ROTRONIC MANUAL

RMS Digital Input Module

rotronic
MEASUREMENT SOLUTIONS

Table of Contents

Scope:

This manual is valid for the RMS digital input module from firmware version V1.x. The low-order digit of the manual is updated with each new release.

1 Overview

1.1 *RMS System Overview*

The Rotronic Monitoring System (RMS) is a network comprising various devices and the RMS server software. The software is the heart of the system. It collects all measured data of the devices and saves it in the database. The individual devices work as input modules (data loggers) and as output modules (displays, analog outputs, switched outputs). The user can view the system data at any time on a PC, laptop or smart phone.

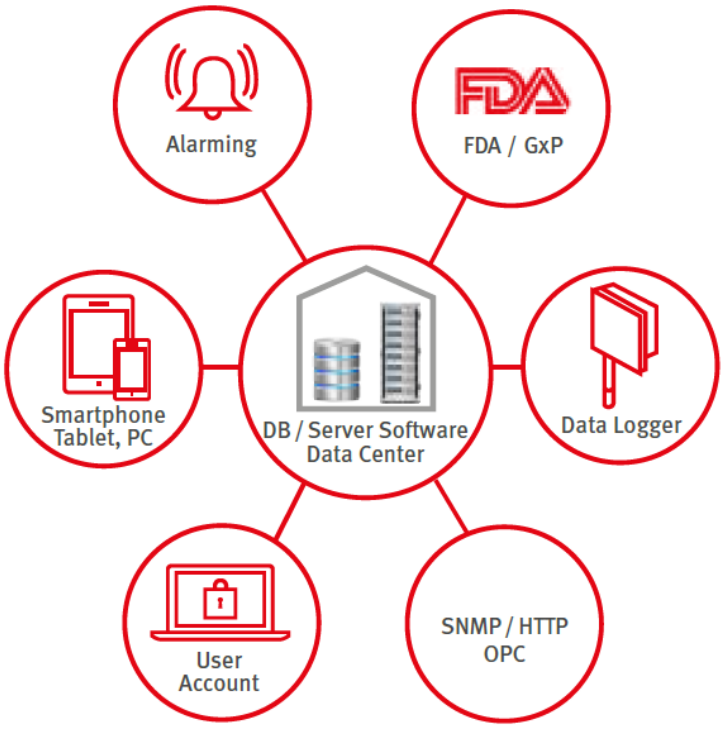
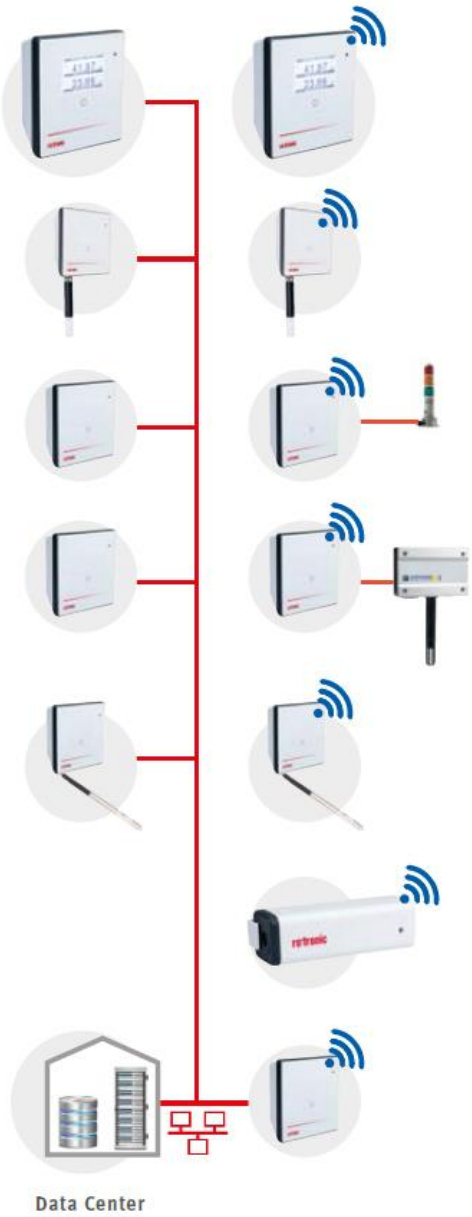


Figure 1: Schematic diagram of the RMS with the server software and database at the heart

1.2 *Device Overview*

All devices can be configured as wanted as modules of the system. The following table shows all basic types of the RMS devices. Almost all modules[1] have the following options:

- Interface: Ethernet / Wireless
- Housing: Wall housing / DIN top hat rail housing



Display Module
The display module can show any values from the RMS network. Humidity, temperature and switch states can be configured per software.

Standard Logger
Records the measured data of the digital HygroClip HCD or other RMS probes. Stored in the ring memory, the data are then sent to the server software.

Output Module
Provides two analog voltage or current outputs or is also available as variant with two solid-state relays in order, for example, to switch alarm lamps.

Input Module
Records voltage or current signals from analog devices such as particle counters, flow transmitters or CO2 probes. For example:

- HF5 transmitter (humidity & temperature)
- AF1 transmitter (air flow)
- CO2 transmitter (CO2)
- PF4 transmitter (differential pressure)

Temperature Logger
The loggers can be equipped with various temperature sensors (NTC, Pt100, Pt1000 or K-element). This offers highest flexibility in use.

Mini Logger
A temperature logger with integrated or remote NTC sensor. Instead of a temperature sensor, it is also available with a switch input in order, for example, to monitor door contacts.

Gateway
The gateway is the connecting element between Ethernet and wireless network and forwards the data flow from the loggers to the data centre.

[1] Except for the Mini Logger

1.3 *RMS Digital Input Module*

The digital input module saves all measured data based on event and sends it to the database via Ethernet. The minimum signal pulse length is 100ms. Should the connection be lost, the module stores the data on the internal memory to protect data integrity and fills up the data gaps when the connection has been restored. The device has a battery so that logging of measured data is also ensured in the event of a failure in the external power supply.

The device provides the following basic functions:

- Two input channels (logic level 5 ... 24V or reed contacts)
- Data logging of up to 75,000 measured values
- Transfer of the recorded data to the RMS software
- Firmware update

1.4 *Power Supply*

The digital input module has the following three power supply variants:

- Two 3.6 V lithium thionyl chloride AA batteries
  The power supply of the batteries suffices to carry out measurement and data storage and to operate the wireless interface. Devices with an Ethernet interface must also have one of the following power supplies.
- 24 VDC ±10 % / <100 mA[2] via terminals (V+ / V-)
- Power over Ethernet (PoE), per standard IEEE 802.3af, Class 1

Note on the batteries:
The AA batteries are lithium thionyl chloride batteries available in the industrial trade. All RMS input modules are designed for this type of battery. Only batteries of the same type or with identical characteristic values may be used as replacement batteries.

1.4.1 Type of Battery

Battery Specifications	
Article	RMS-BAT (please see for Details www.rotronic.com)
Type	Li-SOCl2
Capacitance	2100 mAh
Voltage	3.6 V
Dimensions	AA (50.3mm x Ø14.55mm)

[2] Power supply requirements: 24 VDC ±10 % / >4 W nominal / <15W limited power source

1.5 *Inputs / Outputs*

Two channels are available for measuring a digital Boolean value each. The two inputs are switched either via a logic level of 5 ... 24V or a reed contact. When the input status is changed, the device is activated, and measured values are transferred to the database. This means the measurement of the digital inputs is event triggered. The following table lists the main types of RMS devices:

Data Loggers for Interchangeable Probes	
RMS-LOG-L	Data logger, external probe, LAN
RMS-LOG-868	Data logger, external probe, 868 MHz
Temperature Data Loggers	
RMS-MLOG-T10-xxx	Data logger, external probe, 1 x NTC, 868 / 915 Mhz
RMS-LOG-T-xxx	Data logger, internal probe, 1 x NTC, 868 / 915 Mhz
Analog Input Modules	
RMS-MADC-xxx-A	Data logger, 1 x analog input, 868 / 915 Mhz , 0(4)…20 mA
RMS-MADC-xxx-V	Data logger, 1 x analog input, 868 / 915 Mhz , 0…10 V
RMS-8ADC-L-R-A	8 x analog input, LAN, mounting on DIN top hat rail, 0(4)…20 mA
Digital Input Modules	
RMS-DI-L-R	Data logger, 2 x digital input, LAN, mounting on DIN top hat rail
Digital Output Modules	
RMS-DO-L-R	2 x digital output, LAN, mounting on DIN top hat rail

1.6 *RTCC (Real Time Clock Calendar)*

The device has a real time clock calendar. The time is synchronized continuously when connected to the server.

1.7 *Data Logging*

The values of every measurement are saved in the memory with the time stamp. At a measurement interval of one minute, it is possible to save data of more than one month, which corresponds to 70,000 measured values. When the ring memory is full, the oldest values are overwritten. In case of server or network failures, lost of measured data can only happen after one month.
The recording of measured data is always active when the device is integrated in a RMS-WEB system and thus continuous measurements are carried out.

Following measured values are saved:

- time stamp
- actual status of the digital inputs

1.8 *Operating and display elements*

The device has a button and a multi-color LED for operation and display of the operating state. The button is used during commissioning or for switching the device off in battery operation. The device flashes only if the operating state changes, or if the push button is pressed briefly. The displayed device state is updated for each event. In order to prolong the operating time in the battery operation, the LED flashing can be deactivated.

Trigger	Action	LED
Pairing		
1s	Confirms pairing	N x orange, the indicator flashes while the paring request is running
Device status check		
1s	At "online" operation	1 x green, measurement & data transmission succesful 1x orange, measurement succesful, data transfer failed 1x red, low battery (only by battery powered)
Automatic	At status change from the input	

1.9 *Interface*

The device is operated completely via the LAN interface.

1.10 *MODBUS communication protocol*

For direct connection to other systems, the device provides a MODBUS TCP server. Following data is available via MODBUS communication:

Description	Details
Protocol	MODBUS TCP
TCP Port	502

1.10.1 MODBUS register

Device data (FC4: Read Input Registers)

Address	Number	Parameter	Data type	Comment
10000	16	Digital inputs	Unsigned 16 Bit	Bit 0 = Input 1 / Bit 1 = Input 2

Measurement values (FC2: Read Discrete Inputs)

Adresse	Number	Parameter	Data type	Comment
30000	2	Serial number	Unsigned 32 Bit	SN in Hex: e.g. 01ACCBE1 = 28101601

☞ If no communication is performed for more than 30 seconds, the device automatically closes the TCP connection.

2 Dimensions

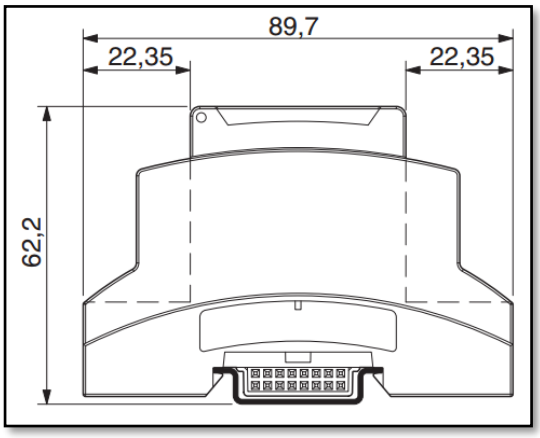


Figure 2: Side view from left of DIN rail housing

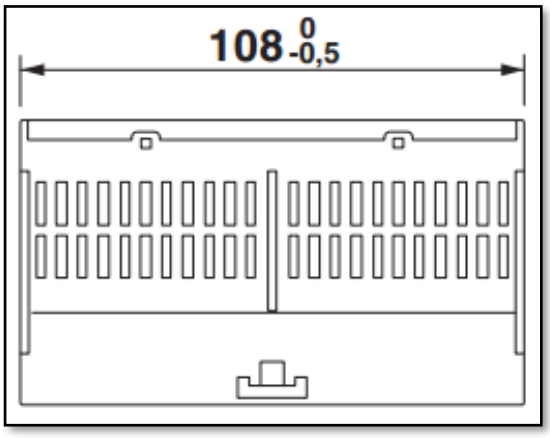


Figure 3: Front view of DIN rail housing

3 Installation

The wall mounting is carried out using a standard DIN rail (EN 50022 / 35mm x 7.5mm). The rail is attached to the wall or in the control cabinet. Then just plug in the device on the DIN rail.

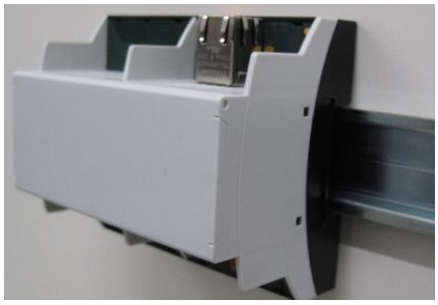


Figure 4: Wall mounting

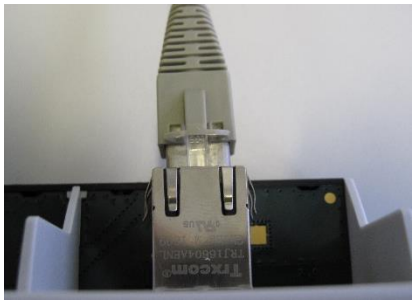


Figure 5: Network cable connection

When plugging the network cable into the device, make sure it clicks in audibly.

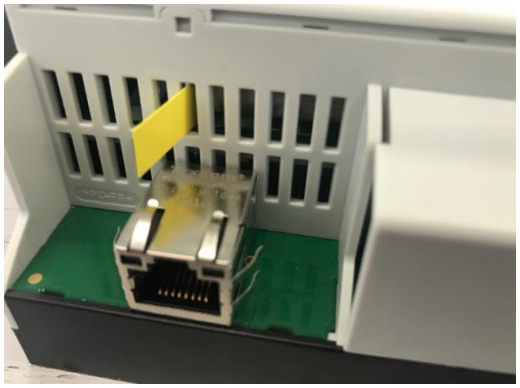


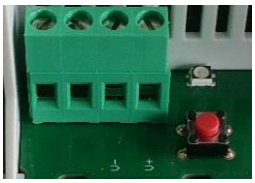
Figure 6: Batterie Stick

Note! Please remove this yellow stick to turn on the battery supply. If you don't remove this stick, you will not be able to record data if the power supply is interrupted.

4 Electrical Connections

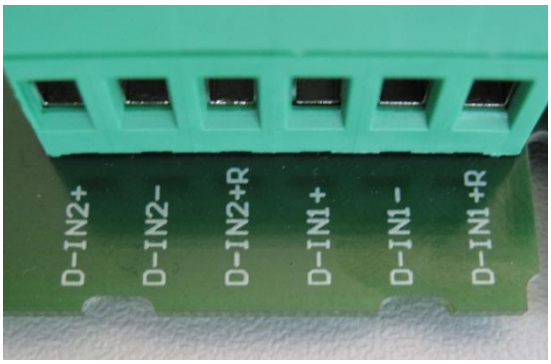
4.1 *Connection of external power supply*

Marking	Function
V+	Power Supply +
V-	Power Supply -



4.2 *Connection of digital inputs*

Marking	Function
D-IN1+R	Input 1 Reed
D-IN1-	Input 1 GND
D-IN1+	Input 1 Input (+ 5-24VDC)
D-IN2+R	Input 2 Reed
D-IN2-	Input 2 GND
D-IN2+	Input 2 Input (+ 5-24VDC)



4.3 *Switch between Input / Reed*

There are 2 options for inputs:

1. Logical voltage level
   User has the possibility to use the input with 5 ... 24VDC as the high level of the digital input.
2. Reed contact
   The two input contacts are connected, e.g. with a relay.

Selection between these two options can be carried out via the software (RMSConfig or Webservice). The two digital inputs can be configured independently.

	D-IN1+	D-IN1-	D-IN1+R	D-IN2+	D-IN2-	D-IN2+R
IN1 Reed		contact-	contact +			
IN1 Input	5…24V	GND				
IN2 Reed					contact -	contact +
IN2 Input				5…24V	GND	

4.4 *Behavior of the inputs*

The measurement of the digital inputs are event-based, which means that the device transmits data to the server only when a voltage level change is detected or the web service requests it at the set interval.
If the inputs are frequently changing, the maximum allowed switching frequency is 0.833 Hz, or a change can be detected every 1.2s.
The inputs are independent, always active and register changes via the trigger. The device is not suitable for pulses shorter than 1.2 seconds.
For the detection of the single pulses, the pulse must be at least 100ms long. The transfer to the web service takes place with 2 different time stamps (1s offset).

Since, especially when using low voltages such as Reed, the input cable length shall be taken into account (refer to the technical data).

4.5 *Behavior in battery operation*

The batteries serve to supply the device with power in the event of a failure in the external power supply. The functionality of the device is restricted in battery mode. The device continues to measure and records all data in the internal memory. The device cannot communicate via the Ethernet interface.
Lithium batteries of the type AA with 3.6 V are used, per section 1.4.1. Make sure they are inserted correctly. The poles are marked on the battery and in the battery compartment.

5 Operation

This section describes all manipulations necessary for operation.

5.1 *Default Configuration*

The devices are configured ex works. All devices with a LAN connection have a standard address for the server with the RMS server software. The standard server corresponds to the Rotronic Cloud. Devices that need to send the data to a different server need to be reconfigured.

LAN Devices

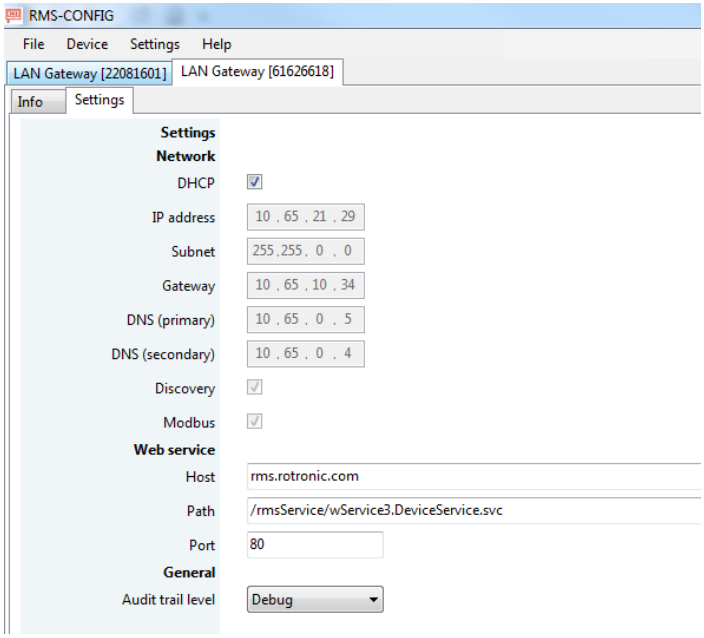
TCPIP configuration: The DHCP server must be on, the configuration is obtained automatically.

RMS-WEB Server URL: http://rms.rotronic.com/wService/wService3.DeviceService.svc

5.2 *Configuration of the LAN Devices with RMS-CONFIG*

If you do not want to connect the device to the Rotronic Cloud, the server must be configured in the device.

- Connect the device to the local network as described in section 3 . Start the RMS configuration software.
- Search for the device under *Device* > *Search* > *Network Device*. The software finds all RMS devices in the local network.
- Enter the host (server address) and the URL of the software services under Settings.
- Finish configuration with *"Write"*.



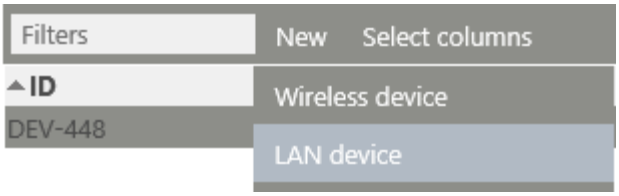
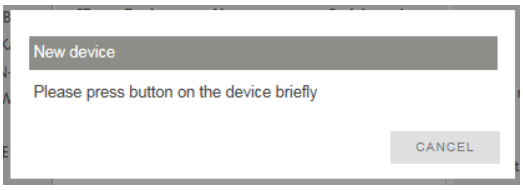
Once they have been configured with the correct server address, the devices can then be integrated into the server software. Details are described in the manual **E-SM-RMS-WEB**.

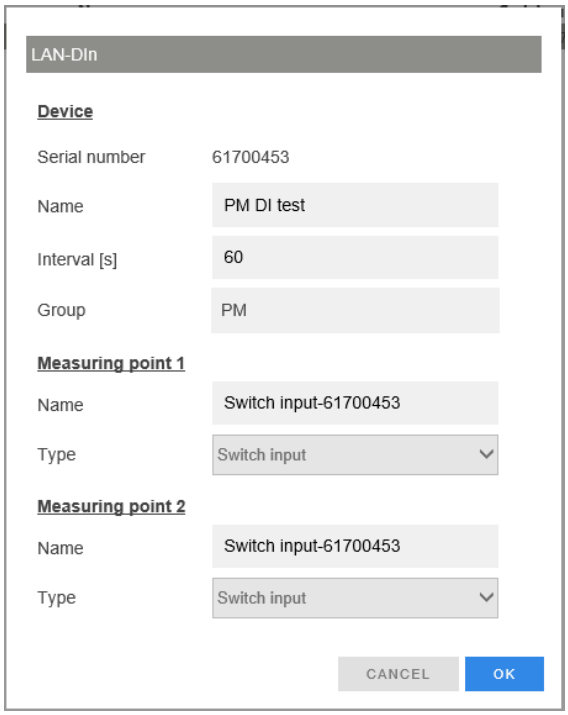
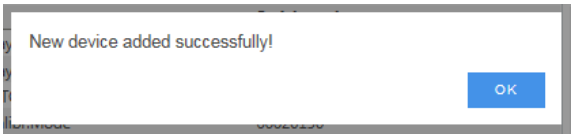
5.3 *Integration in the RMS-WEB Software*

To integrate the device, port 80 must be enabled in your network and a DHCP server must assign the IP address to the device. The device must be able to reach the server with the RMS server software or the Cloud.

The devices can also be given a static IP address if there is no DHCP server available in the network.

Integration of the device (Pairing) in 6 Steps

1	If you do not want to connect the device to the Rotronic Cloud, the server must be configured in the device. • Connect the device to the local network and start the RMS configuration software. • Search for the device under *Device* > *Search* > *Network Device*. The software finds all RMS devices in the local network. • Enter the host (server address) and the URL of the software services under Settings. • Finish configuration with "*Write*".
2	Log into the RMS software / Cloud. Select *Extras* > *Setup* > *Devices* > *New LAN Device* 
3	Enter the serial number of the device. The device flashes orange. 
4	Press the button on the device briefly. The device stops flashing. 

5	Configure the device. 
6	Finish configuration. 

You can find details in the instruction manual for the RMS server software: **E-SM-RMS-WEB**

5.4 *Function Overview*

Overview of the main software functions of the device

► Digital inputs	The device detects status changes at the input and sends these to the RMS-WEB software. The states can also be queried via Modbus TCP.
► Discovery	With Discovery it is possible to find devices in the subnet with the RMS configuration software irrespective of their IP configuration and to change their settings.
► IP configuration	The devices can have static or dynamic IP configurations. It is recommended that you use a dynamic IP configuration whenever possible. If fixed IPs are used, the network topology must be considered exactly.
► RMS Web Server settings	Every device has the server address and software path of the RMS server software stored in it in order to build up communication with the RMS server software. The two parameters can be set with the RMS configuration software: • **Host**: Address of the server with the RMS software • **Server path**: Server path where the server software is installed.
► Audit Trail	The device stores events when changes are made to the configuration.
► Save measured data	The measured values of every measurement are saved in the internal ring memory (75,000 measured values). If the data cannot be sent to the server software directly, they are kept in the device and then sent later as soon as the connection to the server software has been restored. Measurements are still carried out in case of PoE power failure.
► Battery mode	If the external power supply (24 VDC / PoE) fails, the device runs in battery mode. Measurements are still carried out at the set interval and the data saved in the ring memory (75,000 measured values).
►Firmware update	The firmware of the device can be updated directly via the RMS server software.

6 Maintenance

Even the best technology needs regular maintenance. This chapter describes the most important points.

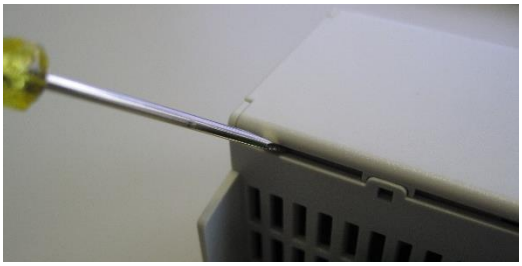
6.1 *Battery Replacement*

The batteries last 1.6 years with 1 minute event interval, and 3 years with a 5 minute event interval. The device shows automatically when the battery needs to be replaced.

- LED flashes red
- System message in the RMS server software

The following steps are necessary to replace the battery:

- Press the front flap of the housing, which is labeled with Rotronic, with a very narrow object.
- Remove the old battery and insert a new one



The time setting of the data logger is synchronized automatically after the battery replacement.

Important:

- The battery life depends on the ambient temperature. Low or high temperatures can lead to a shorter battery life.

7 Firmware Update

The firmware can be updated with the RMS server software. Firmware updates are available for downloading on the Rotronic website.

8 Technical Specifications

Device specific data	
Device type	RMS digital input module
Number of inputs	2 independent digital inputs
Input frequency	Max: 0.833Hz, btw. 1.2s
Pulse detection time	Min: 100ms
Input circuit	Logic levels: 0V / 5-24V Triggering-threshold: ~3,77V Current consumption: <1mA
Reed circuit	Max. load at input: 100kΩ
Max. input cable length	<3m

General data LAN devices	
Range of application	-40…70 °C / 0…100 %RH, Not condensing
Storage and transport conditions	-40…30 °C / 0…90 %RH
Max. altitude of operation	2000 m.a.s.l.
Data memory	75'000 measured values
Interfaces	Ethernet
Cable length ethernet	<30m min. Cat. 5

Power Supply	
Supply voltage	24 VDC ±10 % / <100 mA[3] PoE: 802.3af-2003, Class 1 Battery
Polarity protection	Yes
Current consumption	<100 mA
Battery life	~2 years (at 23 °C)

[3] Power supply requirements: 24 VDC ±10 % / >4 W / limited power source

Start Time and Measurement Interval	
Start time	10 s (typical)
Logging frequency	Event triggered & interval (10 s to 15 min)

Housing Specifications	
Housing material	PC (Polycarbonate)
Dimensions	108 x 89,7 x 62,2 mm
Weight	200 g
IP protection class	IP20
Fire protection klass	UL94-V0

Conformity		
EMV-directives 2014/30/EU	EN 61326-1 EN 61000-6-2 EN 55011 EN 55032	IEC 61326-1 IEC 61000-6-2 IEC CISPR 11 IEC CISPR 32
LVD- directives: 2014/35/EU	EN 61010-1 Performance criterion: www.rotronic.com	IEC 61010-1
RoHS-directives: 2014/65/EU	EN 50581 Soldering material: Lead free	
FDA / GAMP directives	FDA CFR21 Part 11 / GAMP5	

9 Additional Documents

Document Name	Contents
E-IM-RMS-WEB	Instruction Manual: System Installation
E-SM-RMS-WEB	Instruction Manual: System Startup
E-OM-RMS-WEB	Instruction Manual: System Operation

10 Document Version

Version	Date	Notes
V1_0	August 2017	First version
V1_1	February2018	Revision