



CERTIFICATE

Applicant: **Victron Energy B.V.**
De Paal 35
1351 JG Almere
Netherlands

Product: **Battery Storage System with PV input**

Model:	Easysolar-II 48/3000/35-32 MPPT 250/70GX Easysolar-II 24/3000/70-32 MPPT 250/70GX	Easysolar-II 48/5000/70-50 MPPT 250/100GX
Rating:		
Output power (Feed in On-Grid)	2,5kVA / 2,47kW	4,5kVA / 4,4kW
Output power (Off-Grid)	3,0kVA / 2,4kW	5,0kVA / 4,0kW
Firmware Version:	2623504	

Intended use:

Battery Storage System with PV input in accordance with EN 50549-1:2019 with single-phase parallel coupling to the distribution network. The automatic disconnection device is an integral part of the aforementioned inverter.

Applied standards and guidelines:

SOP-9-1_15 GCC Certification Program, 09/21

Based on:

EN 50549-1:2019

Requirements for generating plants to be connected in parallel with distribution networks Part 1:
Connection to a LV distribution network - Generating plants up to and including Type B

Tested according to:

EN 50549-10:2022

Requirements for generating plants to be connected in parallel with distribution networks Part 10:
Tests for conformity assessment of generating units

The safety concept of an aforementioned representative product corresponds at the time of issue of this certificate to the valid safety specifications for the specified use in accordance with regulations.

Limitation:

The tested models have a limitation concerning VRT cases. This special condition is that if the inverter detects voltages of $<80\%U_n$ and above $>115\%U_n$ the inverter immediately switches to a "VRT/UPS" mode. This mode consists in the inverter stops injecting current into the grid (at the AC-IN port) but continues to inject current to the loads connected to the AC-OUT ports 1 and/or 2.

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Parameter table						
Clause(s) / subclause(s) of EN 50549-1:2019	Parameter	Parameter name in the generating unit	Configurable range	Default value	Minimum step size	Considered value range / Remarks
4.3.2 Interface switch	Single fault tolerance for interface switch required	N/A	-	-	-	Automatic disconnection with single fault tolerance is provided.
4.4.2 Operating frequency range	47,0 – 47,5 Hz Duration	N/A	-	-	-	Device can operate in under- and over-frequency for an unlimited time. This is ambient temperature dependent
	47,5 – 48,5 Hz Duration	N/A	-	-	-	
	48,5 – 49,0 Hz Duration	N/A	-	-	-	
	49,0 – 51,0 Hz Duration	N/A	-	-	-	
	51,0 – 51,5 Hz Duration	N/A	-	-	-	
	51,5 – 52 Hz Duration	N/A	-	-	-	
4.4.3 Minimal requirement for active power delivery at underfrequency	Reduction threshold	N/A	-	-	-	Power reduction due to low frequency is lower than the most stringent allowable reduction. The long-term reduction is ambient temperature dependent.
	Maximum reduction rate	N/A	-	-	-	
4.4.4 Continuous operating voltage range	Upper limit	N/A	not configurable	110% Un	-	-
	Lower limit	N/A	not configurable	85% Un	-	-
4.5.2 Rate of change of frequency (ROCOF) immunity	ROCOF withstand capability (defined with a sliding measurement window of 500 ms) non-synchronous generating technology: synchronous generating technology:	N/A	not defined	-	-	Expected to be better than 2Hz/s



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Clause(s) / subclause(s) of EN 50549-1:2019	Parameter	Parameter name in the generating unit	Configurable range	Default value		Minimum step size	Considered value range / Remarks
4.5.3.2 Generating plant with non-synchronous generating technology	Maximum power resumption time	N/A	-	-		-	UVRT not applicable (Type A device, see introduction item 8 page 6 of standard)
	Voltage-Time-Diagram	N/A	-	-	-	-	
		N/A		-	-	-	
		N/A		-	-	-	
4.5.3.3 Generating plant with synchronous generating technology	Maximum power resumption time	N/A	-	-		-	Inverter based technology
	Voltage-Time-Diagram	N/A	-	-	-	-	
		N/A		-	-	-	
		N/A		-	-	-	
		N/A		-	-	-	
		N/A		-	-	-	
4.5.4 Over-voltage ride through (OVRT)	Voltage-Time-Diagram	N/A	Not configurable	Time [s]	U [p.u.]	-	According to or better than Figure 8
		N/A		0,0	1,25	-	
		N/A		0,1	1,25	-	
		N/A		0,1	1,20	-	
		N/A		5,0	1,20	-	
		N/A		5,0	1,15	-	
		N/A		60	1,15	-	
		N/A		60	1,10	-	



Parameter table						
Clause(s) / subclause(s) of EN 50549-1:2019	Parameter	Parameter name in the generating unit	Configurable range	Default value	Minimum step size	Considered value range / Remarks
4.6.1 Power response to overfrequency	Threshold frequency f_1	Start freq $f >$	50...55Hz	50,2Hz	0,025Hz	
	Droop	Droop $f >$	1...12,5%	5 %	0,05%	
	Power reference	N/A	P_{max}	P_{max} , for synchronous Generating technology and EESS PM for other non-synchronous Generating technology	-	
	Intentional delay	Start delay $f >$	0...3,1s	0s	0,1s	
	Deactivation threshold f_{stop}	Stop freq $f >$	50,0 Hz – f_1	Equal to start freq	0,025Hz	
	Deactivation time t_{stop}	Stop delay $f >$	0 – 600 s	30s	0,5s	
	Acceptance of staged disconnection	-	yes no	yes		
4.6.2 Power response to underfrequency	Threshold frequency f_1	Start freq $f <$	50...46Hz	49,8Hz	0,025Hz	
	Droop	Droop $f <$	1...12,5%	5%	0,05%	
	Power reference	N/A	P_{max}	P_{max}	-	
	Intentional delay	Start delay $f <$	0...3,1s	0s	0,1s	
4.7.2.2 Capabilities	Active factor range overexcited	N/A	-	-	-	Capabilities are equal or „better“ than required
	Active factor range underexcited	N/A	-	-	-	Capabilities are equal or „better“ than required
4.7.2.3 Control modes	Enabled control mode	Reactive power regulation	Q setp. Q(U) cos ϕ setp. cos ϕ (P)	Cos Phi =1 fixed Q = 0	-	
4.7.2.3.2 Setpoint control modes	Q setpoint and excitation	Use a fixed Q	0...60% S_r	0	0,1% S_r	
	cos ϕ setpoint and excitation	Use a fixed CosPhi	1...0,8	1	0,01	



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4.7.2.3.3 Voltage related control modes	Characteristic curve	Q as function of input voltage	-	-	-	
	Time constant	Filter time reactive power	1...60s	3.3s	0,1s	
	Min cos ϕ	Min. Cos phi	0,0 – 1	0	0,01	
	Lock in power	P Lock-in	0...100%	Deactivated (0%)	0,5%	
	Lock out power	P Lock-out	0...100%	Deactivated (0%)	0,5%	
4.7.2.3.4 Power related control mode	Characteristic curve		-	-		
4.7.4.2.2 Zero current mode for converter connected generating technology	Enabling	N/A	-	-	-	UVRT not available
	Static voltage range overvoltage	N/A	-	-	-	
	Static voltage range undervoltage	N/A	-	-	-	



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4.9.2 Requirements on voltage and frequency protection	Threshold for protection as dedicated device [in A or kW, kVA]	N/A	-	-	-	-
	Undervoltage threshold stage 1	U<	78...100%U _n	85%U _n	0,25%U _n	
	Undervoltage operate time stage 1	Trip delay U<	0...200s	0,5s	0,05s	
	Undervoltage threshold stage 2	U<	77,75...100 %U _n	80%U _n	0,25%U _n	
	Undervoltage operate time stage 2	Trip delay U<	0...6,5s	0,2s	0,05s	
	Oversvoltage threshold stage 1	U>	100...125%U _n	115%U _n	0,25%U _n	
	Oversvoltage operate time stage 1	Trip delay U>	0...200s	0,5s	0,05s	
	Oversvoltage threshold stage 2	U>	100...130%U _n	120%U _n	0,25%U _n	
	Oversvoltage operate time stage 2	Trip delay U>	0...6,5s	0,2s	0,05s	
	Oversvoltage threshold 10 min mean protection	Over voltage U> (10 min. running mean)	100...125%U _n	110%U _n	0,25%U _n	
	Underfrequency threshold stage 1	f<	45,10...50,0 0Hz	47,50 Hz	0,025Hz	
	Underfrequency operate time stage 1	Trip delay f<	0...200s	30s	0,05s	
	Underfrequency threshold stage 2	f<	45,10...50,0 0Hz	47,00Hz	0,025Hz	
	Underfrequency operate time stage 2	Trip delay f<	0...6,5s	0,2s	0,05s	
	Overfrequency threshold stage 1	f>	50,00...54,9 0Hz	52,70Hz	0,025Hz	
	Overfrequency operate time stage 1	Trip delay f>	0...200s	30s	0,05s	
	Overfrequency threshold stage 2	f>	50,00...55,0 0Hz	53,00Hz	0,025Hz	
	Overfrequency operate time stage 2	Trip delay f>	0...6,5s	0,2s	0,05s	



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4.10.2 Automatic reconnection after tripping	Lower frequency	Low frequency	45,00...50,00Hz	49,5 Hz	0,025Hz	
	Upper frequency	High frequency	50,00...55,00Hz	50,2 Hz	0,025Hz	
	Lower voltage	Low voltage	78...100%U _n	85%U _n	0,25%U _n	
	Upper voltage	High voltage	100...130%U _n	110%U _n	0,25%U _n	
	Observation time	Waiting time	15...1200s	60s	1s	
	Active power increase gradient	Power rate. 100%per xx s	0...1200s	100% / 600s (=10%/min)	0,5s	
4.10.3 Starting to generate electrical power	Lower frequency	Low frequency	45,00...50,00Hz	49,5 Hz	0,025Hz	
	Upper frequency	High frequency	50,00...55,00Hz	50,1 Hz	0,025Hz	
	Lower voltage	Low voltage	78...100%U _n	85%U _n	0,25%U _n	
	Upper voltage	High voltage	100...130%U _n	110%U _n	0,25%U _n	
	Observation time	Waiting time	15...1200s	60s	1s	
	Active power increase gradient	Power rate. 100%per xx s	0...1200s	100% / 0 (disabled)	0,5s	
4.11.1 Ceasing active power	Remote operation of the logic interface	Use Aux 1 as disable FeedIn signal	yes no	Yes	-	
4.11.2 Reduction of active power on set point	Remote operation	N/A	-	-	-	-
4.12 Remote information exchange	Remote information exchange required	N/A	-	-	-	-