



USER MANUAL

Explosion Proof Housing - Analog

Model 2110EX-A

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Model 2110EX-A Explosion Proof Housing

CHARACTERISTICS

General Description:

The Model 2110EX-A is NRTL certified explosion proof for use in hazardous locations/environments (Class I, Division 1, Group D) in accordance with UL1203, UL61010-1, CSA C22.2 No. 30, and CSA C22.2 No. 61010-1. The device is also certified to provide Intrinsically Safe output for use in hazardous locations (Class I, Division 1, Group D) in accordance with ANSI/UL 913, CSA C22.2 No. 60079-0 and CSA C22.2 No. 60079-11. The Barrier Unit actively limits the current and voltage to protect intrinsically safe equipment from power spikes and to maintain the intrinsic safety. The barrier provides intrinsically safe power and intrinsically safe power and communication or I/O lines for devices located in Hazardous Areas.

Functions:

The 2110EX-A is capable of delivering safe levels of supply power and 2-wire RS485 digital signals to a device located in Class I Division 1 location and also provides two 4-20mA(3 wire configuration) analog signal output channels.

SPECIAL WARNINGS

- **Use only NRTL – listed NEC Class 2 power supply. Voltage should not exceed 24VDC**
- **Use only with certified Explosion Proof conduit or certified Explosion Proof cable and connector (eg. CLX and TMCX products).**
- **Always attach the cables to the connector strain relief plate with cable ties. This will ensure that cables do not migrate in the enclosure if they are disconnected from connector by accident.**
- **Always lock the cover by fastening its hex screw with a hex socket; use a hex spanner of 1.5mm.**

AVERTISSEMENTS SPÉCIAUX

- **N'utilisez que des blocs d'alimentation limités NEC class 2 répertoriés d'une Laboratoire d'essai reconnu à l'échelle nationale. La tension ne doit pas dépasser 24VDC**
- **Utilisez uniquement des conduits certifiés antidéflagrants ou des câbles et connecteurs certifiés antidéflagrants (par exemple, les produits CLX et TMCX).**
- **Fixez toujours les câbles à la plaque de décharge de traction du connecteur avec des colliers de serrage. Cela garantira que les câbles ne migreront pas dans le boîtier s'ils sont déconnectés du connecteur par accident.**
- **Verrouillez toujours le couvercle à l'aide d'une vis à six pans creux à l'aide d'une clé hexagonale de 1,5 mm de diamètre.**

TECHNICAL DATA

Supply (X1-4):

Voltage: 12 to 24 VDC max
Maximum input current: 200 mA
Current consumption: 80 mA max

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Communication analog output lines (X1-2 and X1-3):

Voltage: 5 VDC nom / 24 VDC max

Output current:

Maximum: 50 mA max - fuse limited

Normal operation range: 0 to 20mA

Um:

24 VDC (Should be supplied only from NRTL-listed limited power supply)

Environmental Conditions:

Temperature:

Operating -40 to 70 °C

Storage -40 to 85 °C

Atmospheric conditions:

Pressure 1 atm.

Oxygen concentration not greater than 21%

Maximum Altitude 2000m

Approvals:

UL1203 Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations

UL61010-1 Standard for Safety Electrical Equipment For Measurement, Control, and Laboratory Use

CSA C22.2 No. 30 Explosion-proof enclosures for use in Class I hazardous locations

CSA C22.2 No. 61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use

UL 91 Standard for Intrinsically Safe Apparatus and Associated Apparatus for Hazard (Classified) Locations

UL 60079-11 (Intrinsic Safety "i" Zones 0 and 1)

CSA C22.2 No. 60079-0 Explosive atmospheres - Part 0: Equipment - General requirements

CSA C22.2 No. 60079-11 Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"

Mounting:

Weight: approx. – 1.5Kg (3 Lbs.)

Connection: WAGO polarized plug-in disconnect/connect cage clamp connection terminal blocks to accommodate terminations up to 1.5mm²

Location: Class I Div 1 Group D Temperature code T4

Dimensions:

PCB: 3.17" x 3.17"

Enclosure: 4.2"x5.7"x 5" (HxLxW)

TERMINAL CONNECTIONS

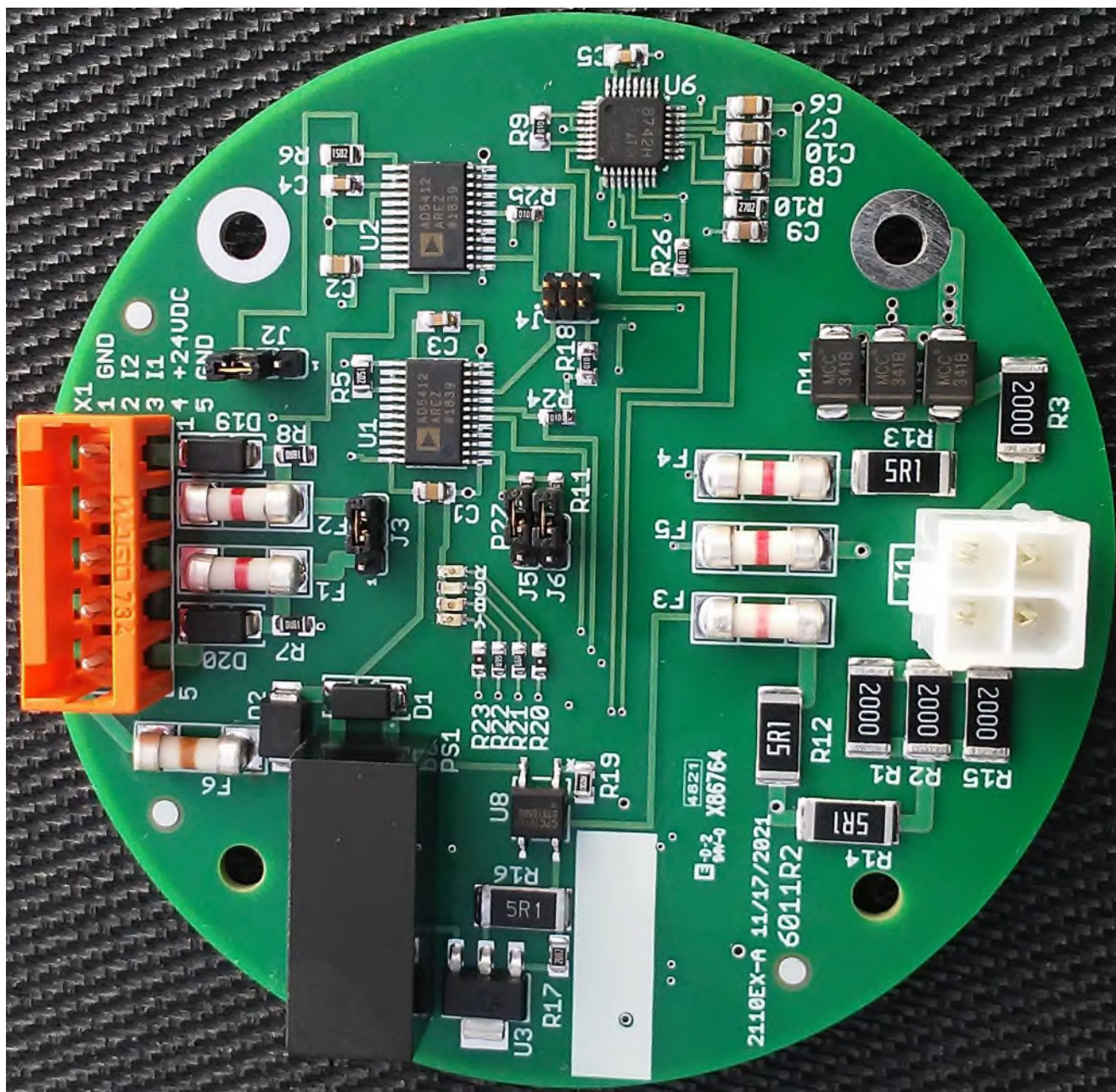


Table 1.

EXPLOSION PROOF CONNECTION	INTRINSICALLY SAFE CONNECTION
X1-L1 → GND	J1-1 → Tx/Rx+
X1-L2 → I2	J1-2 → DC_GND
X1-L3 → I1	J1-3 → Tx/Rx-
X1-L4 → +VCC	J1-4 → VDC
X1-L5 → GND	

ENTITY PARAMETERS TABLE

Table 2.

Terminals	2110EX Parameter	Must be	Hazardous Area Device Parameters
J1-4	$U_o/V_{oc} = 11.655 \text{ V}$	\leq	U_i / V_{max}
J1-1 thru J1-4;	$I_o/I_{sc} = 233.96 \text{ mA}$	\leq	I_i / I_{max}
J1-1 thru J1-4;	$P_o = 0.596 \text{ W}$	\leq	P_i / P_{max}
J1-1 thru J1-4;	$C_o/C_a = 41 \mu\text{F}$	\geq	$C_i/C_i \text{ device} + C \text{ cable}$
J1-1 thru J1-4;	$L_o/L_a = 5.19 \text{ mH}$	\geq	$L_i/L_i \text{ device} + L \text{ cable}$

For installation in which both C_i and L_i of the Intrinsically Safe Apparatus exceed 1% of the C_o and L_o parameters of the Associated Apparatus (excluding cable), then 50% of C_o and L_o parameters are applicable and shall not be exceeded.

If only one of either C_i or L_i parameters exceed 1% of the C_{max} or L_{max} , then 50% of the corresponding L_{max} or C_{max} parameter is applicable and shall not be exceeded(if $C_i \geq 0.01 * C_{max}$ then $L_i \leq 0.5 * L_{max}$; if $L_i \geq 0.01 * L_{max}$ then $C_i \leq 0.5 * C_{max}$).

If cable parameters are unknown, the following values may be used: Capacitance 60pF per foot (180pF per meter), inductance 0.20uH per foot (0.60uH per meter).

JUMPER SETTINGS

Jumper J2 set the analog output channel for HART communication

Table 3.

J2	Function	Notes
1-2	HART out on I1	Connect the HART modulator output to I1 analog channel
2-3	HART out on I2	Connect the HART modulator output to I2 analog channel
open	HART out not used	HART modulator output not connected(not used)

Jumper J3 set the analog input channel for HART communication

Table 4.

J3	Function	Notes
1-2	HART input on I1	Connect the HART modulator input to I1 analog channel
2-3	HART input on I2	Connect the HART modulator input to I2 analog channel
open	HART input not used	HART modulator input not connected(not used)

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Jumper J5 set the output value in case of error and at start up for channel I1 and I2.

Table 5.

J5	Function	Notes
1-2	20 mA	Output 20 mA on error or start up
open	4 mA	Output 4 mA on error or start up

Jumper J6 select the output variable for analog channel I2

Table 6.

J6	Function	Notes
1-2	Temperature output on I2	Output the temperature to I2
open	Bottom level on I2	Output bottom level on I2

WARNING: Never change jumper settings while device power is on.

LED ASSIGNMENTS

The 2110EX-A has 4 LEDs on board :

- Red – assigned to current loop 1 (X1-L3) status
- Green – assigned to DLS2100 sensor communication status
- Blue – assigned to current loop 2 (X1-L2) status
- Yellow – reserved for HART communication

Table 7.

LED color	LED status	2110EX-A status
RED	On solid	Current loop 1 is working properly
	On blinking	Current loop 1 issue (open loop or D/A converter overheat)
	Off	Not assigned
GREEN	On solid	Communication with DLS2100 work properly
	On blinking	DLS2100 sensor not responding or response format error
	Off	Not assigned
BLUE	On solid	Current loop 2 is working properly
	On blinking	Current loop 2 issue (open loop or D/A converter overheat)
	Off	Not assigned
YELLOW	On solid	Reserved
	On blinking	Reserved
	Off	Reserved

Note: If Green LED is blinking and Red/Blue LEDs are off the DLS2100 sensor is not responding to the configuration request command or the response format has errors.

CURRENT LOOP 1 and 2 SCALING

Current loop 1

Current loop 1 is dedicated to communicate DLS2100 sensor top level (usually product level for oil and gas industrie). The scale for this loop is set at the device start up when 2110EX-A read from the DLS2100 level sensor the following parameters

- min_4mA – level for supplying 4 mA in the current loop, usually 0
- max_20mA – level for supplying 20mA in the current loop, usually maximum level that DLS2100 can monitor

The current in the loop for a random level (*top*) is given by:

$$I_1 = (20\text{mA} - 4\text{mA}) * \text{top} / (\text{max_20mA} - \text{min_4mA}),$$

where

I_1 - loop current in mA
top – top level in inches.

Current loop 2

Current loop 2 is dedicated to communicate DLS2100 sensor bottom level (usually interface level for oil and gas industrie) or the temperature according to J6 jumper setting(see Table 6 above).

If J6 is set for bottom level the scale for this loop is set at the device start up when 2110EX-A read from the DLS2100 level sensor the following parameters

- min_4mA – level for supplying 4 mA in the current loop, usually 0
- max_20mA – level for supplying 20mA in the current loop, usually maximum level that DLS2100 can monitor

The current in the loop for a random level (*bottom*) is given by:

$$I_2 = (20\text{mA} - 4\text{mA}) * \text{bottom} / (\text{max_20mA} - \text{min_4mA}),$$

where

I_2 - loop current in mA
bottom – bottom level in inches.

If J6 is set for temperature the scale for this loop is set for the range 0°F to 200°F (4mA current means 0°F and 20mA means 200°F).

The current in the loop for a random temperature *temp* is given by:

$$I_2 = (20\text{mA} - 4\text{mA}) * \text{temp} / 200,$$

where

I_2 - loop current in mA
temp – temperature in °F.

WARNINGS

- Not to be connected to control equipment that uses or generates more than 24VDC with respect to earth ground.
- The 2110EX-A must be installed, operated, and maintained only by qualified personnel, in accordance to relevant national/international installation standards (National Electric Code (NFPA, Article 504) and ANSI/ISA – RP12.6).
- Particular care shall be given to segregation and clear identification of IS conductors from non-IS conductors.
- De-energized power source (turn off power supply voltage) before installing or removing the connections when installed in Hazardous Area/ Hazardous Locations or unless area is known to be non-hazardous.
- **Warning: substitution of components may impair Intrinsic Safety.**
- **Explosion Hazard: to prevent ignition of flammable or combustible atmospheres, disconnect power before servicing or unless area is known to be non-hazardous.**
- The unit cannot be repaired by the end user and must be returned to the manufacturer or authorized representative. Any unauthorized modification must be avoided and void any warranty.

AVERTISSEMENTS

- Ne doit pas être connecté à un équipement de contrôle qui utilise ou génère plus de 24 VDC par rapport à la terre.
- Le 2110EX doit être installé, utilisé et entretenu uniquement par du personnel qualifié, conformément aux normes d'installation nationales / internationales (National Electric Code (NFPA, Article 504) et ANSI / ISA - RP12.6).
- Une attention particulière doit être accordée à la séparation et à l'identification claire des conducteurs IS des conducteurs non IS
- Source d'alimentation hors tension (couper la tension d'alimentation) avant d'installer ou de retirer les connexions lorsqu'elles sont installées dans des zones dangereuses / endroits dangereux ou à moins que la zone ne soit reconnue comme non dangereuse.
- **Avertissement: la substitution de composants peut compromettre la sécurité intrinsèque.**
- **Risque d'explosion: pour éviter l'inflammation des atmosphères inflammables ou combustibles, déconnectez l'alimentation avant l'entretien ou à moins que la zone ne soit reconnue comme non dangereuse.**
- L'appareil ne peut pas être réparé par l'utilisateur final et doit être renvoyé au fabricant ou à un représentant autorisé. Toute modification non autorisée doit être évitée.

MARKING

Labels:

The Model 2110EX-A will be clearly marked on the label attached to the enclosure, label drawing number is 2110EX-A-00.

Serial Number:

For each PCB board a unique serial number will be generated after factory testing. The serial number consists of five digits (e.g. SN: 00101)

For each unit a unique serial number will be generated after factory testing. The serial number consist of 12 alphanumeric characters as below:

EXAMMYYnnnnn

where:

EXA - model 2110EX-A

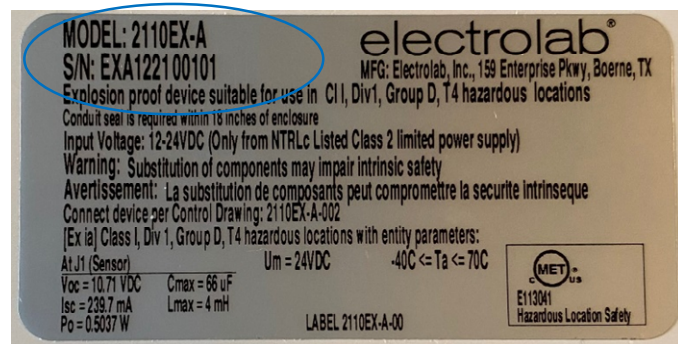
MM - manufacturing month;

YY - manufacturing year;

nnnnn - 5 digits incremental number;

EXA022200101 represents a 2110EX-A model device manufactured in February 2022 and having the assigned order number 00101.

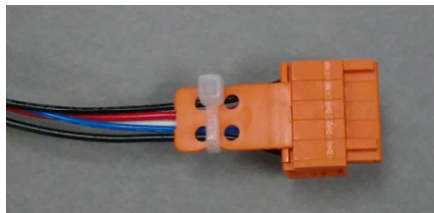
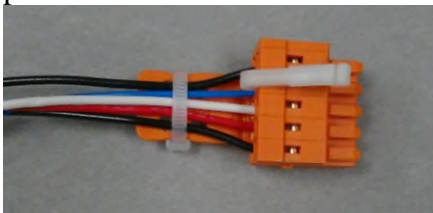
The serial number will be clearly printed on the enclosure label.



INSTALLATION

1. The unit can be mounted with any orientation over the entire ambient temperature range.
2. Use only explosion proof conduit or explosion proof cable to connect to the enclosure in accordance with relevant national/international standards (National Electric Code (NFPA, Article 504)).
3. Conduit seal is required within 18 inches of enclosure.
4. Electrical connection of conductors up to 1.5 mm² are accommodated by polarized plug-in removable WAGO disconnect/connect cage clamp.
5. Connection to earth ground should use at least one wire with a minimum of 4 mm² copper or at least two wires each with a minimum 1.5 mm² copper. The resistance path from device to the point of connection should be less than 1 Ω .
6. Identify the function and location of each connection terminal using the wiring diagram/control drawing (Drawing No. 2110EX-A-002).
7. Intrinsically safe conductors must be identified and segregated from non IS and wired in accordance with relevant national/international standards (National Electric Code (NFPA, Article 504) and ANSI/ISA – RP12.6).

8. Always attach the cables to the connector strain relief plate with cable ties. This will ensure that cables do not migrate in the enclosure if they are disconnected from connector by accident. See pictures below.



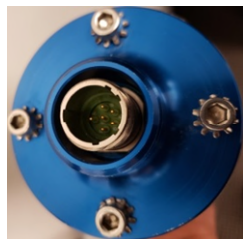
9. The enclosure provides an IP54 minimum degree of mechanical protection for indoor and outdoor installation.
10. Lock the cover by fastening its hex screw with a hex socket; use a hex spanner of 1.5mm.
11. Any unauthorized modification must be avoided.
12. Fuses are not field replaceable and unit must be returned to Manufacturer for repair.
13. Never change jumpers setting while device power is on.

STEP BY STEP INSTALLATION INSTRUCTIONS

1. Check device for proper model and voltage
 - a. Review the model number on the attached label to ensure you are using the analog version of the Explosion Proof Housing. The Model should be 2110EX-A.



2. Loosen the nut on the top part of the 1-inch union, until it is almost removed.
3. Ensure the number of sensor connector pins match the number of 2110EX-A connector pins.



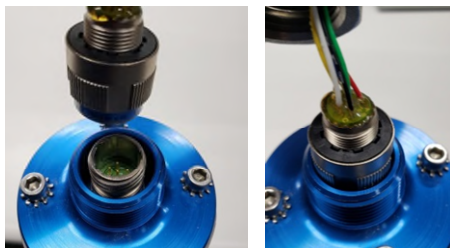
Sensor connector with 6 pins



2110EX-A connector with 6 pins

4. Apply thread sealant to the 1-inch NPT connector on the sensor.
5. Hold the 2110EX-A above the sensor flange connector with one hand; insert and tighten up the connector to the sensor with the other hand.

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Tighten connector

6. Unscrew the bottom part of the union from the 2110EX-A. Then screw the bottom part of the union's 1-inch FNPT onto the sensor's 1-inch MNPT flange until hand tight. Make sure the connector cable is not caught in the threads or joint. Tighten the union using a 1.5" wrench but do not overtighten.



Ensure cable is not caught in threads or joint

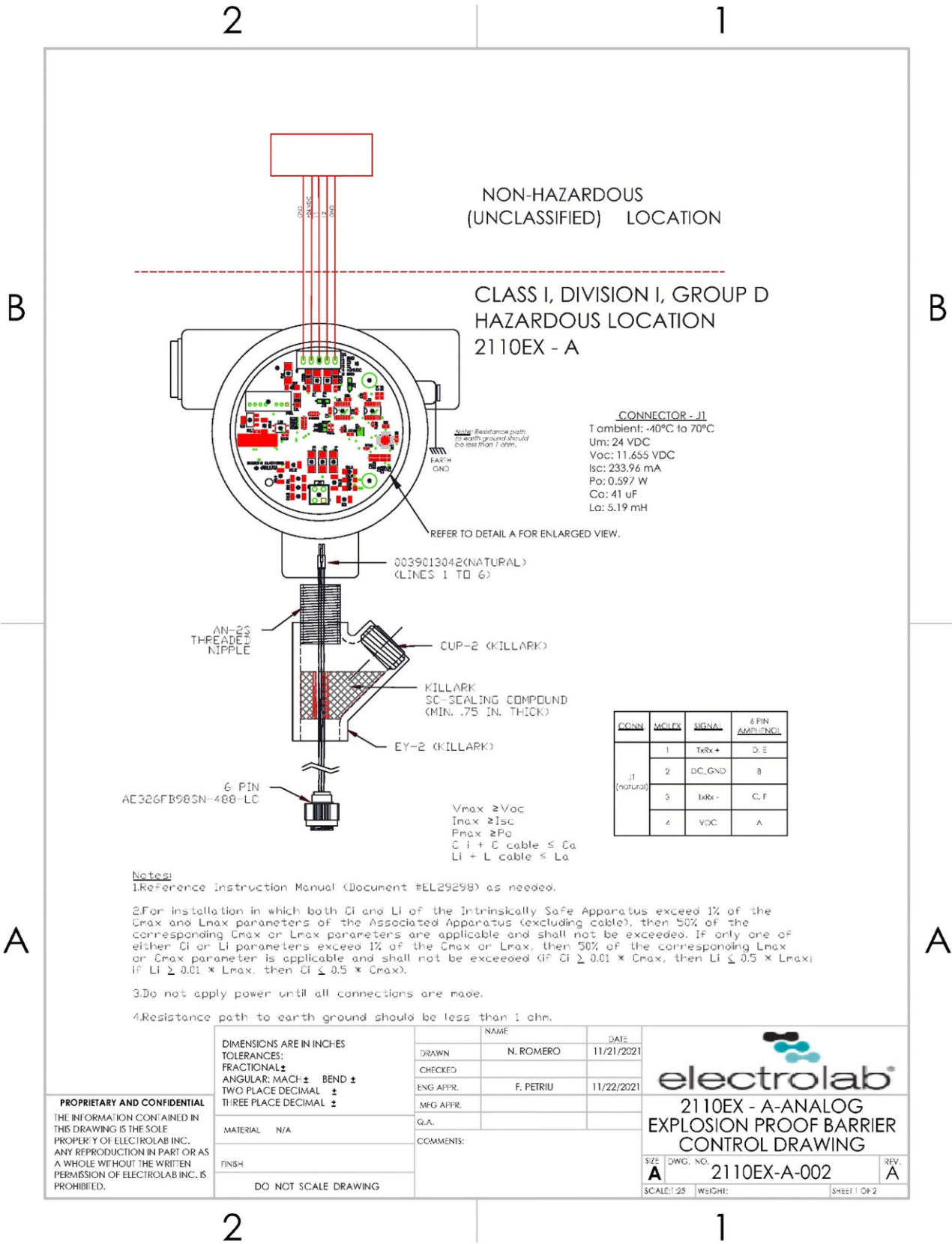
7. Screw together the union parts until hand tight. **Make sure the threads are straight to avoid thread damage.** Use a 1.5" wrench to hold the threaded adapter (bottom part of the union) and a 2-1/16 " torque wrench to tighten the union nut to 125 ft. lbs.



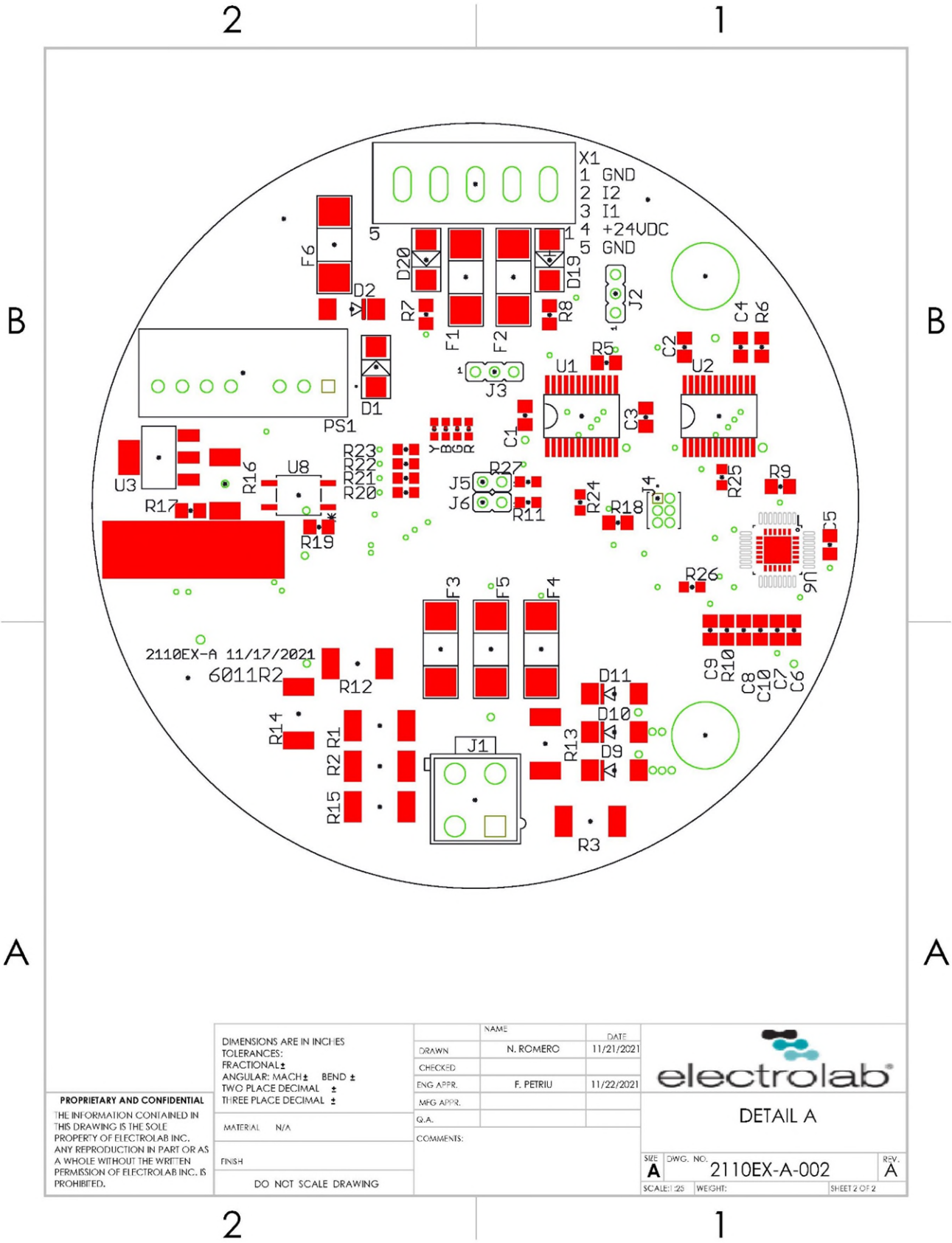
Tighten connector

8. Connect the current loops and power wires to the orange connector X1 according to the control drawing 2110EX-A-002 following the pinout that is marked on the circuit board. The wire size should be in the range 14 to 28 AWG. Secure the wires on the pull tab using a cable tie.
9. Seal the incoming conduit with a certified EX fitting within 18 inches from the 2110EX-A enclosure.

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CONTROL DRAWING



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For more information contact Electrolab:



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