



Kenics® Static Mixers

Kenics Static Mixer Installation, Operation and Maintenance Manual

Model:

KMS-FRP, KME-FRP or KMR-FRP

Unit Serial Number:

Equipment Number:

Manual Number:

803

For Service and Information Contact:

Chemineer, Inc.
A Unit of Robbins & Myers, Inc.

Kenics Static Mixers
125 Flagship Drive
North Andover, MA 01845
Phone: (978) 687-0101
Fax: (978) 687-8500
www.kenics.com

GENERAL: Your Kenics® Mixer is a rugged piece of process mixing equipment manufactured to demanding design and quality standards. This manual has been provided to assist you in the storage, handling, installation and operation of your mixer and should be reviewed carefully before removing the mixer from the package. Adherence to a very few precautions will assure a highly satisfactory installation and years of trouble free service.

The few difficulties encountered with Kenics® Mixers most often result from improper handling, installation and operating procedures. The following quick checklist should assist you in avoiding any difficulties:

1. Flanged mixers should not be bolted into systems where misalignment or gaps exist between the mixer and mating flanges. This can be especially critical to plastic (FRP, PVC or CPVC) mixers. Follow flange tightening instructions later in the manual.
2. Plastic (FRP, PVC or CPVC) mixers must be handled and stored with care. Never use chains, cables or fork lifts in direct contact with the mixer. If the mixer is too large or heavy to be moved manually, use a web sling or two heavy cloth straps spaced at least ½ the mixer length apart. Lifting lugs, if provided, should be used. Never drag or push the mixer; always lift it.
3. Mixers should be operated within process and pressure/temperature limits specified. Consult your local representative or the factory prior to changing operating conditions.
4. Injection of side streams prior to the mixer can be very important to operation of the mixer where large viscosity, density or volumetric differences exist. Refer to the Operation Section of this manual, consult your local representative or the factory for specific recommendations.
5. Some Kenics® Mixers are equipped with loose, removable internal components as specified on the equipment order drawing. Extreme care should be exercised in handling and lifting in order to avoid damage and personal injury.

For dimensional and construction information refer to the PARTS DRAWING in this manual and to the equipment order drawing supplied with your mixer.

INSPECTION AND/OR SHIPPING DAMAGE: Your Kenics® Mixer was carefully packaged, crated or protected for shipment. However, upon receipt it should be carefully inspected for any shipping damage. Any damage should be reported immediately and a claim filed with the responsible carrier. Your local Chemineer-Kenics representative or the factory Customer Order Service Department can assist with claims.

Shipping package contents should be inspected for conformity with your order and for proper unit quantities. Any discrepancies should be reported to the factory Customer Order Service Department within one week of receipt.

STORAGE AND HANDLING: All Kenics® Mixers should be stored indoors in clean, well-ventilated storage areas. Care should be taken to see that excessive loads are not applied to the mixer during storage. Sealing surfaces (threads and flanges) should be protected. The original shipping container is adequate protection for most storage conditions. A rust-preventative paint is applied to carbon steel external surfaces prior to shipment. For external storage in harsh environments additional coating or protection may be required.

Mixers must be handled with appropriate care. Careless handling may result in permanent damage.

FIELD MODIFICATION TO KENICS® MIXERS: No field modifications (cutting to length, addition of fitting, etc.) to Kenics® Mixers should be made without prior consultation with your local representative or the factory. Integrity of the mixing elements can be seriously altered without proper instructions.

OPERATION: There are a few special operating instructions required with Kenics® Mixers. Your mixer was designed based upon the flow rate specified and most efficient performance will occur at that rate. The mixer, however, will accommodate wide flow variations in most processes. Consult you local representative for specific recommendations.

The nameplate on your mixer and the equipment order drawing include product pressure/temperature rating information. These ratings should not be exceeded. For service conditions other than the specified ratings, consult your local representative or the factory

INJECTION AND METERING: Since the Kenics® Mixer is a radial mixer having characteristics approaching a plug flow device, a minimum amount of backmixing is achieved. In order to maintain this characteristic, excessive surging or pulsating of the feed components should be minimized to avoid nonuniformity of the final product. This can be especially important with certain applications including addition of a caustic or acid for pH control or blending of wide viscosity streams. It is therefore important that the upstream equipment including the type of pump and injection method be considered when designing mixer systems.

PUMP SELECTION: For low viscosity systems (500cPs or less) with constant head, centrifugal pumps may be used. With fluctuating heads, a valving system to control flow is necessary to maintain proper on-stream metering. For high viscosity systems and/or high pressure operations, rotary positive displacement types such as gear pumps and screw pumps are recommended.

For reciprocating piston pumps (which have an inherent pulsating action) and accumulator should installed before the flow discharge to the mixer in order to dampen the pulsating effect. High pulse rate or multihead types of pumps can also be used to maintain a steady discharge flow.

Refer to published industry standards and engineering guidelines for recommended practice relating to the design and selection of pumps and piping systems.

INJECTION METHODS

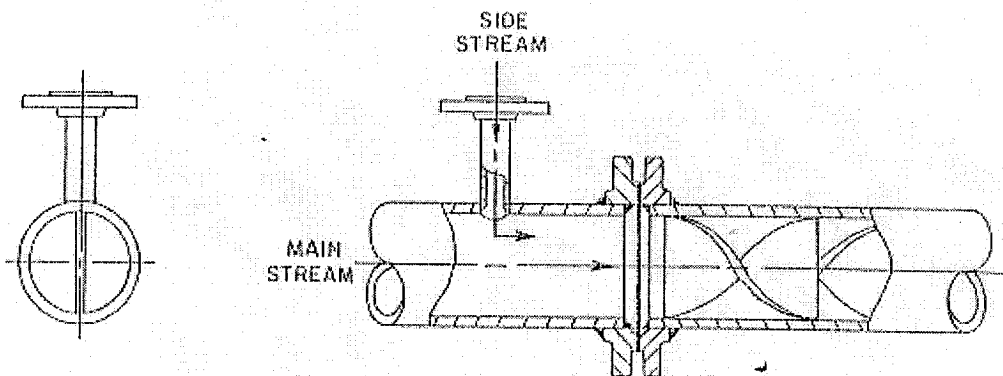
COMMON APPLICATIONS: Side stream introduction normally does not require special consideration and can be simply accomplished by any convenient method including standard 'T' or 'Y' type connections. Most blending applications where three elements or more are utilized and dispersion applications where six elements or more are used do not require special side stream introduction. For certain applications involving extreme volumetric ratios or widely differing viscosities, or where minimum elements are used, injection can be more critical and the following configurations are recommended:

METHOD 1 - For liquid-liquid or gas-gas blending using the two-element design...

- ...with volumetric ratios less than.....100:1
- ...or viscosity ratios less than.....1,000:1
- ...or liquid density ratios less than.....2:1
- ...or gas density ratios less than.....5:1

The side stream introduction point should be as close as possible to the first element, usually no more than 1-2 pipe diameters upstream. Introduction should be in the center of the pipe and parallel to the leading edge of the first element as shown above. The side stream velocity should be equal to approximately twice the mainstream velocity.

Where the above component ratios are exceeded, for either blending or dispersion, Method 2 injection is preferred.



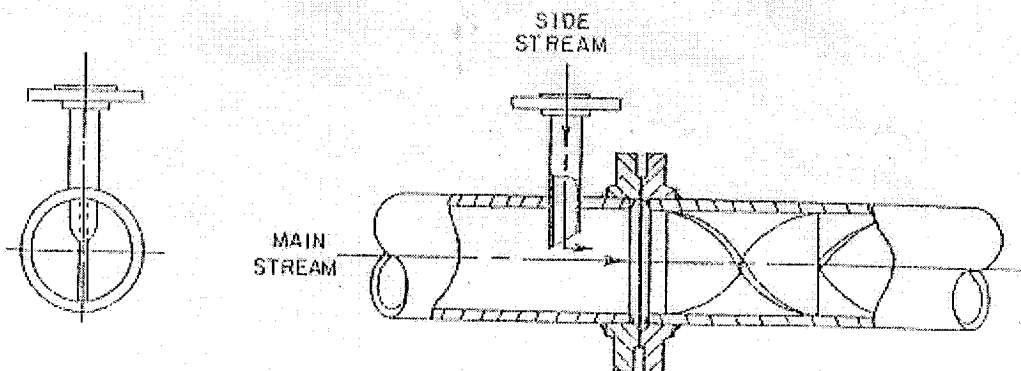
METHOD 2 -For liquid-liquid or gas-liquid dispersion using a four-element design...

...or volumetric ratios are greater than.....100:1

...or viscosity ratios are greater than.....1000:1

...or liquid density ratios are greater than.....2:1

When any of the above design conditions exists, a true injector which crosses the pipe wall and approaches the centerline, as shown below, is preferred to the nozzle introduction shown under Method 1



The smaller stream should be injected into the main flow. The injector tip of the minor component should be in the center of the pipe as close to the leading edge of the first element as possible, ideally less than one pipe diameter. Injection should be parallel to the leading edge of the first element as shown above. The side stream velocity should be approximately two times the mainstream velocity, regardless of components viscosities.

For viscosity ratios much greater than those shown, mixer performance can be affected by shear rate, absolute viscosity level, flow rates and non-Newtonian characteristics. Consult Chemineer-Kenics for specific recommendations.

MAINTENANCE: Kenics mixers require no routine maintenance other than sealing joint care typical to the rest of the piping system. For mixers with removable elements (KMR, KMR-PTFE and Sanitary) the element assembly may be removed for periodic cleaning or inspection by disconnecting the adjacent downstream component which must be as long as the mixer in order to extract the mixing element. Otherwise, both ends of the mixer must be disconnected and the mixer removed from the pipeline.

If the mixer supplied contains removable elements, note the warning below.

CAUTION

**THIS EQUIPMENT CONTAINS REMOVABLE
INTERNAL COMPONENTS, HANDLE WITH
CARE TO PREVENT DAMAGE OR INJURY.**

INSTALLATION, GENERAL: Kenics® mixers can be located anywhere in your piping system and may be installed vertically, horizontally or at any intermediate angle. The mixing action produced by the mixer continues for some distance downstream and it is desirable to leave considerable distance after the mixer to achieve uniformity, such as in sampling, or prior to manifolds and where disengagement of phases can occur, the mixer should be located no more than 1-2 pipe diameters from the desired result.

Style KME-FRP mixers are designed for installation in commonly used piping systems and are available with flanges or plain ends. Refer to your equipment order drawing for the specific end option hardware supplied.

Before installation, purge process lines to remove foreign material and debris. In most new construction or modifications to process piping there is a high probability of foreign material within the system, which if not removed could damage the mixer.

FLANGES MIXERS: Flanged mixers should fit snugly into your piping system without gaps or misalignment at either end. It is poor practice to over-tighten flange bolts in order to compensate for misalignment or gaps in the piping system. Flange distortion or housing to flange joint fracture may occur.

When installing a flanged mixer, do not use the flange bolts to pull the mating flange connection to the mixer. Where misalignment gaps exist between mating flanges and the mixer, repositioning of the mating connection is recommended before assembly and installation.

Soft, resilient, full face, flat gaskets (1/8" or 3/16" thick) with a Shore A durometer rating of 40 to 50 should be used. Depending upon plant standard, materials being handled or gasket supplier recommendations, a wide variety of gasket materials can be used.

Some sizes of KME-FRP mixers are furnished with flat face socket flanges which have an "O" ring groove to be used with either an "O" Ring or a flat gasket.

Recommended mounting hardware is a hex head bolt, hex-nut and two flat washers per bolt hole. Lubricate the bolt thread, the underside of the head and both faces of the washer. Assemble all hardware finger tight. Tighten the bolts in increments of 25% of the recommended bolt torque as shown in the table below, loading all bolts at each increment before proceeding to the next increment. Use a criss-cross pattern as you would tighten the lug nuts of a tire.

RECOMMENDED BOLT TORQUE

PIPE I.D. INCHES	RECOMMENDED BOLT TORQUE IN FOOT POUNDS AT PRESSURE RATINGS			
	25PSI	50PSI	100PSI	150PSI
1	5	5	8	8
1.5	5	5	10	10
2	5	5	10	10
2.5	5	5	10	10
3	5	10	10	10
4	5	10	10	10
6	5	10	10	15
8	10	10	17	25
10	10	10	20	30
12	10	15	30	40
14	10	20	40	60
16	10	20	40	60
18	15	30	60	90
20	15	30	60	90
24	25	45	95	140
30	30	55	105	CF
36	40	80	155	CF
42	50	95	190	CF

CAUTION

**DO NOT OVER-TIGHTEN FLANGE BOLTS.
USE RECOMMENDED BOLT TORQUE
PROCEDURES TO AVOID FLANGE
DISTORTION OR JOINT FRACTURE.**

When final torque value is reached follow a rotational pattern (clockwise) until all bolts are stable at final torque value. Two complete times around is usually sufficient.

PLAIN ENDED MIXERS: KME-FRP mixers are supplied with plain ends for installation directly in a piping system for those customers who are skilled in FRP butt wrap joining methods.