PH & EC Interface
User Manual

VERSION 2.1

1998

FUNCTIONAL DESCRIPTION

The PH and EC of aqueous solutions are measured by PH and EC sensors. The signals generated by the sensors are too low and need to be processed in order to be ready for use by control systems. The PH & EC Interface unit described below, processes the signals received from the sensors and transforms them into standard Analog signals in the range of 4 - 20 mA.

An input is provided for a PT100 temperature sensor for the purpose of automatic temperature compensation, which is very important for the accuracy of the EC measurements.

Two output signals of 4-20 mA are generated, representing the currently measured PH and EC values. There is a total galvanic isolation between the two input channels.

The PH & EC interface unit is equipped with an LCD display that provides a digital readout of the measured values and serves also during the calibration process. All adjustments are made by software via the control panel.

The system can be converted to act as a controller who controls the PH and EC levels by injecting acid and/or fertilizers. In that case, relays will be added by which two injectors can be controlled.

PHYSICAL DESCRIPTION

Supply voltage:	24v AC 50/60 Hz
Power:	12VA
Dimensions:	130 x 200 x 250 mm
Weight:	500g
Inputs:	PH probe - scale 0.0 - 14.0 PH
	EC probe - scale 0.0 - 10.0 mili Siemens
	PT100 temperature sensor - 0 to 50 C˚
Outputs:	PH readout 4-20 mA
	EC readout 4-20 mA
	2 Relay contacts (optional)

INSTALLATION DIRECTIONS

The best location for installing the PH & EC Interface is in the vicinity of the sensors, to eliminate cable extensions. The installation should be on a rigid surface, where there is minimum possibility of damage by moisture and corrosive materials.

When installing the sensors “in line” (as demanded by TALGIL TOPAZ controllers) the following rules should be kept:

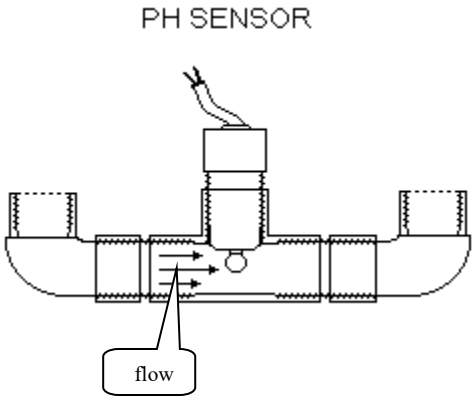
1. The sensors should be installed in such a way that will allow to pull them out easily from time to time for cleaning or calibration, without damaging the sensors or their cables.

2. The sensors should not be located in a position that will expose them to physical damage.

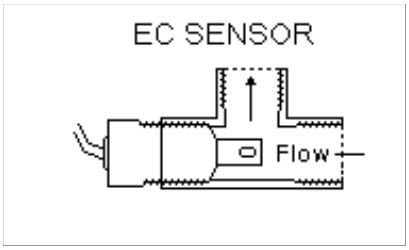
3. The in line pressure on the sensors should never exceed 7 Bar.

4. Between the injection point of the chemicals and the location of the sensors, a good mixing is required. A disk filter or a static mixer should be used in order to create a homogeneous mixture of the chemicals in the water.

5. The PH sensor may get damaged when left dry therefore it should be positioned in a siphon which will always trap some water. The PH electrode should be installed in a vertical position to let the internal air bulb float upstairs.



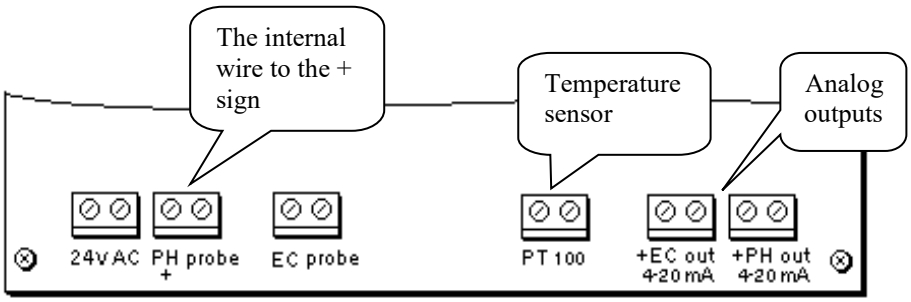
6. The EC sensor should be installed in such a way that the liquid will flow through the sensor as shown in the drawing:



7. During initial calibration and for periodic maintenance, the readout of the sensors should be tested against standard solutions.

The electric installation consists of the following steps:

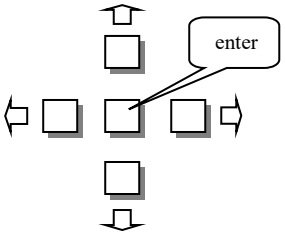
- Connecting the 24 v power supply to the Interface unit.
- Connecting the PH & EC sensors to the Interface unit.
- When the measured PH & EC values have to be transferred to an external controller, the analog outputs of the Interface unit have to be connected to the analog inputs of the controller.
- When the Interface is expanded to control injectors of acid and fertilizer, the relays through which the injectors are driven have to be connected to the injectors.



HOW TO COMMUNICATE WITH THE SYSTEM ?

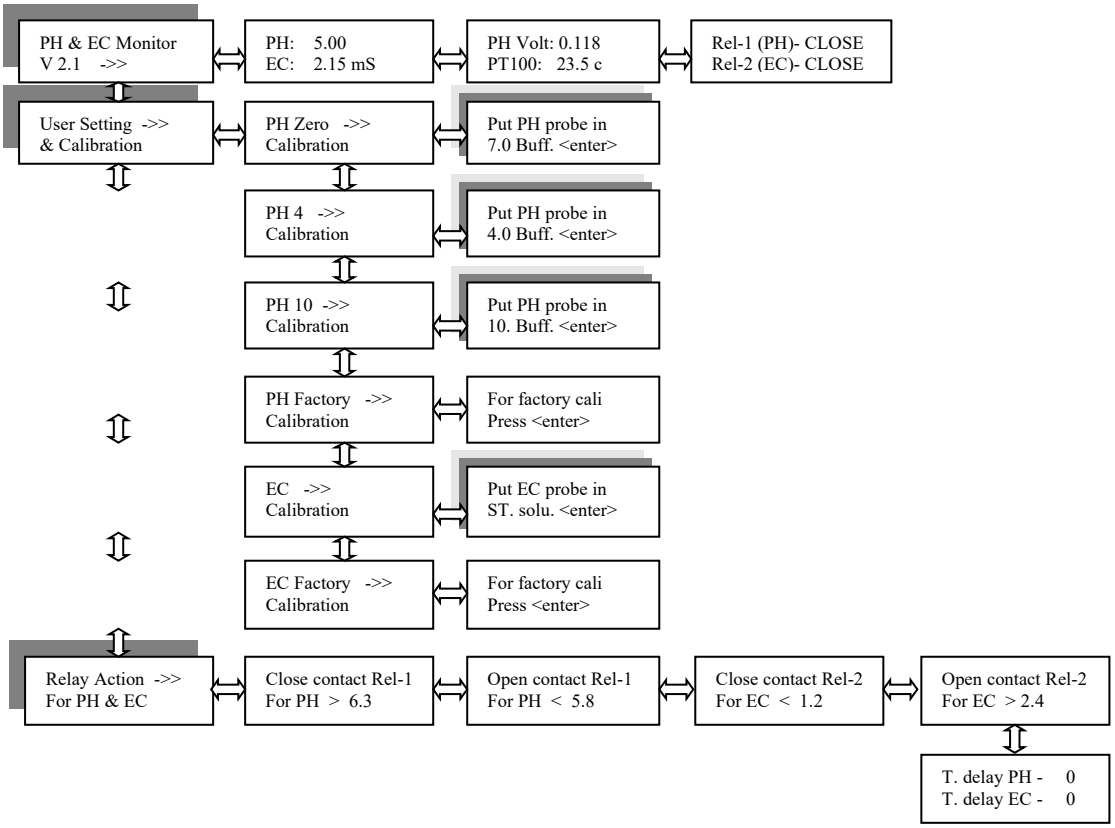
The PH & EC interface is equipped with a 2*16 character LCD display and a keyboard of 5 buttons. The 5 buttons serve both for moving from one screen to another and for changing numerical values inside the screens. When setting numerical values remember the following rules:

- ❒ The up arrow ⇧ increments the numbers.
- ❒ The down arrow ⇩ decrements the numbers.
- ❒ The left arrow ⇦ moves the digits one psition to the left.
- ❒ The right arrow ⇨ moves the digits one position to the right.
- ❒ The <enter> key tells the system to accept the number.
- ❒ First insert the digits in front of the decimal point, push the <enter> and then insert the digits following the decimal point and push <enter> again.



The screens are organized in horizontal rows; each row deals with a separate subject. There are 3 main subjects: “PH & EC Monitor”, “User Setting & Calibration” and “Relay Action For PH & EC”. The “User Setting & Calibration” is divided into 6 sub rows. The horizontal arrow keys accomplish the horizontal movement between the screens.

The user can move from one row to another by using the up and down arrow keys, but only when he is in the leftmost screen in each row. The following layout shows the structure of screens as described above:

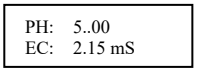


THE PH AND EC MONITOR

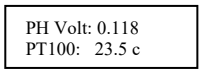
The PH and EC monitor enables inspection of the currently measured values in the system and the current status of the relays.

Select the PH & EC Monitor screen :

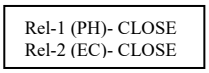
Move to the right to see the current values of the PH and EC. Notice that the EC is expressed in mili -Siemens.



The next screen to the right shows the pure voltage received from the PH sensor prior to being transformed into PH value and the liquid's temperature reported by the PT100 sensor.



The last screen to the right shows the current status of the two optional relays which control the injection of acid and fertilizers when the system is being used as a controller.



USER SETTING AND CALIBRATION

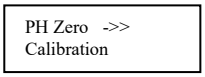
The PH & EC Interface should be calibrated by comparing the measured values to standard solutions, however the Interface is supplied with factory calibration corresponding to standard PH and EC electrodes. In case when no standard solutions can be found the factory calibration should be selected. The calibration process is fully automatic; the user does not need to do any mechanical adjustments.

PH CALIBRATION

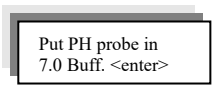
Prior to starting calibration for the first time, immerse the PH probe in tap water for 3 hours. The PH calibration is carried out in two steps, first the "Zero calibration" in which the electrode is inserted into a solution of PH 7 that should result in a "0" readout. The "Zero calibration" corrects the readout to "0" if it is not so. The second step is the "Slope calibration" in which the electrode is inserted into a solution of PH 4 or 10 depending of the range of the scale which you intend to use regularly. The resulting readout is corrected accordingly, this dictates the slope of the graph. The system checks that the needed corrections are within the limit of 25 mili volts, if the limit is exceeded, the electrode is declared faulty. Check the electrode to see if it is not broken and try cleaning it according to the manufacturer directions.

PH Zero Calibration

Select the "PH Zero calibration" screen :



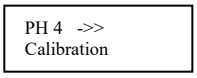
Move to the right and follow the displayed directions, first insert the electrode into a Buffer solution of PH 7, press the <enter> key (the central one), and wait until the system declares success or failure. During the process the measured voltage is displayed.



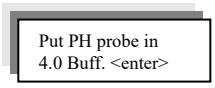
In case of success, continue to the next step; otherwise follow the troubleshooting directions.

PH slope calibration

The slope calibration is done at PH 4 or PH 10, select the desired screen and the proper Buffer solution. The following example will continue with PH 4.



Move to the right and follow the displayed directions, first insert the electrode into a Buffer solution of PH 4, press the <enter> key (the central one) and wait until the system declares success or failure. During the process the measured voltage is displayed.

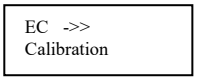


Successful ? Congratulations, you completed the PH calibration process, otherwise follow the troubleshooting directions.

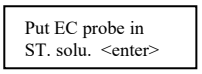
EC CALIBRATION

The EC electrode needs no zero calibration, therefore the EC calibration is done in a single point and needs a single reference solution only.

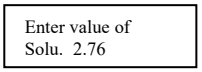
Select the “EC Calibration” screen :



Move to the right and follow the displayed directions, first insert the electrode into the Standard solution and press the <enter> key.



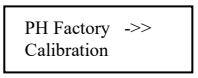
A new screen is now revealed, use the four arrow keys to insert the nominal EC value of your Standard solution (in mili Siemens).



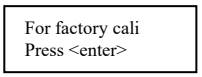
FACTORY CALIBRATION

The factory calibration should be selected whenever there is no option for normal calibration.

Select the appropriate “Factory calibration” screen :



Move to the right and press <enter> to confirm.

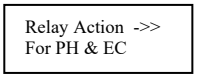


RELAY ACTION FOR PH & EC CONTROL

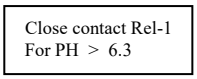
When the PH & EC Interface is required to control the PH and / or the EC levels of an aqueous solution, the system will be expanded by adding an electronic board with two relays to control the injectors. The user is requested to define the two points on the scale at which the relays will be activated and deactivated.

Defining the PH control set-points

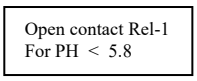
Select the “Relay Action for PH & EC ” screen :



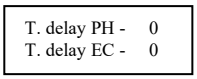
Move one screen to the right and define the set point above Which the relay will be closed.



Move another screen to the right and define the set point below which the relay contact remains open.

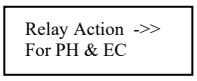


A reaction delay can be defined. Move to the rightmost screen to define the desired delay

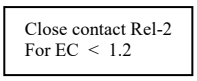


Defining the EC control set points

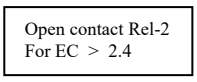
Select the “Relay Action for PH & EC ” screen :



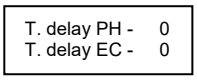
Move three screens to the right and define the set point below which the relay remains closed.



Move another screen to the right and define the set point above which the relay contact remains open.



A reaction delay can be defined. Move to the rightmost screen to define the desired delay



TROUBLESHOOTING

1. The display is blank

- ❒ Check existence of 220v or 110v supply from the mains.
- ❒ Check the connection of the 24v power supply to the power source.
- ❒ Check the connection of the 24v power supply to the Interface unit.
- ❒ Remove the 4 screws of the front panel. If the unit is supplied with 24v AC the red light should be ON.
- ❒ Make sure that the connectors of both sides of the flat cable between the panel and the electric board are all placed properly in their sockets.
- ❒ Try to reset the unit by disconnecting it from the power source and reconnecting after a short while.

2. No PH reading

- ❒ Check the probe’s wiring for cuts or short-circuits.
- ❒ Check the probe for physical damages and replace it if required.

3. No EC reading

- ❒ Check the reading while the probe is immersed in a solution of known EC value. When the probe is not inside any liquid the reading will remain “0”.
- ❒ Check the temperature display, if the temperature reading is also “0” check the wiring of the PT100 (red and green wires) for cuts or short-circuits.
- ❒ Check the probe’s wiring (black and white wires) for cuts or short-circuits.
- ❒ Check the probe for physical damages and replace it if required.

4. Improper PH reading

- ❒ Check the calibration.
- ❒ Check the probe for physical damages and replace it if required.
- ❒ Check the wiring of the probe for inverse polarity.
- ❒ Probe cleaning and calibration is required.

5. Improper EC reading

- ❒ Check the calibration.
- ❒ Check the probe for physical damages and replace it if required.
- ❒ Check the temperature display; if the value is significantly far from the expected value- replace the probe.
- ❒ Probe cleaning and calibration is required.

6. Out of range message during PH probe calibration

- ❒ The covering sleeve of the probe hasn’t been removed.
- ❒ Check the Standard solution to be the correct one.
- ❒ Check the wiring of the probe for inverse polarity.
- ❒ Check the probe for physical damages and replace it if required.
- ❒ Probe cleaning is required.

7. Out of range message during EC probe calibration

- ❒ Check the Standard solution to be the correct one.
- ❒ Check the probe for physical damages and replace it if required.
- ❒ Probe cleaning is required.