ATTESTATION ◆ ATTESTATO ◆ ATESTACIÓN ◆ BESCHEINIGUNG ◆ ATTESTATION

Product Service

Compliance Document

No. D 075386 0287 Rev. 01

Holder of Attestation: **Shenzhen Kstar New Energy Company Limited**
The 9th Floor, R&D Building
Kstar Industrial Park, Guangming Hi-tech Industrial Zone
518107 Shenzhen, Guangdong Province
PEOPLE'S REPUBLIC OF CHINA

Product: **Converter (Energy Storage Inverter & Hybrid Inverter)**

Model(s):

Hybrid Inverter:
KAC50DP2, KAC49.9DP2, KAC40DP2, KAC30DP2, KAC29.9DP2, KAC25DP2, KAC20DP2, KAC50DP2-S0, KAC49.9DP2-S0, KAC40DP2-S0, KAC30DP2-S0, KAC29.9DP2-S0, KAC25DP2-S0, KAC20DP2-S0

Energy Storage Inverter:
KAC50D2, KAC49.9D2, KAC40D2, KAC30D2, KAC29.9D2, KAC25D2, KAC20D2, KAC50D2-S0, KAC49.9D2-S0, KAC40D2-S0, KAC30D2-S0, KAC29.9D2-S0, KAC25D2-S0, KAC20D2-S0

Parameters: See page 2-9

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.: 64290253044102

Date, 2025-12-04

(Billy Qiu)

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Product Service

Compliance Document

No. D 075386 0287 Rev. 01

Parameters:

Model	KAC50DP2	KAC49.9DP2	KAC40DP2	KAC30DP2
PV terminal parameters				
Maximum input voltage [V_{DC}]	1000	1000	1000	1000
Rated input voltage [V_{DC}]	720	720	720	720
MPPT voltage range [V_{DC}]	620-800	620-800	500-800	400-800
MPPT tracker number	4	4	4	4
Maximum operating PV input current [A_{DC}]	45/45/45/45	45/45/45/45	45/45/45/45	45/45/45/45
Maximum PV short circuit current [A_{DC}]	60/60/60/60	60/60/60/60	60/60/60/60	60/60/60/60
Battery input/output parameters				
Battery type	Lithium-ion	Lithium-ion	Lithium-ion	Lithium-ion
Maximum voltage [V_{DC}]	900	900	900	900
Battery rated voltage [V_{DC}]	720	720	720	720
Battery voltage range [V_{DC}]	330-900	330-900	280-900	250-900
Maximum charge power [W]	50000	49900	40000	30000
Maximum discharge power [W]	50000	49900	40000	30000
Maximum charge current [A_{DC}]	80/80	80/80	72/72	65/65
Maximum discharge current [A_{DC}]	80/80	80/80	72/72	65/65
Grid terminal input parameters				
Rated input voltage [V_{AC}]	3P+N+PE, 230/400	3P+N+PE, 230/400	3P+N+PE, 230/400	3P+N+PE, 230/400
Rated input frequency [Hz]	50	50	50	50
Maximum continuous input current from grid to battery [A_{AC}]	80	72	64	48
Maximum continuous input current [A_{AC}]	160	144	128	96
Maximum continuous input power from grid to battery [W]	50000	49900	40000	30000
Maximum continuous input active power [W]	100000	99800	80000	60000
Maximum continuous input apparent power [VA]	110000	99800	88000	66000
Grid terminal output parameters				
Rated output voltage [V_{AC}]	3P+N+PE, 230/400	3P+N+PE, 230/400	3P+N+PE, 230/400	3P+N+PE, 230/400
Rated output frequency [Hz]	50	50	50	50
Rated output current [A_{AC}]	72	72	58	43
Maximum continuous output current [A_{AC}]	80	72	64	48
Rated output active power [W]	50000	49900	40000	30000
Maximum output active power [W]	50000	49900	40000	30000
Maximum continuous output apparent power [VA]	55000	49900	44000	33000
Power factor	0.9 inductive(under-excited) to 0.9 capacitive(over-excited)			

Product Service

Compliance Document

No. D 075386 0287 Rev. 01

Model	KAC29.9DP2	KAC25DP2	KAC20DP2
PV terminal parameters			
Maximum input voltage [V_{DC}]	1000	1000	1000
Rated input voltage [V_{DC}]	720	720	720
MPPT voltage range [V_{DC}]	400-800	350-800	300-800
MPPT tracker number	4	4	4
Maximum operating PV input current [A_{DC}]	45/45/45/45	45/45/45/45	45/45/45/45
Maximum PV short circuit current [A_{DC}]	60/60/60/60	60/60/60/60	60/60/60/60
Battery input/output parameters			
Battery type	Lithium-ion	Lithium-ion	Lithium-ion
Maximum voltage [V_{DC}]	900	900	900
Battery rated voltage [V_{DC}]	720	720	720
Battery voltage range [V_{DC}]	250-900	210-900	200-900
Maximum charge power [W]	29900	25000	20000
Maximum discharge power [W]	29900	25000	20000
Maximum charge current [A_{DC}]	65/65	60/60	55/55
Maximum discharge current [A_{DC}]	65/65	60/60	55/55
Grid terminal input parameters			
Rated input voltage [V_{AC}]	3P+N+PE, 230/400	3P+N+PE, 230/400	3P+N+PE, 230/400
Rated input frequency [Hz]	50	50	50
Maximum continuous input current from grid to battery [A_{AC}]	43	40	32
Maximum continuous input current [A_{AC}]	87	80	64
Maximum continuous input power from grid to battery [W]	29900	25000	20000
Maximum continuous input active power [W]	59800	50000	40000
Maximum continuous input apparent power [VA]	59800	55000	44000
Grid terminal output parameters			
Rated output voltage [V_{AC}]	3P+N+PE, 230/400	3P+N+PE, 230/400	3P+N+PE, 230/400
Rated output frequency [Hz]	50	50	50
Rated output current [A_{AC}]	43	36	29
Maximum continuous output current [A_{AC}]	43	40	32
Rated output active power [W]	29900	25000	20000
Maximum output active power [W]	29900	25000	20000
Maximum continuous output apparent power [VA]	29900	27500	22000
Power factor	0.9 inductive(under-excited) to 0.9 capacitive(over-excited)		

Product Service

Compliance Document

No. D 075386 0287 Rev. 01

Model	KAC50DP2-S0	KAC49.9DP2-S0	KAC40DP2-S0	KAC30DP2-S0
PV terminal parameters				
Maximum input voltage [V_{DC}]	1000	1000	1000	1000
Rated input voltage [V_{DC}]	720	720	720	720
MPPT voltage range [V_{DC}]	620-800	620-800	500-800	400-800
MPPT tracker number	4	4	4	4
Maximum operating PV input current [A_{DC}]	45/45/45/45	45/45/45/45	45/45/45/45	45/45/45/45
Maximum PV short circuit current [A_{DC}]	60/60/60/60	60/60/60/60	60/60/60/60	60/60/60/60
Battery input/output parameters				
Battery type	Lithium-ion	Lithium-ion	Lithium-ion	Lithium-ion
Maximum voltage [V_{DC}]	900	900	900	900
Battery rated voltage [V_{DC}]	720	720	720	720
Battery voltage range [V_{DC}]	330-900	330-900	280-900	250-900
Maximum charge power [W]	50000	49900	40000	30000
Maximum discharge power [W]	50000	49900	40000	30000
Maximum charge current [A_{DC}]	80/80	80/80	72/72	65/65
Maximum discharge current [A_{DC}]	80/80	80/80	72/72	65/65
Grid terminal input parameters				
Rated input voltage [V_{AC}]	3P+N+PE, 230/400	3P+N+PE, 230/400	3P+N+PE, 230/400	3P+N+PE, 230/400
Rated input frequency [Hz]	50	50	50	50
Maximum continuous input current from grid to battery [A_{AC}]	80	72	64	48
Maximum continuous input current [A_{AC}]	80	72	64	48
Maximum continuous input power from grid to battery [W]	50000	49900	40000	30000
Maximum continuous input active power [W]	50000	49900	40000	30000
Maximum continuous input apparent power [VA]	55000	49900	44000	33000
Grid terminal output parameters				
Rated output voltage [V_{AC}]	3P+N+PE, 230/400	3P+N+PE, 230/400	3P+N+PE, 230/400	3P+N+PE, 230/400
Rated output frequency [Hz]	50	50	50	50
Rated output current [A_{AC}]	72	72	58	43
Maximum continuous output current [A_{AC}]	80	72	64	48
Rated output active power [W]	50000	49900	40000	30000
Maximum output active power [W]	50000	49900	40000	30000
Maximum continuous output apparent power [VA]	55000	49900	44000	33000
Power factor	0.9 inductive(under-excited) to 0.9 capacitive(over-excited)			

Product Service

Compliance Document

No. D 075386 0287 Rev. 01

Model	KAC29.9DP2-S0	KAC25DP2-S0	KAC20DP2-S0
PV terminal parameters			
Maximum input voltage [V_{DC}]	1000	1000	1000
Rated input voltage [V_{DC}]	720	720	720
MPPT voltage range [V_{DC}]	400-800	350-800	300-800
MPPT tracker number	4	4	4
Maximum operating PV input current [A_{DC}]	45/45/45/45	45/45/45/45	45/45/45/45
Maximum PV short circuit current [A_{DC}]	60/60/60/60	60/60/60/60	60/60/60/60
Battery input/output parameters			
Battery type	Lithium-ion	Lithium-ion	Lithium-ion
Maximum voltage [V_{DC}]	900	900	900
Battery rated voltage [V_{DC}]	720	720	720
Battery voltage range [V_{DC}]	250-900	210-900	200-900
Maximum charge power [W]	29900	25000	20000
Maximum discharge power [W]	29900	25000	20000
Maximum charge current [A_{DC}]	65/65	60/60	55/55
Maximum discharge current [A_{DC}]	65/65	60/60	55/55
Grid terminal input parameters			
Rated input voltage [V_{AC}]	3P+N+PE, 230/400	3P+N+PE, 230/400	3P+N+PE, 230/400
Rated input frequency [Hz]	50	50	50
Maximum continuous input current from grid to battery [A_{AC}]	43	40	32
Maximum continuous input current [A_{AC}]	43	40	32
Maximum continuous input power from grid to battery [W]	29900	25000	20000
Maximum continuous input active power [W]	29900	25000	20000
Maximum continuous input apparent power [VA]	29900	27500	22000
Grid terminal output parameters			
Rated output voltage [V_{AC}]	3P+N+PE, 230/400	3P+N+PE, 230/400	3P+N+PE, 230/400
Rated output frequency [Hz]	50	50	50
Rated output current [A_{AC}]	43	36	29
Maximum continuous output current [A_{AC}]	43	40	32
Rated output active power [W]	29900	25000	20000
Maximum output active power [W]	29900	25000	20000
Maximum continuous output apparent power [VA]	29900	27500	22000
Power factor	0.9 inductive(under-excited) to 0.9 capacitive(over-excited)		

Product Service

Compliance Document

No. D 075386 0287 Rev. 01

Model	KAC50D2	KAC49.9D2	KAC40D2	KAC30D2
Battery input/output parameters				
Battery type	Lithium-ion	Lithium-ion	Lithium-ion	Lithium-ion
Maximum voltage [V_{DC}]	900	900	900	900
Battery rated voltage [V_{DC}]	720	720	720	720
Battery voltage range [V_{DC}]	330-900	330-900	280-900	250-900
Maximum charge power [W]	50000	49900	40000	30000
Maximum discharge power [W]	50000	49900	40000	30000
Maximum charge current [A_{DC}]	80/80	80/80	72/72	65/65
Maximum discharge current [A_{DC}]	80/80	80/80	72/72	65/65
Grid terminal input parameters				
Rated input voltage [V_{AC}]	3P+N+PE, 230/400	3P+N+PE, 230/400	3P+N+PE, 230/400	3P+N+PE, 230/400
Rated input frequency [Hz]	50	50	50	50
Maximum continuous input current from grid to battery [A_{AC}]	80	72	64	48
Maximum continuous input current [A_{AC}]	160	144	128	96
Maximum continuous input power from grid to battery [W]	50000	49900	40000	30000
Maximum continuous input active power [W]	100000	99800	80000	60000
Maximum continuous input apparent power [VA]	110000	99800	88000	66000
Grid terminal output parameters				
Rated output voltage [V_{AC}]	3P+N+PE, 230/400	3P+N+PE, 230/400	3P+N+PE, 230/400	3P+N+PE, 230/400
Rated output frequency [Hz]	50	50	50	50
Rated output current [A_{AC}]	72	72	58	43
Maximum continuous output current [A_{AC}]	80	72	64	48
Rated output active power [W]	50000	49900	40000	30000
Maximum output active power [W]	50000	49900	40000	30000
Maximum continuous output apparent power [VA]	55000	49900	44000	33000
Power factor	0.9 inductive(under-excited) to 0.9 capacitive(over-excited)			

Product Service

Compliance Document

No. D 075386 0287 Rev. 01

Model	KAC29.9D2	KAC25D2	KAC20D2
Battery input/output parameters			
Battery type	Lithium-ion	Lithium-ion	Lithium-ion
Maximum voltage [V_{DC}]	900	900	900
Battery rated voltage [V_{DC}]	720	720	720
Battery voltage range [V_{DC}]	250-900	210-900	200-900
Maximum charge power [W]	29900	25000	20000
Maximum discharge power [W]	29900	25000	20000
Maximum charge current [A_{DC}]	65/65	60/60	55/55
Maximum discharge current [A_{DC}]	65/65	60/60	55/55
Grid terminal input parameters			
Rated input voltage [V_{AC}]	3P+N+PE, 230/400	3P+N+PE, 230/400	3P+N+PE, 230/400
Rated input frequency [Hz]	50	50	50
Maximum continuous input current from grid to battery [A_{AC}]	43	40	32
Maximum continuous input current [A_{AC}]	87	80	64
Maximum continuous input power from grid to battery [W]	29900	25000	20000
Maximum continuous input active power [W]	59800	50000	40000
Maximum continuous input apparent power [VA]	59800	55000	44000
Grid terminal output parameters			
Rated output voltage [V_{AC}]	3P+N+PE, 230/400	3P+N+PE, 230/400	3P+N+PE, 230/400
Rated output frequency [Hz]	50	50	50
Rated output current [A_{AC}]	43	36	29
Maximum continuous output current [A_{AC}]	43	40	32
Rated output active power [W]	29900	25000	20000
Maximum output active power [W]	29900	25000	20000
Maximum continuous output apparent power [VA]	29900	27500	22000
Power factor	0.9 inductive(under-excited) to 0.9 capacitive(over-excited)		

Product Service

Compliance Document

No. D 075386 0287 Rev. 01

Model	KAC50D2-S0	KAC49.9D2-S0	KAC40D2-S0	KAC30D2-S0
Battery input/output parameters				
Battery type	Lithium-ion	Lithium-ion	Lithium-ion	Lithium-ion
Maximum voltage [V_{DC}]	900	900	900	900
Battery rated voltage [V_{DC}]	720	720	720	720
Battery voltage range [V_{DC}]	330-900	330-900	280-900	250-900
Maximum charge power [W]	50000	49900	40000	30000
Maximum discharge power [W]	50000	49900	40000	30000
Maximum charge current [A_{DC}]	80/80	80/80	72/72	65/65
Maximum discharge current [A_{DC}]	80/80	80/80	72/72	65/65
Grid terminal input parameters				
Rated input voltage [V_{AC}]	3P+N+PE, 230/400	3P+N+PE, 230/400	3P+N+PE, 230/400	3P+N+PE, 230/400
Rated input frequency [Hz]	50	50	50	50
Maximum continuous input current from grid to battery [A_{AC}]	80	72	64	48
Maximum continuous input current [A_{AC}]	80	72	64	48
Maximum continuous input power from grid to battery [W]	50000	49900	40000	30000
Maximum continuous input active power [W]	50000	49900	40000	30000
Maximum continuous input apparent power [VA]	55000	49900	44000	33000
Grid terminal output parameters				
Rated output voltage [V_{AC}]	3P+N+PE, 230/400	3P+N+PE, 230/400	3P+N+PE, 230/400	3P+N+PE, 230/400
Rated output frequency [Hz]	50	50	50	50
Rated output current [A_{AC}]	72	72	58	43
Maximum continuous output current [A_{AC}]	80	72	64	48
Rated output active power [W]	50000	49900	40000	30000
Maximum output active power [W]	50000	49900	40000	30000
Maximum continuous output apparent power [VA]	55000	49900	44000	33000
Power factor	0.9 inductive(under-excited) to 0.9 capacitive(over-excited)			

Product Service

Compliance Document

No. D 075386 0287 Rev. 01

Model	KAC29.9D2-S0	KAC25D2-S0	KAC20D2-S0
Battery input/output parameters			
Battery type	Lithium-ion	Lithium-ion	Lithium-ion
Maximum voltage [V_{DC}]	900	900	900
Battery rated voltage [V_{DC}]	720	720	720
Battery voltage range [V_{DC}]	250-900	210-900	200-900
Maximum charge power [W]	29900	25000	20000
Maximum discharge power [W]	29900	25000	20000
Maximum charge current [A_{DC}]	65/65	60/60	55/55
Maximum discharge current [A_{DC}]	65/65	60/60	55/55
Grid terminal input parameters			
Rated input voltage [V_{AC}]	3P+N+PE, 230/400	3P+N+PE, 230/400	3P+N+PE, 230/400
Rated input frequency [Hz]	50	50	50
Maximum continuous input current from grid to battery [A_{AC}]	43	40	32
Maximum continuous input current [A_{AC}]	43	40	32
Maximum continuous input power from grid to battery [W]	29900	25000	20000
Maximum continuous input active power [W]	29900	25000	20000
Maximum continuous input apparent power [VA]	29900	27500	22000
Grid terminal output parameters			
Rated output voltage [V_{AC}]	3P+N+PE, 230/400	3P+N+PE, 230/400	3P+N+PE, 230/400
Rated output frequency [Hz]	50	50	50
Rated output current [A_{AC}]	43	36	29
Maximum continuous output current [A_{AC}]	43	40	32
Rated output active power [W]	29900	25000	20000
Maximum output active power [W]	29900	25000	20000
Maximum continuous output apparent power [VA]	29900	27500	22000
Power factor	0.9 inductive(under-excited) to 0.9 capacitive(over-excited)		

Product Service

Compliance Document

No. D 075386 0287 Rev. 01

Evaluated protection function and operational capabilities

Clause(s) / subclause(s) of EN 50549-1:2019+ A1:2023 and 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) only for EN 50549-2	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) or Q (P) Q (P) only for EN 50549-2	Pass

Product Service

Compliance Document

No. D 075386 0287 Rev. 01

4.7.3 Voltage related active power reduction	5.6 Voltage related active power reduction - P(U)	P(U)	Pass
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 LV/MV network according to EN 50549-1:2019+A1:2023/EN 50549-2:2019+A1:2023must be installed in final installation	N/A
4.9.4 Means to detect island situation	5.8.6 Islanding detection	External interface protection as dedicated device must be installed in final installation	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	--	N/A

Product Service

Compliance Document

No. D 075386 0287 Rev. 01

Evaluated parameter and parameter range

Specific technical requirement (e.g. grid codes)		**EN 50549-1:2019+A1:2023 and EN 50549-2:2019+A1:2023**			
Clause(s) / subclause(s) of EN 50549-1:2019+A1:2023 and 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	253 V	
	Lower limit	--	not configurable	195.5 V for EN50549-1 207.0 V for EN50549-2	
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 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.]
				--	0.05
		--		0.25	0.05
		--		3.0	0.85
	Voltage-Time-Diagram	--	See figure 6 most stringent curve of EN 50549-2:2019+A1:2023	Time[s]	U [p.u.]
		--		--	0.05
				0.25	0.05

Product Service

Compliance Document

No. D 075386 0287 Rev. 01

		--		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 50549-1:2019+A1:2023 and EN 50549-2:2019+A1:2023	Time[s]	U [p.u.]
		--		--	1.25
		--		0.1	1.25
		--		0.1	1.20
		--		5.0	1.20
		--		5.0	1.15
		--		60	1.15
		--		60	1.10
4.5.5 Phase jump immunity	Phase jump immunity	--	not configurable	50°, 90°, 180°	
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 EESS P_M for Hybrid Inverter	
	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 (%P_n range overexcited	--	0.9 - 1 / 24 kVar - 0 kVar	1 / 0 kVar	
	Active factor / Reactive power (%P_n) range underexcited	--	-0.9 - 1 / -24 kVar - 0 kVar	1 / 0 kVar	

Product Service

Compliance Document

No. D 075386 0287 Rev. 01

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) only for EN 50549-2	Q setp(Q setpoint)
4.7.2.3.2 Voltage support by reactive power - Setpoint control modes	Q setpoint and excitation	--	-24 kVar - 24 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
	Point a	--	195.5 V - 230 V	213.9 V
	Point b	--	195.5 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	--	-48 – 48 %P_n	48 %P_n
	Reactive power of Point b	--	-48 – 48 %P_n	0 %P_n
	Reactive power of Point c	--	-48 – 48 %P_n	0 %P_n
	Reactive power of Point d	--	-48 – 48 %P_n	-48 %P_n
	Time constant	--	3 s - 60 s	3 s
	Min cos φ	--	0.0 - 1	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) (Q(P) mode only for EN 50549-2)	--	--	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	--	0.9un - 0.9 ov	0.9 ov
	Cos φ of Cos φ (P) Point b	--	0.9un - 0.9 ov	1

Product Service

Compliance Document

No. D 075386 0287 Rev. 01

	Cos φ of Cos φ (P) Point c	--	0.9un - 0.9 ov	1
	Cos φ of Cos φ (P) Point d	--	0.9un - 0.9 ov	0.9 un
	Q (P) Point a (P0)	--	0 – 100 %P_n	15 %P_n
	Q (P) Point b (P1)	--	0 – 100 %P_n	20 %P_n
	Q (P) Point c (P2)	--	0 – 100 %P_n	80 %P_n
	Q (P) Point d (P3)	--	0 – 100 %P_n	90 %P_n
	Reactive power of Q(P) Point a (Q0)	--	-48 – 48 %P_n	48 %P_n
	Reactive power of Q(P) Point b (Q1)	--	-48 – 48 %P_n	0 %P_n
	Reactive power of Q(P) Point c (Q2)	--	-48 – 48 %P_n	0 %P_n
	Reactive power of Q(P) Point d (Q3)	--	-48 – 48 %P_n	-48 %P_n
	Cos φ	--	0.9 un to 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 of EN 50549-1 or EN 50549-2	enable | disable	disabled
	Static voltage range overvoltage		230 V - 276 V	253 V
	Static voltage range undervoltage		184 V - 230 V	85 %Un for EN 50549-1 90 %Un for EN 50549-2
	Insensitivity range		0 % – 15 %	0 %
	Gradient k1 for LVRT (both positive and negative)		0 - 6	2
	Gradient k2 for HVRT(both positive and negative)		0 - 6	2

Product Service

Compliance Document

No. D 075386 0287 Rev. 01

4.7.4.2.1.2 Optional Modes Only for EN 50549-2:2019+A1:2023	Active power priority	--	enable | disable	This mode is not supported for EN 50549-2:2019+A1:2023
	Reactive current limitation [% rated current]	--	0 – 100 %	This mode is not supported for EN 50549-2:2019+A1:2023
	Zero current threshold	--	20 – 100 %U_n	This mode is not supported for EN 50549-2:2019+A1:2023
4.7.4.2.2 Zero current mode for converter connected generating technology	Enabling	For type A of EN 50549-1	enable | disable	disabled
	Static voltage range overvoltage		230 V - 276 V	276 V
	Static voltage range undervoltage		46 V - 230 V	115 V
	Enabling	For EN 50549-2	enable | disable	disabled
	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	External interface protection for generating plants to be connected to the LV/MV network according to EN 50549-1:2019+A1:2023/EN 50549-2:2019+A1:2023 must be installed in final installation.
	Undervoltage threshold stage 1	--	46 V - 230 V	
	Undervoltage operate time stage 1	--	0.1 s - 100 s	
	Undervoltage threshold stage 2	--	46 V - 230 V	
	Undervoltage operate time stage 2	--	0.1 s - 5 s	
	Overvoltage threshold stage 1	--	230 V - 276 V	
	Overvoltage operate time stage 1	--	0.1 s - 100 s	
	Overvoltage threshold stage 2	--	46 V – 230 V	
	Overvoltage operate time stage 2	--	0.1 s - 5 s	
	Overvoltage threshold 10 min mean protection	--	230 V – 264.5 V	
	Underfrequency threshold stage 1	--	47.0 Hz - 50.0 Hz	

Product Service

Compliance Document

No. D 075386 0287 Rev. 01

	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	
	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 – 100 %U_n	Only for EN 50549-2:2019+A1:2023
	Positive sequence under-voltage protection operate time	--	0.2 – 100 s	
	Negative sequence over-voltage protection threshold	--	1 – 100 %U_n	
	Negative sequence over-voltage protection threshold time	--	0.2 – 100 s	
	Zero sequence over-voltage protection threshold	--	0 – 100 %U_n	
	Zero sequence over-voltage protection threshold time	--	0.2 – 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	195.5 V for EN 50549-1 207.0 V for EN 50549-2
	Upper voltage	--	230 V - 276 V	253 V
	Observation time	--	10 s - 600 s	60 s
	Active power increase gradient	--	6% - 3000%/min	10 %P_n/min

Product Service

Compliance Document

No. D 075386 0287 Rev. 01

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 for EN 50549-1 207.0 V for EN 50549-2
	Upper voltage	--	230 V - 276 V	253 V
	Observation time	--	10 s - 600 s	60 s
	Active power increase gradient	--	6% - 3000 %/min	disabled
4.11.1 Ceasing active power	Activation option	--	Can be achieved by RS485 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 RS485 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	