TEST REPORT
CEI 0-21:2022 + CEI 0-21:2022/V1:2022 + CEI 0-21:2022/V2:2024
TÜV SÜD Test Report for Reference technical rules for the connection of active and passive users to the LV electrical Utilities

Report No ....:	64.290.24.30714.01
Date of issue..:	2024-07-23
Project handler ....:	Giesen Wan
Name of Testing Laboratory preparing the Report ....:	TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
Address...:	5F&8F East, Communication Building, No.163 Pingyun Road, Huangpu Ave. West, Guangzhou 510656, China
Client..:	Anker Innovations Limited
Client number ....:	127148
Address...:	Unit 56, 8th Floor, Tower 2, Admiralty Centre, 18 Harcourt Road, Central and Western District, HONG KONG
Standard ....:	This TÜV SÜD test report form is based on the following requirements: CEI 0-21:2022 + CEI 0-21:2022/V1:2022 + CEI 0-21:2022/V2:2024
TRF number and revision ....:	TRF CEI 0-21:2022 Rev.02/2024-01
TRF originated by ....:	TÜV SÜD Product Service, Mr. Billy Qiu
Copyright blank test report ....:	This test report is based on the content of the standard (see above). The test report considered selected clauses of the a.m. standard(s) and experience gained with product testing. It was prepared by TÜV SÜD Product Service. TÜV SÜD Group takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.
General disclaimer..:	This test report may only be quoted in full. Any use for advertising purposes must be granted in writing. This report is the result of a single examination of the object in question and is not generally applicable evaluation of the quality of other products in regular production.
Scheme..	☐ TUV Mark ☒ Type verification of conformity ☐ AoC/CoC for EU-Directive / EU-Regulation: ☐ GS Mark ☐ NRTL Mark ☐ other:
Non-standard test method ....:	☒ No ☐ Yes, see details under Summary of testing
National deviations ....:	N/A
Number of pages (*Report*) ....:	305
Number of pages (*Attachments*) ....:	N/A
Tested by (name, function, signature) ....:	Giesen Wan (Project Handler) Giesen Wan
Approved by (name, function, signature) ....:	Jinjing Peng (Designated Reviewer) Peng Jinjing

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Test sample ....: Trademark ....: Model and/ or type reference...........................:	Hybrid Inverter with storage battery system ANKER SOLIX Inverter models: X1-H3.68K-S, X1-H4.6K-S, X1-H5K-S, X1-H6K-S Battery system models:X1-B5-H, X1-B10-HC, X1-B15-HC, X1-B20-HC, X1-B25-HC, X1-B30-HC
Rating(s) ....:	See page 5 to 8
Manufacturer..: Manufacturer number ....: Address..:	Anker Innovations Limited 127148 Unit 56, 8th Floor, Tower 2, Admiralty Centre, 18 Harcourt Road, Central and Western District, HONG KONG
Sub-contractors / tests (clause) ....: Name ....:	N/A N/A
Order description… ....:	☒ Complete test according to TRF
	☐ Partial test according to manufacturer's specifications
	☐ Preliminary test
	☐ Spot check
	☐ Others:
Date of order...: Date of receipt of test item...............................: Date(s) of performance of test.........................:	2024-02-27 2024-03-15 2024-03-20 to 2024-07-01
Test item particulars: All the tests results confirmed to the requirements of the standard.	
General remarks: "(see remark #)" refers to a remark appended to the report. "(see appended table)" refers to a table appended to the report. Throughout this report **a point** is used as the decimal separator. The test results presented in this report relate only to the object tested. This report shall not be reproduced except in full without the written approval of the testing laboratory.	
Revision History: N/A	

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Test item particulars:	
Equipment mobility...:	☐ movable ☐ hand-held ☒ stationary ☒ fixed ☐ transportable ☐ for building-in
Connection to the mains ....:	☐ pluggable equipment ☐ direct plug-in ☒ permanent connection ☐ for building-in
Enviromental category ....:	☒ outdoor ☐ indoor unconditional ☐ indoor conditional
Over voltage category Mains...........................:	☐ OVC I ☐ OVC II ☒ OVC III ☐ OVC IV
Over voltage category PV.................................:	☐ OVC I ☒ OVC II ☐ OVC III ☐ OVC IV
Mains supply tolerance (%) ....:	+/- 10%
Tested for power systems ....:	TN system
IT testing, phase-phase voltage (V) .... :	N/A
Class of equipment .... :	☒ Class I ☐ Class II ☐ Class III ☐ Not classified
Mass of equipment (kg) .... :	19
Pollution degree... :	PD 3(External), PD 2(Internal)
IP protection class .... :	IP 66
Additional information on non-standard test method(s)	
Sub clause .... :	N/A
Page .... :	N/A
Rational.. :	N/A
Possible test case verdicts:	
Test case does not apply to the test object .... :	N/A (Not applicable / Not included in the order)
Test object does meet the requirement.......... :	P (Pass)
Test object was not evaluated for the requirement.. :	N/E (Not evaluated)
Test object does not meet the requirement.... :	F (Fail)

Name and address of factory(ies)

Factory: Dongguan Luxshare Smart-Link Electronic Technology Co., Ltd

Address: Building 3, No. 313, Qingxi North Ring Road, Qingxi Town, 523642 Dongguan City, Guangdong Province, PEOPLE'S REPUBLIC OF CHINA

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Purpose of the product (description of intended use):

(1). The product is non-isolated (transformerless) Hybrid Inverter which works with battery to storage energy or converts PV/battery energy to the grid, it is a bidirectional inverter.
(2). If certain functions are not permitted by local regulation, the function shall be disabled by hardware or software setting (if applicable) by the manufacturer before putting into the market. For example, it's not permissible to draw electricity from the grid and then feed it back in order to claim statutory reimbursement in some nations.
(3). Low voltage electrical installations shall comply with national and local regulation. Only qualified electricians are allowed to install and maintain the converter.
(4). In order to protect the inverter, user and installer, external DC and AC circuit breaker shall be equipped for all source port (battery, AC grid) at the end-use application.
(5). Inverter software version: V1.0
Inverter firmware version: V1.0.0.33, (ARM: V1.0.0.33, DSP: V1.0.0.26)
BMS firmware version: V0.0.1.43
(6). The temperature and humidity ranges of the products are as follows:
Operation temperature range: -25°C to +60°C;
Storage temperature range: -30°C to +70°C;
Relative humidity range: 0% to 95 %;
(7). Back-up port connection and the working mode are not considered in this report. The use of stand-alone mode and electrical installations for unit shall comply with national and local regulation.
(8). For the battery system module, X1-B5-H is the base model of the battery system model, and subsequent models are stacked in X1-B5-H to get other models, with the maximum number of stacks being 6 pieces.

Model difference:

All the models have same electric circuits topology design, same enclosure structure design, same main control circuits and firmware. The output power and current are limited by software.

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Characteristic data (not shown on the marking plate):

Model	X1-H3.68K-S	X1-H4.6K-S	X1-H5K-S	X1-H6K-S
PV terminal parameters				
Maximum PV voltage [V_{DC}]	600			
Rated voltage [V_{DC}]	360			
MPPT voltage range [V_{DC}]	80-550			
MPPT voltage range (full load) [V_{DC}]	200-530			
Maximum input current [A_{DC}]	16/16			
Isc PV [A_{DC}]	20/20			
MPPT tracker number	2			
Maximum input power [W]	7360	9200	10000	12000
Battery input/output parameters				
Battery type	LFP			
Maximum voltage [V_{DC}]	550			
Battery rated voltage [V_{DC}]	400			
Battery voltage range [V_{DC}]	Charge: 390-550 / Discharge: 370-500			
Maximum charge power [W]	3680	4600	5000	6000
Maximum discharge power [W]	3680	4600	5000	6000
Maximum charge current [A_{DC}]	9.4	11.7	12.8	15.3
Maximum discharge current [A_{DC}]	9.9	12.4	15.1	16.2
Maximum charge power from grid to battery [W]	3680	4600	5000	6000
Grid terminal input parameters				
Rated input voltage [V_{AC}]	1P+N+PE, 230			
Rated input frequency [Hz]	50			
Maximum continuous input current from grid to battery [A_{AC}]	16.7	20.9	22.7	27.2
Maximum continuous input current [A_{AC}]	31.3	40.0	40.0	40.0
Maximum continuous input power from grid to battery [W]	3680	4600	5000	6000
Maximum continuous input active power [W]	3680	4600	5000	6000
Maximum continuous input apparent power [VA]	7200	10000	10000	10000
Power factor range	0.8 inductive to 0.8 capacitive			
Grid terminal output parameters				
Rated output voltage [V_{AC}]	1P+N+PE, 230			
Rated output frequency [Hz]	50			
Rated output current [A_{AC}]	16.0	20.0	21.7	26.0
Maximum continuous output current [A_{AC}]	18.1	22.7	25.0	30.0
Rated output active power [W]	3680	4600	5000	6000
Maximum output active power [W]	3680	4600	5000	6000

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Maximum output apparent power [VA]	4000	5000	5500	6600
Power factor range	0.8 inductive to 0.8 capacitive			
Operation temperature range	-25°C to +60°C			
Storage temperature range	-30°C to +70°C			

Remark: Maximum continuous output current is achieved based on low voltage (220V_{AC})

Battery pack model:	X1-B5-H
Input/Output parameters	
Battery type	Li-ion
Maximum voltage [V_{DC}]	550
Rated voltage [V_{DC}]	400
Battery voltage range [V_{DC}]	350-550
Maximum charge/discharge current [A_{DC}]	7.6
Rate capacity of battery [kWh]	5.0
Usable capacity of battery [kWh]	5.0

Battery system model:	X1-B5-H	X1-B10-HC	X1-B15-HC	X1-B20-HC	X1-B25-HC	X1-B30-HC
Number of battery pack	1	2	3	4	5	6
Maximum voltage [V_{DC}]	550					
Rated voltage [V_{DC}]	400					
Battery voltage range [V_{DC}]	350-550					
Maximum charge/discharge current [A_{DC}]	7.6	15.2	22.8	30.4	38.0	45.6
Rate capacity of battery [kWh]	5	10	15	20	25	30
Usable capacity of battery [kWh]	5	10	15	20	25	30

Specificatition for CEI 0-21 is listed as in below:

DISPOSITIVO DI INTERFACCIA Interface Device	PROTEZIONE DI INTERFACCIA Interface Protection Device	DISPOSITIVO DI CONVERSIONE STATICA Static Conversion Device	DISPOSITIVO DI GENERAZIONE TOTANTE Rotating Device

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☒	☐	☒	☐

Technical specifications of storage system				
Storage inverter system components				
Inverter				
Inverter manufacturer	Anker Innovations Limited			
Inverter model	X1-H3.68K-S	X1-H4.6K-S	X1-H5K-S	X1-H6K-S
Inverter type & number of phases	Bidirectional & Single-phase			
Nominal power P_{NINV}[W]	3680	4600	t1+30ms	6000
Maximum Apparent power [VA]	4000	5000	t1+60ms	6600

Battery						
Battery manufacturer	Anker Innovations Limited					
Battery system model	X1-B5-H	X1-B10-HC	X1-B15-HC	X1-B20-HC	X1-B25-HC	X1-B30-HC
Battery type	LFP					
Rated voltage [V_{DC}]	400					
Usable Capacity of battery [kWh]	5	10	15	20	25	30

Storage inverter system parameter						
Inverter model	X1-H3.68K-S					
Battery model	X1-B5-H	X1-B10-HC	X1-B15-HC	X1-B20-HC	X1-B25-HC	X1-B30-HC
Nominal discharge power P_{SN} [W]	3000	3680				
Nominal charge power P_{CN} [W]	-3000	-3680				
Maximum discharge power P_{SMAX} [W]	3000	3680				
Maximum charge power P_{CMAX} [W]	-3000	-3680				
Inverter model	X1-H4.6K-S					
Battery model	X1-B5-H	X1-B10-HC	X1-B15-HC	X1-B20-HC	X1-B25-HC	X1-B30-HC
Nominal discharge power P_{SN} [W]	3000	4600				
Nominal charge power P_{CN} [W]	-3000	-4600				
Maximum discharge power P_{SMAX} [W]	3000	4600				
Maximum charge power P_{CMAX} [W]	-3000	-4600				
Inverter model	X1-H5K-S					
Battery model	X1-B5-H	X1-B10-HC	X1-B15-HC	X1-B20-HC	X1-B25-HC	X1-B30-HC
Nominal discharge power P_{SN} [W]	3000	5000				
Nominal charge power P_{CN} [W]	-3000	-5000				

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<table>
<tr><td>Maximum discharge power P_{SMAX} [W]</td><td>3000</td><td colspan="5">5000</td></tr>
<tr><td>Maximum charge power P_{CMAX} [W]</td><td>-3000</td><td colspan="5">-5000</td></tr>
<tr><td>Inverter model</td><td colspan="6">X1-H6K-S</td></tr>
<tr><td>Battery model</td><td>X1-B5-H</td><td>X1-B10-HC</td><td>X1-B15-HC</td><td>X1-B20-HC</td><td>X1-B25-HC</td><td>X1-B30-HC</td></tr>
<tr><td>Nominal discharge power P_{SN} [W]</td><td>3000</td><td colspan="5">6000</td></tr>
<tr><td>Nominal charge power P_{CN} [W]</td><td>-3000</td><td colspan="5">-6000</td></tr>
<tr><td>Maximum discharge power P_{SMAX} [W]</td><td>3000</td><td colspan="5">6000</td></tr>
<tr><td>Maximum charge power P_{CMAX} [W]</td><td>-3000</td><td colspan="5">-6000</td></tr>
<tr><td>Firmware version of the inverter</td><td colspan="6">V1.0.0.33, (ARM: V1.0.0.33, DSP: V1.0.0.26)</td></tr>
<tr><td>Firmware version of the BMS</td><td colspan="6">V0.0.1.43</td></tr>
</table>

<table>
<tr><td colspan="2" rowspan="2">Case A</td><td colspan="4">Conversion subsystem power (W)</td></tr>
<tr><td>X1-H3.68K-S (P_{MAX}=3680W)</td><td>X1-H4.6K-S (P_{MAX}=4600W)</td><td>X1-H5K-S (P_{MAX}=5000W)</td><td>X1-H6K-S (P_{MAX}=6000W)</td></tr>
<tr><td rowspan="6">Storage subsystem capacity (kWh)</td><td>X1-B5-H (5kWh)</td><td>Partial tests Annex Bbis</td><td>No further tests are required</td><td>No further tests are required</td><td>Partial tests Annex Bbis</td></tr>
<tr><td>X1-B10-HC (10kWh)</td><td colspan="4">No further tests are required</td></tr>
<tr><td>X1-B15-HC (15kWh)</td><td colspan="4">No further tests are required</td></tr>
<tr><td>X1-B20-HC (20kWh)</td><td colspan="4">No further tests are required</td></tr>
<tr><td>X1-B25-HC (25kWh)</td><td colspan="4">No further tests are required</td></tr>
<tr><td>X1-B30-HC (30kWh)</td><td>No further tests are required</td><td>No further tests are required</td><td>No further tests are required</td><td>Complete tests Annex Bbis</td></tr>
</table>

Attachments:

N/A

If additional information is necessary, please provide

N/A

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Copy of marking plate:

Note:
1. For application of this standard, the nominal voltage is 230 V_{AC}, nominal frequency is 50 Hz.
2. The maximum AC output current is the maximum current that can be withstood under low voltage(220 V_{AC}) conditions.
3. Backup is not considered in this report.

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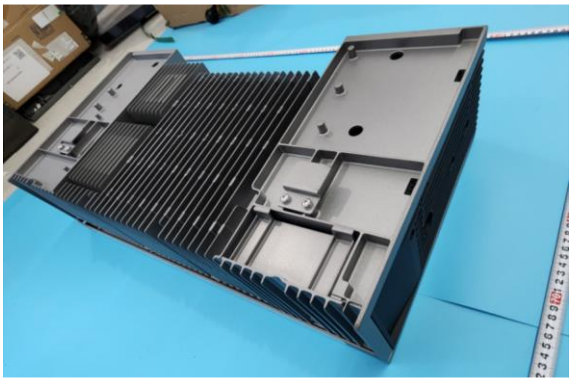
Pictures of the product:

Inverter:

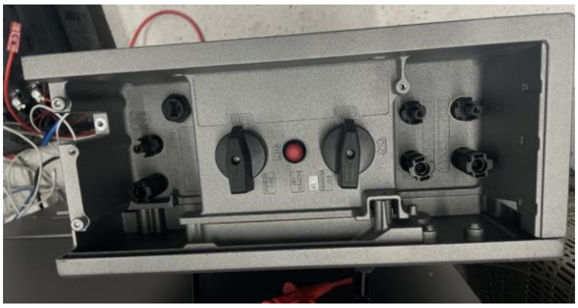
Overall view



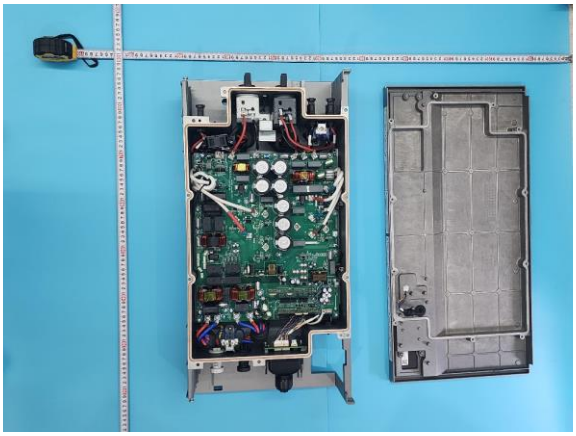
Bottom view

Left side view

AC port view with block cover removed



Right side view



Internal view

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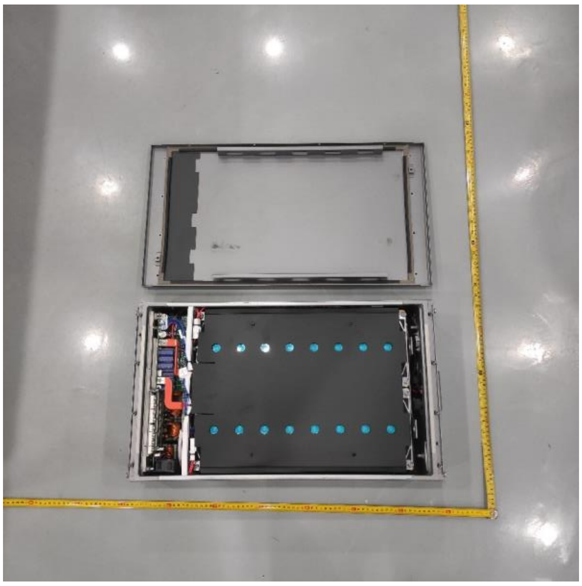
Battery:

Front view of X1-B5-H

Front view of X1-B30-HC

Overall view of X1-B5-H

Terminal view of X1-B5-H



Internal view of X1-B5-H

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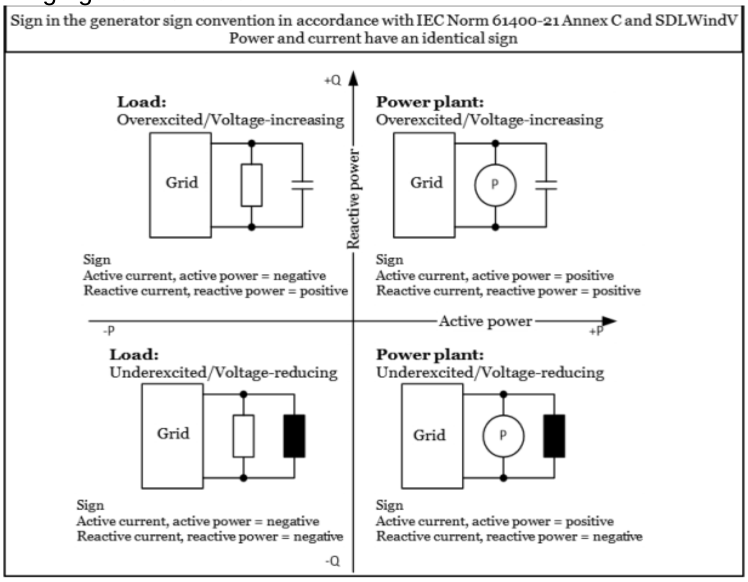
Summary of testing:

☐ deviation(s) found

☒ no deviations found

Generator sign convention has been applied for all measurements and results given in this report. This is described in the following figure and table:



	Inductive (under-excited)	Capacitive(over-excited)
Generator (Discharge mode)	IV. Quadrant P > 0, the equipment supplies active power to the mains (Discharge mode) Q < 0, the equipment draws reactive power from the mains (inductive behaviour)	I. Quadrant P > 0, the equipment supplies active power to the mains (Discharge mode) Q > 0, the equipment supplies reactive power to the mains (capacitive behaviour)
Consumer (Charge mode)	III. Quadrant P < 0, the equipment draws active power from the mains (Charge mode) Q < 0, the equipment draws reactive power from the mains (inductive behaviour)	II. Quadrant P < 0, the equipment draws active power from the mains (Charge mode) Q > 0, the equipment supplies reactive power to the mains (capacitive behaviour)

Tests performed (name of test and test clause):

Clause	Requirement + Test	Sample for testing
A.4.3	Functional test on SPI	X1-H6K-S
8.5.2 & A.4.3	Measuring the rise-in voltage protection as a running 10-minute mean value	X1-H6K-S
A.4.3.3.1	Insensitivity to harmonics of the frequency relay	X1-H6K-S
A.4.3.3.2	Check the remote trip	X1-H6K-S
A.4.3.3.3	communication signal	X1-H6K-S
A.4.3.4	Verification of insensitivity to the frequency derivative	X1-H6K-S
A.4.4	Self-test	X1-H6K-S
A.4.5	Single fault tolerance	X1-H6K-S
A.4.6	EMC compatibility tests	See separated EMC test report
A.4.7	Climatic compatibility tests	X1-H6K-S
A.4.8	Isolation test	X1-H6K-S
A.4.9	Overload test of measuring circuit	X1-H6K-S
Bbis.3	EMC requirements (current harmonic, voltage flicker)	X1-H3.68K-S+ X1-B5-H X1-H6K-S+ X1-B5-H X1-H6K-S+ X1-B30-HC
Bbis.4	Checking of the operation range of the voltage and frequency	X1-H6K-S+ X1-B30-HC
Bbis.5	Checking the connection and reconnection conditions	X1-H3.68K-S+ X1-B5-H X1-H6K-S+ X1-B5-H X1-H6K-S+ X1-B30-HC
Bbis.6.1/Bbis.6.2	Checking of constructional requirements: reactive power capability	X1-H3.68K-S+ X1-B5-H X1-H6K-S+ X1-B5-H X1-H6K-S+ X1-B30-HC
Bbis.6.6	Automatic supply of reactive power according to a characteristic curve cos φ = f (P)	X1-H3.68K-S+ X1-B5-H X1-H6K-S+ X1-B5-H X1-H6K-S+ X1-B30-HC
Bbis.6.7	Checking compliance with the rules for implementing the standard characteristic curve cos φ= f (P)	
Bbis.7.1	Automatic limitation the active power for voltage value close to 110% of the nominal voltage	X1-H3.68K-S+ X1-B5-H X1-H6K-S+ X1-B5-H
Bbis.7.2	Checking of the automatic reduction of the active power in	

Testing location:

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B1F&2F of A4, D1 Buildings, No. 63 Chuangqi Road, Shilou Town, Panyu District, Guangzhou 511447, China

		the presence of over-frequency transient network	X1-H6K-S+ X1-B30-HC		
	Bbis.7.3	Checking of automatic increase of active power in case of underfrequency transients on the transmission network			
	Bbis.7.4	Checking of Active Power adjustment upon external command from Distributor			
	Bbis.8.1	Verification of continuous component emission	X1-H3.68K-S+ X1-B5-H X1-H6K-S+ X1-B5-H X1-H6K-S+ X1-B30-HC		
	Bbis.8.2	Verification of protections against continuous component input	X1-H6K-S+ X1-B30-HC		
	Bbis.10	Checking the insensitivity to automatic reclosing during phase discordance	X1-H6K-S+ X1-B30-HC		

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CEI 0-21:2022			
Clause	Requirement + Test	Result – Remark	Verdict
8	8 Technical connection rules for active Users		P
8.1	Neutral delivered by the DSO		P
8.2	Connection scheme of an active U.S.: expected devices		N/A
8.3	Single-phase/three-phase connection to the distribution network	Single phase inverter unit	P
8.4	Operation of the production facility		P
8.5	Network services		P
8.6	Protection systems		P
8.7	Operating Regulations for Active User		P
8.8	Field verification tests		P
8.9	Technical documentation of the Active User connection point		N/A
9	Provisions for electromagnetic compatibility	Single phase inverter unit	P
10	Measurement of continuity and voltage quality		P
11	Connection technical rules for distribution networks		P
12	Electrical energy measurement systems	External interface protection system is required according to final installation requirement.	P
Annex A	Features and tests for the Interface Protection System (SPI)		P
A.1	Types of tests		P
A.2	Characteristics of the SPI		P
A.3	Adjustment ranges for SPI	Single phase inverter unit	P
A.4	Pes checks and tests		P
A.4.	Characteristics of the relay test box		N/A
A.4.2	Features of the BT network simulator		P
A.4.3	Functional tests on SPI		P
A.4.4	Self-testing		P
A.4.5	Single fault tolerance		P
A.4.6	EMC compatibility tests	See separated EMC test report No.: ENS2406110286E00101R, from EMTEK (SHENZHEN) CO.,LTD	P
A.4.7	Climate compatibility tests	Operation temperature range: -25 °C to +60 °C;	P

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CEI 0-21:2022			
Clause	Requirement + Test	Result – Remark	Verdict
		Storage temperature range: -30 °C to +70 °C. Relative humidity range: 0%-95%	
A.4.8	Insulation tests		P
A.4.9	Tests of overloadability of measuring circuits		P
A.4.10	Conformity of equipment		P
A.4.11	Automatism to avoid current imbalances in production		N/A
Annex B	Tests on generators connected to the grid by means of static converters		N/A
B.1	Tests		N/A
B.1.1	Conditions of connection, reconnection and gradual power supply		N/A
B.1.1.1	Verification of connection and reconnection conditions		N/A
B.1.1.2	Verification of gradual delivery of active power		N/A
B.1.2	Exchange of reactive power		N/A
B.1.2.1	Verification of construction requirements: capability of reactive power		N/A
B.1.2.2	How to perform and record the test		N/A
B.1.2.2.1	Inverters in systems with a total power of up to 11,08 kW		N/A
B.1.2.2.2	Inverters in systems with a total power exceeding 11,08 kW		N/A
B.1.2.3	Exchange of reactive power according to an assigned level		N/A
B.1.2.4	Response time to a step change of the assigned level		N/A
B.1.2.5	Automatic reactive power delivery according to a characteristic curve cosφ = f(P)		N/A
B.1.2.5.1	Verification of compliance with the methods of application of the standard dispensing curve		N/A
B.1.2.6	Automatic exchange of reactive power according to a characteristic curve Q = f(V)		N/A
B.1.3	Limitation of active power		N/A
B.1.3.1	Automatic limitation of active power for voltage values close to 110 % of the rated voltage		N/A
B.1.3.2	Regulation of active power in the presence of overfrequency transients on the transmission network		N/A
B.1.3.3	Verification of the operating range in voltage and frequency		N/A

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Clause	Requirement + Test	Result – Remark	Verdict
B.1.3.4	Limitation of active power on external control from the DSO		N/A
B.1.4	Emission of continuous component in the output current		N/A
B.1.4.1	Verification of continuous component emission		N/A
B.1.4.2	Verification of protection against continuous component input		N/A
B.1.5	Verification of insensitivity to voltage drops (UVRT capability)		N/A
B.1.6	Verification of insensitivity to automatic reclosures in phase discordance		N/A
B.1.6.1	Simulated network testing:		N/A
B.1.6.2	Test on distribution network by coupling transformer		N/A
B.1.6.3	Distribution network testing, frequency drift simulation		N/A
B.1.6.4	Extension of results		N/A
Annex Bbis	Tests on storage systems		P
Bbis.1	Introduction		P
Bbis.2	Execution of tests	Case A	P
Bbis.3	List of tests and reference conditions		P
Bbis.4	Verification of the operating range in voltage and frequency		P
Bbis.5	Conditions of connection, reconnection and gradual power delivery		P
Bbis.5.1	Checking connection and reconnection conditions		P
Bbis.5.2	Verification of the gradual delivery/absorption of active power		P
Bbis.6	Reactive power exchange		P
Bbis.6.1	Verification of construction requirements: capability of reactive power		P
Bbis.6.2	How to perform and record the test		P
Bbis.6.3	Exchange of reactive power according to an assigned level		N/A
Bbis.6.4	Methods of execution of the test and recording of the results (hypothesis of adjustment by Q)		N/A
Bbis.6.5	Response time to a step change in the assigned level		N/A
Bbis.6.6	Automatic reactive power delivery according to a characteristic curve cosφ = f(P)		P

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Clause	Requirement + Test	Result – Remark	Verdict
Bbis.6.7	Verification of compliance with the methods of application of the standard dispensing curve cosφ = f(P)		P
Bbis.6.8	Automatic exchange of reactive power according to a characteristic curve Q=f(V)		N/A
Bbis.6.9	Verification of compliance to the modes of application of the characteristic curve Q=f(V)		N/A
Bbis.7	Active power regulation		P
Bbis.7.1	Automatic limitation of active power for voltage values close to 110 % of the rated voltage		P
Bbis.7.2	Verification of automatic reduction of active power in the presence of overfrequency transients on the network		P
Bbis.7.3	Verification of the automatic increase of the active power in the presence of subfrequency transmitters on the network		P
Bbis 7.4	Verification of the regulation of the active power on external control coming from the DSO		P
Bbis.8	Output of continuous component in the output current		P
Bbis.8.1	Verification of continuous component emission		P
Bbis.8.2	Verification of protections against continuous component input		P
Bbis.9	Verification of insensitivity to voltage drops (UVRT capability)		N/A
Bbis.9.1	UVRT – method of execution and recording of tests		N/A
Bbis.9.2	Test circuits – requirements		N/A
Bbis.10	Verification of insensitivity to automatic reclosures in phase discordance		P
Bbis.10.1	Simulated Network Test		P
Bbis.10.2	Testing on distribution network by coupling transformer		N/A
Bbis.10.3	Distribution Network Testing, Frequency Drift Simulation		N/A
Annex Bter	Synchronous and asynchronous generation group compliance		N/A
Bter.1	Execution of tests		N/A
Bter.2	List of tests and reference conditions		N/A
Bter.3	Voltage quality measurements		N/A
Bter.4	Verification of the operating range in voltage and frequency		N/A

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Clause	Requirement + Test	Result – Remark	Verdict
Bter.5	Verification of synchronization and loading conditions		N/A
Bter.6	Verification of construction requirements regarding reactive power exchange		N/A
Bter.7	Verification of construction requirements regarding active power regulation		N/A
Bter.8	Verification of insensitivity to voltage variations (VFRT capability)		N/A
Bter.9	Method for modelling and validating the mathematical model of a synchronous generation group)		N/A
Annex C	Equipment Compliance		P
Annex D	Signals on CEI EN 61850 protocol		N/A
Annex E	Participation of Distributed Generation (GD) units in voltage control		P
Annex F	Limiting the active power of Distributed Generation (GD) units		P
Annex G	Regulations for the operation of production plants in parallel with the DSO LV network		N/A
Annex Gbis	Regulations for the operation of production plants < 0.8 kW in parallel with the DSO LV network		N/A
Annex H	Characteristics of the relay test box		N/A
Annex I	Evaluation of the angle at the reclosing		N/A

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Clause	Requirement + Test	Result – Remark	Verdict
3	Definitions – conventions		N/A
5.2.2	Operation of portions of the LV distribution network in intentional islanding		N/A
7.4	Technical connection rules common to all categories of Users		N/A
7.4.5	Multiple connection points and emergency power supplies		N/A
7.4.14	Special requirements for facilities intended for electric vehicle charging stations		N/A
8.4.2	Short-term operation	To be considered in final installation	N/A
8.4.4	Continuous operation in parallel with the DSO's network		N/A
8.4.4.4	Insertion diagrams and functional requirements of generating sets for intentional island operation		N/A
8.4.4.5	Technical requirements for extended parallel operation		N/A
12	Energy measurement systems		P
Annex A	Features and tests for the Interface Protection System (SPI)		P
A.4.8	Insulation tests		P
Annex B	Tests on generators connected to the grid by means of static converters		N/A
B.1.5bis	OVRT - Method of performing and recording tests for static generators		N/A
Annex Gter	Operating regulations for generators providing intentional island re-powering service		N/A
Annex 1ter	Single-line wiring diagram of the system		N/A
Annex 2ter	GRI protection system calibration		N/A
Annex 3ter	List and contact information for authorized personnel		N/A
Annex 4ter	Technical addendum to the LV operating regulations facsimile to be used to declare the compliance of the GRI plant with IEC 0-21 standard		N/A
Annex 5ter	Periodic verification of GRI operation. (for emergency groups only)		N/A
Annex 5ter	Maintenance card		N/A
Annex X	Electric Vehicle Charging Infrastructure Controller.		N/A

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3	Definitions – conventions		N/A
4.2	Special Utilisation Facilities		N/A
7.4.4	Connection Utility Plant		N/A
8	Technical Connection Rules for Active Users		P
8.2	Connection diagram of an active user: planned devices - Figure 16		N/A
8.4.4.2	Requirements for generators/plants: reactive power input		P
8.5	Network Services		P
8.5.1	Insensitivity to voltage variations		P
8.5.3.2	Active power limitation for frequency transients		P
8.5.3.4	Active power regulation of a storage system for over- and under-frequency transients originating on the grid		P
8.6.2	Interface Protection System		P
8.6.2.2	Temporary exclusion of the SPI		P
8.7	Operating regulations for active users		N/A
Annex Bbis			P
Bbis.2.1	Accreditation		P
Bbis.2.2	Scalarity and modularity		P
Bbis.3	List of tests and reference conditions		P
Bbis.7.2	Verification of automatic active power reduction in the presence of over-frequency transients on the grid		P
Bbis.7.3	Verification of automatic active power increase in the presence of under-frequency transients on the grid		P
Bbis.7.3.2	Test Results		P
Annex G			N/A
G 3.2	Plant		N/A
G.5	Maintenance , plant upgrades, inspections and service failures		N/A
Annex Gbis			P
Gbis.1	Active user data		N/A
Gbis.2	General Conditions		N/A
Gbis.3	Maintenance, Plant Adaptation, Inspections and Breakdowns		N/A

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Clause	Requirement + Test	Result – Remark	Verdict
Gbis.4	Security and operational provisions		N/A
Gbis.5	Commencement and duration of the Regulation	To be considered by manufacturer	N/A
Gbis.6	Attachments (excluding Plug&Play installations)		N/A
Annex 1	Plant affidavit model		N/A
Annex L			N/A
L.1	Generalities		N/A
L.2	Examples of schemes that can be used		N/A
L.3	Minimum Requirements		N/A
L.3.1	SLI and contribution to generation system short-circuit		N/A
L.3.2	SLI and generation plant network services		N/A
L.4	Compliance Testing		N/A
L.4.1	Test Setups		N/A
L.4.2	Verification of the SLI system's ability to respect the maximum input curve described in L.3 following a load variation		N/A
L.4.3	Verification of the SLI system's ability to comply with the maximum input curve described in L.3 following a power variation of the primary source		N/A
L.4.4	Verification of the SLI system's ability to comply with the limit on power fed into the grid under steady-state conditions		N/A
L.4.5	Verification of SLI system first fault tolerance		N/A
L.5	Field tests for the validation of the SLI system		N/A
L.5.1	Verification of correct SLI system configuration		N/A
L.6	Test Report		N/A

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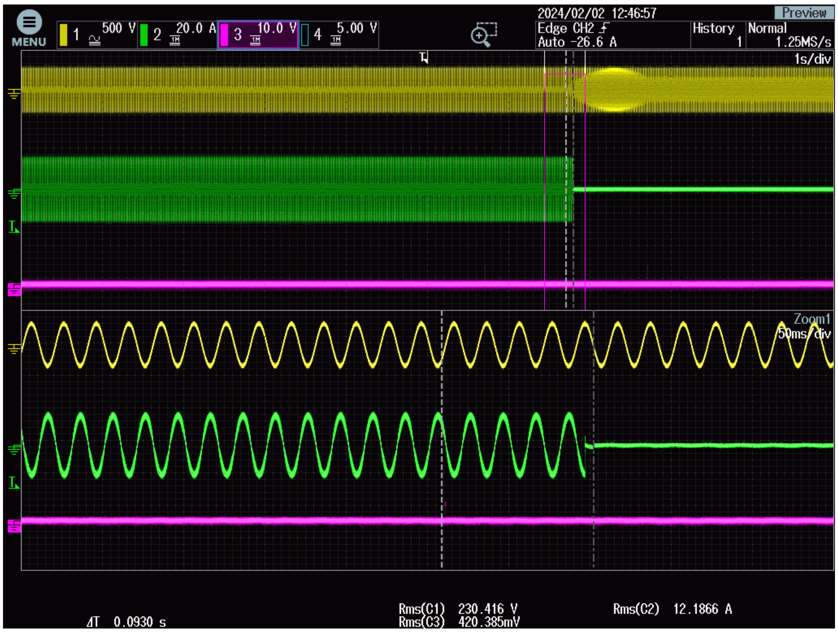
A.4.3	Functional test on SPI							
A.4.3.1 &A.4.3.2	Test procedure for maximum/minimum frequency							P
Tested condition:	20 °C ± 2 °C						Model	X1-H6K-S
Test A	Modalità Transitoria (Transient operation mode):							
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S1	49.80	49.80	49.80	49.80	93	108	100	77 ≤ t ≤ 123
(2):81>S1	50.20	50.20	50.20	50.20	93	102	90	77 ≤ t ≤ 123

Oscilloscope 81< S1:

Test 1:



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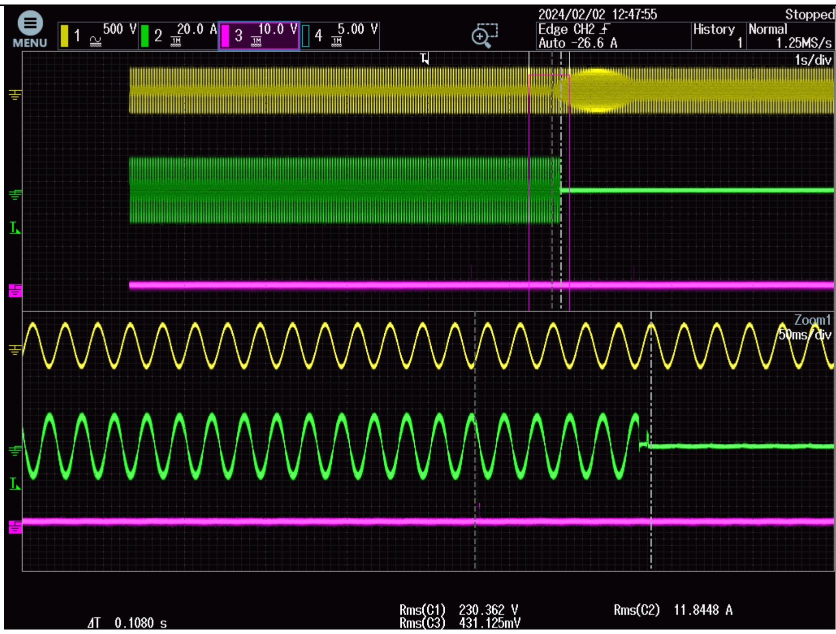
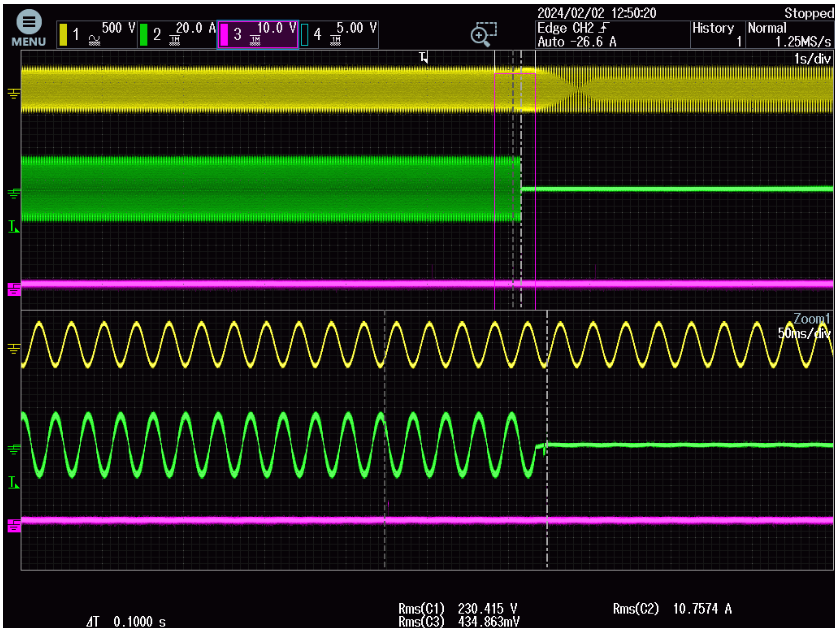


Test 3:



Oscilloscope 81> S1:

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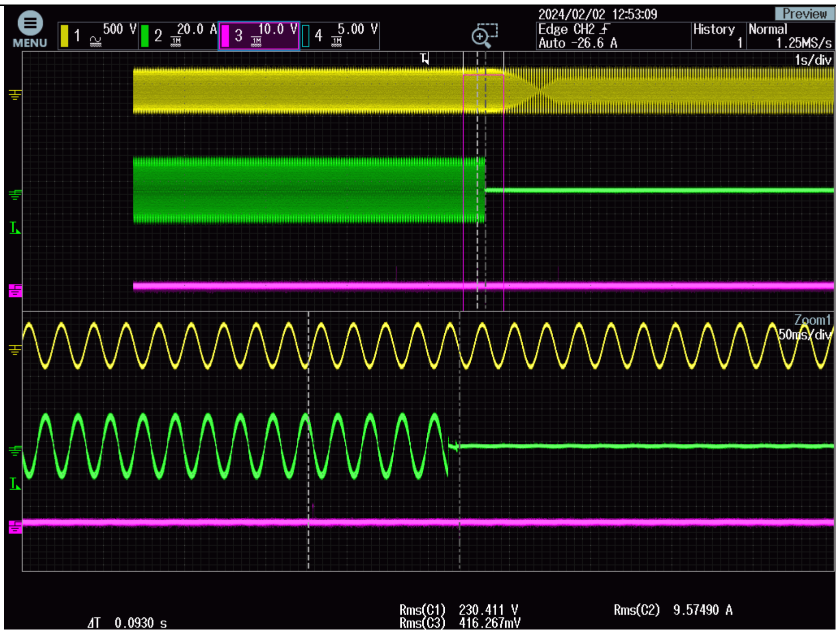

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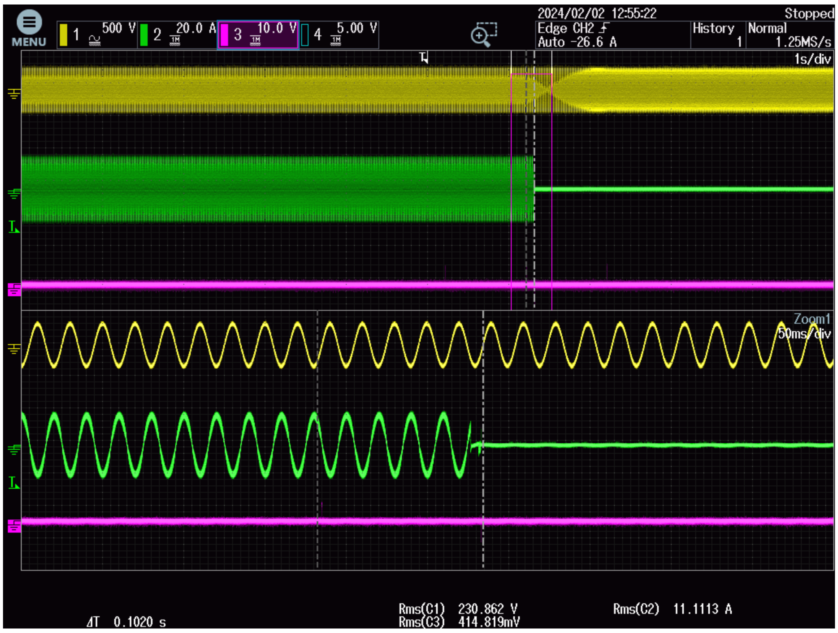

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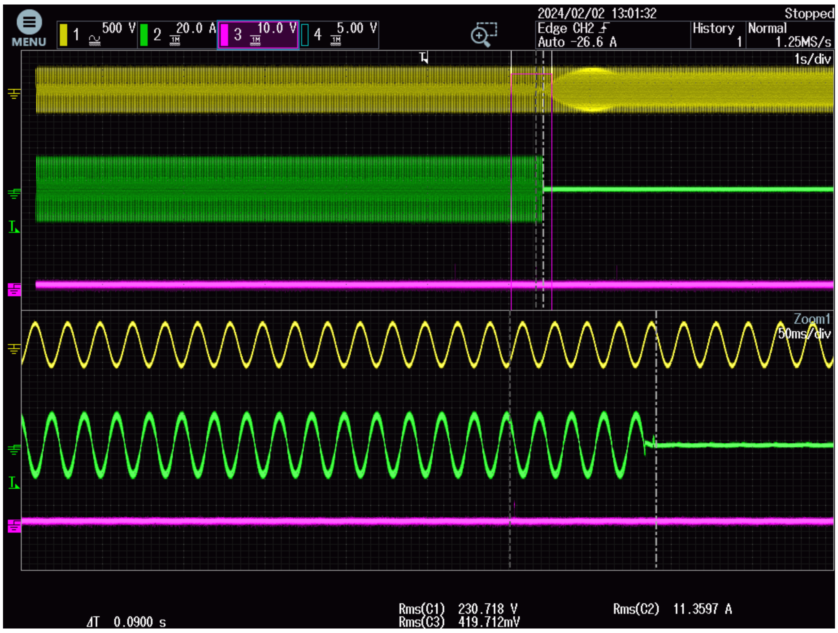
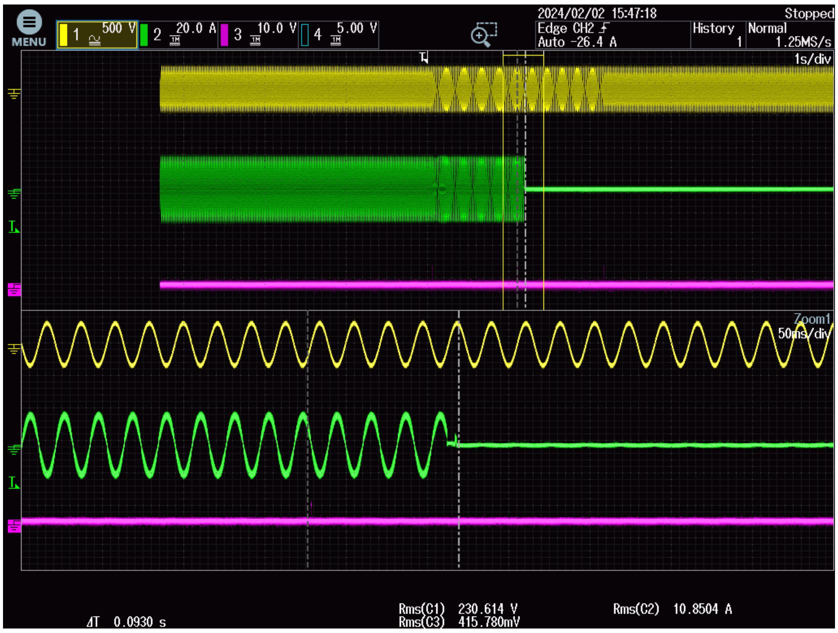


Test B	Modalità Transitoria (Transient operation mode):							
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S2	47.50	47.50	47.50	47.50	93	110	104	77 ≤ t ≤ 123
(2):81>S2	51.50	51.50	51.50	51.50	91	108	108	77 ≤ t ≤ 123

Oscilloscope 81< S2:

Test 1:



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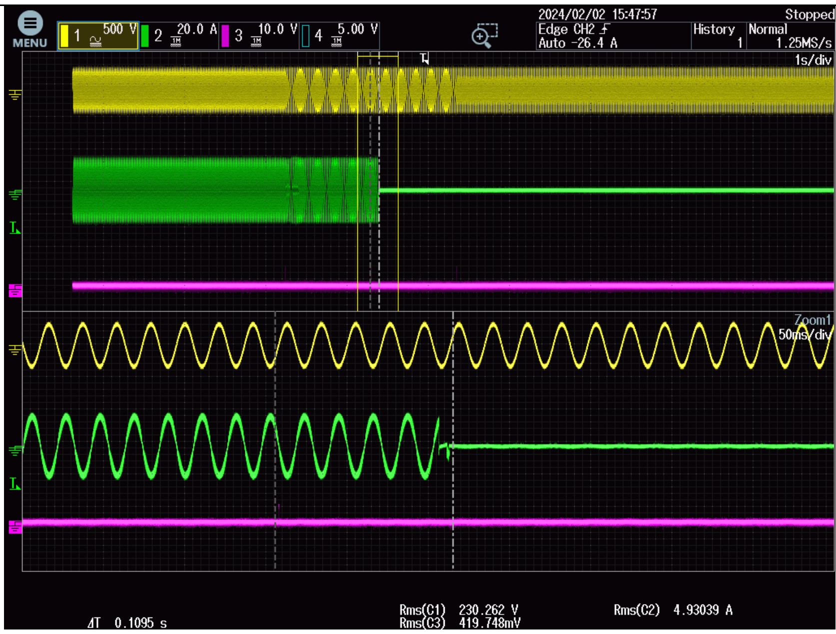
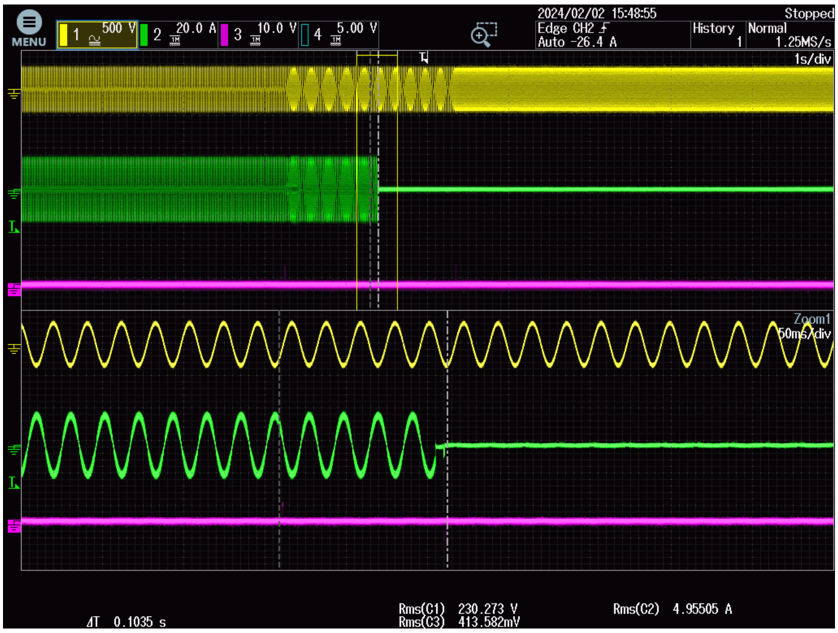


Test 3:



Oscilloscope 81> S2:

Test 1:

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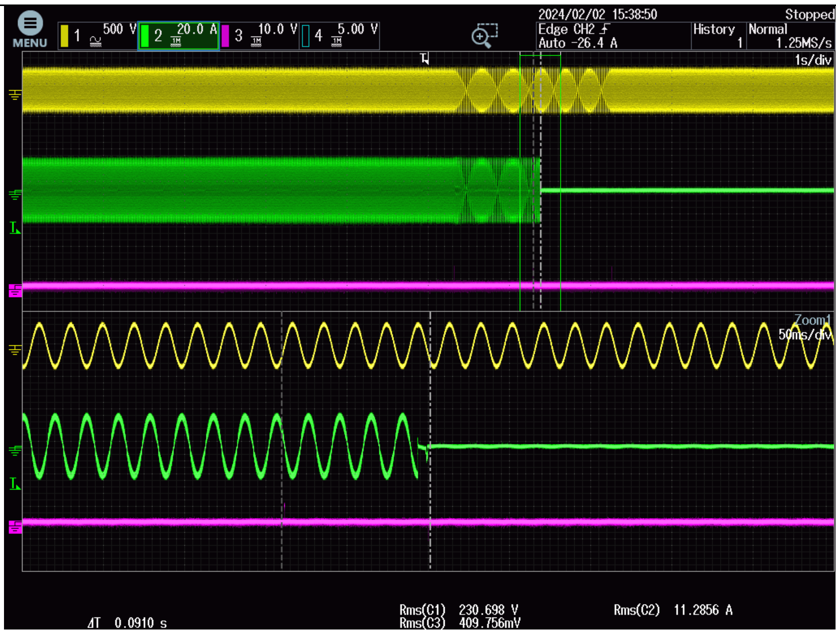
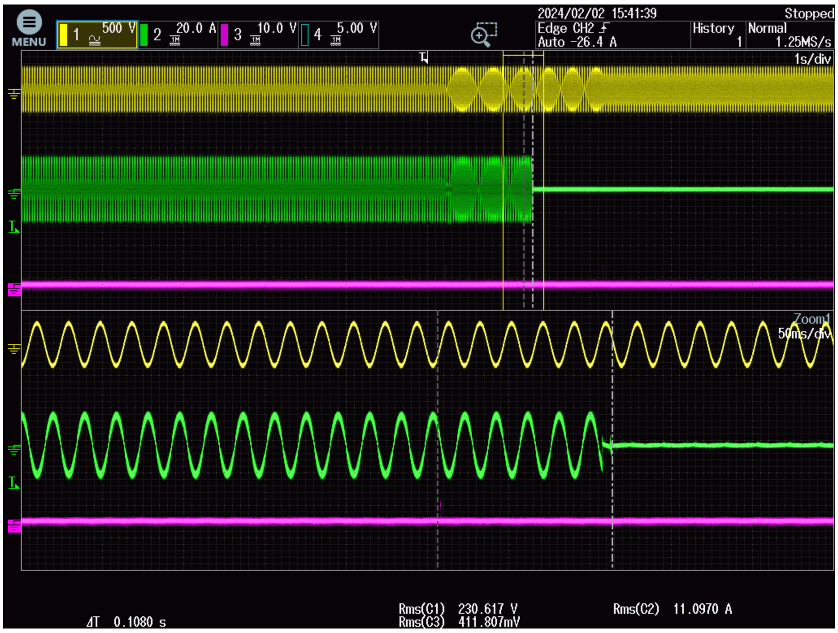


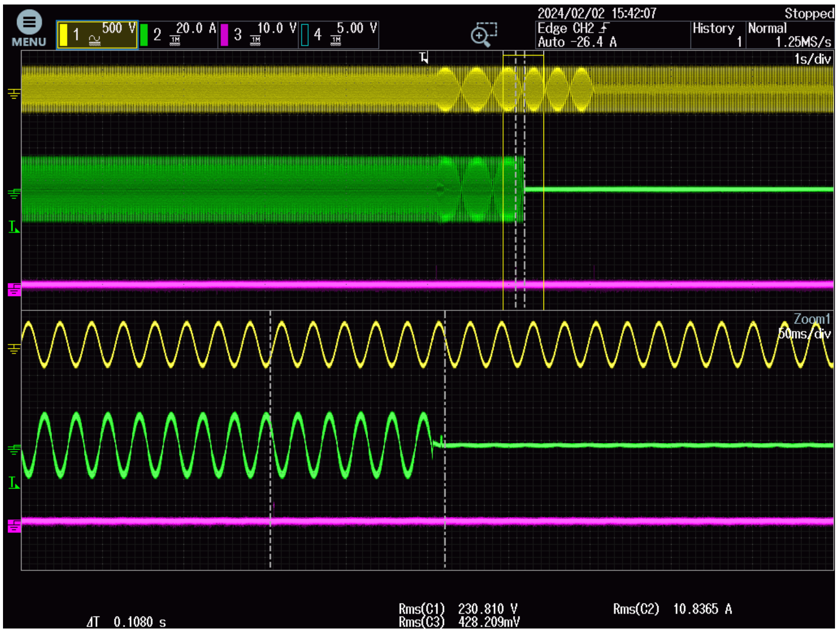
MENU
1 500 V
2 20.0 A
3 10.0 V
4 5.00 V
2024/02/02 15:38:50
Stopped
Edge CH2
Auto -26.4 A
History 1
Normal
1.25MS/s
1s/div
Zoom1
50ms/div
ΔT 0.0910 s
Rms(C1) 230.698 V
Rms(C3) 409.756mV
Rms(C2) 11.2856 A

Test 2:



MENU
1 500 V
2 20.0 A
3 10.0 V
4 5.00 V
2024/02/02 15:41:39
Stopped
Edge CH2
Auto -26.4 A
History 1
Normal
1.25MS/s
1s/div
Zoom1
50ms/div
ΔT 0.1080 s
Rms(C1) 230.617 V
Rms(C3) 411.807mV
Rms(C2) 11.0970 A

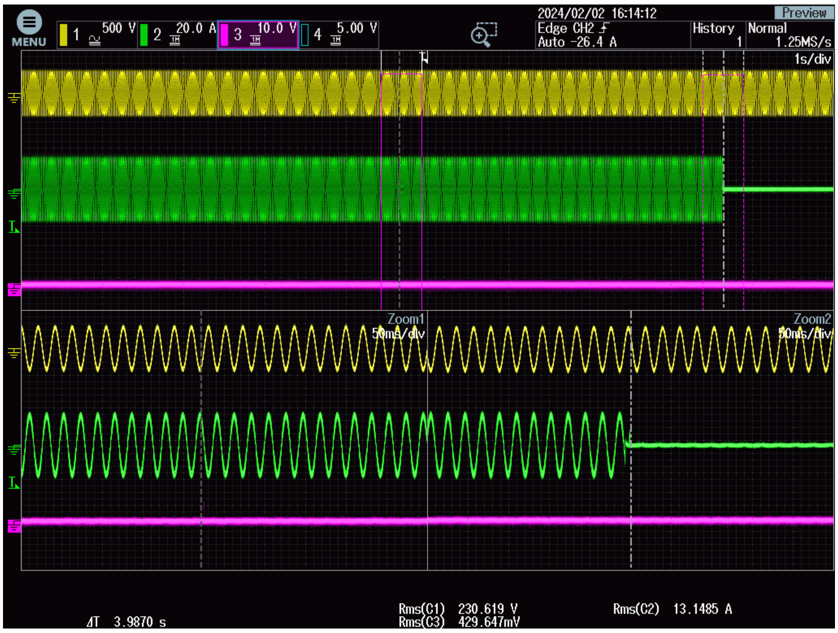
Test 3:



Test C	Modalità definitiva (Final operation mode):							
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S2	47.49	47.49	47.49	47.50	3987	3977	3990	3860 ≤ t ≤ 4140
(2):81>S2	51.50	51.50	51.50	51.50	977	993	989	950≤t≤1050

Oscilloscope 81< S2:

Test 1:



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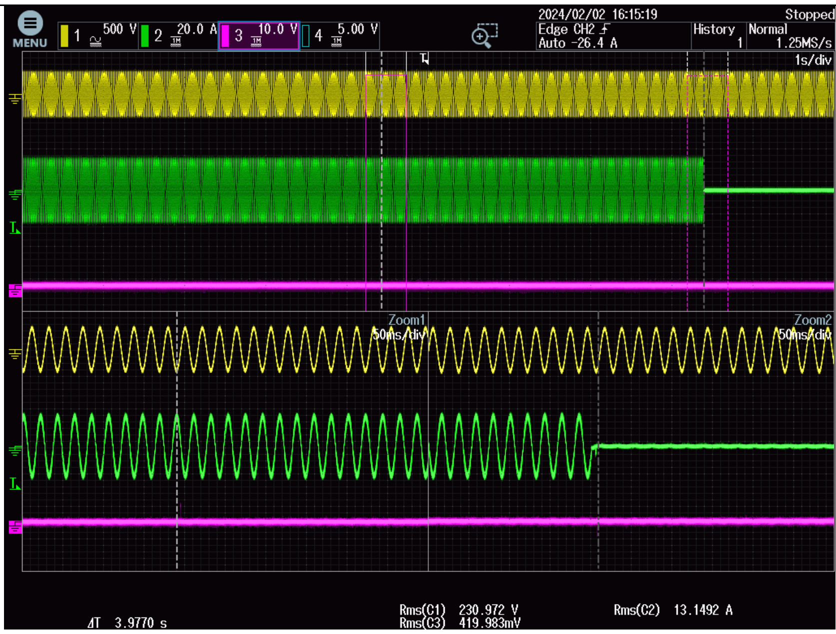
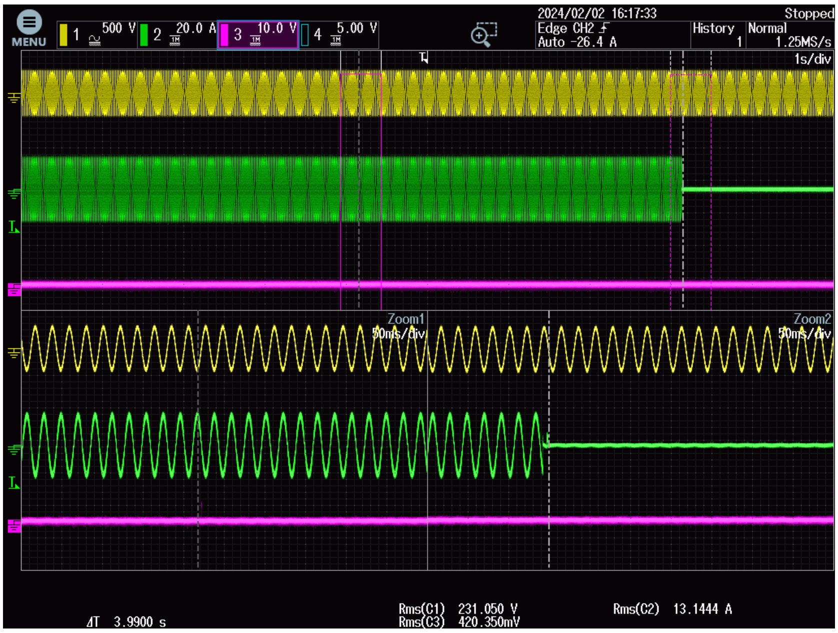


Test 3:



Oscilloscope 81> S2:

Test 1:

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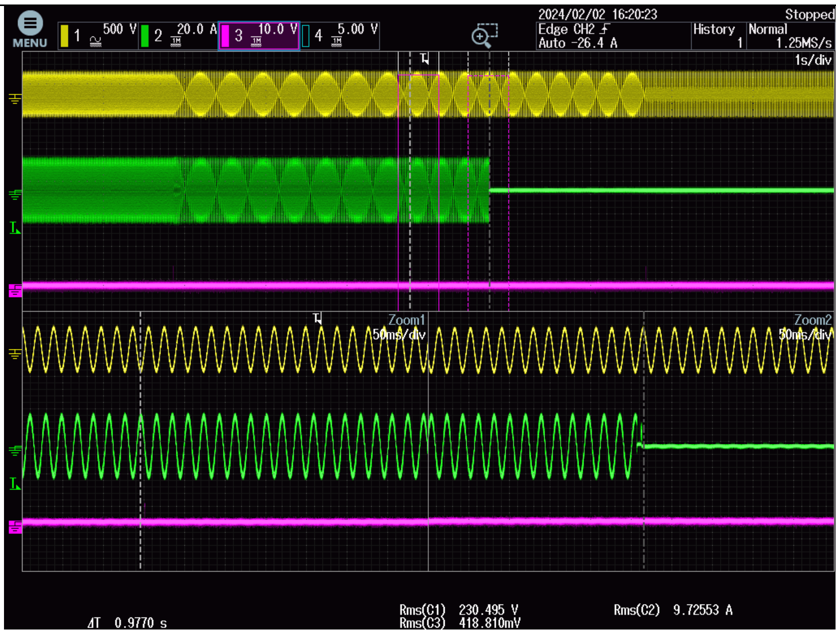
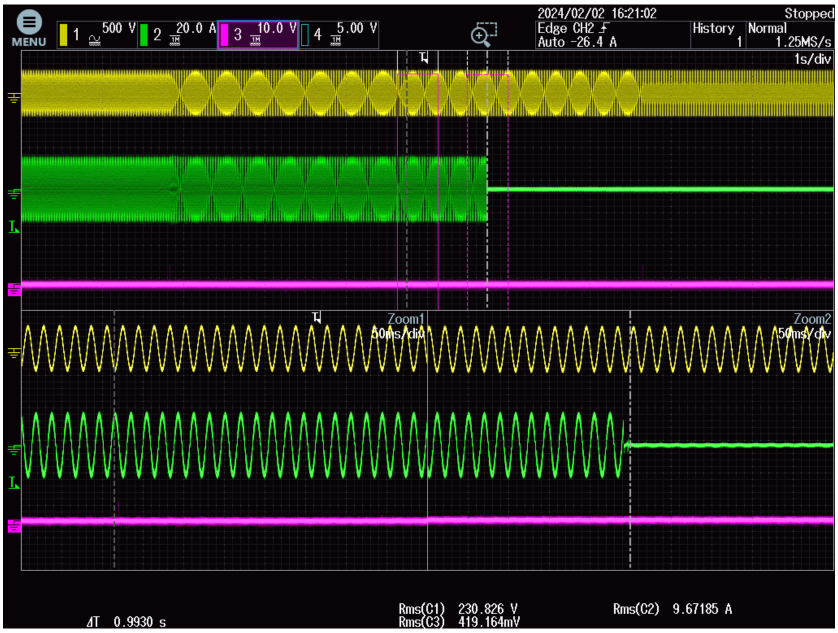


Test 2:



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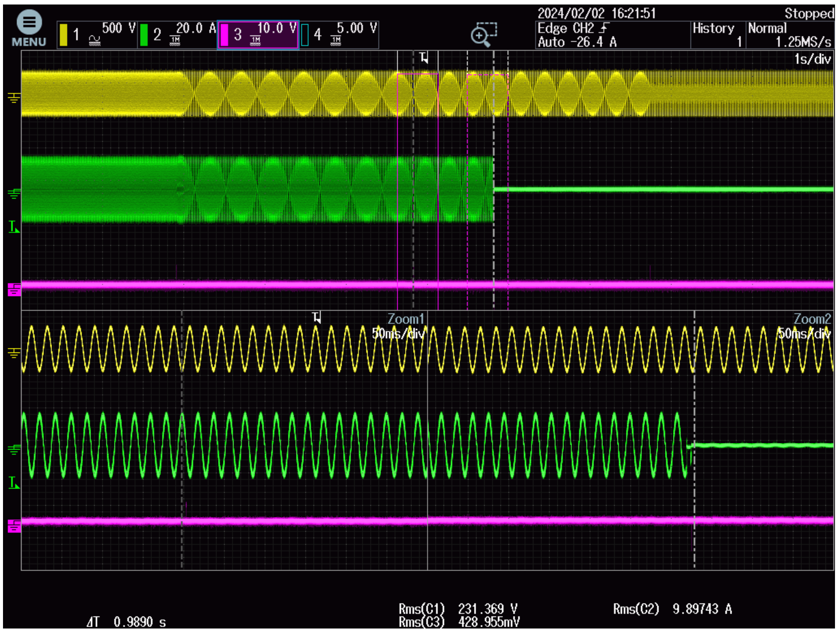
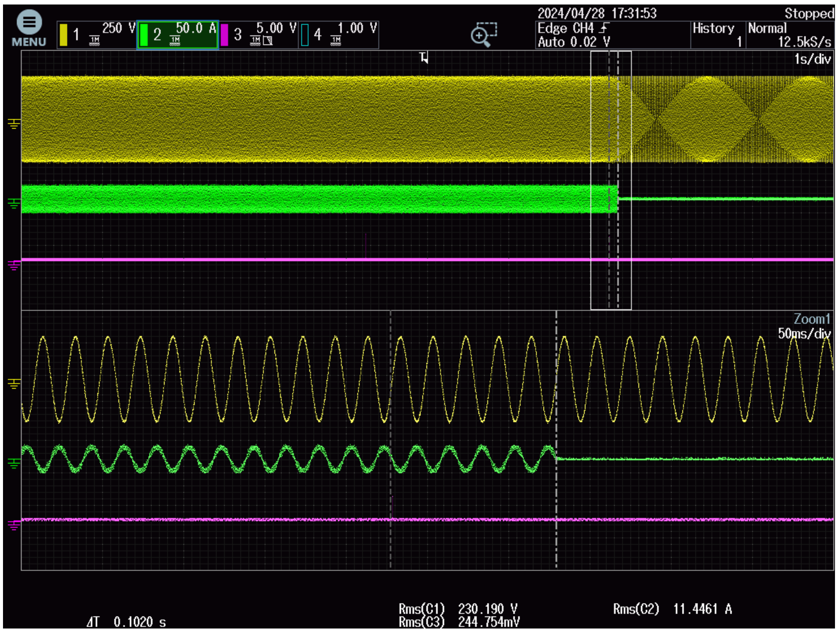


Tested condition:	-25°C (cold) while the equipment is powered(16h).						**Model**	X1-H6K-S
Test A	Modalità Transitoria (Transient operation mode):							
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S1	49.80	49.80	49.80	49.80	102	101	101	77 ≤ t ≤ 123
(2):81>S1	50.20	50.20	50.20	50.20	104	100	100	77 ≤ t ≤ 123

Oscilloscope 81< S1:

Test 1:



Test 2:

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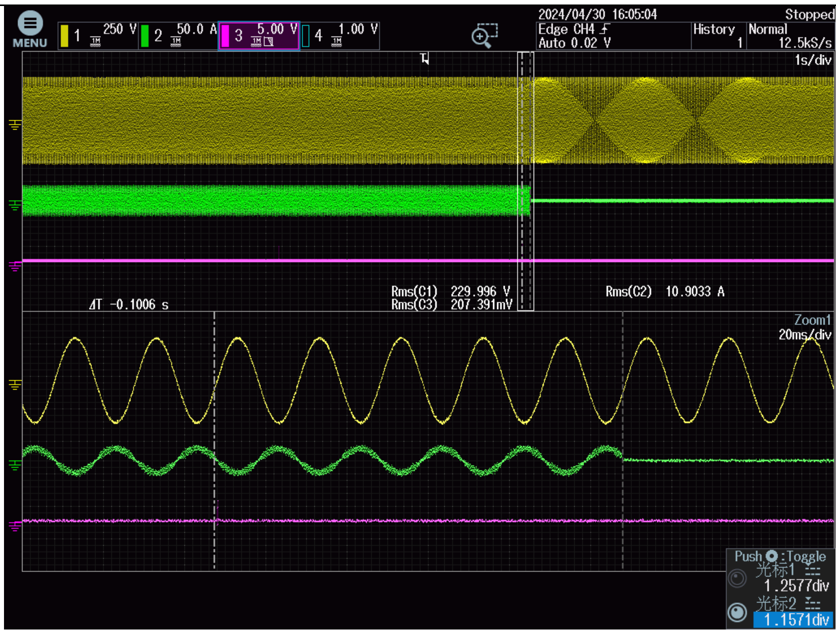
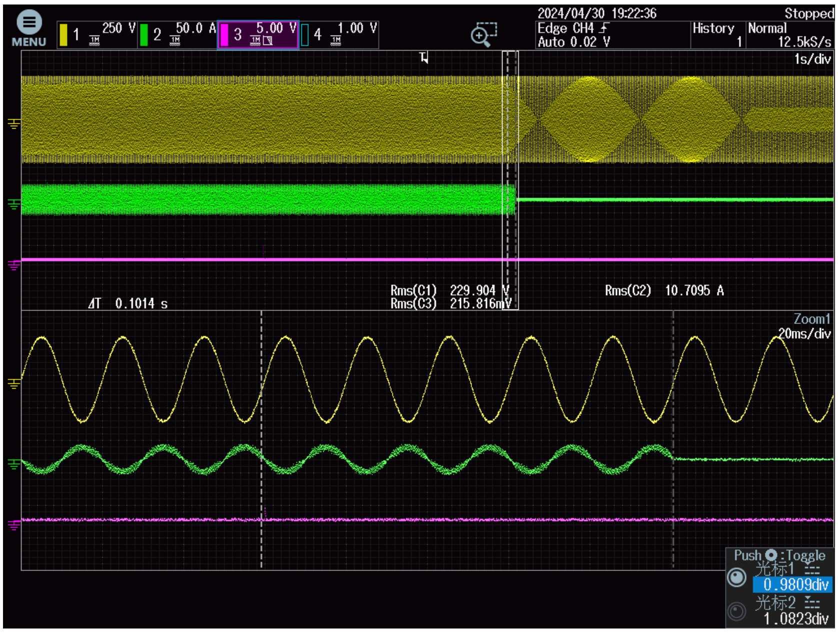


Test 3:



Oscilloscope 81> S1:

Test 1:

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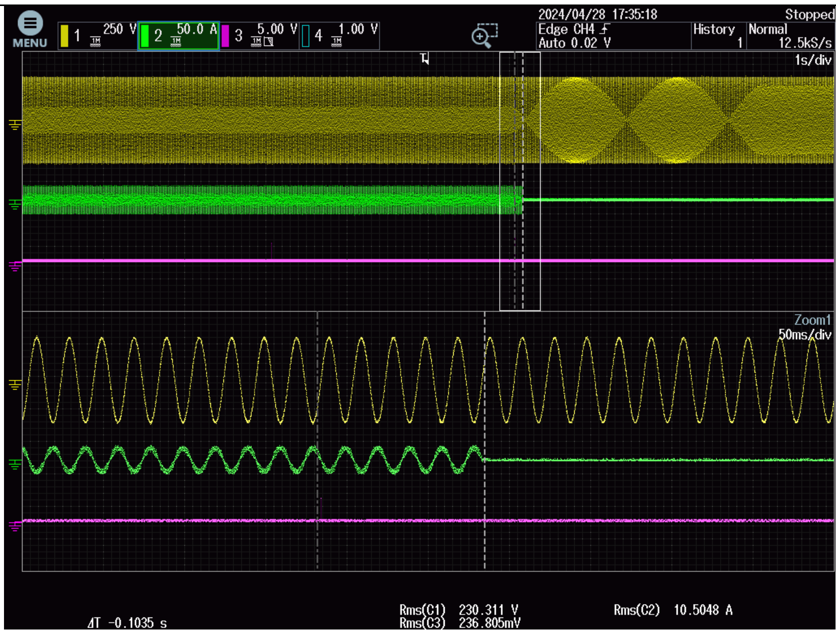
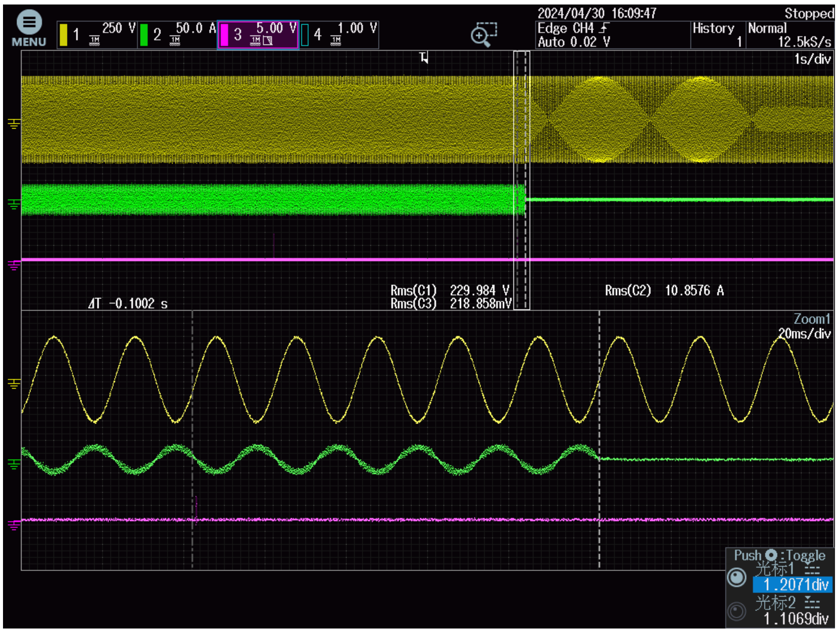


Test 2:



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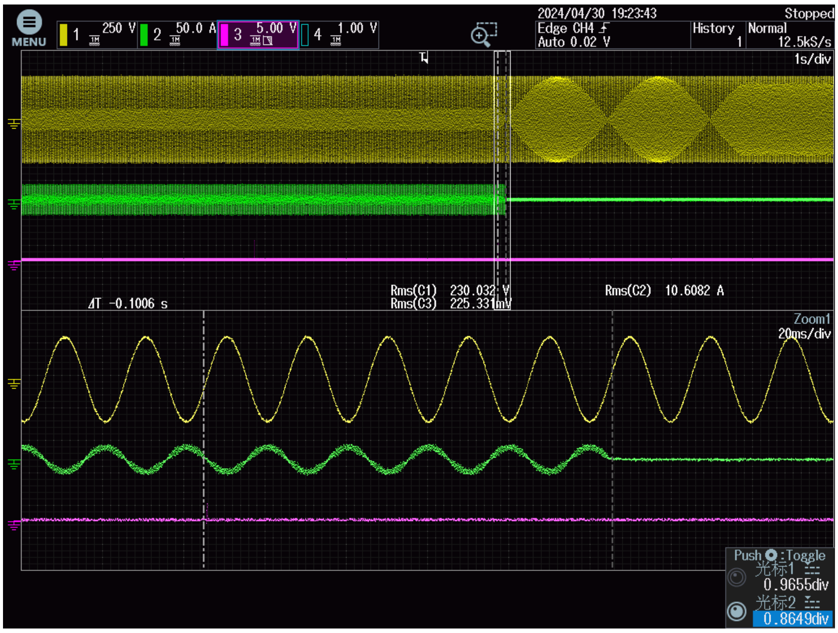
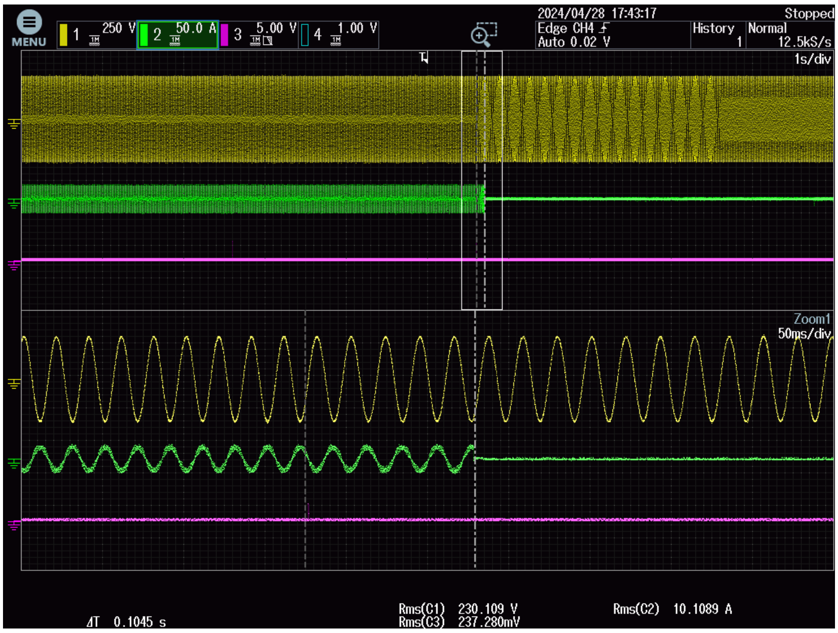


Test B	Modalità Transitoria (Transient operation mode):							
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S2	47.50	47.50	47.50	47.50	105	103	103	77 ≤ t ≤ 123
(2):81>S2	51.50	51.50	51.50	51.50	99	99	99	77 ≤ t ≤ 123

Oscilloscope 81< S2:

Test 1:



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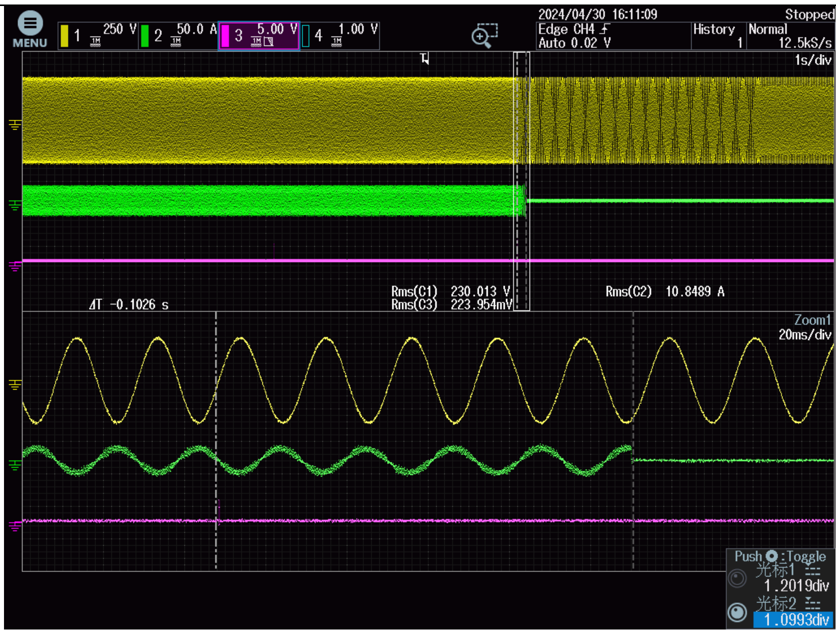
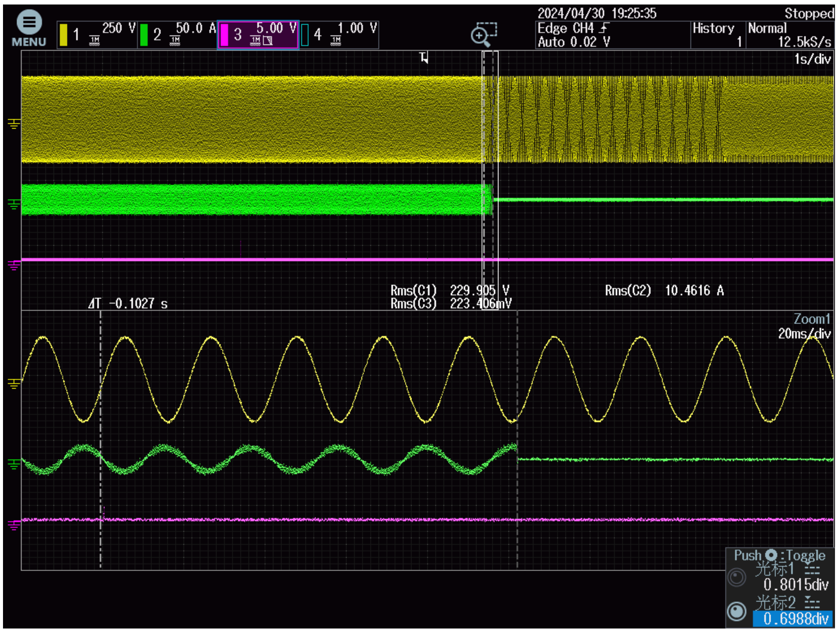
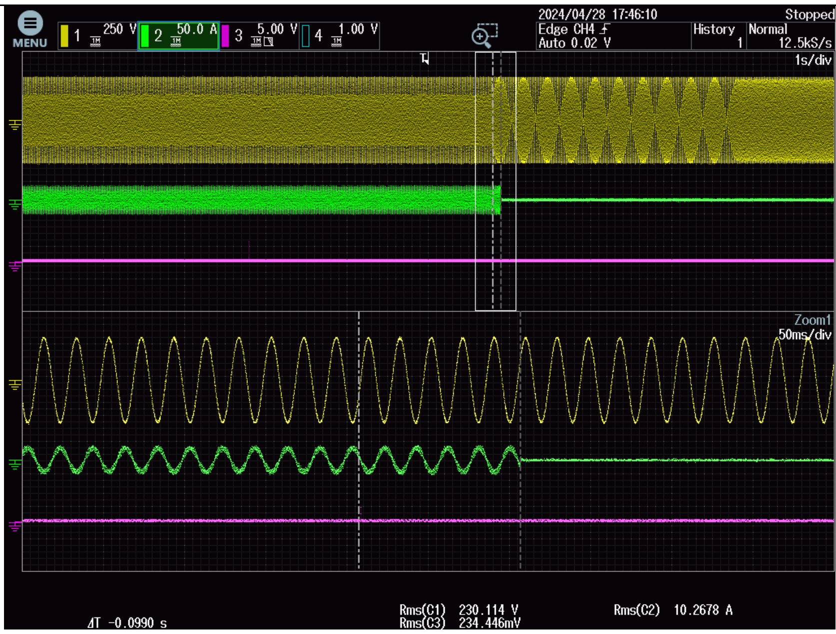


Test 3:



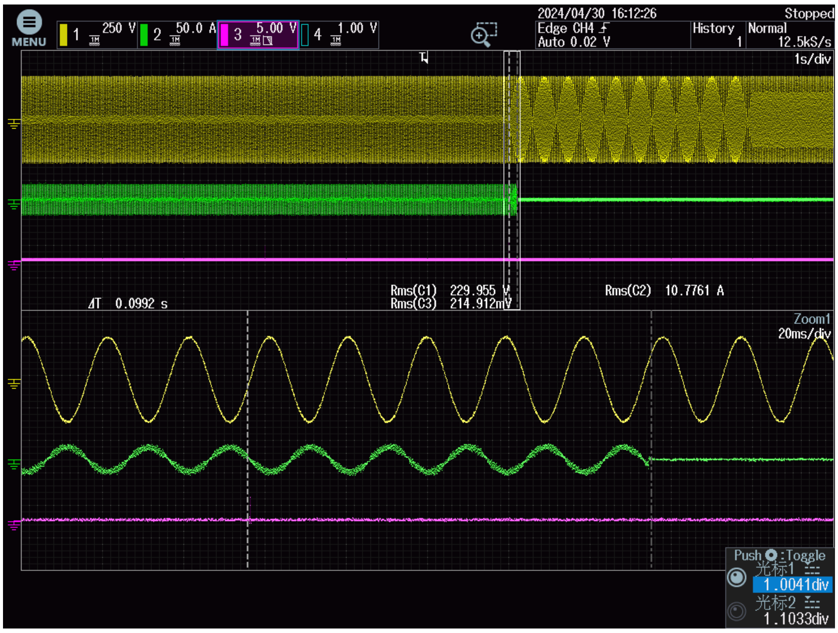
Oscilloscope 81> S2:

Test 1:



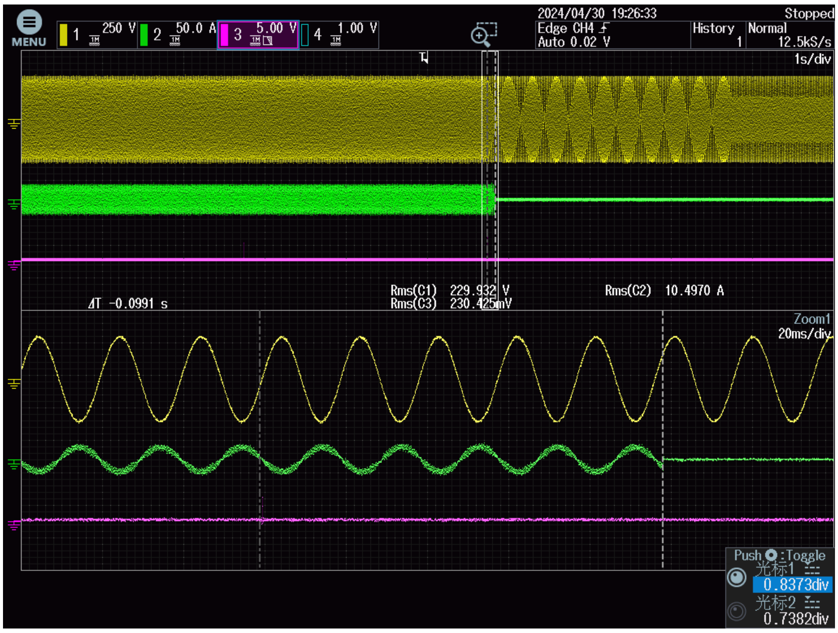
MENU
1 250 V
2 50.0 A
3 5.00 V
4 1.00 V
2024/04/28 17:46:10
Stopped
Edge CH4
Auto 0.02 V
History 1
Normal
12.5kS/s
1s/div
Zoom1
50ms/div
ΔT -0.0990 s
Rms(C1) 230.114 V
Rms(C3) 234.446mV
Rms(C2) 10.2678 A

Test 2:



MENU
1 250 V
2 50.0 A
3 5.00 V
4 1.00 V
2024/04/30 16:12:26
Stopped
Edge CH4
Auto 0.02 V
History 1
Normal
12.5kS/s
1s/div
ΔT 0.0992 s
Rms(C1) 229.955 V
Rms(C3) 214.912mV
Rms(C2) 10.7761 A
Zoom1
20ms/div
Push :Toggle
光标1
1.0041div
光标2
1.1033div

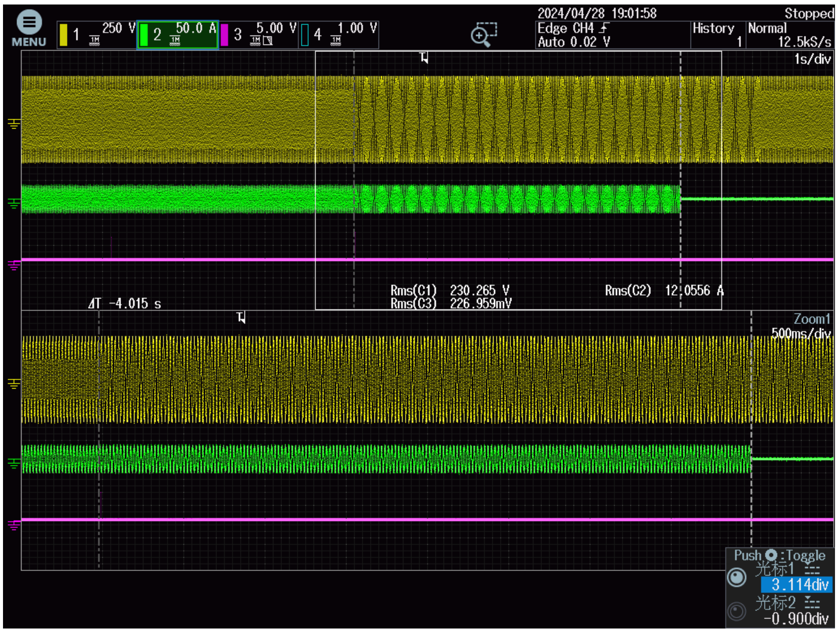
Test 3:



Test C	Modalità definitiva (Final operation mode):							
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S2	47.49	47.49	47.49	47.50	4015	4014	4016	3860 ≤ t ≤ 4140
(2):81>S2	51.50	51.50	51.50	51.50	1007	1008	1007	950≤t≤1050

Oscilloscope 81< S2:

Test 1:



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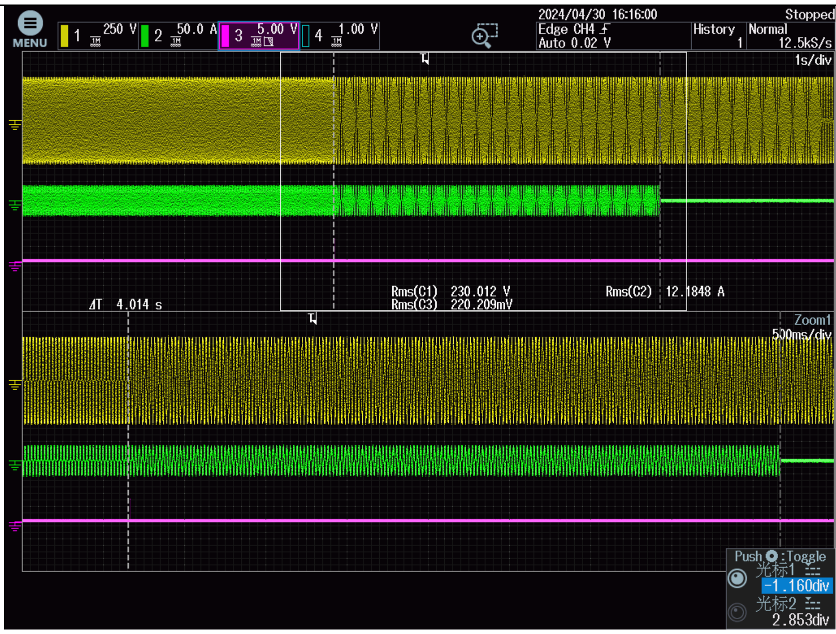
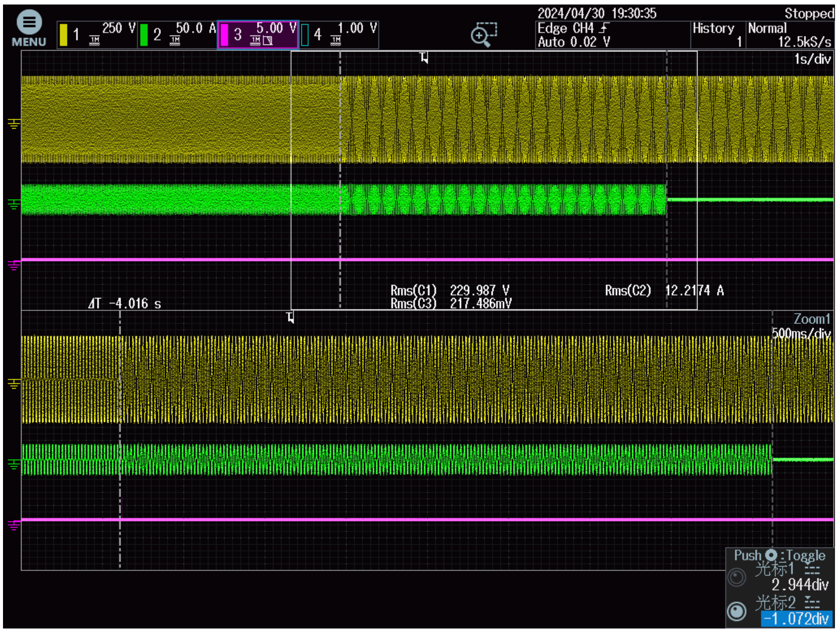


Test 3:



Oscilloscope 81> S2:

Test 1:

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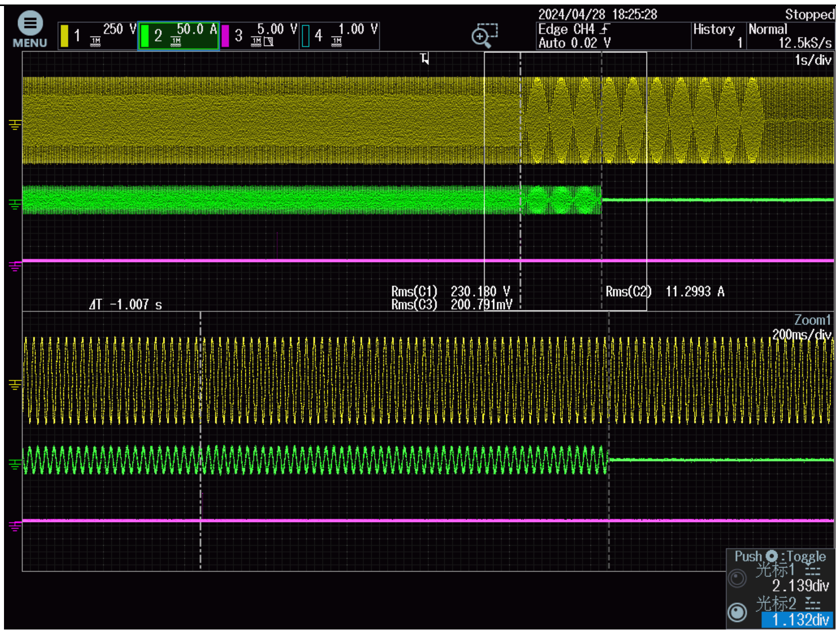
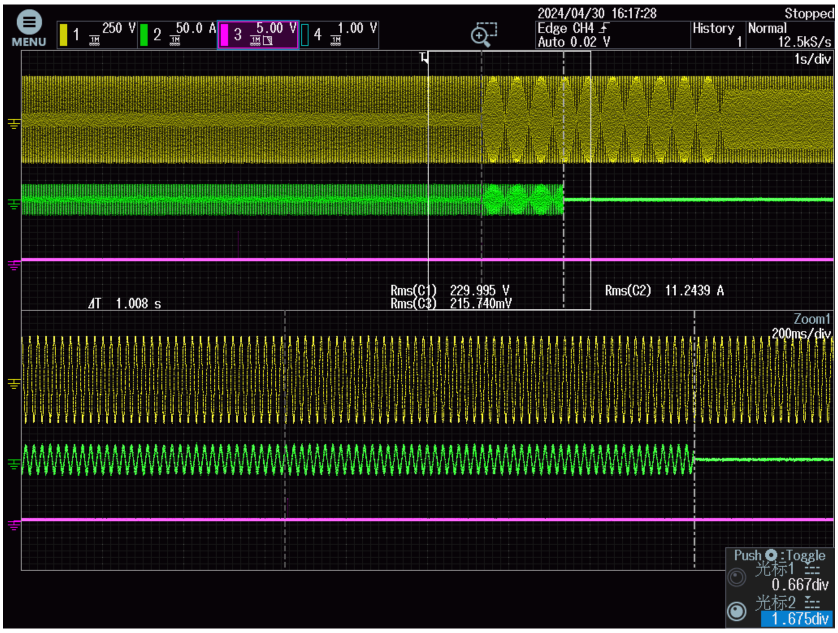
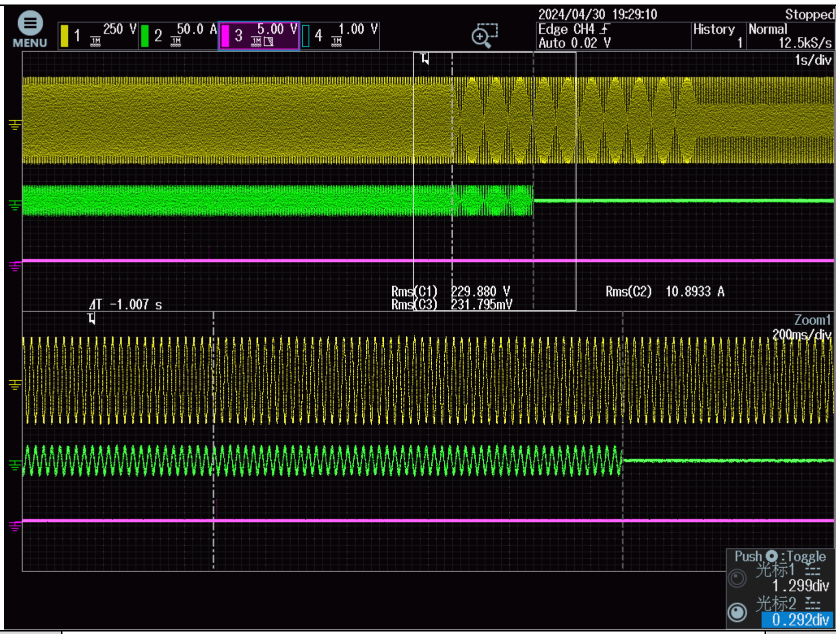

MENU
1 250 V
2 50.0 A
3 5.00 V
4 1.00 V
2024/04/28 18:25:28
Stopped
Edge CH4
Auto 0.02 V
History 1
Normal
12.5kS/s
1s/div
Rms(C1) 230.180 V
Rms(C3) 200.791mV
Rms(C2) 11.2993 A
ΔT -1.007 s
Zoom1
200ms/div
Push :Toggle
光标1
2.139div
光标2
1.132div

Test 2:

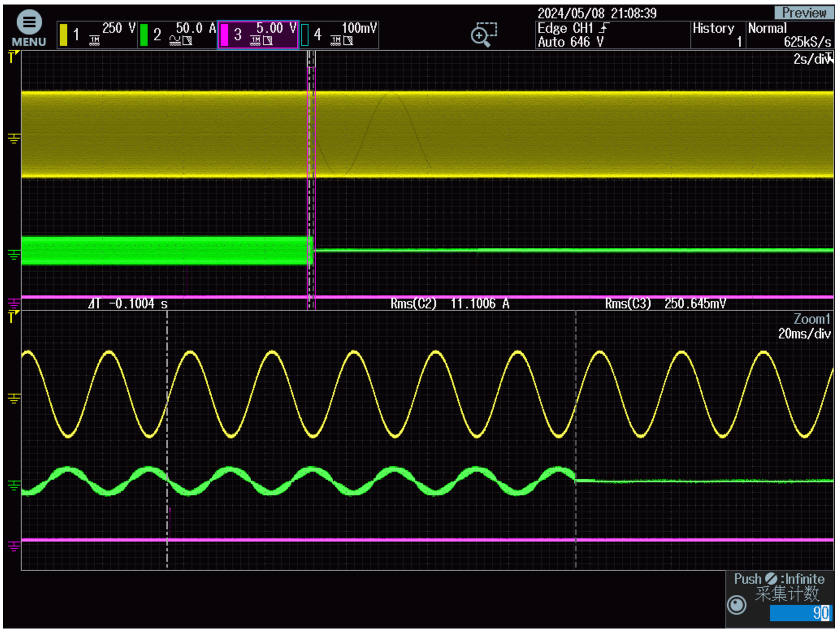

MENU
1 250 V
2 50.0 A
3 5.00 V
4 1.00 V
2024/04/30 16:17:28
Stopped
Edge CH4
Auto 0.02 V
History 1
Normal
12.5kS/s
1s/div
Rms(C1) 229.995 V
Rms(C3) 215.740mV
Rms(C2) 11.2439 A
ΔT 1.008 s
Zoom1
200ms/div
Push :Toggle
光标1
0.667div
光标2
1.675div

Test 3:



Tested condition:	-30°C (cold) while the equipment is not powered(16h).						**Model**	X1-H6K-S
Test A	Modalità Transitoria (Transient operation mode):							
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S1	49.80	49.80	49.80	49.80	100	101	101	77 ≤ t ≤ 123
(2):81>S1	50.20	50.20	50.20	50.20	100	100	101	77 ≤ t ≤ 123

Oscilloscope 81< S1:
Test 1:



Test 2:

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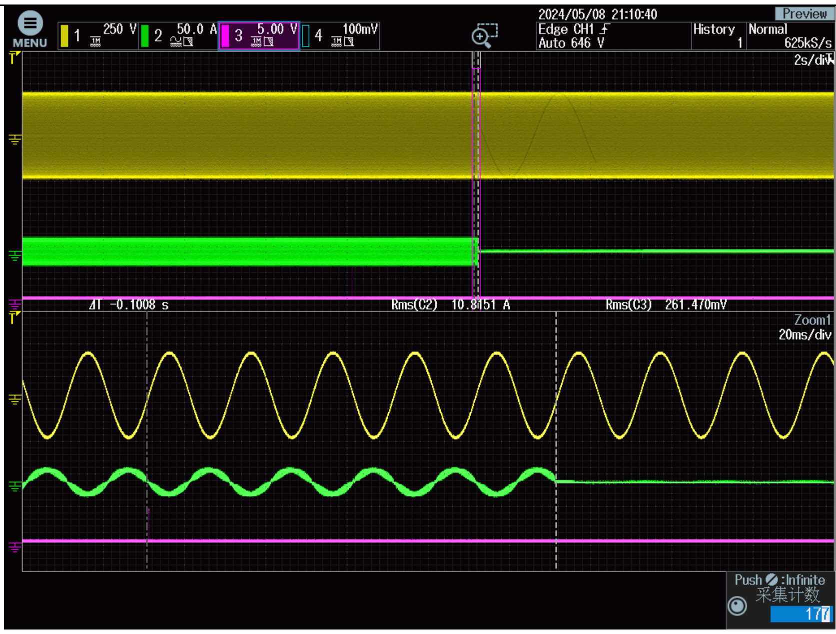
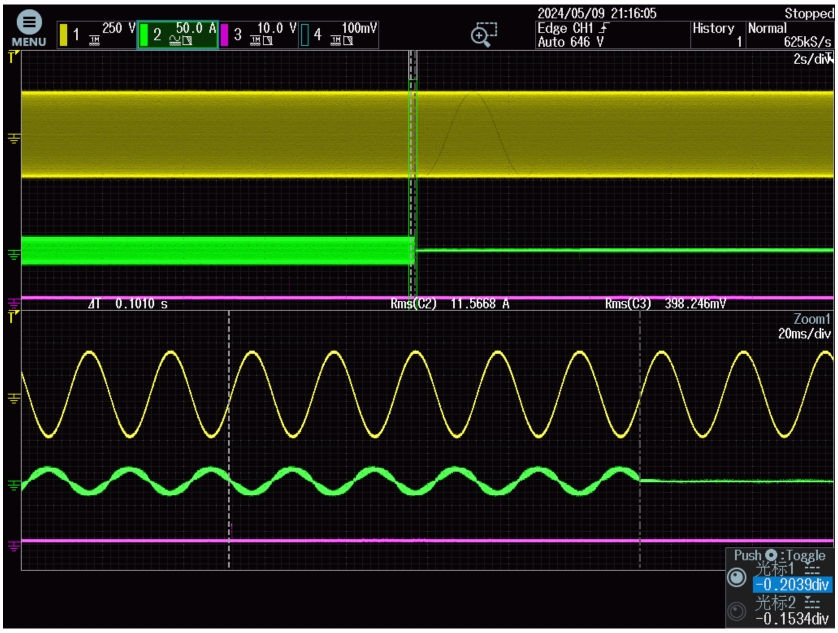


Test 3:



Oscilloscope 81> S1:

Test 1:

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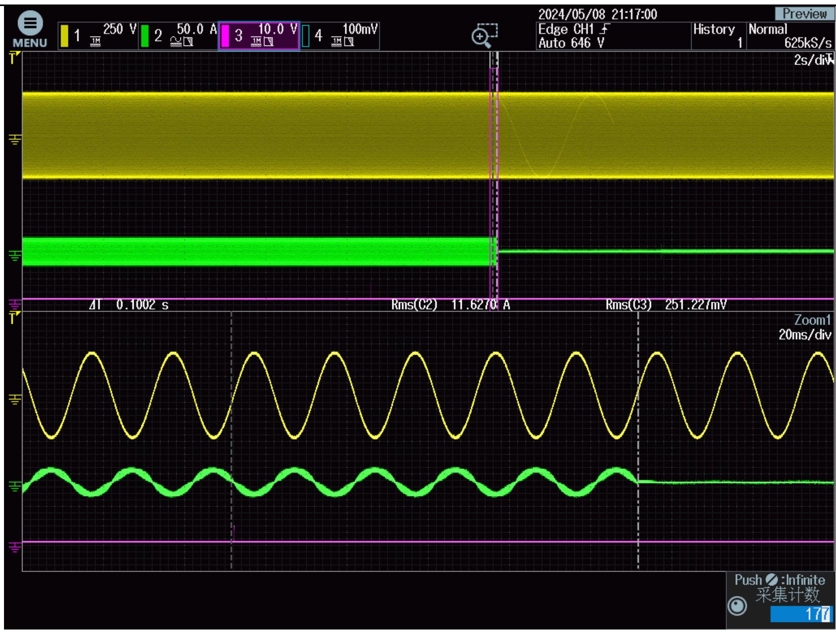
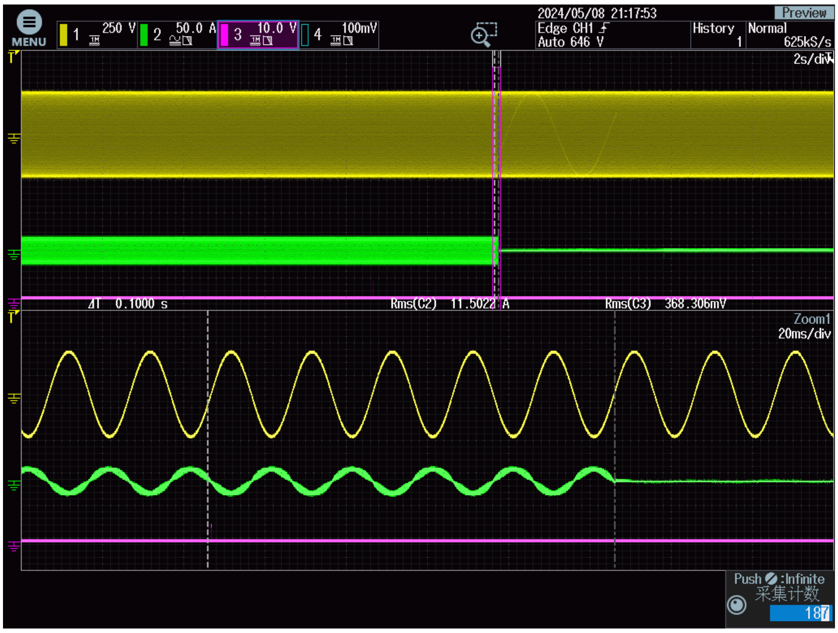

MENU
1 250 V
2 50.0 A
3 10.0 V
4 100mV
2024/05/08 21:17:00
Edge CH1
Auto 646 V
History 1
Normal
625kS/s
Preview
2s/div
ΔT 0.1002 s
Rms(C2) 11.6270 A
Rms(C3) 251.227mV
Zoom1
20ms/div
Push :Infinite
采集计数
177

Test 2:

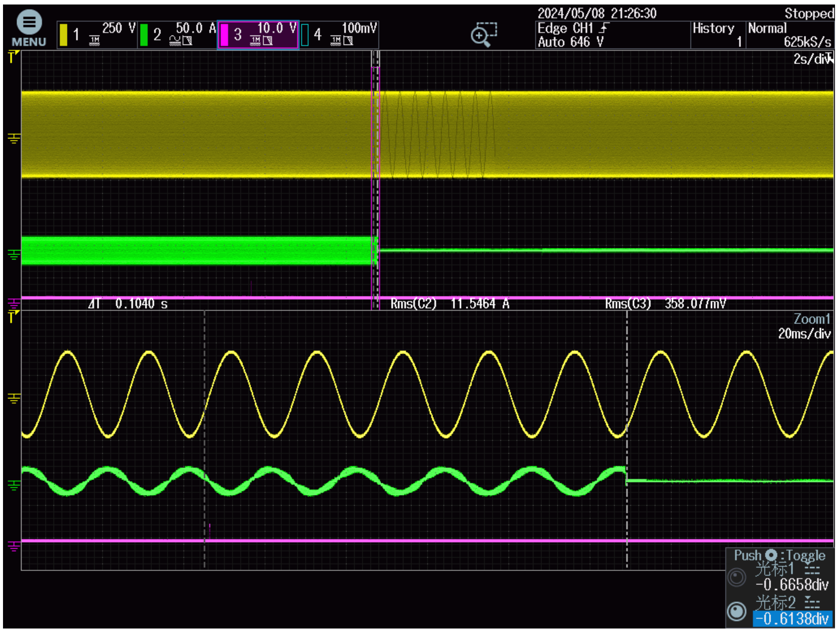

MENU
1 250 V
2 50.0 A
3 10.0 V
4 100mV
2024/05/08 21:17:53
Edge CH1
Auto 646 V
History 1
Normal
625kS/s
Preview
2s/div
ΔT 0.1000 s
Rms(C2) 11.5022 A
Rms(C3) 368.306mV
Zoom1
20ms/div
Push :Infinite
采集计数
187

Test 3:

Test B	Modalità Transitoria (Transient operation mode):							
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S2	47.50	47.50	47.50	47.50	104	103	102	77 ≤ t ≤ 123
(2):81>S2	51.50	51.50	51.50	51.50	100	99	99	77 ≤ t ≤ 123

Oscilloscope 81< S2:

Test 1:



Test 2:

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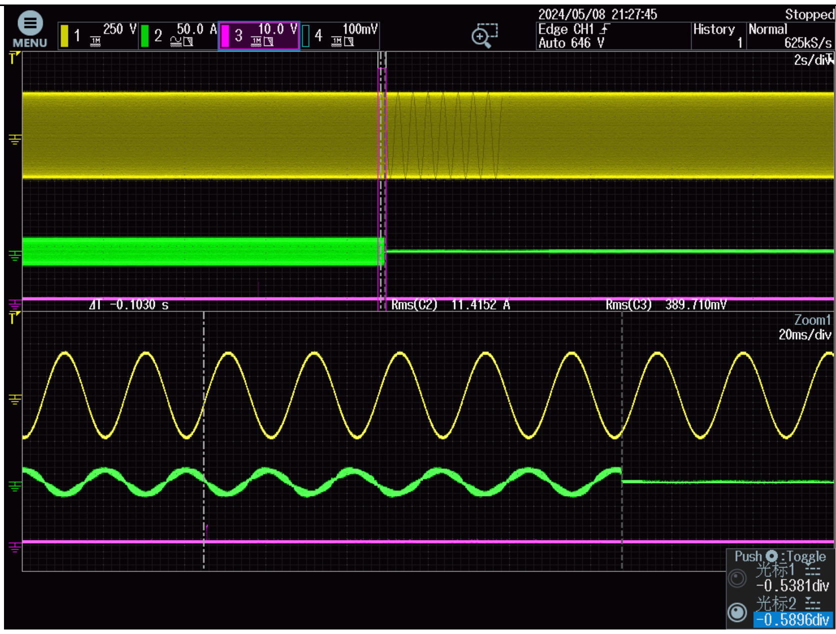

Test 3:

Oscilloscope 81> S2:

Test 1:

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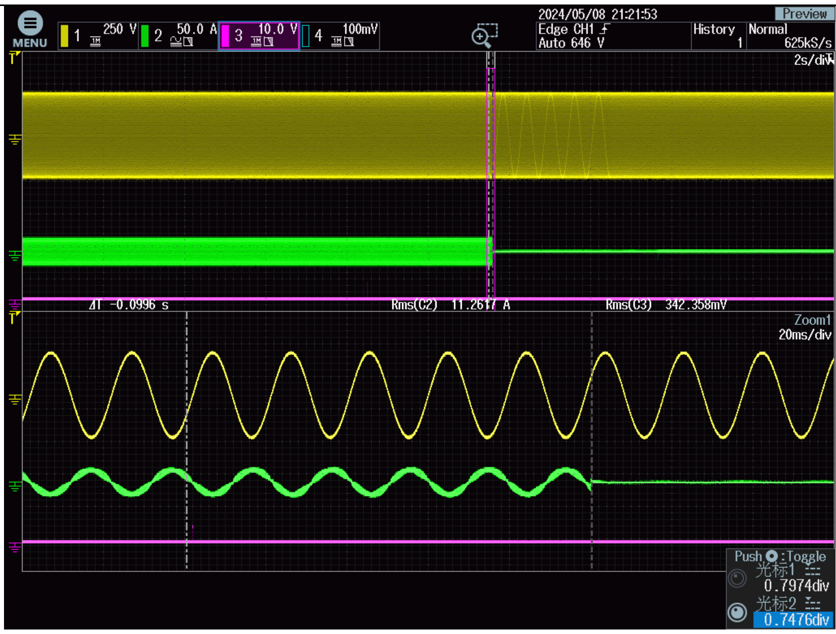
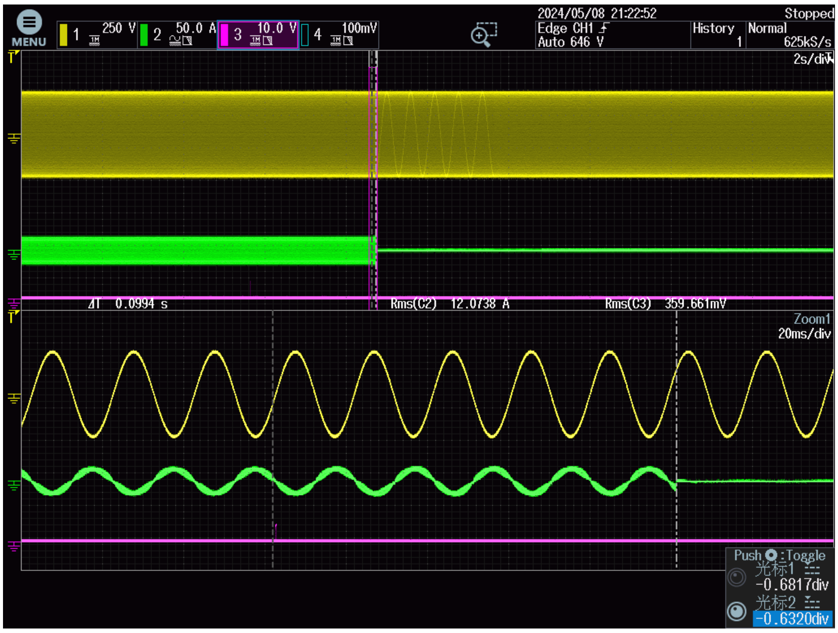


Test 2:



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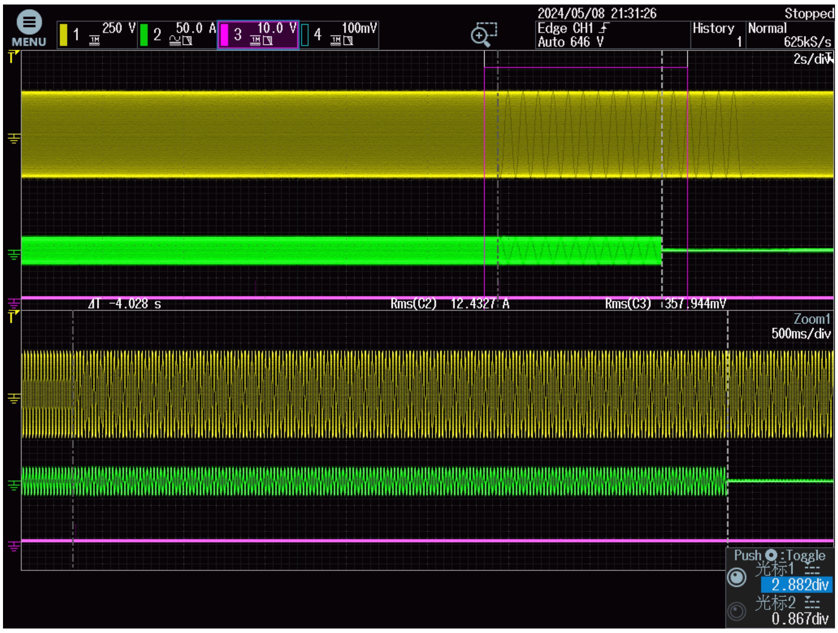
Test C	Modalità definitiva (Final operation mode):							
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S2	47.49	47.49	47.49	47.50	4028	4030	4032	3860 ≤ t ≤ 4140
(2):81>S2	51.50	51.50	51.50	51.50	1008	1006	1006	950≤t≤1050

Oscilloscope 81< S2:
Test 1:



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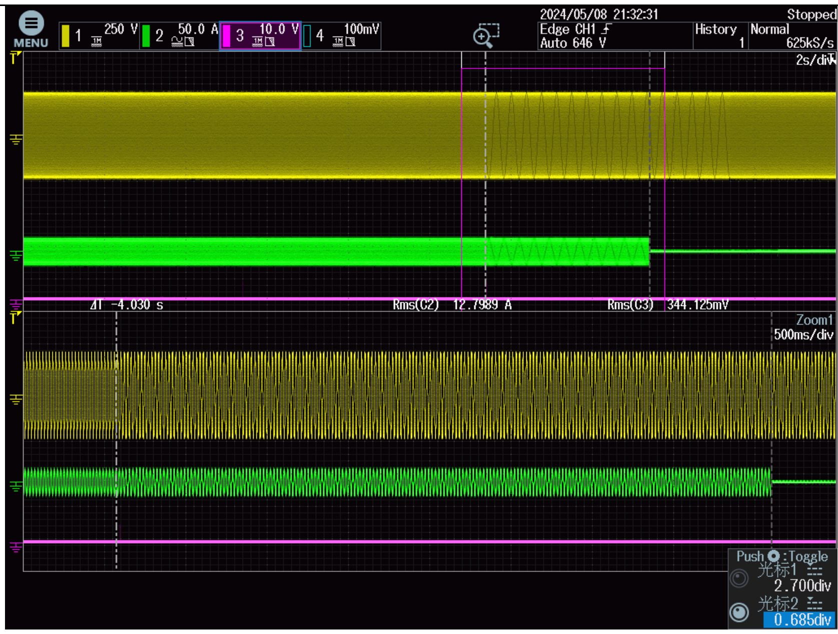
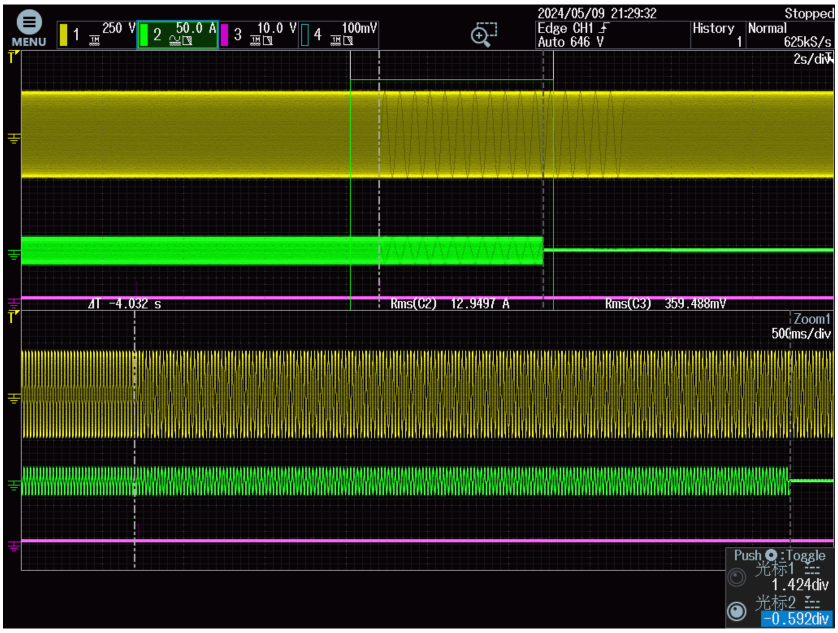


Test 3:



Oscilloscope 81> S2:

Test 1:

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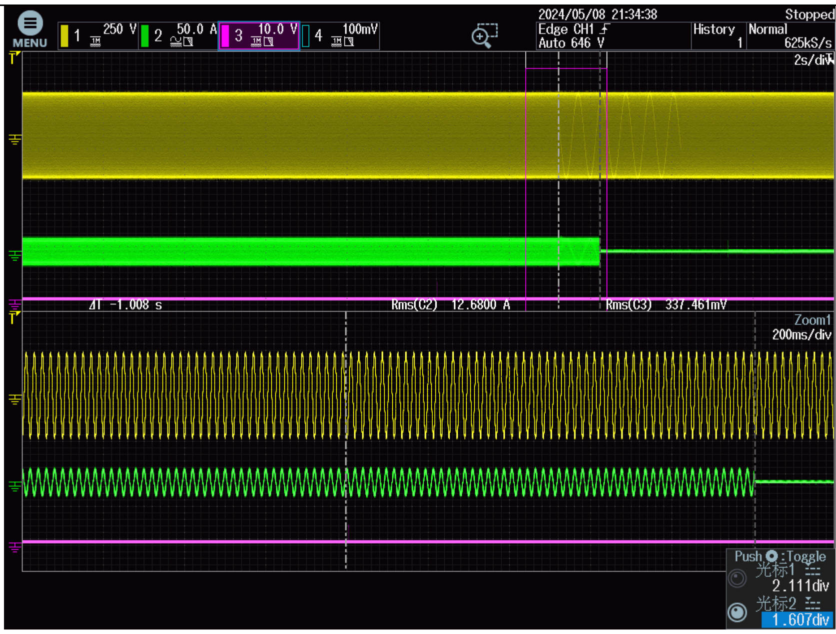
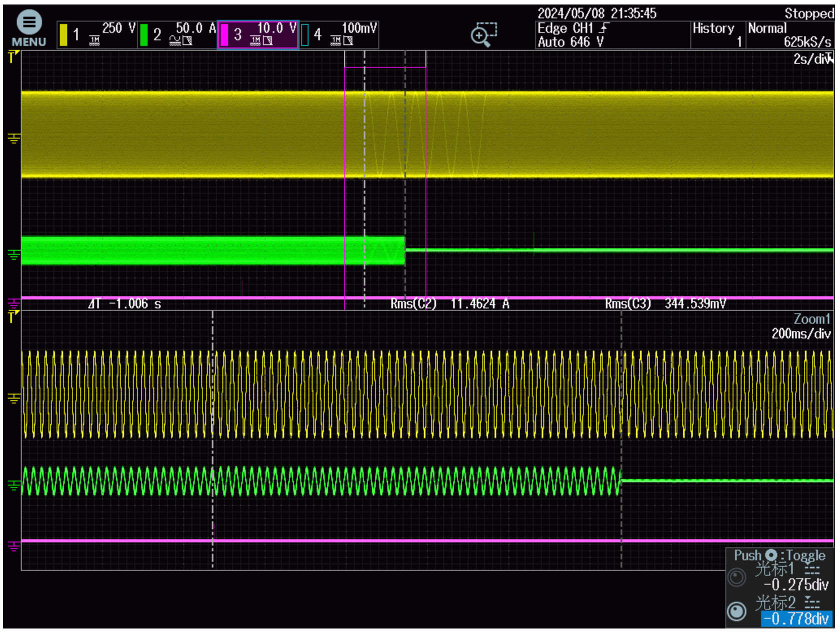
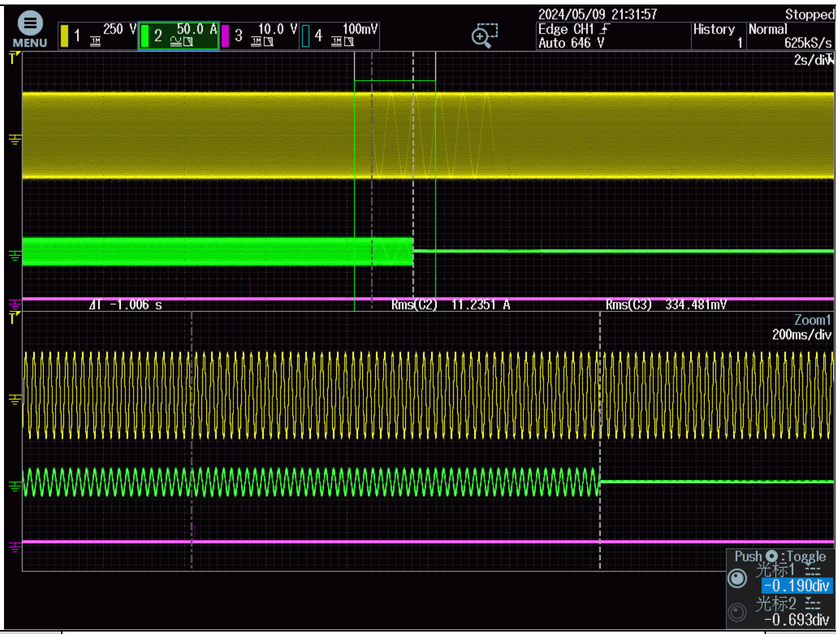
Test 2:


MENU
1 250 V
2 50.0 A
3 10.0 V
4 100mV
2024/05/08 21:34:38
Stopped
Edge CH1
Auto 646 V
History 1
Normal
625kS/s
2s/div
ΔT -1.008 s
Rms(C2) 12.6800 A
Rms(C3) 337.461mV
Zoom1
200ms/div
Push :Toggle
光标1
2.111div
光标2
1.607div

Test 3:


MENU
1 250 V
2 50.0 A
3 10.0 V
4 100mV
2024/05/08 21:35:45
Stopped
Edge CH1
Auto 646 V
History 1
Normal
625kS/s
2s/div
ΔT -1.006 s
Rms(C2) 11.4624 A
Rms(C3) 344.539mV
Zoom1
200ms/div
Push :Toggle
光标1
-0.275div
光标2
-0.778div



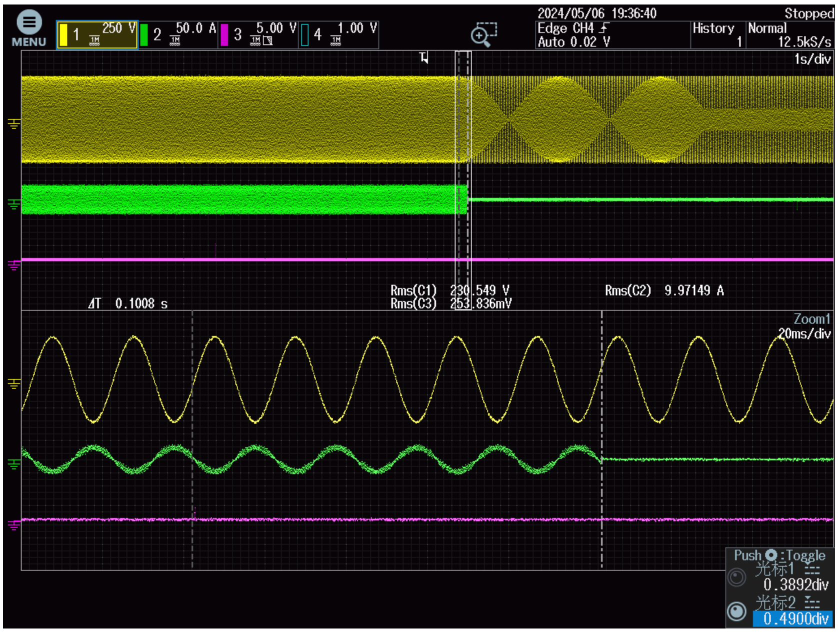
Tested condition:	60°C (Dry hot) while the equipment is powered.(16h).	Model	X1-H6K-S

Test A	Modalità Transitoria (Transient operation mode):

Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S1	49.80	49.80	49.80	49.80	101	100	101	77 ≤ t ≤ 123
(2):81>S1	50.20	50.20	50.20	50.20	100	100	100	77 ≤ t ≤ 123

Oscilloscope 81< S1:

Test 1:



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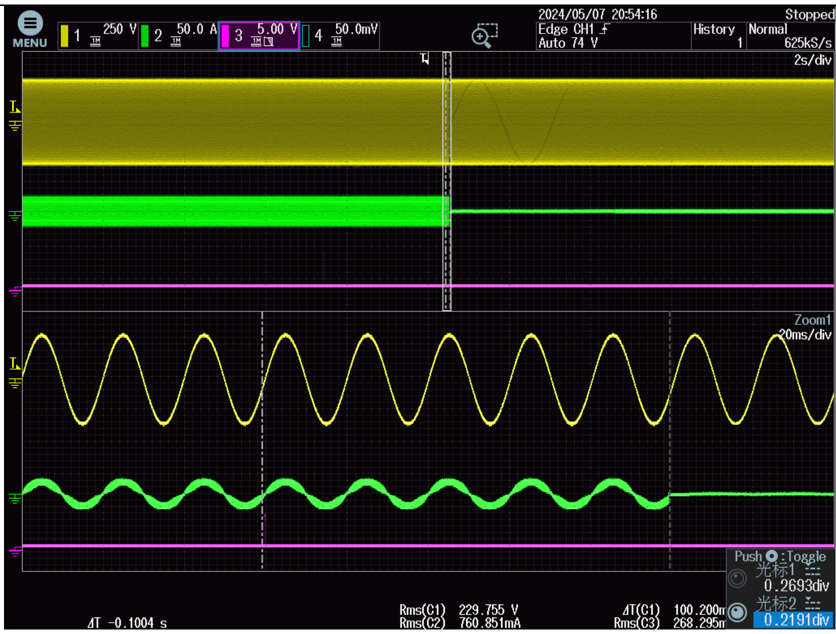
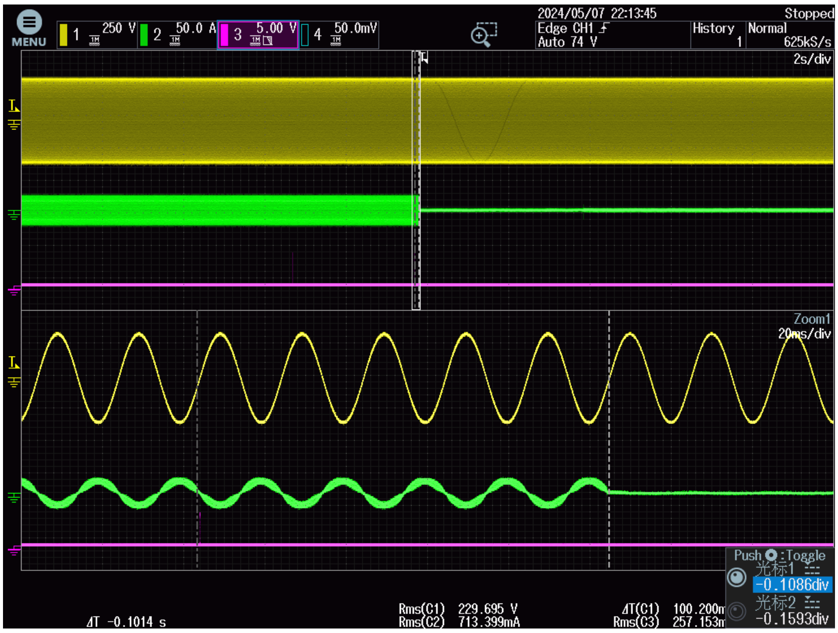


Test 3:



Oscilloscope 81> S1:

Test 1:

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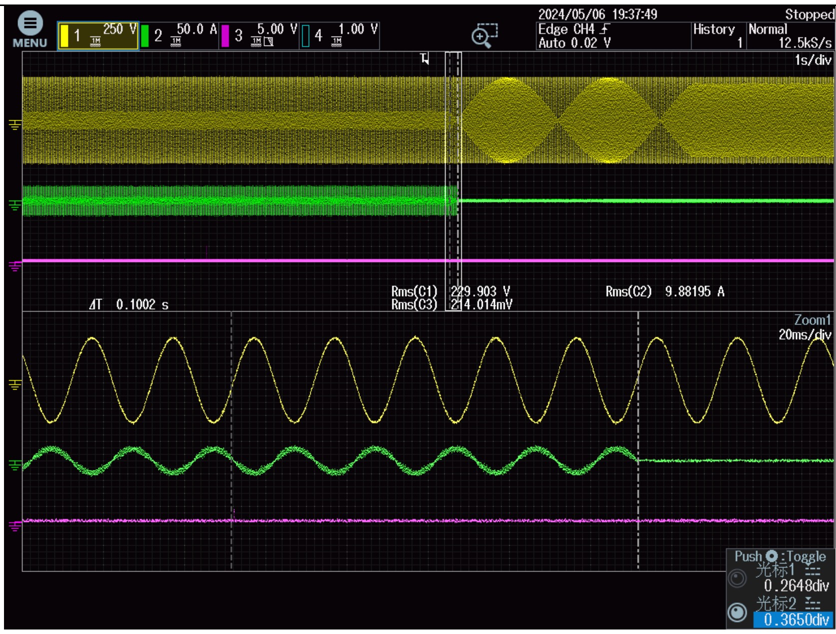

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Test 3:

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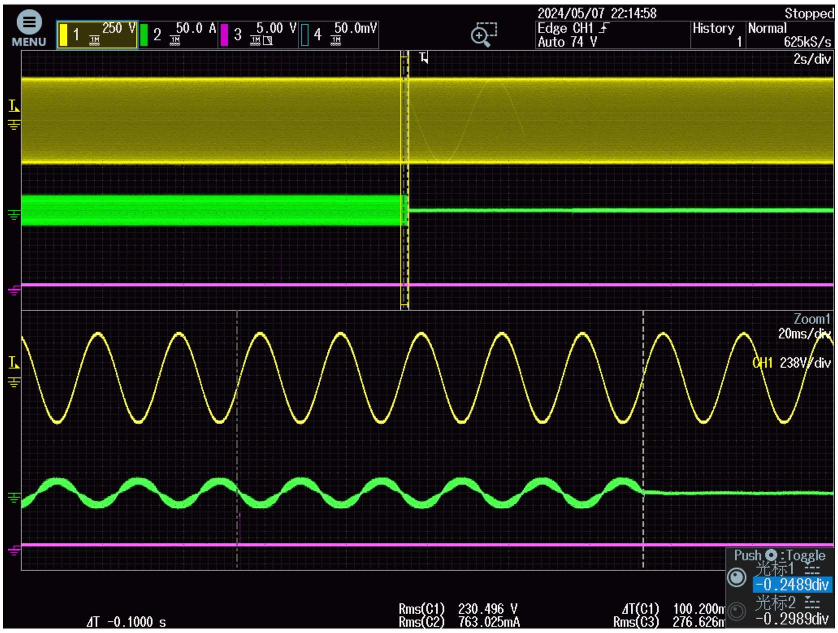
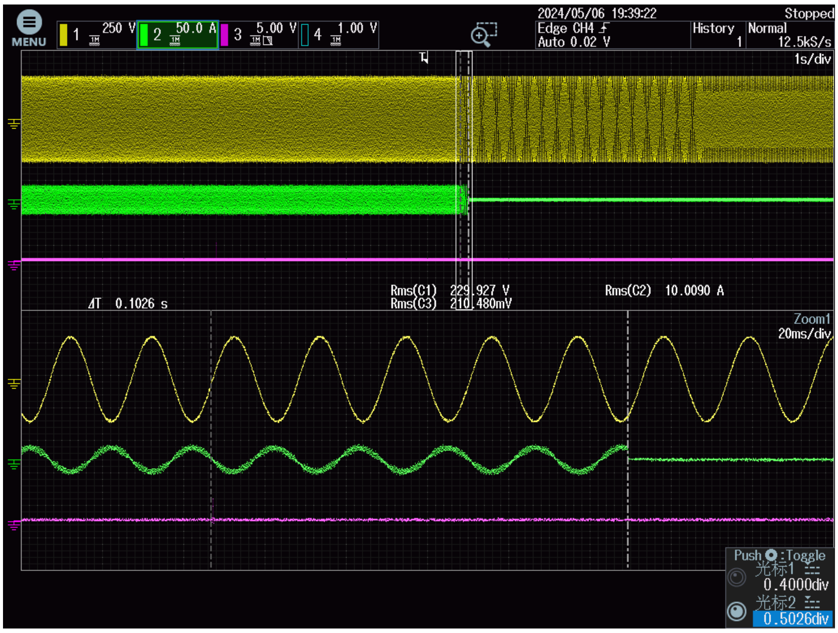


Test B	Modalità Transitoria (Transient operation mode):							
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S2	47.50	47.50	47.50	47.50	103	102	102	77 ≤ t ≤ 123
(2):81>S2	51.50	51.50	51.50	51.50	99	100	99	77 ≤ t ≤ 123

Oscilloscope 81< S2:
Test 1:



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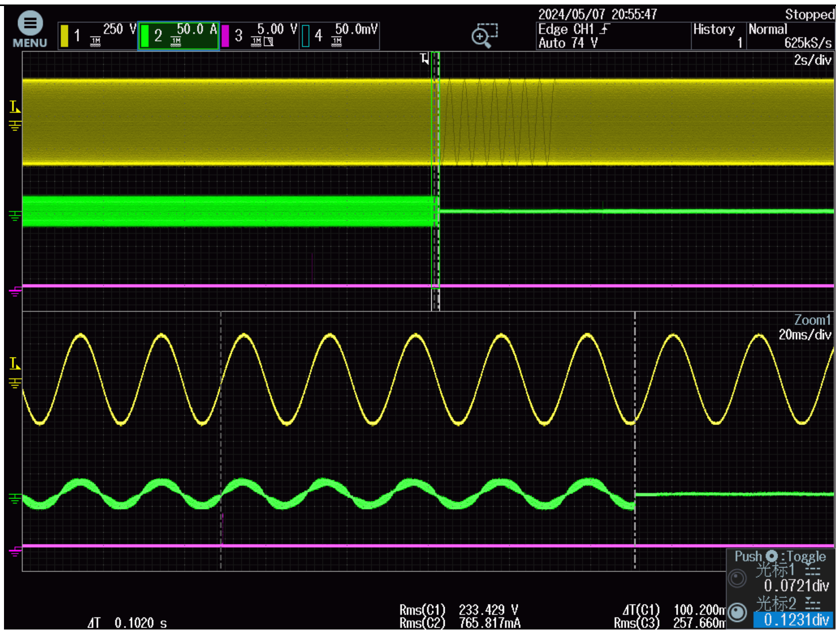
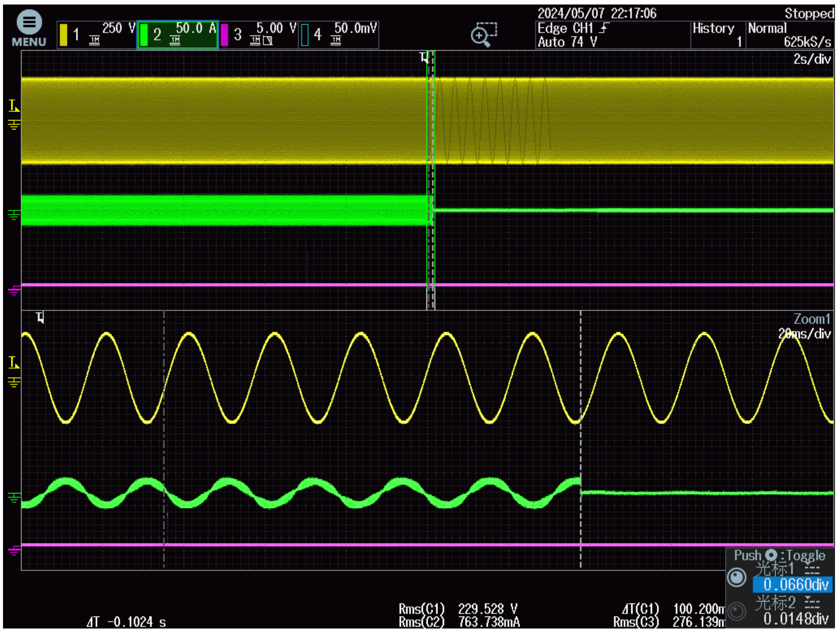


Test 3:



Oscilloscope 81> S2:

Test 1:

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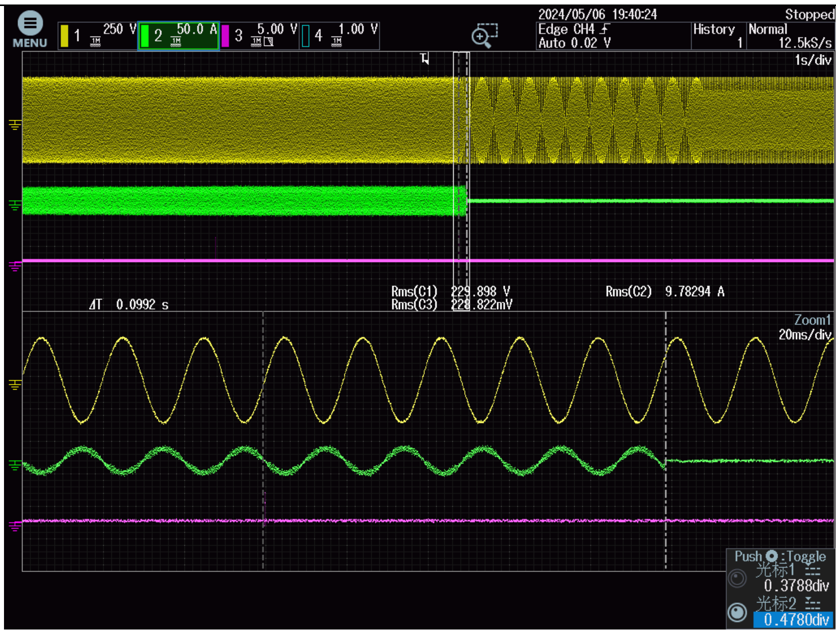
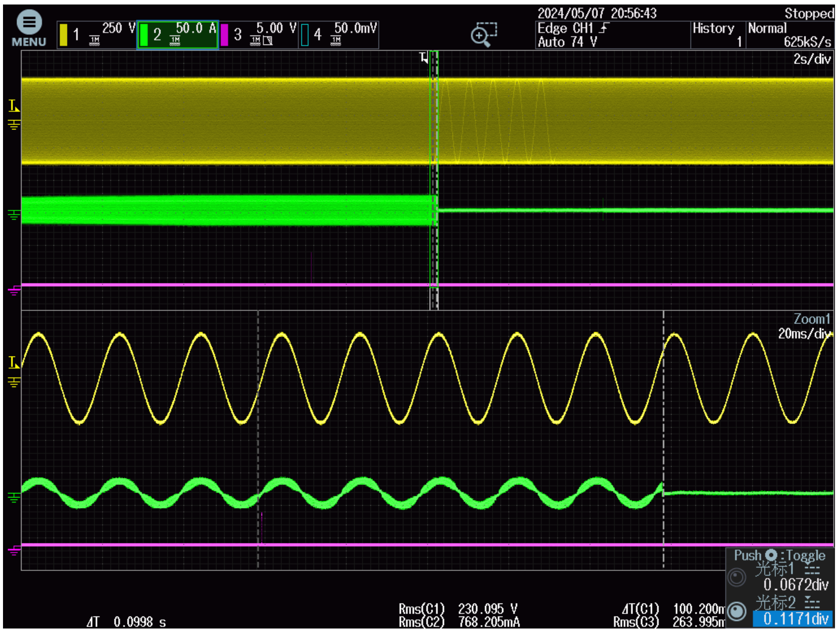


Test 2:



Test 3:

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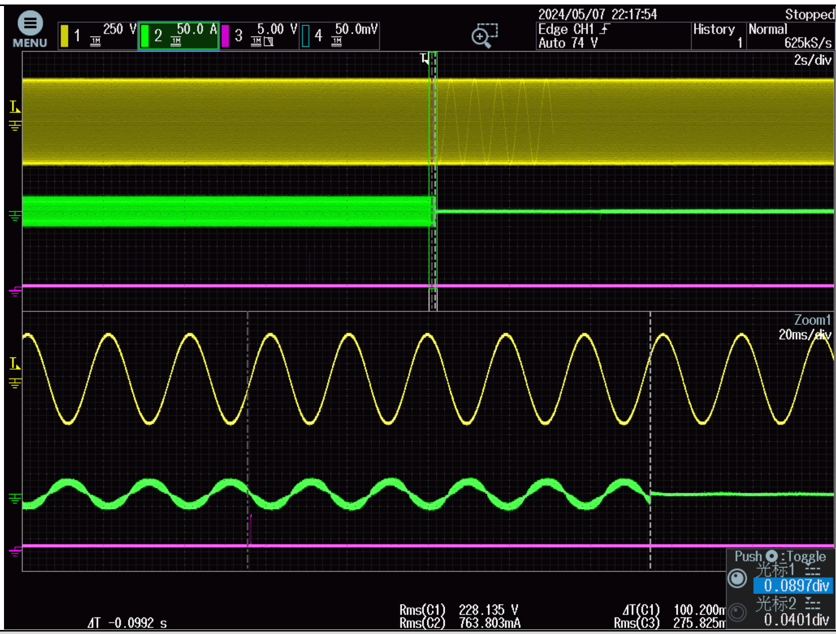
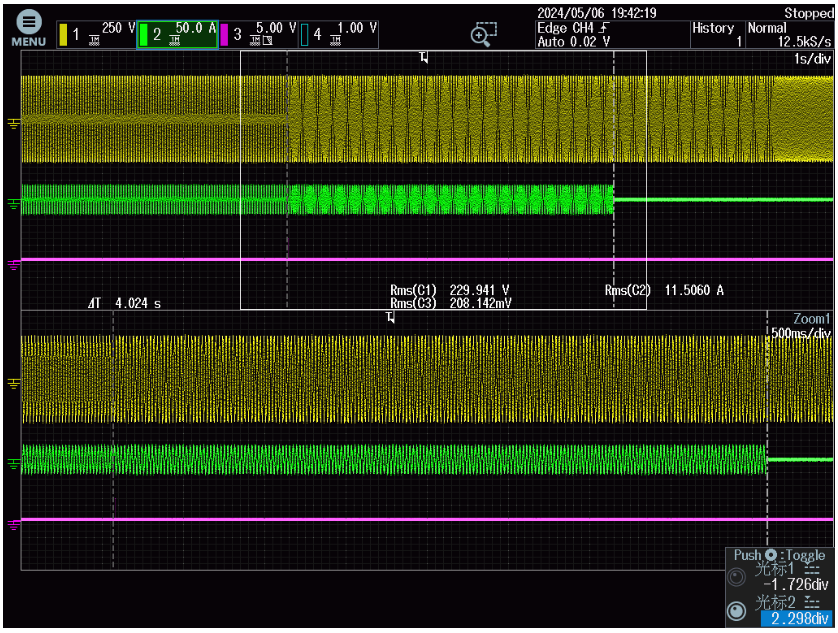


Test C	Modalità definitiva (Final operation mode):							
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S2	47.49	47.49	47.49	47.50	4024	4020	4020	3860 ≤ t ≤ 4140
(2):81>S2	51.50	51.50	51.51	51.50	1006	1008	1008	950≤t≤1050

Oscilloscope 81< S2:

Test 1:



Test 2:

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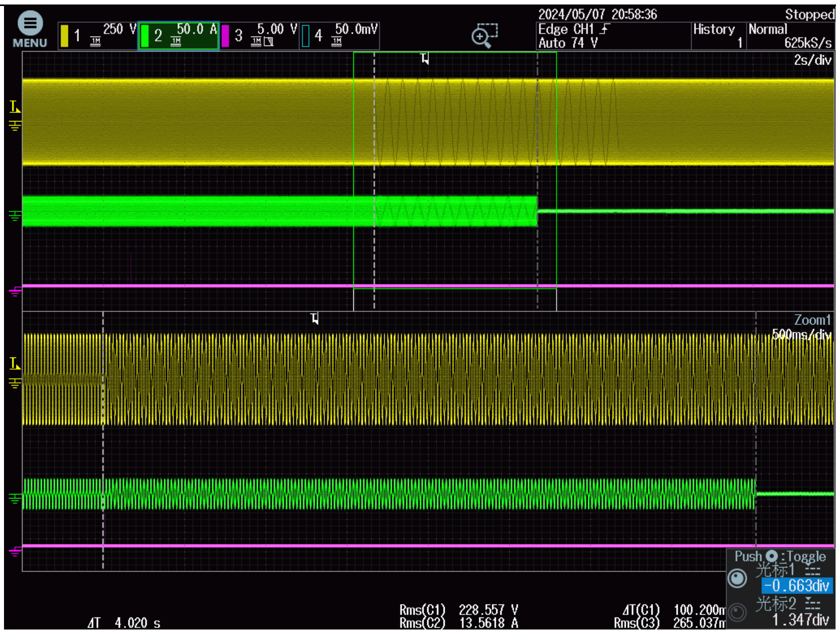
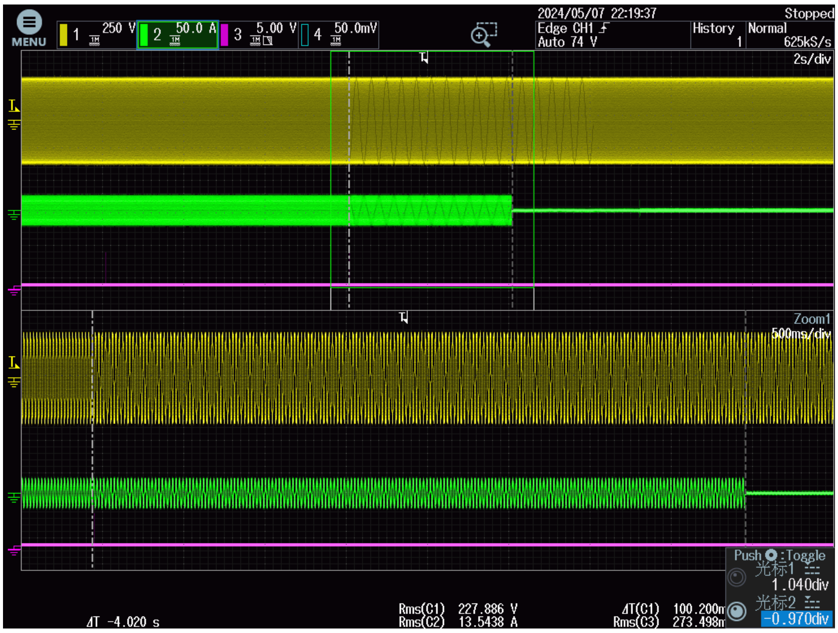


Test 3:



Oscilloscope 81> S2:

Test 1:

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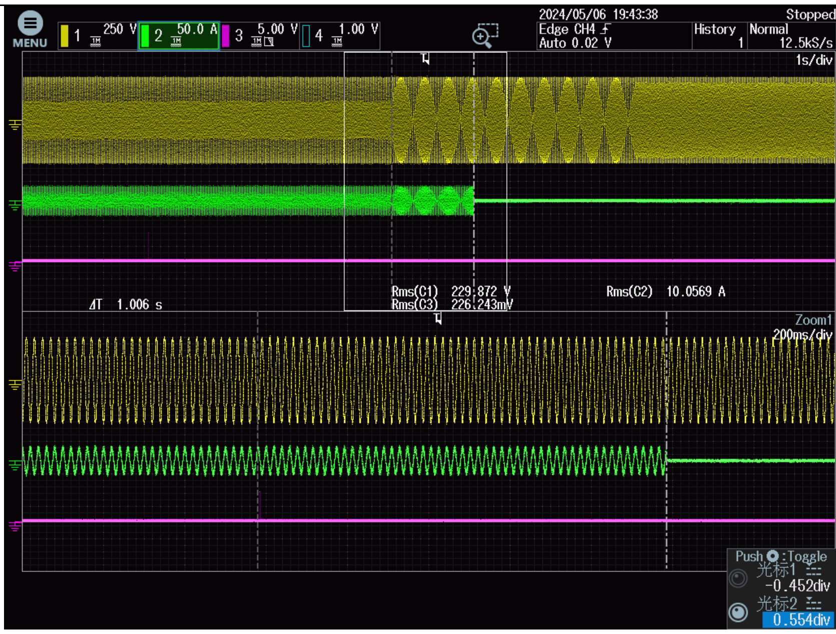
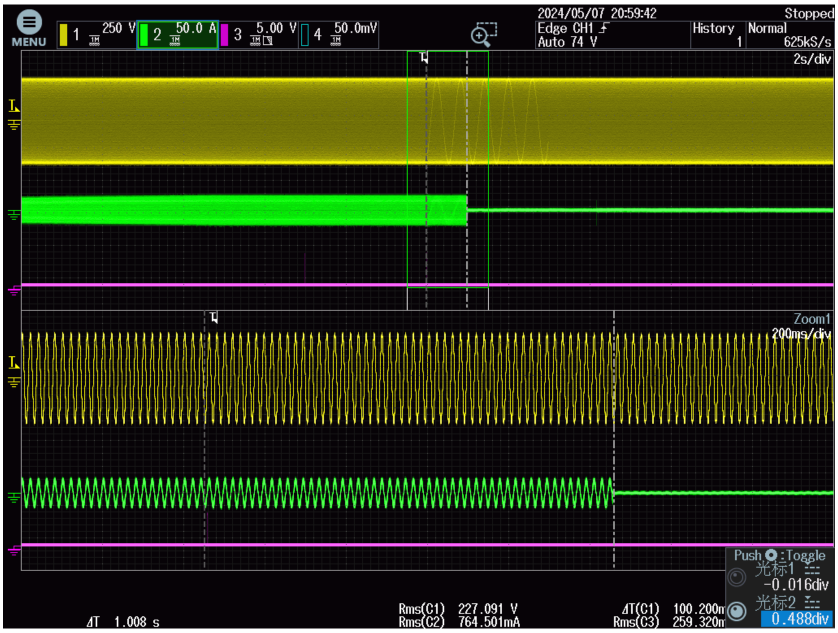


Test 2:



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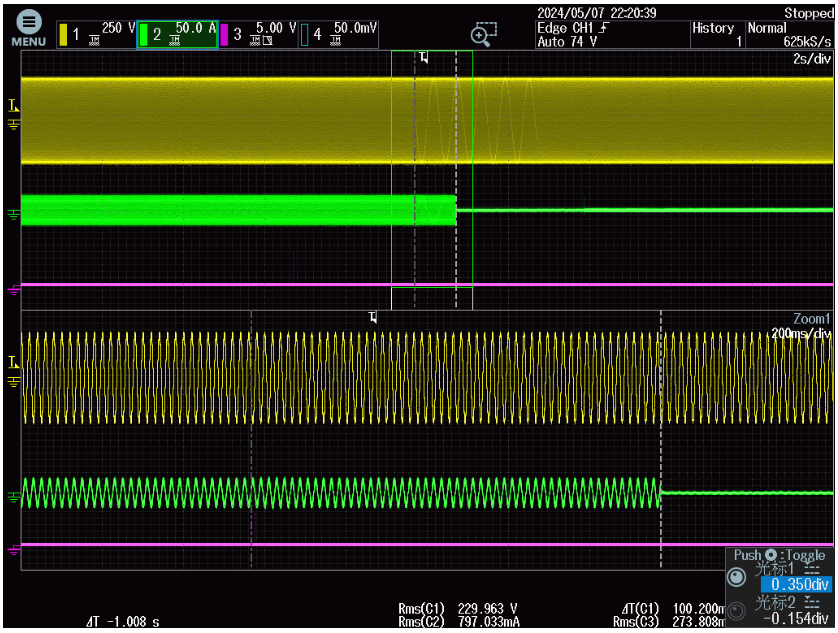

Tested condition:	70°C (Dry hot) while the equipment is not powered.(16h).						**Model**	X1-H6K-S
Test A	Modalità Transitoria (Transient operation mode):							
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S1	49.80	49.80	49.80	49.80	101	101	101	77 ≤ t ≤ 123
(2):81>S1	50.20	50.19	50.20	50.20	100	100	101	77 ≤ t ≤ 123

Oscilloscope 81< S1:

Test 1:

Test 2:

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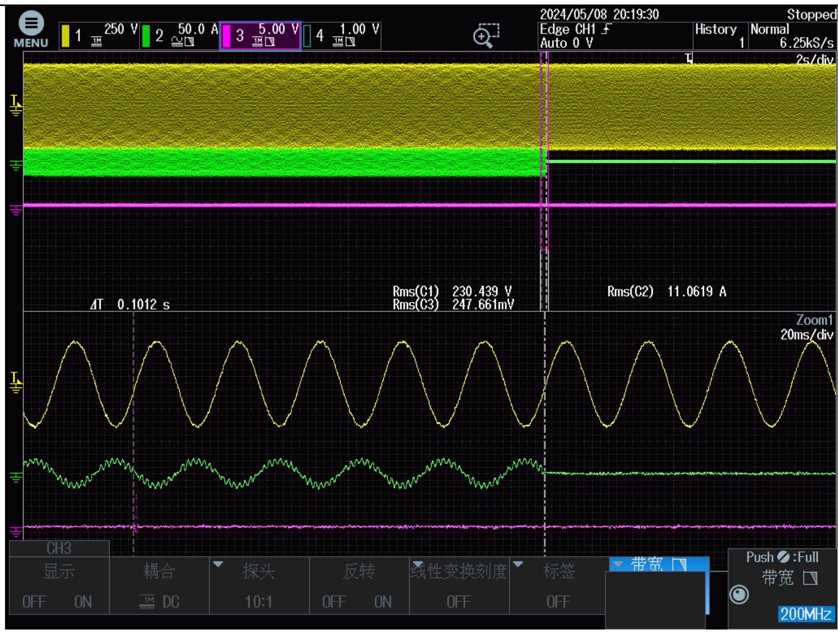


Test 3:

Oscilloscope 81> S1:

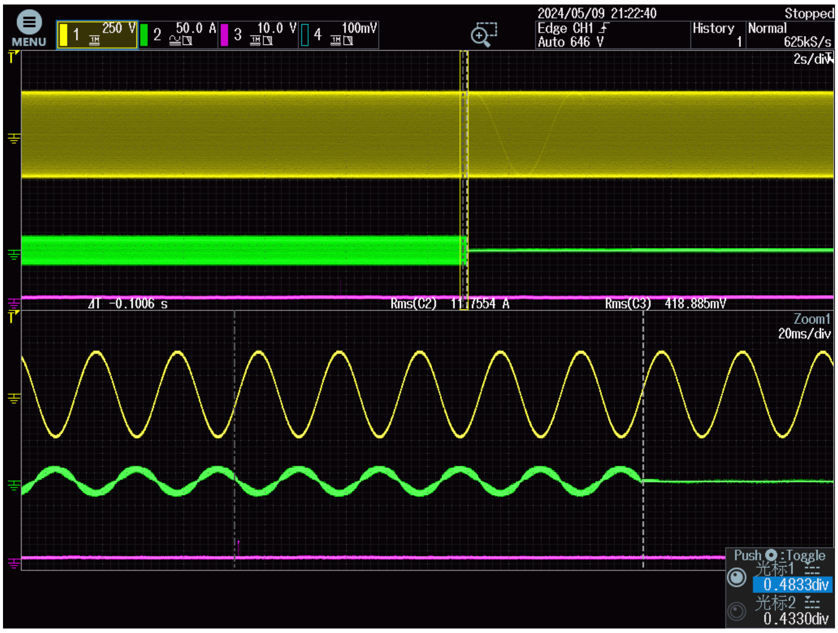
Test 1:


2024/05/08 20:24:39
Stopped
Edge CH1
Auto 0 V
History
Normal
6.25kS/s
2s/div
ΔT 0.1000 s
Rms(C1) 229.726 V
Rms(C3) 237.618mV
Rms(C2) 12.2342 A
Zoom1
20ms/div
Push :0.00V
偏置
0.00V

Test 2:


2024/05/08 20:28:36
Stopped
Edge CH1
Auto 0 V
History
Normal
6.25kS/s
2s/div
ΔT 0.1004 s
Rms(C1) 229.664 V
Rms(C3) 234.517mV
Rms(C2) 12.2356 A
Zoom1
20ms/div
Push :0.00V
偏置
0.00V

Test 3:



Test B	Modalità Transitoria (Transient operation mode):							
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S2	47.50	47.50	47.50	47.50	102	102	103	77 ≤ t ≤ 123
(2):81>S2	51.50	51.50	51.50	51.50	99	99	99	77 ≤ t ≤ 123

Oscilloscope 81< S2:

Test 1:

Test 2:

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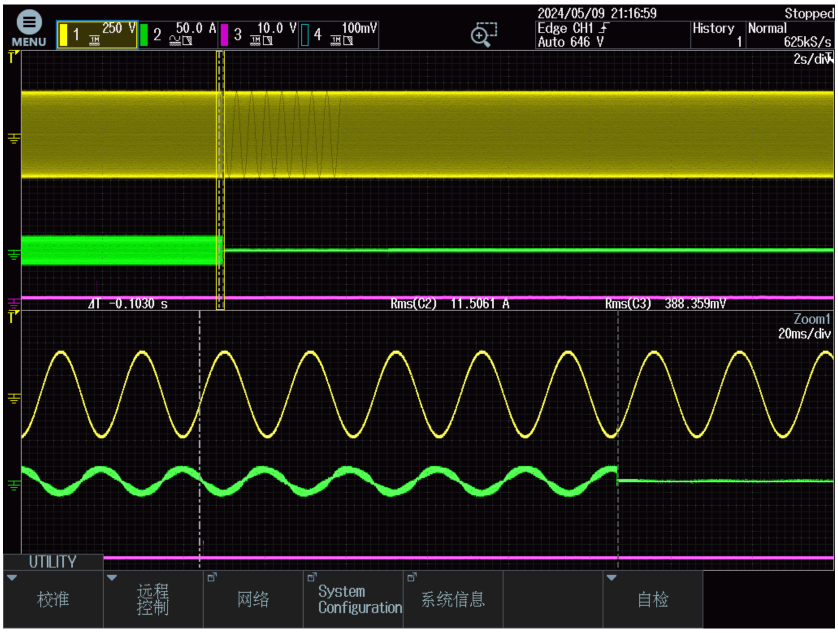
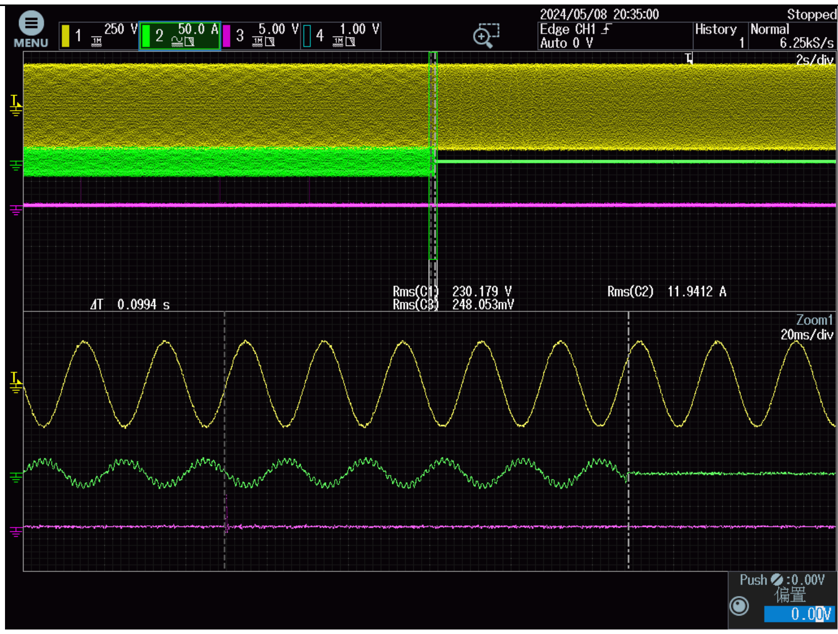
Test 3:



Oscilloscope 81> S2:

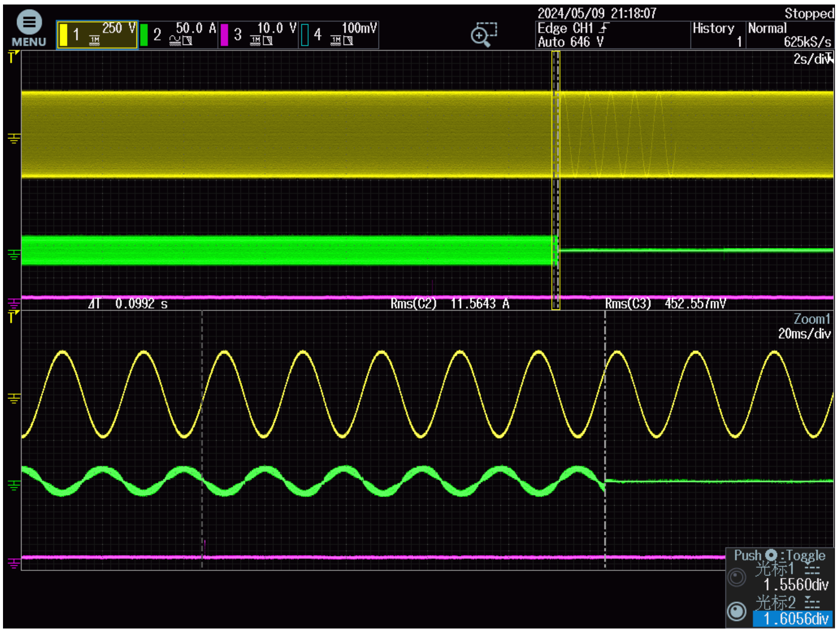
Test 1:


MENU
1 250 V
2 50.0 A
3 5.00 V
4 1.00 V
2024/05/08 20:35:00
Stopped
Edge CH1
Auto 0 V
History 1
Normal
6.25kS/s
2s/div
ΔT 0.0994 s
Rms(C1) 230.179 V
Rms(C3) 248.053mV
Rms(C2) 11.9412 A
Zoom1
20ms/div
Push :0.00V
偏置
0.00V

Test 2:


MENU
1 250 V
2 50.0 A
3 5.00 V
4 1.00 V
2024/05/08 20:36:52
Stopped
Edge CH1
Auto 0 V
History 1
Normal
6.25kS/s
2s/div
ΔT -0.0990 s
Rms(C1) 232.000 V
Rms(C3) 236.763mV
Rms(C2) 11.9230 A
Zoom1
20ms/div
Push :0.00V
偏置
0.00V

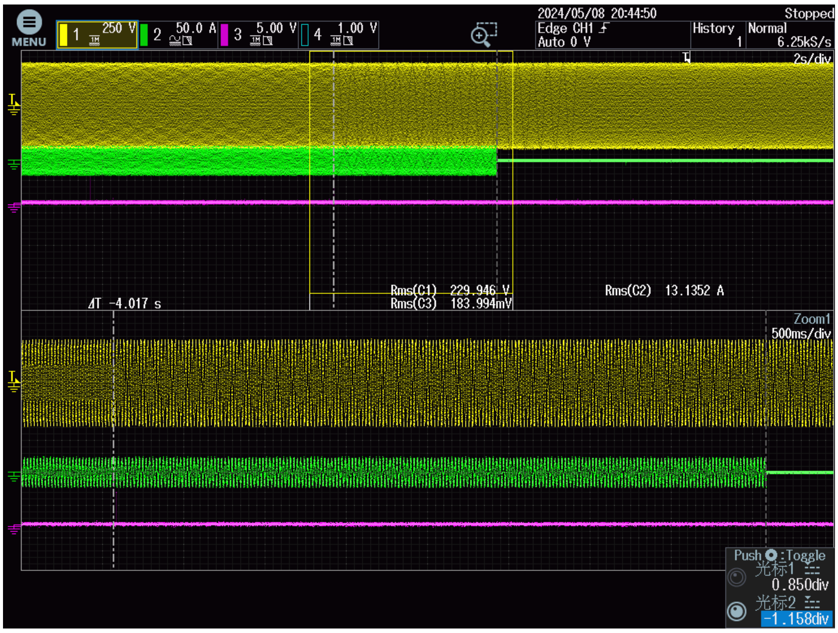
Test 3:



Test C	Modalità definitiva (Final operation mode):							
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S2	47.49	47.49	47.49	47.50	4017	4015	4018	3860 ≤ t ≤ 4140
(2):81>S2	51.50	51.50	51.50	51.50	1005	1005	1006	950≤t≤1050

Oscilloscope 81< S2:

Test 1:



Test 2:

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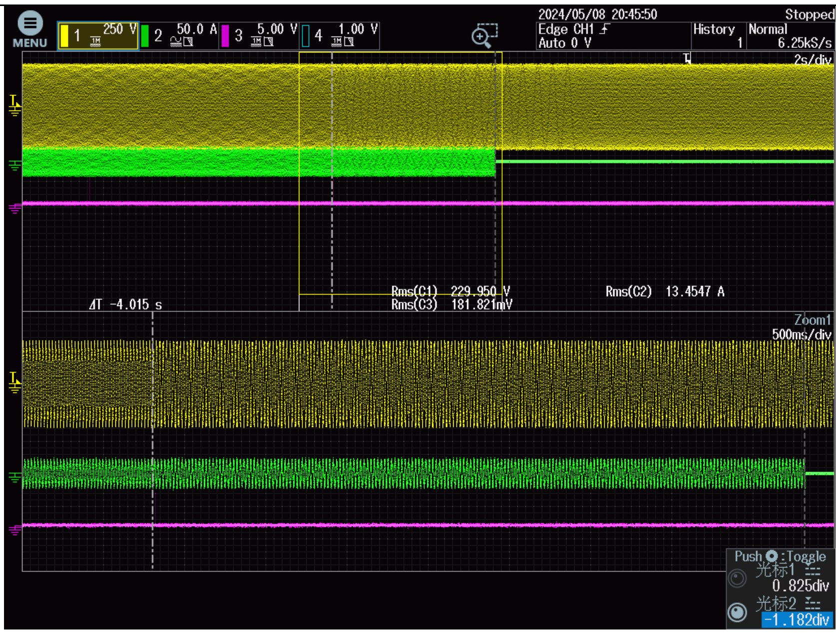
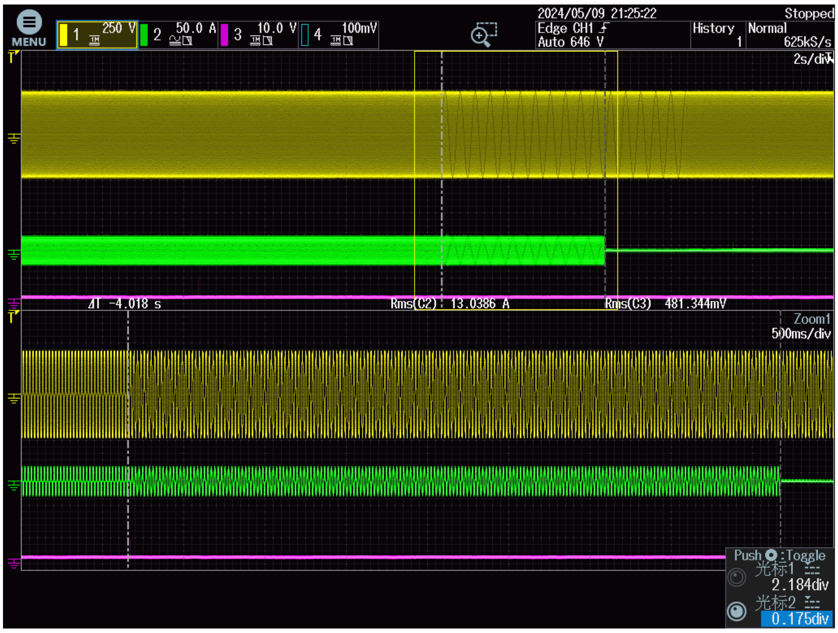


Test 3:



Oscilloscope 81> S2:

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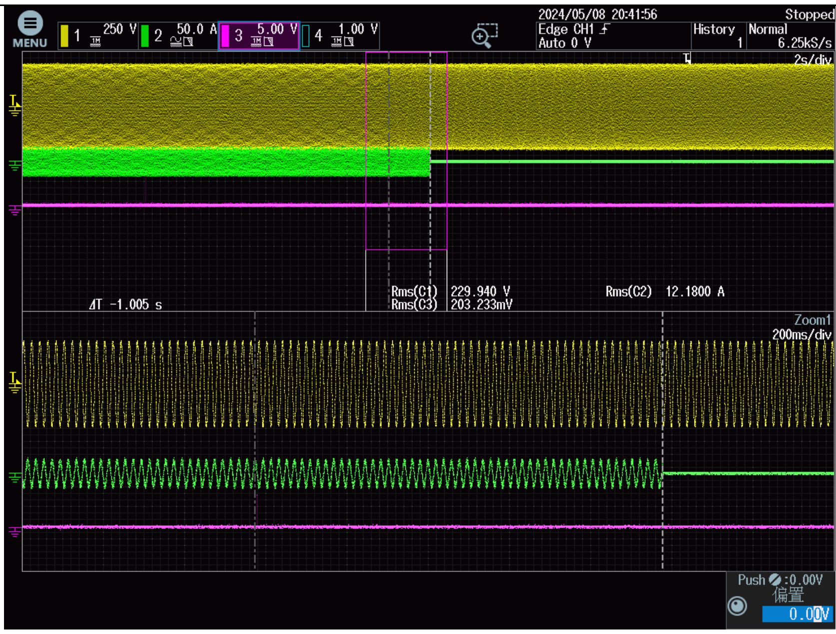
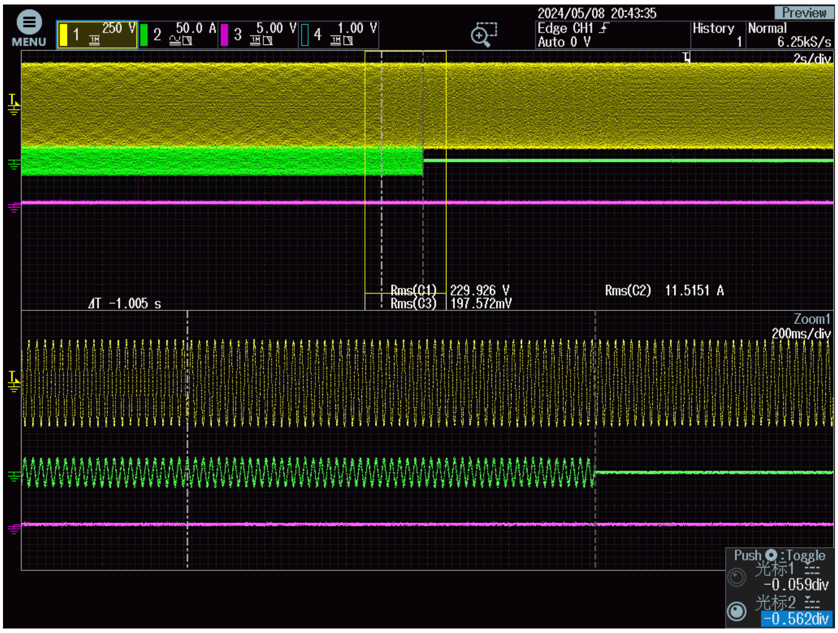


Test 2:



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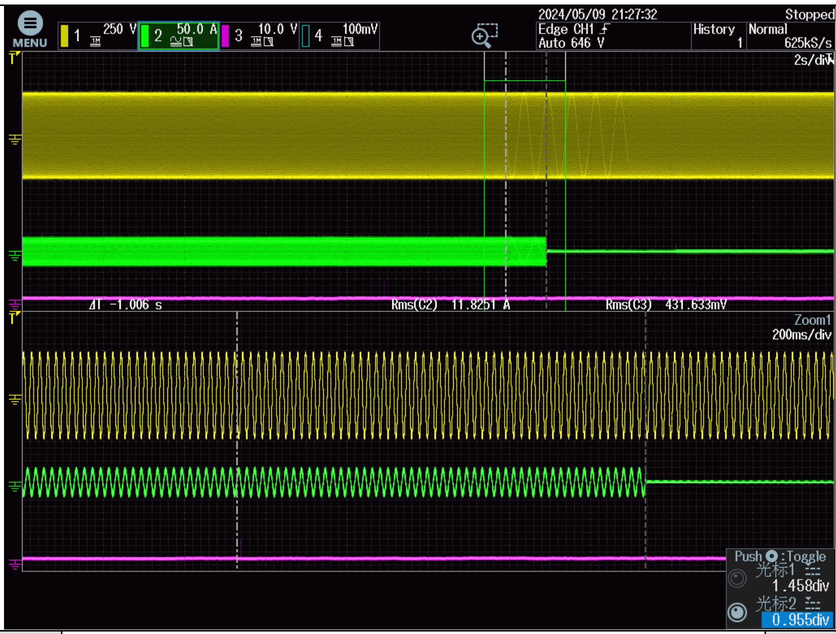
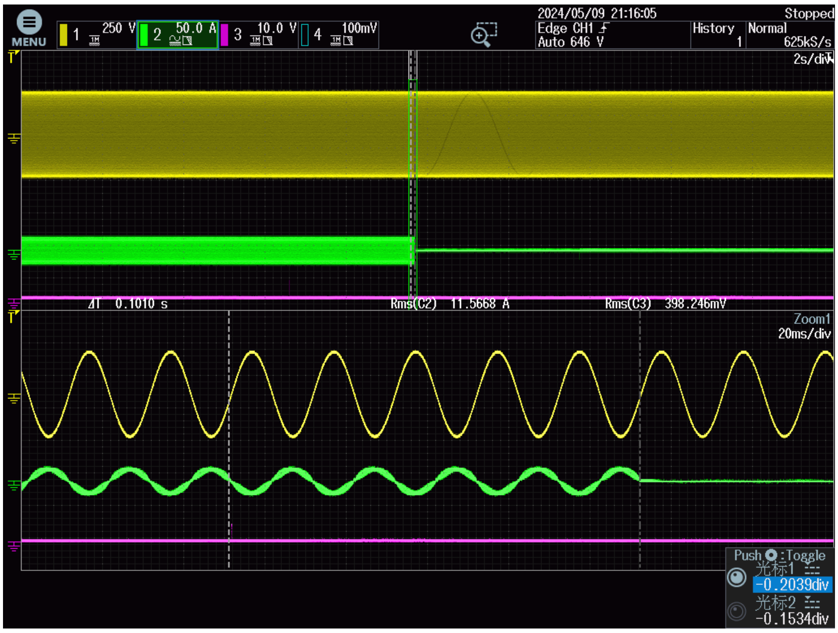


Tested condition:	-25 °C/+60 °C ± 2°C (3 h + 3 h) (Temperature change) while the equipment is powered.						Model	X1-H6K-S
Test A	Modalità Transitoria (Transient operation mode):							
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S1	49.80	49.80	49.80	49.80	101	112	102	77 ≤ t ≤ 123
(2):81>S1	50.20	50.20	50.20	50.20	101	102	100	77 ≤ t ≤ 123

Oscilloscope 81< S1:

Test 1:



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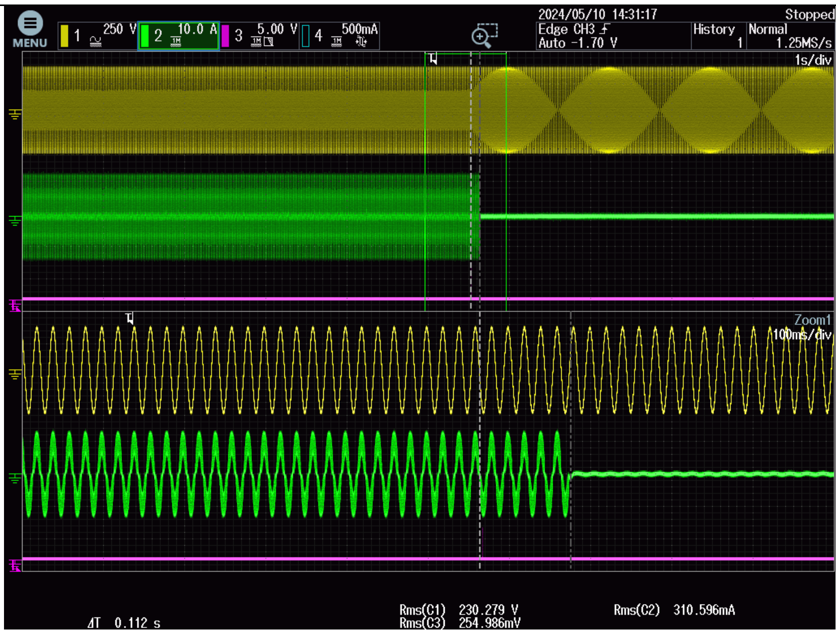
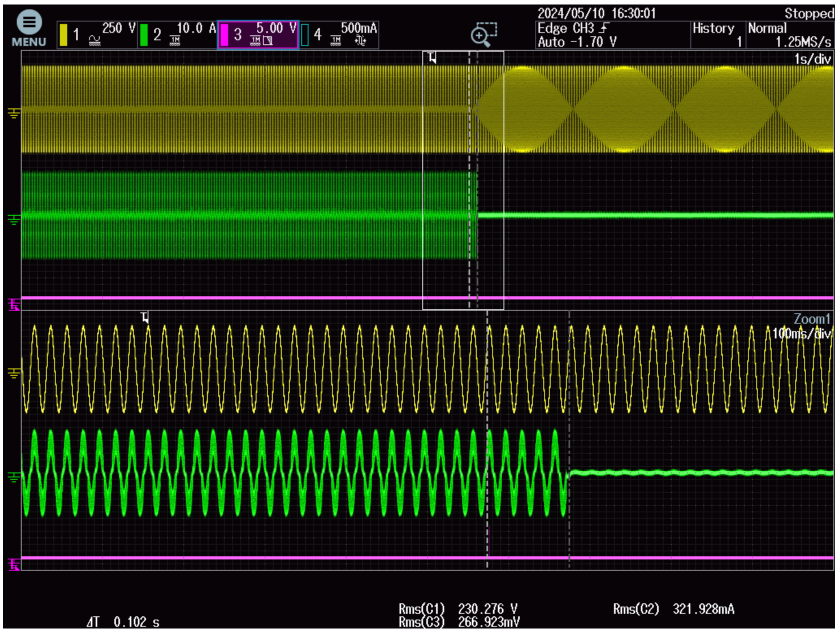


Test 3:



Oscilloscope 81> S1:

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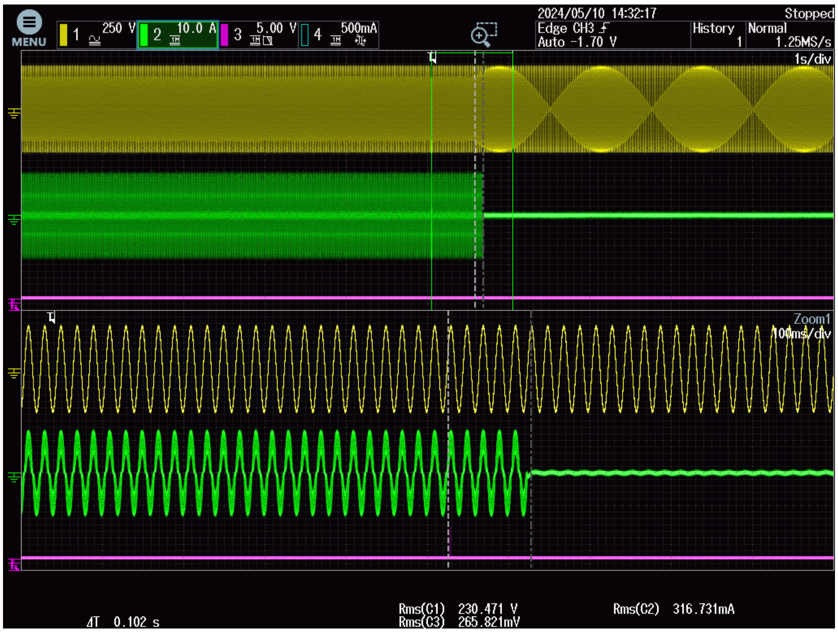
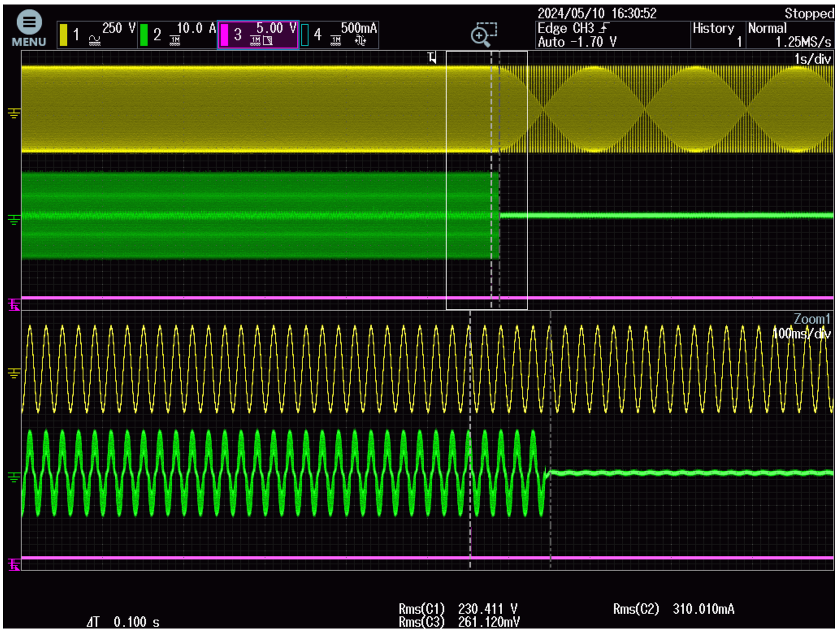
Test 2:


MENU
250 V
50.0 A
10.0 V
100mV
2024/05/09 21:21:11
Stopped
Edge CH1
Auto 646 V
History
1
Normal
625kS/s
2s/div
ΔT 0.1006 s
Rms(C2) 11.9405 A
Rms(C3) 400.439mV
Zoom1
20ms/div
Push :Toggle
光标1
-0.1288div
光标2
-0.0785div

Test 3:


MENU
250 V
10.0 A
5.00 V
500mA
2024/05/10 14:32:17
Stopped
Edge CH3
Auto -1.70 V
History
1
Normal
1.25MS/s
1s/div
Zoom1
100ms/div
ΔT 0.102 s
Rms(C1) 230.471 V
Rms(C3) 265.821mV
Rms(C2) 316.731mA



Test B	Modalità Transitoria (Transient operation mode):							
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S2	47.50	47.50	47.50	47.50	102	102	118	77 ≤ t ≤ 123
(2):81>S2	51.50	51.50	51.50	51.50	99	107	101	77 ≤ t ≤ 123

Oscilloscope 81< S2:

Test 1:

Test 2:

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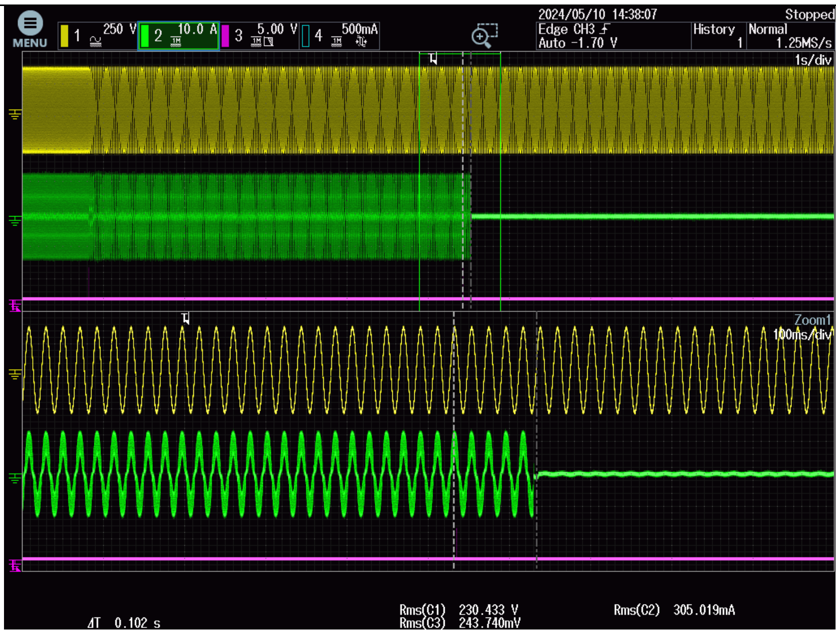
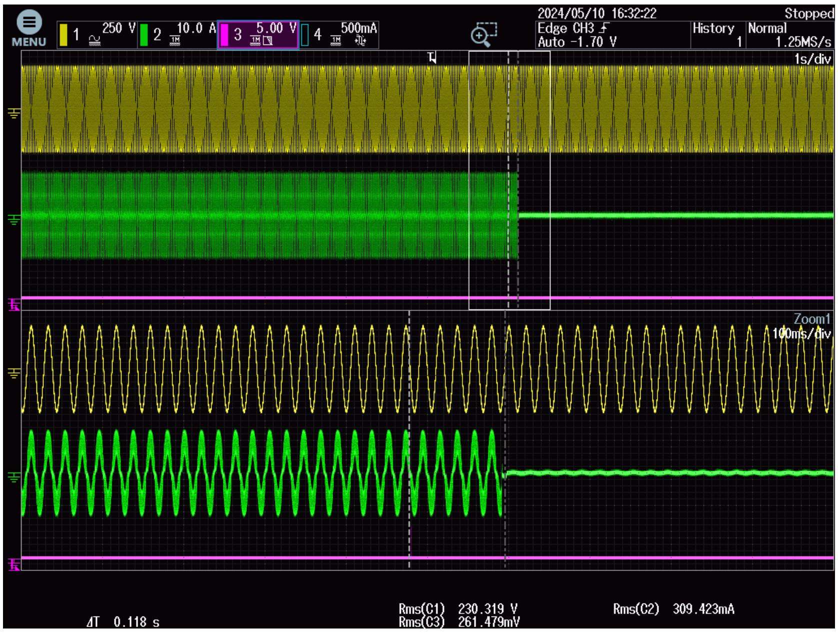


Test 3:



Oscilloscope 81> S2:

Test 1:

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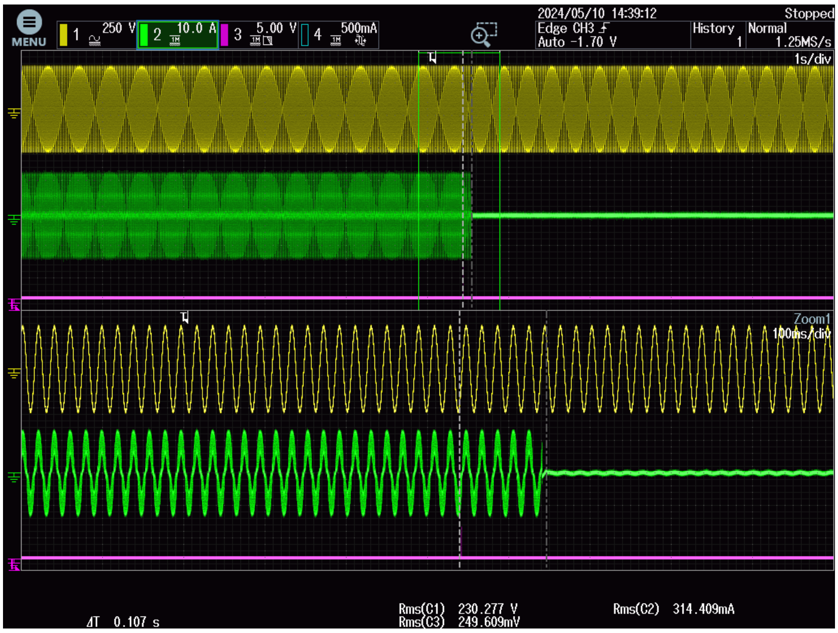
Test 2:



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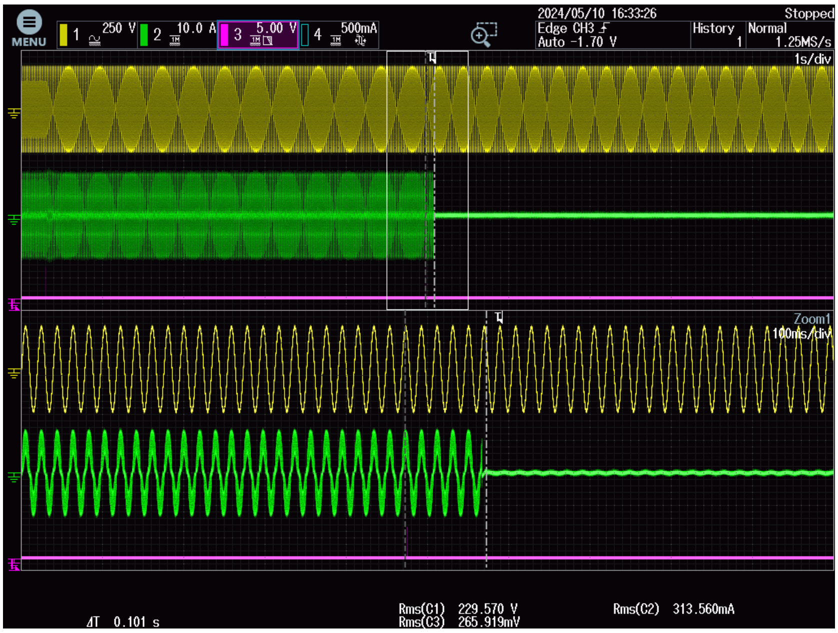
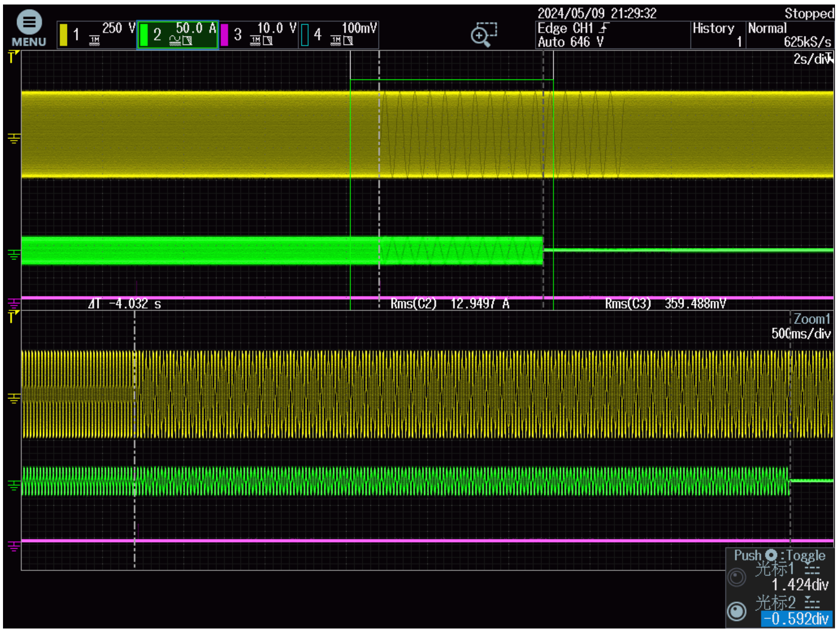


Test C	Modalità definitiva (Final operation mode):							
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S2	47.49	47.49	47.49	47.50	4032	4008	4005	3860 ≤ t ≤ 4140
(2):81>S2	51.50	51.50	51.50	51.50	1006	1020	1009	950≤t≤1050

Oscilloscope 81< S2:
Test 1:



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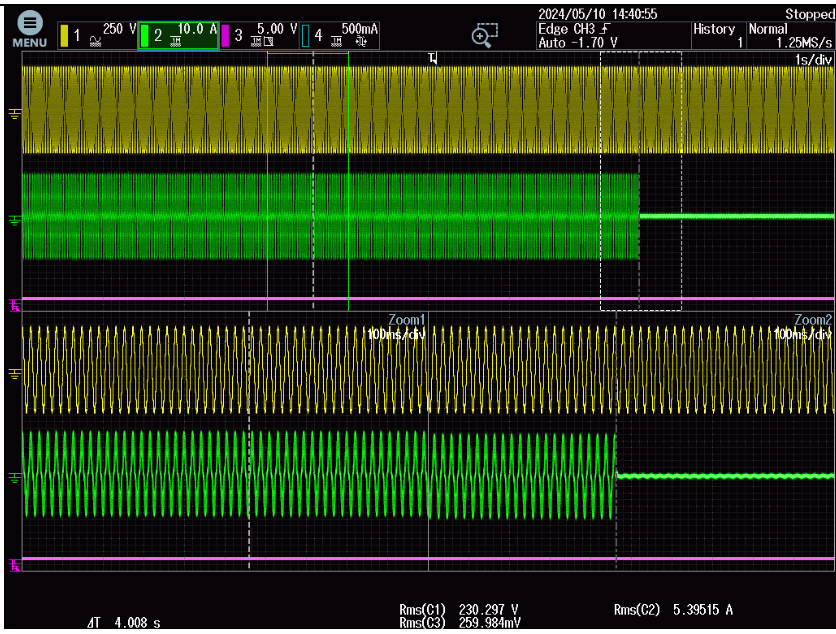
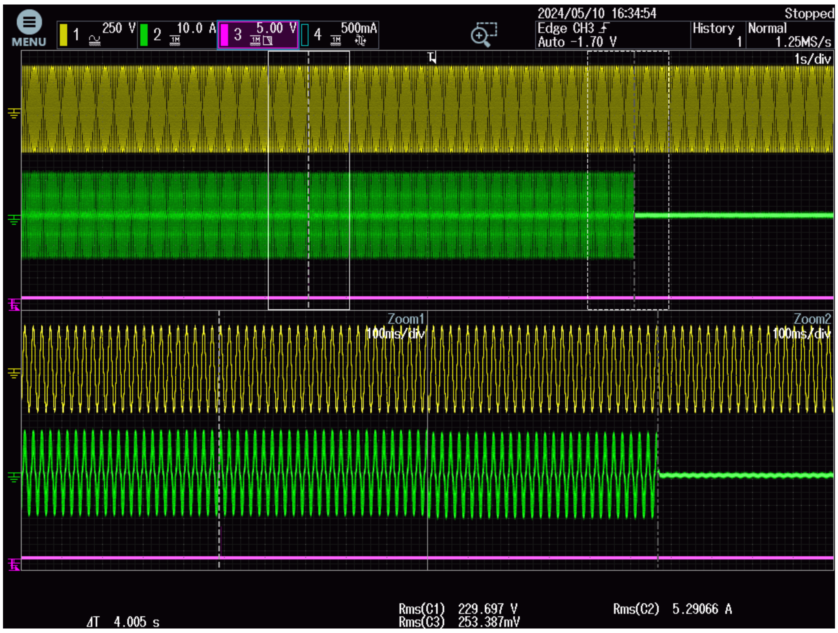


Test 3:



Oscilloscope 81> S2:

Test 1:

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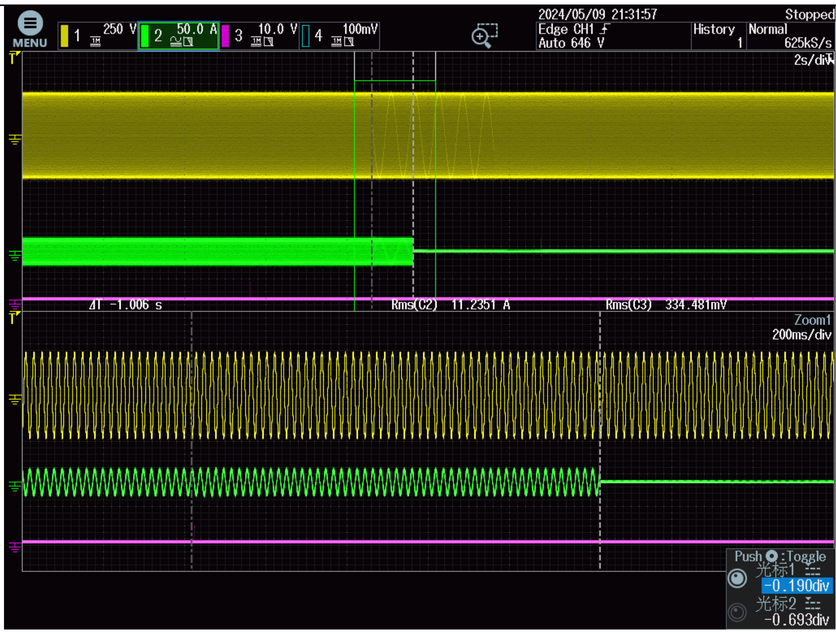
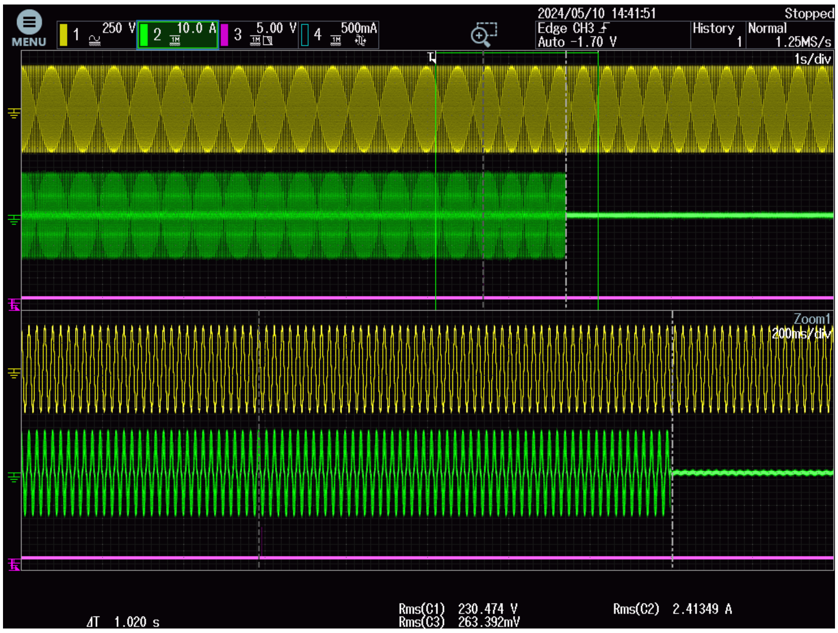


Test 2:



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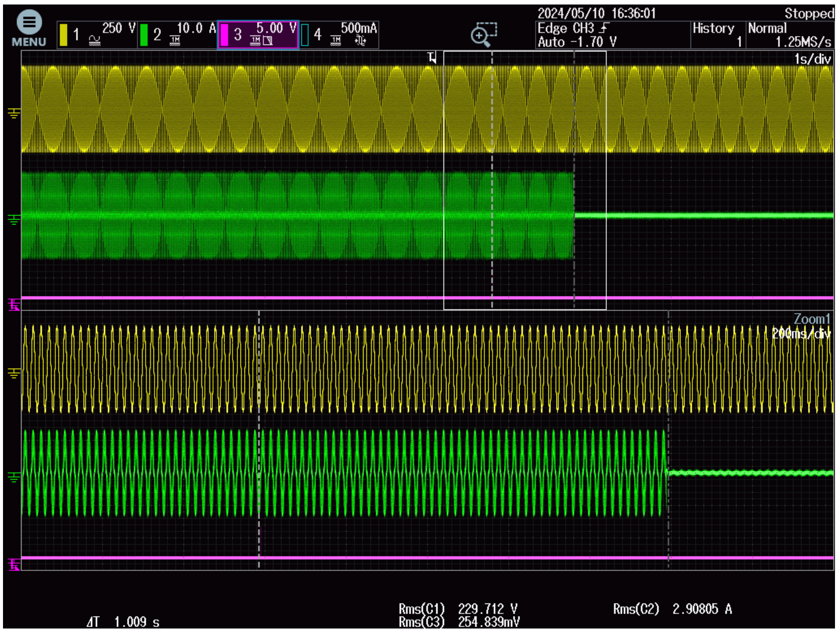

Tested condition:	-30 °C/+70 °C ± 2°C (3 h + 3 h) (Temperature change) while the equipment is not powered.	Model	X1-H6K-S

Test A	Modalità Transitoria (Transient operation mode):							
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S1	49.80	49.80	49.80	49.80	101	110	116	77 ≤ t ≤ 123
(2):81>S1	50.20	50.20	50.20	50.20	101	100	102	77 ≤ t ≤ 123

Oscilloscope 81< S1:
Test 1:

Test 2:

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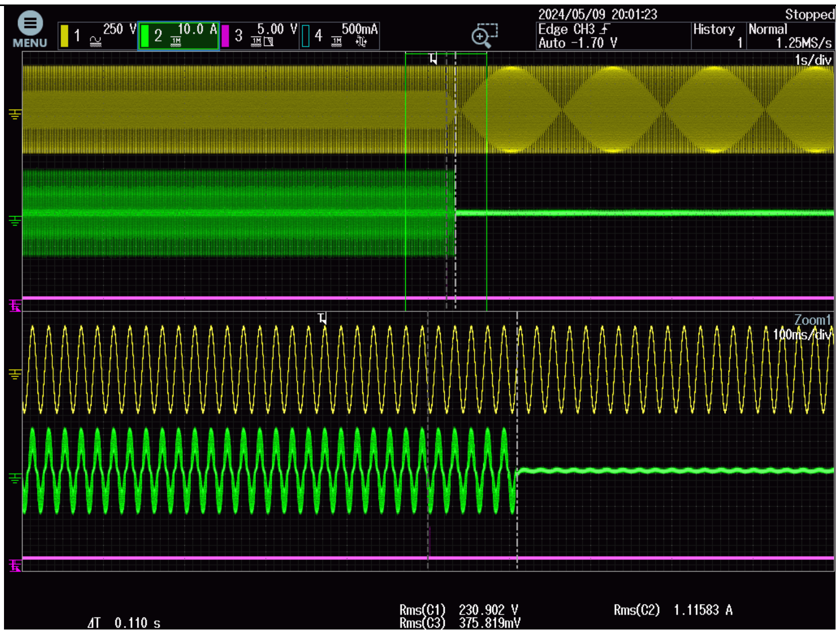
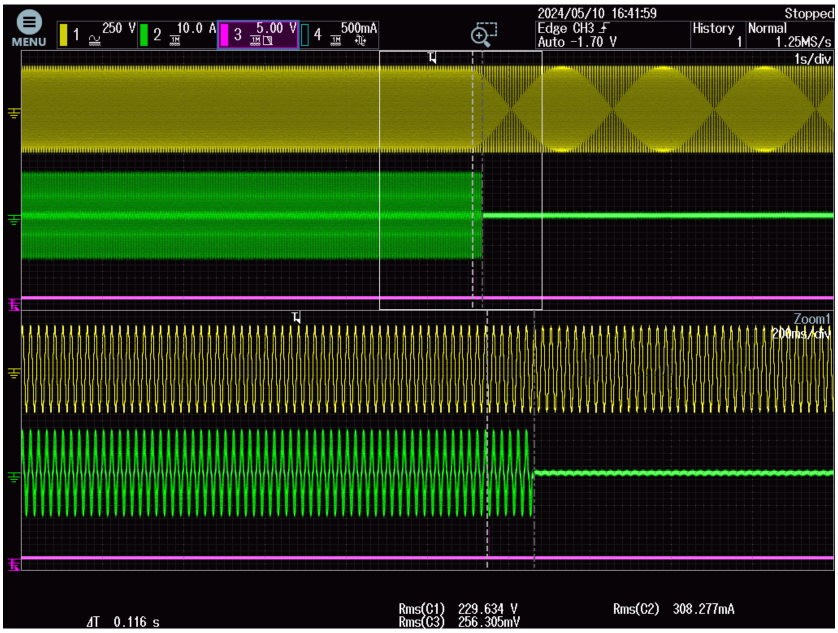


Test 3:



Oscilloscope 81> S1:

Test 1:

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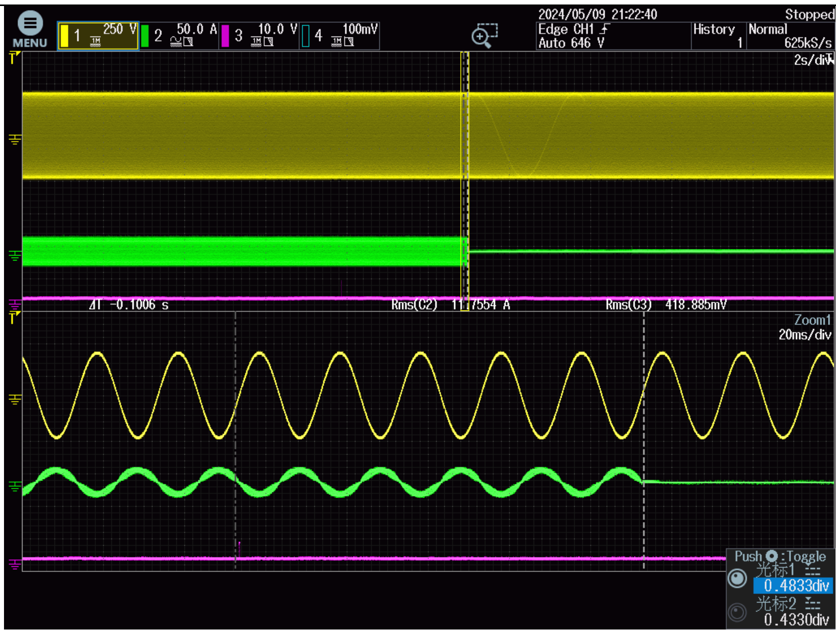
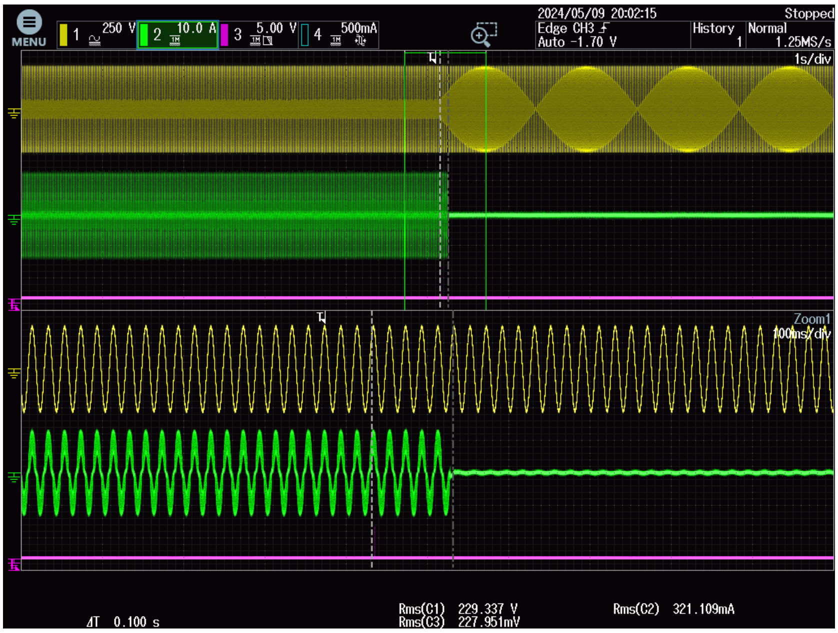


Test 2:



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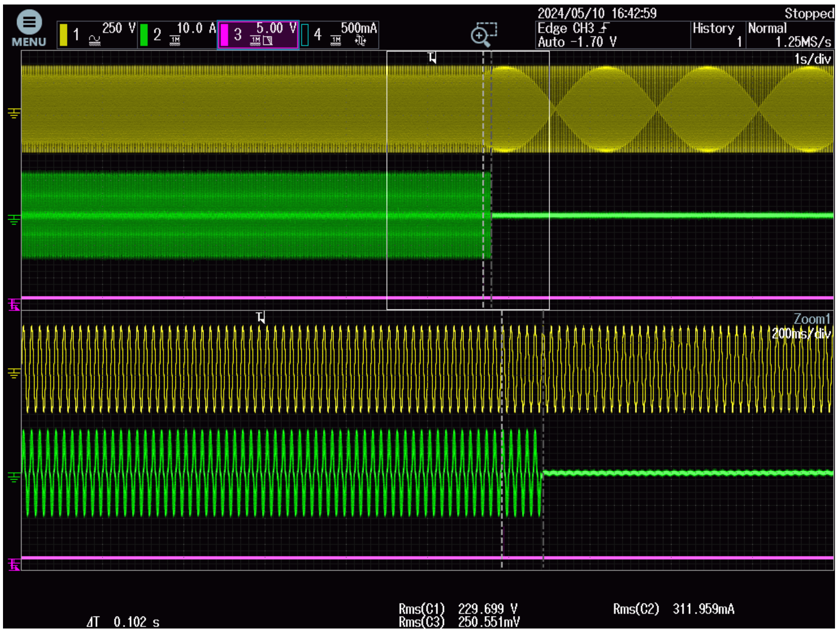
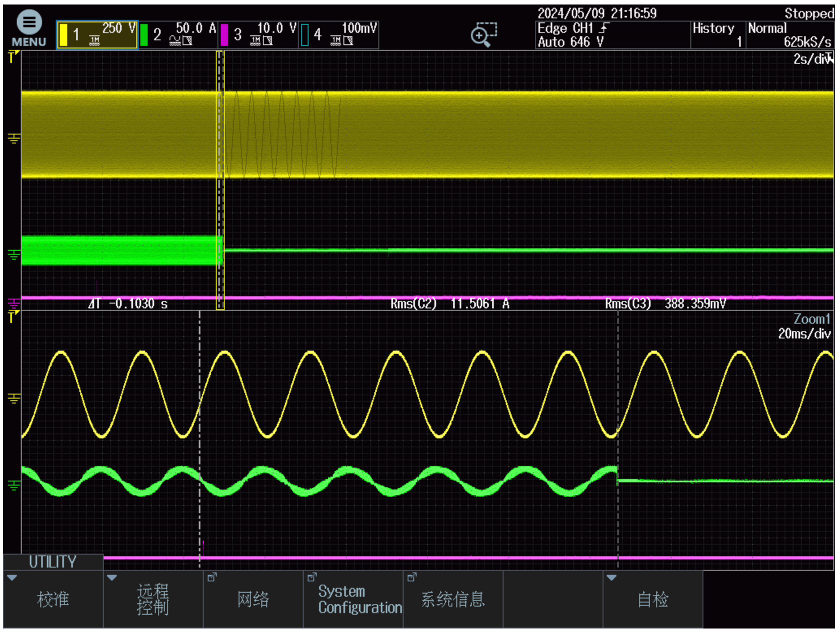


Test B	Modalità Transitoria (Transient operation mode):							
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S2	47.50	47.50	47.50	47.50	103	102	106	77 ≤ t ≤ 123
(2):81>S2	51.50	51.50	51.50	51.50	99	100	111	77 ≤ t ≤ 123

Oscilloscope 81< S2:

Test 1:



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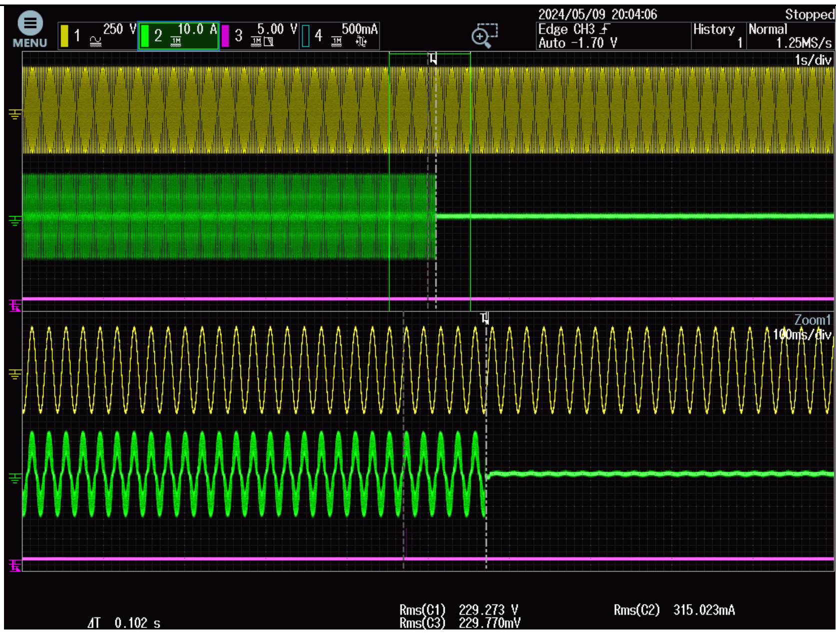
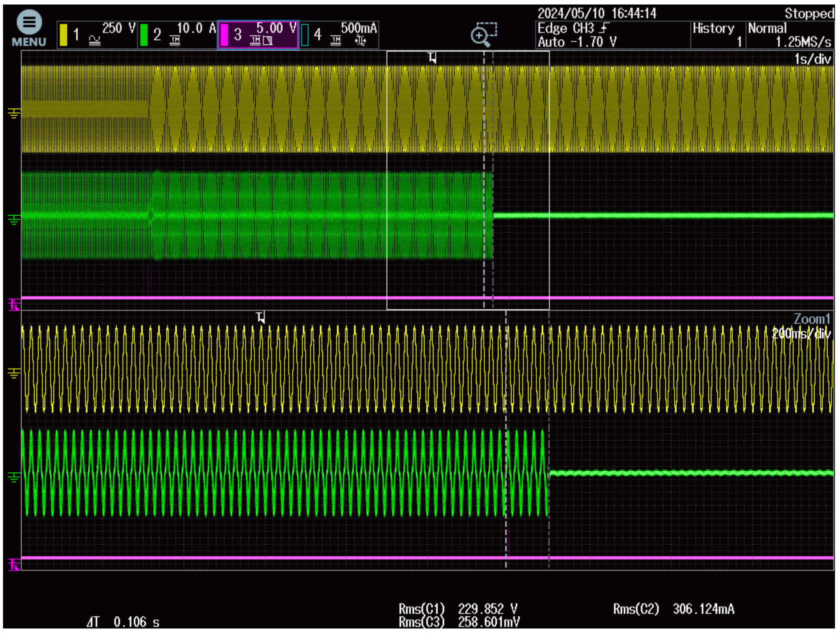


Test 3:



Oscilloscope 81> S2:

Test 1:

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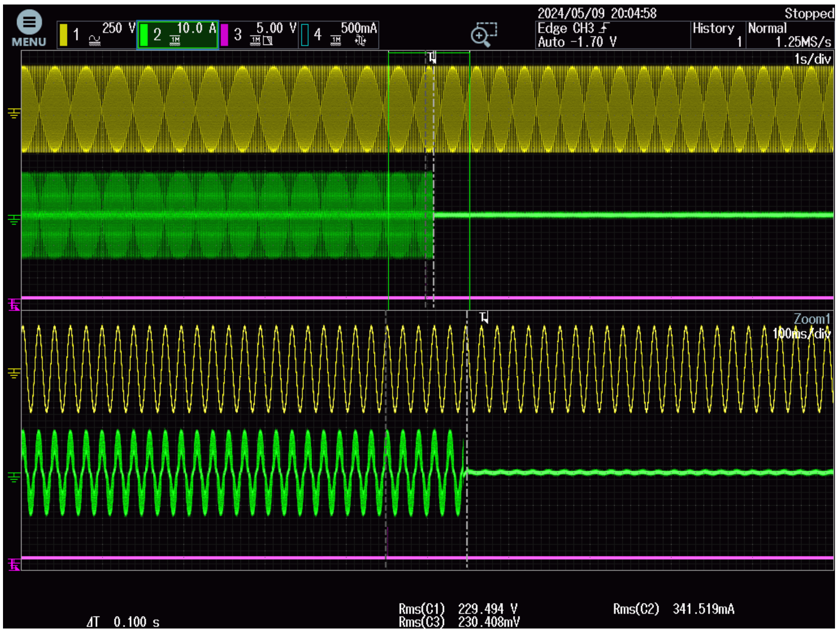
Test 2:



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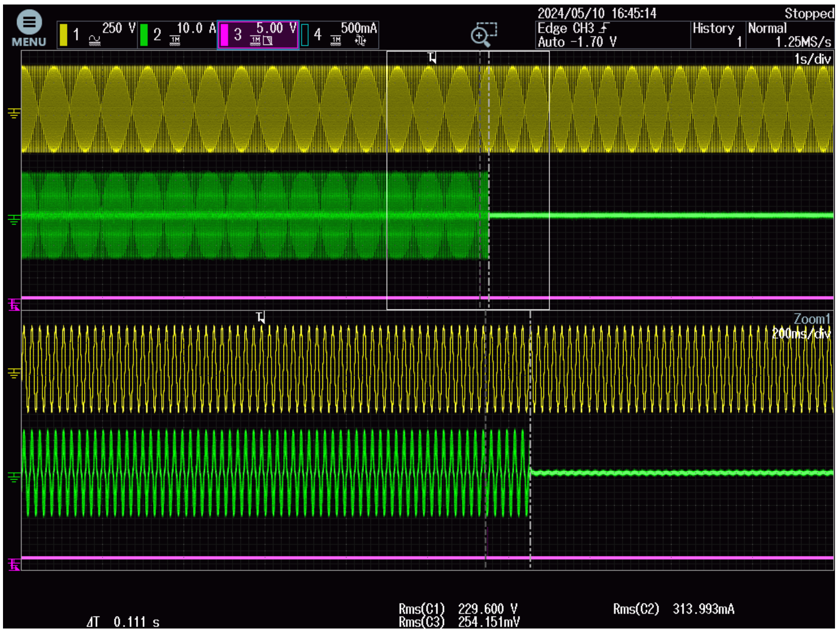
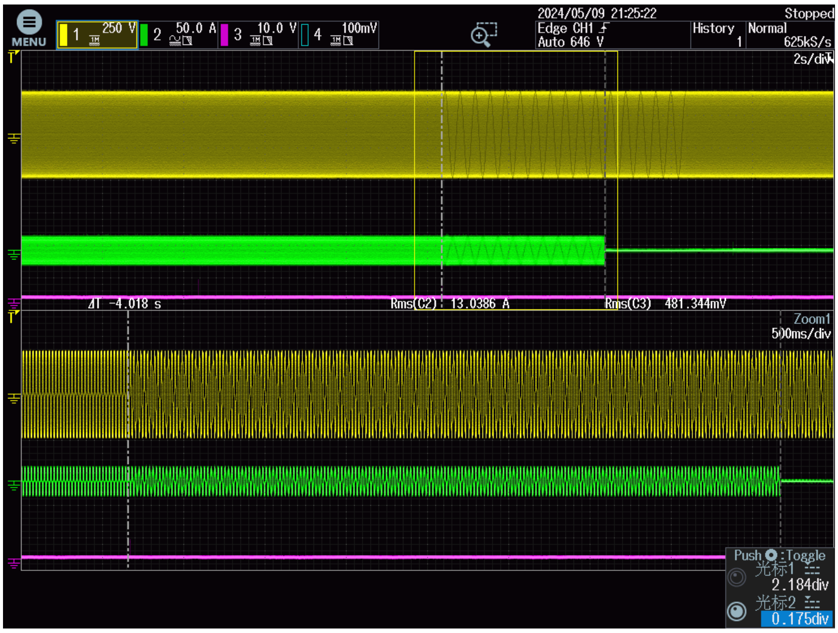
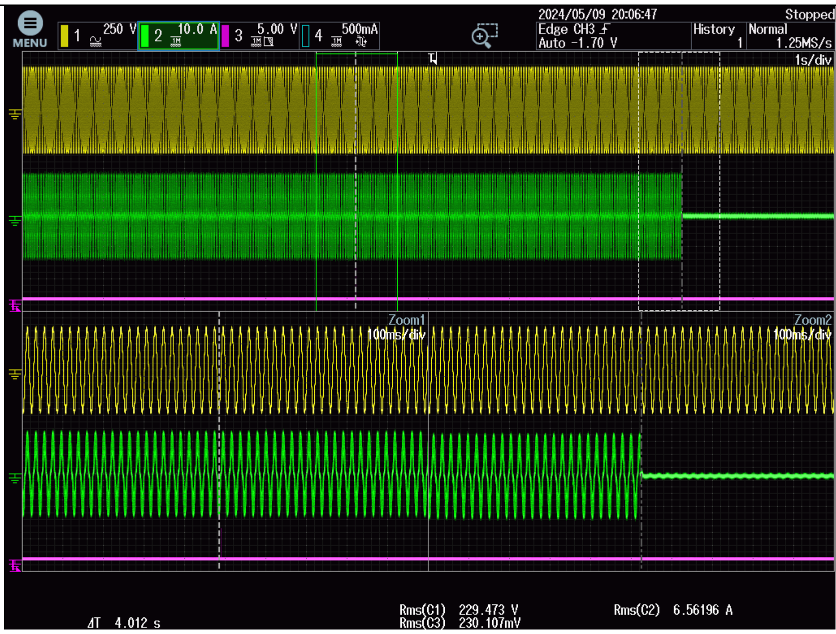


Test C	Modalità definitiva (Final operation mode):							
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S2	47.49	47.50	47.49	47.50	4018	4012	4003	3860 ≤ t ≤ 4140
(2):81>S2	51.50	51.50	51.50	51.50	1006	1006	1009	950≤t≤1050

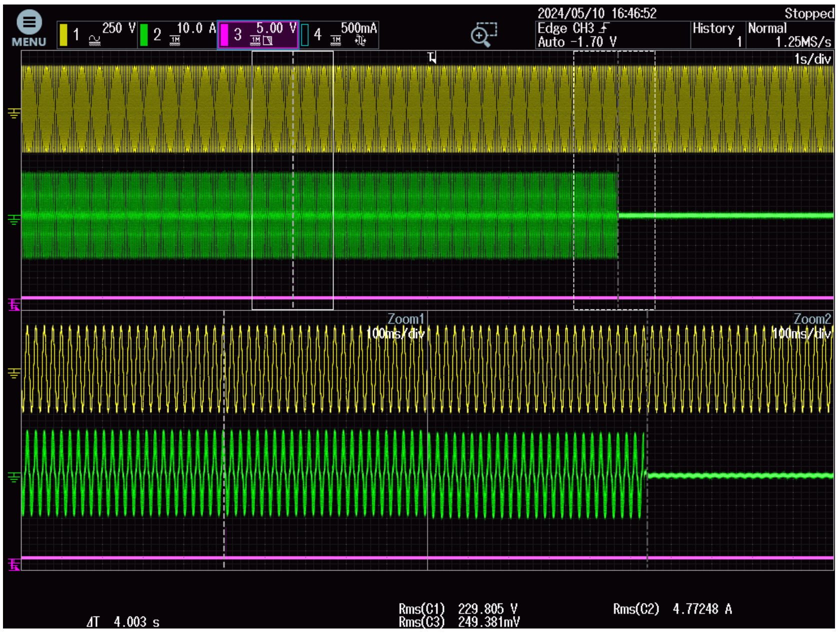
Oscilloscope 81< S2:
Test 1:



Test 2:



Test 3:



Oscilloscope 81> S2:

Test 1:

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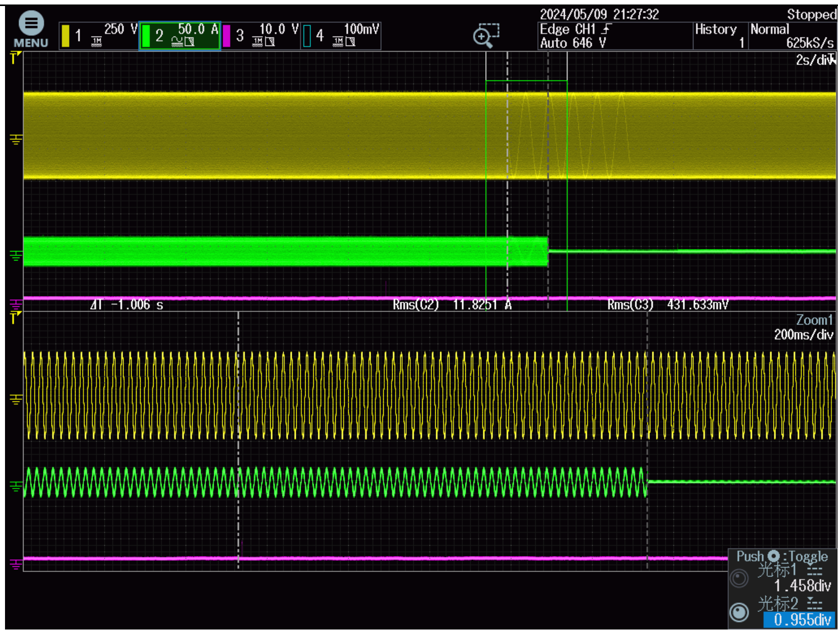
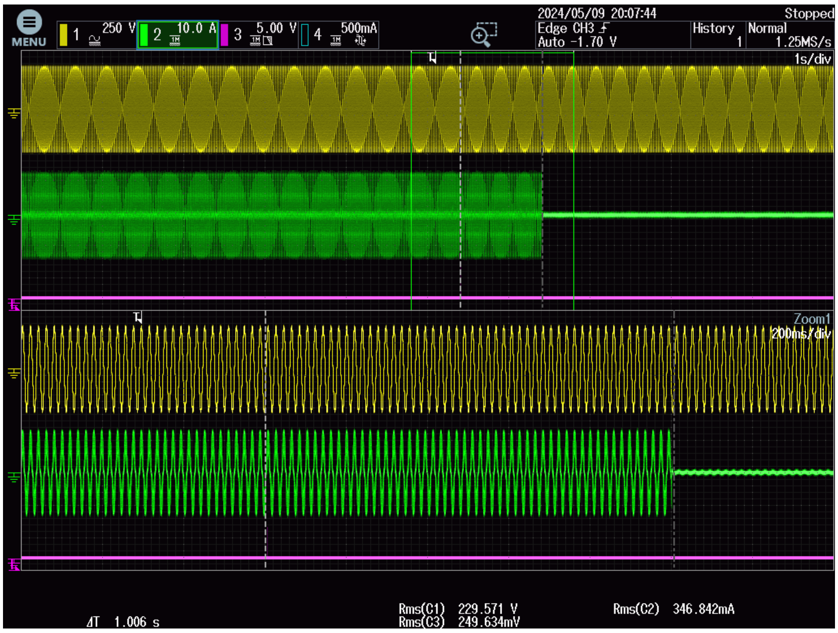


Test 2:



Test 3:

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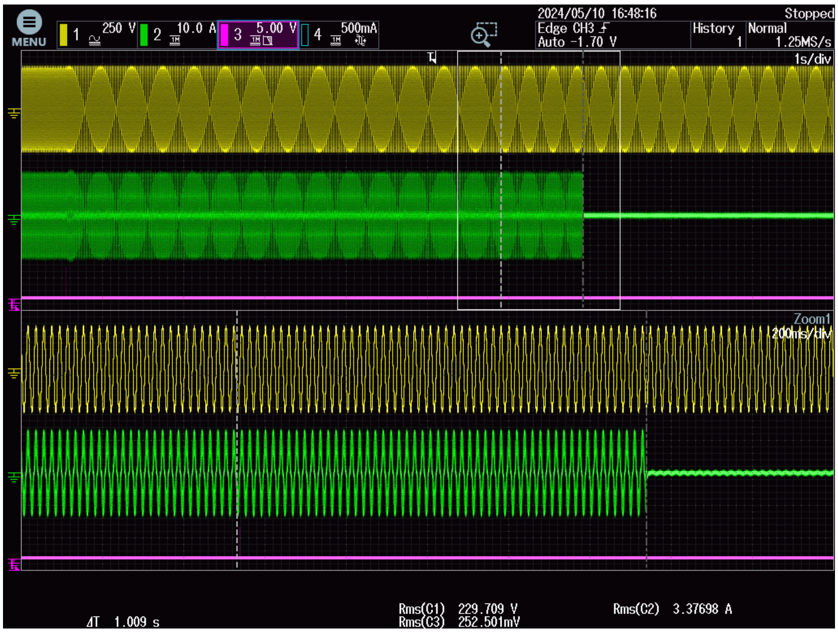
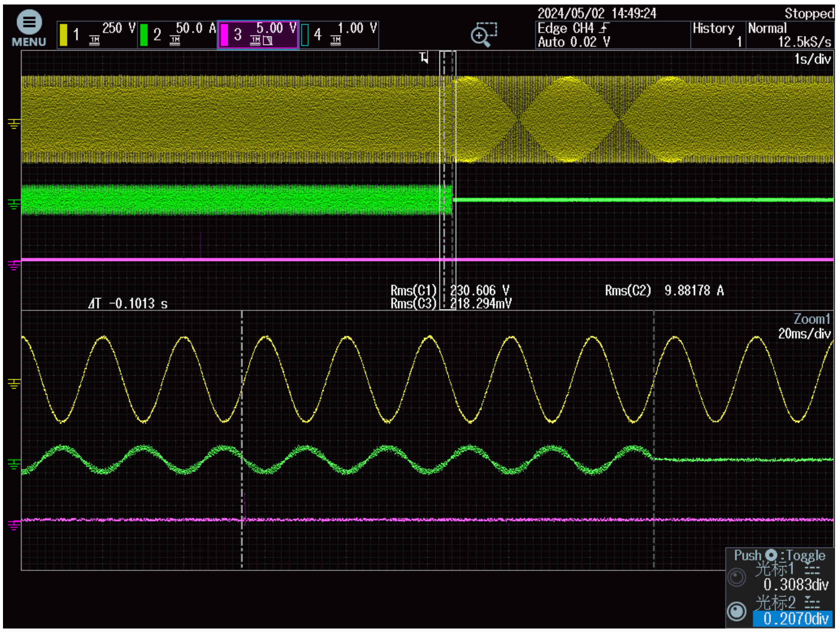


Tested condition:	60°C, 95%Rh (Dram hot) while the equipment is powered(4 days)						Model	X1-H6K-S
Test A	Modalità Transitoria (Transient operation mode):							
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S1	49.80	49.80	49.80	49.80	101	101	101	77 ≤ t ≤ 123
(2):81>S1	50.20	50.20	50.20	50.20	100	100	100	77 ≤ t ≤ 123

Oscilloscope 81< S1:
Test 1:



Test 2:

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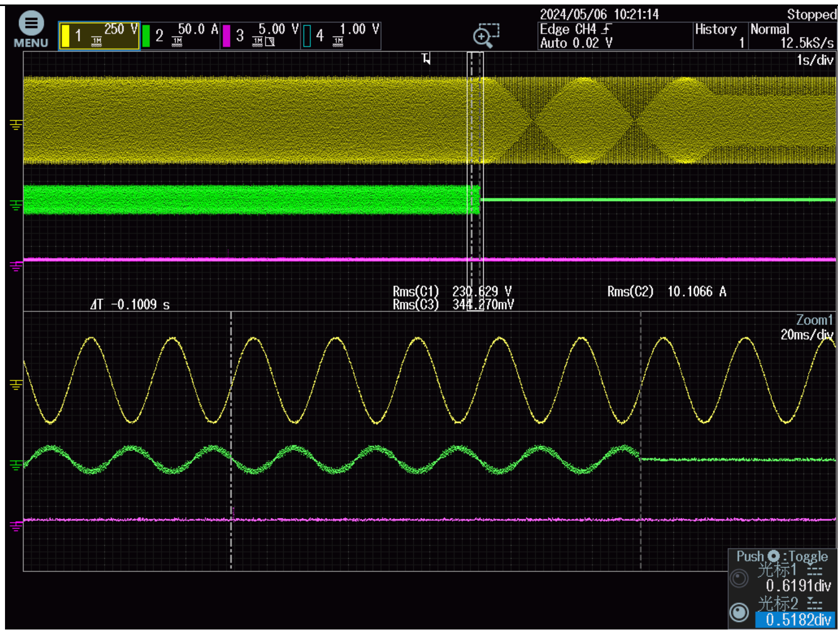
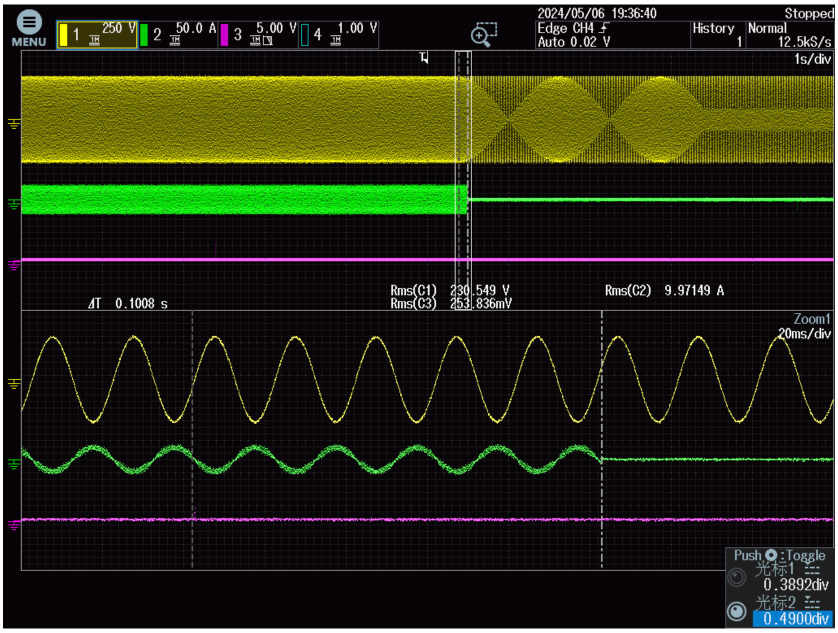


Test 3:



Oscilloscope 81> S1:

Test 1:

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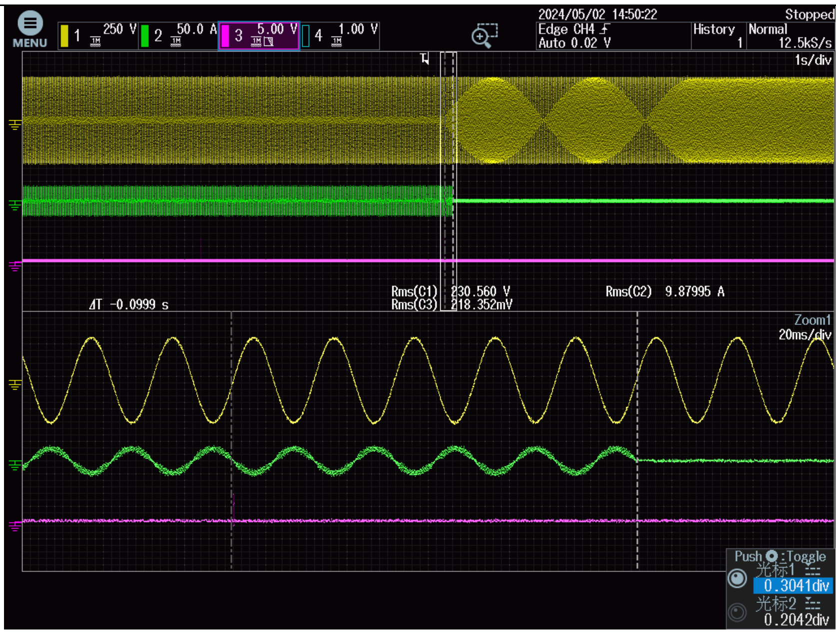
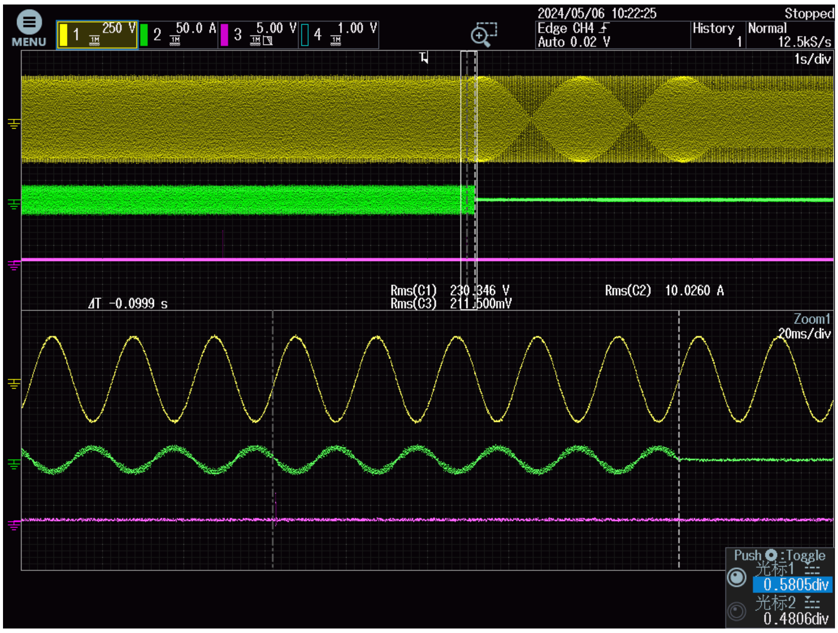


Test 2:



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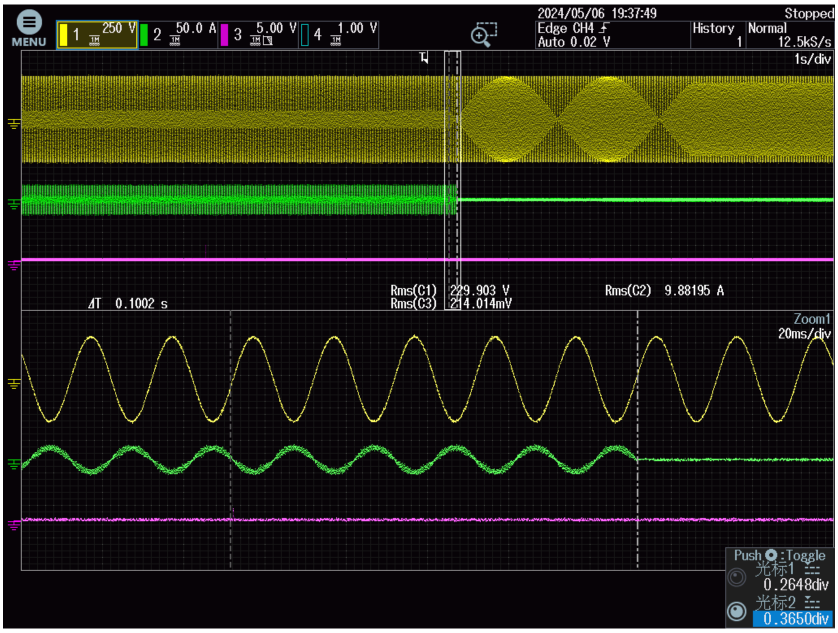
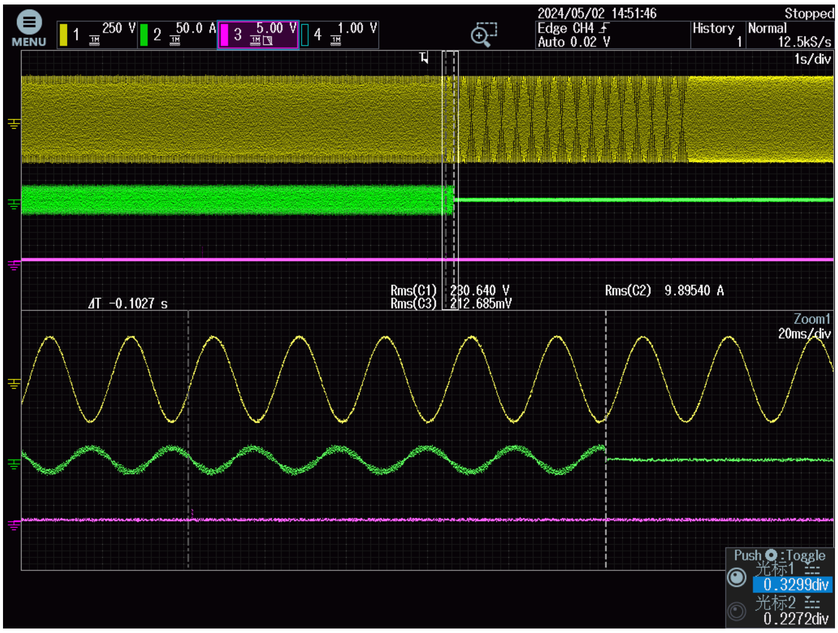


Test B	Modalità Transitoria (Transient operation mode):							
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S2	47.50	47.50	47.50	47.50	103	102	103	77 ≤ t ≤ 123
(2):81>S2	51.50	51.50	51.50	51.50	100	99	99	77 ≤ t ≤ 123

Oscilloscope 81< S2:

Test 1:



Test 2:

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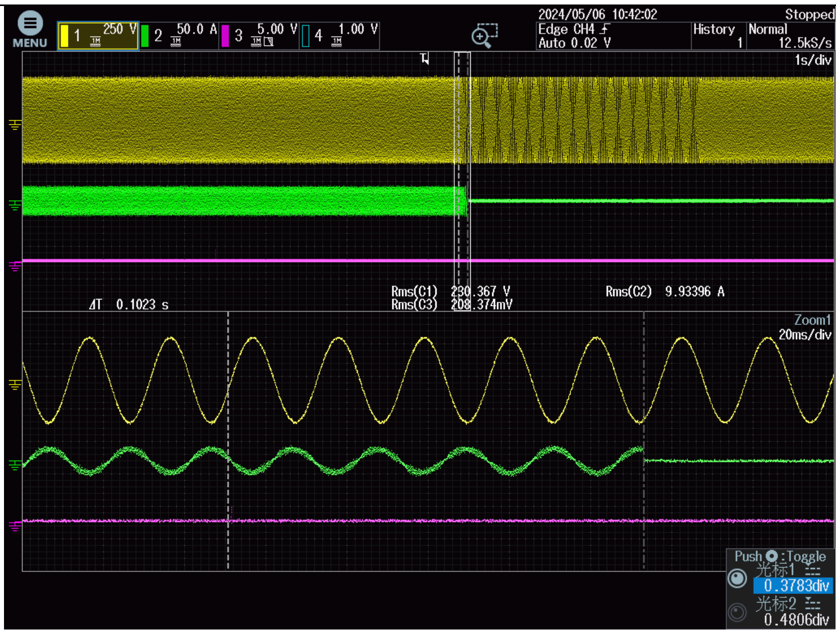
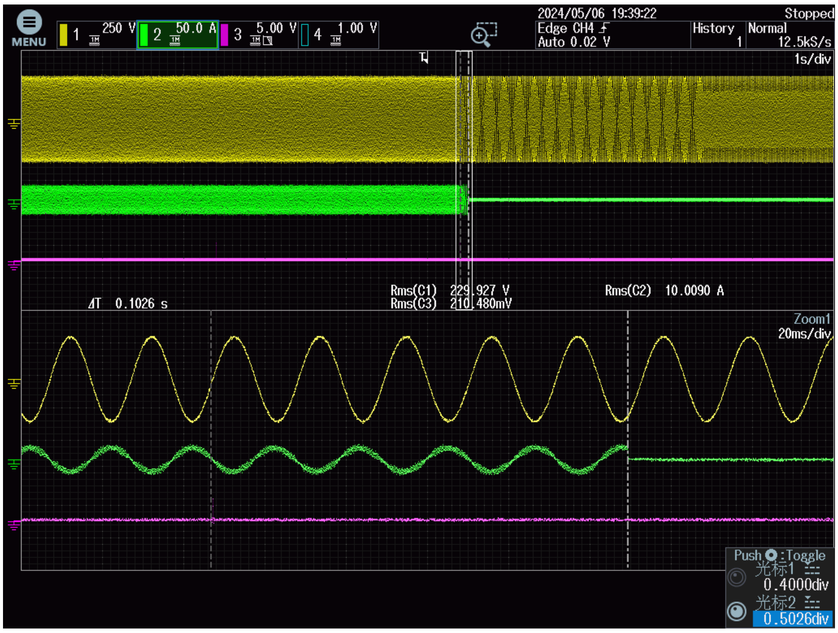
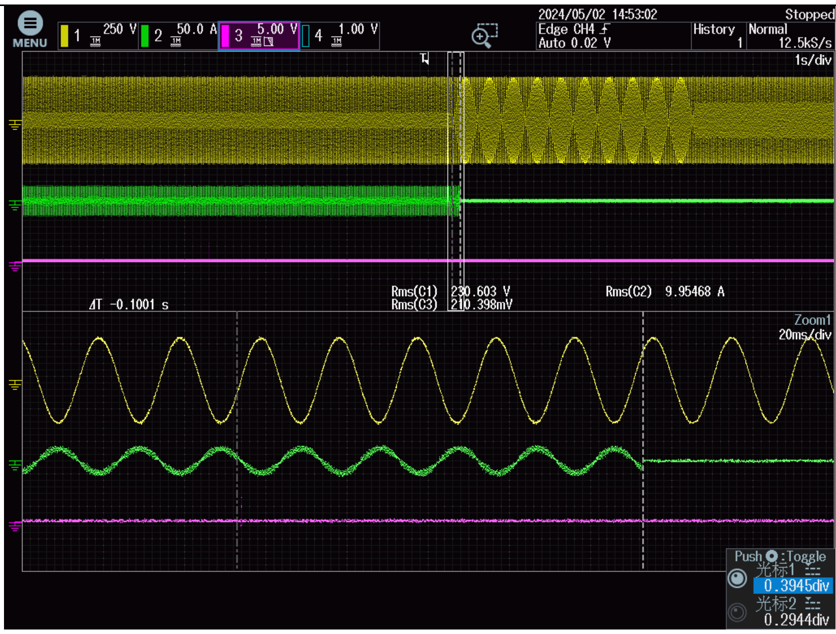


Test 3:

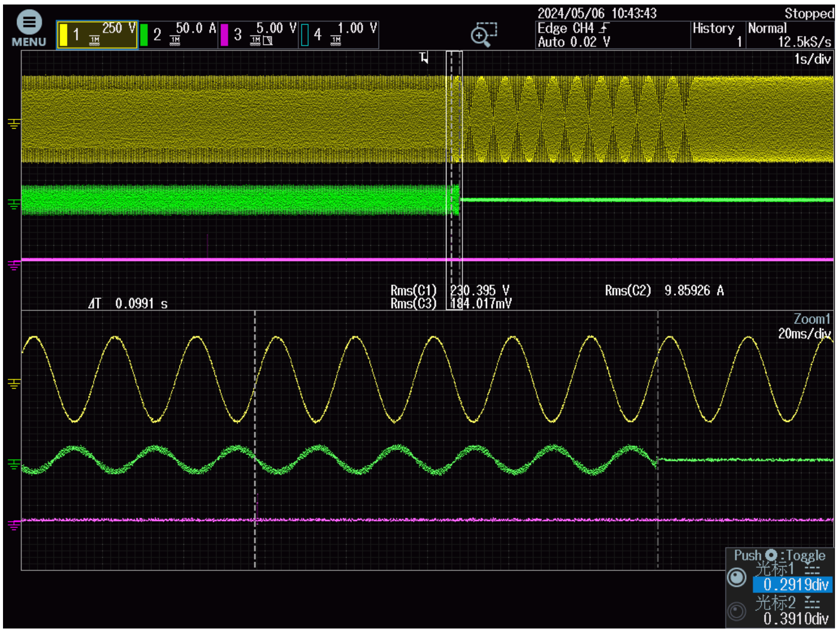


Oscilloscope 81> S2:

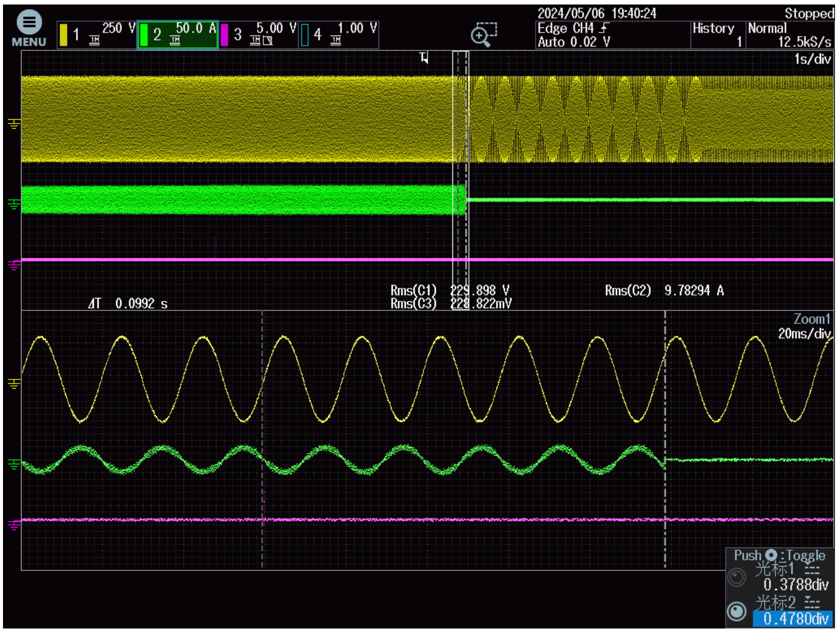
Test 1:


2024/05/02 14:53:02
Stopped
Edge CH4
Auto 0.02 V
History
Normal
12.5kS/s
1s/div
Rms(C1) 230.603 V
Rms(C3) 210.398mV
Rms(C2) 9.95468 A
ΔT -0.1001 s
Zoom1
20ms/div
Push :Toggle
光标1
0.3945div
光标2
0.2944div

Test 2:


2024/05/06 10:43:43
Stopped
Edge CH4
Auto 0.02 V
History
Normal
12.5kS/s
1s/div
Rms(C1) 230.395 V
Rms(C3) 184.017mV
Rms(C2) 9.85926 A
ΔT 0.0991 s
Zoom1
20ms/div
Push :Toggle
光标1
0.2919div
光标2
0.3910div

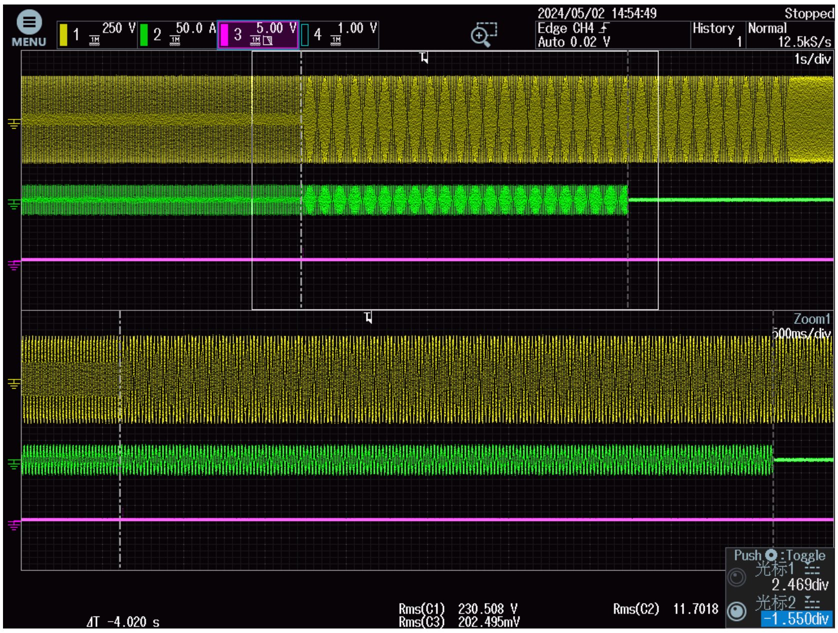
Test 3:



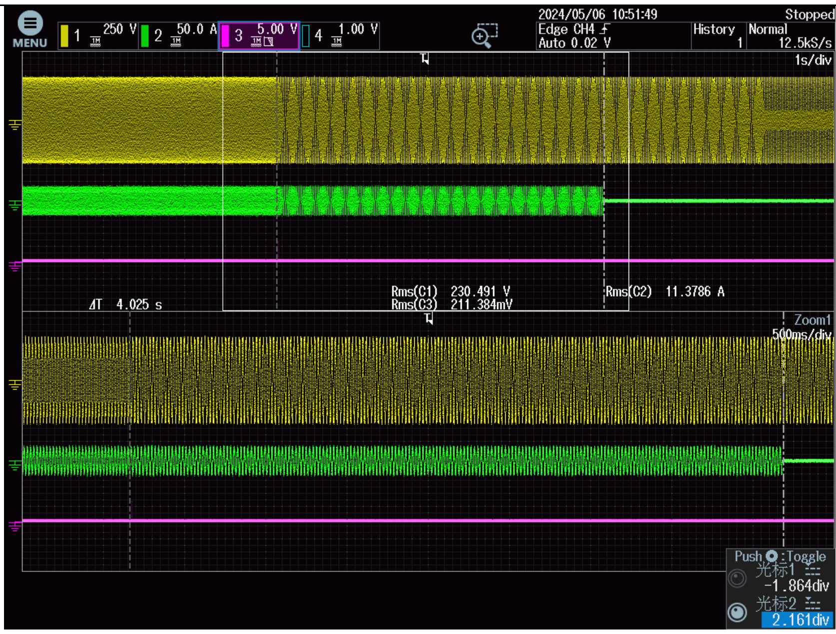
Test C	Modalità definitiva (Final operation mode):							
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S2	47.49	47.49	47.49	47.50	4020	4025	4024	3860 ≤ t ≤ 4140
(2):81>S2	51.50	51.50	51.50	51.50	1006	1009	1006	950≤t≤1050

Oscilloscope 81< S2:

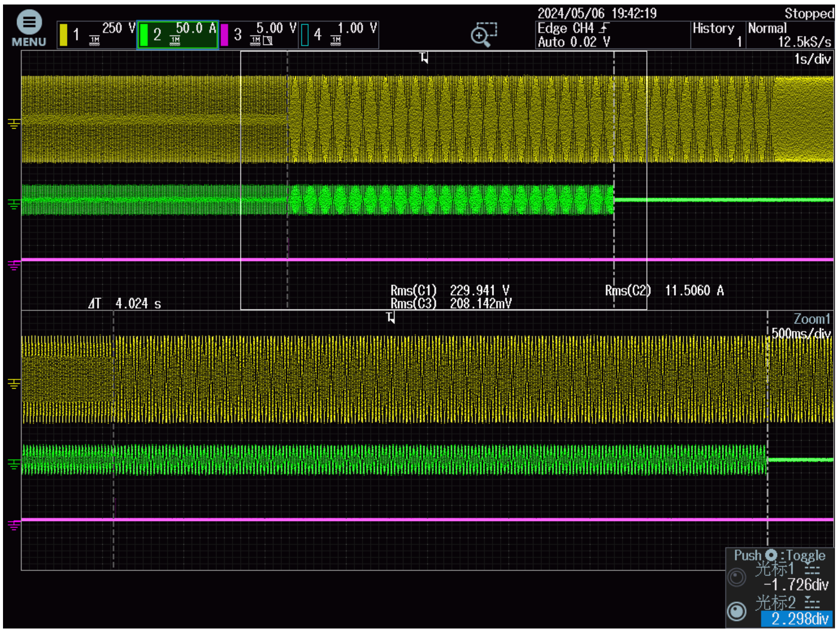
Test 1:



Test 2:

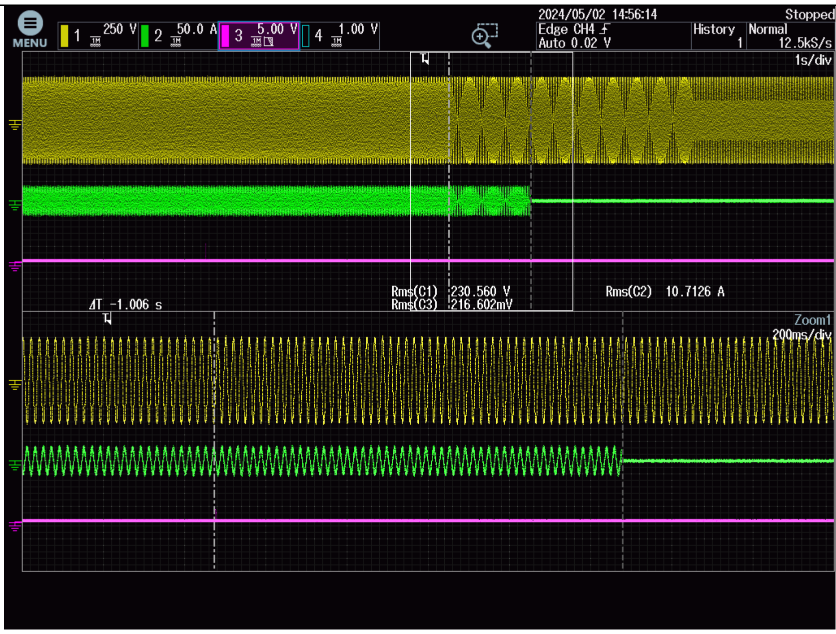


Test 3:

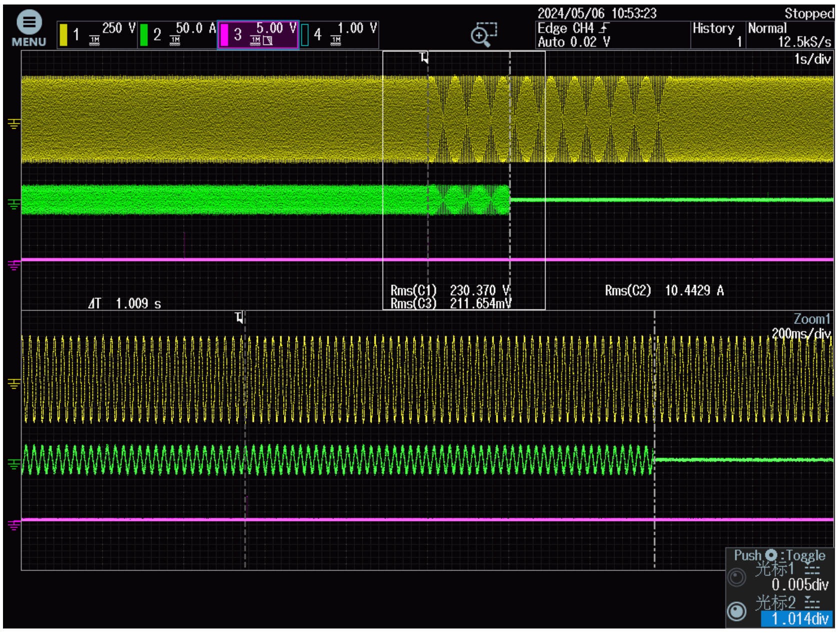


Oscilloscope 81> S2:

Test 1:



Test 2:



Test 3:

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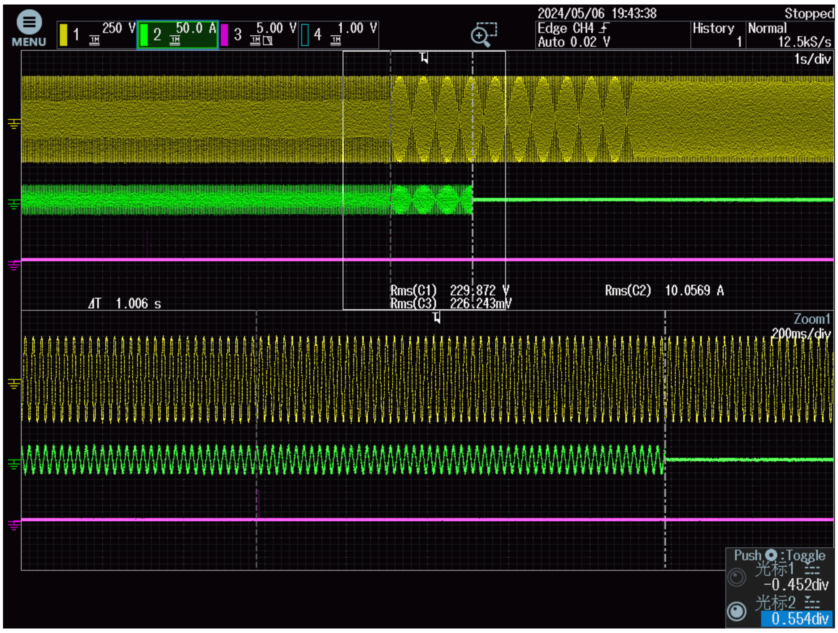
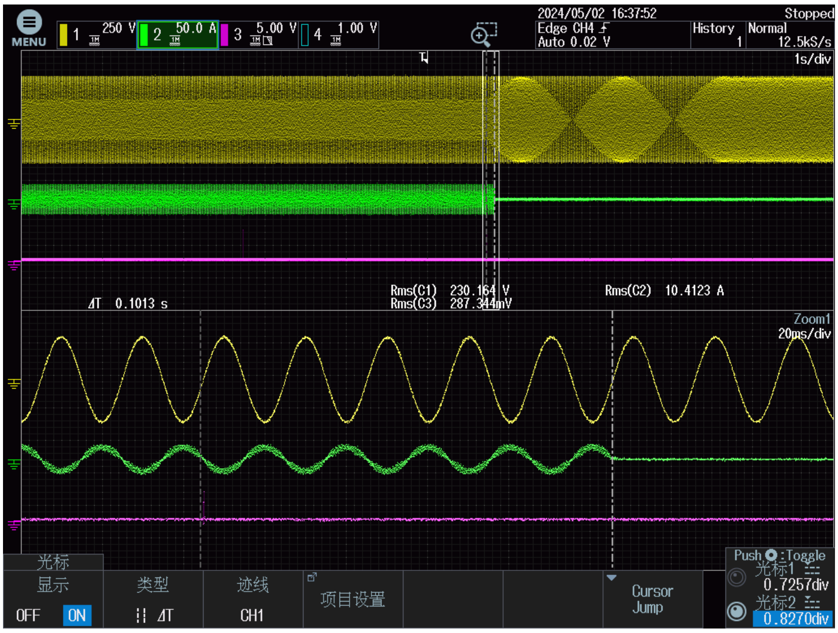


Tested condition:	70°C, 95%Rh (Dram hot) while the equipment is not powered(4 days)				Model	X1-H6K-S		
Test A	Modalità Transitoria (Transient operation mode):							
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S1	49.80	49.80	49.80	49.80	101	101	101	77 ≤ t ≤ 123
(2):81>S1	50.20	50.20	50.20	50.20	100	100	100	77 ≤ t ≤ 123

Oscilloscope 81< S1:
Test 1:



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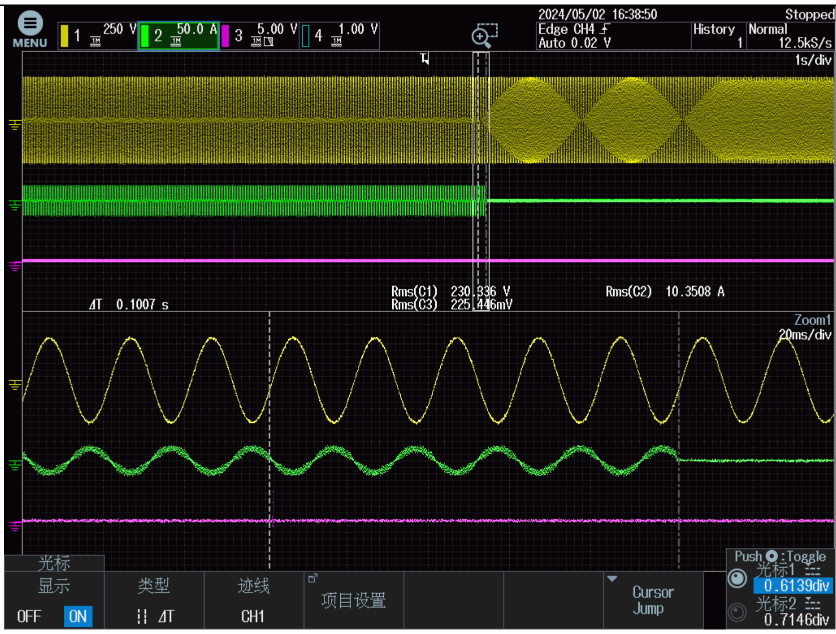
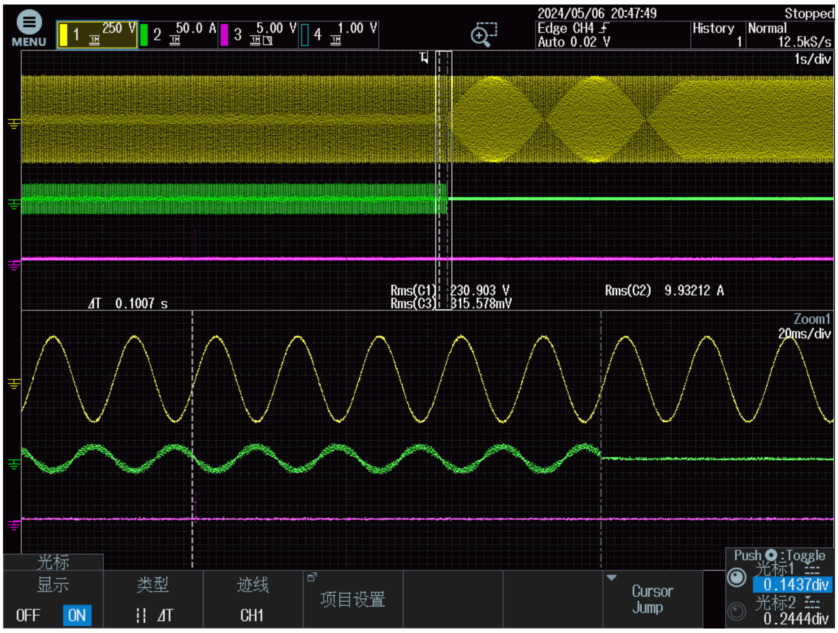


Test 3:



Oscilloscope 81> S1:

Test 1:

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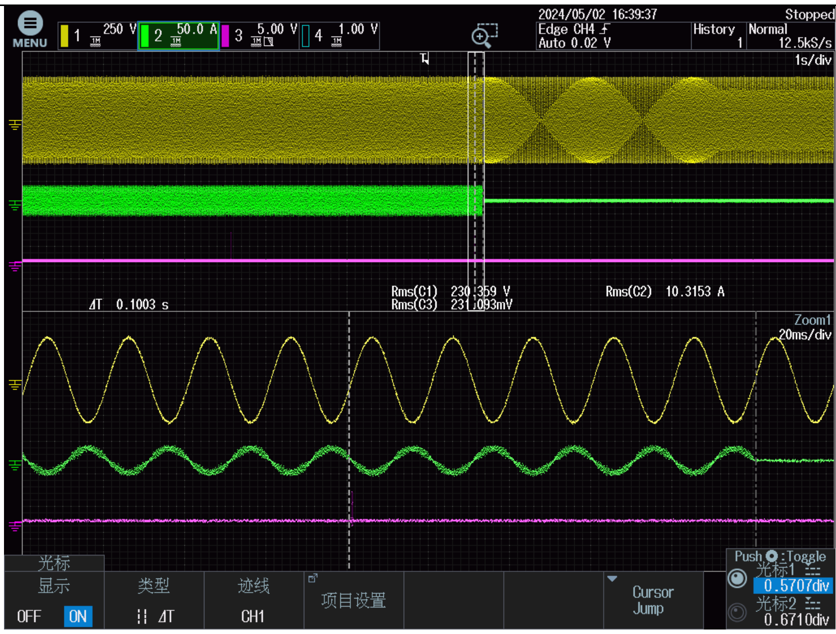
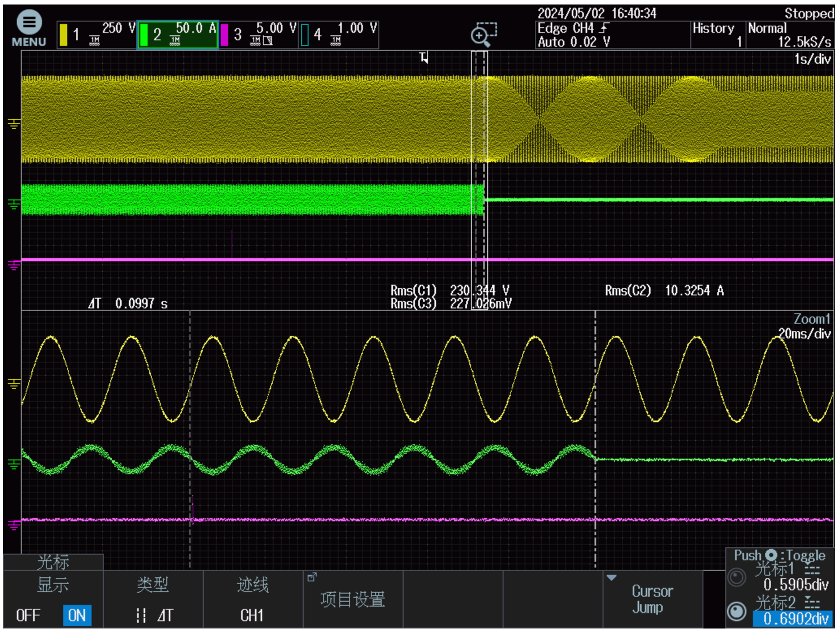
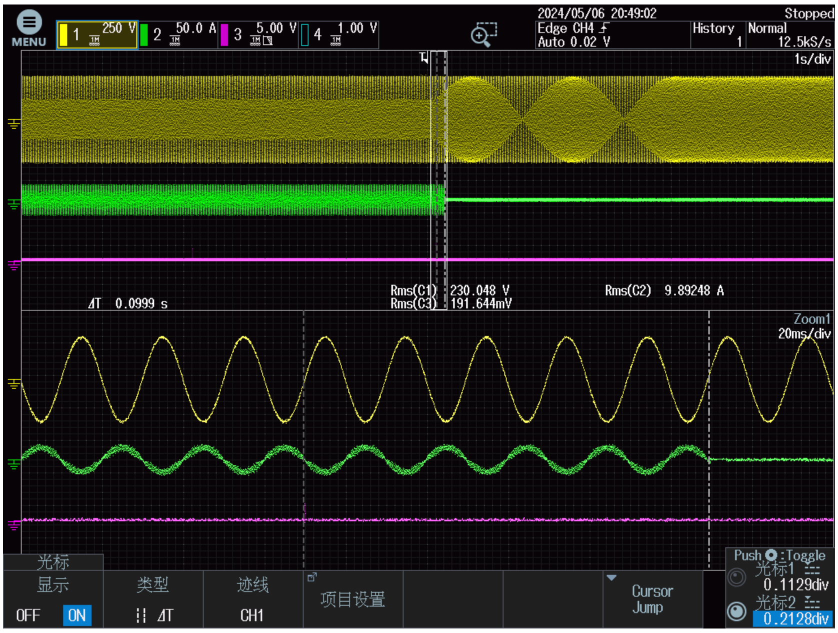

MENU
1 250 V
2 50.0 A
3 5.00 V
4 1.00 V
2024/05/02 16:39:37
Stopped
Edge CH4
Auto 0.02 V
History 1
Normal
12.5kS/s
1s/div
ΔT 0.1003 s
Rms(C1) 230.359 V
Rms(C3) 231.093mV
Rms(C2) 10.3153 A
Zoom1
20ms/div
光标
显示
OFF ON
类型
ΔT
迹线
CH1
项目设置
Cursor
Jump
Push :Toggle
光标1
0.5707div
光标2
0.6710div

Test 2:


MENU
1 250 V
2 50.0 A
3 5.00 V
4 1.00 V
2024/05/02 16:40:34
Stopped
Edge CH4
Auto 0.02 V
History 1
Normal
12.5kS/s
1s/div
ΔT 0.0997 s
Rms(C1) 230.344 V
Rms(C3) 227.026mV
Rms(C2) 10.3254 A
Zoom1
20ms/div
光标
显示
OFF ON
类型
ΔT
迹线
CH1
项目设置
Cursor
Jump
Push :Toggle
光标1
0.5905div
光标2
0.6902div

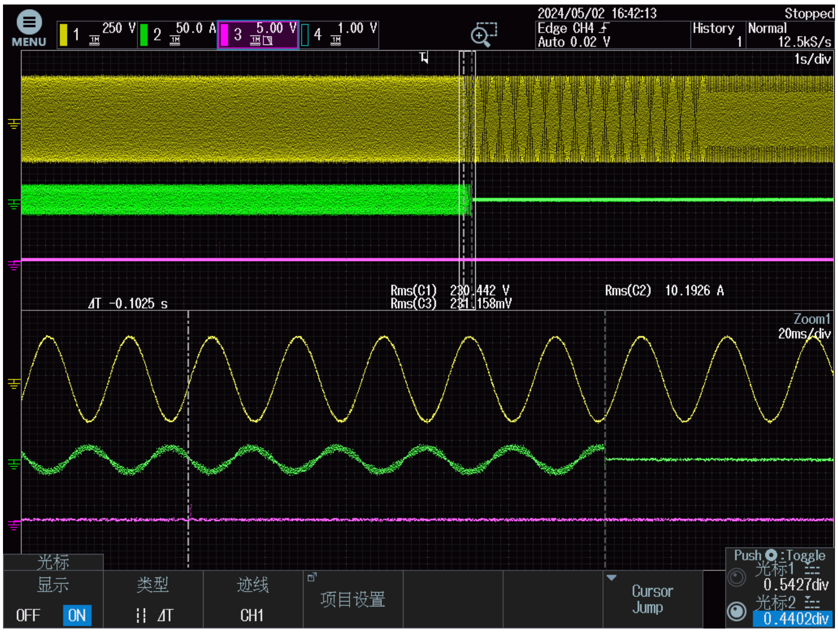
Test 3:



Test B	Modalità Transitoria (Transient operation mode):							
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S2	47.50	47.50	47.50	47.50	103	103	103	77 ≤ t ≤ 123
(2):81>S2	51.50	51.50	51.50	51.50	99	99	99	77 ≤ t ≤ 123

Oscilloscope 81< S2:

Test 1:



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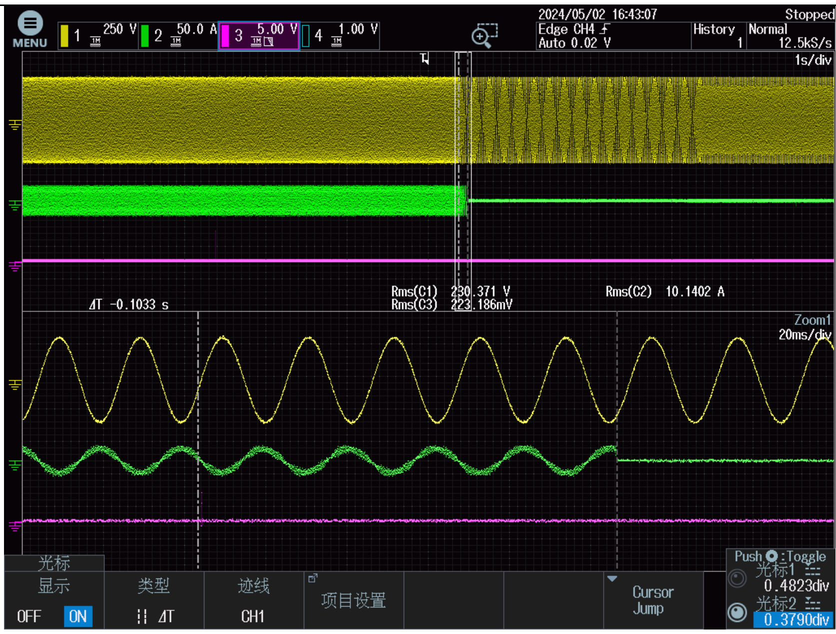
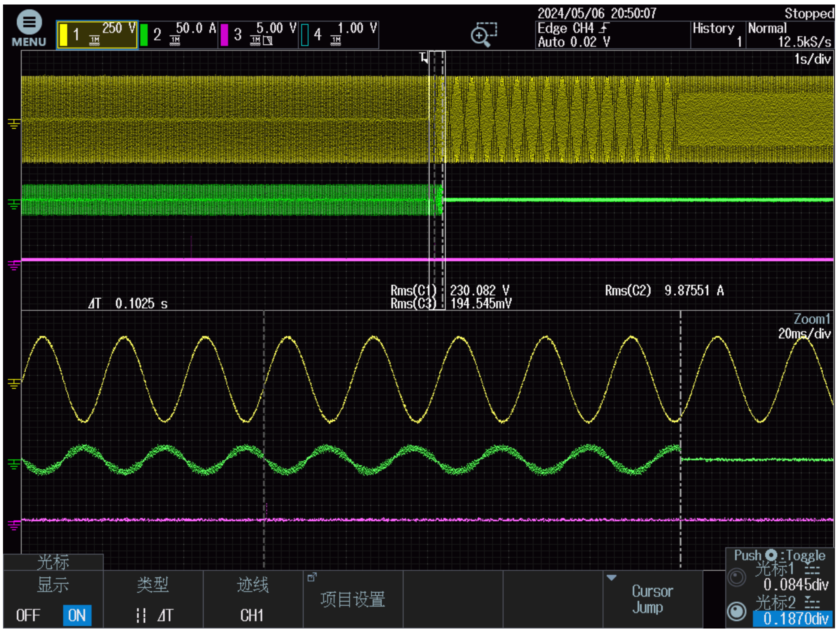


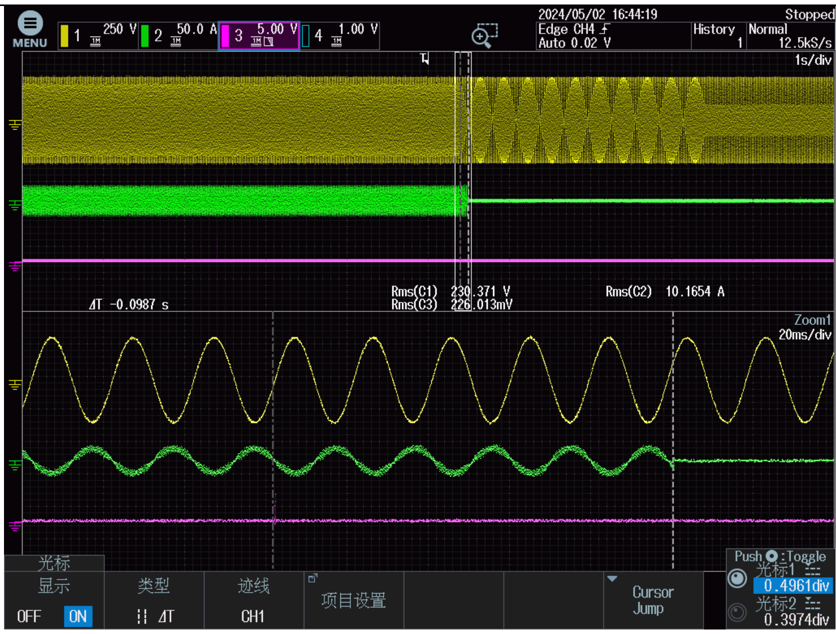
Test 3:



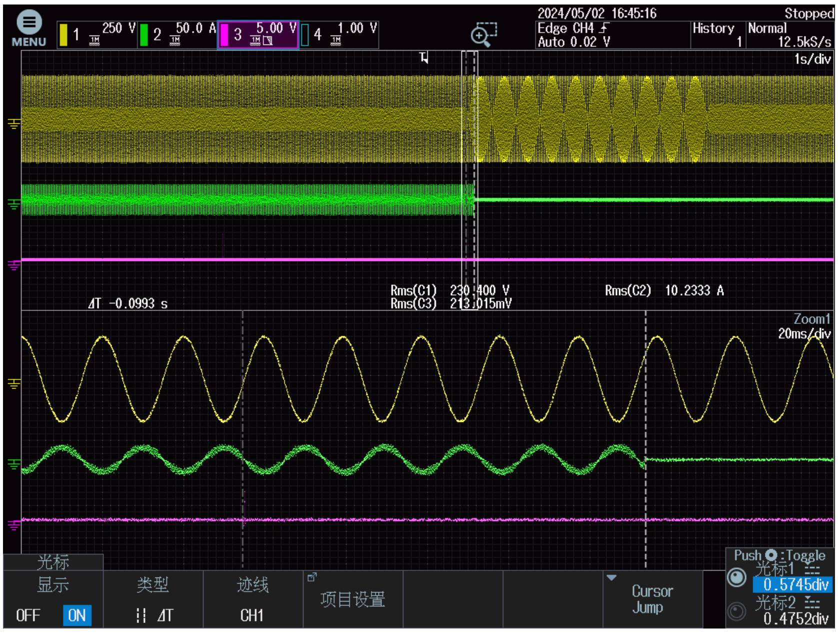
Oscilloscope 81> S2:

Test 1:

Test 2:



Test 3:



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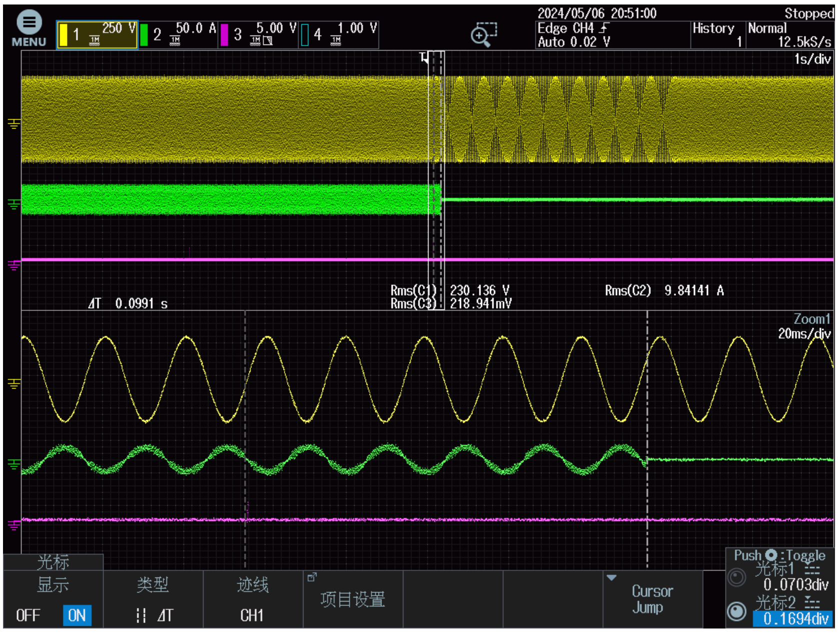
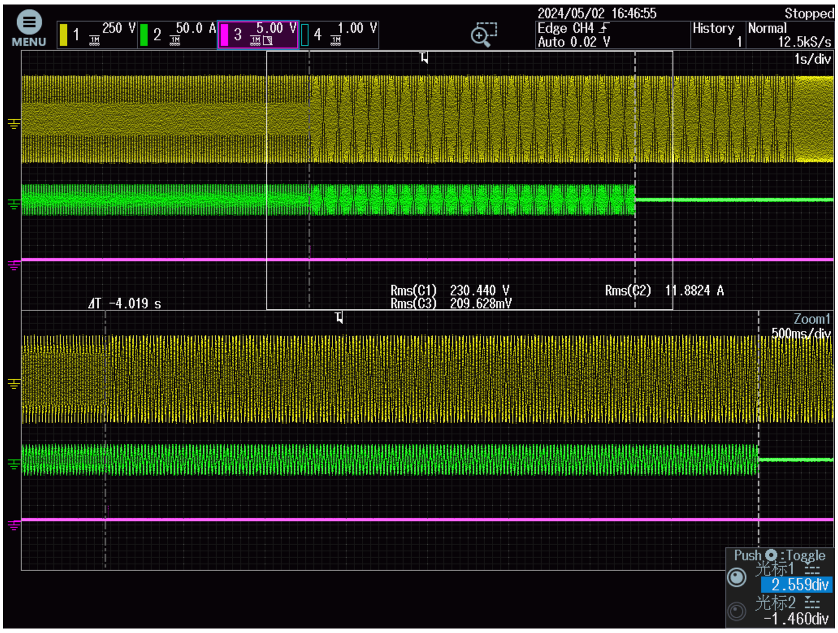


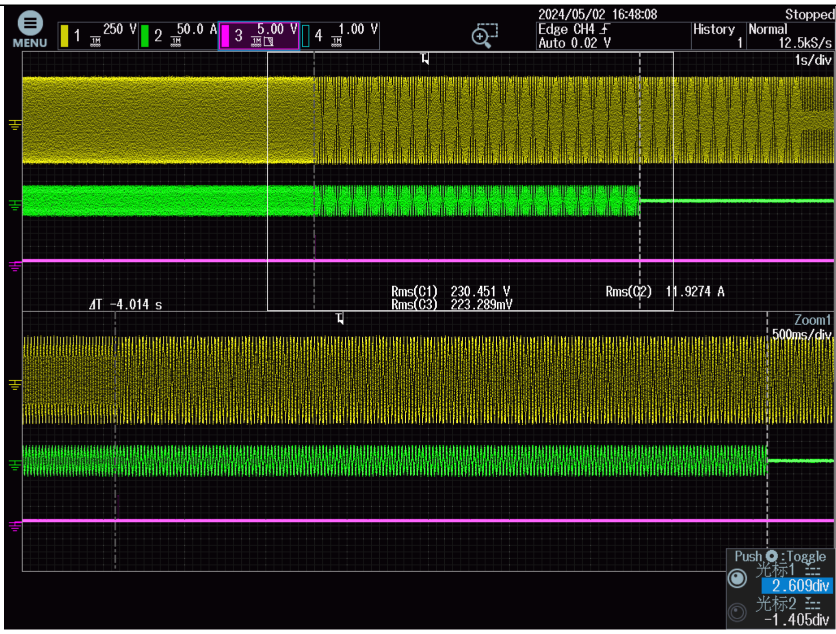
Test C	Modalità definitiva (Final operation mode):							
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S2	47.49	47.49	47.49	47.50	4019	4014	4013	3860 ≤ t ≤ 4140
(2):81>S2	51.50	51.50	51.50	51.50	101	101	101	950≤t≤1050

Oscilloscope 81< S2:

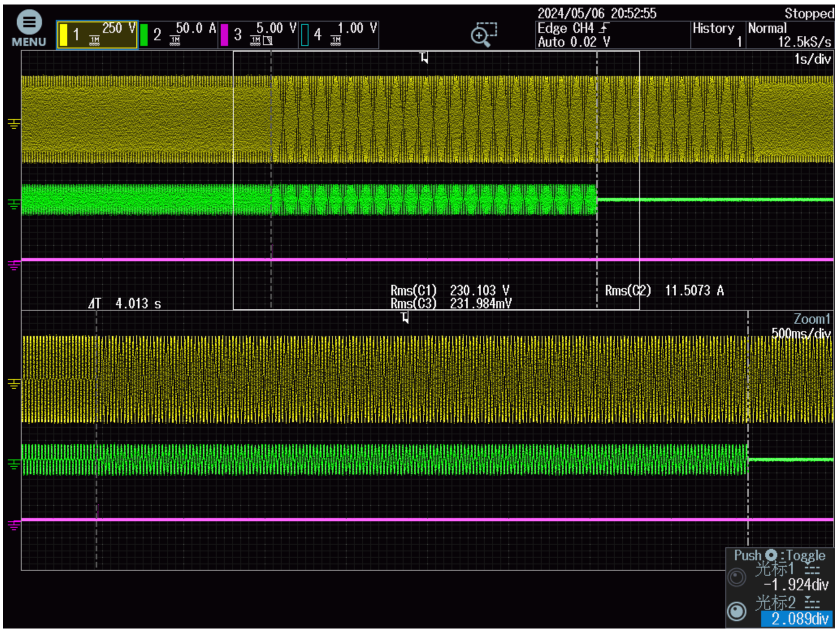
Test 1:



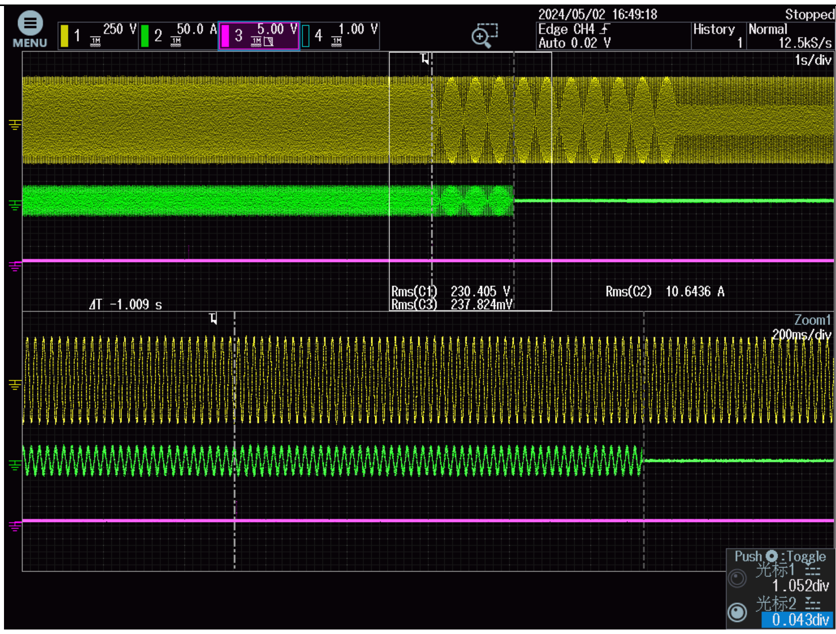
Test 2:



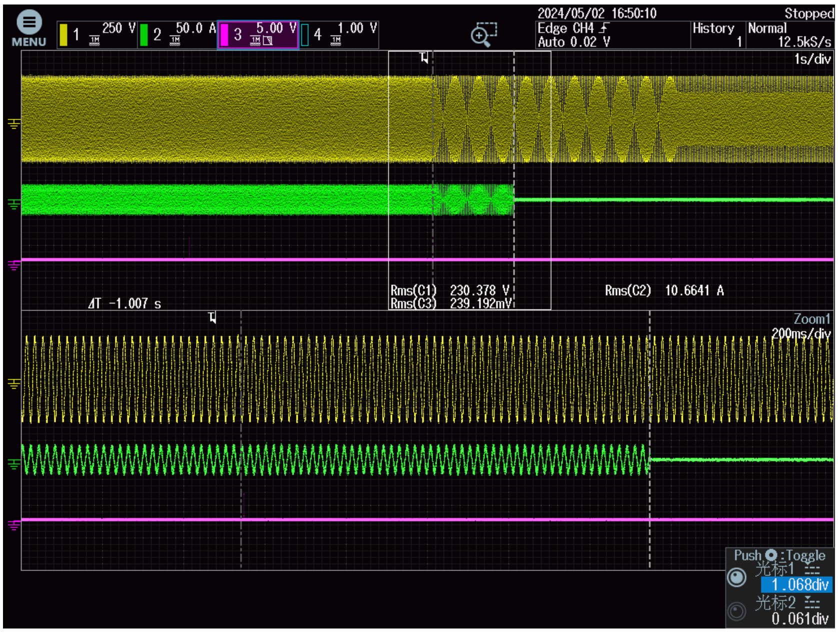
Test 3:



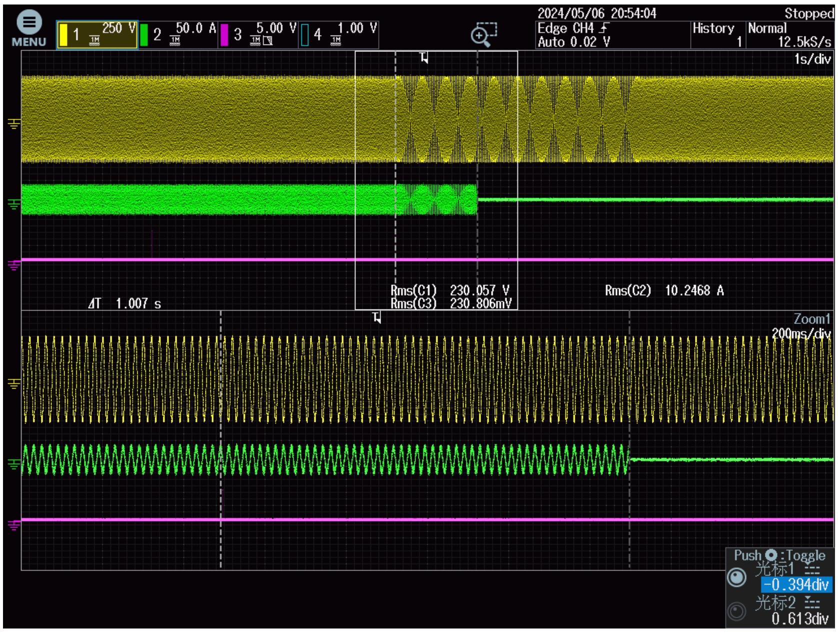
Oscilloscope 81> S2:
Test 1:


2024/05/02 16:49:18
Stopped
MENU
1 250 V
2 50.0 A
3 5.00 V
4 1.00 V
Edge CH4
Auto 0.02 V
History 1
Normal
12.5kS/s
1s/div
Rms(C1) 230.405 V
Rms(C3) 237.824mV
Rms(C2) 10.6436 A
ΔT -1.009 s
Zoom1
200ms/div
Push :Toggle
光标1
1.052div
光标2
0.043div

Test 2:


2024/05/02 16:50:10
Stopped
MENU
1 250 V
2 50.0 A
3 5.00 V
4 1.00 V
Edge CH4
Auto 0.02 V
History 1
Normal
12.5kS/s
1s/div
Rms(C1) 230.378 V
Rms(C3) 239.192mV
Rms(C2) 10.6641 A
ΔT -1.007 s
Zoom1
200ms/div
Push :Toggle
光标1
1.068div
光标2
0.061div

Test 3:



Supplementary information:

Trip threshold:

(1) 1.01 threshold -> decrease by max 10mHz steps

Trip time: (step from Hz to Hz)

(2) 1.01 -> 0.99 threshold

The setting value and the trip value of the frquency: **±20 mHz** for frequency intervention thresholds; **0.02 Hz** and **≤ 3 % ± 20 ms** for intervention times.

Differences between the test values: **± 0.02 Hz** and ≤ **1 % ± 20 ms** for intervention times**.**

A.4.3.1 &A.4.3.2	**Test procedure for maximum/minimum voltage**		P
Tested condition:	20 °C ± 2 °C	**Model**	X1-H6K-S

Voltage	Phase	Tripping threshold				Tripping time			
		Detected [V]			Limit [V] ±1% Vn	Detected [ms]			Request [ms]
Min (27.S1)	L1-N	194.0	194.0	194.0	195.5	1500	1502	1507	1435 ≤ t ≤ 1565
Min (27.S2) *	L1-N	33.0	33.0	33.0	34.5	194	206	206	174 ≤ t ≤ 226
Max (59.S2)	L1-N	264.5	264.5	264.5	264.5	190	189	203	174 ≤ t ≤ 226

Oscilloscope 27.S1:
Test 1:

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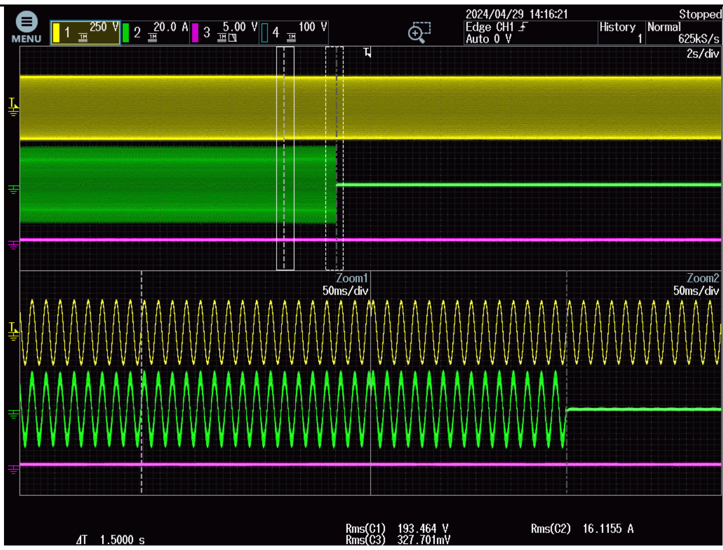
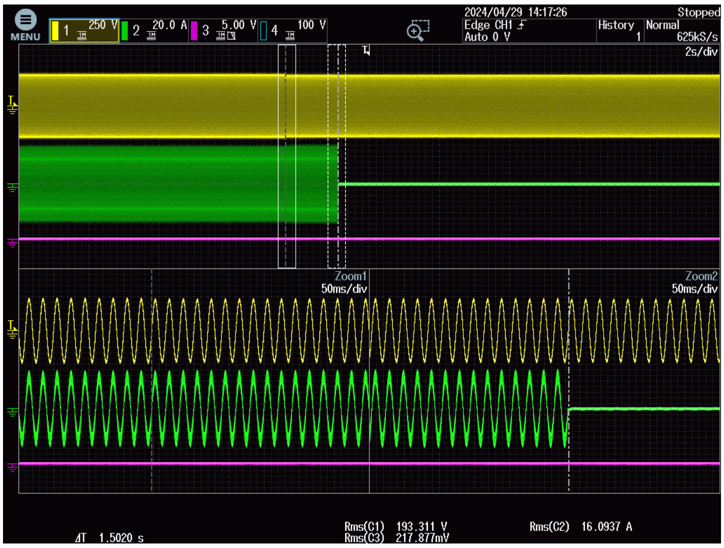
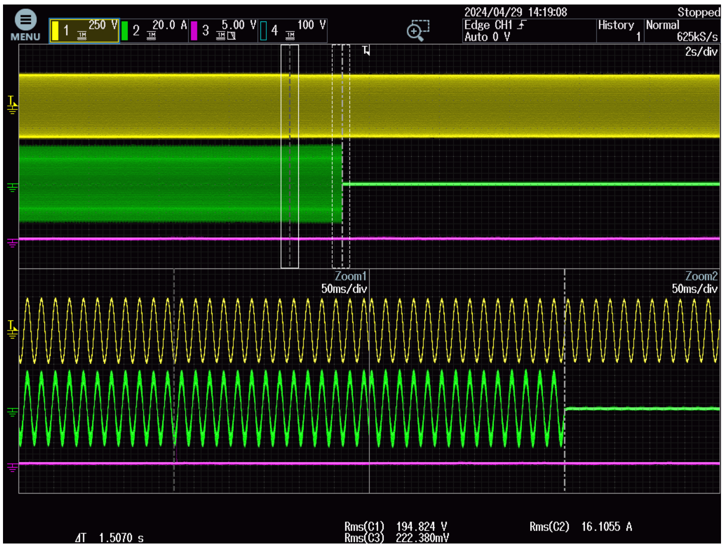


Test 2:

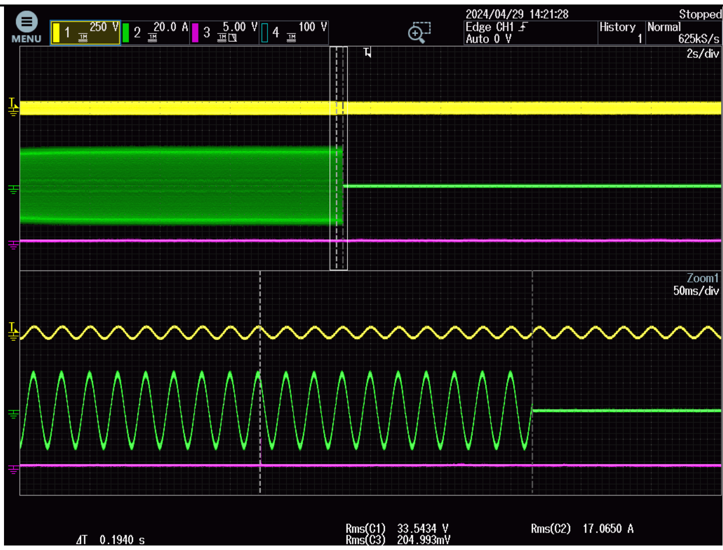


Test 3:

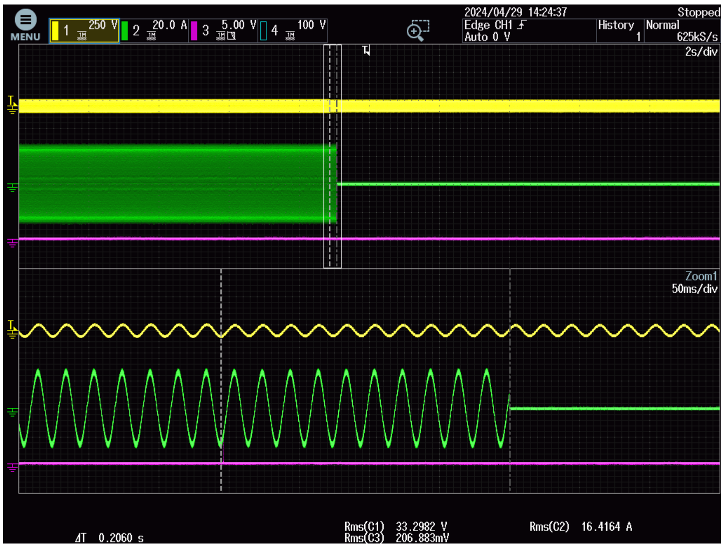


Oscilloscope 27.S2:

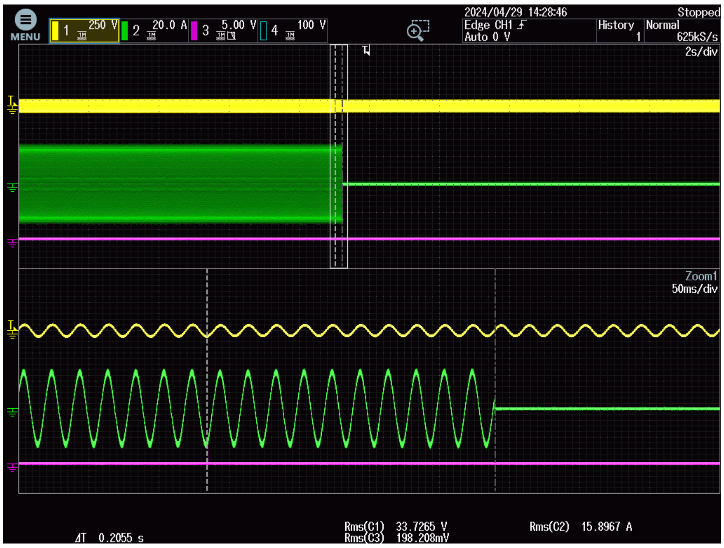
Test 1:



Test 2:



Test 3:



Oscilloscope 59.S2:

Test 1:

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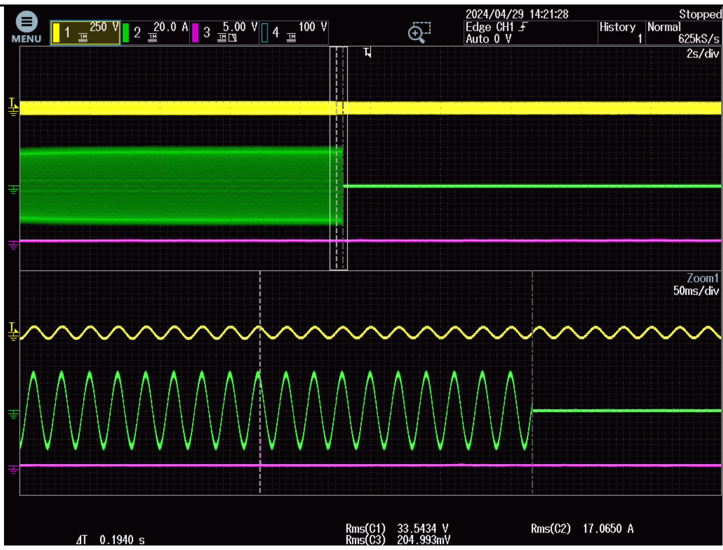
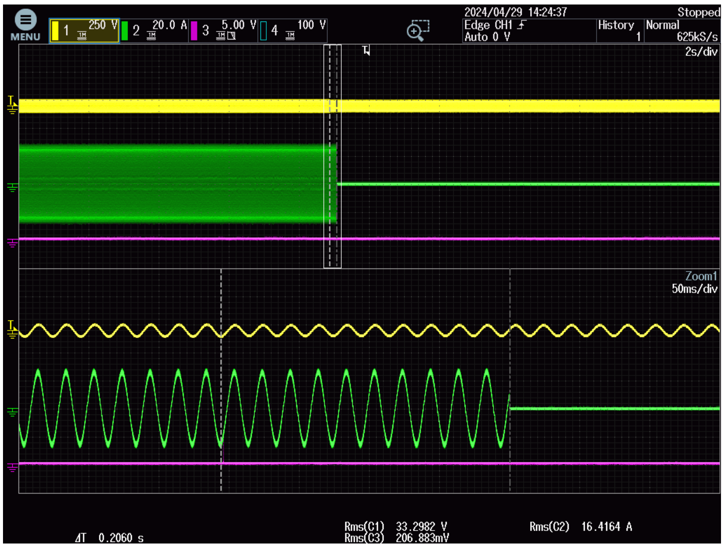
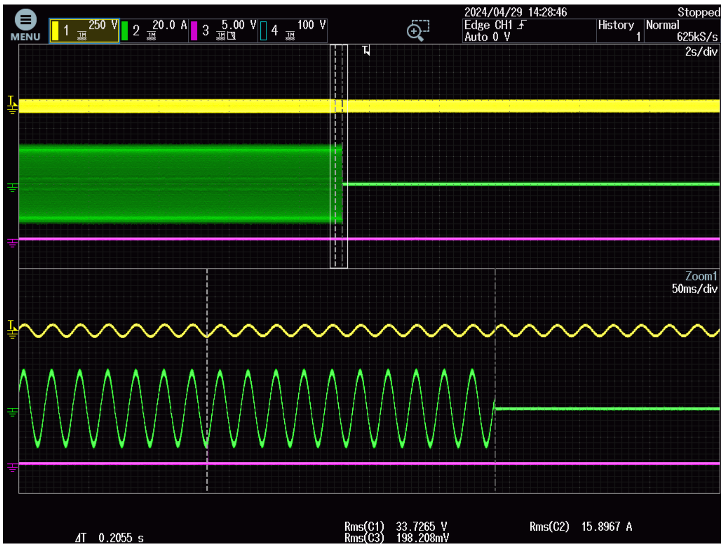


Test 2:



Test 3:



Tested condition:	-25°C (cold) while the equipment is powered(16h)	**Model**	X1-H6K-S

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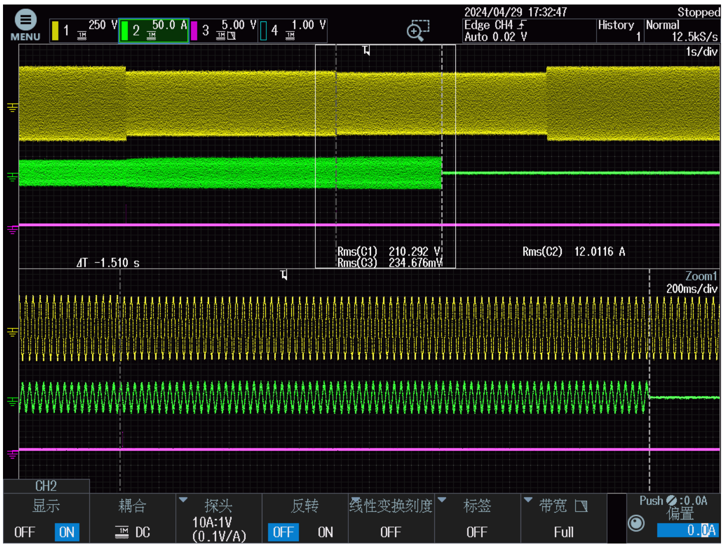
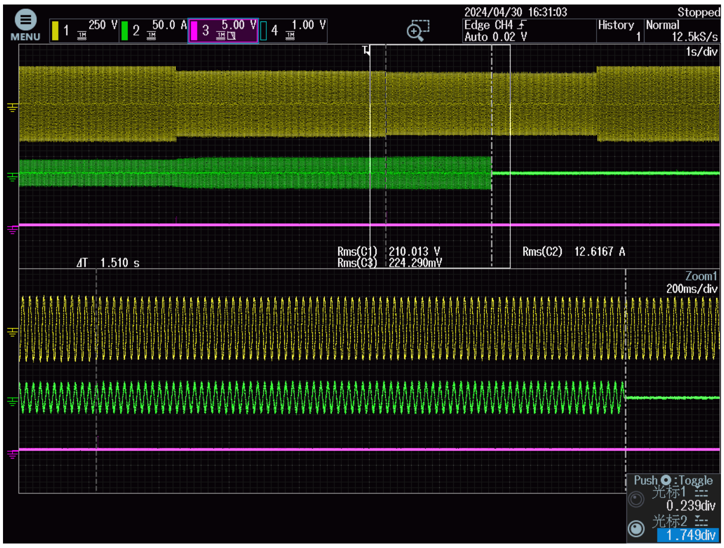
Voltage	Phase	Tripping threshold				Tripping time			
		Detected [V]			Limit [V] ±1% Vn	Detected [ms]			Request [ms]
Min (27.S1)	L1-N	194.4	194.4	194.4	195.5	1510	1510	1512	1435 ≤ t ≤ 1565
Min (27.S2) *	L1-N	33.7	33.5	33.5	34.5	202	201	201	174 ≤ t ≤ 226
Max (59.S2)	L1-N	264.4	264.5	264.4	264.5	202	202	202	174 ≤ t ≤ 226

Oscilloscope 27.S1:

Test 1:



Test 2:



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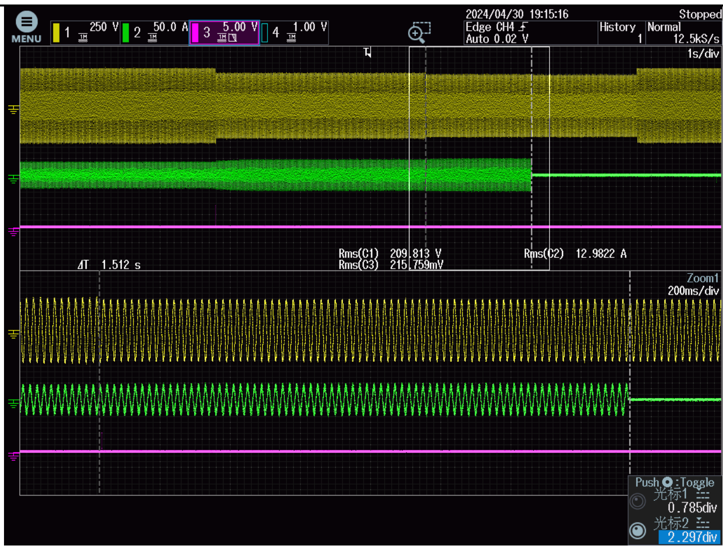
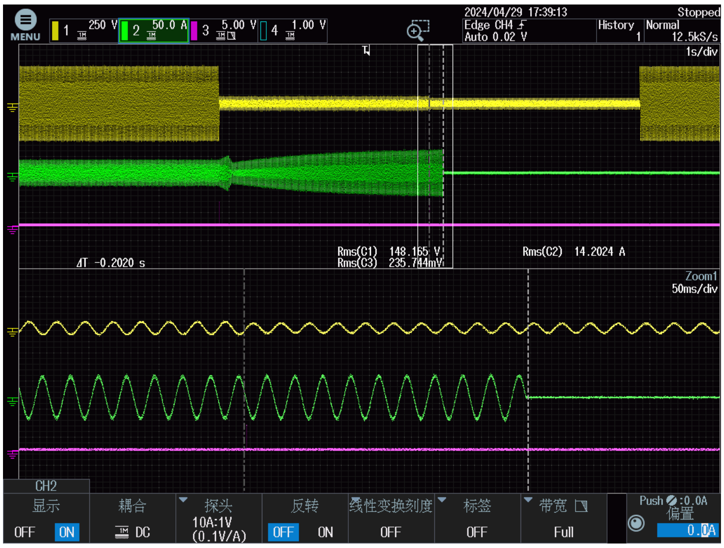
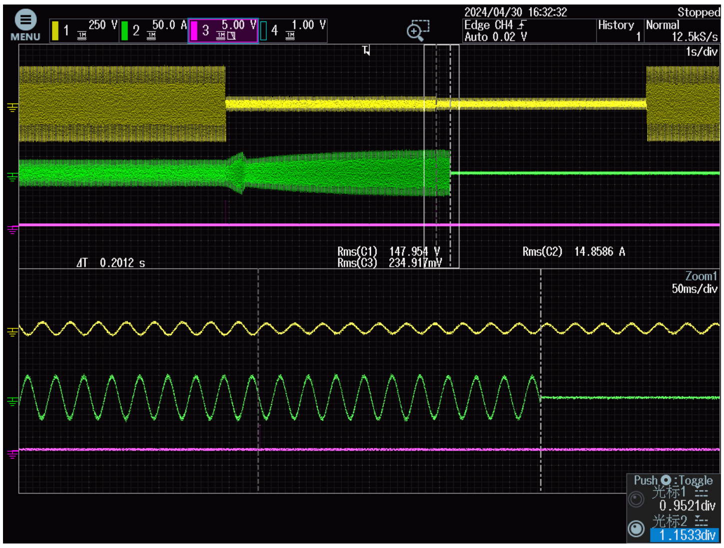


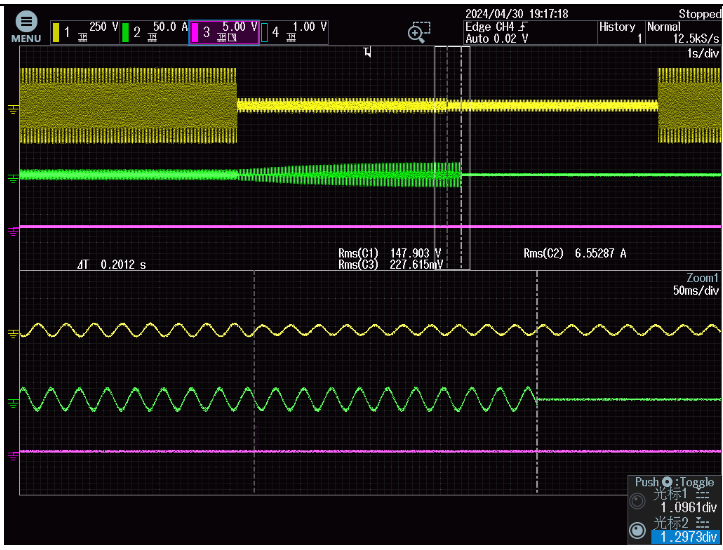
Oscilloscope 27.S2:
Test 1:



Test 2:

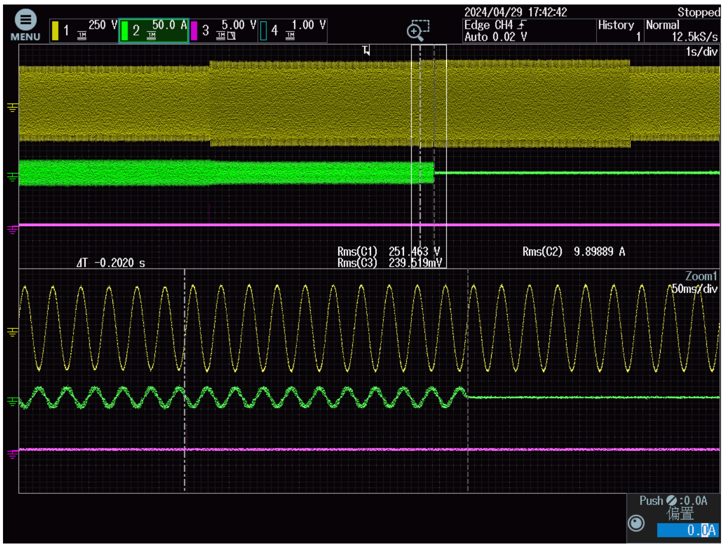


Test 3:

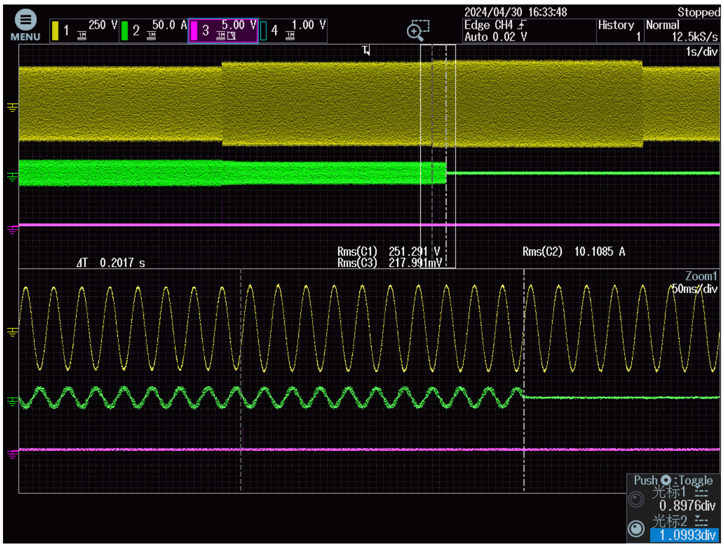


Oscilloscope 59.S2:

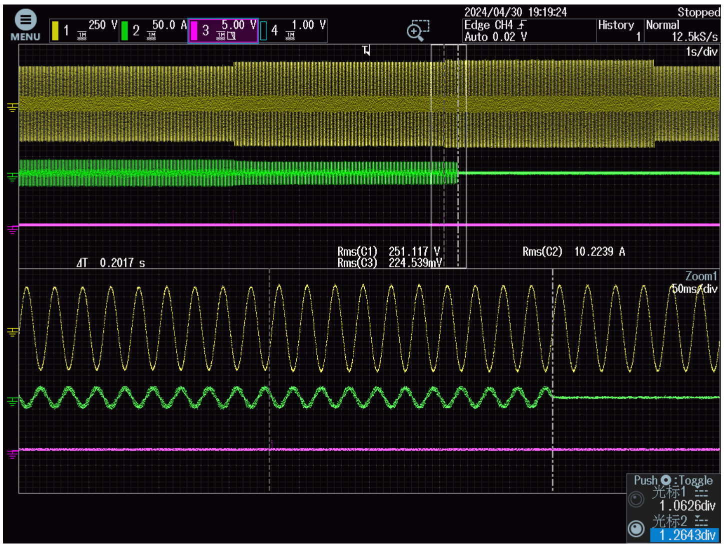
Test 1:



Test 2:



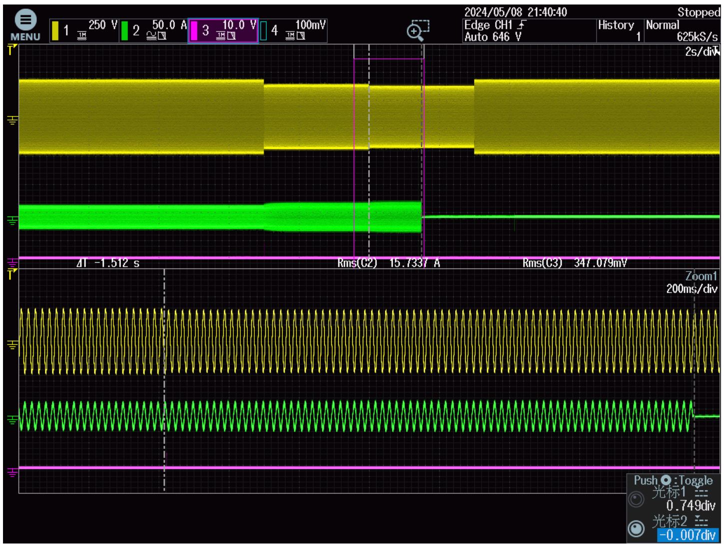
Test 3:



Tested condition:	-30°C (cold) while the equipment is not powered(16h)							Model	X1-H6K-S
Voltage	Phase	Tripping threshold				Tripping time			
		Detected [V]			Limit [V] ±1% Vn	Detected [ms]			Request [ms]
Min (27.S1)	L1-N	194.7	194.7	195.5	195.5	1512	1514	1512	1435 ≤ t ≤ 1565
Min (27.S2) *	L1-N	33.7	33.7	33.3	34.5	202	201	201	174 ≤ t ≤ 226
Max (59.S2)	L1-N	264.6	264.6	264.6	264.5	202	202	202	174 ≤ t ≤ 226

Oscilloscope 27.S1:

Test 1:



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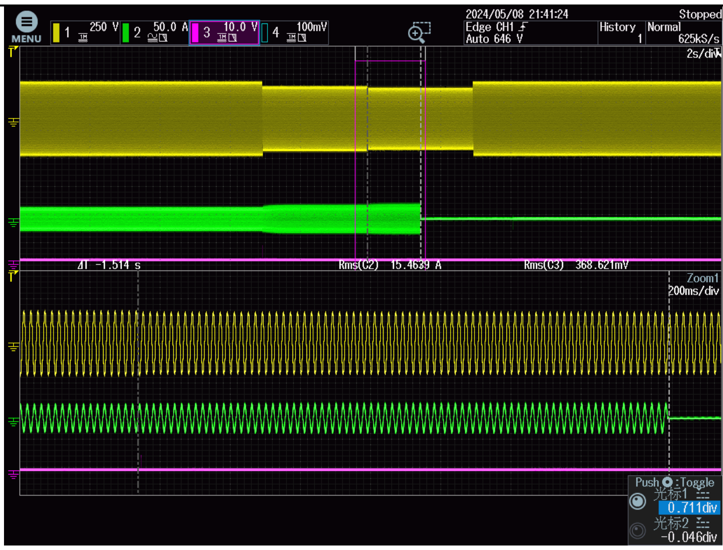
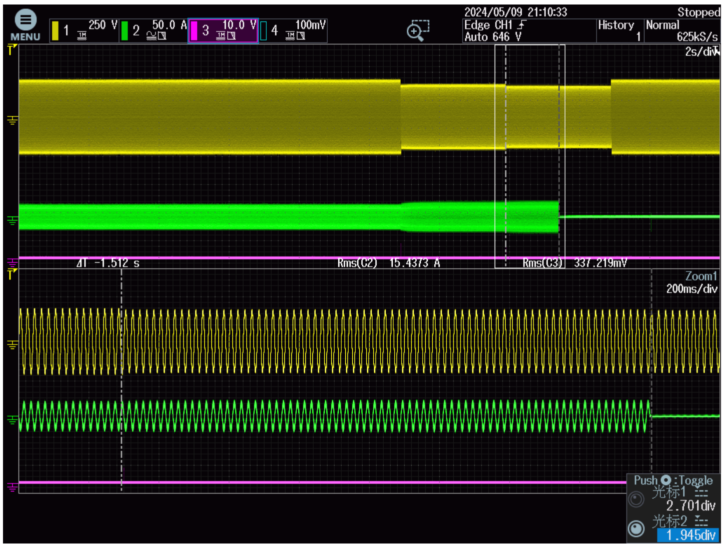
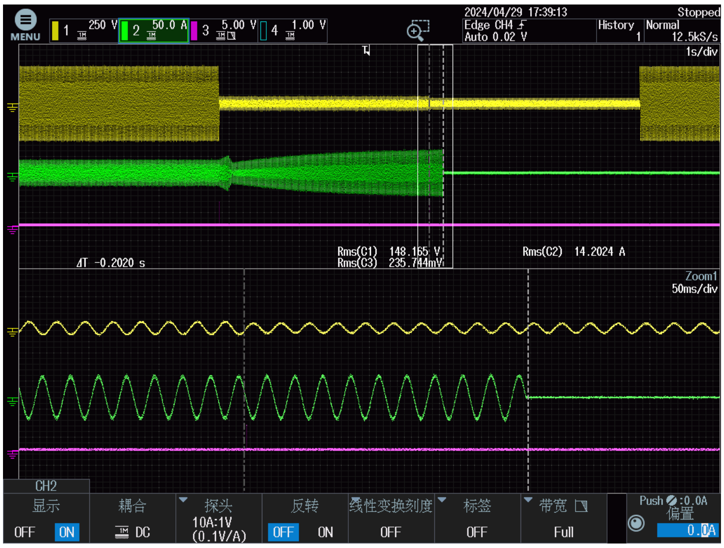


Test 3:



Oscilloscope 27.S2:

Test 1:



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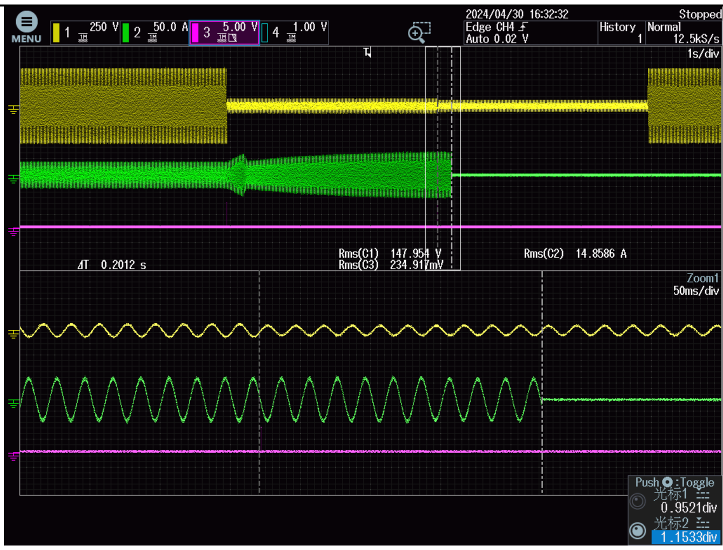
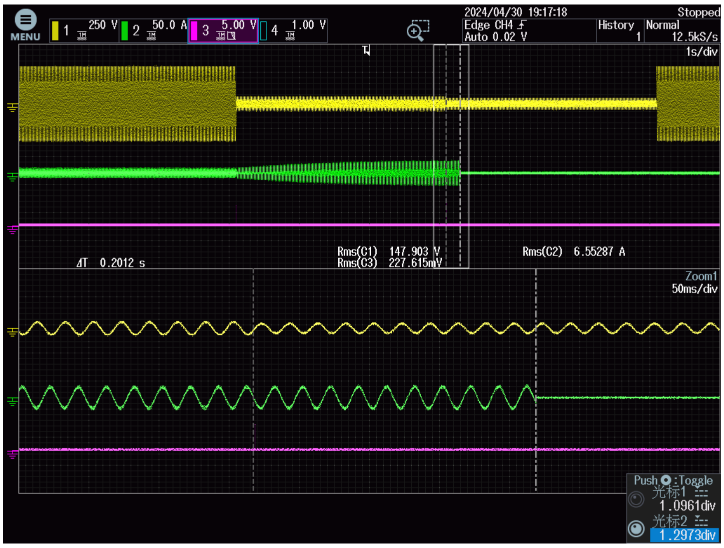
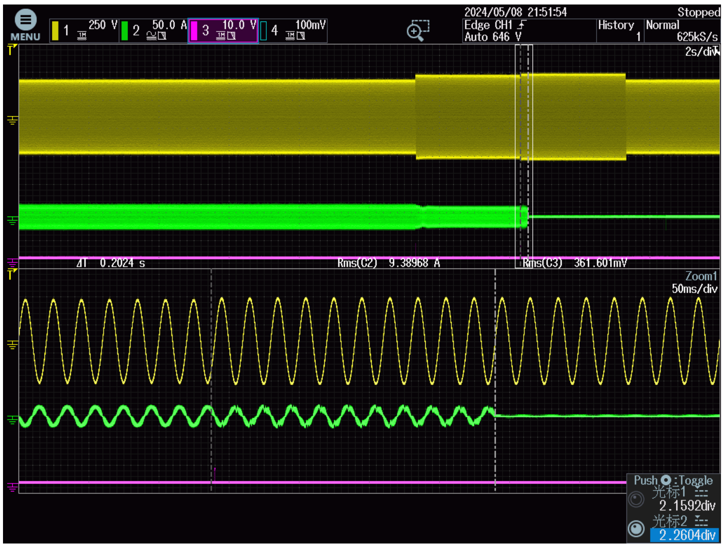


Test 3:



Oscilloscope 59.S2:

Test 1:



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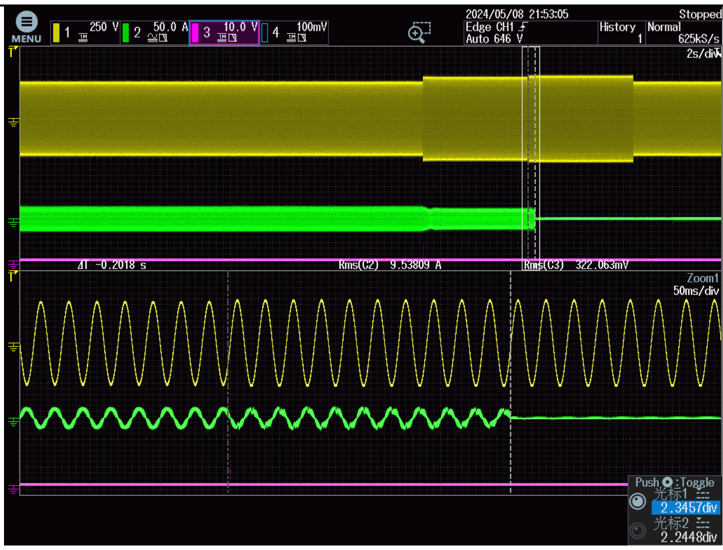
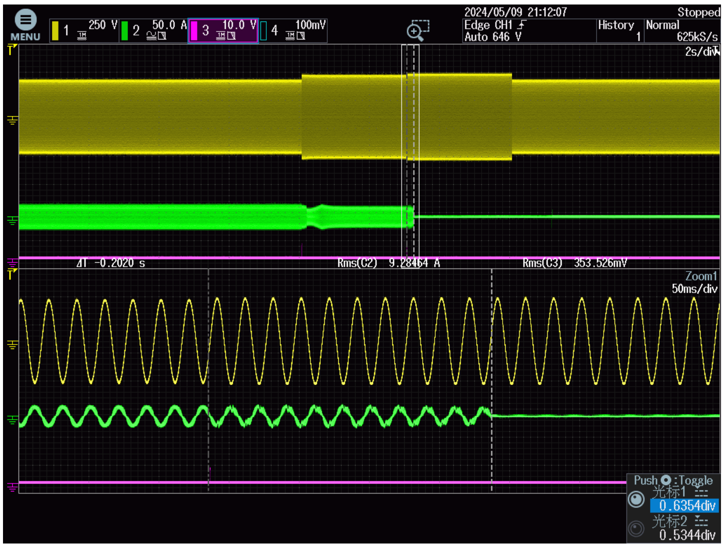


Test 3:



Tested condition:			60°C (Dry hot) while the equipment is powered(16h)					**Model**	X1-H6K-S
Voltage	Phase	Tripping threshold				Tripping time			
		Detected [V]			Limit [V] ±1% Vn	Detected [ms]			Request [ms]
Min (27.S1)	L1-N	194.6	194.7	194.7	195.5	1508	1508	1508	1435 ≤ t ≤ 1565
Min (27.S2) *	L1-N	33.6	33.6	33.5	34.5	202	202	202	174 ≤ t ≤ 226
Max (59.S2)	L1-N	264.4	264.5	264.4	264.5	203	202	202	174 ≤ t ≤ 226

Oscilloscope 27.S1:
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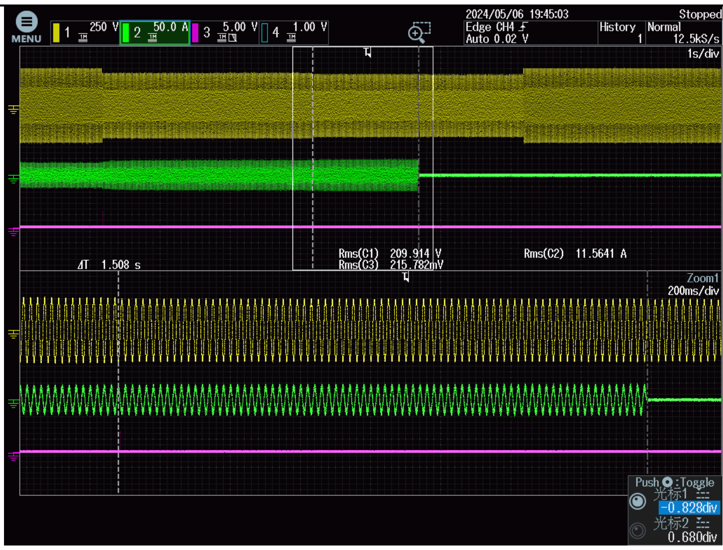
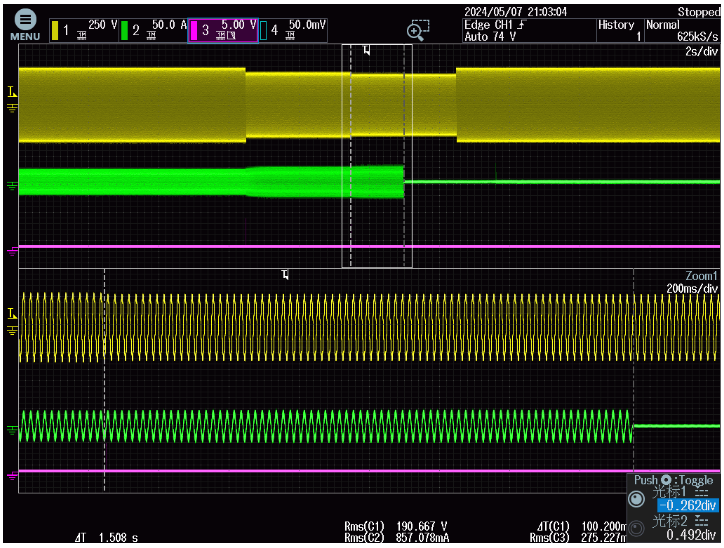
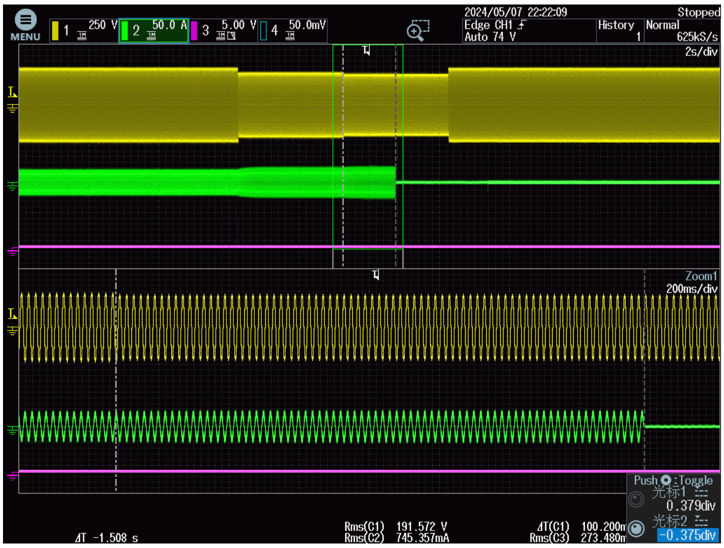


Test 2:

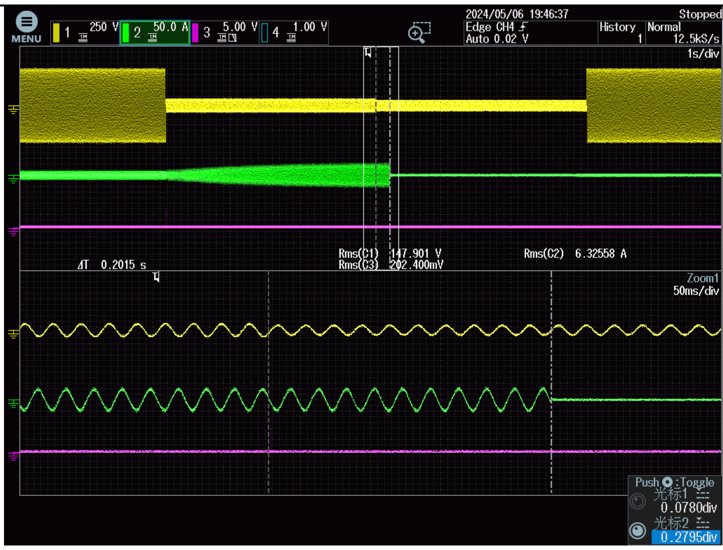


Test 3:

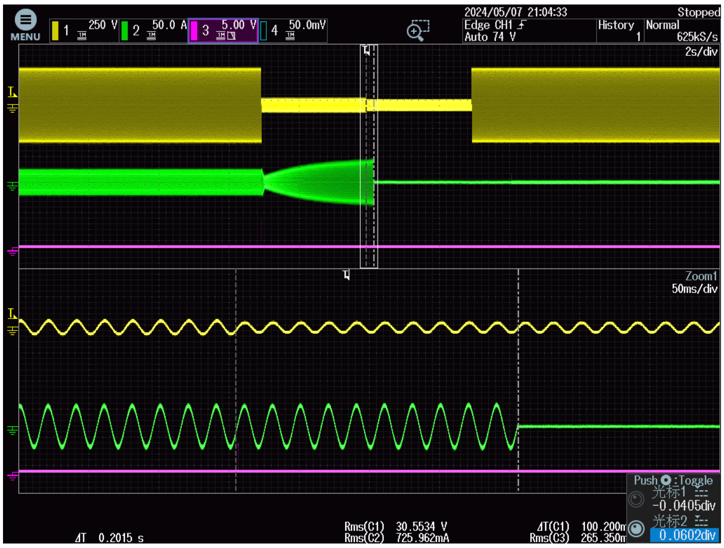


Oscilloscope 27.S2:

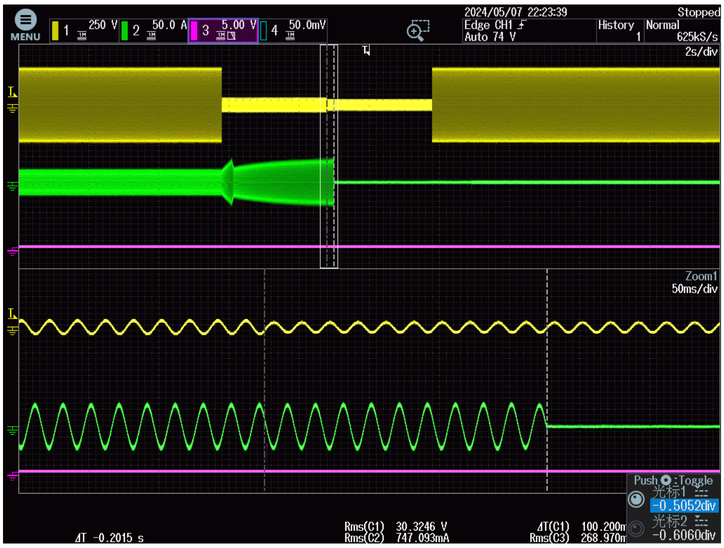
Test 1:



Test 2:



Test 3:



Oscilloscope 59.S2:

Test 1:

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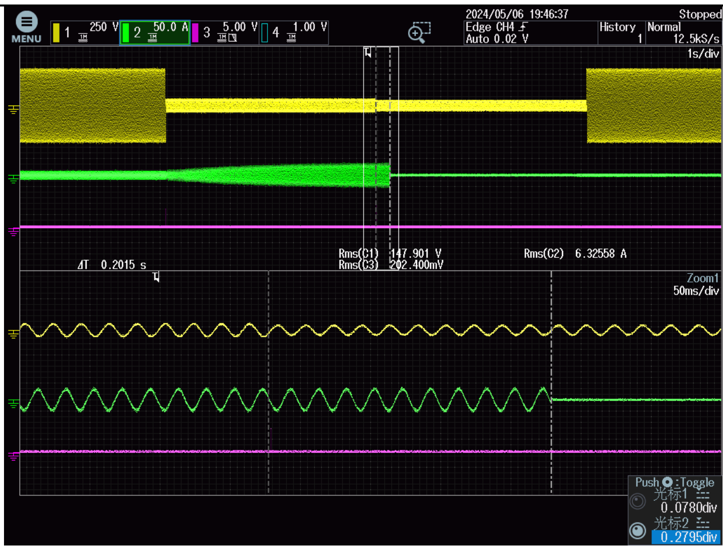
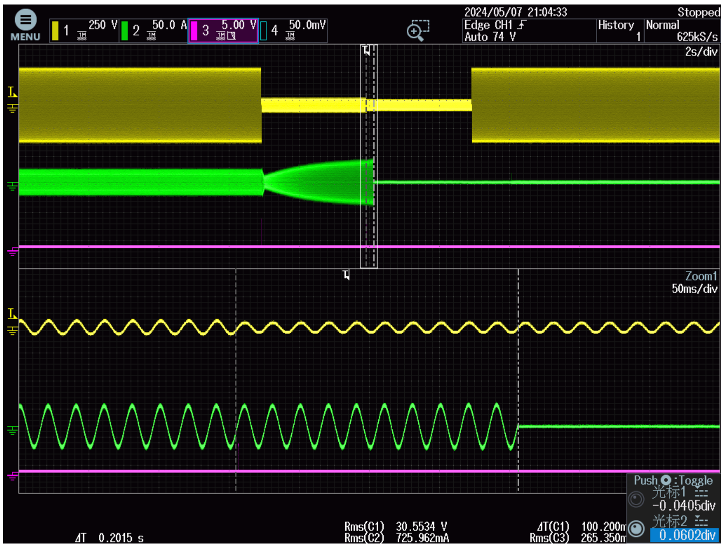
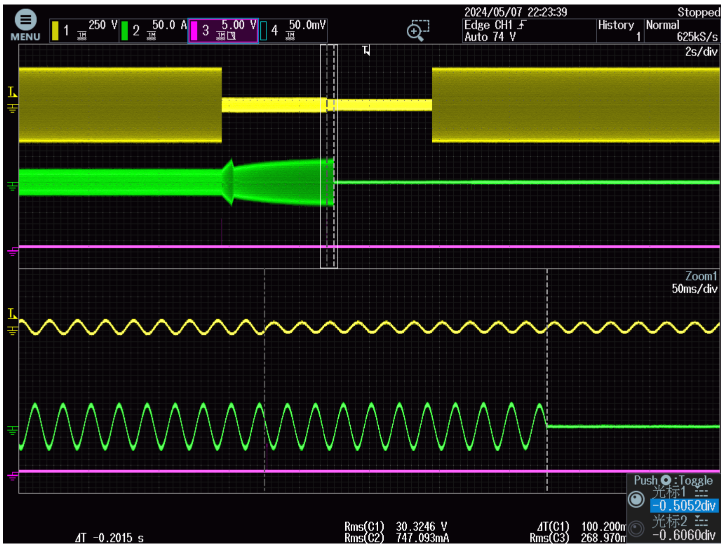


Test 2:



Test 3:



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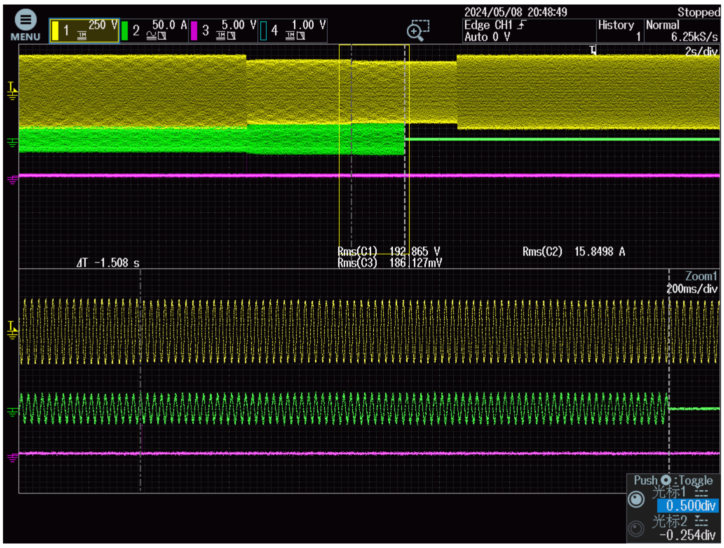
Tested condition:	70°C (Dry hot) while the equipment is not powered(16h)	Model	X1-H6K-S

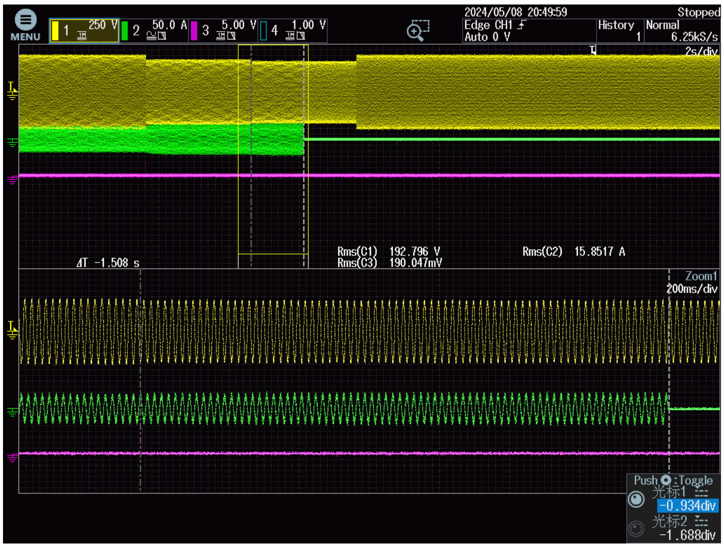
Voltage	Phase	Tripping threshold				Tripping time			
		Detected [V]			Limit [V] ±1% Vn	Detected [ms]			Request [ms]
Min (27.S1)	L1-N	194.4	194.4	194.6	195.5	1508	1508	1514	1435 ≤ t ≤ 1565
Min (27.S2) *	L1-N	33.6	33.6	33.5	34.5	202	202	198	174 ≤ t ≤ 226
Max (59.S2)	L1-N	264.6	264.6	264.6	264.5	203	203	207	174 ≤ t ≤ 226

Oscilloscope 27.S1:

Test 1:



Test 2:



Test 3:

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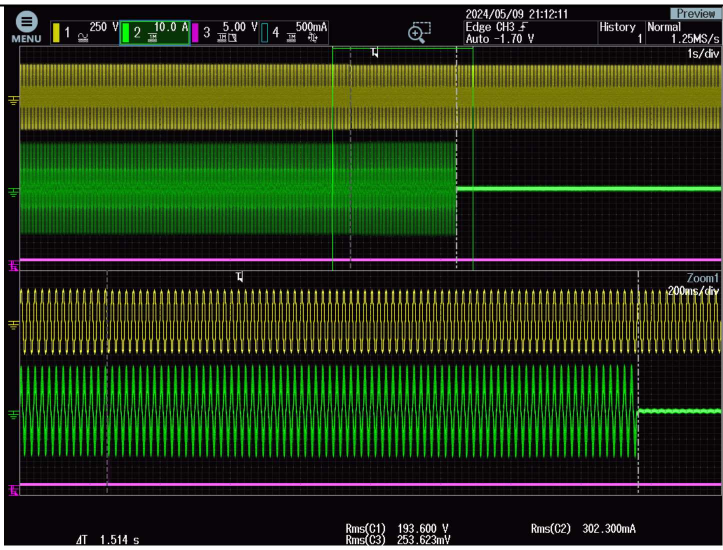
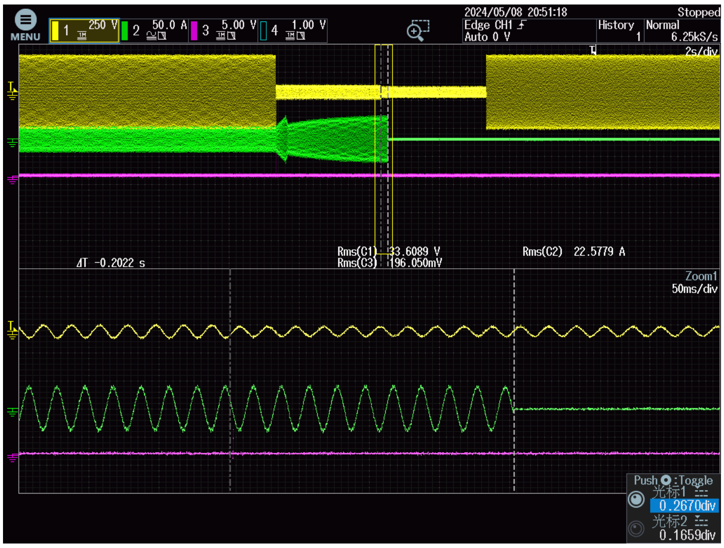
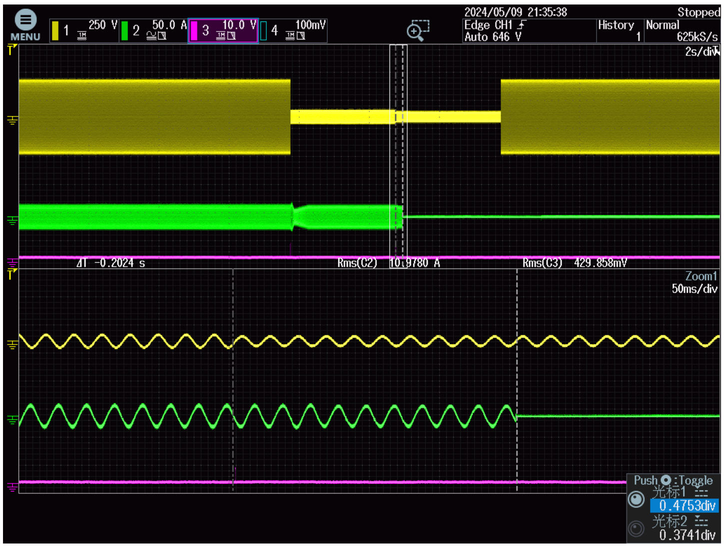


Oscilloscope 27.S2:
Test 1:



Test 2:



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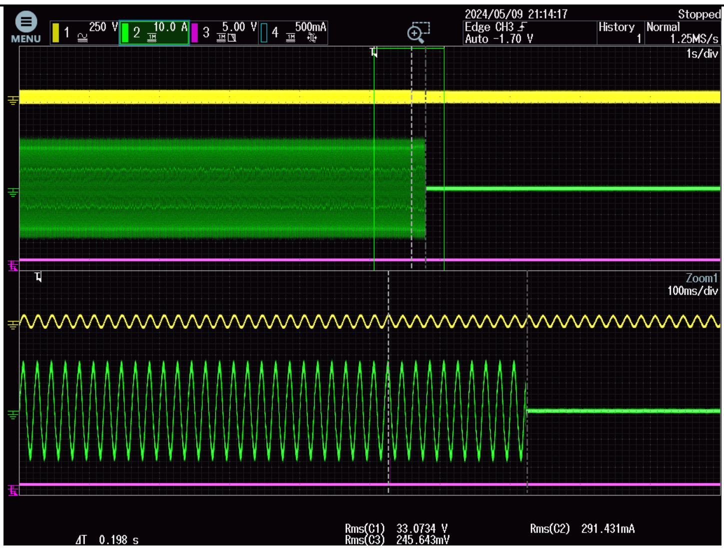
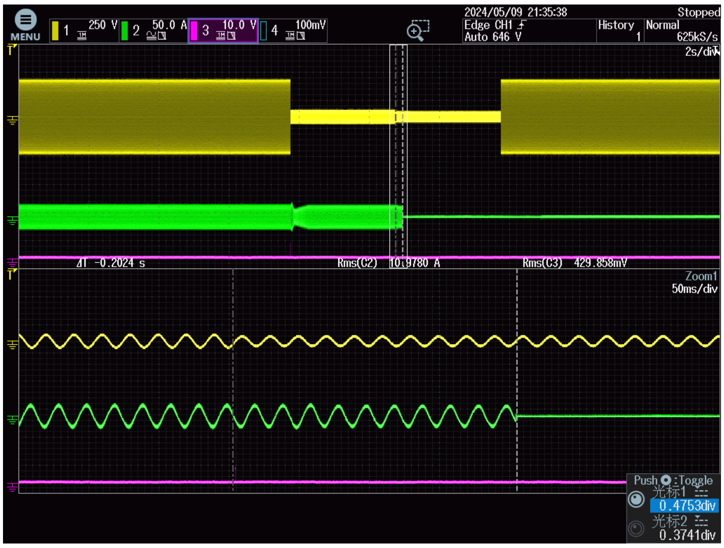
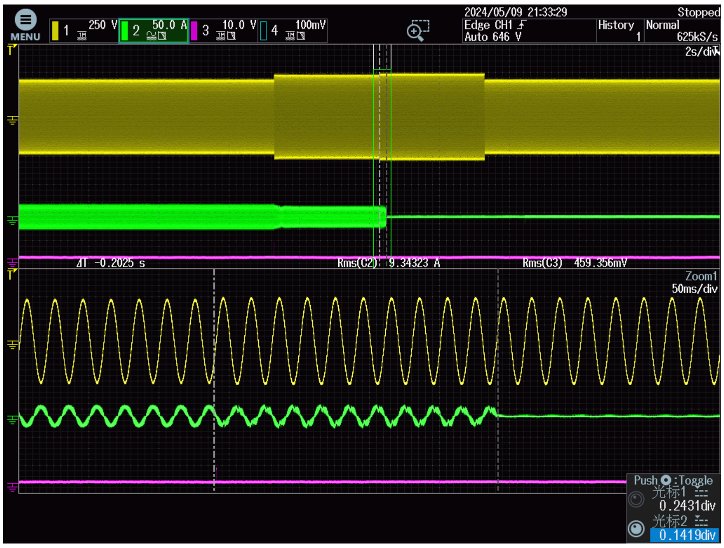


Oscilloscope 59.S2:

Test 1:



Test 2:



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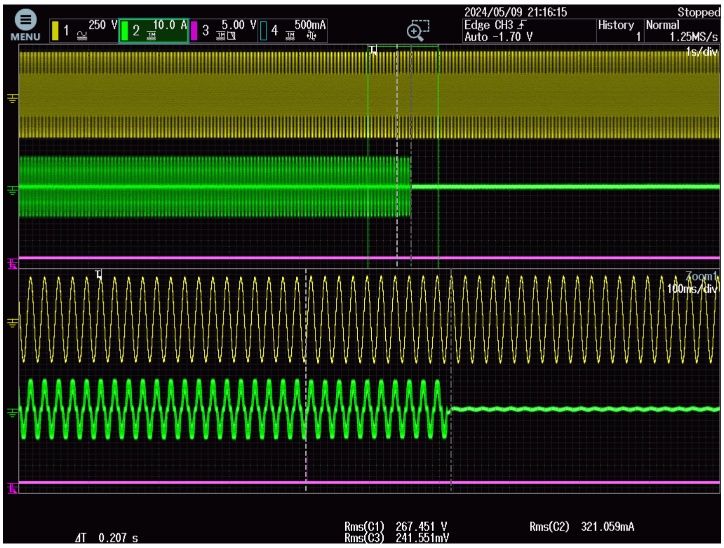
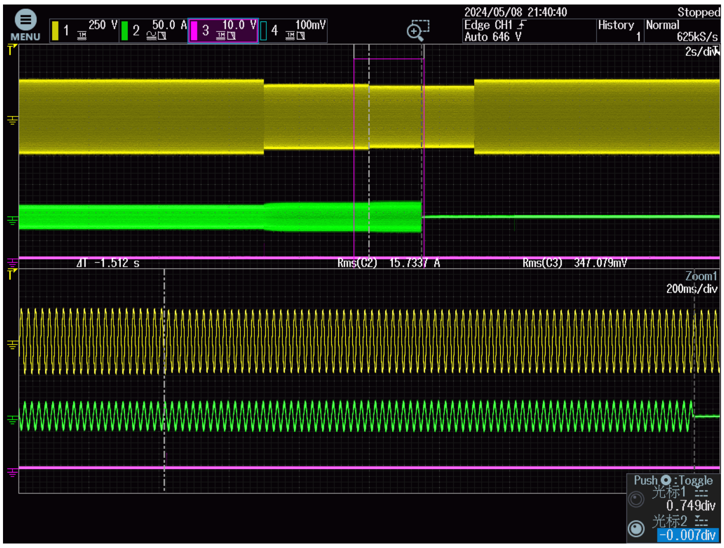


Tested condition:			-25 °C/+60 °C ± 2°C (3 h + 3 h) (Temperature change) while the equipment is powered					Model	X1-H6K-S
Voltage	Phase	Tripping threshold				Tripping time			
		Detected [V]			Limit [V] ±1% Vn	Detected [ms]			Request [ms]
Min (27.S1)	L1-N	195.5	194.4	194.4	195.5	1512	1510	1515	1435 ≤ t ≤ 1565
Min (27.S2) *	L1-N	33.3	33.7	33.7	34.5	202	213	207	174 ≤ t ≤ 226
Max (59.S2)	L1-N	265.6	264.5	264.6	264.5	202	206	207	174 ≤ t ≤ 226

Oscilloscope 27.S1:
Test 1:



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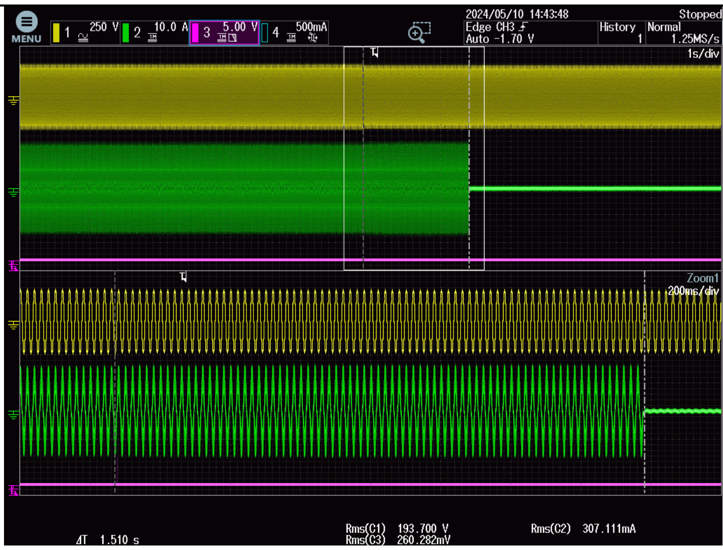
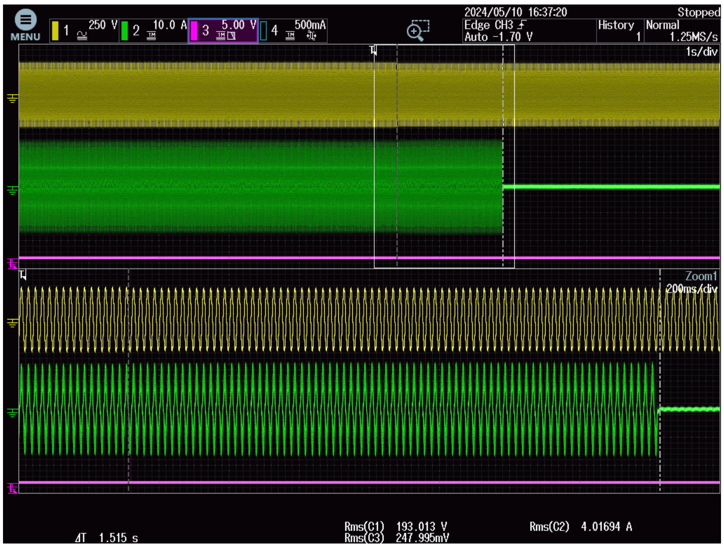
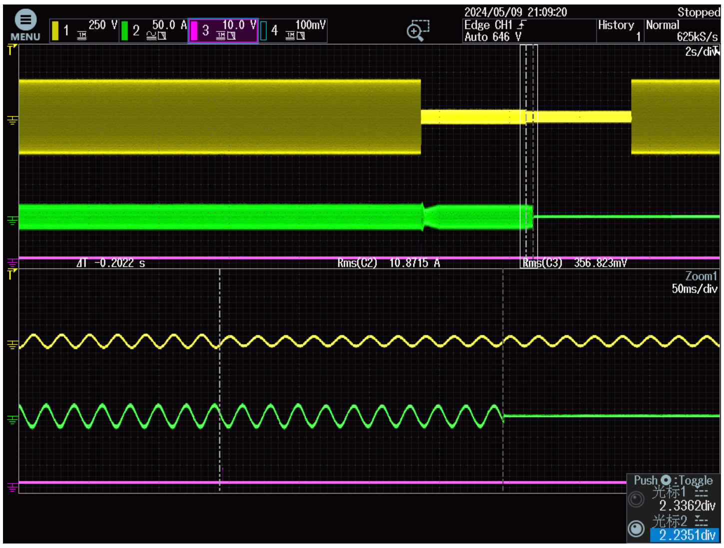


Test 3:



Oscilloscope 27.S2:

Test 1:



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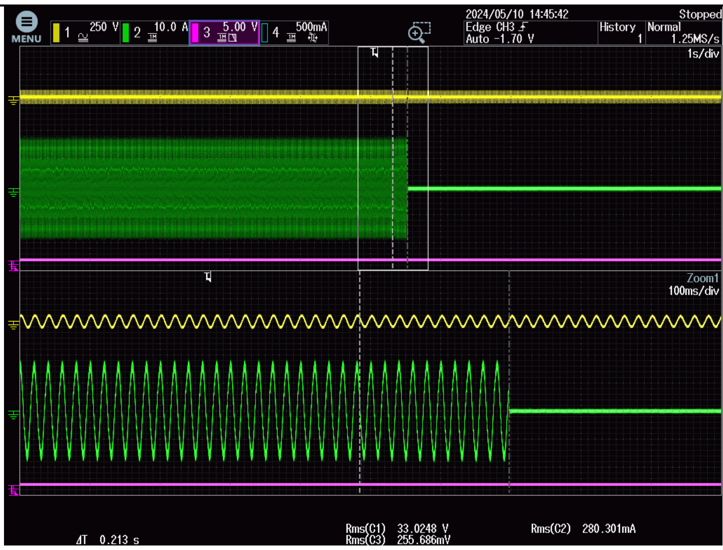
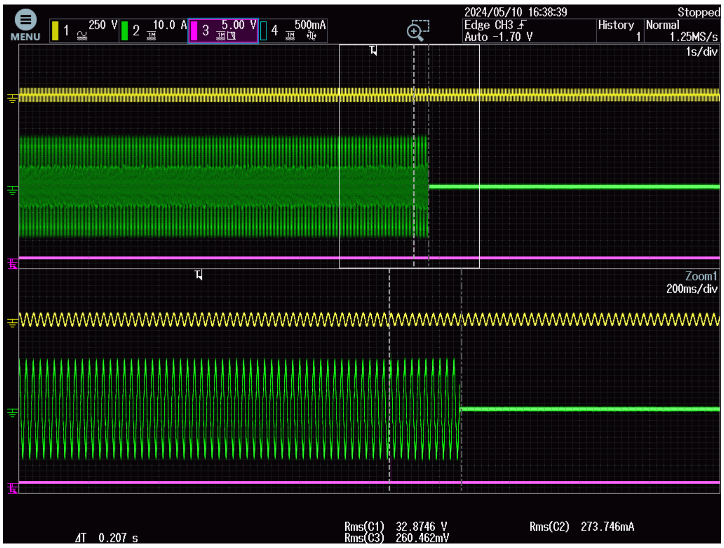
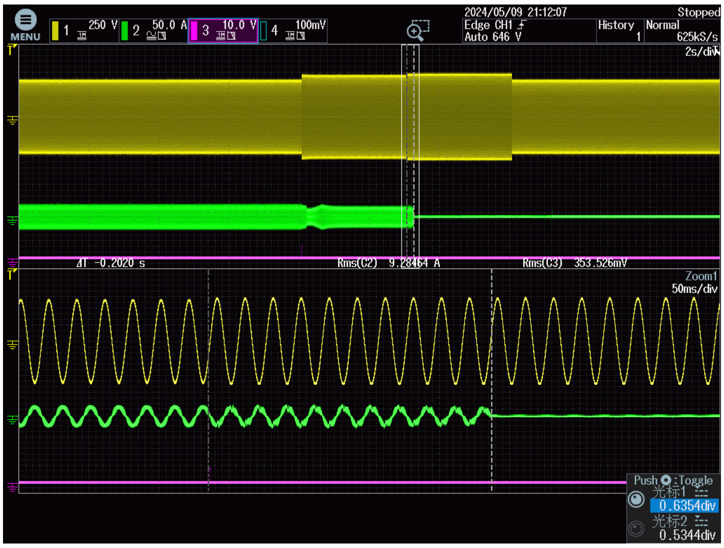


Test 3:



Oscilloscope 59.S2:

Test 1:



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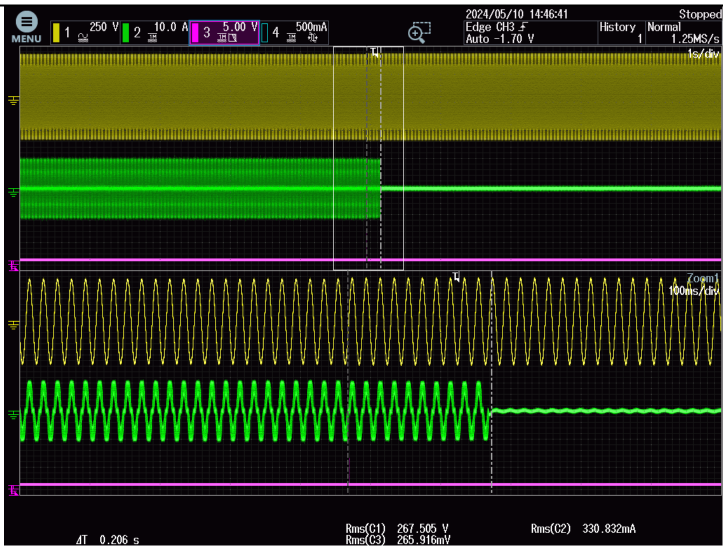
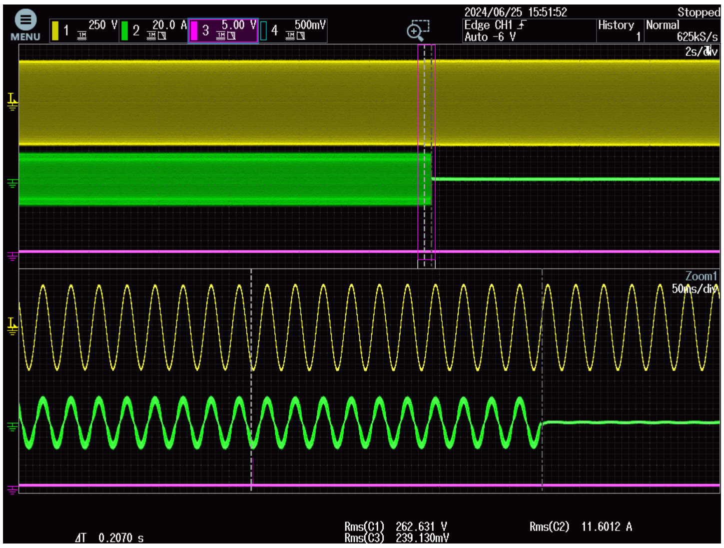
Test 3:





Tested condition:	-30 °C/+70 °C ± 2°C (3 h + 3 h) (Temperature change) while the equipment is not powered	**Model**	X1-H6K-S

Voltage	Phase	Tripping threshold				Tripping time			
		Detected [V]			Limit [V] ±1% Vn	Detected [ms]			Request [ms]
Min (27.S1)	L1-N	194.6	195.5	194.4	195.5	1514	1512	1510	1435 ≤ t ≤ 1565
Min (27.S2) *	L1-N	33.5	33.3	33.5	34.5	198	204	204	174 ≤ t ≤ 226
Max (59.S2)	L1-N	264.6	265.5	264.5	264.5	207	203	204	174 ≤ t ≤ 226

Oscilloscope 27.S1:
Test 1:

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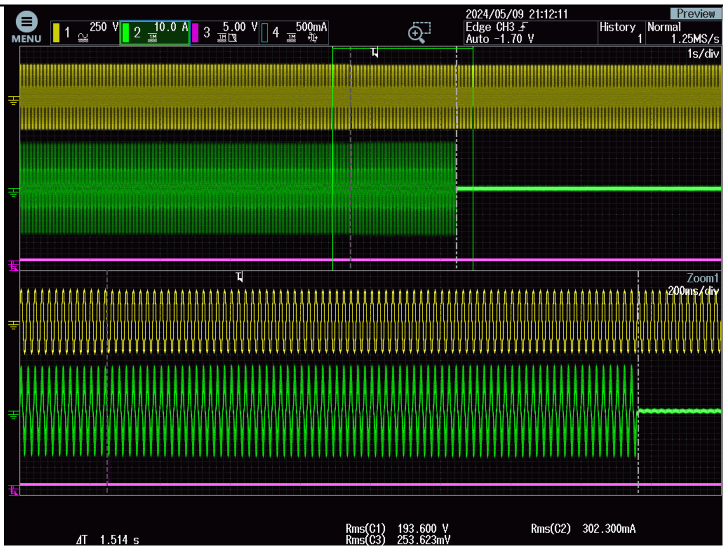
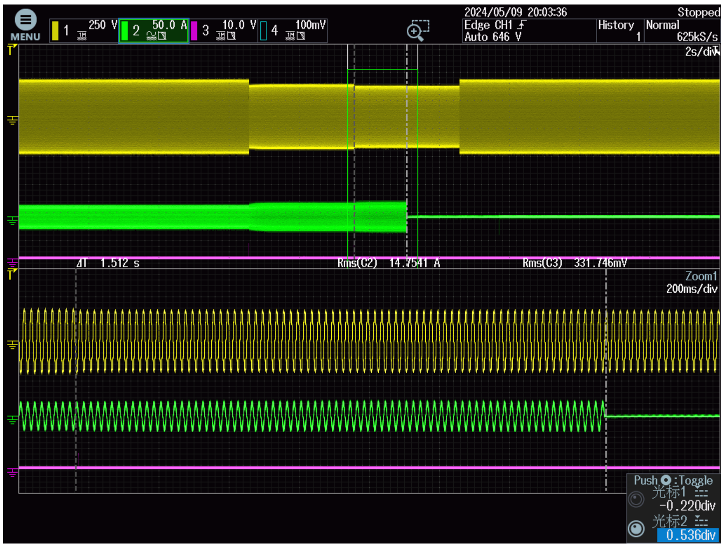
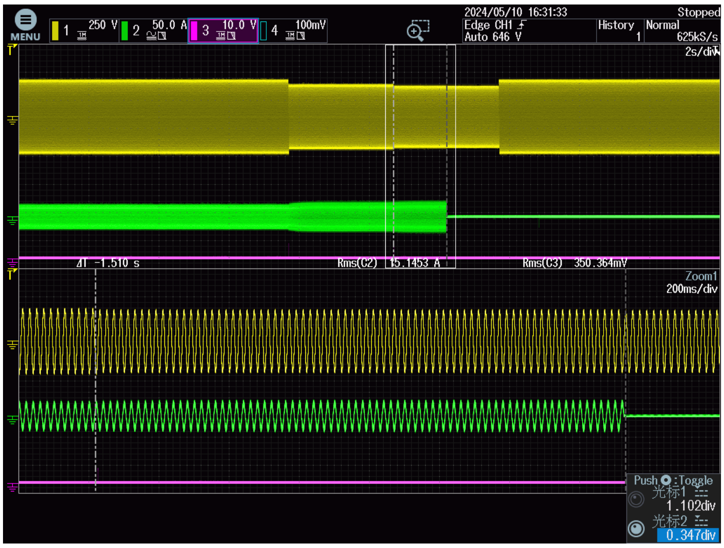


Test 2:

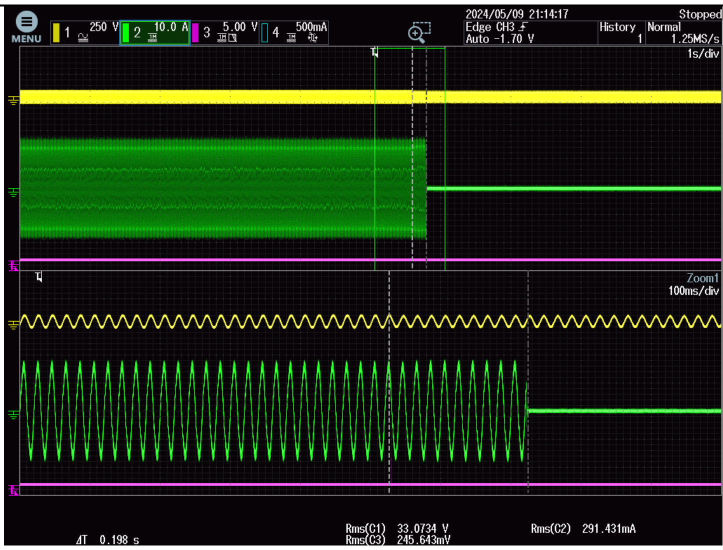


Test 3:

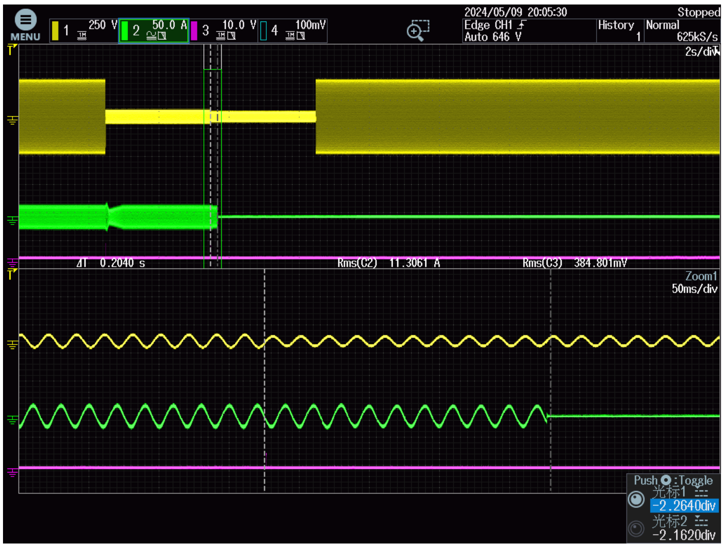


Oscilloscope 27.S2:

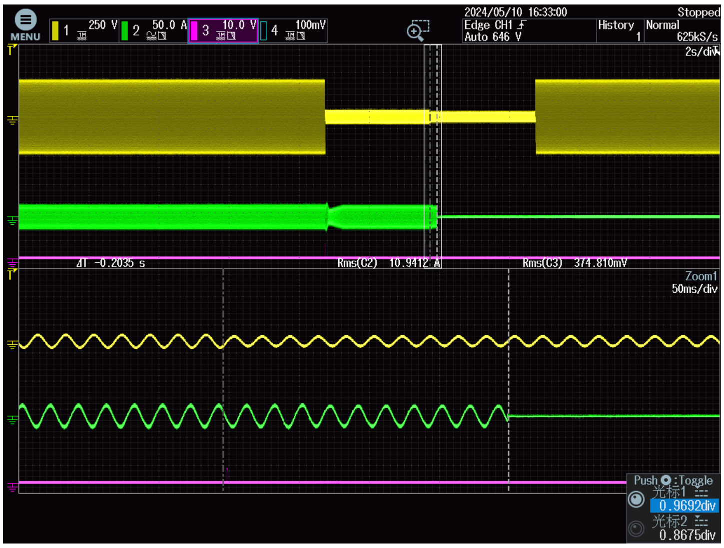
Test 1:



Test 2:



Test 3:



Oscilloscope 59.S2:
Test 1:

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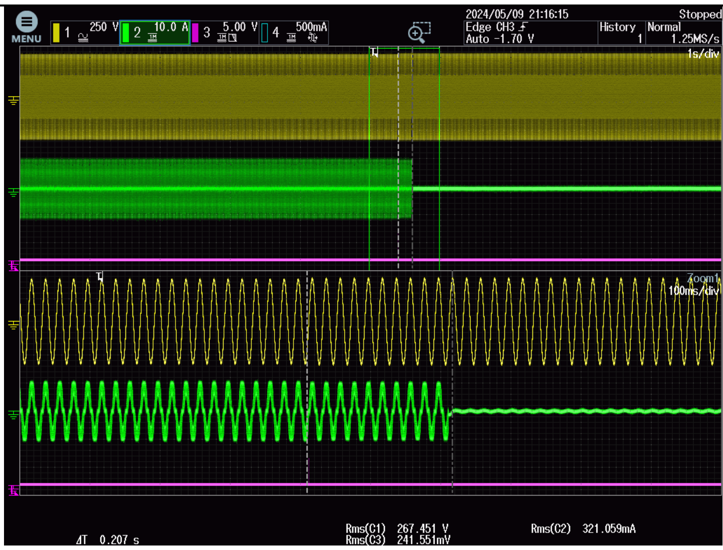
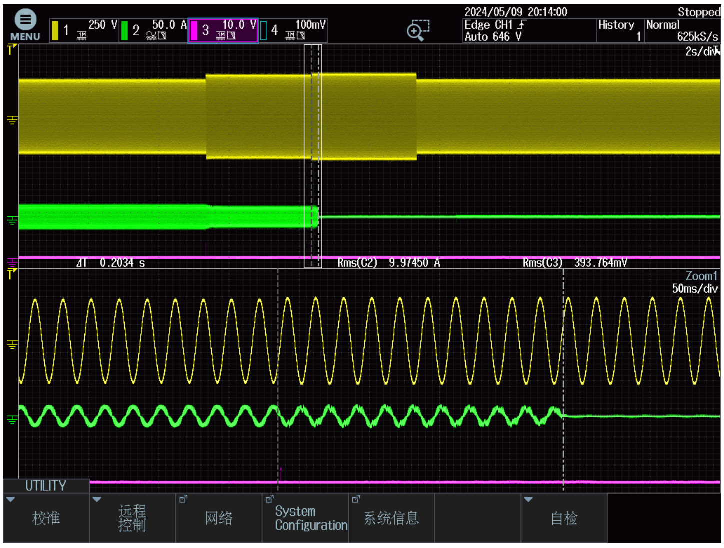


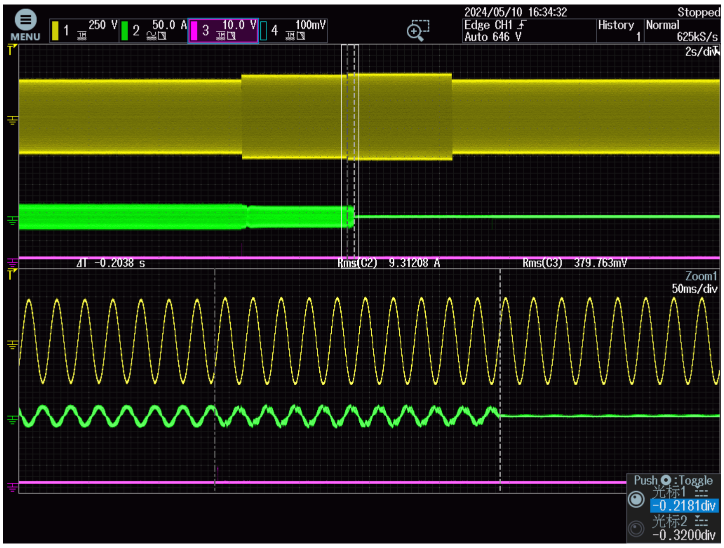
2024/05/09 21:16:15
Stopped
Edge CH3
Auto -1.70 V
History
Normal
1.25MS/s
1s/div
Zoom1
100ms/div
ΔT 0.207 s
Rms(C1) 267.451 V
Rms(C3) 241.551mV
Rms(C2) 321.059mA

Test 2:



2024/05/09 20:14:00
Stopped
Edge CH1
Auto 646 V
History
Normal
625kS/s
2s/div
ΔT 0.2034 s
Rms(C2) 9.97450 A
Rms(C3) 393.764mV
Zoom1
50ms/div
UTILITY
校准
远程控制
网络
System Configuration
系统信息
自检

Test 3:

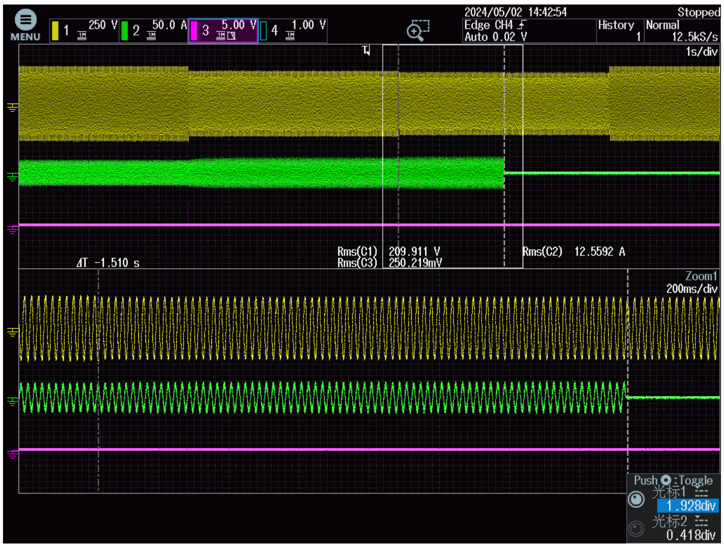


2024/05/10 16:34:32
Stopped
Edge CH1
Auto 646 V
History
Normal
625kS/s
2s/div
ΔT -0.2038 s
Rms(C2) 9.31208 A
Rms(C3) 379.763mV
Zoom1
50ms/div
Push :Toggle
光标1
-0.2181div
光标2
-0.3200div

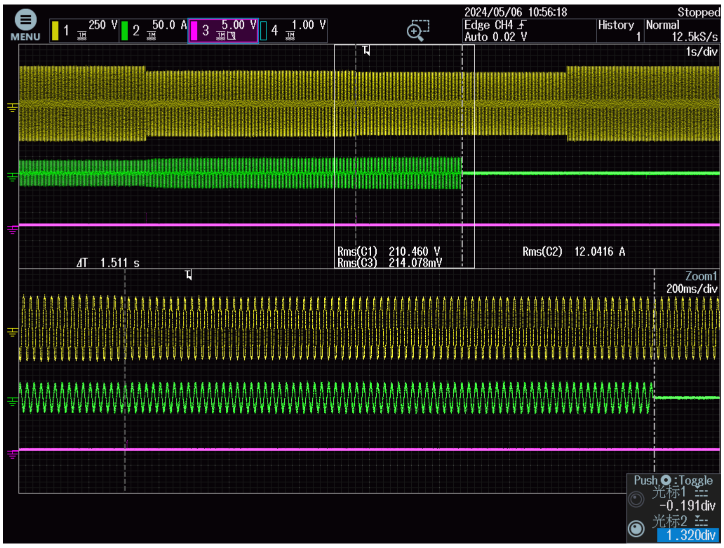
Tested condition:		60°C, 95%RH (Damp Heat) while the equipment is powered(4days)						Model	X1-H6K-S
Voltage	Phase	Tripping threshold				Tripping time			
		Detected [V]			Limit [V] ±1% Vn	Detected [ms]			Request [ms]
Min (27.S1)	L1-N	194.5	194.6	194.6	195.5	1510	1511	1508	1435 ≤ t ≤ 1565
Min (27.S2) *	L1-N	33.7	33.6	33.6	34.5	203	202	202	174 ≤ t ≤ 226
Max (59.S2)	L1-N	264.5	264.5	264.5	264.5	203	203	203	174 ≤ t ≤ 226

Oscilloscope 27.S1:

Test 1:



Test 2:



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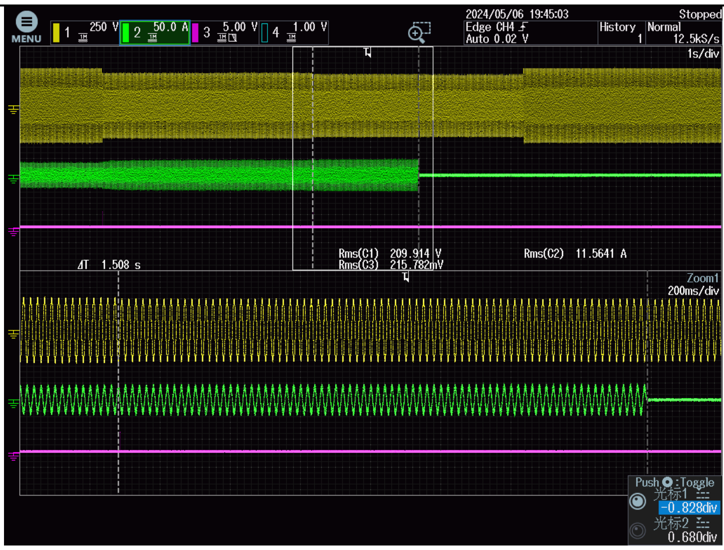
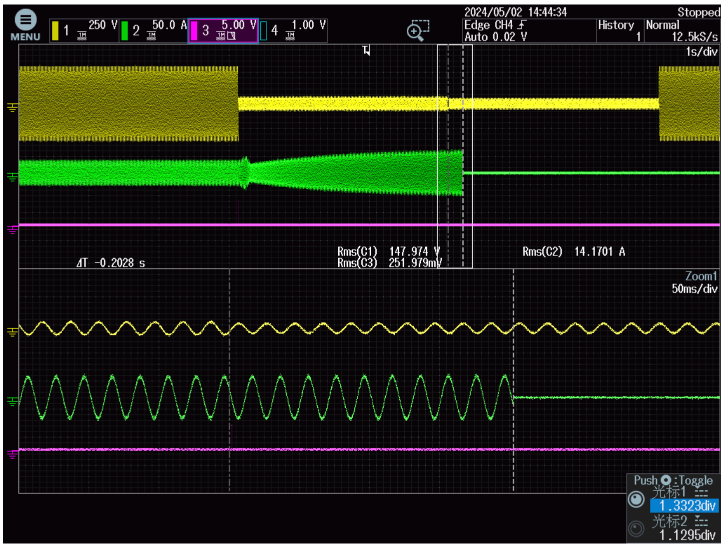
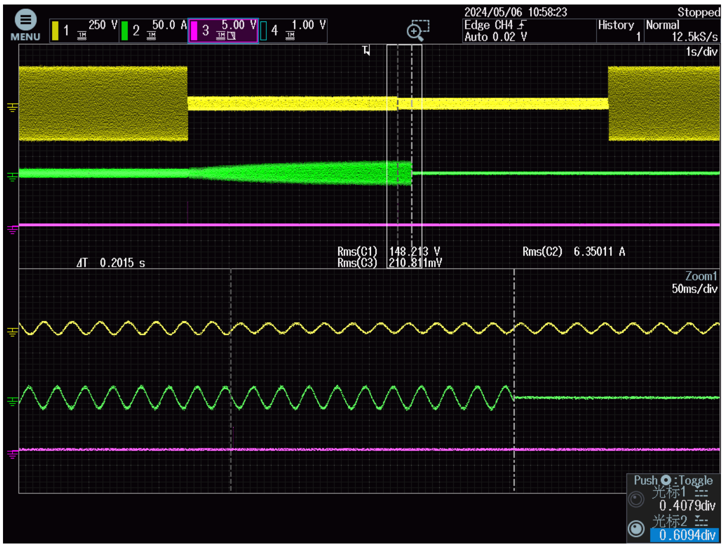


Oscilloscope 27.S2:
Test 1:



Test 2:



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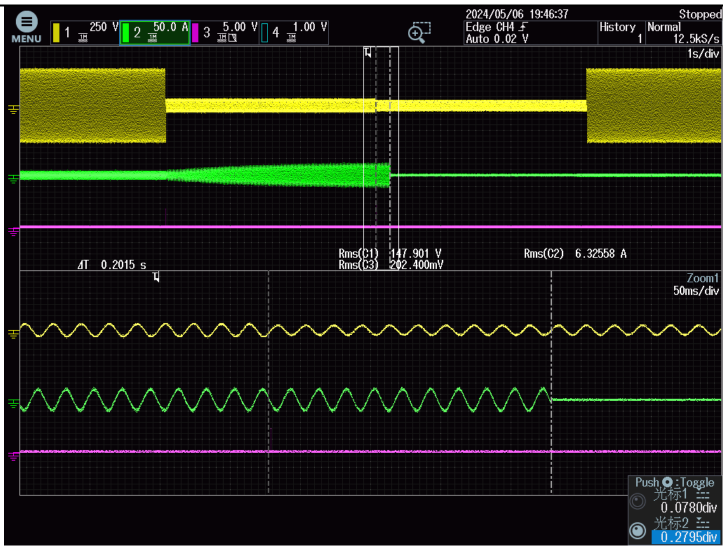
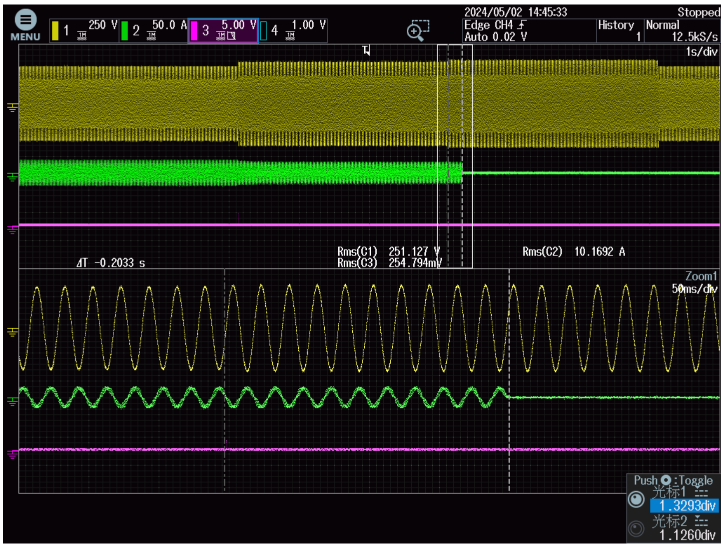
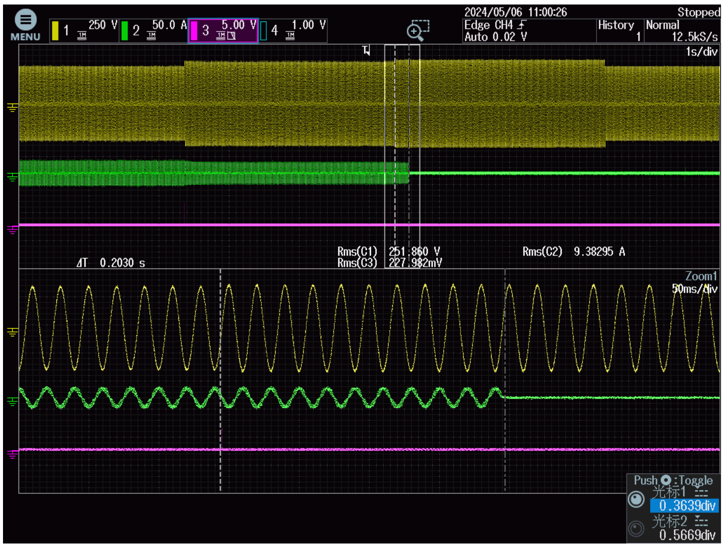


Oscilloscope 59.S2:
Test 1:



Test 2:



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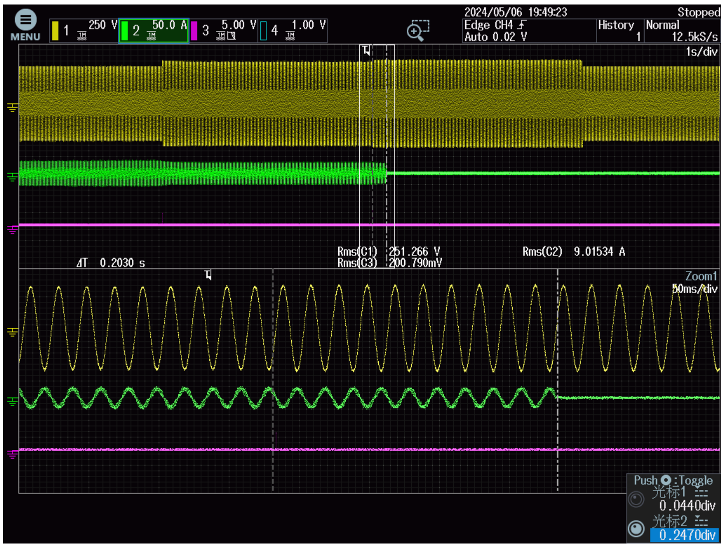
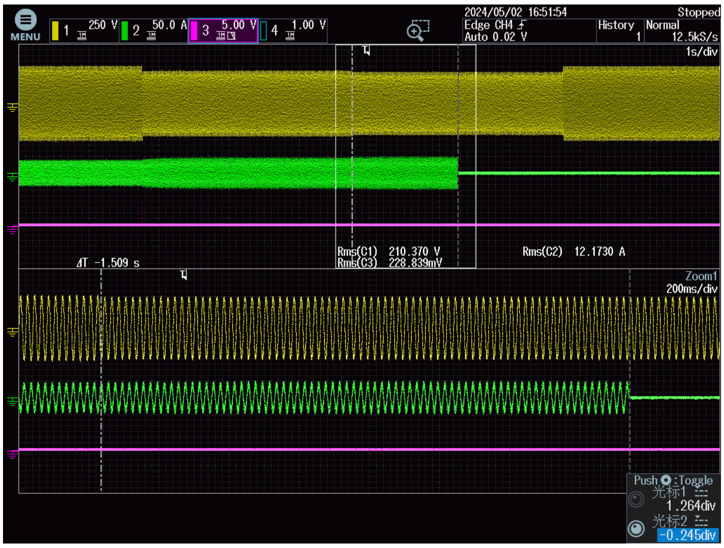


Tested condition:	70°C, 95%RH (Damp Heat) while the equipment is not powered(4days)	Model	X1-H6K-S

Voltage	Phase	Tripping threshold				Tripping time			
		Detected [V]			Limit [V] ±1% Vn	Detected [ms]			Request [ms]
Min (27.S1)	L1-N	194.6	194.7	194.6	195.5	1509	1507	1505	1435 ≤ t ≤ 1565
Min (27.S2) *	L1-N	33.7	33.6	33.6	34.5	203	202	202	174 ≤ t ≤ 226
Max (59.S2)	L1-N	264.5	264.5	264.5	264.5	203	203	203	174 ≤ t ≤ 226

Oscilloscope 27.S1:

Test 1:



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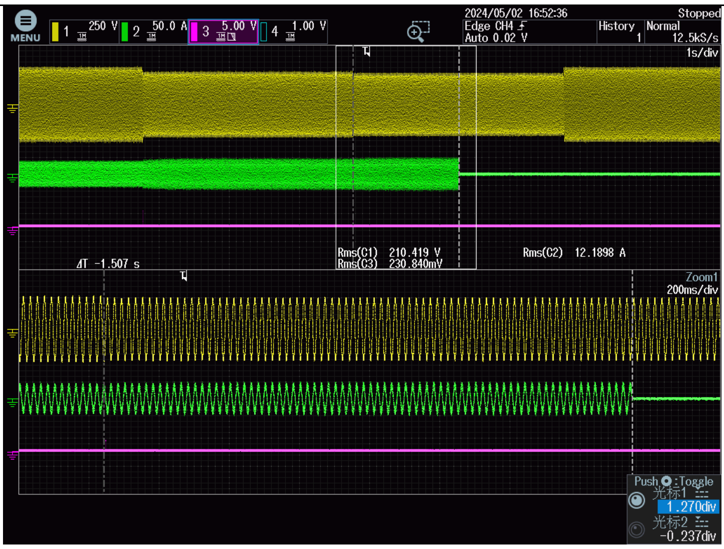
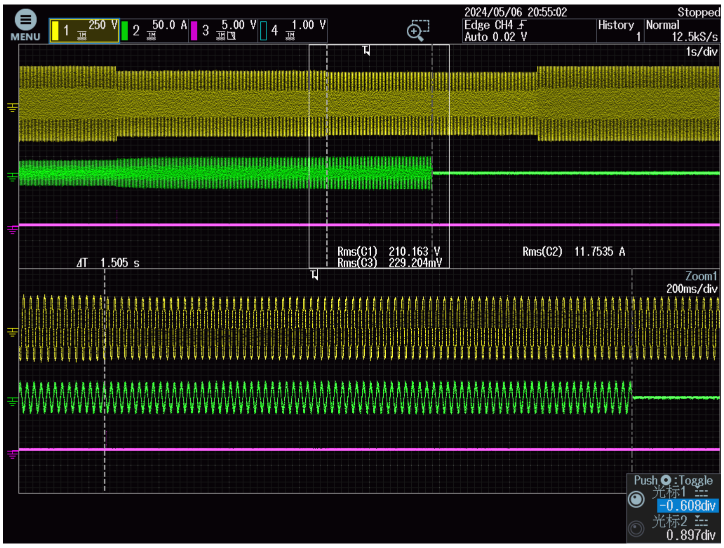
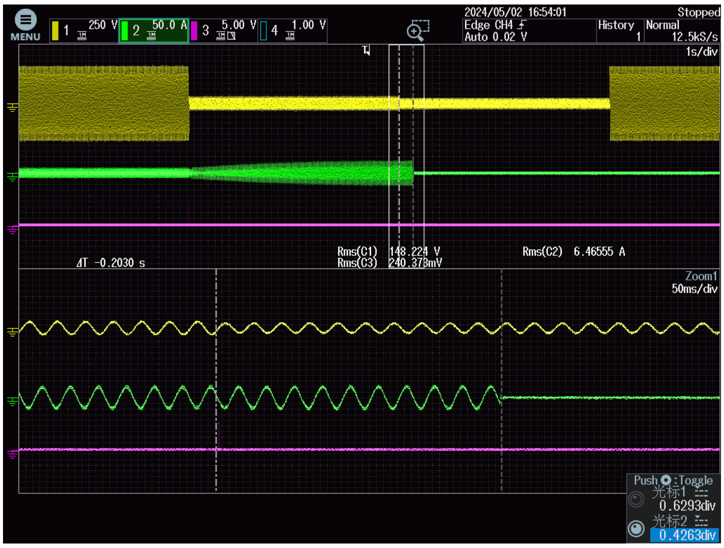


Test 3:

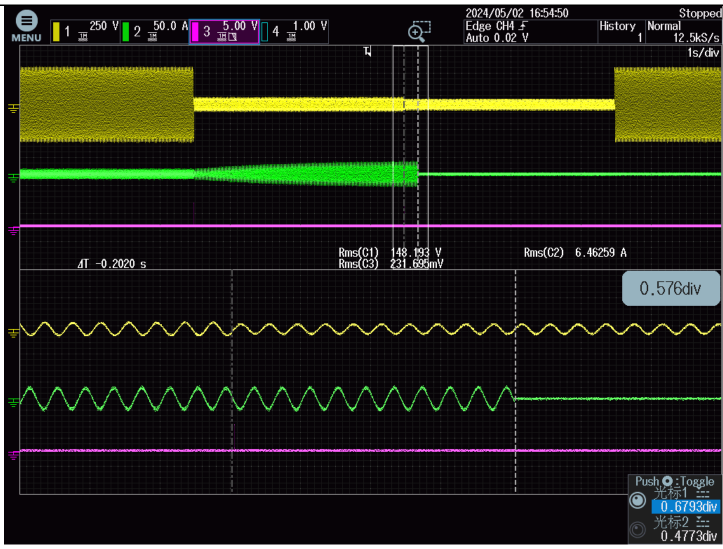


Oscilloscope 27.S2:

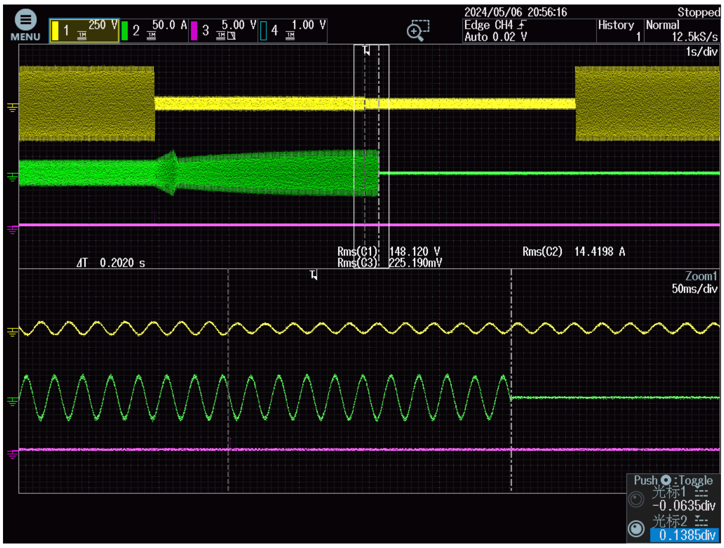
Test 1:



Test 2:

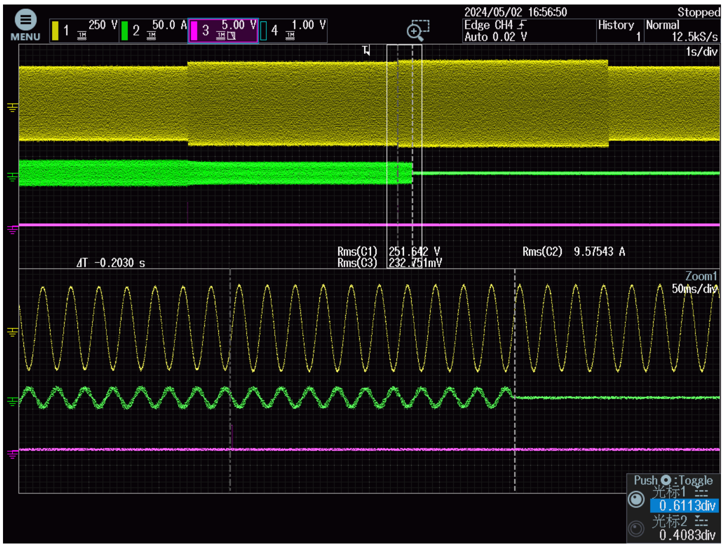


Test 3:



Oscilloscope 59.S2:

Test 1:



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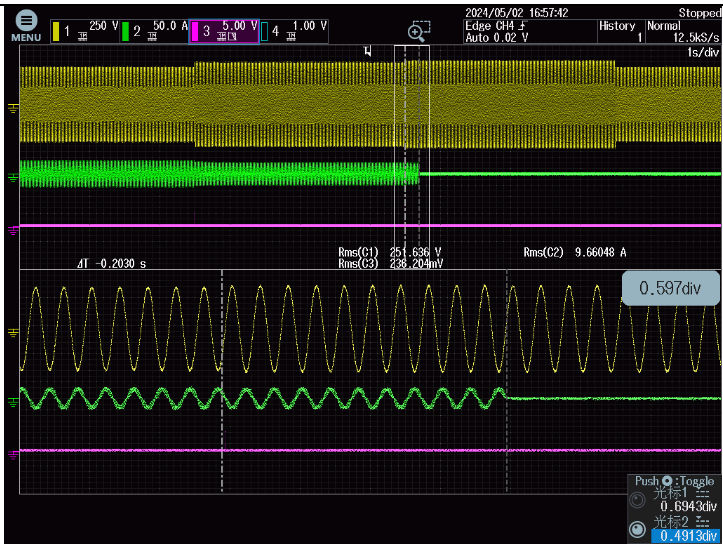
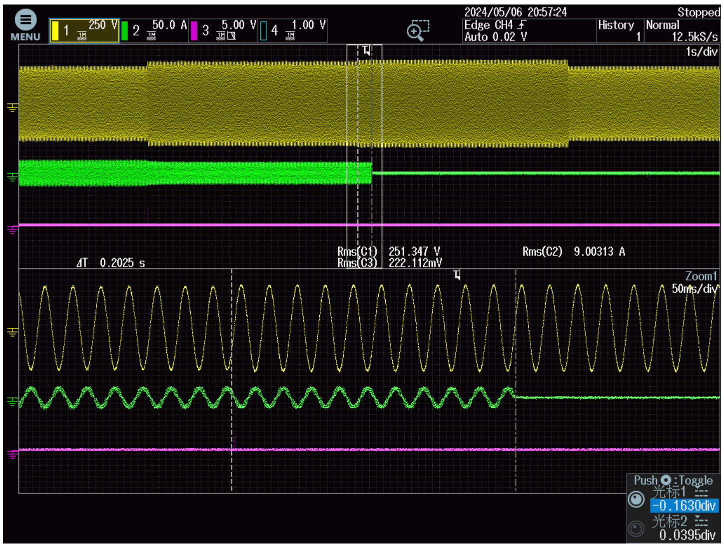


Test 3:



Supplementary information:

Trip threshold:

(1) 1.1 threshold -> decrease by max 0.5%Un steps

Trip time: (step from Un to Un)

(2) 1.01 -> 0.99 threshold

The setting value and the trip value of the voltage: **≤ 1% Vn** for voltage intervention thresholds; **0.02 Hz** and **≤ 3 % ± 20 ms** for intervention times**.**

Differences between the test values: **± 2% Un** and **≤ 1 % ± 20 ms** for intervention times**.**

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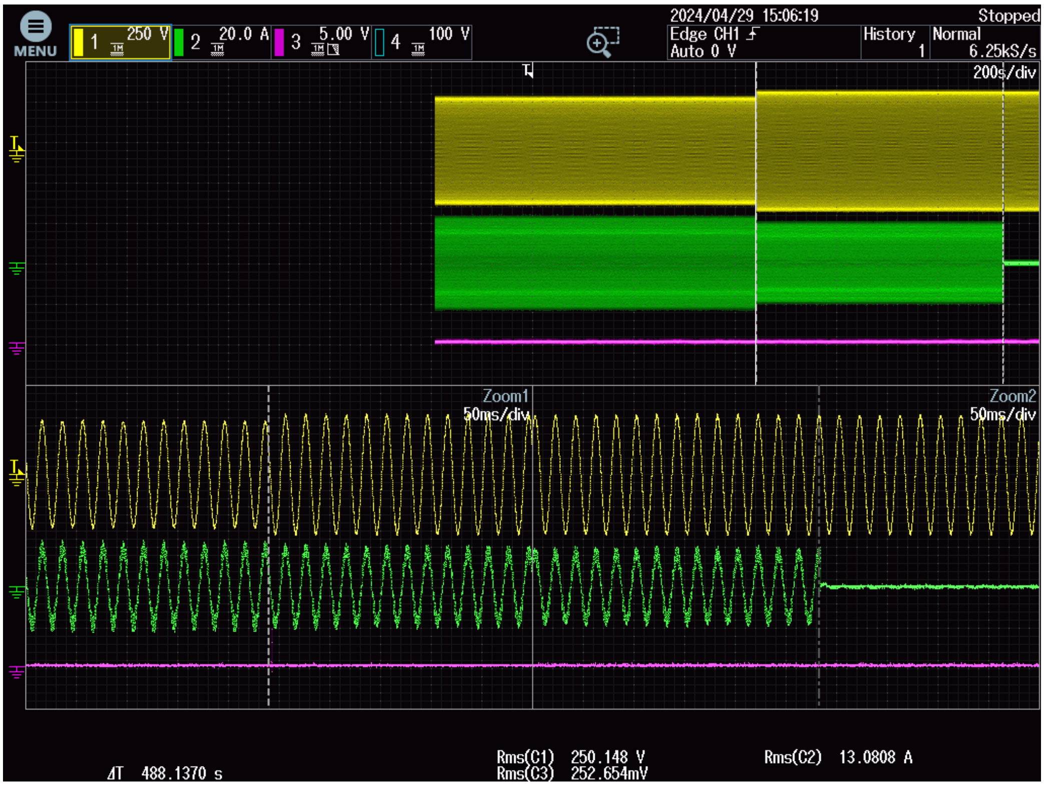
8.5.2&A.4.3	**Measuring the rise-in voltage protection as a running 10-minute mean value**		P
Model	X1-H6K-S		
	Disconnection time:	Limit:	
a) The voltage is maintained at 100% Un for 600s, afterwards the voltage is raise to 112%, the switch off must be within 603s;			
Phase 1	488.14	t ≤ 603 s	
b) The voltage is maintained at Un for 600s, afterwards the voltage is raised to 108% . The switch off should not be activated.			
Phase 1	Disconnection did not take place.	Disconnection should not take place.	
c) The voltage is maintained at 106% Un for 600s, afterwards the voltage is raised to 114%. The switch off should be within 225s-375s.			
Phase 1	279.03	The disconnection time should be within 225s-375s.	

Supplementary information: *If the setting value is set to 600 s, then the disconnection time can be in the range between 225 s and 375 s.
Oscilloscope waveform:
TEST CONDITION a)



TEST CONDITION b)

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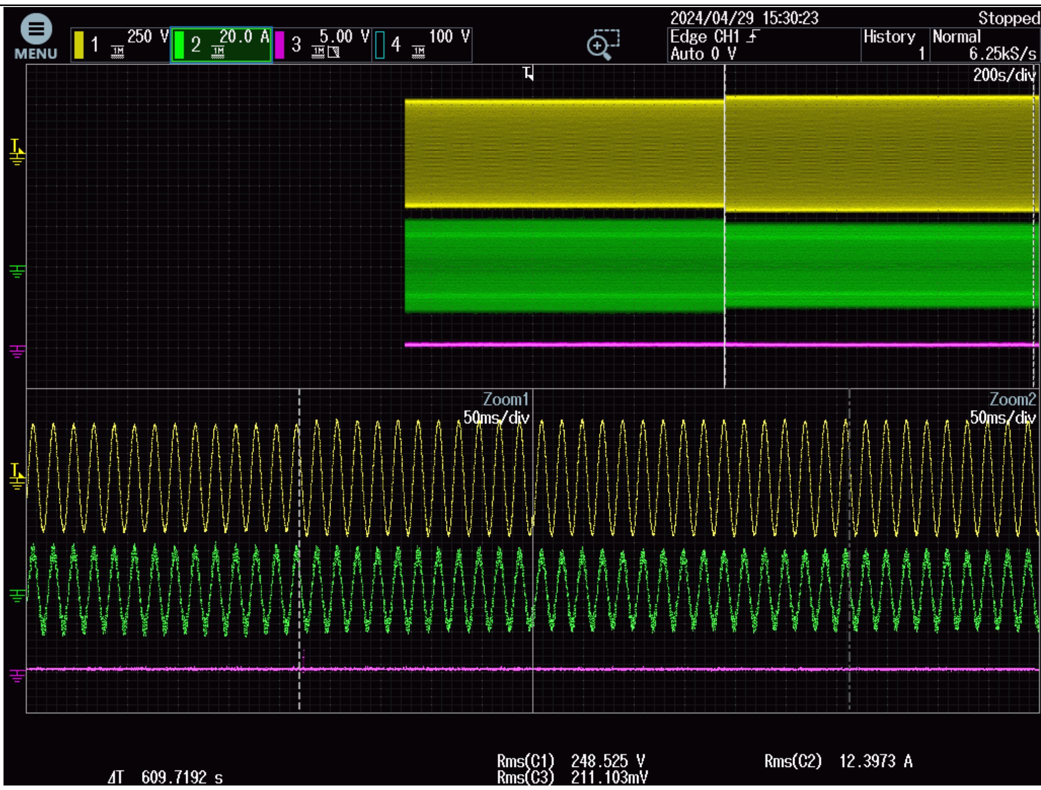


TEST CONDITION c)

A.4.3.3.1	Insensitivity to harmonics of the frequency relay	P

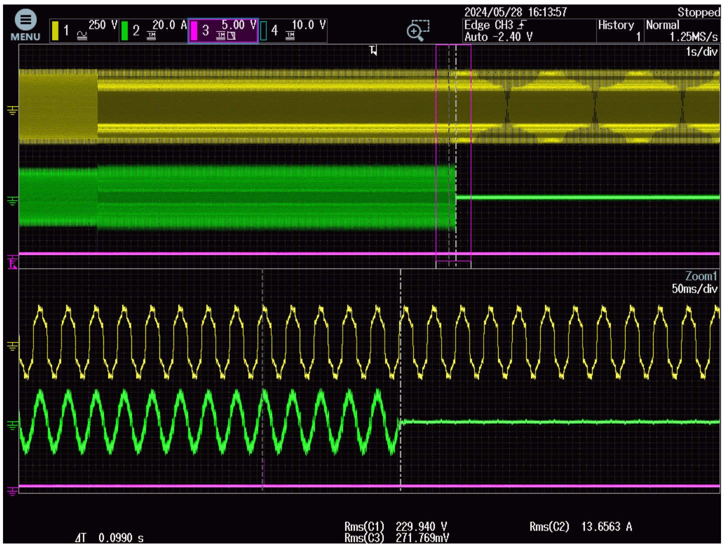
Ambient temperature: 20°C

Modalità Transitoria (Transient operation mode):

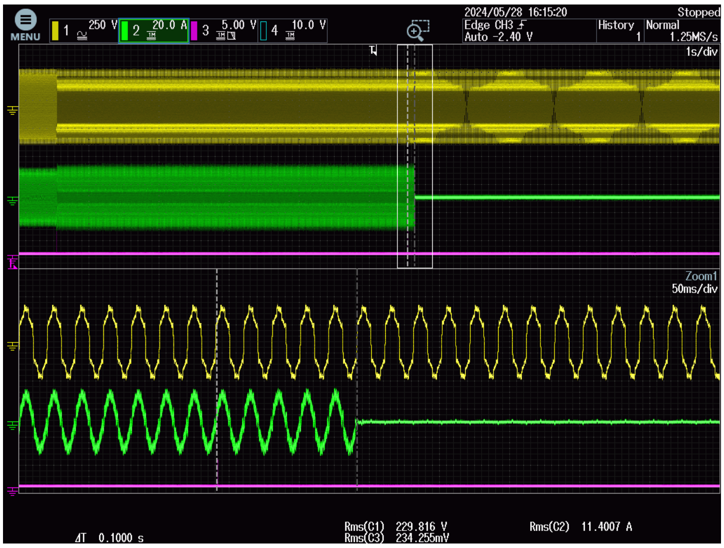
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S1	49.80	49.80	49.80	49.80	99	100	101	77 ≤ t ≤ 123
(2):81>S1	50.20	50.20	50.20	50.20	101	102	105	77 ≤ t ≤ 123

Oscilloscope 81< S2:

Test 1:



Test 2:



Test 3:

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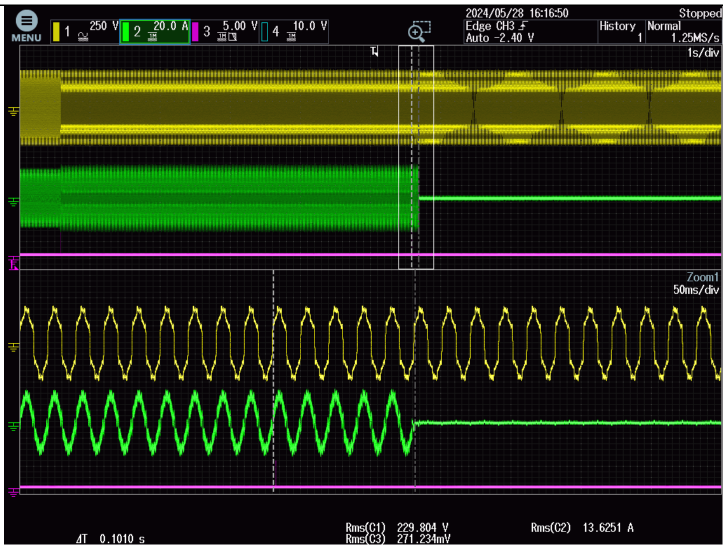
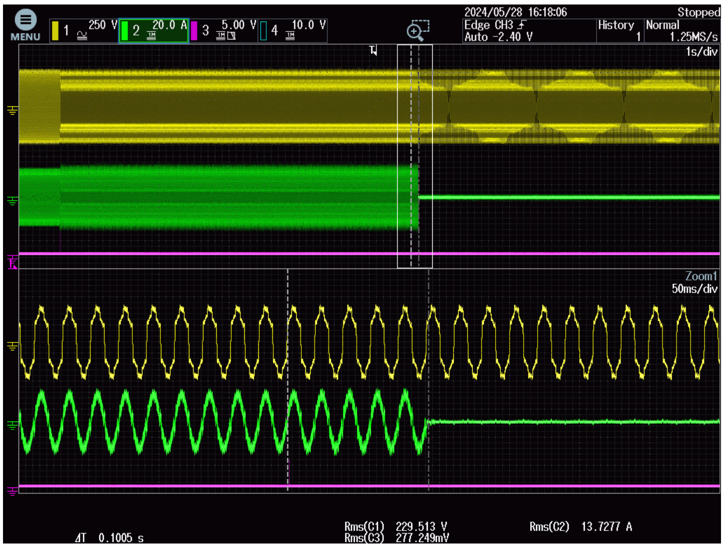
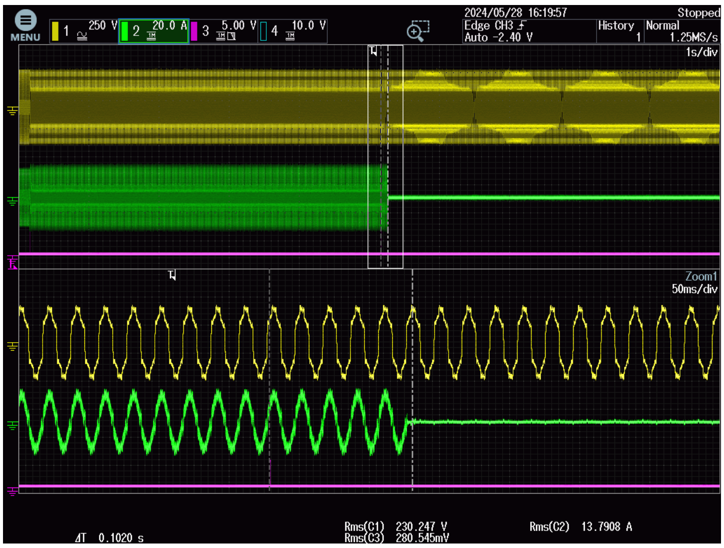


Oscilloscope 81> S2:

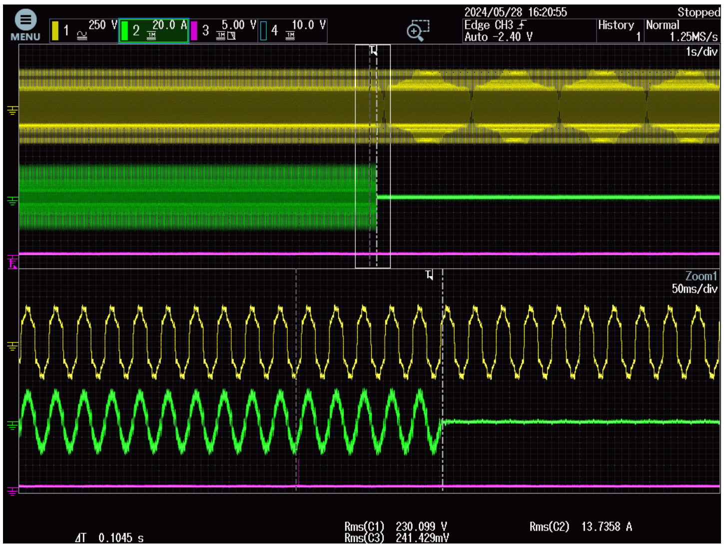
Test 1:



Test 2:



Test 3:

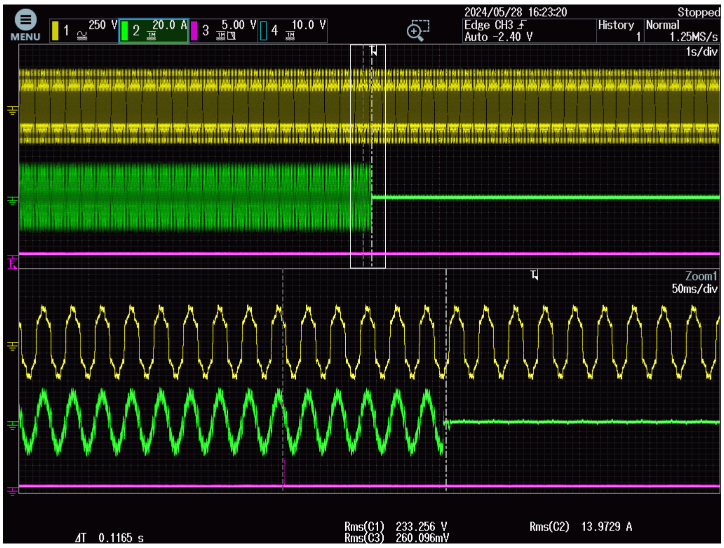


Modalità Transitoria (Transient operation mode):

Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S2	47.50	47.50	47.50	47.50	117	119	113	77 ≤ t ≤ 123
(2):81>S2	51.50	51.50	51.50	51.50	111	100	101	77 ≤ t ≤ 123

Oscilloscope 81< S2:

Test 1:



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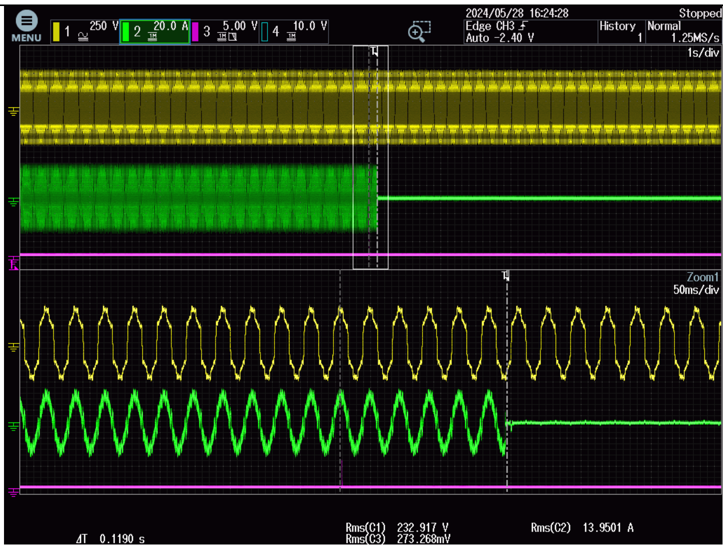
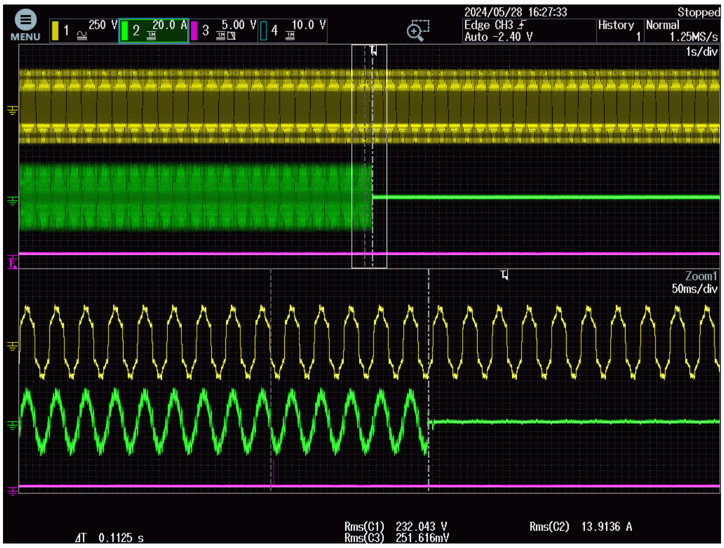
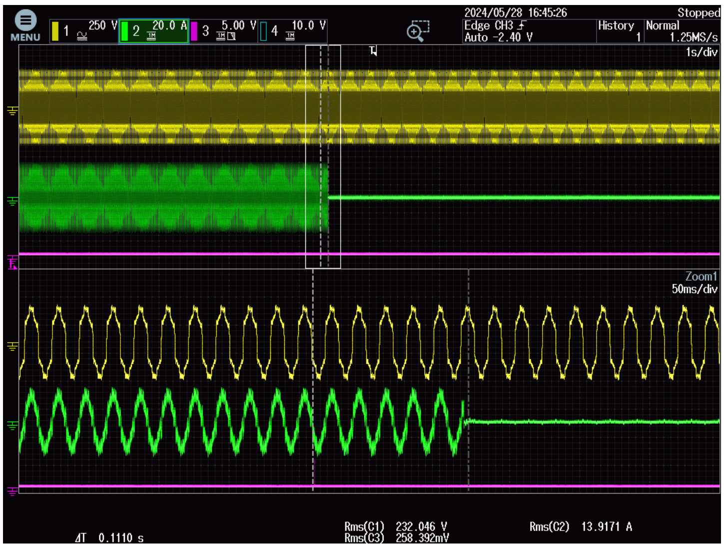


Test 3:



Oscilloscope 81> S2:

Test 1:



Test 2:

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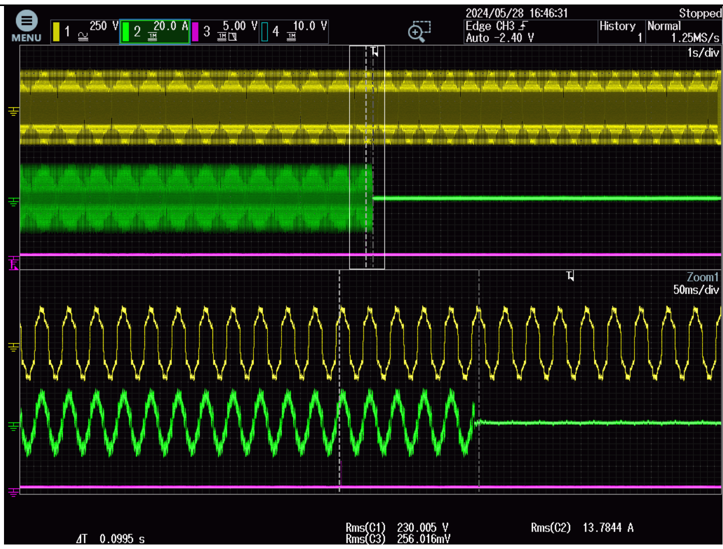
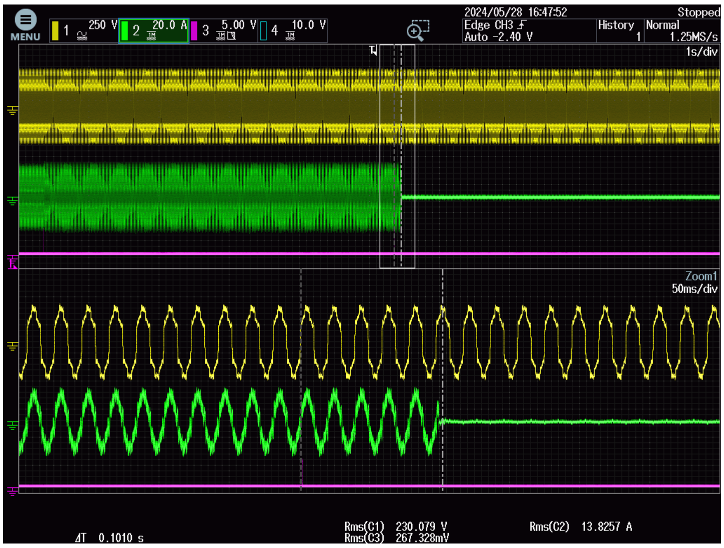


Test 3:



Modalità definitiva (Final operation mode):

Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1):81<S2	47.49	47.49	47.49	47.50	4020	4008	4009	3860 ≤ t ≤ 4140
(2):81>S2	51.51	51.51	51.51	51.50	1005	1007	1010	950≤t≤1050

Oscilloscope 81< S2:
Test 1:

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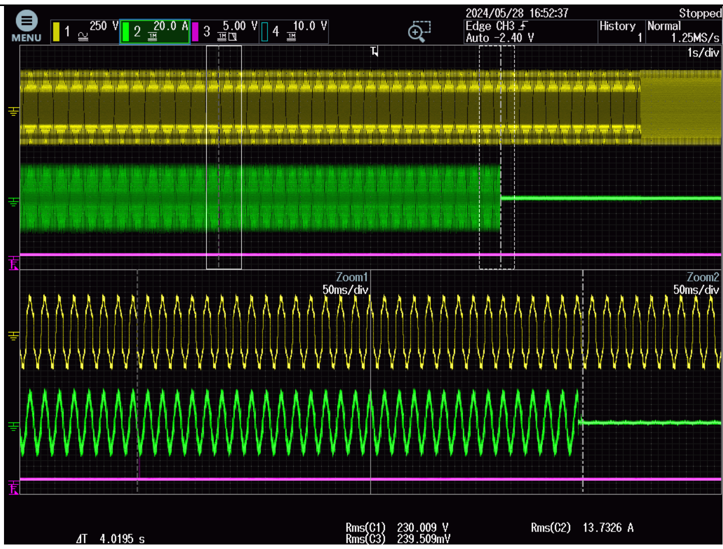
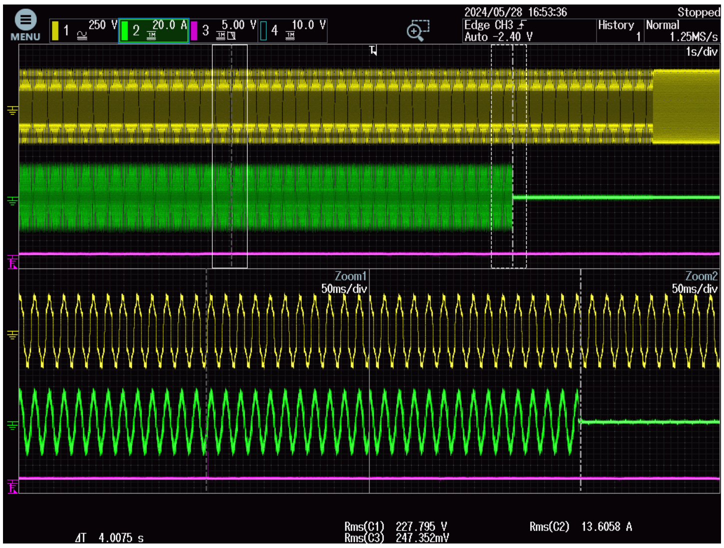
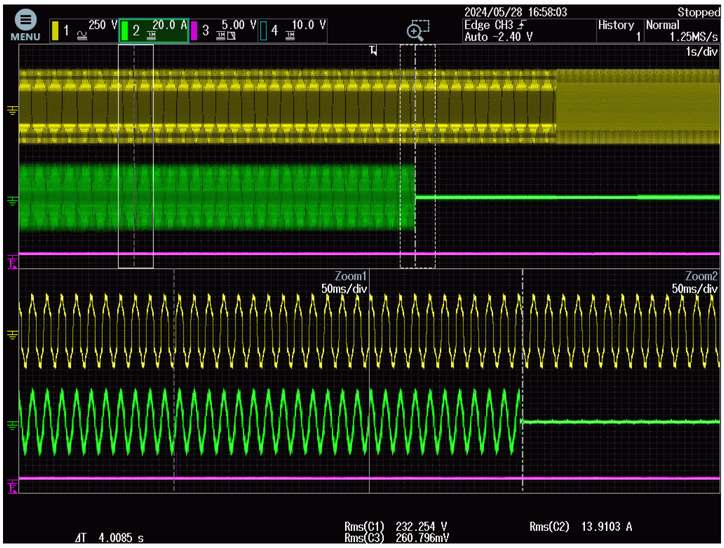


Test 2:



Test 3:



Oscilloscope 81> S2:

Test 1:

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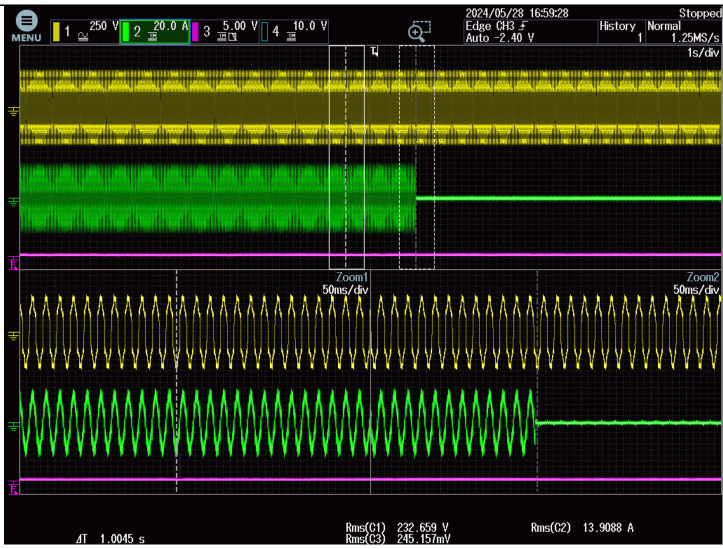
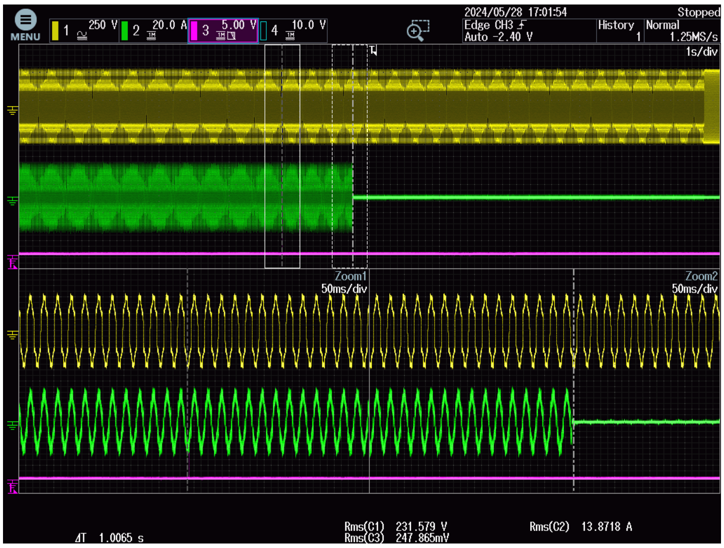
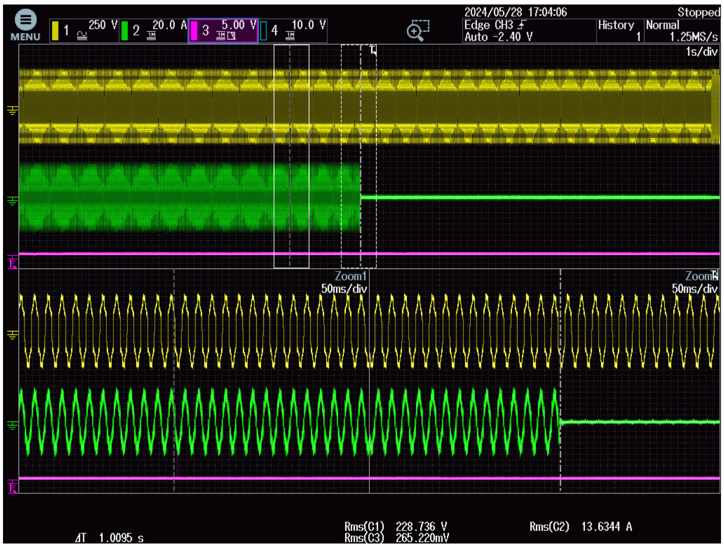


Test 2:



Test 3:



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Supplementary infomation:

Harmonics for the insensitivity of the frequency protective functions:

Harmonics order:	2nd	3rd	5th	7th	9th	11th	13th	17th
%Un:	4.0	10.0	12.0	10.0	3.0	7.0	6.0	4.0

variation of the error during the repetition of tests:

≤ 2 % for the voltages

± 20 mHz for the frequency thresholds

≤ 1 % ± 20 ms for the trip times

A.4.3.3.2	**Remote trip signal**	P
Model	X1-H6K-S	
Ambient temperature: 20±2°C		
Limit	50 ms	
Reaction time of the tripping value [ms]:	18.1 ms	
Oscilloscope waveform:		

Supplementary infomation:
Signal 1: Voltage (V)
Signal 2: Current (A)
Signal 3: Trip signal(V)

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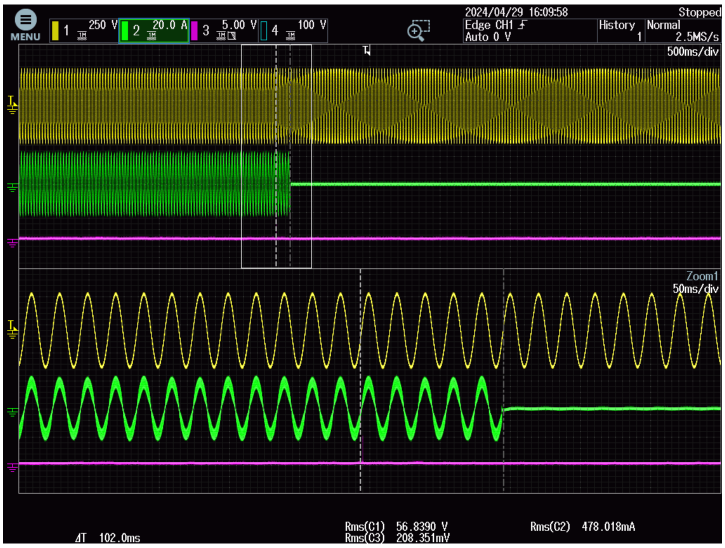
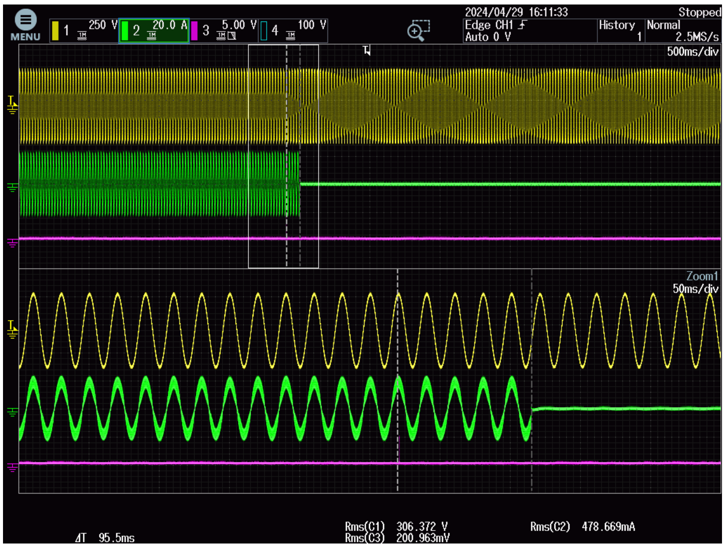
A.4.3.3.3	communication signal							P
Model	X1-H6K-S							
Modalità definitiva (Final operation mode):								
External signal at high state								
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1)81<S1	49.80	49.80	49.80	49.80	102	96	91	77 ≤ t ≤ 123
(2)81>S1	50.20	50.20	50.20	50.20	104	103	96	77 ≤ t ≤ 123

Oscilloscope 81< S1:

Test 1:



Test 2:



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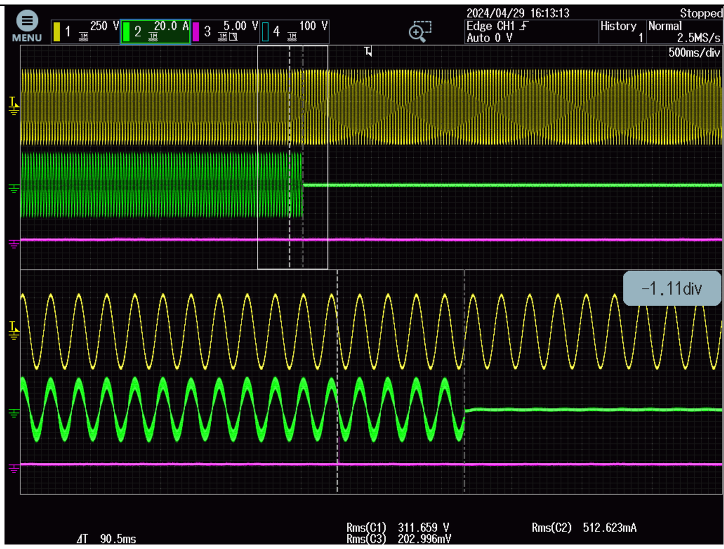
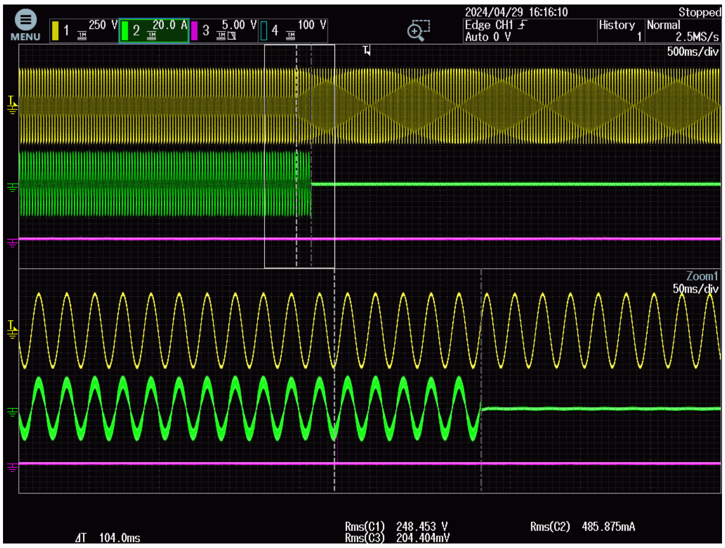
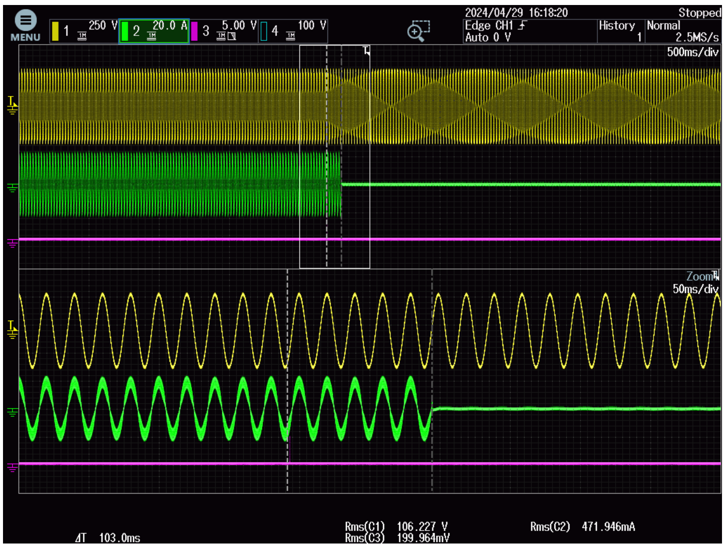
Oscilloscope 81> S1:



Test 1:



Test 2:



Test 3:

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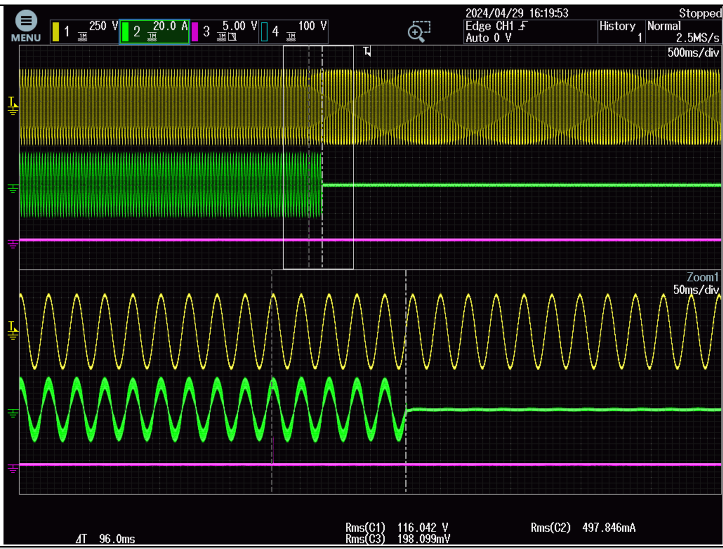
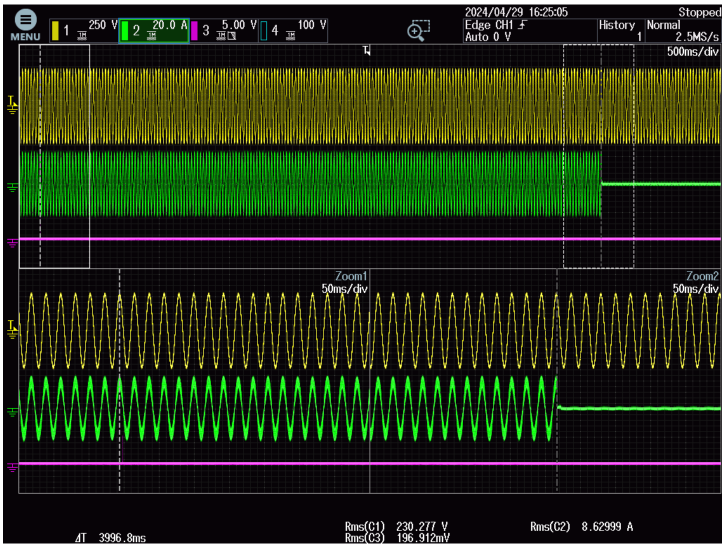


External signal at low state								
Frequency	Tripping threshold				Tripping time			
	Detected [Hz]			Limit [Hz] ±0.02 Hz	Detected [ms]			Request [ms]
(1)81<S1	47.49	47.49	47.49	47.50	3997	4012	4004	3860 ≤ t ≤ 4140
(2)81>S1	51.50	51.50	51.50	51.50	1003	1005	1000	950≤t≤1050

Oscilloscope 81< S1:

Test 1:



Test 2:

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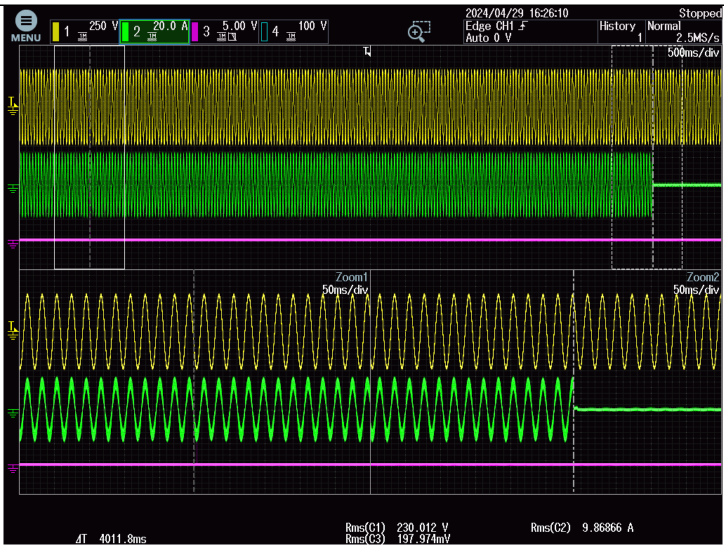
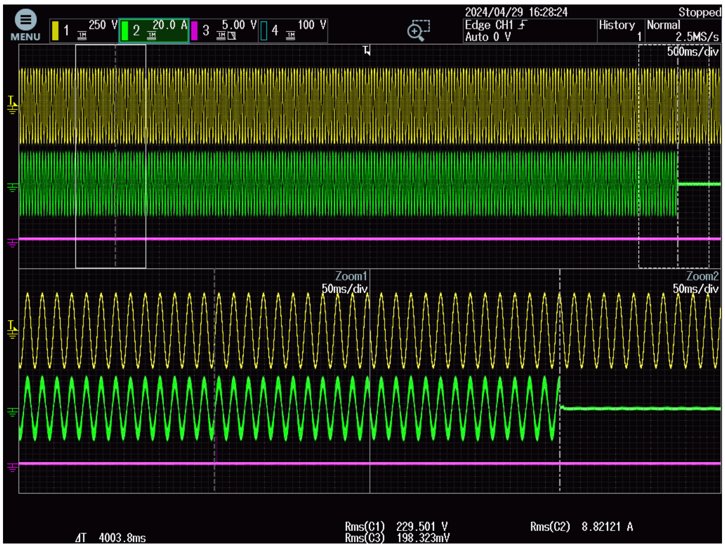
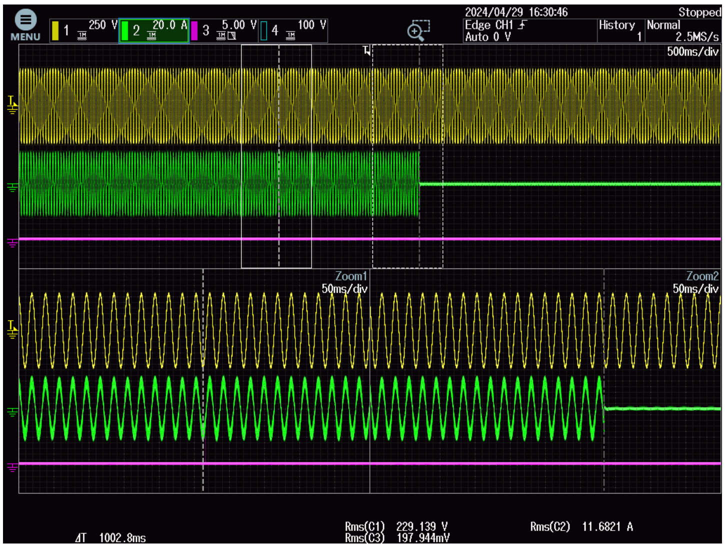


Test 3:



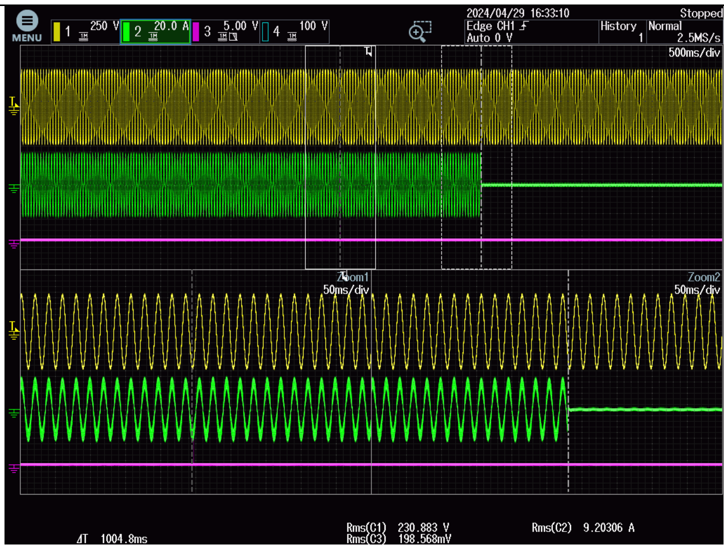
Oscilloscope 81> S1:

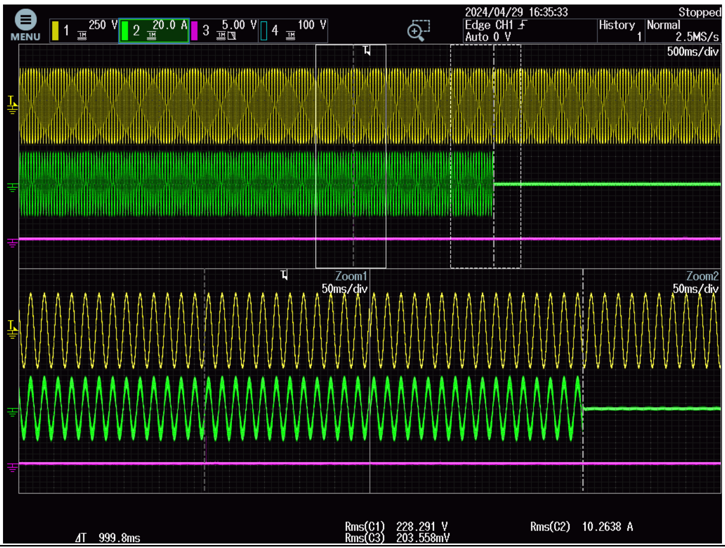
Test 1:



Test 2:

Test 3:


MENU
1 250 V
2 20.0 A
3 5.00 V
4 100 V
2024/04/29 16:33:10
Stopped
Edge CH1
Auto 0 V
History
Normal
2.5MS/s
500ms/div
Zoom1
50ms/div
Zoom2
50ms/div
ΔT 1004.8ms
Rms(C1) 230.883 V
Rms(C3) 198.568mV
Rms(C2) 9.20306 A


MENU
1 250 V
2 20.0 A
3 5.00 V
4 100 V
2024/04/29 16:35:33
Stopped
Edge CH1
Auto 0 V
History
Normal
2.5MS/s
500ms/div
Zoom1
50ms/div
Zoom2
50ms/div
ΔT 999.8ms
Rms(C1) 228.291 V
Rms(C3) 203.558mV
Rms(C2) 10.2638 A

A.4.3.4	**Verification of insensitivity to the frequency derivative**			P
Model	X1-H6K-S			
	Start Frequency	Change	End Frequency	Confirm no trip
Positive Frequency drift	47.550 Hz	+2.5 Hzs^{-1}	51.450 Hz	no trip
	47.550 Hz	+2.5 Hzs^{-1}	51.450 Hz	no trip
	47.550 Hz	+2.5 Hzs^{-1}	51.450 Hz	no trip
	47.550 Hz	+2.5 Hzs^{-1}	51.450 Hz	no trip
	47.550 Hz	+2.5 Hzs^{-1}	51.450 Hz	no trip
Negative Frequency drift	51.450 Hz	-2.5 Hzs^{-1}	47.550 Hz	no trip
	51.450 Hz	-2.5 Hzs^{-1}	47.550 Hz	no trip
	51.450 Hz	-2.5 Hzs^{-1}	47.550 Hz	no trip
	51.450 Hz	-2.5 Hzs^{-1}	47.550 Hz	no trip
	51.450 Hz	-2.5 Hzs^{-1}	47.550 Hz	no trip

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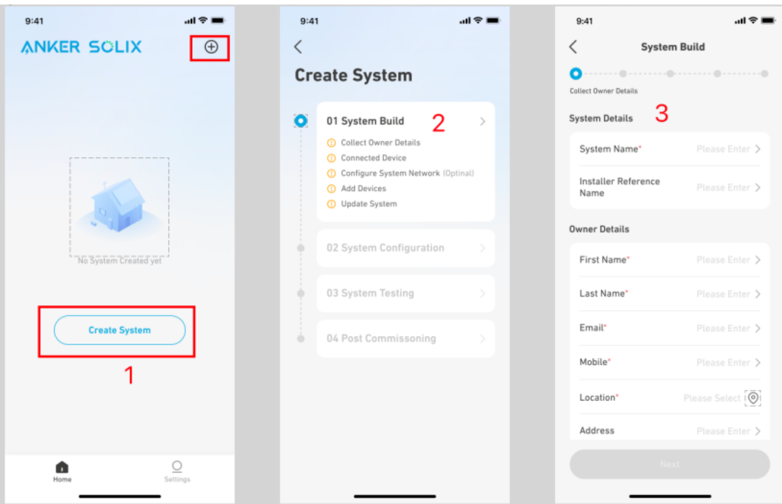
A.4.4	Verification of self-testing function		P
Model	X1-H6K-S		
Type of verification:	Detected:	---	
Algorithm is correct	Self-test process indicated in software	Result: ☒P ☐F ☐NA	
Thresholds are documented	Self-test report indicated in software	Result: ☒P ☐F ☐NA	
Times are documented	Self-test report indicated in software	Result: ☒P ☐F ☐NA	
Procedure documented	Described in user manual on page 59	Result: ☒P ☐F ☐NA	

Operation steps：

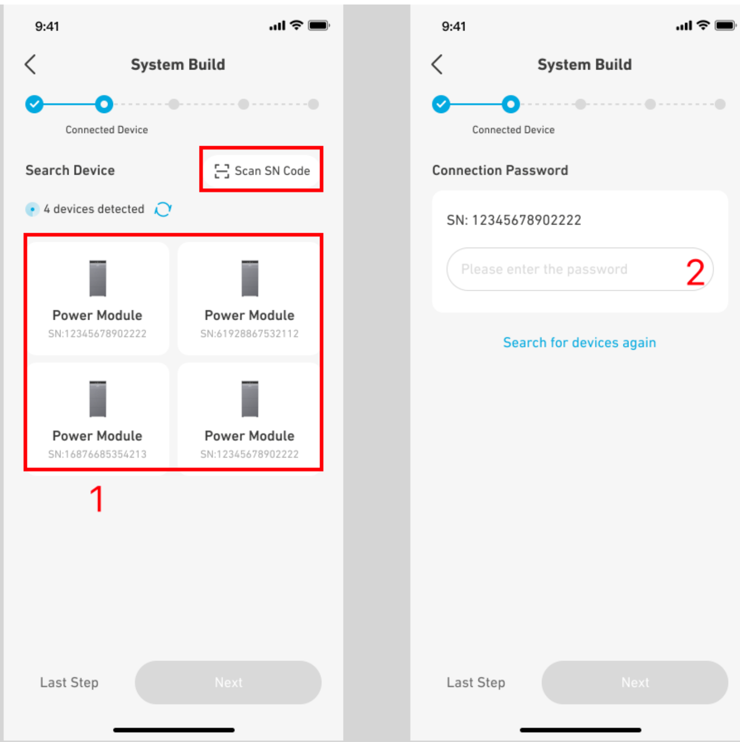
Build System

Step 1

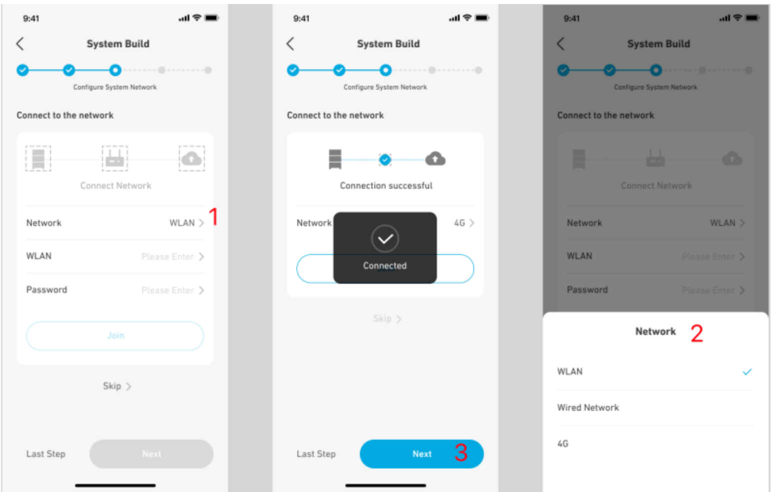
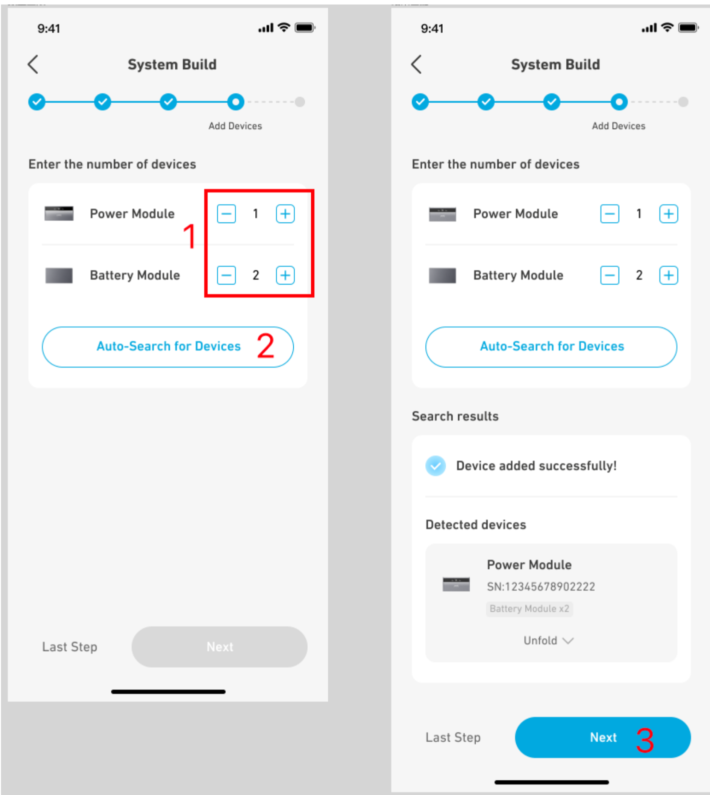


Collect Owner Details
① On the Home screen, tap **Create System** or the [icon] icon on the top right.
② Go to **System Build**.
③ Input the system and owner information.

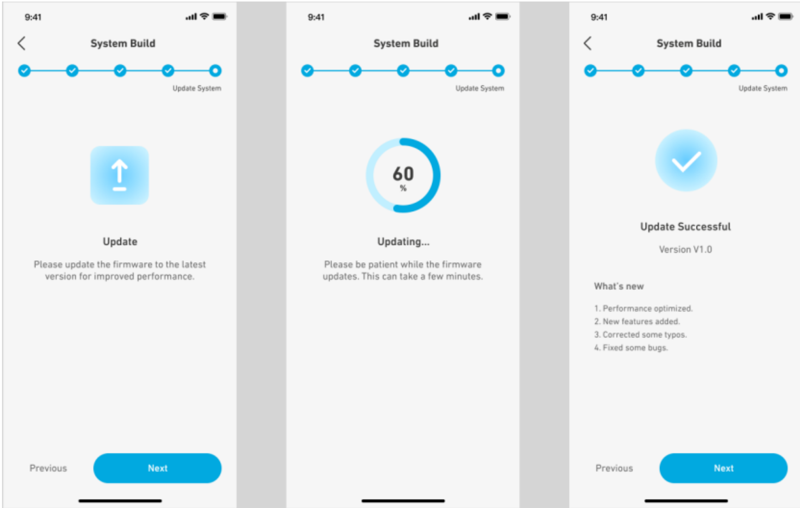
Step 2



Connect Device
Connect the power module to the Anker SOLIX Professional app via Bluetooth.
① Select the power module from the Bluetooth device list or scan the barcode on the power module's label.
② Enter the password located below the barcode.

Step 3		**Configure System Network** Configure the Internet connection using Wi-Fi, Ethernet, or 4G.	
Step 4		**Add Devices** ① Manually input the numbers of the power modules and battery modules. ② Tap **Auto-Search for Devices** to search for the devices automatically. ③ Select **Next** to move on when you will see the prompt "Device added successfully." If the detected numbers do not match the input numbers, restart **Auto-Search for Devices** or change the input numbers.	

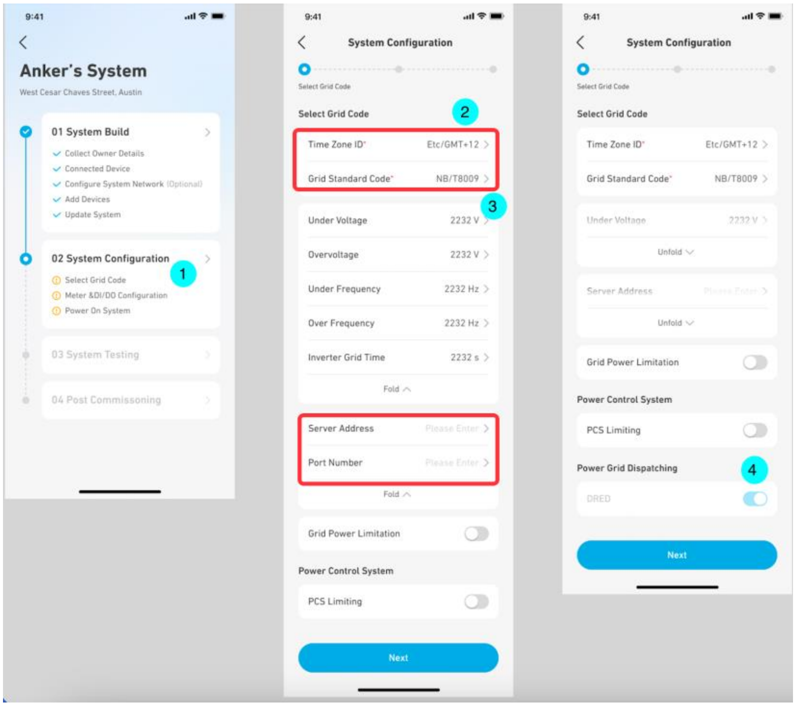
Step 5



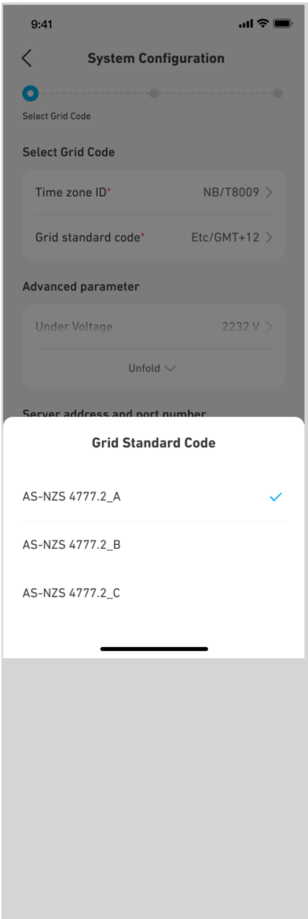
Update Firmware
Update the firmware to the latest version.

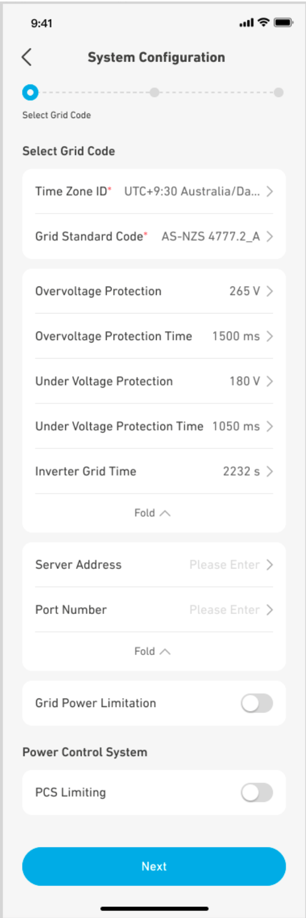
Configure System

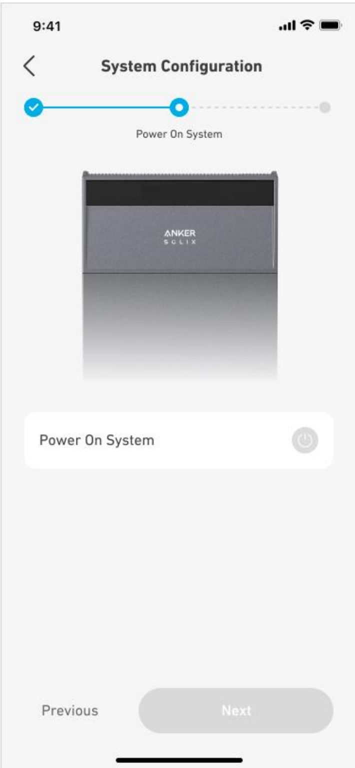
Step 1

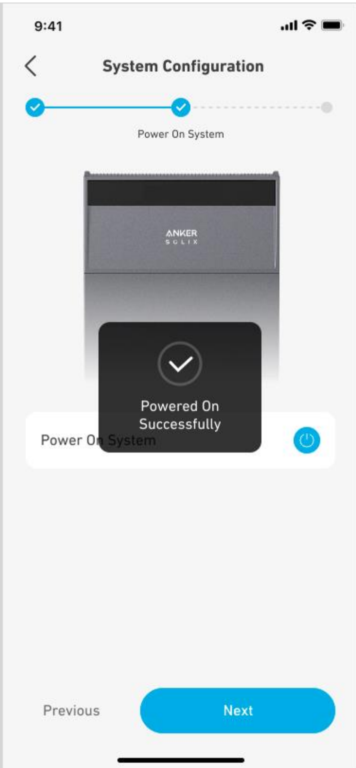


Select Grid Code
① Tap **System Configuration**.
② Select a grid code and time zone. Then, enter the server address and port number.
③ Set parameters for the selected grid code.
④ Note the DRED is turned on by default (for Australia only).

<table>
<tr>
<td></td>
<td>


</td>
<td>When the time zone is set to Australia, select the applicable grid code. Please contact your electricity grid operator for which region
to use.

Grid Code Region
AS-NZS 4777.2_A
Australia A
AS-NZS 4777.2_B
Australia B
AS-NZS 4777.2_C
Australia
AS-NZS 4777.2_NZ
Australia and New Zealand</td>
</tr>
<tr>
<td>Step 2</td>
<td>


</td>
<td>Power On System
Tap the [icon] icon to power on the system.</td>
</tr>
</table>

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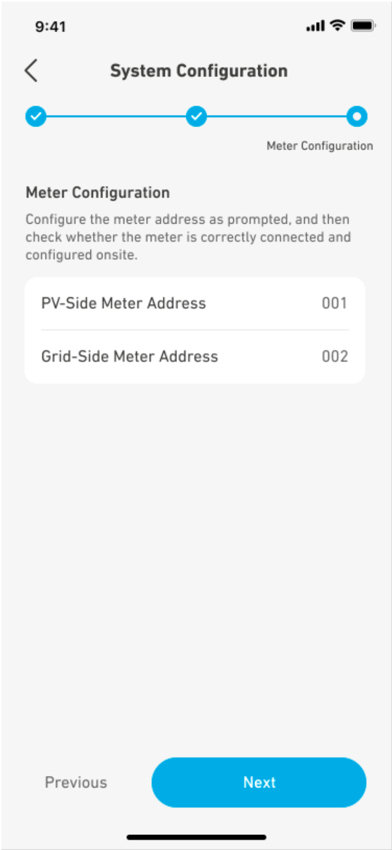
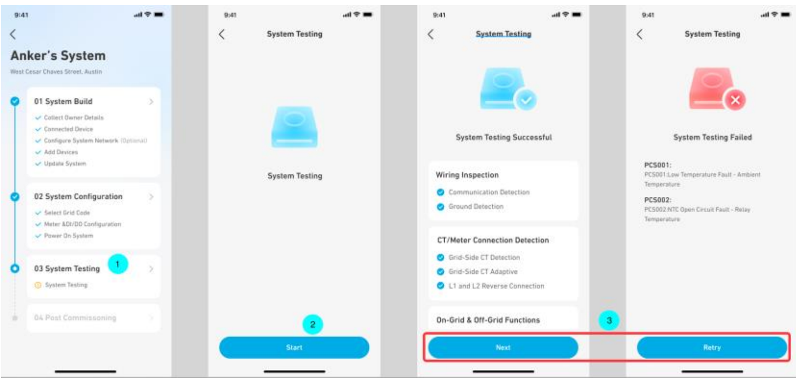
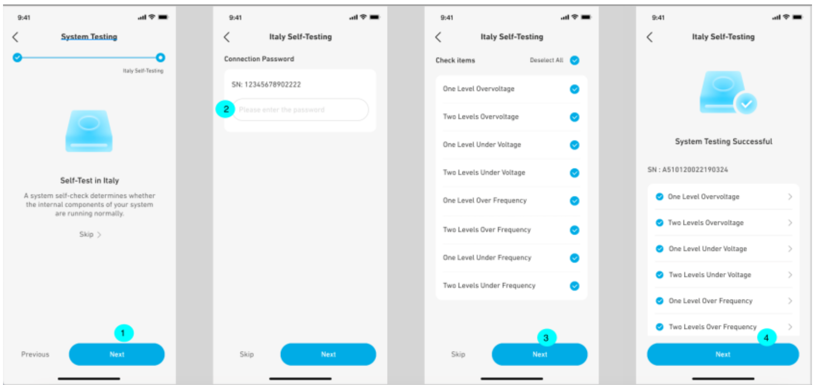
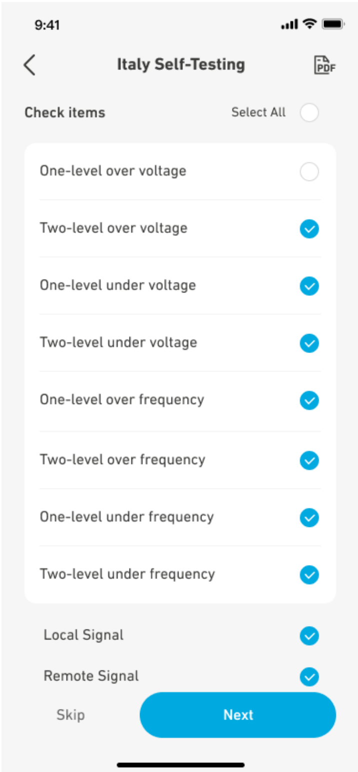
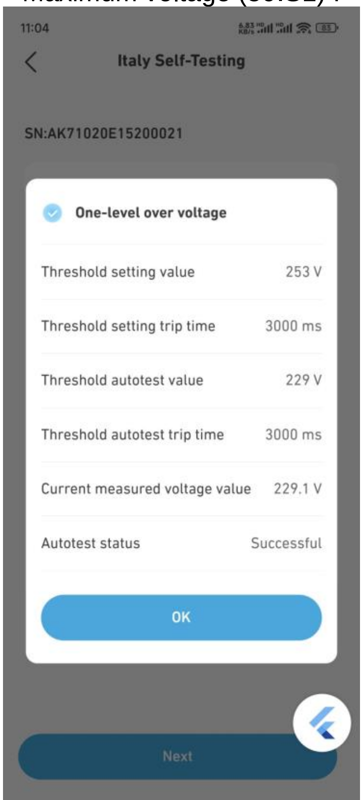
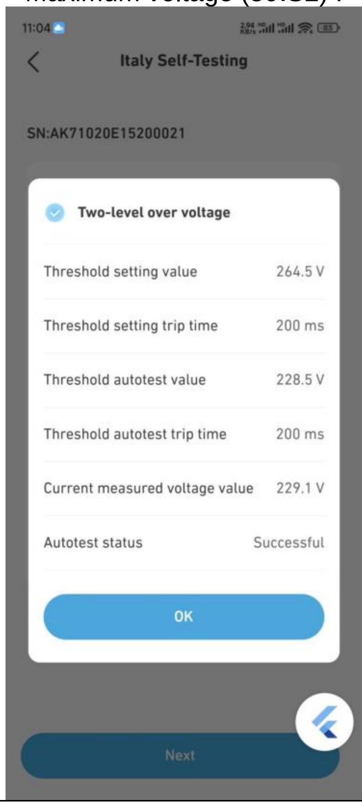
Step 3		**Configure Meter** Configure the meter address, and then check whether the meters are correctly connected and configured onsite.

Perform System Test

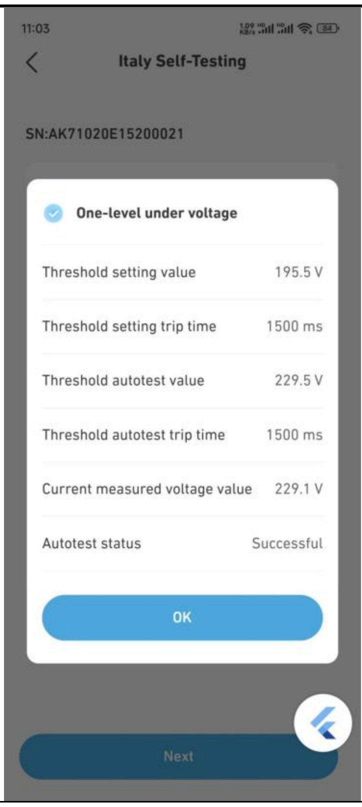
Step 1		**Perform System Test** ① Tap **System Testing.** ② Select **Start** to perform the system test. This involves testing the wiring, CT/meter connections, and both on-grid and off-grid functions. ③ If system testing is successful, tap **Next** to proceed. If system testing fails, follow the on-screen troubleshooting instructions and tap **Retry**.

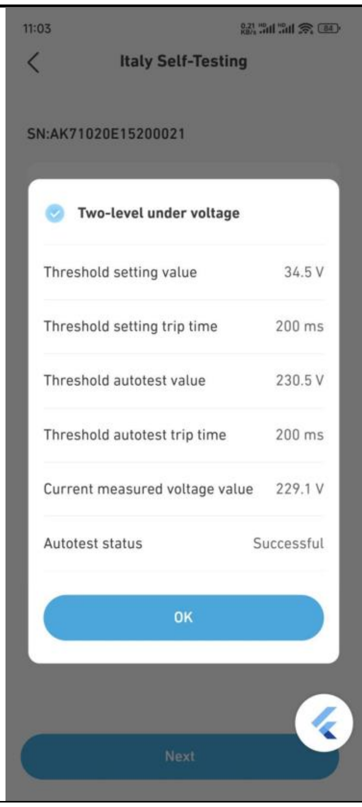
Step 2		**Perform Self-Test (For Italy Only)** ① Tap **Next** after the system test is completed. ② Enter the password located below the power module's barcode. ③ Select the items to be tested. ④ Tap **Next** to proceed only when all the selected items pass. If any self-test item fails, check and retest the failed item.

Operation steps:

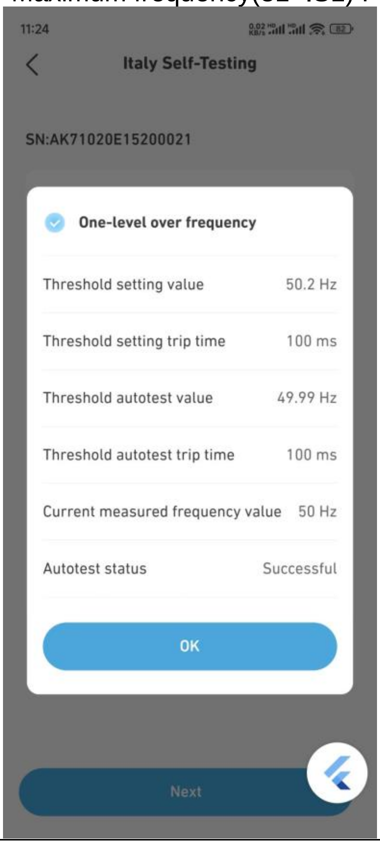
Interface of Self-Test items	Maximum voltage (59.S1) :	Maximum voltage (59.S2) :
		

Undervoltage (27.S1) :	Undervoltage (27.S2) :

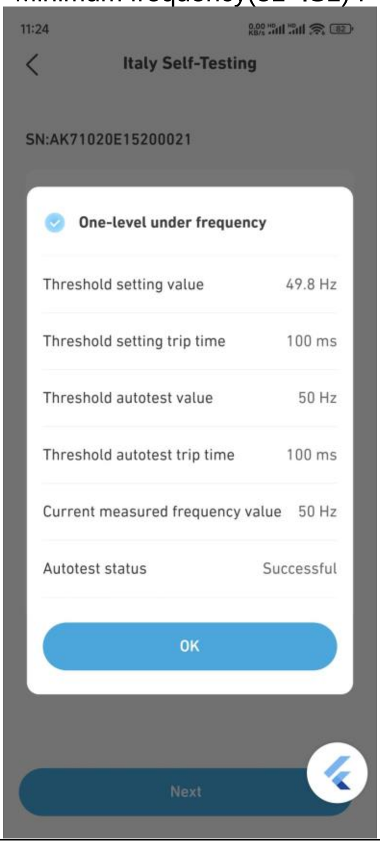




Maximum frequency(81>.S1) :



Minimum frequency(81<.S1) :



Maximum frequency(81>.S2) :

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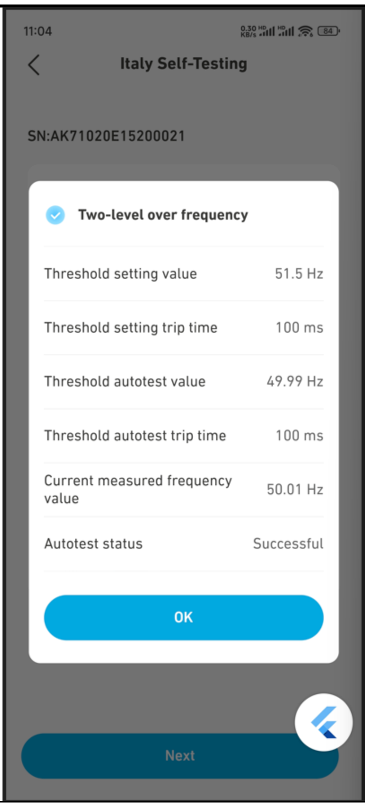
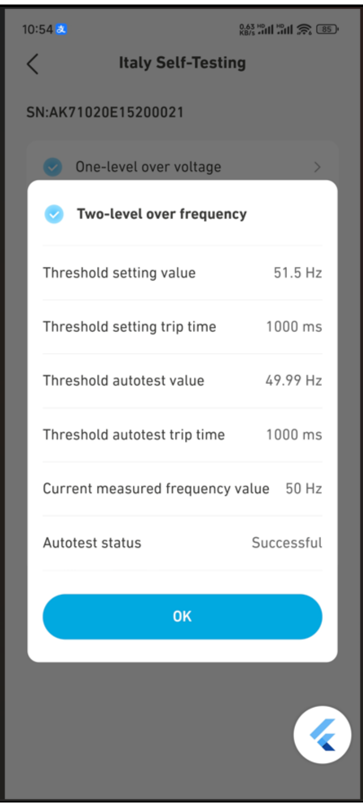
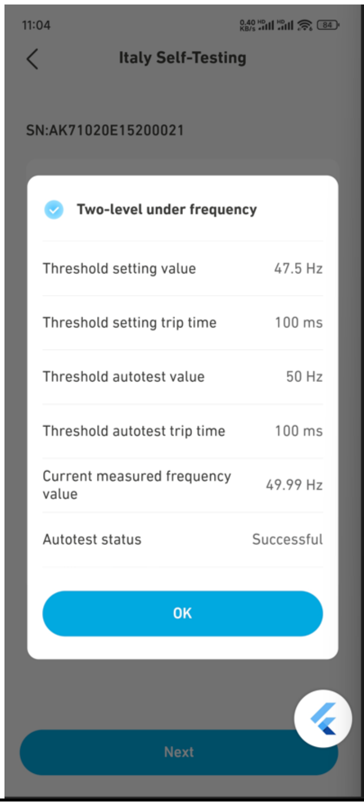
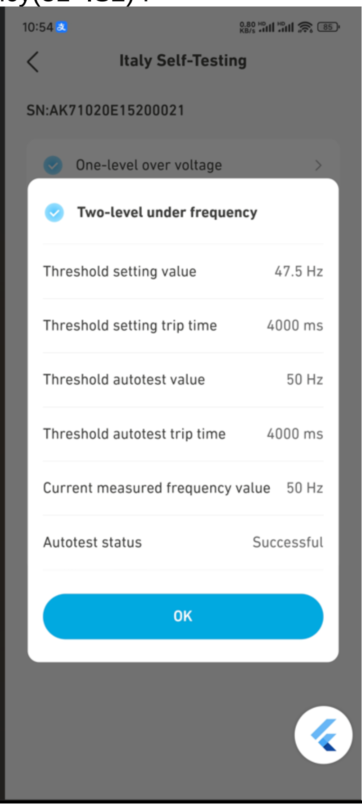




Minimum frequency(81<.S2) :





supplementary information:

- The EUC has self-testing functions for all protection functions, with the right procedure.
- The required value is displayed during every test.

A.4.5	Single fault tolerance					P
Test requirement						
No.	component	Fault	Input (Vdc)	Output (Vac, kW)	Test duration	Observation
1.	R37 (INV voltage sampling circuit)	O-C	530Vmp/400V$_{DC}$	230V 6kW	30min	The fault condition applied befor the operation, After applied the fault, The inverter can run normal. No fault code detected. No danger, no fire. The inverter can run normally after recovery.
2.	R61 (Drive Resistors for Boosted IGBTs)	S-C	530Vmp/400V$_{DC}$	230V 6kW	30min	The fault condition applied after the operation, After applied the fault, The inverter shut down immeiately . Fault code' The DC current hall is faulty ' detected, No damege,No danger, no fire. The inverter can run normally after recovery.
3.	R79 (busbar voltage sampling Resistor)	S-C	530Vmp/400V$_{DC}$	230V 6kW	30min	The fault condition applied after the operation, After applied the fault, The inverter shuut down immeiately . Fault code 'The inverter soft start is faulty ' detected, Q1 Q2 Q3 Q5 Q6 damege. No danger, no fire. The inverter can not run normally after recovery. After the test DUT comply with Dielectric voltage-Withstand test.
4.	R136 (Grid voltage sampling circuit)	S-C	530Vmp/400V$_{DC}$	230V 6kW	30min	The fault condition applied befor the operation, After applied the fault, The inverter can run normal. No fault code detected. No danger, no fire. The inverter can run normally after recovery.
5.	R160 (Load voltage sampling Resistor)	S-C	530Vmp/400V$_{DC}$	230V 6kW	30min	The fault condition applied after the operation, After applied the fault, The inverter shuut down immeiately . Fault code 'Load relay fault ' detected, No damege. No danger, no fire. The inverter can run normally after recovery.
6.	R6 (Resistance of PV current sampling signal circuit)	O-C	530Vmp/400V$_{DC}$	230V 6kW	30min	The fault condition applied after the operation, After applied the fault, The inverter shuut down immeiately . Fault code 'PV short circuit fault ' detected, No damege. No danger, no fire. The inverter can run normally after recovery.

7.	R147 (Resistance of Load current sampling signal circuit)	O-C	530Vmp/400V$_{DC}$	230V 6kW	30min	The fault condition applied befor the operation, After applied the fault, The inverter can run normal. No fault code detected. No danger, no fire. The inverter can run normally after recovery.
8.	R131 (Resistance of Grid current sampling signal circuit)	S-C	530Vmp/400V$_{DC}$	230V 6kW	30min	The fault condition applied after the operation, After applied the fault, The inverter shuut down immeiately . Fault code 'Leakage current self-test failure ' and 'Grid R phese under voltage fault' detected, No damege. No danger, no fire. The inverter can run normally after recovery.
9.	K1 (Insulation Impedance Detection Circuit Relay)	S-C	530Vmp/400V$_{DC}$	230V 6kW	30min	The fault condition applied befor the operation, After applied the fault, The inverter can run normal. No fault code detected. No danger, no fire. The inverter can run normally after recovery.
10.	R306 (Battery voltage sampling Resistor)	S-C	530Vmp/400V$_{DC}$	230V 6kW	30min	The fault condition applied befor the operation, After applied the fault, The inverter can run normal. No fault code detected. No danger, no fire. The inverter can run normally after recovery.
11.	D26 (Diodes in the secondary of the auxiliary source transformer)	S-C	530Vmp/400V$_{DC}$	230V 6kW	30min	The fault condition applied befor the operation, After applied the fault, The inverter can run normal. No fault code detected. No danger, no fire. The inverter can run normally after recovery.
12.	C54 (Isolated Communication IC Power Supply)	O-C	530Vmp/400V$_{DC}$	230V 6kW	30min	The fault condition applied after the operation, After applied the fault, The inverter can not run normal. No fault code detected. No danger, no fire. The inverter can run normally after recovery.
13.	R474 (Isolates communication circuits of communication IC)	O-C	530Vmp/400V$_{DC}$	230V 6kW	30min	The fault condition applied after the operation, After applied the fault, The inverter can not run normal. No fault code detected. No danger, no fire. The inverter can run normally after recovery.
14.	U20 (Isolated Optocoupler Power Circuit)	O-C	530Vmp/400V$_{DC}$	230V 6kW	30min	The fault condition applied after the operation, After applied the fault, The inverter can not run normal. No fault code detected. No danger, no fire. The inverter can run normally after recovery.

15.	K8 (Grid L phase relay)	S-C	$530V_{DC}/230V_{AC}$	230V	3 mins	The relay is short-circuited before the operation, the AC terminal is self-checked after connecting to the grid, and the red light on the front panel alarms, Fault code reported deteced 'Grid relay fault'
16.	K9 (Grid L phase relay)	S-C	$530V_{DC}/230V_{AC}$	230V	3 mins	The relay is short-circuited before the operation, the AC terminal is self-checked after connecting to the grid, and the red light on the front panel alarms, Fault code reported deteced 'Grid relay fault'
17.	K10 (Grid N phase relay)	S-C	$530V_{DC}/230V_{AC}$	230V	3 mins	The relay is short-circuited before the operation, the AC terminal is self-checked after connecting to the grid, and the red light on the front panel alarms, Fault code reported deteced 'Grid relay fault'
18.	K11 (Grid N phase relay)	S-C	$530V_{DC}/230V_{AC}$	230V	3 mins	The relay is short-circuited before the operation, the AC terminal is self-checked after connecting to the grid, and the red light on the front panel alarms, Fault code reported deteced 'Grid relay fault'
supplementary information: N/A						

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A.4.6	EMC compatibility tests		P
Classification of equipment		Required	P/F
SPI stand alone		--	N/A
Inverter with SPI integrated		--	N/A
Inverter		--	N/A
Others:		--	---
supplementary information: See separated EMC test report no.: ENS2406110286E00101R			

A.4.7	Climatic compatibility tests		P
Model	X1-H6K-S		
Detail	**Notes/Test Levels**	**Time**	**Discretion**
Non-powered equipment	Dry heat +70 °C ± 2 °C	16 hours	P
	Damp Heat +70 °C ± 2 °C, RH =95 % ± 3 %	4 days	P
	Cold -30 °C ± 2 °C	16 hours	P
	Temperature change -30 / +70 °C ± 2 °C	3 hours + 3 hours	P
Powered equipment	Dry heat +60 °C ± 2 °C	16 hours	P
	Damp Heat +60 °C ± 2 °C, RH =95 % ± 3 %	4 days	P
	Cold -25 °C ± 2 °C	16 hours	P
	Temperature change -25 / +60 °C ± 2 °C	3 hours + 3 hours	P
Supplemtary information: During the climatic tests the following must be checked. (See datasheet for clause A.4.3.1 &A.4.3.2) − all functions; − measuring the accuracy of tripping thresholds; − measuring the accuracy of trip times.			

A.4.8	Insulation test	P
Model	X1-H6K-S	
A.4.8.1	Insulation voltage test	

Test voltage applied between:	Voltage (V)	Breakdown (Yes/No)
Between live part (AC output shorted) to Ground	2120 Vd.c.	☒P ☐F ☐NA
Between live part (DC input shorted) to Ground	2120 Vd.c.	☒P ☐F ☐NA
Between live part (AC and DC input shorted) to Ground	2120 Vd.c.	☒P ☐F ☐NA
Between live part (AC and DC input shorted) to communication port	4240 Vd.c.	☒P ☐F ☐NA

Remark:

1. The test voltage may be applied with increasing and/or decreasing ramp voltage but the full voltage shall be maintained for 60 s.
2. Test is performed at an ambient temperature of 20°C
3. In case of inverter testing, level and procedure refer to EN 60146-1-1

A.4.8.2	Impulse voltage test

Test voltage applied between:	Voltage (V)	Breakdown (Yes/No)
Between live part (AC output) to Ground	4000 V	☒P ☐F ☐NA
Between live part (DC input) to Ground	4000 V	☒P ☐F ☐NA
Between live part (AC and DC input shorted) to communication port	6000 V	☒P ☐F ☐NA

Remark:

1. The impulse voltage test is performed with a voltage having a 1.2/50 μs waveform (see Figure 6 of IEC 60060-1)
2. Test is performed at an ambient temperature of 20°C
3. Level is referred to Cl. D.2.4.7.2 and E.3.11.2 of CEI0-16 V2 as required by CEI0-21 and CEI0-16

A.4.8.3	Insulation resistance measurement test

Table: Insulation resistance measurement test

Test voltage applied between:	Voltage (V)	Resistance(Ω)	Limit
Between live part (AC output) to Ground	500 V_{DC}	4.1MΩ	>1MΩ
Between live part (DC input) to Ground	500 V_{DC}	13560MΩ	>1MΩ
Between live part (AC and DC input shorted) to communication port	500 V_{DC}	4123MΩ	>1MΩ

Remark:

1. Test is performed at an ambient temperature of 20°C 2. In case of inverter testing, acceptance criteria and procedure refer to EN 60146-1-1

A.4.9	**overload capacity of voltmetric measurement circuits**		P
Model	X1-H6K-S		
Table: Test for the overload capacity of measuring circuits			
Overload capacity	Test duration	Observation after the test	
≥ 1.3 Vn	1hour	No harzard, No fire	
≥ 1.5 Vn	1 s	No harzard, No fire	
Supplemtary information: 1. The unit is not allowed to be damaged while testing. The measurement circuit must show after the test the same values like befor the test. 2. Requirement of 1.3Vn overload is permanent. Test duration is chosen 1 hour.			

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Bbis clause

Bbis.3.a & b	Harmonic emission limits			P
Model	Tested on X1-H3.68K-S (with 1*battery modules:X1-B5-H), the P_{SMAX} consider as 3000W (Battery supply only), and the P_{CMAX} consider as 3000W in this clause test.			
Tested at ambient temperature 25±5°C, **discharge mode**				
Frequency [Hz]	50.0	Nominal power [W]	3680	
Maximum discharge power P_{SMAX} [W]	3000	Maximum charge power P_{CMAX} [W]	3000	

Harmon. Nr.	P/ P_{SMAX}			Limits [A]
	33% P_{SMAX}	66% P_{SMAX}	100% P_{SMAX}	
	Ih [A]			
	L1	L1	L1	
1	4.258	8.745	13.218	-
2	0.011	0.011	0.013	1.080
3	0.047	0.102	0.099	2.300
4	0.007	0.006	0.006	0.430
5	0.153	0.156	0.163	1.140
6	0.007	0.006	0.006	0.300
7	0.070	0.075	0.072	0.770
8	0.005	0.005	0.006	0.230
9	0.012	0.043	0.046	0.400
10	0.005	0.006	0.006	0.180
11	0.017	0.016	0.019	0.330
12	0.006	0.006	0.006	0.150
13	0.026	0.007	0.009	0.210
14	0.006	0.006	0.006	0.130
15	0.031	0.010	0.008	0.150
16	0.006	0.007	0.007	0.120
17	0.038	0.017	0.012	0.130
18	0.008	0.008	0.008	0.100
19	0.038	0.022	0.015	0.120
20	0.007	0.007	0.007	0.090
21	0.034	0.022	0.014	0.110
22	0.008	0.009	0.009	0.080
23	0.027	0.022	0.010	0.100
24	0.006	0.006	0.006	0.080
25	0.021	0.023	0.011	0.090

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26	0.006	0.005	0.006	0.070
27	0.016	0.025	0.010	0.080
28	0.006	0.005	0.006	0.070
29	0.012	0.025	0.010	0.080
30	0.006	0.005	0.006	0.060
31	0.013	0.024	0.009	0.070
32	0.006	0.005	0.006	0.060
33	0.016	0.023	0.008	0.070
34	0.006	0.005	0.005	0.050
35	0.019	0.022	0.008	0.060
36	0.005	0.005	0.006	0.050
37	0.023	0.021	0.008	0.060
38	0.005	0.005	0.006	0.050
39	0.025	0.020	0.009	0.060
40	0.005	0.005	0.006	0.050

Supplementary information:

	33%			66%			100%		
	L1	L2	L3	L1	L2	L3	L1	L2	L3
Vrms (V_{AC})	230.8	-	-	230.7	-	-	230.4	-	-
Arms (A_{AC})	4.84	-	-	9.05	-	-	13.41	-	-
Watt (W)	988			2023			3046		
Frequency (Hz)	50.00			50.00			50.00		
THD(%)	3.87			2.07			1.33		

Test performed in compliance with EN 61000-3-2.

Tested at ambient temperature -25±2°C, **discharge mode**

Frequency [Hz]	50.0	Nominal power [W]	3680
Maximum discharge power P_{SMAX} [W]	3000	Maximum charge power P_{CMAX} [W]	3000

Harmon. Nr.	P/ P_{SMAX}			Limits [A]
	33% P_{SMAX}	66% P_{SMAX}	100% P_{SMAX}	
	Ih [A]			
	L1	L1	L1	
1	4.302	8.628	13.053	-
2	0.014	0.014	0.016	1.080
3	0.062	0.058	0.062	2.300
4	0.009	0.008	0.008	0.430
5	0.153	0.229	0.230	1.140

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6	0.008	0.011	0.008	0.300
7	0.071	0.115	0.114	0.770
8	0.006	0.009	0.006	0.230
9	0.015	0.065	0.068	0.400
10	0.006	0.011	0.007	0.180
11	0.017	0.029	0.028	0.330
12	0.006	0.009	0.007	0.150
13	0.026	0.016	0.013	0.210
14	0.007	0.007	0.007	0.130
15	0.030	0.020	0.007	0.150
16	0.007	0.011	0.007	0.120
17	0.038	0.029	0.013	0.130
18	0.009	0.012	0.009	0.100
19	0.039	0.040	0.018	0.120
20	0.007	0.009	0.008	0.090
21	0.036	0.044	0.021	0.110
22	0.008	0.010	0.009	0.080
23	0.027	0.039	0.016	0.100
24	0.007	0.013	0.008	0.080
25	0.020	0.040	0.016	0.090
26	0.007	0.006	0.008	0.070
27	0.014	0.038	0.015	0.080
28	0.007	0.009	0.008	0.070
29	0.009	0.039	0.016	0.080
30	0.007	0.006	0.009	0.060
31	0.010	0.041	0.015	0.070
32	0.007	0.009	0.009	0.060
33	0.015	0.038	0.016	0.070
34	0.007	0.013	0.009	0.050
35	0.020	0.038	0.016	0.060
36	0.007	0.008	0.009	0.050
37	0.024	0.035	0.015	0.060
38	0.008	0.013	0.011	0.050
39	0.029	0.045	0.020	0.060
40	0.008	0.005	0.011	0.050

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	33%			66%			100%		
	L1	L2	L3	L1	L2	L3	L1	L2	L3
Vrms (V_{AC})	230.2	-	-	230.0	-	-	230.0	-	-
Arms (A_{AC})	4.9	-	-	8.9	-	-	13.2	-	-
Watt (W)	993			1986			3005		
Frequency (Hz)	50.00			50.00			50.00		
THD(%)	3.94			2.89			1.78		

Test performed in compliance with EN 61000-3-2.

Tested at ambient temperature 60±2°C, **discharge mode**

Frequency [Hz]	50.0	Nominal power [W]	3680
Maximum discharge power P_{SMAX} [W]	3000	Maximum charge power P_{CMAX} [W]	3000

Harmon. Nr.	P/ P_{SMAX}			Limits [A]
	33% P_{SMAX}	66% P_{SMAX}	100% P_{SMAX}	
	Ih [A]			
	L1	L1	L1	
1	4.301	8.628	13.052	-
2	0.013	0.014	0.017	1.080
3	0.062	0.057	0.061	2.300
4	0.009	0.007	0.007	0.430
5	0.153	0.228	0.230	1.140
6	0.007	0.007	0.008	0.300
7	0.071	0.116	0.114	0.770
8	0.006	0.006	0.006	0.230
9	0.015	0.064	0.068	0.400
10	0.006	0.007	0.007	0.180
11	0.017	0.029	0.028	0.330
12	0.006	0.007	0.007	0.150
13	0.026	0.017	0.013	0.210
14	0.007	0.007	0.007	0.130
15	0.030	0.022	0.007	0.150
16	0.007	0.007	0.007	0.120
17	0.038	0.029	0.012	0.130
18	0.008	0.009	0.010	0.100
19	0.040	0.033	0.019	0.120
20	0.007	0.008	0.008	0.090
21	0.036	0.037	0.021	0.110

22	0.009	0.010	0.009	0.080
23	0.026	0.037	0.016	0.100
24	0.007	0.008	0.008	0.080
25	0.020	0.038	0.016	0.090
26	0.007	0.009	0.008	0.070
27	0.014	0.039	0.015	0.080
28	0.007	0.009	0.009	0.070
29	0.009	0.040	0.016	0.080
30	0.007	0.009	0.009	0.060
31	0.010	0.038	0.015	0.070
32	0.008	0.009	0.009	0.060
33	0.015	0.038	0.016	0.070
34	0.008	0.010	0.009	0.050
35	0.020	0.038	0.016	0.060
36	0.008	0.010	0.010	0.050
37	0.024	0.037	0.015	0.060
38	0.008	0.011	0.011	0.050
39	0.029	0.036	0.020	0.060
40	0.008	0.011	0.011	0.050

Supplementary information:

	33%			66%			100%		
	L1	L2	L3	L1	L2	L3	L1	L2	L3
Vrms (V_{AC})	230.2	-	-	230.0	-	-	230.0	-	-
Arms (A_{AC})	4.9	-	-	8.9	-	-	13.2	-	-
Watt (W)	992			1986			3004		
Frequency (Hz)	50.00			50.00			50.00		
THD(%)	4.03			2.88			1.78		

Test performed in compliance with EN 61000-3-2.

Tested at ambient temperature 25±5°C, **charge mode**

Frequency [Hz]	50.0	Nominal power [W]	3680
Maximum discharge power P_{SMAX} [W]	3000	Maximum charge power P_{CMAX} [W]	3000

Harmon. Nr.	P/ P_{CMAX}			Limits [A]
	33% P_{CMAX}	66% P_{CMAX}	100% P_{CMAX}	
	Ih [A]			
	L1	L1	L1	
1	4.671	9.079	13.496	-

2	0.007	0.009	0.014	1.080
3	0.049	0.082	0.069	2.300
4	0.005	0.005	0.005	0.430
5	0.128	0.157	0.157	1.140
6	0.007	0.006	0.006	0.300
7	0.065	0.076	0.079	0.770
8	0.005	0.005	0.005	0.230
9	0.072	0.026	0.034	0.400
10	0.006	0.006	0.005	0.180
11	0.053	0.006	0.008	0.330
12	0.006	0.006	0.006	0.150
13	0.023	0.019	0.012	0.210
14	0.006	0.006	0.005	0.130
15	0.009	0.024	0.018	0.150
16	0.006	0.005	0.005	0.120
17	0.015	0.027	0.022	0.130
18	0.007	0.007	0.007	0.100
19	0.016	0.027	0.024	0.120
20	0.007	0.007	0.007	0.090
21	0.020	0.025	0.022	0.110
22	0.007	0.007	0.006	0.080
23	0.026	0.019	0.019	0.100
24	0.007	0.006	0.006	0.080
25	0.029	0.016	0.017	0.090
26	0.007	0.006	0.007	0.070
27	0.027	0.013	0.015	0.080
28	0.006	0.006	0.006	0.070
29	0.026	0.010	0.013	0.080
30	0.007	0.006	0.006	0.060
31	0.027	0.009	0.013	0.070
32	0.006	0.006	0.006	0.060
33	0.031	0.007	0.012	0.070
34	0.006	0.006	0.006	0.050
35	0.035	0.007	0.011	0.060
36	0.007	0.007	0.007	0.050
37	0.035	0.007	0.012	0.060

38	0.007	0.007	0.007	0.050
39	0.032	0.009	0.012	0.060
40	0.007	0.007	0.007	0.050

Supplementary information:

	33%			66%			100%		
	L1	L2	L3	L1	L2	L3	L1	L2	L3
Vrms (V_{AC})	229.9	-	-	230.4	-	-	229.9	-	-
Arms (A_{AC})	5.26	-	-	9.44	-	-	13.74	-	-
Watt (W)	-1071			-2095			-3106		
Frequency (Hz)	50.00			50.00			50.00		
THD(%)	3.55			1.87			1.23		

Test performed in compliance with EN 61000-3-2.

Tested at ambient temperature -25±2°C, **charge mode**

Frequency [Hz]	50.0	Nominal power [W]	3680
Maximum discharge power P_{SMAX} [W]	3000	Maximum charge power P_{CMAX} [W]	3000

Harmon. Nr.	P/ P_{CMAX}			Limits [A]
	33% P_{CMAX}	66% P_{CMAX}	100% P_{CMAX}	
	Ih [A]			
	L1	L1	L1	
1	4.352	8.659	13.082	-
2	0.007	0.010	0.017	1.080
3	0.047	0.082	0.093	2.300
4	0.006	0.006	0.007	0.430
5	0.126	0.213	0.236	1.140
6	0.007	0.006	0.006	0.300
7	0.072	0.092	0.117	0.770
8	0.006	0.006	0.006	0.230
9	0.079	0.026	0.054	0.400
10	0.006	0.007	0.006	0.180
11	0.051	0.054	0.014	0.330
12	0.007	0.007	0.006	0.150
13	0.019	0.053	0.013	0.210
14	0.007	0.007	0.007	0.130
15	0.018	0.040	0.023	0.150
16	0.008	0.007	0.007	0.120
17	0.020	0.025	0.031	0.130

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18	0.008	0.009	0.009	0.100
19	0.026	0.024	0.034	0.120
20	0.008	0.008	0.008	0.090
21	0.029	0.028	0.034	0.110
22	0.009	0.009	0.009	0.080
23	0.028	0.028	0.028	0.100
24	0.008	0.008	0.008	0.080
25	0.030	0.029	0.025	0.090
26	0.008	0.009	0.008	0.070
27	0.027	0.028	0.024	0.080
28	0.008	0.009	0.009	0.070
29	0.031	0.023	0.024	0.080
30	0.008	0.010	0.009	0.060
31	0.037	0.018	0.022	0.070
32	0.009	0.011	0.010	0.060
33	0.042	0.013	0.022	0.070
34	0.009	0.011	0.011	0.050
35	0.041	0.011	0.022	0.060
36	0.009	0.011	0.011	0.050
37	0.038	0.012	0.019	0.060
38	0.009	0.011	0.012	0.050
39	0.035	0.019	0.024	0.060
40	0.008	0.011	0.011	0.050

Supplementary information:

	33%			66%			100%		
	L1	L2	L3	L1	L2	L3	L1	L2	L3
Vrms (V_{AC})	229.8	-	-	229.9	-	-	229.8	-	-
Arms (A_{AC})	5.0	-	-	8.9	-	-	13.2	-	-
Watt (W)	-997			-1988			-3004		
Frequency (Hz)	50.00			50.00			50.00		
THD(%)	4.06			2.61			1.90		

Test performed in compliance with EN 61000-3-2.

Tested at ambient temperature 60±2°C, **charge mode**

Frequency [Hz]	50.0	Nominal power [W]	3680
Maximum discharge power P_{SMAX} [W]	3000	Maximum charge power P_{CMAX} [W]	3000
Harmon. Nr.	P/ P_{CMAX}		Limits [A]

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	33% PCMAX	66% PCMAX	100% PCMAX	
	Ih [A]			
	L1	L1	L1	
1	4.352	8.656	13.083	-
2	0.006	0.010	0.016	1.080
3	0.047	0.082	0.094	2.300
4	0.006	0.007	0.007	0.430
5	0.126	0.213	0.237	1.140
6	0.007	0.007	0.006	0.300
7	0.072	0.092	0.118	0.770
8	0.006	0.006	0.006	0.230
9	0.079	0.026	0.056	0.400
10	0.006	0.007	0.007	0.180
11	0.051	0.053	0.015	0.330
12	0.007	0.007	0.007	0.150
13	0.020	0.053	0.012	0.210
14	0.007	0.007	0.007	0.130
15	0.018	0.040	0.023	0.150
16	0.008	0.007	0.007	0.120
17	0.020	0.025	0.031	0.130
18	0.009	0.009	0.009	0.100
19	0.026	0.024	0.034	0.120
20	0.008	0.008	0.008	0.090
21	0.028	0.028	0.034	0.110
22	0.008	0.010	0.009	0.080
23	0.028	0.028	0.028	0.100
24	0.008	0.008	0.008	0.080
25	0.030	0.028	0.026	0.090
26	0.008	0.009	0.009	0.070
27	0.028	0.028	0.024	0.080
28	0.008	0.009	0.009	0.070
29	0.031	0.023	0.024	0.080
30	0.008	0.009	0.009	0.060
31	0.037	0.017	0.022	0.070
32	0.009	0.011	0.010	0.060
33	0.042	0.013	0.022	0.070
34	0.009	0.011	0.010	0.050

35	0.042	0.011	0.022	0.060
36	0.009	0.012	0.010	0.050
37	0.038	0.013	0.019	0.060
38	0.009	0.012	0.012	0.050
39	0.035	0.019	0.024	0.060
40	0.008	0.011	0.012	0.050

Supplementary information:

	33%			66%			100%		
	L1	L2	L3	L1	L2	L3	L1	L2	L3
Vrms (V_{AC})	229.8	-	-	229.9	-	-	229.8	-	-
Arms (A_{AC})	5.0	-	-	8.9	-	-	13.2	-	-
Watt (W)	-997			-1987			-3004		
Frequency (Hz)	50.00			50.00			50.00		
THD(%)	4.06			2.61			1.91		

Test performed in compliance with EN 61000-3-2.

Model	Tested on X1-H6K-S (with 1*battery modules: X1-B5-H), the P_{SMAX} consider as 3000W (Battery supply only), and the P_{CMAX} consider as 3000W in this clause test.

Tested at ambient temperature 25±5°C, **discharge mode**

Frequency [Hz]	50.0	Nominal power [W]	6000
Maximum discharge power P_{SMAX} [W]	3000	Maximum charge power P_{CMAX} [W]	3000

Harmon. Nr.	P/ P_{SMAX}			Limits [%]
	33% P_{SMAX}	66% P_{SMAX}	100% P_{SMAX}	
	Ih/Iref [%]			
	L1	L1	L1	
2	0.042	0.042	0.050	8
3	0.164	0.391	0.387	21.6
4	0.029	0.022	0.024	4
5	0.593	0.601	0.624	10.7
6	0.027	0.022	0.022	2.67
7	0.265	0.289	0.277	7.2
8	0.021	0.021	0.021	2
9	0.049	0.164	0.178	3.8
10	0.022	0.022	0.023	1.6
11	0.065	0.062	0.074	3.1
12	0.024	0.023	0.022	1.33
13	0.100	0.027	0.035	2
14	0.025	0.024	0.024	-

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15	0.115	0.036	0.030	-
16	0.025	0.025	0.026	-
17	0.143	0.067	0.045	-
18	0.030	0.031	0.030	-
19	0.147	0.084	0.055	-
20	0.025	0.025	0.026	-
21	0.133	0.084	0.052	-
22	0.031	0.032	0.036	-
23	0.105	0.084	0.040	-
24	0.022	0.022	0.023	-
25	0.080	0.090	0.041	-
26	0.023	0.021	0.022	-
27	0.059	0.095	0.039	-
28	0.022	0.020	0.021	-
29	0.044	0.098	0.037	-
30	0.022	0.020	0.021	-
31	0.049	0.093	0.034	-
32	0.022	0.021	0.021	-
33	0.061	0.089	0.029	-
34	0.022	0.020	0.021	-
35	0.074	0.086	0.029	-
36	0.021	0.020	0.021	-
37	0.089	0.081	0.030	-
38	0.020	0.021	0.022	-
39	0.097	0.076	0.032	-
40	0.019	0.019	0.021	-
THC/Iref	0.776	0.855	0.829	23
PWHC/Iref	1.771	1.644	0.837	23
Test performed in compliance with EN 61000-3-12.				

Tested at ambient temperature -25±2°C, **discharge mode**

Frequency [Hz]	50.0	Nominal power [W]	6000
Maximum discharge power P_{SMAX} [W]	3000	Maximum charge power P_{CMAX} [W]	3000

Harmon. Nr.	P/ P_{SMAX}			Limits [%]
	33% P_{SMAX}	66% P_{SMAX}	100% P_{SMAX}	
	Ih/Iref [%]			
	L1	L1	L1	

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2	0.049	0.049	0.059	8
3	0.237	0.221	0.240	21.6
4	0.035	0.031	0.029	4
5	0.587	0.878	0.885	10.7
6	0.029	0.028	0.032	2.67
7	0.275	0.445	0.438	7.2
8	0.023	0.026	0.022	2
9	0.058	0.245	0.261	3.8
10	0.023	0.028	0.026	1.6
11	0.065	0.111	0.107	3.1
12	0.025	0.028	0.025	1.33
13	0.098	0.066	0.051	2
14	0.027	0.028	0.027	-
15	0.116	0.084	0.029	-
16	0.028	0.028	0.027	-
17	0.146	0.111	0.048	-
18	0.031	0.037	0.034	-
19	0.152	0.129	0.072	-
20	0.026	0.030	0.029	-
21	0.137	0.144	0.080	-
22	0.034	0.036	0.038	-
23	0.102	0.143	0.063	-
24	0.026	0.033	0.033	-
25	0.076	0.146	0.060	-
26	0.027	0.033	0.033	-
27	0.052	0.150	0.060	-
28	0.029	0.034	0.034	-
29	0.035	0.155	0.062	-
30	0.028	0.034	0.034	-
31	0.041	0.148	0.057	-
32	0.029	0.036	0.036	-
33	0.057	0.149	0.061	-
34	0.030	0.037	0.036	-
35	0.077	0.147	0.062	-
36	0.031	0.038	0.037	-
37	0.093	0.141	0.057	-

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38	0.032	0.042	0.042	-
39	0.110	0.140	0.077	-
40	0.029	0.042	0.040	-
THC/Iref	0.800	1.170	1.090	23
PWHC/Iref	1.836	2.746	1.364	23
Test performed in compliance with EN 61000-3-12.				

Tested at ambient temperature 60±2°C, **discharge mode**			
Frequency [Hz]	50.0	Nominal power [W]	6000
Maximum discharge power P_{SMAX} [W]	3000	Maximum charge power P_{CMAX} [W]	3000

Harmon. Nr.	P/ P_{SMAX}			Limits [%]
	33% P_{SMAX}	66% P_{SMAX}	100% P_{SMAX}	
	Ih/Iref [%]			
	L1	L1	L1	
2	0.048	0.053	0.065	8
3	0.237	0.219	0.236	21.6
4	0.034	0.029	0.028	4
5	0.587	0.877	0.883	10.7
6	0.030	0.028	0.033	2.67
7	0.274	0.445	0.438	7.2
8	0.023	0.024	0.022	2
9	0.058	0.246	0.261	3.8
10	0.023	0.026	0.026	1.6
11	0.066	0.112	0.108	3.1
12	0.024	0.027	0.025	1.33
13	0.099	0.066	0.051	2
14	0.026	0.027	0.027	-
15	0.117	0.083	0.029	-
16	0.028	0.028	0.027	-
17	0.146	0.110	0.048	-
18	0.034	0.035	0.035	-
19	0.153	0.130	0.071	-
20	0.025	0.030	0.029	-
21	0.138	0.145	0.082	-
22	0.031	0.037	0.036	-
23	0.102	0.142	0.064	-
24	0.026	0.033	0.032	-

25	0.077	0.145	0.061	-
26	0.027	0.033	0.033	-
27	0.052	0.149	0.060	-
28	0.027	0.034	0.034	-
29	0.034	0.154	0.063	-
30	0.028	0.035	0.034	-
31	0.040	0.147	0.057	-
32	0.029	0.036	0.035	-
33	0.057	0.148	0.060	-
34	0.029	0.037	0.036	-
35	0.077	0.147	0.062	-
36	0.030	0.038	0.037	-
37	0.094	0.141	0.056	-
38	0.030	0.045	0.045	-
39	0.110	0.141	0.080	-
40	0.030	0.042	0.040	-
THC/Iref	0.800	1.169	1.088	23
PWHC/Iref	1.840	2.739	1.372	23
Test performed in compliance with EN 61000-3-12.				

Tested at ambient temperature 25±5°C, **charge mode**			
Frequency [Hz]	50.0	Nominal power [W]	6000
Maximum discharge power P_{SMAX} [W]	3000	Maximum charge power P_{CMAX} [W]	3000

Harmon. Nr.	P/ P_{CMAX}			Limits [%]
	33% P_{CMAX}	66% P_{CMAX}	100% P_{CMAX}	
	Ih/Iref [%]			
	L1	L1	L1	
2	0.029	0.033	0.051	8
3	0.193	0.309	0.260	21.6
4	0.020	0.020	0.019	4
5	0.491	0.605	0.602	10.7
6	0.026	0.024	0.022	2.67
7	0.250	0.294	0.305	7.2
8	0.021	0.021	0.021	2
9	0.277	0.100	0.129	3.8
10	0.021	0.022	0.021	1.6
11	0.201	0.025	0.032	3.1

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12	0.024	0.023	0.022	1.33
13	0.088	0.072	0.047	2
14	0.023	0.022	0.021	-
15	0.036	0.094	0.069	-
16	0.023	0.021	0.021	-
17	0.057	0.105	0.085	-
18	0.027	0.026	0.028	-
19	0.062	0.104	0.092	-
20	0.026	0.025	0.026	-
21	0.079	0.092	0.085	-
22	0.026	0.027	0.025	-
23	0.101	0.074	0.073	-
24	0.026	0.024	0.024	-
25	0.112	0.061	0.068	-
26	0.026	0.024	0.026	-
27	0.102	0.051	0.059	-
28	0.026	0.024	0.024	-
29	0.098	0.039	0.052	-
30	0.026	0.024	0.024	-
31	0.103	0.034	0.052	-
32	0.024	0.023	0.024	-
33	0.120	0.027	0.046	-
34	0.025	0.023	0.025	-
35	0.137	0.028	0.042	-
36	0.027	0.026	0.026	-
37	0.132	0.029	0.045	-
38	0.027	0.028	0.027	-
39	0.121	0.036	0.045	-
40	0.027	0.028	0.027	-
THC/Iref	0.782	0.795	0.781	23
PWHC/Iref	2.078	1.202	1.234	23
Test performed in compliance with EN 61000-3-12.				

Tested at ambient temperature -25±2°C, **charge mode**			
Frequency [Hz]	50.0	Nominal power [W]	6000
Maximum discharge power P_{SMAX} [W]	3000	Maximum charge power P_{CMAX} [W]	3000

Harmon. Nr.	P/ P_{CMAX}	Limits [%]

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	33% PCMAX	66% PCMAX	100% PCMAX	
	Ih/Iref [%]			
	L1	L1	L1	
2	0.024	0.039	0.064	8
3	0.182	0.313	0.357	21.6
4	0.022	0.022	0.026	4
5	0.486	0.820	0.910	10.7
6	0.029	0.025	0.022	2.67
7	0.276	0.352	0.451	7.2
8	0.023	0.024	0.024	2
9	0.303	0.098	0.207	3.8
10	0.024	0.025	0.025	1.6
11	0.196	0.207	0.055	3.1
12	0.026	0.027	0.026	1.33
13	0.075	0.202	0.050	2
14	0.028	0.027	0.027	-
15	0.068	0.156	0.090	-
16	0.029	0.028	0.027	-
17	0.076	0.098	0.120	-
18	0.035	0.034	0.035	-
19	0.097	0.093	0.134	-
20	0.031	0.030	0.029	-
21	0.111	0.109	0.133	-
22	0.033	0.037	0.036	-
23	0.109	0.108	0.109	-
24	0.030	0.032	0.031	-
25	0.114	0.110	0.098	-
26	0.031	0.034	0.032	-
27	0.106	0.107	0.094	-
28	0.031	0.034	0.033	-
29	0.118	0.089	0.093	-
30	0.032	0.036	0.036	-
31	0.144	0.066	0.084	-
32	0.033	0.039	0.039	-
33	0.162	0.051	0.087	-
34	0.033	0.043	0.042	-
35	0.159	0.044	0.085	-

36	0.033	0.045	0.041	-
37	0.146	0.048	0.073	-
38	0.032	0.047	0.042	-
39	0.134	0.074	0.094	-
40	0.032	0.044	0.043	-
THC/Iref	0.832	1.061	1.168	23
PWHC/Iref	2.485	1.787	1.965	23
Test performed in compliance with EN 61000-3-12.				
Tested at ambient temperature 60±2°C, **charge mode**				
Frequency [Hz]	50.0	Nominal power [W]	6000	
Maximum discharge power P_{SMAX} [W]	3000	Maximum charge power P_{CMAX} [W]	3000	
Harmon. Nr.	P/P_{CMAX}			Limits [%]
	33% P_{CMAX}	66% P_{CMAX}	100% P_{CMAX}	
	Ih/Iref [%]			
	L1	L1	L1	
2	0.026	0.037	0.063	8
3	0.182	0.316	0.362	21.6
4	0.022	0.025	0.028	4
5	0.486	0.820	0.912	10.7
6	0.028	0.027	0.024	2.67
7	0.275	0.355	0.455	7.2
8	0.022	0.024	0.025	2
9	0.302	0.099	0.215	3.8
10	0.023	0.025	0.027	1.6
11	0.196	0.206	0.060	3.1
12	0.025	0.026	0.028	1.33
13	0.074	0.202	0.047	2
14	0.027	0.026	0.028	-
15	0.068	0.156	0.088	-
16	0.029	0.029	0.028	-
17	0.076	0.097	0.118	-
18	0.035	0.037	0.035	-
19	0.097	0.091	0.130	-
20	0.030	0.032	0.029	-
21	0.111	0.108	0.129	-
22	0.032	0.037	0.037	-

23	0.109	0.108	0.108	-
24	0.030	0.031	0.031	-
25	0.115	0.110	0.098	-
26	0.031	0.033	0.033	-
27	0.106	0.106	0.094	-
28	0.030	0.034	0.033	-
29	0.118	0.090	0.092	-
30	0.031	0.038	0.035	-
31	0.143	0.067	0.083	-
32	0.032	0.041	0.039	-
33	0.161	0.051	0.087	-
34	0.033	0.043	0.042	-
35	0.160	0.043	0.086	-
36	0.033	0.043	0.042	-
37	0.147	0.045	0.074	-
38	0.033	0.043	0.042	-
39	0.132	0.075	0.095	-
40	0.032	0.044	0.043	-
THC/Iref	0.831	1.063	1.174	23
PWHC/Iref	2.482	1.783	1.955	23
Test performed in compliance with EN 61000-3-12.				

Model	Tested on X1-H6K-S (with 6*battery modules: X1-B30-HC), the P_{SMAX} consider as 6000W (Battery supply only), and the P_{CMAX} consider as 6000W in this clause test.

Tested at ambient temperature 25 ±5 °C, **discharge mode**

Frequency [Hz]	50.0	Nominal power [W]	6000
Maximum discharge power P_{SMAX} [W]	6000	Maximum charge power P_{CMAX} [W]	6000

Harmon. Nr.	P/ P_{SMAX}			Limits [%]
	33% P_{SMAX}	66% P_{SMAX}	100% P_{SMAX}	
	Ih/Iref [%]			
	L1	L1	L1	
2	0.032	0.041	0.052	8
3	0.362	0.371	0.309	21.6
4	0.028	0.019	0.031	4
5	0.591	0.602	0.588	10.7
6	0.024	0.023	0.028	2.67
7	0.296	0.280	0.240	7.2

8	0.023	0.022	0.025	2
9	0.163	0.197	0.192	3.8
10	0.023	0.025	0.025	1.6
11	0.060	0.077	0.058	3.1
12	0.023	0.024	0.024	1.33
13	0.025	0.048	0.035	2
14	0.023	0.022	0.023	-
15	0.035	0.041	0.036	-
16	0.024	0.023	0.023	-
17	0.066	0.048	0.057	-
18	0.026	0.025	0.026	-
19	0.081	0.055	0.072	-
20	0.023	0.024	0.026	-
21	0.082	0.053	0.061	-
22	0.028	0.031	0.031	-
23	0.083	0.045	0.050	-
24	0.022	0.022	0.023	-
25	0.090	0.039	0.049	-
26	0.022	0.021	0.022	-
27	0.094	0.035	0.045	-
28	0.020	0.021	0.022	-
29	0.097	0.031	0.049	-
30	0.020	0.019	0.022	-
31	0.091	0.030	0.040	-
32	0.019	0.020	0.021	-
33	0.088	0.035	0.041	-
34	0.019	0.020	0.022	-
35	0.083	0.032	0.042	-
36	0.018	0.019	0.022	-
37	0.078	0.033	0.034	-
38	0.020	0.022	0.023	-
39	0.073	0.043	0.043	-
40	0.018	0.020	0.023	-
THC/Iref	0.834	0.811	0.765	23
PWHC/Iref	1.611	0.850	0.991	23
Test performed in compliance with EN 61000-3-12.				

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Tested at ambient temperature -25 ±2 °C, **discharge mode**				
Frequency [Hz]	50.0		Nominal power [W]	6000
Maximum discharge power P_{SMAX} [W]	6000		Maximum charge power P_{CMAX} [W]	6000
Harmon. Nr.	P/ P_{SMAX}			Limits [%]
	33% P_{SMAX}	66% P_{SMAX}	100% P_{SMAX}	
	Ih/Iref [%]			
	L1	L1	L1	
2	0.049	0.075	0.073	8
3	0.224	0.309	0.462	21.6
4	0.031	0.033	0.037	4
5	0.878	0.890	0.859	10.7
6	0.029	0.029	0.027	2.67
7	0.445	0.431	0.430	7.2
8	0.026	0.022	0.025	2
9	0.243	0.282	0.258	3.8
10	0.028	0.025	0.022	1.6
11	0.110	0.109	0.111	3.1
12	0.028	0.023	0.026	1.33
13	0.066	0.065	0.038	2
14	0.028	0.024	0.023	-
15	0.084	0.034	0.025	-
16	0.028	0.025	0.026	-
17	0.110	0.041	0.056	-
18	0.037	0.033	0.035	-
19	0.129	0.067	0.068	-
20	0.031	0.027	0.027	-
21	0.144	0.070	0.082	-
22	0.037	0.035	0.035	-
23	0.142	0.044	0.048	-
24	0.032	0.030	0.030	-
25	0.146	0.039	0.052	-
26	0.033	0.031	0.030	-
27	0.149	0.031	0.041	-
28	0.034	0.031	0.030	-
29	0.154	0.031	0.036	-
30	0.035	0.032	0.031	-

31	0.146	0.033	0.037	-
32	0.036	0.033	0.032	-
33	0.148	0.037	0.039	-
34	0.036	0.033	0.034	-
35	0.146	0.041	0.041	-
36	0.037	0.034	0.036	-
37	0.141	0.047	0.049	-
38	0.042	0.043	0.039	-
39	0.141	0.076	0.074	-
40	0.042	0.038	0.039	-
THC/Iref	1.169	1.106	1.130	23
PWHC/Iref	2.735	1.114	1.170	23
Test performed in compliance with EN 61000-3-12.				

Tested at ambient temperature 60 ±2 °C, **discharge mode**

Frequency [Hz]	50.0	Nominal power [W]	6000
Maximum discharge power P_{SMAX} [W]	6000	Maximum charge power P_{CMAX} [W]	6000

Harmon. Nr.	P/ P_{SMAX}			Limits [%]
	33% P_{SMAX}	66% P_{SMAX}	100% P_{SMAX}	
	Ih/Iref [%]			
	L1	L1	L1	
2	0.053	0.075	0.072	8
3	0.221	0.304	0.458	21.6
4	0.028	0.032	0.035	4
5	0.876	0.888	0.856	10.7
6	0.027	0.032	0.029	2.67
7	0.445	0.431	0.431	7.2
8	0.024	0.022	0.024	2
9	0.245	0.281	0.256	3.8
10	0.026	0.025	0.022	1.6
11	0.111	0.108	0.110	3.1
12	0.027	0.023	0.026	1.33
13	0.065	0.064	0.037	2
14	0.027	0.024	0.023	-
15	0.083	0.035	0.027	-
16	0.028	0.025	0.026	-
17	0.110	0.043	0.059	-

18	0.036	0.033	0.035	-
19	0.131	0.068	0.068	-
20	0.030	0.026	0.027	-
21	0.147	0.070	0.083	-
22	0.036	0.036	0.034	-
23	0.143	0.046	0.051	-
24	0.032	0.030	0.030	-
25	0.146	0.040	0.054	-
26	0.032	0.031	0.030	-
27	0.149	0.032	0.045	-
28	0.034	0.031	0.030	-
29	0.155	0.032	0.038	-
30	0.035	0.031	0.031	-
31	0.147	0.032	0.040	-
32	0.036	0.032	0.032	-
33	0.148	0.037	0.041	-
34	0.037	0.033	0.033	-
35	0.147	0.041	0.043	-
36	0.039	0.034	0.035	-
37	0.141	0.047	0.051	-
38	0.042	0.042	0.041	-
39	0.141	0.075	0.075	-
40	0.042	0.037	0.041	-
THC/Iref	1.169	1.102	1.127	23
PWHC/Iref	2.747	1.112	1.202	23

Test performed in compliance with EN 61000-3-12.

Tested at ambient temperature 25 ±5 °C,**charge mode**

Frequency [Hz]	50.0	Nominal power [W]	6000
Maximum discharge power P_{SMAX} [W]	6000	Maximum charge power P_{CMAX} [W]	6000

Harmon. Nr.	P/ P_{CMAX}			Limits [%]
	33% P_{CMAX}	66% P_{CMAX}	100% P_{CMAX}	
	Ih/Iref [%]			
	L1	L1	L1	
2	0.031	0.073	0.108	8
3	0.316	0.212	0.098	21.6
4	0.019	0.020	0.021	4

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5	0.606	0.609	0.566	10.7
6	0.021	0.024	0.022	2.67
7	0.292	0.294	0.300	7.2
8	0.019	0.022	0.021	2
9	0.101	0.126	0.115	3.8
10	0.020	0.021	0.022	1.6
11	0.023	0.039	0.031	3.1
12	0.021	0.023	0.022	1.33
13	0.070	0.038	0.044	2
14	0.020	0.023	0.022	-
15	0.092	0.069	0.071	-
16	0.020	0.022	0.021	-
17	0.105	0.091	0.082	-
18	0.026	0.027	0.026	-
19	0.105	0.093	0.097	-
20	0.025	0.027	0.026	-
21	0.093	0.090	0.098	-
22	0.024	0.027	0.026	-
23	0.073	0.082	0.090	-
24	0.024	0.024	0.025	-
25	0.062	0.076	0.093	-
26	0.025	0.026	0.026	-
27	0.052	0.072	0.083	-
28	0.023	0.025	0.026	-
29	0.040	0.066	0.076	-
30	0.023	0.025	0.026	-
31	0.036	0.063	0.077	-
32	0.023	0.026	0.025	-
33	0.028	0.055	0.069	-
34	0.023	0.026	0.027	-
35	0.026	0.057	0.067	-
36	0.025	0.028	0.029	-
37	0.028	0.057	0.073	-
38	0.025	0.030	0.030	-
39	0.035	0.058	0.071	-
40	0.026	0.031	0.029	-

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THC/Iref	0.798	0.778	0.739	23
PWHC/Iref	1.239	1.427	1.580	23

Test performed in compliance with EN 61000-3-12.

Tested at ambient temperature -25 ±2 °C, **charge mode**

Frequency [Hz]	50.0	Nominal power [W]	6000
Maximum discharge power P_{SMAX} [W]	6000	Maximum charge power P_{CMAX} [W]	6000

Harmon. Nr.	P/ P_{CMAX}			Limits [%]
	33% P_{CMAX}	66% P_{CMAX}	100% P_{CMAX}	
	Ih/Iref [%]			
	L1	L1	L1	
2	0.039	0.083	0.131	8
3	0.313	0.404	0.573	21.6
4	0.023	0.025	0.028	4
5	0.819	0.912	0.871	10.7
6	0.025	0.023	0.029	2.67
7	0.353	0.449	0.449	7.2
8	0.024	0.025	0.026	2
9	0.098	0.209	0.197	3.8
10	0.025	0.025	0.026	1.6
11	0.206	0.073	0.063	3.1
12	0.026	0.027	0.028	1.33
13	0.202	0.042	0.031	2
14	0.026	0.027	0.028	-
15	0.156	0.079	0.076	-
16	0.027	0.028	0.028	-
17	0.098	0.112	0.105	-
18	0.034	0.037	0.037	-
19	0.092	0.131	0.122	-
20	0.030	0.031	0.031	-
21	0.108	0.132	0.140	-
22	0.038	0.037	0.037	-
23	0.108	0.112	0.123	-
24	0.032	0.033	0.033	-
25	0.110	0.110	0.119	-
26	0.033	0.036	0.036	-
27	0.106	0.112	0.127	-

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28	0.034	0.038	0.037	-
29	0.089	0.112	0.128	-
30	0.036	0.040	0.039	-
31	0.067	0.105	0.121	-
32	0.039	0.044	0.043	-
33	0.051	0.110	0.135	-
34	0.043	0.045	0.047	-
35	0.044	0.114	0.143	-
36	0.045	0.045	0.047	-
37	0.048	0.107	0.138	-
38	0.046	0.047	0.053	-
39	0.073	0.120	0.153	-
40	0.044	0.049	0.050	-
THC/Iref	1.060	1.201	1.259	23
PWHC/Iref	1.784	2.258	2.576	23
Test performed in compliance with EN 61000-3-12.				

Tested at ambient temperature 60 ±2 °C, **charge mode**			
Frequency [Hz]	50.0	Nominal power [W]	6000
Maximum discharge power P_{SMAX} [W]	6000	Maximum charge power P_{CMAX} [W]	6000

Harmon. Nr.	P/ P_{CMAX}			Limits [%]
	33% P_{CMAX}	66% P_{CMAX}	100% P_{CMAX}	
	Ih/Iref [%]			
	L1	L1	L1	
2	0.040	0.080	0.117	8
3	0.314	0.315	0.579	21.6
4	0.026	0.046	0.027	4
5	0.819	0.925	0.874	10.7
6	0.029	0.031	0.029	2.67
7	0.355	0.456	0.453	7.2
8	0.024	0.023	0.025	2
9	0.098	0.225	0.213	3.8
10	0.024	0.025	0.025	1.6
11	0.205	0.085	0.076	3.1
12	0.025	0.026	0.027	1.33
13	0.202	0.037	0.029	2
14	0.027	0.028	0.027	-

15	0.156	0.072	0.066	-
16	0.030	0.029	0.028	-
17	0.097	0.102	0.097	-
18	0.037	0.035	0.037	-
19	0.091	0.126	0.114	-
20	0.032	0.031	0.031	-
21	0.108	0.126	0.132	-
22	0.037	0.038	0.036	-
23	0.107	0.109	0.118	-
24	0.031	0.034	0.032	-
25	0.108	0.108	0.115	-
26	0.033	0.036	0.035	-
27	0.106	0.111	0.125	-
28	0.034	0.038	0.036	-
29	0.089	0.110	0.126	-
30	0.037	0.039	0.038	-
31	0.067	0.102	0.121	-
32	0.040	0.040	0.041	-
33	0.050	0.106	0.135	-
34	0.043	0.042	0.044	-
35	0.043	0.110	0.144	-
36	0.045	0.043	0.045	-
37	0.047	0.103	0.140	-
38	0.048	0.044	0.051	-
39	0.073	0.121	0.154	-
40	0.044	0.045	0.050	-
THC/Iref	1.061	1.187	1.262	23
PWHC/Iref	1.778	2.190	2.534	23
Test performed in compliance with EN 61000-3-12.				

B.3.c	**Voltage fluctuations and flicker**	P
Model	Tested on X1-H3.68K-S (with 1*battery modules:X1-B5-H), the P_{SMAX} consider as 3000W (Battery supply only), and the P_{CMAX} consider as 3000W in this clause test .	
Measured line voltage at nominal power [Vrms]	Measured currents at nominal power [Irms]	

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L1	L2	L3	L1	L2	L3
229.8	-	-	13.2	-	-

Frequency (Hz)	50	Nominal Power (W)	3680
Maximum discharge power P_{SMAX} [W]	3000	Maximum charge power P_{CMAX} [W]	3000

Ambient temperature:	25 ± 5°C
Mode	Discharge mode

		Starting			Stopping			Running	
TEST	Phase(s)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	Pst	Plt
33% P_{SMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.029	0.029
66% P_{SMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.031	0.031
100% P_{SMAX}	L1	0.000	0.000	0.000	0.185	0.151	0.000	0.032	0.032
Limits according to EN 61000-3-3		4%	3.3%	3.3% 500ms	4%	3.3%	3.3% 500ms	1.0	0.65

Ambient temperature:	-25± 2°C
Mode	Discharge mode

		Starting			Stopping			Running	
TEST	Phase(s)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	Pst	Plt
33% P_{SMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.021	0.021
66% P_{SMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.021	0.021
100% P_{SMAX}	L1	0.000	0.000	0.000	0.058	0.236	0.000	0.027	0.021
Limits according to EN 61000-3-3		4%	3.3%	3.3% 500ms	4%	3.3%	3.3% 500ms	1.0	0.65

Ambient temperature:	60± 2°C
Mode	Discharge mode

		Starting			Stopping			Running	
TEST	Phase(s)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	Pst	Plt
33% P_{SMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.021	0.021

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66% P_{SMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.021	0.021
100% P_{SMAX}	L1	0.000	0.000	0.000	0.054	0.285	0.000	0.028	0.022
Limits according to EN 61000-3-3		4%	3.3%	3.3% 500ms	4%	3.3%	3.3% 500ms	1.0	0.65

Ambient temperature:	25 ± 5°C
Mode	Charge mode

		Starting			Stopping			Running	
TEST	Phase(s)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	Pst	Plt
33% P_{CMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.032	0.031
66% P_{CMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.033	0.032
100% P_{CMAX}	L1	0.000	0.000	0.000	0.203	0.180	0.000	0.040	0.034
Limits according to EN 61000-3-3		4%	3.3%	3.3% 500ms	4%	3.3%	3.3% 500ms	1.0	0.65

Ambient temperature:	-25± 2°C
Mode	Charge mode

		Starting			Stopping			Running	
TEST	Phase(s)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	Pst	Plt
33% P_{CMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.021	0.021
66% P_{CMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.021	0.021
100% P_{CMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.021	0.021
Limits according to EN 61000-3-3		4%	3.3%	3.3% 500ms	4%	3.3%	3.3% 500ms	1.0	0.65

Ambient temperature:	60± 2°C
Mode	Charge mode

		Starting			Stopping			Running	
TEST	Phase(s)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	Pst	Plt
33% P_{CMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.032	0.031
66% P_{CMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.033	0.032
100% P_{CMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.034

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Limits according to EN 61000-3-3	4%	3.3%	3.3% 500ms	4%	3.3%	3.3% 500ms	1.0	0.65

Model	Tested on X1-H6K-S (with 1*battery modules:X1-B5-H), the P_{SMAX} consider as 3000W (Battery supply only), and the P_{CMAX} consider as 3000W in this clause test .

Measured line voltage at nominal power [Vrms]			Measured currents at nominal power [Irms]		
L1	L2	L3	L1	L2	L3
229.9	-	-	13.2	-	-

Frequency (Hz)	50	Nominal Power (W)	6000
Maximum discharge power P_{SMAX} [W]	3000	Maximum charge power P_{CMAX} [W]	3000

Ambient temperature:	25 ± 5°C
Mode	Discharge mode

		Starting			Stopping			Running	
TEST	Phase(s)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	Pst	Plt
33% P_{SMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.030	0.030
66% P_{SMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.030	0.029
100% P_{SMAX}	L1	0.000	0.000	0.000	0.183	0.161	0.000	0.032	0.031
Limits according to EN 61000-3-11		4%	3.3%	3.3% 500ms	4%	3.3%	3.3% 500ms	1.0	0.65

Ambient temperature:	-25± 2°C
Mode	Discharge mode

		Starting			Stopping			Running	
TEST	Phase(s)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	Pst	Plt
33% P_{SMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.021	0.021
66% P_{SMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.021	0.021
100% P_{SMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.028	0.022
Limits according to EN 61000-3-11		4%	3.3%	3.3% 500ms	4%	3.3%	3.3% 500ms	1.0	0.65

Ambient temperature:	60± 2°C

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Mode			Discharge mode					
		Starting			Stopping			Running	
TEST	Phase(s)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	Pst	Plt
33% P_{SMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.021	0.021
66% P_{SMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.021	0.021
100% P_{SMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.022	0.022
Limits according to EN 61000-3-11		4%	3.3%	3.3% 500ms	4%	3.3%	3.3% 500ms	1.0	0.65
Ambient temperature:			25 ± 5°C						
Mode			Charge mode						
		Starting			Stopping			Running	
TEST	Phase(s)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	Pst	Plt
33% P_{CMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.030	0.033
66% P_{CMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.032	0.036
100% P_{CMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.034	0.040
Limits according to EN 61000-3-11		4%	3.3%	3.3% 500ms	4%	3.3%	3.3% 500ms	1.0	0.65
Ambient temperature:			-25± 2°C						
Mode			Charge mode						
		Starting			Stopping			Running	
TEST	Phase(s)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	Pst	Plt
33% P_{CMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.021	0.021
66% P_{CMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.021	0.021
100% P_{CMAX}	L1	0.000	0.000	0.000	0.070	0.274	0.000	0.021	0.021
Limits according to EN 61000-3-11		4%	3.3%	3.3% 500ms	4%	3.3%	3.3% 500ms	1.0	0.65
Ambient temperature:			60± 2°C						
Mode			Charge mode						
		Starting			Stopping			Running	

TEST	Phase(s)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	Pst	Plt
33% P_{CMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.021	0.021
66% P_{CMAX}	L1	0.000	0.000	0.000	0.045	0.257	0.000	0.021	0.021
100% P_{CMAX}	L1	0.000	0.000	0.000	0.060	0.221	0.000	0.023	0.021
Limits according to EN 61000-3-11		4%	3.3%	3.3% 500ms	4%	3.3%	3.3% 500ms	1.0	0.65

Model	Tested on X1-H6K-S (with 6*battery modules:X1-B30-HC), the P_{SMAX} consider as 3000W (Battery supply only), and the P_{CMAX} consider as 3000W in this clause test .

Measured line voltage at nominal power [Vrms]			Measured currents at nominal power [Irms]		
L1	L2	L3	L1	L2	L3
229.9	-	-	26.1	-	-

Frequency (Hz)	50	Nominal Power (W)	6000
Maximum discharge power P_{SMAX} [W]	6000	Maximum charge power P_{CMAX} [W]	6000

Ambient temperature:	25 ± 5°C
Mode	Discharge mode

		Starting			Stopping			Running	
TEST	Phase(s)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	Pst	Plt
33% P_{SMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.030	0.028
66% P_{SMAX}	L1	0.166	0.076	0.000	0.259	0.235	0.000	0.030	0.030
100% P_{SMAX}	L1	0.187	0.093	0.000	0.375	0.349	0.000	0.042	0.037
Limits according to EN 61000-3-11		4%	3.3%	3.3% 500ms	4%	3.3%	3.3% 500ms	1.0	0.65

Ambient temperature:	-25± 2°C
Mode	Discharge mode

		Starting			Stopping			Running	
TEST	Phase(s)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	Pst	Plt
33% P_{SMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.021	0.021
66% P_{SMAX}	L1	0.000	0.000	0.000	0.066	0.246	0.000	0.024	0.023

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100% P_{SMAX}	L1	0.000	0.000	0.000	0.107	0.427	0.000	0.029	0.028
Limits according to EN 61000-3-11		4%	3.3%	3.3% 500ms	4%	3.3%	3.3% 500ms	1.0	0.65

Ambient temperature:	60± 2°C
Mode	Discharge mode

		Starting			Stopping			Running	
TEST	Phase(s)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	Pst	Plt
33% P_{SMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.021	0.020
66% P_{SMAX}	L1	0.000	0.000	0.000	0.130	0.345	0.000	0.021	0.021
100% P_{SMAX}	L1	0.000	0.000	0.000	0.137	0.322	0.000	0.029	0.029
Limits according to EN 61000-3-11		4%	3.3%	3.3% 500ms	4%	3.3%	3.3% 500ms	1.0	0.65

Ambient temperature:	25 ± 5°C
Mode	Charge mode

		Starting			Stopping			Running	
TEST	Phase(s)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	Pst	Plt
33% P_{CMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.031	0.031
66% P_{CMAX}	L1	0.165	0.099	0.000	0.240	0.228	0.000	0.036	0.035
100% P_{CMAX}	L1	0.191	0.106	0.000	0.376	0.361	0.000	0.042	0.038
Limits according to EN 61000-3-11		4%	3.3%	3.3% 500ms	4%	3.3%	3.3% 500ms	1.0	0.65

Ambient temperature:	-25± 2°C
Mode	Charge mode

		Starting			Stopping			Running	
TEST	Phase(s)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	Pst	Plt
33% P_{CMAX}	L1	0.000	0.000	0.000	0.036	0.238	0.000	0.021	0.021
66% P_{CMAX}	L1	0.000	0.000	0.000	0.078	0.359	0.000	0.025	0.024
100% P_{CMAX}	L1	0.000	0.000	0.000	0.119	0.467	0.000	0.03	0.029

Limits according to EN 61000-3-11		4%	3.3%	3.3% 500ms	4%	3.3%	3.3% 500ms	1.0	0.65
Ambient temperature:			60± 2°C						
Mode			Charge mode						
		Starting			Stopping			Running	
TEST	Phase(s)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	d_{max} (%)	d_c (%)	$d_{(t)}$ (ms)	Pst	Plt
33% P_{CMAX}	L1	0.000	0.000	0.000	0.000	0.000	0.000	0.021	0.021
66% P_{CMAX}	L1	0.000	0.000	0.000	0.045	0.257	0.000	0.021	0.021
100% P_{CMAX}	L1	0.000	0.000	0.000	0.060	0.221	0.000	0.023	0.021
Limits according to EN 61000-3-11		4%	3.3%	3.3% 500ms	4%	3.3%	3.3% 500ms	1.0	0.65

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Bbis.3 d) and Bbis.4	**Verification of the operation range of the voltage and frequency**	P

Bidirectional converter:
Test 1: V=85%*Vn; f=47.5 Hz; P=100%*P_{SMAX} (PNINV for EESS integrated); Cosφ=1;
Test 2: V=110%*Vn; f=51.5 Hz; P=100%* P_{SMAX} (PNINV for EESS integrated); Cosφ=1;
Test 3: V=85%*Vn; f=47,5 Hz; P=100%*P_{CMAX}; Cosφ=1;
Test 4: V=110%*Vn; f=51,5 Hz; P=100%*P_{CMAX}; Cosφ=1;

Model	Tested on X1-H6K-S (with 6*battery modules:X1-B30-HC), the P_{SMAX} consider as 6000W, and the P_{CMAX} consider as 6000W in this clause test

	Voltage (V)	Current (A)	Active power (W)	Apparent power (VA)	Frequency (Hz)	Power factor
Test 1	195.6	29.9	5819.0	5840.0	47.5	0.999
Test 2	253.0	24.0	6026.0	6063.0	51.5	0.999
Test 3	195.6	30.1	-5842.0	5885..0	47.5	0.999
Test 4	253.0	24.0	-6015.0	6067.0	51.5	0.999

Supplemtary information:

During the test, OVP/UVP and automatic reduction power in the presence of transient over-frequency function are disabled.

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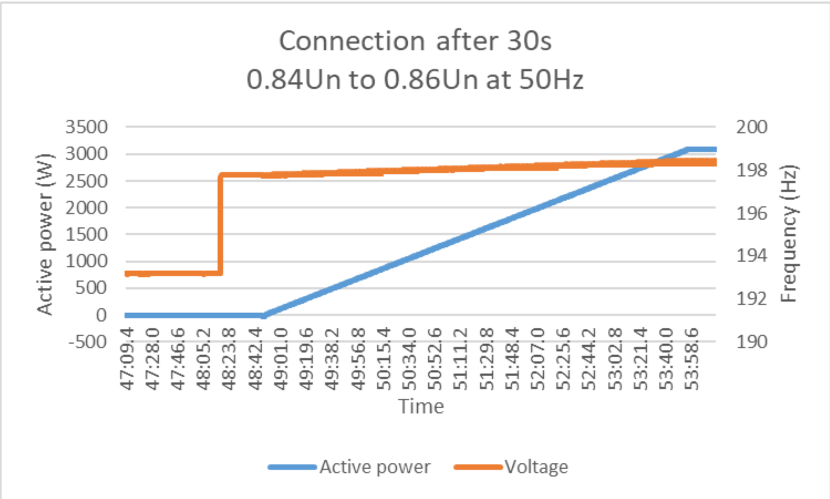
Bbis.5	Method of connection, reconnection and gradual supply of power			P
Model	Tested on X1-H3.68K-S (with 1*battery modules:X1-B5-H), the P_{SMAX} consider as 3000W (Battery supply only), and the P_{CMAX} consider as 3000W in this clause test.			
Test in discharge mode				
Voltage conditions				
Bbis.5.1 a), b) Out of voltage range				
Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	0.84Vn, 50.0 Hz	At least 60s	No connection	No connection
	Change voltage from step a) to 0.86Vn, 50.0 Hz	--	Connection after 30s	30.2s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{NINV}/min



Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	1.11Vn 50.0 Hz	At least 60s	No connection	No connection
	Change voltage from step a) to 1.09Vn, 50.0 Hz	--	Connection after 30s	38.0s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{NINV}/min

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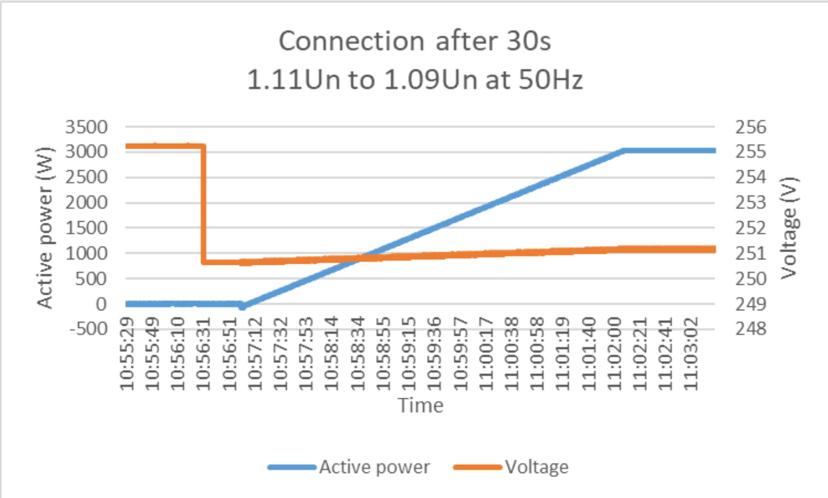
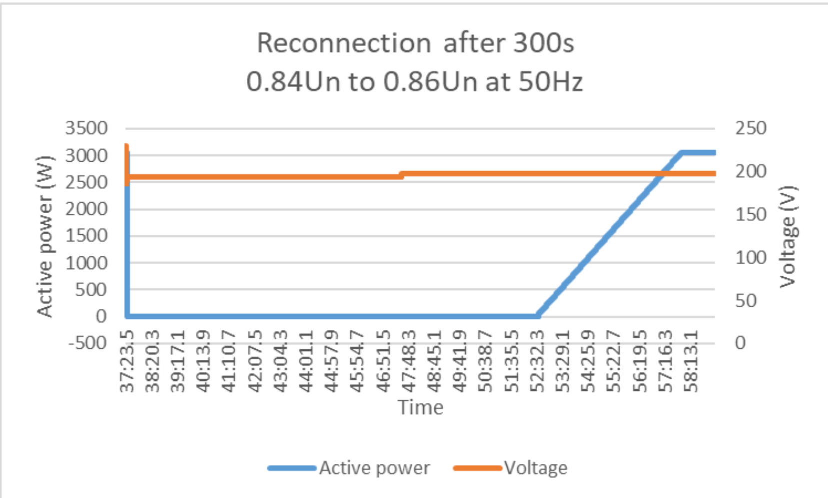


Bbis.5 c) Out of voltage range

Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	Change from 1.00Vn to 0.84Vn, 50.0 Hz	At least 600s	No connection	No connection
	Change voltage to 0.86Vn, 50.0 Hz	--	Re-connection time:	303.4

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{NINV}/min



Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	Change from 1.00Vn to 1.16Vn then change to 1.11Vn, 50.0 Hz	At least 600s	No connection	No connection

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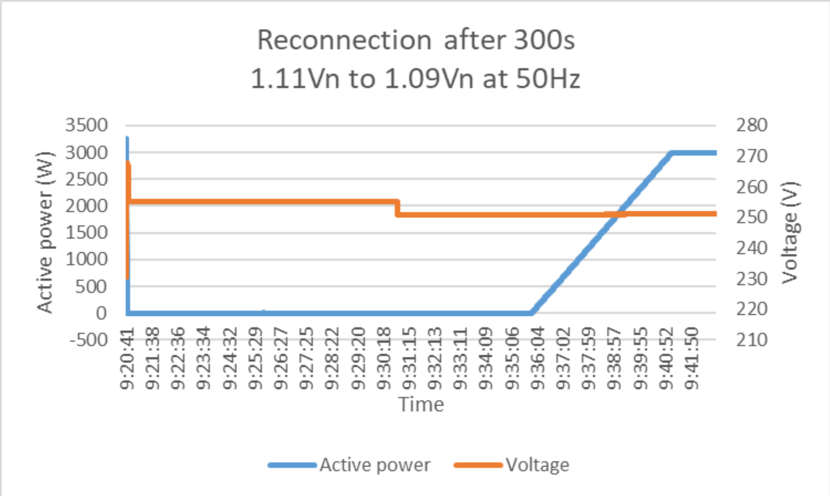
	Change voltage to 1.09Vn, , 50.0 Hz	--	Re-connection time:	300.2s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{NINV}/min

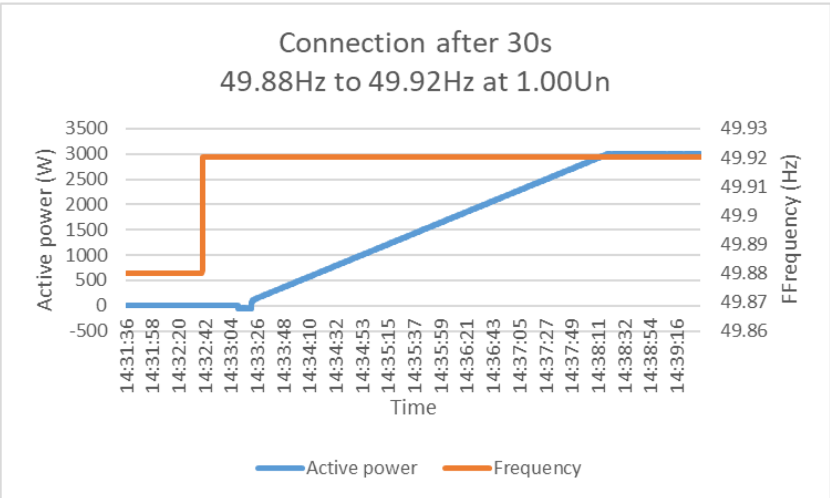


Frequency conditions

B.5.1 d), e), f) Out of frequency range

Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	49.88 Hz 1.00 Vn	At least 60s	No connection	No connection
	Change frequency from step a) to 49.92Hz, 1.00 Vn	--	Connection after 30s	36.1s

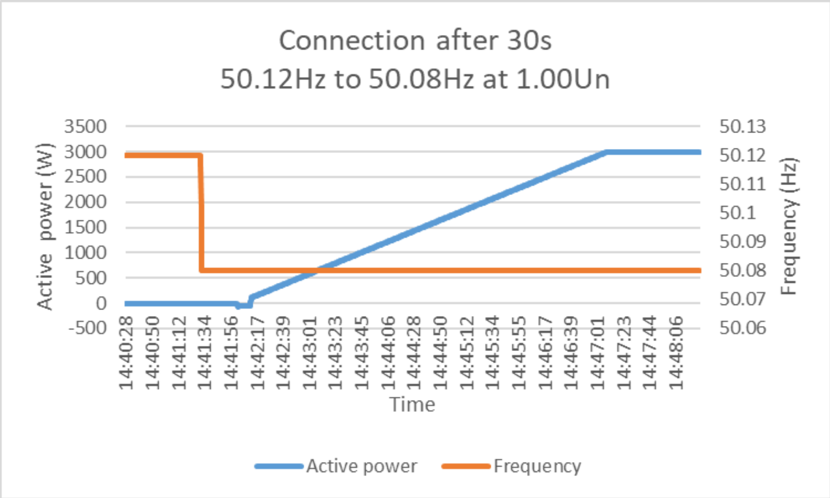
Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{NINV}/min



Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms

All phase	50.12 Hz 1.00Vn	At least 60s	No connection	No connection
	Change frequency from step a) to 50.08Hz, 1.00Vn	--	Connection after 30s	35.4s

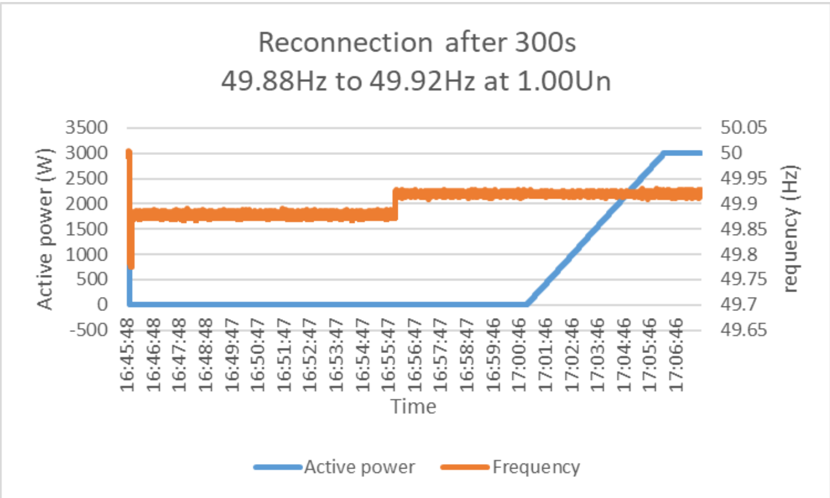
Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{NINV}/min



Bbis.5.1 f) Out of frequency range

Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	Change from 50Hz to 49.78 Hz then change to 49.88 Hz, 1.00Vn	At least 600s	No connection	No connection
	Change frequency to 49.92Hz, 1.00Vn	--	Re-connection time:	300.2s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{NINV}/min



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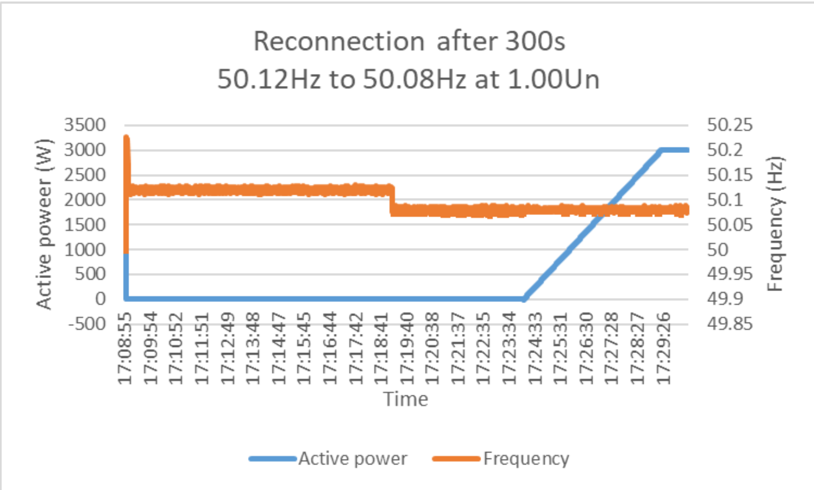
Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	Change from 50Hz to 50.22 Hz then change to 50.12 Hz, 1.00Vn	At least 30s	No connection	No connection
	Change frequency to 50.08Hz, 1.00Vn	--	Re-connection time:	300.3s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{NINV}/min

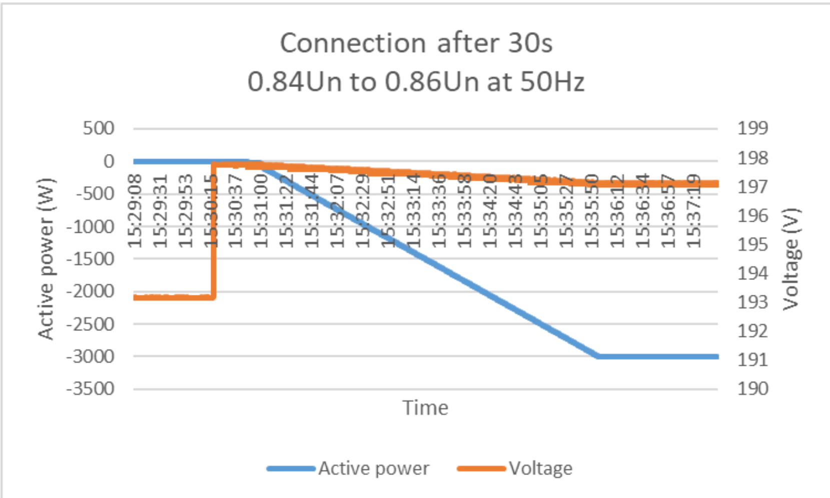


Test in charge mode- Voltage conditions

Bbis.5.1 a), b) Out of voltage range

Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	0.84Vn, 50.0 Hz	At least 60s	No connection	No connection
	Change voltage from step a) to 0.86Vn, 50.0 Hz	--	Connection after 30s	31.0s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{CMAX}/min



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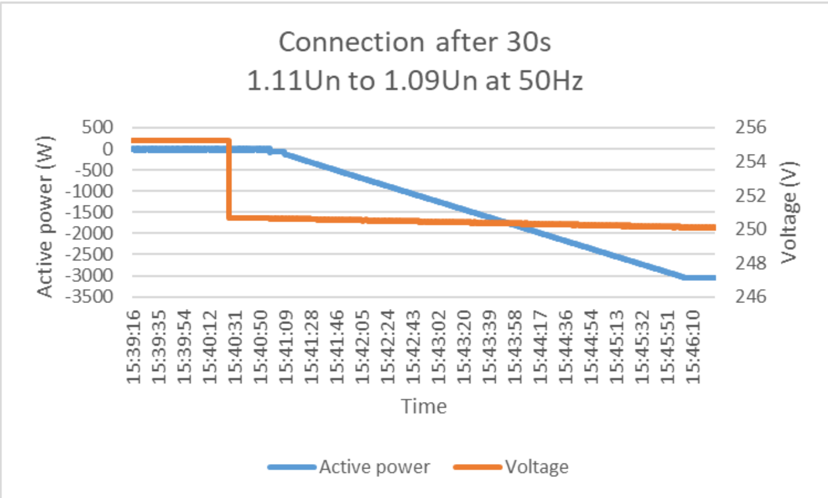
Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	1.11Vn 50.0 Hz	At least 60s	No connection	No connection
	Change voltage from step a) to 1.09Vn, 50.0 Hz	--	Connection after 30s	34.4s

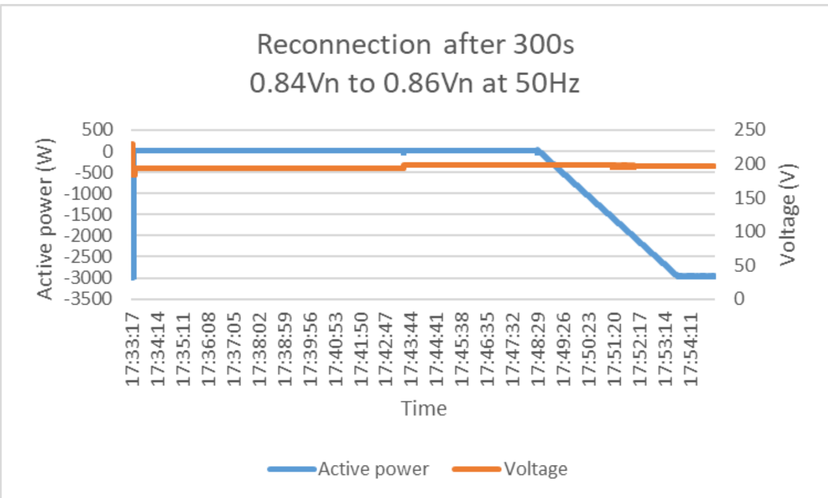
Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{CMAX}/min



Bbis.5 c) Out of voltage range

Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	Change from 1.00Vn to 0.84Vn, 50.0 Hz	At least 600s	No connection	No connection
	Change voltage to 0.86Vn, 50.0 Hz	--	Re-connection time:	300.4s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{CMAX}/min



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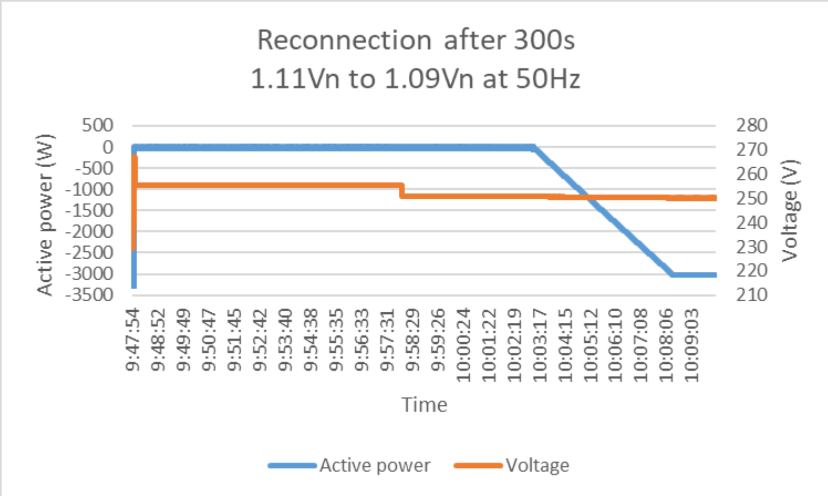
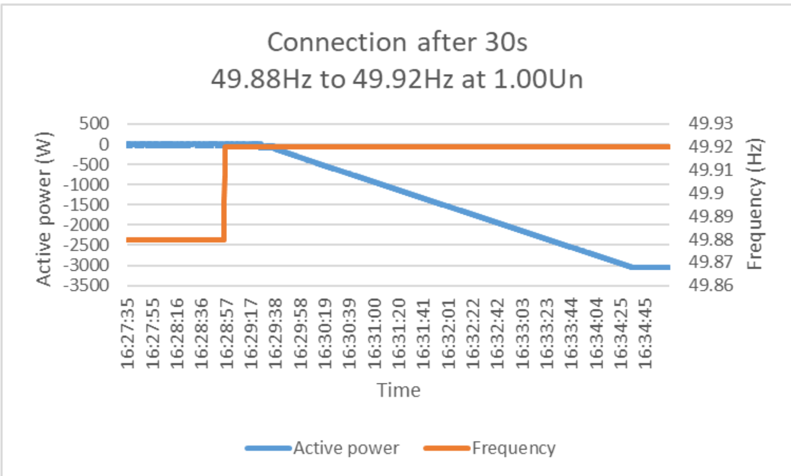
Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	Change from 1.00Vn to 1.16Vn then change to 1.11Vn, 50.0 Hz	At least 600s	No connection	No connection
	Change voltage to 1.09Vn, , 50.0 Hz	--	Re-connection time:	300.2s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{CMAX}/min



Frequency conditions				
B.5.1 d), e), f) Out of frequency range				
Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	49.88 Hz 1.00 Vn	At least 60s	No connection	No connection
	Change frequency from step a) to 49.92Hz, 1.00 Vn	--	Connection after 30s	32.3s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{CMAX}/min



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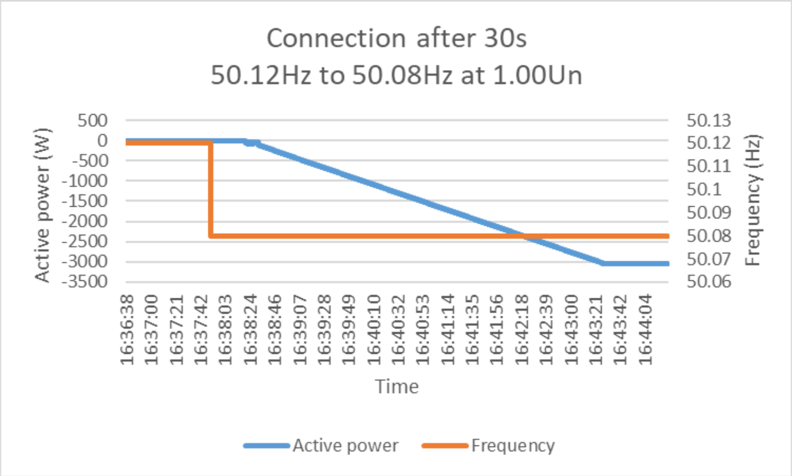
Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	50.12 Hz 1.00Vn	At least 60s	No connection	No connection
	Change frequency from step a) to 50.08Hz, 1.00Vn	--	Connection after 30s	30.6s

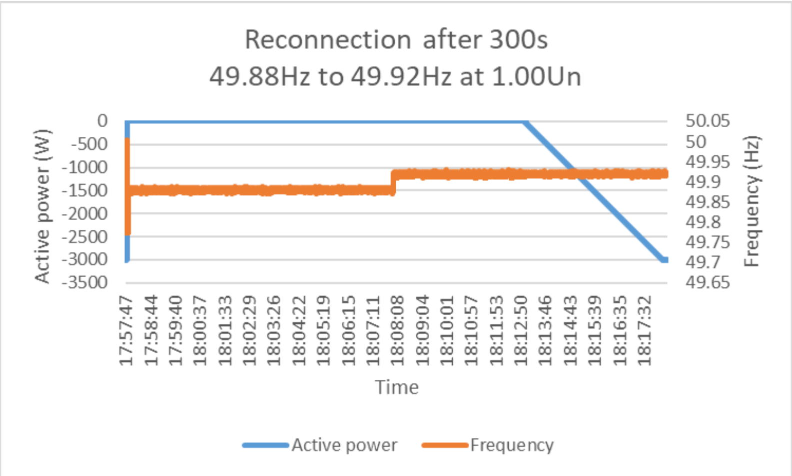
Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{CMAX}/min



Bbis.5.1 f) Out of frequency range

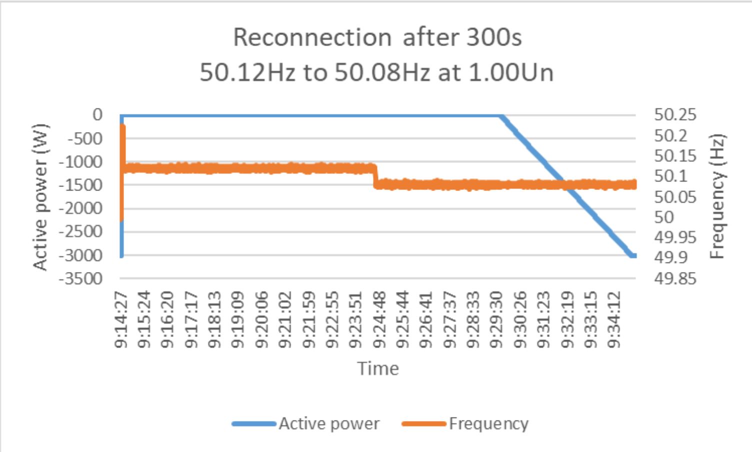
Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	Change from 50Hz to 49.78 Hz then change to 49.88 Hz, 1.00Vn	At least 600s	No connection	No connection
	Change frequency to 49.92Hz, 1.00Vn	--	Re-connection time:	300.3s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{CMAX}/min



Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	Change from 50Hz to 50.22 Hz then change to 50.12 Hz, 1.00Vn	At least 30s	No connection	No connection
	Change frequency to 50.08Hz, 1.00Vn	--	Re-connection time:	300.4s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{CMAX}/min



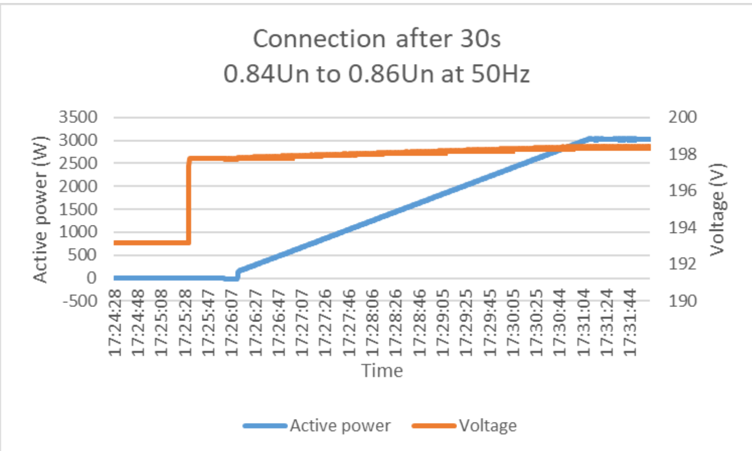
Model	Tested on X1-H6K-S (with 1*battery modules:X1-B5-H), the P_{SMAX} consider as 3000W (Battery supply only), and the P_{CMAX} consider as 3000W in this clause test.

Test in discharge mode- Voltage conditions

Bbis.5.1 a), b) Out of voltage range

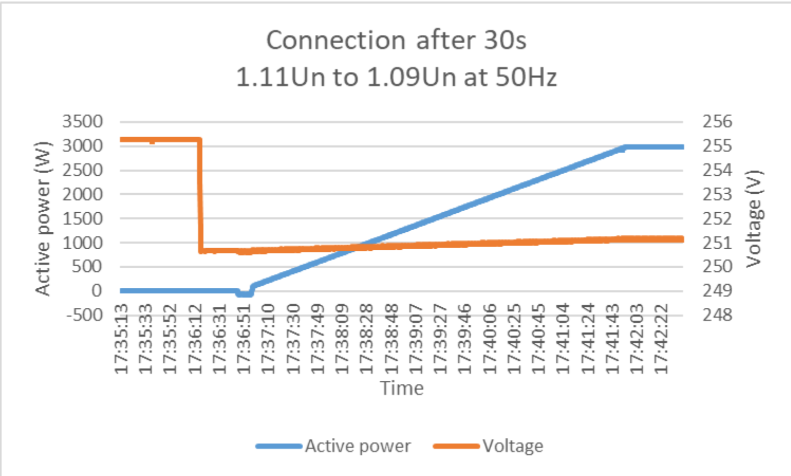
Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	0.84Vn, 50.0 Hz	At least 60s	No connection	No connection
	Change voltage from step a) to 0.86Vn, 50.0 Hz	--	Connection after 30s	36.7s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{NINV}/min



Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	1.11Vn 50.0 Hz	At least 60s	No connection	No connection
	Change voltage from step a) to 1.09Vn, 50.0 Hz	--	Connection after 30s	37.2s

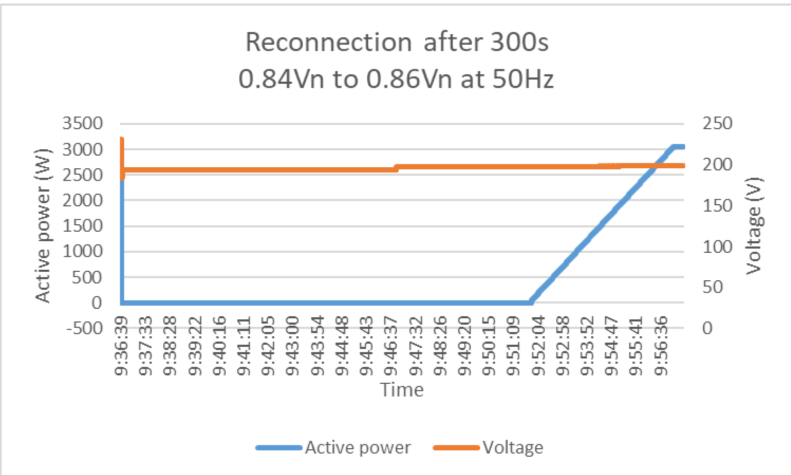
Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{NINV}/min



Bbis.5 c) Out of voltage range

Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	Change from 1.00Vn to 0.84Vn, 50.0 Hz	At least 600s	No connection	No connection
	Change voltage to 0.86Vn, 50.0 Hz	--	Re-connection time:	300.1s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{NINV}/min



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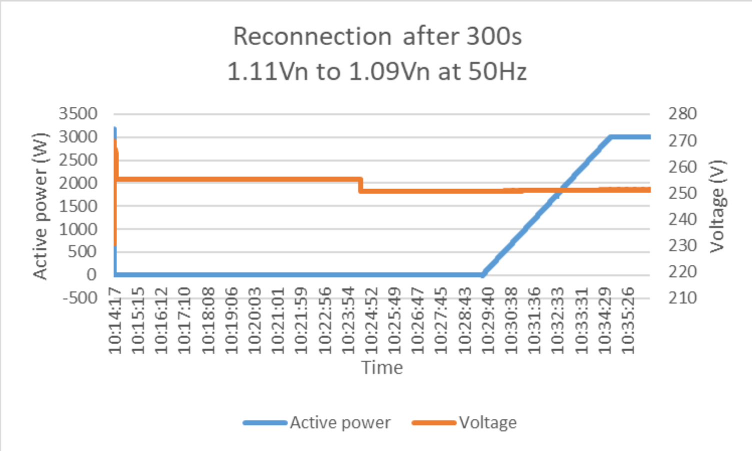
Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	Change from 1.00Vn to 1.16Vn then change to 1.11Vn, 50.0 Hz	At least 600s	No connection	No connection
	Change voltage to 1.09Vn, , 50.0 Hz	--	Re-connection time:	300.4s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{NINV}/min

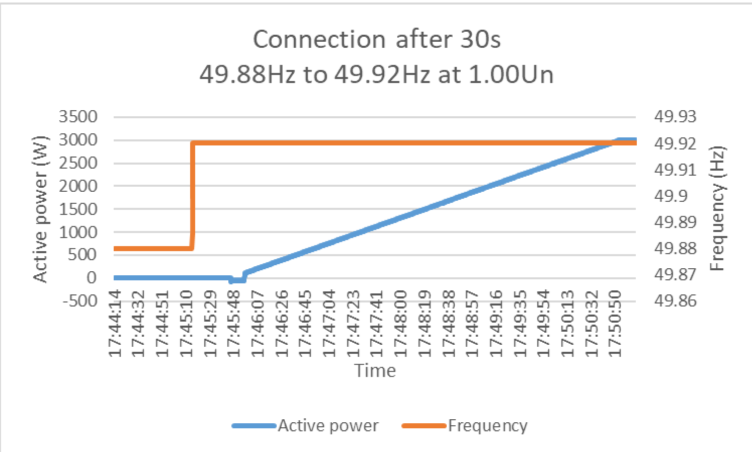


Frequency conditions

B.5.1 d), e), f) Out of frequency range

Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	49.88 Hz 1.00 Vn	At least 60s	No connection	No connection
	Change frequency from step a) to 49.92Hz, 1.00 Vn	--	Connection after 30s	30.5s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{NINV}/min



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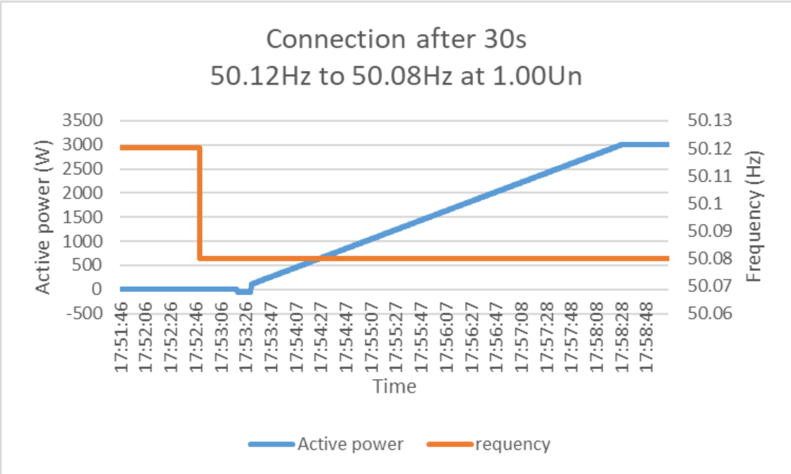
Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	50.12 Hz 1.00Vn	At least 60s	No connection	No connection
	Change frequency from step a) to 50.08Hz, 1.00Vn	--	Connection after 30s	30.0s

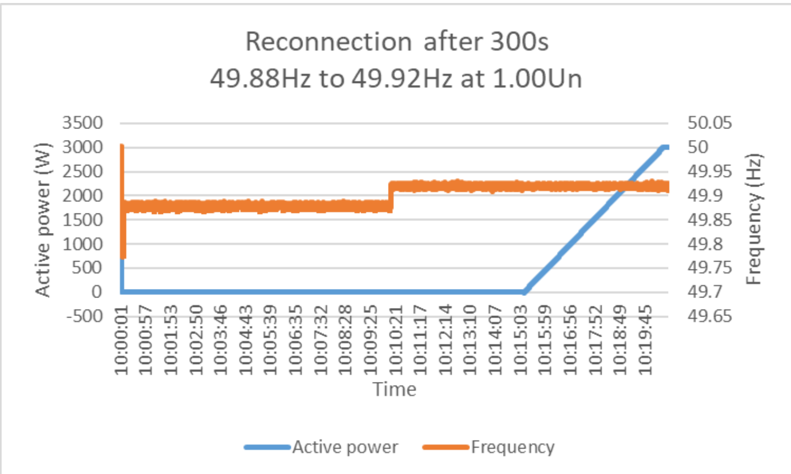
Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{NINV}/min



Bbis.5.1 f) Out of frequency range

Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	Change from 50Hz to 49.78 Hz then change to 49.88 Hz, 1.00Vn	At least 600s	No connection	No connection
	Change frequency to 49.92Hz, 1.00Vn	--	Re-connection time:	300.6s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{NINV}/min



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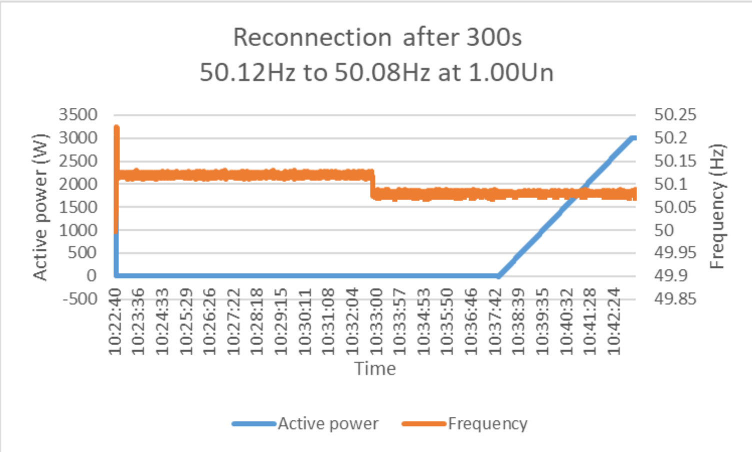
Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	Change from 50Hz to 50.22 Hz then change to 50.12 Hz, 1.00Vn	At least 30s	No connection	No connection
	Change frequency to 50.08Hz, 1.00Vn	--	Re-connection time:	300.1s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{NINV}/min



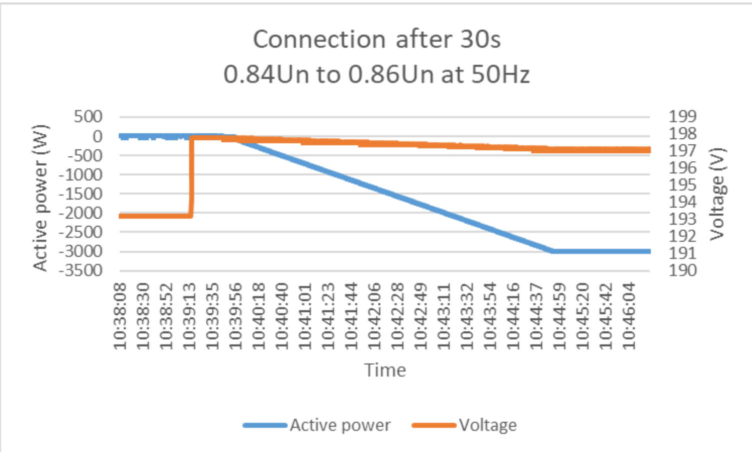
Test in charge mode

Voltage conditions

Bbis.5.1 a), b) Out of voltage range

Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	0.84Vn, 50.0 Hz	At least 60s	No connection	No connection
	Change voltage from step a) to 0.86Vn, 50.0 Hz	--	Connection after 30s	31.0s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{CMAX}/min



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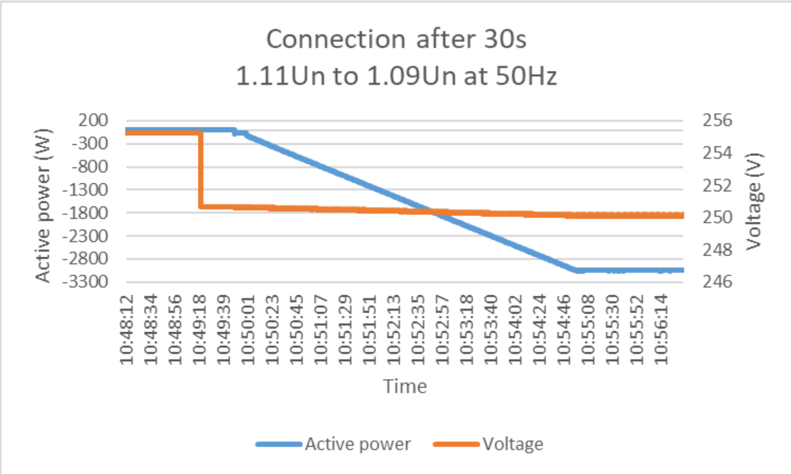
Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	1.11Vn 50.0 Hz	At least 60s	No connection	No connection
	Change voltage from step a) to 1.09Vn, 50.0 Hz	--	Connection after 30s	33.4s

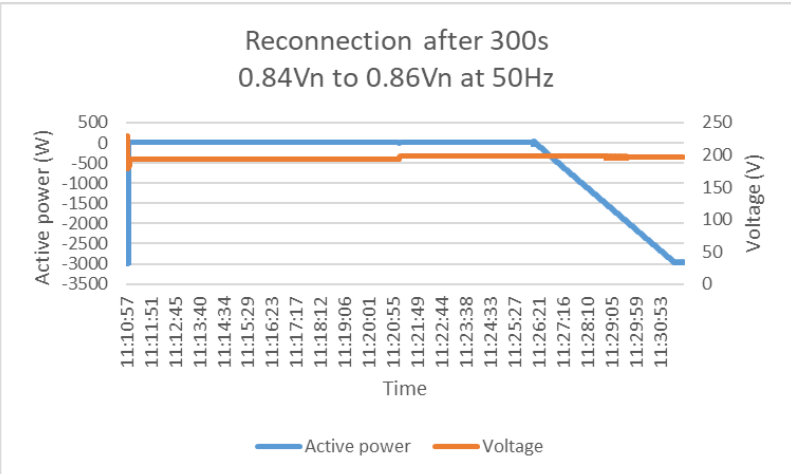
Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{CMAX}/min



Bbis.5 c) Out of voltage range

Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	Change from 1.00Vn to 0.84Vn, 50.0 Hz	At least 600s	No connection	No connection
	Change voltage to 0.86Vn, 50.0 Hz	--	Re-connection time:	300.1s

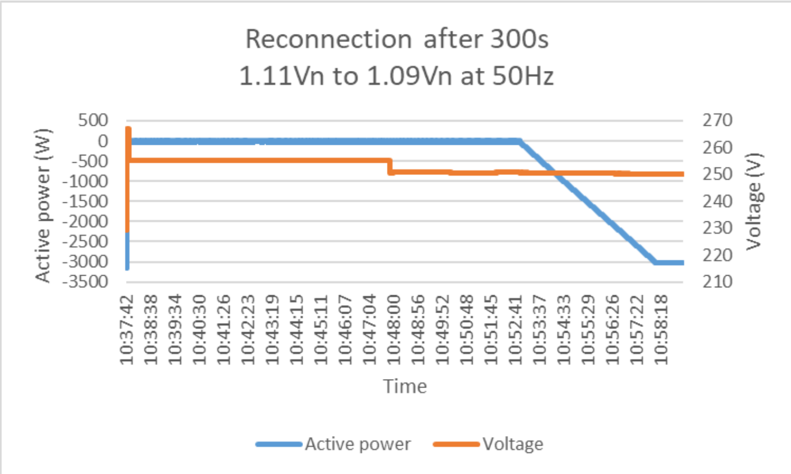
Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{CMAX}/min



Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms

All phase	Change from 1.00Vn to 1.16Vn then change to 1.11Vn, 50.0 Hz	At least 600s	No connection	No connection
	Change voltage to 1.09Vn, , 50.0 Hz	--	Re-connection time:	300.2s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{CMAX}/min

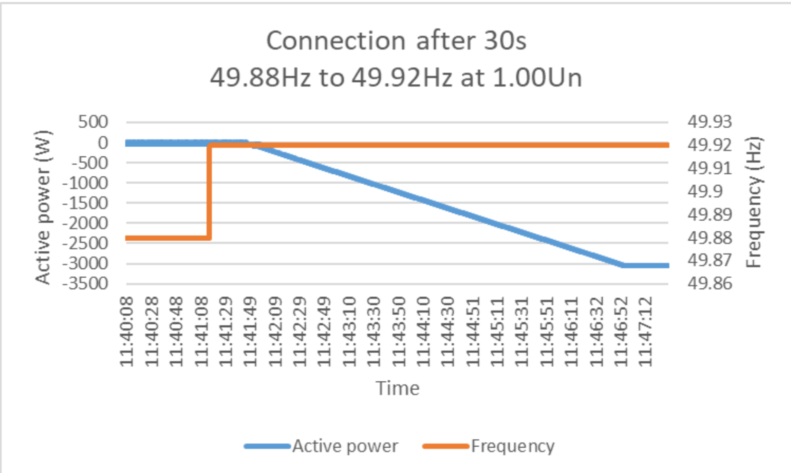


Frequency conditions

B.5.1 d), e), f) Out of frequency range

Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	49.88 Hz 1.00 Vn	At least 60s	No connection	No connection
	Change frequency from step a) to 49.92Hz, 1.00 Vn	--	Connection after 30s	30.3s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{CMAX}/min



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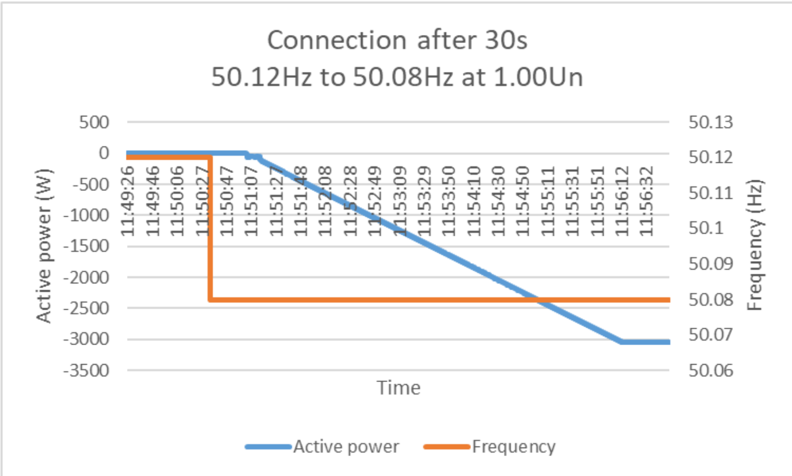
Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	50.12 Hz 1.00Vn	At least 60s	No connection	No connection
	Change frequency from step a) to 50.08Hz, 1.00Vn	--	Connection after 30s	34.6s

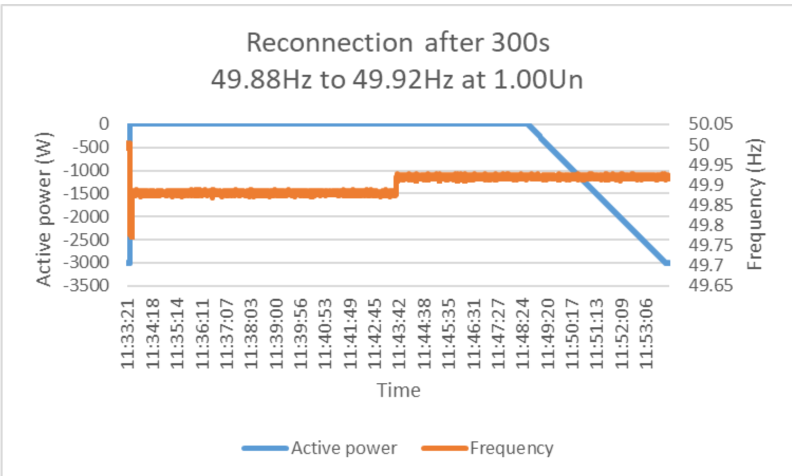
Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{CMAX}/min



Bbis.5.1 f) Out of frequency range

Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	Change from 50Hz to 49.78 Hz then change to 49.88 Hz, 1.00Vn	At least 600s	No connection	No connection
	Change frequency to 49.92Hz, 1.00Vn	--	Re-connection time:	300.5s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{CMAX}/min



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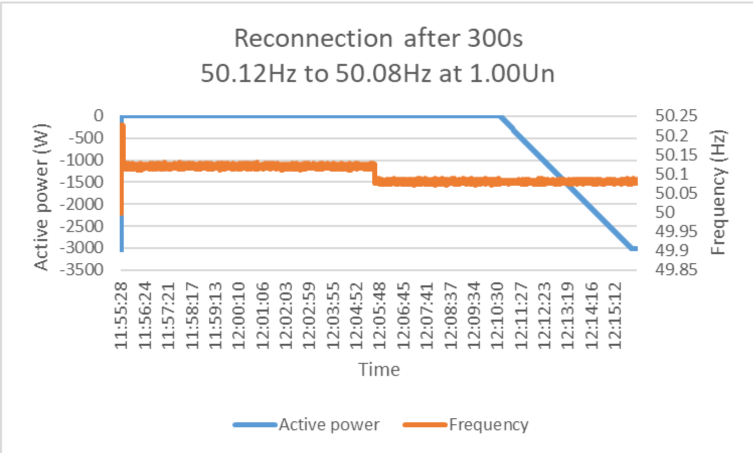
Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	Change from 50Hz to 50.22 Hz then change to 50.12 Hz, 1.00Vn	At least 30s	No connection	No connection
	Change frequency to 50.08Hz, 1.00Vn	--	Re-connection time:	300.1s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{CMAX}/min



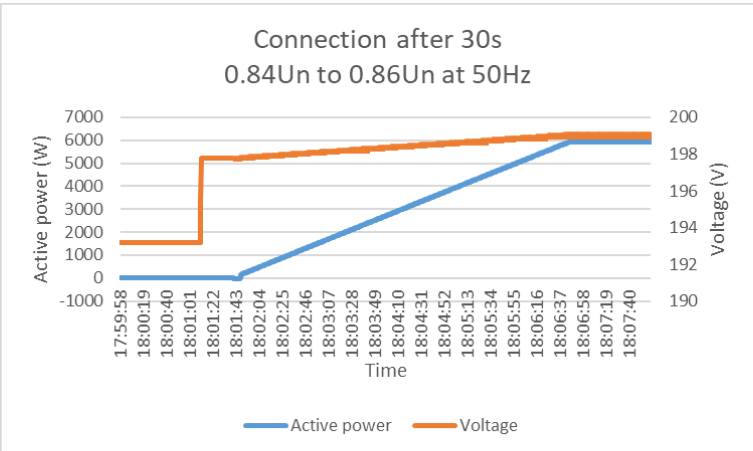
Model	Tested on X1-H6K-S (with 6*battery modules:X1-B30-HC), the P_{SMAX} consider as 6000W (Battery supply only), and the P_{CMAX} consider as 6000W in this clause test.

Test in discharge mode- Voltage conditions

Bbis.5.1 a), b) Out of voltage range

Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	0.84Vn, 50.0 Hz	At least 60s	No connection	No connection
	Change voltage from step a) to 0.86Vn, 50.0 Hz	--	Connection after 30s	30.4s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{NINV}/min



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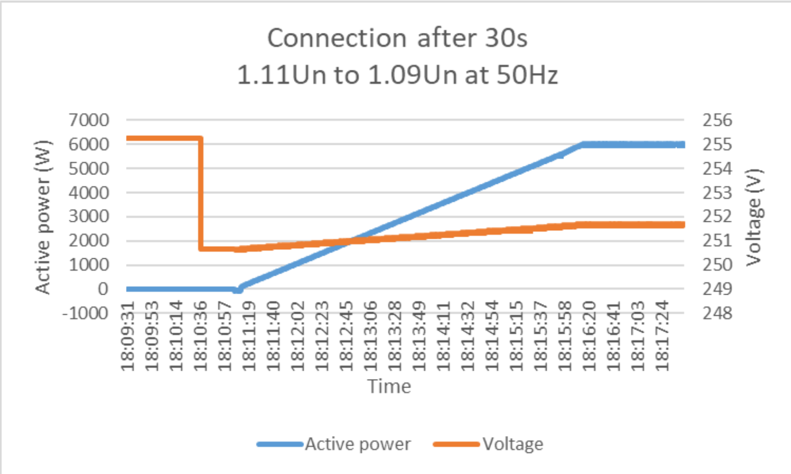
Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	1.11Vn 50.0 Hz	At least 60s	No connection	No connection
	Change voltage from step a) to 1.09Vn, 50.0 Hz	--	Connection after 30s	35.2s

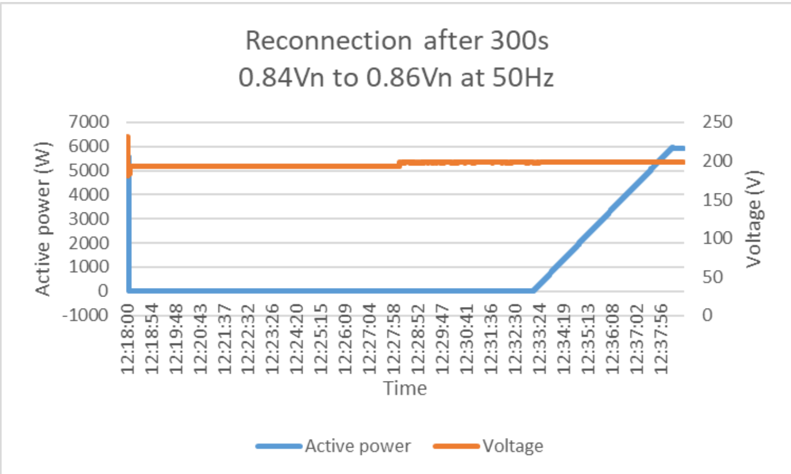
Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{NINV}/min



Bbis.5 c) Out of voltage range

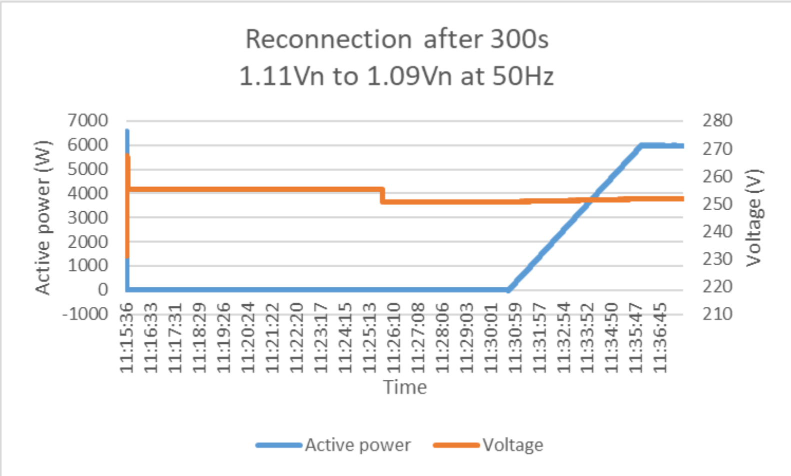
Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	Change from 1.00Vn to 0.84Vn, 50.0 Hz	At least 600s	No connection	No connection
	Change voltage to 0.86Vn, 50.0 Hz	--	Re-connection time:	300.1s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{NINV}/min



Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	Change from 1.00Vn to 1.16Vn then change to 1.11Vn, 50.0 Hz	At least 600s	No connection	No connection
	Change voltage to 1.09Vn, , 50.0 Hz	--	Re-connection time:	300.5s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{NINV}/min

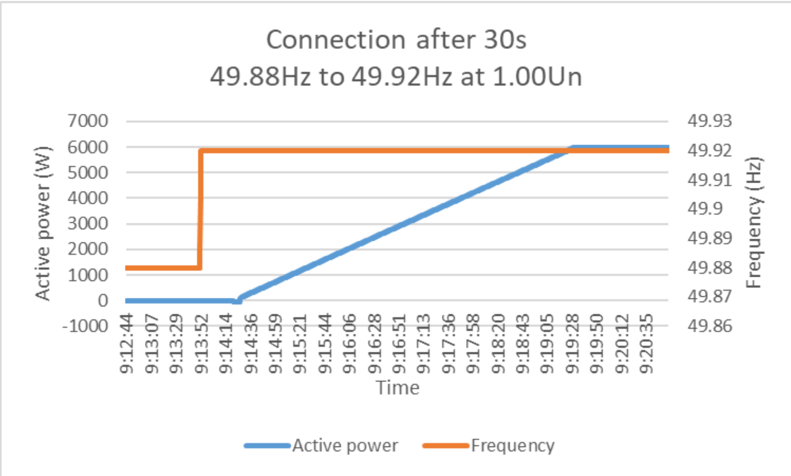


Frequency conditions

B.5.1 d), e), f) Out of frequency range

Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	49.88 Hz 1.00 Vn	At least 60s	No connection	No connection
	Change frequency from step a) to 49.92Hz, 1.00 Vn	--	Connection after 30s	35.5s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{NINV}/min



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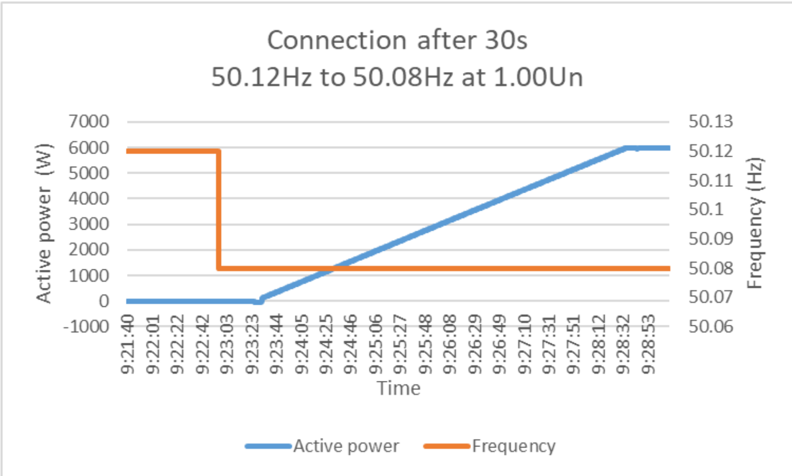
Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	50.12 Hz 1.00Vn	At least 60s	No connection	No connection
	Change frequency from step a) to 50.08Hz, 1.00Vn	--	Connection after 30s	30.3s

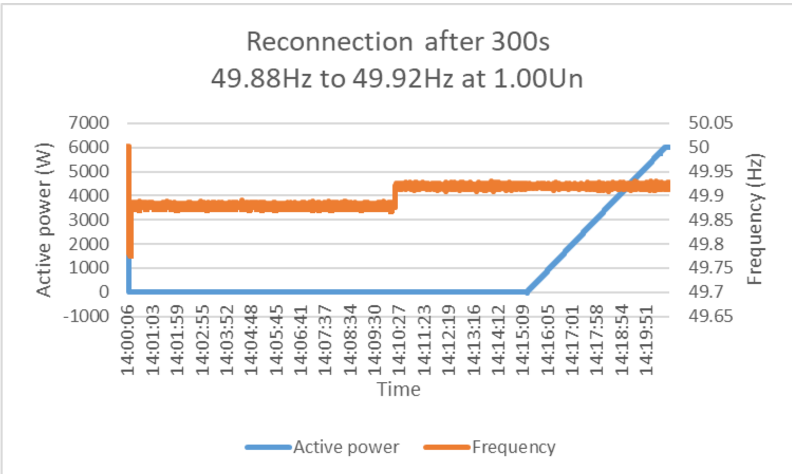
Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{NINV}/min



Bbis.5.1 f) Out of frequency range

Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	Change from 50Hz to 49.78 Hz then change to 49.88 Hz, 1.00Vn	At least 600s	No connection	No connection
	Change frequency to 49.92Hz, 1.00Vn	--	Re-connection time:	300.5s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{NINV}/min



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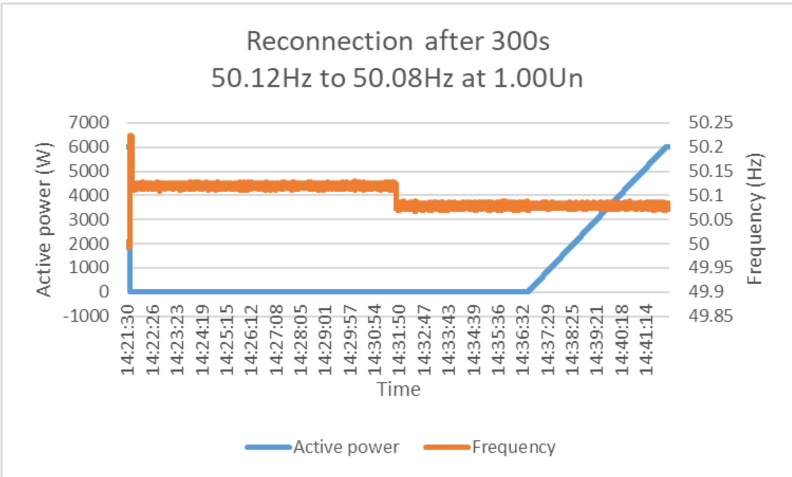
Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	Change from 50Hz to 50.22 Hz then change to 50.12 Hz, 1.00Vn	At least 30s	No connection	No connection
	Change frequency to 50.08Hz, 1.00Vn	--	Re-connection time:	300.3s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{NINV}/min

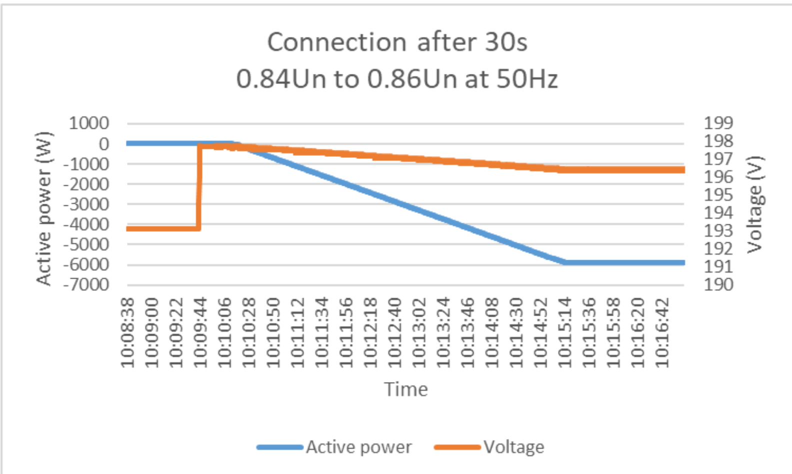


Test in charge mode- Voltage conditions

Bbis.5.1 a), b) Out of voltage range

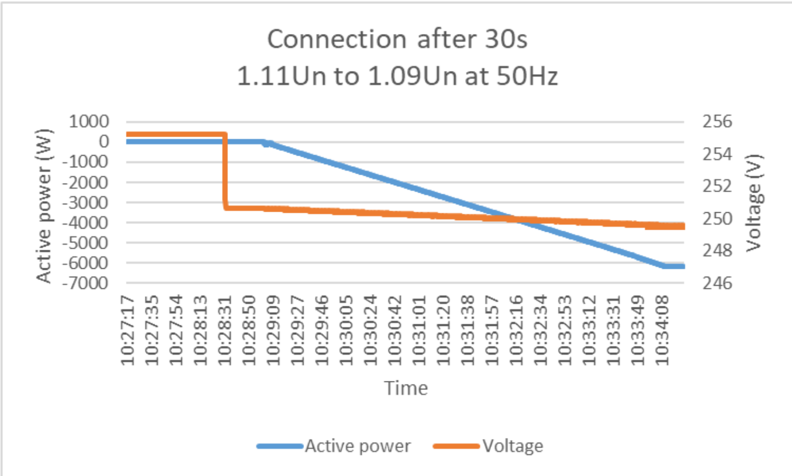
Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	0.84Vn, 50.0 Hz	At least 60s	No connection	No connection
	Change voltage from step a) to 0.86Vn, 50.0 Hz	--	Connection after 30s	30.3s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{CMAX}/min



Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	1.11Vn 50.0 Hz	At least 60s	No connection	No connection
	Change voltage from step a) to 1.09Vn, 50.0 Hz	--	Connection after 30s	30.4s

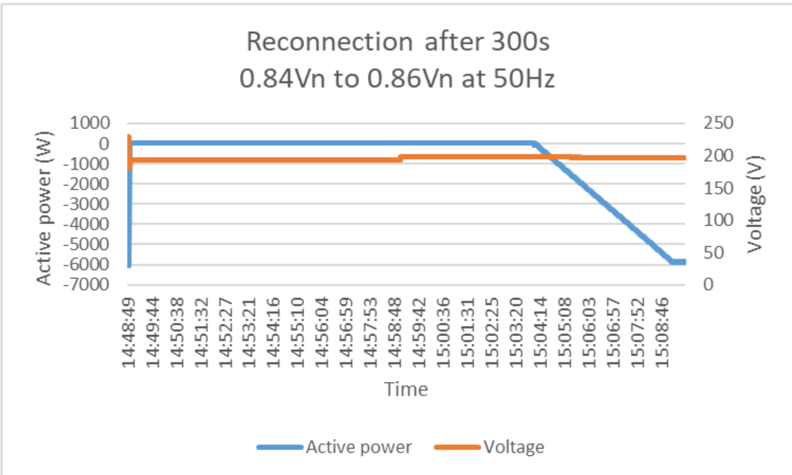
Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{CMAX}/min



Bbis.5 c) Out of voltage range

Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	Change from 1.00Vn to 0.84Vn, 50.0 Hz	At least 600s	No connection	No connection
	Change voltage to 0.86Vn, 50.0 Hz	--	Re-connection time:	300.6s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{CMAX}/min



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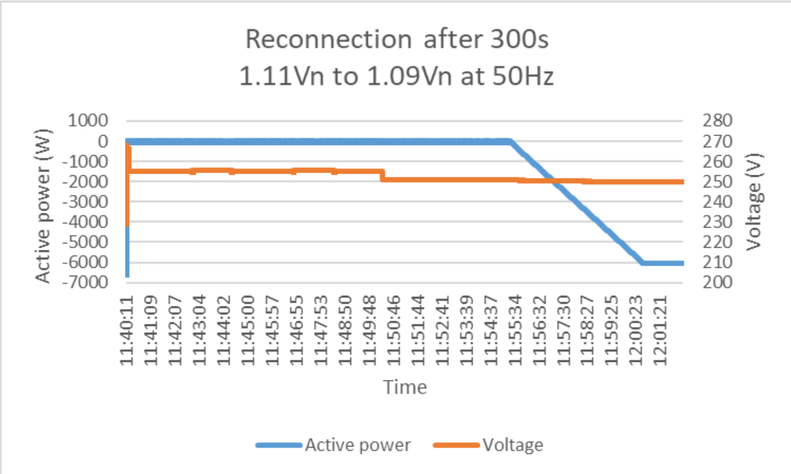
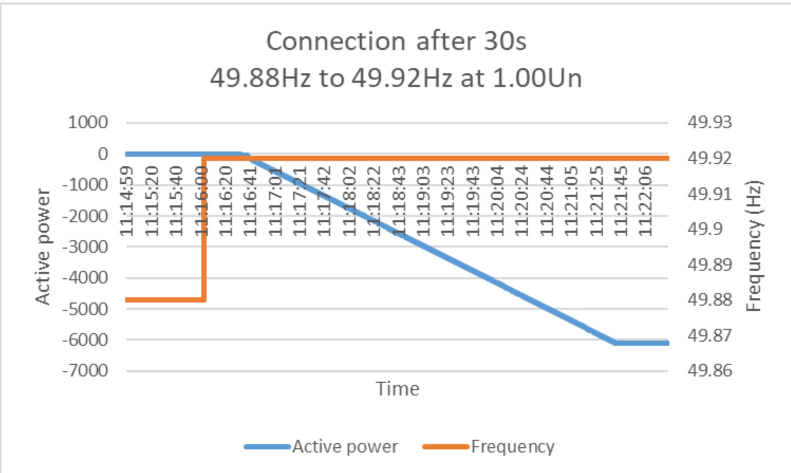
Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	Change from 1.00Vn to 1.16Vn then change to 1.11Vn, 50.0 Hz	At least 600s	No connection	No connection
	Change voltage to 1.09Vn, , 50.0 Hz	--	Re-connection time:	202.1s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{CMAX}/min



Frequency conditions				
B.5.1 d), e), f) Out of frequency range				
Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	49.88 Hz 1.00 Vn	At least 60s	No connection	No connection
	Change frequency from step a) to 49.92Hz, 1.00 Vn	--	Connection after 30s	30.3s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{CMAX}/min



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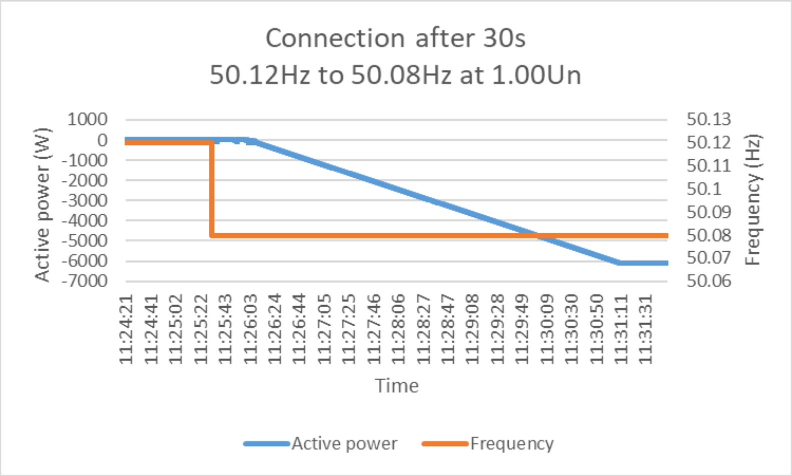
Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	50.12 Hz 1.00Vn	At least 60s	No connection	No connection
	Change frequency from step a) to 50.08Hz, 1.00Vn	--	Connection after 30s	30.6s

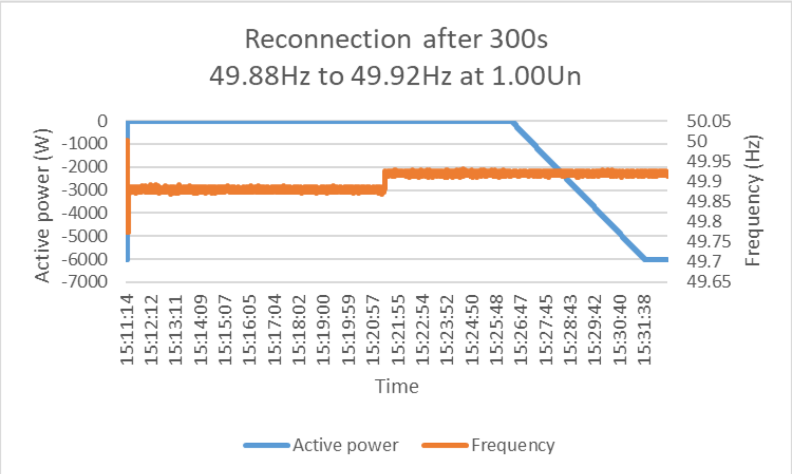
Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{CMAX}/min



Bbis.5.1 f) Out of frequency range

Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	Change from 50Hz to 49.78 Hz then change to 49.88 Hz, 1.00Vn	At least 600s	No connection	No connection
	Change frequency to 49.92Hz, 1.00Vn	--	Re-connection time:	300.4s

Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{CMAX}/min



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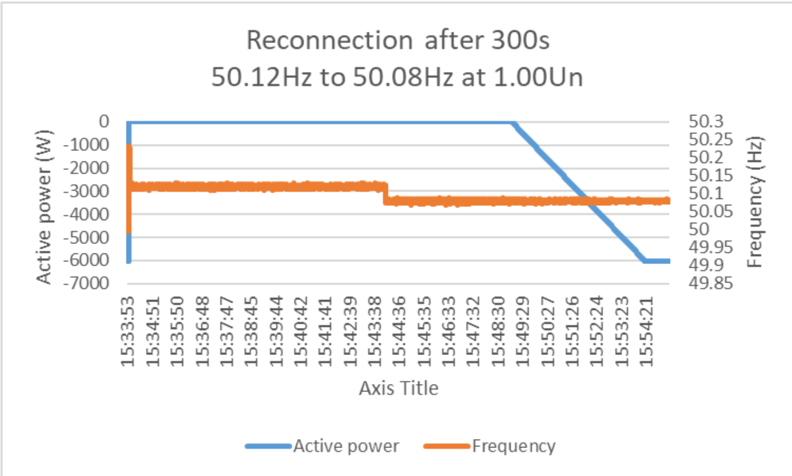
Iteration	Transient program	Holding time	Restore time	Oscilloscope recorded waveforms
All phase	Change from 50Hz to 50.22 Hz then change to 50.12 Hz, 1.00Vn	At least 30s	No connection	No connection
	Change frequency to 50.08Hz, 1.00Vn	--	Re-connection time:	300.3s
Supplementary information: Gradient should be recorded for at least 300 s until the inverter has the full output power. Max gradient: 20%P_{CMAX}/min				



Bbis.6.1&Bbis.6.2	Mode of execution and registration of the test result						P
Model	Tested on X1-H3.68K-S (with 1*battery modules:X1-B5-H), the P_{SMAX} consider as 3000W (Battery supply only), and the P_{CMAX} consider as 3000W in this clause test.						
Inductive reactive power absorption, cos φ = 0.8							
Power range (P/Pn)	Active power [W]	Reactive power[var]	Apparent power[VA]	Power factor[cos φ]	Q/P[%]	Deviation ΔQ/Pn [±2.5%]	DC power[W]
[90-100]%*P_{CMAX}	-2869.00	-2134.89	3622.75	0.802 ind	74.41%	-0.46%	-2778.02
[70-80]%* P_{CMAX}	-2264.50	-1686.54	2879.02	0.802 ind	74.48%	-0.32%	-2192.67
[50-60]%* P_{CMAX}	-1661.92	-1238.14	2143.96	0.802 ind	74.50%	-0.23%	-1607.23
[30-40]%* P_{CMAX}	-1060.24	-790.39	1427.88	0.802 ind	74.55%	-0.13%	-1019.05
[10-20]%* P_{CMAX}(1)	-458.25	-344.35	778.57	0.800 ind	75.14%	0.02%	-427.62
[10-20]%* P_{SMAX}(1)	452.58	-355.24	767.45	0.784 ind	-78.49%	0.43%	483.40
[30-40]%* P_{SMAX}	1057.37	-817.37	1428.03	0.790 ind	-77.30%	0.66%	1099.53
[50-60]%* P_{SMAX}	1661.69	-1281.39	2158.57	0.791 ind	-77.11%	0.95%	1717.12
[70-80]%* P_{SMAX}	2265.78	-1745.73	2905.87	0.792 ind	-77.05%	1.26%	2338.86
[90-100]%* P_{SMAX}	2868.84	-2209.34	3657.96	0.792 ind	-77.01%	1.57%	2959.17
Inductive reactive power absorption, Q=Qmin							
Power range (P/Pn)	Active power [W]	Reactive power[var]	Apparent power[VA]	Power factor[cos φ]	Q/Pn[%]	Deviation ΔQ/Sn [±5.0%]	DC power[W]
[90-100]%*P_{CMAX}	-2863.92	-2399.36	3781.38	0.767 ind	-65.20%	-0.02%	-2767.67
[70-80]%* P_{CMAX}	-2255.63	-2407.65	3348.26	0.684 ind	-65.43%	0.19%	-2171.93
[50-60]%* P_{CMAX}	-1647.61	-2415.90	2977.40	0.564 ind	-65.65%	0.40%	-1573.29
[30-40]%* P_{CMAX}	-1040.33	-2423.94	2694.81	0.395 ind	-65.87%	0.60%	-972.05
[10-20]%* P_{CMAX}(1)	-433.98	-2431.97	2530.35	0.177 ind	-66.09%	0.80%	-369.49
[10-20]%* P_{SMAX}(1)	471.10	-2443.30	2546.02	0.188 ind	-66.39%	1.08%	534.78
[30-40]%* P_{SMAX}	1072.58	-2450.16	2728.21	0.400 ind	-66.58%	1.25%	1141.81
[50-60]%* P_{SMAX}	1673.28	-2458.11	3021.30	0.562 ind	-66.80%	1.45%	1750.35
[70-80]%* P_{SMAX}	2272.72	-2466.07	3395.77	0.677 ind	-67.01%	1.65%	2358.70
[90-100]%* P_{SMAX}	2869.91	-2473.28	3825.93	0.757 ind	-67.21%	1.83%	2965.35

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Capacitive reactive power supply cos φ = 0.8							
Power range (P/Pn)	Active power [W]	Reactive power[var]	Apparent power[VA]	Power factor[cos φ]	Q/P[%]	Deviation ΔQ/Pn [±2.5%]	DC power[W]
[90-100]%*P_{CMAX}	-2855.85	2197.43	3647.31	0.793 cap	-76.94%	-1.51%	-2769.65
[70-80]%* P_{CMAX}	-2254.74	1733.53	2897.10	0.793 cap	-76.88%	-1.15%	-2188.09
[50-60]%* P_{CMAX}	-1656.02	1270.24	2156.51	0.794 cap	-76.70%	-0.77%	-1606.45
[30-40]%* P_{CMAX}	-1057.52	805.96	1432.94	0.796 cap	-76.21%	-0.35%	-1020.83
[10-20]%* P_{CMAX}(1)	-459.94	344.47	777.98	0.803 cap	-74.90%	0.01%	-433.47
[10-20]%* P_{SMAX}(1)	444.67	333.06	753.58	0.800 cap	74.90%	0.01%	471.91
[30-40]%* P_{SMAX}	1038.44	781.44	1392.86	0.799 cap	75.25%	-0.07%	1075.45
[50-60]%* P_{SMAX}	1632.98	1228.81	2104.94	0.799 cap	75.25%	-0.11%	1682.72
[70-80]%* P_{SMAX}	2226.36	1675.90	2832.95	0.799 cap	75.28%	-0.17%	2291.38
[90-100]%* P_{SMAX}	2819.78	2123.64	3566.89	0.799 cap	75.31%	-0.24%	2902.80

Capacitive reactive power supply, Q=Qmax							
Power range (P/Pn)	Active power [W]	Reactive power[var]	Apparent power[VA]	Power factor[cos φ]	Q/Pn[%]	Deviation ΔQ/Sn [±5.0%]	DC power[W]
[90-100]%*P_{CMAX}	-2860.50	2433.89	3798.22	0.762 cap	66.14%	-0.85%	-2771.89
[70-80]%* P_{CMAX}	-2264.55	2426.42	3364.98	0.683 cap	65.94%	-0.66%	-2187.41
[50-60]%* P_{CMAX}	-1669.02	2418.65	2988.78	0.569 cap	65.72%	-0.47%	-1601.00
[30-40]%* P_{CMAX}	-1074.50	2411.08	2693.74	0.408 cap	65.52%	-0.28%	-1014.05
[10-20]%* P_{CMAX}(1)	-480.74	2404.18	2508.90	0.197 cap	65.33%	-0.10%	-423.69
[10-20]%* P_{SMAX}(1)	417.22	2392.24	2484.02	0.171 cap	65.01%	0.19%	473.08
[30-40]%* P_{SMAX}	1019.64	2383.11	2643.88	0.393 cap	64.76%	0.42%	1079.80
[50-60]%* P_{SMAX}	1619.55	2374.21	2920.53	0.563 cap	64.52%	0.64%	1686.74
[70-80]%* P_{SMAX}	2219.34	2366.00	3285.22	0.684 cap	64.29%	0.85%	2295.50
[90-100]%* P_{SMAX}	2817.68	2358.45	3710.58	0.767 cap	64.09%	1.04%	2904.43

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Reactive power(Q=0)							
Power range (P/Pn)	Active power [W]	Reactive power[var]	Apparent power[VA]	Power factor[cos φ]	Q/Pn[%]	Deviation ΔQ/Sn [±5.0%]	DC power[W]
[90-100]%*P_{CMAX}	-2828.85	-0.24	2884.44	0.999 ind	-0.01%	0.01%	-2761.42
[70-80]%* P_{CMAX}	-2234.33	-8.11	2302.07	0.999 ind	-0.22%	0.20%	-2180.02
[50-60]%* P_{CMAX}	-1641.37	-15.30	1729.96	0.999 ind	-0.42%	0.38%	-1597.67
[30-40]%* P_{CMAX}	-1048.58	-22.44	1178.46	0.999 ind	-0.61%	0.56%	-1014.58
[10-20]%* $P_{CMAX}^{(1)}$	-455.22	-33.13	696.16	0.997 ind	-0.90%	0.83%	-428.95
[10-20]%* $P_{SMAX}^{(1)}$	449.34	-43.94	680.35	0.995 ind	-1.19%	1.10%	476.04
[30-40]%* P_{SMAX}	1048.18	-51.26	1161.57	0.999 ind	-1.39%	1.28%	1082.97
[50-60]%* P_{SMAX}	1647.96	-58.74	1721.47	0.999 ind	-1.60%	1.47%	1691.81
[70-80]%* P_{SMAX}	2247.00	-66.20	2301.99	0.999 ind	-1.80%	1.65%	2302.02
[90-100]%* P_{SMAX}	2846.13	-74.27	2890.81	0.999 ind	-2.02%	1.86%	2916.42
Model	Tested on X1-H6K-S (with 1*battery modules:X1-B5-H), the P_{SMAX} consider as 3000W (Battery supply only), and the P_{CMAX} consider as 3000W in this clause test.						
Inductive reactive power absorption, cos φ = 0.8							
Power range (P/Pn)	Active power [W]	Reactive power[var]	Apparent power[VA]	Power factor[cos φ]	Q/P[%]	Deviation ΔQ/Pn [±2.5%]	DC power[W]
[90-100]%*P_{CMAX}	-2856.07	-2172.34	3633.28	0.796 ind	76.06%	0.50%	-2764.54
[70-80]%* P_{CMAX}	-2215.96	-1686.66	2839.00	0.796 ind	76.11%	0.41%	-2145.69
[50-60]%* P_{CMAX}	-1626.82	-1238.28	2114.49	0.796 ind	76.12%	0.30%	-1572.00
[30-40]%* P_{CMAX}	-1038.39	-790.58	1408.55	0.796 ind	76.13%	0.20%	-997.08
[10-20]%* $P_{CMAX}^{(1)}$	-449.37	-344.17	768.04	0.795 ind	76.59%	0.12%	-419.41
[10-20]%* $P_{SMAX}^{(1)}$	452.41	-355.17	762.59	0.784 ind	-78.51%	0.26%	483.19
[30-40]%* P_{SMAX}	1057.10	-817.11	1424.95	0.790 ind	-77.30%	0.40%	1099.00
[50-60]%* P_{SMAX}	1661.22	-1281.23	2155.83	0.791 ind	-77.13%	0.59%	1716.86
[70-80]%* P_{SMAX}	2265.07	-1745.40	2903.13	0.792 ind	-77.06%	0.78%	2339.06
[90-100]%* P_{SMAX}	2868.44	-2208.94	3655.95	0.792 ind	-77.01%	0.96%	2960.44

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Inductive reactive power absorption, Q=Qmin							
Power range (P/Pn)	Active power [W]	Reactive power[var]	Apparent power[VA]	Power factor[cos φ]	Q/Pn[%]	Deviation ΔQ/Sn [±5.0%]	DC power[W]
[90-100]%*P_{CMAX}	-2874.57	-3921.54	4890.21	0.591 ind	-65.36%	-0.58%	-2746.08
[70-80]%* P_{CMAX}	-2261.02	-3930.71	4563.14	0.499 ind	-65.51%	-0.44%	-2142.50
[50-60]%* P_{CMAX}	-1647.47	-3939.25	4299.13	0.386 ind	-65.65%	-0.31%	-1536.17
[30-40]%* P_{CMAX}	-1035.07	-3947.90	4111.13	0.254 ind	-65.80%	-0.18%	-930.13
[10-20]%* P_{CMAX}(1)	-424.64	-3957.54	4009.85	0.107 ind	-65.96%	-0.04%	-322.80
[10-20]%* P_{SMAX}(1)	482.96	-3969.82	4027.37	0.120 ind	-66.16%	0.15%	584.26
[30-40]%* P_{SMAX}	1084.00	-3976.59	4149.11	0.262 ind	-66.28%	0.25%	1189.31
[50-60]%* P_{SMAX}	1684.45	-3984.26	4351.67	0.389 ind	-66.40%	0.37%	1796.51
[70-80]%* P_{SMAX}	2282.84	-3991.66	4622.85	0.496 ind	-66.53%	0.48%	2402.35
[90-100]%* P_{SMAX}	2879.31	-3999.24	4950.96	0.584 ind	-66.65%	0.59%	3007.05

Capacitive reactive power supply cos φ = 0.8							
Power range (P/Pn)	Active power [W]	Reactive power[var]	Apparent power[VA]	Power factor[cos φ]	Q/P[%]	Deviation ΔQ/Pn [±2.5%]	DC power[W]
[90-100]%*P_{CMAX}	-2857.21	2198.49	3647.42	0.793 cap	-76.95%	-0.93%	-2770.88
[70-80]%* P_{CMAX}	-2255.84	1734.45	2896.79	0.793 cap	-76.89%	-0.71%	-2187.92
[50-60]%* P_{CMAX}	-1656.58	1270.60	2155.22	0.794 cap	-76.70%	-0.47%	-1604.74
[30-40]%* P_{CMAX}	-1057.91	806.30	1430.78	0.796 cap	-76.22%	-0.21%	-1019.51
[10-20]%* P_{CMAX}(1)	-460.06	344.60	773.73	0.803 cap	-74.90%	0.01%	-432.92
[10-20]%* P_{SMAX}(1)	444.72	333.07	748.83	0.800 cap	74.89%	0.01%	472.61
[30-40]%* P_{SMAX}	1038.55	781.64	1390.52	0.799 cap	75.26%	-0.05%	1076.03
[50-60]%* P_{SMAX}	1633.20	1229.17	2103.40	0.799 cap	75.26%	-0.07%	1683.54
[70-80]%* P_{SMAX}	2226.42	1676.27	2831.51	0.799 cap	75.29%	-0.11%	2293.18
[90-100]%* P_{SMAX}	2820.18	2124.11	3566.16	0.799 cap	75.32%	-0.15%	2904.98

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Capacitive reactive power supply, Q=Qmax							
Power range (P/Pn)	Active power [W]	Reactive power[var]	Apparent power[VA]	Power factor[cos φ]	Q/Pn[%]	Deviation ΔQ/Sn [±5.0%]	DC power[W]
[90-100]%*P_{CMAX}	-2899.14	4042.85	4996.66	0.583 cap	67.38%	-1.26%	-2775.04
[70-80]%* P_{CMAX}	-2299.50	4035.81	4667.25	0.496 cap	67.26%	-1.15%	-2186.67
[50-60]%* P_{CMAX}	-1700.27	4028.52	4395.56	0.389 cap	67.14%	-1.04%	-1595.89
[30-40]%* P_{CMAX}	-1102.05	4021.02	4192.58	0.265 cap	67.02%	-0.92%	-1003.49
[10-20]%* P_{CMAX}(1)	-505.35	4013.98	4068.93	0.125 cap	66.90%	-0.82%	-410.79
[10-20]%* P_{SMAX}(1)	395.38	4002.22	4044.11	0.098 cap	66.70%	-0.64%	488.41
[30-40]%* P_{SMAX}	1000.30	3993.57	4138.90	0.243 cap	66.56%	-0.51%	1097.45
[50-60]%* P_{SMAX}	1602.72	3984.64	4315.90	0.373 cap	66.41%	-0.37%	1705.05
[70-80]%* P_{SMAX}	2203.68	3975.28	4564.93	0.485 cap	66.25%	-0.23%	2314.01
[90-100]%* P_{SMAX}	2803.36	3967.04	4875.98	0.577 cap	66.12%	-0.11%	2921.97

Reactive power(Q=0)							
Power range (P/Pn)	Active power [W]	Reactive power[var]	Apparent power[VA]	Power factor[cos φ]	Q/Pn[%]	Deviation ΔQ/Sn [±5.0%]	DC power[W]
[90-100]%*P_{CMAX}	-2849.17	32.31	2886.20	1.000	0.54%	-0.49%	-2781.16
[70-80]%* P_{CMAX}	-2251.08	24.39	2296.42	1.000	0.41%	-0.37%	-2196.87
[50-60]%* P_{CMAX}	-1653.49	16.98	1713.40	1.000	0.28%	-0.26%	-1610.59
[30-40]%* P_{CMAX}	-1056.63	9.98	1145.93	1.000	0.17%	-0.15%	-1022.65
[10-20]%* P_{CMAX}(1)	-459.39	-0.99	635.88	1.000	-0.02%	0.02%	-433.73
[10-20]%* P_{SMAX}(1)	449.41	-11.58	617.91	1.000	-0.19%	0.18%	476.06
[30-40]%* P_{SMAX}	1049.83	-19.25	1127.58	1.000	-0.32%	0.29%	1085.18
[50-60]%* P_{SMAX}	1651.72	-26.46	1701.50	1.000	-0.44%	0.40%	1696.99
[70-80]%* P_{SMAX}	2252.07	-34.14	2288.87	1.000	-0.57%	0.52%	2309.05
[90-100]%* P_{SMAX}	2852.12	-42.23	2881.32	1.000	-0.70%	0.64%	2922.98
Model	Tested on X1-H6K-S (with 6*battery modules:X1-B30-HC), the P_{SMAX} consider as 6000W (Battery supply only), and the P_{CMAX} consider as 6000W in this clause test.						

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Inductive reactive power absorption, cos φ = 0.8							
Power range (P/Pn)	Active power [W]	Reactive power[var]	Apparent power[VA]	Power factor[cos φ]	Q/P[%]	Deviation ΔQ/Pn [±2.5%]	DC power[W]
[90-100]%*P_{CMAX}(2)	-5233.12	-3934.02	6577.95	0.799 ind	75.18%	0.15%	-5043.50
[70-80]%* P_{CMAX}	-4465.13	-3361.10	5619.59	0.799 ind	75.27%	0.20%	-4311.34
[50-60]%* P_{CMAX}	-3271.85	-2467.37	4132.36	0.798 ind	75.41%	0.22%	-3166.24
[30-40]%* P_{CMAX}	-2082.50	-1571.45	2656.46	0.798 ind	75.46%	0.16%	-2016.67
[10-20]%* P_{CMAX}(1)	-897.60	-677.96	1224.13	0.798 ind	75.53%	0.08%	-859.92
[10-20]%* P_{SMAX}(1)	908.17	-700.85	1234.27	0.790 ind	-77.17%	0.33%	946.07
[30-40]%* P_{SMAX}	2119.66	-1626.36	2710.74	0.793 ind	-76.73%	0.61%	2187.49
[50-60]%* P_{SMAX}	3328.61	-2554.71	4222.36	0.793 ind	-76.75%	0.97%	3433.99
[70-80]%* P_{SMAX}	4530.39	-3480.74	5735.05	0. 793 ind	-76.83%	1.38%	4684.22
[90-100]%* P_{SMAX}(2)	5081.65	-3906.98	6431.03	0.792 ind	-76.88%	1.60%	5260.27

Inductive reactive power absorption, Q=Qmin							
Power range (P/Pn)	Active power [W]	Reactive power[var]	Apparent power[VA]	Power factor[cos φ]	Q/Pn[%]	Deviation ΔQ/Sn [±5.0%]	DC power[W]
[90-100]%*P_{CMAX}(2)	-5226.02	-3942.59	6577.27	0.798 ind	-65.71%	-0.26%	-5034.26
[70-80]%* P_{CMAX}	-4459.76	-3951.80	5989.27	0.748 ind	-65.86%	-0.12%	-4290.91
[50-60]%* P_{CMAX}	-3257.12	-3968.44	5164.89	0.635 ind	-66.14%	0.13%	-3118.06
[30-40]%* P_{CMAX}	-2057.99	-3985.73	4517.90	0.459 ind	-66.43%	0.39%	-1939.98
[10-20]%* P_{CMAX}(1)	-862.27	-4003.21	4128.08	0.211 ind	-66.72%	0.65%	-756.91
[10-20]%* P_{SMAX}(1)	940.09	-4027.05	4167.01	0.227 ind	-67.12%	1.02%	1045.86
[30-40]%* P_{SMAX}	2142.79	-4042.03	4603.18	0.468 ind	-67.37%	1.24%	2261.61
[50-60]%* P_{SMAX}	3340.93	-4057.43	5280.93	0.635 ind	-67.62%	1.48%	3480.06
[70-80]%* P_{SMAX}	4535.77	-4073.94	6119.33	0.744 ind	-67.90%	1.73%	4705.30
[90-100]%* P_{SMAX}(2)	4951.14	-4079.17	6437.07	0.771 ind	-67.99%	1.81%	5132.30

Capacitive reactive power supply cos φ = 0.8

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Power range (P/Pn)	Active power [W]	Reactive power[var]	Apparent power[VA]	Power factor[cos φ]	Q/P[%]	Deviation ΔQ/Pn [±2.5%]	DC power[W]
[90-100]%*$P_{CMAX}^{(2)}$	-5175.59	3950.45	6536.53	0.795 cap	-76.33%	-1.15%	-4994.39
[70-80]%* P_{CMAX}	-4544.38	3470.85	5744.35	0.795 cap	-76.38%	-1.04%	-4392.15
[50-60]%* P_{CMAX}	-3330.14	2544.36	4221.28	0.795 cap	-76.40%	-0.78%	-3227.10
[30-40]%* P_{CMAX}	-2119.71	1616.39	2709.21	0.796 cap	-76.26%	-0.44%	-2057.35
[10-20]%* $P_{CMAX}^{(1)}$	-914.95	690.64	1240.26	0.799 cap	-75.48%	-0.07%	-880.25
[10-20]%* $P_{SMAX}^{(1)}$	891.70	669.85	1202.38	0.800 cap	75.12%	-0.02%	925.04
[30-40]%* P_{SMAX}	2082.82	1562.53	2642.06	0.800 cap	75.02%	-0.01%	2143.34
[50-60]%* P_{SMAX}	3272.17	2457.79	4117.17	0.800 cap	75.11%	-0.06%	3368.90
[70-80]%* P_{SMAX}	4454.33	3351.59	5593.56	0.799 cap	75.24%	-0.18%	4595.48
[90-100]%* $P_{SMAX}^{(2)}$	5075.14	3822.18	6370.94	0.799 cap	75.31%	-0.26%	5243.70
Capacitive reactive power supply, Q=Qmax							
Power range (P/Pn)	Active power [W]	Reactive power[var]	Apparent power[VA]	Power factor[cos φ]	Q/Pn[%]	Deviation ΔQ/Sn [±5.0%]	DC power[W]
[90-100]%*$P_{CMAX}^{(2)}$	-5078.15	4071.42	6534.42	0.781 cap	67.86%	-1.69%	-4899.46
[70-80]%* P_{CMAX}	-4553.02	4063.66	6128.32	0.746 cap	67.73%	-1.57%	-4389.29
[50-60]%* P_{CMAX}	-3349.55	4047.80	5279.90	0.638 cap	67.46%	-1.33%	-3216.12
[30-40]%* P_{CMAX}	-2150.10	4033.04	4597.49	0.471 cap	67.22%	-1.11%	-2039.49
[10-20]%* $P_{CMAX}^{(1)}$	-953.88	4018.66	4158.30	0.232 cap	66.98%	-0.89%	-857.86
[10-20]%* $P_{SMAX}^{(1)}$	849.37	3995.26	4111.90	0.208 cap	66.59%	-0.53%	944.95
[30-40]%* P_{SMAX}	2053.32	3976.77	4500.27	0.459 cap	66.28%	-0.25%	2160.43
[50-60]%* P_{SMAX}	3251.99	3960.01	5145.65	0.635 cap	66.00%	0.00%	3377.99
[70-80]%* P_{SMAX}	4446.37	3943.44	5962.06	0.748 cap	65.72%	0.25%	4601.56
[90-100]%* $P_{SMAX}^{(2)}$	4989.69	3936.05	6373.29	0.785 cap	65.60%	0.36%	5160.18
Reactive power(Q=0)							

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Power range (P/Pn)	Active power [W]	Reactive power[var]	Apparent power[VA]	Power factor[cos φ]	Q/Pn[%]	Deviation ΔQ/Sn [±5.0%]	DC power[W]
[90-100]%*P_{CMAX}	-5704.74	70.39	5729.26	1.000	1.17%	-1.07%	-5549.42
[70-80]%* P_{CMAX}	-4499.03	54.43	4525.72	1.000	0.91%	-0.82%	-4384.36
[50-60]%* P_{CMAX}	-3298.09	38.28	3330.82	1.000	0.64%	-0.58%	-3216.78
[30-40]%* P_{CMAX}	-2101.03	22.34	2148.91	1.000	0.37%	-0.34%	-2047.75
[10-20]%* P_{CMAX}(1)	-907.88	7.69	1009.01	1.000	0.13%	-0.12%	-874.50
[10-20]%* P_{SMAX}(1)	899.53	-17.31	991.09	1.000	-0.29%	0.26%	933.89
[30-40]%* P_{SMAX}	2102.15	-32.29	2141.96	1.000	-0.54%	0.49%	2156.24
[50-60]%* P_{SMAX}	3302.65	-48.54	3328.37	1.000	-0.81%	0.74%	3384.73
[70-80]%* P_{SMAX}	4497.79	-64.50	4517.44	1.000	-1.07%	0.98%	4610.44
[90-100]%* P_{SMAX}	5687.70	-79.06	5704.99	1.000	-1.32%	1.20%	5835.20

* :Verify that the minimum requirement of this is sustained stably when thermal equilibrium is reached.
(1): For powers delivered less than 20 % of the rated power, the generator shall not exchange a reactive power exceeding 10 % of the rated power.
(2): Active power may not reach the set value due to maximum current limitation.

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Bbis.6.6& Bbis.6.7	**Automatic delivery of reactive power according to a characteristic curve cos φ = f (P)**	P

Model	Tested on X1-H3.68K-S (with 1*battery modules:X1-B5-H), the P_{SMAX} consider as 3000W (Battery supply only), and the P_{CMAX} consider as 3000W in this clause test.

Inductive							
P/Pn [%]	Active power P [W]	Vout [V]	Reactive power Q(Var)	Cos φ measured	Cos φ set-point	Δ cosφ	Limit Δcosφ
20 % P_{SMAX}	590.29	239.13	-0.84	0.999 ind	1.000	0.000	± 0.01
30 % P_{SMAX}	889.87	239.16	-2.68	0.999 ind	1.000	0.000	± 0.01
40 % P_{SMAX}	1189.83	239.19	-6.03	0.999 ind	1.000	0.000	± 0.01
50 % P_{SMAX}	1489.69	239.21	-9.15	0.999 ind	1.000	0.000	± 0.01
60 % P_{SMAX}	1789.36	239.24	-12.42	0.999 ind	1.000	0.000	± 0.01
60% P_{SMAX}	1791.15	243.74	-375.98	0.979 ind	0.980 ind	0.001	± 0.01
70 % P_{SMAX}	2093.13	243.77	-629.91	0.958 ind	0.960 ind	0.002	± 0.01
80 % P_{SMAX}	2395.30	243.75	-894.78	0.937 ind	0.940 ind	0.003	± 0.01
90 % P_{SMAX}	2698.15	243.77	-1180.82	0.916 ind	0.920 ind	0.004	± 0.01
100% P_{SMAX}	3001.09	243.77	-1490.49	0.896 ind	0.900 ind	0.004	± 0.01
100% P_{SMAX}	3007.43	232.27	-1510.16	0.894 ind	0.900 ind	0.006	± 0.01
100% P_{SMAX}	2992.72	227.80	-59.54	0.999 ind	1.000	0.000	± 0.01
Capacitive							
P/Pn [%]	Active power P [W]	Vout [V]	Reactive power Q(Var)	Cos φ measured	Cos φ set-point	Δ cosφ	Limit Δcosφ
20 % P_{SMAX}	594.79	239.23	2.40	0.999 cap	1.000	0.000	± 0.01
30 % P_{SMAX}	895.91	239.27	2.46	0.999 cap	1.000	0.000	± 0.01
40 % P_{SMAX}	1197.33	239.31	6.34	0.999 cap	1.000	0.000	± 0.01
50 % P_{SMAX}	1498.58	239.34	10.00	0.999 cap	1.000	0.000	± 0.01
60 % P_{SMAX}	1799.92	239.39	13.80	0.999 cap	1.000	0.000	± 0.01
60% P_{SMAX}	1793.15	243.98	366.17	0.980 cap	0.980 cap	0.000	± 0.01
70 % P_{SMAX}	2090.59	244.02	613.58	0.960 cap	0.960 cap	0.000	± 0.01

80 % P_{SMAX}	2387.49	244.06	871.64	0.939 cap	0.940 cap	-0.001	± 0.01
90 % P_{SMAX}	2684.54	244.09	1149.85	0.919 cap	0.920 cap	-0.001	± 0.01
100% P_{SMAX}	2982.24	244.13	1452.13	0.899 cap	0.900 cap	-0.001	± 0.01
100% P_{SMAX}	2988.53	232.65	1432.93	0.902 cap	0.900 cap	0.002	± 0.01
100% P_{SMAX}	3008.16	228.05	41.50	0.999 cap	1.000	0.000	± 0.01

Model	Tested on X1-H6K-S (with 1*battery modules:X1-B5-H), the P_{SMAX} consider as 3000W (Battery supply only), and the P_{CMAX} consider as 3000W in this clause test.

Inductive

P/Pn [%]	Active power P [W]	Vout [V]	Reactive power Q(Var)	Cos φ measured	Cos φ set-point	Δ cosφ	Limit Δcosφ
20 % P_{SMAX}	590.40	239.20	-0.78	0.999 ind	1.000	0.000	± 0.01
30 % P_{SMAX}	889.98	239.23	-2.65	0.999 ind	1.000	0.000	± 0.01
40 % P_{SMAX}	1190.15	239.21	-6.10	0.999 ind	1.000	0.000	± 0.01
50 % P_{SMAX}	1489.93	239.24	-9.32	0.999 ind	1.000	0.000	± 0.01
60 % P_{SMAX}	1789.53	239.23	-12.46	0.999 ind	1.000	0.000	± 0.01
60% P_{SMAX}	1791.43	243.76	-375.93	0.979 ind	0.980 ind	0.001	± 0.01
70 % P_{SMAX}	2093.74	243.76	-630.04	0.958 ind	0.960 ind	0.002	± 0.01
80 % P_{SMAX}	2395.95	243.77	-894.94	0.937 ind	0.940 ind	0.003	± 0.01
90 % P_{SMAX}	2698.75	243.77	-1180.97	0.916 ind	0.920 ind	0.004	± 0.01
100% P_{SMAX}	3001.60	243.80	-1490.97	0.896 ind	0.900 ind	0.004	± 0.01
100% P_{SMAX}	3007.98	232.27	-1510.26	0.894 ind	0.900 ind	0.006	± 0.01
100% P_{SMAX}	2992.81	227.77	-48.51	0.999 ind	1.000	0.000	± 0.01

Capacitive

P/Pn [%]	Active power P [W]	Vout [V]	Reactive power Q(Var)	Cos φ measured	Cos φ set-point	Δ cosφ	Limit Δcosφ
20 % P_{SMAX}	594.83	239.23	1.15	0.999 cap	1.000	0.000	± 0.01
30 % P_{SMAX}	895.92	239.27	2.61	0.999 cap	1.000	0.000	± 0.01

40 % P_{SMAX}	1197.31	239.31	6.50	0.999 cap	1.000	0.000	± 0.01
50 % P_{SMAX}	1498.37	239.35	10.05	0.999 cap	1.000	0.000	± 0.01
60 % P_{SMAX}	1799.65	239.39	13.80	0.999 cap	1.000	0.000	± 0.01
60% P_{SMAX}	1792.84	243.98	366.06	0.980 cap	0.980 cap	0.000	± 0.01
70 % P_{SMAX}	2090.46	244.02	613.48	0.960 cap	0.960 cap	0.000	± 0.01
80 % P_{SMAX}	2387.48	244.06	871.60	0.939 cap	0.940 cap	-0.001	± 0.01
90 % P_{SMAX}	2684.56	244.10	1150.02	0.919 cap	0.920 cap	-0.001	± 0.01
100% P_{SMAX}	2981.87	244.13	1452.34	0.899 cap	0.900 cap	-0.001	± 0.01
100% P_{SMAX}	2988.38	232.66	1432.98	0.902 cap	0.900 cap	0.002	± 0.01
100% P_{SMAX}	3008.45	228.06	46.98	0.999 cap	1.000	0.000	± 0.01

Model	Tested on X1-H6K-S (with 6*battery modules:X1-B30-HC), the P_{SMAX} consider as 6000W (Battery supply only), and the P_{CMAX} consider as 6000W in this clause test.

Inductive

P/Pn [%]	Active power P [W]	Vout [V]	Reactive power Q(Var)	Cos φ measured	Cos φ set-point	Δ cosφ	Limit Δcosφ
20 % P_{SMAX}	1188.53	239.05	-6.15	0.999 ind	1.000	0.000	± 0.01
30 % P_{SMAX}	1788.39	239.10	-12.56	0.999 ind	1.000	0.000	± 0.01
40 % P_{SMAX}	2386.66	239.16	-19.40	0.999 ind	1.000	0.000	± 0.01
50 % P_{SMAX}	2985.36	239.22	-26.75	0.999 ind	1.000	0.000	± 0.01
60 % P_{SMAX}	3583.09	239.25	-33.75	0.999 ind	1.000	0.000	± 0.01
60% P_{SMAX}	3589.53	243.95	-767.28	0.979 ind	0.980 ind	0.001	± 0.01
70 % P_{SMAX}	4190.99	243.96	-1274.79	0.958 ind	0.960 ind	0.002	± 0.01
80 % P_{SMAX}	4790.80	244.00	-1804.92	0.937 ind	0.940 ind	0.003	± 0.01
90 % P_{SMAX}	5389.50	244.05	-2376.42	0.916 ind	0.920 ind	0.004	± 0.01
100% P_{SMAX}	5940.59	244.05	-2971.29	0.896 ind	0.900 ind	0.004	± 0.01
100% P_{SMAX}	5946.04	232.46	-2962.63	0.894 ind	0.900 ind	0.006	± 0.01
100% P_{SMAX}	5964.78	228.02	-89.61	0.999 ind	1.000	0.000	± 0.01

Capacitive							
P/Pn [%]	Active power P [W]	Vout [V]	Reactive power Q(Var)	Cos φ measured	Cos φ set-point	Δ cosφ	Limit Δcosφ
20 % P_{SMAX}	1199.78	239.30	-5.69	0.999 cap	1.000	0.000	± 0.01
30 % P_{SMAX}	1802.15	239.38	-12.46	0.999 cap	1.000	0.000	± 0.01
40 % P_{SMAX}	2402.53	239.45	-20.23	0.999 cap	1.000	0.000	± 0.01
50 % P_{SMAX}	3003.43	239.53	-28.49	0.999 cap	1.000	0.000	± 0.01
60 % P_{SMAX}	3603.91	239.61	-36.83	0.999 cap	1.000	0.000	± 0.01
60% P_{SMAX}	3593.13	244.20	713.05	0.981 cap	0.980 cap	0.001	± 0.01
70 % P_{SMAX}	4185.68	244.28	1207.02	0.961 cap	0.960 cap	0.001	± 0.01
80 % P_{SMAX}	4777.00	244.36	1721.31	0.941 cap	0.940 cap	0.001	± 0.01
90 % P_{SMAX}	5365.49	244.43	2274.53	0.921 cap	0.920 cap	0.001	± 0.01
100% P_{SMAX}	5935.12	244.49	2839.75	0.902 cap	0.900 cap	0.002	± 0.01
100% P_{SMAX}	5938.28	233.03	2809.16	0.904 cap	0.900 cap	0.004	± 0.01
100% P_{SMAX}	5994.38	228.46	-76.00	0.999 cap	1.000	0.000	± 0.01

Supplementary information:

Locked-in active power: 50% P_{SMAX}; locked-out active power: 50% P_{SMAX}.

Locked-in voltage: 1.05Un; locked-out voltage: 0.95Un

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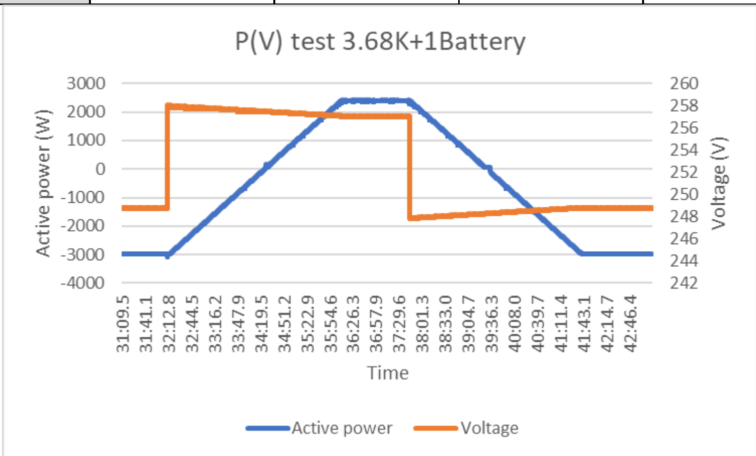
Bbis.7.1	**Automatic limitation the active power for voltage value close to 110% of the nominal voltage**	P

Bidirectional converter

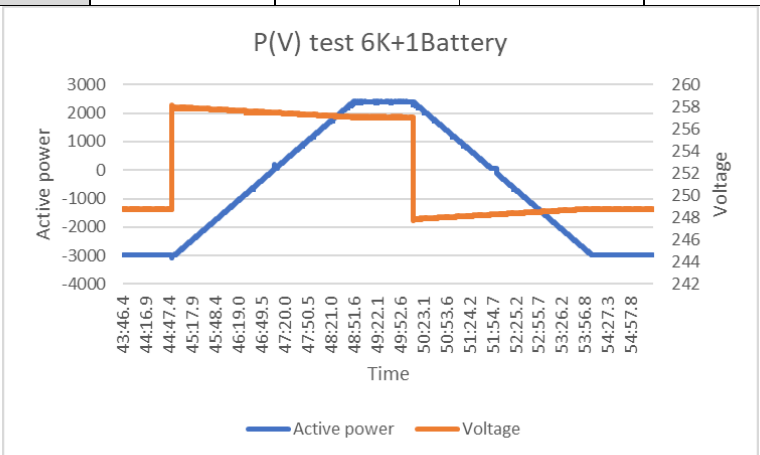
Model: Tested on X1-H3.68K-S (with 1*battery modules:X1-B5-H), the P_{SMAX} consider as 3000W (Battery supply only), and the P_{CMAX} consider as 3000W in this clause test.

	Voltage set-point (V)	Grid voltage (V)	Current (A)	Output power (W)	DC power (W)	Limit
Step 1)	-2% V declared	248.70	11.95	2973.65	3033.21	100%*P_{SMAX}
Step 2)	+2% V declared	257.13	9.42	-2404.72	-2336.43	≥80%*P_{CMAX}
Step 3)	-2% V declared	248.81	12.03	2980.44	3042.12	100%*P_{SMAX}



Model: Tested on X1-H6-S (with 1*battery modules:X1-B5-H), the P_{SMAX} consider as 3000W (Battery supply only), and the P_{CMAX} consider as 3000W in this clause test.

	Voltage set-point (V)	Grid voltage (V)	Current (A)	Output power (W)	DC power (W)	Limit
Step 1)	-2% V declared	248.81	12.08	2981.08	3043.18	100%*P_{SMAX}
Step 2)	+2% V declared	257.13	9.41	-2405.65	-2337.03	≥80%*P_{CMAX}
Step 3)	-2% V declared	248.82	12.22	2980.39	3043.26	100%*P_{SMAX}



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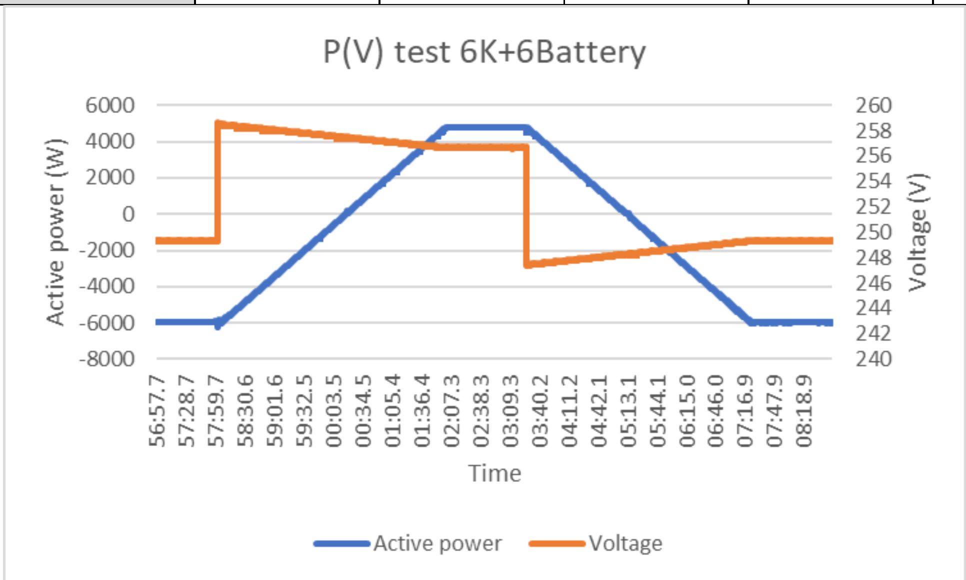
Model	Tested on X1-H6-S (with 6*battery modules:X1-B30-HC), the P_{SMAX} consider as 6000W (Battery supply only), and the P_{CMAX} consider as 6000W in this clause test.					
	Voltage set-point (V)	Grid voltage (V)	Current (A)	Output power (W)	DC power (W)	Limit
Step 1)	-2% V declared	249.31	23.96	5955.72	6081.91	100%*P_{SMAX}
Step 2)	+2% V declared	256.72	18.64	-4764.33	-4633.17	≥80%*P_{CMAX}
Step 3)	-2% V declared	249.37	23.93	5954.11	6080.59	100%*P_{SMAX}



Bbis.7.2	**Control of active power in the presence of transients on the transmission network**					P
Model	Tested on X1-H3.68K-S (with 1*battery modules:X1-B5-H), the P_{SMAX} consider as 3000W (Battery supply only), and the P_{CMAX} consider as 3000W in this clause test.					
Test for storage system connected to the bidirectional converters						
Over-frequency regulation, with active power reduction frequency start point=50.2Hz, gradient droop s=2.6%, (a gradient of 76.92% of (P_{imax}- P_{imin}) per hertz), for storage system connected to the bidirectional converters, P_{imin}=100% P_{CMAX}						
Test Sequence A, P=100% P_{SMAX}, inverter DC input power is set to 100% of maximum active output power first. After the inverter step into frequency range above 50.2Hz, the inverter available input power is set to 100% of maximum active output.						
Step #	Expected power (W)	Frequency (Hz)	Measured active power (W)	Δ P(W)	Δ P/Pn(%)	Limit
1 (t'1)	3000.00	47.51	3003.43	3.43	0.09%	±2.5% Pn
2 (t'2)	3000.00	50+0.15	3003.73	3.73	0.10%	±2.5% Pn
3 (t'3)	2080.69	50+0.40	2078.85	-1.84	-0.05%	±2.5% Pn
4 (t'4)	1157.65	50+0.60	1125.64	-32.01	-0.87%	±2.5% Pn
5 (t'5)	-2949.88	50+1.49	-2915.87	34.00	0.92%	±2.5% Pn
6 (t'6)	-2949.88	50+0.11	-2916.13	33.74	0.92%	±2.5% Pn
7 (t'7)	--	50	See below table	--	--	--
Step #	Freq (Hz)	Time after reconnection (min)	Measured active power (W)	ΔP Arise during 1 min (W)	Gradient of charge rate ΔP/t (W/ min)	Limit rate (≤20% $P_{imax-Pmin}$) (Yes/No)
7 (t'7)	50.00	The time that the active power start increases after the frequency change to 50.00Hz (s)				305.1
After reconnection						
7 (t'7)	50.00	0.0min	-2915.00	--	--	--
7 (t'7)	50.00	0.5min	-2325.36	1179.29	19.64%	Yes
7 (t'7)	50.00	1.0min	-1735.65	1179.41	19.64%	Yes
7 (t'7)	50.00	1.5min	-1148.55	1174.20	19.56%	Yes
7 (t'7)	50.00	2.0min	-560.77	1175.57	19.58%	Yes
7 (t'7)	50.00	2.5min	38.55	1198.64	19.96%	Yes
7 (t'7)	50.00	3.0min	633.32	1189.53	19.81%	Yes
7 (t'7)	50.00	3.5min	1225.82	1185.01	19.74%	Yes
7 (t'7)	50.00	4.0min	1819.28	1186.93	19.77%	Yes

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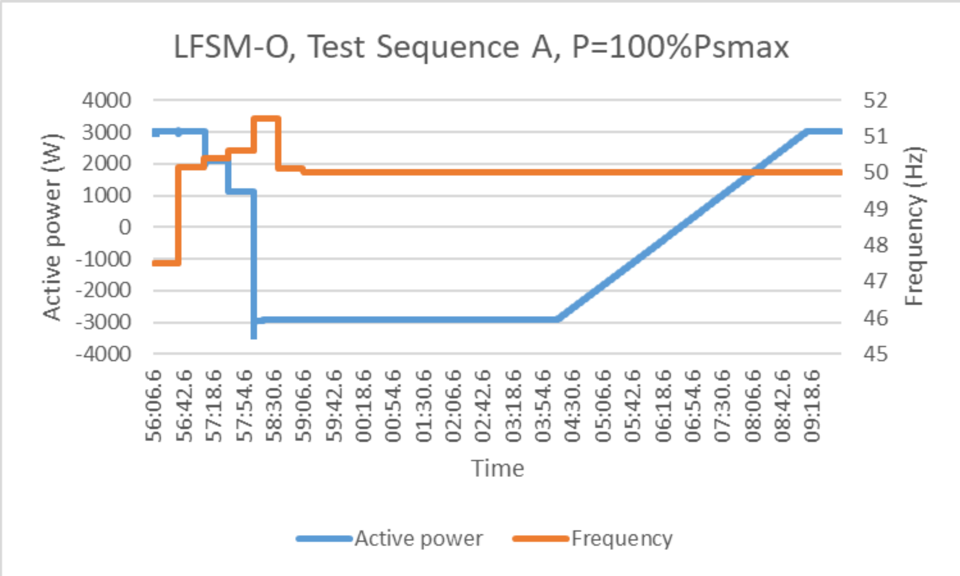
7 (t'7)	50.00	4.5min	2410.43	1182.29	19.69%	Yes
7 (t'7)	50.00	5.0min	3003.68	1186.50	19.76%	Yes
7 (t'7)	50.00	5.5 min	3004.38	1.40	0.02%	Yes
7 (t'7)	50.00	6.0 min	3004.53	0.28	0.00%	Yes

Supplementary information:

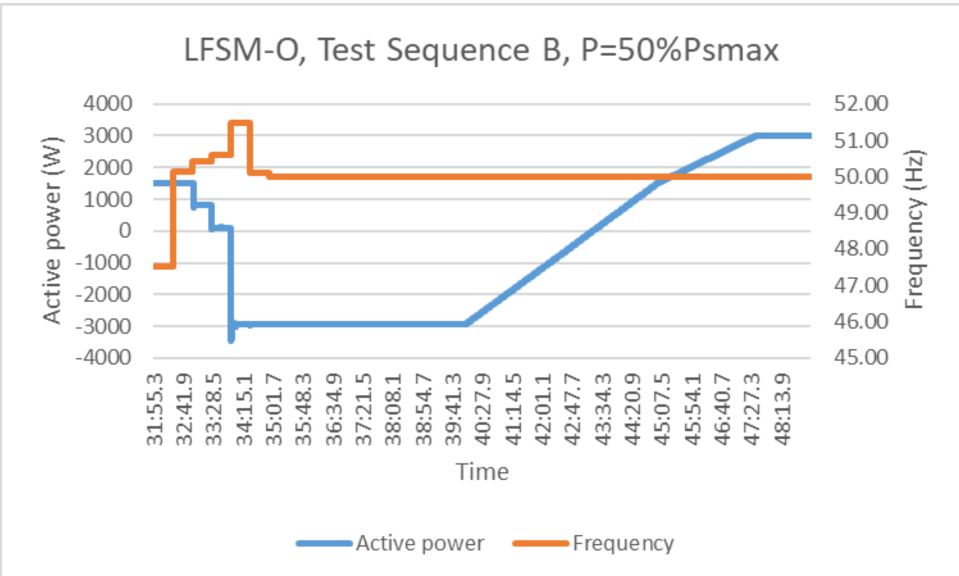


Test Sequence B, P=50% P_{SMAX}, inverter DC input power is set to 50% of maximum active output power first. After the inverter step into frequency range above 50.2Hz, the inverter available input power is set to 100% of maximum active output.

Step #	Expected power (W)	Frequency (Hz)	Measured active power (W)	Δ P(W)	Δ P/Pn(%)	Limit
1 (t'1)	1500.00	47.51	1502.51	2.51	0.08%	±2.5% Pn
2 (t'2)	1500.00	50+0.15	1503.16	3.16	0.11%	±2.5% Pn
3 (t'3)	810.88	50+0.40	815.18	4.30	0.14%	±2.5% Pn
4 (t'4)	118.60	50+0.60	82.99	-35.60	-1.19%	±2.5% Pn
5 (t'5)	-2962.05	50+1.49	-2951.87	10.18	0.34%	±2.5% Pn
6 (t'6)	-2962.05	50+0.11	-2951.62	10.43	0.35%	±2.5% Pn
7 (t'7)	--	50	See below table	--	--	--
Step #	Freq (Hz)	Time after reconnection (min)	Measured active power (W)	ΔP Arise during 1 min (W)	Gradient of charge rate ΔP/t (W/ min)	Limit rate (≤20% $P_{imax-Pmin}$) (Yes/No)
7 (t'7)	50.00	The time that the active power start increases after the frequency change to 50.00Hz (s)				308.6

After reconnection						
7 (t'7)	50.00	0.0min	-2950.17	--	--	--
7 (t'7)	50.00	0.5min	-2504.84	890.65	19.78%	Yes
7 (t'7)	50.00	1.0min	-2061.66	888.50	19.73%	Yes
7 (t'7)	50.00	1.5min	-1617.36	887.48	19.71%	Yes
7 (t'7)	50.00	2.0min	-1174.94	886.72	19.69%	Yes
7 (t'7)	50.00	2.5min	-731.35	886.01	19.68%	Yes
7 (t'7)	50.00	3.0min	-285.82	889.12	19.74%	Yes
7 (t'7)	50.00	3.5min	165.79	897.14	19.92%	Yes
7 (t'7)	50.00	4.0min	611.59	897.41	19.93%	Yes
7 (t'7)	50.00	4.5min	1057.04	891.25	19.79%	Yes
7 (t'7)	50.00	5.0min+2s	1502.56	--	--	--
Mearsure the time when reach P_{imax}						
Step #	Freq (Hz)	Time after reconnection (min)	Measured active power (W)	ΔP Arise during 1 min (W)	Gradient of charge rate ΔP/t (W/ min)	Limit rate (≤20% P_{nom}) (Yes/No)
7 (t'7)	50.00	5.0min+2s	1502.56	--	--	--
7 (t'7)	50.00	5.5min+2s	1797.88	590.64	16.05%	Yes
7 (t'7)	50.00	6.0min+2s	2089.29	586.73	15.94%	Yes
7 (t'7)	50.00	6.5min+2s	2382.47	584.59	15.89%	Yes
7 (t'7)	50.00	7.0min+2s	2675.27	585.98	15.92%	Yes
7 (t'7)	50.00	7.5min+2s	2967.20	584.72	15.89%	Yes
7 (t'7)	50.00	8.0min+2s	3006.69	331.42	9.01%	Yes
7 (t'7)	50.00	8.5min+2s	3006.41	--	--	--

Supplementary information:



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Test Sequence C, P=0% P_{SMAX}, inverter DC input power is set to 0% of maximum active output power first. After the inverter step into frequency range above 50.2Hz, the inverter available input power is set to 100% of maximum active output.						
Step #	Expected power (W)	Frequency (Hz)	Measured active power (W)	Δ P(W)	Δ P/Pn(%)	Limit
1 (t'1)	0.00	47.51	-2.87	--	--	±2.5% Pn
2 (t'2)	0.00	50+0.15	-2.30	-2.30	-0.08%	±2.5% Pn
3 (t'3)	-463.82	50+0.40	-457.01	6.81	0.23%	±2.5% Pn
4 (t'4)	-925.34	50+0.60	-947.80	-22.47	-0.75%	±2.5% Pn
5 (t'5)	-2979.10	50+1.49	-2979.69	-0.59	-0.02%	±2.5% Pn
6 (t'6)	-2979.10	50+0.11	-2979.90	-0.80	-0.03%	±2.5% Pn
7 (t'7)	--	50	See below table	--	--	--
Step #	Freq (Hz)	Time after reconnection (min)	Measured active power (W)	ΔP Arise during 1 min (W)	Gradient of charge rate ΔP/t (W/ min)	Limit rate (≤20% $P_{imax-Pmin}$) (Yes/No)
7 (t'7)	50.00	The time that the active power start increases after the frequency change to 50.00Hz (s)				313.0
After reconnection						
7 (t'7)	50.00	0.0 min	-2979.64	--	--	--
7 (t'7)	50.00	0.5 min	-2683.06	593.17	19.79%	Yes
7 (t'7)	50.00	1.0 min	-2383.60	596.04	19.88%	Yes
7 (t'7)	50.00	1.5 min	-2085.13	597.93	19.95%	Yes
7 (t'7)	50.00	2.0 min	-1788.98	594.62	19.84%	Yes
7 (t'7)	50.00	2.5 min	-1491.57	593.56	19.80%	Yes
7 (t'7)	50.00	3.0 min	-1195.23	593.75	19.81%	Yes
7 (t'7)	50.00	3.5 min	-898.04	593.53	19.80%	Yes
7 (t'7)	50.00	4.0 min	-600.69	594.54	19.83%	Yes
7 (t'7)	50.00	4.5 min	-302.33	595.71	19.86%	Yes
7 (t'7)	50.00	5.0 min+0s	-2.95	--	--	--
Mearsure the time when reach P_{imax}						
Step #	Freq (Hz)	Time after reconnection (min)	Measured active power (W)	ΔP Arise during 1 min (W)	Gradient of charge rate ΔP/t (W/ min)	Limit rate (≤20% P_{nom}) (Yes/No)
7 (t'7)	50.00	5.5 min+0s	-2.95	--	--	--
7 (t'7)	50.00	6.0 min+0s	294.16	594.22	16.15%	Yes

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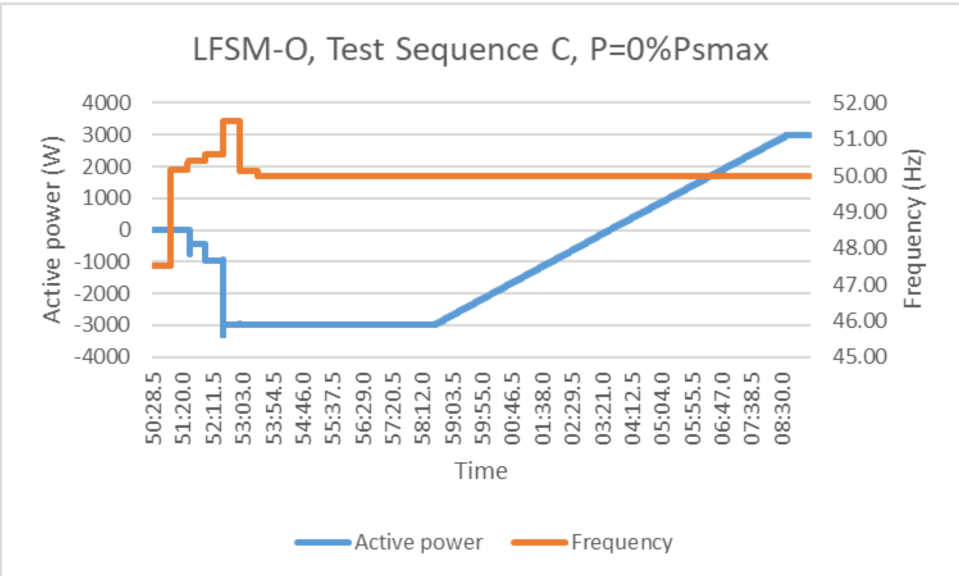
7 (t'7)	50.00	6.5 min+0s	586.50	589.45	16.02%	Yes
7 (t'7)	50.00	7.0 min+0s	880.79	586.63	15.94%	Yes
7 (t'7)	50.00	7.5 min+0s	1174.11	587.61	15.97%	Yes
7 (t'7)	50.00	8.0 min+0s	1468.11	587.32	15.96%	Yes
7 (t'7)	50.00	8.5 min+0s	1760.24	586.13	15.93%	Yes
7 (t'7)	50.00	9.0 min+0s	2053.01	584.90	15.89%	Yes
7 (t'7)	50.00	9.5 min+0s	2345.18	584.95	15.90%	Yes
7 (t'7)	50.00	10.0 min+0s	2639.41	586.40	15.93%	Yes
7 (t'7)	50.00	10.5 min+0s	2930.07	584.88	15.89%	Yes
7 (t'7)	50.00	11.0 min+0s	3005.68	366.27	9.95%	Yes
7 (t'7)	50.00	11.5 min+0s	3005.28	--	--	--

Supplementary information:



Model	Tested on X1-H6K-S (with 1*battery modules:X1-B5-H), the P_{SMAX} consider as 3000W (Battery supply only), and the P_{CMAX} consider as 3000W in this clause test.

Over-frequency regulation, with active power reduction frequency start point=50.2Hz, gradient droop s=2.6%, (a gradient of 76.92% of (P_{imax}- P_{imin}) per hertz), for storage system connected to the bidirectional converters, P_{imin}=100% P_{CMAX}

Test Sequence A, P=100% P_{SMAX}, inverter DC input power is set to 100% of maximum active output power first. After the inverter step into frequency range above 50.2Hz, the inverter available input power is set to 100% of maximum active output.

Step #	Expected power (W)	Frequency (Hz)	Measured active power (W)	Δ P(W)	Δ P/Pn(%)	Limit
1 (t'1)	3000.00	47.51	3005.12	--	--	±2.5% Pn
2 (t'2)	3000.00	50+0.15	3005.43	5.43	0.09%	±2.5% Pn

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3 (t'3)	2082.39	50+0.40	2075.96	-6.43	-0.11%	±2.5% Pn
4 (t'4)	1159.35	50+0.60	1123.69	-35.66	-0.60%	±2.5% Pn
5 (t'5)	-2948.18	50+1.49	-2926.93	21.25	0.36%	±2.5% Pn
6 (t'6)	-2948.18	50+0.11	-2927.23	20.95	0.35%	±2.5% Pn
7 (t'7)	--	50	See below table	--	--	--
Step #	Freq (Hz)	Time after reconnection (min)	Measured active power (W)	ΔP Arise during 1 min (W)	Gradient of charge rate ΔP/t (W/ min)	Limit rate (≤20% $P_{imax-Pmin}$) (Yes/No)
7 (t'7)	50.00	The time that the active power start increases after the frequency change to 50.00Hz (s)				305.9
After reconnection						
7 (t'7)	50.00	0.0min	-2927.26	--	--	--
7 (t'7)	50.00	0.5min	-2338.26	1178.01	19.63%	Yes
7 (t'7)	50.00	1.0min	-1747.41	1179.86	19.65%	Yes
7 (t'7)	50.00	1.5min	-1156.62	1181.64	19.68%	Yes
7 (t'7)	50.00	2.0min	-566.68	1180.73	19.66%	Yes
7 (t'7)	50.00	2.5min	34.82	1191.44	19.84%	Yes
7 (t'7)	50.00	3.0min	627.92	1194.60	19.89%	Yes
7 (t'7)	50.00	3.5min	1223.19	1188.37	19.79%	Yes
7 (t'7)	50.00	4.0min	1818.65	1190.74	19.83%	Yes
7 (t'7)	50.00	4.5min	2409.32	1186.13	19.75%	Yes
7 (t'7)	50.00	5.0min	3004.32	1185.67	19.74%	Yes
7 (t'7)	50.00	5.5 min	3005.12	595.80	9.92%	Yes
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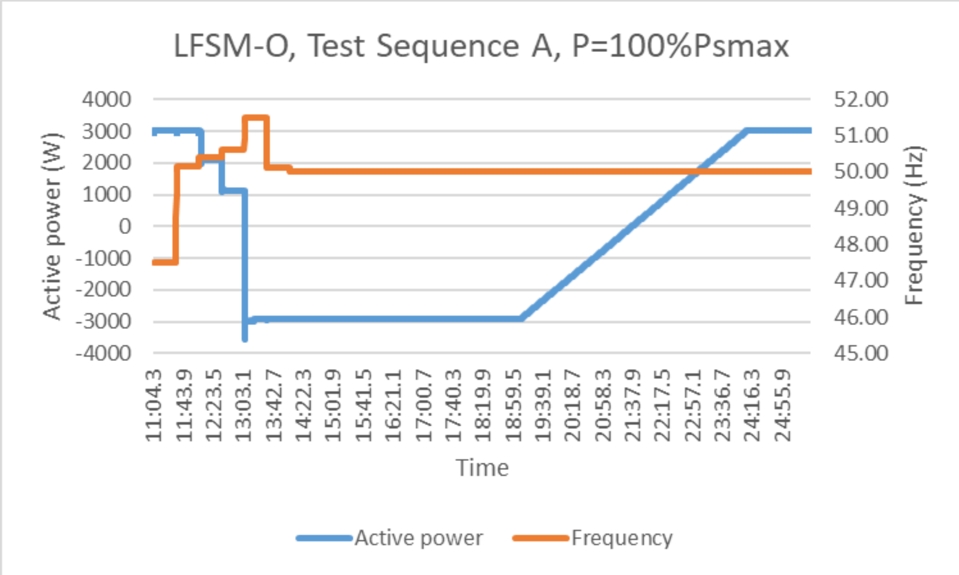
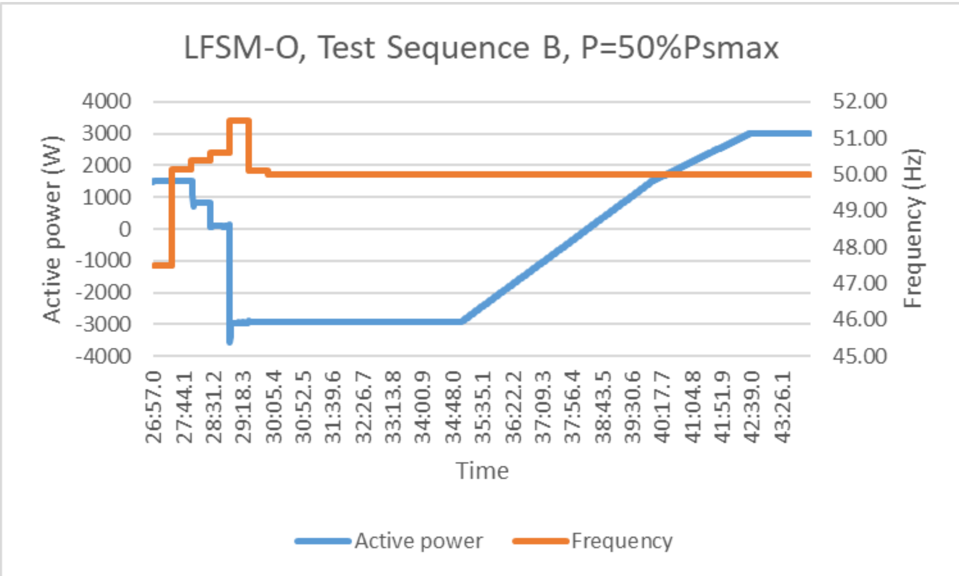


Test Sequence B, P=50% P_{SMAX}, inverter DC input power is set to 50% of maximum active output power first. After the inverter step into frequency range above 50.2Hz, the inverter available input power is set to 100% of maximum active output.

Step #	Expected power (W)	Frequency (Hz)	Measured active power (W)	Δ P(W)	Δ P/Pn(%)	Limit
1 (t'1)	1500.00	47.51	1502.69	2.69	0.05%	±2.5% Pn
2 (t'2)	1500.00	50+0.15	1503.15	3.15	0.05%	±2.5% Pn
3 (t'3)	810.87	50+0.40	822.30	11.43	0.19%	±2.5% Pn
4 (t'4)	118.59	50+0.60	91.20	-27.38	-0.46%	±2.5% Pn
5 (t'5)	-2962.06	50+1.49	-2952.16	9.90	0.17%	±2.5% Pn
6 (t'6)	-2962.06	50+0.11	-2919.33	42.73	0.71%	±2.5% Pn
7 (t'7)	--	50	See below table	--	--	--
Step #	Freq (Hz)	Time after reconnection (min)	Measured active power (W)	ΔP Arise during 1 min (W)	Gradient of charge rate ΔP/t (W/ min)	Limit rate (≤20% $P_{imax-Pmin}$) (Yes/No)
7 (t'7)	50.00	The time that the active power start increases after the frequency change to 50.00Hz (s)				305.1
After reconnection						
7 (t'7)	50.00	0.0min	-2918.46	--	--	--
7 (t'7)	50.00	0.5min	-2476.36	884.20	19.64%	Yes
7 (t'7)	50.00	1.0min	-2036.44	882.03	19.59%	Yes
7 (t'7)	50.00	1.5min	-1595.55	880.81	19.56%	Yes

7 (t'7)	50.00	2.0min	-1155.64	880.80	19.56%	Yes
7 (t'7)	50.00	2.5min	-716.04	879.52	19.53%	Yes
7 (t'7)	50.00	3.0min	-270.66	884.98	19.65%	Yes
7 (t'7)	50.00	3.5min	176.38	892.42	19.82%	Yes
7 (t'7)	50.00	4.0min	618.03	888.69	19.74%	Yes
7 (t'7)	50.00	4.5min	1061.21	884.83	19.65%	Yes
7 (t'7)	50.00	5.0min+1s	1503.77	885.73	19.67%	Yes
Mearsure the time when reach P_{imax}						
Step #	Freq (Hz)	Time after reconnection (min)	Measured active power (W)	ΔP Arise during 1 min (W)	Gradient of charge rate ΔP/t (W/ min)	Limit rate (≤20% P_{nom}) (Yes/No)
7 (t'7)	50.00	5.0 min+1s	1503.77	--	--	--
7 (t'7)	50.00	5.5 min+1s	1797.69	579.26	9.65%	Yes
7 (t'7)	50.00	6.0 min+1s	2091.92	588.15	9.80%	Yes
7 (t'7)	50.00	6.5 min+1s	2381.55	583.86	9.73%	Yes
7 (t'7)	50.00	7.0 min+1s	2676.41	584.49	9.74%	Yes
7 (t'7)	50.00	7.5 min+1s	2968.19	586.64	9.78%	Yes
7 (t'7)	50.00	8.0 min+1s	3005.70	329.29	5.49%	Yes

Supplementary information:



Test Sequence C, P=0% P_{SMAX}, inverter DC input power is set to 0% of maximum active output power first. After the inverter step into frequency range above 50.2Hz, the inverter available input power is set to 100% of maximum active output.

Step #	Expected power (W)	Frequency (Hz)	Measured active power (W)	Δ P(W)	Δ P/Pn(%)	Limit

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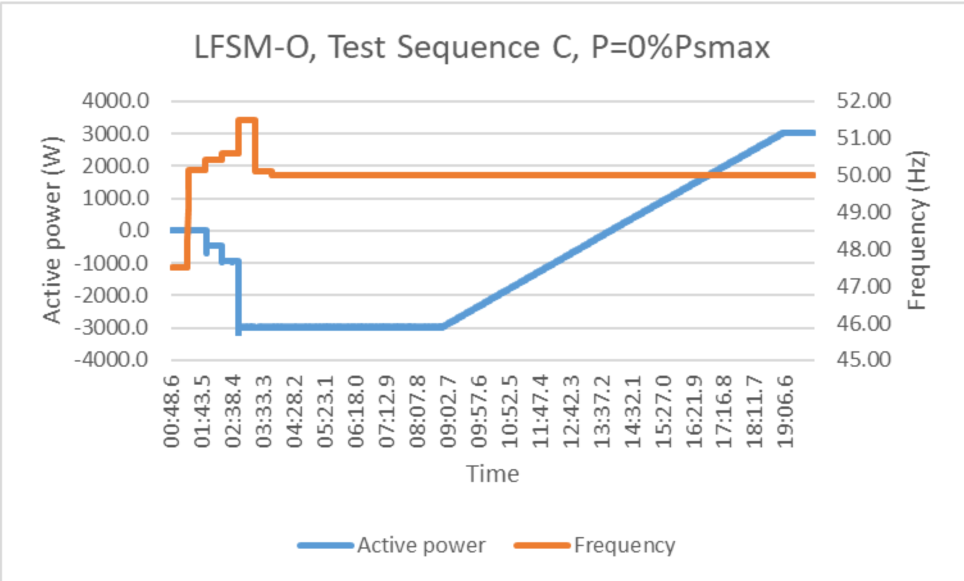
1 (t'1)	0.00	47.51	-2.55	---	--	±2.5% Pn
2 (t'2)	0.00	50+0.15	-2.18	-2.18	-0.04%	±2.5% Pn
3 (t'3)	-463.70	50+0.40	-459.86	3.84	0.07%	±2.5% Pn
4 (t'4)	-925.22	50+0.60	-943.99	-18.78	-0.32%	±2.5% Pn
5 (t'5)	-2978.98	50+1.49	-2974.86	4.12	0.07%	±2.5% Pn
6 (t'6)	-2978.98	50+0.11	-2974.82	4.16	0.07%	±2.5% Pn
7 (t'7)	--	50	See below table	--	--	--
Step #	Freq (Hz)	Time after reconnection (min)	Measured active power (W)	ΔP Arise during 1 min (W)	Gradient of charge rate ΔP/t (W/ min)	Limit rate (≤20% $P_{imax-Pmin}$) (Yes/No)
7 (t'7)	50.00	The time that the active power start increases after the frequency change to 50.00Hz (s)				305.4s
After reconnection						
7 (t'7)	50.00	0.0 min	-2974.49	--	--	--
7 (t'7)	50.00	0.5 min	-2675.15	595.69	19.86%	Yes
7 (t'7)	50.00	1.0 min	-2380.02	594.47	19.82%	Yes
7 (t'7)	50.00	1.5 min	-2082.17	592.99	19.77%	Yes
7 (t'7)	50.00	2.0 min	-1787.44	592.58	19.75%	Yes
7 (t'7)	50.00	2.5 min	-1490.70	591.47	19.72%	Yes
7 (t'7)	50.00	3.0 min	-1194.54	592.90	19.76%	Yes
7 (t'7)	50.00	3.5 min	-899.04	591.66	19.72%	Yes
7 (t'7)	50.00	4.0 min	-602.67	591.87	19.73%	Yes
7 (t'7)	50.00	4.5 min	-303.51	595.53	19.85%	Yes
7 (t'7)	50.00	5.0 min+2s	-3.06	599.61	19.98%	Yes
Mearsure the time when reach P_{imax}						
Step #	Freq (Hz)	Time after reconnection (min)	Measured active power (W)	ΔP Arise during 1 min (W)	Gradient of charge rate ΔP/t (W/ min)	Limit rate (≤20% P_{nom}) (Yes/No)
7 (t'7)	50.00	5.0 min+2s	-3.06	--	--	--
7 (t'7)	50.00	5.5 min+2s	293.21	592.55	9.88%	Yes
7 (t'7)	50.00	6.0 min+2s	585.71	588.77	9.81%	Yes
7 (t'7)	50.00	6.5 min+2s	878.25	585.03	9.75%	Yes
7 (t'7)	50.00	7.0 min+2s	1171.12	585.41	9.76%	Yes
7 (t'7)	50.00	7.5 min+2s	1465.88	587.63	9.79%	Yes
7 (t'7)	50.00	8.0 min+2s	1758.94	587.82	9.80%	Yes

7 (t'7)	50.00	8.5 min+2s	2051.82	585.94	9.77%	Yes
7 (t'7)	50.00	9.0 min+2s	2342.57	583.63	9.73%	Yes
7 (t'7)	50.00	9.5 min+2s	2637.40	585.59	9.76%	Yes
7 (t'7)	50.00	10.0 min+2s	2928.67	586.10	9.77%	Yes
7 (t'7)	50.00	10.5 min+2s	3005.34	367.94	6.13%	Yes
7 (t'7)	50.00	11.0 min+2s	3005.28	76.61	1.28%	Yes

Supplementary information:



Model	Tested on X1-H6K-S (with 6*battery modules:X1-B30-HC), the P_{SMAX} consider as 6000W (Battery supply only), and the P_{CMAX} consider as 6000W in this clause test.

Test for storage system connected to the bidirectional converters

Over-frequency regulation, with active power reduction frequency start point=50.2Hz, gradient droop s=2.6%, (a gradient of 76.92% of (P_{imax}- P_{imin}) per hertz), for storage system connected to the bidirectional converters, P_{imin}=100% P_{CMAX}

Test Sequence A, P=100% P_{SMAX}, inverter DC input power is set to 100% of maximum active output power first. After the inverter step into frequency range above 50.2Hz, the inverter available input power is set to 100% of maximum active output.

Step #	Expected power (W)	Frequency (Hz)	Measured active power (W)	Δ P(W)	Δ P/Pn(%)	Limit
1 (t'1)	6000.00	47.51	5993.44	-6.56	-0.11%	±2.5% Pn
2 (t'2)	6000.00	50+0.15	5991.94	-8.06	-0.13%	±2.5% Pn
3 (t'3)	4148.18	50+0.40	4148.24	2.39	0.04%	±2.5% Pn
4 (t'4)	2303.05	50+0.60	2256.88	-42.89	-0.71%	±2.5% Pn

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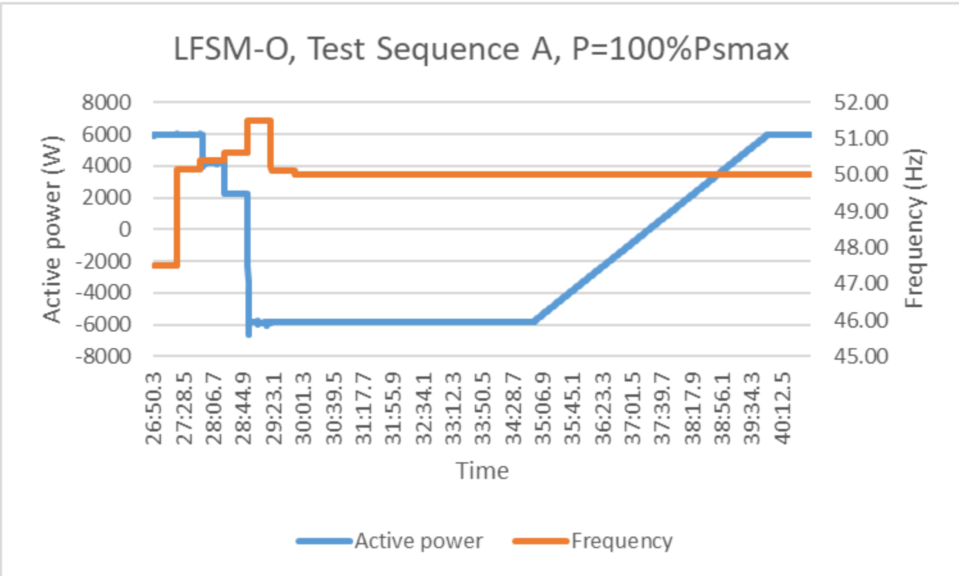
5 (t'5)	-5907.74	50+1.49	-5898.95	16.33	0.27%	±2.5% Pn
6 (t'6)	-5907.74	50+0.11	-5827.24	88.05	1.47%	±2.5% Pn
7 (t'7)	--	50	See below table	--	--	--
Step #	Freq (Hz)	Time after reconnection (min)	Measured active power (W)	ΔP Arise during 1 min (W)	Gradient of charge rate ΔP/t (W/ min)	Limit rate (≤20% $P_{imax\text{-}Pmin}$) (Yes/No)
7 (t'7)	50.00	The time that the active power start increases after the frequency change to 50.00Hz (s)				304.0s
After reconnection						
7 (t'7)	50.00	0.0min	-5827.18	--	--	--
7 (t'7)	50.00	0.5min	-4638.39	2377.57	19.81%	Yes
7 (t'7)	50.00	1.0min	-3454.36	2372.82	19.77%	Yes
7 (t'7)	50.00	1.5min	-2273.27	2365.12	19.71%	Yes
7 (t'7)	50.00	2.0min	-1097.09	2357.27	19.64%	Yes
7 (t'7)	50.00	2.5min	90.95	2364.22	19.70%	Yes
7 (t'7)	50.00	3.0min	1275.01	2372.10	19.77%	Yes
7 (t'7)	50.00	3.5min	2459.88	2368.93	19.74%	Yes
7 (t'7)	50.00	4.0min	3641.35	2366.34	19.72%	Yes
7 (t'7)	50.00	4.5min	4817.40	2357.52	19.65%	Yes
7 (t'7)	50.00	5.0min	5989.52	2348.16	19.57%	Yes
7 (t'7)	50.00	5.5 min	5992.59	1175.19	9.79%	Yes

Supplementary information:



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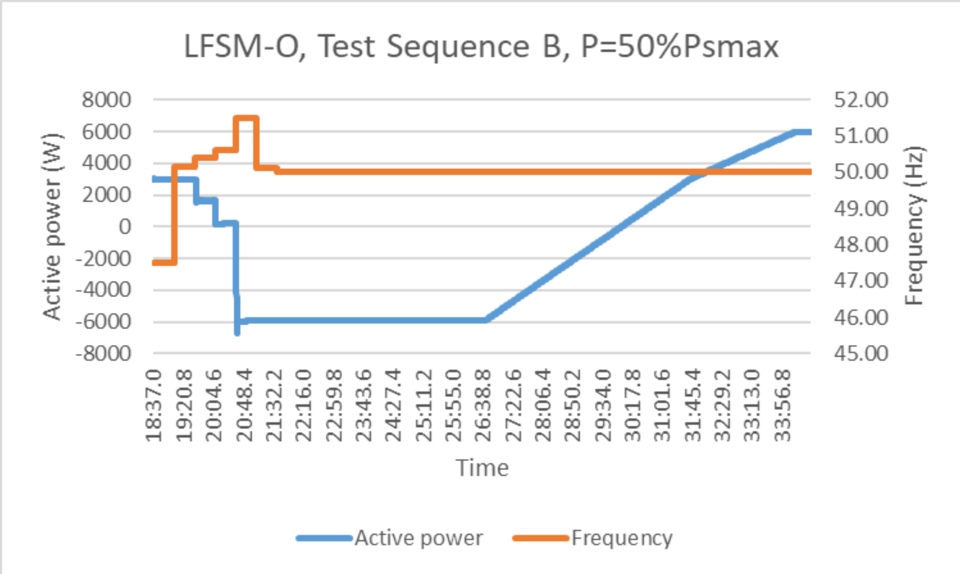
Test Sequence B, P=50% P_{SMAX}, inverter DC input power is set to 50% of maximum active output power first. After the inverter step into frequency range above 50.2Hz, the inverter available input power is set to 100% of maximum active output.						
Step #	Expected power (W)	Frequency (Hz)	Measured active power (W)	Δ P(W)	Δ P/Pn(%)	Limit
1 (t'1)	3000.00	47.51	3003.49	3.49	0.06%	±2.5% Pn
2 (t'2)	3000.00	50+0.15	3003.45	3.45	0.06%	±2.5% Pn
3 (t'3)	1618.89	50+0.40	1645.41	26.52	0.44%	±2.5% Pn
4 (t'4)	234.33	50+0.60	198.41	-35.92	-0.60%	±2.5% Pn
5 (t'5)	-5926.96	50+1.49	-5913.15	13.82	0.23%	±2.5% Pn
6 (t'6)	-5926.96	50+0.11	-5919.35	7.61	0.13%	±2.5% Pn
7 (t'7)	--	50	See below table	--	--	--
Step #	Freq (Hz)	Time after reconnection (min)	Measured active power (W)	ΔP Arise during 1 min (W)	Gradient of charge rate ΔP/t (W/ min)	Limit rate (≤20% $P_{imax-Pmin}$) (Yes/No)
7 (t'7)	50.00	The time that the active power start increases after the frequency change to 50.00Hz (s)				304.1s
After reconnection						
7 (t'7)	50.00	0.0min	-5917.56	--	--	--
7 (t'7)	50.00	0.5min	-5024.64	1785.84	19.84%	Yes
7 (t'7)	50.00	1.0min	-4132.96	1784.60	19.82%	Yes
7 (t'7)	50.00	1.5min	-3239.77	1784.87	19.82%	Yes
7 (t'7)	50.00	2.0min	-2351.04	1781.92	19.79%	Yes
7 (t'7)	50.00	2.5min	-1463.97	1775.81	19.72%	Yes
7 (t'7)	50.00	3.0min	-578.18	1772.86	19.69%	Yes
7 (t'7)	50.00	3.5min	321.71	1785.67	19.83%	Yes
7 (t'7)	50.00	4.0min	1212.73	1790.90	19.89%	Yes
7 (t'7)	50.00	4.5min	2104.03	1782.32	19.80%	Yes
7 (t'7)	50.00	5.0min+1s	2996.08	1783.36	19.81%	Yes
Mearsure the time when reach P_{imax}						
Step #	Freq (Hz)	Time after reconnection (min)	Measured active power (W)	ΔP Arise during 1 min (W)	Gradient of charge rate ΔP/t (W/ min)	Limit rate (≤20% P_{nom}) (Yes/No)
7 (t'7)	50.00	5.0min+1s	2996.08	--	--	--
7 (t'7)	50.00	5.5min+1s	3581.95	1171.74	19.53%	Yes

7 (t'7)	50.00	6.0min+1s	4164.50	1168.42	19.47%	Yes
7 (t'7)	50.00	6.5min+1s	4744.95	1163.00	19.38%	Yes
7 (t'7)	50.00	7.0min+1s	5324.76	1160.26	19.34%	Yes
7 (t'7)	50.00	7.5min+1s	5905.22	1160.27	19.34%	Yes
7 (t'7)	50.00	8.0min+1s	5982.41	657.65	10.96%	Yes
7 (t'7)	50.00	8.5min+1s	5982.40	77.19	1.29%	Yes

Supplementary information:



Test Sequence C, P=0% P_{SMAX}, inverter DC input power is set to 0% of maximum active output power first. After the inverter step into frequency range above 50.2Hz, the inverter available input power is set to 100% of maximum active output.

Step #	Expected power (W)	Frequency (Hz)	Measured active power (W)	Δ P(W)	Δ P/Pn(%)	Limit
1 (t'1)	0.00	47.51	-2.40	-2.40	-0.04%	±2.5% Pn
2 (t'2)	0.00	50+0.15	-2.04	-2.04	-0.03%	±2.5% Pn
3 (t'3)	-925.08	50+0.40	-910.73	14.36	0.24%	±2.5% Pn
4 (t'4)	-1848.12	50+0.60	-1877.18	-29.06	-0.48%	±2.5% Pn
5 (t'5)	-5955.65	50+1.49	-5987.19	-31.54	-0.53%	±2.5% Pn
6 (t'6)	-5955.65	50+0.11	-5924.72	30.93	0.52%	±2.5% Pn
7 (t'7)	--	50	See below table	--	--	--
Step #	Freq (Hz)	Time after reconnection (min)	Measured active power (W)	ΔP Arise during 1 min (W)	Gradient of charge rate ΔP/t (W/ min)	Limit rate (≤20% $P_{imax-Pmin}$) (Yes/No)

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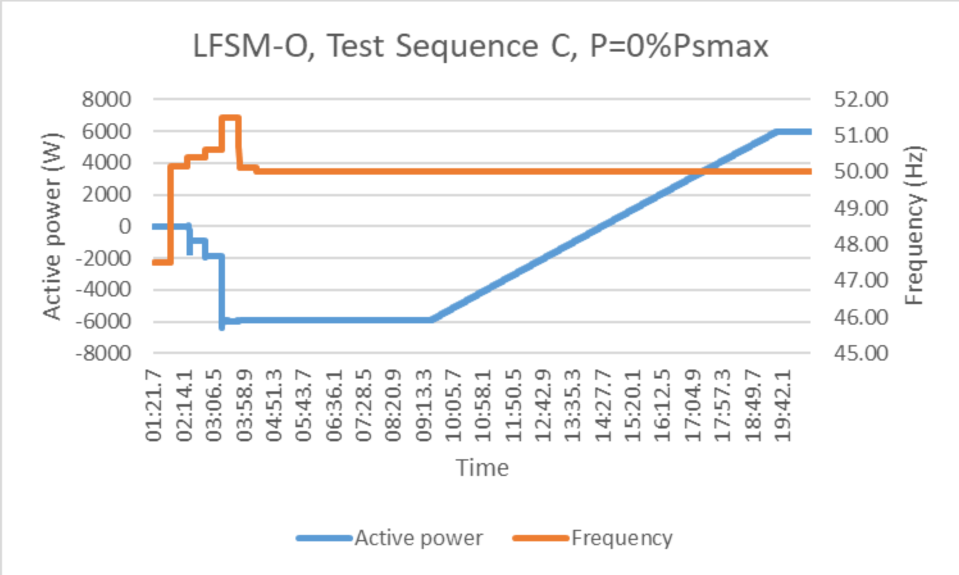
7 (t'7)	50.00	The time that the active power start increases after the frequency change to 50.00Hz (s)				305.3s
After reconnection						
7 (t'7)	50.00	0.0 min	-5922.19	--	--	--
7 (t'7)	50.00	0.5 min	-5322.65	1199.08	19.97%	Yes
7 (t'7)	50.00	1.0 min	-4728.28	1193.91	19.91%	Yes
7 (t'7)	50.00	1.5 min	-4135.31	1187.34	19.80%	Yes
7 (t'7)	50.00	2.0 min	-3541.97	1186.31	19.78%	Yes
7 (t'7)	50.00	2.5 min	-2950.10	1185.21	19.76%	Yes
7 (t'7)	50.00	3.0 min	-2359.16	1182.81	19.72%	Yes
7 (t'7)	50.00	3.5 min	-1771.07	1179.03	19.66%	Yes
7 (t'7)	50.00	4.0 min	-1182.54	1176.62	19.62%	Yes
7 (t'7)	50.00	4.5 min	-594.41	1176.66	19.62%	Yes
7 (t'7)	50.00	5.0 min+1s	-2.31	1180.23	19.68%	Yes
Mearsure the time when reach P_{imax}						
Step #	Freq (Hz)	Time after reconnection (min)	Measured active power (W)	ΔP Arise during 1 min (W)	Gradient of charge rate ΔP/t (W/ min)	Limit rate (≤20% P_{nom}) (Yes/No)
7 (t'7)	50.00	5.0 min+1s	-2.31	--	--	--
7 (t'7)	50.00	5.5 min+1s	589.26	1174.21	19.57%	Yes
7 (t'7)	50.00	6.0 min+1s	1176.70	1179.01	19.65%	Yes
7 (t'7)	50.00	6.5 min+1s	1763.46	1174.21	19.57%	Yes
7 (t'7)	50.00	7.0 min+1s	2349.24	1172.55	19.54%	Yes
7 (t'7)	50.00	7.5 min+1s	2933.85	1170.39	19.51%	Yes
7 (t'7)	50.00	8.0 min+1s	3518.31	1169.07	19.48%	Yes
7 (t'7)	50.00	8.5 min+1s	4101.11	1167.26	19.45%	Yes
7 (t'7)	50.00	9.0 min+1s	4683.07	1164.77	19.41%	Yes
7 (t'7)	50.00	9.5 min+1s	5262.24	1161.13	19.35%	Yes
7 (t'7)	50.00	10.0 min+1s	5843.93	1160.85	19.35%	Yes
7 (t'7)	50.00	10.5 min+1s	5989.87	727.63	12.13%	Yes
7 (t'7)	50.00	11.0 min+1s	5988.76	144.84	2.41%	Yes
Supplementary information:						



Bbis.7.3	**Reduction of active power in case of transients underfrequency on the transmission grid**	P
Model	Tested on X1-H3.68K-S (with 1*battery modules:X1-B5-H), the P_{SMAX} consider as 3000W (Battery supply only), and the P_{CMAX} consider as 3000W in this clause test.	

Test for storage system connected to the bidirectional converters

Under-frequency regulation, with active power reduction frequency start point=49.8Hz, gradient droop s=1.4%(2.6%*(0.7/1.3)), (a gradient of 14.29% of (P_{imax}-P_{imin}) per 0.1 hertz1931.), P_{imin}: active power supplied at the instant of below 49.8 Hz (stored value), Pimax= P_{SMAX}

Test Sequence A, P=50% P_{SMAX}, inverter DC input power is set to 50% of maximum active output power first. After the inverter step into frequency range under 49.8Hz, the inverter available input power is set to 100% of maximum active output.

Step #	Expected power (W)	Frequency (Hz)	Measured active power (W)	Δ P(W)	Δ P/Pn(%)	Limit
1 (t1)	1500.00	51.49	1504.15	4.15	0.11%	±2.5% Pn
2 (t2)	1500.00	49.85	1503.90	3.90	0.11%	±2.5% Pn
3 (t3)	2125.83	49.60	2147.66	21.83	0.59%	±2.5% Pn
4 (t4)	2747.76	49.40	2732.33	-15.43	-0.42%	±2.5% Pn
5 (t5)	3000.00	49.11	3006.76	6.76	0.18%	±2.5% Pn
6 (t6)	3000.00	49.89	3006.87	6.87	0.19%	±2.5% Pn
7 (t7)	--	50.00	See below table	--	--	--

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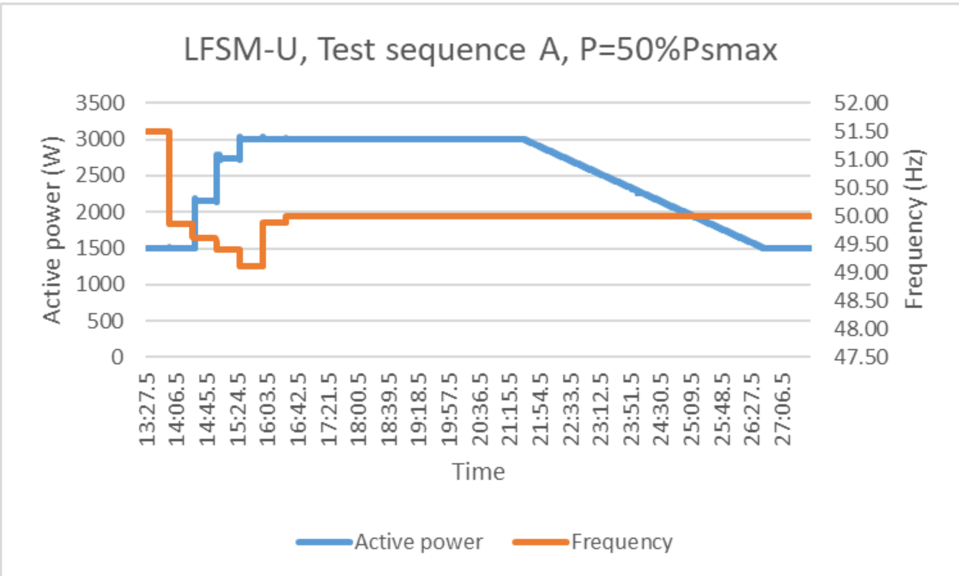
Step #	Freq (Hz)	Time after reconnection (min)	Measured active power (W)	ΔP Arise during 1 min (W)	Gradient of charge rate ΔP/t (W/ min)	Limit rate (≤20% $P_{imax-Pmin}$) /min(Yes/No)
7 (t'7)	50.00	The time that the active power start increases after the frequency change to 50.00Hz (s)				305.2s
After reconnection						
7 (t'7)	50.00	0.0 min	3001.36	--	--	--
7 (t'7)	50.00	0.5 min	2854.22	-294.27	-19.67%	Yes
7 (t'7)	50.00	1.0 min	2709.65	-291.70	-19.50%	Yes
7 (t'7)	50.00	1.5 min	2564.90	-289.32	-19.34%	Yes
7 (t'7)	50.00	2.0 min	2418.46	-291.20	-19.46%	Yes
7 (t'7)	50.00	2.5 min	2275.75	-289.15	-19.33%	Yes
7 (t'7)	50.00	3.0 min	2128.02	-290.44	-19.41%	Yes
7 (t'7)	50.00	3.5 min	1982.21	-293.54	-19.62%	Yes
7 (t'7)	50.00	4.0 min	1838.31	-289.70	-19.36%	Yes
7 (t'7)	50.00	4.5 min	1691.94	-290.27	-19.40%	Yes
7 (t'7)	50.00	5.0 min	1546.53	-291.79	-19.50%	Yes
7 (t'7)	50.00	5.5 min	1502.83	-189.11	-12.64%	Yes
7 (t'7)	50.00	6.0 min	1505.38	-41.14	-2.75%	Yes

Supplementary information:



Test Sequence B, P=0%Psmax, inverter DC input power is set to 0% of maximum active output power first (set the SOC funcation that the battery no discharge). After the inverter step into frequency range under 49.8Hz, the inverter available input power is set to 100% of maximum active output.

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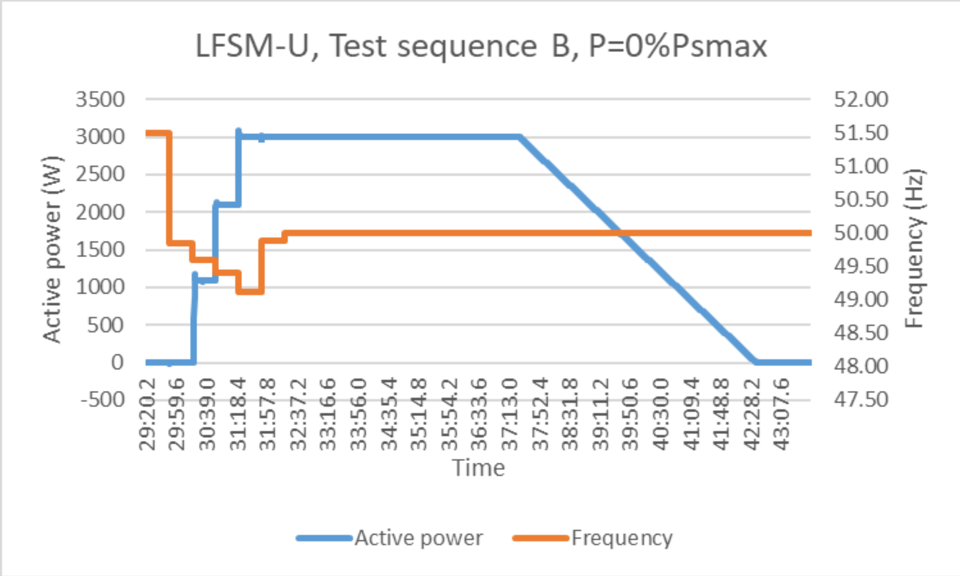
Step #	Expected power (W)	Frequency (Hz)	Measured active power (W)	Δ P(W)	Δ P/Pn(%)	Limit
1 (t1)	0.00	51.49	-1.59	-1.59	-0.04%	±2.5% Pn
2 (t2)	0.00	49.85	-1.69	-1.69	-0.05%	±2.5% Pn
3 (t3)	1050.54	49.60	1085.04	34.50	0.94%	±2.5% Pn
4 (t4)	2102.77	49.40	2093.20	-9.56	-0.26%	±2.5% Pn
5 (t5)	3000.00	49.11	3006.71	6.71	0.18%	±2.5% Pn
6 (t6)	3000.00	49.89	3006.70	6.70	0.18%	±2.5% Pn
7 (t7)	--	50.00	See below table	--	--	--
Step #	Freq (Hz)	Time after reconnection (min)	Measured active power (W)	ΔP Arise during 1 min (W)	Gradient of charge rate ΔP/t (W/ min)	Limit rate (≤20% $P_{imax-Pmin}$) /min(Yes/No)
7 (t'7)	50.00	The time that the active power start increases after the frequency change to 50.00Hz (s)				305.2s
After reconnection						
7 (t'7)	50.00	0.0 min	3006.84	--	--	--
7 (t'7)	50.00	0.5 min	2714.49	-584.71	-19.48%	Yes
7 (t'7)	50.00	1.0 min	2423.80	-583.04	-19.42%	Yes
7 (t'7)	50.00	1.5 min	2134.68	-579.81	-19.32%	Yes
7 (t'7)	50.00	2.0 min	1842.05	-581.75	-19.38%	Yes
7 (t'7)	50.00	2.5 min	1551.37	-583.31	-19.43%	Yes
7 (t'7)	50.00	3.0 min	1260.27	-581.78	-19.38%	Yes
7 (t'7)	50.00	3.5 min	968.06	-583.31	-19.43%	Yes
7 (t'7)	50.00	4.0 min	675.96	-584.31	-19.47%	Yes
7 (t'7)	50.00	4.5 min	385.09	-582.97	-19.42%	Yes
7 (t'7)	50.00	5.0 min	93.18	-582.78	-19.42%	Yes
7 (t'7)	50.00	5.5 min	-2.89	-387.98	-12.93%	Yes
7 (t'7)	50.00	6.0 min	-3.27	-96.45	-3.21%	Yes
Supplementary information:						



Test Sequence C, P=100%P_{CMAX}

Step #	Expected power (W)	Frequency (Hz)	Measured active power (W)	Δ P(W)	Δ P/Pn(%)	Limit
1 (t1)	-3000.00	51.49	-3001.96	-1.96	-0.05%	±2.5% Pn
2 (t2)	-3000.00	49.85	-3001.95	-1.95	-0.05%	±2.5% Pn
3 (t3)	-1092.25	49.60	-1029.75	62.50	1.70%	±2.5% Pn
4 (t4)	817.45	49.40	744.80	-72.65	-1.97%	±2.5% Pn
5 (t5)	3000.00	49.11	3006.82	6.82	0.19%	±2.5% Pn
6 (t6)	3000.00	49.89	3006.94	6.94	0.19%	±2.5% Pn
7 (t7)	--	50.00	See below table	--	--	±2.5% Pn
Step #	Freq (Hz)	Time after reconnection (min)	Measured active power (W)	ΔP Arise during 1 min (W)	Gradient of charge rate ΔP/t (W/ min)	Limit rate (≤20% $P_{imax-Pmin}$) /min(Yes/No)
7 (t'7)	50.00	The time that the active power start increases after the frequency change to 50.00Hz (s)				305.2s
After reconnection						
7 (t'7)	50.00	0.0 min	3006.17	--	--	--
7 (t'7)	50.00	0.5 min	2422.79	-1166.76	-19.44%	Yes
7 (t'7)	50.00	1.0 min	1840.85	-1165.32	-19.42%	Yes
7 (t'7)	50.00	1.5 min	1259.42	-1163.38	-19.38%	Yes
7 (t'7)	50.00	2.0 min	676.18	-1164.67	-19.40%	Yes

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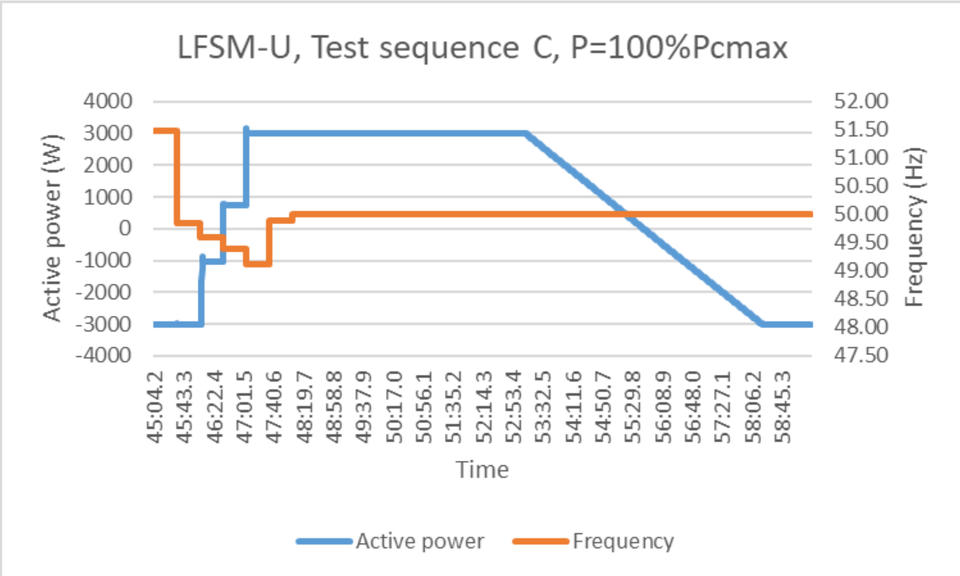
7 (t'7)	50.00	2.5 min	93.98	-1165.44	-19.42%	Yes
7 (t'7)	50.00	3.0 min	-495.56	-1171.74	-19.52%	Yes
7 (t'7)	50.00	3.5 min	-1072.53	-1166.51	-19.44%	Yes
7 (t'7)	50.00	4.0 min	-1650.94	-1155.38	-19.25%	Yes
7 (t'7)	50.00	4.5 min	-2228.38	-1155.84	-19.26%	Yes
7 (t'7)	50.00	5.0 min	-2807.27	-1156.33	-19.27%	Yes
7 (t'7)	50.00	5.5 min	-3002.54	-774.16	-12.90%	Yes
7 (t'7)	50.00	6.0 min	-3001.39	-194.11	-3.23%	Yes

Supplementary information:



Model	Tested on X1-H6K-S (with 1*battery modules:X1-B5-H), the P_{SMAX} consider as 3000W (Battery supply only), and the P_{CMAX} consider as 3000W in this clause test.

Under-frequency regulation, with active power reduction frequency start point=49.8Hz, gradient droop s=1.4%(2.6%*(0.7/1.3)), (a gradient of 14.29% of (P_{imax}-P_{imin}) per 0.1 hertz), P_{imin}: active power supplied at the instant of below 49.8 Hz (stored value), Pimax= P_{SMAX}

Test Sequence A, P=50% P_{SMAX}, inverter DC input power is set to 50% of maximum active output power first. After the inverter step into frequency range under 49.8Hz, the inverter available input power is set to 100% of maximum active output.

Step #	Expected power (W)	Frequency (Hz)	Measured active power (W)	Δ P(W)	Δ P/Pn(%)	Limit
1 (t1)	1500.00	51.49	1504.30	4.30	0.07%	±2.5% Pn
2 (t2)	1500.00	49.85	1504.17	4.17	0.07%	±2.5% Pn
3 (t3)	2789.08	49.60	2777.30	-11.78	-0.20%	±2.5% Pn
4 (t4)	3000.00	49.40	3006.74	6.74	0.11%	±2.5% Pn

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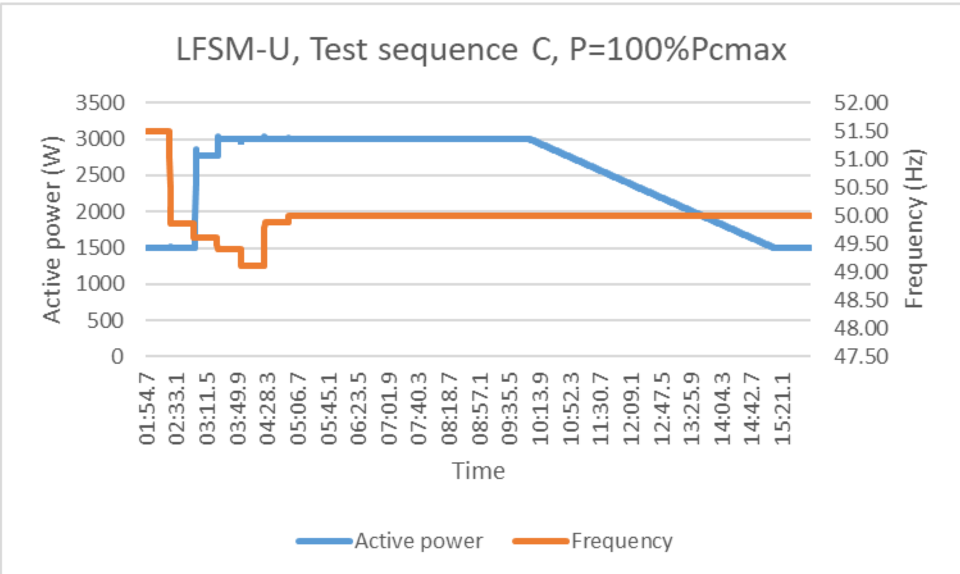
5 (t5)	3000.00	49.11	3006.74	6.74	0.11%	±2.5% Pn
6 (t6)	3000.00	49.89	3006.81	6.81	0.11%	±2.5% Pn
7 (t7)	--	50.00	See below table	--	--	--
Step #	Freq (Hz)	Time after reconnection (min)	Measured active power (W)	ΔP Arise during 1 min (W)	Gradient of charge rate ΔP/t (W/ min)	Limit rate (≤20% $P_{imax-Pmin}$) /min(Yes/No)
7 (t'7)	50.00	The time that the active power start increases after the frequency change to 50.00Hz (s)				305.3s
After reconnection						
7 (t'7)	50.00	0.0 min	3007.60	--	--	--
7 (t'7)	50.00	0.5 min	2860.54	-294.12	-19.66%	Yes
7 (t'7)	50.00	1.0 min	2715.34	-292.25	-19.54%	Yes
7 (t'7)	50.00	1.5 min	2571.57	-288.96	-19.32%	Yes
7 (t'7)	50.00	2.0 min	2424.45	-290.89	-19.45%	Yes
7 (t'7)	50.00	2.5 min	2280.31	-291.27	-19.47%	Yes
7 (t'7)	50.00	3.0 min	2133.95	-290.50	-19.42%	Yes
7 (t'7)	50.00	3.5 min	1988.95	-291.36	-19.48%	Yes
7 (t'7)	50.00	4.0 min	1844.47	-289.48	-19.35%	Yes
7 (t'7)	50.00	4.5 min	1698.00	-290.95	-19.45%	Yes
7 (t'7)	50.00	5.0 min	1553.66	-290.81	-19.44%	Yes
7 (t'7)	50.00	5.5 min	1504.69	-193.31	-12.92%	Yes

Supplementary information:



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Test Sequence B, P=0%Psmax, inverter DC input power is set to 0% of maximum active output power first (set the SOC funcation that the battery no discharge). After the inverter step into frequency range under 49.8Hz, the inverter available input power is set to 100% of maximum active output.						
Step #	Expected power (W)	Frequency (Hz)	Measured active power (W)	Δ P(W)	Δ P/Pn(%)	Limit
1 (t1)	0.00	51.49	-1.33	-1.33	-0.02%	±2.5% Pn
2 (t2)	0.00	49.85	-1.43	-1.43	-0.02%	±2.5% Pn
3 (t3)	1713.78	49.60	1759.13	45.35	0.76%	±2.5% Pn
4 (t4)	3000.00	49.40	3006.92	6.92	0.12%	±2.5% Pn
5 (t5)	3000.00	49.11	3006.99	6.99	0.12%	±2.5% Pn
6 (t6)	3000.00	49.89	3007.18	7.18	0.12%	±2.5% Pn
7 (t7)	--	50.00	See below table	--	--	--
Step #	Freq (Hz)	Time after reconnection (min)	Measured active power (W)	ΔP Arise during 1 min (W)	Gradient of charge rate ΔP/t (W/ min)	Limit rate (≤20% $P_{imax-Pmin}$) /min(Yes/No)
7 (t’7)	50.00	The time that the active power start increases after the frequency change to 50.00Hz (s)				306.7s
After reconnection						
7 (t’7)	50.00	0.0 min	3006.07	--	--	--
7 (t’7)	50.00	0.5 min	2716.13	-579.87	-19.32%	Yes
7 (t’7)	50.00	1.0 min	2425.27	-580.81	-19.35%	Yes
7 (t’7)	50.00	1.5 min	2133.05	-583.09	-19.43%	Yes
7 (t’7)	50.00	2.0 min	1843.85	-581.41	-19.37%	Yes
7 (t’7)	50.00	2.5 min	1551.75	-581.30	-19.37%	Yes
7 (t’7)	50.00	3.0 min	1260.38	-583.47	-19.44%	Yes
7 (t’7)	50.00	3.5 min	967.87	-583.88	-19.45%	Yes
7 (t’7)	50.00	4.0 min	676.84	-583.55	-19.44%	Yes
7 (t’7)	50.00	4.5 min	385.87	-582.00	-19.39%	Yes
7 (t’7)	50.00	5.0 min	94.67	-582.17	-19.40%	Yes
7 (t’7)	50.00	5.5 min	-1.60	-387.47	-12.91%	Yes
7 (t’7)	50.00	6.0 min	-2.40	-97.07	-3.23%	Yes
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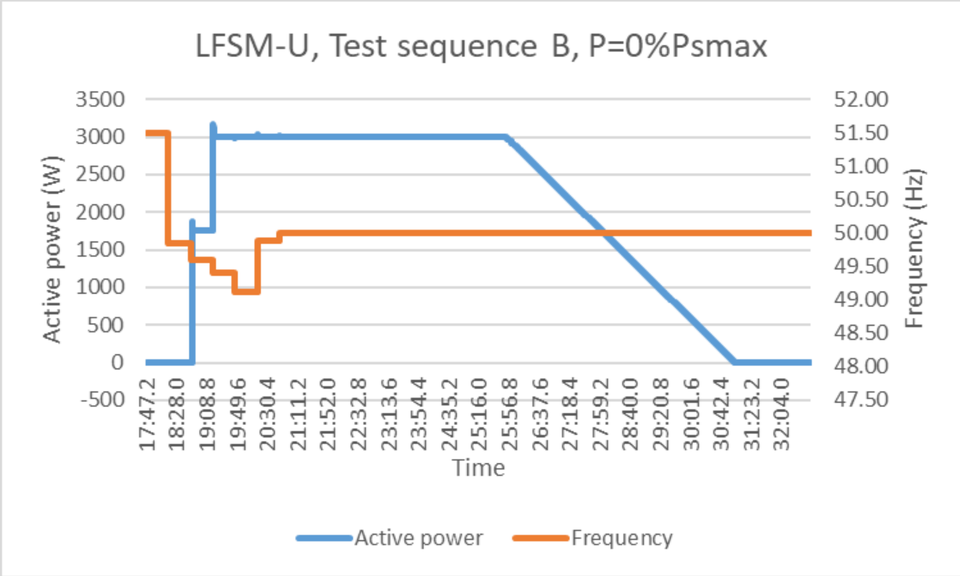

Test Sequence C, P=100%P_{CMAX}

Step #	Expected power (W)	Frequency (Hz)	Measured active power (W)	Δ P(W)	Δ P/Pn(%)	Limit
1 (t1)	-3000.00	51.49	-3001.29	-1.29	-0.02%	±2.5% Pn
2 (t2)	-3000.00	49.85	-3001.86	-1.86	-0.03%	±2.5% Pn
3 (t3)	-429.13	49.60	-400.38	28.75	0.48%	±2.5% Pn
4 (t4)	2143.60	49.40	2083.64	-59.96	-1.00%	±2.5% Pn
5 (t5)	3000.00	49.11	3006.04	6.04	0.10%	±2.5% Pn
6 (t6)	3000.00	49.89	3006.04	6.04	0.10%	±2.5% Pn
7 (t7)	--	50.00	See below table	--	--	±2.5% Pn

Step #	Freq (Hz)	Time after reconnection (min)	Measured active power (W)	ΔP Arise during 1 min (W)	Gradient of charge rate ΔP/t (W/ min)	Limit rate (≤20% $P_{imax-Pmin}$) /min(Yes/No)
7 (t'7)	50.00	The time that the active power start increases after the frequency change to 50.00Hz (s)				304.8s
After reconnection						
7 (t'7)	50.00	0.0 min	3006.19	--	--	--
7 (t'7)	50.00	0.5 min	2423.92	-1164.54	-19.40%	Yes
7 (t'7)	50.00	1.0 min	1842.42	-1163.77	-19.39%	Yes
7 (t'7)	50.00	1.5 min	1261.79	-1162.13	-19.36%	Yes
7 (t'7)	50.00	2.0 min	677.63	-1164.80	-19.41%	Yes

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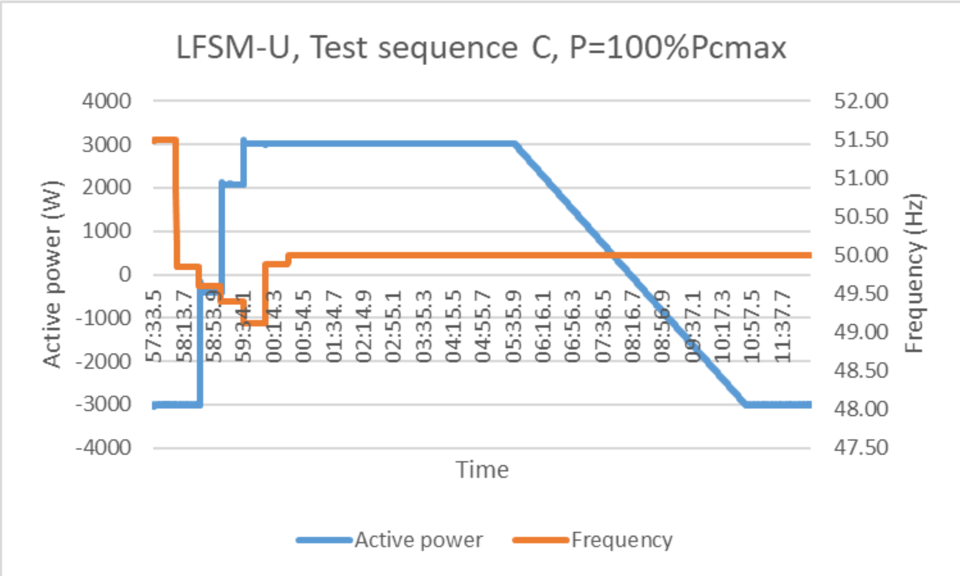
7 (t'7)	50.00	2.5 min	94.90	-1166.88	-19.44%	Yes
7 (t'7)	50.00	3.0 min	-493.60	-1171.23	-19.51%	Yes
7 (t'7)	50.00	3.5 min	-1070.32	-1165.22	-19.41%	Yes
7 (t'7)	50.00	4.0 min	-1649.48	-1155.88	-19.26%	Yes
7 (t'7)	50.00	4.5 min	-2228.27	-1157.95	-19.29%	Yes
7 (t'7)	50.00	5.0 min	-2806.65	-1157.17	-19.28%	Yes
7 (t'7)	50.00	5.5 min	-3002.13	-773.86	-12.89%	Yes
7 (t'7)	50.00	6.0 min	-3001.388	-194.74	-3.24%	Yes

Supplementary information:



Model	Tested on X1-H6K-S (with 6*battery modules:X1-B30-HC), the P_{SMAX} consider as 6000W (Battery supply only), and the P_{CMAX} consider as 6000W in this clause test.

Test for storage system connected to the bidirectional converters

Under-frequency regulation, with active power reduction frequency start point=49.8Hz, gradient droop s=1.4%(2.6%*(0.7/1.3)), (a gradient of 14.29% of (P_{imax}-P_{imin}) per 0.1 hertz), P_{imin}: active power supplied at the instant of below 49.8 Hz (stored value), Pimax= P_{SMAX}

Test Sequence A, P=50% P_{SMAX}, inverter DC input power is set to 50% of maximum active output power first. After the inverter step into frequency range under 49.8Hz, the inverter available input power is set to 100% of maximum active output.

Step #	Expected power (W)	Frequency (Hz)	Measured active power (W)	Δ P(W)	Δ P/Pn(%)	Limit
1 (t1)	3000.00	51.49	3006.87	6.87	0.11%	±2.5% Pn
2 (t2)	3000.00	49.85	3006.47	6.47	0.11%	±2.5% Pn
3 (t3)	3862.02	49.60	3872.55	10.53	0.18%	±2.5% Pn

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4 (t4)	4717.57	49.40	4707.80	-9.77	-0.16%	±2.5% Pn
5 (t5)	5958.12	49.11	5962.33	4.21	0.07%	±2.5% Pn
6 (t6)	5958.12	49.89	5964.80	6.68	0.11%	±2.5% Pn
7 (t7)	--	50.00	See below table	--	--	--
Step #	Freq (Hz)	Time after reconnection (min)	Measured active power (W)	ΔP Arise during 1 min (W)	Gradient of charge rate ΔP/t (W/ min)	Limit rate (≤20% $P_{imax-Pmin}$) /min(Yes/No)
7 (t'7)	50.00	The time that the active power start increases after the frequency change to 50.00Hz (s)				305.4s
After reconnection						
7 (t'7)	50.00	0.0 min	5963.11	--	--	--
7 (t'7)	50.00	0.5 min	5675.41	-575.41	-19.22%	Yes
7 (t'7)	50.00	1.0 min	5391.15	-571.96	-19.11%	Yes
7 (t'7)	50.00	1.5 min	5104.71	-570.69	-19.06%	Yes
7 (t'7)	50.00	2.0 min	4819.53	-571.62	-19.10%	Yes
7 (t'7)	50.00	2.5 min	4533.62	-571.10	-19.08%	Yes
7 (t'7)	50.00	3.0 min	4248.69	-570.84	-19.07%	Yes
7 (t'7)	50.00	3.5 min	3959.00	-574.62	-19.20%	Yes
7 (t'7)	50.00	4.0 min	3673.42	-575.27	-19.22%	Yes
7 (t'7)	50.00	4.5 min	3385.97	-573.03	-19.14%	Yes
7 (t'7)	50.00	5.0 min	3099.01	-574.41	-19.19%	Yes
7 (t'7)	50.00	5.5 min	3006.63	-379.34	-12.67%	Yes
7 (t'7)	50.00	6.0 min	3007.01	-92.00	-3.07%	Yes
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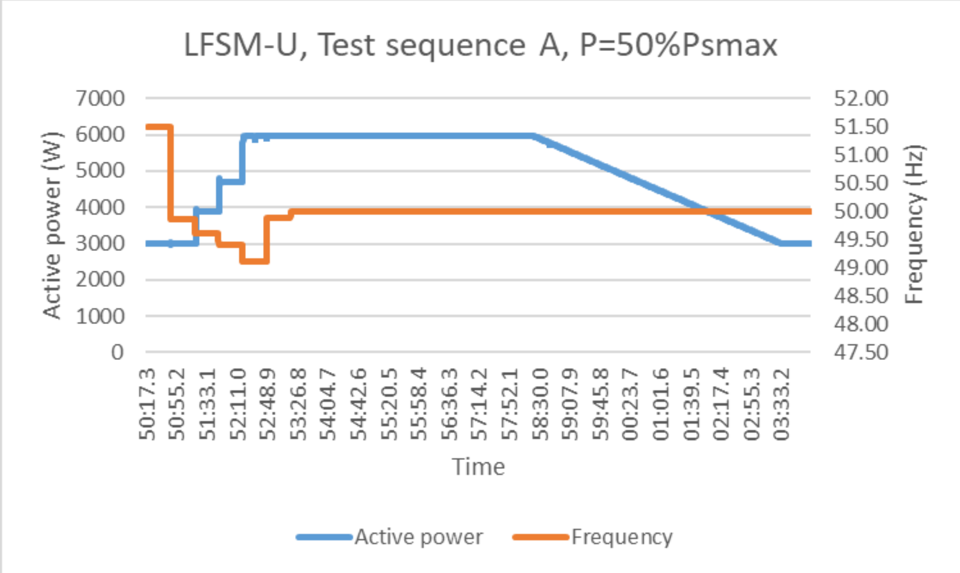

Test Sequence B, P=0%Psmax, inverter DC input power is set to 0% of maximum active output power first (set the SOC funcation that the battery no discharge). After the inverter step into frequency range under 49.8Hz, the inverter available input power is set to 100% of maximum active output.

Step #	Expected power (W)	Frequency (Hz)	Measured active power (W)	Δ P(W)	Δ P/Pn(%)	Limit
1 (t1)	0.00	51.49	-3.39	-3.39	-0.06%	±2.5% Pn
2 (t2)	0.00	49.85	-0.78	-0.78	-0.01%	±2.5% Pn
3 (t3)	1714.24	49.60	1717.84	3.60	0.06%	±2.5% Pn
4 (t4)	3429.26	49.40	3414.23	-15.03	-0.25%	±2.5% Pn
5 (t5)	5916.05	49.11	5930.33	14.28	0.24%	±2.5% Pn
6 (t6)	5916.05	49.89	5930.42	14.37	0.24%	±2.5% Pn
7 (t7)	--	50.00	See below table	--	--	--
Step #	Freq (Hz)	Time after reconnection (min)	Measured active power (W)	ΔP Arise during 1 min (W)	Gradient of charge rate ΔP/t (W/ min)	Limit rate (≤20% $P_{imax-Pmin}$) /min(Yes/No)
7 (t'7)	50.00	The time that the active power start increases after the frequency change to 50.00Hz (s)				305.1s
After reconnection						
7 (t'7)	50.00	0.0 min	5929.45	--	--	--
7 (t'7)	50.00	0.5 min	5363.16	-1132.57	-18.87%	Yes
7 (t'7)	50.00	1.0 min	4791.55	-1137.90	-18.96%	Yes
7 (t'7)	50.00	1.5 min	4219.21	-1143.96	-19.06%	Yes

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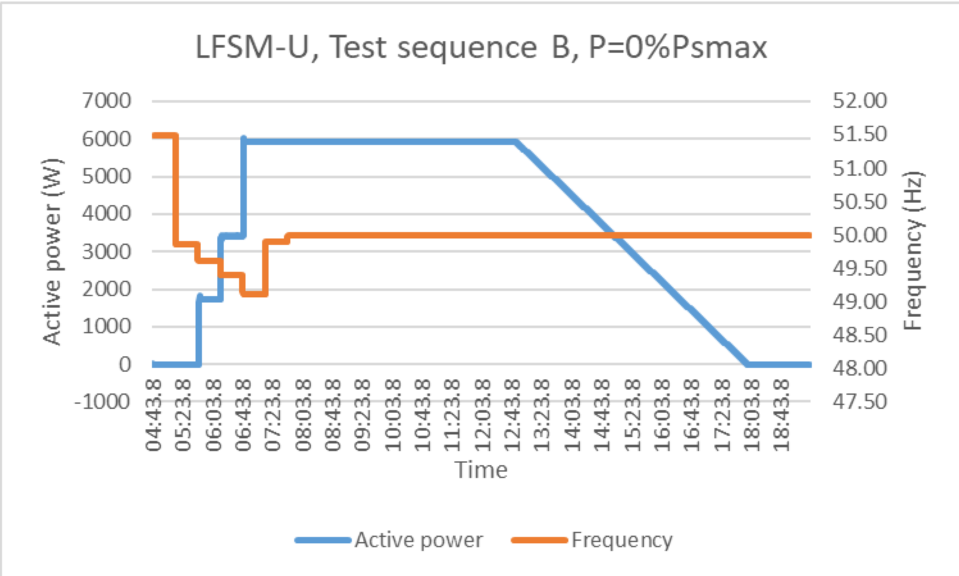
7 (t'7)	50.00	2.0 min	3646.79	-1144.76	-19.08%	Yes
7 (t'7)	50.00	2.5 min	3073.16	-1146.05	-19.10%	Yes
7 (t'7)	50.00	3.0 min	2498.40	-1148.39	-19.14%	Yes
7 (t'7)	50.00	3.5 min	1923.70	-1149.46	-19.16%	Yes
7 (t'7)	50.00	4.0 min	1345.74	-1152.66	-19.21%	Yes
7 (t'7)	50.00	4.5 min	768.98	-1154.72	-19.24%	Yes
7 (t'7)	50.00	5.0 min	193.45	-1152.30	-19.20%	Yes
7 (t'7)	50.00	5.5 min	-1.35	-770.33	-12.84%	Yes
7 (t'7)	50.00	6.0 min	-1.26	-194.71	-3.24%	Yes

Supplementary information:

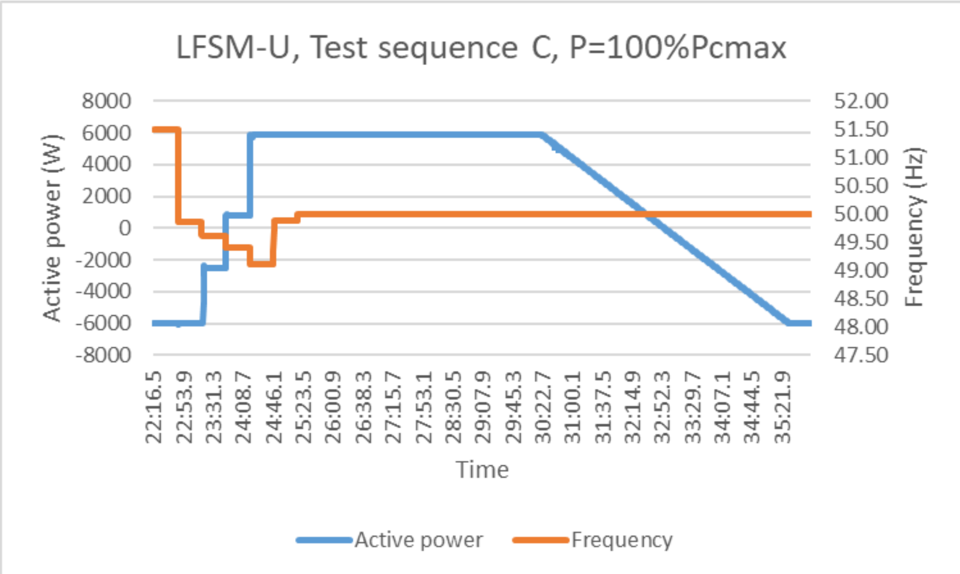


Test Sequence C, P=100%P_{CMAX}

Step #	Expected power (W)	Frequency (Hz)	Measured active power (W)	Δ P(W)	Δ P/Pn(%)	Limit
1 (t1)	-6000.00	51.49	-6014.74	-14.74	-0.25%	±2.5% Pn
2 (t2)	-6000.00	49.85	-6014.64	-14.64	-0.24%	±2.5% Pn
3 (t3)	-2580.86	49.60	-2514.16	66.70	1.11%	±2.5% Pn
4 (t4)	852.93	49.40	799.68	-53.25	-0.89%	±2.5% Pn
5 (t5)	5831.92	49.11	5874.46	42.55	0.71%	±2.5% Pn
6 (t6)	5831.92	49.89	5874.95	43.03	0.72%	±2.5% Pn
7 (t7)	--	50.00	See below table	--	--	--

Step #	Freq (Hz)	Time after reconnection (min)	Measured active power (W)	ΔP Arise during 1 min (W)	Gradient of charge rate ΔP/t (W/ min)	Limit rate (≤20% $P_{imax-Pmin}$) /min(Yes/No)
7 (t'7)	50.00	The time that the active power start increases after the frequency change to 50.00Hz (s)				305.0s
After reconnection						
7 (t'7)	50.00	0.0 min	5881.90	--	--	--
7 (t'7)	50.00	0.5 min	4767.29	-2009.00	-18.55%	Yes
7 (t'7)	50.00	1.0 min	3616.79	-2030.40	-18.85%	Yes
7 (t'7)	50.00	1.5 min	2465.25	-2032.60	-19.17%	Yes
7 (t'7)	50.00	2.0 min	1313.52	-2063.20	-19.17%	Yes
7 (t'7)	50.00	2.5 min	159.04	-2070.80	-19.22%	Yes
7 (t'7)	50.00	3.0 min	-996.45	-1966.40	-19.23%	Yes
7 (t'7)	50.00	3.5 min	-2141.98	-2045.40	-19.07%	Yes
7 (t'7)	50.00	4.0 min	-3289.52	-2106.80	-19.09%	Yes
7 (t'7)	50.00	4.5 min	-4443.12	-2138.80	-19.20%	Yes
7 (t'7)	50.00	5.0 min	-5598.08	-2152.00	-19.21%	Yes
7 (t'7)	50.00	5.5 min	-6014.38	-2171.00	-6.93%	Yes
7 (t'7)	50.00	6.0 min	-6014.03	-788.20	0.01%	Yes

Supplementary information:



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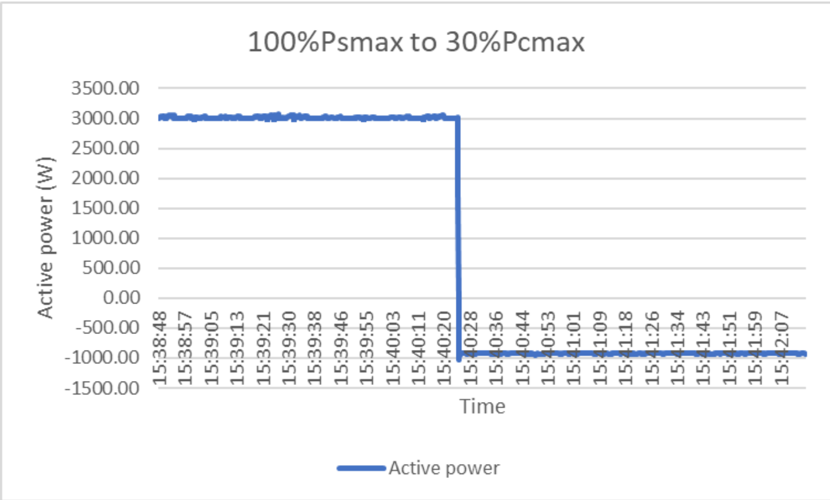
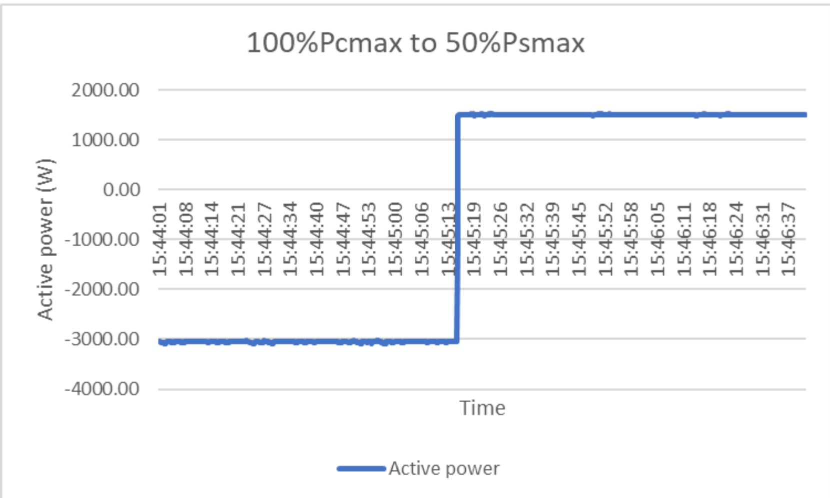
Bbis.7.4	Active Power Limitation upon external command from Distributor				P
Model	Tested on X1-H3.68K-S (with 1*battery modules:X1-B5-H), the P_{SMAX} consider as 3000W (Battery supply only), and the P_{CMAX} consider as 3000W in this clause test.				
Set-point P/Pn [%]	Set-point P [W]	Measured P [W]	Accuracy[%Pn]	Settling time (s)	Limit (< 50s) Yes/No
100% P_{SMAX}	3000	3010.54	0.29%	--	--
30% P_{CMAX}	-900	-923.21	-0.63%	1.1	Yes



Set-point P/Pn [%]	Set-point P [W]	Measured P [W]	Accuracy[%Pn]	Settling time (s)	Limit (< 50s) Yes/No
100% P_{CMAX}	-3000	-3047.01	-1.28%	--	--
50% P_{SMAX}	1500	1499.41	-0.02%	0.4	Yes



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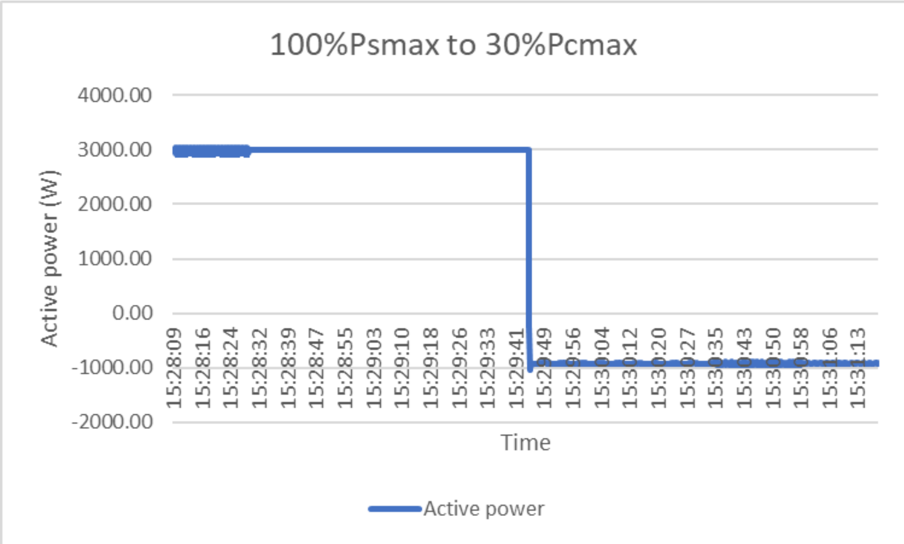
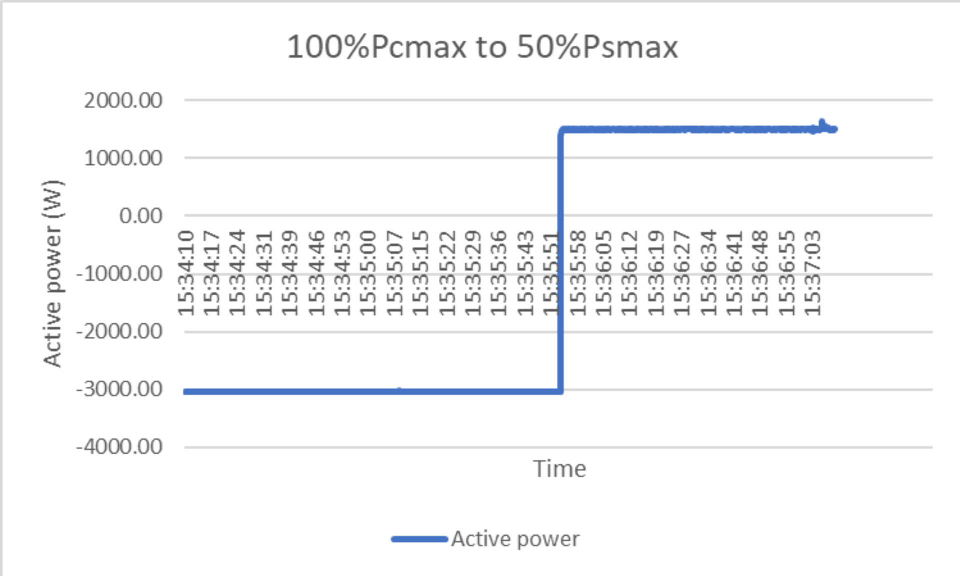
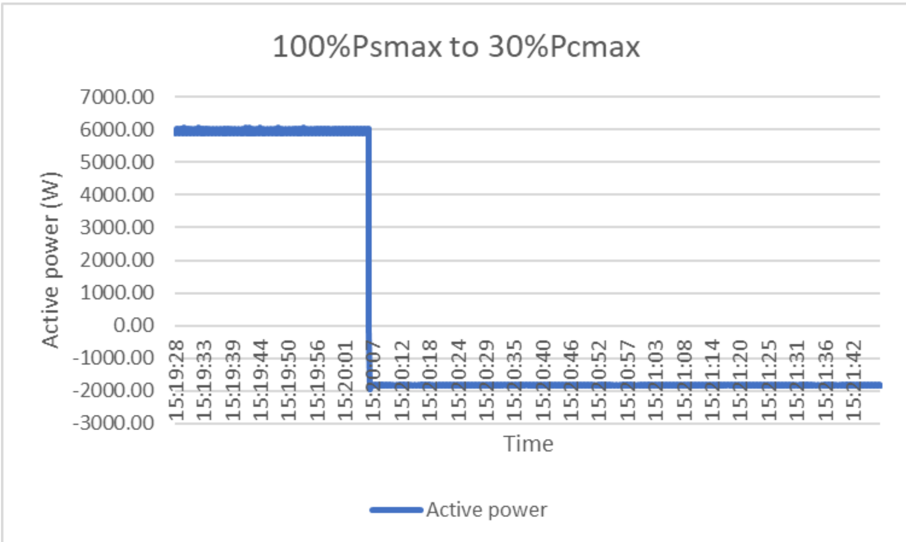
Model	Tested on X1-H6K-S (with 1*battery modules:X1-B5-H), the P_{SMAX} consider as 3000W (Battery supply only), and the P_{CMAX} consider as 3000W in this clause test.				
Set-point P/Pn [%]	Set-point P [W]	Measured P [W]	Accuracy[%Pn]	Settling time (s)	Limit (< 50s) Yes/No
100% P_{SMAX}	3000	2993.12	-0.19%	--	--
30% P_{CMAX}	-900	-919.03	-0.52%	0.8	Yes



Set-point P/Pn [%]	Set-point P [W]	Measured P [W]	Accuracy[%Pn]	Settling time (s)	Limit (< 50s) Yes/No
100% P_{CMAX}	-3000	-3031.70	-0.86%	--	--
50% P_{SMAX}	1500	1504.10	0.11%	0.4	Yes



Model	Tested on X1-H6K-S (with 6*battery modules:X1-B30-HC), the P_{SMAX} consider as 6000W (Battery supply only), and the P_{CMAX} consider as 6000W in this clause test.				
Set-point P/Pn [%]	Set-point P [W]	Measured P [W]	Accuracy[%Pn]	Settling time (s)	Limit (< 50s) Yes/No
100% P_{SMAX}	6000	5970.12	-0.81%	--	--
30% P_{CMAX}	-1800	-1827.87	-0.76%	0.7	Yes



Set-point P/Pn [%]	Set-point P [W]	Measured P [W]	Accuracy[%Pn]	Settling time (s)	Limit (< 50s) Yes/No
100% P_{CMAX}	-6000	-6100.11	-2.72%	--	--

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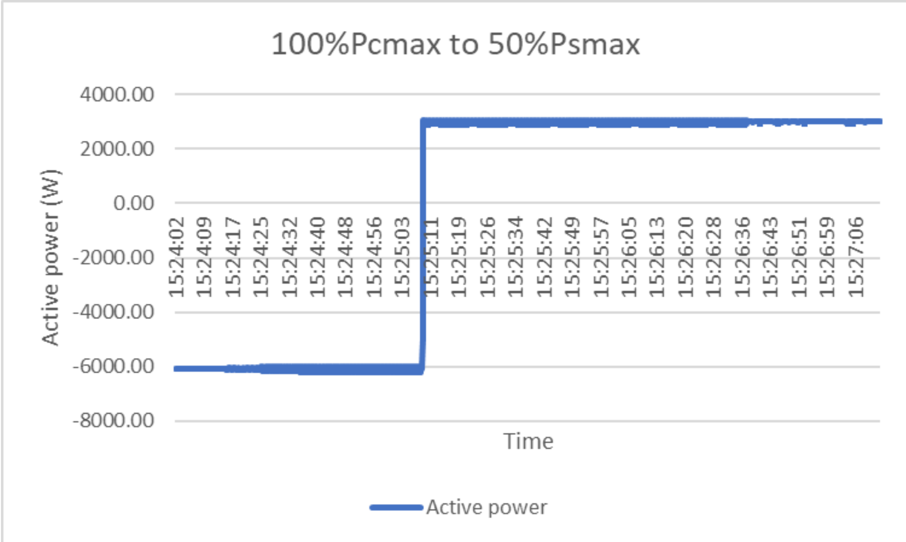
50% P_{SMAX}	3000	2991.10	-0.24%	0.4	Yes



Bbis.8.1	**Verification of emission of a DC component**	P

Model	Tested on X1-H3.68K-S (with 1*battery modules:X1-B5-H), the P_{SMAX} consider as 3000W (Battery supply only), and the P_{CMAX} consider as 3000W in this clause test.

Test in discharge mode

Test is performed at an ambient temperature of 25±5°C

Power level P/P_{SMAX}(%)	Watt	Vrms	Arms	PF	Cos φ	DC(mA)	DC(%)	limit
33 ± 5%	1098.01	230.80	4.84	0.983 ind	0.983 ind	9.53	0.06	0.5%Ir
66 ± 5%	2022.70	230.70	9.05	0.969 ind	0.969 ind	7.75	0.05	0.5%Ir
100 ± 5%	3045.91	230.41	13.41	0.986 ind	0.986 ind	7.14	0.04	0.5%Ir

Test is performed at an ambient temperature of -25±2°C

Power level P/P_{SMAX}(%)	Watt	Vrms	Arms	PF	Cos φ	DC(mA)	DC(%)	limit
33 ± 5%	1105.70	230.18	4.91	0.978 ind	0.978 ind	1.98	0.02	0.5%Ir
66 ± 5%	1986.43	230.01	8.86	0.975 ind	0.975 ind	22.00	0.17	0.5%Ir
100 ± 5%	3004.58	230.04	13.21	0.989 ind	0.989 ind	10.42	0.07	0.5%Ir

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Test is performed at an ambient temperature of 60±2°C								
Power level P/P_{SMAX}(%)	Watt	Vrms	Arms	PF	Cos φ	DC(mA)	DC(%)	limit
33 ± 5%	1105.22	230.19	4.90	0.980 ind	0.980 ind	7.59	0.06	0.5%Ir
66 ± 5%	1986.39	230.02	8.85	0.976 ind	0.976 ind	55.01	0.34	0.5%Ir
100 ± 5%	3004.47	230.07	13.20	0.990 ind	0.990 ind	47.43	0.30	0.5%Ir
Test in charge mode								
Test is performed at an ambient temperature of 25±5°C								
Power level P/P_{CMAX}(%)	Watt	Vrms	Arms	PF	Cos φ	DC(mA)	DC(%)	limit
33 ± 5%	-1190.97	229.87	5.26	0.985 ind	0.985 ind	6.88	0.04	0.5%Ir
66 ± 5%	-2095.28	230.37	9.44	0.963 ind	0.963 ind	1.00	0.01	0.5%Ir
100 ± 5%	-3105.90	229.89	13.74	0.983 ind	0.983 ind	1.27	0.01	0.5%Ir
Test is performed at an ambient temperature of -25±2°C								
Power level P/P_{CMAX}(%)	Watt	Vrms	Arms	PF	Cos φ	DC(mA)	DC(%)	limit
33 ± 5%	-1112.28	229.83	5.01	0.967 ind	0.967 ind	3.33	0.02	0.5%Ir
66 ± 5%	-1987.80	229.86	8.90	0.971 ind	0.971 ind	15.35	0.10	0.5%Ir
100 ± 5%	-3003.96	229.82	13.25	0.987 ind	0.987 ind	10.20	0.06	0.5%Ir
Test is performed at an ambient temperature of 60±2°C								
Power level P/P_{CMAX}(%)	Watt	Vrms	Arms	PF	Cos φ	DC(mA)	DC(%)	limit
33 ± 5%	-1112.33	229.82	5.01	0.967 ind	0.967 ind	1.27	0.01	0.5%Ir
66 ± 5%	-1987.21	229.85	8.89	0.972 ind	0.972 ind	45.15	0.28	0.5%Ir
100 ± 5%	-3003.99	229.81	13.24	0.987 ind	0.987 ind	42.77	0.27	0.5%Ir

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Model	Tested on X1-H6K-S (with 1*battery modules:X1-B5-H), the P_{SMAX} consider as 3000W (Battery supply only), and the P_{CMAX} consider as 3000W in this clause test.							
Test in discharge mode								
Test is performed at an ambient temperature of 25±5°C								
Power level P/P_{SMAX}(%)	Watt	Vrms	Arms	PF	Cos φ	DC(mA)	DC(%)	limit
33 ± 5%	1086.17	229.58	4.80	0.985 ind	0.985 ind	7.15	0.03	0.5%Ir
66 ± 5%	2002.22	229.59	9.00	0.969 ind	0.969 ind	9.64	0.04	0.5%Ir
100 ± 5%	3038.77	230.17	13.40	0.986 ind	0.986 ind	8.48	0.03	0.5%Ir
Test is performed at an ambient temperature of -25±2°C								
Power level P/P_{SMAX}(%)	Watt	Vrms	Arms	PF	Cos φ	DC(mA)	DC(%)	limit
33 ± 5%	1105.80	230.18	4.91	0.978 ind	0.978 ind	1.44	0.01	0.5%Ir
66 ± 5%	1986.79	230.01	8.86	0.975 ind	0.975 ind	13.04	0.05	0.5%Ir
100 ± 5%	3003.77	230.04	13.20	0.989 ind	0.989 ind	9.67	0.04	0.5%Ir
Test is performed at an ambient temperature of 60±2°C								
Power level P/P_{SMAX}(%)	Watt	Vrms	Arms	PF	Cos φ	DC(mA)	DC(%)	limit
33 ± 5%	1105.15	230.19	4.90	0.980 ind	0.980 ind	7.69	0.03	0.5%Ir
66 ± 5%	1986.35	230.02	8.85	0.976 ind	0.976 ind	56.86	0.22	0.5%Ir
100 ± 5%	3003.58	230.06	13.19	0.990 ind	0.990 ind	47.08	0.18	0.5%Ir
Test in charge mode								
Test is performed at an ambient temperature of 25±5°C								
Power level P/P_{CMAX}(%)	Watt	Vrms	Arms	PF	Cos φ	DC(mA)	DC(%)	limit
33 ± 5%	-1190.62	229.83	5.23	0.990 ind	0.990 ind	7.49	0.03	0.5%Ir

66 ± 5%	-2071.65	229.11	9.37	0.965 ind	0.965 ind	5.52	0.02	0.5%Ir
100 ± 5%	-3072.20	228.65	13.69	0.981 ind	0.981 ind	1.11	0.00	0.5%Ir
Test is performed at an ambient temperature of -25±2°C								
Power level P/P_{CMAX}(%)	Watt	Vrms	Arms	PF	Cos φ	DC(mA)	DC(%)	limit
33 ± 5%	-1112.35	229.83	5.01	0.967 ind	0.967 ind	3.64	0.01	0.5%Ir
66 ± 5%	-1987.72	229.86	8.90	0.971 ind	0.971 ind	11.89	0.05	0.5%Ir
100 ± 5%	-3004.22	229.82	13.25	0.987 ind	0.987 ind	11.79	0.05	0.5%Ir
Test is performed at an ambient temperature of 60±2°C								
Power level P/P_{CMAX}(%)	Watt	Vrms	Arms	PF	Cos φ	DC(mA)	DC(%)	limit
33 ± 5%	-1112.27	229.82	5.01	0.967 ind	0.967 ind	4.28	0.02	0.5%Ir
66 ± 5%	-1987.27	229.85	8.89	0.972 ind	0.972 ind	45.17	0.17	0.5%Ir
100 ± 5%	-3004.01	229.80	13.24	0.987 ind	0.987 ind	42.41	0.16	0.5%Ir
Model	Tested on X1-H6K-S (with 6*battery modules:X1-B30-HC), the P_{SMAX} consider as 6000W (Battery supply only), and the P_{CMAX} consider as 6000W in this clause test.							
Test in discharge mode								
Test is performed at an ambient temperature of 25±5°C								
Power level P/P_{SMAX}(%)	Watt	Vrms	Arms	PF	Cos φ	DC(mA)	DC(%)	limit
33 ± 5%	2033.28	231.20	9.08	0.968 ind	0.968 ind	5.55	0.02	0.5%Ir
66 ± 5%	4106.71	231.50	17.89	0.991 ind	0.991 ind	7.39	0.03	0.5%Ir
100 ± 5%	6053.93	231.60	26.24	0.995 ind	0.995 ind	25.6	0.10	0.5%Ir
Test is performed at an ambient temperature of -25±2°C								
Power level P/P_{SMAX}(%)	Watt	Vrms	Arms	PF	Cos φ	DC(mA)	DC(%)	limit

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33 ± 5%	1987.58	230.00	8.85	0.975 ind	0.975 ind	11.22	0.04	0.5%Ir
66 ± 5%	3986.94	230.10	17.43	0.994 ind	0.994 ind	12.77	0.05	0.5%Ir
100 ± 5%	6004.38	230.20	26.15	0.997 ind	0.997 ind	14.68	0.06	0.5%Ir
Test is performed at an ambient temperature of 60±2°C								
Power level P/P_{SMAX}(%)	Watt	Vrms	Arms	PF	Cos φ	DC(mA)	DC(%)	limit
33 ± 5%	1985.45	230.00	8.84	0.976 ind	0.976 ind	68.52	0.26	0.5%Ir
66 ± 5%	3963.11	230.10	17.33	0.994 ind	0.994 ind	76.76	0.30	0.5%Ir
100 ± 5%	6003.18	230.20	26.15	0.997 ind	0.997 ind	80.52	0.31	0.5%Ir
Test in charge mode								
Test is performed at an ambient temperature of 25±5°C								
Power level P/P_{CMAX}(%)	Watt	Vrms	Arms	PF	Cos φ	DC(mA)	DC(%)	limit
33 ± 5%	-2081.24	229.80	9.4	-0.964 ind	-0.964 ind	12.02	0.05	0.5%Ir
66 ± 5%	-4086.82	228.80	18.09	-0.988 ind	-0.988 ind	22.62	0.09	0.5%Ir
100 ± 5%	-6027.83	228.70	26.58	-0.993 ind	-0.993 ind	48.86	0.19	0.5%Ir
Test is performed at an ambient temperature of -25±2°C								
Power level P/P_{CMAX}(%)	Watt	Vrms	Arms	PF	Cos φ	DC(mA)	DC(%)	limit
33 ± 5%	-1984.93	229.90	8.9	-0.971 ind	-0.971 ind	9.00	0.03	0.5%Ir
66 ± 5%	-3959.78	229.80	17.38	-0.992 ind	-0.992 ind	9.66	0.04	0.5%Ir
100 ± 5%	-6019.75	229.70	26.22	-0.996 ind	-0.996 ind	14.15	0.05	0.5%Ir
Test is performed at an ambient temperature of 60±2°C								
Power level P/P_{CMAX}(%)	Watt	Vrms	Arms	PF	Cos φ	DC(mA)	DC(%)	limit

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33 ± 5%	-1973.39	229.80	8.89	-0.972 ind	-0.972 ind	59.23	0.23	0.5%Ir
66 ± 5%	-3962.13	229.60	17.48	-0.988 ind	-0.988 ind	16.87	0.06	0.5%Ir
100 ± 5%	-6000.73	229.70	26.24	-0.996 ind	-0.996 ind	9.88	0.04	0.5%Ir

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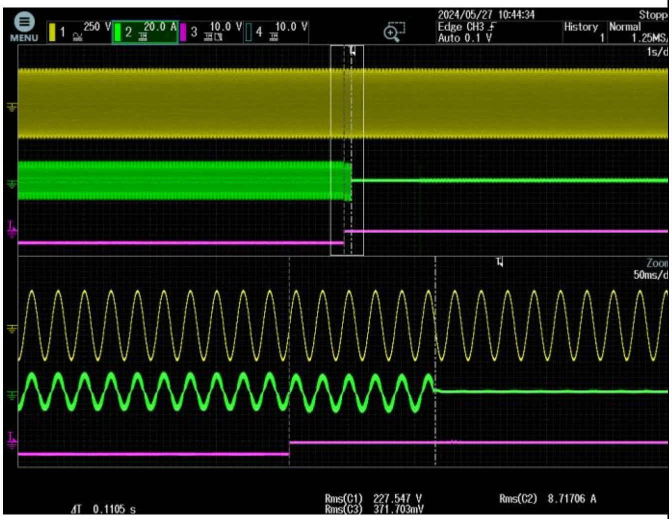
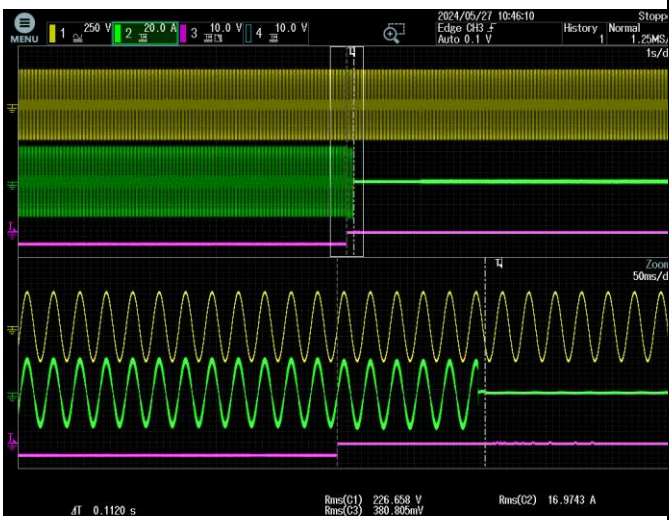
Bbis.8.2	Verification of protections to prevent the injection of a DC component	P
Model	Tested on X1-H6K-S (with 6*battery modules:X1-B30-HC), the P_{SMAX} consider as 6000W (Battery supply only), and the P_{CMAX} consider as 6000W in this clause test.	

Test in discharge mode

Test is performed at an ambient temperature of 25±5°C

Phase	Power level P/P_{SMAX}(%)	DC component	Tripping time (s)	Required tripping time	Oscilloscope waveform
L1	33 ± 5%	+1 A	0.111	0.2 s	
L1	66 ± 5%	+1 A	0.112	0.2 s	

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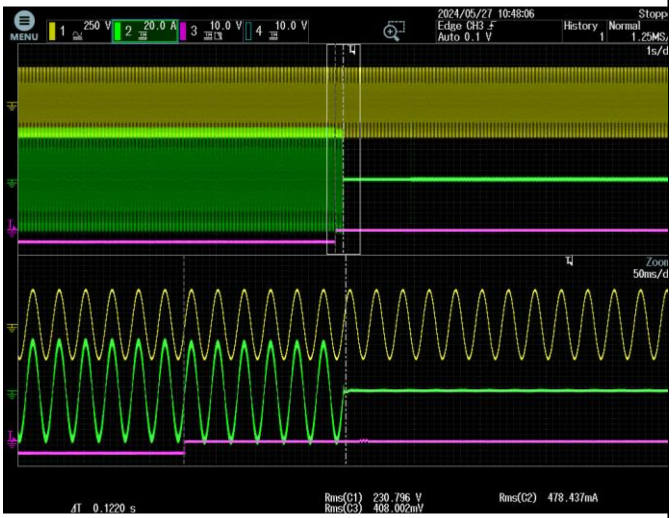
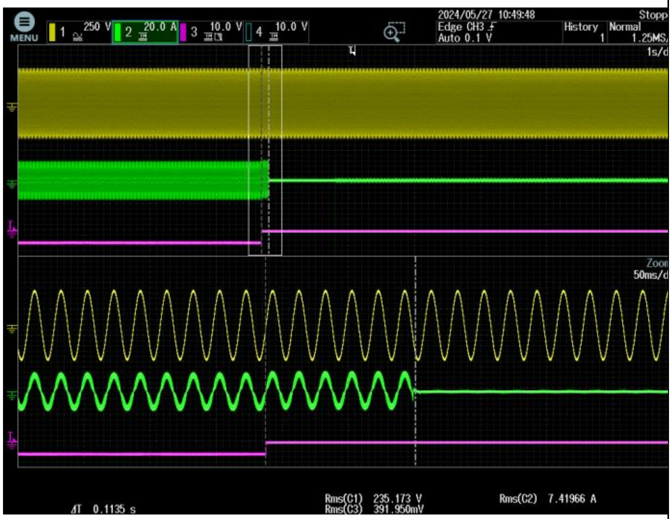
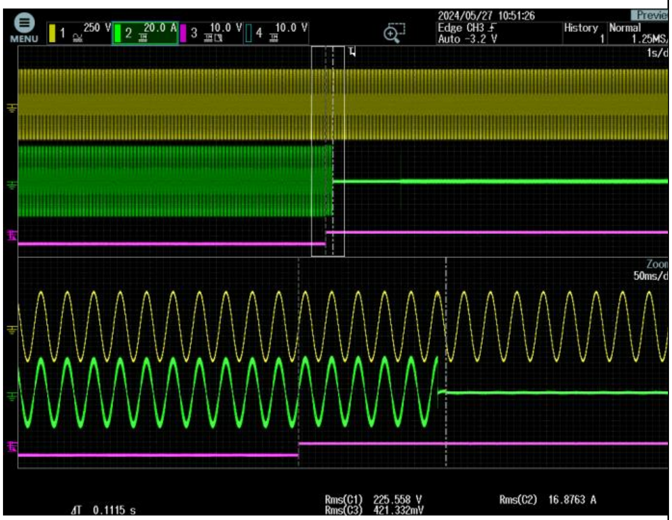
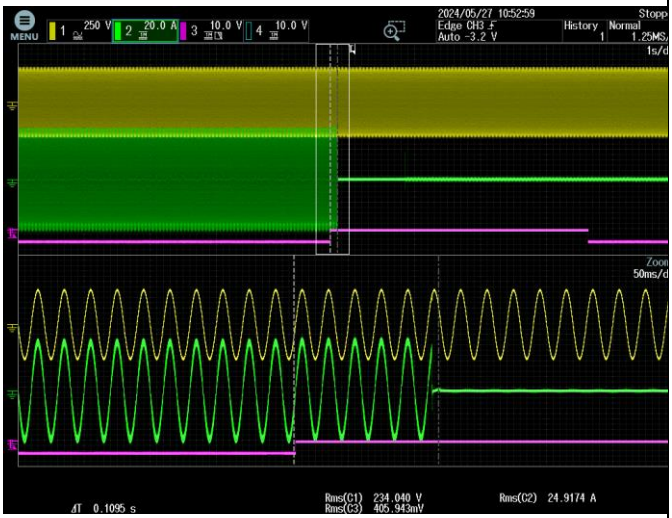
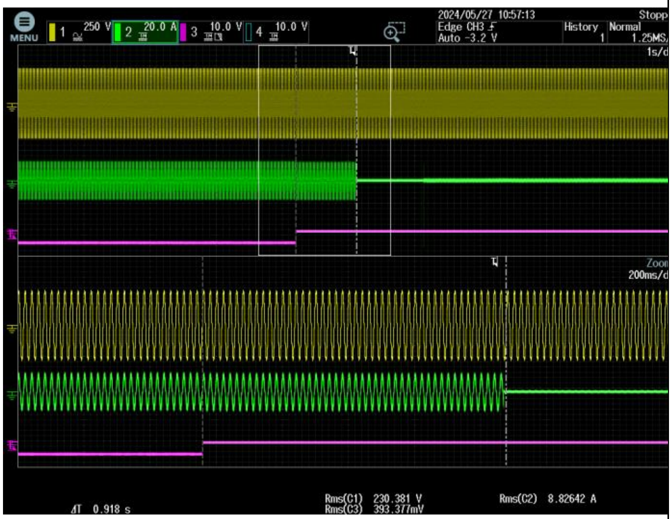
	100 ± 5%		0.122		
L1	33 ± 5%	-1 A	0.114	0.2 s	
	66 ± 5%		0.112		

	100 ± 5%		0.110		
Phase	Power level P/PSMAX(%)	DC component	Tripping time (s)	Required tripping time	Oscilloscope waveform
L1	33 ± 5%	+0.5 % In	0.918	1 s	

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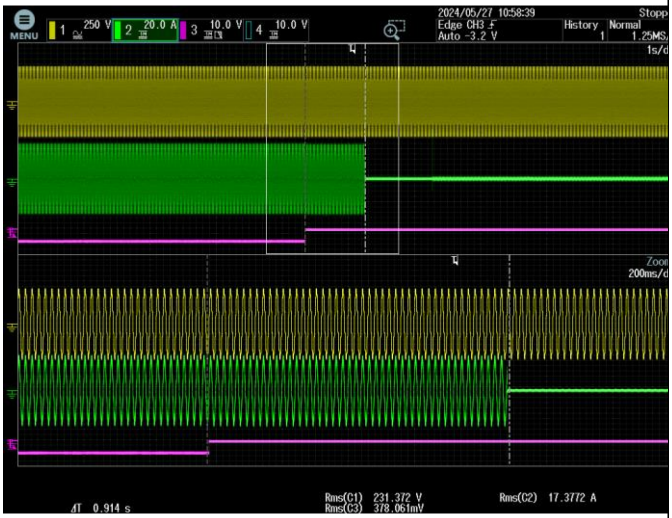
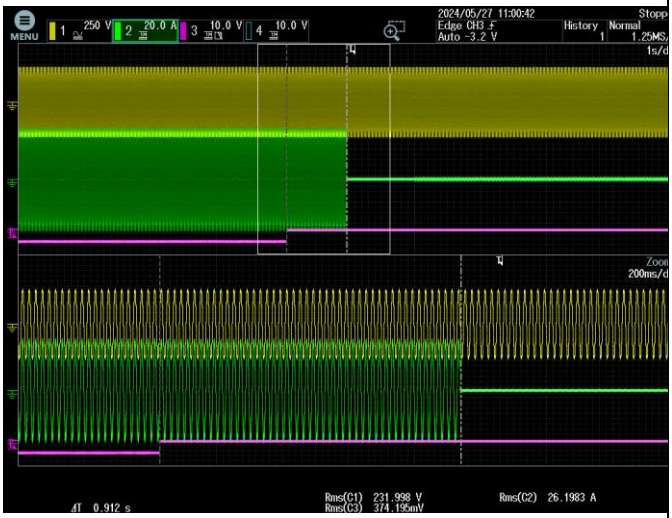
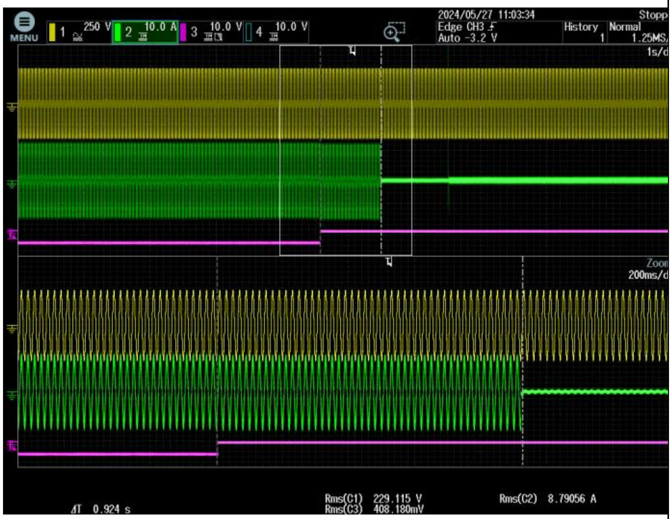
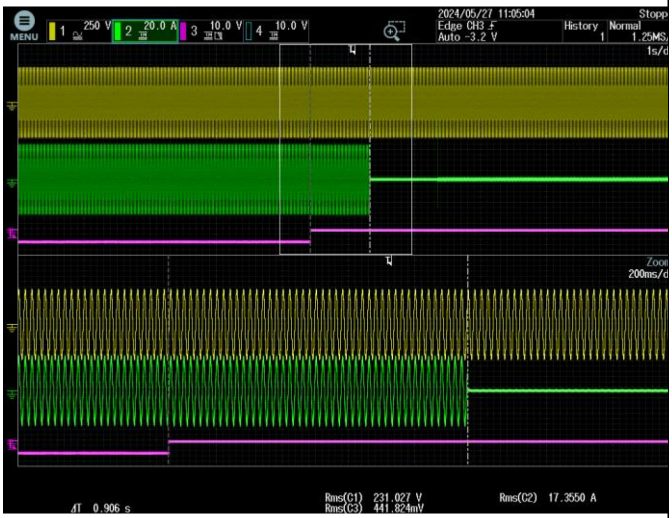
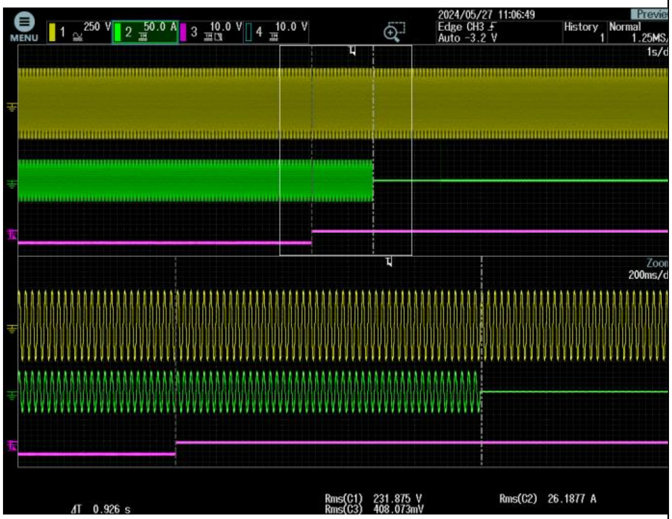
	66 ± 5%		0.914		
	100 ± 5%		0.912		
L1	33 ± 5%	-0.5 % In	0.924	1 s	

	66 ± 5%		0.906		
	100 ± 5%		0.926		
Test is performed at an ambient temperature of -25±2°C					
Phase	Power level P/PSMAX(%)	DC component	Tripping time (s)	Required tripping time	Oscilloscope waveform

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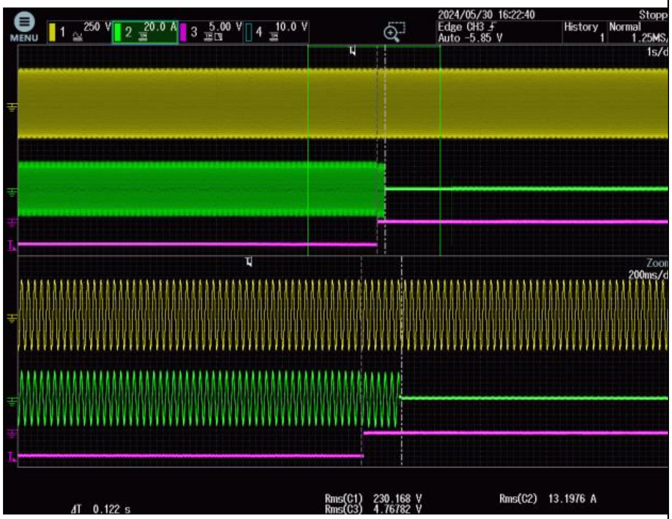
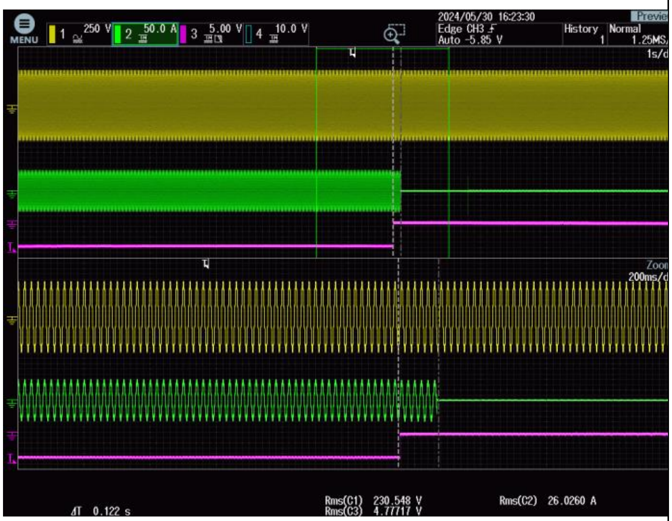
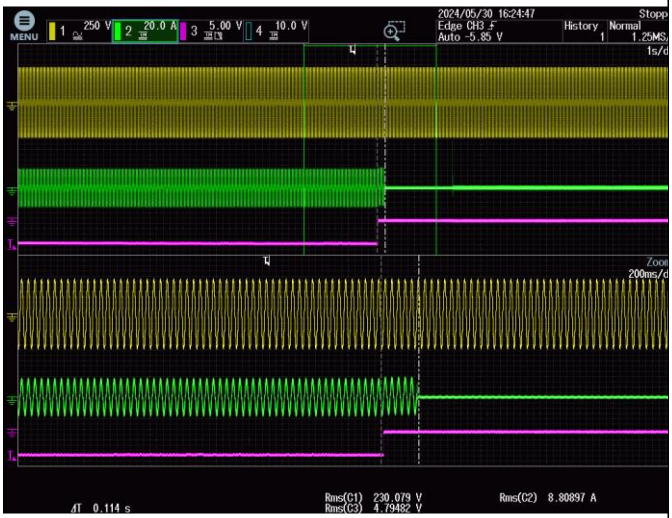
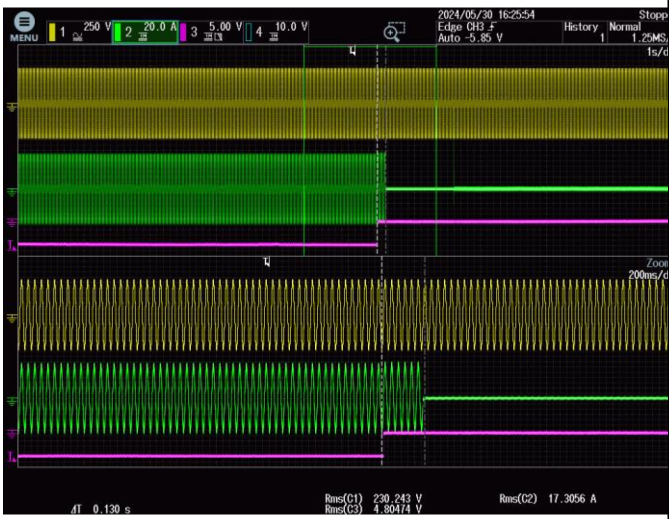
L1	33 ± 5%	+1 A	0.124	0.2 s	
	66 ± 5%		0.122		
	100 ± 5%		0.122		

L1	33 ± 5%	-1 A	0.114	0.2 s	
	66 ± 5%		0.13		
	100 ± 5%		0.116		
Phase	Power level	DC component	Tripping time (s)	Required	Oscilloscope waveform

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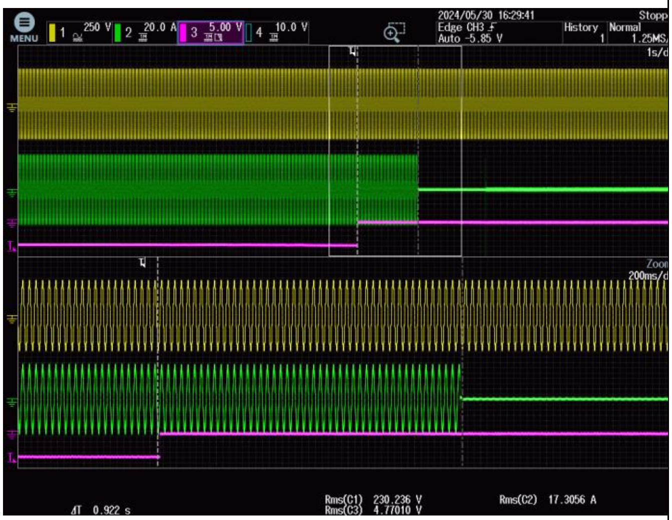
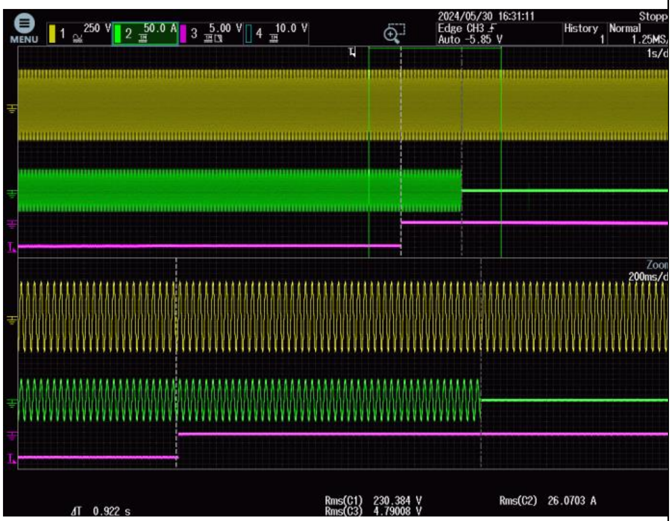
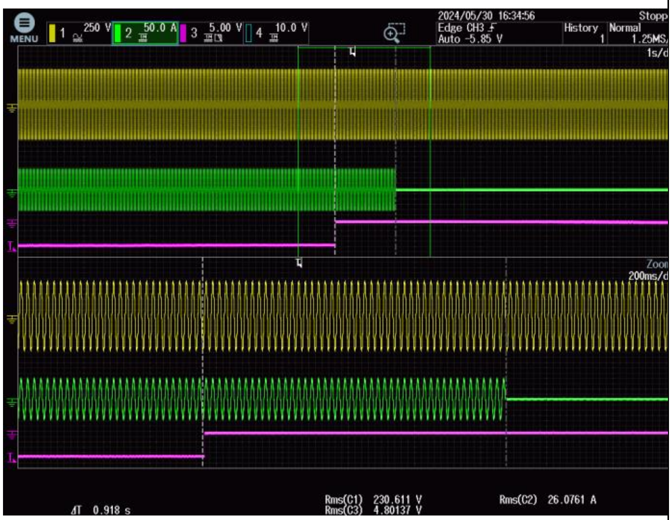
	P/P_{SMAX}(%)			tripping time	
L1	33 ± 5%	+0.5 % In	0.924	1 s	
	66 ± 5%		0.922		
	100 ± 5%		0.922		

L1	33 ± 5%	-0.5 % In	0.926	1 s	
	66 ± 5%		0.932		
	100 ± 5%		0.918		
Test is performed at an ambient temperature of 60±2°C					

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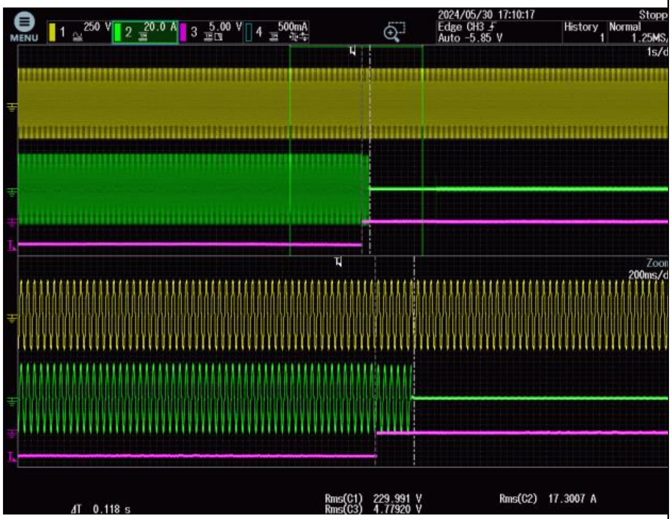
Phase	Power level P/P_{SMAX}(%)	DC component	Tripping time (s)	Required tripping time	Oscilloscope waveform
L1	33 ± 5%	+1 A	0.118	0.2 s	
	66 ± 5%		0.118		

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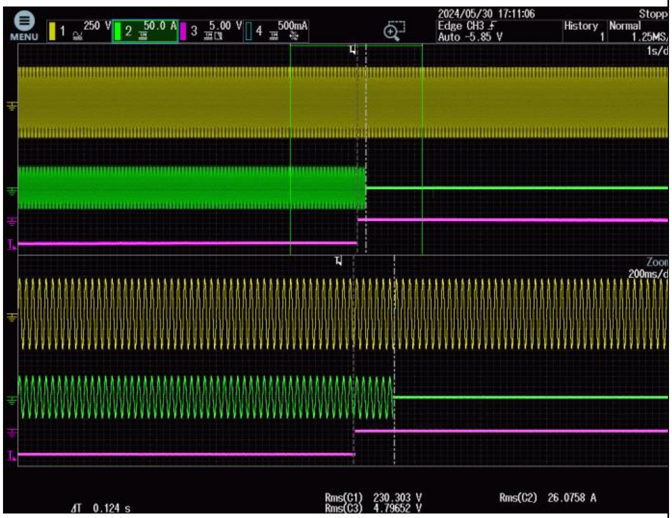
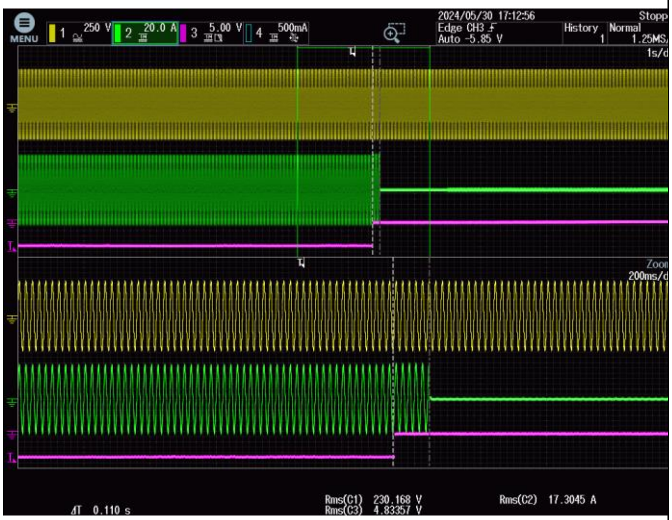
	100 ± 5%		0.124		
L1	33 ± 5%	-1 A	0.128	0.2 s	
	66 ± 5%		0.110		

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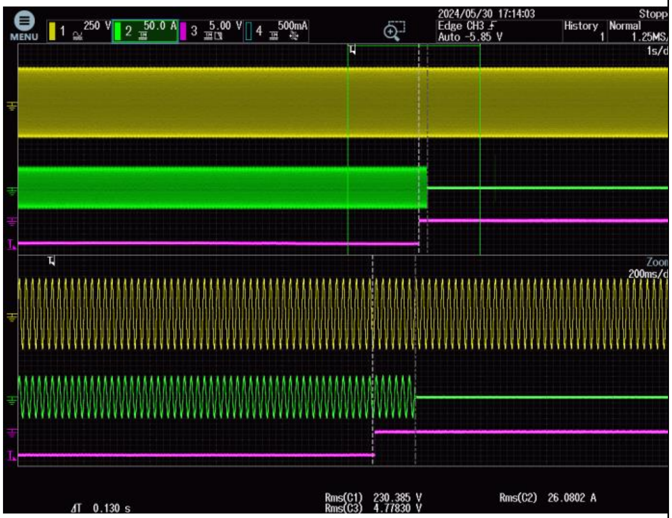
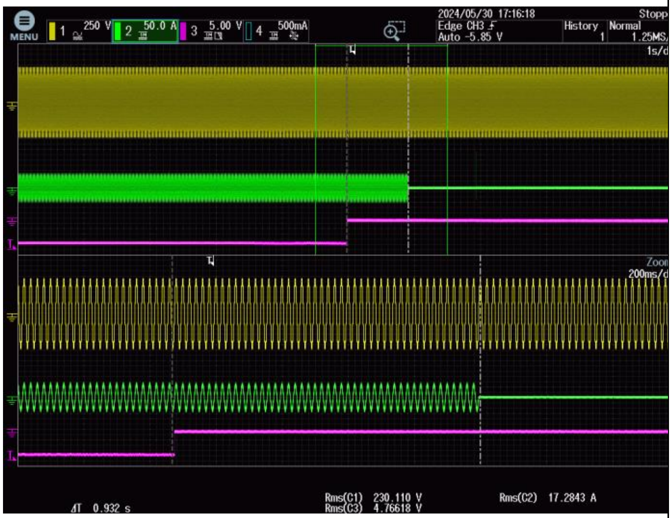
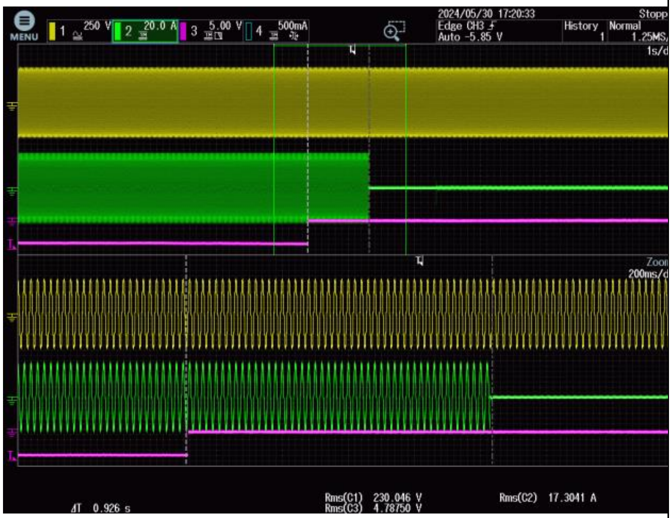
	100 ± 5%		0.130		
Phase	Power level P/P$_{SMAX}$(%)	DC component	Tripping time (s)	Required tripping time	Oscilloscope waveform
L1	33 ± 5%	+0.5 % In	0.918	1 s	

	66 ± 5%		0.932		
	100 ± 5%		0.914		
L1	33 ± 5%	-0.5 % In	0.918	1 s	

	66 ± 5%		0.926		
	100 ± 5%		0.922		
Test in charge mode					
Test is performed at an ambient temperature of 25±5°C					
Phase	Power level P/P_{CMAX}(%)	DC component	Tripping time (s)	Required tripping time	Oscilloscope waveform

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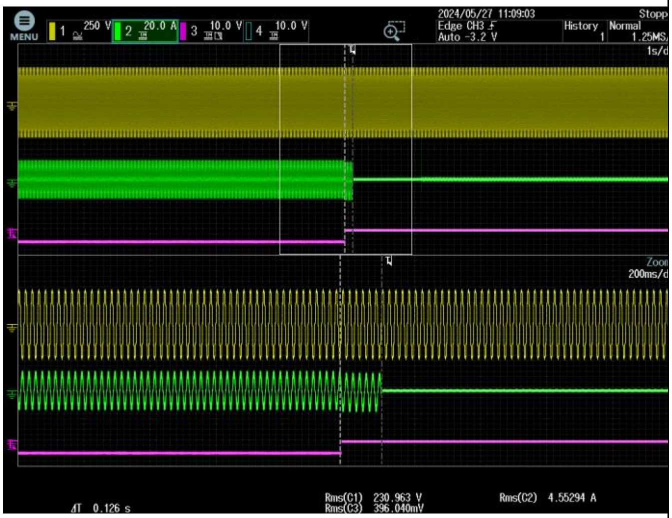
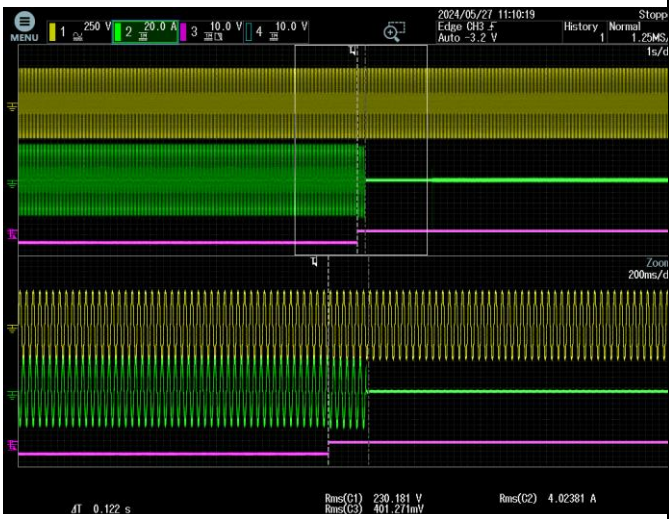
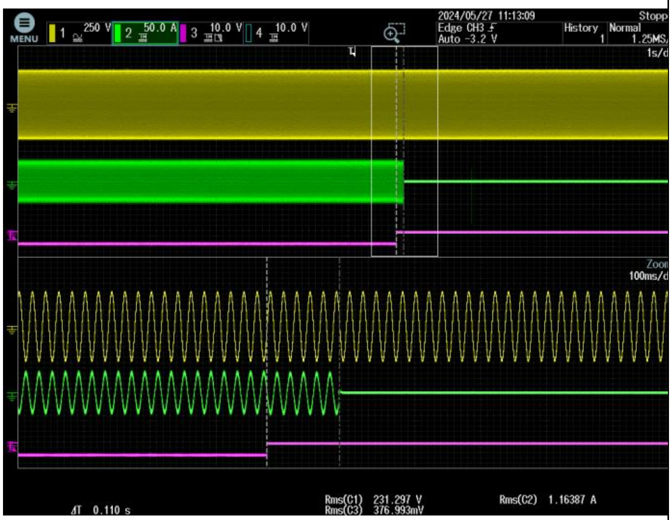
L1	33 ± 5%	+1 A	0.126	0.2 s	
	66 ± 5%		0.122		
	100 ± 5%		0.110		

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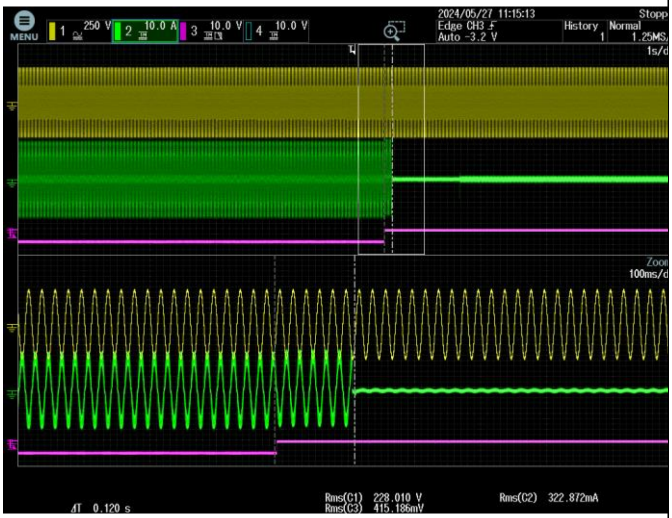
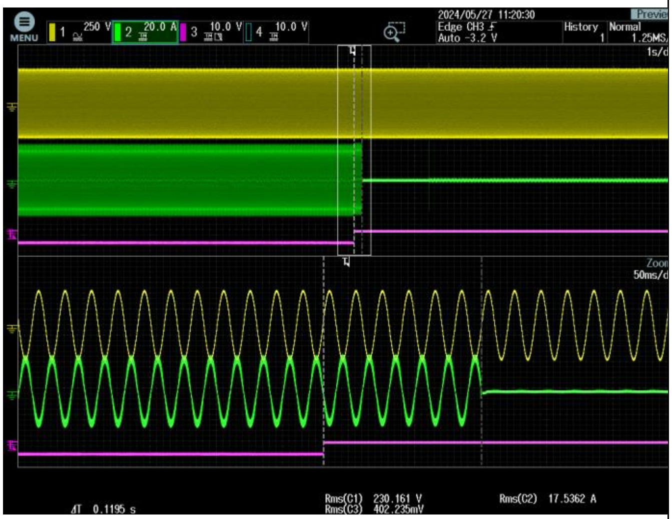
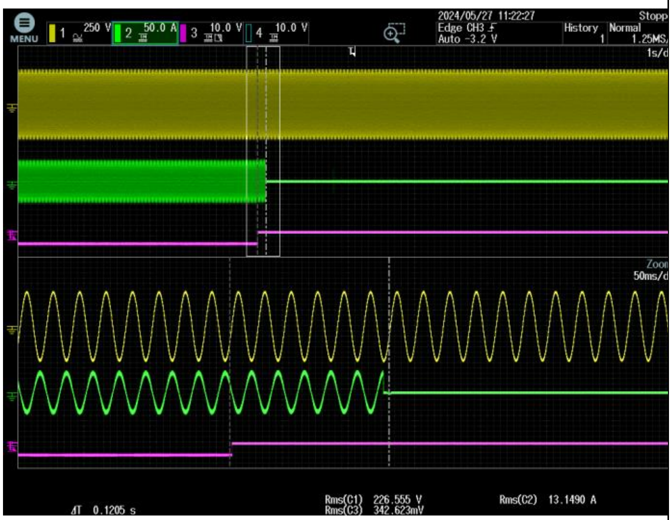
L1	33 ± 5%	-1 A	0.120	0.2 s	
	66 ± 5%		0.120		
	100 ± 5%		0.1205		
Phase	Power level	DC component	Tripping time (s)	Required	Oscilloscope waveform

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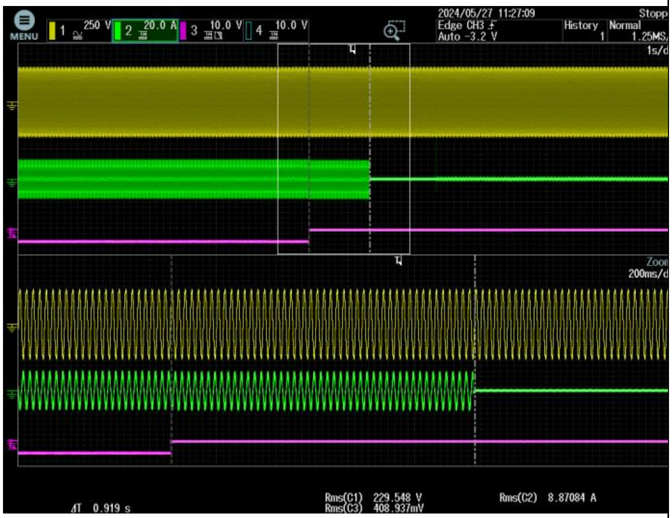
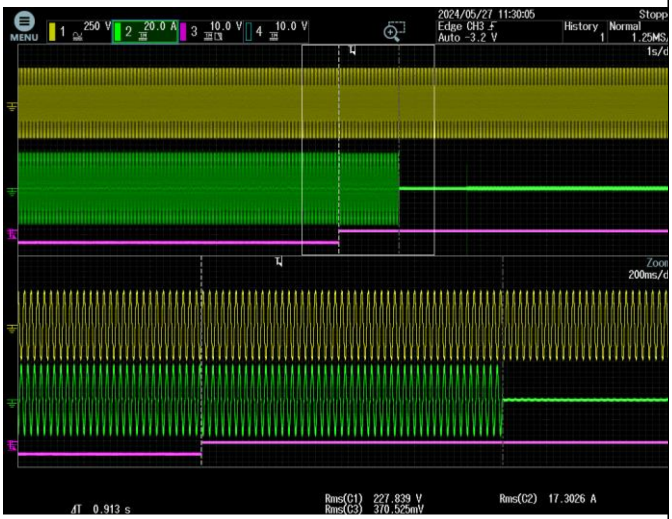
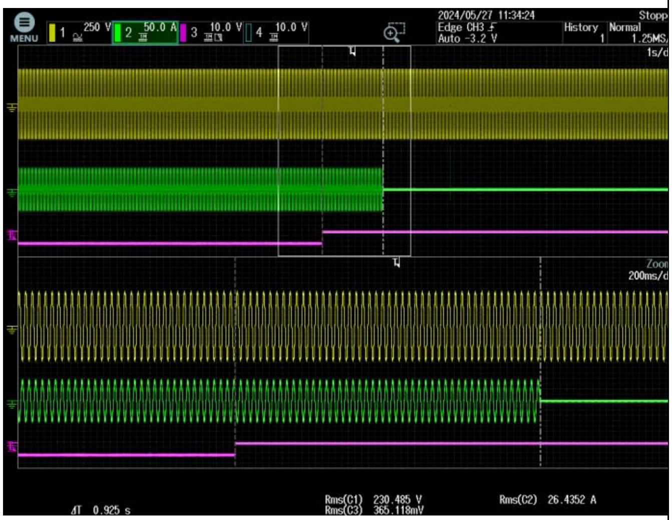
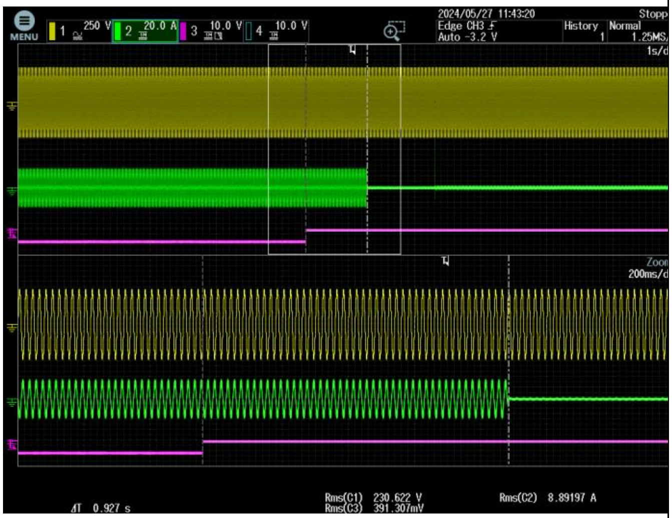
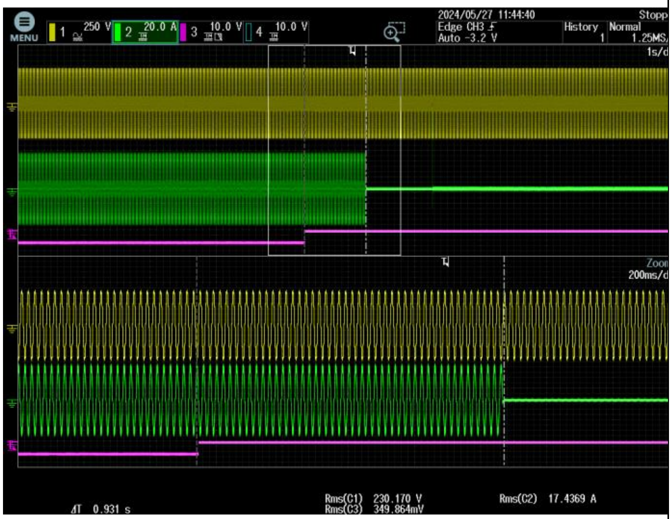
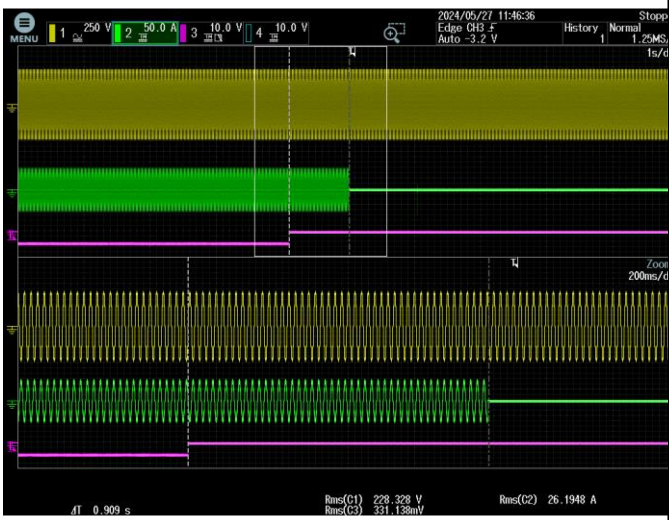
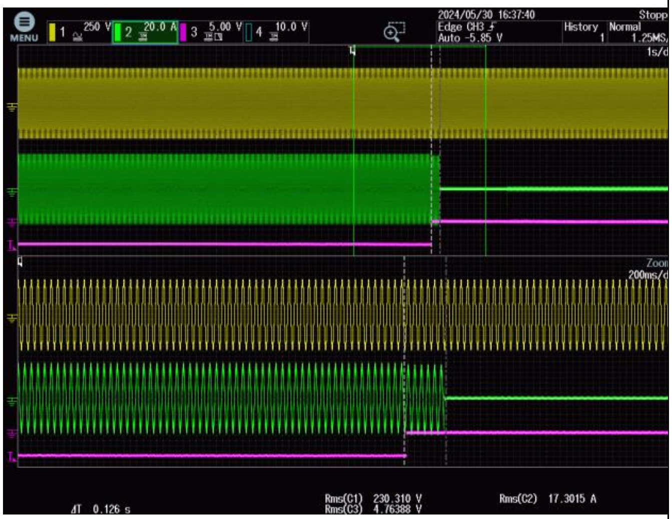
	P/PCMAX(%)			tripping time	
	33 ± 5%		0.919		
L1	66 ± 5%	+0.5 % In	0.913	1 s	
	100 ± 5%		0.925		

L1	33 ± 5%	-0.5 % In	0.927	1 s	
	66 ± 5%		0.931		
	100 ± 5%		0.909		
Test is performed at an ambient temperature of -25±2°C					

<table>
<tr><th>Phase</th><th>Power level P/PCMAX(%)</th><th>DC component</th><th>Tripping time (s)</th><th>Required tripping time</th><th>Oscilloscope waveform</th></tr>
<tr><td rowspan="2">L1</td><td>33 ± 5%</td><td rowspan="2">+1 A</td><td>0.128</td><td rowspan="2">0.2 s</td><td>
</td></tr>
<tr><td>66 ± 5%</td><td>0.126</td><td>
</td></tr>
</table>

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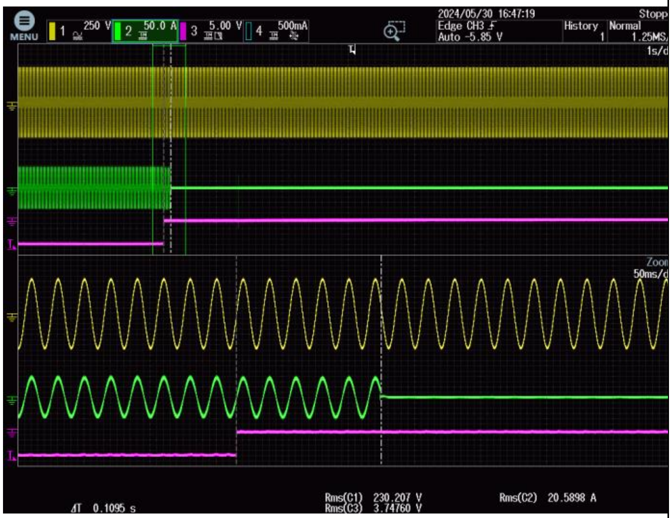
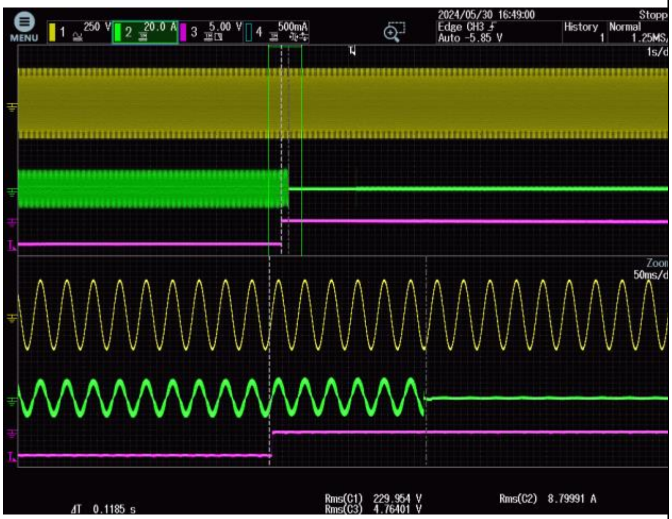
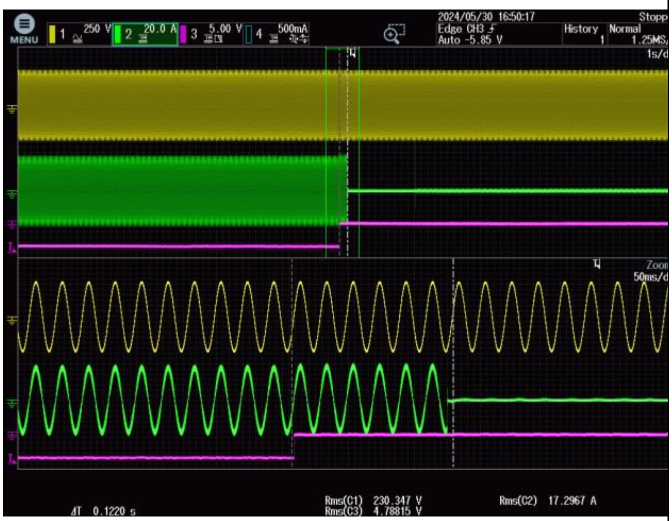
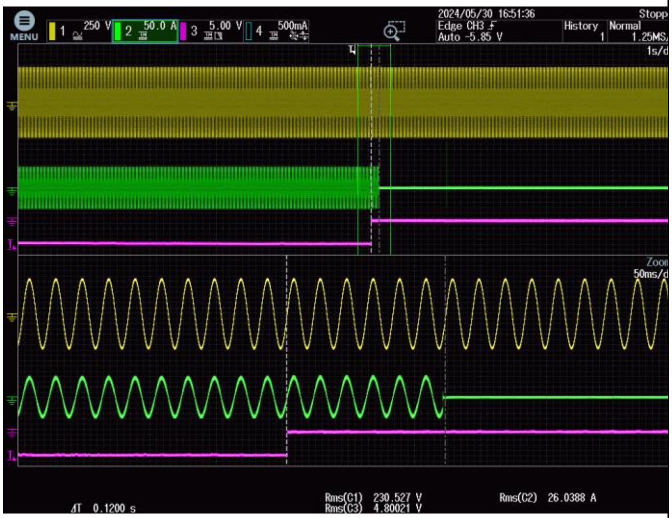
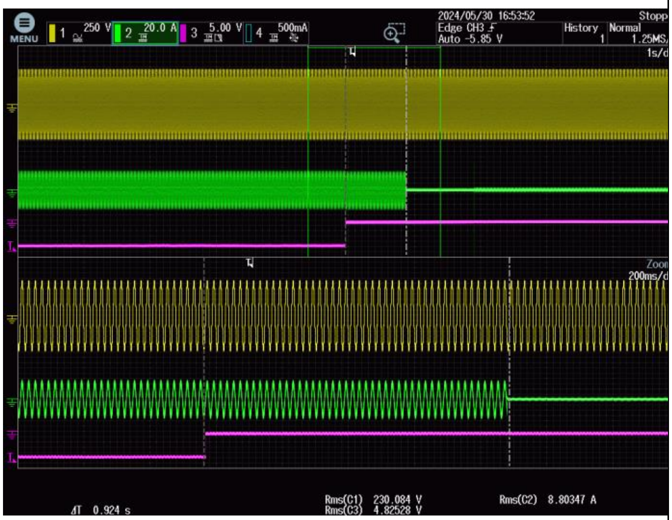
	100 ± 5%		0.110		
L1	33 ± 5%	-1 A	0.119	0.2 s	
	66 ± 5%		0.122		

	100 ± 5%		0.120		
Phase	Power level P/P_{CMAX}(%)	DC component	Tripping time (s)	Required tripping time	Oscilloscope waveform
L1	33 ± 5%	+0.5 % In	0.924	1 s	

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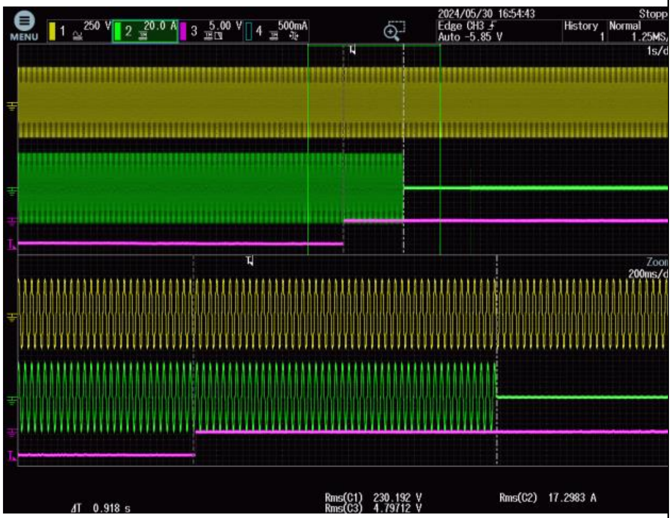
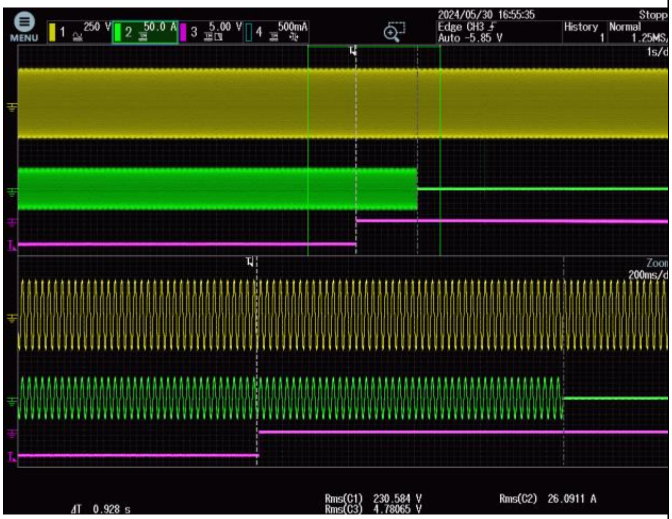
	66 ± 5%		0.918		
	100 ± 5%		0.928		
L1	33 ± 5%	-0.5 % In	0.932	1 s	

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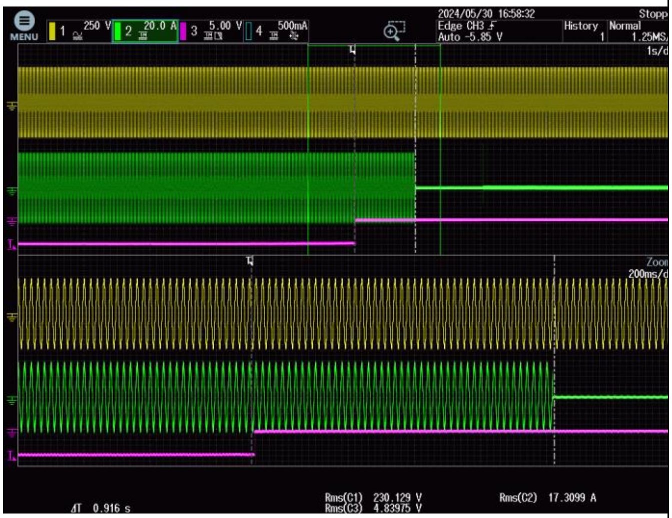
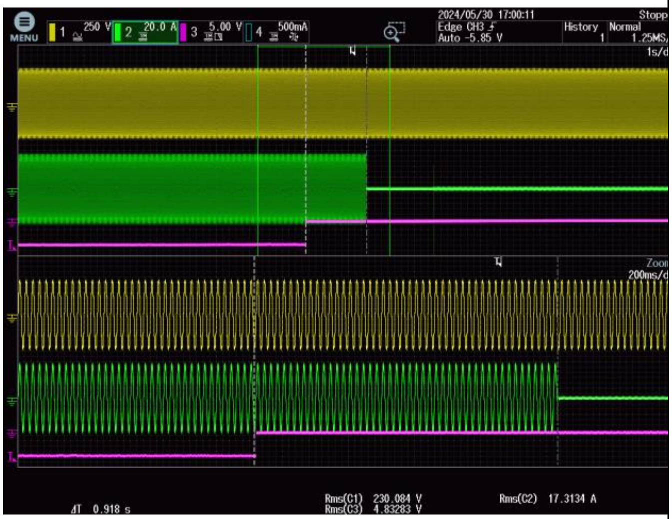
	66 ± 5%		0.916		
	100 ± 5%		0.918		
Test is performed at an ambient temperature of 60±2°C					
Phase	Power level P/P_{CMAX}(%)	DC component	Tripping time (s)	Required tripping time	Oscilloscope waveform

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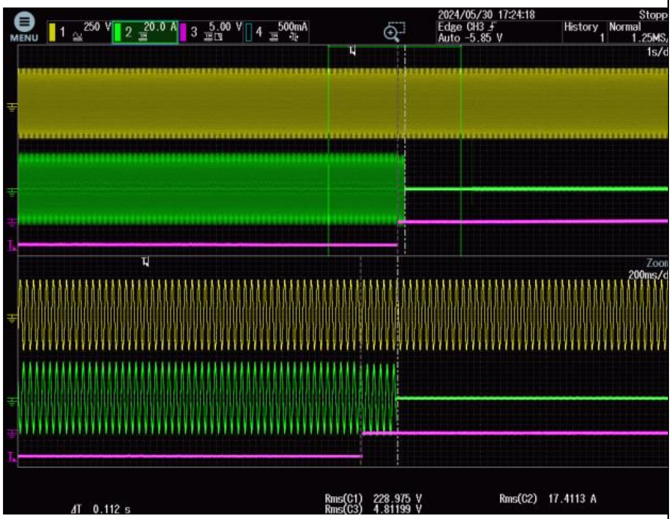
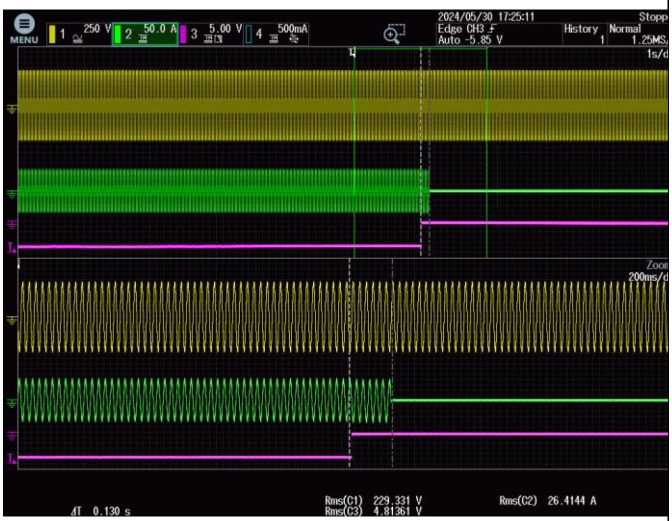
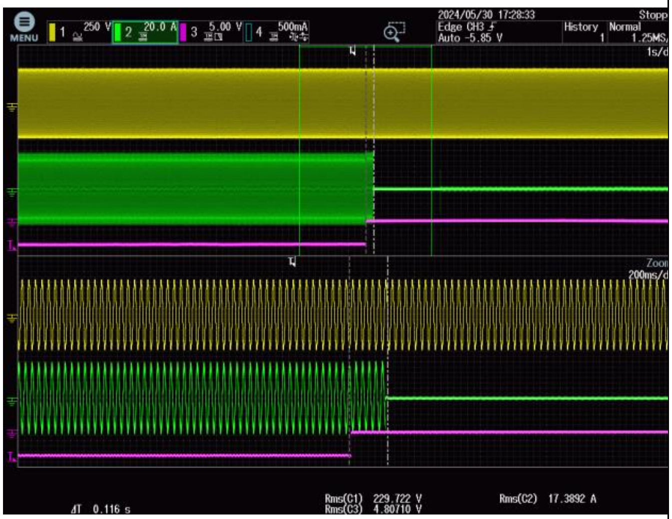
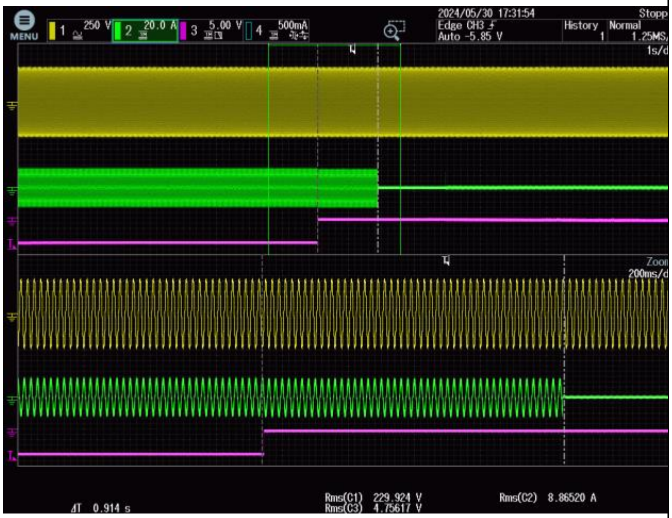
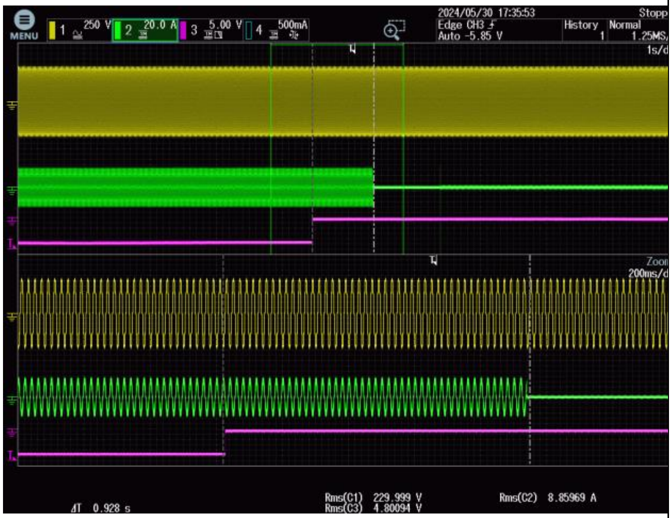
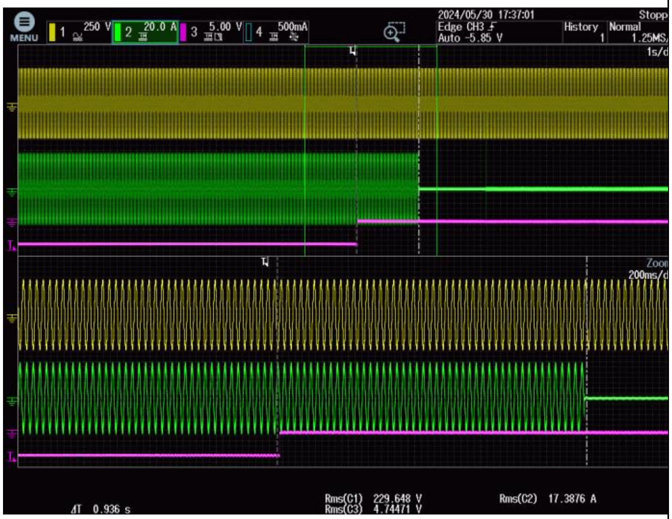
L1	33 ± 5%	+1 A	0.126	0.2	
	66 ± 5%		0.112		
	100 ± 5%		0.130		

L1	33 ± 5%	-1 A	0.118	0.2 s	
	66 ± 5%		0.116		
	100 ± 5%		0.128		
Phase	Power level	DC component	Tripping time (s)	Required	Oscilloscope waveform

	P/P_{CMAX}(%)			tripping time	
	33 ± 5%		0.914		
L1	66 ± 5%	+0.5 % In	0.918	1 s	
	100 ± 5%		0.918		

L1	33 ± 5%	-0.5 % In	0.928	1 s	
	66 ± 5%		0.936		
	100 ± 5%		0.924		

Remark (additional info or observation during the test):
Require test ±1 A and ± 0.5 % In

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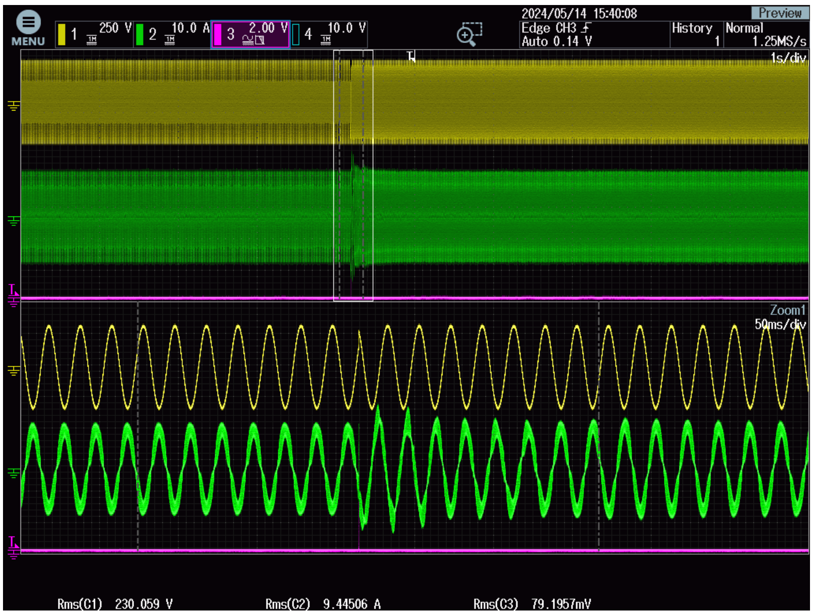
Bbis.10.1	**Verification of insensitivity to automatic reclosing under phase mismatching**					P
Model	Tested on X1-H6K-S (with 6*battery modules:X1-B30-HC), the P_{SMAX} consider as 6000W (Battery supply only), and the P_{CMAX} consider as 6000W in this clause test.					
Test conditions	Phase shift	Test voltage[V]	Power output[W]	Angle between voltages before the phase shift	Angle between voltages after the phase shift	Observition: Damage of the inverter as the result of the test? (Yes / No)
33%P_{SMAX}	90°	230.30	2013.12	0°	90°	No
66%P_{SMAX}	90°	230.60	3997.06	0°	90°	No
100%P_{SMAX}	90°	230.10	6028.67	0°	90°	No
33%P_{SMAX}	180°	230.30	0.54	0°	180°	No
66%P_{SMAX}	180°	230.60	1.26	0°	180°	No
100%P_{SMAX}	180°	231.00	0.98	0°	180°	No
33%P_{CMAX}	90°	229.50	-1986.12	0°	90°	No
66%P_{CMAX}	90°	229.10	-3966.88	0°	90°	No
100%P_{CMAX}	90°	228.70	-6018.34	0°	90°	No
33%P_{CMAX}	180°	229.50	0.44	0°	180°	No
66%P_{CMAX}	180°	229.10	0.92	0°	180°	No
100%P_{CMAX}	180°	228.70	0.28	0°	180°	No

Test on simulated network

Before the operation of phase shift, the system should be operated at least 5 min or the time needed to stabilize the inside temperature of the inverter.

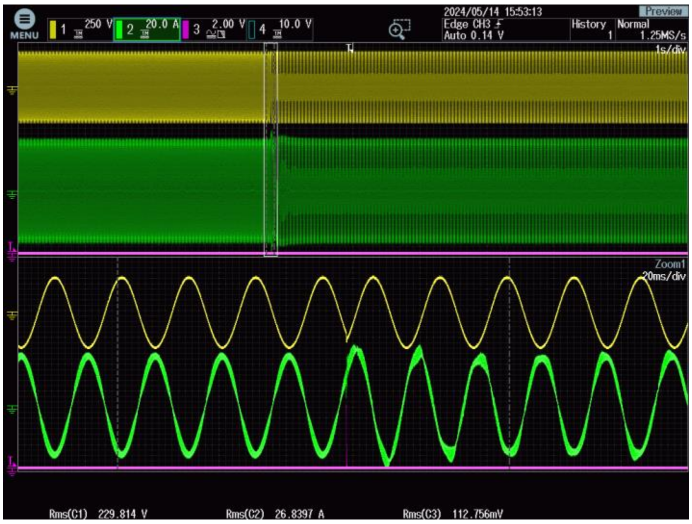
Attach the current curve from 20 ms before to at least 200 ms after the phase shift.

Current curve at 90° phase shift (@33% P_{SMAX}):

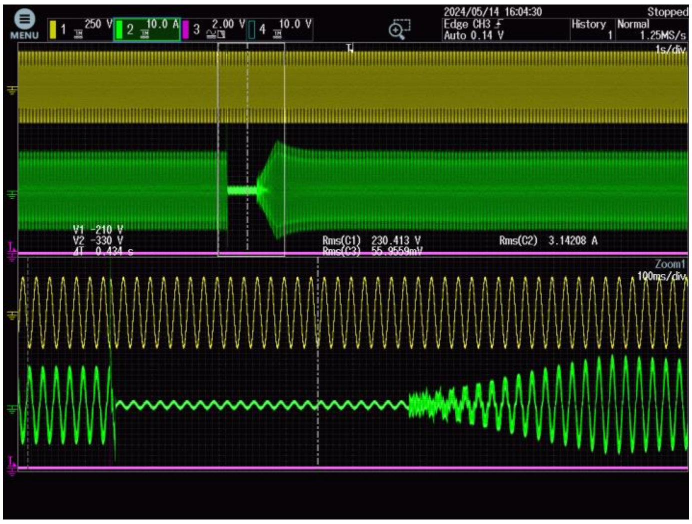


Current curve at 90° phase shift (@66% P_{SMAX}):

Current curve at 90° phase shift (@100% P_{SMAX}):



Current curve at 180° phase shift @33% P_{SMAX}):



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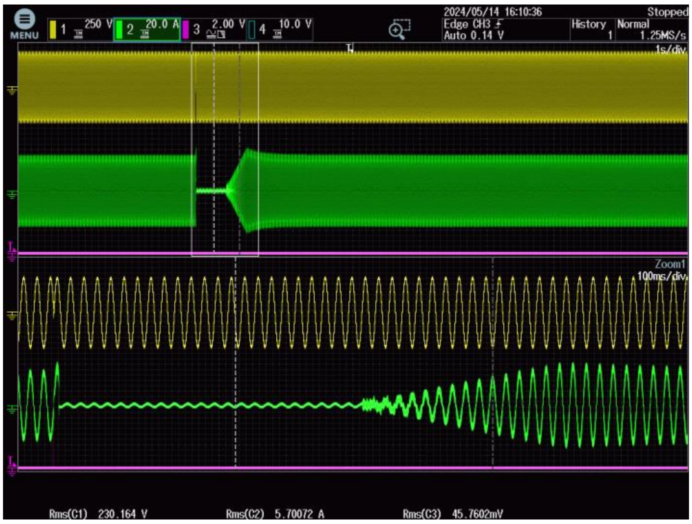
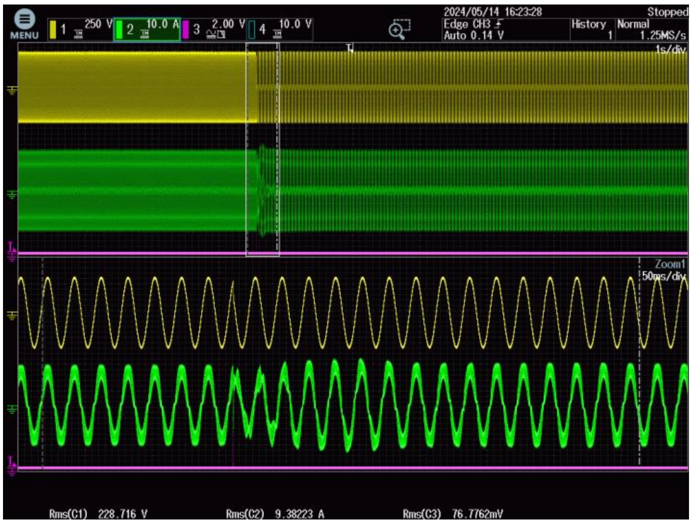
Current curve at 180° phase shift @66% P_{SMAX}):



Current curve at 180° phase shift (@100% P_{SMAX}):

Current curve at 90° phase shift (@33% P_{CMAX}):



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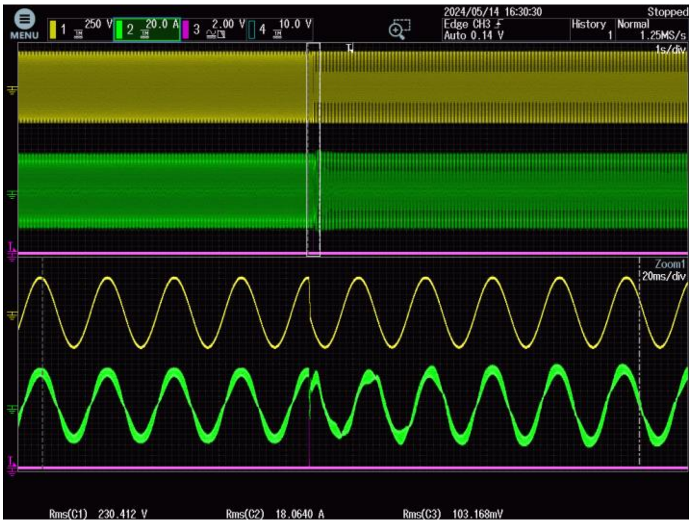
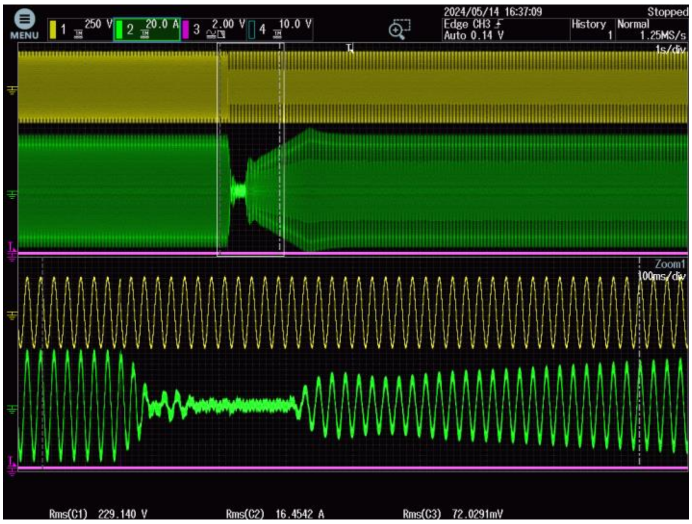
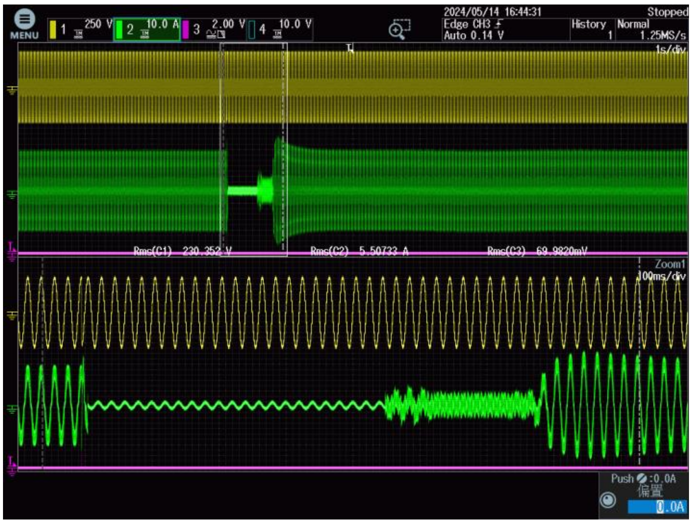
Current curve at 90° phase shift (@66% P_{CMAX}):



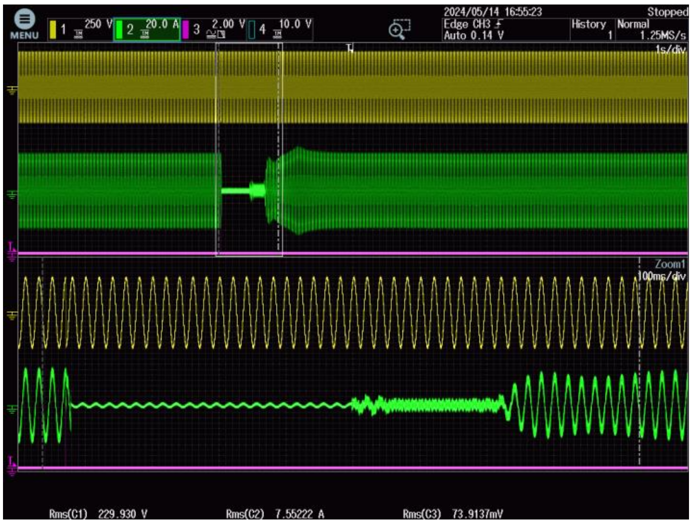
Current curve at 90° phase shift (@100% P_{CMAX}):



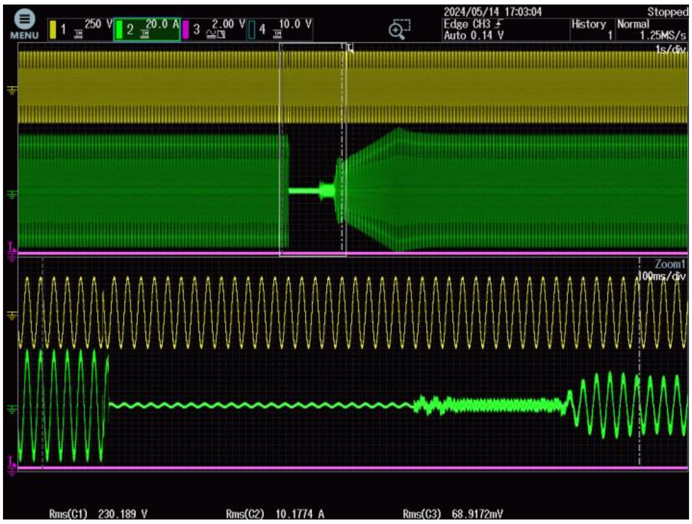
Current curve at 180° phase shift @33% P_{CMAX}):



Current curve at 180° phase shift @66% P_{CMAX}):



Current curve at 180° phase shift (@100% P_{CMAX}):



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