



UNIVERSAL SMART METER:  
pH METER

USER MANUAL

Edition 2.0, November 2013



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# 1 Specifications

Specifications	Universal Smart Meter – pH / Redox
Input	A good combination electrode
Range	0 – 14.00pH or 0 – (+/-) 1000mV
Temperature Range	-5 - 50 degC
Display	Graphic LCD 124x64 dots Negative Blue: 4 Digit Display, 4-20mA graph, Relay Status. 2 Red LED
Set Points	2 minimum / maximum selectable contacts SPDT
Action	5A inductive ON/OFF
Current Output	0 – 20 mA / 4 – 20 mA galvanic isolated
Zero	+/- 2.0 pH
Slope	85% - 112%
Mains Supply	100 – 240 VAC 50/60Hz. Switched-mode Power supply
Power Consumption	5VA
Weight	450 grams. Wall Mount Version
Dimensions	190mm x 125mm x 47mm

## 2 General Information

The information contained in this manual has been carefully checked and is believed to be accurate. However, Smart Storm assumes no responsibility for any inaccuracies that may be contained in this manual. In no event will Smart Storm be liable for direct, indirect, special, incidental or consequential damages resulting from any defect or omission in this manual, even if advised of the possibility of such damages. In the interest of continued product development, Smart Storm reserves the right to make improvements in this manual and the products it describes at any time, without notice or obligation. Revised editions may be found on the Smart Storm’s web site [www.smartsorm.eu](http://www.smartsorm.eu).

## 3 Safety Information

Please read this entire manual before unpacking, setting up or operating this equipment. Pay attention to all danger, warning and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment. Make sure that the protection provided by this equipment is not impaired, do not use or install this equipment in any manner other than that specified in this manual.

<b>⚠ DANGER</b>
<p>The Pulsonic Technologies products designed for outdoor use are provided with a high level of ingress protection against liquids and dust (see specification for rating). If these products are connected to a mains electricity socket by means of a cable and plug rather than by fixed wiring, the level of ingress protection of the plug and socket connection against liquids and dust is considerably lower. It is the responsibility of the operator to protect the plug and socket connection in such a manner that the connection has an adequate level of ingress protection against liquids and dust and complies with the local safety regulations.</p> <p>When the instrument is used outdoors, it should be connected only to a suitable socket with at least IP44 rating (protection against water sprayed from all directions).</p>

### 3.1 Use of hazard information






<b>DANGER</b>
Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.
<b>WARNING</b>
Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.
<b>CAUTION</b>
Indicates a potentially hazardous situation that may result in minor or moderate injury.



<b>NOTICE</b>	
Indicates a situation that, if not avoided, could result in damage to the instrument. It also indicates information that requires special notice.	

### 3.2 Precautionary Labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed

	This symbol, if noted on the instrument, references the instruction manual for operation and/or safety information.
	This symbol, when noted on a product enclosure or barrier, indicates that a risk of electrical shock and/or electrocution exists
	This symbol, if noted on the product, indicates the need for protective eye wear.
	This symbol, when noted on the product, identifies the location of the connection for Protective Earth (ground).
	This symbol, when noted on the product, identifies the location of a fuse or current limiting device.

### 3.3 General product information

The USM is a simple PH or Redox meter depending on its physical configuration. Refer to appendix 1 for instructions on how to configure between modes.

The instrument can be configured to measure pH or redox using any good quality industry standard electrode. It can interface with other instruments or equipment via its two programmable relays and an analogue current loop. The unit includes special features which:

- Allow any value of calibration solution to be used for two-point pH calibration.
- Allows offline and online calibration.
- Real-time pH update as it compares with its previous calibration.
- Intelligent standard probe error detection and power save option.

The unit has an intuitive graphic interface and indicators which allows ease-of-use of the instrument, easy configuration and visibility. The USM and has a dynamic algorithm to overcome pH probe noise and ensure high accuracy and stability of measurement.



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## 4 Setup

Unscrew the bottom cover of the enclosure to expose the connecting terminals on the PCB.

Slide the PCB out of the enclosure box gently until the all the identification and screws of the connecting terminals are visible. Connect the cables through the cable glands (See Section 7.0).

Note: If the 4-20mA current loop is not needed, connect a 100 ohm resistor across the terminals (provided).

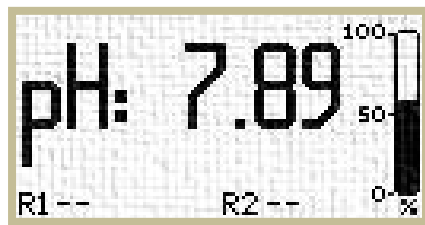
Slide the PCB and the cover back into the enclosure box and screw the cover unto the enclosure tightly as shown in the Figure.

If 100-240VAC version, connect to the mains, else connect to the relevant DC voltage source (9V - 24V DC).

Power the unit ON!

Unit comes up with a manufacturer/distributor information screen for about 10 seconds.





The Home Screen comes up as shown in the figure below.




NOTE: Displayed pH reading is based on the default values for slope. **THE UNIT MUST BE CALIBRATED!**



Calibration is performed using a 2-point calibration method for pH.

### 4.1 Quick pH Calibration

Button	Action
	Scroll Right or Enter
	Increment Number
	Decrement Number
	Return to previous menu level or to Home Screen and Abort


From the Home Screen, press  button to access the PASSWORD page.

**On the first setup of the unit, use the default '0000' to access the menu.**

Use  and  buttons to select the desired digit at each location and pressed enter to select the next digit. See Figure.

If PASSWORD is correct, access to MENU page is granted and displayed.

Select **pH CALIBRATION** on the MENU page and press  button.

Highlight and select 'YES' on the page to proceed to calibration prompt by pressing the  button.



On the calibration mode screen, select ONLINE *or* OFFLINE calibration.



**NOTE:**

- **ONLINE calibration uses the pH reading based on the previous calibration to trigger relays and set 4-20mA current output.**
- **OFFLINE calibration disables the relays and 4-20mA current output during calibration.**

**Set point A:** Calibration Screen (Default 7.01 pH)


The unit allows user to select preferred buffer solution to be used in no specified order. But for consistent industry practice, buffer 7.01 pH is used as default for Set Point A.

User can update the BUFFER field using  or  button to select the pH of the preferred buffer solution.

To run quickly to the preferred pH buffer number, hold down the button  or  in the corresponding direction from the displayed value. Single presses increment or decrement in the step of 0.01 pH.

Insert the probe into the pH buffer selected. Watch the pH READING and mV READING on the screen change until the values is stable.

**NOTE: The pH READING is based on the previous/default calibration and the mV READING is the millivolt generated by probe in the selected buffer.**

After a stable reading is achieved with the electrode in the buffer, press  button, go to Set Point B. Rinse the pH electrode properly with deionised water.

Repeat the procedure in Set Point A with a **DIFFERENT** buffer solution. Default buffer is set at 4.01 pH.

**Wait until a stable reading is achieved!**

When a stable reading is achieved press  button to check and save calibration.



Before a calibration is saved in the Flash memory, the program checks to see if the same buffer has been used at the two set points or if slope calculated is acceptable.



**Calibration is discarded if:**



- **the buffer solutions are the same value**
- **if the calculated slope is less than 85% or greater 115% than of the theoretical slope as this indicates a faulty probe.**

Calibration data is saved to Flash memory and the slope and offset is updated if and only if the above conditions are NOT true.

## 4.2 Quick ORP Calibration

In Menu, scroll up or down with  or  button, select ORP Calibration with SELECT button. In the ORP Calibration function, user can set if the unit measure "relative" or "absolute" readings. The "relative" reading adjust the reading using the previous calibration saved. The "absolute" gives the reading as millivolt value directly measure by the probe.

Use the UP or DOWN buttons to choose option, select the Redox measurement mode "RELATIVE" or "ABSOLUTE" with SELECT button. User can proceed to calibration, scroll  or  for choose the option to calibrate or return to MENU.

When "YES" is selected with , proceed to calibration and "NO" with  returns to MENU.

Redox calibration uses a single-point calibration to correct the millivolt read by the probe to a known redox calibration solution with a verified millivolt value.

Dip probe into known calibration solution with a known millivolt value. Enter the millivolt value of the known calibration solution, allow the probe reading to stabilise and press SELECT button. Calibration will be rejected if the millivolt reading from the probe deviates further than +/-40mV from the solution's known millivolt value.

To save calibration when complete, select "YES" to save and "NO" discard.

Note: If "RELATIVE" mode is selected, on the Home screen, a highlighted "R" is on the screen.


***The instrument is now ready for use as a Redox Meter.***

## 4.3 Hard Reset

This procedure, when activated, loads the default parameters and settings to instrument's memory location. When power is recycled, the updated default values are then used for calculation and setting up the instrument.

To activate hard reset:

1. Power cycle the unit

2. When the unit boots, hold the  button.

3. Hardware reset password screen is loaded

5. Enter the hardware reset password '0005'

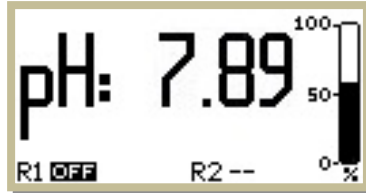
Default data parameter and settings are loaded and the unit is re-initialized as pH or Redox, which depends on the current configuration of the instrument. Values updated now, you can power cycle the unit again.




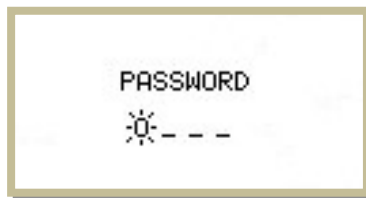






## 5 Menu Overview

All the functions of the instrument are accessed through the MENU page. The user selects the action to configures or view. After a successful password entry, the MENU page is loaded.



Press  to go to the PASSWORD prompt. Enter the combination of the password to access the MENU. The default password is '0000'. Ensure password is changed to a combination of 4-digit that can be remembered easily using the CHANGE PASSWORD function on the MENU.



Enter the correct 4-digit combination and press  to move through each field. Press  or  button to change number and press  to select the number.









The USM pH Meter has the capability to carry out the following processes:




1. **pH CALIBRATION / ORP CALIBRATION**
2. **RELAYS SETUP**
3. **4-20mA SETUP**
4. **RELAYS TEST**
5. **4-20mA TEST**
6. **CONTRAST**
7. **CHANGE PASSWORD**
8. **ENGINEER**

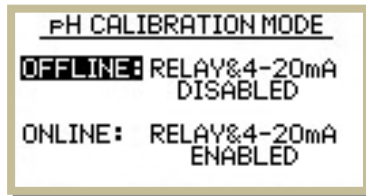
### 5.1 pH Calibration

The instrument uses a two-point calibration to setup the instrument as a pH meter. The system allows the use of any known buffer in any order because its straight line curve will pass through a corresponding zero for the electrode used. pH calibration is accessible only after the user password is accepted and selected on the MENU.

HOME SCREEN ----> PASSWORD ----> MENU ----> pH CALIBRATION +  button  
CONFIGURATION SCREENS ----> PASSWORD ----> MENU ----> pH CALIBRATION +  button

To avoid an unnecessary calibration procedure, a user prompt request is displayed to confirm if a calibration is to be undertaken. Using  or  button, highlight the desired selection and press  button. If 'NO' is selected or  button is pressed, the display returns to MENU page.

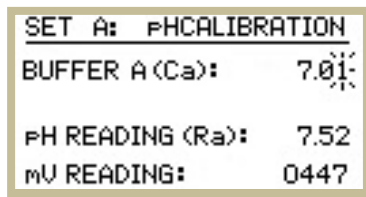
If 'YES' is selected the pH CALIBRATION MODE is prompted by the program. Default is 'OFFLINE' MODE. Using  or  arrow, highlight the desired selection and press  button.







'ONLINE' calibration continues to use the pH reading based on the previous calibration to trigger relays and set 4-20mA current output during calibration.  
'OFFLINE' calibration disables the relays and 4-20mA current output during calibration.

#### Step 1:


The first calibration screen for the pH buffer solution is selected:- SET A: pH CALIBRATION



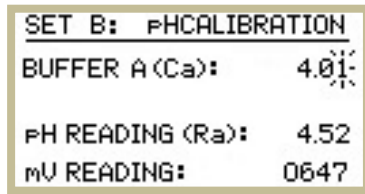
The default buffer solution to be used for this point is default at 7.01 pH. The value of the BUFFER (Ca): This field value can be changed to any standard pH buffer 4.01, 9.01, 10.01 etc. Use  or  button to increment or decrement respectively to the value desired. Pressing  or  button at intervals increment or decrement value by 0.01. To speed up the increment or decrement, the buttons should be held down respectively.  
Ensure the pH probe is clean. Insert the probe into the pH buffer selected. Observe the pH READING and mV READING on the screen change until the values are very stable (usually after a minimum of 120 seconds depending on buffer temperature).  
NOTE: The pH READING (Ra) starts from the previous/default calibration but mV READING is the current millivolt

generated by the probe in the selected buffer. The Ra reading will alter to a value directly relating to the mV reading from the probe.

The Ra reading should approach but not necessarily become the same value as the Ca value.

Once a stable reading Ra value is achieved with the pH electrode in the selected buffer, press  button to move to Set Point B. Ensure pH electrode is rinsed thoroughly with deionised water before immersing in the next buffer solution otherwise cross contamination of buffer solutions will occur.

**Step 2:**



Repeat the procedure in Step 1 with a DIFFERENT buffer solution. Default buffer is set at 4.01 pH.

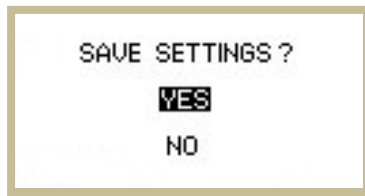
When a stable Ra reading is achieved press  button to check and save calibration.

Before calibration is saved in the Flash memory, the program checks to see if the same buffer value has been used at the two set points or if slope calculated is acceptable.


**Calibration is discarded if Buffer solutions are the same or if the calculated slope is less than 85% or greater 115% than of the theoretical slope.**

If any of these circumstances occur above, an error message is displayed to specify the error type. After such error message the user is returned to the MENU highlighting the last selection.

At any point before the second calibration point is entered, and the HOME button is pressed, the program returns to the MENU.



Calibration data is valid to save if and only if the conditions are NOT satisfied. If 'NO' is highlighted and selected the calibration data will be discarded and the previous calibration data will be retained.

To save, 'YES' is highlighted and selected using the  button on the SAVE DATA prompt. The slope and the intercept for the new curve for the two-point calibration are updated and saved in memory.

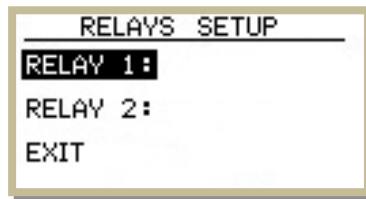
## 5.2 Relay Setup

USM: pH/Redox Meter has two programmable control relays configurable for ON/OFF at any point so desired for high or low operation. By default both relays are 'DISABLED', which is indicated by '--' anywhere their status is displayed.

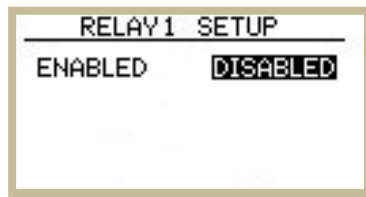
The RELAYS SETUP option is accessible on the MENU page. Highlight by scrolling  or .

HOME SCREEN ----> PASSWORD ----> MENU ----> RELAYS SETUP + ENTER button

CONFIGURATION SCREENS ----> PASSWORD ----> MENU ----> RELAYS SETUP + ENTER button

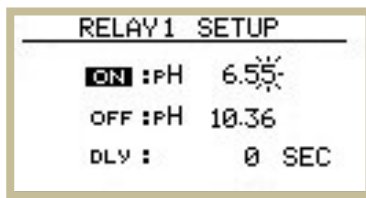


Using or button, highlights and selects the relay choice to be configured. If HOME button is pressed or 'EXIT' is selected by button, the program returns to the MENU page. When 'RELAY 1' or 'RELAY 2' are highlighted press button.

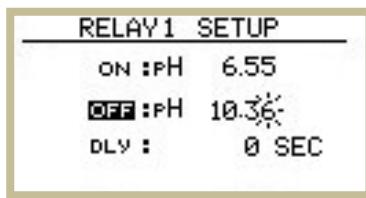


By default the relays configuration are 'DISABLED'. If HOME button is pressed, returns to RELAYS SETUP page, highlighting the last selected relay. When the 'RELAY 1' is highlighted and selected with button, the setup for 'RELAY 1' now configurable.

Using or button highlight and select choice of configuration 'ENABLED'. 'ENABLED' is highlighted and selected, using the button.



The page is updated with 'ON' highlighted and the corresponding on value in pH. Notice the last digit flashing is waiting for a user input value. Using or button, increment and decrement the set point pH value as required. Hold the button down to update faster. When a desired value is reached, for example 6.55,

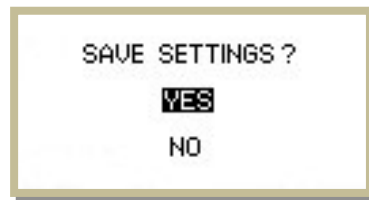



Press button, to set the set point for 'OFF' and 'OFF' will be highlighted and the corresponding pH last digit blinking. Using or button, select the desired pH number e.g 10.36, and then press to select. 'DLY' will be highlighted and the corresponding digit blinks. This is to set the delay in seconds which the relays will

trigger after the set points have been reached. In the example above, if delay is set to 10 seconds, the relay will trigger ON 10 seconds after the pH reading is less than 6.55 and will also trigger OFF 10 seconds after pH value is greater than 10.36. By default is set to 0 (minimum), has a maximum of 20 seconds. This feature is to be used by only **ENGINEERS** when pH balancing is critical.



The user is prompted to save the settings. If 'YES' is highlighted and selected using  button, RELAY X configuration setting is saved and the menu returns to the 'RELAYS SETUP' page.



Otherwise if 'NO' is highlighted and selected using  button, RELAY X configuration setting is discarded and the menu returns to 'RELAYS SETUP' page.

The Relay setup process also imply for the Redox meter. User must take note of the “mV” instead of pH. The relay is triggered at set point for the redox meter input ranges -999.9 mV to 999.9 mV.

**Example 1:**



In the above example the settings are saved for RELAY 1. This implies that RELAY 1 will close 'NORMALLY OPEN' contact and open 'NORMALLY CLOSE' contact when the pH is less than or equal to 6.55 (-100 mV) (Relay **ON**). When the pH is greater than or equal to 10.36 (500mV), RELAY 1 will open the 'NORMALLY OPEN' contact and close the 'NORMALLY CLOSE' contacts (Relay **OFF**).

**Example 2:**


If RELAY 2 is set as: ON at pH 10.38 (500mV), and OFF at pH 6.55 (-100 mV). This implies that RELAY 2 will close 'NORMALLY OPEN' contact and open 'NORMALLY CLOSE' contact (**ON**) when pH is greater than or equal to 10.55 (500mV), until pH is less than or equal to 6.55 (-100 mV) then RELAY 2 will open 'NORMALLY OPEN' contact and close 'NORMALLY CLOSE' contact (**OFF**).

### 5.3 4-20mA Setup

The USM: pH/Redox Meter has a current loop output which can be configured as a 4-20 milliamp loop or a 0 - 20 milliamp loop.

The 4-20mA SETUP is accessible on the MENU page. Highlight by using  or  button to scroll page.

HOME SCREEN ----> PASSWORD ----> MENU ----> 4-20mA SETUP +  button

CONFIGURATION SCREENS ----> PASSWORD ----> MENU ----> 4-20mA SETUP +  button



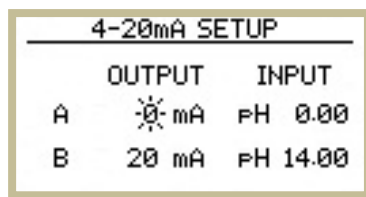


By default the 4-20mA is 'DISABLED'. If 'DISABLED' is selected or HOME button pressed the program returns to MENU.

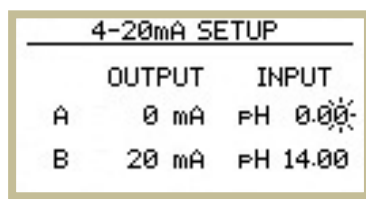
Using or button to highlight the choice of setup 'ENABLED' or 'DISABLED' and select choice using button to validate choice.



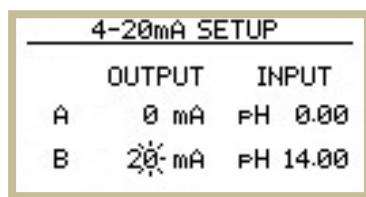
If 'ENABLE' is selected, the setup page is loaded where two coordinates to configure current loop must be entered, such as A (mA, pH) and B (mA, pH) for pH meter or A (mA, mV) and B (mA, mV) for Redox meter.








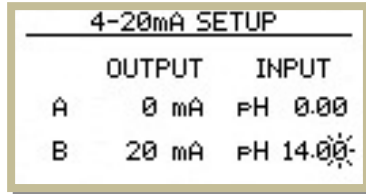
Point A's default values are 0mA 'OUTPUT' for 0.00 pH 'INPUT'. The mA OUTPUT is updated using or button to increment or decrement mA value respectively and the button is pressed to validate value. The control goes to pH input update using or button to increment and decrement to desired value. Press to validate pH value.




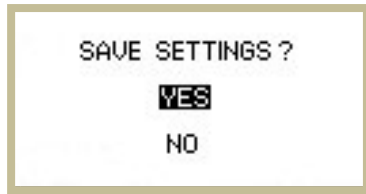
Point B's data to be updated, defaults at 20mA 'OUTPUT' for 14.00 pH 'INPUT'.



mA OUTPUT is updated using  or  button to increment or decrement mA value respectively and the  button is pressed to validate value. The control goes to pH input update using  or  button to increment and decrement to desired value.



Press  to validate pH value and save setting. Press 'YES' to save configuration and updates current loop output configuration or 'NO' to discard the configuration. All steps above imply as well for a Redox meter but user should take note of the "mV". In Redox mode, the millivolt input ranges between -999.9 mV to 999.9 mV.

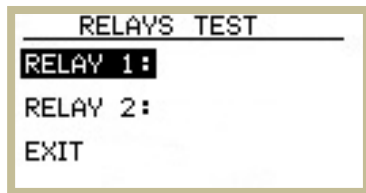





At any point, if  is pressed the configuration is discarded and returns to MENU.

## 5.4 Relay Test

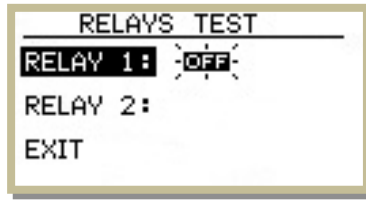
This test functionality triggers the relays ON and OFF one after the other.

HOME SCREEN ----> PASSWORD ----> MENU ----> RELAYS TEST + ENTER button  
CONFIGURATION SCREENS ----> PASSWORD ----> MENU ----> RELAYS TEST + ENTER button

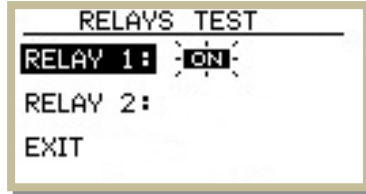


'RELAY 1' is highlighted by default. Use  or  to highlight the 'RELAY 1 or 2' to control or test. If 'RELAY 1' is to be tested, highlight RELAY 1 press  button to select and control. 'OFF' flashes as the RELAY 1 state is

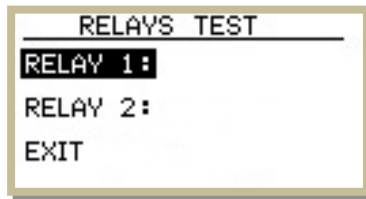
OFF.



Press the button to trigger RELAY 1 'ON' state.



Press the button to trigger RELAY 1 'OFF'. Press to release from control.



Scroll or , to highlight the second relay for test. Repeat the same procedure for 'RELAY 1'. Highlight and selected 'EXIT' or press HOME button to return to MENU.

## 5.5 4-20mA Test

This feature tests the 4-20mA to check if the corresponding output gives the right amount of current into the loop. To use this functionality, the 4-20mA SETUP **MUST** be 'ENABLED' else changing the milliamp value on screen will not have any effect on the loop current.


Connect a multimeter to the current loop to check the output from the USM.

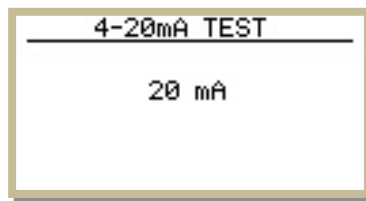
HOME SCREEN ----> PASSWORD ----> MENU ----> 4-20mA TEST + button  
 CONFIGURATION SCREENS ----> PASSWORD ----> MENU ----> 4-20mA TEST + button



To change the value of the current in the 4-20mA loop, use button to increment in steps of 4 mA through to 20 mA







and use  button to decrement in steps of 4 mA through to 0 mA. In both increment and decrement the value folds over.

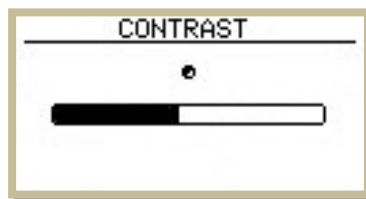






Press  or  button, to exit 4-20 mA test function back to the main MENU.

## 5.6 Contrast

This sets the contrast level of the LCD. It is a useful feature when sun glare affects the clarity of the display.



HOME SCREEN ----> PASSWORD ----> MENU ----> CONTRAST +  button  
 CONFIGURATION SCREENS ----> PASSWORD ----> MENU ----> CONTRAST +  button



To adjust the contrast level, press the  button to increase contrast level and then press the  button to reduce contrast level. In order to validate the adjusted level, press  and exit to MENU. If the  HOME button is pressed the unit will discard the adjusted level and will reset to the previously saved contrast level and return to the MENU.




## 5.7 Change Password


This changes a previously known password to a new password as desired by the user. It MUST be a 4-digit integer number.

HOME SCREEN ----> PASSWORD ----> MENU ----> CHANGE PASSWORD +  button  
 CONFIGURATION SCREENS ----> PASSWORD ----> MENU ----> CHANGE PASSWORD +  button.




The correct combination of the current 4-digit password must be entered to change the password combination.

Use the  or  button to select the number for each digit. Use  button to go to next digit or validate the 4-digit password on the fourth (4th) digit. If the current password entered is wrong, the program returns to the main MENU.

If correct, the user can update the current password with the new 4-digit password. Press  button to validate the new password.



If HOME button is pressed at any stage before validation with  button, all changes are discarded and the unit returns to main MENU.

## 5.8 Engineer

This uses a different password combination to which is only accessible by your supplier. If you need to access, you must contact your supplier.

## 6 Configuration Display

The USM pHRedox Meter enables the user to view the unit's current working configuration. Configuration for all the I/O can be viewed without altering any of the saved data.

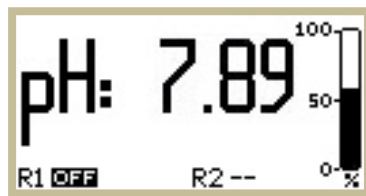
However the MENU can be accessed while viewing the configuration details by pressing the ENTER button and entering the correct user password.



The following details can be viewed in the configuration display menu depending if instrument is configured as pH or Redox meters. Display configurations to be viewed include:

1. Software program version running on the instrument
2. Current pH Slope Configuration
3. Relay Status and Configuration
4. 4-20mA Status and Configuration
5. Manufacturer's contact details

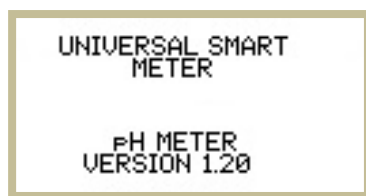
To Access:

To view configuration details, return to the HOME screen.



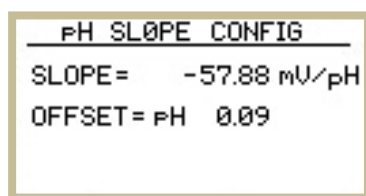
Press the  or  button. Keep pressing at interval to view the entire currently saved configuration on the instrument until it returns to the HOME screen.

### Software Information Screen.



This screen shows the pH/Redox Meter software version and unit type.

### pH Slope Configuration



This shows the pH electrode’s gradient for the last calibration in mV/pH and the offset is the deviation of the electrode intercept from the ideal intercept for the calibration curve.

**Relay Status and Configuration**

RELAY CONFIGURATION			
	STATUS	ON	OFF
1	Enabled	6.55	10.36
2	Disabled	--	--

This shows the status of the relays and the set point which they have been configured to trigger at. In this example Relay 1 status is ‘ENABLED’ and shows the operating points of the relay. Relay 2 status is ‘DISABLED’ and thus has no operating points set.

Note the ‘--’, it signifies the relay is ‘DISABLED’ anywhere in the program.

**4-20mA Status and Configuration**

This screen is only populated when the 4-20mA current loop is ‘ENABLED’ as shown below. The table shows the set current output for each of the points corresponding pH or Redox reading.

4-20mA SETUP			
	OUTPUT	INPUT	
A	0 mA	pH	0.00
B	20 mA	pH	14.00

This configuration implies that at pH reading of 0.00, 0 mA is transmitted on the loop and for pH reading of 14.00, 20 mA is transmitted on the loop.

If the current loop is disabled, a message is displayed instead of the table.

4-20mA CONFIGURATION	
4-20mA	DISABLED

**Manufacturer’s Contact Details**

This page displays our logo and primary contact details: website and telephone number.

To access MENU from the configuration, press the  button.



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## 7 Installation

### 7.1 Wiring Handling Precautions

#### **DANGER**

Electrocution Hazard. Always disconnect mains supply before removing covers and connecting any external wiring.  
Only qualified Electricians should install this product. IET BS7671:2008 wiring regulations must be adhered to when installing the product.

#### **NOTICE**

Delicate internal electronic components can be damaged by static electricity, resulting in indeterminate instrument performance or eventual failure. Pulsonic Technologies recommends taking the following steps to prevent ESD damage to your instrument:

- Before touching any instrument electronic components (such as printed circuit cards and the components on them) discharge static electricity from your body. The user can accomplish this by touching an earth-grounded metal surface for 3 seconds such as the chassis of an instrument, or a metal conduit or pipe.
- To reduce static build-up, avoid excessive movement. Transport static-sensitive components in anti-static containers or packaging.
- To discharge static electricity from your body and keep it discharged, wear a wrist strap connected by a wire to earth ground, especially when handling circuit boards.
- Handle all static-sensitive components in a static-safe area. If possible, use anti-static floor pads and work bench pads.
- 

#### **DANGER**

Electrocution hazard. Always install a ground fault interrupt circuit (GFI)/ residual current circuit breaker (RCCB) with a maximum trigger current of 30 mA. If installed outside, provide overvoltage protection through a MCB rated not greater than 5Amps.

#### **DANGER**

With fixed wiring, a disconnecting device (local interruption) must be integrated into the power supply line. The disconnecting device must meet BS7671:2008 standards and regulations. It must be installed near the device, be able to be reached easily by the operator and labelled as a disconnecting device. If the connection is established using a mains connection cable that is permanently connected to the power supply, the plug of the mains connection cable can serve as local interruption.

**Note: There is no on/off switch to disconnect the probe module from AC Power.**

**⚠ DANGER**

Ensure the relays are not subjected to loads great than 5Amps as this will cause internal damage and possible product destruction.

## 7.2 Wiring Connections

To access the wiring connectors remove the bottom cover taking care not to damage the waterproof gasket. The main PCB is visible and is designed to slide out of the enclosure by up to 2cm to allow access to the terminal blocks.

***Do not use excessive force as this may detach the ribbon cables from the main PCB to the Display.***

### **Power Supply**

AC: 100 – 230 universal supply

DC: 12/24Volts

The USM is factory configured for either DC or AC supply. Refer to the rating label to identify the units supply voltage.

### **pH or ORP Sensor**

Connect the pH sensor to the marked terminal ensuring that the polarity is observed for which the cable screen is normally the negative (–ve) terminal connection.

Ensure the cable connections are well screwed into the connector blocks as loose connections can give erroneous pH readings.

### **4-20 mA Output**

Remove the resistor from the terminal block. Ensure the wiring polarity into the USM is the same as the receiving instrument. If the 4-20mA output is not used always ensure that the resistor supplied is connected between the 4-20mA terminals else the pH readings will be incorrect.

### **Relays**

The relays are rated at 230VAC @5A. Always ensure the cable used has a suitable can sustain the load it is driving. Cable less than 18AWG is not recommended.

Relays can be wired as either Normally Open (NO) which means the contact is open circuit when the relay is not energised (switched on) or Normally Closed (NC) which means the contact is closed when the relay is not energised.

## 8 Fault Finding

Fault	Possible Cause	Remedy
No Display	Lost Power	Check external and internal fuses
No Display	Ribbon Cable disconnected from Main PCB	Carefully remove each end of enclosure. Separate top of enclosure from the bottom. Identify cable and carefully push back onto connector. Reassemble
pH meter won't calibrate	<ul style="list-style-type: none"> <li>• pH sensor failed.</li> <li>• Wiring damaged.</li> <li>• Junction box has been used to extend pH cable and water or moisture is present.</li> </ul>	<ul style="list-style-type: none"> <li>• Replace with new pH sensor.</li> <li>• Check wiring is fully connected in the terminal block.</li> <li>• Check cable to pH sensor.</li> <li>• Check for moisture in Junction box.</li> </ul>
pH reading not stable	Reference and pH voltage cables swapped at the terminals. pH sensor cable is close to a high inductive machine or equipment	Check and ensure the pH sensor is connected to the appropriate slot on the terminal. Ensure cable path is kept isolated from equipment with coils.

## ***Declaration of Conformity***

We,  
Smart Storm Limited  
Riverside House  
North Dean Business Park  
Stainland Road  
Greetland  
Halifax  
HX4 8LR

Declare under our sole responsibility that the products:

USI, Hydrocell, USM, SB2000

to which this declaration relates, is in conformity with the following directive.

<b><u>Directive</u></b>	<b><u>Issue Date</u></b>
89/336 EEC Electromagnetic Compatibility	3 May 1989

And the following harmonised European Norms (EN standards), IRC and Environment Agency standards.

<b><u>Standard</u></b>	<b><u>Issue</u></b>
EN 50081 – 1 Emissions	1992
IEC 801 Immunity	1992

We also declare that the products:

Named above

are of UK origin and are manufactured and tested to Smart Storm internal quality standards defined in the company's formal ISO9001:2008 quality manual.

Dr John Duffy  
Managing Director



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