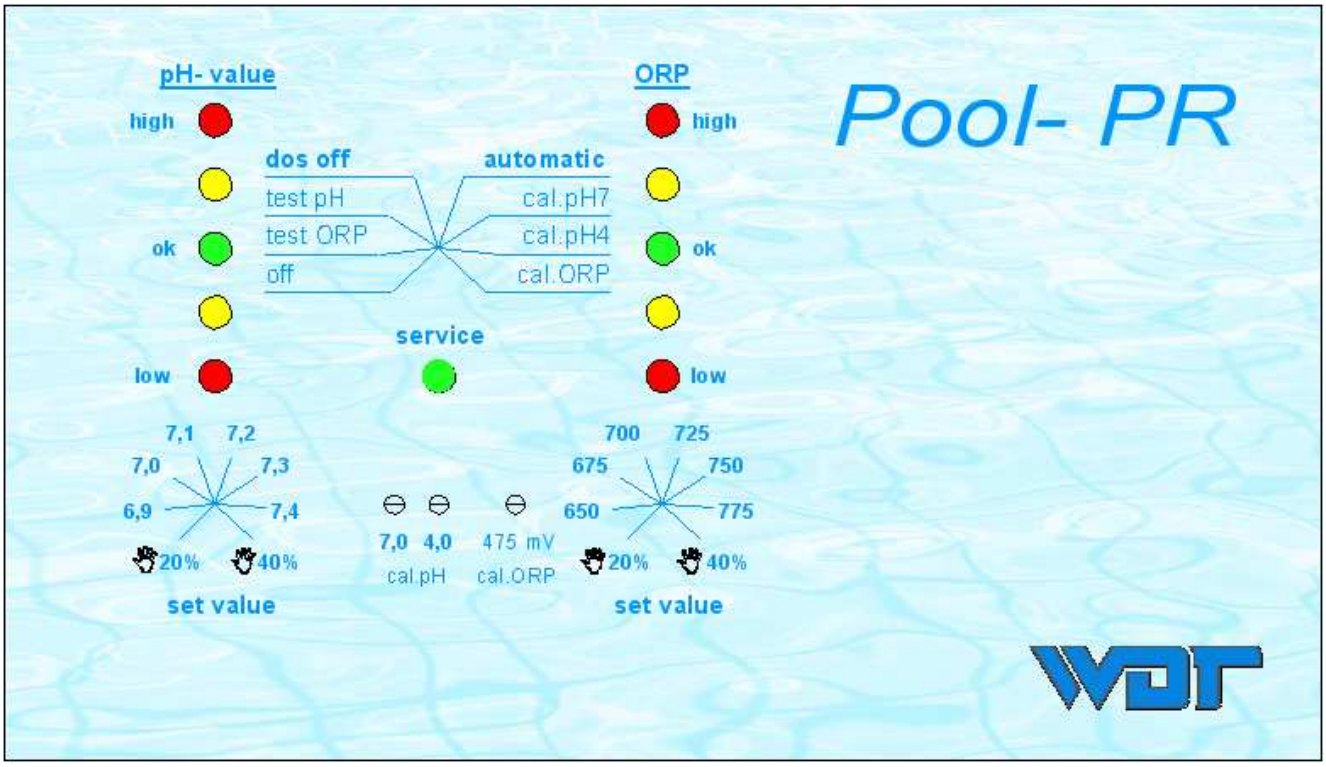
Auto-control and dosing system for residential pools

Pool PR - 2S



Autocontrol- and dosing system for pH regulation and disinfection (ORP measurement)

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1. General usage- and safety instructions

Please read the following safety instructions consciously before you start with the installation and the usage of the unit. If you don´t consider the safety notes this might lead to serious injuries and damages.

Attention!

- To avoid personal harms caused by electrical energy only qualified and educated staff is allowed to install the unit and take it into operation.

- The national electrical regulations and the restrictions of the local energy provider have to be considered.

- Consider the general safety rules and material safety data sheets in the handling of the chemicals. Use goggles, gloves and appropriate protection clothes at handling the chemicals. Never mix chemicals!

- Modifications of the unit are not allowed. In case of modification the warranty expires.

Attention!

- Check the hygienic parameters of the pool water (free chlorine, pH-value) manually (e.g. DPD measurement) and regularly. The need of how often this check has to be done is fixed in the national standards and regulations (e.g. DIN19643, ÖNORM, ...).

- Only authorized persons should work with the unit. Wrong adjustments of the parameters might lead to dangerous overdosing.

- To ensure a long term reliable function of the equipment regular maintenance should be provided by qualified and educated staff.

2. Function

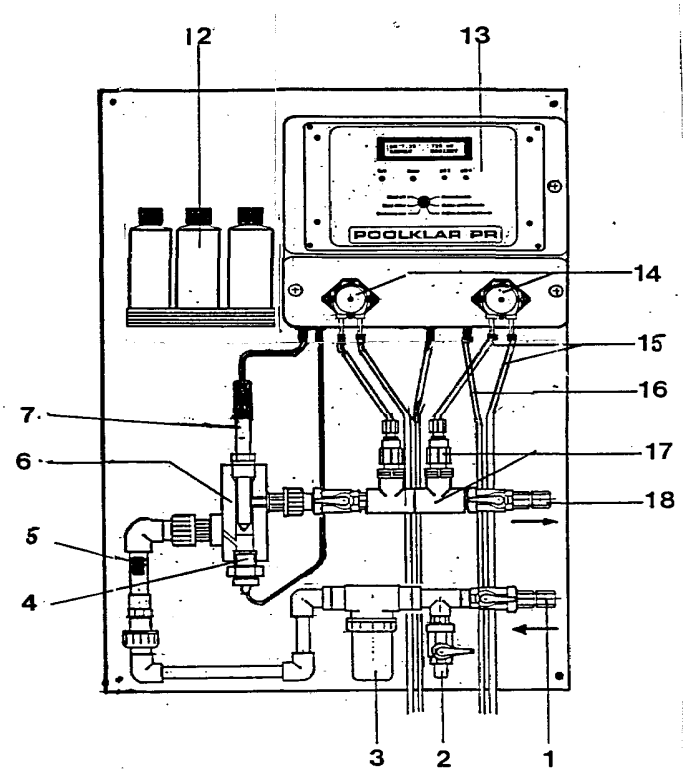
The dosing unit ***POOL PR-2S*** is an auto-control system for residential swimming pools that ensures a safe and reliable disinfection of the pool water. All components that are necessary for the measuring are pre-mounted on a blue PE board. The measured values and possible irritations are indicated by 11 coloured LEDs. The chemicals for the pH regulation (pH minus) and the disinfection (liquid chlorine) are dosed safely and reliable by low-noise peristaltic pumps into the pool water that flows through the unit. A monitoring system for the water flow through the measuring cell and the filling level of the chemicals switches off the dosing in case of faults. These faults are indicated by the red LED.

2.1 Technical characteristics

- All components are pre-mounted and pre-wired on a blue PE board.
- The ORP (Redox) probe is self cleaning and reacts quick and reliable to changes of the water quality.
- The demanded disinfections power is kept reliably.
- The control function works proportionally – small variation of the measured values.
- Programme-switch with adjustment of the set values or manual dosing.
- Reliable and low-noise dosing by peristaltic dosing pumps.
- switch-off of the unit in case of empty chemical containers.
- Automatic safety switch-off of the unit in case of a too low water flow.
- Possibility to connect a remote indication.
- Fault-indications by red LEDs.
- A ball valve for taking test water is included in the tubing of the unit.
- Easy installation and de-installation.

3. Technical description

3.1 The components of the unit



1 measuring water inlet 6x1
2 ball valve for water tests
3 pre-filter 300µm
4 ORP (Redox)- probe
5 Flow switch bobbin
6 Measuring cell
7 pH- probe
12 Check- and cleaning chemicals
13 Front plate with LEDs and switches (the shown front plate is changed to that on front page)
14 peristaltic dosing pumps
15 Suction- and pressure tube 4x1
16 Wire for empty switch
17 Dosing tube with injection valves
18 Connection 6x1 for the dosing tube

3.2 Technical data

materials :	PE, PVC, measuring cell made of PMMA
measures:	430 x 550 mm (width x height)
weight:	app. 12 kg
dosing performance per pump:	app. 1,2 l/h
power supply:	230V 50 Hz / app. 0,1 Ampere

Measuring water and injection connectors:

2 PVC ball valves 1/2" with hose connection 6x1mm
measuring water hose PE, dosing water hose PTFE

3.3 Programme-specification

On the programme chip (EPROM) you find a label on which the version of the programme is indicated. You recognize the installed programme by a combination of numbers and letters. Further programme versions are on demand. In difficult cases the parameters that are defined below may be changed by WDT.

PO_PRa_15
Set points chlorine: 650 – 675 – 700 – 725 – 750 and 775mV
Set points pH: 6,9 – 7,0 – 7,1 – 7,2 – 7,3 and 7,4

PO_PRa_15A
Set points chlorine: 700 – 725 – 750 – 775 – 800 and 825mV
Set points pH: 7,2 – 7,3 – 7,4 – 7,5 – 7,6 and 7,7

PO_PRa_15B
Set points chlorine: 700 – 725 – 750 – 775 – 800 and 825mV
Set points pH: 6,9 – 7,0 – 7,1 – 7,2 – 7,3 and 7,4

Attention!
If a programme chip is changed pay attention that the set points are according to the labelling of the set points on the front plate. If necessary the front plate has to be changed too.
The monitoring of the dosing time is realized as a dynamic monitoring. If a measured value is out of the proportional range (e.g. in case of the start-up of a unit) the current values are compared among each other in cycles. If there are more comparisons where no change of the values in the demanded direction can be realized the dosing will be interrupted and the fault indication will be activated. One of the red LEDs ** pH high ** or ** ORP low ** is flickering. If the current values are in the proportional the monitoring function is deactivated.

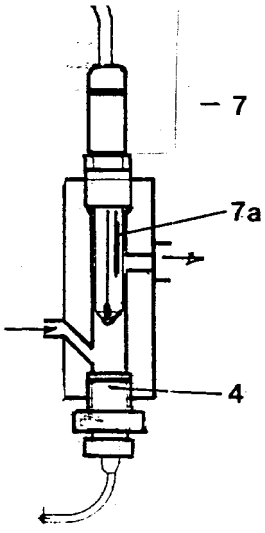
3.4 The measuring technique

3.4.1 pH-Messung

High quality glass-probes (7) are used for the pH-measurements. With this probes a long-term reliable measurement of the pH value is ensured.

3.4.2 Redox voltage (ORP)

The redox tension is an indicator for the hygienic situation of the pool water. The higher the redox (ORP) voltage is, the faster micro organisms are killed by the disinfectant. As there is a rather stable relation between the concentration of free chlorine and the redox – at stable pH-values - redox may serve as an indicator for free chlorine. This voltage is measured between the reference system (7a) of the pH-electrode (7) and the round platinum electrode (4) screwed into the cell from the button. The surface of the platinum is cleaned by glass balls that are kept in movement by the water flow, to ensure a reliable, fast and stable measurement.

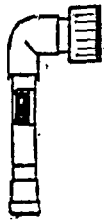


3.4.3 Monitoring of the measuring water flow

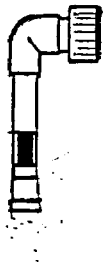
The measuring of the pH value and the ORP is in principle independent from the flow of the measuring water. Anyway a certain flow must be guaranteed! On one hand to get steadily fresh water with the current quality / parameters from the pool, on the other hand the water is needed as a supporting medium for the dosed chemicals.
The measuring water flow consists of a flow switch holder and the flow switch bobbin (5). The flow switch bobbin is kept in an upper position by the water flow. If the water flow is too low (< 25 l/h) the flow switch bobbin falls down and the dosing is switched off.
The fault ** Measuring water flow low ** is indicated by a blinking of the red LED up left. (see fault indication table at the end of the manual)

3.5 Dosing technique

Flow switch bobbin on top → dosing pumps work



Flow switch bobbin down → dosing pumps do not work

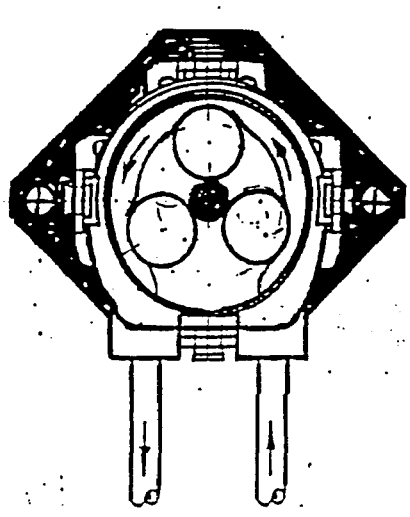


Attention! **Please consider the safety regulations of the handling of the used chemicals!**

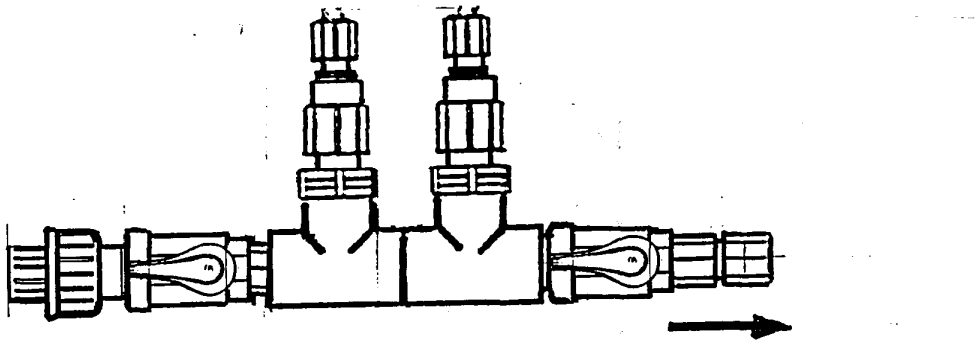
3.5.1 Dosing pumps

For the dosing of the chemicals 2 peristaltic pumps (14) are integrated in the housing of the controller. The pump is ideal for achieving low dose rates and is self priming (i.e. no air bubbles). Rotating rolls press the dosing hose against the pump housing, whereby the liquid within the hose is pressed out in front of the rolls and at the same time drawn in behind them. The pump is extremely reliable and very simple to handle. Furthermore the pumps produce only low noise.

To avoid mix-ups the dosing pumps have a colour coding (chlorine = yellow, acid = red).



3.5.2 Dosing tube



The chemicals are dosed into the measuring water by spring loaded dosing valves (17) behind the measuring cell. The danger of blocking of the chlorine dosing valve by calcification is widely avoided as the dosed acid flows over the outlet of the chlorine dosing valve.

The dosing valves have a colour coding too (chlorine = yellow, acid = red).

For the maintenance of the dosing valves close the ball valves before and after the valves. Disconnect the dosing tubes from the pumps, then screw-out the injection valves.

Attention! The valves are filled with chemicals!

3.5.3 Suction lances

To prime the chemicals suction lances with level switches are used.

If the chlorine container gets empty, the chlorine dosing pump is switched-off. This is indicated by a blinking of the LED ** ORP low **.

If the acid container gets empty, both dosing pumps are switched-off as the disinfectant can achieve the needed disinfection power only at a proper pH value. This case is indicated by a blinking of the LED ** pH low **.

Optionally a remote fault indication can be connected.

To avoid mix-ups the suction lances have a colour coding too (chlorine = yellow, acid = red).

Please consider the legal regulations for the storage of chemicals and use according safety tubs for the chemical containers if necessary.

3.6 The control unit

The control plate and the front plate (indication and operation module) is one technical unit that can be exchanged easily if necessary. The operation possibilities at the front plate have been limited to the necessary basic functions: setting of the set points, re-adjustment of the measuring values, test function for the pumps, switch-off of the pumps. A LED diagnosis system eases the identification of possible irritations.

3.6.1 Control characteristics and dosing performance

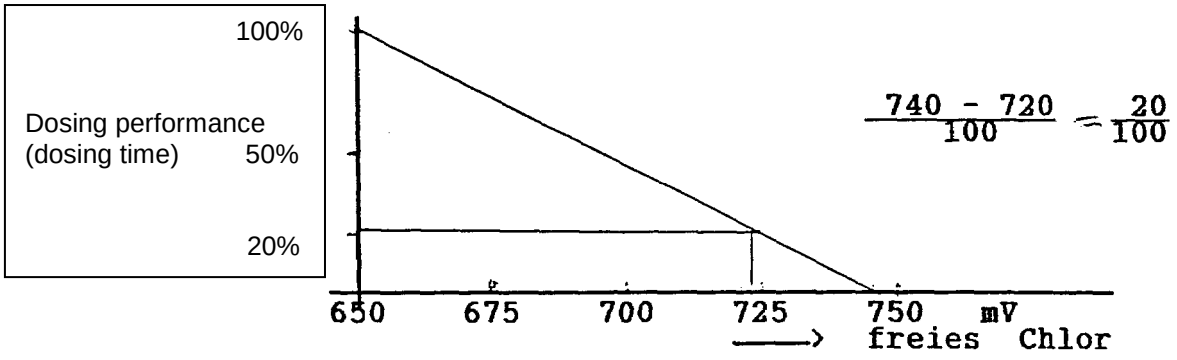
The dosing of the disinfectant (in general liquid chlorine) and pH regulator (in general acid) works always in a certain cycle: 50 seconds for disinfection and 50 seconds for pH regulation with a fixed pause time of 10 seconds in between. This setting avoids that chlorine and acid are dosed together at the same time.

pH-value and ORP (redox voltage) are measured and compared with the set values continuously. The length of the dosing time is determined by the difference between measured value and set value proportionally. The higher the difference, the longer the dosing time at each dosing cycle.

The max. dosing performance of each pump is 1,25 l/h (3 l/h in continuous operation x50 seconds max. dosing time per cycle/120 seconds dosing cycle)
The dosing performance may be reduced by reducing the max dosing time to 20% and by extension of the cycle time to 20 minutes.

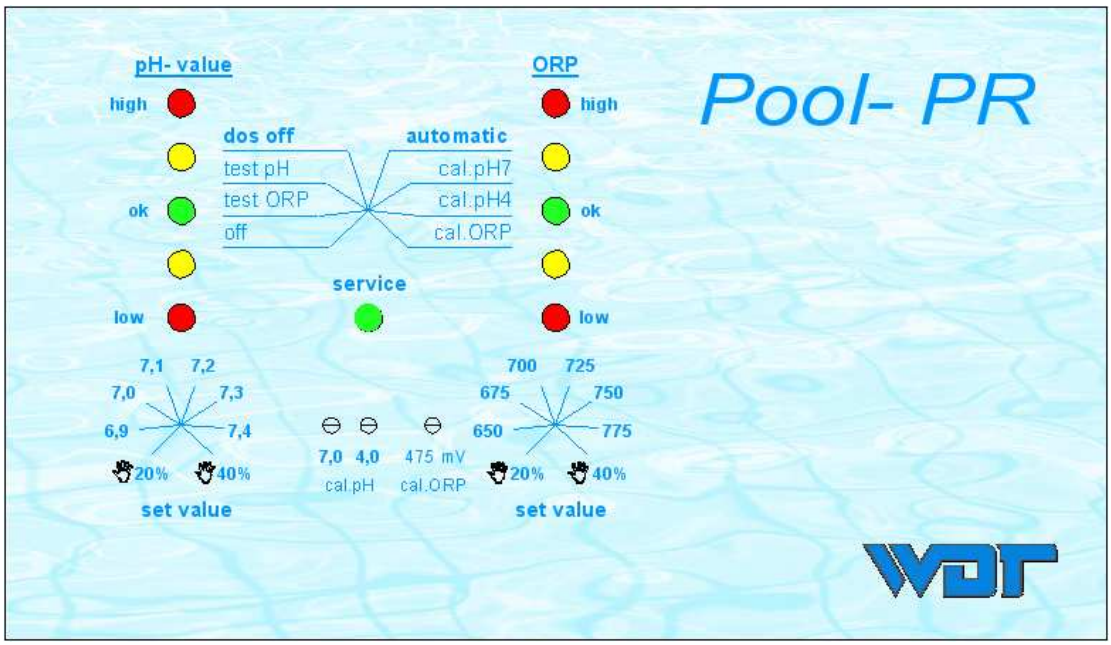
Example: ORP control

set point:	**740 mV**
measured value:	**720 mV**
control range:	**100 mV**
cycle time:	**2 minutes**
dosing performance:	**20%=10sec.=250 ml/h**



In the example the dosing pump doses every 2 minutes for 10 seconds = 250 ml/h = 8 ml/ cycle. A operation time of 8 hours per day leads to a consumption of 2 litres of disinfectant per day if the consumption will stay constant.

3.6.2 The front plate (operation module)



The programme switch:

The programme switch is to chose the demanded programme mode. If the programme **„automatic"** is activated, the dosing will be locked for 10 minutes, the green service LED is flickering at this time. To deactivate this locking time put one of the set value poti to the position of the hand symbol till the green LED is burning only.

After the locking time of the dosing has been finished the „dosing start programme" starts automatically – see 3.6.3.

automatic:
Measuring, control and dosing according to the demanded control characteristics/ parameters. All safety / monitoring functions are activated: dosing start programme with monitoring of the change of the measured values, filling level of the chemicals, water flow through the measuring cell. If ORP is on alarm the pH measurement and control will continue.

Cal. pH7 app. cal. pH4
Adjustment programmes for the pH probe. Unscrew the pH probe out of the measuring cell, clean it with distilled water und put it into the according bottle with the buffer solution (first 7, then 4). Now take the small screwdriver and turn the according poti (screw) pH7 and pH4 until the middle green LED of the scale **pH – value** will shine only. (if at first the yellow LED top of the green LED shines, turn left, if the bottom yellow LED shines, turn right)

Cal. ORP (Redox)
Adjustment programmes for the OPR (redox) probe. *Please consider that a functioning pH probe is necessary for the adjustment/ check of the OPR probe!* Unscrew the ORP probe of the measuring cell and screw it into the OPR test cylinder. Put some ORP buffer solution into the test cylinder. Put the pH probe from above into the solution in the cylinder. Now take a small screwdriver and turn the Poti (screw) 475mV until the middle green LED of the scale **ORP** will shine.

dos off

Both dosing pumps are switched-off. The measuring continues.

test pH / test ORP:
This programme is to do a function test of the dosing pumps. The pumps are activated without considering the measured values. To be activated only if water flows through the cell.

Attention!! Max test time 6 minutes = app. 300 ml – possible overdosing!!

The test programmes are finished by choosing a new programme.

3.6.3 Dosing start programme with dynamic monitoring

The start programme is activated in the "automatic" program always when:

- the POOL PR-2S is switched-on.
- the irritation „low water flow" or „chemical empty" is solved.

1. **"lock of the dosing"**
   As already mentioned the dosing is locked for 10 minutes after the start of the unit. This ensures that really current measuring water from the pool is used for the measurement and the evaluation if a dosing will be necessary or not. Deactivation → see above.

2. **"pH start dosing"**
   As long as the measured pH value is out of the control range (set value + 0,5) after the lapse of the 10 minutes lock of the dosing, only the acid dosing will be released until the pH value will be in the control range with a hysteresis of - 0,1. In this time every 15 minutes the new value is compared to the value before. If no change of min. 0,05 pH in direction of the lower pH value will occur after 4 comparisons, the fault "pH high" switches the unit out of operation. The upper left red LED flickers.

   The chlorine dosing is only released if the pH value will be in the control range. The reason for this is, that the OPR / redox voltage, as a measure for the chlorine dosing, strongly depends from the pH value. If the pH-value is too high, an overdosing of chlorine is risked.

3. **„ORP start dosing"**
   As long as the measured pH value is out of the control range (set point – 50) the dynamic monitoring is activated. In this case the measured values are compared among each other every 15 minutes. If no increase of min. 10mV will occur after 4 comparisons, the fault ** ORP low ** will occur. The lower right LED flickers.

   Note! We recommend to switch-off the filter pump only 1 time (during the night) as it always takes a certain time until the whole pool water will be back in circulation again. Only in this case the dosed chemicals are distributed everywhere in the pool.

As the effectiveness of the disinfectant is only guaranteed at a proper pH value, the dosing of disinfectant is locked if a pH irritation occurs!

4. Installation and taking the unit into operation

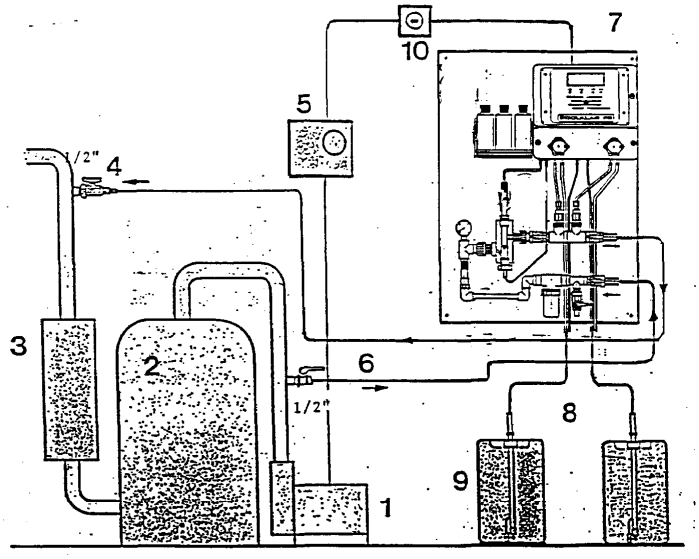
4.1 Place for mounting

The POOL PR – 2S should be installed at a place that is easily accessible. For the voltage supply you need a power socket 230V that is locked with the filter unit.

4.2 Measuring water extraction and tapping point

The precondition for a satisfying water control is a good hydraulic of the pool so that the dosed chemicals reach all parts of the pool in a short period of time. Even if there is a heavy strain the concentrations that are measured at different places in the pool should not vary much. Afterwards the right choice of the measuring water extraction point decides over the effect of the auto-control system. The measuring water should be nearly identical with the pool water. Changes in the water quality should be gathered by the auto-control system very fast – within minutes. This is the only possibility to balance the changes through the dosing of chemicals.

In small, low strained pools with a skimmer the measuring water is normally extracted between the circulation pump and the filter and injected after the heat exchanger together with the dosed chemicals. 2 ball valves PVC ½" with extended tube and hose connection 6 x 1 are also included.



1	circulation pump	6	Measuring water extraction
2	filter	7	POOLKLAR PR
3	heat exchanger	8	suction lances with
4	measuring water backflow with chemical tapping point	9	chemical canisters
		10	power supply
5	controller of the filter		

If the pool water is lead by an overflow and balance tank where the fresh water is injected normally you only will have acceptable results with the auto-control system if the measuring water extraction will be directly from the pool. A reasonable result could be reached by stopping dosing for the time of feeding fresh water plus a retention time till switch on dosing again.

4.3 Measuring water flow

The ball valves at the dosing tube are both open. The measuring water flow is then adjusted at the measuring water inlet ball valve in a way that the flow switch bobbin in the flow tube is pressed up clearly and the cleaning beads rotate well on the platinum redox electrode in the measuring cell. If the measuring water flow gets too low, e.g. by pollution of the strainer, the flow switch bobbin falls down and dosing is switched off.

4.4 set values

The set values for pH and ORP are to be set by the 2 turn keys.

4.4.1 pH set values

the set value for the pH can be selected between 6,9 – 7,4. A pH-value of 7.00 is in most cases an ideal value for the effectiveness of the used chemicals. The higher the pH is, the worse the disinfection power of the chlorine is and the higher the concentration of free chlorine must be selected.

4.4.2 ORP set values (redox tension)

The redox tension is an indicator for the hygienic situation of the pool water.
It is scientifically proofed that the transmission of pathogen germs is nearly impossible from a redox voltage of 700mV. According to the load and the cleaning power of the filter you will reach a certain chlorine concentration in the water at a certain ORP and a constant pH value. So select a ORP set value that the chlorine concentration may be between 0,3 and 0,6 mg/l. As the water qualities may differ in a rather wide range (especially when organic Dichlor has been used) it is important to measure the actual chlorine in case of taking the unit into operation! If necessary choose another set point.

Note!

The cleaner the water and the lower the pH, the lower is the necessary chlorine concentration to reach the demanded redox voltage.

If organic Dichlorine has been used the redox voltage might be below 500 mV. In this case the pool has to be supplied with fresh water.

4.5 Taking the dosing pumps into operation

The dosing cassettes have to be slipped on the axles till they lock in. Position the chemical containers below the unit, open the lids and push the suction lances into them.

Pay attention for the correct positioning, marked by the colours red and yellow:

Left	**acid/pH-regulator**	**mark at the suction lance red.**
Right	**chlorine/disinfectant**	**mark at the suction lance yellow**

The „test" programmes are to test the functions of the dosing pumps: after bringing some air into the suction tube by shaking is up and down above the liquid level, this air can be seen running to top if the pumps are running.

5 Calibration and check of the electrodes/ probes

5.1 Calibration of the pH probe

Every pH probe has to be calibrated if when is taken into operation. Furthermore the probe should be checked regularly and if necessary re-calibrated. At latest if the phenol red measurement leads to a higher difference than 0,2.

Please note!
The measuring method with Phenol red has only an accuracy of +/- 0,2

For calibration close the ball valves before and after the measuring cell. Put the programme switch on **"cal. pH7".** Take out the probe from the cell, flush/ clean the electrode with distilled water and put it into the pH7 buffer solution. After 1-2 minutes the pH7 poti has to be adjusted in a way that only the middle green LED shines. Now clean the electrode again and put it into the pH4 buffer solution. Put the programme switch on **"cal. pH4"** and wait again for 1-2 minutes. Then turn the poti pH4 in a way that only the middle green LED shines.
If at first the yellow LED top of the green LED shines, turn left, if the bottom yellow LED shines, turn right.

If you check the pH electrode with a useful mV-meter (hand meter for pH/redox) the slope should not be lower than 50mV/pH. The "zero point voltage" at pH7 should not be higher than +/-50 mV.

5.2 Checking the ORP measurement

Before you start the check of the ORP measurement you have to make sure that the pH probe works without any faults. A defect respectively worn electrode will lead to a non objective ORP measurement (see chapter 5.1).

The relation between the chlorine concentration and the ORP voltage is well-known due to a regular measurement of the chlorine concentration by the DPD1 method. The DPD1 measurement should lead always to identical results with a deviation up to +/-0,2 mg/l. If the deviations of the DPD1 measurement is higher, the pH and the ORP measurements have to be checked.

- Close the ball valves before and after the measuring cell and screw-out the ORP probe.
- Screw the ORP probe from below into the ORP test cylinder.
- Screw the Ph probe out of the measuring cell and put it into the ORP test cylinder.
- Fill some ORP buffer solution into the test cylinder.
- Put the programme switch on the position **„cal. ORP"**.
- Adjust the **„cal. ORP"** poti in way that only the middle green LED will shine.

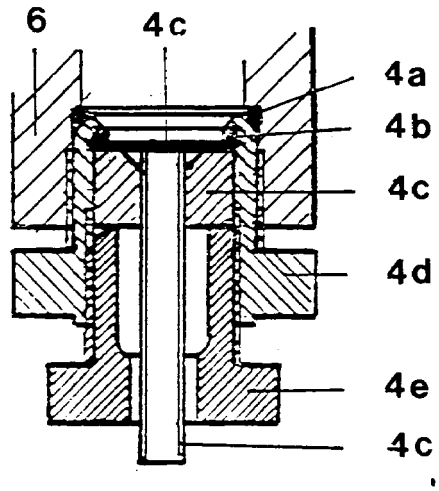
The most likely reasons for deviations that might occur are changes of the water quality due to processes like external pollution of the water, polluted fresh water, flocculation is not working, filter does not work properly, no effective back wash of the filter.

Important!
When you work with the probes please pay attention that no water or humidity will get into the plugs of the probes.

6 Maintenance

6.1 Cleaning of the ORP probe

- close the inlet and outlet valves of the measuring cell, pull the electrode plug to the bottom and bring the plug out of the reach of water droplets.
- Screw out the redox electrode at the holder ½" (4d) completely from the measuring cell (6)
- screw out the electrode clamping screw 3/8" (4e) from the electrode holder (4d) and pull out the electrode insert (4c) from the holder (4d)
- clean the platinum surface with electrode cleaner
- Change the flat seal of the electrode (4b) and the O-ring (4a), put the electrode back into the holder and fix it softly with the clamping screw (4e) again.



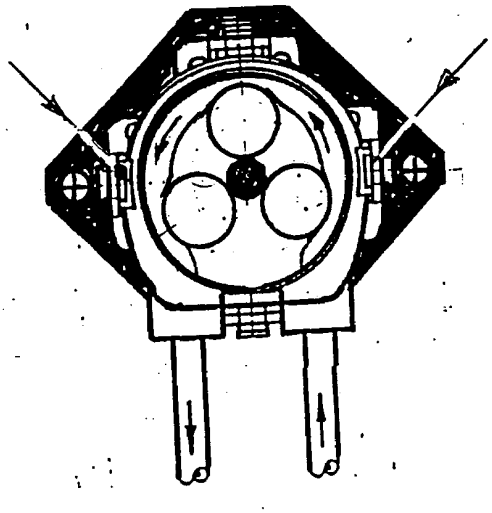
6.2 Cleaning of the pH probe

- close the inlet and outlet valves of the measuring cell, remove the probe plug from the electrode by screwing it to the left,
- screw out the probe from the measuring cell
- screw the electrode plug onto the electrode again
- clean the shaft of the electrode with a humid soft paper

Attention: Do not touch the glass diaphragm nor the diaphragm area!

- swing the electrode in the cleaning solution for 1-2 minutes
- flush the electrode with water
- calibrate the electrode newly and install it

6.3 Maintenance of the peristaltic pumps



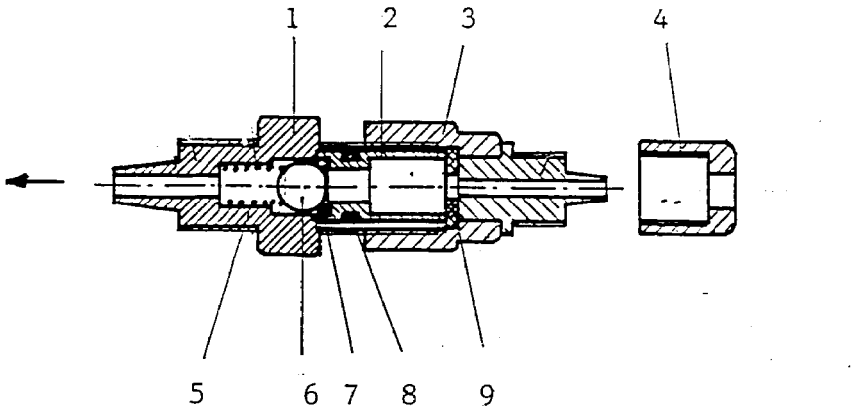
The dosing cassettes should be exchange every year. Monthly check if the dosing hoses are wet at the connections (this means they are not tight anymore). If so check the injection valve and change the dosing cassette.
For the change pull the pump hoses from the hose connections, press the clamping levers and pull off the cassette. The new cassette push on the motor axle until it rests.

Shove the pump hoses on the hose connections. Do not interchange the suction with the pressure hose. Fix the dosing hoses of the cassette with the hose clamps.

At the end check the suction power of the pump using the test program.

6.4 Maintenance of the dosing valves

The yellow dosing valve for chlorine shall be checked/cleaned regularly. Possible residues (inside the valve) might occur cause of calcium hardness which crystallises with the high pH of the liquid chlorine. The quantity of these residues depends mainly on the hardness of the pool water. If the unit has been in operation for a longer period of time and the irritation "dosing time monitoring disinfection" (** ORP low ** flickers) will occur, the reason therefore might be a blocking of the dosing valve for chlorine. A clear hint for a blocking is the fact that liquid leaks out at the hose connections of the dosing pump.



1	valve body 3/8"	5	Hastelloy spring
2	cap nut d16	6	glass ball
3	valve connection 4x1	8	O-Ring 9,25x1,78
4	cap nut 4x1	9	sealing

We offer a maintenance kit with O-rings, sealing, spring, glass ball etc. for the maintenance of the dosing valves.

Attention! The dosing valves are still filled with chlorine and acid when you screw them out!!

- Remove the cap nut (4) with the dosing tube 4x1 from the valve connection (3)
- Unscrew the dosing valve from the dosing tube

Recommendation: dismantle the dosing valve in a bucket of water

- Unscrew the cap nut d16 (2) from the valve body (1)
- Pull the valve connection 4x1 (3) from the valve body (1)
- Remove the O-ring (8) from the valve connection (3)
- Press the glass ball (6) and sealing (9) out of the valve body by a small screw driver or nail
- Take the spring (5) out of the valve body (1)
- Dissolve residues in the valve body with a weak calcium dissolving acid e.g. diluted hydrochloric acid or acetic acid

Recommendation: Keep a second dosing valve for the chlorine dosing in stock. So you can ensure that you will be able to take the unit in operation again quite fast.

6.5 Exchange of the chemical containers

Take the empty container together with the suction lance of the retention tub, then put the new container into the tub. Unscrew the lid from the full one and change over the suction lance. Hold a towel under the suction lance at the change over so that no drops will fall on the ground. Close the empty container and put it aside.

6.6 Filter backwash, exhaustion of the pool floor

At the back wash the dosing has to be switched off. At a manual backwash the meter water tubing has to be isolated. Through this the dosing is switched off automatically because of "lack of water", the measuring stays active. At an automatically backwash the measuring water tube must be isolated for the time of back wash by a solenoid valve to avoid impurities coming to the measuring cell blocking the water flow. If the floor of the pool is cleaned/vacuumed by the filter unit the supply ball valve for the measuring water supply has to be isolated too.

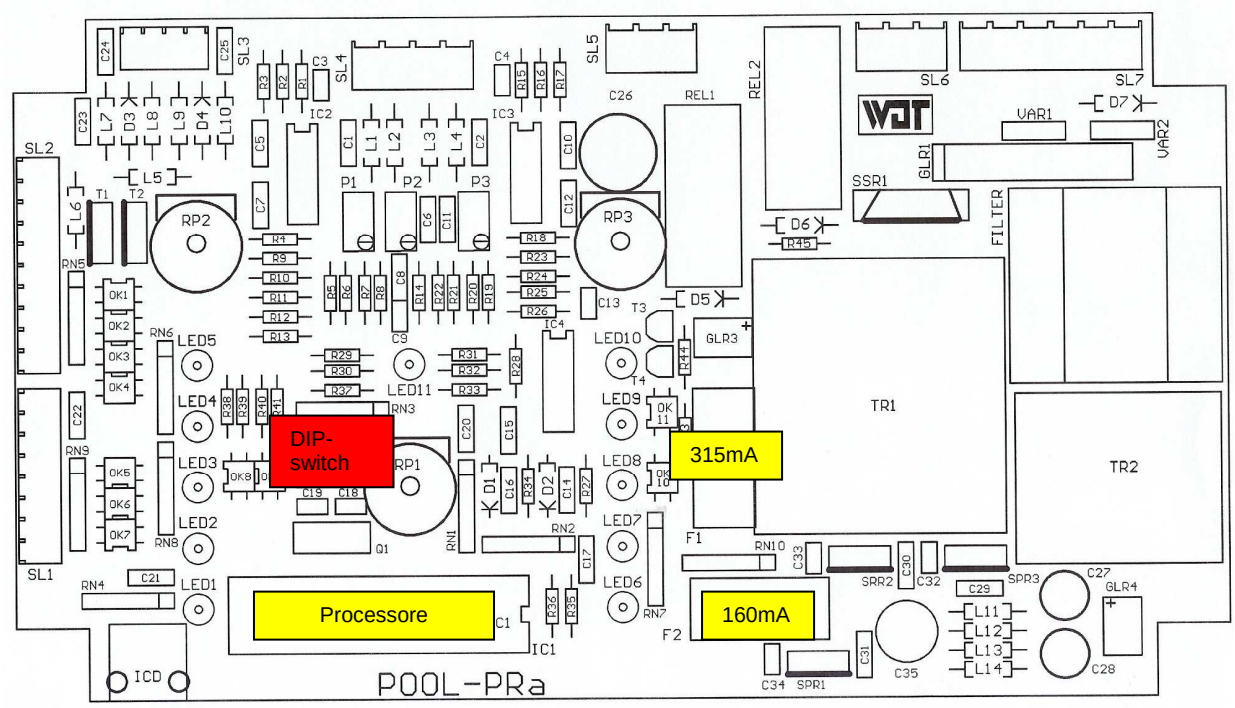
6.7 Taking the unit out of operation/ hibernation

If the unit will be taken out of operation for a longer period of time we recommend to flush the suction lances, dosing pumps and dosing valves with water. This can be done easily by the two "test" programmes. Then you should remove the dosing cassettes from the dosing pumps and close the chemical containers.

At an hibernation in frosty areas all water leading parts like hoses, tubes and the measuring cell have to be emptied completely. Unscrew the pH probe from the measuring cell and put on the protection cap that is filled with electrolyte.

To avoid corrosion at the electronics caused by humidity of condensation in humid rooms we recommend to leave the POOL PR-2S connected to a power socket with permanent voltage during the hibernation.

7. Control board Pool PRa



plug SL1 – outputs 24 Volt DC

plug SL2 – monitoring switch

3-4	acid empty switch	**NO**
5-6	chlorine empty switch	**NC**
8-9	measuring water flow switch	**NO**

plug SL3 – dosing outputs

1(-)	acid pump
2(+)	acid pump
3(-)	chlorine pump
4(+)	chlorine pump

plug SL4 – probes/ electrodes

1	ORP/Redox-probe
2	reference system ORP/Redox
3	reference system pH
4	pH-probe

plug SL 5 – alarm outputs

1	NO – closed
2	center contact
3	NC - opener

plug SL7 – power supply 230 VAC

3	phase L1 - brown
4	neutral - blue
6	protected switch - green/yellow

SL1 and **SL6** are not busy

For Software PO_PRa GR15..”A”...”B”

Cycle time	DIP-Switch S1	S2	S3	Dosing time from - till	max. Dosing performance ca. Chlorine	-	Acid
2 Minute	off	off	off	5-50 Seconds	1.6 l/h	–	1.6 l/h
5 Minute	on	off	off	5-50 Seconds	0.6 l/h	–	0.6 l/h
10 Minute	off	on	off	5-50 Seconds	0.3 l/h	–	0.3 l/h
20 Minute	on	on	off	5-50 Seconds	0.16 l/h	–	0.16 l/h

DIP-Switch S3 pos. ”ON” reduces the max. Dosing time to 10 Seconds, so reduces the max. Dosing performance to 20% of the specify data

DIP-Switch S4 pos. ”ON”: activated the measuring mode
Program switch at **cal. pH7** for pH measuring
Program switch at **cal. ORP** for ORP/ Redox measuring

For Software PO_PRa GR15”C”...”D”...”E”

DIP-Switch **S1** pos. ”ON” automatic monitoring 120 seconds
”OFF” automatic monitoring 360 seconds

DIP-Switch **S2** pos. ”ON” cycle time 90 seconds
”OFF” cycle time 600 seconds

DIP-Switch **S3** pos. ”ON” dosing time ph 5 seconds, dosing time ORP 11 seconds
”OFF” dosing time ph 25 seconds, dosing time ORP 55 seconds

DIP-Switch **S4** pos. ”ON” activated the measuring mode
Program switch at **cal. pH7** for pH measuring
Program switch at **cal. ORP** for ORP/ Redox measuring

7.1 Measuring value indication

If the DIP switch S4 (code switch) is put on ON and the programme switch on **cal pH7 or cal ORP** the controller can be set into the measuring mode. In the measuring mode all 10 LED act as measuring value indication. The measuring value indication is for a short-term check of the current measuring value.

You find the DIP-switch (code switch) on the backside of the control board.

Important!
A pre-condition for an exact measuring value indication is the calibration of the probes.

After the finish of the check the DIP switch S4 has to be set on OFF again.

7.1.1 Measuring value indication pH

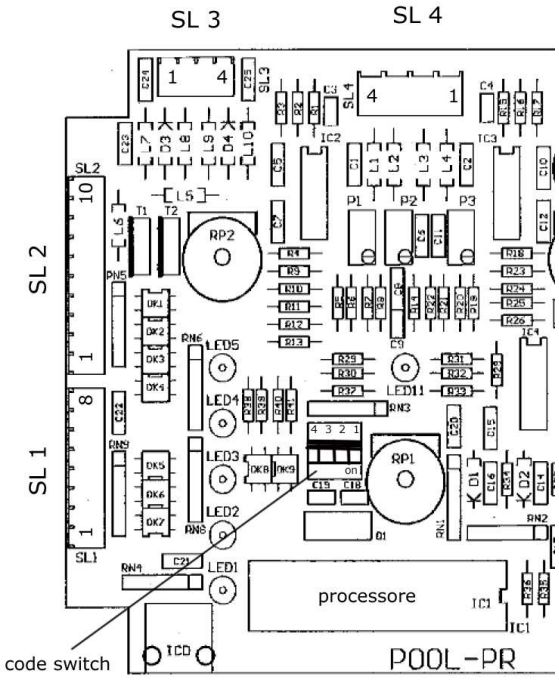
pH-values – programme switch on cal pH 7”

measuring values	pH		ORP	measuring values
pH 7,2	○		○	pH 7,3
pH 7,1	○		○	pH 7,4
pH 7,0	○		○	pH 7,5
pH 6,9	○		○	pH 7,6
pH 6,8	○	✷	○	pH >7,65

7.1.2 Measuring value indication ORP/ Redox

ORP- values – programme switch on “cal ORP”

measuring values	pH		ORP	measuring values
675-700mV	○		○	700-725mV
650-675mV	○		○	725-750mV
625-650mV	○		○	750-775mV
625-625mV	○		○	775-800mV
<600mV	○	✷	○	>800mV



8. Spare parts list

Part no.	Description
Electronic components	
	Control board Pool PR with front plate
Dosing techniques	
12500	pump motor SR10 3,0mm
10039	dosing casette SR10 with white rolls 3mm
16662	maintenance kit for dosing valve 3/8" 1KF
16663	dosing valve 1KS 3/8" 4x1 yellow for chlorine
16664	dosing valve 1KF 3/8" 4x1 red pH
12473	suction lance N d16x500 2m red
12472	suction lance N d16x500 2m yellow
Water leading part	
12023	ball valve PVC 1/4" with hose connection 6x1
13034	ball valve for test water
12548	filter 1/4" 300µm complete
10482	filter insert 300µm
10480	filter cup 300µm
10481	sealing for filter 300µm
15675	flow switch holder d16 NO with flow regulator
11978	flow switch bobbin magnetic d11
12010	flow switch d8x600
11973	measuring cell POOLKAR PR
12030	dosing tube T- piece 3/8" 1/4" IG and 1/4" AG
Electrodes	
10933	pH- electrode PG13,5 60mm
12006	cable for pH- electrode
11984	redox- electrode 1/2"
11986	insert for redox- electrode d14 1/2"
11985	sealing kit for redox- electrode d14 1/2"
12009	wire for redox- electrode 90 cm with plug 4mm
11964	cleaning perls 2,5mm 5ml
10383	buffer solution pH-4 50ml
10384	buffer solution pH-7 50ml
10385	buffer solution redox 475 mV 50ml
11962	electrode cleaner 50ml
11963	distilled water 0.5l

9. Fault indications and diagnosis

Attention! If a red LED shines, blinks or flickers there is a fault in the system. The water quality might not ne ok and the fault has to be solved as soon as possible.

The chart below shall help to find and solve the faults.

Legend:

○ ○ ○	LED off	
● ● ●	LED shines	indication of measuring values
✱	LED blinks (1Sek. on – 1Sek. off)	fault detected by monitoring switch
✱	LED blinks (1Sek. on – 1Sek. off)	manual dosing active (for emergency)
✱	LED flickers (fast blinking)	The monitoring time at the start procedure excessed
✱	LED flickers (fast blinking)	- in the measuring value: dosing active - operation LED: dosing is locked at the start procedure no dosing

Please consider the following points!

- If there are more hardware faults at the same time, several red LED´s blink together.
- Measuring values are not considered in the examples. This means that additionally green and yellow LED´s may shine.
- Changes of the set values and the operation mode (e.g. manual operation) will be adopted delayed, as the set value and programme switch are only interrogated on time per cycle (possible cycle times 2,4,6 & 10 min.)

Hardware faults

Monitoring of the switch inputs (measuring water and chemical containers)

pH		ORP	Meaning	Possible reason	Troubleshooting
✱		○	Measuring water flow too low.	Filter blocked. Ball valve for measuring water not totally opened.	Check supply and back pressure.
○		○			
○		○			
○		○			
○	●	○		Flow switch faulty.	Replace switch.

pH		ORP	Meaning	Possible reason	Troubleshooting
○		○	Chemical container pH empty.	Chemical container pH empty or	Change the empty container (or refill).
○		○			
○		○			
○		○		Faulty level switch of the pH suction lance.	Replace switch.
✱	●	○			

pH		ORP	Meaning	Possible reason	Troubleshooting
○		○	Chemical container chlorine empty. F1 fuse 315mA defect	Chemical container chlorine empty or	Change the empty container (or refill).
○		○			
○		○			
○		○		Faulty level switch of the chlorine suction lance.	Replace switch.
○	●	✱		Too high power consumption of one of the dosing motors.	Measure the motor current: <100 mA – replace fuse.

Manual dosing

If the probes are faulty the dosing can be set on manual operation with 20 and 40%. This is only for emergency cases. The parameters chlorine and pH have to be checked more often to avoid overdosings.

In the example both channels are on manual dosing – but both values must not necessarily be operated on manual dosing:

pH		ORP	Meaning	Possible reason	Troubleshooting
○		○	pH-manual operation on 20% lower LED	Emergency operation in case of faulty probes.	Replace the probe(s) as soon as possible.
○		✱			
○		○			
✱		○	ORP-manual operation on 20% upper LED		
○	●	○			

Monitoring of the measuring values of the Pool PR

Low over-run of the set value (e.g. set value pH7,0 and actual value < pH6,5)

pH		ORP	Meaning	Possible reason	Troubleshooting
○		○	pH-set value> 0,5 - 1pH under-run ORP- set value >50 - 100mV over-run	Overdosing because of bad leading of the measuring water respectively pool circulation or manual addition of chemicals	If this fault will occur more often the dosing performance should be reduced: extend the cycle time resp. reduce the dosing time from 50 – 10 sec.
○		●			
○		○			
●		○			
○	●	○			

High over-run of the set value (e.g. set value pH7,0 and actual value < pH6,0)

pH		ORP	Meaning	Possible reason	Troubleshooting
○		●	ORP- set value > 100mV over-run pH-set value > 1pH under-run	High overdosing. Dosing performance chosen too high. Fresh water refeeding in the measuring water. Lazy measuring water line.	Reduce dosing performance, extend the cycle time resp. reduce the dosing time. Look for better measuring water take off
○		○			
○		○			
○		○			
●	●	○			

Monitoring of the dosing times at dosing starts (4 monitoring cycles with each 15 minutes)

pH		ORP	Meaning	Possible reason	Troubleshooting
✷		○	Dosing time monitoring pH-regulation over-run, pH-value is not decreased although dosing is active ORP-values are faded out	Too low dosing, the measured value has not been decreased about 0,1pH for one hour. Possibly very high carbonate hardness.	The unit has to be restarted! (switch off and on again) Check acid dosing. Possibly pour some acid to the pool water directly
○		○			
○		○			
○		○			
○	✷	○			

pH		ORP	Meaning	Possible reason	Troubleshooting
○		○	Dosing time monitoring. Disinfection under-run.	Too low dosing, the measured value has not been increased about 10mV for one hour. Dosing valve blocked. Dosing motor faulty	The unit has to be restarted! (switch off and on again) Check chlorine dosing. Clean dosing valve Exchange dosing motor
○		○			
●		○			
○		○			
○	●	✷			

Start procedure/ programme and automatic programme POOL PR
(Row of examples after the filling of a pool with fresh water)

pH		ORP	Meaning	Possible reason	Troubleshooting
○		○	10 min. lock of the unit at start. The dosing is only released after the locking time.	Unit was restarted respectively a fault has been solved.	The unit changes automatically into automatic mode after the lapse of the locking time. The locking time can be cancelled by the set value switch: Put on "hand symbol" and back.
○		○			
○		○			
○		○			
○	✷	○			

pH		ORP	Meaning	Possible reason	Troubleshooting
●		○	Start programme pH active.	Actual pH value is > 1pH over the set value.	Either wait until the unit reaches the ideal measuring values automatically or add the chemicals (first acid, the chlorine) manually. !Attention!
●		○			
○		○			
○		●	Chlorine dosing is locked until the yellow and green LED at pH start to shine (deviation <0,5)	Actual ORP value is > 100mV under the set value.	
○	●	●			

pH		ORP	Meaning	Possible reason	Troubleshooting
●		○	Start programme pH active.	Actual pH value is > 1pH over the set value.	Either wait until the unit reaches the ideal measuring values automatically or add the chemicals to the pool (first acid, then chlorine) manually. !Attention!
●		○			
✷		○	Acid pump works (green LED flickers).		
○		●			
○	●	●	Chlorine dosing is still locked.	Actual ORP value is > 100mV under the set value.	

pH		ORP	Meaning	Possible reason	Troubleshooting
○		○	Start programme pH active.	Actual pH value is > 0,5pH over the set value.	Either wait until the unit reaches the ideal measuring values automatically or add the chemicals (first acid, the chlorine) manually. !Attention!
●		○			
○		○			
○		●			
○	●	●	Chlorine dosing is still locked.	Actual ORP value is > 100mV under the set value.	

pH		ORP	Meaning	Possible reason	Troubleshooting
○		○	Actual pH value is in the control range.	Actual pH value is in the proportional range = < 0,5pH over set value.	Either wait until the unit reaches the ideal measuring values automatically or add the chemicals (first acid, the chlorine) manually. !Attention!
●		○			
●		○			
○		●			
○	●	●	Chlorine dosing is released.	Actual ORP value is > 100mV under the set value.	

pH		ORP	Meaning	Possible reason	Troubleshooting
○		○	Actual pH value is in the control range.	Actual pH value is < 0,5pH over the set value.	Either wait until the unit reaches the ideal measuring values automatically or add now only chlorine) manually. !Attention!
●		○			
●		✷			
○		●			
○	●	○	Chlorine dosing motor is running	Actual ORP value is > 50mV under the set value.	

pH		ORP	Meaning	Possible reason	Troubleshooting
○		○	Actual pH value and ORP value are in the control range.	pH-set value is reached +- 0,25pH.	No measures necessary.
○		○			
●		●			
○		●		Actual ORP value is < 50mV under the set value.	
○	●	○			

pH		ORP	Meaning	Possible reason	Troubleshooting
○		○	pH-set value is reached +- 0,25pH.	Ideal operation condition.	No measures necessary.
○		○			
●		●			
○		○	ORP-set value is reached +- 25mV.		
○	●	○			