

GRANUDOS-45/100 Top MC

**Dosing System for Calciumhypochlorit, Acid and
Flocculent complete with Auto-control System *TopControl*
MC
for Commercial Pools**



Part 1: - Manual for Dosing equipment GRANUDOS
- Mounting, taking into service
- Fault analysis, Maintenance

(Part 2:) Manual for the Auto-controller *TopControl MC*

Series No.....Customer.....Date of delivery.....

Safety Devices

1. Chlorine and acid may not be mixed together or with other chemicals

Pay attention to the safety devices on chemical Containers

2. Close hopper immediately after filling
3. If an adapter to a chemical container is used the hopper must be screwed even and firmly to the container
4. Ensure machine is kept clean. If chemical is spilled, clean up immediately.
5. Only instructed personnel may work with the GRANUDOS
6. Ensure booster pump does not run dry, always isolate pump when backwashing.

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1. Function description of the dosing system GRANUDOS 45/100 TOP

1.1 The features

- Measuring of free chlorine , pH-value, redox tension, temperature.
- Big red value displays.
- 4-lines-display for service guide, operated by 1 selection turn key.
- Control and monitoring of all operational functions.
- Proportional dosing control.
- Dosing control of dry chlorine by measuring free chlorine or redox (ORP).
- Dosing of chlorine granulate directly from chemical drum by a dosing screw.
- Acid dosing by a peristaltic pump included.
- Dosing of flocculent by rpm controlled peristaltic pump. Control of the Floc dosing by programming of the circulation flow rates.
- Filter backwash disinfection.
- Programmable shock chlorination.
- Night program with reduced set points for free chlorine and flocculant
- Filling a buffer tank with chlorine solution to disinfect other small pools by additional dosing pumps (optional).
- Non-volt fault report.
- Interface RS485 for printer protocol, remote indication.

1.2 Technical data GRANUDOS 45/100 Top

The GRANUDOS 45/100-TOP MC system comprises::

- Main vertical support with rotating drum carrier.
- Autocontrol system *TopControl MC*.
- Dosing assembly for calcium hypochlorite granules.
- Acid dosing equipment.
- Dissolving system.

Measures / weight:

Floor space app. 60x70 cm

Height app. 150 cm

Weight app. 50 kg

Material:

Main vertical support and drum carrier:

Steel, powder coated .

Other parts: PVC, PE.

Sealings: viton.

Dosing performances:

Chlorine: 2000 g/h (GR 100: 4 kg/h).

Acid: 2,5 l/h (GR 100: 2,5 l/h).

Flocculent: 0,5 l/h. (up to 3 l/h)

Booster pump:

Centrifugal pump 230 VAC / 0,33 kW

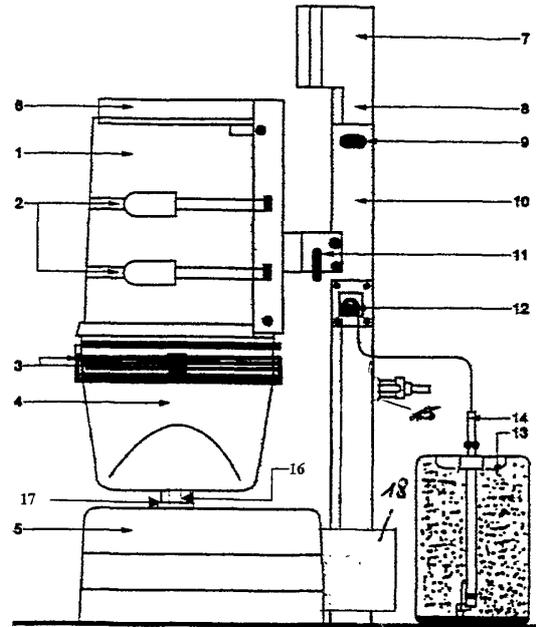
Supply pressure: min.0,2 bar

Counter pressure: 0 – 1,2 bar, depending on the supply pressure

Water flow: app. 800 l/h

Power supply:

Power socket 230 VAC +/- 6%, IP 65



Legende

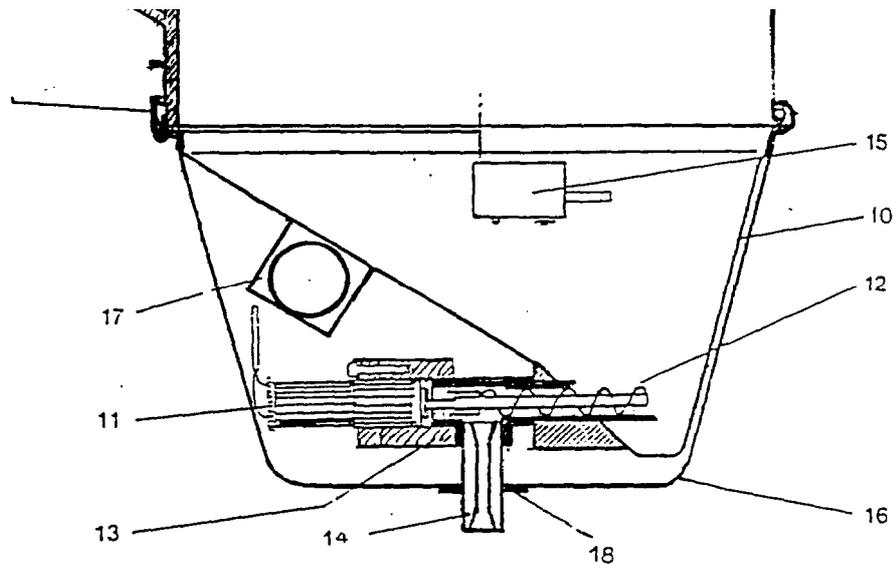
1 Faß	7 Steuerung	13 Säurekanister
2 Spannbänder	8 Klemmgehäuse	14 Sauggarnitur
3 Schraubring	9 Typenschild	15 Kugelhahn Zulauf m. Filter
4 Dosiertrichter	10 Standsäule	16 beheiztes Ausfallrohr
5 Löseeinrichtung	11 Arretierhebel	17 Staubschutz
6 Faßaufnahme	12 Säurepumpe	18 Pumpen-Schutzhaube

1.3 Vertical support with rotating drum carrier and autocontrol system

The rotating drum carrier assembly (6) is fixed to the main vertical support (10). The chlorine drum (1) is fixed on the carrier assembly (6) by 2 band clamps (2) and a retaining belt. The dosing hopper (3) is fixed on the drum instead of the drum lid. The carrier with the drum is then turned through 180° to the dosing position. The drum carrier is locked by the locker of the drum carrier (11). The peristaltic pump for the acid dosing (12) and the water supply filter with ball valve (inline strainer) (15) for the booster pump are mounted at the vertical support too.

The autocontrol system *TopControl MC* is mounted on the top of the vertical support. The measuring water is conveyed from the booster pump to the top and flows back to the bottom back into the water cycle.

1.4 Chlorine Dosing Assembly



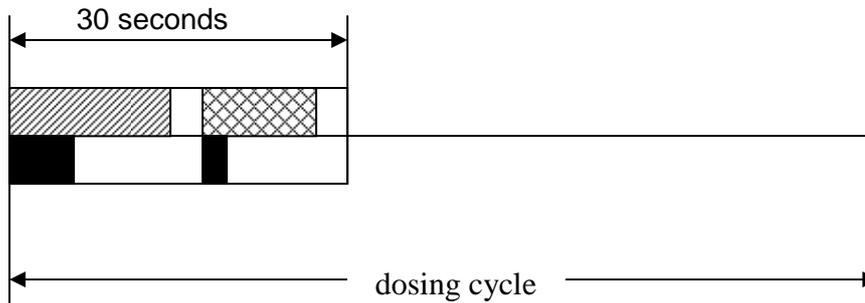
10	dosing hopper	16	hopper cover
11	dosing motor	17	knocker
12	dosing screw	18	seal washer
13	motor holder	19	dosing hopper screw ring
14	dosing nozzle heated		
15	drum empty switch with adjusting screw and LED		

The chlorine dosing assembly consists of the dosing hopper (10), the dosing motor (11), the dosing screw (12), the motor holder with the guidance for the screw (13), the heated dosing nozzle PTFE (14), a capacitive drum empty switch with adjusting screw and LED (15) and the hopper cover (16). The dosing hopper is screwed onto the drum instead of the drum lid.

The dosing screw (12) meters the chlorine through the heated dosing nozzle (14) to the dissolving system. A sticking of the granules to the dosing nozzle is prevented due to the PTFE material the nozzle is made of. Furthermore the nozzle is heated to prevent that the granules stick to the nozzle. The knocker (17) knocks at the dosing hopper at every dosing to prevent a bridging of the granules.

The demanded dosing performance – adjusted to the according pool – is adjusted at the auto-controller **TopControl MC**. The capacitive drum empty switch with adjusting screw and LED (15) detects if chlorine is left even through the walling of the dosing hopper (reserve app. 1 kg).

The dosing is principally as to the following scheme:



Adjustable from 30 seconds to 10 minutes

max. dosing time chlorine
 max dosing time acid
 actual dosing time

Maximum dosing time chlorine:	15 seconds
Maximum dosing time acid:	7,5 seconds
Pause time chlorine – acid:	4 seconds
Pause time acid – chlorine:	3,5 seconds

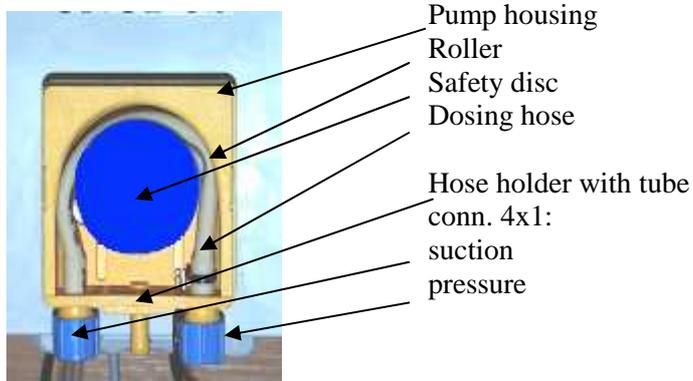
The dosing happens always within the first 30 seconds of a dosing cycle. The dosing cycle can be set in a range between 30 seconds and 10 minutes. Basically there is a pause time of minimum 4 seconds between the dosing of chlorine and acid (at max. dosing performance). A simultaneous dosing of chlorine and acid is prevented safely. Besides the dosing cycle the necessary dosing performance for the according pool size has to be set. Therefore the maximum dosing performance is preset in the menu according to the cycle (e.g. at 60 seconds only 50% of the total performance of the unit, e.g. at 240 seconds only 25%). If the given maximum dosing performance is chosen as the demanded dosing performance, the maximum dosing time of 15 seconds in the “Auto” programme is also available for the effective doing time (calculated from the deviation of the actual value and the set value). The acid dosing works accordingly.

1.5 Acid dosing

The acid required either for pH-control and for cleaning of the flushing, mixing and dosing system is metered by the peristaltic pump to the flushing water via the dosing injector. As the cleaning procedure is vital for the correct function of the complete dosing assembly, chlorine dosing is stopped if the level switch on the supply carboy lance indicates container empty.

As acid use one on base of sulphuric acid (37 – 50 %), please do not use concentrated hydrochloric acid for this job as that penetrates the peristaltic hose and will destroy the pump head. Diluted hydrochloric acid may be not strong enough for the neutralisation job. Please note that using dry acid (sodium bisulphate) 20% (= maximum concentration) is equivalent to a only 10% sulphuric acid.

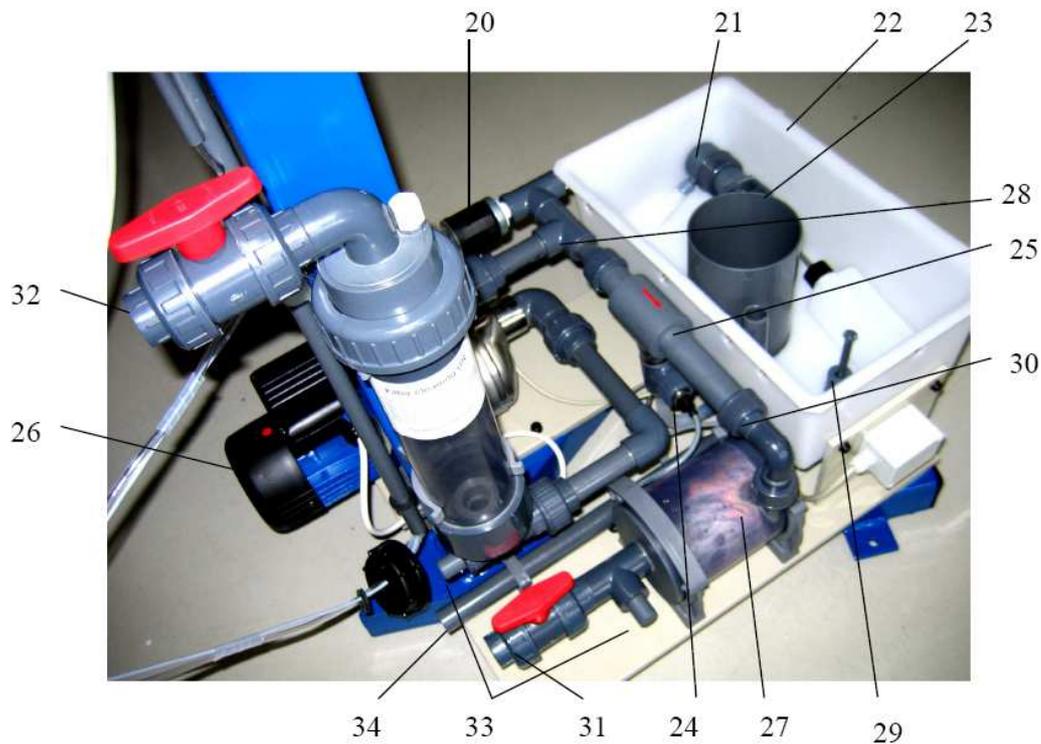
Maximum dosing performance is app. 3 l/h and is set as for chlorine. The dosing cycle set for chlorine is valid for acid too.



Attention

Do not twist the dosing hose!

1.6 Dissolving system



20	pressure switch	28	allocation rinsing water
21	floating valve	29	level control switch
22	flushing tank	30	union bush with washer nozzle
23	flushing tube	31	outlet ball valve d25
24	flow monitoring	32	supply connection d25 with filter
25	venturi nozzle	33	fitting to connect pressure gauge
26	circulation pump	34	overflow tube
27	cyclone mixing/dissolving chamber		

The dissolving water is normally supplied from before or from behind the filter. **There must be a sufficient supply pressure to avoid dry running and/or cavitation on the booster pump, at least 0.2 bar.** The pump pressure is controlled by the pressure switch (20) fitted on top of the pump. At a pressure below the set switch pressure by sucking air or at pressure drops the machine stops, lamp 1 & 2 will burn. At works 1,5 bar is set.

The supply water is divided in the allocation rinsing water (28) at the discharge of the booster pump (26), one way leading to the flushing tank (22), the other branch directed to the venturi nozzle (25), where the water is sucked together with the dosed chemicals out of the flushing tank. The supply water flow is controlled by means of a floating valve (21) and a flow switch (24), the latter being installed in the suction tube of the venturi. To mix the chemicals and to ensure the complete dissolving of the chlorine granules a cyclone mixing chamber (27) is fitted after the venturi.. To ensure that chlorine and acid do not come into contact with each other in the open tank part of the dissolving assembly a sophisticated control system is installed:

- metering of the two chemicals is regulated with pauses between the metering intervals (para 3.7 “Adjusting dosing performance”).
- power supply for chlorine and acid dosing motors are connected by a relay system so that only one or none of them can get power (24VDC) and dose chemical.
- flow switch (24) , level switch (29), pressure switch (20) supervising water supply and flow conditions. If any non-compliance with the given limits occurs, the GRANUDOS will be switched off.

1.7 Flocculent dosing

For the dosing of the flocculent the same type of peristaltic pump is used as for acid but is rpm-controlled ensuring a continuous chemical flow is achieved, which is important for best performance of the flocculent.

The dosing performance is set in the menu by setting the circulation rate of the filter system in m³/h and the specific dosing rate of the chemical in ml/m³ of circulation. The dosing of flocculent works independent of the function of measuring/dosing of chlorine/acid.

2. The measuring system

2.1 The measuring water armature

The measuring water armature consists of:

- Measuring water connection with ball valve DN 6 (1)
- Fine filter 300 μ (3)
- Flow control (5)
- Measuring cell (11)

Measuring cell made of Plexiglas consists of 3 parts:

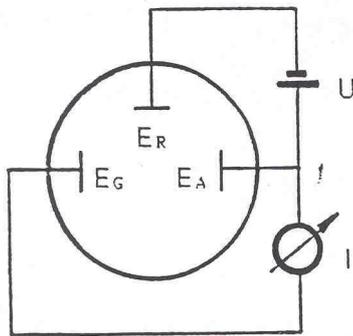
- Flow control cell with temperature sensor
- Measuring cell for free chlorine
- Measuring cell for pH-value and redox (ORP)



The measuring water flow is monitored by a reed switch. The flow bobbin (10a) is pushed upwards in the flow control cell to the temperature sensor fitted into the top of the flow control cell. The reed sensor is fitted simple pushed behind the temperature sensor in the flow cell. At low flow – the switch bobbin goes down in the bore, “meas. water low” is indicated at the display and dosing is stopped. When the Granudos is stopped to avoid uncontrolled water flow through the open measuring cell a spring loaded stop valve is fitted into the inlet union of the measuring cell holding app. 0,7 bar supply pressure. A spring loaded pressure relief valve is installed for the control (adjustment) of the measuring water flow. At a switch-off of the unit the valve prevents an emptying of the measuring water until a supply pressure of 1 bar.

2.2 Measuring system for free chlorine

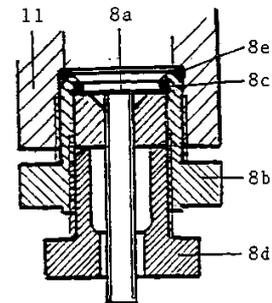
The measuring method for free chlorine works according to the potentiostatic principle: Therefore the working electrode E_A (Nr. 8, gold) is loaded via a reference electrode E_R by a certain potential at which the chlorine chemical reaction on the gold surface is optimised, so the influence of the reaction of other chemicals on the gold is minimised. The measuring current flows between the working electrode and the counter electrode E_G (both made of gold). The measuring current is to a large extent proportional to the concentration of the hypochlorous acid. Disturbing influences by external chemicals are prevented to a large extent. By using 3 separate electrodes for the system a high measuring stability is achieved.



E_R	Reference electrode
E_A	Working electrode
E_G	Counter electrode
I	Measuring current
U	Potential on Reference electrode



The working electrode E_A (8) consists of large-area gold round blank (8a), inserted in the electrode holder (8b). This assembly is screwed from the bottom into the measuring cell. Blue glass beads moved by the measuring water are cleaning the surface of the gold electrode. The reference system (12) made of an Ag/AgCl electrode with the ring-shaped counter electrode made of gold is screwed into the measuring cell from above. This electrode is marked by a yellow ring.



2.3 Ph-value

The pH electrode (13) is screwed into the right combi measuring cell for pH and ORP from above. High-class glass electrodes are used to ensure a safe and long-term reliable measurement if the pH.

2.4 Redox voltage/ ORP

The redox voltage is the relevant value to judge the hygienic state of the pool water. It is indicating the relation between the **red-**uctiv forces (organic chemicals) and the **ox-**idising forces (free chlorine) in the water. The relevant potential is built up on the surface of the platinum electrode and is measured against the reference electrode of the pH-electrode as a voltage (mV). The higher the redox voltage is, the quicker any micro organisms are killed. The platinum surface of the electrode is cleaned by glass beads as the gold electrode.

As the redox voltage is very dependent on the free chlorine and the pH-value it can be used very well to monitor these measurements.



2.5 Temperature

For temperature measuring a digital sensor is used and it also acts as a distance holder for the flow sensor as well. The temperature is only indicated, not controlled.

2.6 Test and cleaning chemicals

The test and cleaning chemicals for the electrodes are found on the left side of the GRANUDOS housing:

- buffer solution pH 4,0 50 ml
- buffer solution pH 7,0 50 ml
- buffer solution Ag/AgCl - Pt 475 mV 50 ml
- cleaning liquid (diluted hydrochloric acid) 50 ml
- glass beads to clean the platinum and gold electrode

2.7 Ball valve for test water

The test water for water analysis is taken from the ball valve behind the measuring cell.

3. Installation of the GRANUDOS Top into the water circulation

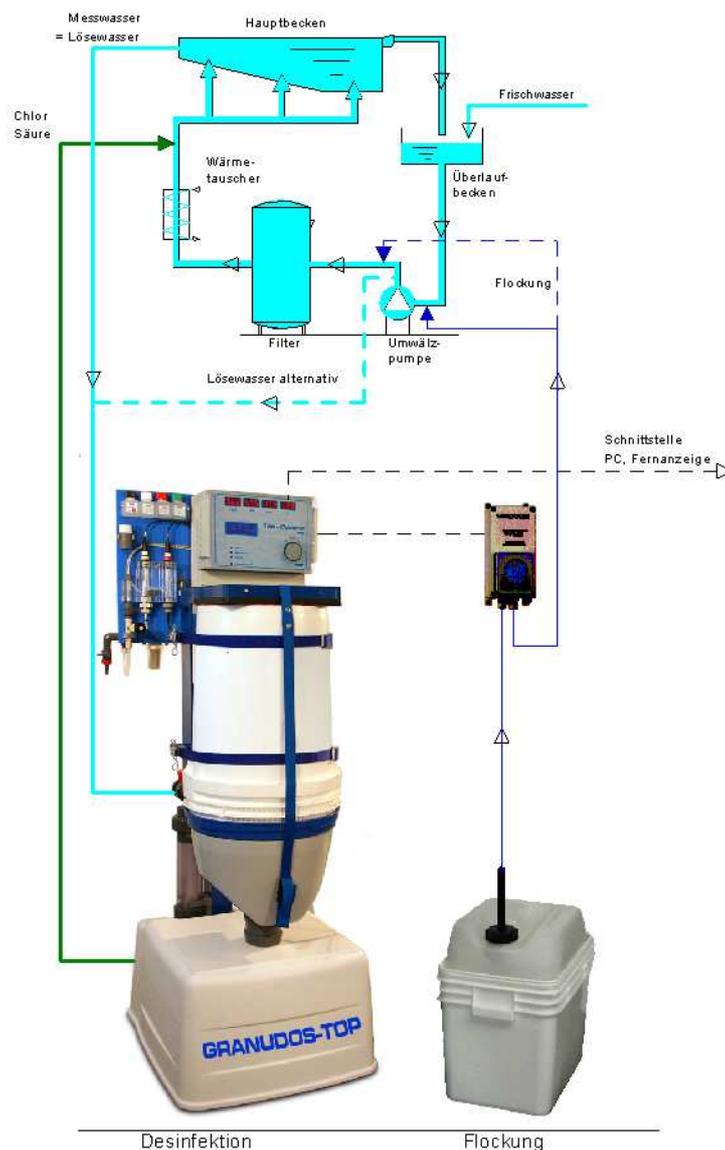
3.1 Mounting the machine

For satisfactory water flow through the dissolving system the supply pressure must be at least 0,2 bars. At low service pressure the counter pressure must be low, too. Counter pressure and pressure loss in the dosing line should be as low as possible. At works the GRANUDOS has been tested at following pressure conditions without washer nozzle:

Service pressure	1,2 bars	Counter pressure	1,2 bars
	0,6 bars		0,8 bars
	0,3 bars		0,5 bars

Within these ranges the GRANUDOS should function well.

If the GRANUDOS is not working well, measure the real pressure conditions by means of the pressure gauge supplied with at inlet and outlet of the GRANUDOS to measure the.



3.2 Measuring water extraction/ flushing and dissolving water

The right choice of the measuring water extraction is very important for the effective operation of the auto control system! The quality of the measuring water should be very identical to the quality of the pool water. Ensure that changes of the water quality can be measured / detected as fast as possible. Measuring the chlorine concentration at the different possible tapping points in the circulation (after the circulation pumps, overflow water before the balance tank) at different charge situations will show the best possibility.

At new pool constructions the measuring water should be taken anyhow directly from the pool by a bore through the wall. In this case the GRANUDOS could be supplied directly from there. As to the DIN 19643 this is stand of the art.

1. Taking the water directly from the pool: bore 1", GRANUDOS placing on short distance. The high difference should be > 2 m to the pool water level.
2. Taking the water from between circulation pump and filter:
¾" tapping, pay attention that the water is not too much falsified by time delay or fresh water in the balance tank, never take it after a chemical dosing. Check water quality first. If fresh water supply does falsify the measuring water: stop dosing in the time of fresh water supply plus 20 minutes by a time relay!
3. Taking the water from behind filter:
This water never is usable as measuring water, only as dissolving water. If the dissolving water is take from behind filter, the measuring water must be taken from a suitable point. The measuring water take off behind the booster pump must be disconnected and the opening screwed by the 3/8" plug.
4. Dosing point after heat exchanger - a non return valve must be installed in the dosing tube.
5. Ensure that the **tapping/dosing points are free flowing** and not blocked by scale or corrosion.
6. **Pipe runs to be kept as short as possible.** PVC-tubing 25 mm or hose 1". For longer distances or poor pressure conditions use bigger tubing. If hoses are used do not kink them !!
7. **Piping should not go up and down** as there could be formed "air bags" in the tubing preventing free water flow with consequently damage of the pump – especially at taking into operation.
8. Use high quality PVC ball valves ¾".
9. **If mounted above pool level** please install non return valves into the supply and dosing tube, the latter spring loaded (0,3-0,5 bar) to prevent self emptying of the flushing system
10. Überlaufstutzen einschrauben und vom Überlauf zum Gully Schlauch/Rohr verlegen.

3.3 Measuring water back flow

The measuring water flows back from the measuring cell to the flushing tank and is so brought back to the circulation

3.4 Electrical connection

The electrical supply of the GRANUDOS has to be controlled by the electrical supply of the circulation pumps that dosing can only take place with water circulation and accordingly water supply to GRANUDOS. The GRANUDOS has to be stopped at back washing, too! See wiring diagram.
To connect external systems to the GRANUDOS please use only flexible cable type as attached

<p>Electrical works are only to be executed by authorised people. Earth proved, FI-protection switch installed? Are the potential free outputs really non volt?</p>

3.5 Flocculant

If the GRANUDOS Top is supplied with the flocculant pump fit the injection valve ½” to the tapping point as far as possible before the filter directly before or behind the circulation pump. Do not kink the tubing. If this happens, use a new one!

4. Taking the unit into operation

After piping is finished, open the ball valves at the tapping points and at GRANUDOS. Press floater of floating valve inside the tank down to let water flow into the flushing tank. When the flushing tank is half full switch on the GRANUDOS mains, the booster pump of GRANUDOS should not run dry.

4.1 Setting the operation and dosing parameters

Take the attached list of settings and work through all settings as indicated. We recommend to write down all settings in this list for further discussions if needed.

To ensure correct dosing of the chemicals water flow through the flushing tank and measuring cell must run in the correct way as described below, otherwise you get faults indication and no function..

Please note, that this start procedure must be executed at every new start after a longer stop of operation to prevent interruptions and pump failures

4.2 Daeration of the water supply tubing

When switching on the GRANUDOS take care to deaerate the supply water tubing completely. For this please observe the water level inside the pre-filter. If it get's empty switch off the pump/machine and wait till the filter is full again, then switch on again. On operation the filter must be and stay full of water; a little air at top staying steadily does not matter. The deaeration procedure can take some minutes depending on the length of the supply tubing.

4.3 Adjusting the measuring water flow

The flow is adjusted so that the switch bobbin in the flow monitoring is pushed up and the glass beads are rotating effectively in the chlorine cell as in the pH/redox cell. If measuring water flow is too low and the switch bobbin falls down, “**meas. water low**” is indicated at the display and dosing is switched off.

4.4 Water level in the flushing tank

Water level in the tank should be maintained at half full. To obtain a higher level unscrew float rod, for a lower level screw in the float rod. One turn gives about 1 cm in height.

4.5 Pressure switch of the booster pump

The installed pressure switch has a switch point at 1,5 bar to protect the pump against cavitation. If no supply pressure or air is in the supply tubing, the pump will be switched off.

4.6 Water flow/suction performance of the venture

At stable water level the switch bobbin of the flow switch inside the suction tube (10) should definitely have risen up to the top, the control lamp of the switch may **not** burn.

To adjust the water flow to the pressure conditions of the filter system a nozzle is inserted in the union (13c) behind the venturi. If water level in the tank tends to run low or if switch bobbin is at top without

pump running (too high suction at the venturi – high pressure difference between tapping points) fit the nozzle with the 5,5 mm diameter hole you find in the spare parts kit. If the water level tends to run high and/or suction is too low – switch bobbin does not rise (too high counter pressure?) put in the 7 mm nozzle or use without nozzle.

Pay attention to pressure conditions at back wash!!

4.7 Loading the Drum onto the Machine (25-50 kg plastic drum - ret. sketch p. 3)

Before carrying out any task involving chemicals the operator should put on the relevant protective clothing, at least for protection of eyes, breathing, skin and clothing i.e. goggles, respirator, gloves and apron. As the chemical can be compressed within the conical drum by vibration on transport and this could make problems at dosing, please roll the drum on the floor before loading.

Before loading the drum ensure that the dissolving system cover is fitted

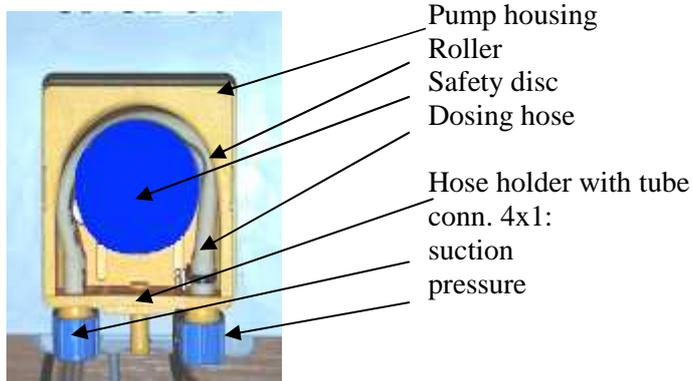
1. Fitting of dosing hopper onto the drum:
 - a) Position the drum on the floor, adjacent to the machine within comfortable reach of the hopper cable i.e. do not strain the cable. The two handles of the drum are sideward from your position.
 - b) Screw off the drum lid. Remove any plastic scoop from inside the drum.
 - c) Position the dosing hopper on the open drum so that the cable is coming on right side after screwing the hopper onto the drum. Ensure that the hopper screw ring fits well to the drum.
2. Ensure that the drum carrier is in the upright position and ready to receive the drum i.e. that it is locked in this position (locking device 7).
2. Load the drum, carefully, onto the drum carrier so that the cable is on the right. This may be lifted manually, but ensure no injury to the back by lifting properly.
3. Ensure that the drum is standing upright and symmetrically on the drum carrier, touching the rear rails being with the drum edge below the retaining rod.
3. Fix the drum securely in position using the drum band clamps. Adjust the clasp tension by adjusting the nuts on the screwed end of the band clamps. Lock the clamp clasps with the securing clips provided so that they cannot open by itself.
4. Pull the hopper retaining belt from the rear to the front over the hopper cover and push the belt clasps with the front belt together.
5. When you are absolutely certain that the drum is firmly fixed in position and that the hopper is firmly clamped to the drum THEN AND ONLY THEN - unlock the drum carrier swivel lock (7) and slowly rotate the drum and carrier left side through 180°. Care should be taken not to stretch or entangle the cable joining the hopper to the control box.
6. Lock the drum carrier in this position via the swivel lock (7).
7. The wind protection tube down in the flushing tank cover is now to be positioned so that the heating nozzle is app. 1 cm inside the tube.
8. The GRANUDOS is now in the dosing position.



4.8 Acid and flocculant dosing pumps

The acid dosing pump mounted right side at the main frame is delivered with loose dosing hose to prevent deformation on stock time. Push the hose holder into the blue housing and turn the roller clockwise some times so that the hose is situated even back in the housing. Then push the safety disc on the shaft and the pump cover –both in the small bag attached at the pump. Position the acid container beside the GRANUDOS, open it and put the acid lance into it. Set the “Test acid” programme. If no fault indicates, the dosing pump must run and acid must now be sucked up through the transparent suction tube to the pump and further to the injection valve down at the bottom of the flushing tank.

As acid use one on base of sulphuric acid (37 – 50 %). Do not use concentrated hydrochloric acid as this damages the peristaltic pump. Please note that using dry acid (sodium bisulfate) 20% (= maximum concentration) is equivalent to a 10% sulphuric acid.



attention

the hose may not
be twisted

4.9 Setting the service parameters -- see part 2 of the manual

If you want to use other settings as fixed at works it is strongly recommended to write them down in the parameters list last page of part 2 of the manual.

4.10 Test run / functions check

Test programmes see para 3.13 and 3.14 pages 25 and 26. for inputs and outputs.

After the test run do not forget to fit the cover on the flushing tank!

5. Calibration of the measuring systems

For calibration a code no. must not be used. Please work through the displayed advises. Here some general remarks. Even the measuring systems are working very stable, the characteristics of sensors are changing with time. By daily checks the measuring quality is monitored.

Please note, that the chemical check kits monitoring measures are not exact, that there are systems faults of about +/- 0.2 at pH-Value and +/- 0,05-0.1 mg/l at free chlorine possible. So calibration should only be done after repeated and higher deviation, **especially not at low values.**

5.1 Calibration of pH-Electrode

There are 2 calibration programmes offered by the *TopControl* system:

- Quick calibration only by using the phenol red indication – calib only within +/- 0.2 pH
- Full calibration programme by the 2 buffer solutions pH 7,0 and 4,0 – **normally used**
 - o Worked through by the operators guide at the display. Please note, that the phenol red check has a systems fault of +/- 0,2. Only the full calibration will indicate the true pH-value – provided that the buffer solutions are ok.
 - o

5.2 Calibration of free chlorine

There are 2 calibration programmes offered by the *TopControl* system:

- Quick calibration by using the DPD 1 indication – **normally used**
- calibration zero point

Please note following guide lines. Calibration only if the DPD-check daily before the begin of pools opening:
:

- At several days there is a deviation in the same direction
- More than 0,1 - 0,15 mg/l shows with several checks
- Not too low values shown, at least 0,3 mg/l

Calibration only in the morning before opening the pool when all circulation water has the same quality.

With high bathers load and maybe poor hydraulics in the pool the values can change rapidly and calibration can lead to bad results. If calibration seems necessary please calibrate only a half of the deviation and check again next morning. Please note that the measuring fault with DPD is 0,05-0,1 mg/l . At a low free chlorine value of e.g. 0,2 mg/l the relative fault would be 25-50 % ! After coming up again with the free chlorine to 1 mg/l, the real free chlorine value could be then from 0,5 – 2 mg/l

5.3 Check of redox voltage

At normal pool operation the indicated values of free chlorine, pH and redox are in an equilibrium, they show always the same relation. With free chlorine 0,3-0,6 and a pH of 7,0-7,4 the redox indicated should be about 720-780 mV. This actual values depend on fresh water quality and efficiency of the pool water treatment, but they stay constant. As the indicated values of free chlorine and pH are controlled, they stay very constant. If redox indication changes temporarily this is an indication for changes in real values of free chlorine or pH or there is a change in the water treatment, e.g. flocculation, bad backwashing, etc. So first check the free chlorine and pH and if they are ok than check the redox as shown in the programme. If this is ok too check your water treatment.

If there are inconsistencies mostly the fault is at the pH-electrode even it can be calibrated normally. The platinum electrode normally is very stable

6. Faults and alarm identification and problems solving

All faults caught by a switch or sensor inputs as all value alarms are identified and shown at the display in the 4th line. Here is only the 1st fault shown. Following faults are shown in a listing after “click” on the cursor before the fault indication. As all switches at the GRANUDOS Top are normally open a fault is clearly indicated by the (1) at the end of the line indicating “closed”.

The faults or alarms must stay for at least 6 seconds to be recognised. If a fault/alarm vanishes itself, the Granudos starts again automatically. If a switch obviously is faulty and stops function, you can start the machine by disconnecting the faulty switch, but see for a new one as this function is now not monitored.

6.1 Faults indicated by monitoring switches

Flow meas-w

Flow switch for measuring water indicates too low flow. Flow switch bobbin is not on top. Increase flow, clean pre-filter and screens in the chlorine and pH-cell. Adjust water flow.

Empty Cl 2

Chlorine empty switch in the hopper indicates empty. Drum is empty or switch is faulty or must be adjusted. The empty indication **does not stop** the dosing motor.

Empty pH

Acid container indicates empty. Change container to a full one. Possibly switch is faulty. The empty indication **does stop** the acid dosing .

Empty flocc

Flocculant container empty. Replace container with a full one. Possibly switch is faulty

Pressure GR

Pressure of supply water to GRANUDOS is too low. Granudos stops.

When taking into operation the supply pressure is really too low. From works the switch pressure is fixed to 1.5 bar. At normal supply conditions the pump should reach this pressure. If not water supply tubing is shut, air is in the tubing, pre-filter blocked.

Suction low

Suction power of venturi is not enough: switch bobbin of flow switch in suction tube is at bottom of tube. By pressing the connecting hose from tank to the suction tube the bobbin does not move, switch LED burns.

- At installation: service pressure too low – counter pressure too high. tubing faulty or too small: take out orifice washer (13c) from union behind venturi.
- Booster pump performance too low – see pressure limits at para 3. “**Installation – piping**”.
Fit the supplied pressure gauge to inlet and outlet to check pressure situation.
- Particles inside venturi or at outlet nozzle of flushing tank (high possibility after installation)
- Suction tube and/or mixing cyclone are turbid by calcium: acid dosing too low:
If there is still a little suction this can be easily cleaned by pouring hydrochloric acid into the suction cone of the tank.
- check acid dosing,
- dismantle the injector and clean it if necessary

Reinstall the switch bobbin of the flow switch with „feet upwards“

- clean pre-filter

Level high

Water level in the flushing tank high. There is more water coming into the tank than is sucked away by the venturi. If suction performance of the venturi is O.K. switch bobbin of flow switch in suction tube is at top of tube. By pressing the connecting hose to the suction tube the bobbin goes down and switch LED burns. If loosened again, bobbin goes up quickly and switch LED goes out.

In this case there should be a fault in the floating valve: check whether by moving the floater slowly up and down the incoming water flow decreases or increases steadily. If so adjust water level by turning the floater rod one turn right. If floating valve does not work steadily, fit a new valve diaphragm.

If suction is not sufficient, see above at “**Suction low**”

Level low

water level in the flushing tank is low.

- Suction power too high: fit an orifice washer of 5,5 mm inside union behind venturi.

- Supply water tubing is blocked

Floating valve to tank is blocked, diaphragm faulty

Cl 2 missing

Chlorine missing switch is indicating at the program “buffer tank filling” no dosing chlorine. GRANUDOS switches off as obviously there is a problem at the chlorine dosing techniques.

6.2 Faults indicated by irregular readings

There are only allowed ranges for the setting of alarm levels depending on the set points. Some alarms can be deactivated by setting a “0” instead of a value in the settings windows.

At soft ware alarms principally check the water figures free and combined chlorine and pH. If the found values are not correct, first calibrate / check the electrodes .

Redox high

Indication for high free chlorine or good water quality.

If free chlorine indication at the display is high too, reduce dosing performance of chlorine and/or set higher redox alarm level.. See for better sampling water take off point. If chlorine indication is normal at set point, check free chlorine by DPD method and adjust the measuring system.

Check pH – may be too low – see para. 6.3

Redox low

Indication for low free chlorine or poor water quality

If free chlorine indication at the display is low too:

- fault on chlorine dosing technics

- check output voltage, test dosing by activating output for chlorine dosing motor

- check pH – may be too high – see para. 6.3

Chlorine high

indicated too by reading 9,99

- Chlorine dosing motor output faulty, dosing whereas set point is surpassed – use new electronic plate

- poor hydraulics in the pool can lead to uneven distribution of chlorine to the sampling water. Reduce dosing performance at increased basic dosing

The higher the set value for free chlorine is chosen, the greater the possibility for this event may be.

Chlorine low

- fault on chlorine dosing technics

- check output voltage, test dosing by activating output for

chlorine dosing motor dosing screw blocked or loose, heated dosing nozzle blocked.

- poor hydraulics in the pool, clouds without chlorine coming to measuring water take out - increase dosing performance at increased basic dosing

pH high
: acid dosing motor output or dosing pump/hose faulty.
check dosing function of acid pump by selecting test program for acid pump. If pump runs, see whether an air bubble is sucked to pump, if not examine the pump roller and pump hose. If all is OK, choose lower set point for pH

pH low acid dosing motor output faulty, dosing whereas set point is surpassed – use new electronic plate

dyn. DOS alarm Cl The ***TopControl MC*** consist of a dynamic dosing time monitoring. The readings are monitored periodically (***time monitoring***) and compared with the reading of the cycle before. If there is no change of the reading triggered by the dosing of chlorine (in the right direction → reading is higher than before) a cycle counter is decreased by one (***cycle monitoring***). If the cycle counter is zero, an alarm is performed, the chlorine dosing stops and an alarm message (***dyn. DOS alarm Cl***) is shown in the bottom line.

6.3 Faults not indicated by monitoring switches

Overflow from tank too much at switch off of GRANUDOS

- switch bobbin of flow switch blocked on top situation
- sealing of switch bobbin faulty
- diaphragm of floating valve faulty
- supply pressure of an external booster pump too high

7. Maintenance / taking out of service

It is strongly recommended that a regular maintenance programme is undertaken. Consult your installer/supplier and take up a service/maintenance agreement. This way the machine will be maintained in good operating condition. The machine should be serviced at least once a year.

7.1 GRANUDOS functions

Minimum checks include the following items:

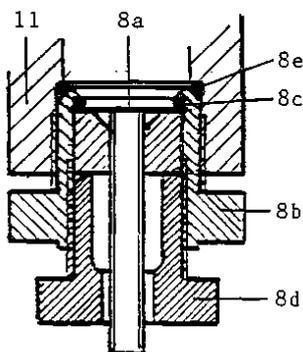
- maintain the environment of the machine clean
- clean strainer if necessary – a polluted filter causes cavitations and consequently damage of the booster pump.

For cleaning take out the complete filter and clean the filter insert outside.

- pay attention to any noise of the pump: cavitation, bearings – if so, contact your supplier
- check monthly for the acid pump whether the springs are o.k. If corrosion can be seen, change the dosing hose. In any case change it once per year.
- monthly or with each new drum/filling up check function of all sensors i.e. water flow, level and empty switches
- every 2 months clean the chlorine dosing screw: dismantle the hopper and take out dosing motor with the screw, clean with a brush – do not use water
- change diaphragm of floating valve once per year
- change seal of flow switch bobbin every ½ year
- check once per year acid dosing valve – change seals

7.2 Autocontrol system/ exchange of the electrodes/ cleaning

7.2.1 Chlorine electrodes



The chlorine sensor itself is the gold electrode (8a) with the contact tube. It is fitted into the stainless steel electrode holder $\frac{3}{4}$ " (8b) with a flat joint (8c) for cleaning or change if worn :

- Pull out the push connector down and place it to the side to prevent water entering connectors.
- Screw out the electrode holder (8b) from the cell.
- Screw out the pressure screw $\frac{1}{2}$ " (8d)
- Now take the isolated contact tube and pull it out
- clean the electrode with alcohol and electrode cleaner

**Attention! The electrode cleaning liquid is a low concentrated acid
Before fitting the gold electrode clean and dry it well
Fit a new flat gasket and fill than the cavity with cleaning glass beads.**

To change the reference electrode undo screw connector and place it to side that it does not get wet. A cleaning of the electrode is technically not necessary. In any situation do not wipe over the diaphragm to avoid scaling.

7.2.2 pH-electrode

- At any circumstance avoid moisture getting into the connection of the electrode. The electrode will not function.
- Pay attention, that there is no air in the bottom part of the inner electrode. Remove air by shaking it like a medical thermometer.

Attention! New electrodes are to be calibrated before taken into service!

7.2.3 Redox- electrode

The redox-electrode is fabricated the same as the chlorine electrode.

7.3 Taking out of service

- disconnect acid dosing hose (or use a new one at starting again)
- empty the dosing hopper, take out chlorine dosing screw, clean it thoroughly and store it at a dry place
- clean all parts of GRANUDOS thoroughly, empty all water containing parts as measuring cell, pump, filter, mixing cyclone
- leave the GRANUDOS switched **on** – use program status “**off**”
- clean the environment of the machine thoroughly.
- If there is no risk of frost keep the electrodes within the cell.

If frost is to be feared of dry all water leading tubing. Take out the glass electrodes from the measuring cell and push on the protection cap, filled with electrolyte. If this is done the electrodes are ready for service at once at new taken into service. If the electrodes are stored dry, the electrodes need app. 24 hours being in electrolyte to be ready for good service.

Let the GRANUDOS switched on being out of service to avoid condensation inside the control housing.

The maintenance jobs are listed on page 23. It is strongly recommended that a regular maintenance programme is undertaken. Consult your installer/supplier and take up a service/maintenance agreement. This way the machine will be maintained in good operating condition.

Please note! At new taking into service please look to the para „4. Start“

8. Spare parts list GR 45/100 TOP

	<u>Designation</u>	<u>Code No.</u>	
Chlorine dosing	dosing hopper (different types on request)		
	cover for dosing hopper GR 45	12866	
	dosing motor PLG 30-35 (GR 45)	11676	
	dosing motor PLG 30-60 (GR100)	11546	
	dosing screw d6/D26	11550	
	dosing nozzle heated GR	11556	
Acid dosing	knocker GR 45 complete	11558	
	acid pump Sa complete	11628	
	pump housing Sa	14140	
	roller Sa	12609	
	dosing hose 4,8x1,6 Sa	13414	
	supply carbuoy lance	12523	
	acid injection valve GR	15099	
	repair set for acid injection valve 3/8"-KFa	15764	
	Flocculant pump	dosing hose 0,8x1,6Ph-Sa	13482
		other pump parts identically to acid pump	
Filter	filter housing d75 GR	12746	
	filter top with PVC ball valve d25	12304	
	O-ring filter GR	11258	
Floating valve	floating valve d25 GR45 complete	17006	
	membrane for floating valve	16367	
	floater	11621	
	level switch GR/PAK	10496	
Booster pump	booster pump Lo 2HMS3-A	10657	
	slide ring seal complete -A	12800	
	Set of ball bearings	16243	
Flow switch assembly	flow switch holder GR 1/2" - S14 US	12729	
	flow switch GR/PAK ind. 18x1	11603	
	flow switch bobbin ind. 1/2" US	12730	
	seal ring Vi 14/8,7 flow switch bobbin	15801	
	connecting hose Si 10/2,5/180	11565	
	venturi 1/2" GR/PAK complete	11792	
	orifice washer for venturi (set)	11594	
Venturi	venturi-nozzle 1/2"	12306	
	venturi-body with connector 1/2"	12305	
	mixing cyclon GR 45-6	11612	
Control system	measuring / basic plate TopControl MC	18104	
	controller plate TopControl MC	18105	
	Power plate TopControl	15083	
	mains switch GR	11338	
Electrodes	pH-electrode	10933	
	chlorine-electrode 3/4" gold insert with seal	17957	
	reference/counter electrode TopControl MC	17179	
	redox-electrode 1/2" complete.	11984	

9. Maintenance List GRANUDOS 10/45/100 Top

Object:.....

GRANUDOS-Type:..... series no.....

Maintenance executed by date:.....

Sign of pool operator:.....

This has to be done



This was necessary too ↓

1 Dissolving system

- | | | | | | |
|------|---|----|--------------------------|-----------------------|--------------------------|
| 1.1 | check level switch: | OK | <input type="checkbox"/> | change switch | <input type="checkbox"/> |
| 1.2 | check pressure switch: | OK | <input type="checkbox"/> | change switch | <input type="checkbox"/> |
| 1.3 | check flow switch: | OK | <input type="checkbox"/> | change switch | <input type="checkbox"/> |
| 1.4 | cleaning flow switch bobbin, fit new seal | | <input type="checkbox"/> | change bobbin | <input type="checkbox"/> |
| 1.5 | change diaphragm of floating valve | | <input type="checkbox"/> | | |
| 1.6 | check function floating valve | OK | <input type="checkbox"/> | adjust water level | <input type="checkbox"/> |
| 1.7 | check connecting hose tank-flow switch holder | | <input type="checkbox"/> | change if brittle | <input type="checkbox"/> |
| 1.8 | check pump end plate (at Calpeda pump only) | | <input type="checkbox"/> | change pump end plate | <input type="checkbox"/> |
| 1.9 | check tightness of pump | OK | <input type="checkbox"/> | new slide ring seal | <input type="checkbox"/> |
| 1.10 | check ball bearings: is it noisy? | OK | <input type="checkbox"/> | new bearings | <input type="checkbox"/> |
| 1.11 | clean pre-filter, if polluted | | <input type="checkbox"/> | | |

2 Dosing chlorine

- | | | | | | |
|-----|-----------------------------------|----|--------------------------|---------------|--------------------------|
| 2.1 | check function heating nozzle: | OK | <input type="checkbox"/> | change nozzle | <input type="checkbox"/> |
| 2.2 | check function empty switch: | OK | <input type="checkbox"/> | change switch | <input type="checkbox"/> |
| 2.3 | check dosing screw, clean it dry | OK | <input type="checkbox"/> | change screw | <input type="checkbox"/> |
| 2.4 | check power dosing motor: | OK | <input type="checkbox"/> | change motor | <input type="checkbox"/> |
| 2.5 | change sealing of dosing motor | | <input type="checkbox"/> | | |
| 2.6 | check clamp bands and safety belt | | <input type="checkbox"/> | change | <input type="checkbox"/> |

3 Dosing acid

- | | | | | | |
|-----|---------------------------------|--|--------------------------|---------------------|--------------------------|
| 3.1 | check function empty switch: OK | | <input type="checkbox"/> | change empty switch | <input type="checkbox"/> |
| 3.2 | check function dosing pump OK | | <input type="checkbox"/> | change pump | <input type="checkbox"/> |
| 3.3 | change dosing hose | | <input type="checkbox"/> | change roller | <input type="checkbox"/> |
| 3.4 | change acid valve insert | | <input type="checkbox"/> | | |

4 Measuring cell – calibration of the electrodes – see manual 2

5 Additional jobs

- | | | | | | |
|-----|-----------------------------------|--|--------------------------|--|--|
| 5.1 | clean GRANUDOS carefully: | | <input type="checkbox"/> | | |
| 5.2 | clean environment of the GRANUDOS | | <input type="checkbox"/> | | |

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