MICROCOM

Simply More

NEMOS N200+

second generation

Battery powered GSM IP68 Datalogger

Installation Manual

Revision 22.11

"Perfection is achieved, not when there is nothing more to add,
But when there is nothing left to take away."
-Antoine de Saint Exupery

Warning

1.- This system has been developed in order 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 putting close attention to properly documenting our products, inconsistencies between product and any specification may be found. In this way, in case of any doubt or comment, please, contact us through the following email: microcom@microcom.es.

3.- Communications based on GSM network are extremely reliable. Nevertheless, we don't recommend using our equipment in critical systems without any redundancy in 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

NEMOS N200+ is a datalogger with GSM capability for remote communications. It is a battery powered and suitable for operating in manholes and flood-prone environments. Standard version includes 4 digital inputs, suitable for flowmeters, and 2 analog inputs. Optionally, it can be equipped with MODBUS RTU interface and with up to 2 integrated pressure probes with water hammer detection capability.

The built-in radio modem is compatible with the latest narrowband communication technologies: NB-IoT and CAT.M1 but keeping 2G fallback. As a result, the device can communicate using the most widely used networks (2G) and at the same time is ready to switch to NB-IoT/CAT.M1 when it is needed. Local communication for configuration and diagnostic tasks are made via Bluetooth which allows doing these tasks comfortably from outside the enclosure or manhole.

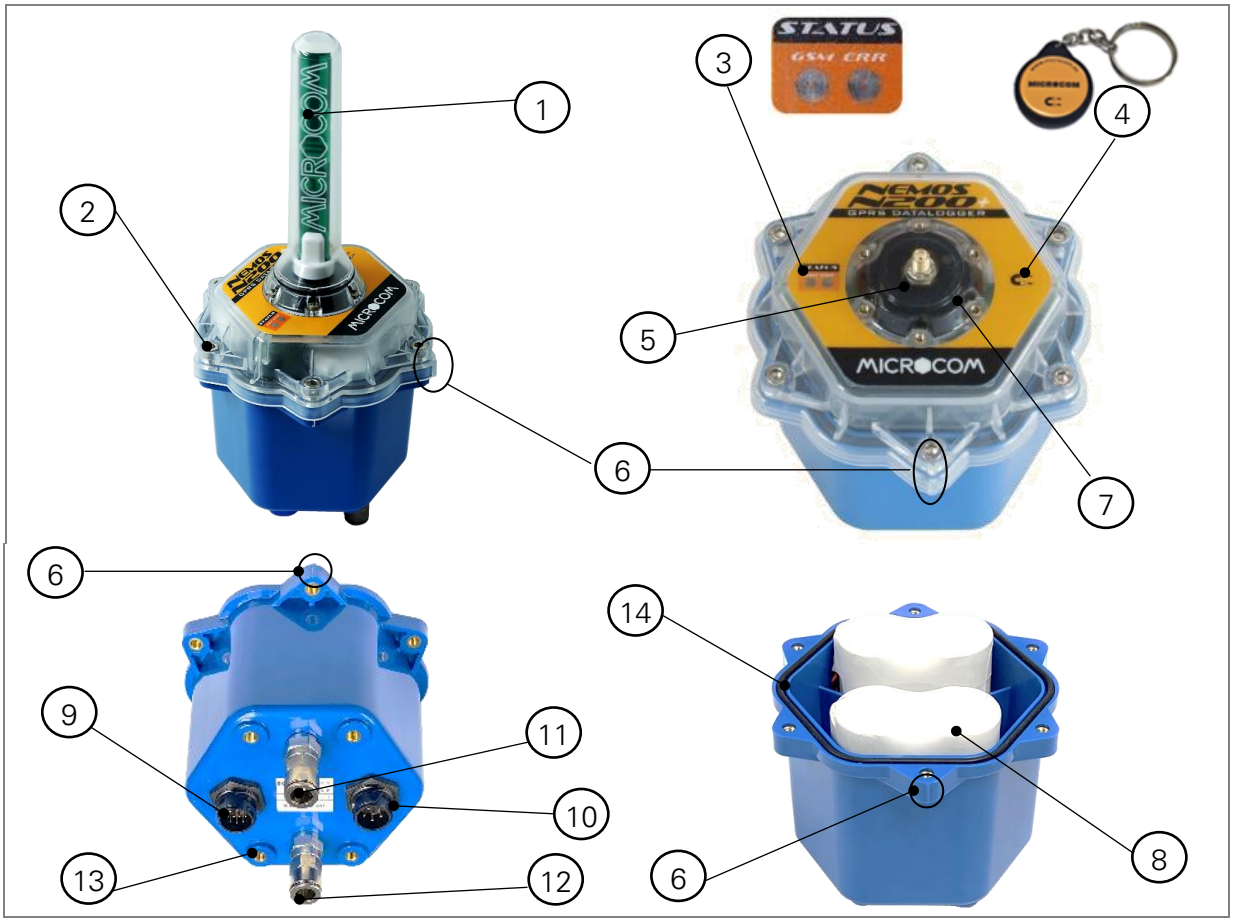
The original concept of detachable antena on the Nemos N200+ offers the best features of an integrated antenna solution, mechanical strength and IP68 protection, and the flexibility to, where necessary, remove the cover and install an external antenna.

- Integrated antenna: the datalogger and antenna form a solid and watertight unit. The half-wave dipole antenna offers excellent performance that surpass the 90%.
- External antenna: Detaching the integrated antenna gives access to a stainless steel SMA connector, thus, the installation of an external antenna is possible.

The acquisition of this system entitles you to free **use of the ZEUSweb monitoring portal.** Register your device and enjoy the convenience of monitoring your dataloggers from the internet and from the Android and iOS mobile applications.

https://www.microcom.es/zeusweb.php

2. Product description



1 ANTENNA ENCLOSURE. Protects Microcom "PEGASUS" antenna
2 TOP COVER AND BODY JUNCTION SCREWS (6)
3 STATUS LEDS. It has two LED lights: GSM LED and ERR LED. These LEDs shows the status of the device, indicating the level of connectivity and possible errors detected. LEDs are active when the logger is "awake". See section "STATUS LEDS blinking codes" for more information.
4 MAGNETIC REED contact. It allows to "wake up" the device by putting a magnet for 5 seconds. Once is "waked up", the logger will turn on the LED lights, GSM modem and Bluetooth for a period of time.
5 ANTENNA CONNECTOR. SMA type.
6 POSITIONING NOTCH. Notches to close the device properly.
7 Holes for ENCLOSURE JUNCTION SCREWS ANTENNA (6)
8 BATTERY PACKS
9 INPUT AND OUTPUT CONNECTOR. Circular connector 10 pins with bayonet fixing where the cable of the inputs and outputs are connected.
10 EXTERNAL POWER CONNECTOR AND MODBUS (Only versions N2x2, N2x3 and N2x4). Circular 6-pin connector with bayonet fixing where the external power cable and MODBUS communication is connected.
11 INTEGRATED PRESSURE PROBE 1 (N21x versions only). "PUSH-TO-LOCK" quick fitting connector type for 8 millimeters pneumatic hoses.
12 INTEGRATED PRESSURE PROBE 2 (N21x and N22x versions only). "PUSH-TO-LOCK" quick fitting connector type for 8 millimeters pneumatic hoses.
13 Holes for FIXING IN SUPPORT PLATE included.
14 HEXAGONAL SILICON GASKET.

2.1. STATUS LEDS blinking codes

LED	*Color*	*Behavior*	*Description*
GSM	**RED**	**Off**	Device is off, in sleep mode or connected to PC via Bluetooth.
		1 blink	Device is on and Bluetooth connection disabled.
		2 blinks	Device is on and Bluetooth connection enabled.
GSM	**GREEN**	**Off**	GSM modem is not registered or device is off.
		1 blink	Insufficient GSM signal field strength.
		2 blinks	Sufficient GSM signal field strength.
		3 blinks	Good GSM signal field strength.
		4 blinks	Excellent GSM signal field strength.
		5 blinks	Excellent GSM signal field strength.
		Continuous	Connected to PC via Bluetooth
ERR	**ORANGE**	**Off**	Proper operation or device is off.
		1 blink	Error: "Hardware Failure"
		2 blinks	SIM card not present.
		3 blinks	SIM card locked by PIN or PUK code.

2.2. Inputs and outputs cable (10 pins)

Color	*Signal*	*Description*
BROWN	**DO**	**Digital input 0**. Activation by contact to GND.
RED	**D1**	**Digital input 1**. Activation by contact to GND.
ROSE	**D2**	**Digital input 2**. Activation by contact to GND.
YELLOW	**D3**	**Digital input 3**. Activation by contact to GND.
GREEN	**O0**	**Voltage output 0**. Configurable: 5 to 24 VDC
WHITE	**A0**	**Analog input 0**. Configurable: 4/20 mA and 0 mA... 10 VDC.
BLUE	**O1**	**Voltage output 1**. Configurable: from 5 to 24 VDC.
VIOLET	**A1**	**Analog input 1**. Configurable: 4/20 mA and 0 mA... 10 VDC.
GREY	**GND**	**Ground**. 0 VDC.
BLACK	**GND**	**Ground**. 0 VDC.

2.3. External power and MODBUS cable (6 pins)

Color	*Signal*	*Description*
WHITE	**V+**	**External power** supply. Voltage input (9-30 VDC)
GREY	**0V**	**External power** supply. 0 VDC
YELLOW	**O0**	**Voltage output 0**. Configurable: 5 to 24 VDC
BROWN	**A (+)**	**RS-485 A(+).** MODBUS RTU
GREEN	**B (-)**	**RS-485 B(-).** MODBUS RTU
ROSE	**MODBUS GND**	**RS-485 GROUND.** MODBUS

3. Operation

3.1. Power management

A battery powered device requires a strict energy control for extending battery life as many years as possible. To achieve that, the Nemos N200+ operates by default in an ultra-low consumption mode called "Sleep mode". This operation mode keeps some features inactive, such as the GSM modem and the main CPU, so the data transmissions will not be available. Functions active in sleep mode are scanning of digital inputs and reading of integrated water pressure proves.

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.

- Timers: 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 placed on the magnetic reed icon for 5 seconds. Once is turned on, the device will perform next actions:
  a) Single data transmission via GSM of the registered data to the Zeus Server.
  b) Turning on the modem for 10 minutes. During this time period, the device will be available to set connection via GSM or SMS.
  c) Activation of Bluetooth connectivity: For 10 minutes, the device will be ready to be paired.

> **Note:** We recommend using a quality Bluetooth adapter in your PC to get the best connection range with your Nemos. At Microcom we can recommend you external adapters with proven performance.

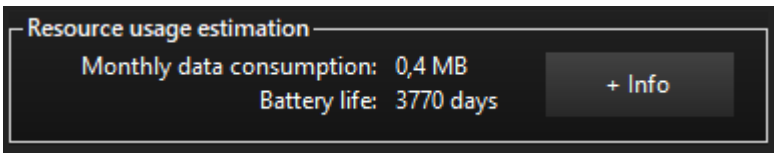
3.2. Battery life

In the following table typical configuration examples and the estimated battery duration are presented.

Signals	*Recording frequency*	*Transmission frequency*	*Battery life**
1 flow	5 minutes	24 hours	10 years
1 flow rate and 1 pressure	5 minutes	24 hours	10 years
1 flow rate and 1 pressure with transients	5 minutes	24 hours	5 years

** Test conditions: Temperature 20ºC, RSSI: -93dBm, simple pack of 7.2v/13AH batteries and download to Zeus server via GPRS.*

Any deviation from this specification may deplete the battery faster, in particular sending data more frequently. MicroConf, MICROCOM's universal configuration software, provides an estimation of the battery life depending on the configuration settings into the device. In case of any doubt, please, revise configuration software or contact our technical staff.

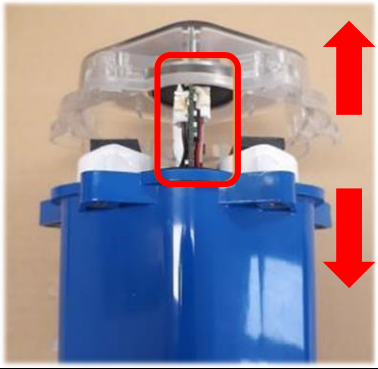


4. Hardware installation

This section indicates how to install and handle the device. Please read the following sections in full before using it.

4.1. Opening

This process is required to access the electronic board and installing the SIM card and batteries.

	Opening	
1	Loose and remove the 6 screws of the top cover that joins the top cover to the body. Use the Allen wrench supplied.	
2	Carefully pull up and separate the top cover from the body. For full separation of the upper and body parts, the batteries must have been disconnected. **Attention!** The top cover forms a whole with the main electronic control board and will come out with it. Please, pay attention to the cables that connect the battery to the board in order not to subject them to excessive stress.	

4.2. Closing

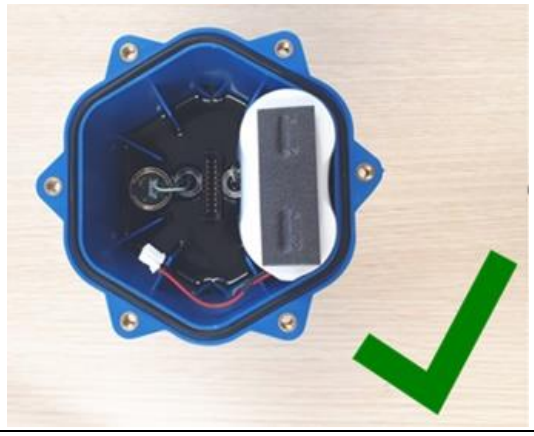
This process is required after installing the SIM card and/or replacing the battery pack(s).

	Closing	
1	Place the rubber hexagonal gasket inside the upper slit of the Nemos N200+ body	

Closing

2 Place the battery pack or packs inside the body.

Attention! Make sure that battery cables are not traped in between lid and rubber joint.



3 Introduce the top cover and the circuit board into the body. Please pay attention to the position notch in both pieces.

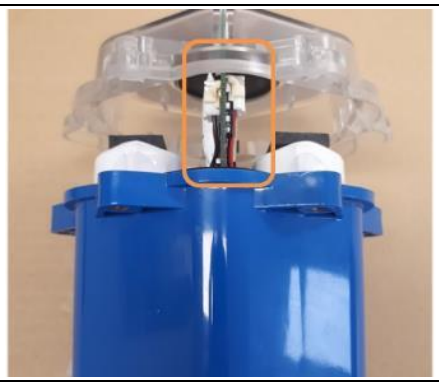
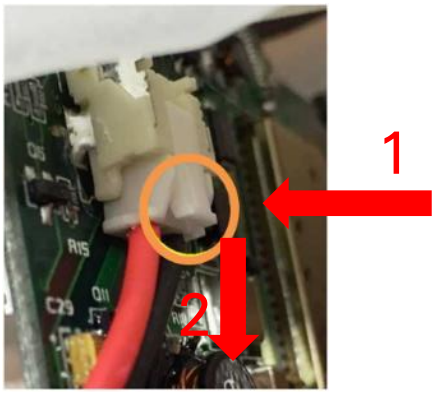
4 Place and tight the 6 Allen screws **following the order shown**. Use the supplied Allen wrench with the equipment.

Attention! An excessive tightening torque can compromise the tightness of the Nemos. A practical way to limit tightening is to **pry with the short side of the key**.

4.3. SIM card installation

	SIM card installation
1	Open the Nemos and raise the top cover until you see the SIM card holder. Follow the steps in section 4.1 of this document.
2	Insert the SIM card as shown in the figure: ▪ Metal part of the SIM towards the electronic board. ▪ Edge cut to 45º to the right (seen from the front) **Note**: The SIM card must have **the PIN code request disabled**. 
3	Close the Nemos. Follow the steps in section 4.2 of this document.

4.4. Battery pack installation

	Battery pack installation
1	Open the device until you have the connectors of the battery or batteries in sight. Follow the steps indicated in section 4.1 of this document. 
2	Disconnect the batteries from the electronic board. Procedure: ▪ Put pressure on the interlocking tab shown in the image. ▪ Pulling out in the direction of the cables 
3	Separate the body from the electronic board
4	Remove exhausted batteries and install new ones. Make sure that the cables are in the most favorable position for connection to the main board and that there is no possibility of them remaining on the rubber hexagonal joint.
5	Close the Nemos. Follow the steps in section 4.2 of this document.

4.5. Antenna cover removal

The Nemos N200+ is shipped with the antenna cover installed. Remove the cover to have access to the integrated antenna "PEGASUS" and the SMA antenna connector. Steps:

Remove antenna cover	
1 Loose and remove 6 screws in the top cover. Use a star screwdriver. 	2 Raise the antenna envelope from the top cover. 
3 Loose and remove the *PEGASUS* antenna by hand. Turn counterclockwise. 	4 Remove the O-ring 

4.6. Antenna cover installation

Install antenna cover	
1 Place the O-ring over the central part of the top cover. Push down the o-ring until it is perfectly fitted 	2 Screw the *PEGASUS* antenna by hand. Turn clockwise and stop when you find some resistance 

Install antenna cover

3 Place the antenna cover **without pressing**. The antenna cover has no positioning mark.

4 **Tight a single screw.** Use a star tip screwdriver

5 **Tight the opposite screw** to the one screwed in the previous step. Use a star tip screwdriver.

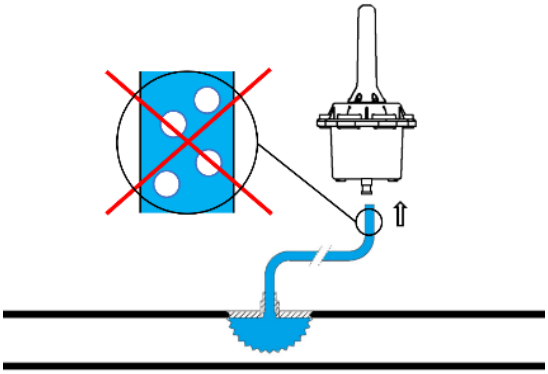
6 Visually verify that the O-ring is held in position. A black stripe should be seen all around.

7 Place and tighten the remaining four screws. Use a star tip screwdriver.

4.7. Connection to pneumatic hoses (N21x and N22x versions only)

The integrated pressure probes have a "PUSH-TO-LOCK" quick fitting connector type for 8 millimeters hoses

Attention! For accurate detection of pressure transients and water hammers, it is necessary to ensure that there are no air bubbles left inside the hose.



5. Configuration

This device is shipped with the battery disconnected and the cover not screwed. The first step to start using the device is to connect the battery as specified in section "4. Assembly and installation" and turn it on following the steps indicated in section "3. Operation"

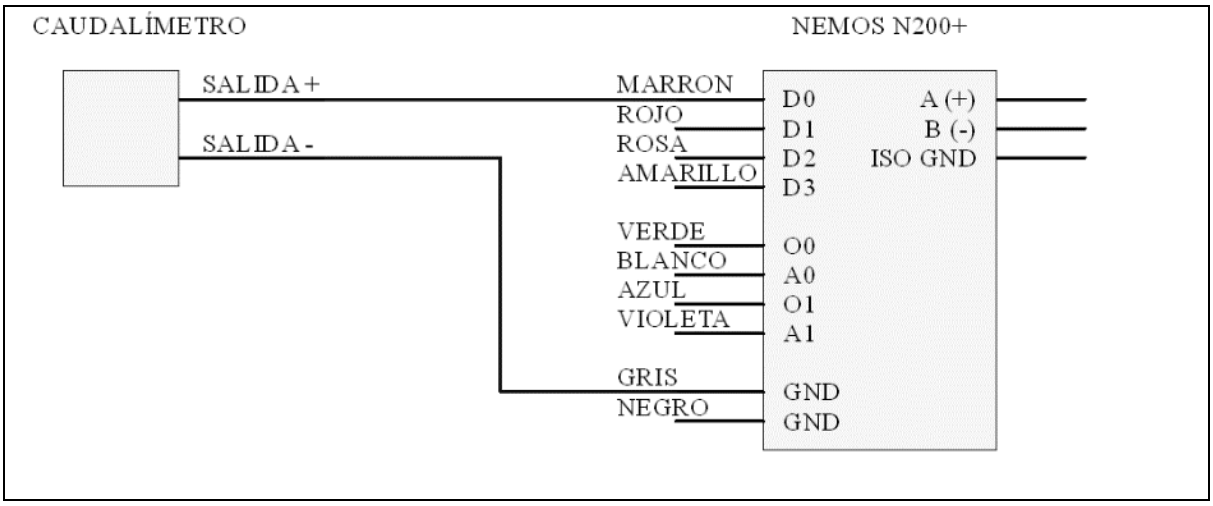
This system **is programmable** by the user. Programming is done using the MICROCONF universal configuration software**.** This software, user manual and video tutorials with programming examples are available for download at the following web link:

https://www.microcom.es/start

6. Wiring examples

6.1. Connection to flowmeter digital output

The schema below shows how to connect a digital flowmeter to one of the Nemos N200+ potential free contacts. In this case, a flowmeter is connected to the digital input 0 (D0).

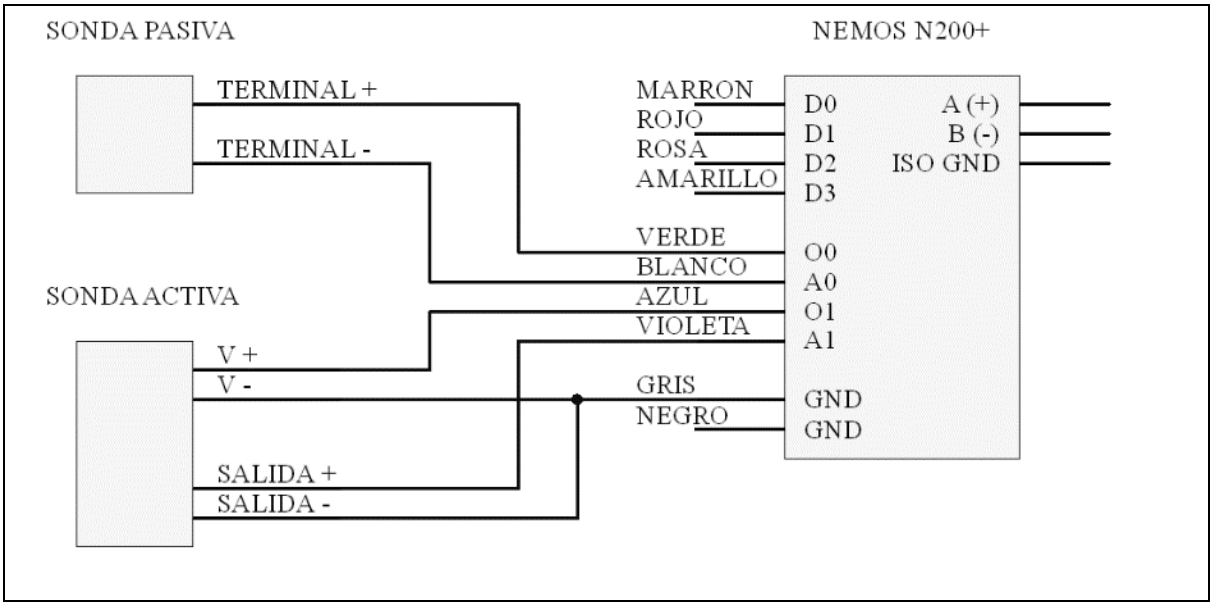


NOTES FOR DIGITAL INPUTS:

- All digital signals are activated by ground contact.
- Unused signals should be left unconnected.
- Depending on the sample rate set to be 64 or 256 Hz, the minimum required width of the input pulse will be 18 or 5 milliseconds respectively.

6.2. Connection to active/passive analog probes

The picture below shows how to connect two different probes to the Nemos N200+ 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).



7. Technical specifications

<table>
<tr><td colspan="2">GENERAL</td></tr>
<tr><td>Battery capacity</td><td>Single Pack: 7.2 V, 13 Ah (N2x0+ / N2x3+ models)
Double Pack: 7.2 V, 26 Ah (N2x1+ / N2x4+ models)</td></tr>
<tr><td>IP Degree</td><td>IP68. Certified at 2 meters deep for 100 days</td></tr>
<tr><td>Radio modem</td><td>
<table>
<tr><th>Version</th><th>Model</th><th>FCC ID</th><th>Bands (MHz)</th></tr>
<tr><td>2G/
NB-IoT</td><td>Quectel
BG95-M3</td><td>XMR201910BG9
5M3</td><td>GSM/(E)GPRS:
850/900/1800/1900
MHz
Cat.M1 / Cat.NB2:
Bands: 1, 2, 3, 4, 5, 8, 12, 13, 18, 19, 20, 25, 26, 27, 28, 66, 71, 85</td></tr>
<tr><td>2G/3G</td><td>U-blox
SARA-U201</td><td>XPY1CGM5NNN</td><td>GSM /(E)GPRS:
850/900/1800/1900
UMTS/HSPA:
800/850/900/1900/
2100 MHz</td></tr>
</table>
</td></tr>
<tr><td>Data logger</td><td>> 90000 data points</td></tr>
<tr><td>Operating temperature</td><td>-20 ºC to +75 ºC</td></tr>
<tr><td>Configuration and diagnostics</td><td>Bluetooth LE (4.0)</td></tr>
<tr><td>Dimensions (cubic)</td><td>Without antenna: 115 x 125 x 150 mm (width, depth, height)
With Antenna: 115 x 125 x 280 mm (width, depth, height)</td></tr>
<tr><td>Exterior materials</td><td>Top cover: Polycarbonate
Body: ABS</td></tr>
<tr><td>Antenna connector</td><td>Male SMA</td></tr>
<tr><td>Antenna included</td><td>Microcom PEGASO. Female SMA. Dipole 1/2 λ (detachable)</td></tr>
<tr><td colspan="2">DIGITAL INPUTS</td></tr>
<tr><td>Quantity</td><td>4. All can be used for reading flowmeters</td></tr>
<tr><td>Sampling frequency</td><td>64 Hz / 256 Hz.</td></tr>
<tr><td colspan="2">ANALOG INPUTS</td></tr>
<tr><td>Quantity</td><td>2</td></tr>
<tr><td>Range</td><td>0-1 VDC, 0-10 VDC or 4/20 mA</td></tr>
<tr><td>Accuracy</td><td>0.1%</td></tr>
<tr><td>Resolution</td><td>16-bit</td></tr>
<tr><td>Impedance</td><td>Voltage mode: 2 MΩ. Current mode: 125 Ω</td></tr>
<tr><td colspan="2">VOLTAGE OUTPUTS</td></tr>
<tr><td>Quantity</td><td>2</td></tr>
<tr><td>Range</td><td>From 5 to 24 VDC. Steps of 1 VDC.</td></tr>
<tr><td>Maximum current</td><td>40 mA</td></tr>
<tr><td colspan="2">PRESSURE SENSORS (models N21x+ / N22x+)</td></tr>
<tr><td>Quantity</td><td>2</td></tr>
<tr><td>Range</td><td>0-10 / 0-20 Bar</td></tr>
<tr><td>Sampling frequency</td><td>Low power mode: 1 Hz
Transient Mode: 8 to 128 Hz</td></tr>
<tr><td>Accuracy</td><td>0.4 %FOE</td></tr>
<tr><td>Hose connection</td><td>Pneumatic quick connect fittings. Ø 8 mm</td></tr>
<tr><td colspan="2">FIELD BUS (models N2x2+ / N2x3+ / N2x4+)</td></tr>
<tr><td>Interface</td><td>RS-485</td></tr>
<tr><td>Protocol</td><td>MODBUS RTU</td></tr>
<tr><td>Channels</td><td>32</td></tr>
<tr><td colspan="2">EXTERNAL POWER SUPPLY (models N2x2+ / N2x3+ / N2x4+)</td></tr>
<tr><td>Range</td><td>9 to 30 VDC</td></tr>
<tr><td>Maximum power</td><td>9 W</td></tr>
</table>

8. Warranty

1. MICROCOM guarantees that this product is free from defective parts or workmanship issues for 5 years. During the warranty period, MICROCOM is limited to cover the repairing or replacing any of the equipment's parts free of charge in case the examination performed by MICROCOM 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) MICROCOM has been noticed 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 MICROCOM
c) The equipment has been used properly and it has not been modified, broken, damage 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 MICROCOM`s facilities placed in Irún (Spain) within a maximum of 30 days after MICROCOM had received a written notification. The shipping charges to MICROCOM's facilities will be borne by MICROCOM if sent from within Spanish territory.
e) The responsibility of MICROCOM is limited to the repair or replacement of any piece of equipment without charge, if the MICROCOM examination reveals that said part has been defective due to failure in the material or in the manufacturing.

1.1. The DISTRIBUTOR or the DISTRIBUTOR's clients may send the equipment directly to MICROCOM 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. In the event that a product needs to be returned to MICROCOM for repair under the warranty, the DISTRIBUTOR must contact MICROCOM prior to sending in order to receive a Return Materials Authorisation
number (RMA).

Disposal of electrical and electronic waste (applicable in the European Union and in other countries with selective collection). The symbol on the product or on the packaging indicates that the product will not be treated as household waste. Instead, it must be delivered to the authorized collection center for the recycling of electrical and electronic waste. Ensuring that the product will be disposed of properly, avoiding a potential negative impact on the environment and human health, which could be caused by improper product disposal management. Recycling of materials will contribute to the conservation of natural resources. To receive more detailed information, we invite you to contact your specific city office, waste disposal service or the supplier from whom you purchased the product.