

MX-1 GSM/GPRS M-BUS/MODBUS DATA LOGGER

USER MANUAL

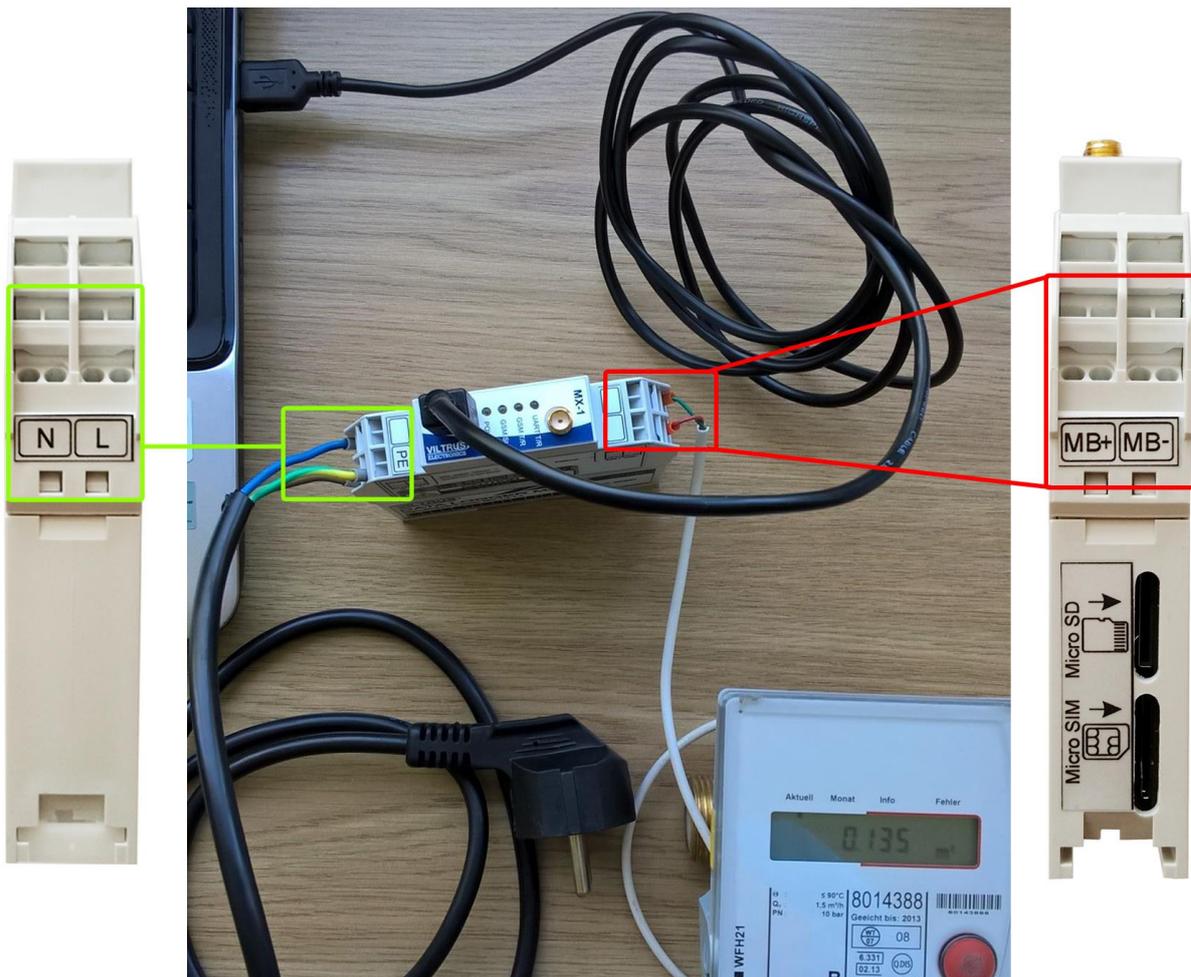


CONTENTS

1 Abbreviations and explanations	3
2 Technical Data.....	5
3 Setting up connection to the device	6
3.1 Connecting via USB.....	6
3.2 Connecting via GPRS.....	7
4 MX-1 General settings and Status indicators.....	8
4.1 Configuration files.....	9
5 "Time parameters" tab.....	10
6 "Communication" tab.....	11
6.1 Communication > GPRS.....	11
7 M-Bus connection configuration	12
8 "Archives" tab.....	17
9 "FTP" client configuration	19
10 Modbus connection configuration	20

1 Abbreviations and explanations

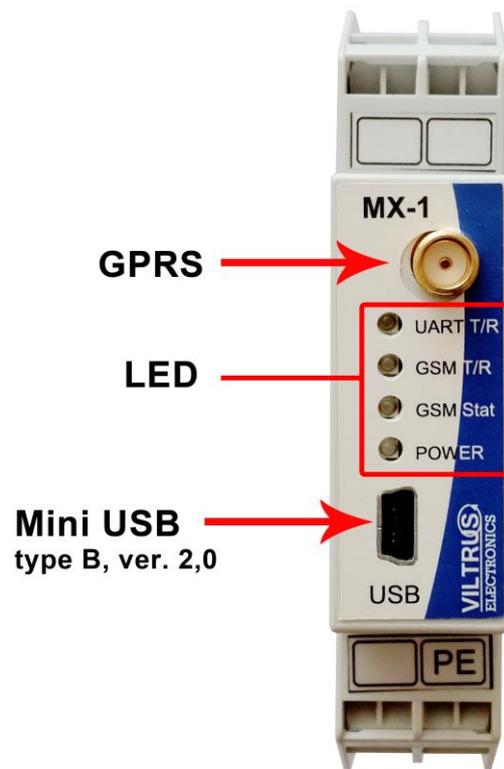
- **MBUS+** – contact for M-Bus positive wire
- **MBUS-** – contact for M-Bus negative wire
- **PE** – Protective ground wire
- **L** – Line, single phase wire
- **N** – Neutral wire



- **UART T/R** – data transfer/receive indicating LED
- **GSM T/R** – data transfer/receive indicating LED
- **GSM Stat** – status of GSM/GPRS indicating LED
- **Power** – power indicating LED

- **USB – Universal Serial Bus** is an industry standard, that defines the cables, connectors and protocols used for connection, communication and power supply between computer and electronic devices. Mini USB type B, ver. 2,0

- **GSM – Global Standart for Mobile Communications.** This interfaces is prepared for remote connections and data bidirectional data transfer over Global Standart Mobile network.
- **GPRS** - a packet oriented mobile data service on the 2G and 3G cellular communication system's global system for mobile communications (GSM).



- **RS485** - standard defining the electrical characteristics of drivers and receivers for use in balanced digital multipoint systems. The standard is published by the ANSI Telecommunications Industry Association/Electronic Industries Alliance (TIA/EIA). Digital communications networks implementing the EIA-485 standard can be used effectively over long distances and in electrically noisy environments. Multiple receivers may be connected to such a network in a linear, multi-drop configuration. RS485 interfaces are prepared for connection of pheripheral devices (example energy meters, controllers, machines and etc.).
- **A+** – contact for positive wire of RS485 socket
- **B-** – contact for negative wire of RS485 socket
- **RS232** – the traditional name for a series of standards for serial binary single-ended data and control signals connecting between a DTE (Data Terminal Equipment) and a DCE (Data Circuit-terminating Equipment). It is commonly used in computer serial ports. The standard defines the electrical characteristics and timing of signals, the meaning of signals, and the physical size and pin out of connectors. RS232 interfaces are prepared for connection of pheripheral devices (example energy meters, controllers, machines and etc.).

2 Technical Data

Interfaces	Technical data
RS485	up to 1,2 km, max 32 transivers, speed up to 38,4 Kbits/s
RS232	up to 15 m, speed up to 38,4 Kbits/s
M-Bus	up to 25 M-Bus devices
GPRS	4 band 850/900/1800/1900 MHz
USB	mini USB type B, ver. 2,0
Indication	
Indication type	LED's
Indicated parameters	<ul style="list-style-type: none"> • GSM/GPRS modem status, Transfer and Receive • Power • M-Bus interface read/write and short circuit
Power supply	
Power supply AC	50-250V ~ 50/60Hz
Capacity	300mA MAX
Power consumption	< 9VA
Over-voltage protection	>1000V
Construction	
Mounting	DIN rail
Dimensions	18x85x97 mm
Weight	105 g
Enclosure protection	IP20
Climate conditions	
Operating temperature	From - 25 °C to + 60°C
Storage temperature	From - 40 °C to + 60°C
Relative humidity	From 5 % to 95 % non-condensing
Other parameters	
Storage memory	archive storage up to 8 MB, data storage without power about 5 years
Real time clock	Yes

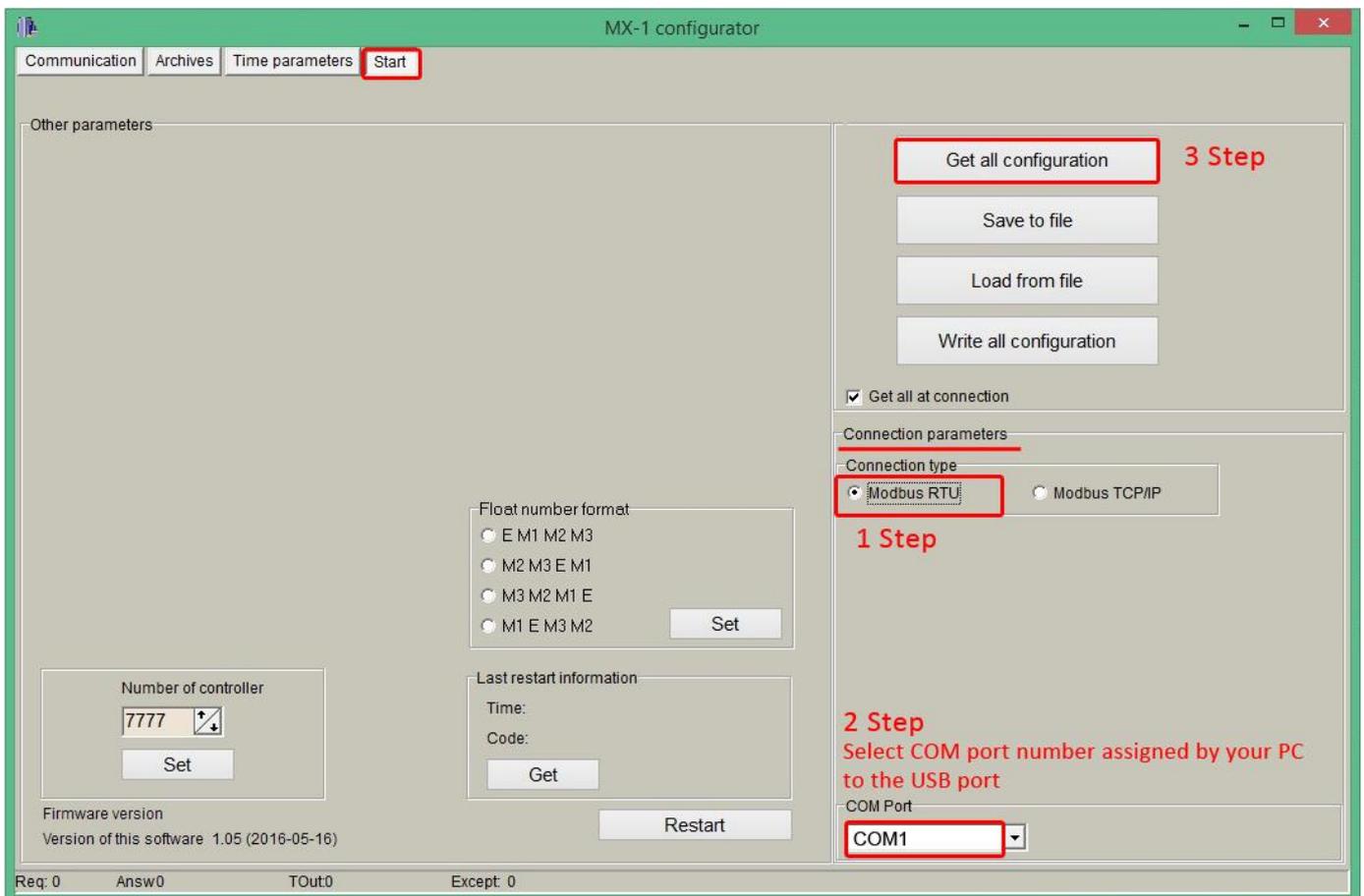
3 Setting up connection to the device

3.1 Connecting via USB

In order to configure the MX-1 data logger, connect it to the any computer via USB and open MX-1 configuration software. If needed, install the USB driver (the USB driver can be found in VILTRUS web page: <http://www.viltrus.com/mx-1/>).

Open MX-1 Configuration software. Set up Connection parameters frame. Steps to be followed:

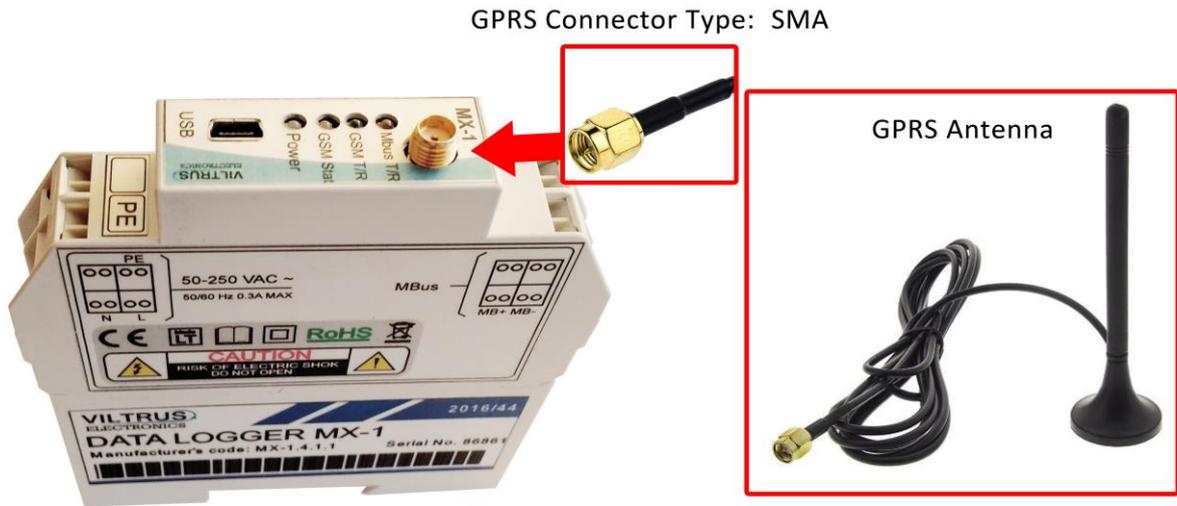
- **1 Step:** Under Connection type select **ModBus RTU** option
- **2 Step:** Select COM port number assigned by your PC to the USB port
- **3 Step:** Click on **Get all** to establish connection with data logger.



USB connection steps

3.2 Connecting via GPRS

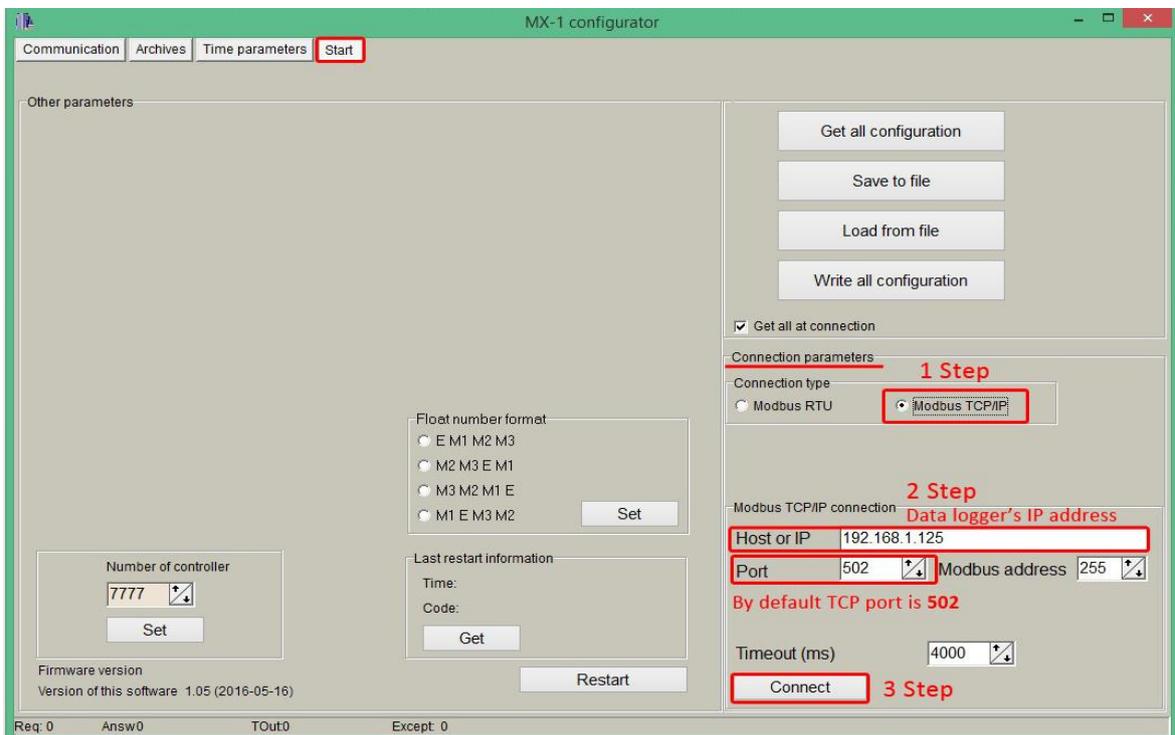
Check GPRS antenna is properly connected to the device.



Steps to connect GPRS antenna

Open MX-1 Configuration software. Steps to be followed are:

- **1 Step:** In “Connection type” area you need to choose **Modbus TCP/IP**
- **2 Step:** Add data logger **IP address** and **TCP port**. By default controller is set to **502 Port** (this is system standard Modbus TCP/IP port), change it if you need other.
- **3 Step** Click on **Connect** to establish connection with data logger. If connection fails, check GPRS modem, Communication type, IP address and try to connect again.



GPRS connection steps

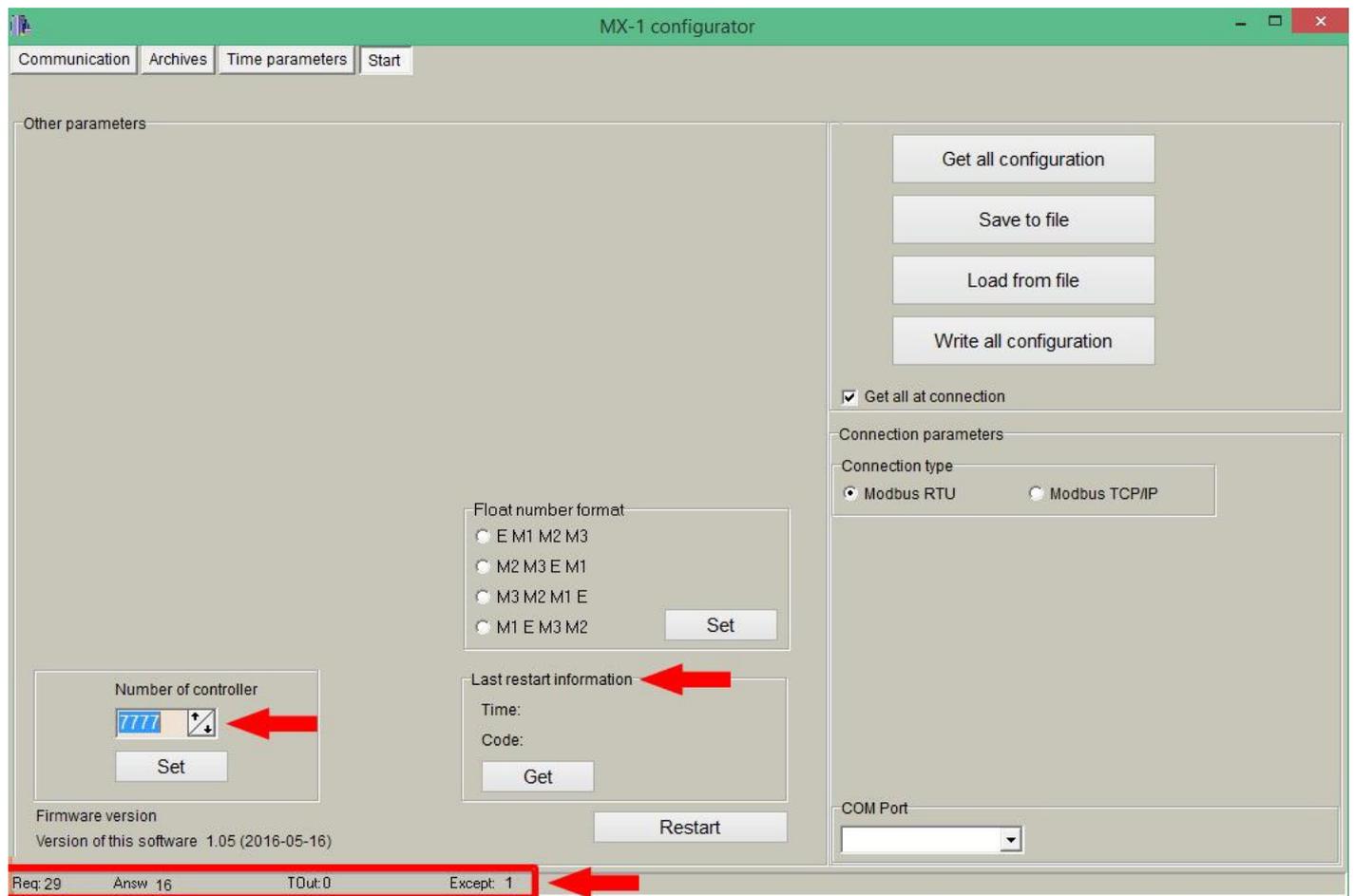
4 MX-1 General settings and Status indicators

Once user has established communication with MX-1, basic information such as **Number of controller** (each controller has its own factory serial number), **Last restart**, etc. is shown in the software frame.

Status indicators

Several status indicators are shown in the MX-1 configuration software in order to inform user about current performance of communication:

- **Req:** number of requests performed.
- **Answ:** Number of answers received.
- **TOut:** number of requests not answered (time outs raised).
- **Except:** number of errors.



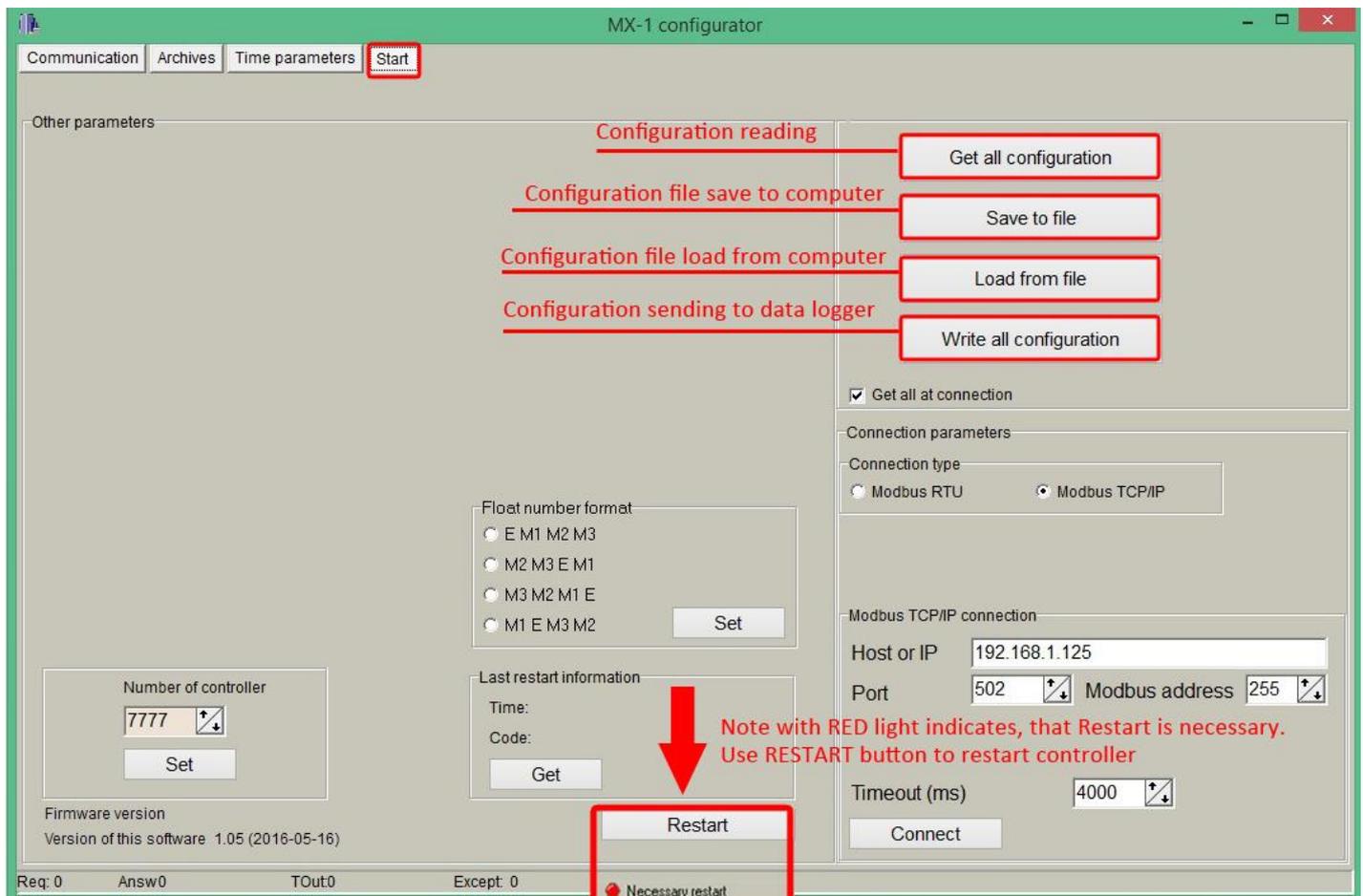
General settings and Status indicators

4.1 Configuration files

This feature enables user to save and load configuration files so that programming a number of data loggers with the same configuration becomes an easy process. Steps:

- **1 Step.** Set up all the configuration parameters making use of MX-1 Configuration software.
- **2 Step.** Then, under **Start** tab, click on **Save to file** button. A dialog will be shown requesting user to select folder destination.
- **3 Step.** Once the file has been stored, connect a new data logger to the PC and then click on **Load from file** and select the file previously stored.
- **4 Step.** Then, click on **Write all configuration** button to load such configuration into the new controller.
- **5 Step.** A restart will be needed so that data logger can start using the loaded configuration. Data logger can be restarted by turning off/on power supply or pressing button **Restart**.

P.S. Repeat from step 3 with all the controllers that need the same configuration.

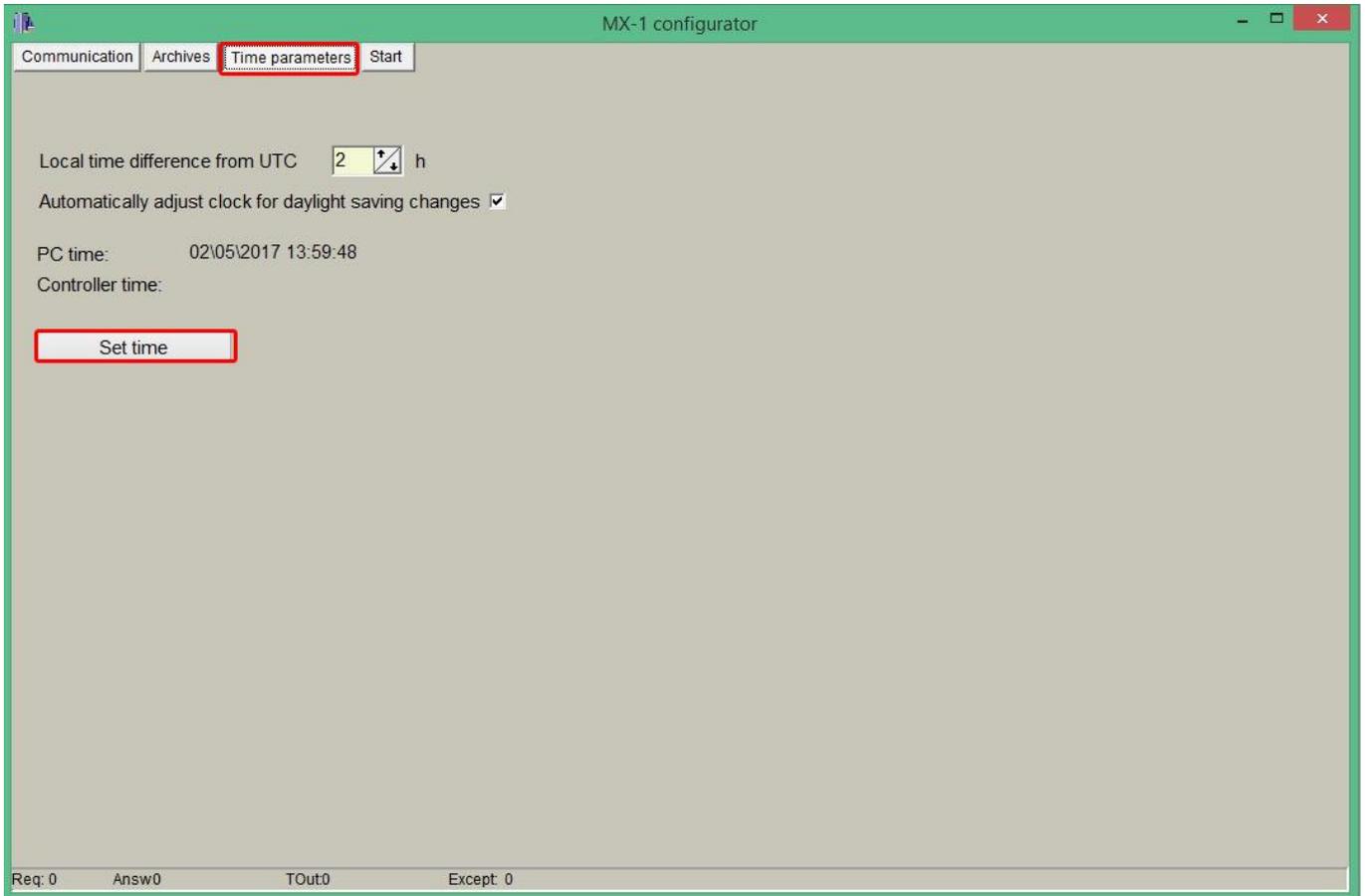


Configuration files management

5 "Time parameters" tab

Time parameters tab enables users to set up time synchronization between MX-1 Real Time Clock (RTC) and external time references. Several parameters can be configured under this tab:

- **Set time** - it synchronizes internal RTC with PC time.

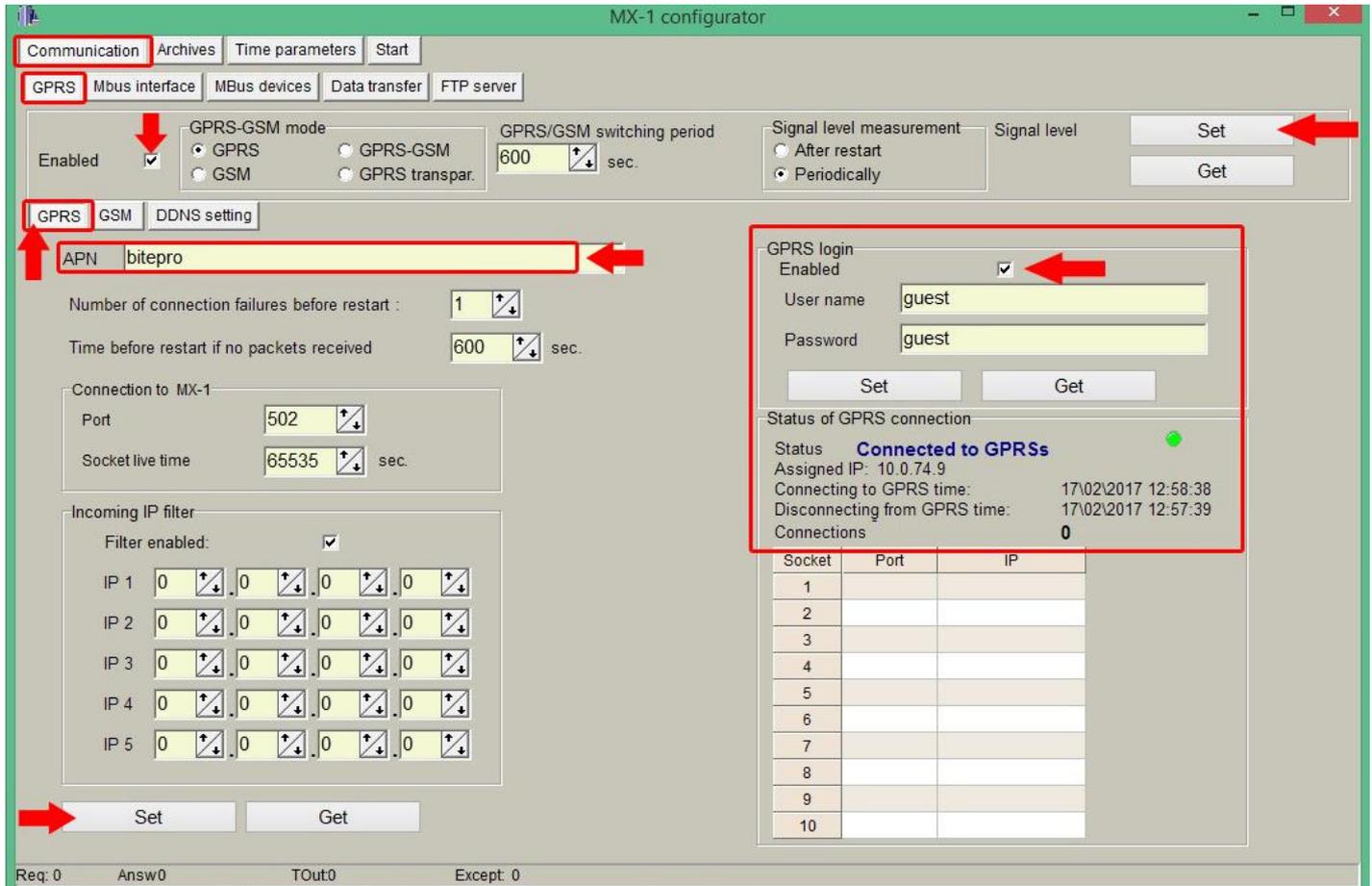


Time Parameters tab. Set time

6 "Communication" tab

6.1 Communication > GPRS

In order to configure MX-1 through GPRS, user must enable GPRS connection as shown below. Then, click on **"SET"** button in order to save changes.



GPRS Tab. Enabling communication

Within this tab, different services can be configured or checked.

GPRS connection parameters:

- **APN:** access point name provided by Internet Service Provider (ISP).

If needed by ISP, credentials can also be configured here:

- **Username:** provided by ISP.
- **Password:** provided by ISP.

*NOTE: After configuration is completed, click on **"SET"** button in order to save changes.*

7 M-Bus connection configuration

Connecting the M-Bus meter/device to the MX-1 M-Bus interface.



Connecting M-Bus meter/device to the MX-1

*Step 1: Click on **Communication tab** - > **Serial interface**. You have to set interfaces to which it is connected your M-Bus meters. Interface settings have to be the same as the meters (Bode, Parity, Data bits, Stop bits).*

*After all is completed, click on **"SET"***

Communication Archives Time parameters Start

GPRS Serial interface **Mbus devices** Data transfer FTP server You have to set interface to which it is connected your Mbus meters.

Bode	Parity	Data bits	Stop bits	Packetization	Packet time (msec.)	Packet symbol(Hex)	Packet byte count	Mode	Destination of DTR
<input type="checkbox"/> 300	<input checked="" type="checkbox"/> Even	<input type="checkbox"/> 5	<input checked="" type="checkbox"/> 1	<input checked="" type="checkbox"/> Time	100	00	1	<input checked="" type="checkbox"/> Full duplex	<input type="checkbox"/> Always OFF
<input type="checkbox"/> 600	<input type="checkbox"/> Odd	<input type="checkbox"/> 6	<input type="checkbox"/> 1.5	<input type="checkbox"/> Symbol				<input type="checkbox"/> Half duplex	<input type="checkbox"/> Always ON
<input type="checkbox"/> 1200	<input type="checkbox"/> Mark	<input type="checkbox"/> 7	<input type="checkbox"/> 2	<input type="checkbox"/> Length					<input checked="" type="checkbox"/> OFF when send
<input checked="" type="checkbox"/> 2400	<input type="checkbox"/> Space	<input checked="" type="checkbox"/> 8							<input type="checkbox"/> ON when send
<input type="checkbox"/> 4800	<input type="checkbox"/> None								
<input type="checkbox"/> 9600									
<input type="checkbox"/> 19200									
<input type="checkbox"/> 38400									

Intercafe settings have to be the same as the meters (Bode, Parity, Data bits, Stop bits)

Set **Get** After all the settings you have to press the "Set".

Purpose of UART

- Nothing
- Modbus RTU Server
- Modbus RTU Master
- Router Modbus TCP/IP to Modbus RTU
- Mbus devices**

Mbus linijos parametrai

Parameter	Value (sec.)
Delay after power on	2
Mbus short circuit reaction time	2
Recover control period after short circuit	20

Set **Get**

COM Client

	Value
Stack depth	2
Timeout (msec.)	2000
Number of repeats	1

Set **Get**

Step 2: Click on **Communication tab** -> **M-Bus devices** -> **Configuration**. Set **Read period (sec.)** and click on **"Search devices"** button.

Communication Archives Time parameters Start

GPRS Serial interface **M-Bus devices** Data transfer FTP server

Configuration Current values

Amount of meters 1

Read period (sec.) 10

Set Get

1 step

In succession

Pos	Type	Address	Data position	Device number	Manufacturer	Medium
1	Unknown	0801438865329906	2	08014388	LSE	Hot Water

Meters search

2 steps

Search devices

Status	Completed
Stroked devices	1

“M-Bus devices” tab. Communication configuration

Step 3: After the search is done, click on **„Include newly found“**, then **„Delete missing“** and finally **„Finish and send“**.

New founded devices

Pos	Address
1	0801438865329906

Previous founded devices

Pos No	Address	Data position
1	0000000000000000	1

1 step

2 step

3 step

Include newly found Merge all Delete missing Restore previous Cancel

Finish and send

Finish without sending

Step 4: After a few seconds, a list including all the M-Bus devices connected to the network will be shown. Moreover, a list of its main parameters will be also identified automatically.

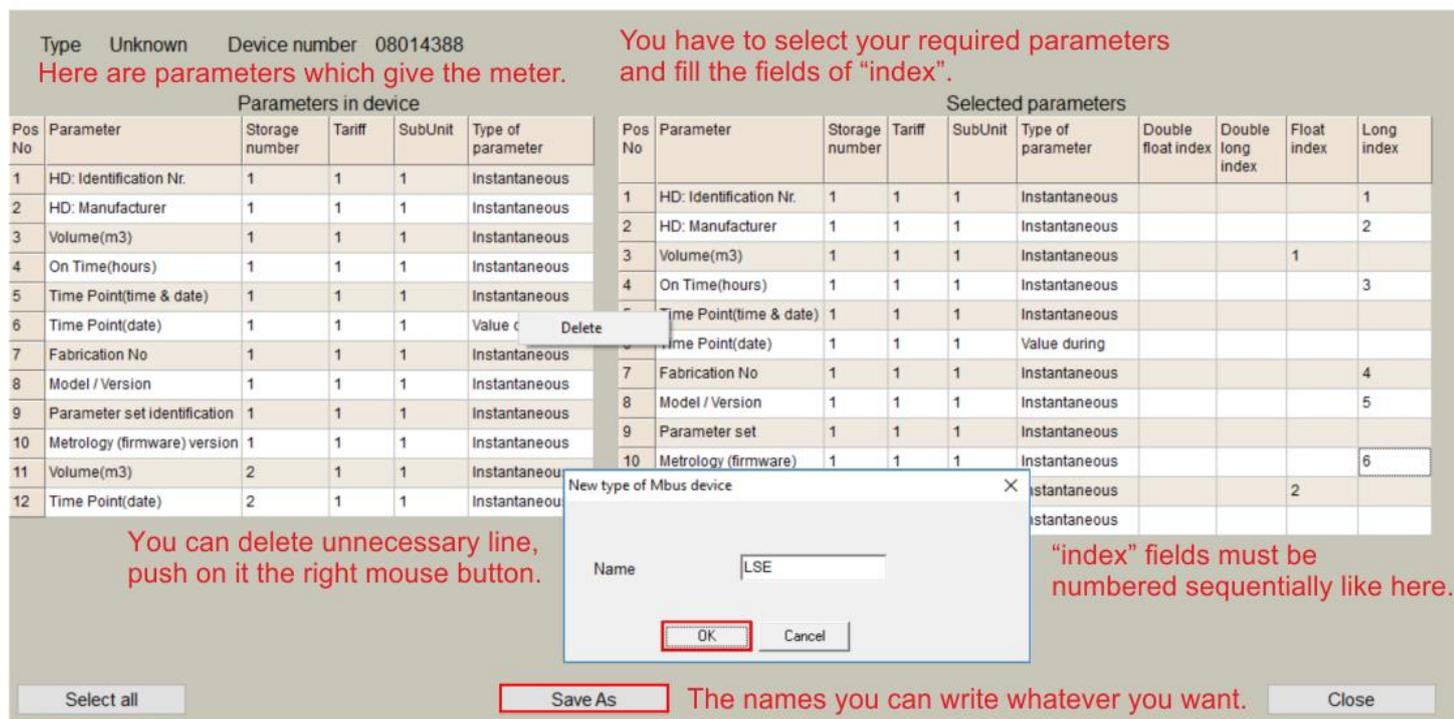
Click „**Read Available parameters**“.



“M-Bus devices” tab. Self-discovery

Step 5: On the left you see all available parameters from the meter. On the right, you can select those parameters, that you need from the meter, you will need to fill the fields of “index” (“index” fields must be numbered sequentially as below). The meter name you can write whatever you want.

After all is completed, click on “Save as”



Step 6: Set the name of M-Bus meter, which you created before.

Step 7: In order to check if data are being received from M-Bus devices, go to **“Current values”** tab, here you can see the values of the meters.

All the values, that you see in the table, you need to archive it, click on **“All values to archive”**

“M-Bus devices” tab. Current values

Once the registers are identified, on the “**Communication -> Data Transfer -> Common parameters**” tab, write all the registers as shown in the next figure and click on the “**Set user archive**” checkbox in order to replicate the structure in the internal datalogging archive. To send data to the FTP server, you need to archive values.

Communication Archives Time parameters Start

GPRS Serial interface MBus devices Data transfer FTP server

Common parameters Modbus TCP/IP client FTP

Amount of groups of registers Set user archive

	Parameter	Register/Coil	Amount of registers/	Format	Header	Dimension
1		124338	1	unsigned long	HD: Identification Nr.	
2		124340	1	unsigned long	HD: Manufacturer	
3		124278	1	Float	Volume(m3)	
4		124342	1	unsigned long	On Time(hours)	
5		124344	1	unsigned long	Time Point(date)	
6		124346	1	unsigned long	Fabrication No	
7		124348	1	unsigned long	Metrology (firmware) version #	
8		124280	1	Float	Volume(m3)	

Here are described the meter values formats, headers and dimensions, which will be archived and sent to the FTP.

Only archived values can be send to the FTP server.

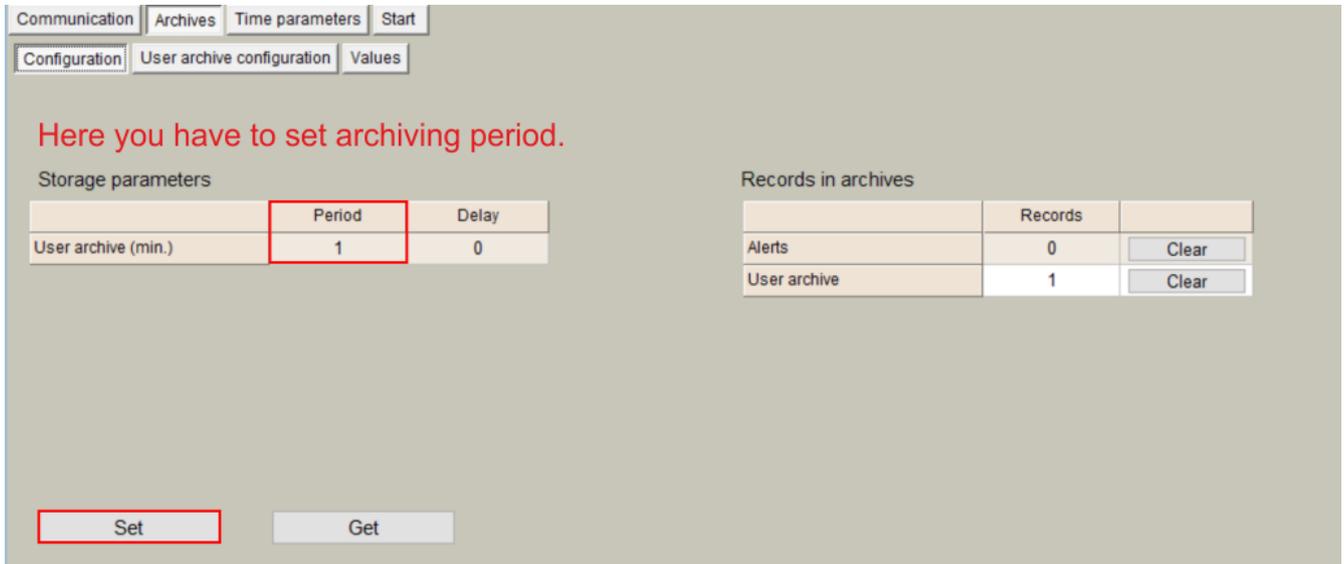
You can load from CSV file your description or save this and use in other devices.

8 "Archives" tab

The MX-1 has an internal 8MB flash memory. In case, the device is used as data logger, the following steps must be:

- Go to **Archives -> Configuration tab**
- In **Storage parameters** frame, configure the **Period**: It defines storage interval. Internal memory is organized in different blocks depending on the devices nature which are connected to the MX-1.

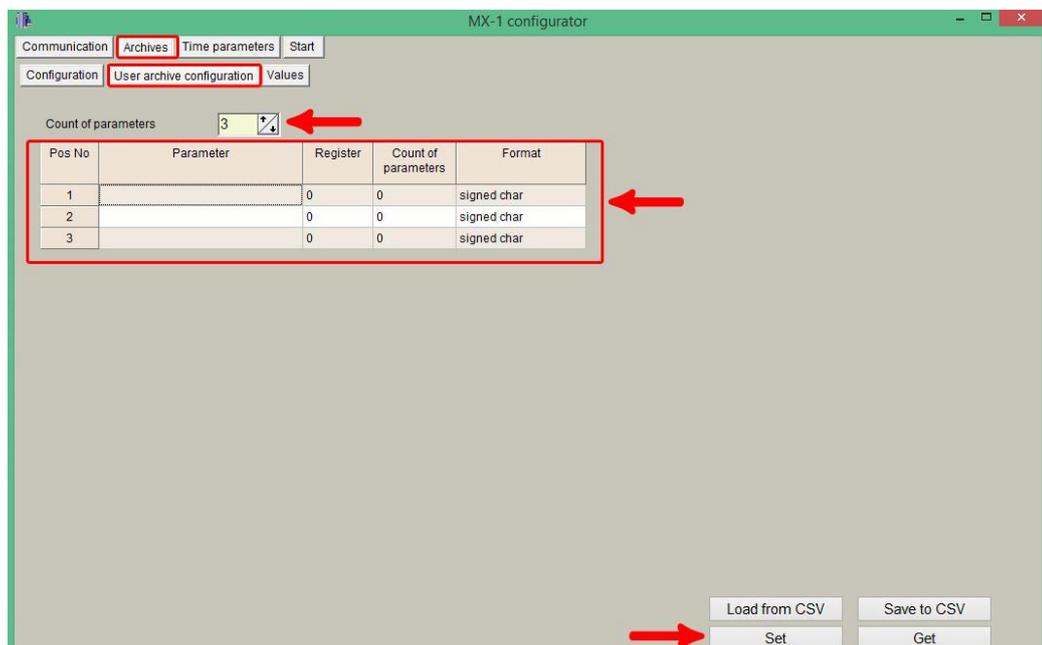
Then click on **"SET"** button in order to save changes.



In case user needs to customize storage blocks, signals acquisition must be configured accordingly. Memory block used will be defined as "User Archive" (see next step).

- Go to **Archives>User Archive Configuration**
- Under this tab, user can configure datalogging following his own requirements. In the next pages, a configuration example is given by setting the following parameters:
 - ✓ "Count of parameters": number of registers to be stored.
 - ✓ "Register": Specific register to be stored.

NOTE: Timestamp is registered automatically.



In order to check current data logged in the internal memory, go to **Archives -> Values -> User archive tab**. Here you can check, what values are archived and save them in your computer.

The screenshot displays the 'User archive' configuration page. At the top, there are tabs for 'Configuration', 'User archive configuration', and 'Values'. Under 'Values', there are sub-tabs for 'Events', 'User archive', and 'Diagnostic'. The 'User archive' sub-tab is active, showing a table of archived data. Below the table, there is a search bar and three buttons: 'Get', 'Save archive', and 'Clear archive'. At the bottom of the window, there is a status bar with the text: 'Req: 1204 Answ: 1203 TOut: 0 Except: 1'.

Pos No	Time	Identification Nr.	Volume(m3)	On Time(hours)	Time Point(time & date)	Time Point(date)	Fabrication
1	06/02/2017 14:31:00	8014388	0.1350	75441	1.4864037E9	943920000	8014
2	06/02/2017 14:30:00	8014388	0.1350	75441	1.4864036E9	943920000	8014
3	06/02/2017 14:29:00	8014388	0.1350	75441	1.4864036E9	943920000	8014
4	06/02/2017 14:28:00	8014388	0.1350	75441	1.4864036E9	943920000	8014

Here you can check what values are archived and save them in your computer.

“Archives” tab. User archive current values

9 "FTP" client configuration

Configure **FTP client**: Go to **Communication -> Data Transfer -> FTP**. In this tab you can set the FTP port, transmission channel, FTP server address / name. You have set your FTP port and transmission channel.

Configure the following parameters: **"FTP server"**: Up to 4 different FTP connections to remote FTP servers can be configured.

- **"Enabled"**: Select it to enable an FTP connection
- **"FTP Port"**: By default, 21 but can be changed.
- **"Transfer period"**: It defines interval between CSV file sending tasks.
- **"Max number of last records to be sent"**: It defines maximum number of previous data stored and not sent due to communication error. These data will be sent in a CSV file when communication is restored.
- **"Transmission channel"**: It can be Ethernet or GPRS

"URL and directory of FTP servers": It defines the complete FTP server URL where CSV file will be hosted.

Username and password of FTP server: to be configured in case credentials are requested by FTP server.

In order to save changes click on **"SET"** button.

Communication Archives Time parameters Start

GPRS Serial interface MBus devices Data transfer FTP server

Common parameters Modbus TCP/IP client FTP **You have to set your FTP port and transmission channel.**

	FTP server 1	FTP server 2	FTP server 3	FTP server 4
Enabled	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FTP port	21	21	21	21
Transfer period (min.)	10	10	10	10
Repeat transfer if failure (min.)	5	5	5	5
Max number of last records to be sent	10	10	10	10
Ryōio kanalas				

Name template of the file to be sent
MX-1_YYYY_MM_DD_HH_NN.csv

URL and directory of FTP servers

FTP server	URL and directory
1	Here you have to set FTP server address or name.
2	
3	
4	

Username of FTP server

FTP server	User name
1	
2	
3	
4	

Password of FTP server

FTP server	Password
1	
2	
3	
4	

FTP server	Status	Successful/attempt/last record transfer times
1	Not active	011011998 00:00:00 011011998 00:00:00 011011998 00:00:00
2	Not active	011011998 00:00:00 011011998 00:00:00 011011998 00:00:00
3	Not active	011011998 00:00:00 011011998 00:00:00 011011998 00:00:00
4	Not active	011011998 00:00:00 011011998 00:00:00 011011998 00:00:00

Set Get

Communication -> "Data transfer" tab. FTP client configuration

10 Modbus connection configuration



Connecting Modbus meter/device to the MX-1

Step 1: Click on **Communication tab** - > **Serial interfaces** and set the **Bode Rate, Parity, Data Bits, Stop Bits**. This information must be the same as indicated on the Modbus meter / device that is being connected to the MX-1 data logger. After entering the parameters, press „**SET**“.

The screenshot shows the 'Modbus devices' configuration screen in the MX-1 software. The 'Communication' tab is active, and the 'Modbus devices' sub-tab is selected. A table lists various communication parameters:

Bode	Parity	Data bits	Stop bits	Packetization	Packet time (msec.)	Packet symbol(Hex)	Packet byte count	Mode	Destination of DTR
<input type="checkbox"/> 300	<input checked="" type="radio"/> Even	<input type="checkbox"/> 5	<input checked="" type="radio"/> 1	<input checked="" type="radio"/> Time	10	FF	100	<input type="checkbox"/> Full duplex	<input type="checkbox"/> Always OFF
<input type="checkbox"/> 600	<input type="radio"/> Odd	<input type="checkbox"/> 6	<input type="checkbox"/> 1.5	<input type="checkbox"/> Symbol				<input checked="" type="radio"/> Half duplex	<input type="checkbox"/> Always ON
<input type="checkbox"/> 1200	<input type="radio"/> Mark	<input type="checkbox"/> 7	<input type="checkbox"/> 2	<input type="checkbox"/> Length					<input checked="" type="radio"/> OFF when send
<input type="checkbox"/> 2400	<input type="radio"/> Space	<input checked="" type="radio"/> 8							<input type="checkbox"/> ON when send
<input type="checkbox"/> 4800	<input type="radio"/> None								
<input type="checkbox"/> 9600									
<input checked="" type="radio"/> 19200									
<input type="checkbox"/> 38400									

Below the table, the 'Purpose of UART' section has 'Modbus RTU Master' selected. The 'Modbus RTU Master' settings table is as follows:

Parameter	Value
Stack depth	1
Timeout (msec.)	2000

A red text box overlaid on the screenshot states: "You have to set UART to which is connected your Modbus meter. UART settings have to be the same as the meter."

Step 2: Click on **Communication tab** - > **Modbus devices** -> **Configuring Modbus devices** -> **Modbus RTU client**. Define the reading time (sec) by your requirements. Then set the amount of requests, press „Enter“. Also set the Adress, Function, Register, and Coils as indicated in the picture above and press „SET“.

Step 3: Click on **Communication tab** - > **Modbus devices** -> **Current values**. In this tab you see if the Modbus meter / device is read. The value is being showed in hex formate. Also there is indication of MX-1 Register adress, where the received modbus value is.

Step 2

Modbus RTU Client

Enabled	<input checked="" type="checkbox"/>
Read period (sec.)	5
Amount of requests	2

You have to define the reading time (sec.), what is right for you.

You have to enter the number in the field, how many you need, and press "Enter".

	Address	Function	Register/Coil	Amount of registers/Coils	MX reg. index	Priority	Error priority
1	30	3	215	2	0	0	0
2	30	3	40000	2	2	0	0

Set **Get**

Step 3

Current values

Here you can check if the meter is read.

The value is showing hex format.

Eil. Nr.	Registras	Kiekis	Duomenys
	52000	2	0000 0000
	52002	2	0000 0D54

52000 is an internal Data Logger register address, into which is attached the received value from the meter.

Get

↑ You have to choose, what function the meter will be reading.

↑ You have to enter a starting address of modbus register number in the field, which you want to read.

↑ The number of registers which are read from the starting registry. In this case 65002

Step 4: Click on **Communication** tab -> **Data transfer** -> **Common parameters**. In this tab are described meter values, formats, headers and dimensions, which will be archived and sent to the FTP. Only archived values can be sent to FTP.

Amount of groups of registers: 2

Set user archive:

	Parameter	Register/Coil	Amount of registers/	Format	Header	Dimension
1		52000	2	Float		
2		52002	2	unsigned long		

Here are described the meter values formats, headers and dimensions, which will be archived and sent to the FTP. Only archived values can be send to the FTP server.

You can load from CSV file your description or save this and use in other devices.

Buttons: Set, Get, Load from CSV, Save to CSV

Step 5: Click on **Archives** -> **Configuration**. In this tab you can set the archiving period.

Here you have to set archiving period.

Storage parameters

	Period	Delay
User archive (min.)	10	0

Records in archives

	Records	
Alerts	0	Clear
User archive	4	Clear

Buttons: Set, Get

Step 6: Click on **Communication** -> **Data Transfer** -> **FTP**. In this tab you can set the FTP port, transmission channel, FTP server address / name. Then click „**SET**“.

Communication Archives Time parameters Start

GPRS Serial interface Modbus devices Data transfer FTP server

Common parameters Modbus TCP/IP client **FTP** You have to set your FTP port and transmission channel.

	FTP server 1	FTP server 2	FTP server 3	FTP server 4
Enabled	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FTP port	21	21	21	21
Transfer period (min.)	10	10	10	10
Repeat transfer if failure (min.)	5	5	5	5
Max number of last records to be sent	10	10	10	10
Ryðio kanalas				

Name template of the file to be sent

URL and directory of FTP servers

FTP server	URL and directory
1	Here you have to set FTP server address or name.
2	
3	
4	

Username of FTP server

FTP server	User name
1	
2	
3	
4	

Password of FTP server

FTP server	Password
1	
2	
3	
4	

FTP server	Status	Successful/attempt/last record transfer times
1	Not active	010111998 00:00:00 010111998 00:00:00 010111998 00:00:00
2	Not active	010111998 00:00:00 010111998 00:00:00 010111998 00:00:00
3	Not active	010111998 00:00:00 010111998 00:00:00 010111998 00:00:00
4	Not active	010111998 00:00:00 010111998 00:00:00 010111998 00:00:00