

User's Manual

Aqua2Trans

pH / ORP



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1. Purpose of this Document

The purpose of this document is to equip the reader with the necessary information required for the safe installation, operation and maintenance of this device, prior to its commissioning. The information within this document is aimed towards those individuals who are technically qualified and experienced in the assembly, installation and operation/ maintenance of the device.

To avoid personal injury or property damage it is important to carefully read, understand, and follow all of the contents of this manual, including all safety cautions and warnings. If you have any questions about these instructions, contact the customer support division of the Manufacturer before proceeding.

Whilst the information in this document aims to be as accurate as possible, the Manufacturer makes no warranty or representations with respect to the information herein. The proper utilization of this information is ultimately the responsibility of the Customer.

Intended use

In order to ensure optimum functionality, the device needs to be utilized solely for those purposes and in those manners as prescribed herein. The Customer is responsible for making certain that the operating conditions for the device correspond to the technical specifications defined. Furthermore, the Customer is also responsible for ensuring that any personnel that operate or maintain the device are made aware of the implications of using or operating the device in unsuitable conditions.

The Manufacturer does not assume any liability for damages resulting from the failure to use the device for its intended purpose or for damage caused by external forces or any other external factors.

Qualified Personnel

The product described in this documentation may be installed, operated and maintained only by personnel qualified for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products.

The Customer must ensure that operating personnel read and understand these instructions as well as the specified hazard statements, warning and caution notes. Furthermore, the operating personnel must be familiar with the applicable health, safety and accident prevention regulations and comply with them.

General Safety & Security

The Customer must consider for the necessity of any protective clothing for its employees in the vicinity in order to provide protection against hazards of temperature (high or low), chemicals, radiation, dangers to eyes and face, noise and falling objects.

There is always a possibility of risk of injury if heavy products are handled manually. Customers are requested to analyze the risk and use appropriate handling methods by taking into consideration the task, the individual, the working environment and the load. Furthermore, it is the Customer's responsibility to ensure that general instructions for proper use of tools and safety of equipment, piping and plant construction must also be complied with and "Warning Notices" need to be put up wherever necessary.

The Customer is solely responsible to prevent unauthorized access to its plants, systems, machines and networks, its information technology infrastructure, firewalls network, internet and appropriate security measures.

Incorrect installation, operation or maintenance of the device in potentially explosive atmospheres may lead to ignition of the atmosphere and cause risk of fatal injury, death or damage to personal property. Please note that the Customer is solely liable for any hazards, damage or injury caused to its personnel or property due to the Customer's failure to comply with the safety instructions above and as established throughout the course of this manual.

Limitation of Liability and Optimum performance

For optimum performance, the Product should only be used in conjunction with components and accessories supplied by the Manufacturer. If the product accessories and components from other manufacturers are used, these must be recommended or approved by the Manufacturer.

The Manufacturer shall not be liable and the Warranty shall not apply, if the Product (i) is used in any manner that is inconsistent with the intended purpose or design of the Product as described in user manual, product literature and/or technical documentation provided by the Manufacturer of the Product; (ii) is altered in any way; (iii) is used or maintained in any manner that is inconsistent with Manufacturer's instructions or warnings ("User Instructions") provided along with the Product; (iv) subjected to any other misuse, lack of proper storage & handling, commissioning, maintenance, faulty repair, neglect, or servicing by persons other than Manufacturer's authorized person and/or failure to operate in permissible ambient conditions.

Compliance with Laws & Directives

Observe the test certification, provisions and laws applicable in your country during connection, assembly and operation.

Product Disposal



It is necessary to dispose this product only in accordance with local regulations at the authorized, qualified collecting point specified for equipment and its parts. Kindly refer to the components mentioned in this document. Please follow all waste disposal guidelines (Management & Handling) as published by local governing authorities and local environmental laws.

2. General information



This User Manual describes the Aqua2Trans – 2 Wire pH / ORP Transmitter, designed and manufactured by Forbes Marshall Pvt. Ltd. (FMPL).

FMPL reserves the right to make changes to the transmitter specifications, the transmitter and the manual at any time without prior notice.

FMPL is not liable for any direct, indirect or consequential damages resulting from any errors or omissions in this manual.

Safety

Please read this manual completely before proceeding with installation. Pay particular attention to all the caution and danger statements. Employ personnel who are trained to install, connect, power-up and operate the sensors and the transmitter. Install and use the transmitter only in the manner specified in this manual.

No unauthorized modifications to the transmitter are allowed. FMPL accepts no responsibility for damage caused by unauthorized modifications. The risk is borne entirely by the user.

Making electrical connections

Before wiring any high voltage/current cables, make sure that the power is off at the source and that the cables are not live. Connect the power Live, Neutral & Earth ground to the AC power plug. Connect the protective earth cable to the extreme right side Earth screw and use other three Earth screws for terminating the shields of sensors and communication cable. All the terminal connectors are pluggable and should be removed to insert and fasten the wires. Make sure that the routing of the sensor cables till the Transmitter prevents exposure to high Electromagnetic fields (e.g. Transmitters, motors and switching equipment). Exposure to these fields can cause inaccurate results.

Hazard info



This indicates that a high risk of electrocution exists and will result in death if due care is not taken.



This indicates that a high risk of electrical shock exists and could result in death or serious injury if due care is not taken.



This indicates the presence of electrical potential and could result in serious injury if due care is not taken.



This indicates that a certain action is prohibited. The user must take precaution to prevent damage to the transmitter, degradation in the transmitter's performance and/or injury to self.



This indicates that the user must disconnect mains power to the transmitter before performing further actions.

Other info



This indicates the presence of modules with electronic devices that are susceptible to electrostatic discharge. Hence caution - do not touch the devices!



This indicates that the user must read an important note and / or observe the instruction during installation, connection and/ or use of the transmitter.



This indicates that you must use only the recommended tools or tools appropriate for the immediate task.

Removal of transmitter from service

- Disconnect the cable wiring from the transmitter terminals.
- Remove the transmitter from the mounting hardware.

3. Overview

Aqua2Trans is a HART® compatible Microcontroller based two wire pH / ORP parameter Transmitter that accepts process sensor inputs and displays the measured values and transmits it in terms of 4-20mA HART® output.

This transmitter is capable of measuring pH, mV and temperature. Thus pH sensor in combination with temperature sensor or ORP (REDOX) sensor can be used as process sensors. The measurement results are displayed on LCD display.

For pH, automatic temperature compensation through PT100 or PT1000 sensors is provided.

The transmitter has rugged, weatherproof housing. The enclosure meets IP66 Protection.

The output of this transmitter is fully scalable over the total range of sensor. During fault conditions the output can be programmed for None or 3.55mA or 22mA as per need.

It communicates via HART with external devices.

Sensor inputs

Aqua2Trans accepts only one PH/ORP sensor connected at a time.

Analog outputs

Aqua2Trans drives one active 4-20 mA current output. Output is freely assignable to any of the fault conditions the output can be programmed None or, 3.55mA or 22mA as per need.

HART communication

Aqua2Trans communicates digitally with external smart devices via HART.

User interface

Aqua2Trans has a large 128x 64 Pixels dots with FSTN mode graphical LCD display panel, minimal number of keys and an easy-to-understand menu structure, making it simple to operate.

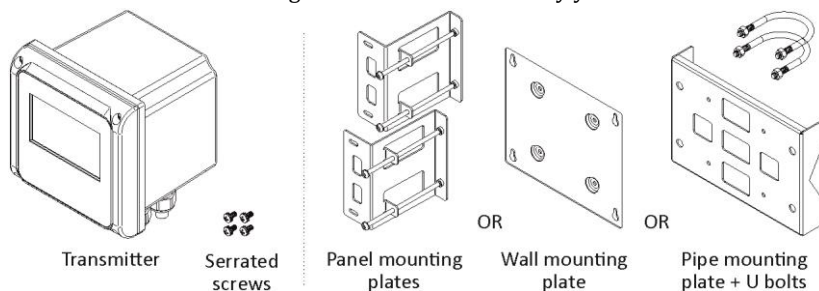
Mounting

Aqua2Trans is housed in an IP66-rated enclosure. Depending on the installation requirement it can be panel-mounted, wall-mounted or pipe-mounted using the accessories provided.

4. Installation

After unpacking

Confirm that you have received the Transmitter with attached Cable Glands, User Manual and one of the mounting accessories as ordered by you.



Inspect all parts for any visible in-transit damage. Report any missing or damaged items immediately to FMPL support.

Tools required



Screw drivers

- Standard Phillips tip for M3 | M4 screws: enclosure lid, mounting and Earth connections.
- Standard flat tip 0.4x1.6 to 0.4x2.5 mm blade: terminal connectors

Side spanners

- Size 24: cable glands
- M8 spanner size 13: U-bolt hex nuts

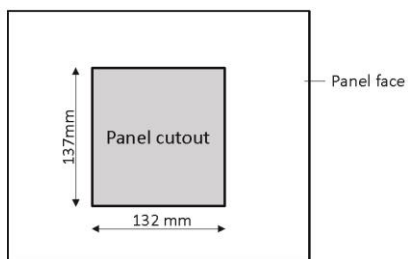
Additional tools required while installation.

- Multimeter 3 ½ digit
- pH buffers^{NOTE1} for sensor calibration



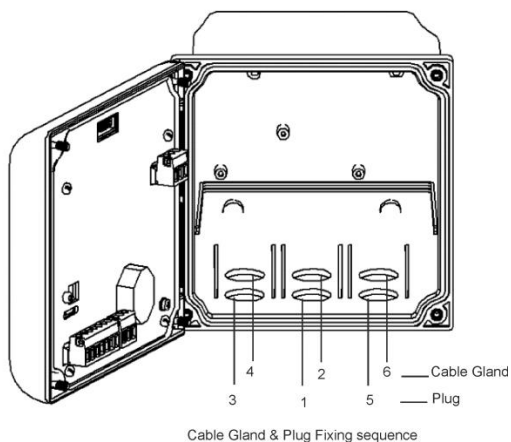
NOTE1 To be arranged by the purchaser

Panel cut-out

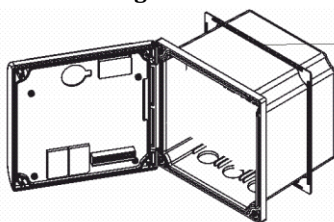


Cable gland sequence

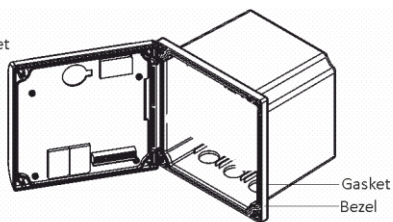
Ensure that the mounting face of the panel has a cut-out as stated in the Specifications. Once mounted onto the panel, follow the sequence shown below when fixing the cable glands.



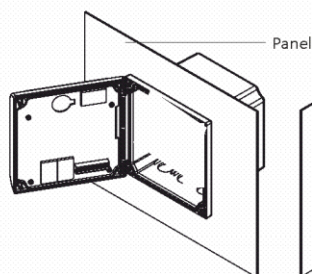
Panel Mounting



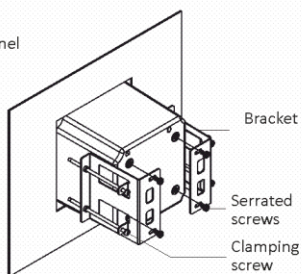
1. Slide gasket around Transmitter.



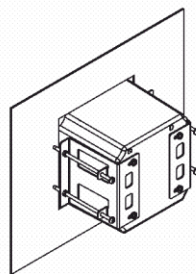
2. Let gasket mate with bezel.



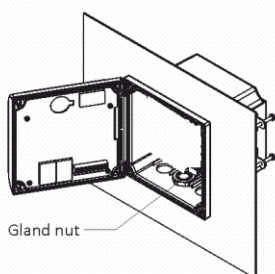
3. Slide Transmitter into cutout until its bezel touches panel.



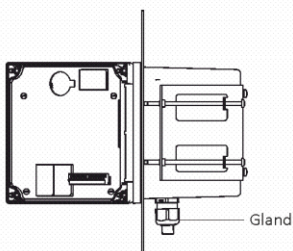
4. Keeping clamping screws loose, fix brackets using serrated screws.



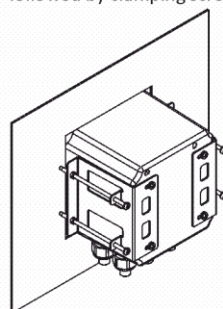
5. Tighten serrated screws followed by clamping screws.



6. Hold gland nut through front open lid.

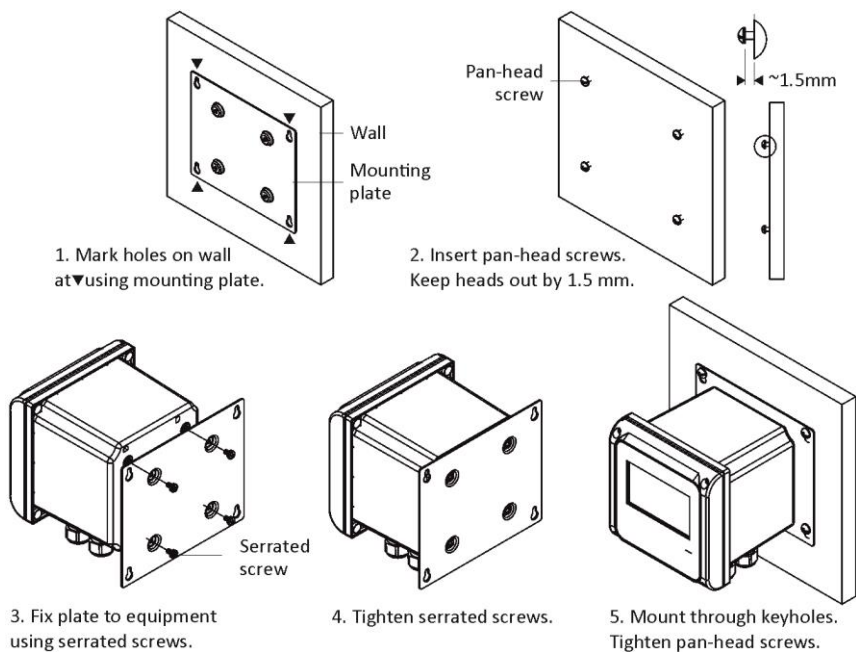


7. Thread-in gland into gland nut from rear of panel.



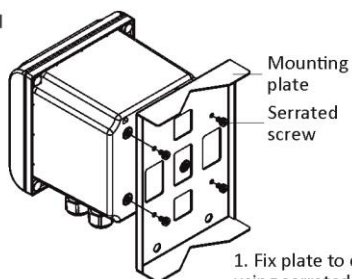
8. Fix all glands following indicated sequence.

Wall mounting

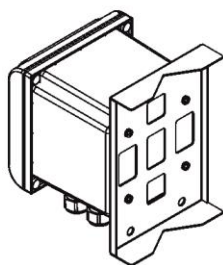
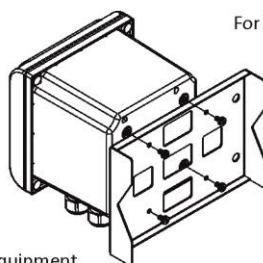


Pipe mounting

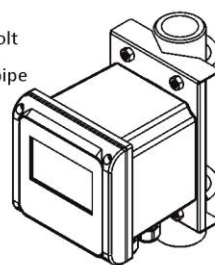
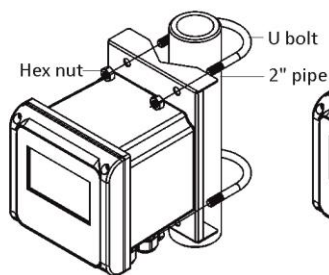
For vertical
pipe



For horizontal
pipe



2. Tighten serrated screws.

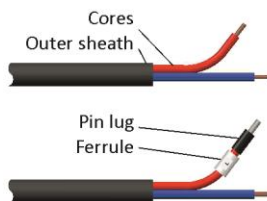


4. Tighten hex nuts.

5. Electrical connections

Recommended cable preparation practices

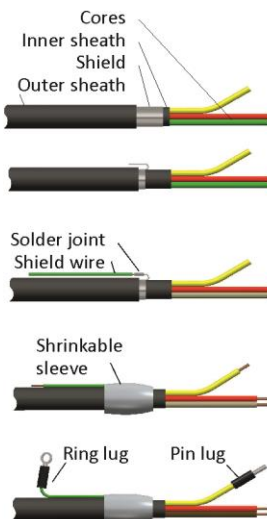
Unshielded cables



Without damaging inner cores:
>Strip off the outer sheath
>Strip off the insulation of each core
Repeat for all cores

Slide in a Ferrule
Crimp a pin Lug
Repeat for all cores

Shielded cables



Without damaging shield and cores:
>Strip off outermost sheath
>Strip off inner sheath
This exposes the shield and the cores

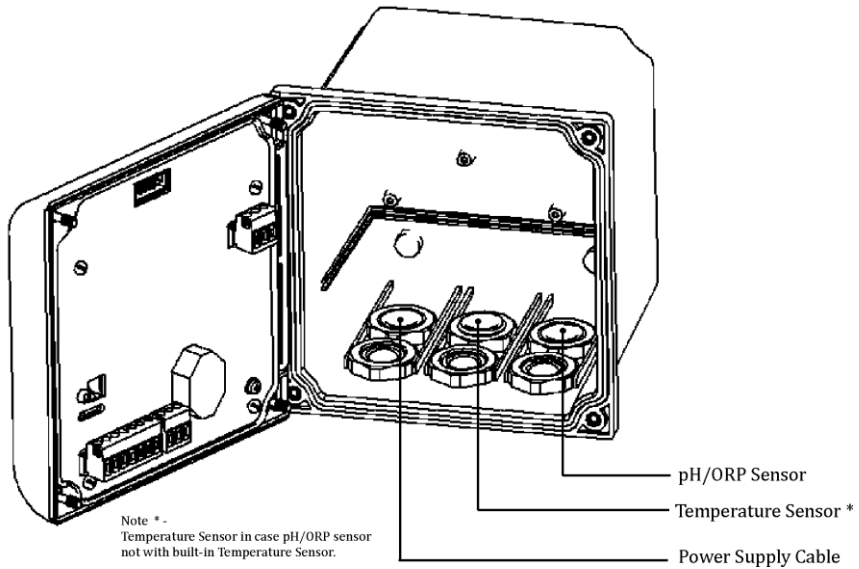
Separate out the shield braid
Tie together the shield strands
Fold backwards

Tin the shield end with solder gun
Solder a length of wire to the shield

Strip off the insulation of the cores
Slide a heat-shrinkable sleeve over solder joint
Shrink the sleeve completely

Crimp a pin Lug to the core
Repeat for all cores
Crimp a ring Lug to the shield wire

Cable gland allocation



Run the prepared cables through the indicated cable glands. Detach the plug from its module. Insert and connect the respective wires according to the termination chart. Plug in. Pull back any extra cable length within the Transmitter and tighten the cable gland nuts.

Power Supply Cabling and Wiring;

Supply cable wires should be clearly marked/color coded for +24V and ground to avoid polarity reversal.

It is mandatory to connect the Earth terminal to the nearest earth pit ensuring proper connectivity.

If conduit is used, ensure the conduit end is properly terminated in cable gland on transmitter side.

The cable used for 24V supply to transmitter should be routed through cable gland.

The Supply cable should be routed away from the Power cabling.

Use proper size of lug suitable for 0.5 to 1 sq mm wire with length of 0.6 ~ 0.8 mm for terminations on transmitter side.

The Aqua2Trans works on wide range of supply voltage from 12VDC to 36VDC. The supply voltage at the transmitter input terminals must be at least 12VDC. The power supply should be capable of taking the loads (minimum 250 Ohms for HART®) and the cable resistance.

For HART® communication the minimum load resistance of 250 Ohms is a must. To supply 12VDC at Transmitter end the power supply voltage must be at least 17.5VDC. The power supply should be capable of supplying the surge current at start up.



Terminate the shields of the various signal cables onto the Chassis Screws using ring type crimp lugs.

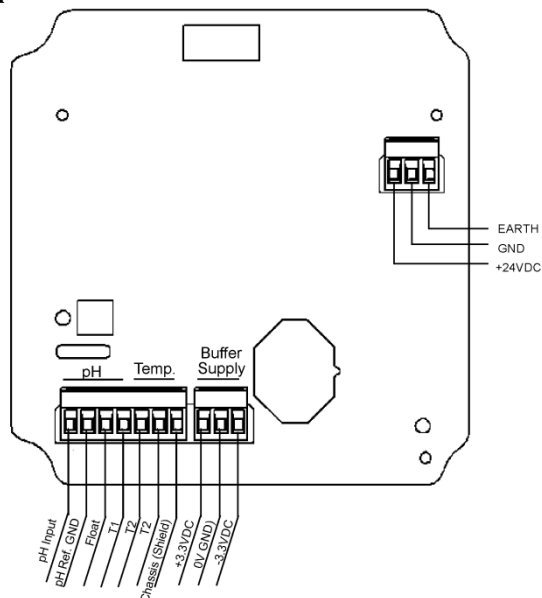
Sensor connections

The cable consists of a screw cap at one end which fits to the sensor end. In some cases the cable could be integral to the sensor at its end. The four conductors at the other end must be connected to the terminal plugs of the appropriate sensor module, and the shield to the chassis screws within the transmitter.



Do not terminate the shield directly without lug. Use sleeve over the shield and a ring-type lug before terminating. This lug must always be terminated to the chassis screw.

pH sensors



CON4:

- 1: pH Input
- 2: pH Ref (GND)
- 3: Float
- 4: T1
- 5: T2
- 6: T2
- 7: Chassis – Shield

CON6:

- 1: +3.3VDC
- 2: 0V (GND)
- 3: -3.3VDC

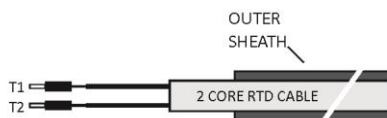
CON2:

- +24VDC
- GND
- Earth (pit earth)

Temperature sensor (2 –wire Pt100)



Not applicable if using pH sensors with inbuilt temperature sensing element. It is necessary to use the temperature sensor for auto compensation of the measured conductivity value. A typical cable for the RTD sensor is shown below.



The temperature input is used during pH sensor calibration with a standard solution. Insert the temperature sensor also into the solution when calibrating the pH sensor.

Terminating lugs



Use pin type lugs suitable for 0.5-1.0 mm² conductor with pin length of 6-8 mm.

6. The First Power-up

Checks before power-up

Unscrew and hinge-open the Transmitter's lid.

Check and confirm that

- the required wiring has been correctly done
- no wires are loose
- protective plate is installed
- all the connectors have been properly plugged into their receptacles
- all shields have been firmly connected to the chassis screws


Close and fasten the Transmitter's lid.

Powering up

Switch on the DC power supply. The display momentarily shows the sign-on screen followed by a default runtime screen. Read the section User Interface for details.

Quick start: putting into operation

The Transmitter is normally dispatched pre-configured with required settings, if you have provided these when ordering.

Use the  key to scroll through the Runtime screens. These show the measured parameter values (primary and secondary variables), the current output values.



Note that the values and status displayed will be in line with the actual conditions of the process at that time. At this point in time, you might observe a difference between the displayed and expected values as the transmitter has not yet been calibrated along with the connected sensors.

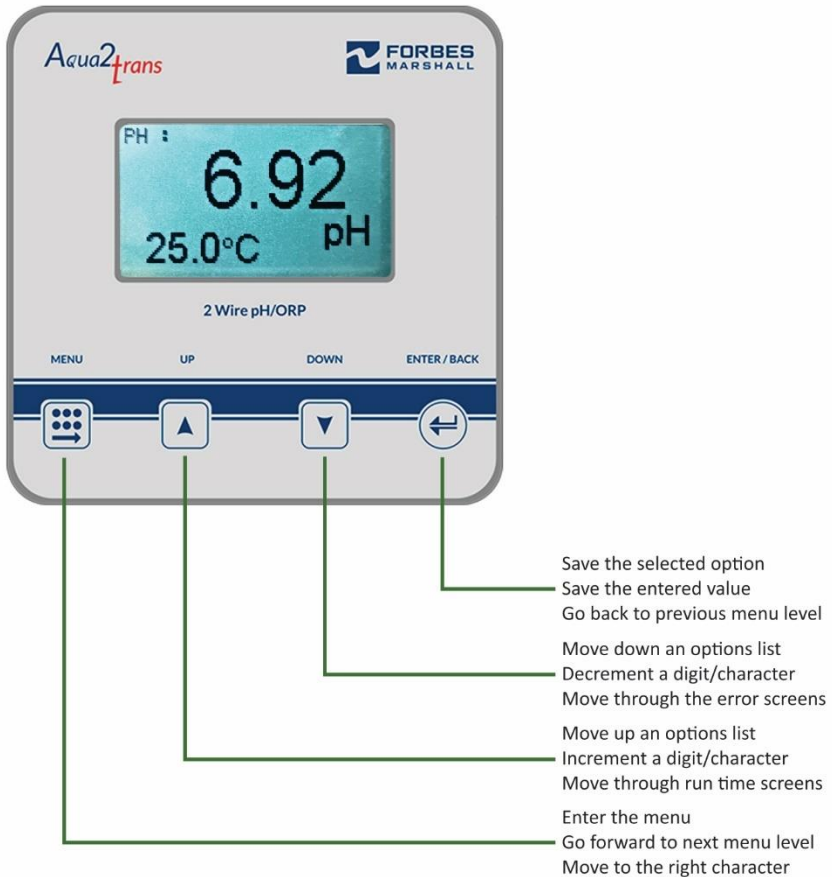


In case the required settings have not been provided when ordering, the Transmitter is configured to default values; see the section Default Settings. Please read the sections Menu and Configuration and perform the required settings.

7. User Interface

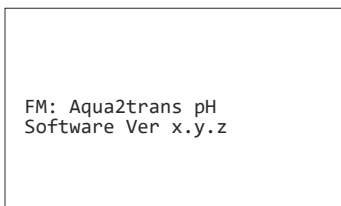
Aqua2Trans has a large 128x 64 Pixels dots with FSTN mode graphical LCD display panel, four tactile keys and an easy to understand menu structure, making it simple to operate.

It will show the runtime screen data.

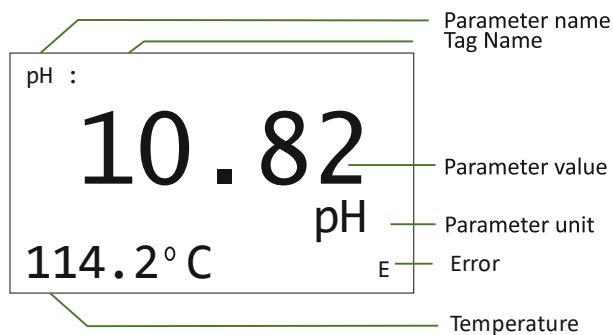



Runtime screens

At power up, Aqua2Trans initially displays the FM logo, and in the next screen software version details.



After few seconds, it displays that runtime screen as previously configured.



Use the  key to scroll through the runtime Error screens shown below.

```
E# Err. Msg.  
09 T-SEN OP
```

8. Menu: overview

Type of menu screens

The menu screens have different formats, illustrated as examples below.

Main menu list

```
➤Config  
Sens Cal.  
Service  
Test
```

Sub menu list level 1

```
➤Proc. Var  
Temp  
TAG  
I Out
```

Sub menu list Level 2

```
➤Sens Sel  
Cab Len.  
Range  
Display
```

Selecting an option

Sens Sel
➤pH
Redox

Entering a value

Time Const.
0 Sec
Enter Value
(0 to 99)














Parameter to set

Entry Box

Value Range

Navigating the menu

Use the four keys to navigate the menu. For simplicity, these keys have been represented with compact icons in the flow charts, as shown below.

	Use   to move to next or previous menu level
	Use   to move up & down a list
	Use   to move up, down and wrap around a list
	Use  to enter and move forward a step
	Use  to move forward a step

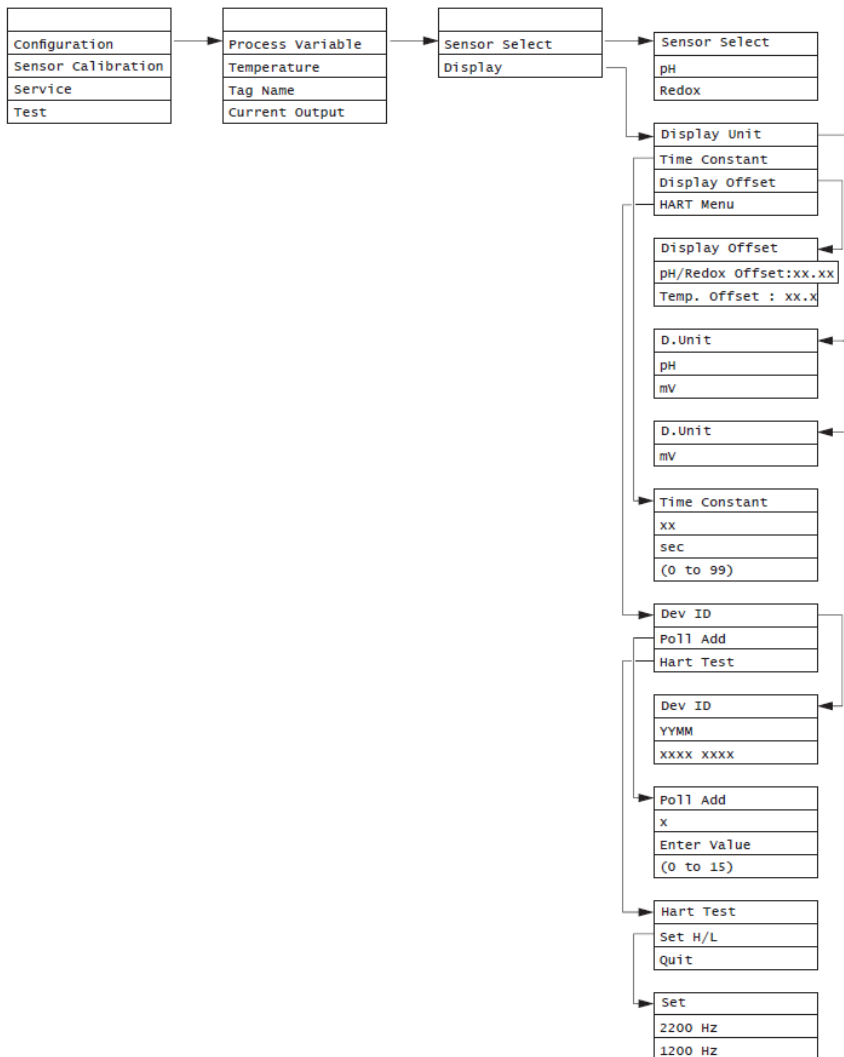
9. Configuration menu

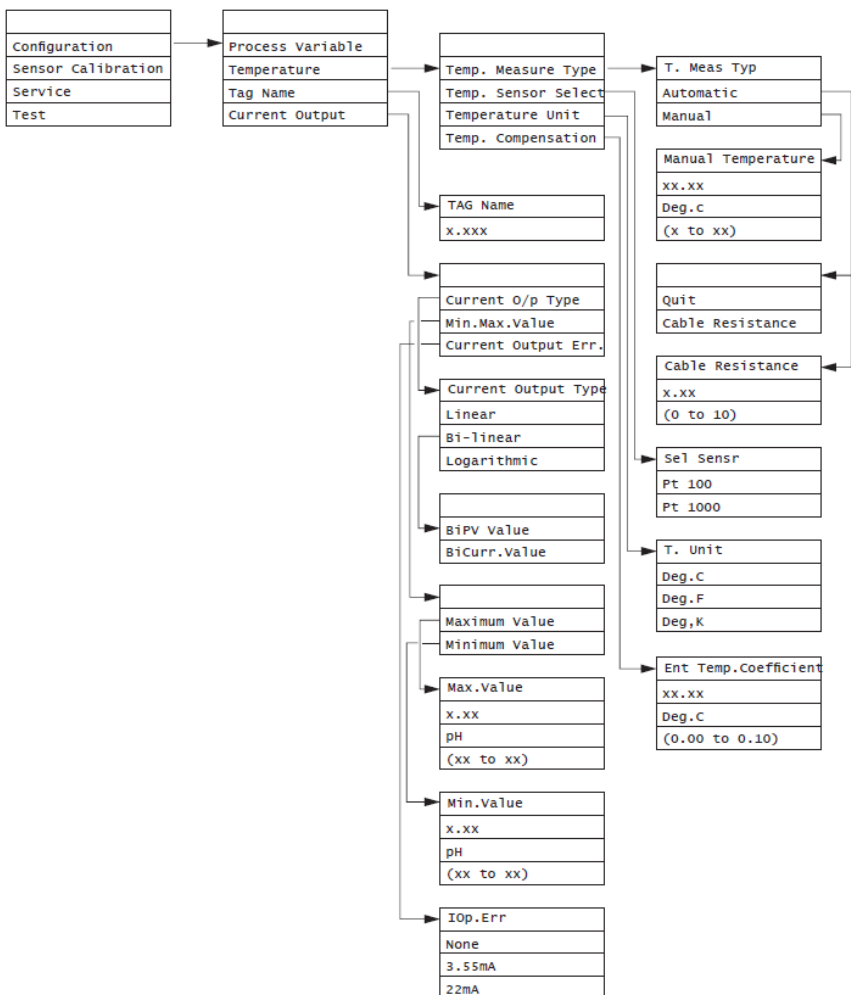
Use this menu to configure various parameters related to the

- Sensor input pH /Radox

Refer to the following sections for details.

Top level





Configuration: Current Output

First assign Current Output to either error which is a parked value – None or 22mA or 3.55mA.

Update Configuration

If you have modified any of the configuration parameters, you will be prompted with the following question before exiting the menu to runtime screen. Select 'Yes' or 'No' appropriately.



10. HART® Communication Topology

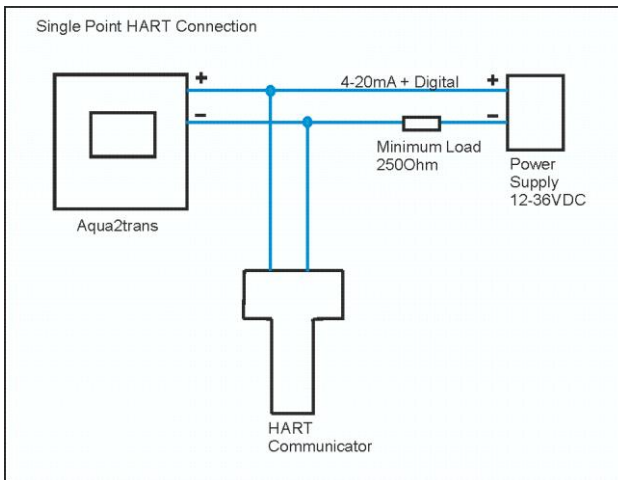
The Aqua2trans is equipped with HART® communication.

The transmitter can be used in multi drop configuration or as a Single HART® instrument.

Following configuration is used to set the Aqua2trans.

Connect the HART® communicator to terminals to configure /monitor the transmitter parameters.

Single point configuration is shown below. This configuration is used to set and check the transmitters locally.

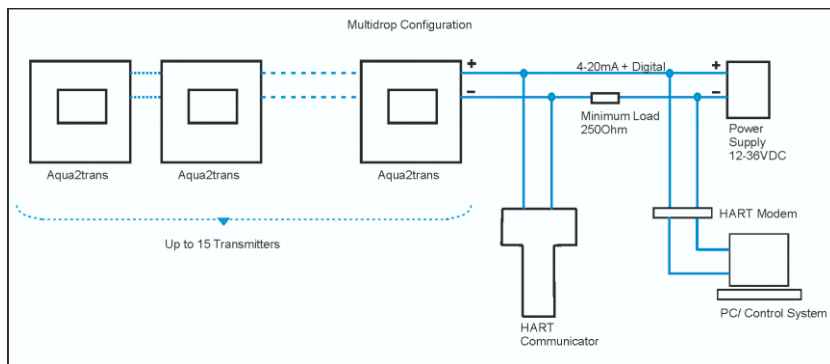


Multipoint topology is shown below.

This configuration is used to set and check up to 15 transmitters.

The cables carry only digital signals, The loop current is set to 4mA.

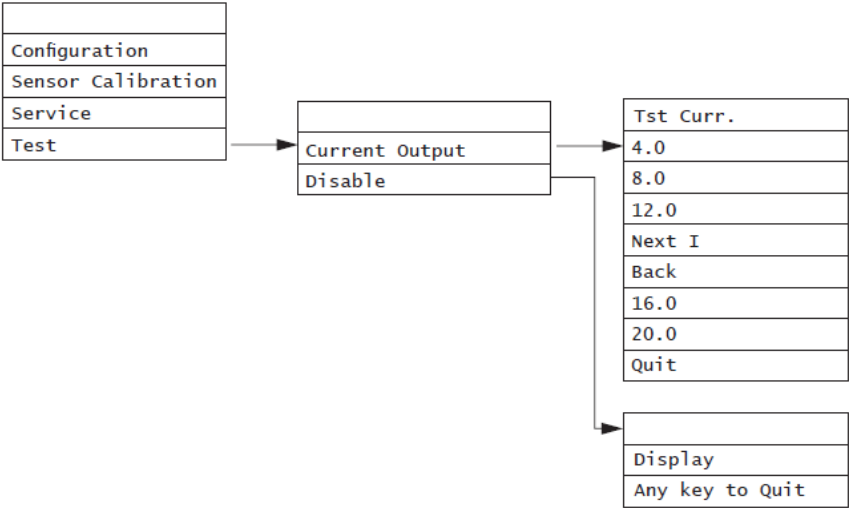
Monitoring data is available on control system/ PC as shown.



11. Test menu

Use this menu to test the hardware as follows -

- Current output: Connect a DMM on 200mA DC range across the respective outputs. Force either of 4/8/12/16/20 mA and confirm against the value indicated on the DMM. Quit the test mode.
- Display : This tests LCD Display. Each digit of LCD Display will get ON then OFF – total 6 times and then asks for hit any key to return to test menu and enter key for further back.



12. Calibration menu

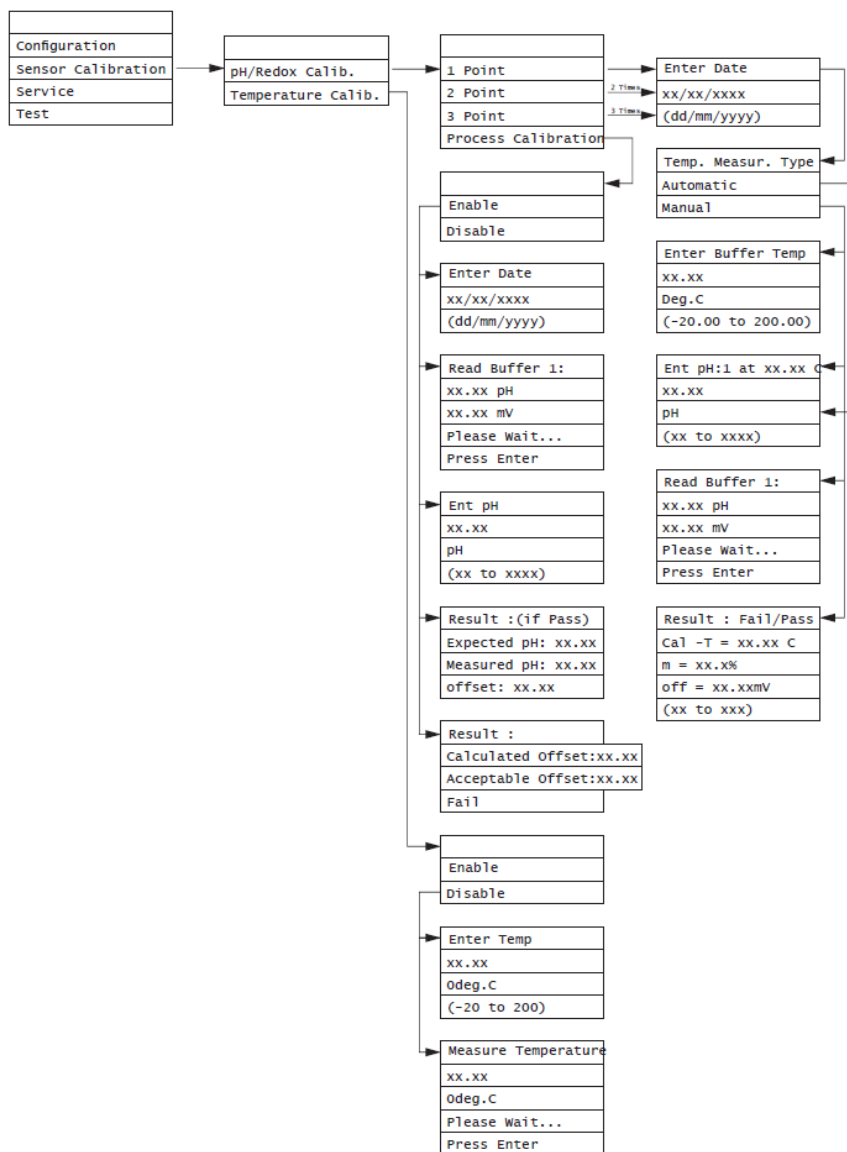
Calibration: pH

Select between 1/2/3 Point calibration and keep the corresponding buffer solutions ready. If you have enabled temperature compensation, ensure that under Configuration-pH you have either.

- Set the temperature measurement to Manual and also set the required temperature value OR
- Set the temperature measurement to Auto and the temperature sensor is functional

Immerse the pH sensor and the temperature sensor (if not inbuilt with the pH sensor) into the buffer solution.

Depending on the number of points selected complete the calibration as prompted on the display.



13. Maintenance and troubleshooting: pH

Sensor care

pH sensors require maintenance at regular intervals. The interval – typically between 1 and 3 months - is decided by the user depending on the process fluid and conditions.



Please check for useful tips on sensor care if provided in the sensor instruction manual.

Cleaning the sensor

The pH sensor has an electro-chemical electrode. When used, its junction and glass membrane get contaminated by the process fluid. This increases the response time of the sensor.

Salt deposits

Immerse the electrode in tap water for 10 to 15 minutes until the salt dissolves. Rinse the electrode in distilled water.

Oil/grease film

Use a mild detergent and water to gently wash the electrode bulb. Rinse the tip of the electrode in distilled water.

Protein deposits

Dip the electrode in a solution prepared with 1% Pepsin solution in 0.1M of HCl for 10 minutes. Rinse the electrode in distilled water.

Clogged reference junction

Heat diluted KCl solution to 60 ~ 80°C. Place the sensing part of the electrode into the heated solution for about 10 minutes. Allow the electrode to cool in unheated KCl solution.

Storing a new sensor for long time

Always keep the pH bulb wet. Use electrode storage solution recommended by the sensor manufacturer.

Use rubber cap or electrode storage bottle filled with electrode storage solution.

You can use pH 4 buffer solution with 1/100th part of saturated KCl solution.

Storing a sensor after use

Use de-ionized water to rinse the pH electrode and reference junction.

Store the sensor after rinsing it, as described earlier.

Before putting back into service, clean the electrode with de-ionized water and gently pat dry with **clean** tissue paper.



Never rub or wipe the electrode. This could give rise to electrostatic charges that will increase the response time of the sensor.

How to rehydrate the bulb?

If the electrode is stored and cleaned as described earlier, it is always service ready. However, if for any reason the bulb gets dehydrated, follow the procedure below.

Immerse the electrode in pH 4 buffer solution for 10 to 30 minutes. Rinse the electrode in distilled water. Check the response of the sensor.



If the procedure fails and the electrode does not respond, contact the sensor manufacturer.

Do's and Don'ts for sensor

Read the instruction manual provided if any with the sensor.

Before putting the sensor to use, remove any special transportation cover wrapped over it during transportation, without damaging the diaphragm.

Clean the pH electrode under low pressure tap water or any cleaning solution recommended by its manufacturer. Do not touch the diaphragm or the tip of the electrode when cleaning.

Gently pat dry the tip of the electrode using a **clean and soft** tissue paper.

Do not rub the tissue paper on the electrode as it may generate static charges over its surface.

Calibrate the transmitter with the pH sensor as a system. Use this calibrated system to measure the pH values. If you replace/change the transmitter or the sensor, it is necessary to recalibrate as a system.

Keep electrode wet when not in use. Dip the electrode in 3M KCl solution, or any storage solution recommended by the sensor manufacturer.



Calibrate the sensor at planned regular intervals.

Error messages

The Aqua2Trans issues messages on the display. User can identify the possible causes of the problems and take corrective actions. The error messages and their meaning are given below.

Error message	Action
PV-SENSOR FAIL	This is displayed during sensor calibration. It implies that the sensor 'zero' or 'slope' is out of the acceptable deviation range.
	Follow the procedure to clean the electrode and rehydrate the bulb. Check again. If the message recurs, replace the sensor.
T-SENSOR OPEN	Check the temperature sensor wires for open or loose connection. Reconnect the wires and check.
	Disconnect the sensor. Check the resistance of the RTD element. It should be: <ul style="list-style-type: none">109.73Ω at 25°C for Pt1001097.3Ω at 25°C for Pt1000 If open, replace the sensor.
T-SENSOR SHORT	Check the temperature sensor wires for a short.
	Disconnect the sensor. Check the resistance of the RTD element. It should be: <ul style="list-style-type: none">109.73Ω at 25°C for Pt1001097.3Ω at 25°C for Pt1000 If short, replace the sensor.

Note: For pH sensors with an inbuilt temperature sensor, replace the complete sensor.

Problems, causes and solutions

Problem	Cause	Solution
Incorrect pH value	Sensor not calibrated for long time.	Recalibrate the sensor.
	Sensor mechanically damaged.	Replace the sensor.
	Process fluid is dirty.	Clean the sensor as described earlier.
	Sensor improperly dipped into the process fluid.	Ensure that the fluid covers the sensor electrode completely.
	Electrical noise pickup.	Follow proper grounding and shielding procedures described earlier.

Problem in temperature measurement and calibration

If the indicated temperature differs from that of a standard thermometer by more than $\pm 1^{\circ}\text{C}$.

Check the following:

- Confirm that the standard thermometer, RTD, thermistor that is used as a reference is calibrated and is accurate.
- General purpose liquid in glass thermometers can have large errors.
- Are the measurements done at the same point?
- Is the standard thermometer dipped into the process up to the correct level?



It is necessary to calibrate the temperature sensor during installation and calibration.

pH reading differs from lab reading

It is normal to see differences in the readings indicated by online instruments and the lab instruments.

The online instrument is subjected to the real process conditions of process temperature, stray voltages, pressure, supply voltage variations, etc.

The lab instrument works under standard controlled conditions. Some impurities are added, the temperature of the lab sample changes and such factors cause the differences to be observed.

How to minimize this difference?

Check both – the online and lab instruments by using the same buffer solution and comparing their readings.

If the difference is vast, calibrate both the instruments using the same buffer solution.



Use single point calibration method to compare the two readings.

Is the transmitter working satisfactorily?

In case of problems that cannot be easily and confidently attributed to either the sensor or the transmitter, it is necessary to isolate the problem areas.

Simulate the pH input

Disconnect the pH sensor wires from the transmitter end. Connect a millivolt source to the transmitter. If the transmitter is healthy, it will indicate accurate pH values. Follow the procedure below.

- i. Turn off the transmitter supply. Disconnect the sensor wires from the transmitter end.
- ii. Connect the milli-volts source to the pH inputs pH_{IN} and REF.
- iii. Turn on the transmitter.
- iv. Simulate pH by feeding 118.4mV from the milli-volts source.
- v. From Menu select Display Unit 'mV'.
- vi. Display will show 118.4mV.
- vii. Display error must be within $\pm 10\text{mV}$.
- viii. Check this over the range -414mV to +414mV.

- ix. If all the indicated readings match the simulated milli-volts, the transmitter is working okay.
- x. Save and exit the menu.
- xi. Reconnect the sensor wires and continue normal operation.

Simulate temperature input

Refer to the related procedure described under the section 'Maintenance and troubleshooting: pH'.

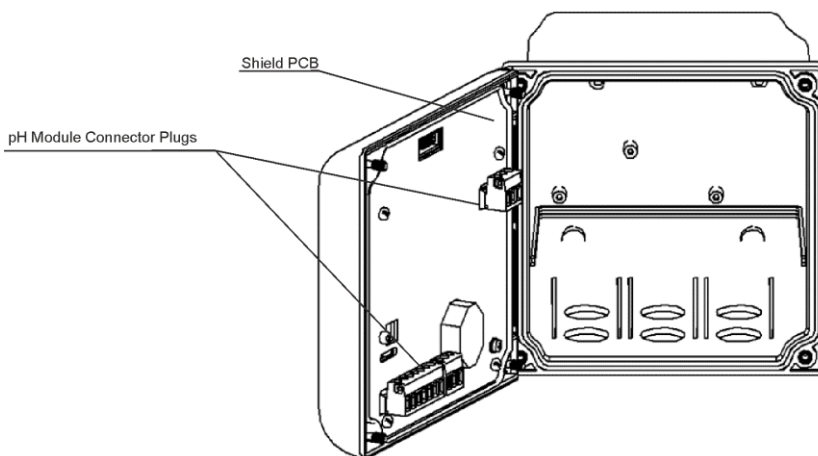
14. Replacing pH module

Replacing a module



Module removal steps

- Switch off the power supply.
- Open the Lid. Unplug the connector plugs from the pH module.
- Unscrew the Shield PCB screws to remove the Shield PCB.
- Remove pH module placed behind the shield PCB.





Do not touch any of the components on the module. Immediately place the module in an anti-static zip-pouch and seal.

Remove the replacement module from its anti-static zip-pouch only when you are about to insert it.

Module installation steps

- Orient the module correctly, Place Shield PCB and tighten the screws.
- Plug in the connectors into their respective receptacles.
- Close and fasten the main lid.
- Switch on the power supply.

Disposing of module



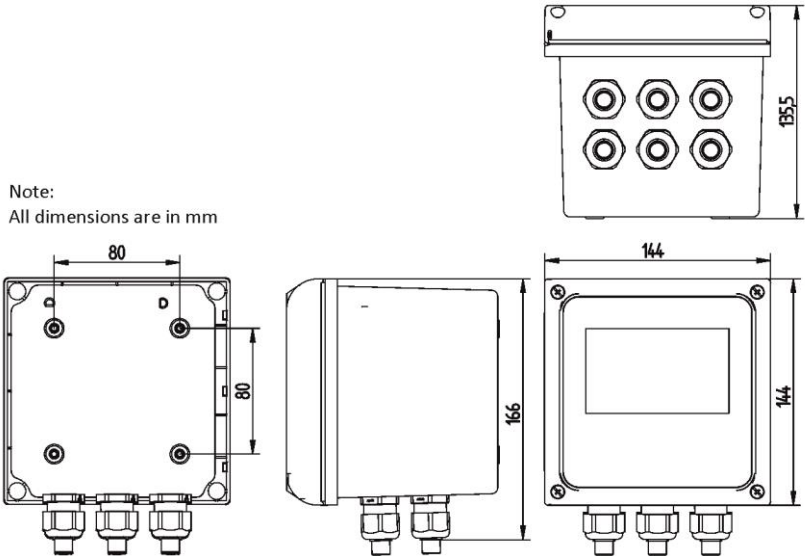
Observe safe disposal procedures as described at the beginning of this manual.

15. Technical specifications

General specifications

Feature	Details
Power Supply and Current Output	
Power Supply	12 ~ 36VDC, 12 ~ 28VDC for Ex
Load Resistance	600Ω @ 24VDC
mA Output	4 ~ 20mA HART®
mA Accuracy	± 0.1mA
mA Format	Linear
Error options	3.55mA DC or 22mA DC or NONE
Isolation	Galvanic isolation from the Sensor and Input
Temperature	
Sensors	Pt100 / Pt1000
Range	-20 ~ 200°C
Mode	Auto / Manual
Accuracy	± 0.5% FS
Display and keypad	
Display	128 x 64 Dot Matrix Liquid Crystal
Display function	Programmable for continuous or sequent
Keypad	Four tactile type keys Menu, Up, Down, Enter/Esc
Mode of operation	Linear
Mechanical Specifications	
Housing material	Polycarbonate, 10% Glass filled.
Colour	Exterior - Satin Silver, Interior – Conductive Paint.
Dimensions	144(H) x 144(W) x 135.5(D) mm
Connections glands	M20x1.5 – 3 nos. (for Power Supply, Sensor, Temperature)
Weight	1.2kg approximately
Mounting type options	Panel / Wall / 2" Pipe type (vertical and horizontal)
Ingress Protection class	IP 66
Approvals	
Immunity (EMC)	EN61326-1
Emission (EMI)	EN61326-1
Ingress protection	IP66 - IEC60529
Vibration	IEC60068-2-6
Environmental Conditions	
Ambient temperature operating range	(-)20 to +65°C
Transport / storage temperature range	(-)20 to +70°C
Maximum relative humidity	95% RH, non-condensing at temperature up to 55°C

Note:
All dimensions are in mm



Mechanical dimensions

Measurement specifications: pH | ORP

Parameter	Details	
pH		
Range	0 ~ 14 pH	
Resolution	0.01 pH	
Accuracy	±0.01 pH	
Span	Range 0 ~ 14 pH: 2 pH (min) ~ 14 pH (max) (settable)	
Excitation	Symmetric / Asymmetric (Hardware selectable)	
mV (ORP)		
Range	±2000 mV	
Resolution	1 mV	
Accuracy	±1 mV	
Span	±200mV (min) to ±2000mV (max) settable	
Temperature		
Range	(-)20°C ~ +200°C	
Resolution	0.1°C	
Accuracy	±0.5 % of FS (±1°C)	
Sensor	Pt100 (default) / Pt1000 (selection)	
Compensation	Automatic / Manual	
Calibration		
pH Sensor slope	70 ~ 110%	
pH Sensor Zero	±2 pH	
	pH	Redox
Calibration points	1/2/3	1/2
Calibration offset limit	±1 pH	±120mV
Diagnostics		
Measurement mode	Temperature sensor open	
	Temperature sensor short	
Calibration mode	Calibration error	

16. Annexure

Default settings

Feature	Parameter	Sub parameter	Factory default
pH	Process variable	Sensor type	pH
		Cable length	Less than 5 m
		Range (pH sensor)	0 to 14 pH
		Range (Redox sensor)	-2000 to +2000 mV
		Unit	pH
	Temperature	Measurement	Manual
		Sensor type	Pt100
		Display unit	°C
		Range	-20°C to +200°C
		Temperature offset	0.00000 °C
		Cable resistance	0.00000 Ω
		Manual mode temperature	25.00000 °C
	Tag name	xxxxxxxxxxx	11 characters
	Time constant		2 s
pH calibration	Calibration points	One/ Two/ Three point	One
	Offset conductivity		0.0000 pH
Current output calibration	Current Low	5.0000 mA	
	Current High	17.5000 mA	
Test current output	Single		4 mA / 8mA / 12mA / 16mA / 20mA

HART commands

The Aqua2Trans supports the following HART® commands.

Command No	Description
Command 0	Read Device Identification
Command 1	Read PV variable
command 2	Read loop current of range
	% of range related to primary variable
Command 3	Read loop current of range
	Read PV variable
	Read PV variable units
	Read SV variable
	Read SV variable units
Command 4	Reserved
Command 5	Reserved
Command 6	Write polling address & loop current mode
Command 7	Read polling address & loop current mode
Command 8	Read Dynamic variable classification
Command 9	Read device variable & status
Command 11	Read Unique Identifier Associated with Tag
Command 12	Read message
Command 13	Read Tag, Descriptor, Date
Command 14	Read Primary Variable Transducer Information
Command 15	Read Device Information
Command 16	Read Final Assembly Number
Command 17	Write Message
Command 18	Write Tag, Descriptor, Date
Command 19	Write Final Assembly Number
command 20	Read Long Tag
Command 21	Read Unique Identifier Associated with Long Tag
Command 22	Write Long Tag
Command 38	Reset Configuration Changed Flag
Command 48	Read Additional Device Status

pH versus mV Table

pH	mV					
	0°C	20°C	25°C	50°C	80°C	100°C
0	379.4	407.1	414.4	448.8	490.5	518.2
1	325.2	349.0	355.2	384.7	420.5	444.2
2	271.0	290.8	296.0	320.6	350.4	370.2
3	216.8	232.6	236.8	256.5	280.3	296.1
4	162.6	174.5	177.6	192.3	210.3	222.1
5	108.4	116.4	118.4	128.3	140.2	148.1
6	54.20	58.15	59.20	64.10	70.05	74.00
7	0	0	0	0	0	0
8	-54.20	-58.15	-59.20	-64.10	-70.05	-74.00
9	-108.4	-116.4	-118.4	-128.3	-140.2	-148.1
10	-162.6	-174.5	-177.6	-192.3	-210.3	-222.1
11	-216.8	-232.6	-236.8	-256.5	-280.3	-296.1
12	-271.0	-290.8	-296.0	-320.6	-350.4	-370.2
13	-325.2	-349.0	-355.2	-384.7	-420.5	-444.2
14	-379.4	-407.1	-414.4	-448.8	-490.5	-518.2

RTD table

Temperature °C	Pt100 Ω	Pt1000 Ω	Temperature °C	Pt100 Ω	Pt1000 Ω
-20	92.16	921.6	65	125.16	1251.6
-10	96.09	960.9	70	127.07	1270.7
0	100.00	1000.0	80	130.89	1308.9
5	101.95	1019.5	90	134.70	1347.0
10	103.90	1039.0	100	138.50	1385.0
15	105.85	1058.5	110	142.29	1422.9
20	107.79	1077.9	120	146.06	1460.6
25	109.73	1097.3	130	149.82	1498.2
30	111.67	1116.7	140	153.58	1535.8
35	113.61	1136.1	150	157.31	1573.1
40	115.54	1155.4	160	161.04	1610.4
45	117.47	1174.7	170	164.76	1647.6
50	119.40	1194.0	180	168.46	1684.6
55	121.32	1213.2	190	172.16	1721.6
60	123.24	1232.4	200	175.84	1758.4

Recommended spares

Aqua2Trans has been designed and manufactured to deliver reliable operation over long periods of time. However, in the unlikely event of under-performance we recommend that you stock the following spares to ensure high uptime of the product.

Sr. No.	Item	Order code
1	pH Main Board	
2	Cable gland	
3	Mounting brackets	

Ordering information

Model	Description	Order code
Aqua2Trans	pH /ORP Transmitter	
	pH/ORP Transmitter - EX	

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