MEMCOR®
an EVOQUA brand

DATA SHEET FOR MEMCOR® SM AUTO AUTOMATED SIMPLE MEMBRANE FILTERS

MODELS SM 1 AUTO, SM 2 AUTO, SM 3 AUTO AND SM 4 AUTO

The Challenge

Small communities require robust, reliable water treatment solutions often from difficult water sources. These treatment systems must provide pathogen free water economically and with minimal operator attendance.

Our Solution

The MEMCOR® SM AUTO automated simple membrane filtration unit is a low cost, easy to operate water filtration solution that utilises a microprocessor based filter controller.

It affords practical, small scale potable water treatment using proven Memcor ultrafiltration (UF) membrane technology. The filter controller provides automatic water production for extended periods, with minimal operator input.

Each MEMCOR® Hollow Fibre Membrane Filtration Module is mounted inside a moulded plastic pressure housing. SM AUTO Units are available with one, two, three or four Module Housings, providing a range of flow capacities in a compact, robust, easy to transport and simple to install filter assembly.

The Memcor UF barrier filtration process provides primary disinfection by removing pathogens and particulates. When combined with ultra violet (UV) or chlorine disinfection, it will supply safe drinking water from the majority of non-saline surface and ground waters.

Typical MEMCOR® SM 4 AUTO Membrane Filtration Unit

A simple automated membrane solution for small scale water treatment

Note: Design, data and dimensions are subject to modification without notice

Typical Applications

- Decentralised water treatment systems
- Community small scale systems
- Remote mining or rural communities
- Point of entry filtration
- Emergency and temporary water supplies
- Hotels / restaurants / resorts
- Bottled water production
- RO (reverse osmosis) pre-treatment

MEMCOR® Membrane Modules

Memcor Membrane Filtration Modules use high permeability, low fouling PVDF hollow fibre membranes for optimum performance and long life. Memcor modules are simple in design and easy to install and maintain. Thousands of potable water and water reuse plants globally rely on Memcor modules for their water filtration requirements.

Some of the significant benefits of the Memcor low pressure membrane filtration process include:

- It is a barrier filtration system that provides positive mechanical retention of suspended solids and micro-organisms;
- Filtrate quality is consistent despite wide variations in feed stream conditions;
- Filtrate quality is independent of operator interaction;
- The use of chemicals for cleaning is minimised by the high efficiency of Memcor filtration membranes and the low pressure air backwash process;
- Memcor PVDF membranes are typically cleaned with inexpensive chlorine based cleaning solutions;
- Operator input requirement is minimal, making unattended operation possible for normal filtration service.

Four SM AUTO Unit Sizes Available

SM AUTO Units are available in four different sizes, with one, two, three or four modules fitted. This provides a range of typical filtered water production capacities up to 100 kilolitres per day for a clear surface water feed.

The Controller

The system controller fully automates operation of the filtration and backwash cycles.

Provision is made for a level switch input from a feed supply tank and a level switch input from a filtrate storage tank. These inputs may be used to pause filtration as the liquid levels in the feed or filtrate storage systems change.

These features minimise operator attendance requirements during normal filtration service.

Operating Description

Raw water flows into the filtration module housings under pressure. As it passes through the porous walls of the hollow fibre membranes (outside to inside), solids are retained on the membrane surface.

The SM AUTO system is suitable for use in either pumped feed or gravity feed applications. In most systems, the flow is regulated at a constant rate by a simple flexible orifice type flow control valve on the feed inlet to each module.

The secret to the successful operation of the SM AUTO Unit is the effectiveness of its backwash process. The backwash uses low pressure aeration to maintain clean membrane surfaces and does not rely on any inside to outside reverse filtrate flushing, as required by many other conventional filtration technologies. The Unit provides its own compressed air for backwash aeration by means of a small electric air blower.

The filter controller automatically initiates backwashing at preset intervals for each module in turn.

Cleaning

The Unit periodically requires a chemical clean or CIP (Clean-In-Place) cycle. This removes residual fouling that cannot be removed by the backwash process alone and helps to limit biological growth in the system. Sodium hypochlorite solution (household chlorine bleach) is typically the chemical used for cleaning. Citric acid cleaning may also be used periodically for some systems, particularly where the feed contains dissolved minerals, such as iron.

The filter controller partially automates the cleaning process and provides guidance to the operator when manual input is required during the cycle. Cleaning frequency is application specific but is generally between weekly and monthly.

Typical User Requirements for SM AUTO Installation and Operation

The MEMCOR® SM AUTO Unit forms the core component of a membrane filtration system. Ancillary equipment external to the Unit is required to complete the system.

Requirements vary from site to site but typically the client or end user must supply the following:

1. A suitable location

A suitable installation location should be found. The location will typically be:

- Close to the feed water source, or;
- Close to the filtered water storage and/or service delivery area;
- Easily accessible for installation, operation and maintenance of the Unit and its ancillary equipment;
- Close to a suitably protected single phase AC power supply (power grid, solar inverter or similar);
- Covered to provide some protection from the elements;
- On a flat, firm and level surface with suitable drainage.

2. A raw water feed delivery system

The feed system typically includes:

- Gravity feed or feed pump system within the specified flow and pressure range (including any external power supply requirements plus call-to-run signal connection via the Unit controller, if necessary);
- Feed tank (where required) and feed storage level low switch (where fitted, plus connection to the Unit controller);
- Feed supply pipe or hose connections and valves;
- Feed strainers/pre-screens;
- Any other feed pre-treatment requirements (such as pH correction).

3. A filtrate storage and/or distribution system.

This typically includes:

- A filtrate storage tank and filtrate storage level high switch (where fitted, plus connection to the Unit controller);
- Filtrate outlet pipe or hose connections and valves;
- Filtrate disinfection system (for potable water);
- Any other filtrate post-treatment requirements.

4. A waste disposal system.

This typically includes:

- Free venting of air out of the waste outlet/vent termination point on the Unit. A vent must be provided at this outlet to allow free discharge of aeration air from the top of the Module Housings;
- A freely draining pipe, pit or channel that removes liquid waste from the waste outlet/vent termination point on the Unit, without returning this waste to the feed water source;
- Pipe or hose connections from other waste outlets on the Unit to the same waste disposal system;
- A means of neutralising cleaning solution waste liquid.

5. Electrical installation.

This typically includes:

- Power connection to the Unit controller from a protected (with external circuit breaker or fuse) single phase power supply and earth. This also supplies the aeration blower and the feed pump output (where used);
- A safety switch (residual current device or RCD) on the incoming power supply;
- Installation and connection of the feed storage level low switch (where used) to the Unit controller;
- Installation and connection of the filtrate storage level high switch (where used) to the Unit controller.

6. An operator

Operator attendance is required intermittently, preferably at least once per day, to monitor Unit and auxiliary systems operation and to perform cleaning cycles when necessary.

Please refer to the SM AUTO Unit process and instrumentation diagram for general operating process requirements.

TECHNICAL DATA

GENERAL OPERATION

Parameter	Details	
Typical application	Filtration of potable non-saline surface water or groundwater for small communities. Post-treatment disinfection is always recommended for potable water applications, typically using chlorination or UV (ultra-violet) steriliser treatment. In potable water applications, this Unit is not suitable if feed water source is saline or contains contaminants such as heavy metals **unless** used as a pre-treatment for desalination systems such as Reverse Osmosis (RO) to remove water soluble contaminants.	
Approximate Unit filtrate production capacity for 24 hour operation treating clear surface water (turbidity < 10 NTU) [Note 1]	Unit configured for "Filter Mode 1" with backwash every 60 minutes of filtration. (Approximate recovery 96 %)	
SM 1 AUTO	25 kL/day	(6,600 US gallons/day)
SM 2 AUTO	50 kL/day	(13,200 US gallons/day)
SM 3AUTO	75 kL/day	(19,800 US gallons/day)
SM 4AUTO	100 kL/day	(26,400 US gallons/day)

[1] Unit capacities shown are based on standard size flow control valve(s) [nominal instantaneous flow rate of 18 litres per minute per module], standard operating process configuration settings and twenty four hour continuous filtration/backwash operation with no downtime for standby, cleaning cycle, etc. As feed water turbidity increases more frequent cleaning will be required to maintain production flow rate.

Parameter	Details	
Approximate Unit filtrate production capacity for 24 hour operation treating slightly turbid surface water (turbidity < 20 NTU) Note 1	Unit configured for "Filter Mode 2" with backwash every 30 minutes of filtration. (Approximate recovery 92 %)	
SM 1 AUTO	22.5 kL/day	(5,950 US gallons/day)
SM 2 AUTO	45 kL/day	(11,900 US gallons/day)
SM 3AUTO	67.5 kL/day	(17,850 US gallons/day)
SM 4AUTO	90 kL/day	(23,800 US gallons/day)
Approximate Unit filtrate production capacity for 24 hour operation treating turbid surface water (turbidity < 50 NTU) Note 1	Unit configured for "Filter Mode 3" (default factory setting) with backwash every 15 minutes of filtration. Approximate recovery 86 %)	
SM 1 AUTO	20 kL/day	(5,300 US gallons/day)
SM 2 AUTO	40 kL/day	(10,600 US gallons/day)
SM 3AUTO	60 kL/day	(15,900 US gallons/day)
SM 4AUTO	80 kL/day	(21,200 US gallons/day)
"Filter" mode operation	Automatic pressurised outside to inside filtration. Filter Mode (filtration time before a backwash) is operator selectable: Automatic standby on feed and filtrate storage levels via level switch inputs (where used).	
"Backwash" mode operation	Automatically initiated and controlled backwash sequence for each module in turn, using low pressure air scour and feed flush. Typical sequence duration is 160 seconds for each module.	
Waste water volume per backwash	Up to 40 litres every backwash cycle for each module housing fitted. Vented gravity drain waste outlet to be provided adjacent to Unit.	
Typical feed inlet pressure range for pumped feed or high head gravity feed (FCV fitted)	10 m to 15 m (100 – 150 kPa) at 18 litres per minute per module. 20 m (200 kPa) maximum housing pressure.	
Unit piping terminations	25 BSP (1") Male (typical)	
Typical feed inlet pressure range for low head gravity feed (FCV not fitted)	2 m (minimum) to 10 m (maximum) at 18 litres per minute per module (flow rate manually adjusted).	
Maximum housing operating pressure	200 kPa (20 m head)	
Feed pre-screen mesh size requirement Note 2	500 µm or finer	
Maximum recommended feed turbidity Note 3	50 NTU	
Typical filtered water turbidity	< 0.1 NTU	
Typical particle removal	> 4 LRV (log reduction value) for particles > 2 µm	
Operating feed temperature range	> 0 to 35 ^{O}C (> 32 to 95 ^{O}F) (Must not be exposed to freezing conditions)	
Typical Feed pH range	6.0 to 9.0 pH	

[2] Unscreened or coarsely screened raw water may cause operating problems and may reduce membrane life.

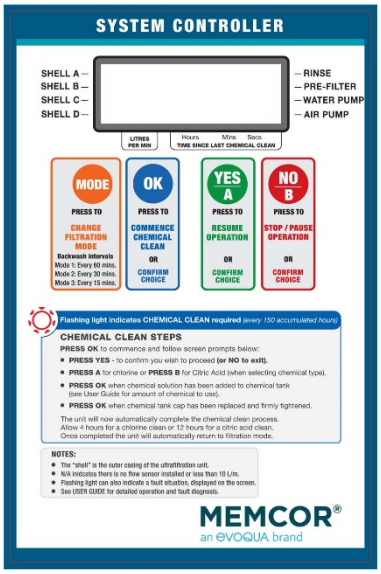
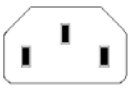
[3] Capacity and backwashing/cleaning frequency will vary based on feed turbidity and suspended solids.

Parameter	Details
Allowable pH range for cleaning	2 – 10.5 pH typical [Note 4]
Cleaning concentrate and volume required for a chlorine cleaning cycle. (Target concentration is 200 to 300 mg/L)	Typically household liquid bleach is used. For sodium hypochlorite 5 % (or 5.0 g/L) concentration, approximately 100 – 150 mL will be used per module fitted. ***Note:*** *Depending on site requirements, cleaning solution waste may require further treatment, such as neutralisation, prior to disposal.*
Cleaning concentrate and volume required for an acid cleaning cycle. (Target concentration is around 2.0 – 2.2 pH but not less than 2.0 pH)	Typically about 300 grams of citric acid powder (dissolved in water) will be used per module fitted if acid cleaning is required.
Typical target acid concentration during an acid clean	2.0 to 2.2 pH ()
Recommended installation location	Unit should be installed under cover with protection from direct sunlight and rainfall.

UNIT SPECIFICATIONS

Parameter	Details
Membrane Filtration Module details	MEMCOR® S10N Polyvinylidene Fluoride (PVDF) Hollow Fibre Ultrafiltration Membranes Nominal pore size 0.04 µm [Note 4]
Temperature range for transportation and storage	> 0 to 40 ^{O}C (> 32 to 104 ^{O}F) [Note 4] ***Note:*** *Units fitted with modules must not be allowed to freeze. Modules must remain moist at all times.*
Standard flow control device	Fixed flow rate flexible orifice flow control valve (FCV) with instantaneous flow rate of approximately 18 litres per minute, fitted to feed inlet of each module.
Materials of Construction: Module Housing Assemblies Valves Seals and Gaskets Pipe and Fittings	 Food grade polyethylene (PE) Various including PVC and PP EPDM typical Various including PVC, PE, ABS and Nylon
Electricity supply requirements ***Note:*** *Power supply voltage and frequency at the installation site must be specified at the time of order so that the correct aeration air blower can be supplied with the Unit.*	110 – 120 VAC, 50 or 60 Hz single phase and earth OR 200 – 240 VAC, 50 or 60 Hz single phase and earth External power supply should include a fuse or circuit breaker and a Residual Current Device (RCD or safety switch). Supply current rating should be based on system total power requirement, in particular, for feed pump motor current draw during starting. Please refer to feed pump motor rating plate to determine power requirements. Full sine wave only from DC to AC inverters – other inverter wave forms are not suitable.

[4] When Membrane Filtration Modules are fitted inside the SM AUTO Unit, the transport, storage and operating limits of the membranes determine allowable limits of environmental exposure. Please refer to the relevant Module specification sheet for further details.

Parameter	Details
 Typical membrane filter system controller	Microprocessor based controller with memory functions and 75 mm x 25 mm LCD graphic display. Four pushbutton function keys for operator input by menu selection. 320 mm H x 240 mm W 110 mm D-sealed PVC enclosure with On/Off switch in the base and couplers provided for electrical connections, including: • Power supply input connection (coupler with pins):  ▪ Similar to desktop computer power input connection (IEC 603200-1 Type C14 Male (to suit incoming power cable with C13 Female coupler) • Feed pump power output connection (coupler with sockets):  ▪ Similar to desktop computer power output for monitor (IEC 603200-2-2 Type E Female plug (to suit pump power cable with Type F Male coupler) • Terminals for (24 VDC) feed tank and filtrate tank level switches • Connector for optional pre-filter • Connector for optional flow sensor Built in switched power supply powers electronics, LCD, discrete inputs and 24 VDC solenoid valve and relay outputs. Advanced circuit design provides controller protection for electronics including replaceable 2AG glass type fuses
Feed Pump requirements	A feed pump is generally not required for systems where direct (gravity) feed is possible. The feed pump is typically supplied by the installer or end user at the time of Unit installation. It is typically a small centrifugal pump with a motor size of between about 0.4 kW up to about 1.2 kW and is connected to power by means of a three pin coupler plugged into the bottom of the SM AUTO controller enclosure. The pump must be sized to provide the rated SM AUTO maximum filtration instantaneous flow rate (typically 18 litres per minute times the number of Modules fitted) at a pressure in the Module Housings of about 100 to 150 kPa. The pressure in the Module Housings must not be allowed to exceed 200 kPa.
Aeration air blower (supplied fitted to the Unit)	Compact linear air pump Alita AL-150 standard series high capacity air pump, powered via main power incomer. Single phase AC power supply with rated performance 170 – 180 L/minute at 20 kPa (0.2 bar, 2.9 psig), approximately 140 Watts rated power input.
Aeration air blower power supply options ***Note:*** *The blower is powered via the Unit power supply incomer. Required power supply voltage and frequency must be specified at the time of order.*	200 – 240 VAC, 50/60 Hz single phase and earth 100 – 120 VAC, 50/60 Hz single phase and earth

TYPICAL UNIT DIMENSIONS AND MASSES

Parameter	SM 1 AUTO	SM 2 AUTO	SM 3 AUTO	SM 4 AUTO
Number of Modules Fitted	1	2	3	4
Approximate Unit frame dimensions and masses				
Height (mm)	1610	1610	1610	1610
Width (mm)	510	710	910	1110
Depth (mm)	340	340	340	340
Approximate mass empty (kg)	50	70	90	110
Approximate mass in operation [filled with water] (kg)	75	100	135	170
Approximate Unit external dimensions and masses packed for shipping (Units are shipped lying flat in shrink wrapped cartons)				
Length (mm)	1650	1650	1650	1650
Width (mm)	630	830	1100	1240
Depth (mm)	380	380	380	380
Approximate shipping mass (kg)	57	78	100	145

Evoqua Water Technologies

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