IOM APOLLO

GMS Datalogger

RAPHAEL VALVES INDUSTRIES

Sep-24

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WARNING

1.- This system has been developed to be installed by trained professionals, not by end users. In case of any technical doubt, please, contact our experts.

2.- Our innovation effort both in software and hardware is constant. However, although paying close attention to properly documenting our products, inconsistencies between the product and any specification may be found. In this way, in case of any doubt or comment, please, contact us through the following email: lmor@raphael-valves.com.

3.- Communications based on GSM network are extremely reliable. Nevertheless, we don't recommend using our equipment in critical systems without any redundancy in the communications network, as it can temporarily be out of order.

4.- "Vital support": This unit has not been designed to be applied in systems on which human life depends, that is, in devices whose malfunction may put human life at risk.

5.- Our liability for the equipment will be limited to its repair or restitution in terms provided by the warranty.

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1. INTRODUCTION

The APOLLO is a GSM data logger designed for its operation on manholes and high humidity environments (IP68 degree). Moreover, this equipment integrates state-of-the-art technology in wireless communications and pressure transient's detection, putting the APOLLO at the cutting edge of its sector.

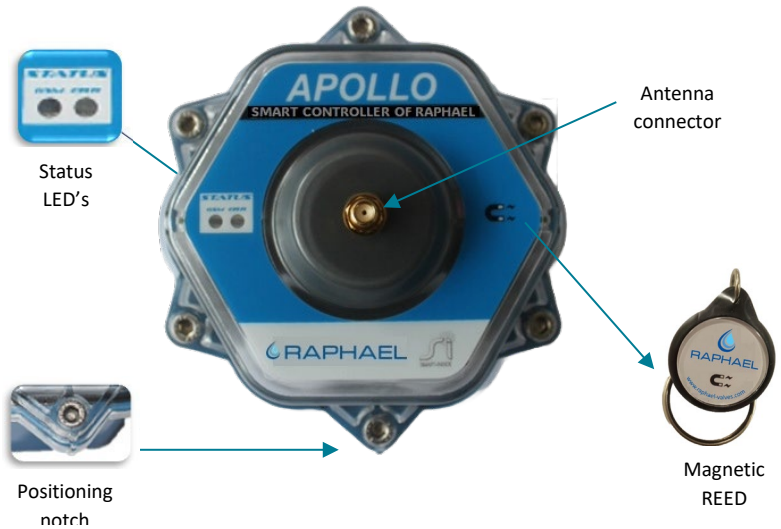
The device has 4 digital inputs that can be used for either reading flowmeters or general-purpose alarms, and 2 analogue inputs that can operate in voltage or 4/20 milliamperes current loop modes. To power the analogue transducers, there are 2 voltage outputs that can source from 5 to 24 volts, allowing the use of both standard industrial transducers and low power ones. Thanks to its low power consumption and high-capacity lithium batteries, ten years of operation are obtained in standard running conditions (flow record every 5 minutes and a daily transmission).

The equipment can integrate up to 2 pressure sensors. One of the sensors is specially designed to register the pressure transients and water hammers with high accuracy, thanks to its capacity to read up to 128 samples per second. For wireless connectivity, the APOLLO 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 Nemos N200+. Thus, the 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.

This manual provides basic information for installing the equipment. The enclosed CD contains the software configuration manual and the commands manual. **RAPHAEL** Valves Industries recommends careful reading to ensure optimum performance of the APOLLO device.

2. PRODUCT DESCRIPTION



Status LEDs: The APOLLO has two LED indicators: **GSM LED** and **ERR LED** that 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 for 5 seconds in order to turn the APOLLO on manually. Once turned on, the device will activate the status LEDs, the GSM modem and Bluetooth connectivity for a specified time.

Position notch: Notch for the alignment between top cover and body

2.1 Status LEDs blinking codes

GSM Red LED blink	GSM Green LED blink	ERR 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 and outputs connector: 10 pins Connector for the inputs and outputs.

External Power and MODBUS connector: 6 pins connector for MODBUS RTU RS-485 interface and for powering the device with an external power supply (9-30 Vdc).

Pressure connections 1 and 2: Pressure inputs for the pressure gauges. PUSH-TO-LOCK connection type for 8 millimeters hose, as option.

3 Operation

3.1 Turning on and power management

A battery powered device requires strict energy control for extending battery life as many years as possible. To achieve that, the APOLLO operates by default in an ultra-low consumption mode, the so called “Sleep mode”. This operation mode keeps some features inactive, such as the GSM modem and the main CPU, so data transmissions will not be available. Functions active in sleep mode are scanning of digital inputs and reading of water pressures.

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 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.

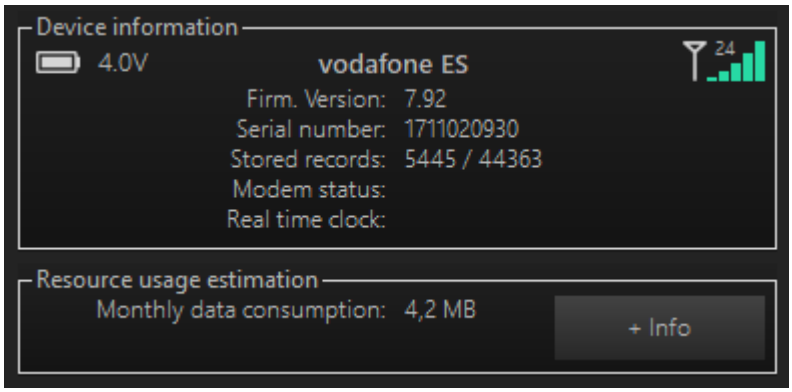
3.2 Battery lifetime

Estimated battery lifetime is shown below:

Data to register	Log frequency	Data transmission frequency	Battery life*
1 flow	5 minutes	24 hours	10 years
1 flow & 1 pressure	5 minutes	24 hours	10 years
1 flow & 1 pressure (high frequency)	5 minutes	24 hours	5 years

* Test conditions: Temperature 20ºC, RSSI: -93dBm, single battery pack 7,2v/14AH 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. **Configurator**, **RAPHAEL**'s universal configuration software, provides an estimation of the battery life depending on the configuration settings of the device. In case of any doubt, please, revise the configuration software or contact our technical staff.



4 Hardware Installation

Opening and closing the Apollo 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 APOLLO

1. Remove the 6 Allen screws that secure the upper cover.
2. Carefully lift the upper part of the cover. For full separation of the upper and body parts, the batteries must have been disconnected.

WARNING!

The upper cover forms a whole with the main electronic control board and will come out with it.

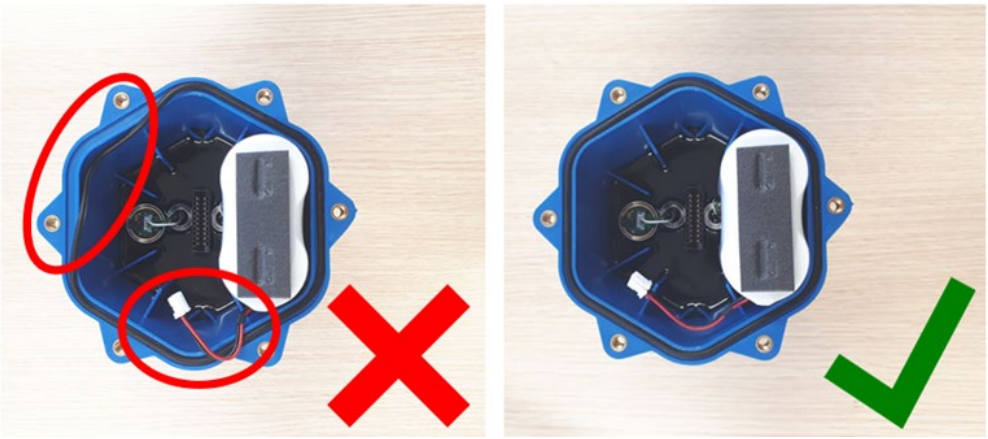
Please, pay particular attention to the cables that connect the battery to the board in order not to subject them to excessive stress.

4.2 Closing the APOLLO

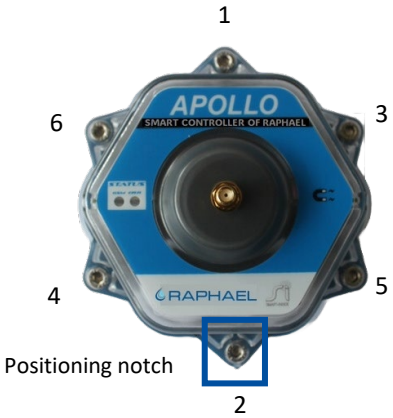
WARNING!

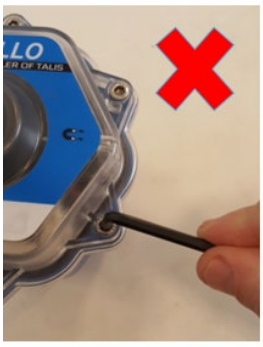
It is mandatory to replace the gasket whenever you open the Nemos N200+. Gaskets are inexpensive and ensure water tightness.

1. Put the gasket in correct position.
2. Put the battery cables into the body. If the cable gets over the gasket, the water tightness can be compromised.



3. Introduce the upper cover and the electronical board into the body. Please pay particular attention to the **position notch** in both pieces.
4. Tighten the 6 Allen screws following the indicated order. The water tightness can be compromised if the screws are over-tightened. We recommend to tighten the screws using the short part (head) of the key





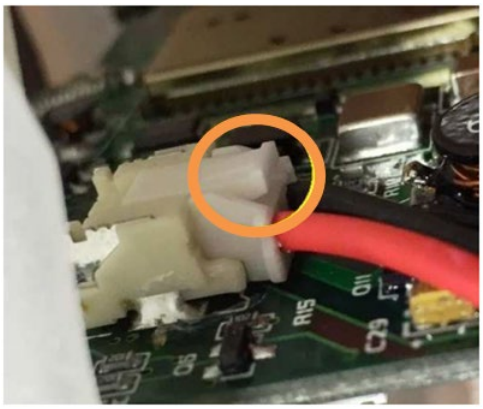
4.3 SIM card Installation

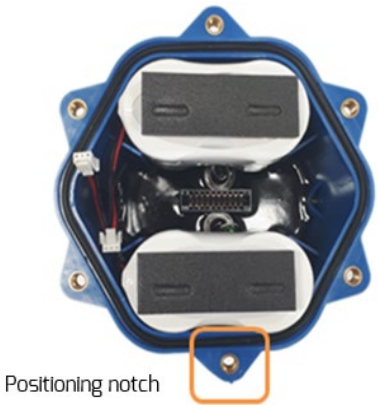
1. Open the device and raise the whole cover-electronic board until you can see the SIM card slot.
2. Insert SIM card as shown in Figure.
3. Close the device.

NOTE: The inserted SIM card must have the pin code request disabled.

4.4 Changing the battery pack

1. Open the device and remove the whole cover-electronic board until you can see the battery connectors. See the picture in the right side.
2. Disconnect the battery from the circuit, pressing on the locking tab. See the picture below.
3. Once the electronic board is disconnected from the batteries, remove the cover assembly so that you have full access to the container for the batteries. Remove the old batteries and install new ones, making sure the wires and gasket are in the best position for connection to the main board as shown in “Closing the device” 4.2. section.





Connections. Full list of input and output signals

Color	Signal	Description
Brown	DO	Digital input 0
Red	D1	Digital input 1
Pink	D2	Digital input 2
Yellow	D3	Digital input 3
Green	O0	Voltage Out 0
White	A0	Analog input 0
Blue	O1	Voltage Out 1
Purple	A1	Analog input 1
Grey	GND	Ground. 0 volts
Black	GND	Ground. 0 volts

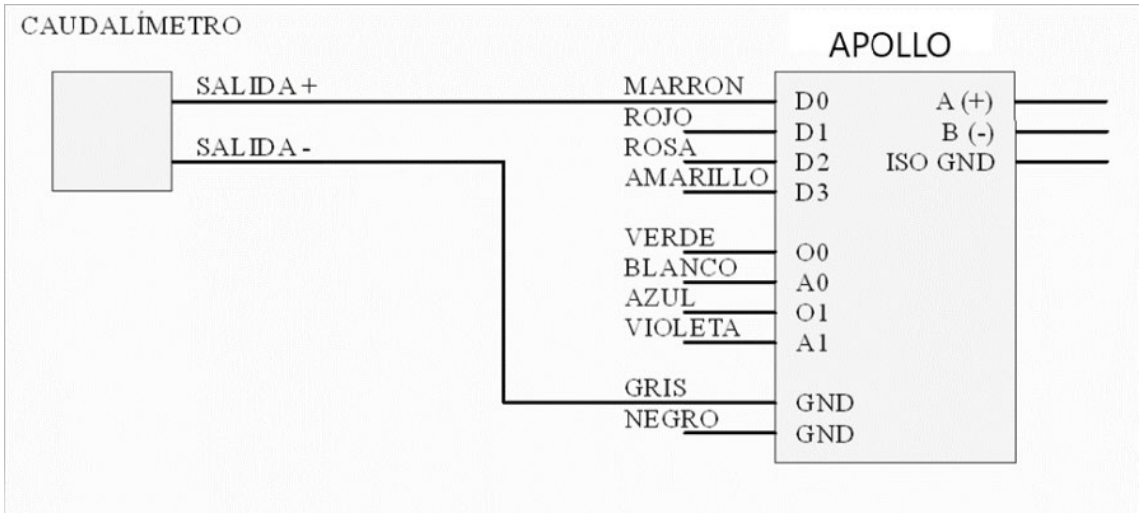
4.5

NOTE:

- 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.

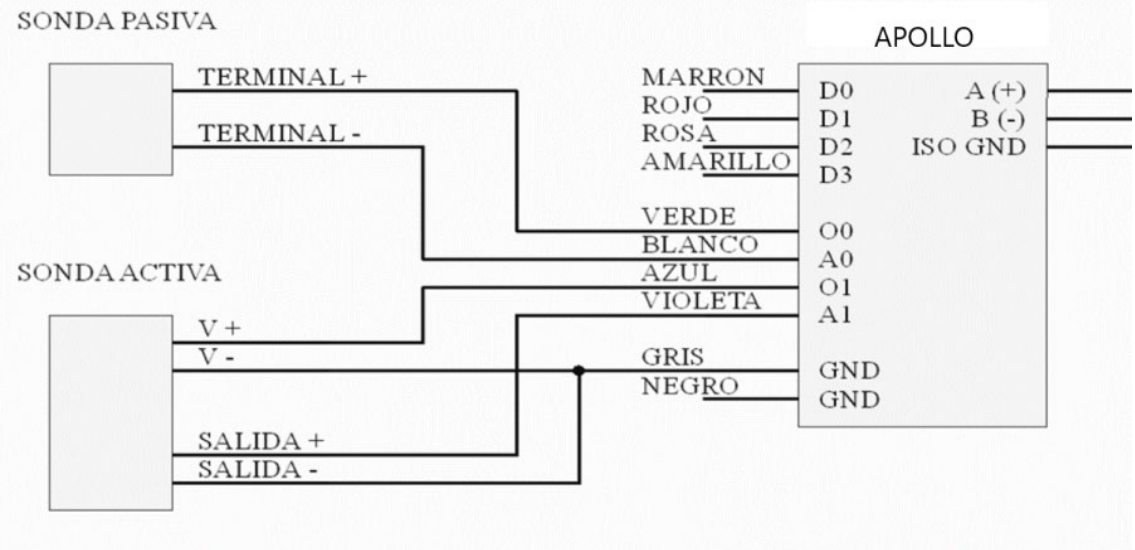
4.5 Digital Flowmeter – Connection example

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



4.6 Analog probe or sensor – Connection example

The picture below shows how to connect two different probes to the APOLLO analog inputs. In this case, the passive probe (two wires) is connected to the analog input 0 (A0) and the active probe (four wires) is connected to the analog input 1 (A1).



4.7 External power and MODBUS connect

Color	Signal	Description
WHITE	**V+**	Positive terminal (9-30 Vdc)
GREY	**0V**	Ground terminal (O Vdc)
YELLOW	**-**	Do not use
BROWN	**A (+)**	MODBUS A(+)
GREEN	**B (-)**	MODBUS B (-)
PINK	**MODBUS GND**	MODBUS Ground

5 Configuration

APOLLO device can be programmed by the user, so an initial configuration through **Configurator**, 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	Single pack: One pair of lithium batteries: 7,2 V, 14 Ah Double pack: Two pairs of lithium batteries: 7,2 V, 28 Ah (Optional)
Ip degree	IP68. 2 meter and 100 days
Operation conditions	Between -20 ºC and +75 ºC
Gsm radio modem	U-blox. Available to use GPRS, 3G and NB-IoT
Real time clock	High accuracy real time clock. Automatic NTP synchronization
Connectivity	Bluetooth LE (4.0)
Communication bus (Optional)	MODBUS RTU RS-485
External power supply (Optional)	Input voltage range: 9-30 Vdc Maximum power: 9 W

DIGITAL INPUTS

Quantity	4. All of them can be used with flowmeters
Sampling frequency	64 Hz/256 Hz
Interface signals	Potential free contacts

ANALOG INPUTS

Quantity	2
Resolution	16 bits
Accuracy	0,1%
Interface signals	0-1 V, 0-10 V or 4/20 mA
Impedance	Voltage mode 2 MΩ, current mode 125 Ω

VOLTAGE OUTPUTS

Quantity	2
Range	5 to 24 Vdc
Accuracy	5%
Max. Output current	40 mA

PRESSURE GAUGES

Quantity	1 or 2 (Optional)
Range	0-10 or 0-20 Bar
Max. Sampling rate	Up to 128 samples per second
Hose diameter	8 mm
Accuracy	0,4 %

7 Warranty

1. **RAPHAEL** Valves Industries (1975) Ltd, warrantees 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. Warranty services will be provided only under the following conditions:

a) RAPHAEL has been notified in writing about the defects during the period of 5 years since the date of the equipment purchase.

b) The equipment has not been maintained, repaired, or altered by any person who is not previously approved or authorized by **RAPHAEL.**

c) The equipment has been used properly and it has not been modified, broken, damaged by accident or another similar catastrophic incident.

d) The purchaser --either a DISTRIBUTOR or a DISTRIBUTOR's client-- must pack and send or delivers the equipment to **RAPHAEL**`s facilities 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 Spanish territory.

1.1. 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.

1.2. If 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 Materials Authorization number (RMA).