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

Operating instructions GRANUDOS 45/100-S4

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. The dosing hopper must be screwed even and firmly to the container

3. Ensure after changing a drum, that it is firmly fixed in position and the securing systems are used

4. In service the dissolving system must be covered with the supplied cover

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. Technical Description
1.1 Technical Data

The GRANUDOS 45/100-S4 dosing system comprises:

- main vertical support with rotating drum carrier
- dosing assembly for calcium hypochlorite granules
- acid dosing equipment
- dissolving system
- microprocessor control panel

measures:
space needed: 60 x 150 cm
height: 140 cm
weight: 50 kg
material:
main vertical support and drum carrier:
steel, powder coated
other parts: PVC, PE

GRANUDOS booster pump(if installed)
centrifugal pump: 0,3 kW, 230 VAC,
supply pressure: >0,2 bar (20 kPa)
fresh water supply. >2 bar (200 kPa)

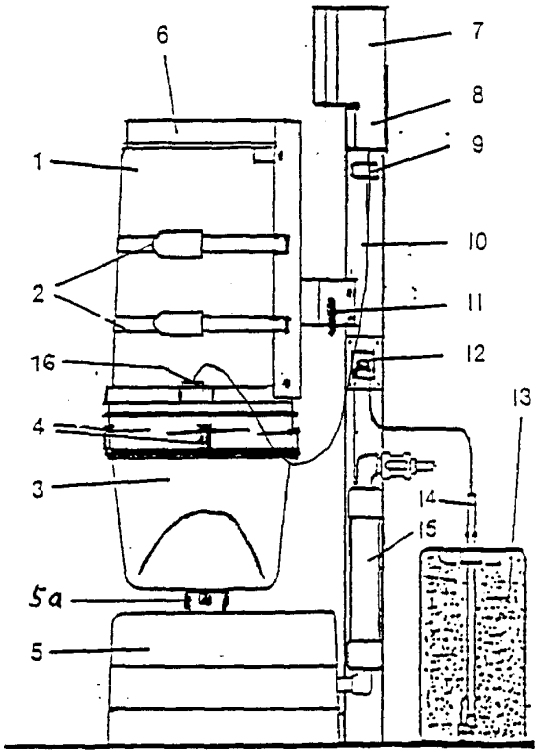
water flow: app. 1000 l/h

Dosing performance with 2 dosing motors and 2 cycle times – see para "control system":

chlorine: GR45 mot 35 rpm app. 2.4 * (0,44**) kg/h
GR100 mot 60 rpm app. 4,0 * (0,7 **) kg/h
acid: 3,0* (0,5 **) l/h

* cycle time 1 minute
** cycle time 6 minutes

Chlorine dosing performance depends on chlorine quality and is affected by too fine or too coarse or humid product. Acid dosing performance is given in litres per hour. It is recommended to use sulphuric acid 37%.

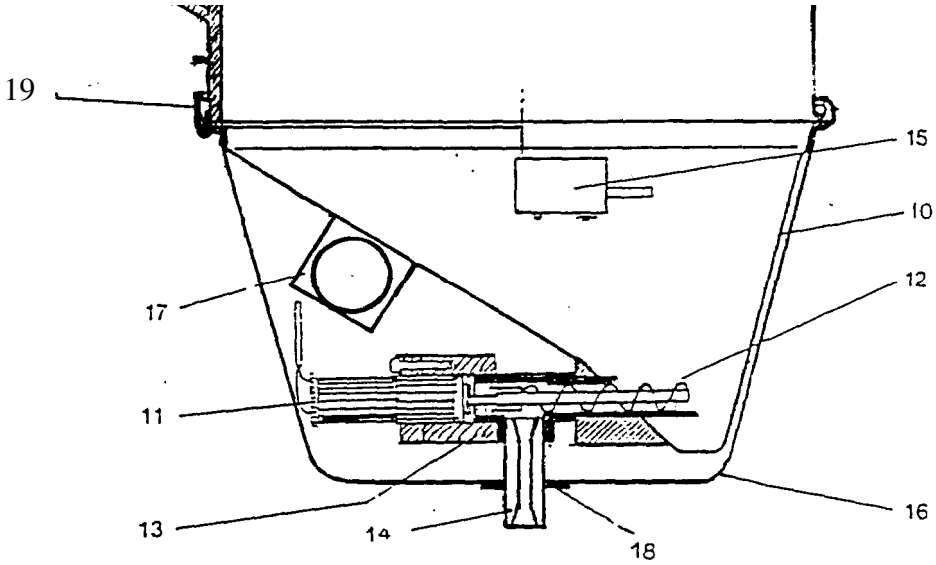


1	drum	9	type label.
2	2 clamp bands	10	vertical carrier
3	dosing hoper	11	locker
4	lid curl	12	acid pump
5	dissolving system	13	acid carboy
6	drum carrier	14	acid carboy lance
7	controlsystem	15	water supply with filter
8	conn. Housing	16	heated dosing nozzle
		17	dust protection
		18	pump cover

1.2 The Drum Carrier

The rotating drum carrier assembly (6) is fixed to the main vertical support (10). The drum (1) with chlorine 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 in place of the drum lid. The carrier with the drum is then turned through 180° to the dosing position, the chemical is dosed into the dissolving system (5) where it is fully dissolved and conveyed by a venturi to the buffer tank.

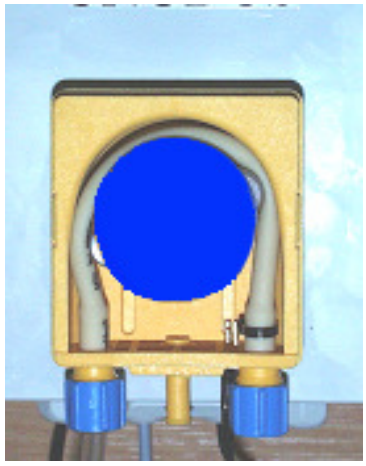
1.3 Chlorine Dosing Assembly



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

The dosing screw (12) meters the chlorine through the heated dosing nozzle (14) to the dissolving system. If the drum empty switch (15) is indicating, app 1 kg chlorine is left in the hopper. The knocker (17) gives a hit to the hopper wall at each dosing motor run cycle so supporting flowing of the granules.

Dosing performance is adjusted by the switch 4 at front fascia, see para "Start up operation".



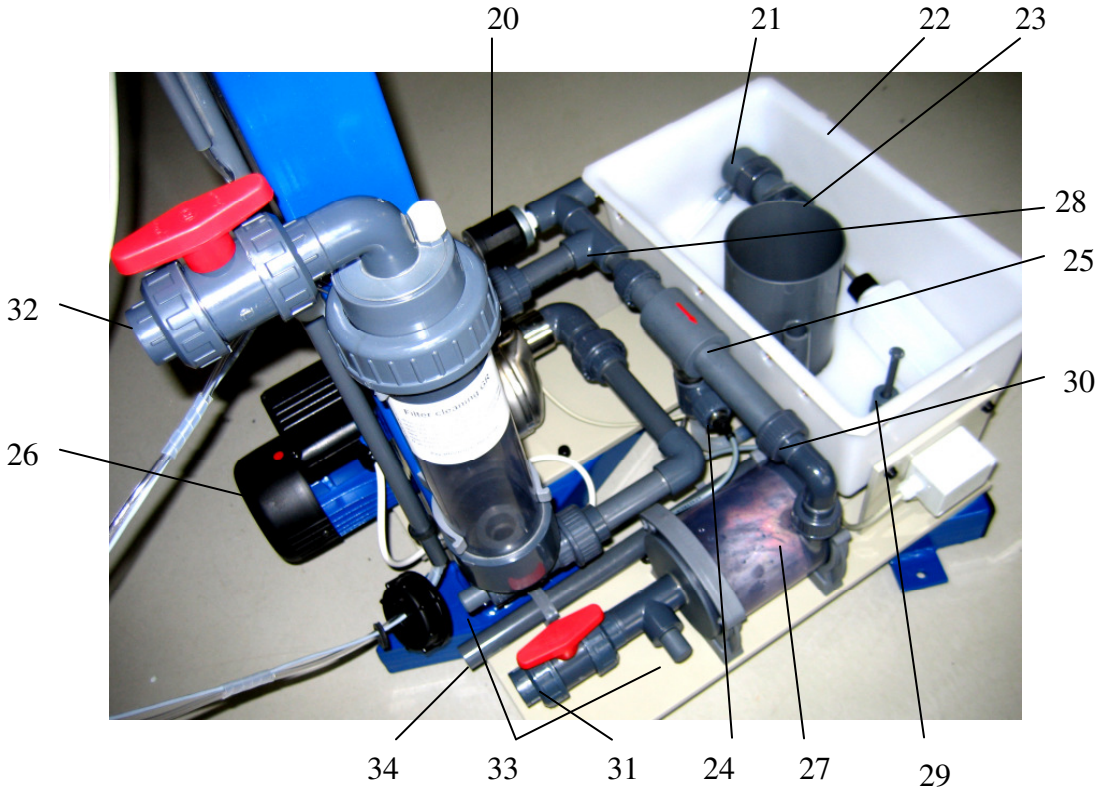
1.4 Acid Dosing

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 (11). 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.

1.5 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 stopps, 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.

1.6 Control System with program GR S41

The microprocessor based control of the GRANUDOS has three functions:

- Contains the circuit self check and dosing and test programmes
- Function control and interruption display (1 green + 4 red LED). If any interruption is displayed, the GRANUDOS dosing is switched off.
- All faults activate the fault remote control.



The control system is enclosed within a dust proof and splash proof housing (IP 65). External switches and fault remote indication are to be connected at the back of the control panel.

1.6.1 Operation and Test Programs

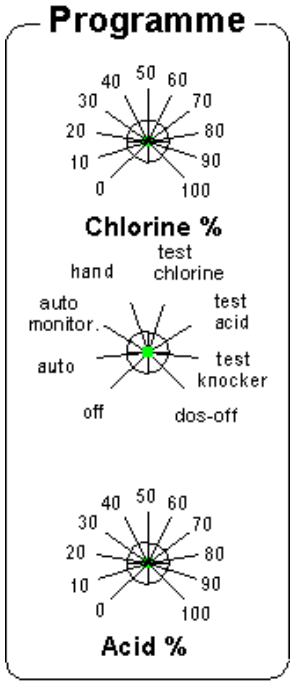
By turning the programme switch there is a retention time of 2 seconds with 2 flashes of the green lamp

Auto:
Dosing control by external auto-controller free chlorine and pH-value. Dosing always within the dosing cycle advance or at the next cycle. The cycle is to be set on 1 minute with code

switch S1 on **"on**", or on 6 minutes with code switch S2 on **"off**". Dosing of chlorine and acid is independent.

Auto monitor.: as „Auto" but with dynamic time monitoring:
:
When controlling the GRANUDOS dosing by an external auto-controller the dosing performance must be set high enough to ensure the dosing times (= dosing performance) of acid and chlorine shall not exceed 50% of total time, the actual values are near to the set points of free chlorine and pH. If the controller output time exceeds 50% , there must be any interruption in the system:

- dosing performance set too low
- interruption at the dosing motor or dosing screw
- interruption at the auto control system: hanging relay, faulty electrode etc.



The GRANUDOS controller S4 adds up all demanded dosing time (input time) that exceeds50% of total time and stops dosing if 60 minutes excess time is reached: Indication by flashing of the red lamp 3 (acid) or 4 (chlorine).

Hand
Continuous dosing as set. dosing cycle as set on code switch S2 "on"1 minute, "off" 6 minutes..
With the longer cycle time you get a lower dosing performance

Test chlorine:
Test chlorine dosing for 6 minutes continuously, then stop, the green lamp flashes
Can be used to test the real dosing performance.

Test acid :
Test acid dosing for 6 minutes continuously, then stop, the green lamp flashes.
Can be used to test the real dosing performance

Test knocker
Test for knocker function: the knocker hits 4 times all 2 seconds then stop, the green lamp flashes

Dos-off
Dosing switched off, the booster pump continues. Used for maintenance.

Off:
Switch off of all functions. Used if the machine is taken out of operation for a longer period.
Used also for a restart of the machine after switch off by the fault "level low – pump pressure"

Dosing can be switched off by an additional external switch e.g. a flow or pressure switch in the measuring water tubing or in the circulation to prevent dosing if there is an interruption.

1.6.2 Dosing Performance - Dosing scheme

The metering of the two chemicals is regulated in cycles with pauses between the metering intervals. The dosing performance are defined by setting dosing cycles (time between the intervals in minutes) and dosing times (durance of running dosing motors 0-100%)

By means of the **Code-switches** on the control plate (see para 5) the dosing performance can be adjusted to the principle need of the pool by setting 4 cycle times and combination for dosing times for chlorine and acid.

Dosing performance for chlorine and acid at continuous dosing – without pause :

Dosing motor PLG 35 /dosing screw:d26	app. 4,8 kg/h (GRANUDOS 45)
Dosing motor PLG 60 /dosing screw:d26	app. 6,5 kg/h (GRANUDOS 100)
Acid pump Sa with dosing hose 4,8x1,6 mm	app. 9,6 l/h (GRANUDOS 45 and 100)

With a set dosing cycle of 1 minute following maximum dosing performances are reached:
Here for GRANUDOS 45 – Dosing performance chlorine = chlorine granulated:

Dosing cycle : **Code switch**	**S1**	**S2**	**Dosing times 100%**	**Chlorine-acid S3**	**S4**	**Dosing performance at 100% set with knob max**
1 minute	off	off	30-20 seconds	off	off	2,4 kg/h – 2,6 l/h
^ 1 minute	off	off	40-10 seconds	on	off	3,2 kg/h – 1,3 l/h
1 minute	off	off	20-20 seconds	off	on	1,6 kg/h – 2,6 l/h
1 minute	off	off	10-10 seconds	on	on	0,8 kg/h – 1,3 l/h
6 minutes	on	off	at standard dosing times 30/20 sec.			0,4 kg/h – 0,43 l/h
8 minutes	off	on	at standard dosing times 30/20 sec.			0,3 kg/h – 0,33 l/h
12 minutes	on	on	at standard dosing times 30/20 sec.			0,2 kg/h – 0,22 l/h

Dosing is running always with the following steps::

- Dosing chlorine as long as set by the performance knob 0-100%,
- 5 seconds pause, then following directly
- Dosing acid as long as set by the performance knob 0-100%,
- Pause till end of set cycle time

Example:

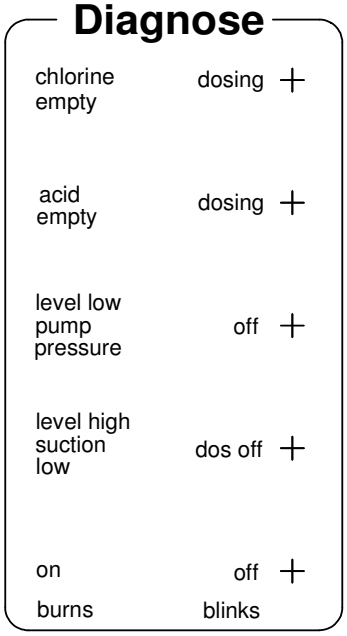
Settings by the code switch on control plate:
Cycle 1 minute, chlorine dosing 100% = 20seconds, acid dosing 100% =20 seconds.
Performance set by performance knob: chlorine 30%, acid 10%

Action: Chlorine dosing 30% of 20 seconds = 7 seconds, then 5 seconds pause, then acid dosing 10% of 20 seconds = 2 seconds, then pause 60 – (7+5+2) = 46 seconds etc.

When controlling the GRANUDOS dosing by an external auto-controller the dosing performance must be set high enough to ensure the dosing times (= dosing performance) of acid and chlorine shall not exceed 50% of total time. Dosing performance should be set on 3-5 times normal consumption.

Chlorine and acid dosing are working independent,, it is dosed when the auto-controller commands for the chemical – but always in the cycle procedure..

1.6.3 Diagnosis



The diagnose field shows the status of the system by 1 green lamp and 4 red lamps.

Starting self check programme

When the machine is switched on a diagnosis programme for the control equipment runs.

1. All lights burn together 2 seconds
2. Each light comes on one after another for one second

If there is no fault indication, all red lamps go out and the dosing programme commences.

Lamp Indicators for function and irritations

Green lamp – indicates program switch and external inputs

on contiuously:	GRANUDOS in operation
no light:	Transformer or fuse for control system burnt - no mains supply
fast blink	(0,5 second on, 0,5 second off...)

- end of test programmes
- programme “dos. off”
- programme “off”
- GRANUDOS switched off by the central control system

Red lamps - indicates faults caught by the monitoring sensors and of dosing monitoring

All sensors separately monitors and indicate by a red lamp on the fascia. If the red lamp burns the sensor must catch an irritation. The system stops dosing is and pump too, if necessary.
To clear up the situation it must be found out, whether

1. there is really an irritation or
2. the sensor is faulty

Normally the “good status” is obviously to be seen at all switch functions. To check a faulty switch, he only has to be tried in function or be disconnected at the control plate. As they are “normally open”, irritation is indicated by a closed switch. By opening the switch connection wires at the plate, the red lamp must go out and dosing starts again. **Attention**: the “chlorine empty” switch is inverse.
The irritations are indicated with following shut off of the dosing by a retention time of 6 seconds; only on “suction low / water max” dosing is shut off at once, then the indication follows.

Red lamp 1:	**level high**	level in the flushing tank is high
burns	**suction low**	the suction performance of the venturi is too low
	dos off	dosing is switched off by an external monitoring switch (switch connected to conn. 7-8 on push connector S06)

There is coming more water to the tank as is sucked off by the venturi. For the following test operations set the programme on “Dos off”.

1. **Water level in the tank is high, but Suction power of venturi is OK**: switch bobbin of flow switch in suction tube is at top. By pressing the connecting hose to the suction hose the bobbin goes down and the switch lamp burns. If loosened again, bobbin goes up and switch lamp goes out.

In this case there should be a fault in the floating valve: check whether with 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.

2. **Suction power of venturi is not enough**: switch bobbin of flow switch in suction tube is at bottom of the tube. By pressing the connecting hose to the suction tube the bobbin does not move, or moves slowly, switch lamp burns.

   Possibilities:
   - at installation: service pressure too low – counter pressure too high.
     tubing faulty fitted or too small:
     take out orifice washer (13c) from union behind venturi.
   - Particles inside venturi or at outlet nozzle of flushing tank
   - Booster pump performance too low – see pressure limits on page 9, para "Installation".
     Fit the by-packed pressure gauge to inlet and outlet to check pressure situation.
   - 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. After cleaning increase acid dosing performance

3. **An external monitoring switch** e.g. a flow switch in the main tubing to avoid dosing if anything in the circulation goes wrong. Dosing is switched off by

Red lamp 2:

burns	**level low**	level in the flushing tank low
	pump	no sufficient water supply,
	pressure	supply pressure too low,
	dos. off	pump and dosing is switched off – restart only by switching to "OFF" and "ON" again

Possibilities:
- Suction power too high: fit an orifice washer (13c) of 5,5 mm inside union behind venturi.
- Supply water tubing is blocked
- too low water supply pressure
- floating valve cone in the flushing tank is blocked by particles, diaphragm is faulty
- supply hole in the floating valve is blocked

Red lamp 3:

burns	**acid**	acid empty switch active (closed) or faulty
	empty	leakage of the dosing hose (option)
	dos. off	dosing acid **and** chlorine are switched off
flickering:	**dosing**	acid dosing pump runs. If not, motor is faulty or breakage on cable/connection or fuse F2 burnt.
blinks		On programme "auto monitored" the monitoring time is exceeded. Valid for acid and chlorine independent. See programme description - Too high bather load – increase dosing performance - Fault in dosing system – see following para - Fault in auto-controller– see following para

Red lamp 4:

burns	**chlorine empty**	Chlorine empty switch activate. Container empty or switch faulty or maybe must be readjusted. Indication only –the dosing of the chemicals is not influenced.

adjustment of the chlorine empty switch

When the container is empty, respectively when the dosing hopper with the barrel has been turned

upstairs, the LED at the empty switch should **not** burn, the LED L4 at the control fascia **must** burn.

When the LED at the switch burns, just turn the little setting screw slowly to the right, until it is turned off. The LED L4 at the control system reacts with some delay. If the switch does not react on the setting or if the little setting screw is destroyed, a new switch has to be installed

flickering:	**dosing**	chlorine dosing motor should run. If not, motor is faulty or connection cable or fuse F2 burnt.
blinks		On programme "auto monitored" the monitoring time is exceeded. Valid for chlorine and acid independent. See programme description - Too high bather load – increase dosing performance - Fault in dosing system – see following para - Fault in auto-controller– see following para

1.6.4 Irritations not indicated by monitoring switches

1. No chlorine dosing: no free chlorine in pool water

No dosing by using the test programme chlorine on fascia

- dosing screw blocked
- dosing screw loose
- dosing nozzle (heated) faulty or blocked
- dosing motor faulty or interruption on wiring
- faulty empty switch: drum empty not indicated

If dosing works by using the test programme there is something wrong on the connection of auto-controller for free chlorine to the GRANUDOS control plate

- correct output: on continuous dosing the 230 volts should be on the connectors
- faulty wiring – interruption in the cable, on connectors
- faulty electrode
- faulty input relay on control plate – does not switch

2. pH in pool water is high, suction tube/mixing chamber is turbid.

No dosing by using the test programme acid on fascia

If pump roller runs, see whether an air bubble is sucked to pump. If all is OK, increase dosing rate and select a lower set point for pH. If not, then:

- pump roller does not move: motor faulty or interruption on wiring
- dosing hose faulty,
- suction tube not well fitted - loose
- injection nozzle faulty or blocked
- faulty empty switch: container empty not indicated

If dosing works by using the test programme there is something wrong on the connection of auto-controller for pH to the GRANUDOS control plate

- correct output: on continuous dosing the 230 volts should be on the connectors
- faulty wiring – interruption in the cable, on connectors
- faulty electrode
- faulty input relay on control plate – it does not switch

3. Continuous dosing of chlorine or acid on programme "auto" without command from the auto-controller: Check whether the output from the auto-controller is correct –there should be no voltage from there. If so, the 230 volt input relay of the GRANUDOS control plate is faulty/hanging. Replace the relay or mount a new control plate.

4. Overflow from tank too much at switch off of GRANUDOS
- switch bobbin of flow switch is blocked on top situation or does not fall down completely
- seal of switch bobbin faulty
- diaphragm of the floating valve is faulty
- piston of floating valve is blocked by impurities: particles from installation or sand if filter is faulty
- supply pressure of an external booster pump too high

5. Tank is sucked empty though pressure conditions are OK.
- inlet bore of the floating valve is blocked by impurities
- at low counter pressure use washer nozzle with smaller hole behind venturi

1.7 Filter disinfektion at back wash – high chlorination

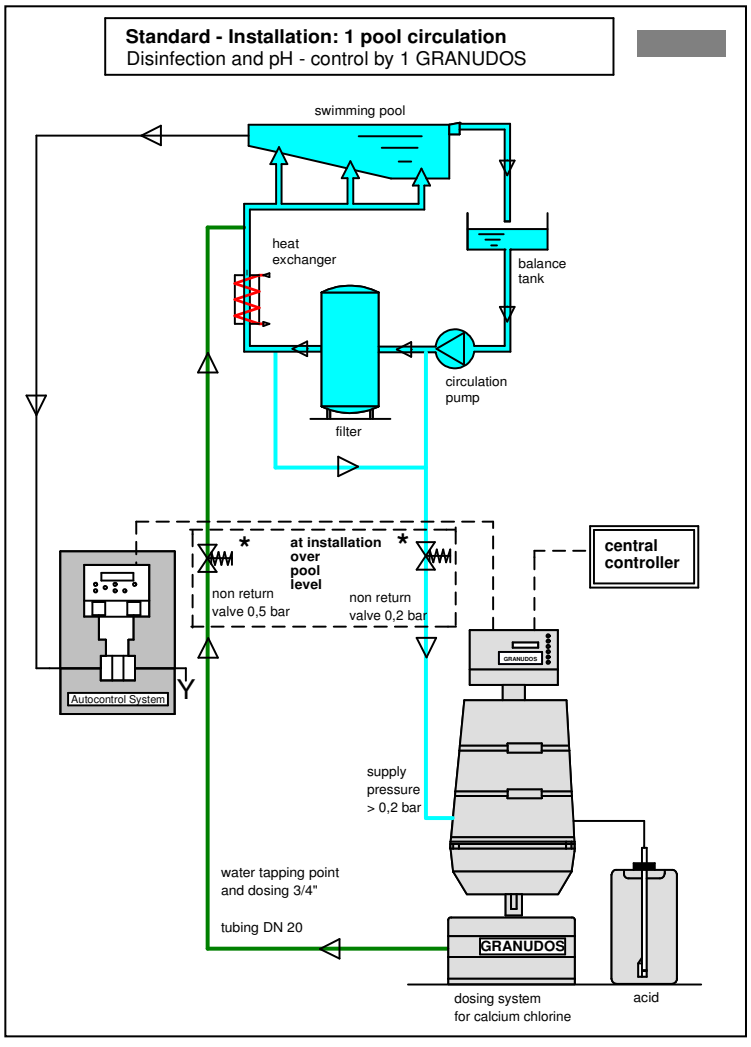
for the durance of the back wash the GRANUDOS must be switched off, as the flocculation(mains supply off or non volt signal from CCT). If at the end of backwash a filterdisinfection is wanted the GRANUDOS is switched on and the control inputs (push conn. S04-7/8) are to be closed. At the same time the dosing tube must be switch over by a 3/2-ways valve to before the filter. The GRANUDOS meters now with the set dosing performance as long the control intut is activ chlorine and acid to the back wash water.

2. Installation -

2.1 Piping

For satisfactory water flow through the dissolving system the **supply pressure must be at least 0,2 bars to avoid cavitations at the pump**. 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 insert**:

Service pressure	1,2 bar (120 kPa)	Counter pressure	1,4 bar = 140 kPa
	0,6 bar (60 kPa)		1,1 bar = 110 kPa
	0,3 bar (30 kPa)		0,9 bar = 90 kPa



Within these ranges the GRANUDOS should function well. In addition please pay attention to the following:

1. Tapping point for supply water to be between circulation pump and filter, dosing point after heat exchanger. At outdoor pools with high pollution it could be advantageous to take the dissolving water from behind filter – but pay attention to the minimum supply pressure.
2. Ensure that the tapping/dosing points are free flowing and not blocked by scale or corrosion.
3. Pipe runs to be kept as short as possible. No ups and downs! PVC-tubing 25 mm or hose 1" – not squeezed! For longer distances i.e. 10m or poor pressure conditions use bigger tubing and swept bends instead of elbows.
4. Use high quality PVC ball valves to isolate take off points.

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

2.2 Electrical connection

The electrical supply of the GRANUDOS has to be controlled by the electrical supply of the circulation pumps that dosing can only be 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. The control cable for pH and free chlorine are prefitted into a connector box to be mounted at the wall.

Electrical works are only to be executed by authorised people.

3. Start up Procedure

Please note, that the following procedure must be executed at each new start or restart. Especially the deaeration of the pump is vital to the function of the machine.
Switch on the machine only if it is sure that the pump turns easily, is deaerated and the isolation valves are opened.

After having fitted the machine open the ball valves at the tapping points and at GRANUDOS inlet valve first. Press floater of floating valve inside the tank down to let water flow into the flushing tank. When the flushing tank is half full, only then switch on the GRANUDOS mains as the booster pump of GRANUDOS should not run dry.

To ensure correct dosing water flow through the flushing tank must run in the correct way as described below.

3.1 Check of pump

Check by means of a screw driver at back shaft of the pump whether the shaft is turning easily. If not, the slide ring seal is blocked. Try to loosen it by rapid moving of the shaft right and left. If no success, the pump must be dismantled completely and the slide ring loosened. If this is not done, the pump will leak in short time as the O-ring on the shaft will be worn.

3. 2 Deaeration of the water supply tubing

At switching on the GRANUDOS take care that all air is to be released/vented from the supply water tubing and the pump completely. For this please observe the water level inside the pre-filter. If he gets empty switch off the pump/machine and wait till the filter is full again, open the vent screw on top of the filter. 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.

3.3 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.

3.4 Water flow/Suction performance of the venturi

At stable water level the switch bobbin of the flow switch inside the suction tube below the venturi 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 washer nozzle is inserted in the union behind the venturi. If the water level in the tank tends to run low or if the 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 washer nozzle or use without nozzle.

3.5 Adjusting the pressure switch

The pressure switch is fitted pressure side of the booster pump, so monitoring the real pump pressure. If air is sucked by the pump or at pressure drops the pump is switched off to avoid:

- overdosing if circulation is disturbed
- the booster pump is not destroyed by cavitations or running dry

The pressure switch is working from 1-3 bar. To adjust the switch to the working conditions take off the switch cover, turn clockwise the switch knob till the pump switches off, then turn back a little. As the GRANUDOS is now on fault, the machine must be restarted manually at the front plate by switching the machine to “off” till the 2 red lamps are off, then to “on” again. Now the GRANUDOS runs again and will be stopped if the pump pressure falls down to the set pressure.
If additional pumps are switched on or off in filtering service (e.g. pump from balance tank) the switch must be adjusted without the additional pump. At works the switch is adjusted to 1,5 bar.

3.6 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).



3. 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.

4. 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.

5. 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.

6. 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.

7. 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.
Lock the drum carrier in this position via the swivel lock (7).

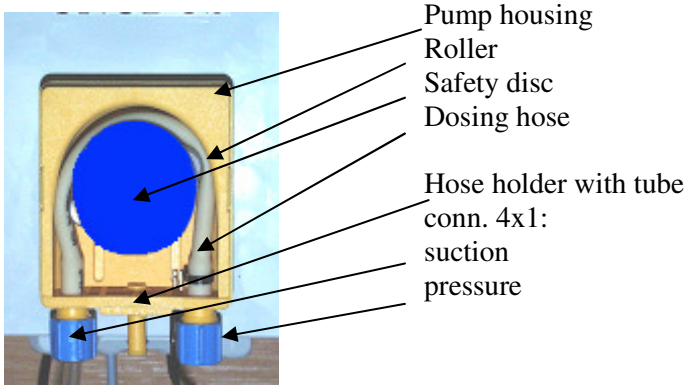
8. The wind protection tube down in the flushing tank cover is now to be positioned so that the heating nozzle is app. 1 cm inside the tube.

The GRANUDOS is now in the dosing position.

3.7 Providing of acid

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

3.8. Adjusting dosing performance of GRANUDOS – continuous dosing

By means of the code switch on the control plate you can select different dosing performances to meet the needs of your individual pool. See hereto para 1.6.2 page 8 and para 5 page 17.

Chlorine
In principle the chlorine consumption of a pool depends on a variety of influences:

Loading, temperature, wanted chlorine concentration etc. Normally a standard indoor pool needs about 300 grs of calcium hypochlorite per 100 m^3 in volume per day. So an indoor pool of 300 m^3 in volume needs app. 900 grs/day or app. 90 g/h at 10 hours continuous dosing. An outdoor pool needs approximately 5 times more as the sun decomposes the free chlorine. With the knowledge of the hourly consumption the relevant dosing performance is set by the code switch on the control plate.

Example:
A pool of 300 m^3 in volume needs app. 900 g/day or app. 90 g/h at 10 hours continuous dosing. These 90 g/h would correspond to only 4 % of the maximum dosing performance of 2,4 kg/h with a cycle time of 1 minute, dosing times chlorine/acid 30/20 seconds – all code switches set on "off". In that case we propose to use a cycle time of 6 minutes by setting the code switch S1 to "on", S2 to "off" and get now a percentage of 90/400 = 22% that we set with the performance knob.

An outdoor pool needs at good weather conditions about 5 times more chemical.
In practice the free chlorine/pH-auto controller does the job. You only have to set a high enough dosing performance.

Acid
The dosing performance of acid is preset by the code switch as above done. The consumption of acid is harder to predict as that of chlorine. For the beginning set a dosing performance as same as for chlorine. The actual need has to be found by trial and error. The pH should be at 7,0 – 7,4.

Attention! At new filling of the pool normally the pH is far away (very high) from the wanted set point. So bring the pH at start near to the set point <u>manually</u> by pouring acid to the pool water – but pay attention that no droplets of acid will meet you – your clothes!

3.9 Dosing Controlled by Auto-Controller
Using the programme "Auto" or "auto monitored" and connecting an external auto controller for free chlorine and pH the set dosing cycle is activated. The dosing of the chemicals is running independent from each other if the control output of the auto controller for free chlorine or pH is active The dosing rate set at the GRANUDOS should be at high level or maximum.
It is strongly recommended to connect both, chlorine and pH controller to the GRANUDOS even there is another dosing system for acid in use. In that case both should be connected in parallel. This is to avoid overdosing of acid in case of malfunction of chlorine dosing.

The auto-controller output must be of 230 VAC on/off - see wiring diagram. The control cable for pH and free chlorine are prefitted into a connector box to be mounted at the wall.

Please note, that the measuring water never should be taken from behind the filter

4. Maintenance
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.

Minimum checks include the following items, see also the attached maintenance list

- clean strainer if necessary – a scaled filter causes cavitation and consequently damage of the booster pump

  For cleaning take out the complete filter from the machine and clean the insert outside
- maintain the machine clean – especially the booster pump
- 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 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 the floating valve once per year
- change seal of flow switch bobbin all ½ year
- check once per year acid dosing valve – change seals

Taking out of service

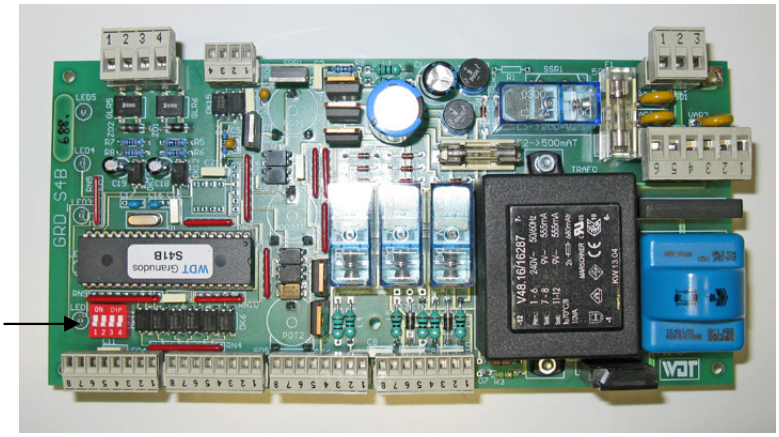
- take out acid pump roller from the pump shaft to avoid long term compression at one spot of the dosing tube
- empty the dosing hopper, take out chlorine dosing screw, clean all thoroughly and store it at a dry place if moisture is possible.
- clean all parts of GRANUDOS thoroughly.
- leave the GRANUDOS switched on - programme switch on “0".to avoid condensation in the cold housing.

At taking into operation again
please pay attention to the para 3. Start up procedure

5. Electrics – connectors - fuses

Fuses 2x 500 mA

code switch



Dosing cycle			Dosing times chlorine-acid 100%			Dosing performance at 100% set with knob
Code switch	S1	S2		S3	S4	max
1 minute	off	off	30-20 seconds	off	off	2,4 kg/h – 2,6 l/h
1 minute	off	off	40-10 seconds	on	off	3,2 kg/h – 1,3 l/h
1 minute	off	off	20-20 seconds	off	on	1,6 kg/h – 2,6 l/h
1 minute	off	off	10-10 seconds	on	on	0,8 kg/h – 1,3 l/h
6 minutes	on	off	at standard dosing times 30/20 sec.			0,4 kg/h – 0,43 l/h
8 minutes	off	on	at standard dosing times 30/20 sec.			0,3 kg/h – 0,33 l/h
12 minutes	on	on	at standard dosing times 30/20 sec.			0,2 kg/h – 0,22 l/h

connector S01 –mains 240 Volt

1	**brown**	**phase**
2	**blue**	**neutral**
3	**yellow/green**	**earth**

connector S02 – pump / knocker

1	**black1**	**knocker**
2	**black2**	**knocker**
3	**yellow/green**	**earth knocker**
4	**yellow/green**	**earth booster pump**
5	**blue**	**booster pump**
6	**brown**	**booster pump**

connector S03 – ext. contr. PH/Chlorine

240 volt with cable to connector box

1–2	**white-brown**	**free chlorine**
3–4	**green-yellow**	**pH-value**

connector S08 – PH/Chlorine non volt

1–2	pH-value
3–4	free chlorine

connector S04 –input switches

1–2	**white-brown**	**acid empty**
3–4		leekage acid pump
5–6		machine off (by central control unit)
7–8		filter disinfection

connector S05 – input switches

1 grey	**empty switch chlorine**
2 blue	**– 24 VDC empty switch**
3 rose	**+ 24 VDC empty switch**
4-5	free
6 green	**flow switch / level high**
7 white	**– 24 VDC switches flushing tank**
8 brown	**+ 24 VDC flow switch**

connector S06 – input switches

1–2		free
3-4		free
5	**yellow**	**level low/pressure low**
7–8		"dos off" by external switch

connector S07 - outputs

1–2	remote fault control (relay NO) **
3-4 green/yellow	**(–/+) dosing pump acid**
5-6 white/brown	**(–/+) dosing motor chlorine**
7–8 green	**(–/+) 24 VDC heating nozzle**

in fat letters: connected at works
** suitable for low voltage only !!

Fuse 1 /fuse 2 each 500 mAmp slow
Fuse on main board 3,15 Amp slow

6. Spare Parts GRANUDOS 45/100-S4

	Designation	Code No.
Chlorine dosing	dosing hopper HTH 40 kg (other types on request)	11527
	cover for dosing hopper GR 45	12866
	dosing motor PLG 30-35 (GR 45)	11676
	dosing motor PLG 30-60 (GR100 / GB)	11546
	motor holder PLG-d32	11542
	motor holder PLG- d25 (GB)	11541
	dosing screw d6/D26	11550
	dosing screw d6/D19 (GB)	11549
	dosing nozzle heated GR	11556
	knocker GR 45 complete	11558
Acid dosing	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
Filter d75	filter housing	12746
	filter top with ball valve d25	12304
	O-ring on top	11258
Control system	control plate GR S41b	14200-1
	transformer S4, 2x9 volt, 10VA	14383
	mains switch GR	11338
	fuse holder GR	13960
	knob 6mm S1/3/4	11031
	cover control box	12600
	locker for cover control box	11512
Floating valve	floating valve d25 complete	17006
	diaphragm for floating valve	17557
	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 ½´´ – S14 US	12729
	flow switch GR/PAK ind. 18x1	11603
	flow switch bobbin ind. ½´´US	12730
	seal ring Vi 14/8,7 flow switch bobbin	15801
	conn. hose to flow switch holder 10x2,5x180 Vi	11565-1
Venturi	venturi ½” GR/PAK complete	11792
	orifice washer for venturi (set)	11594
	venturi-nozzle ½´´	12306
	venturi-body with connector ½´´	12305
Cyclone	mixing cyclone GR 45-6	11612

7 . Maintenance List GRANUDOS 10/45/100

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	[ ]	change switch	[ ]
1.2	check pressure switch: OK	[ ]	change switch	[ ]
1.3	check flow switch: OK	[ ]	change switch	[ ]
1.4	cleaning flow switch bobbin, fit new seal	[ ]	change bobbin	[ ]
1.5	change diaphragm of floating valve	[ ]		
1.6	check function floating valve OK	[ ]	adjust water level	[ ]
1.7	check connecting hose tank-flow switch holder	[ ]	change connecting hose if brittle	[ ]
1.8	check pump end plate (at Calpeda pump only)	[ ]	change pump end plate	[ ]
1.9	check tightness of pump OK	[ ]	new slide ring seal	[ ]
1.10	check ball bearings: is it noisy? OK	[ ]	new bearings	[ ]
1.11	clean pre-filter, if polluted	[ ]		
2	**Dosing chlorine**			
2.1	check function heating nozzle: OK	[ ]	change nozzle	[ ]
2.2	check function empty switch: OK	[ ]	change switch	[ ]
2.3	check dosing screw, clean it dry OK	[ ]	change screw	[ ]
2.4	check power dosing motor: OK	[ ]	change motor	[ ]
2.5	change sealing of dosing motor	[ ]		
2.6	check clamp bands and safety belt	[ ]	change	[ ]
3	**Dosing acid**			
3.1	check function empty switch: OK	[ ]	change empty switch	[ ]
3.2	check function dosing pump OK	[ ]:	change pump	[ ]
3.3	change dosing hose	[ ]	change roller	[ ]
3.4	change acid valve insert	[ ]		
4	**Additional jobs**			
4.1	clean GRANUDOS carefully:	[ ]		
4.2	clean environment of the GRANUDOS	[ ]		

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