User Guide

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1 MATERIALS

1.1 Supplied Materials

- AMIC_Single Ion enclosure IP44. With inserted inside:
    - Single ION Modular PROBE.
    - Output 4-20 mA (wire) - *Optional*
- AMIC_Multi Ion enclosure IP44. With inserted inside:
    - Multi ION Modular PROBE.
- Reference Electrode
- Ion Selective Electrodes (ISE), placed in the PROBE
- 220V to DC 12V-3A Converter
- USB cable type B (initial setup)
- Concentrated Calibration Solutions Standards “P1” and “P2”. (To prepare 5 L of standard)
- Software Windows for configuration (on-line download)
- Tube/Pipe:
    - 2 x 0.75 m. length for Standards (P1, P2)
    - 1 x 2 m. length for Deionized Water
    - 1 x 2 m. length for Drain
    - 1 x 2 m. length for sample intake (M1)
- Two recipients for Calibration Solutions Standards “P1” and “P2” storage.
- 1 fitting for sample tube connecting from 4mm to a ½”
- User’s Manual

1.2 Required Material Non-supplied

- CPU/PC/Laptop with:
    - Software Windows (on-line download)
- Deionized water for cleaning (~5 L)
- Deionized water for diluting standards (10 L) – for standards supplied in concentrated form.
- Fixing elements (screws, …)

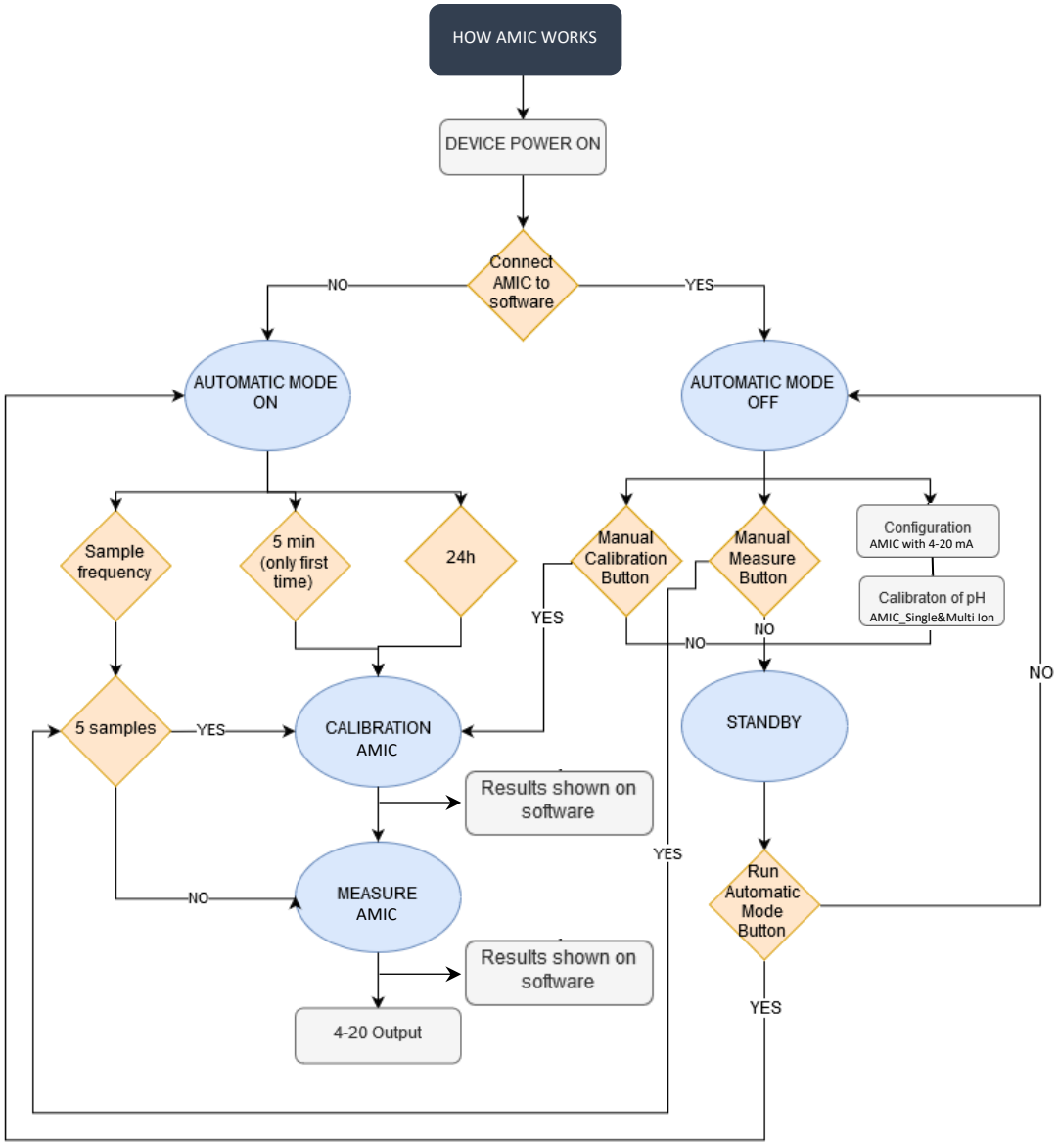
2 HOW AMIC WORKS

The configuration in the system is pre-loaded.

During start-up process the customer must adjust some parameters according to their needs. Such us concentration range, frequency of sampling, etc.

AMIC with 4-20 mA module will require to adjust 4-20 signal (see section 3.8).

The AMIC_SINGLE ION& AMIC_MULTI ION is configured to work on following sequence:



IMPORTANT Notice:

For large periods without use:

- Run a CLEAN SYSTEM (see section 3.7)
- Unplug from power supply

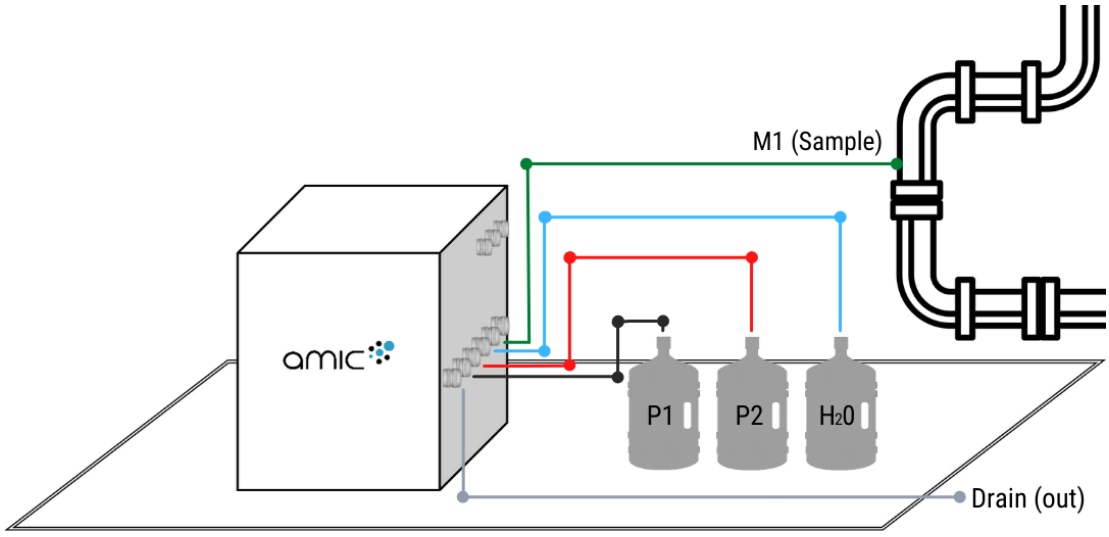
3 INSTALLATION

3.1 Location

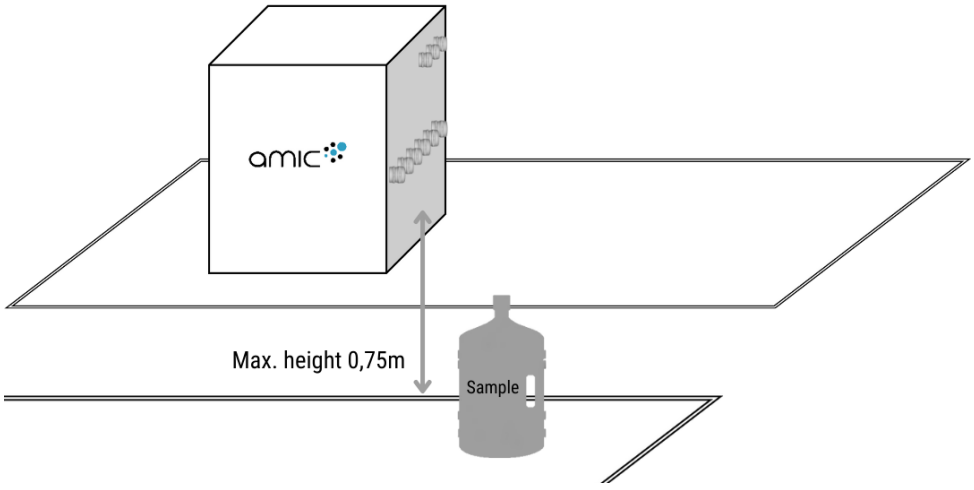
It's recommended to place indoor, in case of outdoor installation take care to protect enclosure from directly sunlight. Temperature working ranges are from 5 to 40 ºC. Notice that low temperature will affect the system setup.

The AMIC must be placed vertically and well-fixed. If necessary, it can be hanged on the wall.

1. Place Standards and Cleaning Water bottles the same LEVEL as the AMIC.



2. Place the sample with a maximum height between AMIC of 0.75m



Standard Preparation

Standards are the solutions that the system needs to be calibrated:

- Standard nº1 or P1 → lower concentration standard
- Standard nº2 or P2→ higher concentration standard

The calibration standards can be supplied in a concentrated form.

If they are concentrated:

Use the concentrated standards and dilute each standard to 5L with using deionized water.

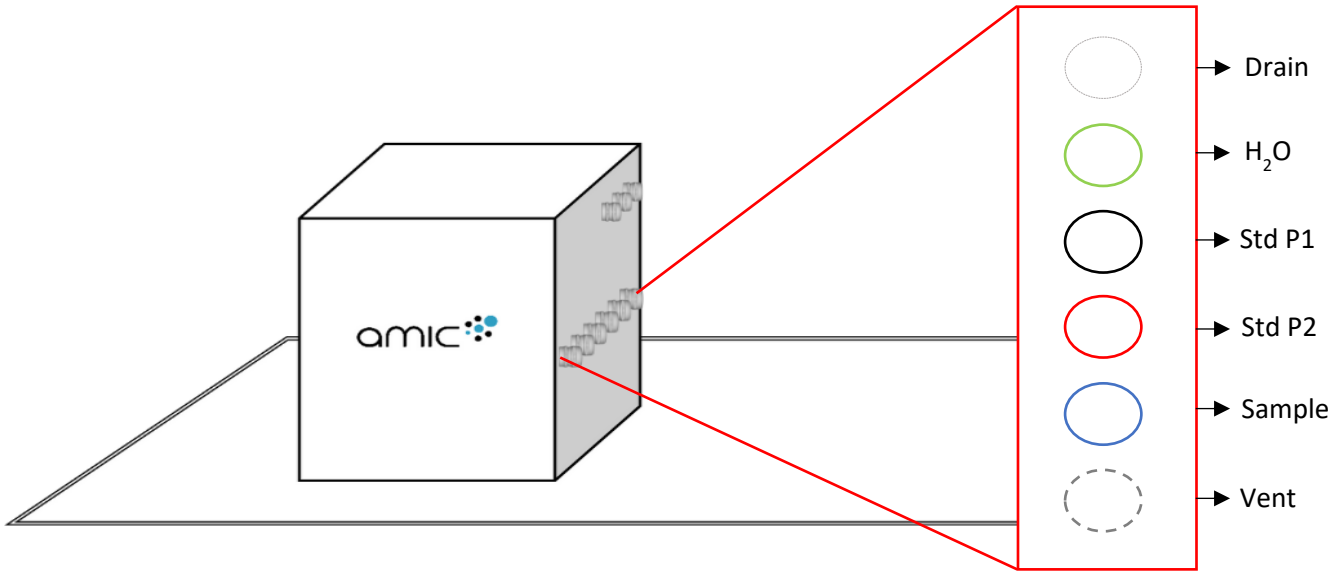
See how to prepare de standard dilution on attached User Guide for Standard Preparation.

3.2 Connection of Tubes

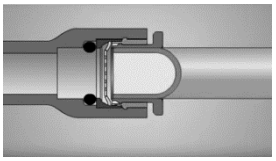
Tubes supplied are:

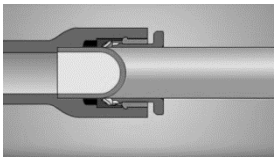
- 1 x 2-meter length for Drain --- transparent (no colour)
- 1 x 2-meter length for Deionized Water-- green
- 1 x 0.75-meter length for Standards P1 -- black
- 1 x 0.75-meter length for Standards P2 -- red
- 1 x 2-meter length or sample intake (M1) – blue
- 1 x 0.02-meter length for Security Drain (Vent)

Schematics layout shows the inlet/outlet configuration:

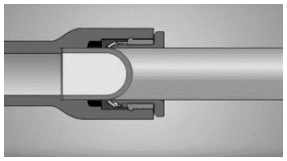


The AMIC uses a “fast connection” system. To plug the tubes to the AMIC simply pushing the tube inside the fitting.





To unplug the tubes, it is necessary to press down the outer ring with two fingers while taking off the tube.



For more info, see: **https://www.youtube.com/embed/zdK1W8oKroM**

3. Plug the P1 and P2 tubes to the AMIC and introduce both in P1 and P2 calibration standards recipient.
4. Plug the H_2O to the AMIC and introduce the tube in H_2O recipient.
5. Plug the Drain/Purge tube to the AMIC and introduce the tube in a waste recipient.
6. Plug the supplied 2-meter length tubes for sampling.

NOTE: It's necessary to assure the proper maintenance from intake sample tubes using the clean system process explained in section 4.4. They must be exchanged for new ones in case of being dirty/obstructed. Please ask for new ones.

CAUTION: AMIC works in nominal conditions at atmospheric pressure (Patm). Maximum sample positive pressure is 1.5 Bar (22 psi). In the case to install it directly in a pipeline take in account to place appropriate pressure reduction to adjust it properly.

A piece for pipe reduction is supplied with the equipment. Please, place it always in horizontal position.

3.3 Probes Installation

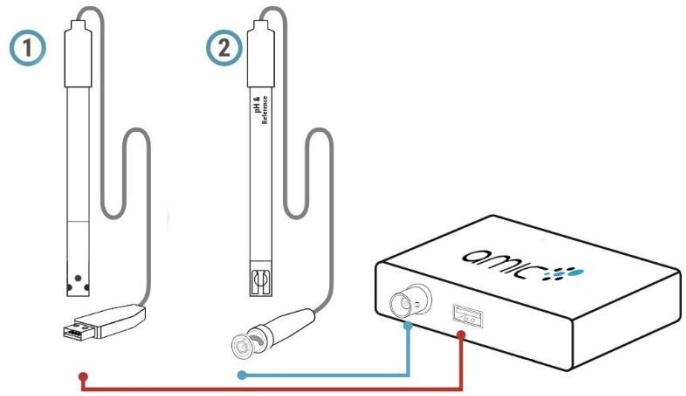
- **AMIC_SINGLE ION**

The AMIC is delivered with 2 probes (Single ion (1) & Reference probe (2)) for AMIC_SINGLE ION.

Check the probes are placed on the cell, and connected to their input place on control box, when not,

Please follow next steps:

1. Remove SINGLE Ion protection probe.
2. Remove the storage bottle from the tip of the reference probe and rinse gently with D.I, water.
3. Connect the Reference probe (2) and Single Ion (1) to control box as indicated on the next image:

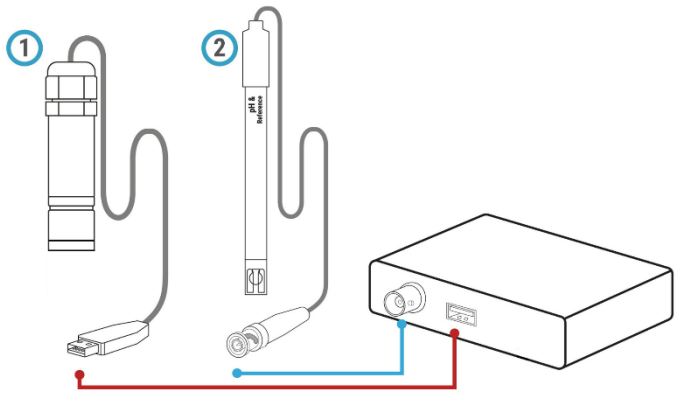


Picture 1. AMIC_Single Ion connection

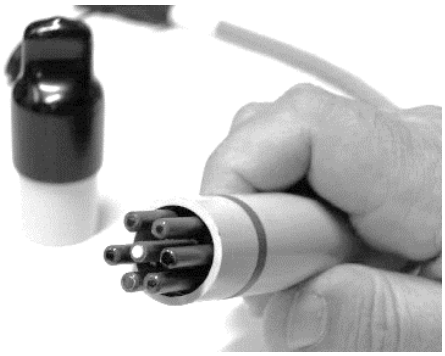
4. Open the cell: rotate the grey wire glands in the opposite direction of clockwise.
5. Introduce the REFERENCE probe to the cell in the side with the 2 pipes intakes.
6. Introduce the SINGLE ION PROBE to the other side of the up to the fixed level.
7. Close the two sides of cell: rotate the grey wire glands in the direction of clockwise.

- **AMIC_MULTI ION**

The AMIC_MULTI ION is delivered with two probes (Multi ion (1) & Reference probe (2)).



Picture 2. AMIC_Multi Ion connection



Please follow next steps:

Check the probes are placed on the cell, and connected to their input place on control box, when not,

1. Insert the electrodes in the multiprobe in case they are provided out from the probe (they are usually preassembled in the multi-ion probe)
2. Remove Multi Ion protection probe **and replace for the short protective piece**
3. Remove the bottle from the tip of the reference probe and rinse gently with D.I. water
4. Connect the Reference probe and MULTI ION to control box, as indicated on the previous image (Figure 2). *Note that Single Ion and Multi Ion use the same type of connection.*
5. Open the cell: rotate the grey wire gland in the opposite direction of clockwise.
6. Introduce the REFERENCE probe to the cell in the side with the 2 pipes intakes,
7. Introduce the MULTI ION PROBE to the other side of the cell, PUSHING
8. Close the cell: rotate the grey wire gland in the direction of clockwise

3.4 Software Installation

1. Please, download (from the NT Sensors site) and install the AMIC software in your laptop/ PC.
2. Open the software. On first time that software is opened, a folder named "**NT Sensors**" in "Desktop" is created. In this folder, a file named "historical" with calibration and measurement results is created. Please verify that NT Sensors folder is created.
3. Ensure next requirements:
    - Windows XP, Windows Vista, Windows 7 or Windows 10
    - Net Framework 4 or later (official link)
    - Available USB port
    - Mouse and keyboard

3.5 Power on

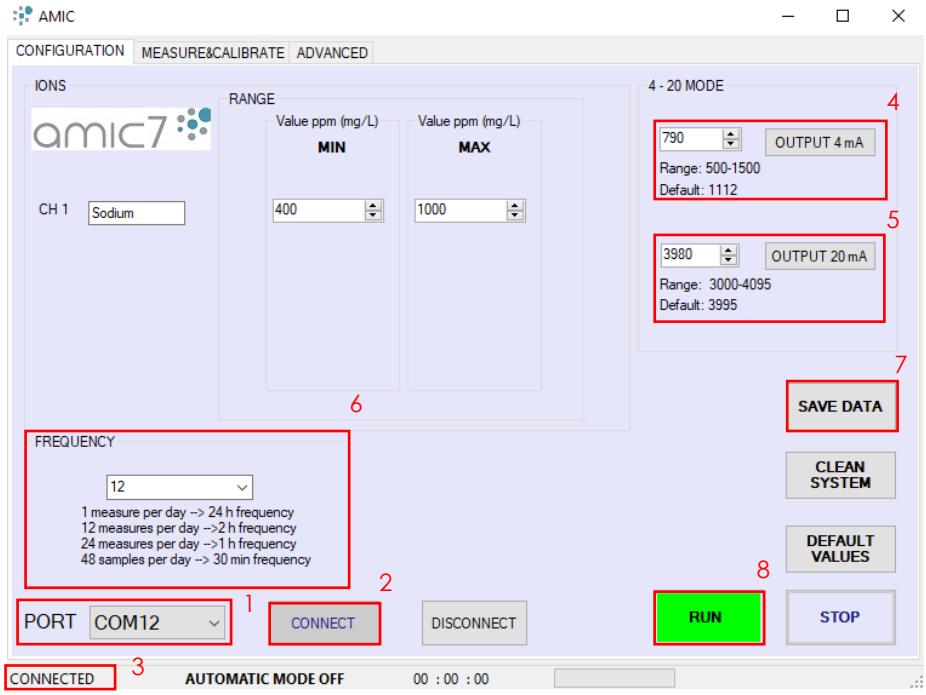
The AMIC is delivered with a standard power converter from 220V to the power supply needed (12V, 3A).
Check the power converter is Plugged to the POWER (input) on control box as indicated on next image.

Note: The stability of the power source is important to avoid eddy currents, which could interfere on the readings of the electrodes, giving bad results.

3.6 Connect the AMIC to Software

Please, follow next sequence every time you want to connect the AMIC to software:

1. Plug the AMIC to your PC using the delivered USB cable type B and check about it is connected at USB port on the control box into the AMIC. (It is important to power on the AMIC before plug the USB to your PC, see 3. 6).
2. Open AMIC software.
3. Select **PORT COM [1]** (see which are in device manager of your PC) (see Picture 3).
4. Click **CONNECT [2]** button (see Picture 3).



Picture 3. Software view example for AMIC_Single Ion with 4-20 mA
(Note: for AMIC_MULTI ION, 7 channels are shown)

Note: Please, it is important to connect the AMIC asap. If the AMIC remains unconnected from your PC for longer period than 5 minutes, it will start the scheduled actions. Once the AMIC is powered on, automatic calibration + measure starts after 5 minutes. If automatic cycle is started the connection with software is not possible until process finishes in approximately 25 minutes.

3.7 Configuration settings

At the bottom of the window appears a message that indicates the AMIC is **CONNECTED [3]** (see Picture 3). Once connected the AMIC remains in standby, and automatic process is suspend. At this moment, it is possible to configure the parameters.

Measuring Frequency Configuration

The measuring frequency corresponds to the duration of the time interval between measurements; the AMIC will **automatically** start a cycle of measurements *(**Note:** This mode is for automatic uses of AMIC).*

Detail what number of measures is going to be required per day.

Range is 1 to 48.

1 → 1 sample per day (24 h frequency)

4 → 4 samples per day (6 h frequency)

6 → 6 samples per day (4 h frequency)

12 → 12 samples per day (2 h frequency)

24 → 24 samples per day (1 h frequency)

48 → 48 samples per day (30 min frequency)

1. Enter a value in the box **[6]** (see Picture 3)
2. Once is properly configurated all parameters. Press **SAVE DATA [7].** (See Picture 3)
3. Configuration is done.

pH Calibration

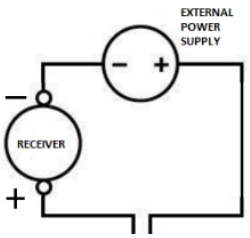
When AMIC is used with Single Ion or Multi Ion probe, it is required to do a manual calibration of the pH.

1. Remove pH reference probe from measuring cell.
2. Go to MEASURE & CALIBRATE tab.
3. Press CALIBRATE pH button.
4. Follow the steps indicated.

4-20 mA Calibration

On the first set up is required to do a calibration of the transmitter module of 4-20 mA connected to the receiver unit.

1. Connect AMIC_SINGLE ION 4-20 wires to your receiver. No polarity.



AMIC_SINGLE
ION 4-20
output

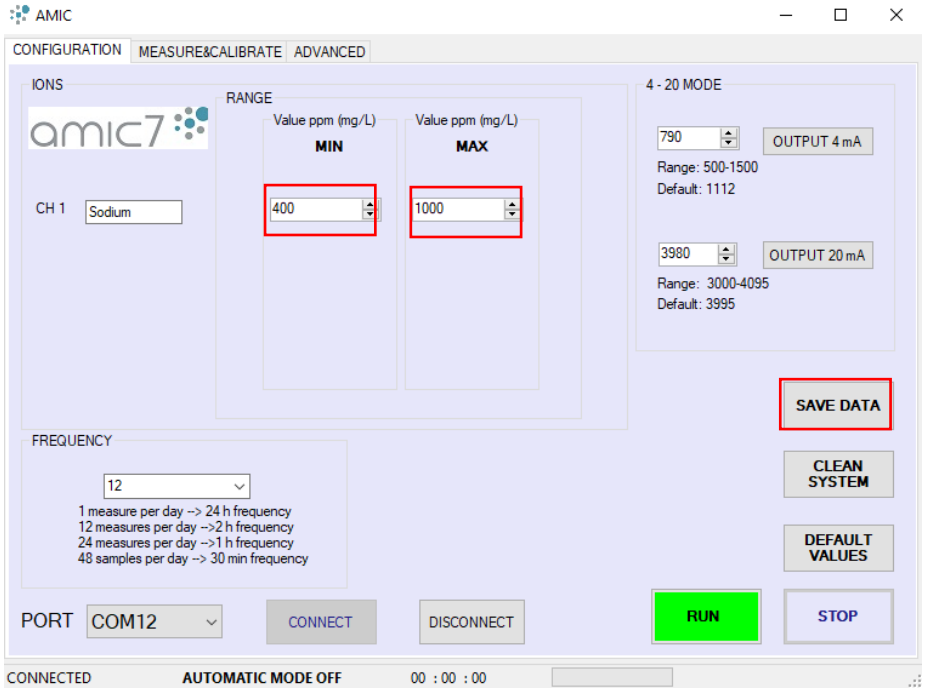
2. Adjust 4mA**:** Press the button "output 4mA" **[4]** (see Picture 3) to send the signal of 4mA to your receiver unit/datalogger. If the received signal is not corresponding to the 4mA or 1 Volt, increment or reduce the number in order to adjust the received signal. Range of accepted values range from 500 to 1500 . Default is 1112.

3. Adjust 20mA**:** Press the button "output 20mA" **[5]** (see Picture 3) to send the signal of 20mA to your receiver unit/datalogger. If the received signal is not corresponding to the 20mA or 5 Volts, increment or reduce the number in order to adjust the received signal. Range of accepted values range from 3000 to 4095 . Default is 3995.

4. When 4-20mA is used, minimum ppm value (mg/L) corresponds to the signal of 4mA and maximum ppm value (mg/L) corresponds to the signal of 20mA.

Range ppm

The AMIC has alarms to know if a concentration is out of range. This range can be configurated in software CONFIGURATION tab. After configuration, it is obligatory press **SAVE DATA** (See Picture 4) to save parameters on the AMIC flash memory. Next times the software is opened, values will be automatically downloaded and displayed on the software.



Picture 4. Configuration tab – Save data (Software view example for AMIC_Single Ion 4-20mA) (Note: for AMIC_MULTI ION, 7 channels are shown)

At the bottom of the window, we can see a message that save data is done. At this moment, is not necessary to use the software again. The AMIC will download the values saved and it will use them every time.

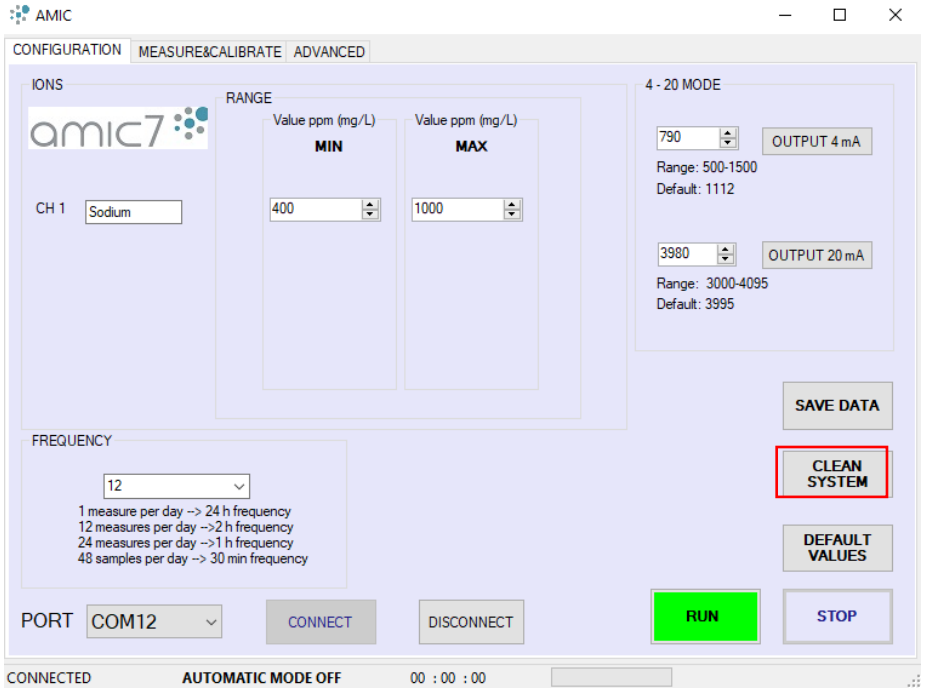
CAUTION: If the AMIC is calibrating or measuring, it is not possible to do any other action. If RUN button is pressed, automatic process will start after 5 minutes which are indicated at the bottom of the window. Please to configure any parameter press STOP button and after SAVE press RUN again.

Clean system

This button is for clean all the inner tubes of AMIC (See Picture 5).

It serves for:

- Maintenance (see section 6.1).
- Keep in stand by for long time (see section 6.2).



Picture 5. Configuration tab – Clean system (Software view example for AMIC_Single Ion 4-20mA) (Note: for AMIC_MULTI ION, 7 channels are shown)

4 OPERATION MODES – *Measure&Calibrate*

After configuration, you can decide in which operation mode you want the AMIC operates. AMIC has different ways to work.

4.1 REMOTE CONTROL mode

For this mode close the software and disconnect the AMIC from your PC.
After 5 minutes powered on, the AMIC realizes an automatic calibration + measure every time as scheduled.
Note: Therefore, it is possible manage the Remote-Control process by two ways:

4.1.1 Using a third device control (PLC /Datalogger)

Use a third-party equipment or PLC to power on and power off whenever you want AMIC realizes a measurement. The AMIC must be disconnected from the configuration software.

1. Power off
2. Power on
3. Wait 30 minutes at end the process
4. Power off

CAUTION: Keep the AMIC powered on for at least 30 minutes to complete full process

4.1.2 Using the Scheduled samples/day on initial configuration

The AMIC must remain powered on. In this case, the AMIC will automatically start a cycle of measurements as detailed in the measuring frequency. A calibration will be done after five (5) consecutive measures or after one day (24 hours).
The results will be sending to your 4-20 receiver device, after each measure.
If for any reason the power is off, the AMIC will automatically restart whit the scheduled frequency when power is on again.

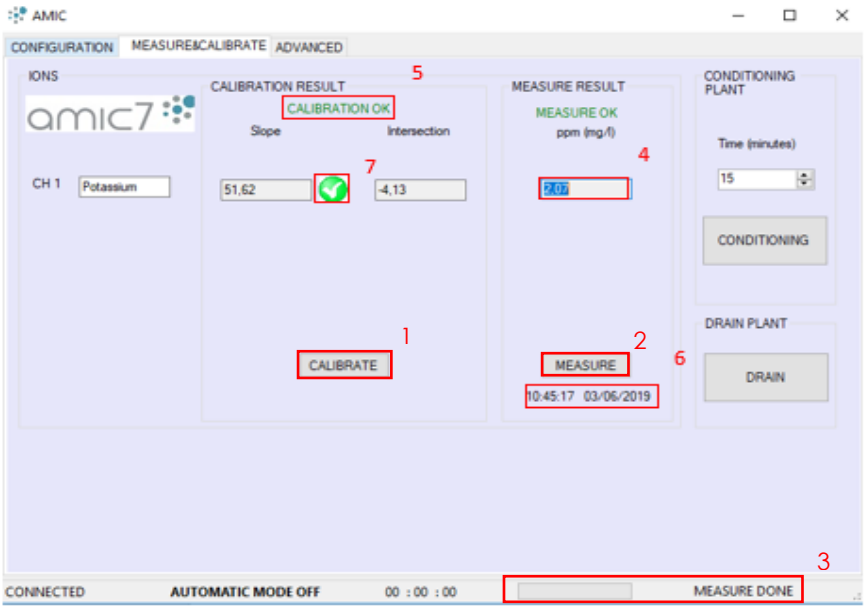
4.2 LOCAL CONTROL mode – Computer connected

For this mode do not close the software and do not disconnect the AMIC from your PC.
With this mode you could view all the historical data in the file named “historical” on your PC, were calibration and measurement results are stored.

4.2.1 MANUAL – Measure/Calibrate manually using software buttons

The AMIC allows doing a manual measure or calibration whenever you want using two different buttons.

1. Open the software
2. Go to MEASURE&CALIBRATE tab



Picture 6. Measure&Calibrate tab (Software view example for AMIC_Single Ion)

(Note: for AMIC_MULTI ION, 7 channels are shown)

3. Press **CALIBRATE** [1] (See Picture 6) button to do a calibration and/or press **MEAURE** [2] (See Picture 6) button to do a measurement
4. At bottom of the window are indicated that **Measure or Calibrate process are done or in progress** [3] (See Picture 6)
5. **Last calibration and measure values** [4] (See Picture 6) appear in this tab when software is connected
6. A **message at the top of Group box** [5] (See Picture 6) is shown indicating the result
7. Information about when the process was performed is shown in **textbox** [6] (See Picture 6)
8. Correct/ Incorrect calibration result are represented by **tick or cross** [7] (See Picture 6)

CAUTION: Keep the AMIC powered on for at least 25 minutes to complete full process

4.2.1 Conditioning

First time electrodes use, or larger periods without use, it is recommended to set up the conditioning process for at least 120 minutes.
Go to MEASURE&CALIBRATE tab press **CONDITIONING** button.

Once pressed Conditioning button starts the conditioning process and other tasks are suspended. At the end of conditioning process, the AMIC retakes the other tasks automatically so once pressed Conditioning button software can be closed.

4.2.2 Drain

This button, placed on MEASURE&CALIBRATE tab is for empty the sensor container.
It serves when the process has been altered by external factors and has remained liquid within the container.
Pressing **DRAIN** button only empties the measuring cell.
Use this button if liquid is inside the sensor container after ends any process.

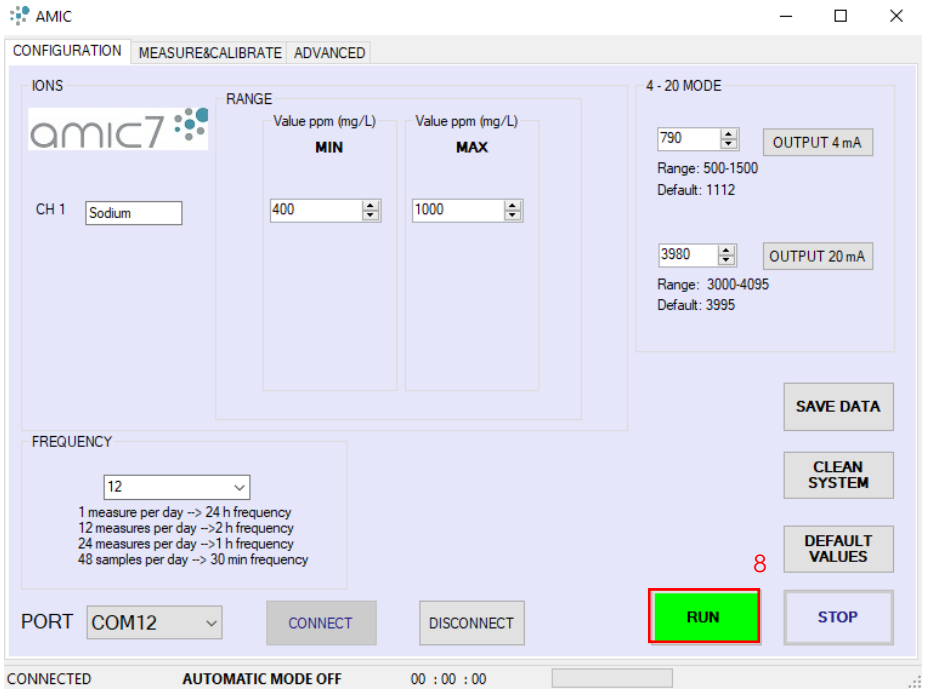
4.2.3 AUTOMATIC– Measure/Calibrate according scheduled, using software

It is possible to run or stop the scheduled automatic process using the software.

The AMIC will automatically start a cycle of measurements as detailed in the measuring frequency. A calibration will be done after five (5) consecutive measures or after one day (24 hours).

1. Open the software
2. Press RUN button **[8]** (See Picture 7)
3. The results will send to 4-20 receiver device (AMIC_SINGLE ION)
4. The results will be also showed on the screen, and stored on file "historical" *
5. When automatic process needs to be ended, press STOP button

**It is required to have the AMIC connected to a PC*



Picture 7. Configuration tab (Software view example for AMIC_Single Ion)

(Note: for AMIC_MULTI ION, 7 channels are shown)

5 RESULTS OUTPUT

5.1 Calibration

At the end of every calibration:

- If calibration result is good:
  - Automatic or Manual measuring process can start.
- If calibration result is wrong:
  - The AMIC_SINGLE ION generates a 20-mA output indicating a wrong calibration (**alarm type 2, section 6.5**).
  - If Automatic process can't start. Value of the measurement are not shown.
  - Repeat a calibration, if second time is wrong, please contact with **NTSensors.**
  - Probably the status of the measurement sensors is poor.

5.2 Measures

At the end of every measurement:

- If measure result is good:
  - Analogic constant output is generated corresponding with 4 and 20 mA calibration.
  - When local mode is in place, results are showed on your screen and stored on historical file.
- If measure result is wrong:
  - The AMIC_SINGLE ION generates a 4-mA analogic constant output indicating a wrong range (**alarm type 1, section 6.5**).

6 MAINTENANCE

6.1 Periodic Maintenance

Quarterly

- Replace Standard 1 & 2.
- Replace Deionized water.
- Replace Ion selective Electrode (section 7.3).

Annually

- Replace Reference Electrode (section 7.3).
- Check Tubing System, if are in bad state replace it.
- Measure / Check values (externally).

6.2 STOP Use

A cleaning process is needed to stop working for long period. The procedure is to clean all the pipes, flow cell, and electrodes with DI water:

1. Take off next tubes: P1, P2, sample.
2. Place P1, P2, Sample tubes inside H_20 recipient (not DRAIN tube).
3. Press **CLEAN SYSTEM** button. (See 6.2 Clean System)
4. Remove P1, P2, Sample tubes from the H_20 recipient, and left it unconnected (air).
5. Press **CLEAN SYSTEM** button.
6. Now all the system is clean-up and empty.

Warning: This cleaning process is crucial after being stopped for a long period of time. System can fail if this process is not done.

6.3 Replace Ion probe & Reference Probe

1. Disconnect the probes BNC & USB connector from the meter.
2. Open the cell: rotate the grey wire glands before extracting the probes
3. Remove the probes from the cell
4. Insert the new electrode/ probe, close the cell, and plug the probes to the connector in meter.

6.4 Consumption

	Calibration cycle	Measurement cycle	TOTAL
Standard 1	40 mL	0	40 mL
Standard 2	40 mL	0	40 mL
Sample	0	60 mL	60 mL
Deionized Water	0	40 mL	40 mL
Duration	20 min	5 min	25 min

6.5 Output 4-20

The analogic signal **4-20 mA** is linearly proportional to the range of the samples. When the calibration is not correct, the transmitter gives a constant analogic signal of 4 mA**.** When the concentration is upper or below out of range the **4-20 mA** transmitter send a constant analogic signal of **20 mA.**

Signal (mA)	Ppm (mg/L)
4-20	Lowest concentration – highest concentration mg/L
4 mA	ERROR TYPE 1 (INCORRECT CALIBRATION)
20 mA	ERROR TYPE 2 (SAMPLE OUT OF RANGE)

6.6 Alarms

ERROR TYPE 1 → INCORRECT CALIBRATION

POSSIBLE REASONS	SOLUTIONS
Age-wo electrode	Replace electrode for a new one
Standard bottles are empty	Check standards liquid level and tubes

ERROR TYPE 2 → SAMPLE OUT OF RANGE

POSSIBLE REASONS	SOLUTIONS
Obstruction of sample tube	Check sample liquid level and tube
Sample concentration is out of range	Make an external test to ensure good conditions

7 COMMON ERRORS

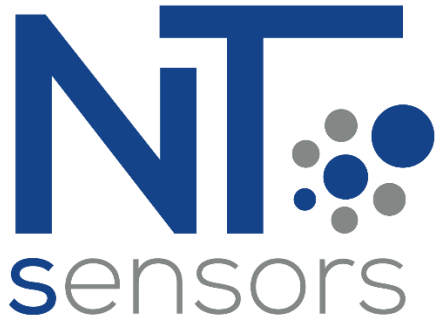
Non-connected

If the status label text is *NOT CONNECTED*, check the AMIC power supply and the serial connector, then click in *CONNECT* button. If this error is not corrected restart the program.

If the error cannot be solved contact with TECH.SUPPORT@NTSENSORS.COM

7.1 Framework 4 or later not installed

Go to Microsoft website and download and install the .NET Framework 4 or later (link).



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