



CERTIFICATE

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Applicant: **Studer Innotec SA**
Rue de Casernes 57
1950 Sion
Switzerland

Product: **Battery storage system with integrated automatic disconnection device between a generator and the public low-voltage grid**

Model: **nx1 6500-48**
nx1 4500-48

Intended use:

Battery storage system in accordance with EN 50549-1 with single-phase parallel coupling to the distribution network. The automatic disconnection device is an integral part of the aforementioned system.

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 generating plant(s) are also considered to be compliant with the relevant Articles of Commission Regulation (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators (NC RfG), provided, that all settings as provided by the DSO and the responsible party are complied with.

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.

Report No: 25PP256-01_0

Certificate No: 25-285-00

Date of issue: 2025-08-14

Tanja Rottach
Certification Engineer





Parameter table acc. EN50549-10:2022 (Parameters as declared by the manufacturer and not according to a specific grid code. Additional testing for deviation to a specific grid code can be necessary)							
Parameter setting name in the generating unit:		Europe (EN-50549-1), Software version: 1.3.61.0, Hardware version: v1					
Clause(s) / sub-clause(s) of EN50549-1 or EN 50549-2:2019	Parameter	Parameter name in the generating unit	Configurable range	Default value		Minimum step size	Considered value range
4.4.2 Operating frequency range	47,0 – 47,5 Hz Duration	Not configurable	0 – 20 s	0s		-	unlimited
	47,5 – 48,5 Hz Duration	Not configurable	30 – 90 min	30 min		-	unlimited
	48,5 – 49,0 Hz Duration	Not configurable	30 – 90 min	30 min		-	unlimited
	49,0 – 51,0 Hz Duration	Not configurable	not configurable	unlimited		-	unlimited
	51,0 – 51,5 Hz Duration	Not configurable	30 – 90 min	30 min		-	unlimited
	51,5 – 52 Hz Duration	Not configurable	0 – 15 min	0 s		-	unlimited
4.4.3 Minimal requirement for active power delivery at underfrequency	Reduction threshold	Not configurable	49 Hz – 49,5 Hz	49,5 Hz		-	
	Maximum reduction rate	Not configurable	2 – 10 % PM/Hz	10 % PM/Hz		-	
4.4.4 Continuous operating voltage range	Upper limit	Not configurable	not configurable	110% Un		-	
	Lower limit	Not configurable	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) nonsynchronous generating technology: synchronous generating technology:	Not configurable	not defined	2 Hz/s		-	
4.5.3.2 Undervoltage ride through (UVRT) Generating plant with non-synchronous generating technology	Maximum power resumption time	Not configurable	not defined	1 s		-	
	Voltage-Time-Diagram	-	see Figure 6 of EN 50549-1:2019 and EN 50549-2:2019	Time [s]	U [p.u.]	-	-
		Under-voltage curve U1		0,0	0,05	0.000001 p.u.	0.01 – 0.9 p.u.
		Under-voltage curve T1 / Under-voltage curve U2		0,25	0,05	0.0001 s / 0.000001 p.u.	0.1 – 2 s / 0.01 – 0.9 p.u.
		Under-voltage curve T2 / Min. permanent voltage		3	0,85	0.0001 s / 0.000001 p.u.	0.5 – 20 s / 0.3 – 0.95 p.u.



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Clause(s) / sub-clause(s) of EN50549-1 or EN 50549-2:2019	Parameter	Parameter name in the generating unit	Configurable range	Default value		Minimum step size	Considered value range
4.5.3.3 Undervoltage ride through (UVRT) Generating plant with synchronous generating technology	Maximum power resumption time	Not configurable	not defined	3 s		N/A	N/A
	Voltage-Time-Diagram	N/A	see Figure 7 of EN 50549-1:2019 and EN 505492:2019	Time [s]	U [p.u.]	N/A	N/A
		N/A		0,0	0,3	N/A	N/A
		N/A		0,15	0,3	N/A	N/A
		N/A		0,15	0,7	N/A	N/A
		N/A		0,7	0,7	N/A	N/A
		N/A		1,5	0,85	N/A	N/A
4.5.4 Over-voltage ride through (OVRT)	Voltage-Time-Diagram	-	Not configurable see Figure 8 of EN 50549-1:2019 and EN 505492:2019	Time [s]	U [p.u.]	-	-
		Over-voltage curve U1		0,0	1,25	0.000001 p.u.	1.05 – 1.35 p.u.
		Over-voltage curve T1 / Over-voltage curve U1		0,1	1,25	0.0001 s / 0.000001 p.u.	0.1 – 2 s / 1.05 – 1.35 p.u.
		Over-voltage curve T1 / Over-voltage curve U2		0,1	1,20	0.0001 s / 0.000001 p.u.	0.1 – 2 s / 1.05 – 1.35 p.u.
		Over-voltage curve T2 / Over-voltage curve U2		5,0	1,20	0.0001 s / 0.000001 p.u.	0.5 – 60 s / 1.05 – 1.35 p.u.
		Over-voltage curve T2 / Over-voltage curve U3		5,0	1,15	0.0001 s / 0.000001 p.u.	0.5 – 60 s / 1.05 – 1.35 p.u.
		Over-voltage curve T3 / Over-voltage curve U3		60	1,15	0.0001 s / 0.000001 p.u.	1 – 120 s / 1.05 – 1.35 p.u.
		Over-voltage curve T3 / Max. permanent voltage		60	1,10	0.0001 s / 0.000001 p.u.	1 – 120 s / 1.05 – 1.2 p.u.
4.6.1 Power response to overfrequency	Threshold frequency f1	Threshold frequency for OF	50,2 Hz – 52 Hz	50,2 Hz		0.0001 Hz	50.1 – 60 Hz
	Droop	Statism for over-frequency	2 % – 12 %	5 %		0.0001 %	1 – 12 %
	Power reference	Pref for over-frequency	PM Pmax	Pmax, for synchronous Generating technology and		-	P maximum / P momentary



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Clause(s) / sub-clause(s) of EN50549-1 or EN 50549-2:2019	Parameter	Parameter name in the generating unit	Configurable range	Default value	Minimum step size	Considered value range
				EESS PM for other nonsynchronous Generating technology		
	Intentional delay	Intensional delay for over-freq.	0 – 2 s	0s	0.0001 s	0 – 2 s
	Deactivation threshold fstop	Disabling threshold freq. for OF	50,0 Hz – f1	deactivated	0.0001 Hz	50 – 60 Hz
	Deactivation time tstop	Disabling delay for over-freq.	0 – 600 s	-	0.0001 s	0 – 600 s
	Acceptance of staged disconnection		yes no	yes		
4.6.2 Power response to underfrequency	Threshold frequency f1	Threshold frequency for UF	49,8 Hz – 46 Hz	49,8 Hz	0.0001 Hz	40 – 49.9 Hz
	Droop	Statism for under-freq.	2 – 12 %	5 %	0.0001 %	1 – 12 %
	Power reference	Pref for under-freq.	PM Pmax	Pmax	-	P maximum / P momentary
	Intentional delay	Intensional delay for under-freq.	0 – 2 s	0 s	0.0001 s	0 – 2 s
4.7.2.2 voltage support by reactive power - Capabilities	Active factor / Reactive power (%Pd) range over-excited	Over-excited cos(φ) capacity	0,9 – 1 / 48%Pd - 0	0,9 – 1 / 48%Pd - 0	0.0001	0 – 1 / ± 60 %Pd
	Active factor / Reactive power (%Pd) range underexcited	Under-excited cos(φ) capacity	0,9 – 1 / 48%Pd - 0	0,9 – 1 / 48%Pd - 0	0.0001	0 – 1/ ± 60 %Pd
4.7.2.3 voltage support by reactive power – Control modes	Enabled control mode	Reactive power method	Q setp. Q(U) cos φ setp. cos φ (P)	None	-	Fixed reactive power / Q=f(U) curve / Fixed cos(φ) /



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Clause(s) / sub-clause(s) of EN50549-1 or EN 50549-2:2019	Parameter	Parameter name in the generating unit	Configurable range	Default value	Minimum step size	Considered value range
						cos(ϕ)=f(P) curve / None
4.7.2.3.2 voltage support by reactive power - Set point control modes	Q setpoint and excitation	Reactive power setpoint	0 – 48 % PD	0	0.0001 %	-60 – 60 % PD
	cos ϕ setpoint and excitation	cos(ϕ) setpoint / Reactive power direction	1 – 0,9	1	0.0001	0.7 – 1 / over-/underexcited
4.7.2.3.3 voltage support by reactive power – Voltage related control modes	Characteristic curve	Reactive power curve Q1 / Reactive power curve Q2 / Reactive power curve Q3 / Reactive power curve Q4 / Reactive power curve U1 / Reactive power curve U2 / Reactive power curve U3 / Reactive power curve U4	-	-	0.0001 %	0 – 60 % (Q1,Q2) / - 60 – 0 % (Q3,Q4) 50 – 100 % (U1,U2) / 100 – 120 % (U3,U4)
	Time constant	React. pow. control time behaviour	3 s – 60 s	10 s	0.0001 s	0.1 – 180 s
	Min cos ϕ	React. pow. control cos(ϕ) min.	0,0 – 1	0,9	0.0001	0 – 1
	Lock in power	React. pow. control lock-in P	0 % – 20 %	deactivated	0.0001 %	0 – 20 %
	Lock out power	React. pow. control lockout P	0 % – 20 %	deactivated	0.0001 %	0 – 20 %



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Clause(s) / sub-clause(s) of EN50549-1 or EN 50549-2:2019	Parameter	Parameter name in the generating unit	Configurable range	Default value	Minimum step size	Considered value range
4.7.2.3.4 voltage support by reactive power – Power related control mode	Characteristic curve	React. pow. curve $\cos(\varphi)$ OE1 / React. pow. curve $\cos(\varphi)$ OE2 / React. pow. curve $\cos(\varphi)$ UE3 / React. pow. curve $\cos(\varphi)$ UE4 / Reactive power curve P1 / Reactive power curve P2 / Reactive power curve P3 / Reactive power curve P4	-	-	0.0001 / 0.0001 %	0.7 – 1 ($\cos(\varphi)$) / 0 – 100 % (P)
only EN 50549-2:2019, 4.7.4.2.1 Voltage support during faults and voltage steps – General / Generating Plant with nonsynchronous generator	Enabling	N/A	enable disable	disabled	N/A	N/A
	Static voltage range over-voltage	N/A	100 % U_c – 120 % U_c	110 % U_c	N/A	N/A
	Static voltage range undervoltage	N/A	80 % U_c – 100 % U_c	90 % U_c	N/A	N/A
	Insensitivity range of $\Delta U_{50\text{per}}$	N/A	0 % – 15 %	5 %	N/A	N/A
	Gradient k1	N/A	0 – 6	2	N/A	N/A
	Gradient k2	N/A	0 – 6	2	N/A	N/A
only EN 50549-2:2019, 4.7.4.2.1.2 Optional Modes / Generating Plant with nonsynchronous generator	Active power priority	N/A	enable disable	disable	N/A	N/A
	Reactive current limitation [% rated current]	N/A	0 % – 100 %	disable	N/A	N/A
	Zero current threshold	N/A	20 % U_c – 100 % U_c	disable	N/A	N/A



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Clause(s) / sub-clause(s) of EN50549-1 or EN 50549-2:2019	Parameter	Parameter name in the generating unit	Configurable range	Default value	Minimum step size	Considered value range
4.7.4.2.2 Zero current mode for converter connected generating technology / Generating Plant with nonsynchronous generator	Enabling	Zero current mode	enable disable	disable	-	Enable / Disable
	Static voltage range over-voltage	OVRT or ZCM over-volt. threshold	100 % Un – 120 % Un	120 % Un	0.0001 %	100 – 120 %
	Static voltage range undervoltage	UVRT or ZCM under-volt. threshold	20 % Un – 100 % Un	50 % Un	0.0001 %	20 – 100 %
4.9.2 Requirements on voltage and frequency protection	Threshold for protection as dedicated device [in A or kW, kVA]		16 A – 250 kVA			
	Undervoltage threshold stage 1	Under-volt. threshold stage 1	0,2 Un – 1 Un	0.8 Un	0.000001 Un	0.1 – 1 Un
	Undervoltage operate time stage 1	Under-volt. operate time stage 1	0,1 s – 100 s	0.5 s	0.0001 s	0 – 200 s
	Undervoltage threshold stage 2	Under-volt. threshold stage 2	0,2 Un – 1 Un	0.7 Un	0.000001 Un	0.05 – 1 Un
	Undervoltage operate time stage 2	Under-volt. operate time stage 2	0,1 s – 5 s	0.2 s	0.0001 s	0 – 180 s
	Overvoltage threshold stage 1	Over-volt. threshold stage 1	1,0 Un – 1,2 Un	1.2 Un	0.000001 Un	1 – 1.25 Un
	Overvoltage operate time stage 1	Over-volt. operate time stage 1	0,1 s – 100 s	0.5 s	0.0001 s	0 – 180 s
	Overvoltage threshold stage 2	Over-volt. threshold stage 2	1,0 Un – 1,3 Un	1.25 Un	0.000001 Un	1 – 1.3 Un
	Overvoltage operate time stage 2	Over-volt. operate time stage 2	0,1 s – 5 s	0.2 s	0.0001 s	0 – 180 s



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Clause(s) / sub-clause(s) of EN50549-1 or EN 50549-2:2019	Parameter	Parameter name in the generating unit	Configurable range	Default value	Minimum step size	Considered value range
	Overvoltage threshold 10 min mean protection	Over-volt. threshold 10min mean	1,0 Un – 1,15 Un	1.1 Un	0.000001 Un	1 – 1.2 Un
	Underfrequency threshold stage 1	Under-freq. threshold stage 1	47,0 Hz– 50,0 Hz	48 Hz	0.0001 Hz	40 – 50 Hz
	Underfrequency operate time stage 1	Under-freq. operate time stage 1	0,1 s – 100 s	1 s	0.0001 s	0 – 100 s
	Underfrequency threshold stage 2	Under-freq. threshold stage 2	47,0 Hz – 50,0 Hz	47.5 Hz	0.0001 Hz	40 – 50 Hz
	Underfrequency operate time stage 2	Under-freq. operate time stage 2	0,1 s – 5 s	0.2 s	0.0001 s	0 – 5 s
	Overfrequency threshold stage 1	Over-freq. threshold stage 1	50,0 Hz – 52,0 Hz	51 Hz	0.0001 Hz	50 – 60 Hz
	Overfrequency operate time stage 1	Over-freq. operate time stage 1	0,1 s – 100 s	1 s	0.0001 s	0 – 100 s
	Overfrequency threshold stage 2	Over-freq. threshold stage 2	50,0 Hz – 52,0 Hz	51.5 Hz	0.0001 Hz	50 – 62 Hz
	Overfrequency operate time stage 2	Over-freq. operate time stage 2	0,1 s – 5 s	0.2 s	0.0001 s	0 – 5 s
only EN 505492:2019, 4.9.3 Requirements on voltage and frequency protection	Positive sequence under-voltage protection threshold	N/A	20 % – 100 %		N/A	N/A
	Positive sequence under-voltage protection operate time	N/A	0,2 s – 100 s		N/A	N/A
	Negative sequence over-voltage protection threshold	N/A	1 % – 100 %		N/A	N/A



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Clause(s) / sub-clause(s) of EN50549-1 or EN 50549-2:2019	Parameter	Parameter name in the generating unit	Configurable range	Default value	Minimum step size	Considered value range
	Negative sequence over-voltage protection operate time	N/A	0,2 s – 100 s		N/A	N/A
	Zero sequence overvoltage protection threshold	N/A	1 % – 100 %		N/A	N/A
	Zero sequence overvoltage protection operate time	N/A	0,2 s – 100 s		N/A	N/A
4.10.2 Automatic reconnection after tripping	Lower frequency	Lower freq. for auto reconnection	47,0 Hz – 50,0 Hz	49,5 Hz	0.0001 Hz	40 – 50 Hz
	Upper frequency	Upper freq. for auto reconnection	50,0 Hz – 52,0 Hz	50,2 Hz	0.0001 Hz	50 – 60 Hz
	Lower voltage	Lower volt. for auto reconnection	50 % Un – 100 % Un	85 % Un	0.0001 % Un	50 – 100 % Un
	Upper voltage	Upper volt. for auto reconnection	100 % Un – 120 % Un	110 % Un	0.0001 % Un	100 – 120 % Un
	Observation time	Observation time for auto reconnection	10 s – 600 s	60 s	0.0001 s	10 – 600 s
	Active power increase gradient	P increase gradient for auto reconnection	6 % – 3000 %/min	10 % /min	0.0001 %/min	5 – 3000 %/min
4.10.3 Starting to generate electrical power	Lower frequency	Lower freq. for start generation	47,0 Hz – 50,0 Hz	49,5 Hz	0.0001 Hz	40 – 50 Hz
	Upper frequency	Upper freq. for start generation	50,0 Hz – 52,0 Hz	50,1 Hz	0.0001 Hz	50 – 60 Hz
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Clause(s) / sub-clause(s) of EN50549-1 or EN 50549-2:2019	Parameter	Parameter name in the generating unit	Configurable range	Default value	Minimum step size	Considered value range
	Lower voltage	Lower volt. for start generation	50 % – 100 % Un	85 % Un	0.0001 % Un	50 – 100 % Un
	Upper voltage	Upper volt. for start generation	100 % – 120 % Un	110 % Un	0.0001 % Un	100 – 120 % Un
	Observation time	Observ. time for start generation	10 s – 600 s	60 s	0.0001 s	10 – 600 s
	Active power increase gradient	P increase gradient for start generation	6 % – 3000 %/min	disabled	0.0001 %/min	6 – 3000 %/min
4.11.1 Ceasing active power	Remote operation of the logic interface	CEI for ceasing produced P	Digital command input (remote entry)			
4.11.2 Reduction of active power on set point	Remote operation	CEI for reduction of produced P / Reduction of produced P / Reduction of produced P slope	Digital command input (remote entry)			
4.12 Remote information exchange	Remote information exchange required					