

### EVALKITST8500-1: getting started with ST8500 evaluation kit

#### Introduction

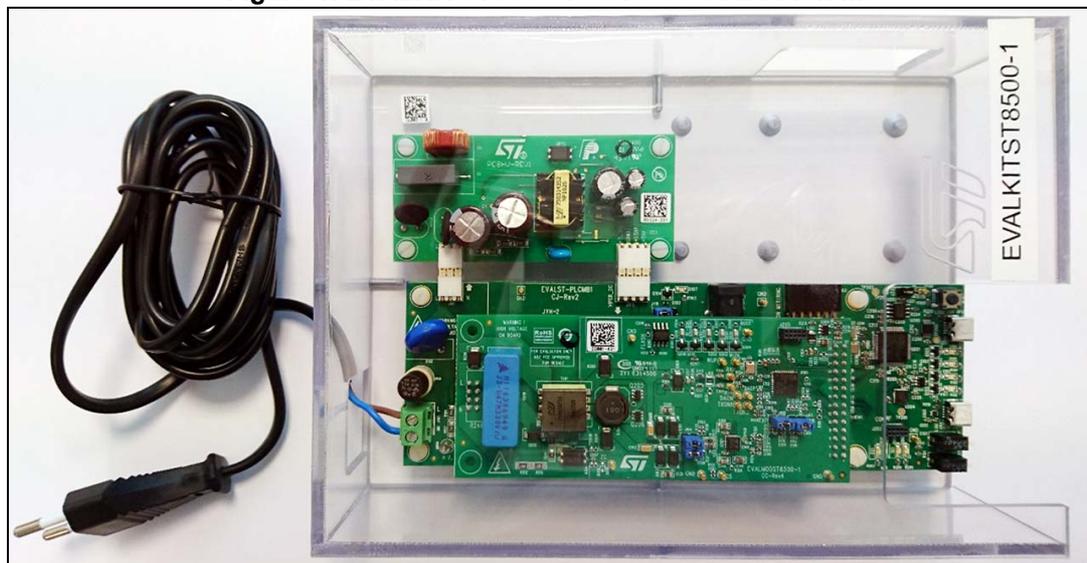
The EVALKITST8500-1 is a platform which allows an easy way to evaluate the features and performance of a power line communication (PLC) node based on the ST8500 modem system-on-chip and the STLD1 line driver.

This user manual explains the EVALKITST8500-1 hardware and software installation, and details the evaluation of the kits. In particular

- [Section 2: Getting started on page 4](#) contains the general information on the EVALKITST8500-1 package
- [Section 3: Hardware description and configuration on page 5](#) gives an overview of the hardware configurations
- [Section 4: PC GUI and evaluation on page 11](#) contains a short introduction to the PC evaluation graphical user interfaces (GUIs) connection
- [Section 5: STM32 FW upgrade and platform recovery on page 14](#) explains the flexibility the user may reach thanks to the available STM32 microcontroller

This user manual does not explain the functionalities of the various PLC protocols running on the ST8500. Detailed information can be found in the protocol specific documentation, available within the software packages, separately delivered under the Software license agreement by contacting your local ST sales office.

**Figure 1. EVALKITST8500-1 - ST8500 evaluation kit**



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# 1 Safety precautions

The development kit must be used only by expert technicians. Due to the high voltage (superior to 50 V ac) present on the parts that are not isolated, it is recommended that special care is taken to ensure safe operation.

There is no protection against accidental high voltage human contact.

After the disconnection of the board from the mains, none of the live parts should be touched immediately because of potential danger from high voltage from the charged capacitors.

It is mandatory to use a mains isolation transformer to perform any tests on the high voltage sections in which test instruments, e.g. spectrum analyzers or oscilloscopes, are used.

Do not connect any oscilloscope probes to high voltage sections to avoid damaging instruments and demonstration tools.

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**Warning: STMicroelectronics assumes no responsibility for any consequences that may result from the improper use of this tool.**

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## 2 Getting started

### 2.1 Included with EVALKITST8500-1

The box delivery contains

- EVALKITST8500-1 platform, based on 3 hardware boards
  - One ST8500 module (including the STLD1 line driver as a companion chip), supporting full PLC system based on ST8500 and STLD1
  - One STM32 mother board, supporting host device and interfaces
  - STEVAL-ISA175V1, wide-range input voltage, 9.4 W power supply board based on VIPER26HD
- USB cable to the evaluation kit to PC
- AC power cord to connect the evaluation kit to AC mains supply

### 2.2 Software packages

The ST8500 evaluation kit can be used with several PLC protocols and in different application scenarios. A complete toolset is available for each software package, including

- Binary images for protocol libraries
- Source code of application examples
- Specific PC GUI to easily evaluate protocol functionalities and performance
- Package documentation (UM, AN, etc.)

The EVALKITST8500-1 is delivered with a pre-programmed STM32 firmware, without any specific protocol package. This basic framework enables the firmware upgrade by the dedicated Smartgrid LabTool PC application, included into each package along with the documentation on the upgrade procedure.

Packages are separately delivered under the Software license agreement by contacting your local ST sales office.

### 2.3 Hardware and software requirements

Using the EVALKITST8500-1 requires the following software and hardware

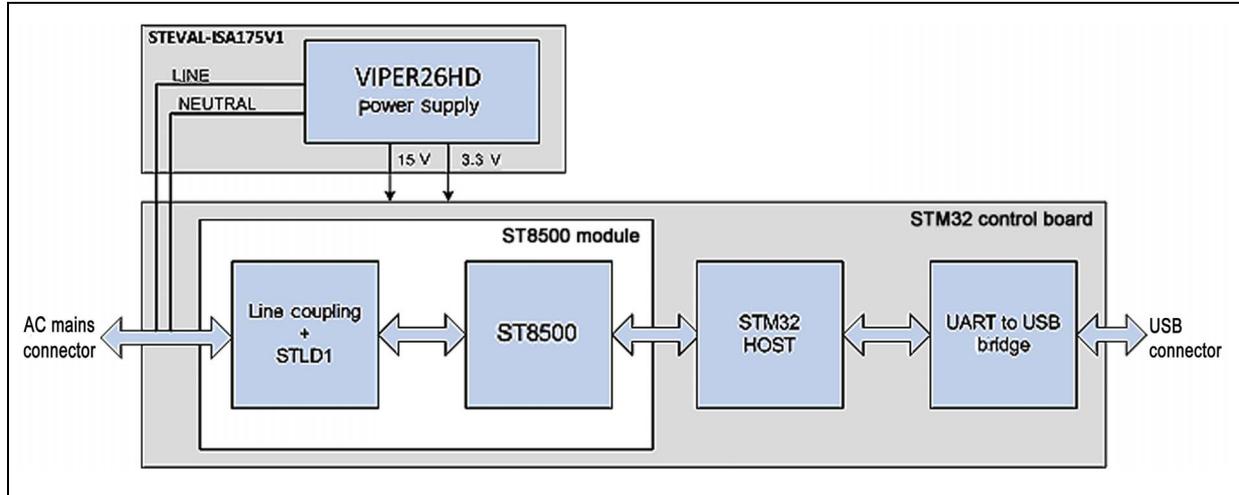
- A PC with the Microsoft® Windows® operating system. The GUI (graphical user interface) tools work with the Microsoft Windows XP® or later and .NET Framework 4
- A PLC network (e.g. an additional EVALKITST8500-1) to test the communication through the power line

The connection between the PC and the EVALKITST8500-1 is made through a USB cable.

### 3 Hardware description and configuration

Figure 2 shows the 3 boards integrated into the EVALKITST8500-1 and their main blocks.

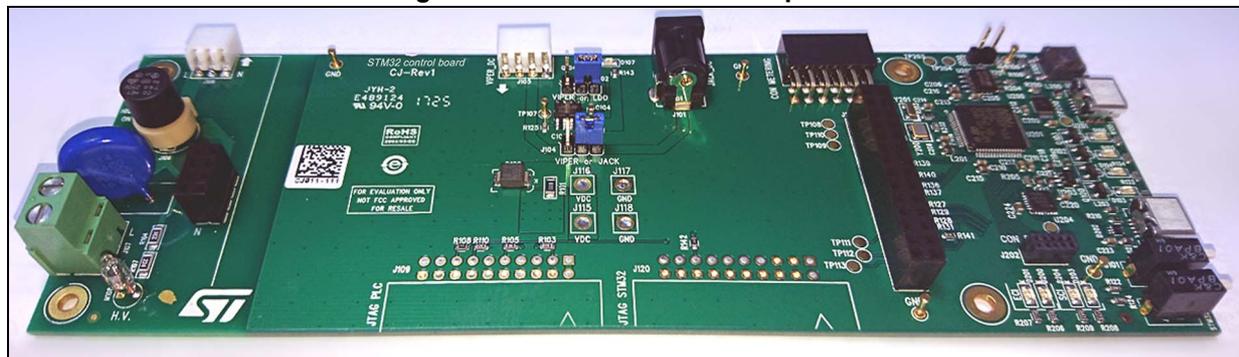
Figure 2. EVALKITST8500-1 block diagram



The up-to-date schematics, placement, BOM and PCB layout of each board are available from [www.st.com](http://www.st.com).

#### 3.1 STM32 control board

Figure 3. STM32 control board photo



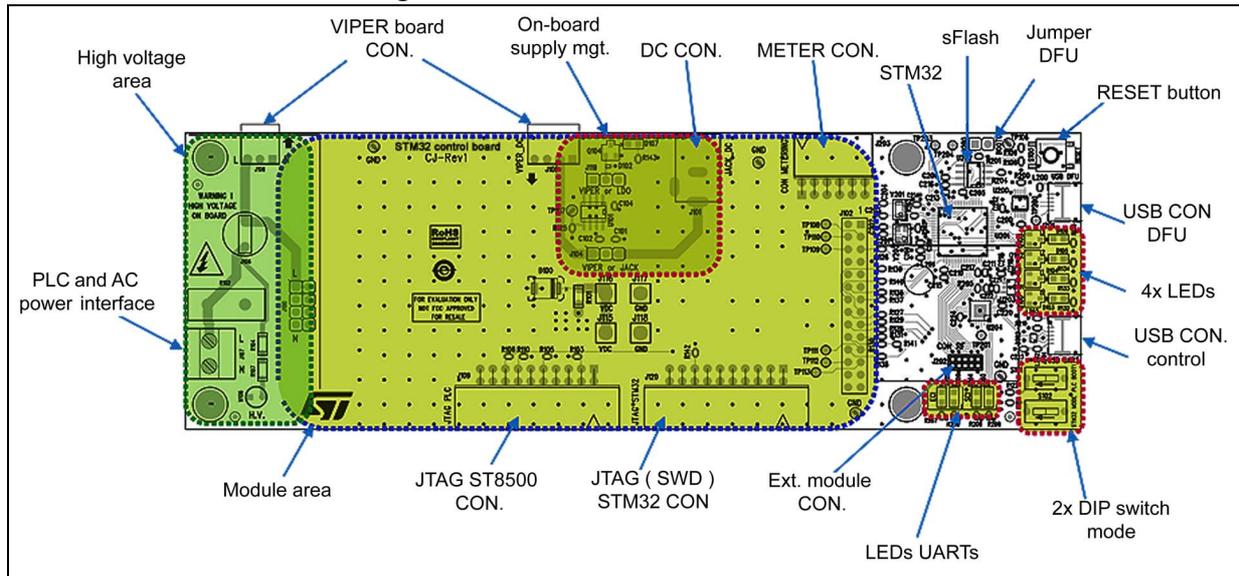
This control board supports the PLC module and allows the connection to

- The AC mains for the PLC and power
- The PC to control the platform through the USB connectors

The board is based on an STM32 MCU that

- Supports all data flow between the PC and the evaluation kit
- Controls the PLC module operation
- Controls the 2 extension connectors available

Figure 4. STM32 control board overview



### 3.1.1 Power supply configuration

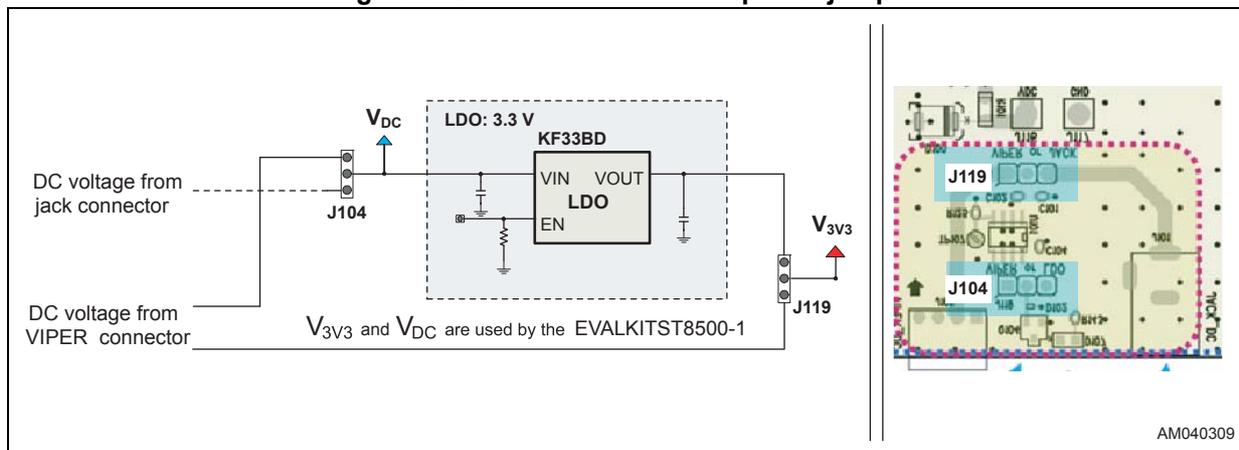
By default, the power supply is provided by the AC/DC board (STEVAl-ISA175V1), so there is no need to use the external DC power supply.

For the lab test, it is possible to power the platform in DC (12 V to 15 V) through the jack connector J101.

Table 1. Power supply configuration

Power mode	Jumper configuration
AC/DC mode	J119: close 1 - 2 (VIPER)
	J104: close 1 - 2 (VIPER)
DC mode	J119: close 2 - 3 (LDO)
	J104: close 2 - 3 (JACK)

Figure 5. STM32 control board - power jumper



### 3.1.2 Platform mode configuration

Two DIP switches are available on the STM32 control board to control the full evaluation kit behavior after the boot. The way to operate the switches is described in [Table 2](#) and [Table 3](#).

**Table 2. DIP switch S101 - ST8500 boot mode**

S101	Description
OPEN/up	PLC FW boot from UART: ST8500 images are loaded through the UART interface from the STM32
CLOSE/down	PLC FW boot from SFlash: ST8500 images are read from the SFlash

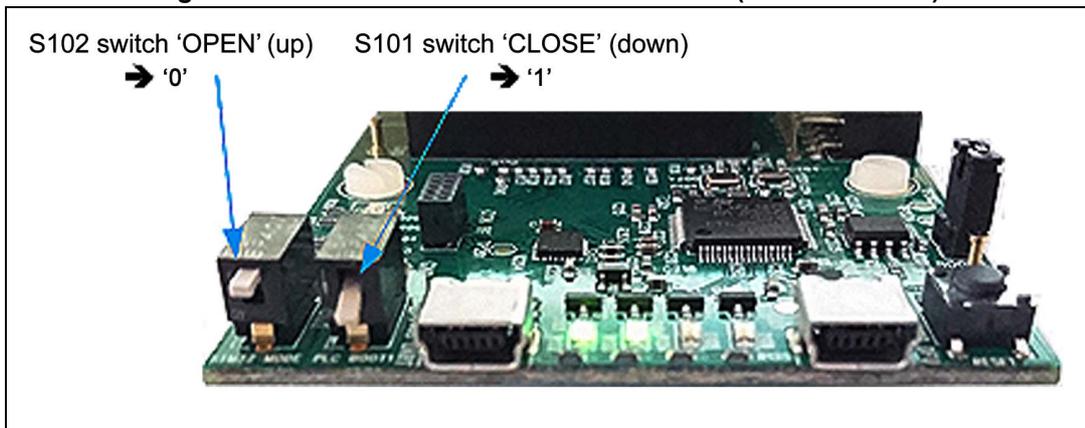
**Table 3. DIP switch S102 - STM32 boot mode**

S102	Description
OPEN/up	Default mode: Smartgrid LabTool controls the PLC module through the STM32 driver
CLOSE/down	Pass through mode: the PLC GUI controls the PLC module through the host interface

The default platform mode configuration is

- ST8500 boot: PLC FW boot from UART (S101 is OPEN/up)
- STM32 boot: default mode (S102 is OPEN/up)

**Figure 6. STM32 control board - DIP switches (S101 and S102)**

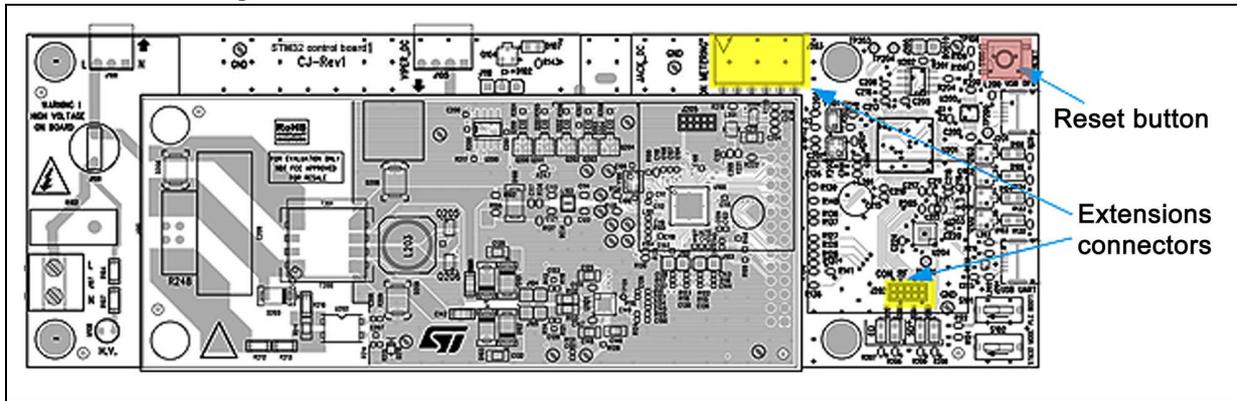


### 3.1.3 Reset and extension connectors

The reset button S100 triggers a system reset: the master reset signal goes to the STM32, which controls the ST8500 reset.

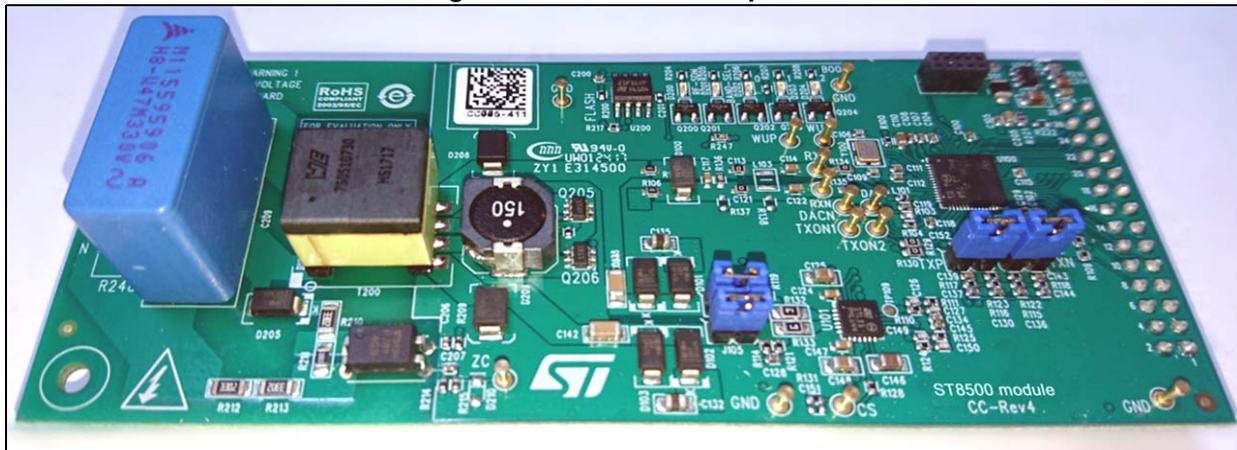
Two extensions connectors (J202/J203) are available for the board evolution.

Figure 7. STM32 control board - reset button and ext. connectors



## 3.2 ST8500 module

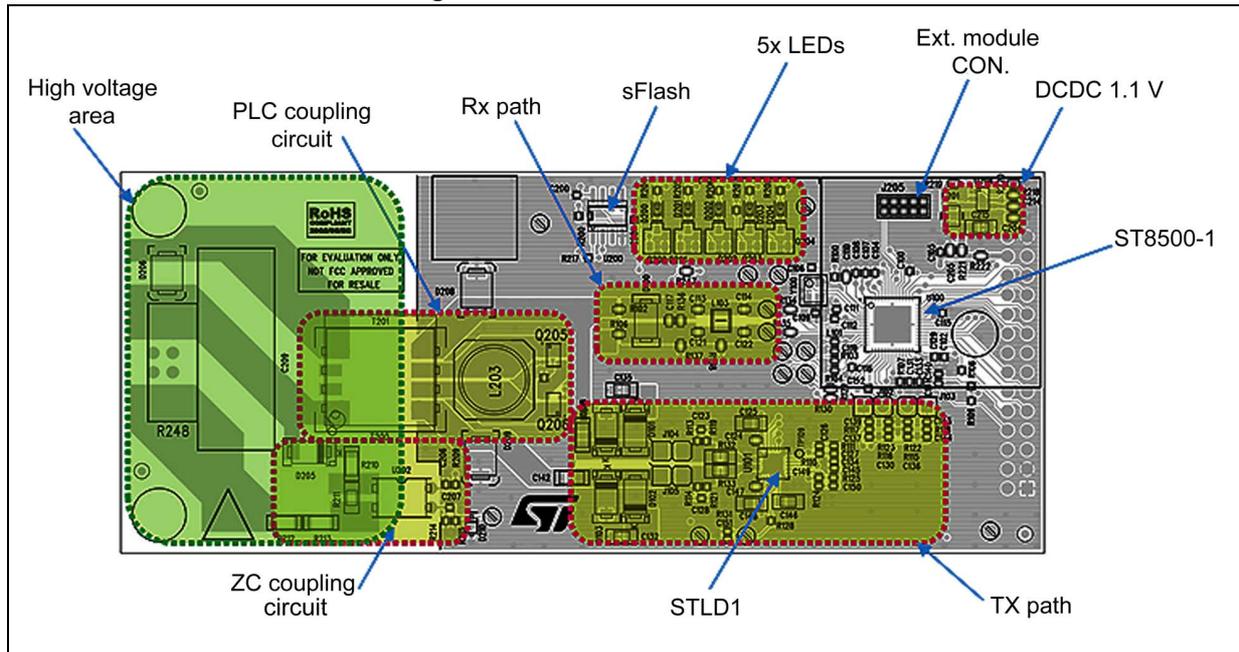
Figure 8. ST8500 module photo



The PLC module is connected to the STM32 control board through 2 connectors

- J201 - high voltage connection (L/N) to interface the PLC to the AC mains
- J200 - low voltage connection (digital and supply) to interface the module to the control board

Figure 9. ST8500 module overview



The basic interface between the host controller and the ST8500 includes the following lines

- UART RX/TX to support host interface commands
- RESETn signal to control the modem reset
- BOOT1 to control the ST8500 boot mode
- LPMODE to control the ST8500 low power mode
- Trace UART TX to output firmware binary traces for debug

Two DC voltages are provided to the module

- 8/18 V (15 V typical) to supply the STLD1 line driver
- 3.3 V as input for the ST8500 section (including 1.1 V on-board DC/DC input and 2.5 V integrated LDO input)

### 3.3 STEVAL-ISA175V1 board

The board is developed using the VIPER26HD offline high-voltage converter by STMicroelectronics.

Figure 10. STEVAL-ISA175V1 photo



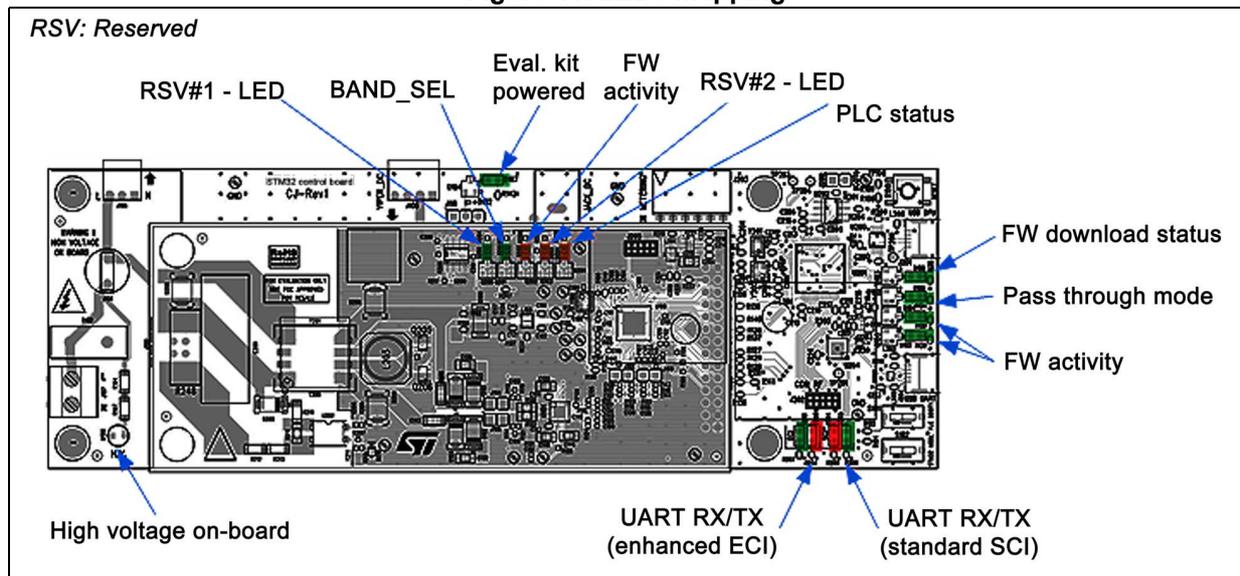
All information related to the STEVAL-ISA175V1 board is available at [www.st.com](http://www.st.com).

Note: Only the 3.3 V and 15 V outputs are used by the EVALKITST8500-1.

### 3.4 EVALKITST8500-1 LED description

When the STM32 and ST8500 are running their firmware, the LEDs activity/status helps to understand the platform operating mode.

Figure 11. LEDs mapping



Note: As the LED toggle is fully controlled by the FW, the above description reflects the software version behavior. More details are provided on the firmware package delivery.

## 4 PC GUI and evaluation

### 4.1 Smartgrid LabTool evaluation

The 'Smartgrid LabTool' PC GUI supports different useful tools to access the EVALKITST8500-1

- FW upgrade tool: to load ST8500 FW to the SPI Flash connected to the STM32 or ST8500
- NVRAM tool: read/write NVRAM configuration (from/to the SPI Flash connected to the STM32)
- Attribute tool: to get and set PLC attributes
- Trace tool: to configure and capture binary traces for debug
- Remote FW upgrade tool: to manage FW upgrade through the PLC link (application example - only available in G3 mode when the PAN coordinator is detected)
- Terminal tool: to send commands and control the STM32 FW

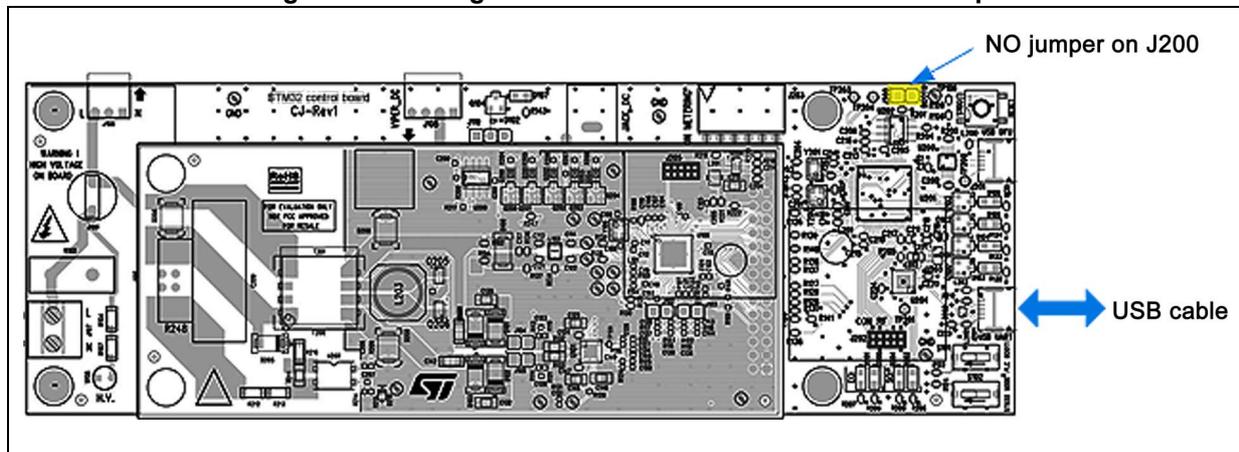
All information regarding those tools are available from the "help" menu on the 'Smartgrid LabTool' GUI itself.

Here is the procedure to connect the Smartgrid tool.

#### Hardware setup

- Switch configuration
  - No jumper on J200
- Connect PC to J204 (named 'USB UART')

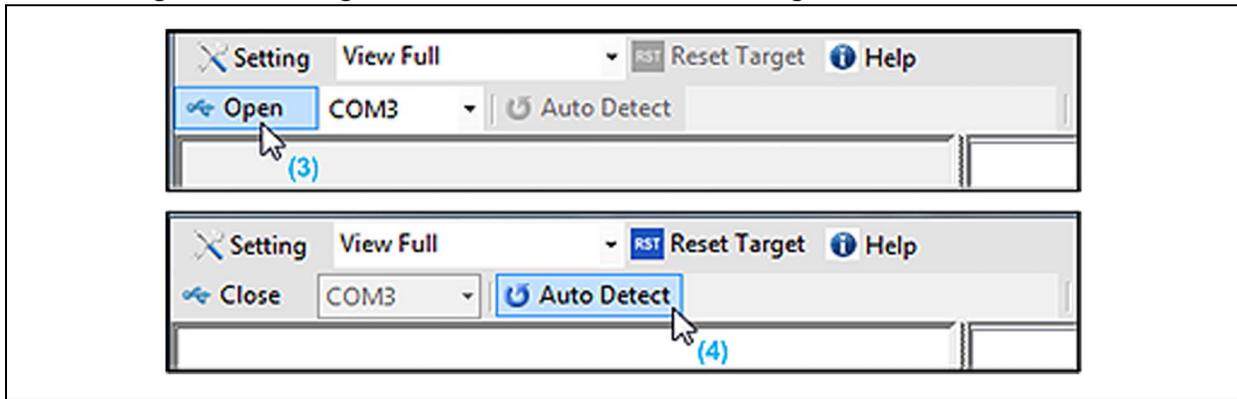
Figure 12. Smartgrid LabTool evaluation - hardware setup



#### Procedure to connect the Smartgrid LabTool

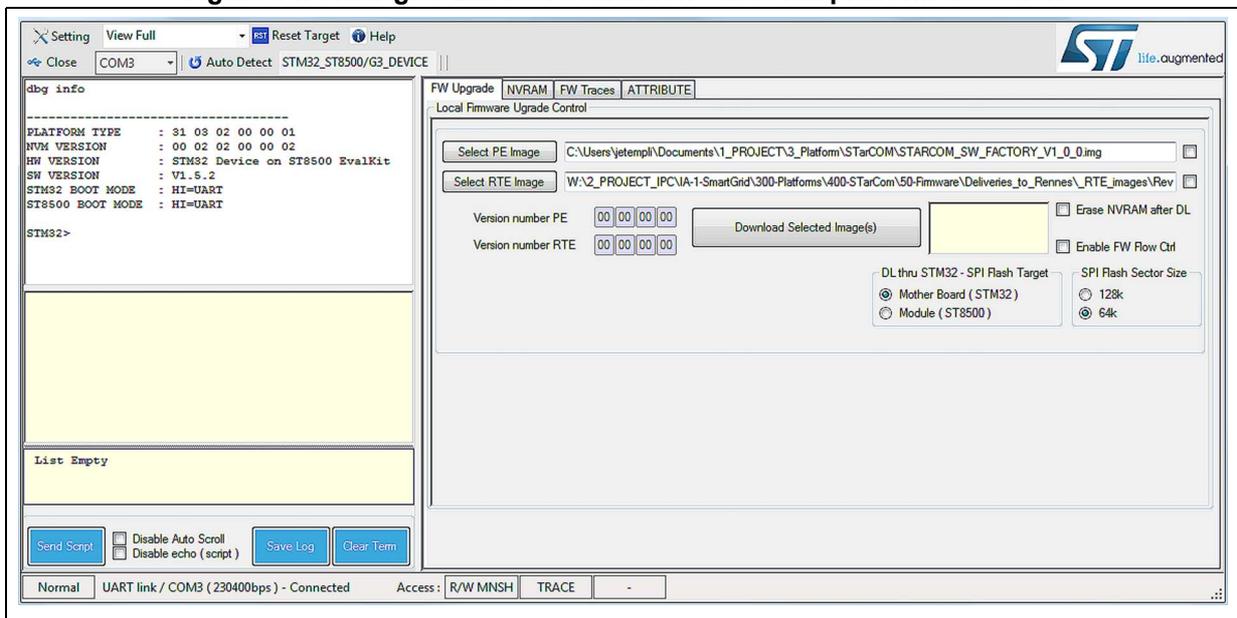
1. Start the 'Smartgrid LabTool' PC GUI
2. Power-up the EVALKITST8500-1
3. Select and open the right COM port (CP2105: standard port, check in the Windows device manager)
4. Press the 'auto detect' button
5. The GUI will show the proper tools based on the detected platform

Figure 13. Smartgrid LabTool evaluation - connecting to ST8500 evaluation kit



In Figure 14 is shown an example of the 'Smartgrid LabTool' GUI view after the "STM32\_ST8500/G3\_DEVICE" platform is detected:

Figure 14. Smartgrid LabTool evaluation - after full platform detection



Note: MNSH messages are used between the target and Smartgrid LabTool.  
Type 'help' on the terminal to get more information.

## 4.2 PLC GUI evaluation

The PLC GUIs are complete PC tools which enable the access to the ST8500 specific protocol APIs. This requires more specific PLC protocol know-how.

To enable this “expert” mode, the STM32 should boot in 'pass through mode' to interface the GUI directly to the ST8500.

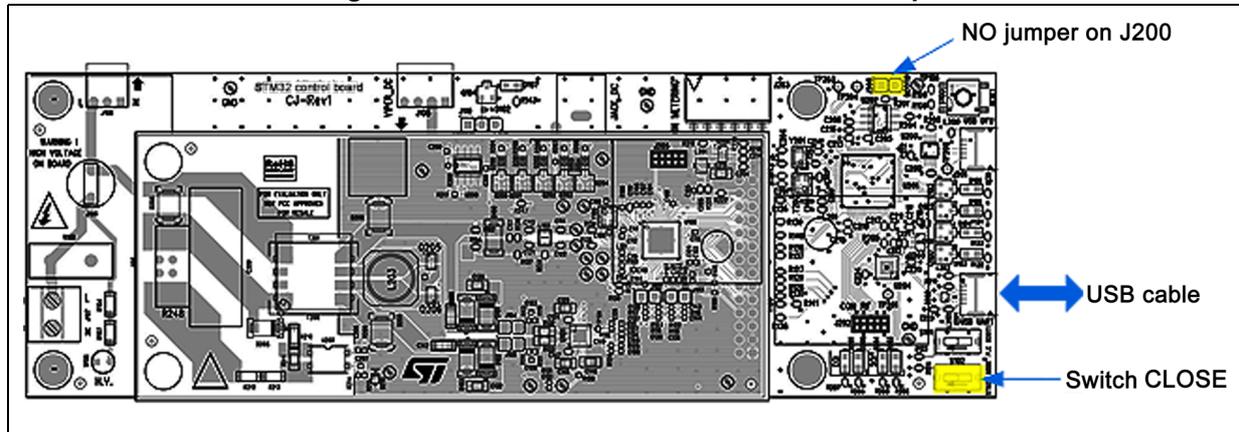
All information regarding this tools are available on the specific user manual released with each PLC GUI.

Here is the procedure to connect the ST8500 evaluation kit to a PLC GUI

### Hardware setup

- Switch configuration
  - Switch S102 - CLOSE/down
  - No jumper on J200
- Connect PC to J204 (named 'USB UART')

Figure 15. PLC GUI evaluation - hardware setup



### Procedure to connect the PLC GUI

1. Start the PLC GUI
2. Power-up the ST8500 evaluation kit
3. Start the PLC GUI and follow the instructions from the specific PLC GUI user manual

*Note:* The Smartgrid LabTool can be connected in parallel with the PLC GUI to recover the binary traces.

## 5 STM32 FW upgrade and platform recovery

### 5.1 How to upgrade STM32 firmware

The ST8500 evaluation kit supports the STM32 upgrade through the USB DFU (device firmware upgrade) profile.

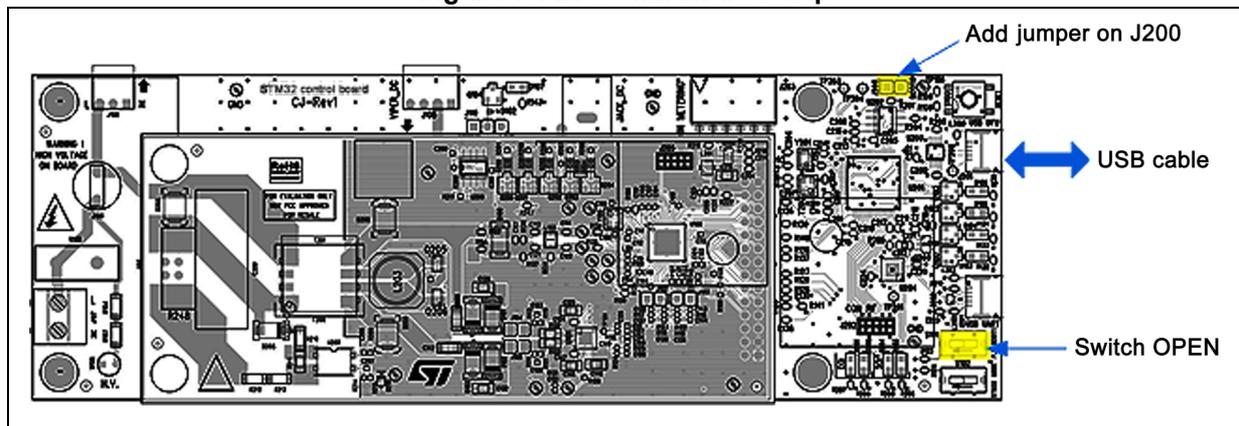
The GUI included in the STSW-STM32080 package should be used to upgrade the FW (available at [www.st.com](http://www.st.com))

After the PC software installation, here is the procedure to follow

#### Hardware setup

- Switch configuration
  - Switch S101 - OPEN/up
  - Add jumper on J200 (named 'BOOT0')
- Connect PC to J201 (named 'USB DFU')

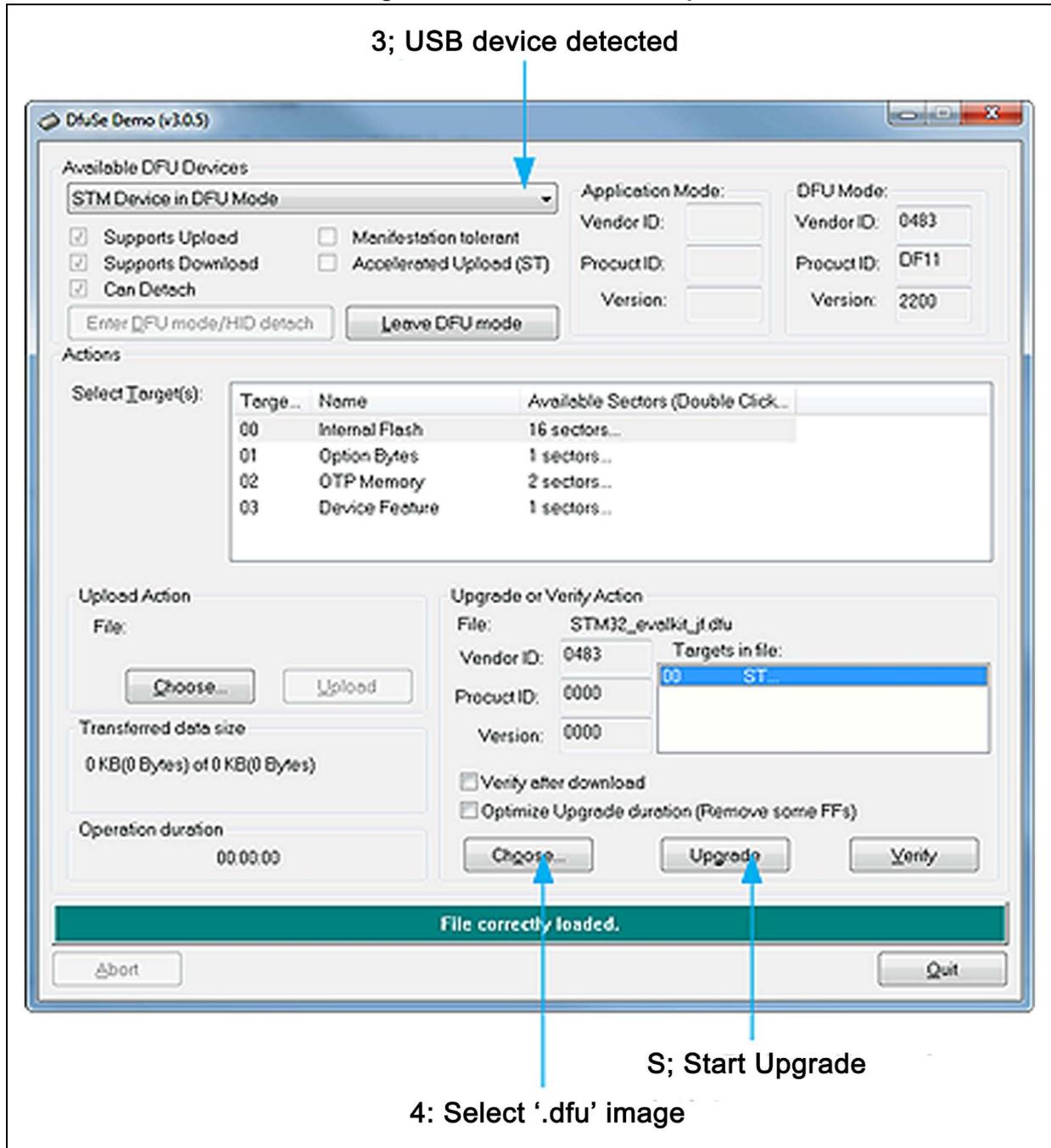
Figure 16. DFU - hardware setup



#### Procedure to upgrade the STM32 firmware

1. Start the “DfuSe Demo” tool
2. Power-up the ST8500 evaluation kit
3. STM device in DFU mode' detected
4. Select the new STM32 FW image (xxx.dfu)
5. Start upgrade
6. When the download is completed: remove the jumper from the J200 and reset the ST8500 evaluation kit.

Figure 17. DFU - software setup



Note: Be sure to use the latest DFU image provided by ST to get the full system functionality.

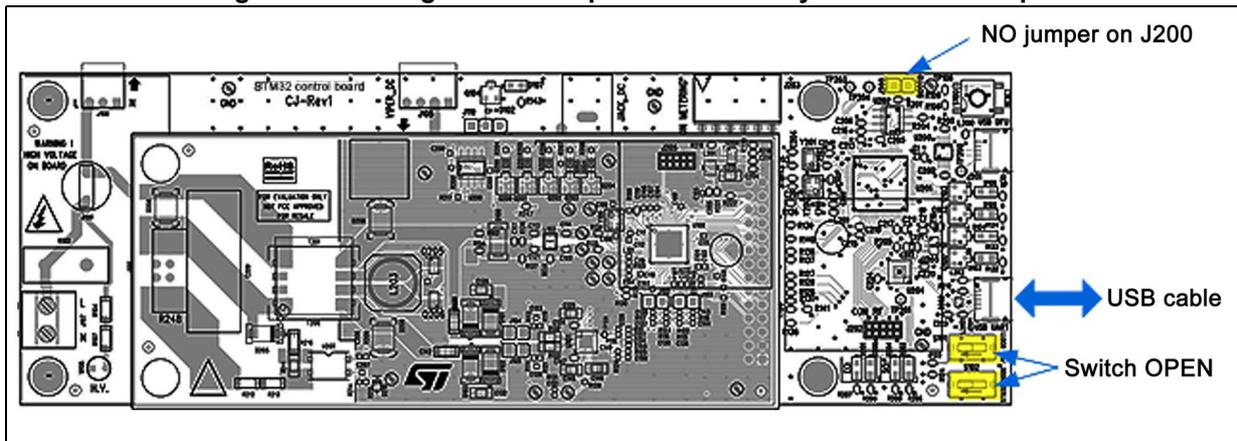
## 5.2 How to manage platform recovery

A recovery procedure supported by the Smartgrid LabTool is available to recover the original EVALKITST8500-1 delivery status.

### Hardware setup

- Switch configuration: default mode
  - Switch S101/S102 - OPEN/up
  - No jumper on J200
- Connect PC to J204 (named 'USB UART')

Figure 18. Smartgrid LabTool platform recovery - hardware setup

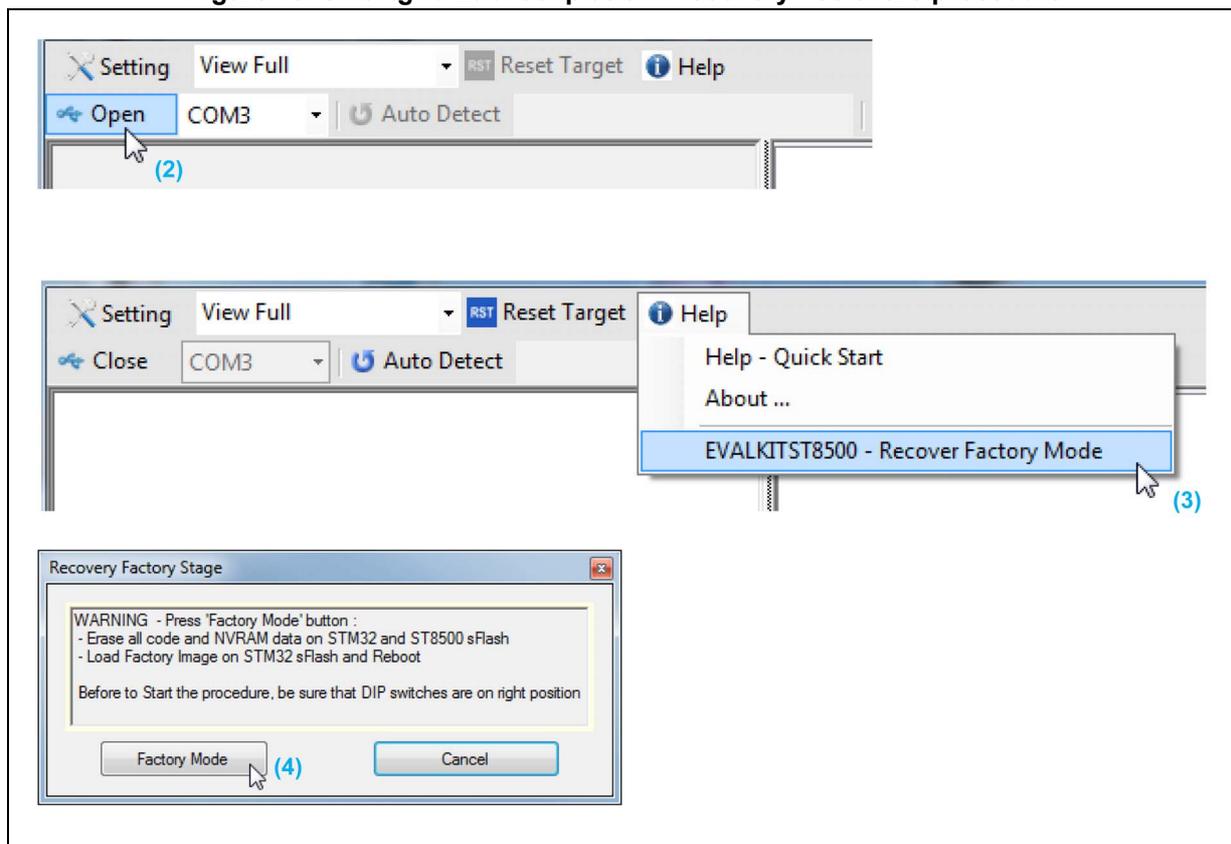


### Recovery procedure

1. Start the 'Smartgrid LabTool' GUI
2. Select and open the right COM port
3. Press “EVALKITST8500 - recover factory mode”
4. Press “factory mode” to start the procedure

The PC tool will erase all data/code stored in the SPI Flash (ST8500 and STM32) and load the factory image into the SPI Flash connected to the STM32.

Figure 19. Smartgrid LabTool platform recovery - software procedure



## 6 Revision history

Table 4. Document revision history

Date	Revision	Changes
05-Mar-2018	1	Initial release.

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