



Measure, Analyze,
Improve, Control
... be smart



USER GUIDE

Impulse counter
smart-MAIC D105 G2

Version 1

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I. INTRODUCTION

Thank you for purchasing the smart-MAC D105 pulse counter. This device allows you to measure resource consumption by taking into account readings from water, gas, electricity and other meters, equipped with pulse outputs. Internet connection and data transfer occurs via WiFi or GSM (optional).

This chapter includes the following sections:

- Appointment of the device and its function
- Input for counting pulses
- Measurement of temperature and / or humidity
- Analog input
- Managed output
- RS485 interface
- Location of device components

Device purpose and its functions

The device is designed for continuous measurement of pulses from connected meters. Measurements and logging are carried out for the purpose of subsequent analysis and implementation of changes aimed at reducing energy costs.

The device measures the following parameters:

- incoming pulses on 2 channels, imp
- temperature with sensors DS18x20 or DHT22
- humidity with DHT22 sensors
- many other quantities measured by sensors
- voltage at the analog input, V

Communication with the device is carried out via the IEEE 802.11 Wi-Fi wireless communication protocol.

The device transmits the accumulated data to the «cloud» server for subsequent analysis and visualization. For more information about processing options received from the device, see the WEB page www.smart-mac.com.

Current data is available on the device's built-in WEB site.

Input for counting pulses.

The device is equipped with two inputs for counting pulses. A pulse is considered to be the closure of the pulse input to GND. Pulse inputs are designed to connect meters and / or sensors that report a change in their status by closing their output contacts.

Pulse counting occurs on two inputs independently of each other.

Measurement of temperature and / or humidity.

The device allows you to connect a maximum of 5 temperature sensors of the DS18x20 type or one DHT22 temperature and humidity sensor or many other sensors.

Analog input

The analog input is for connecting various analog sensors. The analog input measures a constant voltage value between 0-15V.

Controlled output

The device is equipped with a controlled output type «dry contact». A controlled output is designed to automate load management. The output can control a power relay or contactor to which electrical appliances are connected.

The output is controlled remotely, on the device's WEB page or from the server. It is also possible to control the output according to predefined rules and / or schedule.

The controlled output is not intended for switching power loads (> 50W).

The RS485 Interface

The RS485 interface is designed to connect a variety of sensors or receive data using the RS485 standard.

Parameters RS485 9600 8-N-1. Request to get data in JSON format:

N0	N1	N2	N3	Q
----	----	----	----	---

Nx – 4 bytes device number

** RS485 interface is not available when the GSM module is installed*

Location of device components

The device is made in a plastic case designed for installation on a DIN rail. The figure shows the main components of the device.

1	Upper contact group
2	The RS485 interface
3	Reset Button
4	Bottom group of contacts
5	Device status indicator

Device status indicator

The device status indicator is located on the front panel. The indicator signals the following device conditions:



Indicator Status	Device status
The indicator flashes quickly	search and connect to a wireless network
Indicator flashes slowly	connection to the device is possible as a wireless access point for initial settings
LED is steady	device is connected to a wireless network
Indicator does not work	device is turned off or malfunctioning

II. DEVICE WEB INTERFACE

The device's WEB interface is designed to view current data and configure device operation parameters. In the "Data" section, you can change the status of the controlled output.

Access to the device's built-in WEB site is carried out by IP address and password. The inactivity time on the device's website is limited to 5 minutes, after which you will need to re-enter the password to continue working with the device.

III. GETTING STARTED

This chapter provides step-by-step instructions for installing, connecting, and setting up the device.

The chapter includes the following sections:

- Installation and connection to the power supply
- Connect to a wireless network
- Settings

Installation and Connection

The device can be installed in an electrical panel on a DIN rail.

To install the device on the wall, follow these steps:

1. Connect the two wires of the pulse output of your meter. One wire to terminal N1 (GND) second wire to corresponding input, terminal N2 or N3.
2. Connect temperature sensors. Black wire to terminal N1 (GND). Red wire to terminal N6 (+ 5V). Yellow wire (data) to terminal N4.
3. Connect 220V power wires to the device to terminals N9 and N10.

Wiring diagram



Top contact group	
1	GND
2	pulse input 1
3	pulse input 2
4	input temperature sensors
5	analog input
6	+5 V
11	RS485-A up
11	RS485-B down

Bottom contact group	
7-8	controlled output
9-10	power 220 V

A WARNING:
Incorrect power connection (220V)
can lead to damage to the device.

WIRELESS CONNECTION

For normal operation of the device, it is necessary, at the place of its installation, to ensure the presence of a signal from your wireless network.

When you first start up or after restoring the factory settings, the device enters the wireless access point mode.

To connect to your wireless network, follow these steps:

1. On your computer or phone, go to the list of wireless networks and select "smart-MAIC" + network connection (your device number). If the "smart-MAIC" + network (your device number) is missing, click the Reset button on your device. The default password for connection is missing.

2. After successful connection, enter <http://192.168.4.1> in the address bar of the browser and go to the device's built-in WEB site. The default password is 0000
3. In the «WiFi and Network» section, select the name (SSID) of your network from the list of wireless networks, click the «Connect» button and enter the password for your network. If the name (SSID) of your network is not in the list of wireless networks, refresh the list by clicking the Refresh button.
4. Update the connection status or reload the page and make sure that the connection is successful and that the status bar contains the internal IP address of the device. In case of a connection error, repeat step 3.
5. Go to the device's built-in WEB site using the IP address received when connecting and continue the settings.

SETTINGS

To complete the installation and connection of the device, configure the settings by performing the following steps:

1. In the «Configuration» section, select the language of the WEB interface that is convenient for you.
2. Change the password to enter the device's WEB interface. **The default password of 0000 will not allow you to connect devices to your account on the «cloud server».** The password must consist of numbers and have a length of no more than 10. Your new password will allow you to access data from your device stored on a «cloud server».
3. In the «Data» section, you can set the initial values of accumulative counters.
4. In the «Data Server» section, check the device's connection to the «cloud» server.
5. In the «Status» section, look and copy the device ID for yourself. You will need the device ID to connect the device to the «cloud server».



A WARNING:

Remember your new password to enter the device's WEB interface. There is no password recovery mechanism. If you forgot your password, to restore access to the device and data, perform the procedure for restoring factory settings.

INPUT CONFIGURATION AND SENSORS:

1. In the «Counter» section, the values of the pulse input filters are recommended to be left by default 5 ms. Filters are designed to eliminate multiple triggering of the pulse counter. If you are connecting meters with digital pulse sources, set the filter values to 0.
 2. Select the type of connected temperature sensors DS18x20 or DHT22 or other available. After saving the settings of the temperature sensors, the device will re-search for the connected sensors.
 3. If necessary, match the connected sensors with the serial number of the transmitted data (1-5).
 4. Select the option to use the RS485 interface
- Your device is now connected and ready to go.

Connecting other sensors

[in the Knowledge Base >>](#)

IV. DATA VALIDATION

About Current Data Device Config Counter Config	04.08.2021, 15:24:30	
	1. Reverse - T1:	27.0
	2. Forward - T2:	25.8
	3. Input - T3:	27.5
	2. Input 2 - T4:	27.0
	Analog Input:	1.51 V
	Battery:	3.3 V
	Pulse Ch1:	0 imp

Go to the device page in the «Data» section and check the correctness of the readings.

V. MQTT SERVICE

The device supports data transmission and dry contact output control using the Message Queue Telemetry Transport (MQTT) service.

You can activate the MQTT service on the WEB interface of the device in the «MQTT Server» section.

To connect to the server, you must fill in the «Server address», «Port» and «Username» fields.

The device periodically publishes data in the format <device number>. <Topic name> to the following topics:

Имя топики	Данные	Описание
T1-T5	°C / °F	temperature from sensors 1-5
T2	% humidity	with a DHT22 sensor connected
T3	% pressure, hPa	with a D280 sensor connected
ADC	V	analog input, volts 0-15
Ch1-Ch2	imp	pulses for the last period
TCh1-TCh2	imp	pulses cumulative counter
OUT	0-1	exit status
JSON	JSON format	all data in JSON format

To control the “dry contact” output, it is necessary to activate this feature on the device WEB interface in the “MQTT Server” section. The output state is changed by publishing a control phrase to the <device number> .SETOUT topic.

The service supports two control phrases for enabling and disabling the output. Control phrases up to 15 characters long can be changed on the device's WEB interface in the «MQTT Server» section. By default, the phrase to turn on the output «1» is the phrase to turn off the output «0».

VI. RESET AND RECOVERY FACTORY SETTINGS

To restore the factory settings, you must use the Reset button. The Reset button is located near the top group of contacts. The Reset button has two functions:

1. Reboot the device - press the Reset button. After pressing the Reset button, the device will reboot and enter the wireless access point mode.
2. Restore factory settings - press and hold the Reset button for more than 5 seconds. After restoring the factory settings, the device will reboot and enter the wireless access point mode. Connect to your wireless network and configure the device in accordance with Chapter 3, “Connecting to a Wireless Network” and “Configuring Settings”.

Restoring factory settings does not affect energy storage meters. The wireless access point mode will turn off automatically after completing work with the device's WEB interface.

VII. DEVICE MAINTENANCE

The device does not require periodic maintenance.

A lithium battery of the CR 2032 3V type is used to back up the device. Battery life is greatly affected by the temperature conditions of use of the device.

When the battery completely fails, you will receive a notification from the cloud server about the need to replace the battery. The device will continue to operate with limited functionality.

Replacing the battery is carried out in the following sequence:

1. Disconnect the device from the power supply.
2. Unscrew the 4 screws connecting the device case and remove the upper part of the case.
3. Remove the old battery from the holder.
4. Observing the polarity, insert a new battery into the holder.
5. Put on the upper part of the case and tighten the 4 screws.

VIII. CONDITIONS AND NOTIFICATIONS

The function of checking data for compliance with specified conditions allows you to automate the operation of a controlled output or receive notifications.

You can configure several conditions. Conditions are processed sequentially, from top to bottom, the relay will assume the state of the last condition. If the value of the selected data type corresponds to the specified value and condition, the device will perform one of the selected actions: send e-mail; relay activation; relay off. Conditions are checked at intervals of 5 seconds. When the condition is met, the next check will occur in a minute.

To exclude false actuation, you can enable the delay in seconds "Filter before [sec]" during which the condition will not be satisfied.

Checking conditions can be limited in time. If you activate the time interval, the condition will be executed only within the specified time.

Setting conditions is available on the device's WEB interface in the "Conditions" section.

To activate the condition, you must select the data type, select the comparison sign «>» or «<», enter a value for comparison, select the required action.

Condition Management

Configure conditions for relay and notifications

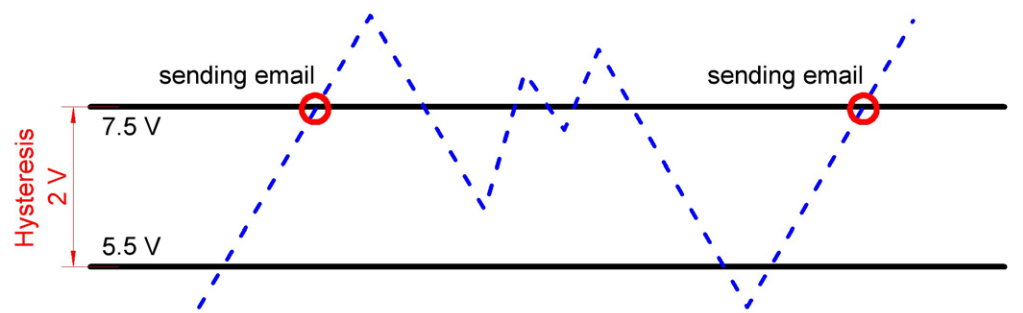
Data	Condition	Value	Mail/Relay	Hysteresis
<input checked="" type="checkbox"/> T1	>	10	Rel. ON	0.07
Filter before [sec]			0	
<input type="checkbox"/> Time interval			23:00	23:00
<input checked="" type="checkbox"/> T1	<	24	Rel. OFF	2.00
Filter before [sec]			0	
<input type="checkbox"/> Time interval			23:00	23:00
<input checked="" type="checkbox"/> ADC	>	7.5	e-mail	2.00

Example: If it is necessary to turn on the relay when the temperature drops below 10°C and turn off the relay when the temperature reaches 24°C, then two conditions must be turned on:

- 1) T1 < 10 Relay ON
- 2) T1 > 24 Relay OFF

Hysteresis is set only for action - sending e-mail. Hysteresis is designed to prevent the sending of repeated e-mail messages when the value of the selected data continues to meet the specified condition.

Important! To avoid spam, set a sufficiently high hysteresis value.
Hysteresis operation example for a condition: ADC> 7.5, e-mail
Hysteresis: 2.0



The event notification function allows you to activate the sending of e-mail messages about selected events that occur with the device.

Event Notifications

Select events to receive notifications.

Low Battery: ☐

Save

IX. CONTENTS OF DELIVERY

Scope of delivery must comply with the following table

№	Name	Q-ty
1	Energy monitor smart-MAIC 105	1
2	Temperature sensor	1

X. SPECIFICATIONS

Measured values:

Temperature, humidity, illumination, oxygen level in water, atmospheric pressure, pressure of liquids and gases, wind direction and speed, CO2, TDS, Ph, water depth in the tank, pulses from any meters, radiation, solar radiation level and many other sensors.

Key Features and ranges of measured values

Pulse input	two, contact closure
Analog input	voltage measurement 0 - 15v
DS18x20 temperature measurement	-55°C + 125°C, accuracy ± 0.5°C
Temperature and humidity measurement DHT22	-40 ° C + 80 ° C, humidity 0-99%
Temperature sensors	макс. 5 шт. или DHT22 – 1шт.
Maximum load power on controlled output	Max. 5 pieces. or DHT22 - 1 pc.
Power consumption	< 1.0 W
RS485 Interface	9600 bps, JSON
Wireless communication protocol	2.4 ГГц / IEEE 802.11 (b, g, n)
Data Refresh Interval	5 sec.
Data collection interval	60 sec.
Maximum data storage time in the absence of communication with the server	11 days
Set operating temperature range	from -40 to +70 °C
Power supply	100 - 240 V, 50-60 Hz
Dimensions LxWxH	90x63x34 mm.
Mounting type	on DIN rail
Weight	0,1 кг

XI. ACCESS TO DATA. VISUALIZATION.

The data obtained during the measurements are sent to the database on the «cloud server». Access to data is carried out using the smart-MAC Dashboard service.

For data visualization and analysis it is necessary:

1. Create your account on the «cloud server», for this, follow the link <https://dash.smart-maic.com/> Follow the steps necessary for registration.
2. In the «Devices» menu, select «Add Device» and enter the following data:
 - Device name - an arbitrary name for your device
 - Device ID - the ID of your device can be viewed on the device's WEB interface in the "Status" tab
 - Password - the password that you set on your device.

After connecting a new device, you will be asked to automatically create two pre-configured boards for displaying data on a PC and mobile device.



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