

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.

## Commissioning Form for GRANUDOS-S4

Please see hereto § 4 Commissioning

Objekt:.....date.....

GRANUDOS-Type:.....year:.....ser.no.....

Commissioning undertaken by.....sign.....

Sign of operator:.....

### 1. Dissolving system (at switches note 6 seconds delay!)

- |            |   |                          |
|------------|---|--------------------------|
| <b>1.1</b> | <b>Adjust pressure switch:</b> <i>see § 4.3</i>                                 | <input type="checkbox"/> |
| <b>1.2</b> | <b>Check pressure switch:</b> <i>close inlet ball valve- L2 burns, GR stopp</i> | <input type="checkbox"/> |
| <b>1.3</b> | <b>Check flow switch:</b> <i>close outlet ball valve - dos. off, L1 burns</i>   | <input type="checkbox"/> |
| <b>1.4</b> | <b>Check level switch:</b> <i>switch body up - dos. off, L1 burns</i>           | <input type="checkbox"/> |
| <b>1.5</b> | <b>Check level switch:</b> <i>switch body down - GR stopps, L2 burns</i>        | <input type="checkbox"/> |
| <b>1.6</b> | <b>Adjust water level:</b> <i>- adjust washer to pressure conditions</i>        | <input type="checkbox"/> |
| <b>1.7</b> | <b>Check function of floating valve:</b> <i>water flow reacts smoothly</i>      | <input type="checkbox"/> |

### 2. Dosing unit chlorine

- |            |   |                          |
|------------|---|--------------------------|
| <b>2.1</b> | <b>Function heating nozzle:</b> <i>dosing tube warm</i>                         | <input type="checkbox"/> |
| <b>2.2</b> | <b>Function empty switch:</b> <i>turn drum - L4 burns</i>                       | <input type="checkbox"/> |
| <b>2.3</b> | <b>Function dosing motor:</b> <i>programme „test chlorine“ - chlorine dosed</i> | <input type="checkbox"/> |
| <b>2.4</b> | <b>check clamp bands and safety belt</b>  | <input type="checkbox"/> |
| <b>2.5</b> | <b>introduction to drum change § 4.6</b>  | <input type="checkbox"/> |

### 3. Dosing unit pH-correction

- |            |   |                          |
|------------|---|--------------------------|
| <b>3.1</b> | <b>Function empty switch:</b> <i>take suction lance out of container - L3 burns</i> | <input type="checkbox"/> |
| <b>3.2</b> | <b>Function dosing pump:</b> <i>programm "test acid" - acid is suct up</i>          | <input type="checkbox"/> |

### 4. Control unit – after opening of the housing

- |            |  |                          |
|------------|--|--------------------------|
| <b>4.1</b> | <b>check all push connectors:</b> <i>well pushed in</i>                      | <input type="checkbox"/> |
| <b>4.2</b> | <b>External control:</b> <i>auto-controller on „Manual“ - chlorine doses</i> | <input type="checkbox"/> |
| <b>4.3</b> | <b>External control:</b> <i>auto-controller on „Manual“ - acid doses</i>     | <input type="checkbox"/> |
| <b>4.4</b> | <b>External control:</b> <i>check any linked switch off</i>                  | <input type="checkbox"/> |

### 5. Other jobs

- |            |  |                          |
|------------|--|--------------------------|
| <b>5.1</b> | <b>Clean GRANUDOS thoroughly</b>                                   | <input type="checkbox"/> |
| <b>5.2</b> | <b>Clean environement of GRANUDOS thoroughly</b>                   | <input type="checkbox"/> |
| <b>5.3</b> | <b>Operation instructions discussed and handed to the operator</b> | <input type="checkbox"/> |

No warranty without fully signed commissioning form!

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Test certification: - loose insert -

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## 1. Notes to this manual

### 1.1 What does that manual describe

That manual describe installation, commissioning and operating of the machine.

### 1.2 Target group

Only people advised in the function are allowed to operate the machine. The mounting of the machine may only be executed by skilled workers.





### 1.3 Safekeeping of the manual


All operation manuals are to be safekept for direct use nearby the machine.


### 1.4 Intended use




The machine is only allowed to be used in the intended purpose. There is no implied warranty for other use than the intended one.

### 1.5 Safety notice/used symbols:

	<p><b>Danger!</b> Under this sign any real fact is described that could lead to personal injury if not regarded.</p>
	<p><b>Attention!</b> Under this sign any real fact is described that could lead to material damages if not regarded.</p>
	<p><b>Note!</b> Under this sign any real fact is described that could lead to improvement of your process if regarded.</p>
	<p><b>Corrosive!</b> Under this sign any real fact is described that could lead to personal injury or material damages if not regarded.</p>

	<p><b>Attention:</b> any works at the electrical parts of the machine may only be executed by skilled workers. Electrical parts must be switched off. If irritations at the electrical supply do occur, switch off the machine immediately. Fuses are only to be exchange through original ones with the same strength.</p>
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	<p>Waste disposal</p> <p>Note:</p> <p>The operator is responsible for the disposal in conformity to the national regulations.</p>
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	<p>Mandatory sign: Use eyes protection</p>
	<p>Mandatory sign: Use face protection</p>
	<p>Mandatory sign: Use protection gloves</p>

## 2. Technical Description

### 2.1 Technical Data

The GRANUDOS 45/100-S4 dosing system comprises:

- main vertical support with rotating drum carrier
- dosing assembly for calcium hypochlorite gran
- 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**  
 see para "control system":

chlorine: GR45 mot 35 rpm app. 2,4 \* ( 0,44\*  
 GR100 mot 60 rpm app. 4,0 \* ( 0,7 \*\* ) kg

acid:

\* cycle time 1 minute

\*\* cycle time 6 minutes



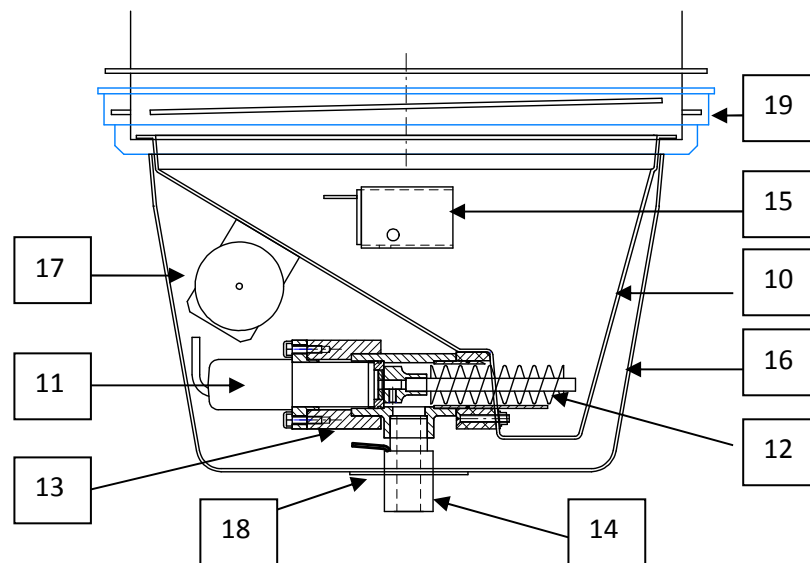
- |    |                         |
|----|-------------------------|
| 1  | drum carrier            |
| 2  | 2 clamp bands           |
| 3  | belts for fasten drum   |
| 4  | dosing hoper            |
| 5  | locker for safety belt  |
| 6  | dissolving system       |
| 7  | controlsystem           |
| 8  | type label (not seen)   |
| 9  | locker for drum carrier |
| 10 | acid pump               |
| 11 | dust protection tube    |
| 12 | acid carboy lance       |
| 13 | acid container with tub |

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%.

## 2.2 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.

## 2.3 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".

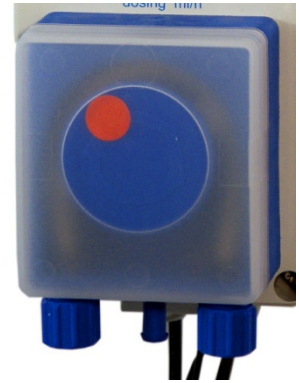
## 2.4 Acid Dosing

The acid required for pH-control is metered by the peristaltic pump to the flushing water via the dosing injector. As the pH-control is vital for the correct function of the chlorine/ORP-control, chlorine dosing is stopped if the level switch at the supply carboy lance indicates container empty. Besides this primary effect of controlling the pH-value, the dosing of the acid at this point ensures an always clean dissolving system and tubing, blockage of the injection valve is avoided.

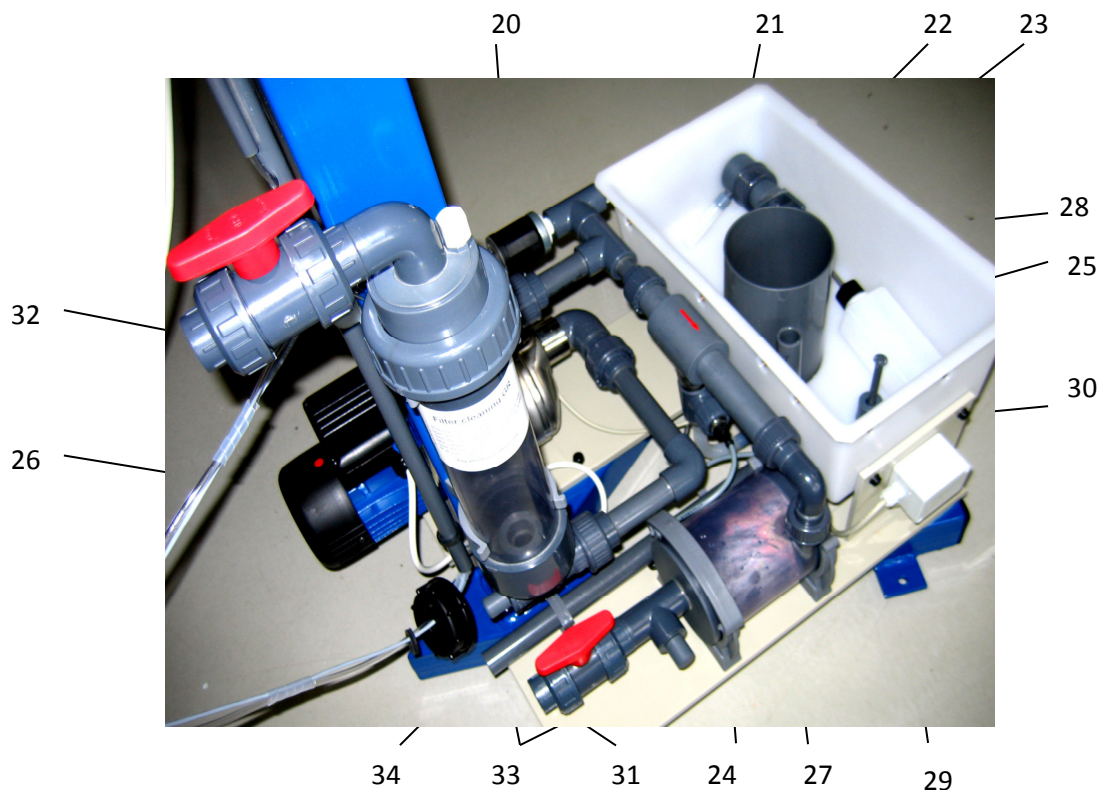
As acid use one on base of sulphuric acid (37 – 50 %), please do not use concentrated hydrochloric acid for this job as that penetrates the peristaltic hose and will destroy the pump head. Diluted hydrochloric acid may be not strong enough for the neutralisation job. Please note that using dry acid (sodium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



## 2.5 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 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 2.6.3, page 11 "Dosing Performance - Dosing scheme").
- 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.

## 2.6 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.

### 2.6.1 Operation elements

#### operation elements on front plate

- mains switch
- main fuse 3,15 Aslow
- 1 programme switch for test- and Operation programmes
- 2 knobs to adjust the wanted dosing performance for chlorine and acid
- 1 LED green to monitor operation
- 4 LED red to monitor irritations

#### operation elements inside on control plate:

- 2 fuses 500 mAslow,
- Code-switch to select programme alternatives



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.

## 2.6.2 Operation and Test Programmes

### **Leistungssteller für Chlor und Säure:**

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

At the performance knobs for chlorine and acid the dosing performance that is selected by the code switches on the control plate is reduced to the wanted one.

### **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 exceeds 50% 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**

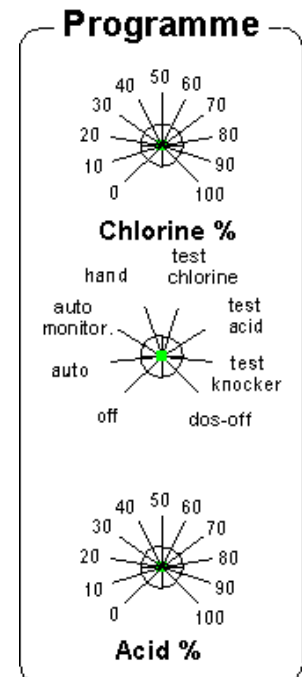
Dosing switched off, the booster pump continues. Used for maintenance.

### **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.



### 2.6.3 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 Calhypo and acid at continuous dosing:

GRANUDOS 45: dosing motor PLG 35 /dosing screw d26: app. 3,6 kg/h  
 GRANUDOS 100: dosing motor PLG 60 /dosing screw d26: app. 8,2 kg/h  
 GRANUDOS 45 and 100: acid pump Sa with dosing hose 4,8x1,6 mm: app. 10,6 l/h

#### 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 time	Dosing times Chlorine-acid 100%				Dosing performance at 100% set with knob max
	Code switch	S1	S2	S3 S4	
1 minute	off	off	30-20 seconds	off off	1,8 kg/h – 3,5 l/h
1 minute	off	off	40-10 seconds	on off	2,4 kg/h – 1,7 l/h
1 minute	off	off	20-20 seconds	off on	1,2 kg/h – 3,5 l/h
1 minute	off	off	10-10 seconds	on on	0,6 kg/h – 1,7 l/h
6 minutes	on	off	at standard dosing times 30/20 sec.		0,3 kg/h – 0,6 l/h
8 minutes	off	on	at standard dosing times 30/20 sec.		0,2 kg/h – 0,4 l/h
12 minutes	on	on	at standard dosing times 30/20 sec.		0,15 kg/h – 0,3 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% = 30seconds, acid dosing 100% =20 seconds.

Performance set by performance knob: chlorine 30%, acid 10%

**Action:** Chlorine dosing 30% of 30 seconds = 9 seconds, then 5 seconds pause, then acid dosing 10% of 20 seconds = 2 seconds, then pause 60 – (9+5+2) = 44 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....

## 2.6.4 Diagnosis by LED indication

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

<b>on continuously:</b>	GRANUDOS in operation
<b>no light:</b>	Transformer or fuse for control system burnt - no mains supply
<b>fast blink:</b>	(0,5 second on, 0,5 second off...)
	- end of test programmes
	- programme "dos. off"
	- programme "off"
	- GRANUDOS switched off by an external control system

Diagnose		
chlorine empty	dosing	+
acid empty	dosing	+
level low pump pressure	off	+
level high suction low	dos off	+
on	off	+
burns	blinks	

#### 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

- there is really an irritation or
- 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.**

<b>Red lamp 1: burns</b>	<b>level high suction low</b>	level in the flushing tank is high the suction performance of the venturi is too low
	<b>dos off</b>	dosing is switched off by an external monitoring switch (switch connected to conn. 7-8 on push connector S06)
<b>blinks</b>		fuse F2 burnt (power 24V complete)

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.

**Red lamp 2:**

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

**blinks** Fuse F4 burnt (chlorine dosing motor)

**Red lamp 3:**

<b>burns</b>	<b>acid empty dos. off</b>	acid empty switch active (closed) or faulty leakage of the dosing hose (option) dosing acid <b>and</b> chlorine are switched off
<b>flickering:</b>	<b>dosing</b>	<b>acid dosing pump runs. If not, motor is faulty or breakage on</b> cable/connection.
<b>blinks</b>		On programme "auto monitored" the monitoring time of acid dosing is exceeded. See programme description
		<ul style="list-style-type: none"> <li>- too high bather load – increase dosing performance</li> <li>- fault in dosing system – see following para</li> <li>- fault in auto-controller– see following para</li> </ul>

**Red lamp 4:**

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

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

**blinks**

- On programme "auto monitored" the monitoring time for chlorine is exceeded. See programme description
- Too high bather load – increase dosing performance
  - Fault in dosing system – see following para
  - Fault in auto-controller– see following para

## 2.6.5 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

## 2.7 Filter disinfection at back wash – high chlorination

---

For the duration 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 filter disinfection 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 input is active chlorine and acid to the back wash water.

### 3. Installation

#### 3.1 Placing of the GRANUDOS in the pool technique room

Please consider the national regulation for installing chlorine dosing devices.  
In general please consider:

- The installation place may not be a working room
- The place should be vented – but not breezy
- Must have a drain for spilling water

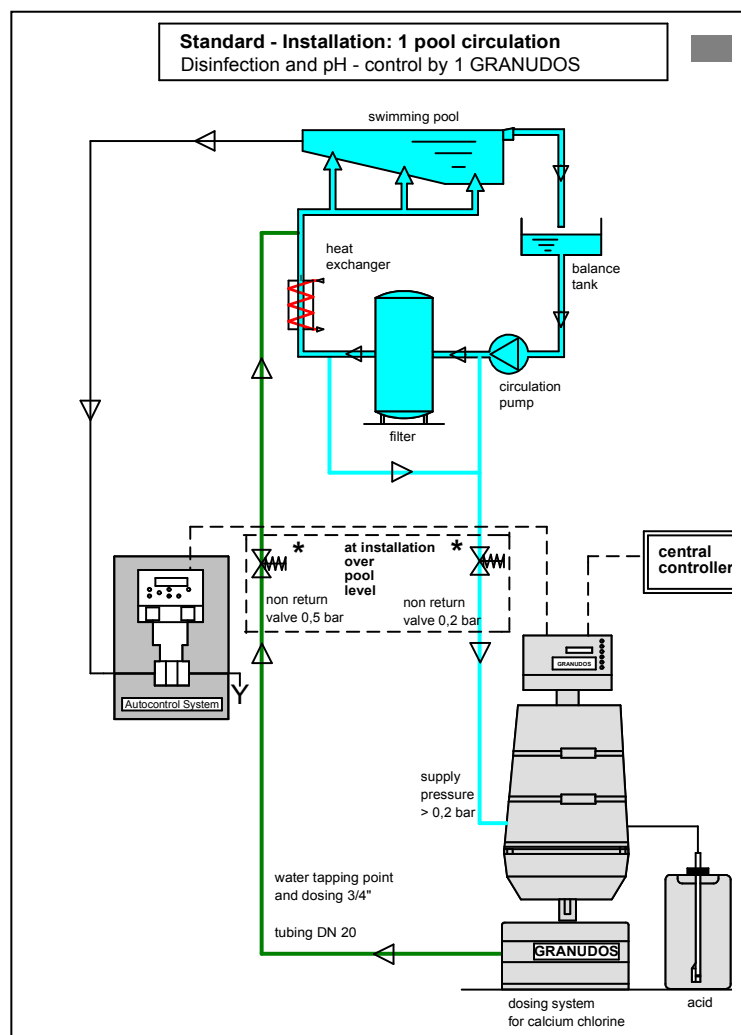
**After finishing the installation works, the GRANUDOS has to be fixed on the floor using the by-packed screws.**

#### 3.2 Installation to the pool circulation

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 supply 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**:

Supply 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.







**The following advices have to be regarded severely as otherwise you have to calculate with malfunction! Warranty claims cannot be accepted.**

**No warranty without signed commissioning formula!**

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.
5. If the GRANUDOS is to be mounted above pool level a free working non return valve has to be mounted in the supply tubing, and in the dosing tubing a spring loaded one to avoid empty running of the tubing at switch off the machine. (see sketch above – conformable valves are available)
6. Connect the overflow to the drain.

If the GRANUDOS is not working well, fit the pressure gauge supplied with at inlet and



**Attention: any works at the electrical parts of the machine may only be executed by skilled workers. Electrical parts must be switched off.**

outlet of the GRANUDOS to measure the real

pressure conditions and check with above range.

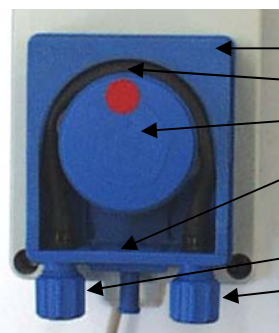
### 3.3 Electrical connection

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.

### 3.4 Fitting the acid pump roller/tube

Pull out the dosing tube from the housing and push on the roller onto the motor shaft. Turn the roller clockwise and bring in the tube again using the recess at the roller. Push on the safety disc on the shaft and the housing cover on the housing. Push in the acid carboy lance into the acid container.



Pump housing  
Roller  
Safety disc  
Tube holder with connectors  
Suction side  
Pressure side

#### **Attention**

The tube may not be twisted.

Pay attention to the marks on the tube!

#### 4. Taking into operation



**Pay attention to the safety devices on the chemical container**

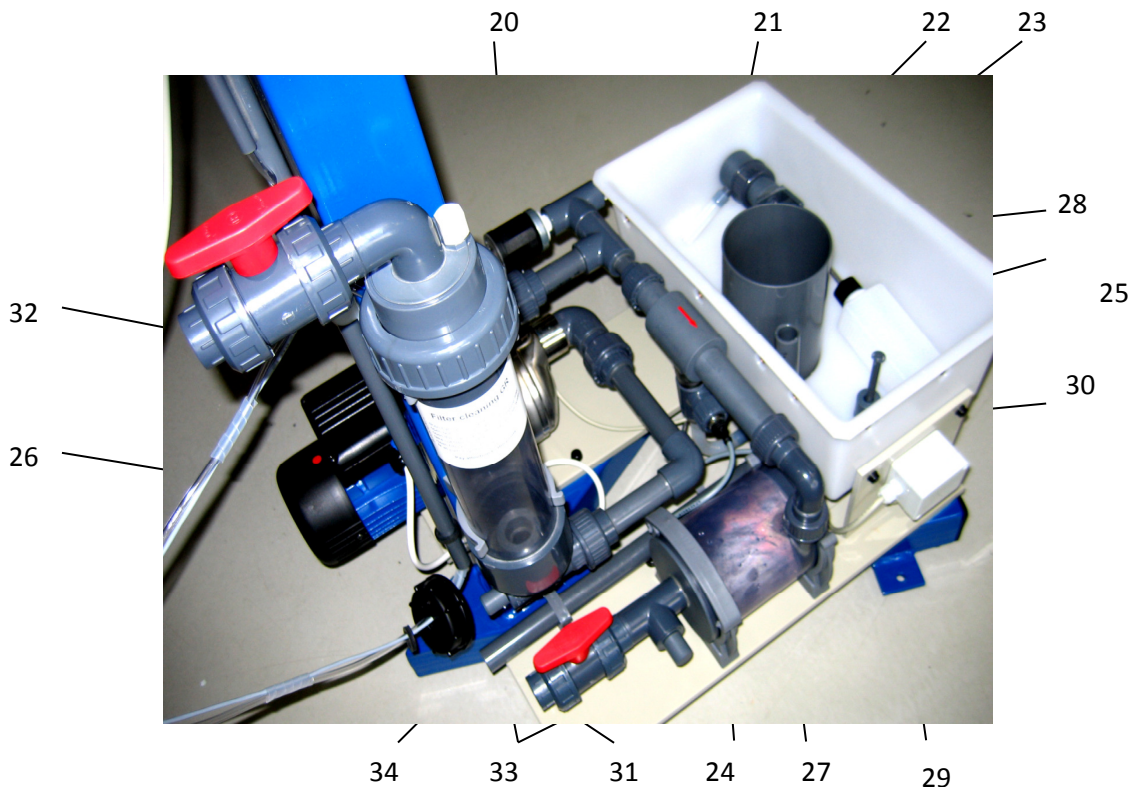
**In service the dissolving system must be covered with the supplied cover**



**Only instructed personnel may work with the ChloRun-FB**

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.



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		

After having fitted the machine open the ball valves at the tapping points and at the GRANUDOS inlet valve (32) first. Press the floater of floating valve (21) 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 function the water flow through the flushing tank must run in the correct way as described below.

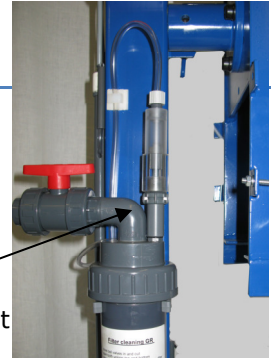
#### 4.1 Check of the pump

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.

#### 4.2 Deaeration of the water supply tubing

Before 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 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.

**An automatic vent device is available** – see picture. As this automatic vent is wanted to be not 100% tight, a discharge tube is led to the flushing tank.



**If in operation or at unattended switching on the pump gets air e.g. at mounting the machine above pool level the slide ring seal of the booster pump runs dry, get hot and gets subsequently leaking.**

#### 4.3 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 L1 and L2 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.

#### 4.4 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.

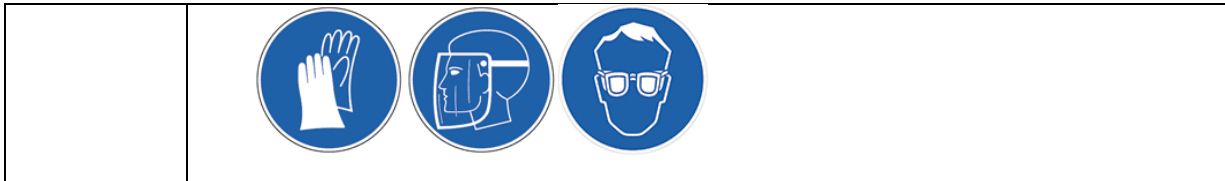
To adjust the water flow to the pressure conditions of the filter system a washer nozzle is inserted in the union behind the venturi. If the water level in the tank tends to run low or if the switch bobbin is at top without pump running (too high suction at the venturi – high pressure difference between 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.

#### 4.5 Water level in the flushing tank

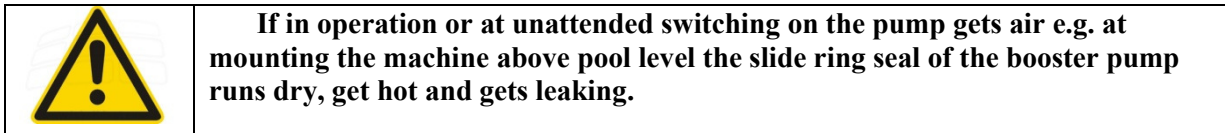
Water level in the tank should be maintained at half full. To obtain a higher level unscrew float rod, for a lower level screw in the float rod. One turn gives about 1 cm in height.

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

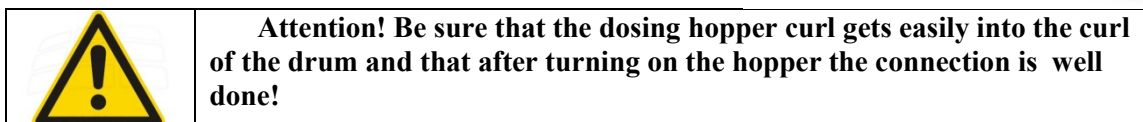
**Before carrying out any task involving chemicals the operator should put on the relevant protective clothing, at least for protection of eyes, breathing, skin and clothing i.e. goggles, respirator, gloves and apron.**



**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.**



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.

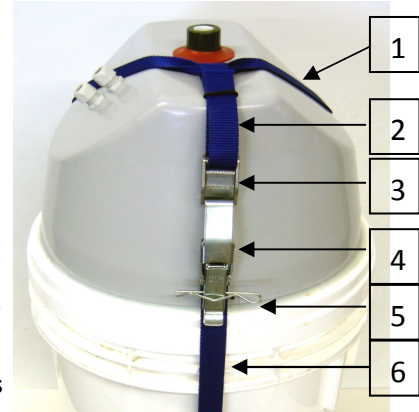


4. Ensure that the drum is standing upright and symmetrically on the drum carrier, touching the rear rails being with the drum edge below the retaining rod.

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 (1+2) from the rear to the front over the hopper cover and hook the clamp (4) into the hinge (3), lock the clamp and put in the securing clip (5).
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 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.
8. The wind protection tube down in the flushing tank cover is now to be positioned so that any light wind will not distribute the chlorine dust to the environment. The heating nozzle should be covered approx. 2-3 cm by the protection tube.



The GRANUDOS is now in the dosing position.

#### 4.7 Providing of acid

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.

#### 4.8 Adjusting the 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:

Bathers charge, temperature, wanted chlorine concentration etc. Normally a standard indoor pool needs about 300 grs of calcium hypochlorite per 100 m<sup>3</sup> in volume per day. An outdoor pool needs approximately 4 to 5 times more as the sun decomposes the free chlorine. With the knowledge of the hourly consumption the relevant dosing performance is preset by the code switch on the control plate.

##### Example:

An indoor pool of 300 m<sup>3</sup> 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.

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 manually by pouring acid to the pool water – but pay attention that no droplets of acid will meet you – your clothes!**

### 4.9 Dosing Controlled by Auto-Controller

Using the programme “auto” and connecting an external auto controller for free chlorine and pH the set dosing cycle is activated. The dosing of the 2 chemicals is running independent from each other if the control output of the auto controller for free chlorine or pH is active > 0,5 sec. The dosing rate set at the GRANUDOS should be at high level or maximum.

It is strongly recommended to connect both, chlorine and pH auto-controller to the GRANUDOS even there is another dosing system for acid in use. In that case acid dosing of both systems should be connected in parallel, at the GRANUDOS a small dosing rate should be selected. This is to avoid overdosing of acid in case of malfunction of chlorine dosing. But please make sure that the acid dosing rate is enough for the cleaning job.

The auto controller output must be of 230 VAC on/off – or non volt contact pulse length control - see wiring diagram. The control cable for pH and free chlorine (ORP) are pre-fitted into a connector box to be mounted at the wall. Never switch off the GRANUDOS during dosing cycle: first switch off dosing, only then the GRANUDOS.



**The auto-control system may not switch the GRANUDOS! Only on connectors S03/S08. Never switch off the machine during dosing cycle. It could be possible that chlorine granules would interrupt the flushing and subsequently together with the acid we could get chlorine.**



**Please note, that the measuring water never should be taken from behind the filter. We shall get the measuring water as quick as possible from the pool.**

## 5. 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 cavitations and consequently damage of the booster pump


	<b>For cleaning take out the complete filter from the machine and clean the insert outside</b>
---	--

- 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

	<b>Never wash the machine with jet water as water may come to the calcium hypochlorite bulk in the drum and cause an exothermal reaction with subsequent fire.</b>
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### At taking out of service

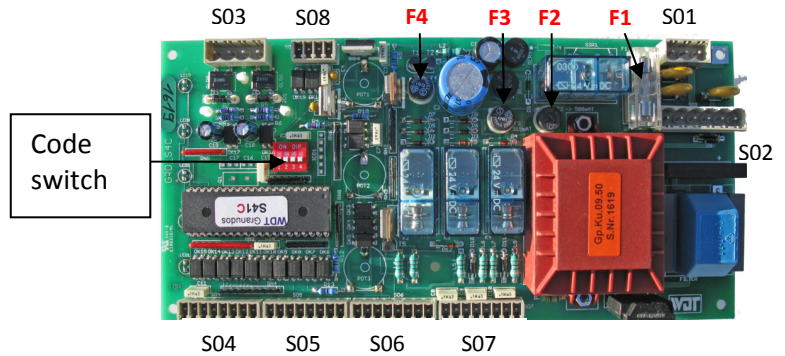
- take out acid pump roller from the pump shaft to avoid long term compression at one spot of the dosing tube
- empty the dosing hopper, take out the chlorine dosing screw, clean all thoroughly and store it at a dry place if moisture is possible.
- clean all parts of GRANUDOS thoroughly.
- leave the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

	<b>At taking into operation again please pay attention to the para 4. Start up procedure. Work through the commissioning formula!</b>
---	---

**6. Control board S41c - wiring - fuses**

- F1** fuse primary 500mA lazy
- F2** fuse 24Vcomplete 500mA lazy
- F3** fuse controller 315 mA lazy
- F4** fuse dosing chlorine 315 mA lazy

Transformer: 2x 9V, 5 VA  
 Fuse on front plate 3,15 A lazy



**Dosing performance GRANUDOS 45**  
**Dosing cycle time**

Code switch	S1 S2		Dosing times 100%	Chlorine-acid		Dosing performance at 100% set with knob max
	S1	S2	S3	S4		
1 minute	off	off	30-20 seconds	off	off	1,8 kg/h – 3,2 l/h
1 minute	off	off	40-10 seconds	on	off	2,4 kg/h – 1,6 l/h
1 minute	off	off	20-20 seconds	off	on	1,2 kg/h – 3,2 l/h
1 minute	off	off	10-10 seconds	on	on	0,8 kg/h – 1,6 l/h
6 minutes	on	off	at standard dosing times 30/20 sec.			0,3 kg/h – 0,5 l/h
8 minutes	off	on	at standard dosing times 30/20 sec.			0,2 kg/h – 0,4 l/h
12 minutes	on	on	at standard dosing times 30/20 sec.			0,15 kg/h – 0,25 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. pH/chlorine 240 Volt**

with cable to connector box

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

**connector S08 – pH/Chlorine non volt**

**connector S04 –input switches**

- 1–2 wh-br acid empty**
- 3–4 leakage acid pump**
- 5–6 machine off (by external 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

\* e.g. flow switch in tubing to the pool

\*\* suitable for low voltage only < 40 volt!



## 7. Spare Parts GRANUDOS 45/100-S4

	<u>Designation</u>	<u>Code No.</u>
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 with maintenance kit	11676*
	dosing motor PLG 30-60 GR100 (GB) with maintenance kit	11546*
	motor holder PLG-d32	11542
	motor holder PLG- d25 (GB)	11541
	dosing screw d6/D26/L120	11550*
	dosing screw d6/D19/L120 (GB)	11549*
	dosing nozzle heated GR10/45/100	11556
	knocker GR 45 - V61/S4 lead length 2,4 m	11558
	empty switch cable 0,6m GR45	10337-1
	clamp band GR45	11500*
	safety belt, kit	17978
	safety belt, porting belt	17975*
	acid pump Sa 4,8 GR45/100 without housing	11628
	Acid dosing	pump housing Sa blue
acid pump roller Sa yellow		12609
dosing hose Sa 4,8x1,6 Ph 2x		13414*
suction carboy lance SN GR45 30l 4x1		12523-1
acid injection valve 1KFa-3/8"		15099
Filter d75	maintenance kit acid injection valve 3/8" KF + KFa	16370**
	filter housing d75 GR	12746
	filter top d75 GR/ PAK with ball valve red handle	12304
Control system	O-ring filter top d75 EPDM	11258**
	control plate GR S4c	14200-2
	transformer S4, 2x9 volt, 10VA	14383
	mains switch GR	11338
	fuse holder front plate GR/PAK	13960
	fuses - set for GR S3/S4	13045**
	knob 6mm with nose	11031
	cover control housing Vario GR-PAK-ME with hinge	12600
	locker with screws for control housing Vario	11512
	floating valve	17006
Floating valve	floating valve d25 GR 45/100 complete	17006
	maint. kit for suction tube 1/2" and float valve d25	16373**
	floater 0,25 l for floating valve d25 GR	11621
	level switch flushing tank 3/8" GR/PAK lead 0,35m	10496
Booster pump	booster pump Kreiselp. 1HM04 GR/PAK-SIC/SIC	24618-1
	slide ring seal Lo 2HMS 3/4-A carbon-ceramic	12800*
	ball bearings - set Lo HMS3A 2x 6202 C3	16243
Flow switch assembly	flow switch holder GR 1/2" - S14-US	12729
	flow switch bobbin 1/2" US	12730
	flow switch 18x1 ind. for GR/PAK, lead 0,7m	11603
	seal ring Vi 14/8,7 for flow switch bobbin	15801**
	connecting hose to flow switch holder 10x2,5x180 Vi	11565-1**
Venturi	venturi 1/2" GR complete	11792
	orifice washers kit 5,5 - 6 - 7 mm	11594
	venturi diffusor nozzle 1/2" GR	12306
	venturi booster nozzle 1/2" GR	12305
Cyclone	mixing cyclone GR 45-6	11612
maintenance kit	Seals, fuses, maintenance record for all GR	12631

\*parts under normal wear,

\*\*included in maintenance kit 12631

## 8. Maintenance List GRANUDOS 10/45/100

Object:..... date:.....

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

Maintenance executed by .....sign.....

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/adjust 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 of 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 _____                | [ ]        |                                       |     |
| 1.12 change o-rings in the unions _____                 | [ ] yearly |                                       |     |

#### **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 _____    | [ ] yearly |                     |     |
| 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 _____                 | [ ] yearly | change roller _____       | [ ] |
| 3.4 change acid valve insert / sealing _____ | [ ] yearly |                           |     |

#### **4 Additional jobs**

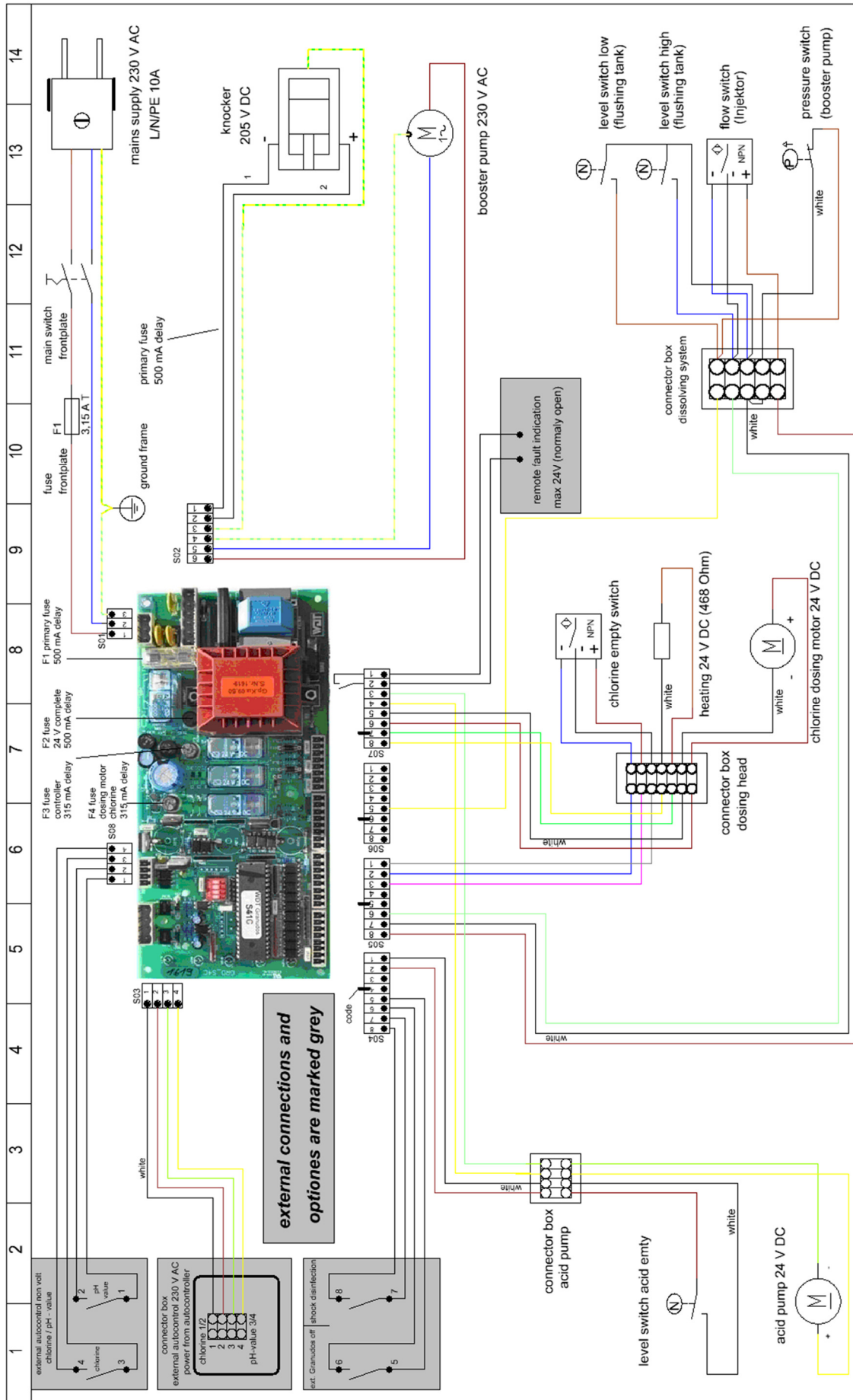
- |   |     |
|---|-----|
| 4.1 clean GRANUDOS carefully: _____         | [ ] |
| 4.2 clean environment of the GRANUDOS _____ | [ ] |

.....

.....

.....

### 9. Wiring diagram



Änderungen		Dateiname: granudos 45-100 s4.spl	
Datum	Art der Änderung	Name	
1.3.10	Platine S4b auf S4c	Müller	Steuerung ab 1.3.10
		Müller	
Datei Speicherplatz: z:\log-wdt\13_s4c\programme\s-plan_40\schaltpläne\3-granuidosieranlagen\30_granudos.granudos 45-100\granudos 45-100 s4.spl		Blattbezeichnung: SP-30/100301	



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86637 Wertingen