WATT & WELL

CONVERTING POWER INTO CONFIDENCE

REFERENCE	Modular Power Unit - User guide
PROJECT	MPU-25

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IMPORTANT INFORMATION

Warranty – this manual

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Glossary

CAN: Controller Area Network
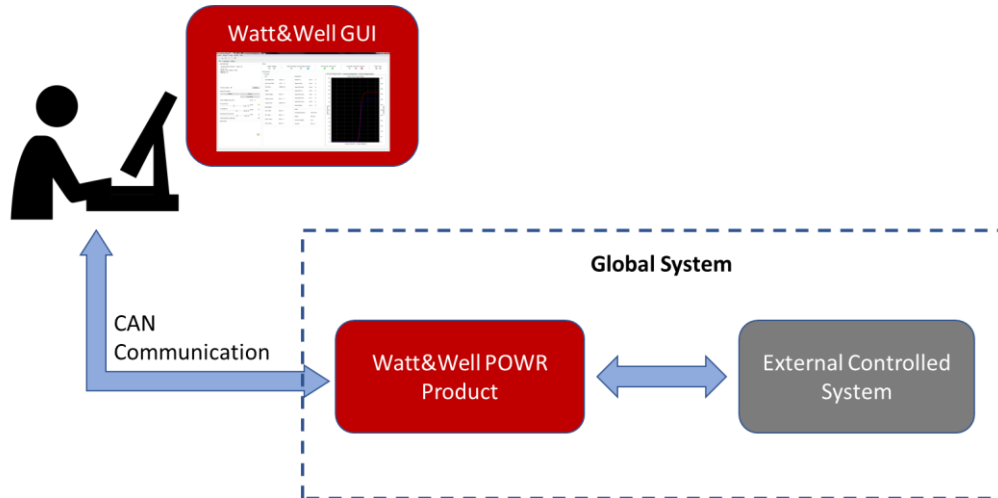FW: Firmware
GUI: Graphical User Interface
MPU: Modular Power Unit
W&W: Watt & Well

Description

This document describes the MPU GUI application. The application is used to control, monitor and configure the MPU product from a user's Windows computer and via a CAN communication (a USB to CAN transceiver is used).

Requirements

- Computer with Windows7 or Windows10 operating system
- Monitor MPU provided by W&W, the package must contain:
  - The executable file of the GUI, e.g: "MPU_Monitor_Protected.exe"
  - The several library files needed by the GUI
  - The "DataDefinition.xml" file that describes all the objects dictionary required by the CANopen protocol and the FW application of the MPU product
- NI CAN transceiver, the transceiver's drivers must be installed on your computer. The compatible USB to CAN transceivers are:
  - NI CAN 8473, High Speed USB CAN interface (W&W uses this one by default)
  - NI PXI-8512
  - NI PCI-8512
  - PCMCIA-CAN/2
- Physical CAN network with 2 termination resistors of 120 Ω each. The smallest CAN network is composed of 2 nodes; the MPU GUI node and the MPU Product node:
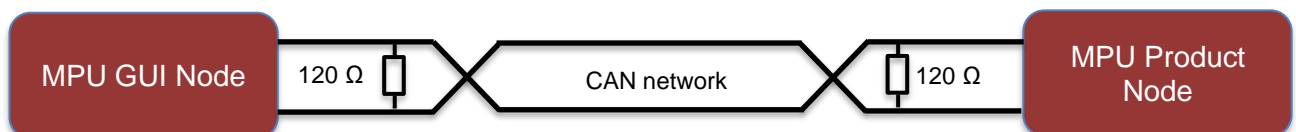
1. Overview

1.1. Communication

The MPU GUI application integrates the CANopen protocol, it's an application layer based on the CAN communication. In the CAN network, the MPU GUI is considered as a CAN node.

The MPU GUI can read and write the several data of the MPU product's object dictionary using the provided communication objects of the CANopen protocol (SDO, PDO …).

1.2. Features

The MPU GUI developed by W&W integrates the features below:
- The GUI Main Window, it's composed from 3 tabs:
    - *The Main tab*: it provides access to the MPU product's information, commands, system status and the main measurements
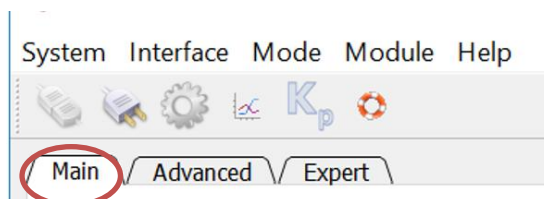

Figure 1: Main tab

- *The Advanced tab*: it provides access to MPU product's advanced settings (critical measurements calibration parameters) and some internal measurements.
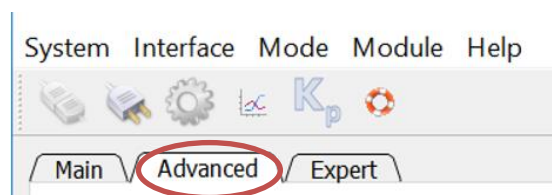

Figure 2: Advanced tab

- *The Expert tab*: it provides access to the MPU product's Real-Time diagnostics and the fault sensitivity selection
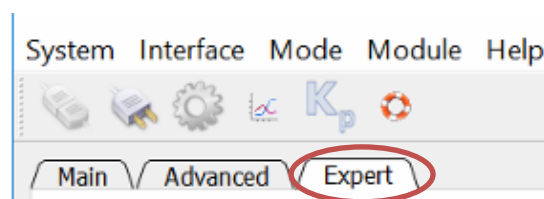

Figure 3: Expert tab

- The Communication Configuration window: it's used to set the CAN communication properties
- The Device Manager window: it provides access to the complete object dictionary; the user can read and write the several data depending on the access type of the object

- The Virtual Scope window: it provides the ability to log and display the fast measurements and/or the internal computed variables of the MPU FW application. The user can select one or many of the proposed variables to log and display for monitoring purpose

1.3. Operating modes

The MPU GUI contains two operating modes, the standard mode (default mode) and the expert mode. The expert mode is reserved to the qualified persons that are able to change the MPU product configuration (product CAN address, regulation parameters, the thresholds of protections, the faults' sensitivity …), this mode is protected by a password. The accessible features in each mode are:

- In the standard mode: the main and advanced tabs of the Main window (with limited commands and measurements) and the Communication Configuration window
- In the expert mode: all the features

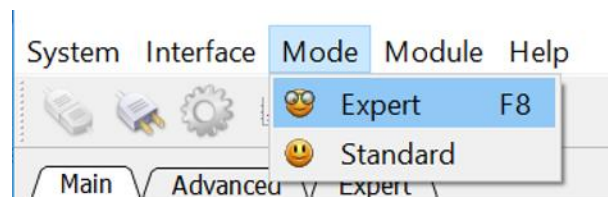The selection of the operating mode can be done manually or by requesting a tool protected by the expert mode:

Figure 4: Operating mode selection

If the expert mode is the requested mode, a password dialog box will request the user to provide the correct password:
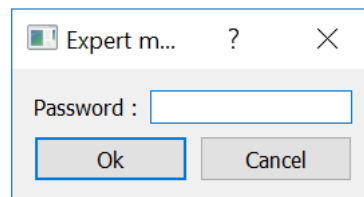

Figure 5: Password dialog box

If the provided password is the correct one, the features protected by the expert mode are unlocked. And they still locked if it's not correct.

2. Using the MPU GUI

In this part we assume that the MPU product is powered up and is connected to the user computer using the compatible NI CAN transceiver.

2.1. Opening, connecting and configuring the MPU GUI

➤ Execute the MPU GUI from the package files provided by W&W, the initially opened window contains disabled panels (in grey color) because the communication is not yet configured and requested:
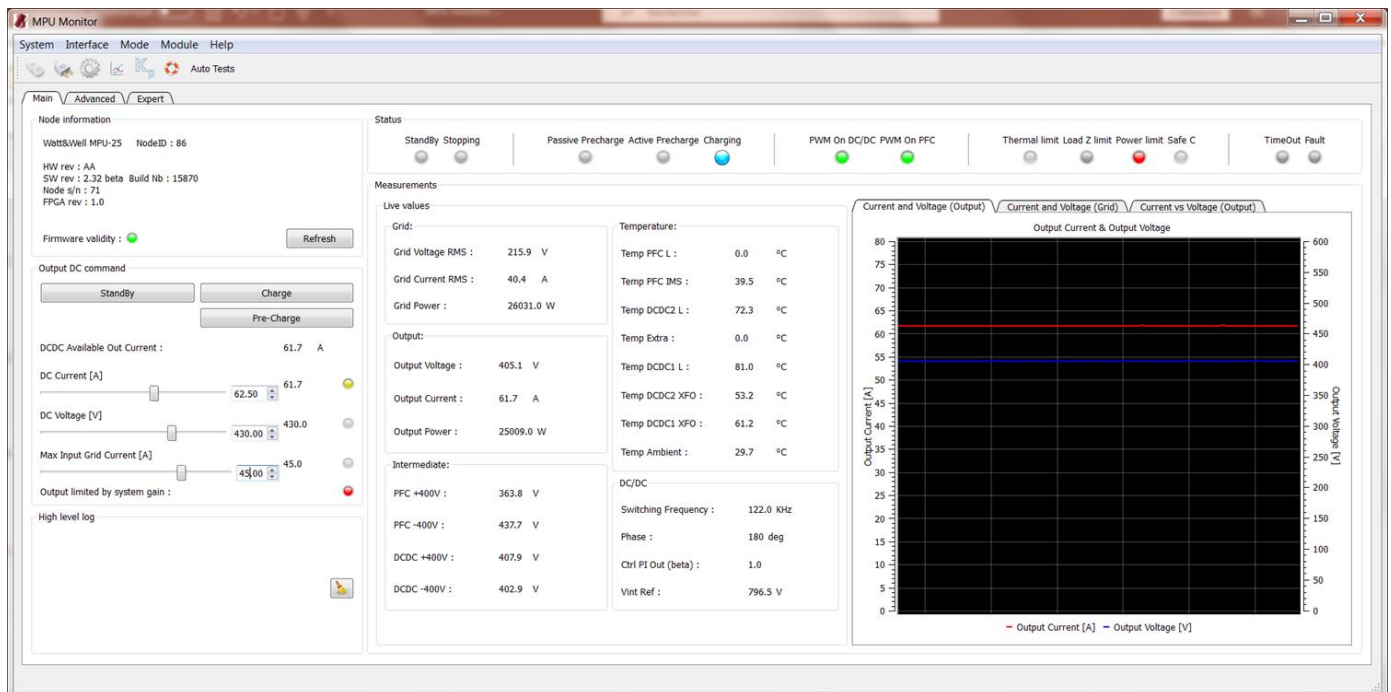

Figure 6: The MPU GUI's main window

➤ Open the CAN Communication Configuration window to set and then request the communication:
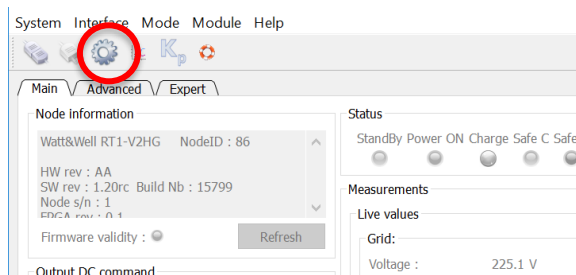

Figure 7: Request configuring the CAN communication
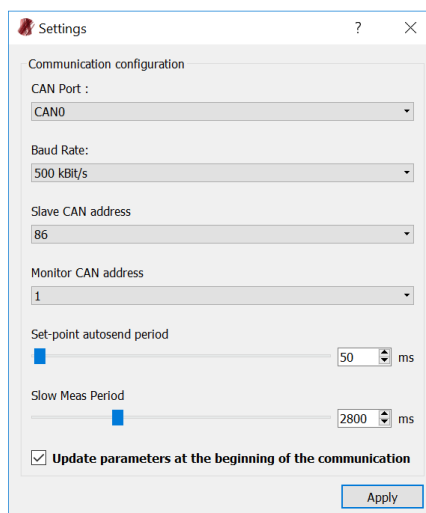
The opened window:

Figure 8: The communication configuration window

The several settings are:
- <u>CAN port:</u> the allocated port to the NI CAN transceiver in your computer
- <u>Baud Rate:</u> The CAN communication speed
- <u>Slave CAN address</u>: the MPU product (slave) CAN address
- <u>Monitor CAN address</u>: the MPU GUI (master) CAN address
- <u>Set-point auto-send period:</u> the sending period of the set-points from the MPU GUI
- <u>Slow Meas Period</u>: the sending period of the measurements from the MPU product

By applying the communication settings (using the Apply button), a request to set the communication is sent, then the communication with the MPU product establishes if the settings are correct. When the communication is established with the MPU product, the Main window is enabled:
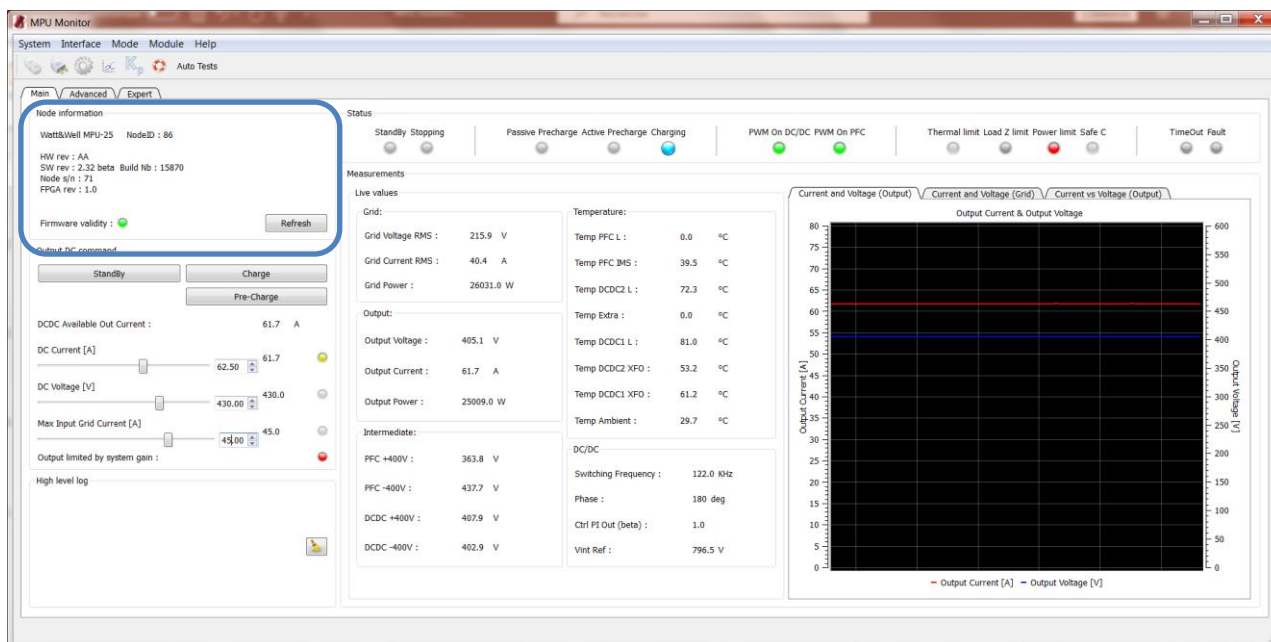

Figure 9: The MPU GUI's main window after the communication is established

By default, the operating mode is the standard one. So, the user has a limited use of the MPU GUI.

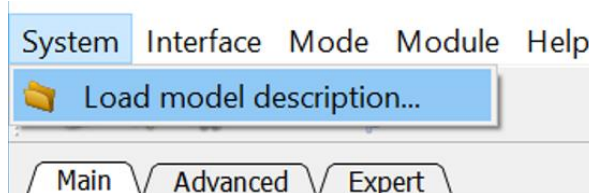➢ Load the "DataDefinition.xml" file to configure the MPU GUI, it's used to load the model description:

Figure 10: Load the model description

A browse file dialog box is opened to select the "DataDefinition.xml" file:
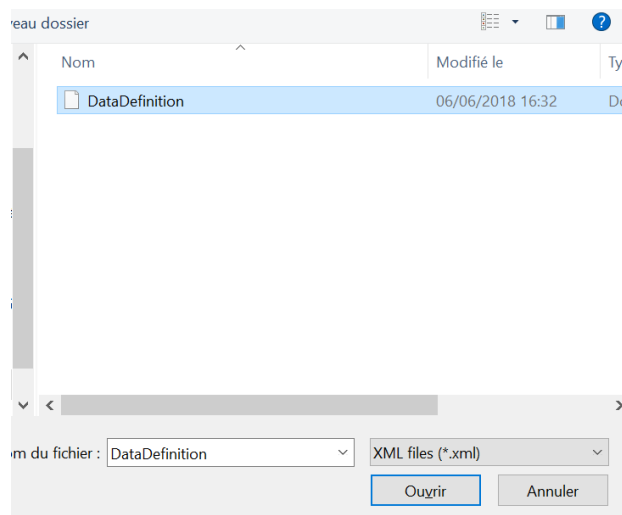
Figure 11: Browse file dialog box

2.2. The Main Window

The Main Window provides access to all the GUI features (depending on the operating mode). In this part we will describe the use of the 3 tabs that compose it.

2.2.1. The Main tab

The Main tab allows the user to:

➢ Get the MPU product information, it's displayed in the "Node information" panel:
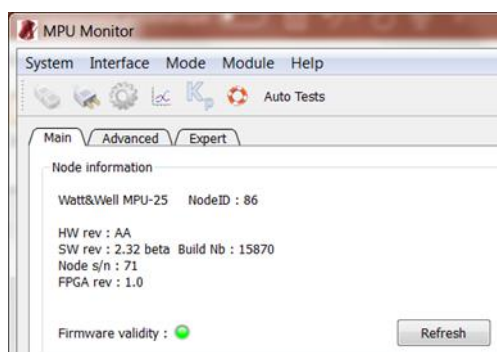

Figure 12: Node information panel

- Name of the MPU product
- NodeID: the CAN address of the product (8 bits)
- HW rev: Hardware revision of the product.
- SW rev: Software revision of the product.
- Build Nb: Versioning revision of the product firmware.
- Node S/N: Serial number of the product
- FPGA rev: the FPGA design revision
- Firmware validity: Versioning verification, the led is red when the firmware is not under versioning control.

The user can also request the Node information by pressing the [Refresh] button.

➢ Change the output DC commands of the MPU product, start/stop the charging, receive the system status and receive live general measurements:
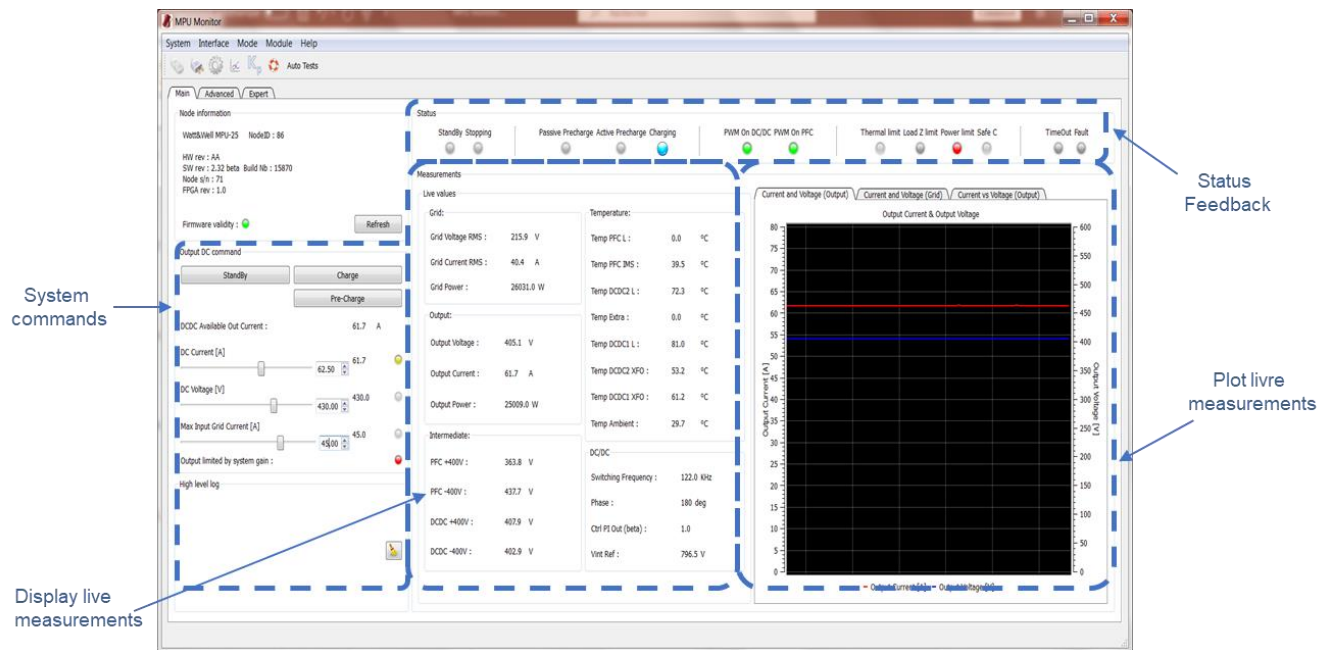
- In the Expert operating mode:

Figure 13: The MPU GUI's main tab in standard mode

2.2.2. The Advanced tab

The Advanced tab allows the user to calibrate the critical measurements, reboot the product, get additional measurements and log the received measurements into an excel file. By checking the "Enable measurements log" checkbox, the received measurements are saved into an excel file located in the same folder as the MPU GUI executable.
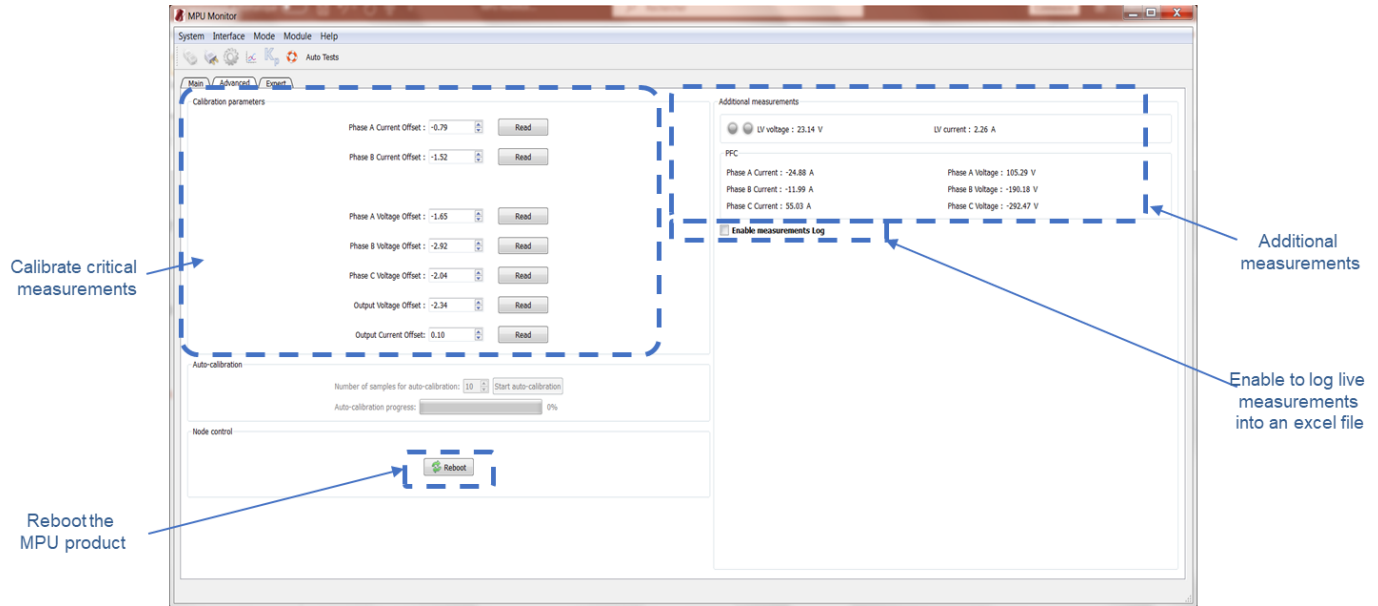

Figure 14: The MPU GUI's advanced tab

2.2.3. The Expert tab

The Expert tab provides access to the MPU product's Real-Time diagnostics and the fault sensitivity selection
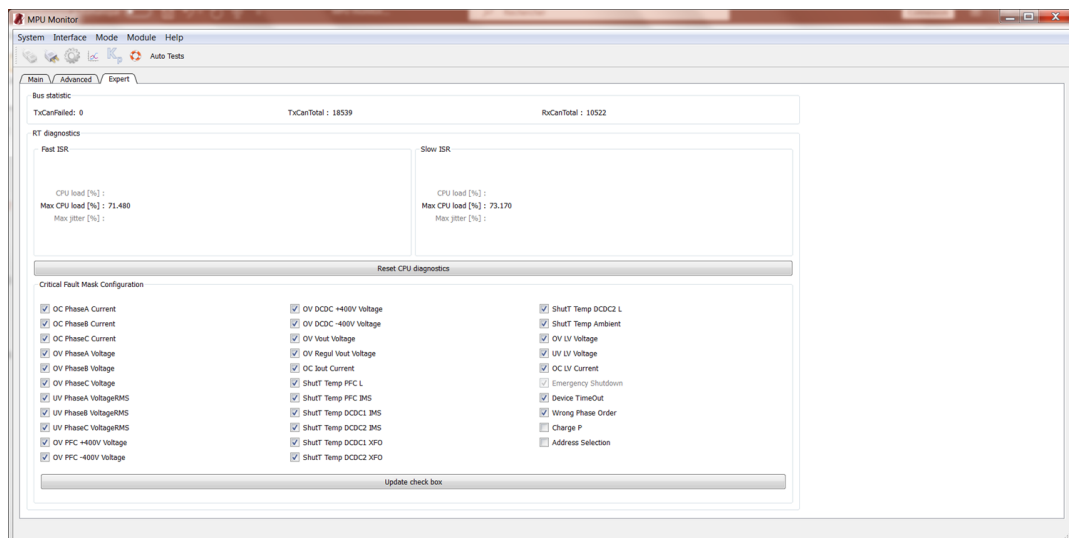

Figure 15: The MPU GUI's expert tab

2.3. The Device Manager

The Device Manager feature provides access to the complete object dictionary that is presented on a tree form, the user can read and write the several data depending on the access type of the object. Please refer to the *object dictionary .html* file provided by W&W that describes in detail each object.

This feature is only unlocked under the expert operating mode, because any modifications of the MPU product data in the object dictionary can damage the converter.

And make sure that loaded model description ("DataDefinition.xml" file) revision corresponds to the FW revision to avoid any damage of the converter.
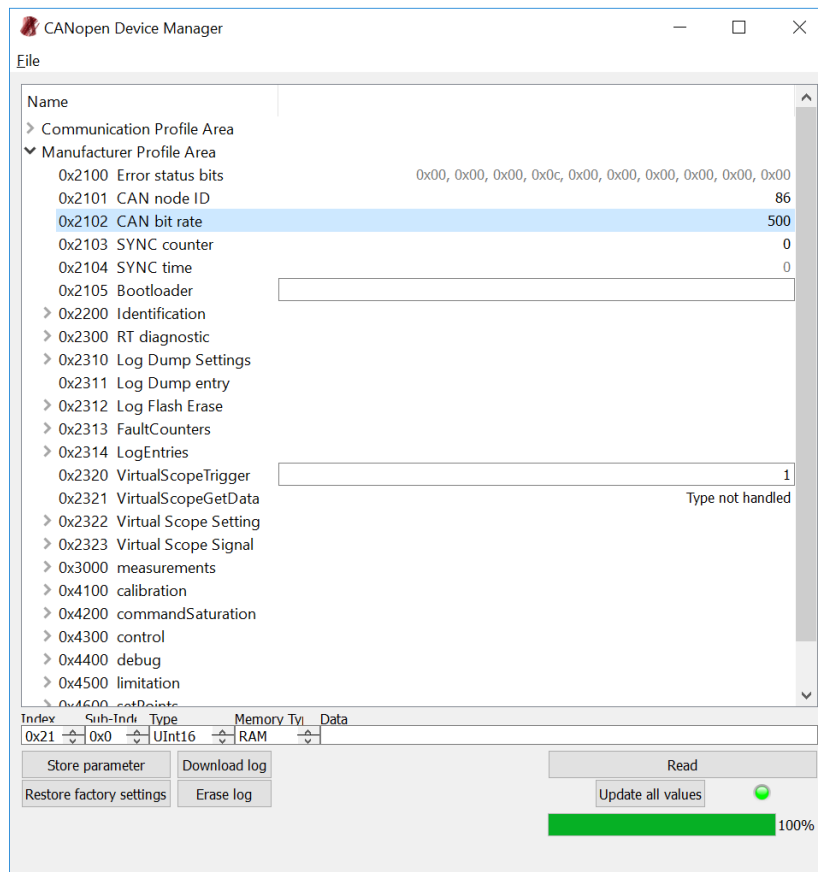

Figure 16: Device Manager window

To load the model description (the "DataDefinition.xml" file) from the Device Manager, open the file using *file menu*:
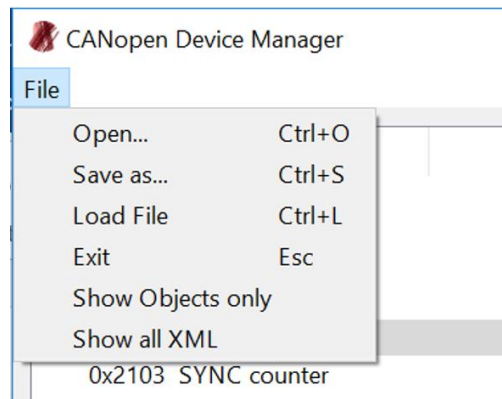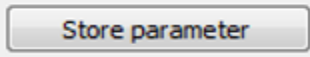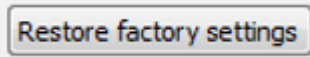
Figure 17: Load DataDefinition.xml file from Device Manager

In addition, this Device Manager provides also the ability to store the non-volatile parameters (with memory type EEPROM) in the external non-volatile memory or to restore the factory settings:

- When a store parameter is requested using the **Store parameter** button, all the non-volatile parameters values are stored in the external memory and they will be loaded at each boot-up of the MPU product.

- When a restore factory settings is requested using the **Restore factory settings** button, the external memory part reserved to store the non-volatile parameters is erased and the application loads the default parameters provided by W&W (expect Serial Number).

For example, the calibration parameters and the regulation control parameters are non-volatile ones, and they present a part of the MPU product's configuration. When the user decides to change those parameters for some reason, he can store the new configuration in the external memory to be loaded at each MPU product's boot up.

N.B: After a store parameter or a restore factory settings you must reboot the MPU Product

2.4. The Virtual Scope

The Virtual Scope feature provides the ability to log and display the fast measurements and/or the internal computed variables of the MPU FW application. The user can select one or many of the proposed variables to log and display for monitoring purpose.
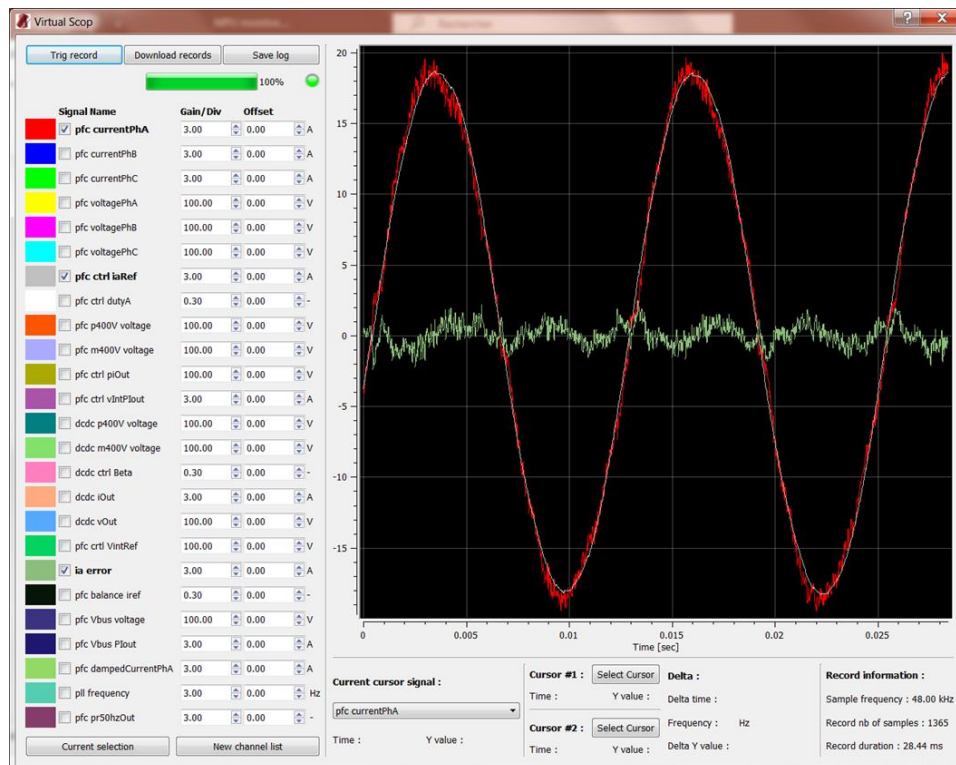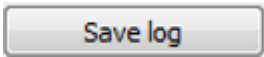

Figure 18: Virtual Scope window

The Virtual Scope is configured automatically after loading the model description (the "DataDefinition.xml" file), the configuration consists of loading the signals' description.

To use the Virtual Scope, the flow presented below must be respected:

The user can select/deselect each signal using the corresponding checkbox, change the displayed Gain/Div and change the displayed offset.

In addition, the user can also save the displayed data, by pressing the **Save log** button, into an excel file that will be created in the same folder as the MPU GUI executable.