# *3TX–TEM-DT Smart Temperature Transmitter*

- 3TX-TEM-DT smart temperature transmitter displays & transmits isolated scalable 0-20 mA or 4-20 mA analog output for temperature by snooping value from smart digital HiQDT MODBUS RTU pH, ORP, Ion Selective (ISE), Dissolved Oxygen (D.O.) or Conductivity (EC) sensor on network
- Tight integration with 3TX-RTU-D transmitters allows sending both the process value & temperature value via 0-20 mA or 4-20 mA analog outputs
- Displays calibrated temperature (°C) as well as the raw temperature and Ohms (Ω) from platinum temperature element inside of the smart digital HiQDT MODBUS RTU sensor which is configured for this output
- Display of current mA output based upon live input and scaling setpoints
- Galvanic isolation between input, power & analog output (3KV rating)
- Trim offset calibration for 4mA and Gain (Span) calibration for 20mA to ensure good agreement of values with mating mA input device
- User adjustable scaling for analog temperature with full range as -40 °C to +210 °C and minimum scaling as 100 °C between low & high setpoints
- Plug & play with any HiQDT field installation to add temperature output
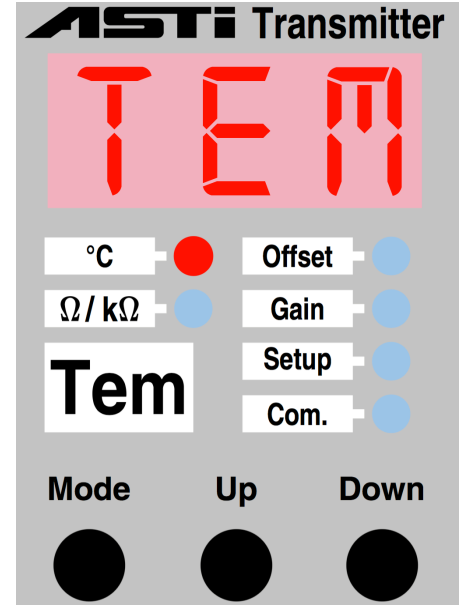
MAIN FEATURES

Application

3TX-TEM-DT modules are ideal for when the temperature value from any connected smart digital RS-485 HiQDT MODBUS RTU sensors needs to sent via an analog current loop output. Temperature values which are the basis of analog output are obtained by "snooping" on the node address of the smart sensor performing the measurement. Since the values are obtained by "snooper" approach there must exist an isolated independent MODBUS RTU master to poll sensor performing measurement so that the 3TX-TEM-DT temperature output module can "snoop" registers corresponding to the temperature values. Master device can be the 3TX-RTU-D universal transmitter or else a different upstream master as preferred.

For the RTU touchscreen controllers there will be two master devices present in the installation; the 3TX-RTU-D transmitter is master to the smart digital sensor slave and the HMI which is master to the 3TX-RTU-D transmitter which then also simultaneously act as slave device. The 3TX-TEM-DT module placed between the HMI and the 3TX-RTU-D transmitter and will "snoop" the values requested from the HMI master when the 3TX-RTU-D transmitter replies to those polling requests. Please refer to the wiring schematic later in this manual for further details on the correct configuration and setup of units.

SMART UNIVERSAL TEMPERATURE TRANSMITTER:

The 3TX-TEM-D supports obtaining, displaying and outputting temperature from all possible smart digital HiQDT MODBUS RTU pH, ORP, dissolved oxygen (D.O.), ion selective (ISE) and conductivity (EC) sensors.

Smart 3TX Family of MODBUS Transmitters Consists Of:

3TX-RTU-D: Smart Universal Transmitter for all Smart Digital HiQDT MODBUS RTU Sensors; Display and output of process values from connected smart sensor and node translation and isolated for upstream MODBUS RTU master device on network such as touchscreen controller.

3TX-TEM-DT: Smart temperature transmitter provides analog output for temperature value from any connected smart digital HiQDT MODBUS RTU sensor in the network.

3TX-REL-DT: Smart Alarm & Relay controller with simple supervision, On/Off or Time Proportional Control (TPC) Modes

3TX-TOT-DT: Computes pH compensated "Total ISE" from Free ISE & pH values; 0/4-20mA analog & MODbus outputs

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 is a "lock" which must be set to 'Off' to change <u>ANY</u> parameter, including the offset and gain calibrations.**

SMART DIGITAL MODBUS RTU SENSOR INPUT

3TX-TEM-DT acts as snooper to obtain calibrated and raw temperature values from smart digital HiQDT sensor.

HIGHLY CONFIGURABLE ANALOG OUTPUT

3TX-TEM-DT provides a scalable, proportional & reversible 4-20mA or 0-20mA analog current output. **Minimum scaling is 100 °C between min & max setpoints. Max scaling is -40 to +210 °C (actual temp limited by sensor).** Analog output is galvanically isolated from input with 3KV rated optocoupler.

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:	200 grams (7.05 ounces)
Dimensions:	D 58 x W 36 x H 86 mm (2.3" X 1.4" X 3.4")

Electrical

Power Supply:	24VDC ±10%
Consumption:	60 mA max
Accuracy:	±0.3% Excluding Sensor (Ideal)
Temp Sensor:	Pt100, Pt1000
Temp Range:	-40 to +210°C ± 0.3°C
Analog Output:	0-20mA or 4-20mA, max. 500Ω
CE mark:	EN61326A

RoHS COMPLIANT

If software lock (Setup parameter P01) is "On" all of parameters can only be read. Set P01 Software Lock to "Off "to change values. The P01 software lock will automatically reset back to "On" if no key is pressed for several minutes.

User Setup Parameters

No	Parameter	Description	Range	Default
P01	Lock	Software Lock	On / Off	On
P02	Address	Address on MODbus	Off, 1…247	Per Order
P03	Baudrate	MODbus baudrate	9,600 / 19,200	Per Order
P04	Analog Output Type	Toggle for Current Loop Type	4-20mA, 0-20mA	Per Order
P05	Analog Output Mode	Select Polarity of Analog Output	noninverted, inverted	Per Order
P06	Output set low	Define temperature for low setpoint	-40 to +110 °C *	Per Order
P07	Output set low	Define temperature for low setpoint	+60 to +210 °C	Per Order
P08	4mA Offset	Trim Low	±9.99% *	Per Factory Cal
P09	20mA Gain (Span)	Trim High	±9.99% *	Per Factory Cal
P10	Output Hold	Keeps last analog output value before hold is enabled	On / OFF	OFF
P11	Back to Default	Reset to Default	Def=Reset, Par=NoReset	Par

** Negative numbers are shown as flashing.*

ANALOG OUTPUT SCALING NOTE:

Minimum difference between low and high setpoints must be 100 °C. Absolute lowest scaled min range is -40 to +60 °C and absolute highest scaled min range is +110 to +210 °C. If no special request is made at time of order default is 0 °C for the low setpoint and +100 °C for the high setpoint. As with all 3TX smart transmitter the default values can be customized if desired if requested at time of order.

Par. no. 2 Node address of smart MODBUS RTU sensor to interface

Par. no. 3 sets baudrate to be used. Choices are 9,600 or 19,200.

Par. no. 4 select whether output type is 0-20mA or 4-20mA.

Par. no. 5 select output as inverted or non-inverted type.

Par. no. 6 & 7 define 0/4mA and 20mA setpoints.

Par. no. 8 & 9 Trim offset for 4mA and Trim span for 20mA

Par. no. 10 Hold feature should be enabled before removing sensor from service to ensure proper operation of any connected device to analog temperature current loop. **Analog output will be held static at the time that hold feature is enabled. When P10 is active the last value is displayed flashing with "HLd" on the main LED mode.**

Par. no. 11 Resets **ALL** parameters back to factory set defaults

Typical Wiring Schematic
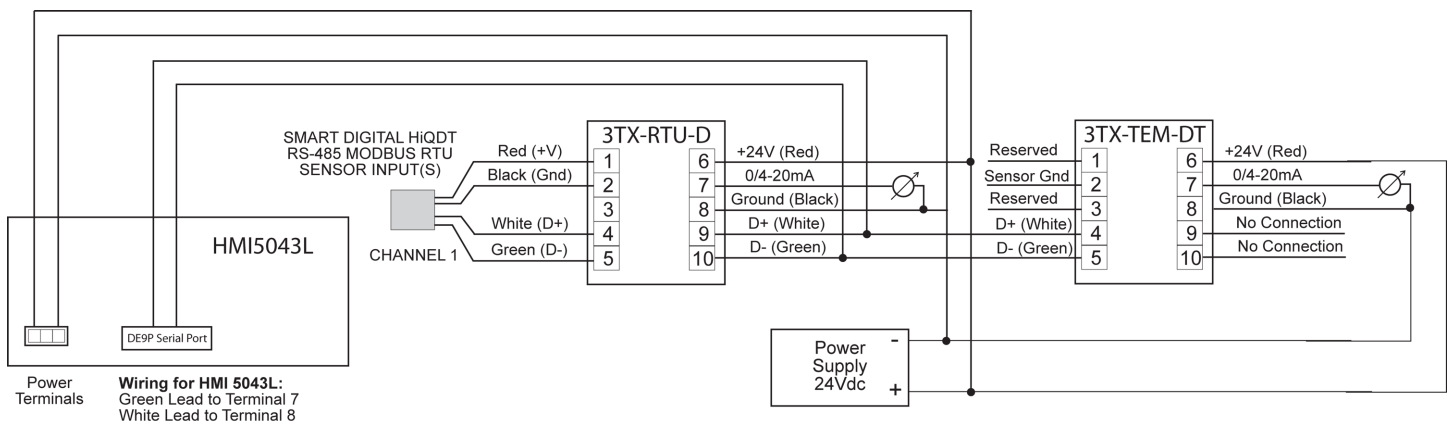
NOTE: Wiring for simplest case of single sensor with single 3TX-RTU-D transmitter & single 3TX-TEM-DT temperature output module. Contact the factory for assistance with the wiring with alternate number of sensors and transmitters present.

Display features

- When in the "°C" display mode the calibrated temperature* from the configured sensor will be shown. If no value is obtained then "---" will be shown to indicate this state. If P10 analog output hold feature is enabled display will show the last value obtained before being placed into this hold mode and flash "Hld" to show the current output status.
  - o If the "Up" key is pressed in this mode the current mA output based upon live input and scaling is shown.
  - o If the "Down" key is pressed in this mode the raw temperature* based upon live input and scaling is shown. If no value is obtained then "---" will be shown to indicate this state.
- When in the "Ω/kΩ" LED display mode the raw resistance from platinum TC of configured sensor will be shown. The units displayed are always kilohms (kΩ). If no value is obtained then "---" will be shown to indicate this state.
- The "Offset" LED displays the result from the parameter P08 4mA trim offset calibration* & the "Gain" LED displays the result from the parameter P09 20mA trim span calibration*. To change trim calibration you must use P08 & P09.
- Production data (yy.m) displayed by pressing 'Down' & 'Mode' simultaneously in main LED display mode. The month will display as 1..9 & then A for October, B for November & C for December. October 2011 displays as "11.A".
- Revision of software is displayed by pressing the 'Up' & 'Mode' simultaneously in main LED display mode.

Negative numbers are shown as flashing.

Modbus Snooper Function

The 3TX-TEM-DT is slave on the network and hence cannot request values from the P02 address. Therefore correct (live) values depend on the master requesting the values from the sensor. If no temperature value is obtained upon boot the analog output will be pegged to the minimum value of either 0mA or 4mA depending upon output mode in use.

To ensure proper function of controller the following registers MUST be polled on the smart digital sensor at the node address as defined in parameter P02 by the MODBUS RTU master on the network (see details below):

All HiQDT Sensor Types
Register(s) Required   30002
Register(s) Recommend   30004

Node Address Scheme when using with Touchscreen HiQDT Controller

When 3TX-TEM-DT analog temperature output module is used with Touchscreen HiQDT Controller then the **P02 snooper node address** MUST be set as defined in the table below.

Snooper Channel Number	1	2	3	4	5	6
pH sensor	1	41	81	121	161	201
Standard ORP sensor	2	42	82	122	162	202
Wide Range ORP Sensor	3	43	83	123	163	203
Dissolved Oxygen Sensor	4	44	84	124	164	204
Ion Selective (ISE) Sensor	5	45	85	125	165	205
Conductivity (EC) Sensor	6	46	86	126	166	206

COMMISSIONING AND SETUP:
ONLY the HiQDT Windows software or Handheld Communicator (HHC) can change the node address of the HiQDT smart digital RS-485 MODBUS RTU sensors (see respective manuals for details).

NOTE: If 3TX-TEM-DT analog temperature output option is requested at time of order and channel configuration is predefined then then all relevant node addresses can be preset at factory such that touchscreen controller will work immediately out of the box.

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