

HIGH POWER SERIES

BMPU series AN001 rev AA



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	MATER OF BMPU-R2
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	80
BMPU Graphical User Interface (GUI)	
BMPU monitor license (USB license dongle)	



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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.



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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).

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



5.

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





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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





VERSION V5.40.102 Release notes Older versions

4. Graphical user interface setup

9.

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

DRIVER	Windows drivers for all our CAN hardware. Please check the release
Kvaser Drivers for Windows	notes for information on which Windows versions are supported. The package also contains a driver for a virtual CAN bus, for testing and evaluation when you don't have access to a physical CAN bus.

Read more 🗸

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.



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Home	Share View Application Tools				
Quick Copy	Paste shortcut	e Rename New folder	Properties	Select all Select none Invert selection	
Clip	oboard Organize	New	Open	Select	
→ ~ ↑	> WL1_BMPU_IHM_v1.3.6r_kvaser_Protected				ບ ຸ⊅ Search WL1_E
^	Name	Date modified	Type	Size	A BMPU Monitor Protected
Quick ac					Application
Doo 🖈	accessible	11/4/2022 3:58 PM	File folder		- Approximit
Dow *	iconengines	11/4/2022 3:58 PM	File folder		
Pict *	imageformats	11/4/2022 3:58 PM	File folder		
HDE -	platforms	11/4/2022 3:58 PM	File folder		
UDT #	BMPU_Monitor_Protected	6/22/2022 9:58 AM	Application	5,065 KB	
HUP X	canlib32.dll	10/8/2019 11:39 PM	Application extension	498 KB	Determine (100,0000,010,000
Soft *	DataDefinition	11/3/2022 5:30 PM	XML Document	324 KB	Size: 4 94 MR
HDF 🖈	DISCLAIM WATT	8/8/2014 8:52 AM	Text Document	1 KB	Date created: 11/4/2022 3:58 PM
MPL 🖈	hasp_rt	11/29/2018 2:42 PM	Application	4,092 K8	
Goo 🖈	haspvlib_113151.dll	11/22/2021 6:10 PM	Application extension	687 KB	
dossier	icudt51.dll	8/13/2014 7:06 PM	Application extension	21,854 KB	
Engle	icuin51.dll	8/13/2014 7:06 PM	Application extension	3,291 KB	
Mu Dai	icuuc51.dll	8/13/2014 7:06 PM	Application extension	1,933 KB	
I MY DIK	libgcc_s_dw2-1.dll	8/13/2014 7:06 PM	Application extension	533 KB	
trunk	Silbstdc++-6.dll	8/13/2014 7:06 PM	Application extension	967 KB	
OneDrive	Bibwinpthread-1.dll	8/13/2014 7:06 PM	Application extension	73 KB	
	LICENSE	2/27/2020 3:40 PM	File	12 KB	
This PC	NOTICE .	3/5/2020 5:58 PM	File	2 KB	
3D Obj	dt_cs.qm	8/13/2014 7:06 PM	QM File	125 KB	
Deskto] qt_de.qm	8/13/2014 7:06 PM	QM File	160 KB	
Docum Y	at hu.am	8/13/2014 7:06 PM	QM File	150 KB	×

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.

6 6 6 K.				
ain Advanced Expert				
ode information	Status Jtandby ower O Charge Safe C Far	Settings	? ×	Pfc On)cdc
	Operation Mode	Device :		
	Vehicle-to-load (V2L)	Kvaser Leaf Light v2 S/N: 83086 CH: 0	•	Single phase - 32 A
Firmware validity : Refresh	G2V / V2G - DC Voltage Contro		Refresh	Three phases + neutral
tate Command	Measurements	Baud Rate :		
StandBy Power ON Charge	Live values	500 kBit/s	•	rent and Voltage (Grid)
Fault ACK	Available Power	Slave CAN address :		age & current
et Points Commands	Charging Active Power: 0	80	•	F 300
AC Active Power [W]	Discharging Active Power 0 Capacitive Reactive Power 0	Monitor CAN address :	•	- 275
1000.00 ∓ 0	Inductive Reactive Power: 0	*		230
	Available Current	Set-point autosenu penou .	50 🗘 ms	- 225
DC Charge Current Limit [A]	Dattery current 0	Slow Meas Period :		- 200
DC Discharge Current Limit [A]		-	5700 🗣 ms	- 175 G
		✓ Update parameters at the beginning	ng of the communication	- 150 00
DC Output Voltage [V]		Silent Mode	Apply	- 125 🖉
2L Voltage [V]: 230.0	F I I		- Abbil	- 100
2L Frequency [Hz]: 50			-10	- 75
igh level log			-12 -	- 50
> 11:11:07.73 : Port cannot be			-16	- 25
open			-18	



🐉 BMPU Monitor					- D >
ystem Interface Mode Module Help					
🌜 😪 😳 🕜 🦉					
Main Advanced / Expert \					
Node information	Status				
BMPU NodeID : 80 SW rev : 2.5.2r Build Nb : 18521 Build Date : Thu Nov 03 17:29:20 2022	Standby ower O Charge Safe C Fault	State : STANDBY Substa	ate : STANDBY	DCDC State	STANDBY Pfc On Ocdc Or
	Operation Mode		Grid Configur	ration	
Node s/n : 241	Vehicle-to-load (V2L)	/ / V2G - AC Power Control	Single ph	nase - 16A	ingle phase - 32 A
Firmware validity : Refresh	G2V / V2G - DC Voltage Control		Three ph	ases 🗌 1	'hree phases + neutral
State Command	Measurements				
StandBy Power ON Charge	Live values			Voltage (Battery) V Curre	ent and Voltage (Grid)
Fault ACK	Available Power	Grid:		HV volta	ge & current
	Charging Active Power: 0.0 W	Voltage : 0.2 V	0	20	F 300
Set Points Commands	Discharging Active Power 0.0 W	Current : 0.00 A		16	- 275
AC Active Power [W]	Capacitive Reactive Power 0.0 VAR	Reactive Power : -10.0 V	AR	14	- 250
AC Reactive Dewer [VAP]	Inductive Reactive Power: 0.0 VAR	Frequency : 47.1 H	z	12	
	Available Current	Grid Detection Detected		10	- 225
BMPU Node[D : 80 W rev : 2.5.2r Build Nb : 18521 SW rev : 2.5.2r Build Nb : 18521 SW rev : 2.5.2r Build Nb : 18521 SW rev : 2.5.2r Build Nb : 18521 Node s/n : 241 Firmware validity :	Battery Current 0.0 A	Battery:		6	- 200
				Z 4	- 175 9
		Voltage : 1.0 V		t 21	d vo
2.00 🔍 0.0		Current : 0.0 A	0	00-2-1	- 150 tage
DC Output Voltage [V]		Power : 0.0 W	r	Pi-5 -4	125 2
V2L Voltage [V]: 230.0				-6	- 100
V2L Frequency [Hz]: 50				-10	- 75
High level log				-12	50
device heart beat				-14	
> 16:12:28 97 - NMT HB				-18	- 25
consumer detected				-20 3	E o
~				- Grid Current [A] - Grid Voltage [V]

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

Expert m	?	\times
Password :	•••••	•
Ok	Car	ncel

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



BMPU Monitor				- 🗆
em Interface Mode Module Help				
, 😪 😳 🐷 K,				
ain V Advanced V Expert				
lode information	Status			
BMPU NodeID: 80 SW rev : 2.5.2r Build Nb : 18521	Standby ower O Charge Safe C Fault	State : STANDBY Substate : STANDBY	DCDC State STANDB	Y Pfc On Jode C
Build Date . 110 Nov 03 17.29.20 2022	Operation Mode	Grid Config	uration	
Node s/n : 242	Vehide-to-load (V2L)	V2G - AC Power Control Single r	ohase - 160 Single ph	ase - 32 A
Firmware validity : 🔍 Refresh	G2V / V2G - DC Voltage Control	Three p	hases Three ph	ases + neutral
tate Command	Measurements			
StandBy Power ON Charge	Live values		Voltage (Battery) V Current and V	/oltage (Grid)
Fault ACK	Available Power	Grid:	HV voltage & curr	rent
Table Ack	Charalas Asthus Dawary 0.0 W	Voltage: 0.2 V 🝚	20 g	F 300
et Points Commands	Discharging Active Power 0.0 W	Current : 0.00 A	18	- 275
AC Active Power [W]	Capacitive Reactive Power 0.0 VAR	Active Power: -10.0 W	16	
1000.00 🗘 0.0	Inductive Reactive Power: 0.0 VAR	Frequency : 50.0 Hz	12	- 250
AC Reactive Power [VAR]	Available Current	Power Factor: 0.5414	10	- 225
0.00 \$ 0.0	Battery Current 0.0 A	Grid Detection Not detected	8	
DC Charge Current Limit [A]		Battery:	6	- 200
10.00 🗘 0.0	Temperature:	Voltage : 0.9 V	[V] 4	- 175 🖁
DC Discharge Current Limit [A]	9	totage : 015 t	2 The second second	150 0
2.00 🛡 0.0	T1 mos PFC : 23.1 °C	Current : 0.1 A	5	150 80
DC Output Voltage [V]	T2 mos PFC : 21.9 °C	Power: 0.0 W	Pi - 4	- 125 -
480.00 - 21.9	T4 mos DEC : 23.6 °C	Deltas	-6 -	- 100
2L Voltage [V]: 230.0	T5 mos DC + 23.5 °C	DC/DC	-8 -	100
2L Frequency [Hz]: 50	T6 mos DC : 23.2 °C	Switch Frequency : 14.0 KHz	-10	- 75
igh level log	T7 mos DC : 22.9 °C	Active Bridge : Grid Side	-12 -	- 50
	T8 mos DC : 23.6 °C	Vbus Ref : 22.2 V	-14	
	T9_xfr: 21.3 °C	Vbus : 22.0 V	-18	- 25
	T10 1 1 0 01 5 05			

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.



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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.

BMPU Monitor			- 0
ystem Interface Mode Module Help			
💊 🙀 🚱 🖻 🔍			
Main V Advanced V Expert			DC voltage
Node information	Status		DC Voltage
BMPU NodeID: 80 SW rev: 2.5.2r Build Nb: 18521 Build Date: Thu Nov 03 17:29:20 2022	Standby ower O Charge Safe C Fault	State : STANDBY Substate : STANDBY	DCDC State STANDBY
Dang Date . The nov 05 17.29.20 2022	Operation Mode	Grid Configu	uration
Node s/n : 241	Vehicle-to-load (V2L)	2G - AC Power Control Single n	hase - 164 Single phase - 32 A
Firmware validity : Refresh	G2V / V2G - DC Voltage Control	Three pl	haves I Three phases + neutral
State Command	Measurements		
StandBy Power ON Charge	Live values		Voltage (Battery) V Current and Voltage (Grid)
Four ACK	Available Power	Grid:	HV voltage & current
Fault ACK		Voltage : 0.1 V	20 3 F 300
Set Points Commands	Charging Active Power: 0.0 W	Current : 0.00 A	18
AC Active Power [W]	Capacitius Deadius Dever - 10.0 W	Active Power: -10.0 W	16
-7400.00 🗘 -4.3	Inductive Reactive Power 0.0 VAR	Reactive Power : -10.0 VAR	14 - 250
AC Reactive Power [VAR]		Power Factor : 0.7870	12
0.00 0 0	Available Current	Grid Detection Detected	223
DC Charge Current Limit [A]	Battery Current 0.0 A	Dattanu	6 - 200
30.00 🗘 0.0	Temperature:	Battery:	2 4
DC Discharge Current Limit [A]		Voltage : 402.2 V	E 2
□ 32.00 € 0.0	T1 mos PEC : 23.5 °C	Current: 0.0 A	목 0 북 ··································
DC Output Voltage IVI	T2 mos PEC : 21.6 °C		Q -2
● 480.00 € 31.5	T3 mos PEC : 24.7 °C	Power: 0.0 W	5 -4
V2I Voltage [V]: 230.0	T4 mos PFC : 24.9 °C	DC/DC	-6 - 100
V2L Voluge [V]. 2000	T5 mos DC : 24.7 °C	Cuitch Frequency : 14.0 KHz	-8 -
V2L Frequency [FI2]: 50	T6 mos DC : 25.1 °C	Switching mode : Burst Mode	-10 - 75
High level log	T7 mos DC : 24.8 °C	Active Bridge : Grid Side	-14 - 50
device heart beat	T8 mos DC : 25.5 °C	Vbus Ref : 22.1 V	-16 -
> 16:12:28 97 · NMT HB	T9_xfr: 24.0 °C	Vbus : 22.0 V	-18 -
consumer detected	T10_Amb_P: 23.8 °C		

16.

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



stem Interface Mode Module Help					
5 😪 😳 🗵 K.,					
Main / Advanced / Expert \					
Node information	Status				
BMPU NodeID: 80 SW rev: 2.5.2r Build Nb: 18521 Build Date: Thu Nov 02 17:30:30 2022	Standby ower O Charge Safe C Fault	State : CHARGE Substa	te : PFC_CHARGING	DCDC State CHARGE	Pfc On Jcdc O
Build Date . Thu Nov 03 17.29.20 2022	Operation Mode		Grid Configuration		
Node s/n : 241	Vehide-to-load (V2L)	2G - AC Power Control	Single phase -	16A Single ph	ase - 32 A
Firmware validity : 🗣 Refresh	G2V / V2G - DC Voltage Control		Three phases	✓ Three pl	ases + neutral
State Command	Measurements				
StandBy Power ON Charge	Live values		Volta	age (Battery) \/ Current and V	oltage (Grid)
Sub toy	Available Power	Grid:		HV voltage & curr	rent
Fault ACK		Voltage : 230.2 V	0	20 3	F 300
Set Points Commands	Charging Active Power: 11050.CW	Current : -10.9C A Active Power : -7410. W		18	275
AC Active Power [W]	Discharging Active Power -11060. W			16	2/3
-7400.00 🗘 -7400.0	Inductive Reactive Power: -4820 VAR	Reactive Power : 0.0 V/	AR .	14	- 250
AC Reactive Power [VAR]	A with the Council	Power Factor : 1.0000		10	225
0.00 🗘 0.0	Available Current 20.1 A	Grid Detection Detected	•	8	
DC Charge Current Limit [A]	battery current 29.1 A	Battery:		6	- 200
30.00 🗘 26.0	Temperature:		X	4	E 175 9
DC Discharge Current Limit [A]	9	Voltage : 401.5 V	at a	2	d s
32.00 🕏 29.1	T1 mos PFC : 23.4 °C	Current : -19.7 A	 5 	0	150 8
DC Output Voltage [V]	T2 mos PFC : 24.4 °C	Power : -7870.0 W	믿고	-2 -	- 125 2
480.00 🗘 480.0	T3 mos PFC : 25.5 °C	10101	0	-6	
V2L Voltage [V]: 230,0	T4 mos PFC : 25.2 °C	DC/DC		-8-	100
V2L Frequency [Hz]: 50	T5 mos DC : 26.3 °C	Switch Frequency : 77.9	KHz	-10	- 75
High level log	T6 mos DC : 26.3 °C	Switching mode : Free	luency Mc	-12	
ngn rever rog	17 mos DC : 30.2 °C	Active Bridge : Batt	ery Side	-14 -	- 50
	18 mos DC : 26.6 °C	Vbus Ref : 734	.2 V	-16	- 25
	19_xfr: 24.2 °C	Vbus : 734	.0 V	-18	
	110_AMD_P: 24.1 °C			-20	- 0

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.





Document Reference: BMPU series AN001 rev AA

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.

BMPU Monitor				- 0	3
stem Interface Mode Module Help					
Main (/ Advanced (/ Expert)					
Node information	Status				
BMPU NodeID: 80 SW rev: 2.5.2r Build Nb: 18521 Build Date: Thu Nov 03 17:29:20 2022	Standby ower O Charge Safe C Fault PFC S	State : FAULT_ACK Substa	te : FAULT_ACK	DCDC State FAULT_ACK	cdc (
build but I find not of The Size Zorz	Operation Mode		Grid Configuration		
Node s/n : 242	Vehicle-to-load (V2L)	/2G - AC Power Control	Single phase - 16A	Single phase - 32 A	
Firmware validity :	G2V / V2G - DC Voltage Control		Three phases	Three phases + neutra	al
State Command	Measurements				
StandBy Power ON Charge	Live values		Voltage (Ba	attery) V Current and Voltage (Grid)	10
Fault ACK	Available Power	Grid:		HV voltage & current	
Set Points Commands	Charging Active Power: 10.0 W Discharging Active Power 0.0 W Capacitive Reactive Power 0.0 VAR Inductive Reactive Power: -10.0 VAR	Voltage : 0.2 V Current : 0.00 A Active Power : -10.0 W Reactive Power : -10.0 V/ Frequency : 50.0 Hz	© 20 0 18 16 16 17 12 12	275 250	D 5 0
AC Reactive Power [VAR]	Available Current Battery Current 8.1 A	Power Factor : 0.7454 Grid Detection Not dete	cted @ 10- 8-	- 225	5
DC Charge Current Limit [A]		Battery:	6 -	- 200	U
DC Discharge Current Limit [A]	emperature:	Voltage : 1.0 V	ert [A]	- 175	Grid vo
2.00 🗘 0.0	T1 mos PFC : 23.1 °C	Current : 0.1 A		- 150	0 da
■ DC Output Voltage [V] 480.00 ♀ 21.9	T2 mos PFC : 21.9 °C T3 mos PFC : 23.6 °C	Power : 0,0 W	0 pi -2 - 10 -4 -	- 125	52
V2I Voltage [V]: 230.0	T4 mos PFC : 23.6 °C	DC/DC	-6 -	- 100	0
V2L Frequency [Hz]: 50	T5 mos DC : 23.4 °C	Switch Frequency : 14.0	-8 -10	- 75	
High level log	T7 mos DC : 22.9 °C	Activo Bridge : Burs	-12 -	- 50	
> 11:15:09.57 : Critical Fault	T8 mos DC : 23.7 °C	Vhus Ref 22 2	V -14 -		
: address	T9 xfr : 21.4 °C	Vbus : 22.0	-10 -18	- 25	
selection	T10_Amb_P: 21.6 °C		-20 -20		

6. Parameter list for grid codes

To access parameters, proceed as follows:

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

谢 BMPU Monitor	
System Interface Mode Modale	Help
S (⊗ (Q) ⊭ K,"	
/ Main / Advanced / Expert /	



Document Reference: BMPU series AN001 rev AA

谢 CANopen Device	Manager	_		\times
Eile				
Name				
> Communication F	Profile Area			
> Manufacturer Pro	ofile Area			
Device Profile Are	ea			
Index Sub-Inde T	vpe N	lemorv	Tvi Data	
\$ \$	<u>^</u>		\$	
Store parameter	Download lo	g	Read	
estore factory setting	Erase log	L	Jpdate all va	lues 🔵
				100%

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.

jle	nanager		^	
Name			^	
> 0x5100 qtp				
> 0x5200 setPoint	s			
✓ 0x5300 std_ieee	_1547			
0x00 max sub	1	4		
0x01_ieee_std_1547_active			0	
0x02 ieee_std_1547_certif		1101202	22	
0x03 us_grid_	277.000	00		
0x04 us_grid_	240.000	00		
0x05 us_grid_	0x05 us_grid_frequency_Hz		00	
0x06 uv_three	shold_percent	88.0000		
0x07 ov_three	7 ov_threshold_percent		00	
0x08 uv_clear	ing_time_sec	0.001	10	
0x09 ov_clear	ing_time_sec	0.001	0	
0x0A uf_three	59.300	00		
0x0B of_thres	hold_Hz	60.500	00	
0x0C uf_clear	0.001	0		
ndex Sub-Inde Typ	e Memory	Ty Data	1 0	
Store parameter	Download log	Read		
Restore factory settings	Erase log	Update all valu	ies 🤇	
			100%	



6.1. IEEE-1547

Parameter	Description	Default	Unit	Range
	_	Value		
<pre>ieee_std_1547_active</pre>	Activation of protections	1	-	0 or 1
	according to std IEEE 1547 ¹			
<pre>ieee_std_1547_certif_date</pre>	Certification date ²	11012022	-	-
us_grid_3ph_voltage_V	Three-phase grid nominal	277	V _{rms}	100-305
	voltage			
us_grid_1ph_voltage_V	Single-phase grid nominal	240	V _{rms}	100-140
	voltage			
us_grid_frequency_Hz	Grid nominal frequency	60	Hz	51-69
uv_threshold_percent	Under voltage protection	88	%	85-90
	trip magnitude in percent			
	of nominal voltage			
ov_threshold_percent	Over voltage trip	110	%	105-112
	magnitude in percent of			
	nominal voltage			
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	59.3	Hz	-
	magnitude			
of_threshold_Hz	Over frequency trip	60.5	Hz	-
	magnitude			
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	1000	W	-
	under/over frequency			
	protections ³			

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 \rightarrow 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 	0	-	2
	itfc_cos_phi_setpoint	0	Scale: 1/1000	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	-	-	-