Manual

Vibro-I Feed System

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

Please read all safety instructions carefully.

This Vibro-I Feed System user manual is part of the product. Keep it in a safe place for future reference.

Please find a separate manual for the Vibro-I on our webpage at: www.sanimembranes.com

Version: 20210412

SANI Membranes

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 cross flow pump is needed. A conventional cross flow pump can damage cells, molecules etc. during operation. By eliminating the cross flow pump Vibro-I has become the most product gentle industrial scale MF and UF system on the marked.

The elimination of the cross flow 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.

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^2 Free Flow Plate module (HP1)

The Vibro-I Feed System is a pilot system utilizing the Vibro-I. The unit is built for MF and UF filtration and the HP1 membrane modules can be exchanged with another set of membranes in 15 minutes.

The Vibro-I Feed System is designed with a retentate loop and a Mix Flow pump. It is recommended to run the Mix Flow pump at as low speed as possible (minimum 400l/h) at normal filtration applications. When running with difficult feeds (e.g. high viscosity) a faster Mix Flow is necessary to mix the feed in the system sufficiently.

The Vibro-I Feed System can easily be modified to run MF filtration over an external tank for extremely gentle MF filtration at low and uniform TMP.

The Vibro-I Feed System is designed to be sanitary. All materials used are FDA compliant and all engineering solutions are sanitary.

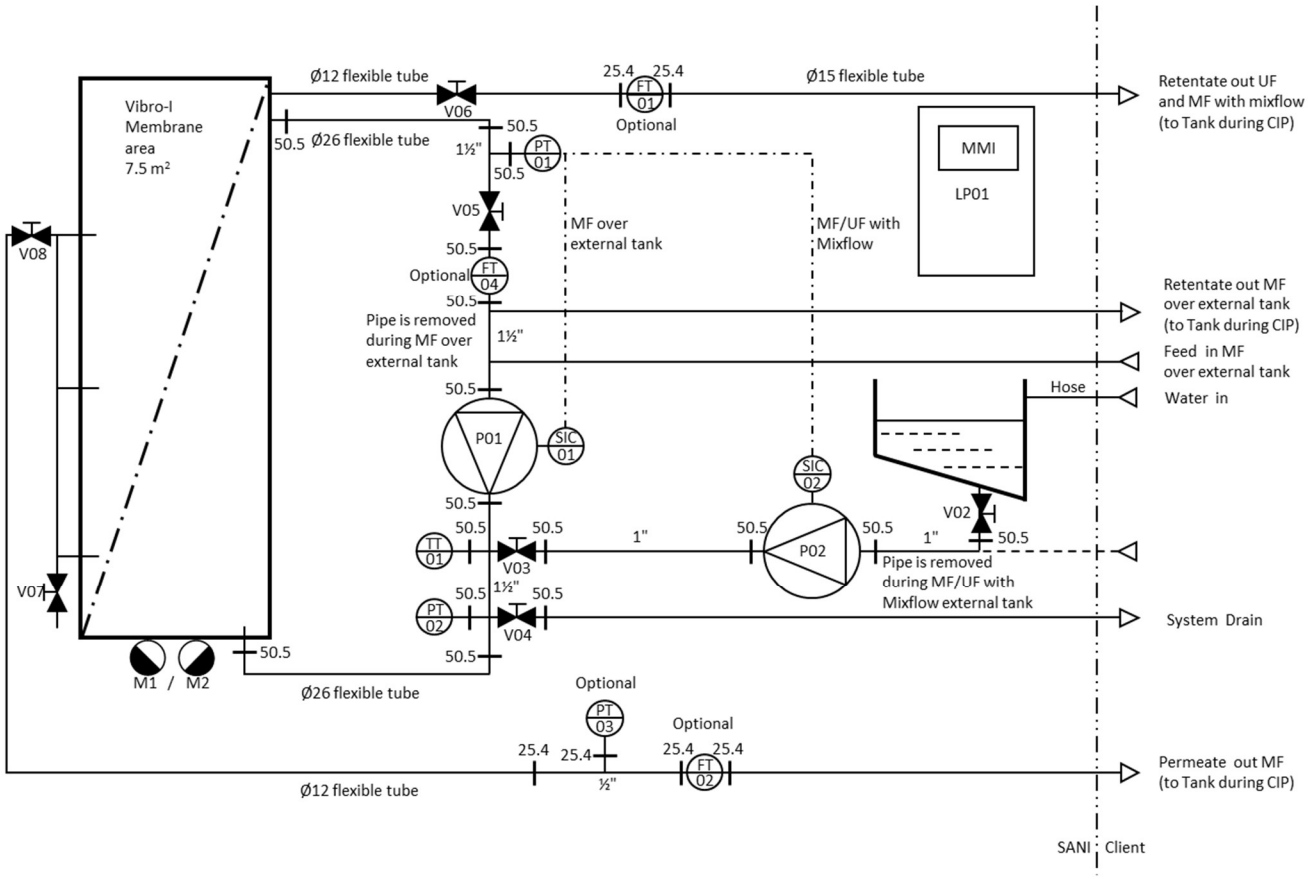
The Vibro-I Feed System is constructed to feed a Vibro-I Please find a separate manual for the Vibro-I on our Webpage at: www.sanimembranes.com The Vibro-I Feed System has the following features:

1. The Vibro-I Feed System comes with 2 modes: 1. A Mix Flow Mode with a Mix Flow Pump for MF/UF concentration in the internal loop and 2. An Over Tank Mode for MF filtration over an external tank
2. A Stainless-steel frame on wheels with all hardware mounted
3. A Feed Pump controlled by a frequency converter
4. A Feed / Mix Flow Pump controlled by a frequency converter
5. A Stainless-steel Feed / CIP tank
6. 2 Pressure Transducers. PT02 measuring the pressure just before the Vibro-I and PT01 measuring the pressure just after the Vibro-I
7. 1 Optional Pressure Transducer (PT03) measuring the pressure on the permeate out of the Vibro-I
8. 1 Temperature Transducer (TT01) measuring the temperature in the feed just before the Vibro-I
9. Up to 3 Flowmeters. FT01 (optional) on the retentate out, FT02 (optional) on the permeate out and FT04 (optional) on the retentate loop
10. A control cabinet with a touchscreen for controlling the Vibro-I Feed System
11. All internal and external media connections are with sanitary Tri-clamps or sanitary push-in connections (feed in, retentate out and permeate out)
12. A logging system that logs all recorded data from the pumps, pressure transducers, flowmeters, temperature transducer and the system status
13. **Operating Pressure: 0-4 bar at 5-35°C, 0-3 bar at 5-55°C and 0-1 bar at up to 80°C**

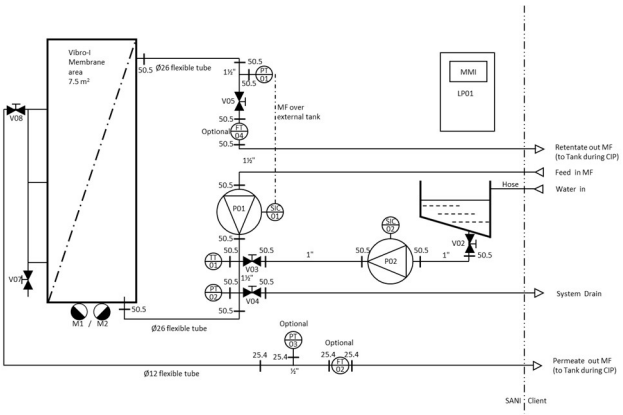
b. System

The Vibro-I Feed System has two functions with 2 different steering's build in.

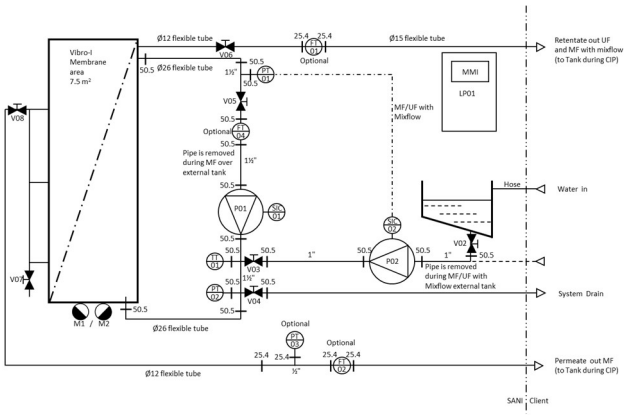
- A Mix Flow Mode with a Mix Flow Pump for internal loop concentration
- An Over Tank Mode for MF concentration over an external tank where the Mix Flow pump (P01) is used as feed pump



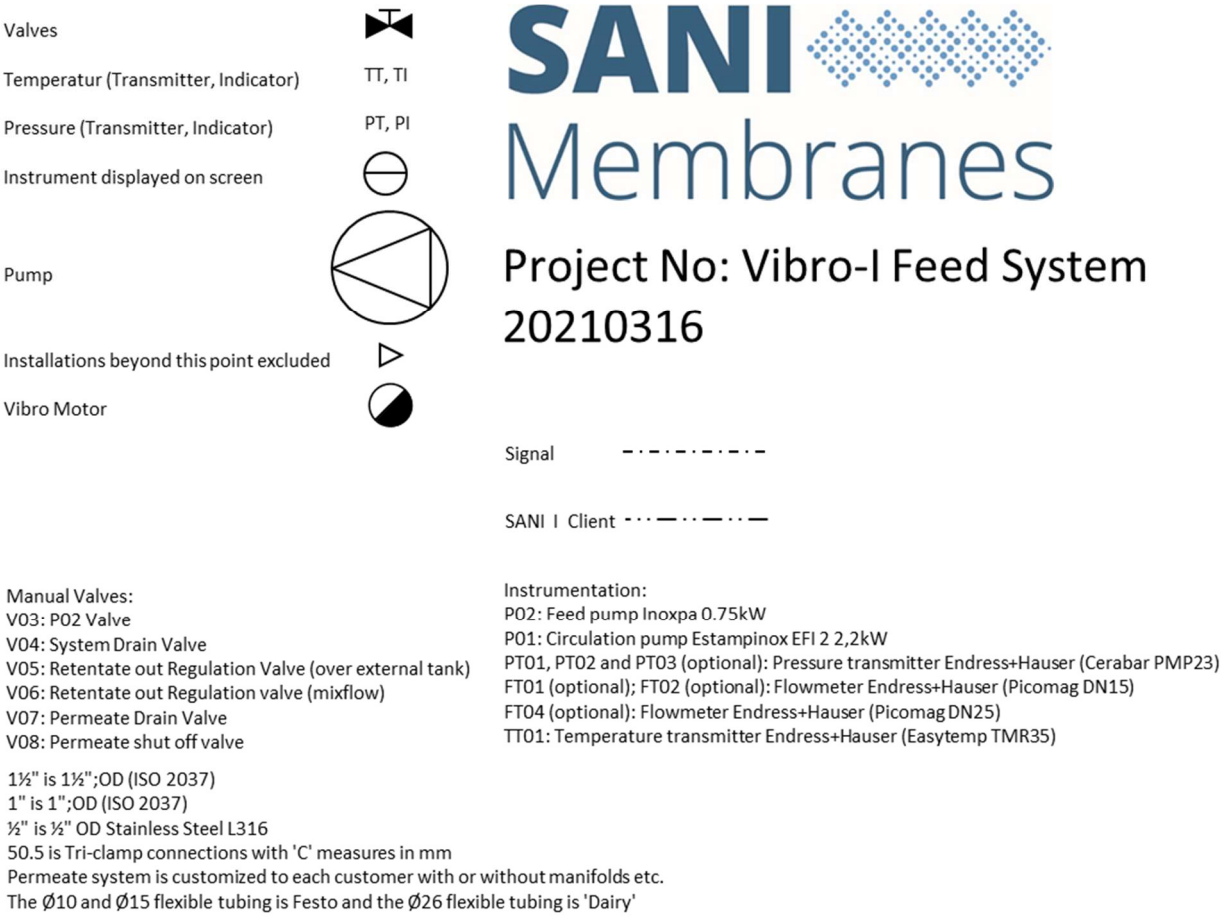
Combination PI Diagram



Mix Flow Set-up (full size on p. 11)



Over Tank Set-up (full size p.13)



The Vibro-I Feed System have 4 options for extra instrumentation:

1. FT01 is a flowmeter on the retentate out and it is only used in Mix Flow Mode
2. FT02 is a flowmeter on the permeate in both Mix Flow Mode and Over Tank Mode
3. FT04 is a flowmeter on the retentate loop in Mix Flow Mode and the Retentate out in Over Tank Mode
4. PT03 is a pressure transducer measuring the pressure in the permeate stream after the Vibro-I

In the following all screenshots, text and figures are including the 4 optional instruments. The software and is however always modified to the exact version of hardware combination in the Vibro-I Feed System at hand.

All the 4 extra instruments can easily be retrofitted to the Vibro-I Feed Systems if desired.

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. Safety

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Please find a separate manual for the Vibro-I on our webpage at: www.sanimembranes.com

a. Intended Use

The Vibro-I Feed System is a feed system for MF and UF filtration that can be operated in numerous ways. The user should read and understand this manual before use. The Vibro-I Feed System is intended for use in an industrial or research facility.

The Vibro-I Feed System is intended to filter media and can only be used with Vibro-I's from SANI Membranes.

The Vibro-I Feed System is NOT suited for use in explosive environments. ⚠ **WARNING**
This instruction manual is part of the Vibro-I Feed System. The Vibro-I Feed System is intended exclusively for use in accordance with this instruction manual.

The Vibro-I Feed System 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, Silicone, EPDM or other materials in the Vibro-I, HP1 membrane module or feed system used

b. Personnel Qualification

All personnel operating the Vibro-I Feed System must have read this instruction manual thoroughly and be skilled in the art of pressurized filtration. All personnel operating the Vibro-I Feed System 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 Feed System must be instructed thoroughly by skilled teachers or other skilled personnel in proper use of the Vibro-I Feed System.

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 googles, 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 Feed System (PP, Stainless Steel, Teflon and PDMS). **ATTENTION**

d. Pressurized Components

The pressure and media flow needed to drive the filtration in the Vibro-I Pilot is generated by an internal feed system. The feed system and the piping, tubing and fittings between the feed system and the Vibro-I is a separate pressurized system. The system must be **operated at maximum 4 bar** at room temperature. Parts of the system can burst if they are subjected to pressures over 4 bar. **WARNING**

Operating Pressure: Operating Pressure: 0-4 bar at 5-35°C, 0-3 bar at 5-55°C and 0-1 bar at up to 80°C. 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 googles, 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 Industrial Springs on the Vibro-I. 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 Feed System must be placed on a horizontal non-slippery surface and the wheels must be locked, as the vibrating movement can otherwise make the Vibro-I Feed System 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 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.

3. Installation

a. Installation of the Vibro-I Feed System in Mix Flow Mode

The Vibro-I Feed System is easy to assemble upon revival. Everything can be assembled with very limited tools. The instructions below are for the Vibro-I Feed System in Mix Flow Mode using the CIP tank and in the end with external tanks (feed, retentate and permeate). How to modify the unit for Over Tank Mode is described in the end of the section.

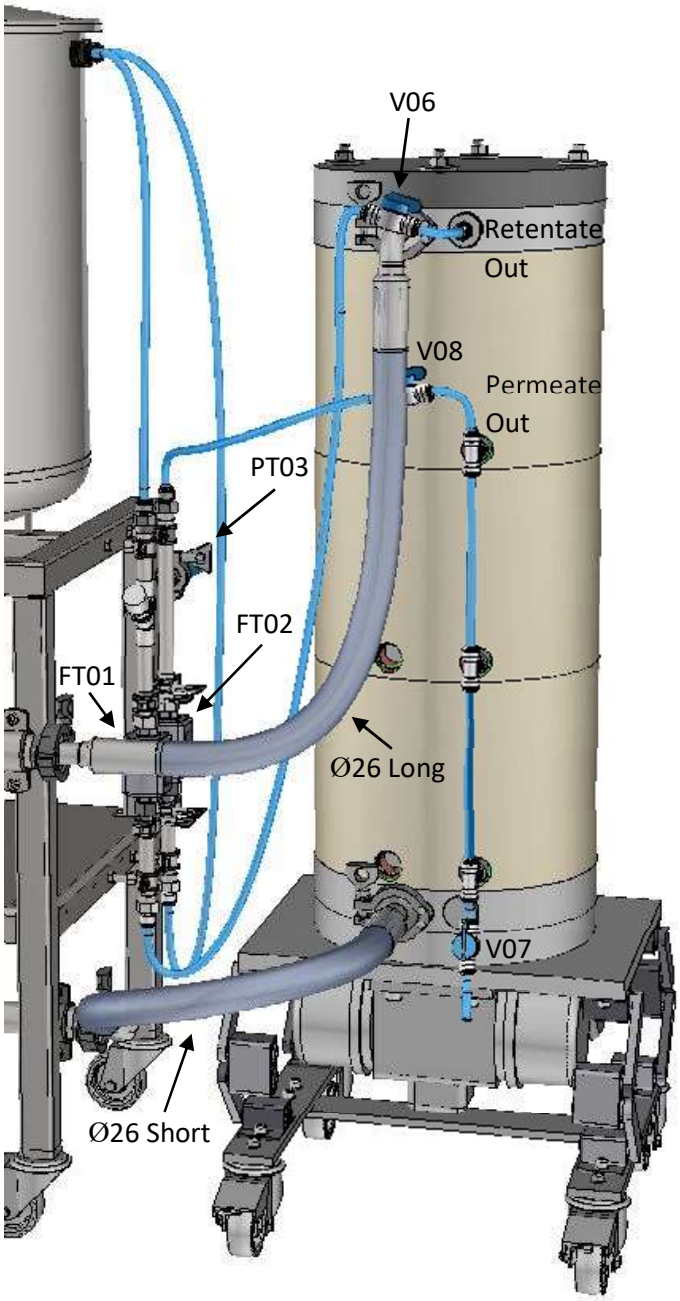
Set-up for MF/UF Mix Flow Mode using internal CIP tank

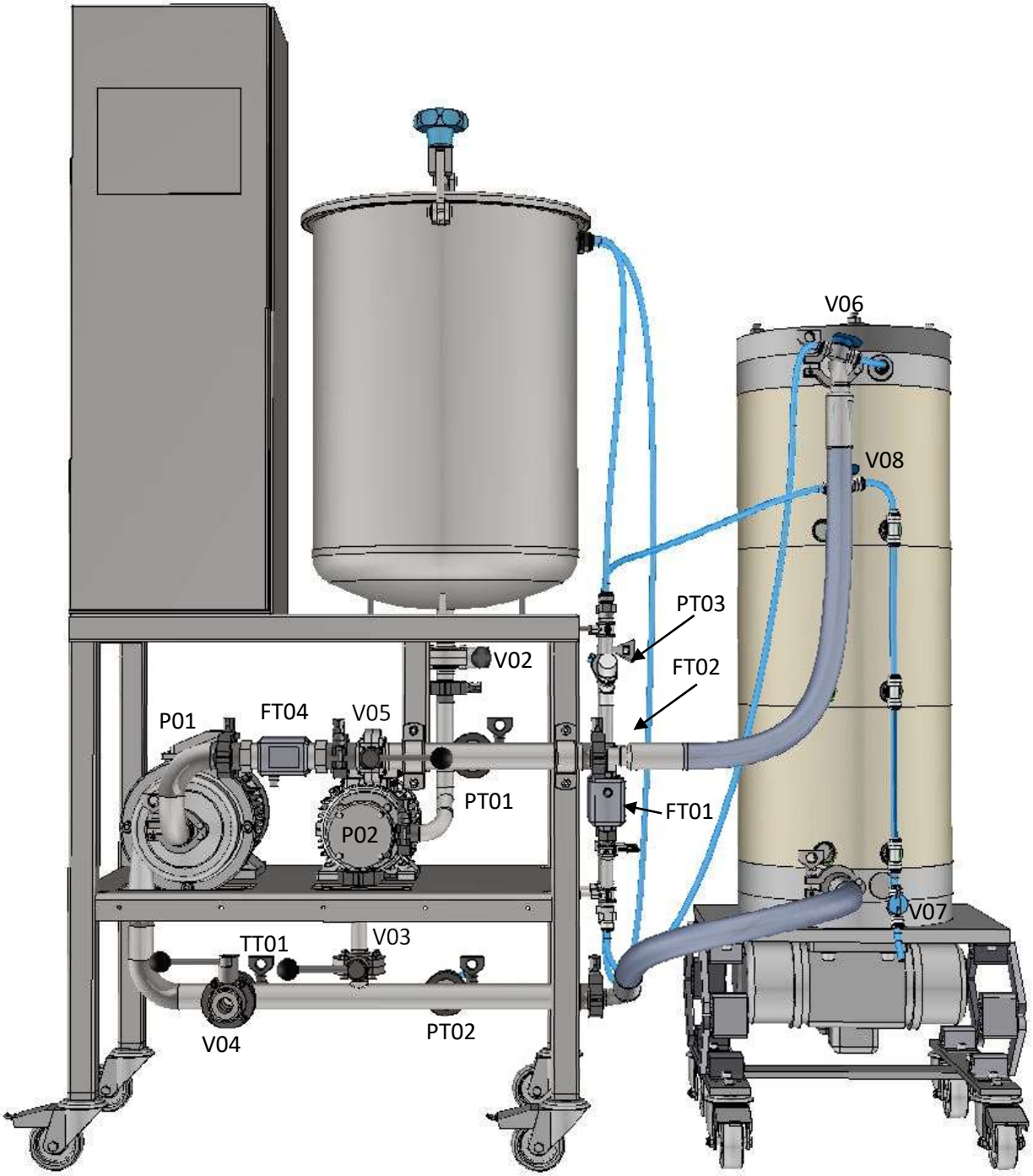
Assemble the Vibro-I Feed System's piping, wiring and instruments as depicted on the PI-diagram on page 11 and the schematic pictures on the next pages.

- The piping from the Vibro-I Feed System and the inlet/outlet of the Vibro-I is connected with the Ø26 flexible tubing with gaskets and Tri-clamps. The short Ø26 tubing fits in the bottom of the Vibro-I and the long Ø26 tubing fits in the top
- The Ø12 flexible tubing and the Retentate Valve (V06) is assembled with push-in fittings to Retentate Out
- If FT01 is present the Retentate Valve (V06) is connected to the bottom of the FT01 string with Ø12 flexible tubing and the top of the FT01 string is connected to the tank or an external permeate collection tank with Ø12 flexible tubing
- If FT01 is not present the Retentate Valve (V06) is connected directly to the tank or an external permeate collection tank with Ø12 flexible tubing

- The tubing used after V06 must be of a higher diameter than Ø12 if it is over 1,5m (to CIP tank during CIP)
- V08 is connected to the top of the Permeate Flowmeter (FT02) string with Ø12 flexible tubing if the system is delivered with FT02 and/or PT03. Otherwise V08 is connected directly to the tank or an external permeate collection tank with Ø12 flexible tubing
- The tubing used after V08 of the Vibro-I must be of a higher diameter than Ø12 if it is over 2m in total to minimize the pressure loss
- Connect the power Vibro-I power cable to the plug under the control cabinet
- Connect the assembled Vibro-I Feed System to 400V under the control cabinet
- The system is now ready for Production or CIP over the CIP tank with preheated CIP Media

(The System can also be CIP over an external heated CIP tank if needed)





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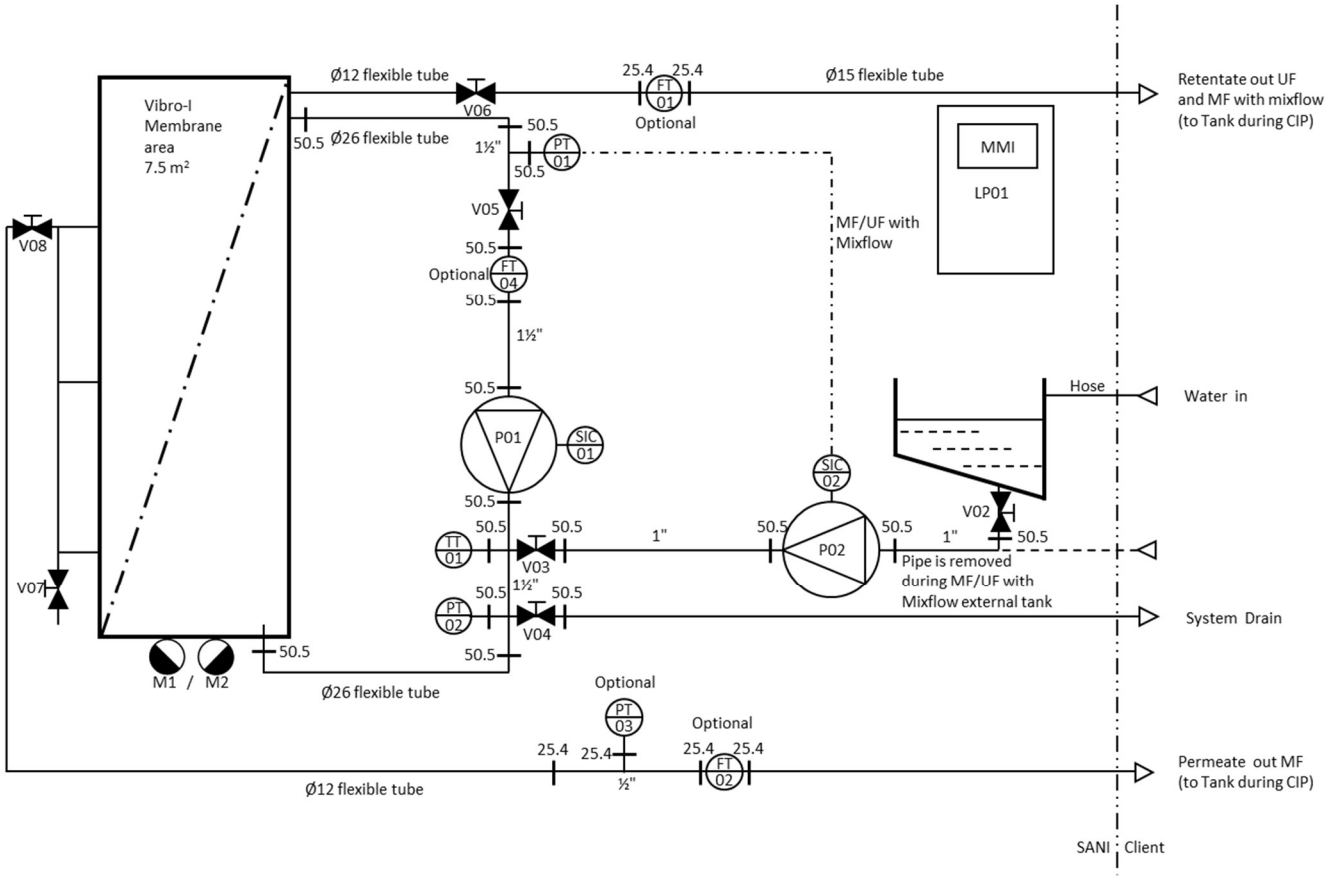


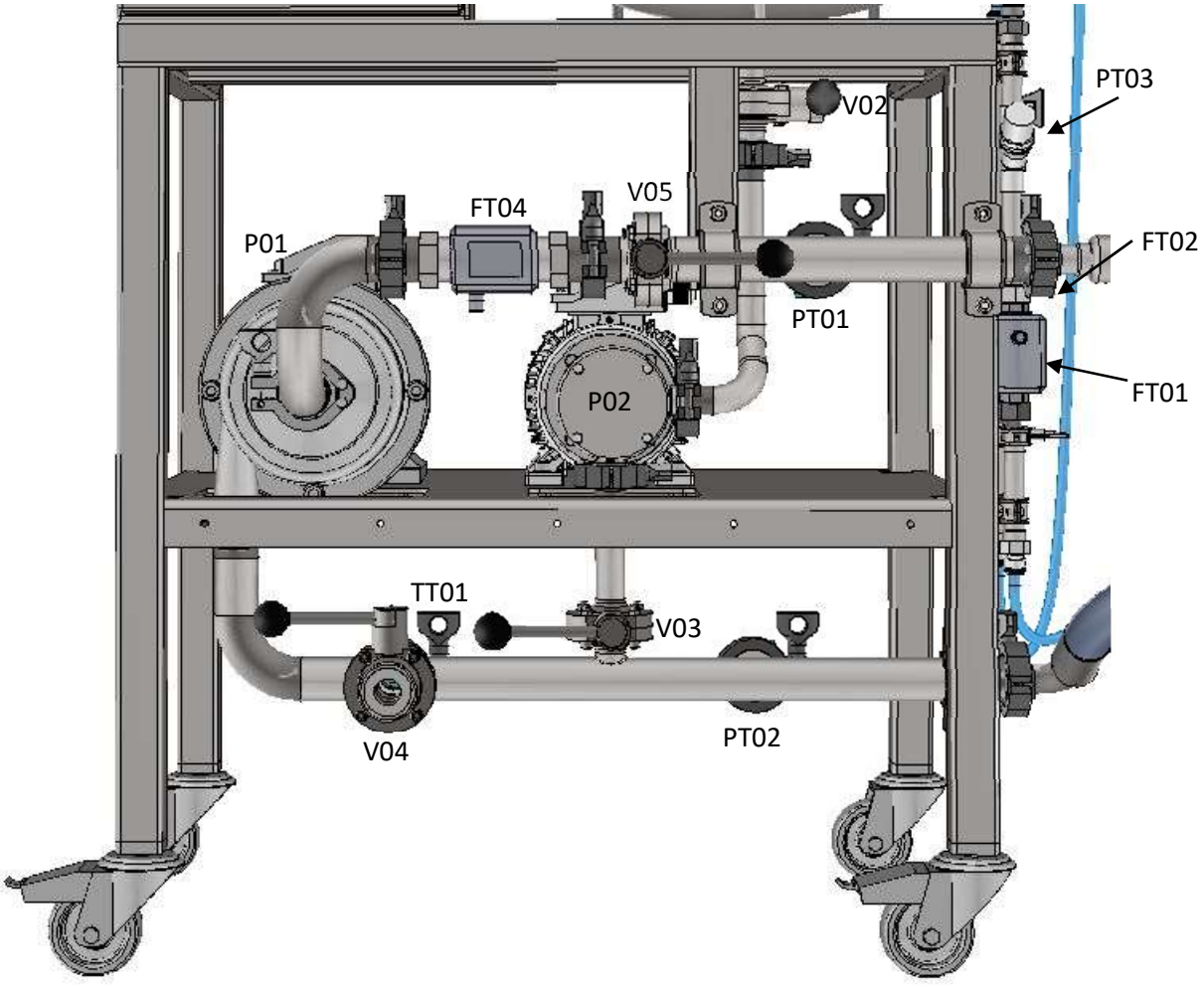
Set-up for MF/UF Mix Flow Mode using external tanks

- Remove the piping between the Feed Pump (P02) and the Tank Valve (V02)
- Connect the external feed tank to the Feed Pump (P02)
- Connect the Permeate tube to an external permeate collection tank (be aware of the pressure loss in the tubing especially with high fluxes and with high viscous permeate)
- Connect the Retentate out tube (from V06) to an external retentate collection tank (be aware of the pressure loss in the tubing especially with high retentate out streams and with high viscous retentate)
- The system is now ready for MF/UF filtration with Mix Flow and external tanks

b. Change from Mix Flow Mode to Over Tank Mode

Set-up with external tanks for Over Tank Mode

- Remove the pipe between the Mix Flow pump (P01) and the retentate loop Flowmeter (FT04) or V05 if FT04 is not included in Your system
- Mount a Feed tube between your external tank and P01
- Mount a Tube between Your external tank and FT04 or V05 if FT04 is not included in Your system
- Close V06 and V03
- The system is now ready for MF filtration in Over Tank Mode



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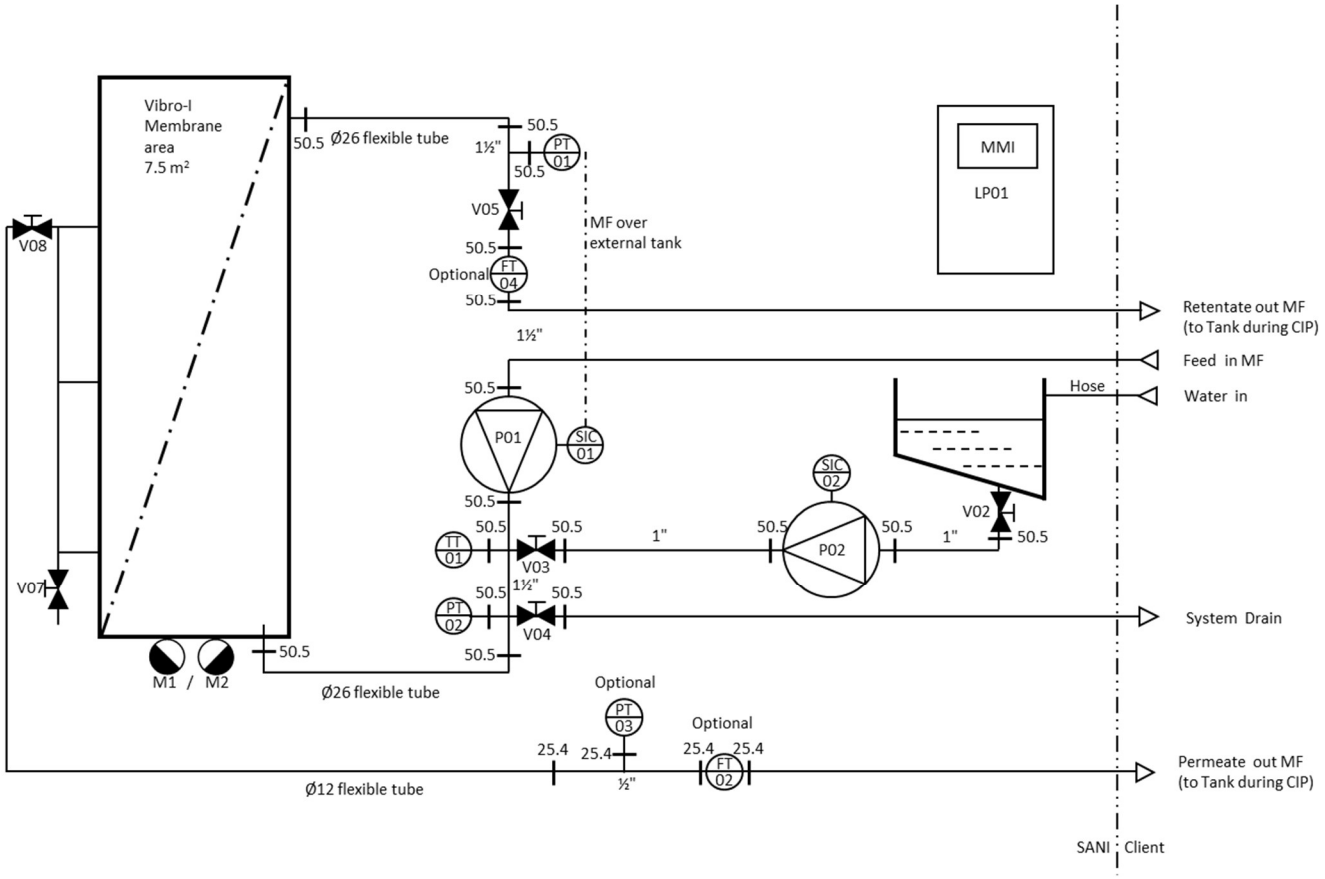


CIP Set-up for MF Over Tank Mode using the internal CIP tank

- Drain the unit
- Mount the pipe between P01 and FT04
- Open V03
- Connect Permeate out and Retentate out (Airvent) to the CIP tank
- The Airvent V06 also needs to be CIP'ed even though it is not in use.
- The system is now ready for CIP over the CIP tank with preheated CIP Media

(The System can also be CIP'ed over a heated external CIP tank if needed)

4. Operation

When the system is installed it can be turned-on on the main switch on the front of the control cabinet. The main menu will appear on the touch screen. The safety stop on the front of the control cabinet should be out to start the system.

a. General Guidelines – Process

1. The Feed Pump (P02 Inoxpa 0.75 kW) must never run dry as the flexible impeller will be damaged if no media is present **ATTENTION**
2. Maintain a positive trans membrane pressure (min 0.02 bar) when vibration mode is on and keep the permeate drain open at all times
3. **Operating Pressure: 0-4 bar at 5-35°C, 0-3 bar at 5-55°C and 0-1 bar at up to 80°C.** ⚠ **WARNING**
4. When filtering media with high viscosity or high solids load a Mix Flow (or a flow over an external tank flow) of 3000-5000 l/h should be established
5. When 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
6. The Vibro-I Feed System (in Mix Flow Mode) is designed with a retentate loop and a Mix Flow pump. It is recommended to run the Mix Flow pump at as low speed as possible at normal filtration applications (at least 400l/h on FT04). When running with difficult feeds (e.g. high viscosity) a faster Mix Flow could be necessary (400-5000l/h)
7. The membranes must never be left to dry out as the pore size will change! **ATTENTION** After each run the membranes must be CIP'ed according to the application and the membrane and stored in preservation media (e.g. 19% Alcohol) to prevent growth of organic matter

Microfiltration (0 – 1 bar)

1. Keeping a very low trans membrane pressure: 0.05 to 0.4 bar often gives the best long-time results
2. The flux can be very high and easily result in severely fouled areas in the Vibro-I unit. Reduce the flux by lowering the TMP and let more retentate out to avoid severe fouling

Ultrafiltration (1 – 4 bar)

1. Make sure that the system pressure does not exceed 4 bar. Operating Pressure: **Operating Pressure: 0-4 bar at 5-35°C, 0-3 bar at 5-55°C and 0-1 bar at up to 80°C**. ⚠ **WARNING**

CIP

1. Always use an appropriate CIP protocol for the membrane used and the application in question
2. Use a heated external tank to reach the temperature needed for the different CIP steps. Alternatively preheat the system with hot water, drain it and add hot CIP media to the CIP tank and adjust CIP temperature during the cycle by adding more
3. Retentate out and Permeate out must be connected to the CIP tank in use during CIP
4. It is recommended to run the Mix Flow pump at 40% at normal CIP cycles. or establishing a flow over an external CIP tank of 3000-5000 l/h
5. Draining between different CIP cycles must be performed
6. Store the unit filled with preservation media (e.g. 19% Alcohol) to prevent growth of organic matter

Please find a separate manual for the Vibro-I on our Webpage at: www.sanimembranes.com for more operation advice of the Vibro-I.

b. General Guidelines - Over Tank Mode

The Over Tank Mode is a batch mode where the concentration of retentate in the system is raised gradually during the run and the final retentate concentration is reached at the end of the run.

- The Mix Flow Pump (P01) is used as the feed pump in Over Tank Mode and it is pressure controlled by the pressure out of the Vibro-I (PT01)
- The manual Retentate Valve (V05) is used to reduce the retentate flow over the membranes and thereby minimizing the pressure loss over the membrane (PT01 - PT02).
- The retentate flow should be adjusted to your application and maybe also gradually to the rising retentate concentration
- The minimum recommended retentate flow is 400l/h for low fouling applications up to 5000l/h for high fouling applications at the final retentate concentration

The Over Tank Mode is used for high fouling microfiltration applications, where it is an advantage that the final concentration of retentate is reached in the end of the batch filtration and for microfiltration applications where an ultralow and uniform TMP is important.

The Over Tank Mode is also used to mimic bigger industrial installations (e.g. one pass concentrations) where the retentate concentration is raised gradually through the system. By mixing the permeate back into the retentate tank it is possible to work a given retentate concentration for longer time periods to optimize the production parameters.

c. General Guidelines - Mix Flow Mode

The Mix Flow Mode is used for continuous MF and UF filtration applications where a concentration degree is reached in the Mix Flow loop and the retentate is bleeded out through V06 throughout the filtration.

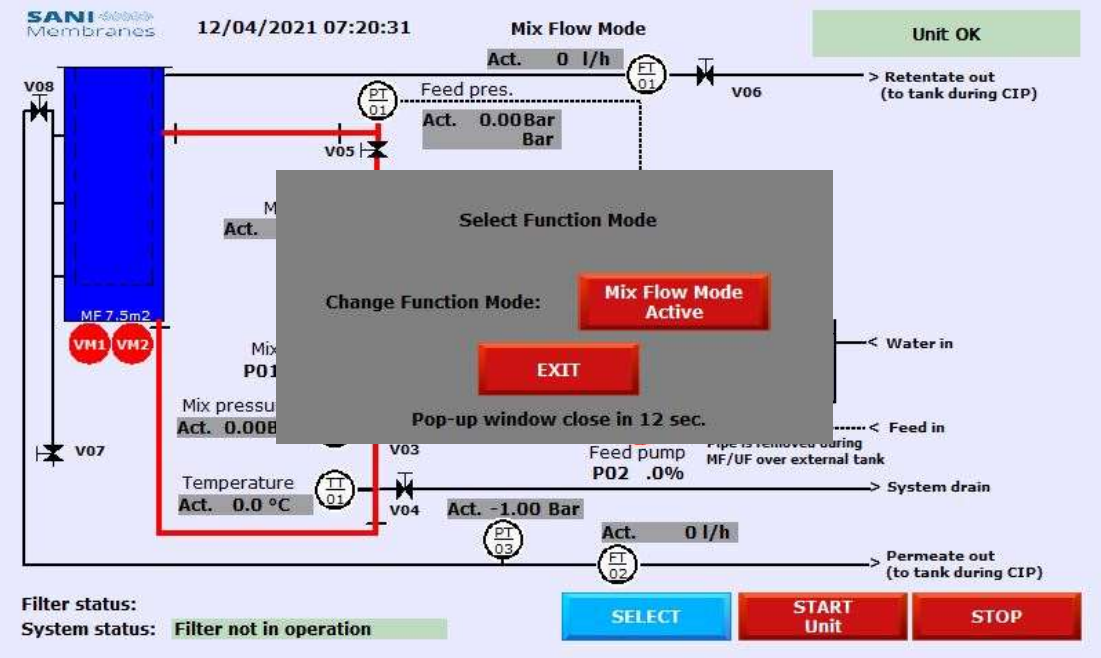
The Vibro-I Feed System will work on the final concentration of retentate almost in the entire run and should only be stopped for CIP cleaning.

The Feed Pump (P02) (a positive pump) is used to create the pressure in the retentate loop and the Mix Flow Pump (P01) is used to create the wanted Mix Flow in the retentate loop.

The speed of the Mix Flow Pump (P01) should be as low as possible to minimize the pressure loss over the membrane (PT01 - PT02). The recommended Mix Flow is 400l/h for low fouling applications and up to 5000l/h for high fouling applications.

d. System Startup

Turn on the power and the program will load on the touch screen:



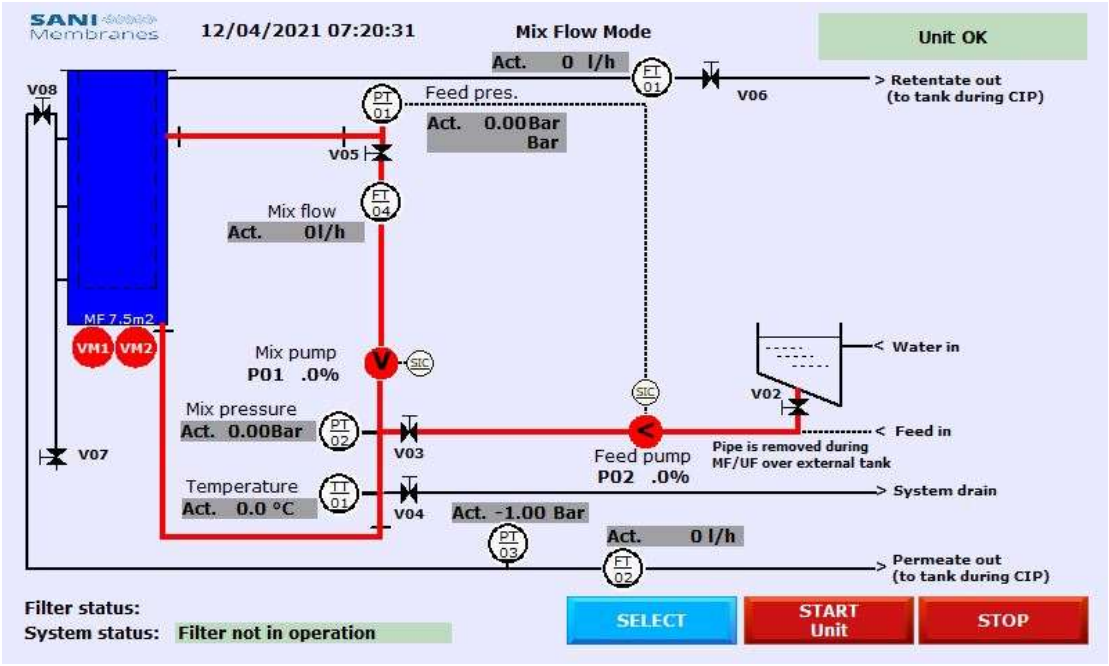
When the program has loaded, a popup screen will display and ask you to select the function mode, you have 2 possibilities:

1. **Over Tank Mode**
   Choose Over Tank Mode for Microfiltration over an external feed/retentate tank

2. **Mix Flow Mode**
   Choose Mix Flow Mode for MF/UF applications where the Mix Flow loop is used and retentate is continuously bleeded out of the loop at the desired concentration

Press exit when the desired function mode is selected. The function mode can be changed on the 'Configuration and Manuel Operation Menu' when the system is stopped.

e. Main Menu (Mix Flow Mode)



Main Menu (Mix Flow Mode)

The 'Main Menu' displays a diagram of the system layout with live screening of all instrument readouts (P01, P02, PT01, PT02, PT03, FT01, FT02, FT04 and TT01).
The system starts by pressing the 'START Unit' button at the Set Points specified in the 'Set Points and Timers' Menu. Before the system starts a pop-up menu will be displayed:

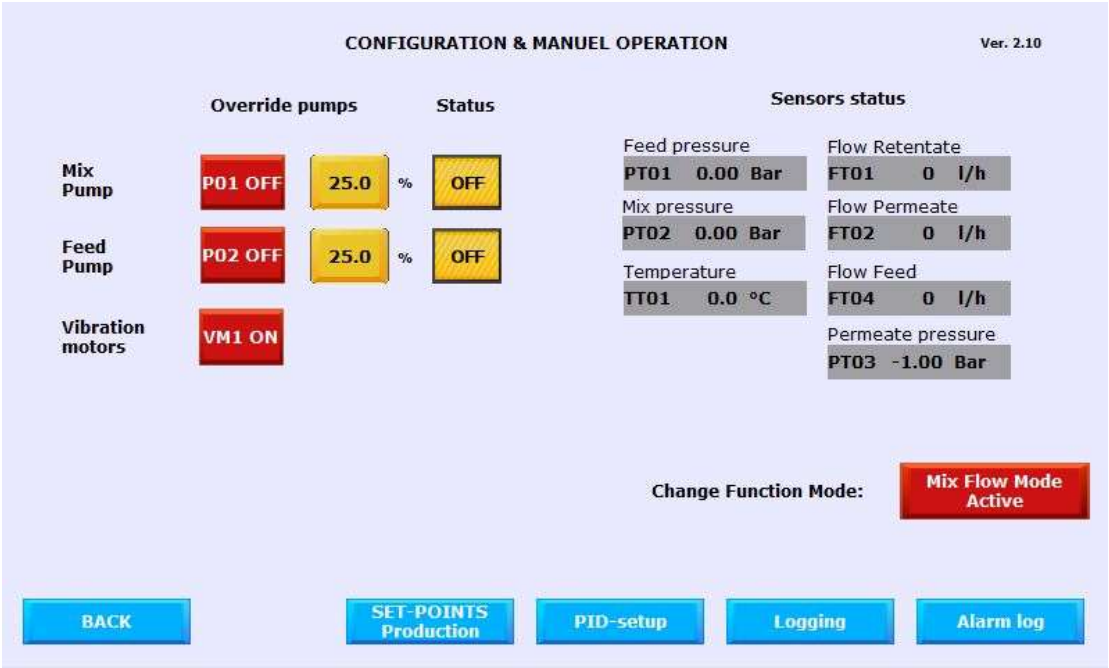
Start unit pop-up Menu (Mix Flow Mode)

The 'Start unit pop-up menu' is displayed to make the operator rethink that all Set Points and Valve positions are correct before start-up. The de-aeration/retentate Valve V06 should always be open when starting the system up to de-aerate the system. It should be adjusted to give the wanted retentate out flow when de-aeration is complete. The system starts by pressing the 'Confirm' button and then the 'Start unit' button. If the operator wants to readjust the Set points before starting the unit, he must press the 'Exit' button

The system stops by pressing the 'STOP' button on the Main Menu

The 'Configuration and Manuel Operation Menu' is displayed when pressing the 'SELECT' button on the Main Menu:

f. Configuration and Manuel Operation Menu (Mix Flow Mode)



Configuration and Manuel Operation Menu (Mix Flow Mode)

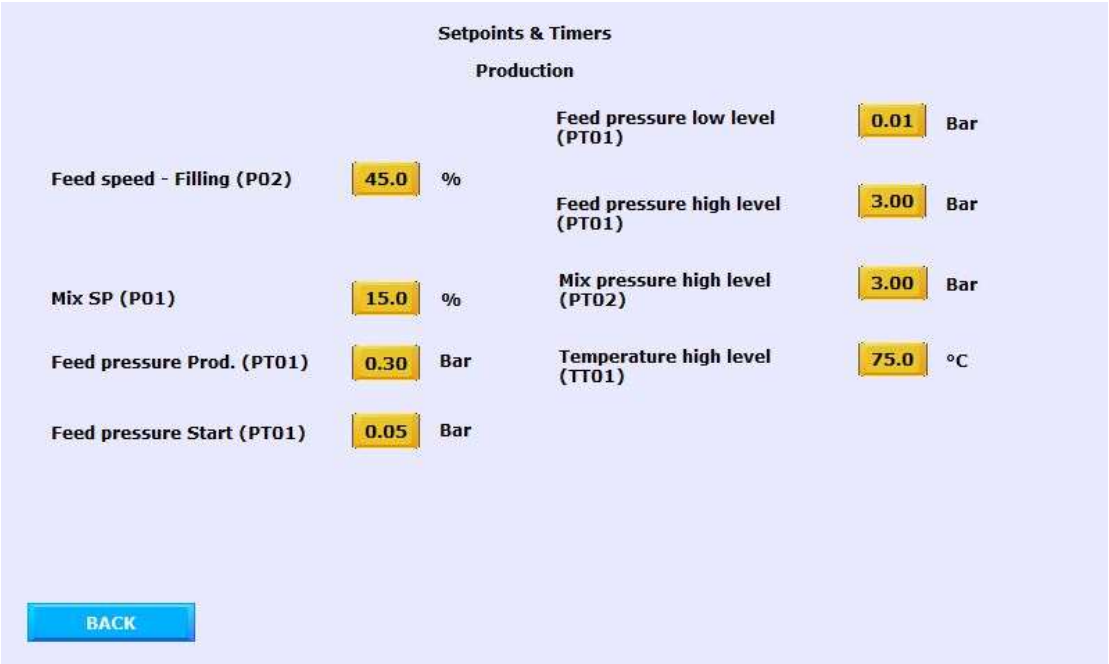
On the 'Configuration and Manuel Operation Menu' the pumps and vibration motors can be operated manually. The manual controls should only be operated when the system is stopped on the 'Main Menu'. If the system is running the Set Points found in the 'Setpoint and Timers Production Menu' should be adjusted instead.

The function mode can be changed from Mix Flow Mode to Over Tank Mode when the system is stopped by pressing the button. The 'Main Menu' and the 'Setpoint and Timers Production Menu' will change to the chosen mode.

The 'Configuration and Manuel Operation Menu' also displays a live screening of all instrument readouts (PT01, PT02, PT03, FT01, FT02, FT04 and TT01).

From the 'Configuration and Manuel Operation Menu' the 'Setpoint and Timers Production Menu', the 'PID-setup Menu', the 'Logging Menu' and the 'Alarms Menu' by pressing the appropriate button.

g. Setpoint and Timers Production Menu (Mix Flow Mode)



Setpoint and Timers Production Menu (Mix Flow Mode)

In the 'Setpoint and Timers Production Menu' all Set Points for production in Mix Flow Mode can be set in the left column of the screen and all Alarm Set Points can be set in the right column of the screen. All setpoints can be altered while the unit is running if the operator wants to e.g. go from 1 bar to 2bar in feed pressure.

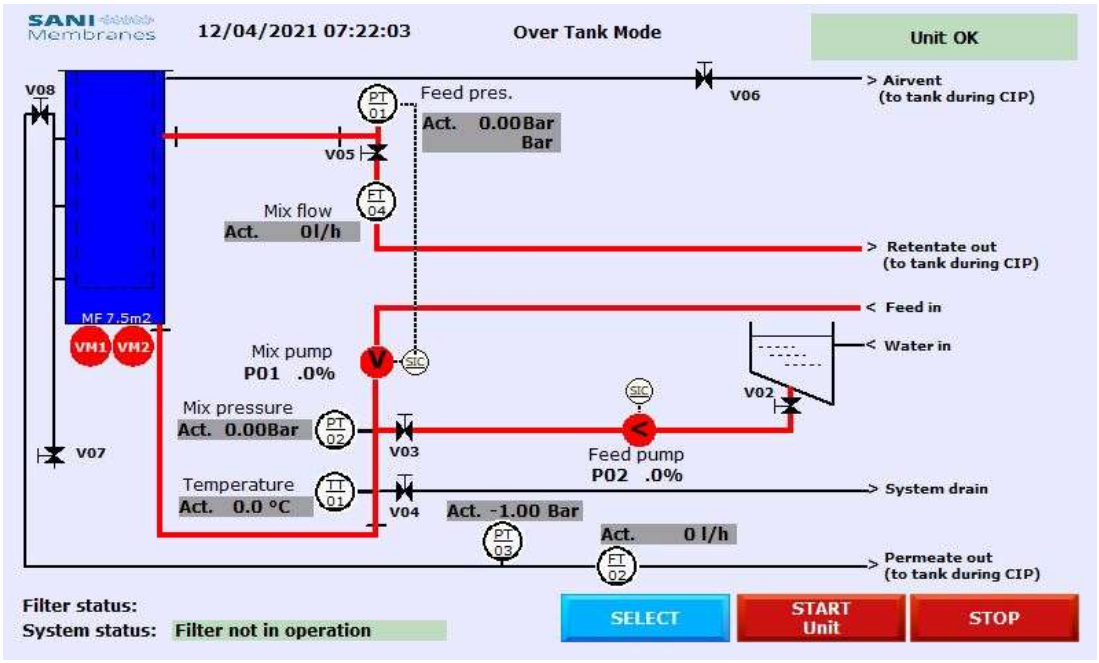
Production Set Points:

- 'Feed speed – Filling (P02)' is the speed of the Feed Pump in % during the startup of the unit. When the 'Feed pressure Start (PT01)' Set Point is reached the Feed Pump speed is regulated by the Set Point 'Feed pressure Prod. (PT01)'
- 'Mix SP (P01)' is the speed of the Mix Flow Pump in % during production (should always be at least 5%)
- 'Feed pressure Prod. (PT01)' is the pressure during production after the Vibro-I. A little pressure loss will occur over the Vibro-I depending on the Mix Flow Pump speed. This means that PT02 will be a little higher than PT01
- 'Feed pressure Start (PT01)' is the pressure at which the Vibration Motors and Mix Flow Pump starts, and the Feed Pump starts to be regulated by the 'Feed pressure Prod. (PT01)'

Alarm Set Points:

- 'Feed pressure low level (PT01)' is the lowest pressure allowed (0,02 bar is the standard)
- 'Feed pressure high level (PT01)' is the highest pressure allowed after the Vibro-I (4,0 bar is the highest setting allowed, see Safety section for more info)
- 'Feed pressure high level (PT02)' is the highest pressure allowed before the Vibro-I (4,0 bar is the highest setting allowed, see Safety section for more info)
- 'Temperature high level (TT01)' is the highest temperature allowed

h. Main Menu (over Tank Mode)



Main Menu (Over Tank Mode)

The 'Main Menu' displays a diagram of the system layout with live screening of all instrument readouts (P01, P02, PT01, PT02, PT03, FT01, FT02, FT04 and TT01).
The system starts by pressing the 'START Unit' button at the Set Points specified in the 'Set Points and Timers' Menu. Before the system starts a pop-up menu will be displayed:

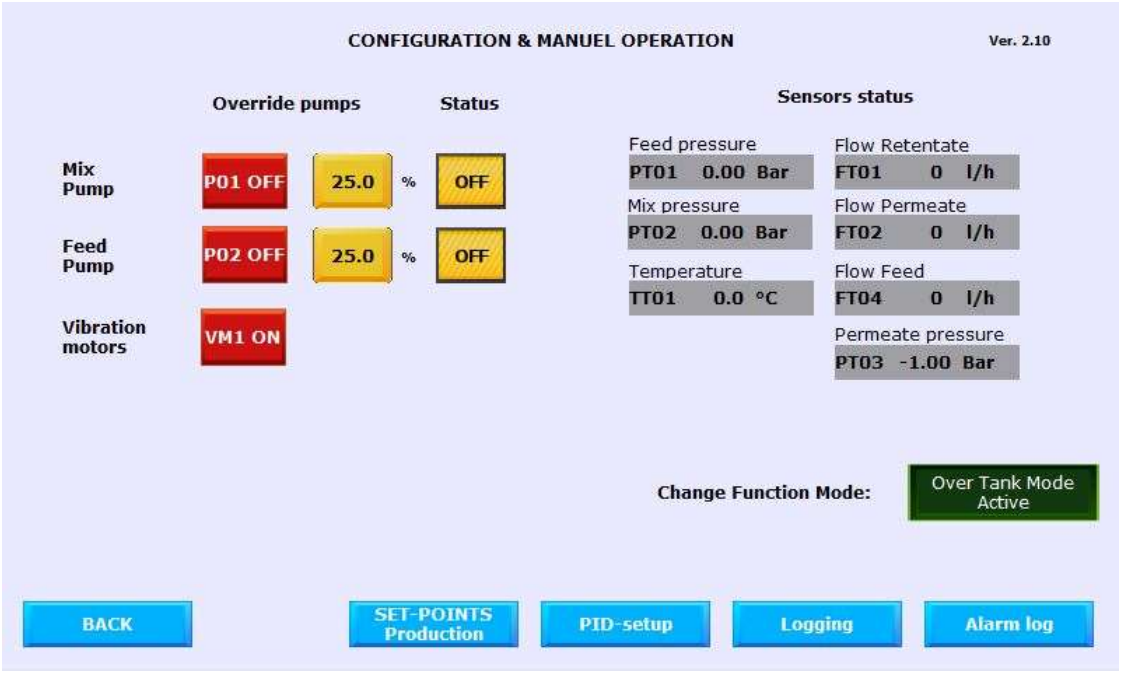
Start unit pop-up Menu (Over Tank Mode)

The 'Start unit pop-up menu' is displayed to make the operator rethink that all Set Points and Valve positions are correct before start-up. The de-aeration/retentate Valve V05 should always be partly open when starting the system up to de-aerate the system. It should be adjusted to give the wanted retentate flow through the system when de-aeration is complete (preferably 500-5000 l/h). The system starts by pressing the 'Confirm' button and then the 'Start unit' button. If the operator wants to readjust the Set points before starting the unit, he must press the 'Exit' button

The system stops by pressing the 'STOP' button on the Main Menu

The 'Configuration and Manuel Operation Menu' is displayed when pressing the 'SELECT' button on the Main Menu:

i. Configuration and Manuel Operation Menu (Over Tank Mode)



Configuration and Manuel Operation Menu (Over Tank Mode)

On the 'Configuration and Manuel Operation Menu' the pumps and vibration motors can be operated manually. The manual controls should only be operated when the system is stopped on the 'Main Menu'. If the system is running the Set Points found in the 'Setpoint and Timers Production Menu' should be adjusted instead.

The function mode can be changed from Over Tank Mode to Mix Flow Mode when the system is stopped by pressing the button. The 'Main Menu' and the 'Setpoint and Timers Production Menu' will change to the chosen mode.

The 'Configuration and Manuel Operation Menu' also displays a live screening of all instrument readouts (PT01, PT02, PT03, FT01 FT02, FT04 and TT01).

From the 'Configuration and Manuel Operation Menu' the 'Setpoint and Timers Production Menu', the 'PID SET-POINTS Menu', the 'Logging Menu' and the 'Alarms Menu' by pressing the appropriate button.

j. Setpoint and Timers Production Menu (Over Tank Mode)

Setpoint and Timers Production Menu (Over Tank Mode)

In the 'Setpoint and Timers Production Menu' all Set Points for production can be set in the left column of the screen and all Alarm Set Points can be set in the right column of the screen. All setpoints can be altered while the unit is running if the operator wants to e.g. go from 0.2 bar to 0.3 bar in feed pressure.

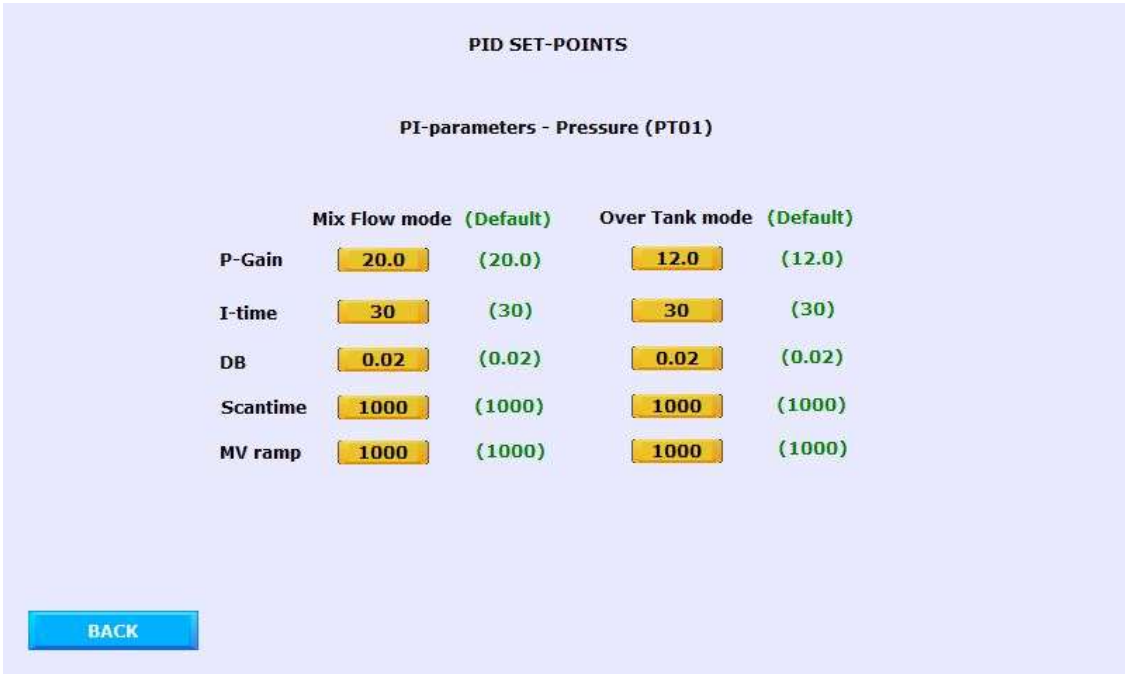
Production Set Points:

- 'Feed speed – Filling (P01)' is the speed of the Feed Pump in % during the startup of the unit. When the 'Feed pressure Start (PT01)' Set Point is reached the Feed Pump speed is regulated by the Set Point 'Feed pressure Prod. (PT01)'
- 'Feed pressure Prod. (PT01)' is the pressure during production after the Vibro-I. A little pressure loss will occur over the Vibro-I depending retentate flow. This means that PT02 will be a little higher than PT01
- 'Feed pressure Start (PT01)' is the pressure at which the Vibration Motors starts, and the Feed Pump (P01) starts to be regulated by the 'Feed pressure Prod. (PT01)'

Alarm Set Points:

- 'Feed pressure low level (PT01)' is the lowest pressure allowed (0,02 bar is the standard)
- 'Feed pressure high level (PT01)' is the highest pressure allowed after the Vibro-I (4,0 bar is the highest setting allowed, see Safety section for more info)
- 'Feed pressure high level (PT02)' is the highest pressure allowed before the Vibro-I (4,0 bar is the highest setting allowed, see Safety section for more info)
- 'Temperature high level (TT01)' is the highest temperature allowed

k. PID SET-POINTS Menu (both modes)



PID SET-POINTS Menu

In the 'PID SET-POINTS Menu' the PID regulation parameters can be adjusted individually for the 2 modes.

l. Logging Menu (both modes)

Number	Date	Status	Status2	PT01	PT02	PT03	FT01	FT02	FT04	TT01	P01	P02
42	23/02/2021 07:34:04			0.00	0.00	-1.00	0	0	0	0.0	0.0	0.0
41	23/02/2021 07:34:02			0.00	0.00	-1.00	0	0	0	0.0	0.0	0.0
40	23/02/2021 07:34:00			0.00	0.00	-1.00	0	0	0	0.0	0.0	0.0
39	23/02/2021 07:33:59			0.00	0.00	-1.00	0	0	0	0.0	0.0	0.0
38	23/02/2021 07:33:57			0.00	0.00	-1.00	0	0	0	0.0	0.0	0.0
37	23/02/2021 07:33:56			0.00	0.00	-1.00	0	0	0	0.0	0.0	0.0
36	23/02/2021 07:33:55			0.00	0.00	-1.00	0	0	0	0.0	0.0	0.0
35	23/02/2021 07:33:53			0.00	0.00	-1.00	0	0	0	0.0	0.0	0.0
34	23/02/2021 07:33:51			0.00	0.00	-1.00	0	0	0	0.0	0.0	0.0
33	23/02/2021 07:33:50			0.00	0.00	-1.00	0	0	0	0.0	0.0	0.0
32	23/02/2021 07:33:48			0.00	0.00	-1.00	0	0	0	0.0	0.0	0.0
31	23/02/2021 07:33:47			0.00	0.00	-1.00	0	0	0	0.0	0.0	0.0
30	23/02/2021 07:33:46			0.00	0.00	-1.00	0	0	0	0.0	0.0	0.0
29	23/02/2021 07:33:44			0.00	0.00	-1.00	0	0	0	0.0	0.0	0.0
28	23/02/2021 07:33:42			0.00	0.00	-1.00	0	0	0	0.0	0.0	0.0

Logging Menu

All instrument values are logged from the 'Logging Menu'. Over Tank Mode and Mix Flow Mode is logged in the same file.
The 'Logging Menu' shows the last 15 logs recorded. You can see earlier logs by using the buttons underneath the last 15 logs.
The system has a maximum capacity of 1500 logs.
The date, time, mode, status, PT01, PT02, PT03, FT01, FT02, FT04, TT01, P01 and P02 is logged.

- Give the logging file a name on the 'Backup filename' button
- Decide the logging interval on the 'Logging interval(s)' button. Remember that the system can only hold 1500 logging points
- Backup the log to a USB key by inserting a USB key on the back of the screen and pressing the 'Start Backup to USB' button
- If You backup to an USB key in intervals the system adds the latest 1500 logging points to the existent file with the same name and format on the USB key (do not change the file)

m. Alarm log Menu (both modes)

Alarm log Menu

All Alarms are displayed in the 'Alarmlog Menu'.
The 'Alarm log Menu' shows the last 25 alarms. The alarms can be saved on the USB-key.

- Give the logging file a name on the 'Backup filename' button
- Backup the log to a USB key by inserting a USB key on the back of the screen and pressing the 'Start Backup to USB' button

5. Maintenance

The pumps and instruments must be maintained according to their individual manuals delivered with the system. Gaskets, flexible tubing's and polymer fittings should be exchanged at regular intervals depending on wear. The Vibro-I must be maintained according to the manual for the Vibro-I on our webpage at: www.sanimembranes.com

6. Conformity

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

All media contacting parts are in durable elastomeric material, durable polymeric materials or stainless steel and comply to FDA CFR 21 and EC 1935/2004 for materials in food contact and all engineering solutions are sanitary except the polymeric ball valves V06, V07 and V08 which only comply to FDA CFR 21 for materials in food contact.