

Kenics Static Mixer Installation, Operation and Maintenance Manual

Model:

KMA MIXERS

Unit Serial No.:

Equipment No.:

Manual No.:

802

For service and information contact:



P. O. Box 1123
Dayton, Ohio 45401

INSTALLATION, OPERATION AND
MAINTENANCE MANUAL

KMA STYLE MIXERS

MANUAL NO. 802 REV. 1/1/82

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FACTORY: Chemineer Kenics
North Andover, Mass. 01845
Refer to the front cover of this manual for the
name and address of your local Chemineer Kenics
representative.

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 check list 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, 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 1/2 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 or 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.

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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 (thread & 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 extended 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 fittings, 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 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 your local representative or the factory 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 type of pump and injection method be considered when designing mixer systems.

PUMP SELECTION: For low viscosity systems (500 cps 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) an accumulator should be 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.

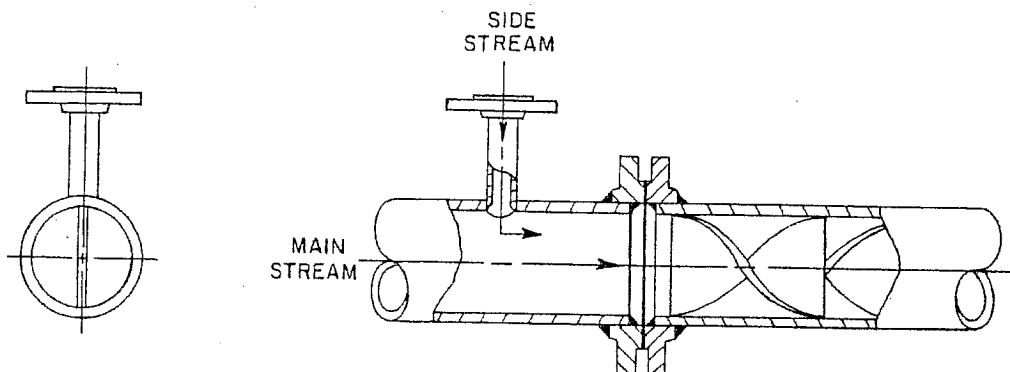
Refer to published industry standards and engineering guide lines for recommended practice relating to the design and selection of pumps and piping systems.

INJECTION METHODS

COMMON APPLICATIONS: Sidestream 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 (Model 3) or more are utilized and dispersion applications where six elements (Model 6) or more are used do not require special sidestream introduction. For certain applications involving extreme volumetric ratios or widely differing viscosities, or where minimum models are used (Model 2 for blending or Model 4 for dispersion), injection can be more critical and the following configurations are recommended:

METHOD 1 - For liquid-liquid or gas - gas blending using a two element design (Model 2)

with volumetric ratios less than..... 100:1
 or viscosity ratios less than..... 1000:1
 or density ratios less than (liquids)..... 2:1
 or density ratios less than (gases) 5:1

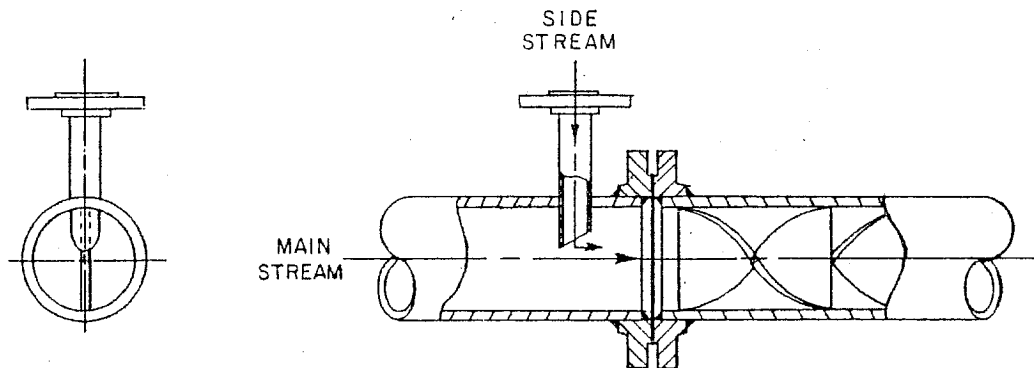


The sidestream introduction point should be as close as possible to the first element, usually no more than 1-2 pipe diameters upstream. Introduction should be in the center of the pipe and parallel to the leading edge of the first element as shown above. The sidestream velocity should be equal to approximately 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 (Model 4)

or volumetric ratios greater than..... 100:1
or viscosity ratios greater than..... 1000:1
or density ratios greater than (liquids)..... 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 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 and 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 sidestream velocity should be approximately two times the mainstream velocity, regardless of component viscosities.

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

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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 pipe line.

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.

GENERAL: KMA style mixers are element assemblies for installation by the customer, and supplied for field welding into customer's housing or alternately for removable field installation (12" and smaller). Refer to equipment order drawing for option supplied. From 1/2" to 12" diameter, the assemblies are welded together as a string requiring welding only on both ends. Over 12" diameter, KMA mixers are supplied as individual elements, each of which must be welded inside the pipe separately. Refer to the equipment order drawing for the size and number of elements required.

KMA style mixers are manufactured with precise tolerances on the element diameter and are designed for a slip fit into appropriate size standard pipe which is within applicable ASTM specifications. No field trimming or fitting is necessary. For non-standard pipe or custom housings, elements are supplied to fit the minimum inside diameter as specified by the customer, without need for field trimming.

INSTALLATION INSTRUCTIONS

FIELD WELDING OF KMA
STYLE MIXERS

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KMA STYLE MIXERS FOR FIELD WELDING, UP TO 12" DIAMETER:

Element strings need only be inserted into the pipe section so that the recess on each end is approximately equal.

The length of the pipe section must be long enough to accommodate the element string yet not so long as to make the end elements inaccessible for welding. Recommended recess is one half the pipe diameter or one inch, whichever is less.

Prior to welding, the element assembly should be centered in the pipe diameter using removable shims.

Welding procedure should be in accordance with good welding practice for the material supplied. The length, location and size of the retention weld is shown on the KMA WELDING DATA SHEET included in this manual.

KMA STYLE MIXERS FOR FIELD WELDING, 14" DIAMETER & LARGER:

KMA style mixers 14" diameter and larger are supplied as individual elements, each of which must be welded inside the pipe separately as shown on the KMA WELDING DATA SHEET included in this manual.

Element orientation must be alternating right hand/left hand with each element radially displaced from the adjacent element by 90°.

Prior to installing the elements in the housing, the elements should be laid out on the floor to see that alternating right and left hand elements have been properly supplied and are in proper sequence. Note that only three elements can be welded into a single pipe spool. Any number of elements can be joined together using additional pipe spools. However, when joining spools together see that alternating right and left hand elements meet at 90°.

Prior to welding, each element should be centered in the pipe diameter using removable shims.

Welding procedure should be in accordance with good welding practice for the material supplied. The length, location and size of the retention weld is shown on the KMA WELDING DATA SHEET.

KMA STYLE MIXERS FOR REMOVABLE/ROD RETENTION:

KMA mixers with removable rod retention as shown on the PARTS DRAWING are designed to engage a field welded rod of the diameter specified which must be installed downstream of the element assembly. Care should be taken to insure that back flow does not occur which will disengage the assembly and cause damage upstream.

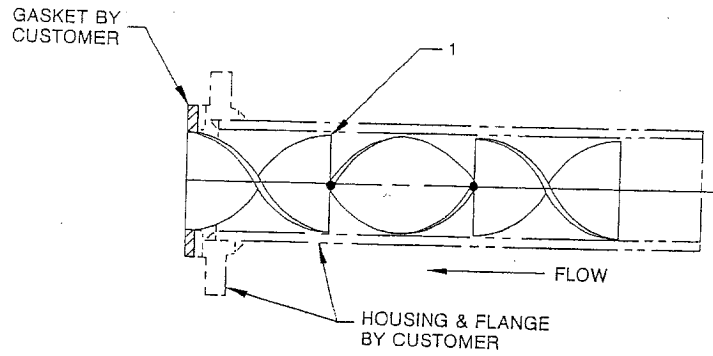
To install proceed as follows:

Refer to the PARTS DRAWING for KMA REMOVABLE/ROD RETENTION.

1. The upstream end of the element assembly is provided at a larger diameter than the specific pipe I.D. These two edges should be hand ground for a slip fit into the pipe. Grind an equal amount from each edge so that the assembly will be centered in the pipe diameter.
2. Insert the element assembly into the pipe to the desired position. The element assembly should be rotated so that the notch on the downstream element is in the horizontal plane.
3. A rod of the diameter shown in the Table should be cut to fit across the pipe diameter. Insert the rod so that it engages the notch. Tack weld the rod to the pipe inside wall on both ends.
4. Slide the element assembly upstream enough to provide room to weld the rod in place for its full circumference on both ends. Follow good welding practice for the material used.
5. Reposition the element assembly to engage the rod.

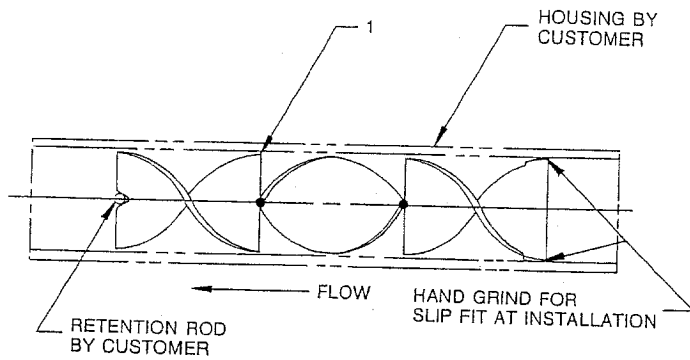
KMA STYLE MIXERS FOR REMOVABLE/RING RETENTION:

KMA mixers with removable ring retention as shown on the PARTS DRAWING can be installed at any flanged joint in the piping system. The ring end should be downstream of the element assembly, and an adequate straight run of pipe must be upstream of the flanged joint to accept the mixer. Two flanged gaskets, one on each side of the ring, are required.



ITEM	DESCRIPTION	MAT'L
1	Removable Element Assembly W/Retention Ring	1

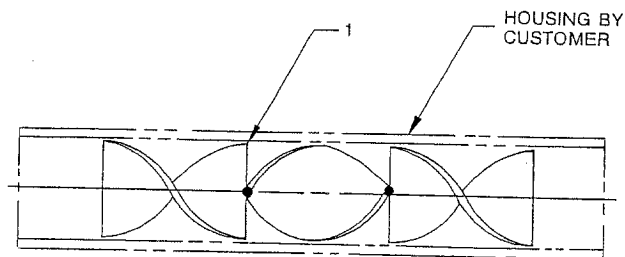
FOR RING RETENTION



PIPE SIZE	ROD DIA
1/2" - 1 1/2"	1/8"
2" - 4"	1/4"
6" - 8"	3/8"
10" - 12"	1/2"

ITEM	DESCRIPTION	MAT'L
1	Removable Element Assembly W/Notch	1

FOR ROD RETENTION



ITEM	DESCRIPTION	MAT'L
1	Element Assembly	1

FOR FIELD WELDING 2

- NOTES: 1 Refer to equipment order drawing for materials of construction.
 2 Model 3 shown. Other models ranging from 2 to 24 elements available. Refer to equipment order drawing for model supplied.
 3 Optional configurations shown in figures above. Refer to equipment order drawing for retention method supplied.

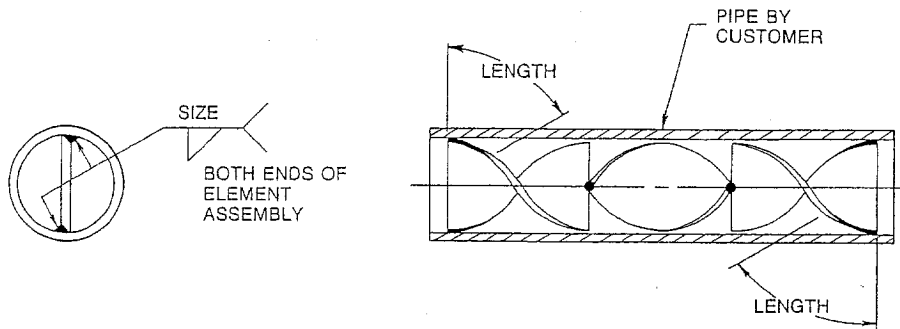


FIGURE 1
WELDING OF ELEMENT ASSEMBLY (1/2"-12" DIA.)

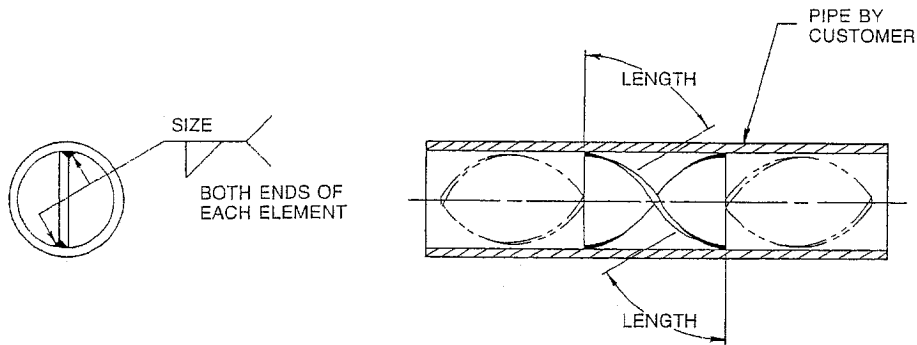


FIGURE 2
WELDING OF INDIVIDUAL ELEMENTS (14" DIA. & LARGER)
ALTERNATE RIGHT AND LEFT HAND ELEMENTS WITH
ENDS RADIALLY DISPLACED AT 90° AS SHOWN.

PIPE SIZE	RETENTION WELD		MAX. NUMBER OF ELEMENTS PER SINGLE SECTION OF PIPE	RETENTION WELD NUMBER & LOCATION
	SIZE	LENGTH		
1/2	1/16	3/16	24	TWO WELDS (4 TOTAL) ON BOTH ENDS OF ELEMENT ASSEMBLY AS SHOWN IN FIGURE 1
3/4	1/8	1/4		
1	1/8	5/16		
1 1/2	1/8	3/4	18	
2	3/16	1		
2 1/2	3/16	1 1/2	12	
3	3/16	2		
4	3/16	3	6	
6	3/16	4		
8	1/4	5		
10	1/4	6		
12	1/4	7	3	
14	3/16	5		
16	3/16	6		
18	3/16	6		
20	3/16	7		
24	3/16	8		
30	1/4	10	LIMITED ONLY BY LOCAL SAFETY REQUIREMENTS	TWO WELDS (4 TOTAL) ON BOTH ENDS OF EACH ELEMENT AS SHOWN IN FIGURE 2
36	1/4	12		
42	1/4	14		