Process Flat ORP Sensor with Modbus output MBRTU-ORPFLAT

- USER GUIDE FOR PROCESS FLAT ORP SENSOR WITH MODBUS OUTPUT MBRTU-ORPFLAT

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JUL-2021

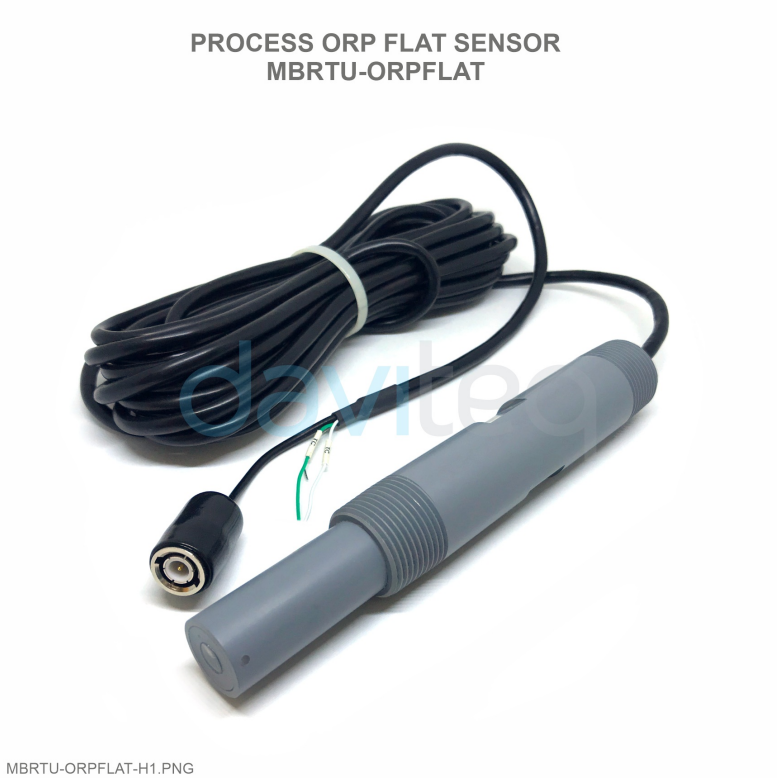
This document is applied for the following products

1. Introduction

MBRTU-ORPFLAT is a general purpose in-line (continuous measurement) ORP sensor offering affordable, flat sensor application coverage for many water applications such as drinking water, industrial water, aquaculture, tank installations or related applications. The flat surface sensor is often referred to as "self-cleaning" when installed in a process stream since the water flow has a tendency to "shear off" biofouling and other debris from the sensor surface. Output is Modbus RTU for easily integrating with any PLC, controller, SCADA, BMS or IoT gateway.

- Robust ORP electrode for continuous measurement;
- Self-cleaning flat electrode;
- Standard ModbusRTU output;
- Plug & Play

Typical Applications: Common applications include disinfection using chlorine, ozone, and bromine. All of these species are strong oxidizers, so ORP is used as an indicator of sanitizing activity. ORP is also used in process applications to monitor destruction of chromate or cyanide, as well as in bleach production and wet scrubbers.

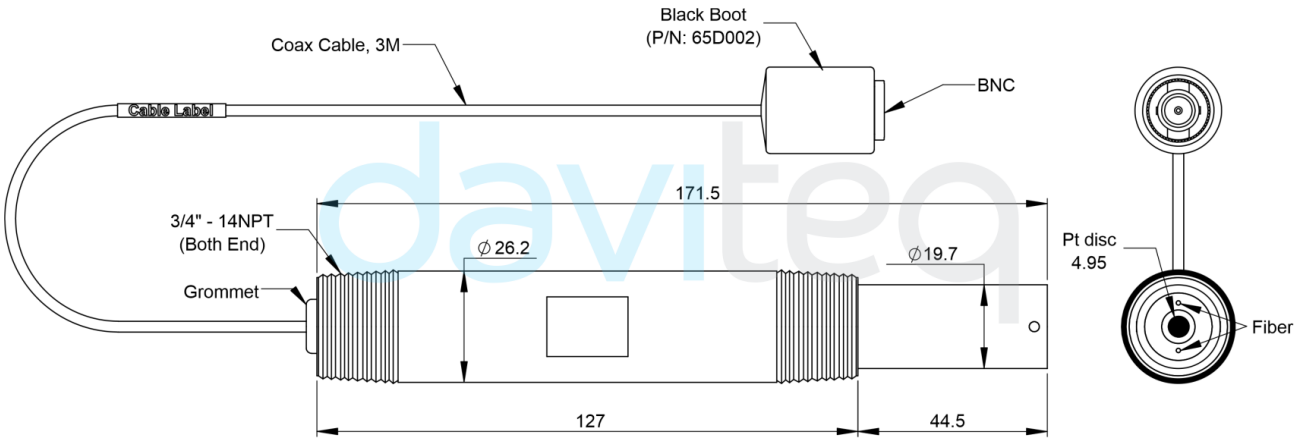


MBRTU-ORPFLAT-H1.PNG

2. Specification

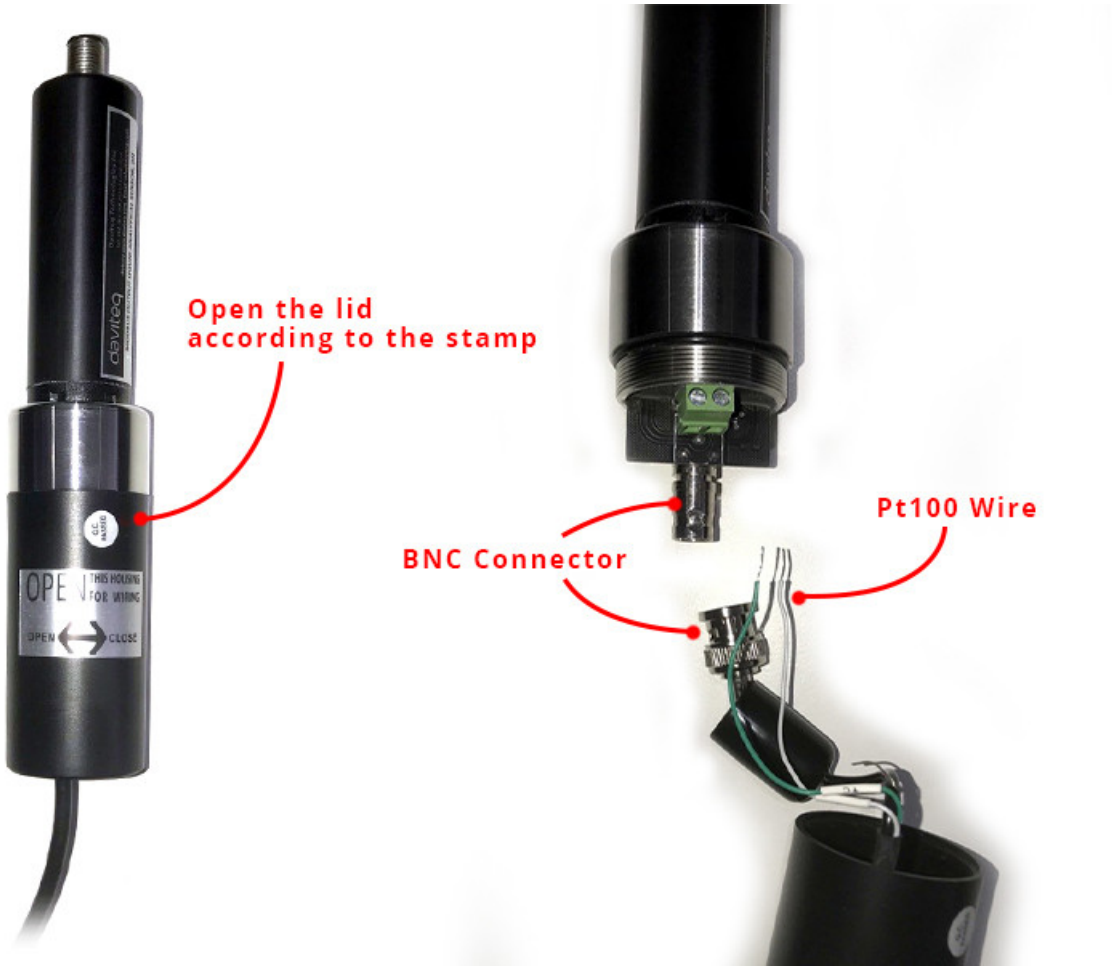
ORP SENSOR SPECIFICATION	
Sensing Technology	Glass, combine electrode
Measuring range	+/- 2000 mV
Resolution	0.1 mV
Accuracy	+/- 1 mV
Working temperature	0 .. 100 oC (compensated)
Working pressure	0 .. 100 psig
Process connection	3/4" NPT both ends
Wetted parts	PVC
Sensor Cable	6m with BNC connector
Rating	IP68
Sensor Dimension	D27 x 172 (mm)
Sensor net weight	< 200 grams
ORP TRANSMITTER SPECIFICATION	
Inputs	mV
Output	RS485, ModbusRTU protocol, max 19200 baud
Power supply	9..36VDC, avg. < 200mA
Mounting	DIN Rail
Working temperature	-40 .. 85 oC
Working humidity	0 .. 95% RH, non-condensing
Housing	Engineered Plastic
Ingress Protection	IP20
Dimension	93 x 40 (mm)
Net weight	<200 grams

3. Dimensions



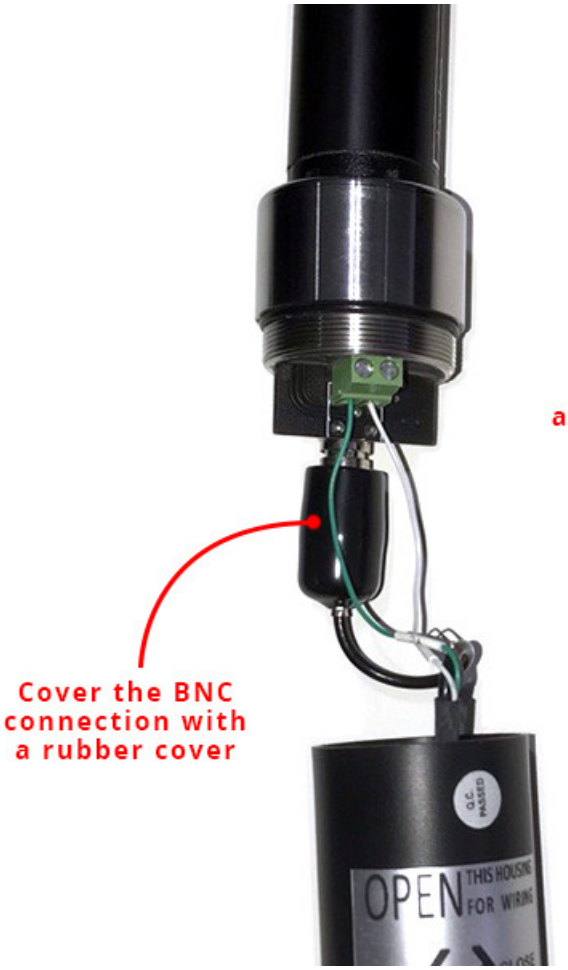
4. Wiring

Please wiring as shown below:




Connect Pt100 wire
to the domino
connector


Connect the BNC
connector


Cover the BNC
connection with
a rubber cover
OPEN
THIS HOUSING
FOR WIRING


Close the lid
according to the stamp
OPEN
CLOSE

5. Memmap registers

> **Function Code: 3 (Read); 16 (Write)**

Functio Code	Modbus Register (Decimal)	# of Registers	Format Type	Parameter Name	Setting Value	Format	Note
3	9	2	float	pH/ORP value		Read	pH/Orp value measured from sensor
3	11	1	byte[]	err & sen_type		Read	Hi-Byte is error code, Lo-Byte is sensor type
3	12	2	float	Temp ℃		Read	
3	14	2	float	ADC value		Read	
3	16	2	float	mV value		Read	
3	18	2	float	PT100 value		Read	
3	256	1	uint16	Modbus address	1	Read / Write	Modbus address of device
3	257	1	uint16	Modbus baudrate	0	Read / Write	Baudrate: 0: 9600, 1: 19200
3	258	1	uint16	Modbus parity	0	Read / Write	Parity: 0: none, 1: odd, 2: even
3	280	2	float	a1 ORP		Read / Write	Scale value of parameter_1 = (a1 * Raw sensor value of parameter_1) + b1
3	282	2	float	b1 ORP		Read / Write	Scale value of parameter_1 = (a1 * Raw sensor value of parameter_1) + b1
16	299	1	uint	pH calibEnb	1	Read / Write	
16	300	2	float	pH Feedback	7	Read / Write	
3	302	2	float	pH Factor		Read / Write	
3	304	2	float	pH 7 adc		Read / Write	
3	306	2	float	pH 7 mV		Read / Write	
3	308	2	float	PT100 wireRes		Read / Write	Offset resistor wires
3	310	2	float	tempManInput		Read / Write	
3	312	1	uint	tempManEnb		Read / Write	

6. Required Equipment and Solutions

- pH/mV meter
- pH buffer 4.01 saturated with Quinhydrone (Solution has 2 – 4 use lifeafter mixing)
- pH buffer 7.00 saturated with Quinhydrone (Solution has 2 – 4 use life after mixing)
- Wash bottle filled with distilled or de-ionized water

- Lab wipes
- Laboratory magnetic stirrer and magnetic stir bars
- Clean beakers

7. Preparation of the Electrode for Initial Use

Mono ORP electrodes are shipped dry with a rubber boot covering the tip of the electrode to protect the sensing element.

Combination ORP electrodes are shipped with a storage bottle with storage solution. Keep the solution bottle and solution for future use.

Remove the bottle or the boot from the electrode and thoroughly rinse the electrode tip with distilled water. Wipe carefully with a clean lab wipe.

For refillable combination ORP models, uncover the filling port to expose the electrode reference chamber fill hole (for sealed, gel filled electrodes, disregard this operation). Fill the reference chamber with reference filling solution. Use the appropriate reference filling solution. Electrodes that have been filled with the incorrect filling solution are not covered under warranty.

8. Reference Filling Solution Selection

- For ORP combination electrodes with Calomel and Double Junction Ag/AgCI reference half cells, use 4 M KCI reference filling solution.
- For ORP combination electrodes with Single Junction Ag/AgCI reference half cells, use 4 M KCI saturated with AgCI reference filling solution.

9. Calibration

Before use, the instrument should be calibrated with standard solutions;

The first is calibration with standard solution ORP**240mV**. Buy standard solutions here:

- https://www.hannavietnam.com/detail-product/chuan-orp-240-mv-500-ml-409
- https://www.hannainstruments.co.uk/orp-240mv-test-solution.html

The next step is to calibrate with standard solution ORP**470mV**. Buy standard solutions here:

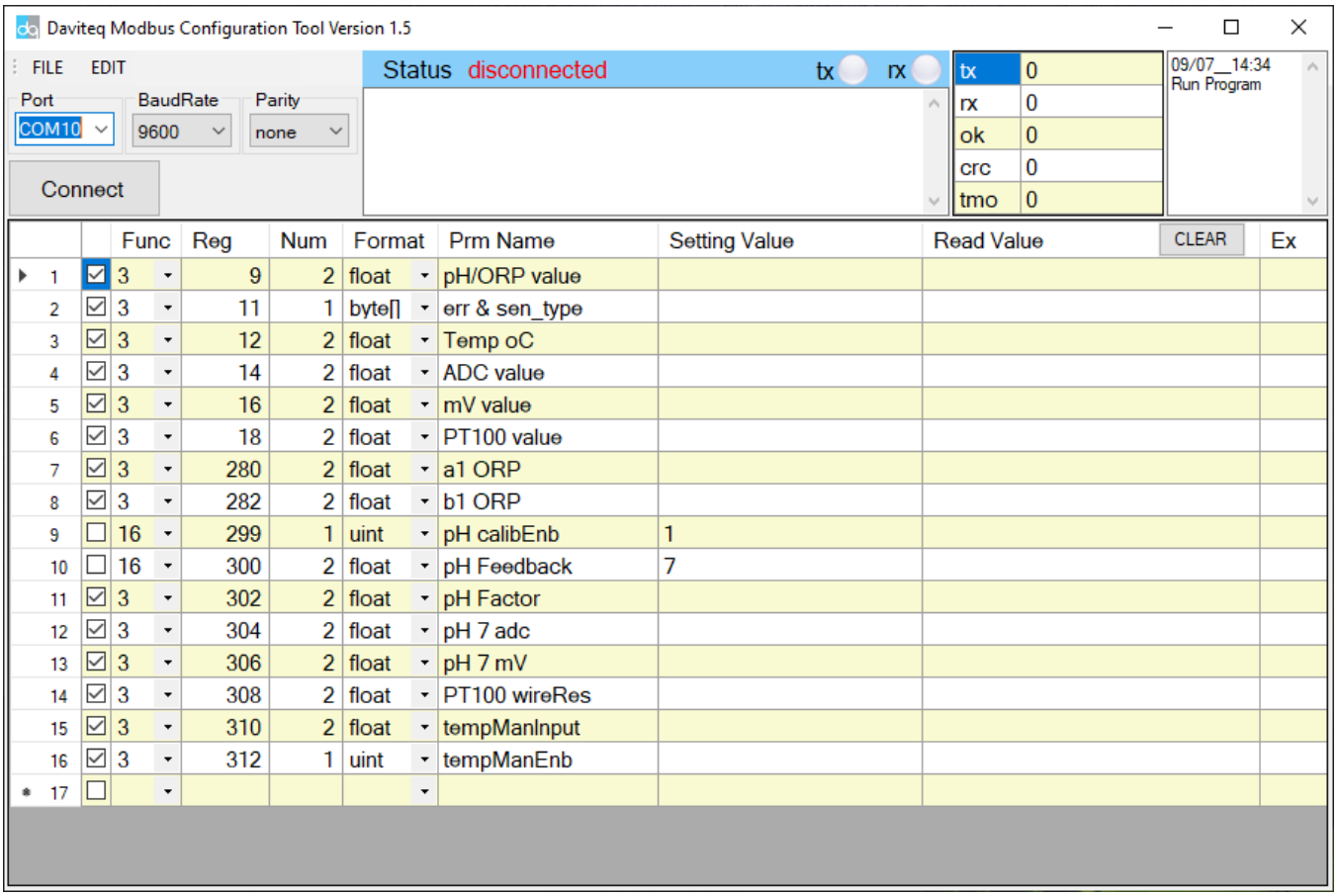
- https://www.hannavietnam.com/detail-product/chuan-orp-470-mv-500-ml-410
- https://www.hannainstruments.co.uk/orp-470mv-test-solution.html

> **Note the ambient temperature at the time of calibration to input the standard mV value according to the temperature (indicated on the body of the standard bottle)**

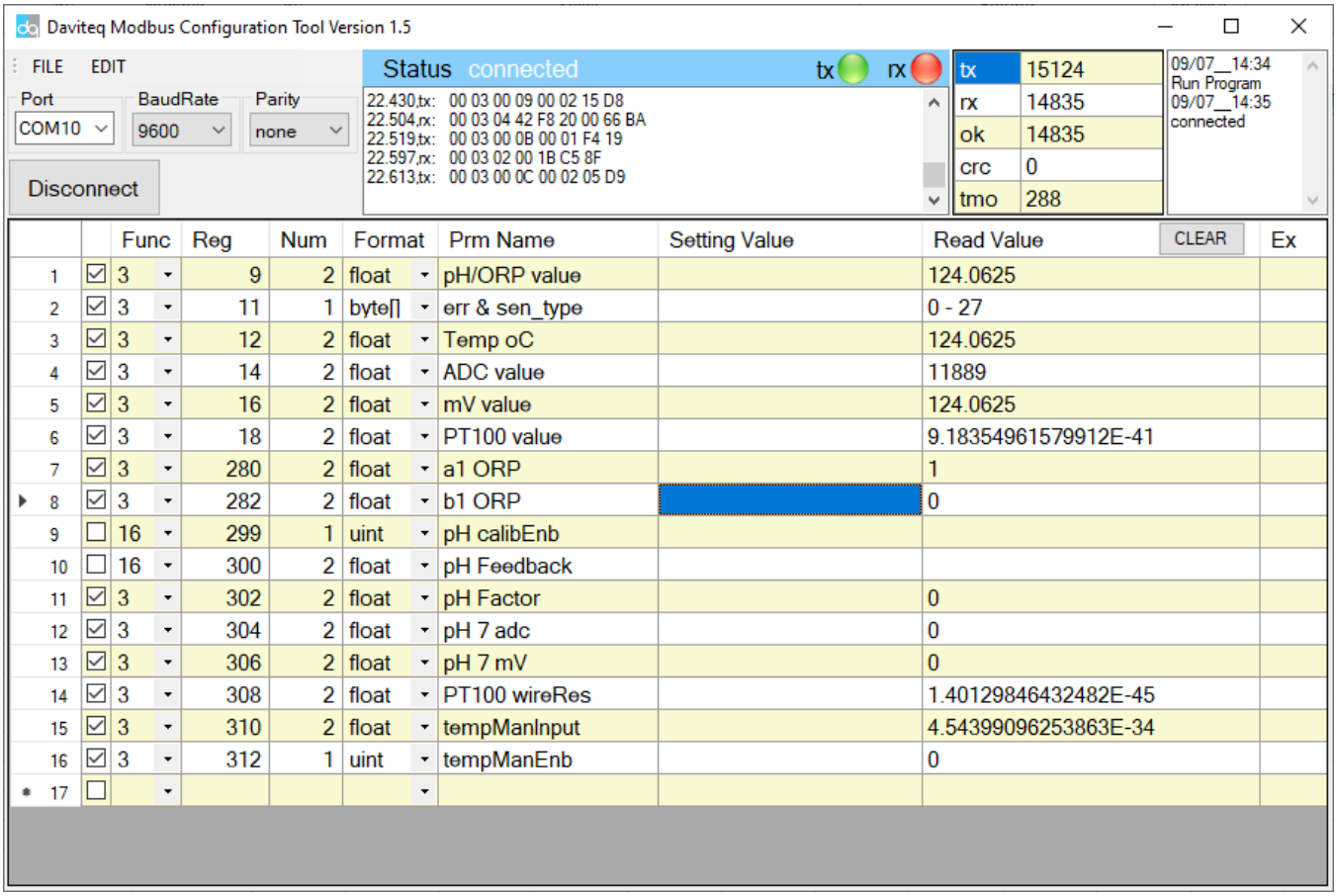
Use any modbus master tool to calibrate the sensor. Or use Daviteq's Modbus software, along with a configuration cable...

> **How to use Modbus Configuration Tool (Click Here)**

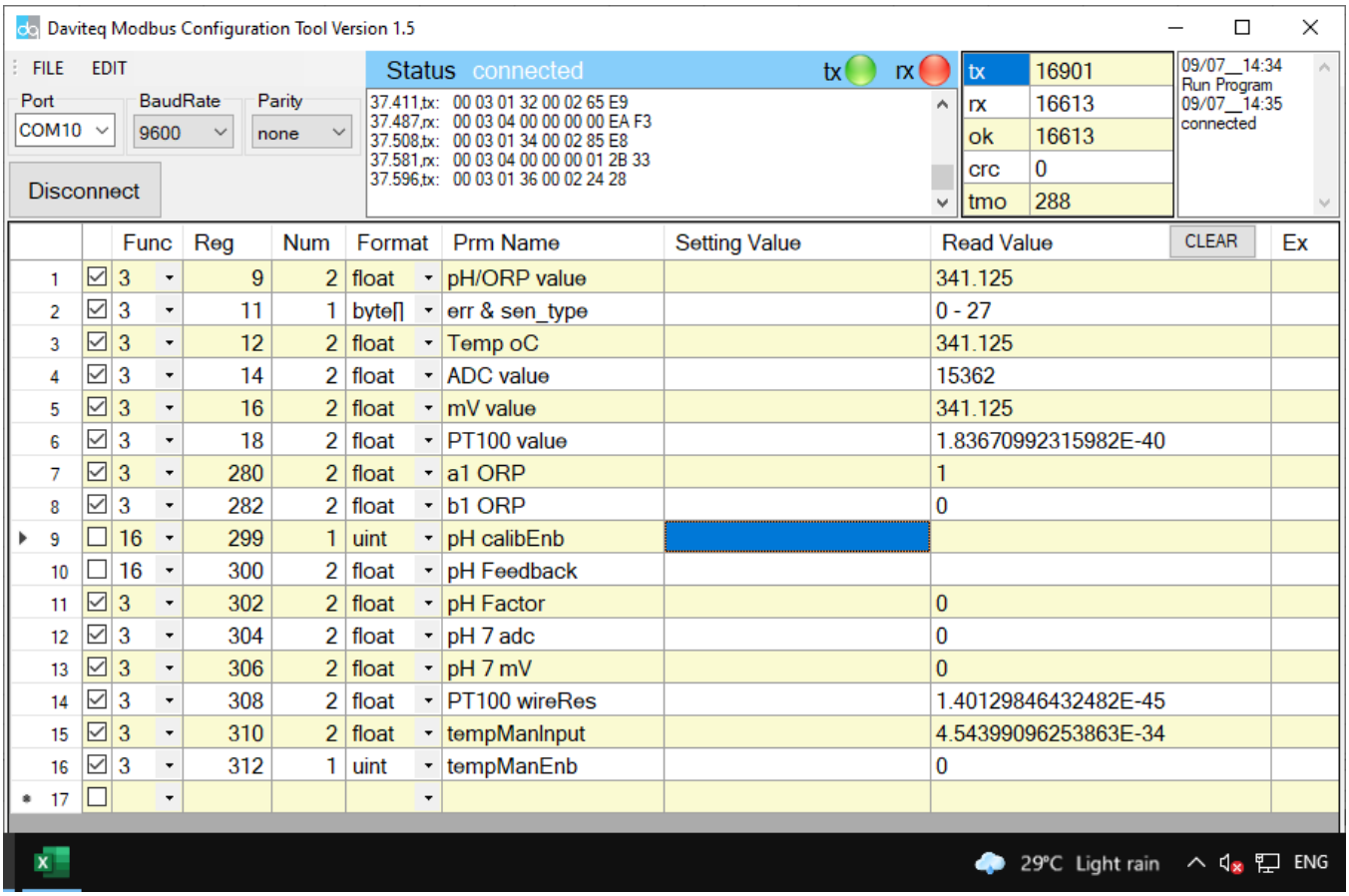
Step 1: Import the Template file into Modbus Configuration Tool



Step 2: Put ORP sensor to standard ORP**240mV** and record mV value

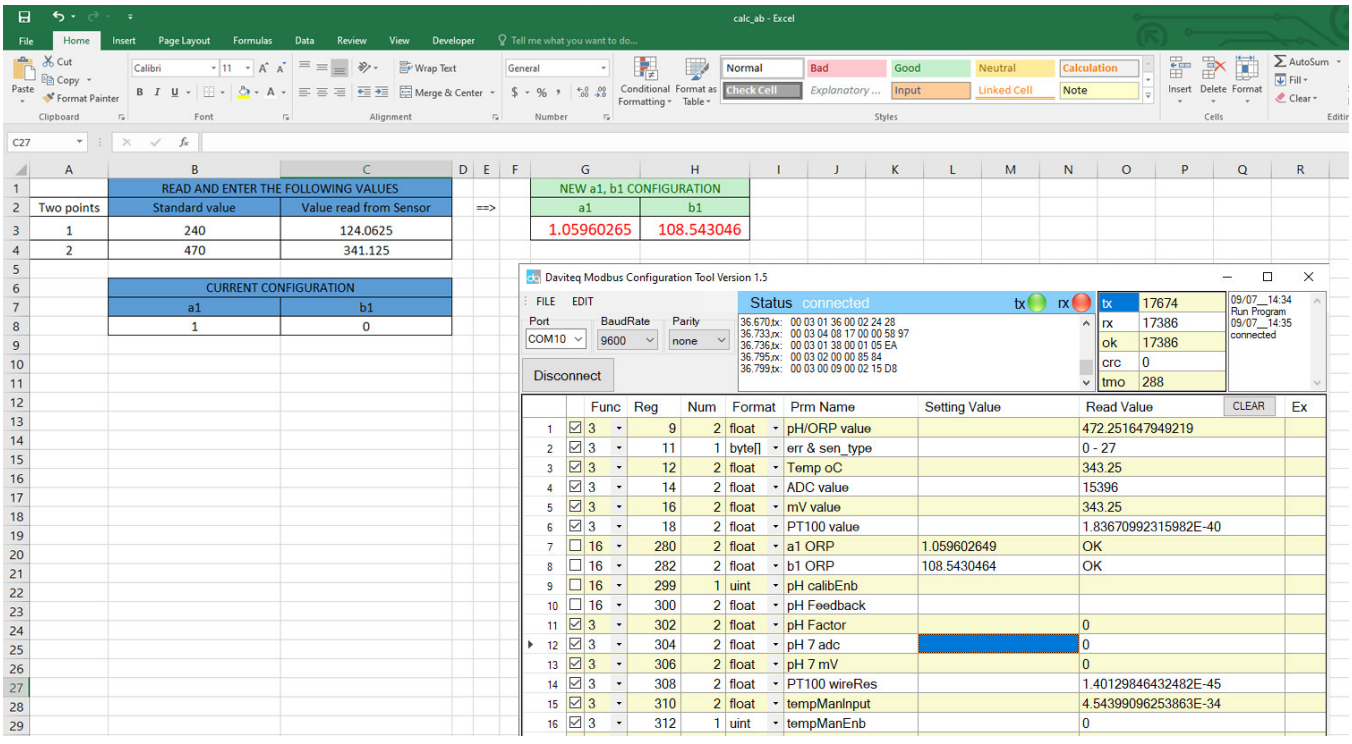


Step 3: Remove the electrode from the buffer. Rinse with distilled water and blot with a lab wipe thenput to Standard ORP **470mV** and record mV value



Step 4: Calculate a1 and b1 value for ORP by excel file then write them to Reg 280 and 282 by check in the box to run func 16.

Caculate a1 and b1 excel file: https://filerun.daviteq.com/wl/?id=qTEXAavKl1dSbnkbUgSAQXdK2jEtr1qA



10. Reading a Sample with the Electrode

1. Rinse the electrode with distilled water and blot with a lab wipe. Place the electrode in a beaker containing the sample and a stir bar. Stir as before. Record the mV reading when the reading is stable.

2. Remove the electrode from the sample, rinse the electrode with distilledwater over the "waste" beaker. Blot the electrode dry with a lab wipe. The electrode is now ready to read the ORP readings of other samples.

11. Storing the Electrode

Mono ORP electrodes should be stored clean and dry. Combination ORP electrodes should always remain immersed in storage solution. When storing for long periods, store the electrode in the storage bottle or boot which came with the electrode.

12. Electrode Cleaning

Contamination of the sensing element often results in slow response and inaccurate readings. Clean the element by one of the following procedures:

1. Inorganic Deposits: Immerse electrode tip in 0.1 N HC1 for 10 minutes.Wash the tip with distilled water.
2. Organic Oil and Grease Films: Wash electrode tip in a liquid detergent and water.
3. After above treatment, soak the electrode tip in alcohol for 5 minutes and wipe dry, then, soak in quinhydrone saturated pH 4.01 for 15 minutes; rinse with distilled water afterwards.

NOTE: DO NOT ATTEMPT TO SAND OR POLISH THE SENSING ELEMENT WITH SAND PAPER OR OTHER POLISHING MATERIAL!

13. Contact

Manufacturer
Daviteq Technologies Inc
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Email: info@daviteq.com | www.daviteq.com