

Prüfbericht-Nr.: Test report no.:	CN22EMBE 001	Auftrags-Nr.: Order no.:	244419401	Seite 1 von 204 Page 1 of 204
Kunden-Referenz-Nr.: Client reference no.:	2026754	Auftragsdatum: Order date:	2022-04-19	
Auftraggeber: Client:	Guangzhou Sanjing Electric Co., Ltd. No.9, Lizhishan Road, Science City, Guangzhou High-tech Zone, Guangdong P.R. China			
Prüfgegenstand: Test item:	ALL-IN-ONE ENERGY STORAGE SYSTEM			
Bezeichnung / Typ-Nr.: Identification / Type no.:	HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X Note: X=1,2,3,4 (Number of Battery Modules) AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X Note: X=1,2,3,4 (Number of Battery Modules)			
Auftrags-Inhalt: Order content:	AK Certification			
Prüfgrundlage: Test specification:	CEI 0-21:2022-03			
Wareneingangsdatum: Date of sample receipt:	2022-05-25			
Prüfmuster-Nr.: Test sample no.:	A003267766-002			
Prüfzeitraum: Testing period:	2022-12-12 - 2023-01-11			
Ort der Prüfung: Place of testing:	TÜV Rheinland (Shanghai) Co., Ltd.			
Prüflaboratorium: Testing laboratory:	TÜV Rheinland (Shanghai) Co., Ltd.			
Prüfergebnis*: Test result*:	Pass			
geprüft von: tested by: Jiayu Hu			genehmigt von: authorized by: Allen Hu	
Datum: Date: 2023-01-11			Ausstellungsdatum: Issue date: 2023-01-11	
Stellung / Position:	Project Engineer	Stellung / Position:	Reviewer	
Sonstiges / Other:	The product maybe installed with Storage Battery System BU2-5.0-HV1.			
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:	Prüfmuster vollständig und unbeschädigt Test item complete and undamaged			
* Legende:	P(ass) = entspricht o.g. Prüfgrundlage(n)	F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
* Legend:	P(ass) = passed a.m. test specification(s)	F(ail) = failed a.m. test specification(s)	N/A = not applicable	N/T = not tested
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the above mentioned test sample as. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

TEST REPORT

☒ **CEI 0-21:2022-03**

Regola tecnica di riferimento per la connessione di Utenti attivi e passivi alle reti BT delle imprese distributrici di energia elettrica
/Reference technical rules for the connection of active and passive users to the LV electrical Utilities

Report reference no. : CN22EMBE 001

Tested by (name + signature) : See coverage

Approved by (name + signature) : See coverage

Date of issue : See coverage

Total number of pages : See coverage

Testing Laboratory : TÜV Rheinland (Shanghai) Co., Ltd.

Address : No. 177, 178, Lane 777 West Guangzhong Road. Jing'an District. Shanghai. 200072 P.R. China

Applicant's name : Guangzhou Sanjing Electric Co., Ltd.

Address : No.9, Lizhishan Road, Science City, Guangzhou High-tech Zone, Guangdong P.R. China

Test item description : ALL-IN-ONE ENERGY STORAGE SYSTEM

Trade Mark :



Manufacturer : Same as applicant.

Model/Type reference : HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.

Ratings : See model list and marking label on following pages.

Sample :

Samples received on : See coverage

TUV reference samples : See coverage

Samples tested n. : See coverage

Testing :

Start Date: : See coverage

End Date: : See coverage

I risultati del rapporto di prova si riferiscono esclusivamente ai campioni sotto test. Senza l'autorizzazione scritta di TÜV Rheinland Italia S.r.l., questo documento può essere riprodotto solo integralmente

The results in this Test Report are exclusively referred to the tested samples. Without the written authorization of TÜV Rheinland Italia S.r.l., this document can be reproduced only integrally

Testing procedure and testing location:	
☒ Testing Laboratory: Testing location/ address.....:	TÜV Rheinland (Shanghai) Co., Ltd. No. 177, 178, Lane 777 West Guangzhong Road. Jing'an District. Shanghai. 200072 P.R.China
☐ Associated Laboratory: Testing location/ address.....: Tested by (name + signature).....: Approved by (+ signature):	
☐ Testing procedure: TMP Testing location/ address.....: Tested by (name + signature).....: Approved by (+ signature):	
☐ Testing procedure: WMT Testing location/ address.....: Tested by (name + signature).....: Witnessed by (+ signature): Approved by (+ signature):	
☐ Testing procedure: SMT Testing location/ address.....: Tested by (name + signature).....: Approved by (+ signature): Supervised by (+ signature).....:	
☐ Testing procedure: RMT Testing location/ address.....: Tested by (name + signature).....: Approved by (+ signature): Supervised by (+ signature).....:	

Reference Standard:

CEI 0-21:2022-03

Regola tecnica di riferimento per la connessione di Utenti attivi e passivi alle reti BT delle imprese distributrici di energia elettrica

/Reference technical rules for the connection of active and passive users to the LV electrical Utilities.

The standard refers to the following standards:

Allienamento al Regolamento UE 2016/631, UE 2016/1388 e UE 2016/1447 (RfG)

/ Alignment with the Regulation UE 2016/631, UE 2016/1388 e UE 2016/1447 (Requirements for Generators - RfG)

CEI EN 60068-2-2:2008-11

Prove ambientali - Parte 2-2: Prove - Prova B: Caldo secco

/Environmental testing - Part 2-2: Tests - Test B: Dry heat

CEI EN 60068-2-78:2002:03

Prove ambientali - Parte 2-78: Prove - Prova Cab: Caldo umido, regime stazionario

/Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state

CEI EN 60068-2-1:2007:11

Prove ambientali - Parte 2-1: Prove - Prova A: Freddo

/Environmental testing - Part 2-1: Tests - Test A: Cold

CEI EN 60068-2-14:2010

Prove ambientali - Parte 2-14: Prove - Prova N: Cambio di temperatura

/Environmental testing - Part 2-14: Tests - Test N: Change of temperature

CEI EN 60255-5:2001-11

Parte 5: Coordinamento dell'isolamento per i relè di misura e per i dispositivi di protezione

Prescrizioni e prove

/Electrical Relays - Part 5: Insulation coordination for measuring relays and protection equipment – Requirements and tests

CEI EN 61000-3-2:2007-04 + CEI EN 61000-3-2/A1/A2:2011-09

Compatibilità elettromagnetica (EMC)

Parte 3-2: Limiti - Limiti per le emissioni di corrente armonica (apparecchiature con corrente di ingresso ≤ 16 A per fase)

/Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)

CEI EN 61000-3-3:2009-09

Compatibilità elettromagnetica (EMC)

Parte 3-3: Limiti - Limitazione delle variazioni di tensioni, fluttuazioni di tensione e del flicker in sistemi di alimentazione in bassa tensione per apparecchiature con corrente nominale ≤ 16 A per fase e non soggette ad allacciamento su condizione

/ Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection.

CEI EN 61000-3-12:2012

Compatibilità elettromagnetica (EMC)

Limiti per le correnti armoniche prodotte da apparecchiature collegate alla rete pubblica a bassa tensione aventi correnti di ingresso > 16 A e ≤ 75 A per fase

/ Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)

CEI EN 61000-3-11:2011

Compatibilità elettromagnetica (EMC)

Limitazione delle variazioni di tensione, delle fluttuazioni di tensione e del flicker in sistemi di alimentazione pubblici a bassa tensione - Apparecchiature con correnti nominali < 75 A e soggetti ad allacciamento su condizione

/ Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection

CEI EN 60146-1-1:1997 + A1:1998

Convertitori a semiconduttori - Prescrizioni generali e convertitori commutati dalla linea

Prove di isolamento (§ 4.2.1).

*/ Semiconductor converters - General requirements and line commutated converters - Part 1-1: Specification of basic requirements
Insulation tests (§. 4.2.1).*

Document not attached recalled into this test report:

Appendix No.	Description	Page(s)
1	Attachment-Photo document	39
2		
3		
4		
5		
6		

Informazioni generali sul prodotto / General product information:	
Product:	☐ Static generator (Photovoltaic grid tied inverter) ☒ Energy Storage System (EES) ☐ Synchronous generator ☐ Asynchronous generator ☐ Wind Full converter (FC) ☐ Wind Doubly Fed Induction Generator
License Holder: <i>Address:</i>	Guangzhou Sanjing Electric Co., Ltd. No.9, Lizhishan Road, Science City, Guangzhou High-tech Zone, Guangdong P.R. China
Manufacturing plant: <i>Address:</i>	Guangzhou Sanjing Electric Co., Ltd. No.9, Lizhishan Road, Science City, Guangzhou High-tech Zone, Guangdong P.R. China
Model(s):	For Complete list of product see 'General Product information' Section
N°serie / Serial n°:	/
Testing Location: <i>Address:</i>	§. N.1 Esecuzione delle prove – accreditamento <i>N.1 Testing - Accreditation</i> ☒ EA - ISO/EN 17025 testing Laboratory <i>(See testing laboratory address)</i> ☐ Manufacturing Plant / Customer facility <i>EA - ISO/EN 17025 testing Laboratory (witnessing)</i> <i>(see Manufacturing plant address)</i>
Testing Laboratory: <i>Address:</i>	TÜV Rheinland (Shanghai) Co.,Ltd. No. 177, 178, Lane 777 West Guangzhong Road. Jing'an District. Shanghai. 200072 P.R.China
Input Voltage (Rated):	See model list
Output Voltage (Rated):	See model list
Firmware version:	Inverter: Control board: V1.010 Display: V 6.011 Battery System: V1.09

Test item particulars..... :

Equipment mobility : ☐ Stationary ☒ fixed

Connection to the mains : ☒ permanent connection
☐ pluggable equipment

Environmental category : ☒ outdoor

Over voltage category Mains..... : ☒ OVC III

Over voltage category PV : ☒ OVC II

Mains supply tolerance (%) : According to the specified supply range.
see model list on the following pages for details.

Tested for power systems : TN, TT

IT testing, phase-phase voltage (V)..... : N/A

Class of equipment : ☒ Class I

Pollution degree..... : ☒ PD 3

Test case verdicts:

Test case does not apply to the test object : N/A

Test object does meet the requirement..... : P(Pass)

Test object does not meet the requirement..... : F(Fail)

Testing..... :

Date of receipt of test item : See first page

Date (s) of performance of tests : See first page

General remarks:

This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

The test results presented in this report relate only to the items tested.

"(see remark #)" refers to a remark appended to the report.

"(see annex #)" refers to an annex appended to the report.

"(see enclosure #)" refers to additional information appended to the report.

"(see appended table)" refers to a table appended to the report.

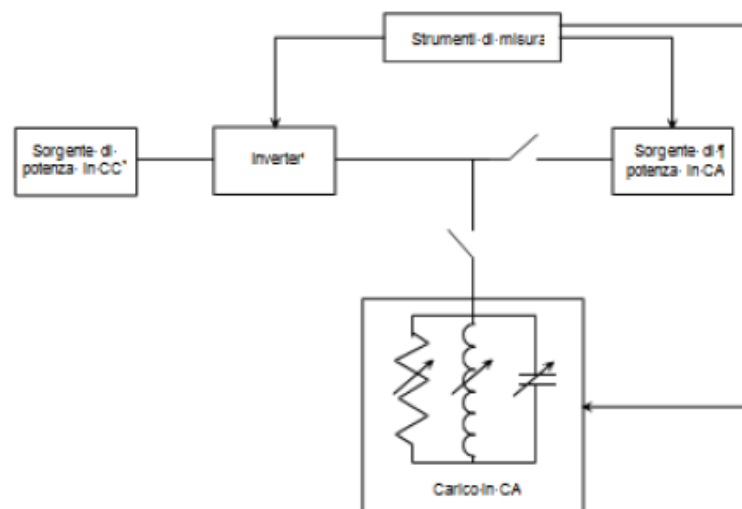
Throughout this report a point is used as the decimal separator.

General product information:

DISPOSITIVO DI INTERFACCIA	PROTEZIONE DI INTERFACCIA	DISPOSITIVO DI CONVERSIONE STATICA	DISPOSITIVO DI GENERAZIONE ROTANTE
☒	☒	☒	☐

Description of tested item:
Verified Sample:

Descrizione /Description:	ALL-IN-ONE ENERGY STORAGE SYSTEM
Costruttore / Manufacturer:	Guangzhou Sanjing Electric Co., Ltd. No.9, Lizhishan Road, Science City, Guangzhou High-tech Zone, Guangdong P.R. China
Modello/ Model	HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X Note: X=1,2,3,4(Number of Battery Modules) AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X Note: X=1,2,3,4(Number of Battery Modules)
N°serie / Serial n°	/
Number of phases	1

Test Setup:

Figura 20 – Simulatore di rete BT

Technical Information:

The PCEs under test HS2-3K-S2-X, HS2-3.6K-S2-X, HS2-4K-S2-X, HS2-4.6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-6K-S2-X, Note: X=1,2,3,4 (Number of Battery Modules) and AS2- 3K-S-X, AS2-3.6K-S-X, AS2-4K-S-X, AS2-4.6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X and AS2-6K-S-X, Note: X=1,2,3,4 (Number of Battery Modules) is a single phase non-isolated multifunction bi-directional Energy Storage System which will be installed and connected to the grid network or standalone.

The PCE under test is an Inverter which utilizes the advanced power electronics conversion components such as MOSFET, IGBT to convert the variable DC power generated from the photovoltaic (PV) arrays as well as batteries to the stable utility AC power which can be fed into the commercial electrical grid. The battery port can be charged by the energy from either PV port or AC grid port. The PCE under test is also able to work in stand-alone mode while the grid voltage is not present.

When the off-grid function is enabled, the product only joins in dynamic grid supporting during the transition period from on-grid mode switching to off-grid mode. When the off-grid function is disabled, the dynamic grid supporting would be entirely joined. The equipment with model name HS2-3K-S2-X, HS2-3.6K-S2-X, HS2-4K-S2-X, HS2-4.6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-6K-S2-X, Note: X=1,2,3,4 (Number of Battery Modules) and AS2- 3K-S-X, AS2-3.6K-S-X, AS2-4K-S-X, AS2-4.6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X and AS2-6K-S-X, Note: X=1,2,3,4 (Number of Battery Modules) is a single phase non-isolated multifunction bi-directional Energy Storage System which will be installed and connected to the grid network or standalone.

The equipment consists of an Inverter and energy storage battery modules (BU2-5.0-HV1), the number of battery modules ranges from 1 to 4 which determined by the customer's use requirements. The equipment shall be fixed to suitable manner as specified in the installation instruction.

The EUTs contains filters for smoothing the output voltage and for EMC, switching and control circuits. Electronic circuits are mounted on a number of PCBs interconnected by appropriate connectors and wires. Power board including electronics components is mounted on the heat sink to earthing by metal screw and spring washer.

DC battery terminals connected to battery, AC output direct connected to grid or load and protective Earthing are provided by dedicated earthing terminals. Grid is protected combination with a two series of relays as redundant build for ensure the inverter can independent disconnected from grid while a relay was fault.

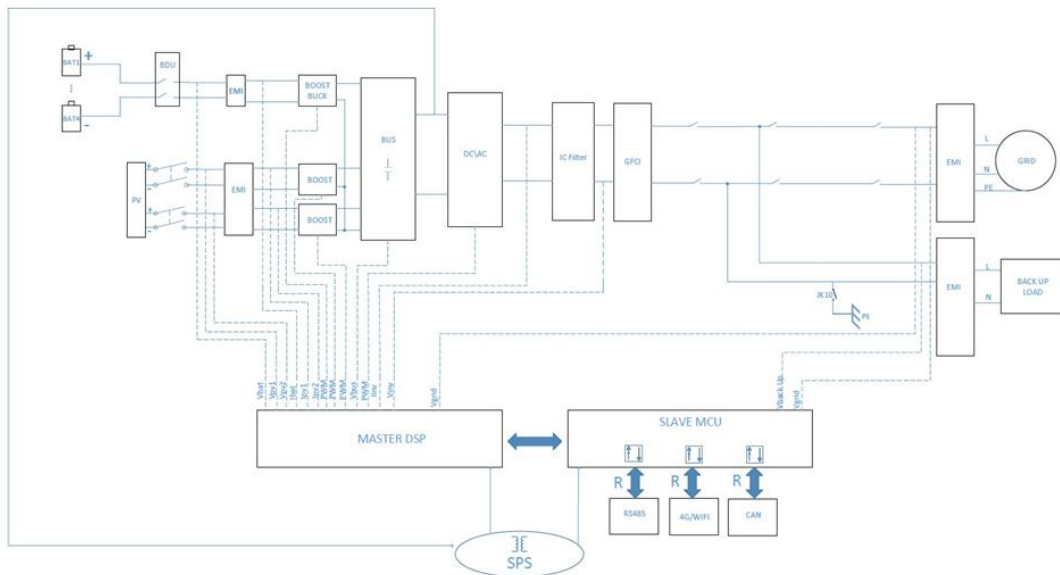
During fault condition defined in this standard, after the DSP receives the abnormal signal from the relevant protective detection circuit, the relays will operate to disconnect the DC active lines from grid automatically. The master DSP and slaver MCU have capacity independently to disconnect from grid, when any grid fault had happened.

The maximum ambient temperature permitted by the manufacturer's specification is 50°C and derate the output power from 45°C.

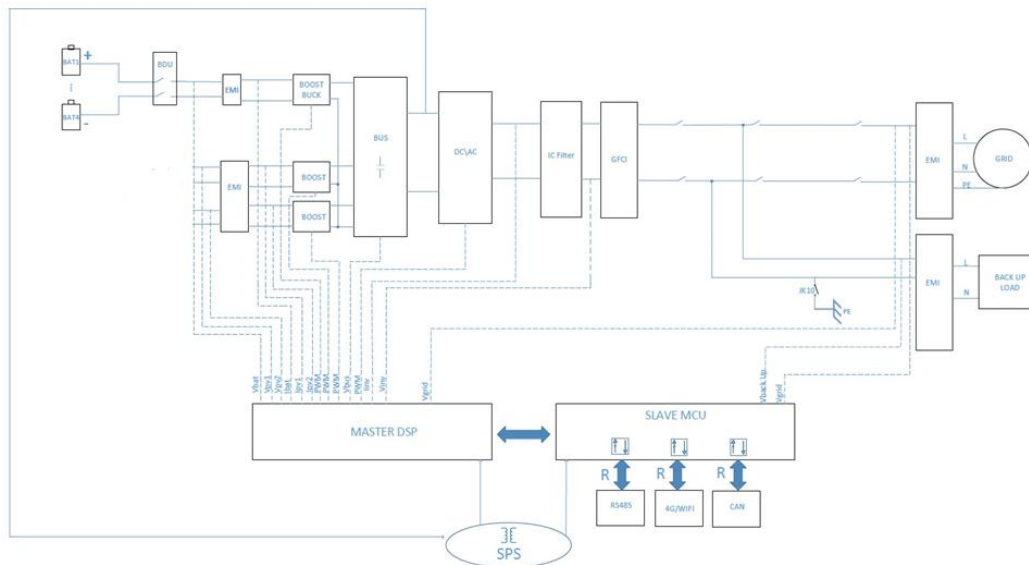
The equipment totally has 7 working models:

1. PV-Grid: The inverter is in inverting state, converts DC into AC that meets the requirement of power grid department in installation region, and feeds the energy from PV to the power grid.
 2. PV-Battery: The inverter is in Boost or Buck state, feeds the energy from PV to the Battery.
 3. PV-Off Grid: The inverter is in inverting state, converts DC into AC that meets the requirement of power grid department in installation region, and provides power supply for load.
 - 4*. Battery-Grid: The inverter is in inverting state, converts DC into AC that meets the requirement of power grid department in installation region, and feeds the energy from Battery to the power grid.
 - 5*. Grid-Battery: The inverter is in rectification state, feeds the energy from Grid to the Battery.
 - 6*. Battery-Off Grid: The inverter is in inverting state, converts DC into AC that meets the requirement of power grid department in installation region, and provides power supply for load.
 - 7*. Grid-Off Grid: The inverter is in by pass state, converts AC into AC that meets the requirement of power grid department in installation region, and provides power supply for load.
- Working models from 4* to 7* for AS2-3K-S-X, AS2-3.6K-S-X, AS2-4K-S-X, AS2-4.6K-S-X, AS2-

5K-S-X and AS2-6K-S-X, AS2-5K-S-B-X, , Note: X=1,2,3,4 (Number of Battery Modules).



The system diagram block for models
HS2-3K-S2-X, HS2-3.6K-S2-X, HS2-4K-S2-X, HS2-4.6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-6K-S2-X,
Note: X=1,2,3,4 (Number of Battery Modules)



The system diagram block for
AS2-3K-S-X, AS2-3.6K-S-X, AS2-4K-S-X, AS2-4.6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-6K-S-X,
Note: X=1,2,3,4 (Number of Battery Modules)

Integrated interface protection and control device disconnect from grid network in case any one of following faults occurred:

1. PV array insulation resistance fault
2. Residual current fault
3. Over & under grid voltage
4. Over & under grid frequency
5. Islanding operation
6. Over DC injection current

Differences of the models:

The models HS2-3K-S2-X, HS2-3.6K-S2-X, HS2-4K-S2-X, HS2-4.6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-6K-S2-X, Note: X=1,2,3,4 (Number of Battery Modules) and AS2-3K-S-X, AS2-3.6K-S-X, AS2-4K-S-X, AS2-4.6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-6K-S-X, Note: X=1,2,3,4 (Number of Battery Modules) are same as the construction, hardware and software, except the output power adjusted by software, the difference as below:

Model Difference	HS2-3K-S2-X	HS2-3.6K-S2-X	HS2-4K-S2-X	HS2-4.6K-S2-X	HS2-5K-S2-X	HS2-5K-S2-B-X	HS2-6K-S2-X	AS2-3K-S-X	AS2-3.6K-S-X	AS2-4K-S-X	AS2-4.6K-S-X	AS2-5K-S-X	AS2-5K-S-B-X	AS2-6K-S-X
Output power (W)	3000	3680	4000	4600	5000	5000	6000	3000	3680	4000	4600	5000	5000	6000
Max. Apparent Power (VA)	3300	3680	4400	4600	5500	5000	6000	3300	3680	4400	4600	5500	5000	6000
PV input	2 MPPT							---						

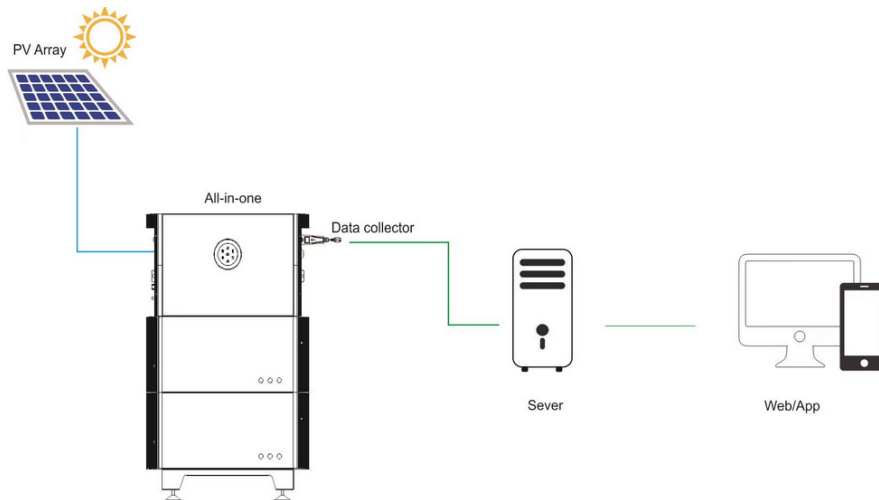
Coverision power subsystem: HS2-6K-S2-X (X=4) (Pmax), HS2-3K-S2-X (X=1) (Pmin)

Storage subsystem capacity: BU2-5.0-HV1, Number of battery module=4 (Emax)

BU2-5.0-HV1, Number of battery module=1 (Emin)

Remote control:

Remote shutdown should be connected as illustrated below.


The product was tested on:

Inverter: Control board: V1.010 Display: V 6.011

Battery System: V1.09

Test condition:

Temperature: 25°C Relative humidity: 65%

Copy of marking plate:

SAJ		Guangzhou Sanjing Electric Co., Ltd.	
		Tel: +86(20) 68905588	Fax: +86(20) 68905588
		Web: www.saj-electric.com	E-mail: service@saj-electric.com
All-In-One Energy Storage System			
Type: HS2-3K-S2-X			
PV Input	Max. Input Voltage	550V	
	MPPT Voltage Range	90-500V	
	Max. Input Current	16A/ 16A	
	Short Circuit Current	19.2A/ 19.2A	
Battery	Voltage Range	85-450Vdc	
	Max. Charging Current	30Adc	
	Max. Discharging Current	30Adc	
AC Input	Rated Voltage	L/N/PE 220/230V	
	Rated Frequency	50/ 60Hz	
	Max Current	26.1Aac	
AC Output	Rated Power	3000W	
	Max. Apparent Power	3300VA	
	Rated Voltage	L/N/PE 220/230V	
	Rated Frequency	50/ 60Hz	
	Rated Current	13.0Aac	
	Max Continuous Current	15.0Aac	
	Power Factor	0.8L~1~0.8c	
Backup Output	Max. Apparent Power	3000VA	
	Rated Voltage	L/N/PE 220/230V	
	Rated Frequency	50/ 60Hz	
	Max Continuous Current	13.6Aac	
Operating Temperature Range: -10°C~50°C			
Overvoltage Category: II(DC), III(AC)			
Protective Class: I Ingress Protection: IP65			
Inverter Topology: Non-Isolated			
Note: X=1, 2, 3, 4(Number of Modules)			
☐ 1 Battery Module/5.0kWh ☐ 2 Battery Modules/10.0kWh ☐ 3 Battery Modules/15.0kWh ☐ 4 Battery Modules/20.0kWh			
   			
S/N			
P/C			
Importer:		MADE IN CHINA	

SAJ		Guangzhou Sanjing Electric Co., Ltd.	
		Tel: +86(20) 68905588	Fax: +86(20) 68905588
		Web: www.saj-electric.com	E-mail: service@saj-electric.com
All-In-One Energy Storage System			
Type: HS2-3.6K-S2-X			
PV Input	Max. Input Voltage	550V	
	MPPT Voltage Range	90-500V	
	Max. Input Current	16A/ 16A	
	Short Circuit Current	19.2A/ 19.2A	
Battery	Voltage Range	85-450Vdc	
	Max. Charging Current	30Adc	
	Max. Discharging Current	30Adc	
AC Input	Rated Voltage	L/N/PE 220/230V	
	Rated Frequency	50/ 60Hz	
	Max Current	32.0Aac	
AC Output	Rated Power	3600W	
	Max. Apparent Power	3680VA	
	Rated Voltage	L/N/PE 220/230V	
	Rated Frequency	50/ 60Hz	
	Rated Current	16.0Aac	
	Max Continuous Current	16.0Aac	
	Power Factor	0.8L~1~0.8c	
Backup Output	Max. Apparent Power	3680VA	
	Rated Voltage	L/N/PE 220/230V	
	Rated Frequency	50/ 60Hz	
	Max Continuous Current	16.7Aac	
Operating Temperature Range: -10°C~50°C			
Overvoltage Category: II(DC), III(AC)			
Protective Class: I Ingress Protection: IP65			
Inverter Topology: Non-Isolated			
Note: X=1, 2, 3, 4(Number of Modules)			
☐ 1 Battery Module/5.0kWh ☐ 2 Battery Modules/10.0kWh ☐ 3 Battery Modules/15.0kWh ☐ 4 Battery Modules/20.0kWh			
   			
S/N			
P/C			
Importer:		MADE IN CHINA	

 Guangzhou Sanjing Electric Co., Ltd. Tel: +86(20) 68808888 Fax: +86(20) 68808888 Web: www.saj-electric.com E-mail: service@saj-electric.com	
All-In-One Energy Storage System Type: HS2-4K-S2-X	
PV Input	Max. Input Voltage 550V MPPT Voltage Range 90-500V Max. Input Current 16A/ 16A Short Circuit Current 19.2A/ 19.2A
Battery	Voltage Range 85-450Vdc Max. Charging Current 30Aac Max. Discharging Current 30Aac
AC Input	Rated Voltage L/N/PE 220/230V Rated Frequency 50/ 60Hz Max Current 34.8Aac
AC Output	Rated Power 4000W Max. Apparent Power 4400VA Rated Voltage L/N/PE 220/230V Rated Frequency 50/ 60Hz Rated Current 17.4Aac Max Continuous Current 20.0Aac Power Factor 0.8i...1...0.8c
Backup Output	Max. Apparent Power 4000VA Rated Voltage L/N/PE 220/230V Rated Frequency 50/ 60Hz Max Continuous Current 18.2Aac
Operating Temperature Range: -10°C~50°C Overvoltage Category: II (DC), III (AC) Protective Class: I Ingress Protection: IP65 Inverter Topology: Non-isolated	
Note: X=1, 2, 3, 4 (Number of Modules) ☐ 1 Battery Module/5.0kWh ☐ 2 Battery Modules/10.0kWh ☐ 3 Battery Modules/15.0kWh ☐ 4 Battery Modules/20.0kWh	
	
S/N	
P/C	
Importer: _____ MADE IN CHINA	

 Guangzhou Sanjing Electric Co., Ltd. Tel: +86(20) 68808888 Fax: +86(20) 68808888 Web: www.saj-electric.com E-mail: service@saj-electric.com	
All-In-One Energy Storage System Type: HS2-4.6K-S2-X	
PV Input	Max. Input Voltage 550V MPPT Voltage Range 90-500V Max. Input Current 16A/ 16A Short Circuit Current 19.2A/ 19.2A
Battery	Voltage Range 85-450Vdc Max. Charging Current 30Aac Max. Discharging Current 30Aac
AC Input	Rated Voltage L/N/PE 220/230V Rated Frequency 50/ 60Hz Max Current 40.0Aac
AC Output	Rated Power 4600W Max. Apparent Power 4600VA Rated Voltage L/N/PE 220/230V Rated Frequency 50/ 60Hz Rated Current 20.0Aac Max Continuous Current 20.0Aac Power Factor 0.8i...1...0.8c
Backup Output	Max. Apparent Power 4600VA Rated Voltage L/N/PE 220/230V Rated Frequency 50/ 60Hz Max Continuous Current 20.9Aac
Operating Temperature Range: -10°C~50°C Overvoltage Category: II (DC), III (AC) Protective Class: I Ingress Protection: IP65 Inverter Topology: Non-isolated	
Note: X=1, 2, 3, 4 (Number of Modules) ☐ 1 Battery Module/5.0kWh ☐ 2 Battery Modules/10.0kWh ☐ 3 Battery Modules/15.0kWh ☐ 4 Battery Modules/20.0kWh	
	
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All-In-One Energy Storage System
Type: HS2-5K-S2-X

PV Input	Max. Input Voltage	550V
	MPPT Voltage Range	90-500V
	Max. Input Current	16A/ 16A
	Short Circuit Current	19.2A/ 19.2A
Battery	Voltage Range	85-450Vdc
	Max. Charging Current	30A _{dc}
	Max. Discharging Current	30A _{dc}
AC Input	Rated Voltage	L/N/PE 220/230V
	Rated Frequency	50/ 60Hz
	Max Current	43.5A _{ac}
AC Output	Rated Power	5000W
	Max. Apparent Power	5000VA
	Rated Voltage	L/N/PE 220/230V
	Rated Frequency	50/ 60Hz
	Rated Current	21.7A _{ac}
	Max Continuous Current	25.0A _{ac}
Backup Output	Max. Apparent Power	5000VA
	Rated Voltage	L/N/PE 220/230V
	Rated Frequency	50/ 60Hz
	Max Continuous Current	22.7A _{ac}

Operating Temperature Range: -10°C~50°C
Overvoltage Category: II (DC), III (AC)
Protective Class: I Ingress Protection: IP65
Inverter Topology: Non-isolated

Note: X=1, 2, 3, 4 (Number of Modules)
☐ 1 Battery Module/5.0kWh ☐ 2 Battery Modules/10.0kWh
☐ 3 Battery Modules/15.0kWh ☐ 4 Battery Modules/20.0kWh

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Web: www.saj-electric.com E-mail: service@saj-electric.com

All-In-One Energy Storage System
Type: HS2-5K-S2-B-X

PV Input	Max. Input Voltage	550V
	MPPT Voltage Range	90-500V
	Max. Input Current	16A/ 16A
	Short Circuit Current	19.2A/ 19.2A
Battery	Voltage Range	85-450Vdc
	Max. Charging Current	30A _{dc}
	Max. Discharging Current	30A _{dc}
AC Input	Rated Voltage	L/N/PE 220/230V
	Rated Frequency	50/ 60Hz
	Max Current	43.5A _{ac}
AC Output	Rated Power	5000W
	Max. Apparent Power	5000VA
	Rated Voltage	L/N/PE 220/230V
	Rated Frequency	50/ 60Hz
	Rated Current	21.7A _{ac}
	Max Continuous Current	22.7A _{ac}
Backup Output	Max. Apparent Power	5000VA
	Rated Voltage	L/N/PE 220/230V
	Rated Frequency	50/ 60Hz
	Max Continuous Current	22.7A _{ac}

Operating Temperature Range: -10°C~50°C
Overvoltage Category: II (DC), III (AC)
Protective Class: I Ingress Protection: IP65
Inverter Topology: Non-isolated

Note: X=1, 2, 3, 4 (Number of Modules)
☐ 1 Battery Module/5.0kWh ☐ 2 Battery Modules/10.0kWh
☐ 3 Battery Modules/15.0kWh ☐ 4 Battery Modules/20.0kWh

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All-In-One Energy Storage System Type: HS2-6K-S2-X	
PV Input	Max. Input Voltage 550V MPPT Voltage Range 90-500V Max. Input Current 16A/ 16A Short Circuit Current 19.2A/ 19.2A
Battery	Voltage Range 85-450Vdc Max. Charging Current 30Aac Max. Discharging Current 30Aac
AC Input	Rated Voltage L/N/PE 220/230V Rated Frequency 50/ 60Hz Max Current 52.2Aac
AC Output	Rated Power 6000W Max. Apparent Power 6000VA Rated Voltage L/N/PE 220/230V Rated Frequency 50/ 60Hz Rated Current 26.1Aac Max Continuous Current 27.3Aac Power Factor 0.8L...1...0.8c
Backup Output	Max. Apparent Power 6000VA Rated Voltage L/N/PE 220/230V Rated Frequency 50/ 60Hz Max Continuous Current 27.3Aac
Operating Temperature Range: -10°C~50°C Overvoltage Category: II(DC), III(AC) Protective Class: I Ingress Protection: IP65 Inverter Topology: Non-isolated	
Note: X=1, 2, 3, 4(Number of Modules) ☐ 1 Battery Module/5.0kWh ☐ 2 Battery Modules/10.0kWh ☐ 3 Battery Modules/15.0kWh ☐ 4 Battery Modules/20.0kWh	
    	
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All-In-One Energy Storage System Type: AS2-3K-S-X	
Battery	Voltage Range 85-450Vdc Max. Charging Current 30Aac Max. Discharging Current 30Aac
AC Input	Rated Voltage L/N/PE 220/230V Rated Frequency 50/ 60Hz Max Current 26.1Aac
AC Output	Rated Power 3000W Max. Apparent Power 3300VA Rated Voltage L/N/PE 220/230V Rated Frequency 50/ 60Hz Rated Current 13.0Aac Max Continuous Current 15.0Aac Power Factor 0.8L...1...0.8c
Backup Output	Max. Apparent Power 3000VA Rated Voltage L/N/PE 220/230V Rated Frequency 50/ 60Hz Max Continuous Current 13.6Aac
Operating Temperature Range: -10°C~50°C Overvoltage Category: II(DC), III(AC) Protective Class: I Ingress Protection: IP65 Inverter Topology: Non-isolated	
Note: X=1, 2, 3, 4(Number of Modules) ☐ 1 Battery Module/5.0kWh ☐ 2 Battery Modules/10.0kWh ☐ 3 Battery Modules/15.0kWh ☐ 4 Battery Modules/20.0kWh	
    	
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All-In-One Energy Storage System Type: AS2-3.6K-S-X	
Battery	Voltage Range 85-450Vdc Max. Charging Current 30Aac Max. Discharging Current 30Aac
AC Input	Rated Voltage L/N/PE 220/230V Rated Frequency 50/60Hz Max Current 32Aac
AC Output	Rated Power 3680W Max. Apparent Power 3680VA Rated Voltage L/N/PE 220/230V Rated Frequency 50/60Hz Rated Current 16.0Aac Max Continuous Current 16.0Aac Power Factor 0.8L...1...0.8c
Backup Output	Max. Apparent Power 3680VA Rated Voltage L/N/PE 220/230V Rated Frequency 50/60Hz Max Continuous Current 16.7Aac
Operating Temperature Range: -10°C~50°C Overvoltage Category: II (DC), III (AC) Protective Class: I Ingress Protection: IP65 Inverter Toplogy: Non-isolated	
Note: X=1, 2, 3, 4 (Number of Modules) ☐ 1 Battery Module/5.0kWh ☐ 2 Battery Modules/10.0kWh ☐ 3 Battery Modules/15.0kWh ☐ 4 Battery Modules/20.0kWh	
           	
S/N	
P/C	
Importer: MADE IN CHINA	

 Guangzhou Sanjing Electric Co., Ltd. Tel: +86(20) 68808888 Fax: +86(20) 68808888 Web: www.saj-electric.com E-mail: service@saj-electric.com	
All-In-One Energy Storage System Type: AS2-4K-S-X	
Battery	Voltage Range 85-450Vdc Max. Charging Current 30Aac Max. Discharging Current 30Aac
AC Input	Rated Voltage L/N/PE 220/230V Rated Frequency 50/60Hz Max Current 34.8Aac
AC Output	Rated Power 4000W Max. Apparent Power 4400VA Rated Voltage L/N/PE 220/230V Rated Frequency 50/60Hz Rated Current 17.4Aac Max Continuous Current 20.0Aac Power Factor 0.8L...1...0.8c
Backup Output	Max. Apparent Power 4000VA Rated Voltage L/N/PE 220/230V Rated Frequency 50/60Hz Max Continuous Current 18.2Aac
Operating Temperature Range: -10°C~50°C Overvoltage Category: II (DC), III (AC) Protective Class: I Ingress Protection: IP65 Inverter Toplogy: Non-isolated	
Note: X=1, 2, 3, 4 (Number of Modules) ☐ 1 Battery Module/5.0kWh ☐ 2 Battery Modules/10.0kWh ☐ 3 Battery Modules/15.0kWh ☐ 4 Battery Modules/20.0kWh	
           	
S/N	
P/C	
Importer: MADE IN CHINA	

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All-In-One Energy Storage System Type: AS2-4.6K-S-X

Battery	Voltage Range	85-450Vdc
	Max. Charging Current	30Adc
	Max. Discharging Current	30Adc
AC Input	Rated Voltage	L/N/PE 220/230V
	Rated Frequency	50/60Hz
	Max Current	40Aac
	Rated Power	4600W
AC Output	Max. Apparent Power	4600VA
	Rated Voltage	L/N/PE 220/230V
	Rated Frequency	50/60Hz
	Rated Current	20.0Aac
	Max Continuous Current	20.0Aac
	Power Factor	0.8L...1...0.8c
Backup Output	Max. Apparent Power	4600VA
	Rated Voltage	L/N/PE 220/230V
	Rated Frequency	50/60Hz
	Max Continuous Current	20.9Aac

Operating Temperature Range: -10°C~50°C
Overvoltage Category: II(DC), III(AC)
Protective Class: I Ingress Protection: IP65
Inverter Topology: Non-Isolated

Note: X=1, 2, 3, 4(Number of Modules)

- ☐ 1 Battery Module/5.0kWh ☐ 2 Battery Modules/10.0kWh
☐ 3 Battery Modules/15.0kWh ☐ 4 Battery Modules/20.0kWh



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All-In-One Energy Storage System Type: AS2-5K-S-X

Battery	Voltage Range	85-450Vdc
	Max. Charging Current	30Adc
	Max. Discharging Current	30Adc
AC Input	Rated Voltage	L/N/PE 220/230V
	Rated Frequency	50/60Hz
	Max Current	43.5Aac
	Rated Power	5000W
AC Output	Max. Apparent Power	5500VA
	Rated Voltage	L/N/PE 220/230V
	Rated Frequency	50/60Hz
	Rated Current	21.7Aac
	Max Continuous Current	25.0Aac
	Power Factor	0.8L...1...0.8c
Backup Output	Max. Apparent Power	5000VA
	Rated Voltage	L/N/PE 220/230V
	Rated Frequency	50/60Hz
	Max Continuous Current	22.7Aac

Operating Temperature Range: -10°C~50°C
Overvoltage Category: II(DC), III(AC)
Protective Class: I Ingress Protection: IP65
Inverter Topology: Non-Isolated

Note: X=1, 2, 3, 4(Number of Modules)

- ☐ 1 Battery Module/5.0kWh ☐ 2 Battery Modules/10.0kWh
☐ 3 Battery Modules/15.0kWh ☐ 4 Battery Modules/20.0kWh



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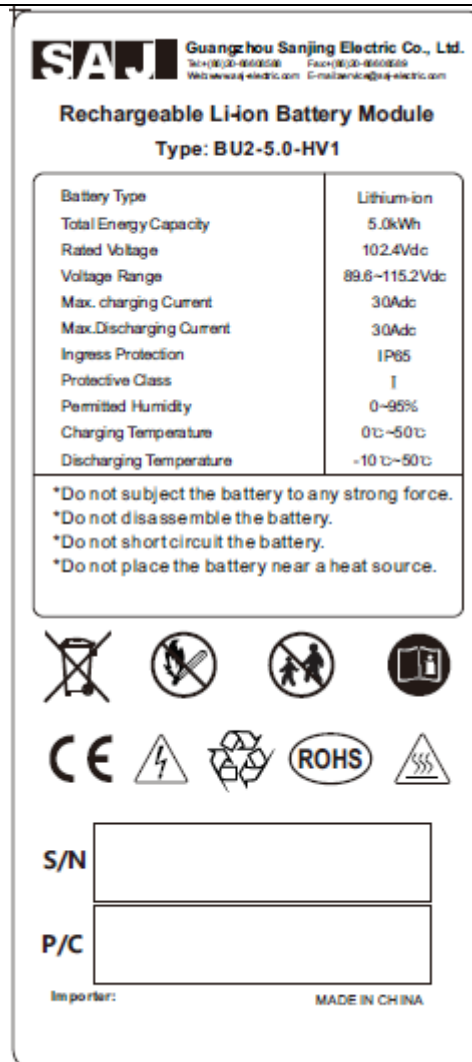
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 Guangzhou Sanjing Electric Co., Ltd. Tel: +86(20) 66908888 Fax: +86(20) 66908888 Web: www.saj-electric.com E-mail: service@saj-electric.com	
All-In-One Energy Storage System Type: AS2-5K-S-B-X	
Battery	Voltage Range 85-450Vdc
	Max. Charging Current 30A _{dc}
	Max. Discharging Current 30A _{dc}
AC Input	Rated Voltage L/N/PE 220/230V
	Rated Frequency 50/60Hz
	Max Current 43.5A _{ac}
AC Output	Rated Power 5000W
	Max. Apparent Power 5000VA
	Rated Voltage L/N/PE 220/230V
	Rated Frequency 50/60Hz
	Rated Current 21.7A _{ac}
	Max Continuous Current 22.7A _{ac}
	Power Factor 0.81...1...0.8c
Backup Output	Max. Apparent Power 5000VA
	Rated Voltage L/N/PE 220/230V
	Rated Frequency 50/60Hz
	Max Continuous Current 22.7A _{ac}
Operating Temperature Range: -10°C~50°C Overvoltage Category: II (DC), III (AC) Protective Class: I Ingress Protection: IP65 Inverter Topology: Non-isolated	
Note: X=1, 2, 3, 4 (Number of Modules) ☐ 1 Battery Modules/5.0kWh ☐ 2 Battery Modules/10.0kWh ☐ 3 Battery Modules/15.0kWh ☐ 4 Battery Modules/20.0kWh	
  	
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All-In-One Energy Storage System Type: AS2-6K-S-X	
Battery	Voltage Range 85-450Vdc
	Max. Charging Current 30A _{dc}
	Max. Discharging Current 30A _{dc}
AC Input	Rated Voltage L/N/PE 220/230V
	Rated Frequency 50/60Hz
	Max Current 52.2A _{ac}
AC Output	Rated Power 6000W
	Max. Apparent Power 6000VA
	Rated Voltage L/N/PE 220/230V
	Rated Frequency 50/60Hz
	Rated Current 26.1A _{ac}
	Max Continuous Current 27.3A _{ac}
	Power Factor 0.81...1...0.8c
Backup Output	Max. Apparent Power 6000VA
	Rated Voltage L/N/PE 220/230V
	Rated Frequency 50/60Hz
	Max Continuous Current 27.3A _{ac}
Operating Temperature Range: -10°C~50°C Overvoltage Category: II (DC), III (AC) Protective Class: I Ingress Protection: IP65 Inverter Topology: Non-isolated	
Note: X=1, 2, 3, 4 (Number of Modules) ☐ 1 Battery Modules/5.0kWh ☐ 2 Battery Modules/10.0kWh ☐ 3 Battery Modules/15.0kWh ☐ 4 Battery Modules/20.0kWh	
  	
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Storage Battery System Model BU2-5.0-HV1

Model list:

Model list			HS2- 3K-S2-X	HS2- 3.6K-S2-X	HS2- 4K-S2-X	HS2- 4.6K-S2-X	HS2- 5K-S2-X	HS2- 6K-S2-X	HS2-5K -S2-B-X
DC side	PV INPUT	Vmax PV [Vdc]	550						
		Isc PV [A]	19.2/19.2						
		MPPT voltage range VMPPT [Vdc]	90-500						
		Max. Input Current IMAX [A] (A/B) (each MPPT if more than 1)	16/16						
		MPPT Full Power Voltage Range [Vdc]	110-500	132-500	143-500	162-500	176-500	210-500	176-500
		Number of MPPT	2						
		String per MPPT	1/1						
		Backfeed Current [A]	0						
		Overvoltage Category (OVC)	II						
	Battery DC side	Battery Type	LiFePO4						
		Battery Voltage Range [V]	85-450						
		Full load voltage range [Vdc]	116-450	140-450	151-450	173-450	187-450	222-450	187-450
		Max. Charging / Discharging Current [A]	30/30						
		Scalability	BU2-5.0-HV1 (up to 4 battery modules)						
		Rated Charging / Discharging current [W]	3000	3680	4000	4600	5000	6000	5000
		Overvoltage Category (OVC)	II						

AC side	AC Output [On-grid]	Rated Output Voltage Ur [Vac]	L+N+PE, 230					
		Rated Output Frequency FNETZ [Hz]	50/60					
		Rated Output Power [W]	3000	3680	4000	4600	5000	6000
		Max. Apparent power [VA]	3300	3680	4400	4600	5500	6000
		Max. Output Current Imax [A]	15	16	20	20	25	27.3
		THD [V / I] (100% full power)	<3%					
	AC Input [On-grid]	Rated Output Voltage Ur [Vac]	L+N+PE, 230					
		Rated Output Frequency FNETZ [Hz]	50/60					
		Max. Input Current Imax [A]	26.1	32	34.8	40	43.5	52.2
	AC Output [Back-up]	Rated Output Voltage Ur [Vac]	L+N+PE, 230					
		Rated Output Frequency FNETZ [Hz]	50/60					
		Max. Output Power [VA]	3000	3680	4000	4600	5000	6000
		Max. Output Current [A]	13.6	16.7	18.2	20.9	22.7	27.3
		Peak Output Apparent Power [VA]	3600,60s	4416,60s	4800,60s	5520,60s	6000,60s	7200,60s
		THD [V / I] (@ Linear Load)	<3%					
	Common data	Power Factor cosφ [λ]	0.8 leading ~0.8lagging					
		Max. Efficiency	97.60%					
		Euro Efficiency	97.00%					
		Acoustic Noise [dB]	<35dB					

		Overvoltage Category (OVC)	III					
CONSTRUCTION	Type of inverter	Non-isolated						
	Hardware [Version]	V1.2						
	Firmware [Version]	Control board: V1.010 Display: V6.011						
	Type of NS Protection	Integrated						
	Separated by	Transformerless						
	Protective Class	Class I						
	Enclosure Protection (IP)	IP65						
	Operating Temperature Range [°C]	-10°C to +50°C (45°C to 50°C with derating)						
	Pollution degree (PD)	PD3						
	Altitude [m]	4000m (>3000m Power Derating)						
	Size [mm]	354*626*365						
Weight [kg]	25							
Model list		AS2-3K-S2-X	AS2-3.6K-S2-X	AS2-4K-S2-X	AS2-4.6K-S2-X	AS2-5K-S2-X	AS2-6K-S2-X	AS2-5K-S2-B-X
Battery DC side	Battery Type	LiFePO4						
	Battery Voltage Range [V]	85-450						
	Full load voltage range [Vdc]	116-450	140-450	151-450	173-450	187-450	222-450	187-450
	Max. Charging / Discharging Current [A]	30/30						
	Scalability	BU2-5.0-HV1 (up to 4 battery modules)						
	Rated Charging / Discharging current [W]	3000	3680	4000	4600	5000	6000	5000

		Overvoltage Category (OVC)	II					
AC side	AC Output [On-grid]	Rated Output Voltage Ur [Vac]	L+N+PE, 230					
		Rated Output Frequency FNETZ [Hz]	50/60					
		Rated Output Power [W]	3000	3680	4000	4600	5000	6000
		Max. Apparent power [VA]	3300	3680	4400	4600	5500	6000
		Max. Output Current Imax [A]	15	16	20	20	25	27.3
		THD [V / I] (100% full power)	<3%					
	AC Input [On-grid]	Rated Output Voltage Ur [Vac]	L+N+PE, 230					
		Rated Output Frequency FNETZ [Hz]	50/60					
		Max. Input Current Imax [A]	26.1	32	34.8	40	43.5	52.2
	AC Output [Back-up]	Rated Output Voltage Ur [Vac]	L+N+PE, 230					
		Rated Output Frequency FNETZ [Hz]	50/60					
		Max. Output Power [VA]	3000	3680	4000	4600	5000	6000
		Max. Output Current [A]	13.6	16.7	18.2	20.9	22.7	27.3
		Peak Output Apparent Power [VA]	3600,60s	4416,60s	4800,60s	5520,60s	6000,60s	7200,60s
		THD [V / I] (@ Linear Load)	<3%					
	Common data	Power Factor cosφ [λ]	0.8 leading ~0.8lagging					
		Max. Efficiency	97.60%					
		Euro Efficiency	97.00%					

		Acoustic Noise [dB]	<35dB
		Overvoltage Category (OVC)	III
CONSTRUCTION	Type of inverter	Non-isolated	
	Hardware [Version]	V1.2	
	Firmware [Version]	Control board: V1.010 Display: V6.011	
	Type of NS Protection	Integrated	
	Separated by	Transformerless	
	Protective Class	Class I	
	Enclosure Protection (IP)	IP65	
	Operating Temperature Range [°C]	-10°C to +50°C (45°C to 50°C with derating)	
	Pollution degree (PD)	PD3	
	Altitude [m]	4000m (>3000m Power Derating)	
	Size [mm]	354*626*365	
	Weight [kg]	23.7	

Battery:

Model	BU2-5.0-HV1			
Battery Module	BU2-5.0-HV1 (1P32S 102.4V 50Ah)			
No. of Modules	1	2	3	4
Rated Energy [kWh]	5.0	10.0	15.0	20.0
Usable Energy [kWh]	4.5	9.0	13.5	18.0
Dimension (H*W*D)[mm]	261*626*365	522*626*365	783*626*365	1044*626*365
Weight [kg]	50.5	101	151.5	202
Nominal Voltage [V]	102.4	204.8	307.2	409.6
Operating Voltage [V]	89.6~115.2	179.2~230.4	268.8~345.6	358.4~460.8
Max. Charge Current [A]	30			
Max. Discharge Current [A]	30			
General Data				
Ingress Protection	IP65			
Mounting	Wall-Mounted / Ground-Mounted			
Operating Temperature Range	Charging: 0~50°C; Discharging: -10~50°C			
Ambient Humidity	0~95% non-condensing			
Cooling Method	Natural convection			
Communication	CAN			

Tests performed (name of test and test clause):

Allegato A: Caratteristiche e prove per il Sistema di Protezione di Interfaccia (SPI)
Annex A: Requirements and test for Interface Protection System (SPI)

A.4 Verifiche e prove sul SPI¹ /test and inspection on SPI

Test	Ref. CEI 0-21	Ref. standard	Result	Sample
Prove funzionali sull'SPI <i>/Functional test on SPI</i>	A.4.3	Condizioni di riferimento / Reference conditions (20 °C) – Tab.9	PASS	HS2-6K-S2-X
	A.4.3.1	Caldo secco / Dry heat test	PASS	HS2-6K-S2-X
	A.4.3.2	CEI EN 60068-2-2 (Test B) - Tab.12	PASS	HS2-6K-S2-X
	A.4.7 (limit conditions)	Umidità / Humidity test CEI EN 60068-2-78 (Test Cab) - Tab.12	PASS	HS2-6K-S2-X
		Freddo / Cold test CEI EN 60068-2-1 (Test A) - Tab.12	PASS	HS2-6K-S2-X

A.4.3.3 Prescrizioni aggiuntive per le prove funzionali
/Additional requirements of the functional test

Test	Ref. CEI 0-21	Ref. standard	Result	Sample
Insensibilità delle armoniche del relè di frequenza	A.4.3.3.1	CEI 0-21:2022-03	PASS	HS2-6K-S2-X
Segnale di telescatto	A.4.3.3.2	CEI 0-21:2022-03	PASS	HS2-6K-S2-X
Segnale di telecomunicazione	A.4.3.3.3	CEI 0-21:2022-03	PASS	HS2-6K-S2-X
Verifica di insensibilità alla derivata di frequenza (ROCOF)	A.4.3.4	CEI 0-21:2022-03	PASS	HS2-6K-S2-X
Autotest	A.4.4	CEI 0-21:2022-03	PASS	HS2-6K-S2-X
Single Fault tolerance	A.4.5	CEI 0-21:2022-03	PASS	HS2-6K-S2-X

A.4.6: Prove di compatibilità EMC

Test	Ref. CEI 0-21	Ref. standard	Result	Sample
Compatibilità elettromagnetica <i>/Electromagnetic compatibility</i>	A.4.6	CEI EN 60255-26 CEI EN 50263 (Severità classe 2 – Livello industriale) – Tab.11	PASS	Refer to EMC report: CN22K1PC 001

¹ Interface protection System (SPI) can be integrated to inverter with output power up to 11.08KW.

A.4.7 Compatibilità Climatica / Climatic compatibility				
Test	Ref. CEI 0-21	Ref. standard	Result	Sample
Compatibilità Climatica /Climatic compatibility Storage conditions	A.4.7 (limit conditions)	Caldo secco / Dry heat test CEI EN 60068-2-2 (Test B) - Tab.12	PASS	HS2-6K-S2-X
		Umidità / Humidity test CEI EN 60068-2-78 (Test Cab) - Tab.12	PASS	HS2-6K-S2-X
		Freddo / Cold test CEI EN 60068-2-1 (Test A) - Tab.12	PASS	HS2-6K-S2-X
		Ciclo termico /changing temperature CEI EN 60068-2-14 - Tab.12	PASS	HS2-6K-S2-X
Compatibilità Climatica /Climatic compatibility Inverter in working conditions	A.4.7 (limit conditions)	Caldo secco / Dry heat test CEI EN 60068-2-2 (Test B) - Tab.12	PASS	HS2-6K-S2-X
		Umidità / Humidity test CEI EN 60068-2-78 (Test Cab) - Tab.12	PASS	HS2-6K-S2-X
		Freddo / Cold test CEI EN 60068-2-1 (Test A) - Tab.12	PASS	HS2-6K-S2-X
		Ciclo termico /changing temperature CEI EN 60068-2-14 - Tab.12	PASS	HS2-6K-S2-X

A.4.8 Prove di isolamento /Insulating test				
Test	Ref. CEI 0-21	Ref. standard	Result	Sample
Tenuta ad impulso /Pulse test	A.4.8	CEI EN 60255-5 Note ²	PASS	HS2-6K-S2-X
Rigidità Dielettrica /Dielectric Strength		CEI EN 60255-5 Note ¹	PASS	HS2-6K-S2-X
Resistenza di Isolamento /insulation resistance		CEI EN 60255-5 Note ¹	PASS	HS2-6K-S2-X

A.4.9 Prove di sovraccaricabilità dei circuiti di misura / Measurement circuits Overload				
Test	Ref. CEI 0-21	Ref. standard	Result	Sample
Prove di sovraccaricabilità dei circuiti di misura / Measurement circuits Overload	A.4.9	CEI 0-21:2022-03	N/A	SPI integrata
			N/A	SPI integrata
			N/A	SPI integrata

² In case of integrated SPI, reference standard for insulating test is the CEI 60146-1-1.

Allegato B: Prove sugli inverter per impianti indirettamente connessi
Allegato B: Inverter tests for PV plants not directly connected to the grid

B.1 Prove sull'inverter / inverter tests				
Test	Ref. CEI 0-21	Ref. standard	Result	Sample
Armoniche di corrente /Harmonics measurement (full power, 66% and 33% of max. power) ☐ CEI EN 61000-3-2 ☒ CEI EN 61000-3-12	B.1 Tab. 14 Tab. 15	Condizioni di riferimento / Reference conditions (20 °C) – Tab.14	PASS	HS2-6K-S2-X
		Caldo secco / Dry heat test CEI EN 60068-2-2 (Test B) - Tab.15	PASS	HS2-6K-S2-X
		Umidità / Humidity test CEI EN 60068-2-78 (Test Cab) - Tab.15	PASS	HS2-6K-S2-X
		Freddo / Cold test CEI EN 60068-2-1 (Test A) - Tab.15	PASS	HS2-6K-S2-X
Fluttuazioni di tensione /Flicker measurement (full power, 66% and 33% of max. power) ☐ CEI EN 61000-3-3 ☒ CEI EN 61000-3-11	B.1 Tab. 14 Tab. 15	Condizioni di riferimento / Reference conditions (20 °C) – Tab.14	PASS	HS2-6K-S2-X
		Caldo secco / Dry heat test CEI EN 60068-2-2 (Test B) - Tab.15	PASS	HS2-6K-S2-X
		Umidità / Humidity test CEI EN 60068-2-78 (Test Cab) - Tab.15	PASS	HS2-6K-S2-X
		Freddo / Cold test CEI EN 60068-2-1 (Test A) - Tab.15	PASS	HS2-6K-S2-X

B.1.1 Condizioni di connessione, riconnessione ed erogazione graduale della potenza Connection, re-connection conditions, and gradual increase of the power production				
Test	Ref. CEI 0-21	Ref. standard	Result	Sample
Verifica delle condizioni di connessione e riconnessione /Check of the connection and re-connection conditions	8.4.1.3 B.1.1.1	CEI 0-21:2022-03	PASS	HS2-6K-S2-X
Verifica della erogazione graduale della potenza attiva /Check of the gradual increase of the power production	8.4.1.3 B.1.1.2	CEI 0-21:2022-03	PASS	HS2-6K-S2-X

B.1.2 Erogazione della potenza reattiva /Reactive power production (or adsorbtion)				
Test	Ref. CEI 0-21	Ref. standard	Result	Sample
Verifica dei requisiti costruttivi: capability erogazione della potenza reattiva / Check of the constructive requirements: reactive power production capability Not Applicable for plant with power <800W.	8.4.4.2 B.1.2.1	CEI 0-21:2022-03	PASS	HS2-6K-S2-X
Erogazione di potenza reattiva secondo un livello assegnato / Reactive power production according to an assigned level Applicable for plant with power >11.08KW.	B.1.2.3	CEI 0-21:2022-03	PASS	HS2-6K-S2-X
Tempo di risposta ad una variazione a gradino del livello assegnato / Reaction time after a step variation of the assigned level. Applicable for plant with power >11.08KW.	B.1.2.4	CEI 0-21:2022-03	PASS	HS2-6K-S2-X
Erogazione automatica di potenza reattiva secondo una curva caratteristica $\cos\phi = f(P)$ / Automatic reactive power production according to a characteristic curve $\cos(\phi)$	B.1.2.5 Annex E E.2	CEI 0-21:2022-03	PASS	HS2-6K-S2-X
Erogazione automatica di potenza reattiva secondo una curva caratteristica $Q = f(V)$ / Automatic reactive power production according to a characteristic curve $Q = f(V)$ Applicable for plant with power >11.08KW.	B.1.2.6 Annex E E.2.1	CEI 0-21:2022-03	PASS	HS2-6K-S2-X

B.1.3 Limitazione della potenza attiva <i>/ Active power limitation</i>				
Test	Ref. CEI 0-21	Ref. standard	Result	Sample
Limitazione della potenza attiva per valori di tensione prossimi al 110 % di Un <i>/ Active power limitation for voltage values near to 100 % di Un</i>	8.5.3.1 B.1.3.1 Annex F.3	CEI 0-21:2022-03	PASS	HS2-6K-S2-X
Regolazione della potenza attiva in presenza di transitori sulla rete di trasmissione <i>/ Active power regulation in coincidence with transitory on the transmission grid</i>	8.5.3.4 B.1.3.2 Annex F.3	CEI 0-21:2022-03	PASS	HS2-6K-S2-X
Verifica del campo di funzionamento in tensione e frequenza <i>/ Check the voltage and frequency operating range</i>	8.4.4 B.1.3.3	CEI 0-21:2022-03	PASS	HS2-6K-S2-X
Riduzione della potenza attiva in presenza di transitori di sottofrequenza sulla rete di trasmissione. <i>/ Active power reduction in coincidence with transitory on the transmission grid</i> <i>Not mandatory on static generator</i>	8.5.3.4 B.1.3.3.1	CEI 0-21:2022-03	PASS	HS2-6K-S2-X
Limitazione della potenza attiva su comando esterno proveniente dal Distributore <i>/ Active power limitation in coincidence with external command coming from the Electricity Distributor</i> <i>Not Applicable for plant with power <800W.</i>	8.5.3.3 B.1.3.4 Annex F.4	CEI 0-21:2022-03	PASS	HS2-6K-S2-X

B.1.4 Emissione di componente continua nella corrente di uscita <i>/ DC current injection on the output</i>				
Test	Ref. CEI 0-21	Ref. standard	Result	Sample
Verifica della emissione di componente continua <i>/Check of DC current injection</i>	8.4.4.1 B.1.4.1	Condizioni di riferimento / Reference conditions (20 °C)	PASS	HS2-6K-S2-X
		Caldo secco / Dry heat test CEI EN 60068-2-2 (Test B)	PASS	HS2-6K-S2-X
		Umidità / Humidity test CEI EN 60068-2-78 (Test Cab)	PASS	HS2-6K-S2-X
		Freddo / Cold test CEI EN 60068-2-1 (Test A)	PASS	HS2-6K-S2-X
Verifica delle protezioni contro l'immissione di componente continua <i>/ Check of protections against the DC current injection.</i>	8.4.4.1 B.1.4.2	Condizioni di riferimento / Reference conditions (20 °C)	PASS	HS2-6K-S2-X
		Caldo secco / Dry heat test CEI EN 60068-2-2 (Test B)	PASS	HS2-6K-S2-X
		Umidità / Humidity test CEI EN 60068-2-78 (Test Cab)	PASS	HS2-6K-S2-X
		Freddo / Cold test CEI EN 60068-2-1 (Test A)	PASS	HS2-6K-S2-X

B.1.5 Verifica della insensibilità agli abbassamenti di tensione (LVFRT capability) <i>/ Check of the LVFRT capability</i>				
Test non accreditato Accredia/Test not Accredia accredited				
Test	Ref. CEI 0-21	Ref. standard	Result	Sample
LVFRT Capability <i>Applicable for plant with power >11.08KW.</i>	8.5.1 B.1.5	CEI 0-21:2022-03	PASS	HS2-6K-S2-X

B.1.6 Verifica della insensibilità alle richiuse automatiche in discordanza di fase <i>/ Check of the insensibility to the re-closures when phases are in discordance</i>				
Test	Ref. CEI 0-21	Ref. standard	Result	Sample
Verifica della insensibilità alle richiuse automatiche in discordanza di fase <i>/ Check of the insensibility to the re-closures when phases are in discordance</i>	B.1.6 ☒ B.1.6.1 ☐ B.1.6.2 ☐ B.1.6.3	CEI 0-21:2022-03	PASS	HS2-6K-S2-X

Allegato B: Prove di compatibilità EMC				
Test	Ref. CEI 0-21	Ref. standard	Result	Sample
Compatibilità elettromagnetica <i>/Electromagnetic compatibility</i>	Annex B	CEI EN 61000-6-3 CEI EN 61000-6-2	PASS	Refer to EMC report: CN22K1PC 001

Allegato B bis: Prove sui sistemi di accumulo
/ Annex Bbis: Tests on Energy storage systems

Sample 1: HS2-6K-S2-X with BU2-5.0-HV1, Number of battery module=4.

Sample 2: HS2-3K-S2-X with BU2-5.0-HV1, Number of battery module=1.

Sample 3: HS2-6K-S2-X with BU2-5.0-HV1, Number of battery module=1.

Bbis.3 Prove sull'inverter / inverter tests				
Test	Ref. CEI 0-21	Ref. standard	Result	Sample
Scalarità e modularità: /Scalability and modularity ☐ Case A ☒ Case B ☐ Case C ☐ Case D <i>Not Applicable for plant with power <800W.</i>	Bbis.2.2	CEI 0-21:2022-03	PASS	1,2,3
Armoniche di corrente /Harmonics measurement (full power, 66% and 33% of P_{Smax}) (full power, 66% and 33% of P_{Cmax} <i>only for bidirectional converters</i>) ☐ CEI EN 61000-3-2 ☒ CEI EN 61000-3-12	Bbis.3 Tab. 2Bbis Tab. 3Bbis	Condizioni di riferimento / Reference conditions (20 °C) – Tab.2Bbis	PASS	1
		Caldo secco / Dry heat test CEI EN 60068-2-2 (Test B) - Tab.3Bbis	PASS	1
		Umidità / Humidity test CEI EN 60068-2-78 (Test Cab) - Tab.3Bbis	PASS	1
		Freddo / Cold test CEI EN 60068-2-1 (Test A) - Tab.3Bbis	PASS	1
Fluttuazioni di tensione /Flicker measurement (full power, 66% and 33% of P_{Smax}) (full power, 66% and 33% of P_{Cmax} <i>only for bidirectional converters</i>) ☐ CEI EN 61000-3-3 ☒ CEI EN 61000-3-11	Bbis.3 Tab. 2Bbis Tab. 3Bbis	Condizioni di riferimento / Reference conditions (20 °C) – Tab.2Bbis	PASS	1
		Caldo secco / Dry heat test CEI EN 60068-2-2 (Test B) - Tab.3Bbis	PASS	1
		Umidità / Humidity test CEI EN 60068-2-78 (Test Cab) - Tab.3Bbis	PASS	1
		Freddo / Cold test CEI EN 60068-2-1 (Test A) - Tab.3Bbis	PASS	1

Bbis.4 Verifica del campo di funzionamento in tensione e frequenza <i>Check the operating range in voltage and frequency</i>				
Test	Ref. CEI 0-21	Ref. standard	Result	Sample
Verifica del campo di funzionamento <i>/Check the operating range</i>	Bbis.4	CEI 0-21:2022-03	PASS	1

Bbis.5 Condizioni di connessione, riconnessione ed erogazione graduale della potenza <i>Connection, re-connection conditions, and gradual increase of the power production</i>				
Test	Ref. CEI 0-21	Ref. standard	Result	Sample
Verifica delle condizioni di connessione e riconnessione <i>/Check of the connection and re-connection conditions</i>	8.4.1.3 Bbis.5.1	CEI 0-21:2022-03	PASS	1
Verifica della erogazione graduale della potenza attiva <i>/Check of the gradual increase of the power production</i>	8.4.1.3 Bbis.5.2	CEI 0-21:2022-03	PASS	1

Bbis.6 Erogazione della potenza reattiva /Reactive power production (or adsorbtion)				
Test	Ref. CEI 0-21	Ref. standard	Result	Sample
Verifica dei requisiti costruttivi: capability erogazione della potenza reattiva <i>/ Check of the constructive requirements: reactive power production capability</i>	Bbis.6.1	CEI 0-21:2022-03	PASS	1,2,3
Erogazione di potenza reattiva secondo un livello assegnato <i>/ Reactive power production according to an assigned level</i> <i>Applicable for plant with power >11.08KW.</i>	Bbis.6.3	CEI 0-21:2022-03	PASS	1
Tempo di risposta ad una variazione a gradino del livello assegnato <i>/Reaction time after a step variation of the assigned level.</i> <i>Applicable for plant with power >11.08KW.</i>	Bbis.6.5	CEI 0-21:2022-03	PASS	1
Erogazione automatica di potenza reattiva secondo una curva caratteristica $\cos\phi = f(P)$ <i>/ Automatic reactive power production according to a characteristic curve $\cos(\phi)$</i>	Bbis.6.6 Annex E E.2	CEI 0-21:2022-03	PASS	1,2,3
Erogazione automatica di potenza reattiva secondo una curva caratteristica $Q=f(V)$ <i>/ Automatic reactive power production according to a characteristic curve $Q=f(V)$</i> <i>Applicable for plant with power >11.08KW.</i>	Bbis.6.8 Annex E E.2.1	CEI 0-21:2022-03	PASS	1

Bbis.7 Limitazione della potenza attiva <i>/ Active power limitation</i>				
Test	Ref. CEI 0-21	Ref. standard	Result	Sample
Limitazione della potenza attiva per valori di tensione prossimi al 110 % di Un <i>/ Active power limitation for voltage values near to 100 % di Un</i>	8.5.3.1 Bbis.7.1 Annex F.3	CEI 0-21:2022-03	PASS	1
Regolazione della potenza attiva in presenza di transitori di sovrافrequenza sulla rete di trasmissione <i>/ Active power regulation in coincidence with transitory on the transmission grid</i>	8.5.3.4 Bbis.7.2 Annex F.3	CEI 0-21:2022-03	PASS	1,2,3
Riduzione della potenza attiva in presenza di transitori di sottofrequenza sulla rete di trasmissione. <i>/ Active power reduction in coincidence with transitory on the transmission grid</i>	8.5.3.4 Bbis.7.3	CEI 0-21:2022-03	PASS	1,2,3
Limitazione della potenza attiva su comando esterno proveniente dal Distributore <i>/ Active power limitation in coincidence with external command coming from the Electricity Distributor</i>	Bbis7.4	CEI 0-21:2022-03	PASS	1
Verifica del tempo di assestamento ad un comando di incremento/riduzione di potenza <i>/ Check settling time with command to increase/decrease of power</i>	Bbis7.4.1	CEI 0-21:2022-03	PASS	1

Bbis.8 Emissione di componente continua nella corrente di uscita <i>/ DC current injection on the output</i>				
Test	Ref. CEI 0-21	Ref. standard	Result	Sample
Verifica della emissione di componente continua <i>/Check of DC current injection</i>	Bbis.8.1	Condizioni di riferimento / Reference conditions (20 °C)	PASS	1
		Caldo secco / Dry heat test CEI EN 60068-2-2 (Test B)	PASS	1
		Umidità / Humidity test CEI EN 60068-2-78 (Test Cab)	PASS	1
		Freddo / Cold test CEI EN 60068-2-1 (Test A)	PASS	1
Verifica delle protezioni contro l'immissione di componente continua <i>/ Check of protections against the DC current injection.</i>	Bbis.8.2	Condizioni di riferimento / Reference conditions (20 °C)	PASS	1
		Caldo secco / Dry heat test CEI EN 60068-2-2 (Test B)	PASS	1
		Umidità / Humidity test CEI EN 60068-2-78 (Test Cab)	PASS	1
		Freddo / Cold test CEI EN 60068-2-1 (Test A)	PASS	1

Bbis.9 Verifica della insensibilità agli abbassamenti di tensione (LVFRT capability) <i>/ Check of the LVFRT capability</i>				
Test non accreditato Accredia/Test not Accredia accredited				
Test	Ref. CEI 0-21	Ref. standard	Result	Sample
LVFRT Capability <i>Applicable for plant with power >11.08KW.</i>	8.5.1 Bbis.9	CEI 0-21:2022-03	PASS	1

Bbis.10 Verifica della insensibilità alle richiuse automatiche in discordanza di fase <i>/ Check of the insensibility to the re-closures when phases are in discordance</i>				
Test	Ref. CEI 0-21	Ref. standard	Result	Sample
Verifica della insensibilità alle richiuse automatiche in discordanza di fase <i>/ Check of the insensibility to the re-closures when phases are in discordance</i>	Bbis.10 ☒ Bbis.10.1 ☐ Bbis.10.2 ☐ Bbis.10.3	CEI 0-21:2022-03	PASS	1

TESTING RESULTS

Allegato A: Caratteristiche e prove per il Sistema di Protezione di Interfaccia (SPI)
Annex A: Requirements and test for Interface Protection System (SPI)

Prove funzionali sull'SPI /Functional test on SPI

A.4.3 A.4.3.1 A.4.3.2 A.4.7 (limit conditions)	TABLE: Prove funzionali sull'SPI /Functional test on SPI	P
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Ambient temperature (°C)	: 20°C ± 2°C
Humidity (RH %)	: 35% - 75% RH
Instrumentation list.....	: See table "Measurement equipment and instrumentation"
Uncertainty	: See Table "Testing Methods"
Condizioni di riferimento / Reference conditions	Temperature test: 20°C ± 2°C

Tabella 8 – Regolazioni del SPI (ad esclusione degli impianti di potenza inferiore a 800 W)

Protezione	Soglia di intervento	Tempo di intervento (tempo intercorrente tra l'istante di inizio della condizione anomala rilevata dalla protezione e l'emissione del comando di scatto)
Massima tensione (59.S1, misura a media mobile su 10 min, in accordo a CEI EN 61000-4-30)	1,10 Vn	Variabile in funzione del valore iniziale e finale di tensione, al massimo 603 s.
Massima tensione (59.S2)	1,15 Vn	0,2 s
Minima tensione (27.S1)	0,85 Vn	1,5 s
Minima tensione (27.S2) *	0,15 Vn	0,2 s
Massima frequenza (81>.S1)** ◊	50,2 Hz	0,1 s
Minima frequenza (81<.S1)** ◊	49,8 Hz	0,1 s
Massima frequenza (81>.S2) ◊	51,5 Hz	0,1 s oppure 1 s §
Minima frequenza (81<.S2) ◊	47,5 Hz	0,1 s oppure 4 s §
* Il valore indicato per il tempo di intervento deve essere adottato quando la potenza complessiva è superiore a 11,08 kW, mentre per potenze inferiori, può essere facoltativamente utilizzato un tempo di intervento senza ritardo intenzionale. Nel caso di generatori sincroni, il valore può essere innalzato a 0,7 Un e t = 0.150 s ** Soglia abilitata solo con segnale esterno al valore alto e con comando locale alto. ◊ Per valori di tensione al di sotto di 0,2 Vn, la protezione di massima/minima frequenza si deve inibire. § Si veda in proposito quanto riportato nel testo che segue la Fig. 15.		

Tabella 8a – Regolazioni del SPI negli impianti di potenza inferiore a 800 W

Protezione	Soglia di intervento	Tempo di intervento (tempo intercorrente tra l'istante di inizio della condizione anomala rilevata dalla protezione e l'emissione del comando di scatto)
Massima tensione (59.S2)	1,15 Vn	0,2 s
Minima tensione (27.S1)	0,80 Vn	0,4 s
Massima frequenza (81>.S1)	51,5 Hz	0,1 s
Minima frequenza (81<.S1)	47,5 Hz	0,1 s

Tab. 1

Supplementary information:

A.4.3 A.4.3.1 A.4.3.2 A.4.7 (limit conditions)	TABLE: Prove funzionali sull'SPI /Functional test on SPI	P
Ambient temperature (°C)	20°C ± 2°C	
Humidity (RH %)	35% - 75% RH	
Instrumentation list.....	See table “Measurement equipment and instrumentation”	
Uncertainty	See Table “Testing Methods”	
Condizioni di riferimento / Reference conditions	Temperature test: 20°C ± 2°C	
Teledistacco Misura V 1,10 V_n 0,15 0,4 V_n 1,15 V_n 0,85 V_n 81.S2 47,5 Hz 81.S2 51,5 Hz 81.S1 49,8 49,5 Hz 81.S1 50,2 50,5 Hz Segnale esterno Comando locale 0 T = 3 s 0 T = 0,2 s 0 T = 0,2 s 0 T = 1,5 0,4 s 0 T = 4,0 s (oppure 0,1 s) 0 T = 1 s (oppure 0,1 s) 0 T = 0,1 s 0 T = 0,1 s OR OR AND Scatto DDI		
Operator	see cover page	
Supervisor	see cover page	
Test Date	see cover page	

TABLE: Prove funzionali sull'SPI
/Functional test on SPI

Protection	Soglie di intervento		Tempo di intervento		Soglie di intervento Worst case		Tempo di intervento Worst case	
Frequency	Misurato	Limite	Misurato	Limite	Misurato	Limite	Misurato	Limite
Phase A	[Hz]	[Hz]	[ms]	[ms]	[Hz]	[Hz]	[ms]	[ms]
[81<S2] Minima	47.50	47.50	90.4	100	47.50	47.50	90.4	100
	47.50		78.4					
	47.50		79.2					
[81>S2] Massima	51.50	51.50	77.2	100	51.50	51.50	86.4	100
	51.50		77.6					
	51.50		86.4					
Protection	Soglie di intervento		Tempo di intervento		Soglie di intervento		Tempo di intervento	
Voltage	Misurato	Limite	Misurato	Limite	Misurato	Limite	Misurato	Limite
Phase A	[V]	[V]	[ms]	[ms]	[V]	[V]	[ms]	[ms]
[59.S1] Massima	253.0	1.10Vn 253.0	585600	≤ 603000	253.0	1.10Vn 253.0	588900	≤ 603000
	253.0		584100					
	253.0		588900					
[59.S2] Massima	264.5	1.15Vn 264.5	192	200	264.5	1.15Vn 264.5	192	200
	264.5		186					
	264.5		187					
[27.S1] Minima	195.5	0.85Vn 195.5	1494	1500	195.5	0.85Vn 195.5	1514	1500
	195.5		1506					
	195.5		1514					
[27.S2] Minima	34.5	0.15Vn 34.5	198	200	34.5	0.15Vn 34.5	205	200
	34.5		205					
	34.5		205					
Phase B	[V]	[V]	[ms]	[ms]	[V]	[V]	[ms]	[ms]
[59.S1] Massima	--	1.10Vn 253.0	--	≤ 603000	--	1.10Vn 253.0	--	≤ 603000
	--		--					
	--		--					
[59.S2] Massima	--	1.15Vn 264.5	--	200	--	1.15Vn 264.5	--	200
	--		--					
	--		--					
[27.S1] Minima	--	0.85Vn 195.5	--	1500	--	0.85Vn 195.5	--	1500
	--		--					
	--		--					

[27.S2] Minima	--	0.15Vn 34.5	--	200	--	0.15Vn 34.5	--	200
	--		--					
	--		--					
Phase C	[V]	[V]	[ms]	[ms]	[V]	[V]	[ms]	[ms]
[59.S1] Massima	--	1.10Vn 253.0	--	≤ 603000	--	1.10Vn 253.0	--	≤ 603000
	--		--					
	--		--					
[59.S2] Massima	--	1.15Vn 264.5	--	200	--	1.15Vn 264.5	--	200
	--		--					
	--		--					
[27.S1] Minima	--	0.85Vn 195.5	--	1500	--	0.85Vn 195.5	--	1500
	--		--					
	--		--					
[27.S2] Minima	--	0.15Vn 34.5	--	200	--	0.15Vn 34.5	--	200
	--		--					
	--		--					

TABLE: Prove funzionali sull'SPI
/Functional test on SPI

A 4.3.3.3 SEGNALE DI COMUNICAZIONE / <i>Signal of communication</i>								
Protection	Soglie di intervento		Tempo di intervento		Soglie di intervento		Tempo di intervento	
Frequency	Misurato	Limite	Misurato	Limite	Misurato	Limite	Misurato	Limite
	[Hz]	[Hz]	[ms]	[ms]	[Hz]	[Hz]	[ms]	[ms]
Modalità Transitoria								
[81<S1] Minima	49.80	49.80	92.0	100	49.80	49.80	101.6	100
	49.80		85.2					
	49.80		101.6					
[81>S1] Massima	50.20	50.20	101.2	100	50.20	50.20	101.2	100
	50.20		85.2					
	50.20		89.2					
[81<S2] Minima	47.50	47.50	90.4	100	47.50	47.50	90.4	100
	47.50		78.4					
	47.50		79.2					
[81>S2] Massima	51.50	51.50	77.2	100	51.50	51.50	86.4	100
	51.50		77.6					
	51.50		86.4					
Modalità Definitiva								
[81<S2] Minima	47.50	47.50	4013	4000	47.50	47.50	4013	4000
	47.50		4003					
	47.50		4003					
[81>S2] Massima	51.50	51.50	1005	1000	51.50	51.50	1007	1000
	51.50		997					
	51.50		1007					

A.4.3 A.4.3.1 A.4.3.2 A.4.7 (limit conditions)	TABLE: Prove funzionali sull'SPI / Functional test on SPI	P
Ambient temperature (°C) :		20°C ± 2°C
Humidity (RH %) :		35% - 75% RH
Instrumentation list..... :		See table "Measurement equipment and instrumentation"
Uncertainty :		See Table "Testing Methods"
Caldo secco /Dry heat test		Temperature test: +55 °C ± 2°C

Supplementary information:	
Operator	see cover page
Supervisor	see cover page
Test Date	see cover page

TABLE: Prove funzionali sull'SPI
/Functional test on SPI

Protection	Soglie di intervento		Tempo di intervento		Soglie di intervento Worst case		Tempo di intervento Worst case	
Frequency	Misurato	Limite	Misurato	Limite	Misurato	Limite	Misurato	Limite
	[Hz]	[Hz]	[ms]	[ms]	[Hz]	[Hz]	[ms]	[ms]
[81<S2] Minima	47.50	47.50	86.8	100	47.50	47.50	90.0	100
	47.50		86.4					
	47.50		90.0					
[81>S2] Massima	51.50	51.50	92.8	100	51.50	51.50	92.8	100
	51.50		82.0					
	51.50		91.2					
Protection	Soglie di intervento		Tempo di intervento		Soglie di intervento		Tempo di intervento	
Voltage	Misurato	Limite	Misurato	Limite	Misurato	Limite	Misurato	Limite
Phase A	[V]	[V]	[ms]	[ms]	[V]	[V]	[ms]	[ms]
[59.S1] Massima	253.0	1.10Vn 253.0	601600	≤ 603000	253.0	1.10Vn 253.0	602600	≤ 603000
	253.0		600600					
	253.0		602600					
[59.S2] Massima	264.5	1.15Vn 264.5	199.6	200	264.50	1.15Vn 264.5	199.6	200
	264.5		178.4					
	264.5		196.0					
[27.S1] Minima	195.5	0.85Vn 195.5	1448	1500	195.50	0.85Vn 195.5	1461	1500
	195.5		1460					
	195.5		1461					
[27.S2] Minima	34.5	0.15Vn 34.5	201.0	200	34.5	0.15Vn 34.5	201.0	200
	34.5		195.0					
	34.5		177.0					
Phase B	[V]	[V]	[ms]	[ms]	[V]	[V]	[ms]	[ms]
[59.S1] Massima	--	1.10Vn 253.0	--	≤ 603000	--	1.10Vn 253.0	--	≤ 603000
	--		--					
	--		--					
[59.S2] Massima	--	1.15Vn 264.5	--	200	--	1.15Vn 264.5	--	200
	--		--					
	--		--					
[27.S1] Minima	--	0.85Vn 195.5	--	1500	--	0.85Vn 195.5	--	1500
	--		--					
	--		--					

[27.S2] Minima	--	0.15Vn 34.5	--	200	--	0.15Vn 34.5	--	200
	--		--					
	--		--					
Phase C	[V]	[V]	[ms]	[ms]	[V]	[V]	[ms]	[ms]
[59.S1] Massima	--	1.10Vn 253.0	--	≤ 603000	--	1.10Vn 253.0	--	≤ 603000
	--		--					
	--		--					
[59.S2] Massima	--	1.15Vn 264.5	--	200	--	1.15Vn 264.5	--	200
	--		--					
	--		--					
[27.S1] Minima	--	0.85Vn 195.5	--	1500	--	0.85Vn 195.5	--	1500
	--		--					
	--		--					
[27.S2] Minima	--	0.15Vn 34.5	--	200	--	0.15Vn 34.5	--	200
	--		--					
	--		--					

TABLE: Prove funzionali sull'SPI
/Functional test on SPI

A 4.3.3.3 SEGNALE DI COMUNICAZIONE / <i>Signal of communication</i>								
Protection	Soglie di intervento		Tempo di intervento		Soglie di intervento		Tempo di intervento	
Frequency	Misurato	Limite	Misurato	Limite	Misurato	Limite	Misurato	Limite
	[Hz]	[Hz]	[ms]	[ms]	[Hz]	[Hz]	[ms]	[ms]
Modalità Transitoria								
[81<S1] Minima	49.80	49.80	101.6	100	49.80	49.80	101.6	100
	49.80		94.8					
	49.80		95.6					
[81>S1] Massima	50.20	50.20	96.4	100	50.20	50.20	96.4	100
	50.20		91.6					
	59.20		91.6					
[81<S2] Minima	47.50	47.50	86.8	100	47.50	47.50	90.0	100
	47.50		86.4					
	47.50		90.0					
[81>S2] Massima	51.50	51.50	92.8	100	51.50	51.50	92.8	100
	51.50		82.0					
	51.50		91.2					
Modalità Definitiva								
[81<S2] Minima	47.50	47.50	4053	4000	47.50	47.50	4053	4000
	47.50		4031					
	47.50		4041					
[81>S2] Massima	51.50	51.50	1003	1000	51.50	51.50	1011	1000
	51.50		1001					
	51.50		1011					

A.4.3 A.4.3.1 A.4.3.2 A.4.7 (limit conditions)	TABLE: Prove funzionali sull'SPI / Functional test on SPI	P
Ambient temperature (°C)		20°C ± 2°C
Humidity (RH %)		35% - 75% RH
Instrumentation list.....		See table "Measurement equipment and instrumentation"
Uncertainty		See Table "Testing Methods"
Caldo Umido / Cabt test		Temperature test: +40 °C± 2°C Humidity: 93 % ± 3% RH

Supplementary information:	
Operator	see cover page
Supervisor	see cover page
Test Date	see cover page

TABLE: Prove funzionali sull'SPI
/Functional test on SPI

Protection	Soglie di intervento		Tempo di intervento		Soglie di intervento Worst case		Tempo di intervento Worst case	
Frequency	Misurato	Limite	Misurato	Limite	Misurato	Limite	Misurato	Limite
	[Hz]	[Hz]	[ms]	[ms]	[Hz]	[Hz]	[ms]	[ms]
[81<S2] Minima	47.50	47.50	99.2	100	47.50	47.50	105.2	100
	47.50		105.2					
	47.50		93.2					
[81>S2] Massima	51.50	51.50	104.0	100	51.50	51.50	104.0	100
	51.50		99.2					
	51.50		88.8					
Protection	Soglie di intervento		Tempo di intervento		Soglie di intervento		Tempo di intervento	
Voltage	Misurato	Limite	Misurato	Limite	Misurato	Limite	Misurato	Limite
Phase A	[V]	[V]	[ms]	[ms]	[V]	[V]	[ms]	[ms]
[59.S1] Massima	253.0	1.10Vn 253.0	597800	≤ 603000	253.0	1.10Vn 253.0	598800	≤ 603000
	253.0		598800					
	253.0		598800					
[59.S2] Massima	265.5	1.15Vn 264.5	193.2	200	265.50	1.15Vn 264.5	200.4	200
	265.5		200.4					
	265.5		188.8					
[27.S1] Minima	195.5	0.85Vn 195.5	1482	1500	195.50	0.85Vn 195.5	1482	1500
	195.5		1462					
	195.5		1481					
[27.S2] Minima	34.5	0.15Vn 34.5	187.0	200	34.5	0.15Vn 34.5	189.0	200
	34.5		189.0					
	34.5		179.0					
Phase B	[V]	[V]	[ms]	[ms]	[V]	[V]	[ms]	[ms]
[59.S1] Massima	--	1.10Vn 253.0	--	≤ 603000	--	1.10Vn 253.0	--	≤ 603000
	--		--					
	--		--					
[59.S2] Massima	--	1.15Vn 264.5	--	200	--	1.15Vn 264.5	--	200
	--		--					
	--		--					
[27.S1] Minima	--	0.85Vn 195.5	--	1500	--	0.85Vn 195.5	--	1500
	--		--					
	--		--					

[27.S2] Minima	--	0.15Vn 34.5	--	200	--	0.15Vn 34.5	--	200
	--		--					
	--		--					
Phase C	[V]	[V]	[ms]	[ms]	[V]	[V]	[ms]	[ms]
[59.S1] Massima	--	1.10Vn 253.0	--	≤ 603000	--	1.10Vn 253.0	--	≤ 603000
	--		--					
	--		--					
[59.S2] Massima	--	1.15Vn 264.5	--	200	--	1.15Vn 264.5	--	200
	--		--					
	--		--					
[27.S1] Minima	--	0.85Vn 195.5	--	1500	--	0.85Vn 195.5	--	1500
	--		--					
	--		--					
[27.S2] Minima	--	0.15Vn 34.5	--	200	--	0.15Vn 34.5	--	200
	--		--					
	--		--					

TABLE: Prove funzionali sull'SPI
/Functional test on SPI

A 4.3.3.3 SEGNALE DI COMUNICAZIONE / <i>Signal of communication</i>								
Protection	Soglie di intervento		Tempo di intervento		Soglie di intervento		Tempo di intervento	
Frequency	Misurato	Limite	Misurato	Limite	Misurato	Limite	Misurato	Limite
	[Hz]	[Hz]	[ms]	[ms]	[Hz]	[Hz]	[ms]	[ms]
Modalità Transitoria								
[81<S1] Minima	49.80	49.80	97.6	100	49.80	49.80	97.6	100
	49.80		88.8					
	49.80		83.2					
[81>S1] Massima	50.20	50.20	91.6	100	50.20	50.20	98.8	100
	50.20		94.4					
	50.20		98.8					
[81<S2] Minima	47.50	47.50	99.2	100	47.50	47.50	105.2	100
	47.50		105.2					
	47.50		93.2					
[81>S2] Massima	51.50	51.50	104.0	100	51.50	51.50	104.0	100
	51.50		99.2					
	51.50		88.8					
Modalità Definitiva								
[81<S2] Minima	47.50	47.50	4044	4000	47.50	47.50	4044	4000
	47.50		4037					
	47.50		4027					
[81>S2] Massima	51.50	51.50	1014	1000	51.50	51.50	1014	1000
	51.50		1007					
	51.50		1005					

A.4.3 A.4.3.1 A.4.3.2 A.4.7 (limit conditions)	TABLE: Prove funzionali sull'SPI / Functional test on SPI	P
Ambient temperature (°C)	: 20°C ± 2°C	
Humidity (RH %)	: 35% - 75% RH	
Instrumentation list.....	: See table "Measurement equipment and instrumentation"	
Uncertainty	: See Table "Testing Methods"	
Freddo / Cold test	Temperature test: -10 °C ± 2°C	

Supplementary information:	
Operator	see cover page
Supervisor	see cover page
Test Date	see cover page

TABLE: Prove funzionali sull'SPI
/Functional test on SPI

Protection	Soglie di intervento		Tempo di intervento		Soglie di intervento Worst case		Tempo di intervento Worst case	
Frequency	Misurato	Limite	Misurato	Limite	Misurato	Limite	Misurato	Limite
	[Hz]	[Hz]	[ms]	[ms]	[Hz]	[Hz]	[ms]	[ms]
[81<S2] Minima	47.50	47.50	92.4	100	47.50	47.50	92.4	100
	47.50		82.4					
	47.50		78.0					
[81>S2] Massima	51.50	51.50	100.0	100	51.50	51.50	100.0	100
	51.50		90.4					
	51.50		81.6					
Protection	Soglie di intervento		Tempo di intervento		Soglie di intervento		Tempo di intervento	
Voltage	Misurato	Limite	Misurato	Limite	Misurato	Limite	Misurato	Limite
Phase A	[V]	[V]	[ms]	[ms]	[V]	[V]	[ms]	[ms]
[59.S1] Massima	253.0	1.10Vn 253.0	592800	≤ 603000	253.0	1.10Vn 253.0	592800	≤ 603000
	253.0		592800					
	253.0		591800					
[59.S2] Massima	264.5	1.15Vn 264.5	194.8	200	264.50	1.15Vn 264.5	197.8	200
	264.5		197.8					
	264.5		195.8					
[27.S1] Minima	195.5	0.85Vn 195.5	1490	1500	195.50	0.85Vn 195.5	1498	1500
	195.5		1496					
	195.5		1498					
[27.S2] Minima	34.5	0.15Vn 34.5	193.0	200	34.5	0.15Vn 34.5	199.0	200
	34.5		190.0					
	34.5		199.0					
Phase B	[V]	[V]	[ms]	[ms]	[V]	[V]	[ms]	[ms]
[59.S1] Massima	--	1.10Vn 253.0	--	≤ 603000	--	1.10Vn 253.0	--	≤ 603000
	--		--					
	--		--					
[59.S2] Massima	--	1.15Vn 264.5	--	200	--	1.15Vn 264.5	--	200
	--		--					
	--		--					
[27.S1] Minima	--	0.85Vn 195.5	--	1500	--	0.85Vn 195.5	--	1500
	--		--					
	--		--					

[27.S2] Minima	--	0.15Vn 34.5	--	200	--	0.15Vn 34.5	--	200
	--		--					
	--		--					
Phase C	[V]	[V]	[ms]	[ms]	[V]	[V]	[ms]	[ms]
[59.S1] Massima	--	1.10Vn 253.0	--	≤ 603000	--	1.10Vn 253.0	--	≤ 603000
	--		--					
	--		--					
[59.S2] Massima	--	1.15Vn 264.5	--	200	--	1.15Vn 264.5	--	200
	--		--					
	--		--					
[27.S1] Minima	--	0.85Vn 195.5	--	1500	--	0.85Vn 195.5	--	1500
	--		--					
	--		--					
[27.S2] Minima	--	0.15Vn 34.5	--	200	--	0.15Vn 34.5	--	200
	--		--					
	--		--					

TABLE: Prove funzionali sull'SPI
/Functional test on SPI

A 4.3.3.3 SEGNALE DI COMUNICAZIONE / <i>Signal of communication</i>								
Protection	Soglie di intervento		Tempo di intervento		Soglie di intervento		Tempo di intervento	
Frequency	Misurato	Limite	Misurato	Limite	Misurato	Limite	Misurato	Limite
	[Hz]	[Hz]	[ms]	[ms]	[Hz]	[Hz]	[ms]	[ms]
Modalità Transitoria								
[81<S1] Minima	49.80	49.80	99.6	100	49.80	49.80	99.6	100
	49.80		86.0					
	49.80		89.6					
[81>S1] Massima	50.20	50.20	89.2	100	50.20	50.20	107.2	100
	50.20		107.2					
	50.20		93.2					
[81<S2] Minima	47.50	47.50	92.4	100	47.50	47.50	92.4	100
	47.50		82.4					
	47.50		78.0					
[81>S2] Massima	51.50	51.50	100.0	100	51.50	51.50	100.0	100
	51.50		90.4					
	51.50		81.6					
Modalità Definitiva								
[81<S2] Minima	47.50	47.50	4059	4000	47.50	47.50	4059	4000
	47.50		4037					
	47.50		4027					
[81>S2] Massima	51.50	51.50	1011	1000	51.50	51.50	1011	1000
	51.50		1003					
	51.50		993					

A.4.3 A.4.3.1 A.4.3.2 A.4.7 (limit conditions)	TABLE: Prove funzionali sull'SPI / Functional test on SPI	P
Ambient temperature (°C) :		20°C ± 2°C
Humidity (RH %) :		35% - 75% RH
Instrumentation list..... :		See table "Measurement equipment and instrumentation"
Uncertainty :		See Table "Testing Methods"
Cambio di temperatura / Change of temperature		Temperature test: -10 °C / +55 °C ± 2°C

Supplementary information:	
Operator	see cover page
Supervisor	see cover page
Test Date	see cover page

TABLE: Prove funzionali sull'SPI
/Functional test on SPI

Protection	Soglie di intervento		Tempo di intervento		Soglie di intervento Worst case		Tempo di intervento Worst case	
Frequency	Misurato	Limite	Misurato	Limite	Misurato	Limite	Misurato	Limite
	[Hz]	[Hz]	[ms]	[ms]	[Hz]	[Hz]	[ms]	[ms]
[81<S2] Minima	47.50	47.50	86.0	100	47.50	47.50	116.4	100
	47.50		116.4					
	47.50		105.2					
[81>S2] Massima	51.50	51.50	83.2	100	51.50	51.50	108.4	100
	51.50		108.4					
	51.50		102.8					
Protection	Soglie di intervento		Tempo di intervento		Soglie di intervento		Tempo di intervento	
Voltage	Misurato	Limite	Misurato	Limite	Misurato	Limite	Misurato	Limite
Phase A	[V]	[V]	[ms]	[ms]	[V]	[V]	[ms]	[ms]
[59.S1] Massima	253.0	1.10Vn 253.0	585000	≤ 603000	253.0	1.10Vn 253.0	597700	≤ 603000
	253.0		585200					
	253.0		597700					
[59.S2] Massima	265.5	1.15Vn 264.5	179	200	265.50	1.15Vn 264.5	180	200
	265.5		177					
	265.5		180					
[27.S1] Minima	195.5	0.85Vn 195.5	1451	1500	195.50	0.85Vn 195.5	1451	1500
	195.5		1445					
	195.5		1445					
[27.S2] Minima	34.5	0.15Vn 34.5	208.0	200	34.5	0.15Vn 34.5	208.0	200
	34.5		184.0					
	34.5		201.0					
Phase B	[V]	[V]	[ms]	[ms]	[V]	[V]	[ms]	[ms]
[59.S1] Massima	--	1.10Vn 253.0	--	≤ 603000	--	1.10Vn 253.0	--	≤ 603000
	--		--					
	--		--					
[59.S2] Massima	--	1.15Vn 264.5	--	200	--	1.15Vn 264.5	--	200
	--		--					
	--		--					
[27.S1] Minima	--	0.85Vn 195.5	--	1500	--	0.85Vn 195.5	--	1500
	--		--					
	--		--					

[27.S2] Minima	--	0.15Vn 34.5	--	200	--	0.15Vn 34.5	--	200
	--		--					
	--		--					
Phase C	[V]	[V]	[ms]	[ms]	[V]	[V]	[ms]	[ms]
[59.S1] Massima	--	1.10Vn 253.0	--	≤ 603000	--	1.10Vn 253.0	--	≤ 603000
	--		--					
	--		--					
[59.S2] Massima	--	1.15Vn 264.5	--	200	--	1.15Vn 264.5	--	200
	--		--					
	--		--					
[27.S1] Minima	--	0.85Vn 195.5	--	1500	--	0.85Vn 195.5	--	1500
	--		--					
	--		--					
[27.S2] Minima	--	0.15Vn 34.5	--	200	--	0.15Vn 34.5	--	200
	--		--					
	--		--					

TABLE: Prove funzionali sull'SPI
/Functional test on SPI

A 4.3.3.3 SEGNALE DI COMUNICAZIONE / <i>Signal of communication</i>								
Protection	Soglie di intervento		Tempo di intervento		Soglie di intervento		Tempo di intervento	
Frequency	Misurato	Limite	Misurato	Limite	Misurato	Limite	Misurato	Limite
	[Hz]	[Hz]	[ms]	[ms]	[Hz]	[Hz]	[ms]	[ms]
Modalità Transitoria								
[81<S1] Minima	49.80	49.80	120.0	100	49.80	49.80	120.0	100
	49.80		105.2					
	49.80		118.4					
[81>S1] Massima	50.20	50.20	86.4	100	50.20	50.20	110.4	100
	50.20		83.2					
	50.20		110.4					
[81<S2] Minima	47.50	47.50	86.0	100	47.50	47.50	116.4	100
	47.50		116.4					
	47.50		105.2					
[81>S2] Massima	51.50	51.50	83.2	100	51.50	51.50	108.4	100
	51.50		108.4					
	51.50		102.8					
Modalità Definitiva								
[81<S2] Minima	47.50	47.50	4014	4000	47.50	47.50	4014	4000
	47.50		4004					
	47.50		4004					
[81>S2] Massima	51.50	51.50	991	1000	51.50	51.50	994	1000
	51.50		984					
	51.50		994					

Figure: Prove funzionali sull'SPI
/Functional test on SPI

[59.S1] Massima tensione OV1 – 110% Vn – Trip Time

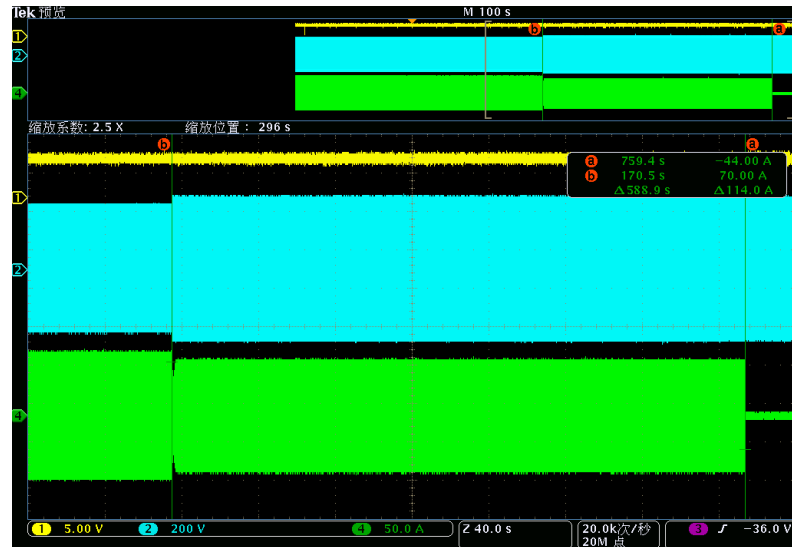


Figure: Prove funzionali sull'SPI
/Functional test on SPI

[59.S2] Massima tensione OV2 – 115% Vn – Trip Time

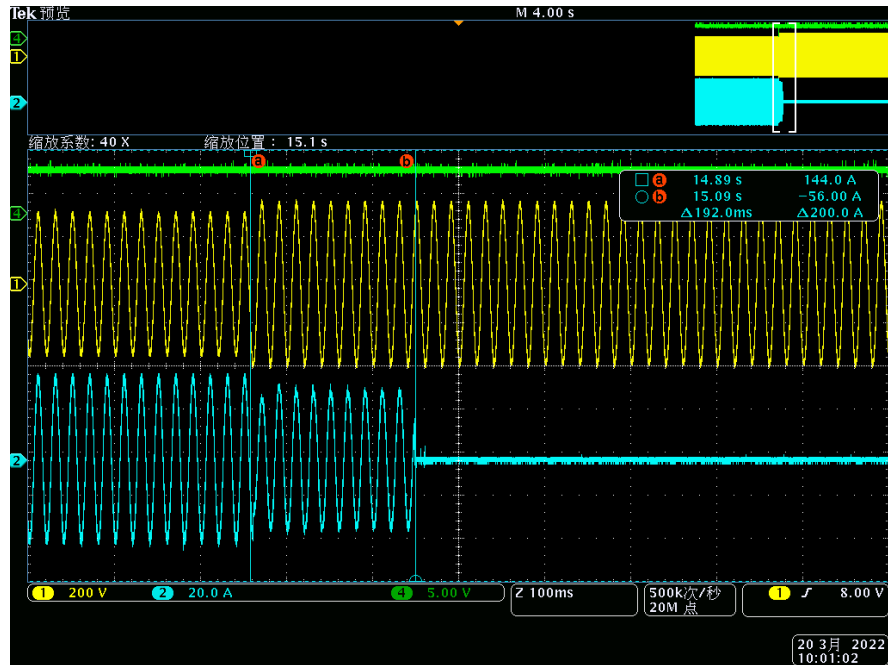


Figure: Prove funzionali sull'SPI
/Functional test on SPI

[27.S1] Minima tensione OV1 – 85% Vn – Trip Time

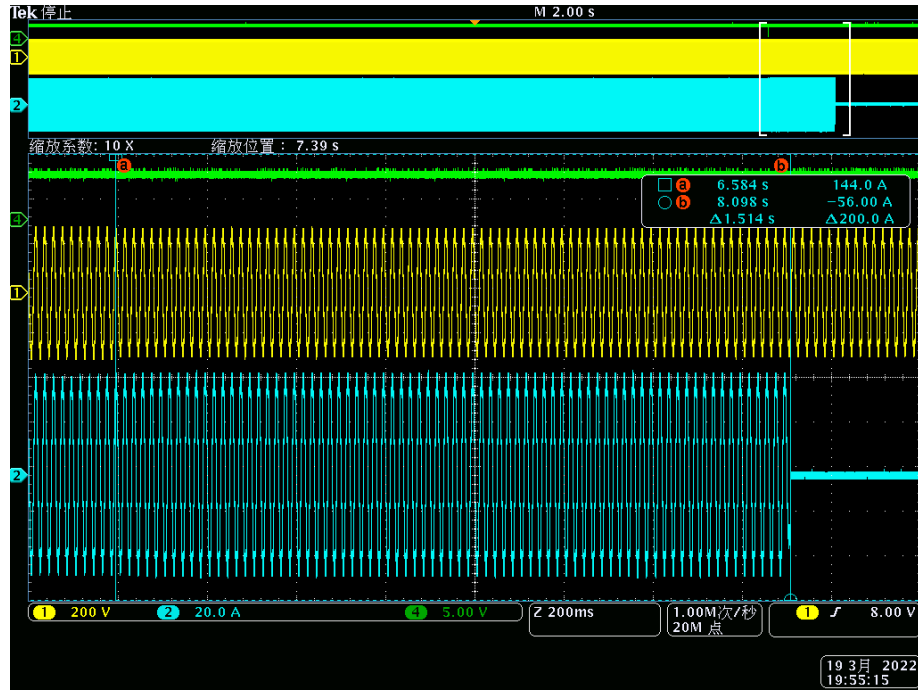


Figure: Prove funzionali sull'SPI
/Functional test on SPI

[27.S2] Minima tensione OV2 – 15% Vn – Trip Time

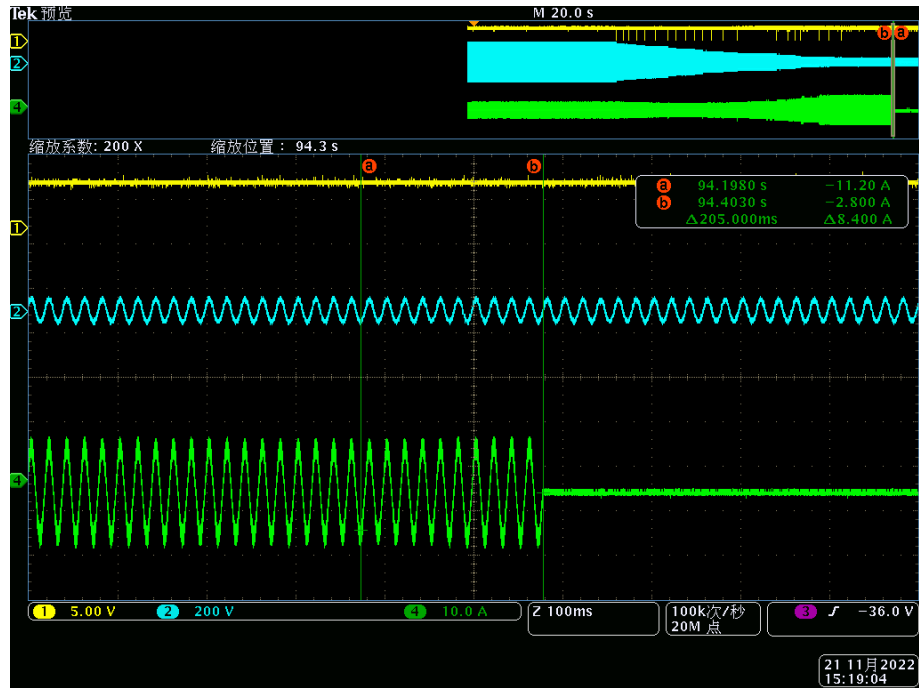


Figure: Prove funzionali sull'SPI

/Functional test on SPI

[81>S1] Massima frequenza OF1 – 50.20 Hz – Trip Time

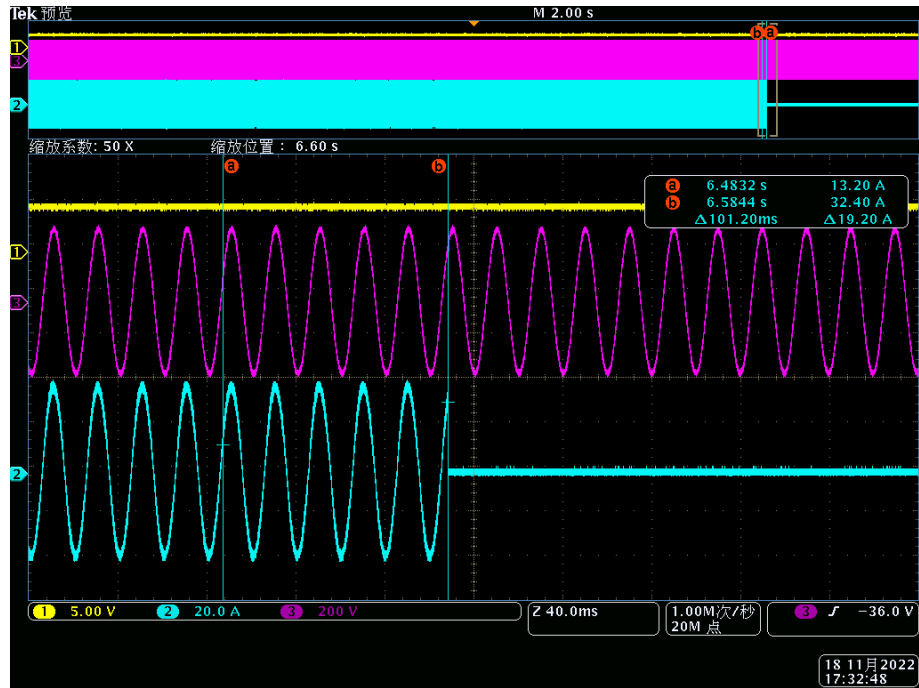


Figure: Prove funzionali sull'SPI

/Functional test on SPI

[81<S1] Minima frequenza UF1 – 49.80 Hz – Trip Time

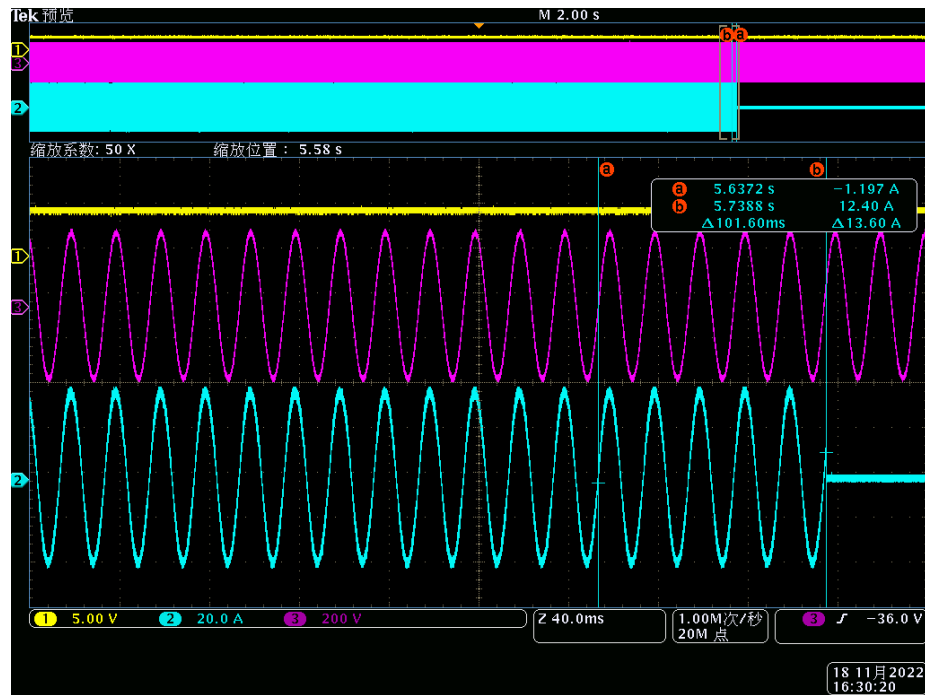


Figure: Prove funzionali sull'SPI

/Functional test on SPI

[81>S2] Massima frequenza OF2 – 51.50 Hz – Trip Time

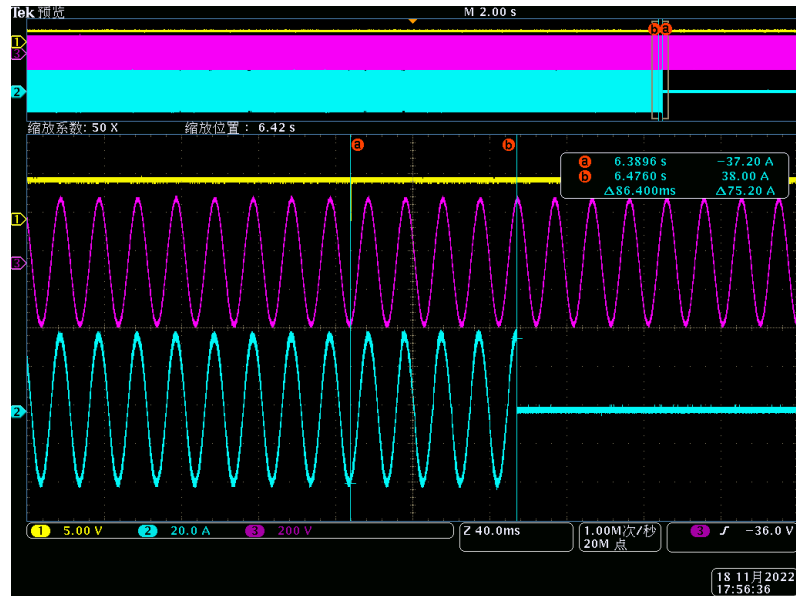
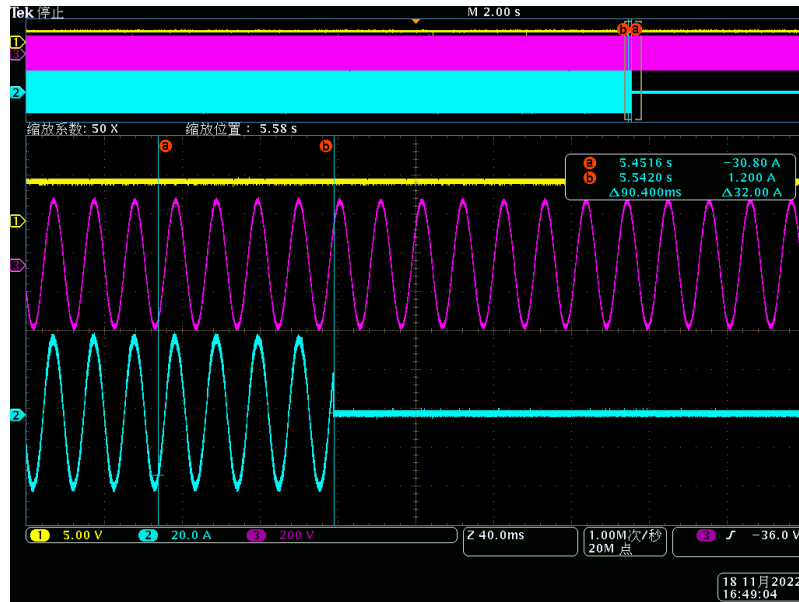


Figure: Prove funzionali sull'SPI
/Functional test on SPI

[81<S1] Minima frequenza UF2 – 47.50 Hz – Trip Time



Prescrizioni aggiuntive per le prove funzionali /Additional requirements of the functional test

A.4.3.3.1	TABLE: Insensibilità delle armoniche del relè di frequenza <i>/ Immunity at the harmonics of frequency relay</i>	P
Ambient temperature (°C)	20°C ± 2°C	
Humidity (RH %)	35% - 75% RH	
Instrumentation list.....	See table "Measurement equipment and instrumentation"	
Uncertainty	See table	

Supplementary Information:

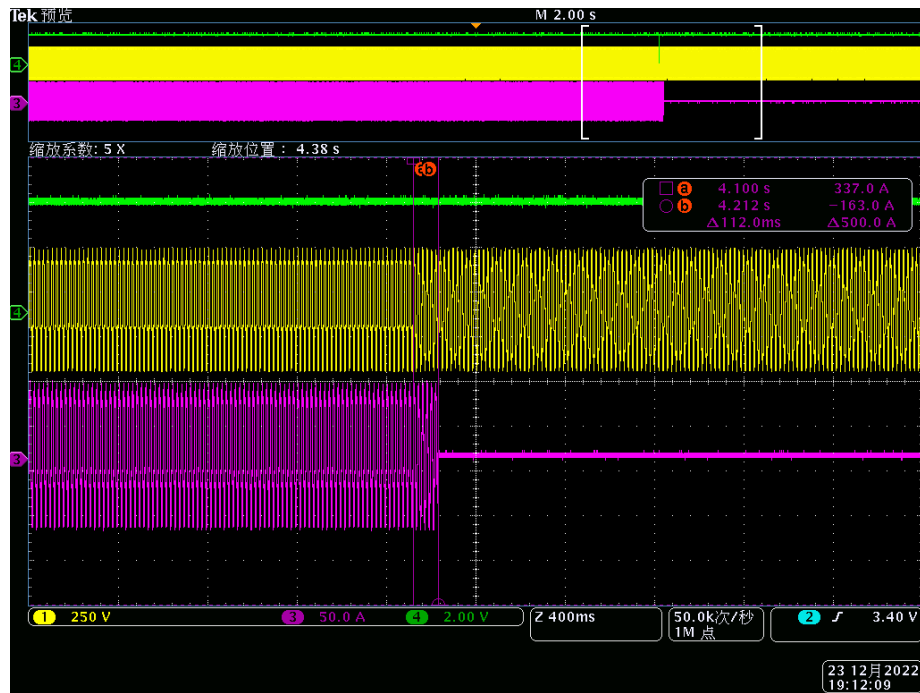
Operator	see cover page
Supervisor	see cover page
Test Date	see cover page

Protection	Soglie di intervento		Tempo di intervento		Soglie di intervento		Tempo di intervento	
Frequency	Misurato	Limite	Misurato	Limite	Misurato	Limite	Misurato	Limite
	[Hz]	[Hz]	[ms]	[ms]	[Hz]	[Hz]	[ms]	[ms]
[81<S2] Minima	47.50	47.50	80.0	100 (4000)	47.50	47.50	80.0	100 (4000)
	47.50		80.0					
	47.50		80.0					
[81>S2] Massima	51.50	51.50	112.0	100 (1000)	51.50	51.50	112.0	100 (1000)
	51.50		92.0					
	51.50		88.0					

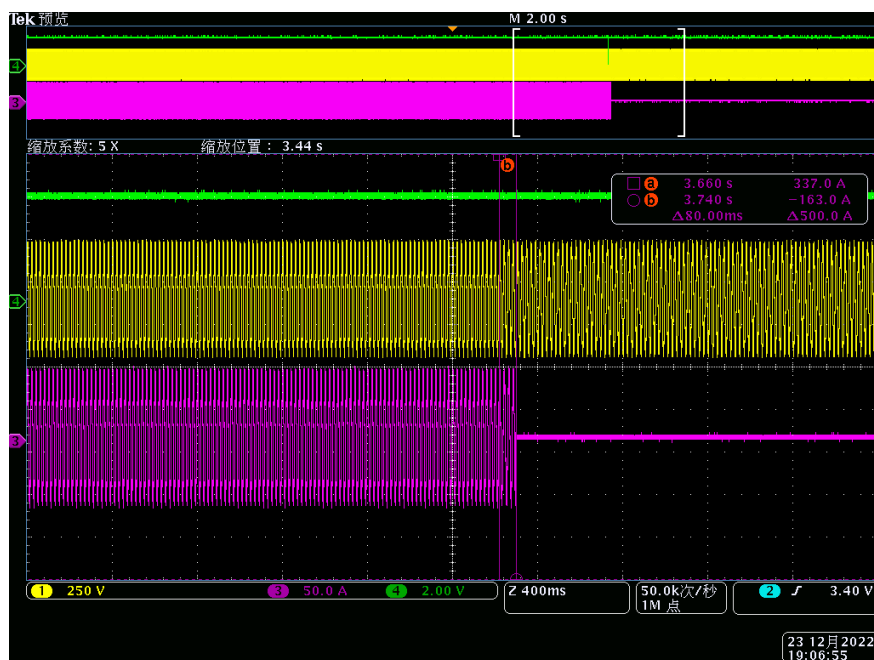
Grafico: Test di insensibilità delle armoniche del relè di frequenza

/ Graph: Immunity test at the harmonics of frequency relay

[81>S2] Massima frequenza OF2 – 51.50 Hz – Trip Time



[81<S1] Minima frequenza UF2 – 47.50 Hz – Trip Time



A.4.3.3.2	TABLE: Segnale di telescatto / Signal of Telescatto	P
Ambient temperature (°C)	20°C ± 2°C	
Humidity (RH %)	35% - 75% RH	
Instrumentation list	See table "Measurement equipment and instrumentation"	
Uncertainty	See table	

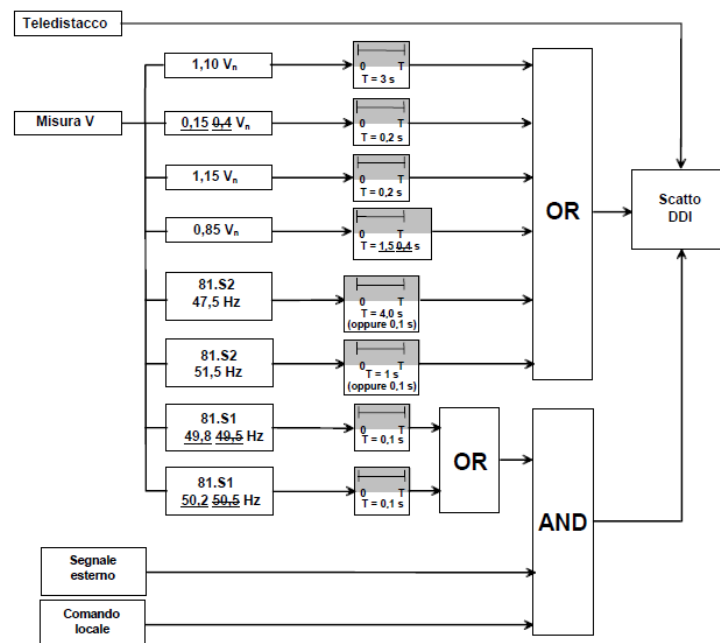


Figura 15 – Schema logico funzionale del SPI dei parchi di generazione (i valori tra parentesi si riferiscono alla modalità transitoria di funzionamento del SPI)

Functional Logic Scheme of the SPI

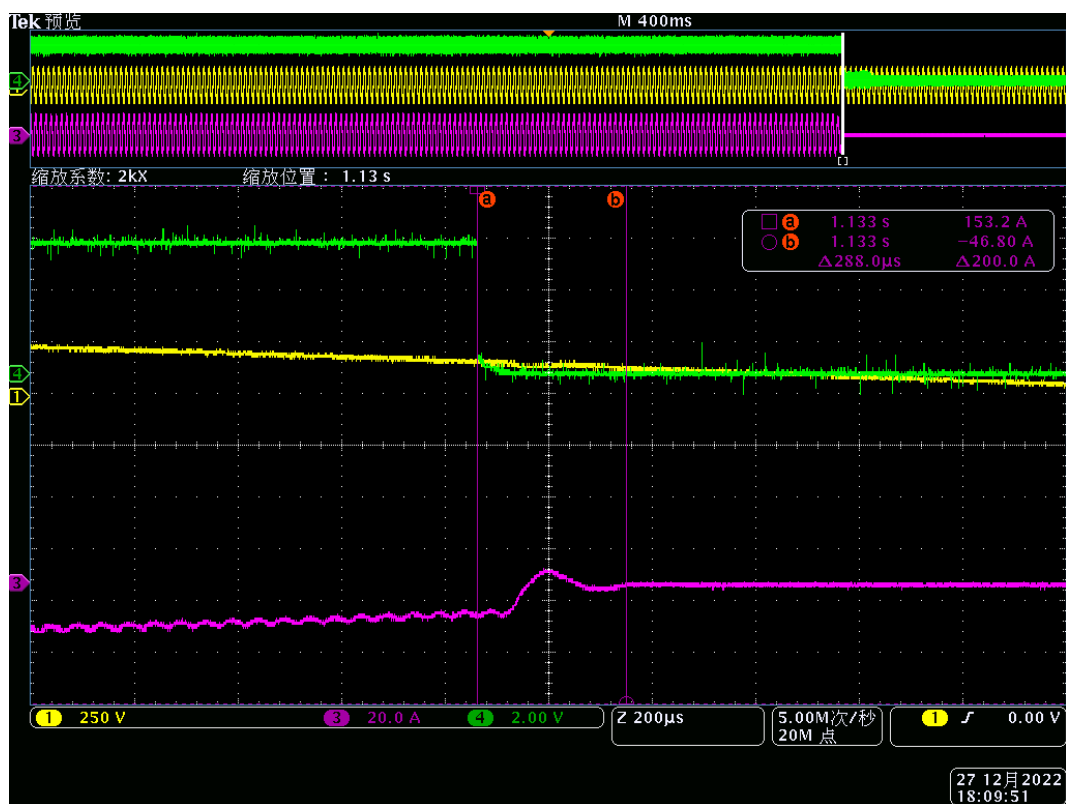
Supplementary Information:

Description of the Telescatto signal must be given.

Operator	see cover page
Supervisor	see cover page
Test Date	see cover page

Signal	Tempo di intervento	
	Misurato	Limite
	[ms]	[ms]
Telestacco	0.288	50

Trip Time Waveform (Oscilloscope)



A.4.3.3.3	TABLE: Segnale di telecomunicazione / Signal of Telecommunication	P
Ambient temperature (°C)	20°C ± 2°C	
Humidity (RH %)	35% - 75% RH	
Instrumentation list	See table "Measurement equipment and instrumentation"	
Uncertainty	See table	

Supplementary Information:

Description of the Telecomunicazione signal must be given.

See the table of functional test on SPI where are been reported the threshold and trip time test in according to Transitory and Definitive Mode.

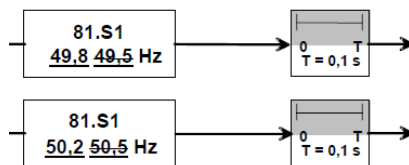
Operator	-- see cover page
Supervisor	-- see cover page
Test Date	-- see cover page

Signal	Status	Disconnection for 81<S2 or 81>S2 [Y / N]	Result [Y / N]
Telecomunicazione	Attendance	Y	Y
	Non-Attendance	N	N

Procedure:

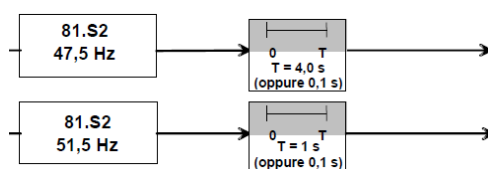
- Telecommunication Signal Non-Attendance → disconnection for **81<S1 or 81>S1**

Set the frequency closed to 81<S1 or 81>S1



- Telecommunication Signal Attendance → disconnection for **81<S2 or 81>S2**

Set the frequency closed to 81<S2 or 81>S2



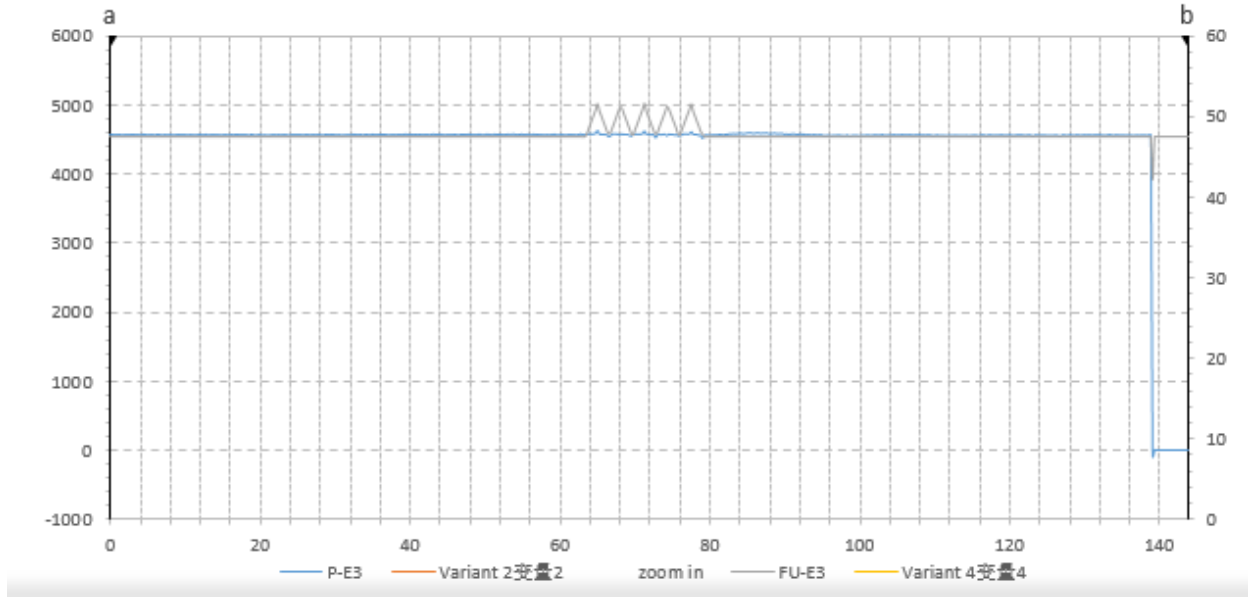
A.4.3.4	TABLE: Verifica di insensibilità alla derivata di frequenza (ROCOF) <i>/ Check of immunity at the frequency derived (ROCOF)</i>	P
Ambient temperature (°C)	20°C ± 2°C	
Humidity (RH %)	35% - 75% RH	
Instrumentation list.....	See table "Measurement equipment and instrumentation"	
Uncertainty	See table	

Supplementary Information:	
Operator	see cover page
Supervisor	see cover page
Test Date	see cover page

Grafico: Test verifica di insensibilità alla derivata di frequenza (ROCOF)

/ Graph: Check of immunity test at the frequency derived (ROCOF)

[81>S2] ROCOF – 51.50 Hz-47.5HZ

CHART 1


RESULT: The Inverter doesn't disconnects from the grid after ROCOF test

A.4.4	TABLE: Autotest / Autotest function	P
Ambient temperature (°C)	20°C ± 2°C	
Humidity (RH %)	35% - 75% RH	
Instrumentation list	N/A	
Uncertainty	N/A	

Supplementary Information:

Operator	see cover page
Supervisor	see cover page
Test Date	see cover page

Test	Pictures of the Autotest function		
	Please attached picture of autotest		
U>>	Ovp(59.S2) results 检测时间: 2022.09.06 09:38:24		
	Vt: 264.5 V	Vs: 232.0 V	Vo: 231.5 V
	Tt: 200 ms	To: 200 ms	
	Please attached picture of autotest		
U<<	Uvp2(27.S2) results 检测时间: 2022.09.06 09:38:24		
	Vt: 34.5 V	Vs: 230.1 V	Vo: 230.6 V
	Tt: 200 ms	To: 196 ms	
	Please attached picture of autotest		
U> 10min	Ovp10(59.S1) results 检测时间: 2022.09.06 09:38:24		
	Vt: 253.0 V	Vs: 232.8 V	Vo: 232.3 V
	Tt: 603.0 s	To: 603.0 s	

	Please attached picture of autotest		
U<	Uvp(27.S1) results 检测时间: 2022.09.06 09:38:24		
	Vt: 195.5 V	Vs: 229.9 V	Vo: 230.4 V
	Tt: 1500 ms	To: 1499 ms	
	Please attached picture of autotest		
F>>	Ofp2(81>.S2) results 检测时间: 2022.09.06 09:38:24		
	Ft: 51.50 Hz	Fs: 49.99 Hz	Fo: 49.97 Hz
	Tt: 100 ms	To: 95 ms	
	Please attached picture of autotest		
F<<	Ufp2(81<.S2) results 检测时间: 2022.09.06 09:38:24		
	Ft: 47.50 Hz	Fs: 49.99 Hz	Fo: 50.01 Hz
	Tt: 100 ms	To: 98 ms	
	Please attached picture of autotest		
F>	Ofp(81>.S1) results 检测时间: 2022.09.06 09:38:24		
	Ft: 50.20 Hz	Fs: 50.00 Hz	Fo: 49.98 Hz
	Tt: 100 ms	To: 97 ms	
	Please attached picture of autotest		
F<	Ufp(81<.S1) results 检测时间: 2022.09.06 09:38:24		
	Ft: 49.80 Hz	Fs: 49.99 Hz	Fo: 50.01 Hz
	Tt: 100 ms	To: 97 ms	

A.4.5	TABLE: Single Fault tolerance	P
Ambient temperature (°C)	20°C ± 2°C	
Humidity (RH %)	35% - 75% RH	
Instrumentation list	See table "Measurement equipment and instrumentation"	
Uncertainty	See table	

Supplementary Information:	
Operator	see cover page
Supervisor	see cover page
Test Date	see cover page

A.4.5		TABLE: fault condition tests					P
		ambient temperature (°C): 25					—
No.	component No.	fault	test voltage (V)	test time	fuse No.	fuse current (A)	Result
OUTPUT Board							
1	C2	short	400V	3min	--	--	Error message: "Master No Grid Error", Inverter shutdown and disconnected from grid Immediately, No damaged, no hazard.
2	C3	short	400V	3min	--	--	Inverter Normal operation No damaged, no hazard.
Control Board							
3	Q13	short	400V	3min	--	--	Inverter Normal operation No damaged, no hazard.
4	R207	Open	400V	3min	--	--	Error message: "Master DCI Error", Inverter disconnected from grid Immediately, No damaged no hazard.
5	R194	Open	400V	3min	--	--	Error message: "Master DCV Error", Inverter disconnected from grid Immediately, No damaged no hazard.
6	C133	short	400V	3min	--	--	Error message: "Master HW Inv Current High", Inverter disconnected from grid Immediately, No damaged no hazard.
7	R433	Open	400V	3min	--	--	Error message: "Master HW Inv Current High", Inverter disconnected from grid Immediately, No damaged no hazard.
8	C113	short	400V	3min	--	--	Error message: "Master No Grid Error", Inverter disconnected from grid Immediately, No damaged no hazard.
9	R126	Open	400V	3min	--	--	Error message: "Master No Grid Error", Inverter disconnected from grid Immediately, No damaged no hazard.

10	C169	short	400V	3min	--	--	Error message: "Master HW Inv Current High", Inverter disconnected from grid Immediately, No damaged, no hazard.
11	R206	Open	400V	3min	--	--	Error message: "Master HW Inv Current High", Inverter disconnected from grid Immediately, No damaged, no hazard.
12	U8 3PIN	Open	400V	3min	--	--	Error message: "Master No Grid Error", Inverter disconnected from grid Immediately, No damaged no hazard.
13	C157	short	400V	3min	--	--	Inverter Normal operation No damaged, no hazard.
14	R188	Open	400V	3min	--	--	Inverter Normal operation No damaged, no hazard.
15	C127	short	400V	3min	--	--	Error message: "Master Grid NE Voltage Error", Inverter disconnected from grid Immediately, No damaged, no hazard.
16	R145	Open	400V	3min	--	--	Error message: "Master Grid NE Voltage Error", Inverter disconnected from grid Immediately, No damaged, no hazard.
17	C171	short	400V	3min	--	--	Error message: "Master GFCI Error", Inverter disconnected from grid Immediately, No damaged, no hazard.
18	R215	Open	400V	3min	--	--	Error message: "Master GFCI Error", Inverter disconnected from grid Immediately, No damaged, no hazard.
19	R241	Open	400V	3min	--	--	Inverter disconnected from grid Immediately, No damaged, no hazard.
20	R244	Open	400V	3min	--	--	Error message: "Master HW PV Current High", Inverter disconnected from grid Immediately, No damaged, no hazard.

21	C88	short	400V	3min	--	--	Error message: "Master HW PV Current High", Inverter disconnected from grid Immediately, No damaged, no hazard.
22	R128	Open	400V	3min	--	--	Error message: "Master HW PV Current High", Inverter disconnected from grid Immediately, No damaged, no hazard.
23	R150	Open	400V	3min	--	--	Inverter disconnected from grid Immediately, No damaged, no hazard.
24	C109	Short	400V	3min	--	--	Error message: "Master Battery Current High", Inverter disconnected from grid Immediately, No damaged, no hazard.
25	R161	Open	400V	3min	--	--	Error message: "Master Battery Current High", Inverter disconnected from grid Immediately, No damaged, no hazard.
26	C110	Short	400V	3min	--	--	Error message: "Master Battery Open Circuit Error", Inverter disconnected from grid Immediately, No damaged, no hazard.
27	R162	Open	400V	3min	--	--	Error message: "Master Battery Open Circuit Error", Inverter disconnected from grid Immediately, No damaged, no hazard.
28	C111	short	400V	3min	--	--	Error message: "Master Bus Voltage High", Inverter disconnected from grid Immediately, No damaged, no hazard.
29	R165	Open	400V	3min	--	--	Error message: "Master Bus Voltage High", Inverter disconnected from grid Immediately, No damaged, no hazard.

30	R212	Open	400V	3min	--	--	Error message: "Master ISO Error", Inverter disconnected from grid Immediately, No damaged, no hazard.
31	Q1	short	400V	3min	--	--	Inverter disconnected from grid Immediately, No damaged, no hazard.
Main Power Board							
32	C3	Short	400V	3min	--	--	Error message: "Master Battery Open Circuit Error", Inverter disconnected from grid Immediately, No damaged, no hazard.
33	C6	Short	400V	3min	--	--	Error message: "Master Bus Voltage High", Inverter disconnected from grid Immediately, No damaged, no hazard.
34	C8	Short	400V	3min	--	--	Inverter disconnected from grid Immediately, No hazard.
35	Q3 C G	Short	400V	3min	--	--	Q3 Q4 damaged, Inverter shutdown and disconnected from grid Immediately, no hazard.
36	Q3 C E	Short	400V	3min	--	--	Q3 Q4 damaged, Inverter disconnected from grid Immediately, No hazard.
37	Q4 C G	Short	400V	3min	--	--	Q3 Q4 damaged, Inverter shutdown and disconnected from grid Immediately, no hazard.
38	Q4 C E	Short	400V	3min	--	--	Q3 Q4 damaged, Inverter shutdown and disconnected from grid Immediately, no hazard.
39	R17	Short	400V	3min	--	--	Error message: "Master Battery Current High", Inverter disconnected from grid Immediately, No damaged, no hazard.

40	R16	Open	400V	3min	--	--	Error message: "Battery Open Circuit Err", Inverter disconnected from grid Immediately, No damaged, no hazard.
41	R23	Short	400V	3min	--	--	Error message: "Master Battery Current High", Inverter disconnected from grid Immediately, No damaged, no hazard.
42	R22	Open	400V	3min	--	--	Error message: "Battery Open Circuit Err", Inverter disconnected from grid Immediately, No damaged, no hazard.
43	Q6	Short	400V	3min	--	--	U4 Q3 Q4 damaged Inverter shutdown and disconnected from grid Immediately, no hazard.
44	C27	Short	400V	3min	--	--	Inverter shutdown and disconnected from grid Immediately, No damaged, no hazard.
45	C97	Short	400V	3min	--	--	Error message: "Master Bus Voltage High", Inverter disconnected from grid Immediately, No damaged, no hazard.
46	Q10 C G	Short	400V	3min	--	--	Q10 damaged, Error message: "Master HW PV Current High", Inverter disconnected from grid Immediately, no hazard.
47	Q10 C E	Open	400V	3min	--	--	Q10 damaged, Error message: "Master HW PV Current High", Inverter disconnected from grid Immediately, no hazard.
48	C99	Short	400V	3min	--	--	Error message: "Master Bus Voltage High", Inverter disconnected from grid Immediately, No damaged, no hazard.

49	Q8	Short	400V	3min	--	--	Q10 damaged, Error message: "Master HW PV Current High", Inverter disconnected from grid Immediately, no hazard.
50	R74	Open	400V	3min	--	--	Q11 U5 damaged, Error message: "Master HW PV Current High", Inverter disconnected from grid Immediately, no hazard.
51	R83	Open	400V	3min	--	--	Inverter shutdown and disconnected from grid Immediately, No damaged, no hazard.
52	R84	Short	400V	3min	--	--	Inverter shutdown and disconnected from grid Immediately, No damaged, no hazard.
53	R101	Short	400V	3min	--	--	Inverter shutdown and disconnected from grid Immediately, No damaged, no hazard.
54	R102	Open	400V	3min	--	--	Inverter shutdown and disconnected from grid Immediately, No damaged, no hazard.
55	Q13 D S	Short	400V	3min	--	--	Error message: "Master ISO Error", Inverter shutdown and disconnected from grid Immediately, No damaged, no hazard.
56	Q13 D G	Short	400V	3min	--	--	Error message: "Master ISO Error", Inverter shutdown and disconnected from grid Immediately, No damaged, no hazard.
57	R73	Open	400V	3min	--	--	Error message: "Master ISO Error", Inverter shutdown and disconnected from grid Immediately, No damaged, no hazard.

58	R66	Open	400V	3min	--	--	Error message: "Master ISO Error", Inverter shutdown and disconnected from grid Immediately, No damaged, no hazard.
59	C57	Short	400V	3min	--	--	D7 D9 damaged, Inverter disconnected from grid Immediately, no hazard.
60	Q16 C G	Short	400V	3min	--	--	Q16 Q20 Q21 damaged, Inverter disconnected from grid Immediately, no hazard.
61	Q16 C E	Short	400V	3min	--	--	Q16 Q20 Q21 damaged, Inverter disconnected from grid Immediately, no hazard.
62	Q21	Short	400V	3min	--	--	Q16 Q17 Q20 Q21 damaged, Inverter disconnected from grid Immediately, no hazard.
63	Q21	Short	400V	3min	--	--	Q16 Q17 Q20 Q21 damaged, Inverter disconnected from grid Immediately, no hazard.
64	R92	Open	400V	3min	--	--	Error message: "Master Phase DCI Error", Inverter disconnected from grid Immediately, No damaged no hazard.
65	C75	Short	400V	3min	--	--	Error message: "Master Phase DCI Error", Inverter disconnected from grid Immediately, No damaged no hazard.
66	R133	Open	400V	3min	--	--	Error message: "Master Bus Voltage High", Inverter disconnected from grid Immediately, No damaged, no hazard.

67	R134	Short	400V	3min	--	--	Error message: "Master Bus Voltage High", Inverter disconnected from grid Immediately, No damaged, no hazard.
68	R138	Open	400V	3min	--	--	Error message: "Master Bus Voltage High", Inverter disconnected from grid Immediately, No damaged, no hazard.
69	R139	Short	400V	3min	--	--	Error message: "Master Bus Voltage High", Inverter disconnected from grid Immediately, No damaged, no hazard.
70	R146	Open	400V	3min	--	--	Error message: "Master No Grid Error", Inverter disconnected from grid Immediately, No damaged no hazard.
71	R147	Short	400V	3min	--	--	Error message: "Grid Volt High", Inverter disconnected from grid Immediately, No damaged, no hazard.
72	R158	Open	400V	3min	--	--	Error message: "Master HW Inv Current High", Inverter disconnected from grid Immediately, No damaged, no hazard.
73	R159	Short	400V	3min	--	--	Error message: "Master HW Inv Current High", Inverter disconnected from grid Immediately, No damaged, no hazard.
74	R165	Open	400V	3min	--	--	Error message: "Master HW Inv Current High", Inverter disconnected from grid Immediately, No damaged, no hazard.
75	R163	Short	400V	3min	--	--	Error message: "Master HW Inv Current High", Inverter disconnected from grid Immediately, No damaged, no hazard.

76	R178	Open	400V	3min	--	--	Error message: "Master Grid NE Voltage Error", Inverter disconnected from grid Immediately, No damaged, no hazard.
77	R179	Short	400V	3min	--	--	Error message: "Master Grid NE Voltage Error", Inverter disconnected from grid Immediately, No damaged, no hazard.
78	R185	Open	400V	3min	--	--	Error message: "Master Grid NE Voltage Error", Inverter disconnected from grid Immediately, No damaged, no hazard.
79	R186	Short	400V	3min	--	--	Error message: "Master Grid NE Voltage Error", Inverter disconnected from grid Immediately, No damaged, no hazard.
80	C106	Short	400V	3min	--	--	Error message: "Master HW Inv Current High", Inverter disconnected from grid Immediately, No damaged, no hazard.
81	C91	Short	400V	3min	--	--	Error message: "Master HW Inv Current High", Inverter disconnected from grid Immediately, No damaged, no hazard.
82	C88	Short	400V	3min	--	--	Error message: "Master HW Inv Current High", Inverter disconnected from grid Immediately, No damaged, no hazard.
83	R193	Open	400V	3min	--	--	Error message: "GFCI Device Error", Inverter disconnected from grid Immediately, No damaged, no hazard.
84	R194	Open	400V	3min	--	--	Error message: "GFCI Device Error", Inverter disconnected from grid Immediately, No damaged, no hazard.

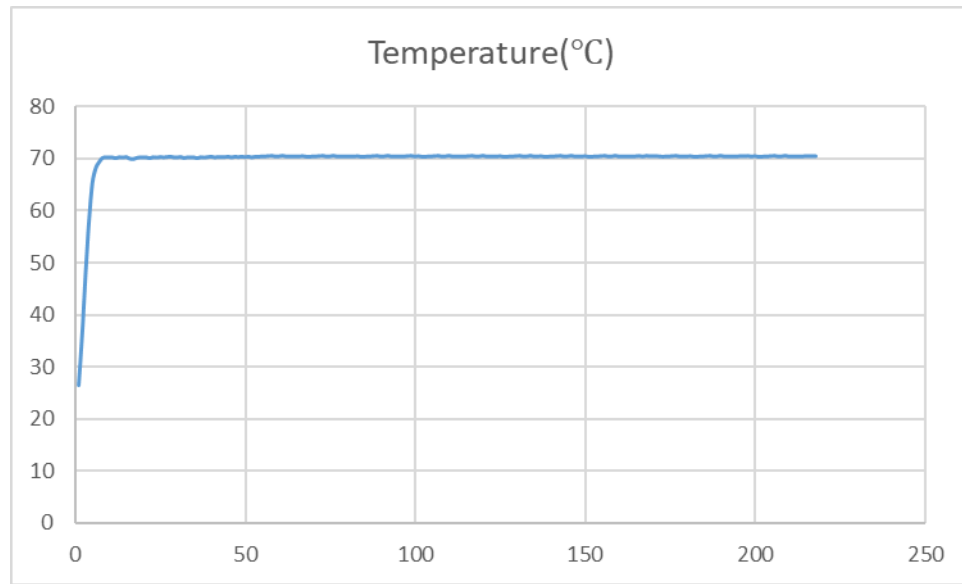
85	JK4	Short	400V	3min	--	--	Error message: "Master Relay Err", Inverter disconnected from grid Immediately, No damaged, no hazard.
86	JK15	Short	400V	3min	--	--	Error message: "Master Relay Err", Inverter disconnected from grid Immediately, No damaged, no hazard.
87	JK6	Short	400V	3min	--	--	Error message: "Master Relay Err", Inverter disconnected from grid Immediately, No damaged, no hazard.
88	JK8	Short	400V	3min	--	--	Error message: "Master Relay Err", Inverter disconnected from grid Immediately, No damaged, no hazard.
89	C86	Short	400V	3min	--	--	Error message: "Master HW Inv Current High", Inverter disconnected from grid Immediately, No damaged, no hazard.
90	Q30 D S	Short	400V	3min	--	--	Error message: "Master Relay Err", Inverter disconnected from grid Immediately, No damaged, no hazard.
91	Q30 D G	Short	400V	3min	--	--	Error message: "Master Relay Err", Inverter disconnected from grid Immediately, No damaged, no hazard.
92	Q31 D S	Short	400V	3min	--	--	Error message: "Master Relay Err", Inverter disconnected from grid Immediately, No damaged, no hazard.
93	Q31 D G	Short	400V	3min	--	--	Error message: "Master Relay Err", Inverter disconnected from grid Immediately, No damaged, no hazard.
94	JK10	Short	400V	3min	--	--	Inverter disconnected from grid Immediately, No damaged, no hazard.

95	C126	Short	400V	3min	--	--	Inverter disconnected from grid Immediately, No damaged, no hazard.
96	C137	Short	400V	3min	--	--	Inverter disconnected from grid Immediately, No damaged, no hazard.
97	C122	Short	400V	3min	--	--	Inverter disconnected from grid Immediately, No damaged, no hazard.
98	C161	Short	400V	3min	--	--	Inverter disconnected from grid Immediately, No damaged, no hazard.
99	JK11	Short	400V	3min	--	--	D45 damaged Inverter shutdown and disconnected from grid Immediately, no hazard.
100	JK12	Short	400V	3min	--	--	D45 damaged Inverter shutdown and disconnected from grid Immediately, no hazard.
101	R280	Open	400V	3min	--	--	Inverter Normal operation No damaged, no hazard.
102	R199	Open	400V	3min	--	--	Error message: "GFCI Device Error", Inverter disconnected from grid Immediately, No damaged, no hazard.
103	R229	Open	400V	3min	--	--	Error message: "GFCI Device Error", Inverter disconnected from grid Immediately, No damaged, no hazard.
Supplementary information s-c: short-circuited, o-c: open-circuited.							
See technical documentation.							

Compatibilità Climatica / Climatic compatibility

A.4.7	TABLE : Dry heat (Test B) – storage conditions.	P
CEI EN 60068-2-2:2008-11 Prove ambientali - Parte 2-2: Prove - Prova B: Caldo secco /Environmental testing - Part 2-2: Tests - Test B: Dry heat		
Condizioni di test /Test conditions		dissipa calore /heat -dissipating
Tipo di campione /Specimen type		Bb: graduale / gradual
Tipo di ventilazione /Air circulation		forzata / forced air
Temperatura misurata /Measured temperature:		70 °C
Duration:		16 h
Precondizionamento /Preconditioning --		
Verifiche iniziali /Initial measurement Verifica della corretta funzionalità del dispositivo / verification of correct device functionality Verifica del corretto funzionamento della protezione di interfaccia / verification of correct interface protection		
Verifiche finali /Final measurement Dopo il ciclo termico / after thermal cycle Verifica della corretta funzionalità del dispositivo / verification of correct device functionality Verifica del corretto funzionamento della protezione di interfaccia / verification of correct interface protection		
Condizioni particolari di prova /Particular test condition Apparato non operativo (non alimentato) / device not operative (not powered)		
Supplementary information: After the conditions, the inverter still work without any problem.		
Operator		see cover page
Supervisor		see cover page
Test Date		see cover page

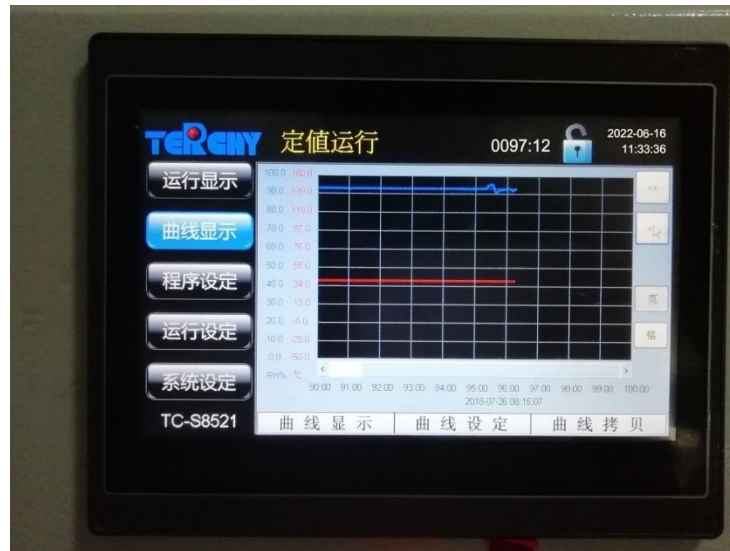
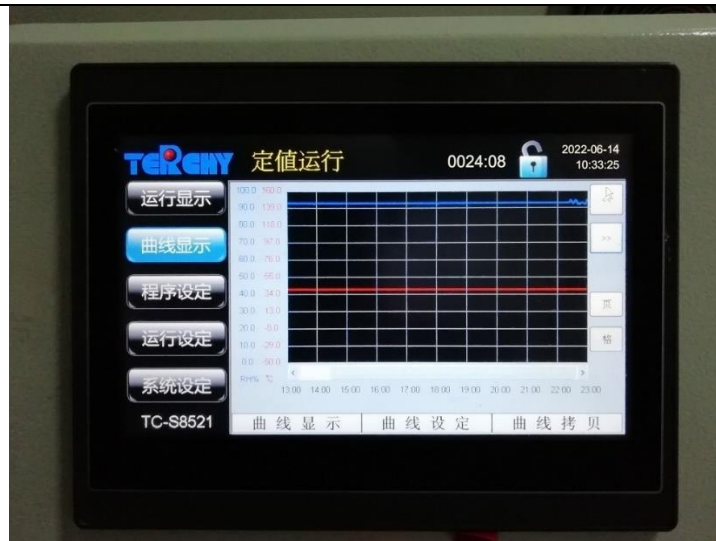
Image: Dry heat (Test B) – storage conditions.



A.4.7	TABLE : Humidity test (Test Cab) - storage conditions.	P
CEI EN 60068-2-78:2002:03 Prove ambientali - Parte 2-78: Prove - Prova Cab: Caldo umido, regime stazionario /Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state		
Temperatura misurata /Measured temperature:		40 °C
Umidità misurata /measured humidity:		93 RH%
Duration:		96 h
Instrumentation list		See table "Measurement equipment and instrumentation"
Uncertainty		See table
Precondizionamento /Preconditioning -		
Verifiche iniziali /Initial measurement Verifica della corretta funzionalità del dispositivo / verification of correct device functionality Verifica del corretto funzionamento della protezione di interfaccia / verification of correct interface protection		
Verifiche finali /Final measurement Dopo il ciclo termico / after thermal cycle Verifica della corretta funzionalità del dispositivo / verification of correct device functionality Verifica del corretto funzionamento della protezione di interfaccia / verification of correct interface protection		
Condizioni particolari di prova /Particular test condition Apparato non operativo (non alimentato) / device not operative (not powered)		
Supplementary information: After the conditions, the inverter still work without any problem.		
Operator		see cover page
Supervisor		see cover page
Test Date		see cover page

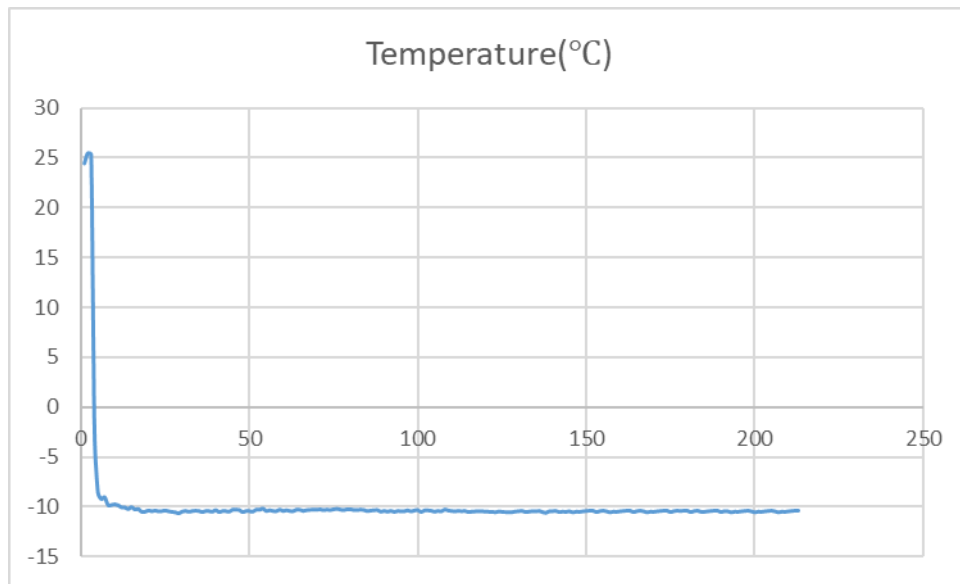
Image: Humidity test (Test Cab) - storage conditions.





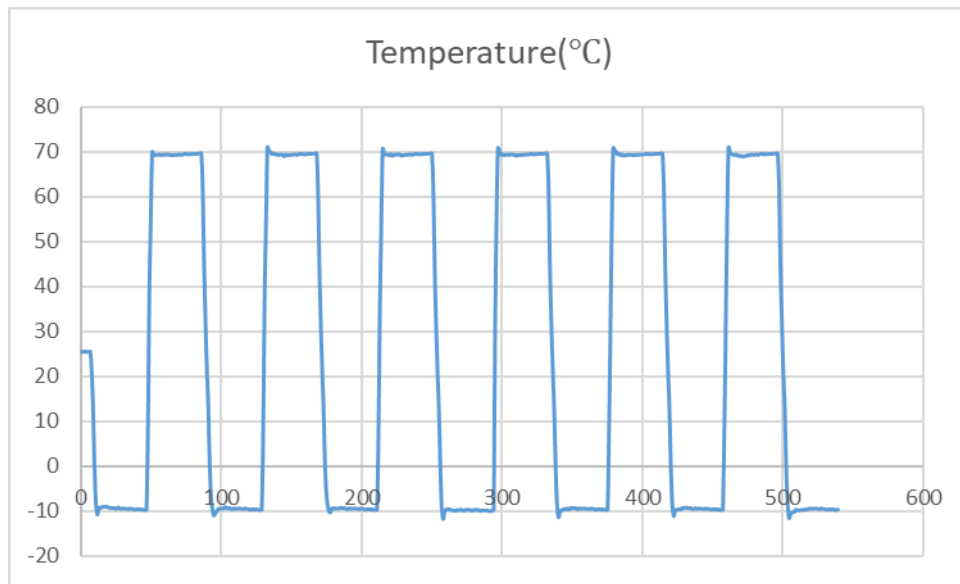
A.4.7	TABLE : Cold test (Test A) – storage conditions.	P
CEI EN 60068-2-1:2007:11		
Prove ambientali - Parte 2-1: Prove - Prova A: Freddo		
/Environmental testing - Part 2-1: Tests - Test A: Cold		
Condizioni di test /Test conditions	dissipa calore /heat -dissipating	
Tipo di campione /Specimen type	Bb: graduale / gradual	
Tipo di raffreddamento del campione /Specimen cooling type	senza raffreddamento artificiale /without artificial cooling	
Tipo di ventilazione /Air circulation	forzata / forced air	
Temperatura misurata /Measured temperature:	-10 °C	
Duration:	16 h	
Instrumentation list:	See table “Measurement equipment and instrumentation”	
Uncertainty:	See table	
Precondizionamento /Preconditioning		
-		
Verifiche iniziali /Initial measurement		
Verifica della corretta funzionalità del dispositivo / verification of correct device functionality		
Verifica del corretto funzionamento della protezione di interfaccia / verification of correct interface protection		
Verifiche finali /Final measurement		
Dopo il ciclo termico / after thermal cycle		
Verifica della corretta funzionalità del dispositivo / verification of correct device functionality		
Verifica del corretto funzionamento della protezione di interfaccia / verification of correct interface protection		
Condizioni particolari di prova /Particular test condition		
Apparato non operativo (non alimentato) / device not operative (not powered)		
Supplementary information:		
After the conditions, the inverter still work without any problem.		
Operator	:	see cover page
Supervisor	:	see cover page
Test Date	:	see cover page

Image: Cold test (Test A) – storage conditions



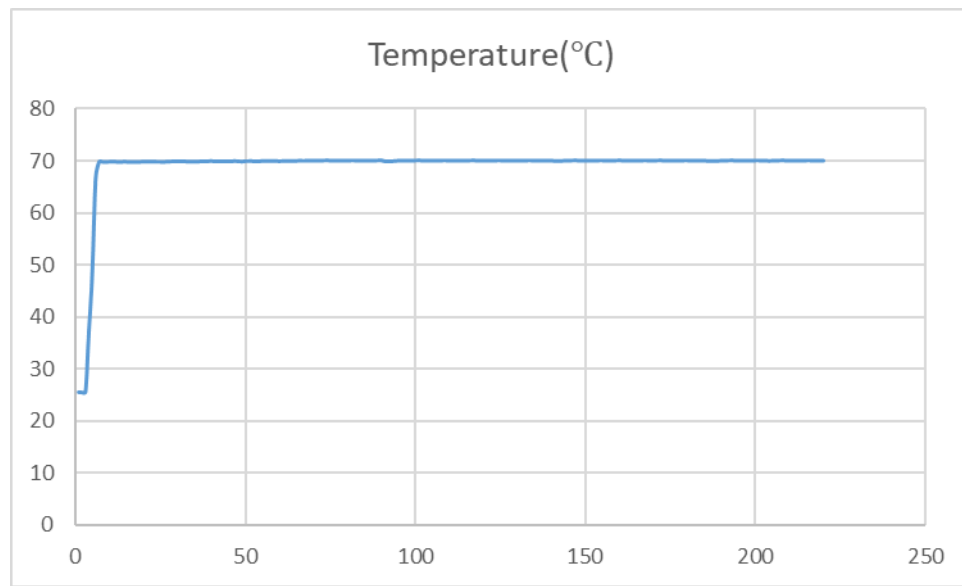
A.4.7	TABLE : Change of temperature (Test N) – storage conditions.	P
CEI EN 60068-2-14:2010		
Prove ambientali - Parte 2-14: Prove - Prova N: Cambio di temperatura		
/Environmental testing - Part 2-14: Tests - Test N: Change of temperature		
Prova/Test	NB: Cambio a velocità controllata /NB Change with specified rate of change	
Tipo di ventilazione /Air circulation	forzata / forced air	
N° cicli /Number of cycle:	1	
Temperatura minima T _A /Minimum temperature T _A:	- 10 ± 2 °C	
Temperatura massima T _B /Maximum temperature T _B :	+70 ± 2°C	
Durata di esposizione t ₁ /Exposure time t ₁	3 h	
Tempo di trasferimento t ₂ /Transition time t ₂ ...:	3 h	
Instrumentation list:	See table “Measurement equipment and instrumentation”	
Uncertainty:	See table	
Precondizionamento /Preconditioning		
-		
Verifiche iniziali /Initial measurement		
Verifica della corretta funzionalità del dispositivo / verification of correct device functionality		
Verifica del corretto funzionamento della protezione di interfaccia / verification of correct interface protection		
Verifiche finali /Final measurement		
Dopo il ciclo termico / after thermal cycle		
Verifica della corretta funzionalità del dispositivo / verification of correct device functionality		
Verifica del corretto funzionamento della protezione di interfaccia / verification of correct interface protection		
Condizioni particolari di prova /Particular test condition		
Apparato non operativo (non alimentato) / device not operative (not powered)		
Supplementary information:		
After the conditions, the inverter still work without any problem.		
Operator	:	see cover page
Supervisor	:	see cover page
Test Date	:	see cover page

Image: Change of temperature (Test N) – storage conditions.



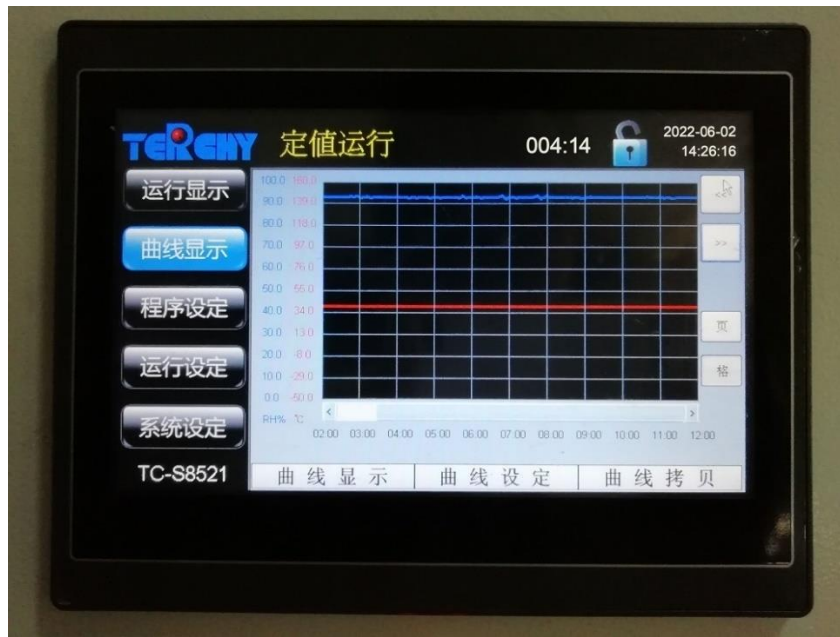
A.4.7	TABLE : Dry heat (Test B) – working conditions.	P
CEI EN 60068-2-2:2008-11 Prove ambientali - Parte 2-2: Prove - Prova B: Caldo secco <i>/Environmental testing - Part 2-2: Tests - Test B: Dry heat</i>		
Condizioni di test <i>/Test conditions</i>		dissipa calore <i>/heat -dissipating</i>
Tipo di campione <i>/Specimen type</i>		Bb: graduale <i>/ gradual</i>
Tipo di ventilazione <i>/Air circulation</i>		forzata <i>/ forced air</i>
Temperatura misurata <i>/Measured temperature:</i>		55 °C
Duration:		16 h
Precondizionamento <i>/Preconditioning</i> --		
Verifiche iniziali <i>/Initial measurement</i> Verifica della corretta funzionalità del dispositivo <i>/ verification of correct device functionality</i> Verifica del corretto funzionamento della protezione di interfaccia <i>/ verification of correct interface protection</i>		
Verifiche finali <i>/Final measurement</i> Dopo il ciclo termico <i>/ after thermal cycle</i> Verifica della corretta funzionalità del dispositivo <i>/ verification of correct device functionality</i> Verifica del corretto funzionamento della protezione di interfaccia <i>/ verification of correct interface protection</i>		
Condizioni particolari di prova <i>/Particular test condition</i> Apparato non operativo (non alimentato) <i>/ device not operative (not powered)</i>		
Supplementary information: After the conditions, the inverter still work without any problem.		
Operator		see cover page
Supervisor		see cover page
Test Date		see cover page

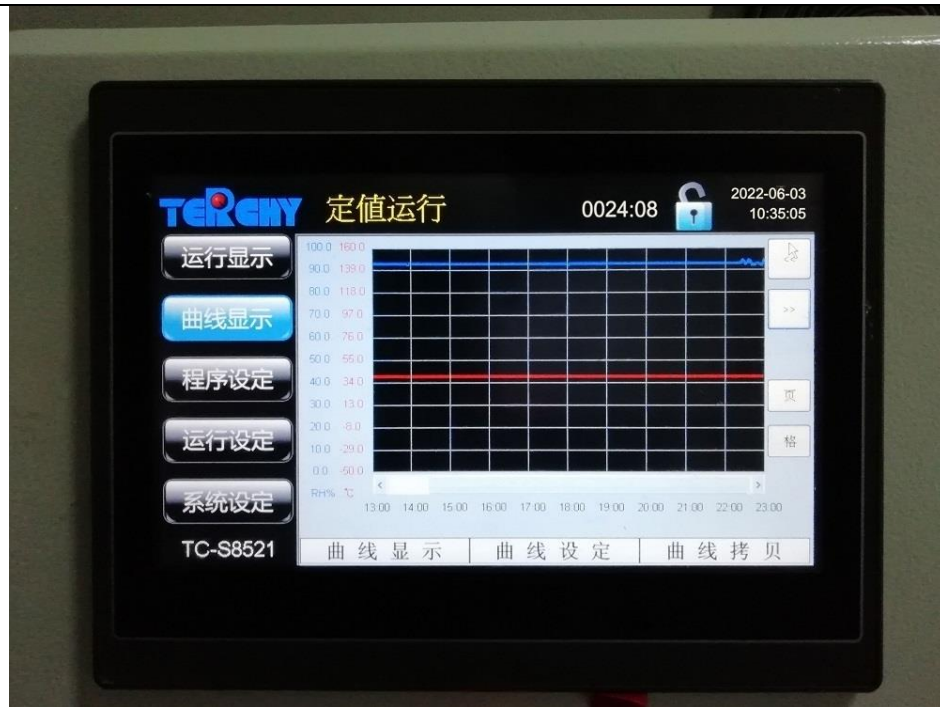
Image: Dry heat (Test B) – working conditions.



A.4.7	TABLE : Humidity test (Test Cab) - working conditions.	P
CEI EN 60068-2-78:2002:03		
Prove ambientali - Parte 2-78: Prove - Prova Cab: Caldo umido, regime stazionario		
/Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state		
Temperatura misurata /Measured temperature:	40 °C	
Umidità misurata /measured humidity:	93 RH%	
Duration:	96 h	
Instrumentation list	See table “Measurement equipment and instrumentation”	
Uncertainty	See table	
Precondizionamento /Preconditioning		
-		
Verifiche iniziali /Initial measurement		
Verifica della corretta funzionalità del dispositivo / verification of correct device functionality		
Verifica del corretto funzionamento della protezione di interfaccia / verification of correct interface protection		
Verifiche finali /Final measurement		
Dopo il ciclo termico / after thermal cycle		
Verifica della corretta funzionalità del dispositivo / verification of correct device functionality		
Verifica del corretto funzionamento della protezione di interfaccia / verification of correct interface protection		
Condizioni particolari di prova /Particular test condition		
Apparato non operativo (non alimentato) / device not operative (not powered)		
Supplementary information:		
After the conditions, the inverter still work without any problem.		
Operator	:	see cover page
Supervisor	:	see cover page
Test Date	:	see cover page

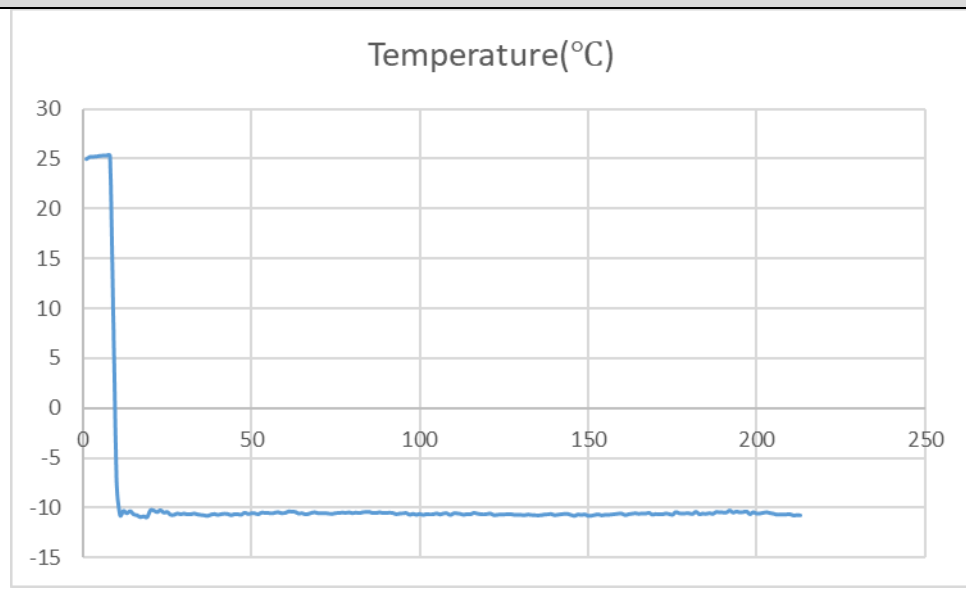
Image: Humidity test (Test Cab) - working conditions.





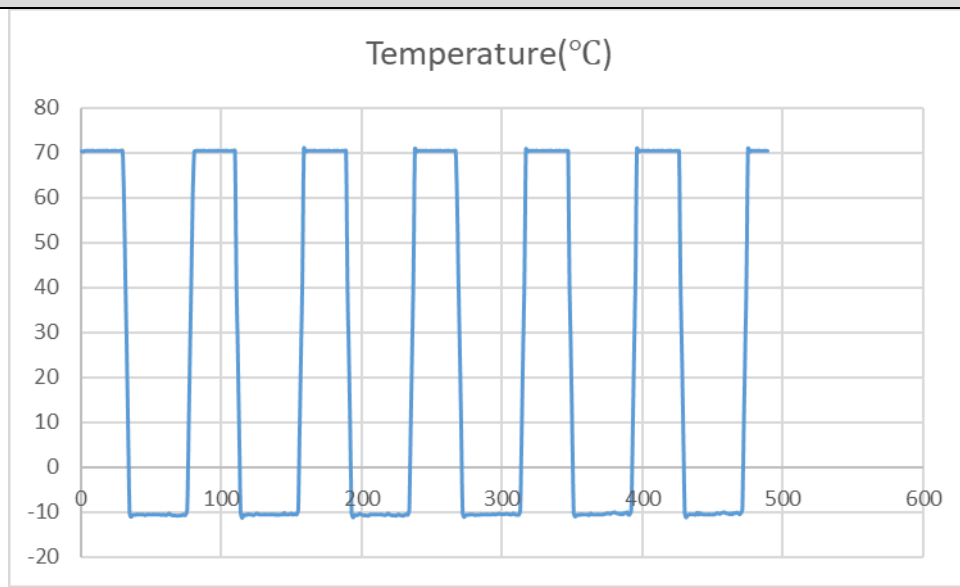
A.4.7	TABLE : Cold test (Test A) – working conditions.	P
CEI EN 60068-2-1:2007:11		
Prove ambientali - Parte 2-1: Prove - Prova A: Freddo		
/Environmental testing - Part 2-1: Tests - Test A: Cold		
Condizioni di test /Test conditions	dissipa calore /heat -dissipating	
Tipo di campione /Specimen type	Bb: graduale / gradual	
Tipo di raffreddamento del campione /Specimen cooling type	senza raffreddamento artificiale /without artificial cooling	
Tipo di ventilazione /Air circulation	forzata / forced air	
Temperatura misurata /Measured temperature:	-10 °C	
Duration:	16 h	
Instrumentation list:	See table “Measurement equipment and instrumentation”	
Uncertainty:	See table	
Precondizionamento /Preconditioning		
-		
Verifiche iniziali /Initial measurement		
Verifica della corretta funzionalità del dispositivo / verification of correct device functionality		
Verifica del corretto funzionamento della protezione di interfaccia / verification of correct interface protection		
Verifiche finali /Final measurement		
Dopo il ciclo termico / after thermal cycle		
Verifica della corretta funzionalità del dispositivo / verification of correct device functionality		
Verifica del corretto funzionamento della protezione di interfaccia / verification of correct interface protection		
Condizioni particolari di prova /Particular test condition		
Apparato non operativo (non alimentato) / device not operative (not powered)		
Supplementary information:		
After the conditions, the inverter still work without any problem.		
Operator	:	see cover page
Supervisor	:	see cover page
Test Date	:	see cover page

Image: Cold test (Test A) – working conditions



A.4.7	TABLE : Change of temperature (Test N) – working conditions.	P
CEI EN 60068-2-14:2010		
Prove ambientali - Parte 2-14: Prove - Prova N: Cambio di temperatura		
/Environmental testing - Part 2-14: Tests - Test N: Change of temperature		
Prova/Test	NB: Cambio a velocità controllata /NB Change with specified rate of change	
Tipo di ventilazione /Air circulation	forzata / forced air	
N° cicli /Number of cycle:	1	
Temperatura minima T _A /Minimum temperature T _A:	- 10 ± 2 °C	
Temperatura massima T _B /Maximum temperature T _B :	+55 ± 2°C	
Durata di esposizione t ₁ /Exposure time t ₁	3 h	
Tempo di trasferimento t ₂ /Transition time t ₂ ...:	3 h	
Instrumentation list:	See table “Measurement equipment and instrumentation”	
Uncertainty:	See table	
Precondizionamento /Preconditioning		
-		
Verifiche iniziali /Initial measurement		
Verifica della corretta funzionalità del dispositivo / verification of correct device functionality		
Verifica del corretto funzionamento della protezione di interfaccia / verification of correct interface protection		
Verifiche finali /Final measurement		
Dopo il ciclo termico / after thermal cycle		
Verifica della corretta funzionalità del dispositivo / verification of correct device functionality		
Verifica del corretto funzionamento della protezione di interfaccia / verification of correct interface protection		
Condizioni particolari di prova /Particular test condition		
Apparato non operativo (non alimentato) / device not operative (not powered)		
Supplementary information:		
After the conditions, the inverter still work without any problem.		
Operator	:	see cover page
Supervisor	:	see cover page
Test Date	:	see cover page

Image: Change of temperature (Test N) – working conditions.



A.4.8	TABLE: Insulation tests			P
☐ CEI EN 60255-5:2001-11 Parte 5: Coordinamento dell'isolamento per i relè di misura e per i dispositivi di protezione Prescrizioni e prove <i>/Electrical Relays - Part 5: Insulation coordination for measuring relays and protection equipment – Requirements and tests</i>				
☒ CEI EN 60146-1-1:1997 + A1:1998 Convertitori a semiconduttori - Prescrizioni generali e convertitori commutati dalla linea Prove di isolamento (§ 4.2.1). <i>/ Semiconductor converters - General requirements and line commutated converters - Part 1-1: Specification of basic requirements</i> <i>Insulation tests (§. 4.2.1).</i>				
Ambient temperature (°C)		20°C ± 2°C		
Humidity (RH %)		35% - 75% RH		
Instrumentation list.....		See table "Measurement equipment and instrumentation"		
Uncertainty		See table		
Resistenza di isolamento /Insulation Resistance				
Test	Test Voltage (V)	R measured	Limit	
Between PE and AC output shorted	500 Vdc	9999 MΩ	≥1MΩ	
Between PE and DC input shorted	500 Vdc	9999 MΩ	≥1MΩ	
Between PE and DC + AC shorted	500 Vdc	9999 MΩ	≥1MΩ	
Prova di rigidità dielettrica/ Dielectric strenght test				
Test	Test Voltage (V)	R Measured after test MΩ @ 500Vdc	Limit	
Between PE and AC output shorted	2120 Vdc	/	No discharge	
Between PE and DC + AC shorted	2120 Vdc	/	No discharge	
Supplementary information:				
Operator		see cover page		
Supervisor		see cover page		
Test Date		see cover page		

TESTING RESULTS

Allegato B: Prove sugli inverter per impianti indirettamente connessi
Allegato B: Inverter tests for PV plants not directly connected to the grid

B1: TABLE: Armoniche di corrente / Harmonics measurement
(full power of max. power)

- ☐ CEI EN 61000-3-2 ($I_{rated} \leq 16$ A single-phase)
☒ CEI EN 61000-3-12 ($16A < I_{rated} \leq 75A$ single-phase)

Ambient temperature (°C)	20°C ± 2°C
Humidity (RH %)	65% RH
Instrumentation list.....	See table "Measurement equipment and instrumentation"
Uncertainty	See table
Supplementary information:	
Operator	see cover page
Supervisor	see cover page
Test Date	see cover page

Harmonics current measured on L1 phase discharge mode (limits acc. to IEC 61000-3-12)				
100%				
Order [h]	I [A]	I/In [%]	Limits [%]	Results
1	26.36	101.05	--	--
2	0.08	0.29	8.00	P
3	0.12	0.45	21.6	P
4	0.01	0.05	4.00	P
5	0.16	0.63	10.70	P
6	0.01	0.02	2.67	P
7	0.07	0.26	7.20	P
8	0.00	0.02	2.00	P
9	0.02	0.08	3.8	P
10	0.00	0.02	1.60	P
11	0.05	0.21	3.10	P
12	0.01	0.02	1.33	P
13	0.06	0.22	2.00	P
14	0.01	0.02	N/A	P
15	0.05	0.17	N/A	P
16	0.01	0.02	N/A	P
17	0.03	0.12	N/A	P
18	0.01	0.02	N/A	P
19	0.02	0.09	N/A	P
20	0.01	0.02	N/A	P
21	0.03	0.10	N/A	P
22	0.01	0.02	N/A	P
23	0.03	0.10	N/A	P
24	0.01	0.02	N/A	P
25	0.03	0.11	N/A	P
26	0.01	0.02	N/A	P
27	0.02	0.09	N/A	P
28	0.01	0.02	N/A	P
29	0.02	0.09	N/A	P
30	0.01	0.02	N/A	P
31	0.02	0.08	N/A	P
32	0.01	0.02	N/A	P
33	0.02	0.07	N/A	P
34	0.01	0.02	N/A	P
35	0.02	0.07	N/A	P
36	0.00	0.02	N/A	P
37	0.02	0.06	N/A	P
38	0.01	0.02	N/A	P
39	0.02	0.07	N/A	P
40	0.00	0.02	N/A	P
THDi	-	0.991	13	P
PWHD	-	0.854	22	P

B.1: TABLE: Armoniche di corrente / Harmonics measurement (full power of max. power)	
☐ CEI EN 61000-3-2 ($I_{rated} \leq 16$ A single-phase) ☒ CEI EN 61000-3-12 ($16A < I_{rated} \leq 75A$ single-phase)	
Ambient temperature (°C)	+55°C ± 2°C
Humidity (RH %)	65% RH
Instrumentation list.....	See table "Measurement equipment and instrumentation"
Uncertainty	See table
Supplementary information:	
Operator	see cover page
Supervisor	see cover page
Test Date	see cover page

Harmonics current measured on L1 phase discharge mode (limits acc. to IEC 61000-3-12)				
	100%			
Order [h]	I [A]	I/In [%]	Limits [%]	Results
1	26.37	101.10	--	--
2	0.08	0.29	8.00	P
3	0.12	0.45	21.6	P
4	0.01	0.05	4.00	P
5	0.16	0.63	10.70	P
6	0.01	0.02	2.67	P
7	0.07	0.26	7.20	P
8	0.00	0.02	2.00	P
9	0.02	0.08	3.8	P
10	0.00	0.02	1.60	P
11	0.06	0.21	3.10	P
12	0.01	0.02	1.33	P
13	0.06	0.23	2.00	P
14	0.01	0.02	N/A	P
15	0.05	0.18	N/A	P
16	0.01	0.02	N/A	P
17	0.03	0.12	N/A	P
18	0.01	0.02	N/A	P
19	0.02	0.09	N/A	P
20	0.01	0.02	N/A	P
21	0.03	0.10	N/A	P
22	0.01	0.02	N/A	P
23	0.03	0.10	N/A	P
24	0.01	0.02	N/A	P
25	0.03	0.11	N/A	P
26	0.01	0.02	N/A	P
27	0.02	0.09	N/A	P
28	0.01	0.02	N/A	P
29	0.02	0.09	N/A	P
30	0.00	0.02	N/A	P
31	0.02	0.08	N/A	P
32	0.01	0.02	N/A	P
33	0.02	0.08	N/A	P
34	0.01	0.02	N/A	P
35	0.02	0.07	N/A	P
36	0.00	0.02	N/A	P
37	0.02	0.07	N/A	P
38	0.01	0.02	N/A	P
39	0.02	0.07	N/A	P
40	0.00	0.02	N/A	P
THDi	-	1.002	13	P
PWHD	-	0.903	22	P

**B.1: TABLE: Armoniche di corrente / Harmonics measurement
(full power of max. power)**

- ☐ CEI EN 61000-3-2 ($I_{rated} \leq 16$ A single-phase)
- ☒ CEI EN 61000-3-12 ($16A < I_{rated} \leq 75A$ single-phase)

Ambient temperature (°C)	-10°C ± 2°C
Humidity (RH %)	65% RH
Instrumentation list.....	See table "Measurement equipment and instrumentation"
Uncertainty	See table
Supplementary information:	
Operator	see cover page
Supervisor	see cover page
Test Date	see cover page

Harmonics current measured on L1 phase discharge mode (limits acc. to IEC 61000-3-12)				
100%				
Order [h]	I [A]	I/In [%]	Limits [%]	Results
1	26.37	101.07	--	--
2	0.08	0.29	8.00	P
3	0.12	0.45	21.6	P
4	0.01	0.05	4.00	P
5	0.16	0.63	10.70	P
6	0.01	0.02	2.67	P
7	0.07	0.26	7.20	P
8	0.00	0.02	2.00	P
9	0.02	0.08	3.8	P
10	0.01	0.02	1.60	P
11	0.05	0.21	3.10	P
12	0.01	0.02	1.33	P
13	0.06	0.22	2.00	P
14	0.01	0.02	N/A	P
15	0.05	0.18	N/A	P
16	0.01	0.02	N/A	P
17	0.03	0.12	N/A	P
18	0.01	0.02	N/A	P
19	0.02	0.09	N/A	P
20	0.01	0.03	N/A	P
21	0.03	0.10	N/A	P
22	0.01	0.03	N/A	P
23	0.03	0.10	N/A	P
24	0.01	0.03	N/A	P
25	0.03	0.11	N/A	P
26	0.01	0.02	N/A	P
27	0.02	0.09	N/A	P
28	0.01	0.02	N/A	P
29	0.02	0.09	N/A	P
30	0.01	0.02	N/A	P
31	0.02	0.08	N/A	P
32	0.01	0.02	N/A	P
33	0.02	0.07	N/A	P
34	0.01	0.02	N/A	P
35	0.02	0.07	N/A	P
36	0.01	0.02	N/A	P
37	0.02	0.06	N/A	P
38	0.01	0.02	N/A	P
39	0.02	0.07	N/A	P
40	0.00	0.02	N/A	P
THDi	-	0.995	13	P
PWHD	-	0.879	22	P

TESTING RESULTS

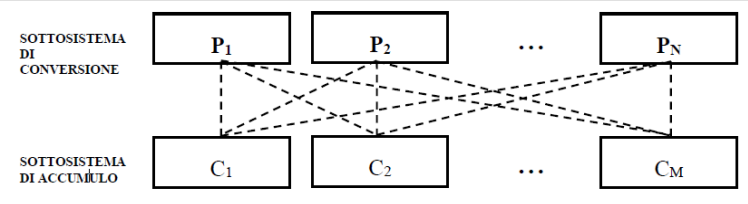
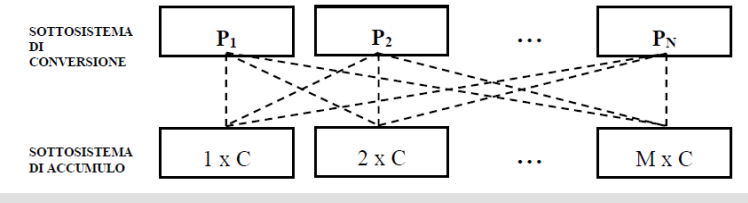
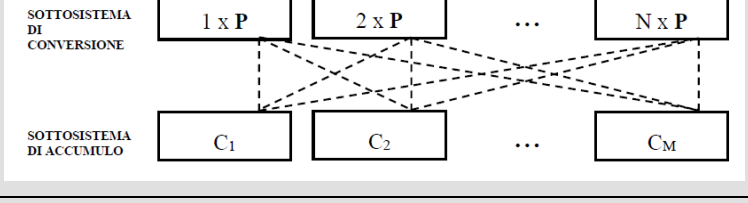
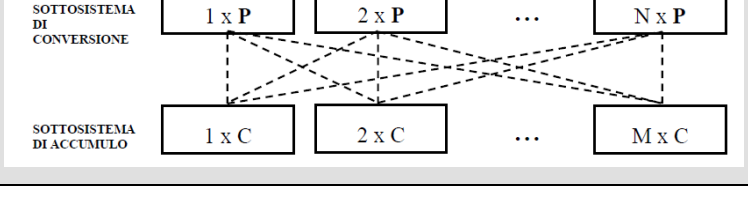
Allegato B bis: Prove sui sistemi di accumulo
/ Annex B bis: Tests on Energy Storage Systems

Terminologia e definizioni degli EESS in accordo al par. 8.5.3.4

/ Terminology and definitions for EESS systems in according to clause 8.5.3.4 :

CUS:	Capacity of the storage system	20.0kWh	
PSN:	Power from Battery to the Grid	6000W	
PCN:	Power from the Grid to the Battery	-6000W	
PS_{MAX}:	Power from Battery to the Grid within the CUS – (range of 10% - 90%)	6000W	
PC_{MAX}:	Power from Grid to the Battery within the CUS – (range of 10% - 90%)	-6000W	
PN_{INV}:	Rated Power from the Inverter	6000W	

Operation Condition
$PS_{MAX} \geq PSN$
$PC_{MAX} \geq PCN$
$PS_{MAX} \leq PN_{INV}$
$PC_{MAX} \leq PN_{INV}$

Bbis.2.2: TABLE: Scalarità e modularità <i>/Table: Scalarity and modularity</i>	
Ambient temperature (°C)	N/A
Humidity (RH %)	N/A
Instrumentation list.....	N/A
Uncertainty	N/A
☐ Caso A	
☒ Caso B	
☐ Caso C	
☐ Caso D	
Supplementary information:	
Operator	see cover page
Supervisor	see cover page
Test Date.....	see cover page

Configurazione di Energy Storage System
/ Energy Storage system configuration
Inverter:

P_{MIN}		P_{MAX}	
P_1 :	3000W	P_N :	6000W
$N_{module\ min}$:	N/A	$N_{module\ max}$:	N/A

Storage:

E_{MIN}		E_{MAX}	
C_1 :	2800W	C_M :	6000W
$M_{module\ min}$:	10.65KWH	$M_{module\ max}$:	24.86KWH

Tabella di prove per EESS:
/ Table of tests for EESS

Caso A		Potenza sottosistema di conversione (W)		
		$P_1 (P_{MIN})$	...	$P_N (P_{MAX})$
Capacità sottosistema di accumulo (Wh)	$C_1 (E_{MIN})$	Prove parziali Allegato Bbis	non sono richieste ulteriori prove	Prove parziali Allegato Bbis
	...	non sono richieste ulteriori prove	non sono richieste ulteriori prove	non sono richieste ulteriori prove
	$C_M (E_{MAX})$	non sono richieste ulteriori prove	non sono richieste ulteriori prove	Prove complete Allegato Bbis

Caso C		Potenza sottosistema di conversione (W)			
		modulo base P (P_{MIN})	2 moduli	≥ 3 moduli	N moduli (P_{MAX})
Capacità sottosistema di accumulo (Wh)	$C_1 (E_{MIN})$	Prove parziali Allegato Bbis	non sono richieste ulteriori prove	Prove parziali Allegato Bbis in una qualunque delle configurazioni con (almeno) 3 moduli del sottosistema di conversione	non sono richieste ulteriori prove
	...	non sono richieste ulteriori prove	non sono richieste ulteriori prove		non sono richieste ulteriori prove
	$C_M (E_{MAX})$	Prove complete Allegato Bbis	non sono richieste ulteriori prove		non sono richieste ulteriori prove

Caso B		Potenza sottosistema di conversione (W)		
		$P_1 (P_{MIN})$	...	$P_N (P_{MAX})$
Capacità sottosistema di accumulo (Wh)	modulo base C (E_{MIN})	Prove parziali Allegato Bbis	non sono richieste ulteriori prove	Prove parziali Allegato Bbis
	...	non sono richieste ulteriori prove	non sono richieste ulteriori prove	non sono richieste ulteriori prove
	M moduli (E_{MAX})	non sono richieste ulteriori prove	non sono richieste ulteriori prove	Prove complete Allegato Bbis

Caso D		Potenza sottosistema di conversione (W)			
		modulo base P (P_{MIN})	2 moduli	≥ 3 moduli	N moduli (P_{MAX})
Capacità sottosistema di accumulo (Wh)	modulo base C (E_{MIN})	Prove parziali Allegato Bbis	non sono richieste ulteriori prove	Prove parziali Allegato Bbis in una qualunque delle configurazioni con 3 moduli del sottosistema di conversione	non sono richieste ulteriori prove
	...	non sono richieste ulteriori prove	non sono richieste ulteriori prove		non sono richieste ulteriori prove
	M moduli (E_{MAX})	Prove complete Allegato Bbis	non sono richieste ulteriori prove		non sono richieste ulteriori prove

Bbis.3: TABLE: Armoniche di corrente /Harmonics measurement (full power, 66% and 33% of $P_{S_{max}}$) (Discharge mode)	
☐ CEI EN 61000-3-2 ($I_{rated} \leq 16$ A single-phase)	
☒ CEI EN 61000-3-12 ($16A < I_{rated} \leq 75A$ single-phase)	
Ambient temperature (°C)	25 °C ± 5 °C
Humidity (RH %)	65% ± 10% RH
Instrumentation list.....	See table "Measurement equipment and instrumentation"
Uncertainty	See table
Supplementary information:	
Operator	See cover page
Supervisor	See cover page
Test Date	See cover page

Harmonics current measured on L1 phase (limits acc. to IEC 61000-3-12)								
	33%		66%		100%			
Order [h]	I [A]	I/In [%]	I [A]	I/In [%]	I [A]	I/In [%]	Limits [%]	Results
1	8.59	32.93	17.30	66.33	25.05	96.04	--	--
2	0.06	0.23	0.02	0.09	0.02	0.08	8.00	P
3	0.25	0.98	0.40	1.54	0.73	2.81	21.6	P
4	0.00	0.02	0.01	0.03	0.01	0.05	4.00	P
5	0.06	0.22	0.07	0.28	0.17	0.63	10.70	P
6	0.01	0.02	0.01	0.02	0.01	0.02	2.67	P
7	0.05	0.19	0.02	0.09	0.07	0.28	7.20	P
8	0.00	0.02	0.00	0.02	0.00	0.02	2.00	P
9	0.04	0.15	0.03	0.13	0.01	0.04	3.8	P
10	0.00	0.01	0.00	0.01	0.00	0.02	1.60	P
11	0.03	0.12	0.01	0.05	0.02	0.08	3.10	P
12	0.00	0.01	0.00	0.01	0.00	0.01	1.33	P
13	0.02	0.09	0.01	0.02	0.02	0.07	2.00	P
14	0.00	0.01	0.00	0.01	0.00	0.01	N/A	P
15	0.02	0.06	0.01	0.03	0.01	0.05	N/A	P
16	0.00	0.01	0.00	0.00	0.00	0.00	N/A	P
17	0.01	0.05	0.01	0.03	0.01	0.03	N/A	P
18	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
19	0.01	0.03	0.01	0.02	0.00	0.01	N/A	P
20	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
21	0.01	0.02	0.00	0.02	0.00	0.01	N/A	P
22	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
23	0.00	0.02	0.00	0.02	0.00	0.01	N/A	P
24	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
25	0.00	0.01	0.00	0.01	0.00	0.01	N/A	P
26	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
27	0.00	0.01	0.00	0.01	0.00	0.01	N/A	P
28	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
29	0.00	0.01	0.00	0.01	0.00	0.01	N/A	P
30	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
31	0.00	0.01	0.00	0.01	0.00	0.01	N/A	P
32	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
33	0.00	0.00	0.00	0.01	0.00	0.00	N/A	P
34	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
35	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
36	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
37	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
38	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
39	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
40	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
THDi	-	1.071	-	1.575	-	2.898	13	P
PWHD	-	0.073	-	0.025	-	0.037	22	P

Bbis.3: TABLE: Armoniche di corrente /Harmonics measurement (full power, 66% and 33% of PC_{max}) (Charge mode)	
☐ CEI EN 61000-3-2 ($I_{rated} \leq 16$ A single-phase) ☒ CEI EN 61000-3-12 ($16A < I_{rated} \leq 75A$ single-phase)	
Ambient temperature (°C)	25 °C ± 5 °C
Humidity (RH %)	65% ± 10% RH
Instrumentation list.....	See table "Measurement equipment and instrumentation"
Uncertainty	See table
Supplementary information: - <i>Test not applicable to unidirectional generators</i>	
Operator	See cover page.
Supervisor	See cover page.
Test Date	See cover page.

Harmonics current measured on L1 phase (limits acc. to IEC 61000-3-12)								
	33%		66%		100%			
Order [h]	I [A]	I/In [%]	I [A]	I/In [%]	I [A]	I/In [%]	Limits [%]	Results
1	8.62	33.06	17.23	66.04	26.03	99.77	--	--
2	0.02	0.07	0.05	0.19	0.08	0.29	8.00	P
3	0.10	0.37	0.05	0.19	0.13	0.48	21.6	P
4	0.01	0.04	0.01	0.02	0.01	0.03	4.00	P
5	0.09	0.34	0.05	0.18	0.16	0.60	10.70	P
6	0.01	0.04	0.00	0.02	0.01	0.02	2.67	P
7	0.08	0.31	0.06	0.21	0.07	0.25	7.20	P
8	0.01	0.04	0.01	0.02	0.00	0.02	2.00	P
9	0.07	0.28	0.07	0.27	0.02	0.09	3.8	P
10	0.01	0.04	0.01	0.02	0.01	0.02	1.60	P
11	0.06	0.22	0.04	0.16	0.05	0.20	3.10	P
12	0.01	0.03	0.01	0.02	0.01	0.03	1.33	P
13	0.05	0.19	0.03	0.13	0.06	0.22	2.00	P
14	0.01	0.02	0.01	0.03	0.01	0.02	N/A	P
15	0.04	0.16	0.04	0.17	0.05	0.18	N/A	P
16	0.00	0.02	0.01	0.03	0.01	0.03	N/A	P
17	0.03	0.12	0.04	0.14	0.03	0.11	N/A	P
18	0.00	0.01	0.01	0.03	0.01	0.03	N/A	P
19	0.02	0.09	0.04	0.14	0.02	0.09	N/A	P
20	0.00	0.01	0.01	0.03	0.01	0.03	N/A	P
21	0.02	0.08	0.04	0.14	0.03	0.10	N/A	P
22	0.00	0.01	0.01	0.02	0.01	0.03	N/A	P
23	0.01	0.05	0.03	0.12	0.03	0.10	N/A	P
24	0.00	0.01	0.01	0.02	0.01	0.03	N/A	P
25	0.01	0.06	0.03	0.11	0.03	0.11	N/A	P
26	0.00	0.01	0.00	0.02	0.01	0.03	N/A	P
27	0.01	0.05	0.03	0.10	0.02	0.08	N/A	P
28	0.00	0.02	0.01	0.02	0.01	0.03	N/A	P
29	0.02	0.06	0.03	0.10	0.02	0.08	N/A	P
30	0.00	0.02	0.01	0.02	0.01	0.03	N/A	P
31	0.02	0.06	0.02	0.08	0.02	0.06	N/A	P
32	0.01	0.02	0.01	0.02	0.01	0.02	N/A	P
33	0.02	0.06	0.02	0.08	0.02	0.08	N/A	P
34	0.01	0.02	0.01	0.02	0.01	0.02	N/A	P
35	0.02	0.06	0.02	0.08	0.02	0.08	N/A	P
36	0.01	0.02	0.01	0.02	0.01	0.02	N/A	P
37	0.01	0.05	0.02	0.07	0.02	0.07	N/A	P
38	0.00	0.02	0.00	0.02	0.01	0.02	N/A	P
39	0.01	0.05	0.02	0.07	0.02	0.07	N/A	P
40	0.00	0.01	0.00	0.02	0.01	0.02	N/A	P
THDi	-	0.784	-	0.658	-	0.985	13	P
PWHD	-	0.578	-	1.053	-	0.840	22	P

Bbis.3: TABLE: Armoniche di corrente /Harmonics measurement (full power, 66% and 33% of $P_{S_{max}}$) (Discharge mode)	
☐ CEI EN 61000-3-2 ($I_{rated} \leq 16$ A single-phase) ☒ CEI EN 61000-3-12 ($16A < I_{rated} \leq 75A$ single-phase)	
Ambient temperature (°C)	+55 °C ± 2 °C
Humidity (RH %)	65% ± 5% RH
Instrumentation list.....	See table "Measurement equipment and instrumentation"
Uncertainty	See table
Supplementary information:	
Operator	See cover page.
Supervisor	See cover page.
Test Date	See cover page.

Harmonics current measured on L1 phase (limits acc. to IEC 61000-3-12)								
	33%		66%		100%			
Order [h]	I [A]	I/In [%]	I [A]	I/In [%]	I [A]	I/In [%]	Limits [%]	Results
1	8.45	32.39	17.43	66.82	25.36	97.21	--	--
2	0.06	0.24	0.04	0.13	0.03	0.10	8.00	P
3	0.26	1.00	0.41	1.57	0.76	2.90	21.6	P
4	0.01	0.03	0.01	0.04	0.01	0.06	4.00	P
5	0.06	0.24	0.07	0.28	0.17	0.64	10.70	P
6	0.00	0.02	0.00	0.02	0.01	0.02	2.67	P
7	0.05	0.21	0.02	0.09	0.07	0.28	7.20	P
8	0.01	0.02	0.00	0.01	0.00	0.02	2.00	P
9	0.04	0.16	0.04	0.14	0.01	0.04	3.8	P
10	0.00	0.02	0.00	0.01	0.00	0.01	1.60	P
11	0.03	0.12	0.02	0.06	0.02	0.08	3.10	P
12	0.00	0.01	0.00	0.01	0.00	0.01	1.33	P
13	0.02	0.09	0.01	0.02	0.02	0.08	2.00	P
14	0.00	0.01	0.00	0.01	0.00	0.01	N/A	P
15	0.02	0.06	0.01	0.03	0.01	0.05	N/A	P
16	0.00	0.01	0.00	0.00	0.00	0.00	N/A	P
17	0.01	0.04	0.01	0.03	0.01	0.03	N/A	P
18	0.00	0.01	0.00	0.01	0.00	0.00	N/A	P
19	0.01	0.03	0.01	0.02	0.00	0.01	N/A	P
20	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
21	0.01	0.02	0.00	0.02	0.00	0.01	N/A	P
22	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
23	0.00	0.01	0.00	0.02	0.00	0.01	N/A	P
24	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
25	0.00	0.01	0.00	0.01	0.00	0.01	N/A	P
26	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
27	0.00	0.01	0.00	0.01	0.00	0.01	N/A	P
28	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
29	0.00	0.01	0.00	0.01	0.00	0.01	N/A	P
30	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
31	0.00	0.01	0.00	0.01	0.00	0.01	N/A	P
32	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
33	0.00	0.00	0.00	0.01	0.00	0.01	N/A	P
34	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
35	0.00	0.00	0.00	0.00	0.00	0.01	N/A	P
36	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
37	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
38	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
39	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
40	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
THDi	-	1.101	-	1.616	-	2.984	13	P
PWHD	-	0.073	-	0.024	-	0.043	22	P

Bbis.3: TABLE: Armoniche di corrente /Harmonics measurement (full power, 66% and 33% of PC_{max}) (Charge mode)	
☐ CEI EN 61000-3-2 ($I_{rated} \leq 16$ A single-phase) ☒ CEI EN 61000-3-12 ($16A < I_{rated} \leq 75A$ single-phase)	
Ambient temperature (°C)	+55 °C ± 2 °C
Humidity (RH %)	65% ± 5% RH
Instrumentation list.....	See table "Measurement equipment and instrumentation"
Uncertainty	See table
Supplementary information: - <i>Test not applicable to unidirectional generators</i>	
Operator	See cover page.
Supervisor	See cover page.
Test Date	See cover page.

Harmonics current measured on L1 phase (limits acc. to IEC 61000-3-12)								
	33%		66%		100%			
Order [h]	I [A]	I/In [%]	I [A]	I/In [%]	I [A]	I/In [%]	Limits [%]	Results
1	8.62	33.05	17.41	66.74	26.22	100.51	--	--
2	0.02	0.07	0.04	0.14	0.07	0.26	8.00	P
3	0.10	0.37	0.76	2.93	1.02	3.90	21.6	P
4	0.01	0.03	0.01	0.03	0.02	0.06	4.00	P
5	0.09	0.34	0.27	1.05	0.36	1.38	10.70	P
6	0.01	0.03	0.01	0.02	0.00	0.02	2.67	P
7	0.08	0.31	0.18	0.68	0.15	0.57	7.20	P
8	0.01	0.03	0.00	0.02	0.00	0.01	2.00	P
9	0.07	0.28	0.12	0.47	0.10	0.38	3.8	P
10	0.01	0.03	0.00	0.02	0.00	0.01	1.60	P
11	0.06	0.22	0.06	0.23	0.08	0.30	3.10	P
12	0.01	0.03	0.00	0.02	0.00	0.01	1.33	P
13	0.05	0.19	0.03	0.11	0.06	0.22	2.00	P
14	0.01	0.02	0.00	0.01	0.00	0.01	N/A	P
15	0.04	0.16	0.01	0.06	0.03	0.13	N/A	P
16	0.00	0.02	0.00	0.01	0.00	0.01	N/A	P
17	0.03	0.12	0.01	0.03	0.02	0.07	N/A	P
18	0.00	0.01	0.00	0.01	0.00	0.01	N/A	P
19	0.02	0.09	0.00	0.01	0.01	0.04	N/A	P
20	0.00	0.01	0.00	0.01	0.00	0.01	N/A	P
21	0.02	0.08	0.00	0.01	0.01	0.03	N/A	P
22	0.00	0.01	0.00	0.01	0.00	0.01	N/A	P
23	0.01	0.05	0.00	0.01	0.00	0.02	N/A	P
24	0.00	0.01	0.00	0.01	0.00	0.01	N/A	P
25	0.01	0.06	0.00	0.01	0.00	0.01	N/A	P
26	0.00	0.01	0.00	0.00	0.00	0.01	N/A	P
27	0.01	0.05	0.00	0.01	0.00	0.01	N/A	P
28	0.00	0.02	0.00	0.00	0.00	0.00	N/A	P
29	0.02	0.06	0.00	0.01	0.00	0.00	N/A	P
30	0.00	0.02	0.00	0.00	0.00	0.00	N/A	P
31	0.02	0.06	0.00	0.01	0.00	0.00	N/A	P
32	0.00	0.02	0.00	0.00	0.00	0.00	N/A	P
33	0.02	0.06	0.00	0.01	0.00	0.00	N/A	P
34	0.00	0.02	0.00	0.00	0.00	0.00	N/A	P
35	0.02	0.06	0.00	0.01	0.00	0.00	N/A	P
36	0.00	0.02	0.00	0.00	0.00	0.00	N/A	P
37	0.01	0.05	0.00	0.01	0.00	0.00	N/A	P
38	0.00	0.01	0.00	0.00	0.00	0.00	N/A	P
39	0.01	0.05	0.00	0.01	0.00	0.00	N/A	P
40	0.00	0.01	0.00	0.00	0.00	0.00	N/A	P
THDi	-	0.783	-	3.233	-	4.218	13	P
PWHD	-	0.581	-	0.052	-	0.258	22	P

Bbis.3: TABLE: Armoniche di corrente /Harmonics measurement (full power, 66% and 33% of $P_{S_{max}}$) (Discharge mode)	
☐ CEI EN 61000-3-2 ($I_{rated} \leq 16$ A single-phase) ☒ CEI EN 61000-3-12 ($16A < I_{rated} \leq 75A$ single-phase)	
Ambient temperature (°C)	-10 °C ± 2 °C
Humidity (RH %)	65% ± 5% RH
Instrumentation list.....	See table "Measurement equipment and instrumentation"
Uncertainty	See table
Supplementary information:	
Operator	See cover page.
Supervisor	See cover page.
Test Date	See cover page.

Harmonics current measured on L1 phase (limits acc. to IEC 61000-3-12)								
	33%		66%		100%			
Order [h]	I [A]	I/In [%]	I [A]	I/In [%]	I [A]	I/In [%]	Limits [%]	Results
1	8.65	33.15	17.30	66.33	25.14	96.37	--	--
2	0.03	0.10	0.05	0.21	0.08	0.30	8.00	P
3	0.24	0.92	0.37	1.41	0.69	2.63	21.6	P
4	0.01	0.03	0.01	0.03	0.01	0.05	4.00	P
5	0.06	0.24	0.06	0.24	0.15	0.56	10.70	P
6	0.01	0.02	0.01	0.02	0.00	0.02	2.67	P
7	0.04	0.17	0.03	0.11	0.04	0.14	7.20	P
8	0.00	0.01	0.00	0.02	0.00	0.01	2.00	P
9	0.03	0.10	0.03	0.11	0.01	0.03	3.8	P
10	0.00	0.01	0.00	0.01	0.00	0.01	1.60	P
11	0.01	0.06	0.01	0.04	0.01	0.06	3.10	P
12	0.00	0.01	0.00	0.01	0.00	0.01	1.33	P
13	0.01	0.03	0.00	0.02	0.01	0.04	2.00	P
14	0.00	0.01	0.00	0.01	0.00	0.01	N/A	P
15	0.01	0.02	0.01	0.02	0.01	0.03	N/A	P
16	0.00	0.00	0.00	0.01	0.00	0.00	N/A	P
17	0.00	0.01	0.00	0.02	0.00	0.01	N/A	P
18	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
19	0.00	0.01	0.00	0.01	0.00	0.01	N/A	P
20	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
21	0.00	0.01	0.00	0.01	0.00	0.01	N/A	P
22	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
23	0.00	0.00	0.00	0.01	0.00	0.01	N/A	P
24	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
25	0.00	0.00	0.00	0.01	0.00	0.01	N/A	P
26	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
27	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
28	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
29	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
30	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
31	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
32	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
33	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
34	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
35	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
36	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
37	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
38	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
39	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
40	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
THDi	-	0.976	-	1.455	-	2.713	13	P
PWHD	-	0.008	-	0.009	-	0.011	22	P

Bbis.3: TABLE: Armoniche di corrente /Harmonics measurement (full power, 66% and 33% of PC_{max}) (Charge mode)	
☐ CEI EN 61000-3-2 ($I_{rated} \leq 16$ A single-phase) ☒ CEI EN 61000-3-12 ($16A < I_{rated} \leq 75A$ single-phase)	
Ambient temperature (°C)	-10 °C ± 2 °C
Humidity (RH %)	65% ± 5% RH
Instrumentation list.....	See table "Measurement equipment and instrumentation"
Uncertainty	See table
Supplementary information: - <i>Test not applicable to unidirectional generators</i>	
Operator	See cover page.
Supervisor	See cover page.
Test Date	See cover page.

Harmonics current measured on L1 phase (limits acc. to IEC 61000-3-12)								
	33%		66%		100%			
Order [h]	I [A]	I/In [%]	I [A]	I/In [%]	I [A]	I/In [%]	Limits [%]	Results
1	8.62	33.03	17.24	66.09	25.40	97.36	--	--
2	0.01	0.05	0.03	0.10	0.05	0.17	8.00	P
3	0.26	1.00	0.36	1.37	0.46	1.75	21.6	P
4	0.00	0.01	0.00	0.02	0.00	0.02	4.00	P
5	0.04	0.17	0.05	0.19	0.07	0.26	10.70	P
6	0.00	0.01	0.00	0.01	0.00	0.01	2.67	P
7	0.01	0.03	0.02	0.06	0.01	0.06	7.20	P
8	0.00	0.00	0.00	0.00	0.00	0.00	2.00	P
9	0.00	0.01	0.01	0.03	0.01	0.03	3.8	P
10	0.00	0.00	0.00	0.00	0.00	0.00	1.60	P
11	0.00	0.01	0.00	0.01	0.00	0.02	3.10	P
12	0.00	0.00	0.00	0.00	0.00	0.00	1.33	P
13	0.00	0.01	0.00	0.01	0.00	0.01	2.00	P
14	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
15	0.00	0.00	0.00	0.00	0.00	0.01	N/A	P
16	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
17	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
18	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
19	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
20	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
21	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
22	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
23	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
24	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
25	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
26	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
27	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
28	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
29	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
30	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
31	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
32	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
33	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
34	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
35	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
36	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
37	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
38	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
39	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
40	0.00	0.00	0.00	0.00	0.00	0.00	N/A	P
THDi	-	1.019	-	1.391	-	1.778	13	P
PWHD	-	0.000	-	0.000	-	0.001	22	P

Bbis.3: TABLE: Fluttuazioni di tensione /Flicker measurement
(full power, 66% and 33% of $P_{S_{max}}$)

- ☐ CEI EN 61000-3-3 ($I_{rated} \leq 16$ A single-phase)
- ☒ CEI EN 61000-3-11 ($16A < I_{rated} \leq 75A$ single-phase)

Ambient temperature (°C)	25 °C ± 5 °C
Humidity (RH %)	65% ± 10% RH
Instrumentation list.....	See table "Measurement equipment and instrumentation"
Uncertainty	See table
Supplementary information:	
Operator	See cover page.
Supervisor	See cover page.
Test Date	See cover page.

100% PS_{max}	L1	L2	L3	Limit
Pst	0.241	--	--	1.00
Plt	0.234	--	--	0.65
dc [%]	0.436	--	--	3.30
dmax [%]	0.508	--	--	6.00
dt [s]	0.000	--	--	0.50

66% PS_{max}	L1	L2	L3	Limit
Pst	0.241	--	--	1.00
Plt	0.235	--	--	0.65
dc [%]	0.436	--	--	3.30
dmax [%]	0.502	--	--	6.00
dt [s]	0.000	--	--	0.50

33% PS_{max}	L1	L2	L3	Limit
Pst	0.237	--	--	1.00
Plt	0.230	--	--	0.65
dc [%]	0.431	--	--	3.30
dmax [%]	0.491	--	--	6.00
dt [s]	0.000	--	--	0.50

Bbis.3: TABLE: Fluttuazioni di tensione /Flicker measurement (full power, 66% and 33% of PC_{max})	
☐ CEI EN 61000-3-3 ($I_{rated} \leq 16$ A single-phase) ☒ CEI EN 61000-3-11 ($16A < I_{rated} \leq 75A$ single-phase)	
Ambient temperature (°C)	25 °C ± 5 °C
Humidity (RH %)	65% ± 10% RH
Instrumentation list.....	See table "Measurement equipment and instrumentation"
Uncertainty	See table
Supplementary information: - <i>Test not applicable to unidirectional generators</i>	
Operator	See cover page.
Supervisor	See cover page.
Test Date	See cover page.

100% PC_{max}	L1	L2	L3	Limit
Pst	0.238	--	--	1.00
Plt	0.231	--	--	0.65
dc [%]	0.433	--	--	3.30
dmax [%]	0.504	--	--	6.00
dt [s]	0.000	--	--	0.50

66% PC_{max}	L1	L2	L3	Limit
Pst	0.238	--	--	1.00
Plt	0.232	--	--	0.65
dc [%]	0.433	--	--	3.30
dmax [%]	0.497	--	--	6.00
dt [s]	0.000	--	--	0.50

33% PC_{max}	L1	L2	L3	Limit
Pst	0.237	--	--	1.00
Plt	0.230	--	--	0.65
dc [%]	0.431	--	--	3.30
dmax [%]	0.497	--	--	6.00
dt [s]	0.000	--	--	0.50

Bbis.3: TABLE: Fluttuazioni di tensione /Flicker measurement (full power, 66% and 33% of PS_{max})	
☐ CEI EN 61000-3-3 ($I_{rated} \leq 16$ A single-phase) ☒ CEI EN 61000-3-11 ($16A < I_{rated} \leq 75A$ single-phase)	
Ambient temperature (°C)	+55 °C ± 2 °C
Humidity (RH %)	65% ± 5% RH
Instrumentation list.....	See table "Measurement equipment and instrumentation"
Uncertainty	See table
Supplementary information:	
Operator	See cover page.
Supervisor	See cover page.
Test Date	See cover page.

100% PS_{max}	L1	L2	L3	Limit
Pst	0.237	--	--	1.00
Plt	0.231	--	--	0.65
dc [%]	0.436	--	--	3.30
dmax [%]	0.494	--	--	6.00
dt [s]	0.000	--	--	0.50

66% PS_{max}	L1	L2	L3	Limit
Pst	0.236	--	--	1.00
Plt	0.230	--	--	0.65
dc [%]	0.432	--	--	3.30
dmax [%]	0.491	--	--	6.00
dt [s]	0.000	--	--	0.50

33% PS_{max}	L1	L2	L3	Limit
Pst	0.241	--	--	1.00
Plt	0.231	--	--	0.65
dc [%]	0.434	--	--	3.30
dmax [%]	0.501	--	--	6.00
dt [s]	0.000	--	--	0.50

Bbis.3: TABLE: Fluttuazioni di tensione /Flicker measurement (full power, 66% and 33% of PC_{max})	
☐ CEI EN 61000-3-3 ($I_{rated} \leq 16$ A single-phase) ☒ CEI EN 61000-3-11 ($16A < I_{rated} \leq 75A$ single-phase)	
Ambient temperature (°C)	+55 °C ± 2 °C
Humidity (RH %)	65% ± 5% RH
Instrumentation list.....	See table "Measurement equipment and instrumentation"
Uncertainty	See table
Supplementary information: - <i>Test not applicable to unidirectional generators</i>	
Operator	See cover page.
Supervisor	See cover page.
Test Date	See cover page.

100% PC_{max}	L1	L2	L3	Limit
Pst	0.236	--	--	1.00
Plt	0.230	--	--	0.65
dc [%]	0.431	--	--	3.30
dmax [%]	0.503	--	--	6.00
dt [s]	0.000	--	--	0.50

66% PC_{max}	L1	L2	L3	Limit
Pst	0.241	--	--	1.00
Plt	0.233	--	--	0.65
dc [%]	0.436	--	--	3.30
dmax [%]	0.499	--	--	6.00
dt [s]	0.000	--	--	0.50

33% PC_{max}	L1	L2	L3	Limit
Pst	0.238	--	--	1.00
Plt	0.233	--	--	0.65
dc [%]	0.436	--	--	3.30
dmax [%]	0.495	--	--	6.00
dt [s]	0.000	--	--	0.50

Bbis.3: TABLE: Fluttuazioni di tensione /Flicker measurement (full power, 66% and 33% of PS_{max})	
☐ CEI EN 61000-3-3 ($I_{rated} \leq 16$ A single-phase) ☒ CEI EN 61000-3-11 ($16A < I_{rated} \leq 75A$ single-phase)	
Ambient temperature (°C)	-10 °C ± 2 °C
Humidity (RH %)	65% ± 5% RH
Instrumentation list.....	See table "Measurement equipment and instrumentation"
Uncertainty	See table
Supplementary information:	
Operator	See cover page.
Supervisor	See cover page.
Test Date	See cover page.

100% PS_{max}	L1	L2	L3	Limit
Pst	0.240	--	--	1.00
Plt	0.233	--	--	0.65
dc [%]	0.433	--	--	3.30
dmax [%]	0.503	--	--	6.00
dt [s]	0.000	--	--	0.50

66% PS_{max}	L1	L2	L3	Limit
Pst	0.239	--	--	1.00
Plt	0.231	--	--	0.65
dc [%]	0.435	--	--	3.30
dmax [%]	0.502	--	--	6.00
dt [s]	0.000	--	--	0.50

33% PS_{max}	L1	L2	L3	Limit
Pst	0.239	--	--	1.00
Plt	0.231	--	--	0.65
dc [%]	0.437	--	--	3.30
dmax [%]	0.484	--	--	6.00
dt [s]	0.000	--	--	0.50

Bbis.3: TABLE: Fluttuazioni di tensione /Flicker measurement (full power, 66% and 33% of PC_{max})	
☐ CEI EN 61000-3-3 ($I_{rated} \leq 16$ A single-phase) ☒ CEI EN 61000-3-11 ($16A < I_{rated} \leq 75A$ single-phase)	
Ambient temperature (°C)	-10 °C ± 2 °C
Humidity (RH %)	65% ± 5% RH
Instrumentation list.....	See table "Measurement equipment and instrumentation"
Uncertainty	See table
Supplementary information: - <i>Test not applicable to unidirectional generators</i>	
Operator	See cover page.
Supervisor	See cover page.
Test Date	See cover page.

100% PC_{max}	L1	L2	L3	Limit
Pst	0.236	--	--	1.00
Plt	0.229	--	--	0.65
dc [%]	0.433	--	--	3.30
dmax [%]	0.480	--	--	6.00
dt [s]	0.000	--	--	0.50

66% PC_{max}	L1	L2	L3	Limit
Pst	0.234	--	--	1.00
Plt	0.229	--	--	0.65
dc [%]	0.436	--	--	3.30
dmax [%]	0.485	--	--	6.00
dt [s]	0.000	--	--	0.50

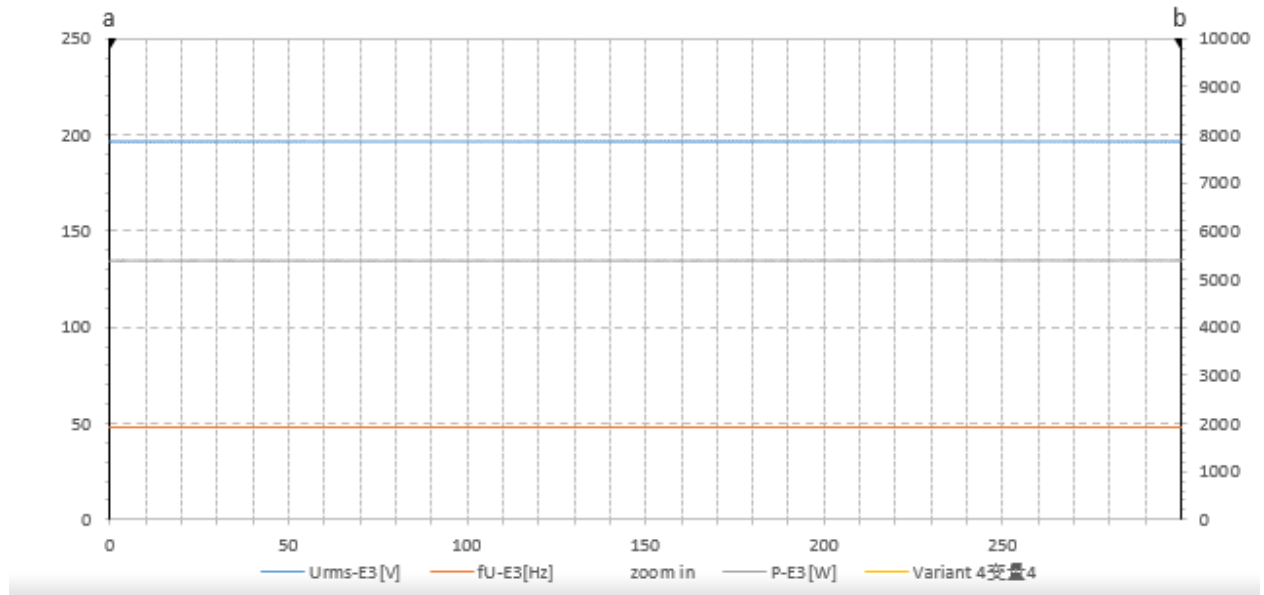
33% PC_{max}	L1	L2	L3	Limit
Pst	0.237	--	--	1.00
Plt	0.230	--	--	0.65
dc [%]	0.435	--	--	3.30
dmax [%]	0.486	--	--	6.00
dt [s]	0.000	--	--	0.50

Bbis.4	TABLE: Verifica del campo di funzionamento in tensione e frequenza <i>/ Check the operating range in voltage and frequency</i>	
Ambient temperature (°C)	:	25 °C ± 5 °C
Humidity (RH %)	:	65% ± 5% RH
Instrumentation list.....	:	See table "Measurement equipment and instrumentation"
Uncertainty	:	See table
Supplementary information: Voltage and frequency values are measured with at least 1 sample at second. Test n.3 and 4, are not applicable at unidirectional generators. Sn is the maximum active power delivered during test.		
Operator	:	See cover page.
Supervisor	:	See cover page.
Test Date	:	See cover page.

Test Point	Range of operation	P _{out} [W]	Cosφ	Test time [s]	Limit [%]	Result
Test 1	85% U _n – 47.5Hz	100% P _{Smax} (o P _{NINV})	1.00	at least 300	±5% S _n	No Disconnection
Test 2	110% U _n - 51.5Hz	100% P _{Smax} (o P _{NINV})	1.00	at least 300	±5% S _n	No Disconnection
Test 3	85% U _n – 47.5Hz	100% P _{Cmax}	1.00	at least 300	±5% S _n	No Disconnection
Test 4	110% U _n - 51.5Hz	100% P _{Cmax}	1.00	at least 300	±5% S _n	No Disconnection

Grafico Test 1: 85% U_n - 47.5Hz / 100% PS_{max}

/ Graph Test 1: 85% U_n - 47.5Hz

CHART 1

Grafico Test 2: 110% U_n - 51.5Hz / 100% PS_{max}

/ Graph Test 2: 110% U_n - 51.5Hz

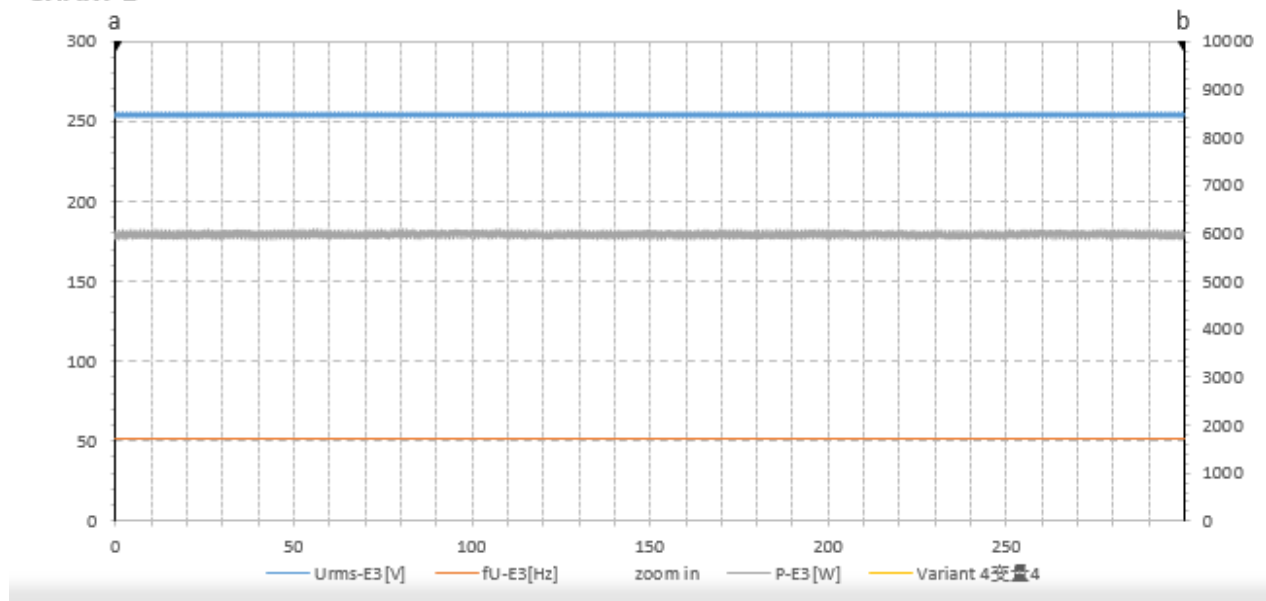
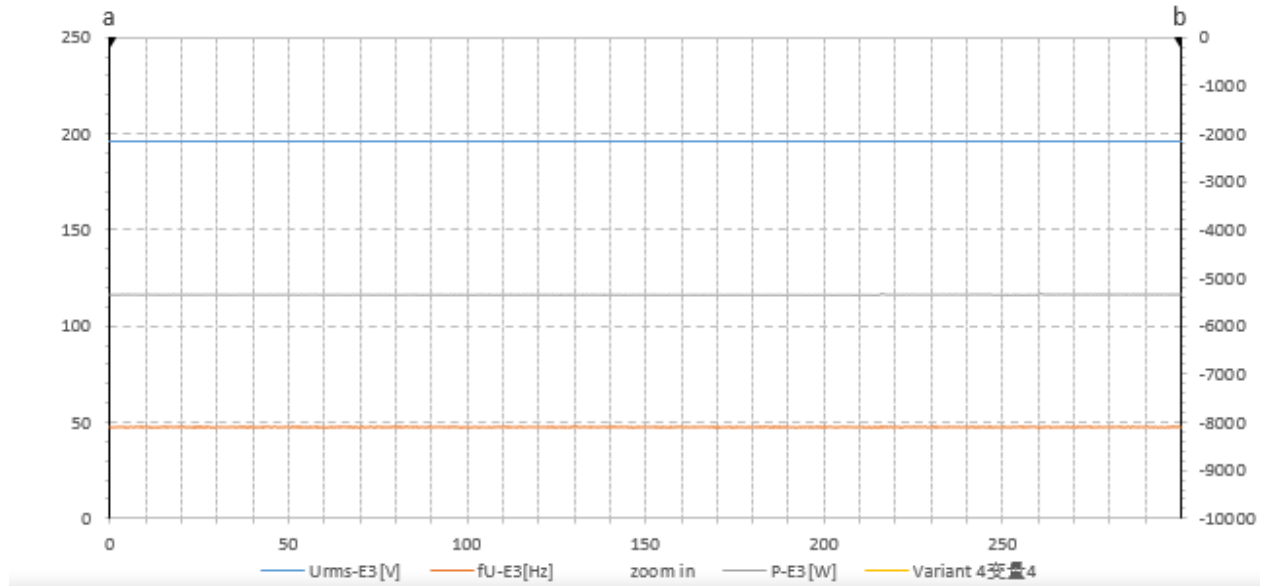
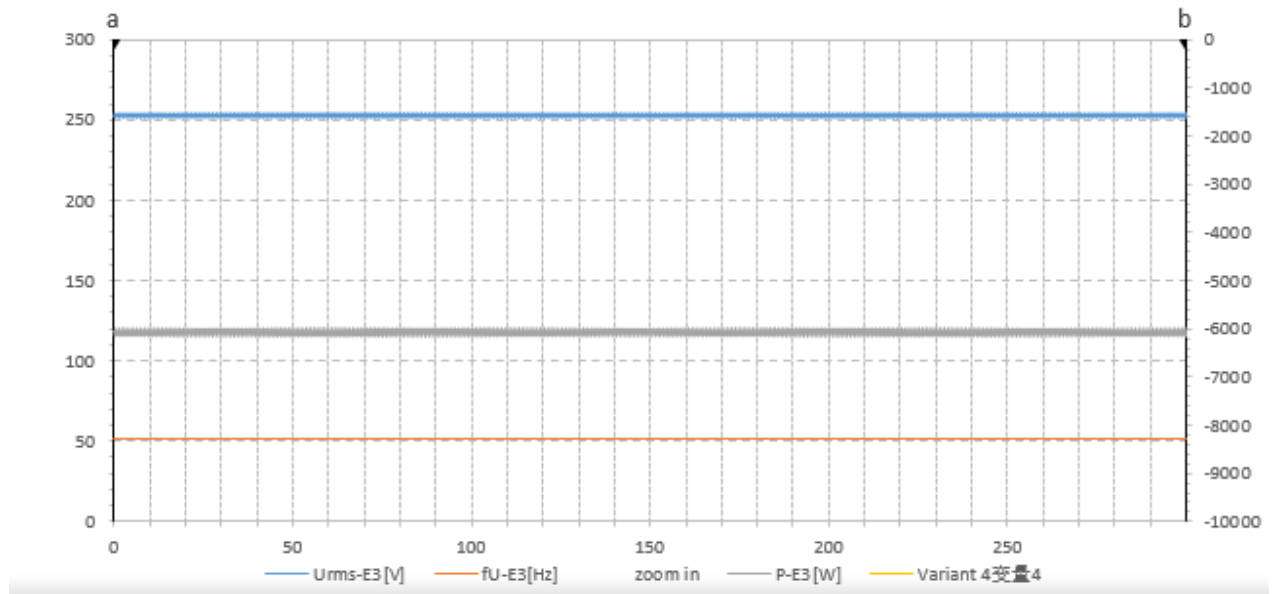
CHART 1


Grafico Test 3: 85% U_n - 47.5Hz / 100% $P_{C_{max}}$

/ Graph Test 1: 85% U_n - 47.5Hz

CHART 1

Grafico Test 2: 110% U_n - 51.5Hz / 100% $P_{C_{max}}$

/ Graph Test 2: 110% U_n - 51.5Hz

CHART 1


8.4.1.3 Par. a) & b) Bbis.5.1 Bbis.5.2	TABLE: Verifica delle condizioni di connessione e riconnessione <i>/ Check of the connection and re-connection conditions</i> TABLE: Verifica della erogazione graduale della potenza attiva <i>/ Check of the gradual increase of the power production</i>	
Ambient temperature (°C)		25 °C ± 5 °C
Humidity (RH %)		65% ± 5% RH
Instrumentation list		See table “Measurement equipment and instrumentation”
Uncertainty		See table
Supplementary information:		
Operator		See cover page.
Supervisor		See cover page.
Test Date		See cover page.

Voltage [Vac]	Voltage Condition [Vac]	Frequency [Hz]	Frequency condition [Hz]	Output Power [W]	Rec. Time [sec]	Ramp Time [sec]	Ramp gradient [%Pn/s]	Acceptability criteria	Note
193.9	V < 85% or V > 110%	50.00	49.9Hz < f < 50.1Hz	---	---	---	---	no connection after 30s	First connection
230.1	85% < V < 110%	50.00	49.9Hz < f < 50.1Hz	6019.1	30.8	329.8	0.303	Connection Delay for Reconnection ≥ 30 s Ramp ratio P < 0.333 % Pn/s	Connection to grid (no after fault of the grid- ex. First connection) Ref. a) 8.4.1.3
193.7	V < 85%	50.00	49.9Hz < f < 50.1Hz	---	---	---	---	no connection after 300 s	UV Ref. b) 8.4.1.3
230.1	85% < V < 110%	50.00	49.9Hz < f < 50.1Hz	6020.9	301.2	332.8	0.300	Connection Delay for Reconnection ≥ 300 s Ramp ratio P < 0.333 % Pn/s	Reconnection after fault recovery Ref. b) 8.4.1.3
255.9	V > 110%	50.00	49.9Hz < f < 50.1Hz	---	---	---	---	no connection after 300 s	OV Ref. b) 8.4.1.3
230.1	85% < V < 110%	50.00	49.9Hz < f < 50.1Hz	6022.0	305.0	329.4	0.302	Connection Delay for Reconnection ≥ 300 s Ramp ratio P < 0.333 % Pn/s	Reconnection after fault recovery Ref. b) 8.4.1.3
229.8	85% < V < 110%	47.40	f < 47.5Hz	---	---	---	---	no connection after 300 s	UF Ref. b) 8.4.1.3
230.1	85% < V < 110%	50.00	49.9Hz < f < 50.1Hz	6025.8	306.6	331.8	0.303	Connection Delay for Reconnection ≥ 300 s Ramp ratio P < 0.333 % Pn/s	Reconnection after fault recovery Ref. b) 8.4.1.3
229.8	85% < V < 110%	51.20	f > 51.1Hz	---	---	---	---	no connection after 300 s	OF Ref. b) 8.4.1.3
230.0	85% < V < 110%	50.00	49.9Hz < f < 50.1Hz	6023.1	301.2	333.2	0.301	Connection Delay for Reconnection ≥ 300 s Ramp ratio P < 0.333 % Pn/s	Reconnection after fault recovery Ref. b) 8.4.1.3

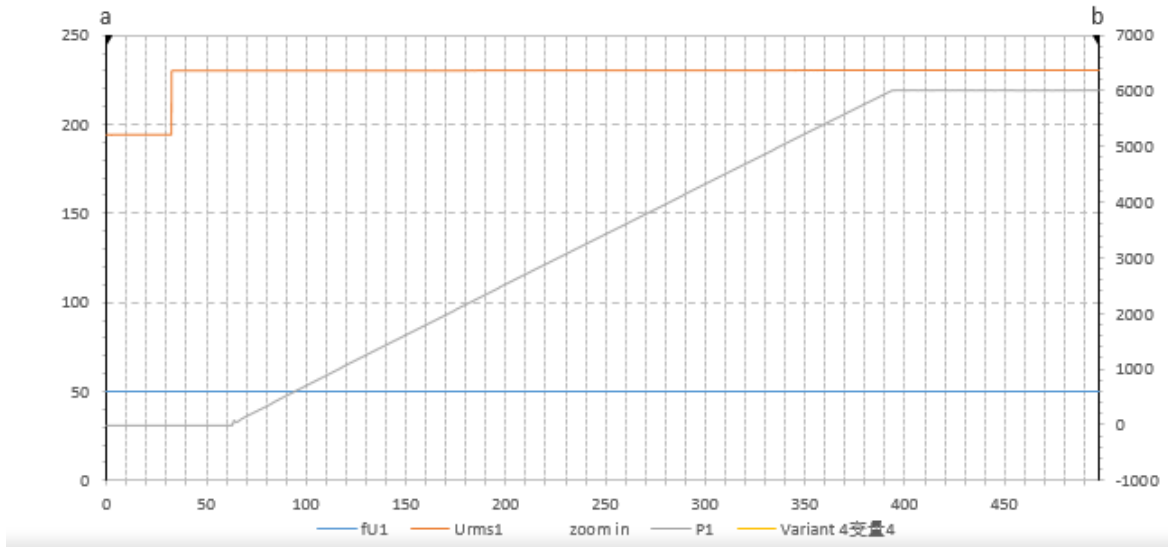
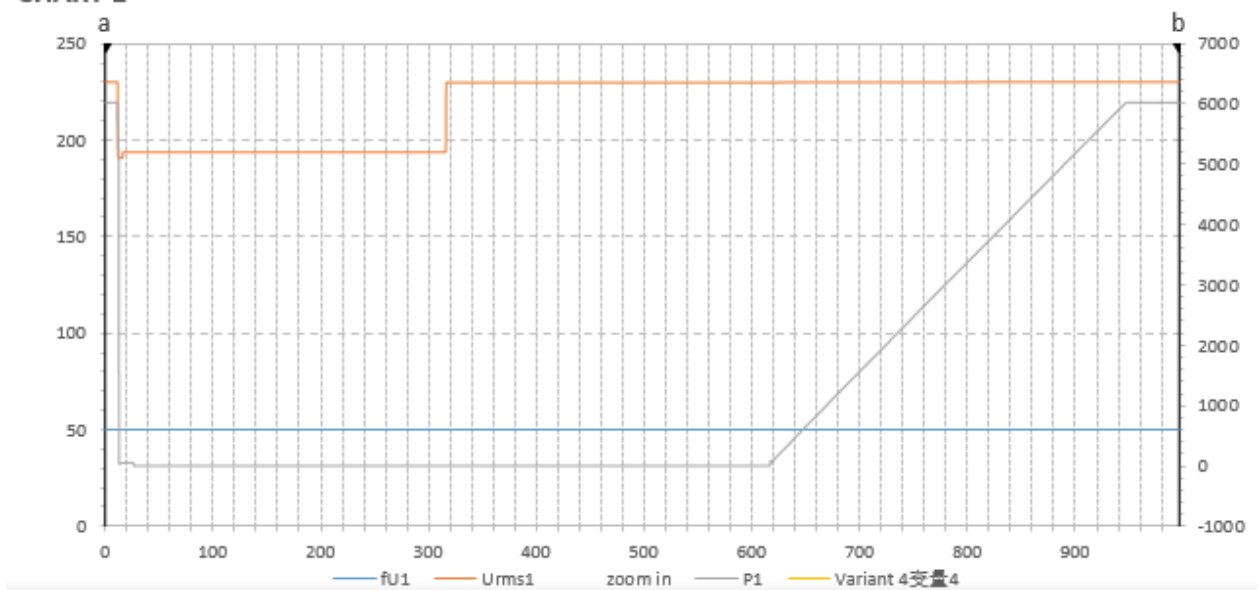
Grafico Bbis.5.2: Verifica della erogazione graduale della Potenza attiva
/ Graph Bbis.5.2: Check of the gradual increase of the power production
Test in discharging mode ($P_{s_{max}}$)
CHART 1

CHART 1


CHART 1

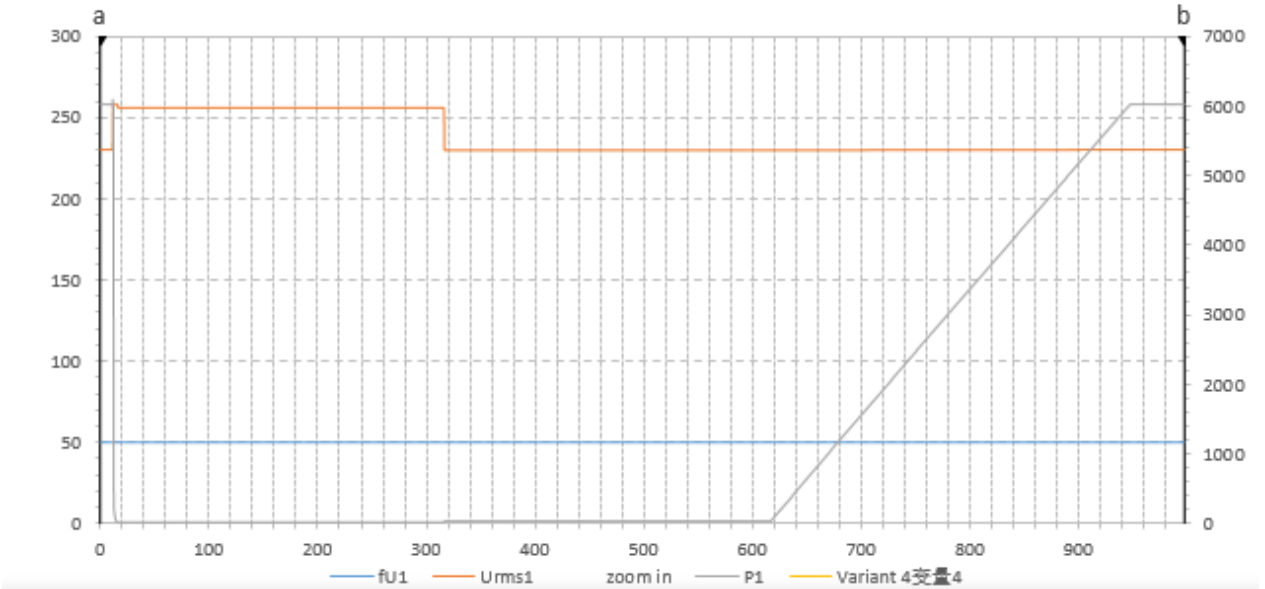
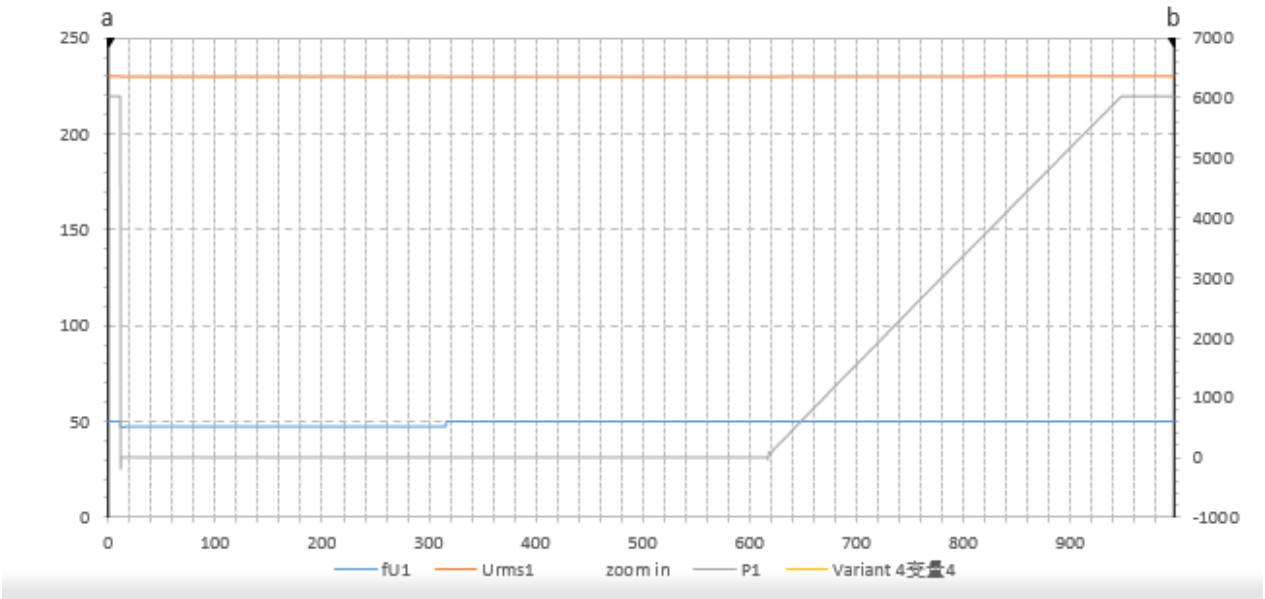
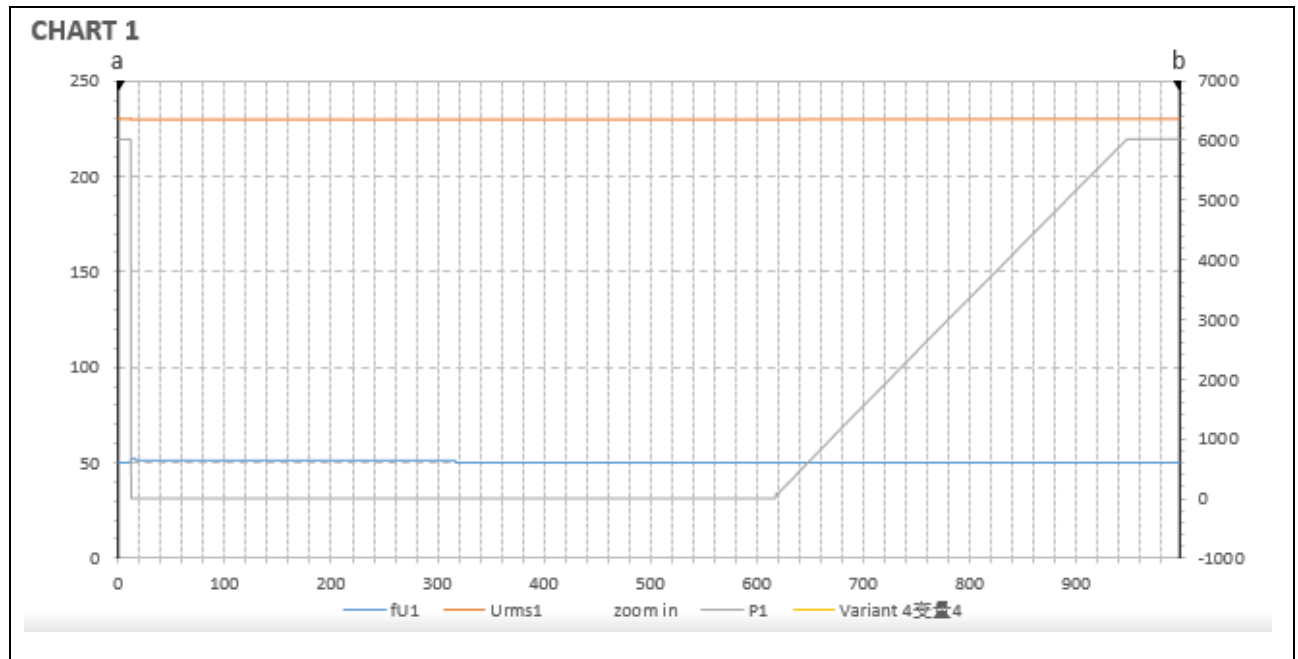


CHART 1





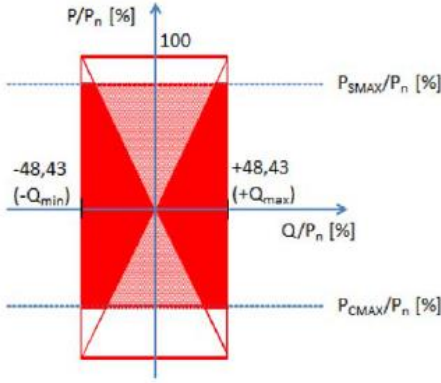
8.4.4.2 Bbis.6.1	TABLE: check of the constructive requirements: reactive power production capability	
Ambient temperature (°C)	25 °C ± 5 °C	
Humidity (RH %)	65% ± 5% RH	
Instrumentation list.....	See table “Measurement equipment and instrumentation”	
Uncertainty	See table	
Max. cosφ declared.....	☒ cosφ: 0.9 → Pout ≤ 11.08 KW (triangular) ☐ Q/Pn% = 48.43% →Pout > 11.08 KW (rectangular)	
 ■ Capability “rettangolare” Per ogni P = P_n; Q = 0,4843 P_n ▨ Capability “triangolare” Per ogni P = P_n; Q = 0,4843 P Figura 3Bbis – Capability per un sistema di accumulo con inverter bidirezionale.		
Supplementary information: <i>For each of the 10 levels of active power, 1 value of inductive reactive power and 1 value of conductive reactive power shall be registered as average values in 1 min, based on the measurements at the fundamental in a window of 200ms.</i>		
Operator	See cover page.	
Supervisor	See cover page.	
Test Date	See cover page.	

TABLE: Reactive power production with set point Q = 0								
Power Step	Active Power		Reactive Power		Power Factor	Deviation	Target value	Limit
	[W]	[%Sn]	[VAr]	[%Sn]	Cosφ	ΔQ/Sn[%]	Cosφ	ΔQ/Sn
90% - 100% $P_{S_{max}}$	5707.0	95.12	-32.8	-0.55	1.000	-0.55	1	<±5%
70% - 80% $P_{S_{max}}$	4515.3	75.26	-35.6	-0.59	1.000	-0.59	1	<±5%
50% - 60% $P_{S_{max}}$	3359.4	55.99	-39.6	-0.66	1.000	-0.66	1	<±5%
30% - 40% $P_{S_{max}}$	2196.1	36.60	-45.6	-0.76	1.000	-0.76	1	<±5%
10% - 20% $P_{S_{max}}$	1010.0	16.83	-52.5	-0.88	0.999	-0.88	1	<±10%
10% - 20% $P_{C_{max}}$	-1002.3	-16.71	-65.4	-1.09	-0.998	-1.09	1	<±10%
30% - 40% $P_{C_{max}}$	-2092.6	-34.88	-73.7	-1.23	-0.999	-1.23	1	<±5%
50% - 60% $P_{C_{max}}$	-3309.4	-55.16	-83.6	-1.39	-1.000	-1.39	1	<±5%
70% - 80% $P_{C_{max}}$	-4533.4	-75.56	-93.5	-1.56	-1.000	-1.56	1	<±5%
90% - 100% $P_{C_{max}}$	-5769.3	-96.16	-105.4	-1.76	-1.000	-1.76	1	<±5%

TABLE: Reactive power adsorbed with set point $Q = Q_{min}$								
Power Step	Active Power		Reactive Power		Power Factor	Deviation	Target value	Limit
	[W]	[%Sn]	[VAr]	[%Sn]	Cosφ	ΔQ/Sn[%]	Cosφ	ΔQ/Sn
90% - 100% $P_{S_{max}}$	5368.3	89.47	-2629.7	-43.83	0.898	-0.50	0.9	<±5%
70% - 80% $P_{S_{max}}$	4511.7	75.20	-2218.7	-36.98	0.897	-0.56	0.9	<±5%
50% - 60% $P_{S_{max}}$	3312.9	55.22	-1600.0	-26.67	0.900	0.08	0.9	<±5%
30% - 40% $P_{S_{max}}$	2107.2	35.12	-987.0	-16.45	0.906	0.56	0.9	<±5%
10% - 20% $P_{S_{max}}$	893.4	14.89	-444.8	-7.41	0.895	-0.20	0.9	<±5%
10% - 20% $P_{C_{max}}$	-904.0	-15.07	-439.0	-7.32	0.899	-0.02	0.9	<±5%
30% - 40% $P_{C_{max}}$	-2103.2	-35.05	-1036.2	-17.27	0.897	-0.29	0.9	<±5%
50% - 60% $P_{C_{max}}$	-3323.1	-55.39	-1565.1	-26.09	0.905	0.74	0.9	<±5%
70% - 80% $P_{C_{max}}$	-4499.3	-74.99	-2139.7	-35.66	0.903	0.66	0.9	<±5%
90% - 100% $P_{C_{max}}$	-5488.8	-91.48	-2662.2	-44.37	0.900	-0.06	0.9	<±5%

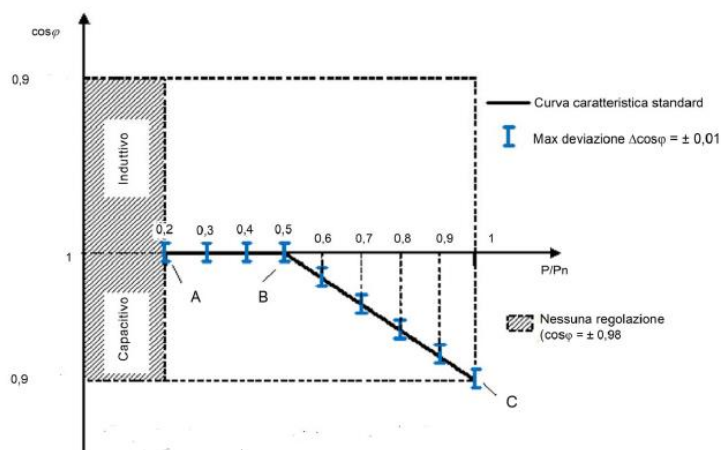
TABLE: Reactive power produced with set point Q = Qmax								
Power Step	Active Power		Reactive Power		Power Factor	Deviation	Target value	Limit
	[W]	[%Sn]	[VAr]	[%Sn]	Cosφ	ΔQ/Sn[%]	Cosφ	ΔQ/Sn
90% - 100% $P_{S_{max}}$	5413.7	90.23	2617.3	43.62	0.900	-0.08	0.9	<±5%
70% - 80% $P_{S_{max}}$	4608.5	76.81	2200.9	36.68	0.902	-0.52	0.9	<±5%
50% - 60% $P_{S_{max}}$	3417.5	56.96	1644.7	27.41	0.901	-0.17	0.9	<±5%
30% - 40% $P_{S_{max}}$	2041.5	34.03	1006.9	16.78	0.897	0.30	0.9	<±5%
10% - 20% $P_{S_{max}}$	937.3	15.62	443.6	7.39	0.904	-0.17	0.9	<±5%
10% - 20% $P_{C_{max}}$	-888.0	-14.80	430.5	7.17	0.900	0.01	0.9	<±5%
30% - 40% $P_{C_{max}}$	-2115.2	-35.25	1032.9	17.21	0.899	0.14	0.9	<±5%
50% - 60% $P_{C_{max}}$	-3343.5	-55.73	1590.3	26.51	0.903	-0.48	0.9	<±5%
70% - 80% $P_{C_{max}}$	-4506.5	-75.11	2169.5	36.16	0.901	-0.22	0.9	<±5%
90% - 100% $P_{C_{max}}$	-5448.7	-90.81	2636.3	43.94	0.900	-0.04	0.9	<±5%
Note(s):								

Bbis.6.3	TABLE: reactive power production according to an assigned level Required for inverter used in plant > 11.08KW (applicable for inverter with Pnom < 11.08 KW as well)	
Ambient temperature (°C)	25 °C ± 5 °C	
Humidity (RH %)	65% ± 5% RH	
Instrumentation list.....	See table “Measurement equipment and instrumentation”	
Uncertainty	See table	
Max. cosφ declared..... SET-POINT	☒ cosφ: 0.9 → Pout ≤ 11.08 KW ☐ Q/Pn% = 48.43% → Pout > 11.08 KW	
Supplementary information: - Output power during test set at 50%Pn (power level set by DC simulator). - Maintain each set point at least 60 s. - Calculate the average values in 1 min, based on measurements at the fundamental frequency in a window of 200ms.		
Operator	See cover page.	
Supervisor	See cover page.	
Test Date.....	See cover page.	

Tabella Bbis.6.3: Misura dell' accuratezza della regolazione della potenza reattiva in base ad un comando esterno

/ Tabella Bbis.6.3 : reactive power production according to an assigned level

Output Power [%]	Set point Q/Sn [%]	Output Power measured [W]	Reactive Power measured [Var]	Deviation ΔQ/Sn [%]	ΔQ Limit [%]	RESULT
50% PS_{MAX}	40.0 %	3027.3	2416.7	0.28	≤ 5% Sn	PASS
50% PC_{MAX}	40.0 %	-3044.9	2373.3	-0.44	≤ 5% Sn	PASS

Bbis.6.6 Annex E E.2	TABLE: Erogazione automatica di potenza reattiva secondo una curva caratteristica $\cos\varphi = f(P)$ / Automatic production of reactive power according to a characteristic curve $\cos\varphi = f(P)$
Ambient temperature (°C) :	25 °C ± 5 °C
Humidity (RH %) :	65% ± 5% RH
Instrumentation list..... :	See table "Measurement equipment and instrumentation"
Uncertainty :	See table
Max. $\cos\varphi$ declared :	☒ $\cos\varphi$: 0.9 → $P_{out} \leq 11.08$ KW ☐ $Q/P_n\%$ = 48.43% → $P_{out} > 11.08$ KW
Set value..... :	Lock-in: 1.05 Vn (Vn and 1.1 Vn with steps of 0.01) Lock-out: 230 V or 50%Pn (0.9 Vn and Vn with steps of 0.01)
 Figura 7Bbis – Curva caratteristica standard $\cos\varphi = f(P)$	

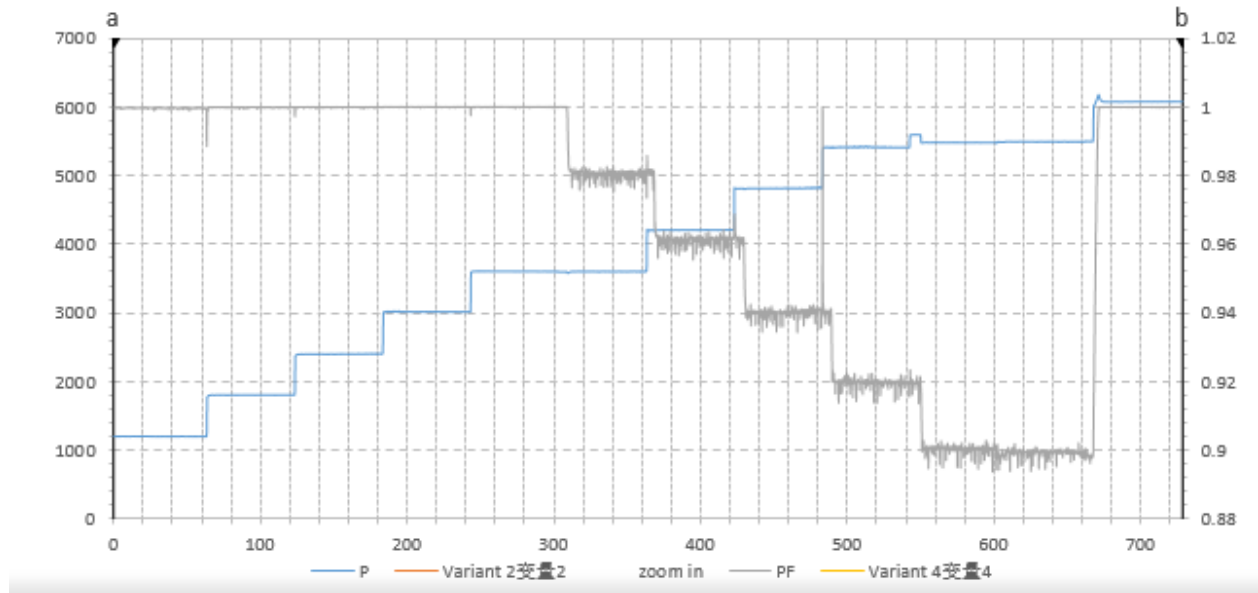
Supplementary information:

- Function must be enable by a local command of the converter.
- Each value must be reach in < 10s.

Operator :	See cover page.
Supervisor :	See cover page.
Test Date..... :	See cover page.

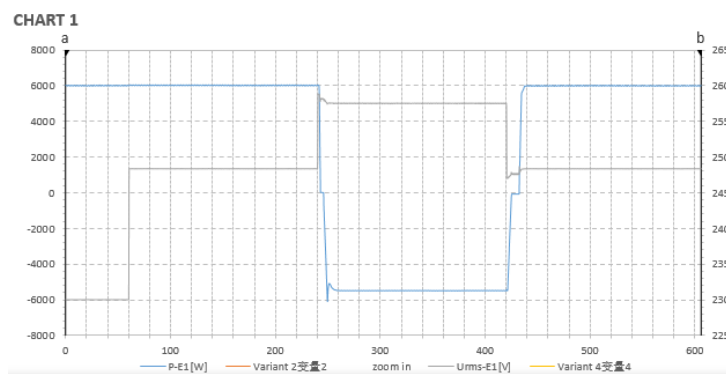
Tabella Bbis.7: Erogazione automatica di potenza reattiva secondo una curva caratteristica $\cos\varphi = f(P)$
/ Table Bbis.7: $\cos\varphi = f(P)$

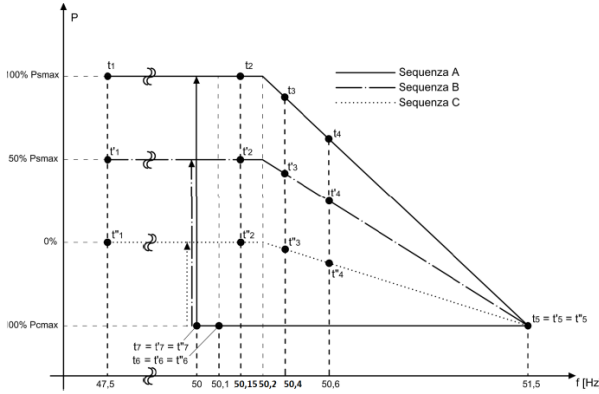
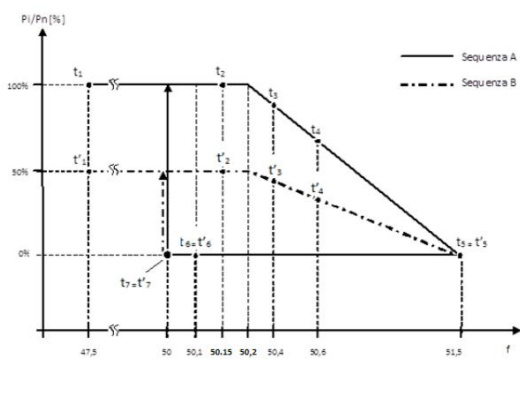
P/Pn [%]	P [W]	Vout [V]	Q [Var]	Cos φ measured	Cos φ Set-point	ΔQ	Limit $\Delta Q/P_n$	RESULT
20	1200.1	239.1	-28.5	1.000	1.00	-0.48	$\pm 2.5\%$	P
30	1804.3	239.0	-26.3	1.000	1.00	-0.44	$\pm 2.5\%$	P
40	2400.8	239.3	-23.9	1.000	1.00	-0.40	$\pm 2.5\%$	P
50	3014.4	239.3	-20.4	1.000	1.00	-0.34	$\pm 2.5\%$	P
60	3603.3	239.2	-20.3	1.000	1.00	-0.34	$\pm 2.5\%$	P
60	3601.2	243.7	-721.5	0.980	0.98	0.16	$\pm 2.5\%$	P
70	4206.2	243.7	-1205.1	0.961	0.96	0.36	$\pm 2.5\%$	P
80	4814.4	243.8	-1746.8	0.940	0.94	0.01	$\pm 2.5\%$	P
90	5412.9	243.8	-2311.3	0.920	0.92	-0.09	$\pm 2.5\%$	P
100	5480.4	243.7	-2650.1	0.900	0.90	0.07	$\pm 2.5\%$	P
100	5492.9	232.1	-2671.8	0.899	0.90	-0.19	$\pm 2.5\% P_n$	P
100	6075.4	225.4	-54.7	1.000	1.00	-0.91	$\pm 2.5\% P_n$	P

Grafico: Erogazione automatica di potenza reattiva secondo una curva caratteristica $\cos\varphi = f(P)$
/ Graph: Reactive power production according to a characteristic curve $\cos(\phi) = f(P)$
CHART 1


8.5.3.1	TABLE: Limitazione della potenza attiva per valori di tensione prossimi al 110 % di Un	
Bbis.7.1	<i>/ Active power limitation for voltage values near to 100 % di Un</i>	
Ambient temperature (°C)		25 °C ± 5 °C
Humidity (RH %)		65% ± 5% RH
Instrumentation list.....		See table "Measurement equipment and instrumentation"
Uncertainty		See table
Supplementary information:		
Please describe the enable mode of fuction defined by the customer		
Active power was been measured with an average of 1 second.		
Operator		See cover page.
Supervisor		See cover page.
Test Date.....		See cover page.

Set Point	Measure		Limits	Result
V/V _{110%} [%]	P _{out} [W]	V _{out} [V]		
-2%	6022.0	248.4	-	P
+2%	-5489.5	257.5	≤ 20% P _{Smax} (for unidirectional) ≥ 80% P _{Cmax} (for bidirectional)	P
-2%	6001.9	248.4	-	P

Graph curve P=f(V) :


8.5.3.4 8.5.3.5 Bbis.7.2	TABLE: Verifica della riduzione automatica della potenza attiva in presenza di transitori di sovrافrequenza sulla rete <i>/Active power regulation in coincidence with transitory on the transmission grid</i>
Ambient temperature (°C) :	25 °C ± 5 °C
Humidity (RH %) :	65% ± 5% RH
Instrumentation list..... :	See table “Measurement equipment and instrumentation”
Uncertainty :	See table
 Figura 9Bbis – Curve di limitazione della potenza attiva per convertitori bidirezionali	 Figura 10Bbis – Curve di limitazione della potenza attiva per convertitori unidirezionali
Sequence test for Bi-directional EESS	Sequence test for Uni-directional EESS
Supplementary information: Test shall be performed disabling the frequency threshold protection Test was performed with a sampling time of 200ms Sn is an active nominal power of the inverter	
Operator :	See cover page.
Supervisor :	See cover page.
Test Date :	See cover page.

Sequence A						
Step #	Set output power [%]	frequency [Hz]	Expected power value [W]	Actual power values [W]	limits	Graph point
1	100% P _{Smax}	50.00	6000	5991.5	± 2.5% S _n	t1
2	100% P _{Smax}	50.15	6000	5987.7	± 2.5% S _n	t2
3	100% P _{Smax}	50.40	4143	4142.7	± 2.5% S _n	t3
4	100% P _{Smax}	50.60	2299	2318.6	± 2.5% S _n	t4
5	100% P _{Smax}	51.49	-5908	-5941.4	± 2.5% S _n	t5
6	100% P _{Smax}	50.11	-5908	-5947.9	± 2.5% S _n	t6
7	100% P _{Smax}	50.00	6000	5986.3	± 2.5% S _n	t7
Sequence B						
Step #	Set output power [%]	frequency [Hz]	Expected power value [W]	Actual power values [W]	limits	Graph point
1	50% P _{Smax}	50.00	3000	3004.3	± 2.5% S _n	t1'
2	50% P _{Smax}	50.15	3000	3003.2	± 2.5% S _n	t2'
3	50% P _{Smax}	50.40	1618	1622.5	± 2.5% S _n	t3'
4	50% P _{Smax}	50.60	233	243.6	± 2.5% S _n	t4'
5	50% P _{Smax}	51.49	-5931	-5957.4	± 2.5% S _n	t5'
6	50% P _{Smax}	50.11	-5931	-5957.1	± 2.5% S _n	t6'
7	50% P _{Smax}	50.00	3000	2999.6	± 2.5% S _n	t7'

Sequence C*						
Step #	Set output power [%]	frequency [Hz]	Expected power value [W]	Actual power values [W]	limits	Graph point
1	0% PS _{max}	50.00	0	34.1	± 2.5% S _n	t1''
2	0% PS _{max}	50.15	0	34.0	± 2.5% S _n	t2''
3	0% PS _{max}	50.40	-894	-916.6	± 2.5% S _n	t3''
4	0% PS _{max}	50.60	-1823	-1835.4	± 2.5% S _n	t4''
5	0% PS _{max}	51.49	-5954	-6001.5	± 2.5% S _n	t5''
6	0% PS _{max}	50.11	-5954	-6000.5	± 2.5% S _n	t6''
7	0% PS _{max}	50.00	0	34.2	± 2.5% S _n	t7''

**Sequence C applicable only for bidirectional converters.*

Grafico Sequenza A: Curva di limitazione della potenza attiva rispetto alla frequenza

/ Graph Sequence A: Active power regulation in coincidence with transitory on the transmission grid

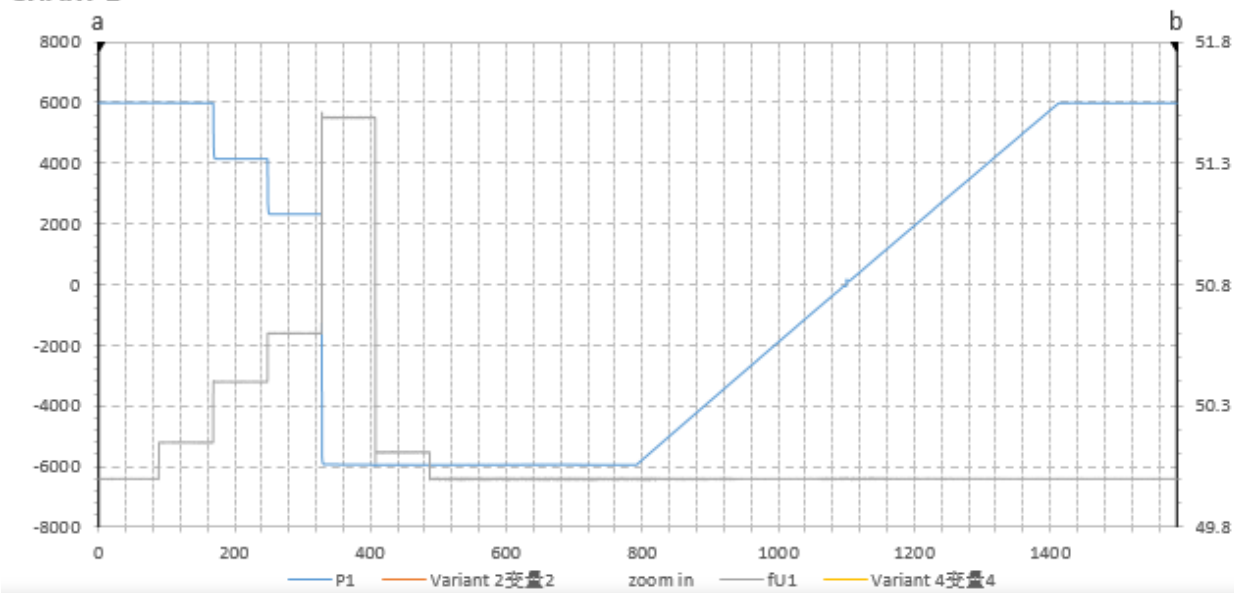
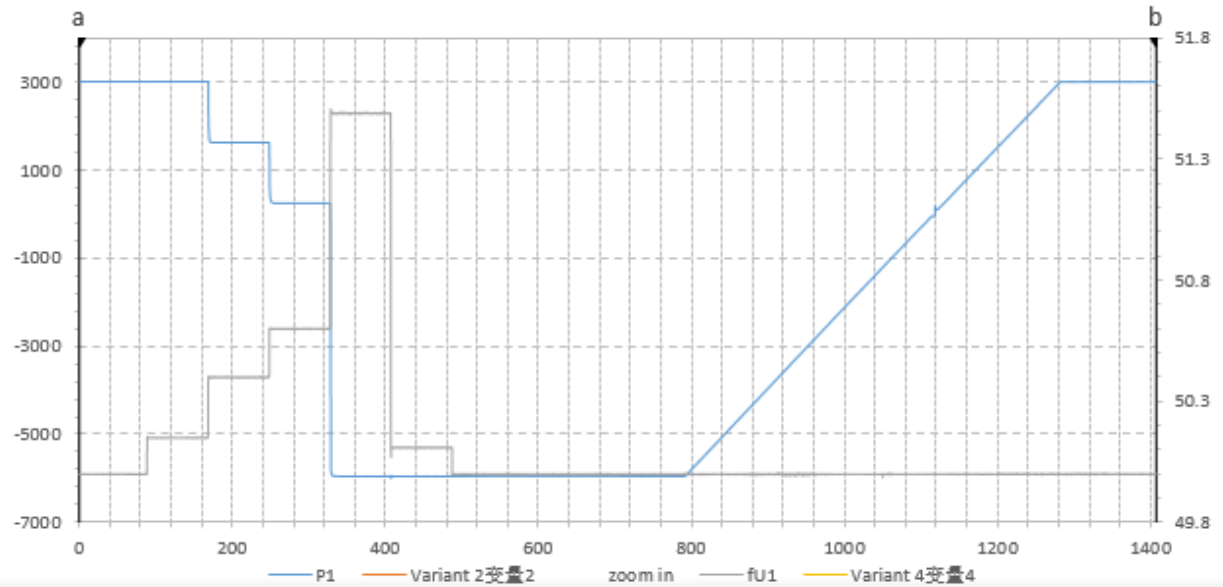
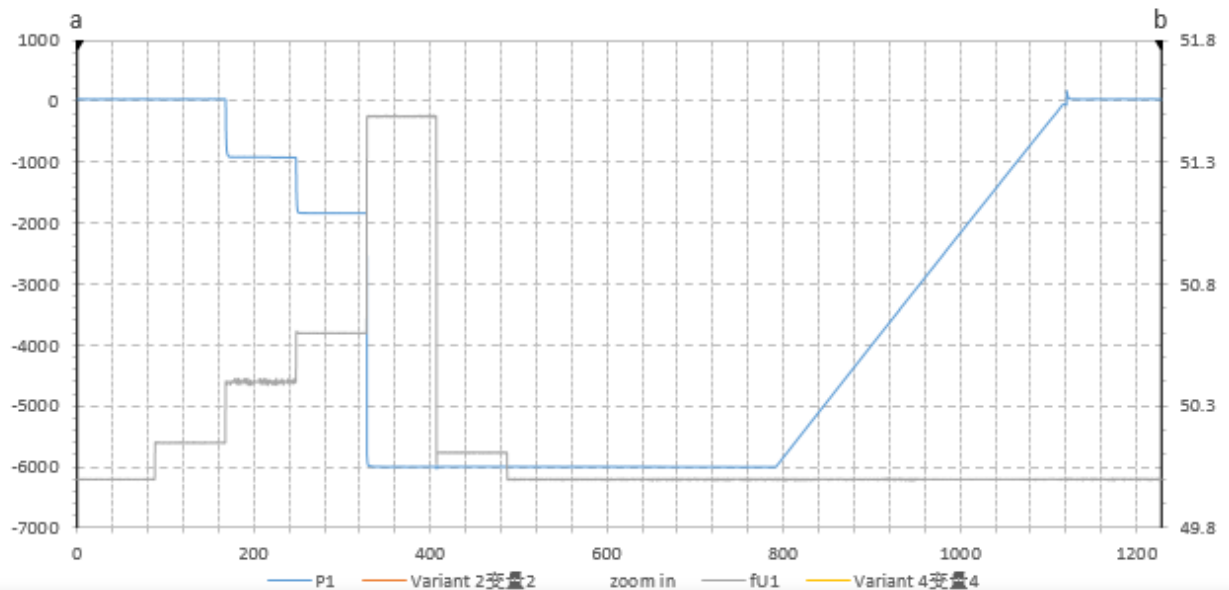
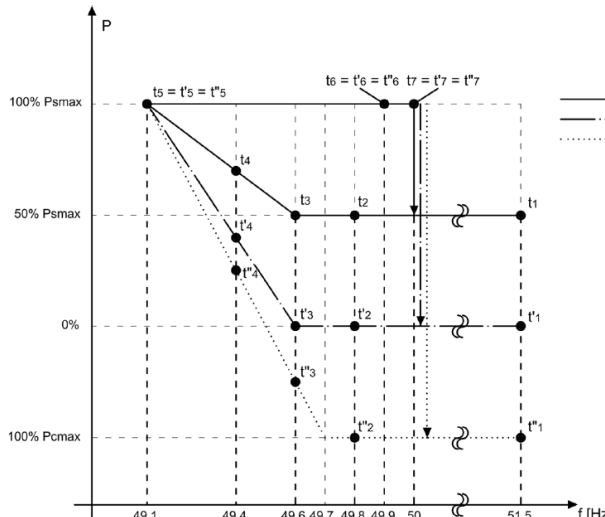
CHART 1


Grafico Sequenza B: Curva di limitazione della potenza attiva rispetto alla frequenza
/ Graph Sequence B: Active power regulation in coincidence with transitory on the transmission grid
CHART 1

Grafico Sequenza C*: Curva di limitazione della potenza attiva rispetto alla frequenza
/ Graph Sequence C: Active power regulation in coincidence with transitory on the transmission grid*
CHART 1


8.5.3.4	TABLE: Regolazione della potenza attiva in presenza di transitori sulla rete di trasmissione <i>/Active power regulation in coincidence with transitory on the transmission grid</i>
8.5.3.5	
Bbis.7.3	
Ambient temperature (°C)	25 °C ± 5 °C
Humidity (RH %)	65% ± 5% RH
Instrumentation list.....	See table "Measurement equipment and instrumentation"
Uncertainty	See table
 Figura 11Bbis – Curve di limitazione della potenza attiva	
Supplementary information: Test shall be performed disabling the frequency threshold protection The storage needs an energy capacity of 20% of CUS Test was performed with a sampling time of 200ms Sn is an active nominal power of the inverter	
Operator	See cover page.
Supervisor	See cover page.
Test Date.....	See cover page.

Sequence A						
Step #	Set output power [%]	frequency [Hz]	Expected power value [W]	Actual power values [W]	limits	Graph point
1	50% PS _{max}	50.00	3000	3059.2	± 2.5% S _n	t1
2	50% PS _{max}	49.85	3000	3059.1	± 2.5% S _n	t2
3	50% PS _{max}	49.60	3899	3859.0	± 2.5% S _n	t3
4	50% PS _{max}	49.40	4740	4748.9	± 2.5% S _n	t4
5	50% PS _{max}	49.11	5958	6054.2	± 2.5% S _n	t5
6	50% PS _{max}	49.89	5958	6055.4	± 2.5% S _n	t6
7	50% PS _{max}	50.00	3000	3057.7	± 2.5% S _n	t7
Sequence B						
Step #	Set output power [%]	frequency [Hz]	Expected power value [W]	Actual power values [W]	limits	Graph point
1	0% PS _{max}	50.00	0	36.1	± 2.5% S _n	t1'
2	0% PS _{max}	49.85	0	36.0	± 2.5% S _n	t2'
3	0% PS _{max}	49.60	1740	1674.4	± 2.5% S _n	t3'
4	0% PS _{max}	49.40	3444	3447.3	± 2.5% S _n	t4'
5	0% PS _{max}	49.11	5915	6029.2	± 2.5% S _n	t5'
6	0% PS _{max}	49.89	5915	6037.2	± 2.5% S _n	t6'
7	0% PS _{max}	50.00	0	36.2	± 2.5% S _n	t7'

Sequence C*						
Step #	Set output power [%]	frequency [Hz]	Expected power value [W]	Actual power values [W]	limits	Graph point
1	100% P _{Cmax}	50.00	-6000	-6004.0	± 2.5% S _n	t1''
2	100% P _{Cmax}	49.85	-6000	-6004.9	± 2.5% S _n	t2''
3	100% P _{Cmax}	49.60	-2575	-2603.7	± 2.5% S _n	t3''
4	100% P _{Cmax}	49.40	855	828.4	± 2.5% S _n	t4''
5	100% P _{Cmax}	49.11	5829	5933.9	± 2.5% S _n	t5''
6	100% P _{Cmax}	49.89	5829	5933.6	± 2.5% S _n	t6''
7	100% P _{Cmax}	50.00	-6000	-6003.4	± 2.5% S _n	t7''

**Sequence C applicable only for bidirectional converters.*

Grafico Sequenza A: Curva di limitazione della potenza attiva rispetto alla frequenza

/ Graph Sequence A: Active power regulation in coincidence with transitory on the transmission grid

CHART 1

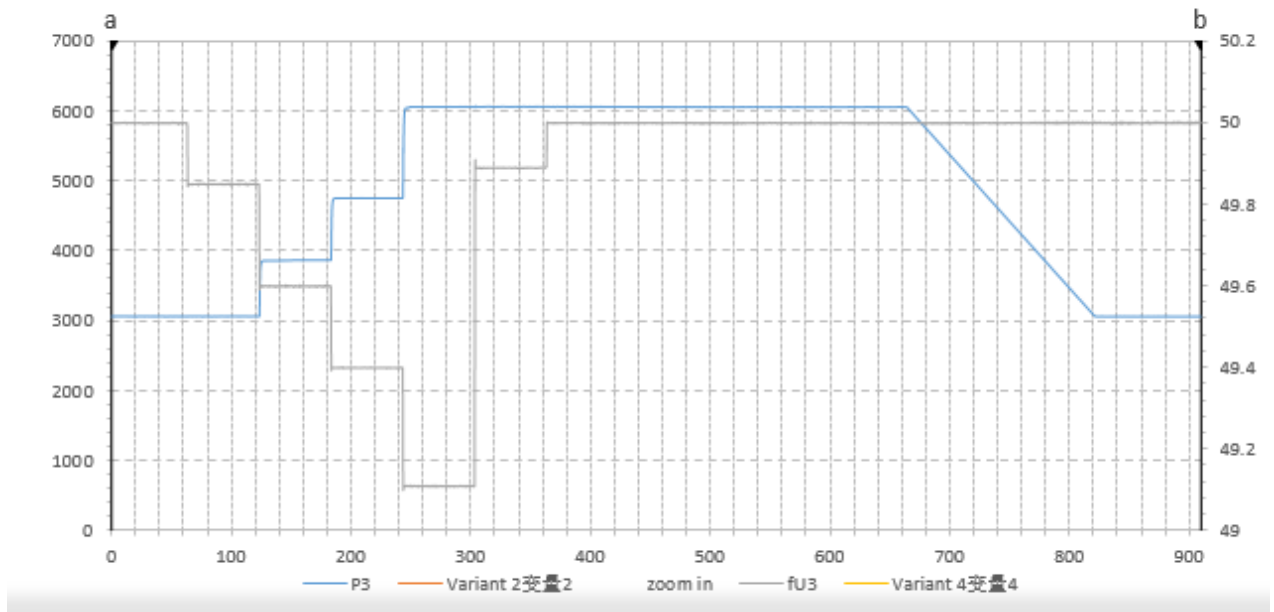
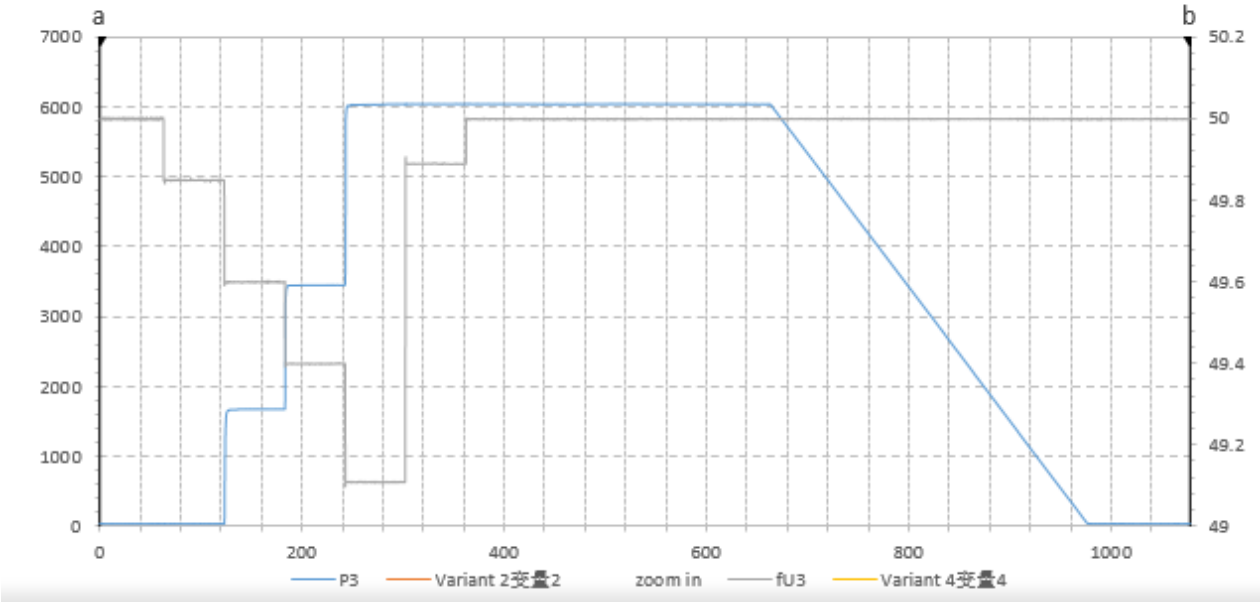
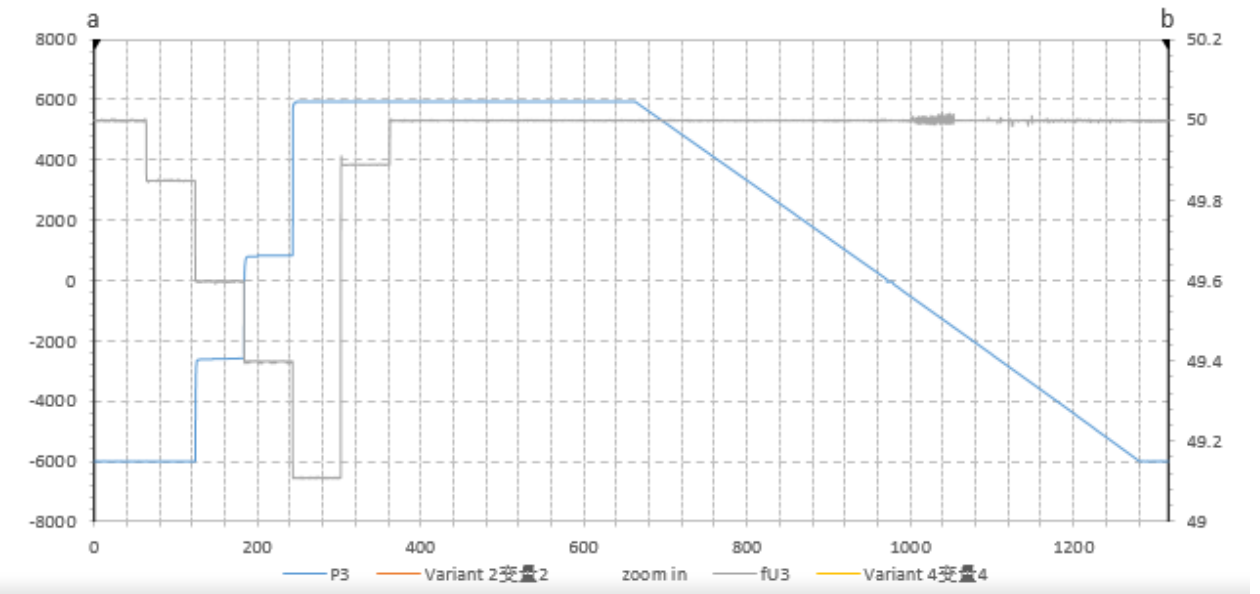
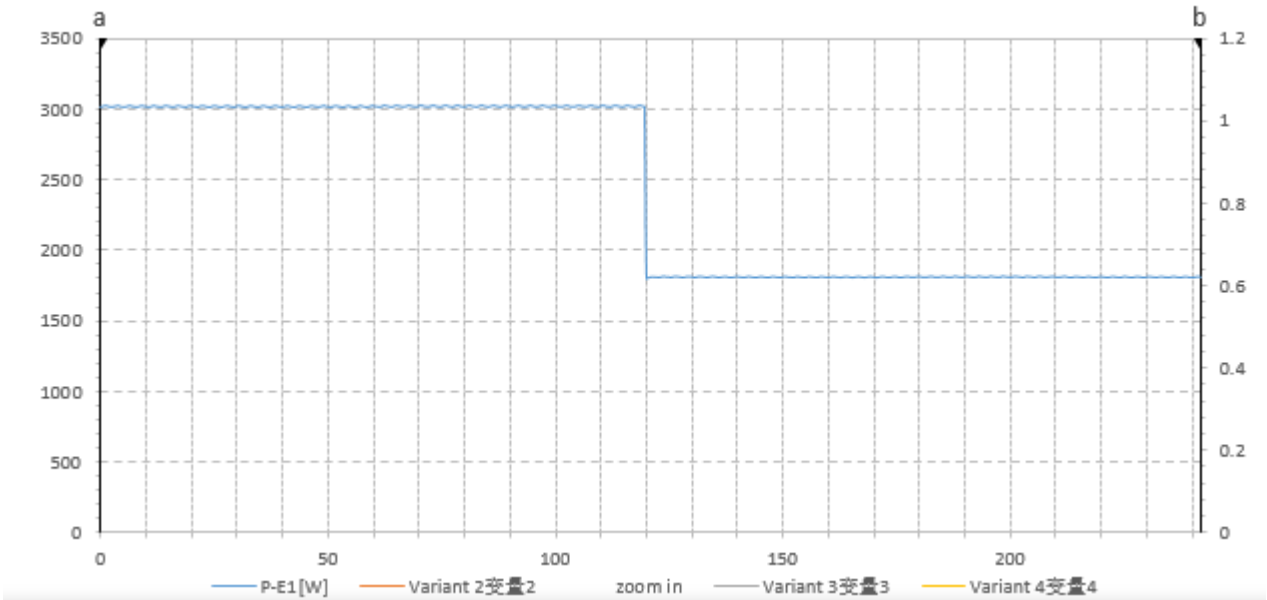
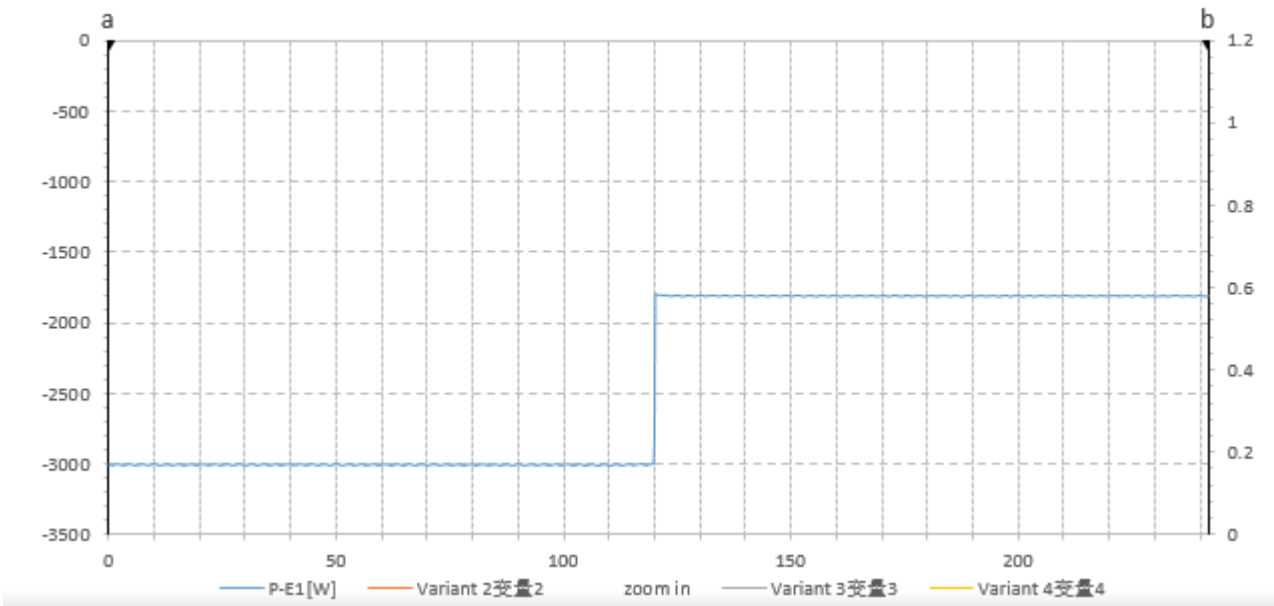


Grafico Sequenza B: Curva di limitazione della potenza attiva rispetto alla frequenza
/ Graph Sequence B: Active power regulation in coincidence with transitory on the transmission grid
CHART 1

Grafico Sequenza C*: Curva di limitazione della potenza attiva rispetto alla frequenza
/ Graph Sequence C: Active power regulation in coincidence with transitory on the transmission grid*
CHART 1


Bbis.7.4	TABLE: Limitazione della potenza attiva su comando esterno proveniente dal Distributore <i>/ Active power limitation in coincidence with external command coming from the Electricity Distributor</i>	
Ambient temperature (°C)	:	25 °C ± 5 °C
Humidity (RH %)	:	65% ± 5% RH
Instrumentation list.....	:	See table "Measurement equipment and instrumentation"
Uncertainty	:	See table
Supplementary information:		
The setting point time's of active power command is 60 seconds.		
The active power was been measured with average value of 1 minute and its measure is checked at least after 30 seconds from the set-point of active power command.		
Operator	:	See cover page.
Supervisor	:	See cover page.
Test Date	:	See cover page.

Test	Set Point	Output Power expected [W]	Output Power measured [W]	$\Delta P/P_n$ [%]	Limit [%]	RESULT
1	50%PS _{max} → 30%PS _{max}	1800	1807.6	0.13	± 2.5% PS _{max}	PASS
2	50%PC _{max} → 30% PC _{max} *	-1800	-1805.0	-0.08	± 2.5% PS _{max}	PASS
*Test applicable only for bidirectional converters.						

Grafico Test 1: Limitazione della potenza attiva in risposta a comando esterno
/ Graph Test 1: Active power limitation in coincidence with external command coming from the Electricity Distributor
CHART 1

Grafico Test 2: Limitazione della potenza attiva in risposta a comando esterno
/ Graph Test 2: Active power limitation in coincidence with external command coming from the Electricity Distributor
CHART 1


Bbis.7.4.1	TABLE: Verifica del tempo di assestamento ad un comando di incremento/riduzione di potenza <i>/ Check the settling time with external command to increase/decrease the power</i>	
Ambient temperature (°C)	:	25 °C ± 5 °C
Humidity (RH %)	:	65% ± 5% RH
Instrumentation list.....	:	See table "Measurement equipment and instrumentation"
Uncertainty	:	See table
Supplementary information:		
Operator	:	See cover page.
Supervisor	:	See cover page.
Test Date	:	See cover page.

Tabella A: Tempo di assestamento ad un comando di riduzione della potenza attiva
/ Table A: Time of alignment after an active power reduction command

Test	Set Point	Output Power expected [W]	Output Power measured [W]	Output Power limit [%]	Settling Time [s]	Settling Time limit [s]	RESULT
A.1*	100% $P_{S_{max}}$ → 30% $P_{C_{max}}$	-1800	-1804.9	$\pm 2.5\% S_n$	4.0	< 50	P
A.2	100% $P_{S_{max}}$ → 30% $P_{S_{max}}$	1800	1802	$\pm 2.5\% S_n$	2.0	< 50	P

Table B: Tempo di assestamento ad un comando di incremento della potenza attiva
/ Table B: Time of alignment after an active power increasing command

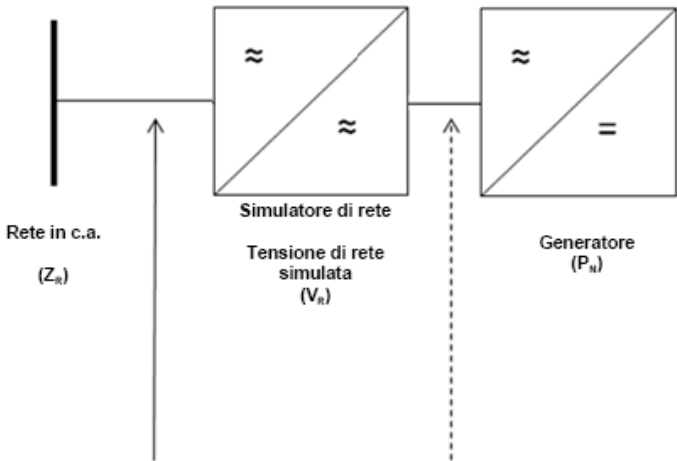
Test	Set Point	Output Power expected [W]	Output Power measured [W]	Output Power limit [%]	Settling Time [s]	Settling Time limit [s]	RESULT
B.1*	100% $P_{C_{max}}$ → 50% $P_{S_{max}}$	3000	3023.2	$\pm 2.5\% S_n$	4.0	< 50	P
B.2	0% $P_{S_{max}}$ → 50% $P_{S_{max}}$	3000	3024.6	$\pm 2.5\% S_n$	2.0	< 50	P

***Test applicable only for bidirectional converters.**

Bbis.8		TABLE: Emissione di componente continua nella corrente di uscita /Check of DC current injection											
Ambient temperature (°C)							25 °C ± 5 °C						
Humidity (RH %)							65% ± 5% RH						
Instrumentation list.....							See table “Measurement equipment and instrumentation”						
Uncertainty							See table						
Temperature test:							Reference Conditions						
Bbis.8.1		TABLE: Verifica della emissione di componente continua / Check of DC current injection.											
Power [%]	Power [W]	Rated Voltage [Vrms]	Cosφ	Rated Current [Arms]			Injected value D.C. [mA]			Injected value D.C. [%In]			Limit [%In]
				R	S	T	R	S	T	R	S	T	
33± 5	1981.0	230	0.999	8.66	--	--	70.7	--	--	0.27	--	--	0.5
66± 5	3973.8	230	1.000	17.31	--	--	90.2	--	--	0.35	--	--	0.5
100 ± 5	6038.1	230	1.000	26.26	--	--	77.2	--	--	0.30	--	--	0.5
Bbis.8.2		TABLE: Verifica delle protezioni contro l'immissione di componente continua / Check of protections against the DC current injection.											
Power [%]	Power [W]	Rated Voltage [Vrms]	Cosφ	Rated Current [Arms]			Intervention value D.C.			Trip Time [ms]	Limit [s]		
				R	S	T	[mA]	[%In]	I _{dc} >				
33± 5	1981.0	230	0.999	8.66	--	--	249.5	0.96	0.5% In	940.0	1		
66± 5	3973.8	230	1.000	17.31	--	--	209.5	0.80	0.5% In	970.0	1		
100 ± 5	6038.1	230	1.000	26.26	--	--	484.3	1.86	0.5% In	880.0	1		
Power [%]	Power [W]	Rated Voltage [Vrms]	Cosφ	Rated Current [Arms]			Intervention value D.C.			Trip Time [ms]	Limit [s]		
				R	S	T	[A]	[%In]	I _{dc} >>				
33± 5	1981.0	230	0.999	8.66	--	--	1.22	4.68	1A	148.0	0.2		
66± 5	3973.8	230	1.000	17.31	--	--	1.28	4.91	1A	158.0	0.2		
100 ± 5	6038.1	230	1.000	26.26	--	--	1.51	5.79	1A	164.0	0.2		

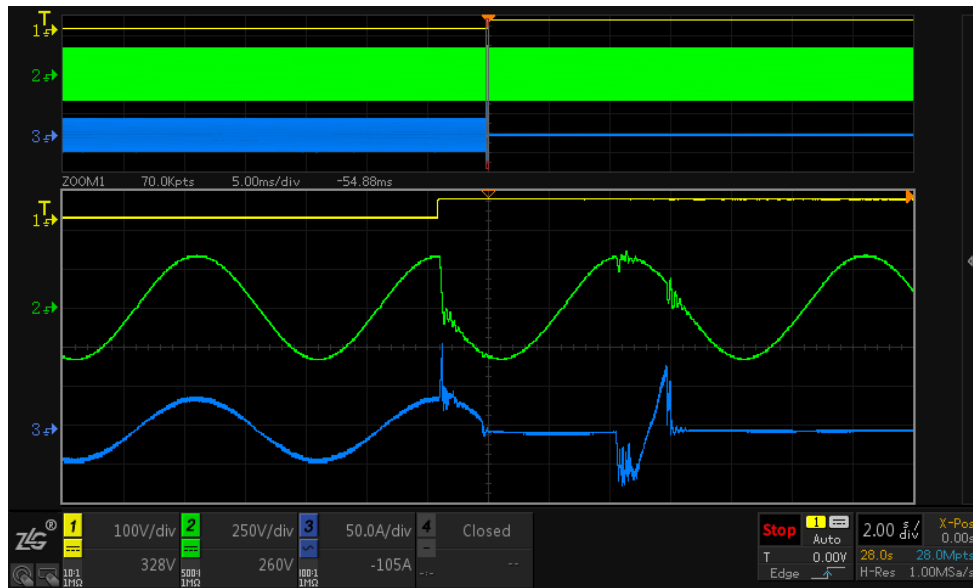
Bbis.8		TABLE: Emissione di componente continua nella corrente di uscita /Check of DC current injection											
Ambient temperature (°C)					25 °C ± 5 °C								
Humidity (RH %)					65% ± 5% RH								
Instrumentation list.....					See table “Measurement equipment and instrumentation”								
Uncertainty					See table								
Temperature test:					+55°C ± 2°C								
Bbis.8.1		TABLE: Verifica della emissione di componente continua / Check of DC current injection.											
Power [%]	Power [W]	Rated Voltage [Vrms]	Cosφ	Rated Current [Arms]			Injected value D.C. [mA]			Injected value D.C. [%In]			Limit [%In]
				R	S	T	R	S	T	R	S	T	
33± 5	1979.3	229.5	0.999	8.65	--	--	35.8	--	--	0.14	--	--	0.5
66± 5	3966.9	229.5	1.000	17.28	--	--	70.9	--	--	0.27	--	--	0.5
100 ± 5	5913.6	229.5	1.000	25.73	--	--	73.9	--	--	0.28	--	--	0.5
Bbis.8.2		TABLE: Verifica delle protezioni contro l'immissione di componente continua / Check of protections against the DC current injection.											
Power [%]	Power [W]	Rated Voltage [Vrms]	Cosφ	Rated Current [Arms]			Intervention value D.C.			Trip Time [ms]	Limit [s]		
				R	S	T	[mA]	[%In]	I _{dc} >				
33± 5	1979.3	229.5	0.999	8.65	--	--	258.2	0.99	0.5% In	976.0	1		
66± 5	3966.9	229.5	1.000	17.28	--	--	1011.5	3.88	0.5% In	988.0	1		
100 ± 5	5913.6	229.5	1.000	25.73	--	--	179.4	0.69	0.5% In	952.0	1		
Power [%nominal VA]	Power [W]	Rated Voltage [Vrms]	Cosφ	Rated Current [Arms]			Intervention value D.C.			Trip Time [ms]	Limit [s]		
				R	S	T	[A]	[%In]	I _{dc} >>				
33± 5	1979.3	229.5	0.999	8.65	--	--	1.33	5.10	1A	150.0	0.2		
66± 5	3966.9	229.5	1.000	17.28	--	--	1.18	4.52	1A	146.0	0.2		
100 ± 5	5913.6	229.5	1.000	25.73	--	--	1.51	5.79	1A	150.0	0.2		

Bbis.8		TABLE: Emissione di componente continua nella corrente di uscita <i>/Check of DC current injection</i>											
Ambient temperature (°C)							25 °C ± 5 °C						
Humidity (RH %)							65% ± 5% RH						
Instrumentation list.....							See table “Measurement equipment and instrumentation”						
Uncertainty							See table						
Temperature test:							-10 °C ± 2 °C						
Bbis.8.1		TABLE: Verifica della emissione di componente continua <i>/ Check of DC current injection.</i>											
Power [%]	Power [W]	Rated Voltage [Vrms]	Cosφ	Rated Current [Arms]			Injected value D.C. [mA]			Injected value D.C. [%In]			Limit [%In]
				R	S	T	R	S	T	R	S	T	
33± 5	1979.1	230	0.999	8.65	--	--	69.6	--	--	0.27	--	--	0.5
66± 5	3972.3	230	1.000	17.31	--	--	70.2	--	--	0.27	--	--	0.5
100 ± 5	6033.6	230	1.000	26.24	--	--	82.0	--	--	0.31	--	--	0.5
Bbis.8.2		TABLE: Verifica delle protezioni contro l'immissione di componente continua <i>/ Check of protections against the DC current injection.</i>											
Power [%]	Power [W]	Rated Voltage [Vrms]	Cosφ	Rated Current [Arms]			Intervention value D.C.			Trip Time [ms]	Limit [s]		
				R	S	T	[mA]	[%In]	I _{dc} >				
33± 5	1979.1	230	0.999	8.65	--	--	256.0	0.98	0.5% In	988.0	1		
66± 5	3972.3	230	1.000	17.31	--	--	158.1	0.61	0.5% In	876.0	1		
100 ± 5	6033.6	230	1.000	26.24	--	--	246.8	0.95	0.5% In	988.0	1		
Power [%]	Power [W]	Rated Voltage [Vrms]	Cosφ	Rated Current [Arms]			Intervention value D.C.			Trip Time [ms]	Limit [s]		
				R	S	T	[A]	[%In]	I _{dc} >>				
33± 5	1979.1	230	0.999	8.65	--	--	1.22	4.68	1A	158.0	0.2		
66± 5	3972.3	230	1.000	17.31	--	--	1.23	4.72	1A	158.0	0.2		
100 ± 5	6033.6	230	1.000	26.24	--	--	1.45	5.56	1A	162.0	0.2		

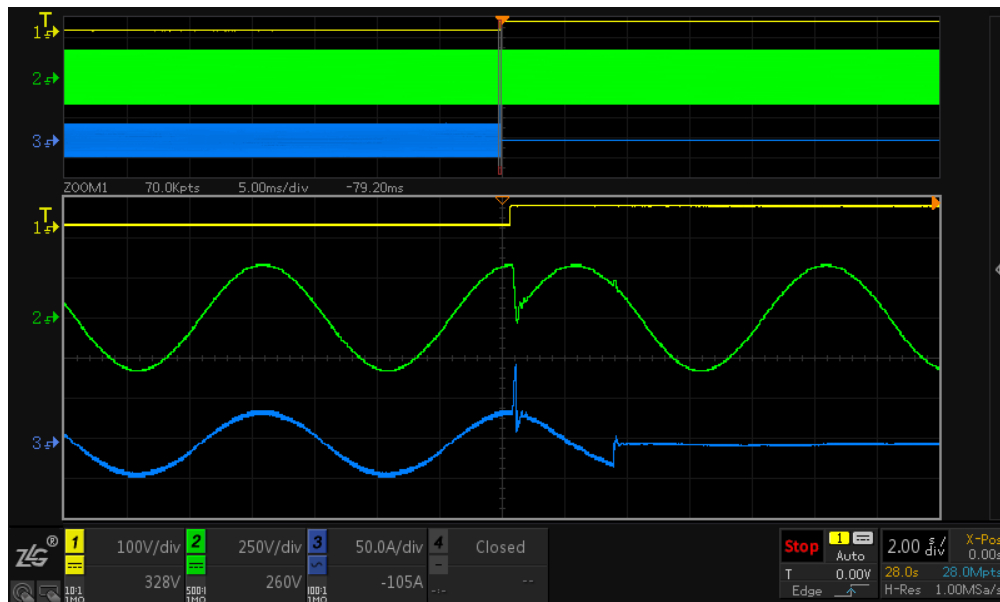
Bbis.10	TABLE: Verifica della insensibilità alle richiusure automatiche in discordanza di fase <i>/ Check of the insensibility to the re-closures when phases are in discordance</i>		
☒ Bbis.10.1 Test su rete simulata <i>/ Test on simulated grid</i> ☐ Bbis.10.2 Test su rete di distribuzione tramite trasformatore di accoppiamento <i>/ Test on distribution grid through coupler transformer</i> ☐ Bbis.10.3 Test su rete di distribuzione, simulazione della deriva di frequenza <i>/ Test on distribution grid, simulation of frequency deviation</i>			
	Ambient temperature (°C)	25 °C ± 2 °C	
	Humidity (RH %)	35 %	
	Instrumentation list	See table "Measurement equipment and instrumentation"	
	Uncertainty	See table	
Supplementary information: Test made with grid simulator as follow: 			
Operator		see cover page	
Supervisor		see cover page	
Test Date		see cover page	

Test	Output Power [W]	Output Current [A]	Phase displacement [°]	Phase displacement [°]	Result
1	6076	26.50	+90°	+90°	No damage inverter connected
2	6075	26.49	-90°	-90°	No damage Inverter connected
3	6066	26.42	+180°	+180°	No damage Inverter connected
4	6068	26.43	180°	180°	No damage inverter connected

TEST#1: $+90^\circ$ phase displacement



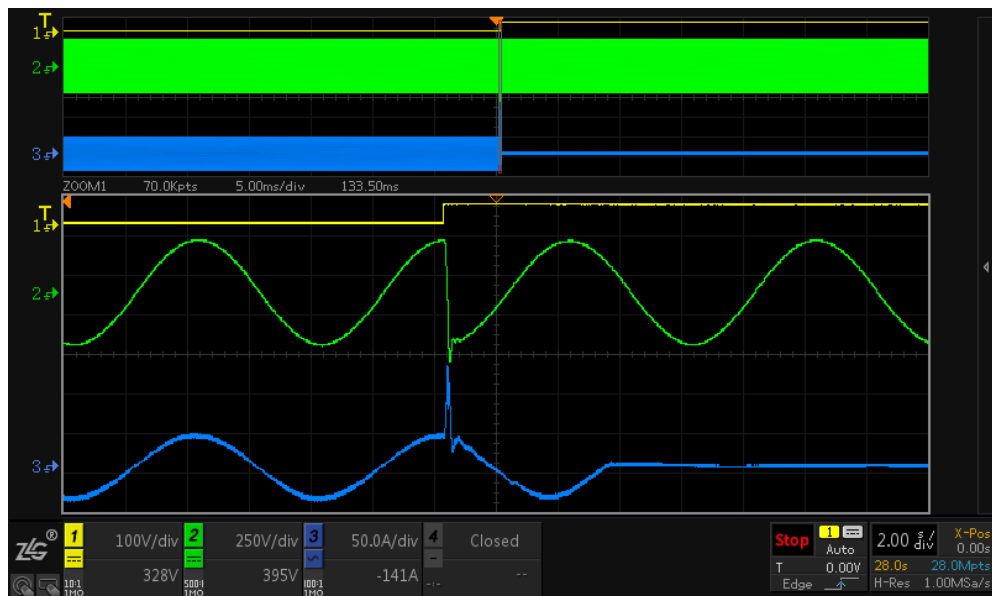
TEST#2: -90° phase displacement.



TEST#3: +180° phase displacement



TEST#4: -180° phase displacement



TESTING RESULTS

Allegato B bis: Prove Parziali sui sistemi di accumulo per i seguenti casi:

/ Annex B bis: Partial Tests on Energy Storage Systems to following case:

- ☐ **Case A** – P1 (P_{MIN}) and C1 (E_{MIN})
- ☒ **Case B** – P1 (P_{MIN}) and module base C (E_{MIN})
- ☐ **Case C** – module base P (P_{MIN}) and C1 (E_{MIN})
- ☐ **Case D** – module base P (P_{MIN}) and module base C (E_{MIN})

Please selected the box with correct case.

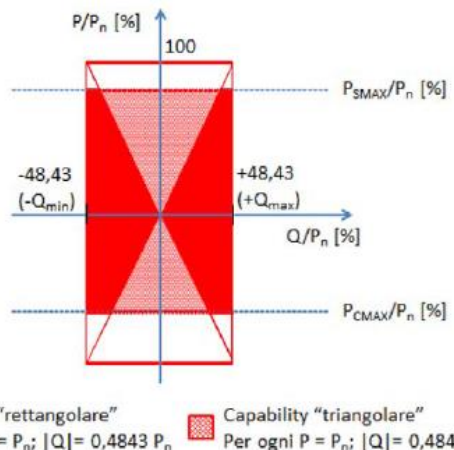
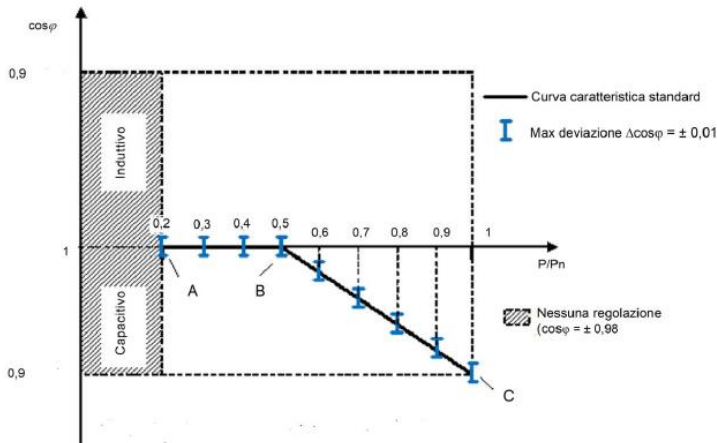
8.4.4.2 Bbis.6.1 Bbis.6.2	TABLE: check of the constructive requirements: reactive power production capability	
Ambient temperature (°C)	25 °C ± 5 °C	
Humidity (RH %)	65% ± 5% RH	
Instrumentation list.....	See table “Measurement equipment and instrumentation”	
Uncertainty	See table	
Max. cosφ declared.....	☒ cosφ: 0.9 → Pout ≤ 11.08 KW (triangular) ☐ Q/Pn% = 48.43% → Pout > 11.08 KW (rectangular)	
 Figura 3Bbis – Capability per un sistema di accumulo con inverter bidirezionale.		
Supplementary information: <i>For each of the 10 levels of active power, 1 value of inductive reactive power and 1 value of conductive reactive power shall be registered as average values in 1 min, based on the measurements at the fundamental in a window of 200ms.</i>		
Operator	see cover page	
Supervisor	see cover page	
Test Date	see cover page	

TABLE: Reactive power production with set point Q = 0								
Power Step	Active Power		Reactive Power		Power Factor	Deviation	Target value	Limit
	[W]	[%Sn]	[VAr]	[%Sn]	Cosφ	ΔQ/Sn[%]	Cosφ	ΔQ/Sn
90% - 100% $P_{S_{max}}$	2861.3	86.71	-41.0	-1.24	1.000	-1.24	1	<±5%
70% - 80% $P_{S_{max}}$	2258.1	68.43	-45.7	-1.38	1.000	-1.38	1	<±5%
50% - 60% $P_{S_{max}}$	1653.4	50.10	-48.1	-1.46	1.000	-1.46	1	<±5%
30% - 40% $P_{S_{max}}$	1048.1	31.76	-52.9	-1.60	0.998	-1.60	1	<±5%
10% - 20% $P_{S_{max}}$	457.9	13.88	-54.9	-1.66	0.992	-1.66	1	<±10%
10% - 20% $P_{C_{max}}$	-455.6	-13.81	-60.3	-1.83	-0.990	-1.83	1	<±10%
30% - 40% $P_{C_{max}}$	-1048.6	-31.78	-64.0	-1.94	-0.998	-1.94	1	<±5%
50% - 60% $P_{C_{max}}$	-1641.8	-49.75	-66.9	-2.03	-0.999	-2.03	1	<±5%
70% - 80% $P_{C_{max}}$	-2251.1	-68.21	-69.6	-2.11	-1.000	-2.11	1	<±5%
90% - 100% $P_{C_{max}}$	-2845.5	-86.23	-74.9	-2.27	-1.000	-2.27	1	<±5%

TABLE: Reactive power adsorbed with set point $Q = Q_{min}$								
Power Step	Active Power		Reactive Power		Power Factor	Deviation	Target value	Limit
	[W]	[%Sn]	[VAr]	[%Sn]	Cosφ	ΔQ/Sn[%]	Cosφ	ΔQ/Sn
90% - 100% $P_{S_{max}}$	2869.2	86.94	-1392.1	-42.18	0.900	-0.08	0.9	<±5%
70% - 80% $P_{S_{max}}$	2265.3	68.64	-1107.2	-33.55	0.898	-0.30	0.9	<±5%
50% - 60% $P_{S_{max}}$	1658.1	50.25	-797.9	-24.18	0.901	0.16	0.9	<±5%
30% - 40% $P_{S_{max}}$	1051.8	31.87	-501.0	-15.18	0.903	0.25	0.9	<±5%
10% - 20% $P_{S_{max}}$	444.2	13.46	-215.2	-6.52	0.899	0.00	0.9	<±5%
10% - 20% $P_{C_{max}}$	-454.5	-13.77	-218.7	-6.63	0.901	0.04	0.9	<±5%
30% - 40% $P_{C_{max}}$	-1061.1	-32.15	-510.0	-15.46	0.901	0.12	0.9	<±5%
50% - 60% $P_{C_{max}}$	-1668.0	-50.55	-807.3	-24.46	0.900	0.02	0.9	<±5%
70% - 80% $P_{C_{max}}$	-2276.5	-68.98	-1103.0	-33.42	0.900	-0.01	0.9	<±5%
90% - 100% $P_{C_{max}}$	-2876.6	-87.17	-1391.3	-42.16	0.900	0.06	0.9	<±5%

TABLE: Reactive power produced with set point Q = Qmax								
Power Step	Active Power		Reactive Power		Power Factor	Deviation	Target value	Limit
	[W]	[%Sn]	[VAr]	[%Sn]	Cosφ	ΔQ/Sn[%]	Cosφ	ΔQ/Sn
90% - 100% $P_{S_{max}}$	2831.2	85.79	1382.2	41.88	0.899	0.33	0.9	<±5%
70% - 80% $P_{S_{max}}$	2256.0	68.36	1087.7	32.96	0.901	-0.15	0.9	<±5%
50% - 60% $P_{S_{max}}$	1664.9	50.45	811.8	24.60	0.899	0.17	0.9	<±5%
30% - 40% $P_{S_{max}}$	1066.4	32.32	518.8	15.72	0.899	0.07	0.9	<±5%
10% - 20% $P_{S_{max}}$	480.8	14.57	225.7	6.84	0.901	-0.22	0.9	<±5%
10% - 20% $P_{C_{max}}$	-421.3	-12.77	205.9	6.24	0.890	0.06	0.9	<±5%
30% - 40% $P_{C_{max}}$	-1020.7	-30.93	490.7	14.87	0.901	-0.11	0.9	<±5%
50% - 60% $P_{C_{max}}$	-1646.1	-49.88	792.7	24.02	0.901	-0.14	0.9	<±5%
70% - 80% $P_{C_{max}}$	-2256.7	-68.38	1076.5	32.62	0.903	-0.50	0.9	<±5%
90% - 100% $P_{C_{max}}$	-2831.0	-85.79	1359.8	41.21	0.901	-0.34	0.9	<±5%
Note(s):								

Bbis.6.6 Bbis.6.7 Annex E E.2	TABLE: Erogazione automatica di potenza reattiva secondo una curva caratteristica $\cos\varphi = f(P)$ <i>/ Automatic production of reactive power according to a characteristic curve $\cos\varphi = f(P)$</i>
Ambient temperature (°C)	25 °C ± 5 °C
Humidity (RH %)	65% ± 5% RH
Instrumentation list.....	See table "Measurement equipment and instrumentation"
Uncertainty	See table
Max. $\cos\varphi$ declared	☐ $\cos\varphi: 0.9 \rightarrow P_{out} \leq 11.08 \text{ KW}$ ☒ $Q/P_n\% = 48.43\% \rightarrow P_{out} > 11.08 \text{ KW}$
Set value.....	Lock-in: 1.05 Vn (Vn and 1.1 Vn with steps of 0.01) Lock-out: 230 V or 50%PS _{max} (0.9 Vn and Vn with steps of 0.01)
 Figura 7Bbis – Curva caratteristica standard $\cos\varphi = f(P)$	

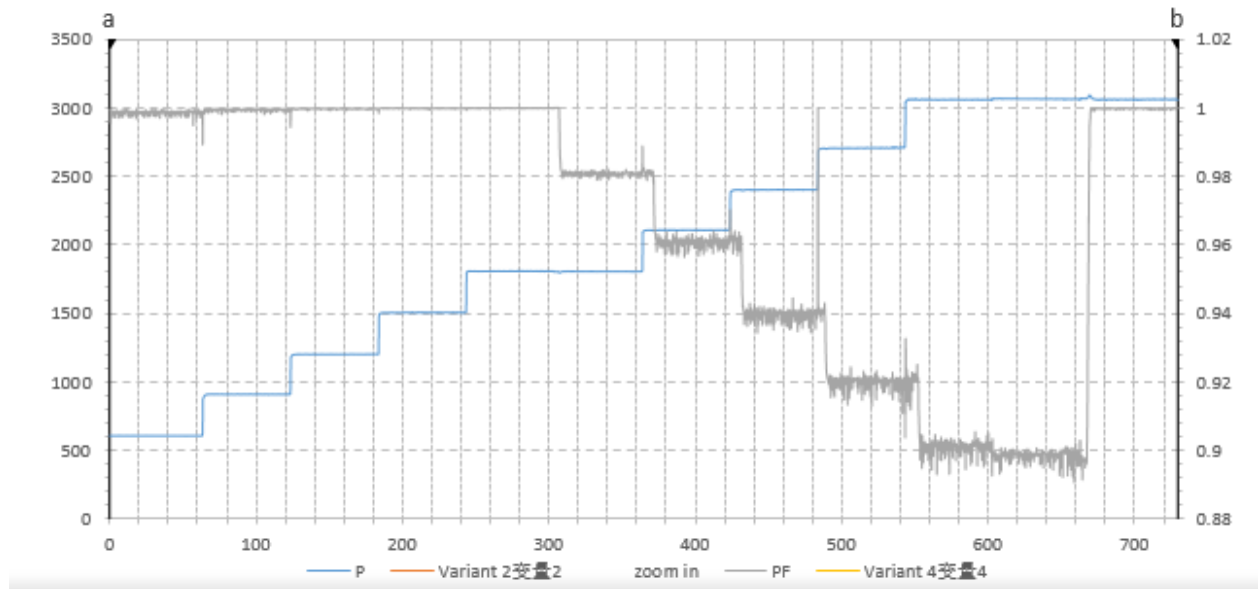
Supplementary information:

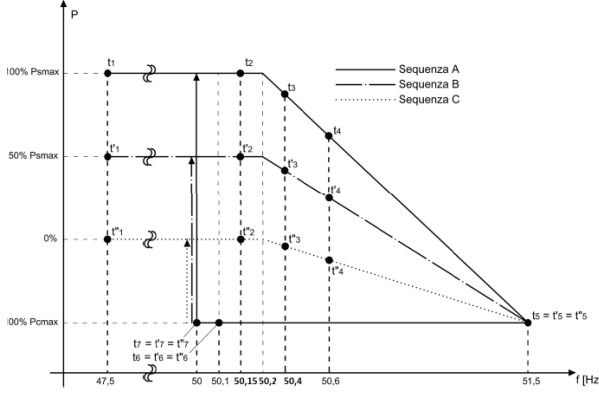
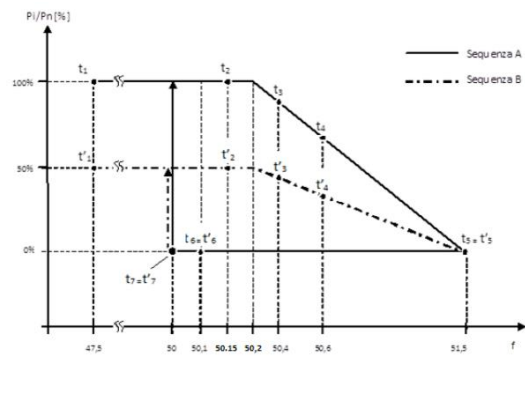
- Function must be anable by a local command of the converter.
- Each value must be reach in < 10s.

Operator	see cover page
Supervisor	see cover page
Test Date	see cover page

Tabella Bbis.7: Erogazione automatica di potenza reattiva secondo una curva caratteristica $\cos\varphi = f(P)$
/ Table Bbis.7: $\cos\varphi = f(P)$

P/Pn [%]	P [W]	Vout [V]	Q [Var]	Cos φ measured	Cos φ Set-point	$\Delta Q/P_n$	Limit $\Delta Q/P_n$	RESULT
20	606.4	239.3	-31.3	0.999	1.00	-1.04	$\pm 2.5\% P_n$	P
30	908.5	239.2	-30.4	0.999	1.00	-1.01	$\pm 2.5\% P_n$	P
40	1201.0	239.1	-29.0	1.000	1.00	-0.97	$\pm 2.5\% P_n$	P
50	1505.3	239.2	-28.5	1.000	1.00	-0.95	$\pm 2.5\% P_n$	P
60	1807.4	239.2	-26.7	1.000	1.00	-0.89	$\pm 2.5\% P_n$	P
60	1805.4	243.7	-359.6	0.981	0.98	0.23	$\pm 2.5\% P_n$	P
70	2107.6	243.6	-609.9	0.961	0.96	0.16	$\pm 2.5\% P_n$	P
80	2400.9	243.7	-874.1	0.940	0.94	-0.09	$\pm 2.5\% P_n$	P
90	2705.5	243.8	-1152.7	0.920	0.92	0.00	$\pm 2.5\% P_n$	P
100	3059.4	243.9	-1474.2	0.901	0.90	0.25	$\pm 2.5\% P_n$	P
100	3063.6	232.0	-1496.5	0.899	0.90	-0.43	$\pm 2.5\% P_n$	P
100	3060.8	225.3	-58.4	1.000	1.00	-1.95	$\pm 2.5\% P_n$	P

Grafico: Erogazione automatica di potenza reattiva secondo una curva caratteristica $\cos\varphi = f(P)$
/ Graph: Reactive power production according to a characteristic curve $\cos(\phi) = f(P)$
CHART 1


8.5.3.4 8.5.3.5 Bbis.7.2	TABLE: Verifica della riduzione automatica della potenza attiva in presenza di transitori di sovrافrequenza sulla rete <i>/Active power regulation in coincidence with transitory on the transmission grid</i>
Ambient temperature (°C) :	25 °C ± 5 °C
Humidity (RH %) :	65% ± 5% RH
Instrumentation list..... :	See table “Measurement equipment and instrumentation”
Uncertainty :	See table
 Figura 9Bbis – Curve di limitazione della potenza attiva per convertitori bidirezionali	 Figura 10Bbis – Curve di limitazione della potenza attiva per convertitori unidirezionali
Sequence test for Bi-directional EESS	Sequence test for Uni-directional EESS
Supplementary information: Test shall be performed disabling the frequency threshold protection Test was performed with a sampling time of 200ms Sn is an active nominal power of the inverter	
Operator :	see cover page
Supervisor :	see cover page
Test Date :	see cover page

Sequence A						
Step #	Set output power [%]	frequency [Hz]	Expected power value [W]	Actual power values [W]	limits	Graph point
1	100% P _{Smax}	47.51	2800	2797.5	± 2.5% S _n	t1
2	100% P _{Smax}	50.15	2800	2798.4	± 2.5% S _n	t2
3	100% P _{Smax}	50.40	1937	1938.4	± 2.5% S _n	t3
4	100% P _{Smax}	50.60	1076	1077.0	± 2.5% S _n	t4
5	100% P _{Smax}	51.49	-2757	-2797.1	± 2.5% S _n	t5
6	100% P _{Smax}	50.11	-2757	-2797.1	± 2.5% S _n	t6
7	100% P _{Smax}	50.00	2800	2799.4	± 2.5% S _n	t7
Sequence B						
Step #	Set output power [%]	frequency [Hz]	Expected power value [W]	Actual power values [W]	limits	Graph point
1	50% P _{Smax}	47.51	1400	1410.3	± 2.5% S _n	t1'
2	50% P _{Smax}	50.15	1400	1410.6	± 2.5% S _n	t2'
3	50% P _{Smax}	50.40	763	756.2	± 2.5% S _n	t3'
4	50% P _{Smax}	50.60	115	129.4	± 2.5% S _n	t4'
5	50% P _{Smax}	51.49	-2768	-2801.1	± 2.5% S _n	t5'
6	50% P _{Smax}	50.11	-2768	-2801.7	± 2.5% S _n	t6'
7	50% P _{Smax}	50.00	1400	1409.7	± 2.5% S _n	t7'

Sequence C*						
Step #	Set output power [%]	frequency [Hz]	Expected power value [W]	Actual power values [W]	limits	Graph point
1	0% PS _{max}	47.51	0	32.8	± 2.5% S _n	t1''
2	0% PS _{max}	50.15	0	33.1	± 2.5% S _n	t2''
3	0% PS _{max}	50.40	-403	-415.7	± 2.5% S _n	t3''
4	0% PS _{max}	50.60	-839	-854.3	± 2.5% S _n	t4''
5	0% PS _{max}	51.49	-2778	-2801.5	± 2.5% S _n	t5''
6	0% PS _{max}	50.11	-2778	-2801.8	± 2.5% S _n	t6''
7	0% PS _{max}	50.00	0	33.2	± 2.5% S _n	t7''

**Sequence C applicable only for bidirectional converters.*

Grafico Sequenza A: Curva di limitazione della potenza attiva rispetto alla frequenza

/ Graph Sequence A: Active power regulation in coincidence with transitory on the transmission grid

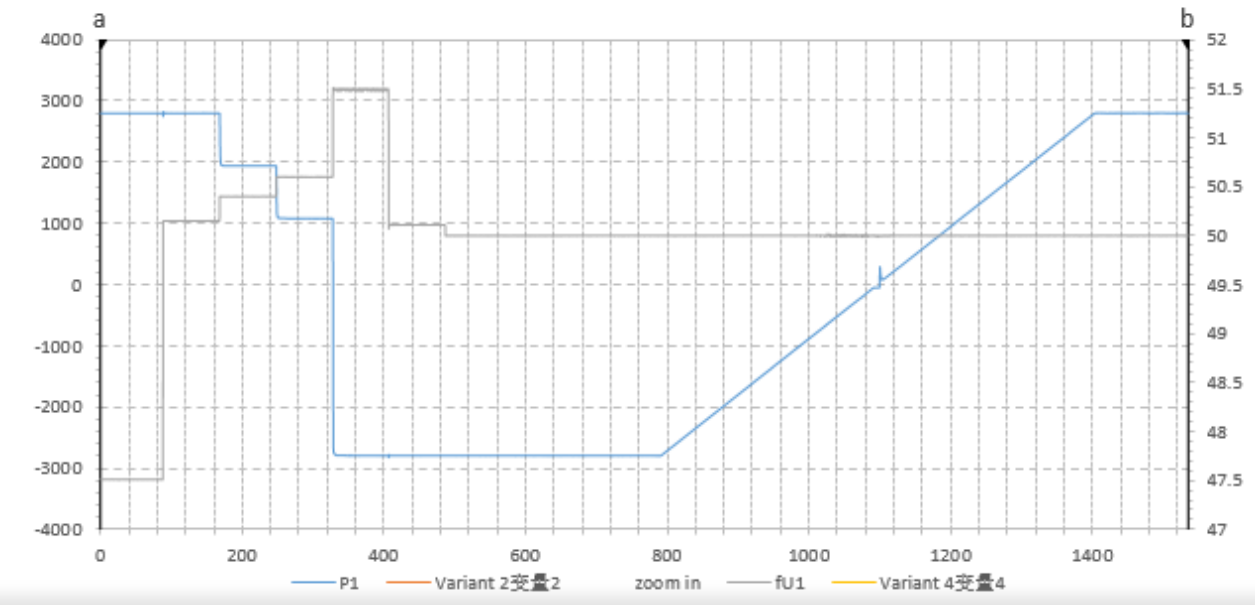
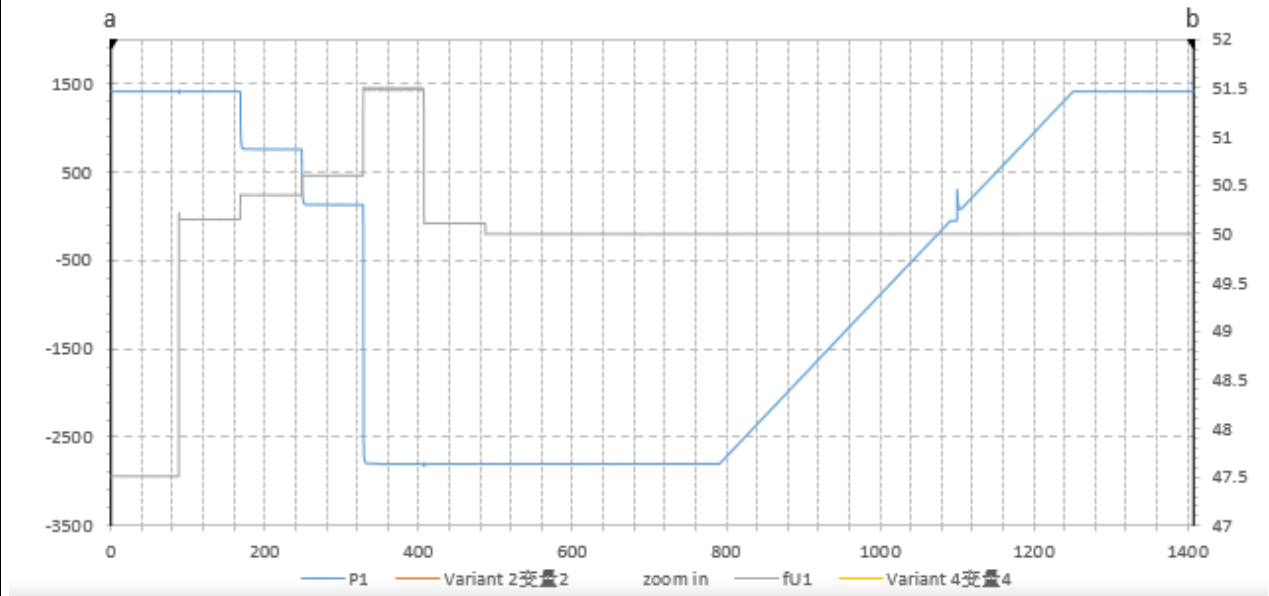
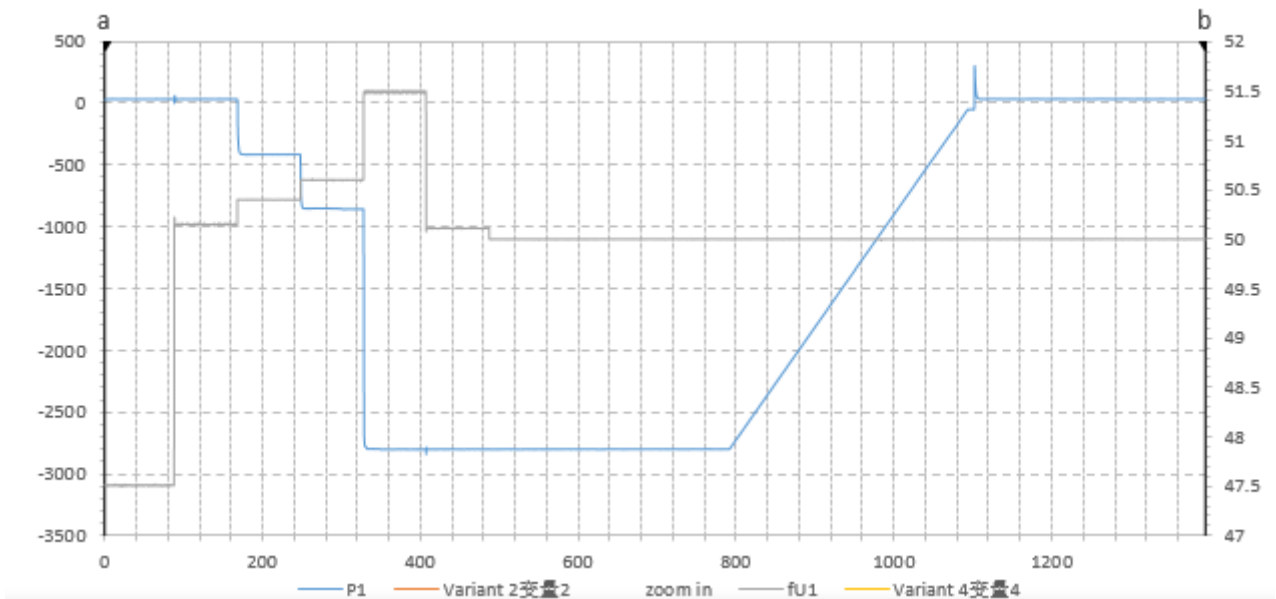
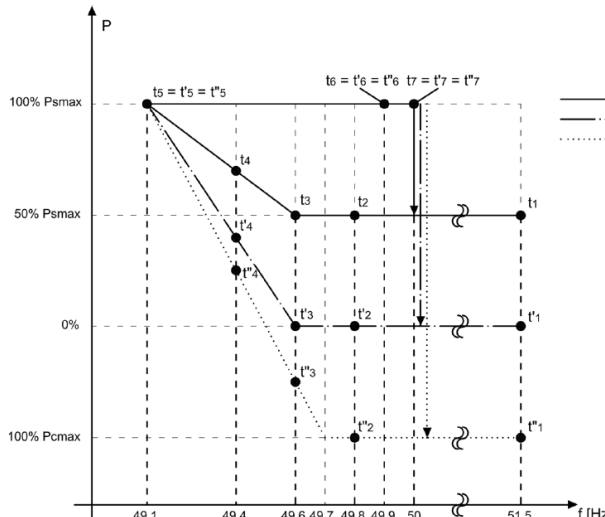
CHART 1


Grafico Sequenza B: Curva di limitazione della potenza attiva rispetto alla frequenza
/ Graph Sequence B: Active power regulation in coincidence with transitory on the transmission grid
CHART 1

Grafico Sequenza C*: Curva di limitazione della potenza attiva rispetto alla frequenza
/ Graph Sequence C: Active power regulation in coincidence with transitory on the transmission grid*
CHART 1


8.5.3.4 8.5.3.5 Bbis.7.3	TABLE: Regolazione della potenza attiva in presenza di transitori sulla rete di trasmissione <i>/Active power regulation in coincidence with transitory on the transmission grid</i>	
Ambient temperature (°C)		25 °C ± 5 °C
Humidity (RH %)		65% ± 5% RH
Instrumentation list.....		See table "Measurement equipment and instrumentation"
Uncertainty		See table
 Figura 11Bbis – Curve di limitazione della potenza attiva		
Supplementary information: Test shall be performed disabling the frequency threshold protection The storage needs an energy capacity of 20% of CUS Test was performed with a sampling time of 200ms Sn is an active nominal power of the inverter		
Operator		see cover page
Supervisor		see cover page
Test Date.....		see cover page

Sequence A						
Step #	Set output power [%]	frequency [Hz]	Expected power value [W]	Actual power values [W]	limits	Graph point
1	50% PS _{max}	51.49	1400	1407.3	± 2.5% S _n	t1
2	50% PS _{max}	49.85	1400	1407.3	± 2.5% S _n	t2
3	50% PS _{max}	49.60	1805	1805.9	± 2.5% S _n	t3
4	50% PS _{max}	49.40	2203	2188.9	± 2.5% S _n	t4
5	50% PS _{max}	49.11	2780	2751.4	± 2.5% S _n	t5
6	50% PS _{max}	49.89	2780	2751.2	± 2.5% S _n	t6
7	50% PS _{max}	50.00	1400	1407.6	± 2.5% S _n	t7
Sequence B						
Step #	Set output power [%]	frequency [Hz]	Expected power value [W]	Actual power values [W]	limits	Graph point
1	0% PS _{max}	51.49	0	33.9	± 2.5% S _n	t1'
2	0% PS _{max}	49.85	0	33.6	± 2.5% S _n	t2'
3	0% PS _{max}	49.60	824	851.0	± 2.5% S _n	t3'
4	0% PS _{max}	49.40	1614	1632.1	± 2.5% S _n	t4'
5	0% PS _{max}	49.11	2760	2784.1	± 2.5% S _n	t5'
6	0% PS _{max}	49.89	2760	2785.3	± 2.5% S _n	t6'
7	0% PS _{max}	50.00	0	34.0	± 2.5% S _n	t7'

Sequence C*						
Step #	Set output power [%]	frequency [Hz]	Expected power value [W]	Actual power values [W]	limits	Graph point
1	100% P _{Cmax}	51.49	-2800	-2801.0	± 2.5% S _n	t1''
2	100% P _{Cmax}	49.85	-2800	-2801.7	± 2.5% S _n	t2''
3	100% P _{Cmax}	49.60	-1201	-1171.8	± 2.5% S _n	t3''
4	100% P _{Cmax}	49.40	399	400.9	± 2.5% S _n	t4''
5	100% P _{Cmax}	49.11	2720	2785.7	± 2.5% S _n	t5''
6	100% P _{Cmax}	49.89	2720	2787.3	± 2.5% S _n	t6''
7	100% P _{Cmax}	50.00	-2800	-2802.7	± 2.5% S _n	t7''

**Sequence C applicable only for bidirectional converters.*

Grafico Sequenza A: Curva di limitazione della potenza attiva rispetto alla frequenza

/ Graph Sequence A: Active power regulation in coincidence with transitory on the transmission grid

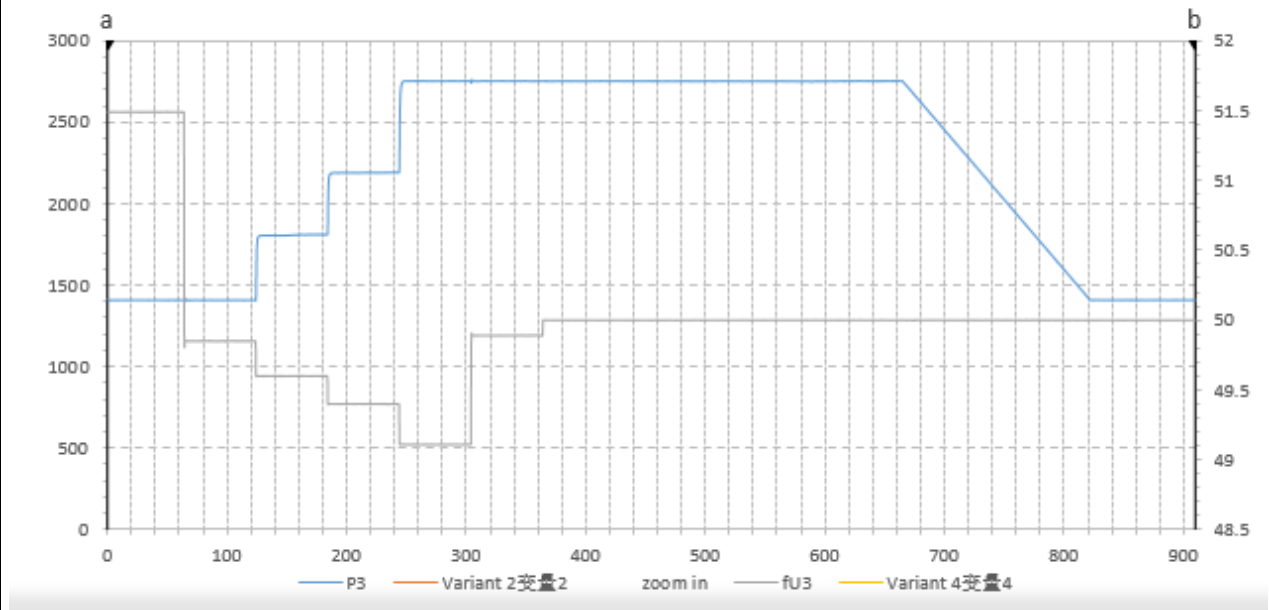
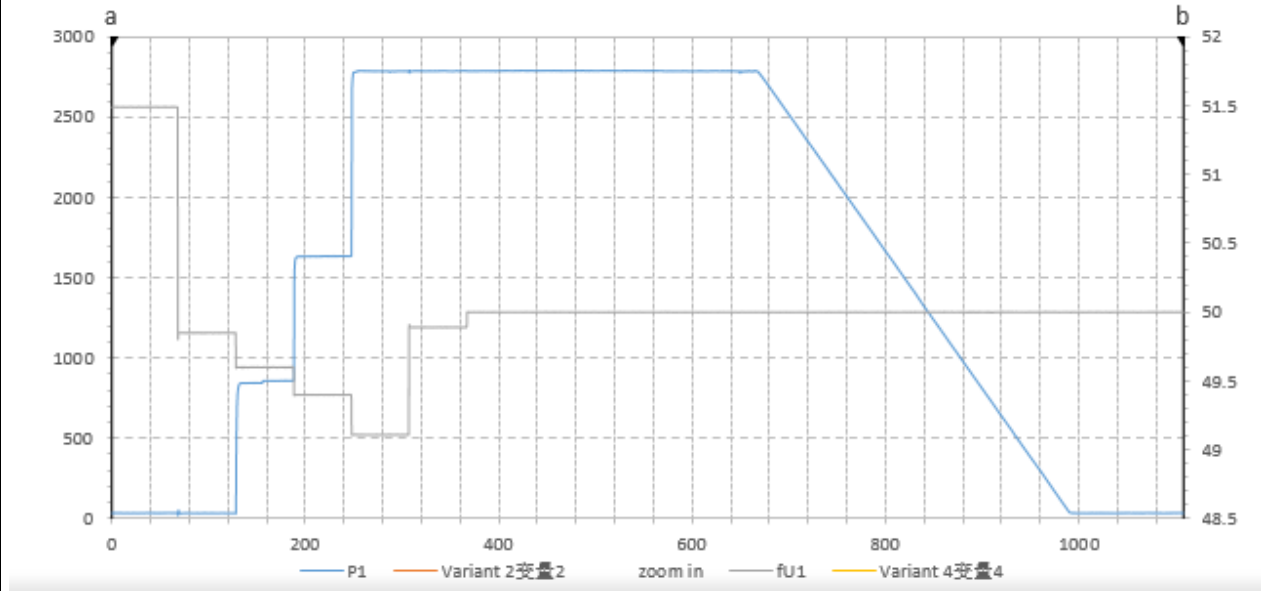
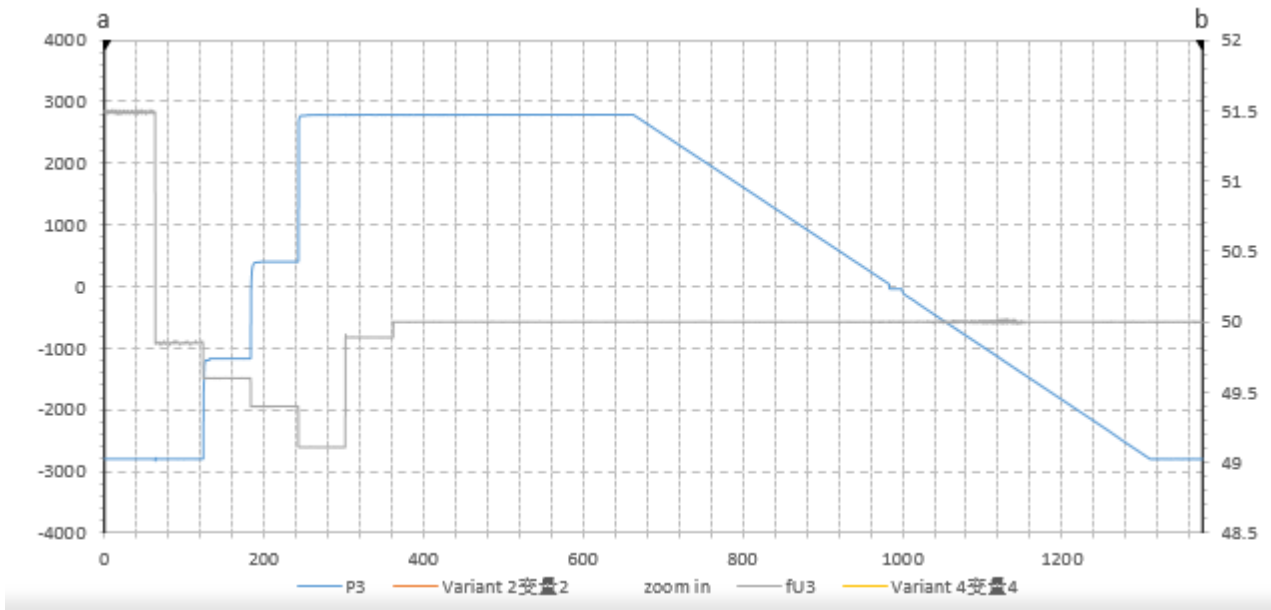
CHART 1


Grafico Sequenza B: Curva di limitazione della potenza attiva rispetto alla frequenza
/ Graph Sequence B: Active power regulation in coincidence with transitory on the transmission grid
CHART 1

Grafico Sequenza C*: Curva di limitazione della potenza attiva rispetto alla frequenza
/ Graph Sequence C: Active power regulation in coincidence with transitory on the transmission grid*
CHART 1


TESTING RESULTS

Allegato B bis: Prove Parziali sui sistemi di accumulo per i seguenti casi:

/ Annex B bis: Partial Tests on Energy Storage Systems to following case:

- ☐ **Case A** – P_N (P_{MAX}) and C1 (E_{MIN})
- ☒ **Case B** – P_N (P_{MAX}) and module base C (E_{MIN})
- ☐ **Case C** – module base P ($\geq 3 P_{module}$) and C1 (E_{MIN})
- ☐ **Case D** – module base P ($\geq 3 P_{module}$) and module base C (E_{MIN})

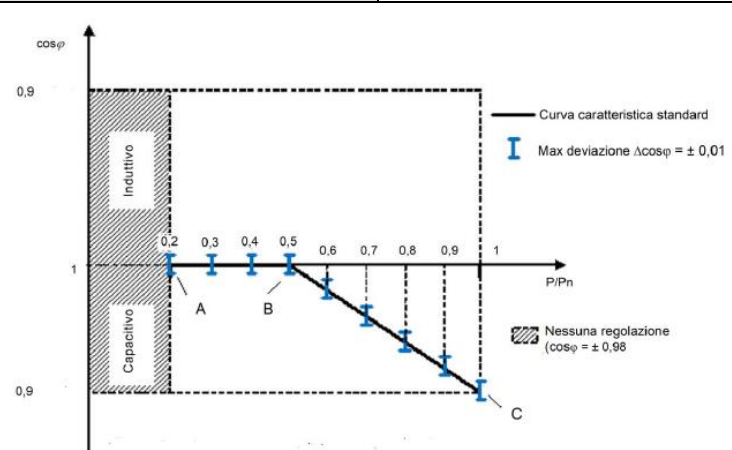
Please selected the box with correct case.

8.4.4.2 Bbis.6.1 Bbis.6.2	TABLE: check of the constructive requirements: reactive power production capability	
Ambient temperature (°C)		25 °C ± 5 °C
Humidity (RH %)		65% ± 5% RH
Instrumentation list.....		See table “Measurement equipment and instrumentation”
Uncertainty		See table
Max. cosφ declared.....		☒ cosφ: 0.9 → Pout ≤ 11.08 KW (triangular) ☐ Q/Pn% = 48.43% → Pout > 11.08 KW (rectangular)
■ Capability “rettangolare” Per ogni P = P_n; Q = 0,4843 P_n ▴ Capability “triangolare” Per ogni P = P_n; Q = 0,4843 P Figura 3Bbis – Capability per un sistema di accumulo con inverter bidirezionale.		
Supplementary information: <i>For each of the 10 levels of active power, 1 value of inductive reactive power and 1 value of conductive reactive power shall be registered as average values in 1 min, based on the measurements at the fundamental in a window of 200ms.</i>		
Operator		see cover page
Supervisor		see cover page
Test Date		see cover page

TABLE: Reactive power production with set point Q = 0								
Power Step	Active Power		Reactive Power		Power Factor	Deviation	Target value	Limit
	[W]	[%Sn]	[VAr]	[%Sn]	Cosφ	ΔQ/Sn[%]	Cosφ	ΔQ/Sn
90% - 100% $P_{S_{max}}$	2676.3	44.61	-45.9	-0.77	1.000	-0.77	1	<±5%
70% - 80% $P_{S_{max}}$	2102.0	35.03	-47.7	-0.80	1.000	-0.80	1	<±5%
50% - 60% $P_{S_{max}}$	1545.1	25.75	-50.5	-0.84	0.999	-0.84	1	<±5%
30% - 40% $P_{S_{max}}$	979.8	16.33	-52.0	-0.87	0.998	-0.87	1	<±5%
10% - 20% $P_{S_{max}}$	421.4	7.02	34.7	0.58	0.996	0.58	1	<±10%
10% - 20% $P_{C_{max}}$	-425.1	-7.09	-1.6	-0.03	1.000	-0.03	1	<±10%
30% - 40% $P_{C_{max}}$	-981.5	-16.36	-0.1	0.00	1.000	0.00	1	<±5%
50% - 60% $P_{C_{max}}$	-1538.6	-25.64	-0.1	0.00	1.000	0.00	1	<±5%
70% - 80% $P_{C_{max}}$	-2098.3	-34.97	-0.1	0.00	1.000	0.00	1	<±5%
90% - 100% $P_{C_{max}}$	-2668.8	-44.48	-27.4	-0.46	1.000	-0.46	1	<±5%

TABLE: Reactive power adsorbed with set point Q = Qmin								
Power Step	Active Power		Reactive Power		Power Factor	Deviation	Target value	Limit
	[W]	[%Sn]	[VAr]	[%Sn]	Cosφ	ΔQ/Sn[%]	Cosφ	ΔQ/Sn
90% - 100% $P_{S_{max}}$	2661.9	44.37	-1279.1	-21.32	0.901	0.17	0.9	<±5%
70% - 80% $P_{S_{max}}$	2107.0	35.12	-1018.2	-16.97	0.900	0.04	0.9	<±5%
50% - 60% $P_{S_{max}}$	1541.7	25.70	-743.8	-12.40	0.901	0.05	0.9	<±5%
30% - 40% $P_{S_{max}}$	981.3	16.35	-474.6	-7.91	0.900	0.01	0.9	<±5%
10% - 20% $P_{S_{max}}$	420.4	7.01	-202.9	-3.38	0.900	0.01	0.9	<±5%
10% - 20% $P_{C_{max}}$	-424.5	-7.08	-206.4	-3.44	0.899	-0.01	0.9	<±5%
30% - 40% $P_{C_{max}}$	-980.0	-16.33	-473.4	-7.89	0.900	0.02	0.9	<±5%
50% - 60% $P_{C_{max}}$	-1536.7	-25.61	-744.4	-12.41	0.900	0.00	0.9	<±5%
70% - 80% $P_{C_{max}}$	-2093.6	-34.89	-1014.2	-16.90	0.900	0.00	0.9	<±5%
90% - 100% $P_{C_{max}}$	-2662.2	-44.37	-1270.4	-21.17	0.902	0.32	0.9	<±5%

TABLE: Reactive power produced with set point Q = Qmax								
Power Step	Active Power		Reactive Power		Power Factor	Deviation	Target value	Limit
	[W]	[%Sn]	[VAr]	[%Sn]	Cosφ	ΔQ/Sn[%]	Cosφ	ΔQ/Sn
90% - 100% $P_{S_{max}}$	2666.8	44.45	1245.0	20.75	0.906	-0.78	0.9	<±5%
70% - 80% $P_{S_{max}}$	2105.4	35.09	996.3	16.61	0.904	-0.39	0.9	<±5%
50% - 60% $P_{S_{max}}$	1543.5	25.73	744.3	12.41	0.901	-0.05	0.9	<±5%
30% - 40% $P_{S_{max}}$	980.8	16.35	471.1	7.85	0.901	-0.07	0.9	<±5%
10% - 20% $P_{S_{max}}$	423.1	7.05	201.1	3.35	0.903	-0.06	0.9	<±5%
10% - 20% $P_{C_{max}}$	-421.9	-7.03	201.6	3.36	0.902	-0.04	0.9	<±5%
30% - 40% $P_{C_{max}}$	-985.4	-16.42	470.4	7.84	0.902	-0.11	0.9	<±5%
50% - 60% $P_{C_{max}}$	-1544.6	-25.74	740.4	12.34	0.902	-0.13	0.9	<±5%
70% - 80% $P_{C_{max}}$	-2104.9	-35.08	1011.4	16.86	0.901	-0.13	0.9	<±5%
90% - 100% $P_{C_{max}}$	-2666.0	-44.43	1291.8	21.53	0.900	0.01	0.9	<±5%
Note(s):								

Bbis.6.6 Bbis.6.7 Annex E E.2	TABLE: Erogazione automatica di potenza reattiva secondo una curva caratteristica $\cos\phi = f(P)$ <i>/ Automatic production of reactive power according to a characteristic curve $\cos\phi = f(P)$</i>
Ambient temperature (°C)	25 °C ± 5 °C
Humidity (RH %)	65% ± 5% RH
Instrumentation list.....	See table "Measurement equipment and instrumentation"
Uncertainty	See table
Max. $\cos\phi$ declared	☒ $\cos\phi: 0.9 \rightarrow P_{out} \leq 11.08 \text{ KW}$ ☐ $Q/P_n\% = 48.43\% \rightarrow P_{out} > 11.08 \text{ KW}$
Set value.....	Lock-in: 1.05 Vn (Vn and 1.1 Vn with steps of 0.01) Lock-out: 230 V or 50%PS _{max} (0.9 Vn and Vn with steps of 0.01)
 Figura 7Bbis – Curva caratteristica standard $\cos\phi = f(P)$	

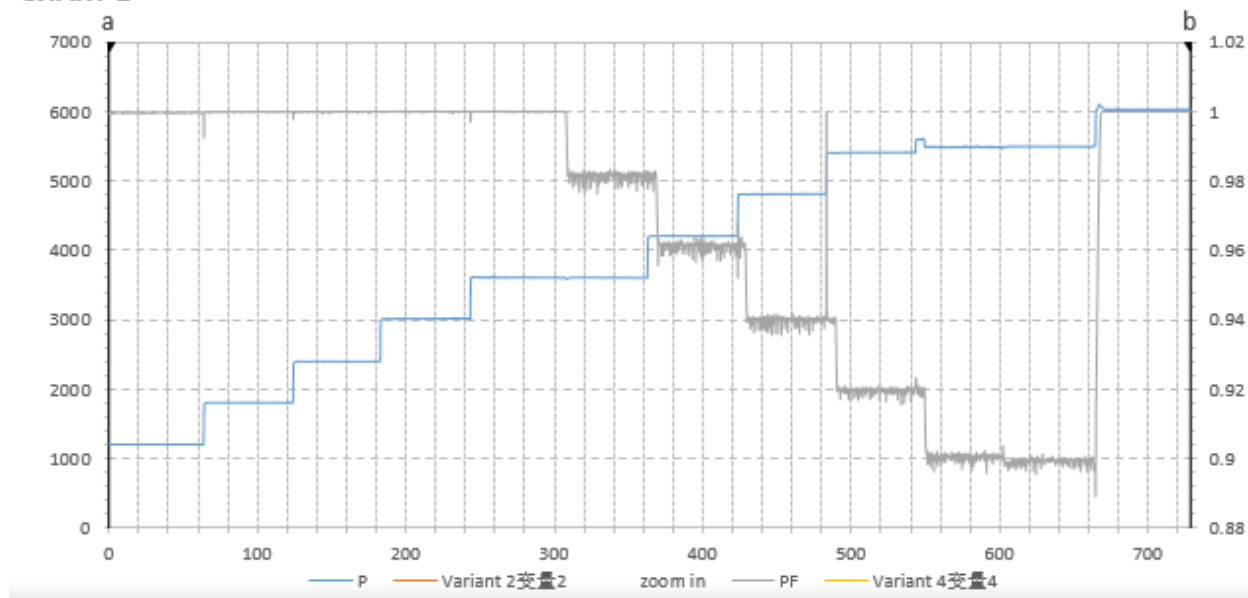
Supplementary information:

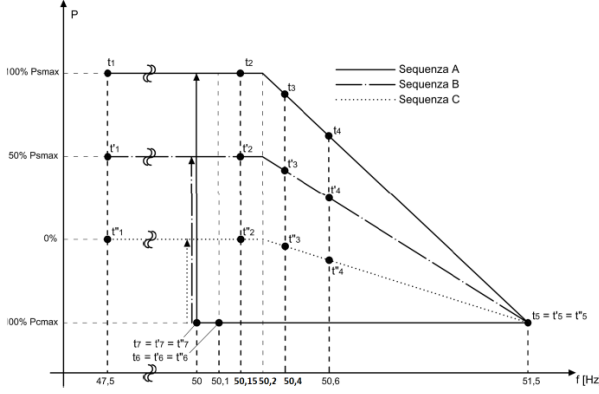
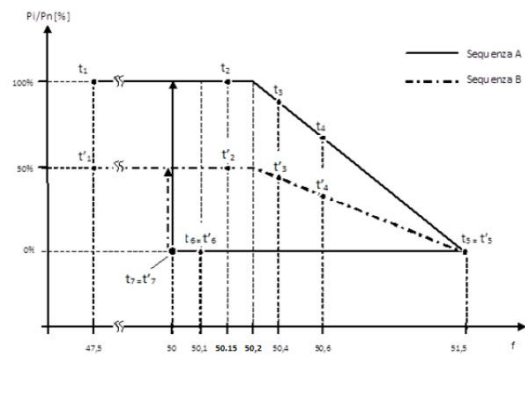
- Function must be anable by a local command of the converter.
- Each value must be reach in < 10s.

Operator	see cover page
Supervisor	see cover page
Test Date	see cover page

Tabella Bbis.7: Erogazione automatica di potenza reattiva secondo una curva caratteristica $\cos\varphi = f(P)$
/ Table Bbis.7: $\cos\varphi = f(P)$

P/Pn [%]	P [W]	Vout [V]	Q [Var]	Cos φ measured	Cos φ Set-point	$\Delta Q/P_n$	Limit $\Delta Q/P_n$	RESULT
20	1202.2	239.3	-29.9	1.000	1.00	-0.50	$\pm 2.5\% P_n$	P
30	1804.5	239.0	-26.7	1.000	1.00	-0.44	$\pm 2.5\% P_n$	P
40	2398.0	239.0	-24.5	1.000	1.00	-0.41	$\pm 2.5\% P_n$	P
50	3013.6	239.2	-21.9	1.000	1.00	-0.37	$\pm 2.5\% P_n$	P
60	3607.8	239.3	-20.2	1.000	1.00	-0.34	$\pm 2.5\% P_n$	P
60	3605.1	243.8	-702.9	0.982	0.98	0.49	$\pm 2.5\% P_n$	P
70	4206.4	243.7	-1204.8	0.961	0.96	0.37	$\pm 2.5\% P_n$	P
80	4810.9	243.8	-1747.5	0.940	0.94	-0.02	$\pm 2.5\% P_n$	P
90	5408.4	243.8	-2311.2	0.920	0.92	-0.12	$\pm 2.5\% P_n$	P
100	5488.0	243.9	-2650.3	0.900	0.90	0.13	$\pm 2.5\% P_n$	P
100	5495.3	232.1	-2672.2	0.899	0.90	-0.18	$\pm 2.5\% P_n$	P
100	6030.3	225.1	-55.0	1.000	1.00	-0.92	$\pm 2.5\% P_n$	P

Grafico: Erogazione automatica di potenza reattiva secondo una curva caratteristica $\cos\varphi = f(P)$
/ Graph: Reactive power production according to a characteristic curve $\cos(\varphi) = f(P)$
CHART 1


8.5.3.4 8.5.3.5 Bbis.7.2	TABLE: Verifica della riduzione automatica della potenza attiva in presenza di transitori di sovrافrequenza sulla rete <i>/Active power regulation in coincidence with transitory on the transmission grid</i>
Ambient temperature (°C) :	25 °C ± 5 °C
Humidity (RH %) :	65% ± 5% RH
Instrumentation list..... :	See table “Measurement equipment and instrumentation”
Uncertainty :	See table
 Figura 9Bbis – Curve di limitazione della potenza attiva per convertitori bidirezionali	 Figura 10Bbis – Curve di limitazione della potenza attiva per convertitori unidirezionali
Sequence test for Bi-directional EESS	Sequence test for Uni-directional EESS
Supplementary information: Test shall be performed disabling the frequency threshold protection Test was performed with a sampling time of 200ms Sn is an active nominal power of the inverter	
Operator :	see cover page
Supervisor :	see cover page
Test Date :	see cover page

Sequence A						
Step #	Set output power [%]	frequency [Hz]	Expected power value [W]	Actual power values [W]	limits	Graph point
1	100% P _{Smax}	47.51	2800	2797.6	± 2.5% S _n	t1
2	100% P _{Smax}	50.15	2800	2798.1	± 2.5% S _n	t2
3	100% P _{Smax}	50.40	1937	1941.3	± 2.5% S _n	t3
4	100% P _{Smax}	50.60	1076	1090.4	± 2.5% S _n	t4
5	100% P _{Smax}	51.49	-2757	-2797.0	± 2.5% S _n	t5
6	100% P _{Smax}	50.11	-2757	-2796.7	± 2.5% S _n	t6
7	100% P _{Smax}	50.00	2800	2798.7	± 2.5% S _n	t7
Sequence B						
Step #	Set output power [%]	frequency [Hz]	Expected power value [W]	Actual power values [W]	limits	Graph point
1	50% P _{Smax}	47.51	1400	1410.1	± 2.5% S _n	t1'
2	50% P _{Smax}	50.15	1400	1410.6	± 2.5% S _n	t2'
3	50% P _{Smax}	50.40	763	760.2	± 2.5% S _n	t3'
4	50% P _{Smax}	50.60	115	130.1	± 2.5% S _n	t4'
5	50% P _{Smax}	51.49	-2768	-2800.9	± 2.5% S _n	t5'
6	50% P _{Smax}	50.11	-2768	-2800.4	± 2.5% S _n	t6'
7	50% P _{Smax}	50.00	1400	1410.8	± 2.5% S _n	t7'

Sequence C*						
Step #	Set output power [%]	frequency [Hz]	Expected power value [W]	Actual power values [W]	limits	Graph point
1	0% PS _{max}	47.51	0	33.3	± 2.5% S _n	t1''
2	0% PS _{max}	50.15	0	33.3	± 2.5% S _n	t2''
3	0% PS _{max}	50.40	-403	-412.4	± 2.5% S _n	t3''
4	0% PS _{max}	50.60	-839	-851.7	± 2.5% S _n	t4''
5	0% PS _{max}	51.49	-2778	-2800.9	± 2.5% S _n	t5''
6	0% PS _{max}	50.11	-2778	-2800.4	± 2.5% S _n	t6''
7	0% PS _{max}	50.00	0	33.3	± 2.5% S _n	t7''

**Sequence C applicable only for bidirectional converters.*

Grafico Sequenza A: Curva di limitazione della potenza attiva rispetto alla frequenza

/ Graph Sequence A: Active power regulation in coincidence with transitory on the transmission grid

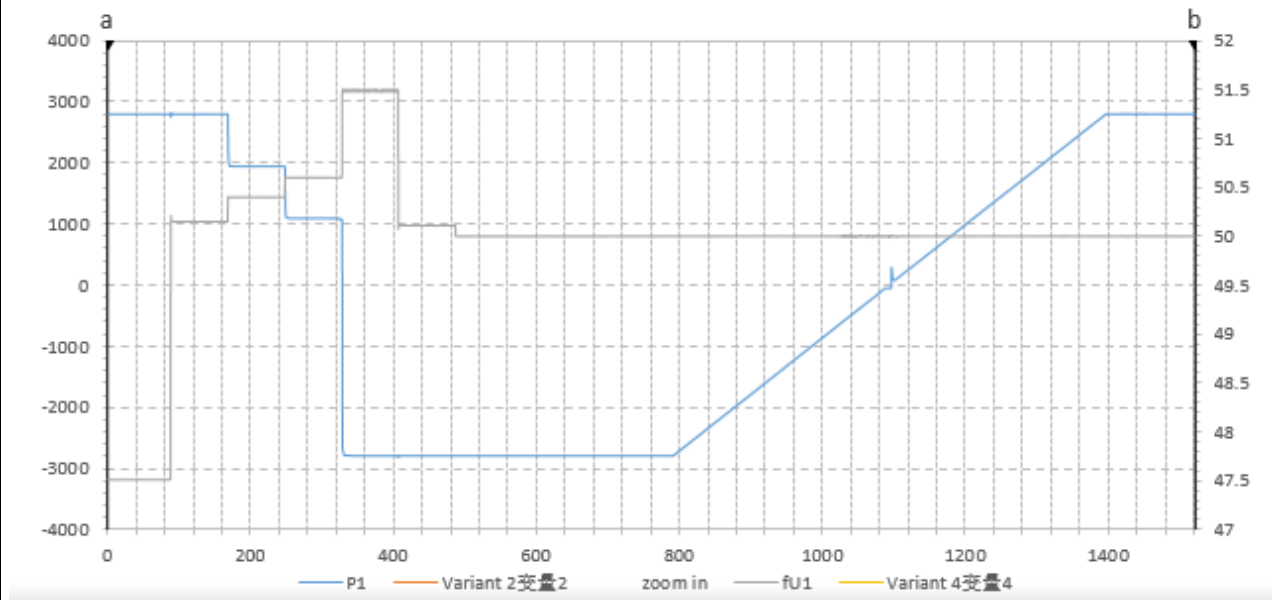
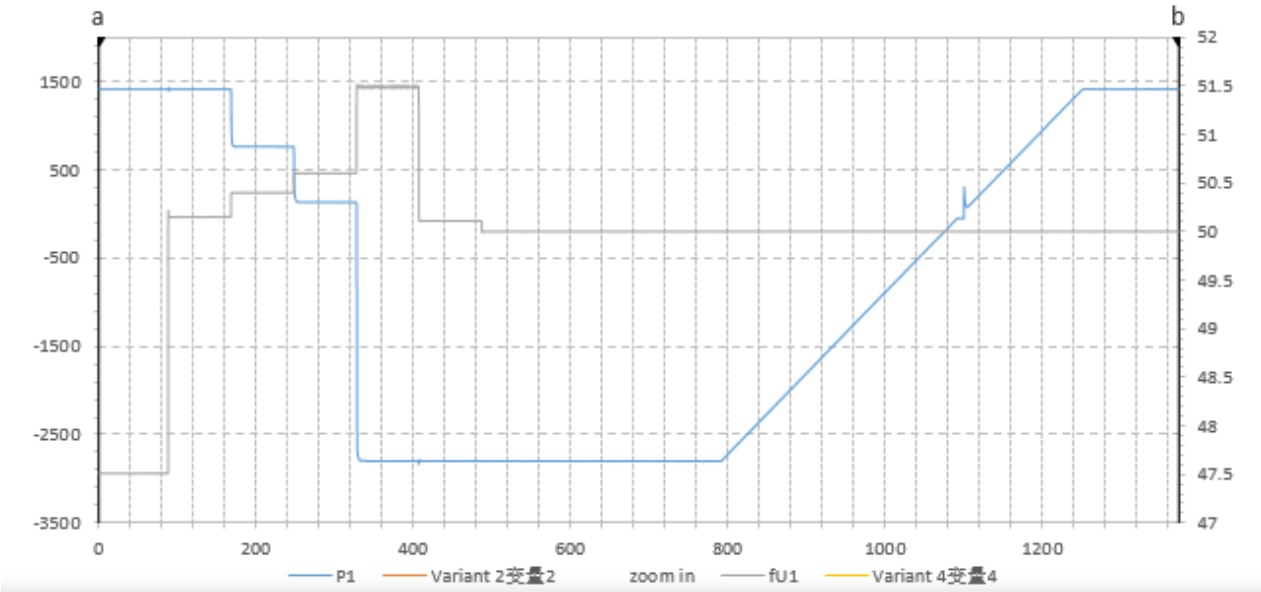
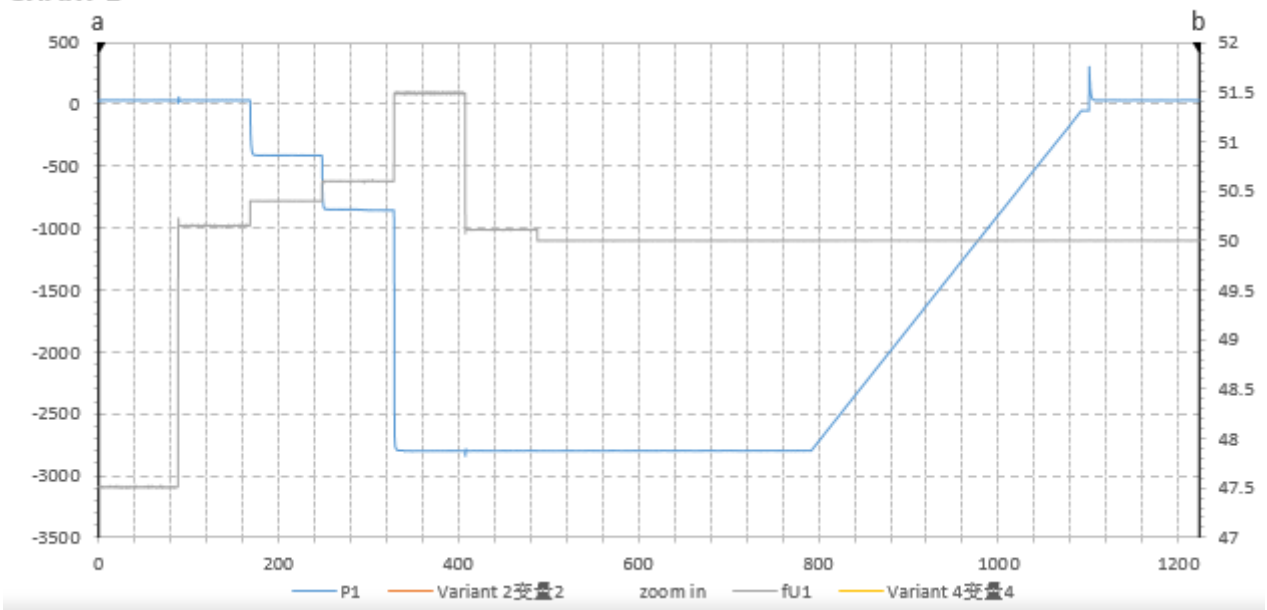
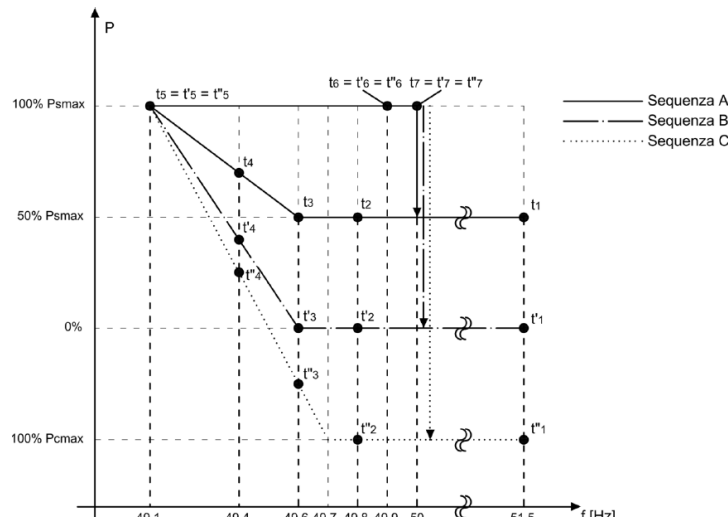
CHART 1


Grafico Sequenza B: Curva di limitazione della potenza attiva rispetto alla frequenza
/ Graph Sequence B: Active power regulation in coincidence with transitory on the transmission grid
CHART 1

Grafico Sequenza C*: Curva di limitazione della potenza attiva rispetto alla frequenza
/ Graph Sequence C: Active power regulation in coincidence with transitory on the transmission grid*
CHART 1


8.5.3.4 8.5.3.5 Bbis.7.3	TABLE: Regolazione della potenza attiva in presenza di transitori sulla rete di trasmissione <i>/Active power regulation in coincidence with transitory on the transmission grid</i>	
Ambient temperature (°C)		25 °C ± 5 °C
Humidity (RH %)		65% ± 5% RH
Instrumentation list.....		See table “Measurement equipment and instrumentation”
Uncertainty		See table
 Figura 11Bbis – Curve di limitazione della potenza attiva		
Supplementary information: Test shall be performed disabling the frequency threshold protection The storage needs an energy capacity of 20% of CUS Test was performed with a sampling time of 200ms Sn is an active nominal power of the inverter		
Operator		see cover page
Supervisor		see cover page
Test Date.....		see cover page

Sequence A						
Step #	Set output power [%]	frequency [Hz]	Expected power value [W]	Actual power values [W]	limits	Graph point
1	50% PS _{max}	51.49	1400	1408.1	± 2.5% S _n	t1
2	50% PS _{max}	49.85	1400	1408.0	± 2.5% S _n	t2
3	50% PS _{max}	49.60	1806	1805.6	± 2.5% S _n	t3
4	50% PS _{max}	49.40	2203	2188.6	± 2.5% S _n	t4
5	50% PS _{max}	49.11	2780	2751.1	± 2.5% S _n	t5
6	50% PS _{max}	49.89	2780	2751.1	± 2.5% S _n	t6
7	50% PS _{max}	50.00	1400	1407.8	± 2.5% S _n	t7
Sequence B						
Step #	Set output power [%]	frequency [Hz]	Expected power value [W]	Actual power values [W]	limits	Graph point
1	0% PS _{max}	51.49	0	33.9	± 2.5% S _n	t1'
2	0% PS _{max}	49.85	0	33.8	± 2.5% S _n	t2'
3	0% PS _{max}	49.60	824	849.3	± 2.5% S _n	t3'
4	0% PS _{max}	49.40	1614	1636.4	± 2.5% S _n	t4'
5	0% PS _{max}	49.11	2760	2787.4	± 2.5% S _n	t5'
6	0% PS _{max}	49.89	2760	2787.6	± 2.5% S _n	t6'
7	0% PS _{max}	50.00	0	33.8	± 2.5% S _n	t7'

Sequence C*						
Step #	Set output power [%]	frequency [Hz]	Expected power value [W]	Actual power values [W]	limits	Graph point
1	100% P _{Cmax}	51.49	-2800	-2802.3	± 2.5% S _n	t1''
2	100% P _{Cmax}	49.85	-2800	-2802.5	± 2.5% S _n	t2''
3	100% P _{Cmax}	49.60	-1202	-1175.6	± 2.5% S _n	t3''
4	100% P _{Cmax}	49.40	399	409.9	± 2.5% S _n	t4''
5	100% P _{Cmax}	49.11	2720	2775.0	± 2.5% S _n	t5''
6	100% P _{Cmax}	49.89	2720	2777.2	± 2.5% S _n	t6''
7	100% P _{Cmax}	50.00	-2800	-2801.6	± 2.5% S _n	t7''

**Sequence C applicable only for bidirectional converters.*

Grafico Sequenza A: Curva di limitazione della potenza attiva rispetto alla frequenza

/ Graph Sequence A: Active power regulation in coincidence with transitory on the transmission grid

CHART 1

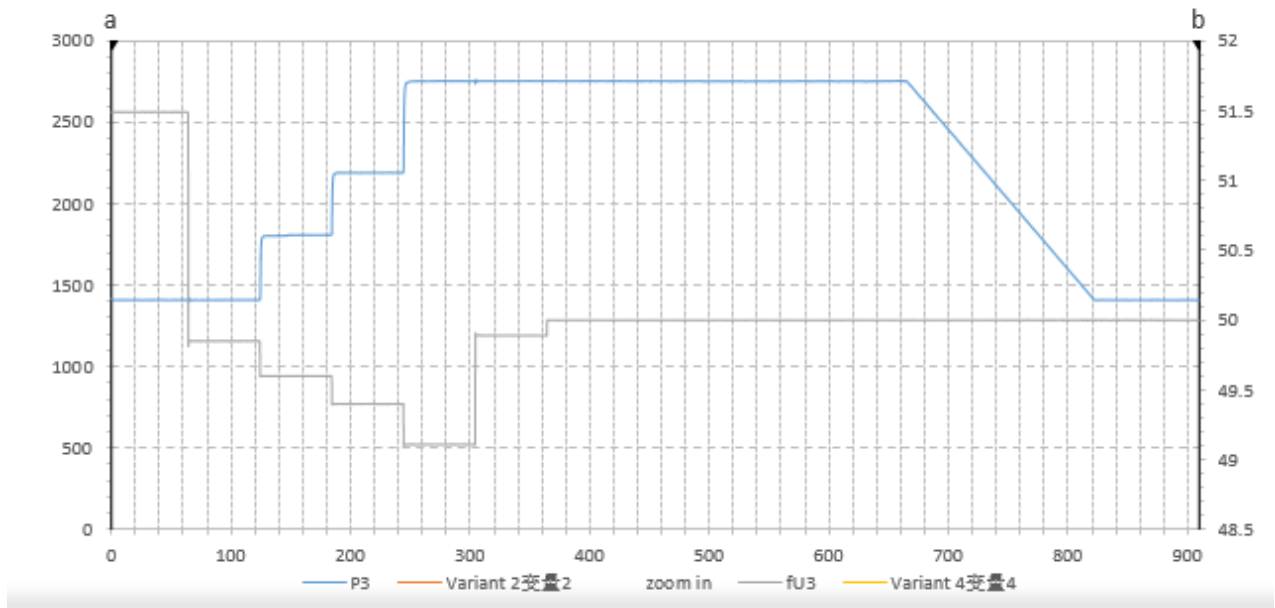
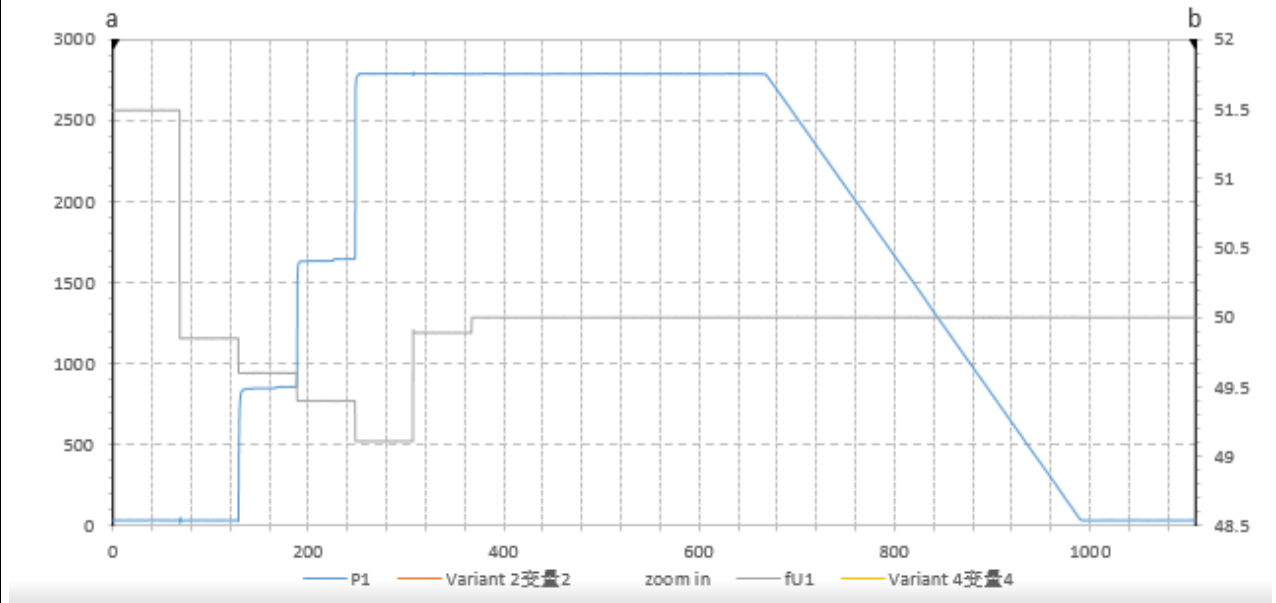
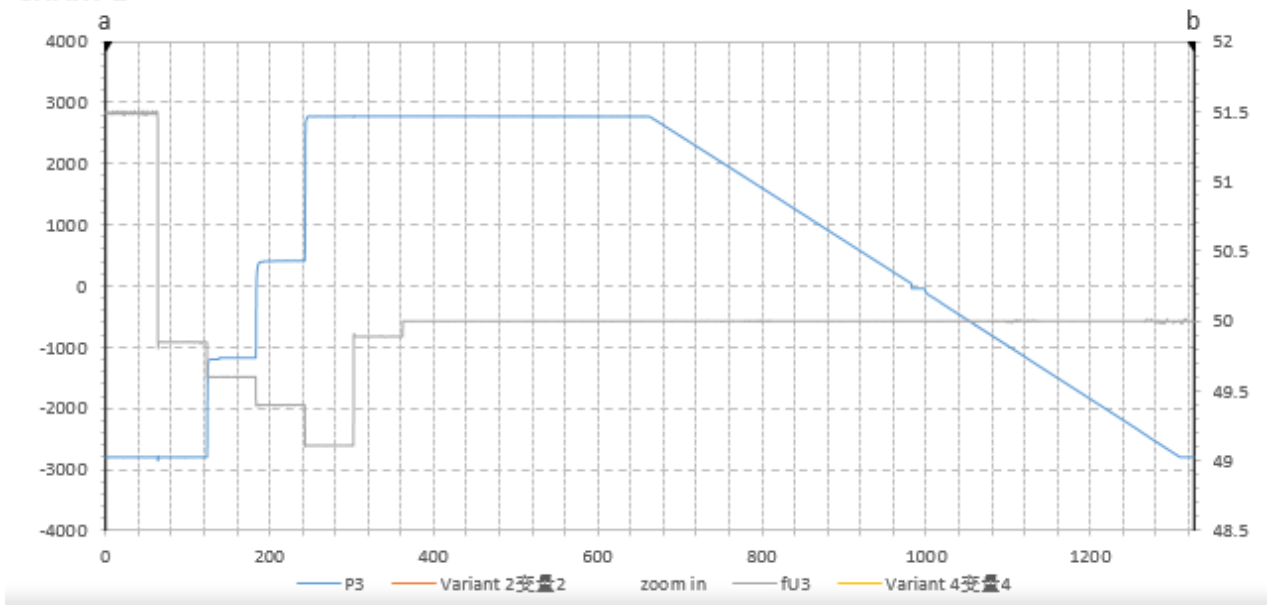


Grafico Sequenza B: Curva di limitazione della potenza attiva rispetto alla frequenza
/ Graph Sequence B: Active power regulation in coincidence with transitory on the transmission grid
CHART 1

Grafico Sequenza C*: Curva di limitazione della potenza attiva rispetto alla frequenza
/ Graph Sequence C: Active power regulation in coincidence with transitory on the transmission grid*
CHART 1


TEST REPORT END

PHOTO DOCUMENTATION

CN22EMBE 001

for

ALL-IN-ONE ENERGY STORAGE SYSTEM With
Storage Battery System

BU2-5.0-HV1

Guangzhou Sanjing Electric Co., Ltd.



This documentation consists of 38 pages (excluding this cover page)

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.

Photos:



Figure 1. Front view for model
HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X,
HS2-3K-S2-X,
AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X
Configure 1 battery module



Figure 2. Left view for model
HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X,
HS2-3K-S2-X
Configure 1 battery module

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.

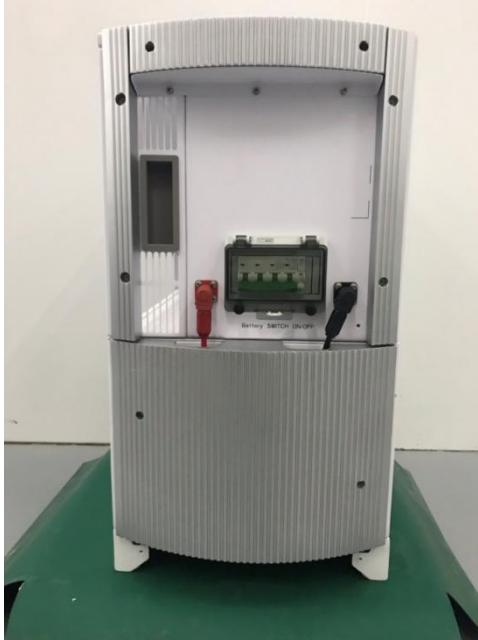


Figure 3. Left view for model
AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X
Configure 1 battery module

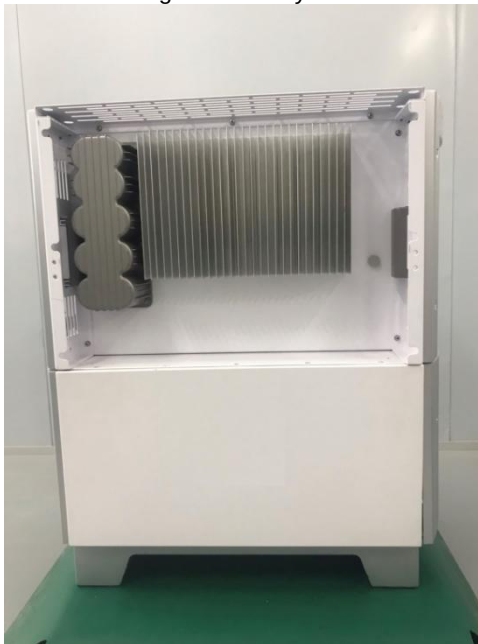


Figure 4. Back view for model
HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X,
HS2-3K-S2-X,
AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X
Configure 1 battery module

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.



Figure 5. Right view for model
HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X,
HS2-3K-S2-X,
AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X
Configure 1 battery module



Figure 6. Battery side connected view for model
HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X,
HS2-3K-S2-X
Configure 1 battery module

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.



Figure 7. Battery side connected view for model AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X Configure 1 battery module



Figure 8. Communication side connected view for model HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X, HS2-3K-S2-X, AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X Configure 1 battery module

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.



Figure 9. Front view for model
HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X,
HS2-3K-S2-X,
AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X
Configure 2 battery module

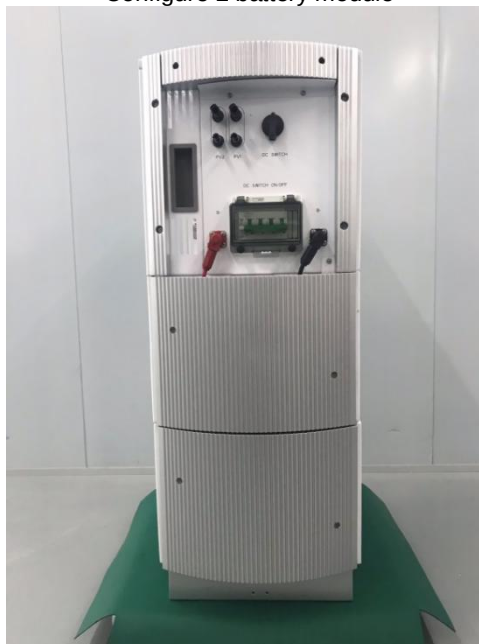


Figure 10. Left view for model
HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X,
HS2-3K-S2-X,
Configure 2 battery module

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.

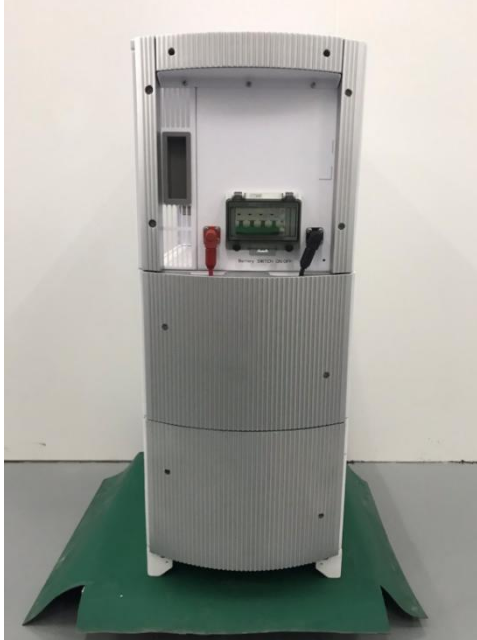


Figure 11. Left view for model
AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X
Configure 2 battery module



Figure 12. Back view for model
HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X,
HS2-3K-S2-X,
AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X
Configure 2 battery module

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.



Figure 13. Right view for model
HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X,
HS2-3K-S2-X,
AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X
Configure 2 battery module



Figure 14. Battery side connected view for model
HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X,
HS2-3K-S2-X,
Configure 2 battery module

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.



Figure 15. Battery side connected view for model
AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X
Configure 2 battery module



Figure 16. Communication side connected view for model
HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X,
HS2-3K-S2-X,
AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X
Configure 2 battery module

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.



Figure 17. Front view for model
HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X,
HS2-3K-S2-X,
AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X
Configure 3 battery module



Figure 18. Left view for model
HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X,
HS2-3K-S2-X
Configure 3 battery module

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.



Figure 19. Left view for model
AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X
Configure 3 battery module



Figure 20. Back view for model
HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X,
HS2-3K-S2-X,
AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X
Configure 3 battery module

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.



Figure 21. Right view for model
HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X,
HS2-3K-S2-X,
AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X
Configure 3 battery module



Figure 22. Battery side connected view for model
HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X,
HS2-3K-S2-X,
Configure 3 battery module

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.

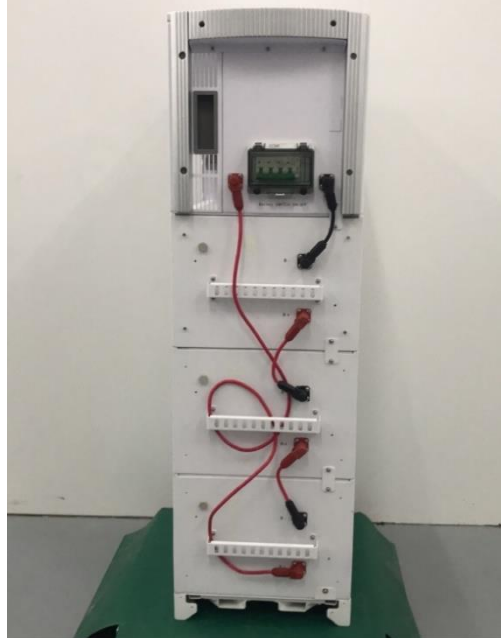


Figure 23. Battery side connected view for model
AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X
Configure 3 battery module



Figure 24. Communication side connected view for model
HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X,
HS2-3K-S2-X,
AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X
Configure 3 battery module

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.



FigureV25. Front view for model
HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X,
HS2-3K-S2-X,
AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X
Configure 4 battery module



Figure 26. Left view for model
HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X, HS2-3K-S2-X
Configure 4 battery module

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.



Figure 27. Left view for model
AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X
Configure 4 battery module



Figure 28. Back view for model
HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X,
HS2-3K-S2-X,
AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X
Configure 4 battery module

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.



Figure 29. Right view for model
HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X,
HS2-3K-S2-X,
AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X
Configure 4 battery module



Figure 30. Battery side connected view for model
HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X,
HS2-3K-S2-X
Configure 4 battery module

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.



Figure 31. Battery side connected view for model
AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X
Configure 4 battery module



Figure 32. Communication side connected view for model
HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X,
HS2-3K-S2-X,
AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X
Configure 4 battery module

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.

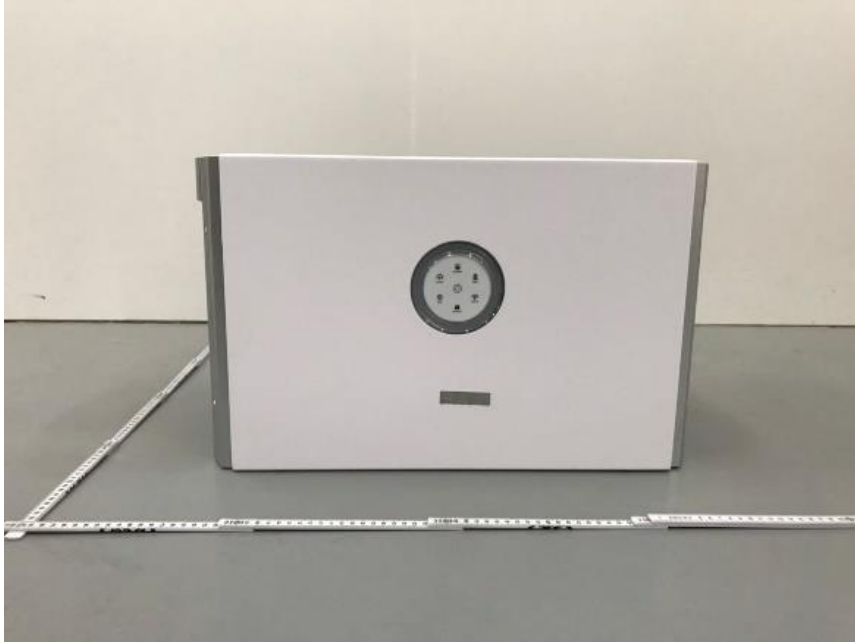


Figure 33. Front view of Inverter part for model
HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X,
HS2-3K-S2-X,
AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X



Figure 34. Left view of Inverter part for model
HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X,
HS2-3K-S2-X

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.

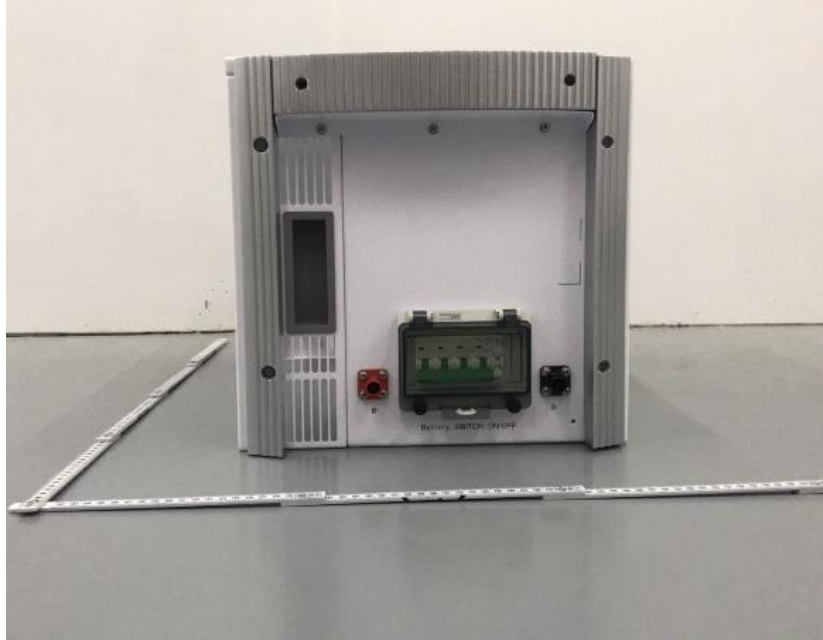


Figure 35. Left view of Inverter part for model
AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X

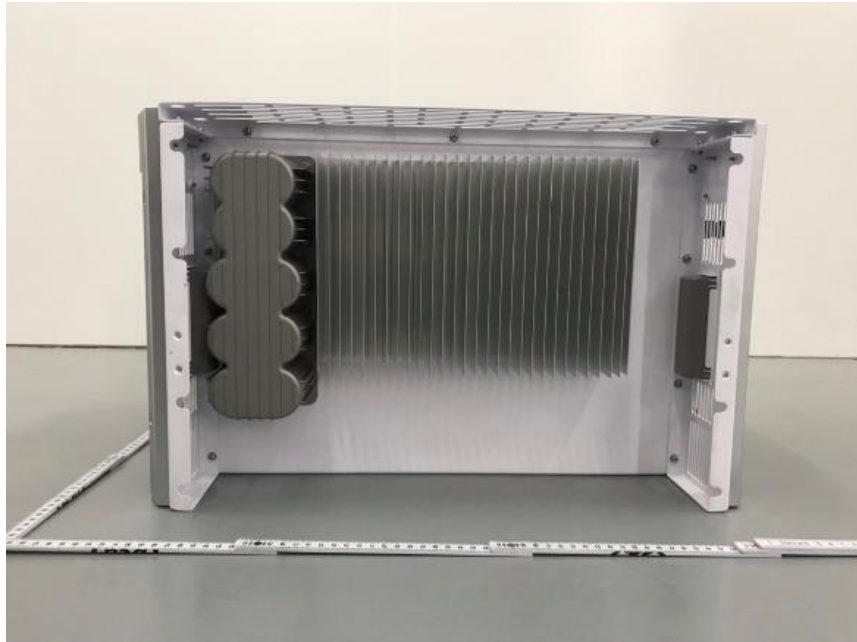


Figure 36. Back view of Inverter part for model
HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X, HS2-3K-S2-X,
AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.

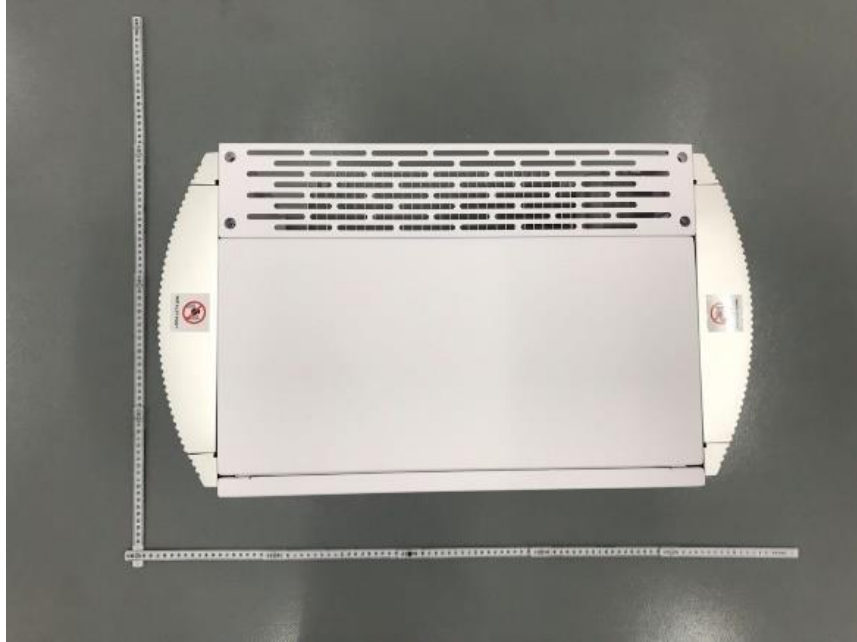


Figure 37. Top view of Inverter part for model
HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X,
HS2-3K-S2-X,
AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X



Figure 38. Communication terminal view of Inverter part for model
HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X,
HS2-3K-S2-X,
AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.



Figure 39. Internal view-1 of Inverter part for model HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X, HS2-3K-S2-X

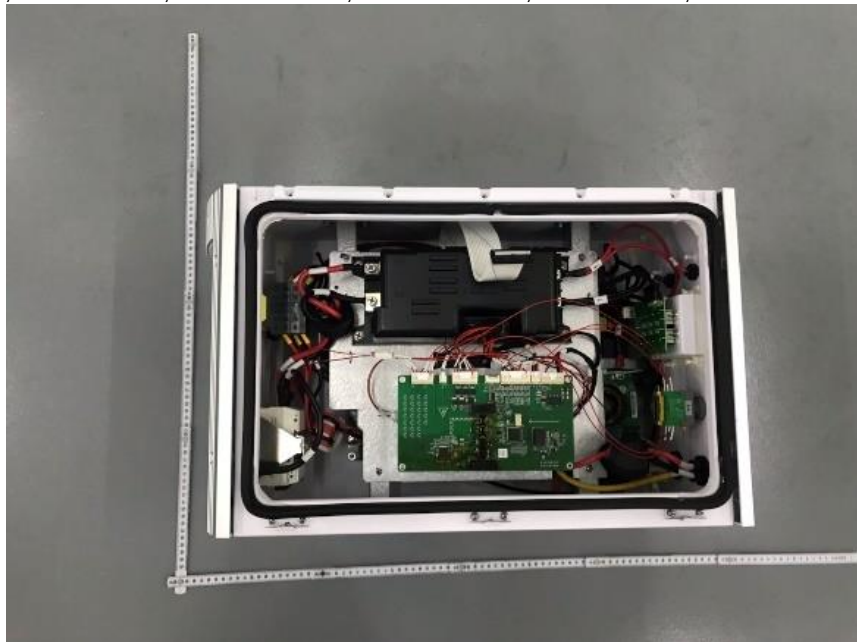


Figure 40. Internal view-2 of Inverter part for model HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X, HS2-3K-S2-X

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.

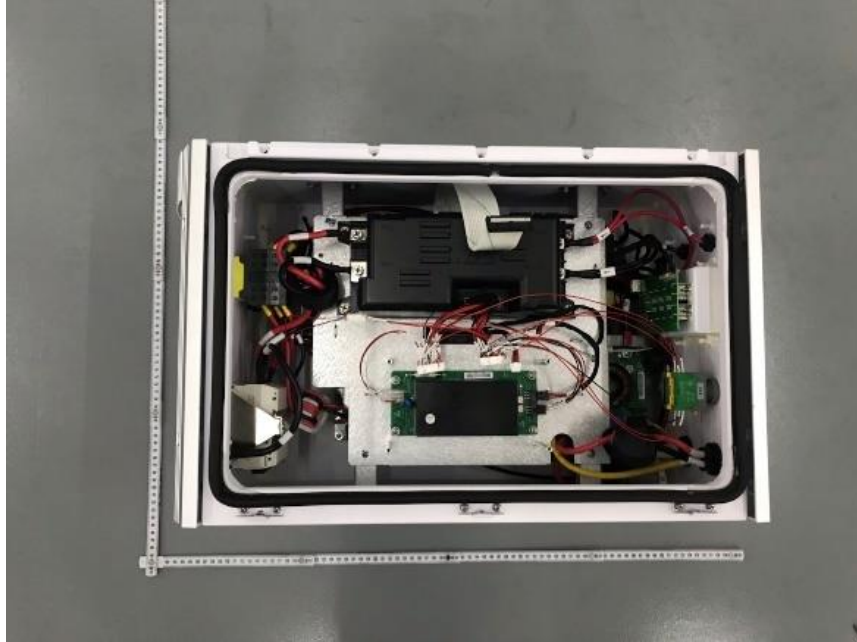


Figure 41. Internal view-3 of Inverter part for model HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X, HS2-3K-S2-X

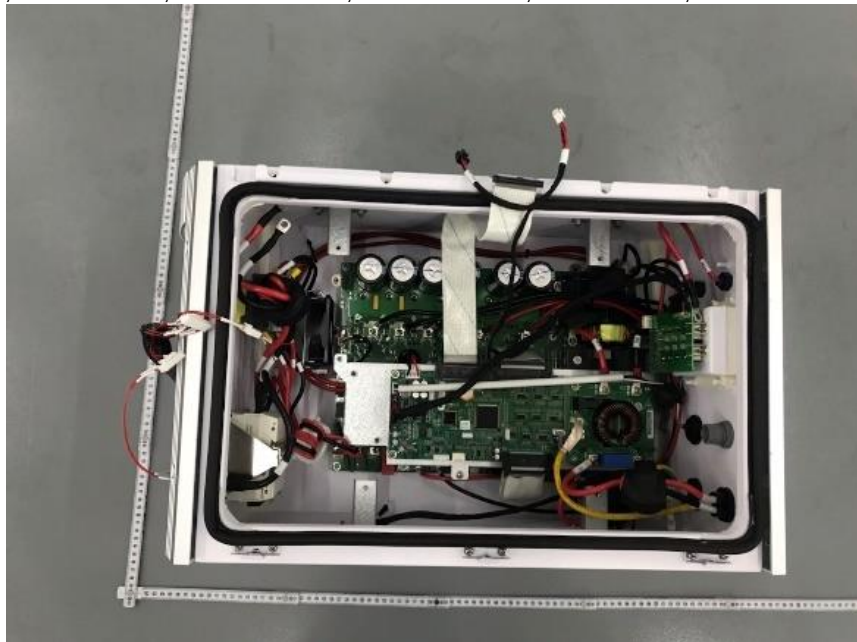


Figure 42. Internal view-4 of Inverter part for model HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X, HS2-3K-S2-X

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.

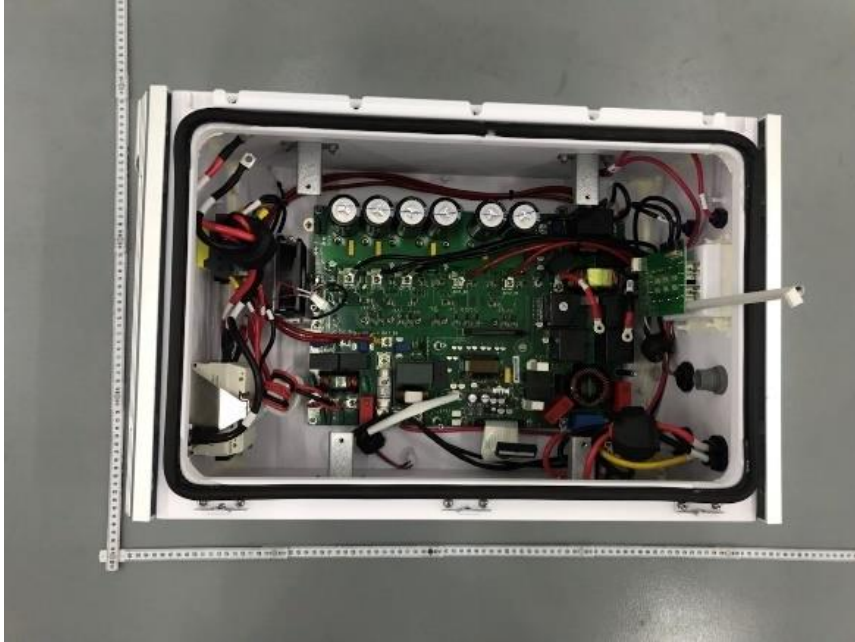


Figure 43. Internal view-5 of Inverter part for model HS2-6K-S2-X, HS2-5K-S2-X, HS2-5K-S2-B-X, HS2-4.6K-S2-X, HS2-4K-S2-X, HS2-3.6K-S2-X, HS2-3K-S2-X

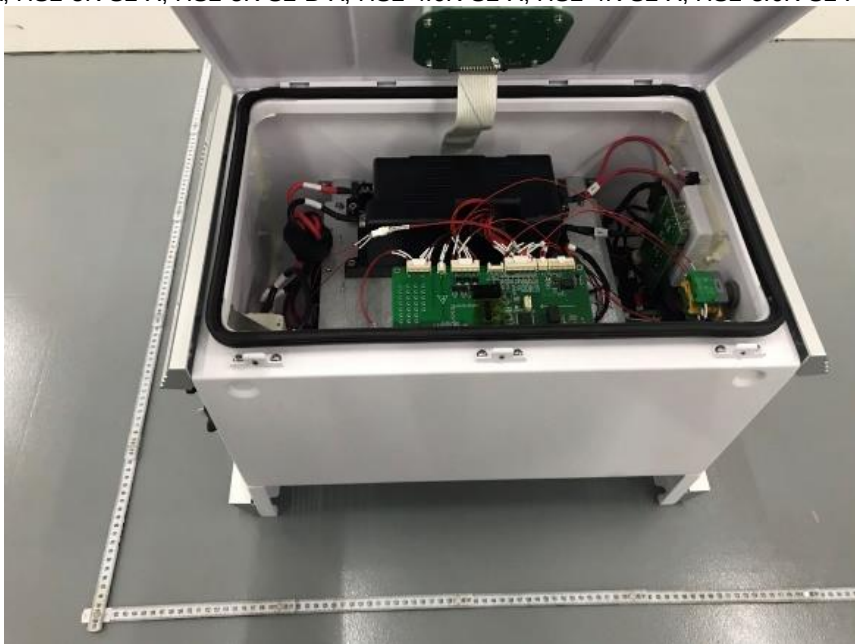


Figure 44. Internal view-1 of Inverter part for model AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.

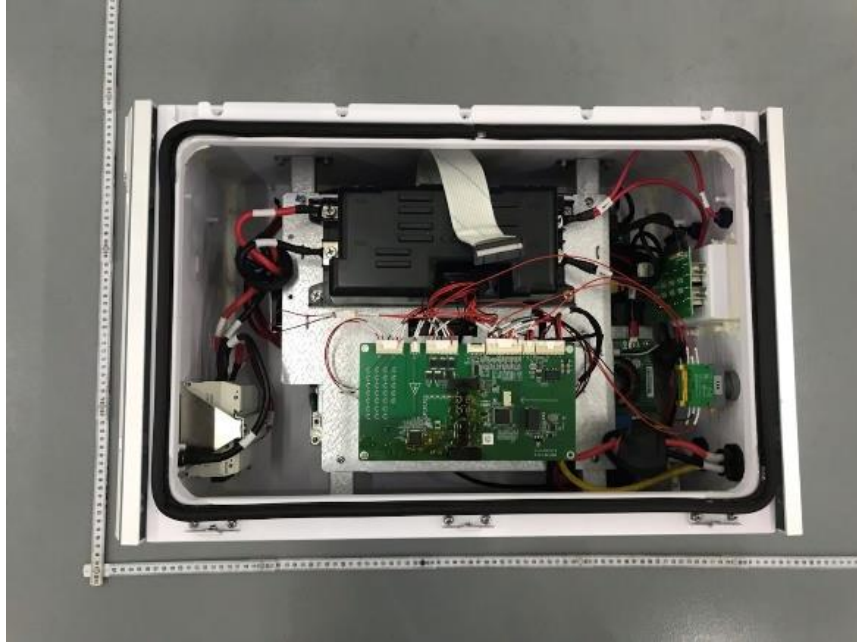


Figure 45. Internal view-2 of Inverter for model AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X

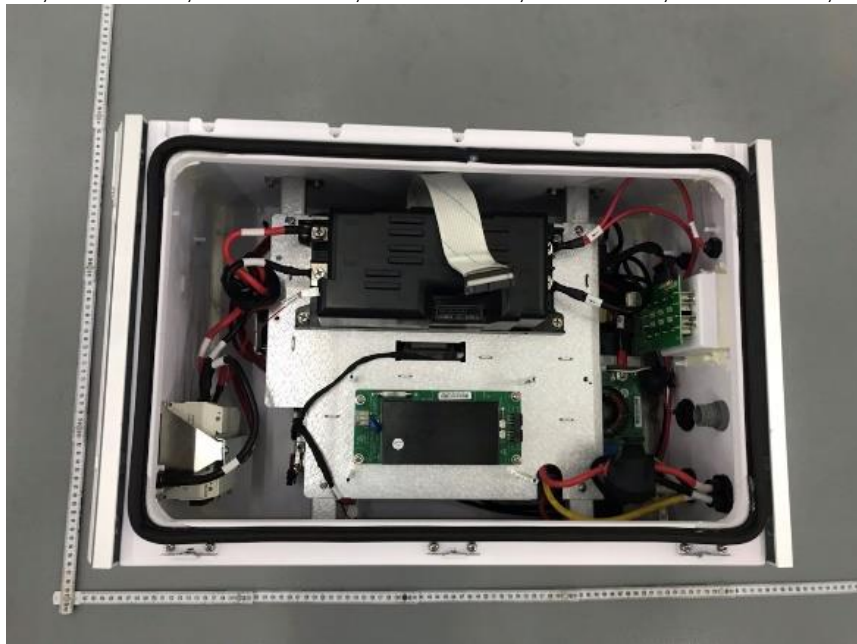


Figure 46. Internal view-3 of Inverter part for model AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.



Figure 47. Internal view-4 of Inverter part for model AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X

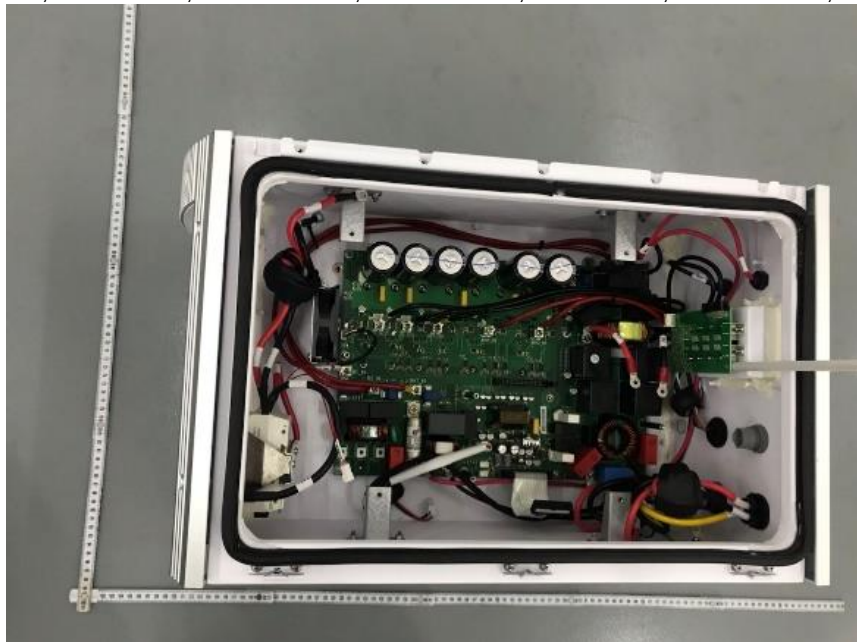


Figure 48. Internal view-5 of Inverter part for model AS2-6K-S-X, AS2-5K-S-X, AS2-5K-S-B-X, AS2-4.6K-S-X, AS2-4K-S-X, AS2-3.6K-S-X, AS2-3K-S-X

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.

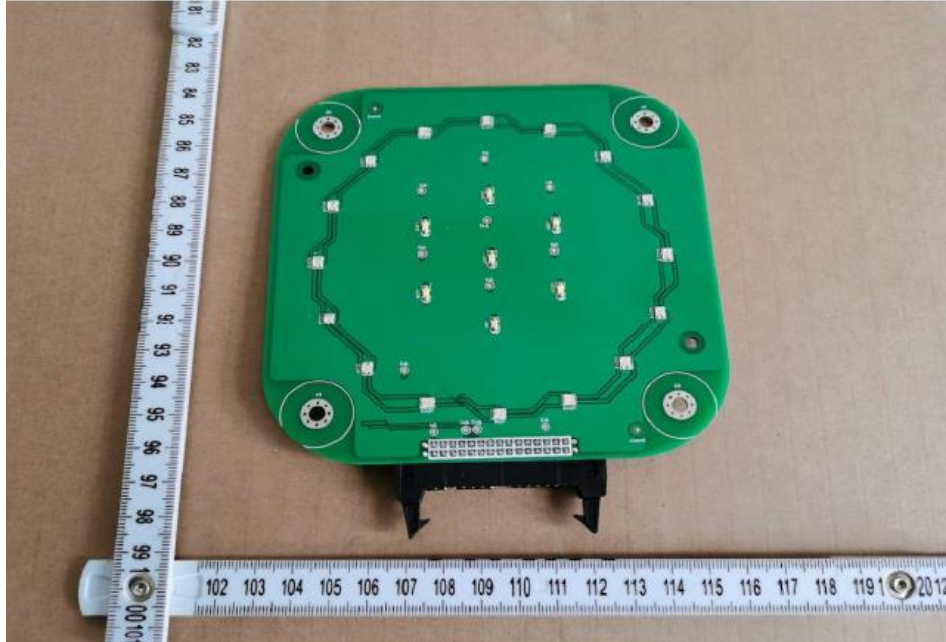


Figure 49. Front view of Display board

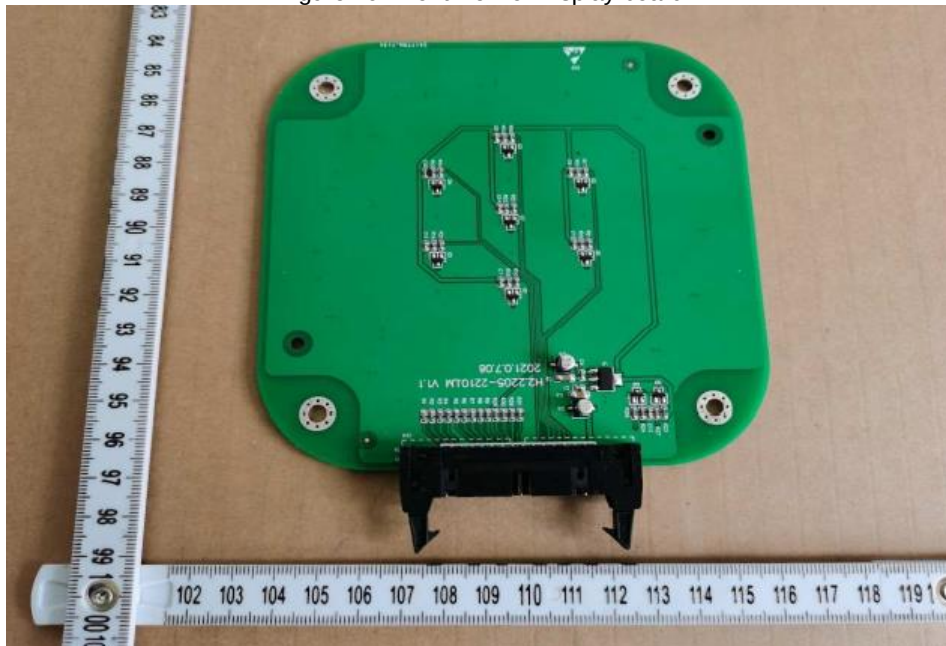


Figure 50. Back view of Display board

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.

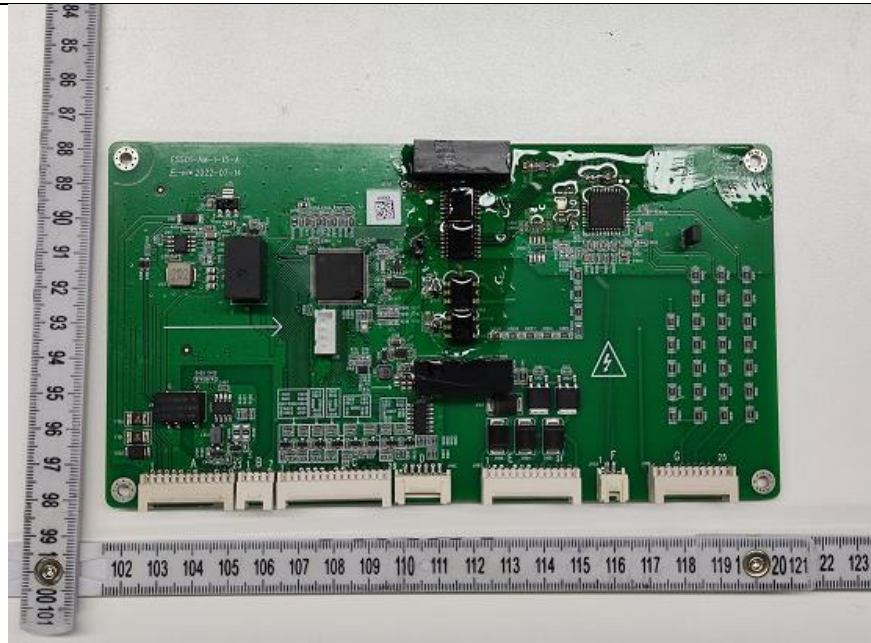


Figure 51. Front view of Main BMS board

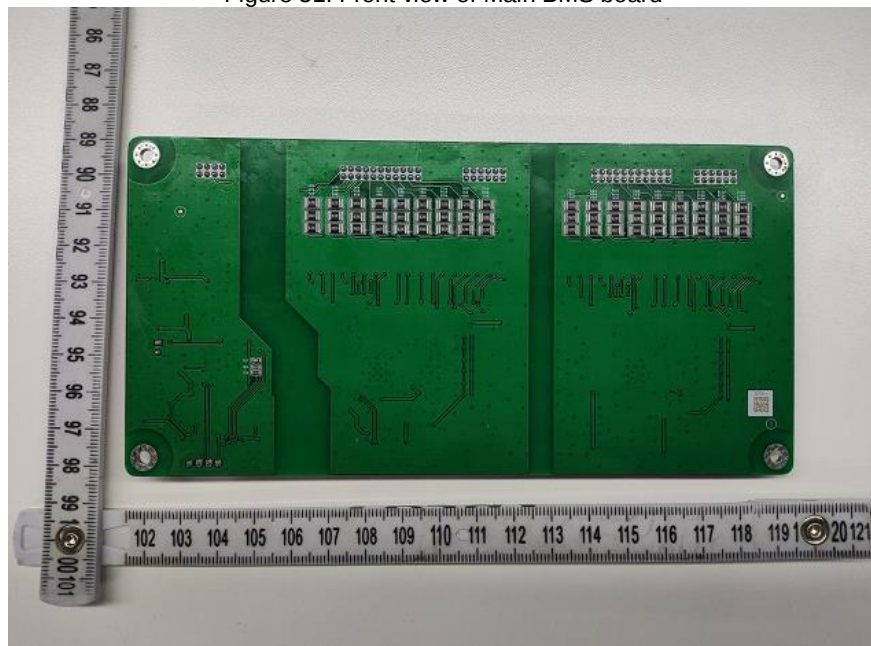


Figure 52. Back view of Main BMS board

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.



Figure 53. BDU Oversize view

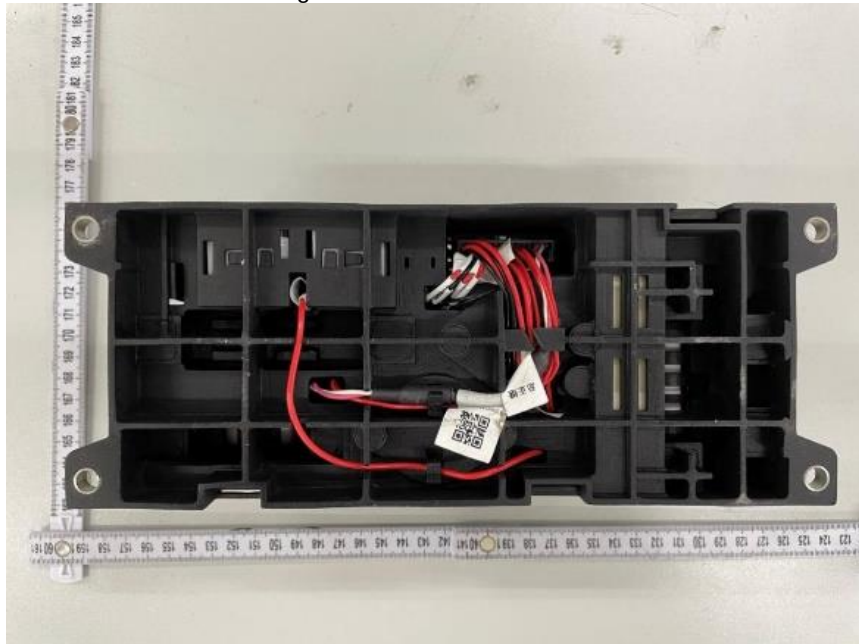


Figure 54. BDU bottom view

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.

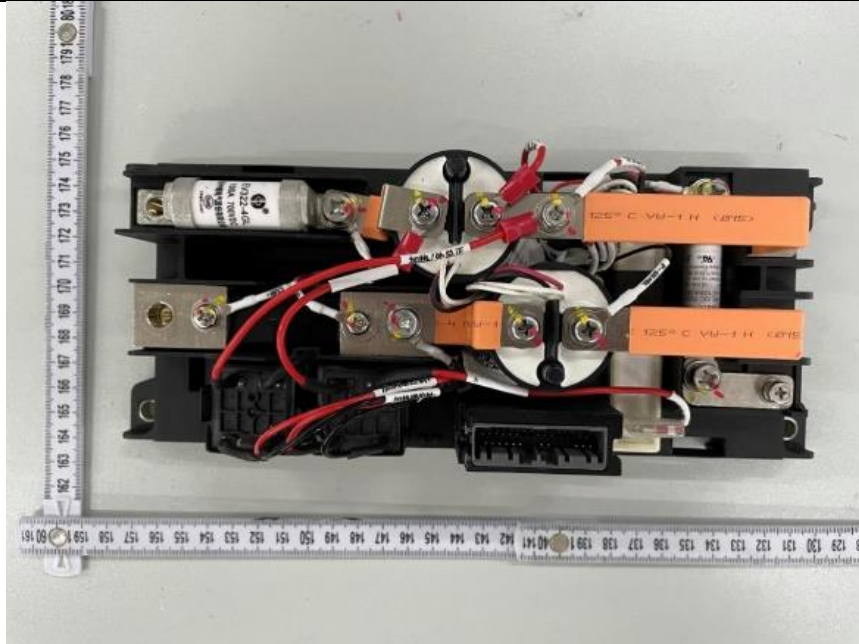


Figure 55. BDU internal view

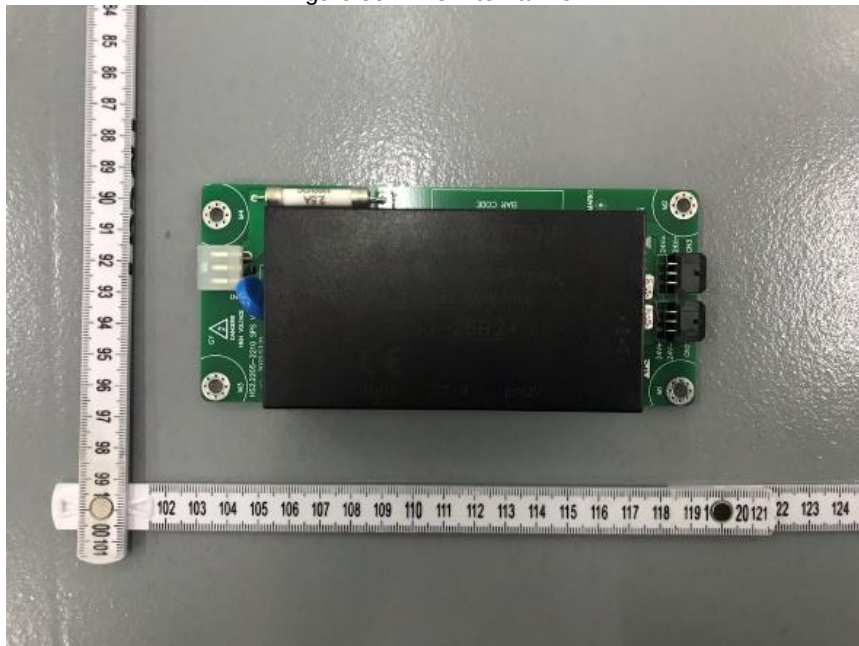


Figure 56. Front view of DC-DC Power module

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.

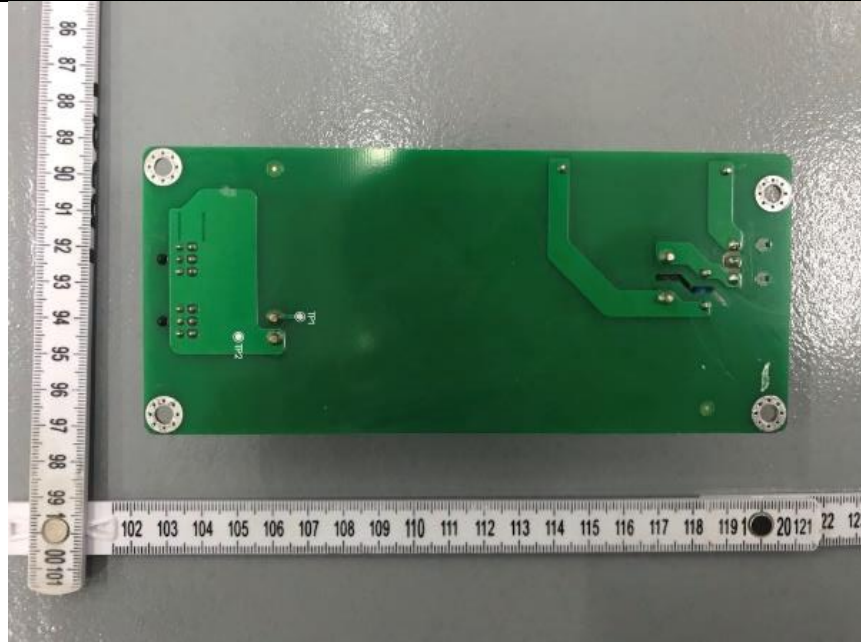


Figure 57. Back view of DC-DC Power module

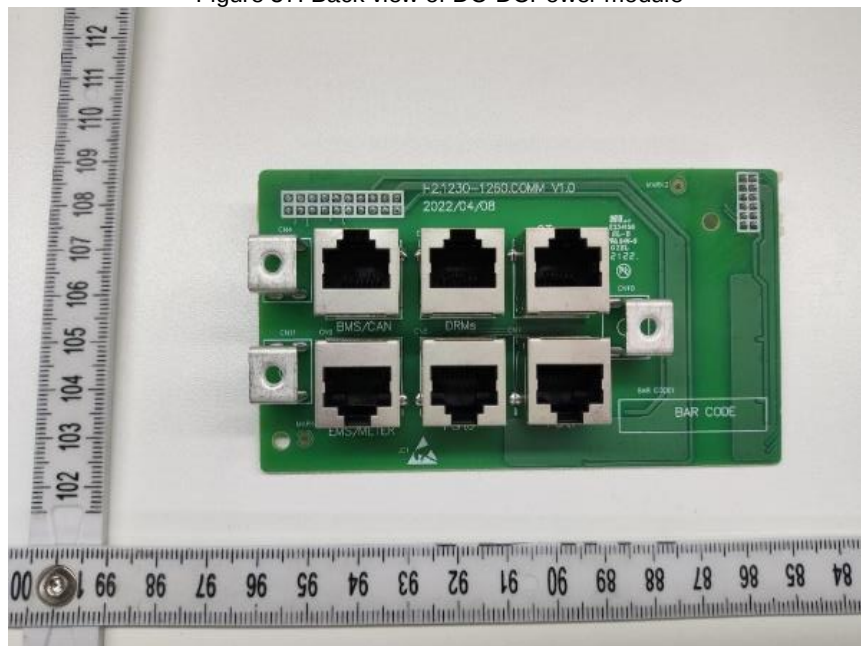


Figure 58. Front view of Communication board

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.

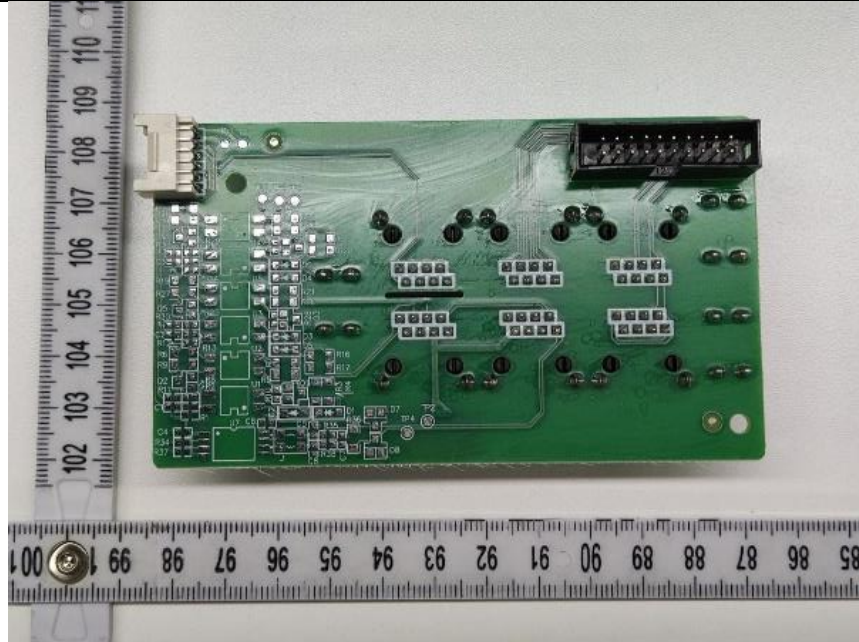


Figure 59. Back view of Communication board

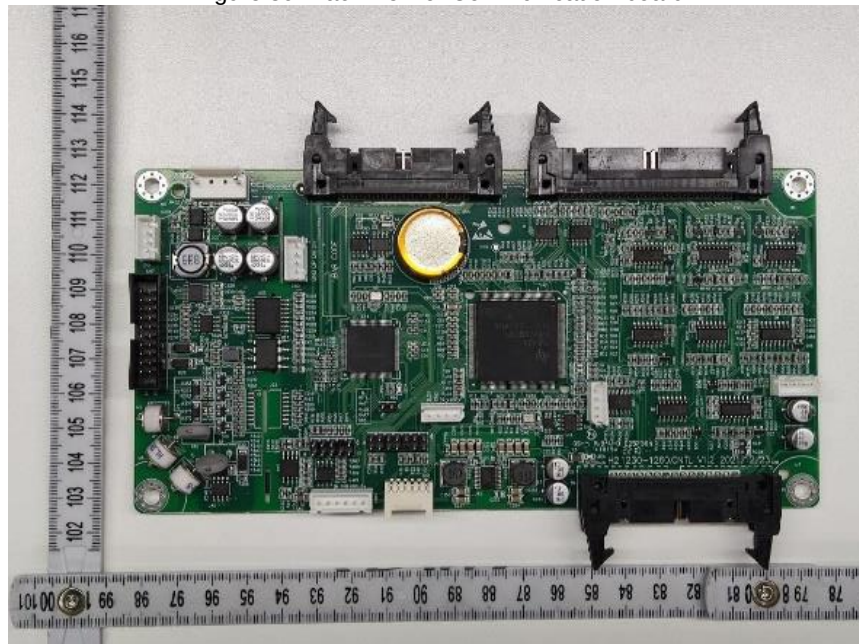


Figure 60. Front view of Control board

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.

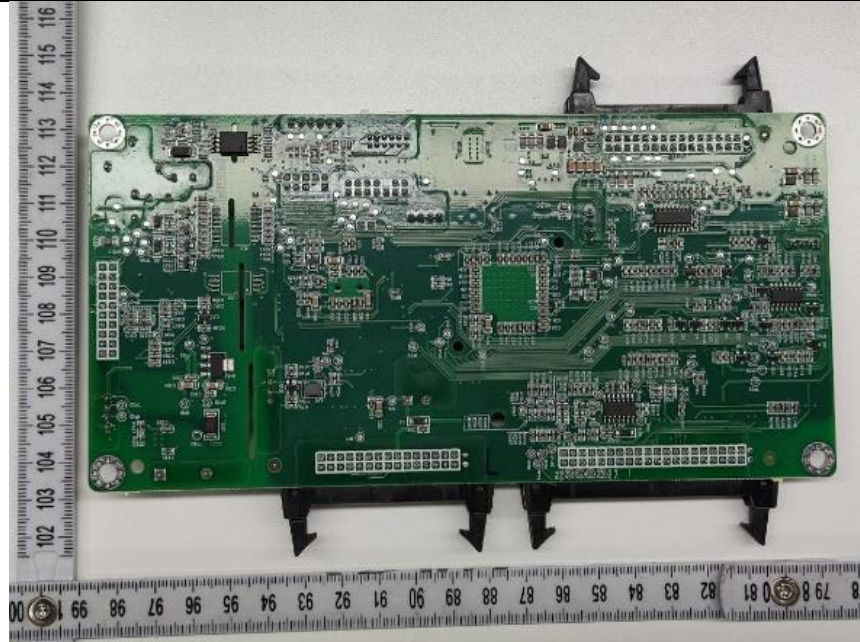


Figure 61. Back view of Control board



Figure 62. Front view of Main power board

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.

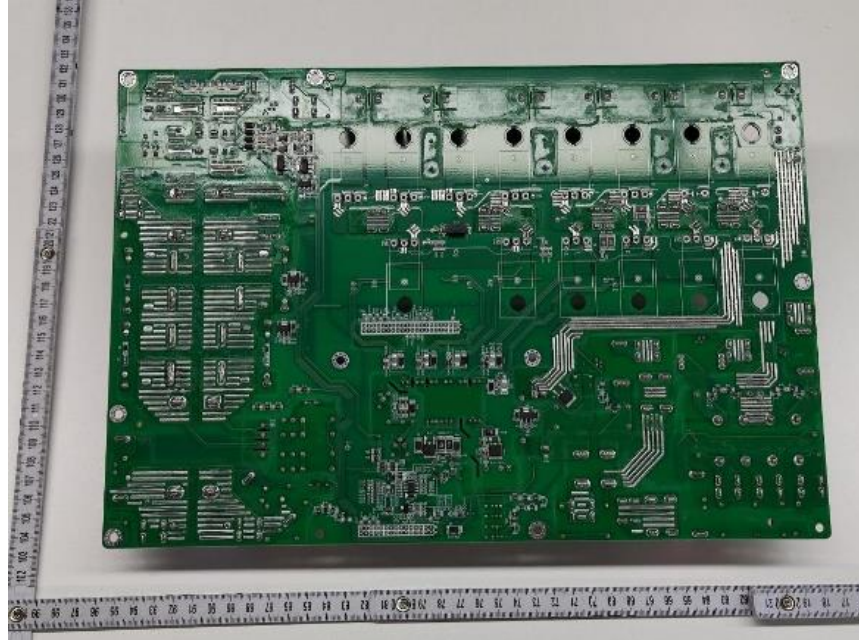


Figure 63. Back view of Main power board



Figure 64. Front view of EMI board

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.

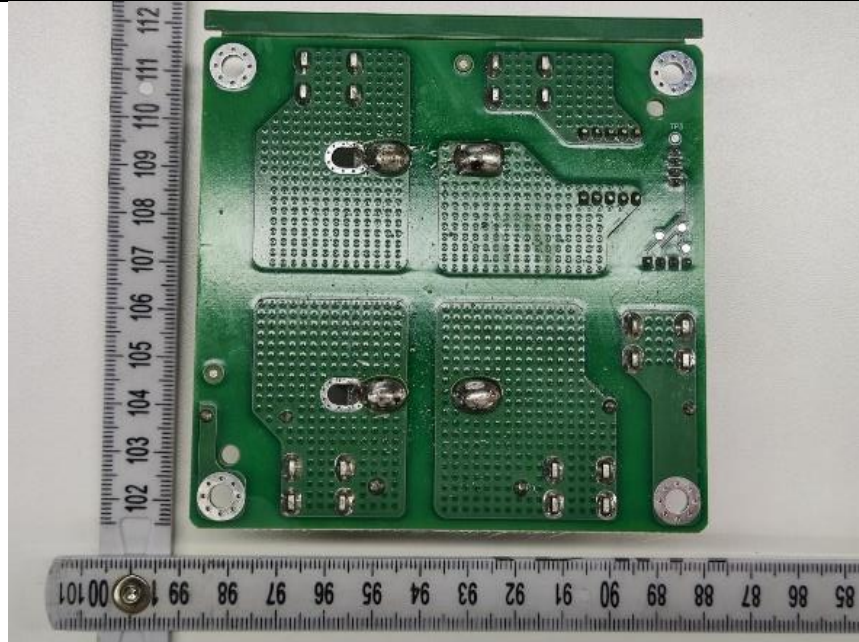


Figure 65. Back view of EMI board



Figure 66. Battery module oversized view

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.



Figure 67. Battery module side view- Communicate port



Figure 68. Battery module side view- DC connector

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.

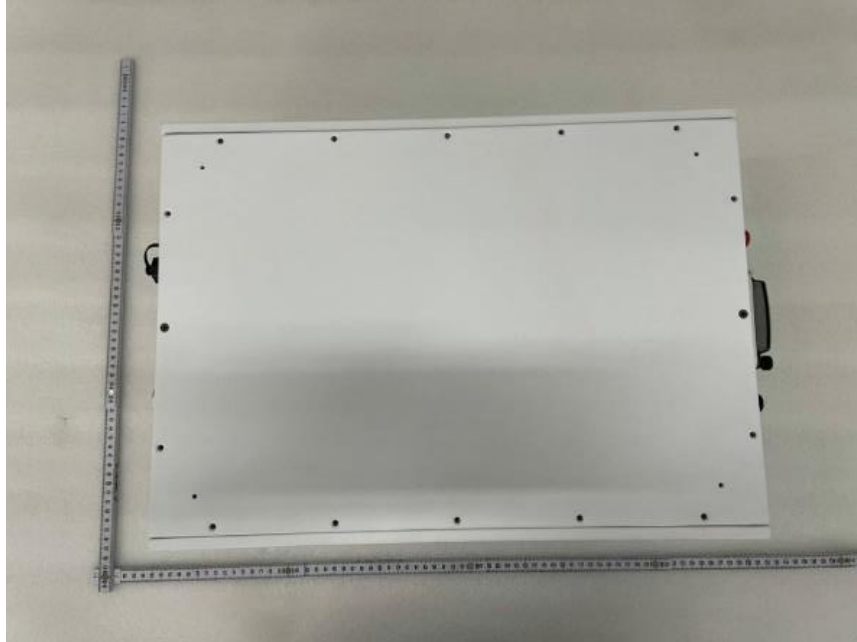


Figure 69. Battery module bottom view

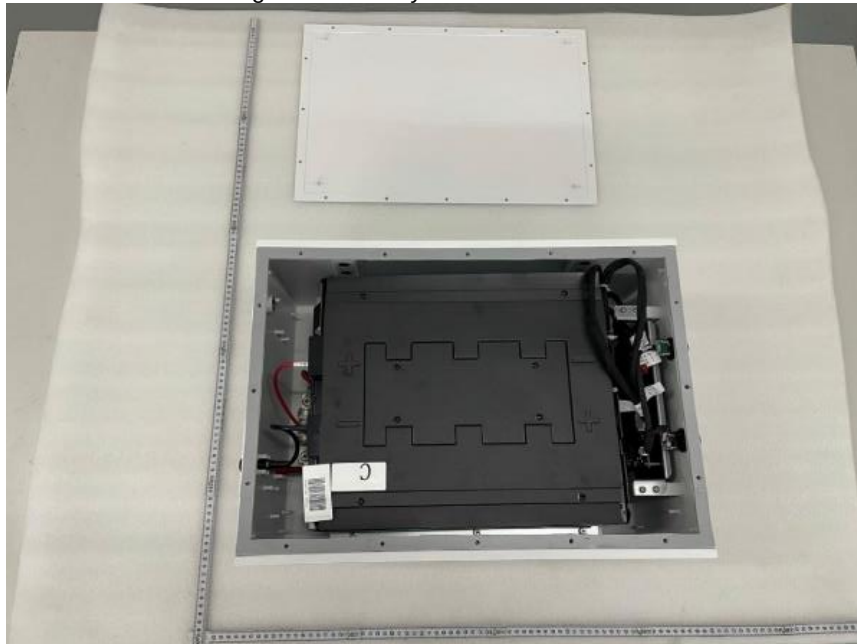


Figure 70. Battery module internal view

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.

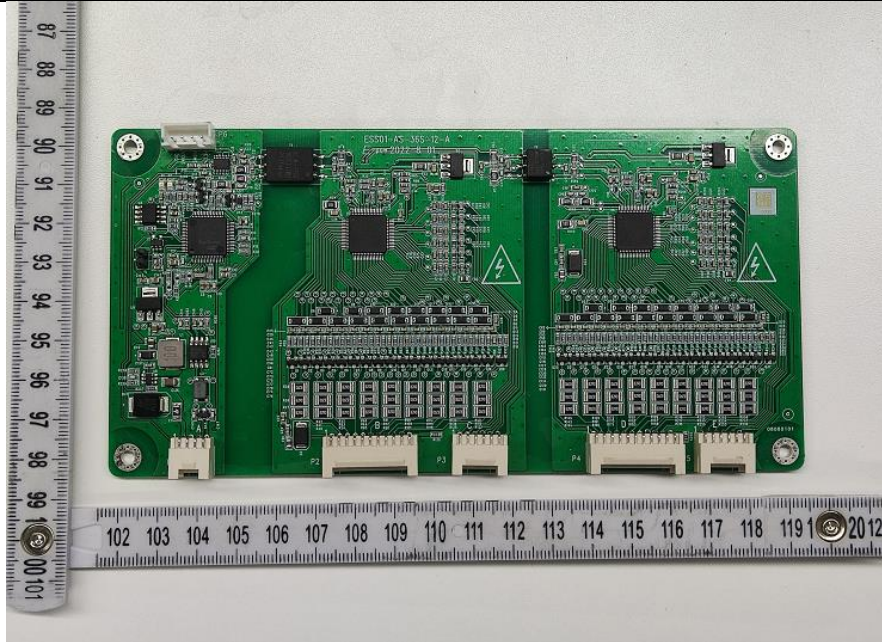


Figure 71. Front view of battery module slave BMS board

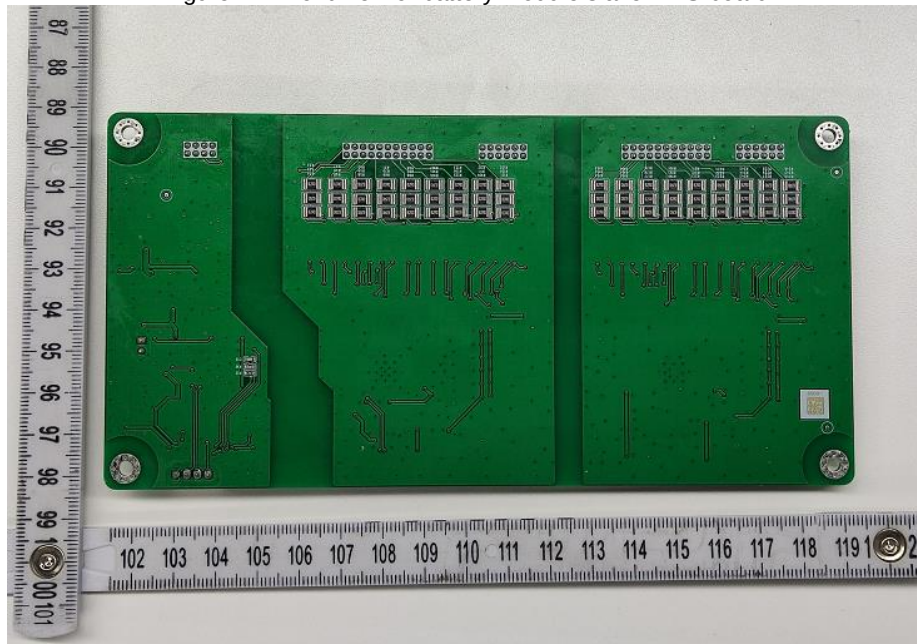


Figure 72. Back view of battery module slave BMS board

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.



Figure 73. Battery cell oversize view

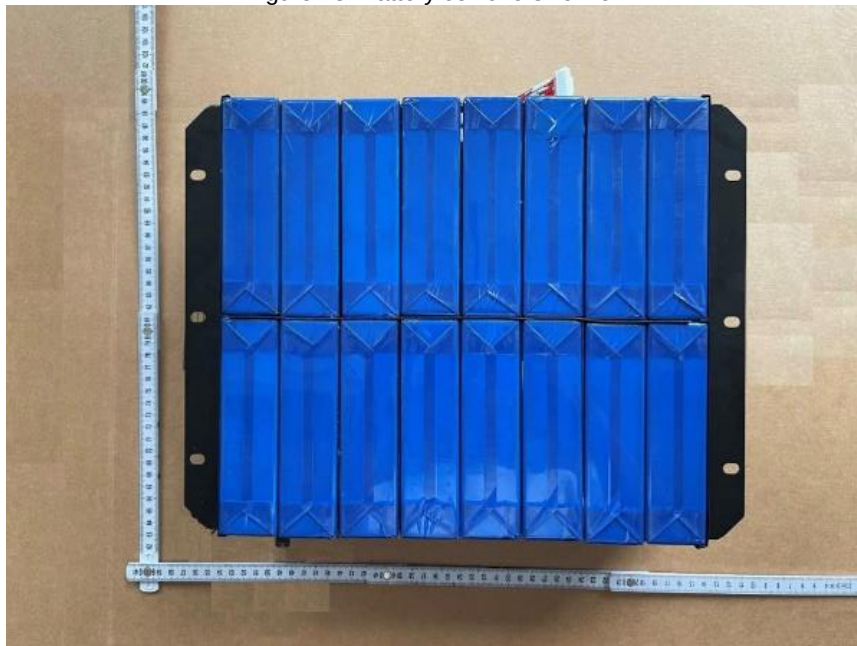


Figure 74. Battery cell bottom view

Report Number: CN22EMBE 001

Model: HS2-xxK-S2-X (xx=3, 3.6, 4, 4.6, 5, 6), HS2-5K-S2-B-X, Note: X=1,2,3,4 (Number of Battery Modules); AS2-yyK-S-X (yy=3, 3.6, 4, 4.6, 5, 6), AS2-5K-S-B-X, Note: X=1,2,3,4 (Number of Battery Modules) with Storage Battery System BU2-5.0-HV1.



Figure 75. Battery cell side view