



PBS3 - Process Buoy System

User manual



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1. Introduction

This manual contains information about the installation, programming and operation of the Process Buoy for Ammonia, the PBS3.



Fig. 1 - PBS3 Analyser in maintenance mode

1.1 Description of the Process Buoy for Ammonia

The Process Buoy System PBS3 consists of an analyser, a connection cable, and a transmitter. It can be mounted on a stand or alternatively by a wall bracket.

The analyser is placed into the waste water and measurements are taken. Following these measurements, the data is transmitted to the transmitter where the current values are graphically displayed and stored.

Data is sent to the transmitter over a period of 12 months, provided a standard SD card is fitted in the transmitter housing. In the absence of an SD card, data can be stored for up to 1 month.

The analyser can be manually controlled and monitored, using either the glove-friendly High Viz touch screen device or keypad. Measured data can be transmitted over a 4-20 mA signal output for external processing. As an option, it is possible to connect the controller to a modem and control and monitor the analyser remotely, via the VNC protocols or FTP. There is also a feature to download data logs via USB.

1.2 Analyser Components

The analyser consists of a cylindrical unit, enclosed in a stainless steel casing, on the bottom end of which the measuring and settling cell is mounted (see fig. 2.1 & 2.2). The measuring equipment (electrodes, distributor board, tanks for standard and reagent solution, solenoid valves etc. are contained inside the casing.

If the stainless steel casing is removed, the interior components of the analyser are visible:

Fig. 2.1

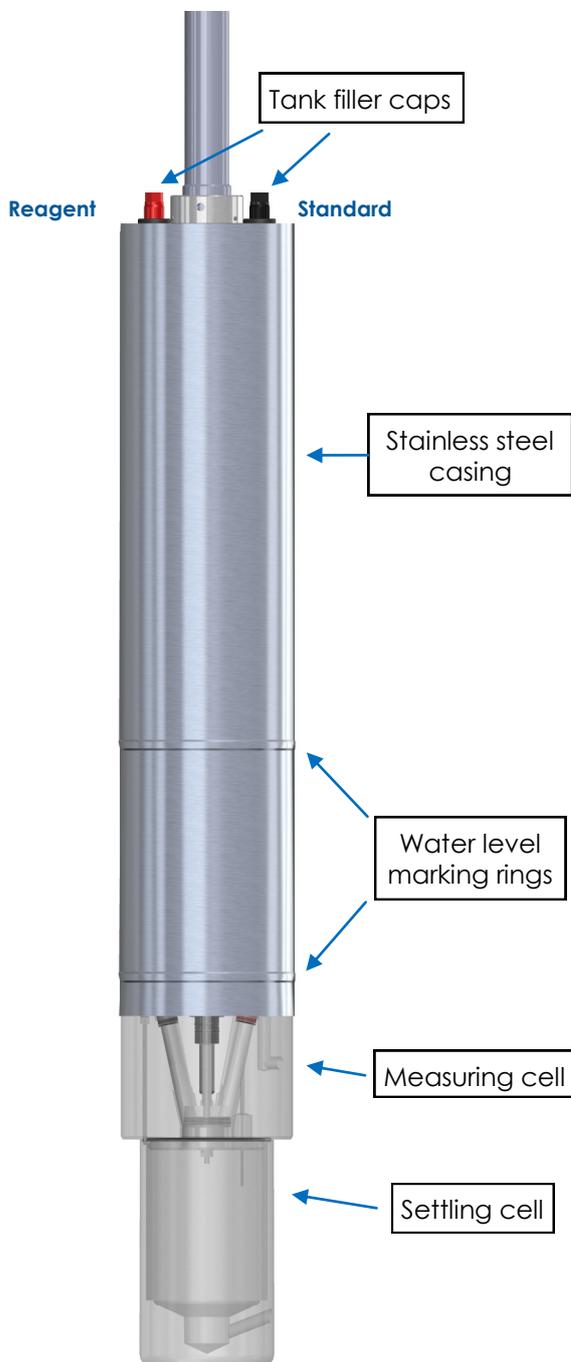
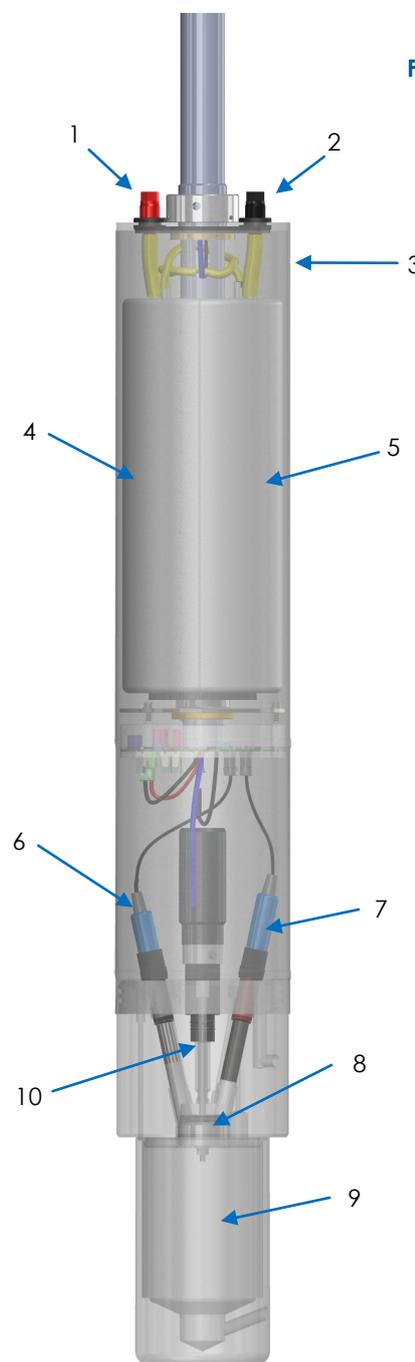


Fig. 2.2



Pos.	Description
1	Tank filler cap red - reagent
2	Tank filler cap black - standard
3	Stainless steel casing
4	Tank reagent solution
5	Tank standard solution

Pos.	Description
6	Ammonium electrode
7	pH-electrode
8	Measuring cell
9	Settling cell
10	Mixer

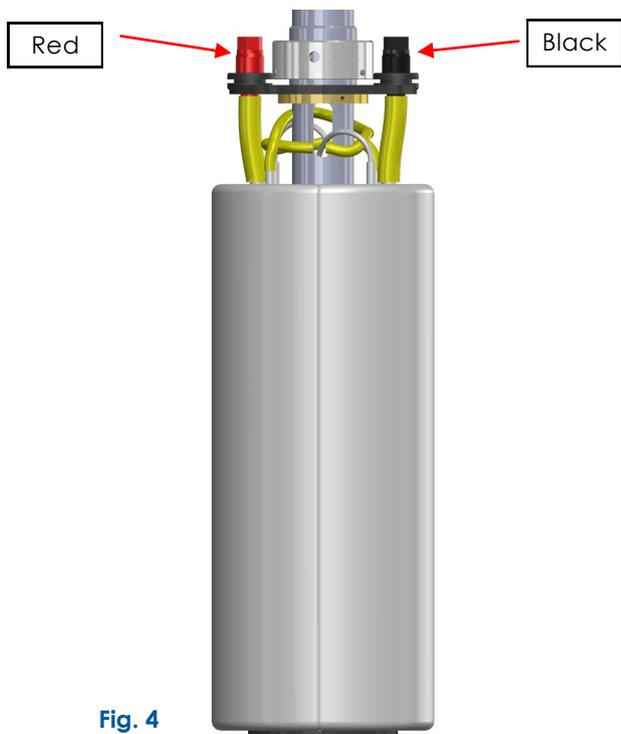


Fig. 4

The tank with the red tank filler cap contains reagent solution for the Ammonium measurement. The standard solution for calibrating the system is in the tank with the black filler cap. Both tanks are always under pressure while the analyser is operating.

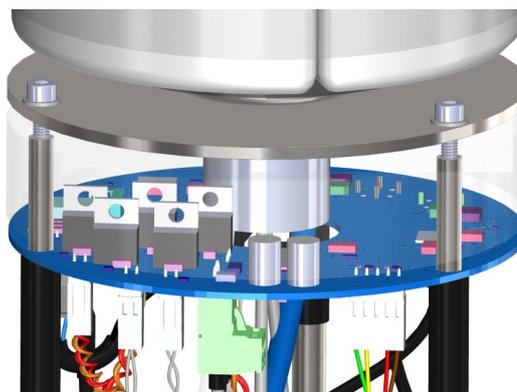


Fig. 3

The distributor board of the analyser controls the solenoid valves for filling and purging the measuring and settling cell. The measured data are also sent to the transmitter by the distributor board.

The main body is an acrylic block in which electrodes, sensors solenoid valves and the stirrer are mounted.

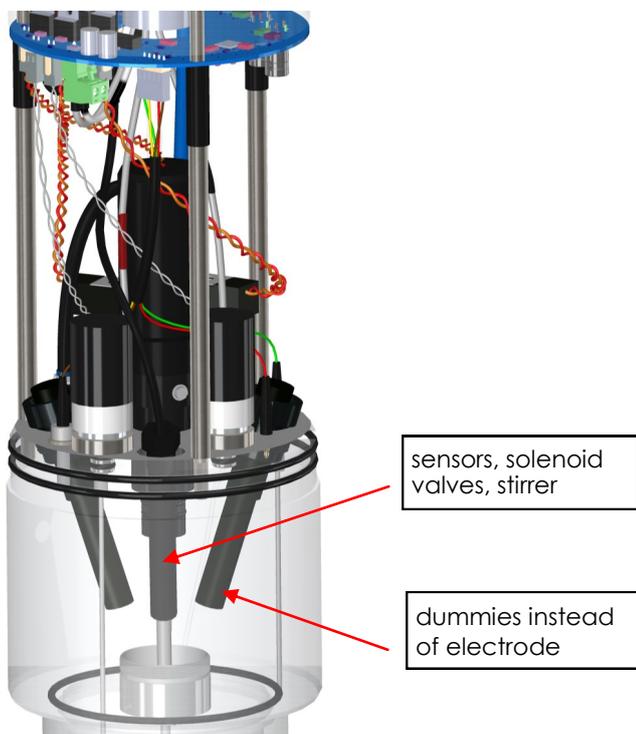


Fig. 5

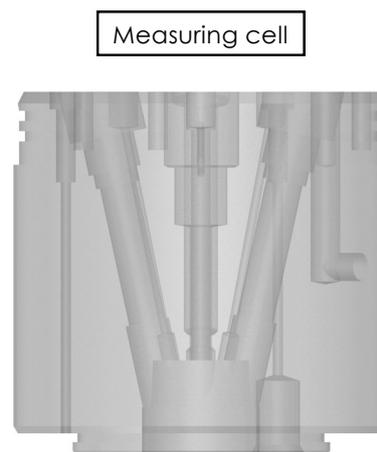
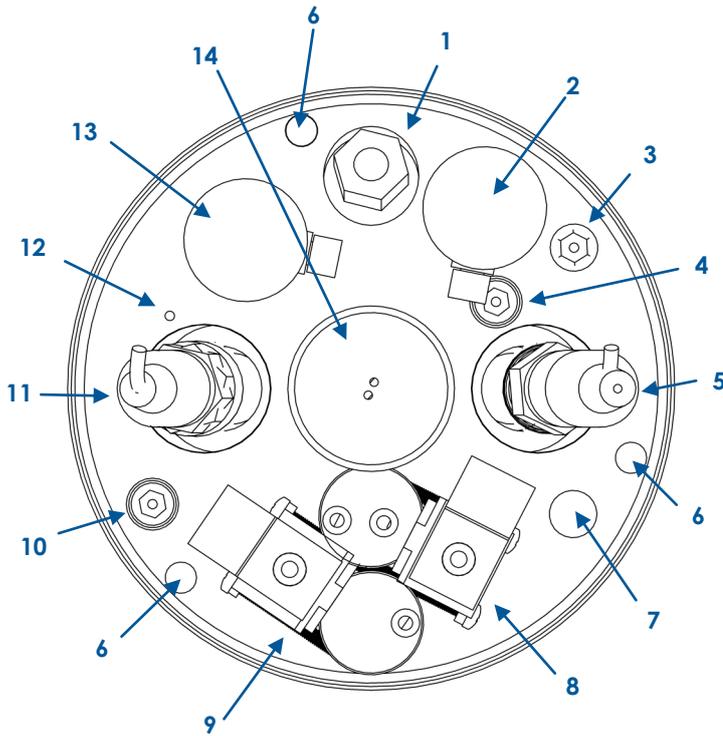


Fig. 6



Pos.	Description
1	Temperature sensor
2	Valve for standard solution
3	Alarm sensor (brown)
4	Settling cell sensor (green)
5	Electrode B (pH electrode)
6	Support rods
7	Air outlet
8	Aeration valve
9	De-aeration valve
10	Sensor, secured contact (yellow)
11	Electrode A (ammonium)
12	Leakage sensor (red)
13	Valve for reagent solution
14	Stirrer

Fig. 7

Table 2

View of wet end components.

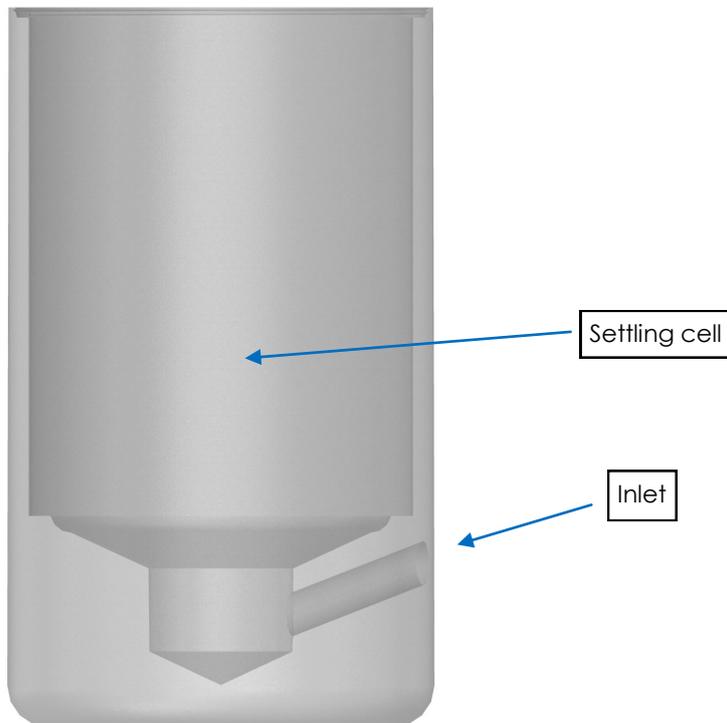


Fig. 8

The settling cell is an acrylic cylinder at the bottom of the analyser.

Connection cable

The connection cable consists of a supporting pipe and a flexible, plastic covered protective hose. The cable protective hose contains the power supply cables (black/white), the data transfer cable (black) and a tube (blue), which supplies the analyser with air from an air pump.

The supporting pipe is connected to the cable protective hose and is fastened to the analyser/supporting pipe. The cable protective hose and the wires which run through it are fastened to the transmitter.

The connection cable is available in different lengths.

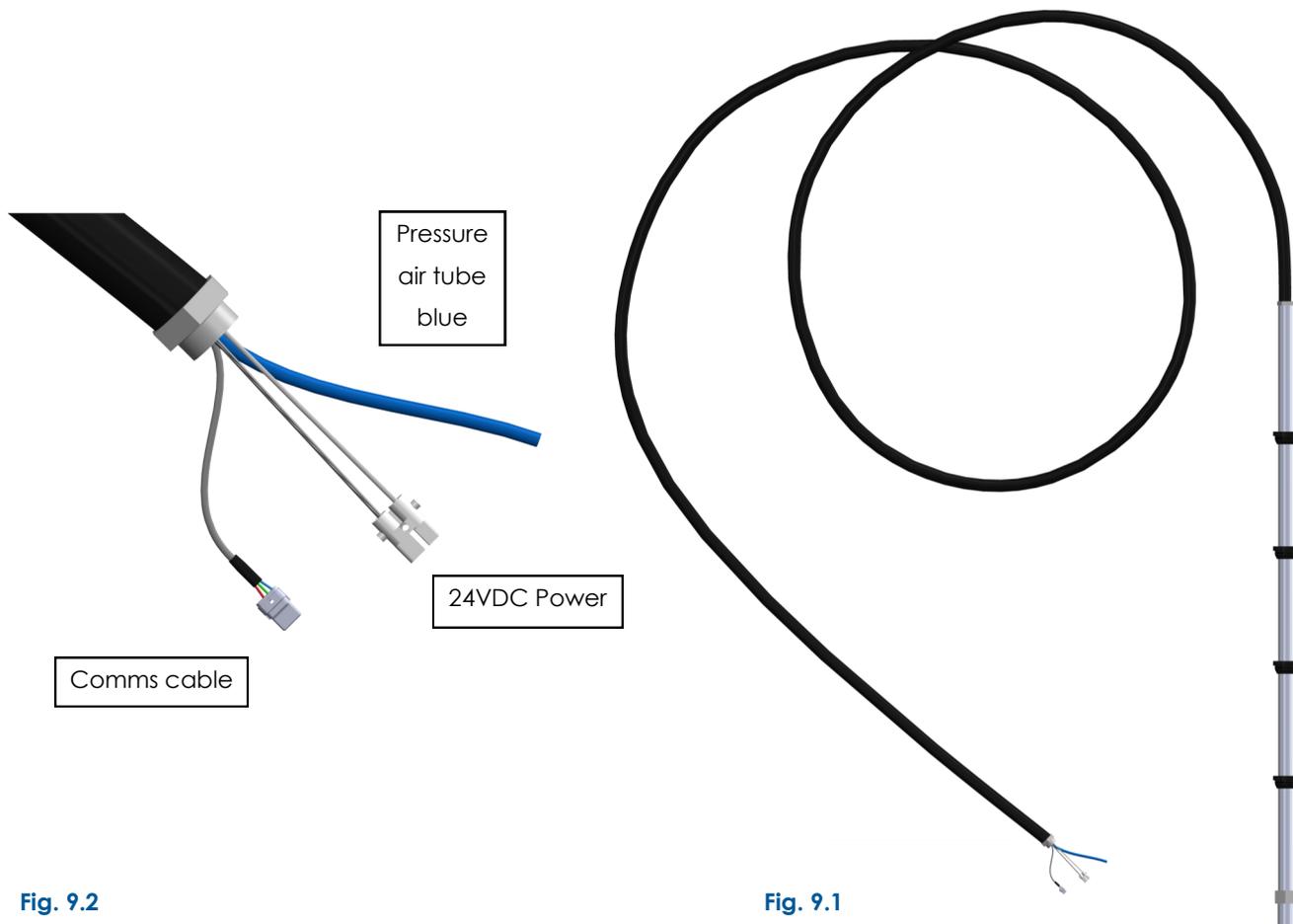


Fig. 9.2

Fig. 9.1

Supporting pipe

The supporting pipe is connected to the protective hose and is fastened to the analyser. With the aid of the supporting pipe, the analyser is fastened to the stand and raised and lowered into the waste water. The analyser can be suspended in maintenance position for maintenance or repair.

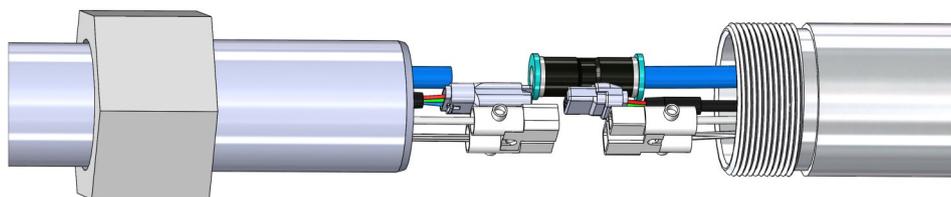


Fig. 10



The transmitter controls and monitors the connected analyser. By using the transmitter, the user can:

- adjust settings of the analyser
- store measured data
- manually start maintenance routines
- control analyser operation

Fig. 11

2. Operation - Display and Operating Elements



Fig. 12.1

2.1 Menu Display

The basic menu offers a simplified top level view of the current system status and active operation. It aims to offer at-a-glance information of instrument status and activity. In addition to enabling access to system configuration options and detailed information through the Advanced Menu. The Basic Menu also offers quick access to commonly used processes and data.

Indicators

- Last measured NH4-N concentration
- The date & time when the measurement was recorded
- System Clock
 - If no new measurement recorded within the interval window, The 'time of last measurement' changes to RED
- Measurement progress information
 - Measurement Pending
 - Purging Chamber
 - Filling Chamber
 - Settling
 - Filling Dome
 - pH Adjustment
 - NH4-N Measurement
 - NH4-N Calibration
 - Chamber Wash

- Activity indicator
Blinking LED visible only during system active
- System status indicator :
3 States
 - GREEN = OK
 - YELLOW = WARNING
 - RED = ERROR (measurement stopped)

- Fill Sensor Status

Consumables estimated level

3 States

- GREEN = OK
- YELLOW = reagent level below 10% and standard below 15%
- RED = reagent level below 5% and standard level below 10%

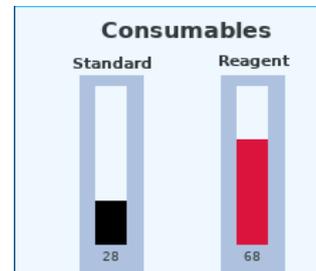


Fig. 12.2

In the operation mode, the current measured value, as well as the values of the past four hours, are graphed as a curve on the display. All recorded values can be transferred to a USB disk for further processing.

In operation mode, calibrations are automatically carried out by the transmitter. Any malfunctions are displayed and recorded. Limit alarms, which activate the corresponding potential-free signal relays, are displayed on the screen.

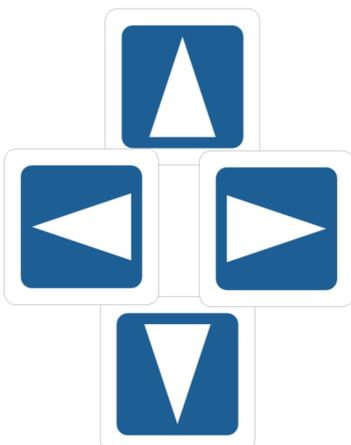
Manual operation is necessary only for maintenance or repairs. Automatic operations are stopped for the duration of servicing.



The ESC-key is used as a return function to navigate the menu structure of the main software. On the top most screen (main menu), pressing the key brings up system status messages console.



Enter-key



The Arrow-keys are mainly used to navigate the graphical user interface. Additionally, they can be used to scroll the previous recorded measurement graph and the "measurement history menu".

Fig. 12.3

Accessing and changing settings and menus can be carried out either via the touch-screen or alternatively via the keypad

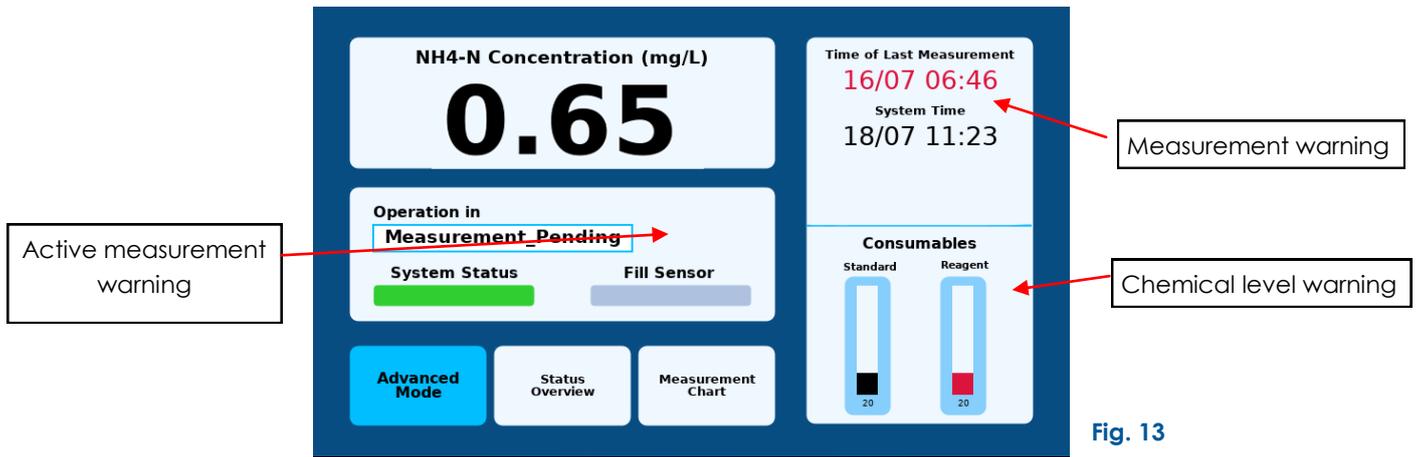


Fig. 13

2.2 Navigation

- Advanced Mode
 - Opens the Advanced Menu which offers an in-depth view of the measuring process and additional details about the current status of the analyser.
- Status Overview
 - Opens a quick overview of the system configuration and latest errors
- Measurement Chart (button and indicator)
 - Open the Measurement History menu graphing all measurements recorded Up to 2 months prior
- System Status
 - Shows all currently active error and warning codes along with a short description
 - Can be accessed by tapping the onscreen indicator or pressing the ESC key on the built in keypad (this will only work on the basic screen and not the advanced screen)
- Chemical Consumable indicators
 - Used to access the Chemical Refill Menu
 - If the user is not logged into a service account, he will be asked to do so before proceeding
 - **! Measurement activity is suspended during servicing operations**
 - If a measurement operation is active, the Chemical Refill Menu is opened after the measurement completes

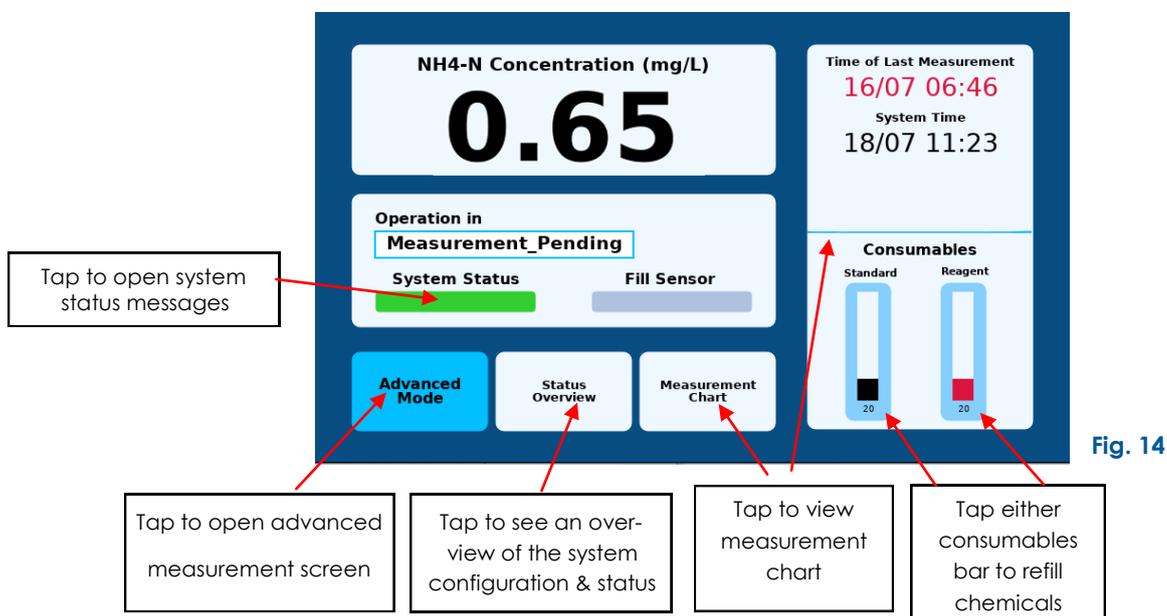


Fig. 14

2.3 Common Interfaces



Figure 15: System Status Bar

System Status Bar

Visible in some of the advanced system menus, it aims to offer at-a-glance information about the current system status. Indicators include communication status with the analyser probe and its firmware version, the user account currently logged in, status of the fill and leak sensors as well as active errors and warnings. Tapping the error box, reveals the error message box detailing possible issues.

Example Error boxes

Tapping the error indicator will create a message box detailing the issue. The text boxes below illustrate what the user may see when pressing the error status indicator.

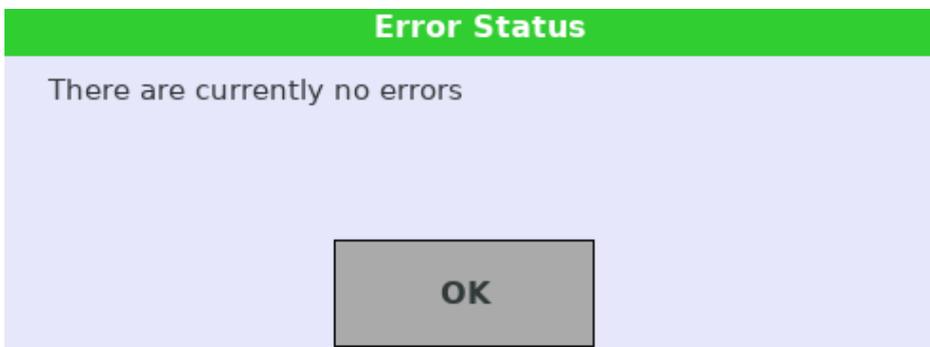


Figure 16: Example error box – no warnings or errors active



Figure 17: Example error box - warnings active

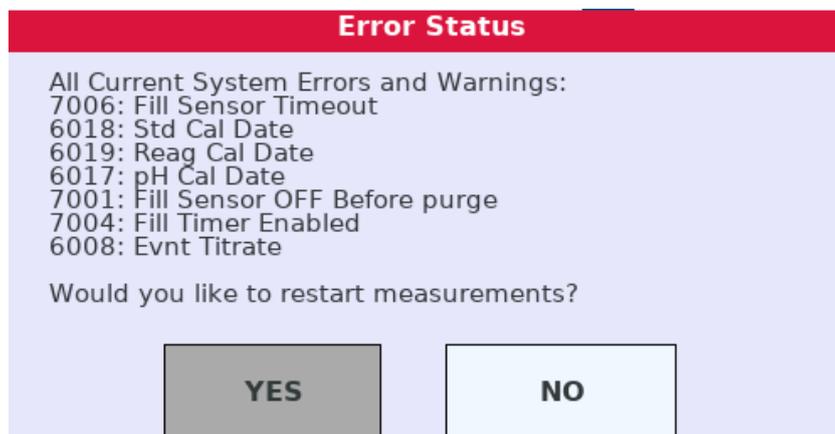


Figure 18: Example error box - errors active

2.4 System status overview and Advanced system menu

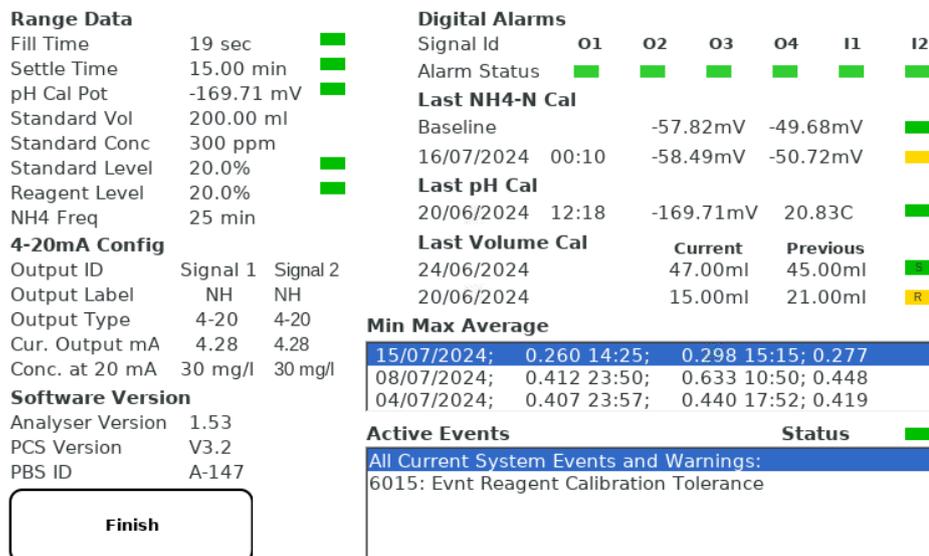


Figure 19: Status Overview

Summary screen showing all key parameters with the status. Useful to take a screen shot / photo and send to Envitech Tech Support.

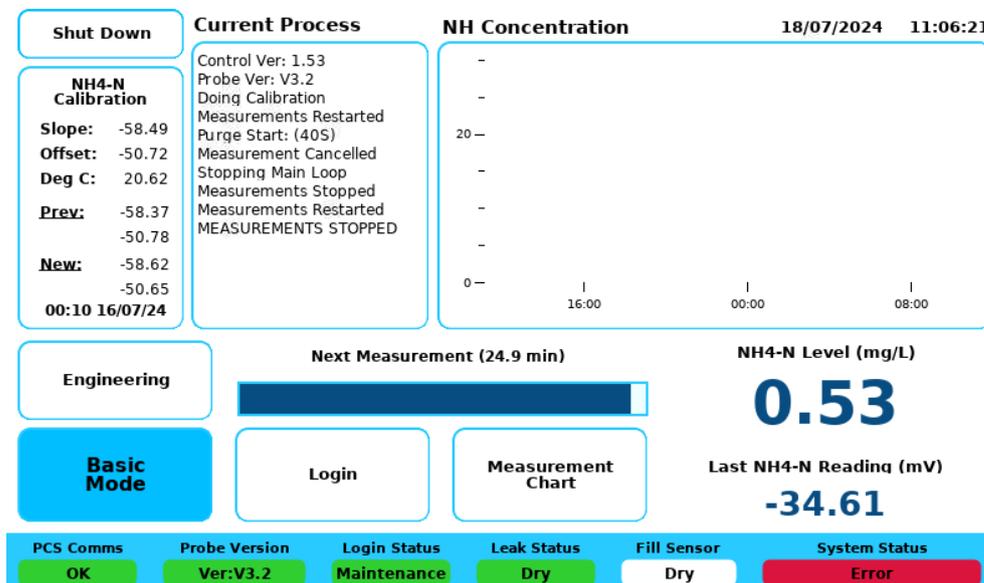


Figure 20: Advanced Menu - System Idle

2.5 Advanced Menu

The Advanced Menu offers detailed real-time status of the measurement and calibration processes as well as providing access to system configuration options. The menu has 2 primary states of operation: system idle and process active. The process active state indicates one of 3 activities: measurement, calibration and wash. Active operations are updated in real-time in the Current Process list and are colour coded based on activity.

Logging in with a valid service account enables access to the system configuration options via the Engineering Menu.

Indicators

- NH4-N Calibration parameters
 - Currently active slope and offset and calibration temperature (average between last and latest calibration parameters)
 - Previous calibration parameters
 - Newest calibration parameters
 - New slope and offset

- Current Process
 - Shows step-by-step information about the currently active measurement/calibration such as current process stage or number of reagent doses to be delivered

- NH4-N measurement trend graph
 - System Idle
 - Plots all measurements taken in the past 24 hours
 - Y-axis scale can be changes in the Operational Parameters menu
 - Process Active
 - Plots results of current process stage, such as NH4-N and pH levels
 - Colour coded based on active process

- System date and time

- Countdown timer bar
 - Counts down to next measurement when system is idle
 - Counts down to end of each process stage during measurement

- Last recorded reading displayed in mg/l and mV
 - Change to current readings during measurement
 - Show pH readings while adjusting the sample pH level
- System Status Bar

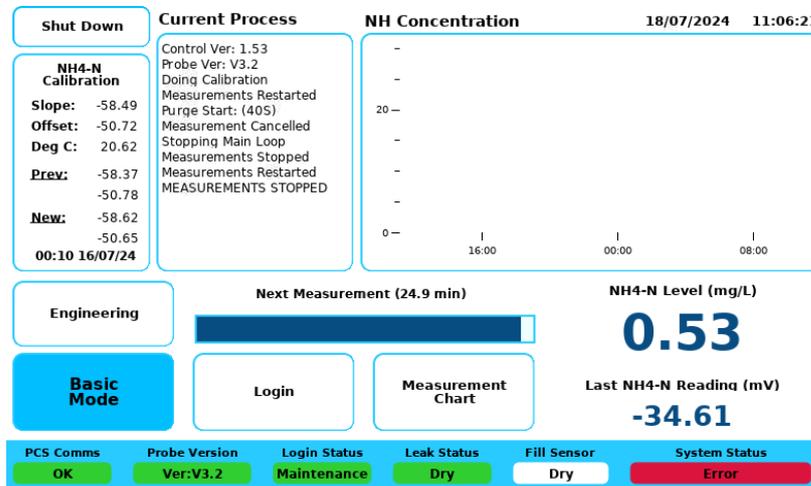


Figure 21: Advanced Menu - System Idle Service account

Buttons

- Engineering
 - Only visible to servicing users
 - Opens the Engineering menu
 - Has 2 modes of operation
 - IF measurement pending: stops the next scheduled measurement or calibration from starting and grants access to full engineering options. If the measurement interval has passed, the next measurement or calibration will start as soon as the Engineering menu is closed
 - IF measurement active: limited access to engineering options, next measurement will take place at the regular interval
- Basic Mode
 - Opens the Basic Menu
- Login
 - Opens login console
- Measurement Chart
 - Opens recorded measurement history
- Shut Down
 - Stops scheduled operations and allows the user to empty or fill the measurement chamber
 - This also turns off the compressor which puts the analyser in a state to safely power off (no data or log corruption)
- Stop
 - Only visible when a process is active
 - Stops active measurement or calibration

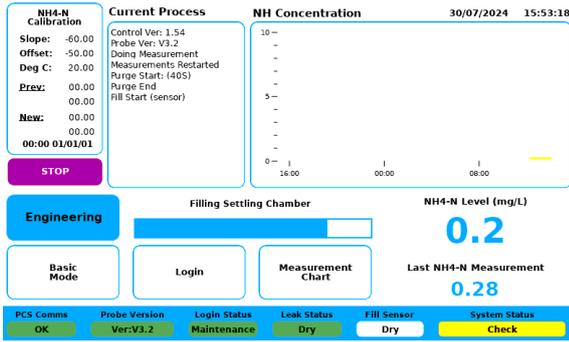


Figure 22: Advanced Menu - Fill Settling Chamber

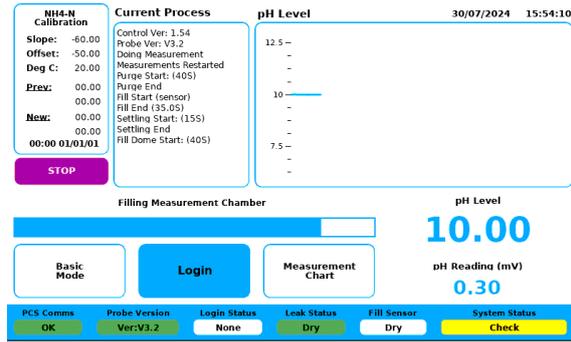


Figure 23: Advanced Menu - Fill Measurement Chamber

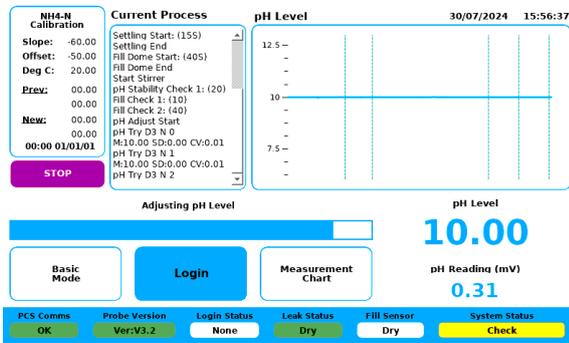


Figure 24: Advanced Menu - Adjusting pH

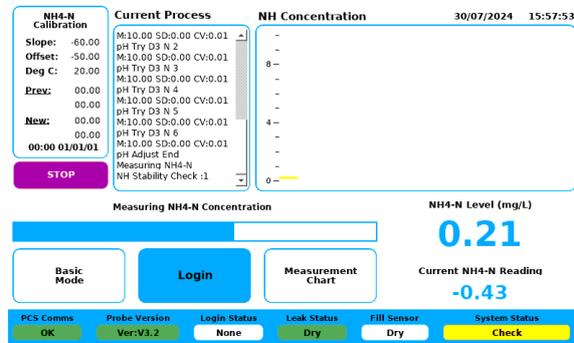


Figure 25: Advanced Menu - Adjusting NH4-N

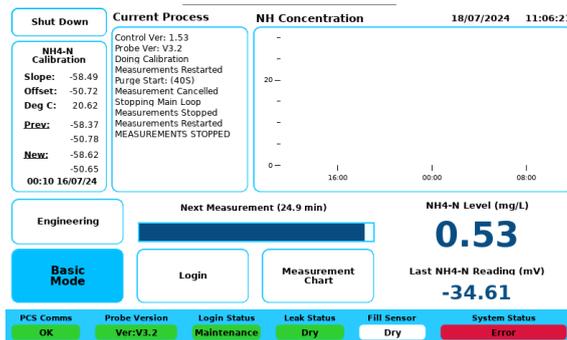


Figure 26: Advanced Menu - System Idle

Indicators	Description
NH4-N Calibration	Shows latest slope and offset parameters and calibration temperature *will show average of last 3 calibrations Shows previous slope and offset * will show latest parameters * will show previously used calibration
Current Process	Shows information about current measurement/calibration such as current activity or number of reagent doses to be delivered
NH4-N measurement trend	Plots every measurement taken in the past 24 hours X-axis self-adjusts Y-axis scale can be changes in the operational parameters menu Changes colour based on operation - Green during calibration - Blue during washes
System date and time	Shows the current date and time
Last recorded reading displayed in mg/l and mV	Changes to current readings during measurement Show pH readings when adjusting the sample pH Changes colour to blue if an operation is currently active
PCS Comms status	Shows the connection status between the Controller & Probe
PCS firmware version	Indicates Probe firmware version
Current login status	Shows current user account
Leak sensor status	Shows leak sensor active status
Fill sensor status	Shows fill sensor active status
Error status	Tap to show full list of errors/warnings
Buttons	Description
Engineering	Only visible to logged in users Opens the Engineering menu Has 2 modes of operation - IF measurement pending: stops the next scheduled measurement or calibration from starting and grants access to full engineering options. If the measurement interval has passed, the next measurement or calibration will start as soon as the Engineering menu is closed - IF measurement active: limited access to engineering options, next measurement will take place at the regular interval
Basic mode	Opens the basic menu
Login	Opens login console
History	Opens measurement history
Shut down	Turns software off *Secondary function: puts system in 'safe to power off' mode *To re-activate you will need to power off & on via the isolator switch
Stop	Only visible when a measurement is active Stops active measurement or calibration

Table 3

2.6 Configuration

Change operating parameters

Login Menu

The login menu provides a basic keypad for text entry with additional Clear, Cancel and Help buttons. Successfully inputting a user PIN automatically enables the user class and closes the login menu. Daily pins are available. Most pins can be changed from the Operational Parameter menu. All user classes timeout after 1 minute of inactivity.

PINs

- Contractor = 4738
 - Call Envitech for further access codes / daily pass

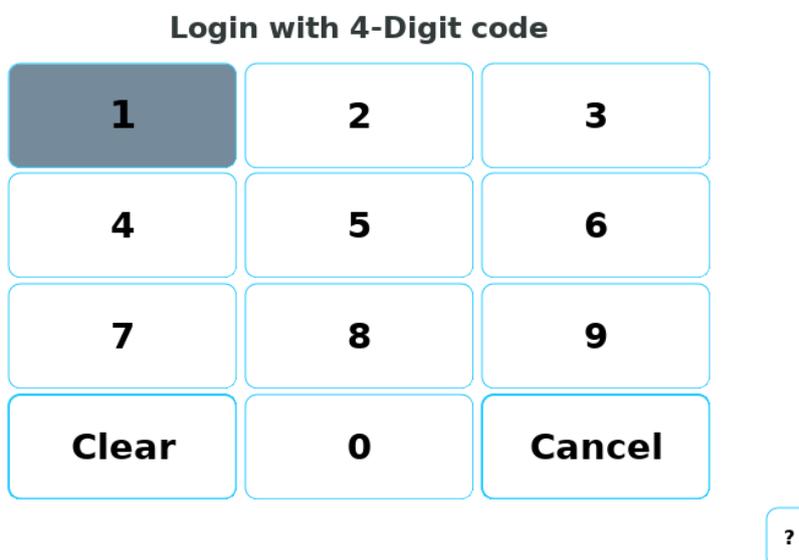


Figure 27: Login Menu

Operating Parameters Configuration

This menu is used to view or modify any of the working parameters used by the analyser. For ease of use, parameters are separated into categories. Entries can be selected using the touch screen by tapping on the desired parameter, pressing the UP or DOWN button to go through entries one-by-one or by using the physical keypad.

Changing the category, will open a new list of parameters.

Operating Parameters Configuration

This menu is used to view or modify any of the working parameters used by the analyser. For ease of use, parameters are separated into categories. Entries can be selected using the touch screen by tapping on the desired parameter, pressing the UP or DOWN button to go through entries one-by-one or by using the physical keypad.

Changing the category, will open a new list of parameters.

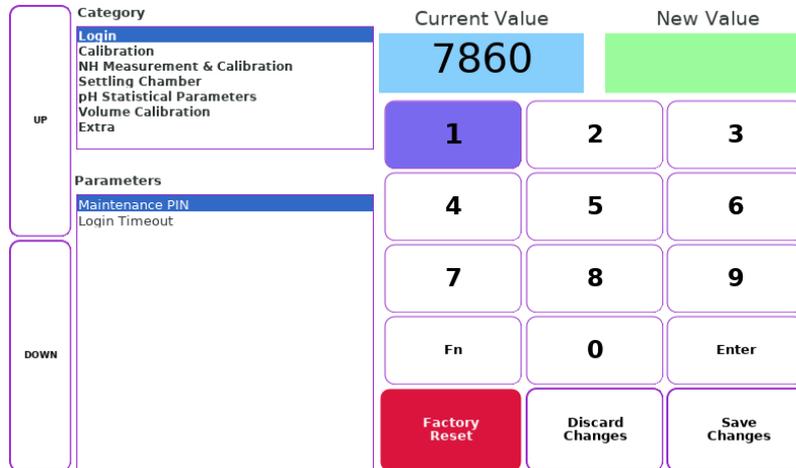


Figure 28

Indicators

- Category panel
 - Select the category of the setting that needs to be changed
- Parameter panel
 - Entries are added and removed based on the highlighted category
- Current value
 - Currently registered value
- New value
 - Desired value

Buttons

- UP/DOWN
 - Navigate panel entries
- Numeric keypad
- Fn
 - Function key; enables CLEAR, decimal point and sign buttons
- Enter
 - Must be pressed to confirm new parameter values
- Factory Reset
- Discard Changes
- Save Changes

2.7 Engineering Menu

The Engineering menu is the main point of access for all the maintenance functions and configuration. The menu contains a timeout function and automatically closes after 5 minutes of inactivity. Depending on currently active warnings and errors, closing the Engineering menu will suggest a number of actions to remedy the issue before resuming measurement.

Go back to Advanced menu and select STOP if some buttons are not available because of measurement status.

Buttons

ALL OF THE BELOW = Only accessible if measurement is pending

- Manual NH Measurement and Calibration
- PCS Functions
- Refill Volumes
- Calibrate Volumes
- Calibrate pH
 - ALL OF THE ABOVE = Only accessible if measurement is pending
- Change Operating Parameters
- Restart Measurement
 - Only accessible if measurements have stopped
- Extras
- Comms Set-UP
- Finish

Engineering Options Menu

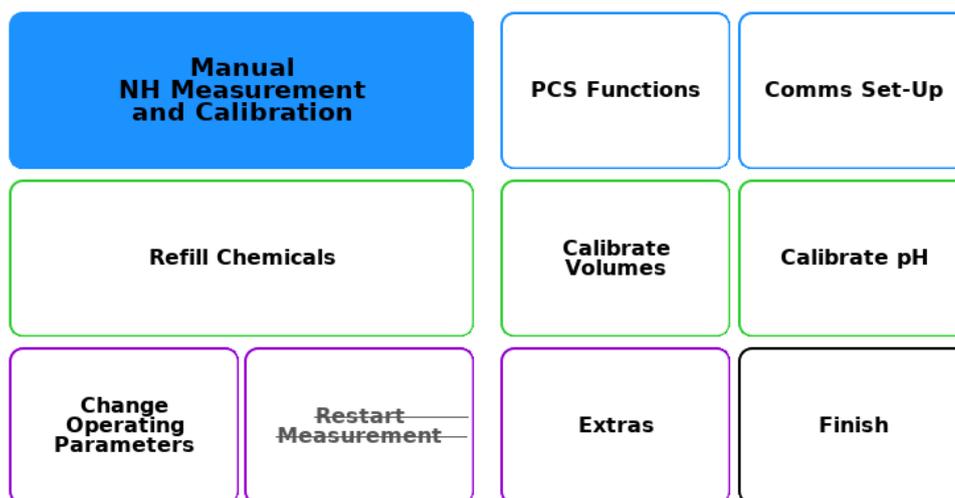
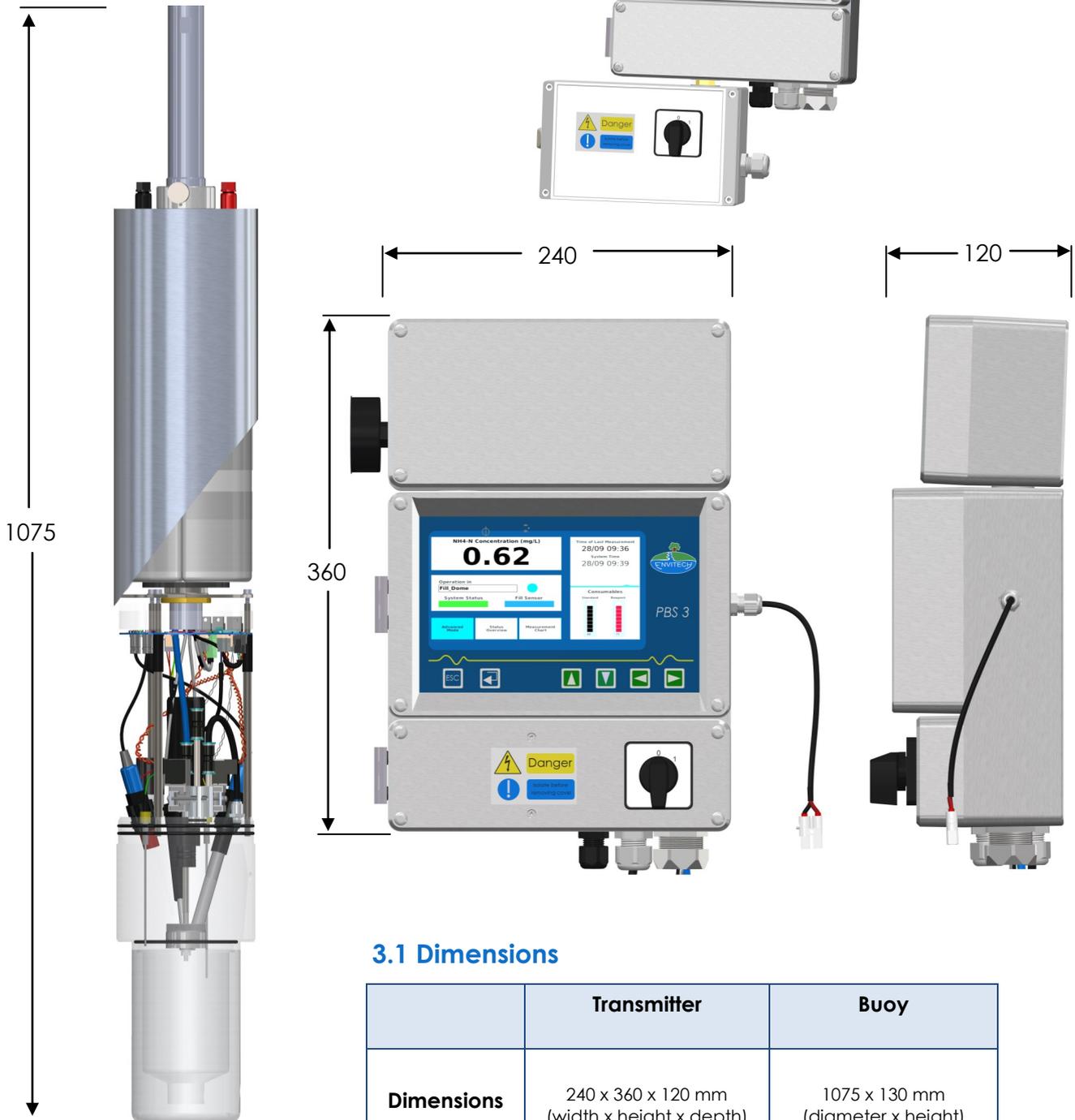


Figure 29: Engineering Menu

3. Technical Data



3.1 Dimensions

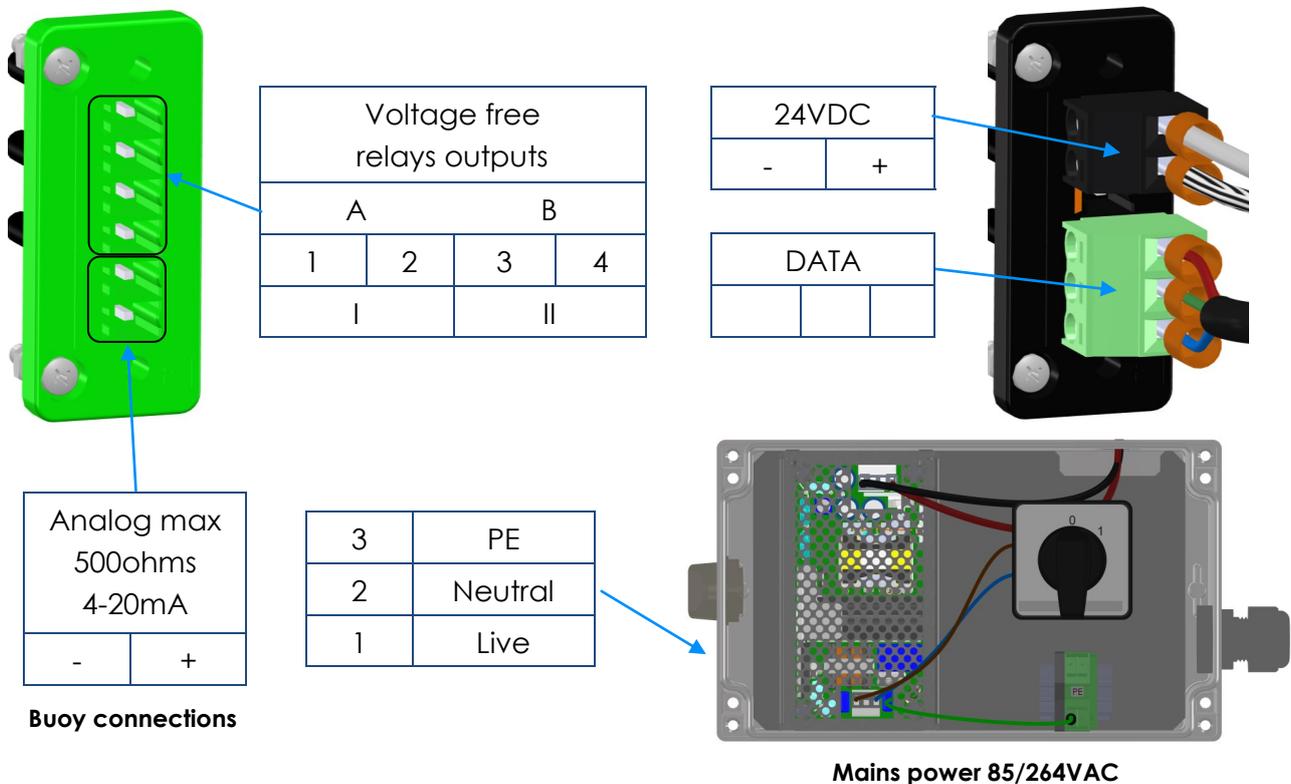
	Transmitter	Buoy
Dimensions	240 x 360 x 120 mm (width x height x depth)	1075 x 130 mm (diameter x height)
Weight	6 kg 13.2 lbs	14.0 kg 30.9 lbs

Table 4

3.2 Transmitter Data input and outputs

Table 5

Power supply analyser	24V dc, 3.4A, 81.6W
Rated output analyser	30 W
AC Input Voltage	85 - 264VAC (47-63Hz)
Display	7" TFT RGB backlit
Keypad	6 Keys 13 x 13mm
Analog Output	Single 4-20mA max load 500 Ohm, 24V
Voltage-Free Outputs	2 x voltage-free configurable outputs - max 5A, 230VAC, 30VDC
Test Standard	EN61010-1:2010 +A1:2016



Specification of the ammonium measuring

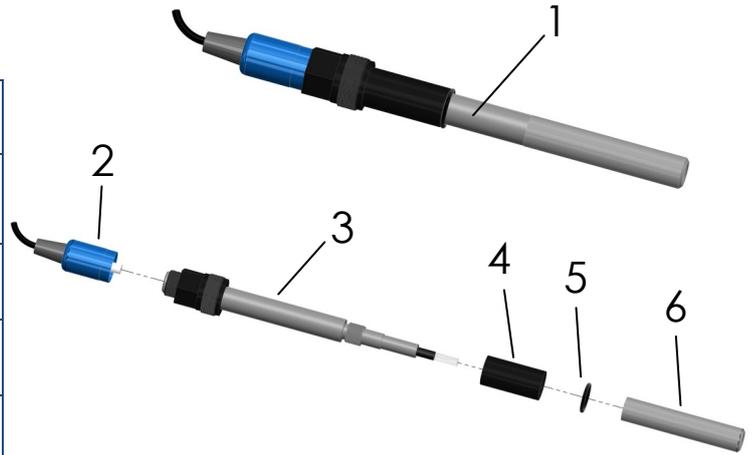
measuring range	0.1 - 50 mg/l NH ₄ -Na) (0.1 - 65 mg/l)
detection limit	0.1 mg/l NH ₄ -N
reproducibility	3%
reagent consumption	0.5 - 1 litre / month
max. flow velocity	0.3 m/s

Table 6

3.3 Specification of the electrodes

Specification of the ammonium-electrode

Measuring range	0.1 - 1000 mg/l NH ₄ -N
Temperature range	0 - 50°C (32°F to 122°F)
Length	120mm (4.72in.)
Shaft diameter	12mm (0.47 in.)
Shaft material	POM Copolymer
Sensitive time	T90 < 3 min.
pH range	> 11.5 (for measuring)
Resistance	< 2 x 10 ⁹ ohms
Drift (monthly)	< 1 mV
Interferences	Surface-active agents, volatile

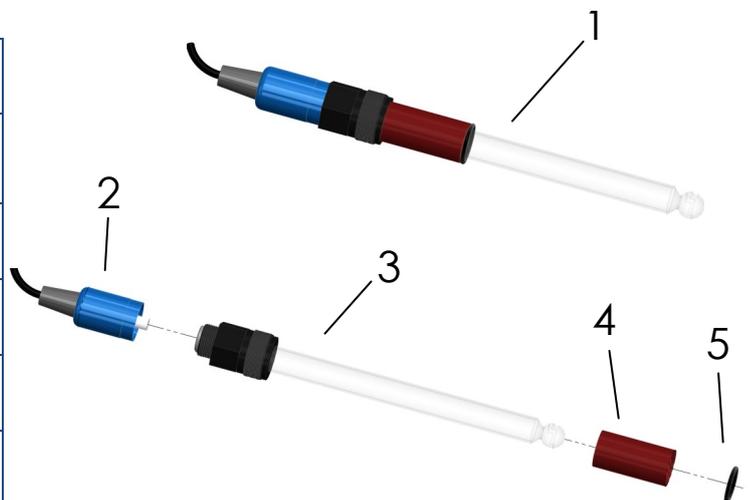


Item No.	Description
1	Electrode assembly
2	Connector
3	Electrode
4	Spacer
5	O-ring
6	Membrane cap

Table 7

Specification of the pH-electrode

Measuring range	2 to 12
Temperature range	-5°C to +80°C (23°F to 176°F)
Operating range	0.5 bar
Length	120mm (4.72in.)
Shaft diameter	12mm (0.47 in.)
Shaft material	glass
Sensitive time	20 secs
Electrolyte	gel
Resistance	240 x 10 ⁹ ohms
Drift (monthly)	< 1 mV
Diaphragm	Ceramic



Item No.	Description
1	Electrode assembly
2	Connector
3	Electrode
4	Spacer
5	O-ring

Table 8

3.4 Reagents

Please use only original solution reagents. We cannot take responsibility for damage caused by the use of incorrect chemicals.

Standard solutions

Envitech offers different standard solutions for different ammonium measuring ranges at your disposal. The standard solutions are separately available, as well as the kits together with reagent and buffer solution. The stability of the standard solution is 6 months, if refrigerated and kept in the dark.



WARNING

Always wear protective clothing, gloves and goggles to prevent direct contact with standard solution! Also, the Health & Safety regulations applicable to your country for handling caustic chemicals must be observed. In case of contact with skin, wash immediately with plenty of water.

Reagent solutions

The reagent solution for the ammonium measurement (part# 71019799) contains sodium hydroxide to produce the alkaline environment and EDTA to prevent the precipitation of hydroxides and carbonates. The reagent solution can be stored for up to 2 years, if kept in the dark and unopened. Once opened, a chemical reaction of the reagent with carbon dioxide of the air will degrade the solution. Therefore, always keep containers closed.



WARNING

Always wear protective clothing, gloves and goggles to prevent direct contact with reagent solution! Sodium hydroxide is corrosive. Also, the Health & Safety regulations applicable to your country for handling caustic chemicals must be observed.

In case of contact with skin, wash immediately with plenty of water. In case of contact with eyes, flush eyes and seek medical advice, showing the information on the can.

3.5 Buffer solution

The buffer solution (part# 71013781) with a pH-value of 10 is used for calibrating the pH-electrode.



CAUTION

Always wear protective clothing, gloves and goggles to prevent direct contact with buffer solution! The buffer solution is corrosive. Also, the Health & Safety regulations applicable to your country for handling caustic chemicals must be observed. In case of contact with skin, wash immediately with plenty of water. In case of contact with eyes, flush eyes and seek medical advice, showing the information on the can.

Process Buoy Ammonium (PBS3) solution options;

measuring range [mg NH ₄ /l]	recommended conc. of standard solution [mg NH ₄ /l]	part# of recommended standard solution
0.25 - 8.0	300	71019798
1.0 - 25.0	1000	71019800

Table 9

Interferences

Volatile primary amines produce elevated ammonium values. Fats on the membrane may cause low results and/or wrong factors.

Disposal of reagents

Empty containers may be returned to Envitech Ltd. If there is residual reagent inside

4. Safety

4.1 General Instructions

Observe the indications in the operating instructions

Conditions for the safe use and trouble-free operation of this instrument require the knowledge of the basic safety regulations. These instructions provide information for safe operation of this instrument. The safety instructions are to be followed by every user. In addition, attention must be paid to the local regulations on occupational safety and accident prevention.

User's obligations

The user is obligated to ensure that everyone who operates the instrument:

- is familiar with the regulations for occupational safety and accident prevention and have been trained on the instrument
- has read and understood the safety chapter and the warnings in this manual

Hazards when using the instrument

Improper use can result in hazards to life and limb of the user or others. Damage to the instrument or other property may occur. Safety hazards must be corrected immediately.

Proper use

The analyser system is intended to measure ammonium in the field of wastewater treatment and water pollution control. Any other or additional use is considered improper. Envitech Ltd is not liable for any damage resulting from improper use. Proper use also requires the operator to follow all instructions contained in the operating instructions, and to observe the required inspections and maintenance work.

Warranty and liability

The "General Terms and Conditions" of Envitech Ltd apply. These will be made available to the operator at the latest when the contract is concluded. Warranty and liability claims for injuries to persons and property damage are excluded, if they are the result of the following causes:

- improper use of the analyser
- unauthorized assembly, installation, operation or maintenance of the analyser
- operation of the analyser with damaged and/or non-functioning safety and protective equipment
- failure to observe the instructions on transport, storage, installation & maintenance of the analyser
- unauthorized changes to the analyser
- exceeding the prescribed depth of immersion
- insufficient monitoring of parts subject to wear
- improper repairs
- catastrophes caused by foreign bodies and acts of God

4.2 Safety Instructions

Explanation of symbols and warnings

The following designations and symbols are used to indicate the hazards .



DANGER

This symbol means an immediate threat of danger to life and health. Failure to comply with these instructions may result in serious damage to health or life-threatening injuries.



NOTE

Under this symbol you are given instructions, tips, and useful information.



INFORMATION

This symbol gives important instructions on how to operate the instrument properly.
Failure to comply with these instructions may result in malfunctions of the instrument.



CAUTION

This symbol means a potentially dangerous situation.
Failure to comply with these instructions may result in minor injuries or property damage.



WARNING

This symbol means a potential threat of danger to life and health.
Failure to comply with these instructions may result in serious damage to health or life-threatening injuries.

Safety Equipment

All safety equipment must always be properly mounted and operable before installation and operation.

Safety equipment may only be removed:

- during maintenance and repair work and after disconnecting the power supply
- after securing the device against restarting



DANGER

Bolted-on safety screens and barriers must not be removed when the equipment is running.

Passive protection devices:

- Protection cover IP65 on Transmitter
- Protection cover IP54 (analyser outside of measuring medium)
- Protection cover IP65 (analyser inside of measuring medium)

Informal safety measures

The manual should be permanently kept near the operating location of the device. In addition to the manual, the applicable and the local regulations on accident prevention and environmental protection should be provided and observed.

Personnel training

Only trained personnel should work with the device. The responsibilities of the personnel for assembly, commissioning, operation, set-up, maintenance and service must be clearly defined. Trainees may only work with the device under the supervision of an experienced operator.

Device control

Only authorized trained staff should be allowed to adjust or change production values using the device controls. Changes must not be made to the software by the operator under any circumstances.

Hazards from electric power

Work on the power supply should only be carried out by a certified electrician. The electrical equipment of the device must be checked regularly. Loose connections must be tightened and defective parts replaced immediately. The cabinet should always be kept locked. Always switch off the main power switch when working on electrical components.

Maintenance service and trouble-shooting

Follow the regulations to prevent accidents.

Changes to device

No changes, additions, or modifications may be carried out on the device without the manufacturer's approval. All conversion measures require written confirmation from Envitech Ltd. Any device parts not in proper condition must be replaced immediately. Only original spare parts and parts subject to wear may be used.

If parts from other manufacturers are used, there is no guarantee that they are designed and manufactured in conformance with the loading and safety specifications of the original-equipment parts and voids the warranty.

Cleaning solution and reagent disposal

The required substances and materials must be used and disposed of properly. This applies particularly to:

- cleaning agents containing solvents
- emptying and refilling the chemical tanks
- caustic reagents: hazards due to pH value (strongly alkaline or acidic)

Disposal of the analyser

The analyser contains electronic components. This components must be disposed as electronic industry waste. Follow in particular the local disposal regulations of your country.

Copyright

The copyright for these operating instructions is held by Envitech Ltd. These operating instructions are intended only for the operator and personnel.

They contain specifications and information which may not be reproduced, distributed, or passed on to third parties in any other manner in full or in part.

Violations may be prosecuted by law.

5. Setting up and Commissioning

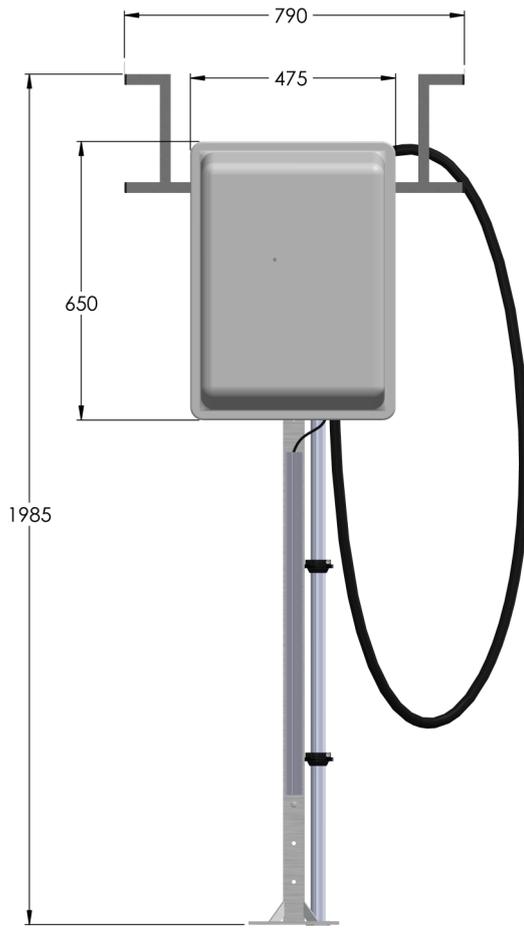


Figure 38



Figure 39

5.1 Overview

This chapter describes the transport & storage of the analyser, installation, and commissioning and decommissioning.

Use the following order to set up the Process Buoy PBS 3 (Ammonium):

1. Mounting and installation of the stand, the controller and the weather protection housing
2. Assessment of the settling behaviour of the sample
3. Preparation of the electrodes
4. Insert the electrodes into the analyser body
5. Pressure check of the analyser
6. Join the connection cable
7. Join the external power supply connection
8. Installation and connection of the optional modem
9. Sample reservoir chamber (option)
10. CLR-Start
11. Add analyser to network
12. Service menu INITIAL STARTUP

Transport and Storage

Delivery scope and damage in transit

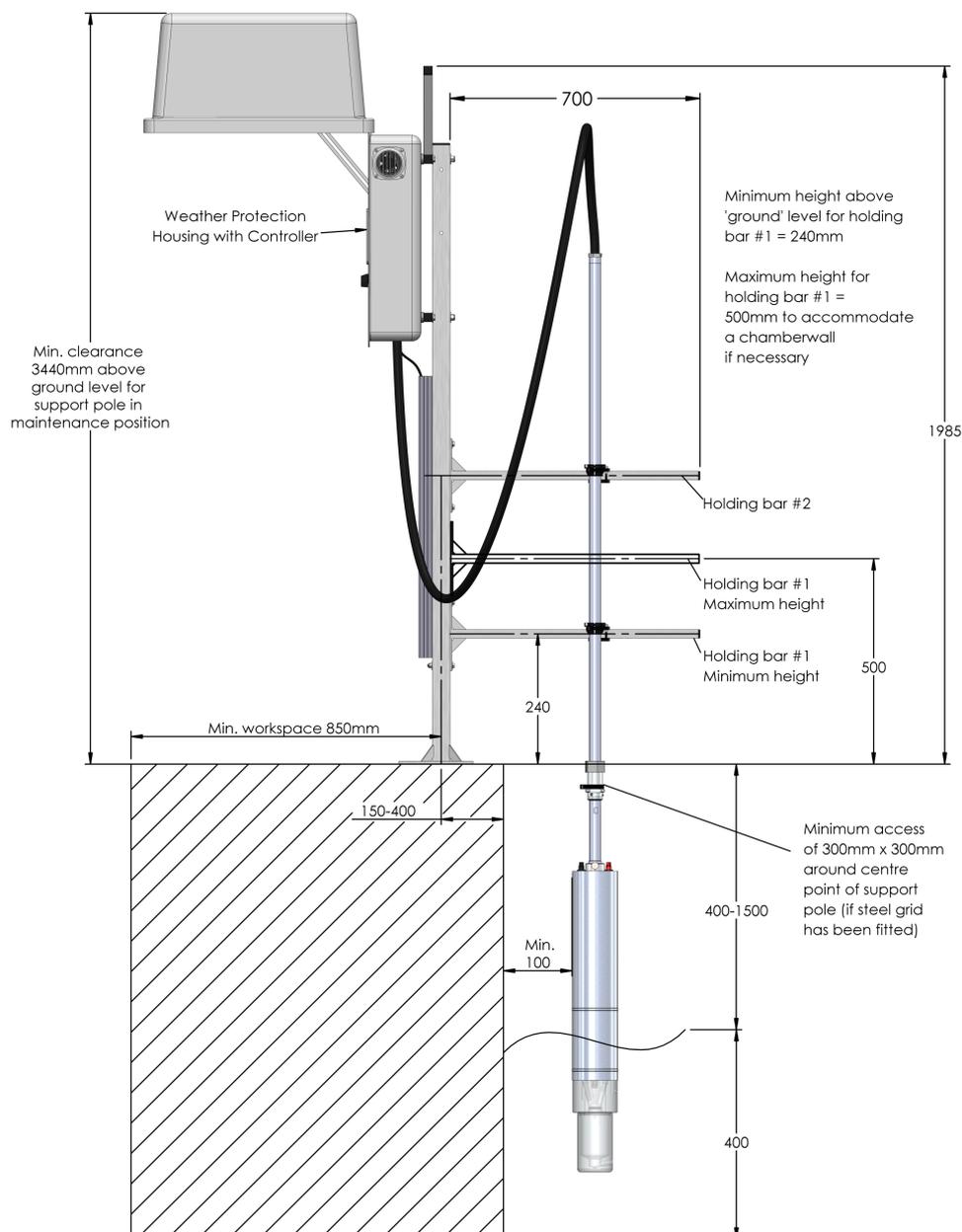
In order to set up the equipment correctly on the customer's premises, the completeness of the components supplied must be checked against the delivery documentation.

In addition, the equipment should be checked for possible transit damage and loose components.

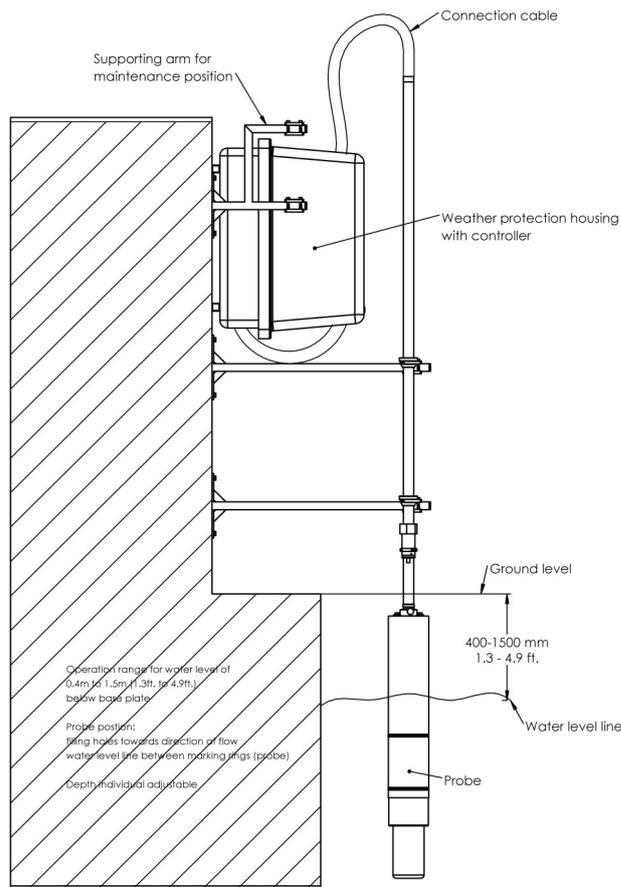
Storage

When storing the equipment for a long period, you must observe the following:

- the equipment should be stored for as short a time as possible,
- the analyser should only be stored in an unfilled state (without reagents and standard solutions),
- equipment should only be stored in dry premises, suitable packaging should be chosen for storage (e.g. protective covers) and the ambient temperature must be between -15°C (-5°F) and +40°C (104°F)



5.2 Set-up and assembly



Wall mounting of single PBS3 and weather protection housing (side view)

Figure 42 - Wall mounting of single PBS and weather protection housing

The Process Buoy System PBS 3 (Ammonium) consists of an analyser probe, a connection cable, and transmitter.

It can be mounted on a stand or an optional wall bracket. Because there are many ways of mounting it to a wall, the following chapters will deal exclusively with the stand mounting for one analyser and the transmitter with the weather protection housing.

Set-up conditions

The conditions for setting up the Process Buoy PBS 3 (Ammonium) are:

- it must be possible to place the analyser in the maintenance position
- the analyser must be accessible
- the transmitter must be within reach
- power connection of the controller: 230 V or 110v , 50 cps
- the ambient temperature must be between -15°C (-5°F) and +40°C (104°F)

Conditions for the stand:

The stand must be secured on concrete using four screws with anchors. We recommend anchor fittings (component of the stand accessory kit). Envitech Ltd cannot be held responsible for incorrect set up.

5.3 Mounting and installation of the housing, the transmitter and the weather protection housing

Mounting and installation of stand, the controller and the protective housing require:

- concrete drill bit $\varnothing 14$ mm (0.55 in.)
- drill
- fixed spanner 19 mm (0.75 in.), 2x 17 mm (0.67 in.), 2x 13 mm (0.51 in.)
- stand with accessories
- Set the stand (fig. 44) in position.
- Mark and drill the bore holes in accordance with fig. 43.

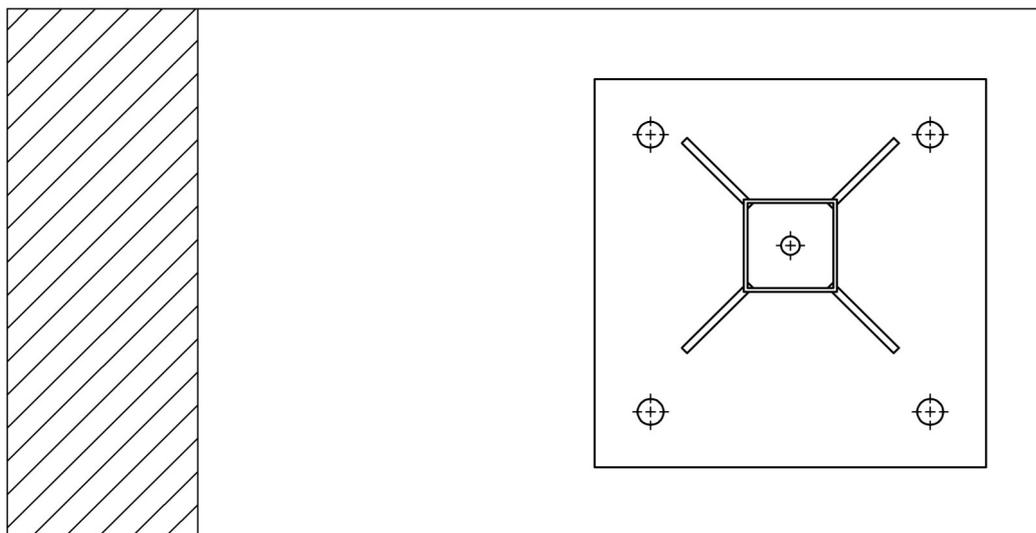


Figure 43 - Base plate



Figure 44 - Stand

- Using suitable anchor bolts, secure the stand.
- For grounding, connect the socket head screw (of the stand) with the grounding cable (4 mm²).
- Screw the supporting arms (fig. 45) to the stand (screws: M4x70). Set up with the largest possible distance between the two supporting arms.

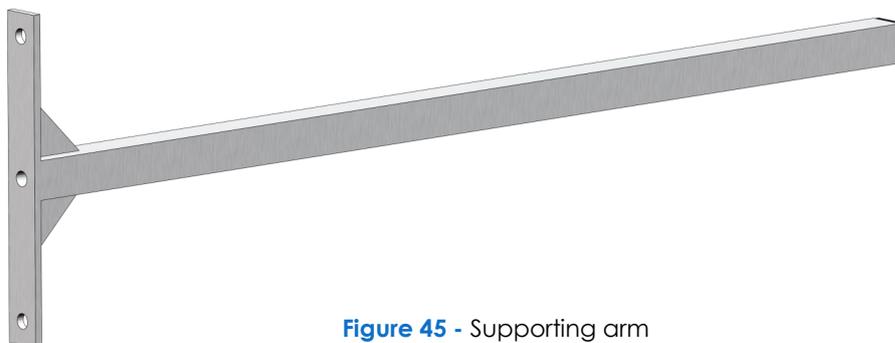
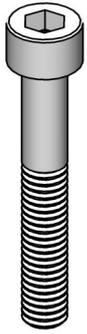


Figure 45 - Supporting arm



2

- Screw on probe holder (fig. 47, pos. **1**) and counterpart (pos. **2**) to the supporting arm.

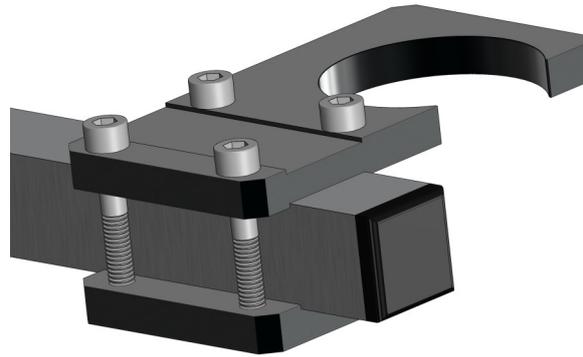


Figure 47 - Probe holder and counter part on supporting arm



- Screw on holder (fig. 46, pos. **1**) and counterpart (pos. **2**) to the supporting arm with two maintenance positions (fig. 48.)
- Assemble the holding arm for the protective housing concentric to the second bore hole at the top of the post (fig. 49) (screws: M10x90).

1

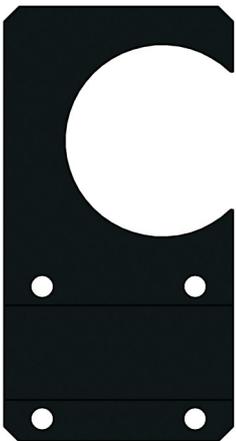


Figure 49 - Holding arm

- Screw on the supporting arm with two maintenance positions (fig. 48) to the top bore holes of the post (screws: M10x90) so that the maintenance positions point upwards.
- Screw the weather protective housing with transmitter to the outer bore holes of the holding arm (screws: M10x40).

Figure 46 -
Holder and counterpart

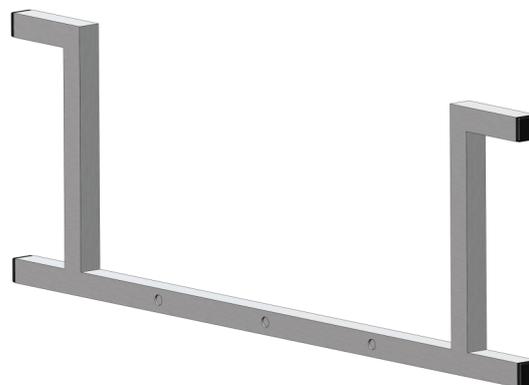
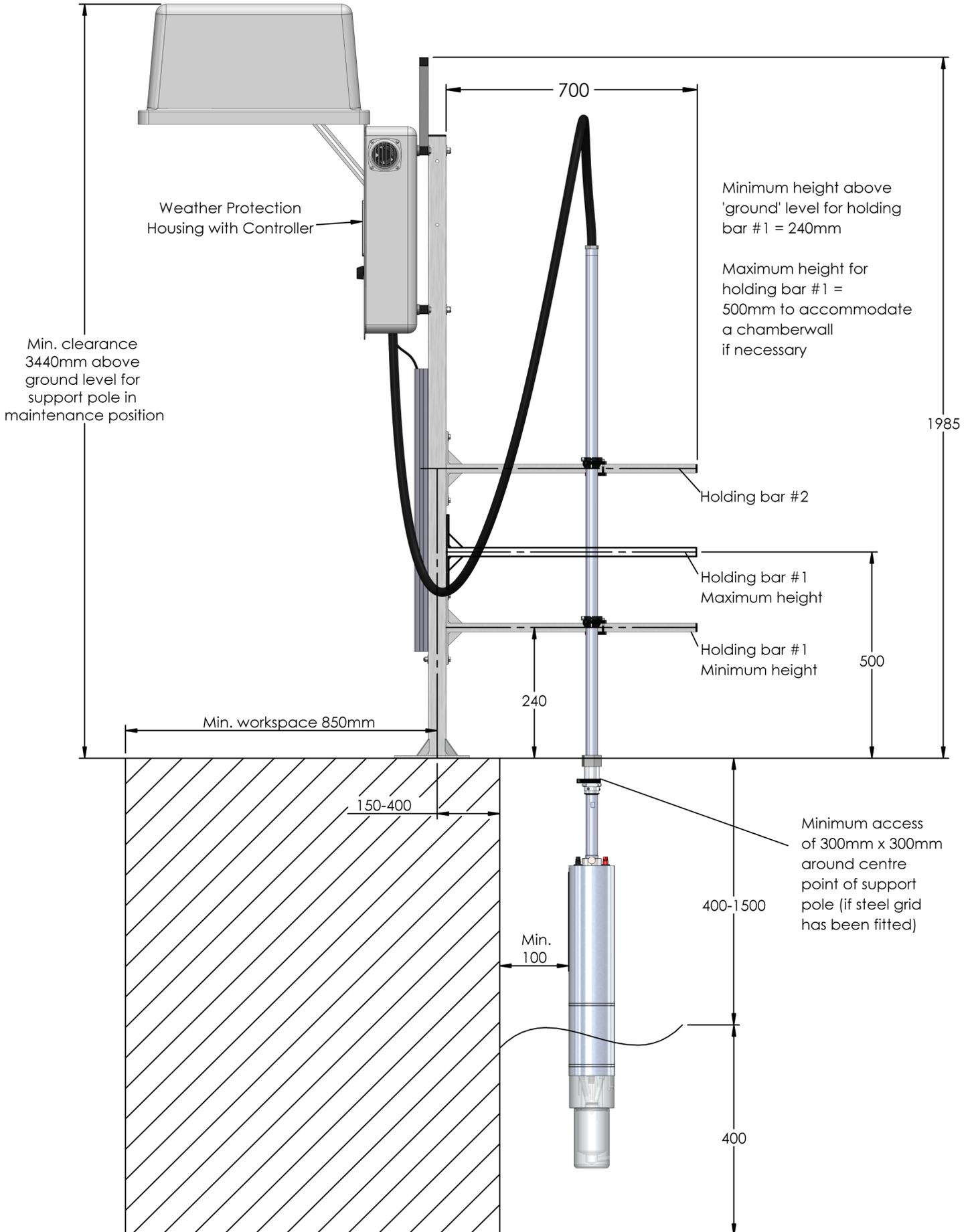


Figure 48 - Supporting arm with two maintenance positions



5.4 Assessment of the settling behaviour of the sample



WARNING

To avoid injuries and infection, wear protective clothing, gloves and goggles.

For this step, you need a measuring cylinder (1000 ml (0.264 US gal)).

Test the settling behaviour of the undiluted sewage:

- Take an undiluted sample and fill the 1000 mL measuring cylinder. Observe the settling behaviour of the sample carefully and note the time needed to detect a 100 ml clean-water zone. The required time for the clean-water zone is the minimum settling time that is needed for settling time in software.
Engineering - Change Operating Parameters - Settling Chamber (Category) - Chamber Settling Time (min) (Parameters)

Equipment requirements

- Electrodes
- Included accessories pack

INFORMATION



When working with the ammonium electrode never invert the electrode. Otherwise, air can come into contact with the electrolyte. Air bubbles in the interior of the membrane module affect the operation of the electrode.

- Remove the washing cap of the ammonium-electrode. Handle the top of the glass electrode carefully, otherwise it can be scratched or broken.
- Put at least 15 drops (approximately 1 ml) of electrolyte solution into a replacement cap (membrane module). Don't touch the membrane with your fingers. Remove any air bubbles by lightly tapping on the side of the cap.
- Screw on the replacement cap tightly. Rinse the electrode with distilled water, and wipe clean the outside with a paper towel.
- The electrode is ready for measuring approximately 1 hour after being re-inserted into the analyser, and allowed to operate. Before any valid measurement can occur, the electrode must be initialised and calibrated.

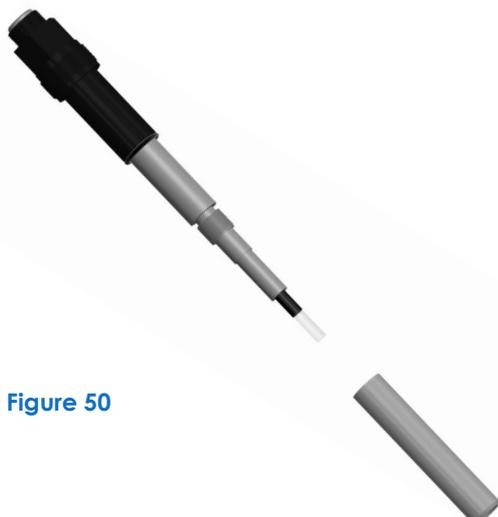


Figure 50



Figure 51

pH electrode

Connect the pH-electrode and the analyser with the pH-measuring lead. Pay attention that the plug and the cable remain dry. The electrode has to be calibrated using the PBS3.

Open the analyser to insert the electrodes into the analyser body



CAUTION

A falling analyser cover can cause severe injury. Make sure it is safe to open the analyser cover before doing so. Secure the analyser with the safety latch.

The analyser (probe) has an opening mechanism, which is described in the following.

You will find an opener with wire rope (see fig. 52 pos. **2**) in the accessories. The housing (**6**) is fastened by a knurled screw (**4**) on the analyser body.

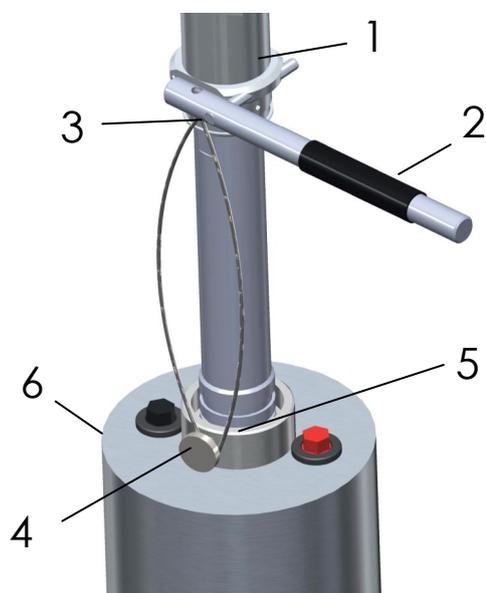


Figure 52 - Lift up housing

Open the analyser as following:

- Unscrew knurled screw (**4**) up to the inside of the holding ring (**5**).
- Lay wire rope clip (**2**) around the lower side of the knurl screw (**4**).
- Insert shaft of handle into the hole in the connection sleeve (**1**).
- Lift up the housing (**6**) by gentle pressing down on the grip of the handle (**2**).
- Remove handle and wire rope.
- Push the housing (**6**) up to the stop position of the connection sleeve (**1**). The housing will not be retained by the slot (**3**).
- Secure analyser with safety latch.



CAUTION

If the housing (**6**) was NOT pushed up to stop position of the connection sleeve (**1**), the knurled screw (**4**) will not be retained by slot (**3**).



CAUTION

The main power switch MUST be turned OFF before the analyser is opened. If power reaches the analyser, the tanks inside the analyser body become pressurized! Closing the analyser body with tanks under pressure may cause damages to the tanks and connection lines/cables!

5.5 Insert the electrodes



CAUTION

Make sure there is no power to the analyser while it is in maintenance mode

- Prepare the electrodes
- Take the electrode-dummies out of the analyser body
- To insert the ammonium electrode (electrode A):
 1. Push (with the aid of water) the spacer/sleeve (length: 30 mm) and the o-ring onto the shaft.
 2. Screw the electrode A into the main body of the analyser until it stops.
 3. Put on and screw on the cable head.
 4. Check that the distance between electrode and stirrer inside the measuring cell is approx. 1- 2 mm.
 5. Connect the cable to the BNC connector on the PCB.
- To insert the pH electrode (electrode B):
 1. Remove o-ring and PVC seal from pH electrode.
 2. Put on and screw on the cable head. (Same as NH4 electrode)
 3. Push (with the aid of water) the spacer/sleeve (length: 26 mm) and the o-ring onto the shaft.
 4. Screw the electrode B into the main body of the analyser until it stops.



CAUTION

Do NOT use silicone grease to insert the electrodes into the analyser body. This can cause leakage! If needed, use water.

5. Check that the distance between electrode and stirrer inside the measuring cell is approx. 1- 2 mm. (the pH electrode has a ref. point on its body above the bulb. This should be unobstructed by the Perspex in order for the electrode to function correctly)
6. Connect the cable. (Same as NH4 electrode)

Close the analyser

- Check the o-rings on the analyser for defects



INFORMATION

Carefully place all cables inside the analyser before closing the housing

- Manually hold up the housing (6) and loosen knurl screw (4).
- Lift the safety catch.
- Position housing (6) according to the stoppers for tank sealing and lower housing.
- Use gentle pressure to push housing (6) onto the analyser body until the knurl screw (4) has reached the height of the groove of the holding pipe.
- Screw knurl (4) screw into the key way of the holding pipe.



INFORMATION

Check the analyser pressure system after each time the analyser is opened.

5.6 Pressure check of the analyser

For this step, you need a test cap (accessories).

Check the pressure system of the analyser as follows:

1. Screw the test cap (accessory) onto the analyser and connect to the compressed air tube in the connection cable.
2. Turn on the main power switch on the transmitter. The compressor should be running now.
3. Switch off the main power switch, when the pressure has stabilized.
4. Now record the pressure indicated on the test cap:
 - If the analyser is sealed, the pressure should be constant for minimum of 3 minutes.
 - If the analyser is not sealed, check the o-rings on electrodes and analyser body, re-insert the electrodes or exchange O-rings if necessary.



Join the connection cable to the transmitter



DANGER

Join the connection cable to the controller **BEFORE** you connect the controller to external power supply! There's the risk of electric shock!



CAUTION

Ensure protective housing is securely latched to prevent injury. Make sure it is safe to open the housing-cover before doing so.

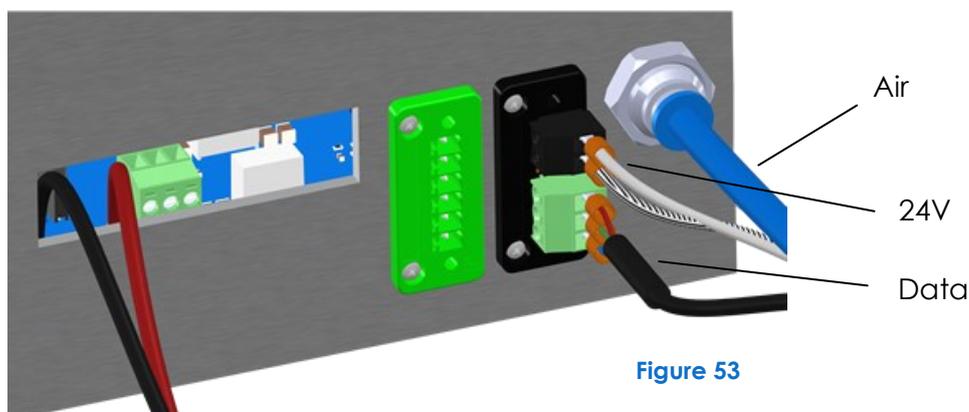


Figure 53

- Insert the cables and the compressed air tube through the opening of the junction box of the transmitter.
- Connect the data cable (black), the power supply (white/black) and the compressed air tube (blue) according to the fig. 54 (see next page).
- The left sided terminal (green) is for external communications (Digital OUT relays / 4-20mA OUT)



WARNING

The noise filter and the mains switch remain under power supply voltage when the mains switch is turned off. The power supply needs to be disconnected when working in this area!

Join the connection cable to the analyser

For this connection you need:

- a fixed spanner, \varnothing 50 mm (accessories)



DANGER

Switch off the main power!

An electric shock could endanger your life!



WARNING

The mains switch remains under power supply voltage when the mains switch is turned off.

The power supply needs to be disconnected when working in this area!

- Lay the analyser cable pole and the connection cable pole on a workbench



NOTE

The analyser can only be tipped or placed horizontally in an unfilled state (without reagents and standard solutions)!

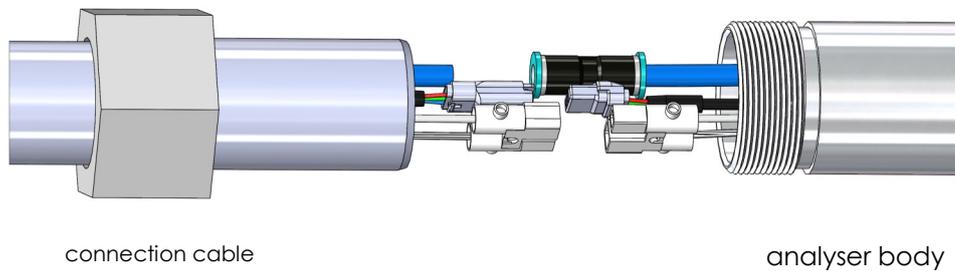


Figure 54

6 . Initial Start-up

Start-Up Procedure

- Loads configuration file from SD card
- If no configuration file exists, creates one from memory (default values)
- Start calibration within 30 seconds
 - If last calibration happened less than 24 hours ago, start measurement within 5 minutes

**There is an initialisation process on first boot-up and when there's no existing config. file available.*

Normal Operation

- By Default, the instrument calibrates every 24 hrs at 23.30 with the aim to complete calibration by midnight
- Connectivity to wet-end is confirmed every 5 sec, even when system is idle
- If connectivity is lost, the system tries to re-establish comms every 1 minute
- After 5 failed attempts the system will reboot—after 3 reboots the analyser will activate standby mode

Other

- New electrodes should be initialised from the “Manual NH Measurement and Calibration” menu
 - This process establishes the baseline performance criteria for the electrode & dictates drift tolerances.
 - If new electrodes are not initialised, calibrations may be rejected due to a significant change in calibration parameters. Depending on the results of the next calibration, the new parameters may be accepted.

Service menu INITIAL STARTUP

**ACCESS INITIAL STARTUP VIA
ADVANCES MENU / ENGINEERING / EXTRAS / INITIALISE SYSTEM**

Needed material for initial start-up:

- personal protective equipment (protective goggles, gloves, protective clothing)
- pH-buffer solution (standard: pH = 10.00)
- syringe (accessory)
- standard solution with concentration
- reagent solution

7. Maintenance

7.1 Maintenance and service

Summary of all maintenance and service work, implementation in the correct order

Maintenance or Service	Interval
clean and rinse the settling cell	weekly
check the measuring cell and, if necessary, clean with washing bottle	weekly
calibration of the pH electrode (electrode B)	monthly
check the tank volume empty and refill the tanks interval may be changed according to experience and site conditions.	monthly
determine the volume of standard and/or reagent after refilling it is necessary to determine the standard or reagent volume again.	monthly
exchange the membrane module (ammonium-electrode) routinely replacement every 2 months; interval can be extended to up to 4 months once need has been determined.	every 2 - 4 months
check the filling level sensor inside the settling cell for corrosion. If necessary replace the filling level sensor	every 3 months
exchange the electrodes	when needed

Table 11

Visual inspection

Regularly check for any faults and/or warnings relating to the analyser and remedy these as described in chapter 8 ("Trouble shooting").

7.2 Refill Chemicals Menu

The menu is designed to offer a step-by-step guide to emptying and refilling the solution tanks. As such, the user is required to follow the on screen instructions and confirm each step. When first opened, the menu presents the user with the choice of emptying the measurement and settling chambers. Users are then presented with a walk through for getting the analyser in the correct position before having access to chemical tank operations. If chemicals have been refilled, closing the menu will cause a prompt to appear, advising the operator to perform a dosing valve calibration.

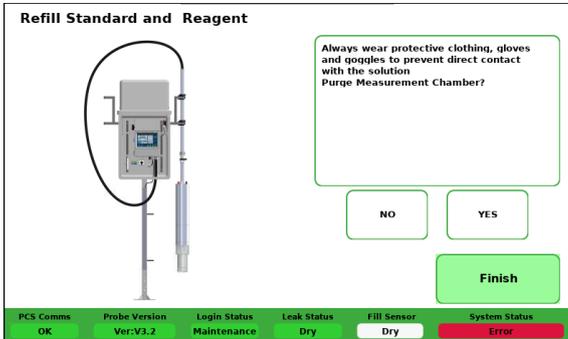


Figure 55

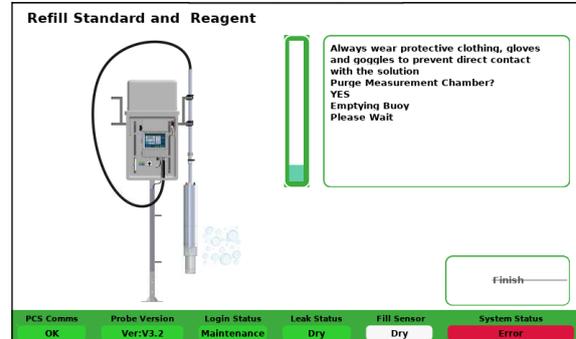


Figure 56

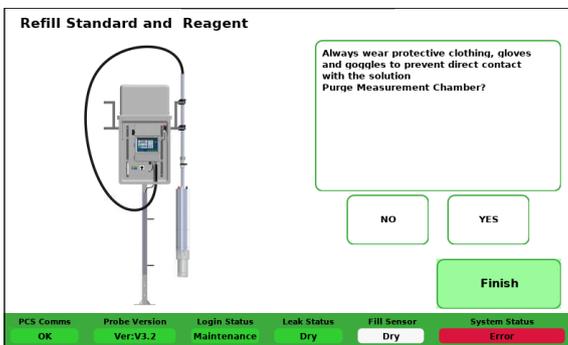


Figure 57

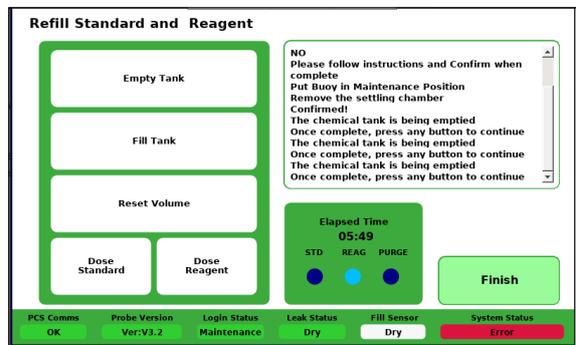


Figure 58

Buttons

- Empty Tank
 - ⇒ Opens new window asking which solution tank to empty
- Fill Tank
 - ⇒ Opens aeration valve
 - ⇒ Adds new instructions to list
- Reset Volumes
 - ⇒ Closes aeration valve
 - ⇒ Asks user to enter estimated solution percentages
 - ⇒ Adds new instructions to list
- Dose Standard/Reagent
 - ⇒ Closes aeration valve
 - ⇒ Doses solution

Indicators

- System status bar
- Instruction list
- Valve status indicators
- Countdown progress bar
 - ⇒ Only visible when purging sample chambers
- Elapsed time indicator
 - ⇒ Used when emptying the solution tanks



Figure 60: Refill Chemicals Menu – Empty chemicals

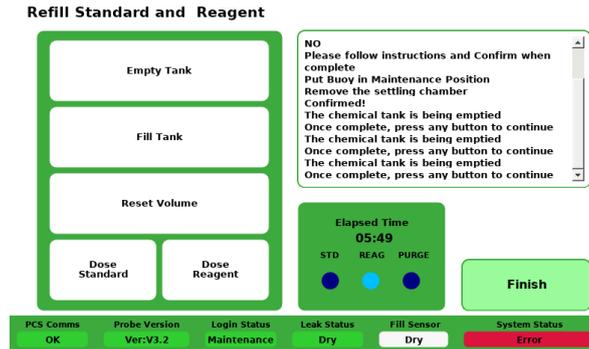


Figure 61: Refill Chemicals Menu – Fill chemical tanks

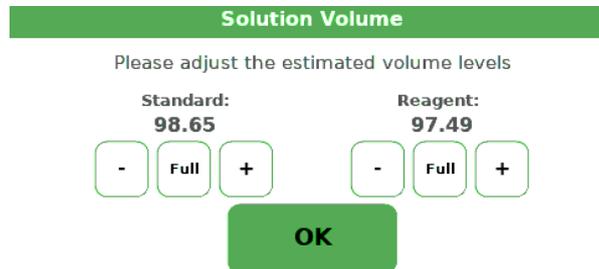


Figure 62: Refill Chemicals Menu – Reset level indicators

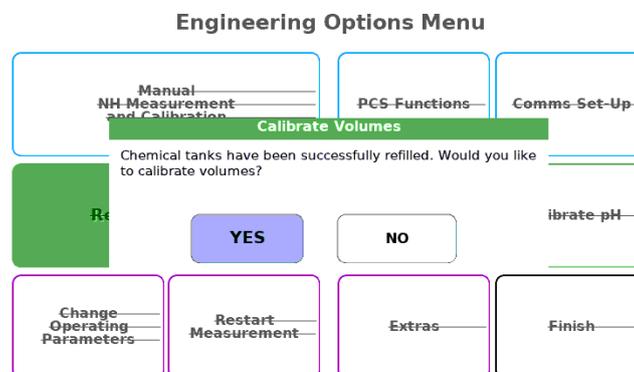


Figure 63: Refill Chemicals Menu – Menu closed

7.3 Manual NH Measurement & Calibration Menu

As the name suggests, this menu allows the user to start a manual measurement process or a manual calibration process. Additionally, the menu provides access to the NH₄-N electrode initialisation. N.B. in order to ensure valid calibration parameters do not get discarded, an “electrode initialisation” should be started for every new electrode or end-cap; the process conducts 3 calibrations and uses the average value of each parameter as a baseline to determine whether the electrodes are functioning correctly.

Indicators

- Standard PCS status bar on the bottom
 - ⇒ Tapping “System Status”
- Time and date of last recorded value
- Last measured NH₄-N concentration
 - ⇒ Used to display real-time values when a process is active
- Process details list
- Readings trend graph
- Progress bar countdown timer

Buttons

- Start Calibration
 - ⇒ Shows dialog asking user if the instrument should return to the main menu & resume automatic measurement
- Start Measurement
- Start Base Calibration
 - ⇒ Used to re-initialise the NH₄-N electrode

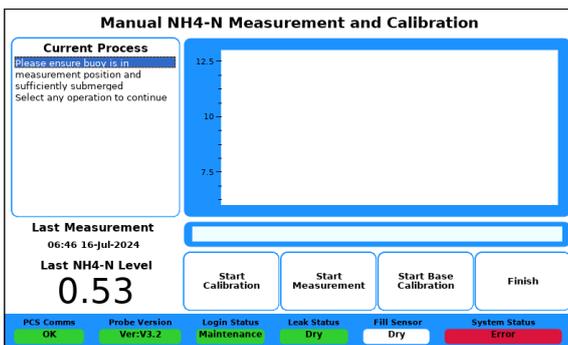


Figure 64: Manual Measurement and Calibration - System Idle

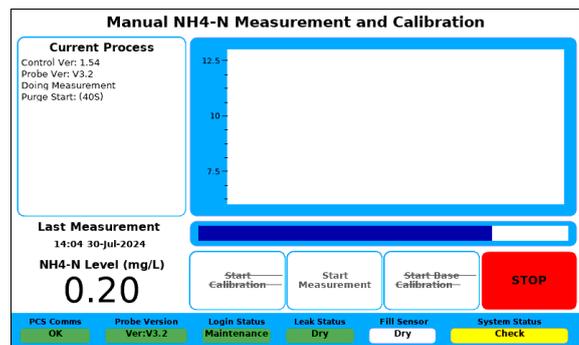


Figure 65: Manual Measurement and Calibration – Measurement Active

7.4 Calibrate Dosing Volumes

The dosing volumes menu is meant to provide a simple to follow interface, despite a relatively high number of controls. As such, interface elements such as buttons and panels are hidden or shown depending on their relevancy to the current stage of the calibration process. When opening the menu, the only visible elements are the standard PCS status bar, the instruction list, the yes and no buttons. Once the measurement and settling chambers have been emptied, new options are enabled and further instructions are provided. Initiating a calibration hides or locks unused elements and begins delivering doses of solution. Once all doses have been delivered, the user will be asked to input the volume of solution dispensed (in ml) using the on- screen keypad. If a dosing calibration has been attempted, a wash button will be enabled to clean the measurement chamber of contaminants.

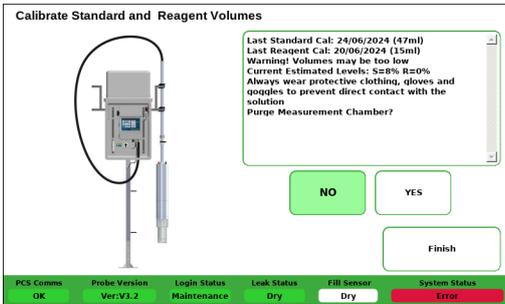


Figure 66: Calibrate Dosing Volumes – Start-up

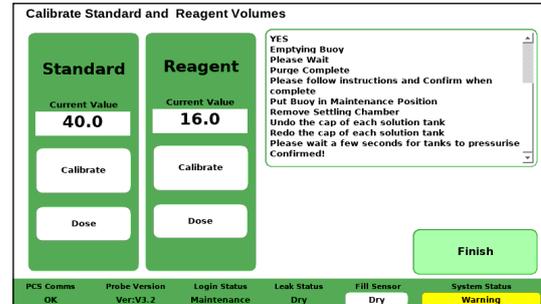


Figure 67: Calibrate Dosing Volumes - Calibration option

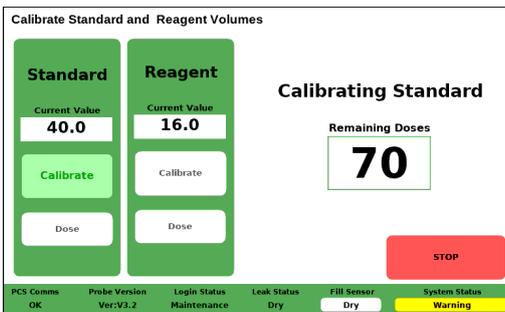


Figure 68: Calibrate Dosing Volumes - Calibration in progress

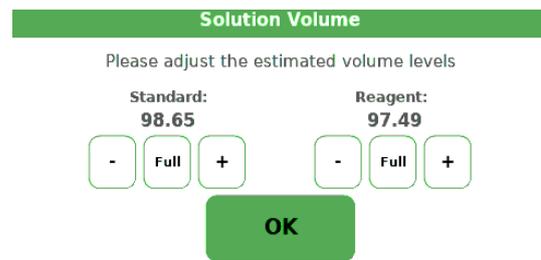


Figure 69: Calibrate Dosing Volumes – Volume input

Indicators

- System status bar
- Instruction list
- 2 progress bars
 - ⇒ Used only for initial purge
 - ⇒ Used only if wash process is initiated
- Current dosing values for each solution
- Calibration doses remaining

Buttons

- Yes/No
 - ⇒ Only visible on start-up
- Confirm
 - ⇒ Only visible during set-up
- STOP
 - ⇒ Only visible when a calibration has been initiated
- Number pad
 - ⇒ Only visible at calibration end
- Calibration start buttons
- Wash
 - ⇒ Only visible after calibration
- Dosing buttons
- Finish

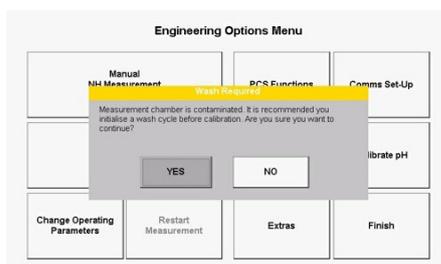


Figure 70: Calibrate Dosing Volumes - Wash required prompt

7.5 Calibrate pH Electrode

Similar in structure to the Dosing Valves menu, the Calibrate pH menu walks the user through the calibration procedure by hiding and showing relevant menu items. The pH calibration menu has 2 basic modes of operation based on the user account accessing it. The basic mode allows for single point calibration using pH10 buffer solution, providing accurate calibration for high pH levels. The precision mode enables a two point calibration using both pH4 and pH10 buffer solutions, providing greater range and improved precision. As with previous menus, the sample chambers must be emptied at start up. The operator is then guided through the process using the instruction list and prompts.

Indicators

- System status bar
- Instruction list
- Progress bar
- Current parameters panel (Green)
 - ⇒ Shows calibration parameters currently in use
- New parameters panel (Blue/Pink)
 - ⇒ Replaces the current parameter panel
 - ⇒ Only visible during calibration
 - ⇒ Shows calibration parameters based on current readings
- New Value (mV)
 - ⇒ Current mV output of pH electrode
- Current Value
 - ⇒ Previously registered mV output for selected buffer solution

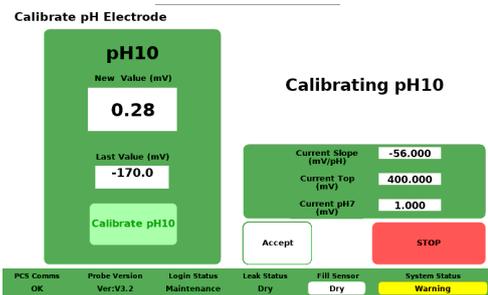


Figure 73: Calibrate pH Electrode – pH10

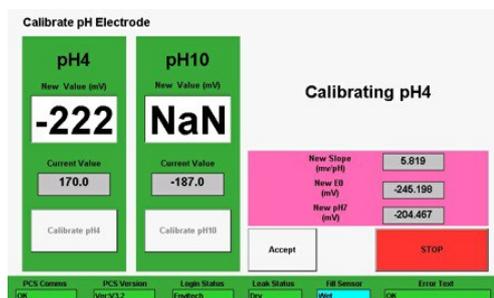


Figure 74: Calibrate pH4 Electrode

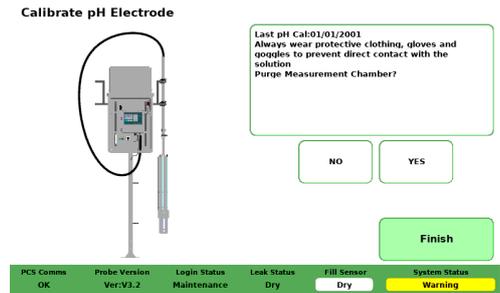


Figure 71: Calibrate pH Electrode -

Step 1

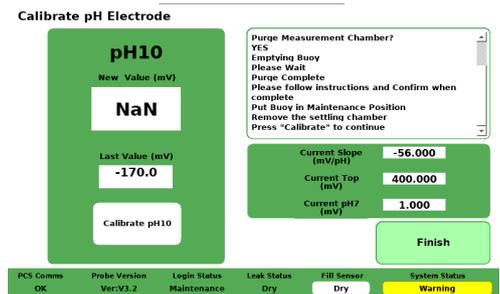


Figure 72: Calibrate pH Electrode – Precision mode

Buttons

- Yes/No
 - ⇒ Select whether a chamber purge is required
- Confirm
 - ⇒ Instructions have been read
- Finish
 - ⇒ Shows instruction message box & enables aeration
- Calibrate
 - ⇒ Aeration is disabled & stirrer motor is started
- STOP
 - ⇒ Only visible when a calibration has been initiated
- Accept
 - ⇒ Manually accept current values
 - ⇒ Only visible when a calibration has been initiated

7.6 Removing the electrodes

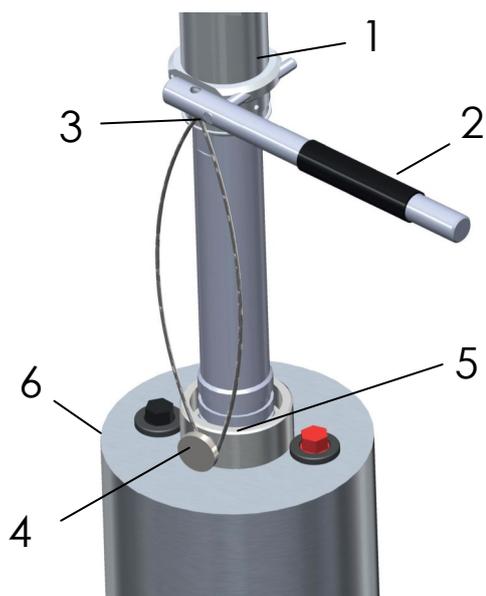


Fig. 75

- Unscrew knurled screw (4) up to the inside of the holding ring (5).
- Lay wire rope clip around the lower side of the knurl screw (4).
- Insert bolt of handle (2) into cross drilling of the connection sleeve (1).
- Lift up housing (6) by pressing gently on the grip of the handle.
- Remove handle (2) and wire rope.
- Push the housing (6) with your hand until it stops against the connection sleeve (1) and screw in knurl screw (4) until it stops.



CAUTION

If the analyser housing (6) isn't pushed until it stops against the connection sleeve (1), the knurl screw (4) can't find support in the supported

- Unscrew the electrodes, screw off the cable and remove the electrodes.
- Insert electrode-dummies.
- Store the electrodes.
- Check the o-rings on the main body for defects.
- Clean the sealing surfaces carefully.
- Lubricate the o-rings of the housing with silicone and insert them.
- Close the analyser housing.

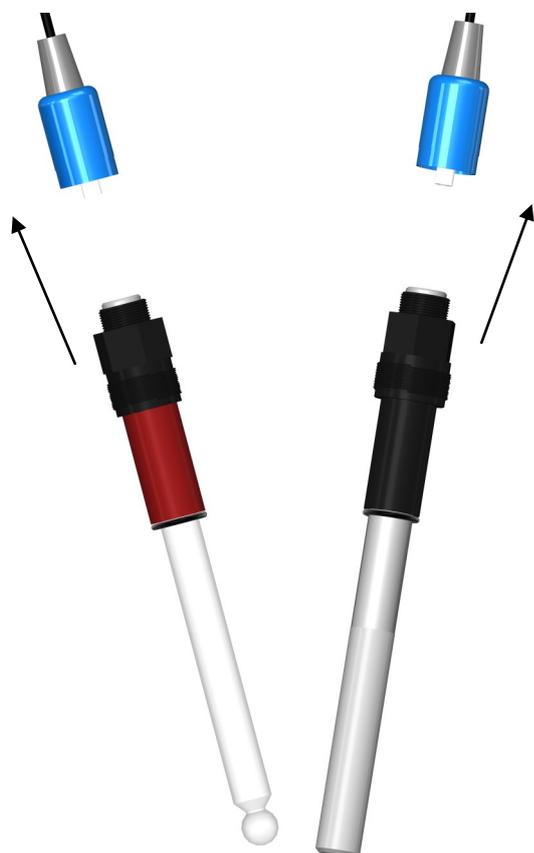


Fig. 76

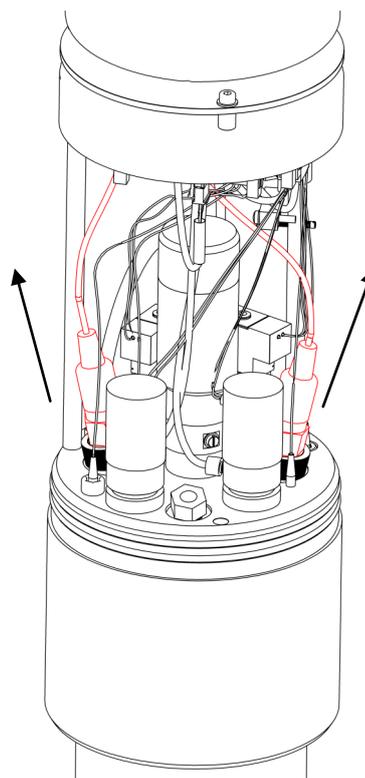


Fig. 77

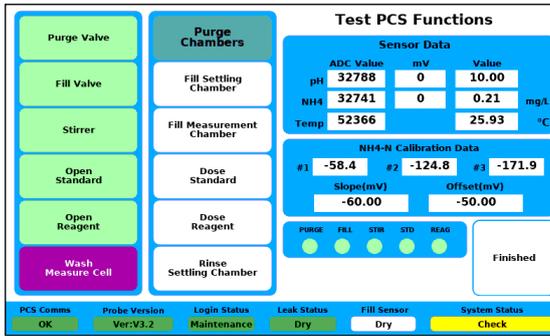


Figure 78: Test PCS Functions - System idle

Indicators

- Standard system status bar
- Sensor Data
 - ⇒ ADC values for pH, NH & temperature channels
 - ⇒ Used to assess firmware & electrical component functionality
 - ⇒ mV output of pH and NH electrodes
 - ⇒ Calculated values for pH, NH4-N and °C
- Calibration Data
 - ⇒ Calibration Potentials
 - ⇒ Calibration Slope
 - ⇒ Calibration Offset
- Valve indicators
 - ⇒ GREEN = Closed
 - ⇒ YELLOW = Open
- Countdown timer
 - ⇒ Visible only for automated processes

7.7 Test PCS Functions

The main purpose of the Test PCS Functions menu is to assess the functional aspect of each individual feature of the analyser probe. Additionally, it can be used to perform quick operations pre or post servicing. In addition to manual triggers, the menu facilitates the testing of system timing configurations via automated processes. Manual triggers are colour coded based on the control state (open or closed).

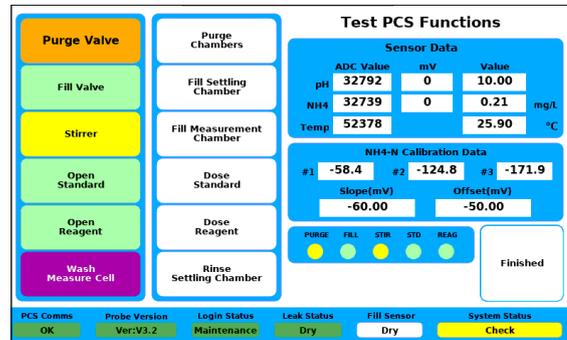


Figure 79: Test PCS Functions - Manual test

Buttons

- Manual Triggers
 - ⇒ Purge Valve
 - ⇒ Fill Valve
 - ⇒ Stirrer
 - ⇒ Open Standard
 - ⇒ Open Reagent
- Automated Processes
 - ⇒ Purge Chambers
 - ⇒ Opens purge valve for a defined interval
 - ⇒ Fill Settling Chamber
 - ⇒ Opens fill valve until the sensor is activated or timer runs out
 - ⇒ Fill Measurement Chamber
 - ⇒ Opens fill valve for a defined interval
 - ⇒ Dose Standard
 - ⇒ Dose Reagent
 - ⇒ Rinse Cycle
 - ⇒ Purge chamber and fill settling chamber
 - ⇒ Wash Cycle
- Longest automated function
- Simulates wash process after NH4N calibrations

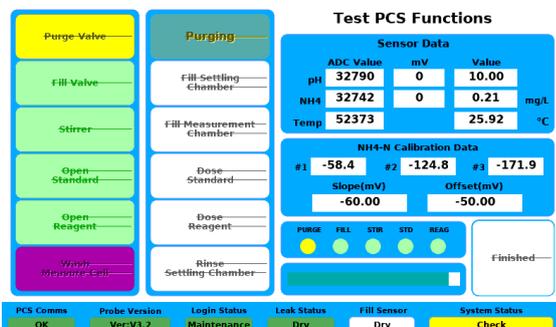


Figure 80: Test PCS Function - Automated test

8. NH4-N Measurement Trend

Measurement Chart

The Measurement Chart is used to assess NH4-N concentration patterns in the effluent by plotting all recorded measurements within a specified time frame. In addition to measurement data, the chart can also highlight calibration events. When opening the measurement chart, the default behaviour is to use data gathered in the past 7 days. Graphs can be plotted using weekly or monthly time frames by default, while more precise durations can be observed using the zoom button. Additionally, by using the physical LEFT and RIGHT keys, individual measurements can be displayed using a measurement cursor.

The X-axis automatically adjusts to encapsulate all available data within the specified default window. The maximum Y-axis scale can be set via the Operating Parameters menu.

Indicators

- Trend graph
- Measurement details
 - ⇒ Visible only if calibration markers disabled

- Date range

Buttons

- Calibration Markers
 - ⇒ Draw a vertical marker for every calibration recorded within the selected dates
- Zoom Button
 - ⇒ Used to zoom in and out around the measurement cursor
- Previous & Next
 - ⇒ Scroll through data sets
- View Month/Week
 - ⇒ Toggles between monthly and weekly data sets
- Finish
 - ⇒ Closes Measurement History

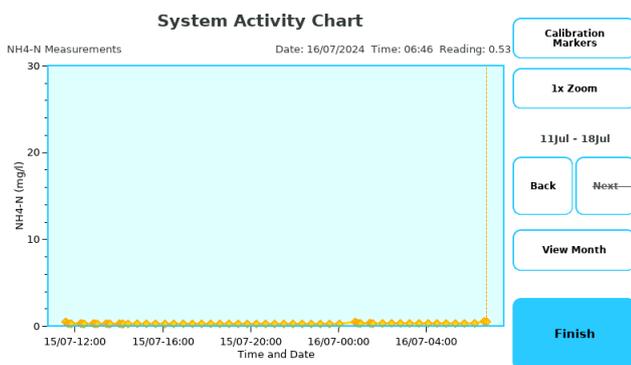


Figure 81: Measurement Chart - no calibration indicators

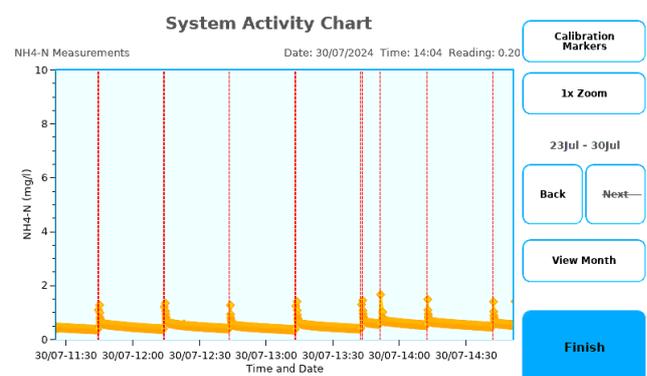


Figure 82: Measurement Chart - active calibration indicators

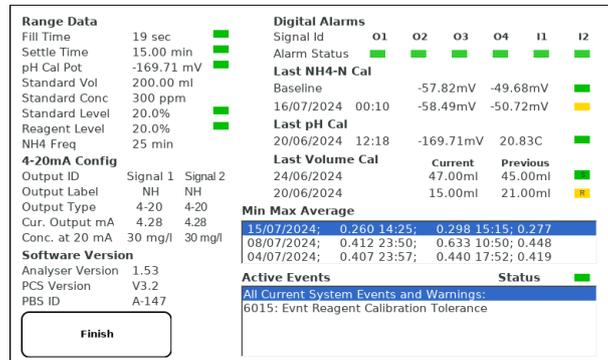
9. Troubleshooting

System Overview

As the name implies, the system overview menu offers "big picture" information about the system which can be used when investigating possible issues. Along with system configuration and status indicators, the menu shows the minimum, maximum and average readings recorded in the past 3 days and the 5 most recent measurement warnings and errors.

Certain parameters contain colour coded indicators to highlight problem areas. Text information is displayed using a larger font to enable clients to take a picture of the screen in the event where remote access is not possible.

Figure 83:
System Overview
menu



Error Codes List

Err_None = 0,
 STOP = 9999,
 Err_RS485_Write_TimeOut = 9001,
 Err_RS485_ReadTimeOut = 9002,
 Err_No_PCS_ID = 9003,
 Err_Port_Open_Failure = 9005,
 Err_Port_Access = 9006,
 Err_420_Timeout= 9011,
 Err_420_InvalidOp=9012,
 Err_420_NotConnected=9013,
 Err_Bytes_To_Double_Conversion = 8000,
 Err_No_Indicators_Read = 8001,
 Err_IndexOutOfRange = 8002,
 Err_Fill_Sensor_ON_After_Purge = 7000,
 Err_Fill_Sensor_OFF_Before_purge = 7001,
 Err_Fill_Sensor_OFF_After_Fill = 7002,
 Err_Fill_Sensor_ON_At_Fill_Start = 7003,
 Err_Fill_Sensor_Fail = 7004,
 Err_FillTime_DifferenceExceeded = 7005,
 Err_Fill_Sensor_Timeout=7006,
 Err_Fill_Sensor_MaxExceeded=7007,
 Err_Calib_Values_Out_of_Range = 6000,
 Err_Calib_Fit_Failed = 6001,
 Err_No_NH_Stability = 6002,
 Err_Cal_Init_NH_Measure = 6004,
 Err_pH_Titrate_Fail = 6005,
 Err_Fill_Sensor_Goes_Off_During_Setting = 6006,
 Err_Start_pH_High = 6007,
 Err_Titrate = 6008,
 Err_Start_pH_Fail = 6009,
 Err_No_pH_Stability=6010,
 Err_Check_NH_Electrode=6011,
 Err_pH_Calibration_Tolerance=6012,
 Err_NH4_Spike=6013,
 Err_Std_Calibration_Tolerance = 6014,
 Err_Reag_Calibration_Tolerance = 6015,
 Err_pH_CalibrationWash=6016,
 Err_pH_Cal_Date=6017,
 Err_Std_Cal_Date=6018,
 Err_Reag_Cal_Date=6019,
 Err_Std_Level=6020,
 Err_Reag_Level=6021,
 Err_No_SD_Card = 5000,
 Err_Log_Not_Found = 5001,
 Err_Cfg_Format = 5002,
 Err_File_Access = 5003,
 Err_Aeration_Valve_Fail = 4000,
 Err_Fill_Time_Increased = 4001,
 Err_Fill_incomplete = 4002,
 Err_Chamber_Pressure = 4003,
 Err_Mchamber_not_full = 4004,
 Err_Fill_Failed=4005,
 Err_LEAK = 3000,
 Digital_Alarm1=3001,
 Digital_Alarm2=3002,
 Analogue_Alarm=3003,
 Analogue_Out_Of_Range=3004,
 Inf_CV_Out_Of_Range = 1000,
 High_CV = 1001,
 Err_NH_Electrode_Connection=1002,
 Err_pH_Electrode_Connection = 1003,
 Err_Temp_Sensor_Connection = 1004

Extras 2

The second page of the Extras menu, its purpose is performing maintenance functions such as cleaning the probe, adjusting the NH₄-N measurement correlation factor and recalibrating the fill duration. The menu is fairly basic, with the focus being on the instruction list.

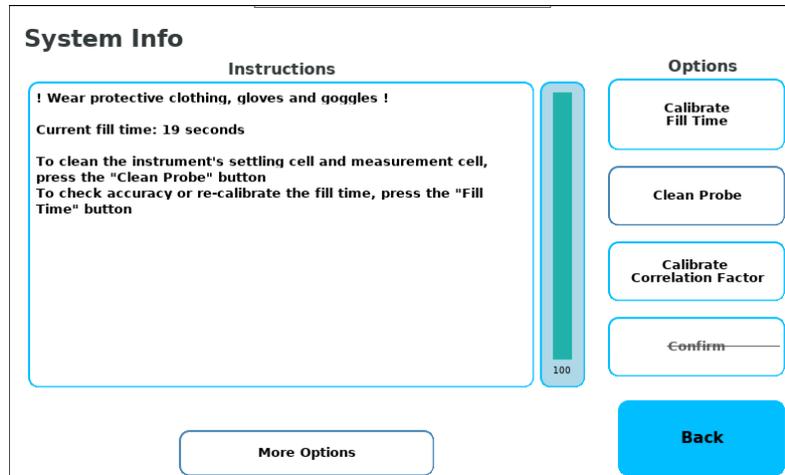


Figure 86 - Extras - System Info

Buttons

- Calibrate Fill Time
 - Empties and refills the settling chamber 3 times and averages the duration
- Clean Probe
 - Walks users through disassembling the probe and cleaning it
- Calibrate Correlation Factor
 - The operator is asked to inject 20ml of a solution with known NH₄-N concentration into the measurement chamber and initiate a measurement. Once the measurement completes, the operator is asked to enter the concentration of the solution. A correlation factor is automatically generated based on the measurement's result.
- Confirm
 - Used to generate new instructions
- Back
- More Options

Extras 3

Download data to USB stick and change date & time.

- Event log
- More options
- System info
- More options

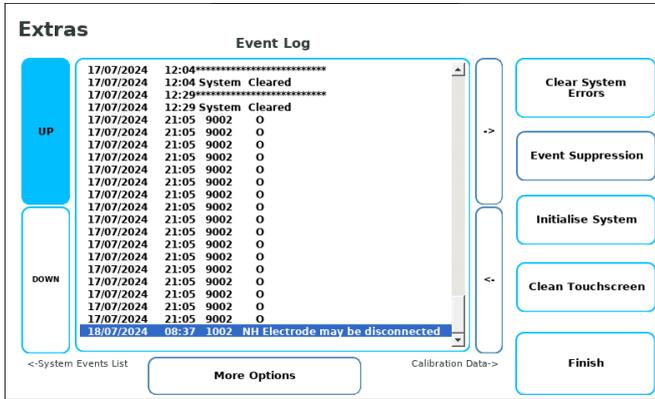


Figure 86 - Extras - Event log

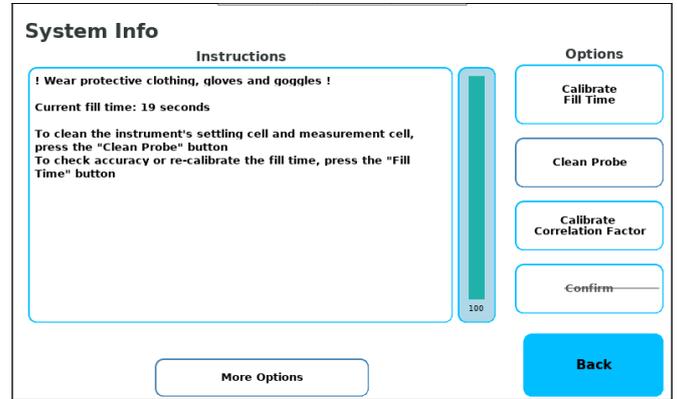


Figure 87 - System info

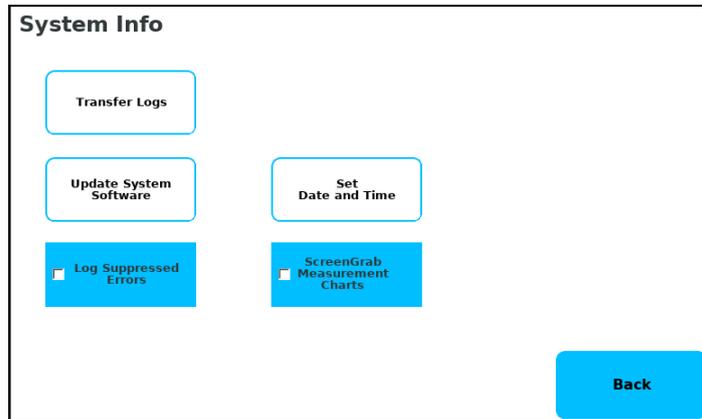


Figure 88 - System info

Download data to USB stick

- More options
- Transfer Logs
- Select storage device
- Confirm

Change date & time

- More options
- Set date and time
- Use numbers to input correct data
- Update

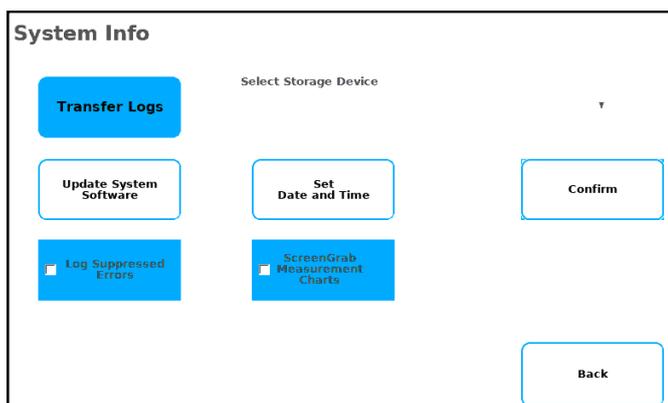


Figure 89 - USB Transfer

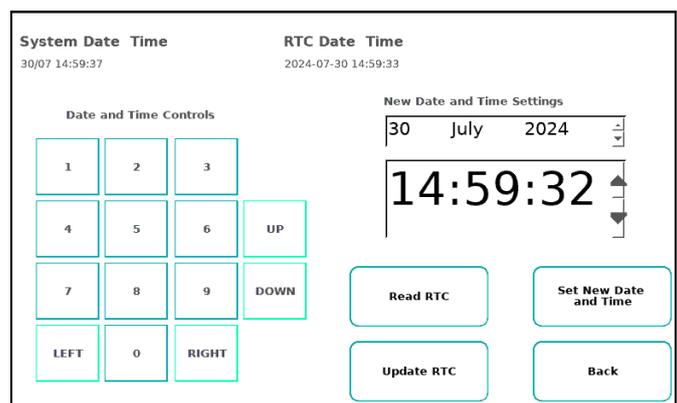


Figure 90 - Date & time

11. Comms configuration overview

Comms Configuration

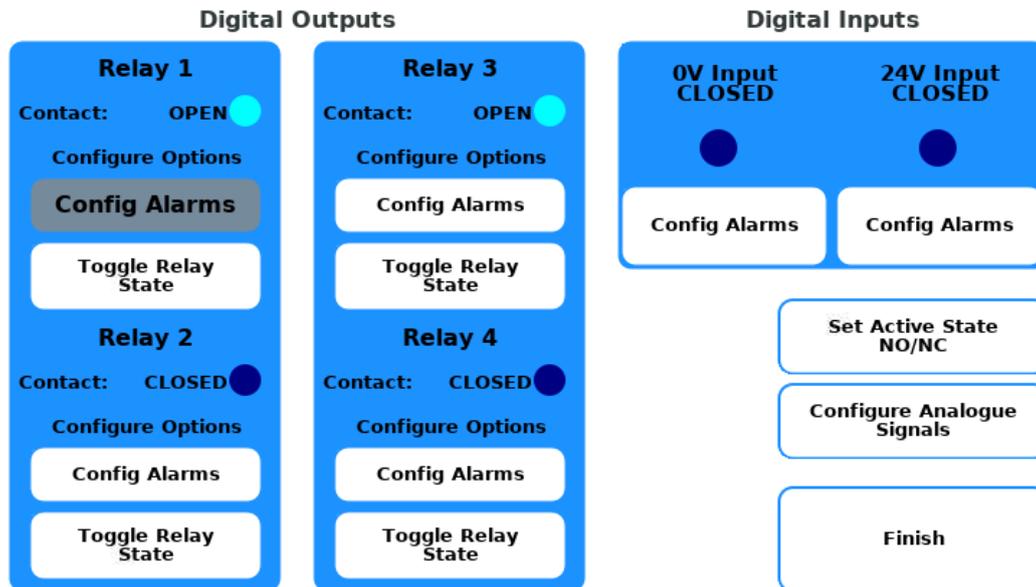


Figure 91 - Comms Configuration

Relay 1 Alarm Config

Events

- All Events
- RS485 Write TimeOut
- RS485 ReadTimeOut
- No PCS ID
- Port Open Failure
- Leak Detected
- Port Access
- Index Out Of Range

Warnings

- All Warnings
- Bytes To Double
- No Indicators Read

- Fill Sensor ON After
- Fill Sensor OFF After Fill
- Fill Sensor ON At Fill
- Fill Time Difference
- Fill Sensor Timeout
- Fill Sensor MaxExceeded
- Calib Values Out of Range
- Calib Fit Failed
- No NH Stability
- Cal First NH Measure
- No pH Stability
- Check NH Electrode
- pH Calibration Tolerance

- NH4 Spike
- pH Calibration
- pH Cal Date
- Standard Level
- Reagent Level
- High NH4 Measurement
- Low NH4 Measurement
- No Folder Access
- Cfg Format

Figure 92 - Config alarms

Testing PBS3 digital output

1. Open Advanced Mode
2. Login
3. Stop any active measurement or calibration
4. Open Engineering
5. Open Comms Set-Up
6. Set multi-meter to continuity mode
7. Connect multi-meter to PBS3 digital output 1
8. Tap "Toggle Relay State" from the Relay Out 1 column
9. Confirm multi-meter has detected the changed state
10. Connect multi-meter to PBS3 digital output 1
11. Tap "Toggle Relay State" from the Relay Out 2 column
12. Confirm multi-meter has detected the changed state

* Set NC/NO is only a software level toggle. The relay contacts are OPEN when de-energised. Alternative configurations can be provided on the hardware level.

Comms Configuration

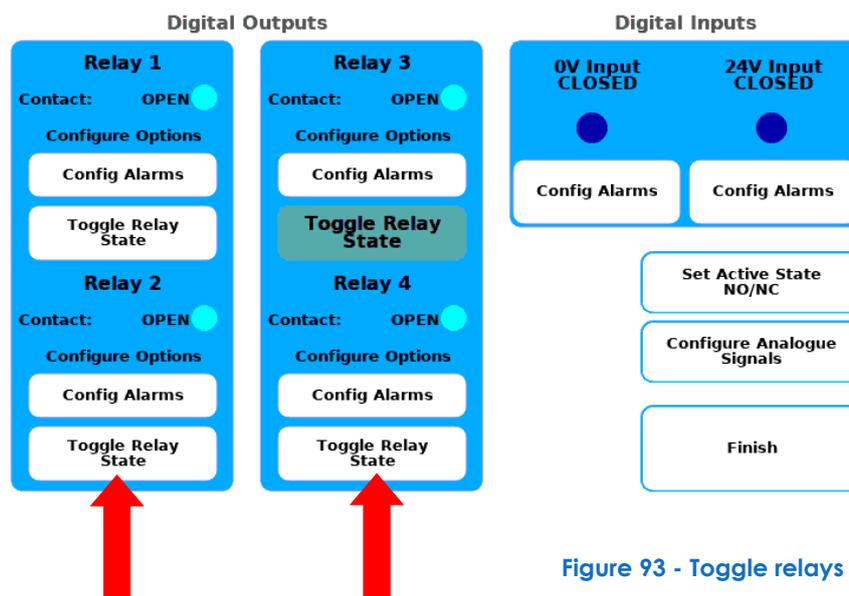


Figure 93 - Toggle relays

12. 4-20mA testing and calibration

STEP 1: Engineering -> Comms Setup

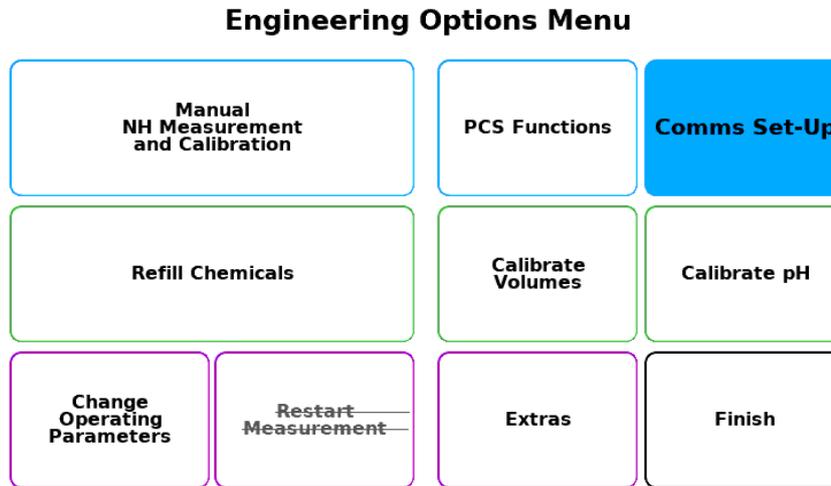


Figure 94 - Engineering options menu

STEP 2: Test 4-20mA Output

Comms Configuration

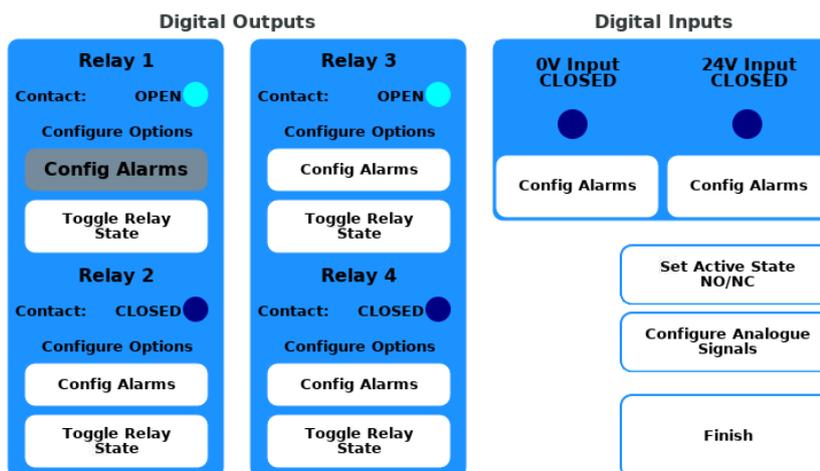


Figure 95- Comms config.

STEP 3A: Enter desired mA output between 4 and 20

Low NH4-N Alarm Level

0		
1	2	3
4	5	6
7	8	9
Clear	0	.
Cancel	OK	

High NH4-N Alarm Level

30		
1	2	3
4	5	6
7	8	9
Clear	0	.
Cancel	OK	

STEP 3B: Press OK

Figure 96

STEP 4: To calibrate press the right arrow then tap on + or -

STEP 5: Press 'Cancel' to end this process

Set Output and Press SET

20			1.4
1	2	3	Calibrate +
4	5	6	
7	8	9	-
Clear	0	.	
Cancel	OK		

Figure 97

PBS3 - Process Buoy System



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