FLEX SI

USERS MANUAL

Numerex™

Contents

Revision History

Version	Author	Date	Comments
Initial Draft	TL	2012-01-12	Initial Draft
Draft 2	TL	2012-01-13	Added certifications, mechanical drawings, and description of sensor module connector
Draft 3	DW/EJ/TL	2012-01-20	Updated CE, added clarity, formatting changes

Introduction

The FLEX SI (Sensor Interface) is a highly adaptable wireless sensor interface for use with the FLEX satellite based asset tracker. The FLEX SI is capable of supporting various combinations of analog, digital, and intelligent Sensor Modules. Examples of Sensor Modules include: tank level sensors, pressure transducers, temperature sensors, door intrusion sensors, event counters, etc. In a typical usage scenario battery life can be expected to multi- year.

The behavior of the FLEX SI is also highly configurable enabling the user to monitor status in near real-time, to receive notification of an exception event, or to perform complex analysis in the field for specific reporting requirements. Numerex will work closely with the end user to identify the proper Sensor Module and to develop the firmware required to support the required mode of operation.

Up to four FLEX SIs can be paired with one FLEX.

Hardware

Enclosure

The FLEX SI is contained within an ultrasonically welded environmentally sealed enclosure. Connections to sensor modules are made by joining the FLEX SI 10 pin circular connector to a suitable companion connector on the Sensor Module cable.   Up to four FLEX SIs can be paired to each Satellite FLEX.

Sensor Modules

The Sensor Module is a critical component of the solution. The customer shall identify a measurement to be taken and work in conjunction with Numerex to source a suitable third-party sensor. The standard FLEX SI can provide a maximum 50 milliamps of at 3.3V to power Sensor Modules. The sensors are connected to the FLEX SI through a 10-pin circular connector.

Batteries

The FLEX SI requires two 3.6v lithium-thionyl chloride AA batteries.   These batteries are installed in the FLEX SI in a sealed compartment that is user accessible. The user shall change the batteries in a non-hazardous environment to reduce the risk of igniting a flammable or explosive atmosphere.

Battery level monitoring is conducted and reported through sensor messages. Battery life resolution is reported to within 1%. Due to the nature of the battery chemistry, battery life remaining cannot be directly inferred from voltage readings. Therefore the value is calculated based on component measurements and aggregated usage totals. Although the accuracy should be acceptable, the user should replace the batteries when the level falls below 20% to ensure uninterrupted operation.

Firmware

Firmware is a critical component of the FLEX SI. Custom firmware will be required for each application as defined by the customer. Thorough system testing shall be conducted to ensure the functionality delivered is the exact functionality specified.

Wireless Communication

The FLEX SI utilizes a 779 to 928 MHz ISM band transceiver. The frequency is configurable to allow for ISM band operation in North America, Europe, and other locales. Transmit power, data modulation, data encoding, and data rates are also configurable to allow for reliable communication in noisy environments. It is recommended to perform a site survey to identify possible sources of interference such that Numerex can make adjustments accordingly.

Each FLEX SI has a unique sensor identification number (SID). The SID ranges from 0 to 255. The SID shall be included in the over-the-air message to identify the FLEX SI from which the data transmission originated. Each FLEX SI is also uniquely paired to a single FLEX through which it shall exclusively report.

In open air the FLEX SI can be up to 50 feet from the FLEX and maintain reliable signaling. Although greater distances can be achieved, reliability should be assessed before full deployment.

Data transmission through various materials has been tested and throughput has been shown to be reliable. However, when no direct line of site is available it is important to test wireless signal reliability. An installation assessment kit, consisting of a FLEX wireless programmer and software tools, is available from Numerex.

When an event occurs that requires data transmission, the FLEX SI signals the FLEX to wake up and relays the appropriate information. This process can take up to 40 seconds. Subsequently, the FLEX, if not handling the transmission of another event, can delay the message up to 40 minutes. In applications where promptness is a concern, it is recommended to minimize the number of sensors and optimize the regular reporting of the FLEX to ensure delivery of data as quick as possible. In a typical application data can be expected to be delivered in less than 1 minute 90% of the time, within 20 minutes 95% of the time, and within 40 minutes 98% of the time.

Installation

The recommended installation method is to use VHB tape to secure the FLEX SI to the asset being monitored. Ultimately, however, each installation may require special mounting and should be properly assessed by the customer. Installation should be done in such a manner to provide direct line of sight from the FLEX SI to the FLEX at a distance greater than 3 feet and less than 50 feet. The FLEX SI should be mounted "screws down" to avoid attenuating the internal antenna. As previously mentioned, installation kits should be used to ascertain the wireless signal reliability of the installation before deployment.

Factory Configuration

For each customer implementation, Numerex will load appropriate firmware, and conduct FLEX SI/FLEX pairing operations. In most cases, the customer will connect the FLEX SI and Sensor Module cables (10 pin round connector) at final installation. Depending on usage, batteries may be factory installed by Numerex or shall be required to be installed on site.   When a fielded FLEX is to be paired with a FLEX SI,

it is required for the customer to correctly identify and provide the ESN of the FLEX to which the FLEX SI shall be paired. Alternatively, Numerex will provide intuitive software and the required 10-pin USB connector to perform the field paring. Each FLEX SI shall be labeled with its SID and the ESN of the FLEX to which it is paired.

Addendum

Certifications

FCC

FCC ID: TWV-FLEXSI
Part 15

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced technician for help.

WARNING: Changes or modifications not expressly approved by Numerex may render the device non-compliant to FCC and other regulatory body standards for operation and may void the user's authority to operate the equipment.

Accessory items that can be readily obtained from multiple retail outlets are not considered to be special accessories and are not to be marketed with the equipment. Only those accessory items provided by Numerex have been tested to ensure operation consistent with the regulatory standards that the device is required to perform.

FCC RF Exposure Information

In August 1996 the Federal Communications Commission (FCC) of the United States with its action in Report and Order FCC 96-326 adopted an updated safety standard for human exposure to radio frequency electromagnetic energy emitted by FCC regulated transmitters. Those guidelines are consistent with the safety standard previously set by both U.S. and international standards bodies. The design of this module complies with the FCC guidelines and these international standards. The FCC ID of this unit is TWV192513384X. For more information about RF exposure, please visit the FCC website at www.fcc.gov.

The term "IC" before the certification/registration number only signifies that the Industry Canada Technical Specifications were met. The external antennas used for this module must provide a separation distance of at least 20cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

Canadian Compliance (Industry Canada)

IC ID: 6322A-FLEXSI

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device. The FLEX SI is configured with a less than 10% transmission duty factor and is excluded from routine RF exposure evaluation in accordance with the requirements of RSS-102 section 2.5.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement. L'émetteur de la FLEX SI est configuré avec un facteur de devoir de transmission de moins de 10 %, et est exclu de l'évaluation de l'exposition RF conformément aux exigences de RSS-102 article 2.5 de la routine.

R&TTE 1558

CE 1558

The FLEX SI has been fully tested and complies with all the requirements of EN301 489-1, EN301 489-3 and EN60950-1/A1:2010. Compliance to EN300 200-1 and EN300 220-2 has been demonstrated.

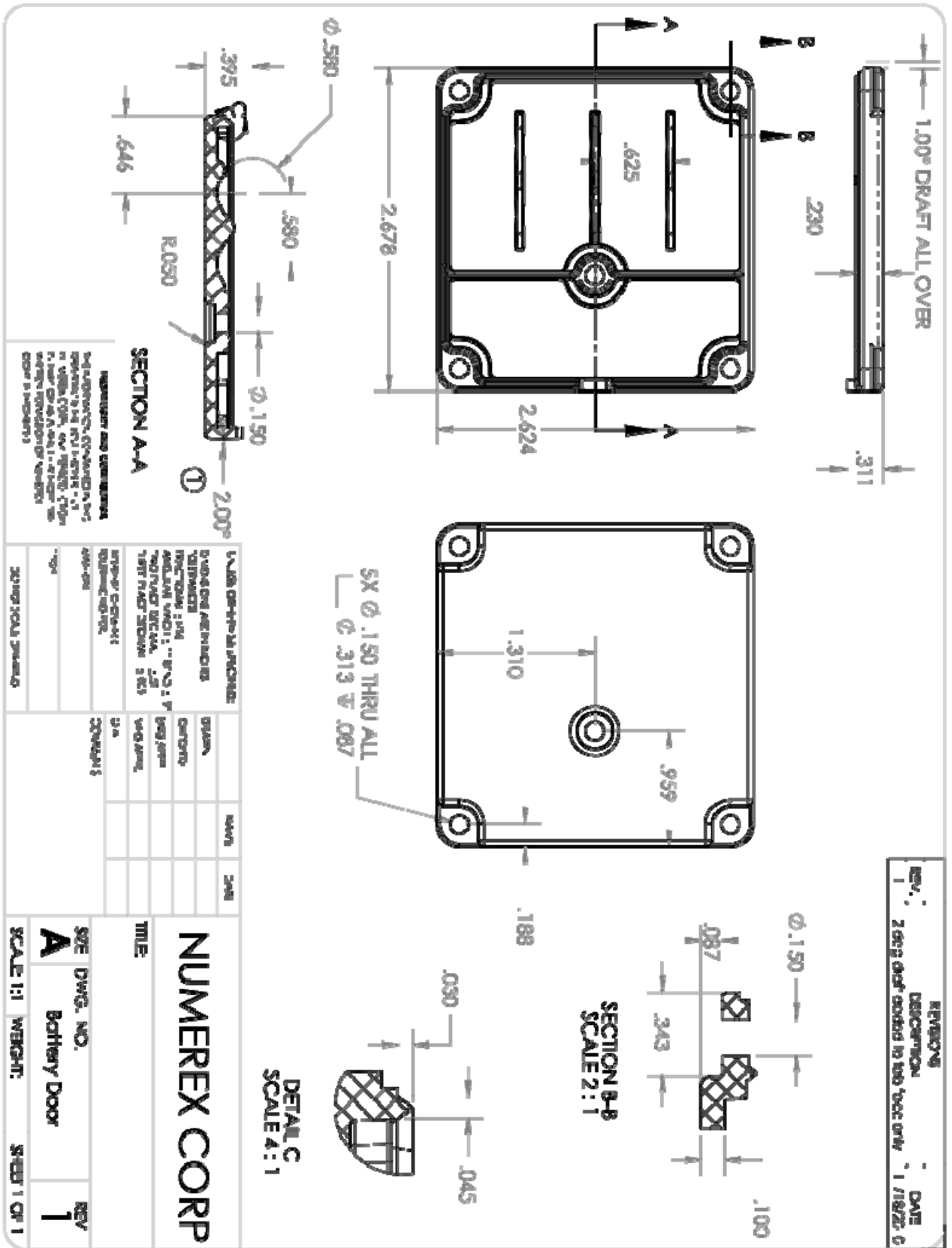The FLEX SI is certified to the following safety standards:

UL 913, Fifth Edition – Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division I, Hazardous (Classified) Locations
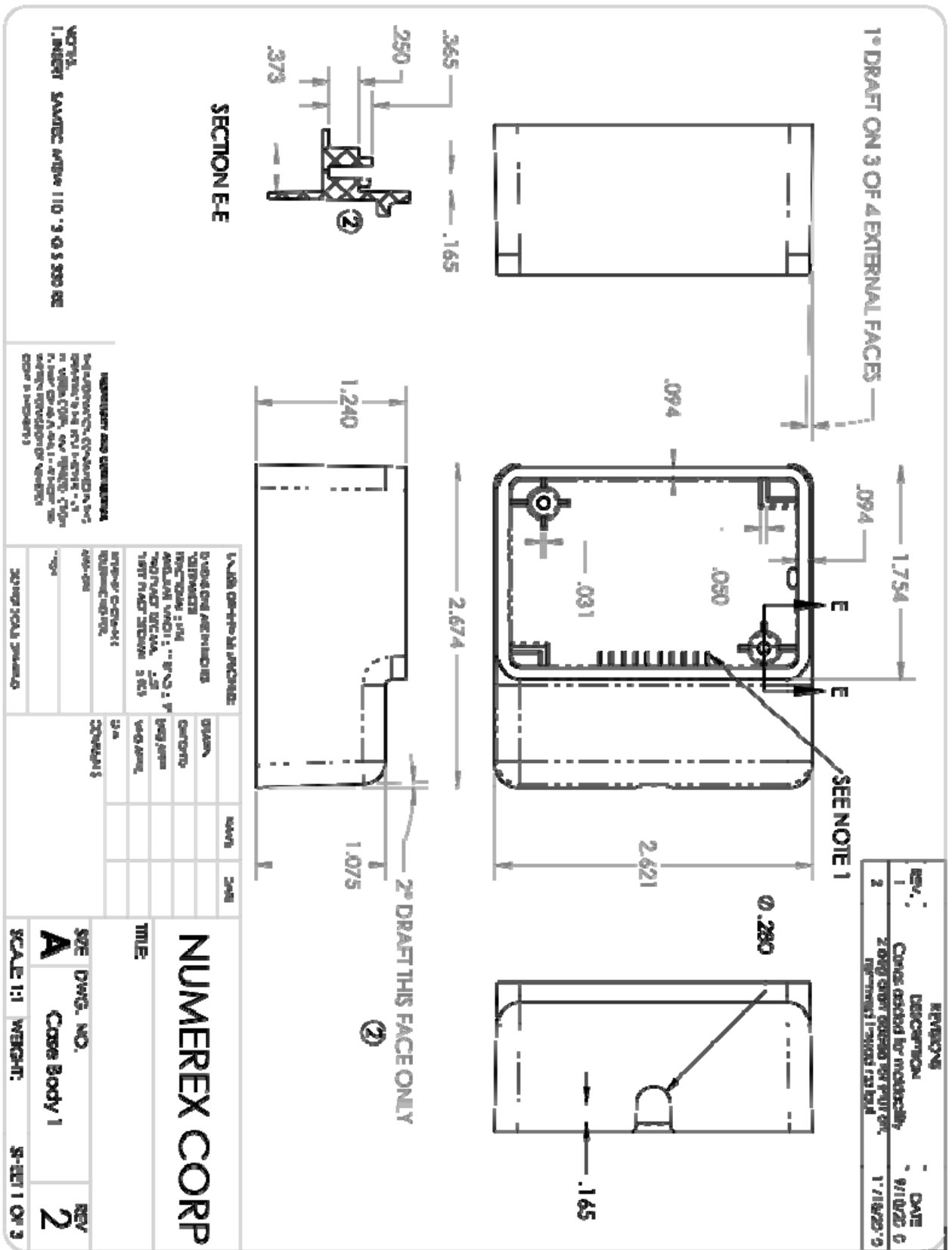
CSA C22.2 No. 157-92-CAN/CSA, 1992.06.01 (R2006) Intrinsically Safe and Non-Incendive Equipment for Use in Hazardous Locations – Third Edition
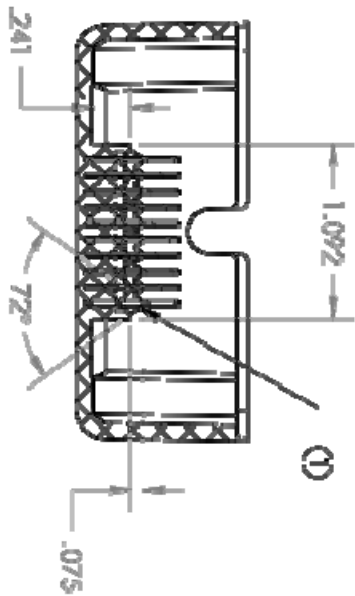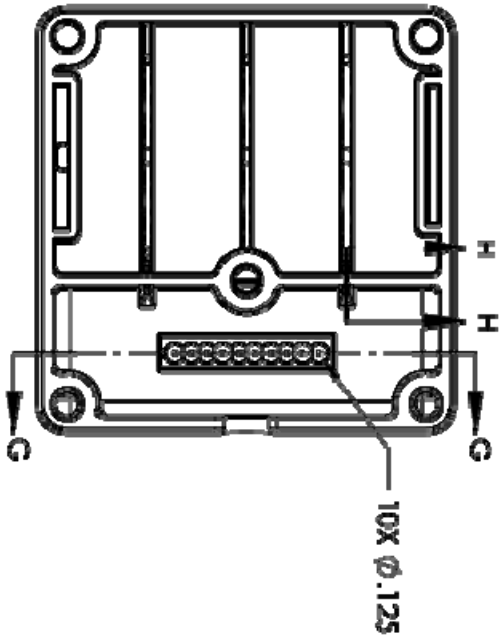
MET listing # E112687.

Installation Requirements

In hazardous environments, must only employ a GEMS XM800 or 860 float sensor using no more than 100 feet of cabling.

Mechanical Drawings

SECTION H-H
2 SPOTS

.075
.060
.033
4°

10X ⌀.125

SECTION G-G

.241
1.092
.075
.072

NUMEREX CORP

SIZE: A
DWG. NO.: Case Body 1
SCALE 1:1
WEIGHT:
REV: 2
SHEET 3 OF 3