

Assembly instructions & operating manual

for KLARO sludge dewatering unit

We provide clean water



No mechanical parts
in the wastewater



No pumps
in the wastewater



No electrical parts in
the wastewater

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1. General Safety Instructions



Bio hazard!

Sludge from a wastewater treatment plant may contain pathogens. When dealing with sludge appropriate protective measures should be taken (gloves, goggles, face mask, hand sanitizer)



Slip hazard!

The flocculant used is extremely slippery when spilled! First wipe up spilled liquid with towels, then wash off with plenty of water.

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2. Function of the KLARO sludge dewatering unit

The KLARO sludge dewatering unit is used to reduce the sludge volume in the KLARO container.blue wastewater treatment plant and for dewatering of the extracted sludge. The solid mass of the activated sludge, important for cleaning wastewater, increases depending on the amount and characteristics of the inflow to the treatment plant. Drift-off of activated sludge with clear water discharge can occur from an activated sludge volume of 500 ml/l (SV30) or more in tank 3 of the treatment plant (see Figure 1). To prevent this, the activated sludge volume should be regularly measured and, if appropriate, desludging of the plant undertaken.

The dewatering of sludge occurs by gravity filtration in a filter bag frame after flocculation of the sludge with a polyacrylamide-based flocculant and can be performed on site by one person. With normal sludge consistency one filter bag is sufficient for desludging the entire container. The draining filtrate is collected in a drip tray and can be fed into the discharge of the wastewater treatment plant.

The retained, thickened sludge remains in the filter bag frame at least until the next desludging. If the container treatment plant is operated under full load (10 m³ / day) under typical wastewater characteristics, the sludge storage capacity of the container plant is at least three months. During this time, the filtered sludge can drain and partially dry.

Since the sludge can potentially contain pathogens, the filtered sludge is covered during the dewatering phase and fitted with a vent to avoid contact.

After the sludge is sufficiently dried, it can be composted or otherwise disposed of, depending on local regulations. The usage on site of the secondary sludge, left over from the treatment process, or disposal in a highly dehydrated form offers a distinct advantage over the disposal of the sludge in the liquid state, due to the significant weight and volume reductions.

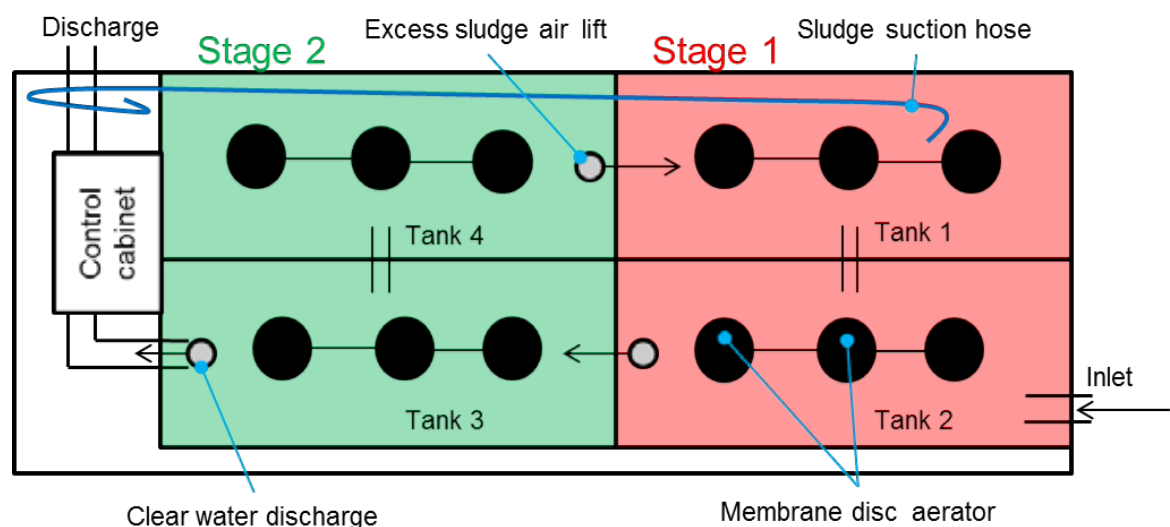


Figure 1: Schematic design of Container.blue treatment plant

3. Components and design

The KLARO sludge dewatering unit consists of:

- A suction hose that is already installed in the container,
- A pump unit consisting of impeller pump, metering pump and drip tray,
- the filter unit consisting of filter bag frame, splash guard, cover and vent, as well as
- consumables, namely filter bags and flocculant.

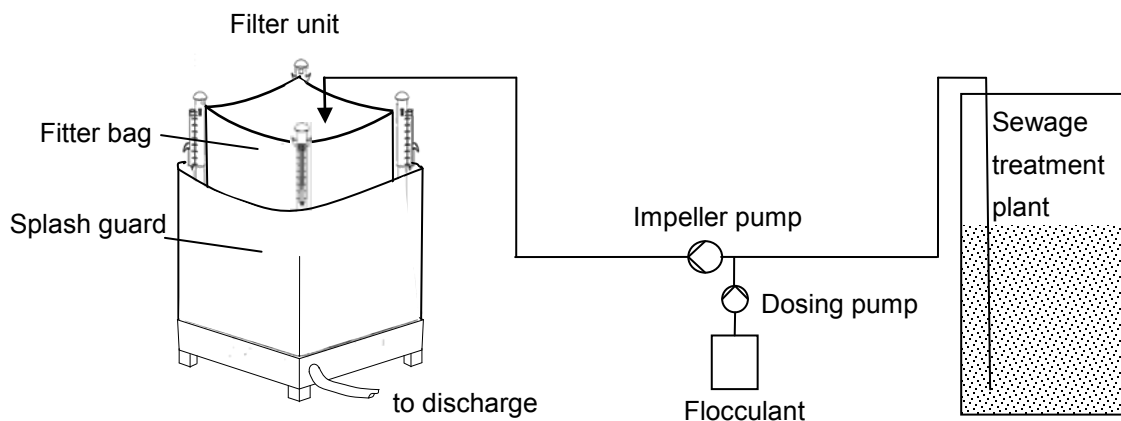


Figure 2: Schematic design of dewatering unit

The individual components, their function and design are discussed further below.

3.1. Suction hose

The end of the suction hose is installed in the tank 1 of the container treatment plant, which serves as a sludge storage. From here the sludge-water mixture is sucked out and conveyed toward the front of the container. The end of the hose is provided with a snap coupling for connection to the pump and dosing unit and provided with a plug.



Figure 3: Suction hose for desludging in the container.blue

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3.2. Pump unit

The pump unit consists of:

- A drip tray,
- A dry-priming impeller pump, for sucking out and conveying the sludge-water mixture, and
- A peristaltic dosing pump for dosing flocculant, which is mounted together with the impeller pump on a carrier frame.

As a result, the pump unit is mobile and suitable for use on several plants.



Figure 4: Pump unit with carrier frame next to the flocculant on the drip tray

As can be seen in Figure 4 the pump unit and the flocculant canister are placed next to each other on the drip tray.

The adjustable dosing pump (see Figure 5) conveys flocculant from a canister to the injection point on the impeller pump. To match the dosage to various sludge consistencies, the delivered quantity of the peristaltic dosing pump can be infinitely adjusted using a screwdriver. The suction hose of the dosing pump is fed into the canister and can optionally be secured with a cable tie to the handle of the canister. The direction of rotation of the peristaltic pump can be seen by arrow marks on the pump. The metering pump can be manually switched on and off by the flip switch on the pump frame.

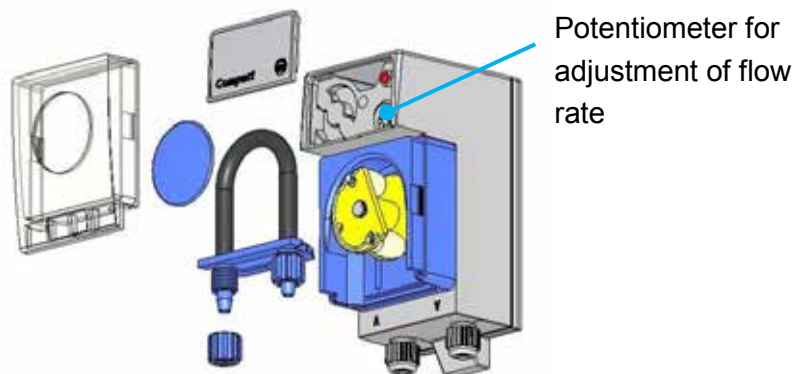


Figure 5: Peristaltic pump for dosing of flocculant

The impeller pump must be connected to the hose described above, such that the injection point of the flocculant is located on the suction side. This will ensure that the dosing pump does not have to work against the pressure of the impeller pump, and that a good mixing of the flocculant with the sludge can occur in the pump housing.

The impeller pump is connected to the free plug socket on the pump frame. The pump can be started with the rotary switch on the impeller pump, and in addition the pumping direction can be freely selected. The pipe line can therefore be emptied back into the wastewater treatment plant, after dewatering, or a potential blockage can be resolved by short-term reversal of rotation.

The 10 meter long hose supplied is connected to the pressure side, and directs the flocculated sludge to the filter.

Both closure caps and plugs are included for the pump and for the hose to prevent drying of residual sludge or dirt penetration when not in use.

3.3. Filter unit

The flocculated sludge is separated from water in the filter unit and then dewatered and dried. It consists essentially of:

- A drain tray with connection for a drain line, which is laid to the discharge of the treatment plant,
- A mounting for a filter bag,
- The filter bag itself,
- A splash guard and
- A cross member for connecting the sludge line and for installation of the vent.
- In addition a cover and a fan for the rack are included for use during drying after completion of desludging.

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Figure 6: The filter unit consisting of collection tank, bag mounting, bag filters and cross member (left); filter unit covered with ventilation for drying (right)

The filter unit should be installed up to a maximum of 10 metres away from the pump unit, otherwise the pipeline supplied between the pump and filter unit must be extended. In addition, it is essential to ensure that the discharge of drain tray is positioned so that the draining filtrate can be directed by gravity flow to the discharge of the treatment plant. The drain tray must be horizontal, and this must be checked with a spirit level. The connection between the drain tray and treatment plant discharge is not supplied and is installed on site. For this purpose, a hose or a pipe with 50 mm outer diameter should be used. The line should be routed so that it can remain in place for at least one week, until no more water drips out of the filter bag and further dewatering takes place only through evaporation.

The base plate of the bag mounting is placed onto the drain tray, and the four posts inserted. Two of the posts are provided with a hole; they should be placed diagonally opposite each other, in order to later insert the cross member (Figure 7).

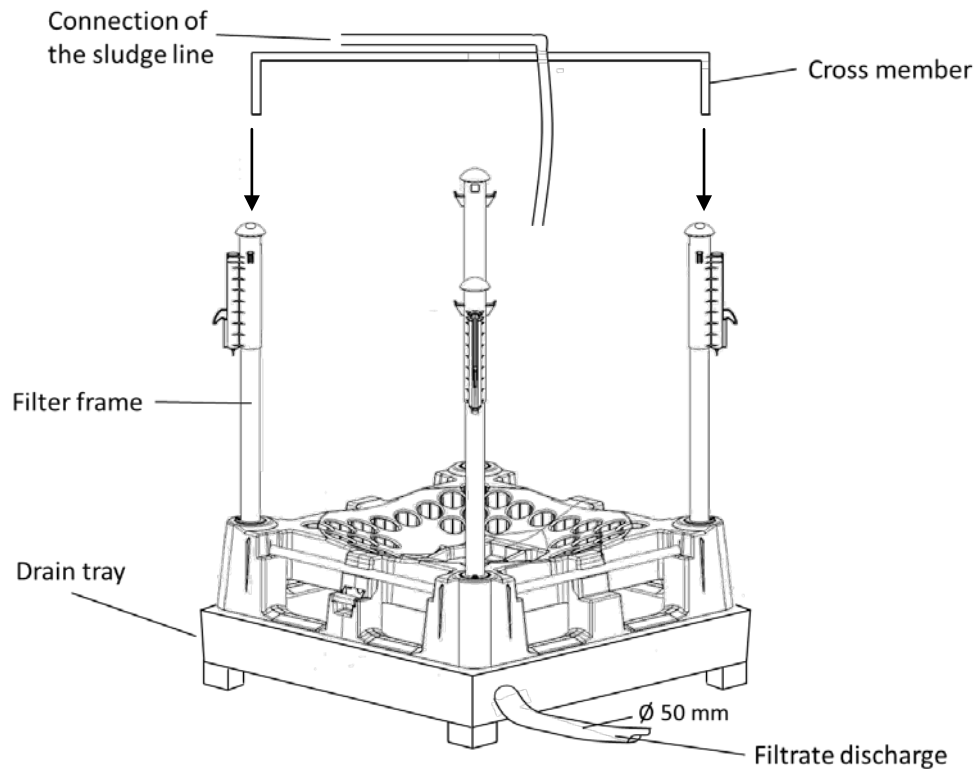


Figure 7: Filter bag frame with cross member for connecting the sludge line

The filter bag is hung in the holders of the posts and lightly tensioned (Figure 6). During filtration, a splash guard can be attached around the filter bag frame. For this purpose, the splash protection foil sheets supplied are wrapped around two opposite poles. Then the sheets may be placed around the four posts, and fixed using the supplied spring clamps (Figure 8)



Figure 8: Attaching the splash guard (left to right): Winding the splash guard foil sheets on two opposite posts; pulling the sheets out; fixing with spring clamps; fully assembled splash guard

Subsequently, the cross member can be inserted into the holes in the post and the hose, coming from the pump unit, can be connected.

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3.4. Consumables

A filter bag and flocculant are required for each sludge dewatering. Under normal conditions one filter bag is sufficient for desludging of a container.blue treatment plant, if it has run for three months at full capacity. However, both the volume of sludge after filtration and the flocculant requirement are highly dependent on the sludge composition and texture and can therefore not be predicted with certainty.

Since the flocculant solidifies in contact with water or humidity, it may be necessary to replace the dosing pump hoses or the peristaltic hose prior to using the dosing unit again.

4. Operation

After the construction of all components has been completed as described above, desludging of the wastewater treatment plant can be started. The desludging process takes about two hours to complete, including assembly and carrying out. The process must be monitored continuously during this time. All hose connections and the discharge of the plant should be checked for seating and water tightness before starting up.

The desludging procedure is described in detail below. For this, the points 4.1 to 4.6 must be carried out sequentially in the order described.

4.1. Activation of the desludging mode in the control system of the wastewater treatment plant

The "Set desludging date" function is first selected, in both controls of the container plant, (Set, →, →, →). The previous day must be selected as the start date and the current date as the finish date.

The first clarification stage, from which the sludge is removed, is continuously aerated in this program, so that the sludge to be drawn off cannot settle and uniform consistency is guaranteed for the sludge drawn off. The second clarification stage alternates between aeration and sludge recirculation from the second into the first stage. Thus, excess sludge can be drawn off from the second stage.

The lifter for sludge recirculation sucks the sludge from a specific height, so that after the desludging enough activated sludge remains in the container for continued trouble-free operation of the treatment plant.

The controller then automatically changes the following day from desludging mode back to the normal clarifying mode.

4.2. Initial running of the metering pump

As soon as the control is in the desludging mode, the flocculant dosing pump is turned on at the toggle switch of the pump unit and maintained until the flocculant has reached the dosing point on the impeller pump.



Figure 9: Dosing pump, toggle switch and injection point for the dosage of flocculant

4.3. Starting the impeller pump

Then the impeller pump is turned on, whereby attention must be given to the direction of rotation of the pump. To start the pump, the rotary switch must be briefly turned to the

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stop. In the event that the pump does not start immediately, the pump is briefly run in the opposite direction to free the impeller. The pump noise can clearly be heard when the suction hose is completely vented and liquid is sucked.



Figure 10: Rotary switch on the impeller pump

4.4. Readjustment of flocculant dosage

As soon as sludge is conveyed to the filter bag, a check must be made as to whether the sludge conveyed into the filter bag is clearly separated from the water. If a clear distinction can be seen, the dosing of the flocculant to the hose pump can be carefully reduced. If there is no clear separation recognisable, the dosing rate is increased by slightly rotating the screw on the metering pump clockwise with a screwdriver. The flocculation of the sludge-water mixture must be checked regularly and manually readjusted if necessary. With dosing too low, there are no large, compact sludge flakes formed and fine flakes clog the filter fabric, resulting in an excess of water relative to the sludge. An overdose can be recognised by vigorous foaming and equally has a negative impact on flocculation.



Figure 11: Readjustment of the metering pump, filtration without excess water (under dosing) or foams (overdose)

4.5. Shutting down impeller pump and dosing pump

The filtration process must be constantly monitored.

When the sludge has been pumped out to the minimum level in the treatment plant, the pump runs dry, which is indicated by a significant change in pump noise. A dry run of the impeller pump longer than one minute must be avoided. In this case, or when the filter bag is completely filled, the impeller pump and dosing pump can be switched off.

If the performance of the impeller tails off, it can be brought to full power again by brief reversal of the pumping direction.

4.6. Notes on dismantling

After filtration, proceed as follows:

- The impeller is operated for about 30 seconds in the opposite direction in order to convey the residual sludge, remaining in the hose, back into the wastewater treatment plant.
- The couplings of the impeller are released and fitted with the plugs or caps to prevent leakage / drying.
- The flocculant canister must always be stored closed, as humidity can lead to hardening of the flocculant.
- Finally the splash guard can be removed from the filter frame, the cover pulled over the filter bag and the vent connected. With indoor installation of the filter, the ventilation of the filter should be ducted outside.

Finally, the filtered-off sludge can drip or dry until the next desludging and then be discarded.

On the next day, the controller automatically switches back to the normal cleaning cycle. In stage 2 of the container treatment plant, a sufficient amount of residual sludge always remains, which serves as a bacteria inoculation of the plant for continued operation.

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5. Technical data

Impeller pump	Niostar 2000-D	
Rated flow volume	[l/min]	115
Connected power rating	[Watt]	1500
Type of connection	[VAC/Hz]	230/50
Protection type		IP55
Pump housing		Stainless steel
Impeller		EPDM
Shaft seal		EPDM
Dosing pump	Saier Compact U	
Volume output		adjustable
peristaltic hose		PS 135 – 4.8x1.6 TG-G
Hose holder		4.8-4x1 PVDF
Protection type		IP65
Fitter bag		
Volume	[l]	Approx. 900
Material		PE
Flocculant	see product data sheet	
Filter frame, tank, cover	UV resistant	
Dimensions HxWxL	[mm]	1700x1300x1300

6. Faults and fault elimination

Fault	Possible causes	Solutions or recommended testing
Impeller pump does not start	Impeller jammed	Brief operation in the opposite direction releases the impeller.
	Pump disconnected / cable broken	Ensure cabling is free of breaks.
	Pump is blocked	Disconnect the pump from the power supply and open the pump housing. Remove debris.
Impeller does not pump, despite the motor running	Impeller jammed	Brief operation in the opposite direction releases the impeller.
	Pump runs dry	Switch off the pump immediately, the minimum level in the sewage treatment plant has been reached Wrong direction of pump. Turn rotary switch of the pump in the opposite direction.
	Suction hose is clogged	Brief operation in the opposite direction releases the blockage.
Dosing pump not delivering during running in (see 4.2)	Dosing or peristaltic hose is clogged with old, hardened flocculant	Change dosing hose or peristaltic hose
Poor flocculation effect / water does not run fast enough from the filter, but no foaming	Underdosed flocculant	Flocculation mode is not activated on the controls → activate!
		Dosing pump output is too low → readjust dosing (see 4.4)
		Flocculant canister is empty.
Foaming in the filter bag	Overdosed flocculant	Flocculation mode is not activated on the controls → activate!
		Performance of the impeller pump is reduced due to blockage → brief reversal of the direction of the impeller pump releases the blockage
		Dosing pump output is too high → readjust dosing (see 4.4)

Technical changes reserved.

KLARO GmbH

Spitzwegstraße 63
95447 Bayreuth

Telephone: +49 (0) 921 16279-0

Fax: +49 (0) 921 16279-100

E-Mail: info@klaro.eu



Technical hotline

+49 (0) 921 16279-330

Further information under

www.klaro.eu

