

**Appendix 1 to certificate: AK60184286 0001 and AK60184287 0001**

Clause(s) / subclause(s) of this EN 50549-1/-2	Parameter	configurable value range	Default value	
4.3.2 Interface switch	Single fault tolerance for interface switch	not configurable	yes	
4.4.2 Operating frequency range	47.0 – 47.5 Hz Duration	not configurable (limitation via protection settings)	unlimited	
	47.5 – 48.5 Hz Duration	not configurable (limitation via protection settings)	unlimited	
	48.5 – 49.0 Hz Duration	not configurable (limitation via protection settings)	unlimited	
	49.0 – 51.0 Hz Duration	not configurable	unlimited	
	51.0 – 51.5 Hz Duration	not configurable (limitation via protection settings)	unlimited	
	51.5 – 52 Hz Duration	not configurable (limitation via protection settings)	unlimited	
4.4.3 Minimal requirement for active power delivery at underfrequency	Reduction threshold	not configurable	no reduction	
	Maximum reduction rate	not configurable	0 % P <sub>M</sub> /Hz	
4.4.4 Continuous operating voltage range	Upper limit	not configurable	115% U <sub>n</sub>	
	Lower limit	not configurable	80% U <sub>n</sub>	
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:	not configurable	8 Hz/s	
4.5.3.2 Generating plant with nonsynchronous generating technology	Maximum power resumption time	not defined	< 1 s	
	Voltage-Time-Diagram	not configurable (limitation via protection settings)	Time [s]	U [p.u.]
			0.000	0.0
			0.260	0.0
			0.760	0.2
			1.760	0.5
			2.400	0.75
60.000	0.9			
4.5.4 Over-voltage ride through (OVRT)	Voltage-Time-Diagram	not configurable (limitation via protection settings)	Time [s]	U [p.u.]
			0.000	1.25
			0.100	1.25
			0.100	1.25
			5.000	1.20
			60.000	1.15
60.000	1.10			
4.6.1 Power response to overfrequency	Threshold frequency f <sub>1</sub>	50.2 Hz – 52 Hz	50.2 Hz	
	Droop	2 % – 12 %	5 %	
	Power reference	P <sub>M</sub>   P <sub>max</sub>	P <sub>M</sub>	
	Intentional delay	0 – 2 s	0s	
	Deactivation threshold f	50.0 Hz – f <sub>1</sub>	deactivated	
	Deactivation time t <sub>stop</sub>	0 – 600 s	-	
	Acceptance of staged disconnection	yes   no	deactivated (possible via protection setting)	
4.6.2 Power response to underfrequency	Threshold frequency f <sub>1</sub>	49.8 Hz – 46 Hz	49.8 Hz	
	Droop	2 – 12 %	5 %	
	Power reference	P <sub>M</sub>   P <sub>max</sub>	P <sub>max</sub>	
	Intentional delay	0 – 2 s	0 s	
4.7.2.2 Capabilities	Active factor range overexcited	0 – 1	0 – 1	
	Active factor range underexcited	0 – 1	0 – 1	
4.7.2.3 Control modes	Enabled control mode	Q setp. Q(U) cos φ setp.	Q setpoint	

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Clause(s) / subclause(s) of this EN 50549-1/-2	Parameter	configurable value range	Default value
		cos $\varphi$ (P) Q(P)	
4.7.2.3.2 Setpoint control modes	Q setpoint and excitation	0 – 100 % P <sub>D</sub>	0
	cos $\varphi$ setpoint and excitation	1 – 0	1
4.7.2.3.3 Voltage related control modes	Characteristic curve	4 points	-
	Time constant	0.01 s – 60 s	10 s
	Min cos $\varphi$	0.0 – 1	0
	Lock in power	0 % – 100 %	deactivated
	Lock out power	0 % – 100 %	deactivated
4.7.2.3.4 Power related control mode	Characteristic curve	4 points	-
only EN 50549-2:2019, 4.7.4.2.1 Voltage support during faults and voltage steps – General	Enabling	enable   disable	disabled
	Static voltage range overvoltage	100 % U <sub>c</sub> – 120 % U <sub>c</sub>	110 % U <sub>c</sub>
	Static voltage range undervoltage	80 % U <sub>c</sub> – 100 % U <sub>c</sub>	90 % U <sub>c</sub>
/ Generating Plant with non-synchronous generator	Insensitivity range of $\Delta U_{50per}$	0 % – 15 %	5 %
	Gradient k1	0 – 10	2
	Gradient k2	0 – 10	2
only EN 50549-2:2019, 4.7.4.2.1.2 Optional Modes / Generating Plant with non-synchronous generator	Active power priority	enable   disable	disable
	Reactive current limitation [% rated current]	0 % – 100 %	disable
	Zero current threshold	20 % U <sub>c</sub> – 100 % U <sub>c</sub>	disable
4.7.4.2.2 Zero current mode for converter connected generating technology	Enabling	enable   disable	disabled
	Static voltage range overvoltage	100 % U <sub>n</sub> – 130 % U <sub>n</sub>	120 % U <sub>n</sub>
	Static voltage range undervoltage	0 % U <sub>n</sub> – 100 % U <sub>n</sub>	50 % U <sub>n</sub>
	Undervoltage threshold stage 1	0.15 U <sub>n</sub> – 1 U <sub>n</sub>	0.8 U <sub>n</sub>
	Undervoltage operate time stage 1	0.1 s – 300 s	3 s
	Undervoltage threshold stage 2	0.15 U <sub>n</sub> – 1 U <sub>n</sub>	0.45 U <sub>n</sub>
	Undervoltage operate time stage 2	0.1 s – 300 s	0.3 s
	Overvoltage threshold stage 1	1.0 U <sub>n</sub> – 1.25 U <sub>n</sub>	1.15 U <sub>n</sub>
	Overvoltage operate time stage 1	0.1 s – 300 s	1 s
	Overvoltage threshold stage 2	1.0 U <sub>n</sub> – 1.25 U <sub>n</sub>	1.22 U <sub>n</sub>
	Overvoltage operate time stage 2	0.1 s – 300 s	0.1 s
	Overvoltage threshold 10 min mean protection	1.0 U <sub>n</sub> – 1.25 U <sub>n</sub>	1.1 U <sub>n</sub>
	Underfrequency threshold stage 1	45.0 Hz – 50.0 Hz	47.5 Hz
	Underfrequency operate time stage 1	0.1 s – 300 s	0.1 s
	Underfrequency threshold stage 2	45.0 Hz – 50.0 Hz	47.5 Hz
	Underfrequency operate time stage 2	0.1 s – 300 s	0.1 s
	Overfrequency threshold stage 1	50.0 Hz – 58.0 Hz	51.5 Hz
	Overfrequency operate time stage 1	0.1 s – 300 s	0.1 s
Overfrequency threshold stage 2	50.0 Hz – 58.0 Hz	51.5 Hz	

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Clause(s) / subclause(s) of this EN 50549-1/-2	Parameter	configurable value range	Default value
	Overfrequency operate time stage 2	0.1 s – 300 s	0.1 s
	RoCoF protection	0.95 – 99 Hz/sec	deactivated
	Loss of mains (EN 62116)	yes   no	yes
only EN 50549-2:2019, 4.9.3 Requirements on voltage and frequency protection	Positive sequence under-voltage protection threshold	not integrated	
	Positive sequence under-voltage protection operate time	not integrated	
	Negative sequence over-voltage protection threshold	not integrated	
	Negative sequence over-voltage protection operate time	not integrated	
	Zero sequence over- voltage protection threshold	not integrated	
	Zero sequence over- voltage protection operate time	not integrated	
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	50 % $U_n$ – 100 % $U_n$	85 % $U_n$
	Upper voltage	100 % $U_n$ – 120 % $U_n$	110 % $U_n$
	Observation time	10 s – 600 s	60 s
	Active power increase gradient	6 % – 3000 %/min	10 % /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	50 % – 100 % $U_n$	85 % $U_n$
	Upper voltage	100 % – 120 % $U_n$	110 % $U_n$
	Observation time	10 s – 600 s	60 s
	Active power increase gradient	6 % – 3000 %/min	disabled
4.11.1 Ceasing active power	Remote operation of the logic interface	yes   no	yes digital input, Fronius Solar API (JSON), sunspec
4.11.2 Reduction of active power on set point	Remote operation	yes   no	yes digital input, Fronius Solar API (JSON), sunspec
4.12 Remote information exchange	Remote information exchange required	yes   no	yes Fronius Solar API (JSON), sunspec

**Certification Body**

  
**Marco Piva**
**Date: 25.09.2025**