Microscreen drum filter
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Use

FB type microscreen drum filters are suitable mainly for tertiary treatment, especially for removal of suspended solids from residential and commercial waste water treatment plants. They can also be used in fish farms, food and paper industry and for recycling cooling water in power plants. In some cases these filters can be also used for recovery of precious substances.

How it works

Principle of filtration

Water containing solid particles flows through the filter cloth/sieve of the given structure which has openings of a certain size. The filter cloth traps impurities which are bigger than openings in the filter cloth while smaller particles, including water, flow through the filter out. As the filter cloth slowly becomes clogged by the increasing amount of filtered impurities, the filter cloth must be backwashed so it can work again.

Fig. 1 Filtration principle

Fig. 2 Filter cloth cleaning
**SS (mg/l), mesh (micrones)**

Suspended solids (SS) are in mg/l and show how many SS (e.g. flocs and other debris) are in one litre of water. It is just a reference parameter. It is also important to know what solids look like and select the mesh accordingly.

![Fig. 3 The same value of SS (mg/l), but solids are of different sizes](image)

**Secondary filter layer**

Filter capacity is greatly influenced not only by the volume but also by the nature of filtered SS. What matters is their size (flat particles tend to clog openings more easily than round ones), mechanical strength (compact particle can be filtered better than non-compact slimy ones) and the proportion of small and big particles in the total volume of influent. If a certain number of compact solids, bigger than the mesh openings, occur, it can result in a thin layer of sludge - secondary filter layer, which is capable of catching solids which are considerably smaller than the size of mesh openings, see Fig. 4. It is therefore advisable to choose a filter with a greater filter area so the filter idle time is as long as possible and an efficient secondary filter layer can form on the inner side of the mesh. This layer is flushed down to the sludge channel during backwash.

![Fig. 4 Secondary filter layer](image)

**Filter description**

The microscreen drum filter is a filtration unit. The filter is made up of a drum with filter cartridges. Above the filter is a backwash unit and inside the filter is a sludge channel. The cover which protects the filter cartridges from sunlight and other weather influences is supported by struts. Probes and other necessary filter parts are placed on the frame of the unit.
**Principle**

Water containing solid particles flows through the inlet pipe or sewer into the centre of the filter drum, solid particles are caught on the inside of the filter cloth and the filtered water flows through the cloth out. The entire filter remains off during this process. The filter cloth slowly becomes clogged by the increasing amount of filtered impurities, which leads to the rise of water level inside the drum as well as in front of the unit.
Once the water inside the drum reaches a certain level (switch-on level), it activates the drum and the backwash pump which pumps the already treated water to the nozzles of the backwash unit. The impurities on the filter cloth are removed by a directed jet stream of water to the sludge channel, from there they flow to the sludge tank. The cloth is thus cleaned and the water level inside the drum drops. The filtration process repeats automatically. The inflow of raw water is not interrupted during the drum cleaning process (during the drum rotation).

The water level is monitored by water level probes, see Control of one filter, page 39. The rinsing water (already treated water) is pumped to the nozzles which rinse the cloth on the outside of the drum and thus remove impurities caught on the inside of the drum which then fall to the sludge channel located inside the drum. Sludge is discharged from the channel by gravity to the sludge tank and from there it is either discharged by gravity or pumped out. The operation of the sludge pump is controlled by a water level probe. The ratio of the filter idle time and rotation depends on the amount of impurities flowing to the filter, their character and on the condition of the filter cloth.

As the inflow of raw water is not interrupted during the backwash and backwash water is taken directly from the filter unit, there is no need for additional water tanks for backwash or sludge water which leads to great reductions in initial costs.

As the filter switches on and off automatically, it minimizes electrical consumption and rinsing water consumption, enhances average quality of treated water, increases density of sludge discharge and prolongs the life of the whole unit.

**Right choice – filter selection**

From the point of view of the filter capacity the basic parameter is the **effective filtration area** (area of the filter cloth under water) which is defined by the filter size selected. The second parameter is **the size of openings** in the filter cloth and the third is the **quantity of suspended solids (SS)**. Your IN-EKO representative will recommend the size of the filter and the filter cloth based on the required quality of the treated water.

All the above mentioned criteria, which are usually of variable character, influence the current filter capacity.
Treated water must not contain any grease (oil, fats)! The filter cloth would get clogged by grease which cannot be rinsed off. Should the water contain grease, we recommend using a different unit, e.g. multifunctional pretreatment unit, which removes such substances from the inflowing water in the pretreatment phase.

No sand (not even deatomaceous powder) may enter the unit! It could cause damage to the filter (e.g. bearings). It is necessary to use a sand trap and sand separator to remove sand in the pretreatment phase.

Common practice shows that when using microscreen filters as tertiary treatment in residential and commercial waste water treatment plants it is best to use filter mesh with 0.04 mm (40 µm). If the treated water contains bigger impurities or for special uses of filters, it is necessary to select the optimal size of the filter and parameters of the filter mesh based on experience with filtration in similar conditions or by a filter test.

In any case it is advisable to consult the type of filter suitable for a site with IN-EKO representative and to know the average amount of suspended solids (SS) in the water to be treated, the estimated average flow and estimated maximum flow through the filter.

Filters are manufactured in different models to meet the requirements of designers:

**Concrete channel type**

The basis is the concrete channel of precise sizes according to the Technical drawings, including a crest. The channel should also include a service area and bypass channel.

*The crest is not part of the delivery and must be waterproof!*

The concrete channel must not contain any reinforcement or other support braces, e.g. for grate bars, which would narrow the channel.

![Concrete channel with the filter](image)
If the filter is not located in the building, it is ideal to place it to an insulated channel with a cover to protect it from low temperatures. The filter can be supplied with an insulated cover, which is used when it is not possible to insulate the channel or if the filter sticks out from the channel. This protects the cover from freezing and eliminates the risk of filter cloth rupture due to ice frost.

Service area:

- Regular checks of the unit (probes, sludge pump, drive, etc.) are carried out from the service area, which provides good access to the filter.
- Thanks to the “cli-clo” innovation system it is not necessary to lift the filter from the channel when changing the filter cartridges.
- The service area should be at least 700 mm wide and be separated from the channel, in which the filter is placed, by a sufficiently high wall, see Technical drawing.

Bypass channel:

- The filter itself does not have a fully working bypass!
- Thanks to the “cli-clo” innovation system it is not necessary to lift the filter from the channel when changing the filter cartridges.
- The basic function of the bypass channel is to ensure cheaper and faster maintenance service of the filter!
- It also protects the filter from overload. If there is excessive water flow, increase in SS or filter failure, the water level in front of the filter increases quickly, which is signalled by the emergency probe. For longer life of the filter the filter drum should not turn with such amount of water and it is hence necessary to have the water flow in another way.
- The bypass channel can be shut in two ways:
  - Passive: crest
  - Active: Manual sluice gates or electric gates which open automatically when there is an overload or failure
- It must be designed so it can function as fully working filter bypass (filter batteries). If there is a crest, it must be long enough to ensure optimal overflow.

Standard delivery of the filter includes a sludge tank and a sludge pump which automatically (activated by the water level probe) empties the sludge tank once it is full. Upon agreement with our sales representatives, it is possible to have the sludge removed by gravity.
The filter can be installed into the concrete channel into batteries (more filters for one inflow). Each filter works as an independent unit (as if it was not in a battery), while all the filters are set so they work fully automatically. There can be only one switchboard for more filters. Each filter should have its own service area, either separate or the same with another filter.

Standard delivery of filters includes a cover.

**Steel type**

Filters can be installed on the ground. Water flow is ensured by stainless steel pipes which are connected to the filter by flanges or KG piping. Diameters of the connecting pipes can vary in a certain range.

Filters should be installed in places where it does not freeze. If it is not possible to ensure this, filters must be manufactured with an insulated filter cover and insulated sludge tank. Insulation is not usually not done to all the filter. Insulation of the unit should be subject of consultation with IN-EKO TEAM representatives.
A distribution board if part of the delivery, should be placed directly on the filter for easier operation of the filter and for service purposes. A switchboard must be easily accessed.

Standard delivery of the filter includes a sludge tank.

Sludge discharge can be done in two ways, which can be combined:
- Gravity discharge, sludge flows out by gravity
- Sludge pump, located in the sludge tank, which pumps out the sludge

**Probes**

Pressure (see Fig. 37 p. 40):
- There is one pressure probe on the inlet which controls the filter operation.
- Another probe is located in the sludge tank activating the sludge pump.
- The switchboard controlling these two probe includes a PLC unit (LOGO! Siemens).

Contact probes (see Fig. 36 p. 40):
- There are three probes on the inlet (switch-on, switch-off, emergency).
- There are two probes in the sludge tank (switch-on and switch-off).
- Water levels can be set mechanically by the probes.

In both cases probes must be cleaned from stuck debris, see Regular checks, p. 45.

**Installation of the unit**

Filters, especially those installed in the concrete channel, must be placed there so water level in front of the filter can oscillate in the given range (see the Technical drawings). Water level in the units preceding the filter (settling tank, flotation unit, ...) must be at least 100 mm higher than the max. (emergency) level of the filter.

Water to the filter must flow gradually, must not splash and create vortex and shocks. The filter in the concrete channel must be preceded by a stilling area (see Technical drawings). Another solution is to have an influent under the water level (water flows in, does not splash). The optimal option for the filter in the stainless steel tank is having a settling tank in front of the filter.

**Inflow to the filter must be made possible to stop if necessary (e.g. using a sluice gate)**

and also **drain the tank with the filter**. Bypass of the filter can be equipped with a crest (of necessary length!) or manual gate, or electric gate.

**Inflow to the filter must be free of any particles which are bigger than 30 mm, sharp impurities, grit, sand, grease and sticky substances.**

Filter fitted in the concrete channel usually contains a sludge tank from which sludge is pumped out by a sludge pump. The connection sizes are given in the Technical drawings. In the installation site the connecting pipe to the sludge pump hose must be equipped with a back valve. If there is a danger that the connecting pipe will freeze in winter, it must be insulated or heated. If sludge is discharged by gravity, it is necessary to have pipes ready for connection.
The filter can be equipped with a terminal box, loose cables or bundled cables located in the flexi pipe. It is necessary to plan a route for these cables according to the standards as well as where to mount the switchboard.

The switchboard must be suitably placed to enable visual check of the operation of the unit. If the delivery includes assembly as well, then the location of the switchboard and its distance from the filter must be known when the unit is ordered.

### Preparation of the site

The unit is placed on a horizontal solid big foundation base (concrete channel, steel/plastic tank, concrete plate/foot, metal structure).

Check the sizes of the concrete channel if they correspond with the Technical drawings.

It is necessary to ensure that there is enough space around the filter and above it to enable handling the unit during assembly and maintenance service.

### Type designation

![Diagram of filter type designation]

- **3FBB X**
- **FBB** – concrete channel installation
- **FBO** – steel tank installation
- **L** – left orientation
- **R** – right orientation
- **Z** – insulated
- **atyp** – special design

Note.: the filter orientation is defined by the filter cover opening side. When water flows through the filter from left to right, it is right-hand orientation and vice versa (see Fig. below)

![Diagram of filter orientation]

**Fig. 11** Right-hand orientation of the filter

### Filter size

Filter size is given by the number of filter cartridges in a row along the circumference of the filter drum (see Table 1).
### Filtration and usable surface area of the drum

<table>
<thead>
<tr>
<th>FILTER TYPE</th>
<th>FILTRATION AREA IN THE DRUM IN m²</th>
<th>USABLE FILTER AREA IN m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1FBO</td>
<td>0,728</td>
<td>0,416</td>
</tr>
<tr>
<td>1FBB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2FBO</td>
<td>1,872</td>
<td>1,109</td>
</tr>
<tr>
<td>2FBB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3FBO</td>
<td>3,744</td>
<td>2,392</td>
</tr>
<tr>
<td>3FBB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4FBO</td>
<td>6,240</td>
<td>4,16</td>
</tr>
<tr>
<td>4FBB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5FBO</td>
<td>9,360</td>
<td>6,24</td>
</tr>
<tr>
<td>5FBB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6FBO</td>
<td>13,104</td>
<td>8,736</td>
</tr>
<tr>
<td>6FBB</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2 Filtration surface area

### Filter capacity

The capacity of the flow through the filter depends on how contaminated the influent water is. IN-EKO TEAM representative will tell you an estimated capacity of the filter for the given application (it is good to know the amount of SS (mg/l), size of flocs, or type of filtered material, and required quality of the filtered/treated water).
Filter drum innovation

Older types of filter with BMF designation had a single filter cloth for the whole drum. New FB filters contain filter cartridges which make up the whole body of the drum.

In older filter types when the cloth was damaged (ruptured), it was necessary to change the whole cloth (i.e. remove the holding rails fixed to the drum by screws. Then the new filter cloth had to be drawn on the drum and fixed with holding rails).

With new drum types, it is possible to change the broken cartridge (where the cloth is damaged) using “CLI-CLO” system described below. This innovation makes the replacement faster and service cheaper. The innovation also means a longer life and better resistance of the filter cloth.

“CLI-CLO“ system

The filter cloth is attached to a plastic frame and forms a single filter cartridge which is the same for all the filter sizes. Different filter sizes only mean a different number of filter cartridges.

Replacing filter cartridges is very simple, there are no fixing or connecting elements, see p. 50.

Life of the filter cloth is considerably longer, too. The filter cloth can be made of polystyrene (20 – 500 µm), polyamide (20 – 500 µm) or stainless steel (20 – 60 µm).

Technical drawings

See p. 15 - 29.
SECTION A-A

SECTION B-B

Anchor points

- Crew is not part of delivery, must be completely waterproof.
- It is used to build tightness because of better maintenance of filter as flow in flooded channel cannot be achieved.
- It is recommended to build a service area, heater replacement of cartridges, better sources for service work.
- No touches across the channel neither along the walls inside the channel are allowed, otherwise that cannot be installed.
- It is necessary to maintain the channel depth or at least elevation of the wall between service area and filter chamber (≤100 mm) because of maintainance and opening of filter cover.
- Filter body is equipped with only partial bypass, rectified bypass.
- Placement of weld/brass is recommended to be above the crew.
- Sludge tank outlet can be done in free way which cannot be combined.

1. Grizzly outlet which is placed in U-pipe with extended pipe.
2. Sludge tank and sludge pump.

Microscreen drum filter

500 kg

Mass weight XXX

with water

www.in-eko.com

Projects

ISO 2768 – mK

ALL FOR WATER

Tlnoy 66603

Czech Republic

Name

In-eko s.r.o.

Mass weight 1000 kg

Net weight 800 kg

without water

5FB3_R

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Fig. 12 Channel model

Fig. 13 Channel drawing

<table>
<thead>
<tr>
<th>FILTER TYPE</th>
<th>A [mm]</th>
<th>B [mm]</th>
<th>C [mm]</th>
<th>D [mm]</th>
<th>E [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1FBB</td>
<td>710</td>
<td>1450</td>
<td>332</td>
<td>930</td>
<td>705</td>
</tr>
<tr>
<td>2FBB</td>
<td>890</td>
<td>2000</td>
<td>385</td>
<td>1030</td>
<td>720</td>
</tr>
<tr>
<td>3FBB</td>
<td>1100</td>
<td>2800</td>
<td>545</td>
<td>1250</td>
<td>940</td>
</tr>
<tr>
<td>4FBB</td>
<td>1300</td>
<td>3340</td>
<td>650</td>
<td>1500</td>
<td>1100</td>
</tr>
<tr>
<td>5FBB</td>
<td>1500</td>
<td>4240</td>
<td>900</td>
<td>1900</td>
<td>1100</td>
</tr>
<tr>
<td>6FBB</td>
<td>1900</td>
<td>5050</td>
<td>1080</td>
<td>2200</td>
<td>1100</td>
</tr>
</tbody>
</table>

Table 3 Channel sizes for FBB
Service gangway:
If it is not possible to build a service channel (e.g. due to a lack of space), it is possible to use a gangway which can be supplied together with the filter if agreed with IN-EKO representative. It is made of stainless steel and its purpose is to facilitate access to the filter which is inserted deep in the channel.

Fig. 14 Gangway

Fig. 15 Gangway in the channel
Anchor points

Sludge outlet from the sludge tank can be solved with two different ways and can also be combined:

1) Gravity outlet: outlet from the sludge channel is ended with a pipe for further connection.
2) Sludge pump

Specifications:

- Projection
- Accuracy: ISO 2785
- Mass weight without water: 380 kg
- Mass weight with water: 1085 kg
- Name: Microscreen drum filter
- Type: 2FKO 24
- Company: IN-EKO TEAM
- Address: Žilina 668 03
- Country: Czech Republic

www.in-eko.com

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Anchor points

Sludge outlet from the sludge tank can be solved with two different ways and can also be combined:
1) Gravity outlet: outlet from the sludge channel is ended with a pipe for further connection
2) Sludge pump

Backwash pump 0.9 kW
Backwash pump 1.1 kW
2 ball valves for drainage the lamina with 2" male thread
Sludge probe
Gravity sludge outlet - 2"
Outlet DN 200

Inlet DN 200

Engine 0.37 kW

Probe's drainage valve
Inlet probe

Max. (emergency) level
ON level
LPF level

1.5
2.0
3.0
3.5
4.0
4.5
5.0
The assembly platform shown in the Technical drawing for 5FBO and 6FBO filters, is not part of the delivery. Upon agreement with IN-EKO TEAM the platform can be made and supplied together with the filter.

**Sizes**

<table>
<thead>
<tr>
<th>FILTER TYPE</th>
<th>LENGTH [mm]</th>
<th>WIDTH [mm]</th>
<th>HEIGHT [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1FBO</td>
<td>1253</td>
<td>877</td>
<td>976</td>
</tr>
<tr>
<td>2FBO</td>
<td>1839</td>
<td>1008</td>
<td>1125</td>
</tr>
<tr>
<td>3FBO</td>
<td>2394</td>
<td>1264</td>
<td>1457</td>
</tr>
<tr>
<td>4FBO</td>
<td>2811</td>
<td>1520</td>
<td>1549</td>
</tr>
<tr>
<td>5FBO</td>
<td>3449</td>
<td>1746</td>
<td>1963</td>
</tr>
<tr>
<td>6FBO</td>
<td>4411</td>
<td>2145</td>
<td>2379</td>
</tr>
</tbody>
</table>

Table 4 Sizes for standard versions of FBO with a cover

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1FBO</td>
<td>150</td>
<td>150</td>
<td>80</td>
<td>2</td>
</tr>
<tr>
<td>2FBO</td>
<td>200</td>
<td>200</td>
<td>80</td>
<td>2</td>
</tr>
<tr>
<td>3FBO</td>
<td>200</td>
<td>200</td>
<td>150</td>
<td>2</td>
</tr>
<tr>
<td>4FBO</td>
<td>300</td>
<td>300</td>
<td>150</td>
<td>2</td>
</tr>
<tr>
<td>5FBO</td>
<td>400</td>
<td>400</td>
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<td>2</td>
</tr>
<tr>
<td>6FBO</td>
<td>500</td>
<td>500</td>
<td>150</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 5 Connecting sizes for FBO

**Sizes of switchboard and their stands**

The stand of the switchboard is necessary if the switchboard is not installed directly on the filter or on the wall next to the filter, or e.g. on the floor by the filter or directly mounted on the concrete channel in which filters are installed. Fig. 16 - Fig. 19 show recommended shapes of stands of switchboards. Fig. 20 and Fig. 21 show two standard types of switchboards for our filters. One is for the filter with pressure probes and the other with contact probes.
Stands for switchboards

Installation on the concrete channel wall

Fig. 16 Stand for the switchboard for filters with contact probes

Fig. 17 Stand for the switchboard for filters with pressure probes

Installation on the floor

Fig. 18 Stand for the switchboard for filters with contact probes

Fig. 19 Stand for the switchboard for filters with pressure probes
Standard switchboards

Fig. 20 Switchboard for filters with contact probes

Fig. 21 Switchboard for filters with pressure probes
Handling the unit

All units which have 4 lifting loops for ropes can be lifted by a crane with appropriate capacity depending on the filter size.

![Filter lifted by a crane](image)

Fig. 22 Filter lifted by a crane

For less complicated moves the unit can be transferred using a fork-lift. However, make sure the filter does not suffer any damage, especially cloth rupture (FBB).

![Handling the unit](image)

Fig. 23 Handling the unit

DO NOT USE chains or materials from carbon steel, which could cause contamination of the stainless steel and lead to its corrosion.
If there are still some masonry works in progress around the filter after its installation, cover the filter with a plastic foil so the filter or its parts do not get soiled or damaged by concrete, construction chemicals, particles flying off when angle grinders are used, or by other materials.

If the above instructions are not complied with, we shall not accept the guarantee for non-corrosiveness of the unit. For more information see page 55.

The filter cloth can break easily during installation. Workers must take care not to damage the cloth.

Transport
Contact IN-EKO TEAM representative to agree transport conditions. If the transport is arranged by IN-EKO TEAM, it is often transported by a truck with roll-off tarpaulin cover. When unloading the unit, equipment with sufficient capacity should be used. Upon the arrival of the unit, check for any damage done during the transport. If you see any, contact IN-EKO TEAM representative without delay, take a photo of the damage and make a protocol with the forwarder.

Later complaints will not be considered!

Storage
Filter cloth must be protected from long-term exposure to sun beams and UV radiation. The filter cloth for filters in concrete channels (FBB) is exposed to these effects under the filter frame. When storing the filter, cover the unit with a tarpaulin in order to protect the unit from UV radiation for the whole storage time.

Spare parts include the filter cloth. As described above, longer exposure to sun rays/UV radiation is harmful for the cloth. The replacement cloth must be stored in its package box without direct exposure to the sun. Make sure that the storage place has relatively stable temperature (10 – 40 °C) and humidity (40 – 60 %). The cloth must be stored in a place where it cannot be damaged.

Inadequate storage conditions will affect not only the filter cloth but also the rubber seals. During the low temperatures, the rubber is getting firm and montage of filter cartridges is more difficult. If there is a need of the filter cartridges replacement, we recommend to let the filter cartridges and seals for a few hours at room temperature. Even so, please pay attention and care to the montage.

Assembly and commissioning

The filter must be levelled on a stable area with maximum allowance of 3 mm (length of the unit) using anchor bolts (FBB) or wedges (FBO).
Nuts of adjustable bolts (FBB) must be well tightened.

All feet of the filter must stand on a solid ground.

To fix the filter in a horizontal position stainless steel sheets of appropriate thickness can be used.
If the filter does not have a gravity discharge and sludge is pumped out by a sludge pump, it is necessary to connect sludge discharge pipe. Standard delivery includes a 3m-long sludge hose. Ø of the hose changes depending on the filter type.

The influent water should be free of solid coarse particles bigger than 3 mm big, sand and sticky substances including oils and fats.

**Outlet of the filtered water must be kept free!**

The water level behind the filter must not be allowed to rise to such a level that the level in the outside part of the filter drum would rise excessively due to the inability of the effluent to flow out.

**The filter would stop functioning!**

When connecting the filter to the switchboard, it is **necessary to check the correct rotation of the drives** – rotation of the drum (see the arrow on the inner side), the correct rotation of the sludge and backwash pump see Fig. 28. If at the startup the pump “kicks” against the direction of the arrow, it must be slightly lifted (Fig. 30).
When the filter is first put into operation or after a long idle time, it is necessary to fill the inside of the filter with clean water up to the overflow level in order to avoid having very different water levels which would cause the drum or the backwash pumps to start rotating. The pumps would not have enough water and could be damaged. The flow to the filter should be gradual.
Filter installed in a concrete channel

The filter is supplied with anchor bolts for setting the filter. It is also supplied with sealing which is placed between the front of the filter and the concrete (Fig. 32). Please refer to the Technical drawing (stilling area) to see the distance between the front of the filter and the beginning of the channel in which the filter is placed (see Fig. 33, letter X).

Before commissioning the unit, it is necessary to remove all protective packaging including the probe packaging.
Normally, it is not necessary to remove the filter from the tank when doing service works. If it is, however, necessary for some reason, inflow to the filter must be shut, closed and the water in the channel, in which the filter is installed, must be drained. When removing the filter from the channel, it is recommended to use a lifting device. It is necessary to make sure there is sufficient handling space around the filter and above.

Filter installed in a steel tank
The filter installed in the steel tank is fixed with 4 anchor bolts similarly to the one placed in the concrete channel. Instead of anchor bolts it is also possible to use stoppers around the feet of sufficient strength (Fig. 35). Dimensions for connections change per filter type and order (flanges, KG pipes, etc.) see Table 4 (page 29).
**Shutdown of the unit (for longer than 2 days)**

If you need to shut down the unit for any reason, follow these instructions:

Stop the inflow of raw water into the unit.

Switch the switchboard to manual mode (MAN). Start backwash and check that it is working correctly. Next, rinse all the filter cassettes thoroughly. Switch off the unit (main circuit breaker). Drain/discharge water and clean all the available parts of the unit, including filters of backwash, probes, belts, etc.

**Filter control**

The Microscreen Drum Filter is controlled by level probes. These probes are located on the inlet to the filter and in the sludge tank.

The filter can be controlled by:

- contact probes
- pressure probes
- tensiometer

**Control of one filter**

By contact probes

- There are three probes on the inlet to the filter (switch-off, switch-on, emergency)
  
  o When the water level in front of the filter rises to the set switch-on level, the probe automatically activates the rotation of the drum and backwash. After the level drops under the switch-off level, the filter stops running. The cycle repeats all the time.
  
  o When the emergency level is reached, the filter runs for a time set by the timer and if the water level does not drop, the filter stops running (it stops completely) and a red light of emergency level on the switchboard switches on.
There are two probes (switch-on and switch-off) in the sludge tank.

- When the water level in the sludge tank rises to the switch-on level, the probe activates the sludge pump, which drains water out of the tank and once the level drops under the switch-off level, it switches off.

By pressure probes

- There is a probe on the influent side of the filter which is connected to PLC (LOGO! Siemens) where the levels (switch-off, delayed switch-off\(^1\) for increased level, switch-on, emergency level) are set. The probe monitors the water level in front of the filter and sends signal to the PLC. If the switch-on level is reached, the drum and backwash pump are activated. When the level is dropped under the preset switch-off level, the filter stops running. The cycle repeats all the time. When the emergency level is reached, the filter is in operation for the time set by the timer, and if the level does not drop, the filter stops and a red light of the emergency level switches on on the switchboard.

- There is also one probe in the sludge tank with only two levels (switch-on and switch-off level). The principle is the same as described above on the inlet to the filter.

\(^1\) Gradual aging of the cloth can cause that the water level in front of the filter never drops to the switch-off level (there is an increased switch-off level) and if some time has passed since the activation of the drum and backwash pump and the level still does not drop under the switch-off level, the filter stops running and waits until the water level rises to the switch-on level.
By tensiometer
- This method of filter automation uses weight for activation and deactivation. The weight of the drum with hydromixture is monitored in the filter. When the set weight is reached, the drum starts to rotate and the backwash pump is activated.

Control of more filters at the same time

Control by pressure probe
If more filters (with a joint influent) are controlled by one pressure probe, the filters are controlled by the PLC as one unit. The operation of individual filters is distributed evenly to avoid overloading one or more filter units. There are normally 3 scenarios for the operation of three microscreen filters. In the case of a different number of filters, the principle of the control is the same.

- Once the switch-on level is reached, filter 1 is activated. When the level drops under the switch-off level, filter 1 is deactivated. After the switch-on level is reached again, filter 2 is activated and when the switch-off level is reached, it is deactivated. After the switch-on level is reached again, the same process repeats for filter 3 and then the cycle starts again with filter 1. Each filter will be on for the minimum preset running time, which is set in the computer as "the minimum running time of the filter".

- When the switch-on level is reached, filter 1 is activated. If the level does not drop in the preset time (set by "timer activating the other filters ") under the switch-off level, filter 2 will also be activated. Once the level drops under the switch-off level, both filters are deactivated (filter 2 is activated for the minimum preset time). Upon reaching the switch-on level again, filter 3 is activated. If the level does not drop (within the time set by "timer activating the other filters"), filter 1 will also be activated. The cycle continues repeatedly.

- The same situation repeats as in the previous paragraph but even though two filters are activated, the level still does not drop to the switch-off level. In this case the other filters are gradually activated in preset time intervals ("timer activating the other filters"). That means that all filter units can run at the same time.

If one of the filters is in "0" mode or "MAN" mode (see below), it is deactivated and is automatically replaced by the next filter.

If a filter is not activated within the preset time, it is automatically switched on for its minimum running time.

⚠️ When the emergency level on the inlet to the filter is reached, the operation of sludge pumps and filters is automatically blocked.

Filter control

The information in this section applies only to filters with switchboards. For other filters this information should be taken as recommendation.

There are 2 selector switches for each filter on the switchboard. One for the drum drive and backwash pumps and the other for the sludge pump (Fig. 38).
It can be operated in the following modes:

a) continuous (manual) operation (MAN)
b) automatic operation (AUT)
c) switched off (0)

The following applies to the drum drive and backwash pump drive:

a) Placing the switch to the "MAN" position (continuous mode) the engine of the filter drive and backwash pump drive are activated. The filter is then in continuous mode. The manual mode is designed for service and maintenance only.

b) Placing the switch to the "AUT" position (automatic mode). The filter is at standstill at first. As the filter cloth gets clogged with impurities, the level of the water inside the drum rises gradually until the preset switch-on level is reached. The filter operation is controlled by water level probes.
c) The operations can be shut down by switching to "0".

The number of control switches on the front side of the switchboard can be different depending on the filter equipment.

![Switchboard for two filters](image)

**Fig. 39 Switchboard for two filters**

**Setting and editing**

All the logic functions in the switchboard are performed by a programmable Siemens unit called LOGO! This unit enables editing important parameters for the operation of microscreen filters. LOGO! uses cursor buttons, ESC and OK buttons on the display to edit parameters. There is also a well laid out LCD display to check and monitor the various functions see Fig. 40.
Table 6 Discription of different controls at the switchboard for three filters (for fewer or more filters the designation is more or less the same)

When the unit is switched on, the display shows the real time and date. Individual active and inactive inputs and outputs are showed in the following menus, which can be switched using cursor buttons, see Fig. 41. Table of inputs is I and table of outputs is Q. Their active state is highlighted. For the description of individual inputs and outputs see Table 6.

Enter the parameter set-up menu by pressing the ESC button. Select Program and then Set parameter and move the cursor to select the desired value for editing. In the Set parameter menu, individual settings for microscreen filter operation can be changed.
Individual items are divided into blocks in the program and their designation has index B and a numerical designation. See the Appendix – List of programs LOGO! Siemens.

**Motohours of the unit**

The filter operation depends on the water levels as described in the chapter Principle on page 6.

They are optimum motohours of the unit, or optimum cycles for which the unit is designed. It is always necessary to take into consideration the type of operation and capacity of the unit (character of impurities and their quantity).

Backwash cycle: 4 min idle, 20 second run
Run in 24 hours: 111 min
Run in 1 year: 674 hours
Run in 2 years: 1348 hours

**Service and maintenance of the unit**

It is necessary to do regular visual checks of the unit (daily checks) and occasional cleaning (weekly checks).

Regular maintenance and checks of the unit are very important for a long life of the filter and its correct functioning which is vital for the quality of treated water.

- **Turn off the main circuit breaker when performing any maintenance work on the filter!**

  When doing any service or maintenance works it is necessary to use protective equipment in accordance with The Safety and Health at Work Directive 89/391/EEC.

**Regular checks**

<table>
<thead>
<tr>
<th>Daily</th>
<th>Weekly</th>
<th>Monthly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activation of drum rotation, operation of pumps and drive belts</td>
<td>Nozzle cleaning</td>
<td>Guides for cartridges</td>
</tr>
<tr>
<td>Nozzles</td>
<td>Backwash system</td>
<td>Shaft support</td>
</tr>
<tr>
<td>Cloth</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 7 Regular checks
1x day
Do a visual check of the filter for any **mechanical defect** on the unit.

During several cycles of the filter in the automatic mode check the filter operation. Check the correct rotation of the drum and the backwash pump (they should be activated and deactivated at the same time). Check if the sludge pump is activated after the level increases (if there is no gravitational discharge pipe) and also deactivated when the level drops. This way you can check the regular function of the **water level probes**. If this is not the case, the probes must be cleaned using a clean damp cloth or if necessary wash them with clean water in a container. Do not use pressure water!

Water jet from **nozzles** of the spray pipe must be directed and have the correct shape (Fig. 43 and Fig. 44).

Do a visual check of the **cloth** for any mechanical damage.

![Image](image1.png)

**Fig. 43 Shape of the water jet coming from nozzles**

![Image](image2.png)

**Fig. 44 Water jet from nozzles – right and wrong shape (the picture shows water jet only for one spray pipe)**

1x week.
Once a week it is necessary to clean water level probes (see Fig. 46). Probes which are well cleaned and regularly checked ensure the correct functioning of the filter. The contact probes of steel filters and all pressure probes must be removed from the protective pipe.
Probes can be cleaned by two possible ways

- It is usually sufficient just to wipe the probes with a wet cloth, **make sure you do not cause any mechanical damage to the probe.**

- If the probes are so dirty that they cannot be well cleaned with a cloth, remove the probes and wash them in some container, but **do not use pressure water!**

- In the case of the pressure probe, remember to keep all 4 holes on the black lid clean (Fig. 37) clean. If they are not clean and flushing them out in water does not help, clean the lid as shown in Fig. 46.

Pierce the cap with a suitable tool. Remove the black cap ... ...and after clearing the cap put it back.

**Fig. 46 Correct cleaning of the pressure probe**

**Fig. 47 Incorrect cleaning of the pressure probe**
Next, the **spray pipes** must be checked in a similar way once a week.

- First check the rinsing function (if the jet coming from the nozzles has the right shape see Fig. 43 and Fig. 44). If this is not the case, in the manual mode (the drum keeps rotating as well as the backwash pump), open and close the ball valve of the spray pipe several times (Fig. 48). If it does not help, the nozzles which are clogged must be cleaned with a Ø 1 mm wire, see Fig. 49 whilst the ball valve is open.

![Fig. 48 Valve on the spray pipe](image1)

![Fig. 49 Cleaning the nozzle](image2)

- If, however, the intensity of the jet stream is small or very low, it can signal a defect of the basket on the backwash pump. Remove the pump from the filter, rinse the basket with pressure water. Fig. 46 shows examples of clean and dirty basket.
Remember to check that the backwash system is functioning well, the sieve for pressure water is not clogged (if installed), that valve is working correctly, the sieve and the valve are tight.

1x month:
- Perform a visual check of the **drum drive belts** (Fig. 51). It is necessary to check the belt for any mechanical damage (Fig. 52)
- Perform a visual check of the shaft mounting, check for wear and mechanical damage of the mounting (Fig. 53).

„CLI-CLO“ system - changing the filter cloth:

The filter cloth is attached to a plastic frame and forms a single filter cartridge which is the same for all the filter sizes. Different filter sizes only mean a different number of filter cartridges.

Replacing filter cartridges is very simple, there are no fixing or connecting elements.
1. In order to change the damaged cartridge it is necessary to first dismantle the end cartridge mounted in that row because its lock is laid over the next cartridge.

2a. Apply pressure on the cartridge using your palm in the direction of the red arrow.

2b. With the help of a special strap loosen the cartridge on one side from the rail in the direction of the blue arrow.

2c. Follow the arrow to remove the cartridge.

3. Use the same method to dismantle other cartridges in a row until you get to the damaged one.

4. Remove the damaged cartridge and replace with a new one.
5. Restore the fine cartridges back to their respective places.

Correct mounting of cartridges

Always check condition of longitudinal sealing in the ridge on reused cartridges. If damaged or not stucked properly, use new cartridge.

Incorrect mounting of cartridges

Cartridge without side rubber seal   Incorrectly rotated cartridge   Cartridge without side rubber seal
Troubleshooting

Turn off the main circuit breaker when performing any maintenance work on the filter!

Backwash system is not working correctly
The most important aspect for the correct functioning of the filter is to make sure that the nozzles are functioning correctly. Therefore the nozzles must be regularly checked for blockage and that the water jets are the right shape. See cleaning nozzles on page 48.

If the jets are not strong enough, it is necessary to remove the backwash pump from the filter basket, then the filter basket from the sewer. Flush out the sieve on the circumference of the filter basket. If the jet rinse system shows heavy clogging, it is necessary to dismantle the spray pipes with nozzles and flush them out with a stream of clean water.

Continuous rotation of the drum
It can be caused by the following:

- The filter is overloaded with an excessive amount of detritus in the influent water. Once the quantity of detritus is decreased, normal function is restored.
- Improper function of the backwash system (for restoring see Backwash system is not working correctly, page 53).
- Filter mesh is clogged with grease or becomes gradually clogged due to a long operation. This can be eliminated by switching the filter to continuous run for the period of 30 to 60 minutes. If the problem remains, the cloth can be either sprayed with degreasants or changed.
- The level probe in front of the filter is clogged. The probe needs to be taken out of the holder and the impurities between the electrodes removed.
- The filter is switched to continuous operation.
- Exceeded capacity of the filter.
- Very fine particles whose size approaches to that of the filter mesh.

Water keeps flowing over the edge of the sludge tank inside the drum and into the sludge tank
- The backwash system is not functioning properly.
- The filter is overloaded with a large amount of detritus in the influent water.
- The filter mesh is clogged.
- The filter capacity is exceeded.

Water does not reach the edges of the sludge channel inside the drum but flows over the edges of the sludge tank.
- The level probe in the sludge tank is clogged.
- The sludge pump is clogged.
When checking the filter it is necessary to check that the automatic discharge of the sludge tank is functioning properly.

When the sludge tank is filled with sludge up to the switch-on water level, the sludge pump must be automatically activated. Once the sludge is pumped out to the switch-off level, it is deactivated.

If the sludge pump or probe breaks down, sludge flows into the outlet for treated water.

In 5 FBB and 6FFB filters if the sludge continuously flows over the edge of the sludge tank, there is a danger of clogging the screen of the filter basket of the backwash pump and thus stopping the operation of the whole filter!

![Turn off the main circuit breaker when performing any maintenance work (e.g. cleaning nozzles) on the filter!](warning_icon)

**Safety**

When using, handling and maintaining the machine it is necessary to follow the instructions contained in this document and observe the regulations and standards on the occupational health and safety for wastewater treatment plants. It is also necessary to observe legal regulations on occupational health and safety when working in the environment which presents a risk of electric shocks.

**ATTENTION!**

- It is necessary to switch off the circuit breaker on the switchboard before handling or carrying out assembly works on the microscreen filter.
- Do not touch any moving components of the microscreen filter unit with any part of the body unless the electrical supply on the switchboard is switched off.
- The unit can be installed, operated and maintained only by authorized and qualified personnel, familiar with the conditions under which the filter operates and occupational safety principles.

When doing service or maintenance works it is necessary to use protective equipment in accordance to The Safety and Health at Work Directive 89/391/EEC.

**Service**

All service interventions and other services applicable to this product can be obtained from the manufacturer:

**IN-EKO TEAM s.r.o.**

Trnec 1734
666 03 Tišnov, Czech Republic

Tel.: +420 517 070 613
+420 549 415 234

E-mail: help@in-eko.cz

[www.in-eko.cz](http://www.in-eko.cz)
Guarantee

There is 24 month guarantee on the product. The producer does not take any responsibility for damage caused by improper storage, bad or unqualified operation or handling, overloading the filter above the normal operational conditions or any other accidental cause or disregarding the information contained in this document.

The guarantee does not apply to the filter cloth (disposable material). With optimal power load and operation the replacement is usually necessary once a year.

Stainless steel maintenance

Stainless steel has a passive layer which is continuously renewed and prevents corrosion. Corrosive process starts when the protective passive layer is damaged. Corrosion is caused by unsuitable environment or mechanical damage. Resistance of stainless steel to corrosion is influenced by pH value of the environment, chemical composition, impurities in water, sediments and speed of water flow.

The worst is uniform corrosion, which can damage whole components or large areas.

The pH value of the environment (water) must be in the range of 6.5 to 7.6 (for AISI 304), however it depends on the substances, their concentration and time of exposure, which determines that the environment becomes aggressive and corrosion occurs. For some less favourable environments (sea water) it is better to use more resistant type of stainless steel.

Do not expose stainless steel to chemicals.

If the water contains chlorides or chlorine, they settle on the surface of stainless steel, stop oxygen and hence prevent renewing the passive layer. The concentration of chlorine must not be higher than 2 mg/l (for AISI 304).

If there are more than two or more types of metals in water, galvanic corrosion can occur (because of electrical connection). This can be prevented by earthing all the metal parts of the unit.

Prevent contact with other metals, especially iron, for example when carbon steel components are cut.

Protect the unit from mechanical damage (scratch). Do not use abrasives for stainless steel.

Regular maintenance ensures long life of the stainless steel (use pressurized water when cleaning the unit).