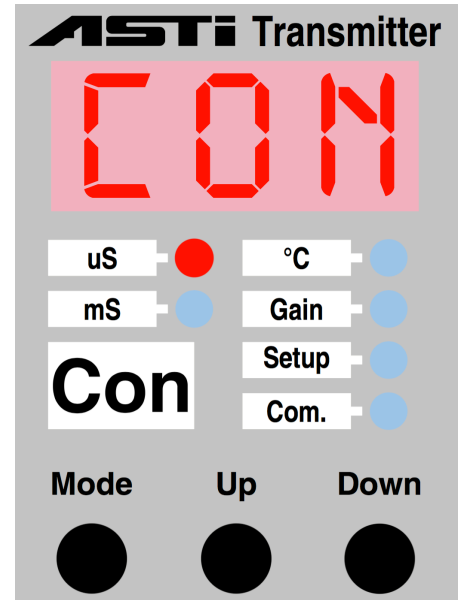


3TX-CON 3-Wire Contacting Conductivity Transmitter

- 3TX-CON is a transmitter for Conductivity & Temperature Measurement
- Measurement Ranges: 0.05–1,000,000 μS | 0.00005–1,000 mS (*par 21*), 0–210 °C
- Cell Constants Supported: 0.01–20.0 (*par no. 22*) - custom cell constants available
- The full scale measurement range and nominal cell constant must be defined at the time of order and cannot be changed after dispatch from factory
- Production Calibration a.k.a. Single (1-Point Offset) Calibration supported for quick calibration to allow for agreement with laboratory conductance analysis
- Temperature compensation via Platinum 100 or 1000 Ohm element
- Display Conductivity (in μS or mS) or Temperature
- Scalable Analog Output 0–20 mA or 4–20 mA for Conductivity or Temperature
- Galvanic isolation between sensor input and analog output (3000V rating)
- Automatic correction for resistance and capacitance of sensor cable
- Optional: RS-485 MODbus RTU; High Resolution 3TX-CON-E style available
- Field installations supported using weatherproof NEMA 4X & IP65 enclosures
- Up to 7 measurement modules can be used in a single enclosure assembly
- Optional 115/230 VAC power supply, relay/controller & datalogger modules



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

Conductivity cell outer and inner electrodes are connected to terminals 1 and 2, respectively. The current through the cell is proportional to the conductivity of the solution and measurement of the current is the basis of the readout, the analog output as well as the value sent over the MODbus. The Pt100/Pt1000 temperature sensor is connected to terminals 4 and 5 and the measured value is the basis of the temperature correction, which is performed by the built-in microprocessor. Terminal 3 is the ground terminal and should be connected to sensor wire shield.

Analog Output (Standard)

The 3TX-CON transmitter (module) has a scalable & reversible analog 0–20 mA or 4–20 mA output (selectable). The scaling between the minimum (0mA or 4mA) and maximum (20mA) output is anywhere from 10% to 100% of full range scale specified where low and high setpoints can be otherwise arbitrarily defined in conductivity units. The analog output is galvanically isolated from input and proportional to conductivity or temperature value.

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: 2-Wire Contacting Cell
Measuring Range: See Par. 21 for Max Full Range
Cell Constant: See Par. 22 (Nominal) & 15 (Gain)
Accuracy: ±1% Excluding Sensor (Ideal)
Temp Sensor: Pt100, Pt1000
Temp Range: 0-210°C ± 0.3°C
Temperature Compensation: Fixed (Manual) or Automatic using Temperature (TC) Measurement
Analog Output: 0-20mA or 4-20mA, max. 500Ω
Output Hold: Automatic when 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 module's address for MODbus communication.
Par. no. 3 indicates type temperature input (Pt100 or Pt1000).
Par. no. 4 sets the temperature compensation to be either fixed (manual/set) or automatic from measured temperature.
Par. no. 5 sets temp value when temperature compensation of the conductivity measurement is in fixed (manual/set mode).
Par. no. 6 is the temperature compensation coefficient used, expressed in %/°C units (valid for auto or manual TC mode)
Par. no. 7 the wire gauge (AWG) for the sensor cable used
Par. no. 8 the length of sensor cable in units of feet.
Par. no. 9 select the conductivity (S) or temperature measurement (°C) signal used for the analog output.
Par. no. 10 sets analog output to either 0-20 mA or 4-20 mA.
Par. no. 11 define low 0/4mA setpoint in conductivity units.
Par. no. 12 define high 20mA setpoint in conductivity units. Difference between low & high output setpoints (P11 & P12) must be at least 10% of full range scaling per parameter P21.
Par. no. 13 Step change for up/down button during cal
Par. no. 14 Zero offset calibration when sensor is dry in air.
Par. no. 15 Set/display gain on cell constant. The effective cell constant is the product of P15 (gain) and P22 (nominal cell).
Par. no. 16 Offset adjustment for 4mA low analog output trim.
Par. no. 17 Gain adjustment for 20mA analog output trim.
Par. no. 18 If no keys pressed for 10 minutes, display shows flashing bar (Energy Save Mode). Pressing any key to exit
Par. no. 19 Sets baudrate to either 9,600 or 19,200 kbps.
Par. no. 20 Feature to reset analyzer back to factory default.
Par. no. 21 is the full range of the particular 3TX-CON module/transmitter. This is a display (read-only) parameter.
Par. no. 22 is the nominal conductivity cell constant. This is a display (read-only) parameter. Both P21 and P22 are set at the factory prior to dispatch and cannot be changed in the field.
Par. no. 23 allows setting output to be inverted (i.e. for use in control) with the output corresponding to 20-0mA or 20-4mA.
Par. no. 26 resets back to factory default the P14 zero dry in air calibration as well as the wet P15 gain slope/span calibration.

* Negative trim adjustments will be shown as flashing numbers.

List of Parameters

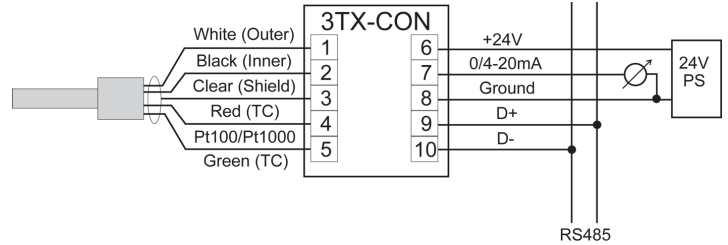
No	Parameter	Description	Range	Default
01	Lock	Software Lock	On / Off	On
02	Address	Address on MODbus	Off, 1...247	Off
03	Temperature	Type of Input	Pt100, Pt1000	Pt1000
04	Compensation	Temp. Comp. Conductivity	Auto, Fixed (Manual / Set)	Auto
05	Comp. Temp.	Compensating Temperature	0..210	25
06	Temp. Comp. Factor	Compensation Factor	0.50 - 5.00 %/°C	2.10
07	Wire Gauge	Sensor AWG	20, 22, 24	22
08	Cable Length	Length in feet	1...999 feet	10
09	Select Analog Output Type	Input for the analog output	Conductivity (S) or Temp °C	Con (S)
10	Analog Output	Type of output	0-20mA or 4-20mA	4.20
11	0/4mA Low Output Scale	Low Output (Cond Units)	0%-90% of Full Range	0%
12	20mA High Output Scale	High Output (Cond Units)	10%-100% of Full Range	100%
13	Step Change	Increments for Calibration	0=0.1%, 1 =0.2%, 2=0.5%, 3=1.0%	2 (0.5%)
14	Offset Adjustment	Zero Calibration	Increments per P13	N/A
15	Working Gain (Slope)	Gain on Cell Constant	±50% or ±70%	1.00
16	0/4mA Offset	Trim Low	±9.99% *	Factory
17	20mA Gain	Trim High	±9.99% *	Factory
18	Energy Save	Energy Save	On / Off	On
19	Baudrate	MODbus	9,600 / 19,200	19,200
20	Back to Default	Reset to Default	Def=Reset, Par=NoReset	Par
21	Full Range	Max Range	Per Cell K	N/A
22	Nominal Cell Constant	Cell constant a.k.a. "K"	As defined on order	N/A
23	Set Analog Output Mode	Set polarity of analog output	noninverted, inverted	n.inv
26	Reset Cals Only	Reset both the P14 & P15 calcs	Def=Reset, Par=NoReset	Par

Calibration

Use 'Mode' to select 'Gain', then 'Up' or 'Down' to adjust the readout corresponding to the expected value. The adjustment may be $\pm 50\%$ or $\pm 70\%$ from nominal value depending upon model, and may be entered manually using Par no. 15. **The effective cell constant is found by multiplying the nominal cell constant (P22) with effective gain (P15).** Zero calibration is performed with sensor clean and dry and exposed to only air with Par no. 14, with the steps determined by Par no. 13.

NOTES: The temperature can be calibrated by pushing the "Up" or "Down" buttons when in the temperature display (°C) mode. The raw (uncompensated) conductivity can be viewed by pushing the 'Down' button in the main measure display mode. The mA output for the current configuration is displayed by pressing the "Up" key in the main conductivity display mode.

Typical Installation



Cell Constant

20.0 (6.0-34.0)
10.0 (3.0-17.0)
2.0 (0.6-3.4) *
1.0 (0.3-1.7)
0.2 (0.06-0.34) *
0.2L (0.1-0.3)
0.1 (0.03-0.17)
0.1L (0.05-0.15)
0.02E (0.006-0.034)
0.02L (0.01-0.03)
0.01 (0.005-0.015)
0.01L (0.005-0.015)

Full Scale Maximum Conductivity Range (Nominal)

0 to 1,000,000 microSiemens(μ S)/cm | 0-1,000 mS/cm
0 to 500,000 microSiemens(μ S)/cm | 0-500 mS/cm
0 to 100,000 microSiemens(μ S)/cm | 0-100 mS/cm *
0 to 50,000 microSiemens(μ S)/cm | 0-50 mS/cm
0 to 10,000 microSiemens(μ S)/cm | 0-10 mS/cm *
0 to 400 microSiemens(μ S)/cm | 0-0.4 mS/cm
0 to 5,000 microSiemens(μ S)/cm | 0-5 mS/cm
0 to 200 microSiemens(μ S)/cm | 0-0.2 mS/cm
0 to 2,000 microSiemens(μ S)/cm | 0-2.0 mS/cm
0 to 40 microSiemens(μ S)/cm | 0-0.04 mS/cm
0 to 500 microSiemens(μ S)/cm | 0-0.5 mS/cm
0 to 20 microSiemens(μ S)/cm | 0-0.02 mS/cm

Minimum Range at 10% of Maximum Full Range

0 to 100,000 microSiemens(μ S)/cm | 0-100 mS/cm
0 to 50,000 microSiemens(μ S)/cm | 0-50 mS/cm
0 to 10,000 microSiemens(μ S)/cm | 0-10 mS/cm *
0 to 5,000 microSiemens(μ S)/cm | 0-5 mS/cm
0 to 1,000 microSiemens(μ S)/cm | 0-1 mS/cm *
0 to 100 microSiemens(μ S)/cm | 0-0.1 mS/cm
0 to 500 microSiemens(μ S)/cm | 0-0.5 mS/cm
0 to 50 microSiemens(μ S)/cm | 0-0.05 mS/cm
0 to 200 microSiemens(μ S)/cm | 0-0.2 mS/cm
0 to 10 microSiemens(μ S)/cm | 0-0.01 mS/cm
0 to 50 microSiemens(μ S)/cm | 0-0.05 mS/cm
0 to 5 microSiemens(μ S)/cm | 0-0.005 mS/cm

* $K=2.0/cm$ extended range is 0-200mS (min scale 0-20mS); $K=0.2/cm$ extended range is 0-20mS (min scale 0-2mS) in both analog & MODbus outputs.

NOTES: Many alternate cell constants and ranges can be supported (inquire to factory). The full scale measurement range and nominal cell constant must be defined at the time of order and cannot be changed after dispatch. The effective cell constant can be modified with a gain calibration from $\pm 50\%$ to $\pm 70\%$ of the nominal cell constant (depending upon model). The possible effective cell constants after a gain adjustment is performed are shown to the right of the cell constant (in parentheses).

MODBUS

In order to utilize the MODbus interface the 3TX-CON must be ordered with MODbus. 3TX-CON may be used as a slave for the 3TX-DAT or in a SCADA data acquisition. Refer to the separate specifications for the high resolution 3TX-CON-E unit.

With 3TX-DAT

If 3TX-CON is used with 3TX-DAT, the baud rate on the MODbus as well as the address of the 3TX-CON should be noted. **The baud rate (P19)** must be set to the baud rate of the 3TX-DAT. Whether 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 or with Windows software

The baud rate (P22) must be set to the baud rate of the SCADA.

The address (P02) must be unique in the network. Up to 247 3TX transmitters may be on one network although repeaters may be required if more than 32 nodes are used and/or to support very long cable distances in noisy areas.

MODbus Scaling

The MODbus scaling for the conductivity process measurement output is the same as the analog output range as defined by P11 (low 0/4mA setpoint) and P12 (high 20mA setpoint).

The 3TX-CON contains 2 measurements (Conductivity and temperature). Access to these both of these measurements is gained through the function code *Read_Input_Registers (04)*.

Read_Input_Registers

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

Value 1 is Conductivity and value 2 is Temperature. If 2 values are chosen, both conductivity and temperature are transmitted. If, for instance, the value for temperature is wanted, 2 values must be requested. Both values are sent as 0-1000 corresponding to the effective range, but temperature has an offset of 1024; i.e. conductivity range as set by P11 & P12 is transmitted as 0-1000 while the 0-210°C temperature is then transmitted as 1024- 2024.

The 3TX-CON gives access to different diagnostic values via *Diagnostics (08)*, as shown in the following.

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 Defined at Time of Order)
-ISE-ION *	Ion Selective (ISE) Measurement Module / Transmitter for ppm ranges ** 4-20mA & MODBUS outputs are standard
-ISE-kilo-ION *	Ion Selective (ISE) Measurement Transmitter for kilo-ppm ranges ** Both 4-20mA & MODBUS outputs are standard
-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 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

* To obtain a 3TX transmitter that supports and requires analog sensors with **preamplifiers**, order the pH/ORP transmitters as **-pH-X** and the ion selective (ISE) transmitters as **-ISE-X** or **-ISE-kilo-X**

** The type of ion to be measured must be defined at time of order and cannot be changed after dispatch from the factory.

*** 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).



3TX-CON-E HIGH RESOLUTION MODBUS CONDUCTIVITY TRANSMITTER SUPPLEMENT

The 3TX-CON-E series of contacting conductivity transmitters allows for high resolution MODbus output to take full advantage of the maximum internal resolution of the instrument for applications where this is advantageous. Please contact factory to determine if your application would benefit from use of the 3TX-CON-E version. All specifications not detailed below are identical to the standard 3TX-CON transmitter for the given cell constant and configuration.

Nominal Cell Constant	Calibrated Cell Range	Full Range with Temp. Comp.	Full Range Resolution MODBus Value 1 Scaling	Raw Conductivity Input Range	Raw Input Resolution MODBus Value 3 Scaling
K = 0.02/cm	0.006 to 0.034	0-2,000 µS (0-2mS)	0.1µS 0-20,000 Steps	0-5,000 µS (0-5mS)	0.1µS 0-50,000 Steps
K = 0.1/cm	0.03 to 0.17	0-5,000 µS (0-5mS)	0.5µS 0-10,000 Steps	0-25,000 µS (0-25mS)	0.5µS 0-50,000 Steps
K = 0.2/cm	0.06 to 0.34	0-20,000 µS (0-20mS)	1µS 0-20,000 Steps	0-50,000 µS (0-50mS)	1µS 0-50,000 Steps
K = 1.0/cm	0.30 to 1.70	0-50,000 µS (0-50mS)	5µS 0-10,000 Steps	0-250,000 µS (0-250mS)	5µS 0-50,000 Steps
K = 2.0/cm	0.60 to 3.40	0-200,000 µS (0-200mS)	10µS 0-20,000 Steps	0-500,000 µS (0-500mS)	10µS 0-50,000 Steps
K = 10.0/cm	3.00 to 17.0	0-500,000 µS (0-500mS)	50µS 0-10,000 Steps	0-2,500,000 µS (0-2,500mS)	50µS 0-50,000 Steps
K = 20.0/cm	6.00 to 34.0	0-1,000,000 µS (0-1,000mS)	100µS 0-10,000 Steps	0-5,000,000 µS (0-5,000mS)	100µS 0-50,000 Steps

Shared Modifications for all 3TX-CON-E series units from standard 3TX-CON transmitters:

- The second MODbus value is always the temperature. The scaling is 0-210 °C sent as 0-1,000 steps.
- Changing parameter P11 (low 0/4 mA setpoint) and/or the parameter P12 (high 20mS setpoint) will modify the scaling on the analog 0/4-20mA outputs only. The MODbus output ranges are fixed as defined above for the 3TX-CON-E version. In contrast, for the standard MODbus resolution CON-CELL/RANGE-D units, the MODbus scaling follows what is set for the analog 0/4-20mA outputs via parameters P11 & P12 and sent as 0-1000 steps.
- The MODbus output of any CON-E unit is incompatible with the DAT MODbus datalogger. To interface a 3TX conductivity transmitter with a DAT, use the standard MODbus resolution CON-CELL/RANGE-D units instead.
- The CON-E high resolution units are compatible with the “ASTI Windows Datalogging & Graphing Software for 3TX Conductivity Transmitters”, Version 2.3 or above.
- The CON-E high resolution units are compatible with any suitable standards compliant MODbus PLC, SCADA or data acquisition system. Please inquire to ASTI factory if you have any specific question regarding compatibility for your planned use and setup or the protocol employed.

To order the 3TX-CON-E style, simply include the desired nominal cell constant only when ordering. For example, the K=0.2/cm cell constant unit is simply ordered as 3TX-CON-E-0.2. Note that there is no need to indicate that the CON-E is a MODbus output style (typically denoted with a -D at the end of the typical 3TX transmitter part number) since this CON-E high resolution MODbus conductivity transmitter ONLY comes in the dual analog plus MODbus output configuration. There is no difference in price between the standard MODbus resolution CON-CELL/RANGE-D transmitters (and these are the DAT datalogger compatible units) and these high resolution MODbus CON-E-CELL transmitters (which are DAT incompatible). Please contact factory for assistance to ensure that you select the most appropriate unit for your desired application.

Last Modified August 11, 2014 - Revision 10

3TX-CON CONDUCTIVITY TRANSMITTERS SUITABLE FOR LOW-RANGE MEASUREMENTS

The 3TX-CON conductivity transmitter configurations detailed are optimized for performing measurements in low conductivity samples. In particular the 3TX-CON-L configurations may be advantageous to allow for use of relatively high more open geometry cell constant configurations to perform low conductivity measurements.

- EXAMPLE 1: A conductivity sensor with **cell constant K=0.1/cm** can be used to perform low range measurements down to 0-50 $\mu\text{S/cm}$ (min scaling for the 3TX-CON-L-0.1/0.2) but as high as 0-5,000 $\mu\text{S/cm}$ with the full range scaling for the standard mode 3TX-CON-0.1/5.0 transmitter configuration.
- EXAMPLE 2: A conductivity sensor with **cell constant K=0.2/cm** can be used to perform low range measurements down to 0-100 $\mu\text{S/cm}$ (min scaling for the 3TX-CON-L-0.2/0.4) but as high as 0-20,000 $\mu\text{S/cm}$ with the full range scaling for the high range mode 3TX-CON-0.2/20 transmitter configuration.
- EXAMPLE 3: A conductivity sensor with **cell constant K=2.0/cm** can be used to perform low range measurements down to 0-1,000 $\mu\text{S/cm}$ (min scaling for the 3TX-CON-L-2.0/4) but as high as 0-200,000 $\mu\text{S/cm}$ with the full range scaling for the high range mode 3TX-CON-2.0/200 transmitter configuration.

Please contact the factory to determine the best choice of 3TX-CON transmitter model and configurations for the particular measurement range of interest and desired installation scheme in your process line.

Nominal Cell Constant	Calibrated Cell Range	3TX-CON Model Type & Configuration	Full Range Scaling with Temperature Compensation	Minimum Analog Output Scaling	Temperature Range
K = 0.01/cm	0.005 to 0.015	3TX-CON-L-0.01/0.02	0-20 μS (0-0.02mS)	0-5 μS (0-0.005mS)	0-150 °C
K = 0.01/cm	0.005 to 0.015	3TX-CON-0.01/0.5	0-500 μS (0-0.5mS)	0-50 μS (0-0.05mS)	0-210 °C
K = 0.02/cm	0.01 to 0.03	3TX-CON-L-0.02/0.04	0-40 μS (0-0.04mS)	0-10 μS (0-0.01mS)	0-150 °C
K = 0.02/cm	0.006 to 0.034	3TX-CON-E-0.02	0-2,000 μS (0-2mS)	0-200 μS (0-0.2mS)	0-210 °C
K = 0.1/cm	0.05 to 0.15	3TX-CON-L-0.1/0.2	0-200 μS (0-0.2mS)	0-50 μS (0-0.05mS)	0-150 °C
K = 0.2/cm	0.10 to 0.30	3TX-CON-L-0.2/0.4	0-400 μS (0-0.4mS)	0-100 μS (0-0.1mS)	0-150 °C
K = 1.0/cm	0.50 to 1.50	3TX-CON-L-1.0/2	0-2,000 μS (0-2.0mS)	0-500 μS (0-0.5mS)	0-150 °C
K = 2.0/cm	1.00 to 3.00	3TX-CON-L-2.0/4	0-4,000 μS (0-4.0mS)	0-1,000 μS (0-1.0mS)	0-150 °C

NOTES:

- Changing parameter P11 (low 0/4 mA setpoint) and/or the parameter P12 (high 20mS setpoint) will modify the scaling on the analog 0/4-20mA output. The support minimum and maximum scaling are detailed above.
- MODbus output scaling follows what is set for the analog 0/4-20mA outputs via parameters P11 & P12 and sent as 0-1000 steps for all 3TX-CON transmitters except for 3TX-CON-E which uses a single high resolution output mode independent of the analog output scaling used (please see separate 3TX-CON-E supplement for details).
- This table only details the available 3TX-CON conductivity transmitters for use in low-range samples. Refer to main 3TX-CON and 3TX-CON-E documentation for measurement in mid and high conductivity range samples.