Application Note – Quick start guide

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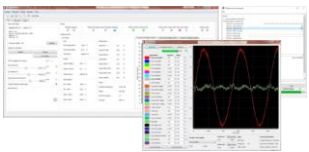
1. Introduction

This document describes installation and procedure for a quick start with BMPU unit.

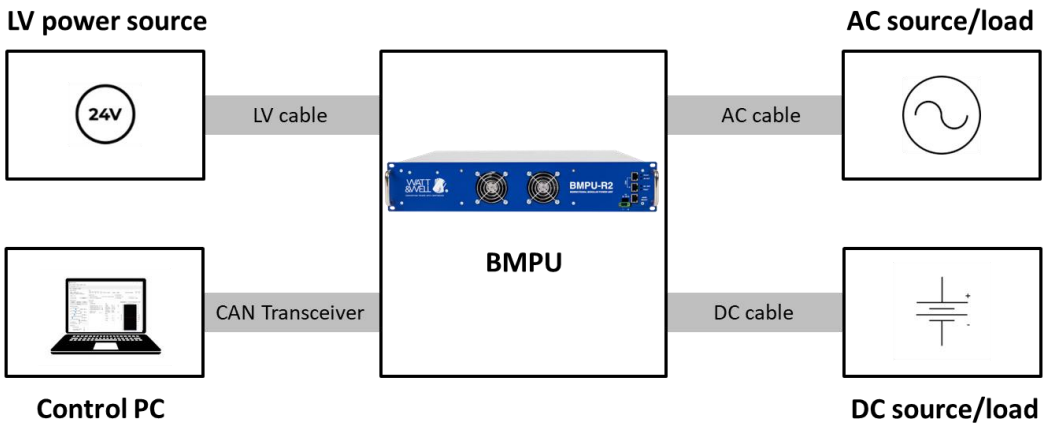
2. Test setup

To install a test setup, the following items are necessary:

BMPU unit	
Pre-wired AC connector 32A	
Pre-wired DC connector	
Pre-wired LV connector	
USB-to-CAN transceiver (Kvaser)	
DB9 to RJ45 CAN bus adapter	
Addressing connector	
BMPU Graphical User Interface (GUI)	
BMPU monitor license (USB license dongle)	

PC for control and monitoring	
Low voltage power supply (min. 70 W)	 
AC source, AC load or Bidirectional AC power supply (min. 15 kW)	 
Battery, DC load or Bidirectional DC power supply (min. 15 kW)	 

The test setup synoptic is as follows

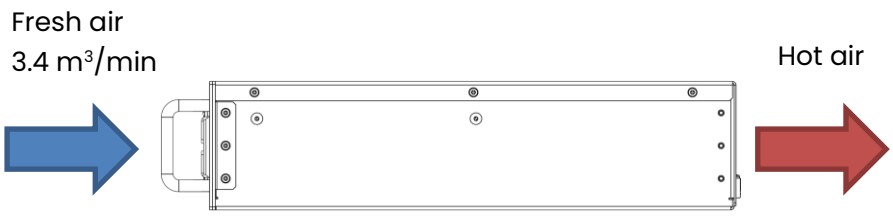


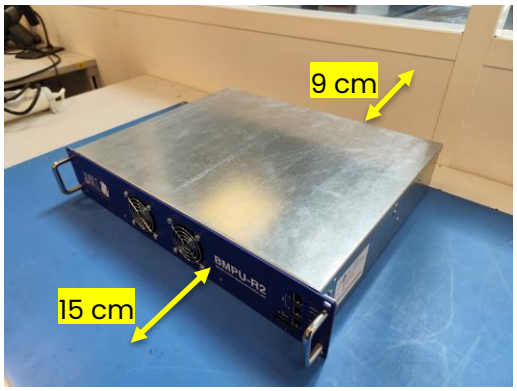
3. Mechanical and Electrical installation

1.

Install the BMPU unit flat and respect minimum distances for air cooling as

- 15 cm for front side
- 9 cm for rear side



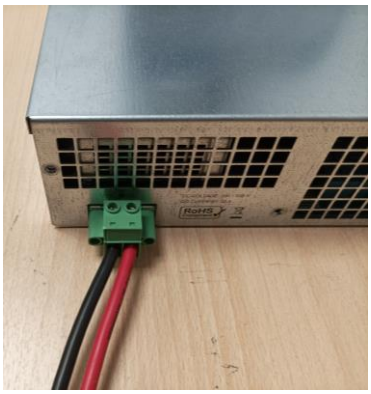


2.

Connect Phoenix contact AC connector to the AC input of the BMPU and connect the grid side connector to the grid or to the AC source.

3.

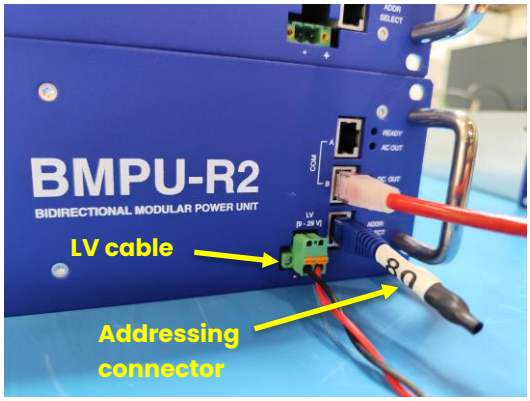
Connect Phoenix contact DC connector to the DC input of the BMPU and connect the other side to the DC source (DC power supply, battery emulator …etc)



4.

Connect the addressing connector to ADDR SELECT input
Connect Phoenix contact LV connector to LV input and connect the other side to the LV source (24V).

⚠ The addressing connector must be connected before turning on the LV source.

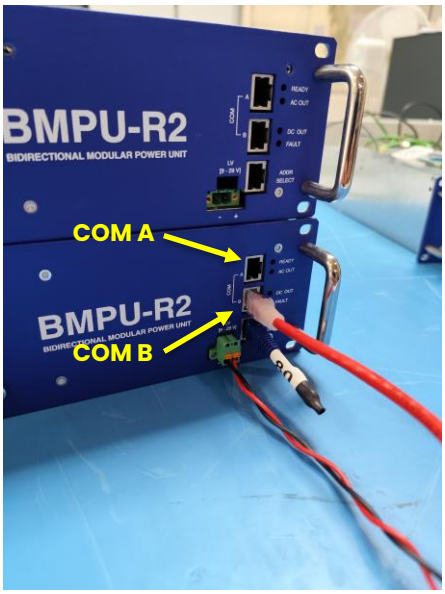


5.

Connect the DB9-to-RJ45 adapter to the Kvaser transceiver

6.

Connect DB9-to-RJ45 adapter to COM A or COM B input

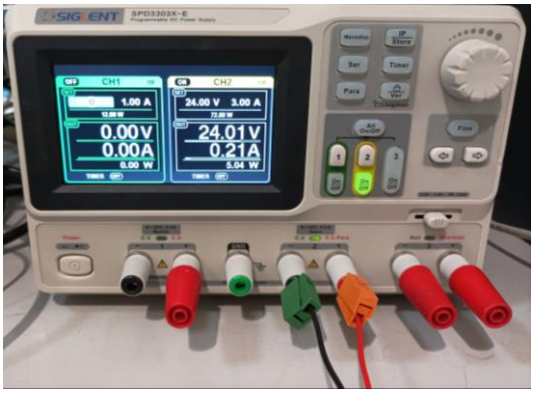


7.

Connect the Kvaser USB to the control PC

8.

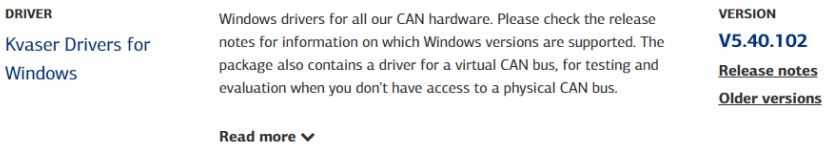
Power on the LV source



4. Graphical user interface setup

9.

Download Kvaser drivers for Windows at https://www.kvaser.com/download/



10.

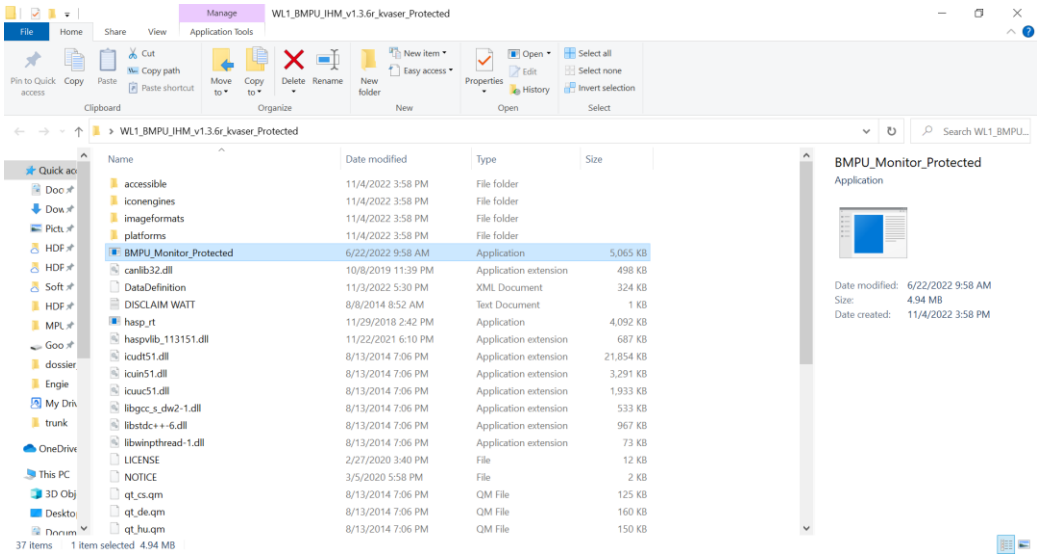
Plug the license dongle in the control PC

11.

Start the graphical user interface (GUI) by running the application file **BMPU_Monitor_Protected.exe**

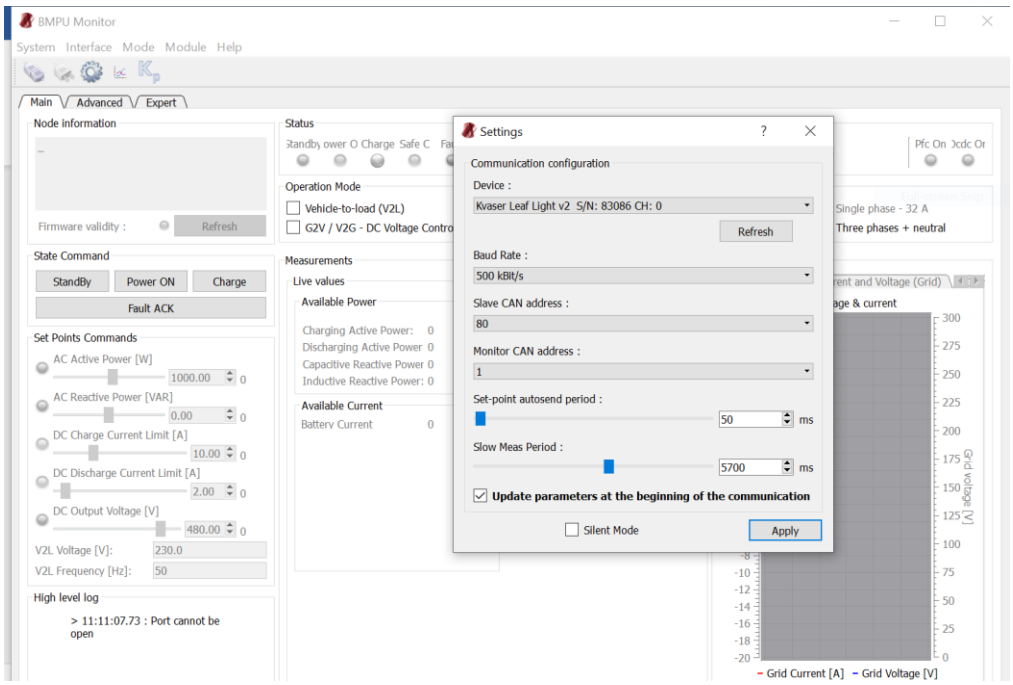
The application file is located in the delivered folder **WL1_BMPU_IHM_vx.y.z_kvaser_Protected** (For the illustration, the version vx.y.z is v1.3.6).

Request the GUI folder if it is not delivered with the BMPU unit.

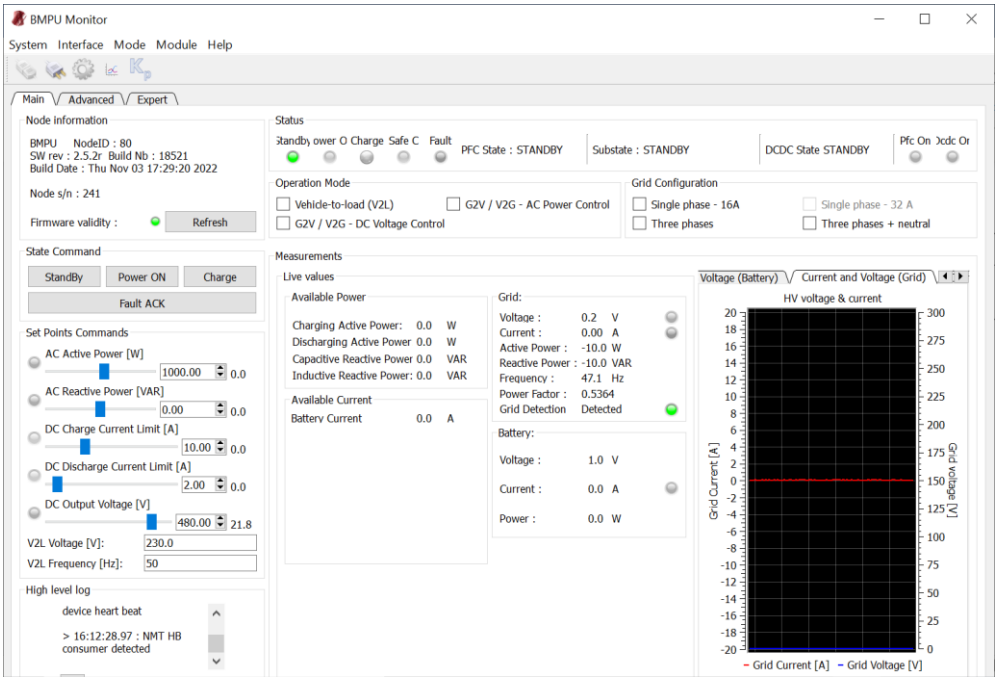


The windows shown below will appear. Check that on Settings window that the device Kavser is detected. If it is not the case, click on refresh.

Then, click on Apply.



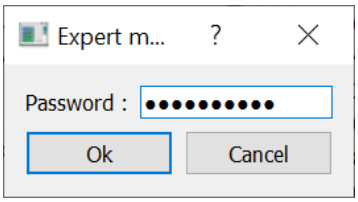
The BMPU Monitor window will appear as shown in the following image.



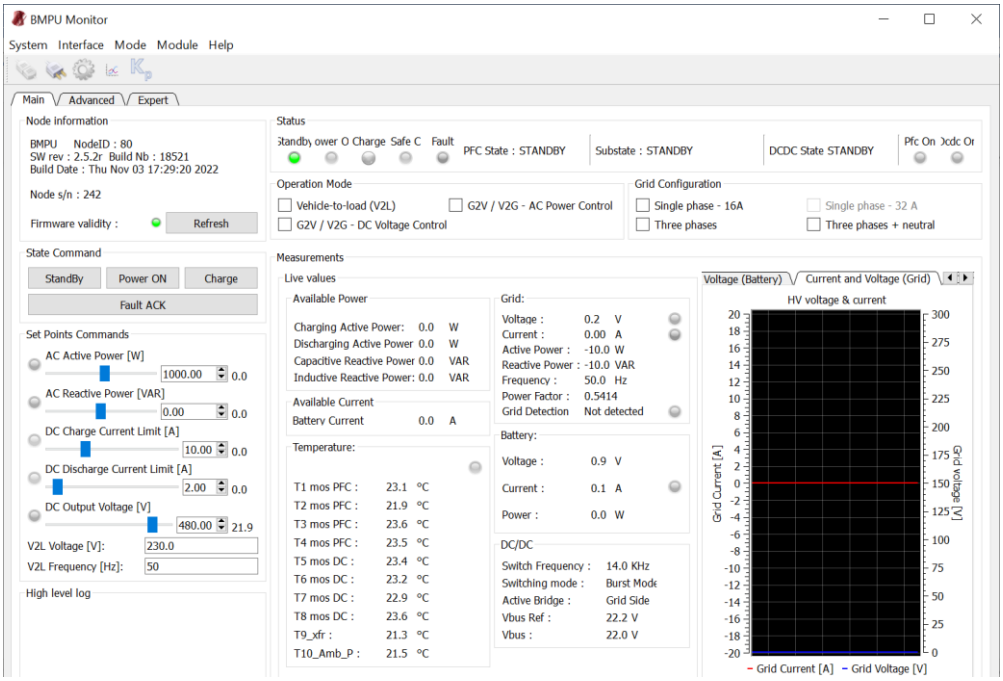
Note
If PFC State shows the message FAULT instead of STANDBY, click on Fault ACK button and then on StandBy button.

12.

Unlock expert mode by clicking on Expect tab and entering the Password when the following window appears



Extra information will appear on the GUI and access to parameters and other features is enabled.



5. Power operations

13.

Configure operation modes and set targets. To this, proceed as follows:

1) Set Operation mode by selecting one of the three options in Operation Mode area on the main tab of the GUI.

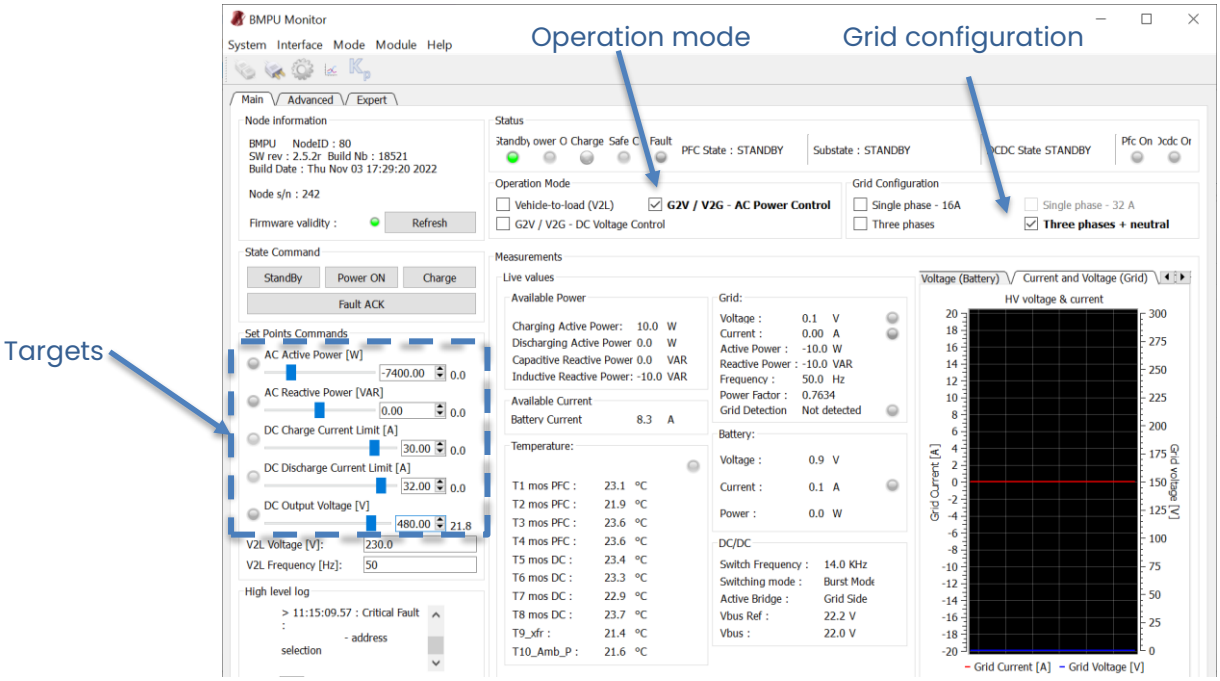
   As an example, G2V/V2G-AC power control is selected. This mode enables to charge/discharge a battery and to control injected/absorbed active and reactive power to/from the grid.

2) Select grid configuration: single-phase, three-phase or three-phase + neutral in Grid Configurations are on the main tab of the GUI.

   As an example, three-phase + neutral configuration is selected.

3) Click on StandBy button to confirm selection. Selected values turn to bold font after confirmation

Note
Operation mode and Grid configuration can be modified only in stand by state.



4) Set active power setpoint to desired value
    a. Positive value requests charger to operate in G2V mode
    b. Negative value requests charge to operate in V2G mode

5) Set reactive power setpoint to desired value.

    a. Zero value requests unity power factor behavior
    b. Positive value requests capacitive behavior (current leads the voltage)
    c. Negative value requests inductive behavior (current lags the voltage)

6) Set DC charge/discharge current limits. For the sake of a quick start, set these limits to their max values.

    a. Set DC charge current limit to 30A
    b. Set DC discharge current limit to 32A

7) Set DC output voltage to desired value. If charging with battery, set this value higher than the battery voltage. This target is intended to limit battery voltage during charging while controlling active/reactive power on AC side. If discharging, this target has no impact.

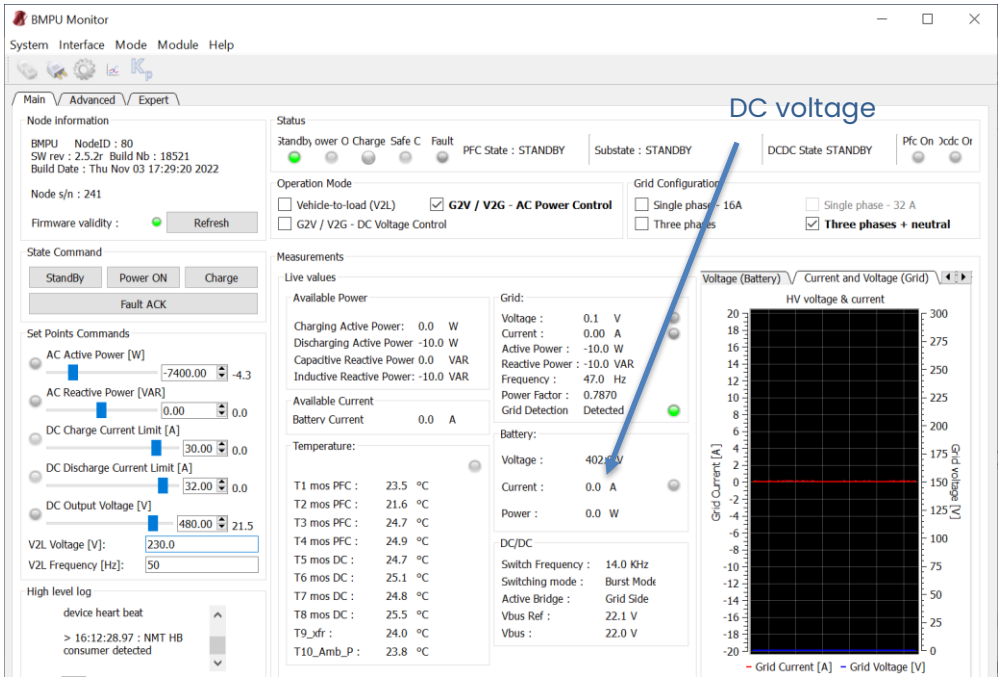
14.

Set voltage on AC source or grid (Three-phase with neutral at 230V/50Hz for the example). AC voltage cannot be read on GUI during Stand by state.

15.

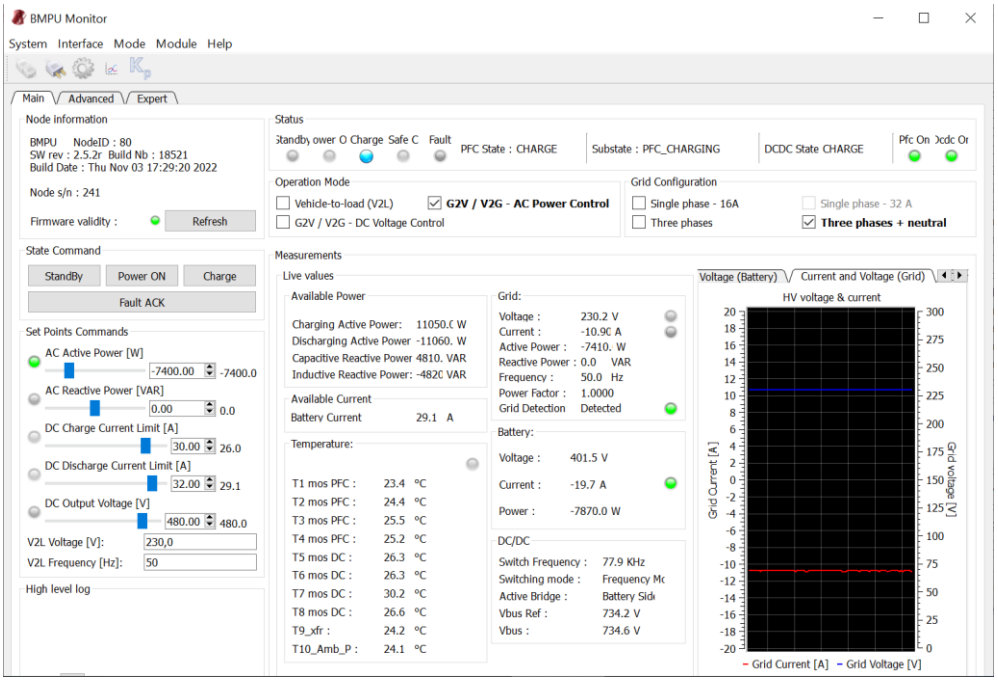
Set voltage on DC source (400V for example).

Voltage can be read on GUI as soon as is set on the source.



16.

Click on Charge button to start power operations. Blue led named Charge is On when charger is delivering power.

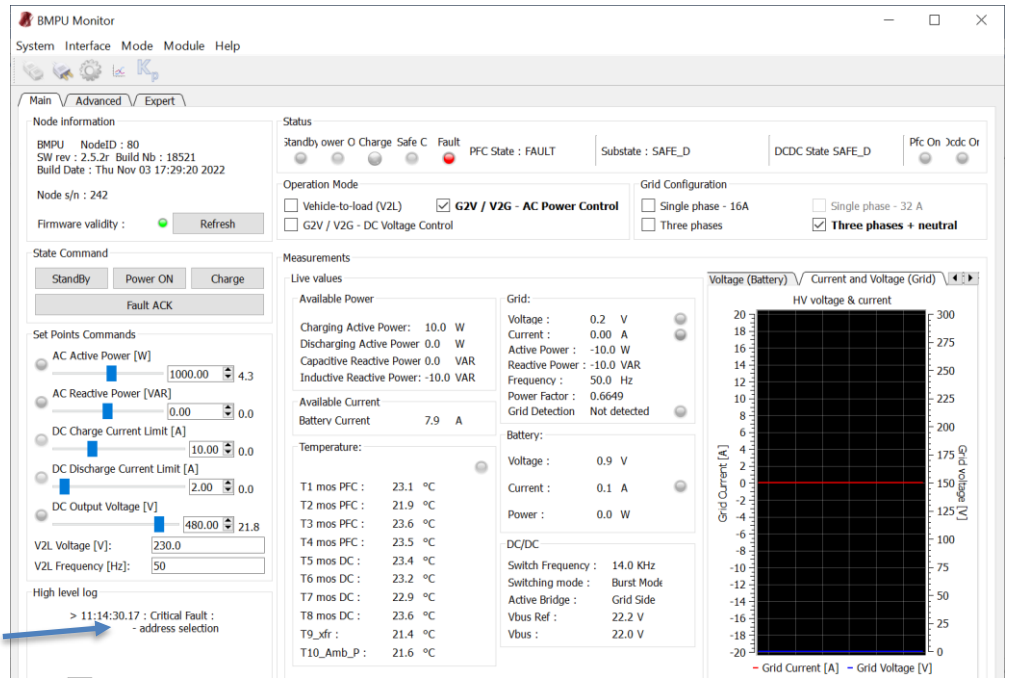


17.

Click on StandBy to stop power operations

18.

If an error occurs, the charger enters fault mode and the red led named Fault is on. The error name is displayed on High level log area of the GUI.

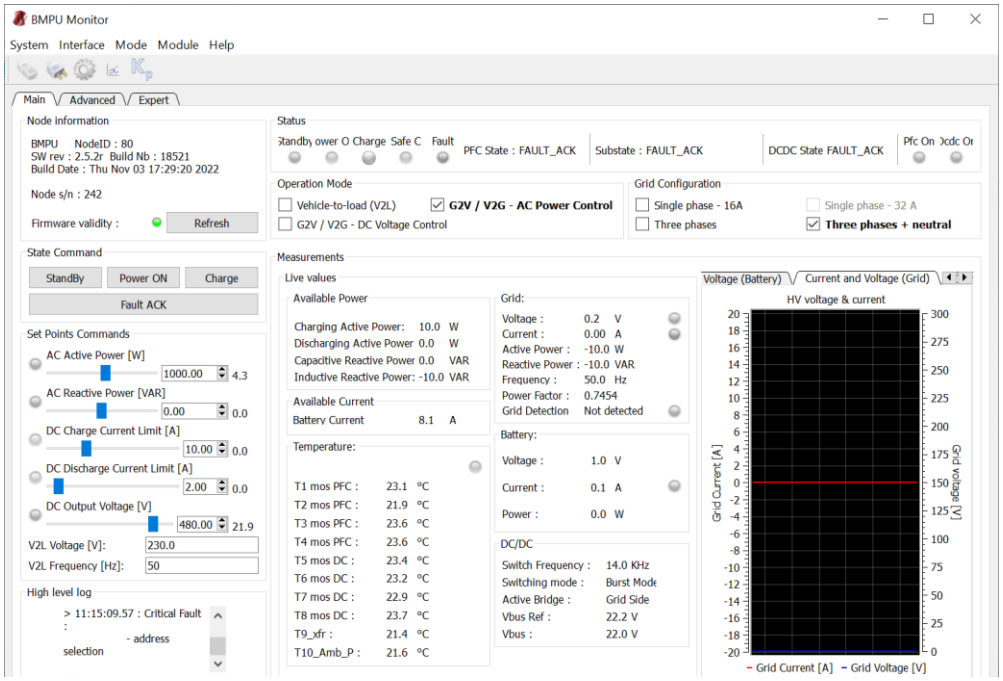


Fault name

19.

To clear an error and restart, proceed as follows:

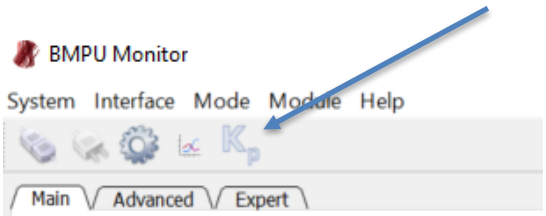
a. Click on Fault ACK button. PFC state displays the message FAULT_ACK.
b. Click on StandBy button to restart.

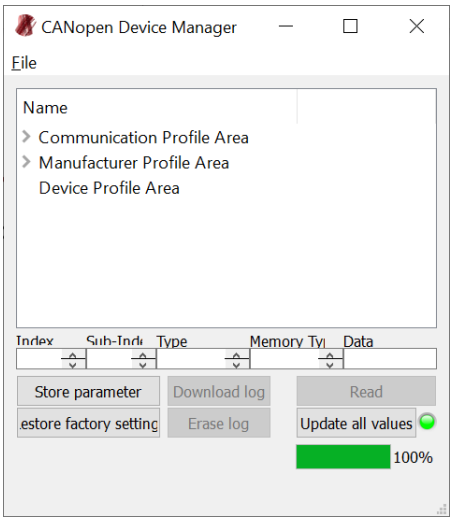


6. Parameter list for grid codes

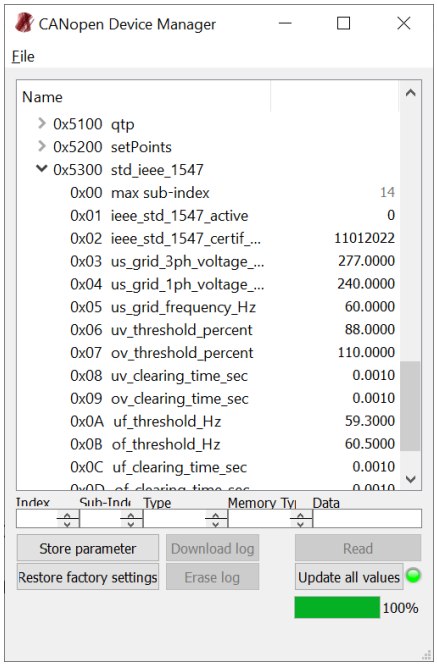
To access parameters, proceed as follows:

a. open the CANopen Device manager by clicking on the button Kp





b. Expand Manufacturer Profile Area and go to the desired parameters group. For example expand 0x5300 std_ieee-1547 group to access to IEEE 1547 setting parameters.



6.1. IEEE-1547

Parameter	Description	Default Value	Unit	Range
ieee_std_1547_active	Activation of protections according to std IEEE 1547 [1]	1	-	0 or 1
ieee_std_1547_certif_date	Certification date[2]	11012022	-	-
us_grid_3ph_voltage_V	Three-phase grid nominal voltage	277	V_{rms}	100-305
us_grid_1ph_voltage_V	Single-phase grid nominal voltage	240	V_{rms}	100-140
us_grid_frequency_Hz	Grid nominal frequency	60	Hz	51-69
uv_threshold_percent	Under voltage protection trip magnitude in percent of nominal voltage	88	%	85-90
ov_threshold_percent	Over voltage trip magnitude in percent of nominal voltage	110	%	105-112
uv_clearing_time_sec	Under-voltage trip time	0.001	Sec	0.001-0.1
ov_clearing_time_sec	Over-voltage trip time	0.001	Sec	0.001-0.1
uf_threshold_Hz	Under frequency trip magnitude	59.3	Hz	-
of_threshold_Hz	Over frequency trip magnitude	60.5	Hz	-
uf_clearing_time_sec	Under frequency trip time	0.001	Sec	0.001-0.1
of_clearing_time_sec	Over frequency trip time	0.001	Sec	0.001-0.1
uof_start_power_W	Power threshold to activate under/over frequency protections[3]	1000	W	-

6.2. VDE-AR-N 4105

For all tests :

- 0x4100 calibration : AC voltage calibration must be done (from "0x26 calib_v_L1_offset" to "0x2B calib_v_L3_gain").
- 0x4100 calibration → 0x3C grid_code_active = 1
- P_{set} and Q_{set} are modified through BMPU monitor.

[1] Set 1 for activation and 0 for deactivation
[2] Certification date to be ignored

Test	Configuration: description/parameter	Default Value	Unit	Test value
Fast voltage change	• No parameter modification	-	-	-
5.2.3 Flicker	• No parameter modification		-	-
5.2.4 Harmonics and Interharmonics according IEC 61000-3-2 (for Ir≤16A) or IEC 61000-3-12 (for Ir>16A)	• No parameter modification	-	-	-
5.2.5 Commutation Notch	N/A	N/A	N/A	N/A
5.2.6 DC injection	• No parameter modification	-	-	-
5.3.2.1 Calculation of the unbalance of three-phase inverters	• No parameter modification	-	-	-
5.3.2.2 Symmetrical operation with a symmetry device	N/A	N/A	N/A	N/A
5.4.2 Active and reactive power range	• No parameter modification	-	-	-
5.4.3 Active power reduction by setpoint	• No parameter modification	-	-	-
5.4.3.4 Measurement of the power gradient	• 0x5000 limitation → 0x18 active_power_ramp_w_per_sec	40000	W/s	See test sequence
5.4.5 Active power injection by over frequency P(f) for storage systems	• 0x4900 gridCode → 0x1F frequency_response_active	1	-	1
5.4.7 Active power injection by under frequency P(f) for storage systems	• 0x4900 gridCode → 0x1F frequency_response_active	1	-	1
5.4.8.2 Reactive power/cos ϕ parameter precision	• 0x4900 gridCode → 0x0B reactive_power_control_mode • 0x5200 setPoints → 0x0E itfc_cos_phi_setpoint	0 0	- Scale: 1/1000	2 See test sequence
5.4.8.4 Characteristic curve Q(U)	• 0x4900 gridCode → 0x0B reactive_power_control_mode	0	-	1

5.6 Connection conditions and synchronization	• No parameter modification	-	-	-
5.8 Behavior during grid fault	• No parameter modification	-	-	-