Instruction manual

LoRaModCon2-A

ENGLISH

Contents

General

Warranty

The warranty period begins with the purchase of the device. Please provide proof of purchase (receipt, invoice, delivery note, etc.). Please keep these documents in a safe place.
Our warranty service is based on our warranty conditions valid at the time of purchase. In the event of a repair, please return the device.

CE

The device is labelled with the CE mark and therefore complies with the essential requirements of the European Directives 2014/30/EU, electromagnetic compatibility and 2014/35/EU, electrical safety; as well as the European Radio Equipment Directive 2014/53/EU; and the Ecodesign Directive 2009/125/EC; as well as 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

All devices sold by us comply with the safety regulations valid at the time of purchase and are fundamentally safe when used as intended!

The operating instructions must be carefully read and understood before starting any work.
The operating instructions are part of the equipment and must be kept accessible at all times.

Please follow the instructions in the operating manual to avoid possible hazards, damage or malfunctions.

Observe the local safety regulations and accident prevention regulations that apply to the area in which the appliance is used.

Scope of delivery

- LoRaModCon2-A
- Instruction manual

Note: There are additional inscriptions on the label on the housing.

Subject to technical changes and errors

Safety instructions

Read the instructions in the manual.
The safety of this product is only guaranteed when it is used in accordance with its purpose.
Maintenance should only be carried out by qualified persons.
Do not install the equipment close to a heat source or in damp conditions.
Do not open the product as there is a risk of electrical shock.
For your own safety, you must ensure that the equipment is switched off before carrying out any work on it.
For your own safety, the power supply circuit must be SELV (Safety Extra Low Voltage) and must be from limited power sources.
The product must be equipped with a switching mechanism so that the power can be cut. This must be close to the product.
All electrical connections of the product must be equipped with a protective device against overload and short-circuit protection.

RECOMMANDATIONS REGARDING USE

- Before using the system, check that the power supply voltage shown in the user manual corresponds to your supply. If it doesn't, please consult your supplier.
- The device must be installed in a dry location that is sufficiently ventilated so that there is no risk of internal heating and it must not be covered with objects such as newspapers, cloths, curtains, etc.#
- Ambient temperature: -20°C ... +50°C
- An external antenna can be connected to the SMA socket on the front of the device. It must be free and at least 10 cm away from any conducting material.
- The device must never be exposed to heat sources such as heating equipment or sunlight.
- Do not install the device close to objects with naked flames such as lit candles, blowtorches, etc.
- The device must not be exposed to harsh chemical agents or solvents likely to damage the plastic or corrode the metal parts.

Disposal instructions for packaging
Packaging and packaging aids are recyclable and should always be recycled. Please separate the packaging in accordance with local regulations.

Information about environmental protection
If one day this device becomes obsolete, you should not simply throw it into the trash. There is probably a recycling center in your community that sells old devices accepted and recycled.

Intendend use

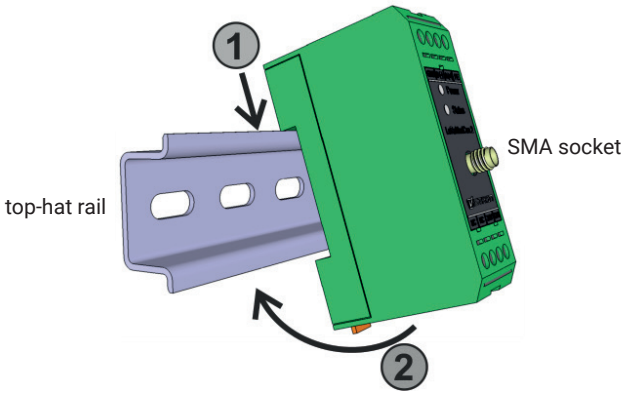
Improper use
- The appliance must not be modified without authorisation.
- The appliance must not be overloaded during operation.
- If the appliance is used other than as intended, this is considered improper use.
- This appliance must not be used in emergency stop or safety installations.

Specialised personnel
Only trained specialist personnel may carry out the activities described in these operating instructions.

Mounting on top-hat rail

Important note:
Only ever apply pressure to the green housing.
Never press on the black LED-window with the imprint or the SMA socket.

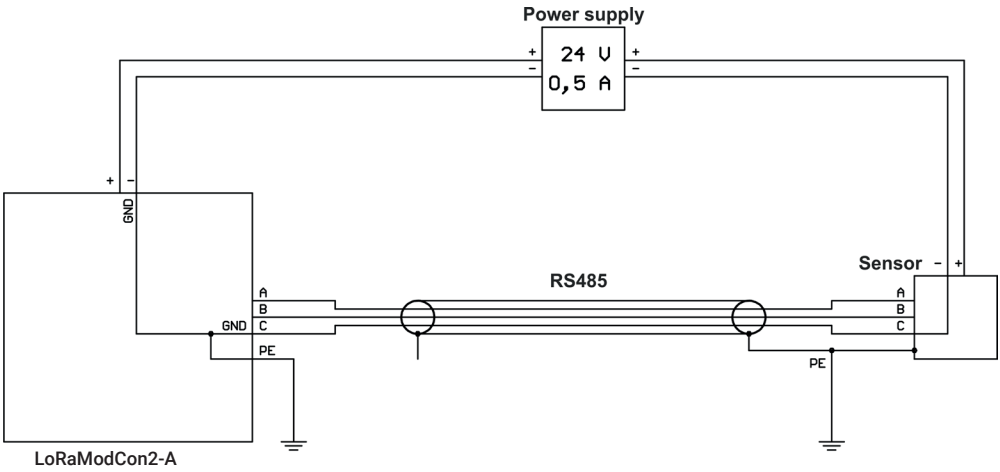
Hook the device onto the top of the top-hat rail and press it down against the top-hat rail until the locking hook engages.
To remove, unlock the hook on the underside with a screwdriver.



Connect external antenna

The SMA plug of the external antenna must only be screwed onto the SMA socket by hand.
Do not use any tools!

Connection diagram



Terminal assignment

Number	Name	Description
5	PE	Protective earth connection
6	A (+)	Sensor cable: Balanced signal line not inverted, positive
7	B (-)	Sensor cable: Balanced signal line inverted, negative
8	GND	Sensor cable: Signal ground
9		SMA socket for external antenna
10	QR-Code	Contains the parameters required for integration: DEV EUI and JOIN EUI

Number	Name	Description
1	NC	not connected
2	NC	not connected
3	24V	Supply voltage: +24 V
4	GND	Supply voltage: Ground

Integration guide

The device is supplied with a sticker containing the parameters required for integration
DEV EUI and JOIN EUI required for integration. The APPKEY is supplied as a CSV file.

The DEV EUI is both numeric and barcode and can be read with a scanner or a corresponding app and entered into the network server.

Networkparameters

DEV EUI	Barcode/QR Code/label
APP/JOIN EUI	QR Code/CSV file
APP KEY	CSV file
Regional Parameters	RP001 V1.0.3 Rev A
LoRaWAN version	V1.0.3
Frequency plan	EU868
Downlink port	2

Commissioning

The device must be connected according to the connection diagram.
The power LED lights up green to indicate that the power supply is connected correctly.

After the power supply has been connected, the status LED initially flashes orange.

This indicates that the join procedure is in progress. If the join is successful, the LED starts to flash green; if the join fails, the LED briefly lights up red and then starts the next join attempt.

After 12 failed join attempts, the next join is only carried out after the rejoin timeout has elapsed.

LoRa Downlink messages

The downlink frame starts with a frame code to identify the message type. To distinguish the different types of configuration frames, the frame code is followed by a frame ID for configuration messages. The downlink bytes should be in hexadecimal format and all described bytes of a message should be filled out. Use Port 2 for all downlink messages.

Device configuration

Set the device configuration parameters.

Frame code	Frame ID	Description
0x01 (Downlink configuration frame)	0x00	Device configuration

Data 0	Data 1	Data 2	Data 3	Data 4	Data 5	Data 6	Data 7	Data 8	Data 9
0x01	0x00	Reboot timeout [h]	Rejoin timeout [h]	0x01	0x01	MSB Keep-alive timeout [min]	LSB Keep-alive timeout [min]	-	-

Reboot timeout:
Reboot timeout is set in Byte[2]. Setup the timeout as a hex value in hours. The end node performs a reboot and a rejoin periodically with the configured timeout.

Rejoin timeout:
Rejoin timeout is set in Byte[3]. Setup the timeout as a hex value in hours. After a failed join process, the device performs a new join process after the configured timeout.

Keep-alive timeout:
Keepalive timeout is setup in Byte[6] and Byte[7]. Calculate the hex value for the timeout in minutes and split it to MSB in Byte[6] and LSB in Byte[7].
The timeout defines the period, at which a keepalive frame is send on LoRa.

Example:
Reboot Timeout set to 24[h], Rejoin timeout set to 1[h] and keepalive timeout set to 1[h](60[min]).

Data 0	Data 1	Data 2	Data 3	Data 4	Data 5	Data 6	Data 7	Data 8	Data 9
0x01	0x00	0x18	0x01	0x01	0x01	0x0E	0x10	-	-
		24[h]	1[h]			60[min]/1[h]			

LoRa configuration

Set the LoRa network parameters.

Frame code	Frame ID	Description
0x01 (Downlink configuration frame)	0x01	LoRa configuration

Data 0	Data 1	Data 2	Data 3	Data 4	Data 5	Data 6	Data 7	Data 8	Data 9
0x01	0x01	Device class	ADR enable	TX con-firmed	Default data rate	Force rejoin	Activation type	-	-

Device class:
Device Class is set in Byte[2]. Set „0“ for class A, „1“ for class B or „2“ for class C.

Auto Data Rate (ADR):
Auto data rate is enabled in Byte[3]. Set Byte[3] to „1“ to enable ADR or „0“ to disable ADR.

Transmission Confirmation:
Tx confirmation is enabled in Byte[4]. Set Byte[4] to „1“ to enable Tx confirmation or „0“ to disable Tx confirmation.

Default Data Rate:
Setup the default data rate in Byte[5]. The end node supports data rate from „0“ to „7“.

Force Rejoin:
Byte[6] is used to specify whether the device triggers a rejoin procedure after a reboot.
If the byte[6] is set to 1, a rejoin is carried out with every reboot. If byte [6] is set to 0, a rejoin is only carried out if the device can no longer establish the context parameters.

Activation Type:
The device activation is set using byte[7]. Set "2" for OTAA activation and "1" for set "1" for ABP activation.

Example:
Device class set to Class C, ADR enabled, default data rate 0 and Tx confirmation disabled.
Rejoin after reboot and OTAA activation.

Data 0	Data 1	Data 2	Data 3	Data 4	Data 5	Data 6	Data 7	Data 8	Data 9
0x01	0x01	0x02	0x01	0x00	0x00	0x01	0x02	-	-
		Class C	ADR x enabled	Tx con-firmation disabled	Default datarate 0	Force rejoin	Activa-tion type		

RS485 configuration

Setup RS485 bus configuration.

Frame code	Frame ID	Description
0x01 (Downlink configuration frame)	0x02	RS485 configuration

Data 0	Data 1	Data 2	Data 3	Data 4	Data 5	Data 6	Data 7	Data 8	Data 9
0x01	0x02	baudrate	stopbits	parity	MSB timeout [ms]	LSB timeout [ms]	-	-	-

- Set the baudrate in Byte[2]. 0 = 1200 baud, 1 = 2400 baud, 2 = 4800 baud, 3 = 9600 baud, 4 = 19200 baud, 5 = 38400 baud, 6 = 57600 baud, 7 = 115200 baud
- Setup the stopbits in Byte[3]. 0 = Onestopbit, 1 = Twostopbit
- Setup parity in Byte[4]. 0 = no parity, 1 = even parity, 2 = odd parity
- Set the RS485 timeout in Byte[5] and Byte[6] in milliseconds. Byte[5] is the hex value of the MSB and byte[6] ist he hex value oft he LSB

Example:
Baudrate set to 9600, one stopbit, no parity and a timeout of 1500 [ms].

Data 0	Data 1	Data 2	Data 3	Data 4	Data 5	Data 6	Data 7	Data 8	Data 9
0x01	0x02	0x03	0x00	0x00	0x05	0xDC	-	-	-
		9600 baud	one stoppbit	no parity	1500 [ms] timeout				

Periodic modbus request configuration

A periodic modbus request can be setup with this downlink message. The end node supports 8 periodic slots (0 to 7). The Modbus command is performed every time, the periodicity is elapsed. A uplink frame with the requested Modbus data is sent afterwards.

Frame code	Frame ID	Description
0x01 (Downlink configuration frame)	0x03	Periodic slot configuration

Data 0	Data 1	Data 2	Data 3	Data 4	Data 5	Data 6	Data 7	Data 8	Data 9
0x01	0x03	Slot	MSB periodicity [s]	LSB periodicity [s]	Slave address	Number of registers	MSB register address	LSB register address	Modbus comand

- Setup a periodic slot request by choosing one of the slots beginning at slot 0 to slot 7 in Byte[2]
- Set the periodicity for the Modbus request in Byte[3] and Byte[4] in seconds
- Setup the Modbus request starting with the slave address in Byte[5], number of registers in Byte[6], register address in Byte[7] and Byte[8]
- Choose one of the the following Modbus commands "Read coil status" = 1, "Read discrete inputs" = 2, "Read holding registers" = 3, "Read input registers" = 4

Example:
Slot 5 setup to read Modbus holding register address 0x03 on Modbus slave address 0x0F every 15 minutes.

Data 0	Data 1	Data 2	Data 3	Data 4	Data 5	Data 6	Data 7	Data 8	Data 9
0x01	0x03	0x05	0x03	0x84	0x0F	0x01	0x00	0x03	0x03
		Slot 5	15[min]/900[s]		Slave address 16	One register	Register address 3		Read holding register

To stop a periodic slot the slot can be reset by sending the downlink message with 0x00 in Byte[3] to Byte[9].

Send a Modbus request

A modbus request can be send to the end node via LoRa downlink in real time. All basic Modbus commands are supported. The end node sends an uplink message with the requested data afterwards.

Frame code (byte[0])	Frame ID (byte[1])	Description
0x04	-	Send Modbus request

Data 0	Data 1	Data 2	Data 3	Data 4	Data 5	Data 6	Data 7	Data 8	Data 9
0x04	Modbus comand	Slave address	MSB register address	LSB register address	Number of registers	Data	Data	Data	Data

- Setup the Modbus request starting with the Modbus command in Byte[1]. Use one of the following commands: Read coil status" = 1, "Read discrete inputs" = 2, "Read holding registers" = 3, "Read input registers" = 4, "Write single coil" = 5, "Write single register" = 6, "Write multiple register" = 0x0F
- Set the slave address in Byte[2], register address in Byte[3] and Byte[4], number of registers in Byte[5]
- The remaining Bytes are used for data transmission

Example:
Write 0xFEFA to Modbus holding register address 0x03 on Modbus slave address 0x0F

Data 0	Data 1	Data 2	Data 3	Data 4	Data 5	Data 6	Data 7	Data 8	Data 9
0x04	0x06	0x0F	0x00	0x03	0x01	0xFA	0xFE	-	-
	Write holding register	Slave address 16	Register address 3		One register	Data 0	Data 1		

Reboot device
The end node can be remotely forced to reboot and re-join the LoRa network.

Frame code (byte[0])	Frame ID (byte[1])	Description
0x08	-	Trigger a device reboot with LoRa rejoin

Example:
Reboot the device

Data 0	Data 1	Data 2	Data 3	Data 4	Data 5	Data 6	Data 7	Data 8	Data 9
0x08	-	-	-	-	-	-	-	-	-

LoRa Uplink messages

The device supports following uplink messages:

Configuration Fault code message

After sending a configuration downlink, the end node checks all parameters for validity. If any of the parameters are out of the specified range, the configuration is cancelled and the fault message is send as a LoRa uplink.

Frame code	Description
0x02	Receive fault code

Data 0	Data 1
0x02	0xFF

Periodic modbus data uplink

After the period of the time slot has expired, the end node sends the data of the Modbus query as an uplink message.

Frame code	Description
0x03	Receive periodic slot data

Data 0	Data 1	Data 2	Data 3	Data 4	Data 5	Data 6	Data 7	Data 8	Data 9
0x03	Slot	fault	Modbus command	Slave address	MSB register address	LSB register address	Number of registers	Data	Data

For a description of the individual bytes, see “periodic slot configuration”.
The fault code is 0x00, if no modbus fault occurred. Following table describes the fault codes.

Faultcode	0x01	0x02	0x03	0x04	0x05	0x06
Description	TX fault	RX fault	Driver fault	Frame fault	CRC fault	Timeout fault

Receive Modbus request data

After sending a real time modbus request, the node sends an uplink containing the requested data.

Frame code	Description
0x05	Receive modbus request

Data 0	Data 1	Data 2	Data 3	Data 4	Data 5	Data 6	Data 7	Data 8	Data 9
0x05	fault	Modbus command	Slave address	MSB register address	LSB register address	Number of registers	Data	Data	Data

For a description of the individual bytes, see “Send a Modbus request”. The fault code is 0x00, if no modbus fault occurred. Following table describes the fault codes.
The fault codes are explained in “Periodic slot data uplink” above.

Receive Keep alive frame

The end node sends a keep alive frame periodically. The time period can be setup in downlink device configuration message as explained above under “Device configuration”.

Frame code	Description
0x07	Receive keep-alive frame

Get configuration

To get the configuration parameters, a request must be sent. Following requests are supported.

Data 0	Data 1	Data 2
0x02 (Get configuration frame)	0x00 (Device configuration)	-
0x02 (Get configuration frame)	0x01 (LoRa configuration)	-
0x02 (Get configuration frame)	0x02 (RS485 configuration)	-
0x02 (Get configuration frame)	0x03 (slot configuration)	slot

The Bytes are explained above in the Downlink configuration chapter.

Factory settings

PARAMETER	VALUE	
REBOOT TIMEOUT	24 [h]	**Device settings**
REJOIN TIMEOUT	1 [h]	
KEEP-ALIVE TIMEOUT	24 [h]	
BAUDRATE	11920	**RS485 settings**
PARITY	even	
STOPBITS	one	
TIMEOUT	1500 [ms]	
DEVICE CLASS	Class C	**LoRa settings**
AUTO DATARATE	enabled	
DEFAULT DATARATE	DR_0	
TX CONFIRMED	disabled	
Force Rejoin	enabled	
Activation Type	OTAA	
Slot	0	**Modbus Slot settings**
Modbus Command	Read input registers	
Register address	0	
Slave address	1	
Length	4	
Request interval	5[min]	

Technical data

General		
Ambient temperature	-20°C ... +50°C	Avoid exposing the device to direct sunlight. The maximum operating temperature of +50°C must not be exceeded in order to avoid damage.
Dimensions L x H x W	75 x 53.5 x 25 mm	
Weight	60g	
Protection class	IP20	
Mounting	On mounting rails according to EN60715	e.g. TH35 / TS35
Connections		
Power supply	Connection terminals: 24V, GND	
MODBUS / RS485	MODBUS Remote Terminal Unit (RTU) Connection terminals: A(+), B(-), PE, GND	Please refer to the wiring diagram in the "Connection diagram" section!
Connection data	Rigid conductor cross-section: 0.2mm² ... 4mm² Conductor cross-section flexible: 0.2mm² ... 2.5mm² Conductor cross-section AWG/kcmil: 24 ... 12 Stripping length: 8mm Tightening torque: 0.5 Nm ... 0.6 Nm	
Antenna	SMA socket for connecting an external antenna	External antenna on request
Housing	Material: Glass fibre reinforced polycarbonate Flammability: UL94V0	
Status display	2 LEDs: Power ▶ Power supply on/off Status ▶ Bus status / communication	

Electronics		
Microcontroller	32-bit Arm® Cortex® -M4 MCU	
LoRaWAN® Wireless standard	868MHz (EU)	
LoRaWAN® Version	1.0.3	1.0.4 possible on request
Functions	- For up to 6 sensors with MODBUS interface - Read and control MODBUS registers via LoRaWAN - Configuration via LoRa downlink - RS485 bus parameters can be set - Extended ESD protection for demanding environmental conditions	Support for > 6 sensors possible on request
Power supply	External power supply 24V DC Supply voltage: min. 21V DC ... max. 26V DC Ripple voltage: 100mVpp max.	e.g. Phoenix Contact STEP-PS/1AC/24DC/0.5
Power consumption	10mA	

Subject to technical changes and errors May 2026

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