MTX-StarWater

Software User Guide - Pulses

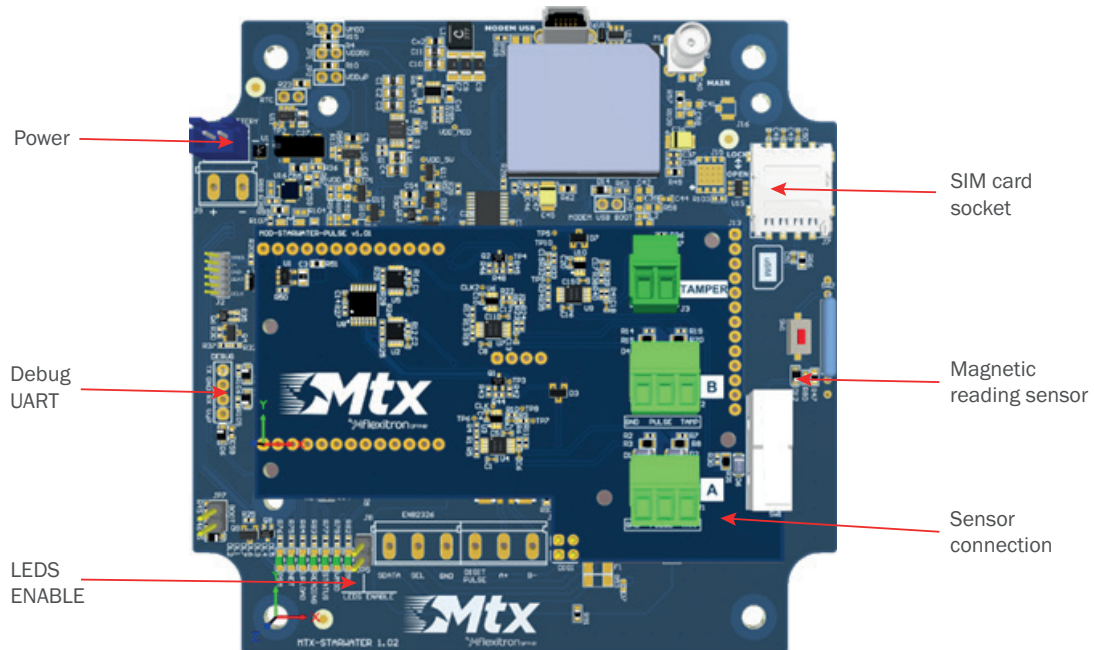# Index

Quick Start

This document has instructions to start up the MTX-StarWater [NB/2- U-N] with UNE82326 bus.

1. Start Up

1.1 SIM Placement

Once the equipment is received, the first step will be to place the SIM card in the socket. The configuration of the SIM, if necessary, will be done with the configuration app or through the Cervello Stem platform (as seen in the Configuration section).

1.2 Power

After inserting the SIM, the device is powered by connecting the battery to the power connector. If tests are to be carried out, an external source with a voltage between 7v and 15v and a current of at least 500mA can be connected to avoid unnecessary battery consumption.

1.3 Enable/Disable LEDs

To increase the autonomy, the equipment has the LED indicator lights disabled by default. To enable them, the jumper must be set to LEDS ENABLE. Once placed, it will be possible to see the status of the 5v source, the modem voltage, the status of the equipment, if the meters are being read or sent, and the status of the network and PSM. After performing the function checks, the jumper must be removed before closing the equipment in order not to impair autonomy. **Leaving the LEDs enabled implies a drastic decrease in the autonomy of the equipment.**
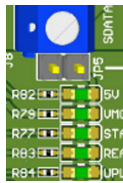
1.4 Meter Connection Plate
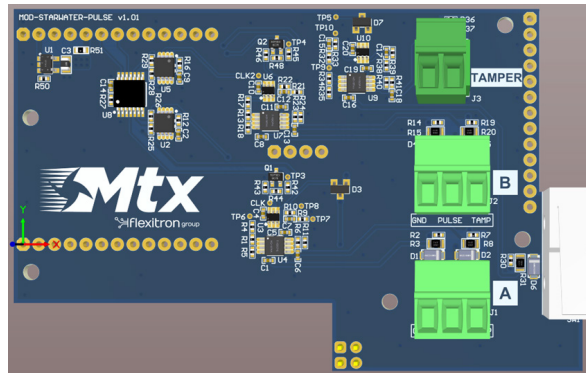
To check the correct operation of the equipment, the pulse counters must be connected to connectors A and B of the pulse counter connection board with the following configuration:

External tamper

B channel

A channel

GND   Pulse   Tamper
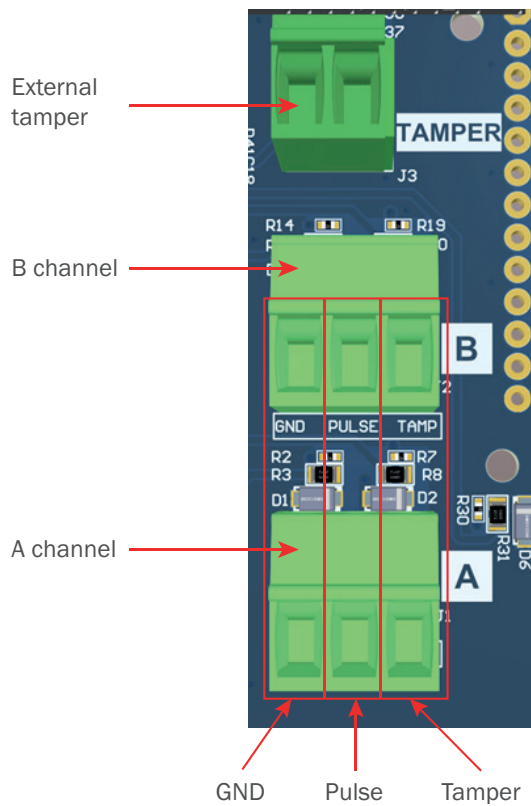
If the installation has an external tamper, the connection can be made through the external tamper terminal located on the pulse board.

1.5 Switching On

To turn on the equipment, it is necessary to pass a magnet next to the magnetic reading sensor or, if the equipment is open, press the button labeled SW1 located next to the sensor.

Once the equipment is turned on, it will read the meters connected to the MTX-StarWater and then connect to the platform to receive several configuration parameters (such as date and time, window configuration, etc.). After receiving the configuration parameters, the equipment will begin to send all the frames stored in memory and will go to sleep.

Just before going to sleep, the equipment consults the read and send windows stored in memory and configures the RTC that will wake up the equipment to carry out the pertinent operation.

If the LEDs are enabled, the Status LED will blink, indicating that the equipment is on, as well as the Read LED while reading the meters and the Net and Upload LEDs while connecting to the platform and sending of data.

1.6 Power On After Battery Change

After a battery change, leave the magnet next to the sensor for at least 10 seconds (or press the button during that time.

If you have launched an OTA with a critical battery and the device has not been reconnected since then (it ran out of battery), increase this time from 10 seconds to 2 minutes.

2. Configuration

Configuration can be done through the desktop application through the debug uart or through the Cervello platform.

Communication between the device and the platform is done by executing remote commands through MQTT. After establishing the connection with the platform, it must execute at least the NOREQUEST command for correct operation (if no NTP server is configured, the CCLK command must also be executed). In the case of wanting to send several commands, make sure that it always ends with NOREQUEST, since this command is in charge of indicating to the device that no more commands are going to be received. If it is not sent, the device will wait to receive it for 1 minute and then it will restart the connection.

The commands are received through the command topic ({CMD}), the responses are sent through the response topic ({RSP}), if the command requires data to be sent to the server, these will be sent through the telemetry topic of the server. device ({DEV_TEL}) after receiving the NOREQUEST command
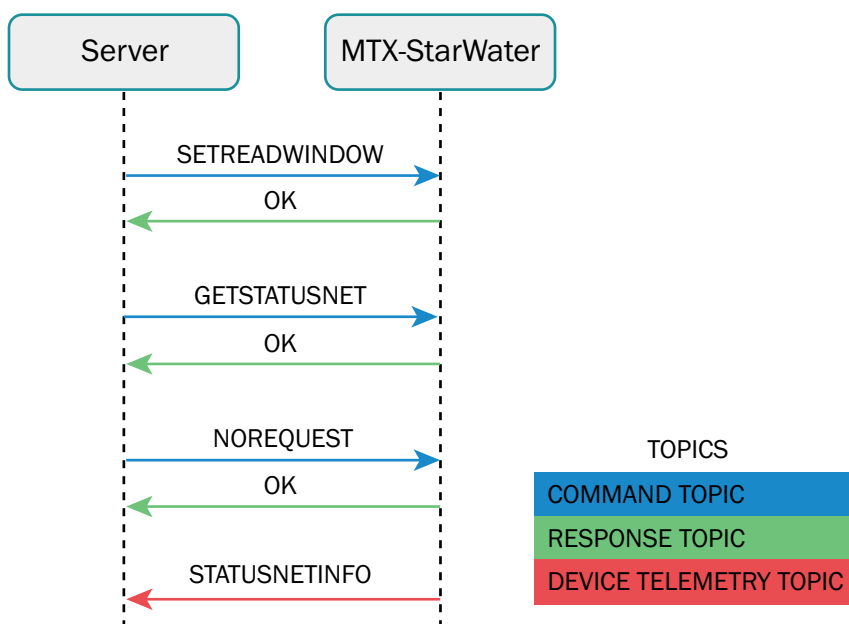
2.1 Commands

The next section will detail all the commands available up to version 3.10.

2.1.1 CCLK: Set Date/Time

The team updates the RTC with this data. The RTC will be used for the timestamp of the meter measurements.

({CMD}) AT^MTX=CCLK,"YY/MM/DD,HH:NN:SS"

({RSP}) OK/ERROR

Note: it is not necessary to use this command if an NTP server has been configured for time update.

2.1.2 RESET: Equipment Reset

The equipment will start the complete reset process (microphone and modem).

({CMD}) AT^MTX=RESET

({RSP}) OK/ERROR

2.1.3 UPDATEFW: Execution of The OTAP Process

The device will start the firmware update process.

The microprocessor firmware is a *.cyacd extension file made up of X lines of text (ASCII). This file must be transmitted from the platform to the device (before starting the physical firmware update process) to be stored in the non-volatile memory of the modem (BG95-BG96).

({CMD}) AT^MTX=UPDATEFW

({RSP}) OK/ERROR

Once the device finishes downloading the file, it will perform a reset and will run in bootloader mode. The bootloader will be in charge of reading the file and recording it line by line in the microcontroller. Once recorded, the device will restart running the new firmware version.

2.1.4 DELETELOGGER: Clear Storage Memory

The equipment will erase all the frames stored in the memory.

({CMD}) AT^MTX=DELETELOGGER

({RSP}) OK/ERROR

2.1.5 GETSTATUSAPP: Reading the Team Application

The team will return a JSON with the general status of the team's application with the accumulated variables.

({CMD}) AT^MTX=GETSTATUSAPP

({RSP}) OK/ERROR

({DEV_TEL})

{

      "FW":"<FW>",

      "LB":<LB>,

      "LA":<LA>,

      "LI":<LI>,

      "CP":<CP>,

      "NT":<NT>,

"RO":<RO>,

"RE":<RE>,

"PR":<PR>,

"VT":<VT>,

"TA":<TA>,

"DI":<DI>,

"RT":<RT>,

"VBAT":<VBAT>

"RP":<RP>,

"SP":<SP>

}

Where:

<FW>: FW version of the mic

<LB>: number of bus reads executed so far

<LA>: N/A (value in frame for compatibility)

<LI>: N/A (value in frame for compatibility)

<CP>: number of connections to platform

<NT>: number of transmissions (packets sent)

<RO>: number of correct NB network records

<RE>: number of erroneous NB network records

<PR>: number of packets resent due to missing ACK

<VT>: cumulative number of executed transmission windows

<TA>: total accumulated time transmission windows

<DI>: digital input value

<RT>: average RTT

<VBAT>: battery voltage in mV

<RP>: number of pulse readings read since the last sending

<SP>: number of pulse readings that were sent in the previous connection

2.1.6 DELSTATUSAPP: Clear Application State Variables

The equipment will delete the accumulated status variables.

({CMD}) AT^MTX=DELSTATUSAPP

({RSP}) OK/ERROR

2.1.7 GETSTATUSNET: Reading the Status of Network Parameters

The device will return a JSON with the network status parameters.

({CMD}) AT^MTX=GETSTATUSNET

({RSP}) OK/ERROR

({DEV_TEL})

{

       "RSRP":<RSRP>,

       "RSRQ":<RSRQ>,

       "<SNR>":<SNR>,

       "<ECL>":<ECL>,

       "<CELLID>":<CELLID>,

       "CCID":<CCID>

}

Where:

       <RSRP>: reference signal received power (use AT+QCSQ)

       <RSRQ>: reference signal received quality (use AT+QCSQ)

       <SNR>: signal to noise ratio (use AT+QCSQ)

       <ECL>: coverage Enhancement Level (AT+QCFG="celevel")

       <CELLID>: cell ID (use AT+QENG="servingcell")

       <CCID>: SIM card ID

2.1.8 NOREQUEST: The Platform Does Not Require Further Communication

The team can decide to close the communication window with the platform, since the platform will not send any more data. Once this command is received, if there are no data pending to be sent by the device, it closes communications and goes to sleep.

({CMD}) AT^MTX=NOREQUEST

({RSP}) OK/ERROR

2.1.9 DELETEWINDOWS: Clearing the Read and Send Windows

The equipment will delete all the meter reading configuration windows and the sending windows.

({CMD}) AT^MTX=DELETEWINDOWS

({RSP}) OK

2.1.10 SETREADWINDOW: Setting a Reading Window

The team will configure a reading window.

({CMD}) AT^MTX=SETREADWINDOW,<id>,<enabled>,<start>,<end>,<period>,<mask>,<wDay>,
<mDay>

({RSP}) OK

Where:

id: (0...7 indicates the reading window ID)

enabled: (0=not enabled, 1=enabled)

start: (0 ... 23)

end: (0...23)

period: (300 ... 86400 seconds)

mask: (reading mask, they are activated with bit 3 (8 in decimal))

wDay: (7 bits, one for each day of the week)

mDay: (31 bits, one for each day of the month)

Examples:

wDay	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Week day	Sunday	Saturday	Friday	Thursday	Wednesdey	Tuesday	Monday

I want to request frames on Mondays and Wednesdays -> Bits 0 and 2 must be set to 1, leaving 0b0000101, so the value to be set in "wDay" is 05.

mDay	Bit 30	Bit 29	…	Bit 3	Bit 2	Bit 1	Bit 0
Day	Day 31	Day 30	…	Day 4	Day 3	Day 2	Day 1

I want to request frames on the 10th and 25th of each month -> Bits 9 and 24 must be set to 1, leaving 0x00100200, so the value to be set in "mDay" is 00100200.

2.1.11 SETSENDWINDOW: Send Window Settings

The team will set up a submission window.

({CMD}) AT^MTX=SETSENDWINDOW,<id>,<enabled>,<start>

({RSP}) OK/ERROR

Where:

        id: (0...7 indicates the send window ID)

        enabled: (0=not enabled, 1=enabled)

        start: (0 ... 23)

2.1.12 GETREADWINDOW: Reading the Configuration of A Reading Window

The device will return a JSON with the configuration of the requested reading window.

({CMD}) AT^MTX=GETREADWINDOW,<id>

({RSP}) OK/ERROR

({DEV_TEL})

```
{
        "data": {
                "RW":{
                        "ID":<id>,
                        "EN":<en>,
                        "ST":<start>,
                        "ED":<end>,
                        "PR":<period>,
                        "MK":<mask>,
                        "WM":<wDay>,
                        "MM":<mDay>
                }
        }
}
```

The meaning of each field is the same as described in SETREADWINDOW.

2.1.13 GETSENDWINDOW: Reading the Configuration of a Send Window

The team will return a JSON with the configuration of the requested delivery window.

({CMD}) AT^MTX=GETSENDWINDOW,<id>

```
({RSP}) OK/ERROR

({DEV_TEL})

{

        "data": {

                "SW":{

                        "ID":<id>,

                        "EN":<en>,

                        "ST":<start>

                }

        }

}
```

The meaning of each field is the same as described in SETSENDWINDOW.

2.1.14 SETPARAM: Modification of Configuration Parameters

The equipment will save this configuration parameter in memory. The new value will not take effect until a device reset is executed.

({CMD}) AT^MTX=SETPARAM,<paramName>,<paramValue>

({RSP}) OK/ERROR

The next section will list all the parameters available for configuration.

2.1.15 GETPARAM: Read Configuration Parameters

The equipment will return this configuration parameter stored in memory.

({CMD}) AT^MTX=GETPARAM,<paramName>

({RSP}) <paramValue>

({RSP}) OK/ERROR

The next section will list all the parameters available for configuration.

2.1.16 RESCANNW: Force Network Scan

The computer will be marked so that on the next connection to the network, it will force a configuration and a network scan. This command is used when a device, which has configured connections for different

technologies (LTE NBIoT, LTE CAT-M, GSM), has connected to the network using a lower priority technology.

({CMD}) AT^MTX=RESCANNW

({RSP}) OK/ERROR

2.1.17 SETSENDOFFSET: Configure Transmission Offset

Activates or deactivates a random transmission offset, to deactivate a value of 0 is sent, to configure a transmission offset the maximum value in minutes is sent (valid values between 10 min and 59 min). The device will calculate an offset in seconds between 0 and the inserted value.

({CMD}) AT^MTX= SETSENDOFFSET,<value>

({RSP}) OK/ERROR

Where:

> <value>: value in minutes, 0 to disable or value between 10 and 59

2.1.18 GETSENDOFFSET: Read Offset Setting

Sends the configured offset value to the server (in seconds).

({CMD}) AT^MTX=GETSENDOFFSET

({RSP}) OK/ERROR

({DEV_TEL})

{

      "data":{

           "OFFSET": <value>

      }

}

Where:

> <value>: is the configured offset value (the value is in seconds)

2.1.19 GETNTP: Read NTP Configuration

Read NTP configuration.

({CMD}) AT^MTX=GETNTP

({RSP}) OK/ERROR

({DEV_TEL})

```
{
    "data":{
        "NTP": <en>,
        "NTP_URL": <url>:<port>
    }
}
```

Where:

<en>: EN/DIS indicates if the NTP service is ENABLE or DISABLE

<url>: NTP server address

<port>: NTP server port (default port 123)

2.1.20 SETNTP: Configure NTP Functionality

The equipment will enable/disable the NTP functionality and configure the server and port.

({CMD}) AT^MTX=SETNTP,<en>,<server>,<port>

({RSP}) OK/ERROR

Where:

<en>: 0/1 to indicate whether it is enabled or disabled

<url>: NTP server address

<port> NTP server port (default 123)

2.1.21 GETDELAY: Read Threshold for RTC Alarm

Sends to the server the value of the threshold to notify alarm due to RTC delay/advance.

({CMD}) AT^MTX=GETDELAY

({RSP}) OK/ERROR

({DEV_TEL})

```
{
    "data":{
        "Delay": <value>
    }
}
```

Where:

        `<value>`: threshold value in seconds

2.1.22 SETDELAY: Modifies the Threshold for the RTC Alarm

Modifies the value of the threshold to generate alarms for advance/delay of the RTC of the equipment.

({CMD}) AT^MTX=SETDELAY,<value>

({RSP}) OK/ERROR

Where:

        `<value>`: threshold value in seconds

2.1.23 AUTOSENDWINDOW: Enable Auto-Send of Windows Configuration

The equipment is configured so that it sends the configuration information of all the windows on each connection.

({CMD}) AT^MTX= AUTOSENDWINDOW,<enable>

({RSP}) OK/ERROR

Where:

        `< enable >`: 0 disabled, 1 enabled (default disabled)

2.1.24 Configurable Parameters

In the following, all the configurable and readable parameters with SETPARAM and GETPARAM are described.

paramName	DESCRIPTION	DEFAULT VALUE
NET_APN	Carrier APN	Empty
NET_USERNAME	Operator username	Empty
NET_PASSWORD	Operator password	Empty
NET_DNS1	DNS1 to use	Empty
NET_DNS2	DNS2 to use	Empty
NET_OPERATOR	Operator code to use	Empty
NET_NWSCANMODE_PARAM	Operating technology	3 (LTE)
NET_NWSCANSEQ_PARAM	Scan sequence	030201 (LTE_NB > LTE > GSM
NET_IOTOPMODE_PARAM	Network category to search	1 (LTE_NB)

MQTT_BROKER	URL broker connection	connect.cervello.io
MQTT_ID	ID for broker	-
MQTT_USERNAME	Username for broker	-
MQTT_PASSWORD	Password for broker	-
MQTT_ATTOPIC	Command subscription topic	/device/MQTT_ID/rpc
MQTT_ATRTOPIC	Command Response Topic	/device/MQTT_ID/response
MQTT_ALARM_TOPIC	Alarm topics	/device/MQTT_ID/alarm
MQTT_DATATOPIC	Topic for sending meter data	/gateway/MQTT_ID/telemetry
MQTT_DEVTEL_TOPIC	Topic for sending telemetry from the MTX-StarWater	/device/MQTT_ID/telemetry
CLAC_BUTTONENABLED	0=not enabled 1=enabled	1 (enabled)
CLAC_SENDWINDOWMAX	Maximum sending window duration in minutes	10 (10 minutes)

2.2 Configuration Via Windows Software

The configuration of the device can also be done using desktop software running on Windows 10. To do this, the device must be connected to a PC by plugging a UART cable into the debug port.

For more information on the configuration through the desktop application, review the application manual.

3. Alarmas

The device is capable of sending some alarms to identify operating problems, these alarms are sent by the alarm topic that has been configured.

The alarms follow the format:

{

    "title": <title>,

    "type": <type>,

    "severity": <severty>,

    "status": <status>,

    "propagate": <propagate>

    "time": <time>,

}

Where:

    <title>: title of the alarm

    <type>: type of alarm

    <severity>: severity of the alarm (from 1 to 3)

    <status>: 1 enabled; 0 disabled

    <propagate>: indicates if the alarm must be propagated (optional parameter)

    <time>: value in EPOCH of when the alarm occurred

3.1 Tamper Alarm

It indicates the device case has been opened and subject to manipulation.

3.2 Low Battery Alarm

It indicates the device has low battery and a battery replacement is needed.

3.3 Clock Delay Alarm

When synchronizing the unit, if the internal clock has drifted more seconds than those configured with the SETDELAY command, an alarm will be sent indicating the seconds the clock has drifted.

NOTE: if the equipment comes from off, it will send an alarm when it gets the time.

3.4 Connection Change Alarm

The device can be configured to work with different communication networks. By default it will try to connect to the priority network and if it fails it will try the lower priority ones. If you want to reconnect to the priority network, you have to do it manually, sending the force network scan command (RESCANNW).

Any network change will send an alarm message to the server indicating what the change has been.

3.5 Alarm Due to Deletion of Counter Data in Memory

If the device is commanded to clear the counter data stored in the device or if a problem occurs with the device memory, an alarm will be sent to the server.

4. Reading of Meters

The meter readings will be sent after configuring and sending the alarms, these are sent to a telemetry topic encoded using JSON. Readings are grouped into the JSON message to save data (up to a maximum of 10 readings).

4.1 Coding of Readings

```
{
        "METER_<id1>":[
                {
                        "data"{ "pulses":<value> }
                        "time": "YYYY-MM-DDTHH:mm:SSZ"
                },
                {
                        "data"{ "pulses":<value> }
                        "time": "YYYY-MM-DDTHH:mm:SSZ"
                }
        ],
        "METER_<id2>":[
                {
                        "data"{ "pulses":<value> }
                        "time": "YYYY-MM-DDTHH:mm:SSZ"
                },
                {
                        "data"{ "pulses":<value> }
                        "time": "YYYY-MM-DDTHH:mm:SSZ"
                }
        ]
}
```

Where:

    <id1>/<id2>: configurable values through the configuration application; they identify the meters connected to each of the 2 interfaces.

    <value>: value of the pulse counter, it is always 4 bytes encoded in hexadecimal (example

000A3456 to encode 668758).

<time>: date and time in which the reading was carried out following the established format.

Sales Contact

SPAIN

C/ Alejandro Sánchez 109
28019 Madrid

Phone 1: 902.19.81.46
Phone 2: +34-91.560.27.37
Email: contact@webdyn.com

FRANCE

26 Rue des Gaudines
78100 Saint-Germain-en-Laye

Phone: +33.139042940
Email: contact@webdyn.com

INDIA

803-804 8th floor, Vishwadeep Building
District Centre, Janakpurt, 110058 New Delhi

Phone: +91.1141519011
Email: purchase-india@webdyn.com

PORTUGAL

LusoMatrix Lda.
Av. Coronel Eduardo Galhardo 7-1ºC
1170-105 Lisbon, Portugal

Phone: +351.218162625
Email: comercial@lusomatrix.pt

APAC

9F, No. 156, Sec. 3, Minsheng E. Rd.
Songshan Dist., Taipei City 10596, Taiwan

Phone: +886.965333367
Email: ahsu@matrix.es

AUE

Dubai

Phone: +34.915602737
Email: hperchin@matrix.es

USA

Chicago

Phone: +34.915602737
Email: jcabezas@matrix.es