



E&E

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IOT WIRELESS TRANSMITTER

Tested under

UL 121201, Ninth Edition, Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations (Rev April 1, 2021)
 CSA C22.2 No. 213-17, Third Edition, Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations (Rev April 1, 2021)
 UL/CSA 61010-1, Electrical Equipment for Measurement, Control, and Laboratory Use; Part 1: General Requirements, Third Edition, May 11, 2012

File: E115469

MET Report: 128340 – Hazloc / Ordloc

Approved: April 22, 2024

Applicant:

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Prepared By:

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For:

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 (410) 949-1802

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Report: NRTLC128340

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Page 1 of 29

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SAFJ TEMP-100-0, NRTL-MET-C Report 3-11-2021

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File Number: E115469



Report: NRTLC 128340

Table of Contents

CHANGE RECORD 3

DESCRIPTION 4

GENERAL REQUIREMENTS.....7

MARKINGS.....9

MANUAL/SERVICE INSTRUCTIONS 11

ALTERNATE LISTEE INFORMATION 12

APPLICANT’S RESPONSIBILITIES 13

 PRODUCT MODIFICATIONS: 13

CRITICAL COMPONENTS.....16

CRITICAL DRAWINGS.....18

FIGURES 19

TESTING CONSIDERATIONS 28

CONCLUSION 29

원문: 인증 NRTL 128340 C1 132068 (media.ncd.io) · 제조사 원문 자료입니다. 사양은 제조사 사정에 따라 변경될 수 있습니다.



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Report: NRTL 128340

Change Record

Change Number	Description	Approval Date	Project Number	Amendment Engineer	Engineer Initials
C1	- Updated following critical components: 1/8 1/9 - Added following alternate critical components: 1/7 - Updated critical drawing "PR57-3" from rev N to rev U - Updated applicant address to "National Control Devices, LLC 430 Market St. , Osceola, Missouri 64776"	June 27, 2024	132068	Jignesh Patel	JP

Description

Product(s) Covered:

- IOT wireless transmitter

Product Description:

- The Industrial Wireless Transmitter is a long-range sensor powered by 6AA L91 non-rechargeable batteries. It features two connectors, one of which is used to connect to a sensor, while the other remains open. This is a battery-operated device that has two different probes: a 5-pin probe and an 8-pin probe. This probe is used to connect a sensor to the transmitter. Depending on the sensor type, it can connect to either an 8-pin or a 5-pin probe. This Industrial IoT Wireless Transmitter Device employs an open communication protocol, ensuring secure data transmission through hardware encryption. This versatility allows seamless integration with a wide range of control systems or gateways. Apart from this, this transmitter is housed in nonmetallic enclosure, rated as type 3R and which has a gasket. There are different types of connectors which don't have a gasket, but they have pins, so they are appropriately sealed when they mate with sensors. Also, the transmitter contains a battery compartment which is located internally to enclosure. It also has another side which contains PCB.
 - The device can simultaneously transmit data to various platforms, including personal computers, Raspberry Pi, Losant IoT Cloud, Microsoft Azure IoT, and embedded systems. Moreover, it supports different types of probes, facilitating easy connection for obtaining various output.
1. CO2 Probe: This module allows our sensor to reliably measure CO2 concentration levels from 400 to 5000 ppm, with an accuracy of $\pm(30 \text{ ppm} + 3\%)$ within the 400-5000 ppm range.
 2. Vibration Probe: This sensor is its built-in Fast Fourier Transform (FFT) analysis. This critical tool facilitates the conversion of vibration signals from the time domain to the frequency domain, uncovering vital patterns that can help anticipate potential machine failures ahead of time. By deploying FFT analysis, users can pinpoint specific frequency components within the vibration data, making it markedly easier to identify irregularities and detect anomalies at an early stage.
 3. Predictive current Sensor: This sensor ensures accurate and real-time monitoring of electrical parameters, providing crucial insights into the health and efficiency of any electrical systems. This sensor allows for the conversion of AC current signals from the time domain to the frequency domain, revealing vital patterns that can help anticipate potential electrical faults ahead of time.
 4. Linear displacement sensor: This sensor uses for linear displacement measurements. This sensor provides high-performance data in real-time, allowing for remote monitoring and alerts, reducing manual tracking, and enhancing efficiency.
 5. Tank level sensor: This sensor is used for monitoring liquid level. This sensor excels at accurately determining tank levels within range of 40 mm to 9999 mm, with an impressive resolution of 1mm, providing critical data for optional resource management and operational efficiency.

6. 2- Channel door sensor: This sensor is enough capable of providing real-time monitoring of door statuses. Beyond doors, its versatility extends to monitoring the open or closed status of a wide range of objects, provided they can accommodate the sensor and the corresponding magnet.
7. Pressure sensor: This sensor is used for monitoring pressure. Measures pressure levels with high precision, useful in various applications such as HVAC systems industrial processes, and weather monitoring.
8. High-Temp Thermocouple Probe: This probe is used for measuring real time temperature but a distinguishing feature of this thermocouple probe is its capability to cater to high temperature ranges and compatible with K-type thermocouples, this highly versatile device also supports an array of other thermocouple types, including J,T,N,S,E,B and R.
9. Temperature humidity probe: This sensor is used for measuring temperature and humidity. Provides high-accuracy humidity and temperature readings, ideal for maintaining ideal conditions in environments like server rooms or greenhouses.
10. Ultrasonic Vibration Sensor Probe: This sensor is used for measuring and monitoring vibrational frequencies. This sensor harnesses the power of ultrasound technology to detect and analyze minute vibrational in industry machinery. This vibrational signal can be indicative of various mechanical issues, such as misalignments, imbalance, or wear and tear, allowing for timely intervention before catastrophic failures occur.
11. Air Quality Probe: Measures a range of air quality parameters including particulate matter, carbon dioxide levels, volatile organic compounds, and other pollutants.

Model Differences:

- None

Electrical Rating:

- 3.6 VDC, 300mA, Battery operated

Engineering Considerations (Not For Field Representative's Use):

- The IoT wireless transmitter has been investigated in accordance with UL 121201, Ninth Edition, Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations (Rev April 1, 2021) CSA C22.2 No. 213-17, Third Edition, Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations (Rev April 1, 2021) UL/CSA 61010-1, Electrical Equipment for Measurement, Control, and Laboratory Use; Part 1: General Requirements, Third Edition, May 11, 2012.
- This product must be installed in accordance with all codes applicable to the location of the installation and in accordance with its instructions for use.



File Number: E115469

Report: NRTL 128340

Description (Continued)

Note to Field Representative:

- A sample of each component listed below and a purchase order for the work described below at the current hourly rate shall be submitted to:*

Eurofins E&E NA, Inc.
914 West Patapsco Avenue
Baltimore, Maryland 21230-3432

for reassessment processed under job #130820 for verification of construction against the associated drawings also listed below. The component(s) shall be subjected to an annual audit for continued compliance. The annual re-verification is a client incurred expense to be assessed at the current hourly rate at the time of the test. The estimated time for re-verification is also listed below.

Figure/ Item #	Component	Controlled Document Number	Re-Verification Type	Re-verification Maximum Estimated time (hours)
N/A	N/A	N/A	N/A	N/A

*Alternatively: If the evaluation is performed by the Eurofins E&E NA representative’s lab other than the location above or by the MET representative during the Follow-up inspection, all data shall be returned to the Baltimore office listed above for surveillance tracking under the assigned job number mentioned above.

- The above inspections are a client incurred cost and will be billed at the hourly rate in place at the time of the inspection.

General Requirements

Scope of Requirements: The requirements contained within this section apply to all products contained within this Follow-Up Service Report File where applicable.

Definitions: (as defined or used in the context of the standard)

Term	Definitions
SELV:	Safety Extra Low Voltage
PCB:	Printed Circuit Board
TNV:	Telecommunications Network Voltage
Listed/Recognized Component:	A component evaluated to the applicable U.S. standards by a Nationally Recognized Testing Laboratory (NRTL).
Certified Component:	A component evaluated to the applicable Canadian standards by a Certification Organization (CO).
Listee:	Applicant

Measurements: All dimensions indicated in the body of this report are approximations unless otherwise indicated.

Corrosion Protection: All corrosive metals shall be provided with a means to protect from corrosion. Acceptable methods include painting, plating and galvanizing. Dissimilar metals shall not be employed where reliable continuity is required.

Soldered Connections: All soldered connections shall be made mechanically secure before soldering. Tack soldering is not acceptable. Acceptable forms of mechanical securement include:

- A) Lead is inserted through an eyelet or opening of a terminal block prior to soldering.
- B) Lead is inserted into a U or V shaped slot in the terminal prior to soldering.
- C) Lead is wrapped around a terminal post prior to soldering.
- D) Lead is tied to adjacent lead with wire tie-wrap near termination point.

Electrical Connections: All electrical connections other than soldering shall be provided with positive detent, crimp type insulated Recognized Component connectors suitable for the voltage and temperatures involved. They shall be sized for the wire and mounting terminations. Where hazardous voltage or energy is involved, all wire connections to connectors shall employ a recognized method of double securement. Where fork-type lugs are used, they shall be snap-on or up-turned lug type.

Mechanical Assembly: All parts shall be secured by welding, bolts/nuts with lock or star washers, or thread forming screws.

General Requirements (Continued)

Internal Plastics: Shall be a Recognized/Certified Component, Plastic, rated minimum 94V-2.

PCB: Shall be a Recognized Component, rated minimum 94V-2 and 105°C.

Wire Connectors: (Various crimp-type) Shall be Listed/Recognized/Certified Components sized for the wire and mounting terminations. Both the wire insulation and the conductor shall be crimped.

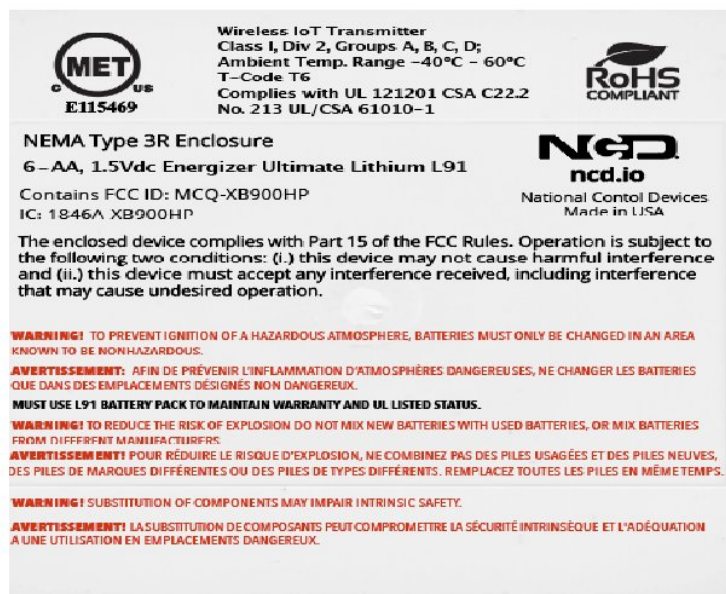
Internal Wiring: All internal wiring and connections are properly jacketed or enclosed within the equipment. Wiring is routed and secured to reduce the possibility of stress being transmitted to electrical connections, as necessary. All internal conductors in the secondary circuits are routed away from primary circuit conductors and from uninsulated live parts. There is no internal wiring subject to contact by the user when the product is employed as intended. The internal wiring is acceptable for conditions of service to which it will be subjected. Internal conductors consist of Recognized Component AWM insulated individual conductors; sized in accordance with the National Electric code and Canadian Electrical code, as may be applicable for the current expected in the conductor, rated VW-1, 300V, 90°C, and signal level ribbon wiring of flammability rating VW-1.

Interconnecting Cords and Cables: Flexible telecommunication cord and cable assemblies employed for interconnection between components are to be rated for and comply with temperatures, exposure to oil or grease and other conditions of service within the environment the product is to be utilized.

Markings

Etching, molding, die-stamping, silk-screening, stamped-, or etched-metal labels secured by rivets or screws are considered permanent. Recognized/Certified Component, Marking and Labeling Systems, and/or labels tested and deemed suitable for the surface to which it is applied is also considered permanent. Per the Canadian Electrical Code described in CSA C22.2 No. 0 General Requirements, Canadian product certification requires warning/cautionary markings in both English and French languages. It is the Applicant's responsibility to provide the listed Bilingual Markings shown below in accordance with the Canadian regulatory requirements. Each product is to be permanently marked with the following information:

- The MET Mark (refer to MET Applicant Contract), with the applicant/listee name or alternate listee name as identified within this report, trade name or trade mark, product model number, and a date of manufacture or serial number.
- Method of applying the MET Mark:
 - ☒ Direct Imprinting
 - ☐ Purchasing Labels from Eurofins E&E NA
 Approved MET Mark:



- A rating label identifying the voltage and current or power.
- Near each terminal and control, there shall be a marking to identify the function.
- The following marking shall be included next to the battery holder:

Warning: To reduce the risk of explosion do not mix old batteries with used batteries or mix batteries from different manufacturers.



File Number: E115469

Report: NRTL 128340

- f. The unit shall be marked:
- Class I, Division 2, Groups ABCD T6
 - Temperature range: -40°C to +60°C
- g. Alternate listees and product names or model numbers: None

Manual/Service Instructions

- Operations and Service instructions are provided with the equipment.
- Operations and Service instructions must state or show the following, or equivalent:
 - This equipment is suitable for use in:
 - Class I, Division 2, Groups ABCD T6
 - Battery is the only replaceable component.
 - Warning: To prevent ignition of a hazardous atmosphere, batteries must only be changed in an area known to be non-hazardous.
 - Warning: To reduce the risk of explosion do not mix new batteries with used batteries, or mix batteries from different manufactures.



File Number: E115469



Report: NRTL 128340

Alternate Listee Information

Alternate listees and product names or model numbers: None

Applicant's Responsibilities

Product Modifications:

Minor product modifications by the manufacturer may be allowed using the following guidelines:

1. Components identified in this report as "Listed, Recognized, or Certified" and **NOT** identified with a manufacturer name or part number may be exchanged with an alternate "Listed, Recognized, or Certified" component of equivalent value.

Example: Appliance Inlet Connector - Listed/Certified Component, IEC 320 style male connector, rated 250 volts and 20 amperes. Mechanically secured to the front panel with screws and locking washers.

- This inlet connector may be replaced with any Listed/Certified inlet connector with the same ratings as stated and where mechanical securement is maintained.

2. Components identified by a manufacturer name, part number, or with specific comments, (such as AC only, indoor use only, approved for use in this product only), may **NOT** be replaced or modified without prior approval from MET Laboratories.

Example: Circuit Breaker - Recognized/Certified Component, ABCD Co. P/N XYZ123, rated 250 volts maximum, 50/60 Hz, 25 full-load amperes, 31.3 trip amperes. Toggle handle marked with IEC on/off symbols. Mechanically secured to the front panel with screws and locking washers.

- This circuit breaker can **NOT** be modified or changed without prior approval by Eurofins E&E NA, Inc.

This product was tested for use in **Hazardous Locations**.
The manufacturer **may not** make any modifications to the construction detailed within this report without prior approval of Eurofins E&E NA, Inc.



File Number: E115469

Report: NRTL 128340

Project Amendments:

For any changes related to product construction, manufacturing locations, if the product is intended to be marketed/sold under an alternate name or model number than that originally listed, or any issues which would require notification or change in the status of this file, please complete the form and return to Eurofins E&E NA following the instructions provided on the form.

For your convenience a Project Amendment Request (PAR) form is available for download at <http://corp.metlabs.com/safetyreq/>. Alternatively, please provide it to your local Eurofins office or Eurofins Partner Representative.

If you are terminating or temporarily suspending production of this product for an extended period, please send a letter on company letterhead to:

Eurofins E&E NA, Inc.
Attn: Follow Up Services Department
914 West Patapsco Avenue
Baltimore, Maryland 21230
USA
Fax: (410) 354-3313



File Number: E115469



Report: NRTL 128340

Applicant's Responsibilities (Continued)

Manufacturing and Production-Line Tests and Documentation

This product is exempt from production line testing regarding Hazardous Locations.

Critical Components

Figure/ item No.	Object/ Parts No.	Manufacturer/ Trademark	Type/ Model	Technical Data	Standard (Edition / year)	Mark(s) of Conformity	Secured Method
1/1	Enclosure	ECP CORD, DBA POLYCASE	ML-34F*15	Polycarbonate Resin, UL94 V-0, 1.5mm min. thickness, 125°C max. Temp, fl rated	UL 94	UL/CSA (E352997)	Secured with screws
1/2	PCB	HuBei GongMing Circuits Co.,Ltd	GF212	V-0 flame rated, 130° max operating temp	UL94	UL/CSA (E365663)	Secured with screws
1/3	Battery	Energizer L91	AA batteries	Lithium AA batteries, 1.5 V, -40°C to 60°C operating temperature range,	IEC 60086- 4:2019, UL 1642	UL/CSA	Secured to Battery holder
1/4	Toggle Switch	Yuandi Electronics Co.,Ltd	TA-3532S-A	a toggle 240VAC current capacity NOT exceeding 3A b toggle 28VDC current capacity NOT exceeding 3A	UL/CSA 61010-1	N/A	Secured to PCB
1/5	connector	Dongguan Runlai Electronic Technology Co., LTD	M12	5 pins and 8 pins connector, 63 V DC, 16 A	UL/CSA 61010-1	N/A	Secured to enclosure
1/7	Battery holder	Interchangeable	Interchangeable	Steel, Nickel Plated, 0.016” min thickness	UL/CSA 61010	N/A	Secured to PCB
	Battery holder (Alternate)	Interchangeable	Interchangeable	Polypropylene material, V-2 flame rated, 105°C MAX. Temperature, min. 0.8 mm thick	UL94	cURus	Secured to PCB
1/8	Interconnect cable	DONGGUAN YANGDA ELECTRONIC TECHNOLOG Y CO LTD	Style 2468	24AWG*8C or 24AWG*5C, 80°C, 300 V, VW-1	UL 758/ CSA- C22.2 No. 210	cURus (E467966)	N/A
1/9	Gasket	Parker Hannifin Corporation	N0674-70	Nitrile, Max. service	UL50E	cURus (MH25709)	Secured to enclosure

				temperature 60°C,			
Optional							
2	Co2 Probe	NCD	PR55-75	Input: 3.3V-5V/100mA, Operating temp: -40 °C – 85 °C	N/A	N/A	N/A
3	Vibration Probe	NCD	PR52-56	Input: 3.3V-5V/100mA, Operating temp: -40 °C – 85 °C	N/A	N/A	N/A
4	Predictive current Sensor	NCD	ncd_100,ncd_200,ncd_600,ncd_100	Input: 3.3V-5V/100mA, Operating temp: -40 °C – 85 °C	N/A	N/A	N/A
5	Linear displacement sensor	NCD	ncd_LVDT	3.3V-5V/100mA, Operating temp: -40 °C – 85 °C	N/A	N/A	N/A
6	Tank level sensor	MaxBotix	ncd_WD	Input: 3.3V-5V/100mA, Operating temp: -40 °C – 85 °C	N/A	N/A	N/A
7	2- Channel door sensor	NCD	ncd_door	Input: 3.3V-5V/100mA, Operating temp: -40 °C – 85 °C	N/A	N/A	N/A
8	Pressure sensor	Micro Sense	ncd_PS	Input: 3.3V-5V/100mA, Operating temp: -40 °C – 85 °C	N/A	N/A	N/A
9	High-Temp Thermocouple Probe	Omega	ncd_TC	Input: 3.3V-5V/100mA, Operating temp: -40 °C – 85 °C	N/A	N/A	N/A
10	Ultrasonic Vibration Sensor Probe	SDT	ncd_sdt	Input: 10VDC - 16VDC/20mA, Operating temp: -40 °C – 85 °C	N/A	N/A	N/A
11	Temperature humidity probe	NCD	P57-2	Input: 3.3V-5V/100mA, Operating temp: -40 °C – 85 °C	N/A	N/A	N/A
12	Air quality Probe	NCD	PR57-12A	Input 3.3 V-5V/100 Ma Operating temp: -40 °C – 85 °C	N/A	N/A	N/A



File Number: E115469

Report: NRTLC 128340

Critical Drawings

Title:	Drawing No.:	Rev. Level:	Date:
ML-34F Outdoor NEMA Enclosure	ML-34F POLY	1	2/5/2013
PCB Main	PR55-81	O	09/24/2023
PCB Battery	PR57-3	U	05/08/2024
Main BOM	PR55-81	O	09/24/2023
Probe Details	PD_01	A	10/03/2023

Figures

Figure 1.

IOT Transmitter – Internal Side



Front Side



Back Side

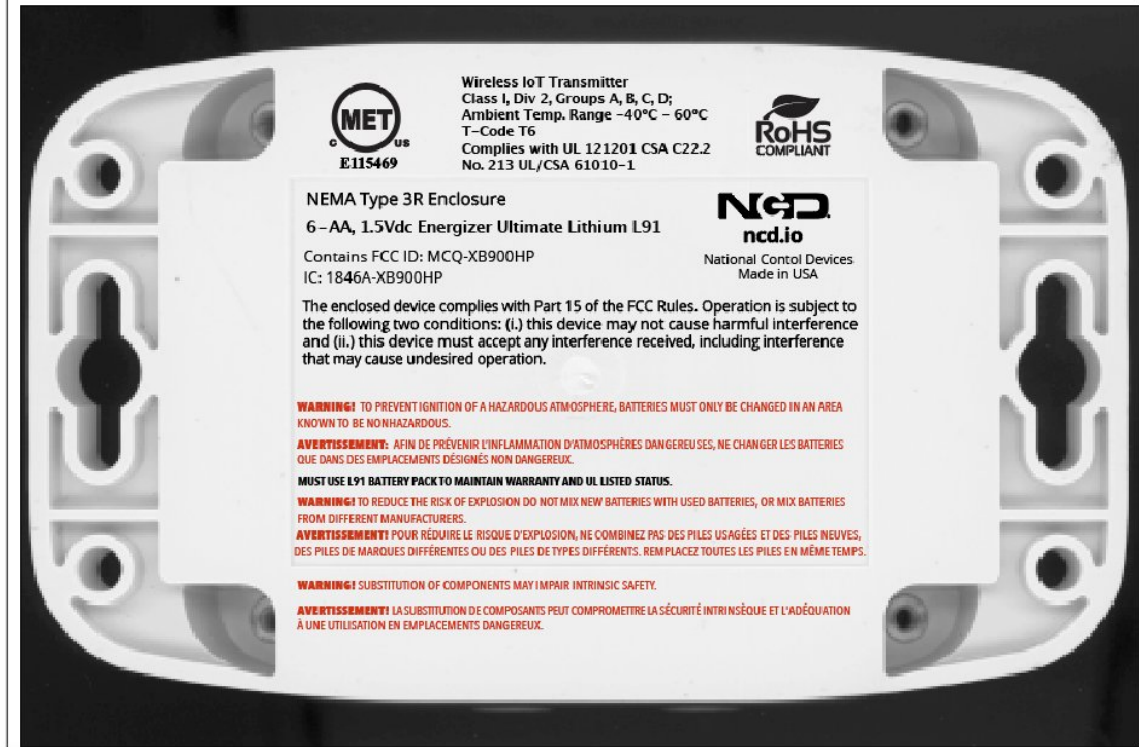


Figure. 2 - Co2 Probe



Figure. 3 - Vibrational probe



Figure. 4 - Predictive Maintenance Sensor



Figure. 5- Linear displacement sensor

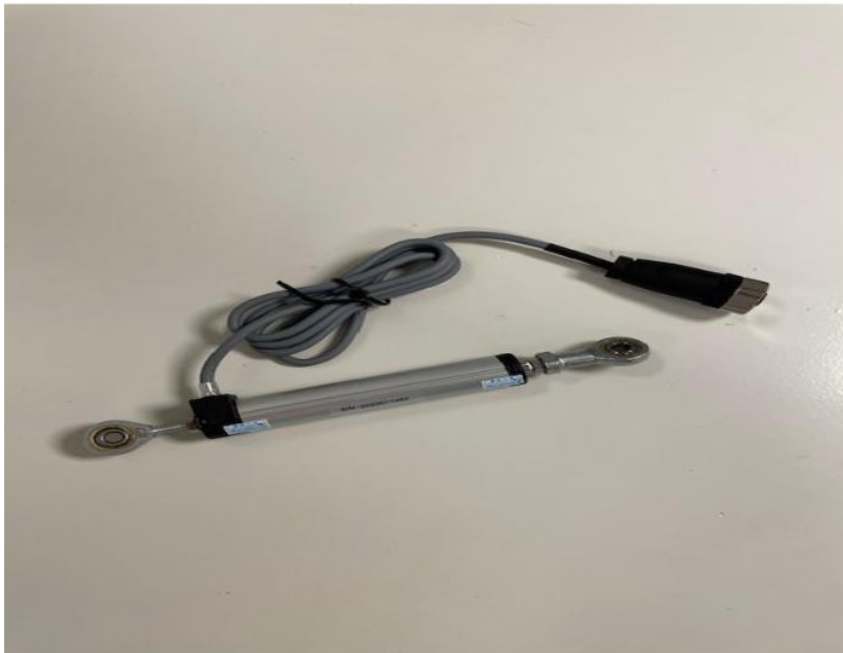


Figure. 6 - Tank Level Sensor



Figure. 7- Door Sensor



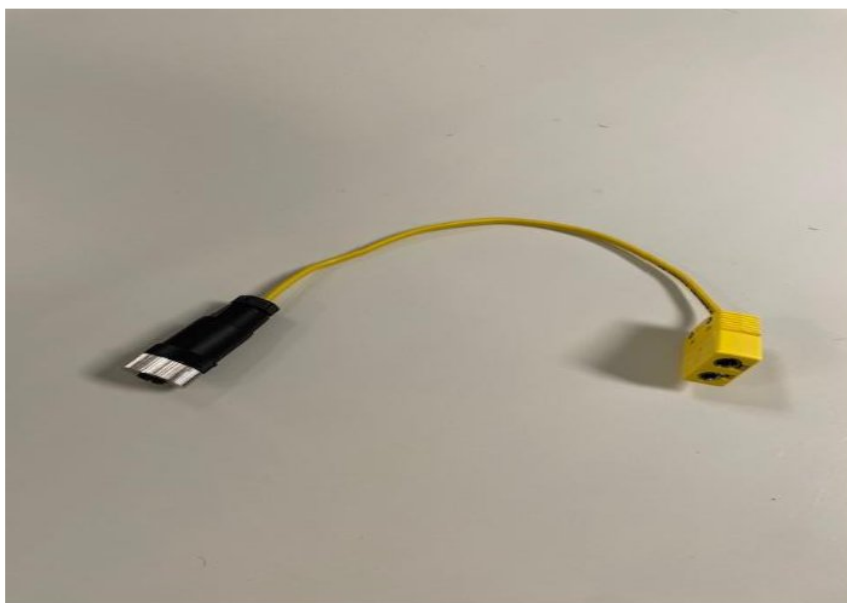
Figure. 8 - Pressure sensor probe**Figure.9 - High frequency temperature probe:**

Figure. 10 - Ultrasonic Vibration Sensor Probe



Figure.11 - Temperature humidity probe



Figure.12 - Air quality probe



Testing Considerations

A sample of the IoT Wireless Transmitter was subjected to the following test program with satisfactory results. All tests were conducted in accordance with UL 121201, Ninth Edition, Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations, CSA C22.2 No. 213-17, Third Edition, Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations, UL/CSA 61010-1, Electrical Equipment for Measurement, Control, and Laboratory Use; Part 1: General Requirements, Third Edition.

Only these tests were considered necessary due to engineering considerations. Detailed test results are on file at MET Laboratories under project number 128340.

UL 121201/CSA 213-17 TESTS CONDUCTED:

1. Connectors and plug-in components, Clause 8.2
2. Determination of maximum surface temperature, Clause 10.1

UL/CSA 61010-1 TESTS CONDUCTED:

1. Abnormal Operations, Clause 4.4.2
2. Permissible Limits for Accessible Parts, Clause 6.3
3. Wall Mounting, 7.5
4. Mechanical Resistance to Shock and Impact, Clause 8
5. Temperature Limits and Resistance to Heat, Clause 10
6. Durability of Markings, Clause 5.3
7. Resistance to heat Clause, 10.5

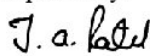
UL/CSA 50E TESTS CONDUCTED:

1. Rain Test, 8.3

Conclusion

The product covered by this report have been tested, examined, and found to comply with the applicable requirements of UL 121201, Ninth Edition, Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations, CSA C22.2 No. 213-17, Third Edition, Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations, UL/CSA 61010-1, Electrical Equipment for Measurement, Control, and Laboratory Use; Part 1: General Requirements, Third Edition. This certification has been granted under a System 3 program as defined in ISO/IEC 17067.

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