

**Wallace & Tiernan® Disinfection Systems  
System 3NX Pool and Spa Controller**

**WT.040.625.000.GE.IM.0211**

### IMPORTANT ANNOUNCEMENT

#### Supply of Spares - Payment by Credit/Debit Card

Siemens Water Technologies are pleased to announce that we are able to accept payment for spare parts by major credit/debit cards.

We appreciate that some of our Customers periodically require quantities of spare parts, possibly to repair plant breakdowns. Standard procedures, whereby an official order has to be issued before parts can be supplied, often hinders this process, leaving the operations/maintenance personnel frustrated and without vital spares to complete the job.

If you, or your staff, have a valid credit/debit card, that is all you need. We will not require an official order to cover credit/debit card transactions.

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We are sure that this "Fast Track" facility will be welcomed by your "sharp end" personnel who keep plant operational.

G.Horden  
**Sales & Marketing Director**  
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Siemens plc

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## CUSTOMER FEEDBACK

In line with our ISO 9001 Quality Procedures, we are constantly looking for ways in which to improve our level of service to our customers. We are therefore very interested to obtain your views of the current service we provide and any ideas for improvement. We want to deliver a service that is tailored to meet your needs, so we would be most grateful if you take a few moments to complete this feedback form.

We read every comment, good or bad, highlighted on returned questionnaires and will take the comments extremely seriously. The results will be reported to our management team as part of our quality procedures.

Would you please complete the form below. This will help us assess your responses accurately.

If you have any comments that that will help us improve our service, could you tell us what could have been done differently using the space in the appropriate sections. Please return your completed form in the pre-paid envelope or, if you prefer, fax back to +44 (0)1732 771800.



Did we .....	Excellent	Highly Satisfactory	Satisfactory	Unsatisfactory	Highly Unsatisfactory
1 Treat you in a helpful & friendly manner?	<input type="radio"/>				
2 Provide sound advice, which demonstrates professionalism and knowledge of your application?	<input type="radio"/>				
3 Provide products and services that meet your range of chemical dosing & disinfection needs?	<input type="radio"/>				
4 Provide products and services of the quality that meets your needs?	<input type="radio"/>				
5 If you have recently received an instruction manual, was it clear & easy to understand?	<input type="radio"/>				
6 If you have recently requested parts, were those parts available?	<input type="radio"/>				
7 If we have recently supplied equipment to you, did it meet its stated performance?	<input type="radio"/>				
8 Give efficient, prompt service and keep you up to date on progress of your order?	<input type="radio"/>				
9 Are we there when you need us – accessible and supportive?	<input type="radio"/>				
10 Did we take ownership of any problems that may have arisen?	<input type="radio"/>				
11 Overall how do you rate our service?	<input type="radio"/>				
	Much Better	Better	The same	Worse	Much Worse
12 Compared to 12 months ago, how do you rate our company's performance?	<input type="radio"/>				
13 Compared to other equipment companies, how do you rate our service?	<input type="radio"/>				
	Definitely	Probably	Undecided	Probably not	Definitely not
14 Would you recommend our company to a colleague?	<input type="radio"/>				

15	If you are not at all satisfied with our service, it would help us if you could tell us why and what we could have done differently.
16	Please give us your suggestions on how we can improve our products and services, or tell us those you would like us to introduce.
17	Within our company, we like to recognise those people who provide excellent customer service. If you have received such a service, please name the person or the team involved.
18	Which other equipment suppliers you deal with provide the level of service that you require?
19	What makes them better?
20	Any other comments or feedback
Name:	Position:
Company:	
Address:	
Tel:	Fax:
Email:	

Thank you for your time in completing this questionnaire. This will help us to further improve the services we offer, and ensure that we meet your future requirements.

Clive Dean  
Managing Director

**INTRODUCTION**

The System 3<sup>NX</sup> is designed to provide analysis and control of the pH and Redox (HRR) potentials in a swimming pool.

This manual has been produced to enable the user to obtain maximum service from the equipment and comprises installation, operation, maintenance and spare parts information. Minor changes may be made to the equipment that are not immediately reflected in the manual - if such a change appears to have been made, contact Siemens Water Technologies for information.

Our guarantee is conditional upon the equipment being used in accordance with the instructions herein and we therefore recommend that they be read and fully understood before the equipment is placed in service.

*Siemens Water Technologies*

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**Warnings: Hazardous Chemicals.**

All operators of this equipment should be aware of the problems associated with handling hazardous chemicals. Reference should be made to the literature available from the suppliers of these chemicals, particular attention being paid to the requirements regarding protective clothing and emergency procedures.

**Warnings: Mains Voltages.**

Mains voltages can Kill. Before carrying out any maintenance or repair, persons concerned must ensure that the equipment is isolated from the electrical supply and make tests to verify that isolation is complete. If the supply cannot be isolated, functional testing, maintenance and repair is to be undertaken only by persons fully aware of the danger and who have taken adequate precautions.

## **Safety Notes Intended Use**

The System 3<sup>NX</sup> is exclusively designed for the control of treatment of swimming pool water.

The System 3<sup>NX</sup> may only be installed indoors and operated under the conditions described in the technical data.

The System 3<sup>NX</sup> is not designed for any application other than that described in this manual.

Compliance with the intended use of this device also includes reading this operating manual and observing all instructions which it contains, particularly the safety instructions.

If the System 3<sup>NX</sup> is not employed in accordance with its intended use, safe and reliable operation cannot be guaranteed.

The operator is solely responsible for any personal injury or damage to property resulting from employment of the device which is contrary to its intended use. The operator is obliged to keep the device in proper working order.

## **General Principles**

The System 3<sup>NX</sup> corresponds to the state of the art and recognised technical safety regulations. It contains inherent hazards for personnel and equipment. These hazards relate to live components or incorrect dosing of chemicals.

Always observe the safety instructions and hazard warnings.

Only use this device in accordance with its intended purpose.

Faults which can negatively affect safety must be remedied immediately.

## **Notes for the Operator and Operating Personnel**

### **Notes for the operator**

This operating manual and technical documentation must always be available at the installation site.

Always observe any supplementary, generally valid, legal regulations or other binding rules and ensure their compliance. These rules and regulations concern, for example:

Work safety  
Accident prevention  
Environmental protection  
Hygiene  
First aid

All personnel charged with installation, commissioning, operation, maintenance and repair of the System 3<sup>NX</sup> must read and understand this manual, in particular the safety instructions.

Never attempt to perform any modifications, extensions or conversions to the device which would have an adverse affect on safety without written approval of the manufacturer.

Only use Siemens water Technologies manufactured or approved spare parts.

### **Notes for operating personnel**

Before starting operation of this device always read the instruction manual, in particular the safety instructions.

Never employ any working methods that could endanger safety.

Never deactivate any safety features.

During operation of the device there is a risk of unexpected incorrect functions resulting from failure or errors of the control system. In the event of such safety relevant changes in the operating performance of the device, switch it off immediately and remedy the fault or have it remedied immediately.

When the device is switched off external voltage may still be applied.

## **Safety Instructions During Specific Operations**

### **Normal operation**

Never employ any working methods which could affect safety.

Only run the unit when the housing is closed.

Inspect the System 3<sup>NX</sup> at least once a day for externally visible damage and faults. Inform the person/authority responsible immediately of any detected changes (including any changes in the operating performance).

In the event of any functional faults always switch the device off immediately. Faults must be remedied immediately.

### **Installation and maintenance work**

Always perform installation or maintenance work in accordance with this manual.

Secure the device against activation during installation and maintenance work.

Always retighten released screw connections.

Never use corrosive cleaning agents.

Ensure safe disposal of agents and replaced parts in accordance with environmental regulations.

### **Notes on Special Dangers**

#### **Electrical power**

Only use original fuses with the prescribed current rating. In the event of a fault in the electrical power supply, switch the device off immediately.

Only qualified electricians or trained personnel supervised by a qualified electrician are permitted to perform any work on electrical components in accordance with valid regulations.

If stipulated, disconnect all parts of the device from the power supply before performing any inspection, maintenance or repair work. First test the disconnected components to ensure they do not carry any voltage. Inspect/check the electrical system regularly. Remedy any faults immediately.

Connect disconnected cables in accordance with the wiring diagram.

## NOTES ON PROTECTIVE EQUIPMENT AND CLOTHING

The following warning is general in nature due to the variety of hazardous liquids the equipment is capable of handling.



**WARNING:** WHEN DEALING WITH HAZARDOUS MATERIAL IT IS THE RESPONSIBILITY OF THE EQUIPMENT USER TO OBTAIN AND FOLLOW ALL SAFETY PRECAUTIONS RECOMMENDED BY THE MATERIAL MANUFACTURER.

It is good general practice to make use of the following types of protective clothing when handling any hazardous liquid. It is recommended that such protective equipment is used by all persons servicing this equipment and its associated piping, tubing, valves and accessories.

1 Goggles, flexible fitting, hooded ventilation (per BS EN 2092)



2 Face shield (BS EN 2092)



3 Chemical apron (BS EN 7184)



4 Chemical gloves (BS EN 7184)



5 Self contained, positive pressure breathing apparatus (BS EN 2091)



**NOTE 1:** BS EN 7028 "practice for occupational.....eye and face protection" recommends goggles (see 1 above) as the "preferred protection" when handling chemicals which present a hazard from splash, acid burns or fumes; for severe exposure, a face shield (see 2 above) over the goggles is recommended.

**NOTE 2:** An eye flushing fountain and a deluge type shower may also be recommended.

## 1 GENERAL DESCRIPTION

The System 3<sup>NX</sup> is capable of the direct measurement of pH range 2 to 12, Redox (HRR) range 0 to 1000mV and temperature range 0 to 60°C. Chlorine residual is derived from the Redox (HRR) potential within the range 0.6 to 6.0 ppm chlorine.

### 1.1 Sample Requirements

Sample water is fed to the measuring cell from the delivery side of the circulating pump at approximately 18 l/m at 0.3 bar (5 psi). The pH and Redox (HRR) signals are fed to the System 3<sup>NX</sup> for display and control processing. The derived chlorine value is calculated and indicated as a bar graph.

The recommended sample pressure is 0.3 bar, (5 psi) but can be increased to a maximum of 0.7 bar (10 psi). Probe life may be reduced if operated above this pressure.

### 1.2 Technical Data

#### Power Supply

Voltage:	100 – 240V AC	
Frequency:	50/60 Hz	
Power:	5VA + external load	
Fuses:	Mains input (F1, F2.)	1.6A T (5 x 20mm)
	Output (F3, F4, F5)	2.5A T (5 x 20mm)
Connection:	Screw terminals	

#### HMI

Display:	2 line x 20 backlit LCD
Keys:	4 keys (Cal, Up, Down & Set Point)
LED's:	pH Feed
	Cl/Br Feed
	Alarm
	Cl <sub>2</sub> Alarm (Lo, Hi)

#### pH Input

Range:	-300...+300 mV
Resolution:	0.1 pH
Accuracy:	± 0.1 pH
Display:	2...12.0 pH
Input Impedance:	>1 TΩ
Connection:	Bulkhead BNC

**HRR Input**

Range: 0 to +1000 mV  
 Resolution: 1 mV  
 Accuracy: ± 1mV  
 Display: 0...1000mV  
 Input Impedance: >1 TΩ  
 Connection: Bulkhead BNC

**Temp Input**

Type: 2 wire, Pt100  
 Range: 0...60°C  
 Resolution: 1 °C  
 Accuracy: ± 1 °C  
 Connection: Screw terminals

**Isolation**

pH, HRR and Pt100 inputs are dc isolated (50V) from mains earth but NOT from each other.

**Flow Switch Input**

Type: Volt free contact only  
 Connection: Screw terminals

**Relays**

Number of Relays: 3 (pH Control, Cl<sub>2</sub> Control & Auxiliary)  
 Type: Solid state output, SPST  
 Rating: 2.5A, 230V AC  
 Indicators: LED indicator for each relay  
 Protection: Series fuse on each contact  
 Connection: Screw terminals

**Environmental**

Ingress Protection: IP 66  
 Operating Temperature: 0...50°C  
 Storage Temperature: -20...70°C  
 Relative Humidity: 95% (non-condensing)  
 Installation: Wall mounting plastic enclosure

**Approvals**

CE: CE marked product  
 LVD: BS EN 61010-1, Installation category III,  
 Safety Class II  
 EMC: BS EN 61326-1

## **2 INSTALLATION**

### **2.1 Controller Location**

There are a number of factors that should be considered when selecting a location.

- The board upon which the controllers are mounted should be secured against a sound surface. M8 rawlbolts are recommended for this purpose; ensure the spacers supplied are positioned between the board and the wall prior to tightening to prevent crushing the cables located on the rear of the board.
- Select a location that provides protection from direct sun light, rain, etc. and provides convenient access for operation and routine servicing.
- To minimise System 3NX response times, locate the unit in a place that will keep the length of sample line to a minimum.
- Do not mount controllers below a header or make-up tanks, etc, where potential spillage or breakage would result in the controller being drenched.
- Lighting should be adequate and clearance must be provided for maintenance to the controllers to be carried out.
- Chemical fumes and excessive heat can seriously damage the controllers. The plant room must be adequately ventilated. We do not recommend locating the controller in close proximity to Hydrochloric Acid.
- The controllers must be located well away from high voltage electrical supplies, transformers and other energy emitting electrical devices as they can affect the delicate sensing signals.

### **2.2 Unpacking**

When unpacking the equipment check all items against the packing note to ensure that no part is discarded with the packing material. Whenever possible the equipment should be unpacked at the installation site.

### **2.3 Wall Mounting**

The System 3<sup>NX</sup> should be wall mounted using suitable fixings and the supplied spacers, failure to use the spacers can result in damage to the flow and temperature sensor cables.

Locate the wall mounted housing with the cable glands at the bottom. Refer to Figs.2 and 3 for dimensions.

**2.4 Sample Supply**

It is recommend that the representative sample be taken between the main circulation pump delivery side and the filter. Ensure sample take-off is not located after fresh water make-up or chemical addition. The sample return to be positioned on the suction side of the main circulation pumps. If duty/standby pumps are installed please ensure sample return is not in a “dead leg” of pipe. The sample pipework should be run in ½” N.B. uPVC pipe with isolation valves installed and the point of draw off and return. Refer to Fig.6.

**2.5 Electrical Connections (Fig.4)**

The mains input voltage must conform to the requirements shown in section 1.2. The mains supply and pump connections are made to the screw terminals in the junction box. The System 3<sup>NX</sup> is designed to be supplied from a fused and isolated circuit.



**WARNING:** Cables must be installed so that any loosening/freeing of wiring does not cause a hazard. Ensure individual wires are not too long and/or are retained using cable ties.



**CAUTION:** The unit can be damaged if wrongly installed or connected.

The power supply to the System 3<sup>NX</sup> should be electrically interlocked with the starter for the main circulation pump. Power should be drawn from 240V AC 1-phase via a localised fused switch spur/double pole isolator. This “feed interlock” will prevent chemical feed operation if there is no water recirculation. Failure to provide for the above interlock could result in the swimming pool/spa equipment being damaged and/or constitute a health hazard to bathers.

The electrical supply to the Metering Pumps/Solenoids should be hard wired terminating in a double pole isolator or IP65 15 Amp socket, BS4343, into which the pumps and solenoids are wired.



**WARNING:** Mains voltages can Kill. Mains voltages are present in the terminal box at all times.

**2.6 Ancillary Equipment**

**2.6.1 Day tank location**

Before commencement of the installation a risk assessment should be carried out to determine the location of the equipment. Full consideration should be given to:-

- a) Safe operation of the equipment
- b) Minimal handling of chemicals
- c) Ease of operation and maintenance
- d) COSHH (Control of Substances Hazardous to Health Regulations 1988) Employers must have copies of the relevant legislation on the premises. Material Safety Data Sheets for all chemicals must be on site.

## **2.6.2 Chemical Storage**

Hydrochloric Acid and Sodium Bisulphate react violently with Sodium Hypochlorite and Calcium Hypochlorite, generating heat and liberating highly poisonous and corrosive Chlorine Gas. It is, therefore, essential that acids be kept apart from the chlorine donor.

## **2.6.3 Storage of Chemical Containers not in use**

Separate areas within the storage room, each with their own bund, must be provided. The volume of banded areas must not be less than 110% of the total capacity of the maximum number of containers stored at any one time.

## **2.6.4 Siting Storage Areas**

Chemical storage rooms should be on ground level and have a secured vandal-proof entrance. For Bulk Storage of Sodium Hypochlorite Volume banded area must not be less than 110% of that of the largest tank contained within it.

## **2.6.5 Bunded Area**

Banded areas should have a sump of adequate capacity at the lowest point within the area. These sumps must not be connected directly to a sewer or to a surface water drain. Drainage of the bund should not be achieved by means of a transfer pump. It is not recommended to have pipes with valves fitted passing through the bund wall. As an alternative, plastic bund/overflow tanks can be used, but the pool operator must be made aware that these containers are not fireproof. All valves and pumps associated with the tanks should be placed within the banded area and above the highest level of liquid expected in the bund.

**USE ONLY uPVC PIPE AND FITTINGS WITH SODIUM HYPOCHLORITE**

### 2.6.6 Spillage

An adequate supply of water should be provided for purposes of hosing down and diluting any chemical. The emptying of bunded sumps directly into the sewers must not be carried out without the permission of the Water Authority. In the event of a spillage on site, staff should refer to COSHH data sheets supplied by the Chemical Supplier.

### 2.6.7 Chemical Metering Sets

We recommend that the metering pump be attached to the day tank via a 3/8" LDP bolt and nut.

A 10mm dia. hole should be drilled in the top section of the day tank to allow the head, i.e. suction side of the pumps, to be located over the low step in the top of the day tank.

A 10mm dia. hole should be drilled through the centre of the pump base.

Pass the bolt up through the tank and locate the nut within the underside section of the pump and tighten. A clearance hole to allow the suction hose to pass through the tank should be drilled, aligning with the suction housing located on the bottom of the pump head.

Secure the foot valve assembly on one end of the suction hose, drop the foot valve assembly into the tank and pass the hose through the clearance hole. Cut the hose to such a length that the foot valve assembly is off the floor of the day tank. This will ensure that the assembly does not sit within any sediment that may occur.

Please refer to the Pump Manual supplied within the pump box for installation instructions.

If Calcium Hypochlorite, Soda Ash or Alum is being used, a perforated mixing basket may have been supplied. To install, simply remove the day tank lid and insert the mixing basket. The day tank screw-on lid will fit over the mixing basket. Ensure the lid is kept on at all times other than when chemical addition is required.

### 2.6.8 Chemical Dosing Lines

Separate dosing lines for Chlorine and Acid must be run to the point of injection. All pipelines should be individually shielded in uPVC pipes, installed wherever possible to drain back towards the bunded area. The protective pipe to be adequately and securely supported.

Use only hose as supplied by Siemens Water Technologies. Keep dosing lines as short as possible, avoid running lines over doors, gangways and heating pipes where possible. When terminating the hose at the pump head and the injector, allow a small coil of hose to permit new connection to be made if, after a time, the hose flares and does not form a satisfactory connection. All chemical dosing line should be clearly labelled.

### **2.6.9 Injection Points**

Wherever possible Siemens Water Technologies recommend that the Chlorine and Acid injectors be located post filter on the return line to the pool. Injectors should be located after the heat exchanger/heat pump. The main criterion for the location of the injection points is that they should be easily accessible to enable routine maintenance. They should be positioned at a convenient working height. Do not site injection points overhead unless absolutely necessary. In these instances, use adequate warning labels. Allow at least 1 metre minimum between the injection points to reduce the risk of mixing whilst undertaking routine maintenance. Ideally the injection should be located on a horizontal length of pipe. If injectors have to be positioned on a vertical length of pipe do not fit injectors above each other, as one could drip onto the other. Drilling and tapping into uPVC or ABS fittings is recommended, but for location into pipe lengths of CI or s/s pipe, a Talbot Clamp is recommended.

### 3 COMMISSIONING



**WARNING:** There will be mains voltages present within the terminal box as soon as the supply to the unit is made live.

It is recommended that appliances connected to the controller should, during initial configuration, be switched off when inputting parameters to prevent uncontrolled running or malfunction.

Switch on the mains. The unit version is displayed, e.g.:

System 3nx ver ..-..  
Initialisation GB

(GB) indicates the selected language.

The unit is now ready for initial configuration.

#### 3.1 Introduction

The following details refer to the front face of the System 3<sup>NX</sup> and give a description of the functions of each key.

##### **Alarm LED**

The alarm LED flashes when any alarm condition is active. The type of alarms are identified in the alphanumeric display.

##### **Alphanumeric**

During normal operation the Alphanumeric display shows the current pH, Redox (HRR) and Temperature as measured at the flow cell. PPM is derived from the measured Redox potential.

In an alarm condition, the display alternates between the current flow cell readings and the alarm condition.

All those alarms present will be displayed. Depending upon which alarms are shown, some will override the control function and shut down the dosing outputs. No flow, Over feed Alarm, pH Alarm, Cl/Br Lockout

##### **Cl/Br Feed Indicator LED**

The Cl/Br LED will illuminate when the dosing pump output is activated. The LED will be constant when the pump is dosing and within the Redox (HRR) proportional band and flash whilst waiting for the cycle to complete.

**pH Feed Indicator LED**

The pH LED will illuminate when the dosing pump output is activated in either acid or alkali dosing mode. The LED will illuminate when the pump is dosing and within the pH proportional band and flash whilst waiting for the cycle to complete.

**Key Function**

See Section 3.3

**Relay Function**

- K1 Single Acid or Alkali dosing pump, if Acid / Alkali mode controls the Alkali pump.
- K2 Single dosing pump for Chlorine pump.
- K3 Alarm active, or Sensor wash if enabled or if Acid / Alkali mode controls the Acid pump.

**3.2 Ancillary Board Mount Equipment****3.2.1 Sample Cell**

A representative sample of pool water is taken from the circulation pump delivery pipe to a purpose-made cell that houses the probes in an environment that is free from vast pressure and flow variations, and is protected from debris that may otherwise cause damage to the probes. The water passes from the cell to the suction side of the circulation pumps to ensure a positive flow is induced and to retain all the water used in the sampling process. A sample tap is provided on the cell for manual testing. This must be routinely carried out to ensure the controller is operating correctly. A pressure gauge is provided; the valves must be set to produce around +5 psi; a negative pressure in the cell will cause premature failure of the probes.

**3.2.2 Flow Switch**

To ensure that the controller does not continue to dose in the event of no flow to the sample cell and the probes reading only stagnant water with either a high pH or no chlorine, a reed operated flow switch is fitted. When the flow stops the outputs to the dosing pumps are interrupted and the controller shows a No Flow alarm. The inhibit control timer is initiated with the result that dosing is inhibited for 3 minutes after the restoration of the water flow.



### 3.3.2 Adjust alarm levels

Note: High Alarms cannot be lower than the Low alarm and Low alarms cannot be higher than the High alarm.

Press the **Cal** and **▲** keys together and hold for 10 seconds.

The display initially reads **Alarm ??**

and then changes to:-

Display            =            **pH High ALARM**

either

Press **Cal** to enable alarm adjustment..

Press the **▲▼** keys to scroll to the desired High alarm.

Press **Cal** to save the new High Alarm.

or

Press **▼** to select the next Alarm.

Display            =            **pH Low ALARM**

either

Press **Cal** to enable alarm adjustment..

Press the **▲▼** keys to scroll to the desired Low alarm.

Press **Cal** to save the new Low Alarm.

or

Press **▼** to select the next Alarm.

Display            =            **HRR High ALARM**

either

Press **Cal** to enable alarm adjustment..

Press the **▲▼** keys to scroll to the desired High alarm.

Press **Cal** to save the new High Alarm.

or

Press ▼ to select the next Alarm.

Display            =            **HRR Low ALARM**

either

Press **Cal** to enable alarm adjustment..  
 Press the ▲▼ keys to scroll to the desired Low alarm.  
 Press **Cal** to save the new Low Alarm.

or

Press ▼ to select the next Alarm.

Display            =            **Temp High ALARM**

either

Press **Cal** to enable alarm adjustment..  
 Press the ▲▼ keys to scroll to the desired High alarm.  
 Press **Cal** to save the new High Alarm.

or

Press ▼ to select the next Alarm.

Display            =            **Temp Low ALARM**

either

Press **Cal** to enable alarm adjustment..  
 Press the ▲▼ keys to scroll to the desired Low alarm.  
 Press **Cal** to save the new Low Alarm.

or

Press ▼ to return to the main menu

### 3.3.3 View set points

Press the **Set Point** key and release.

The display initially reads    **Setpoint ??**

Display            =            **pH Set Point  
7.5**



Press ▼ to select the next sensor.

Selection = **HRR Set point**

Display = **HRR Set point**

either

Press **Cal** to enable set point adjustment.

Press the ▲▼ keys to scroll to the desired set point.

Press **Cal** to save the new HRR set point.

or

Press ▼ to return to the main display.

### 3.4 Calibration

Whenever the pH is calibrated, the PPM value should always be checked and calibrated accordingly. If both require calibration the pH should always be calibrated first, followed by the chlorine.

Calibration should not be performed within 1 hour of probe cleaning.

Measure the Free Chlorine Residual, pH and Temperature values using the sample point at the flow-cell. It is recommended that at least three sequential measurements are taken to eliminate any spurious readings.

**NOTE:** Calibrating the PPM will automatically adjust the derived PPM setpoint to track the changes made to the PPM calibration points. PPM calibration can only be performed if the HRR measurement is within the range 100 to 900mV.

Press and hold the **Cal** key for 10 seconds.

The display initially reads **Calibrate??**

and then changes to:-

Display = **Calibrate pH**

either

Press **Cal** to enable calibration.

Press the ▲▼ keys to scroll to the sample reading.

Press **Cal** to save the new pH value.

or

Press ▼ to select the next sensor.

Display = **Calibrate Temp**

either

Refer to the NOTE at the beginning of this section.

Press **Cal** to enable calibration.

Press the ▲▼ keys to scroll to the sample reading.

Press **Cal** to save the new Temperature value.

or

Press ▼ to select the next sensor.

Display = **Calibrate PPM**

either

Press **Cal** to enable calibration.

Press the ▲▼ keys to scroll the Bar graph to the sample reading.

Press **Cal** to save the new Chlorine Residual (PPM) value.

or

Press ▼ to return to the Main display.

### **3.5 Control Parameter Adjustment**

Press the **Cal** and ▲ and ▼ keys together.

Press **Cal** to switch between:-

**CI2 Control Mode** (normal pool setting)

or

**HRRControlMode**(contact Siemens Water  
Technology for details)

Press ▼ to select the next control parameter.

Display = **Overfeed Lock time**

either

Press **Cal** to enable time adjustment..

Press the ▲▼ keys to scroll (1 to 360 minutes) to the desired delay time(s).

To disable the overfeed alarm the time should be set to 0.

Press **Cal** to save the new time.

or

Press ▼ to select the next control parameter.

Display = **Sensor Wash**

either

Press **Cal** to select status.

**On**  
**Off.**

When Sensor Wash is turned ON it would normally be an automatic process controlled by the AUX Output. Control is shut down for the sensor wash period and any measurements taken during this period are not valid. Sensor wash will occur approximately every 24 hours from the point that the function is initiated.

or

Press ▼ to select the next control parameter.

Display = **pH Feed Chemical**

either

Press **Cal** to select chemical.

Acid  
Alkali  
Acid + Alkali

The selection made should conform to the chemical being dosed.

or

Press ▼ to select the next control parameter.

Display = **Control Type**

either

Press **Cal** to select type.

- pH + Cl TBP
- pH + Cl on/off
- pH TBP + Cl on/off
- pH on/off + Cl TBP

**pH + Cl TBP** = both pH and chlorine controls are time based proportional e.g. the larger the error from the set point the longer the pump will run.

**pH + Cl on/off** = any error outside the span setting will turn the output 'on' then 'off' when the setpoint is reached.

**pH TBP + Cl on/off** = a combination of on and off control for chlorine and time based proportional control for pH.

**pH on/off + Cl TBP** = a combination of on and off control for pH and time based proportional control for chlorine.

or

Press ▼ to select the next control parameter. The value entered here determines the setpoint deadband for on/off control and the proportional range when used in time based proportional mode.

Display = **HRR TBP span**

either

Press **Cal** to enable span adjustment..

Press the ▲▼ keys to scroll to the desired span (10 to 100mV).

Press **Cal** to save the new span.

or

Press ▼ to select the next control parameter. The value entered here determines the setpoint deadband for on/off control and the proportional range when used in time based proportional mode.

Display = **pH TBP span**

either

Press **Cal** to enable span adjustment..

Press the ▲▼ keys to scroll to the desired span (0.1 to 0.5pH).

Press **Cal** to save the new span.

or

Press ▼ to select the next control parameter. When in time based proportional mode the value entered here represents the cycle time for updating the controlled outputs.

Display            =            **TBP Time base**

either

Press **Cal** to enable time adjustment..

Press the ▲▼ keys to scroll (1 to 180 seconds) to the desired control time(s).

Press **Cal** to save the new time.

or

Press ▼ to return to the main menu

### 3.6 Control Inhibit

Control will be inhibited whilst the following alarms are active and for a further 3 minutes after the alarm condition has been rectified.

Power is turned on.

Flow stops.

Over feed alarm becomes active.

Cl / BR alarm becomes active as a result of the measured pH being outside the pH control span. Chlorine dosing is inhibited.

The display will show

“Control inhibit 180”

Monitoring and alarms are still active during this period, this inhibit period will ensure the sensors have sufficient time to respond to the change of state.

### 3.7 Pump Operation Mode

The System 3<sup>NX</sup> controls the pumps in automatic mode only. There is no provision for ‘manual’ or ‘off’ modes. If it is required that the dosing pumps are run without automatic control, it is suggested they are powered independently from a suitable power source.

**NOTE:** The System 3<sup>NX</sup> will only display the values found in the sample cell. Tests should also be taken from the pool to ascertain that the correct levels are being maintained throughout the entire water volume. When calibrating the controller the sample must come from the flow cell. The

sample cell provides water which is representative of the entire volume; adjusting the pump output and proportional bands will give a more accurate result across the pool if there is a discrepancy. This would be done by trial and error over the course of week or so. The location of the injection points and the sample draw off will also have a bearing on the accuracy of control.

### **3.8. Overfeed Failsafe Alarm**

The System 3<sup>NX</sup> is programmed to feed chemicals, when called for only, for a limited pre-set period. This minimises further complications in the event of a blocked injector, empty day tank, split hose, failed flow-switch or failed probe. An overfeed failsafe condition is indicated by ‘Overfeed alarm’ being shown in the alphanumeric display and the red LED alarm lamp flashing.

Before resetting the System 3<sup>NX</sup> determine the reason for the overfeed, rectify the fault and then press both the ▲ and ▼ keys simultaneously to restore dosing.

### **3.9 Control Function**

The System 3<sup>NX</sup> controls the pH to the operator set pH setpoint. It continuously measures and compares the pH to the setpoint and, in the event of a deviation, activates the pH output for a proportion of the time base period (TBP), the ratio being dependent upon the pH span value. If the deviation is within the pH span the pH output is active for the equivalent proportion of the TBP. If the deviation is greater than the pH span the pH output will be permanently active.

The pH active state is indicated by the pH feed LED being illuminated and constant. If the LED is flashing the pH control function is controlling within the pH span. When the LED is off the output is deactivated.

Control can be set for acid dosing, control down to the setpoint, or alkali dosing, control up to the setpoint. An optional auxiliary control output can be used to control additional dosing equipment, no external alarm output is available for this mode.

If the pH measurement exceeds the pH span value, Cl/BR will be inhibited until the pH returns to the control span.

The System 3<sup>NX</sup> controls the chlorine to the user set derived chlorine PPM or HRR setpoint. The HRR is continuously measured and compared to the operator selected PPM/HRR setpoint. If there is a difference the Cl

output will be activated for a proportion of the time base period (TBP) the ratio of which is dependent upon the HRR span value. If the deviation is within the HRR span the Cl output is active for the equivalent proportion of the TBP. If the deviation is greater than the HRR span the Cl output will be permanently active.

The Cl2 active state is indicated by the Cl/BR feed LED being illuminated and constant. If the LED is flashing the HRR/Cl2 control function is controlling within the HRR span. When the LED is off the output is deactivated.

PPM/HRR calibration can only be performed if the resultant end points are greater than 100mV and less than 900mV. Typically calibration would only be performed after the pH has reached the desired setpoint. Normal calibration values at 2 ppm are 780mV @7.4pH, these values are dependent upon the actual site conditions

Alarm conditions are continuously monitored and compared to the operator defined values. When the measured values exceed those set an alarm is activated. Normal alarms are reset once the condition is rectified.

The 'OverfeedAlarm' is latching and will inhibit dosing. This alarm requires operator intervention to reset the alarm condition, see Section 3.8

## 4 MAINTENANCE

### 4.1 Probes

#### 4.1.1 Probe cleaning

The interval between probe cleaning will be established on site over a period of time. We do not advise that the probes are routinely cleaned without proper cause, to do so will shorten the life of the probe. The probes should be cleaned when the difference between the controller readings and the test results taken at the flow-cell are unacceptably high.



**WARNING:** Personal Protection equipment must be worn whilst cleaning the probes.

Respirator Protection – When using in a spray form use a disposable face mask which conforms to the European Standard EN149 Class FFP2S or Class FFP3SL.

Hand Protection – Use lightweight rubber or PVC gloves.

Eye Protection – Wear polycarbonate safety spectacles with side shield or clear polycarbonate goggles.

Skin Protection – Use a barrier cream against water based chemicals.

Polyester/cotton overalls are normally suitable.

1. Switch off the power to the controller and disconnect the probe lead.
2. Close the sample supply valves.
3. Unscrew the probe from the flow-cell ensuring the cable is not twisted.
4. Using a toothbrush, scrub the tip of the probe with probe cleaner.
5. Rinse with clean water, gently shake off any excess water and to remove any air bubbles.
6. Refit the probe into the flow-cell ensuring the cable is not twisted.
7. Reconnect the probe and open the supply valves to restore the flow.
8. Switch on the controller, allow the flow and measured readings to stabilize and the recalibrate typically 1 hour.

#### **4.1.2 Probe replacement**

The probes for the System 3<sup>NX</sup> are supplied with a two year warranty. The life of the probe is dependant upon the demands placed upon it from bather pollution and, therefore, the frequency of cleaning. We suggest you assess your probes efficiency between 3 and 5 years.

#### **4.1.3 Probe care**

Should the sample cell be drained or the probes removed from the sample cell, they must be kept in the protective cap supplied in a little water. If the probes are left dry for more than 6-10 hours the liquid junction will dry out and the probe will fail.

#### **4.1.4 Seasonal operation**

If your pool is closed during the winter months, or will not be circulating at all times in freezing conditions, the probes should be removed from the flow cell. The protective cap, containing a small quantity of clean water, placed on the probe to ensure the sensor junction is kept wet. Store in a warmer environment.

### **4.2 Flow Cell**

Check the flow cell and carefully clean if there is signs of contamination. Check the pipe work for leaks and rectify.

### **4.3 Sample Strainer**

The flow to the sample cell is protected by a strainer against the ingress of debris that may damage or foul the probes/flow switch. This should be removed a cleaned periodically to ensure an adequate flow through the cell. If the strainer becomes blocked and the flow drops too low, the flow switch will inhibit the control of the dosing pumps. An increased lag between controller response and pool demand may be found if the strainer is not cleaned at the correct intervals.

### **4.4 Flow switch**

The flow to the sample cell should be isolated utilizing the sample valves to check the operation of the flow switch. This must be done each day whilst manually testing the sample cell water. Turning off the water supply to the flow switch should disable the dosing pump output relays and give a No Flow alarm message on the controller's alphanumeric display.

**5 FAULT FINDING**

The System 3<sup>NX</sup> has been manufactured to the highest possible quality standards. However as with all electronic devices there may be times when a malfunction occurs. The following guide should help solve any problems that might arise. Please note that under the 1989 Electricity at Work Act only suitably qualified personnel may carry out certain items below; these include electrical supply corrections and troubleshooting.

Remember, if contacting Siemens Water Technologies please give the fullest possible details of the model of controller, the lights illuminated (or not illuminated), the readings from the controller, the pool and the sample cell, so you receive the best advice available with the information given.



**WARNING:** Mains voltages can Kill. Mains voltages are present within the System 3<sup>NX</sup>. Only suitably qualified and trained personnel should work on the System 3<sup>NX</sup>.

**5.1 System 3<sup>NX</sup> Appears Dead**

CAUSE	REMEDY
External power supply failure	Check supply fuse / circuit breaker* Check supply isolation switch*
Internal power failure	Check the internal fuses F1, F2 on assembly AAB8599  Check the 2 yellow LED's on assembly AAB8604 are lit.

**5.2 Alarm Light Flashing**

CAUSE	REMEDY
	Check the alphanumeric display for alarm condition. Refer to the following for further guidance.

**5.3 pH High Alarm**

CAUSE	REMEDY
Acid pump not delivering chemical	Check correct operation of dosing pump.  Check that there is sufficient chemical in the day tank.

	For CO <sup>2</sup> systems check gap meter solenoid and cylinder content.
pH probe tip not filled with fluid	'Shake down' probe and reinstall.
Faulty probe	Replace probe.
Feed relay fuse	Check pH feed relay fuse F3 and F5
Feed relay	Contact Siemens Water Technologies for guidance

**5.4 pH Low Alarm**

CAUSE	REMEDY
pH probe tip not filled with fluid	'Shake down' probe and reinstall.
Faulty probe	Replace probe.
Chemical siphoning	Check by turning off the pump and marking the day tank level. If the level drops fit a 4-function valve to prevent siphoning.

**5.5 pH Over Feed**

CAUSE	REMEDY
Dosing pump on for longer than Over Feed Timer limit day tank	Check correct operation of dosing pump Check there is sufficient chemical in the  Check that turnover period does not exceed over feed timer setting (4 hours as standard)

**5.6 No pH Feed**

CAUSE	REMEDY
Over feed alarm	See above
Controller in proportional feed mode near set point	No action required providing the controller ultimately reaches set point. The feed light will flash to indicate the controller is not dosing as the proportional control in effect.
Feed relay fuse	Check pH feed relay fuse. F3 and F5
Feed relay	Consult Siemens Water Technologies for details

**5.7 Constant pH Over Dosing**

CAUSE	REMEDY
System 3 <sup>NX</sup> out of calibration	Refer to Section 3.4
The set point is too high Dosing pump set too high	Verify the set point is correct Adjust output refer to pump manuals

**5.8 Inaccurate pH Readings**

CAUSE	REMEDY
System 3 <sup>NX</sup> needs calibrating	Refer to Section 3.4
Inaccurate test kit readings	Refer to test kit manufacturer's recommendations. Ensure the kit is clean and in full working order the samples are not being contaminated with other samples and that the tables are not out of date.
Faulty probes	Replace probes

**5.9 PPM or HRR High Alarm**

CAUSE	REMEDY
System 3 <sup>NX</sup> needs calibrating	Refer to Section 3.4
Chemical siphoning	Check by turning off the pump and marking the day tank level. If the level drops fit a 5-function to prevent siphoning.
Faulty probes	Replace probes

**5.10 PPM or HRR Low Alarm**

CAUSE	REMEDY
System 3 <sup>NX</sup> needs calibrating	Refer to Section 3.4
Chlorine dosing pump not delivering chemical	Check correct operation of dosing pump Check that there is sufficient chemical in the day tank.
Faulty probes	Replace probes

**5.11 Chlorine/Bromine Over Feed**

CAUSE	REMEDY
Dosing pump on for longer than timer limit	<p>Check correct operation of dosing pump.</p> <p>Check there is sufficient chemical in the day tank.</p> <p>Check that turnover period does not exceed overfeed timer setting (4 hours as standard).</p> <p>Check that the injection point is clear.</p> <p>Consult Siemens Water Technologies for further details.</p>

**5.12 No Chlorine/Bromine Feed**

CAUSE	REMEDY
Over feed alarm	See above
Controller in proportional feed mode	Not action required providing the controller ultimately reaches the set point. The feed light will flash to indicate the controller is not dosing as the proportional control is close to set point.
Feed relay fuse	Check Cl <sub>2</sub> feed relay fuse F4.
Feed relay	Consult Siemens Water Technologies for further details.

**5.13 Constant PPM/HRR Over Feed**

CAUSE	REMEDY
System 3 <sup>NX</sup> out of calibration	Refer to Section 3.4.
The set point is too high	Verify the set point is correct.
Dosing pump set too high Chemical siphoning	<p>Adjust output refer to the pump manuals.</p> <p>Check by turning off the pump and marking the day tank level. If the level drops fit a 4-function to prevent siphoning.</p>

**5.14 Inaccurate PPM Reading**

CAUSE	REMEDY
System 3 <sup>NX</sup> needs calibrating	Refer to Section 3.4.
Inaccurate test kit readings	Refer to test kit manufacturer's recommendations. Ensure the kit is clean and in full working order, the samples are not being contaminated with other samples and that the tablets are not out of date.
Faulty probes	Replace probes

**5.15 No Output to Remote Alarm (if fitted)**

CAUSE	REMEDY
Alarm relay fuse	Check alarm relay fuse (F5) by switching off the flow and checking that the relay outputs a voltage.

**5.16 Intermittent Controller Faults**

CAUSE	REMEDY
Unclean incoming power supply	Make sure power supply is clean.
Power spikes	Check that timer-controlled plant is not causing a phase imbalance upon start up.
Inconsistent readings	This may be normal for a pool of low volume and high pollution content. Monitor and contact Siemens Water Technologies if the problem persists. Check that there is not a variance of over 5°C in the water temperature flowing through the cell. Voltage leak into the sample cell from external source.
Readings intermittently differ from test kit	Check manual test kit and operator testing procedure

**6 DISPLAYED MESSAGES**

<b>Overfeed Alarm</b>	Either or both pH and Redox (HRR) measurements have failed to reach the set point within the overfeed time.
<b>No Flow Alarm</b>	Indication of flow status.
<b>CI/BR Lockout Alarm</b>	pH measurement not within the proportional pH span.
<b>Sensor Wash</b>	Sensor wash process active.
<b>HRR High Alarm</b>	Redox (HRR) measurement above high alarm setting.
<b>HRR Low Alarm</b>	Redox (HRR) measurement below low alarm setting.
<b>pH High Alarm</b>	pH measurement above high alarm setting
<b>pH Low Alarm</b>	pH measurement below low alarm setting
<b>Temp High Alarm</b>	Temperature measurement above high alarm setting
<b>Temp Low Alarm</b>	Temperature measurement below low alarm setting

**KEY PART No. QTY DESCRIPTION**

-	AAB8655	1	System 3 <sup>NX</sup> complete
1	AAB8583	1	Overlay
2	AAB8580	1	Enclosure - pre drilled
3	AAB8595	2	Insulated bulkhead socket
4	AAB8619	1	pH label
5	AAB8622	1	ORP label
6	AAB8625	1	Warning label
7	AAB8658	4	Srew, csk. M2.5 x 8 long
8	AAB8634	4	Hexagonal spacer M2.5 x 8 lg.
9	AAB8598	1	Power/output PCB assembly
10	AAA3843	4	Tooth washer M2.5 int.
11	P88476	4	Screw, pan hd., Pozi No.8 x 9.5 lg.
12	AAA1359	4	Screw, pan hd., M2.5 x 8 lg.
13	AAB8643	1	Corrosion inhibitor
14	AAB8604	1	MCU/Input PCB
15	AAA1080	1	Serial label
16	AAB8610	1	Ribbon cable assembly

**Fig.1 General assembly of System 3<sup>NX</sup> Controller (AAB8655)**

# SYSTEM 3<sup>NX</sup> POOL AND SPA CONTROLLER

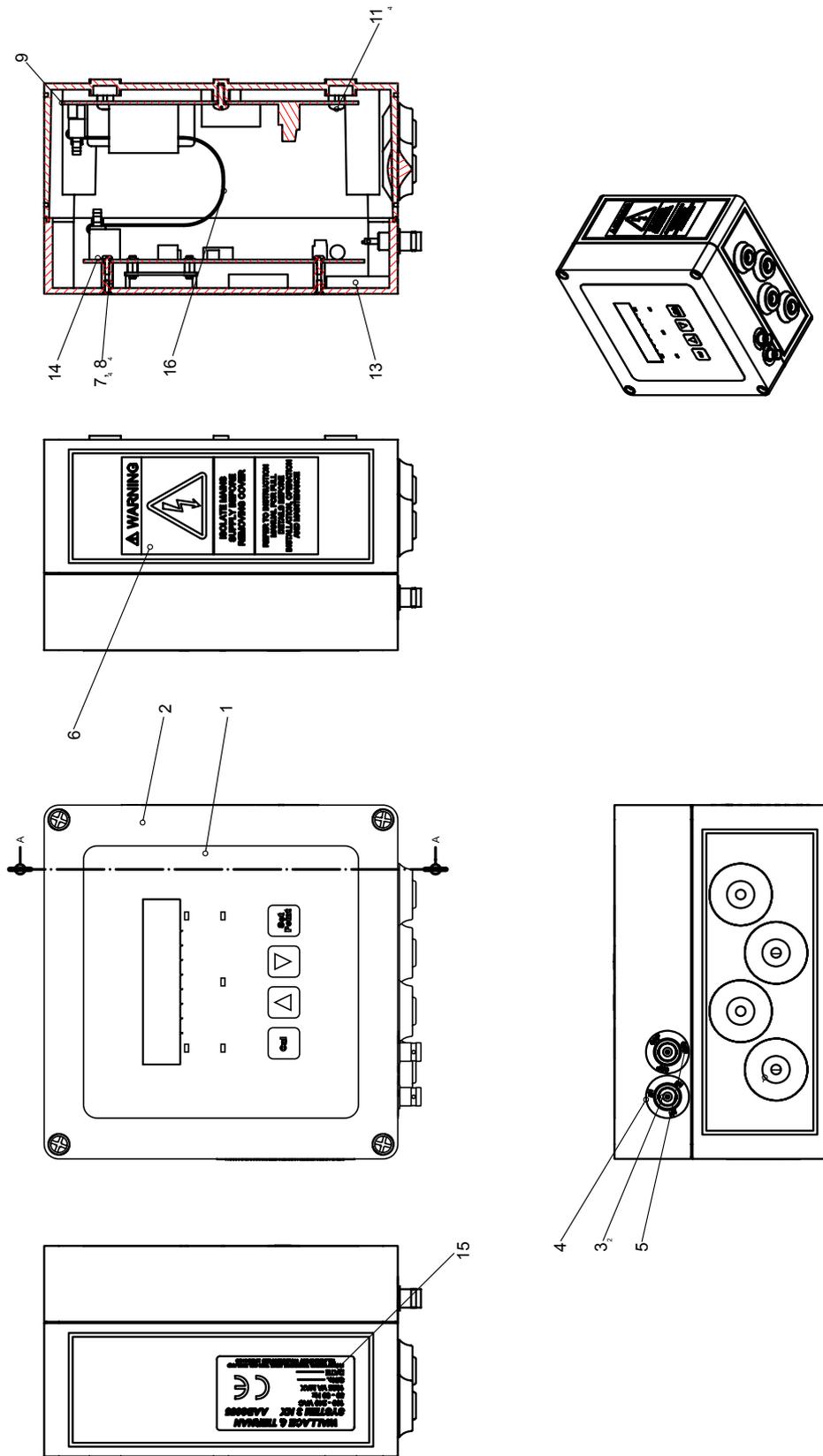


Fig.1 General assembly of System 3<sup>NX</sup> Controller (AAB8655)

## SYSTEM 3<sup>NX</sup> POOL AND SPA CONTROLLER

KEY	PART No.	QTY	DESCRIPTION
1	6075	1	Mounting board
2	16006	1	pH Probe
3	16007	1	HRR Probe
4	4038-SYS4	1	Flow cell Assembly
5	3262-temp	1	Temperature sensor
6	P87200	2	Maclow Clip
7	6018-SPACER	2	Spacer
8	6045	1	Flow Switch
9	6030-A	1	Sample strainer
10	4052A	4	Backboard Spacer
11	2109	1	Probe cleaner
12	2226	1	½" Plain ball valve
13	6056	1	Isolator
14	1234	1	Enclosure
	6050	5	Terminal Green/Yellow
	6049	6	Terminal Blue
	6048	9	Terminal
	6052	1	End cover
	6054	1	End stop
15	AAB8655	1	System 3 <sup>NX</sup> controller

**Fig.2 Layout/Overall Dimensions System 3<sup>NX</sup> Board Mount (AAB8979)**

# SYSTEM 3<sup>NX</sup> POOL AND SPA CONTROLLER

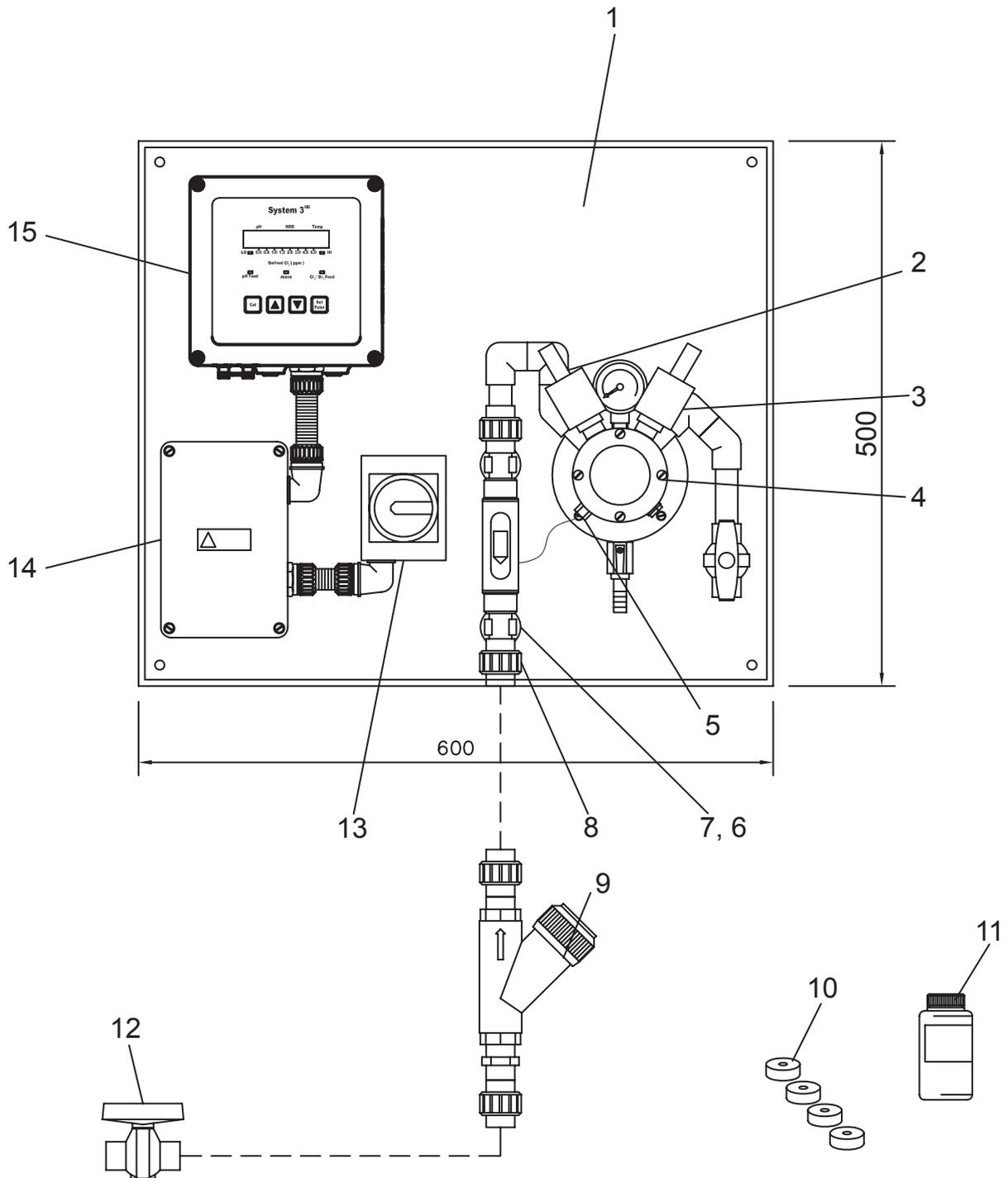


Fig.2 Layout/Overall Dimensions System 3<sup>NX</sup> Board Mount (AAB8979)

**SYSTEM 3<sup>NX</sup> POOL AND SPA CONTROLLER**

<b>KEY</b>	<b>PART No.</b>	<b>QTY</b>	<b>DESCRIPTION</b>
1	6075-SOP	1	Mounting board
2	16006	1	pH Probe
3	16007	1	HRR Probe
4	4038-SYS4	1	Flow cell Assembly
5	P87200	2	Maclow Clip
6	6018-SPACER	2	Spacer
7	6045	1	Flow Switch
8	6030-A	1	Sample strainer
9	4052A	4	Backboard Spacer
10	2109	1	Probe cleaner
11	2226	1	½" Plain ball valve
12	AAB8655	1	System 3 <sup>NX</sup> controller

**Fig.3 Layout/Overall Dimensions System 3<sup>nx</sup> Mini Mount (AAB8985)**

# SYSTEM 3<sup>NX</sup> POOL AND SPA CONTROLLER

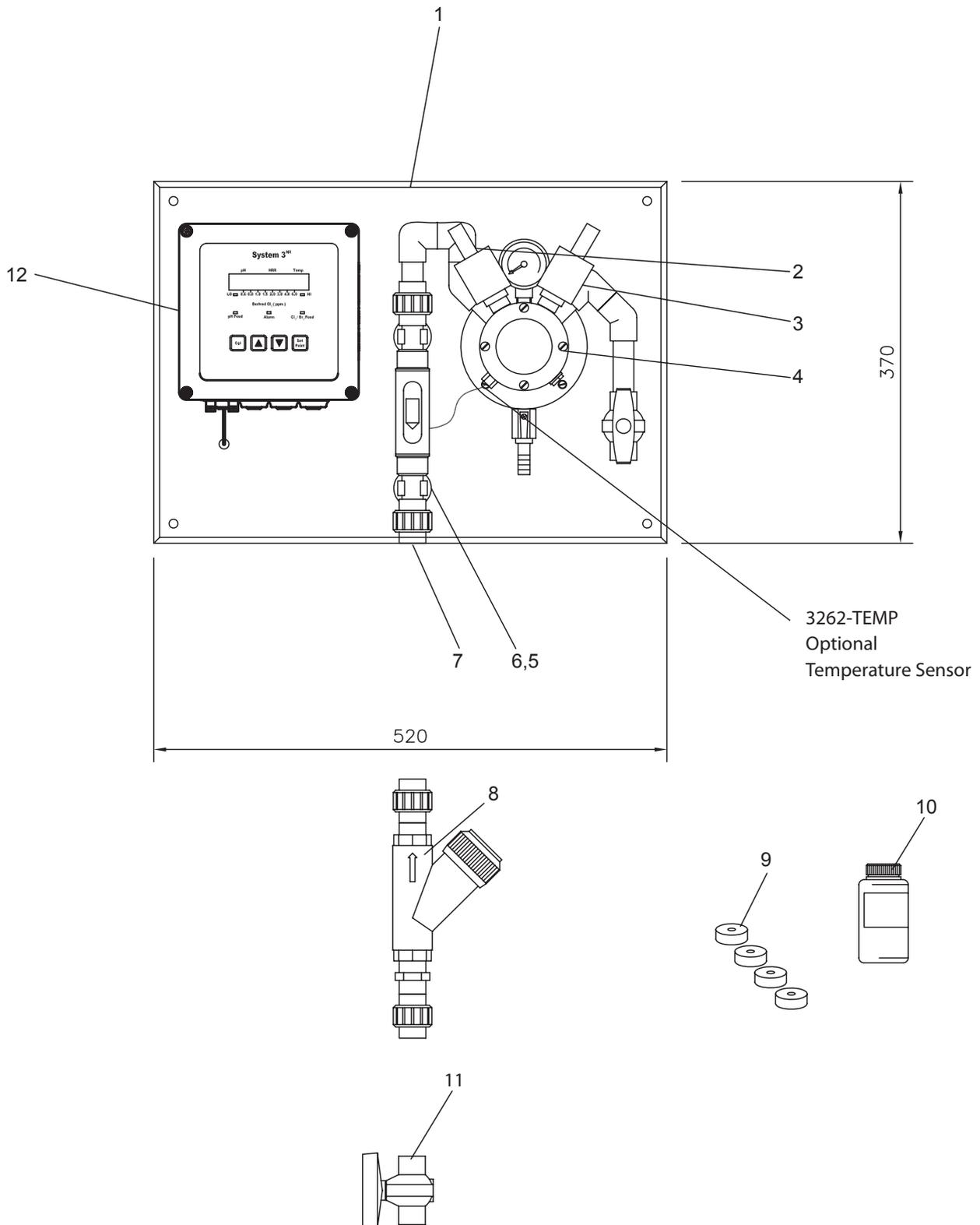
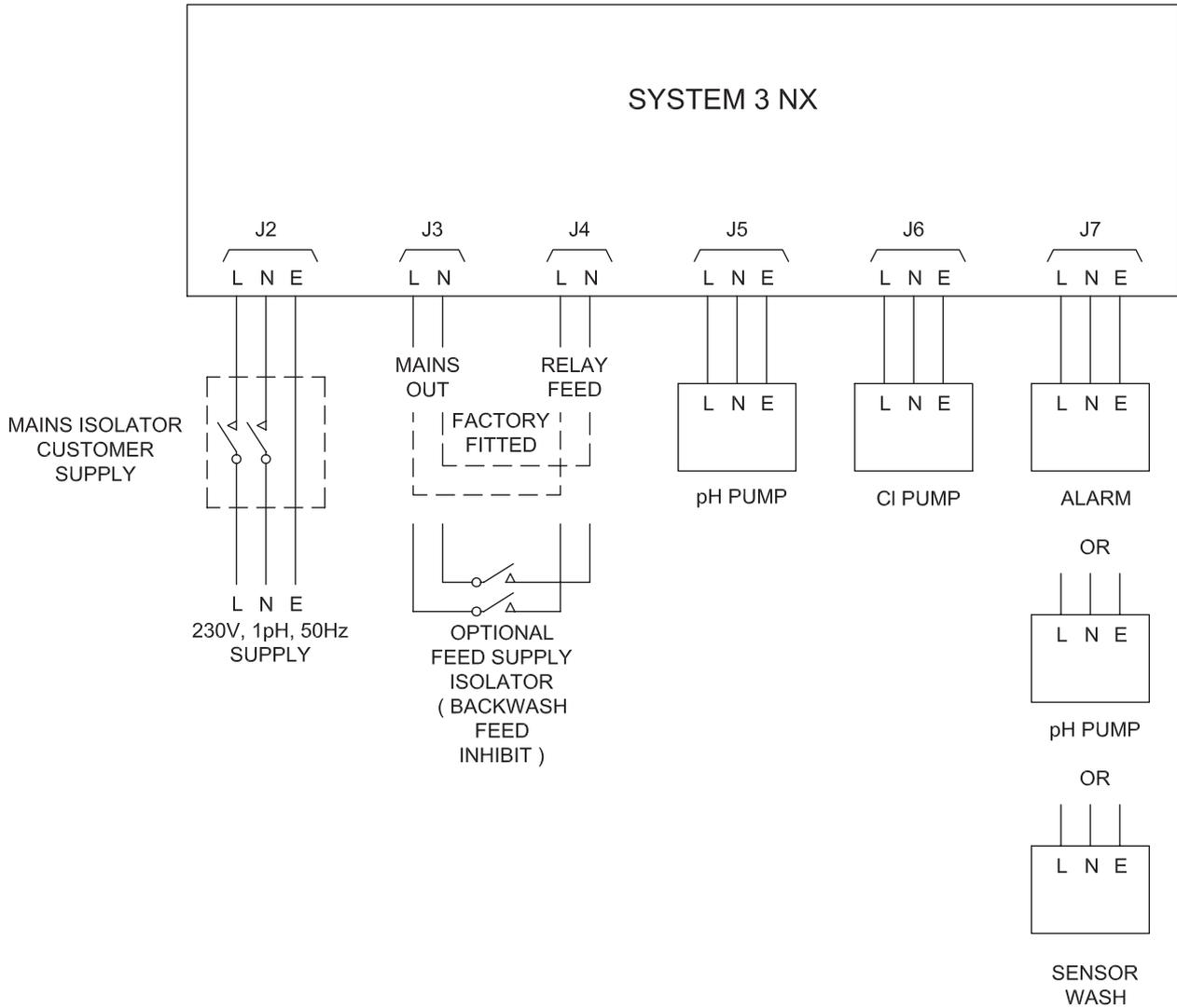
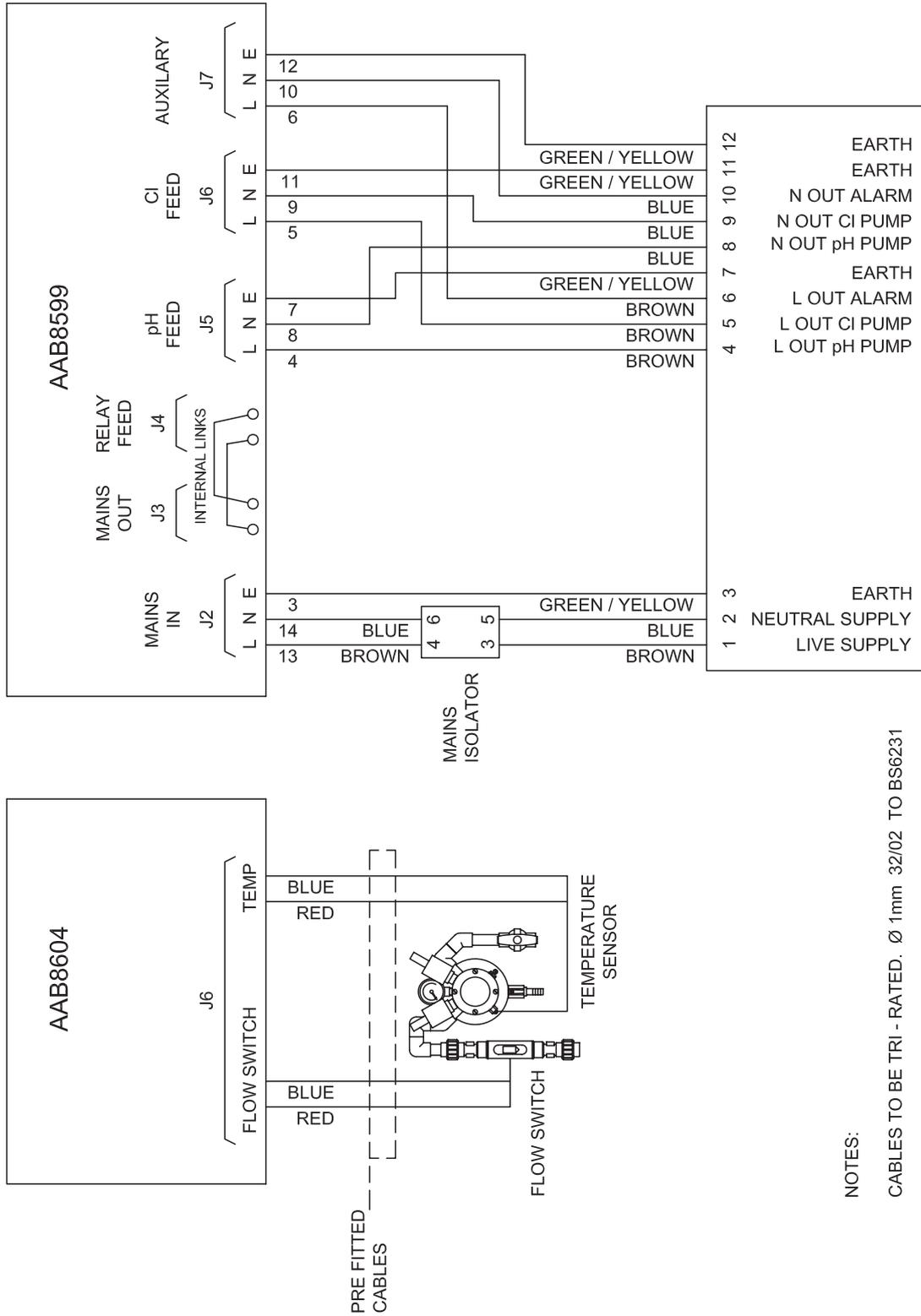


Fig.3 Layout/Overall Dimensions System 3<sup>NX</sup> Mini Mount (AAB8985)



**Fig.4 External Connection Diagram (XAC1279)**



**Fig.5 Connection Diagram (XAC1280)**

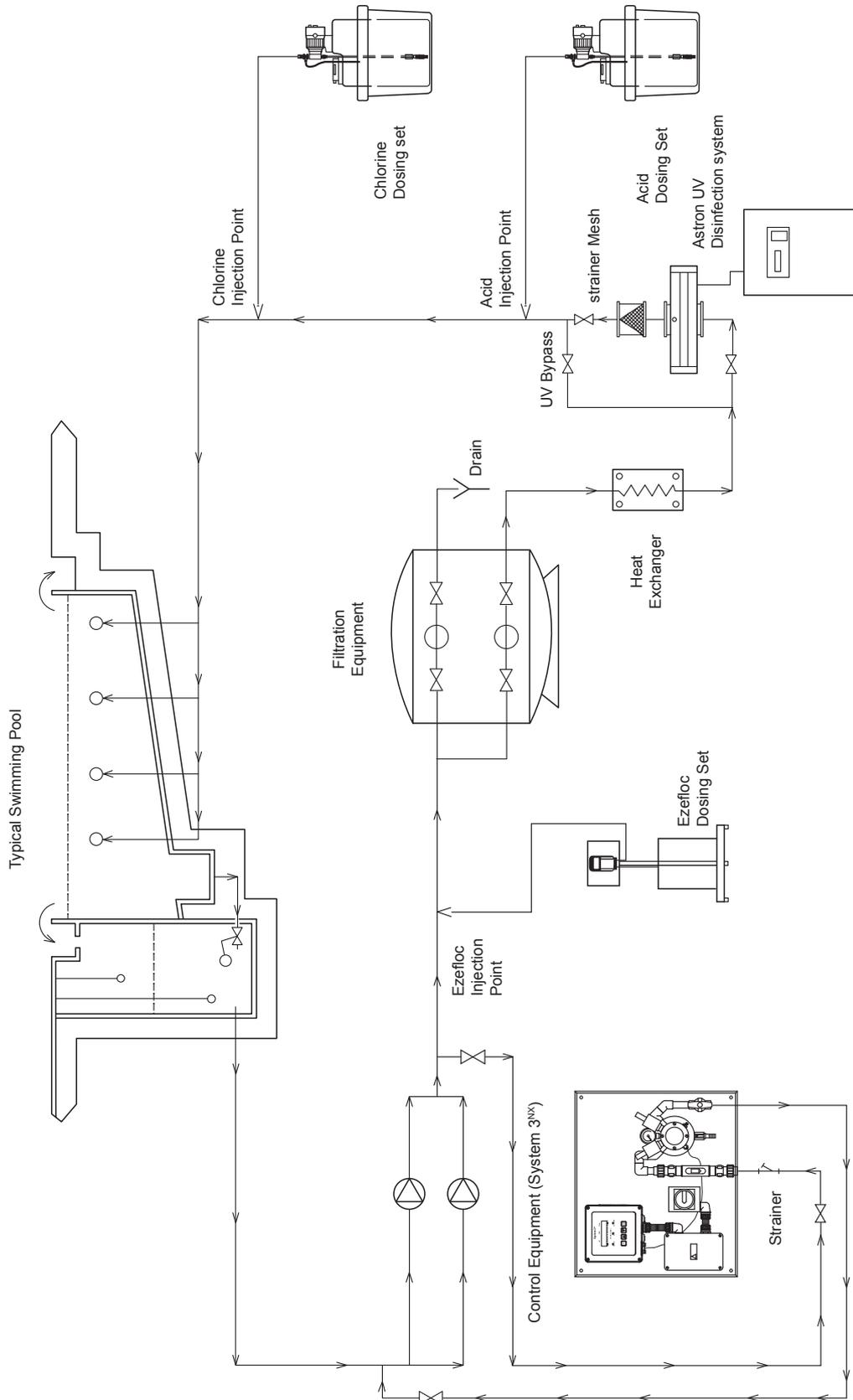


FIG.6 TYPICAL INSTALLATION (PSK499)