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IMPORTANT NOTES FOR AMMONIUM ISE SYSTEM WITH 3TX-ISE AMMONIUM ANALYZER & TRANSMITTER

Calibration, Installation, Cleaning & Use of Ammonium ISE Measurement Systems For Applications Including:

- **Municipal Water Distribution Monitoring**
- **Municipal Wastewater Treatment Plants (WWTP)**
- **Industrial Wastewater Treatment Systems (Including Air Scrubbers)**
- **Environmental Monitoring of Rivers and Lakes and other water streams**

Before proceeding further, it is recommended that a review of the following technical documents that describes the general provisions for online ion selective measurements:

http://www.astisensor.com/GENERAL_GUIDE_TO_ONLINE_ISE_MEASUREMENTS.pdf

All calibration solutions and process grab sample should be calibrated and tested at identical temperatures to the process temperature for optimal results. The actual temperature of the process solution (and thereby the calibrating solutions as well) is not as critical as the fact that they are calibrated at the same temperature to eliminate all potential sources of uncertainty. For greatest overall accuracy of the ammonium (NH_4^+) measurement, however, all tests should be performed as close to 25 degrees Celsius (room temperature process solutions) as possible. The valid (permissible) temperature range for all ammonium ion selective sensors is five to fourty (5-50) degrees Celsius (41 to 104 degrees Fahrenheit).

Calibration Point 1 (always the lower concentration value) and Calibration Point 2 (always the higher concentration value) determines the response curve of a given ammonium Ion Selective Sensor (AB 6410, AB 6410A or AB 8410). The 3TX-ISE transmitter as supplied has already been preconfigured with the characteristic sensor slope for your application and range of interest. In the absence of suitable ammonium calibration standards at the job site it is recommended to use the ASTI factory pre-programmed characteristic 2-point slope and to perform only a 1-point grab sample offset field calibration.

The calibration value for point 1 is the low ppm solution and point 2 is high ppm solution. The one point offset calibration using a process grab sample is always performed by using the offset calibration option only. The calibration solutions should be kept clean and out of direct sunlight and/or other high-energy radiation sources to maximize accuracy of their ppm values. New sensors should be conditioned in ammonium standard solution for 3 - 5 minutes before beginning the calibration procedure as described in this guide. If necessary, special conditioning may be required for sensors in stock long periods of time and assistance with such needs can be obtained from the ASTI factory. All sensors should be rinsed with deionized (DI) water prior to conditioning in any standard solution.

The acceptable pH range for any of the ammonium ion selective sensors is 2.5 to 9.0 (up to 11 pH if the 3TX-TOT pH compensation module is used). Any calibration standards should be pH adjusted and stabilized to prevent errors in the 2-point slope calibration. There are currently no known commercially available ammonium calibration standards that can be used as they do not meet these criterion. The last page of this ISE addendum contains the procedures for how to prepare suitable ammonium ISE standards in your laboratory. It is NOT recommend to use any calibration standard solution to perform the 1-point offset calibration. Note that adjusting the inline reading to agree with a grab sample determined value of the process sample should ALWAYS be the used as the 1-point calibration scheme.

At pH levels above 7.0, the ammonium sensor will not detect the total ammonium content, as some of the ammonium ion will be converted into the form of dissolved ammonia gas (NH_3) form. To convert the measured ammonium ion activity (free ammonium) into total ammonium the free ammonium measurement must be compensated for pH. See the pH dependent extent of ionization curve for NH_3 dissolved gas and ammonium ions (NH_4^+) for a graphical representation of this phenomenon. Compensation for the effect of pH on the extent of ionization for NH_3 may be required for pH values above 7.0 to provide complete total ammonium data. Please also note that these pH effects are a temperature dependent phenomenon. The provided extent of ionization curve is only completely valid for pure two component systems with deionzied (DI) water. Real world water solutions of a much more complex makeup may vary somewhat from these idealized curves, although the deviation is not expected to be vast for most typical systems. The 3TX-TOT module is capable of performing such pH compensation to find the "Total Ammonium" as defined by the sum of the free ionized ammonium ion species (NH_4^+) together with the dissolved gas NH_3 bound form. For further information please refer to the 3TX-TOT specification sheet and manual or contact ASTI directly to see if pH compensation should be used for your particular application.

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The following steps are required for an installation of a new Ammonium sensor:

1) Perform a two-point calibration to empirically determine slope. See the following procedure to ensure that a valid 2-point calibration is accomplished. In very many cases using the factory predefined slope is perfectly acceptable alternative to performing a 2-point slope calibration in the field.
2) Place sensor into process and allow it to find electrochemical and thermal equilibrium. The time required for this may vary depending upon the particular application.
3) To account for any differences between the ionic strength and interfering ions between calibration and measured solution, a grab sample should be taken and analyzed by a suitable analysis system, and the online ammonium ion selective measurement system adjusted to read the grab sample analyzed value. The sensor should be left continuously in service and this grab sample offset calibration performed as may be required, unless the sensor seems to be losing sensitivity, giving erratic readings or requires cleaning. The 1-point grab sample 1-point offset calibration is simply called “Offset” in the 3TX-ISE analyzer LED main menu.

Please refer to the 3TX-ISE manual for instructions on how to perform both 1-point and 2-point calibrations using the three-button operation. Only issues specific to your given ion selective measurement are covered in this ISE addendum and all general use topics are discussed in the 3TX-ISE manual and specification sheet.

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Configuring 3TX-ISE Analyzers for Ammonium Measurements

Your 3TX-ISE has been preconfigured at the ASTI factory for your ion selective measurement requested at your time of order. The ISE measurement type configured for the 3TX-ISE transmitter cannot be modified in the field. You can use the last parameter on the 3TX-ISE transmitter (P20) to reset the unit back to the factory dispatched configuration (see 3TX-ISE specification sheet and manual for details about this). The only two variables that will change when you perform a calibration will be the slope parameter (P15) and the mV offset at the isopotential point (P14). Below are the nominal values for the parameter P14 and P15 for the ammonium ion selective measurement:

Slope (Parameter P15 on 3TX-ISE): 57.2 mV per decade

The slope parameter will only be changed when a 2-point slope calibration is performed (see later in this addendum for details). Parameter P15 allows you to both view and manually modify the working slope. This slope may vary depending upon your application and range and has been preconfigured at the ASTI factory.

Offset (Parameter P14 on 3TX-ISE): +200 mV

The offset parameter will be changed both when a 2-point slope or 1-point offset calibration is performed (see later in this addendum for details). Parameter P14 allows you to both view and manually modify the offset. This offset may vary depending upon your application and range as preconfigured at the ASTI factory.

Formula Weight of Ion (Parameter P13 on 3TX-ISE): 18.04 grams per mol (FIXED)

The value is a display only variable that clearly denotes the ISE measurement type. In this case the value for the formula weight of the ion measured is 19.00 grams per mol for ammonium.

To modify the slope (or any other parameter actually) the software lock (P01) must be disabled.

You should check that your ASTI ISE sensor is properly wired according to the official ASTI hook-up schematic for ASTI sensors with and without preamplifiers to the 3TX analyzer (also provided later in this guide for convenience). All three common wiring configurations are found in this ISE addendum for your convenience or installation and commissioning.

The 3TX-ISE analyzer and transmitter will support both ASTI ISE sensors with and without preamplifiers, although preamplifiers are generally not required for cable length of less than 20 feet. If you require an installation where a preamplifier is to be used, please consult the ASTI factory for further assistance.

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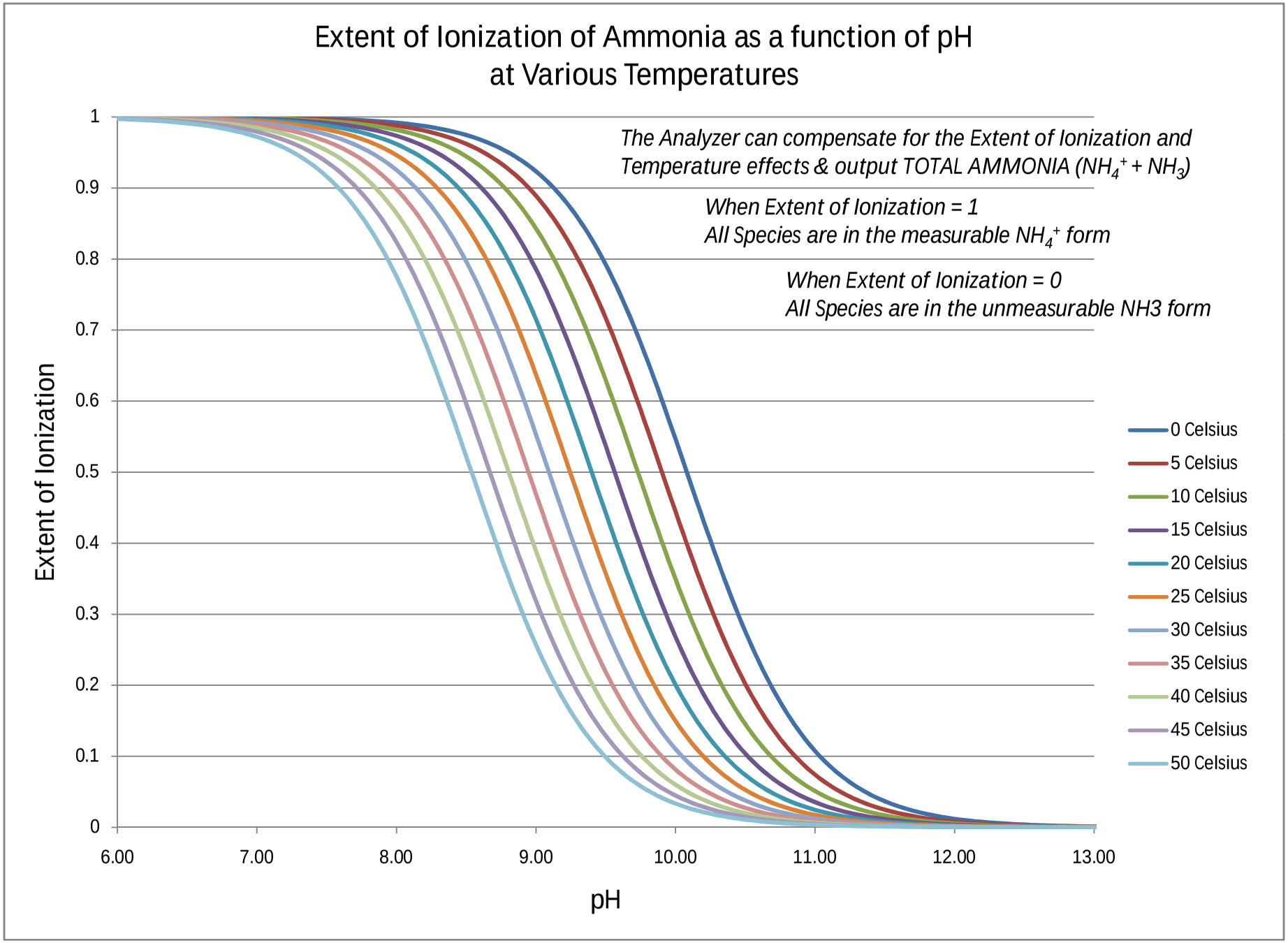
Please note that if you perform a reset to factory defaults (P20), you will need to repeat your 2-point calibration using calibration solutions that are one decade (10X) apart in value. In addition, you will need to once again place the ISE sensor back into service and allow it to equilibrate. You will then also need to repeat your 1-point grab sample offset calibration. This means taking a sample from the process and determining the ISE concentration (in ppm) for the grab sample and then using the 1-point offset calibration feature of the 3TX-ISE analyzer to bring the online reading in accordance with the laboratory grab sample determination.

Please also note that the activity coefficient for the free ammonium ions in solutions is pH and temperature dependent within the measurable range of pH and temperatures for your system. In addition, the extent of ionization that converts the (unmeasurable) dissolved ammonia gas into the measurable ammonium ion form is also a pH and temperature dependent process. The following page describes such dependence. If you have purchased the 3TX-TOT module, you will be able to compensate for the pH induced effects on the extent of ionization but NOT for any changes to the free ion activity as a function of pH and temperature (these are physically chemistry issues that cannot so easily be de-convoluted as can the extent of ionization). Depending upon your exact pH and temperature conditions, you may or may not need to have this 3TX-TOT module. Contact the factory for additional assistance with this technical issue. Note that the 3TX-TOT can be added after the initial time of commissioning although it is generally recommended for this module to be supplied complete as part of the initial package used for installation since ASTI can then prewired, preconfigure and test the 3TX-TOT as part of the supplied package (without any additional cost).


Extent of Ionization of Ammonia as a function of pH
at Various Temperatures
The Analyzer can compensate for the Extent of Ionization and
Temperature effects & output TOTAL AMMONIA ($NH_4^+ + NH_3$)
When Extent of Ionization = 1
All Species are in the measurable NH_4^+ form
When Extent of Ionization = 0
All Species are in the unmeasurable NH3 form
Extent of Ionization
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
6.00
7.00
8.00
9.00
10.00
11.00
12.00
13.00
pH
0 Celsius
5 Celsius
10 Celsius
15 Celsius
20 Celsius
25 Celsius
30 Celsius
35 Celsius
40 Celsius
45 Celsius
50 Celsius

Connection Diagram of Iotron™ pH, ORP and Ion Selective (ISE) Sensors without Preamplifiers (Tinned Leads Only) to 3TX-pH pH/ORP Transmitters and 3TX-ISE Ion Selective Transmitters

ASTI Cable Color Coding	Instrument Terminal Value	3TX-pH/ISE Terminal Number
Red	pH/ISE Sensor (-) *a.k.a Reference*	1
Clear	pH/ISE Sensor (+) *a.k.a mV Signal*	2
Black	Pt100 or Pt1000	4
Black	Pt100 or Pt1000	5

Note 1: The 3TX-pH transmitter can be used for either pH or ORP measurement and wiring connections are the same for both pH and ORP sensors (only the Parameter No. 03 needs to be changed/toggled to select between the two input types). For ORP sensors select mV as the input type in P03.

Note 2: For 3TX-ISE the ion measurement type (ammonium, fluoride, nitrate, calcium..etc) must be defined at time of purchase an cannot be changed after receipt of transmitter (see label on 3TX-ISE for which ion measurement type is supported for that given unit).

Note 3: Depending upon the TC ordered it may be necessary to change the parameter 04 from PT1000 (default) to PT100 (selectable).

Connection Diagram of Iotron™ pH, ORP and Ion Selective (ISE) Sensors WITH Preamplifiers to 3TX-pH-X pH/ORP Transmitters and 3TX-ISE-X Ion Selective Transmitters

ASTI Cable Color Coding	Instrument Terminal Value	3TX-pH/ISE Terminal Number
Green	+5V Power (Green)	1
White	pH/ISE Sensor *mV Signal*	2
Black	-5V Power (Black)	3
Yellow	TC (Yellow)	4
Blue & Red	TC (Blue) & Common–Ground–Reference (Red)	5

Note 1: The 3TX-pH transmitter can be used for either pH or ORP measurement and wiring connections are the same for both pH and ORP sensors (only the Parameter No. 03 needs to be changed/toggled to select between the two input types). For ORP sensors select mV as the input type in P03.

Note 2: For 3TX-ISE the ion measurement type (ammonium, fluoride, nitrate, calcium..etc) must be defined at time of purchase an cannot be changed after receipt of transmitter (see label on 3TX-ISE for which ion measurement type is supported for that given unit).

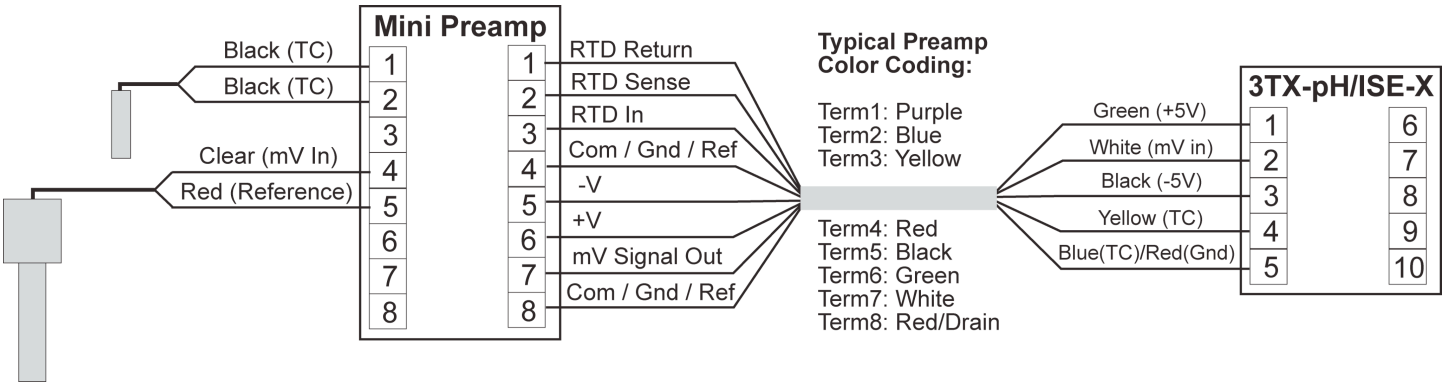
Note 3: Depending upon the TC ordered it may be necessary to change the parameter 04 from Pt1000 (default) to Pt100 (selectable). The wiring is identical whether Pt100/Pt1000 are used.

Note 4: Mating pH/ORP/ISE sensor must have the appropriate type of preamplifier integrated inside the sensor or using an external preamplifier in a waterproof J-Box to interface with the 3TX-pH-X or 3TX-ISE-X transmitter. These 3TX-pH-X & 3TX-ISE-X are different hardware from the 3TX-pH and 3TX-ISE transmitter that can directly interface pH/ORP/ISE sensors WITHOUT preamplifiers. The software and functionality is identical for both types of 3TX transmitter; the only difference is whether the sensor to interface must or must not have a preamplifier. The maximum recommended cable length for sensors with preamplifiers is 300 feet (in conduit).

Connection Diagram of ASTI Sensors WITHOUT PREAMPLFIERS (Input) to External "Mini" Conventional Preamplfier (Output) to ASTI 3TX-pH-X and 3TX-ISE-X Preamp Style Transmitters

Input from ASTI pH / ORP / ISE Sensors Without Preamp
(Inside J-Box Connections)

Output from ASTI "Mini" Conventional External Preamplfier
(Inside Transmitter Assembly Connections)



Connection from ASTI "Mini" External Conventional Preamplifier Output (Schematic on Left) to Input Terminal Block on ASTI 3TX Transmitter (Schematic on Right)

Note 1:
The temperature compensation element input shown on the far left as the input side to the "Mini" external preamp terminal 1 & 2 can be 100 or 1000 Ohm Platinum (selectable in 3TX-pH-X or 3TX-ISE-X transmitter).

Note 2:
When using the "Mini" external conventional preamplifier with the 3TX-pH-X and 3TX-ISE-X it is not necessary to interface with the output side terminal 1 (RTD Return). This is not required because the 3TX transmitters do not support 3-wire TC inputs. As such the blue terminal 2 and yellow terminal 3 output connections provide the 2-wire Pt100 or Pt1000 TC inputs.

Note 3:
When using the "Mini" external conventional preamplifier with the 3TX-pH-X and 3TX-ISE-X it is not necessary to interface with the output side terminal 8 (duplicate common/ground/reference). This is because the 3TX transmitters do not require two common input leads (as some transmitter do) but rather just a single common/ground/reference connection from terminal 4 (red color coded lead).

Note 4:
This "Mini" external conventional preamplifier can interface quite a number of additional transmitters besides the 3TX-pH-X and 3TX-ISE-X units. Please inquire to ASTI factory for wiring schematics to other transmitter types.

Note 5:
It is possible to power this "Mini" external preamplifier from a two-sided battery pack power source if it is to be mated with a pH/ORP transmitter that does not support preamplifiers. Inquire to ASTI factory this type of alternate wiring schematic.

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Ammonium (NH_4^+) Probe Two Point Calibration

This calibration method should not need to be performed frequently. All new ammonium ion selective sensors should have a 2-point calibration performed unless you wish to use the factory defined 2-point slope calibration (all new system have this done automatically). This two-point calibration determines the sensitivity or slope of each sensor, which is then stored in the analyzer. Subsequent 1-point offset calibrations can be made using only the offset option. An offset calibration must be performed after every 2-point calibration. Details for the 1-point calibration are given in the proceeding page. **THE "HOLD" FEATURE IS AUTOMATICALLY ACTIVATED EACH TIME THAT ANY 2-POINT OR 1-POINT CALIBRATION IS PERFORMED. THIS MEANS THAT THE LAST PROCESS VALUE WILL CONTINUE TO BE SENT VIA THE ANALOG 4-20 mA AND MODBUS DIGITAL OUTPUT BEFORE ENTERING THE CALIBRATION MODE. THIS IS THE DEFAULT BEHAVIOR AND CAN ONLY BE MODIFIED AT THE ASTI FACTORY IF THIS IS NOT DESIRED.**

Set-up requirements:

Two 250 mL GLASS OR PLASTIC BEAKERS

(Preferably heavy enough so that the ISE sensor does not tip over the beaker!)

Low Ammonium Standard Solution (low ppm)

High Ammonium Standard Solution (high ppm)

Parameter No. 01 is a "lock" which must be set to 'Off' to change ANY parameter, including the temperature, offset and slope calibrations.

Calibration of the ion selective sensor is done with Up/Down keys. To perform a 2-point slope calibration using the 'Mode' key select 'Offset' and adjust the reading the Up/Down keys until the display shows the correct value for the first Low ISE standard. Next use the 'Mode' key to select 'Slope' and use the Up/Down keys until the display reads the second desired value for the second High ISE standard. After this 2-point slope calibration is performed it is always necessary to perform a production 'Offset' calibration to ensure agreement with grab sample analysis (described on the following page).

The exact values for these low and high ammonium standard solutions will depend upon your exact needs. The last page of this addendum details a typical ammonium calibration standard formulation. Alternative customized recommend may be made by the ASTI factory should your application require it.

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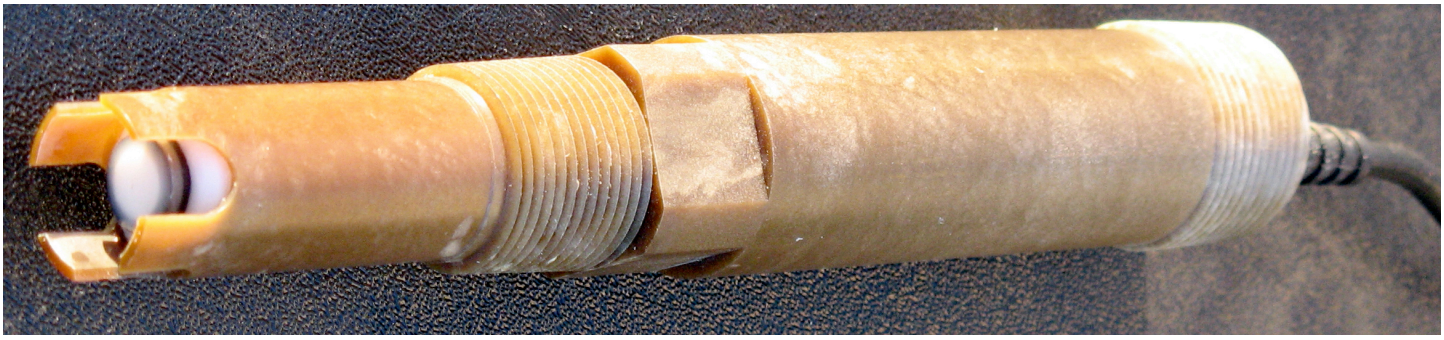
Important Notes about Calibration:

- Fill a 250 mL GLASS beaker with enough standardization solution such that the entire tip of the Ammonium sensor will be submersed
- Please read sheet on the cleaning procedure for this ion selective sensor. The cleaning procedure should usually be performed when transferring a sensor in or out of solution. Sensors can also be cleaned before being placed into different concentration standardization solutions and/or grab sample solutions. Cleaning is only required if fouling appears on the ISE membrane or on the reference junction. If no contamination is apparent, then the simple rinsing procedure can be used (see following sections for details).
- Thoroughly rinse the sensors with DI water and gently blot dry with a clean paper towel. Be careful not to scratch or damage the sensitive ammonium ion selective membrane
- Allow a minimum of 3 – 5 minutes for the sensor to stabilize once it has been removed from the process and placed into the low standard solution (low ppm).
- Allow a minimum of 3 – 5 minutes for the sensor to stabilize between the low and high Calibration Solutions (low ppm to high ppm).

YOU CAN VIEW THE SENSOR SLOPE RESULTING FROM A 2-POINT CALIBRATION WITH PARAMETER P15 AND THE SENSOR OFFSET RESULTING FROM A 2-POINT CALIBRATION WITH PARAMETER P14. IF YOU PERFORM A 1-POINT GRAB SAMPLE OFFSET SUBSEQUENTLY THE OFFSET (P14) WILL CHANGE WHEREAS THE SENSOR SLOPE (P15) WILL REMAIN FROM YOUR 2-POINT SLOPE CALIBRATION.



The ion selective sensor shown above is a representative picture for visualization purposes. Your particular sensor may appear somewhat different to that shown above for a variety of reasons

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Single Point (1-Point) Offset Calibration – Grab Sample

This is the correct method to Adjust for Sensor Drift!!

Ammonium Sensor One Point Calibration ("Production Offset")

Only use "Offset" function in Calibrate Menu.

Can be performed as frequently as may be required.

When the ammonium sensor has been calibrated by the 2-point method previously described only a "single point" grab sample offset calibration should be required thereafter. **THE "HOLD" FEATURE IS AUTOMATICALLY ACTIVATED EACH TIME THAT ANY 2-POINT OR 1-POINT CALIBRATION IS PERFORMED. THIS MEANS THAT THE LAST PROCESS VALUE WILL CONTINUE TO BE SENT VIA THE ANALOG 4-20 mA AND MODBUS DIGITAL OUTPUT BEFORE ENTERING THE CALIBRATION MODE. THIS IS THE DEFAULT BEHAVIOR AND CAN ONLY BE MODIFIED AT THE ASTI FACTORY IF THIS IS NOT DESIRED.**

Set-up requirements:

Two 250 mL GLASS OR PLASTIC BEAKERS

Process Grab Sample Solution

Parameter No. 01 is a "lock" which must be set to 'Off' to change ANY parameter, including the temperature, offset and slope calibrations.

Calibration of the ion selective sensor is done with Up/Down keys. To perform a 1-point slope calibration using the 'Mode' key select 'Offset' and adjust the reading the Up/Down keys until the display shows the correct value in accordance with the concentration determined by analysis of the grab sample. The ISE sensor should be left in service for the production 1-point 'Offset' calibration. All settings are stored in EEProm so unit can be powered down without loss of configuration or calibration.

A grab sample should be taken from the process and analyzed by an alternate method for ammonium ion concentration. There are a variety of ways to perform the grab sample analysis including the commonly employed portable photometers. In some cases where there is significant turbidity in the sample, a dilution scheme may be advisable for best results. This grab sample determined concentration of the process sample (by whatever method employed) will then be entered into the standardize menu as further described below. Using this recommended procedure, the online ammonium sensor can be standardized and be in agreement with the grab sampling method chosen without ever having to remove the sensor from process service.

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Important Note about 1-point "Standardize" Calibration:

The sensor should be left in service and obtain a stable reading with the process solution. It is not necessary in any way to remove the sensor from service to perform a 1-point grab sample offset "Standardize" calibration.

THERE IS A TIME AVERAGING (DAMPEN) FUNCTION THAT IS SET IN THE 3TX-ISE AT THE ASTI FACTORY. THIS VALUE IS CONFIGURABLE FOR BOTH THE EXTENT OF TIME AVERAGING FOR THE MEASURE AND CALIBRATE MODES SEPARATELY. IF YOU FIND THAT YOU WISH TO HAVE MORE OR LESS TIME AVERAGING THAN WHAT IS PROVIDED ON YOUR UNIT AT PRESENT, CONTACT THE FACTORY FOR ASSISTANCE WITH THIS. THESE VALUES CANNOT BE MODIFIED IN THE FIELD BUT RATHER NEED TO BE CHANGED AT THE ASTI FACTORY. THE PRESET VALUES ARE FINE FOR THE VAST MAJORITY OF USERS AND APPLICATIONS ALTHOUGH THEY CAN BE MODIFIED UPON REQUEST WITHOUT INCURRING ANY COST.

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Cleaning and Maintenance of ASTI Ammonium (NH_4^+) Probe

Before a major 2-point calibration is performed the sensor may need to be cleaned each time. The frequency of cleaning will depend on the process water and build up of process reagents on the probe tip.

Note:

Any noticeable deposits on the tip of the sensor will result in a less accurate calibration and measurement.

CLEANING:

1. Thoroughly rinse the sensor tip with DI water. Gently blot the sensor tip dry.
2. The ammonium sensor tip can be cleaned with isopropyl alcohol to remove any oily or waxy build-up. No other solvents or reagents should be used without contacting ASTI to ensure that it is suitable.
3. Scrape the entire reference area clean with a sharp blade or Stanley knife. This reference is solid-state and cannot be damaged with ordinary cleaning techniques. **Do not scratch the membrane.**
4. Once the reference junction has been cleaned the entire sensor tip can be soaked in either the low or high standardization solution. After allowing sufficient time for conditioning before proceed to perform a 2-point calibration.
5. Any calibration high standard solution can serve as conditioning solution for extended storage. Do not allow sensor to be exposed to air for prolonged periods of time as this will cause the reference junction to become dehydrated (meaning that a reconditioning period will be required to restore it to normal operation). Always store sensor in high standard solution when not in service in process. The cap should be filled with a calibration standard sealed onto sensor tip with TEFLON tape.

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Miscellaneous

The decimal place on the display with automatically move as appropriate based upon the ppm value of the sensor reading. Note that the display will always autorange from 0.00 to 9.99, 00.0 to 99.9 and 000 to 999 ppm. Your analog and digital MODbus output will, however, be defined as selected in parameter P09. This means that your output may be maxed out and not reflect the exact process reading if you selected too low a range for your output scaling in P09.

Do not to allow air bubbles to get trapped near the ammonium ion selective membrane. This is will cause erroneous readings and drift. In some cases air bubbles may become entrapped within the ISE sensor itself. A firm shake down of the sensor should alleviate any internal air bubbles and proper installation of the sensor (including having the line be completely full and degassed) will ensure that there are no air bubbles on the measuring tip. Contact ASTI factory for details regarding optimal process installation approaches.

The ammonium sensor is comprised of a high-impedance ion selective membrane system. Care should be taken not to move or touch the cable once a value is being stabilized. Touching the sensor cable can cause a noisy signal that may result in erroneous values and calibrations. For best results the sensor cable should be run in conduit. For noisy environments and/or longer cable runs a preamplifier should be employed either integral to the sensor or else an external preamplifier in a waterproof J-Box assembly. In some cases, it may be desirable to both use a preamplifier and to run the cable in conduit (for rather noisy environment or else in combination with longer cable runs, or both).

Please see the specification and hook-up schematics found in the AB 6410, AB 6410A or AB 8410 ammonium sensor shipping box. This data is included in this ISE addendum for convenience as well in case the hard copy was lost or misplaced.

Procedures for Preparation of Ammonium Standard Solutions

Materials

Ammonium Chloride - CAS # 12125-02-9 (Analytical/Reagent Grade or better, brand new sealed dry bottle preferred)
Magnesium Chloride Hexahydrate - CAS # 7791-18-6 (Commercial Grade OK)
1 Liter Volumetric Flask (minimum one each)
5 Liter Volumetric Flask (one each)
1 mL, 5 mL, 10 mL, 50 mL volumetric pippete
1 liter plastic bottles with air-tight sealing cap (5 each recommended, minimum 2 each)
DI Water (15 MegaOhms or higher resistivity grade)

- ENSURE THAT ALL GLASSWARE IS CLEAN AND DRY BEFORE PROCEEDING.
- THOROUGHLY CLEAN EACH VOLUMETRIC FLASKS AFTER PREPARING ANY SOLUTION WITH DI WATER.
- SOLUTION PREPARED FROM THIS PROCEDURE WILL STAY GOOD FOR 1 YEAR FROM DATE OF MANUFACTURE IF STORED IN AN SEALED, PLASTIC BOTTLE IN COOL, DRY LOCATION AWAYFROM LIGHT.

Stock Solution Preparation Procedures:

Preparation of 1.0 Molar Magnesium Chloride stock solution (DO THIS FIRST!):

1. Measure out 203.3 grams of magnesium chloride hexahydrate per liter of stock solution (1,016 grams per 5L).
2. Place this magnesium chloride into a 5 liter volumetric flask.
3. Dilute with DI water to 5 liter mark. Mix solution well until all magnesium chloride is dissolved.
4. Seal 5 liter volumetric flask with glass stopper.

Preparation of 10,000 ppm Ammonium stock solution:

1. Measure out 29.654 grams of ammonium chloride salt.
2. Place this ammonium ammonium into 1 liter volumetric flask.
3. Dilute with DI water to the 1 liter mark. Mix solution well until it is completely homogeneous.
4. Transfer this 10,000 ppm ammonium stock solution to a 1 liter plastic bottle and label appropriately.

Ammonium Calibration Solution Preparation Procedures:

Preparation of 1 each liter of 50 ppm Ammonium Standard Ion Solution with 1 Molar Magnesium Chloride Background

1. Draw 5.0 mL of 10,000 ppm ammonium stock solution and transfer to a 1 liter volumetric flask.
2. Dilute with 1.0 Molar magnesium chloride stock solution to the 1 liter mark. Mix solution well until it is completely homogeneous.
3. Transfer this 50 ppm ammonium calibration solution to a 1 liter plastic bottle and label appropriately.

Preparation of 1 each liter of of 500 ppm Ammonium Standard Ion Solution with 1 Molar Magnesium Chloride Background

4. Draw 50.0 mL of 10,000 ppm ammonium stock solution and transfer to a 1 liter volumetric flask.
5. Dilute with 1.0 Molar magnesium chloride stock solution to the 1 liter mark. Mix solution well until it is completely homogeneous.
6. Transfer this 500 ppm ammonium calibration solution to a 1 liter plastic bottle and label appropriately.