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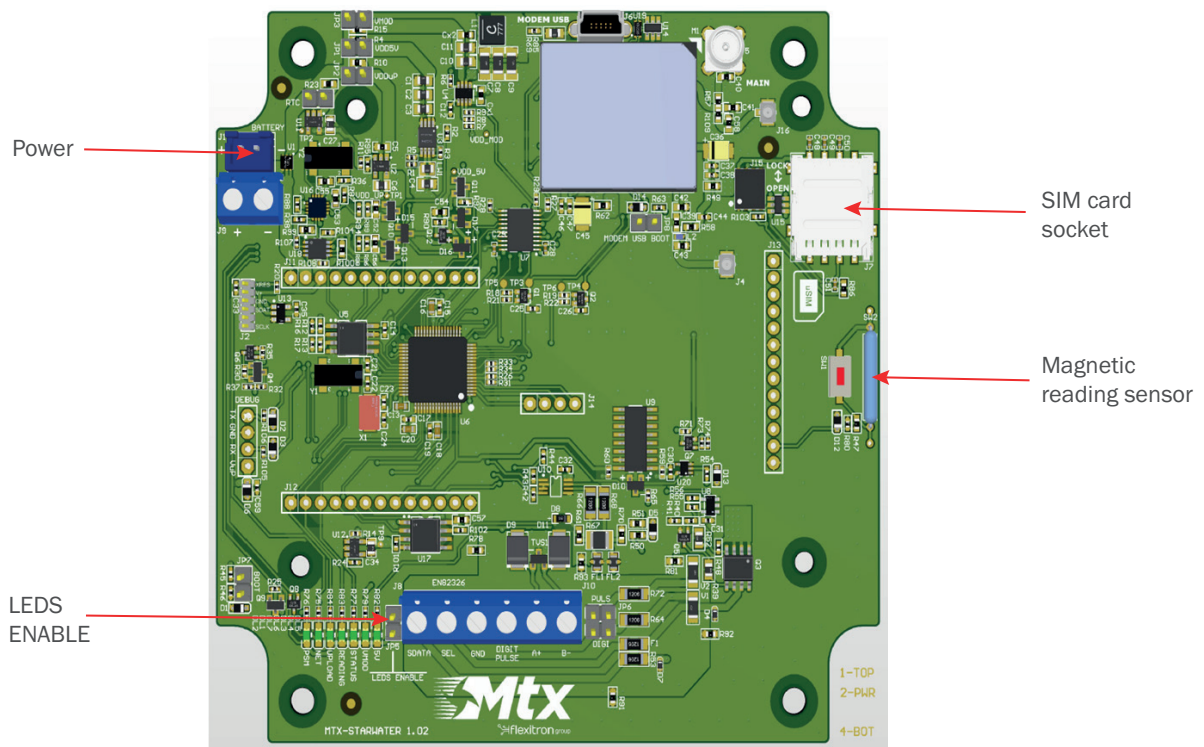# MTX-StarWater

Hardware Details

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Device: Parts

1. Enclosure

The format of the box is like the one in the image. The size may vary depending on the number of batteries required. The approximate measurements would be approximately 121x160x96cm.
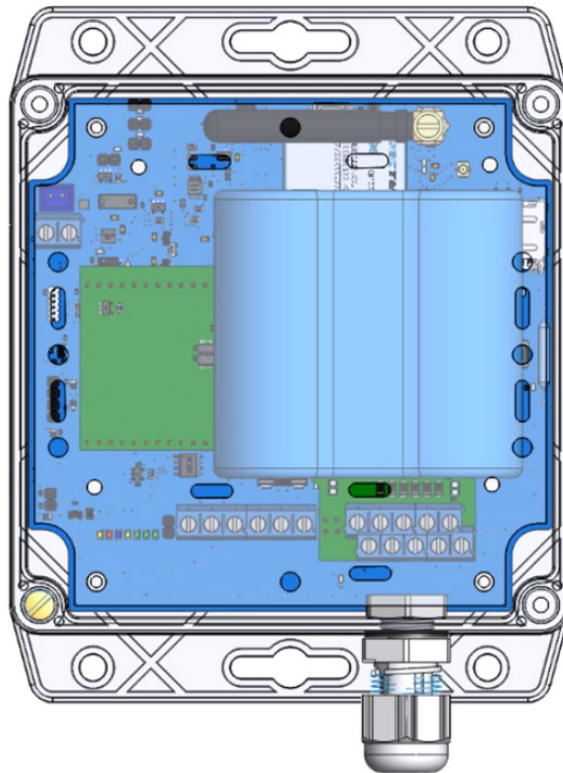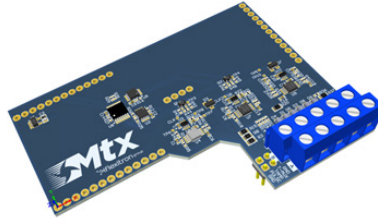

2. Motherboard

The carrier includes the communications module, microprocessor, power supply, LEDs...
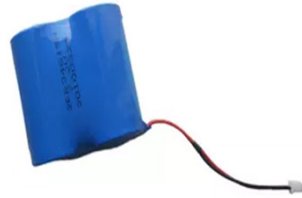
3. Expansion Board: Pulse and Tamper

A new PCB has been created, which is added to the carrier, to expand the possibilities of the equipment, adding the capability of very low consumption pulse input, as well as a tamper input.

4. Consumption

A 7.2V Li-SOCl2 battery pack is used, with a nominal capacity of 14,500mAh, and a maximum self-discharge of 2% per year.

For the estimates of the life span of the battery pack, the following has been taken into account:

Consumption in ULP (Ultra Low Power) mode:

- 2 pulse inputs, maximum 900nAh each
- 1 tamper input: 7uAh

The consumption of the microprocessor, which wakes up 4 times an hour for 3 seconds to read the number of accumulated pulses of the Ultra Low Power electronics.

The consumption of the microprocessor while the NB-IoT connection is being made, once a day, for 4 seconds that the initial connection can last worst case scenario (the normal is 12 seconds for the first connection and 2 seconds for successive ones), and approximately 50 seconds of the transmission of all the data accumulated in the day, as well as the exchange of data with the server such as time synchronization, etc.

The average consumption of the NB-IoT communication module during the 4+50 seconds of daily communication in the B8 and B28 bands.

Consumption in local connections of operators or in the initial configuration has not been taken into account, as it is considered negligible as it is something isolated.

NB-IoT

			Operation seconds	Total operations seconds per day	mAsecond	mAday
Pulse Counter + Tamper	(2x900nA) + 7uA	Always active	1	86400	0,0000088	0,000009
NBIoT		Establish connetion	4	4	158	0,007315
		Transmission	50	50	158	0,091435
Microcontroller		Microcontroller fully operational	1	630	5	0,036458
		Ultra Low Power quiescent current		85.770	0,012	0,011913

| Power consumption NB-IoT	0,147130	mAday
9	**Years of autonomy**	

Applying the annual self-discharge coefficient gives us a result of an estimated life span of the batteries of 9 years.

5. Pulse Input Expansion

The MTX-StarWater has an expansion board to add pulse and tamper input. This way, water meters based on a pulse reading system can be connected.

It has a pulse input capable of connecting to dry contact circuits, such as a reed switch, relay, open drain, etc.

Tamper-type inputs are provided to detect the cut of the meter cable if it has a specific line for this function, as well as the opening of the MTX-StarWater's own enclosure.

GND | PULSE IN | TAMPER METER | TAMPER | GND
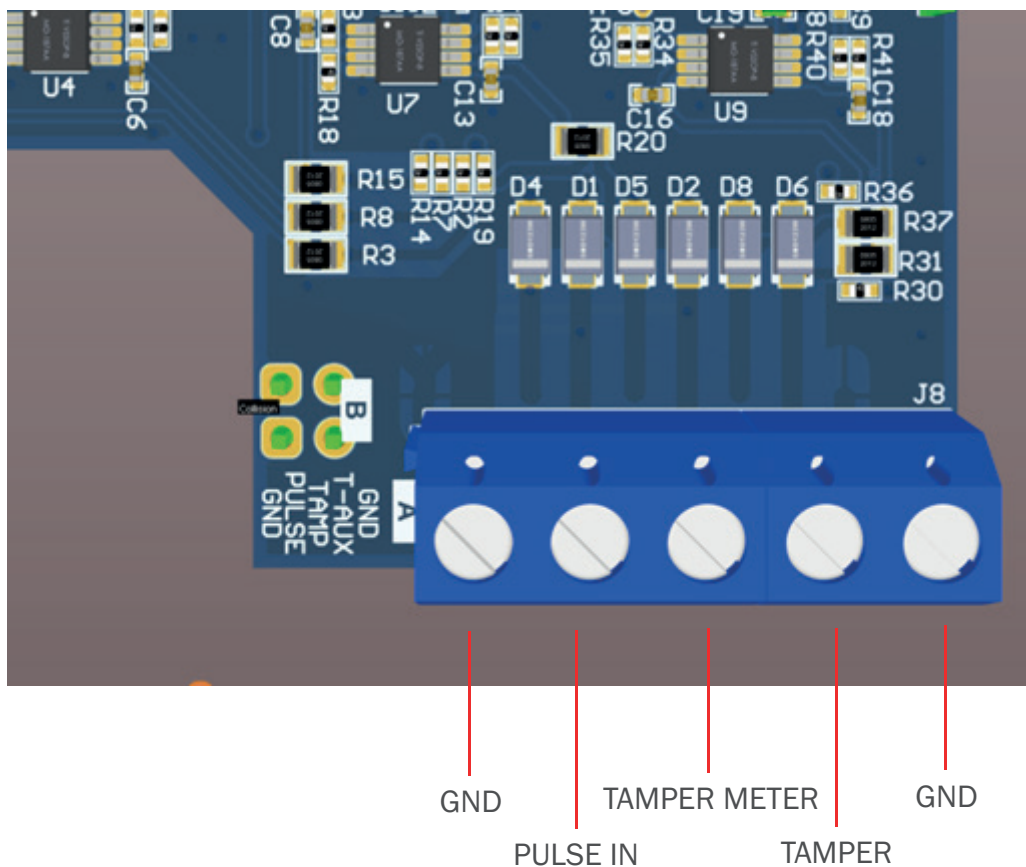
6. Storage Capacity

The equipment has the capacity to store 1 full year of readings in non-volatile memory for each pulse input (it has 2 pulse inputs). This storage capacity is calculated taking into account that 4 readings are made every hour and that each reading stores the number of pulses in addition to the time and day, which is equivalent to more than 35040 records of 16 bytes each ". The information stored in memory is not lost when changing the battery.

Software for Windows

The "StarWater App" application is designed to be able to write and read parameters from the MTX device through a serial port of a Windows PC or portable tablet.

The external serial port cable must have its own TTL to RS232 DB9 level converter, for which it is necessary to build (or purchase) an additional interconnect PCB. Since most laptops only have physical USB ports, it is essential to also have a USB-TTL or USB-RS232 converter for a correct connection of the PC with the MTX device. It is important that the digital power supply of the level converter is provided only by the MTX device (internal 3.3V) and not by the external computer.

The application "StarWater App" is developed with Microsoft Visual Studio. It is therefore necessary that the operating system of the portable PC or tablet is Microsoft Windows 8 or Windows 10 so that the application works.

In the upper bar of the application we have the "Serial Port" menu to select the COM serial port and the default speed of 115200 baud. We press the "Open" button to open the serial port or the "Close" button to close it. With the "Refresh" button we can check which are the different connected COM ports that our computer is detecting.
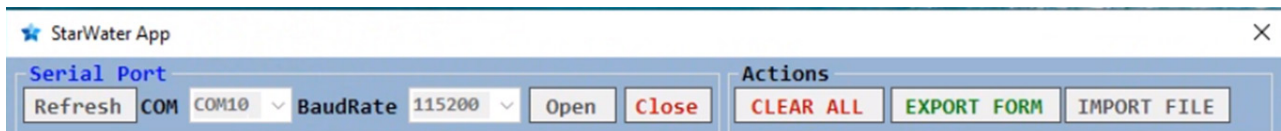
In the "Actions" menu we can clear the entire form with the "Clear All" button, while with the "Export Form" button we can export the form to a .txt text file. This text file is useful for making status

reports and being able to consult them at any time. The files are saved by default in the "LOG" folder of our application.

The "Import File" button is not enabled yet. Future versions will have it enabled to be able to preload a form with the data we want, instead of having to write it manually.

The "StarWater App" application is structured in two tabs: the "MAIN" tab and the "WINDOWS" tab.

The MAIN tab has a serial port console on which we can write on the command line ("SEND" button), or select and send a specific command from a drop-down list using the "GET PARAM" button.
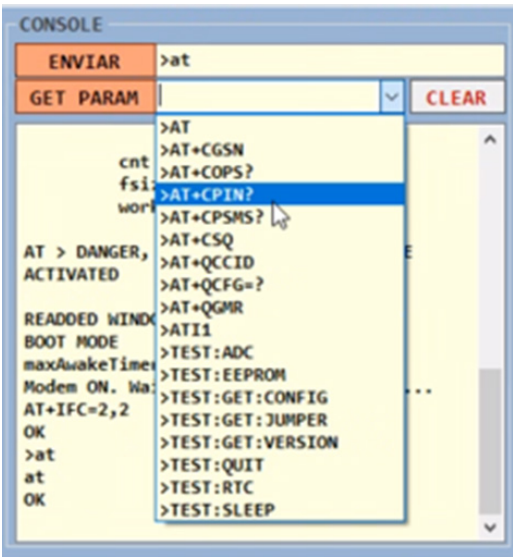
The rest of the GUI of the "MAIN" tab is made up of sections dedicated to read ("RD" button: read) or

write ("WR" button: write) different MTX parameters: MODEM, PLATFORM, INFO, DEVICE, MEMORY , STATUS.

Figure: "MAIN" tab

"WINDOWS" tab: in this block we can configure up to eight different windows ("WINDOWS PROGRAMMING").

In each window we can select whether it is active or not (ACTIVE), its time interval defined in o'clock hours (0:00-23:00) within the same day (Start-Time/End-Time), the period (PERIOD), the type of frame to be used (frames A, B and C), the days of the week (WEEK) and the days of the month (MONTH).

In the section "CONNECTION TO CERVELLO" we can select up to eight time zones in which the MTX device will connect with the Cervello Stem platform.

Using the buttons "SET WINDOWS", "GET WINDOWS", "SET CONNECTION", "GET CONNECTION", we can read and write the MTX configuration.

In this block, the "EXPORT FORM" button at the moment has no effect when trying to save the information in a local file (in case we want to import the same default configuration in several MTX

devices without having to fill in all fields).

Figure: "WINDOWS" tab

A new menu is being implemented to be able to download data from a local equipment, in case it does not have enough coverage in the area to be able to make the daily connection.

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