CBOT™ V1 Corrosion Data Logger & Electrode User Guide

Description

The CBOT™ sensor is an Internet of Things (IoT) device which measures atmospheric corrosion rates using a customized steel electrode and electrochemical impedance spectroscopy (EIS). The CBOT™ uses a patented and specialized electrode, in line with ISO22858 standards, which measures changes in impedance on an electrode which can be mapped back to ISO9223 corrosion rates.

The efficient power system design ensures low power consumption for extended field operations in conditions ranging from -40°C to 60°C. The sensor is capable of recording data to an on-device SD Card or submitting data via the on-board LTE module.

Figure 1. CBOT™ Sensor

Features

- Standards Compatible: Generates corrosivity estimates in line with ISO9223, ISO12944, and ISO22858

- Steel Compatibility: Designed to measure atmospheric corrosion rates for 1018 (Cold Rolled) Steel.

- Connectivity: Supports wireless data transmission (LTE, Satellite) for remote monitoring. For backup, data is stored on an on-board SD Card.

- Power Management: Efficient power management, small embedded solar panel for extended operation, and 1200mAh on-board Lithium Phosphate (LifePO4) battery.

- Durability: Operates reliably in high humidity and wide temperature ranges.

- Additional Sensors: Measure temperature, humidity, barometric pressure, and electromagnetic field strength (EMF) and can be adapted to other uses.

- Installation: Simple installation and includes an optional mounting kit for pole installation.

Applications

- Infrastructure Monitoring
- Oil & Gas Industry
- Maritime Industry
- Environmental Analysis
- Industrial Equipment Maintenance
- Research & Development
- Remote Locations Monitoring

Supported Regions

- United States (including Gulf of Mexico)
- Canada
- Mexico
- Europe

1. Corrosion Sensing Electrodes

The CBOT™ comes with two corrosion sensing electrodes, vacuum sealed in a package with dessicant. These electrodes are capable of measuring the atmospheric corrosion rate over time as they degrade. They should last between 6 weeks and 2 years depending on the corrosivity of the surrounding environment. Carefully insert the electrode into the bottom of the CBOT™ housing slot until it is fully inserted. It is critical that the user does not touch the metal surface of the electrode, which may cause an accelerated rate of corrosion of the sample.
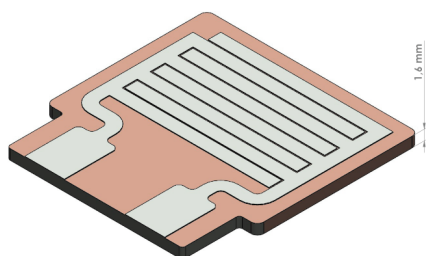
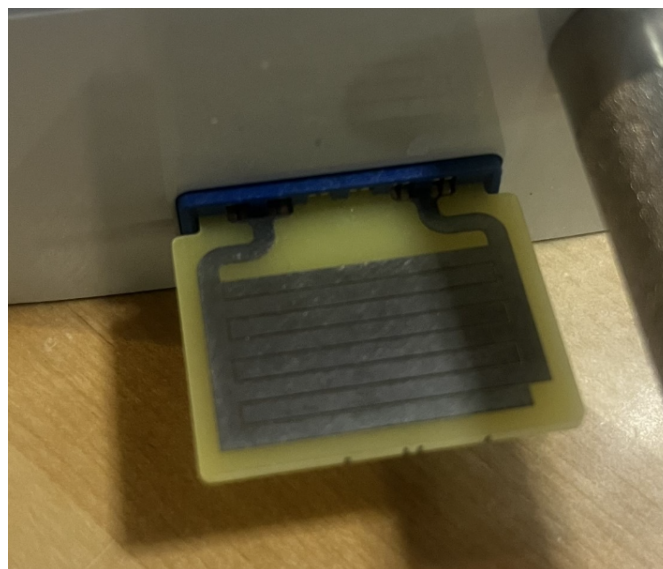**Figure 2.** Electrode Dimensions

Figure 3. Fully Inserted Electrode

    If replacement electrodes are needed, please contact EDI using the information in the Contact Information section of this document.

2. Installation & Optional Mounting Kit

The CBOT™ can be installed either directly onto a flat surface with mounting screws or affixed to a pole with the pole mounting kit (included). Either installation method is suitable, as long as the electrodes (see section below) are not in contact with any metal surfaces and the face of the sensor has adequate sunlight (there is a small solar array inside of the housing).

2.1 Parts Included
The below parts are included in the CBOT™ box. If any parts are missing, please contact the individuals listed in the Contact Information section at the end of this document.

- CBOT™ Data Logger (CBOT-V1)
- Pole Mount Kit (PK-085) - See below
- 2 Corrosion Sensing Electrodes (8D25L)
- 1 25cm USB-A to USB-Micro Charging Cable
- (Optionally) Carbon Steel Test Panel and Attachment Hook

2.2 Tools Required
The only tools required for installation are a #1 or #2 Phillips Screwdriver and a 5/16-Inch slotted screwdriver.

2.3 Mounting Kit
The mounting kit contains the below parts:

Id	Part No	Description	Qty
1	SC-080	Strut Channel P4100SLPG	2
2	SN-001	Strut Channel NUT 1/4-20	4
3	CL-01	Hose Clamp, 2" to 12.25"	2
4	SW-001	Strut Channel Washer 1/4	4
5	031	CR PHMS 0.25-20x0.75	4
6	W-002	WASHER #10 X .734 X .04	4
7	030	CR-PHMS #10-24x0.625	4
8	W-012	#10 SAE WASHER	4
9	N-001	NUT #10-24	4
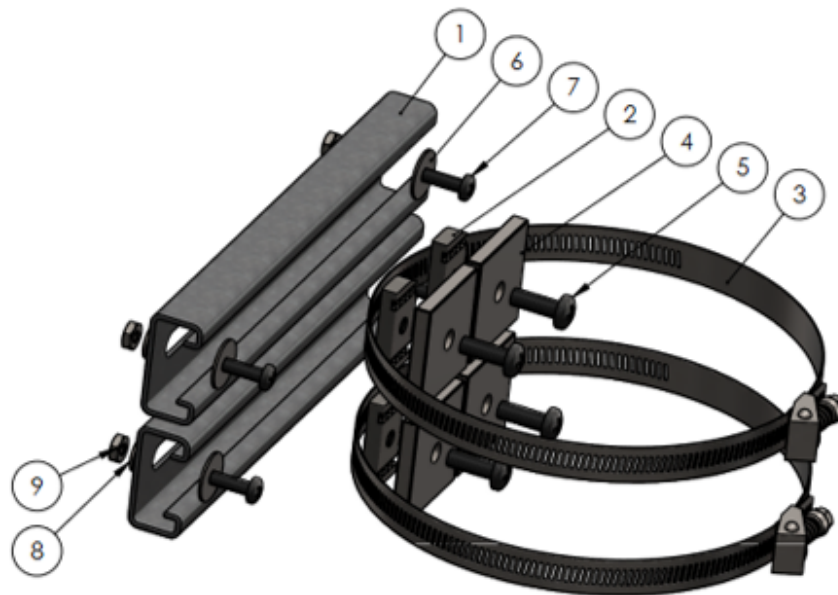
Figure 4. Pole Mounting Kit Layout

All mounting kit parts, except parts 1 and 3 (the hose clamp and strut) are in a sealed plastic bag. If required, the specific drawings for the mounting kit and parts are available at the URL: http://bit.ly/30Bfha7

After assembling the mounting kit, affix the mounting kit to a pole with diameter between 2" and 12.25". The CBOT™ Data Logger is then affixed horizontally to the strut, visible in figure 3.

3. Power & Charging

The CBOT™ should come charged and requires no external power source. Inside the device, there is a high efficiency monocrystalline solar panel which is capable of maintaining charge in the removeable 3.2V LifePO4 battery. In the case of failure or power drainage, the enclosed Micro-USB cable can be attached to a USB Power Brick, laptop, or other external USB-based power source. In most cases, this will not be required since the device will maintain its battery levels according to charging capacity available.

To power on the device, press the button on the side of the CBOT™ until the light turns solid blue for 10 seconds. Leave the button depressed in that state indefinitely.

4. Absolute Maximum Ratings

Parameter	Rating
Operating Temperature	-40C to +60C
Charging Temperature	-10C to 60C
Input Voltage (Micro-USB)	3.3V to 5.0V
SHT-30 Accuracy Tolerance (RH)	+/- 3 %
SHT-30 Accuracy Tolerance (T)	+/- 2C
Battery Capacity	1200mAh

5. Regulatory & Compliance

For cellular connectivity, this device uses the ublox SARA-R5 chipset and complies with the following declaration below from ublox:

> Manufacturers of mobile or fixed devices incorporating SARA-R5 series modules are authorized to use the FCC United States Grants and ISED Canada Certificates of SARA-R5 series modules for their own final host products if, as per FCC KDB 996369, the antenna trace design implemented on the host PCB is electrically equivalent to the antenna trace design implemented on the u-blox host PCB used for regulatory type approvals of SARA-R5 series modules, described in this section.

For further information on this module's certification please see the document titled: "SARA-R5 series LTE-M / NB-IoT modules based on UBX-R5 chipset System integration manual"

5.1 United States

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.
2. This device must accept any interference received, including interference that may cause undesired operation.

FCC ID	XPYUBX19KM01
IC	8595A-UBX19KM01

5.2 Canada

This device complies with the ISED Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

ISED Certification Number	8595A-UBX19KM01

5.3 Warning

1. It is the responsibility of the customer to determine any potential or related hazards and the suitability of using this product in any specific environment, including those classified as hazardous.
2. Only properly qualified personnel should work on the installation of this equipment. Company and industry safety procedures must be followed. Manufacturer is not responsible for any misuse of the product by customer or any damage related thereto.

6. Contact Information

If you have any questions, concerns, below are contacts on the project:

Tom Hayden
Direct Phone: (224) 420-6722
Email: thayden@engineeringdirector.com

Joe Mazzella
Direct Phone: (331) 457-7663
Email: jmazzella@engineeringdirector.com

7. Dimensions

145.88

15.79   114.3

19.1   61.9