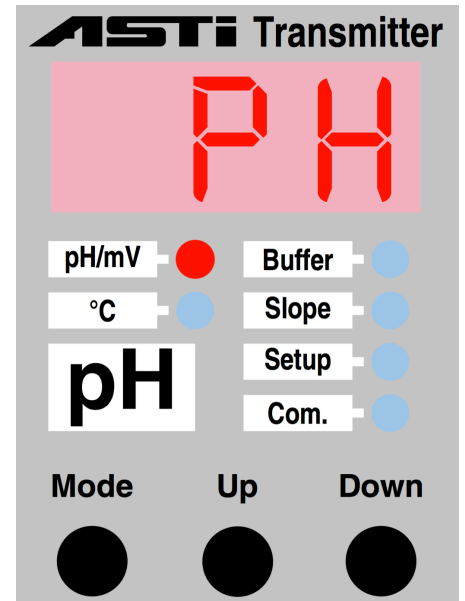


Model 3TX-pH 3-Wire pH/ORP/mV/Temp Transmitter

- 3TX-pH is a transmitter for pH, ORP, mV and Temperature Measurement
- Data Ranges: 0-14pH, ±1000mV, 0-210 °C (-2 to +16 pH for 3TX-pHE version)
- pH/ORP sensors with & without preamp supported (330 feet max w/preamp)
- 2-Point Slope calibrations use the same slope in acidic and alkaline ranges
- 3-Point calibration dual slope mode allows for a separate slope to be calibrated for the acidic ranges below pH7 and the alkaline ranges above pH7
- Single (1-Point Offset) Calibration supported for quick calibration with single pH buffer or to allow for agreement between laboratory pH determinations
- Temperature compensation via Platinum 100 or 1000 Ohm element
- Display calibrated pH, relative mV or Absolute mV and Temperature values
- Fully Scalable Analog Output 0-20 mA or 4-20 mA for pH/mV or Temperature
- Galvanic isolation between sensor input, power & analog output (3000V rating)
- Optional: Serial communication via RS-485 MODbus Digital Output
- 3TX-pHE version has 0.001pH / 0.1mV high resolution modbus output
- Field installations using weatherproof NEMA 4X & IP65 enclosures for up to 9 each pH/ORP/ISE/DO or conductivity transmitters in single enclosure assy



FEATURES

The ASTI 3TX Family of Transmitters Consists Of:

- 3TX-pH:** pH, ORP/mV & Temperature Transmitter with fully scalable 0/4-20mA output and MODbus (optional)
- 3TX-CON:** Contacting Conductivity Transmitter with fully scalable 0/4-20mA output and MODbus (optional)
- 3TX-ISE:** Ion Selective * (ISE) Transmitter with fully scalable 0/4-20mA output and MODbus (optional)
- 3TX-DO:** Dissolved Oxygen Transmitter with fully scalable 0/4-20mA output and MODbus (optional)
- 3TX-TEM:** Add scalable 4-20mA output of Temperature to 3TX-pH, 3TX-ISE, 3TX-CON or 3TX-DO transmitter.
- 3TX-REL:** Alarm & relay controller (On/Off, TPC, PFC) for pH/ORP, ISE, DO & Conductivity measurements
- 3TX-TOT:** Compute pH compensated "Total ISE" from ISE & pH inputs, 0/4-20mA analog & MODbus outputs
- 3TX-DAT:** Datalogger & MODbus Master for up to 63 each 3TX transmitter modules with MODbus output

The 3TX family has 3 digit display and 6 LEDs for setup & displaying values. The 'Mode' key is used to navigate.

Programming

The module is programmed by 3 keys on the front panel. The 'Mode' toggles and the 'Up' or 'Down' scroll through parameters. The parameter is altered via the 'Mode' and the value is changed using the 'Up' or 'Down'.

Parameter P01 "lock" must be set to 'Off' to change ANY parameter, including performing the temperature, offset and slope calibrations.

* Ion selective measurement must be validated by ASTI factory prior to order. 3TX-ISE sold only as part of complete ISE system with mating ISE sensor.

Input

The pH/ORP sensor without a preamplifier is connected directly to 3TX-pH transmitter. The mV signal from these sensors are processed by an integrated high impedance amplifier before entering the microprocessor. Alternatively, the 3TX-pH-X hardware version can support external preamplifiers to enable installations that require long cable lengths or to operate in very high interference areas. Temperature measurement is accomplished with a 2-wire Pt100/Pt1000 temperature sensor and then temperature compensation performed by the built-in microprocessor.

Analog Output

The 3TX-pH transmitter (module) has a scalable analog output of either 0-20 mA or 4-20 mA (selectable). The minimum pH range between the low (0mA or 4mA) and high (20mA) output is 1 pH unit with the default as 0 pH at 0mA or 4mA and 14pH at 20 mA. Analog output is proportional to pH/mV or Temperature as configured and is galvanic isolated from the sensor input.

MODbus (Optional)

Acquired data is transferred using MODbus standard for multidrop communication and connected using RS485. The Modbus-master may be 3TX-DAT or any SCADA system. When units are ordered with MODbus option, the free of charge Windows datalogging and graphing software and be used to monitor and record all process and temperature values from up to 247 3TX transmitters simultaneously at distances up to 6500 feet (2 kilometers).

TECHNICAL SPECIFICATIONS

Mechanical

Housing: Lexan UL94V-0 (Upper part)
Noryl UL94V-0 (Lower part)
Mounting: M36 for 35 mm DIN rail
IP Class: Housing IP40. Connector IP20
Connector: Max 16A. Max 2.5 mm²
Max torque 0,6 Nm
Temp.: Usage -15 to +50 °C (Storage -35 to +75 °C)
Weight: 75 grams (2.64 ounces)
Dimensions: D 58 x W 36 x H 86 mm (2.3" X 1.4" X 3.4")
CE mark: EN61326A



Electrical

Power Supply: 24VDC ±10%
Consumption: 60 mA max
Sensor: Combination Sensor
pH/mV Range: 0-14 pH, ±1000mV
pH input: < 1pA, >10GΩ
Accuracy: ±0.2% Excluding Sensor (Ideal)
Temp Sensor: Pt100, Pt1000
Temp Range: 0-210°C ± 0.3°C
Temperature: Fixed (Manual) or Automatic using
Compensation: Temperature (TC) Measurement
Analog Output: 0-20mA or 4-20mA, max. 500Ω
Output Hold: Automatic in calibration mode

PARAMETERS

Function and Programming

The 23 programmable parameters are shown to the right. For access see the paragraph about programming on page 1.
If the software lock (Par. no. 1) is "On" the parameter can only be read. Set Software Lock to "Off" to change values.
Par. no. 2 sets address for MODbus communication.
Par. no. 3 indicates the type of input for the pH/mV input.
Par. no. 4 indicates the type of input for the temperature input.
Par. no. 5 If Par. no. 3 is set to pH, the signal is temperature compensated. Par. no. 5 sets the temperature compensation to either set (manual) or based on the measured temperature.
Par. no. 6 sets the temperature for when temperature compensation of the pH measurement is in set (manual mode).
Par. no. 7 If long cable run is used with Pt100 TC then cable impedance is entered and subtracted from measured value.
Par. no. 8 is used to set how the pH sensor slope is calibrated. If 3-Point Slope Option is (On), the sensor is calibrated to one slope for the acidic range (below pH7) and another slope for the alkaline range (above pH7). If 3-Point Slope Option is (Off), the same single slope will be used in all pH ranges (0-14).
Par. no. 9 If Par.no. 3 is mV, then range set with this parameter. It is possible to select the whole range (±1000mV), the negative range (-1000-0mV) or the positive range (0-1000mV). This setting impacts the analog output and transferred data.
Par. no. 10 is used to set the analog output proportional to either the pH/mV signal or the temperature signal.
Par. no. 11 sets the analog output to either 0-20 mA or 4-20 mA.
Par. no. 12 allows setting output to be inverted (i.e. for use in control) with the output corresponding to 20-0mA or 20-4mA.
Par. no. 13 & 14 are used to set the pH value that corresponds to 0/4mA output setpoint (**Par no. 13**) and sets the pH value that corresponds to 20mA output setpoint (**Par no. 14**). The minimum difference between Par no. 13 & 14 must be at 1.0 pH unit although it is fully scalable without the ranges specified.
Par. no. 15 Variable to define the mV change for each "Up" or "Down" button depression when calibration is performed.
Par. no. 16 View & edit working sensor offset (Abs mV at pH 7)
Par. no. 17 View & edit working sensor slope. If P08 is OFF then slope for full 0-14 range. If P08 is ON (3-Point Cal for Dual Slope mode) then this is the slope for 0-7 pH range.

List of Parameters

No	Parameter	Description	Range	Default
01	Lock	Software Lock	On / Off	On
02	Address	MODbus	Off, 1...247	Off
03	pH/mV	Type of Input	pH, mV	pH
04	Temperature	Type of Input	Pt100, Pt1000	Pt1000
05	Compensation	Temp. Comp.	Auto, Set	Auto
06	Manual Temp	Fixed Temp	0...210	25
07	Cable Impedance	Only for Pt100	0.0 .. 9.9 Ohm	0.0
08	3-Point Slope Option	Calibration of Sensor Slope	Off (2-Point) On (3-Point)	Off
09	Range mV	Range for mV	±1000, -1000 to 0 0 to +1000	±1000
10	Select Analog Output Type	Input for the analog output	pH or Temp °C	pH
11	Out	Type of output	4-20mA, 0-20mA	4-20
12	Set Analog Output Mode	Set polarity of analog output	noninverted, inverted	n.inv
13	0/4mA Set	Low Setpoint	0.0-13.0 pH	0.0
14	20mA Set	High Setpoint	1.0-14.0 pH	14.0
15	Step Change	mV Increment for Calibration	0=0.2, 1=0.5, 2=1.0, 3=2.0	1 (0.5mV)
16	Offset	mV @ pH 7	±250 mV	0
17	Slope 1	mV per pH	30 to 90	59.2
18	Slope 2	mV per pH	30 to 90	---
19	0/4mA Offset	Trim Low	±9.99%	0.00
20	20mA Gain	Trim High	±9.99%	0.00
21	Energy Save	Energy Save	On / Off	On
22	Baudrate	MODbus	9,600/19,200	19,200
23	Back to Default	Reset to Default	Def=Reset, Par=NoReset	Par

Par. no. 18 View & edit working sensor slope 2 for 7-14 pH range. This is valid only if P08 is ON, or else just blank "----" no value.
Par. no. 19 Offset adjustment for 0/4mA low analog output trim.
Par. no. 20 Gain adjustment for 20mA high analog output trim.
Par. no. 21 If no keys are pressed for 10 minutes the display will show a flashing bar (Energy Save). Pressing any key to return.
Par. no. 22 The MODbus standard requires a baudrate of 9,600 or 19,200 set in accordance with the MODbus-master.
Par. no. 23 Feature to reset the analyzer back to factory default.

Buffer / Slope Adjustment

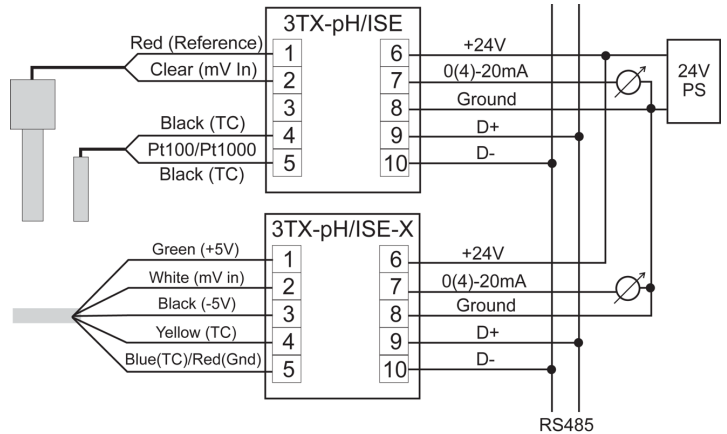
Using 'Mode' select 'Buffer' and calibrate to first desired value using Up/Down keys (typically pH buffer 6.86 or 7.00). Next using 'Mode' select 'Slope' and use Up/Down keys until display reads the second desired value (typically pH buffer 4.00 for low pH use and 9.18 or 10.00 for high range pH use). Dual slope mode is recommended when the process media frequently crosses pH 7 boundary (P08 set to 'On'). For dual slope, sensor is calibrated at three points: one near pH 7 (in 'Buffer' mode) then in a pH buffer below pH7 (in 'Slope' mode) and then in a pH buffer above pH7 (in 'Slope' mode). You must exit the 'Slope' mode after completing the acidic slope (below pH7) calibration before entering the alkaline slope (above pH7) calibration.

The 'Buffer' calibration can achieve a process offset whereby the online reading can be made to agree with any grab sample analysis. A two (2) second dampener exists for both calibrate modes and a ten (10) second dampener for the measure mode.

The sensor offset & slope values can be manually entered using **P16, P17 & P18**. All settings are stored in EEPROM so unit can be powered down without loss of configuration or calibration.

NOTE: The raw uncompensated (a.k.a. "absolute") mV potential of the pH sensor is displayed by pressing the "Down" key in the main pH/mV display mode. The display now changes from pH to absolute mV units. Negative values will be displayed flashing. The temperature can be calibrated pushing the "Up" or "Down" buttons when in the temperature display (°C) mode.

Typical Installation



The wiring for sensors with and without preamplifiers are detailed above. Note that these two wiring details represent interface with two altogether different hardware versions which must be selected at time of purchase. Care should be taken to ensure that the proper wiring scheme is used.

MODBUS

In order to utilize the MODbus interface the 3TX-pH must be ordered with MODbus. 3TX-pH may be used as a slave for the 3TX-DAT or as a slave in a SCADA data acquisition. The setup and communication for each case will be explained below.

With 3TX-DAT

If 3TX-pH is used with 3TX-DAT, the baud rate on the MODbus as well as the address of the 3TX-pH should be noted. **The baud rate (P22)** must be set to the baud rate of the 3TX-DAT. Whether a baud rate of 19,200 or 9,600 is used is of no importance, as long as all units on the MODbus are set to the same baud rate.

The address (P02) must be unique in the network; Two units cannot have the same address. In a network with 3TX-DAT as master, all addresses must be assigned in series; i.e. if 3 units are connected to 3TX-DAT, the addresses 1, 2 & 3 must be assigned to the three units. The order of the addresses is of not important. In network with a 3TX-DAT, up to 63 slaves may be connected.

In a SCADA system

The baud rate (P22) must be set to the baud rate of the SCADA system. **The address (P02)** must be unique in the network and Up to 247 3TX transmitters may be connected on one network.

MODbus Scaling

The 3TX-pH in pH mode has the 0-14 pH range or else in ORP mode will be as set in P09 (mV range). The 3TX-pHE in pH mode has full -2 to +16 pH range or else while in ORP mode has the -1000 to +1000 mV range (both full scale). Note the MODbus scaling may differ from 0/4-20 mA analog scaling for both units.

The 3TX-pH contains 2 measurements (pH/mV & temperature). Access is gained through function code *Read_Input_Registers (04)*. The 3TX-pH gives access to different diagnostic values as well via *Diagnostics (08)* as shown in the following tables below.

Read_Input_Registers

Function code	Start address	Number of values
04	1	1 or 2

Value 1 is pH/mV and value 2 is temperature. Measurements are transmitted in sequence; If 2 values are chosen both pH/mV and temperature are transmitted. If the value for temperature is wanted, 2 values must be requested. Both values are rated 0-1000 corresponding to the range, but the temperature has an offset of 1024; i.e. 0-14pH is transmitted as 0-1000 & 0-210°C as 1024- 2024. Inquire to factory about scaling for special 3TX-pHE units.

Diagnostics

Function Code	Sub Code (HEX)	Description
08	00	Return Query Data
	0A	Clear counters & diagnostics register
	0B	Return Bus Message Count
	0C	Return Bus Comm. Error count
	0D	Return Exception Error count
	0E	Return Slave Message count
	0F	Return Slave No Response count
	12	Return Bus Character Overrun count



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
-HiQ-pH	Intelligent pH & ORP Transmitter for Smart Digital pH & ORP Sensors; Both 4-20mA & MODBUS outputs standard
-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 ANALOG MEASUREMENT MODULES (ONE OPTION MUST BE SELECTED FOR EACH MODULE)	
CODE	DESCRIPTION
-A	Single Fully Scalable Analog 0-20 or 4-20 mA Output Only
-D	Single Fully Scalable Analog 0-20 or 4-20 mA Output 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
-PS/BAT	Dual Isolated & Regulated 24VDC Power Supply Step-Up Converter for operation from 5V, 6V & 9V Batteries
-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 outputs
-DAT	Datalogger & MODbusmaster for 3TX Transmitters w/ RS485 MODbus; Download & Setup via RS232/USB on Windows

Contact the factory for specific recommendations & ALL ISE inquiries. 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 (NH₃) 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 (NH₃) 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 rated 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

** For sensors with integral preamplifiers, order the pH/ORP transmitters as -pH-X and the ion selective (ISE) transmitters as -ISE-X and dissolved oxygen (DO) transmitters as -DO-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).