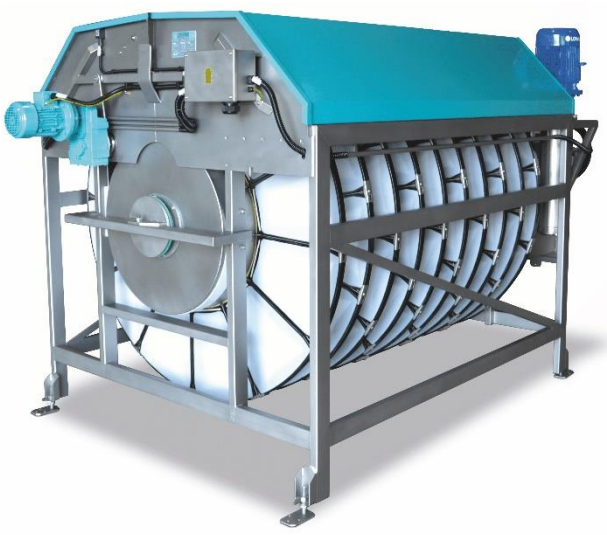
ALL FOR WATER

IN-EKO® TEAM

Disc filter



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Content

Use

FD and FDG disc 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 a certain mesh 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.

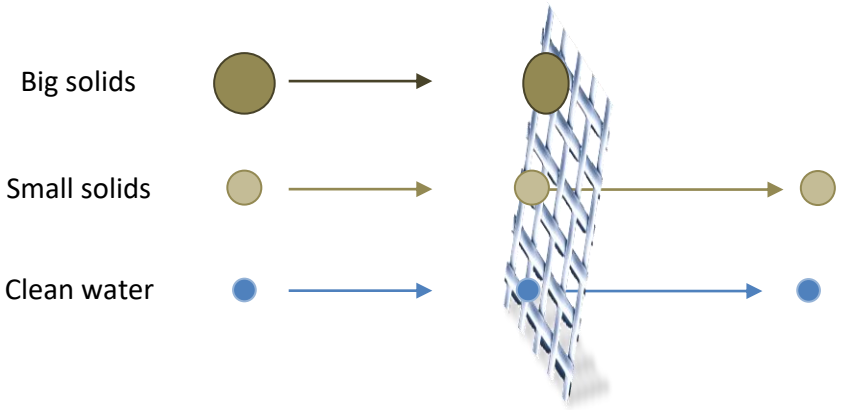


Fig. 1 Principle of filtration

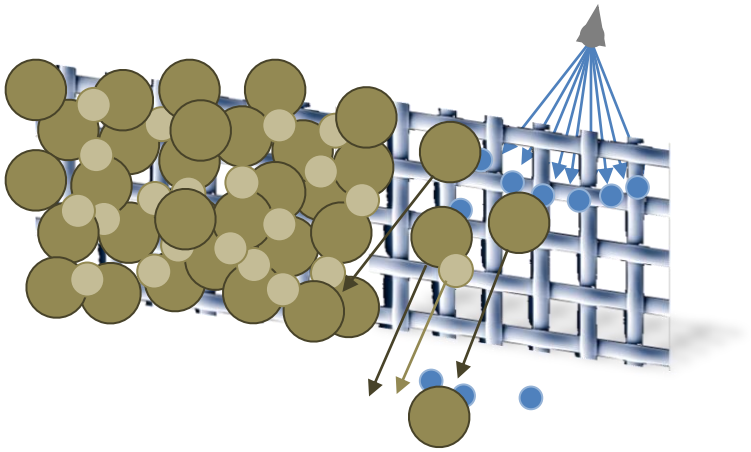


Fig. 2 FIlter cloth backwash

SS (mg/l), mesh (microns)

Suspended solids (SS) are in mg/l and show how many SS (e.g. flocs and other debris) are present 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

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.

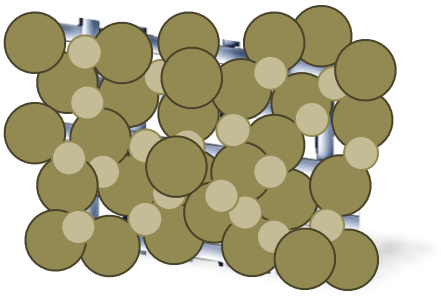


Fig. 4 Secondary filter layer

Filter description

The disc filter is a filtration unit. The filtration is made up of a shaft of the disc filter with filter cassettes. There is a backwash unit between the cassettes 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.

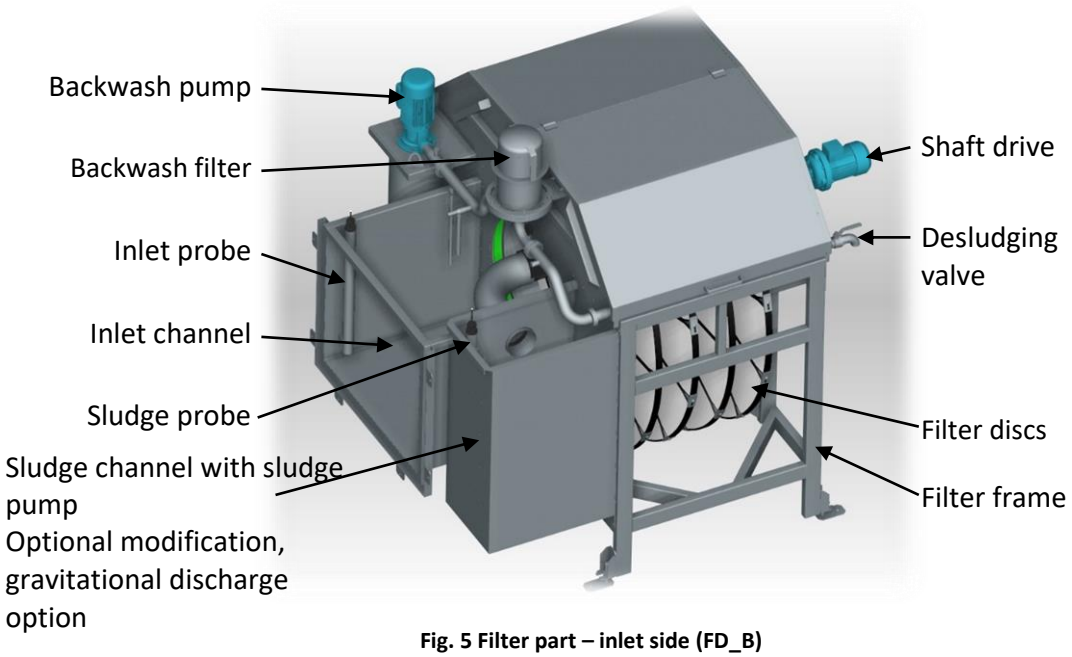


Fig. 5 Filter part – inlet side (FD_B)

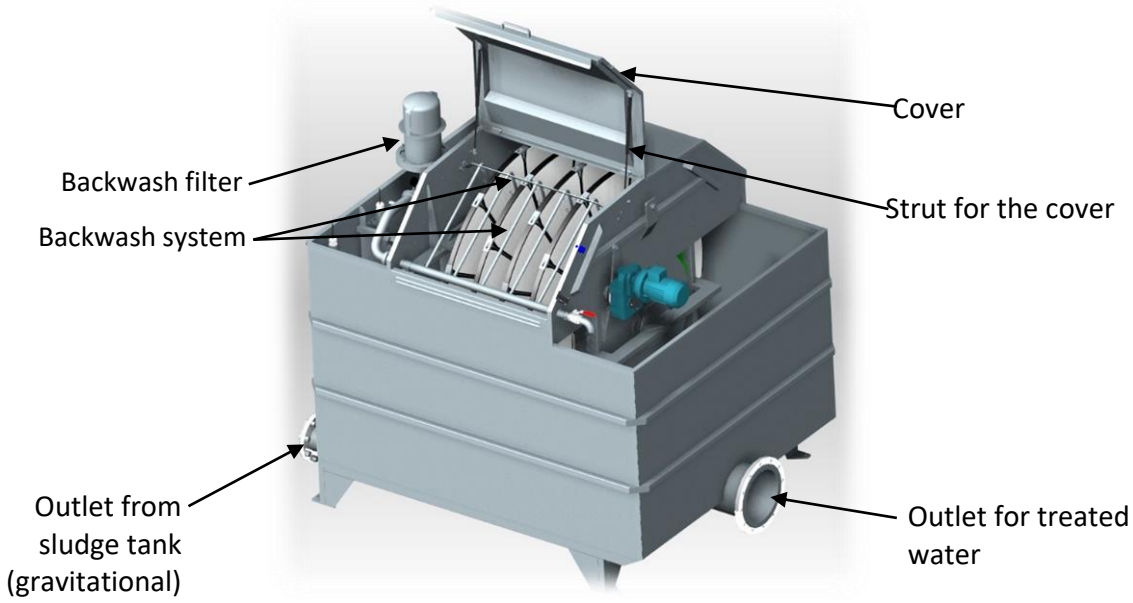


Fig. 6 Filter part – the outlet side (FD_O)

Filter disc

The filter disc is placed on the shaft of a disc filter. Each disc is made up of 12 filter cassettes of annular shape. The cassettes are moulded from ABS plastic and coated with filter polyester (PES) cloth with mesh size of 5, 10, 20, 30, 40 or 60 µm depending on the customer´s needs.

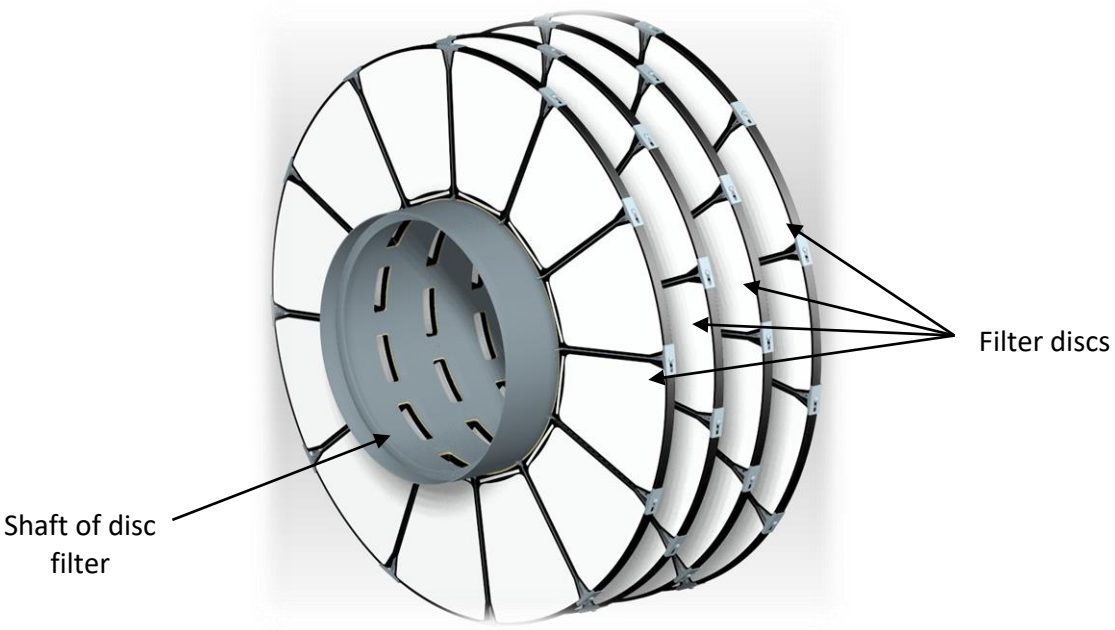


Fig. 7 Disc filter shaft

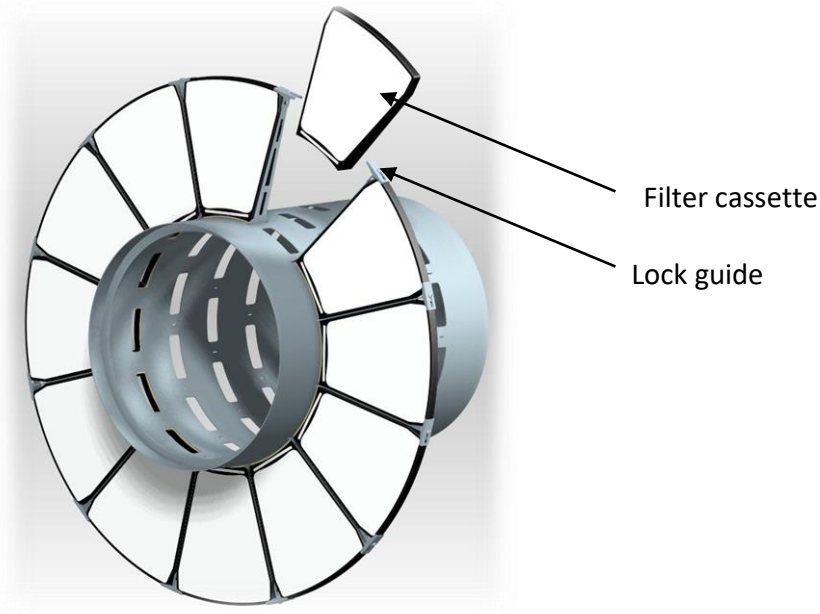


Fig. 8 Filter disc

If the cassettes get damaged, it is possible to change it, see Changing filter cassettes page 55.

Backwash system

The backwash system ensures that trapped solids are delivered to a sludge channel and the flow through the filter cloth is restored.

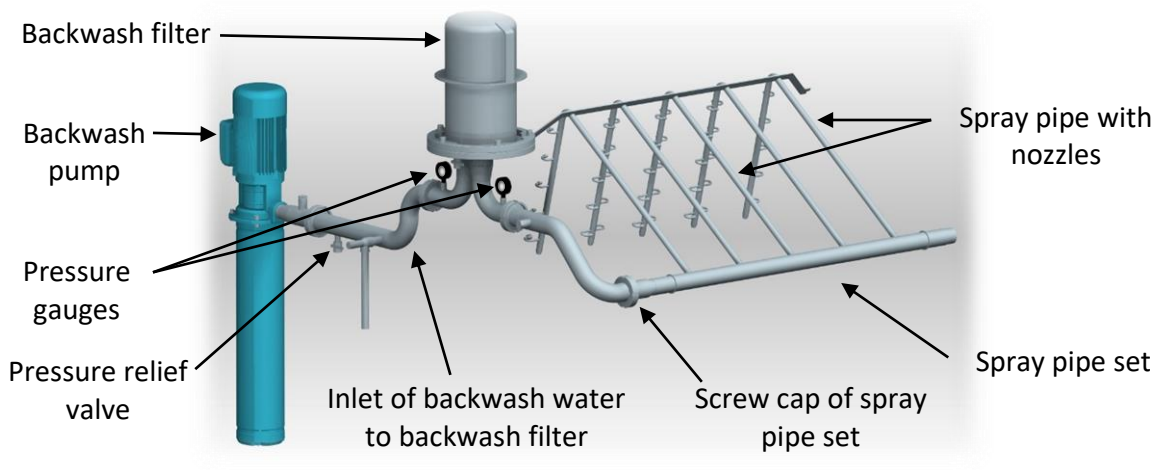


Fig. 9 Backwash system

Treated water is then used for backwash. The backwash pump pumps this water to a backwash pipe and delivers it through backwash filter to a backwash spray set. When the backwash system is being cleaned, it is necessary to lower the pressure in the backwash pipe, which is done by a pressure relief valve.

Backwash filter

Backwash filter filters water before it is fed to the backwash system – to nozzles. This filtration is necessary in order to prevent clogging of nozzles and breakdown of this system.

It is necessary to monitor the flow capacity of the filter and if clogging is discovered, it needs to be cleaned. Permeability of the backwash filter is indicated by the difference in the pressure of backwash water in front of the filter and behind the filter.

Fig. 10 Backwash filter

The filter is supplied in two versions – with either a pressure meter or pressure probes. In the case of a filter with pressure meters, the difference of pressure is checked by operating personnel – they have to check pressure values in the meters at certain intervals (1x a day) and read the values to find the difference. When the difference of pressure shows a value higher than is permissible (1bar), it

means that the filter is clogged. It is then necessary to stop the filter, remove the filter cassette and rinse it thoroughly (see chapter Maintenance of filter backwash, page 53).

Fig. 11 Probes to check pressure difference

If the backwash filter is supplied with an automatic control of pressure values (Fig. 11), the results are sent to PLC and when the PLC finds that the difference of the pressure was exceeded, the disc filter shall stop, PLC shows an error message and a check light is switched on.

Backwash system

Backwash system consists of backwash spray pipes with fitted nozzles. Each backwash spray pipe has a drain plug at its end.

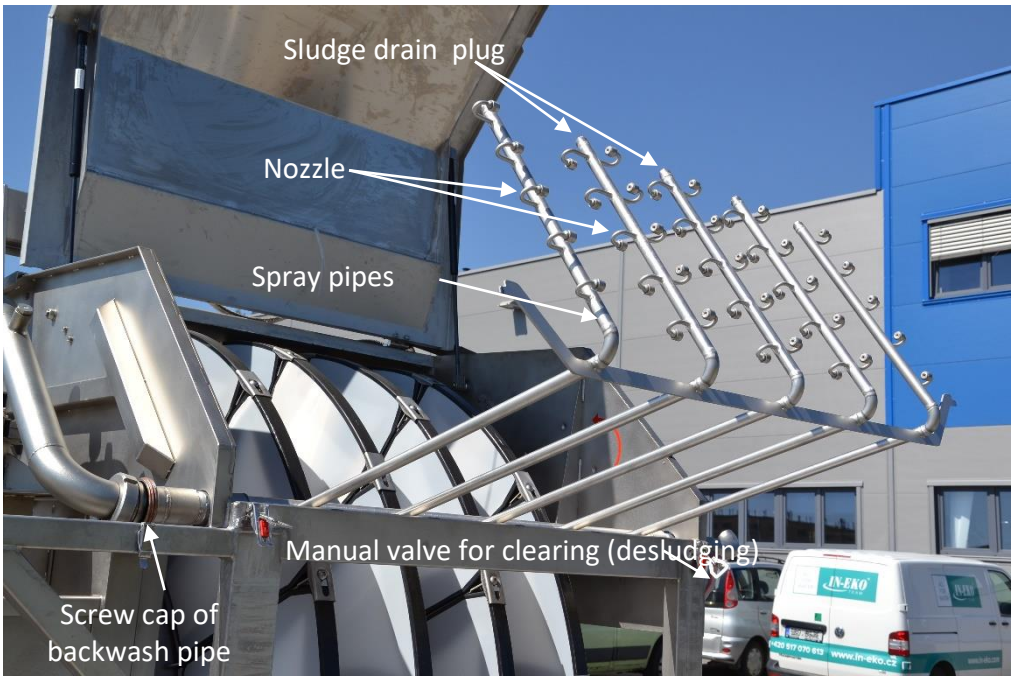


Fig. 12 Backwash pipe set in service position

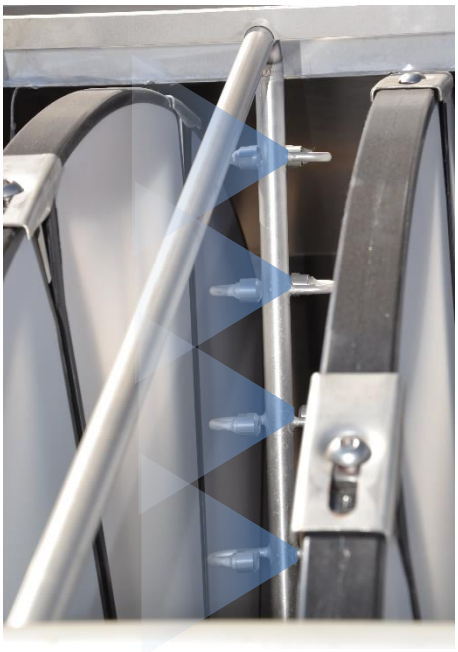


Fig. 13 Detail of a backwash spray pipe (for cleaning see p. 50)

Crest

The crest maintains the filter partially immersed in water. Water helps to relieve the filter load on the straps holding the shaft of the disc filter. Small filters (4-10_FD) have a crest on the back side of the filter, 16-28_FD have a crest on the side of the filter. Big filters (FDG) have a crest alongside the whole circumference. See the technical drawings.

How it works

Water containing solid particles flows through the inlet pipe/sewer and inlet channel inside the disc shaft and filter cassettes, impurities are caught on the inside of the filter cloth and filtered water flows through the cloth out. The shaft of the disc filter remains off during this process. As the filter cloth slowly becomes clogged by the increasing amount of filtered impurities, its resistance to the flow increases and the water level inside the disc shaft- and in front of the filter rises.

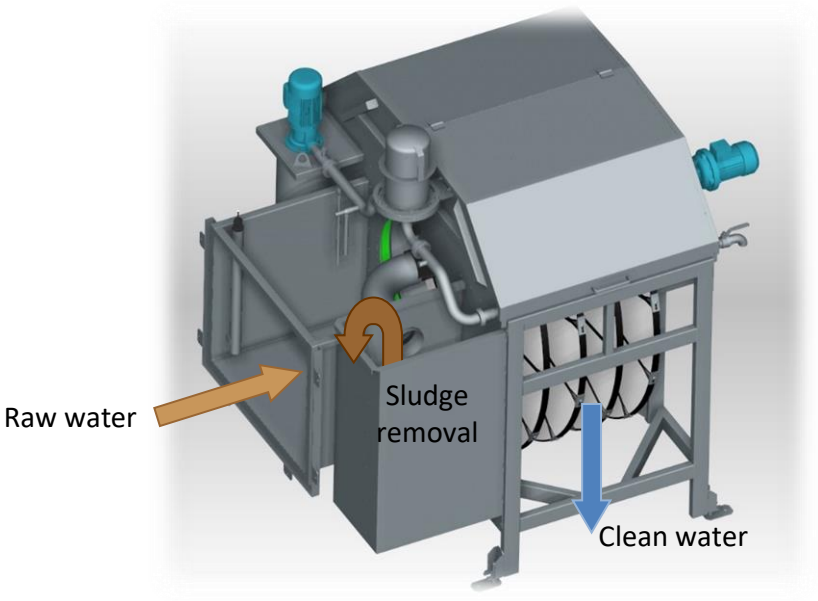


Fig. 14 Water flow through the filter

When the water level inside the shaft of the disc filter reaches a certain level (switch-on level), the shaft of the disc filter starts turning and at the same time backwash pump is activated, pumping the treated water to the nozzles of the backwash system. Impurities from the filter cloth are rinsed down by a jet of backwash water to the sludge channel, and then delivered to the sludge tank outside the filter. The cloth is cleaned and the water in the shaft of the disc filter drops. The filter process repeats automatically. The flow of raw water is not interrupted during the backwash (turning) of the shaft of the disc filter.

Water level is monitored by water level probes, see Probes, p. 15. Backwash water (treated water) is pumped to the nozzles which clean the cloth of the filter cassettes by rinsing off the impurities on the inside of the filter cloth to a sludge channel placed inside the shaft of the disc filter (see Fig. 15). Sludge is discharged by gravity to a sludge tank. From there it is either discharged by gravity or pumped out. The sludge pump is controlled by a water level probe. The ratio of the idle cycle and the rotation cycle depends on the amount of solids flowing into the filter, their character and the condition of the filter cloth.

After each backwash cycle the preset idle time is counted down. If during this time the water level does not rise to the preset water level which activates backwash cycle of the filter cassettes, rotation and backwash are automatically activated so the filter cloth remains functional (does not dry out or gets clogged).

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 backwash water consumption, enhances average quality of treated water, increases density of sludge discharge and prolongs the life of the whole unit.

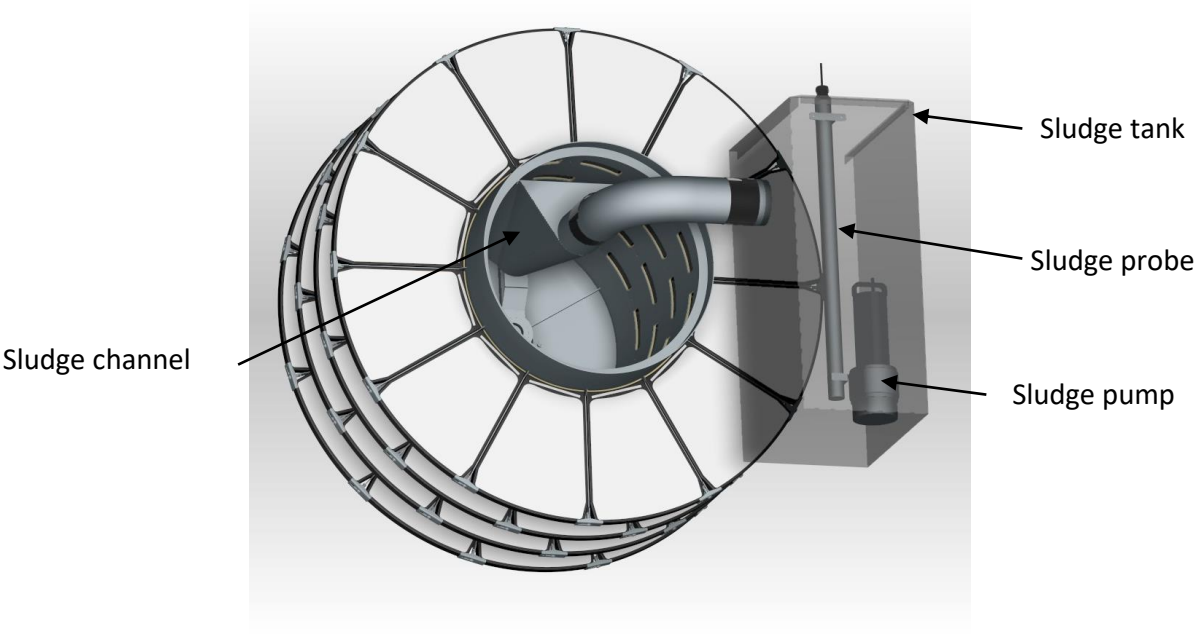


Fig. 15 Sludge system

Standard delivery includes a sludge tank and a sludge pump which automatically drains the sludge tank when it is full. After an agreement with our sales representatives, it is possible to have sludge discharged by gravity.

The filter is designed to clean waste water which can contain various microorganisms. It is therefore necessary to use protective rubber gloves and goggles or a face shield when in contact with this water.

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.

Suspended solids do not have constant properties and size and they influence actual filter capacity. IN-EKO TEAM representatives will tell you the capacity upon your request (based on the water parameters and type of application).

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 pre-treatment unit, which removes such substances from the inflowing water in the pre-treatment phase.

No **sand** (not even diatomaceous 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 pre-treatment phase.

Common practice shows that when using disc filters for tertiary treatment in residential and commercial waste water treatment plants it is best to use filter mesh with 0.01mm (10 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 proposed **average flow** and **estimated maximum flow** through the filter.

The level of acoustic noise at the service station s (1 m far from the unit) does not exceed 70 dBA.

In order to meet the requirements of designers different filter models are manufactured.

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 for FD_B and FDG_B is not part of the delivery and must be waterproof!

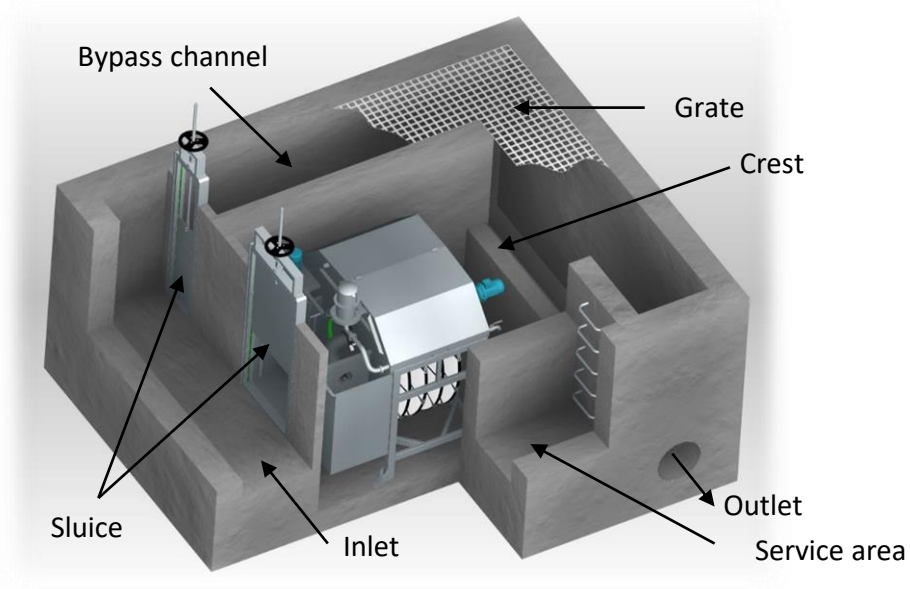


Fig. 16 Concrete channel with filter

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

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 very 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 overlaps 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 (correct functioning of probes, sludge pump, drive, etc.) are carried out from the service area, which enables good access to the filter.
- When changing the filter cassettes it is not necessary to lift the filter from the channel. Anchoring elements (lock guide, bar, bolt) are part of the filter, it is not necessary to reserve some space for storing anchoring elements. See Changing filter cassettes, p. 55.

- The service area should be at least 700mm 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!**
- The sludge channel is able to function as bypass channel but only for a short time. There is risk of damaging the unit!
- The basic function of the bypass channel is to ensure bypassing the filter (having water flow outside the unit) when the filter is overloaded, there is a breakdown or during service works!
- 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 check light – "combined alarms" in the switchboard. For a longer life of the filter the shaft of the disc filter 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 during overload or failure
- Its design must be such to enable a fully working filter bypass (filter batteries). If a crest is designed too, it must be long enough to ensure optimal overflow.

Fig. 17 Filter battery

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 in open space area and connected by stainless steel pipes with flanges or KG pipes. Diameters of the connecting pipes can vary within 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 cover for the filter and sludge tank. The filter is usually not

insulated as a whole. The extent of insulation of the unit should be consulted with IN-EKO team representatives.

Fig. 18 Filter in a steel tank

A switchboard, 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

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 unless gravity discharge is chosen.

Fig. 19 Pressure probe (detail, in sludge tank)

The switchboard includes PLC unit (LOGO! Siemens), which processes signals sent by the probes and hence controls the automatic operation of the filter.

Probes must be cleaned regularly from impurities, see Regular checks p. 45, Probe cleaning p. 53.

Installation of the unit

The filter operates in a damp environment. All the connections to mains and any works done on the electrical wires must be performed by electricians who are qualified and trained by the manufacturer!

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 drawing). 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 or create vortex and shocks. This is ensured by the inlet channel which is part of every delivery.

It must be possible to stop the influent to each filter (e.g. using a sluice gate) and also drain the tank, in which the filter is installed. 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 10mm, sharp impurities, grit, sand, grease and sticky substances.

Filters fitted in the concrete channel usually contain a sludge tank from where the 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 prepare connecting pipes.

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 according to the standards for these cables. It is also necessary to plan the location of the switchboard.

The switchboard must be suitably placed to enable a 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.

Filters must be protected from low temperatures during their operation. If filters are used outside, precautions must be taken to prevent water from freezing. It could lead to damage which the manufacturer does not provide responsibility. The precautions must be consulted with IN-EKO TEAM designers before ordering the unit.

If the filter is installed outside, precautions must be taken to prevent damage caused by atmospheric electricity (e.g. lightening).

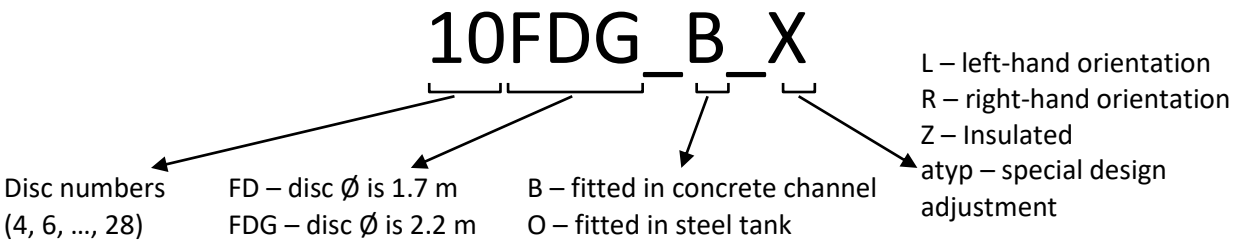
Preparation of the site

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

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

It is necessary to ensure that there is enough space around the filter and above, including enough space for a lifting device, to enable handling the unit during assembly and maintenance service.

Type designation



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).

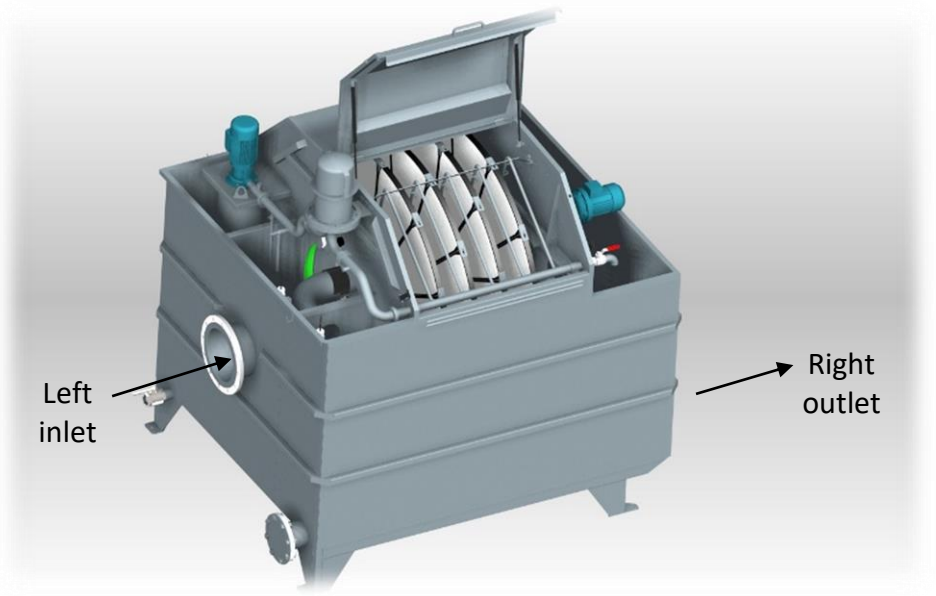


Fig. 20 Right-hand orientation of the filter

Filter size

Filter size is given by the number of filter cassettes fitted to the shaft of the disc filter. Each disc consists of 12 cassettes; see Table 1 (p. 18). The diameter of the disc is 1.7m for FD and 2.2m for FDG.

Fig. 21 Disc sizes (FD, FDG)

FILTER TYPE	NUMBER OF DISCS	TOTAL NUMBER OF CASSETTES
4FD	4	48
4FDG		
6FD	6	72
6FDG		
10FD	10	120
10FDG		
16FD	16	192
16FDG		
24FD	24	288
24FDG		
28FD	28	336
28FDG		

Table 1 Filter size

Filtration and usable surface area of the filter

FILTER TYPE	FILTRATION AREA [m^2]	USABLE FILTRATION AREA [m^2]
4FD	11.8	7.6
6FD	17.7	11.3
10FD	29.5	18.9
16FD	47.2	30.2
24FD	70.8	45.3
28FD	82.6	52.9

Table 2 FD Filter area

FILTER TYPE	FILTRATION AREA [m^2]	USABLE FILTRATION AREA [m^2]

4FDG	21.1	13.6
6FDG	31.7	20.2
10FDG	52.8	33.8

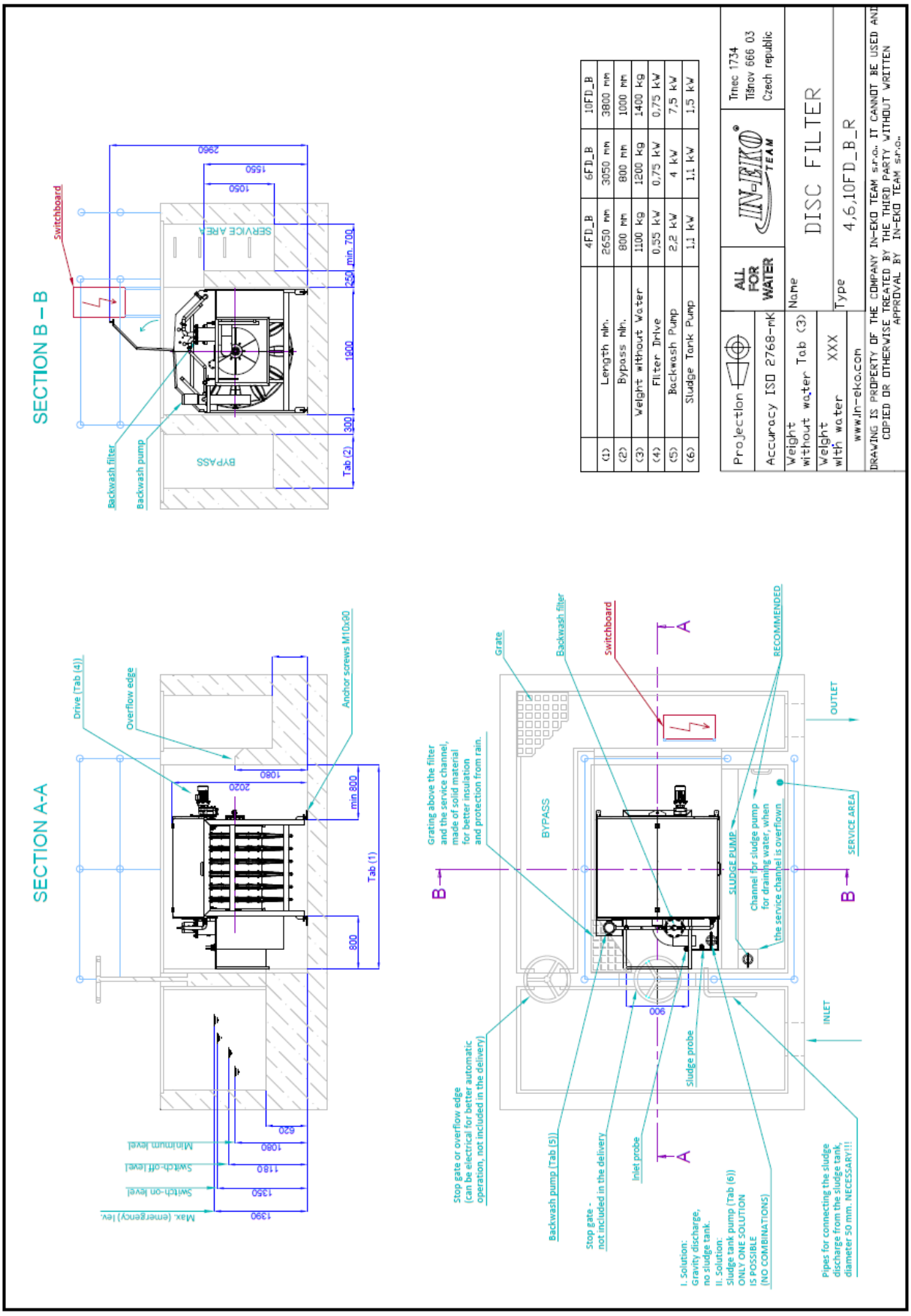
16FDG	84.5	54.1
24FDG	126.7	81.1
28FDG	147.8	94.6

Table 3 FDG filter area

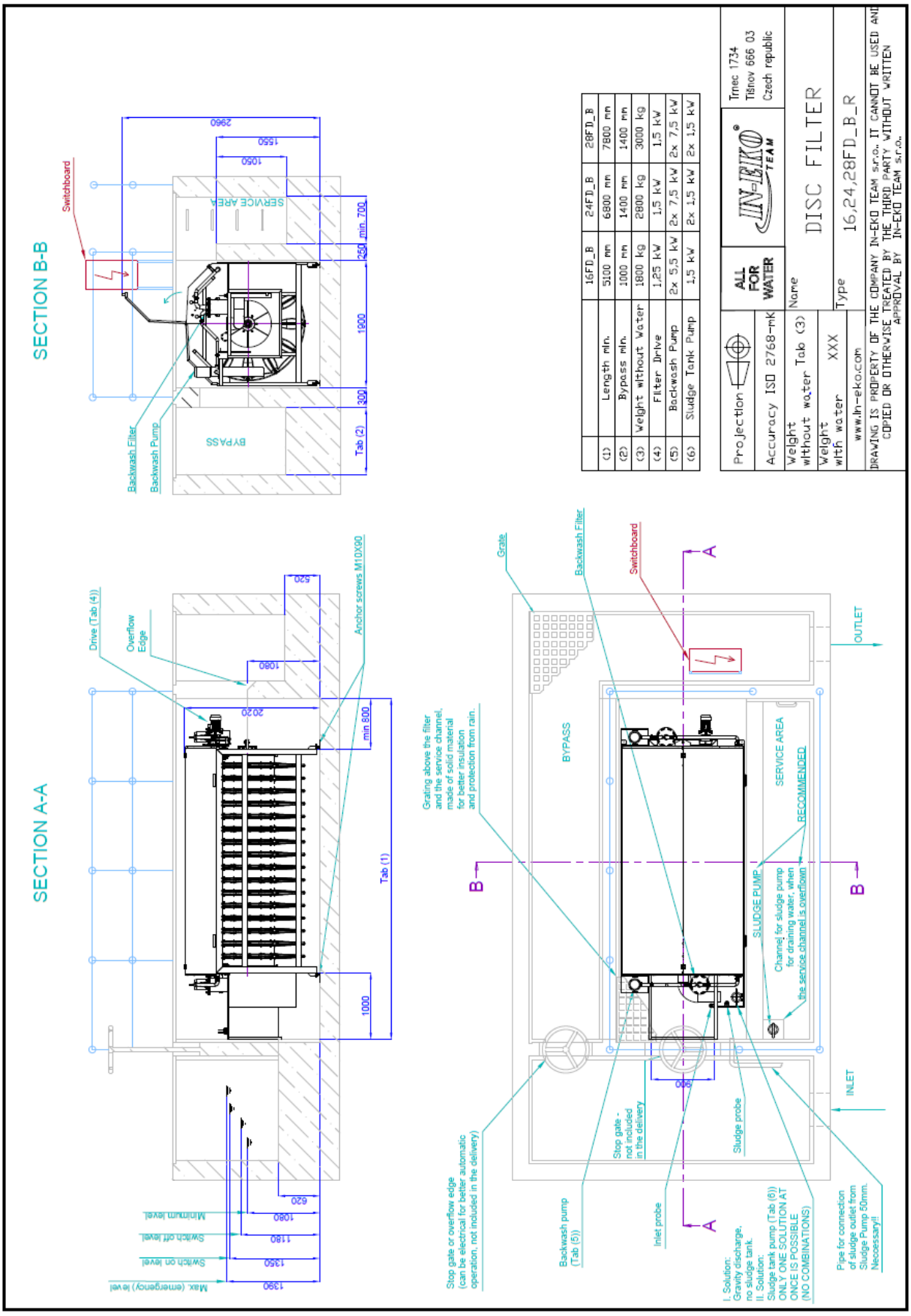
Technical drawings

See pages 20 - 30.

FD_B

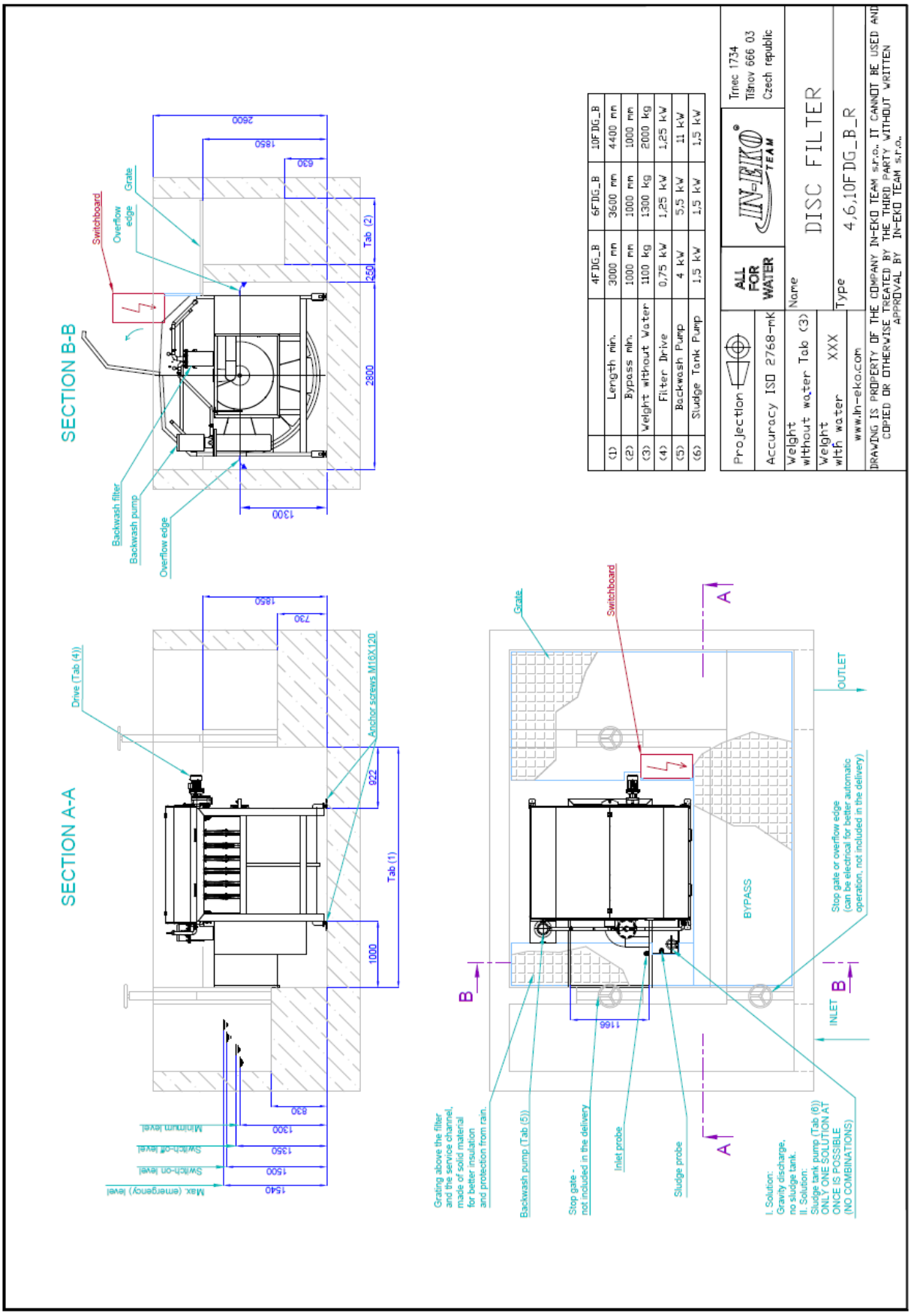


	4FD_B	6FD_B	10FD_B
(1) Length mm.	2650 mm	3050 mm	3800 mm
(2) Bypass mm.	800 mm	800 mm	1000 mm
(3) Weight without Water	1100 kg	1200 kg	1400 kg
(4) Filter Drive	0,55 kW	0,75 kW	0,75 kW
(5) Backwash Pump	2,2 kW	4 kW	7,5 kW
(6) Sludge Tank Pump	1,1 kW	1,1 kW	1,5 kW



		16FD_B	24FD_B	28FD_B
(1)	Length min.	5100 mm	6800 mm	7800 mm
(2)	Bypass min.	1000 mm	1400 mm	1400 mm
(3)	Weight without Water	1800 kg	2800 kg	3000 kg
(4)	Filter Drive	1,25 kW	1,5 kW	1,5 kW
(5)	Backwash Pump	2x 5,5 kW	2x 7,5 kW	2x 7,5 kW
(6)	Sludge Tank Pump	1,5 kW	2x 1,5 kW	2x 1,5 kW

FDG_B


SECTION B-B
SECTION A-A
Switchboard
Overflow edge
Grate
Backwash filter
Backwash pump
Overflow edge
Drive (Tab (4))
Anchor screws M16X120
Tab (1)
Tab (2)
Max. (emergency) level
Switch-on level
Switch-off level
Minimum level
Grating above the filter and the service channel, made of solid material for better insulation and protection from rain.
Backwash pump (Tab (5))
Stop gate - not included in the delivery
Inlet probe
Sludge probe
I. Solution: Gravity discharge, no sludge tank.
II. Solution: Sludge tank pump (Tab (6)) ONLY ONE SOLUTION AT ONCE IS POSSIBLE (NO COMBINATIONS)
Stop gate or overflow edge (can be electrical for better automatic operation, not included in the delivery)
BYPASS
INLET
OUTLET
1166
4FDG_B 6FDG_B 10FDG_B
(1) Length min. 3000 mm 3600 mm 4400 mm
(2) Bypass min. 1000 mm 1000 mm 1000 mm
(3) Weight without Water 1100 kg 1300 kg 2000 kg
(4) Filter Drive 0,75 kW 1,25 kW 1,25 kW
(5) Backwash Pump 4 kW 5,5 kW 11 kW
(6) Sludge Tank Pump 1,5 kW 1,5 kW 1,5 kW
Projection
Accuracy ISO 2768-mK
Weight without water Tab (3)
Weight wth water XXX
www.in-eko.com
ALL FOR WATER
IN-EKO TEAM
Trnec 1734
Tišnov 666 03
Czech republic
Name
DISC FILTER
Type
4,6,10FDG_B_R
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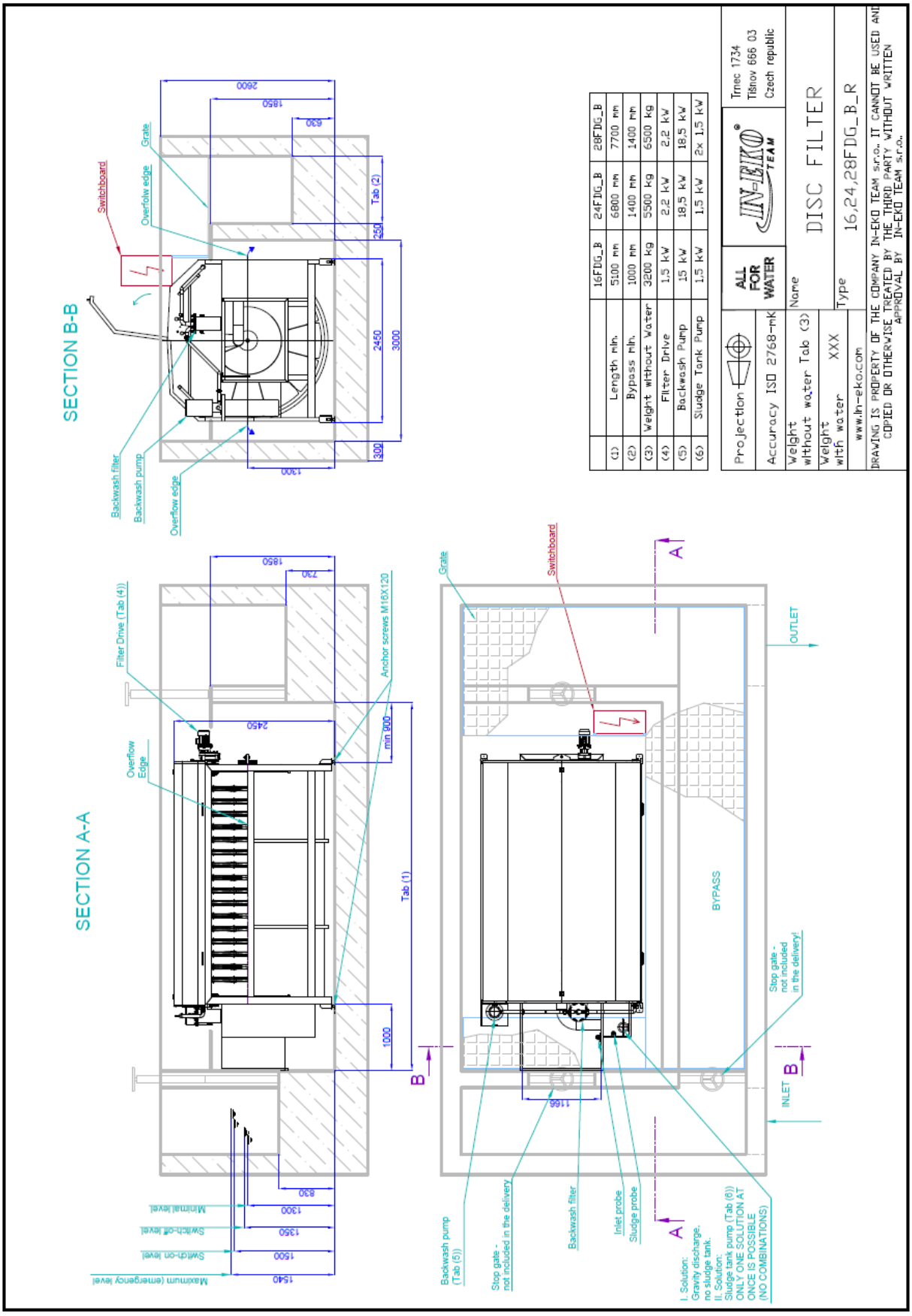


		16FDG_B	24FDG_B	28FDG_B
(1)	Length min.	5100 mm	6800 mm	7700 mm
(2)	Bypass min.	1000 mm	1400 mm	1400 mm
(3)	Weight without Water	3200 kg	5500 kg	6500 kg
(4)	Filter Drive	1.5 kW	2.2 kW	2.2 kW
(5)	Backwash Pump	15 kW	18.5 kW	18.5 kW
(6)	Sludge Tank Pump	1.5 kW	1.5 kW	2x 1.5 kW

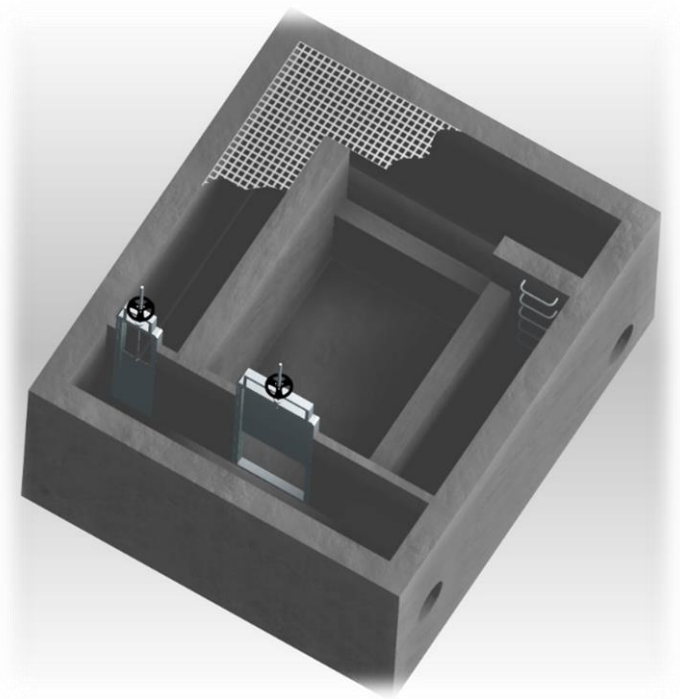


Fig. 22 Channel model

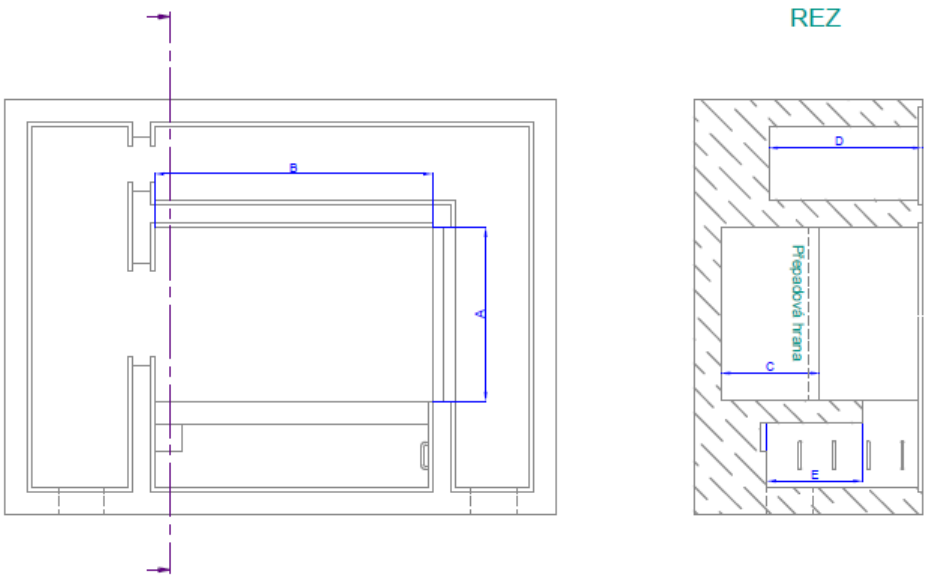


Fig. 23 Channel drawing

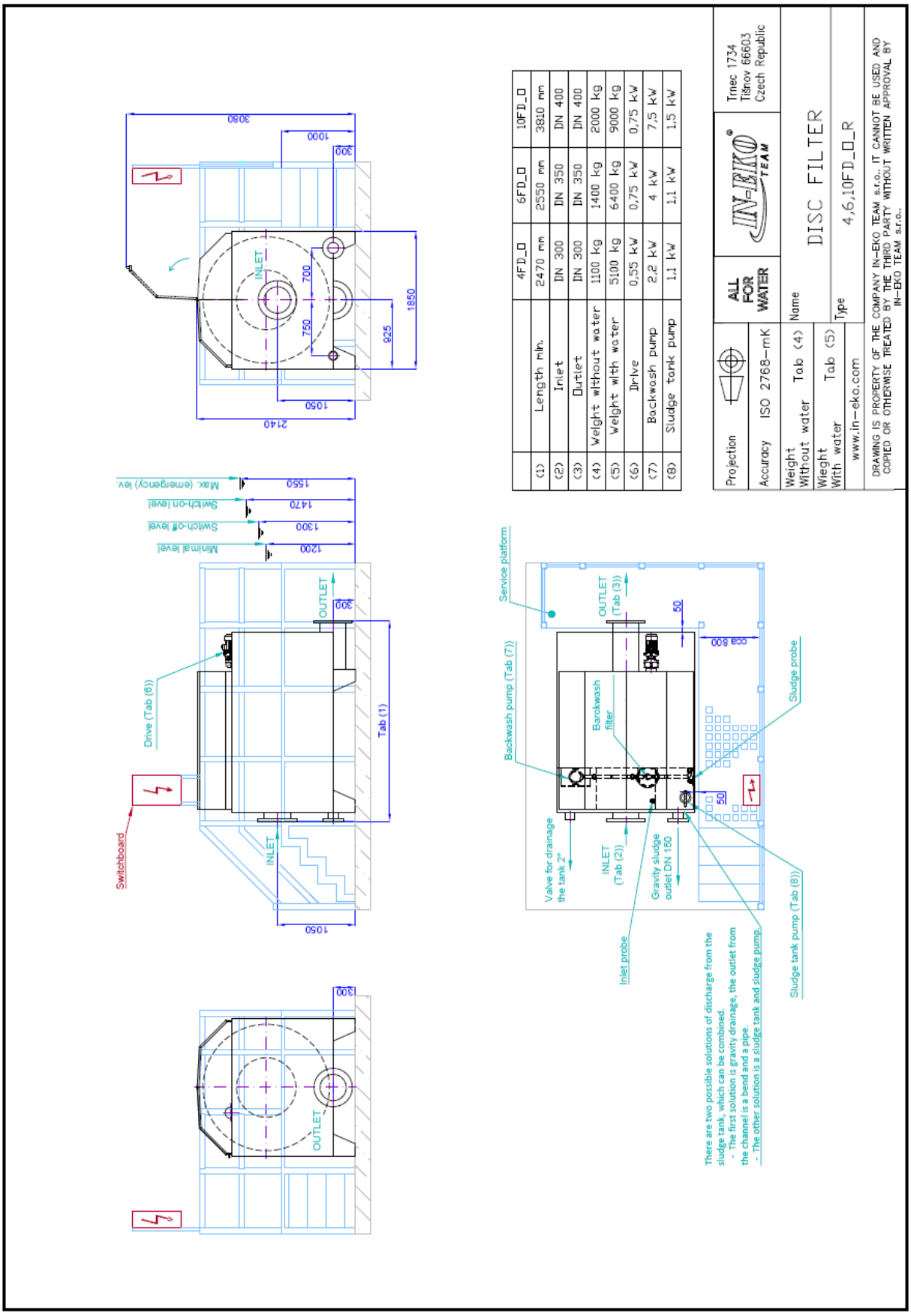
FILTER TYPE	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
4FD	1900	2650	1080	1680	1050
6FD	1900	3050	1080	1680	1050
10FD	1900	3800	1080	1680	1050
16FD	1900	5100	1080	1680	1050
24FD	1900	6800	1080	1680	1050
28FD	1900	7100	1080	1680	1050

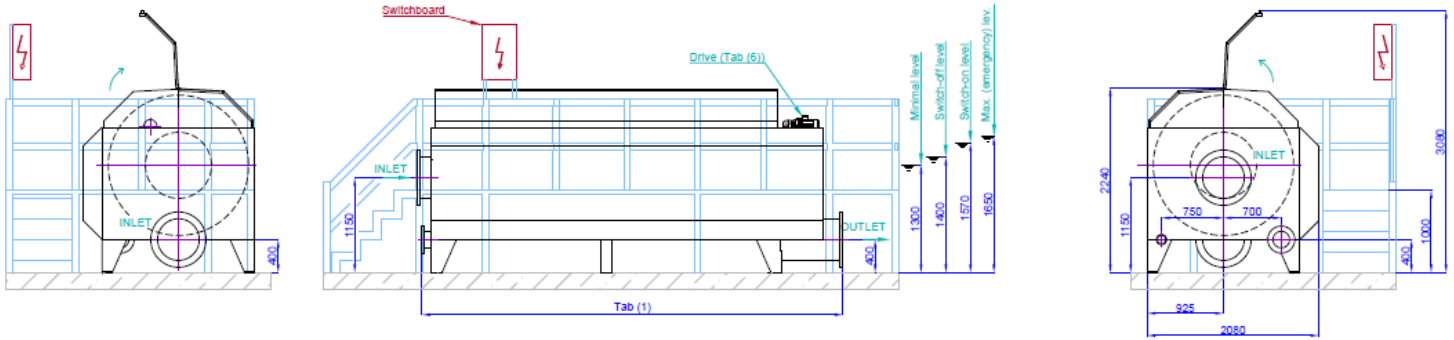
Table 4 Sizes of channel for FD_B

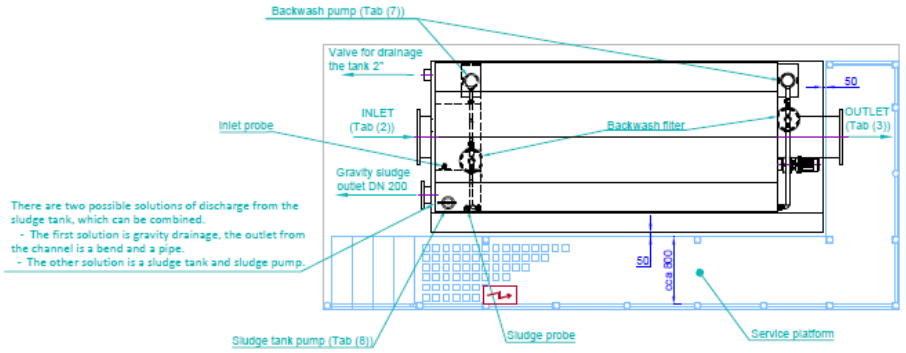
FILTER TYPE	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]
4FDG	2800	3000	-	1970	-
6FDG	2800	3600	-	1970	-
10FDG	2800	4400	-	1970	-
16FDG	2800	5100	-	1970	-
24FDG	2800	6800	-	1970	-
28FDG	2800	7700	-	1970	-

Table 5 Sizes of channel for FDG_B

FD_O


4FD_O
6FD_O
10FD_O
(1) Length min. 2470 mm 2550 mm 3810 mm
(2) Inlet DN 300 DN 350 DN 400
(3) Outlet DN 300 DN 350 DN 400
(4) Weight without water 1100 kg 1400 kg 2000 kg
(5) Weight with water 5100 kg 6400 kg 9000 kg
(6) Drive 0,55 kW 0,75 kW 0,75 kW
(7) Backwash pump 2,2 kW 4 kW 7,5 kW
(8) Sludge tank pump 1,1 kW 1,1 kW 1,5 kW
Projection
Accuracy ISO 2768-mK
ALL FOR WATER
IN-EKO TEAM
Trnec 1734
Tišnov 66603
Czech Republic
Weight
Without water Tab (4)
Wieght
With water Tab (5)
Name
DISC FILTER
Type
4,6,10FD_O_R
www.in-eko.com
DRAWING IS PROPERTY OF THE COMPANY IN-EKO TEAM s.r.o., IT CANNOT BE USED AND COPIED OR OTHERWISE TREATED BY THE THIRD PARTY WITHOUT WRITTEN APPROVAL BY IN-EKO TEAM s.r.o.
3080
1000
300
INLET
700
750
925
1850
1050
2140
Max. (emergency) lev.
Switch-on level
Switch-off level
Minimal level
1550
1470
1300
1200
OUTLET
300
Drive (Tab (6))
Tab (1)
Switchboard
INLET
1050
300
OUTLET
Service platform
OUTLET (Tab (3))
50
cca 800
Backwash pump (Tab (7))
Backwash filter
Sludge probe
Valve for drainage the tank 2"
INLET (Tab (2))
Gravity sludge outlet DN 150
50
Inlet probe
Sludge tank pump (Tab (8))
There are two possible solutions of discharge from the sludge tank, which can be combined:
- The first solution is gravity drainage, the outlet from the channel is a bend and a pipe.
- The other solution is a sludge tank and sludge pump.





		16FD_D	24FD_D
(1)	Length min.	5150 mm	6870 mm
(2)	Inlet	DN 500	DN 600
(3)	Outlet	DN 500	DN 600
(4)	Weight without water	3600 kg	5500 kg
(5)	Weight with water	14600 kg	20800 kg
(6)	Drive	1,25 kW	1,5 kW
(7)	Backwash pump	2x 5,5 kW	2x 7,5 kW
(8)	Sludge tank pump	1,5 kW	2x 1,5 kW

Projection		ALL FOR WATER	IN-EKO TEAM
Accuracy	ISO 2768-mK		
Weight Without water	Tab (4)	Name	DISC FILTER
Wieght With water	Tab (5)	Type	16,24FD_D_R
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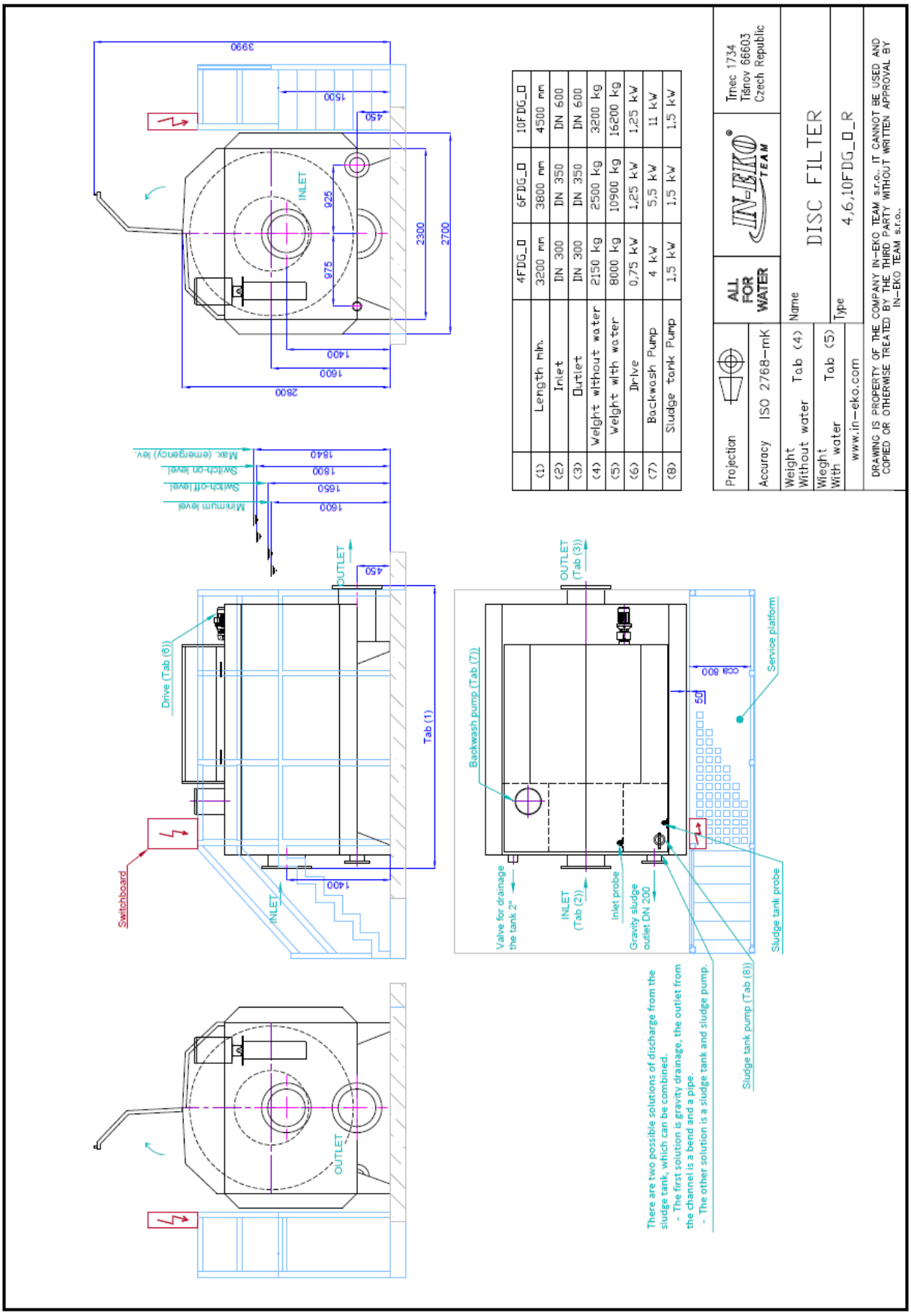
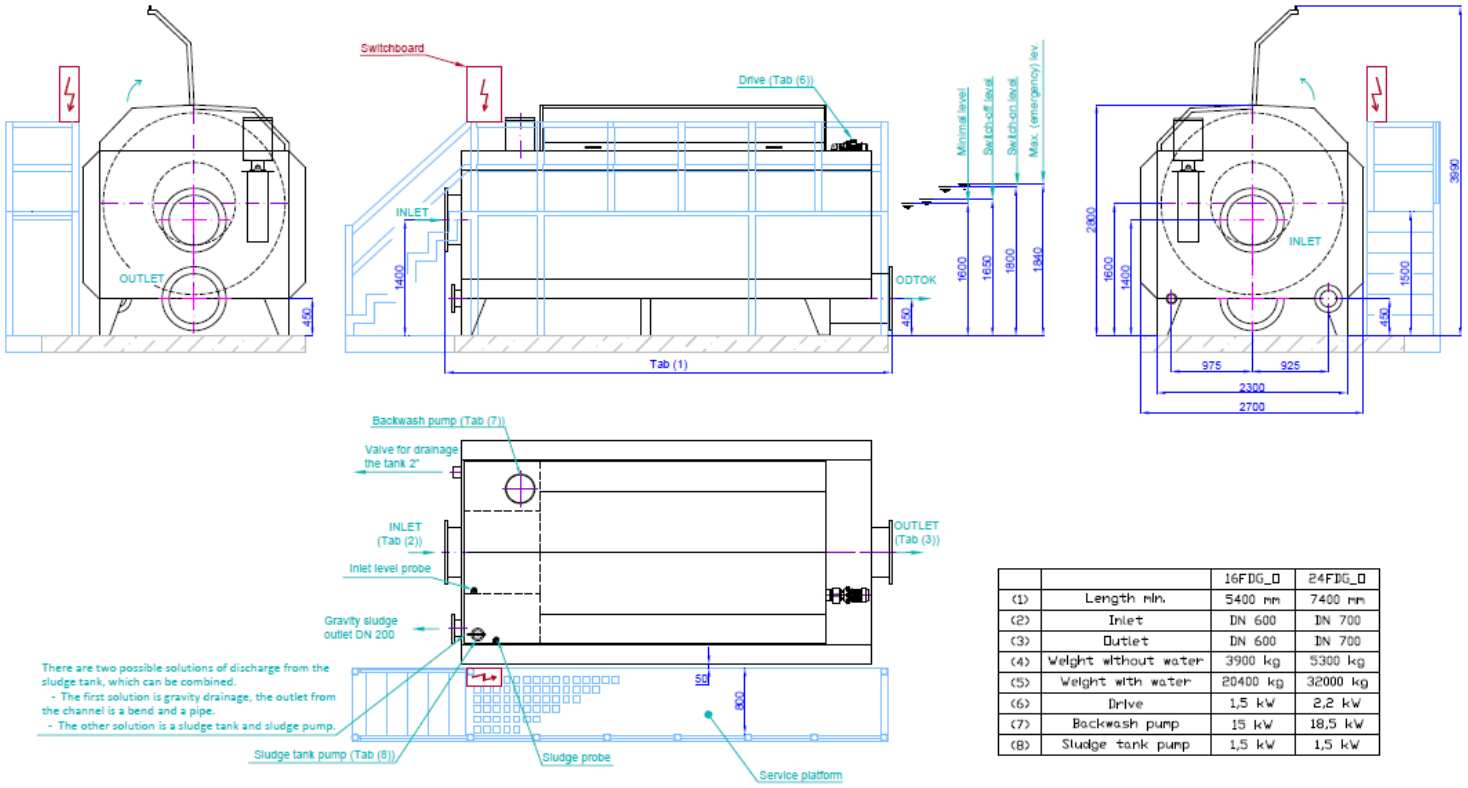
FDG_O



	4FDG_O	6FDG_O	10FDG_O
(1)	Length min.	3200 mm	3800 mm	4500 mm
(2)	Inlet	DN 300	DN 350	DN 600
(3)	Outlet	DN 300	DN 350	DN 600
(4)	Weight without water	2150 kg	2500 kg	3200 kg
(5)	Weight with water	8000 kg	10900 kg	16200 kg
(6)	Drive	0,75 kW	1,25 kW	1,25 kW
(7)	Backwash Pump	4 kW	5,5 kW	11 kW
(8)	Sludge tank Pump	1,5 kW	1,5 kW	1,5 kW

Projection
Accuracy ISO 2768-mK
ALL FOR WATER
IN-EKO TEAM
Tmec 1734
Tišnov 66603
Czech Republic
Weight Without water Tab (4)
Weight With water Tab (5)
Name DISC FILTER
Type 4,6,10FDG_O_R
www.in-eko.com



		16FDG_D	24FDG_D
(1)	Length min.	5400 mm	7400 mm
(2)	Inlet	DN 600	DN 700
(3)	Outlet	DN 600	DN 700
(4)	Weight without water	3900 kg	5300 kg
(5)	Weight with water	20400 kg	32000 kg
(6)	Drive	1,5 kW	2,2 kW
(7)	Backwash pump	15 kW	18,5 kW
(8)	Sludge tank pump	1,5 kW	1,5 kW

Projection		ALL FOR WATER	IN-EKO TEAM
Accuracy	ISO 2768-mK		
Weight Without water	Tab (4)	Name	DISC FILTER
Wieght With water	Tab (5)	Type	16,24FDG_D_R
www.in-eko.com			

Tmec 1734
Tišnov 66603
Czech Republic

ALL FOR WATER
IN-EKO TEAM

Gangway shown in the technical drawing is not part of the delivery. It can be manufactured and supplied together with the filter upon agreement with IN-EKO TEAM representative.

Sizes

FILTER TYPE	WIDTH [mm]	LENGTH [mm]	HIGHT [mm]
4FD	1850	2470	2140
6FD	1850	2550	2140
10FD	1850	3810	2140
16FD	2080	5150	2240
24FD	2080	6870	2240

Table 6 FD_O sizes

FILTER TYPE	WIDTH [mm]	LENGTH [mm]	HIGHT [mm]
4FDG	2700	3200	2800
6FDG	2700	3800	2800
10FDG	2700	4500	2800
16FDG	2700	5400	2800
24FDG	2700	7400	2800

Table 7 FDG_O sizes

FILTER TYPE	INLET [DN]	OUTLET FOR TREATED WATER [DN]	OUTLET FROM SLUDGE TANK [DN]	DRAIN VALVES OF THE TANK ["]
4FD	300	300	150	2
6FD	350	350	150	2
10FD	400	400	150	2
16FD	500	500	200	2
24FD	600	600	200	2

Table 8 FD_O connecting sizes

FILTER TYPE	INLET [DN]	OUTLET FOR TREATED WATER [DN]	OUTLET FROM SLUDGE TANK [DN]	DRAIN VALVES OF THE TANK ["]
4FDG	300	300	150	2
6FDG	350	350	150	2
10FDG	600	600	200	2
16FDG	600	600	200	2
24FDG	700	700	200	2

Table 9 FDG_O connecting sizes

Sizes of switchboard and their stands

The stand for 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. 24 and Fig. 25 show recommended shapes of stands for switchboards. Fig. 26 shows a standard type of switchboard for our filters.

Stands for switchboards

Concrete channel installation

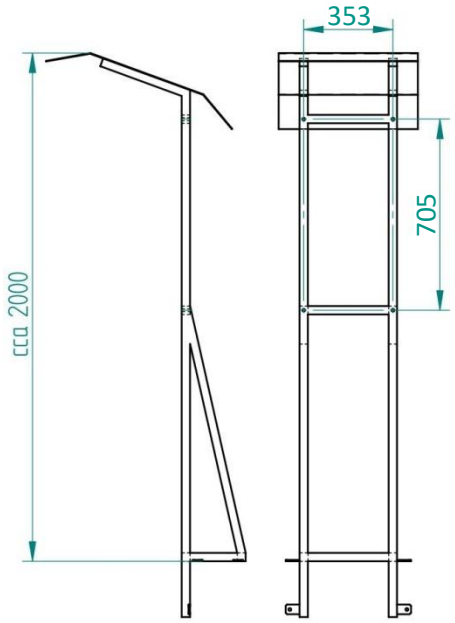


Fig. 24 Switchboard stand for installation on the edge of the channel

Ground installation

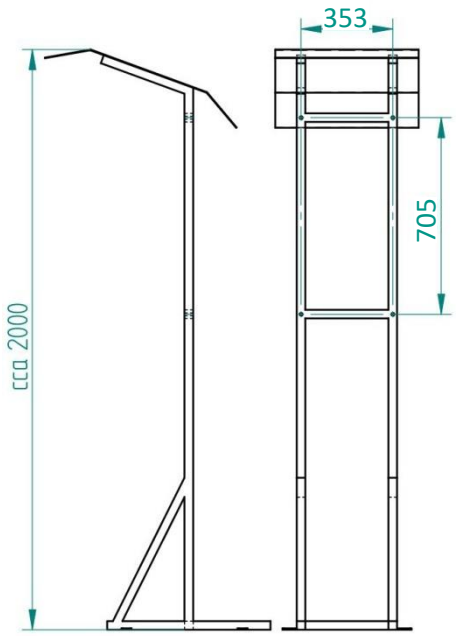


Fig. 25 Switchboard stand for installation on the ground

Switchboard

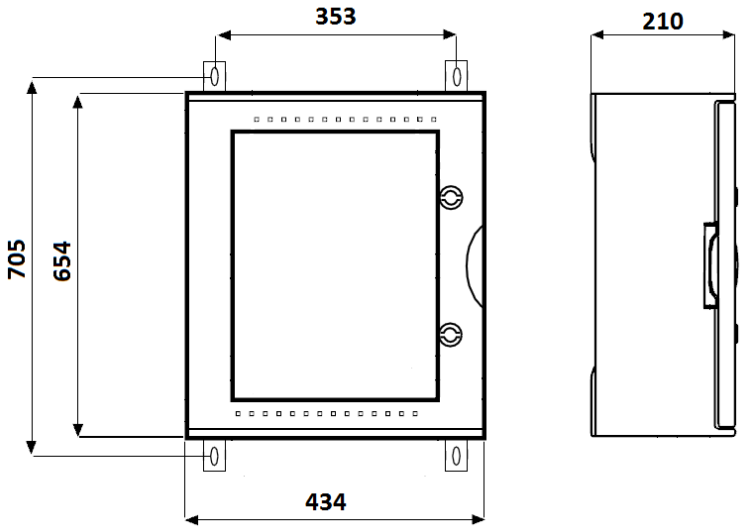


Fig. 26 Switchboard - sizes

Handling the unit

Disc filters in steel tanks (FD_O, FDG_O) have 4 lifting loops for ropes where it is possible to lift the filter by a crane with appropriate capacity depending on the filter size.

Fig. 27 Filter suspended on ropes, detail

Disc filters fitted to concrete channels (FD_B, FDG_B) can be moved by a rocker arm and a lift truck. Filters can be lifted by a rocker arm, see Fig. 28, and moved. Make sure the filter does not get damaged during the transfer!

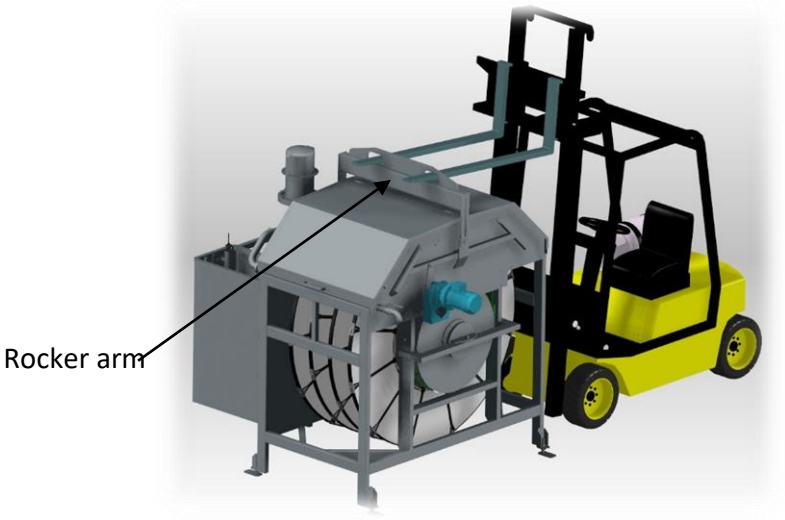


Fig. 28 Handling using a fork-lift truck

DO NOT USE chains or carbon steel material, which could contaminate stainless steel and eventually lead to corrosion.

If assembly or construction works around the filter are carried out after the installation, cover it with a plastic foil to prevent the filter from getting dirty by concrete, chemicals used during construction, particles flying off during angle grinding or other materials.

Failure to comply with these conditions means that corrosion shall not be covered by guarantee!
For more information go to p. 59.

Filter cloth can easily rupture during installation. Personnel must be careful not to damage the cloth.

Rocker arm

If the delivery includes more than one filter, there is only one rocker arm in the delivery! The rocker arm is attached to the filter by bolts. After the filter is installed on a solid ground, the rocker arm can be dismantled and attached to another filter which is necessary to move.

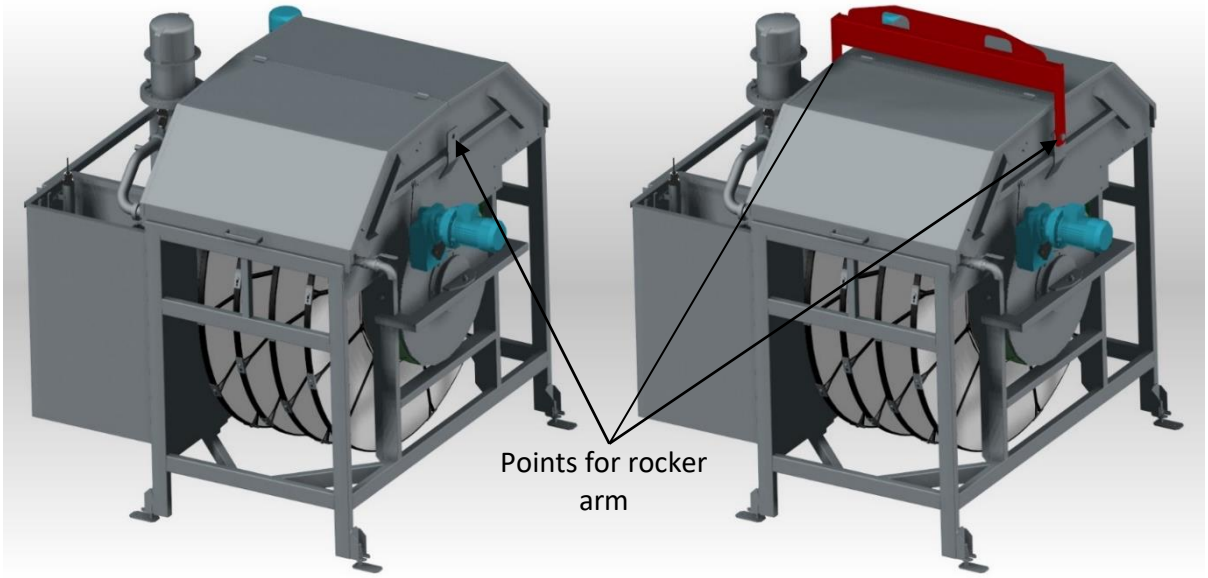


Fig. 29 Filter with and without a rocker arm

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 suffered during the transportation. If you see any, contact IN-EKO TEAM representative without delay, take a photo of the damage and compile a protocol with the forwarder.

Later complaints shall not be acknowledged!

Storage

Filter cloth must be protected from long-term exposure to sun beams and UV radiation. The cloth for filters fitted in concrete channels (FD_B, FDG_B) 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 to 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 a relatively stable temperature and humidity. The cloth must be stored in a place where it cannot be damaged.

Assembly and commissioning

The filter must be levelled on a stable area with maximum allowance of 0.5 mm (to 1 m) using anchor bolts (FD_B, FDG_B) , see Fig. 31 or made steady by supports (FD_O, FDG_O), see Fig. 32.

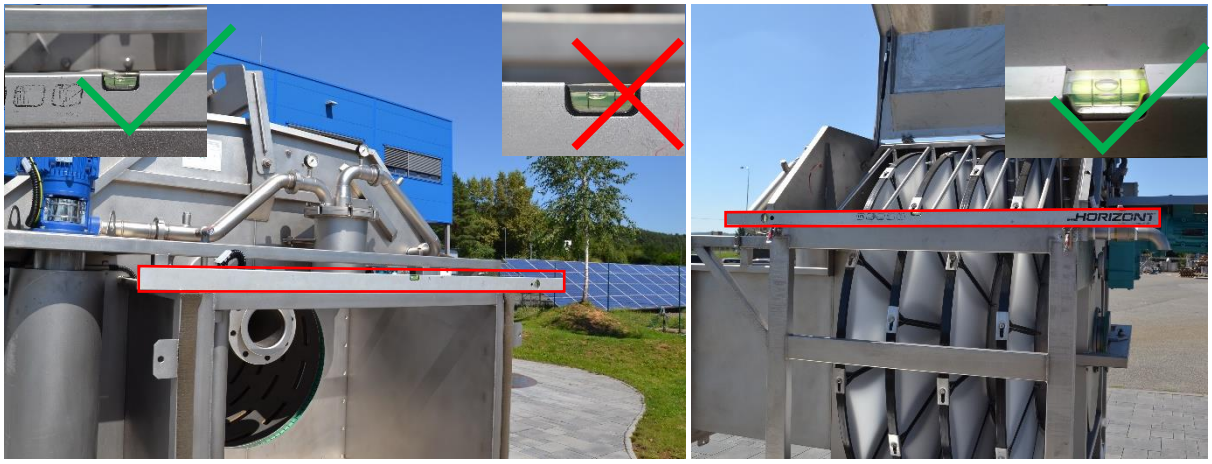


Fig. 30 Levelling the filter (from the front and side)

Nuts of adjustable bolts must be well tightened.

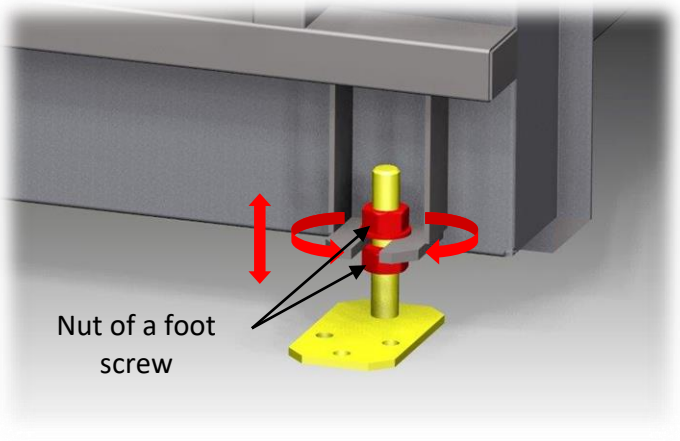


Fig. 31 Support footing for levelling filters FD_B, FDG_B

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.

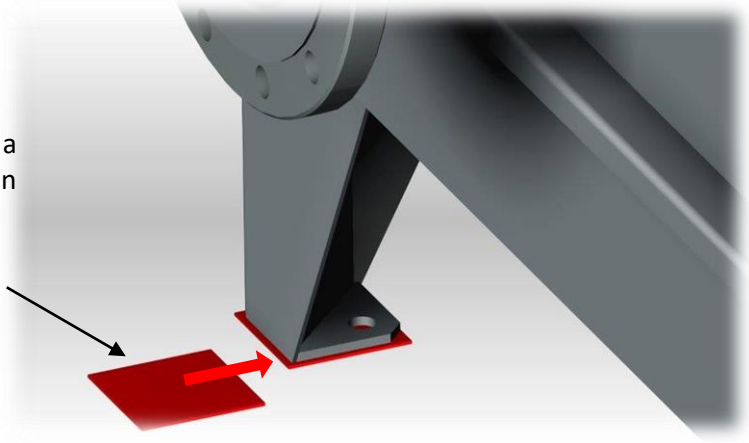


Fig. 32 Levelling filters FD_O, FDG_O

Fig. 33 Wrong and right filter installation

If the filter is not levelled, it may result in uneven load of the unit and hence reduce its life span. To level the filter well make sure the ground is flat.

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 3 m-long sludge hose, ø 50 mm.

The influent water should be free of solid coarse particles bigger than 10 mm big, sand and sticky substances including oils and fats.

The outlet of the filtered water must be kept free!

The maximum water level in the bypass channel must be higher than 200 mm below the crest.

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 shaft of the disc filter would rise excessively due to the inability of the effluent to flow out (over the crest). **The filter would stop turning!**

When connecting the filter to the switchboard, it is **necessary to check the correct rotation of the drives** – rotation of the shaft of the disc filter (see the arrow on the inner side), the correct rotation of the sludge and backwash pump see Fig. 34.

a) b) c)

Fig. 34 Direction of rotation

a) direction of disc rotation b) direction of backwash filter rotation c) direction of sludge pump rotation

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 shaft of the disc filter 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.

Before commissioning the unit, it is necessary to remove all protective packaging including the probe packaging.

Fig. 35 Probe

When the filter has been idle for a long time, it is necessary to clean the backwash filter by spraying (p. 53).

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. 36).

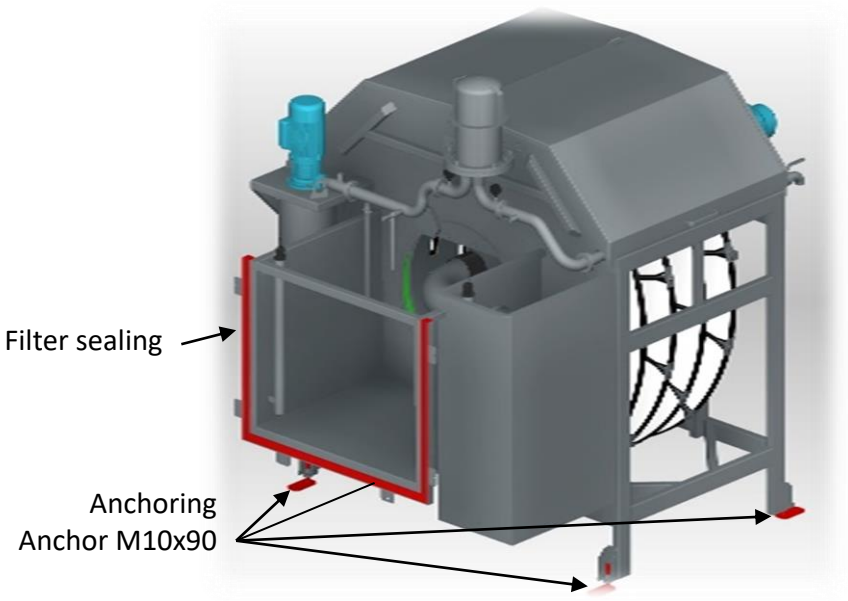


Fig. 36 Sealing and anchoring of filters FD_B, FDG_B

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 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

Filter installed in a steel tank is fixed by 4 anchor bolts (Fig. 37) as in the case of the concrete channel installation. Instead of anchor bolts it is possible to use stop pieces around the feet with sufficient strength. The connecting sizes change per filter type and project (flanges, KG pipes, …) see Table 8 and Table 9 (page 30).

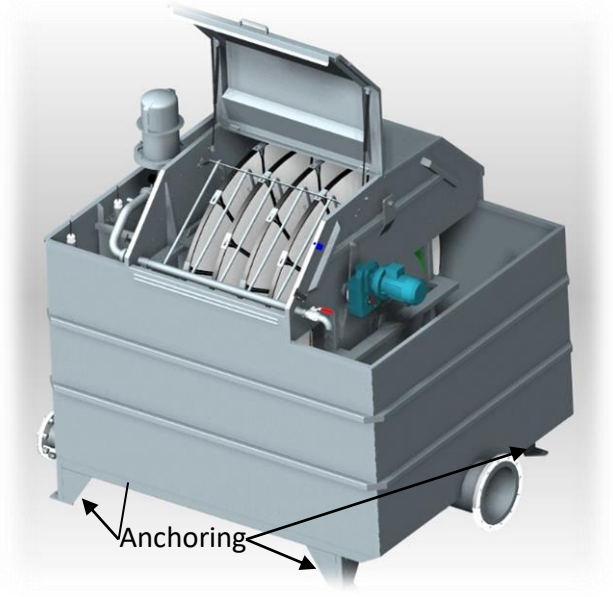


Fig. 37 Filters FD_O, FDG_O - anchoring

Fig. 38 Back stop around the foot of the filter

Some parts of the unit are very heavy – for handling use a suitable lifting device!

Putting the filter out of operation

If you need to put the filter out of operation for some reason, it is necessary to follow these instructions.

Stop the inflow of raw water to the unit.

The switchboard must be switched to manual mode (MAN). Run backwash and check whether it is working correctly. Then rinse thoroughly all the cassettes. Switch off the unit (main switch). Drain water and clean all the available parts of the unit, including backwash filter, probes, belts, etc.

The unit must be stored in a dry and dust free place to protect it from adverse weather conditions. Cover the unit with a breathable textile. Do not use impermeable textiles – there is a risk of occurrence of condensate and damage to the unit by caused by water.

Fig. 39 Unsuitable packaging for long-term storage

Description of Filter Control

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

Control 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, switch-on, delayed switch-off [1], for increased level, emergency level) are set. The probe monitors the water level in front of the filter and sends signal to the PLC. When the switch-on level is reached, rotation and backwash cycle is 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 in 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.

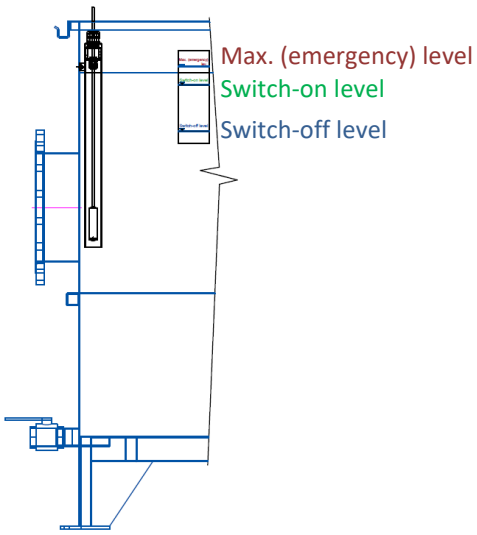


Fig. 40 Water levels

Control of more filters at once

Control by a pressure probe

If more filters (with a joint inlet) are controlled by one pressure probe, the battery of filters is 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 disc filters. If the number of filters is different, the principle of the control is the same.

[1] As the filter cloth ages, it can happen that the water level in front of the filter never decreases to the switch-off level. For this case there is a preset “elevated switch-off level” in the PLC. If the shaft of the disc filter and backwash pump run continuously for a certain time and the water does not drop under the switch-off level, the filter is switched off and shall be reactivated only after the water level reaches the switch-on level.

- Once the switch-on level is reached, filter 1 is activated. When the level is decreased 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 other filters ") under the switch-off level, filter 2 is also activated. Once the level drops under the switch-off level, both filters are deactivated (filter 2 is at least 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 preceding paragraph but even though two filters are running; 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 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" more (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, after the preset time 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.

The area around the switchboard must comply with applicable standards. It is therefore necessary to maintain an open area of min. 800 mm in front of the switchboard. The switchboard must be easily accessible. If it is allowed to store anything near the switchboard, it is necessary to designate an area which is to remain free. It is forbidden to place any objects on the switchboard or to step on it.

If the switchboard is not part of the delivery, it is necessary to connect it to the switchboard, which is equipped with a lockable main switch and security STOP button for emergency switchoff with adequate safety circuit.

Before connecting the unit it is necessary to check if the parameters of the supply network (voltage and frequency) comply with the required parameters of the unit.

There are 2 selector switches for each filter on the switchboard. One for the rotation of the filter disc shaft and the other for the sludge pump (Fig. 41).

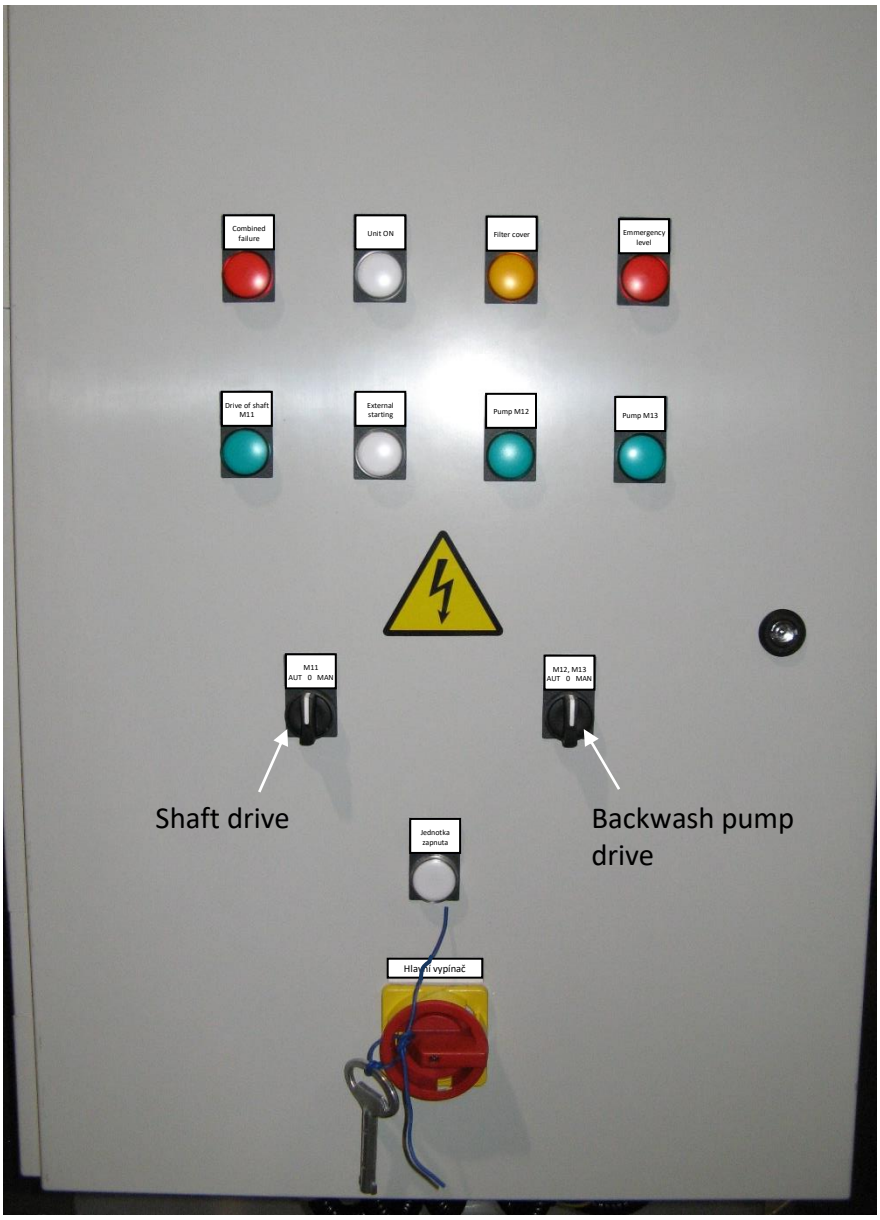


Fig. 41 Switchboard (without sludge pump)

It can be controlled in the following modes:
a) continuous (manual) operation (MAN)
b) automatic operation (AUT)
c) out of operation (0)

The following applies to the disc shaft and backwash pump drive:

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

Make sure that the backwash pumps have enough water; they must not run “dry”!

b) Placing the switch to automatic operation (AUT). The shaft of the disc filter does not turn at first and the backwash pumps do not do any backwashing. As the filter cloth gets clogged with impurities,

the water level inside the shaft of the disc filter rises until it reaches the preset switch-on level which activates the rotation of the disc shaft and backwash cycle. The filter is controlled by water level probes.

c) In order to deactivate the above, place the switch in “0“ position.

The number of controls on the switchboard corresponds to the number of filters, which must be controlled. If the delivery includes only one filter with a switchboard, the switchboard can only operate one filter.

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

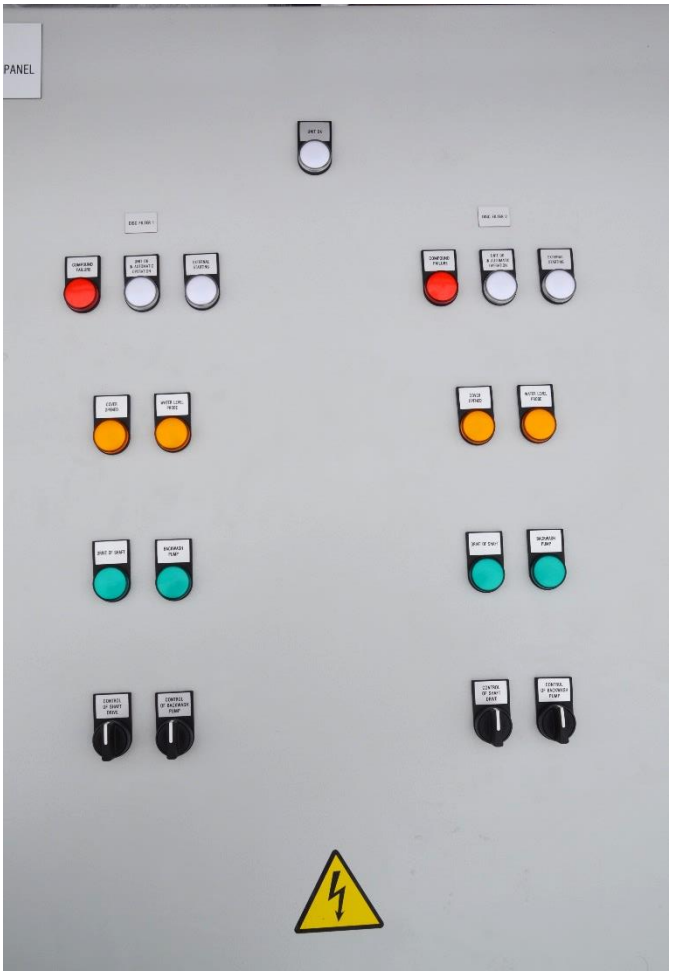


Fig. 42 Switchboard for two filters

Setting and editing

All the logical functions in the switchboard are performed by a programmable PLC LOGO! – Siemens. This unit enables editing important parameters for the operation of disc filters. LOGO! uses cursor buttons, ESC and OK buttons on the front display to edit parameters. There is also a well laid out LCD display to check and monitor different functions, see Fig. 43. The manufacturer does not take any responsibility for damages caused by incorrect setting. We recommend discussing any setting which is considerably different to the default setting, with the manufacturer.

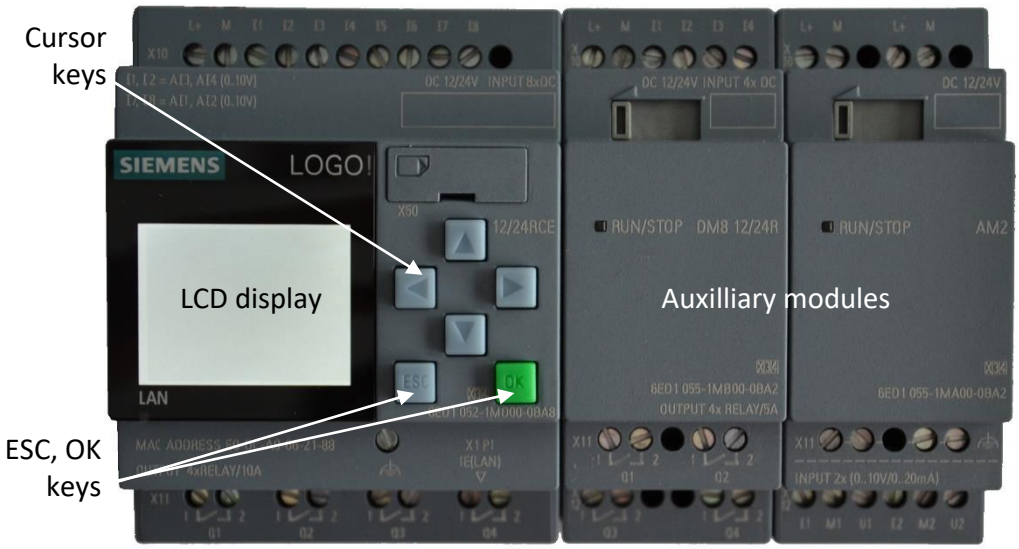


Fig. 43 PLC (LOGO!)

Filter No.	Designation	Description
1	Motor operation M11	Rotation of the disc filter shaft
	Motor operation M12, M13	Backwash pumps
	Motor operation M14	Sludge pump
2	Motor operation M21	Rotation of the disc filter shaft
	Motor operation M22, M23	Backwash pumps
	Motor operation M24	Sludge pump
3	Motor operation M31	Rotation of the disc filter shaft
	Motor operation M32, M33	Backwash pumps
	Motor operation M34	Sludge pump

Table 10 Description of labels on IN-EKO switchboard for three filters (for fewer or more filters labelling is very similar)

When the unit is switched on, the display shows the real time and date. Individual active and inactive inputs and outputs are shown in the following menus, which can be switched between using cursor buttons, see Fig. 44. 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 10.

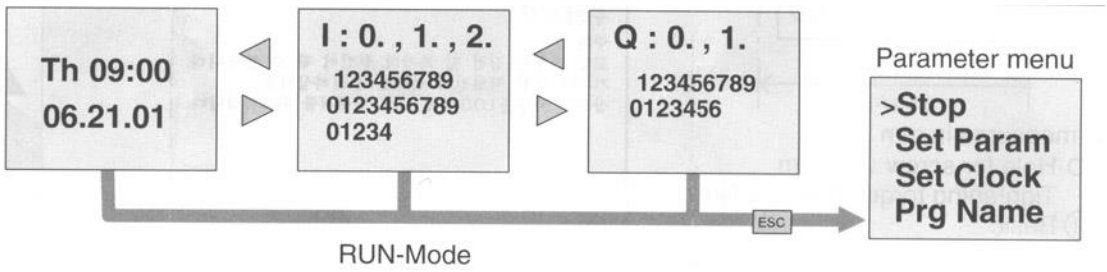


Fig. 44 PLC (LOGO!) inputs (I) and outputs (Q)

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 disc filter operation can be changed.

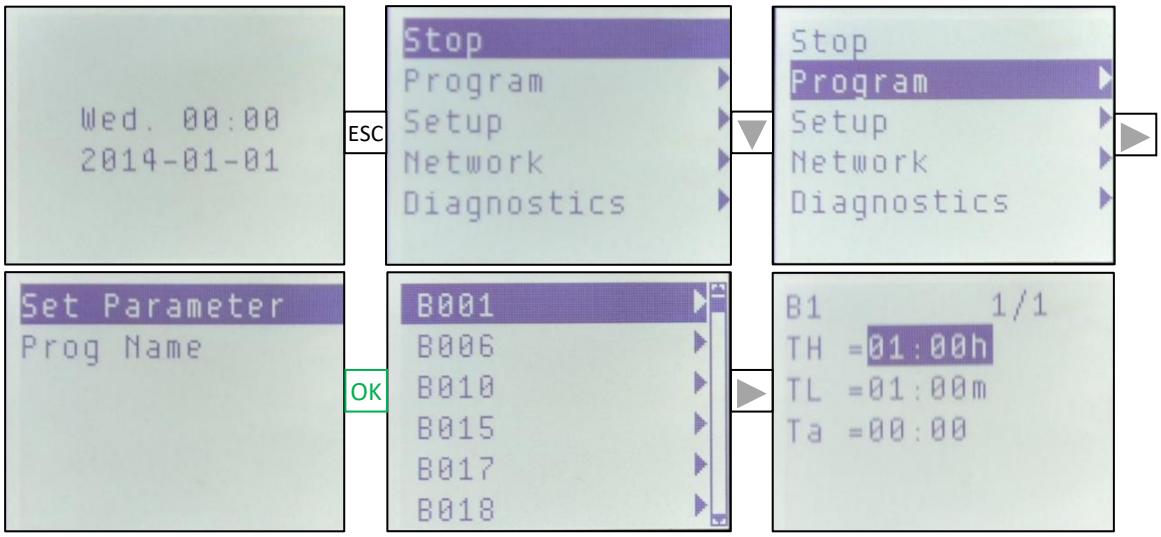


Fig. 45 Parameter setting

Individual items are divided into blocks in the program and their designation has index **B** and a number code. See the Listing of programs LOGO! Siemens.

Motohours of the unit

The filter operation depends on the water levels as described in the chapter How it works, p. 10.

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	Operating time in 1 year:	674 hours
Operating time in 24 hours:	111 min	Operating time in 2 years:	1348 hours

Service and maintenance of the filter

The filter requires regular visual checks (1 x day) and occasional cleaning checks (1 x week).

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

When doing any mechanical maintenance of the unit SWITCH OFF THE MAIN CIRCUIT BREAKER and secure with a padlock!

When doing maintenance and service of the unit it is necessary to use personal protective equipment in accordance with the Labour Code (Act 262/2006 Coll.).

Before any check or maintenance work it is necessary to switch off the main circuit breaker and secure with a padlock against inadvertent switching by another person!

Doing maintenance works on an unsecured machine presents a risk of serious injury! The padlock can be removed only after all the service and maintenance works have been completed! If it is necessary to carry out works with the main circuit breaker switched on, it is necessary to take more precautions and put a sign on the machine informing others about maintenance work carried out.

These precautions must be made even if a power supply is interrupted during maintenance work or a check. The machine is switched on automatically after the power supply is restored!

If any covers or lids are removed during maintenance, it is necessary to put them back in their original place after the works are finished and secure properly.

Regular checks

Daily	Daily	Weekly
Alarms in the switchboard, notices on the PLC display	Check the backwash system	Probe cleaning
Mechanical defect	- pressure difference	Check the belts
Check the rotation of the disc filter shaft and pump (probes)	- cloth backwash	
Check the filter cloth	- water jet from nozzles	**Monthly**
	- enough backwash water	Check the pulleys of shaft mounting

Table 11 Regular checks

1x day

Check the alarms in the **switchboard** and **notices** on PLC display.

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 **rotation** of the disc filter shaft and the backwash **pump** (they should be activated and deactivated at the same time). The disc filter shaft revolves continuously. Check if the sludge **pump** is activated after the level increases (if there is no gravity 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. Does not use pressure water!

Check the filter **cloth** for any mechanical damage or excessive clogging.

Pressure difference in front and behind the filter should not be higher than 1 bar**.** If the difference is higher, it means that the filter is clogged and needs to be cleaned, see Maintenance of filter backwash, p. 53. If the filter is equipped with pressure probes, check for notices on the PLC display.

Water jet from **nozzles** of the spray pipe must be directed and of the correct shape (Fig. 46 and Fig. 47). The cloth must be all rinsed off without big "gaps" see Fig. 52.

Fig. 46 Correct water jet (shown only on one spray pipe)

Fig. 47 Incorrect water jet (shown only on one spray pipe)

1x week.

Once a week it is necessary to clean **water level probes** (see Fig. 59). Probes which are well cleaned and regularly checked ensure the correct functioning of the filter. All pressure probes must be removed from the protective pipe and put back once cleaned properly.

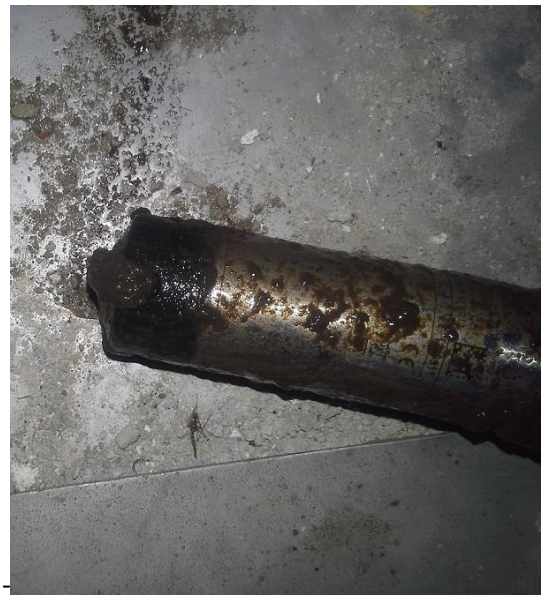


Fig. 48 Dirty pressure probe

Do a visual check of the **drive belts** of the disc filter shaft (Fig. 49). It is necessary to check them for any mechanical damage or elongation (Fig. 50).

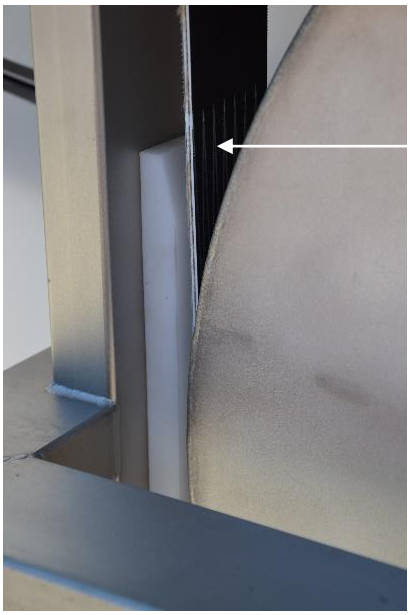


Fig. 49 Drive belt

Fig. 50 Damaged drive belt

1x month:

- Do a visual check of pulleys of shaft mounting for any wear or mechanical damage of shaft bearings (Fig. 51).

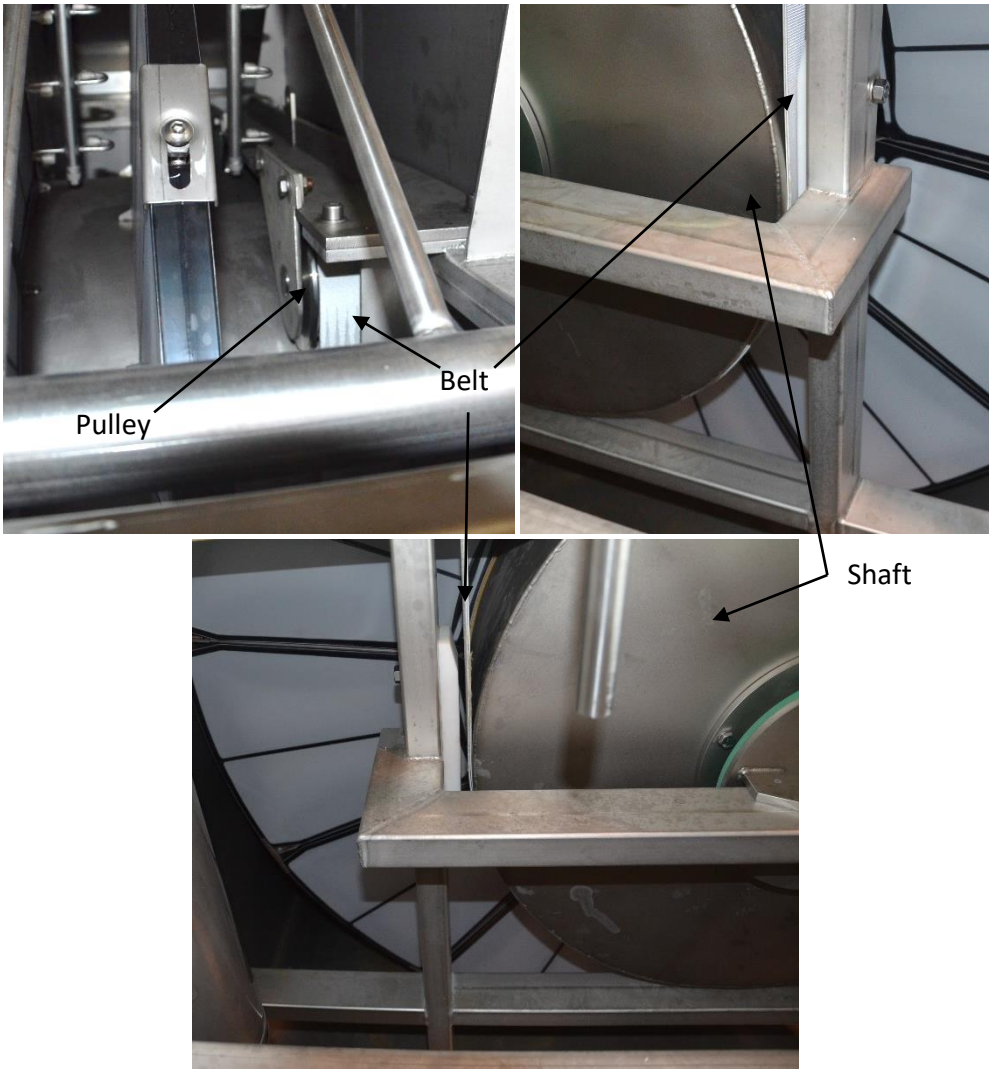


Fig. 51 Shaft mounting

Backwash system – maintenance and cleaning

It is necessary to check the correct function of the backwash system in order to prevent excessive clogging of the filter cloth which could result in its blockage. This would lead to gradual decrease in the capacity of the filter which would not manage to clean the required amount of water and water would start to build up in front of the filter. As a result the emergency level would be reached quickly which would mean bypassing the filter.

With the view of the above, maintenance of the backwash system is the second most important part of the filter function following filtration and must be taken due care of !

Fig. 52 Badly rinsed cloth

The basic check if the backwash system is working correctly includes checking the cloth for clogging, especially checking the water jets from the nozzles of the backwash water. If the cloth is not clean after it was backwashed, it is necessary to release the pressure relief valve in order to check the shape of water jets more easily.

In Fig. 46 you can see the correct process of backwash – complete and overlapping water jets. Jets which are not full (See Fig. 47), do not overlap, only flow out or spout from the nozzles interruptedly, signal that the backwash system must be cleaned.

First it is necessary to find out if the problem does not involve just one nozzle. If so, it must be cleaned (see p. 51). If water spouts from all nozzles incorrectly, then the whole backwash system must be cleaned.

Cleaning the backwash system

If you find that the water jet is not of the right shape, it is necessary to check first if there is enough **filtered water**. Next, you must check **the pressure difference** in the backwash filter. If the pressure

difference is higher than permissible (1 bar), it is necessary to clean the backwash filter (see p. 53), if the pressure difference is all right, the filter must be switched to manual mode (**MAN**).

When the backwash is switched on, open the **manual valve** at the end of the backwash system and let water run through this valve for a few seconds (turn to **0** to switch it off). Repeat several times.

Fig. 53 Manual valve for desludging of backwash pipe set

If this does not help, it is necessary to clean the arms and nozzles of the backwash system.

Cleaning the arms of the backwash system

When performing any maintenance on the filter, it is switched off (0); to check backwash function it is necessary to use manual mode (MAN).

To clean the backwash pipes we need to tilt the backwash system from the disc shaft. **Loosen the screw cap** of the backwash system using the key (part of the delivery), **tilt** the backwash pipe set to its end position as shown in Fig. 54.

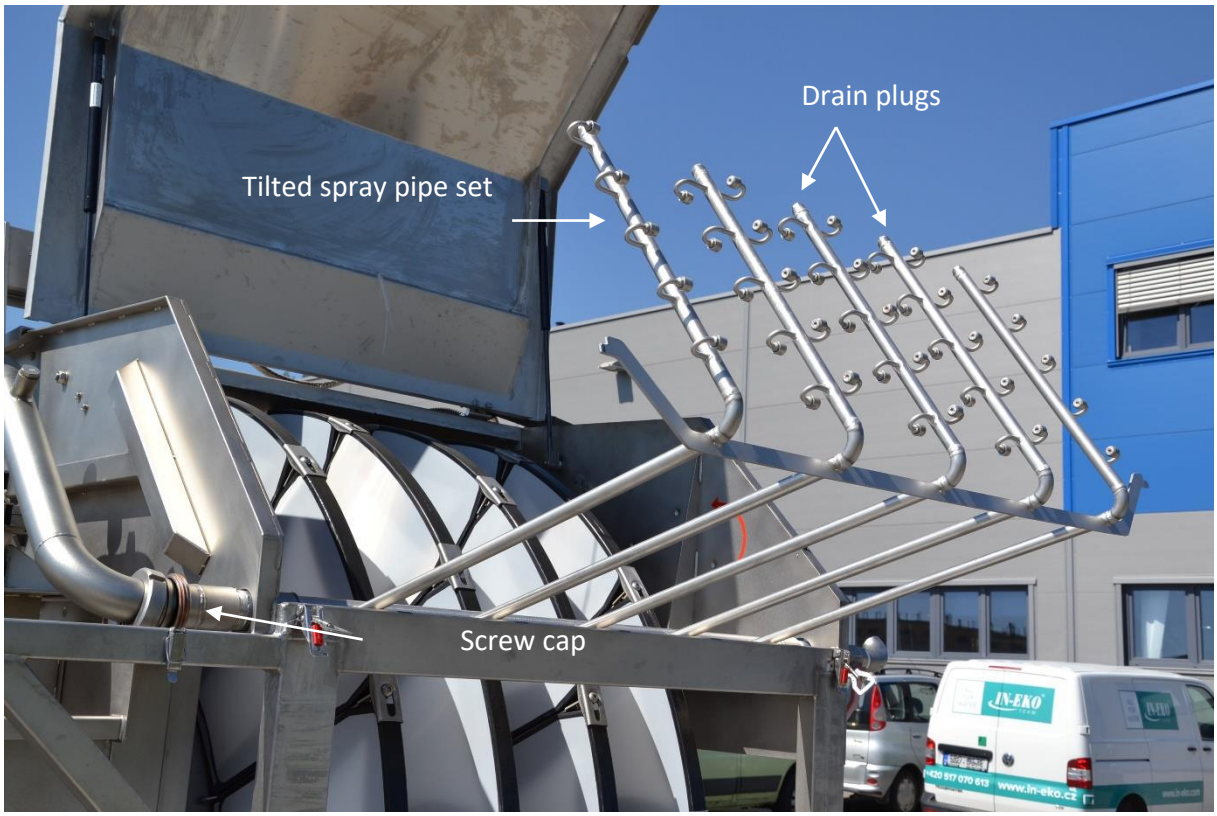


Fig. 54 Service position of spray pipe set

Unscrew and remove the **sludge discharge plugs** at the end of the backwash arms (right-hand thread, screw key 15 mm). **Put** the arms **back** to their working position, **tighten the screw cap** and **run backwash in the manual mode** (0 → MAN). At this moment the arms should get cleaned by spouting water. **Stop backwash** by switching off the manual mode (MAN → 0), unscrew the screw cap, tilt the backwash pipe and **put the sludge discharge plug back**. Return the backwash pipe set to its place, tighten the screw cap, switch on backwash in manual mode (MAN) and check if water spouts from nozzles correctly. Switch off the backwash (MAN → 0). If it is still not the case, go on to clean the nozzles.

Cleaning nozzles

Fig. 55 Nozzles

Check visually which nozzle shows incorrect water jet (Fig. 47) and clean them. Cleaning nozzles is similar to cleaning backwash arms. First, switch off the backwash pumps in the switchboard (**0**).

Loosen the screw cap of the backwash pipe and move the backwash system to a service position. Remove the nozzles which need cleaning using a screw key (13 mm).

Put the backwash system back in the working position and tighten the screw cap. Switch backwash in the manual mode (MAN). This should clean the side arms. Stop backwash (Man → 0); tilt the backwash pipe set out. Clean nozzles with running water, or clean mechanically if necessary. Put the nozzles back on the backwash pipe (make sure the nozzles are put back to the right position, see Fig. 56, Fig. 57! Nozzles are flat on the side.), put the backwash arm back to its working position and tighten the screw cap. Run manual backwash (0 → MAN) and check it.

Fig. 56 Correct turning of nozzles (see position of the key)

Fig. 57 Incorrect turning of nozzles (see position of the key)

Maintenance of filter backwash

As was already mentioned, the backwash filter is supplied in two model versions – in the first version the monitoring and evaluating the condition of the filter is performed by operating personnel and in the case of the second version the monitoring and evaluating is done automatically.

Pressure difference should not be higher than 1 bar. If the difference is higher, it means that the filter is clogged and needs to be cleaned.

Prior to cleaning it is necessary to switch off the main circuit breaker in the switchboard!

Remove the cartridge of the filter by loosening the screw caps in front and behind the filter and remove the filter. Loosen the screws of the lid, lift the lid together with the pressure gauges and put aside. Lift the cartridge and clean it with a water jet.

Fig. 58 Backwash filter

After cleaning put everything back, tighten all the screws and switch on the filter in the switchboard.

Probe cleaning

Probes can be cleaned in 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!**
- All 4 holes on the black lid (Fig. 19) must be clean. If they are not clean and flushing them out in water does not help, clean the lid as shown in Fig. 59.

Pierce the cap with a suitable tool in a vertical direction, …

… remove the black cap,...

… and after cleaning the cap put it back.

Fig. 59 Correct cleaning of the pressure probe

Fig. 60 Incorrect cleaning of the pressure probe

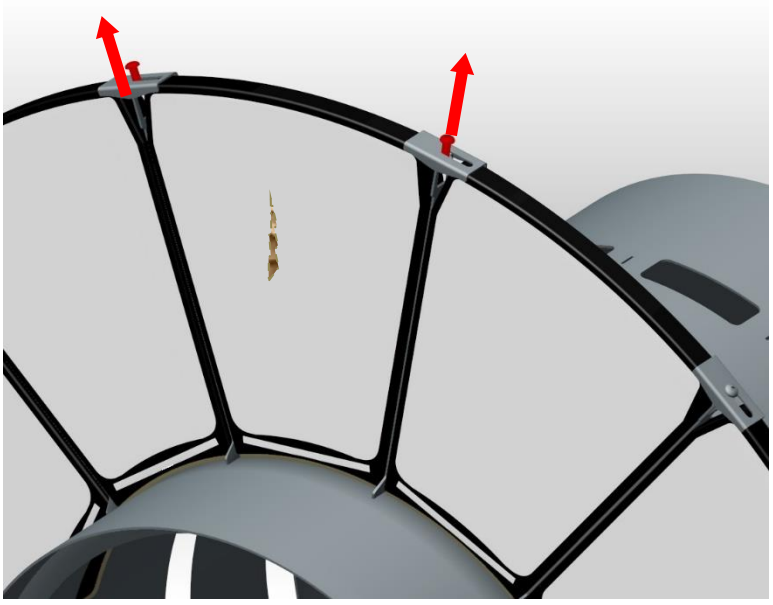
Changing filter cassettes

Changing filter cassettes is easy and fast. No fixture is removable from the rotary part of the disc filter. Fixtures are easily accessible and are placed only on the circumference of the disc. It is therefore not necessary to change the cassettes in the centre of the discs but it can be comfortably done on the disc circumference. As the fixtures are not removable, it is not necessary to hold them in hand when changing cassettes and thus there is no risk that the screws could fall down inside the bottom part of the filter usually filled with water, where they could not be reached.

Before you start changing the cassettes, the main circuit breaker must be switched off in the switchboard!

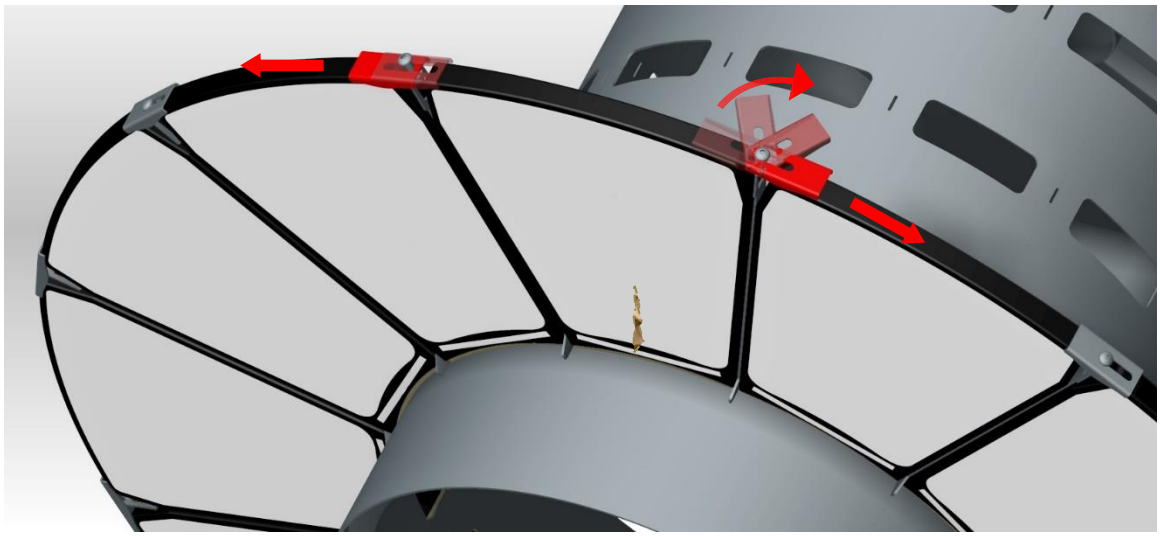
If it is necessary to change more cassettes at the same time, it does not matter in which order the cassettes are removed and replaced.

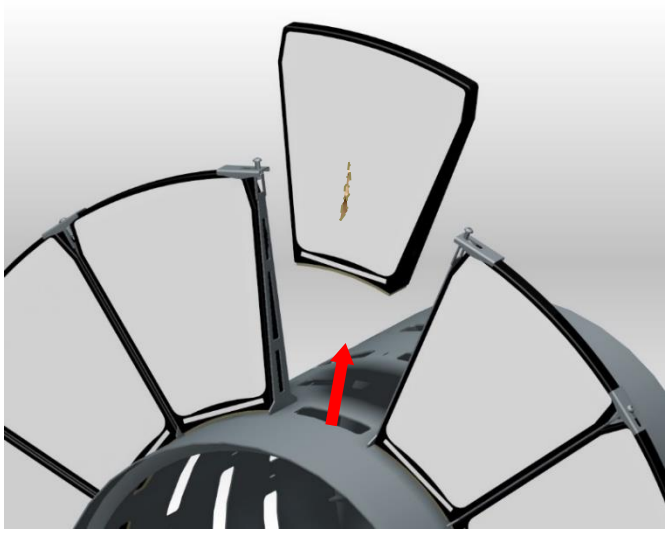
When loosening and tightening screws, it is necessary to apply the torque force of **5 to 8 Nm**, to avoid damaging the screw in the end position and its subsequent fall to the tank. Hence it is recommended to use an acudrill to loosen or tighten screws because torque can be preset.



1. Use a hex key (6 mm) to loosen the bolts on the (damaged) cassette. Do not remove the bolts completely, but only loosen them so it is possible to manhandle the lock guides.

2. Move the lock guides on the side so it is possible to remove the cassette.





3. Remove the cassette with both hands.

Fitting the cassette back in place is done in the reverse order. Put a new cassette in place of the damaged one, restore the lock guide and tighten the bolts using 5-8 Nm torque.

It is necessary to make sure the cassettes are precisely in their place. To ensure this, they are spacer pads which will fit in openings in radial spokes.

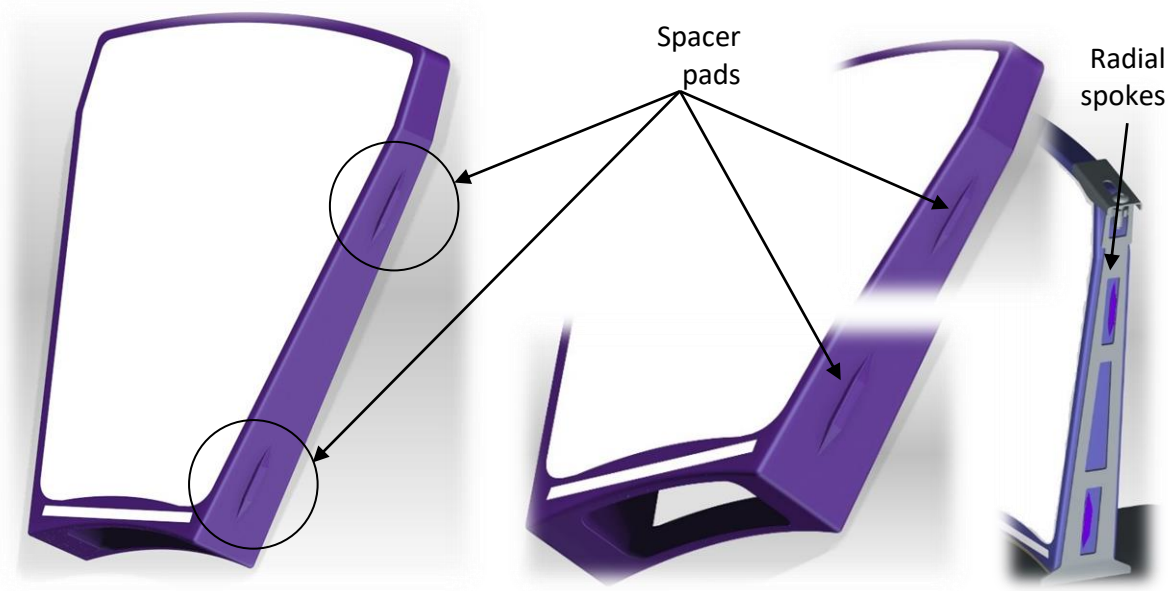


Fig. 61 Spacer pads of cassettes

Troubleshooting

Turn off the main circuit breaker when performing any maintenance work on the filter and secure with a padlock!

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 of the right shape. See Regular checkson page 45.

If the water jets do not show the right shape or one of the nozzles does not function correctly, it is necessary to clean it according to the instructions in chapter Backwash system – maintenance and

cleaning, Cleaning nozzles. If water does not spout out of nozzles with a strong jet, it is necessary to clean the whole backwash system.

Continuous rotation of the shaft of the disc filter

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, p. 56).
- Filter mesh is clogged with either 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, chemical agents or changed completely.
- The level probe in front of the filter is clogged. For Probe cleaning see p. 53.
- The filter is switched to continuous operation.
- Exceeded capacity of the filter.
- Very fine particles with size similar to that of the filter mesh.

Water keeps flowing over the side of the sludge tank inside the shaft of the disc filter and into the sludge tank or by gravity discharge

- 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 sides of the sludge channel inside the shaft of the disc filter but flows over the sides of the sludge tank (pumped sludge discharge).

- 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 inlet for raw water, or outlet for treated water (FDG).

If the sludge continuously flows over the side of the sludge tank, there is a danger of clogging the sleeve of the backwash filter and nozzles with particles 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 and secure with a padlock!

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 disc filter and to secure it with a padlock.
- Do not touch any moving components of the disc 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.

It is necessary to use personal protective equipment when doing maintenance or servicing the unit, under the Labour Code (Act No. 262/2006 Coll.)

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
www.in-eko.com

Tel.: +420 517 070 613
+420 549 415 234
E-mail: help@in-eko.cz

Guarantee

There is 24 month guarantee for the production and material defects of the unit. The guarantee is governed by respective provisions of the Commercial Code. The manufacturer 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.

Disposal after the end of service life

After the end of service life of the unit it is necessary to ensure its disposal according to the valid laws. It is prohibited to throw the unit or its parts to mixed waste containers. The unit contains hazardous substances, such as gearbox fluids, etc. Its disposal must be carried out by a specialized company. We recommend disposal through a company specializing in this type of waste.

Maintenance of stainless steel

Stainless steel has a “passive coating” which is continuously renewed and prevents correction. Corrosion occurs when the protective passive coating is damaged. It can be caused by a bad environment or mechanical damage. The resistance of stainless steel to corrosion is influenced by pH value, chemical composition, and character of impurities in water, sedimented particles and water flow rate.

The worst type of corrosion is the uniform one which can be destructive for whole parts or big areas.

The pH value of the environment (water) must range between 6.5 – 7.6 (for AISI 304), but it always depends on the concrete substances, their concentration and time of exposure, otherwise the environment becomes aggressive and corrosion occurs. For some less favourable environments it is possible to use a more resistant type of stainless steel.

Do not expose stainless steel to chemicals.

If water contains chlorides or chlorine settles on the surface of stainless steel, it prevents oxygen access thus preventing the renewal of passive layer. The concentration of chlorine must not be higher than 2 mg/l (for AISI 304).

If there are two or more types of metals in water, galvanic corrosion can occur (in electric contact). It is possible to avoid it by grounding all the metal parts of the technology.

Avoid contact with other metals, especially iron, e.g. when cutting components made of carbon steel.

Avoid mechanical damage (scratching). Do not use abrasive agents for stainless steel.

A long service life can be ensured by performing regular maintenance of stainless steel (clean it by pressure water).