STPMC1 evaluation software

Introduction

STPMC1 evaluation software is a graphical user interface to read, configure and calibrate an STPMC1 energy metering device, suitable for parallel and serial hardware interfaces.

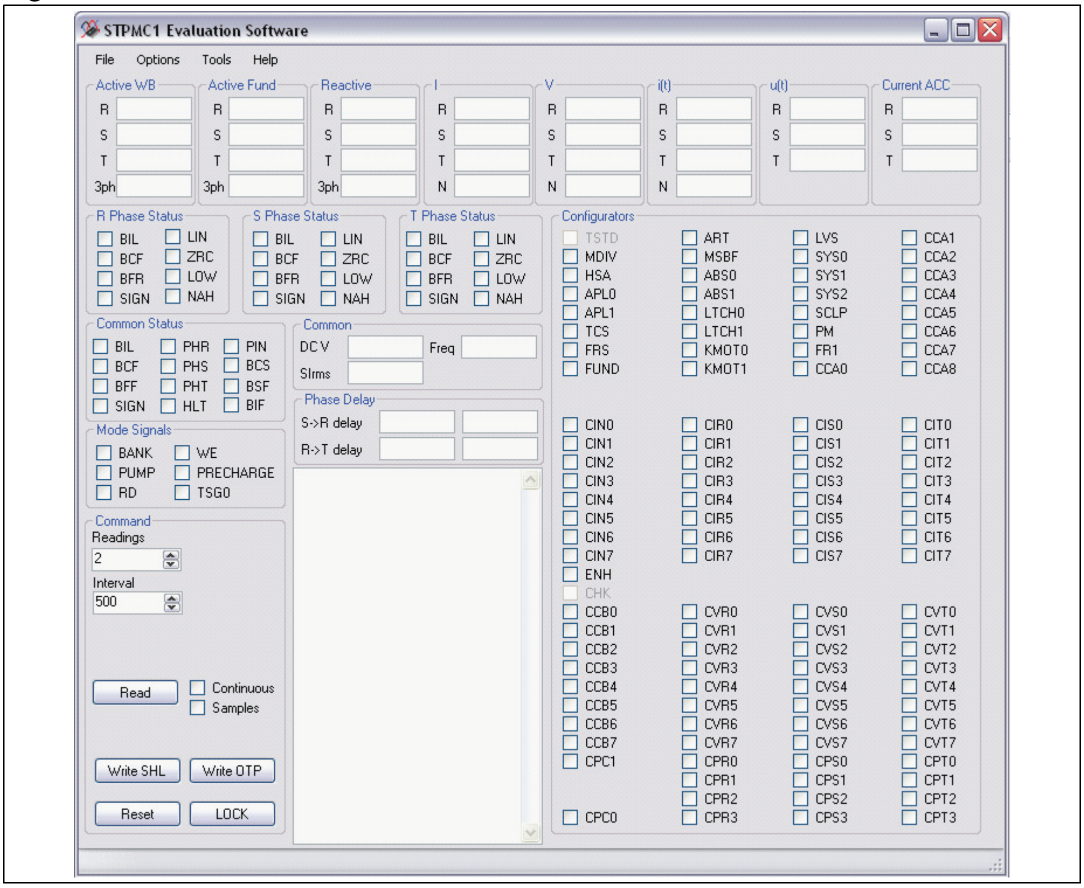
The application has a unique work area where the user can read device registers and write configuration and calibration parameters.

It is possible to configure application parameters (such as sensor sensitivity, crystal oscillator frequency) to calculate measured energy, current and voltage.
Data acquisition can be customized to read either a single or a certain number of data samples from the device. Read data can be output in table format and saved to an Excel file.

Two 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 current session data in a project, to open an existing project or to create a new project.

Figure 1. STPMC1 evaluation software screenshot



Contents

1 Introduction

1.1 Prerequisites

This evaluation software is a Windows® based application and requires .NET framework 2.0.

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

1.2 Hardware programmer

The STPMC1 evaluation software can be used with either a parallel or a serial hardware interface.

The parallel interface is provided free of charge with any STPMC1 demonstration board.

The serial interface, also providing galvanic isolation, is available as a separate demonstration board with the code STEVAL-IPE005V1.

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

1.3 Recommended reading

This document only concerns evaluation software.

More details on the STPMC1 device can be obtained from the datasheet.

Before reading this document, please read carefully:

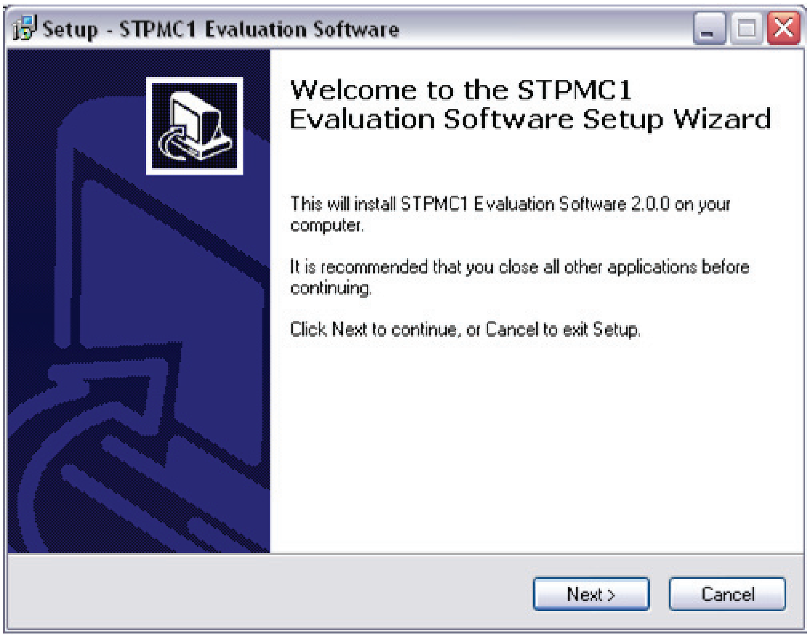
- STPMC1 datasheet
- AN3254 application note
- AN3398 application note.

2 Application setup

2.1 Software setup

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

Figure 2. Welcome



3 Getting started

To start working with an STPMC1 demonstration board, follow the steps below:

1. Connect the demonstration board to the parallel hardware programmer or to the serial programmer (STEVAL-IPE005V1)
2. Connect the programmer to the PC through a parallel or serial cable
3. Power on the demonstration board (and eventually the serial programmer)
4. Open STPMC1 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 5.5*) or Calibrate the 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.

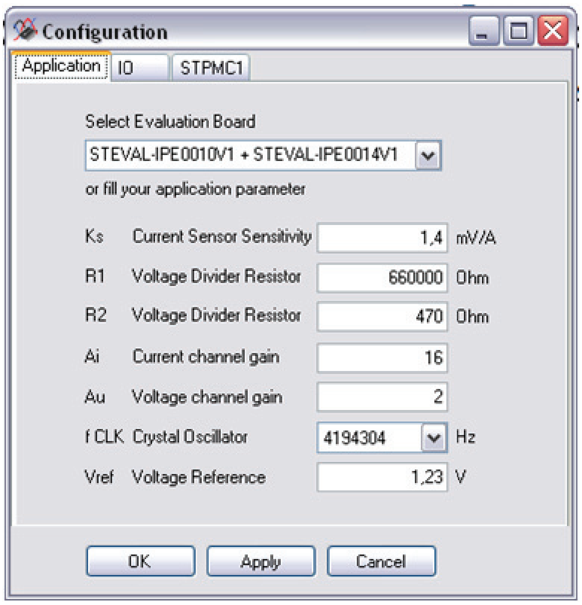
4.2 Options

- 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-IPE005V1 is used.
- Configuration:

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

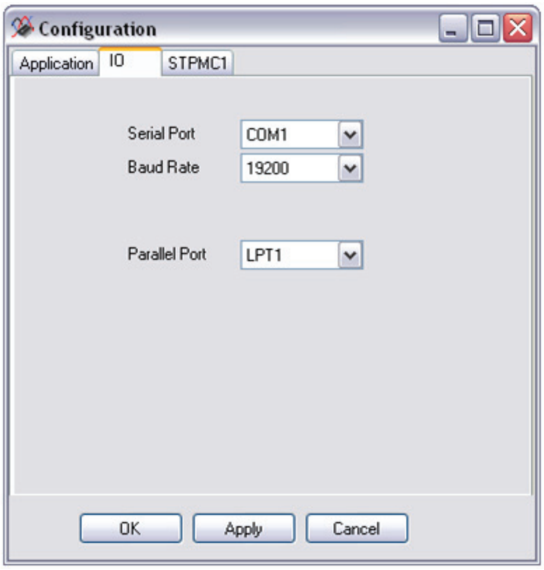
  - Application: to correctly transform data coming from the device into meaningful values it is necessary to configure the basic parameters of the board, like resistors of the voltage divider, current sensor sensitivity, voltage and channel amplification gains as set for the companion chip STPMSx. The user can either select an existing demonstration board or put the value for their specific design.

Figure 3. Configuration - Application tab



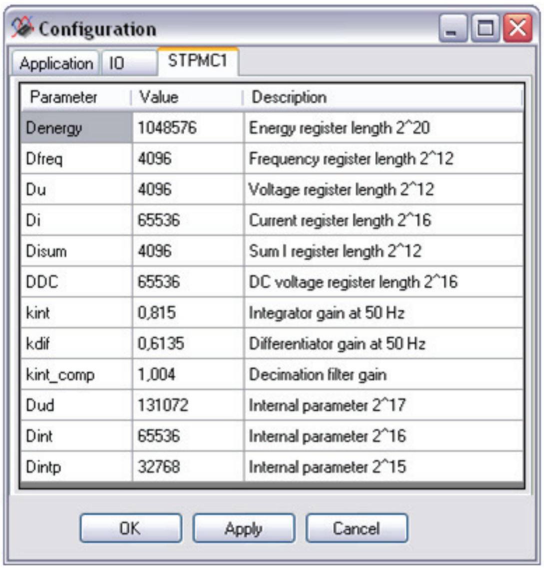
  - **IO**: in this tab the user selects the ports for the hardware interface connection.

Figure 4. Configuration - IO tab



– **STPMC1**: in this tab all the internal device parameters with their values are reported.

Figure 5. Configuration - STPMC1 tab

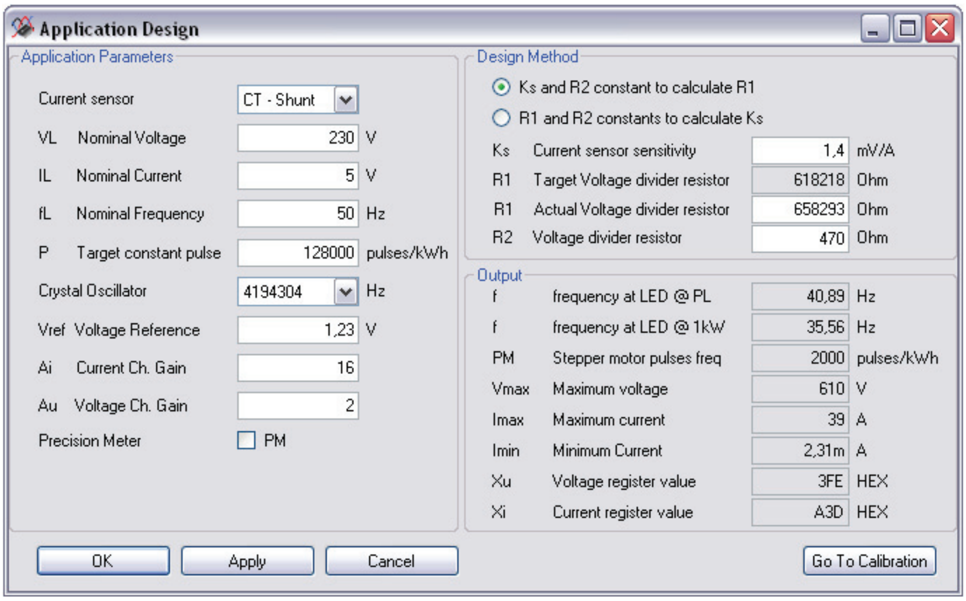


4.3 Tools

4.3.1 Design wizard

This tool helps the application design and 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 (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). If the PM configuration bit of the STPMC1 is set, it is necessary to check the PM check box.

If a demonstration board has been selected in Configuration Form - Application tab, the board parameters are filled automatically with the default data for that board.

After this, the choice of a design method is required to calculate one of the analog front end components. 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 information on 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 the form, “Apply” to save only and “Cancel” to exit without applying changes.

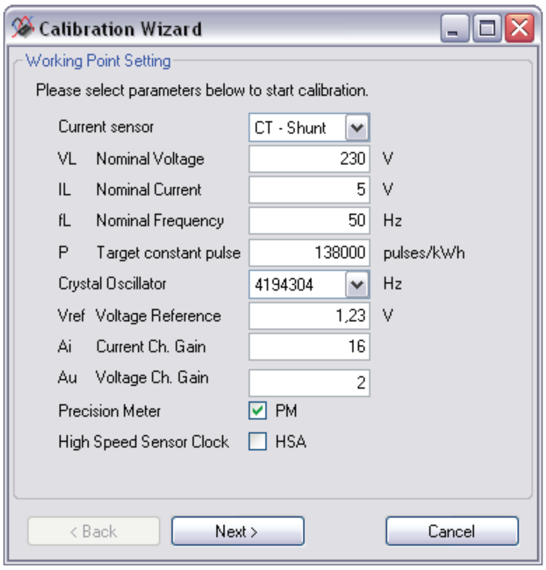
The “Go To Calibration” button opens the calibration wizard form, if a hardware interface is selected.

4.3.2 Calibration wizard

To open the calibration wizard it is necessary to have the board connected (through “Option”-”Interface" menu) and powered on.

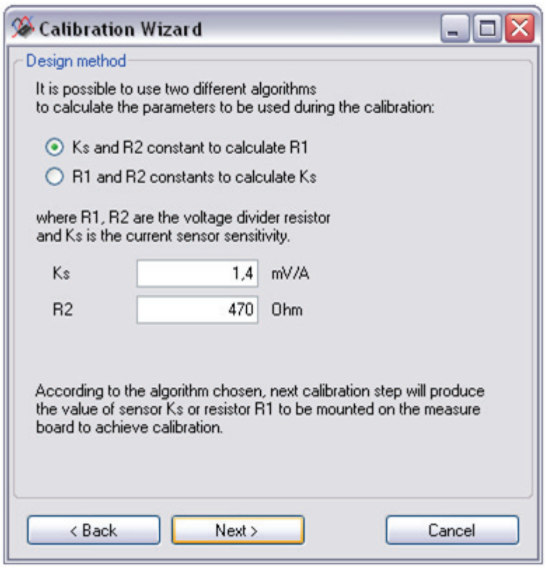
The calibration wizard consists of four steps. In the first, shown in *Figure 13*, the user must fill the board parameters and the working point for calibration. If either PM or HSA bits are to be set in STPMC1, the user must check the corresponding check boxes.

Figure 7. Calibration wizard - Working point setting



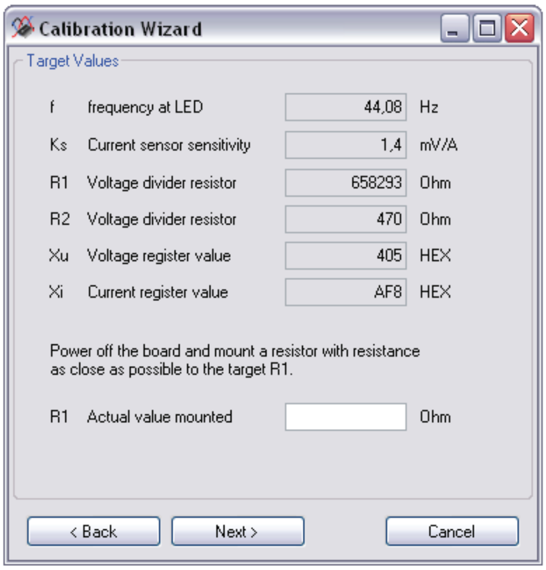
In the second step (*Figure 8*), the user must select a design method, as to achieve calibration it is necessary to choose mutually compatible sensor sensitivities for voltage and current.

Figure 8. Calibration wizard - Design method



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

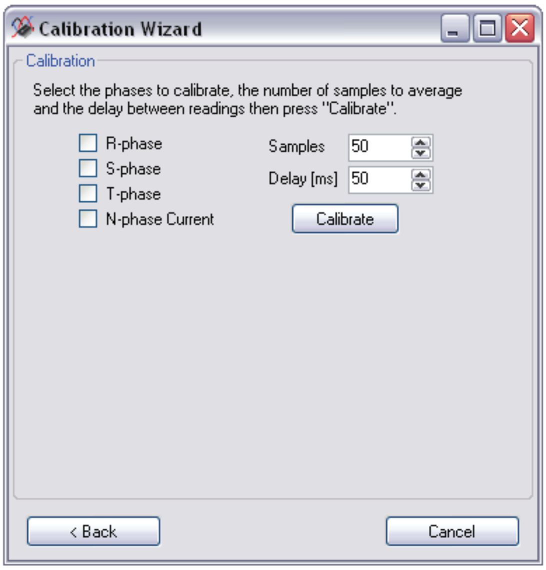
Figure 9. Calibration wizard - Target values



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

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

Figure 10. Calibration wizard - Calibration



It is advisable to apply the voltage to all phases and the load current to one phase at a time for calibration, but it is also possible to select all phases and calibrate them all at once.

The choice is left to the user.

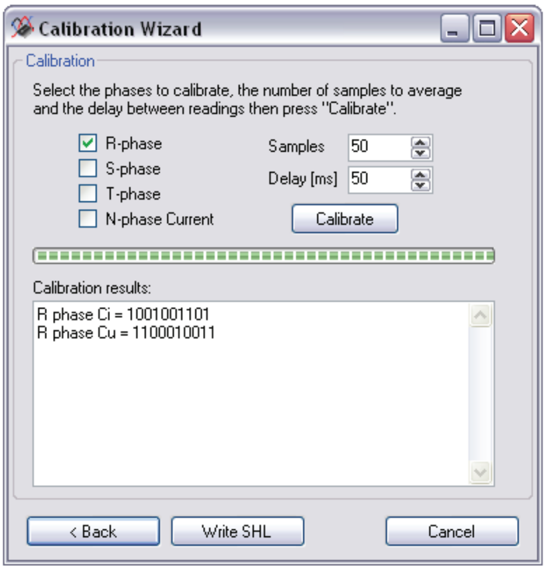
According to the choice above, the user should check the check boxes related to the phases to calibrate, select the number of samples to average and the delay between samples.

Pressing the “Calibrate” button starts the calibration procedure consisting 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. The process can be repeated for each of the three phases and the neutral current.

Figure 11. Calibration wizard - Calibration complete



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

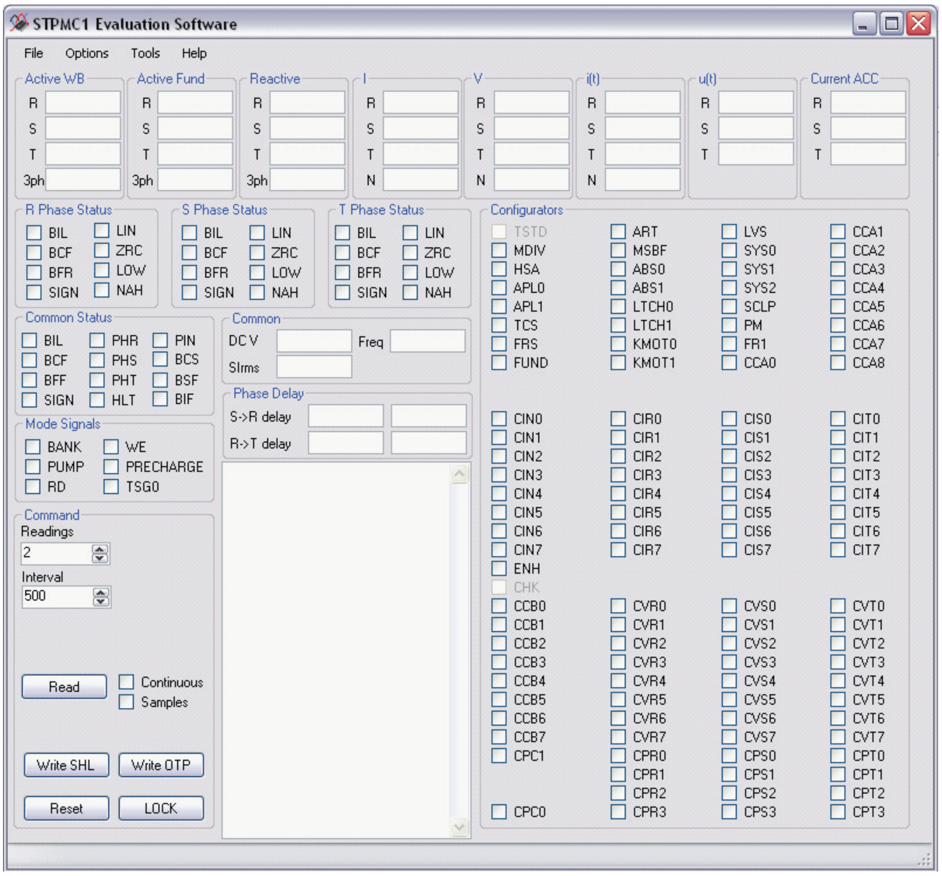
If the calibrators are out of range the user is asked to go back and modify the board parameters and/or the constant pulse to achieve calibration.

5 Application work area

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

In this way device status and all registers' readings are always available to the user at a single glance.

Figure 12. Application work area



5.1 Calculated values

In the top most section of the work area there are all the data calculated from the device registers, like:

- active, reactive and active fundamental energies for each phase and as three-phase sum
- RMS and instantaneous values of voltage and current
- current accumulators (in case of bad frequency line).

Other calculated parameters are shown in the “Common” and in the “Phase Delay” groups:

- DC value of N-channel voltage input
- line frequency
- sum of RMS currents
- S to R and R to T phase delays.

All calculation formulas can be found in the AN3254 application note.

5.2 Status bits

There are four group-boxes (R-Phase status, S-Phase status, T-Phase status, Common status) showing the device status bits contained in:

- DAR register for R-Phase status
- DAS register for S-Phase status
- DAT register for T-Phase status
- DAP+DRP registers for Common status.

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

5.3 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 uncheck 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 signal to perform these operations.

5.4 Configurators

In the configurators’ area 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 respectively check or uncheck the related check box, then use the button “Write SHL” or “Write OTP” from the Command area to respectively write temporarily or permanently all the configurators.

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

The TSTD bit is disabled and can be set only through the “Lock” button.

CHK bit is a read only bit.

If the PM bit is set, the bits are automatically arranged to append the calibrators' extenders to the corresponding phase.

5.5 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 the STPMC1 datasheet.

5.5.1 Read

It is possible to read the device a single time 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 energy values. It is also possible to set the time (in ms) between two readings through the “Interval” numeric text box. Pressing the “Read” button performs the device reading.

5.5.2 Samples read

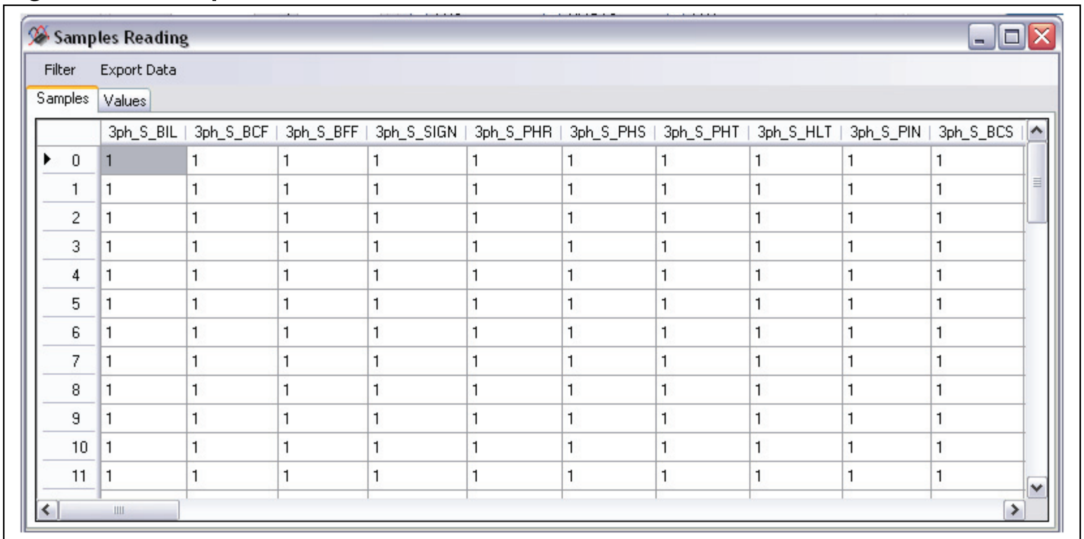
To perform a samples’ reading it is necessary to check the “Samples” check box and then press the “Read” button. It is possible to choose:

- the number of samples (“Readings” numeric text box)
- the delay between samples’ reading in ms (“Delay” numeric text box)
- if reading starts from first group of registers or from later groups (“Start Group” numeric text box)
- the number of groups to read (“Groups” numeric text box)
- the number of registers to read in each group (“Registers” numeric text box).

The default values are set to read the whole device memory content.

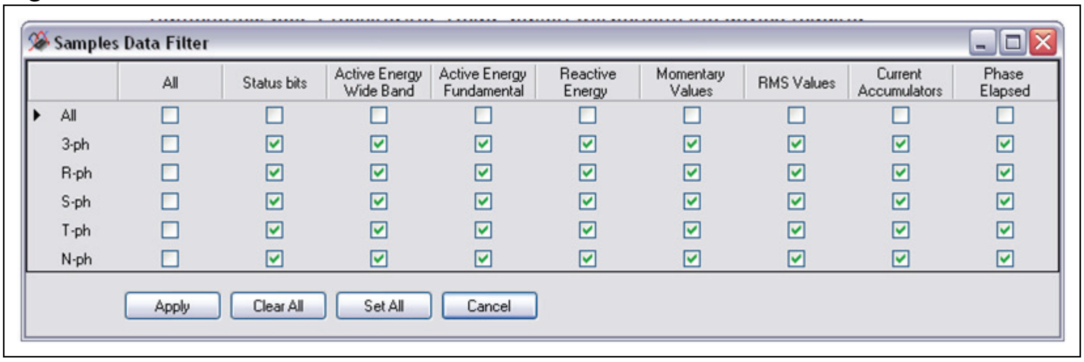
After completion of a sample reading, a form (in *Figure 13*) is opened displaying in a grid all the data taken from the registers and the corresponding energy values in two different tabs.

Figure 13. Samples read form



Is it possible to export these data in an Excel file through the “Export Data” menu or to filter the columns using the “Filter” menu. In this case the filter form in *Figure 14* is opened to allow the user to select which data is displayed in the grid.

Figure 14. Filter form



5.5.3 Write to shadow memory latches

The “Write SHL” button allows to write temporarily all the bits set in the Configurators area.

5.5.4 Write to OTP memory

The “Write OTP” button allows to write permanently all the bits set in the Configurators area. A proper voltage source should be connected to the device VOTP pin.

5.5.5 Reset

The “Reset” button performs a software reset of the device.

5.5.6 Lock

The “Lock” button locks the device writing the TSTD bit. Once the device is locked, it is no longer possible to write it or to access mode signals.

5.6 Panel

In the middle of the work area a panel displays application messages and registers read from the device.

6 Revision history

Table 1. Document revision history

Date	Revision	Changes
17-Nov-2011	1	Initial release.
20-Dec-2011	2	Modified: framework 4.0 ==> framework 2.0 *Section 1.1 on page 3*.