UM1599
User manual

The STPM01 and STPM1x evaluation software

Introduction

The STPM1x evaluation software is a graphical user interface to read, configure and calibrate the STPM01 or STPM1x single phase energy metering device, suitable for parallel and USB hardware interfaces.

The application has a unique work area where the user can read the device's registers and write configuration and calibration parameters.

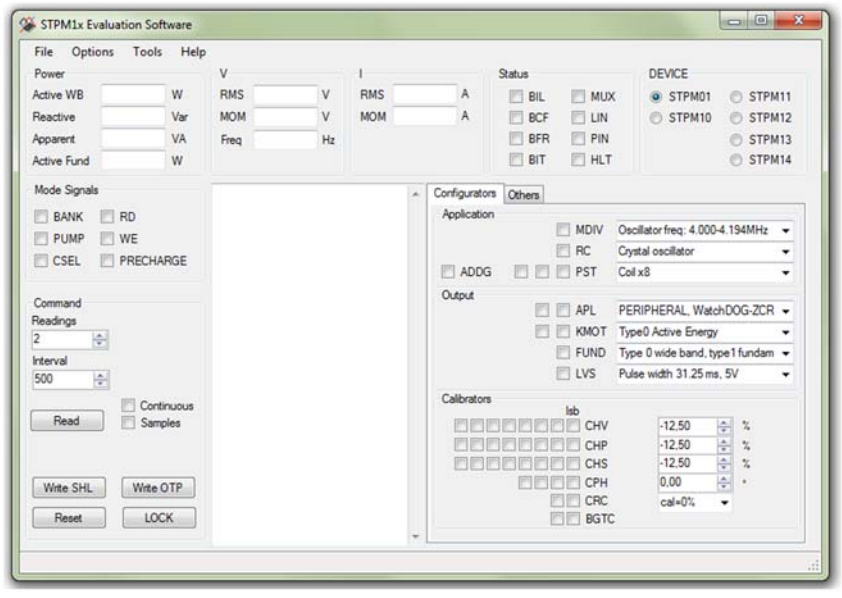
It is possible to select a specific device and configure application parameters (such as sensor sensitivity, crystal oscillator frequency) to calculate measured power, current and voltage.

Data acquisition can be customized to read either a single or a number of data samples from the device. Reading data can be output in table format and saved as excel file.

Wizard tools are provided to guide the user during the application design and automatically calibrate the device.

At any time it is possible to save the current session data in a project, to open an existing project or to create a new project.

Figure 1. STPM1x evaluation software screenshot



Contents

1 Introduction

1.1 Prerequisites

This evaluation software is a window-based application and requires .NET framework 2.0.

It is possible to free download and install this framework from www.microsoft.com.

1.2 Hardware programmer

The STPM1x evaluation software can be used with either parallel or USB hardware interface.

The parallel interface is provided free of charge with any STPM1x demonstration board.

The USB interface, also providing galvanic isolation, is available as a separate demonstration board with the code STEVAL-IPE023V1. The application setup installs automatically the STM32 Virtual COM drivers, needed to use the USB interface.

To communicate with the device through the evaluation software, a hardware programmer must be connected to both the PC and the demonstration board, then the demonstration board must be powered on.

1.3 Recommended readings

This document concerns the evaluation software only.

Further details about the STPM family devices are available in the relative datasheet.

Before reading this document, please read carefully:

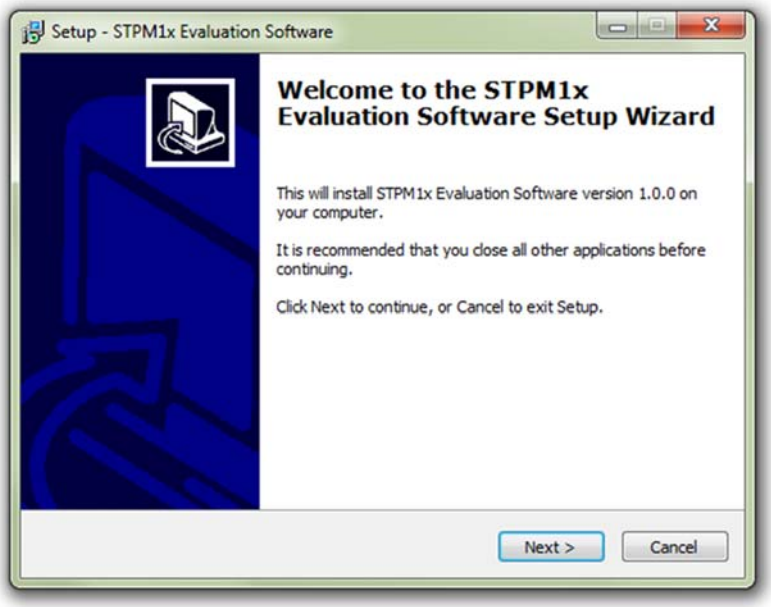
- STPM01, STPM10, STPM1x datasheet
- SPI protocol for the STPM01/STPM10 metering devices (AN2159)
- Fast digital calibration procedure for STPM01 based-energy meters (AN2299)

2 Application setup

2.1 Software setup

The setup file guides you through the software installation. Double-click on the setup file to start the installation (*Figure 2*) and follow the guided process.

Figure 2. Welcome



3 Getting started

To start working with the STPM01 or STPM1x demonstration board, follow the below steps:

1. Connect the demonstration board to the parallel hardware programmer or to the USB programmer (STEVAL-IPE023V1)
2. Connect the programmer to the PC through a parallel or a USB cable
3. Power on the demonstration board
4. Open the STPM1x evaluation software
5. Select the menu Option - Interface - Parallel or Serial according to the chosen hardware programmer (see *Section 4.2*)
6. Configure the application parameters selecting Option - Configuration menu (see *Section 4.2*)
7. The user is now ready to read, write (see *Section 5.6*) or calibrate your application (see *Section 4.3*)

4 Application menu

4.1 File

From the “File” menu it is possible to:

- Open: open an existing .stpm file with configuration parameters
- Save: save the configuration in the current .stpm file
- Save as: save a new .stpm configuration file containing:
  - Configuration bits
  - Application parameters (see *Section 4.2* below)
- Exit: quit the application

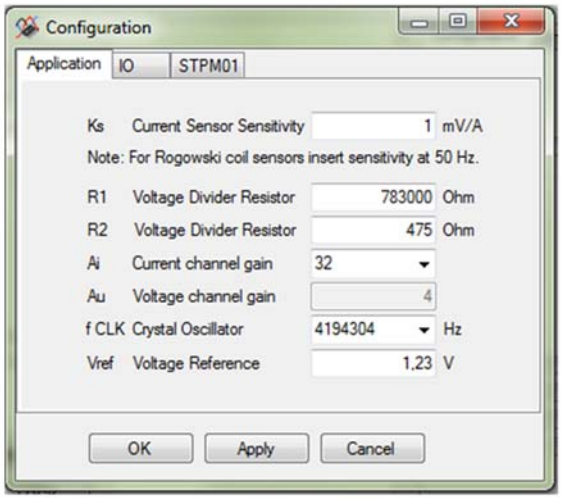
4.2 Options

- Interface: to open the communication with the device, select the proper hardware interface:
  - Parallel: for the parallel hardware interface coming with the demonstration board
  - Serial: if STEVAL-IPE023V1 is used
- Configuration

This form allows the application and the IO port configuration. Use the “OK” button to save and close form, “Apply” to save only and “Cancel” to exit without applying changes.

  - Application: to correctly transform data coming from the device into meaningful values, the basic parameters of the board have to be configured, like resistors of the voltage divider, current sensor sensitivity, voltage and channel amplification gains.

Figure 3. Configuration - application tab

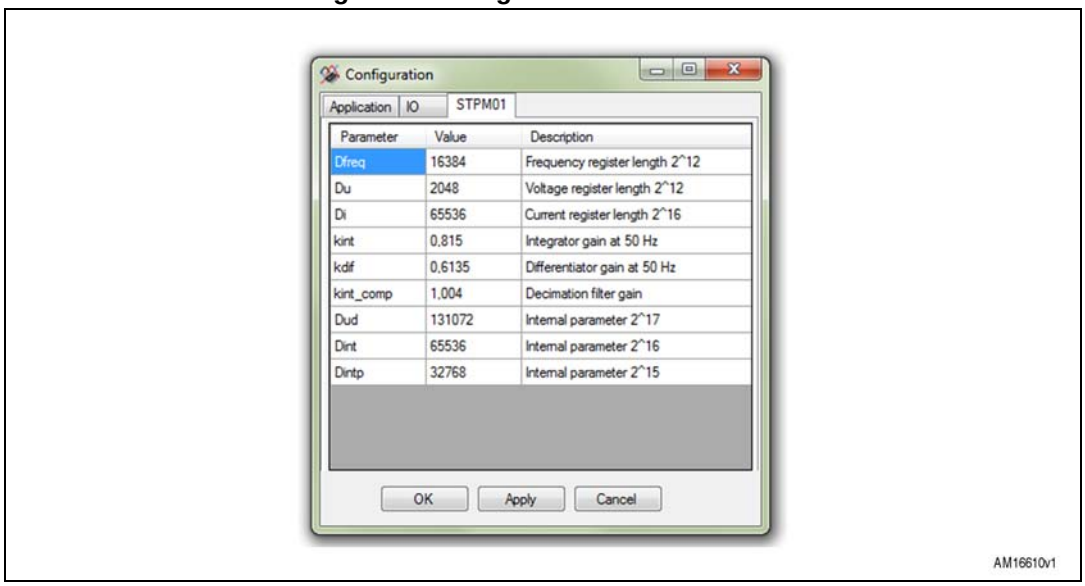


– IO: in this tab the user selects the ports for the hardware interface connection. As the STEVAL-IPE023V1 USB interface, use the proper virtual com port.

Figure 4. Configuration - IO tab

– STPM01: in this tab all the internal device parameters together with their values are reported.

Figure 5. Configuration - STPM01 tab

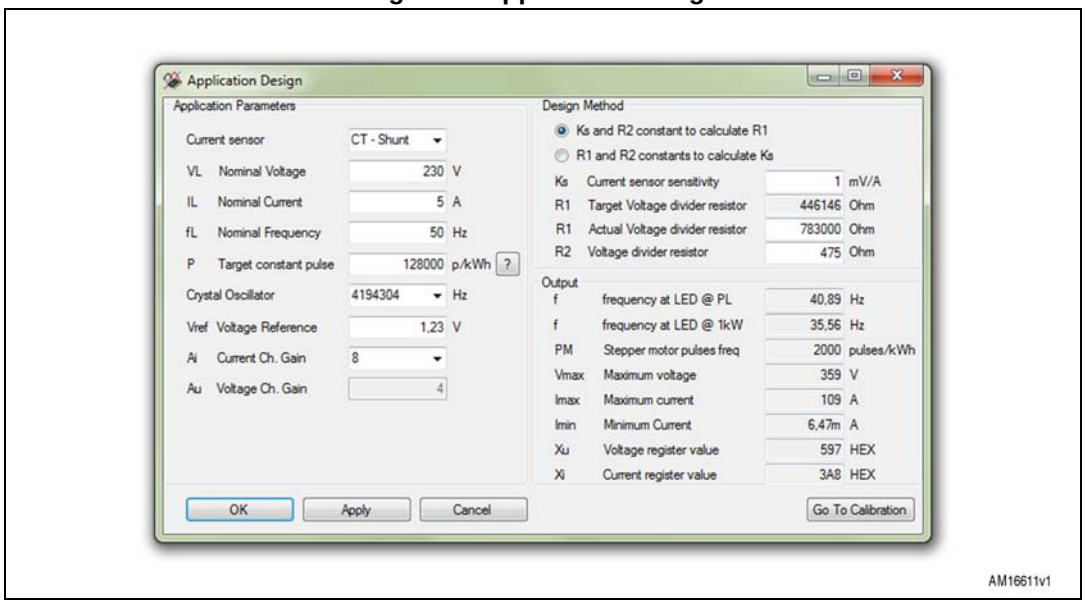


4.3 Tools

4.3.1 Design wizard

This tool helps the application design and it is a preliminary step of the calibration process. By setting the application parameters and selecting a design method, all the ratings of the meter are calculated.

Figure 6. Application design



The user is asked to input the current sensor type (if CT/Shunt or Rogowski Coil), the calibration working point (nominal voltage, current and frequency of the line), some board parameters and the target value of P (number of pulses per kWh from the LED pin).

The choice of a design method is required to calculate one of the analog front end components, either Ks or R1 according to the chosen method. A target value is suggested for this component, and its real value should be chosen as close as possible to it.

Once all these data are input, the “Output” section gives some information about the meter ratings, like output frequencies, voltage and current maximum ratings and target values of RMS registers at specified load.

Use the “OK” button to save and close form, “Apply” to save only and “Cancel” to exit without applying changes.

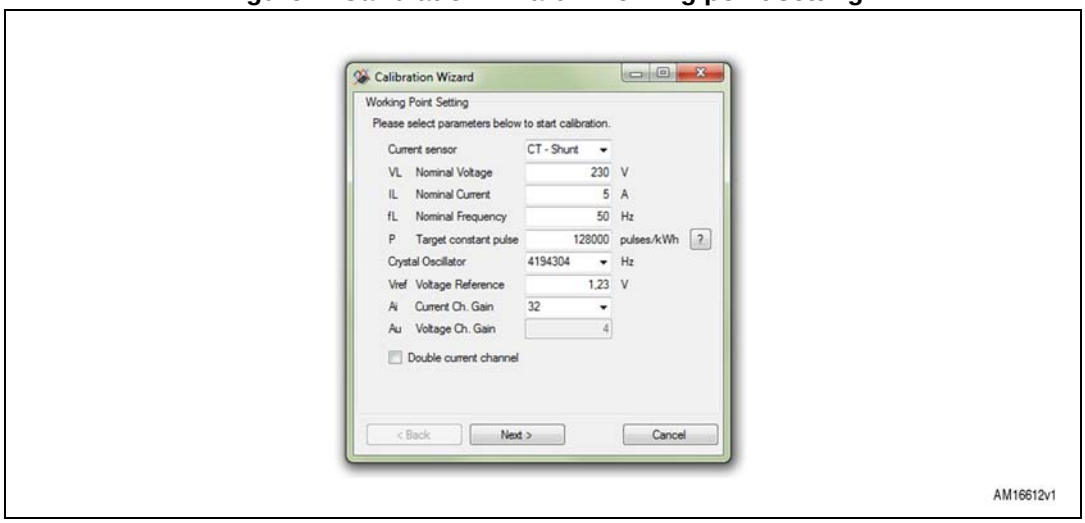
The “Go To Calibration” button opens the calibration wizard form, if a hardware interface is selected.

4.3.2 Calibration wizard

To open the calibration wizard, the board has to be connected (through “Option”-”Interface” menu) and powered on.

The calibration wizard consists of four steps. In the first one, shown in *Figure 7*, the user has to insert the board parameters and the working point for calibration, and the number of current channels used.

Figure 7. Calibration wizard - working point setting

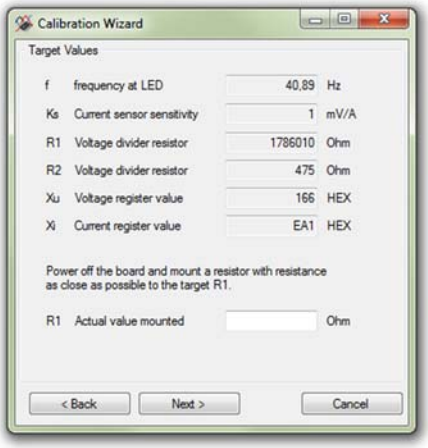


In the second step (*Figure 8*), the user has to select a design method, choose mutually compatible sensor sensitivities for voltage and current so to achieve the calibration.

Figure 8. Calibration wizard - design method

The third step resumes some of the board parameters and some target outputs at the selected load: the frequency of LED pin and the hexadecimal values of RMS voltage and current reading.

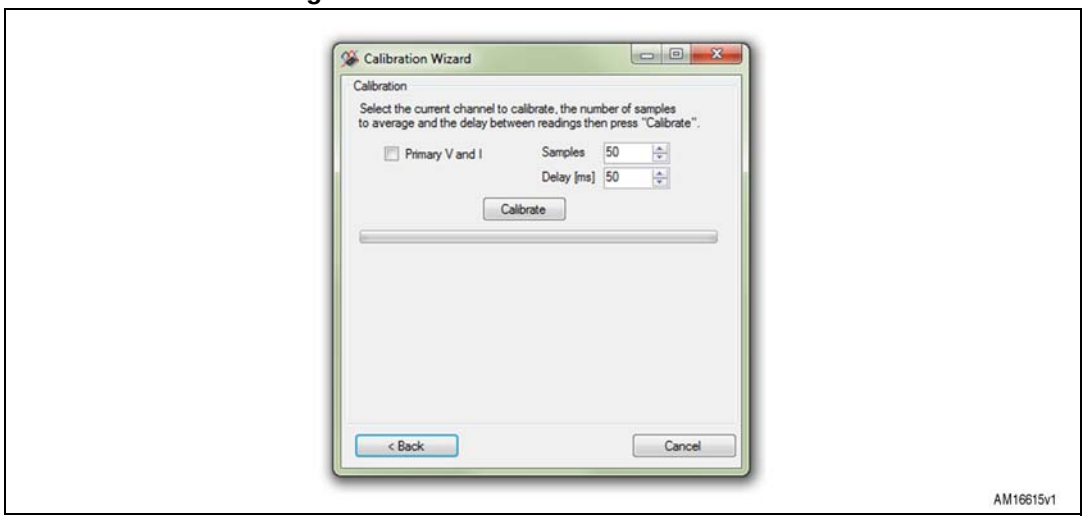
Figure 9. Calibration wizard - target values



Filling in the mask, by indicating the value of the component mounted on the board, (R1 or Ks according to the design method) allows a later correct calculation of voltage, current and energy values.

The last step, in *Figure 10*, requires the board to be connected to the selected load.

Figure 10. Calibration wizard - calibration



It is possible to calibrate one current channel at a time or both at the same time.

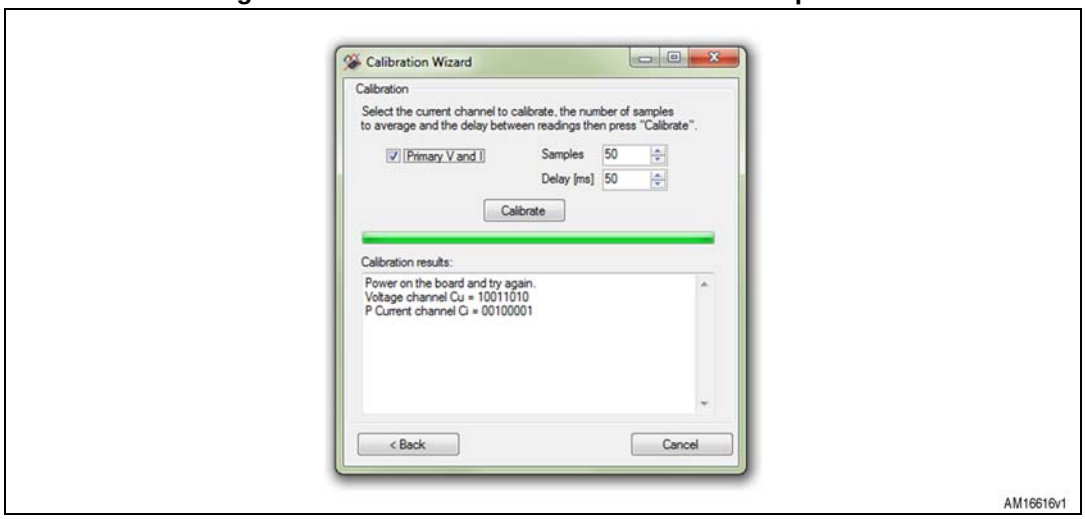
According to the choice, the user should check the check boxes related to the channels to calibrate, select the number of samples to average and the delay between samples.

Pressing the “Calibrate” button, the calibration procedure starts and it consists of:

- Writing device configuration bits and setting calibrators in the middle of the range
- Reading and averaging samples
- Calculating the calibrators to reach the target measure calculated above.

Once the calibration process is completed correctly (*Figure 11*), it is possible to write in the shadow memory the calibrators or to calibrate next phase selecting the proper check box and pressing “Calibrate” again.

Figure 11. Calibration wizard - calibration completed



To close the process, press “Write SHL” to write all calibrators in shadow memory and return to the main form.

If the calibrators are out of range, the user is asked to go back and modify the board parameters and/or the constant pulse to achieve the calibration.

4.3.3 RC startup wizard

In applications using the internal STPM01 or STPM10 RC oscillator, the configuration bit RC has to be set to start the internal oscillator. Since the SPI communication requires clocking, to set this bit, a special sequence of steps has to be followed. This sequence is automatically implemented in the GUI and accessible from the “Tools”-”RC Startup Wizard” menu.

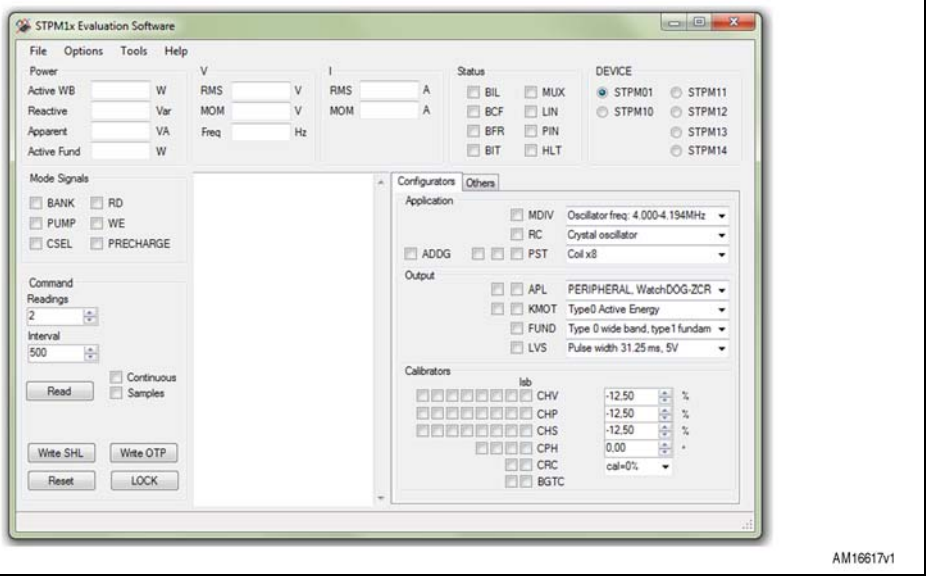
For further information on this topic refer to STPM01 or STPM10 datasheet.

5 Application work area

The application work area is divided into several read/write sections logically grouping the device relevant information.

In this way, the device status and the register’s readings are always available to the user at a single glance.

Figure 12. Application work area



5.1 Device selection

On the top right of the work area, a group-box is available to select the device. The application work area changes according to the selected device’s features.

5.2 Calculated values

On the topmost section of the work area, all data, calculated from the device's registers, are available, such as:

- Type0, Type1, reactive and apparent power values
- RMS and instantaneous values of voltage and current
- Line voltage frequency

All calculation formulas can be found in the AN2159: SPI protocol for the STPM01/STPM10 metering devices.

5.3 Status bits

There is a group-box (Status) showing the device status bits.

These bits are read-only and are automatically updated every time the device is read.

5.4 Mode signals

The mode signal group-box shows the device mode signals.

This is a read/write area: the mode signals are updated every time the device is read. To set or clear these bits, the user should respectively check or unchecked the related check box, then right-click and click on the "Write" button. One mode signal is written at a time.

The mode signal check boxes are automatically updated every time the device is read.

Note: When the user selects "Write SHL" (write to shadow memory) or "Write OTP" (write permanently to OTP memory) the software manages by itself the mode signals to perform these operations.

5.5 Configurators

In the configurator area, divided into two tabs, all device configuration bits can be read and written.

These bits are automatically updated every time the device is read. To set or clear a configuration bit, the user should select the desired value from the check box or combo-box, then use the button "Write SHL" or "Write OTP" from the command area to respectively write temporarily or permanently all the configurators.

The TSTD bit is disabled and can be only set by the "Lock" button.

Note: All the configuration bits are written at the same time.

5.6 Command area

The command buttons to read, write, reset and lock the device are in this area.

For details on these operations, please refer to each device datasheet.

5.6.1 Reading

The device can be read once or continuously by checking/unchecking the "Continuous" check box. For a single reading, a default value of two register readings is set in the "Readings" numeric text box, in order to have at least two data to correctly compute power values. The time (in ms) can be also set between two readings through the "Interval" numeric text box. Pressing the "Read" button, the device reading is performed.

This operation is not available for STPM11, STPM12, STPM13 and STPM14 devices.

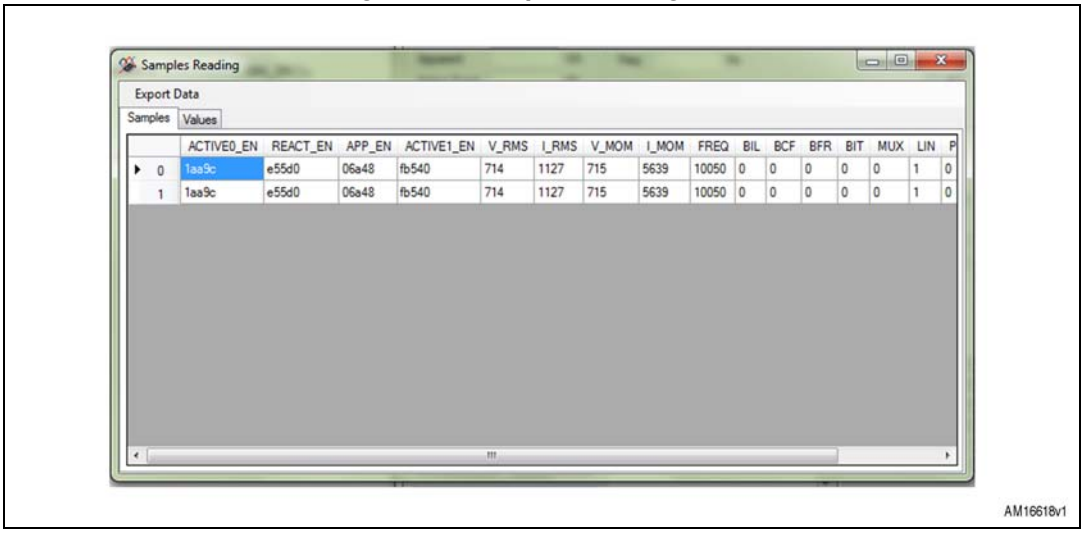
5.6.2 Samples reading

To perform the samples reading, the "Samples" check box has to be checked, then the "Read" button has to be pressed. It is possible to choose:

- the number of samples ("Readings" numeric text box)
- the delay between samples reading in ms ("Delay" numeric text box)

After the samples reading is completed, a form (in *Figure 13*) is opened displaying in a grid all the data taken from the registers and the corresponding energy values in two different tabs.

Figure 13. Samples reading form



5.6.3 Write to shadow memory latches

The "Write SHL" button allows all the bits to be written and set temporarily in the configurator area.

5.6.4 Write to OTP memory

The "Write OTP" button allows all the bits, set in the configurator area, to be written permanently. If the USB interface is used, a proper voltage source should be connected to the device VOTP pin (not available for STPM10).

5.6.5 "Reset" button performs a software reset of the device

"Reset" button performs a software reset of the device.

5.6.6 Lock

The "Lock" button locks the device writing the TSTD bit. Once the device is locked, writing or accessing mode signals is no more possible (not available for STPM10).

5.7 Panel

In the middle of the work area, a panel displays the application messages and register’s readings.

6 Revision history

Table 1. Document revision history

Date	Revision	Changes
27-Aug-2013	1	Initial release.

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