

SKYIND1-IO



Industrial Bridge

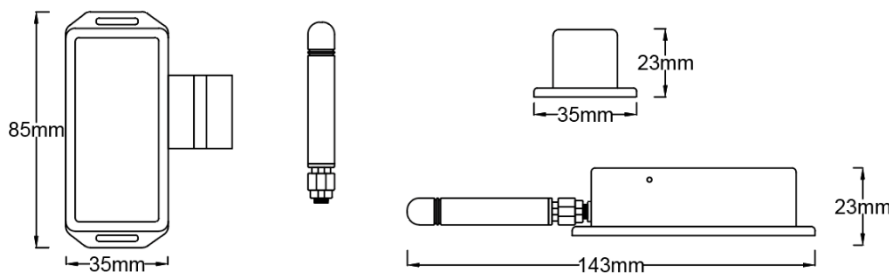
Skysens SKYIND1-IO is a LoRaWAN compatible industrial bridge device equipped with multiple I-Os and MODBUS RTU interface module.

- ✓ Equipped with MODBUS RTU interface.
- ✓ Excellent long-term stability.
- ✓ LED interface.
- ✓ Easy attachment with accessories.
- ✓ Completely programmable MODBUS RTU read table.
- ✓ Adjustable reading interval from network
- ✓ Ready with end-to-end software application.
- ✓ 2 mode restart pin button.
- ✓ Control of output pins via downlink message remotely.
- ✓ Open-Drain pin which allows up to 50 Volts and 20 Amperes DC power through this pin.



> Application Areas

Industries, Remote Control Applications, Houses, Farms, etc.



> Technical Features

Dimensions	35 x 85 x 23 mm	Available Frequencies	All
Weight	60 gr (apprx)	Digital IO Pins	1 Digital Output (3V) 1 OD Output 1 Digital Input (3-5 V)
Casing	ABS with RoHS Compliancy	Analog Input	Up to 2 Volts DC
Antenna	+2 dBi or +3 dBi external	Operating Conditions	-40°C to +80°C & 0% RH to 100% RH
Supply Voltage Range	5-9 Volts DC		

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MODBUS INTRODUCTION

- This device is designed for reading Modbus devices remotely. It is possible to set following parameters: Modbus IDs of the devices to read, communication speed, start registers and register count to read.
- There are 10 slots to configure remotely in the device. Different IDs can be stored in these slots and/or different registers can be read from the same ID.
- Up to 17 registers can be read from a total of 5 zones per slot. For example, the reading mentioned here can be made by starting from register number 40001, followed by 4 registers, followed by 3 registers starting from register 40010.
- The settings of each slot should be made by separate downlink messages.
- Once configured remotely, the device retains its values in the EEPROM. In this way, when the device is de-energized or reset, it can continue to operate with the last set values.
- Modbus speeds should be sent to the device as coded below. The default value is 9600 bps.
- With a message sent remotely, the device can be reset to factory settings.
- The device's uplink message length is dynamic. That is, the length of the uplink message changes depending on the number of registers to be read.
- The values currently set on the device can be read with a downlink message.
- The device reads all non-0 Modbus IDs stored in the slots and sends messages repeatedly at 45-second intervals.

CODE	SPEED (BPS)
01	300
02	1200
03	2400
04	4800
05	9600
06	19200

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IO INTRODUCTION

- SKYIND1 device has got 1 digital input, 1 analog input, 1 digital output and 1 open-drain output.
- Digital output and open-drain output can be activated remotely via a downlink message. These outputs can operate on a timed or timeless basis. This means any of these outputs can be logic high for a specific time period or can be logic high endless.
- Device sends immediate message when digital input connected to logic low level. Device repeats these report messages once in 3 minutes until the input is released.
- Analog input can read voltage values up to 2 Volts in 12 bits resolution.
- Open drain output can switch up to 30V and 5A power.
- A specific downlink message should be sent to activate IO functions.

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UPLINK STRUCTURE (MODBUS)

MODBUS Reading Messages comes from port 4.

a. Regular Uplink

Message length for reading from 1 or 2 zone is given below,

$$l_m = 4 + 2x(\text{totalregisterstoberead})(\text{byte})$$

For reading from 3 or 4 zones is given below.

$$l_m = 5 + 2x(\text{totalregisterstoberead})(\text{byte})$$

i. Reading from 1 Zone

030003000300000000000059620000138700000C9000

In this example, 9 registers are read from a single zone. The information is as follows:

- Read Modbus ID
- Read Register Contents
- Battery Information
- Error Code

Error Code readings from one or two zones are as follows.

ERROR CODE	ERROR CONTENT
0X00	Reading is Successful
0X01	Reading Error

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UPLINK STRUCTURE (MODBUS)

ii. Reading from Multiple Zones

0300030003000000000000059620000138700000C900000

In this example, a total of 9 registers were read from 4 zones. The information here is as follows.

- Read Modbus ID
- Read Register Contents
- Battery Information
- Error Code

The error code here is in addition to the table above. This means that each digit indicates the reading error in the respective zone.

ERROR CODE	ERROR CONTENT
0X00	Reading is Successful
0X01	Reading Error

b. Keepalive Uplink

The device performs the regular uplink by checking if the IDs stored in the slots are 0 or not. If the device is stored in all slots 0, it sends a keepalive message in order to be able to do uplink only to be sent in this case (the downlink message is only sent immediately after the uplink message.). The standard form of this message is as follows. The message is sent from port 7.

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UPLINK STRUCTURE (MODBUS)

c. Writing Status Uplink

When a data is written to the device (described in detail in the downlink section), it is the message returned to ensure that the data requested is written correctly. It is sent from port 5. If all bytes of the incoming message (except the first byte) are 0, this means that writing is done without any problems.

d. Control Uplink

It is the message that is sent by the device after sending the relevant downlink message to check the data written in the corresponding slot of the device (to be used in the Modbus reading). Sent from port 6. Its structure is as follows as standard.

000105000105000702000C01000E01

- Slot Number
- Modbus ID
- Modbus Communication Speed
- Starting Register for Zone 1
 - Number of Registers to Read from Zone 1
 - Starting Register for Zone 2
 - Number of Registers to Read from Zone 2
 - Starting Register for Zone 3
- Number of Registers to Read from Zone 3
 - Starting Register for Zone 4
 - Number of Registers to Read from Zone 4

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UPLINK STRUCTURE (IO)

a. IO Report Uplink

When activated, device sends IO information via **port 8** regularly. Device sends immediate message when digital input pin is set to be logic 0.

Sample Payload: 0x01000000A500

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
0x00	Open-drain Output State	Digital Output State	Digital Input State	Analog Input MSB	Analog Input LSB	Reserved

Byte 1-3 shows current states of digital IOs, 01 shows logic high and 00 shows logic low. Byte 4 and 5 represents 16 bits analog input information.

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DOWNLINK STRUCTURE

a. Downlink Message for Remote Reset

The message to remotely reset the device.

Port: 0xFA

Message: 0xDE

b. Downlink Message for Changing Message Frequency

This is the message that is sent to change the normal message sending frequency of the device. In the last 4 digits, seconds should be added in hexadecimal form.

Port: 0x0B

Message: 0x020000SSSS

c. Downlink Message for Reading Current Values

It is the message that should be sent for remote control of the values (to be used in reading) written in the corresponding slot of the device. LL in the message is the number of the slot to be read.

Port: 0x16

Message: 0x04LL

d. Downlink for Factory Reset

This is the message that must be sent to restore the values of the device to the factory settings. The device then deletes the data written to the EEPROM and returns to the factory settings.

Port: 0x014

Message: 0xEE

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DOWNLINK STRUCTURE

e. Downlink for Changing Values to Read

It is the downlink that must be sent to change the reading parameters of the device. The length varies according to the number of zones. The device detects the number of zones according to the length of the message. Examples by zone are as follows. 4 and 5 zones are same with multiple zones, there must be start address and register to read info added continuously to the message.

Port: 0x015

i. 1 Zone

Message: 03000105000105

- Prefix
- Slot Number (Starts from 0)
- Modbus ID
- Modbus Communication Speed (coded)
- Start Adress
- Number of Registers to Read

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DOWNLINK STRUCTURE

ii. 2 Zones

Message: 03000105000105000702

- Prefix
- Slot Number (Starts from 0)
- Modbus ID
- Modbus Communication Speed (coded)
- Start Address
- Number of Registers to Read
- Start Address (2. Zone)
- Number of Registers to Read (2. Zone)

iii. 3 Zones

Message: 03000105000105000702001A05

- Prefix
- Slot Number (Starts from 0)
- Modbus ID
- Modbus Communication Speed (coded)
- Start Address
- Number of Registers to Read
- Start Address (2. Zone)
- Number of Registers to Read (2. Zone)
- Start Address (3. Zone)
- Number of Registers to Read (3. Zone)

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DOWNLINK STRUCTURE

f. Downlink to Activate & Deactivate IO Feature

This message should be sent to the device to activate and deactivate IO feature of the device. Until activation message, device does not do any IO operation and does not send any IO information to the server.

Port: 0x30

Activation Message: 0x0701

Deactivation Message: 0x0700

g. Downlink to Set Digital Output

Following message should be sent to the device to set digital output state. If the message contains time information, device will set the state of digital output pin to logic 0 after given time information. For example, if the message received to the device contains 10 seconds information, device will automatically set its digital output pin to logic 0. If there is no time information or time information only contains zeros while state of the pin is set to be logic high (1), device will keep digital output pin logic high forever.

Port: 0x0C

Message:0x050STTTT

0S means state, 00 sets the pin state to logic low, 01 sets the pin state logic high.

TTTT means time, when sent as 0000 pin will set its state as desired and keep that state forever, when sent greater than zero with state information of high, device will keep state of the pin high until given period of time.

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DOWNLINK STRUCTURE

h. Downlink to Set Open-Drain Output

Following message should be sent to the device to set open-drain output state. If the message contains time information, device will set the state of open-drain output pin to logic 0 after given time information. For example, if the message received to the device contains 10 seconds information, device will automatically set its open-drain output pin to logic 0. If there is no time information or time information only contains zeros while state of the pin is set to be logic high (1), device will keep open-drain output pin logic high forever.

Port: 0x0C

Message:0x060STTTT

0S means state, 00 sets the pin state to logic low, 01 sets the pin state logic high.

TTTT means time, when sent as 0000 pin will set its state as desired and keep that state forever, when sent greater than zero with state information of high, device will keep state of the pin high until given period of time.

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Reset Operation

Push the reset button and hold, red LED must light for a while and start blinking. When you see the blinking release the button. The device gets reset by this operation and after every reset operation, the device goes into sleep mode automatically by blinking red and green LEDs once.

Wake Up

To exit sleep mode and take the device to the normal operation mode, push the reset button until you see the red LED light. When you see red light release the button and the device will go into normal operation mode by blinking LEDs in a sequence of green-red-green.

OTAA Mode

The device requests OTAA join to the server after the device wakes up and goes into the normal operation mode. OTAA requests are represented by the blinking green LED once per request. When the device successfully joins to OTAA mode green LED lights for a while.

Communication

The device indicates uplink communication by blinking green LED once and downlink communication by blinking red LED once.

ABP

For ABP please contact SKYSENS.

Error Behaviour

The first time device with a hardware problem is energized, it flashes the red led at the intervals of five hundred milliseconds, to indicate there is a hardware problem.