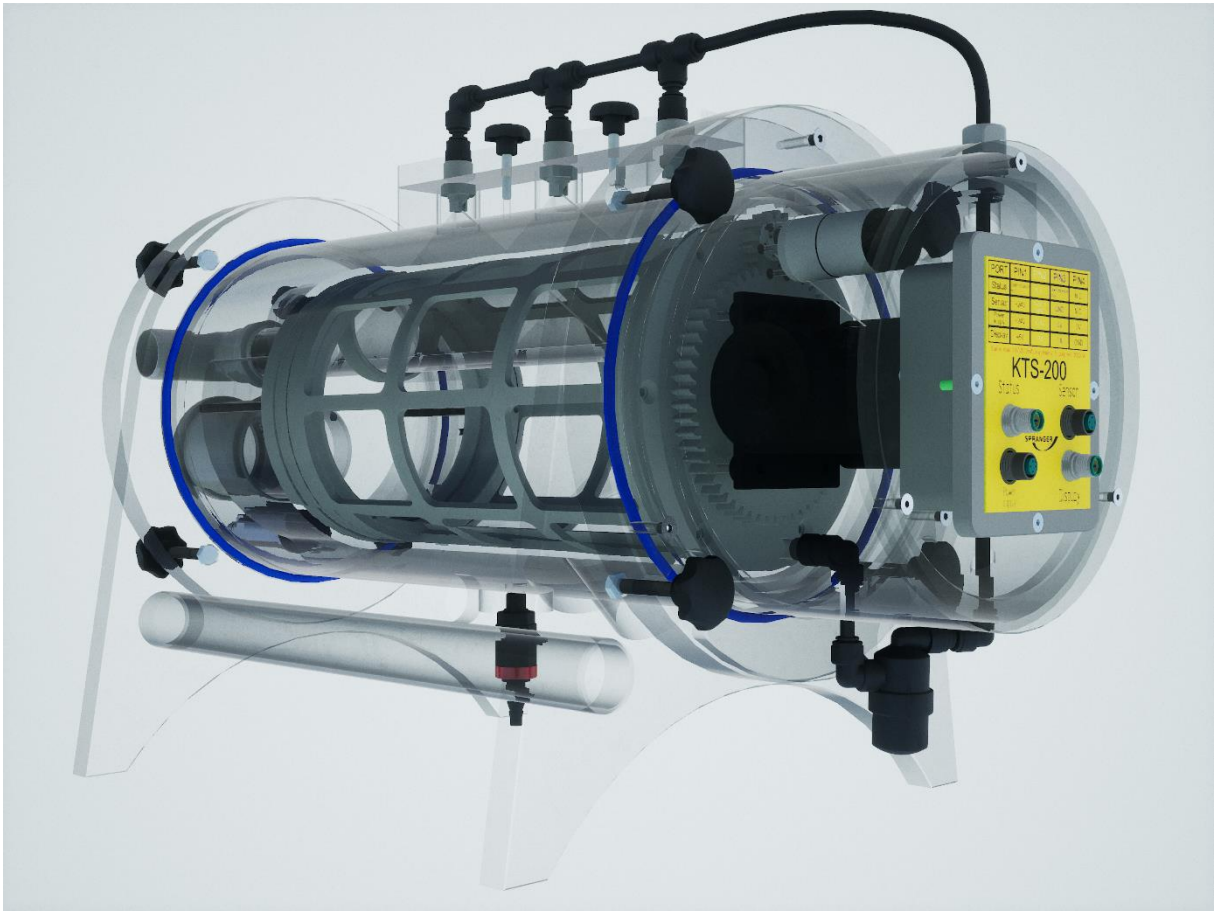
Manual Drum Filter

TinyDrum®

Series S / M / L / XL



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1 General Instructions

The operating instructions must be followed exactly.

Performance limits stated by the manufacturer regarding flow rate and degree of contamination must be strictly adhered to.

Higher loads may result in a reduced maximum flow rate.

The unit is designed for semi-automatic operation. The functions are monitored and controlled by means of various sensors. In the event of a malfunction, a fault signal is emitted, and operation is interrupted.

The electrical connection of the screen drum is made by the customer. This connection must be protected by a residual current circuit breaker.

A non-slip stand must be provided in and around the area of the screen drum.

No liability is assumed for accidents and malfunctions caused by improper handling, treatment or use other than intended.

2 Setup

2.1 Setup of Drum Filter based on TinyDrum® Model M3

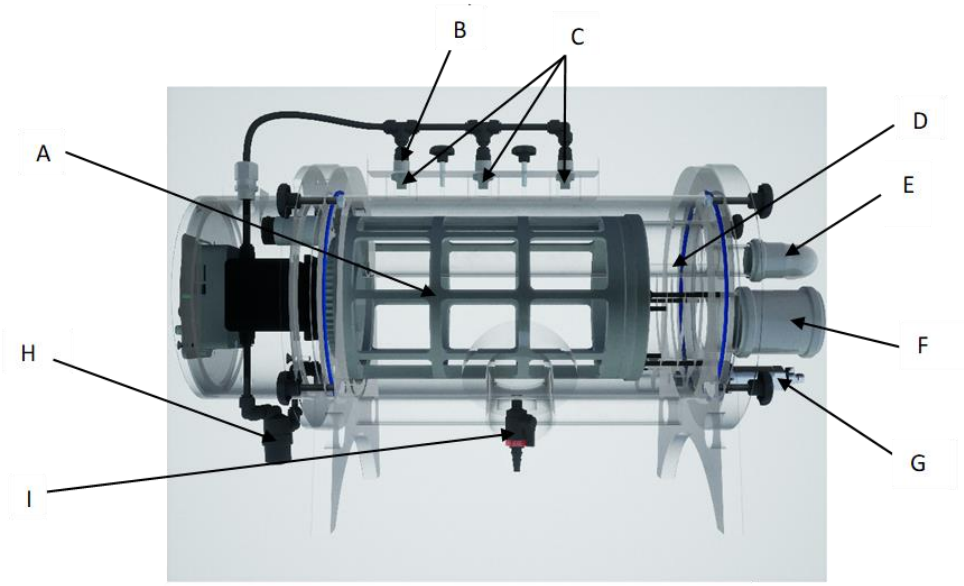


Figure: 1 Drum Filter side elevation (model M3)

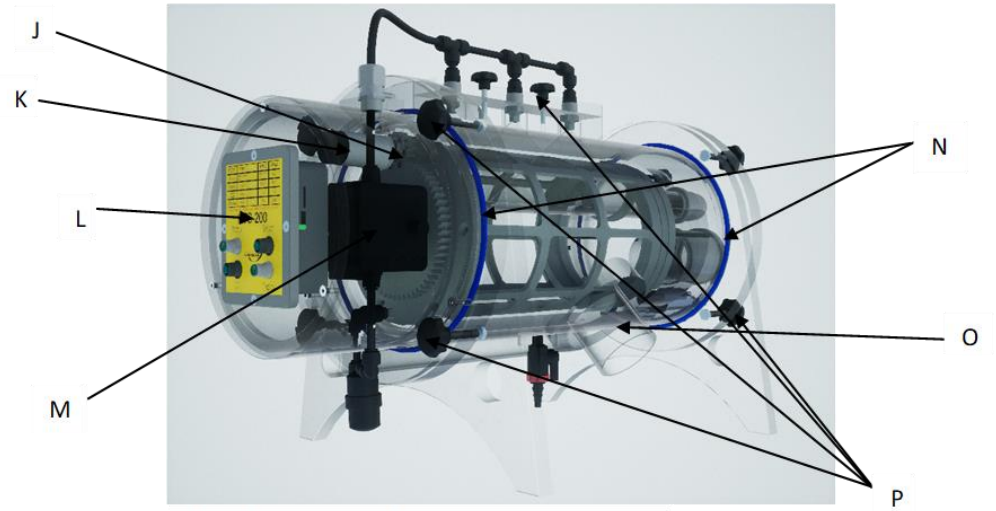


Figure: 2 Drum filter iso elevation

A	Drum filter with strainer drum	I	Residue discharge
B	Cleaning attachment	J	Pinion and gear wheel
C	Spray nozzle system	K	Gear motor
D	Wastewater trough	L	Control element
E	Wastewater pipe	M	Membrane pump
F	Inlet pipe for pool water	N	Seals
G	Pressure sensor	O	Outflow pipe
H	Pre-filter	P	Screw connections

2.2 Programmable Controller/Connections

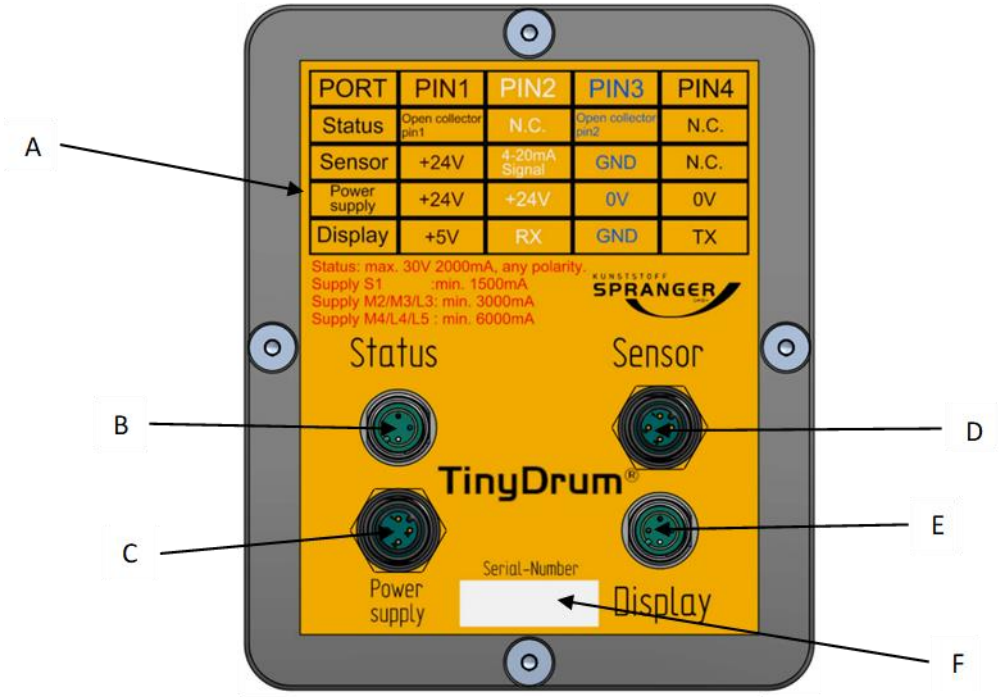


Figure: 3 Programmable Controller front elevation

A	Technical data	D	Pressure sensor connection
B	External forwarding connection	E	Multifunctional display connection
C	Power connection	F	Serial number

2.3 Multifunctional display

Figure: 4 Start screen

A	Series designation	D	Total running time
B	Software version	E	Motor running time
C	Serial number	F	Pump running time

The start screen is only visible for a short time after starting the system and shows the runtimes in addition to the type designation, software version and serial number.

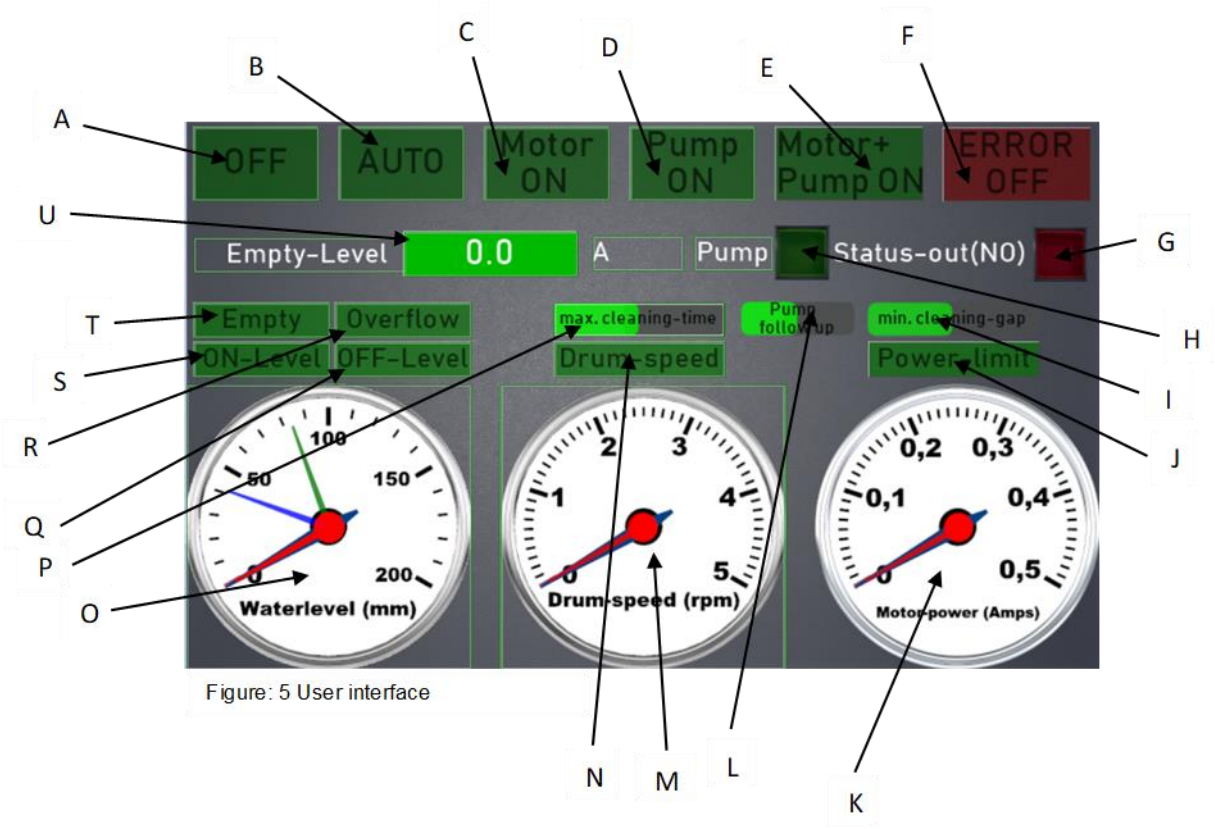


Figure: 5 User interface

A	Switch off	L	Membrane pump run-time setting
B	Automatic mode	M	Drum rotation display
C	Manual operation, motor only	N	Setting drum rotation speed
D	Manual operation, pump only	O	Water level display
E	Manual operation of motor and pump	P	Setting of maximum length of cleaning process
F	General error message and auto switch-off	Q	Setting water level to end cleaning process
G	Collective fault (for external forwarding)	R	Setting water level overflow warning
H	Pump status	S	Setting water level to start cleaning process
I	Setting minimum intervals between cleaning processes	T	Setting water level minimum warning
J	Setting motor current limit	U	Performance data display
K	Current draw display		

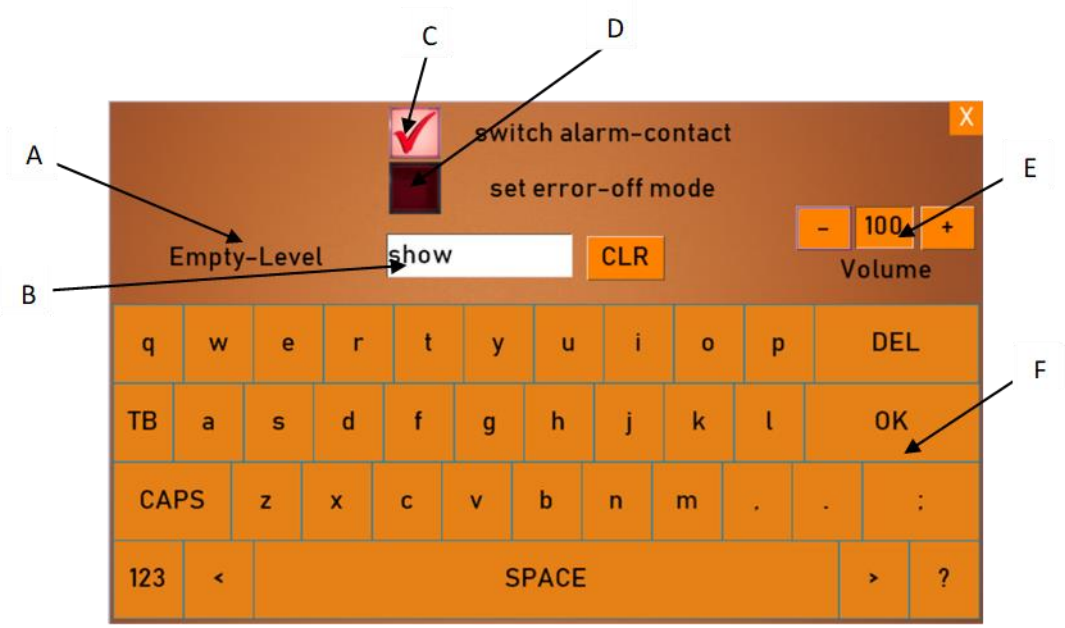


Figure: 6 Editing interface

A	Currently selected editing parameter	D	Activation of system shutdown (after error)
B	Value of the parameter to be edited	E	Volume control alarm tone
C	Activation of collective fault (for external forwarding)	F	Keyboard for entry

Control is via a multi-function display, which is connected to the control element via a cable and can thus be mounted anywhere.

2.4 Pressure sensor

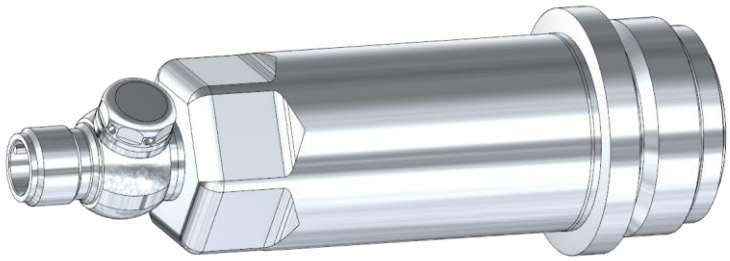


Abb. 7 Pressure sensor

When delivered by Spranger-Kunststoffe GmbH, a pressure sensor from IFM electronic GmbH is installed. For further information see data sheet.

2.5 Cleaning system

Abb. 8 Membrane pump, pre-filter and nozzle

The cleaning system used consists of a high-performance pressure pump which ensures the cleaning of the screen drum via a spray nozzle system (adapted to the respective model version) with exchangeable PVDF spray nozzles. The spray nozzles are screwed into a special holder and connected to the membrane pump with pressure hoses via plug-in connectors. The water sucked out of the drum filter chamber is cleaned via a pre-filter with stainless steel sieve insert.

3 Function

3.1 Intended Use

The TinyDrum drum filters of the S, M, L and XL series are used for pressureless mechanical separation of suspended matter from water. The drum filter is not suitable for other liquids unless expressly approved by Kunststoff-Spranger GmbH.

3.2 Mode of operation

The system is a direct flow system.

The water to be cleaned flows through the inlet pipe directly into the strainer drum. The water flows through the gauze covering and is thus cleaned. The cleaned water then flows back into the receiver via the outlet pipe or, if necessary, is sent for further cleaning (UV, Ozone or biological).

The drum filter is controlled by means of a programmable controller and a pressure sensor. The main task of the programmable controller is to control the cleaning processes and the different settings of the drum filter characteristics (minimum level, lower level, upper level, maximum level, rotation speed, length of the cleaning process if the shut-off level is not reached, pump follow-up time, minimum interval between the repetitions of the cleaning processes), as well as the output of error messages and alarms. An alarm delay of 10 seconds is preset.

The pressure sensor registers the filling levels in the drum filter chamber with millimetre precision. If, due to soiling of the gauze covering, the water level in the filter chamber rises above the previously set switching value for cleaning, the cleaning process is initiated.

The cleaning process consists of simultaneous drum rotation by means of a gear motor and backwashing by means of a high-pressure pump.

The high-pressure pump draws cleaned water from the filter chamber via a pre-filter and feeds it to the spray nozzles.

The dirt adhering to the fabric is thus loosened from the fabric and flushed into the wastewater trough. The rinsing water is discharged via the wastewater pipe.

The cleaning process continues until the filling level in the filter chamber has fallen below the previously set switching point for "End cleaning process".

Caution: A possible pressure drop at the spray nozzles can be caused by contamination of the pre-filter. In this case, it must be cleaned immediately!

Furthermore, there may be a defect in the pressure line or the pump.

The particle size of the separable substances is limited by the selection of the sieve tension.

4 Installation

4.1 Installation

- The drum filter must not be installed in places where there is a risk of explosion.
- The drum filter must not be installed outdoors unless this has been expressly approved by Kunststoff-Spranger GmbH.
- The drum filter must be aligned horizontally at the installation site and set up with its entire surface.
- The floor in the area of the Strainer insert should be such that there is no danger of slipping.
- If outdoor installation is unavoidable and approval has been obtained from Kunststoff-Spranger GmbH, the filter must be protected from direct sunlight. Direct sunlight can cause distortion of the components due to thermal expansion and thus lead to accidents.
- If there is a risk of frost, the drum filter must be taken out of operation and protected against frost by suitable measures.

4.2 Strainer drum

The screen drum is freely supported and is driven by a gear motor via a pinion which operates a gear wheel.

4.3 Electric Connections

When reinstalling the drum filter, connect the control element to a suitable power source. The sensor and the display must be connected with their respective cables. It is possible to set up an output of the warning and fault signals to external systems via a cable.

Caution: Connect the respective Cable with their counterpart (cables are labeled)!

4.4 Piping

The inlet and outlet pipes are to be connected to the respective piping on site.
The diameters of the inlet and outlet pipes are listed in *Appendix A Dimension Sheet*. It is recommended that the flow velocity in the inlet pipe does not exceed 1 m/s in order to avoid turbulence in the drum.
The wastewater pipe should be installed with a slope.

Caution: The piping should only be carried out by experienced specialist personnel.

4.5 Cleaning device

The cleaning device must be checked before the drum filter is put into operation.

This includes checking the pre-filter in the intake pipe and checking the spray nozzles. If they are dirty, clean them by rinsing with clean water.

Caution: The nozzles must be set with the longitudinal opening slightly inclined to the drum.

By Slightly inclining the nozzles to the drum an overlapping spraying area of the nozzles is prohibited. Overlapping areas would lead to reduced cleaning, because the impact of the water on the drum surface would be less efficient due to turbulences.

5 Commissioning and Operation

5.1 Checklist before Commissioning

- See Appendix B

5.2 Control Unit

The standard scope of delivery of Kunststoff-Spranger GmbH includes a programmable controller (see Figure 3), that takes over the control and regulation processes and the multifunctional display (see Figure 5), this issues error messages and allows operation. Two modes can be selected on the multifunctional display:

- Manual mode (divided into “OFF” / “Motor ON” / “Pump ON” / “Motor+Pump ON”).
- Automatic mode

5.2.1 Manual Mode

In manual mode, the drive, the membrane pump of the cleaning device or the combination of both can be switched on manually; automatic mode is cancelled. Depending on the setting, the drum rotates continuously and/or cleaning is continuous. This operating mode is mainly used for maintenance and control work and is not suitable as a normal operating mode.

5.2.2 Automatic Mode

In automatic mode, the start and end of the drum rotation and the pump are controlled by the pressure sensor. When the level in the drum filter chamber reaches the switch-on level, the cleaning process starts and ends when the switch-off level is reached due to the water level dropping. For setting the sensor, see section 5.6 Setting the sensor for automatic operation.

5.3 Drive

The strainer drum is driven by a motor that moves a gear wheel through a pinion, that is operating an actuator on the drum. The rotation speed can be changed within a preset range via the multifunction display. To do this, simply open the "Drum-Speed" editing area on the multifunction display and adjust the drum's rotation speed in the control panel within the preset limits.

Note: Changes to the drum rotation speed will affect the filter performance and may only be carried out by designated personnel.

5.4 Cleaning Device

5.4.1 Membrane pump

The high-pressure pumps of M.R.S. (see *Appendix E Overview of electrical components*) are optimised for the nozzle count of each cleaning device.

5.4.2 Nozzles

The standard spray nozzles or nozzle mouthpieces are made of PVDF and have an equivalent bore diameter of 0.9 mm. For some applications it may be necessary to use spray nozzles with other orifices or made of other materials. For further information, please contact your Kunststoff-Spranger GmbH representative.

5.5 Water Levels

In automatic mode, the water levels in the drum vary. The lowest water level is reached after a cleaning process and rises until the switch-on level is reached and the cleaning process starts again. If the levels are below or above this, either no more water arrives in the drum filter or too much or the strainer drum is dirty and must be cleaned.

5.6 Setting the sensor for automatic operation

All drum filters of the TinyDrum series are tested by Kunststoff-Spranger GmbH before delivery and equipped with a switch-on cleaning and switch-off cleaning level (with clear water) adapted to the mesh size of the gauze. New level settings only must be made if the gauze size changes or if the water is consistently heavily polluted. If the permeability is lower, there is a permanently increased water level in drum filter chamber, which can lead to the switch-off level being constantly exceeded. This leads to an error message as well as the shutdown of the cleaning process due to the repeating error message. Changes are made via the multifunction display.

- Change from automatic mode to manual mode ("*Motor&Pump*") (lights up green) via the user interface (see Figure 6).
- Reading the minimum value via the water level indicator of the user interface while cleaning is in progress and the water level is not dropping any more.
- Open the processing interface by selecting the "Off-Level" button on the user interface of the multifunctional display.
- The processing interface that opens (see Figure 7) should show "Off-Level" as the selected processing parameter and the old level value should be displayed in the parameter window.
- Enter the previously read minimum value plus 5-10mm in the parameter window and confirm. The additional increase of the new value by 5-10mm is due to a continuous contamination that cannot be cleaned with the cleaning system (see maintenance of cleaning device, chapter 7) and would lead to a very fast triggering of the error (alarm) for not reaching the "Off-Level" if not observed.
- To change other parameters, simply select the desired processing surface via the respective button.

Attention: The "Off-Level" should never be below the "Empty"-level and the "On-Level" should never exceed the "Overflow"-level.

6 Maintenance Instructions

6.1 Maintenance Schedule

See Appendix C – Maintenance Schedule

6.2 Cleaning Device

The main reasons for a malfunction of the purification device are blockages of the pipe or the built-in parts. The clogging can be caused by biological growth (in the case of highly polluted water) or by particles sucked in from the filter chamber.

Caution: After all cleaning work, make sure that the pump is vented before putting it into operation. To do this, it is best to run the membrane pump in manual mode with the drum filter flowing through and the hose on the cleaning adapter disconnected until there is no more air in the system.

Cleaning the pre-filter

- Switch off the drum filter
- Stop water inflow into the drum filter
- Open the residual drain
- Unscrew the pre-filter
- Take out the strainer insert clean it with compressed air or under clear water
- Reassemble in reverse order
- Screw the prefilter back on tightly
- Put the drum filter back into automatic mode

Cleaning the spray nozzles

- Switch off the drum filter
- Remove the connection hose to the pump on the cleaning attachment (plug-in connector)
- Loosen the cleaning attachment via the screw connections and remove it.
- Unscrew spray nozzles
- Clean the spray nozzles with compressed air or under clean water with a plastic brush

  Caution: do not use a metal brush!

- Reassemble in reverse order
- Put the drum filter back into automatic operation

Cleaning the hose line

Cleaning the hose line is only necessary if the two measures described above have not been successful.

The line for sucking in and passing on the cleaning water from the drum screen chamber is completely fitted with plug-in connectors and can be completely dismantled, after the drum filter has been switched off and emptied of its residue, and cleaned either with compressed air or a water jet. When reassembling, make sure that all plug-in connectors are properly reconnected, otherwise air will be sucked in and the cleaning effect will be greatly reduced, or the necessary cleaning pressure cannot be built up at all.

6.3 Control system

The control system including the sensor is maintenance-free for the operator. Only the sensor itself should be cleaned with a soft cloth as required, as deposits on the sensor membrane can lead to incorrect values.

6.4 Drive System

The drive system does not need to be lubricated. The maintenance schedule calls for the pinion and gear to be checked every 12 months. The geared motor must be maintained according to the M.R.S. operating instructions.

6.5 Strainer drum

The strainer drum in the drum filter must be subjected to additional manual cleaning if the cleaning process is initiated more frequently, with the same load of water.

Long-term soiling of the mesh can be caused by iron, calcium or organic substances in the water, as well as bacterial growth.

Hydrochloric acid, sodium hydroxide, citric acid or peracetic acid can be used for cleaning, as the strainer drum from Kunststoff-Spranger GmbH work with polyester fabric.

Attention: No matter what kind of soiling is to be dissolved; appropriate safety precautions must always be taken when using chemicals.

Follow the safety instructions of the chemical manufacturer.

- Switch off the drum filter
- Stop water inflow into the drum filter
- Open the residual drain
- Remove the wiring (not necessary but safer to avoid damage to the cables and plugs)
- Loosen the 4 screw connections on the control element side and remove the housing
- Remove the strainer drum
- Apply the respective solution to the gauze cover with a soft brush or immerse it in a solution bath and let it soak in.
- Rinse with clear water
- Reassemble in reverse order
- When inserting the control unit housing, make sure that actuator is well connected again. Turn it slightly in both directions until the strainer drum rotates with it.
- Put the drum filter back into automatic operation

6.6 Replacing the strainer drum

The covering on the strainer drum is a wearing part and must be replaced if damaged. Kunststoff-Spranger GmbH offers the service of re-covering. However, it is advisable to have spare strainer drums in stock in order to be able to continue using the drum filter until it is repaired. Strainer drums can be purchased from Kunststoff-Spranger GmbH.

The replacement of a sieve insert is carried out as described under *6.5 Strainer drum* (cleaning).

Caution: No pointed or sharp-edged tools may be used for the procedures described above. In addition, handle the cover carefully to prevent damage.

6.7 Wastewater trough

According to the maintenance plan, the wastewater trough or the wastewater pipe must be checked for dirt or blockages at certain intervals and cleaned if necessary.

As the drum filters of the TinyDrum series are transparent, the wastewater trough can be checked from the outside for dirt or blockages. If this is the case, the wastewater trough must be cleaned.

- Switch off the drum filter
- Stop water inflow into the drum filter
- Open the residual drain
- Remove the wiring (not necessary but safer to avoid damage to the cables and plugs)
- Loosen the 4 screw connections on the control element side and remove the housing
- Remove the strainer insert
- Remove the pipework for the wastewater pipes
- Loosen the screw connection of the wastewater channel (single screw centrally above the wastewater pipe) and remove the wastewater channel to the control element side.
- Clean the wastewater channel with a soft brush.
- Reassemble in reverse order
- When inserting the control unit housing, make sure that actuator is well connected again. Turn it slightly in both directions until the strainer drum rotates with it.
- Put the drum filter back into automatic operation.

7 Troubleshooting

7.1 Faults

Faults are indicated on the multifunctional display by the problem-related button changing colour from green to yellow. If the malfunction lasts longer, the button changes from yellow to red. An error message is only displayed, and the drum screen only switches off if the necessary authorisations are set. In Figure 7, Processing interface, "*C*"- "switch alarm contact" (as shown in the picture) must be activated with a tick so that an error message is output (this item must also be activated for external collective fault forwarding). If the drum filter is to be switched off in the event of a malfunction, "*D*"- "*set error-off mode*" must also be activated (not activated in the picture). An alarm delay of 10 seconds is stored in the system.

7.2 Troubleshooting

In the event of a malfunction, always check that the motor and pump are not defective. To do this, switch to manual mode and test the motor and pump separately. If a lack of functionality is detected, the motor and/or pump may be defective and must be replaced.

7.2.1 „Overflow“

Not enough water arrives in the drum filter chamber (volume flow too low).

Reason	Action
Drum filter is not integrated in the system	Open bypass and close main line or open main valve when not in bypass
No water coming out of the basin overflow	Check circulation pump for function Clean basin drains Clean supply pipes
Sensor dirty or defective	Clean or replace

7.2.2 „Overflow“

Water runs unfiltered into the filter chamber via the overflow.

Reason	Action
Volume flow too high	Throttle circulation pump
Strainer drum dirty	Clean (see 6.5 Strainer drum)
Cleaning device dirty	Clean (see 6.2 Cleaning device)
Sensor dirty or defective	Clean or replace

7.2.3 „max. cleaning-time“

Water level in the sieve drum permanently too high, cleaning time exceeded

Reason	Action
Volume flow too high	Throttle circulation pump output or readjust level (see 5.6 "Adjusting the sensor for automatic operation")
Rotation speed too low	Increase "*drum speed*" over the processing surface
Duration of the rinsing process too	Increase "*max. cleaning-time*" over the working surface
Strainer drum dirty	Clean (see 6.5 Strainer drum)
Cleaning device dirty	Clean (see 6.2 Cleaning Device)
Sensor dirty or defective	Clean or replace

7.2.4 „min. cleaning-gap“

Water level in the sieve drum is too high, the time interval between the rinsing processes is too short.

Reason	Action
Volume flow too high	Reduce circulation pump output or readjust level (see 5.6 "Adjusting the sensor for automatic operation")
Periods between the rinsing processes are too short	Increase the "min. cleaning-gap" over the processing surface

7.2.5 „Drum-speed“ and *„Power-limit“*

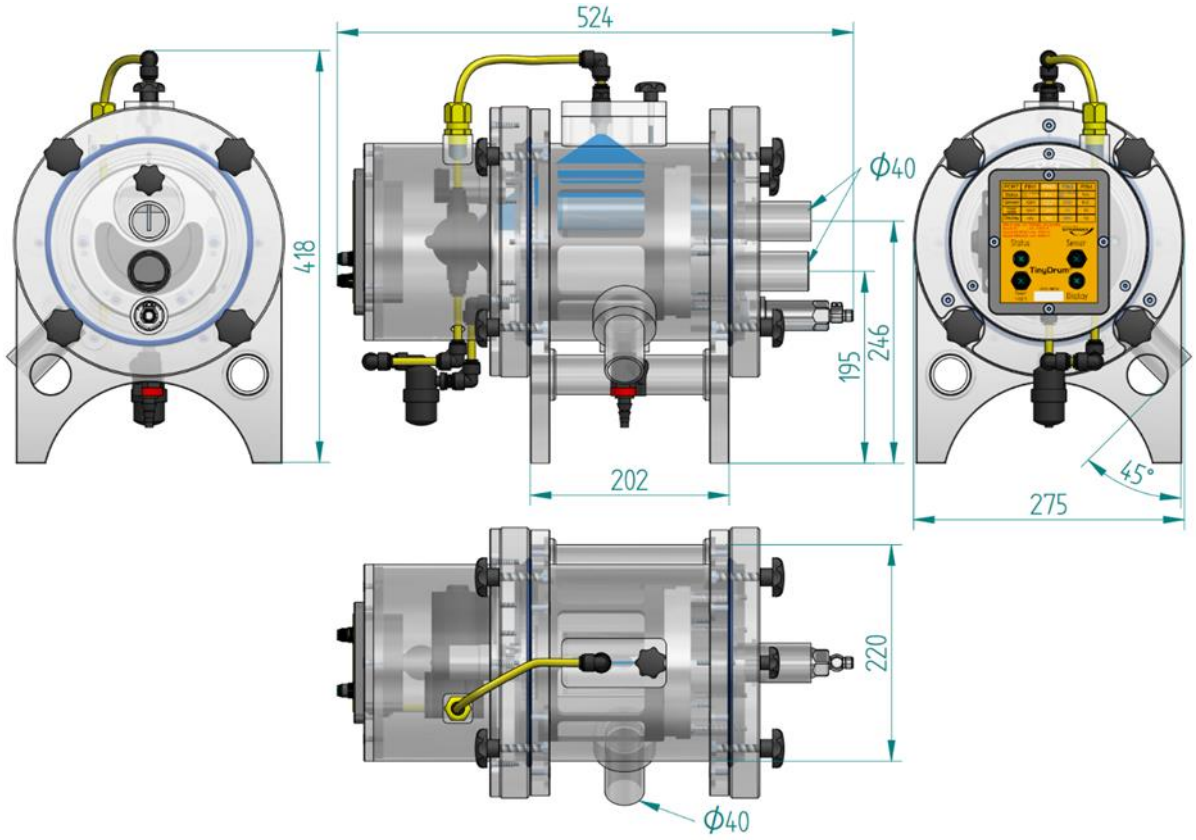
No rotation of the sieve drum while cleaning is in progress

Reason	Action
Bearing block	Check running bearing of screen drum and clean if necessary
Gear motor defective	Replace gear motor

Appendix A – Dimension Sheets

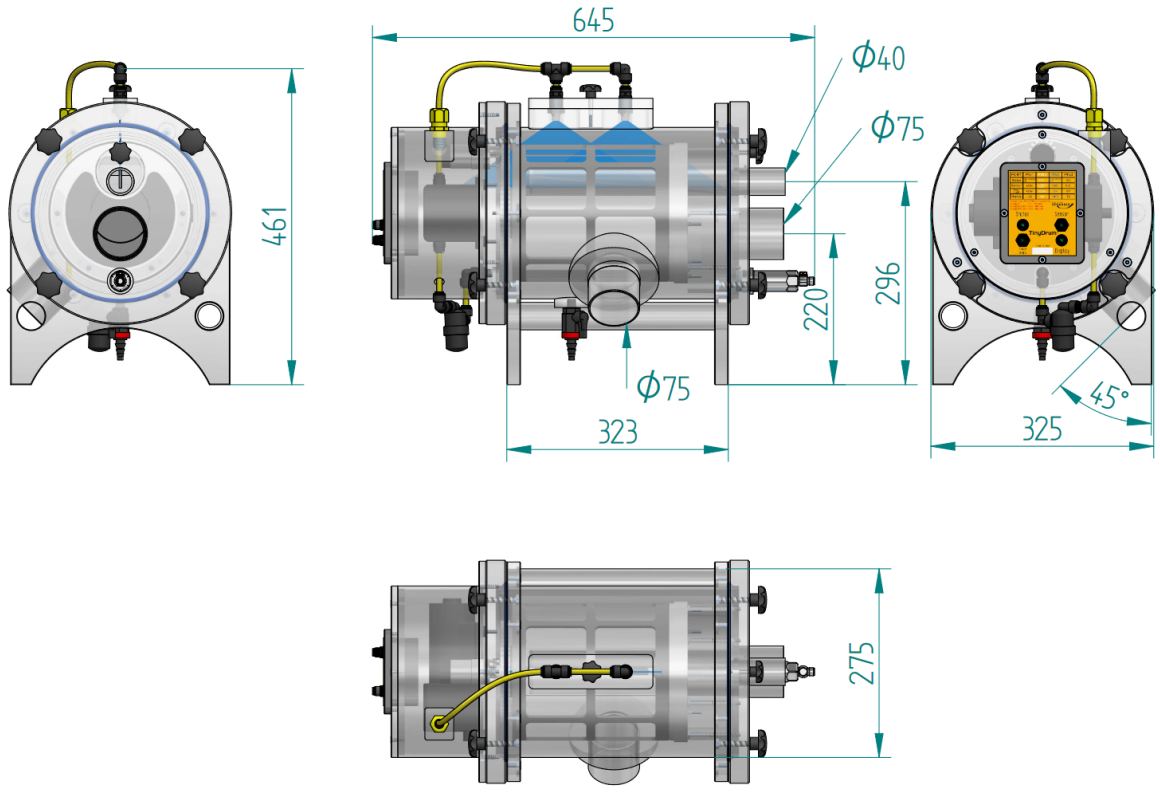
S- series

S1

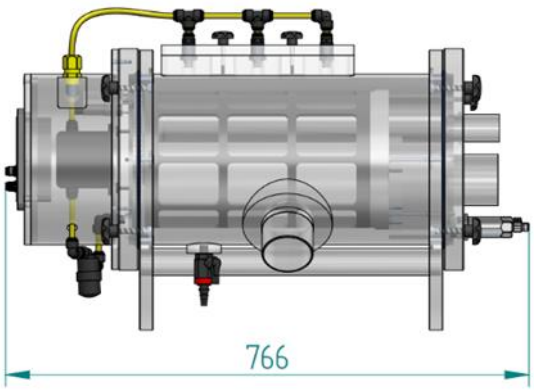


M- series

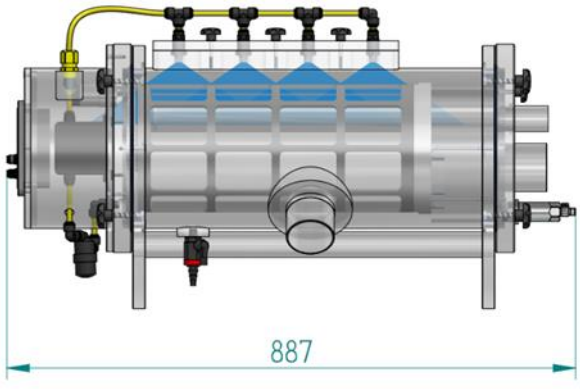
M2



M3

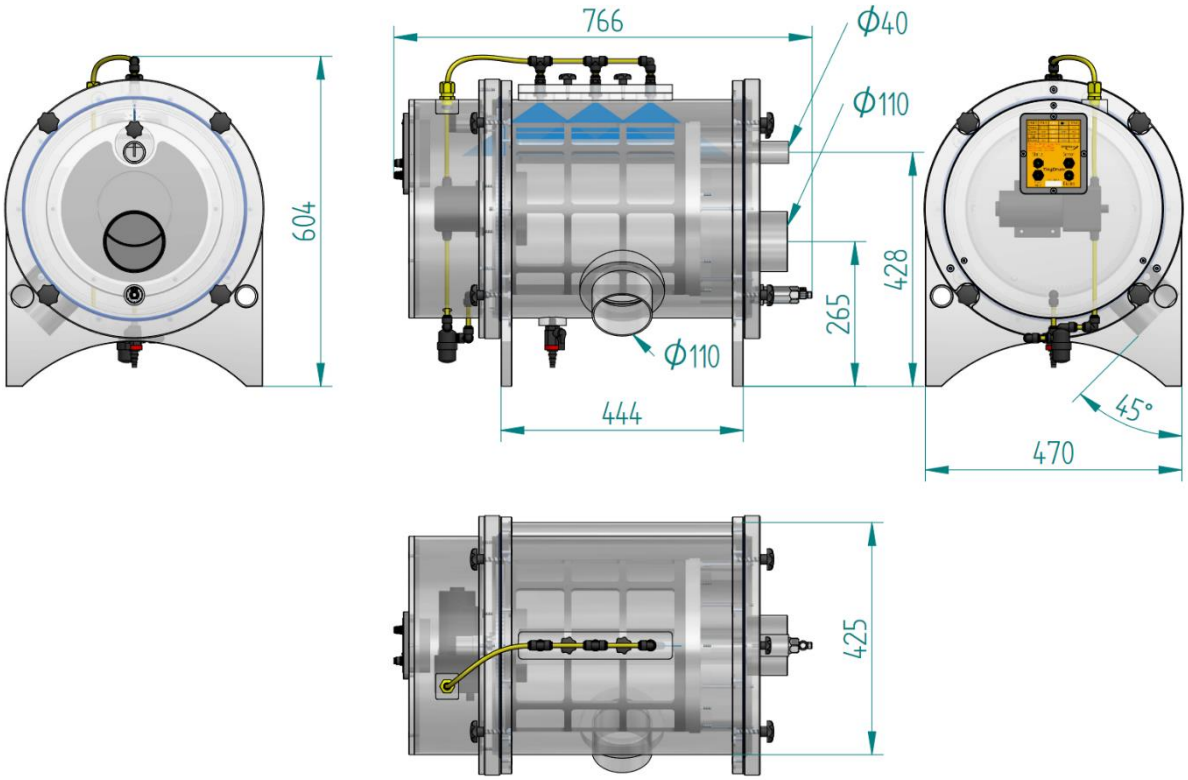


M4

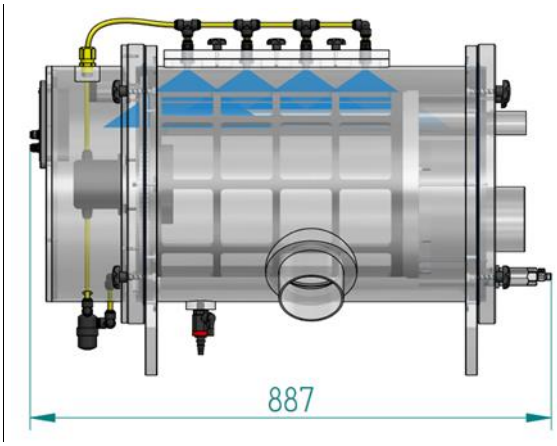


L- series

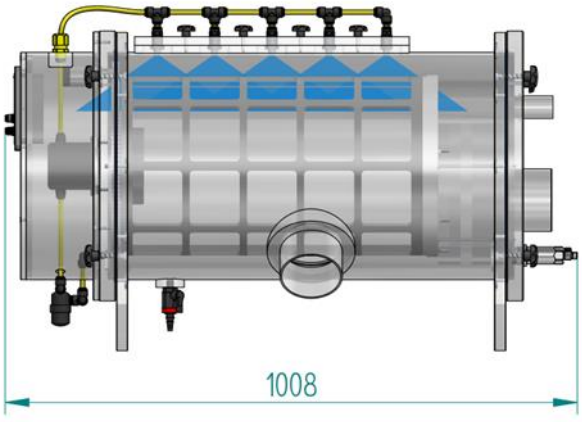
L3



L4

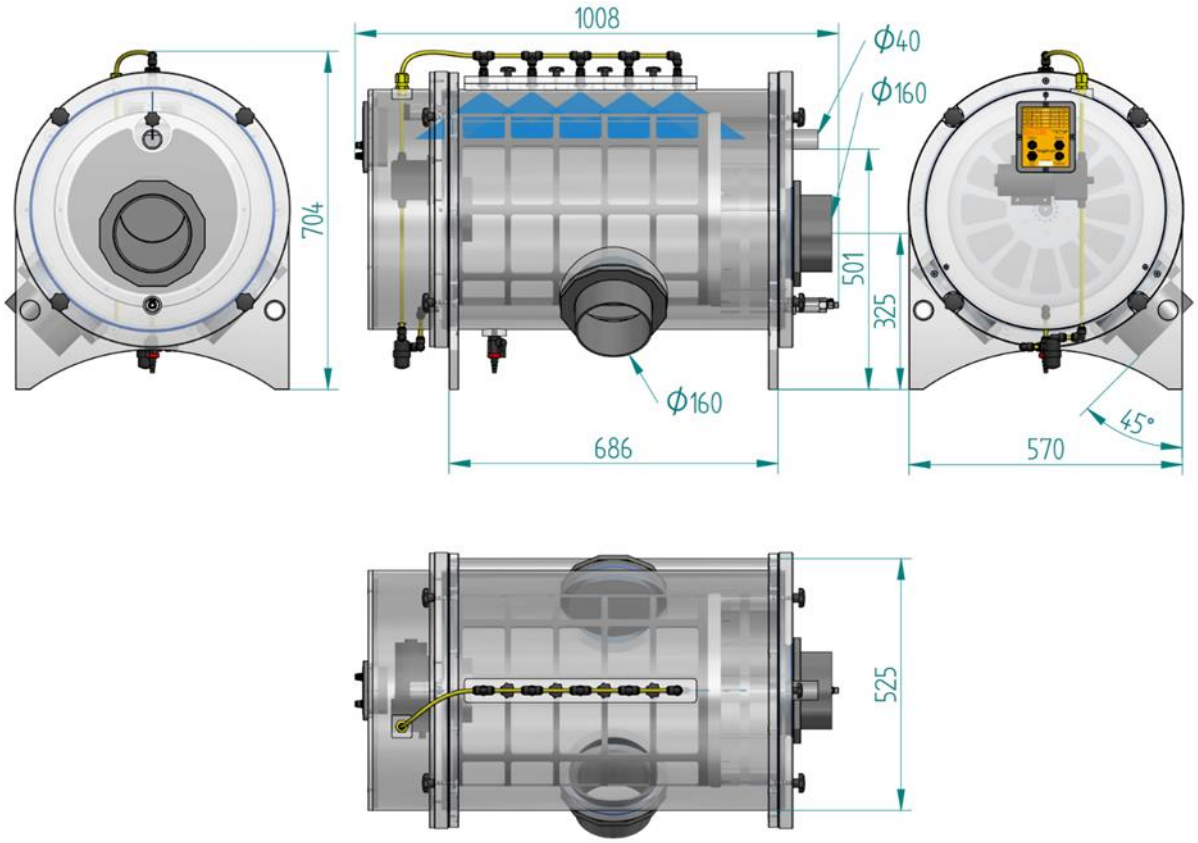


L5



XL- series

XL5



Appendix B – Checklist for Commissioning

- Are all electrical components wired and fused according to specifications?
- Is the electrical connection protected by a residual current device?
- Is the screen drum screen standing fully on a non-slip surface and is it level?
- Are the nozzle slots correctly aligned to the drum axis?
- Do the pump and the gearbox rotate as specified?
- Is the pre-filter clean?
- Are all screw connections and pipe connections tightened and tight?
- Is the membrane pump completely vented?
- Is the drum filtere connected to the circuit?
- Is the residual drain closed?

Appendix C – Maintenance Schedule

A maintenance book must be kept in which all maintenance work carried out is documented and confirmed with a signature.

Component	***Intervall***				
	Non-recurring	***Weekly***	***Every 14 days***	***Annually***	***If necessary***
Check or retighten screw connections	***X*** ***2 days after commissioning***			***x***	***x***
Check cleaning system for water leakage		***x***			***x***
Check wastewater trough for blockage and clean if necessary			***x***		***x***
Check spray nozzles for dirt and clean if necessary			***x***		***x***
Check drum filter for dirt and solid deposits or sediments		***x***			***x***
Check strainer drum for soiling and clean manually if necessary		***x***			***x***
Complete inspection by the manufacturer				***x***	

This annual inspection by Kunststoff Spranger GmbH includes:

- Checking and, if necessary, replacement of defective or worn parts
- Inspection of all safety devices
- Inspection of all control and regulating devices

Appendix D – Replacement Parts

- Connection cable for control options
- Sealing rings
- Nozzles for cleaning device
- Pressure sensor
- Pressure hoses and connectors for cleaning device
- Gauze cover for strainer drum
- Gear motor
- Plain bearing
- Membrane pump
- Multifunctional display
- Pinion
- Wastewater trough
- Strainer drum
- Control element
- Pre-filter
- Pre-filter stainless steel sieve insert
- Gear wheel

Appendix E – Overview of electrical components

- **Gear motor from Pololu**
  - Type 37D Metal Gearmotors (see data sheet)
- **Pressure sensor from IFM electronic**
  - Type PM-,10BREA01-E-ZVG/US electronical pressure sensor PM1789 (see data sheet)
- **Membrane pump from Micro Rain Systems (M.R.S.)**
  - Type M.R.S. Whisper PowerPump 24V – 8,.3bar (see data sheet) for Tiny Drum S-series (1 nozzle)
  - Type M.R.S. Whisper PowerPump Professional (see data sheet) for Tiny Drum M- and L-series (2 and 3 nozzles)
  - Type M.R.S. Whisper PowerPump Professional XL 360 LPH (see data sheet) for Tiny Drum M-, L- und XL-series (4 and 5 nozzles)
- **Control Unit from Kunststoff-Spranger GmbH**
  - Type KS CU 21A
- **Multifunctional Display from Itead**
  - Type Nextion Intelligent Series NX8048P070-011C-Y (see data sheet)