

Firmware for STDES-EMETER1PV1 single phase smart meter using STPM33 and STM32L4

Applications & demonstrations	STSW-EMETER1-FW	
Middleware	STPM33 Library	
Hardware Abstraction	STM32L4 HAL Library	STPM33 HAL
Hardware	STDES-EMETER1PV1	

Features

- Software driver for CT and shunt sensing
- Software driver for magnetic tamper detection using Hall effect sensors
- Algorithm for neutral missing management using low power mode
- RMS/instantaneous V, I, kW and pf measurement
- Calendar implementation using STM32 RTC

Description

The **STSW-EMETER1-FW** firmware for the **STDES-EMETER1PV1** single phase meter allows you developing customized applications.

The value of RMS current, voltage, date and time, and frequency is periodically refreshed on the board LCD.

The firmware runs on STM32 microcontroller. It contains STM32 HAL_Driver and **STPM33** driver.

The dedicated Hall effect sensor detects magnetic tampering.

Product summary	
Firmware for STDES-EMETER1PV1 single phase smart meter using STPM33 and STM32L4	STSW-EMETER1-FW
Single phase smart meter using STPM33 and STM32L4	STDES-EMETER1PV1
Ultra-low-power with FPU Arm Cortex-M4 MCU 80 MHz with 256 Kbytes of Flash memory, LCD, USB	STM32L433VCT6
ASSP for metering applications with up to four independent 24-bit 2nd order sigma-delta ADCs, 4 MHz OSF and 2 embedded PGLNA	STPM33
Applications	Single phase meter

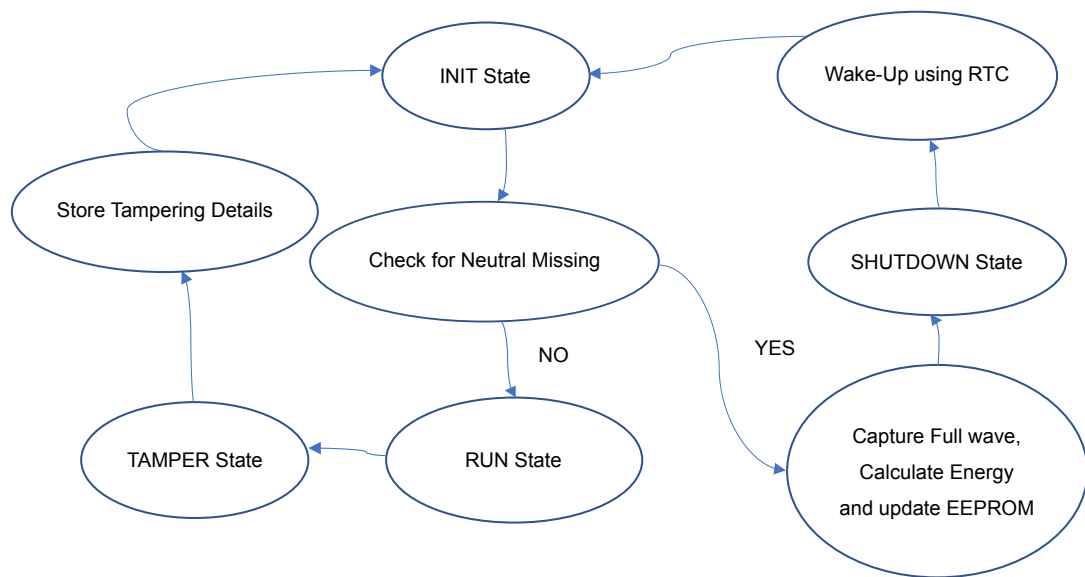
1 Detailed description

Once the STDES-EMETER1PV1 board is powered up, the STM32 runs below the state machine. It keeps on calculating the voltage, current, active power, frequency, and active energy.

Accumulated active energy keeps increasing with power consumption. After each defined interval, it updates the EEPROM with new accumulated energy.

The pulse LED keeps blinking with a frequency proportional to the power consumption. It is currently aligned with 3200 impulse per kWh.

Figure 1. State machine running in the meter firmware



State machine description

- **INIT State**
 - Initializes MCU and peripherals
- **Check for neutral missing**
 - Checks if it is the case of neutral missing
 - If yes, initializes MCU at lower frequency
 - If proper voltage is built at VDD, reads and stores in EEPROM
- **RUN state**
 - Refreshes metering data reading by reading STPM33
 - Updates LCD
 - Updates EEPROM
- **Tamper state**
 - If any tamper is detected, stores details in EEPROM with TIME
- **Capture state in case on neutral missing**
 - Captures one full wave and calculates energy
 - Stores value in EEPROM
- **SHUTDOWN state**
 - In case of neutral missing, it shuts down STPM33 and MCU for 2 seconds
 - It will wake up periodically using RTC
- **Wake up using RTC state**
 - It will wake up periodically using RTC

Revision history

Table 1. Document revision history

Date	Revision	Changes
23-Aug-2021	1	Initial release.
07-Sep-2021	2	Updated cover image.

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