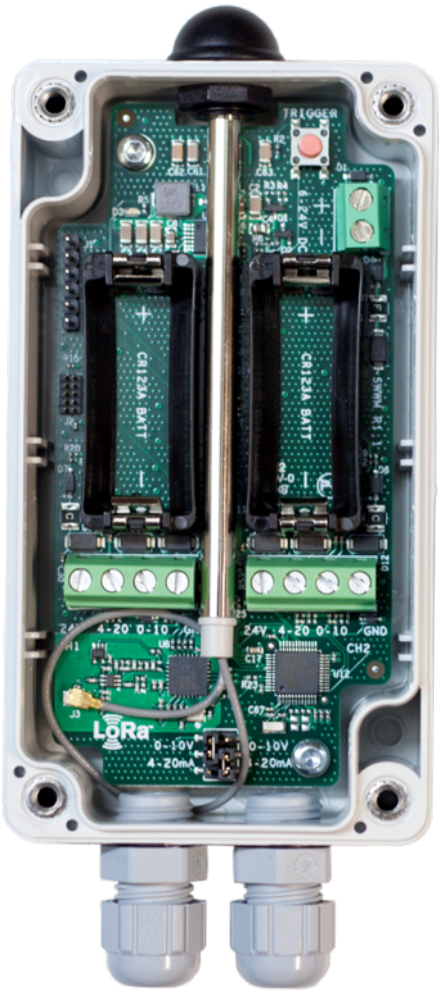


OY1400 Industrial communication and control unit manual

This manual offers a simple 5-step guide for getting started with the sensor, as well as configuration with Talkpool's Sensepool visualization layer and information for advanced users.

The OY1400 Industrial communication and control unit is designed with focus on ease-of-use and reliable operation in LoRaWAN networks. The product is suited for a huge variety of use cases, as external probes can be connected to the unit. Normal users will only need to read the 5-step guide at the beginning of this manual.

Digital activation

Upon receiving your OY1400 Industrial Control and communication unit you should first provision it to your network server. The product comes with the following:

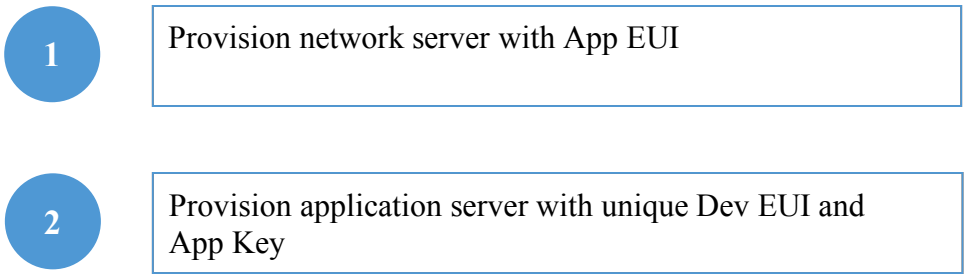
1. Dev EUI (also can be found on the outside of the unit)
2. App Key

These codes are unique for each sensor. The Dev EUI can be seen as a simple identification code, the App Key is a securely generated authentication code.

The first step you should take is to simply provision the network server, this can be Talkpool's solution called Sensepool or any other system that you would like to integrate the sensor with, with your App EUI.

The second step is to provision the application server with your unique Dev EUI and App Key.

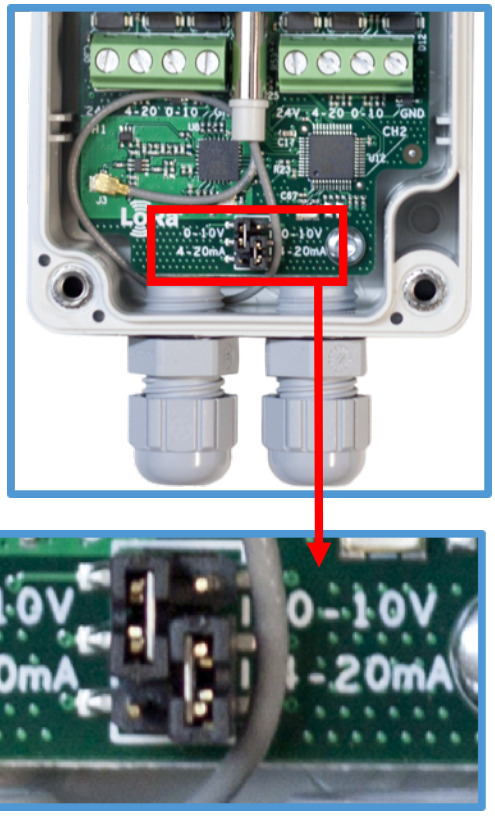
Digital activation process



After the digital activation the sensor has to be physically activated and installed.

Physical installation

When the sensors have been digitally configured it is time to physically activate and install them. The OY1400 Industrial communication and control unit can be used for dozens of unique use cases, which are of course all slightly different in installation. This is a general guideline to get started with the sensor.



The product comes with 2 batteries and a plug. The plug is meant for when you only wish to use one of the probe inputs, so you can plug the other one to close it off and protect it from water or dust. The product has 2 openings in the backside for wall mounting.

After you open the OY1400 with a screwdriver you can connect the external probe(s) to the desired slot (more on that in the next chapter). The next step is to correctly set the jumpers, depending on what kind of probe you would like to use. As can be seen in the picture to the right, you can set the jumper either to 0-10V or 4-20mA, which should correspond to the probe you are connecting. In this picture, the jumper on the left side is set to 0-10V, the jumper to the right side is set to 4-20mA. In the case you connect a probe to the 24V option, one of your probe's threads goes into the 24V option, the other one in either 0-10V or 4-20mA and possibly a third into the ground option (indicated GND). Then you set the jumper accordingly (either 0-10V or 4-20mA).

After that you install the (replaceable) batteries, which activates the unit, you close the box and start measuring your data!

Physical installation process

3	Open the unit, install probes and set jumpers
4	Install batteries, activating the sensor
5	Close unit and install in location, you can now view the first data coming in on your application server

If you require further support, please contact IoT.support@talkpool.com or your vendor. If you require more advanced information on the OY1400 Industrial Communication and control unit, please check the next sections.

Sensor connection

The OY1400 supports up to two sensors. Each sensor can independently be configured either to measure 0-10V or 4-20mA. It is also possible to configure a threshold for a channel and then the channel becomes digital and the measurement is only 0 or 1.

Voltage measurement

Each channel can independently be setup to measure a 0-10V signal. The input is 24V tolerant.

Setting up a channel for voltage measurement is done by configuring the input selection jumper to position “0-10V”, left side of the jumper block is channel 1 and right side is channel 2.

The measurement on the LoRa network shall be multiplied by a factor of 4.1 to get the correct measured voltage.

Current measurement

Each channel can independently be setup to measure a 4-20mA signal. The shunt resistor is 120 Ohm.

Setting up a channel for current measurement is done by configuring the input selection jumper to position “4-20mA”, left side of the jumper block is channel 1 and right side is channel 2.

The measurement on the LoRa network shall first be multiplied by a factor of 4.1 (to get a voltage reading across the shunt resistor) and then divided with by 120 to get the correct measured current.

Digital measurement

Each channel can independently be setup to make a “digital” measurement. This is done by configuring a threshold. When the measured voltage is above the threshold the signal is considered to be “1”, otherwise it is considered to be “0”.

The benefit of configuring the channel as digital is that the transmission requires less power.

The threshold can be configured using a downlink command. Configuring the threshold to 0 makes the channel analog.

As an example, a threshold of 5V is achieved by configuring a threshold value of 9756 (0x261C), 9756 * 1/8mV * 4.1 = 5000mV.

Standard measurement cycle

For the standard application type the measurement cycle measures both channels simultaneously. The measurement cycle is performed with a configurable period. First the 24V power output is enabled. Then there is a configurable delay before both channels are measured. This delay must be set to match the slower of the two channels. After the measurement the 24V power is disabled directly.

Manual trigger

It is possible to trigger a measurement manually by pressing the button of the OY1400. The measurement cycle is performed directly and the measurement is then transmitted (regardless of measurement grouping setting),

Measurement grouping

In order to reduce the power consumption, it is possible to configure the OY1400 to group a number of measurements in one transmission.

Applications type

It is possible to order a different application type than the standard. An application specific type typically has a customized measurement cycle including specific logic.

It is possible to read the Application type using downlink but it can only be configured during production.

The standard application is type 0.

LoV application type

The LoV (“Luft och Vatten”) application is type 1.

Protocol

This describes the payload data that is sent to and from the application server.

Uplink command device => network				
Field	Bytes	Value	Description	Note
Type	1	xx	0x01: Data 0x02: Command NACK	
Index	1	xx	Command Index	
Data			As defined for Command Index (only for Type: Data)	

Downlink command network => device				
Field	Bytes	Value	Description	Note
Type	1	xx	0x01: Set 0x02: Query 0x03: Action	
Index	1	xx	Command Index	
Data			As defined for Command Index	

Commands

Index	Description	Datatype	Encoding	Valid range	Access	Unsolicited	Description	Note
0x03	FW build hash	6 x Uint8			Query	No	Unique number that identifies the firmware version	
0x05	Device reset				Action	No	Reset of device	
0x06	CPU voltage	Uint8	25mV/ LSB	0-3.6V	Query	No	Read CPU voltage. Max/min ranges depend on battery chemistry.	
0x0A	CPU temperature	Uint16 Big endian	0.01C / LSB	-50- +125 C	Query	No	Temperature from CPU sensor with 50 °C offset. Approximately 5 °C accuracy.	
0x21	Sensor values Ch1 Analog Ch2 Analog	TxGroupSize * (Uint16, Uint16) Big endian	 1/8 mV 1/8 mV	 0-26400 0-26400	Query	Yes	Sensor reading when both Ch1 and Ch2 are analog.	The payload length can be used to determine the number of measurements that are grouped.
0x22	Sensor values Ch1 Digital Ch2 Analog	TxGroupSize * (Uint8, Uint16) Big endian	 - 1/8 mV	 0-1 0-26400	Query	Yes	Sensor reading when Ch1 is Digital and Ch2 is Analog.	
0x23	Sensor values Ch1 Analog Ch2 Digital	TxGroupSize * (Uint16, Uint8) Big endian	 1/8 mV -	 0-26400 0-1	Query	Yes	Sensor reading when Ch1 is Analog and Ch2 is Digital.	
0x24	Sensor values Ch1 Digital Ch2 Digital	TxGroupSize * (Uint8, Uint8) Big endian	 - -	 0-1 0-1	Query	Yes	Sensor reading when both Ch1 and Ch2 are analog.	
0x25	Application type		-	0-1	Query	No	0 = Standard application 1 = LoV application	
0x26	Measurement interval	Uint16 Big endian	Minutes	1-10080	Query Set	No	Measurement interval in minutes	
0x27	Tx Group size	Uint8	-	1-12	Query Set	No	Number of measurements to group in each transmission.	
0x28	Sensor delay	Uint16 Big endian	ms	0-20000	Query Set	No	Delay between activation of the 24V power and the measurement of both channels.	
0x29	Ch1 Threshold	Uint16 Big endian	1/8 mV	0-26400	Query Set	No	Threshold setting for the digital sensor. Setting the threshold to 0 makes Ch1 analog.	

0x2A	Ch2 Threshold	Uint16 Big endian	1/8 mV	0-26400	Query Set	No	Threshold setting for the digital sensor. Setting the threshold to 0 makes Ch2 analog.	

Examples

Uplink: 012147901738
Single measurement result when both Ch1 and Ch2 is configured as analog channels. Ch1 is 2.29V and Ch2 is 0.743V. If configured for voltage measurement this would translate to 9.389V and 3.0463V. If configured for current measurement this would translate to 19.083mA and 6.192mA.

Uplink: 012147901738386021883248252O
Three combined measurements when both Ch1 and Ch2 is configured as analog channels. Ch1 is 2.29V, 1.804V and 1.609V for the first, second and third measurement. Ch2 is 0.743V, 1.073V and 1.188V for the first, second and third measurement.

Uplink: 0122011738002188
Two combined measurements when Ch1 is configured as digital and Ch2 is configured as analog. Ch1 is 1 and 0 for the first and second measurement. Ch2 is 0.743V and 1.073V for the first and second measurement.

Uplink: 0123479000
Single measurement when Ch1 is configured as analog and Ch2 is configured as digital. Ch1 is 2.29V and Ch2 is 0.

Uplink: 01240101000100000001
Four combined measurements when both Ch1 and Ch2 is configured as digital channels. Ch1 is 1, 0, 0 and 0. Ch2 is 1, 1, 0, 1.

Downlink: 012605A0
Uplink: 012605A0
Sets the measurement interval to 1440 minutes = 24 hours.

Downlink: 0227
Uplink: 012702
Query the Tx group size. The reply is 2 combined measurements.

Commands

LoRa MAC Command

The OY1400 can be controlled over by sending down link commands.

The following MAC commands per LoRaWAN specification 1.0.2

CID	Command	Transmitted by	Short Description
0x02	***LinkCheckReq***	End-device	Used by an end-device to validate its connectivity to a network.
0x02	***LinkCheckAns***	Gateway	Answer to LinkCheckReq command. Contains the received signal power estimation indicating to the end-device the quality of reception (link margin).
0x03	***LinkADRReq***	Gateway	Requests the end-device to change data rate, transmit power, repetition rate or channel.
0x03	***LinkADRAns***	End-device	Acknowledges the LinkRateReq.
0x04	***DutyCycleReq***	Gateway	Sets the maximum aggregated transmit duty-cycle of a device
0x04	***DutyCycleAns***	End-device	Acknowledges a DutyCycleReq command
0x05	***RXParamSetupReq***	Gateway	Sets the reception slots parameters
0x05	***RXParamSetupAns***	End-device	Acknowledges a RXSetupReq command
0x06	***DevStatusReq***	Gateway	Requests the status of the end-device
0x06	***DevStatusAns***	End-device	Returns the status of the end-device, namely its battery level and its demodulation margin
0x07	***NewChannelReq***	Gateway	Creates or modifies the definition of a radio channel
0x07	***NewChannelAns***	End-device	Acknowledges a NewChannelReq command
0x08	***RXTimingSetupReq***	Gateway	Sets the timing of the of the reception slots
0x08	***RXTimingSetupAns***	End-device	Acknowledges RXTimingSetupReq command