OSENSA
INNOVATIONS

FTX-300-LUX+

USER MANUAL

DMK-0024A-2

OSENSA INNOVATIONS CORPORATION
www.osensa.com

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Safety Message

The information contained in this document is not intended to explain all safety concerns associated with installation, operation and maintenance of this product. This product is designed to be installed by knowledgeable personnel who possess relevant technical skills and follow safe work practices.

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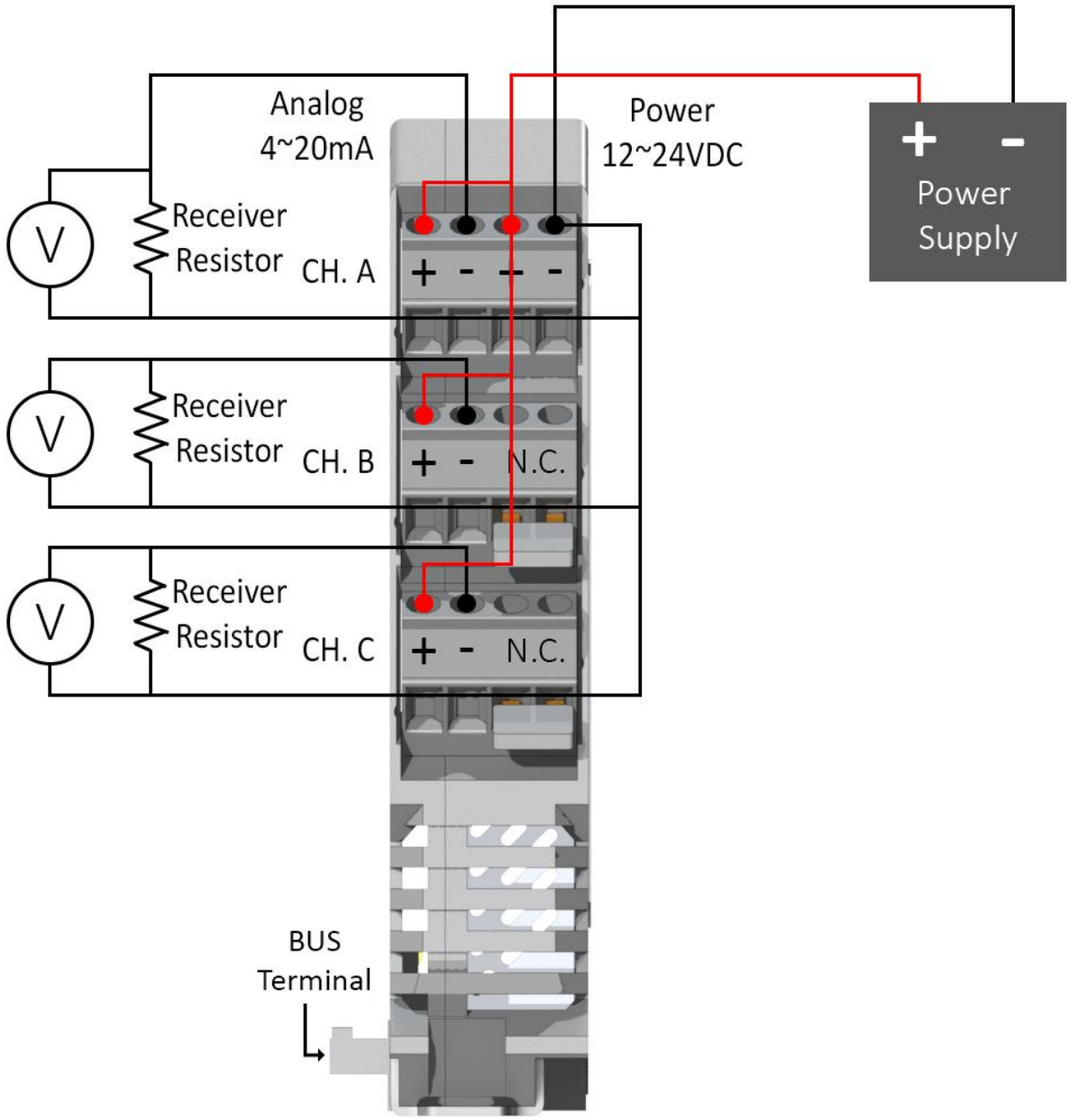
Contents



Product Overview

FTX-300-LUX+ Fiber Optic Temperature Transmitter

The FTX-300-LUX+ Fiber Optic Temperature Transmitter is an industrial optical signal conditioner that accurately reads fiber-optic temperature probes based on the principle of time-decay fluorescence

thermometry. It includes superior optics and ultra-high sensitivity electronics for compatibility with 1000µm to 200µm core fiber probes. It offers an extremely wide temperature measurement range, and is particularly well suited for High Voltage, Microwave, and Research applications.

The FTX-300-LUX+ offers the following communication options:

- USB 2.0 compatible Modbus
- Analog 4-20 mA
- RS-485 Modbus

Location	Description
A	**LED Status Indicators**
B	**USB 2.0 Compatible Connector** **(Mini-B Receptacle)**
C	**12-24 VDC Input Power and 4-20mA Output Terminals**
D	**Shared RS-485 and Input Power Bus Connector**
E	**Fiber Optic Temperature Probe Interface** **(ST Receptacle)**

LED Status Indicators

The tri-color LED status indicators show the current state of each sensing channel according to the table below. When the device is initially powered up, and when probes are connected or disconnected, the indicator LED's will change status as the device automatically configures itself. A 10 second delay may be observed after a new probe is connected, as the device only checks for probe presence periodically.

LED Color	State	Description
Green	Solid	Probe connected, no fault conditions
	Blinking	Probe disconnected
Orange	Solid	Warning, maximum LED current
	Blinking	Critical warning, low signal level
Red	Solid	EEPROM Updating
	Blinking	No signal, possible LED Failure
None	Off	No Power to the Transmitter

Device Specifications

Model Name	FTX-300-LUX	FTX-300-LUX+
Number of Channels	1, 2 or 3	1, 2 or 3
4-20mA Output, 16 Bit	1.5 KV Isolation	3 KV Isolation
Measurement Range	-40°C to +250°C	-70°C to +350°C
Resolution	0.1°C	0.01°C
Accuracy*	0.1°C	0.1°C
Update rate	10 to 50Hz	30 to 100 Hz
Operating Temp.	-20°C to +55°C	-40°C to +65°C
Light Source	Blue	Blue
USB Interface	115.2kbps	115.2kbps
RS-485 Interface	No Isolation	3 KV Isolation
Comm. Protocol	Half Duplex, Modbus RTU	
Status Indication	3 color Flashing and Solid LEDs	
Operating Humidity	0 to 90% Relative Humidity (Non-Condensing)	
Dimensions	114mm Tall x 22.5mm Wide x 102mm Long	
Power	12-24 VDC (2.5W max)	
Mounting	35mm DIN Rail	
* Measurement accuracy depends on Probe Accuracy and Transmitter Accuracy		

Getting Started

Inspecting the Package and Product

Examine the packaging for obvious signs of damage prior to installing this product and notify the carrier if you suspect any damage occurred during shipment or delivery. Inspect the contents of the package to confirm all items on the packing list are present.

In the unlikely event items are missing or damaged, contact your OSENSA Innovations distributor to report the problem. If you purchased the products directly from the factory, contact OSENSA Innovations Corp.

Customer Support

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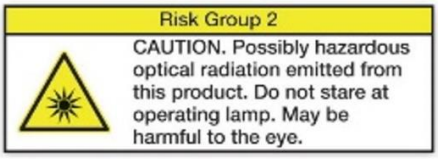
Device Safety Information

The FTX-300-LUX+ temperature transmitter contains LEDs that emit light intensity described under Risk Group 2. The device presents a moderate risk to the human eye due to the high intensity light. Do no not look directly at the LED or into a fiber optic cable while the device is in operation.

Device Warning!



Operating Environment

To extend the service life of the product, it is advisable to install the device in a well-ventilated area to minimize the internal board temperature. Ensuring the internal PCB temperature does not exceed 75°C will extend the life of the product. The maximum operating temperature rating assumes the device inputs are supplied with 12VDC. If powering from 24VDC, each unit should be de-rated by 10°C. Similarly, if 3 or more units are connected together directly in contact with each other the maximum temperature rating should be de-rated by 5°C.

Installation

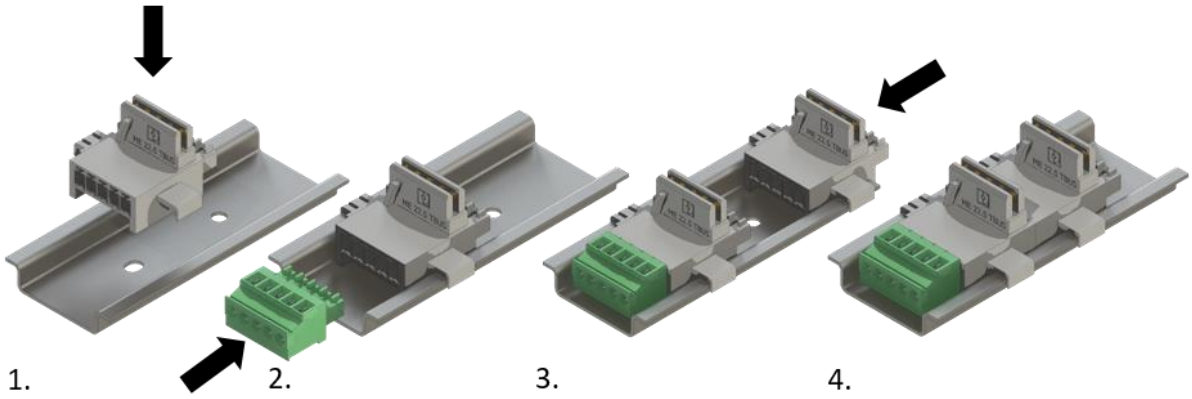
Installation Overview

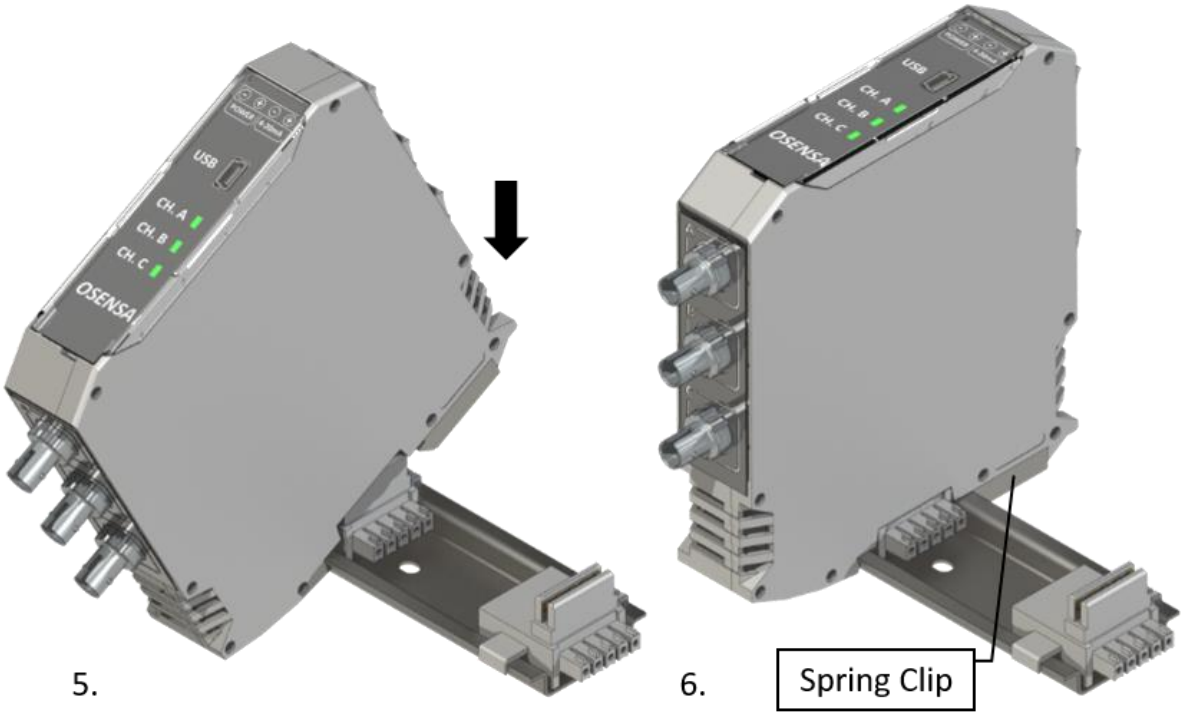
The FTX-300-LUX+ transmitter can be connected in three different ways: USB connection, Analog 4-20mA current loop, and shared RS-485 bus. Here is a general overview of the installation procedure.

1. Install OSENSAView software on your PC or Laptop
2. Snap the FTX-300-LUX+ Transmitter onto a section of 35mm DIN rail (RS-485 requires an additional DIN terminal block power connector)
3. Connect a fiber optic temperature probe
4. Connect power supply (either DIN terminal or side terminal – see details below)
5. Apply power to the FTX-300-LUX+
6. Connect to computer (either USB or RS-485 – see details below)
7. Start the OSENSAView software
8. Refer to OSENSAView Software user guide

Device Installation

The transmitter is designed to mount to standard 35mm DIN rail. If the required communication is RS-485, a DIN rail T-BUS connector (ACC-CON-TBUS) must be installed onto the DIN rail first. The transmitter then rotates down and snaps onto the DIN rail over the T-BUS connector. Refer to the images below. The green wiring connector (ACC-CON-TBUS-WIRE) is then slid into the T-BUS connector.





Description of Installation Steps:

1. Snap a DIN rail T-BUS connector (ACC-CON-TBUS) onto a section of 35mm DIN rail.
2. Slide the green 5-position wire terminal block (ACC-CON-TBUS-WIRE) into the DIN rail T-BUS connector. The wire terminal block allows for the connection of wires for power and RS-485 communication.
3. If needed, snap more T-BUS connectors (ACC-CON-TBUS) onto the DIN rail.
4. Hook the front bottom of the temperature transmitter (the side opposite of the metal spring clip) onto the DIN rail and pivot the device over top of the T-BUS connector. Rotate the device downwards onto the DIN rail.
5. The spring clip will snap into place, securing the temperature transmitter to the DIN rail.

Note: The Transmitter shall be installed inside an industrial panel or similar end use UL Listed enclosure. If you are not using RS-485 communication, the T-BUS connector does not need to be installed since the device power can be supplied to the side terminals.

To remove the transmitter from the DIN rail:

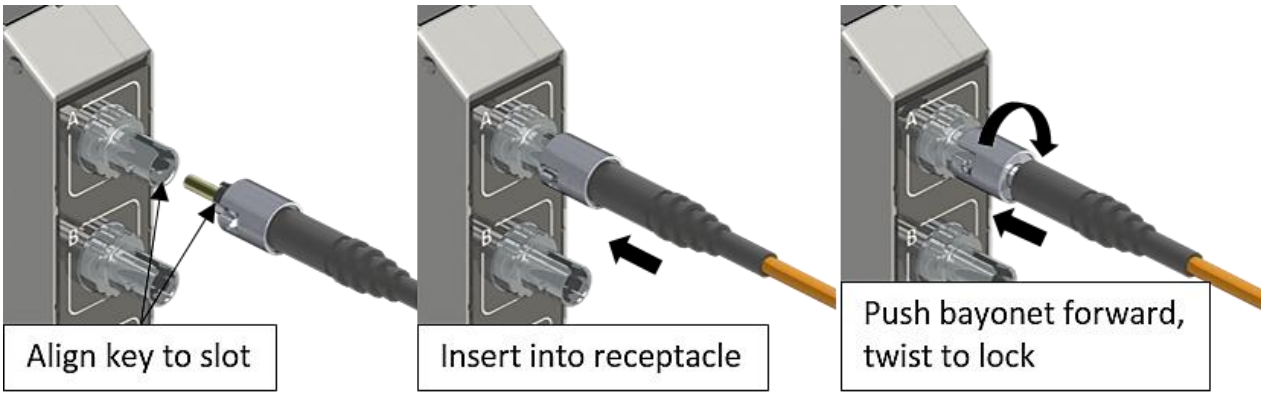
1. Pull back on the metal spring clip (a flat head screw driver is handy for this operation).
2. Rotate the transmitter forward and lift off the DIN rail.

Temperature Probe Installation

The transmitter has receptacles that connect to temperature probes using ST connectors. The ST connector on the probe has three main features: a spring-loaded bayonet lock, a key, and a ferrule.

When mating the ST connector to the receptacle on the transmitter, the key must be properly aligned with the slot before insertion. The purpose of the key is to prevent the ferrule from rotating. The bayonet lock is then engaged by pushing and twisting until it reaches the end of its travel. When locked, the bayonet spring prevents the probe from disconnecting.

Note that not all ST connectors have the key feature.



Device Communication

There are three ways to communicate with the FTX-300-LUX+ transmitter:

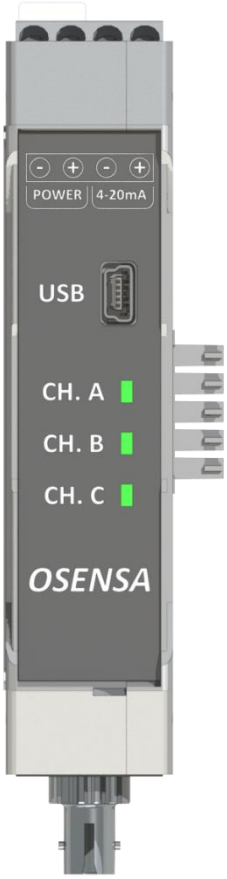
- USB communication
- Analog 4-20mA current loop
- Shared RS-485 Bus

USB Communication

The FTX-300-LUX+ transmitter includes a USB connection for quick configuration of a single transmitter device. The transmitter can connect with a laptop or PC using a USB A to USB Mini-B cable.

Note: The USB interface does not provide power to the device, an external power supply must be connected to either the device side terminal or the DIN rail power terminal.

To connect external power to the transmitter side terminal, refer to the instructions regarding analog 4-20mA output. To connect external power with a DIN rail power terminal, refer to the instructions regarding RS-485 BUS.



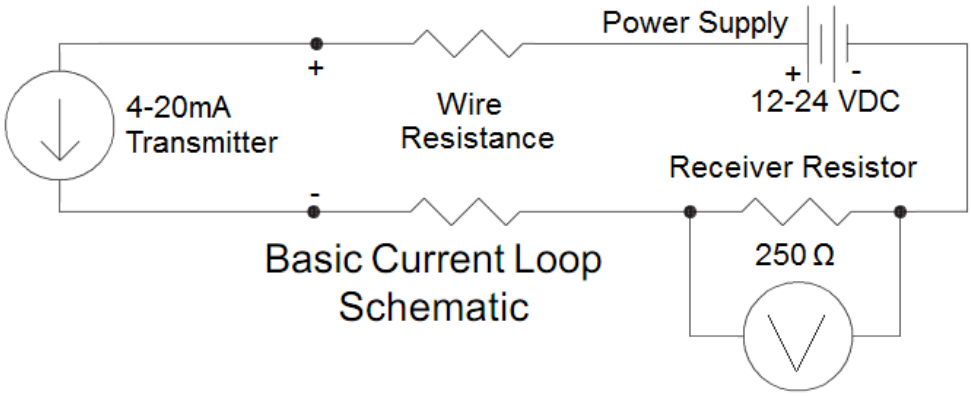
Once the device is powered and a USB cable is connected to the transmitter, the device can be configured within OSENSAView software. The USB port has fixed communication parameters according to the table below. These parameters cannot be changed.

USB Communication Parameters

	Baud Rate	No. Bits	Parity	Stop Bits
USB Interface	**115200**	**8**	**None**	**1**

Analog 4-20mA Output

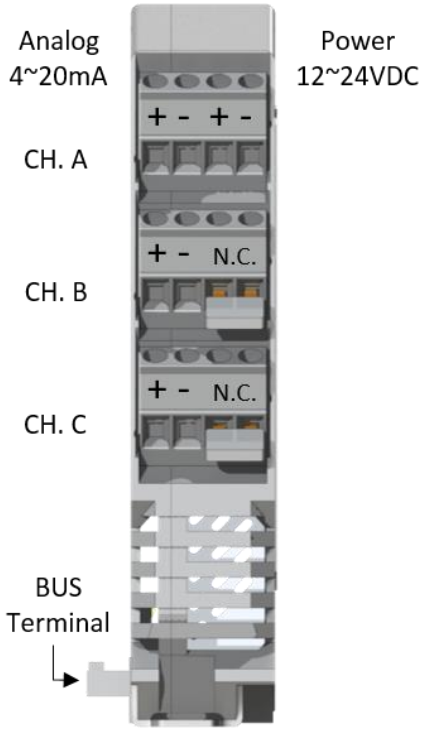
The FTX-300-LUX+ temperature transmitter outputs a 4-20mA analog signal proportional to temperature measurement for each sensing channel. To use the FTX-300-LUX+ in a 4-20mA loop configuration, a 12-24VDC power supply must be connected in series to power the isolated current loop. The loop does not draw power from the internal electronics. The schematic below shows a typical current loop configuration that is loop powered, where the voltage across the precision Receiver Resistor is proportional to temperature.



The 4-20mA outputs must be loop powered with a supply voltage between 12 VDC and 24 VDC. The label on the top of the transmitter indicates the polarity. It is important not to reverse the polarity, as this may cause permanent damage to the device.

It is important to remember that the total loop resistance multiplied by the maximum output current must be less than the supply voltage. This is particularly important to consider when running wires over long distances.

Example: Wire resistance = 300Ω
Precision Receiver Resistor = 250Ω
Max Current = 23mA (in alarm condition)
Min Power Supply Voltage = 23mA x 550Ω = 12.65 VDC



The transmitter is connected into the current loop by output terminals on the device. The pairs of terminals on the left side of the housing are isolated 4-20mA analog outputs. The analog output top pair is for Channel A, the middle pair is for Channel B, and the lower pair is for Channel C.

Side Terminal Input Power

The top right pair of terminals is one of two locations to supply power to the device. The transmitter should only be connected to a Separated Extra-Low Voltage (SELV) protected circuit. The power input terminals are connected through internal wiring to the BUS Terminal at the bottom of the device.

Note: Power should only be supplied at one location. If the device is powered from the BUS Terminal, do not supply power to the Side Terminals and vice versa. Use minimum 75C rated wiring.

Similarly, if more than one transmitter is connected by the shared T-BUS connector; only apply power to a single transmitter, as the shared T-BUS connector will distribute power across all devices.

Un-Used Side Terminals

There are two pairs of un-used terminals on the side of the unit. These terminals come from the factory with wire jumpers across them to indicate that they are not to be used. These terminals are not connected to the internal electronics, so there is no risk of damaging anything if wires are accidentally connected to them.

RS-485 BUS Communication

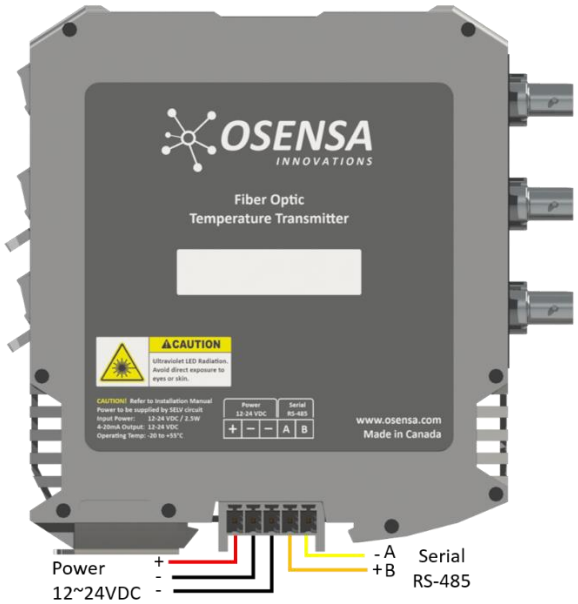
Multiple FTX-300-LUX+ temperature transmitters can be connected in series by using the shared RS-485 BUS. Devices are supplied power and serially connected to each other using a 5-position pluggable DIN rail T-BUS connector. This configuration will supply power and RS-485 communication to several transmitter devices at once. To install a transmitter, see the mechanical installation section of this document. The connector accepts 12 VDC to 24 VDC power from an SELV (Separated Extra-Low Voltage) protected circuit. The power input terminals are connected through internal wiring to the Side Input Power Terminals.

Note: Power should only be supplied at one location. If the device is powered from the DIN rail BUS terminal, do not supply power to the Side Terminals and vice versa. Use minimum 75°C rated wiring.

CAUTION: Note the BUS terminal wiring differences between the –LUX and –LUX+ transmitter styles. The legacy FTX-300-LUX style transmitter is a two-wire, non-isolated RS-485 device. The center pin of the T-BUS connector is shorted internally with the negative voltage power supply rail (DC ground). This is different from the FTX-300-LUX+ transmitter which uses the center pin as the isolated ground for the RS-485 circuit. It is therefore not recommended to connect both FTX-300-LUX and FTX-300-LUX+ transmitters on the same DIN rail. Doing so, will prevent the RS-485 circuit from being isolated as it will tie the negative voltage rail to the RS-485 ground.

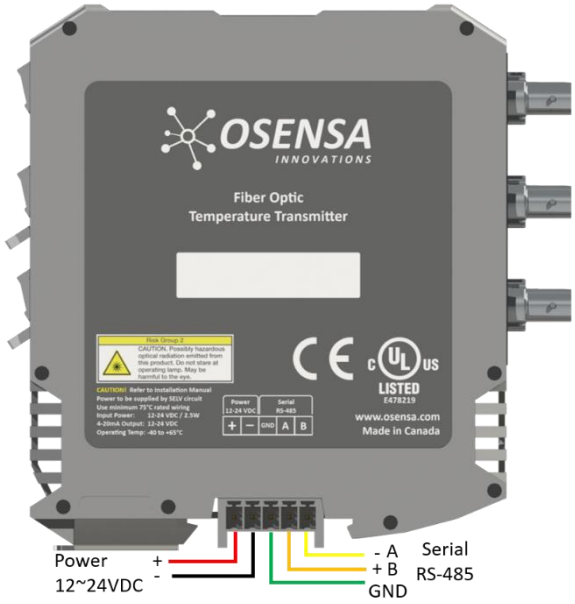
Legacy FTX-300-LUX

Non-Isolated RS-485 Circuit



FTX-300-LUX+

Isolated RS-485 Circuit



RS-485 Communication Parameters

The standard communication protocol is half-duplex MODBUS RTU. Multiple transmitters can be addressed by this common bus connection. Each transmitter must be configured with a unique MODBUS device ID in the range of 1 to 247. The factory default MODBUS device ID is 247. The table below summarizes the configurable communication parameters.

	Baud Rate	No. Bits	Parity	Stop Bits
RS-485 Interface	**9600* 14400 19200 56000 115200**	**8**	**None**	**1**

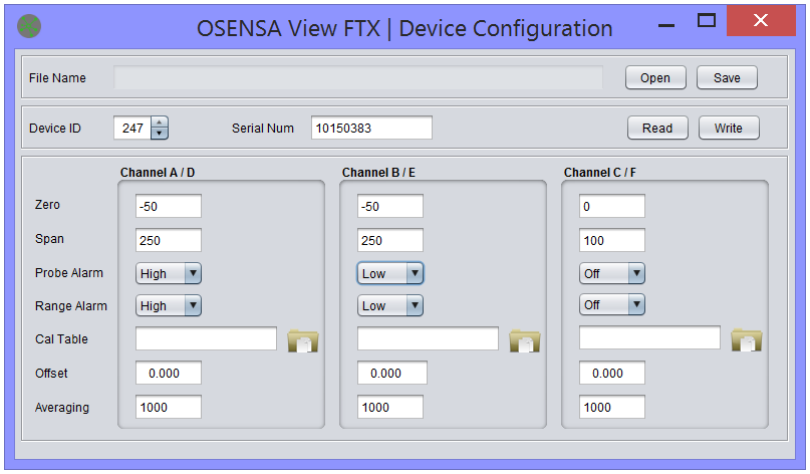
*Factory default value

Device Setup and Configuration

Install OsensaView FTX software on a laptop or PC and connect to the FTX-301-PWR+. Refer to the OSENSAView User Manual for installation instructions.

Setting Analog Zero, Span & Alarms

Select the Device Configuration window from the Config menu or press Ctrl+C. The window below will open. Make sure the Modbus Device ID is set correctly (factory default value is 247), and then click the Read button to load the current device configuration values into the window. Edit the fields as desired by entering values in degrees Celsius.

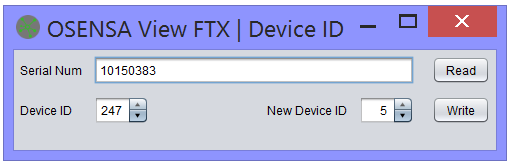


For instance, a Zero value of -50 in Channel A will mean that the analog output will be 4mA when the probe connected to Channel A reads -50°C. If the span is set to 250, then the analog output will read 20mA at 200°C (since -50 + 250 = 200). By setting the Probe Alarm High, the analog output for that channel will read 22.5mA if the probe becomes damaged or disconnected. Similarly, if the Range Alarm

is set low, the analog output for that channel will read 3.5mA if the probe senses a temperature outside of the range defined by the zero and span settings. You can also enter a temperature offset in each channel and change the Averaging value (default is 1000ms). Normally, the Cal Table fields should be left blank. After editing the desired fields, click the Write button to permanently save the settings into the Flash EEPROM. OsensaView will ask for a password. The default password is the number zero "0". Verify the values were stored correctly by cycling power to the device and then reading the values again.

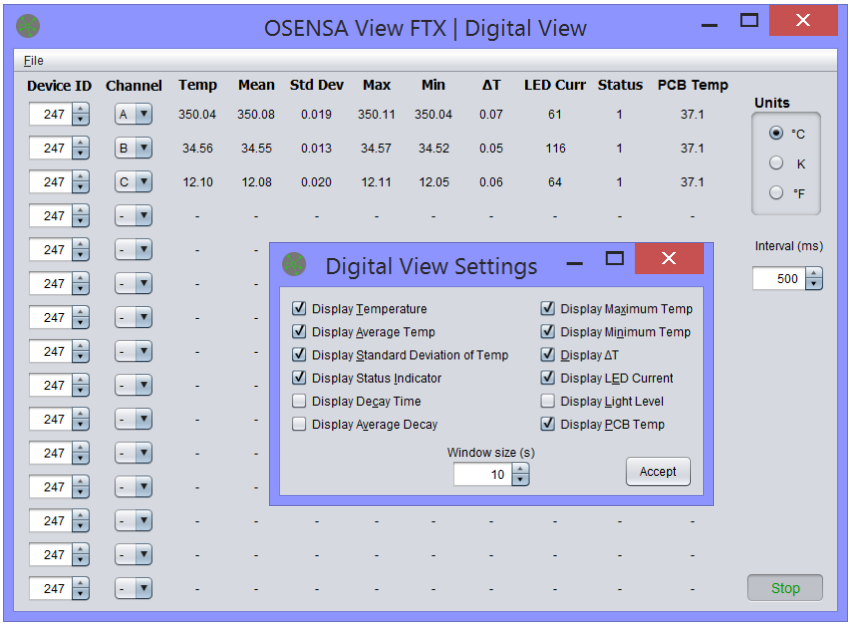
Setting Modbus ID

Select the Device ID window from the Config menu or press Ctrl+E. The window below will open. Select the current Device ID and click the Read button. The Serial Number will be read from the device. Enter the New Device ID value and then click the Write button to permanently save the change. Remember to label the transmitter with its new Modbus Device ID.



Display Temperature Readings

Open the Digital View window from the View menu or press Ctrl+D. The window below will open.



Select the correct Device ID and Channel to read and then press the Start button. Right clicking anywhere in the window will bring up the Display Settings window to configure which parameters are displayed. For further settings and features, refer to the OSENSAView User Manual.

Supported Modbus Functions

The FTX-300-LUX+ supports the following two Modbus commands.

- 0x03 Read Multiple Registers
- 0x10 Write Multiple Registers

Example: (0x03) Read Multiple Registers

	ID	Function	Addr.H	Addr.L	# Bytes.H	# Bytes.L	CRC.H	CRC.L
Master Send	0xF7	0x03	0x00	0x02	0x00	0x02	0x??	0x??

	ID	Function	# Bytes	Value.H	Value.L	Value.H	Value.L	CRC.H	CRC.L
Slave Response	0xF7	0x03	0x04	0x11	0x11	0x22	0x22	0x??	0x??

	ID	Function	Addr.H	Addr.L	Value.H	Value.L	CRC.H	CRC.L	
Slave Response	0xF7	0x06	0x00	0x02	0xFF	0xFF	0x??	0x??	(Normal Response is echo of query)

Example: (0x10) Write Multiple Registers

	ID	Function	Addr.H	Addr.L	# Regs.H	# Regs.L	# Bytes	Value.H	Value.L	Value.H	Value.L	CRC.H	CRC.L
Master Send	0xF7	0x10	0x00	0x02	0x00	0x02	0x04	0x11	0x11	0x22	0x22	0x??	0x??

	ID	Function	Addr.H	Addr.L	# Regs.H	# Regs.L	CRC.H	CRC.L
Slave Response	0xF7	0x10	0x00	0x02	0x00	0x02	0x??	0x??

The default Modbus device ID is 247.

The default USB baud rate is 115200, 8-N-1.

The default RS-485 baud rate is 9600, 8-N-1.

These default values are easily changed through OsensaView FTX configuration software.

Common Modbus Addresses

Channel Temperatures can be read from the Modbus addresses below. Values read are signed integers. Divide the integer value by 100 to get the temperature value with one digit after the decimal point. If the second digit after the decimal is even (zero), the temperature reading is valid. If the last digit is odd (one), the temperature reading is still converging and may have some error associated with it. If the temperature value is 327.67, then there is a probe error, likely caused from no probe being connected.

HEX	DEC	Description	Min	Max	R/W	Default (HEX)	Example
100x Temperature in °C, valid reading? (Format: xxx.xn)							
0400	1024	Ch A (1)	0	FFFF	R	32767	Max Range: -273.15 to +327.66, No probe = 32767
0401	1025	Ch B (2)	0	FFFF	R	32767	Std Range: -50.00 to +225.00, No Probe 32767
0402	1026	Ch C (3)	0	FFFF	R	32767	Last Digit=xxx.x0, (even) means valid temp reading
							Last Digit=xxx.x1, (odd) means convergence error
							Examples:

Hex	Dec	Temp (°C)	Comment
0x3034	12340	123.4	Valid reading
0xF2A3	-3421	-34.2	Converging
0x7FFF	32767	327.6	Probe Error

Channel LED Power as a percentage of full power can be read from the Modbus addresses below. Values read are signed integers. Divide the integer value by 100 to get the temperature value with one digit after the decimal point. The second digit after the decimal represents the channel status. A status of 1 indicates Normal operation while status of 2 means No probe is connected. Status 3 means a probe is connected, but the maximum LED current is being used to read it. This indicates a potential problem with the probe or connections.

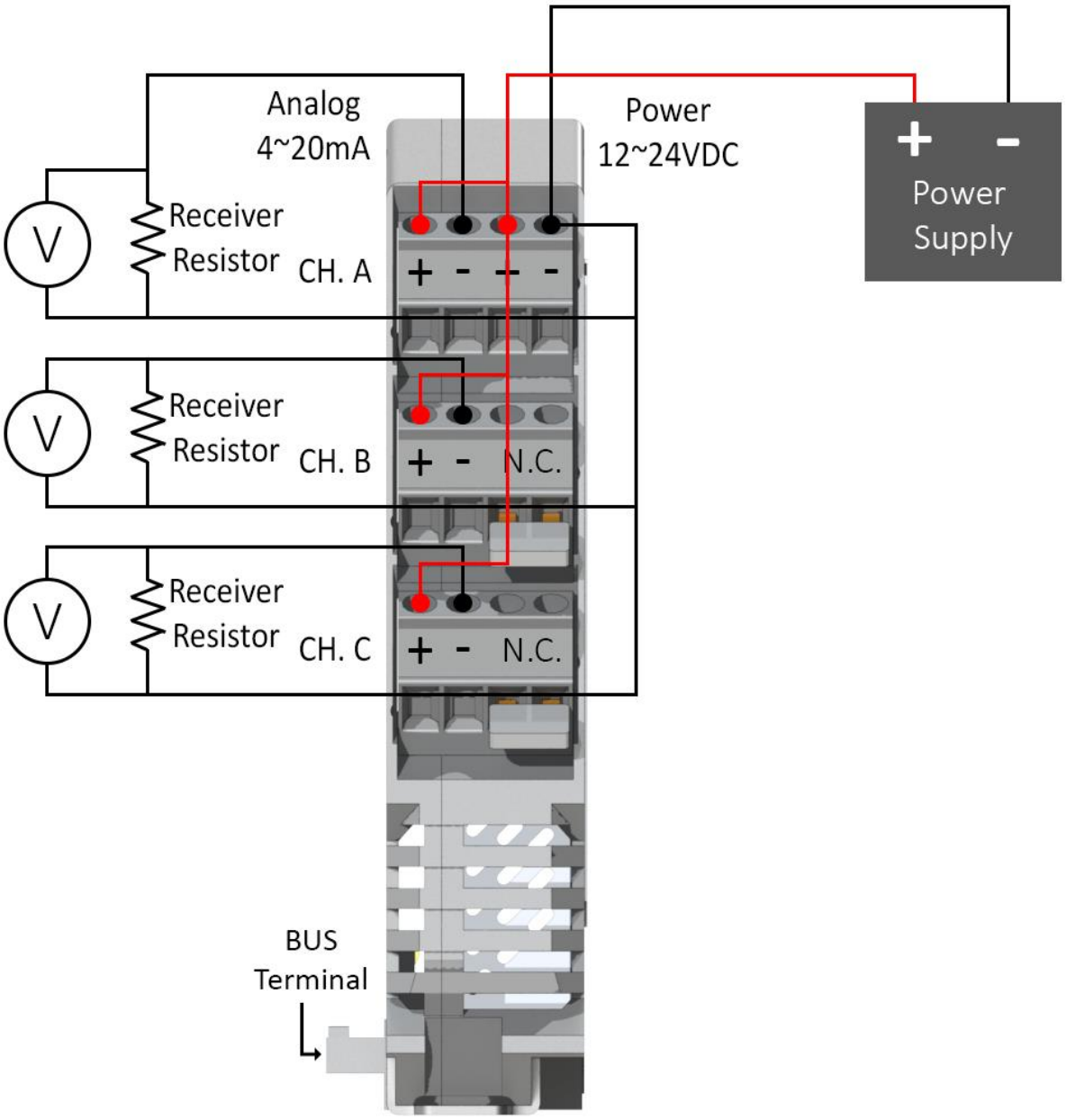
HEX	DEC	Description	Min	Max	R/W	Default (HEX)	Example
100x LED Power as %, status number (Format: xxx.xn)							
0464	1124	Ch A (1)	0	FFFF	R	100.1	Max Range: 0.01 to 100.09, No Probe=100.02
0465	1125	Ch B (2)	0	FFFF	R	100.1	Examples:
0466	1126	Ch C (3)	0	FFFF	R	100.1	

Hex	Dec	Pwr %	Status	Comment
0x04E3	1251	12.5	1	Normal Operation
0x2712	10002	100	2	No Probe
0x2713	10003	100	3	Max LED Current

For a more detailed list of all available addresses for both Flash and RAM, please contact Osensa technical support.

Wiring Schematics

4-20mA Schematic with Single Power Source and All Channels Connected



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