

# Vibro™-I Manual



Please be sure to read this entire user manual prior to use of the equipment.

Please read all safety instructions carefully.

This user manual is part of the product. Keep it in a safe place for future reference.

Replacement manuals can be downloaded from our Webpage at: [www.sanimembranes.com](http://www.sanimembranes.com)

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# 1. Description

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## a. Introduction

The Vibro™-I is an industrial filtration solution for applications where low energy consumption, high flux, sanitary function, low capital investment and gentle filtration are key words. The Vibro™-I delivers continuous low fouling filtration where the filter is kept clean by vibration shear.

The membrane module vibrates vertically while the patented Vibro™ technology makes the media inside the module stationary. The relative vibration of media and membrane creates turbulence on the membrane surface and thereby keeps the fouling layer at a minimum. The turbulence is only created at vertical surfaces. Thus, the energy required to create the turbulence at the membrane surfaces is minimized. Because the Vibro-I only creates turbulence at the membrane surfaces, the need to cool the retentate is reduced and most often eliminated, which again adds to the energy savings.

The Vibro™-I handles the feed solution very gently as no large circulation pump is needed. A conventional circulation pump can damage cells, molecules etc. during operation. By eliminating the circulation pump Vibro™-I has become the most product gentle industrial scale MF and UF system on the market.

The elimination of the circulation pump also gives you virtually uniform trans membrane pressures throughout

the unit. The uniform TMP gives you the sharpest membrane cut-offs of any industrial system.

Due to the open design of the Free Flow Plate™ Module (HP1), the Vibro™-I can handle very difficult products with high viscosity, high mass loadings and even high particulates. When extremely difficult feeds are processed, it is possible to homogenize the retentate in the Vibro™ systems by attaching a “slow” circulation pump.

The Vibro™-I is fully drainable of both retentate and permeate. Thus, no product loss and faster CIP cycles.

The Vibro™-I utilizes the 2,5 m<sup>2</sup> Free Flow Plate™ module (HP1) and comes with 7,5; 15 or 20 m<sup>2</sup> membrane as 1-tower units and with 60 or 80 m<sup>2</sup> membrane as a 4-tower unit. Units can be connected in series or parallel depending on your needs.

The tower configuration and the elimination of circulation pumps, cooling aggregates, booster pumps and intricate piping layout gives the Vibro™-I systems a small footprint. All media contacting parts are in durable polymeric materials or stainless steel. The Vibro™-I can conform to GMP/FDA materials and sanitary standards if required.

## **b. Validity**

This manual applies to the Vibro-I in all versions including: Vibro-I 7,5 m<sup>2</sup>; Vibro-I 15 m<sup>2</sup>; Vibro-I 20 m<sup>2</sup>; Vibro-I 60 m<sup>2</sup> and Vibro-I 80 m<sup>2</sup>

This manual applies to the Vibro-I in combination with a suitable feed, permeate and CIP systems. The design and the degree of automation of said systems can vary a lot depending on the application and other needs of the end-user. A dedicated feed, permeate and CIP system should be designed and constructed in collaboration with the end-user.

## **c. Symbols**

As warning of danger, all text statements in these instructions to be noted will be marked as follows:

### **WARNING**

This symbol denotes a possible danger with medium risk that death or (severe) injury may result if it is not avoided.

### **CAUTION**

This symbol denotes a possible danger with a low risk that moderate or minor injury may result if it is not avoided.

### **ATTENTION**

This symbol denotes a danger with low risk of damage to property if not avoided.

## 2. System

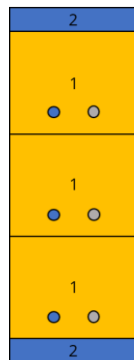


### a. Parts list Vibro-I

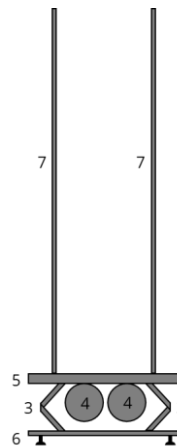
- HP1 2,5 m<sup>2</sup> membrane modules
- Vibro-I Cushion Assemblies (top and bottom)
- Vibro-I Motor Assembly

### b. System Description

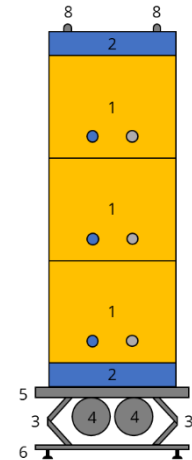
1. HP1 2,5 m<sup>2</sup> Membrane Module
2. Vibro-I Cushion Assembly
3. Industrial Springs
4. Vibro-I Motor
5. Base Plate
6. Vibro-I Stand
7. Rods
8. Bolts



Vibro-I Membrane Assembly



Vibro-I Motor Assembly



Vibro-I

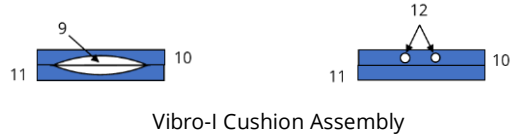
The Vibro-I Membrane Assembly consist of a number of stacked HP1 2,5 m<sup>2</sup> membrane modules (1) connected with 2 Vibro-I Cushion Assemblies (2) on the top and bottom of the HP1 stack. The Vibro-I Membrane Assembly is the only part of the Vibro-I with product contact.

The Vibro-I Motor Assembly consist of a Vibro-I Stand with 4 feet (7), 4 Industrial Springs (4) are mounted on the Vibro Stand (7) and the Base Plate (6) is mounted on top of the Industrial Springs (4). The 2 Vibro-I Motors are mounted under The Base Plate (6) and 4 Rods (8) are mounted on top of the Base Plate (6).

The Vibro-I Membrane Assembly is assembled on top of the Vibro-I Motor Assembly (see assembly instructions) and secured with 4 Bolts (9) on top forming the Vibro-I ready for production.

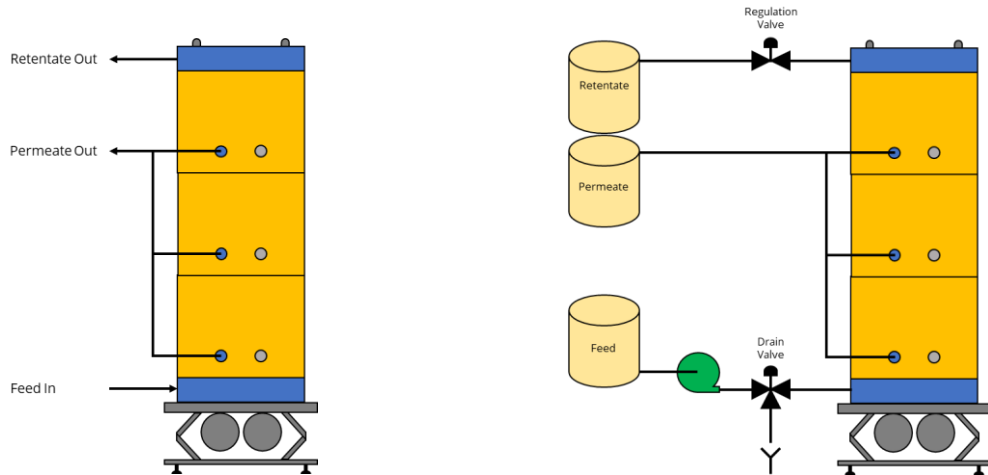
The Vibro-I Motor Assembly is connected to 400V, its function is to make the Vibro-I Membrane Assembly vibrated vertically at the right frequency and amplitude during operation.

- 9. Vibro-I Cushion
- 10. Media Inlet/Outlet Part
- 11. Top/bottom Part
- 12. Media Inlet/Outlet



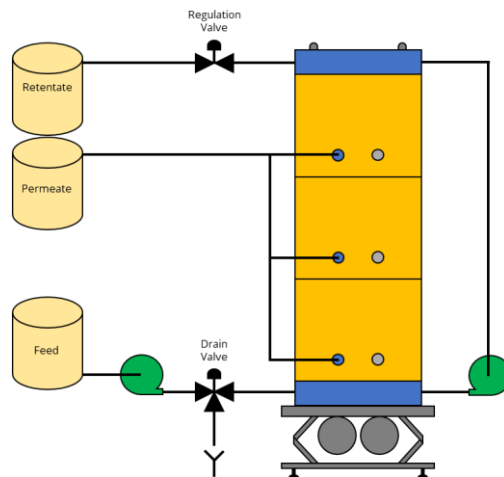
The Vibro-I Cushion Assembly consists of a Vibro-I Cushion (9) secured between a Media Inlet/Outlet Part (10) and a Top/Bottom Part (11). The Media Inlet/Outlet Part (10) has minimum two Media Inlet/Outlets for feed and retentate.

The Media Inlet/Outlet Part (10) comes in different versions with a different number and sizes of Media Inlet/Outlets and connections for instrument as pressure transducers, thermometer etc.



The standard way to run the Vibro-I is to feed media in through one of the feed inlets in the bottom of the Vibro-I Membrane Assembly and plug the other one. The permeate is taken out through the individual permeate outlets of each HP1 membrane module and the retentate is bled out at the desired concentration through one of the Media Inlets/Outlets in the top Vibro-I Cushion, while the other one is plugged. The Vibro-I is aerated during filling and drainage through the retentate outlet and drained through the feed inlet.

The Vibro-I Motors must be turned on when the Vibro-I Membrane Assembly is filled with media (pressure above 0,1 bar) and turned off during drainage and filling (pressure below 0,1 bar). It is crucial to start the Vibro-I Motors as soon as the filling is done as the fouling starts immediately. Starting the Vibro-I Motors too late can result in severe fouling of the membranes. **ATTENTION** Automating the starting and stopping of the Vibro-I Motors is very easy and highly recommendable in any application.



If the retentate has a high viscosity, high solid loads or a tendency to make fouling cakes on the membrane a slow mix / homogenization flow can be beneficial. A mix pump is then mounted between the 2<sup>nd</sup> Media Inlets/Outlets in the top Vibro-I Cushion and the 2<sup>nd</sup> Media Inlet/Outlet in the bottom Vibro-I Cushion. The mixflow has a relatively slow speed (approx. 0,1m/s over the membrane surface) to mix the retentate in the Membrane Assembly and avoid severe fouling of the membrane.

See more examples of use in the Operation section.

### 3. Safety

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#### a. Intended use


The Vibro-I is a filtration system for MF and UF filtration that can be operated in numerous ways both 100% manual, 100% automated and every option in-between. The user should read and understand this manual before use. The Vibro-I is intended for use in an industrial or research facility.

The Vibro-I is intended to filter media and can only be used with HP1 membrane modules from SANI Membranes.

The Vibro-I can only be used together with a feed system with a CE approved safety valve set to maximum 4 bars.

The Vibro-I is NOT suited for use in explosive environments.  **WARNING**

This instruction manual is part of the Vibro-I. The Vibro-I is intended exclusively for use in accordance with this instruction manual.

The Vibro-I must only be used for intended use, the following are examples of improper use  **WARNING:**


- Unauthorized modifications and technical changes to the Vibro-I are improper use.
- Operation outside the permissible physical conditions given in this document (e.g. temperature, pressure, chemical vapors etc.) and given in the specification sheet for the HP1 membrane module used.
- Installation of unauthorized items on the Vibro-I.
- Connection of unsuited devices to the Vibro-I (e.g. unsuited feed systems).
- Use of media with biological materials in Safety Classes 2 and 3.
- Use of flammable or potentially explosive substances.
- Filtration of unstable media.
- Use of media which are incompatible with PP, Stainless Steel, PDMS or other materials in the Vibro-I, HP1 membrane module or feed system used.


#### b. Personnel Qualification


All personnel operating the Vibro-I must have read this instruction manual thoroughly and be skilled in the art of pressurized filtration. All personnel operating the Vibro-I should be used to conduct themselves in a laboratory or industrial process environment and have passed mandatory safety courses etc. Students operating the Vibro-I must be instructed thoroughly by skilled teachers or other skilled personnel in proper use of the Vibro-I.


#### c. Media

The media used in the system can be dangerous to handle and cause personnel injuries or equipment damage when not handled correctly.

The operator should always seek the applicable safety information for the media to be filtered (e.g. handling and storage and conduct in emergency situations).  **WARNING**

Personal safety equipment should always be worn when applicable (e.g. safety goggles, safety gloves etc.).  **WARNING**


Do Not use media with biological materials in Safety Classes 2 and 3.  **WARNING**

Do Not use flammable or potentially explosive substances.  **WARNING**

Do Not use unstable media where concentration changes might start chemical reactions within the media.  **WARNING**


The operator should always make sure that the media to be filtered is compatible with the materials in fluid connection in the Vibro-I (PP, Stainless Steel and PDMS) and the feed system used. **ATTENTION**


#### d. Pressurized Components

The pressure and media flow needed to drive the filtration in the Vibro-L is generated by an external feed system (not included). The external feed system and the tubing and fittings between the external feed system and the Membrane Assembly including the Membrane Assembly are a separate pressurized system. The system must be **operated at maximum 4 bar** and the external feed system must have a CE approved safety valve set at **maximum 4 bar**. Parts of the system can burst if they are subjected to pressures over 4 bar.  **WARNING**


#### e. Leaking fluids


If the fluid system is leaking, liquid spill can cause a serious health danger depending on media. The operator should always seek the applicable safety information for the media to be filtered (e.g. handling and storage and conduct in emergency situations).


Personal safety equipment should always be worn when applicable (e.g. safety goggles, safety gloves etc.).  **WARNING**

If the fluid system is leaking, liquid spill to the floor can cause a slipping hazard.  **CAUTION**

#### f. Moving parts





Body parts can be crushed when they come into contact with moving parts, e.g. the Membrane Assembly, the Industrial Springs and. This can lead to injuries.  **WARNING**

Lose hair or lose clothing parts can be caught in moving parts and cause injuries.  **CAUTION**

The Vibro-I must be placed on a horizontal non-slippery surface as the vibrating movement can otherwise make the Vibro-I move doing operation and cause injuries.  **CAUTION**

#### g. Personal protective equipment



Mandatory personal protective equipment to protect against risks arising from the equipment or the material being processed:

- Tight-fitting work clothing - Protects against being caught by moving parts.  **CAUTION**
- Head covering - Protects hair from being pulled into moving parts.  **CAUTION**
- Safety glasses - Protects against substances leaking under high pressure, splashing liquids etc.  **WARNING**
- Safety shoes - Protects against injuries to the feet caused by mechanical effects.  **CAUTION**

#### h. Accessories and spare parts

The Vibro-I can only be used together with a feed system with a CE approved safety valve set to maximum 4 bars.

The use of unsuitable accessories, consumables and spare parts can be hazardous and have the following consequences:

- Severe personnel injury  **WARNING**
- Damage to the device  **WARNING**
- Malfunctions of the device **ATTENTION**
- Device failure **ATTENTION**

Only use accessories, consumables and spare parts that are in technically perfect condition.

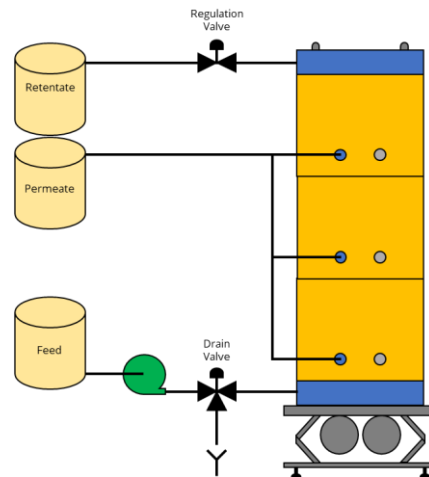
The use of accessories, consumables and spare parts **not** approved by SANI Membranes is the sole responsibility of the operator.



## 4. Operation

### a. Introduction

The Vibro-I is simple to operate and gives you a perfect continuous filtration.



The Membrane Assembly is filled by feeding media carefully through the Feed inlet with the Regulation Valve closed and the Airvent and Permeate Outlet open. Close the Airvent when the media has covered the membrane completely (pressure is above 0,1 bar) Start the Vibration Motors just after filling the Membrane Assembly with media and turn it off just before draining the Membrane Assembly for media. Severe fouling will occur if you stop the vibration motor with pressurized media in the chamber.

The pressure is regulated up to the operating pressure and retentate is bled out through the Regulation Valve. The amount of retentate to bleed out is calculated from your desired up-concentration degree and the amount of permeate produced (e.g. to up-concentrate your feed to double concentration you need to bleed out the same amount of retentate as the amount of permeate produced).

When the filtration process is finished, take of the feed pressure and drain the system for retentate and permeate. Clean the system with the appropriate CIP protocol for your membrane and application and finish the CIP by filling the system with an appropriate storing solution for your membrane and application.

Attention: Organic membranes must never be allowed to dry out after initial wetting. See storage after CIP. **ATTENTION**

Attention: Always maintain a positive trans membrane pressure when operating Your Vibro-I. The Permeate Outlets must be kept open when the unit is in operation. **ATTENTION**

Pressure guidelines during operation:

- Avoid operating the unit at excessive flux leading to fast and high fouling of the membranes.
- Recommended trans membrane pressure for microfiltration is 0.05 - 1 bar.
- Recommended trans membrane pressure for ultrafiltration is 1 - 3 bar.

### b. General Guidelines – Process

- Maintain a positive trans membrane pressure (min 0,02 bar) when vibration mode is on and keep the permeate drain open at all times.
- Maintain a retentate flow to avoid dead-end type filtration. A suitable retentate flow is normally +30 L/h but it is application dependent.
- When filtering media with high viscosity or high solids load a mix flow of 2000-10000 l/h should be established.

- When MF filtering media with high solids load, the mix flow and vibration must be initiated as soon as the unit is filled to avoid severe fouling.

#### Microfiltration (0 – 1 bar)

- Keep a very low trans membrane pressure: 0,05 to 0.4 bar often gives the best long-time results.
- The flux can be very high and easily result in severely fouled areas in the Vibro-I unit. Reduce the flux by lowering the trans membrane pressure and let more retentate out to avoid severe fouling.

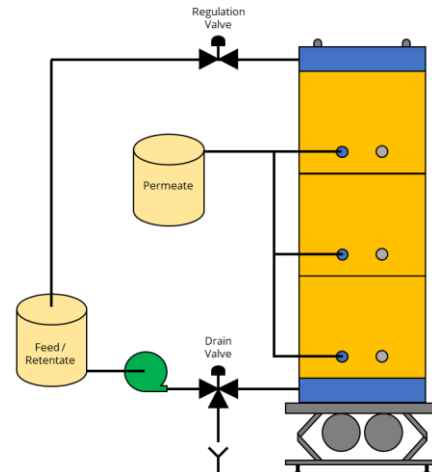
#### Ultrafiltration (1 – 4 bar)

- Make sure that the system pressure does not exceed 4 bar (3 bar at temperatures above 50°C) – a 4 bar safety valve is required!

#### Examples of Microfiltration and Ultrafiltration Process Configurations:

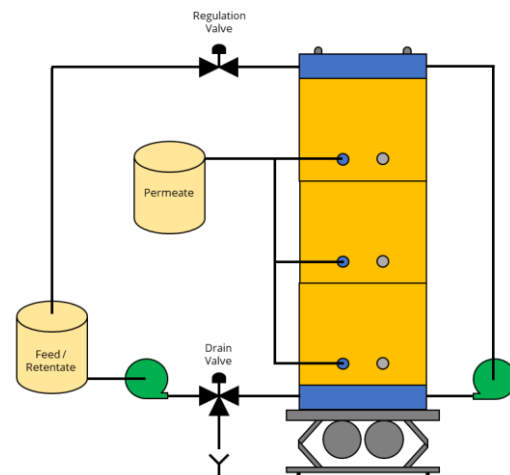
##### MF/UF batch mode with Batch Feed System and concentration in tank

- Simple configuration for viscosities up to “cream level”
- The trans membrane pressure is regulated with the Regulation Valve
- The retentate flow is regulated with the speed of the feed pump in combination with the Regulation Valve
- The concentration factor in the retentate is calculated from the amount of permeate collected and the initial feed volume
- This setup can also be used for diafiltration applications



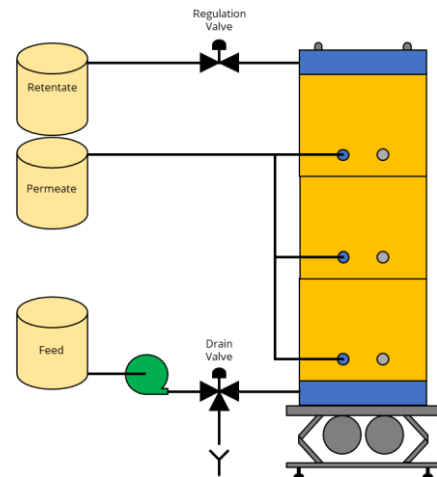
##### MF/UF batch mode with Batch Feed System and concentration in tank – high solids or high viscosity

- Configuration for high viscosity or high solids load; retentate must be kept fluid
- A mixflow is established to keep the retentate mixed and diminish fouling
- The trans membrane pressure is regulated with the Regulation Valve
- The retentate flow over the feed/retentate tank is regulated with the speed of the feed pump in combination with the Regulation Valve
- The concentration factor in the retentate is calculated from the amount of permeate collected and the initial feed volume
- This setup can also be used for diafiltration applications



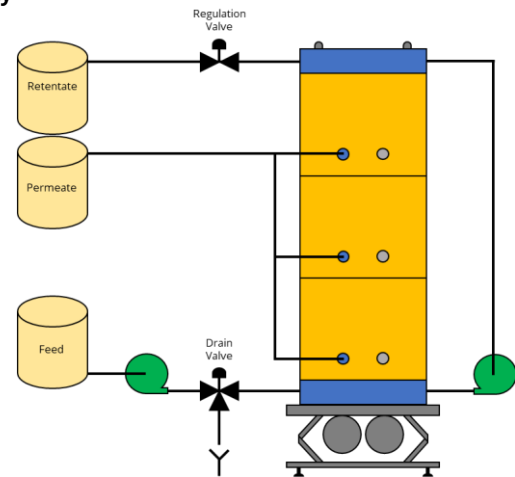
### Continuous MF/UF mode- plug flow

- Configuration for viscosities up to "cream level"
- The trans membrane pressure is regulated with the feed pump
- The concentration factor is regulated with the Retentate Valve (flow of permeate measured against flow of retentate).
- The retentate can be bled out continuously or in portion depending on your setup and application



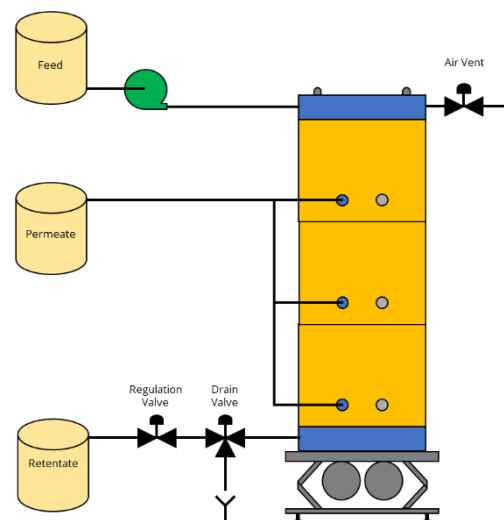
### Continuous MF/UF mode with mix pump – high solids or high viscosity

- Configuration for high viscosity or high solids load; retentate must be kept fluid.
- The trans membrane pressure is regulated with the Regulation Valve
- The concentration factor is regulated with the Retentate Valve (flow of permeate measured against flow of retentate).
- The retentate can be bled out continuously or in portion depending on your setup and application



### Continuous MF/UF mode with precipitate in the feed- plug flow

- Configuration for viscosities up to "cream level"
- If precipitate is present it can be an advantage to feed in at the top and take retentate out at the bottom
- A dedicated Air Vent is necessary in this configuration
- The trans membrane pressure is regulated with the Regulation Valve
- The concentration factor is regulated with the Retentate Valve (flow of permeate measured against flow of retentate).
- The retentate can be bled out continuously or in portion depending on your setup and application



The process configurations above are only examples of simple configurations. The optimal process configuration is very application dependent and an application specific process configuration must be thought through to each industrial application including CIP system, degree of automation, temperature control system etc.

The Vibro-I units can also be coupled in parallel, series and cascade filtration systems.

**c. Normal CIP for all Process Configurations (MF and UF):**

Water flushes, buffer flushes or CIP cleaning must be performed after each run with media in the Vibro™-I. The appropriate cleaning method must be found for each membrane and membrane application by the user. Typical CIP routines for operation with organic material could consist of:

**Standard Dairy CIP:**

- Drain for product
- Flush through with warm water and drain
- Lye, 55°C at pH 11.5 for 20-25 min. and drain
- Flush with water for 5 min. and drain
- Lye, 55°C at pH 11.5 with enzymes for 20-25 min. and drain
- Flush with water for 5 min. and drain
- Acid at pH 1.5 for 15-20 min. and drain
- Flush with water for 5 min. and drain
- Ready for new production or leave filled with water or water + preservation or 20% alcohol until next production

**Simple CIP**

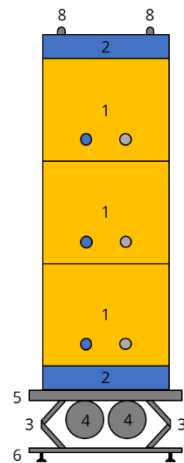
- Drain for product
- Flush through with warm water and drain
- Lye, 55°C at pH 11.5 for 20-25 min. and drain
- Flush with water for 5 min and drain
- Ready for new production or leave filled with water or water + preservation or 20% alcohol until next production

To adjust timing adjust flow, adjust trans membrane pressure and retentate flow. Ensure around 50/50 flow through the permeate and the retentate outlet at as low trans membrane pressure as possible.

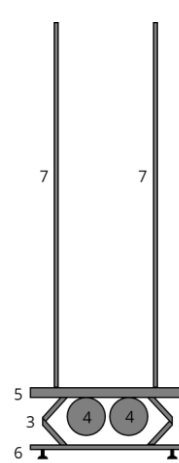
## 5. Membrane exchange

### a. Disassembly of the Membrane Assembly on the Vibro-I

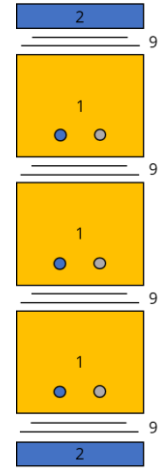
1. HP1 2,5 m<sup>2</sup> Membrane Module
2. Vibro-I Cushion Assembly
3. Industrial Springs
4. Vibro-I Motor
5. Base Plate
6. Vibro-I Stand
7. Rods
8. Bolts
9. Inner and Outer Gaskets



Vibro-I



Vibro-I Motor Assembly

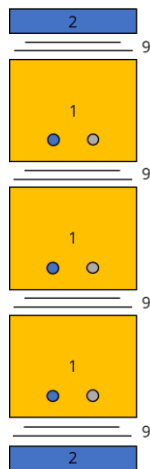


Vibro-I Membrane Assembly

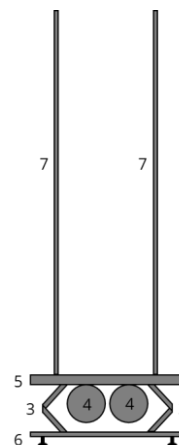
1. Disconnect the drained Vibro-I from all other equipment and power
2. Take off the 4 Bolts (8) and the washers at the top of the Membrane Assembly
3. Lift the top Vibro-I Cushion Assembly (2) free off the Rods (7)
4. Take the Inner and Outer Gaskets (9) off the top HP1 2,5 m<sup>2</sup> Membrane Module (1)
5. Lift the top HP1 2,5 m<sup>2</sup> Membrane Module (1) free off the Rods (7)
6. Lift all the HP1 2,5 m<sup>2</sup> Membrane Module (1) off the Rods (7) in the same way
7. Take the Inner and Outer Gaskets (9) off the bottom Vibro-I Cushion Assembly (2)
8. Lift the bottom Vibro-I Cushion Assembly (2) free off the Rods (7)
9. Make sure that all parts are intact and clean then with 50% EtOH if necessary
10. Store the HP1 2,5 m<sup>2</sup> Membrane Module (1) in preservation fluid (e.g. 20% EtOH) if they are to be reused

### b. Assembly of the Membrane Assembly on the Vibro-I

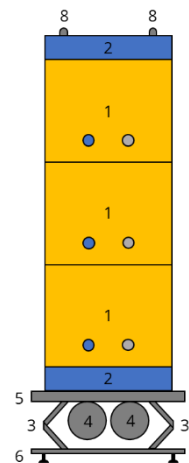
1. HP1 2,5 m<sup>2</sup> Membrane Module
2. Vibro-I Cushion Assembly
3. Industrial Springs
4. Vibro-I Motor
5. Base Plate
6. Vibro-I Stand
7. Rods
8. Bolts
9. Inner and Outer Gaskets



Vibro-I Membrane Assembly Parts



Vibro-I Motor Assembly



Vibro-I

1. Make sure that all parts are intact and clean then with 50% EtOH if necessary
2. Place the bottom Vibro-I Cushion assembly (2) in the desired orientation by sliding it over the 4 Rods (7)
3. Place the Inner and Outer Gaskets (9) carefully in the gasket grooves of the bottom Vibro-I Cushion Assembly (2)
4. Place the bottom HP1 2,5 m<sup>2</sup> Membrane Module (1) in the desired orientation by sliding it over the Rods (7)
5. Place the Inner and Outer Gaskets (9) carefully in the gasket grooves of the bottom HP1 2,5 m<sup>2</sup> Membrane Module (1)
6. Place all the HP1 2,5 m<sup>2</sup> Membrane Module (1) in the same way
7. Place the top Vibro-I Cushion Assembly (2) on top of the top HP1 2,5 m<sup>2</sup> Membrane Module (1) in the desired orientation
8. Place washers on each Rod (7) and secure the Bolts (8) by cross tightening them slowly with a torque wrench adjusted to 40 Nm (The bolts must be re-tightened after the first 3 uses of the Vibro-I)
9. Connect the Vibro-I to power, feed system etc.

## 6. Technical Data

<b>Vibro™-I 7,5 m<sup>2</sup> Data</b>	
Weight	120 kg
Dimensions (L x W x H)	478 mm x 400 mm x 1170 mm
Membrane	3 x 2,5 m <sup>2</sup> Free Flow Plate Modules (HP1)
Internal Retentate volume	16 L, Fully Drainable
Internal Permeate volume	3 L, Fully Drainable
Operating Pressure	0-4 bar at 3-35°C, 0-3 bar at 3-55°C and 0-1 bar at up to 80°C
Vibration Motor	Electric, 480 W

<b>Vibro™-I 15 m<sup>2</sup> Data</b>	
Weight	190 kg
Dimensions (L x W x H)	659 mm x 645 mm x 1934 mm
Membrane	6 x 2,5 m <sup>2</sup> Free Flow Plate Modules (HP1)
Internal Retentate volume	28 L, Fully Drainable
Internal Permeate volume	6 L, Fully Drainable
Operating Pressure	0-4 bar at 3-35°C, 0-3 bar at 3-55°C and 0-1 bar at up to 80°C
Vibration Motor	Electric, 700 W

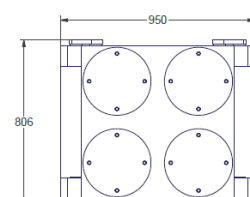
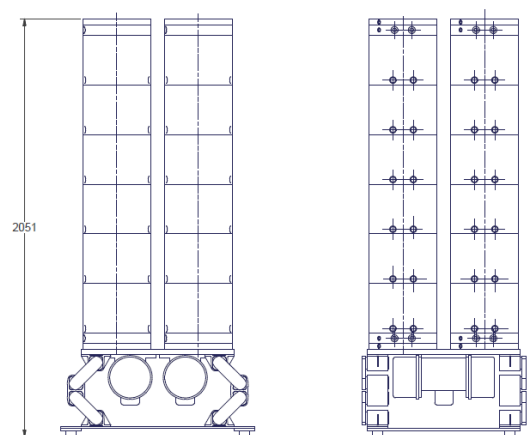
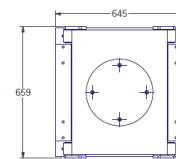
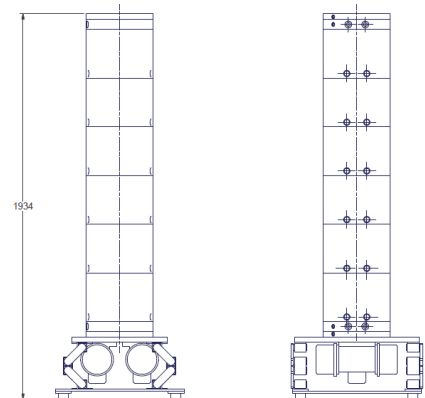
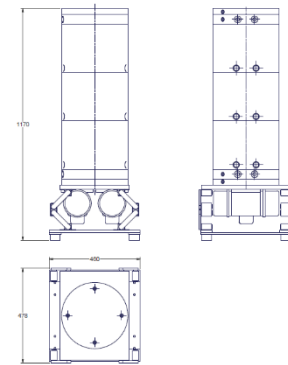
<b>Vibro™-I 20 m<sup>2</sup> Data</b>	
Weight	210 kg
Dimensions (L x W x H)	659 mm x 645 mm x 2420 mm
Membrane	8 x 2,5 m <sup>2</sup> Free Flow Plate Modules (HP1)
Internal Retentate volume	38 L, Fully Drainable
Internal Permeate volume	7 L, Fully Drainable
Operating Pressure	0-4 bar at 3-35°C, 0-3 bar at 3-55°C and 0-1 bar at up to 80°C
Vibration Motor	Electric, 700 W

<b>Vibro™-I 60 m<sup>2</sup> Data</b>	
Weight	650 kg
Dimensions (L x W x H)	950 mm x 806 mm x 2051 mm
Membrane	24 x 2,5 m <sup>2</sup> Free Flow Plate Modules (HP1)
Internal Retentate volume	112 L, Fully Drainable
Internal Permeate volume	24 L, Fully Drainable
Operating Pressure	0-4 bar at 3-35°C, 0-3 bar at 3-55°C and 0-1 bar at up to 80°C
Vibration Motor	Electric, 1800 W

<b>Vibro™-I 80 m<sup>2</sup> Data</b>	
Weight	730 kg
Dimensions (L x W x H)	950 mm x 806 mm x 2420 mm
Membrane	32 x 2,5 m <sup>2</sup> Free Flow Plate Modules (HP1)
Internal Retentate volume	150 L, Fully Drainable
Internal Permeate volume	28 L, Fully Drainable
Operating Pressure	0-4 bar at 3-35°C, 0-3 bar at 3-55°C and 0-1 bar at up to 80°C
Vibration Motor	Electric, 1800 W

<b>Vibro™-I Cushion Assemblies</b>	
Option 1	2 X 1" and 1 X 1/4" threaded inlets/outlets
Option 2	2 X 1/2" and 1 X 1/4" threaded inlets/outlets
Pharma Option	GMP and FDA with 2 X (1" / 1/2" / blank) clamp inlets/outlets
FDA Option	FDA with 2 X (1" / 1/2" / blank) clamp inlets/outlets

More options are available upon request



<b>Free Flow Plate™ Membrane Module (HP1) Standard Membranes</b>		
Membrane type	Cut-off	Membrane Material
UF	5 kDa	PES
UF	5 kDa	PESH
UF	30 kDa	PESH
UF	100 kDa	PVDF
UF	300 kDa	PES
UF	400 kDa	PAN
MF	800 kDa / 0,08 µm	PVDF
MF	0,2 µm	PVDF
MF/Filter	1 µm	PET (Woven)
MF/Filter	5 µm	PET (Woven)
MF/Filter	10 µm	PET (Woven)

**The HP1 can be equipped with your membrane of choice.** SANI Membranes have a line of standard MF and UF membranes from Synder, Microdyn-Nadir and others on stock. Most commercially available membranes can however also be used with the HP1. Please, do not hesitate to contact us with your membrane wishes.

## 8. Conformity

The Vibro-I system is CE marked to demonstrate compliance with relevant regulations including the European Machine, Electrical and Pressure Directives.