Kaiterra Square
Modbus User Manual

May 2023

1.

Introduction

The Kaiterra Square is a commercial air quality monitor that supports multiple communication methods, including Modbus.

Modbus is a serial communications protocol. Developed for industrial applications, Modbus is relatively easy to deploy and maintain. Modbus uses the RS485 or Ethernet as its wiring type. Modbus supports communication to and from multiple devices connected to the same cable or Ethernet network.

The Kaiterra Square provides Modbus/RTU support via the RS-485 port on the device. Kaiterra Square can still upload data to the cloud via Wi-Fi or Ethernet when Modbus is used for local communication.

Note: Before setting up Modbus for your Kaiterra Square, please make sure your device is running the latest firmware and make sure the latest version of Kaiterra Enterprise Configuration Tool is installed on your computer or smartphone.

Latest firmware version: 2.3.34 (June 2022)

2.

Setting up Modbus on the Kaiterra Square

### 1. Set up Modbus via RS-485

Make sure your power cable is disconnected, and follow the steps in the Kaiterra Square Installation Guide, to insert the RS-485 communication cables into the pins and fasten the screws. Pin A is for Cable A in RS-485, and Pin B is for Cable B in RS-485. Connect the power to turn on the device.

2. Prepare for Configuration

Download the Kaiterra Enterprise Configuration Tool and install it on your computer or smartphone.

After the device has been turned on, it will automatically enter the configuration mode for 15 minutes.

Note: If your Kaiterra Square is not compatible with the current version of our Kaiterra Enterprise Configuration Tool, please contact your Kaiterra rep for further assistance.
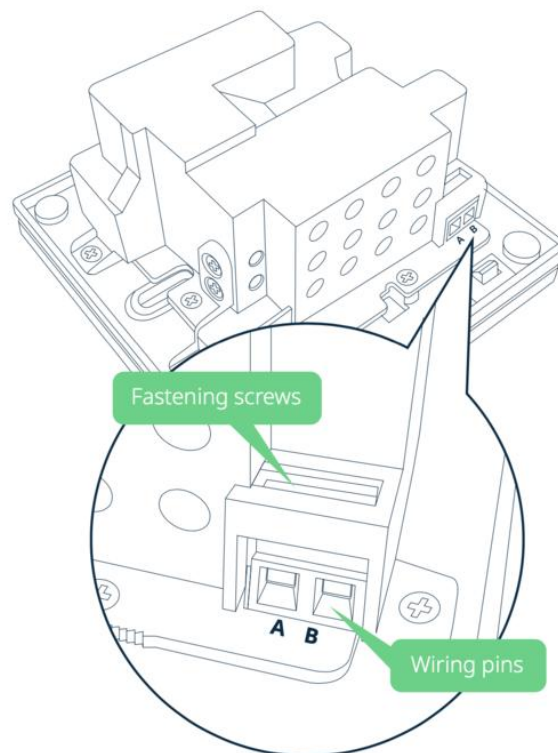
3. Connect to the device

Open the network settings on your computer or smartphone and look for the Wi-Fi network that starts with "Kaiterra". Connect to that network.

On the Kaiterra Enterprise Configuration Tool, you can enter a name for the device (e.g. the location of the device or the serial number) and a project tag. This will provide easy identification and filtering in the configuration history page later on to help you quickly connect the device to the Kaiterra dashboard.

Enter the Modbus settings details to the applicable fields on the Configuration Tool following the instructions below:

Setting Device Address

You can customize your device address in the Kaiterra Enterprise Configuration Tool. The device address is used to identify the device in the system, so please make sure each device is given a unique device address.

Customize your device address by entering an address from 1 to 247 in the address field in the Kaiterra Enterprise Configuration Tool. It is recommended to set your device address onsite during or right after installation, so that you can keep track of the device installed and the corresponding device address.

Setting Parity Type

You can configure Parity to be odd, even, or none by selecting from the drop down menu in the Kaiterra Enterprise Configuration Tool. The default setting for Parity is "even".

If your Modbus network does not use parity checking, select "none". Please consult your Modbus network admin or BMS admin to confirm the parity type of your local network. Please note that all devices in the same network should be set to the same parity type.

Setting AQI

You can choose your AQI standard and customize your AQI calculation in the Kaiterra Enterprise Configuration Tool. AQI stands for Air Quality Index, an index calculated based on the concentration of a set of air pollutants. The Kaiterra Square offers AQI value in the Modbus communication so that you can integrate the information into your local system.

Choose the AQI standard from the drop down menu in the Kaiterra Enterprise Configuration Tool, and select the pollutants used for the AQI calculation. Please note that only the pollutants monitored by your device can be included in the calculation.

Please consult the facility manager or other responsible personnel if the Modbus address is not clear.

Click configure device and disconnect from the "Kaiterra" network

3.

Communication Protocol - Modbus RTU

Data type and format:

Data length=8

Stop bit=1

Transmission rate=9600

Check=even

Data format	Address	Function	Data	Error check
Data length	1	1	N	16 digit CRC code (Cyclic Redundancy Check)

Default Modbus address code is 0x01

Commands

Read Input Register (0x04) command 01 04 00 00 00 05 30 09 to read all input register

Write single Register (0x06) command 01 06 00 00 00 02 08 0B to set the modbus address to 0x02

Read holding Register (0x03) command 01 03 00 00 00 02 C4 0B to read all holding register

Register Address

Address	Content	R/W Property	Comments
Input register 0	PM2.5	R	0-999 ug/m3
Input register 1	TVOC	R	0-60000 ppb
Input register 2	Temperature	R	-30.0-50.0°C**
Input register 3	Humidity	R	0.0%-100% RH
Input register 4	CO2	R	0-9999 ppm
Input register 5	PM10	R	0-999 ug/m3
Input register 6	HCHO	R	0-2000 ppb
Input register 7	CO	R	0.0-500.0 ppm
Input register 8	O3	R	0.0-100.0 ppm
Input register 9	Reserved	R	
Input register 10	Reserved	R	
Input register 11	Reserved	R	
Input register 12	Reserved	R	
Input register 13	Reserved	R	
Input register 14	AQI	R	0-500

Holding Register 0	Modbus address code	R/W	Min 1, Max 247

* Other features could be customized upon requests.

* Temperature is in absolute temperature $T(k)=273.15+t(celsius)$

* Temperature and humidity have resolution of 0.1, the transmitted data is 10 times of the raw data.

** Since our temperature readings in Modbus are provided in Kelvin, you must convert them to Celsius. You can use the formula above $[T(k) = 273.15+t(celsius)]$ or you can do this:

1. Take the Modbus reading (ie. 3000)
2. Minus 2732 (ie. 3000 - 2732 = 268)
3. Divide it by 10 (ie. 268 / 10 = 26.8**℃**)