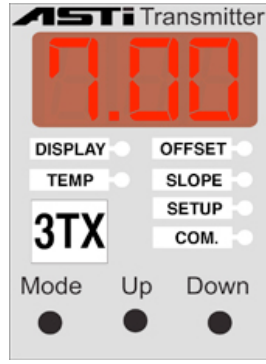# pH, ORP, Ion Selective (ISE), Conductivity & Dissolved Oxygen (DO) Inline Field Analyzers, Controllers & Transmitters

ASTI 3TX-HiQ Smart Digital Control Systems for Measurement of pH, ORP & Temperature Parameters

See Pages 2 to 17

ASTI Model 3TX Modular pH, ORP, ISE, DO & Conductivity Transmitters & Controllers with Datalogging

See Pages 18 to 25

Rosemount 56 Advanced Single or Dual Channel pH, ORP & Conductivity Analyzer, Transmitter & Controller

See Pages 29 to 30

ASTI Model 2TX Isolated 2-Wire Loop-Powered pH & ORP Transmitter

See Page 26

Rosemount 1056 Single or Dual Channel pH, ORP & Conductivity Analyzer, Transmitter & Controller

See Pages 31 to 32

Rosemount 1057 Single, Dual or Triple Channel pH, ORP & Conductivity Analyzer, Transmitter & Controller

See Pages 33 to 34

ASTI Model 4TX 4-wire AC Line Powered pH & ORP Meter, Analyzer & Programmable Controller

Page 27 + 28 (Comparison Chart)

Rosemount 1066 Two-Wire Loop-Powered pH/ORP & Conductivity Analyzer with HART & FieldBus

See Pages 35 to 36

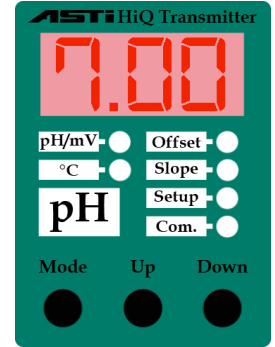Rosemount Explosion-Proof 5081 HART & FieldBus Transmitter & Analyzer for use in even the most hazardous areas

See Page 37 + 38 (Comparison Chart)

3TX-HiQ Digital Measurement System

Superior & Cost-Effective Monitoring, Control & Datalogging in Process

pH, ORP & Temperature Parameters

- *Simplify commissioning & maintenance with smart digital plug & play sensors & intelligent transmitters*

- *Available for both continuous measurements & portable intermittent use*

- *Lowest startup and ongoing cost of ownership of any digital measurement platform*

- *Proprietary solid-state reference system for long-life & low-maintenance*

- *Suitable for abrasive slurries, solvents and high pressures & temperatures*

- *Sensors are built-to-order allowing for extensive customization*

- *Robust industrial construction handles the most difficult severe service measurements*

- *Inline, immersion, submersible, sanitary & HOT-TAP valve retractable style process installations supported*

3TX-4MW-3EA-HiQ-pH-PS Triple Channel Intelligent Transmitter Assembly with snap panel connectors & Smart Digital ZEUS™ pH Sensor

HiQ Smart Digital pH & ORP Measurement System Feature Summary:

- **Smart Digital IOTRON**TM **pH Sensors & ORP Sensors for Intelligent 3TX-HiQ-pH pH & ORP Transmitters are the most cost-effective & rugged industrial smart digital pH & ORP measurement system available.**

- **Intelligent management of calibrations with true plug and play digital sensors. Calibrate anywhere and hot-swap interchange the sensor in and out of field service with rugged industrial NEMA 6P snap connector.**

- **Calibration values are automatically loaded when Smart Digital IOTRON**TM **pH Sensors & ORP Sensors are connected to Intelligent 3TX-HiQ-pH Transmitter. No user action of any kind nor any contact with the transmitter is required for exchange of a sensor. In this way sensors can be removed and installed between different transmitters at will as may be desired.**

- **Intelligent installation management:**

  o **Create and upload complete transmitter configuration to smart digital sensor or download complete transmitter configuration from smart digital sensor to transmitter. Shadow copy allows for easy reverting to previous configuration.**

- **Optimized commissioning & maintenance:**

  o **Track smart digital sensor initial installation & last used in field dates plus total service time usage. Tracking of this information over the course of time allows for an optimization of stocking levels to further reduce the cost of ownership.**

- **All aspects of installation are completely portable from the shop to the field.**

- **3TX-HiQ intelligent transmitters for smart digital sensors are identical form factor to the 3TX transmitters for analog sensors for seamless integration of both digital & analog sensors & transmitters.**

- **For measurement with analog Conductivity, Ion Selective (ISE) or Dissolved Oxygen (DO) sensors and shared 3TX module documentation visit the 3TX webpage**

- **Review the 3TX FAQ before commissioning any system to ensure proper installation.**

Complete digital HiQ measurement system installation guide with hook-up schematics can be found at the end of this printer friendly PDF document.

SENSOR CALIBRATION FEATURES & INSTALLATION MANAGEMENT

- Calibration data is stored on smart digital sensor. Calibrate in the lab or instrument shop & snap pre-calibrated sensor into process use. Plug & play sensors can be swapped in and out at will.

- No contact with transmitter of any kind is required for an operator to change out a sensor.

  o Calibration values automatically loaded from digital sensor to 3TX-HiQ-pH transmitter. Install & swap out for cleaning, re-calibration or replacement is quick, easy & simple.

- Smart digital sensors come standard with 6 meters (20 feet) cable with rugged NEMA 6P & IP67 rated quick disconnect waterproof & corrosion-resistant snap connector. No screwdrivers are ever needed.

- Total cable length up to 610 meters (2,000 feet) using extension cables with mating rugged NEMA 6P & IP67 quick disconnect waterproof & corrosion-resistant snap connector terminations.

- Automatic pH calibration recognizes 4.00, 6.86, 7.00, 9.18 & 10.00 pH buffers for 1-point, 2-point and 3-point calibrations with built-in correction for temperature induced changes to pH buffers (see below):
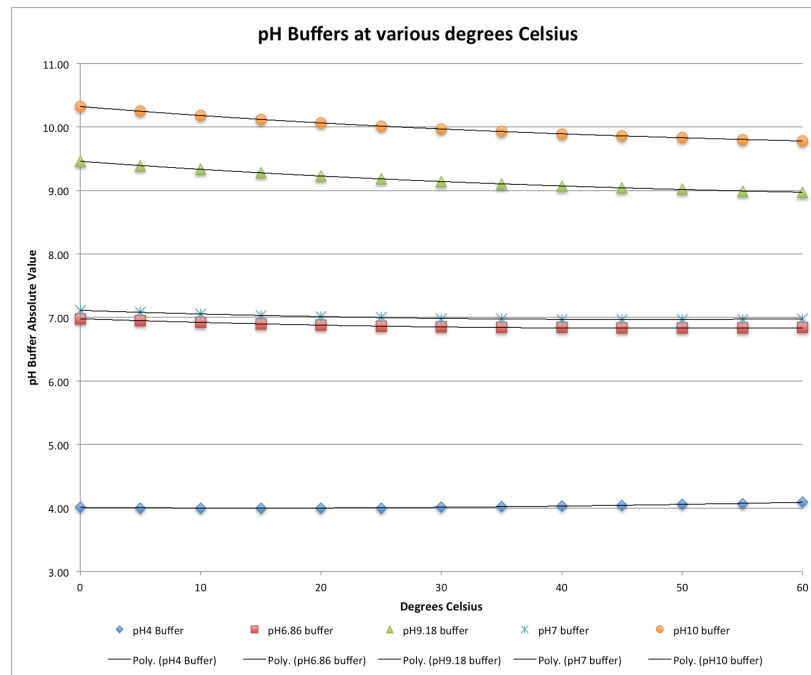

- Manual pH calibration allows offset & slope adjustment to any pH buffer or grab sample reference value

- Display previous five calibration sets on transmitter & the date that correspond to each one. Historical & current calibrations can be viewed and saved to track calibrations through sensor lifecycle.

- Total time in field service use is logged on sensor for systematic tracking of complete sensor life cycle to allow for best practice installation, maintenance and inventory/stocking management

- Min and max temperatures in use digitally stamped on sensor for process condition tracking

- Calibrate the smart digital sensor on Windows software as well as on 3TX-HiQ-pH transmitter

- Calibration values can be hard reset back to the ASTI factory defaults (configuration unchanged)

TRANSMITTER CONFIGURATION MANAGEMENT FEATURES

3TX-4MW-3EA-HiQ-pH-PS Triple Channel Intelligent Transmitter Assembly with 4 each HiQ4F female snap panel connectors for quick disconnect smart digital HiQ4M snap connector sensor inputs
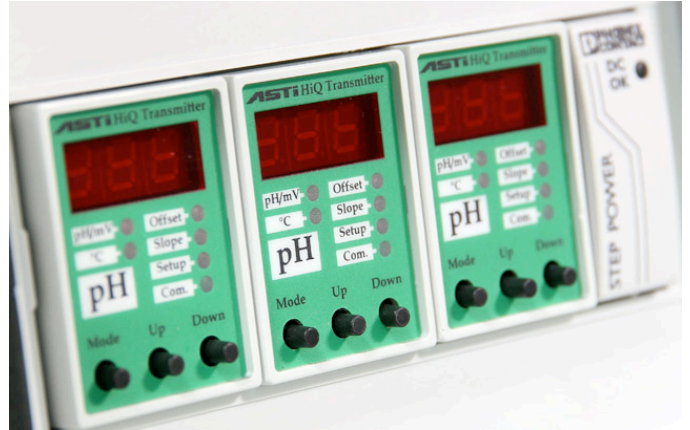
Detail of 3TX-HiQ-pH Intelligent Digital pH/ORP transmitters. All functionality accomplished by the 'Mode', 'Up' or 'Down' buttons.

- The HiQ configuration system features are available by pairing the smart digital HiQ sensor with the intelligent 3TX-HiQ transmitter, selecting the desired parameter settings and saving this configuration to a Windows file or else invoking a shadow copy on the 3TX-HiQ transmitter.

- The HiQ configuration system provides systematic & advanced management of the your field installations without the high cost and complexity of the HART®, Profibus or FOUNDATION™ fieldbus digital protocols.

  o The HiQ configuration system allows for very detailed tracking of both the current and previous complete transmitter configuration for each installation point in a simple and low-cost manner.

- Transmitter configuration on 3TX-HiQ can be downloaded to the smart digital sensor as a backup or else to be uploaded directly onto other 3TX-HiQ transmitters to clone configurations

- Configuration on the smart digital sensor can be saved as a file when used with the supplied Windows software for backup, archiving or tracking the configurations at each installation site

- Configurations saved to file can be directly loaded to smart digital sensor. Configurations loaded to sensor can in turn be loaded onto any 3TX-HiQ transmitter to which it is connected.

- The 3TX-HiQ transmitter can create a restore point backup of the exact current working configuration. The 3TX-HiQ can be reverted back to this restore point configuration at any time.

- The 3TX-HiQ transmitter configuration can be hard reset back to the ASTI factory defaults

Complete digital 3TX-HiQ intelligent transmitter manual & user guide can be found in a subsequent portion of this printer friendly PDF document.

OVERALL 3TX-HiQ-pH MEASUREMENT SYSTEM FUNCTIONALITY

- One pH/ORP transmitter for all your needs: -2 to +16 pH range services all possible pH installs. The -1,000 to +1,000 mV ORP range services nearly all possible practical field ORP applications.

- Analog 0-20mA or 4-20mA output can be scaled to 1pH to get an effective output resolution of 0.001pH units or else down to 100mV to get a net output resolution of 0.1mV for any part of the ORP range.

- The RS-485 MODbus RTU output mode can be set to achieve a 0.001pH or 0.1mV resolution for best precision or set to a lower 0.01pH and 1mV resolution mode to achieve compatibility with the 3TX-DAT MODbus field datalogger or else if the higher resolution mode is simply not desired

- 3TX-HiQ-pH transmitter comes standard with both scalable analog 0-20mA or 4-20mA to support legacy control systems & RS-485 MODBUS for use with more modern digital control systems.

- Commissioning new field installations using RS-485 MODBUS RTU digital output is as simple as daisy-chain wiring together all installed 3TX-HiQ transmitters and assigning the node address for each module.

  o The MODBUS protocol allows for the flexibility to add or remove nodes at will and avoid any potential ground loops issues.

- Analog output is galvanically isolated from the sensor input, scalable linear and fully reversible.

- User adjustable temperature compensation coefficient for special sensors & critical applications.

- Automatic temperature compensation (ATC) from -40 to +210°C ensures accurate pH readings.

- **Analog and digital outputs are placed on hold automatically when in calibration mode**. When calibration mode is entered, the last value from measurement mode will be held for both the 4-20mA analog output as well as the MODbus output.

- Active 4-20mA can support remote external displays to allow for viewing measured values in control panels, secondary field locations, or instrumentation shops.

  o It is possible to connect a single 4-20mA output to multiple devices since it is a powered active current loop output. The details are provided as detailed in **this drawing**

- Although all of the 3TX transmitters are 3-wire devices they can also be powered with installations that are designed for 2-wire loop-powered devices. An example of this wiring approach can be found by using the following **2-wire to 3-wire installation scheme**. Please review the **3TX FAQ** for the typical 3-wire power and output installation scheme for the 3TX modules.

SMART DIGITAL SENSORS FOR 3TX-HiQ-pH INTELLIGENT TRANSMITTER

Selected smart digital pH sensors with low-profile break-resistant parabolic pH glass elements for use in slurry & abrasive process solutions

- Entire line of proven built-to-order customizable application specific Iotron™ inline, immersion, submersible, twist lock, sanitary, HOT-TAP retractable pH & ORP sensors can be viewed from the **pH Sensors & ORP sensors overview webpage**. ALL of these sensors are available for use with 3TX-HiQ-pH transmitter.

- Ultra-Rugged Industrial Grade Construction **ZEUS™ SMART DIGITAL pH SENSORS** are ideal choice for Tough Process Inline, Immersion or Submersible installations. Suitable for measurements with high temperatures & high pressures, dissolved ammonia, chlorine, sulfides & solvents and many other aggressive conditions such as abrasive slurries and high flow velocity.

Dimensional Drawing for ZEUS™ Smart Digital pH Sensors for Inline, Immersion & Submersion Industrial Process Installations for use with 3TX-HiQ-pH Intelligent Digital Transmitter
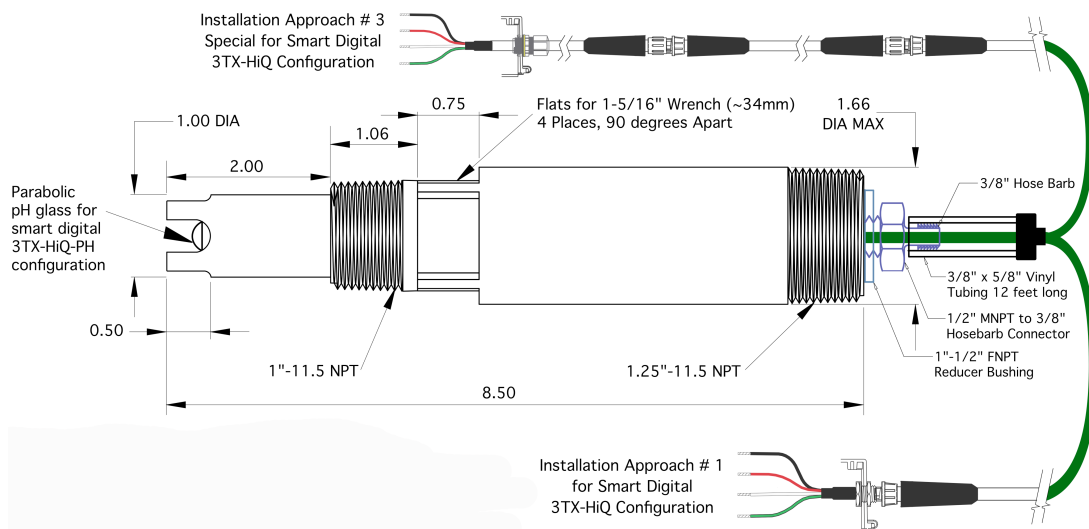
- o The **ZEUS™ SMART DIGITAL pH SENSORS are typically in stock or available on a short lead time** to solve your most difficult and severe service pH measurement application promptly. The complete specification sheet and installation guide can be downloaded here >> **Item # 1205 ZEUS™ SMART DIGITAL pH SENSOR**.

- The unique rugged **low-profile impact & break resistant parabolic pH glass** element optimized for use in slurries & high viscosity applications (X3XX series) is available as a smart digital sensor

- The novel **extreme dehydration resistant style reference technology** that allows for prolonged exposure to dry conditions and intermittent wet & dry use also available as smart digital sensor

WHAT ARE THE BENEFITS OF USING IOTRON™ SMART DIGITAL SENSORS?

- 100% pure digital communications means reliable operation even in noisy process environments.

- No degradation in signal even with very long cable runs up to max of 610 meters (2,000 feet)

- Bridging connections & modifying installations is easy and done without loss of signal quality with NEMA 6P & IP67 quick disconnect waterproof and corrosion-resistant snap connectors.

- Low-cost snap digital extension cables facilitate consolidation of transmitters into a single panel enclosure where very many remote field installations can all be conveniently all viewed at once.

- Smart 3TX-HiQ software identifies the type of sensor connected to confirm it is compatible for the mating transmitter. There exists no possibility of ever interfacing the wrong sensor type.

- 3TX-HiQ-pH smart configuration feature automatically recognizes & differentiates between pH & ORP sensors. The relevant settings are automatically adjusted if existing setup is incompatible.

- Input terminal wiring identical for all smart digital 3TX-HiQ measurement modules. Smart sensors have exactly the same color coding & wiring to input terminals on 3TX-HiQ transmitters.

- All Extension cables for HiQ sensors are intercompatible. Uniform extension cables minimize stocking. Field installation guide details options to commission & exchange sensors in the field.

SENSOR & INSTALLATION TRACKING FEATURES

- Digital date stamping of dispatch from factory, initial field installation & final field service use

- Digital stamping of serial number & item number for each smart digital HiQ style sensor

TURN-KEY PLUG & PLAY SMART DIGITAL pH DATALOGGING SYSTEM

IOTRON™ Smart Digital pH Sensor & 3TX-HiQ-pH Intelligent Digital pH Transmitter with MODBUS 3TX-DAT Field Datalogger with quick disconnect snap RS-232 to USB download cable in 3MF NEMA 4X Rated Enclosure with 2 each HiQ4FP panel snap connectors for HiQ4M inputs 3TX-3MF-2H-HiQ-pH-DAT-PS assembly as shown above ready for wall/plate installation or 2" NPT pipe mounting with optional kit (not shown)

TURN-KEY PLUG & PLAY SMART DIGITAL pH DATALOGGING SYSTEM CONT'D

PNXGR 8052-HiQ IOTRON™ Smart Digital Twist Lock Quick Disconnect Bayonet Style Inline pH Sensor with HiQ4M snap connector
3TX-2M-1H-HiQ-pH-PS Intelligent Digital Transmitter with HiQ4FP panel mount connectors for HiQ4M snap input
Datalogging on Windows PC using RS-485 to USB converter from MODBUS RTU from 3TX-HiQ-pH (100 feet twisted-pair cable shown)
IP65 Rated Enclosure complete with universal 100-240 VAC line powered operation ready for immediate commissioning
3TX-2M-1H-HiQ-pH-PS ready for wall/plate installation or 2" NPT pipe mounting with optional kit

*Plug & Play Submersible pH & ORP Measurement System for Intermittent Battery-Powered Operation at Remote Installs is **Case Study # 22***
PNXGRE 5631/5331-HiQ-12m-WPB/20 IOTRON™ Smart Digital Submersible pH Sensor for Intermittent Wet & Dry Use & Hot-Swap Exchange
3TX-7MF-3H-2EA-HiQ-pH-DAT-Q2FP-UPT Intelligent Digital pH & ORP Measurement & Datalogging System for Smart Digital pH/ORP Sensors
***Ultralow-Power-Timer (UPT) switch** uses just 0.4mA @ 24VDC to allow for very long intermittent operation from Sealed Lead Acid (SLA) Batteries*
Logged pH, ORP & temperature data downloaded & visualized on Windows PC via RS-232 to USB snap plug & play cable to 3TX-DAT Datalogger
NEMA 4X Rated Field Enclosure System with all NEMA 6P rated snap connections is ready for immediate commissioning
7MF-24VDC-2EA-12AH-SLA-Q2FP Hot-Swappable 24VDC battery power supply with Q2M-Xm-Q2M snap disconnect power cable &
3TX-7MF-3H-2EA-HiQ-pH-DAT-Q2FP-UPT Measurement & Datalogging System Ready for wall/plate install or 2" NPT pipe mount with kit

SELECTED PHOTOS OF IOTRON™ SMART DIGITAL SENSORS

5X31 Sanitary Series smart digital pH sensor with WPIT sealing option

6X31 series submersible pH sensor with WPH sealing option

PNXGR 8052-HiQ Twist Lock smart digital pH sensor with 4 ea tines

PNGRO 6011-HiQ 3/4"-3/4" Inline/Immersion smart digital pH sensor with "GRO" 2 each protective tines

*Standard grommet seal provided for all sensors if no waterproofing option is invoked. For outdoor use or indoor use with wet environments (washdowns) or fully submersible installs see the **waterproofing options***

PNTJ 6831/6631-HiQ Sulfide Resistant Smart Digital ORP Sensor

HiQ4F female snap & HiQ4M male snap connector for digital sensors

Snap to Snap extension cable for smart digital HiQ sensors

PN 6053-HiQ General Purpose Smart Digital pH Sensor

WINDOWS SOFTWARE FOR CALIBRATION & CONFIGURATION OF SMART DIGITAL pH & ORP SENSORS FOR 3TX-HiQ-pH TRANSMITTERS

Portability HiQ to Windows Bridge Box Assembly (Item # 14099) with Smart Digital ZEUS™ pH sensor (Item # 1205) & USB Male "A" to Q6M cable. Ready for use as a field calibrator of smart digital sensors with Windows PC or tablet.

Portable HiQ to Windows Bridge Box with industrial RS-485 to USB converter. Top angle view showing rugged carrying handle & rubber feet. Sealing caps ensure NEMA4X rating when sensor input and USB output ports are not in use.

- HiQ Windows software is provided with a free of charge perpetual software zero cost license. Only a suitable RS-485 to USB converter assembly is required to use the Windows software. ASTI offers a field ready NEMA4X **Windows Interface Bridge Box for Smart Digital HiQ Sensors** to enable turn-key out of the box use of this HiQ Windows software.

- HiQ Windows software provides convenient testing and calibration of plug and play smart digital sensor and creating complete 3TX-HiQ transmitter configuration which can be saved to file as well as to additional HiQ smart digital sensors. This can be done at field installation points throughout the plant from anywhere that a laptop, desktop or tablet with a USB connection is available.

- Windows software is not required for any feature of the 3TX-HiQ intelligent transmitter and smart digital sensor measurement platform but rather available for those that prefer to calibrate the sensor and configure the transmitter with this option.

- Calibrate the smart digital sensors:

  o All sensors can be offset calibrated for temperature.

  o The HiQ smart digital pH sensors can accept 1-point (offset), 2-point (slope) as well as a 3-point calibration that results in a dual slope scheme whereby you can a separate operating slope for acidic and alkaline measurement ranges.

    ▪ The autoread mode ensures a systematic result no matter which operator does the pH calibration for the sensor.

  o ORP sensor can be offset for the mV value to create a calibrated relative mV (RmV) for use as a process control setpoint.

- The complete sensor status can be viewed. The stats window allows for following information:

  o Permanent values such as the sensor item number, invoice number & dispatch date from ASTI factory, sensor serial number, sensor type, sensor board software revision and first installation date in field (activation).

  o Dynamic information gives "snapshot" of the current sensor status such as last five calibration values for temperature, offset and slope(s) as well as the last date used, the total time in field service and the highest and lowest temperature.

- HiQ Windows software acts as a pH & ORP measurement device without 3TX-HiQ-pH transmitter functioning equivalent to a laboratory pH or ORP meter displaying calibrated pH, relative mV (ORP) and temperature from the connected digital HiQ sensor.

  o To record the values obtained from your measurements use the MODBUS output from 3TX-HiQ-pH with the free of charge ASTI Windows datalogging and graphing software for 3TX transmitters with MODBUS output.

TYPICAL FIELD COMMISSIONING SCHEME FOR 3TX-HiQ DIGITAL SYSTEMS

"LUNCHBOX" portable assembly with 6700mAH rated LiPo battery with Smart Digital ZEUS™ pH sensor interfaced via HiQ4FP female panel connector to mate with HiQ4M male sensor snap connector. Ready or use as a field calibrator of smart digital pH/ORP sensors for 3TX-HiQ digital transmitters or intermittent spot grab sample measurements in process in configuration shown above. Install protective caps when port is not in use to ensure NEMA 4X rating of assembly.

Side angle view showing rugged carrying handle & rubber feet installed for ease of portability. Measuring 3TX module installed can be swapped as desired from 35mm DIN-RAIL hardware. Protective caps are supplied to seal all ports not actively in use to maintain NEMA 4X rating. 3350mAH @ 5VDC rated lithium polymer (LiPo) battery shown installed for ~4.5 hours runtime. Optional larger 6700mAH @ 5VDC LiPo battery pack (shown to left) will allow ~9 hours runtime.

- Calibrate smart digital HiQ sensor with Windows software or spare 3TX-HiQ transmitter. Use of HiQ Windows setup & calibration software requires optional ASTI supplied HiQ to Windows bridge box assembly (see previous page for details).

    o The values from the calibrations performed with the Windows software will not be written to the calibration history for a brand new out of box HiQ digital sensor but can be viewed in the calibrate Window.

        ▪ Calibration values will only be written to the history after the sensor is field activated (see below).

        ▪ If you wish to simply test the functionality of your new-in-box smart digital 3TX-HIQ sensor without setting the initial field installation date only the Windows software can allow you accomplish this goal.

    o Initial calibration and transmitter configuration can be performed between 3TX-HiQ transmitter and HiQ sensor instead of Windows software. When 3TX-HiQ transmitters are used for first calibration & configuration setup the initial field installation (activation) date will be stamped. If first calibration & configuration is done with Windows software the initial installation date is not stamped. First calibration with Windows software is not added to calibration history.

- Setup the 3TX-HiQ transmitter configuration as is desired for the planned installation point with the Windows software or spare 3TX-HiQ transmitter. Using the Windows software to create the configuration allows for it to be saved on the PC with a logical filename should it need to be loaded onto a new sensor in the future or else to keep track of changes to the transmitter configuration over time for the given installation point. If multiple installations will use exactly the same transmitter configuration this same file can be loaded onto multiple sensors. This task of loading the same configuration onto multiple smart digital sensors can also be accomplished via the 3TX-HiQ Intelligent transmitter using the appropriate parameter call.

- Connect the HiQ smart digital sensor that was previously calibrated with the Windows software to the 3TX-HiQ transmitter. The calibration values will be automatically loaded and the values displayed in the measurement mode will reflect the process parameter and temperature including this previous calibration done with the Windows software. At this moment the initial installation field is stamped onto the sensor as the activation date. After this moment, the last date in field service will also be stamped whenever this sensor is connected to any intelligent HiQ digital transmitter.

- Load the configuration saved onto the smart digital HiQ sensor onto the 3TX-HiQ transmitter (see transmitter manual for details).

- Calibrations performed with 3TX-HiQ-pH transmitter or HiQ Windows software are recorded to calibration history after sensor activation. It is not relevant whether subsequent calibrations are performed with the 3TX-HiQ-pH transmitter in field installation or a separate 3TX-HiQ-pH transmitter in the shop or using a portable battery-powered LUNCHBOX or CARRY-ON assembly.

TYPICAL OPTIMIZED ONGOING MAINTENANCE SCHEME & WORKFLOW FOR HiQ SMART DIGITAL MEAUSREMENT SYSTEMS

- One of the core advantages of the smart digital HiQ platform is the availability to calibrate in one location and to install the sensor into another location. The calibration values saved on the sensor are automatically loaded to the 3TX-HiQ intelligent transmitter after the sensor is interfaced with the NEMA 6P rated field snap connector without any user action of any kind meaning for a true plug and play hot-swap ability between any sensor and transmitter.

  o The choice of where to perform the calibration is a matter of what is best for your particular facility and operational setup. In order to avoid downtime while the calibrations are performed, at least one spare HiQ digital sensor is required. If a spare HiQ sensor was not purchased as a part of the initial commissioning it is recommended to purchase one for ongoing maintenance best practice.

- There are three convenient options to perform the calibration of the HiQ digital sensor and modify the transmitter configuration after the initial field commissioning aside from using the field installed 3TX-HiQ transmitter to which the HiQ sensor is installed for continuous inline service. All are functionally equivalent and the choice of which approach is employed need only be selected based upon what best suits your needs. The three possibilities are:

  o Use a spare 3TX-HiQ transmitter assembly. The unit employed can be identical to the field commissioned package so that this spare 3TX-HiQ transmitter assembly can serve both for purposes of calibration as well as a backup in case the field unit(s) are damaged due to some unforeseen incident.

  o Use a portable LUNCHBOX or CARRYON assembly with a 3TX-HiQ transmitter installed. The primary advantage here is that such a portable unit is battery powered (either from a 9V or a 5V USB rechargeable cell) and so the calibration can be done in any location whether line power is available or not. This portable assembly can also serve to spot check process measurement values as well as performing recalibration for the field installed sensors.

  o Use the HiQ Windows software. This can be done in the lab with a desktop PC and also in the field if the HiQ to Windows bridge box is purchased with the portability package and a laptop computer is employed.

    ▪ Note that when calibrating a sensor new out of box only the Windows software will not stamp the sensor with the initial installation field activation date nor the last date in service.

    ▪ If you simply wish to spot-check any sensor in stock then the Windows approach is the best choice as it will not stamp/update either the field activation (first date in use) nor the last date field in field service dates.

- While calibration values from any of the three choices detailed above will automatically be loaded onto the field installed inline 3TX-HiQ transmitter in contrast any change in the transmitter configuration requires an affirmative user action (see 3TX-HiQ or HiQ Windows manual for more details about this aspect). This requirement for an affirmative user action to make any change to the transmitter configuration is done to prevent accidental crossing of transmitter configuration for different installation points.

  o Since transmitter configurations are NOT automatically loaded from the HiQ sensors (but rather only the calibration are automatically loaded) this design scheme allows for the HiQ sensors to be seamlessly hot-swapped between installations that may have different transmitter configuration but use the same type of smart digital sensor model.

- It is best practice to save any modifications to the transmitter configuration for a given installation point as a new filename from the HiQ Windows software for archival tracking of transmitter configurations as well as to allowing to revert to a previous setup if desired.

All modules in the 3TX series share these features and options:

- **Easy-to-read displays**: Bright three-digit LED displays are visible even in bright sunlight and do not suffer from the common problems associated with LCD displays, such as environmental fatigue and wear.

- **Easy to use**: Simple & intuitive three-button operation. No complex codes to memorize for day-to-day tasks.

- **Easy installation**: Enclosures are customized for your modules and arrive ready for field mounting on any wall with no additional specialized hardware required. Modules are also available individually in a small, 35mm DIN-rail mountable form factor for direct integration into OEM equipment.

- **Galvanic isolation** between all inputs, power & analog output (3000V rating)

- **Weatherproof**: NEMA 4X CSA/UL rated & IP65 enclosures include high quality sealing cable glands (a.k.a. strain relief) that are ideal for weatherproof sealing on sensor, power, and output cables. Waterproof caps are also provided at no additional cost for all cable glands to seal and weatherproof any channels that will not be used.

- **Certifications**: CE marked for use in safe, non-hazardous areas.

- **Security**: Optional lock available for enclosure assembly to restrict access to selected keyholders.

- **Power supply options**: Choose our CSA/UL/CE approved universal 100 to 240 VAC 50/60 Hz power supply module for line powered operation, or you may use any module with a 3-wire 24VDC powered operation if you already have a dedicated 24VDC power supply (i.e. not shared with other equipment) available onsite.

- **Battery powered options**: **Portable 3TX Transmitter Assemblies** are field ready for Temporary Installations, Troubleshooting and Grab Sample Analysis of pH, OPP, Ion Selective (ISE), Conductivity & Dissolved Oxygen (DO) parameters of process samples using industrial analog and digital sensors. The 3TX portable assemblies employ the **3TX-PS/BAT module** that provides dual isolated and regulated 24VDC power to energize the 3TX transmitters from 5V, 6V or 9V rechargeable or non-rechargeable batteries. Portable assemblies can be converted to permanent continuous inline measurement systems for going from proof of feasibility to closed-loop control.

  o The 3TX portable assemblies are ideal for applications where power is either unstable/unreliable or else when no AC or DC power source is available at all. All portable 3TX assemblies can be converted for use as permanent installations since the enclosure and all employed fittings are NEMA4X rated.

- **Option to customize default values for 3TX transmitters for use with analog sensors**: Each module can be preset with your own preferred defaults for all user parameters at no additional cost (minimum order quantities may apply). This allows for your own customized transmitter configuration to be restored in the field using the reset all parameters function that is implemented on all 3TX modules.

- **1/2-DIN Panel & Pipe mounting option:** A universal two-inch (2") NPT pipe mounting kit is available for all 3TX enclosure options. The 3MP enclosure can be installed into any standard ½-DIN panel cutout. All enclosures are ready for wall mounting standard without any additional special hardware.

Download the **common mechanical, electrical and dimensional details for all 3TX transmitter supplied in the base 35mm DIN-RAIL configuration**

Download the **dimensional drawings for the weatherproof 2M, 4M & 6M IP65 enclosures and pipe mounting kit**

Download the **dimensional drawings for the NEMA 4X CSA/UL listed 3MP 1/2-DIN panel mounting enclosure assembly**

Download the **dimensional drawings for the NEMA 4X CSA/UL listed 3MF field wall & pipe mounting enclosure assembly**

Download the **dimensional drawings for the NEMA 4X CSA/UL listed 7MF field wall & pipe mounting enclosure assembly**

The modular components of the 3TX series provide the flexibility to meet your application needs in a cost-effective way:

- **Custom configurations** offer the freedom to only pay for the specific modules you need

- **Select any combination of measurements** that you need: pH, ORP, dissolved oxygen (DO), conductivity, ion selective (ISE) and temperature. The pH and ORP measurement can be accomplished either via digital or analog sensors. The ion selective (ISE), dissolved oxygen (DO) and conductivity measurements must be accomplished by means of an analog sensor.

- **Select the number of measurement channels** in the field assembly, from a single up to nine (9) channels

- Enjoy the flexibility to **add measurement and/or complementary modules after commissioning** using the original analyzer assembly (assuming sufficient room exists for the expansion in the selected enclosure).

  o Measurement modules can be added for inline measurement of the pH/ORP parameters using the 3TX-pH for analog sensors and the 3TX-HiQ-pH for digital sensors

  o Measurement modules can be added for inline measurement of ion selective (3TX-ISE), dissolved oxygen (3TX-DO) and conductivity (3TX-CON) parameters for use with analog sensors.

  o In addition the 3TX-HiQ intelligent digital transmitters can be interfaced with complementary modules such as programmable alarm/relay controllers (3TX-REL), MODBUS dataloggers (3TX-DAT) and pH compensation for ISE modules including MODbus converter for all inputs (3TX-TOT).

Control Module (3TX-REL)

- Each 3TX-REL module has 2 each independent Single-Pole Single-Throw (SPST) 5 Amp contact relays.

- Each relay is fully configurable by the user as to control mode and variables for each control algorithm.

- Tight integration between 3TX alarm & relay controller and 3TX measurement modules software makes configuration and scaling simple & easy for any local control requirements of the pH, ORP, ion selective (ISE), dissolved oxygen (DO) or conductivity parameters. Find below a very useful configuration guide for setup of the REL module with any of the 3TX measurement modules:

  o Download the **3TX-REL analog input configuration guide (R10 or later software versions)**

- The 3TX-REL alarm and relay controller module includes both basic and more sophisticated controlling options, including all of the following modes:

  o 1) A simple supervision option for alarm functionality only;

  o 2) An On/Off control with a user-configurable deadband (a.k.a. hysteresis);

  o 3) Time proportional control (TPC); and,

  o 4) Proportional frequency control (PFC, a.k.a. variable pulse controller).

Download **alternate wiring schematic for 3TX-REL module** when analog output from 3TX-HiQ-pH, 3TX-pH, 3TX-ISE, 3TX-DO or 3TX-CON measurement transmitter is to be connected to other data acquisition or control device prior to connection with 3TX-REL alarm/relay module. Standard wiring for when the analog output from measurement transmitter is connected directly to the 3TX-REL is contained in the respective measurement module specification sheet.

Datalogging Options for MODbus output from 3TX-HiQ Digital Transmitters

1) You may **use a free of charge optional Windows PC software interface kit to the MODbus digital output**. This allows for real time display of all values for all transmitters that are wired to that MODbus line. In addition, the software kit allows for datalogging for all transmitters connected on the line, including both the scaled output value and temperature for each measurement module. Up to 247 devices can be supported on a single MODbus digital line (2-wire cable), and long cable length can be supported for field installations up to 6500 feet (1.23 miles or 1.98 kilometers) to make viewing in the instrument shop practical and easy.

Find below a link to the installation and user manual for the **free of charge Windows PC datalogging and graphing software** described above for use with 3TX transmitters with the optional MODbus RS-485 digital output (Revision 2.4.2):

- o **Manual for ASTI Windows Datalogging and Graphing Software for 3TX Transmitters with MODbus**

2) Alternatively, you may **add a 3TX-DAT field datalogging module**. The 3TX-DAT module allows for datalogging of up to 63 each MODbus digital inputs from any mix of digital 3TX-HiQ and analog 3TX-pH, 3TX-ISE, 3TX-CON, 3TX-DO and 3TX-TOT modules as input nodes . The sampling rate is fully configurable from once per second to once per hour, although all nodes must have the same sampling rate. With 8MB onboard flash memory standard there is a quite extensive datalogging capacity. Configuration of the 3TX-DAT is accomplished via the free of charge Windows datalogging and graphing software for 3TX transmitters with MODbus and uploaded & downloaded using the separate Windows software for 3TX-DAT. The 3TX-DAT unit can be supplied pre-configured from the ASTI factory upon request without additional charge. The logged data is downloaded to a PC or tablet for further workup, with graphing and analysis also via the Windows software. The 3TX-DAT can be added at any time after commissioning if datalogging should become a requirement provided that the mating measurement module(s) have the MODbus output option and sufficient room has been left in the ASTI supplied or customer provided enclosure assembly.

Find below a link to the installation and user manual for the **free of charge Windows PC DAT Configuration & Download software** described above for use with 3TX transmitters with the optional MODbus RS-485 digital output together with the DAT logging module (Revision 1.5):
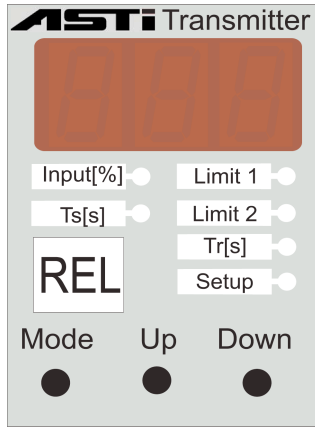
- o **Manual for Windows Software to Configuration & Download logged data from 3TX-DAT Module**

3TX-TOT pH Compensation Module to Compute Total ISE

- 3TX-TOT module computes the total ISE. For example, this module can compute total ammonia, total fluoride and total cyanide.

- The module computes the total ISE using three inputs: 1) the free ion activity; 2) the pH; and, 3) the temperature. These three input parameters are provided by the analog output from the respective measurement modules.

- A scalable 4-20mA analog signal is available to output the computed total ISE to PLC or other data acquisition equipment.

- MODbus output is standard: All input and output data can be sent via RS-485 MODbus RTU from the 3TX-TOT module.

- Links below provide examples for visualization of weak base and weak acid species where the total ISE can be determined:

  - o **Total Ammonia** (NH3-N, or total ammonia as nitrogen)

  - o **Total Fluoride** (Total HF, or unreacted fluoride) or **Total Cyanide** (Total HCN, or unreacted cyanide)

- Find below a link to the technical document that summarizes the capabilities of the 3TX-TOT module and addresses the questions of what exactly pH compensation means for ISE measurements and when it is required (recommended):

  - o **Total ISE 3TX-TOT Module Summary**

- Find below a link for the 3TX-TOT wiring supplement for the Approach 1 Spliced Pt100/Pt1000 TC input scheme when using pH & ISE sensors with integral preamplifiers:

  - o **3TX-TOT wiring supplement when using pH & ISE sensors with integral preamplifiers**

- Download **MODbus output supplement for 3TX-TOT** to configure your MODbus data acquisition, SCADA or control system.

Selected Complementary Mating Modules for Control & Datalogging of pH & ORP Measurement with 3TX-HiQ-pH Digital Transmitters

3TX-REL
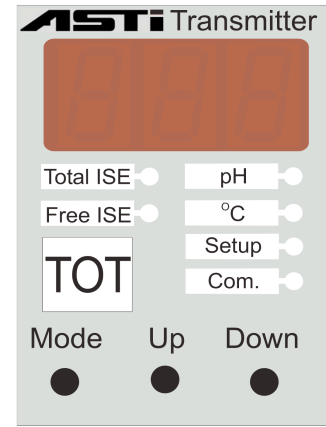### Alarm & Relay Controller

ASTi Transmitter

Input[%]	Limit 1
Ts[s]	Limit 2
REL	Tr[s]
	Setup

Mode   Up   Down

3TX-DAT
MODbus Datalogger

ASTi Transmitter

Capacity	Type
Node	Reading
DAT	Setup
	Com.

Mode   Up   Down

3TX-TOT Total ISE
pH Compensation Module

ASTi Transmitter

Total ISE	pH
Free ISE	°C
TOT	Setup
	Com.

Mode   Up   Down
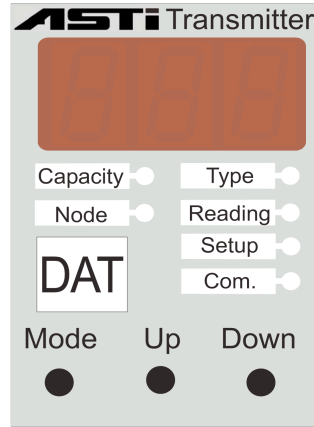
Key Features of 3TX-HiQ pH & ORP Measurement Module

Measurement	Input	Measurement Range	Outputs	Calibration Capabilities	Special HiQ Smart Digital Sensor Features	Special 3TX-HiQ Transmitter Features
pH or ORP **3TX-HiQ-pH**	- Any Iotron™ Type Series Smart Digital pH Sensor or ORP Sensor	-2 to +16 for pH Mode -1000 to +1000 mV for ORP Mode	- Fully Isolated, Scalable & Reversible Analog 0-20 mA or 4-20 mA output for pH or ORP process value - Minimum 1 pH unit or 100mV for ORP mode between 0/4mA and 20mA output setpoints - RS-485 MODbus RTU digital output comes standard; Selectable High Resolution mode or 3TX-DAT compatible mode	- Two (2) or three (3) point calibration for determination of separate acidic and alkaline slopes - 1 point user defined pH standardize calibration to correct for offset (drift) - Offset calibration for temperature value	- Date stamping for initial installation (field activation), last date in field service and total time in use allows for detailed life-cycle management for optimal inventory. - Date stamping for dispatch from factory, factory invoice number as well as sensor item number & serial number for detailed procurement tracking. - Entire 3TX-HiQ-pH intelligent transmitter configuration can be saved on the smart digital pH sensor or ORP sensor for cloning of setup or else as a backup to enable reverting capability.	- Calibration values from connected HiQ-pH or HiQ-ORP sensor automatically loaded without any user action. Last 5 calibrations stored on sensor can be viewed. - Shadow copy of allows for on-the-fly saving of current configuration with ability to later revert back if desired. - Entire transmitter configuration can be loaded to connected smart digital HiQ smart digital pH or ORP sensor for cloning to other transmitter(s) or else for saving to file with Windows software for archival purposes.

Last Revised November 2, 2016

3TX Transmitters for Measurement, Control & Datalogging of Ion Selective, pH & ORP, Dissolved Oxygen & Conductivity

Triple Channel Nitrate, pH & Conductivity Transmitter 3TX-3MF-ISE-NO3-D-pH-D-CON-1.0/50-D-PS

The modular components of the 3TX series provide the flexibility to meet your application needs in a cost-effective way:

- <u>**Custom configurations**</u> means you only pay for the specific modules you need

- <u>**Select any combination of measurements**</u> that you need: pH, ORP, dissolved oxygen (DO), conductivity and ion selective (ISE)

- <u>**Select the number of measurement channels**</u> in the field assembly, from a single channel up to seven (7) channels

- Enjoy the flexibility to **add complementary modules either at initial installation or at a later time** without decommissioning the original analyzer assembly, including controllers (3TX-REL), dataloggers (3TX-DAT), pH compensation for ISE modules including MODbus converter for all inputs (3TX-TOT) and universal AC power supply

All modules in the 3TX series share these features and options:

- **Easy-to-read displays**: Bright three-digit LED displays are visible even in bright sunlight and do not suffer from the common problems associated with LCD displays, such as environmental fatigue and wear.

- **Easy to use**: Simple and intuitive three-button operation with no complex codes to memorize for most day-to-day tasks.

- **Easy installation**: Enclosures are customized for your modules and arrive ready for field mounting on any wall with no additional specialized hardware required. Modules are also available individually in a small, 35mm DIN-rail mountable form factor for direct integration into OEM equipment.

- **Weatherproof**: NEMA 4X CSA/UL rated & IP65 enclosures include high quality sealing cable glands (a.k.a. strain reliefs) that are ideal for weatherproof sealing on sensor, power, and output cables. Waterproof caps are also provided at no additional cost for all cable glands to seal and weatherproof any channels that will not be used.

- **Certifications**: CE approved for use in safe, non-hazardous areas (Class I, Division II or above - a.k.a. Zone 1 or above).

- **Security**: Optional lock available for all enclosure assemblies to restrict access to selected keyholders.

Triple Channel Total Ammonia, pH & Conductivity Transmitter 3TX-4M-ISE-NH4-A-pH-A-TOT-CON-1.0/50-A

- **Power supply options**: Choose our CSA/UL/CE approved universal 100 to 240 VAC 50/60 Hz power supply module for line powered operation, or use any 3TX module with 3-wire 24VDC powered operation if you already have a dedicated 24VDC power supply (i.e. not shared with any other equipment) available onsite.

Single Channel pH Controller
3TX-2M-pH-A-REL

- **Option to customize default values**: Each module can be preset with your own preferred defaults for all user parameters at no additional cost (minimum order quantities apply for the feature)

- **½-DIN Panel & Pipe mounting option:** A universal two-inch (2") NPT pipe mounting kit is available for all 3TX enclosure options. The 3MP enclosure can be installed into any standard ½-DIN panel cutout. All enclosures are ready for wall mounting standard without any additional special hardware.

3TX Measurement Modules

- Measurement modules are available for pH, ORP, mV, temperature, ion selective (ISE), dissolved oxygen and conductivity.

- Scalable 4-20mA analog output is standard for all measurement modules, with optional MODbus digital output available at a nominal surcharge. Precise factory-calibrated linear analog output allows excellent use in control applications. All analog outputs have built-in trim calibration support, including both offset and span adjustments.

- Hold feature standard for all versions of the measurement modules for pH, ORP, ion selective (ISE), dissolved oxygen (DO) and conductivity parameters. When calibration mode is entered, the last value from measurement mode is held for both 4-20mA analog output as well as the MODbus output(s).

- Calibration of temperature is available for all measurement modules.

Single Channel Contacting Conductivity Transmitter
3TX-2M-CON-2.0/200-A-PS

- Active 4-20mA can support remote external displays for viewing measured values in control panels, secondary field locations, or instrumentation shops.

- **ISE measurement module (3TX-ISE)**:

    o 3TX-ISE displays, calibrates, and output in convenient ppm units.

    o Measures any ion, including Ammonium (NH_4^+)**,** Calcium (Ca^{++}), Fluoride (F^-), Nitrate (NO_3^-) and Nitrite (NO_2^-) amongst many others. The type of ISE measurement must be preset at the factory. *

    o Simple offset adjustment allows easy field calibration of sensors while in service to agree with grab sample or laboratory analysis.

    o The standard 3TX-ISE transmitter supports and requires directly interfacing ion selective sensors without preamplifiers. In addition, the 3TX-ISE-X hardware version supports and requires ion selective sensors with preamplifiers to enable installations that require long cable lengths or to operate in very high interference areas. The software, features and functionality is perfectly identical for both hardware versions.

    o When the 3TX-ISE is combined with the 3TX-TOT and 3TX-pH modules, it can provide continuous inline field measurement of total ammonia (NH_3-N), total fluoride (HF), total cyanide (HCN) or total sulfide (H_2S) parameters without the use of any reagents within the permissible pH & temperature ranges.

Six Channel pH/ORP/ISE/Conductivity Assembly 3TX-6MW-CON-ISE-REL-pH-ORP-ISE-PS

Seven Channel pH/ORP/ISE/Conductivity Assembly 3TX-7MF-ISE-CON-ISE-REL-pH-ORP-ISE-PS

- **Contacting Conductivity measurement module (3TX-CON)**:

  o The 3TX-CON module supports most any cell constant (K), including 0.01, 0.02, 0.05, 0.1, 0.2, 0.5, 1.0, 2.0, 3.0, 5.0, 10.0 & 20.0. Effective calibrated cells anywhere from K=0.005/cm up to K=34.0/cm.

  o Support for low ranges down to 0-5 µS and all the way up to 0-1,000 milliSiemens as required for the given application requirements.

  o Zero calibration for true 0.00 reading with your sensor dry in air.

  o Precise and wide-range gain calibration allows for effective (a.k.a. apparent) cell constant to be +/- 70% of the nominal sensor value.

  o Automatic correction for resistance and capacitance contribution of the cable length to the measurement for any sensor wire gauge and distance.

  o High resolution MODbus output available with 3TX-CON-E style unit.

- **pH/ORP measurement module (3TX-pH)**:

  o The 3TX-pH pH/ORP/mV/Temp transmitter allows for precise sensor calibration with support for two and three point slope calibrations. This means that a precise acid slope (pH below 7) and alkaline slope (pH above 7) is possible. One-point offset calibrations are possible at any pH value to allow for agreement with grab sample laboratory analysis.

  o The standard 3TX-pH transmitter supports and requires directly interfacing pH or ORP sensors without preamplifiers. In addition, the 3TX-pH-X hardware version supports and requires pH or ORP sensors with preamplifiers to enable installations that require long cable lengths or to operate in very high interference areas.

- **Dissolved Oxygen (DO) measurement module (3TX-DO)**:

  o 3TX-DO module displays and outputs the concentration of dissolved oxgyen in ppm, % saturation units, as well as the process temperature

  o Automatic correction for temperature, pressure and salinity for calibration and % saturation measurement modes

  o A simple gain calibration with sensor dry in air. The automatic gain calibration adjusts the sensor slope (mV per ppm DO) based upon pre-programmed 100% DO saturation at the temperature & pressure. No look-up tables are ever needed to calibrate the galvanic DO sensor.

    ▪ No "Zero" calibration is ever needed for galvanic type dissolved oxygen (DO) sensors as they have a true zero potential.

  o The 3TX-DO module supports most any galvanic dissolved oxygen type sensor that is self temperature compensating (internal without integrated TC element required for this correction).

Temperature Module (3TX-TEM)

- 3TX-TEM is a module to add a scalable analog output for Temperature to any 3TX-pH, 3TX-ISE, 3TX-CON or 3TX-DO measurement module. This optional module can be used to add a temperature output at any time before or after commissioning.

- Input for temperature measurement can be Pt100 or Pt1000 type TC element integrated inside the sensor or else a separate temperature probe.

- Special hardware & software allows a single Pt100/Pt1000 element to be used both as input for a 3TX measurement module and a 3TX-TEM temperature transmitter. This configuration is referred to as "spliced" input mode and is the default.

- Any pH, ORP, ISE, conductivity or DO sensor with integral Pt100 or Pt1000 TC when in "splice" input mode will be used both for temperature compensation on the measurement module and to send a scalable output for temperature from the 3TX-TEM temperature module

- Direct wiring from separate (rather than shared) Pt100 or Pt1000 temperature elements is also supported. This configuration is referred to as "raw" input mode. In "raw" mode automatic correction for the resistance due to the cable is performed from user entered values for the wire gauge and cable length.

- Displays Temperature (°C) and raw Ohms from connected Pt100/Pt1000 element.

- Offset and gain (span) calibration types supported in both "splice" and "raw" modes for precise temperature measurement.

- Full range 0-210°C with a resolution of 0.2°C, Scalable 0-20mA or 4-20mA analog output type is selectable.

Control Module (3TX-REL)

- Each 3TX-REL module has 2 each independent Single-Pole Single-Throw (SPST) 5 Amp contact relays.

- Each relay is fully configurable by the user as to control mode and variables for each control algorithm.

- Tight integration between 3TX alarm & relay controller and 3TX measurement modules software makes configuration and scaling simple & easy for any local control requirements of the pH, ORP, ion selective (ISE), dissolved oxygen (DO) or conductivity parameters.

- The 3TX-REL alarm and relay controller module includes both basic and more sophisticated controlling options, including all of the following modes:

  o 1) A simple supervision option for alarm functionality only;

  o 2) An On/Off control with a user-configurable deadband (a.k.a. hysteresis);

  o 3) Time proportional control (TPC); and,

  o 4) Proportional frequency control (PFC, a.k.a. variable pulse controller).

It is possible to wire the analog 0/4-20mA output from 3TX-pH, 3TX-ISE, 3TX-DO or 3TX-CON measurement transmitter to other data acquisition or control device prior to connection with 3TX-REL alarm/relay module using the appropriate wiring scheme (see alternate wiring schematic for details).
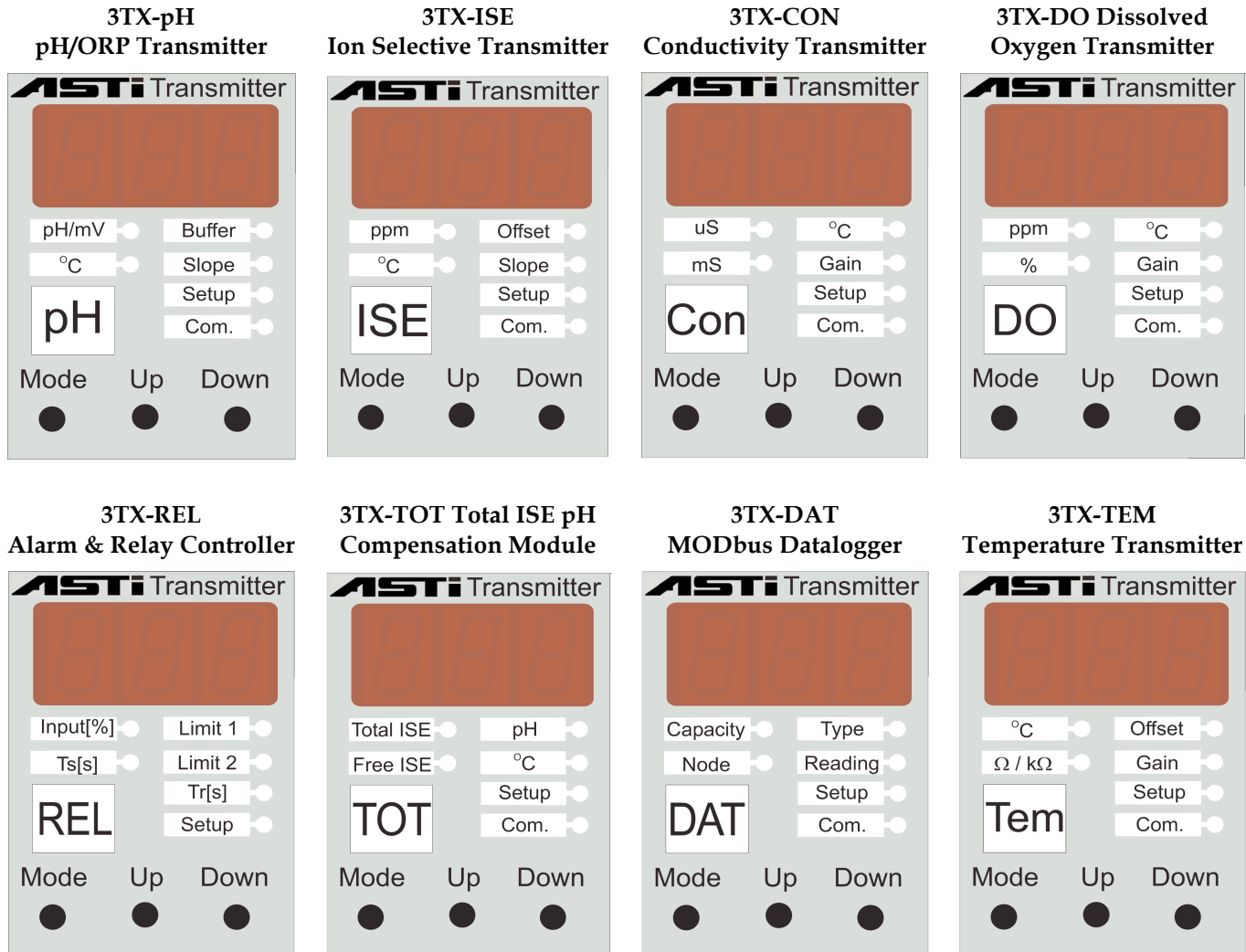
Datalogging Module (3TX-DAT) and MODbus Options

- **MODbus**: If you would like to have MODbus digital output, there are two different approaches available:

  - 1: **Order measurement modules with MODbus option included**. Please note that adding the MODbus output is not an option after the module leaves the factory without MODbus.

  - 2: **Add a 3TX-TOT module to convert from analog to MODbus output.** Unlike the first approach, this flexible option may be selected either at the time of initial installation or at any time thereafter. The 3TX-TOT module also has additional functionality, as detailed in the section below.

- **Datalogging**: For datalogging functionality, there are also two different approaches:

  - 1: If you have opted for MODbus output using either of the approaches described above, you may **use a free of charge optional Windows PC software interface kit to the MODbus digital output**. This allows for real time display of all values for all transmitters that are wired to that MODbus line. In addition, the software kit allows for datalogging for all transmitters connected on the line, including both the scaled output value and temperature for each measurement module. Up to 247 devices can be supported on a single MODbus digital line (2-wire cable), and long cable length can be supported for field installations up to 6500 feet (1.23 miles or 1.98 kilometers) to make viewing in the instrument shop practical and easy.

  - A **free of charge Windows PC datalogging and graphing software** is provided for use with 3TX transmitters with the optional MODbus RS-485 digital output:

  - 2: A **3TX-DAT module** can be added to perform MODbus datalogging. The 3TX-DAT module allows for datalogging up to 63 each MODbus digital inputs from any mix of 3TX-pH, 3TX-ISE, 3TX-CON, 3TX-DO and 3TX-TOT modules. The sampling rate is configurable from once per second to once per hour. The 16MB onboard flash memory allows extensive datalogging capacity. Configuration of the 3TX-DAT is accomplished via the free of charge Windows datalogging and graphing software for 3TX transmitters with MODbus and uploaded & downloaded the separate ASTI Windows software for 3TX-DAT. The 3TX-DAT can be pre-configured upon request without additional charge. The logged data is downloaded to a Windows PC or tablet for further workup, graphing and analysis via the ASTI Windows software. The 3TX-DAT can be added at any time after commissioning if the mating 3TX measurement module(s) have the MODbus output option.

  - 3: Datalogging can also be accomplished by connecting (either directly or in series) the standard scalable 4-20mA analog output from the 3TX transmitters to any commercial PLC, SCADA or other data acquisition device that can be suitable configured to log engineered units for all measurements.

3TX-TOT pH Compensation Module to Compute Total ISE

- The 3TX-TOT module computes the total ISE. This module can compute total ammonia, total cyanide, total fluoride and total sulfide.

- The module computes the total ISE using three inputs: 1) the free ion activity; 2) the pH; and, 3) the temperature. These three input parameters are provided by the analog output from the respective measurement modules.

- A scalable 4-20mA analog signal is available to output the computed total ISE to PLC or other data acquisition equipment.

- MODbus included: All input and output data sent via MODbus standard with the 3TX-TOT module.

3TX Product Specification Sheet and Manual Links

3TX-pH
pH/ORP Transmitter

ASTi Transmitter

pH/mV	Buffer
°C	Slope
	Setup
pH	Com.

Mode   Up   Down

3TX-ISE
Ion Selective Transmitter

ASTi Transmitter

ppm	Offset
°C	Slope
	Setup
ISE	Com.

Mode   Up   Down

3TX-CON
Conductivity Transmitter

ASTi Transmitter

uS	°C
mS	Gain
	Setup
Con	Com.

Mode   Up   Down

3TX-DO Dissolved
Oxygen Transmitter

ASTi Transmitter

ppm	°C
%	Gain
	Setup
DO	Com.

Mode   Up   Down

3TX-REL
Alarm & Relay Controller

ASTi Transmitter

Input[%]	Limit 1
Ts[s]	Limit 2
	Tr[s]
REL	Setup

Mode   Up   Down

3TX-TOT Total ISE pH
Compensation Module

ASTi Transmitter

Total ISE	pH
Free ISE	°C
	Setup
TOT	Com.

Mode   Up   Down

3TX-DAT
MODbus Datalogger

ASTi Transmitter

Capacity	Type
Node	Reading
	Setup
DAT	Com.

Mode   Up   Down

3TX-TEM
Temperature Transmitter

ASTi Transmitter

°C	Offset
Ω / kΩ	Gain
	Setup
Tem	Com.

Mode   Up   Down

Common Special Features for All Measurement Modules (See Next Page)

* Support for Custom OEM Configuration upon Request to define all setup parameter to a value of your choosing

* Optional RS-485 MODbus digital output for all measurement modules (standard on 3TX-TOT module)

* Low Cost datalogging and real-time monitoring with Windows PC software & MODbus digital output combination

* 3TX-DAT MODbus datalogger interfaces with 3TX-pH, 3TX-ISE, 3TX-DO, 3TX-CON & 3TX-TOT modules with MODbus option

Key Features of 3TX Measuring Modules

Measurement	Input	Measurement Range	Outputs	Calibration Points	Compatible Sensor(s)	Special Features
Ion Selective (ISE) **(3TX-ISE)** *	- Any Combination Ion Selective Solid State & Organic Membrane *	Low (0.00 to 9.99), Mid (00.0 to 99.9), High (000 to 999) *All units for ranges are in ppm (mg/L)*	- Scalable Analog 0/4-20 mA for ISE or Temperature - Scaling Minimum 20% of selected range for Analog & MODbus outputs	- 2 point user defined to determine ISE slope - 1 point user defined for ISE standardize to correct for offset (drift)	- Any Suitable ASTI Ion Selective (ISE) Sensor with Pt100 or Pt1000 TC * *or* - Any Suitable ASTI Ion Selective (ISE) Sensor with Pt100 or Pt1000 TC and compatible preamp *	- Simplest field ISE instrument available on the market for easy commissioning and maintenance
pH or ORP **(3TX-pH)**	- Any Combination pH or ORP Sensor	- 0 to 14 for pH Standard *(-2 to +16 with 3TX-pHE)* -1000 to +1000 mV for ORP	- Scalable Analog 0/4-20 mA for pH, ORP (mV) or Temperature - Minimum 3 pH for Analog & MODbus outputs	- 2 point or 3 point calibration for determination of acid and alkaline slopes - 1 point user defined pH standardize calibration to correct for offset (drift)	- Any Suitable ASTI pH/ORP Sensor with Pt100 or Pt1000 TC *or* - Any Suitable ASTI pH/ORP Sensor with Pt100 or Pt1000 TC and compatible preamp	- Support for 1-point, 2-point, 3-point and arbitrary field offsets for optimal calibrations
Contacting Conductivity **(3TX-CON)**	- Any Contacting Conductivity Sensor with supported Cell Constant (K)	<u>Cell Constants Supported:</u> 0.01, 0.02, 0.05, 0.1, 0.2, 0.5, 1.0, 2.0, 3.0, 5.0, 10.0 & 20.0 <u>Ranges:</u> 0-5uS up to 0-1,000 mS as per mating cell/configuration	- Scalable Analog 0/4-20 mA for Conductivity or Temperature - Minimum 10% of full scale range for Analog & MODbus outputs	- Gain adjustment to calibrate to effective (a.k.a. "apparent") cell constant - User configurable corrections for sensor cable length	- Any Suitable ASTI Contacting Conductivity Sensor with supported cell constant and integrated 100 or 1000 Ohm Platinum TC	- Correction for resistance and capacitance of sensor cable for both TC input and conductivity measurement itself
Dissolved Oxygen (DO) **(3TX-DO)**	- Most galvanic dissolved oxygen sensors that are self temperature compensating	<u>Minimum</u> 0.00 to 4.00 ppm (0-40% Saturation) <u>Maximum</u> 00.0 to 40.0 ppm (0-400% Saturation)	- Scalable Analog 0/4-20 mA output for DO readings in ppm or % Saturation - Minimum 10% of full scale range for Analog & MODbus outputs	- Gain calibration with sensor dry in air using either automatic or manual mode - No "zero" calibration for galvanic type DO sensors	- AST-DO or equivalent active self-polarizing galvanic DO cell that is self temperature compensating (without need of integrated TC element for this correction)	- Calibration and % saturation is automatically corrected for temperature, pressure and salinity for accurate measurements

* Ion selective measurement type must be set at time of purchase at ASTI factory. 3TX-ISE transmitters are not sold separately but rather only as part of complete ISE system including both the ISE transmitter AND ISE sensor supplied complete from ASTI factory. ISE measurement must be validated for feasibility by ASTI prior to sale.

Last Modified October 15, 2015

ORDERING INFORMATION FOR 3TX FAMILY OF TRANSMITTERS

ENCLOSURE TYPE	
CODE	**DESCRIPTION**
3TX-0M	3TX Transmitter with No Enclosure
3TX-DIN	3TX Transmitter with No Enclosure; Preinstalled onto 35mm DIN-Rail
3TX-2MW	3TX Transmitter(s) with IP65 WeatherProof Enclosure; Up to 2 Total Modules (**Wall Installations Only**)
3TX-2M	3TX Transmitter(s) with IP65 WeatherProof Enclosure; Up to 2 Total Modules (Wall or Pipe Installations)
3TX-3MP	3TX Transmitter(s) with NEMA 4X Enclosure for ½-DIN **Panel Only**; Up to 3 Modules (**with Panel Bracket Assembly**)
3TX-3MF	3TX Transmitter(s) with NEMA 4X Enclosure; Up to 3 Total Modules (Wall or Pipe Installations)
3TX-4MW	3TX Transmitter(s) with IP65 WeatherProof Enclosure; Up to 4 Total Modules (**Wall Installations Only**)
3TX-4M	3TX Transmitter(s) with IP65 WeatherProof Enclosure; Up to 4 Total Modules (Wall or Pipe Installations)
3TX-6M ***	3TX Transmitter(s) with IP65 WeatherProof Enclosure; Up to 6 Total Modules (Wall or Pipe Installations)
3TX-7MF ***	3TX Transmitter(s) with NEMA 4X Enclosure; Up to 7 Total Modules (Wall or Pipe Installations)
3TX-9MF ***	3TX Transmitter(s) with NEMA 4X Enclosure; Up to 9 Total Modules (Wall or Pipe Installations)
MEASUREMENT MODULES ONE (1) THROUGH SEVEN (7)	
CODE	**DESCRIPTION**
-pH **	pH/ORP/mV/Temp Measurement Module / Transmitter
-CON-CELL/RANGE	Contacting Conductivity Measurement Module / Transmitter (CELL Constant & RANGE in mS Defined at Time of Order)
-ISE-ION **	Ion Selective (ISE) Measurement Module / Transmitter (Ion Measurement Type ION Must be Defined at Time of Order) *
-DO	Dissolved Oxygen Measurement Module / Transmitter For Galvanic Type DO sensors
OUTPUT OPTIONS FOR MEASUREMENT MODULES (ONE OPTION MUST BE SELECTED FOR EACH MODULE)	
CODE	**DESCRIPTION**
-A	Single Fully Scalable Analog 0-20 or 4-20 mA Ouput Only
-D	Single Fully Scalable Analog 0-20 or 4-20 mA Ouput Only AND RS-485 MODbus Digital Output
ADD-ON MODULES FOR MEASUREMENT MODULE ENCLOSURE ASSEMBLIES	
CODE	**DESCRIPTION**
-PS	100 to 240 VAC 50/60 Hz Universal Power Supply Adapter for Line Powered Operation
-TEM	Scalable Analog 0-20 or 4-20mA Temperature Transmitter for Raw or Spliced Pt100/Pt1000 temperature element
-SW	On/Off Power Switch (½ Width of power supply module and ¼ width of standard 3TX transmitter)
-REL	Alarm and Relay Controller Module for 3TX-pH, 3TX-ISE, 3TX-CON and 3TX-DO measurement modules
-TOT	Compute pH compensated "Total ISE" from analog inputs for ISE & pH, 0/4-20mA analog & MODbus digital ouputs
-DAT	Datalogger & MODbusmaster for 3TX Transmitters with RS485 MODbus; Download & Setup via RS232/USB on Windows
-TIM	Timer for Intermittent Operation with Battery Packs – Special Ultralow Power Consumption Style
-BAT	Universal Uninterruptible Power Supply with 1.4Ah (33W) LiPo Battery; For use with 7MF or 9MF Enclosures Only

Contact the factory for specific recommendations & ALL ISE inqueries. Pipe mounting bracket kits supplied separately. For 3MP, 3MF, 6M & 7MF enclosures power supply is not counted as a module for space purposes.

Model: **3TX-2M-pH-A-CON-1.0/50-D**
Description: Dual Channel Transmitter Assy w/ Weatherproof Enclosure (2 Total Modules); 1 each pH Measurement w/ Analog Output; 1 each Contacting Conductivity Measurement w/ Cell Constant 1.0/cm & Full Range 0-50mS/cm (Min Scaling 0-5.0mS/cm); with Analog and Digital MODbus RS-485 Outputs (No AC Power Supply)

Model: **3TX-3MP-ISE-F-A-pH-A-TOT-PS**
Description: Dual Channel Total Fluoride Measurement Transmitter Assembly with NEMA 4X (UL) Enclosure for ½-DIN Panel Mounting Installations (for 3 Total Modules); 1 each ISE Fluoride Ion and 1 each pH Measurement Module with Analog Output Only; 1 each TOT module to compute total fluoride (HF + F-) with Analog & MODbus Outputs for all free fluoride, total fluoride, pH and temperature; With Universal 11 Power Supply Module

Model: **3TX-3MF-DO-D-TEM-SW-PS**
Description: Dissolve Oxygen Transmitter Assembly with NEMA 4X CSA/UL rated Enclosure; Field or Wall Mounting Installations (3 Module Max); 1 each DO transmitter for galvanic type dissolved oxygen sensors; Scalable Analog & MODbus Output for DO ppm, saturation & Temperature; 115/230 Power Supply with On/Off Switch

Model: **3TX-4MW-ISE-NH4-A-pH-A-TOT-PS**
Description: Dual Channel Total Ammonia Measurement Transmitter Assembly; Weatherproof Wall Mount Only Enclosure (4 Modules Max); 1 each ISE Ammonium Ion and 1 each pH Measurement Module with Analog Output Only; 1 each TOT to compute total ammonia (NH$_3$) with Analog & MODbus Outputs; With 115/230 Power Supply

Model: **3TX-6M-ISE-NH4-A-pH-A-TOT-ISE-NO2-A-pH-D-DO-D-PS**
Description: Five Channel Transmitter Assembly with Weatherproof Enclosure (for 6 Total Modules); 1 each ISE Ammonium Ion and 1 each pH Measurement Module with Analog Output Only; 1 each TOT module to compute total ammonia (NH$_3$) with Analog & MODbus Outputs; 1 each ISE Nitrite Ion with Analog Output Only; 1 each ORP Measurement Module and 1 each DO transmitter for galvanic active self-polarizing type sensors both with Scalable Analog & MODbus Outputs; With 115/230 Power Supply

Model: **3TX-6M-ISE-X-F-D-REL-pH-X-D-REL-CON-10.0/500-D-DAT-PS**
Description: Triple Channel Transmitter Assembly with Weatherproof Enclosure (for 6 Total Modules Max); 1 each Preamp Style Fluoride ISE Measurement Module & 1 each Preamp Style pH Measurement Module with Alarm/Relay Controller for both Fluoride ISE & pH; 1 each Contacting Conductivity Measurement with K=10.0/cm & Full Range 0-500mS; Analog & MODbus Outputs for All Measurements; DAT Datalogger/MODbusmaster Module to record all parameters; Universal 115/230 Power Supply

Model: **3TX-7MF-ISE-NH4-D-ISE-NO3-D-ISE-NO2-D-pH-D-CON-1.0/50-D-DO-D-DAT**
Description: Six Channel Measuring Transmitter Assembly Optimized for Low-Power Battery Operation; with NEMA 4X CSA/UL Enclosure (7 Module Max); 1 each ISE Ammonium Ion, 1 each ISE Nitrate Ion and 1 each ISE Nitrite Ion Module; 1 each pH module; 1 each Contacting Conductivity K= 1.0/cm & Full Range 0-50mS; 1 each Dissolved Oxygen module; Analog & MODbus Outputs for all Measurements & Temp; DAT Datalogger/MODbusmaster for continuous datalogging of all parameters

** To obtain a 3TX that supports and requires sensors with **preamplifiers**, order the pH/ORP transmitters as **–pH-X** and the ion selective (ISE) transmitters as **–ISE-X**
*** For 2″ NPT pipe mounting installations, an additional adapter plate must also be ordered for the 6M, 7MF & 9MF enclosures (inquire to factory for details).

2TX 2-Wire Transmitter for pH, ORP and Temperature Measurements

Reliable & Affordable Isolated 2-Wire Loop Powered pH & ORP Transmitter
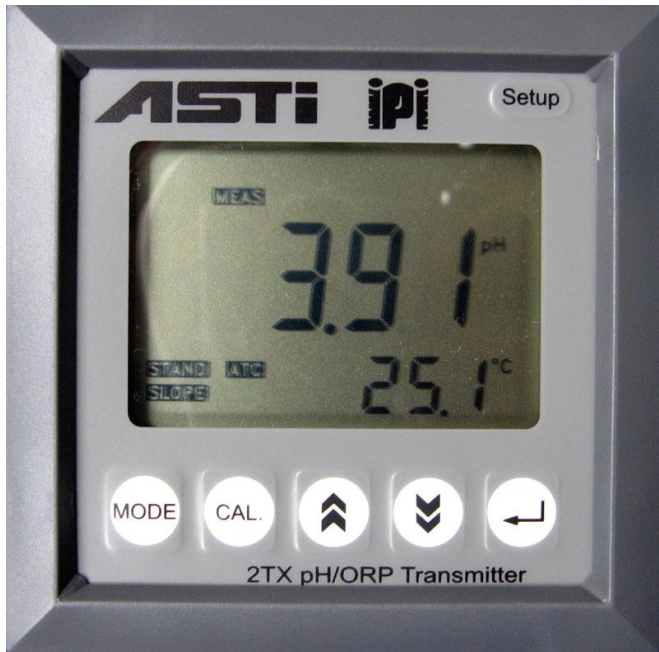
Ease-of-use & Reliability Is our Priority

- Large LCD Display of pH or ORP plus Temperature
- Power Down Flash Memory: Stores all calibration & parameter data even if the unit is powered down
- 6 Button easy to use Keypad w/ Intuitive Large Screen LCD Menu
- 1 or 2 Point pH Calibration
- Buffer Select: (4.01, 7.00, 10.01) or (4.00, 6.86, 9.18)
- Supports External Preamplifiers for Low Noise Operation and Extended Cable Lengths up to 500 feet from 6TX meter
- Wide Operational Range of 12 V to 36 V DC
- Excellent Input / Output Signal Isolation
- Scaleable 4 to 20 mA Output

pH and Temperature Specifications	
pH Range	-2.00 to 16.00 pH
pH Resolution	0.01 pH
pH Accuracy	±0.01 pH ± 1 LSD
Temperature Range	-10.0 to 120.0 °C
Temperature Resolution	0.1 °C
Temperature Accuracy*	±0.3 °C

ORP & Transmitter Specifications	
ORP / mV Range	- 1000 to + 1000 mV
ORP / mV Resolution	1 mV
ORP / mV Accuracy	± 1 mV
Electrode Input Impedance	$>10^{12}$ Ω
Signal Output	4.0 to 20.0 mA
Over Range Current Output	21.00 mA
Under Range Current Output	3.80 mA

pH Electrode Offset & Slope Recognition	
pH Electrode Offset	± 90 mV
pH Electrode Slope Recognition	± 30 %

- EFF, Electrode Efficiency Function
- Auto ATC Temperature Sensor Select or Manual ATC
- Selectable ATC: 3K Balco, Pt-100, Pt-1000, or 10K Thermistor
- IP-65 Waterproof and Dustproof Enclosure
- ¼ DIN Package, Dimensions: ¼ DIN x 148 mm Depth
- **CE Approved**

Quality Assured Engineering

4TX 4-Wire Transmitter for
pH, ORP and Temperature Measurements

**The Right Features To Measure,
Analyze And Control pH & ORP**

- 4 programmable on/off relays: 4 for pH or 4 for ORP.
- 1 manual on/off relay for electrode wash.
- Automatic temperature compensated (ATC)
- Displays absolute and relative ORP.
- Programmable per relay for customized control.
- Isolated & reversible 4-20 mA output for pH or ORP. This output can be used as a proportional output.
- DC voltage output for pH/ORP pre-amplifier
- RS-485 output for remote access computer. This allows multiple units to be connected, ganged, together.
- Large LCD displays accurate and stable readings.
- Simultaneous display of: pH or ORP with temperature, and relay status.
- Quick And Easy Setup, Intuitive Operation
- Convenient calibration with automatic buffer recognition of US and European buffer sets.
- Calibration data is stored in memory and is ready for use on power up (no battery backup required).
- Standard ¼ DIN size with panel mount bracket standard.

pH, ORP & Temperature Specifications

Range

pH	-2.00 to +16.00 pH
mV (Absolute/Relative)	-2500 to 2500 / -6499 to 6499
Temp	-10.0 to +120.0 °C

Resolution

pH	0.01 pH
mV (Absolute/Relative)	1 mV / 1 mV
Temp	0.1 °C

Accuracy

pH	± 0.1 % pH ± 1 LSD
ORP	± 0.1 % ORP ± 0.1 ORP
Temp	± 0.1 °C

General

pH Temp Compensation	Auto -10.0 to +120.0 °C
pH Buffer Recognition	4.00, 4.01, 6.86, 7.00, 9.18, 10.01
pH Buffer Temp Range	0 to 60 °C
pH Offset Recognition	± 100 mV @ pH 7.00
	± 108.3 mV @ pH 6.86
pH Slope Recognition	± 30% for pH 4.01, 9.18, 10.01
Input Impedance	> 10^{13} Ohms
Preamplifier Output	± 5V DC with Common (Ref)

Temperature

Temperature Sensor	10K Therm. 3K Balco & 1K Pt

4-20 mA Output

Current Output Range	4-20 mA isolated
Current Output Scale	Programmable, linear or log
Maximum Load	500 Ohms
Accuracy	± 0.02 mA
Isolation Voltage	500 V DC

Relays

Control Type	5 ON/OFF Controls
Relay Output	5A @ 115VAC, 2.5A @ 230VAC

Other / General

Power Supply	115 VAC/230 VAC @ 50/60 Hz
Security	4-digit password
Digital Communication	RS-485
Display Size	16mm wide by 8.5mm tall
Ambient Temp Range	0 to 50 °C
Case	IP65, ¼ DIN case, 148mm depth
Weight	940 grams

- Standard terminal block for tinned leads connectors.
- ATC supported: Pt-1000, 10k thermistor or 3K Balco.
- Analyzer is in a complete watertight case (IP65).
- Displays slope (efficiency) to optimize maintenance.
- Password protection for beter security & stability.
- CE Approved

Comparison Chart of 3TX, 2TX & 4TX Transmitters
for pH, Ion Selective and Conductivity Measurements

Feature	3TX	4TX	2TX
Enclosure	Field use with optional secondary enclosure (IP65) or 35mm DIN-RAIL	IP65	IP65
Agency Approvals	CE	CE	CE
Power Operation	3-wire 24VDC or 115/230 VAC with power supply module option	115/230 VAC (Line Powered)	2-wire 24VDC (Loop Powered)
Scalable 0/4-20mA Output	Yes *	Yes	Yes
Number of 0/4-20mA Output	1 each	1 each	1 each
Trim for each 0/4-20mA	Yes	No	No
Maximum Inputs	6 each (ISE/pH/ORP/Conductivity)	1 each (ISE/pH/ORP/Cond)	1 each (ISE/pH/ORP/Cond)
Preamplifier Support for pH/ORP/ISE Sensors	Yes, with 3TX-pH-X or 3TX-ISE-X hardware version only (300 feet max)	Yes, Max 300 feet total cable length with preamp	Yes, Max 300 feet total cable length with preamp
Relay for Alarm/Control	Yes, with optional 3TX-REL alarm/relay module, 2 each	Yes, 4 each	No
Type of Relay Control	On/Off, Time Proportional & Variable Frequency, Selectable	On/Off Only	None (N/A)
Digital Output Options	None Standard, MODbus optional	RS485 (NOT Modbus)	None
Remote Monitoring/Datalog	Yes, with MODbus Option	No	No
Display	Small 3-digit LED	Large Screen LCD	Large Screen LCD
Interface	Toggle Select Modes with 3-buttons	Menu-Driven Software	Menu-Driven Software
Manual Entry of sensor slope(s) and offset	Yes, using P14 & P15 for 3TX-ISE and P16, P17 & P18 for 3TX-pH	No	No
Buffer Cal for slope & offset	Yes for both Slope & Offset	2-Point Calibration Only	2-Point Calibration Only
Process Offset to Agree with Grab Sample Analysis	Yes	No	No
ISE Ranges Supported	0.00-9.99, 00.0-99.9 or 0-999 ppm	No ISE Support	NO ISE Support
pH Compensation for ISE	Yes, with 3TX-TOT Module	No (N/A)	No (N/A)
pH Range Supported	0-14 (-2 to +16 with 3TX-pHE unit)	-2 to +16	-2 to +16
ORP Range Supported	-1000 to +1000 mV	-2500 to +2500 mV	-1000 to +1000 mV
Conductivity Cell Constant and Corresponding Maximum Range Supported	0.01/0-500μS, 0.1/0-5mS, 1.0/0-50mS, 2.0/0-100mS, 10.0/0-500mS *Other cell constants/ranges available*	No Conductivity Support	No Conductivity Support
TC Elements Supported	Pt100 or Pt1000 (Software Selectable)	Pt1000 or Balco 3K	Pt100 / Pt1000 / Balco 3K
Supported TC Range	0-210°C for pH & Conductivity, 0-150°C for ISE	-10 to +120 °C for pH	-10 to +120 °C for pH
Datalogging Supported	Yes with MODbus output option (via free Windows software) or with 3TX-DAT Module for Analog or Digital	NO (from 4-20mA Only), No Software for RS485 output (Documents Only)	NO (from 4-20mA Only)
Primary Advantages	* Modular, Cost Effective Design * Simple, stable and easy to use * 3 button LED toggle operation * Bright LED display * 35mm DIN rail mountable for integration with OEM enclosures * MODbus support available for digital data acquisition/control and free datalogging (with Windows App)	* Cost Effective for Panel Mounting (¼-DIN) * Cost Effective for simple On/Off local control needs * Supports sensors with and without preamps	* Cost Effective for Panel Mounting (¼-DIN) * Cost Effective for 2-wire loop-powered installations * Supports sensors with and without preamps

* Scaling limits for 0/4-20mA analog outputs are: for 3TX-pH is min 1 pH unit; for 3TX-ISE is min 20% of range selected (0-10, 0-100, 0-999 ppm); for 3TX-CON is min 10% of full range for that cell constant (MODbus digital scaling may differ from Analog)

Last Revised January 24, 2012

Model 56 Single/Dual pH, ORP, Ion Selective (ISE), Contacting & Toroidal Conductivity 4-Wire Transmitter, Controller & Analyzer

- Chemically & Mechanically Resilient Polycarbonate NEMA 4X / CSA 4 IP65 Enclosure - Standard 1/2 DIN Cutout

- 115/230 VAC & 24 VDC 4-Wire Power Operation Standard With Relays

- **Time Proportional Control (TPC) Relays for advanced control functionality, 4 each included with each controller**

- **Available in any combination of Single or Dual Channel pH / ORP / ISE / Conductivity Configurations**

- Extremely cost effective solution to provide full realtime measurement, analysis and control for pH, ORP, ISE & Conductivity Analyzer / Transmitter / Controller Requirements

- Automatic Temperature Compensation via 100 or 1000 Ohm Platinum Temperature Compensation Element

- Quad (4 each) Isolated & Independent 0-20 or 4-20 mA outputs for Signal and/or temperature standard, fully user configurable

   o **PID algorithm available for advanced control purposes**

- **HART is Standard** and ProfiBUS available as an optional digital output

- Large LCD Display with touch membrane keypad - Menu Driven Interface and Programming

- Automatic Temperature Compensation from 0 to 150 °C (32 to 302 °F) for pH & ISE and 0 to 200 °C (32 to 392 °F) for Conductivity

- **Standard Onboard datalogging offers realtime and historical trends for all process parameters on one or two channels (depending upon analyzer configuration) for up to 30 days time. This data can be downloaded to any USB stick for further data analysis and workup with programs such as Excel. Local displays allows for graphing and trending for this realtime data as well as review recent data sets up to 30 days back.**

- **Preprogrammed curves for realtime computation of total ammonia** (NH3-N, or total ammonia as nitrogen)**, total fluoride** (Total HF, or unreacted fluoride)**, total cyanide** (Total HCN, or unreacted cyanide) **species from measured free ion activity, pH & temperature.**

- **All 56 analyzers ordered in the dual ISE/pH configuration can determine total ISE. This means that you can display, output and use for control purposes the free ISE and total ISE such as total ammonia (NH3), total fluoride (HF), total cyanide (HCN) or total sulfide (H2S). A link is provided below that summarizes the 56 analyzer capabilities to compute the total ISE present from the free ISE measurement (from the ISE sensor), the pH value (from the pH sensor) and the process temperature:**

pH/ORP/ISE Sensors WITHOUT preamplifier Hook-Up Schematic

pH/ORP/ISE Sensors WITH preamplifier Hook-Up Schematic

pH/ORP/ISE Sensors with Mini External Preamplifier Hook-Up Schematic

Guide to quick disconnect Q7M/Q7F snap cable system for Rosemount transmitters

Contacting Conductivity Sensor Hook-Up Schematic

Toroidal Conductivity Sensor Hook-Up Schematic

Model 56 Single/Dual pH, ORP, Ion Selective (ISE), Contacting & Toroidal Conductivity 4-Wire Transmitter, Controller & Analyzer Measurement Selection Guide and Configuration Table

Measurement	Input	Measurement Range	Outputs	Calibration Points	Compatible Sensor(s)	Special Features
Ion Selective (ISE) *	*Single or Dual Channel* - Solid State or Organic Membrane Ion Selective (ISE) Sensor	5 Decades Maximum Concentration Range from 1 ppb to 1 Molar (varies with each ion; please inquire to factory)	- 0-20/4-20 mA output for pH, ORP, ISE & temp for each input channel - HART Standard or ProfiBUS Output (Optional)	- 2 point user defined to determine ISE sensor slope - 1 point user defined for grab sample standardize to correct for offset (drift)	- Suitable ASTI ISE Sensor with Pt100 / Pt1000 TC element - Suitable ASTI ISE Sensor with Pt100/Pt1000 & 56 compatible preamplifier	- Onboard "pH Compensation" yields total ammonia, total fluoride, total cyanide and in proper dual ISE/pH setup with 2.19 software
pH/ORP	*Single or Dual Channel* - pH/ORP	- 0 to 14 pH (standard) - Fully Scalable from 1 to 13 pH units	- 0-20/4-20 mA output for pH, ORP, ISE & temp for each input channel - HART Standard or ProfiBUS Output (Optional)	- 2 point auto buffer recognition for pH for slope determination - 1 point user defined pH standardize calibration to correct for offset (drift)	- Suitable ASTI pH or ORP Sensor with Pt100 / Pt1000 TC element - Suitable ASTI pH or ORP Sensor with Pt100/Pt1000 & 56 compatible preamplifier	- Onboard "pH Compensation" yields total ammonia, total fluoride, total cyanide and in proper dual ISE/pH setup with 2.19 software
Contacting Conductivity	*Single or Dual Channel* - Contacting Conductivity Sensor	- Cells from 0.01 to 10.0, user selectable - Ranges from 0-200 μS for 0.01/cm cell to 0-200 mS for 10.0/cm cell	- 0-20/4-20 mA Conductivity & temp output for each input - HART Standard or ProfiBUS (Optional)	- Zero Calibration (Dry in Air) - Cell constant calibration in standard solution or process media	- Any Suitable Contacting Conductivity Sensor with 1000 Ohm Platinum TC	- Concentration units of acids, bases, salinity & electrolytes - Ultrapure water temp. compensation, Resistivity in megaohms MΩ
Toroidal Conductivity (Contactless Inductive)	*Single or Dual Channel* - Toroidal Conductivity Sensor	- Range from From 0.050μS up to 2,000mS	- 0-20/4-20 mA Conductivity & temp output for each input - HART Standard or ProfiBUS (Optional)	- Zero Calibration (Dry in Air) - Cell constant calibration in standard solution or process media	- Any Suitable Toroidal Conductivity Sensor with 20/20 Windings and 1000 Ohm Platinum TC	- Concentration units of acids, bases, salinity & electrolytes - Excellent for strong acids, bases & electrolyte solutions

* Ion selective measurement type must be set at time of purchase at ASTI factory. Transmitters configured for ISE measurement not sold separately but rather only as part of complete ISE system including ISE transmitter AND ISE sensor supplied complete from ASTI factory. ISE measurement must be validated for feasibility by ASTI prior to sale.

Model 1056 Single & Dual Channel pH, ORP, Ion Selective (ISE), Contacting and Toroidal Conductivity 4-Wire Transmitter, Controller & Analyzer

COMPARISON CHART FOR 1056, 1057 & 56 ANALYZERS

- Chemically & Mechanically Resilient Polycarbonate NEMA 4X / CSA 4 IP65 Enclosure - Standard 1/2 DIN Cutout

- 115/230 VAC & 24 VDC 4-Wire Power Operation Standard (With or Without Relays)

- Optional Dry Contact 5A Relays for alarm or simple on/off control functionality, 4 each

- **Available in any combination of Single or Dual Channel pH / ORP / ISE / Conductivity Configurations**

- Extremely cost effective solution to simple pH, ORP, ISE & Conductivity Analyzer / Transmitter / Controller Requirements

- Automatic Temperature Compensation via 100 or 1000 Ohm Platinum Temperature Compensation Element (Available in Standard and ACCU-TEMP configurations)

- Dual (2 each) Isolated & Independent 0-20 or 4-20 mA outputs for Signal and/or temperature standard, fully user configurable

- Optional HART and ProfiBUS available for any mix of measurement channels

- Large LCD Display with touch membrane keypad - Menu Driven Interface and Programming

- Automatic Temperature Compensation from 0 to 150 °C (32 to 302 °F) for pH & ISE and 0 to 200 °C (32 to 392 °F) for Conductivity

pH/ORP/ISE Sensors WITHOUT preamplifier Hook-Up Schematic

pH/ORP/ISE Sensors WITH preamplifier Hook-Up Schematic

pH/ORP/ISE Sensors with Mini External Preamplifier Hook-Up Schematic

Guide to quick disconnect Q7M/Q7F snap cable system for Rosemount transmitters

Contacting Conductivity Sensor Hook-Up Schematic

Toroidal Conductivity Sensor Hook-Up Schematic

1056 Product Specifications

1056 Operation Manual

1056 HART Addendum

1056 ProfiBUS Addendum

Model 1056 Single & Dual pH, ORP, Ion Selective (ISE), Contacting & Toroidal Conductivity 4-Wire Transmitter, Controller & Analyzer Measurement Selection Guide & Configuration Table

Measurement	Input	Measurement Range	Outputs	Calibration Points	Compatible Sensor(s)	Special Features
Ion Selective (ISE) *	*Single or Dual Channel* - Solid State or Organic Membrane Ion Selective (ISE) Sensor	5 Decades Maximum Concentration Range from 1 ppb to 1 Molar (varies with each ion; please inquire to factory)	- 0-20/4-20 mA output for pH, ORP, ISE & temp for each input channel - Optional HART or ProfiBUS Digital Output	- 2 point user defined to determine ISE sensor slope - 1 point user defined for grab sample standardize to correct for offset (drift)	- Suitable ASTI ISE Sensor with Pt100 / Pt1000 TC element - Suitable ASTI ISE Sensor with Pt100/Pt1000 & 1056 style preamplifier	- Cost Effective Solution for Dual Channel Ion Selective (ISE) field industrial & municipal measurements
pH/ORP	*Single or Dual Channel* - pH/ORP	- 0 to 14 pH (standard) - Fully Scalable from 1 to 13 pH units	- 0-20/4-20 mA output for pH, ORP, ISE & temp for each input channel - Optional HART or ProfiBUS Digital Output	- 2 point auto buffer recognition for pH for slope determination - 1 point user defined pH standardize calibration to correct for offset (drift)	- Suitable ASTI pH or ORP Sensor with Pt100 / Pt1000 TC element - Suitable ASTI pH or ORP Sensor with Pt100/Pt1000 & 1056 style preamplifier	- Cost Effective Solution for Dual Channel pH & ORP field industrial & municipal measurements
Contacting Conductivity	*Single or Dual Channel* - Contacting Conductivity Sensor	- Cells from 0.01 to 10.0, user selectable - Ranges from 0-200 μS for 0.01/cm cell to 0-200 mS for 10.0/cm cell	- 0-20/4-20 mA Conductivity & temp output for each input - Optional HART or ProfiBUS Digital Output	- Zero Calibration (Dry in Air) - Cell constant calibration in standard solution or process media	- Any Suitable Contacting Conductivity Sensor with 1000 Ohm Platinum TC	- Concentration units of acids, bases, salinity & electrolytes - Ultrapure water temp. compensation, Resistivity in megaohms MΩ
Toroidal Conductivity (Contactless Inductive)	*Single or Dual Channel* - Toroidal Conductivity Sensor	- Range from From 0.050μS up to 2,000mS	- 0-20/4-20 mA Conductivity & temp output for each input - Optional HART or ProfiBUS Digital Output	- Zero Calibration (Dry in Air) - Cell constant calibration in standard solution or process media	- Any Suitable Toroidal Conductivity Sensor with 20/20 Windings and 1000 Ohm Platinum TC	- Concentration units of acids, bases, salinity & electrolytes - Excellent for strong acids, bases & electrolyte solutions

* Ion selective measurement type must be set at time of purchase at ASTI factory. Transmitters configured for ISE measurement not sold separately but rather only as part of complete ISE system including ISE transmitter AND ISE sensor supplied complete from ASTI factory. ISE measurement must be validated for feasibility by ASTI prior to sale.

Model 1057 Single, Dual or Triple Channel pH, ORP, Ion Selective (ISE), Contacting and Toroidal Conductivity 4-Wire Transmitter, Controller & Analyzer

COMPARISON CHART FOR 1056, 1057 & 56 ANALYZERS

- Chemically & Mechanically Resilient Polycarbonate NEMA 4X / CSA 4 IP65 Enclosure - Standard 1/2 DIN Cutout

- 115/230 VAC & 24 VDC 4-Wire Power Operation Standard With Relays

- Standard Dry Contact 5A Relays for alarm or simple on/off control functionality, 4 each included with each controller

- **Available in any combination of Single, Dual or Triple Channel pH / ORP / ISE / Conductivity Configurations**

- Extremely cost effective solution to simple pH, ORP, ISE & Conductivity Analyzer / Transmitter / Controller Requirements

- Automatic Temperature Compensation via 100 or 1000 Ohm Platinum Temperature Compensation Element (Avaialble in Standard and ACCU-TEMP configurations

- Quad (4 each) Isolated & Independent 0-20 or 4-20 mA outputs for Signal and/or temperature standard, fully user configurable

- Large LCD Display with touch membrane keypad - Menu Driven Interface and Programming

- Automatic Temperature Compensation from 0 to 150 °C (32 to 302 °F) for pH & ISE and 0 to 200 °C (32 to 392 °F) for Conductivity

pH/ORP/ISE Sensors WITHOUT preamplifier Hook-Up Schematic

pH/ORP/ISE Sensors WITH preamplifier Hook-Up Schematic

pH/ORP/ISE Sensors with Mini External Preamplifier Hook-Up Schematic

Guide to quick disconnect Q7M/Q7F snap cable system for Rosemount transmitters

Contacting Conductivity Sensor Hook-Up Schematic

Toroidal Conductivity Sensor Hook-Up Schematic

1057 Product Specifications

1057 Operation Manual

Model 1057 Single, Dual & Triple pH, ORP, Ion Selective (ISE), Contacting & Toroidal Conductivity Transmitter, Controller & Analyzer Measurement & Configuration Selection Guide

Measurement	Input	Measurement Range	Outputs	Calibration Points	Compatible Sensor(s)	Special Features
Ion Selective (ISE) *	*Single or Dual Channel* - Solid State or Organic Membrane Ion Selective (ISE) Sensor	5 Decades Maximum Concentration Range from 1 ppb to 1 Molar (varies with each ion; please inquire to factory)	- 0-20/4-20 mA output for pH, ORP, ISE & temp for each input channel	- 2 point user defined to determine ISE sensor slope - 1 point user defined for grab sample standardize to correct for offset (drift)	- Suitable ASTI ISE Sensor with Pt100 / Pt1000 TC element - Suitable ASTI ISE Sensor with Pt100/Pt1000 & 1057 style preamplifier	- Cost Effective Solution for Triple Channel Ion Selective (ISE) field industrial & municipal measurements
pH/ORP	*Single or Dual Channel* - pH/ORP	- 0 to 14 pH (standard) - Fully Scalable from 1 to 13 pH units	- 0-20/4-20 mA output for pH, ORP, ISE & temp for each input channel	- 2 point auto buffer recognition for pH for slope determination - 1 point user defined pH standardize calibration to correct for offset (drift)	- Suitable ASTI pH or ORP Sensor with Pt100 / Pt1000 TC element - Suitable ASTI pH or ORP Sensor with Pt100/Pt1000 & 1057 style preamplifier	- Cost Effective Solution for Triple Channel pH & ORP field industrial & municipal measurements
Contacting Conductivity	*Single or Dual Channel* - Contacting Conductivity Sensor	- Cells from 0.01 to 10.0, user selectable - Ranges from 0-200 µS for 0.01/cm cell to 0-200 mS for 10.0/cm cell	- 0-20/4-20 mA Conductivity & temp output for each input	- Zero Calibration (Dry in Air) - Cell constant calibration in standard solution or process media	- Any Suitable Contacting Conductivity Sensor with 1000 Ohm Platinum TC	- Concentration units of acids, bases, salinity & electrolytes - Ultrapure water temp. compensation, Resistivity in megaohms MΩ
Toroidal Conductivity (Contactless Inductive)	*Single or Dual Channel* - Toroidal Conductivity Sensor	- Range from From 0.050µS up to 2,000mS	- 0-20/4-20 mA Conductivity & temp output for each input	- Zero Calibration (Dry in Air) - Cell constant calibration in standard solution or process media	- Any Suitable Toroidal Conductivity Sensor with 20/20 Windings and 1000 Ohm Platinum TC	- Concentration units of acids, bases, salinity & electrolytes - Excellent for strong acids, bases & electrolyte solutions

* Ion selective measurement type must be set at time of purchase at ASTI factory. Transmitters configured for ISE measurement not sold separately but rather only as part of complete ISE system including ISE transmitter AND ISE sensor supplied complete from ASTI factory. ISE measurement must be validated for feasibility by ASTI prior to sale.

Model 1066 Single Channel pH, ORP, Contacting and Toroidal Conductivity 2-Wire Loop-Powered Transmitter & Analyzer

- Chemically & Mechanically Resilient Polycarbonate NEMA 4X / CSA 4 IP66 Enclosure - Standard 1/2 DIN Cutout

- 2-Wire Loop-Powered 24VDC Power Operation with scalable 4-20mA analog current loop output standard

  - Second 4-20mA loop-powered output available to send process temperature reading in addition to measured analytical liquid parameter

- Automatic Temperature Compensation via 100 or 1000 Ohm Platinum Temperature Compensation Element (Available in Standard and ACCU-TEMP fast response configurations)

- **HART 7 is Standard** and Foundation FieldBus available as an optional digital output

- Large LCD Display with touch membrane keypad - Menu Driven Interface and Programming

- Automatic Temperature Compensation from 0 to 150 °C (32 to 302 °F) for pH/ORP and 0 to 200 °C (32 to 392 °F) for Conductivity

- Area Classifications:

  - Intrinsically Safe (with appropriate safety barrier) for:

    - CSA/UL Class I, II, III, Div. 1 Groups A-G T4 Tamb = -20°C to 65°C

    - ALTEX Baseefa04ATEX0195X EEx ia IIC T4 Tamb = -20°C to 65°C

    - IECEx BAS 11.90098X EEx ia IIC T4 Tamb = -20°C to 65°C

  - Non-Incendive:

    - CSA/UL Class I, Div. 2, Groups A-D Dust Ignition Proof Class II & III, Div. 1, Groups E-G NEMA 4X Enclosure T4 Tamb = -20°C to 65°

pH/ORP/ISE Sensors WITHOUT preamplifier Hook-Up Schematic

pH/ORP/ISE Sensors WITH preamplifier Hook-Up Schematic

pH/ORP/ISE Sensors with Mini External Preamplifier Hook-Up Schematic

Guide to quick disconnect Q7M/Q7F snap cable system for Rosemount transmitters

Contacting Conductivity Sensor Hook-Up Schematic

Toroidal Conductivity Sensor Hook-Up Schematic

1066 Product Specifications

1066 Operation Manual

Model 1066 2-Wire Loop-Powered pH, ORP, Contacting & Toroidal Conductivity Transmitter & Analyzer Measurement Selection Guide and Configuration Table

Measurement	Input	Measurement Range	Outputs	Calibration Points	Compatible Sensor(s)	Special Features
pH/ORP	*Single Channel* - pH/ORP	- 0 to 14 pH (standard) - Fully Scalable from 1 to 13 pH units	- 4-20 mA output for pH or ORP & temperature - HART Standard or ProfiBUS Output (Optional)	- 2 point auto buffer recognition for pH for slope determination - 1 point user defined pH standardize calibration to correct for offset (drift)	- Suitable ASTI pH or ORP Sensor with Pt100 / Pt1000 TC element - Suitable ASTI pH or ORP Sensor with Pt100/Pt1000 & 1066 style preamplifier	- Excellent option for severe service pH & ORP measurement in areas with flammable gas and corrosive environments.
Contacting Conductivity	*Single Channel* - Contacting Conductivity Sensor	- Cells from 0.01 to 10.0, user selectable - Ranges from 0-200 μS for 0.01/cm cell to 0-200 mS for 10.0/cm cell	- 4-20 mA output for Conductivity & Temperature - HART 7 is Standard or Foundation Fieldbus is Optional	- Zero Calibration (Dry in Air) - Cell constant calibration in standard solution or process media	- Any Suitable Contacting Conductivity Sensor with 1000 Ohm Platinum TC	- Concentration units of acids, bases, salinity & electrolytes - Ultrapure water temp. compensation, Resistivity in megaohms MΩ
Toroidal Conductivity (Contactless Inductive)	*Single Channel* - Toroidal Conductivity Sensor	- Range from From 0.050μS up to 2,000mS	- 4-20 mA output for Conductivity & Temperature - HART 7 is Standard or Foundation Fieldbus is Optional	- Zero Calibration (Dry in Air) - Cell constant calibration in standard solution or process media	- Any Suitable Toroidal Conductivity Sensor with 20/20 Windings and 1000 Ohm Platinum TC	- Concentration units of acids, bases, salinity & electrolytes - Excellent for strong acids, bases & electrolyte solutions

Model 5081 2-Wire Loop-Powered Transmitter & Analyzer

- Rugged, weatherproof , corrosion-resistant enclosure.

- NEMA 4X and IP65 of epoxy-painted aluminum.

- This enclosure also meets NEMA 7B explosion-proof standards.

- 24V DC Operation Standard, 12 V minimum and 42.4 maximum.

- Continuous Diagnostics monitor sensor performance and warns of failure (FAULT) or approaching failure (WARNING).

- CE Certification for Class I, Division I Areas and FM group A-G.

- Automatic Two-Point Buffer Calibration reduces errors.

- Choice of Communication Protocol: HART® or Foundation Fieldbus.

- Non-Volatile Memory retains program settings and calibration data during power failures.

- Solution Temperature Compensation converts measured pH into the pH at 25°C.

pH/ORP/ISE Sensors WITHOUT preamplifier Hook-Up Schematic

pH/ORP/ISE Sensors WITH preamplifier Hook-Up Schematic

pH/ORP/ISE Sensors with External Preamplifier Hook-Up Schematic

Guide to quick disconnect Q7M/Q7F NEMA 6P rated snap connectors

Product Specifications for Hart & Fieldbus (242K-PDF)

5081 pH/ORP Operation Manual (2,465K-PDF)

Measurement	Input	Measurement Range	Outputs	Calibration Points	Compatible Sensor(s)	Special Features
pH/ORP	*Single Channel* - pH/ORP	- 0 to 14 pH (standard) - Fully Scalable from 1 to 13 pH units	- 4-20 mA output for pH or ORP - HART or Foundation Fieldbus Optional	- 2 point auto cal with pH buffers - 1 point user defined pH standardize calibration for offset	- pH or ORP Sensor with Pt100 / Pt1000 - pH or ORP Sensor with Pt100/Pt1000 & 1066 style preamplifier	- Severe service pH & ORP measurement in areas with flammable gas and corrosive environments.
Contacting Conductivity	*Single Channel* - Contacting Conductivity Sensor	- Cells from 0.01 to 10.0, user selectable - Ranges from 0-200 µS for 0.01/cm cell to 0-200 mS for 10.0/cm	- 4-20 mA output for Conductivity - HART or Foundation Fieldbus Optional	- Zero Calibration (Dry in Air) - Precise cell calibration in standard or process	- Any Suitable Contacting Conductivity Sensor with 1000 Ohm Platinum TC	- Concentration units of acids, bases, salinity & electrolytes - Measurement in UltraPure Water (MΩ)
Toroidal Conductivity (Contactless Inductive)	*Single Channel* - Toroidal Conductivity Sensor	- Range from From 0.050µS up to 2,000mS	- 4-20 mA output for Conductivity - HART or Foundation Fieldbus Optional	- Zero Calibration (Dry in Air) - Precise cell calibration in standard or process	- Any Suitable Toroidal Conductivity Sensor with 20/20 Windings and 1000 Ohm Platinum TC	- Concentration units of acids, bases, salinity & electrolytes - Excellent choice for high conductivity samples

Comparison Chart of 1056, 1057 & 56 pH, ORP, Ion Selective and Conductivity Transmitters

Feature	1056	1057	56
Enclosure	NEMA 4X	NEMA 4X	NEMA 4X
Agency Approvals	CE, CSA, FM, UL	CE, CSA, FM, UL	CE, CSA, FM, UL
Power Operation	115/230VAC or 24VDC	115/230VAC or 24VDC	115/230VAC or 24VDC
Scalable 0/4-20mA Output	Yes	Yes	Yes
Number of 0/4-20mA Output	2 each	4 each	4 each
Trim for each 0/4-20mA	Yes	Yes	Yes
Maximum Inputs	2 each (ISE/pH/ORP/Cond)	3 each (ISE/pH/ORP/Cond)	2 each (ISE/pH/ORP/Cond)
Preamplifier Support for pH/ORP/ISE Sensors	Yes, Max 300 feet total cable length with preamp	Yes, Max 300 feet total cable length with preamp	Yes, Max 300 feet total cable length with preamp
Relay for Alarm/Control	Yes, with -02 or -03 option only, 4 each	Yes, 4 each	Yes, 4 each
Type of Relay Control	On/Off Only	On/Off Only	On/Off or PID/TPC (Standard)
Digital Output Options	None Standard, HART & ProfiBUS Optional	None	HART Standard, ProfiBUS optional
Remote Monitoring/Datalog	Yes with HART/ProfiBUS	NO (from 4-20mA Only)	Yes with HART/ProfiBUS
Display	Large Screen LCD	Large Screen LCD	Large Screen LCD (Color/Graph)
Interface	Menu-Driven Software	Menu-Driven Software	Menu-Driven Software
Manual Entry of sensor slope and offsets	Yes, Using Calibration Menu Interface	Yes, Using Calibration Menu Interface	Yes, Using Calibration Menu Interface
Buffer Cal for slope & offset	Yes for both Slope & Offset	Yes for both Slope & Offset	Yes for both Slope & Offset
Process Offset to Agree with Grab Sample Analysis	Yes ("Standardize" Calibration)	Yes ("Standardize" Calibration)	Yes ("Standardize" Calibration)
ISE Ranges Supported	0 to 9,999 ppb, 0 to 9,999 ppm, 0 to 99.99%	0 to 9,999 ppb, 0 to 9,999 ppm, 0 to 99.99%	0 to 9,999 ppb, 0 to 9,999 ppm, 0 to 99.99%
pH Compensation for ISE	No	No	Yes
pH Range Supported	0-14	0-14	0-14
ORP Range Supported	-1500 to +1500 mV	-1500 to +1500 mV	-1500 to +1500 mV
Conductivity Cell Constant and Corresponding Maximum Range Supported	Cell from 0.01 to 10.0, user selectable; Ranges from 0-200μS (0.01/cm) to 0-200mS (10.0/cm) as mates with cell	Cell from 0.01 to 10.0, user selectable; Ranges from 0-200μS (0.01/cm) to 0-200mS (10.0/cm) as mates with cell	Cell from 0.01 to 10.0, user selectable; Ranges from 0-200μS (0.01/cm) to 0-200mS (10.0/cm) as mates with cell
Toroidal Conductivity Sensor (Inductive Contactless)	Any toroid sensor w/ compatible 20/20 Windings & Pt1000 TC	Any toroid sensor compatible 20/20 Windings & Pt1000 TC	Any toroid sensor w/ compatible 20/20 Windings & Pt1000 TC
TC Elements Supported	Pt100 or Pt1000	Pt100 or Pt1000	Pt100 or Pt1000
Supported TC Range	0-150°C for pH & ISE, 0-200°C for Conductivity	0-150°C for pH & ISE, 0-200°C for Conductivity	0-150°C for pH & ISE, 0-200°C for Conductivity
Datalogging Supported	HART/ProfiBUS	None (from 4-20mA Only)	Yes (USB Download, 30 days)
Primary Advantages	* ½-DIN Form Factor suitable for panel and field (pipe/wall mounting) installations * Large LCD display, easy to use menu-driven interface * Cost effective in dual channel configurations and/or when alarm/control relays are required * HART and ProfiBUS are supported as options	* ½-DIN Form Factor suitable for panel and field (pipe/wall mounting) installations * Large LCD display, easy to use menu-driven interface * Cost effective in triple channel configurations when alarm/control relays required * 4 each 4-20mA Analog Outputs Standard	* ½-DIN Form Factor suitable for panel and field (pipe/wall mounting) installations * Large Color LCD Display with Graphing of historical trends * Cost Effective Option when HART and/or Datalogging is required (both standard) * Ideal for applications where pH Compensation for ISE is required * Full PID and TPC algorithms are standard for advanced control * Profibus available as option

Last Revised February 21, 2012