

# Installation Operation & Maintenance Manual

Prepared By:



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## Revision Record

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Prepared By



# H2O Rx

H2O Rx

Email: [info@h2orx.com.au](mailto:info@h2orx.com.au)

Web: [www.h2orx.com.au](http://www.h2orx.com.au)

Phone: 0421 795 353 / 0409 784 236

## Installation

### Overview

Installation should be carried out by experienced piping installation contractors following all necessary OH&S and construction legislation, regulation, standards and codes of practice.

### Lifting

There are no special lifting requirements for mixers under 20 kg.

### Orientation

The static mixer must be orientated so that the mixing tabs protrude to the downstream pipeline, and such that the tips of any injection quills are “behind” the tabs. Refer to Figure 1 - Flow Direction.

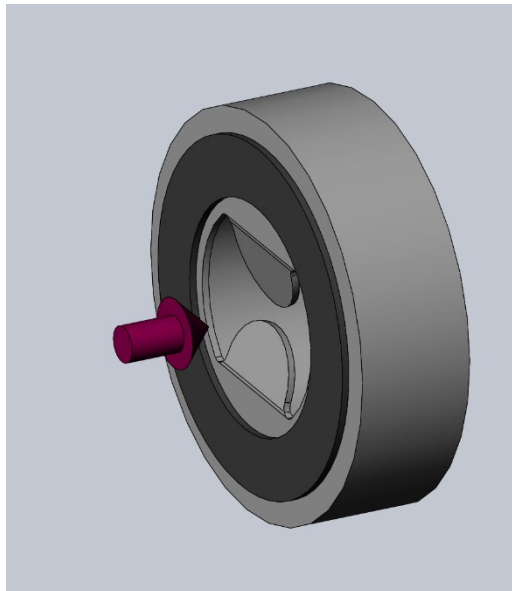


Figure 1 - Flow Direction

### Fixing

The mixer should be bolted up between two flanges and held central to the pipe axis. The gasketing and bolting hardware should be in accordance with the relevant flange standards.

Bolts should be tightened in a “cross pattern” sequence to ensure even gasket compression. Bolt torques should be as defined in the relevant flange standards.

### Testing

There are two key tests that can be done on the installed static mixer. Both require pre-planning and additional hardware.

The tests should be done with clean water as a process medium.

## **Headloss**

The pressure drop across the mixer is a function of flow rate. This requires a method of accurately recording the flow rate through the static mixer, and pressure measuring approximately 1/3 diameters upstream and downstream of the static mixer. If pressure gauges are used, snubbers should be fitted.

At a range of flows, the difference between the pressure upstream and downstream of the mixer should be recorded and plotted against the theoretical headloss calculated from the headloss coefficients lists in the table below.

Beta Pate	Headloss Coefficient (Kv)
0.7	32.59
0.8	13.63
0.9	6.78

## **Mixing Efficacy**

Mixing efficacy tests are used to measure the mixing performance.

At 10 diameters downstream of the mixer sample quills should be installed at 90 deg apart on the pipe diameter.

At a constant and known flow rate, a known dose rate of a trace chemical should be dosed at the mixer.

Samples are to be taken at 5 locations on each pipe diameter by retracting the injection quill in steps, such that 10 samples are taken.

The 10 samples should be analysed and the standard deviation determined.

The theoretical concentration should be determined from the trace chemical flow rate and the process water flow rate. This is the mean concentration.

The co-efficient of variance should be calculated by dividing the standard deviation by the mean concentration.

The coefficient of variation should be equal to or better than (ie lower number) than in the table below.

Beta Pate	Coefficient of Variation (CoV)
0.7	0.008
0.8	0.009
0.9	0.05

## **Commissioning and Example**

First determine the mean concentration of the trace chemical:

	Example	Mixer 1	Mixer 2
Process Flow (L/s)	8000		
Trace Chemical (L/s)	100		
Mean Concentration	0.0125		
Mean Concentration (%)	1.25		

Now determine the standard deviation:

Sample	Example	Mixer 1	Mixer 2
1	0.012		
2	0.0122		
3	0.0121		
4	0.0126		
5	0.0128		
6	0.0127		
7	0.0125		
8	0.0129		
9	0.0121		
10	0.0123		
Standard Deviation	0.000322		

Calculate the CoV:

	Example	Mixer 1	Mixer 2
Standard Deviation	0.000322		
Mean	0.0125		
CoV	0.02576		

## Operation

### Overview

Static mixers are passive devices and do not require any special procedures for operation. If the process becomes more difficult to control over time, then the testing should be performed and compared to the original installation test data.

## Maintenance

### Overview

Under normal circumstances there is no maintenance required, however with some applications cleaning may be required. This is usually noticed with an increase in headloss over time.

### Cleaning

Using all necessary isolation procedures, isolate and depressurise the pipeline. Using dismantling joints in the pipework remove the static mixer. Clean the mixer by pressure washing or scale removal before returning it to service.