



Compliance Document

No. D 073135 0084 Rev. 00

Holder of Attestation: **Hansol EnergyON co., Ltd.**
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REPUBLIC OF KOREA

Product: **Converter**
(Battery Energy Storage System)

Model(s): **HSES-100kW-215kWh-1**

Parameters: See page 2

Tested according to: EN 50549-1:2019/A1:2023
EN 50549-2:2019/A1:2023
EN 50549-10:2022

This Compliance document confirms the compliance with the listed standards on a voluntary basis. It refers only to the particular sample. This compliance document makes no statement regarding the quality or safety of the serial products. For details see: www.tuvsud.com/ps-cert

Test report no.: 64290263072601

Date, 2026-06-10



(Billy Qiu)

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Parameters:

Model	HSES-100kW-215kWh-1
Battery terminal parameters	
Battery type	LFP
Maximum voltage [V_{DC}]	876
Battery rated voltage [V_{DC}]	768
Battery stable operating voltage range [V_{DC}]	735 - 876
Maximum charge/discharge power [kW]	105/110
Maximum charge/discharge current [A_{DC}]	140/140
Grid terminal parameters	
Rated input/output voltage [V_{AC}]	3P+N+PE, 230/400
Rated input/output frequency [Hz]	50
Rated input/output current [A_{AC}]	145
Maximum continuous input/output current [A_{AC}]	167
Rated input/output active power [kW]	100
Maximum continuous input/output active power [kW]	100
Maximum input/output apparent power [kVA]	110
Power factor range	0.9 inductive(under-excited) to 0.9 capacitive(over-excited)

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Evaluated protection function and operational capabilities

Clause(s) / subclause(s) of EN 50549-1:2019+ A1:2023	Applicable clause(s) / subclause (s) of EN 50549-10:2022	Remarks, optional modes and constraints	Verdict
4.4.2 Operating frequency range	5.2.1 Frequency operating range	--	Pass
4.4.3 Minimal requirement for active power delivery at underfrequency	5.2.1 Frequency operating range	--	Pass
4.4.4 Continuous operating voltage range	5.2.2 Voltage operating range	--	Pass
4.5.2 Rate of change of frequency (ROCOF) immunity	5.3.1 Immunity to disturbances - Rated of change of frequency (ROCOF)	--	Pass
4.5.3.2 Generating plant with nonsynchronous generating technology	5.3.3 Immunity to disturbances - Fault ride through, over-voltage (OVRT) and under-voltage (UVRT)	--	Pass
4.5.4 Over-voltage ride through (OVRT)	5.3.3 Immunity to disturbances - Fault ride through, over-voltage (OVRT) and under-voltage (UVRT)	--	Pass
4.5.5 Phase jump immunity	5.3.2 Phase jump	--	Pass
4.6.1 Power response to overfrequency	5.4 Active response to frequency deviation	--	Pass
4.6.2 Power response to underfrequency	5.4 Active response to frequency deviation	--	Pass
4.7.2.2 Voltage support by reactive power, Capabilities	5.5.1 Power capabilities assessment	--	Pass
4.7.2.3 Voltage support by reactive power, Control modes	5.5.2 Voltage support by reactive power - test to determine the reactive power control modes	Q setp Q(U) Cos φ setp Cos φ (P)	Pass
4.7.2.3.2 Set point control modes	5.5.2.3 Verification procedure for set point control	Q setp	Pass
4.7.2.3.3 Voltage related control modes	5.5.2.4 Verification procedure for voltage related control mode for reactive power Q(U)	Q(U)	Pass
4.7.2.3.4 Power related control mode	5.5.2.5 Verification procedure for power related control modes for reactive power	Cos φ (P)	Pass
4.7.3 Voltage related active power reduction	5.6 Voltage related active power reduction - P(U)	P(U)	Pass

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4.7.4.2.1 Voltage support during faults and voltage steps	5.3.3 Immunity to disturbances - Fault ride through, over-voltage (OVRT) and under-voltage (UVRT)	--	Pass
4.7.4.2.2 Zero current mode for converter connected generating technology	5.3.3 Immunity to disturbances - Fault ride through, over-voltage (OVRT) and under-voltage (UVRT)	--	Pass
4.9.3 Requirements on voltage and frequency protection	5.8.3 Verification procedure for generating plants to be connected to a LV distribution network with Interface protection as internal device	--	Pass
4.9.4 Means to detect island situation	5.8.6 Islanding detection	--	Pass
4.10.2 Automatic reconnection after tripping	5.9.3 Automatic reconnection after tripping	--	Pass
4.10.3 Starting to generate electrical power	5.9.4 Starting to generate electrical power	--	Pass
4.11.1 Ceasing active power	5.10 Active power reduction on set point	--	Pass
4.11.2 Reduction of active power on set point	5.10 Active power reduction on set point	--	Pass
4.12 Remote information exchange	5.11 Remote information exchange	Standardized communication protocol not provided by manufacturer	N/A
4.13 single fault tolerance of interface protection system and interface switch	5.12 Requirements regarding single fault tolerance of interface protection system and interface switch	--	Pass

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Clause(s) / subclause(s) of EN 50549-2:2019+ A1:2023	Applicable clause(s) / subclause (s) of EN 50549-10:2022	Remarks, optional modes and constraints	Verdict
4.4.2 Operating frequency range	5.2.1 Frequency operating range	--	Pass
4.4.3 Minimal requirement for active power delivery at underfrequency	5.2.1 Frequency operating range	--	Pass
4.4.4 Continuous operating voltage range	5.2.2 Voltage operating range	--	Pass
4.5.2 Rate of change of frequency (ROCOF) immunity	5.3.1 Immunity to disturbances - Rated of change of frequency (ROCOF)	--	Pass
4.5.3.2 Generating plant with nonsynchronous generating technology	5.3.3 Immunity to disturbances - Fault ride through, over-voltage (OVRT) and under-voltage (UVRT)	--	Pass
4.5.4 Over-voltage ride through (OVRT)	5.3.3 Immunity to disturbances - Fault ride through, over-voltage (OVRT) and under-voltage (UVRT)	--	Pass
4.5.5 Phase jump immunity	5.3.2 Phase jump	--	Pass
4.6.1 Power response to overfrequency	5.4 Active response to frequency deviation	--	Pass
4.6.2 Power response to underfrequency	5.4 Active response to frequency deviation	--	Pass
4.7.2.2 Voltage support by reactive power, Capabilities	5.5.1 Power capabilities assessment	--	Pass
4.7.2.3 Voltage support by reactive power, Control modes	5.5.2 Voltage support by reactive power - test to determine the reactive power control modes	Q setp Q(U) Cos φ setp Cos φ (P) Q (P)	Pass
4.7.2.3.2 Set point control modes	5.5.2.3 Verification procedure for set point control	Q setp	Pass
4.7.2.3.3 Voltage related control modes	5.5.2.4 Verification procedure for voltage related control mode for reactive power Q(U)	Q(U)	Pass
4.7.2.3.4 Power related control mode	5.5.2.5 Verification procedure for power related control modes for reactive power	Cos φ (P)	Pass
4.7.3 Voltage related active power reduction	5.6 Voltage related active power reduction - P(U)	P(U)	Pass

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4.7.4.2.1 Voltage support during faults and voltage steps	5.3.3 Immunity to disturbances - Fault ride through, over-voltage (OVRT) and under-voltage (UVRT)	--	Pass
4.7.4.2.2 Zero current mode for converter connected generating technology	5.3.3 Immunity to disturbances - Fault ride through, over-voltage (OVRT) and under-voltage (UVRT)	--	Pass
4.9.3 Requirements on voltage and frequency protection	5.8.3 Verification procedure for generating plants to be connected to a LV distribution network with Interface protection as internal device	External interface protection for generating plants to be connected to the MV network according to EN 50549-2:2019+A1:2023 must be installed in final installation	N/A
4.9.4 Means to detect island situation	5.8.6 Islanding detection	The inverter has an active islanding detection capability but needs to be used with an external interface protection as dedicated device must be installed in final installation.	N/A
4.10.2 Automatic reconnection after tripping	5.9.3 Automatic reconnection after tripping	--	Pass
4.10.3 Starting to generate electrical power	5.9.4 Starting to generate electrical power	--	Pass
4.11.1 Ceasing active power	5.10 Active power reduction on set point	--	Pass
4.11.2 Reduction of active power on set point	5.10 Active power reduction on set point	--	Pass
4.12 Remote information exchange	5.11 Remote information exchange	Standardized communication protocol not provided by manufacturer	N/A

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Evaluated parameter and parameter range

Specific technical requirement (e.g. grid codes)		EN 50549-1:2019+A1:2023			
Clause(s) / subclause(s) of EN 50549-1:2019+A1:2023	Parameter	Remarks/ additional information	Configurable value range	Default value	
4.4.2 Operating frequency range	47.0 - 47.5 Hz Duration	--	0 - 20 s	20 s	
	47.5 - 48.5 Hz Duration	--	30 - 90 min	30 min	
	48.5 - 49.0 Hz Duration	--	30 - 90 min	30 min	
	49.0 - 51.0 Hz Duration	--	not configurable	unlimited	
	51.0 - 51.5 Hz Duration	--	30 - 90 min	30 min	
	51.5 - 52.0 Hz Duration	--	0 - 15 min	15 min	
4.4.3 Minimal requirement for active power delivery at underfrequency	Reduction threshold	--	not configurable	No reduction.	
	Maximum reduction rate	--	not configurable	Maximum allow 10 % of P_{max} per 1 Hz	
4.4.4 Continuous operating voltage range	Upper limit	--	not configurable	110% U_n	
	Lower limit	--	not configurable	85% U_n	
4.5.2 Rate of change of frequency (ROCOF) immunity	ROCOF withstand capability (defined with a sliding measurement window of 500 ms)	--	not configurable	2.5 Hz/s	
4.5.3.2 Under-voltage ride through (UVRT) Generating plant with non-synchronous generating technology	Maximum power resumption time	--	not configurable	1 s	
	Voltage-Time-Diagram	--	See figure 6 most stringent curve of EN 50549-1:2019+A1:2023	Time[s]	U [p.u.]
		--		0.0	0.05
		--		0.25	0.05
4.5.4 Over-voltage ride through (OVRT)	Voltage-Time-Diagram	--	See figure 8 of EN 50549-1:2019+A1:2023	3.0	0.85
		--		Time[s]	U [p.u.]
		--		--	1.25
		--		0.1	1.25
		--		--	1.20
		--		5.0	1.20
		--		--	1.15
		--		60	1.15

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		--		--	1.10
4.5.5 Phase jump immunity	Phase jump immunity	--	not configurable	30°	
4.6.1 Power response to overfrequency	Threshold frequency f1	--	50.2 Hz - 52 Hz	50.2 Hz	
	Droop	--	2 % - 12 %	5 %	
	Power reference	--	P_M P_{max}	P_{max} for BESS	
	Intentional delay	--	0 - 2 s	0s	
	Deactivation threshold fstop	--	50.0 Hz - f1	deactivated	
	Deactivation time tstop	--	0 - 600 s	--	
	Acceptance of staged disconnection	--	yes no	yes	
4.6.2 Power response to underfrequency	Threshold frequency f1	--	49.8 Hz - 46 Hz	49.8 Hz	
	Droop	--	2 - 12 %	5 %	
	Power reference	--	P_M P_{max}	P_{max}	
	Intentional delay	--	0 - 2 s	0 s	
4.7.2.2 Voltage support by reactive power - Capabilities	Active factor / Reactive power range overexcited	--	0.9 - 1 / 0 kVar - 48 kVar	1 / 0 kVar	
	Active factor / Reactive power range underexcited	--	-0.9 - 1 / -48 kVar - 0 kVar	1 / 0 kVar	
4.7.2.3 Voltage support by reactive power - Control modes	Enabled control mode	--	Q setp Q(U) Cos φ setp Cos φ (P)	Q setp(Q setpoint)	
4.7.2.3.2 Voltage support by reactive power - Setpoint control modes	Q setpoint and excitation	--	-48 kVar - 48 kVar	0 kVar	
	cos φ setpoint and excitation	--	0.9 underexcited - 0.9 overexcited	1	
4.7.2.3.3 Voltage support by reactive power - Voltage related control modes	Characteristic curve - Q (U)	--	--	Indicate default characteristic	
	Piont a	--	207 V - 230 V	213.9 V	
	Piont a	--	207 V - 230 V	216.2 V	
	Piont a	--	230 V - 253 V	243.8 V	
	Piont a	--	230 V - 253 V	248.4 V	

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	Reactive Power of Piont a	--	0 kVar - 48 kVar	48 kVar
	Reactive Power of Piont b	--	-48 kVar - 48 kVar	0 kVar
	Reactive Power of Piont c	--	-48 kVar - 48 kVar	0 kVar
	Reactive Power of Piont d	--	-48 kVar - 0 kVar	-48 kVar
	Time constant	--	3 s - 60 s	3 s
	Min cos φ	--	0.0 – 0.95	0.4
	Lock in power	--	0 % - 20 % P_n	deactivated
	Lock out power	--	0 % - 20 % P_n	deactivated
4.7.2.3.4 Voltage support by reactive power - Power related control mode	Characteristic curve - Cos φ (P)	--	--	Indicate default characteristic
	Cos φ (P) point a	--	0% - 100% P_n	15% P_n
	Cos φ (P) point b	--	0% - 100% P_n	20% P_n
	Cos φ (P) point c	--	0% - 100% P_n	80% P_n
	Cos φ (P) point d	--	0% - 100% P_n	90% P_n
	Cos φ (P) du point a de Cos φ (P)	--	0.9 un – 0.9 ov	0.9 ov
	Cos φ (P) du point b de Cos φ (P)	--	0.9 un – 0.9 ov	1
	Cos φ (P) du point c de Cos φ (P)	--	0.9 un – 0.9 ov	1
	Cos φ (P) du point d de Cos φ (P)	--	0.9 un – 0.9 ov	0.9 un
	Time constant	--	3 s - 60 s	3 s
	Lock in voltage	--	105%Un	deactivated
	Lock out voltage	--	100%Un	deactivated
4.7.3 Voltage related active power reduction	Characteristic curve - P (U)	--	--	Indicate default characteristic
	Voltage high Point 1	--	230 V - 276 V	253 V
	Voltage high Point 2	--	230 V - 276 V	257.6 V
	Power high Point 1	--	0% - 100% P_n	100% P_n
	Power high Point 2	--	0% - 100% P_n	0% P_n
	Time constant	--	3 s - 60 s	3 s
4.7.4.2.1 Voltage support during faults and voltage steps	Enabling	For type B	enable disable	disabled
	Static voltage range overvoltage		230 V - 276 V	253 V

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	Static voltage range undervoltage		184 V – 230 V	195.5 V
	Gradient k1		0 - 6	2
	Gradient k2		0 - 6	2
4.7.4.2.2 Zero current mode for converter connected generating technology	Enabling	For type A	enable disable	disabled
	Static voltage range overvoltage		230 V - 276 V	276 V
	Static voltage range undervoltage		46 V - 230 V	115 V
4.9.3 Requirements on voltage and frequency protection	Threshold for protection as dedicated device [in A or kW, kVA]	--	16 A - 250 kVA	Not specified, inverter integrated as default
	Undervoltage threshold stage 1	--	46 V - 230 V	161 V
	Undervoltage operate time stage 1	--	0.1 s - 100 s	3 s
	Undervoltage threshold stage 2	--	46 V - 230 V	149.5 V
	Undervoltage operate time stage 2	--	0.1 s - 5 s	0.16 s
	Overvoltage threshold stage 1	--	230 V – 276 V	264.5 V
	Overvoltage operate time stage 1	--	0.1 s - 100 s	1 s
	Overvoltage threshold stage 2	--	46 V – 299 V	287.5 V
	Overvoltage operate time stage 2	--	0.1 s - 5 s	0.7 s
	Overvoltage threshold 10 min mean protection	--	230 V – 264.5 V	253 V
	Underfrequency threshold stage 1	--	47.0 Hz - 50.0 Hz	48.5 Hz
	Underfrequency operate time stage 1	--	0.1 s - 100 s	1 s
	Underfrequency threshold stage 2	--	47.0 Hz - 50.0 Hz	48.0 Hz

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	Underfrequency operate time stage 2	--	0.1 s - 5 s	0.7 s
	Overfrequency threshold stage 1	--	50.0 Hz - 52.0 Hz	51.5 Hz
	Overfrequency operate time stage 1	--	0.1 s - 100 s	0.1 s
	Overfrequency threshold stage 2	--	50.0 Hz - 52.0 Hz	52.0 Hz
	Overfrequency operate time stage 2	--	0.1 s - 5 s	0.7 s
4.10.2 Automatic reconnection after tripping	Lower frequency	--	47.0 Hz - 50.0 Hz	49.5 Hz
	Upper frequency	--	50.0 Hz - 52.0 Hz	50.2 Hz
	Lower voltage	--	115 V - 230 V	195.5 V
	Upper voltage	--	230 V - 276 V	253 V
	Observation time	--	10 s - 600 s	60 s
	Active power increase gradient	--	6% - 3000% P_n /min	10 % P_n /min
4.10.3 Starting to generate electrical power	Lower frequency	--	47.0 Hz - 50.0 Hz	49.5 Hz
	Upper frequency	--	50.0 Hz - 52.0 Hz	50.1 Hz
	Lower voltage	--	115 V - 230 V	195.5 V
	Upper voltage	--	230 V - 276 V	253 V
	Observation time	--	10 s - 600 s	60 s
	Active power increase gradient	--	6% - 3000 % P_n /min	disabled
4.11.1 Ceasing active power	Activation option	--	Can be achieved by pin 485-1A and pin 485-1B via Modbus communication protocol, decision should be made by the DSO and responsible party	
4.11.2 Reduction of active power on set point	Activation option	--	Can be achieved by pin 485-1A and pin 485-1B via Modbus communication protocol, decision should be made by the DSO and responsible party	
4.12 Remote information exchange	Available communication standards	--	Standardized communication protocol not provided by manufacturer	

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Specific technical requirement (e.g. grid codes)		EN 50549-2:2019+A1:2023			
Clause(s) / subclause(s) of EN 50549-2:2019+A1:2023	Parameter	Remarks/ additional information	Configurable value range	Default value	
4.4.2 Operating frequency range	47.0 - 47.5 Hz Duration	--	0 - 20 s	20 s	
	47.5 - 48.5 Hz Duration	--	30 - 90 min	30 min	
	48.5 - 49.0 Hz Duration	--	30 - 90 min	30 min	
	49.0 - 51.0 Hz Duration	--	not configurable	unlimited	
	51.0 - 51.5 Hz Duration	--	30 - 90 min	30 min	
	51.5 - 52.0 Hz Duration	--	0 - 15 min	15 min	
4.4.3 Minimal requirement for active power delivery at underfrequency	Reduction threshold	--	not configurable	No reduction.	
	Maximum reduction rate	--	not configurable	Maximum allow 10 % of P_{max} per 1 Hz	
4.4.4 Continuous operating voltage range	Upper limit	--	not configurable	110% Un	
	Lower limit	--	not configurable	90% Un	
4.5.2 Rate of change of frequency (ROCOF) immunity	ROCOF withstand capability (defined with a sliding measurement window of 500 ms)	--	not configurable	2.5 Hz/s	
4.5.3.2 Under-voltage ride through (UVRT) Generating plant with non-synchronous generating technology	Maximum power resumption time	--	not configurable	1 s	
	Voltage-Time-Diagram	--	See figure 6 most stringent curve of EN 50549-2:2019+A1:2023	Time[s]	U [p.u.]
		--		0.0	0.05
		--		0.25	0.05
		--		3.0	0.85
		--		180.0	0.85
		--		180.0	0.90
4.5.4 Over-voltage ride through (OVRT)	Voltage-Time-Diagram	--	See figure 8 of EN 50549-2:2019+A1:2023	Time[s]	U [p.u.]
		--		--	1.25
		--		0.1	1.25
		--		--	1.20
		--		5.0	1.20

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		--		--	1.15
		--		60	1.15
		--		--	1.10
4.5.5 Phase jump immunity	Phase jump immunity	--	not configurable	30°	
4.6.1 Power response to overfrequency	Threshold frequency f1	--	50.2 Hz - 52 Hz	50.2 Hz	
	Droop	--	2 % - 12 %	5 %	
	Power reference	--	P_M P_{max}	P_{max} for BESS	
	Intentional delay	--	0 - 2 s	0s	
	Deactivation threshold fstop	--	50.0 Hz - f1	deactivated	
	Deactivation time tstop	--	0 - 600 s	--	
	Acceptance of staged disconnection	--	yes no	yes	
4.6.2 Power response to underfrequency	Threshold frequency f1	--	49.8 Hz - 46 Hz	49.8 Hz	
	Droop	--	2 - 12 %	5 %	
	Power reference	--	P_M P_{max}	P_{max}	
	Intentional delay	--	0 - 2 s	0 s	
4.7.2.2 Voltage support by reactive power - Capabilities	Active factor / Reactive power range overexcited	--	0.9 - 1 / 0 kVar - 48 kVar	1 / 0 kVar	
	Active factor / Reactive power range underexcited	--	-0.9 - 1 / -48 kVar - 0 kVar	1 / 0 kVar	
4.7.2.3 Voltage support by reactive power - Control modes	Enabled control mode	--	Q setp Q(U) Cos φ setp Cos φ (P) Q (P)	Q setp(Q setpoint)	
4.7.2.3.2 Voltage support by reactive power - Setpoint control modes	Q setpoint and excitation	--	-48 kVar - 48 kVar	0 kVar	
	cos φ setpoint and excitation	--	0.9 underexcited - 0.9 overexcited	1	
4.7.2.3.3 Voltage support by reactive power - Voltage related control	Characteristic curve - Q (U)	--	--	Indicate default characteristic	
	Point a	--	207 V - 230 V	213.9 V	

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modes	Point b	--	207 V - 230 V	216.2 V
	Point c	--	230 V - 253 V	243.8 V
	Point d	--	230 V - 253 V	248.4 V
	Reactive power of Point a	--	0 kVar - 48 kVar	48 kVar
	Reactive power of Point b	--	-48 kVar - 48 kVar	0 kVar
	Reactive power of Point c	--	-48 kVar - 48 kVar	0 kVar
	Reactive power of Point d	--	-48 kVar - 0 kVar	-48 kVar
	Time constant	--	3 s - 60 s	3 s
	Min cos φ	--	0.0 – 0.95	0.4
	Lock in power	--	0 % - 20 % P_n	deactivated
	Lock out power	--	0 % - 20 % P_n	deactivated
4.7.2.3.4 Voltage support by reactive power - Power related control mode	Characteristic curve - Cos φ (P) and Q (P)	--	--	Indicate default characteristic, Cos φ (P) and Q (P) can be enabled only one at a time
	Cos φ (P) point a	--	0% - 100% P_n	15% P_n
	Cos φ (P) point b	--	0% - 100% P_n	20% P_n
	Cos φ (P) point c	--	0% - 100% P_n	80% P_n
	Cos φ (P) point d	--	0% - 100% P_n	90% P_n
	Cos φ of Cos φ (P) point a	--	0.9 un – 0.9 ov	0.9 ov
	Cos φ of Cos φ (P) point b	--	0.9 un – 0.9 ov	1
	Cos φ of Cos φ (P) point c	--	0.9 un – 0.9 ov	1
	Cos φ of Cos φ (P) point d	--	0.9 un – 0.9 ov	0.9 un
	Q (P) point a	--	0% - 100% P_n	15% P_n
	Q (P) point b	--	0% - 100% P_n	20% P_n
	Q (P) point c	--	0% - 100% P_n	80% P_n
	Q (P) point d	--	0% - 100% P_n	90% P_n
	Reactive power of Q (P) point a	--	-48% - 48% P_n	48 % P_n
	Reactive power of Q (P) point b	--	-48% - 48% P_n	0 % P_n

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	Reactive power of Q (P) point c	--	-48% - 48% P _n	0 %P _n
	Reactive power of Q (P) point d	--	-48% - 48% P _n	-48 %P _n
	Time constant	--	3 s - 60 s	3 s
	Lock in voltage	--	105%Un	deactivated
	Lock out voltage	--	100%Un	deactivated
4.7.3 Voltage related active power reduction	Characteristic curve - P (U)	--	--	Indicate default characteristic
	Voltage high Point 1	--	100%Un - 120%Un	110%Un
	Voltage high Point 2	--	100%Un - 120%Un	112%Un
	Power high Point 1	--	0% - 100% P _n	100% P _n
	Power high Point 2	--	0% - 100% P _n	0% P _n
	Time constant	--	3 s - 60 s	3 s
4.7.4.2.1 Voltage support during faults and voltage steps	Enabling	--	enable disable	disabled
	Static voltage range overvoltage		230 V - 276 V	253 V
	Static voltage range undervoltage		184 V – 230 V	207 V
	Insensitivity range		0 % - 15 %	0%
	Gradient k1		0 - 6	2
	Gradient k2		0 - 6	2
4.7.4.2.1.2 Optional Modes	Active power priority	--	enable disable	This mode is not supported for EN 50549-2:2019+A1:2023 software setting.
	Reactive current limitation [% rated current]	--	0% - 100%	
	Zero current threshold	--	20% - 100% Un	
4.7.4.2.2 Zero current mode for converter connected generating technology	Enabling	--	enable disable	This mode is not supported for EN 50549-2:2019+A1:2023 software setting.
	Static voltage range overvoltage		100%Un - 120%Un	
	Static voltage range undervoltage		20%Un - 100%Un	

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4.9.3 Requirements on voltage and frequency protection	Threshold for protection as dedicated device [in A or kW, kVA]	--	16 A - 250 kVA	External interface protection for generating plants to be connected to the MV network according to EN 50549-2:2019+A1:2023 must be installed in final installation.
	Undervoltage threshold stage 1	--	20% Un - 100% Un	--
	Undervoltage operate time stage 1	--	0.1 s - 100 s	--
	Undervoltage threshold stage 2	--	20% Un - 100% Un	--
	Undervoltage operate time stage 2	--	0.1 s - 5 s	--
	Overvoltage threshold stage 1	--	100% Un - 120%Un	--
	Overvoltage operate time stage 1	--	0.1 s - 100 s	--
	Overvoltage threshold stage 2	--	100% Un - 130%Un	--
	Overvoltage operate time stage 2	--	0.1 s - 5 s	--
	Overvoltage threshold 10 min mean protection	--	100%Un - 115% Un	--
	Underfrequency threshold stage 1	--	47.0 Hz - 50.0 Hz	--
	Underfrequency operate time stage 1	--	0.1 s - 100 s	--
	Underfrequency threshold stage 2	--	47.0 Hz - 50.0 Hz	--
	Underfrequency operate time stage 2	--	0.1 s - 5 s	--
	Overfrequency threshold stage 1	--	50.0 Hz - 52.0 Hz	--

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	Overfrequency operate time stage 1	--	0.1 s - 100 s	--
	Overfrequency threshold stage 2	--	50.0 Hz - 52.0 Hz	--
	Overfrequency operate time stage 2	--	0.1 s - 5 s	--
	Positive sequence under-voltage protection threshold	--	20% Un - 100% Un	--
	Positive sequence under-voltage protection operate time	--	0.2 s - 100 s	--
	Negative sequence over-voltage protection threshold	--	1%Un - 100%Un	--
	Negative sequence over-voltage protection threshold time	--	0.2 s - 100 s	--
	Zero sequence overvoltage protection threshold	--	1%Un - 100%Un	--
	Zero sequence overvoltage protection threshold time	--	0.1 s - 100 s	--
4.10.2 Automatic reconnection after tripping	Lower frequency	--	47.0 Hz - 50.0 Hz	49.5 Hz
	Upper frequency	--	50.0 Hz - 52.0 Hz	50.2 Hz
	Lower voltage	--	115 V - 230 V	207 V
	Upper voltage	--	230 V - 276 V	253 V
	Observation time	--	10 s - 600 s	60 s
	Active power increase gradient	--	6% - 3000% P _n /min	10 %P _n /min
4.10.3 Starting to generate electrical power	Lower frequency	--	47.0 Hz - 50.0 Hz	49.5 Hz
	Upper frequency	--	50.0 Hz - 52.0 Hz	50.1 Hz

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	Lower voltage	--	115 V - 230 V	207 V
	Upper voltage	--	230 V - 276 V	253 V
	Observation time	--	10 s - 600 s	60 s
	Active power increase gradient	--	6% - 3000 % P _n /min	disabled
4.11.1 Ceasing active power	Activation option	--	Can be achieved by pin 485-1A and pin 485-1B via Modbus communication protocol, decision should be made by the DSO and responsible party	
4.11.2 Reduction of active power on set point	Activation option	--	Can be achieved by pin 485-1A and pin 485-1B via Modbus communication protocol, decision should be made by the DSO and responsible party	
4.12 Remote information exchange	Available communication standards	--	Standardized communication protocol not provided by manufacturer	