

Operating instructions GRANUDOS 45/100-Plus

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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2.1.1 Technical Data

The GRANUDOS 45/100 dosing system comprises:

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

Measures:

base 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: minimum 0,2 bar
Fresh water supply: min. 2 bars

Water flow: app. 1000 l/h

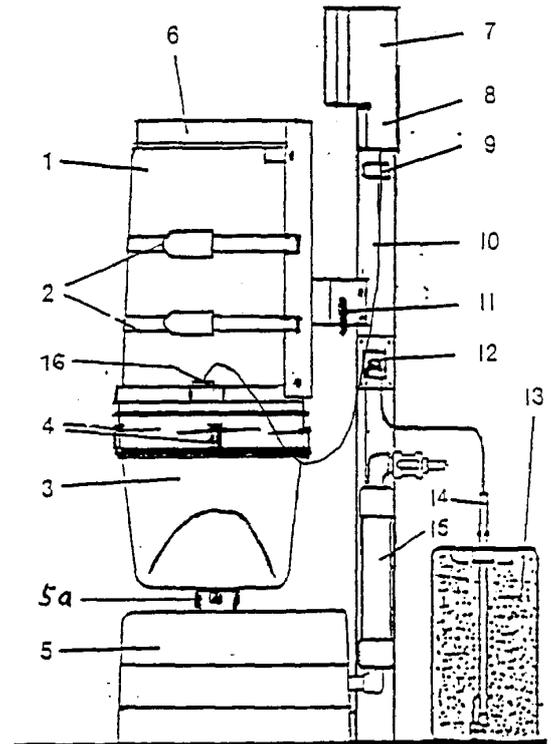
Dosing Performance:

chlorine: GR 45: 2 kg/h. GR 100: 5 kg/h *
acid: GR 45: 2 l/h, GR 100: 3 l/h

Feed booster pump:

Magnetic clutch centrifugal pump with PVDF body
0,45 kW, 230 VAC, 50Hz, app. 1000 l/h at 1,0 bar
(higher performance pump on request)

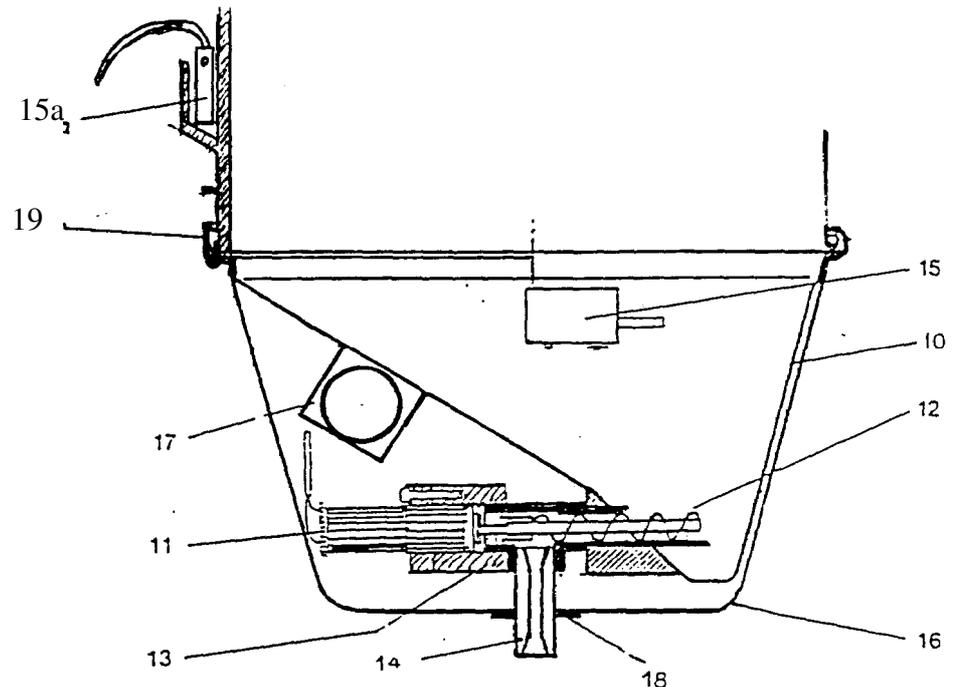
* Chlorine dosing performance depends on chlorine quality and is affected by too fine or too coarse material. Acid dosing performance is given in litres per hour. It is recommended to use sulphuric acid 37%.



2.1.2 The Drum Carrier

The rotating drum carrier assembly (6) is fixed to the main vertical support (10). The drum (1) with hypochlorite is fixed on the carrier assembly (6) by 2 band clamps (2) and a retaining belt (option). 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.

2.1.3 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		
15a	chlorine reserve switch to be put outside into the handle of drum		

The dosing screw (12) meters the chlorine through the heated dosing nozzle (14) to the dissolving system. Chlorine reserve is indicated by the switch (15a) which is fitted outside in the handles of the plastic drum. If the drum empty switch (15) is indicating, GRANUDOS is stopped. The function of chlorine dosing is controlled by the opto-sensor (33) fitted at the end of the dissolving cyclone: 8 seconds after 2nd start of the dosing motor at one filling cycle chlorine must rotate in the cyclone, the switch LED burns continuously. If not, the GRANUDOS stops. The knocker (17) gives a hit to the hopper at each dosing motor run so supporting dosing.

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

2.1.4 Acid Dosing

The acid dosing for neutralisation of the chlorine solution is of great importance for the correct function of the system and has to be controlled carefully.

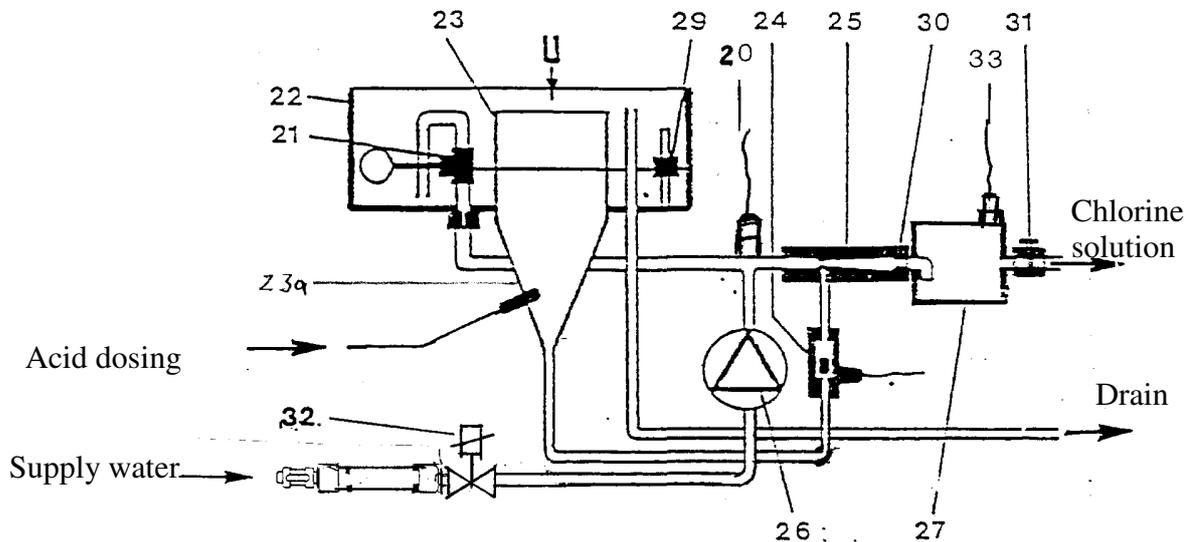
The acid is dosed down in the flushing cone (23 - see next para) by the peristaltic pump, which is fitted directly at the vertical support. The supply carboy lance has two level switches: 1 for reserve indication, 1 for empty switch off. If acid is empty GRANUDOS is stopped too to avoid wrong chlorine solution concentration and scaling.

As acid use sulphuric acid 37%. Concentrated hydrochloric acid (HCl) penetrates the pump hose and will attack the pump rollers and further the pump. Diluted HCl will be not strong enough for the neutralisation job.

The dosing performance of acid is to be adjusted to the chlorine dosing performance so that the pH of the chlorine solution is neutral (pH 6,5-7,5), the solution is nearly clear and does merely smell to chlorine. If too much acid is dosed, solution becomes acidic, smells strongly to chlorine and also

becomes more corrosive. A too high pH will cause scaling within the buffer and distribution system and is to be seen by turbid flow meters.

2.1.5 Dissolving System



20	pressure switch	26	booster pump
20a	acid dosing valve	27	cyclone mixing/dissolving chamber
21	floating valve	29	level control switch
22	flushing tank	30	union bush with nozzle
23	flushing tube	31	outlet ball valve
23a	flushing cone	32	water supply control valve
24	suction tube with flow control	33	chlorine missing switch
25	venturi nozzle		

The supply water is divided 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 drawn 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 hypochlorite granules a cyclone mixing chamber (27) is fitted after the venturi. The actual service pressure of the venturi is controlled by the pressure switch (20). The chlorine missing switch (33) cuts off dosing if 8 seconds after 2. start of chlorine dosing motor at each dosing cycle no chlorine granules are to be seen in the mixing cyclone (27). The switch LED must then burn continuously if chlorine is dosed. To ensure that calcium hypochlorite and acid do not come in 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 4.2 '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.

Dissolving water supply has to be separated from filter function that there is no influence on GRANUDOS function as this could cause irritations. Three supply ways are possible as shown on 'Installation diagram' page 21:

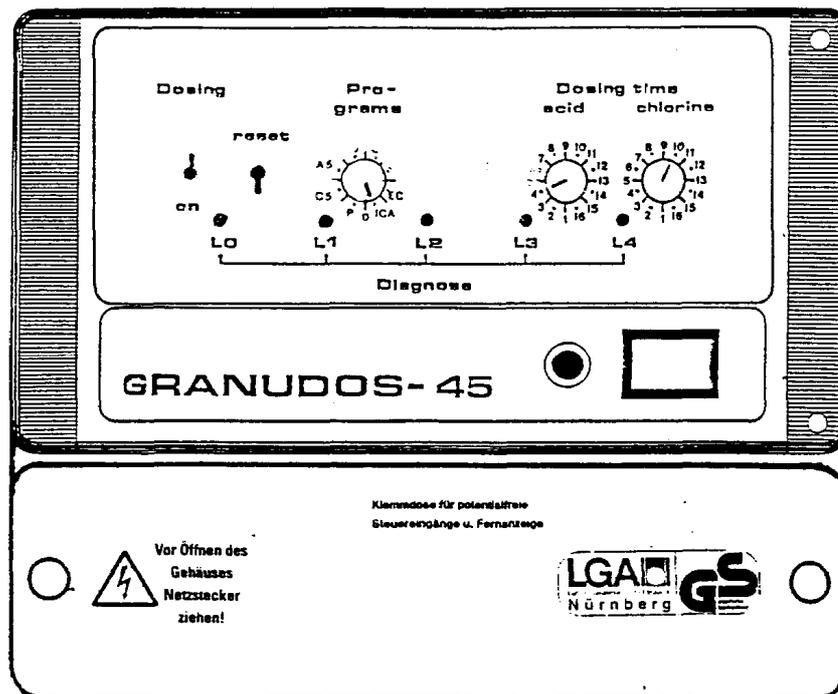
1. Take off from behind the filter if static pressure after filter is higher 0,2-0,3 bar.
2. Take off from balance tank by external fitted booster pump
3. Use of public water (only if 1. or 2. caned be verified)

As the GRANUDOS does work only on demand of the buffer tank, water supply has to be cut off after filling procedure by means of a solenoid valve - at take off situation 2. a non return valve can be adequate too if GRANUDOS is standing higher than balance tank.

2.1.6 Control Panel

The microprocessor based control of the GRANUDOS has three functions:

- Contains the circuit self check and dosing programmes for chlorine and acid
- Function control and interruption display (1 green + 4 red LED). If any interruption is displayed, the GRANUDOS is switched off - 'Chemicals on reserve' is only indicated. All irritations normally activate the fault remote control. A programme is available at which 'Chemicals on reserve' does not 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 in the lower part of the housing.

Programme Selection (GR 64PL)

P: Proofing programme for control board, only used by authorized personnel

For test and check of dosing motors:

C2: Continuous dosing of chlorine for 2 minutes

A2: Continuous dosing of acid for 2 minutes

These programmes can only be activated if the buffer tank is not full.

The programme starts with the initially water flushing procedure for 12 seconds, than the relevant dosing starts if no fault occurs. After the 2 minutes dosing the cleaning flushing goes on. Than the green LED will flash continuously and a new programme has to be chosen.

Start: The GRANUDOS is producing for 10 Minutes chlorine solution without remarking any alarm switches, the booster pump on feed system is switched off. Afterwards the GRANUDOS stops. The green LED flashes. The feed system is now ready for service. Now switch the programme to "On" (on normal service) and proceed as described at point 4.3.

On: The GRANUDOS starts by the lower level switch at buffer tank or "reset". The supply control valve opens and initially for 12 seconds water flushes only through the dissolving system. If no fault occurs, dosing of chlorine and acid starts. The booster pump on feed system runs to dose the chlorine solution via the distribution system. All alarm switches are active. After stopping filling procedure at buffer tank full level the dissolving system is cleaned by dosing acid for 20 seconds, afterwards only flushing water for 20 seconds. The green LED flashes to indicate ready for next filling procedure.

All hour additional water flushes for 10 seconds through the dissolving system.

FP: Feed pump works for 1 minute at an alarm situation where the feed pump normally is switched off e.g. to empty the buffer tank if needed. With 'reset' the program FP can be started again if necessary.

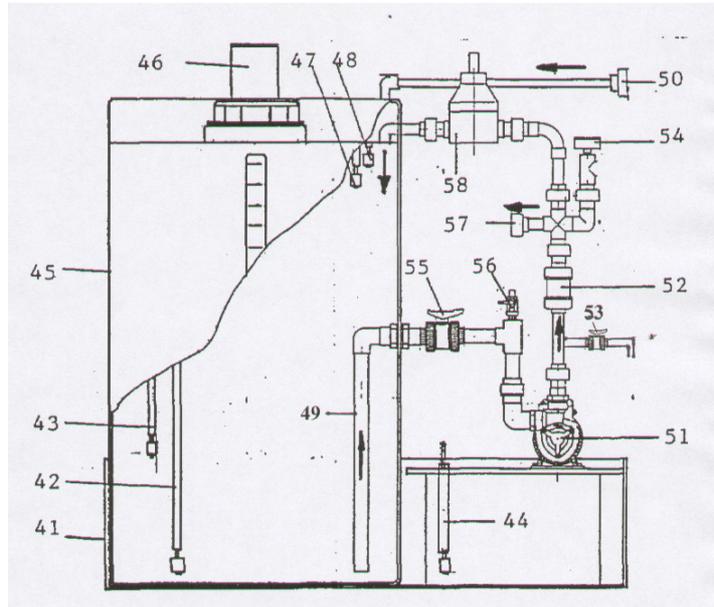
2.2. Feed System with Buffer Tank

The feed system for the hypochlorous acid consists of the 300 litre PE buffer tank (45) and the feed (booster) pump (51) fitted together in the safety tub.

The tank is equipped with 4 level switches: At low control level (43) GRANUDOS starts to fill the buffer tank, at upper control switch (47) the GRANUDOS stops filling. The two alarm switches (42 and 48) shut down the GRANUDOS and give remote alarm for malfunction. The feed system is fitted within a protection tub of PP (41) with an additional alarm level switch (44) to indicate leaks at the tank or overflow.

As feed pump (51) a magnetic clutch centrifugal pump is used with corrosion resistant PVDF pump body. The pump pressure is hold constant by means of the pressure control valve (58) on the return line to tank. So constant dosing conditions are hold for all dosing lines independent of the dosing performance of the different lines. On top of the tank a filter with activated carbon (46) is fitted through which the tank is vented preventing chlorine smell to the environment.

- 41 protection tube
- 42 bottom alarm switch
- 43 bottom control switch
- 44 alarm switch in tube
- 45 buffer tank 3001
- 46 activated carbon vent filter
- 47 upper control switch
- 48 upper alarm switch
- 49 suction tube
- 50 filling tube from Granudos (down at tube)
- 51 feed (booster) pump
- 52 non return valve
- 53 pump vent ball valve
- 54 pressure gauge
- 55 ball valve d32
- 56 pH-electrode (option)
- 57 adapter union to distribution system / dosing lines
- 58 pressure control valve

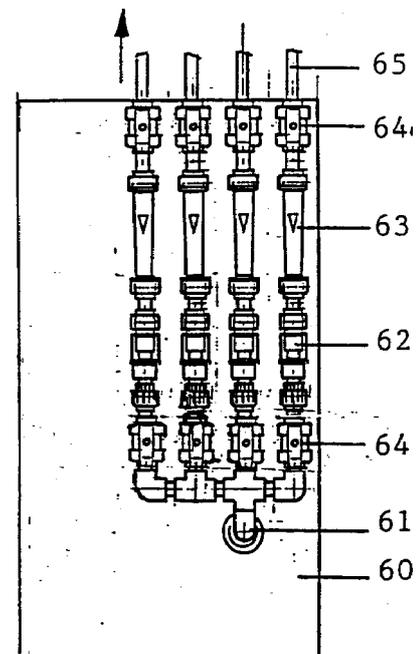


2.3. Distribution and Metering System

The distribution system is prefitted ready for service for the special pool situation on a PVC table together with the feed system within the PP protection tub.

The standard dosing line of the distribution system consists of:

- 60 fitting plate
- 61 adapter union from booster pump
- 62 solenoid valve controlled by auto controller for free chlorine
- 63 flow meter to control dosing rate
- 64 ball valve d25 to shut off dosing line
- 64a membrane valve to adjust dosing rate
- 65 tubing to injection point



3. Installation

3.1 Piping (see hereto installation diagramme on page 21)

Dissolving water supply has to be separated from filter function that there is no influence on GRANUDOS function as this could cause irritations. Three supply ways are possible as shown on 'Installation diagram" page 21:

1. Take off from behind the filter if static pressure after filter is higher 0,2-0,3 bar.
2. Take off from balance tank by external fitted booster pump (from the GRANUDOS)
3. Use of public water (only if mode 1. or 2. are not possible)

As the GRANUDOS does work only on demand of the buffer tank, water supply has to be cut off after filling procedure by means of a solenoid valve to prevent dilution of the chlorine. At take off situation 2. a spring loaded non return valve can be adequate too.

Ensure that the tapping / dosing points are free flowing and not blocked by scale or corrosion. Pipe runs to be kept as short as possible. PVC-tubing 25 mm for supply, PVC d20 for dosing lines at flow rates below app. 300 l/h, at higher rates use d25.

3.2 Mounting of Feed system

The feed system is to be set left besides the GRANUDOS. Screw the distribution/dosing system plate (60) to the fitting frame and connect the adapter union (57) to feed system, fill water to the pressure gauge guard and screw the pressure gauge (54) to it, then fit it to the union.

The control cable as the power supply cable are to be connected at the GRANUDOS connector box. Inside the connector box a connection diagram is deposited. If not there see connector diagram on page 20.

3.3 External switch off dosing /Feed system/Remote control

<p>The mains power supply is 240 volt, single phase, not connected to filter circulation system. No switch off or irritation on GRANUDOS function from outside!</p>
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- fault remote control non volt on push connector **SO1 conn. 1-2**
- external fitted booster pump for GRANUDOS on push connector **SO1 conn. 3-4**
- to switch off dosing/feed system pump a switch can be connected on push connectors **SO1 conn. 5-6**. The switch interrupts the supply tension of the feed pump relay. At works these connectors are bridged.

3.4 Connecting and Control of Chlorine Dosing Lines

The tubing of the chlorine solution to the injection points - after filter, after heat exchanger (!!) should be executed in PVC d20, tapping points closed with PVC ball valves. Non return valves should be fitted at the injection points. Chlorine auto control cables with 240 volt output are to be connected in the housing back of the dosing line fitting plate (see connecting diagram on page 19). Here a relay system cuts off power supply of the chlorine control valves if feed pump is not working caused by an irritation at the GRANUDOS system and the buffer tank is so closed to the pool system in this case and no flow back to the buffer tank can be.

4. Taking to Operation

4.1 Loading the Drum onto Machine (40-50 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.

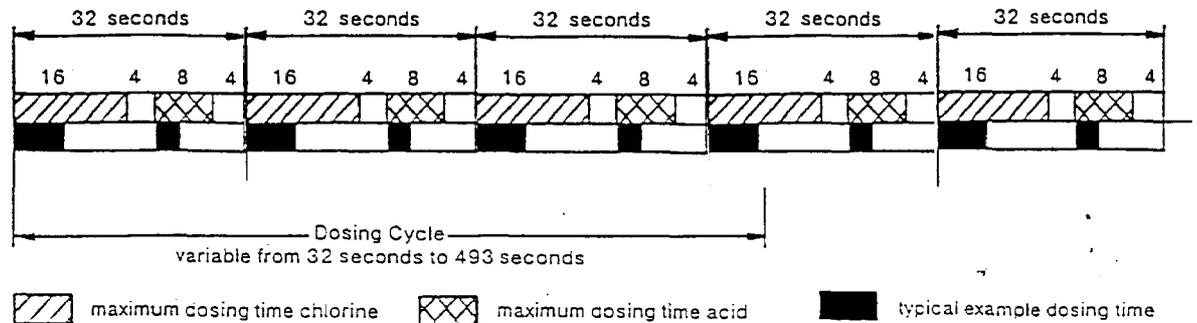
Before loading the drum ensure that the dissolving system cover is fitted

1. Fitting of dosing hopper on to 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 at right. This may be lifted manually, but ensure no injury to the back by lifting properly - or better still use a GRANUD08 DRUM LIFTER.
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 springs provided so that they cannot open itself.
6. Pull the hopper retaining belt from rear to front over the hopper cover and push the belt clasps with the front belt together. (Option)
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).

The GRANUDOS is now in the dosing position.

4.2 Adjusting dosing performance of GRANUDOS

On principle dosing of the GRANUDOS is working to the following scheme where the dosing cycle is always 32 seconds:



Within the GRANUDOS Plus System the function of the GRANUDOS is only to produce the chlorine solution needed for all pools to be supplied. So first the total need of chlorine has to be calculated as addition of the requirements of each pool. In practice a dosing rate of 2-5 times of the actual need is executed.

Note! As the chlorine dosing has to be counter checked by the optical chlorine missing sensor at the mixing chamber the dosing performance is at least 50 % or app. 1000 g/h with the GRANUDOS 45 or 2 kg/h with the GRANUDOS 100.

As the GRANUDOS has to produce a pH-neutral chlorine solution, the dosing of acid has to be adjusted to the needs by measuring the pH at start up of the system. At first you begin with a dosing rate of 1/2 of chlorine if a sulphuric acid 37% is used which is recommended. The pH has to be controlled after the end of a filling step and the end of flushing cycle, where additional acid is dosed for cleaning.

Note: It is more advantageous to have a little turbid solution with a pH of app. 7.2-7.5 than a too acidic one which is more corrosive and affects the pH of the pool water. If the solution is too turbid, increase acid dosing rate, if very clean and smelling to chlorine reduce it.

The percentage values of the following performance table are to be related to the maximum dosing rates:

GRANUDOS 45:	Chlorine app. 2.5 kg/h.	acid app. 3 l/h	*
GRANUDOS 100:	Chlorine app. 5 kg/h,	acid app. 3 l/h	*

With a water flow through the GRANUDOS of app. 1000 l/h the concentration of the chlorine solution is determined. With a dosing rate of e.g. 1 kg/h a concentration of 0,1 % calcium hypochlorite or 0,07% chlorine is reached or 70 grams per 100 litre. This number is needed to calculate the needed flow rate at the dosing lines to the different pools.

The dosing rate of calcium hypochlorite depends on the quality of the material: too much fine powder or too coarse granules results in lower dosing performance. So if high dosing rate is needed a good quality is required.

For acid it is recommended to use sulphuric acid 37-50%. Dry acid at lower concentration is possibly not strong enough for the neutralising job, higher concentration could contain undissolved crystals which could affect the dosing pump.

Table for Dosing performances

Switch Position	Cycle Time	Dosing Time			
		Chlorine		Acid	
		Sec.	%	Sec.	%
1	on all positions 32 seconds = 100%	5	31	2	25
2		5,5	34	2	25
3		6	38	2	25
4		6,5	41	2	25
5		7	44	2,5	31
6		7,5	47	3	38
7		8	50	3,5	44
8		8,5	53	4	50
9		9	56	4,5	56
10		10	63	5	63
11		11	69	5,5	69
12		12	75	6	75
13		13	81	6,5	81
14		14	87	7	88
15		15	94	7,5	94
16		16	100	8	100

4.3 First filling of buffer tank

The GRANUDOS Plus system is completely fitted, chlorine drum is in dosing position, acid dosing is ready, supply water is on pressure. **Programme knob is set on 'Start'**, dosing switch on front fascia is on **'off'**. Now switch on GRANUDOS with mains switch.

GRANUDOS starts and fills the buffer tank with water 10 minutes only for without reacting to alarm switch low level. In this time the function of the flushing/dissolving system of the GRANUDOS has to be proofed as described as follows and the feed pump must be deaerated/vented. If there occur problems, the tank can be emptied (only water in) using the **programme FP1** and it can be worked further by starting the "Start" program again.

4.4 Deaeration of the chlorine solution feed pump

At first filling of the buffer tank connect a hose to the end tube of the deaeration ball valve top of the feed pump, connect it to a drain or bucket and open the ball valve. When by filling the buffer tank water is flowing out, the pump is deaerated. At emptying the tank afterwards by program FP1 – see below - please use this way. So you can be sure that the pump is really deaerated.

4.5 Adjustment of water flow through flushing tank

To adjust the water flow to supply pressure conditions a nozzle is inserted in the union (30) behind the venturi nozzle. If water level in the tank tends to run low (too high suction at the (venturi) 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 put in the 7 mm nozzle or use without nozzle.

4.6 Water level in 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.

4.7 Adjustment of chlorine missing switch on mixing cyclon

If the water is flowing correctly switch on dosing at the front panel switch to start dosing. The chlorine missing switch (33) fitted at the end of the mixing cyclone has a red indication LED and an adjustment screw. If no chlorine is rotating in the cyclone, the LED may not burn. The GRANUDOS control system looks to the sensor indication 8 seconds after 2nd start of the chlorine dosing motor. Then the LED must burn continuously for at least 2 seconds. If this does not happen, the GRANUDOS is switched off, control LED L4 on fascia burns to indicate (subsequently L1 is burning too). There is a fault on the dosing system: motor, dosing screw, blocking and /or the switch must be adjusted: At no chlorine situation turn the screw clockwise till the LED burns, then turn back slowly till it goes out again and further app.10-15°.

4.8 Flow rate to be adjusted at the flow meters

The chlorine dosing performance is defined by the product of chlorine concentration in the solution and the flow rate. For a chlorine dosing performance of 200 g/h and a chlorine concentration of 0,07% (= 70g/100 l) a flow rate of $200/0,7 = 2851/h$ is to be adjusted at the flow meter.

The total output of the feed pump (= 100% dosing performance = 100% flow rate) must stay below the flow through the GRANUDOS by filling the buffer tank.

The tank must be filling slowly at 100% dosing flow rate – all valves open.

4.9 Adjustment of feed (booster) pump pressure

Before switching on the feed pump on buffer system the pump must be deaerated

If water flow through the dissolving system is o.k. turn program switch to “on” position. Now the booster pump at the feed system runs too. Dosing remains 'off'. Open the ball valves of the dosing lines and adjust the flow to the wanted value by means of the upward fitted membrane valves. If service pressure is not high enough to supply all lines sufficiently, pressure is to be increased at the back flow pressure control valve. **In this dosing situation: all lines are dosing 100% of their requirements a back flow to the buffer tank via the pressure control valve must be seen at the back flow tube by opening the tank. Also, if all dosing lines are closed, the booster pump must circulate well the solution back into the buffer tank. If there is no back flow at closed control valves the feed pump will get overheated if no chlorine demand is required and the pump will fail after a short time. In this case reduce the required flow e.g. by increasing the chlorine concentration or install a stronger pump.**

In all operating situations there must be a back flow through the pressure control valve

4.10 Special remarks to GRANUDOS Plus programme

At start any irritation in the flushing tank is suppressed for 12 seconds. Then dosing if no irritation.

At dosing/filling procedure an irritation must be valid for at least 6 seconds till reaction

The “chlorine missing” switch must see chlorine in the mixing cyclone 8 seconds after start of the 2nd chlorine dosing cycle (switch lamp burns with chlorine). If not, GRANUDOS stops and indicates L1 + L4 blink together

Filling finish programme to clean the flushing tank: At buffer tank full 20 seconds only acid, then 20 seconds only water, then stop GRANUDOS, L0 is blinking to indicate ready for new filling.

Flushing of flushing tank in GRANUDOS all hour for 10 seconds if not on filling procedure or full

On programme FP1 feed pump is running for 1 minute for test or to empty the buffer tank. Restart with “reset”

Heating of dosing nozzle is always on

5 Diagnosis Programme / LED Signification (GRD 64PL)

5.1 Starting self check programme

When the machine is switched on a diagnosis programme for the control equipment runs. The same happens when the reset key is pressed.

1. All lights burn together 3 seconds
1. Each light comes on one after another for one second
2. If there is no fault, all red lamps go out and the dosing programme commences.

5.2 LED Indicators for function and irritations

Green LED

on continuously: GRANUDOS in operation

no light: Transformer Tr. 2 or fuse F4 for control system burnt

flashing (0,5 second on, 0,5 second off...)

- Programme knob not on a programme station
- End of test programme A 2, C 2
- Dosing switched off with front fascia switch
- GRANUDOS waiting for start at low level in buffer tank or “reset”

Red LED shows function of dosing and interruptions indicated by the different Sensors. At any interruption (without chemical on reserve) the complete system stops.

Glimmering: indicates dosing: L3 = acid, L4 = chlorine

on continuously: Interruption indicated by a sensor (see below)

Interruption has to exist longer than 6 seconds for further reaction

slow flashing: (2 seconds on, 2 seconds off....) fuse of an output burnt

LED (red) signal

Interruption indicated

L1	on continuously	Any interruption at dissolving system Water flow too low, water level high or low Supply pressure to venturi too low
L1	Slow blink	Fuse F3 burnt (power 24 VDC–800 m amp slow) or transformer Tr1 faulty
L2	on continuously	Chlorine or acid container is empty
L3	on continuously	Chlorine or acid container is on reserve
L4	on continuously	Chlorine dosing missing: 8 seconds after start of 2nd dosing motor cycle sensor at mixing cyclone gives no sign
L4	slow blink	fuse 2 burnt (chlorine dosing motor – 315 m amp slow)
L1 + L4	blink together	Chlorine missing (L4) + subsequently (L1) - no flow as GRANUDOS stops

L1 to L4 blink together

Alarm switch at feed system indicates:

buffer tank overflow or empty, solution in safety tub

- Supply water cut off valve faulty or blocked by particles.
 - Non return valve of distribution system faulty.
 - Pressure control valve at feed system is not work correctly.
- with 3 phase feed pump: motor protection switch active
with pH control: pH outside set limits

5.3 Irritations not indicated by LED

- **Flow meters get turbid, deposits in the buffer tank:**
- Check pH of the chlorine solution, should be neutral at pH 6,8-7,2. probably the pH is too high too low dosing performance for acid. Check acid dosing pump: dosing hose, rollers, blocking of suction/dosing line
- If technics are all o.k. increase dosing rate of acid at the front plate knob as needed, or increase acid concentration to get neutral value
- **Chlorine solution smells strongly to chlorine / acid:**
- Check pH of the chlorine solution, should be neutral at pH 6,8-7,2.
- If pH is too low, reduce dosing rate of acid at the front plate knob to get neutral value

6. Maintenance

It is strongly recommended that a regular maintenance programme is undertaken. In this connection consult your installer and take up a service / maintenance agreement. This way the machine will be maintained in good operating condition.

At least check the following items:

6.1 GRANUDOS

Minimum checks include the following items:

- clean strainer if necessary – a scaled filter causes cavitation and consequently damage of the booster pump
- 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 ok. 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
- all 2 months clean the chlorine dosing screw: dismantle the hopper and take out dosing motor with the screw
- change membrane of floating valve once per year
- change seal of flow switch bobbin all ½ year
- check once per year acid dosing valve – change seals

At taking out of service

- disconnect acid dosing hose from the housing (and 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 the GRANUDOS thoroughly.
- let the GRANUDOS switched on - programme switch on "0" to avoid moisture inside the control housing at cold times..

6.2 Feed system

Every year at the end of the season clean the system by washing the buffer tank system and the control valves first with water 2 times with the procedure of para 4.3 – First filling. Then with a weak hydrochloric acid solution (1 or 2 litres of acid on the 300 litres of water) till all is propper. For washing first close the chlorine control valves, then open them and let the solution go through the dosing lines or let the solution through the deaeration ball valve to drain.

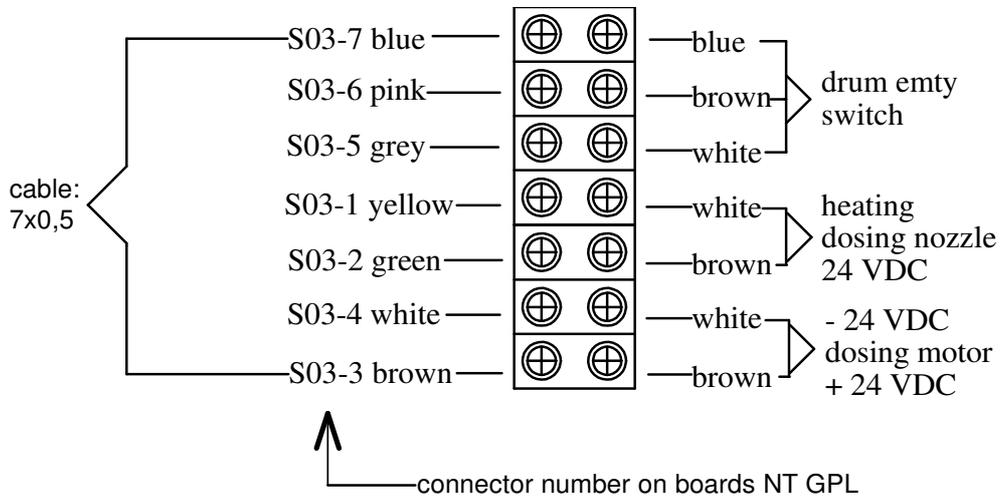
Every year change the membranes of the chlorine control valves and the membranes of the non return valve

Every year check the PTFE slide rings and the ball bearings of the feed pump and the membrane of the pressure control valve.

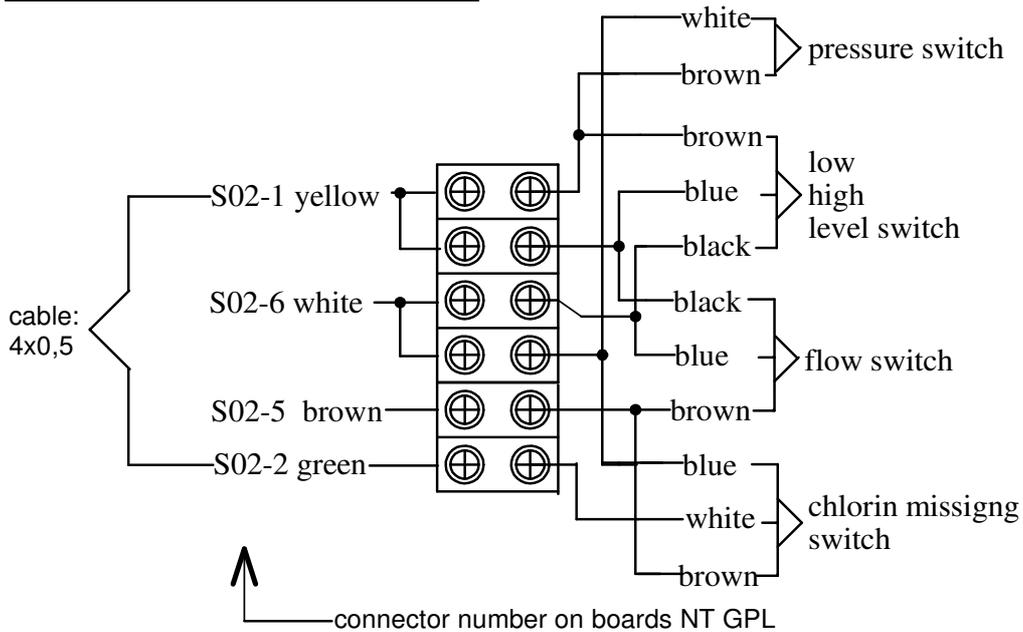
All 3 years change the PTFE slide rings and the ball bearings of the feed pump and the membrane of the pressure control valve

7. Electrics – connectors - fuses

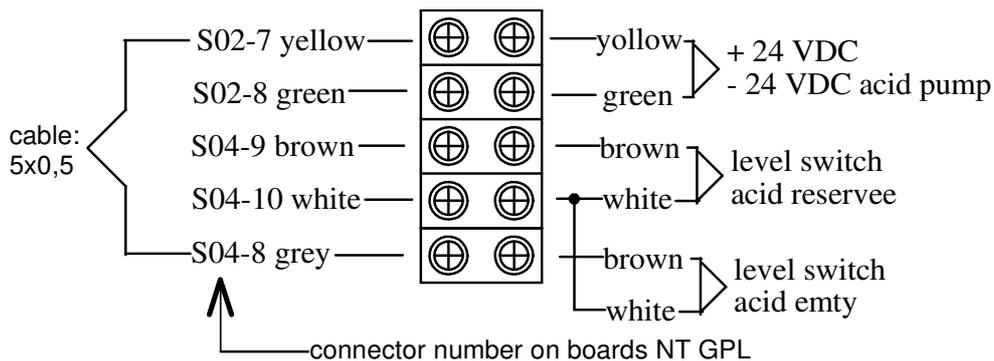
7.1 Terminal dosing hopper



7.2 Terminal Dissolving system

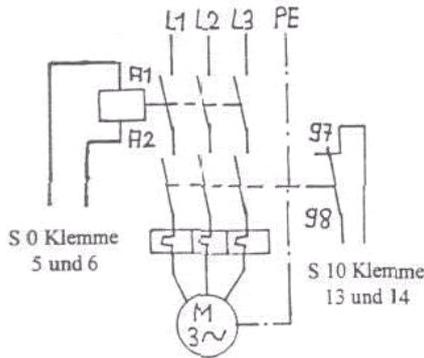


7.3 Terminal acid pump

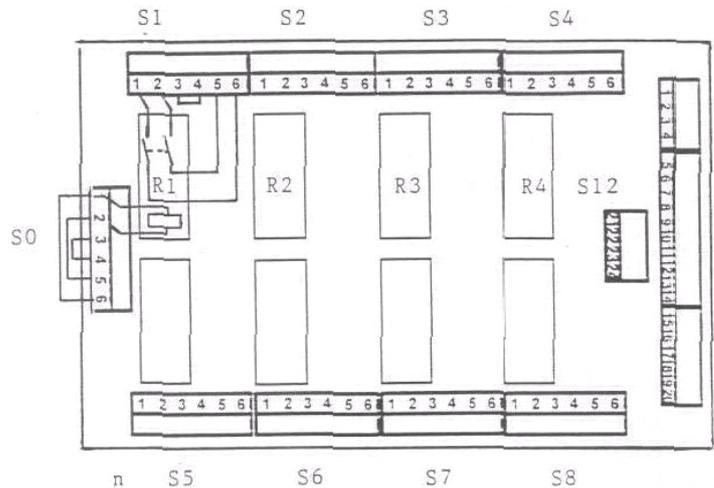


7.4 Connection of buffer tank switches, feed pump, chlorine dosing valves

3-phase pump controlled by GRANUDOS supply from outside (optional)



bar plate to close the chlorine control valves if feed pump does not work (on fault)



Plug S0

Control of feed pump

1	L	from GR (S011-1)
2	N	from GR (S011-2)
3	PE	from GR (S011-3)
4	PE	feed pump
5	N	feed pump 230 VAC
6	L	feed pump 230 VAC

plugs S1-S8 - identically

bar relays for chlorine control valves

1	L	from chlorine controller
2	N	from chlorine controller
3	PE	from chlorine controller
4	PE	control valve
5	N	control valve
6	L	control valve

Plug S9 with S10 - Switch inputs of feed system

1-2	lower switch level (GR on)	7-8	alarm at safety tub
3-4	upper switch level (GR off)	9-10	lower alarm level
5-6	upper alarm level	11-12	alarm on pH
		13-14	motor protection switch

plug S11

connecting cable to GRANUDOS

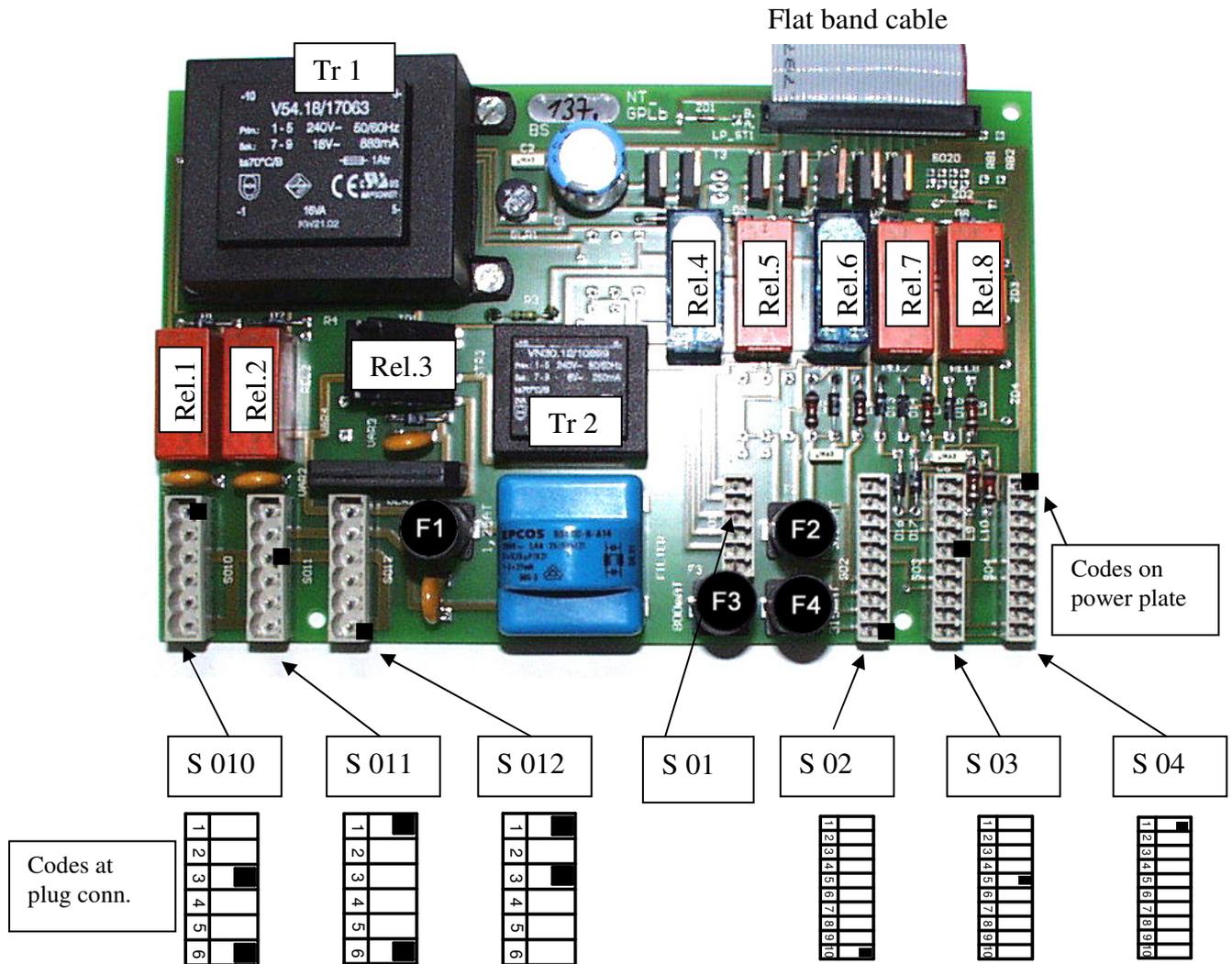
15		reserve
16	white	S04-7 mass
17	yellow	S04-4 alarm min / pH
18	green	S04-3 alarm max / tub
19	brown	S04-2 upper switch level (GR off)
20	grey	S04-1 lower switch level (GR on)

plug S12 -

(optional)

21-23	input additional alarm switch
22-24	output extra alarm non volt to control center

7.5 Power and relay plate with connectors designation



Connectors 240 volts – connectors in detail see next page

- SO10 Booster pump and water supply cut off valve
- SO11 Feed pump and reserve connectors parallel to booster pump
- SO12 Mains supply 240 volt and knocker 205 volt DC

Connectors low voltage or non volt – connectors in detail see next page

The switch inputs are normally open for service, closed for fault/function indication

- SO 1 External connectors to control centre: fault remote control, feed pump control, external booster pump to be supplied by control centre
- SO 2 Dissolving system, acid dosing motor
- SO 3 Chlorine dosing hopper, chlorine reserve switch from outside drum
- SO 4 Control and alarm switches from buffer tank, acid level switches

7.6 Connectors on power plate in detail

Connector SO 10 – booster pump / water supply cut off valve

1	Ph	brown	Booster pump
2	N	blue	Booster pump
3	SL	yellow / green	Earth
4	Ph	brown	solenoid valve water supply
5	N	blue	solenoid valve water supply
6	SL	yellow / green	Earth

Connector SO 11 – feed (chlorine dosing) pump – reserve on booster pump

1	Ph	black	Feed pump
2	N	black	Feed pump
3	SL	yellow / green	Earth
4	Ph		Reserve parallel to booster pump
5	N		Reserve parallel to booster pump
6	SL		Earth

Connector SO 12 – mains supply – knocker at dosing hopper

1	Ph	brown	Mains supply 240 volt
2	N	blue	Mains supply 240 volt
3	SL	yellow/green	Earth
4		black no. 1	+ 205 volt DC knocker
5		black no. 2	- 205 volt DC knocker
6		yellow/green	Earth

Connector SO 1 non volt switches to control centre

1 – 2	to control centre	remote fault indication
3 – 4	to control centre	control of external fitted booster pump
5 – 6	to control centre	shut down of feed/chlorine dosing pump. Pump runs if switch closed – at works bridged

Connector SO 2 to GRANUDOS tank / acid dosing

1	yellow	fault indication from dissolving system
2	green	chlorine missing switch
5	brown	+ 24 VDC supply for above switches
6	white	mass for above switches
7	yellow	+ 24 VDC acid dosing motor
8	green	- 24 VDC acid dosing motor
9-10		remote indication of “chemical on reserve” non volt

Connector SO 3 to chlorine dosing

1	yellow	+ 24 VDC heating dosing nozzle
2	green	- 24 VDC heating dosing nozzle
3	brown	+ 24 VDC chlorine dosing motor
4	white	- 24 VDC chlorine dosing motor
5	grey	chlorine empty switch
6	pink	+ 24 VDC empty switch supply
7	blue	mass empty switch
8	white	chlorine reserve switch
9	brown	+ 24 VDC chlorine reserve switch
10	blue	mass chlorine reserve switch

Connector SO 4 – buffer tank control and alarm switches – acid container switches

1	grey	bottom level control switch to start filling buffer tank
2	brown	upper level control switch to stop filling buffer tank
3	green	upper level alarm switch / alarm switch in safety tub
4	yellow	bottom level alarm switch
6		+ 24 VDC
7		mass (- 24 VDC)
8	grey	acid empty switch
9	brown	acid on reserve switch
10	white	mass to acid switches

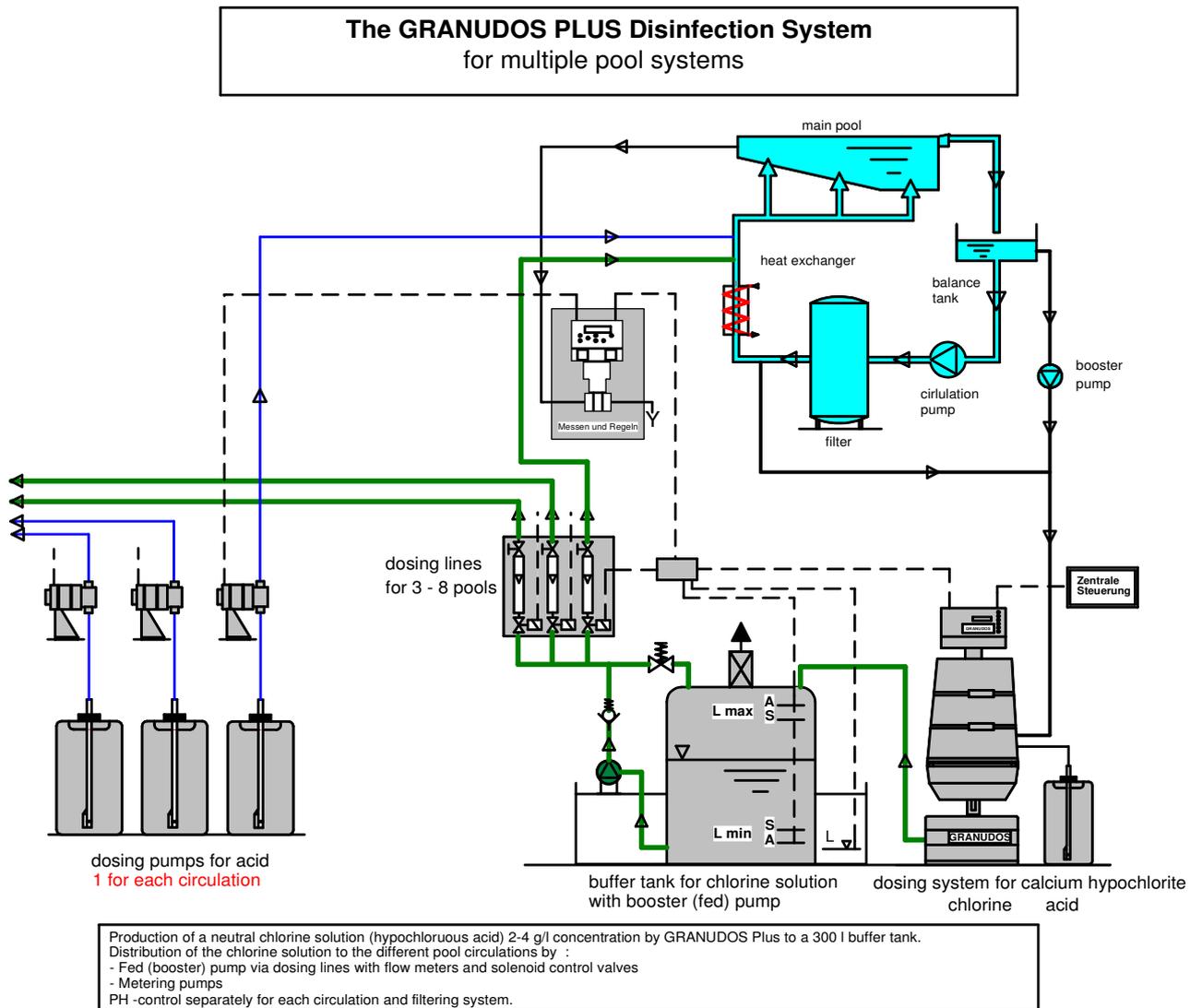
7.7 Fuses, transformers, relays

FO	mains fuse in front plate	6,3 amp slow
F1	fuse supply 240 v (knocker)	1,25 amp slow
F2	fuse chlorine dosing motor	315 m amp slow
F3	fuse power output total	800 m amp slow
F4	fuse control plate	315 m amp slow
Tr1	transformer for power outputs	18 volt, 16 va
Tr2	transformer for control system	6 volt, 1,5 va

Relays

Rel. 1	booster pump / solenoid valve 240 v
Rel. 2	feed pump 240 v
Rel. 3	knocker 205 vdc
Rel. 4	external control of booster pump non volt
Rel. 5	fault remote control non volt
Rel. 6	remote indication of “chemical on reserve” non volt
Rel. 7	internal blocking chlorine dosing
Rel. 8	internal blocking acid dosing

8. Installation Diagramme GRANUDOS PLUS



9. Spare parts list

	<u>Designation</u>	<u>code no.</u>
Chlorine dosing	dosing hopper GR PlusHTH 40 kg	15401
	Cover for dosing hopper GR45 Plus	12866
	dosing motor PLG 30-35 GR45	11676
	dosing motor PLG 30-60 GR100	11546
	Motor holder PLG-d32	11542
	dosing screw d6/D26	11550
	dosing nozzle heated GR	11556
	knocker GR 45complete	11558
Acid dosing	Acid pump Sa complete	11628
	Pump housing Sa	12702
	Roller Sa	12609
	Dosing hose 4,8x1,6 Sa	13414
	Supply carbuoy lance GR Plus standard	15417
	acid injection valve GR	15099
	Repair set for acid valve	15764
Filter	Filter housing d75 GR Plus	15407
	Filter top with ball valve d25	12304
	O-ring on top	11258
Control system	Control plate MCU 1c	13472
	Power plate NTGPI-6	13471
	Power transformer, 240/18 volt, 16VA	11665
	Control transformer 240/18V-2VA	10929
	mains switch	11338
	fuse holder GR	12324
	Knob 4mm	11757
	Cover control box	12600
	Locker for control housing	11512
	Floating valve	floating valve d25 GR Plus complete
membrane for floating valve		11619
floater		11621
level switch GR/PAK		10496
Booster pump	booster pump Lo 2HMS3-A	10657
	slide ring seal complete -A	12800
Flow switch assembly	Flow switch holder GR ½'' – S14 GR Plus	13058
	flow switch GR/PAK ind. 18x1	11603
	flow switch bobbin GR Plus 18/9/25	11607
	connecting tube Si 10/2,5/180	11565
	Venturi ½'' GR/PAK complete	11792
venturi	orifice washer for venturi	11594
	venturi-nozzle ½''	12306
	venturi-body with connector ½''	12305
cyclon	mixing cyclon GR 45/100-6 Plus	11613
	Chlorine missing switch	11609
Feed system	Filter with activated carbon GR Plus	12867
	Level switch in tank ¼'' PVC GR Plus	12803

	Booster pump MPN 130 – 1 bar	11241
	Booster pump MPN 150 – 1,5 bar	11242
	Non return valve d25 Pr	11013
	Pressure gauge guard d25-1/4"	10042
	Pressure gauge 4 bar 1/4"	10667
	Pressure relieve valve d25	10071
	Spare diaphragm	10041
	Chlorine control valve 1/2" Si	12477
	Diaphragm control valve 1/2" Si EPDM	12674
	Diaphragm to hand valve d20	11008
PH- Überwachung	PH-Elektrode GR Plus	12436
	Cable for pH electrode GR Plus	11680

10. pH-monitoring NE of GRANUDOS Plus

10.1 The function of pH-monitoring

At taking into operation of the GRANUDOS Plus the relation of dosing performance of chlorine and acid must be balanced to a neutral pH that there are no deposits of calcium at too high pH nor acidic chlorine solution that increases the corrosion problems and disturbs by evaporation of chlorine and acidic vapour from the solution. A change in the pH indication of the chlorine solution can only be if one of the 2 chemicals is not dosed correctly, or the pH-electrode indication is incorrect.

The pH-value is measured and displayed. Monitoring limits are set from works at pH 6,5 and 7,5. 60 seconds after surpassing these set values the “alarm GW” is shown by intermitted blinking with the displayed value. In addition a buzzer is activated for better attention. This can be depressed by pushing the left bottom knob. The signal to the GRANUDOS – a relay switch closed – can not be taken out: So the Granudos is stopped till the pH is adjusted and back in the limits again.

If there are problems with the adjustment the alarm connecting cable to the GRANUDOS has to be disconnected in the connecting box at backside of the distribution plate on connectors 11-12 on plug 9/10 see point 7.4 on page 18. If this is done there is enough time to bring the pH of the solution again inside the limits.

10.2 Taking to operation and calibration

the needed buffer solutions pH 7,0 and 4,0 is by packed. the controller is set from works to the values:

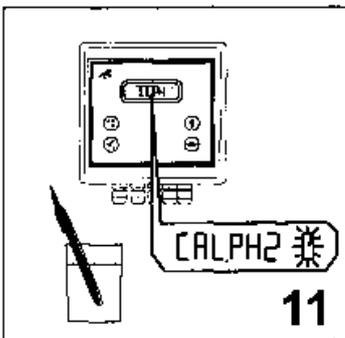
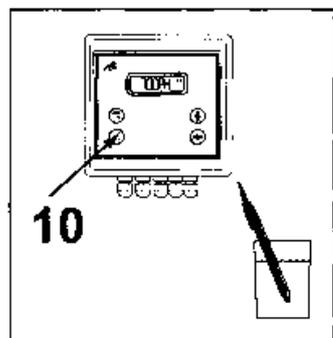
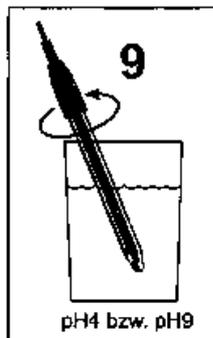
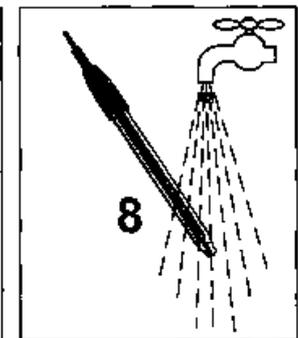
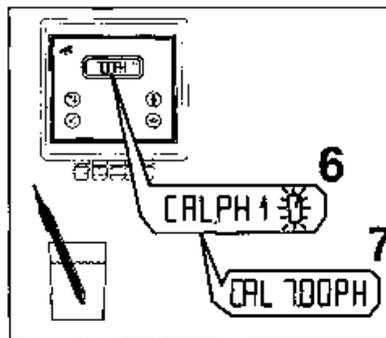
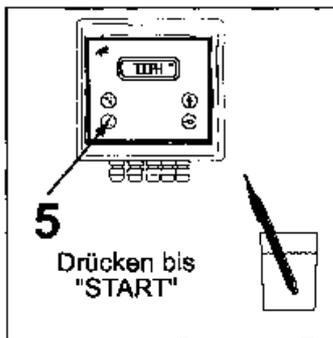
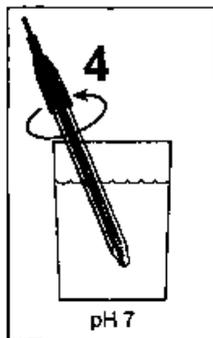
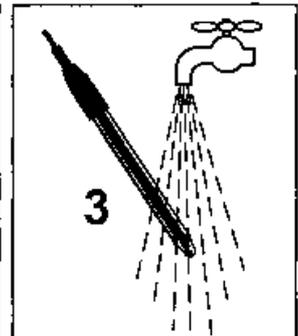
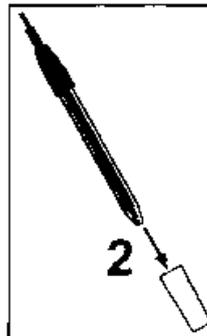
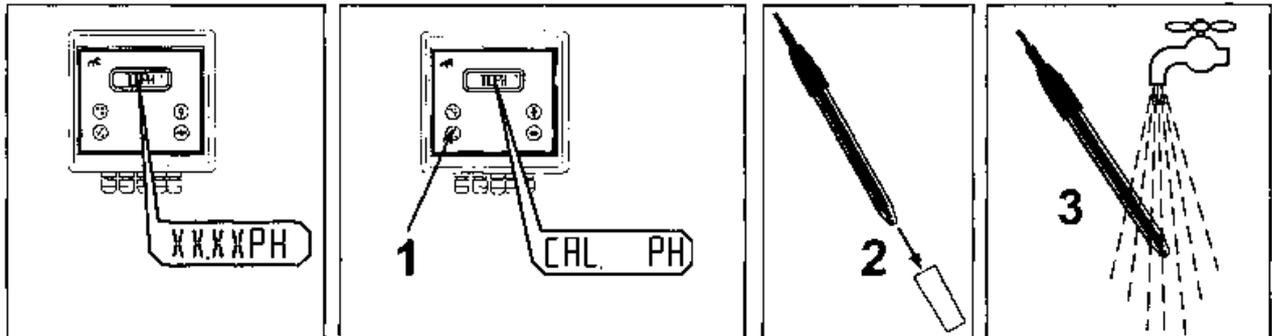
set value limits: pH 6,5 and 7,5

alarm retention time 60 seconds please do not change these values.

Calibration should not be done at filling procedure as in this time the values may change rapidly.

- Turn the programme knob at the GRANUDOS to “0”,
- than close the suction ball valve and the ball valves at the distribution.
- Turn off the electrodes top connector from the electrode.
- turn out the electrode from the holder
- Turn on the electrodes top connector of the electrode again
- Go further on next page with the short guide:
- (1) push the button till CAL PH is shown
- (2+3) wash the electrode with water only
- (4) put the electrode into buffer pH 7,00
- (5) push button till “START” is shown
- (6) Then is shown “CALPH1”, then after some time (7) “CAL 7,0PH” – calibration of pH 7,0 is finished
- (8) clean electrode with water
- (9) put the electrode into buffer pH 4,0
- (10) (11) push button till “CALPH2” is shown
- (12) next after some time the slope (Steilheit) and zero-point deviation (Nullpunkt) is indicated
 - o The display blinks if the slope is less 49 mV or higher 60 mV or the
 - o zero point deviation is more than +/- 50 mV
- (13) push button till “CAL. PH” is shown
- (14) push button till the actual pH-value is shown

KURZANLEITUNG pH-KALIBRIEREN



12 XXXX+XXZ

Steilheit Nullpunkt

Die Anzeige blinkt, wenn die Steilheit kleiner 45mV oder größer 60mV ist. Oder die Nullpunktabweichung größer ±50mV ist. In diesem Fall wird die Steilheit auf 57mV und der Nullpunkt auf 0mV gesetzt.

Kalibrierung wiederholen!

