LORAWAN PULSE COUNTER

VEGA SI-12 REV.3

USER MANUAL

DOCUMENT REVISION	FIRMWARE VERSION
17	2.3

CONTENTS

INTRODUCTION

This manual is designated for Vega SI-12 rev.3 pulse counter (hereinafter – the counter) manufactured by Vega-Absolute OOO and provides information on powering and activation procedure, control commands and functions of the counter.

This manual is targeted at specialists familiar with installation work fundamentals for electronic and electrical equipment.

Vega-Absolute OOO reserves the right to make changes to the manual related to the improvement of equipment and software, as well as to eliminate typos and inaccuracies, without prior notice.

1 DESCRIPTION AND OPERATION

DEVICE DESCRIPTION

Vega SI-12 rev.3 pulse counter is designed for counting of pulses incoming to 4 independent inputs, further accumulating and transmitting of this information to the LoRaWAN® network.

In addition, Vega SI-12 rev.3 can be used as a security device - all inputs can be configured as security inputs.

The counter has two open-collector digital outputs and can be used as a control device.

The pulse counter can be used for any utilities' meters and industrial equipment with pulse output of dry reed switch type or open-drain type.

> **Equipment with NAMUR pulse output is not supported**

The pulse counter has a pulse filtering function with adjustable minimum duration in ms for the pulse and for the pause separately. Counting is performed only for pulses passing the filter.

The counter is powered by 3.6 V battery type A. The counter also can be powered by the 5V external power supply.

> **The device is powered by a non-rechargeable lithium-thionyl chloride (LiSOCl$_2$) battery**
> **Attempts to charge the battery may result in fire**

> Long-term storage of equipment outside the operating mode leads to battery passivation, which does not allow the equipment to operate in the declared mode.
> For correct operation, before starting the equipment, carry out the depassivation process. To request the instructions please e-mail us support@vega-absolute.ru

COMUNICATION AND DATA COLLECTION ALGORITHM

Vega SI-12 rev.3 operates in modes listed below:

"Active" – is a main mode of device operation.

Before start using you need to switch the device out of "Storage" mode.

Vega SI-12 rev.3 supports two activation methods in the LoRaWAN® network - ABP and OTAA.

ABP method. After pressing the start button, the device immediately starts working in the "Active" mode.

OTAA method. After pressing the start button, the device makes three attempts to connect to the network within the set frequency plan. After the activation in the LoRaWAN® network is confirmed, the device sends a signal (LED flashing for 5 seconds) and switches to the "Active" mode. If all attempts fail, the counter will continue to accumulate data and will attempt to connect to the network every 6 hours.

The device forms the data packet with current state with a configurable period from 5 minutes to 24 hours. The packets stored in the device memory and transmitting during the next communication session with the LoRaWAN® network.

Examples

If the data collection period is set to 24 hours the packet is formed at 00.00 on the internal clock of the device

If the data collection period is 12 hours then at 00.00 and at 12.00, and so on.

The adjustable data transfer period can be from 5 minutes to 24 hours. When beginning of communication session, the device starts sending packets with readings from the earliest packet. The time of data transmitting cannot be specified, it's defined in random way for every device in chosen period of transmission from the moment of connection to the network.

Example

Transmission period is 30 minutes, and device was started at 16:40 by the internal device clock. In random way the device calculate data transmitting time and set it at 16:41 in the half-hour period from 16:40 to 17:10. Thus, packets from this device will transmit at 16:41, at 17:11, at 17:41, at 18:11 and so on every 30 minutes by the internal device clock.

The internal clock is set automatically when you connect to the device through USB, also can be adjust via LoRaWAN® network.

FUNCTIONAL

Vega SI-12 rev.3 pulse counter can be either of A class or C class (LoRaWAN®) classification) and has the following features:

- ⊙ Automatic change from A class to C class when powered from an external power supply
- ⊙ ADR support (Adaptive Data Rate)
- ⊙ Sending of confirmed packets (configurable)
- ⊙ Simultaneous readings from 4 independent inputs
- ⊙ Configurable duration for pulse and pause for pulses filtering
- ⊙ Two open-drain outputs
- ⊙ Inputs switching to the "Security" mode for connection of leakage, safety, and other external sensors
- ⊙ Saving non-transmitted packets in device memory
- ⊙ Time referencing readings by internal clock
- ⊙ Communication in case of security inputs actuation
- ⊙ Temperature measurement
- ⊙ Charge measuring of the built-in battery (%)

MARKING

Device marked with sticker that contain the next information:

- ⊙ Device model;
- ⊙ DevEUI;
- ⊙ Month and year of manufacture;

Sticker located in three places – on device case, in factory certificate and on the packing box.
Besides, there is an additional sticker located on the packing box and contains:

- ⊙ Information about firmware version;
- ⊙ QR-code containing DevEUI and keys for device registration in network via OTAA method.

2 SPECIFICATION

DEVICE SPECIFICATION

MAIN	
Parameter	UART, FSK radio channel
Double-contact digital inputs	up to 4
Maximum input frequency	200 Hz
Security inputs	up to 4
Open-drain outputs (optional)	2
Relay outputs (optional)	2
Maximum relay switching current	up to 2 A
Operating temperatures	-40...+85 °C
Built-in temperature sensor	yes
LORAWAN®	
LoRaWAN® class	A or C depending on presence of the external power supply
Quantity of LoRaWAN channels	8
Frequency plans supported by default	RU868, EU868, KZ865, custom (EU868 based)
Frequency plans available as order option	IN865, AS923, AU915, KR920, US915
Activation type	ABP or OTAA
Communication period	5, 15, 30 minutes, 1, 4, 6, 12 or 24 hours
Data collection period	5, 15, 30 minutes, 1, 4, 6, 12 or 24 hours
Memory amount for storing packets	200 packets
Type of the LoRaWAN antenna	internal
Sensitivity	-138 dBm
Radio coverage in restrained urban conditions	up to 5 km
Radio coverage within line of sight	up to 15 km
Maximum transmitter power	100 mW
POWER	
External power supply	8 V – 36 V, DC
Battery	LiSOCl$_2$ 3.6 V, type A
Calculated number of packets sent by the device with default settings	80 000
CASE	
Housing dimensions, no more than	90 x 49 x 46 mm
Ingress protection rating	IP65
Mounting	Clamp fastening to the support, DIN-rail, wall-mounting

DEFAULT DEVICE SETTINGS

PARAMETER	VALUE
Frequency plan	RU868
Activation type	OTAA
Adaptive Data Rate	ON
Confirmed Uplinks	OFF
Rx 1 Delay	1 second
Join Accept Delay	5 seconds
Uplink number of transmissions	1
Data rate	DR0
Power	14 dBm
Communication period	24 hours
Data collection period	24 hours
Time zone	UTC +00:00
Inputs operate in mode	pulse
Pulses filtering settings	50 ms for pulse and pause

For changing the device settings, you need to connect to it with "Vega LoRaWAN Configurator" application. Additionally, the Configurator software allows you to update the firmware and perform advanced device configuration, such as setting up operation scenarios with external equipment. You can download app on the iotvega.com site in SOFT section as well as User Manual for configurator. Go to the app page.

3 OPERATION

DEVICE APPEARANCE

Vega SI-12 rev.3 is represented in small plastic case which has four screws and mounting for DIN-rail.
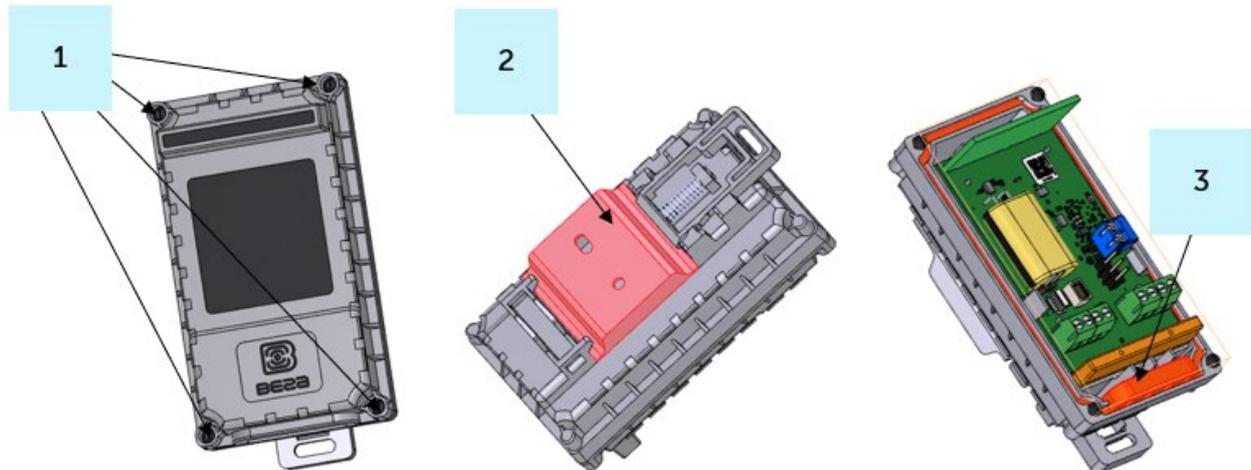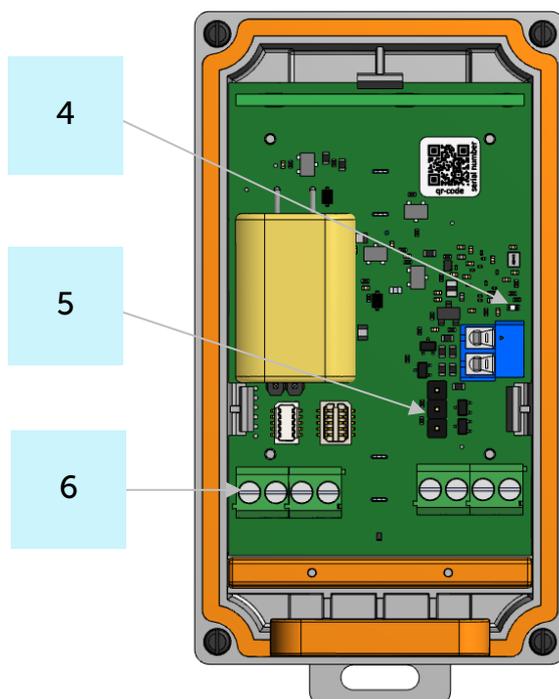

1 – screw ø 2 mm x 8 mm, cross

2 – DIN-rail with mounting holes ø 3 mm

3 – silicone gasket without through holes, ensuring the protection rating of the device case IP65.

All of elements for manage and indication as well as connecting contacts are placed on the board inside the case.
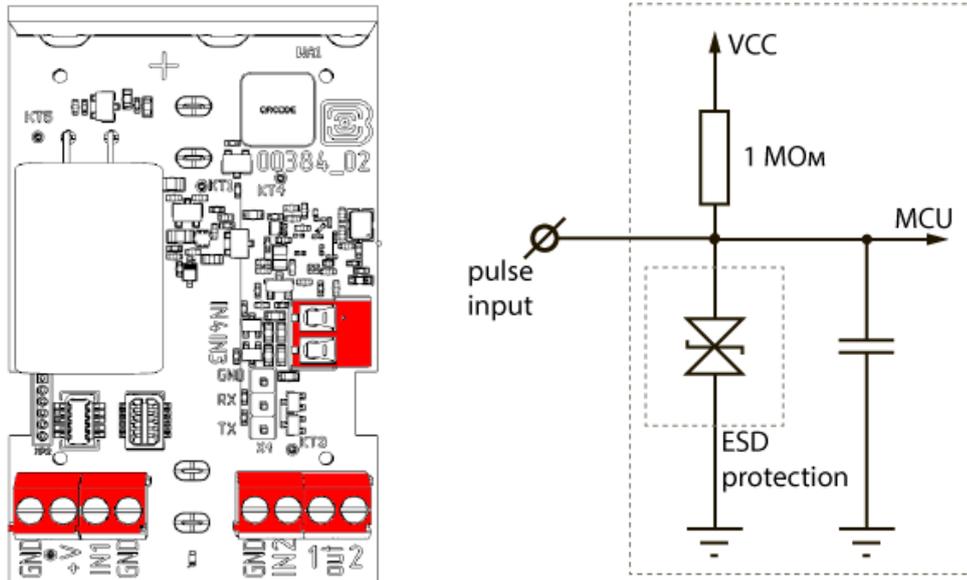

4 – LED indicator

5 – UART

6 – contacts

CONTACTS DESCRIPTION

When connecting a radio modem to external devices, consider the internal circuitry of its pulse inputs shown below.

The pulse counter has 10 contacts, see table below (in order from left to right):

CONTACT	DESCRIPTION
GND (shown on the left)	Power –
+V	Power +
IN1, IN2, IN3, IN4	Pulse inputs
GND	Signal ground
out 1 out 2	Open collector outputs 1 and 2, or relay outputs 1 and 2, depending on the device version

Ground contacts (⊥,⊥) are used for connection of pulse inputs IN1, IN2, IN3 and IN4.

The pulse counter has a pulse filtering function with adjustable minimum duration in ms for the pulse and for the pause separately. Counting is performed only for pulses passing the filter.

The pulse counter features a configurable impulse filtering function with independent settings for minimum pulse duration and minimum pause duration (in milliseconds). Counting is performed only for impulses that pass the filter.

The pulse counter incorporates an anti-bounce algorithm with a time constant of 5 ms. Pulse counting is supported for frequencies up to 200 Hz.

The pulse counter has 4 pairs of contacts that is allows to connect circuits with the following types of NO contacts:

- reed switch;

- mechanical pushbutton;

- open-collector output.

> **Equipment with NAMUR pulse output is not supported**

Polarity effects only "open collector" circuits.

Pulse inputs can be configured for work in the "Security" mode via the "Vega LoRaWAN Configurator" application. In this mode, the device does not count pulses at the "Security" input, but only monitors its status. Should the "Security" input trigger, the device is activated and sends an alarm message to the network.

The maximum possible frequency of sending alarm packets is one per 1 second.

OPEN COLLECTOR OUTPUT OPERATION

Outputs 1 and 2 are designed to control the state of an external connected device by supplying forward or reverse current for a short duration. The maximum permissible load on these outputs is 0.2 A.

The state of Outputs 1 and 2 can be changed via a command from the LoRaWAN® network. See Packet 5 in the section "Communication Protocol".

Actuating devices are connected to the counter via Outputs 9 and 10, which are of the "Open Collector" type.

> **ⓘ** Permissible load for each digital output is 0.2 A

To increase the load on the device outputs, it is necessary to use an external relay. The relay connection scheme is shown below.

Direct current diode 1A and reverse voltage not less than 50 V
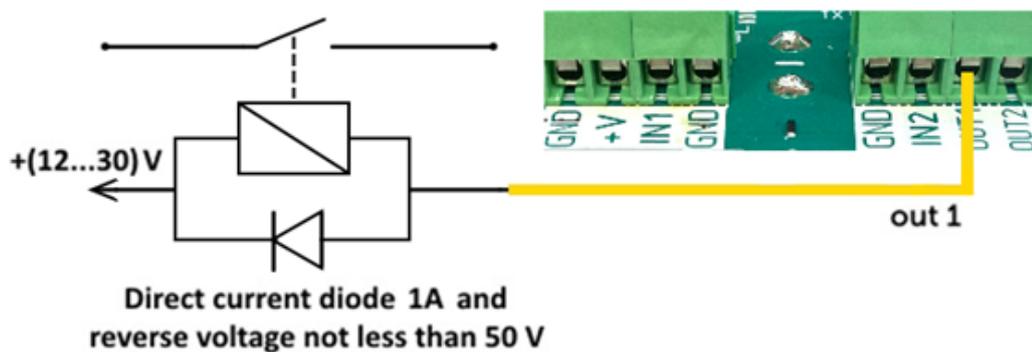
LED INDICATIONS

There is one red LED on the board. The indication is only used when the device is activating in the LoRaWAN® network and when the operating modes are changing.

LED location on the board
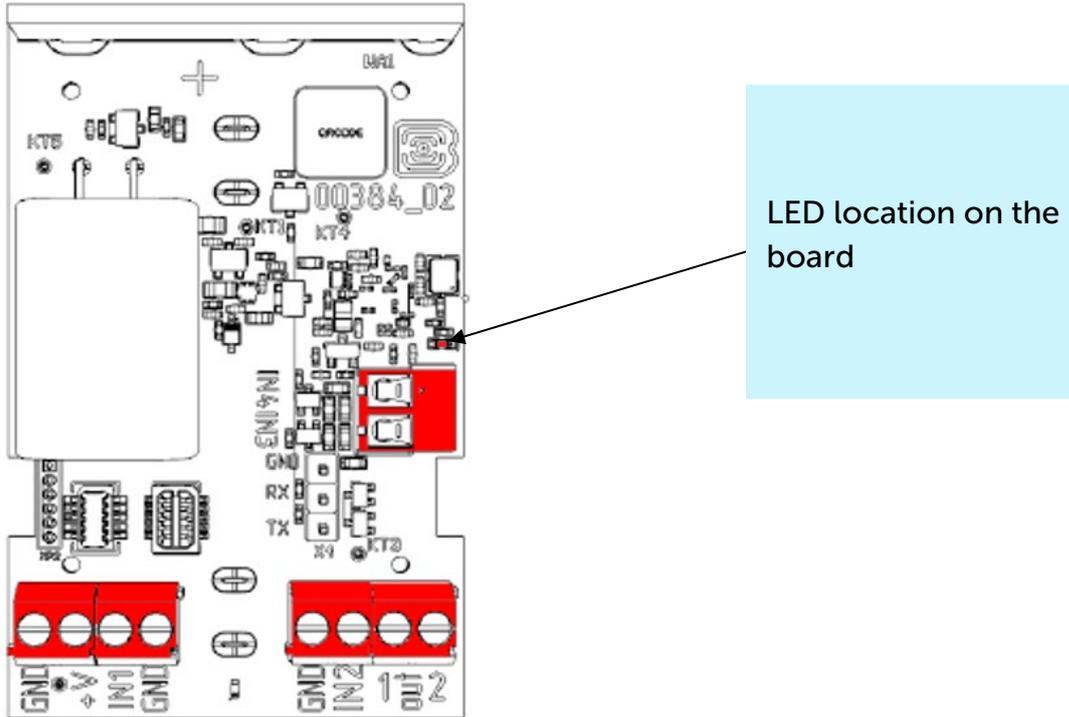
LED SIGNAL		MEANING
▮▮▮▮▮▮▮▮	Short flashings	Linking to the network in progress
▬▬▬	One long flashing during 5 sec	The device has been successfully connected to the network and is in active mode
▮▮▮▯▯▯	Three flashings each by 1 sec	Linking to the network has been failed or the device switched to the "Storage" mode

ℹ️ In case of connection attempt fail, the device will continue to accumulate data and will attempt to connect to the network every 6 hours

MOUNTING RECOMENDATIONS

To provide the stable radio between the gateway and the end device is recommended avoiding the device installation in the places which are barriers for the radio signal getting through like a reinforced floors and walls, a basement, an underground facilities and wells, a metal case etc.

The necessary stage for the network deploying including a big quantity of end devices is a radio planning work with nature experiments.

> **Before starting mounting work, you must make sure that the latest firmware version is installed on the equipment**

The device must be installed at a distance of at least 20 cm from the operator's workstation and areas of constant human occupancy.

> **The device is sensitive to static electricity!**
> **Observe anti-static protection rules during any manipulation of the printed circuit board to avoid damaging the device. It is prohibited to touch any electrical components on the board without anti-static precautions.**

For mounting you will need:

- cross-shaped screwdriver ✚;
- awl;
- wire stripper;
- laptop.

Step by step mounting be like:

1. Setting the devices and connecting them to the network are usually carried out in the office (see Network Deployment Manual).
2. Determination of suitable places for mounting at the object with a network tester.
3. De-energizing the connected equipment, metering devices, etc.
4. Making holes in the silicone gasket for wires - strictly according to the number of wires. It must be remembered that the wire must be of circular cross-section and no more than 3 mm in diameter.

> **When removing the sealant, as well as when installing wires of a different diameter or cross-section, device performance may deteriorate until failure due to moisture entering the case**

5. Connecting all necessary wires to the SI-12 contacts.
6. Device launching – switching to the "Active" mode and registration in the network. The device will automatically switch to "Active" mode after removing the battery insulating tab. The tab is located between the battery holder and the battery.

Location of the launch button on the board
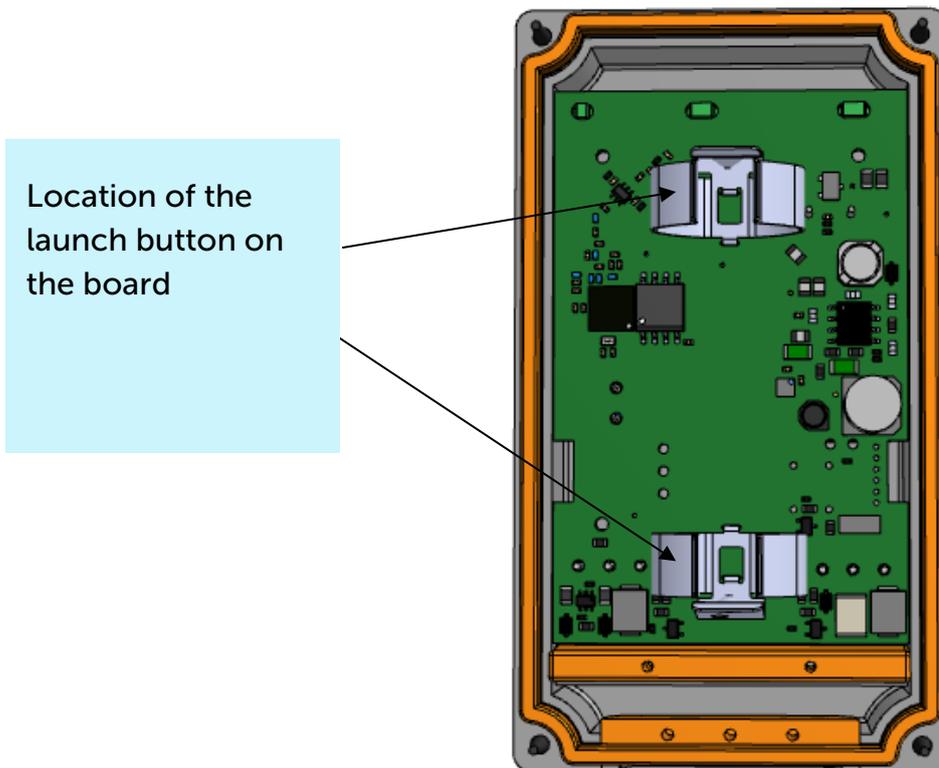
7. By the laptop you can make sure that the device successfully sends the data.
8. Assembling the device.
9. DIN-rail mounting or another available way to mount the device on the object.

4 SAFE OPERATION RECOMMENDATIONS

GENERAL RECOMMENDATIONS

Before starting work with the Vega SI-12 rev.3, you should learn this Operation Manual (hereinafter referred to as the Manual).

Vega SI-12 rev.3 pulse counter is designed for counting of pulses incoming to 4 independent inputs, further accumulating and transmitting of this information to the LoRaWAN® network. In addition, Vega SI-12 rev.3 can be used as a security device - all inputs can be configured as security inputs. The counter has two open-collector digital outputs and can be used as a control device.

The Vega SI-12 rev.3 device should be operated by a trained person.

The device isn't intended for use by children or in areas where children may be present

Prohibited:
independent repair of the device, making changes to the device design, installation of any software (except for the producer's software)

Unprofessionally performed repair work or installed third party software can result in device failure, personal injury, and property damage.

The producer does not assume liability for unpredictable effects resulting from the use of third party software on the device

ELECTRICAL SAFETY

Do not operate the device near an open flame or direct sunlight. Doing so may result in overheating and fire. The device should be used at air temperatures range from -40 °C (-40 F) to +85 °C (185 F)

If a fire is detected, immediately stop using the device and eliminate the fire. After that, the device should be sent to the producer for diagnostics (See the Warranty section for the producer's contacts).

Don't allow foreign objects to get into the device case during operation, as this may result in short circuits and fire. Don't operate the device with the case open or damaged.

Prohibited to immerse the device case in water, it is not recommended to put it under water jets.

	Don't touch wires, circuit boards, or the device enclosure with wet hands

Don't use the device after it has been exposed to water. Doing so may result in injury or damage to the device and cause it to malfunction. In such cases, contact the producer's technical support.

BATTERY OPERATION SAFETY RULES

	This device uses a SAFT LS 17500 3600 mAh 3.6V battery. The use of batteries of other types is prohibited
	The effective capacity of the battery decreases when operated in low-temperature conditions

When installing the battery, observe polarity.

The battery must not be used in conditions of extremely low air pressure; this may lead to explosion or leakage of flammable substances.

The device is not suitable for operation in conditions of extremely low air pressure (at altitudes above 2000 m).

Heating and/or exposing the battery to open flame and/or placing it near open flame and/or deforming it is prohibited.

The battery supplied with the device contains lithium.

	Do not open or attempt to recharge the battery; this may result in explosion, fire, or leakage of flammable substances

In case of battery fire, do not inhale combustion products and do not touch the battery with bare hands. This may cause chemical burns.

If electrolyte from the battery gets into the eyes, immediately rinse the eyes thoroughly with plenty of clean water and seek medical attention as soon as possible.

SAFETY RULES IN CASE OF DAMAGE TO THE ENCLOSURE

During normal operation of the device, the housing is not dangerous. If the case is mechanically damaged, sharp edges and corners may form, posing a potential hazard to the user. In this case, stop using the device and send it to the producer for replacement of the housing.

When operated in accordance with this manual, the device does not pose a danger to person.

RADIATION INFORMATION

When used correctly and following the installation recommendations, the device has no harmful effects on the person body and electrical equipment.

TROUBLESHOOTING COMMON ISSUES

If you observe smoke, fire, sparking, abnormal heating, functional malfunctions, or moisture ingress into the enclosure, immediately disconnect the battery pack to de-energize the device and contact the manufacturer's technical support.

5 COMMUNICATION PROTOCOL

This part describes the Vega SI-12 rev.3 communication protocol with LoRaWAN® network.

In fields consisting of several bytes, the little endian byte order is used

VEGA SI-12 REV.3 PULSE COUNTER TRANSMITS THE FOLLOWING TYPES OF PACKETS

1. Packet with current readings

Sent regularly on LoRaWAN® port 2.

Size in bytes	Field description	Data type
1 byte	Packet type, this packet == 1	uint8
1 byte	Battery charge, %	uint8
1 byte	Values of basic settings (bit field)	uint8
4 bytes	Reading time for values in this packet (unixtime UTC)	uint32
1 byte	Temperature, °C	int8
4 bytes	Input 1 reading (depending on the type – number of pulses or status: 0 – open, 1 - closed)	uint32
4 bytes	Input 2 reading (depending on the type – number of pulses or status: 0 – open, 1 - closed)	uint32
4 bytes	Input 3 reading (depending on the type – number of pulses or status: 0 – open, 1 - closed)	uint32
4 bytes	Input 4 reading (depending on the type – number of pulses or status: 0 – open, 1 - closed)	uint32
1 byte	Status (bit field)	uint8

Reasons for transmitting a packet with current readings

Setting ID	Description
0x00	Transmission by timer
0x01	Alarm input 1 triggered
0x02	Alarm input 2 triggered
0x03	Alarm input 3 triggered
0x04	Alarm input 4 triggered
0x05	Threshold exceeded on pulse input 1
0x06	Threshold exceeded on pulse input 2
0x07	Threshold exceeded on pulse input 3
0x08	Threshold exceeded on pulse input 4
0x09	On request

The counter has internal clock and calendar; time and date are factory set. When sending a packet with the current readings, the device uses the data taken at the nearest time, which is multiple to the interval according to data collection period:

- 1 hour period: the readings of the beginning of the current hour are sent;

- 6 hours period: 00:00, 06:00, 12:00, 18:00 readings are sent;

- 12 hours period: 00:00, 12:00 readings are sent;

- 24 hours period: the readings of 00:00 of the current day are sent.

"Values of basic settings" bit field decoding

Bit	Meaning
0 bit	Activation type: 0 - off, 1 - on
1, 2, 3 bits	Communication period: |3 == 0|4 == 0|5 == 0| - 5 minutes |3 == 1|4 == 0|5 == 0| - 15 minutes ||3 == 0|4 == 1|5 == 0| - 30 minutes |3 == 1|4 == 1|5 == 0| - 1 hour |3 == 0|4 == 0|5 == 1| - 6 hours |3 == 1|4 == 0|5 == 1| - 12 hours |3 == 0|4 == 1|5 == 1| - 24 hours
1 bit	First input type: 0 – pulse, 1 - security
2 bit	Second input type: 0 – pulse, 1 - security
3 bit	Third input type: 0 – pulse, 1 - security
4 bit	Fourth input type: 0 – pulse, 1 - security

Decoding of the "Status" bit field

Bit	Field Description
0 bit	Output 1: 0 – off, 1 – on
1 bit	Output 2: 0 – off, 1 – on
2 bit	External power: 0 – off, 1 – on
3-7 bits	Reserved

2. Packet with information on external power and output status

Transmitted by the device via LoRaWAN® port 5.

Size in bytes	Field description	Data type
1 byte	Reason for packet transmission	uint8
1 byte	Battery charge, %	uint8
1 byte	Main settings value (bit field)	uint8
4 bytes	Packet generation time (unixtime)	uint32
1 byte	Temperature, °C	uint8
1 byte	Status (bit field)	uint8

Reasons for transmitting a packet with current readings

Setting ID	Description
0x00	Output status changed
0x01	External power status changed

Decoding of the "Main Settings Value" bit field

Bit	Meaning
0 bit	Packet acknowledgment request: 0 – disabled, 1 – enabled
1, 2, 3 bits	Data transmission period: |3 == 0|4 == 0|5 == 0| - 5 minutes |3 == 1|4 == 0|5 == 0| - 15 minutes ||3 == 0|4 == 1|5 == 0| - 30 minutes |3 == 1|4 == 1|5 == 0| - 1 hour |3 == 0|4 == 0|5 == 1| - 6 hours |3 == 1|4 == 0|5 == 1| - 12 hours |3 == 0|4 == 1|5 == 1| - 24 hours
1 bit	Input 1 mode: 0 – pulse, 1 – alarm
2 bit	Input 2 mode: 0 – pulse, 1 – alarm
3 bit	Input 3 mode: 0 – pulse, 1 – alarm
4 bit	Input 4 mode: 0 – pulse, 1 – alarm

Decoding of the "Status" bit field

Bit	Field Description
0 bit	Output 1: 0 – off, 1 – on
1 bit	Output 2: 0 – off, 1 – on
2 bit	External power: 0 – off, 1 – on
3-7 bits	Reserved

3. Informational Packet

Transmitted by the device via LoRaWAN® port 195.

Size in bytes	Field description	Data type
1 byte	Packet type, this packet == 195	uint8
1 byte	Transmission reason: «0» – during network registration, «1» – on request	uint8
16 byte	Manufacturer code, ASCII	uint8
16 byte	Device model, ASCII	uint8
4 bytes	Firmware release date (unixtime)	uint32
2 bytes	Board version	uint8
2 bytes	Firmware version (high byte – major, low byte – minor) Example: 0x0301 – firmware version 3.0	uint8[1]
2 bytes	Protocol version (high byte – major, low byte – minor) Example: 0x0200 – protocol version 2.0	uint8[2]
1 byte	Battery charge, %	uint8

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[1] Depends on firmware version
[2] Depends on firmware version

| 4 bytes | Number of packets transmitted over the air (byte order: big endian) | uint32 |

4. Settings packet

Transmitting on LoRaWAN® port 3.

Size in bytes	Field description	Data type
1 byte	Packet type, this packet == 0	-
1-45 bytes	Settings	-

Table of SI-12 rev.3 Setting IDs and Their Possible Values

Parameter ID	Description	Data Length	Accepted Values
4	Request acknowledgment	1 byte	1 – request 2 – do not request
8	Number of packet retransmissions	1 byte	from 1 to 15
12	Input 1 mode	1 byte	1 – pulse 2 – alarm
13	Input 2 mode	1 byte	1 – pulse 2 – alarm
14	Input 3 mode	1 byte	1 – pulse 2 – alarm
15	Input 4 mode	1 byte	1 – pulse 2 – alarm
16	Data transmission period	1 byte	1 – 1 hour 2 – 6 hours 3 – 12 hours 4 – 24 hours 5 – 5 minutes 6 – 15 minutes 7 – 30 minutes 8 – 4 hours

| 49 | Data collection period | 1 byte | 1 – 1 hour 2 – 6 hours 3 – 12 hours 4 – 24 hours 5 – 5 minutes 6 – 15 minutes 7 – 30 minutes 8 – 4 hours |
| 55 | Time zone, in minutes | 2 bytes | from -720 to 840 |

VEGA SI-12 REV.3 PULSE COUNTER RECEIVES PACKETS OF THE FOLLOWING TYPES

1. Packet with settings request

    Sent by application on LoRaWAN® port 3.

Size in bytes	Field description	Data type
1 byte	Settings reques == 01	uint8

2. Output on command

    Sent by application on LoRaWAN® port 2.

Size in bytes	Field description	Data type
1 byte	Packet type, this packet == 03	uint8
1 byte	Output no. (1 or 2)	uint8
1 byte	Output on time in seconds (1...255, 0 - forever).	uint8

3. Output off command

    Sent by application on LoRaWAN® port 2.

Size in bytes	Field description	Data type
1 byte	Packet type, this packet == 4	uint8
1 byte	Output no. (1 or 2)	uint8

4. Packet with request of digital inputs state

    Sent by application on LoRaWAN® port 2.

Size in bytes	Field description	Data type
1 byte	Packet type, this packet == 6	uint8

Answering this packet, the device sent the packet with digital inputs state.

5. Packet with request of settings

Sent by application on LoRaWAN® port 3.

Size in bytes	Field description	Data type
1 byte	Packet type, this packet == 00	-
1-45 bytes	Settings	-

Answering this packet, the device sent the packet with settings.

Table of Vega SI-12 rev.3 setting ID and their possible values

Setting ID	Description	Data Length	Accepted Values
4	Request acknowledgment	1 byte	1 – request 2 – do not request
8	Number of packet retransmissions	1 byte	from 1 to 15
12	Input 1 mode	1 byte	1 – pulse 2 – alarm
13	Input 2 mode	1 byte	1 – pulse 2 – alarm
14	Input 3 mode	1 byte	1 – pulse 2 – alarm
15	Input 4 mode	1 byte	1 – pulse 2 – alarm
16	Data transmission period	1 byte	1 – 1 hour 2 – 6 hours 3 – 12 hours 4 – 24 hours 5 – 5 minutes 6 – 15 minutes 7 – 30 minutes 8 – 4 hours
49	Data collection period	1 byte	1 – 1 hour 2 – 6 hours 3 – 12 hours 4 – 24 hours 5 – 5 minutes 6 – 15 minutes 7 – 30 minutes 8 – 4 hours
55	Time zone, in minutes	2 bytes	from -720 to 840

6 STORAGE AND TRANSPORTATION REQUIREMENTS

Vega SI-12 rev.3 pulse counters shall be stored in their original manufacturer's packaging, in covered dry warehouse facilities under conditions that exclude direct exposure to moisture. The devices must be protected from conductive dust, acid and alkali vapors, as well as gases that cause corrosion and degrade insulation. Ambient air temperature must not fall below +5 °C or exceed +40 °C. Relative humidity must not exceed 85%.

The devices shall be transported in their original packaging by all types of transport, in covered vehicles, in accordance with the cargo transportation regulations applicable to each type of transport, and in compliance with technical requirements for loading and securing cargo.

During loading/unloading operations and transportation, crates must not be subjected to sharp impacts or exposure to atmospheric precipitation.

The method of stacking crates containing the devices on the vehicle must prevent any movement during transit.

Transportation of the device without its packaging may result in damage.

Transportation of the devices is permitted in covered cargo compartments of all types, over any distance, at temperatures ranging from -40 °C to +85 °C.

7 CONTENT OF THE PACKAGE

The pulse counter is delivered complete with:

Vega SI-12 rev.3 pulse counter – 1 pc.

Screw – 4 pcs.

Factory certificate – 1 pc.

8 WARRANTY

The manufacturer guarantees that the product complies with the current technical documentation, subject to the storage, transportation and operation conditions specified in the "User Manual".

The warranty period is 36 months.

The warranty does not apply to batteries.

The warranty period of operation is calculated from the date of sale marked in the product factory certificate, and from the release date when such a mark is absent. During the warranty period, the manufacturer is obliged to provide repair services or replace a failed device or its components.

The manufacturer does not bear warranty obligations in the event of a product failure if:

- the product does not have a factory certificate;

- the factory certificate does not have an TCD stamp and / or there is no sticker with information about the device;

- the serial number (DevEUI, EMEI) printed on the product differs from the serial number (DevEUI, EMEI) specified in the factory certificate;

- the product has been subject to alterations in the design and / or software which are not provided for in the operational documentation;

- the product has mechanical, electrical and / or other damage and defects arising from violation of the conditions of transportation, storage and operation;

- the product has traces of repair outside the manufacturer's service center;

- the components of the product have internal damage caused by the ingress of foreign objects / liquids and / or natural disasters (flood, fire, etc.).

The average service life of the product is 7 years.

In the event of a warranty claim, contact the service center:

119A, Bol'shevistskaya Str., Novosibirsk, 630009, Russia.

Tel.: +7 (383) 206-41-35

e-mail: remont@vega-absolute.ru

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Revision and date	17 of 18 March 2026	

Revision History

Revision	Date	Name	Comments
01	20.03.2017	KEV	Document creation date
02	14.04.2017	KEV	Photos was added, minor edits
03	10.05.2017	KEV	New photos of appearance
04	17.06.2017	PKP	Protocol changed
05	11.07.2017	PKP	Fixed error in protocol description
06	16.08.2017	PKP	Adding's in alarm command description
07	07.09.2017	KEV	Part "Vega LoRaWAN Configurator" was added
08	18.10.2017	KEV	Warranty conditions was changed, minor edits
09	04.05.2018	KEV	Edits concerning the field of application with meters with pulse outputs, minor edits, new illustrations in the "Operation" part
10	22.01.2019	KEV	Readings reset by pressing the button described, internal circuit scheme added, communication protocol changed, setting via 'air' described. Frequency plans added, specification changed, blackbox described, warranty changed, configurator updated. "Marking" part added.
11	24.01.2019	KEV	Inaccuracy in communication protocol fixed – packet type for packets with settings and request of settings
12	03.07.2020	KEV	Scheduled revision of the document, minor changes
13	04.08.2021	PAV	Scheduled revision of documentation. New warranty conditions, new parts
14	03.02.2022	KEV	New packets with request of digital inputs state and answering this in the communication protocol (type packet is 6), new period of data collection and communication is 4 hours, anti-bounce algorithm is replaced with configurable function of pulses filtering
15	21.06.2022	KMA	Image replaced
16	23.08.2022	KMA	Minor edits

17	18.03.2026	NEE	Full revision of sections/subsections: "Comunication and data collection algorithm", "Functional", "2 Specification", "3 Operation", "5 Communication protocol", "6 Storage and transportation requirements". Added new section "4 Safe operation recommendations". Replacement of images throughout the text.