IOM MARS

GMS Datalogger

RAPHAEL VALVES INDUSTRIES

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1. INTRODUCTION

MARS is a GSM datalogger designed for its operation on manholes and high humidity environments (IP68 degree). Moreover, this equipment integrates the state-of-the-art technologies in wireless communications with a unique price-performance ratio, setting a new standard in control of water distribution networks industry.

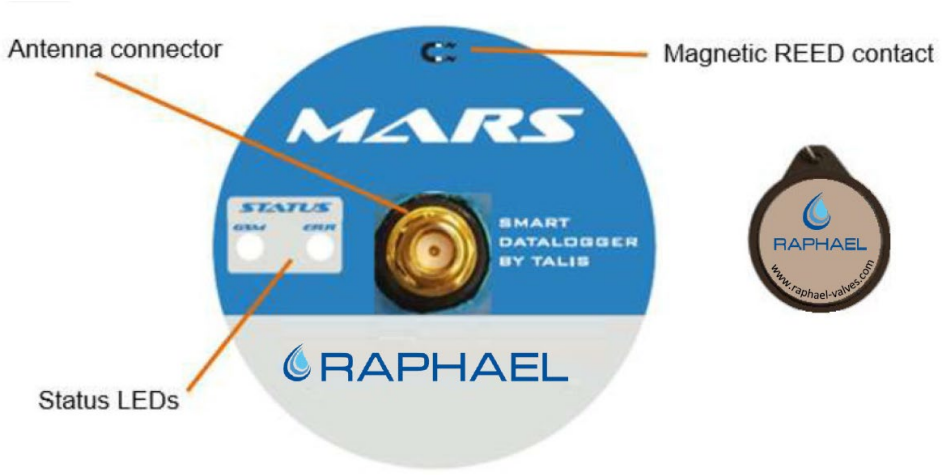
The device has 2 digital inputs that can be used for either reading flowmeters or general-purpose alarms and optional pressure transducer (0-10bar). Thanks to its low power consumption and high-capacity lithium batteries five years of operation are obtained in standard running conditions (flow/pressure record every 5 minutes and a daily transmission). For wireless connectivity, the **MARS** uses the Bluetooth LE (4.0) to set local communication with a PC. Data transmissions can be carried out using the GPRS, 3G or NB-IoT networks.

Simplicity in installation and diagnosis is the key feature of the **MARS**. Thus, he most important parameters of the device can be easily seen through status LEDs that indicate the GSM field strength and possible detected errors, all without needing any special equipment. Battery and SIM card are easy to replace by the user without compromising water tightness.

These features become the **MARS** the most suited device to be installed in water distribution networks, where water flow turns into the most important parameter to be controlled.

This manual provides basic information for installing the equipment RAPHAEL recommends a careful reading to ensure optimum performance of the **MARS** device.

2. PRODUCTION DESCRIPTION



Status LEDs: The MARS has two LED indicators: GSM LED and ERR LED that are used to inform about the hardware status, GSM signal strength and Bluetooth connectivity. Active only when the device is turned on.
Antenna connector: SMA type antenna connector for GSM modem.
Magnetic REED contact: Put the reed over a magnet during 5 seconds to turn the MARS on manually. Once turned on, the device will activate the status LEDs, the GSM modem and Bluetooth connectivity for 10 minutes.

2.1 Status LED blinking codes

GSM Red LED blinks	GSM Green LED blinks	GSM Yellow LED blinks	Meaning
0	Solid	0	The device is paired via Bluetooth with your PC
½	0	0	GSM Modem not registered
½	1	0	GSM Modem registered, insufficient signal strength
½	2	0	GSM Modem registered, sufficient signal strength
½	3	0	GSM Modem registered, good signal strength
½	4	0	GSM Modem registered, excellent signal strength
½	5	0	GSM Modem registered, excellent signal strength
½	0	1	Hardware failure
½	0	2	SIM card not detected
½	0	3	SIM card locked by PIN or PUK code

GSM Red LED: 1 – device is not in Bluetooth pairing mode; 2- Device is in Bluetooth pairing mode

Inputs connector: 4 wire cables to connect digital inputs & flexible tubing to pressure sensor (push-it connection)
Threaded ring: used to link the two parts of the device.
Wall Mount: This mounting allows to assembly the device on a wall without needing any tool.

3. OPERATION

3.1 Turning On and Power Management

A battery powered device requires a strict energy control for extending battery life as many years as possible. To achieve that, the **MARS** operates by default in an ultra-low consumption mode, the so called “Sleep mode”.
This running mode keeps some features inactive, such as the GSM modem and the main CPU, so the data transmissions will not be available. The functions that are active in sleep mode are the scanning of digital inputs. The device will exit from the “Sleep mode” under the following circumstances:
Activation of a digital input alarm: activating GSM communications and reporting the alarm as the configuration requires.
Timer runs out: The actions configured in the timers are executed regardless of whether the device is operating in “Sleep mode”.
Via magnetic reed. Device will turn on when a magnet is put on the magnetic reed icon for 5 seconds. Once it is turned on, the device will perform next actions: Turning on the modem for 10 minutes. During this period, the device will be available to set connection via GSM or SMS.
Single data transmission via GSM of the registered data to the Zeus Server.
Activation of Bluetooth connectivity: For 10 minutes, the device will be ready to be paired.

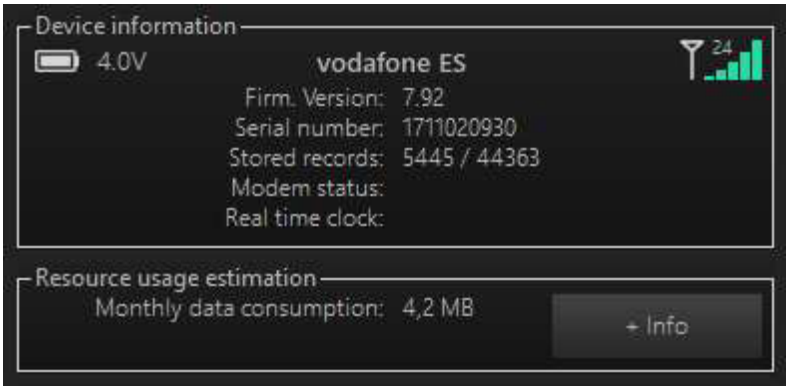
3.2 Battery Lifetime

Estimated battery lifetime is shown below:

Data to register	Log frequency	Data transmission frequency	Battery life*
1 or 2 flows	5 minutes	24 hours	5 years
1 flow & 1 pressure	5 minutes	24 hours	5 years

* Test conditions: Temperature 20ºC, RSSI: -93dBm and data downloaded to a Zeus Server via GPRS.

Any operational deviation from this specification may exhaust the battery faster, particularly sending data more frequently. Confitool, **RAPHAEL's** universal configuration software, provides an estimation of the battery life depending on the configuration settings. In case of any doubt, please, revise configuration software or contact our technical staff.



4. HARDWARE INSTALLATION

Opening and closing the MARS device is the first step to install the SIM card and to change the batteries. Please read these instructions carefully before taking any step.

4.1 Opening the MARS

1. Untighten the threaded ring.

2. Separate the cylindrical cover and the bottom part of the device.

The upper cover forms a whole with the electronic control board that contains the battery and comes out with it.

Note wall mount:

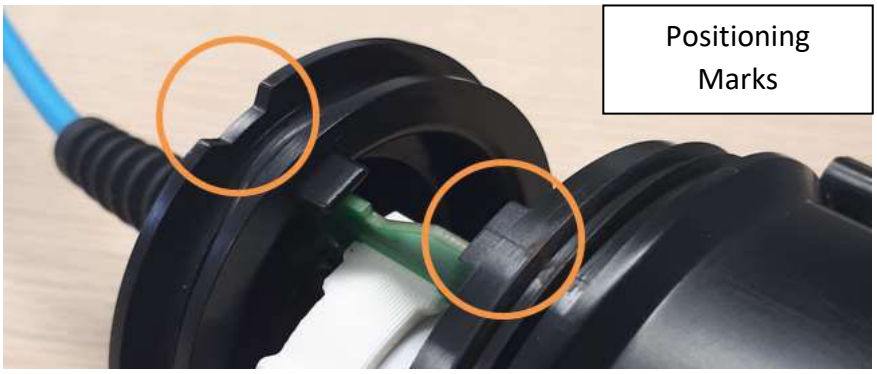
To detach the MARS from the wall mount just pinch with your fingers over the fasteners located behind the threaded ring, as shown in the picture.

4.2 Closing the MARS

It is mandatory to close the device as described in this manual.
The water tightness failures caused by bad closing procedure is not covered in the warranty.

1. Introduce the electronic board that contains the battery and the SIM card into the cylindrical cover until the positioning notches get together. Ensure that:

The positioning marks are aligned.



The electronic board is located between the guiding rails.

2. Tighten the threaded ring.

Replace the gasket whenever you open the **MARS**.
Gaskets are inexpensive and ensure water tightness.

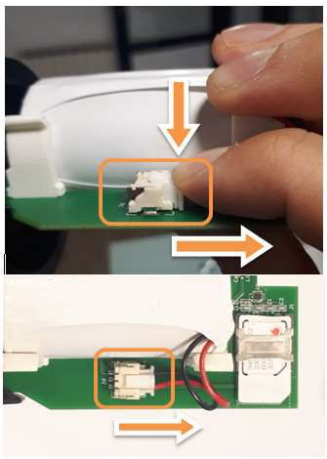
4.3 SIM card Installation

1. Open the device and lift the whole cover-electronic board until you can see the SIM card slot.
2. Insert SIM card as shown in the Figure.
3. Close the device following the instructions in" Opening and closing" (sections 4.1 & 4.2).

The inserted SIM card must have the pin code requested disabled.

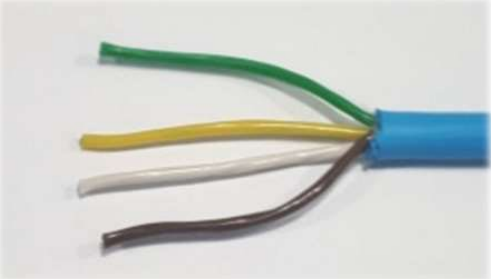
4.4 Changing the Battery Pack

1. Open the device and remove completely the electronic board that contains the battery.
2. Disconnect the battery from the circuit, pushing on the locking tab. See the picture below.
3. Pull out the battery from the electronic board, pushing the bottom part of the battery.
4. Install the battery, putting it on the electronic board and pushing the upper part of the battery.
5. Connect the battery to the electronic board.
6. Close the device following the instructions in" Opening and closing" (sections 4.1 & 4.2).



4.5 Connections. Full list of Signals

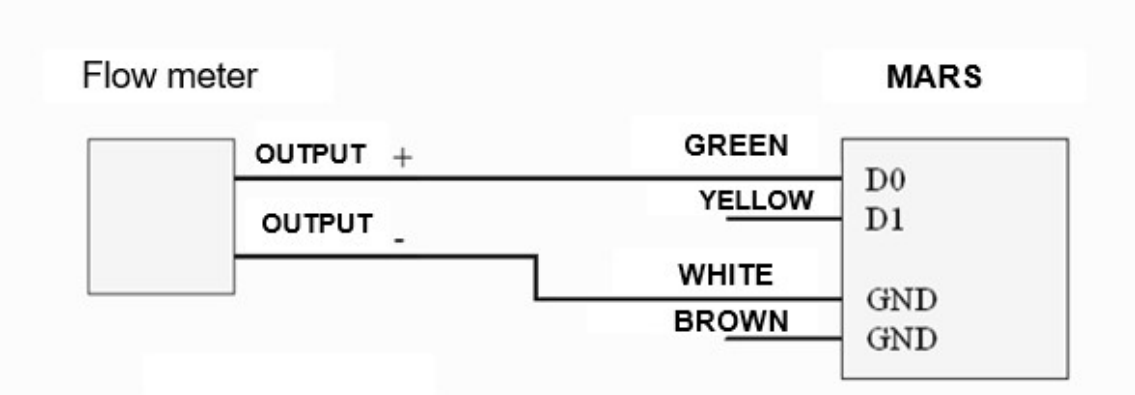
Signal	Description	Color
DO	Digital Input 0	Green
DI	Digital Input 1	Yellow
GND	Gound. 0 Volts	White
GND	Gound. 0 Volts	Brown



- All signals are activated by contact to ground. Unused signals should remain unconnected.
- Depending on **sampling rate** set to 64 or 256 Hz, the minimum pulse width of the pulse is 18 or 5 ms respectively.

4.6 Digital Flowmeter – Connection example

The schema below shows how to connect a digital flowmeter to one of the MARS potential free contacts. In this case, the flowmeter is connected to the digital input 0 (D0).



- Replace the gasket whenever you open the MARS.
- Gaskets are inexpensive and ensure water tightness.

5. CONFIGURATION

MARS device can be programmed by the user, so an initial configuration through Confitool, RAPHAEL's universal configuration software, is needed to start it. For further information, please, refer to the software configuration manual included in the CD.

6. TECHNICAL SPECIFICATIONS

GENERAL	
Power supply	Lithium battery: 6V, 14 Ah
IP degree	IP68.2 meters and 100 days
Operating conditions	Between -20°C to 75°C
DSM radio modem	U-Blox. Available to use GPRS, 3G & NB-IoT
Real time clock	High accuracy real time clock. Automatic NTP synchronization
Connectivity	Bluetooth LE (4.0)
DIGITAL INPUTS	
Quantity	2 pieces. All of them can be used with flowmeters
Sampling frequency	64 Hz/256 Hz
INTERNAL PRESSURE SENSOR	
Number	1
Range	0-10 bar
Precision	0.4 %

7. WARRANTY

1. **RAPHAEL** VALVES INDUSTRIES (1975) Ltd. guarantees that this product is free from defective parts or workmanship issues for 5 years. During the warranty period, **RAPHAEL** is limited to cover the repairing or replacing any of the equipment's parts free of charge in case the examination performed by **RAPHAEL** technicians reveals that the malfunctioning of the equipment is caused by a defective part or workmanship issues.
2. Warranty services will be provided only under the following conditions:
3. **RAPHAEL** has been noticed in writing about the defects during the period of 5 years since the date of the equipment purchase.
4. The equipment has not been maintained, repaired, or altered by any person who is not previously approved or authorized by **RAPHAEL.**
5. The equipment has been used properly and it has not been modified, broken, damage by accident or another similar catastrophic incident.
6. The purchaser, either a DISTRIBUTOR or a DISTRIBUTOR's client, must pack and send or delivers the equipment to **RAPHAEL** `s facilities placed Or Akiva (Israel) within a maximum of 30 days after **RAPHAEL** had received a written notification. The shipping charges to **RAPHAEL** facilities will be borne by **RAPHAEL** if sent from within Israeli territory.

7. The DISTRIBUTOR or the DISTRIBUTOR's clients may send the equipment directly to **RAPHAEL** if the DISTRIBUTOR is unable to repair the equipment, even if it has been approved to do so, and the DISTRIBUTOR has agreed with the client to have the repairs performed as covered by this limited warranty.
8. In case that a product needs to be returned to **RAPHAEL** for repair under the warranty, the DISTRIBUTOR must contact **RAPHAEL** prior to sending to receive a Return Material's Authorization number (RMA).