



ROSSMA™

MEASURING AND SWITCHING DEVICE ROSSMA IIOT-AMS ANALOG

OPERATION MANUAL

ROSSMA IIOT-AMS Analog is used for autonomous data measurement from control and measuring devices with current interface 4-20mA and/or with resistive interfaces of pt1000, Ni1000, TK5000 type with subsequent transmission of received data in LoRaWAN and/or NBiOT network.

The ROSSMA IIOT-AMS Analog switching device provides non-volatile operation of control and measuring devices.

DATA ON THE DOCUMENT

Title	Measuring and switching device ROSSMA IIOT-AMS Analog
Document type	Operation manual
Document code	MAN-RIAA-01
Last revision number and date	08.08.2019

THIS DOCUMENT IS VALID FOR THE FOLLOWING DEVICES

LINE NAME	DEVICE NAME
ROSSMA IIOT-AMS ANALOG	ROSSMA IIOT-AMS ANALOG LoRaWAN®
ROSSMA IIOT-AMS ANALOG	ROSSMA IIOT-AMS ANALOG Ex (multichannel) LoRaWAN®
ROSSMA IIOT-AMS ANALOG	ROSSMA IIOT-AMS ANALOG Ex (single channel) LoRaWAN®
ROSSMA IIOT-AMS ANALOG	ROSSMA IIOT-AMS ANALOG Ex (multichannel) NBiOT
ROSSMA IIOT-AMS ANALOG	ROSSMA IIOT-AMS ANALOG Ex (single channel) NBiOT

HISTORY OF DOCUMENT EDITION

EDITION №	DATE	COMMENTS
01	04.09.2017	Date of document creation
02	21.12.2017	Correction of operation algorithm
03	04.03.2018	Correction of operation algorithm
04	07.05.2018	Adding a single-channel switching device description
05	12.09.2018	Correction of operation algorithm
06	14.04.2019	Correction of control algorithm
07	28.08.2019	Correction of data collection and transmission algorithm

CONTENTS

INTRODUCTION	3
1. DESCRIPTION AND OPERATION PRINCIPLE	4
SWITCHING DEVICE DESCRIPTION	4
DATA COLLECTION AND TRANSMISSION ALGORITHM	5
FUNCTIONALITY	5
MARKING	6
DATA ON CERTIFICATION	7
2. TECHNICAL CHARACTERISTICS	8
3. WORKING WITH THE SWITCHING DEVICE	10
CONTACTS DESCRIPTION	10
INDICATORS AND BUTTONS	10
INITIAL START-UP	11
4. COMMUNICATIONS PROTOCOL	12
DATA PACKAGE FORMAT	12
CONTROLLING THE SWITCHING DEVICE	12
SWITCHING DEVICE CONFIGURATION AND PROGRAMMING	13
5. STORAGE AND TRANSPORTATION RULES	14
6. DELIVERY SET	15
7. WARRANTY	16

INTRODUCTION

This manual applies to ROSSMA IIOT-AMS ANALOG measuring and switching device (hereinafter switching device) and defines installation and connection procedure, as well as control commands and functional description.

The manual is intended for specialists familiar with the installation rules in the field of various electronic and electrical equipment.



To ensure proper functioning, the switching device must be installed and adjusted by qualified personnel.

1. DESCRIPTION AND OPERATION PRINCIPLE

SWITCHING DEVICE DESCRIPTION

The ROSSMA IIOT-AMS ANALOG switching device is intended for independent data measurement from control and measuring devices (CMD) with 4-20 mA current interface and/or with resistive interface pt1000, Ni1000, TK5000, with the subsequent transfer of the obtained data in LoRaWAN® and/or NBiOT network at 860-1000 Mhz range frequencies.

The switching device provides non-volatile operation of control and measuring devices connected to the switching device inputs.

The switching device can be used in industrial enterprises, infrastructure of housing and communal facilities, in hard-to-reach places (wells, basements). The switching device provides the possibility to install control and measuring devices in places with no power supply, operates in difficult climatic and weather conditions.



ROSSMA IIOT-AMS ANALOG switching device provides instrument functionality from the built-in power supply, allowing to install sensors with the switching device in hard-to-reach locations where no power supply is available.

The switching device can have single-channel and multi-channel modifications. The multi-channel modification of the switching device can have up to 8 inputs.

The switching device supports two operation modes:

- For operation with active control and measuring devices, which are powered from an external power supply source and outputs an analog signal to the switching device input.
- For operation with passive control and measuring devices, which are powered directly from the switching device and outputs an analog signal to the switching device input.

The switching device is manufactured with an integrated 3.6 V power supply. At the same time, the switching device can be powered using an external DC source with a voltage of 3 to 5 V.

The power cell of the ROSSMA IIOT-AMS ANALOG switching device is a 14000 mAh battery designed for up to 10 years of service life when measuring instrument readings and transmitting data once a day.



WARNING: The switching device is equipped with a built-in power cell - a non-rechargeable lithium-thionyl chloride (LiSOCL₂) battery. **Attempts to charge the battery can cause fire!**

DATA COLLECTION AND TRANSMISSION ALGORITHM

Data are read from a control and measuring device with a configurable period of 1 minute (it is not recommended to set the measurement frequency to less than 1 minute to ensure a long non-volatile mode of operation). The read data are stored in the switching device memory and transmitted at a predetermined discrete session with the LoRaWAN network.

The data transmission period can be configured from 1 minute. By default, the manufacturer sets the data transmission frequency to 1 time/hour. The data is transmitted on the specified timer, which is installed in the internal memory of the switching device.

The switching device operates from a 3-5V DC power supply or a built-in power supply. The 14A/h power cell capacity is designed for operation life according to the table:

	Data read frequency			
	1 time/min.	1 time/2min.	1 time/10min.	1 time/hour
<i>When connecting passive CMD</i>				
<i>Autonomous operation time of ROSSMA IIOT-AMS Analog</i>	90 days	180 days	300 days	3 years
<i>When connecting active CMD</i>				
<i>Autonomous operation time of ROSSMA IIOT-AMS Analog</i>	110 days	220 days	2,5 years	10 years

If the Request Confirmation parameter is enabled, the switching device will send the next package only after receiving delivery confirmation of the previous package. If you do not receive such an acknowledgement after three replays, the switching device ends the session until the next scheduled session. At the same time, the switching device stores the untransmitted data to the memory. Non-transmitted packages remain in the switching device memory and are sent during the next communication session.

If the Request Confirmation parameter is disabled, the switching device sends the current data to the network with the specified frequency. There is no package delivery check in this mode. Untransferred packages do not remain in the switching device memory.

The communication time of the switching device is controlled by the LoRaWAN network server and can be adjusted by command.

FUNCTIONALITY

The switching device is designed for operation with the following control and measuring devices:

- Pressure sensors;
- Temperature sensors;
- Level sensors;
- Vibration sensors;
- Gas sensors (gas analysis);

- Luminance sensors;
- Humidity sensors;
- Current and voltage/battery sensors.

The switching device is class A device (LoRaWAN classification) and provides the following functionality:

- Support of both active and passive control and measuring devices;
- ADR (Adaptive Data Rate) support
- Wireless configurable LoRaWAN activation type in LoRaWAN network - OTAA, AVP;
- Configurable communication period from 1 minute and more (configured remotely over LoRaWAN network). The default value is 1 times per hour;
- Support for sending confirmation packages (configurable)
- Two operating modes "Active" and "Warehouse";
- Frequency plan: EU-868\RU-868 (to switch remotely in LoRaWAN network). Default is RU- 868;
- Temperature measurement;
- Measurement of built in battery charge in %.

MARKING

The switching device marking is made in the form of application on the housing, which contains information on the product name.

There is a label with the device number for its identification from the manufacturer in the housing. This number also serves as ID with the ratings of a particular switching device.

The switching device certificate contains the following information:

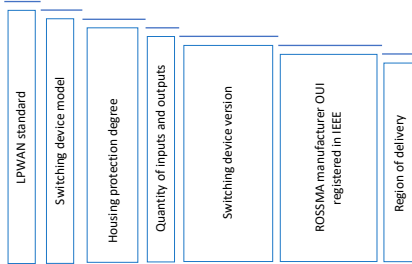
- Product name;
- Product version information;
- Keys required to log in the switching device in the network;
- DevEUI;
- Month and year of production.

The label with the device number is located in three places - on the switching device housing, on the electronic board inside the housing and on the packing box (the first digits before the separator: the device number - XXXXXXXXXXXX).

It is possible to identify the device certificate by the device number in the column "identifier" - the last digits in the number after the separator.

The ID is XXXXXXXXXXXXXXXXXXXXXXXXXXXX - XXXXXX. The first part of the identifier is the part number and the second part is the serial number of the switching device. Interpretation of part number:

[LW]AN[EX66]X1[420V30]A[83CC]BRU



LPWAN standard: LW – LoRaWAN, NB – NbiOT, 6LP-6LoWPAN, LWNB - both standards.

Switching device model ROSSMA IIOT-AMS: AN-Analog, MB-Modbus, MU-Modbus Utility, Pulse-P0, DC-Dry Contact, LD-Leak Detector, SD-Smoke Detector, AB-Alarm Button, CN-Can, UC-Universal Controller.

Degree of enclosure protection: IP56-0056, EX IP66-EX66, EX IP68- EX68,etc.

Number of inputs: X1-single channel, X4-four inputs, etc.

Switching device version: specifies the hardware platform and firmware version.

Manufacturer OUI: Unique identifier of ROSSMA in IEEE.

Region of delivery: RU-Russian Federation, EU-European Union.

DATA ON CERTIFICATION

Manufactured according to УАБИ.001.83301259.2017 TY specification.

Certificate of compliance No. ПОСС RU.0001.21AB90

Declaration EAЭC N RU Д-RU.AБ93.B.08697 on Compliance with the Technical Regulation Requirements of the Customs Union TP TC 020/2011 "Electromagnetic Compatibility of Technical Means" meets industrial safety requirements. Certificate of conformity NoC-RU.MTЭ.OC.001.H.0003

The housing complies with the Technical Regulation Requirements of the Customs Union TP TC 012/2011 "On Equipment Safety for Operation in Explosive Environments"

2. TECHNICAL CHARACTERISTICS

THE MAIN

Analog inputs (current, resistive):	
Single-channel	1
Multichannel	Up to 8 - on-request (default 3)
connection interface	Current loop 4-20 mA or resistance pt1000, Ni1000, TK5000
Operation temperature range	-55...+85°C
Built-in temperature sensor	Yes (sends data every time you connect)
Built-in power supply charge measuring	Yes (sends data every time you connect)

LoRaWAN

Class of LoRaWAN device	A
Frequency plan	RU868, EU868, IN865, AS923, AU915, KR920, US915, KZ865, any (on the basis of EU868)
Activation method in LoRaWAN network	ABP или OTAA (adjustable)
Communication Period	Adjustable in LoRaWAN network
LoRa antenna type	internal
Sensitivity	-138 dBm
Radio communication range in dense development	Up to 5 km
Radio communication range in non-urban area	Up to 15 km
Default transmitter power	25 milliwatt (adjustable)
Maximum transmitter power	100 milliwatt

POWER SUPPLY

Built-in battery capacity	14000 mAh
External power supply capability	yes
Power supply of connected instrumentation from switching device	yes

HOUSING

Housing dimensions	
Housing protection degree	Versions: IP 56 1ExeIICT4 Gb, IP66 (for single channel model)

	<p>OEx ia IIC T4 Ga, IP66 (for multichannel model)</p> <p>OEx ia 1ExeIICT4 Gb, IP68 (for multichannel model)</p>
<p>Mounting</p>	<p>The housing has holes for stationary fastening to any surface.</p> <p>The housing can be completed with a plate with for DIN rail adapter(it is specified when ordering).</p> <p>The ROSSMA IIOT-AMS ANALOG (single channel) housing provides attachment directly to the instrument using a coupling with HЭB 20x1,5 fitting.</p>

3. WORKING WITH THE SWITCHING DEVICE

CONTACTS DESCRIPTION

XA1 XA2 XA3 terminals for passive CMD and XP1 XP2 XP3 terminals for active CMD are used for connection to CMD with output interface current loop of a 4-20mA or resistive pt1000, Ni1000, TK5000. Simultaneous connection to XA and XP with the same digital index is not allowed. The maximum connected quantity of devices with output interface current loop 4-20mA or resistive pt1000, Ni1000, TK5000 on ROSSMA IIOT-AMS ANALOG (multichannel) is no more than 3 (three). On request, the switching device can be equipped with a number of terminals for connection and simultaneous operation of up to 8 CMD.

To switch from "warehouse" mode to "active" mode, use a jumper marked "On" located near the built-in battery.

It is possible to connect external antenna to the SMA connector on the board. The switching device is equipped with an internal temperature sensor.

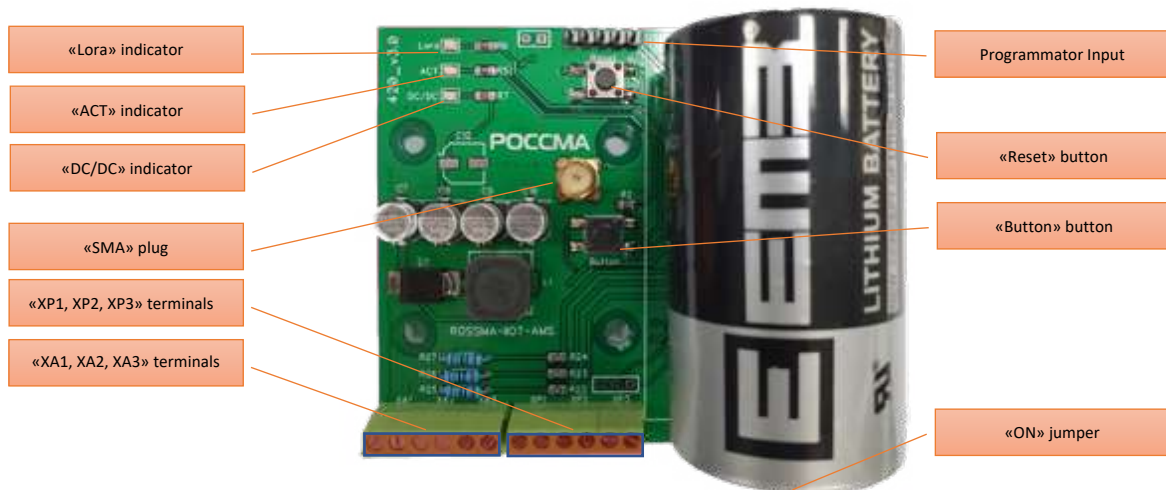


Fig.1 ROSSMA IIOT-AMS ANALOG (multichannel)

INDICATORS AND BUTTONS

There are ACT(power), Lora (sending data in LoRaWAN network), DC/DC (indicator of power supply from switching device to CMD) indicators on the switching device.

There are two buttons: RESET - to reset the device and Button - when pressing it the switching device begins to perform measurement and sending data in LoRaWAN network.

INITIAL START-UP

The switching device has a special "Warehouse" mode designed for storage and transportation. In this mode, the switching device does not regularly transfer data to the network. The switching device must be taken out of Warehouse mode before it can be used. To switch from Warehouse mode to Active mode, install the jumper on both terminals On.

The switching device supports two methods of activation in the LoRaWAN network - ABP and OTAA. By default, the manufacturer sets the activation method to ALT. You can specify one way by using a special command sent to the switching device in LoRaWAN network.

You can switch from the "Active" mode back to the "Warehouse" mode using a jumper by removing it from both terminals "On."

4. COMMUNICATIONS PROTOCOL

DATA PACKAGE FORMAT

Data package format for ROSSMA IIOT-AMS ANALOG switching device (multichannel):

The total amount of the transferred package = 10 byte

(Example **DD02EE0EA608CA0E0114**):

Byte 0: 0xDD - package type. 0xDD - Package with measurement data

Possible options:

CC - Data when pressing button Button

BB - Switching device Software Release Data

DD - Scheduled data from switching device

Bytes 1-2: 0x02EE - Current of the 1st measurement channel (0x2EE = 750 = 4mA)

Bytes 3-4: 0x0EA6 - Current of the 2nd measurement channel (0xEA6 = 3750 = 20mA)

Bytes 5-6: 0x08CA - Current of the 3rd measurement channel (0x8CA = 2250 = 12mA)

Bytes 7-8: 0x0E01 - Supply voltage in mV (0xE01 = 3585 = 3.585V)

Byte 9: 0x14 - Temperature in degrees (0x14 = 20 = 20 degrees C)

Data package format for ROSSMA IIOT-AMS ANALOG switching device (single channel):

The total amount of the transferred package = 6 10 byte

(Example **DD02EE0EA608CA0E0114**):

Byte 0: 0xDD - package type. 0xDD - Package with measurement data

Possible options:

CC – Data when pressing button Button

BB – Switching device Software Release Data

DD - Scheduled data from switching device

Байты 1-2: 0x02EE - Current of the 1st measurement channel (0x2EE = 750 = 4mA)

Байты 3-4: 0x0E01 - Supply voltage in mV (0xE01 = 3585 = 3.585B)

Байт 5: 0x14 - Temperature in degrees (0x14 = 20 = 20 degrees C)

CONTROLLING THE SWITCHING DEVICE

The switching device receives the following control commands on port 1 or port 2:

0x01001E, where 0x001E is the new call-out interval in seconds (not saved when power is reset)

0x02001E, where 0x001E - time in seconds when the switching device communicates next time

0xBB - Query of the switching device version. The answer with version numbers, for example 0xBB010402000301 where will be at once sent to this command where:

0xBB - Package type

0x0104 - Switching device type

0x0200 - Software version

0x0301 - Device version

SWITCHING DEVICE CONFIGURATION AND PROGRAMMING

The switching device is supplied with built-in firmware that enables the switching device to operate with the characteristics specified in this document. The switching device is programmed using a special input for the programmer.

The switching device is configured using special control commands that are sent to the switching device in LoRaWAN network:

5. STORAGE AND TRANSPORTATION RULES

ROSSMA IIOT-AMS switching devices shall be stored in the factory package in heated rooms at temperature from 5 ° C to 40 ° C and with relative humidity not more than 85%.

The switching devices can be transported in covered cargo compartments of all types for any distances at temperature from -40 ° C to 85 ° C.

6. DELIVERY SET

The standard delivery set of ROSSMA IIOT-AMS Analog switching device includes:

- ROSSMA IIOT-AMS Analog switching device in factory packaging - 1 pc.
- Sealed outlet installed in the switching device housing - 1 pc.
- Certificate - 1 pc.

7. WARRANTY

The warranty period for the switching device is 12 months after the start of operation or 18 months from the date of delivery, whichever of these periods expires earlier (the "Warranty Period").

The Manufacturer will correct (by repair or supply of replacement parts) any defect which will appear in the Goods and which will be reported to the Manufacturer within the Warranty Period.

The manufacturer is obliged to provide repair services or replace the failed switching device within the entire warranty period.

The consumer is obliged to observe the conditions and rules of transportation, storage and operation specified in this user manual.

The Manufacturer shall not be liable for defects caused by normal wear, non-compliance with the Manufacturer 's requirements in terms of storage, installation, operation or operating conditions; inadequate usage; any changes or repairs not previously authorized by the Manufacturer in writing.

Warranty is not subject to:

- Switching device power cells that have sent more than 80,000 packages
- switching devices with the mechanical, electric and/or other damages and defects which arose at violation of transportations, storage and operation condition;
- Switching devices with repair traces outside the manufacturer 's service center;
- Switching devices with traces of oxidation or other signs of liquids ingress into the device housing.

If a warranty case occurs, contact the service center of the ROSSMA manufacturer at:

614064, Perm, Chkalova Str., 9 Lit. "И".

Phone: 7 (342) 233-93-99.

Or fill out the form on the support page: <https://rossma.ru/support/>



ROSSMA™

www.rossma.ru

Operation manual LLC ROSSMA 2019.

www.rossma.ru