	1080	1600	2150	2680	3200
12	323.9	4.57	9.53	12.7	635	1280	1920	2550	3200	-
14	355.6	4.78	9.53	12.7	720	1420	2150	2850	3520	-
16	406.4	4.78	9.53	12.7	820	1630	2450	3250	-	-
18	457.2	4.78	9.53	12.7	1000	1850	2750	-	-	-
20	508	5.54	9.53	12.7	1050	2050	3080	-	-	-
24	609.6	6.35	9.53	12.7	1250	2500	3700	-	-	-

Element Number

- The Tolerance Of Overall Length is ± 5mm

CESM Static Mixer With Slip On Flange & Injection Quills

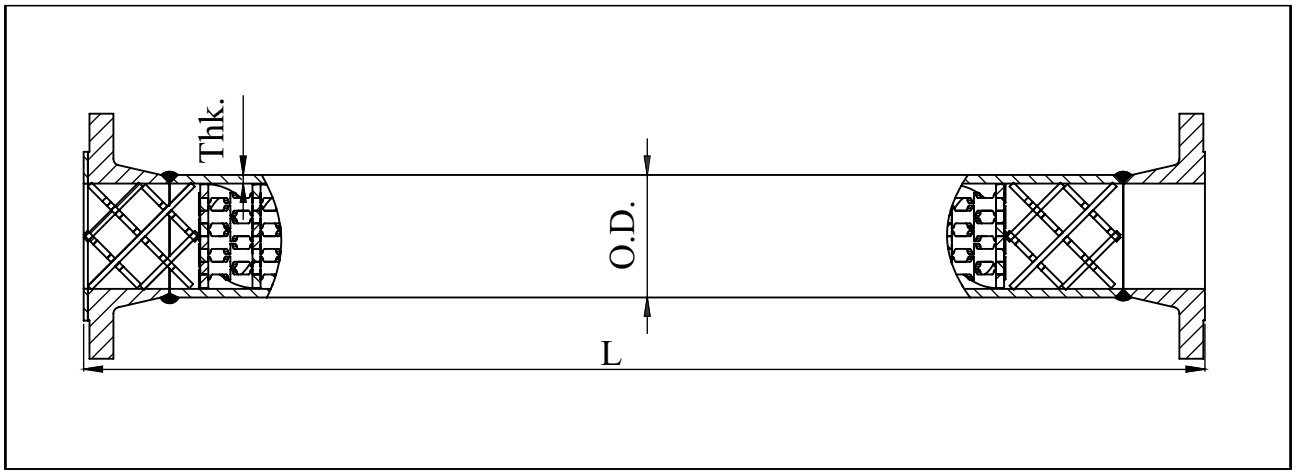


Element Number

Normal Size (inch)	OD(mm)	Coupling Size (Inch)	TOTAL LENGTH L (mm)																	
			2			4			6			8			10			12		
			1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1/2	21.3	1.2	180	280	380	180	280	380	205	305	405	235	335	435	260	360	460	295	395	495
3/4	26.7	1.2	180	280	380	195	295	395	230	330	430	275	375	475	310	410	510	350	450	550
1	33.4	1.2	180	280	380	215	315	415	265	365	465	320	420	520	370	470	570	420	520	620
1 1/2	48.3	1.2	205	305	405	280	380	480	355	455	555	435	535	635	510	610	710	600	700	800
2	60.3	1.2	220	320	420	330	430	530	430	530	630	535	635	735	525	625	725	740	840	940
3	88.9	1.2	280	380	480	430	530	630	585	685	785	740	840	940	900	1000	1100	1050	1150	1250
4	114.3	3.4	330	430	530	530	630	730	750	850	950	960	1060	1160	1180	1280	1380	1400	1500	1600
5	141.3	3.4	385	485	585	640	740	840	920	1020	1120	1180	1280	1380	1450	1550	1650	1700	1800	1900
6	168.3	3.4	430	530	630	750	850	950	1100	1200	1300	1400	1500	1600	1750	1850	1950	2050	2150	2250
8	219.1	3.4	535	635	735	950	1050	1150	1400	1500	1600	1800	1900	2000	2220	2320	2420	2650	2750	2850
10	273.1	3.4	640	740	840	1180	1280	1380	1700	1800	1900	2250	2350	2450	2780	2880	2980	3300	3400	3500
12	323.9	3.4	735	835	935	1380	1480	1580	2020	2120	2220	2650	2750	2850	3300	3400	3500	-	-	-
14	355.6	3.4	820	920	1020	1520	1620	1720	2250	2350	2450	2950	3050	3150	3620	3720	3820	-	-	-
16	406.4	3.4	920	1020	1120	1730	1830	1930	2550	2650	2750	3350	3450	3550	-	-	-	-	-	-
18	457.2	3.4	1100	1200	1300	1950	2050	2150	2850	2950	3050	-	-	-	-	-	-	-	-	-
20	508	3.4	1150	1250	1350	2150	2250	2350	3180	3280	3380	-	-	-	-	-	-	-	-	-
24	609.6	3.4	1350	1450	1550	2600	2700	2800	3800	3900	4000	-	-	-	-	-	-	-	-	-

- The Tolerance Of Overall Length is ± 5mm

CESM Static Mixer With Welding Neck Flange

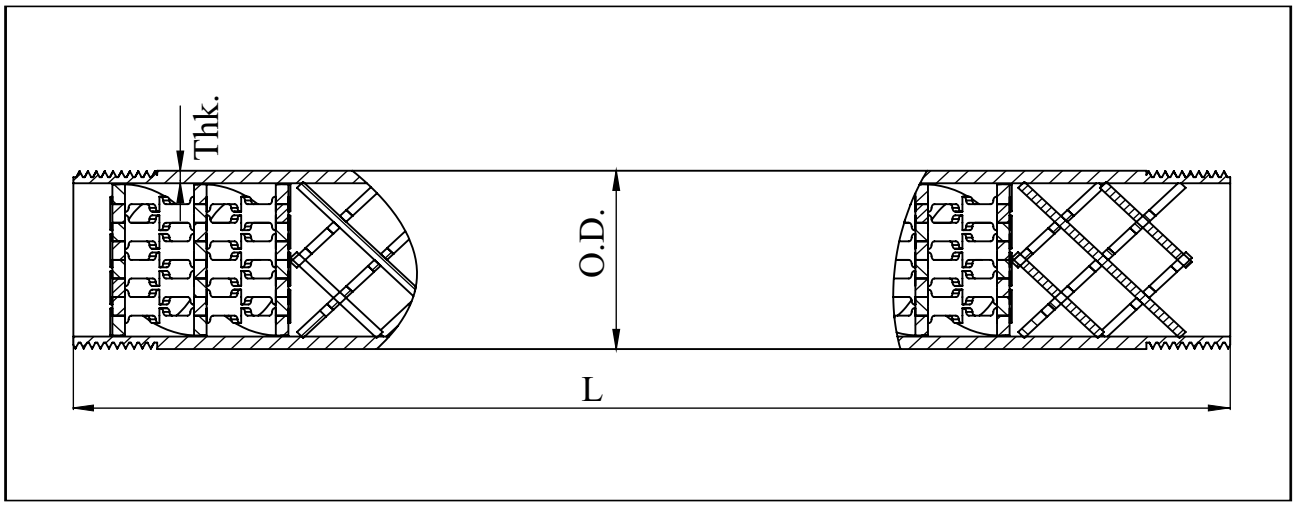


Element Number

Normal Size (inch)	OD(mm)	HOUSING THICKNESS Thk (mm)			TOTAL LENGTH L (mm)					
		SCH 10/10S	SCH 40/40S	SCH 80/80S	2	4	6	8	10	12
1/2	21.3	2.11	2.77	3.73	145	145	170	200	225	260
3/4	26.7	2.11	2.87	3.91	155	170	205	250	285	325
1	33.4	2.77	3.38	4.55	155	190	240	295	345	395
1 1/2	48.3	2.77	3.68	5.08	185	260	335	415	490	580
2	60.3	2.77	3.91	5.54	200	310	410	515	505	720
3	88.9	3.05	5.49	7.62	260	410	565	720	880	1030
4	114.3	3.05	6.02	8.56	315	515	735	945	1165	1385
5	141.3	3.4	6.55	9.53	390	645	925	1185	1455	1705
6	168.3	3.4	7.11	10.97	430	750	1100	1400	1750	2050
8	219.1	3.76	8.18	12.7	550	965	1415	1815	2235	2665
10	273.1	4.19	9.27	12.7	645	1185	1705	2255	2785	3305
12	323.9	4.57	9.53	12.7	755	1400	2040	2670	3320	-
14	355.6	4.78	9.53	12.7	860	1560	2290	2990	3660	-
16	406.4	4.78	9.53	12.7	950	1760	2580	3380	-	-
18	457.2	4.78	9.53	12.7	1150	2000	2900	-	-	-
20	508	5.54	9.53	12.7	1195	2195	3225	-	-	-
24	609.6	6.35	9.53	12.7	1390	2640	3840	-	-	-

- The Tolerance Of Overall Length is ± 5mm

CESM Static Mixer With NPT Thread



Element Number

Normal Size (inch)	OD(mm)	HOUSING THICKNESS Thk (mm)			TOTAL LENGTH L (mm)					
		SCH 10/10S	SCH 40/40S	SCH 80/80S	2	4	6	8	10	12
1/2	21.3	2.11	2.77	3.73	40	65	90	125	155	180
3/4	26.7	2.11	2.87	3.91	45	90	200	160	200	245
1	33.4	2.77	3.38	4.55	65	105	155	205	255	305
1 1/4	42.2	2.77	3.56	4.85	70	140	205	270	345	410
1 1/2	48.3	2.77	3.68	5.08	90	168	245	320	395	480
2	60.3	2.77	3.91	5.54	110	210	315	415	515	618

- The Tolerance Of Overall Length is ± 5mm

