

Prüfbericht-Nr.: Test report no.:	CN24E4X5 001	Auftrags-Nr.: Order no.:	190149512	Seite 1 von 11 Page 1 of 11
Kunden-Referenz-Nr.: Client reference no.:	2542484	Auftragsdatum: Order date:	2023.08.14	
Auftraggeber: Client:	Langfang IN-Power Electric Co., Ltd. No.68 Lotus Rd, Economic&Technical Development Zone, Langfang, Hebei, 065001, P.R.China			
Prüfgegenstand: Test item:	Power Conversion System			
Bezeichnung / Typ-Nr.: Identification / Type no.:	INPPCS-100/0.4-W-14-C1-OS, INPPCS-100/0.4-W-24-C1-OS			
Auftrags-Inhalt: Order content:	A3 Certification			
Prüfgrundlage: Test specification:	VDE-AR-N 4105/11.18 <i>Erzeugungsanlagen am Niederspannungsnetz – Technische Mindestanforderungen für Anschluss und Parallelbetrieb von Erzeugungsanlagen am Niederspannungsnetz</i> <i>Generators connected to the low-voltage distribution network – Technical requirements for the connection to and parallel operation with low-voltage distribution networks</i>			
Wareneingangsdatum: Date of sample receipt:	2023.08.16			
Prüfmuster-Nr.: Test sample no.:	A003653835-001			
Prüfzeitraum: Testing period:	2023.12.21- 2024.01.20			
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: Ruiyang Ding	X 	genehmigt von: authorized by: Chu Sun	X 	
Datum: Date:	2024.01.30	Ausstellungsdatum: Issue date:	2024.01.30	
Stellung / Position:	Project Engineer	Stellung / Position:	Reviewer	
Sonstiges / Other:	N/A			
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. 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>				

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Anmerkungen
Remarks

1	Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben. Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden. <i>The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.</i>
2	Wie vertraglich vereinbart, wurde dieses Dokument nur digital unterzeichnet. Der TÜV Rheinland hat nicht überprüft, welche rechtlichen oder sonstigen diesbezüglichen Anforderungen für dieses Dokument gelten. Diese Überprüfung liegt in der Verantwortung des Benutzers dieses Dokuments. Auf Verlangen des Kunden kann der TÜV Rheinland die Gültigkeit der digitalen Signatur durch ein gesondertes Dokument bestätigen. Diese Anfrage ist an unseren Vertrieb zu richten. Eine Umweltgebühr für einen solchen zusätzlichen Service wird erhoben. Informationen zur Verifizierung der Authentizität unserer Dokumente erhalten Sie auf folgender Webseite: go.tuv.com/digital-signature <i>As contractually agreed, this document has been signed digitally only. TUV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TUV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged. For information on verifying the authenticity of our documents, please visit the following website: go.tuv.com/digital-signature</i>
3	Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt. <i>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report.</i> <i>Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</i>
4	Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnissen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezüglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019. <i>The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.</i>

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Liste der verwendeten Prüfmittel
List of used test equipment

Equip.	Description	Model	Manufacturer
9017073	Power Analyser(DEWETRON)	DEWE2-PA7	Austria, DEWETRON
9017078	Programmable AC Source(61860)	61860	Chroma ATE INC.
G1819268	Anti-islanding test detection devices	ACLT-4830H	QUNLING Energy Resources
G1819272	Leakage Current Testing Network	IEC 60990, Figure 4	Shanghai Anbiao Co., Ltd.
G1819277	PV array simulator	62150H-1000S	Chroma Co.
G1819278	PV array simulator	62150H-1000S	Chroma Co.
G1819279	PV array simulator	62150H-1000S	Chroma Co.
G1819280	PV array simulator	62150H-1000S	Chroma Co.

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Liste der verwendeten Prüfmittel
List of used test equipment

1 Produktdetails
Product details

See below.

Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.

Name : Power Conversion System		Name : Power Conversion System	
Model : INPPCS-100/0.4-W-14-C1-OS		Model : INPPCS-100/0.4-W-24-C1-OS	
Max. DC voltage	900V	Max. DC voltage	900V
DC voltage range	630-900V	DC voltage range	630-900V
Rate DC power	100kW	Rate DC power	100kW
Max DC power	110kW	Max DC power	110kW
Max. DC current	175A	Max. DC current	175A
Nominal AC voltage	3P/N/PE 400V/230V	Nominal AC voltage	3P4W+PE 400V
AC voltage tolerance	-15%- + 15%	AC voltage tolerance	-15%- + 15%
Nominal frequency	50Hz	Nominal frequency	50Hz
Rated AC power	100kW	Rated AC power	100kW
Max. AC current	160A	Max. AC current	160A
power factor	-0.99- +0.99	power factor	-0.99- +0.99
Protection Class	Class I	Protection Class	Class I
Degree of protection	IP20	Degree of protection	IP20
Temperature range	-25-60 °C(>45°C derating)	Temperature range	-25-60 °C(>45°C derating)

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Produktbeschreibung
Product description

Possible test case verdicts:

- test case does not apply to the test object.....: N/A
- test object was not evaluated for the requirement.....: N/E
- test object does meet the requirement.....: Pass (P)
- test object does not meet the requirement.....: Fail (F)

Testing:

Date of receipt of test items.....: See cover page

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

General remarks:

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

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

The tests results presented in this report relate only to the object tested.

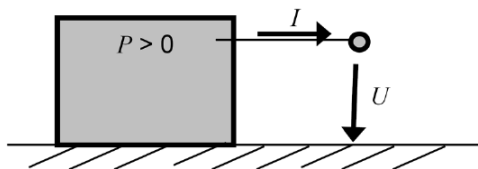
This report shall not be reproduced except in full without the written approval of the testing laboratory.

List of test equipment must be kept on file and available for review.

Additional test data and/or information provided in the attachments to this report.

Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

Generator reference system:



General product information:

Brief description:

The main function of INPPCS-100/0.4-W-14-C1-OS and INPPCS-100/0.4-W-24-C1-OS is to charge and discharge battery components. The DC voltage range is 630V-900V, the AC voltage range is 340-460V a.c. They can work at Grid-connected model to charge or discharge the battery, or work at Grid-disconnected model to supply the AC load with battery discharging, or work at standby model to wait for receiving operation instructions after grid-connected INPPCS is turned on.

See model list below for more information.

Produktbeschreibung Product description

Block Diagram:

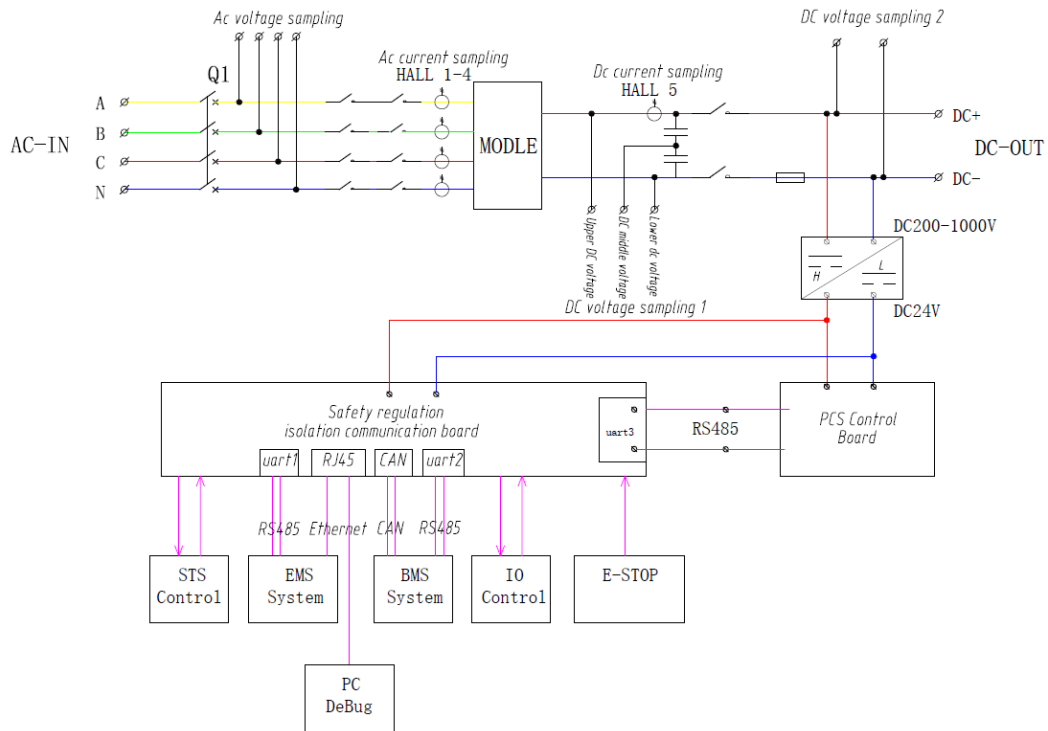


Figure 1 system block diagram of INPPCS-100/0.4-W-14-C1-OS

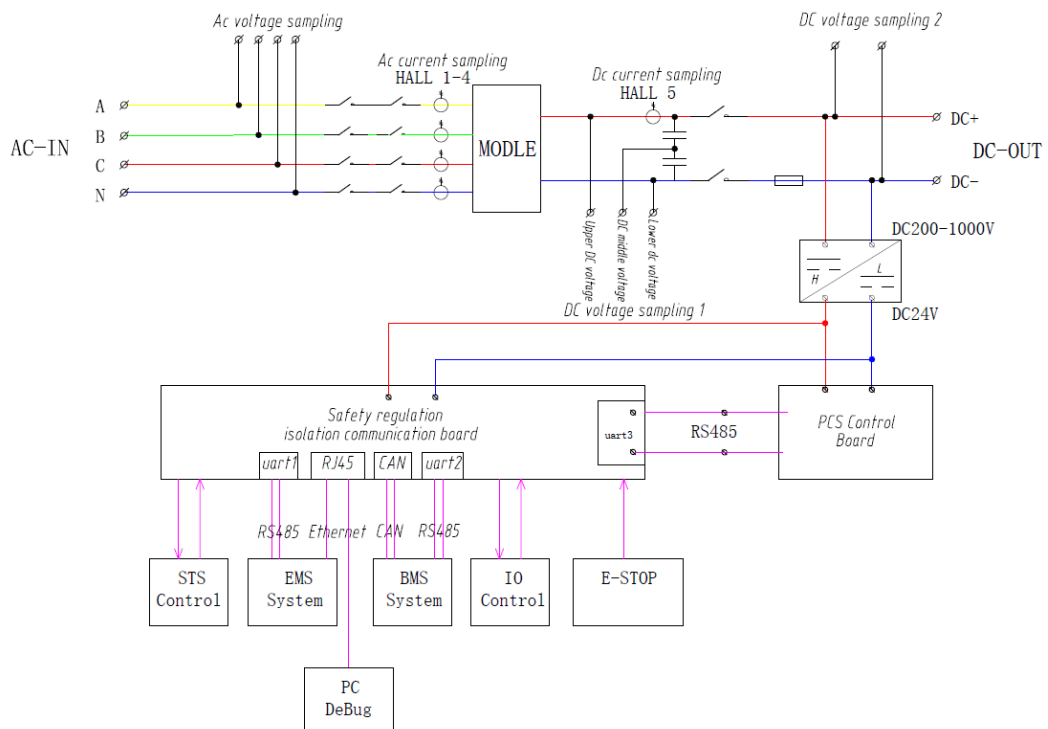


Figure 2 system block diagram of INPPCS-100/0.4-W-24-C1-OS

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Produktbeschreibung
Product description

Integrated interface protection and control device 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 two models: INPPCS-100/0.4-W-14-C1-OS and INPPCS-100/0.4-W-24-C1-OS have the same hardware, the only difference is that the model INPPCS-100/0.4-W-14-C1-OS has a AC circuit breaker at AC side and INPPCS-100/0.4-W-24-C1-OS has no AC circuit breaker.

Table 2: Mode difference list

Reference Position	INPPCS-100/0.4-W-14-C1-OS	INPPCS-100/0.4-W-24-C1-OS	Comments
AC breaker	CM3-250C	NC	
Terminal block	NC	RD150-01-V-RT/DW80-02-02-C/DSTB150	

Unless otherwise specified, all tests were conducted on basic model of INPPCS-100/0.4-W-14-C1-OS to represent the other models.

The product was tested on:

Software version: ARM 679.0 FPGA 78.5

Test condition:

Temperature: 25°C Relative humidity: 65%

Remote control:

INPPCS can be reserved with one RS485, one Ethernet interface and one CAN for communication between INPPCS and battery components, user local station or remote upper computer, and has Ethernet interface with Power station monitoring system.

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Produktbeschreibung
Product description

Model list:

Model		INPPCS-100/0.4-W-14-C1-OS	INPPCS-100/0.4-W-24-C1-OS
DC Side	Max. DC voltage [Vd.c.]	900	900
	Min. DC voltage [Vd.c.]	630	630
	DC voltage range [Vd.c.]	630-900	630-900
	Max. DC current [Ad.c.]	175	175
	Rated DC power [kW]	100	100
	Max. DC power [kW]	110	110
	Rated conditional short-circuit current [Ad.c.]	30k	30k
	Overvoltage Category(OVC)	II	II
AC Side (Grid)	AC rated Input /Output active Power P_E [kW]	100	100
	AC rated Input /Output apparent Power P_E [kVA]	100	100
	Max. AC Input/Output current [Aa.c.]	160	160
	Nominal AC voltage U_r [Va.c.]	3L/N/PE, 400 /230	3L/N/PE, 400 /230
	AC voltage tolerance	-15%- + 15%	-15%- + 15%
	Nominal frequency/Frequency F_{NETZ} [Hz]	50 /60	50 /60
	Harmonic (THDi)	≤5% (at nominal Power), Linear load	≤5% (at nominal Power), Linear load
	Power factor	-0.99-+0.99, At nominal Power	-0.99-+0.99, At nominal Power
	Adjustable reactive Power range	-100%–100%	-100%–100%
	Overvoltage Category(OVC)	III	III
AC Side (Off-Grid)	Nominal AC voltage U_r [Va.c.]	3L/N/PE, 400 /230	3L/N/PE, 400 /230
	AC voltage tolerance	AC 400 V ± 3%	AC 400 V ± 3%
	AC rated Input /Output apparent Power P_E [kVA]	100	100
	Max. AC Input/Output current [Aa.c.]	160	160
	Harmonic THDu	≤3%, Linear load	≤3%, Linear load

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Produktbeschreibung
Product description

System Parameters	DC voltage component	<0.5% , Linear load	<0.5% , Linear load
	Unbalance load capacity	100%	100%
	Nominal frequency/Frequency F_{NETZ} [Hz]	50 /60	50 /60
	Max. efficiency	>98%	>98%
	Communication	RS485, CAN, Ethernet	RS485, CAN, Ethernet
	Enclosure Dimensions (W * H * D)	480 mm × 260 mm × 620 mm(Cabinet size), 480 mm × 260 mm × 720 mm(added circuit breaker size)	480 mm × 260 mm × 620 mm, Cabinet size
	Weight	70 kg	70 kg
	Degree of protection	IP20	IP20
	Operating ambient temperature [°C]	-25-60 (>45 derating)	-25-60 (>45 derating)
	Allowable relative humidity	RH ≤95%	RH ≤95%
	Cooling method	Forced air cooling	Forced air cooling
	Max. operating altitude	4,000 m (>2,000 m derating)	4,000 m (>2,000 m derating)
	Pollution degree	2	2
	Firmware version	ARM 679.0 FPGA 78.5	ARM 679.0 FPGA 78.5

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Produktbeschreibung
Product description

2	Maße / Gewicht <i>Dimensions / Weight</i>	Please refer to the user manual.
3	Bedienelemente <i>Operating elements</i>	N/A
4	Ausstattung / Zubehör <i>Equipment / Accessories</i>	N/A
5	Verwendete Materialien <i>Used materials</i>	N/A
6	Sonstiges <i>Other</i>	N/A

1	Anwendungsbereich Scope Details zur Ausgestaltung der messtechnischen Nachweise und zur Dokumentation der Messergebnisse sind in DIN VDE-V 0124-100 (VDE V 0124-100):2020-06 beschrieben. <i>Details on the design of the measuring certificates and the documentation of the measurement results are described in DIN VDE-V 0124-100 (VDE V 0124-100):2020-06.</i>
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ANLAGE zum Prüfbericht-Nr.: CN24E4X5 001
APPENDIX to Test Report No.:

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ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

See CN24E4X5 001 attachment 1 for test report of VDE V 0124-100: 2020.
See CN24E4X5 001 attachment 2 for Photo documentations

Prüfbericht-Nr.: <i>Test Report No.:</i>	See test report CN24E4X5 001	Auftrags-Nr.: <i>Order No.:</i>	See test report CN24E4X5 001	Seite 1 von 5 Page 1 of 5	
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	See test report CN24E4X5 001	Auftragsdatum: <i>Order date:</i>	See test report CN24E4X5 001		
Auftraggeber: <i>Client:</i>	See test report CN24E4X5 001				
Prüfgegenstand: <i>Test item:</i>	See test report CN24E4X5 001				
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	See test report CN24E4X5 001				
Auftrags-Inhalt: <i>Order content:</i>	A3 certificate				
Prüfgrundlage: <i>Test specification:</i>	DIN VDE V 0124-100/06.20 <i>Netzintegration von Erzeugungsanlagen –Niederspannung –Prüfanforderungen an Erzeugungseinheiten vorgesehen zum Anschluss und Parallelbetrieb am Niederspannungsnetz</i> <i>Grid integration of generator plants – Low-voltage – Test requirements for generator units to be connected to and operated in parallel with low-voltage distribution networks</i>				
Wareneingangsdatum: <i>Date of receipt:</i>	See test report CN24E4X5 001				
Prüfmuster-Nr.: <i>Test sample No.:</i>	See test report CN24E4X5 001				
Prüfzeitraum: <i>Testing period:</i>	See test report CN24E4X5 001				
Ort der Prüfung: <i>Place of testing:</i>	See test report CN24E4X5 001				
Prüflaboratorium: <i>Testing laboratory:</i>	See test report CN24E4X5 001				
Prüfergebnis*: <i>Test result*:</i>	Pass				
geprüft von / tested by:		kontrolliert von / reviewed by:			
See test report CN24E4X5 001		See test report CN24E4X5 001			
Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>
Sonstiges / Other:					
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>			Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>		
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor 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 a. m. test sample. 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>					

V04

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Liste der verwendeten Prüfmittel
List of used test equipment

See test report CN24E4X5 001 for detail.

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List of used test equipment

See test report CN24E4X5 001

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Absatz	Anforderungen-Prüfungen	Messergebnisse-Bemerkungen	Bewertung
Clause	Requirements-Tests	Measuring results-Remarks	Evaluation

1	Anwendungsbereich Scope		
	Diese DIN-VDE-Vornorm dient dem Nachweis der elektrischen Eigenschaften von Erzeugungseinheiten (EZE) nach der VDE-AR N 4105:2018-11 und gegebenenfalls anderen Netzanschlussbedingungen. <i>This DIN VDE preliminary standard serves to verify the electrical properties of power generation units (PGU) in accordance with VDE-AR N 4105:2018-11 and, if applicable, other grid connection conditions.</i>		
5	Prüfungen Tests		
5.1	Allgemeines General information		P
5.2	Nachweis zulässiger Netzzrückwirkungen Verification of permitted network reaction		P
5.3	Nachweis des Symmetrieverhaltens von Umrichtern Verification of symmetry behaviour of inverter		P
5.4	Nachweis des Verhaltens der Erzeugungseinheit am Netz Verification of behaviours of PGU on grid		P
5.5	Nachweis des NA-Schutzes Verification of NS-protections		N/A
5.6	Zuschaltbedingungen und Synchronisierung Connection conditions and synchronisation		P
5.7	Nachweis der PAV,E-überwachung Verification of PAV,E-monitoring		P
5.8	Nachweis der dynamischen Netzstützung Verification of dynamic network supporting		P

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ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

See following data for details.

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Test Engineer:	Ruiyang Ding	Reviewer:	Chu Sun
Signature:	<i>Ruiyang Ding</i>	Signature:	<i>Chu Sun</i>

Testing Location:	
Name:	TÜV Rheinland (Shanghai) Co., Ltd.
Address:	No. 177, 178, Lane 777, Guangzhong West Road, Jing'an District, Shanghai, China

Test Sample No.:	A003653835-001
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Test Date:	2023.12.21- 2024.01.20
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Test items		Remark
5.2	Verification of permitted network reaction	P
5.2.2	Rapid voltage change (Kimax)	P
5.2.3	Flicker	P
5.2.4	Harmonics and Inter-harmonics (I inter, I higher)	P
5.2.5	Commutation notches	P
5.2.6	DC current feeding to network (Idc)	P
5.3	Verification of symmetry behaviours of inverter	P
5.3.2	Tests of three-phase inverter (Imbalance)	P
5.3.3	Symmetry operation with a symmetry device	N/A
5.4	Verification of behaviours of PGU on network	P
5.4.2	Measurement of active- and reactive power ranges (P&Q range)	P
5.4.3	Active power reduction through setting provision (P control)	P
5.4.4	Active power output of PGU by over-frequency (LFSM-O)	N/A
5.4.5	Active power output of ESS by over-frequency (LFSM-O)	P
5.4.6	Active power output of PGU by under-frequency (LFSM-U)	N/A
5.4.7	Active power output of ESS by under-frequency (LFSM-U)	P
5.4.8.2	Tests of reactive power / displacement factor setting accuracy (Fixed $\cos\phi$)	P
5.4.8.3	Tests of displacement factor- / active power character curve ($\cos\phi(P)$)	P
5.4.8.4	Tests of reactive power-voltage character curve (Q(U))	P
5.5	Verification of NS-protection*	N/A
5.5.2	NS-protection	N/A
5.5.3	Central NS-protecton	N/A
5.5.4	Integrated NS-protection	N/A
5.5.6	Interface switch (Functional safety)	N/A
5.5.7	Protection devices and protection settings (OV/UV, OF/UF)	N/A
5.5.9	Constructional features of NS protection	N/A
5.5.10	Islanding detection	N/A
5.6	Connection conditions and synchronization (Reconnection)	P
5.7	Verification of $P_{AV,E}$ monitoring	N/A
5.8	Verification of dynamic network supporting (FVRT)	P
*: Although the product integrated interface switches, the central NS protection device shall be applied in final installation per requirements of VDE-AR-N 4105.		

5.2.2	TABLE: Rapid voltage change (Kimax)			P
Test Conditions	Measurements			Limit
	U/Un	I/In	Ki	Ki
Starting to 50%Pn	1.01	0.50	0.50	≤ 1.2
Starting to 100% Pn	1.01	1.00	1.00	≤ 1.2
Stopping at 100% Pn	1.00	1.00	1.00	≤ 1.2
Note(s):				

5.2.3	TABLE: Flicker							P	
L1									
Test Condition	Measurement								
	30°		50°		70°		85°		
P/Pn [%]	Pst	C _{ψk}	Pst	C _{ψk}	Pst	C _{ψk}	Pst	C _{ψk}	
10	0.014	0.210	0.019	0.285	0.024	0.360	0.025	0.375	
20	0.014	0.210	0.015	0.225	0.016	0.240	0.015	0.225	
30	0.012	0.180	0.014	0.210	0.017	0.255	0.018	0.270	
40	0.011	0.165	0.013	0.195	0.016	0.240	0.018	0.270	
50	0.012	0.180	0.015	0.225	0.018	0.270	0.019	0.285	
60	0.012	0.180	0.014	0.210	0.017	0.255	0.018	0.270	
70	0.014	0.210	0.018	0.270	0.021	0.315	0.022	0.330	
80	0.015	0.225	0.019	0.285	0.022	0.330	0.023	0.345	
90	0.013	0.195	0.018	0.270	0.021	0.315	0.022	0.330	
100	0.013	0.195	0.019	0.285	0.022	0.330	0.023	0.345	
100	0.016	0.240	0.021	0.315	0.024	0.360	0.025	0.375	
100	0.016	0.240	0.020	0.300	0.023	0.345	0.024	0.360	
L2									
Test Condition	Measurement								
	30°		50°		70°		85°		
P/Pn [%]	Pst	C _{ψk}	Pst	C _{ψk}	Pst	C _{ψk}	Pst	C _{ψk}	
10	0.014	0.210	0.020	0.300	0.024	0.360	0.025	0.375	
20	0.014	0.210	0.016	0.240	0.017	0.255	0.017	0.255	
30	0.013	0.195	0.015	0.225	0.017	0.255	0.018	0.270	
40	0.011	0.165	0.014	0.210	0.017	0.255	0.018	0.270	
50	0.012	0.180	0.016	0.240	0.018	0.270	0.019	0.285	
60	0.014	0.210	0.018	0.270	0.020	0.300	0.020	0.300	
70	0.015	0.225	0.019	0.285	0.022	0.330	0.023	0.345	
80	0.016	0.240	0.020	0.300	0.023	0.345	0.023	0.345	
90	0.015	0.225	0.020	0.300	0.023	0.345	0.024	0.360	
100	0.015	0.225	0.020	0.300	0.023	0.345	0.024	0.360	
100	0.015	0.225	0.020	0.300	0.023	0.345	0.024	0.360	
100	0.017	0.255	0.021	0.315	0.024	0.360	0.025	0.375	
L3									
Test Condition	Measurement								
	30°		50°		70°		85°		

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P/P _n [%]	P _{st}	C _{ψ_k}	P _{st}	C _{ψ_k}	P _{st}	C _{ψ_k}	P _{st}	C _{ψ_k}
10	0.014	0.210	0.019	0.285	0.024	0.360	0.026	0.390
20	0.013	0.195	0.014	0.210	0.015	0.225	0.015	0.225
30	0.013	0.195	0.015	0.225	0.017	0.255	0.018	0.270
40	0.011	0.165	0.014	0.210	0.017	0.255	0.019	0.285
50	0.012	0.180	0.015	0.225	0.019	0.285	0.020	0.300
60	0.013	0.195	0.017	0.255	0.021	0.315	0.023	0.345
70	0.014	0.210	0.019	0.285	0.021	0.315	0.022	0.330
80	0.015	0.225	0.019	0.285	0.022	0.330	0.023	0.345
90	0.013	0.195	0.019	0.285	0.022	0.330	0.023	0.345
100	0.014	0.210	0.020	0.300	0.023	0.345	0.024	0.360
100	0.017	0.255	0.022	0.330	0.024	0.360	0.025	0.375
100	0.016	0.240	0.021	0.315	0.024	0.360	0.024	0.360

Note(s): PGU and ESS with nominal current > 75A (Per FGW TR3 Ver25)

Sk/Sn=15

5.2.4		TABLE: I _{inter} & I _{higher}										P	
Harmonics													
P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100	Limit	
Order No.	I/I _n [%]												
2	0.153	0.158	0.194	0.241	0.204	0.105	0.078	0.090	0.093	0.098	0.105	8.0	
3	0.479	0.422	0.525	1.253	1.335	1.539	1.673	1.736	1.735	1.760	1.767	--	
4	0.224	0.158	0.239	0.095	0.172	0.194	0.196	0.181	0.177	0.189	0.203	4.0	
5	0.129	0.224	0.507	0.144	0.685	0.802	1.142	1.392	1.540	1.640	1.679	10.7	
6	0.098	0.062	0.109	0.082	0.079	0.075	0.102	0.100	0.090	0.076	0.063	2.7	
7	0.117	0.146	0.120	0.243	0.187	0.363	0.472	0.671	0.821	0.945	1.001	7.2	
8	0.326	0.282	0.317	0.301	0.268	0.344	0.374	0.397	0.427	0.502	0.546	2.0	
9	0.322	0.327	0.203	0.488	0.481	0.382	0.372	0.329	0.326	0.292	0.286	--	
10	0.275	0.273	0.260	0.276	0.291	0.332	0.365	0.383	0.388	0.446	0.488	1.6	
11	0.181	0.276	0.494	0.267	0.141	0.167	0.202	0.256	0.353	0.468	0.529	3.1	
12	0.039	0.074	0.056	0.030	0.036	0.023	0.028	0.056	0.026	0.042	0.035	1.3	
13	0.187	0.175	0.170	0.388	0.226	0.181	0.122	0.169	0.234	0.312	0.357	13.0	
14	0.100	0.078	0.148	0.132	0.060	0.110	0.131	0.101	0.097	0.128	0.142	--	
15	0.094	0.128	0.176	0.169	0.073	0.085	0.109	0.133	0.142	0.124	0.103	--	
16	0.035	0.052	0.103	0.088	0.082	0.053	0.062	0.030	0.037	0.061	0.062	--	
17	0.159	0.142	0.140	0.199	0.238	0.225	0.137	0.096	0.160	0.212	0.235	--	
18	0.029	0.030	0.052	0.042	0.036	0.045	0.037	0.028	0.031	0.044	0.045	--	
19	0.124	0.169	0.310	0.085	0.245	0.268	0.155	0.124	0.144	0.182	0.205	--	
20	0.030	0.051	0.045	0.070	0.101	0.067	0.048	0.051	0.040	0.030	0.039	--	
21	0.105	0.107	0.098	0.131	0.114	0.096	0.116	0.126	0.140	0.144	0.137	--	
22	0.039	0.046	0.052	0.103	0.114	0.092	0.064	0.070	0.072	0.061	0.068	--	
23	0.079	0.106	0.069	0.224	0.130	0.166	0.183	0.151	0.118	0.145	0.167	--	
24	0.016	0.023	0.032	0.035	0.031	0.033	0.041	0.025	0.020	0.025	0.025	--	
25	0.053	0.057	0.039	0.191	0.155	0.095	0.166	0.154	0.109	0.094	0.109	--	
26	0.031	0.033	0.038	0.061	0.053	0.057	0.048	0.049	0.055	0.040	0.031	--	

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27	0.092	0.088	0.103	0.141	0.098	0.126	0.107	0.092	0.094	0.107	0.106	--
28	0.023	0.035	0.033	0.042	0.052	0.033	0.028	0.034	0.046	0.037	0.030	--
29	0.037	0.058	0.136	0.022	0.108	0.082	0.136	0.137	0.085	0.057	0.069	--
30	0.016	0.024	0.016	0.017	0.014	0.021	0.030	0.032	0.025	0.021	0.018	--
31	0.031	0.088	0.133	0.078	0.110	0.116	0.127	0.137	0.104	0.075	0.084	--
32	0.020	0.033	0.038	0.031	0.041	0.027	0.023	0.027	0.039	0.038	0.033	--
33	0.076	0.088	0.095	0.085	0.080	0.081	0.105	0.105	0.084	0.087	0.107	--
34	0.022	0.024	0.032	0.028	0.033	0.028	0.021	0.029	0.034	0.031	0.028	--
35	0.026	0.066	0.061	0.100	0.074	0.115	0.085	0.101	0.074	0.050	0.057	--
36	0.014	0.027	0.016	0.023	0.012	0.025	0.034	0.043	0.051	0.044	0.032	--
37	0.025	0.047	0.025	0.028	0.037	0.063	0.038	0.041	0.044	0.059	0.065	--
38	0.019	0.025	0.027	0.014	0.018	0.023	0.020	0.024	0.032	0.032	0.028	--
39	0.040	0.038	0.057	0.046	0.033	0.044	0.035	0.054	0.073	0.082	0.095	--
40	0.020	0.030	0.015	0.006	0.021	0.017	0.021	0.016	0.019	0.025	0.030	--

Inter-harmonics												
P/Pn [%]	0	10	20	30	40	50	60	70	80	90	100	Limit
f [Hz]	I/In [%]											
75	0.189	0.216	0.136	0.156	0.171	0.173	0.169	0.183	0.183	0.192	0.201	--
125	0.084	0.082	0.076	0.126	0.147	0.092	0.129	0.163	0.142	0.145	0.145	--
175	0.144	0.117	0.156	0.083	0.136	0.124	0.116	0.133	0.131	0.130	0.141	--
225	0.245	0.213	0.171	0.171	0.244	0.259	0.287	0.315	0.298	0.262	0.253	--
275	0.283	0.244	0.148	0.211	0.247	0.288	0.349	0.347	0.364	0.354	0.350	--
325	0.221	0.216	0.182	0.180	0.202	0.292	0.266	0.327	0.334	0.319	0.317	--
375	0.305	0.289	0.259	0.282	0.286	0.380	0.365	0.431	0.483	0.533	0.557	--
425	0.210	0.183	0.204	0.193	0.192	0.225	0.231	0.246	0.269	0.317	0.346	--
475	0.157	0.154	0.159	0.155	0.154	0.191	0.202	0.189	0.182	0.209	0.228	--
525	0.190	0.192	0.194	0.201	0.200	0.244	0.259	0.283	0.290	0.324	0.348	--
575	0.093	0.083	0.166	0.100	0.134	0.129	0.106	0.122	0.148	0.174	0.179	--
625	0.097	0.100	0.080	0.096	0.089	0.102	0.097	0.094	0.095	0.101	0.105	--
675	0.124	0.114	0.119	0.137	0.140	0.147	0.111	0.127	0.131	0.136	0.141	--
725	0.114	0.111	0.124	0.110	0.121	0.123	0.120	0.124	0.124	0.130	0.137	--
775	0.093	0.095	0.099	0.095	0.111	0.113	0.100	0.117	0.123	0.121	0.120	--
825	0.116	0.109	0.136	0.121	0.139	0.140	0.156	0.149	0.149	0.155	0.162	--
875	0.076	0.070	0.086	0.108	0.093	0.092	0.115	0.108	0.108	0.106	0.111	--
925	0.052	0.051	0.062	0.050	0.067	0.054	0.074	0.065	0.054	0.060	0.064	--
975	0.061	0.065	0.096	0.074	0.100	0.073	0.092	0.091	0.089	0.080	0.078	--
1025	0.056	0.061	0.068	0.075	0.070	0.070	0.072	0.085	0.081	0.078	0.080	--
1075	0.051	0.051	0.057	0.060	0.068	0.069	0.061	0.062	0.059	0.055	0.057	--
1125	0.060	0.059	0.074	0.089	0.095	0.083	0.073	0.075	0.076	0.072	0.075	--
1175	0.047	0.048	0.064	0.060	0.060	0.060	0.062	0.067	0.063	0.056	0.055	--
1225	0.034	0.036	0.046	0.044	0.053	0.043	0.049	0.051	0.053	0.048	0.047	--
1275	0.040	0.041	0.053	0.055	0.058	0.058	0.054	0.060	0.061	0.054	0.052	--
1325	0.037	0.039	0.047	0.060	0.055	0.056	0.051	0.058	0.057	0.053	0.051	--
1375	0.032	0.035	0.037	0.043	0.042	0.038	0.038	0.040	0.040	0.039	0.040	--
1425	0.036	0.036	0.050	0.052	0.054	0.044	0.036	0.046	0.050	0.045	0.044	--

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1475	0.032	0.033	0.033	0.034	0.040	0.038	0.034	0.039	0.043	0.040	0.038	--
1525	0.027	0.029	0.033	0.030	0.035	0.037	0.037	0.038	0.040	0.039	0.038	--
1575	0.030	0.031	0.034	0.035	0.041	0.041	0.037	0.034	0.042	0.041	0.040	--
1625	0.026	0.030	0.030	0.039	0.038	0.035	0.034	0.036	0.041	0.045	0.041	--
1675	0.020	0.022	0.022	0.026	0.029	0.033	0.033	0.033	0.036	0.036	0.037	--
1725	0.022	0.022	0.024	0.031	0.036	0.032	0.028	0.034	0.035	0.033	0.033	--
1775	0.020	0.020	0.021	0.024	0.023	0.022	0.027	0.030	0.035	0.032	0.030	--
1825	0.021	0.023	0.022	0.024	0.025	0.028	0.032	0.035	0.040	0.038	0.035	--
1875	0.023	0.028	0.023	0.022	0.024	0.026	0.026	0.022	0.028	0.029	0.028	--
1925	0.021	0.026	0.020	0.018	0.024	0.024	0.028	0.027	0.029	0.032	0.031	--
1975	0.018	0.020	0.018	0.017	0.025	0.025	0.026	0.026	0.025	0.030	0.035	--

Higher frequency Harmonics												
P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100	Limit
f [kHz]	I/I _n [%]											
2.1	0.056	0.083	0.085	0.133	0.085	0.054	0.052	0.048	0.070	0.110	0.125	--
2.3	0.071	0.092	0.079	0.080	0.073	0.060	0.064	0.062	0.069	0.091	0.096	--
2.5	0.066	0.055	0.056	0.093	0.064	0.053	0.055	0.051	0.050	0.057	0.059	--
2.7	0.065	0.067	0.090	0.056	0.099	0.083	0.069	0.067	0.056	0.056	0.059	--
2.9	0.063	0.068	0.053	0.062	0.055	0.063	0.058	0.064	0.062	0.058	0.062	--
3.1	0.070	0.066	0.084	0.085	0.075	0.062	0.059	0.062	0.063	0.061	0.062	--
3.3	0.118	0.130	0.124	0.134	0.138	0.121	0.112	0.112	0.117	0.116	0.118	--
3.5	0.065	0.079	0.081	0.089	0.051	0.064	0.055	0.054	0.060	0.055	0.055	--
3.7	0.074	0.066	0.097	0.088	0.058	0.055	0.052	0.049	0.049	0.055	0.053	--
3.9	0.091	0.099	0.094	0.071	0.102	0.058	0.070	0.051	0.050	0.054	0.052	--
4.1	0.089	0.094	0.084	0.100	0.087	0.067	0.071	0.069	0.054	0.061	0.059	--
4.3	0.102	0.097	0.100	0.087	0.079	0.073	0.073	0.074	0.057	0.066	0.059	--
4.5	0.120	0.120	0.108	0.097	0.122	0.115	0.095	0.112	0.096	0.093	0.080	--
4.7	0.100	0.094	0.089	0.112	0.106	0.102	0.107	0.107	0.111	0.112	0.115	--
4.9	0.305	0.287	0.281	0.263	0.310	0.328	0.337	0.359	0.372	0.375	0.365	--
5.1	0.072	0.076	0.083	0.082	0.078	0.080	0.080	0.078	0.087	0.085	0.082	--
5.3	0.073	0.065	0.068	0.074	0.077	0.080	0.079	0.071	0.071	0.068	0.066	--
5.5	0.061	0.049	0.054	0.049	0.061	0.064	0.066	0.061	0.056	0.064	0.068	--
5.7	0.036	0.033	0.039	0.039	0.049	0.043	0.050	0.054	0.048	0.053	0.050	--
5.9	0.029	0.027	0.034	0.032	0.038	0.038	0.041	0.039	0.031	0.031	0.036	--
6.1	0.021	0.019	0.026	0.027	0.032	0.033	0.031	0.027	0.025	0.027	0.030	--
6.3	0.024	0.022	0.026	0.025	0.026	0.026	0.026	0.026	0.025	0.029	0.031	--
6.5	0.017	0.016	0.018	0.018	0.021	0.021	0.021	0.019	0.020	0.021	0.020	--
6.7	0.012	0.012	0.015	0.016	0.019	0.018	0.018	0.017	0.017	0.016	0.014	--
6.9	0.010	0.011	0.013	0.014	0.012	0.014	0.014	0.012	0.010	0.010	0.011	--
7.1	0.010	0.009	0.010	0.011	0.014	0.012	0.013	0.013	0.013	0.012	0.011	--
7.3	0.010	0.009	0.010	0.011	0.012	0.012	0.011	0.010	0.010	0.009	0.009	--
7.5	0.008	0.008	0.010	0.010	0.010	0.010	0.009	0.008	0.008	0.008	0.008	--
7.7	0.010	0.009	0.011	0.011	0.012	0.012	0.012	0.011	0.011	0.012	0.012	--
7.9	0.017	0.017	0.017	0.019	0.021	0.023	0.026	0.029	0.031	0.032	0.030	--
8.1	0.009	0.008	0.010	0.010	0.014	0.014	0.013	0.013	0.015	0.016	0.015	--

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8.3	0.007	0.006	0.008	0.007	0.009	0.008	0.007	0.007	0.008	0.007	0.007	--
8.5	0.006	0.007	0.007	0.007	0.007	0.007	0.006	0.007	0.007	0.007	0.007	--
8.7	0.007	0.007	0.006	0.007	0.009	0.008	0.007	0.006	0.006	0.007	0.007	--
8.9	0.007	0.007	0.006	0.006	0.007	0.006	0.007	0.006	0.006	0.007	0.007	--

Note(s): The max. value of three phases were chosen.

5.2.5	TABLE: Commutation notches			P
Test Conditions P/ P _{E_{max}}	Measurements			
	I _{com} [A]			
	L1	L2	L3	
	25% - 35%	0	0	0
65% - 75%	0	0	0	
> 90%	0	0	0	
Note(s):				

Note(s):

5.2.6	TABLE: DC current feeding to network (Idc)				P
Test Conditions P/ P _{E_{max}}	Measurements			Limit	
	Idc / In [%]			Idc/In	
	L1	L2	L3		
	30% - 40%	0.22%	0.42%	0.10%	0.5%
60% - 70%	0.40%	0.46%	0.16%	0.5%	
> 95%	0.44%	0.47%	0.13%	0.5%	
Note(s):					

Note(s):

5.3.2	TABLE: Tests of three-phase inverter (Imbalance)									P
Test Conditions		Measurements							Limit	
cosφ	S/S _{E_{max}} [%]	S _{asy} /S _{E_{max}} [%]							S _{asy} /S _{E_{max}} [%]	
1.0	100	0.30%	0.30%	0.31%	0.31%	0.32%			≤ ±5	
1.0	50	0.16%	0.15%	0.15%	0.15%	0.14%				
0.80un	100	0.33%	0.33%	0.33%	0.33%	0.33%				
0.80un	50	0.20%	0.20%	0.19%	0.19%	0.19%				
0.80ov	100	0.31%	0.31%	0.30%	0.31%	0.31%				
0.80ov	50	0.17%	0.17%	0.17%	0.17%	0.17%				

Note(s):

S_{asy}: Max. Asymmetry power among three phases.

5.4.2		TABLE: Measurement of active- and reactive power ranges (P&Q range)				P			
Test Conditions		Measurements				Δ Limit			
U/Un	cosφ	U [V]	P _{max} [W]	cosφ	S _{max} [VA]	cosφ	P _{max} / P _E max	S _{max} / S _E max	
0.9	1.0	207.42	93328.12	1.00	93404.76	--	≤102%	≤102%	
1.0		230.44	100114.73	1.00	100201.31				
1.09		251.09	100171.91	1.00	100267.51				
0.95	Max.un	218.37	84989.63	0.90	94279.35	≤0.9			
1.0		229.88	89467.43	0.90	99200.03				
1.09		250.59	89640.51	0.90	99233.88				
0.9	Max.ov	207.75	82240.86	0.90	91037.55				
1.0		230.76	91193.83	0.90	101033.59				
1.05		242.22	91179.21	0.90	101104.39				
Note(s):									

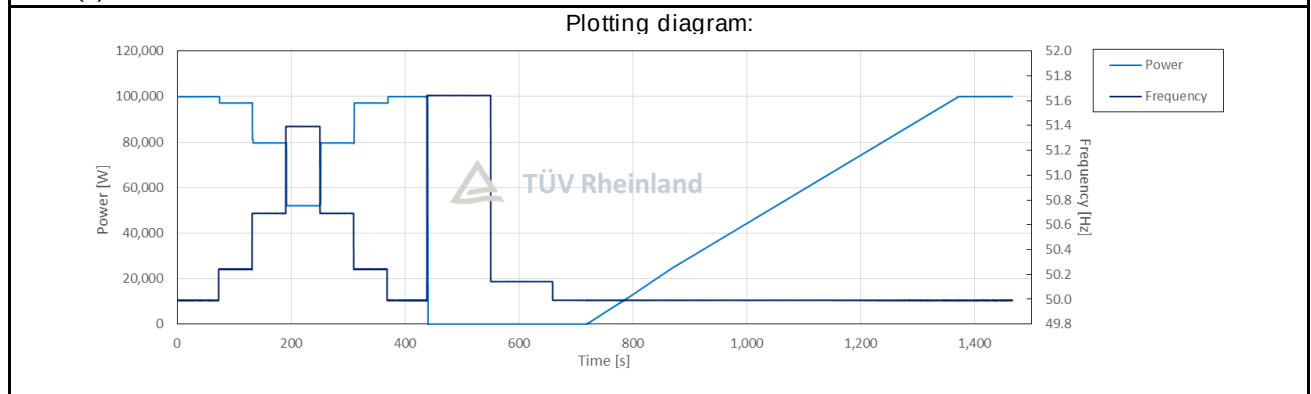
5.4.3(a)		TABLE: Active power reduction through setting provision (P control)		P
Test Conditions		Measurements		Limit
P/Pn [%]		P/Pn [%]	$\Delta P/Pn$ [%]	$\Delta P/Pn$ [%]
100		100.08%	0.08%	$\leq 5\%$
90		90.07%	0.07%	
80		80.05%	0.05%	
70		70.03%	0.03%	
60		60.03%	0.03%	
50		50.04%	0.04%	
40		40.05%	0.05%	
30		30.05%	0.05%	
20		20.06%	0.06%	
10		10.06%	0.06%	
No disconnection occur				Y

5.4.3(b)	TABLE: Active power reduction through setting provision (P control)		P
Test Conditions	Measurements		Limit
P/Pn [%]	$\Delta P/\Delta t$ [%Pn/s]		$\Delta P/\Delta t$ [%Pn/s]
100->5	0.54		0.33-0.66
5->100	0.54		

5.4.3(d)		TABLE: Active power reduction through setting provision (P control)		P
Test Conditions		Measurements	Limit	
P/Pn [%]		T _{response} [s]	T _{response} [s]	
100->0		0.98	≤ 5	

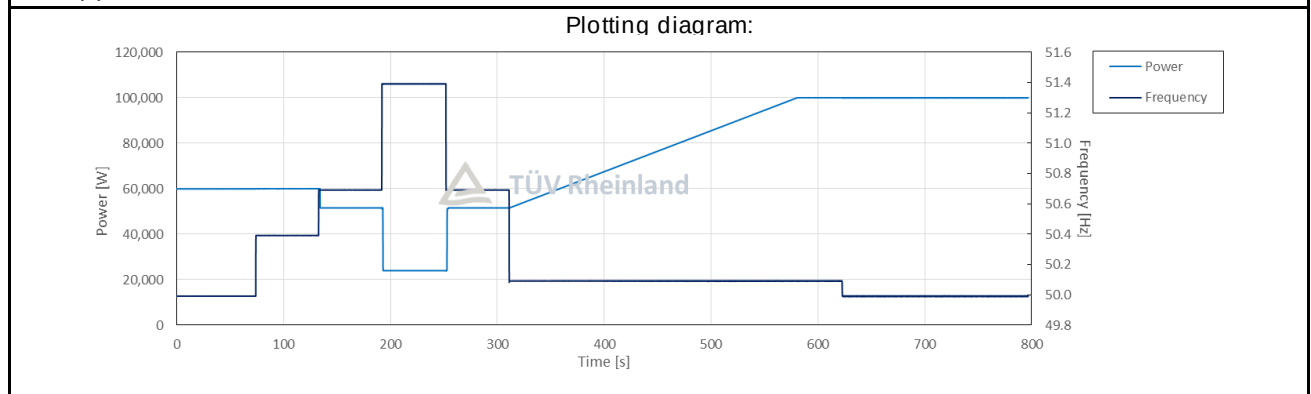
5.4.5(a)		TABLE: Active power output of ESS by over-frequency (LFSM-O)							P		
LFSM-O settings		f _{active}		f _{stop}			f _{deactive}		Droop		
		50.2		N/A			50.2		5%(40%P _{Emax} /Hz)		
Test Conditions		Measurements					Target	Tolerance	Limit		
f [Hz]	P _{Prim} [%]	P/P _{Emax} [%]	f [Hz]	T _{rise} [s]	T _{set} [s]	T _v [s]	P/P _{Emax} [%]	ΔP/P _{Emax} [%]	ΔP [%]	T _{rise} [s]	T _{set} [s]
50.00	100	99.97%	49.99	0.70	0.70	0.20	100	-0.03%	≤±10	≤1	≤20
50.25	100	97.19%	50.24	0.70	0.70	0.30	98	-0.81%			
50.70	100	79.61%	50.69	0.90	0.90	0.20	80	-0.39%			
51.40	100	52.02%	51.39	0.80	0.80	0.00	52	0.02%			
50.70	100	79.61%	50.69	0.90	0.90	0.10	80	-0.39%			
50.25	100	97.20%	50.24	0.70	0.70	0.20	98	-0.80%			
50.00	100	100.00%	49.99	0.70	0.70	0.30	100	0.00%			
51.65	100	0.00%	51.64	--	--	--	0	0.00%			
50.15	100	0.00%	50.14	--	--	--	0	0.00%			
Test Conditions		Measurements					Target	Tolerance	Limit		
f [Hz]	P _{Prim} [%]	P/P _{Emax} [%]	f [Hz]	ΔP/Δt [%/min]			P/P _{Emax} [%]	ΔP/P _{Emax} [%]	ΔP [%]	ΔP/Δt [%/min]	
50.00	100	100.07%	49.99	9.9			100	0.07%	≤±10	≤10	

Note(s):



5.4.5(b)		TABLE: Active power output of ESS by over-frequency (LFSM-O)							P		
LFSM-O settings		f _{active}		f _{stop}		f _{deactive}		Droop			
		50.5		N/A		50.2		5%(40%P _E _{max} /Hz)			
Test Conditions		Measurements					Target	Tolerance	Limit		
f [Hz]	P _{Prim} [%]	P/P _E _{max} [%]	f [Hz]	T _{rise} [s]	T _{set} [s]	T _v [s]	P/P _E _{max} [%]	ΔP/P _E _{max} [%]	ΔP [%]	T _{rise} [s]	T _{set} [s]
50.00	60	59.99%	49.99	--	--	--	60	-0.01%	≤±10	≤1	≤20
50.40	60	60.00%	50.39	--	--	--	60	0.00%			
50.70	60->100	51.62%	50.69	0.80	0.80	0.30	52	-0.38%			
51.40	100	24.02%	51.39	0.90	0.90	0.20	24	0.02%			
50.70	100	51.62%	50.69	0.90	0.90	0.20	52	-0.38%			
Test Conditions		Measurements					Target	Tolerance	Limit		
f [Hz]	P _{Prim} [%]	P/P _E _{max} [%]	f [Hz]	ΔP/Δt [%/min]			P/P _E _{max} [%]	ΔP/P _E _{max} [%]	ΔP [%]	ΔP/Δt [%/min]	
50.10	100	100.00%	50.09	9.8			100	0.00%	≤±10	≤10	
50.00	100	100.01%	49.99	--			100	0.01%	≤±10	--	

Note(s):

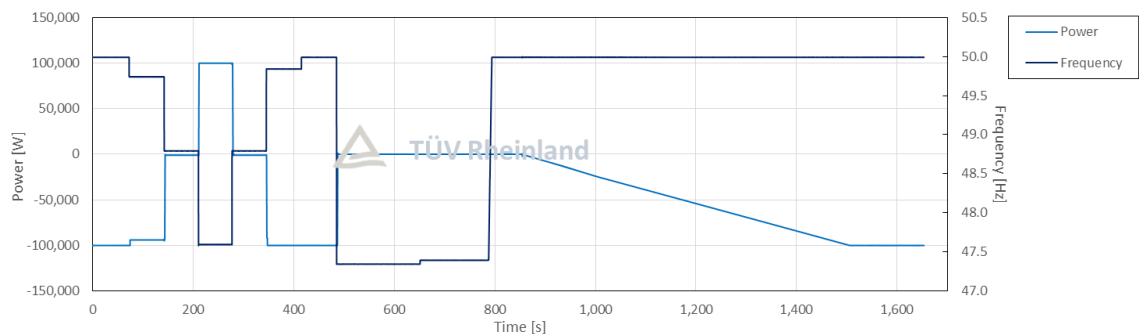


5.4.7(a)		TABLE: Active power output of ESS by under-frequency (LFSM-U)							P		
LFSM-U settings		f _{active}		f _{stop}			f _{deactive}		Droop		
		49.8		N/A			49.8		2%(100%P _{E_{max}} /Hz)		
Test Conditions		Measurements					Target	Tolerance	Limit		
f [Hz]	P _{Prim} [%]	P/P _{E_{max}} [%]	f [Hz]	T _{rise} [s]	T _{set} [s]	T _v [s]	P/P _{E_{max}} [%]	ΔP/P _{E_{max}} [%]	ΔP [%]	T _{rise} [s]	T _{set} [s]
50.00	100	-100.15%	49.99	--	--	--	-100	-0.15%	≤±10	≤1	≤20
49.75	100	-94.13%	49.74	0.90	0.90	0.20	-95	0.87%			
48.80	100	-0.96%	48.79	0.80	0.80	0.10	0	-0.96%			
47.60	100	99.95%	47.59	0.80	0.80	0.30	100	-0.05%			
48.80	100	-0.96%	48.79	0.80	0.80	0.10	0	-0.96%			
49.85	100	-100.10%	49.84	0.90	0.90	0.20	-100	-0.10%			
50.00	100	-100.10%	49.99	--	--	--	-100	-0.10%			
47.35	100	0.00%	47.34	--	--	--	0	0.00%			
47.40	100	0.00%	47.39	--	--	--	0	0.00%			
Test Conditions		Measurements					Target	Tolerance	Limit		
f [Hz]	P _{Prim} [%]	P/P _{E_{max}} [%]	f [Hz]	ΔP/Δt [%/min]			P/P _{E_{max}} [%]	ΔP/P _{E_{max}} [%]	ΔP [%]	ΔP/Δt [%/min]	
50.00	100	-100.19%	49.99	9.9			-100	-0.19%	≤±10	≤10	

Note(s):

Product was set in charging mode under rated power at the beginning of test.

Plotting diagram:

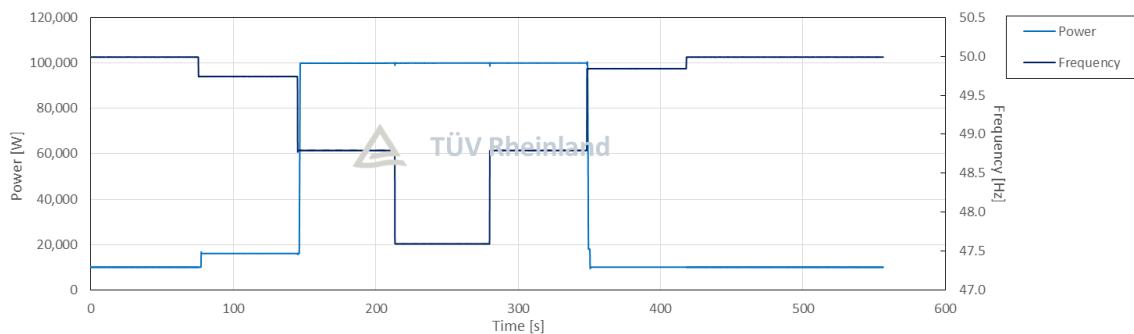


5.4.7(b)		TABLE: Active power output of ESS by under-frequency (LFSM-U)							P		
LFSM-U settings		f _{active}		f _{stop}		f _{deactive}		Droop			
		49.8		N/A		49.8		2%(100%P _{Emax} /Hz)			
Test Conditions		Measurements					Target	Tolerance	Limit		
f [Hz]	P _{Prim} [%]	P/P _{Emax} [%]	f [Hz]	T _{rise} [s]	T _{set} [s]	T _v [s]	P/P _{Emax} [%]	ΔP/P _{Emax} [%]	ΔP [%]	T _{rise} [s]	T _{set} [s]
50.00	100	10.04%	49.99	--	--	--	10	0.04%	±10	≤1	≤20
49.75	100	16.04%	49.74	0.90	0.90	0.20	15	1.04%			
48.80	100	99.92%	48.79	0.90	0.90	0.30	100	-0.08%			
47.60	100	99.93%	47.59	--	--	--	100	-0.07%			
48.80	100	99.95%	48.79	--	--	--	100	-0.05%			
49.85	100	10.04%	49.84	0.80	0.80	0.10	10	0.04%			
50.00	100	10.04%	49.99	--	--	--	10	0.04%			

Note(s):

Product power was limited to 10% at the beginning of test by a lower priority command from user.

Plotting diagram:



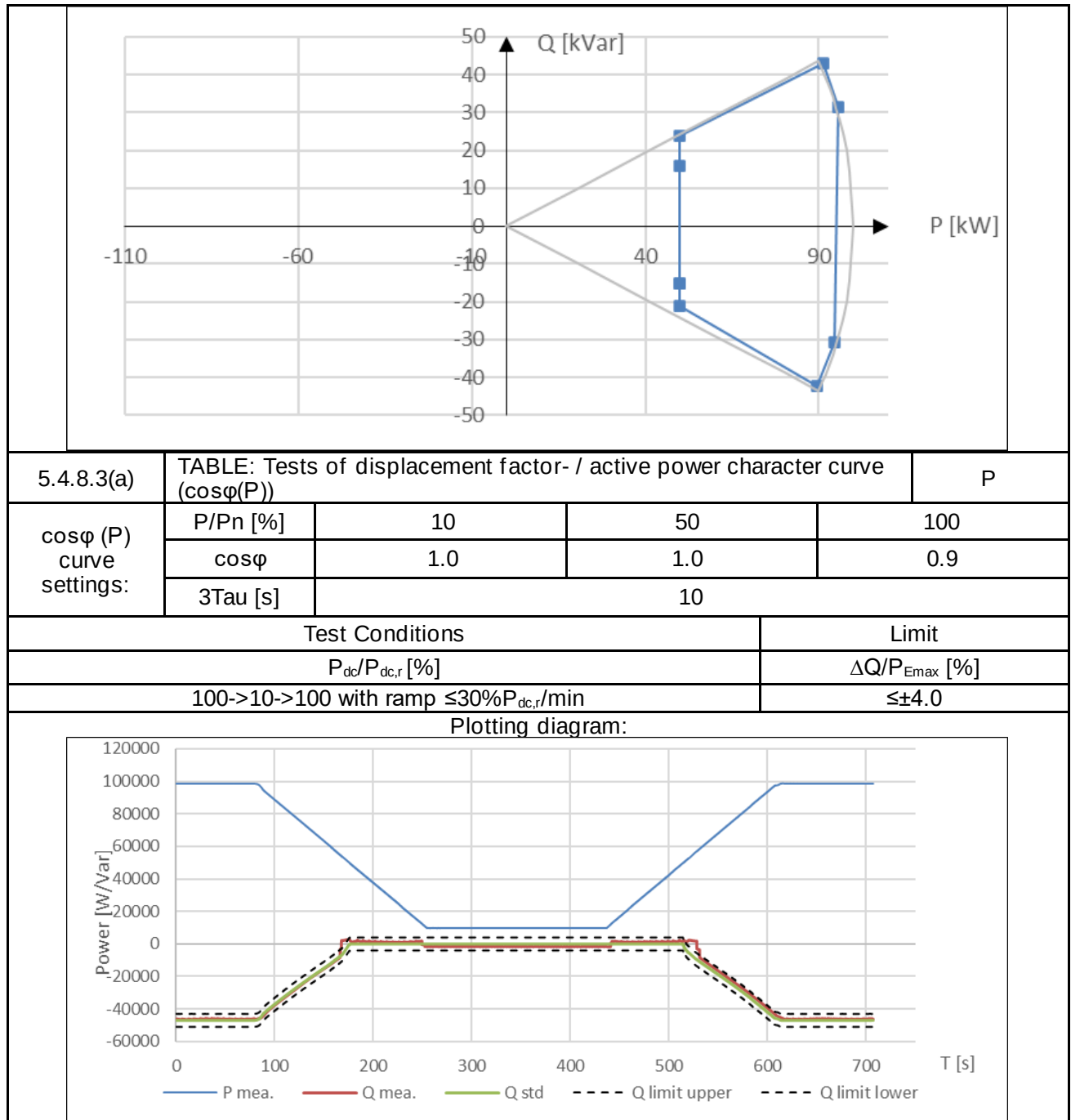
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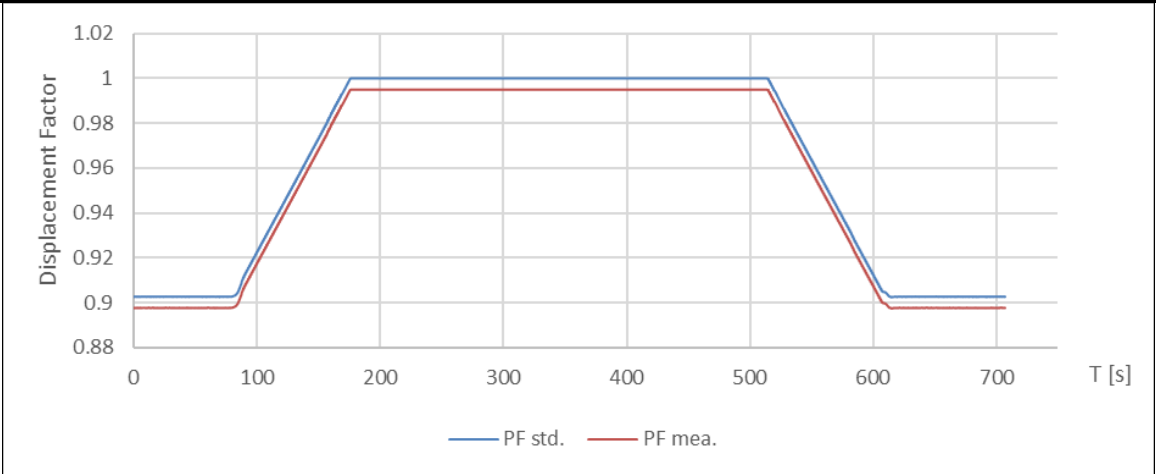
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5.4.8.2		TABLE: Tests of reactive power / displacement factor setting accuracy (Fixed cosφ)								P	
Test Conditions			Measurements					Target	Tolerance	Limit	
U/Un [%]	P/P _{E_{max}} [%]	cosφ	P [W]	Q [Var]	S [VA]	U [V]	cosφ	Q [kVar]	ΔQ/P _{E_{max}} [%]	ΔQ/P _{E_{max}} x [%]	
90	50	0.90 under- excited	50.02	-21.26	54.41	208.04	0.92	-24.23	2.97%	≤± 4	
90	S _{E_{max}}		80.56	-38.02	89.14	206.85	0.90	-39.02	0.99%	≤± 4	
100	50		50.05	-21.05	54.36	231.23	0.92	-24.24	3.19%	≤± 4	
100	S _{E_{max}}		89.46	-42.15	98.96	229.84	0.90	-43.33	1.18%	≤± 4	
110	50		50.06	-20.79	54.29	254.29	0.92	-24.24	3.45%	≤± 4	
110	S _{E_{max}}		89.61	-41.94	99.02	252.86	0.91	-43.40	1.47%	≤± 4	
90	50	0.95 under- excited	50.00	-15.46	52.39	208.46	0.95	-16.43	0.98%	≤± 4	
90	S _{E_{max}}		84.97	-27.64	89.41	206.97	0.95	-27.93	0.29%	≤± 4	
100	50		50.02	-15.30	52.37	231.71	0.96	-16.44	1.14%	≤± 4	
100	S _{E_{max}}		94.38	-30.61	99.29	229.96	0.95	-31.02	0.41%	≤± 4	
110	50		50.05	-15.06	52.34	254.67	0.96	-16.45	1.39%	≤± 4	
110	S _{E_{max}}		94.46	-30.38	99.30	252.96	0.95	-31.05	0.67%	≤± 4	
90	50	0.90 under- excited	49.88	23.55	55.19	208.23	0.90	24.16	-0.61%	≤± 4	
90	S _{E_{max}}		82.19	38.73	90.90	207.72	0.90	39.80	-1.07%	≤± 4	
100	50		49.90	23.71	55.29	231.23	0.90	24.17	-0.46%	≤± 4	
100	S _{E_{max}}		91.12	43.01	100.81	230.71	0.90	44.13	-1.12%	≤± 4	
110	50		49.91	24.01	55.44	254.09	0.90	24.17	-0.16%	≤± 4	
110	S _{E_{max}}		91.26	43.21	101.02	253.64	0.90	44.20	-0.99%	≤± 4	
90	50	0.95 under- excited	49.91	15.57	52.32	208.42	0.95	16.40	-0.83%	≤± 4	
90	S _{E_{max}}		86.09	28.28	90.66	207.61	0.95	28.29	-0.02%	≤± 4	
100	50		49.92	15.78	52.40	231.41	0.95	16.41	-0.62%	≤± 4	
100	S _{E_{max}}		95.51	31.33	100.57	230.61	0.95	31.39	-0.06%	≤± 4	
110	50		49.94	16.04	52.51	254.23	0.95	16.41	-0.38%	≤± 4	
110	S _{E_{max}}		95.57	31.76	100.77	253.55	0.95	31.41	0.34%	≤± 4	
Note(s):											
P-Q Diagram:											

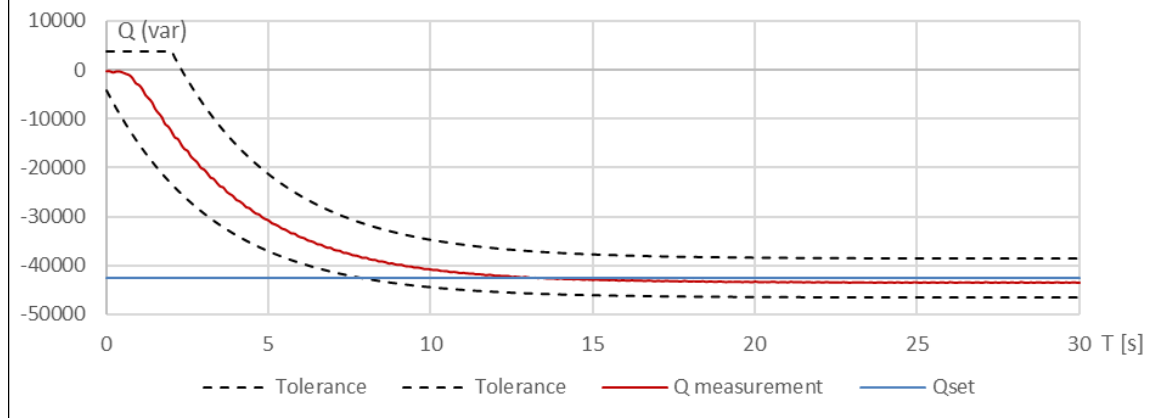




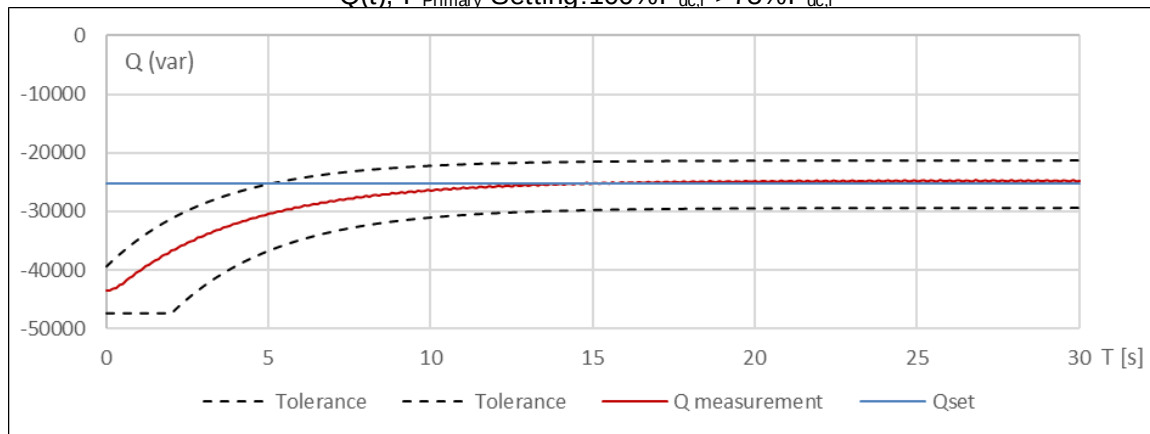
5.4.8.3(b)	TABLE: Tests of displacement factor- / active power characer curve (cosφ(P))		P
Test Conditions		Measurements	Limit
P _{rim} /P _{dc,r} [%]		Response time T [s]	Response time T [s]
100->40		10.0	Complied with PT-1 curve
40->100		10.0	
100->75		9.9	

Plotting diagram:
Q(t), P_{Primary} Setting:100%P_{dc,r}->40%P_{dc,r}

Q(t), P_{Primary} Setting:40%P_{dc,r}->100%P_{dc,r}



Q(t), P_{Primary} Setting: 100%P_{dc,r} → 75%P_{dc,r}



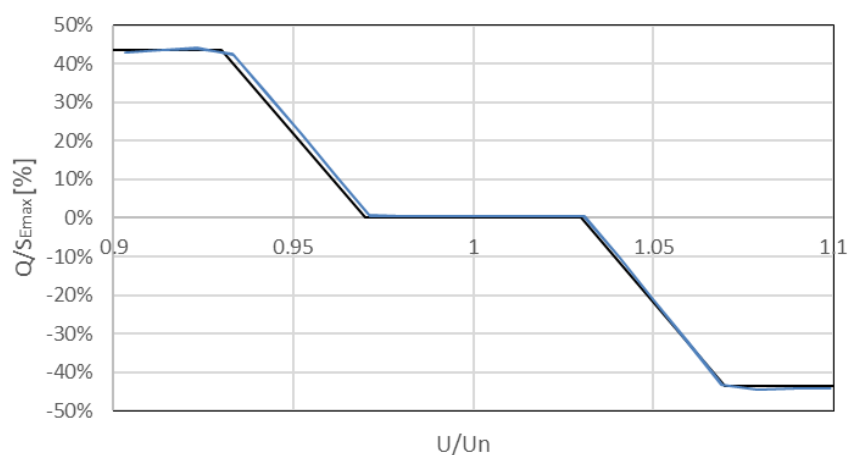
5.4.8.4(a)	TABLE: Tests of reactive power-voltage character curve (Q(U))					P
Q (U) curve settings:	U/Un	0.93	0.97	1.03		1.07
	Q/S _{Emax}	+0.436	0	0		-0.436
	3Tau [s]	6				
Test Conditions		Measurements		Target	Tolerance	Limit
U/Un[%]		Q[kVar]	U [V]	Q[kVar]	$\Delta Q/P_{E_{max}}[\%]$	$\Delta Q/P_{E_{max}}[\%]$
100		0.38	230.36	0	0.38	$\leq \pm 4$
99		0.37	228.05	0	0.37	$\leq \pm 4$
98		0.37	225.75	0	0.37	$\leq \pm 4$
97		0.36	223.44	0	0.36	$\leq \pm 4$
96		11.02	221.26	10.9	0.12	$\leq \pm 4$
95		21.57	219.07	21.8	-0.23	$\leq \pm 4$
94		31.95	216.87	32.7	-0.75	$\leq \pm 4$
93		42.22	214.67	43.6	-1.38	$\leq \pm 4$
92		44.01	212.37	43.6	0.41	$\leq \pm 4$
91		43.51	210.04	43.6	-0.09	$\leq \pm 4$
90		43.01	207.73	43.6	-0.59	$\leq \pm 4$
91		43.50	210.03	43.6	-0.10	$\leq \pm 4$
92		43.99	212.31	43.6	0.39	$\leq \pm 4$
93		42.43	214.58	43.6	-1.17	$\leq \pm 4$
94		32.30	216.76	32.7	-0.40	$\leq \pm 4$
95		21.85	218.95	21.8	0.05	$\leq \pm 4$

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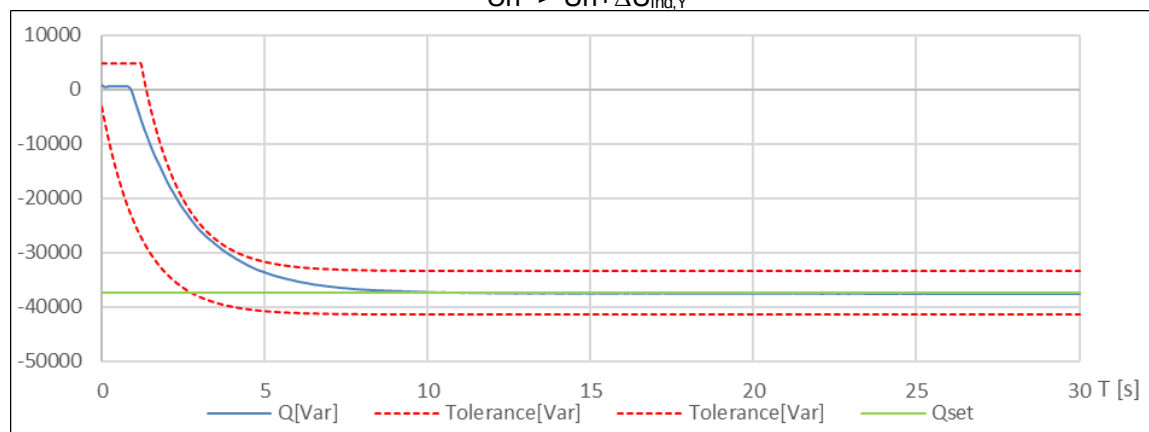
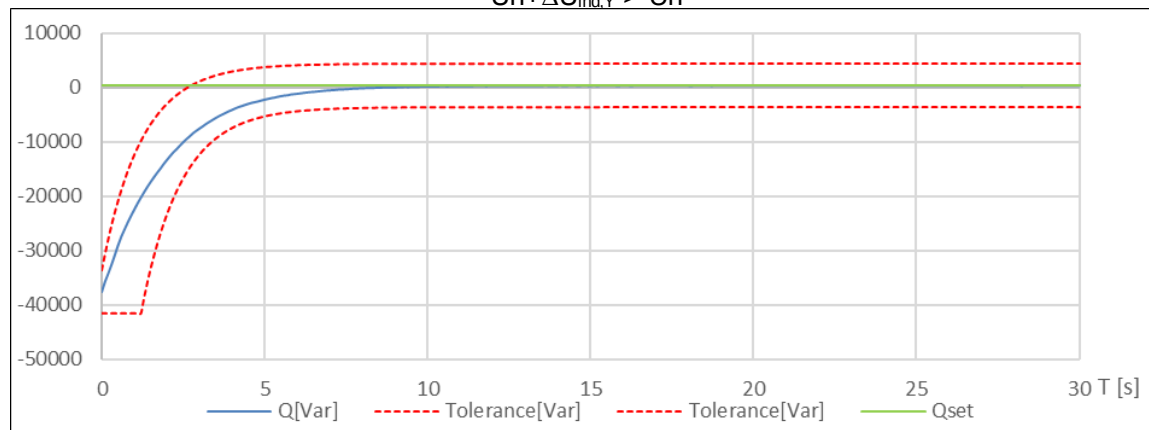
96	11.37	221.14	10.9	0.47	$\leq \pm 4$
97	0.74	223.31	0	0.74	$\leq \pm 4$
98	0.36	225.59	0	0.36	$\leq \pm 4$
99	0.37	227.90	0	0.37	$\leq \pm 4$
100	0.38	230.19	0	0.38	$\leq \pm 4$
101	0.40	232.47	0	0.40	$\leq \pm 4$
102	0.42	234.76	0	0.42	$\leq \pm 4$
103	0.44	237.06	0	0.44	$\leq \pm 4$
104	-10.00	239.27	-10.9	0.90	$\leq \pm 4$
105	-21.03	241.47	-21.8	0.77	$\leq \pm 4$
106	-32.11	243.65	-32.7	0.59	$\leq \pm 4$
107	-43.19	245.85	-43.6	0.41	$\leq \pm 4$
108	-44.41	248.14	-43.6	-0.81	$\leq \pm 4$
109	-44.38	250.46	-43.6	-0.78	$\leq \pm 4$
110	-44.33	252.76	-43.6	-0.73	$\leq \pm 4$
109	-44.38	250.47	-43.6	-0.78	$\leq \pm 4$
108	-44.42	248.17	-43.6	-0.82	$\leq \pm 4$
107	-43.29	245.88	-43.6	0.31	$\leq \pm 4$
106	-32.20	243.70	-32.7	0.50	$\leq \pm 4$
105	-21.17	241.51	-21.8	0.63	$\leq \pm 4$
104	-10.14	239.33	-10.9	0.76	$\leq \pm 4$
103	0.43	237.14	0	0.43	$\leq \pm 4$
102	0.42	234.83	0	0.42	$\leq \pm 4$
101	0.40	232.54	0	0.40	$\leq \pm 4$
100	0.38	230.24	0	0.38	$\leq \pm 4$

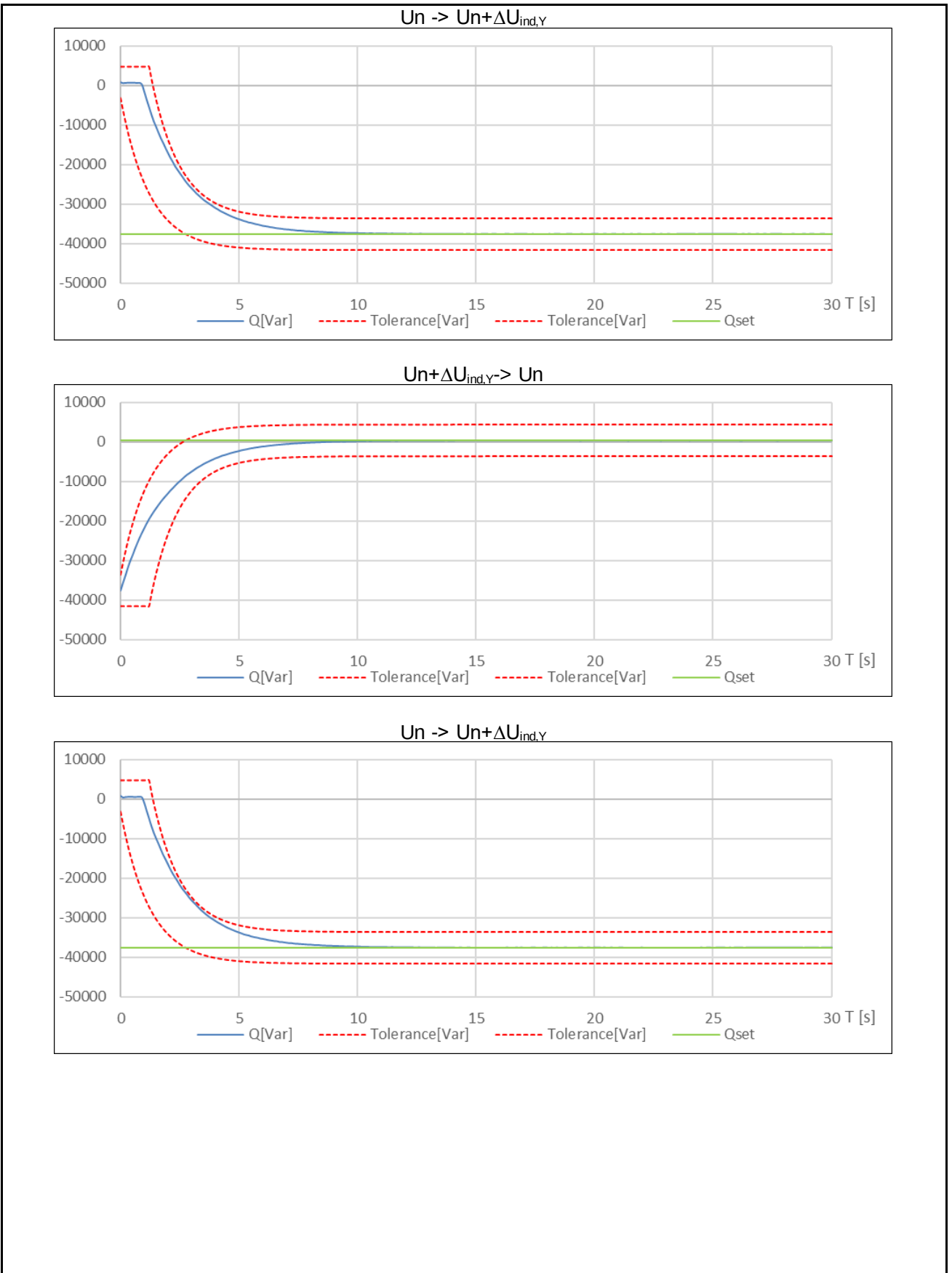
Diagram:

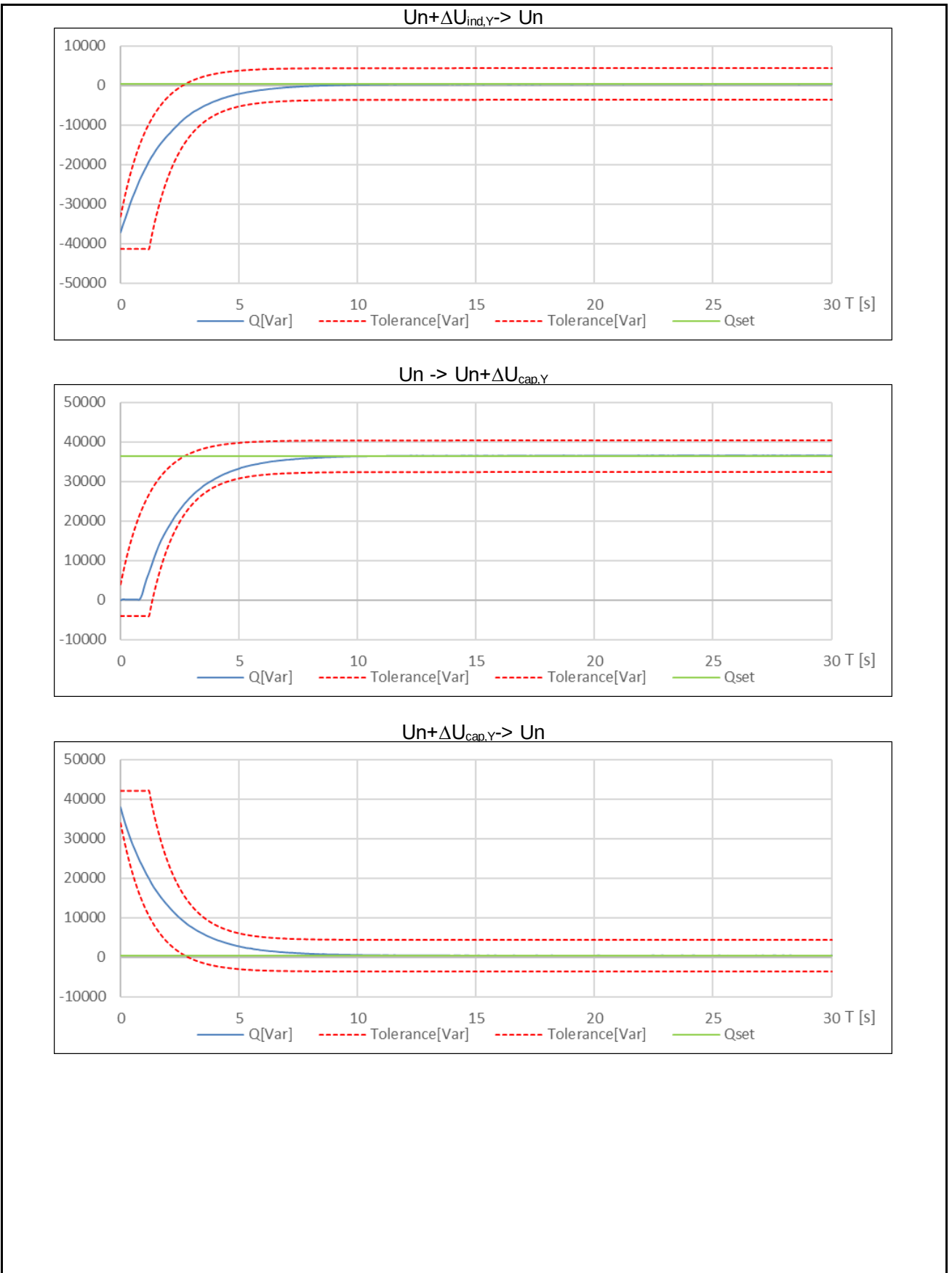


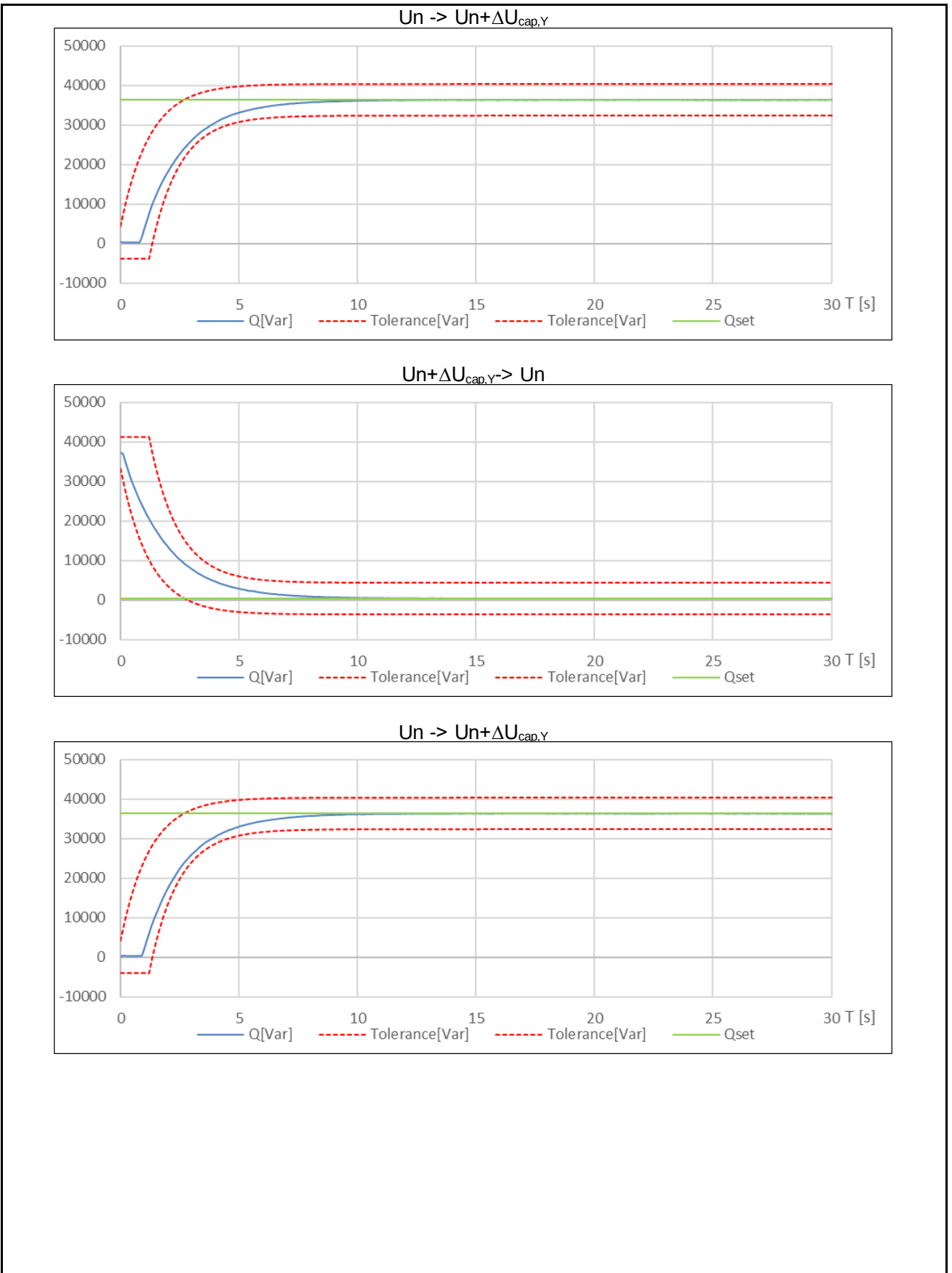
5.4.8.4(b)	TABLE: Tests of reactive power-voltage character curve (Q(U))				P
Test Conditions	Measurement			Target	Limit
	Settling time T [s]	Q _{Start} [kVar]	Q _{end} [kVar]	Q _{end} /S _{E_{max}} [%]	ΔQ _{end} /P _{E_{max}} [%]
Un -> Un+ΔU _{ind,Y}	6.0	0.81	-37.59	-37%	--
Un+ΔU _{ind,Y} -> Un	6.0	-37.67	0.34	0	≤±4
Un -> Un+ΔU _{ind,Y}	6.0	0.73	-37.53	-37%	--
Un+ΔU _{ind,Y} -> Un	6.0	-37.53	0.34	0	≤±4
Un -> Un+ΔU _{ind,Y}	6.0	0.83	-37.63	-37%	--
Un+ΔU _{ind,Y} -> Un	6.0	-37.24	0.34	0	≤±4
Un -> Un+ΔU _{cap,Y}	6.0	0.20	36.42	37%	--
Un+ΔU _{cap,Y} -> Un	6.0	38.03	0.42	0	≤±4
Un -> Un+ΔU _{cap,Y}	6.0	0.30	36.39	37%	--
Un+ΔU _{cap,Y} -> Un	6.0	37.20	0.42	0	≤±4
Un -> Un+ΔU _{cap,Y}	6.0	0.44	36.30	37%	--
Un+ΔU _{cap,Y} -> Un	6.0	36.78	0.42	0	≤±4

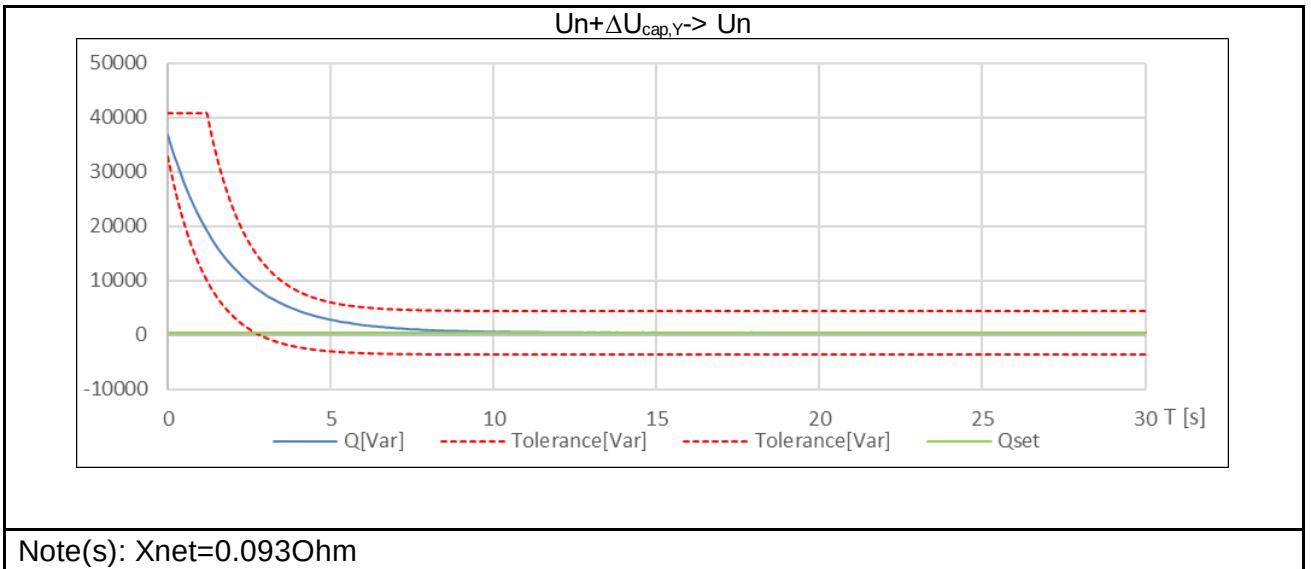
Plotting Diagram

Un -> Un+ΔU_{ind,Y}

Un+ΔU_{ind,Y}-> Un










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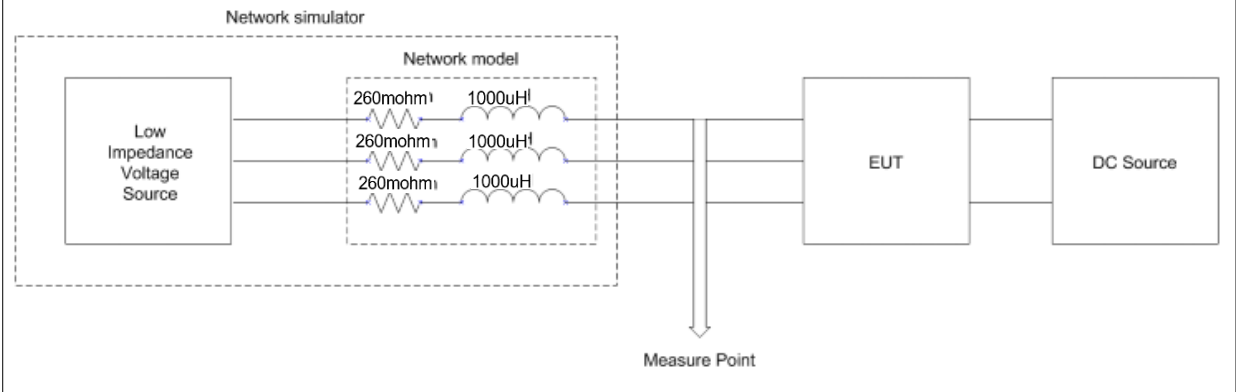
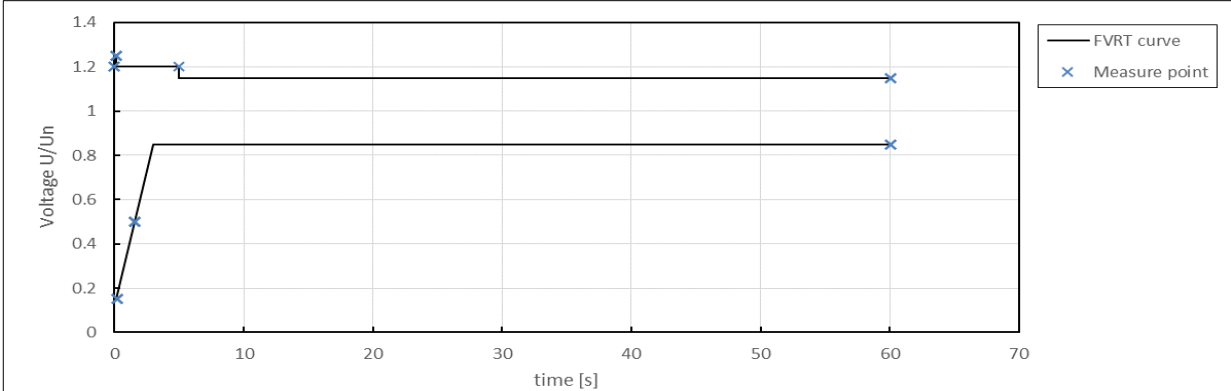
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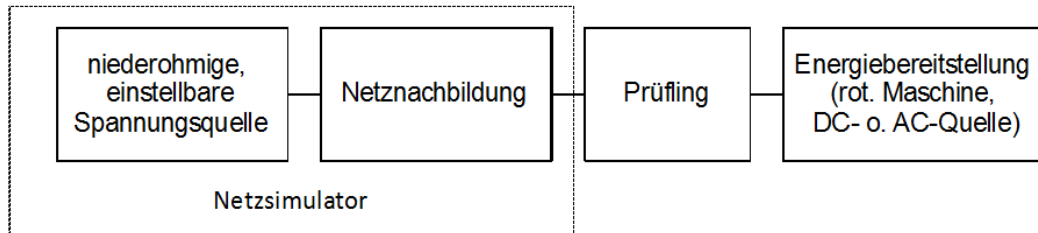
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5.5.2, 5.5.4, 5.5.6	TABLE: NS-protection, Integrated interface switch (Functional safety)	P
The max. initial short-circuited current I_k [A]:	160	
Switch type:	CHAR-A200	
Switch capability:	220	
Manufacturer:	CHUROD	
DIN EN 62109-1 cert/report No.:	CN23ZN7U 001	

5.6	TABLE: Connection conditions and synchronization (Reconnection)			P
Condition	Measurement		Limitation	
	Reconnection	Delay time [s]	Reconnection	Delay time [s]
$f < 47.45\text{Hz}$	No	--	No	≥ 60
$f \geq 47.55\text{Hz}$	Yes	99.6	Yes	≥ 60
$f > 50.15\text{Hz}$	No	--	No	≥ 60
$f \leq 50.05\text{Hz}$	Yes	105.6	Yes	≥ 60
$U < 0.84U_n$	No	--	No	≥ 60
$U \geq 0.86U_n$	Yes	125.5	Yes	≥ 60
$U > 1.11U_n$	No	--	No	≥ 60
$U \leq 1.09U_n$	Yes	119.4	Yes	≥ 60

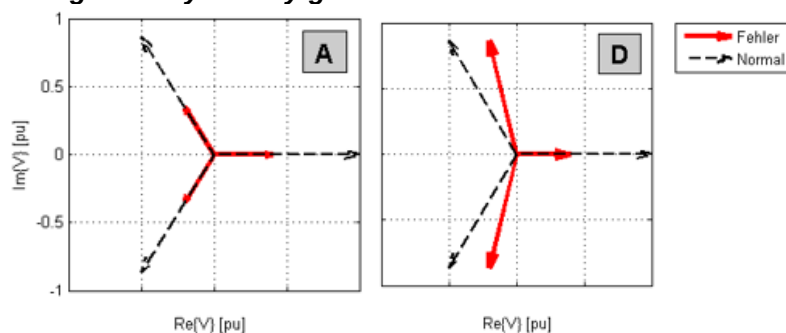
5.8	TABLE: Verification of dynamic network supporting (FVRT)	P
Test bench diagram:		
R_{netz}: ??Ohm, X_{netz}: ??Ohm 		
FRT curve settings:		
		
Fault Type	3-phase fault and 2-phase fault	
Transformer Type	Dy5	
NS protection settings	See table 5.5.7 for detail.	
Any auxilliary power supply in fault ride through?	Yes/No	
Terminal sequence	For D1: U-L1, V-L2, W-L3 For D2: U-L3, V-L1, W-L2	

Test Procedure:

Test Equipment:


The test equipment and network simulator must be able to take the max. occurring PGU current, both in generating and motoring area. The energy absorb shall be designed for sudden short circuited current I_p (per IEC 60909). I_p is obvious different by the type of test sample, the correct value shall be:

- for inverter coupled system about $2.2I_n$,
- for direct coupled Asynchronous or Synchronous machines about $7I_n$.

Grid simulator settings for asymmetry grid fault:


D1	Test Equipment	Test Sample
Connection terminal	U	L1
	V	L2
	W	L3 (L for single phase)
D2	Test Equipment	Test Sample
Connection terminal	U	L3
	V	L1 (L for single phase)
	W	L2

VDE No.	U	V	W	Type	Remark
--	1.00, -150°	1.00, 90°	1.00, -30°	A	Initial status
1.3, 1.4	0.62, -173.3°	0.15, 90°	0.62, -6.9°	D	UVRT
2.3, 2.4, 3.3, 3.4	0.76, -161.1°	0.50, 90°	0.76, -19.1°	D	
4.3, 4.4	0.93, -152.8°	0.85, 89.9°	0.93, -27.4°	D	
5.3, 5.4	1.08, -144.5°	1.25, 89.1°	1.06, -36.3°	D	OVRT
6.3, 6.4	1.06, -145.5°	1.20, 89.3°	1.05, -35.1°	D	
7.3, 7.4	1.04, -146.6°	1.15, 89.4°	1.04, -33.9°	D	

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Test	U/Un [p.u.]	Fault type	Fault duration [ms]	P/Pn [p.u.]	Q/Pn [p.u.]	Test No.
1	0.15.....0.25	A	For 0.15pu ≥ 150 For 0.25pu ≥ 500	1.0	0...±0.1	1.1
		D1		0.2...0.6		1.2
				1.0		1.3
				0.2...0.6		1.4
				D2		1.0
2	0.50....0.60	A	For 0.5pu ≥1500 For 0.60pu ≥ 2000	1.0	Max. over- excited	2.1
		D1		0.2...0.6		2.2
				1.0		2.3
				0.2...0.6		2.4
3	0.50....0.60	A	For 0.5pu ≥1500 For 0.60pu ≥ 2000	1.0	Max. under- excited	3.1
		D1		0.2...0.6		3.2
				1.0		3.3
				0.2...0.6		3.4
4	0.85....0.90	A	≥ 60000	1.0	0...±0.1	4.1
		D1		0.2...0.6		4.2
				1.0		4.3
				0.2...0.6		4.4
5	1.2....1.25	A	≥ 100	1.0	0...±0.1	5.1
		D1		0.2...0.6		5.2
				1.0		5.3
				0.2...0.6		5.4
				D2		1.0
6	1.15...1.20	A	≥ 5000	1.0	0...±0.1	6.1
		D1		0.2...0.6		6.2
				1.0		6.3
				0.2...0.6		6.4
7	1.10...1.15	A	≥ 60000	1.0	0...±0.1	7.1
		D1		0.2...0.6		7.2
				1.0		7.3
				0.2...0.6		7.4

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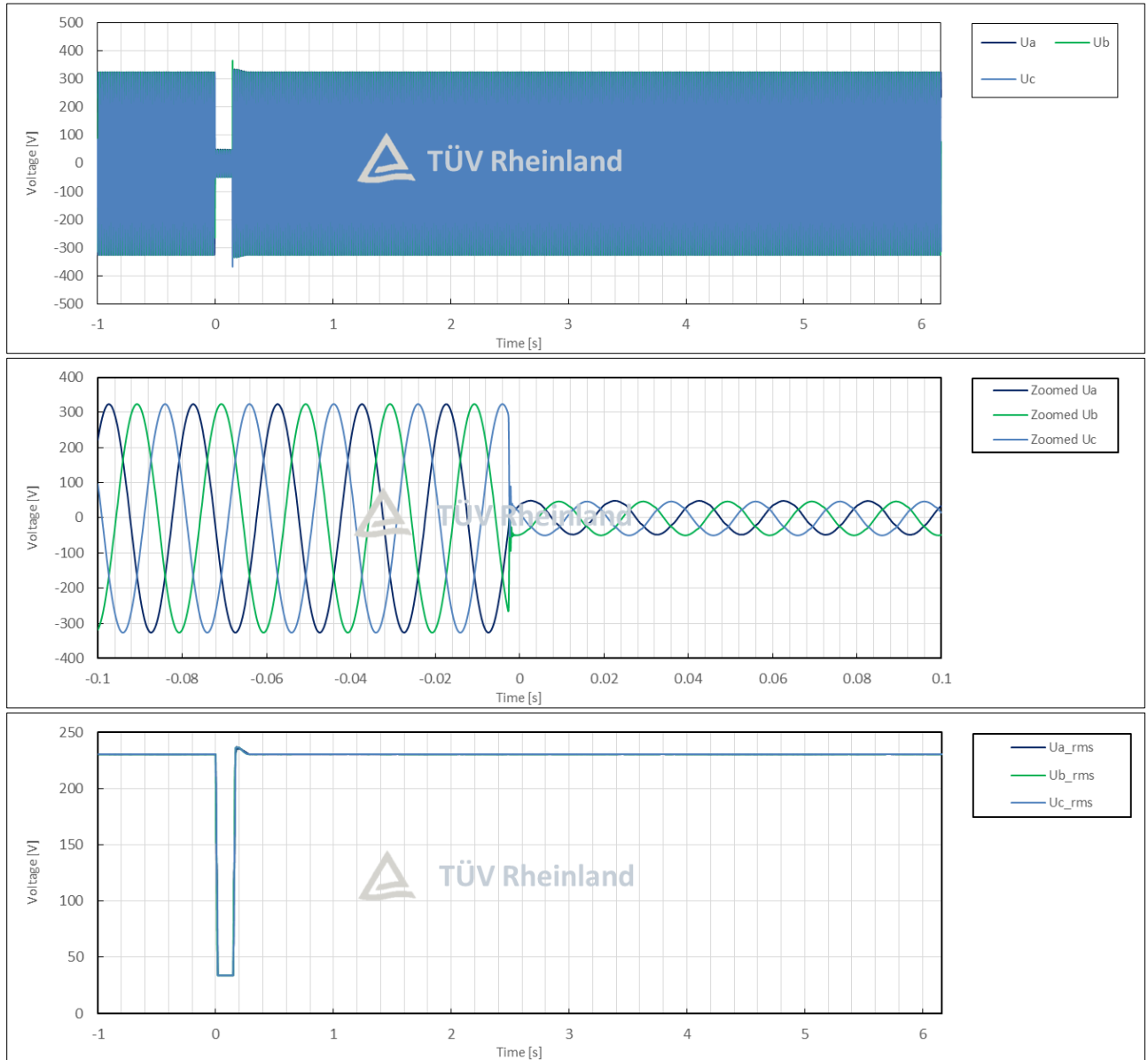
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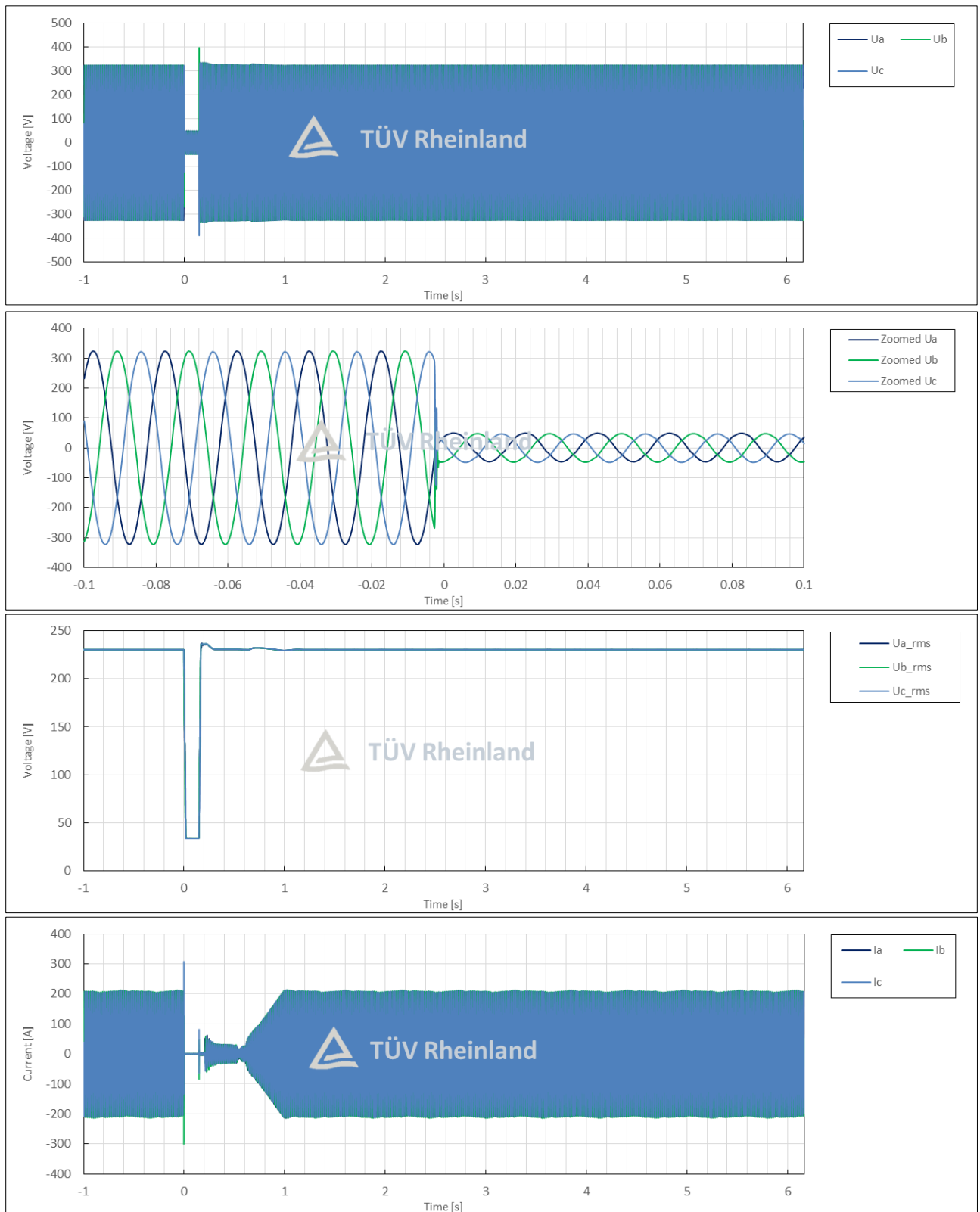
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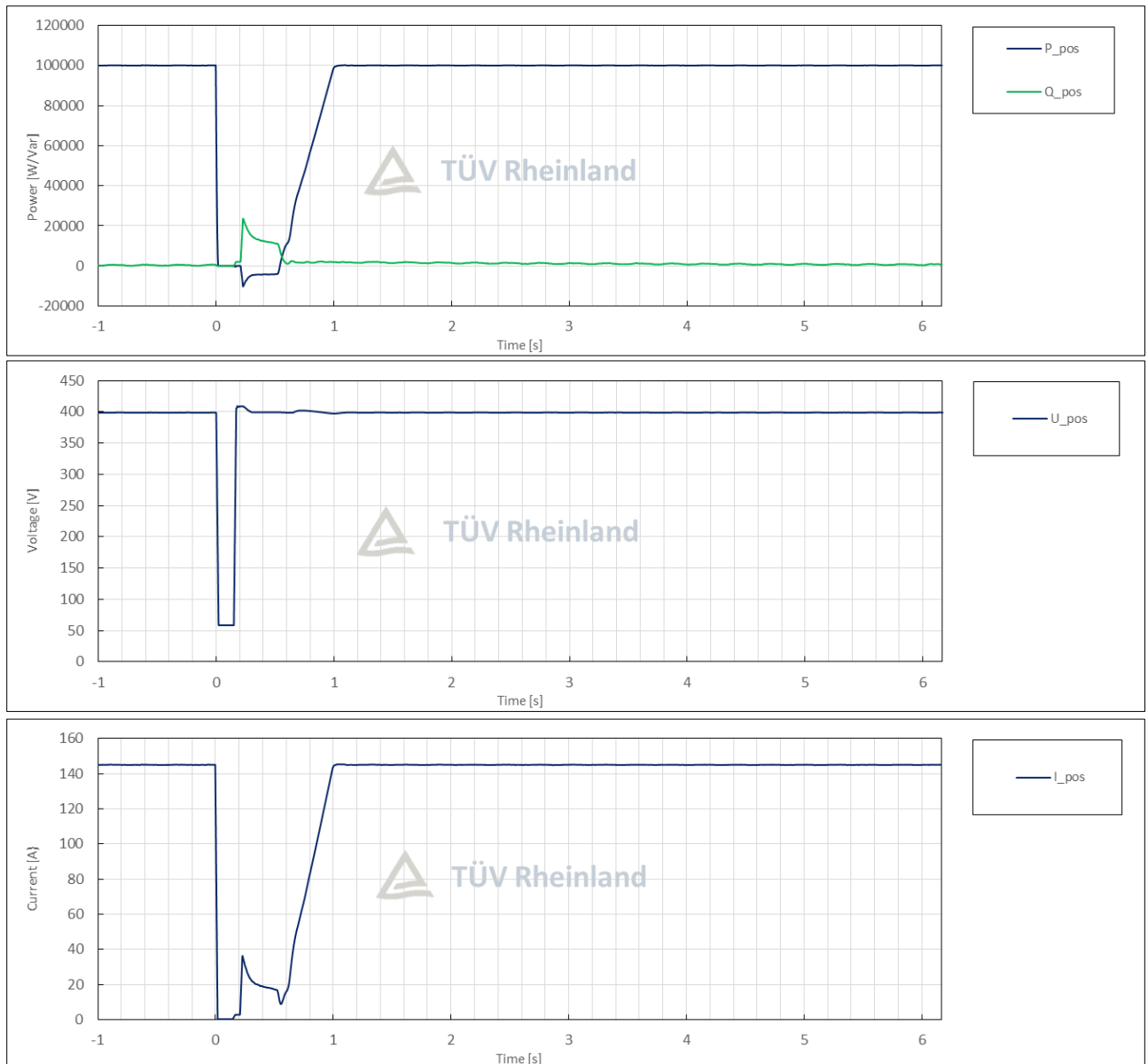
Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	1.1
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	12:58:52
	3	Fault type (phase)	--	--		3-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	0.15
	5	Setting dip duration		--		166
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	166
	8	Fault duration in empty load test	Total	--	ms	166
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	0.15
	10		Pos.		p.u.	0.15
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.00
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	1.00
	13	Active power	Total	t1-10s to t1	p.u.	1.00
	14		Pos.			1.00
	15	Reactive power	Total	t1-10s to t1	p.u.	0.00
	16		Pos.			0.00
	17	Cosφ	--	t1-10s to t1	--	1.000
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	0.15
	19	Line current	Phase 1	t1+60ms	p.u.	0.00
	20		Phase 2			0.00
	21		Phase 3			0.00
	22	Line current	Phase 1	t1+100ms	p.u.	0.00
	23		Phase 2			0.00
	24		Phase 3			0.00
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	0.00
	26		Pos.			0.00
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.00
	28	Active power	Total	t2+3s to t2+10s	p.u.	1.00
	29		Pos.			1.00
	39	Active power rising time	Pos.	--	s	0.791
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	0.01
	32		Pos.			0.01
	33	Reactive power rising time	Pos.	--	s	N/A
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

Test No. 1.1 idle test



Test No. 1.1 with PGU






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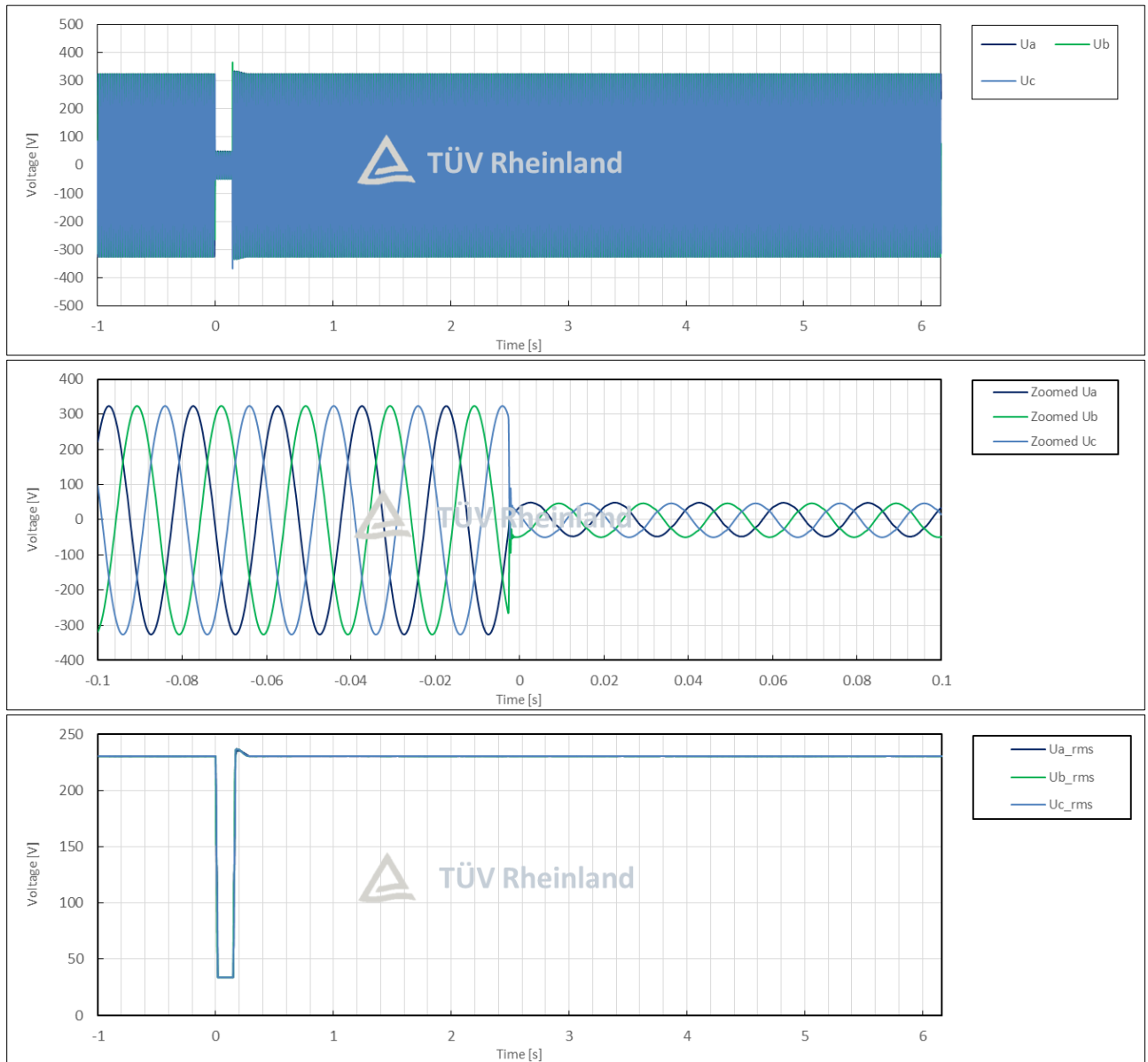
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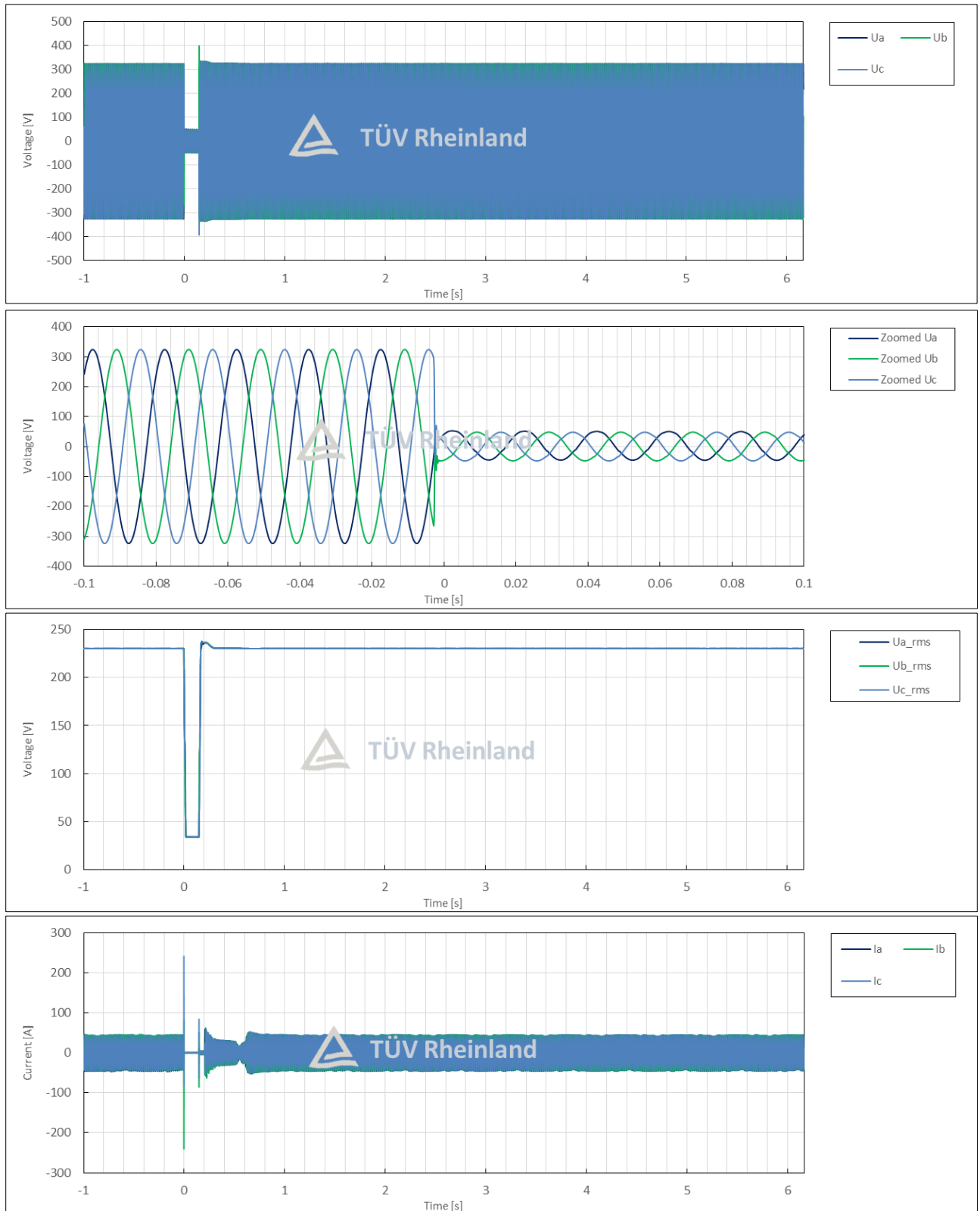
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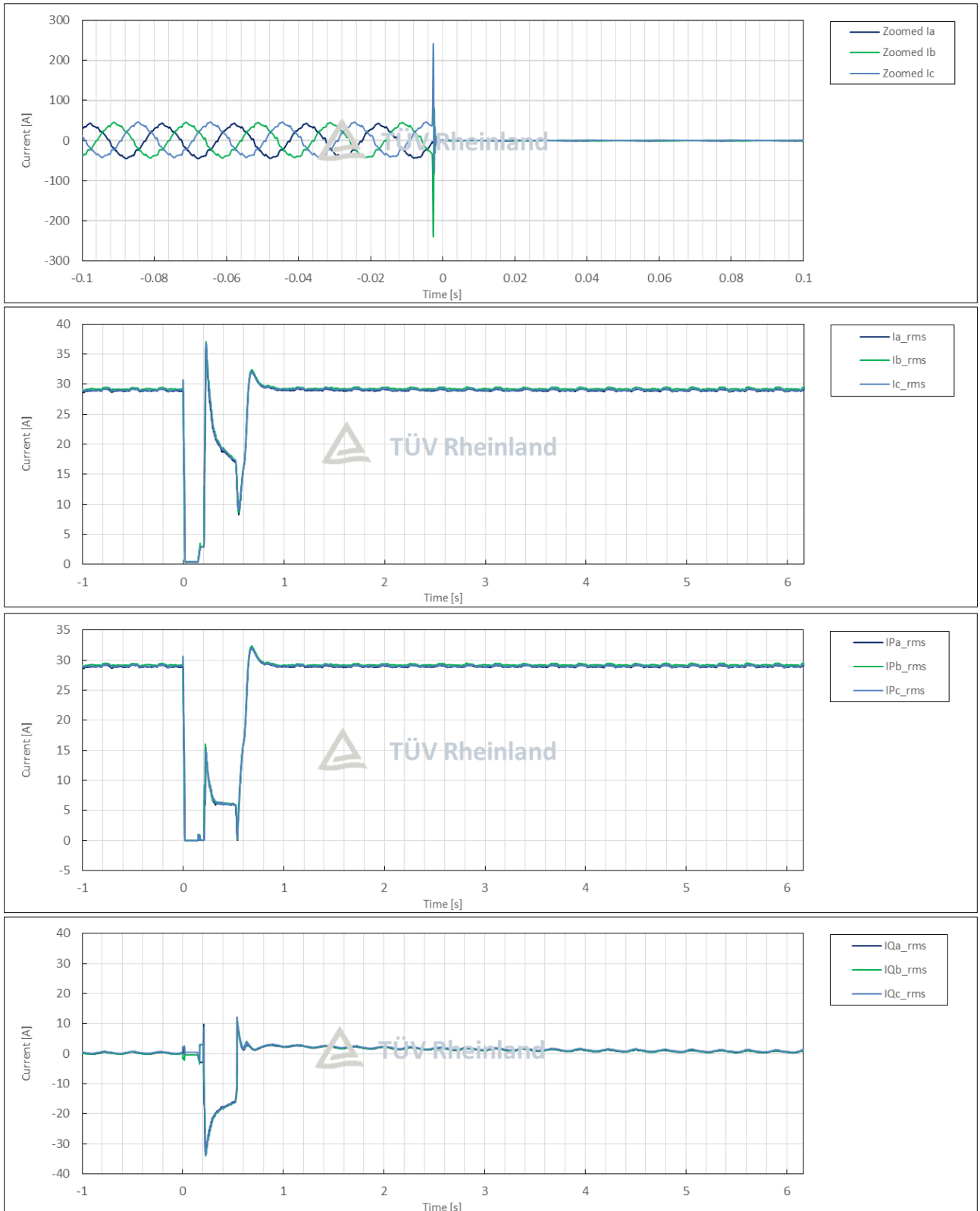
Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	1.2
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	13:02:16
	3	Fault type (phase)	--	--		3-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	0.15
	5	Setting dip duration		--		166
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	166
	8	Fault duration in empty load test	Total	--	ms	166
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	0.15
	10		Pos.		p.u.	0.15
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.00
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	0.20
	13	Active power	Total	t1-10s to t1	p.u.	0.20
	14		Pos.			0.20
	15	Reactive power	Total	t1-10s to t1	p.u.	0.00
	16		Pos.			0.00
	17	Cosφ	--	t1-10s to t1	--	1.000
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	0.15
	19	Line current	Phase 1	t1+60ms	p.u.	0.00
	20		Phase 2			0.00
	21		Phase 3			0.00
	22	Line current	Phase 1	t1+100ms	p.u.	0.00
	23		Phase 2			0.00
	24		Phase 3			0.00
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	0.00
	26		Pos.			0.00
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.00
	28	Active power	Total	t2+3s to t2+10s	p.u.	0.20
	29		Pos.			0.20
	39	Active power rising time	Pos.	--	s	0.471
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	0.00
	32		Pos.			0.00
	33	Reactive power rising time	Pos.	--	s	N/A
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

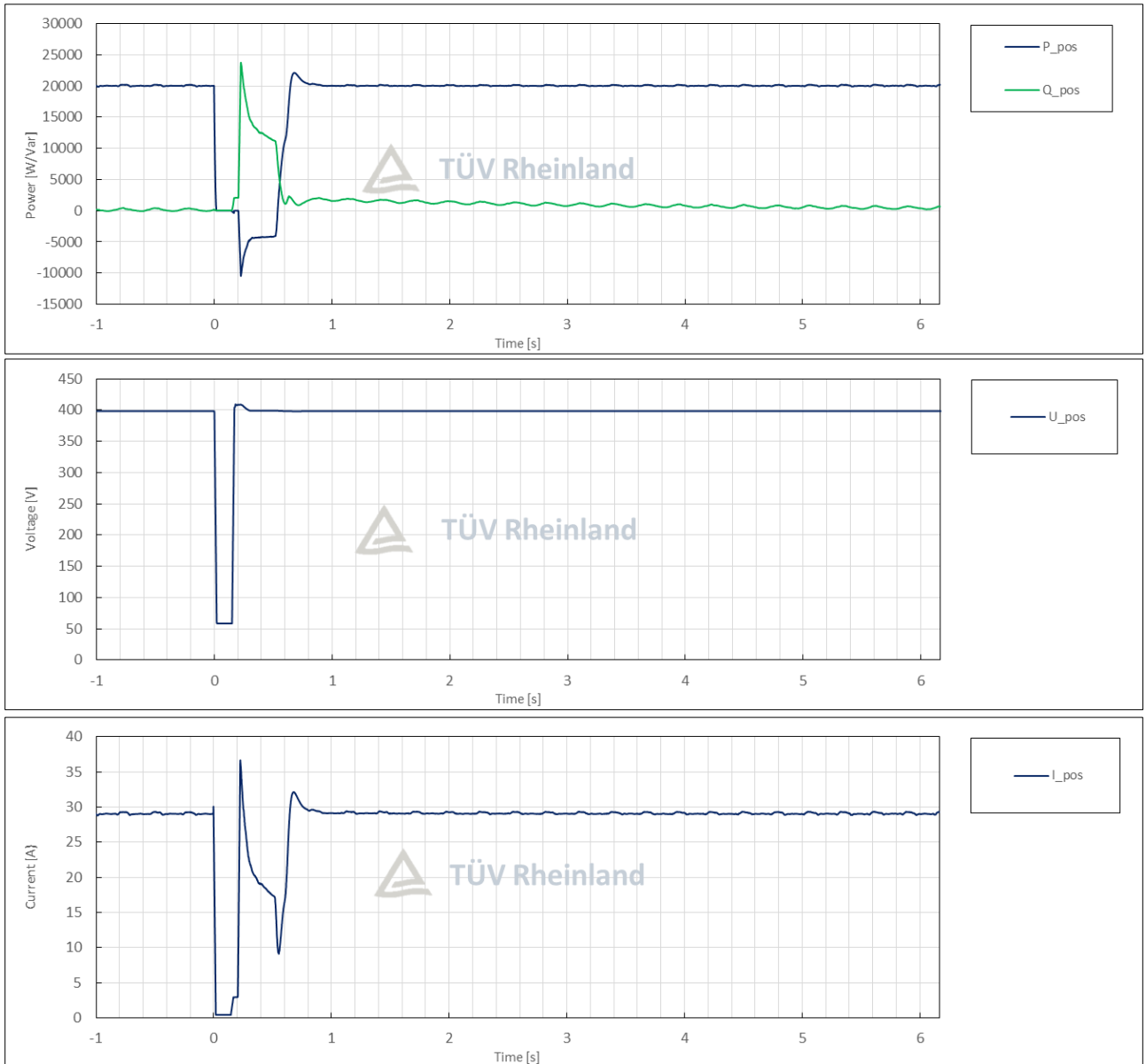
Test No. 1.2 idle test



Test No. 1.2 with PGU







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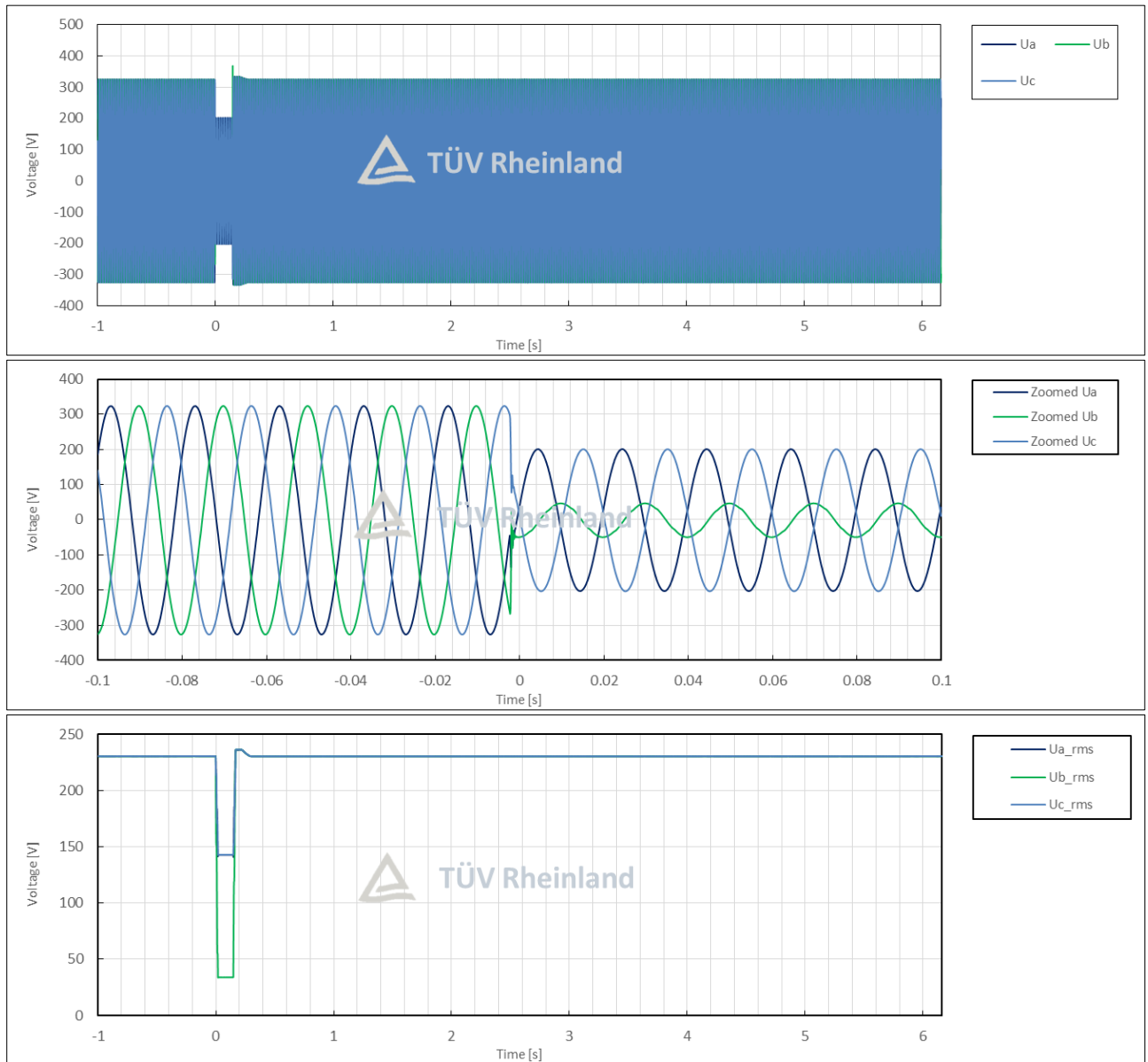
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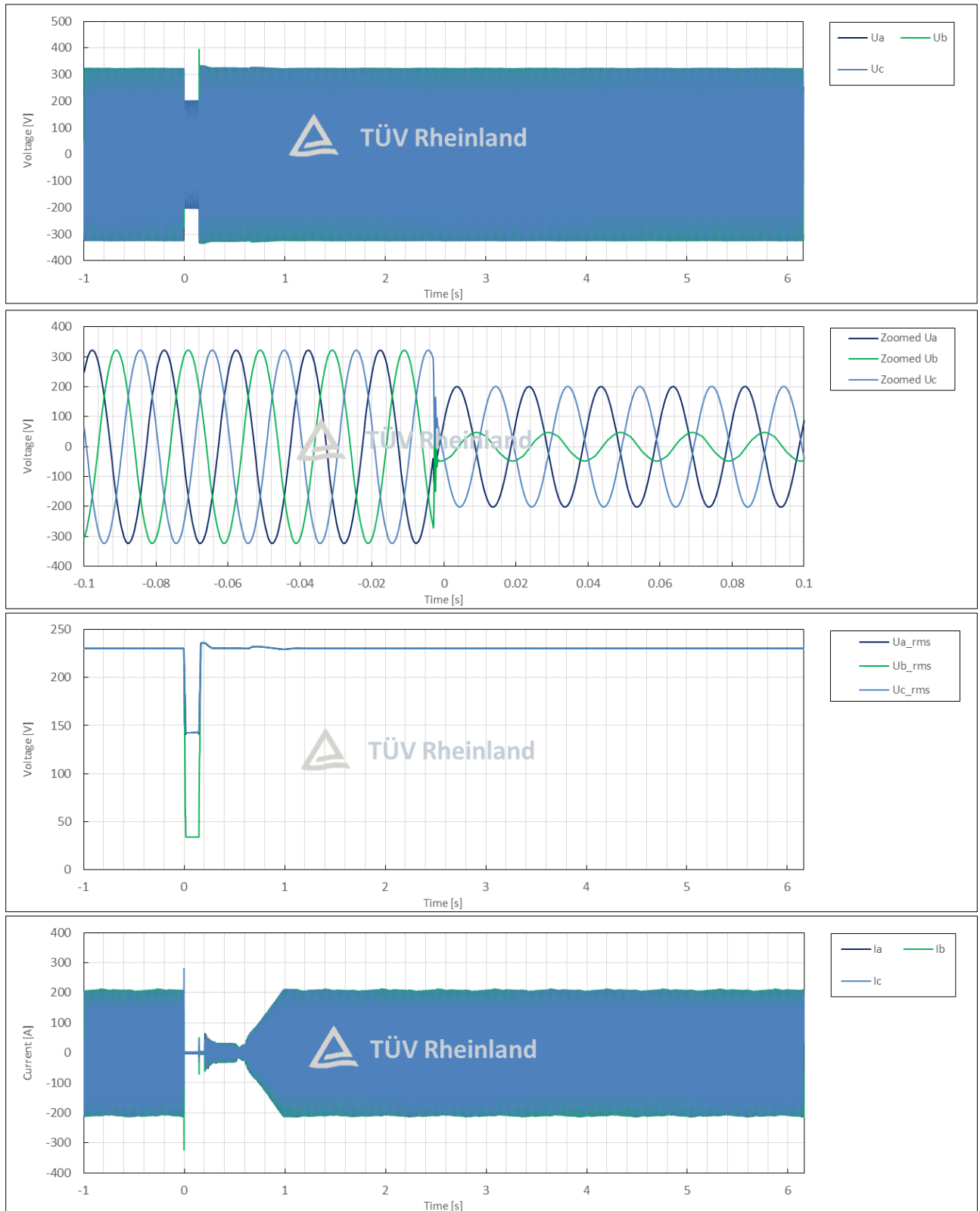
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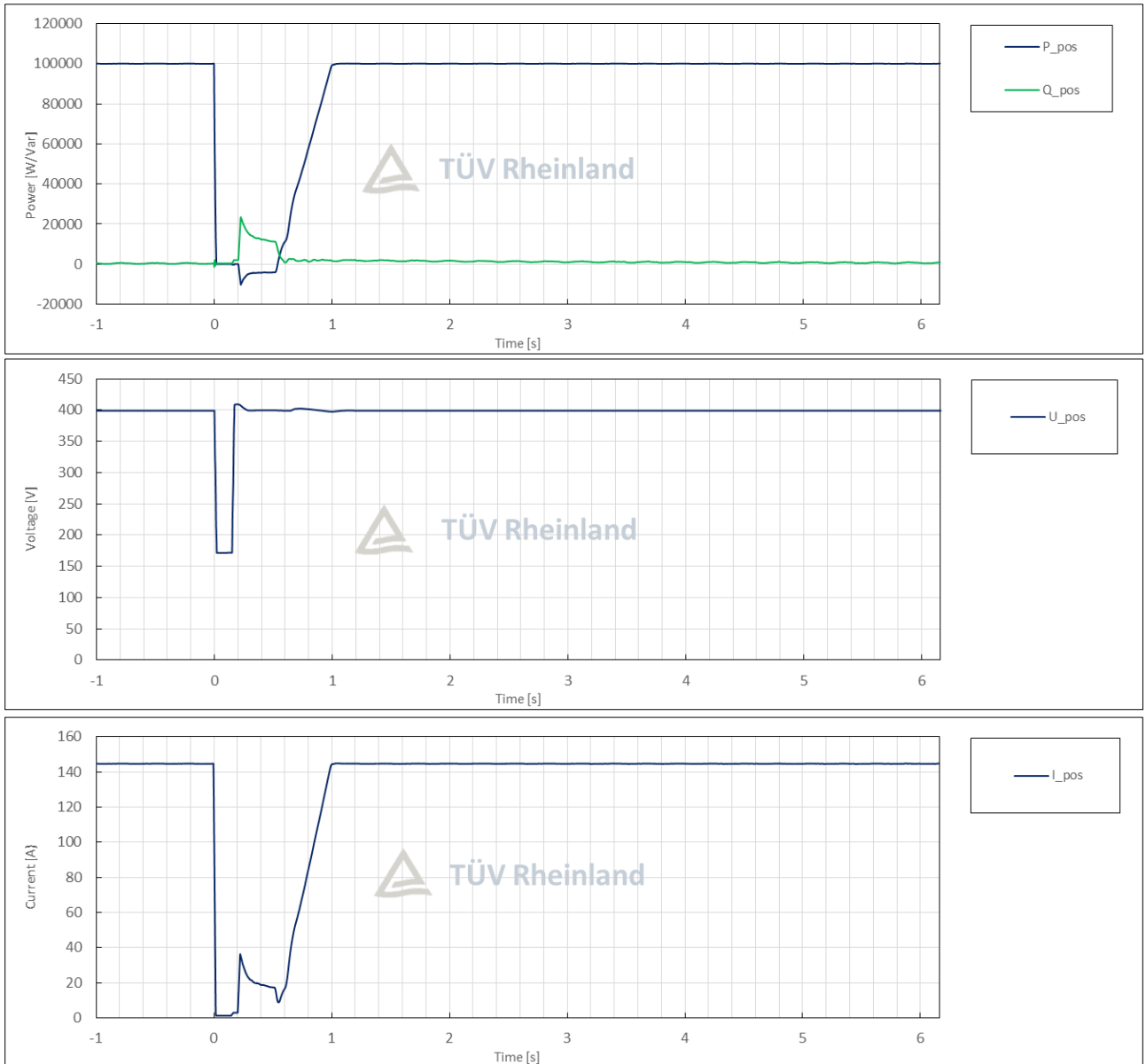
Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	1.3
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	13:02:32
	3	Fault type (phase)	--	--		2-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	0.15
	5	Setting dip duration		--		162
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	162
	8	Fault duration in empty load test	Total	--	ms	162
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	0.15
	10		Pos.		p.u.	0.43
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.00
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	1.00
	13	Active power	Total	t1-10s to t1	p.u.	1.00
	14		Pos.			1.00
	15	Reactive power	Total	t1-10s to t1	p.u.	0.00
	16		Pos.			0.00
	17	Cosφ	--	t1-10s to t1	--	1.000
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	0.15
	19	Line current	Phase 1	t1+60ms	p.u.	0.01
	20		Phase 2			0.00
	21		Phase 3			0.01
	22	Line current	Phase 1	t1+100ms	p.u.	0.01
	23		Phase 2			0.00
	24		Phase 3			0.01
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	0.00
	26		Pos.			0.00
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.00
	28	Active power	Total	t2+3s to t2+10s	p.u.	1.00
	29		Pos.			1.00
	39	Active power rising time	Pos.	--	s	0.791
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	0.01
	32		Pos.			0.01
	33	Reactive power rising time	Pos.	--	s	N/A
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

Test No. 1.3 idle test



Test No. 1.3 with PGU






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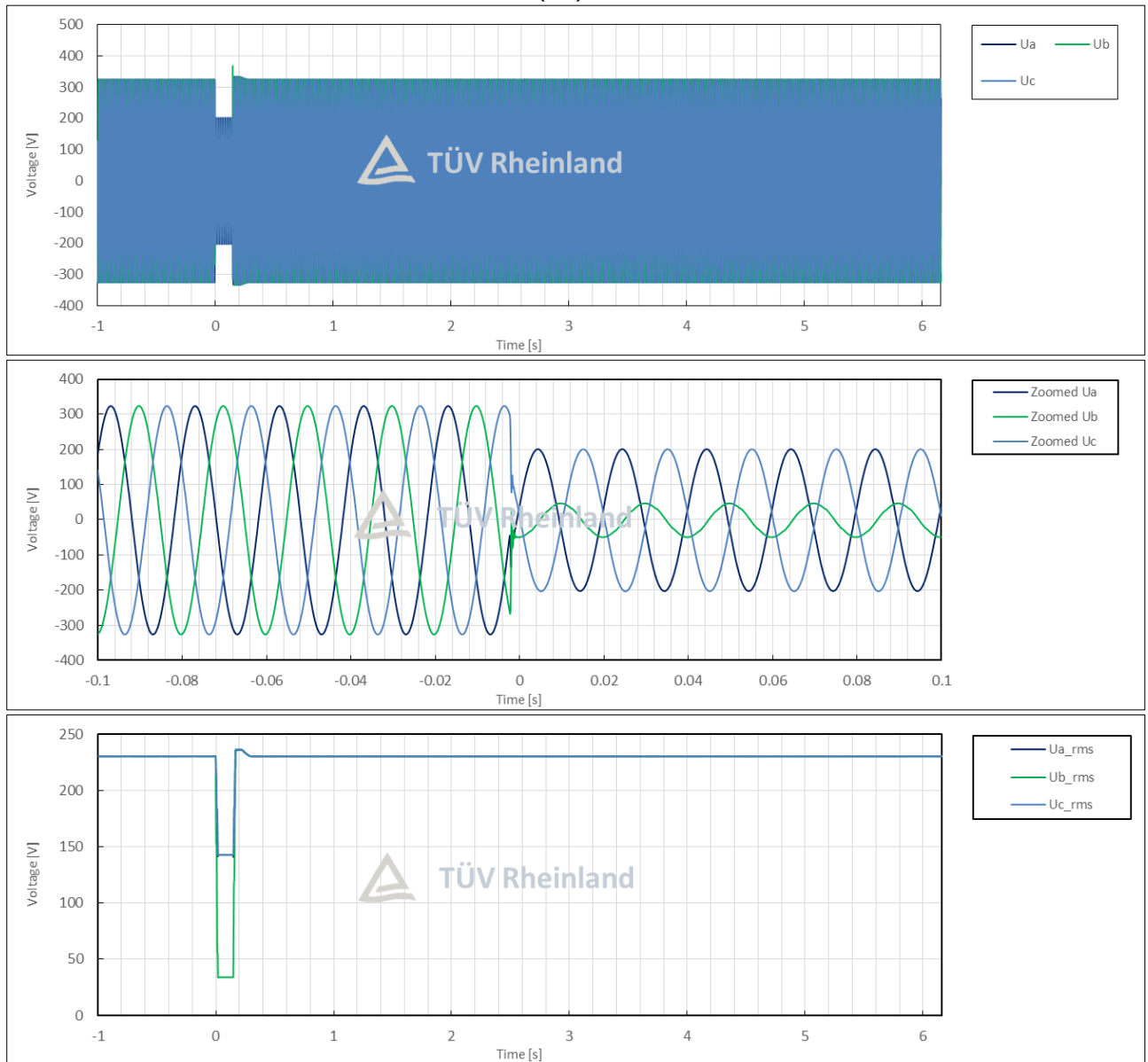
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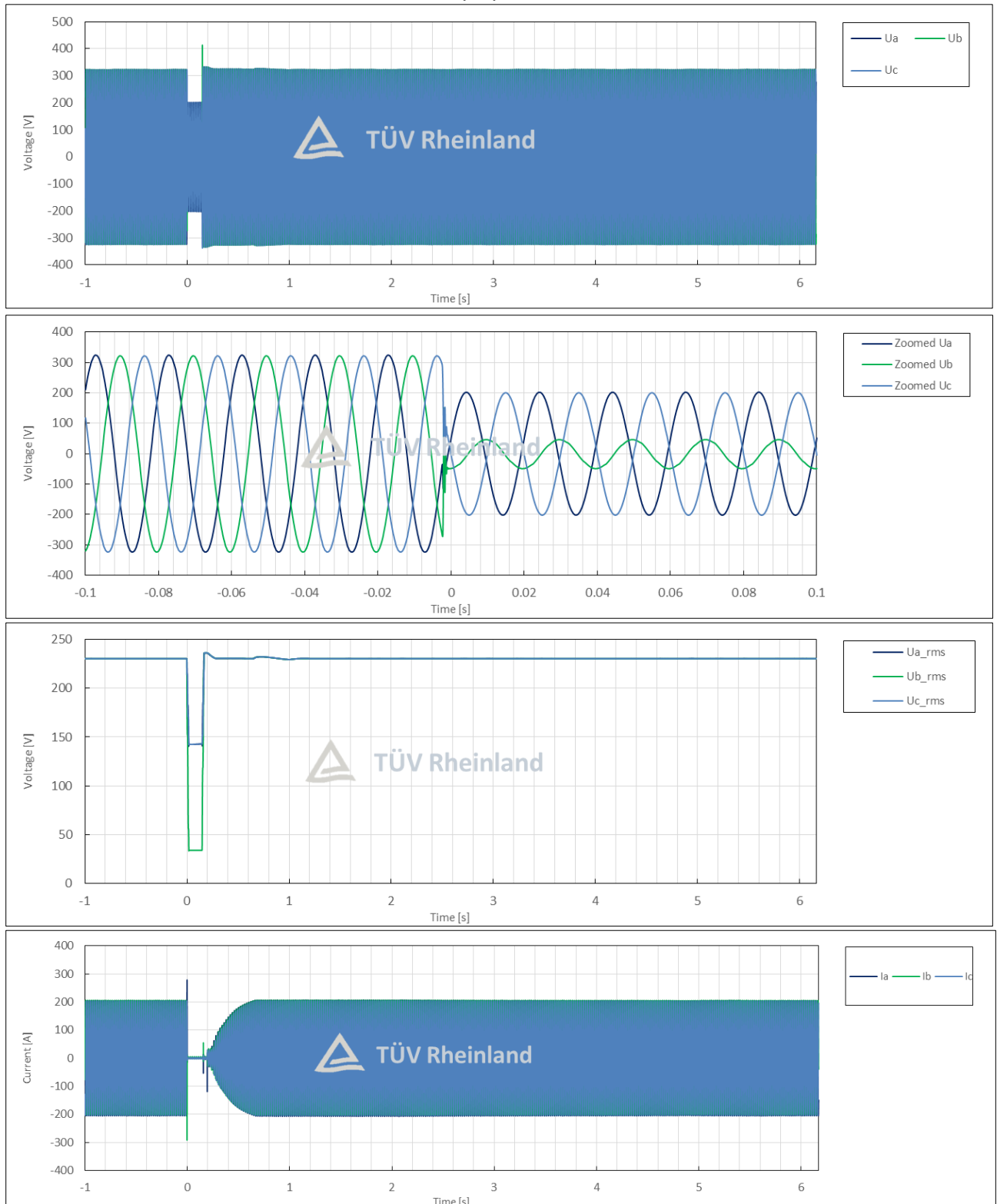
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Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	1.3(D2)
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	12:59:10
	3	Fault type (phase)	--	--		2-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	0.15
	5	Setting dip duration		--		162
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	162
	8	Fault duration in empty load test	Total	--	ms	162
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	0.15
	10		Pos.		p.u.	0.43
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.00
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	1.00
	13	Active power	Total	t1-10s to t1	p.u.	1.00
	14		Pos.			1.00
	15	Reactive power	Total	t1-10s to t1	p.u.	0.02
	16		Pos.			0.02
	17	Cosφ	--	t1-10s to t1	--	1.000
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	0.15
	19	Line current	Phase 1	t1+60ms	p.u.	0.00
	20		Phase 2			0.01
	21		Phase 3			0.01
	22	Line current	Phase 1	t1+100ms	p.u.	0.00
	23		Phase 2			0.01
	24		Phase 3			0.01
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	0.00
	26		Pos.			0.00
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.00
	28	Active power	Total	t2+3s to t2+10s	p.u.	1.00
	29		Pos.			1.00
	39	Active power rising time	Pos.	--	s	0.375
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	0.03
	32		Pos.			0.03
	33	Reactive power rising time	Pos.	--	s	N/A
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

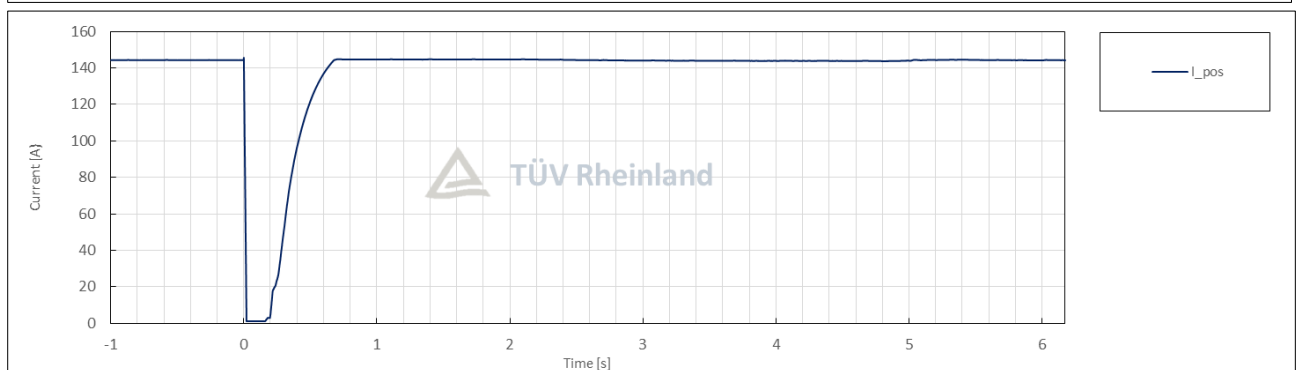
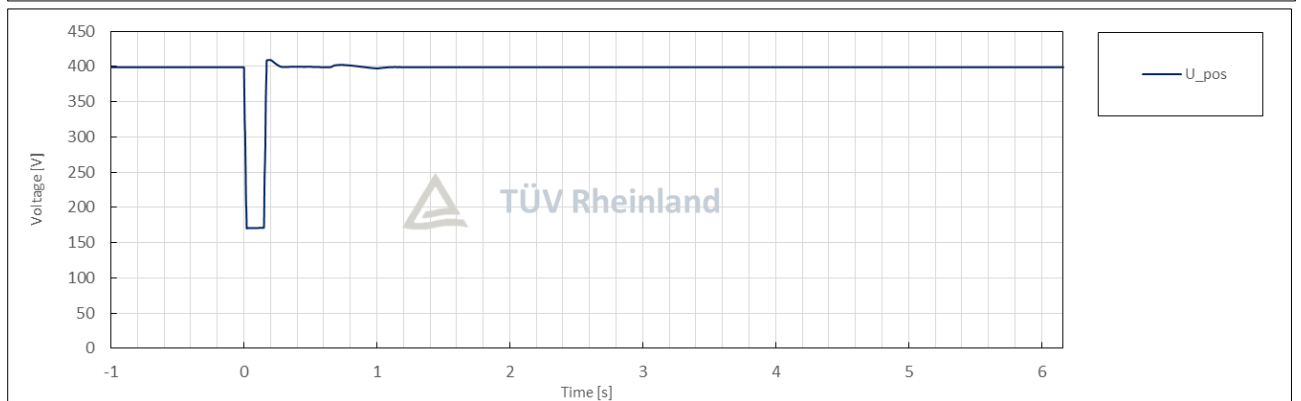
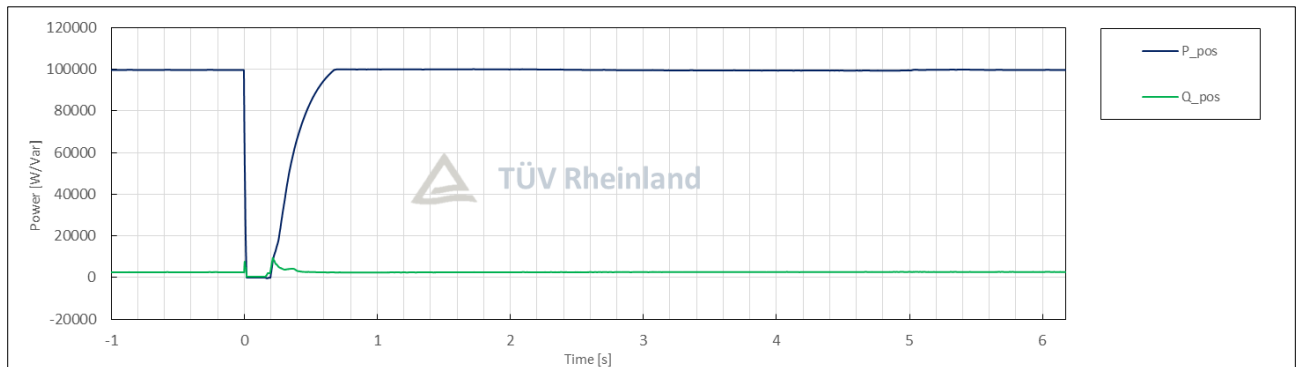
Test No. 1.3(D2) idle test



Test No. 1.3(D2) with PGU







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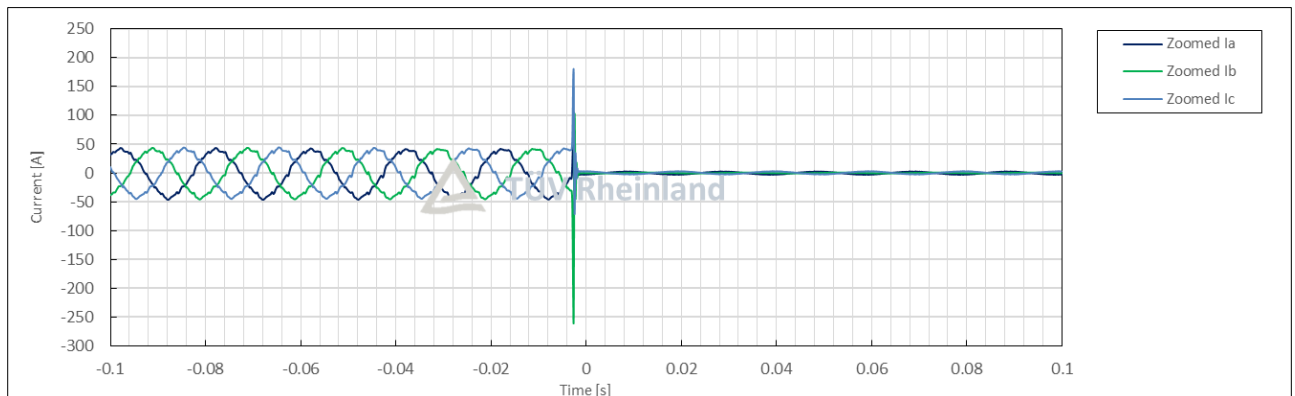
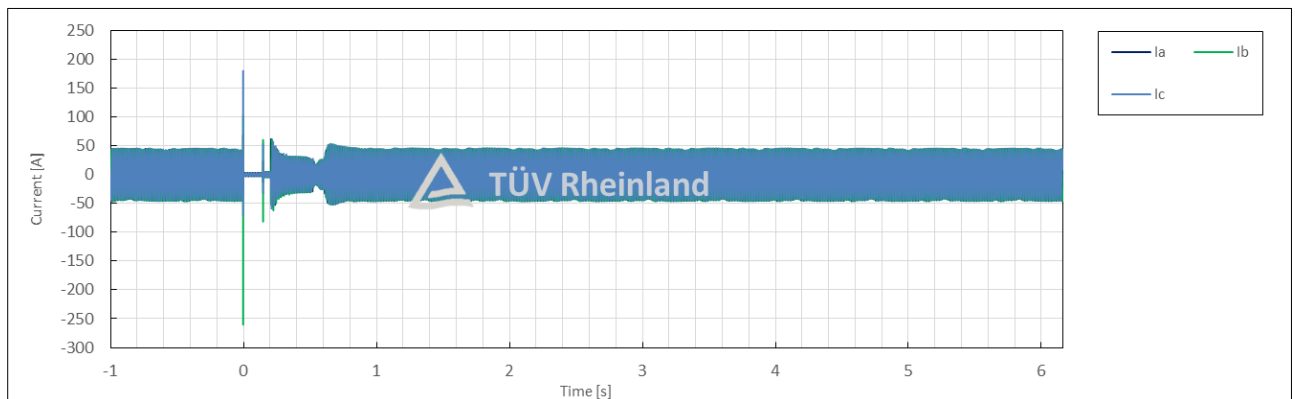
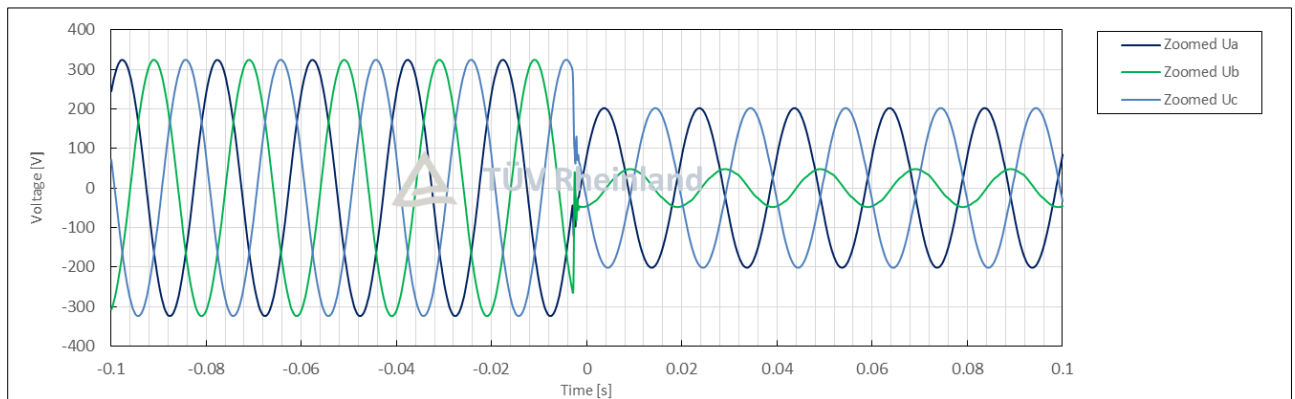
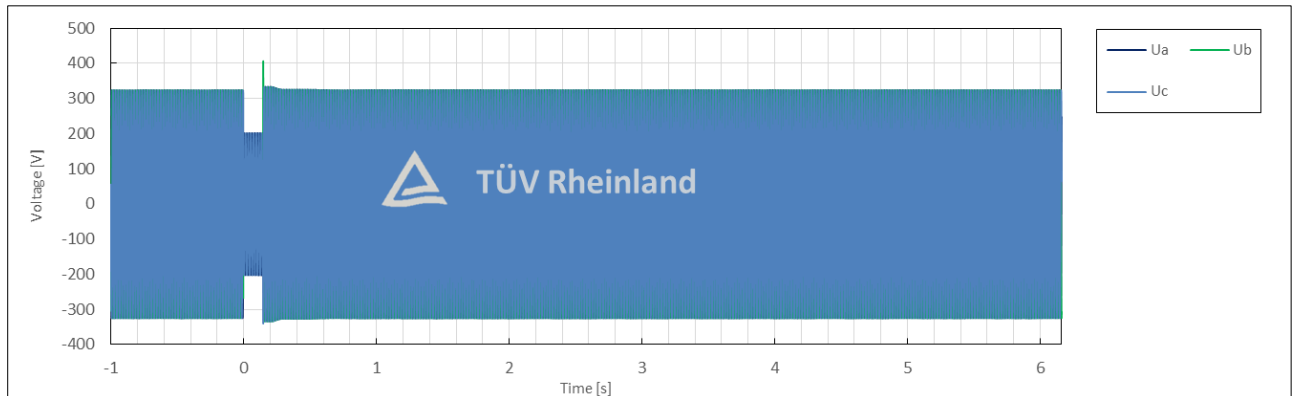
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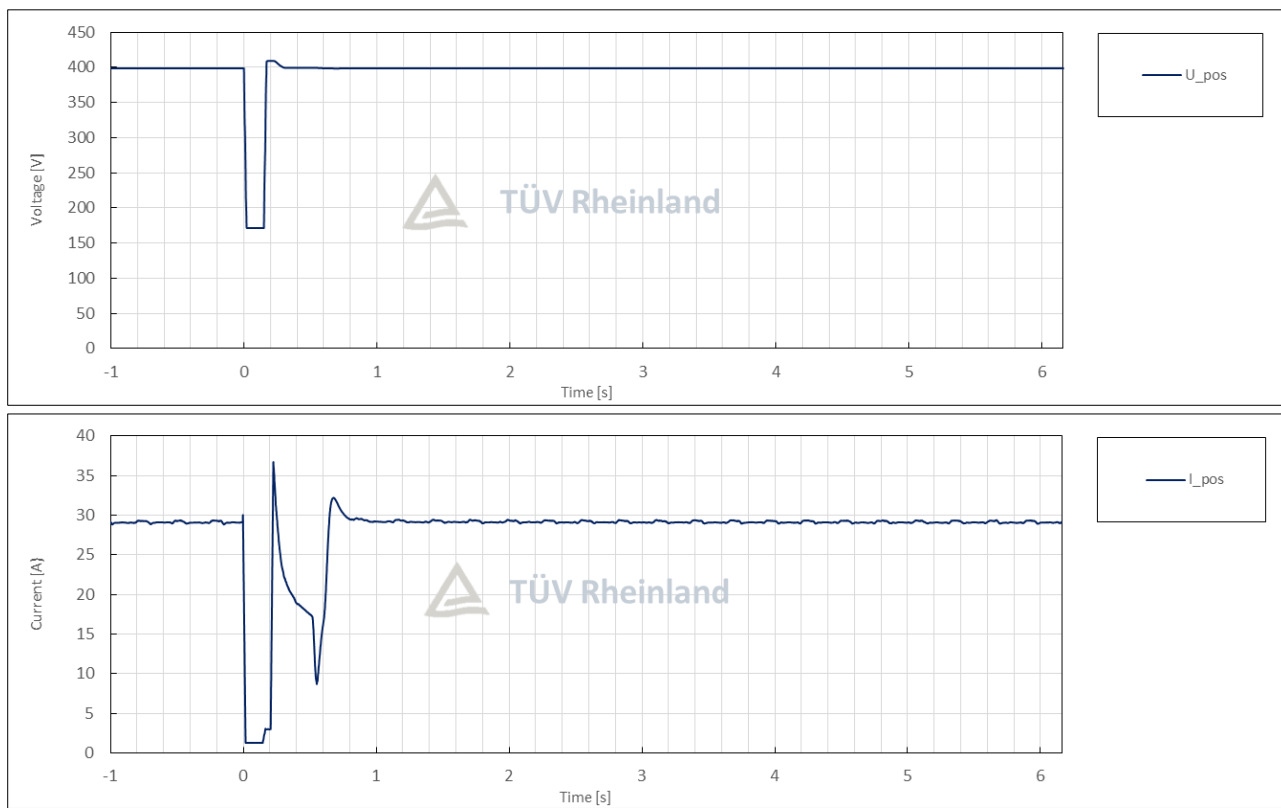
Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	1.4
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	13:02:02
	3	Fault type (phase)	--	--		2-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	0.15
	5	Setting dip duration		--		162
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	162
	8	Fault duration in empty load test	Total	--	ms	162
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	0.15
	10		Pos.		p.u.	0.43
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.00
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	0.20
	13	Active power	Total	t1-10s to t1	p.u.	0.20
	14		Pos.			0.20
	15	Reactive power	Total	t1-10s to t1	p.u.	0.00
	16		Pos.			0.00
	17	Cosφ	--	t1-10s to t1	--	1.000
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	0.15
	19	Line current	Phase 1	t1+60ms	p.u.	0.01
	20		Phase 2			0.00
	21		Phase 3			0.01
	22	Line current	Phase 1	t1+100ms	p.u.	0.01
	23		Phase 2			0.00
	24		Phase 3			0.01
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	0.00
	26		Pos.			0.00
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.00
	28	Active power	Total	t2+3s to t2+10s	p.u.	0.20
	29		Pos.			0.20
	39	Active power rising time	Pos.	--	s	0.477
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	0.00
	32		Pos.			0.00
	33	Reactive power rising time	Pos.	--	s	N/A
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

Test No. 1.4 idle test


Test No. 1.4 with PGU







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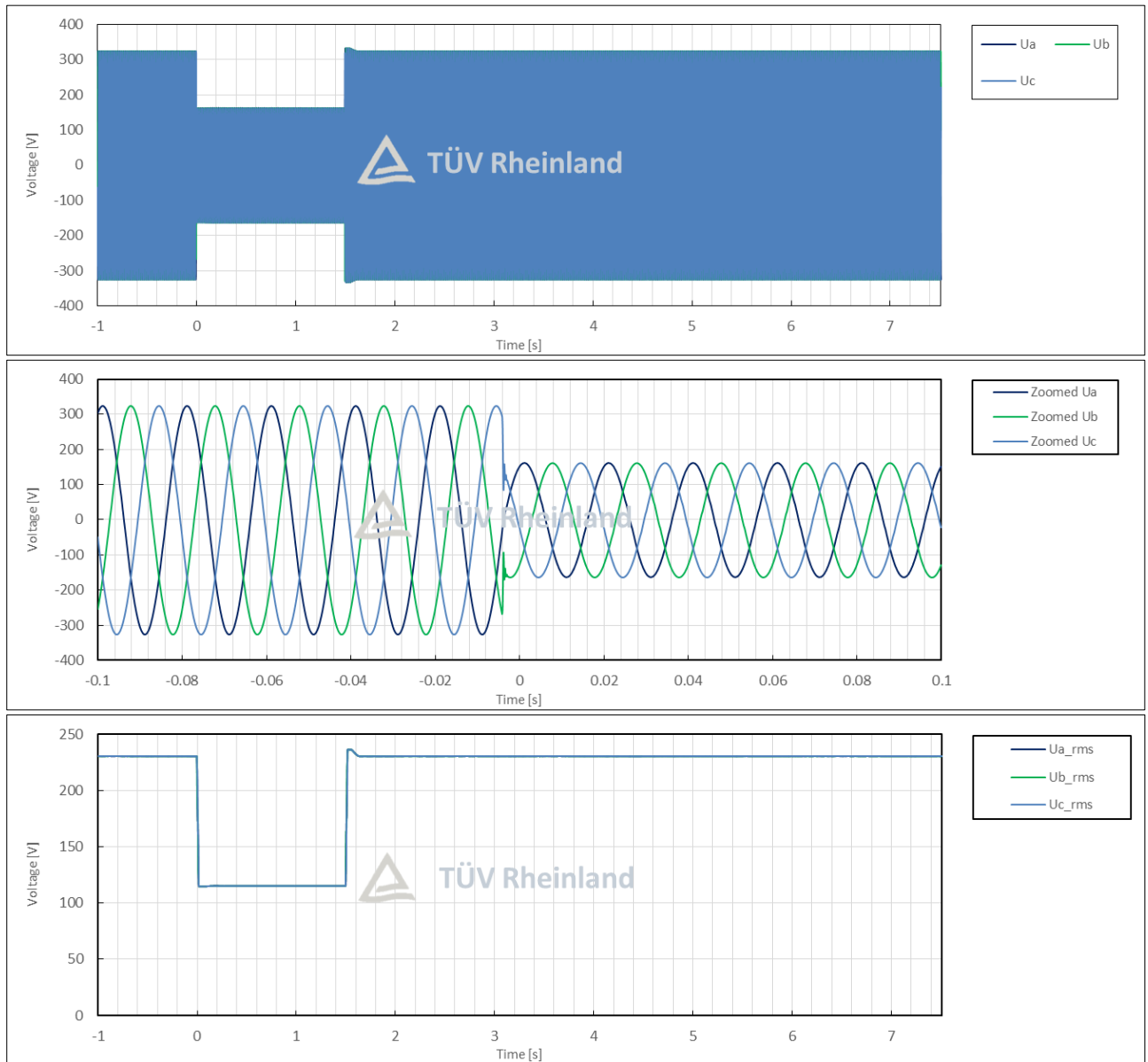
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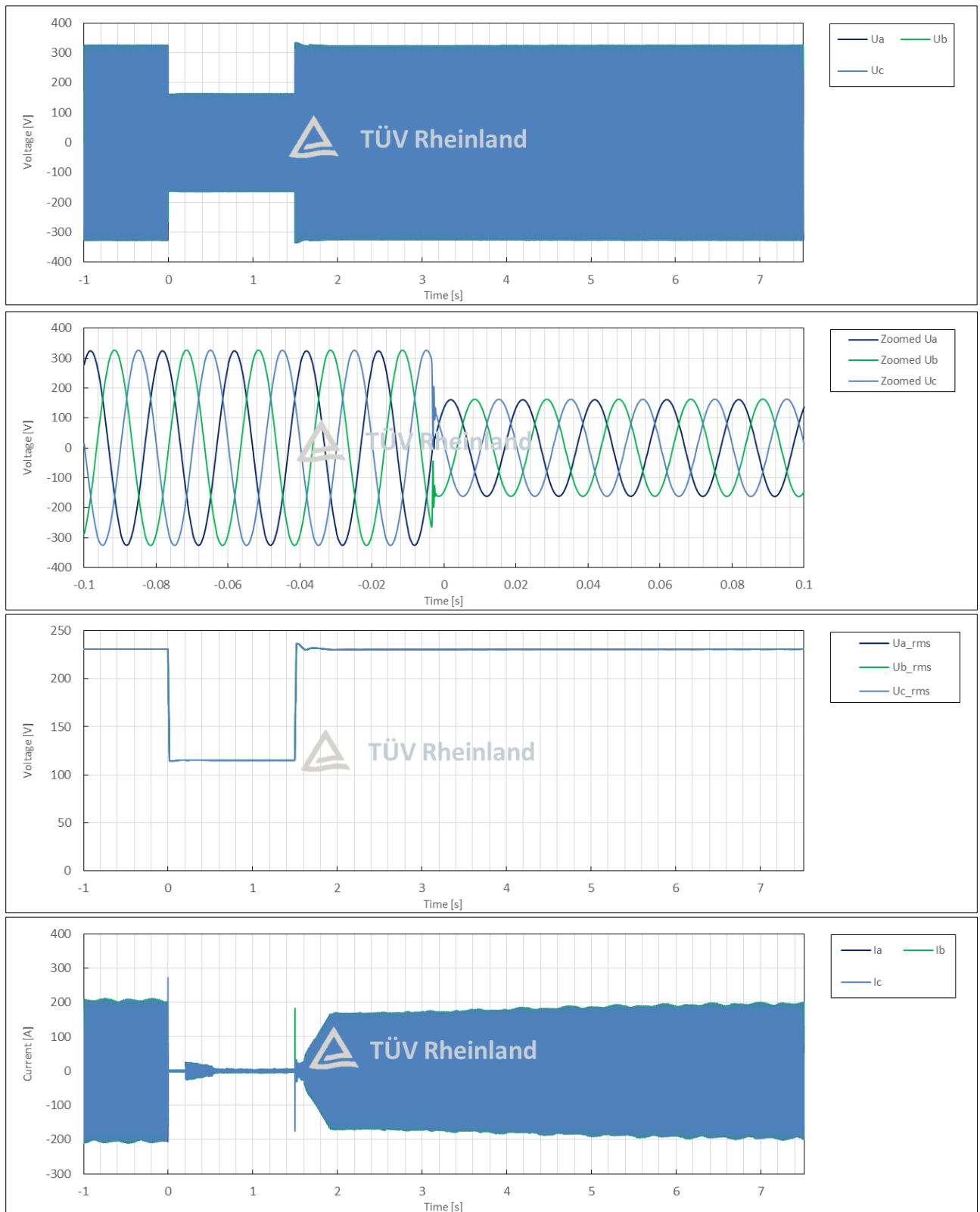
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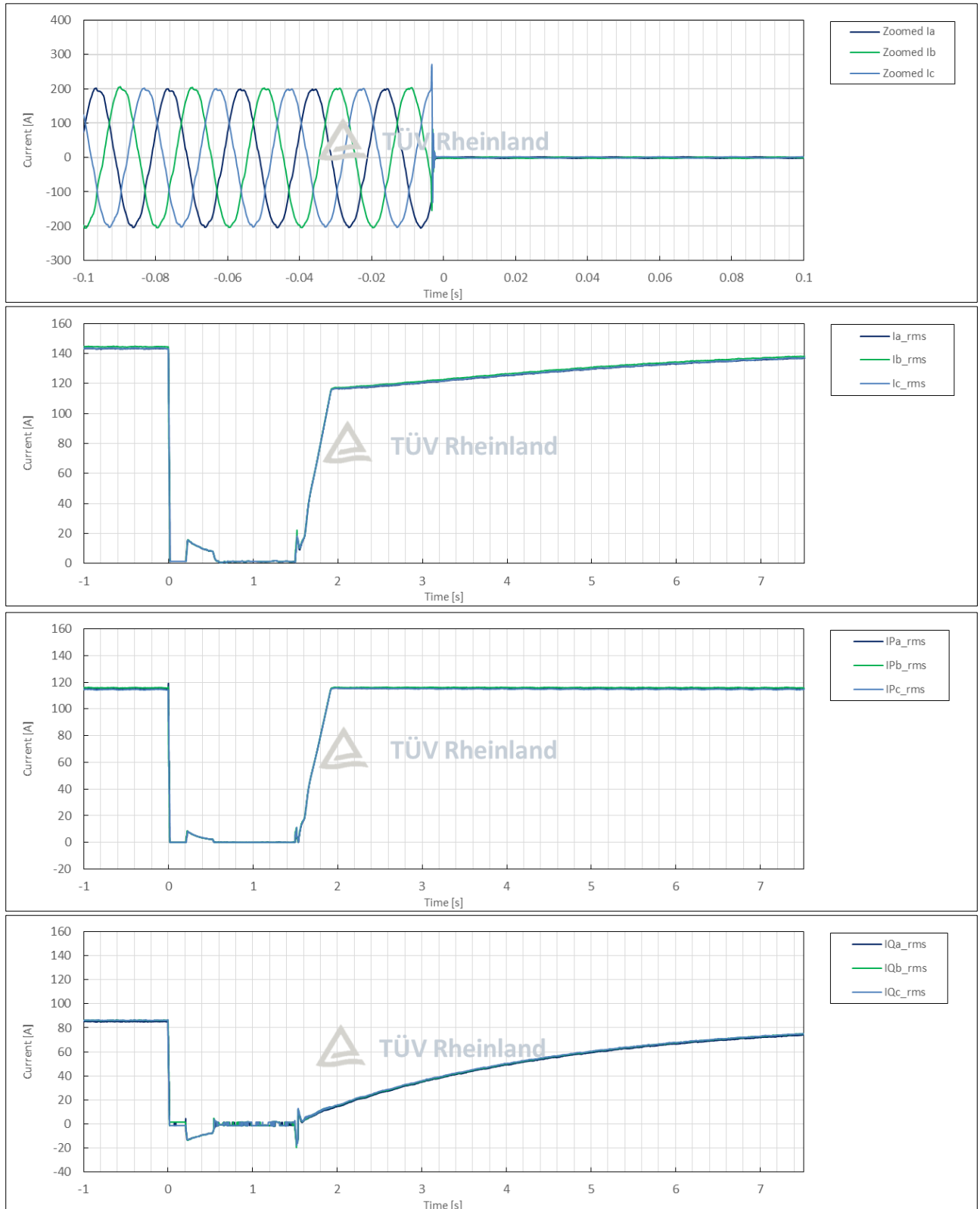
Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	2.1
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	13:01:52
	3	Fault type (phase)	--	--		3-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	0.50
	5	Setting dip duration		--		1513
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	1513
	8	Fault duration in empty load test	Total	--	ms	1513
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	0.50
	10		Pos.		p.u.	0.50
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.00
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	0.99
	13	Active power	Total	t1-10s to t1	p.u.	0.80
	14		Pos.			0.80
	15	Reactive power	Total	t1-10s to t1	p.u.	0.60
	16		Pos.			0.60
	17	Cosφ	--	t1-10s to t1	--	0.802
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	0.50
	19	Line current	Phase 1	t1+60ms	p.u.	0.01
	20		Phase 2			0.01
	21		Phase 3			0.01
	22	Line current	Phase 1	t1+100ms	p.u.	0.01
	23		Phase 2			0.01
	24		Phase 3			0.01
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	0.00
	26		Pos.			0.00
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.00
	28	Active power	Total	t2+3s to t2+10s	p.u.	0.80
	29		Pos.			0.80
	39	Active power rising time	Pos.	--	s	0.367
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	0.51
	32		Pos.			0.51
	33	Reactive power rising time	Pos.	--	s	8.738
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

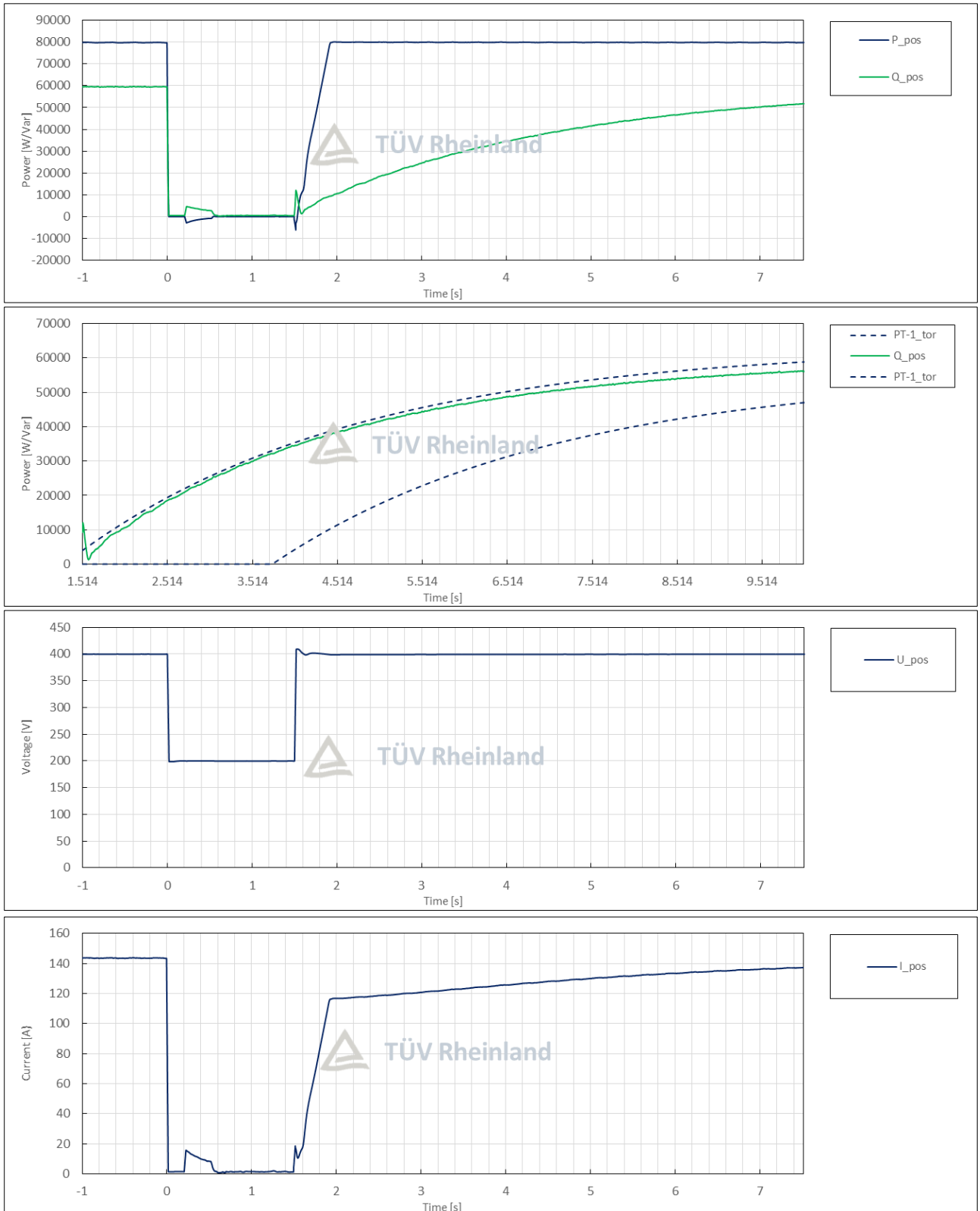
Test No. 2.1 idle test



Test No. 2.1 with PGU







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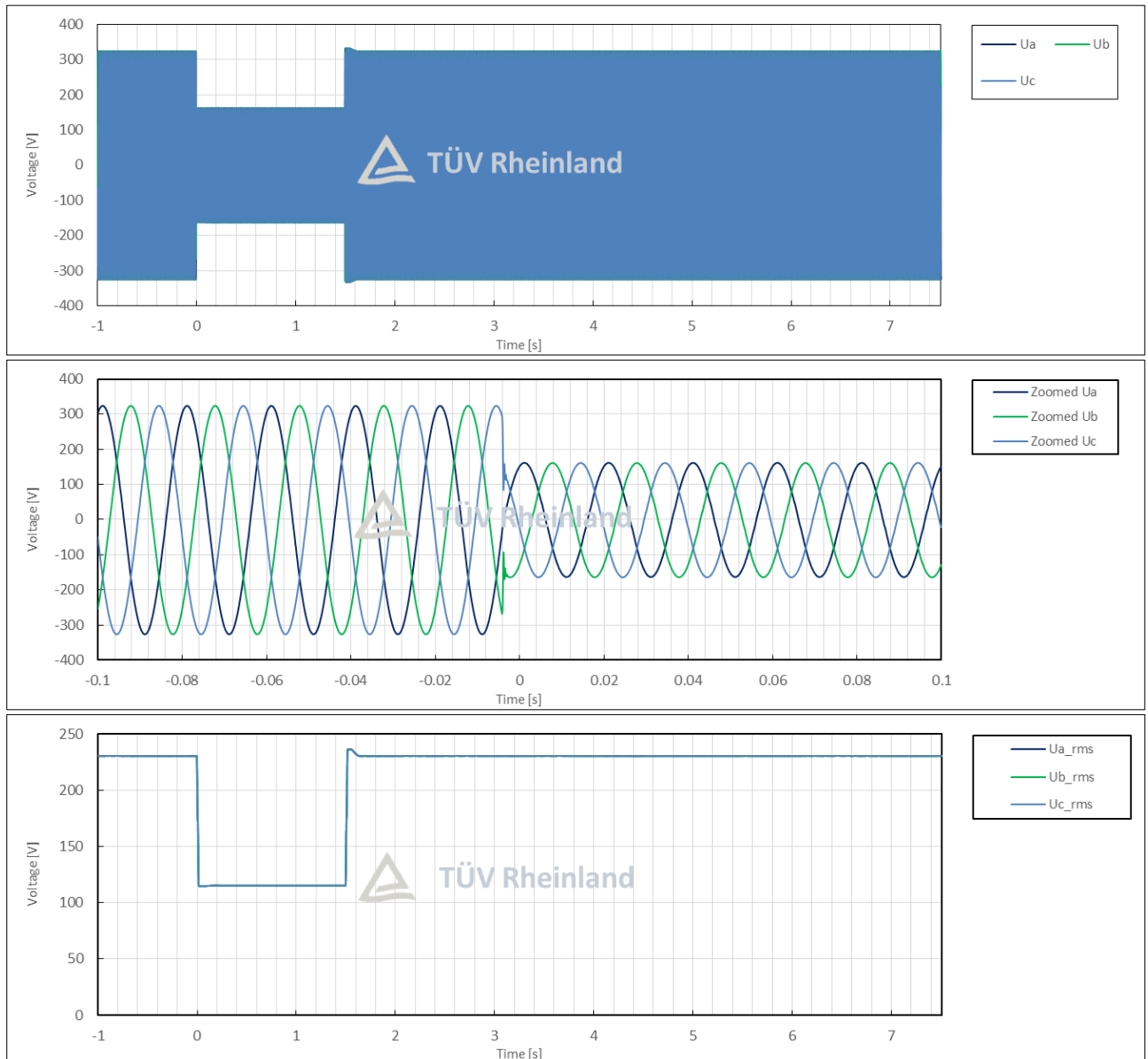
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Test report no.:

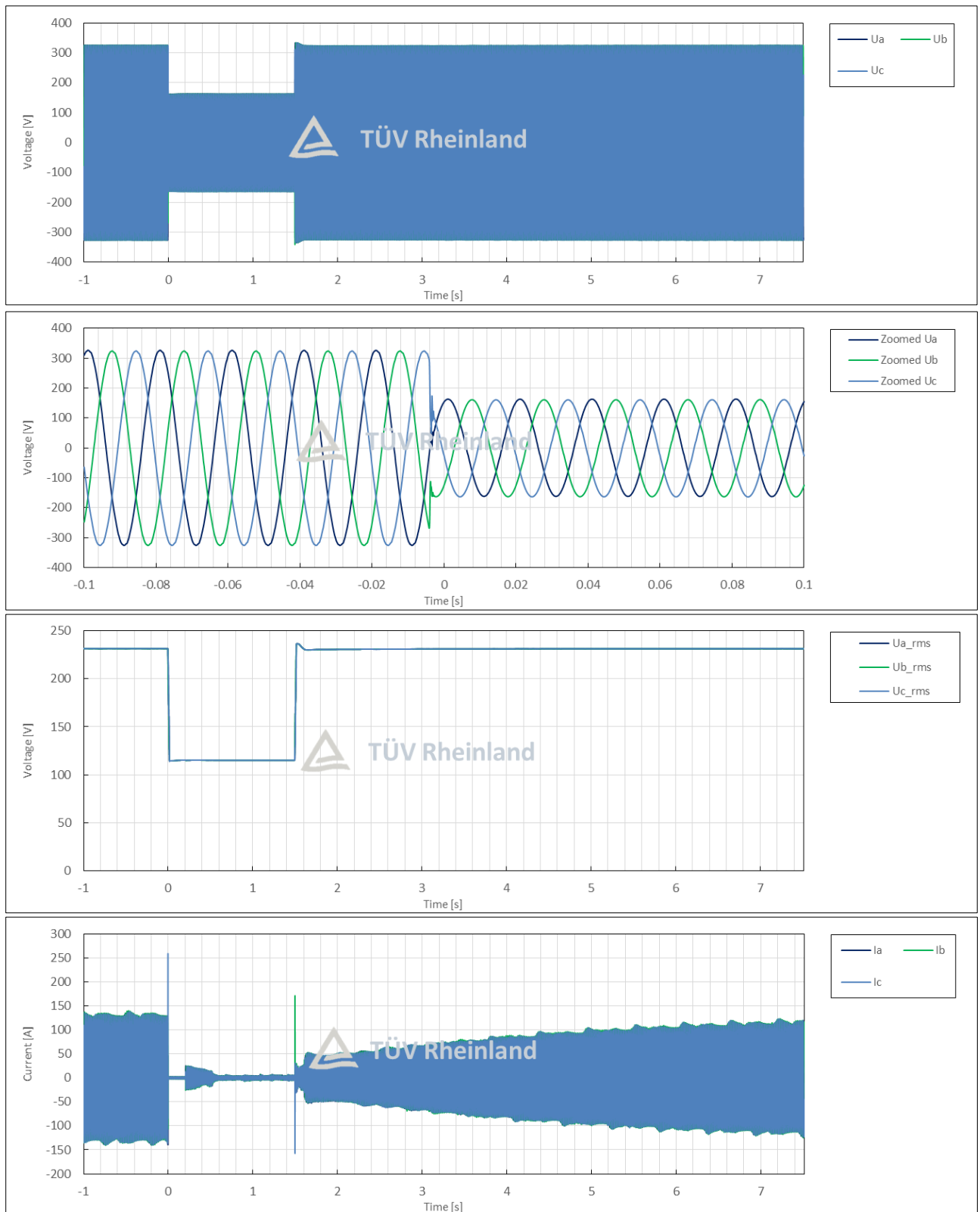
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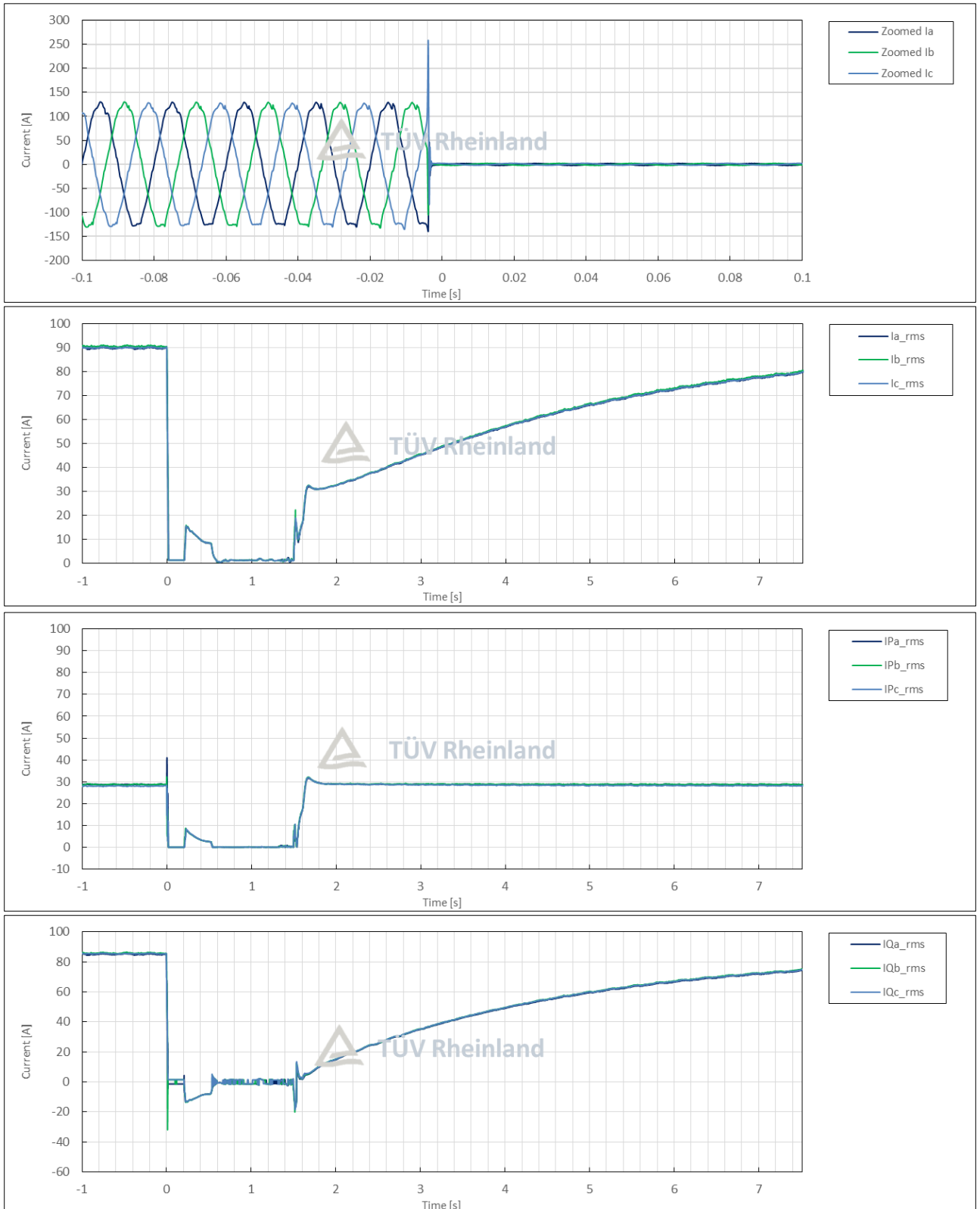
Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	2.2
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	13:01:30
	3	Fault type (phase)	--	--		3-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	0.50
	5	Setting dip duration		--		1513
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	1513
	8	Fault duration in empty load test	Total	--	ms	1513
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	0.50
	10		Pos.		p.u.	0.50
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.01
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	0.62
	13	Active power	Total	t1-10s to t1	p.u.	0.20
	14		Pos.			0.20
	15	Reactive power	Total	t1-10s to t1	p.u.	0.59
	16		Pos.			0.59
	17	Cosφ	--	t1-10s to t1	--	0.317
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	0.50
	19	Line current	Phase 1	t1+60ms	p.u.	0.01
	20		Phase 2			0.01
	21		Phase 3			0.01
	22	Line current	Phase 1	t1+100ms	p.u.	0.01
	23		Phase 2			0.01
	24		Phase 3			0.01
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	0.00
	26		Pos.			0.00
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.01
	28	Active power	Total	t2+3s to t2+10s	p.u.	0.20
	29		Pos.			0.20
	39	Active power rising time	Pos.	--	s	0.115
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	0.51
	32		Pos.			0.51
	33	Reactive power rising time	Pos.	--	s	8.498
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

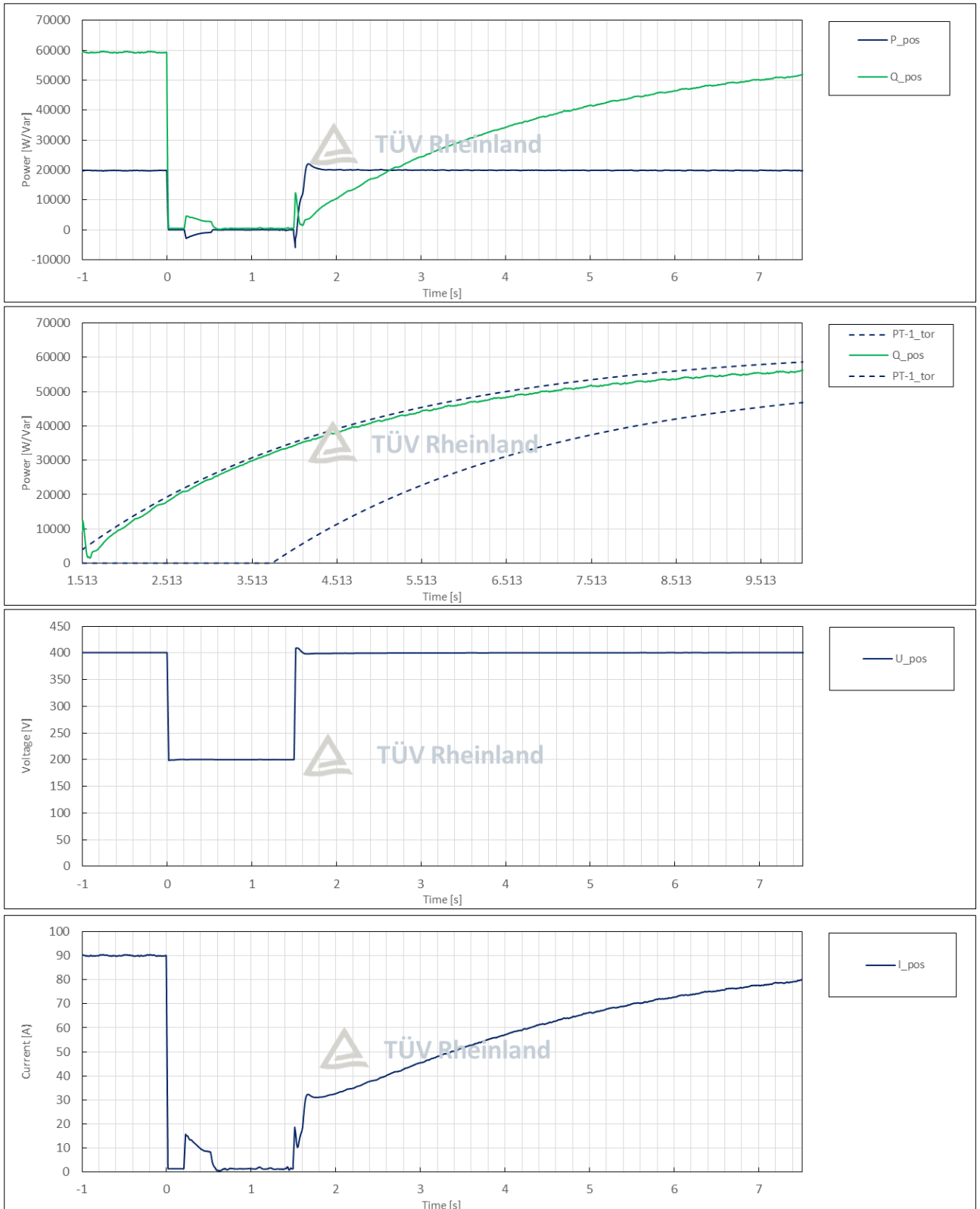
Test No. 2.2 idle test



Test No. 2.2 with PGU







Prüfbericht-Nr.: CN24E4X5 001

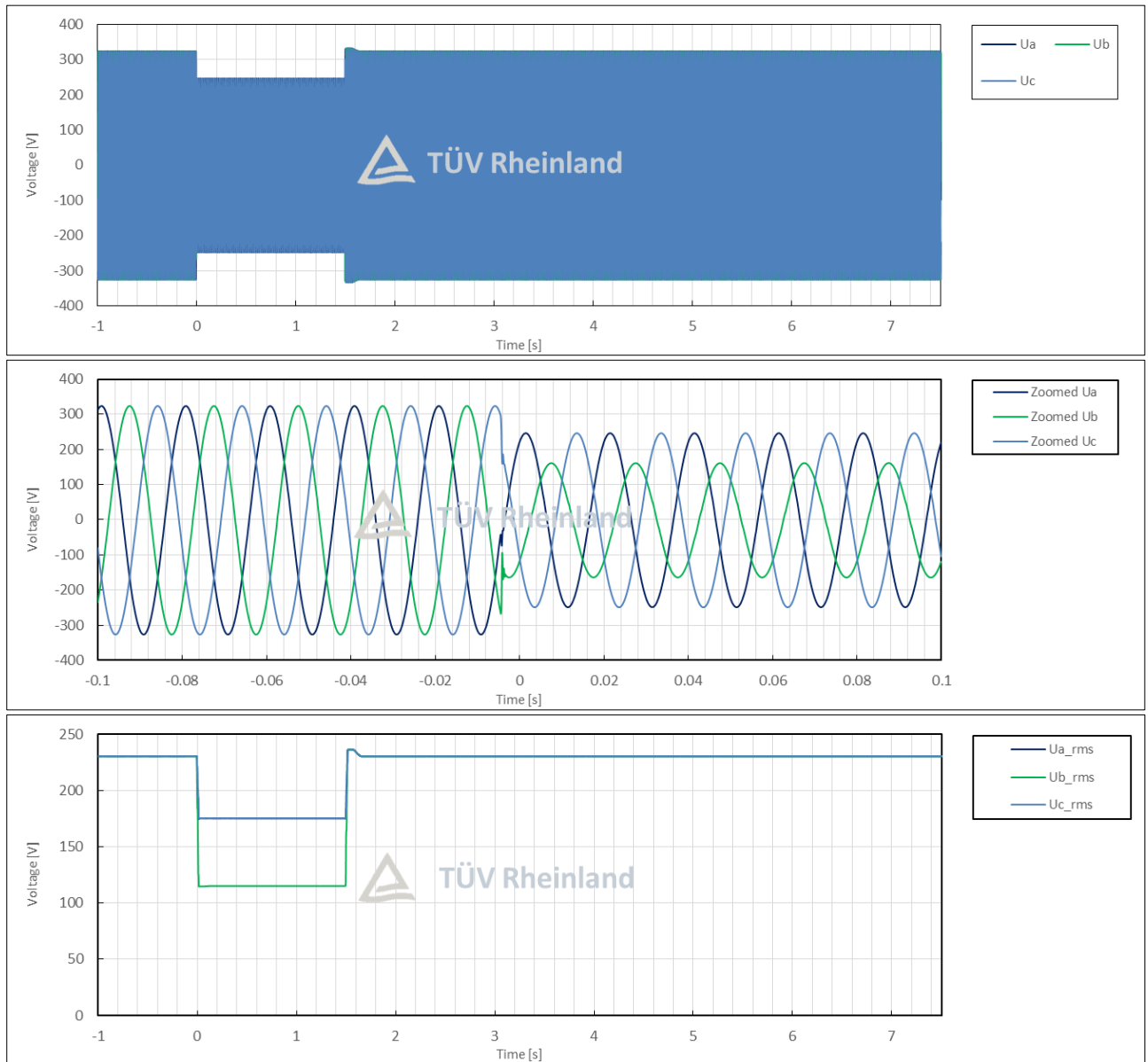
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Test report no.:

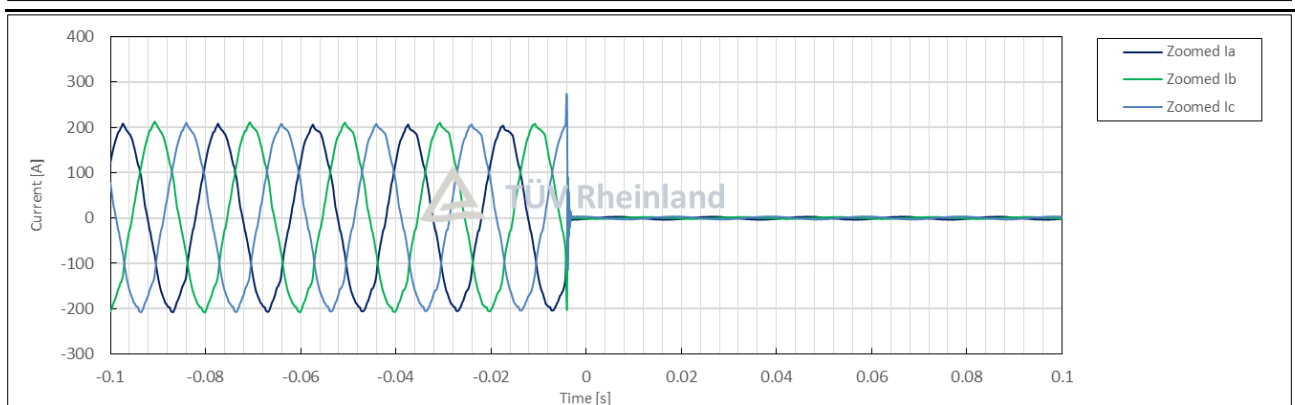
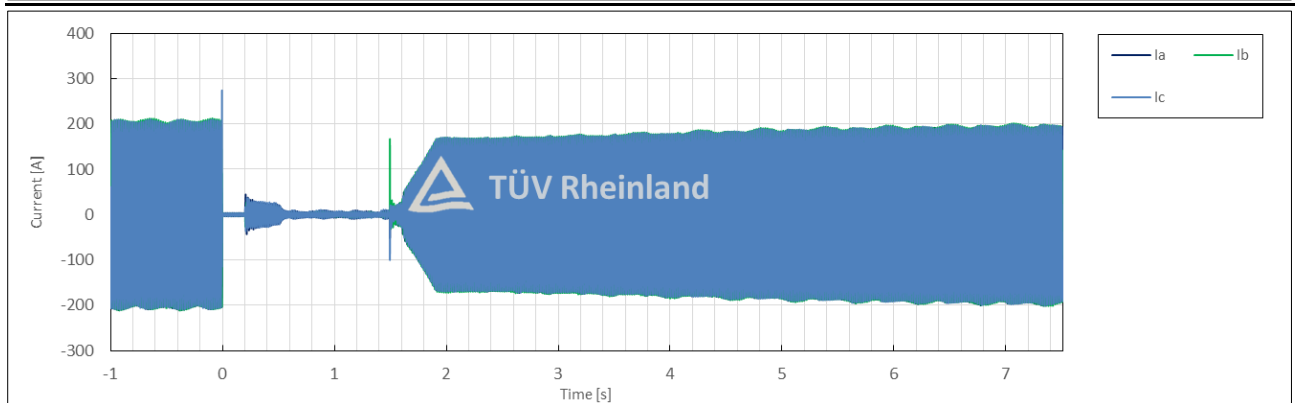
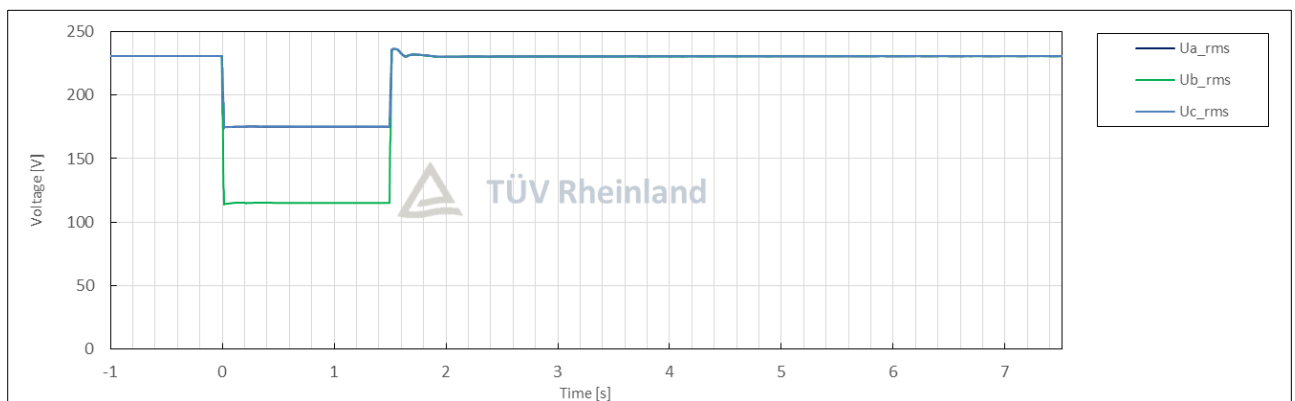
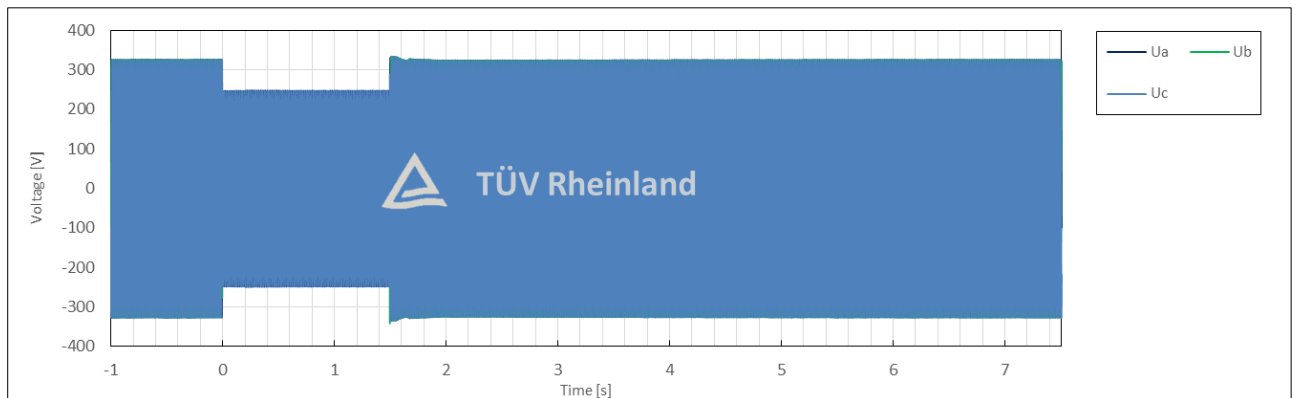
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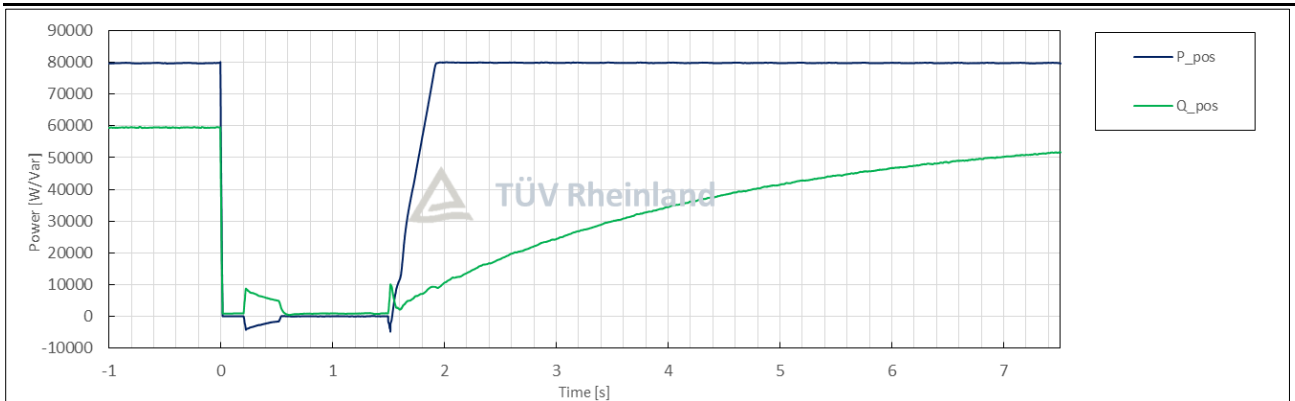
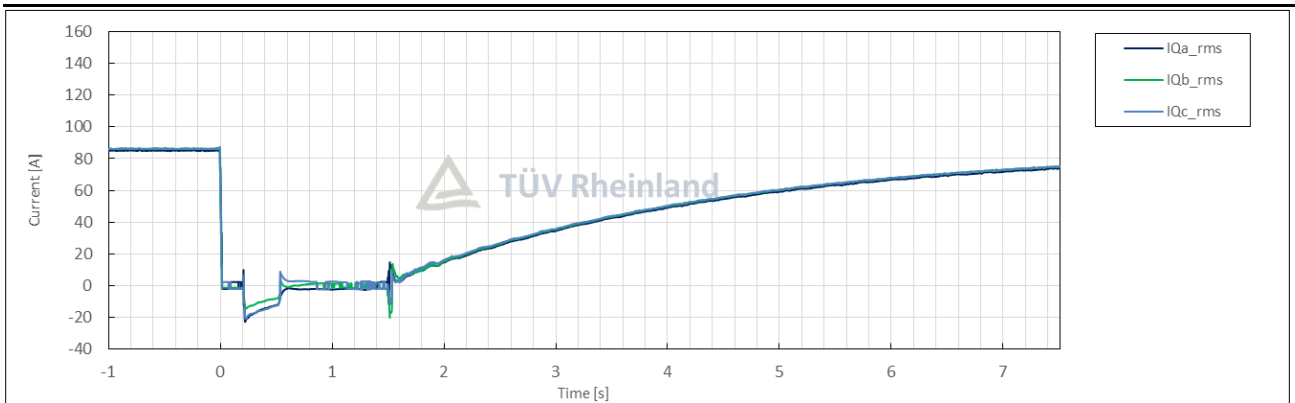
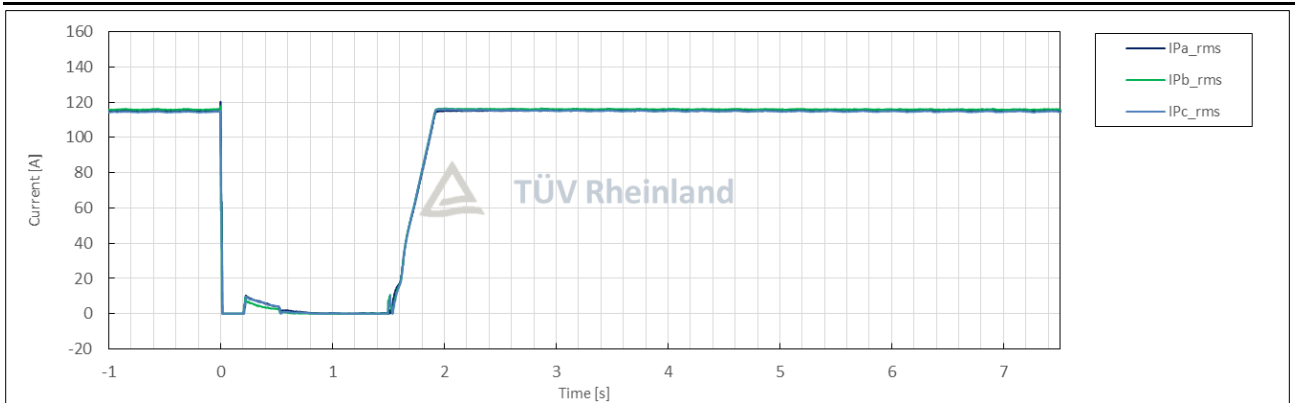
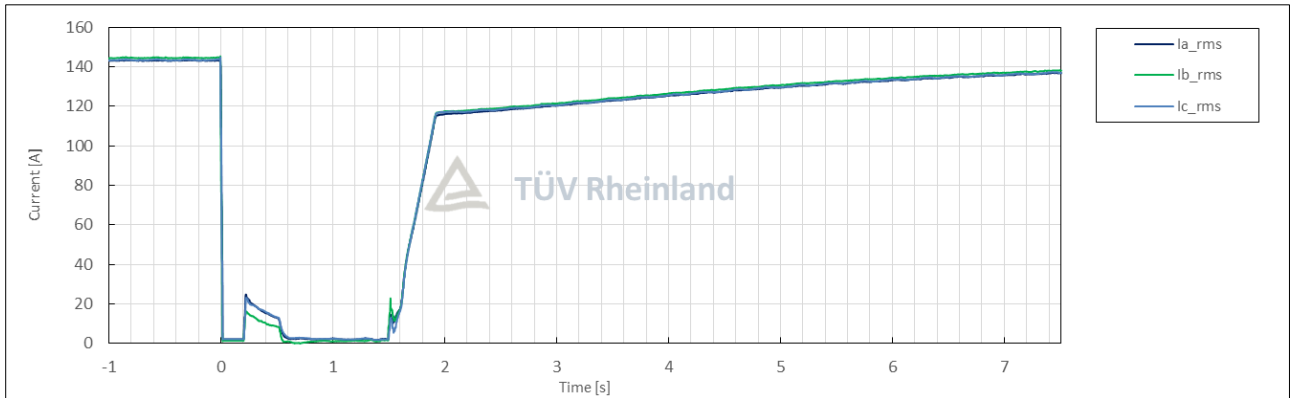
Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	2.3
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	13:01:42
	3	Fault type (phase)	--	--		2-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	0.50
	5	Setting dip duration		--		1508
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	1508
	8	Fault duration in empty load test	Total	--	ms	1508
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	0.50
	10		Pos.		p.u.	0.66
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.00
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	0.99
	13	Active power	Total	t1-10s to t1	p.u.	0.80
	14		Pos.			0.80
	15	Reactive power	Total	t1-10s to t1	p.u.	0.60
	16		Pos.			0.60
	17	Cosφ	--	t1-10s to t1	--	0.802
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	0.50
	19	Line current	Phase 1	t1+60ms	p.u.	0.02
	20		Phase 2			0.01
	21		Phase 3			0.02
	22	Line current	Phase 1	t1+100ms	p.u.	0.02
	23		Phase 2			0.01
	24		Phase 3			0.02
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	0.01
	26		Pos.			-0.01
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.00
	28	Active power	Total	t2+3s to t2+10s	p.u.	0.80
	29		Pos.			0.80
	39	Active power rising time	Pos.	--	s	0.372
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	0.51
	32		Pos.			0.51
	33	Reactive power rising time	Pos.	--	s	8.752
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

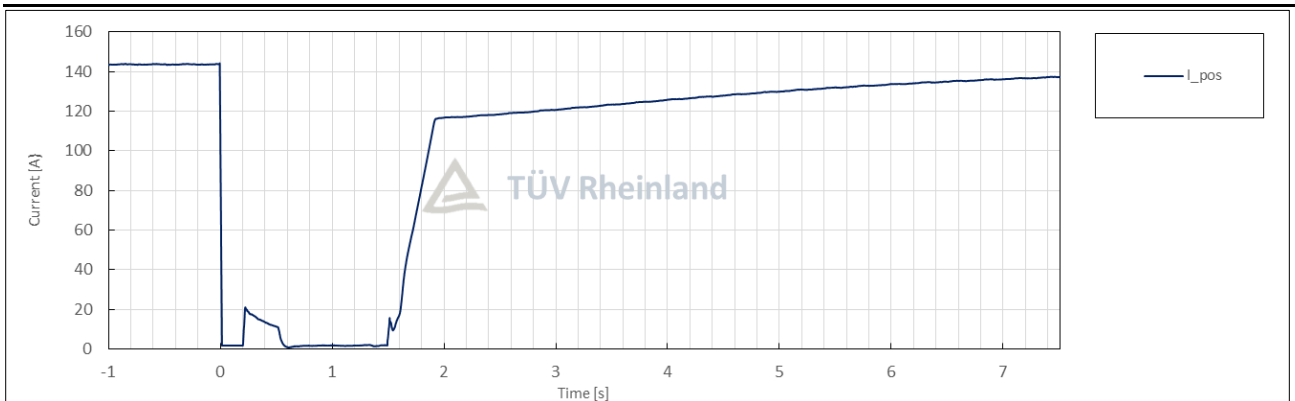
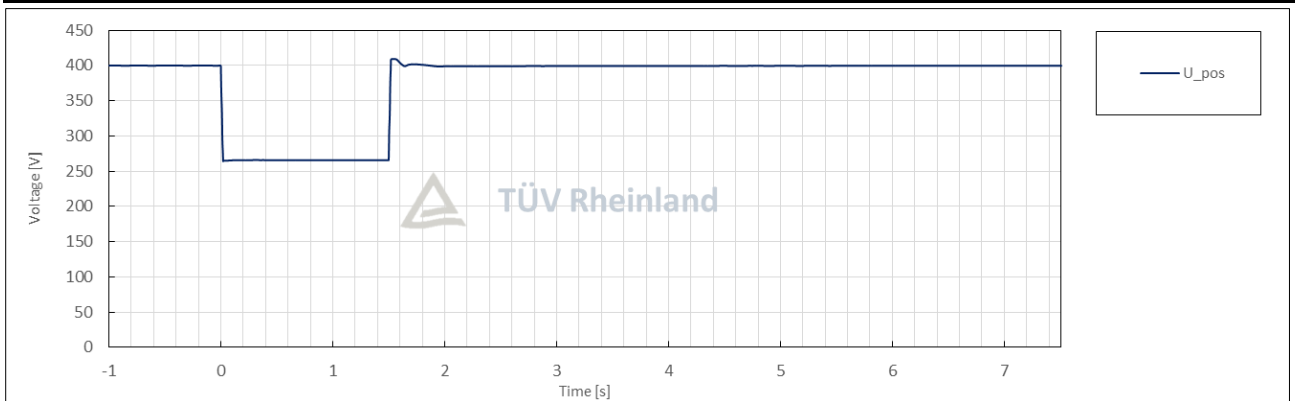
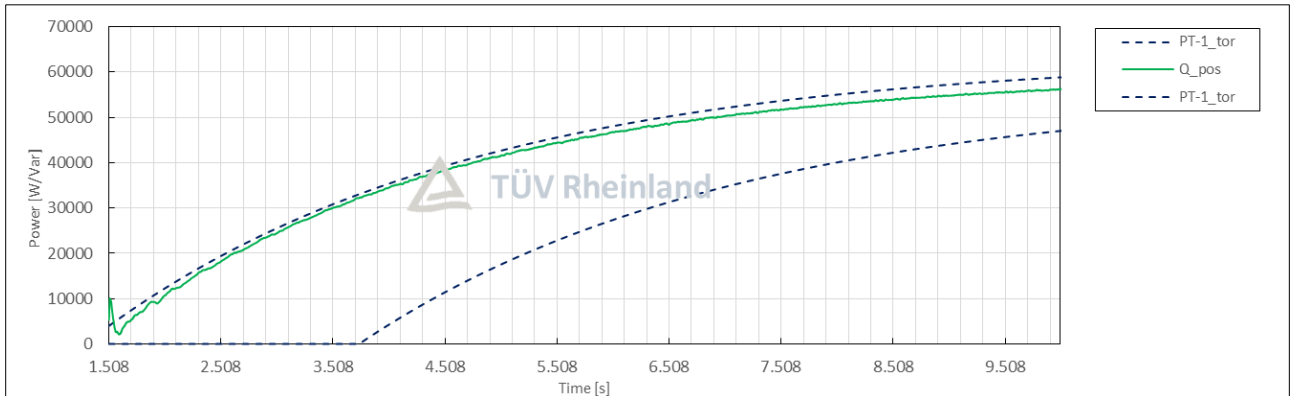
Test No. 2.3 idle test



Test No. 2.3 with PGU







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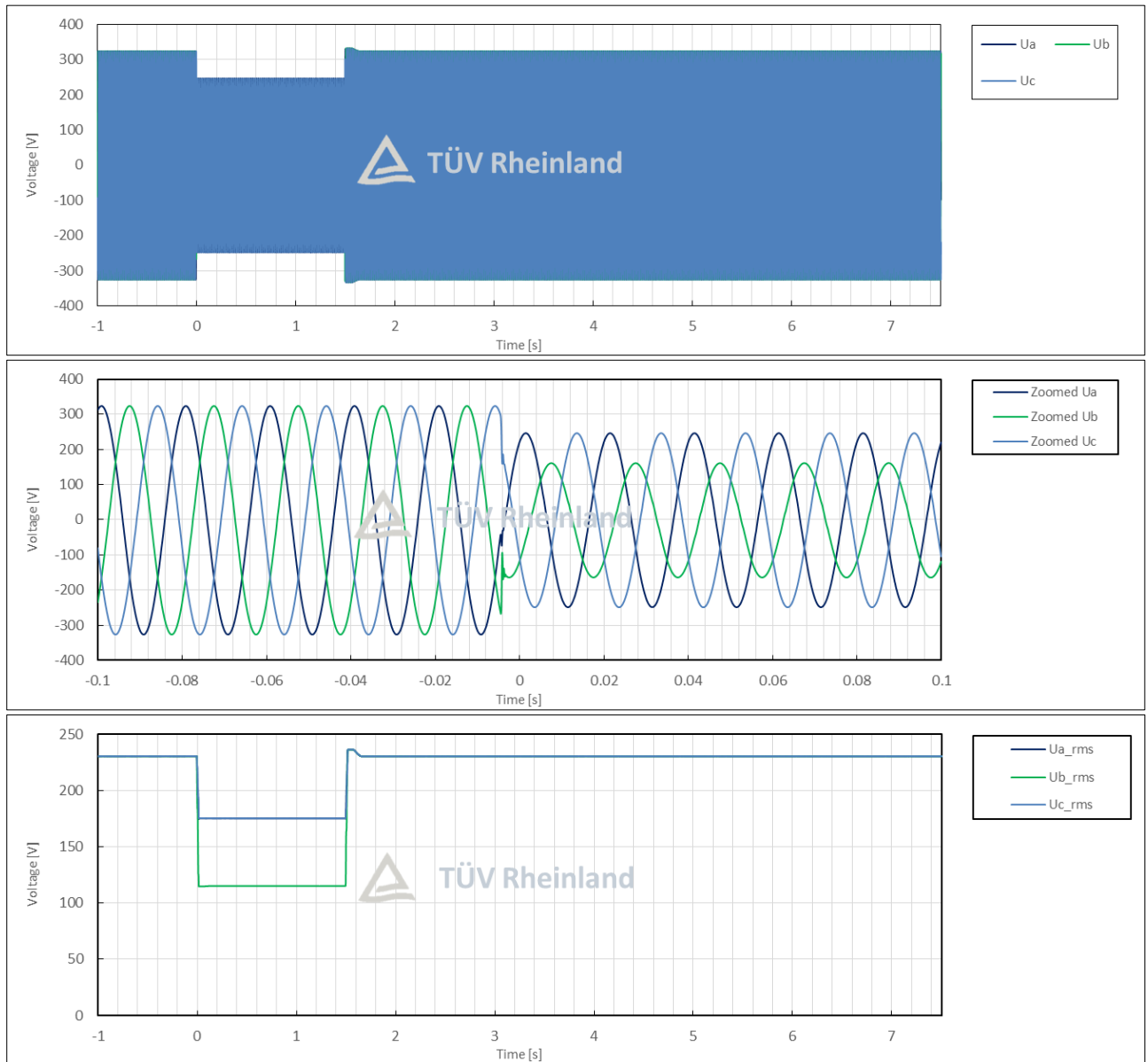
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Test report no.:

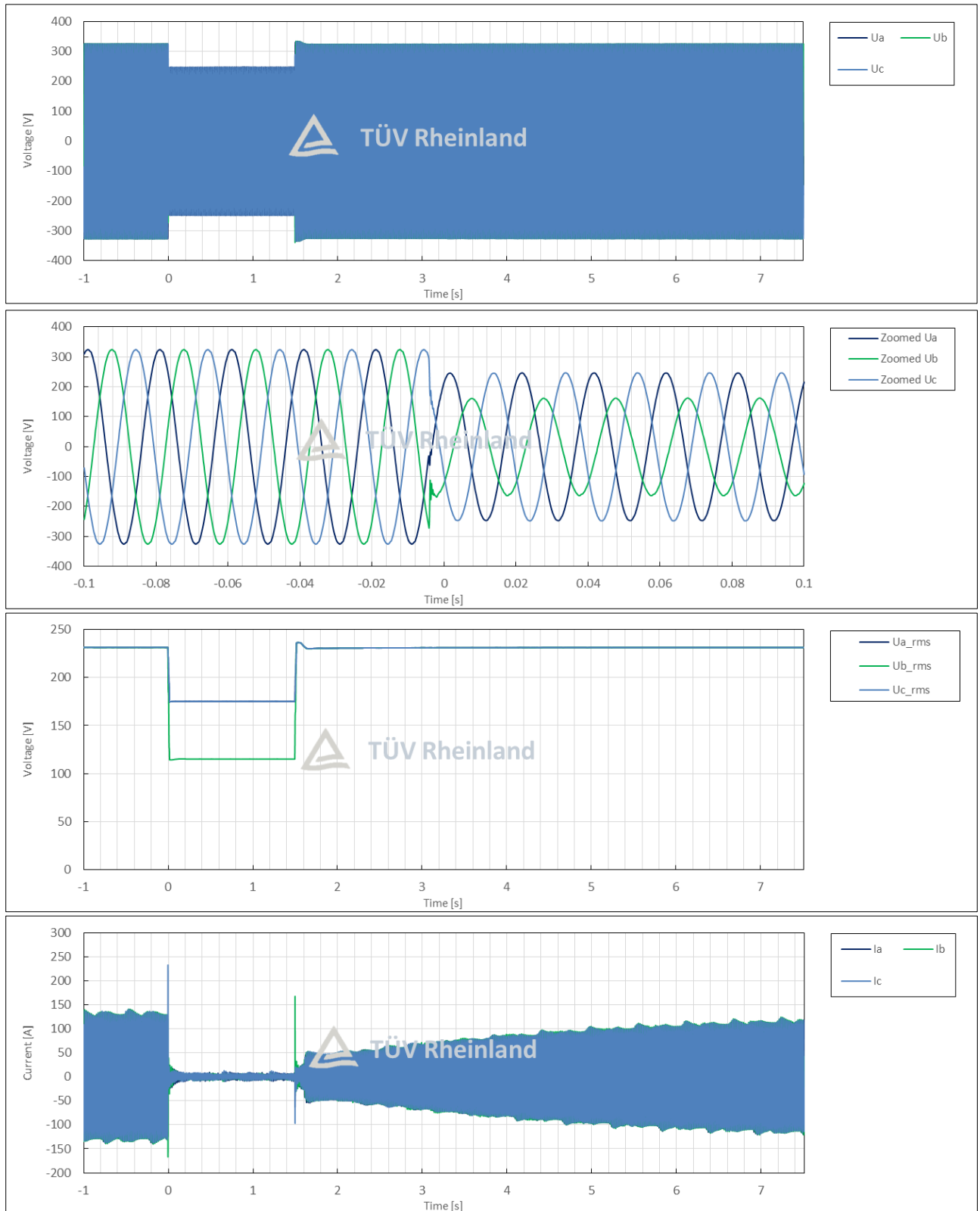
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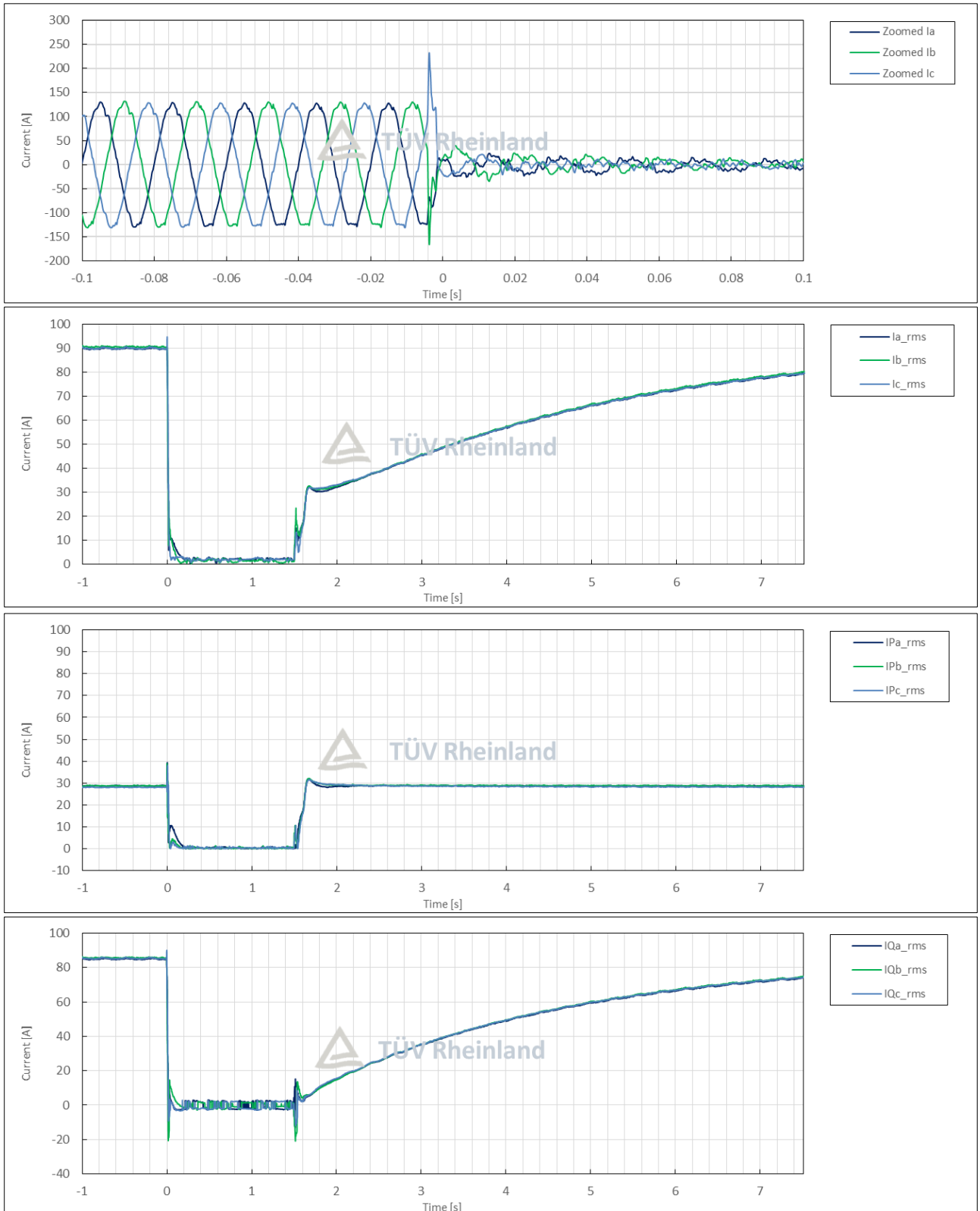
Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	2.4
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	13:01:14
	3	Fault type (phase)	--	--		2-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	0.50
	5	Setting dip duration		--		1508
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	1508
	8	Fault duration in empty load test	Total	--	ms	1508
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	0.50
	10		Pos.		p.u.	0.66
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.01
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	0.62
	13	Active power	Total	t1-10s to t1	p.u.	0.20
	14		Pos.			0.20
	15	Reactive power	Total	t1-10s to t1	p.u.	0.59
	16		Pos.			0.59
	17	Cosφ	--	t1-10s to t1	--	0.317
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	0.50
	19	Line current	Phase 1	t1+60ms	p.u.	0.07
	20		Phase 2			0.06
	21		Phase 3			0.02
	22	Line current	Phase 1	t1+100ms	p.u.	0.04
	23		Phase 2			0.03
	24		Phase 3			0.02
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	0.00
	26		Pos.			0.00
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.01
	28	Active power	Total	t2+3s to t2+10s	p.u.	0.20
	29		Pos.			0.20
	39	Active power rising time	Pos.	--	s	0.12
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	0.51
	32		Pos.			0.51
	33	Reactive power rising time	Pos.	--	s	8.735
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

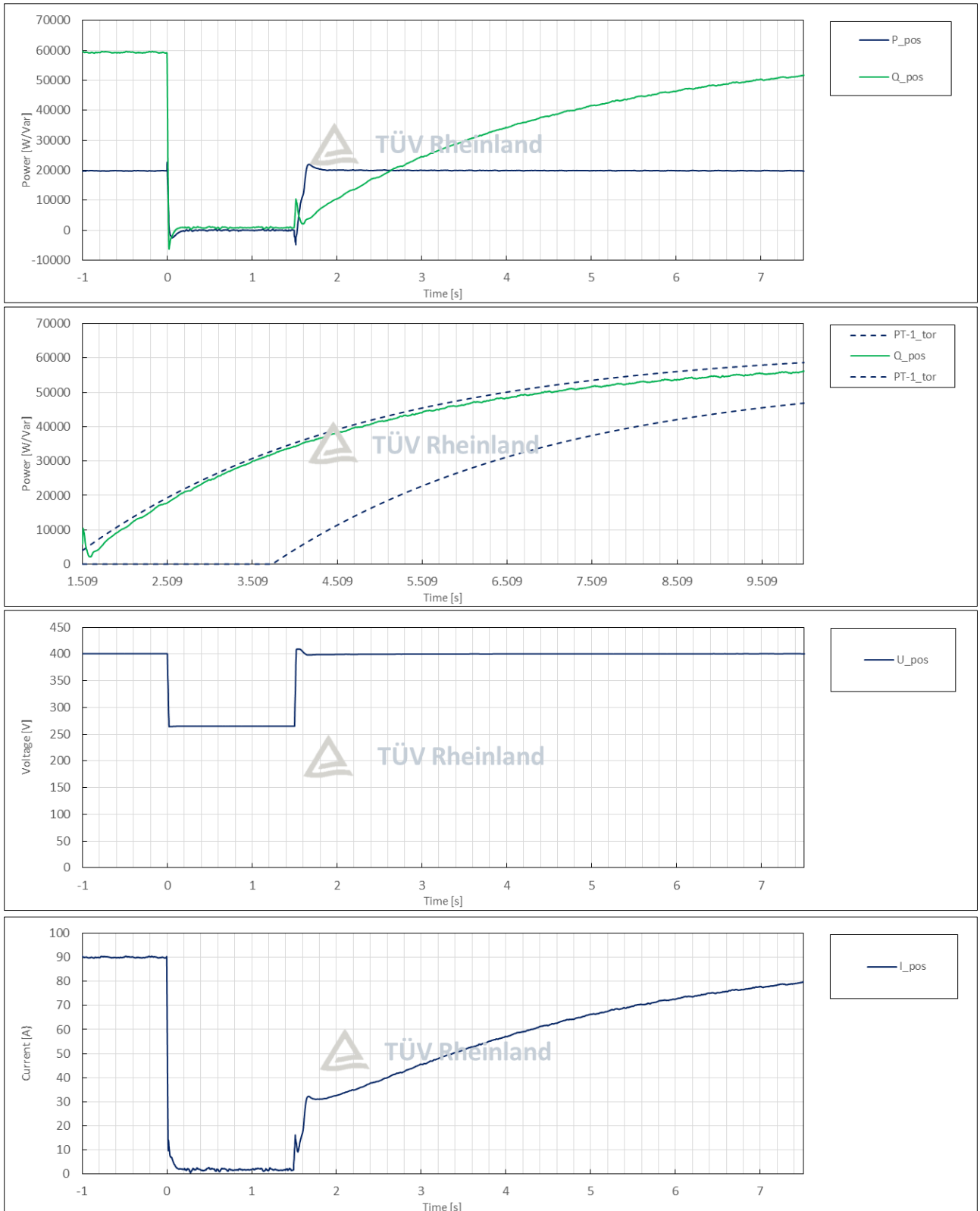
Test No. 2.4 idle test



Test No. 2.4 with PGU







Prüfbericht-Nr.:CN24E4X5 001

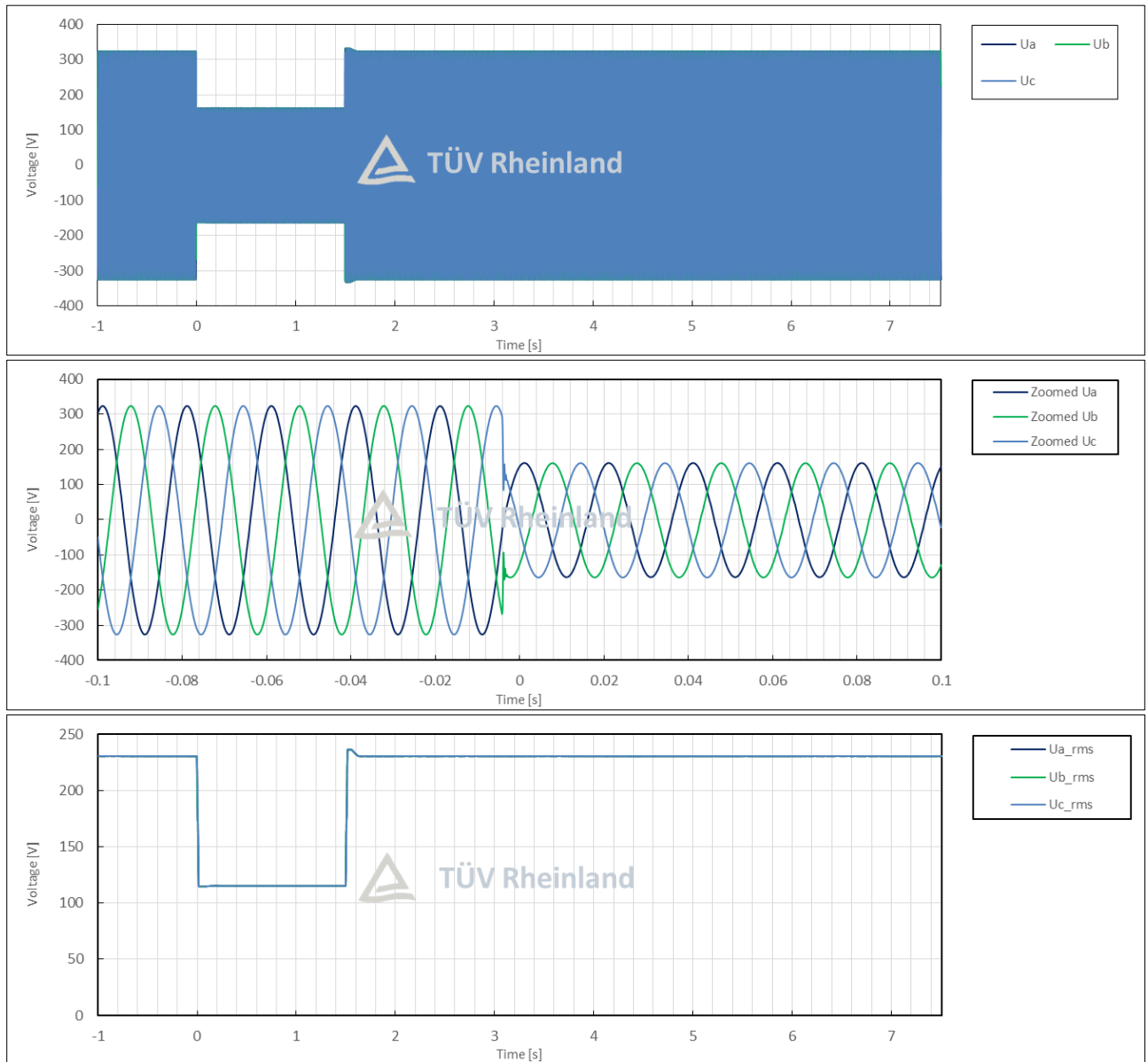
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Test report no.:

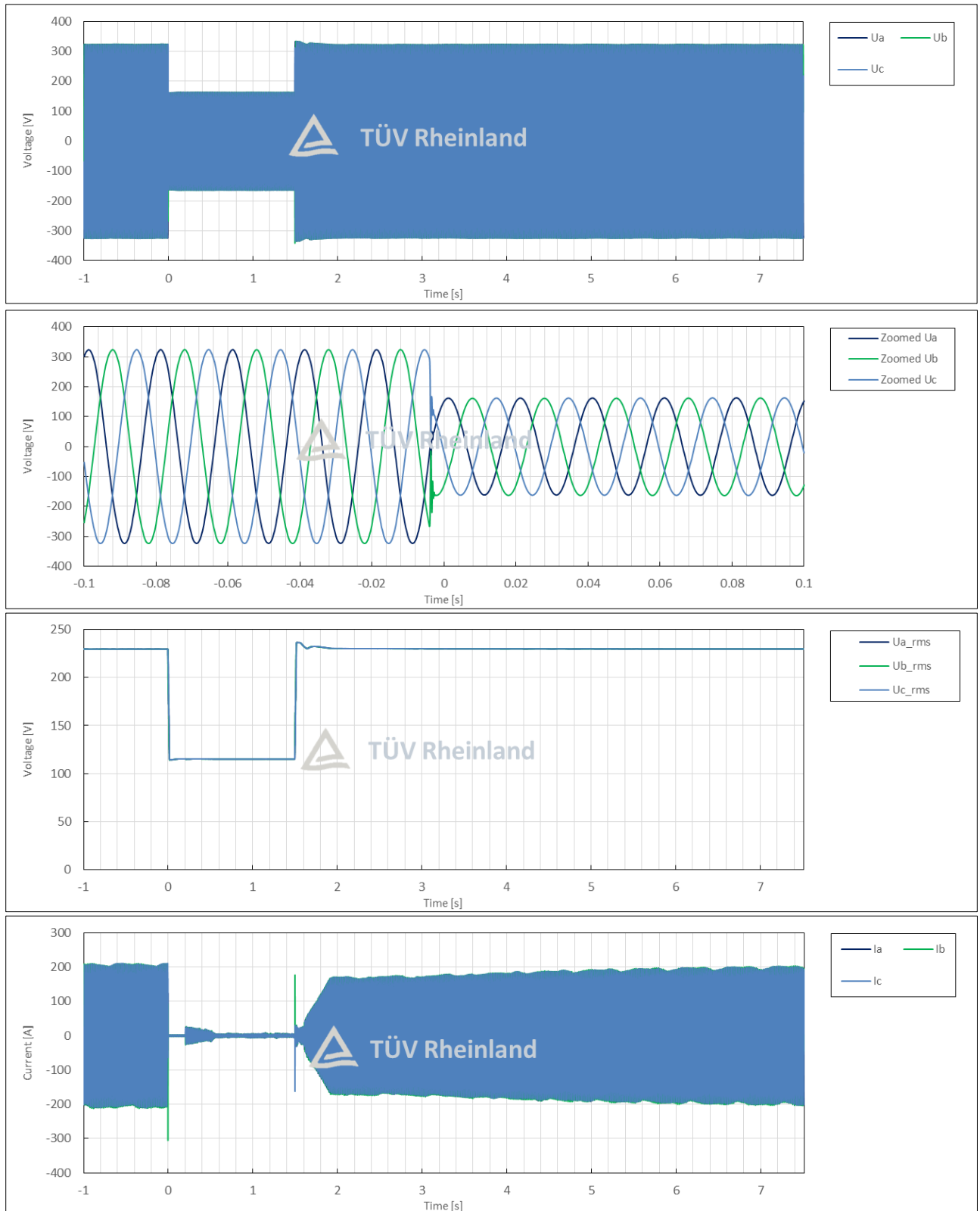
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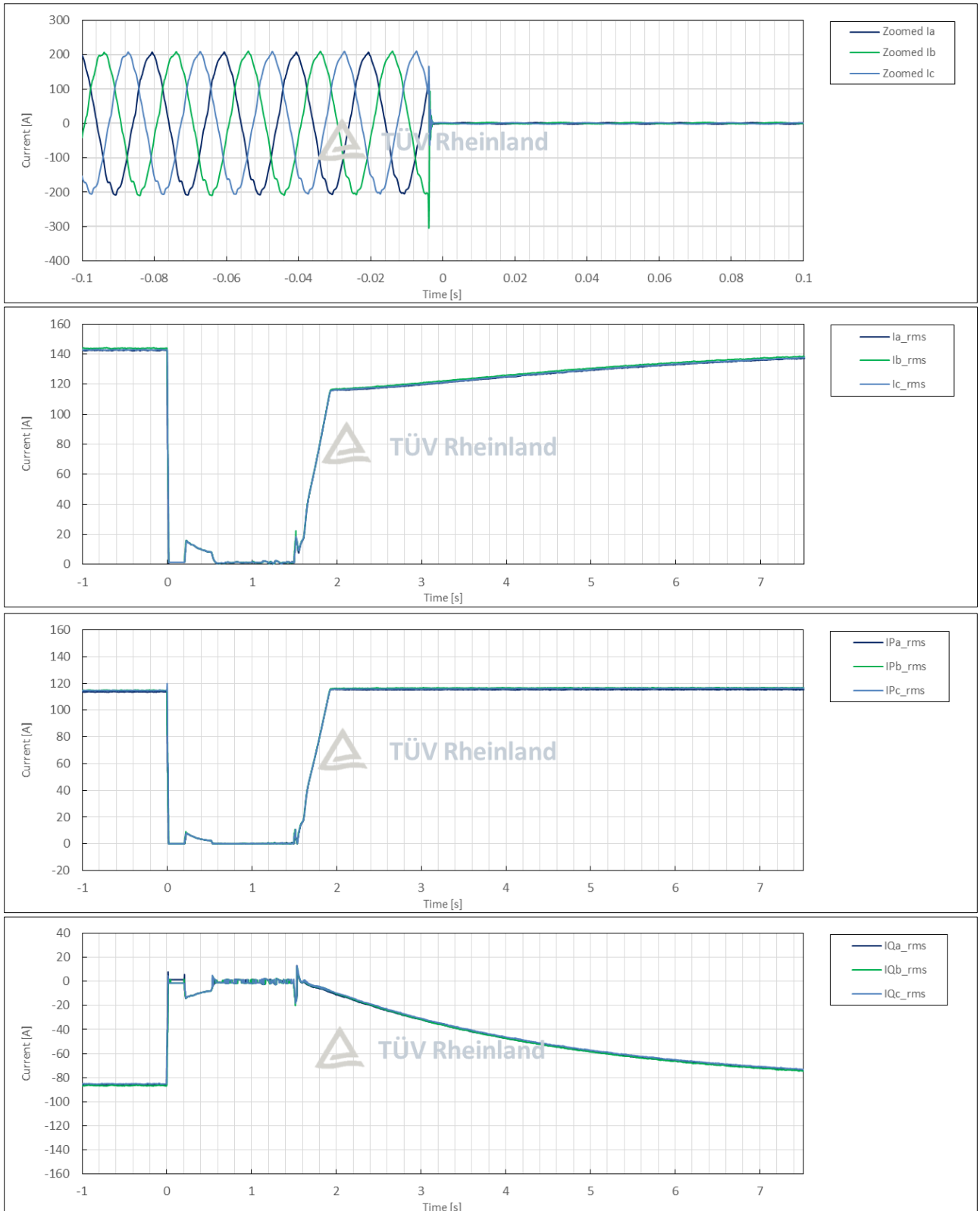
Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	3.1
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	13:01:04
	3	Fault type (phase)	--	--		3-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	0.50
	5	Setting dip duration		--		1513
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	1513
	8	Fault duration in empty load test	Total	--	ms	1513
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	0.50
	10		Pos.		p.u.	0.50
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.00
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	0.99
	13	Active power	Total	t1-10s to t1	p.u.	0.79
	14		Pos.			0.79
	15	Reactive power	Total	t1-10s to t1	p.u.	-0.59
	16		Pos.			-0.59
	17	Cosφ	--	t1-10s to t1	--	0.800
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	0.50
	19	Line current	Phase 1	t1+60ms	p.u.	0.01
	20		Phase 2			0.01
	21		Phase 3			0.01
	22	Line current	Phase 1	t1+100ms	p.u.	0.01
	23		Phase 2			0.01
	24		Phase 3			0.01
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	0.00
	26		Pos.			0.00
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.00
	28	Active power	Total	t2+3s to t2+10s	p.u.	0.80
	29		Pos.			0.80
	39	Active power rising time	Pos.	--	s	0.363
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	-0.50
	32		Pos.			-0.50
	33	Reactive power rising time	Pos.	--	s	8.968
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

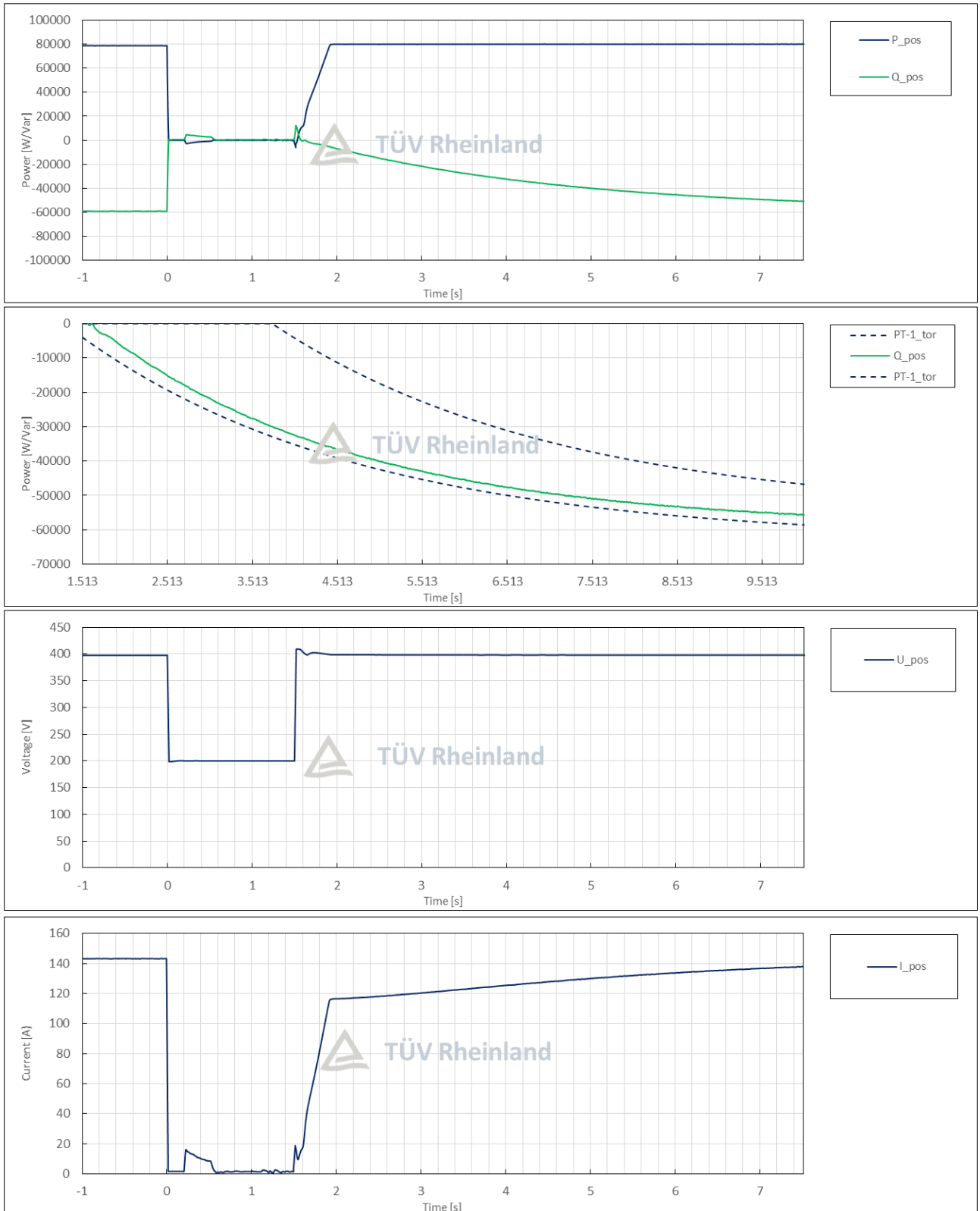
Test No. 3.1 idle test



Test No. 3.1 with PGU







Prüfbericht-Nr.:CN24E4X5 001

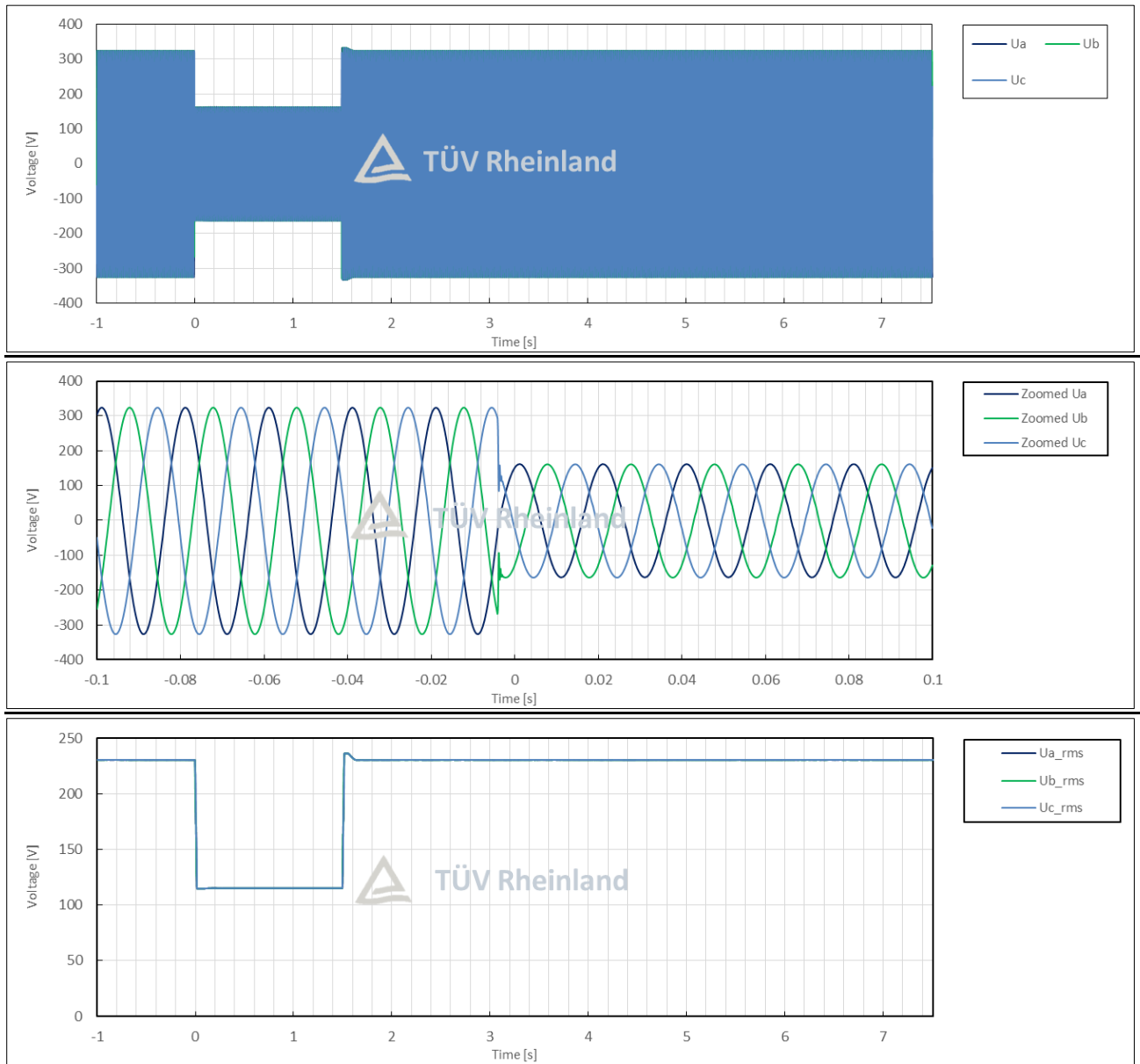
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Test report no.:

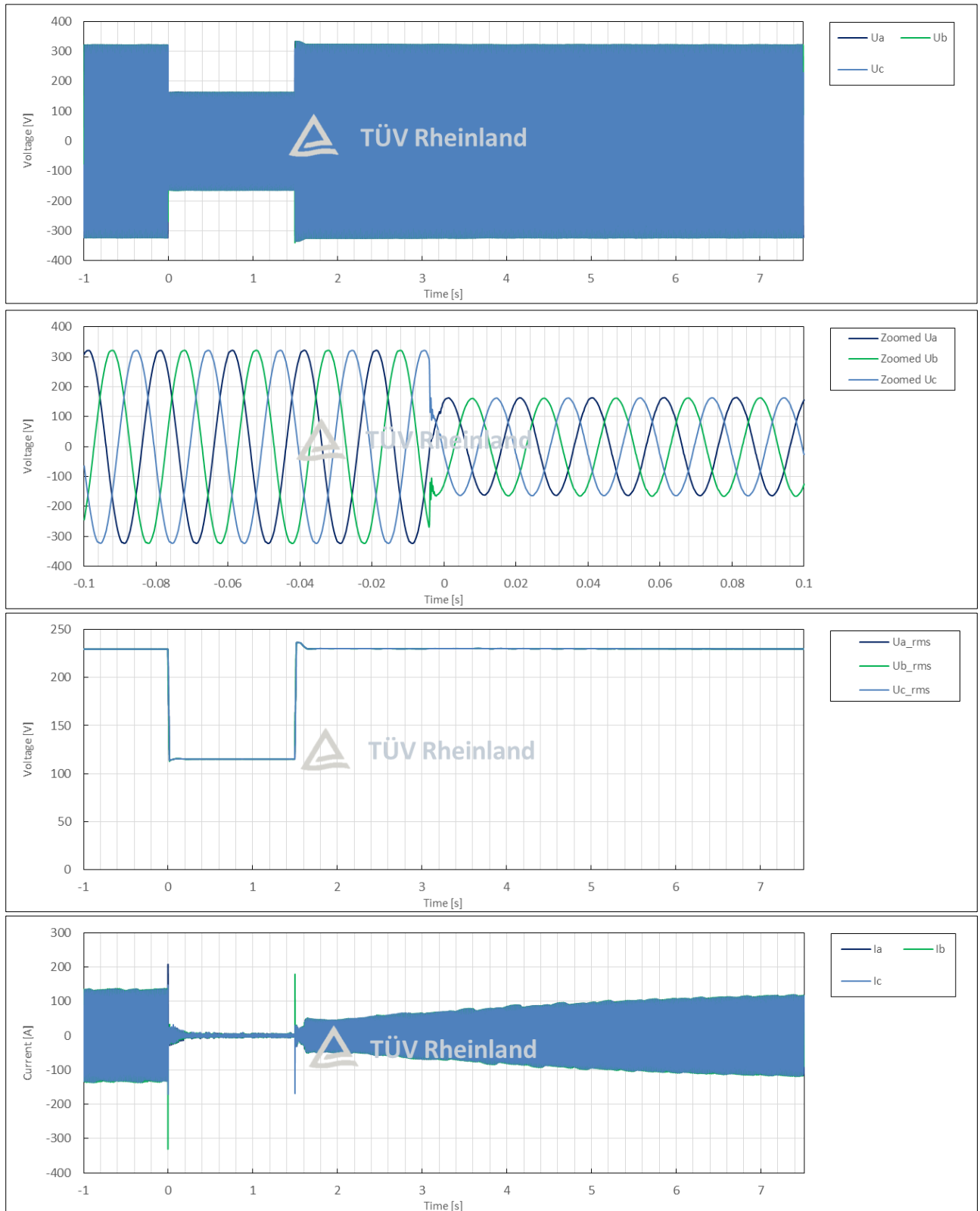
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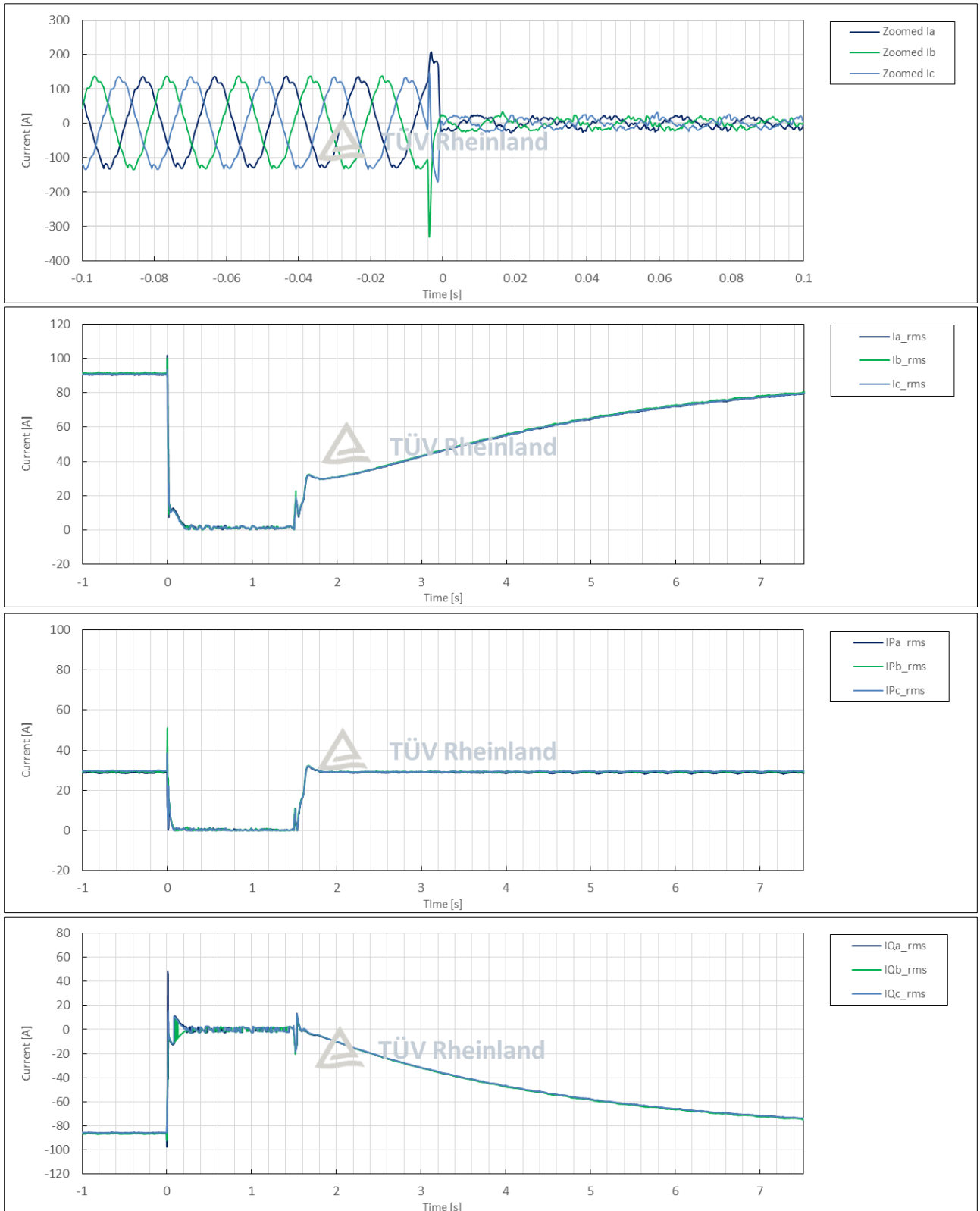
Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	3.2
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	13:00:34
	3	Fault type (phase)	--	--		3-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	0.50
	5	Setting dip duration		--		1513
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	1513
	8	Fault duration in empty load test	Total	--	ms	1513
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	0.50
	10		Pos.		p.u.	0.50
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.00
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	0.63
	13	Active power	Total	t1-10s to t1	p.u.	0.20
	14		Pos.			0.20
	15	Reactive power	Total	t1-10s to t1	p.u.	-0.59
	16		Pos.			-0.59
	17	Cosφ	--	t1-10s to t1	--	0.322
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	0.50
	19	Line current	Phase 1	t1+60ms	p.u.	0.09
	20		Phase 2			0.08
	21		Phase 3			0.08
	22	Line current	Phase 1	t1+100ms	p.u.	0.07
	23		Phase 2			0.07
	24		Phase 3			0.07
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	0.00
	26		Pos.			0.00
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.00
	28	Active power	Total	t2+3s to t2+10s	p.u.	0.20
	29		Pos.			0.20
	39	Active power rising time	Pos.	--	s	0.116
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	-0.51
	32		Pos.			-0.51
	33	Reactive power rising time	Pos.	--	s	8.985
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

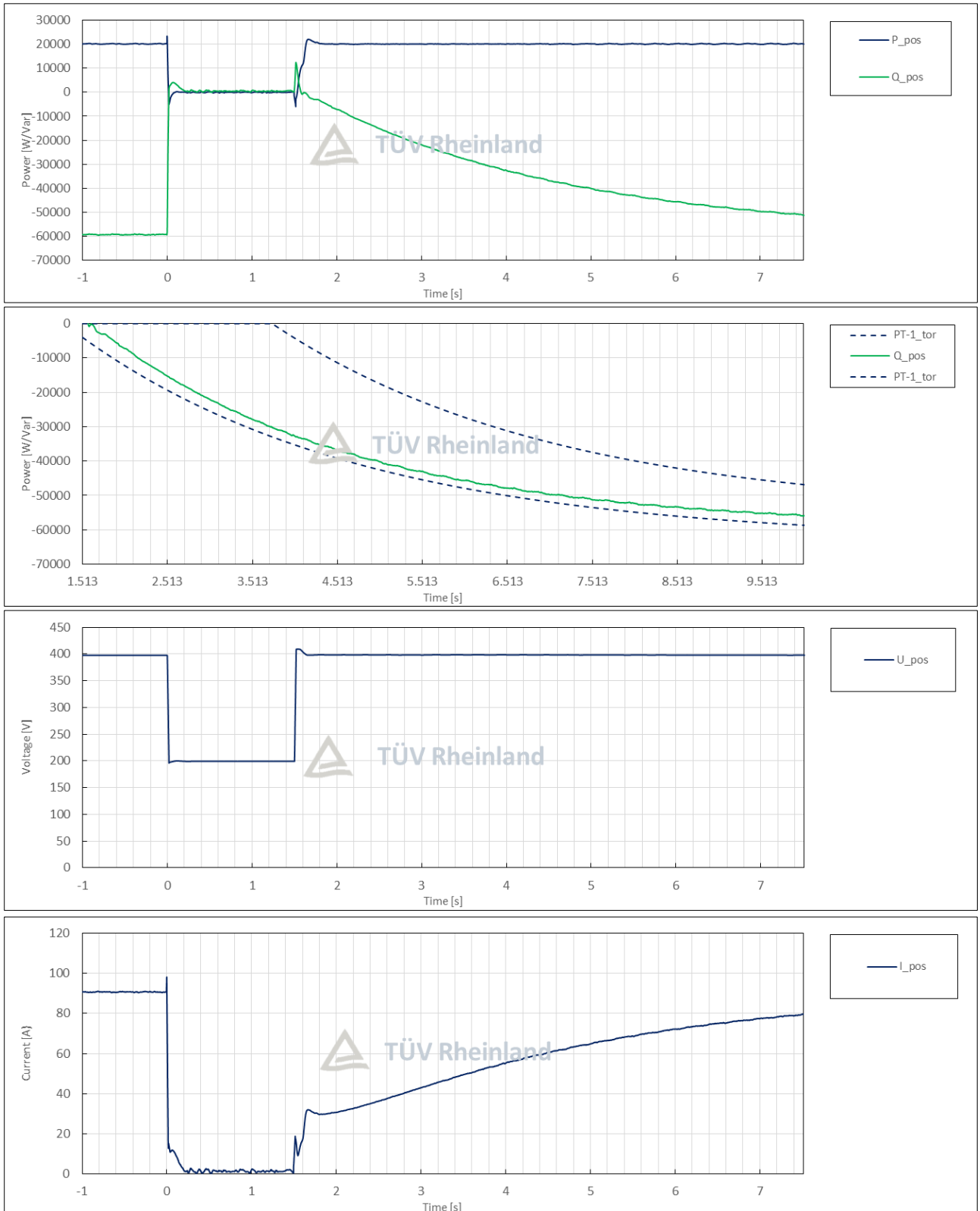
Test No. 3.2 idle test



Test No. 3.2 with PGU

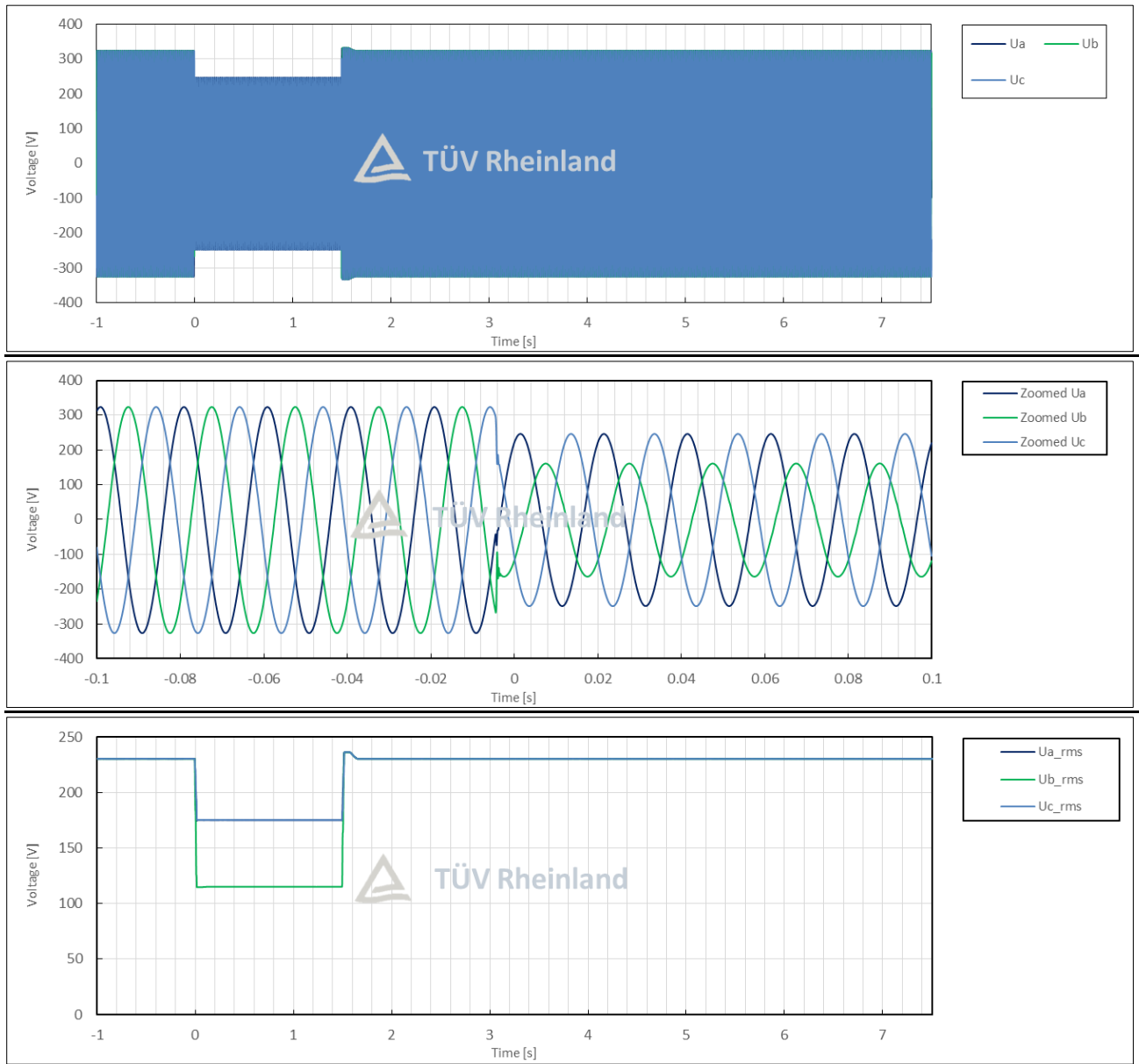


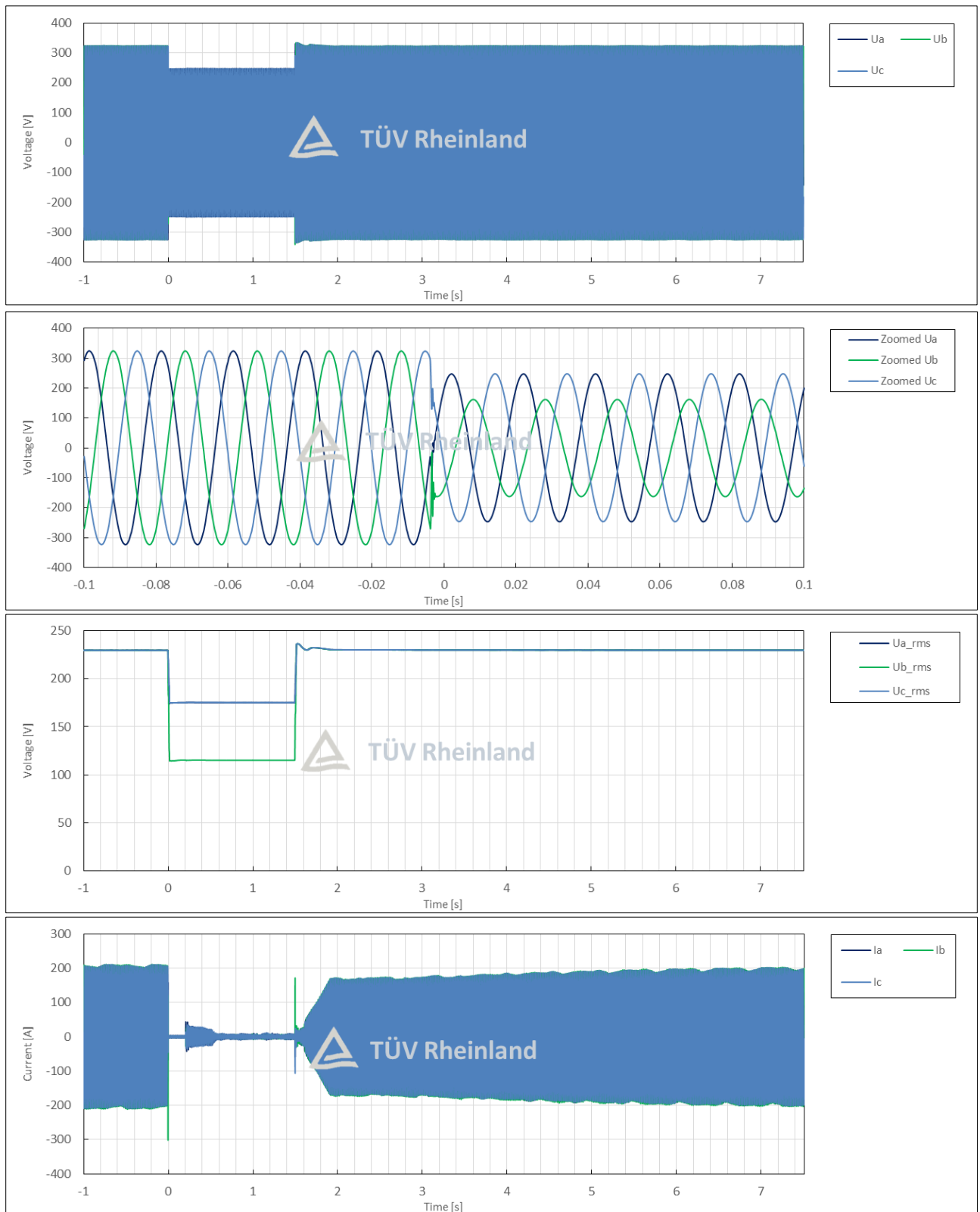


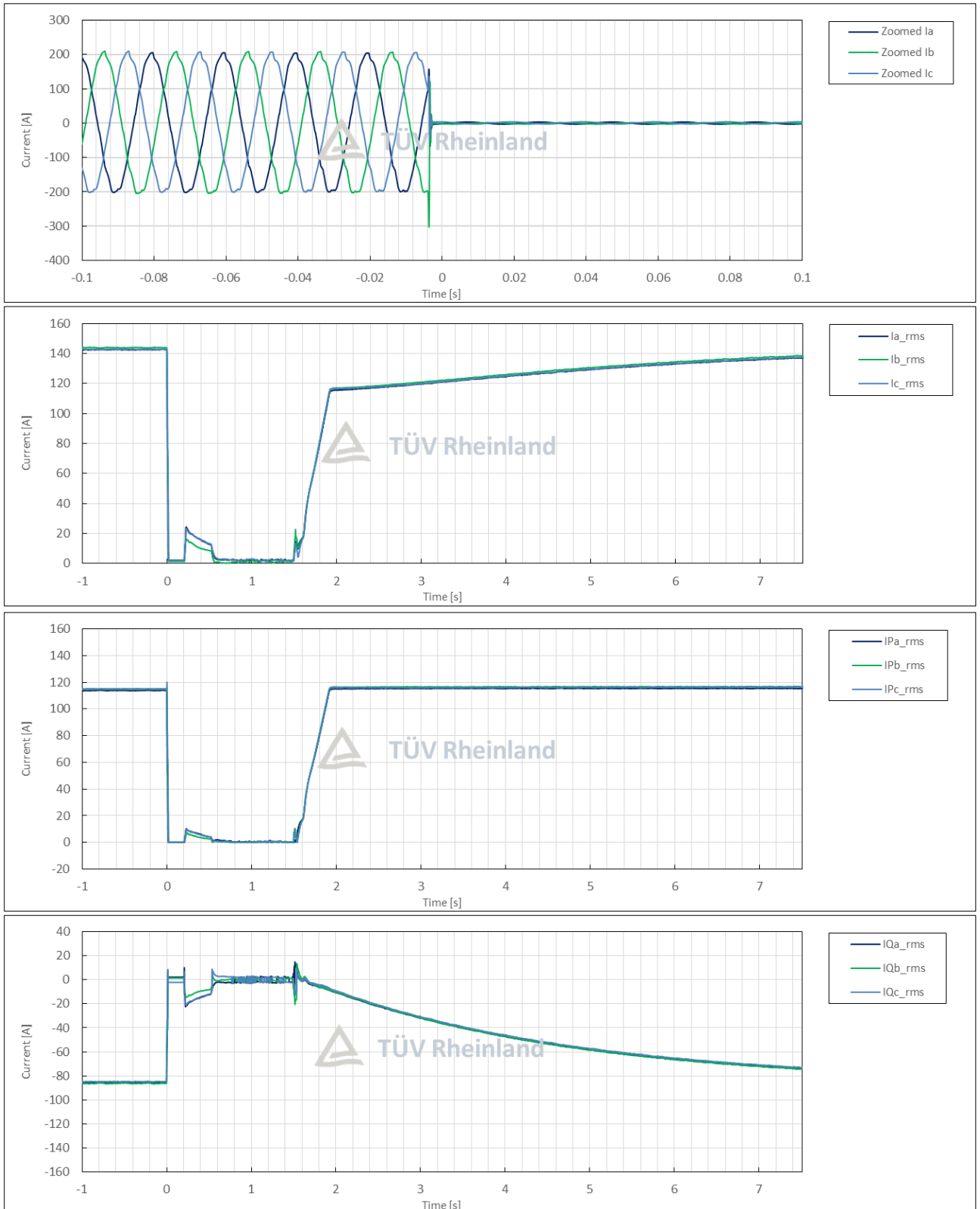


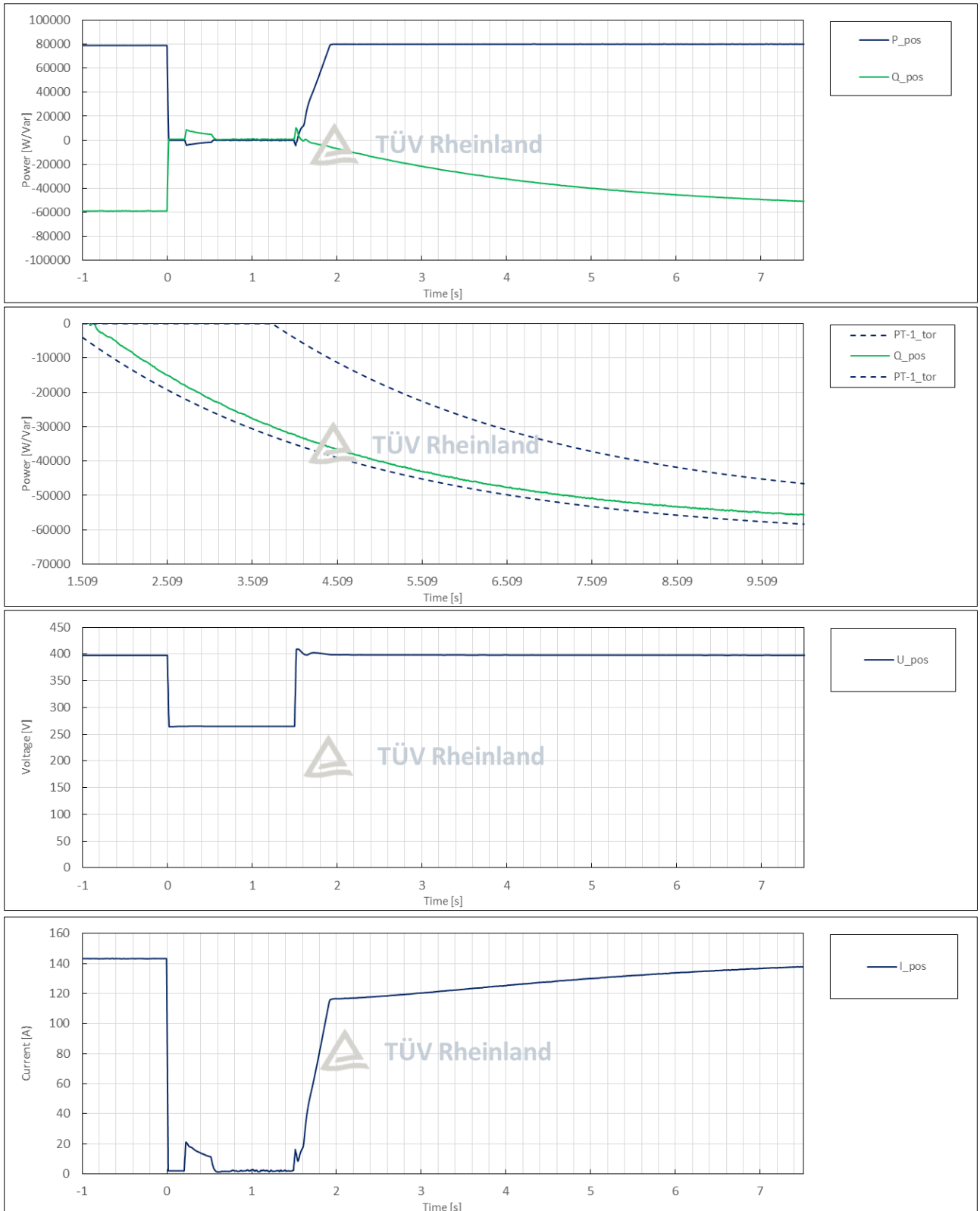
5.8	TABLE: Verification of dynamic network supporting (FVRT)					P/F
Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	3.3
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	13:00:52
	3	Fault type (phase)	--	--		2-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	0.50
	5	Setting dip duration		--		1508
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	1508
	8	Fault duration in empty load test	Total	--	ms	1508
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	0.50
	10		Pos.		p.u.	0.66
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.00
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	0.99
	13	Active power	Total	t1-10s to t1	p.u.	0.79
	14		Pos.			0.79
	15	Reactive power	Total	t1-10s to t1	p.u.	-0.59
	16		Pos.			-0.59
	17	Cosφ	--	t1-10s to t1	--	0.801
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	0.50
	19	Line current	Phase 1	t1+60ms	p.u.	0.02
	20		Phase 2			0.01
	21		Phase 3			0.02
	22	Line current	Phase 1	t1+100ms	p.u.	0.02
	23		Phase 2			0.01
	24		Phase 3			0.02
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	0.01
	26		Pos.			-0.01
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.00
	28	Active power	Total	t2+3s to t2+10s	p.u.	0.80
	29		Pos.			0.80
	30	Active power rising time	Pos.	--	s	0.368
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	-0.50
	32		Pos.			-0.50
	33	Reactive power rising time	Pos.	--	s	8.786
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

Test No. 3.3 idle test



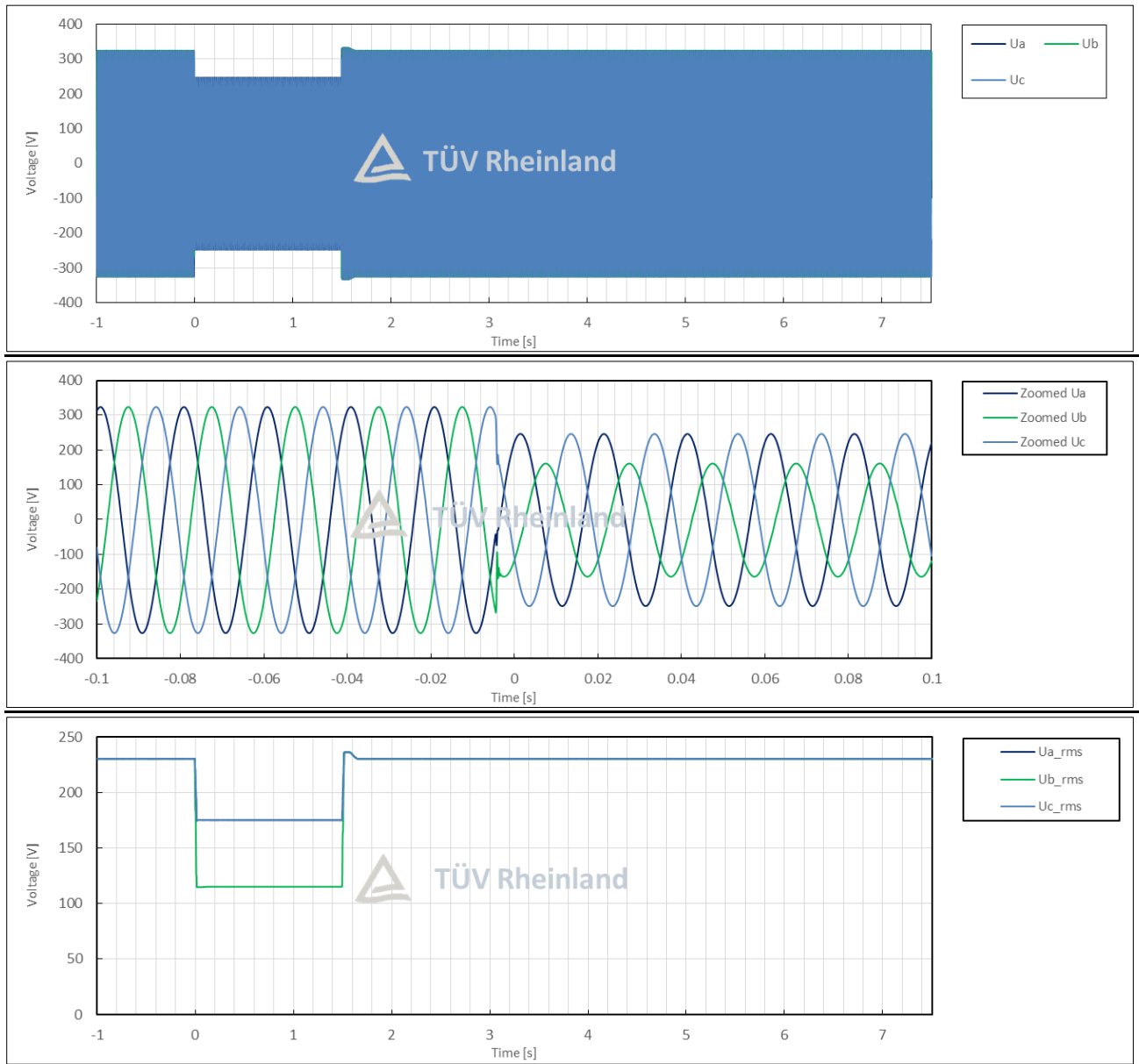
Test No. 3.3 with PGU




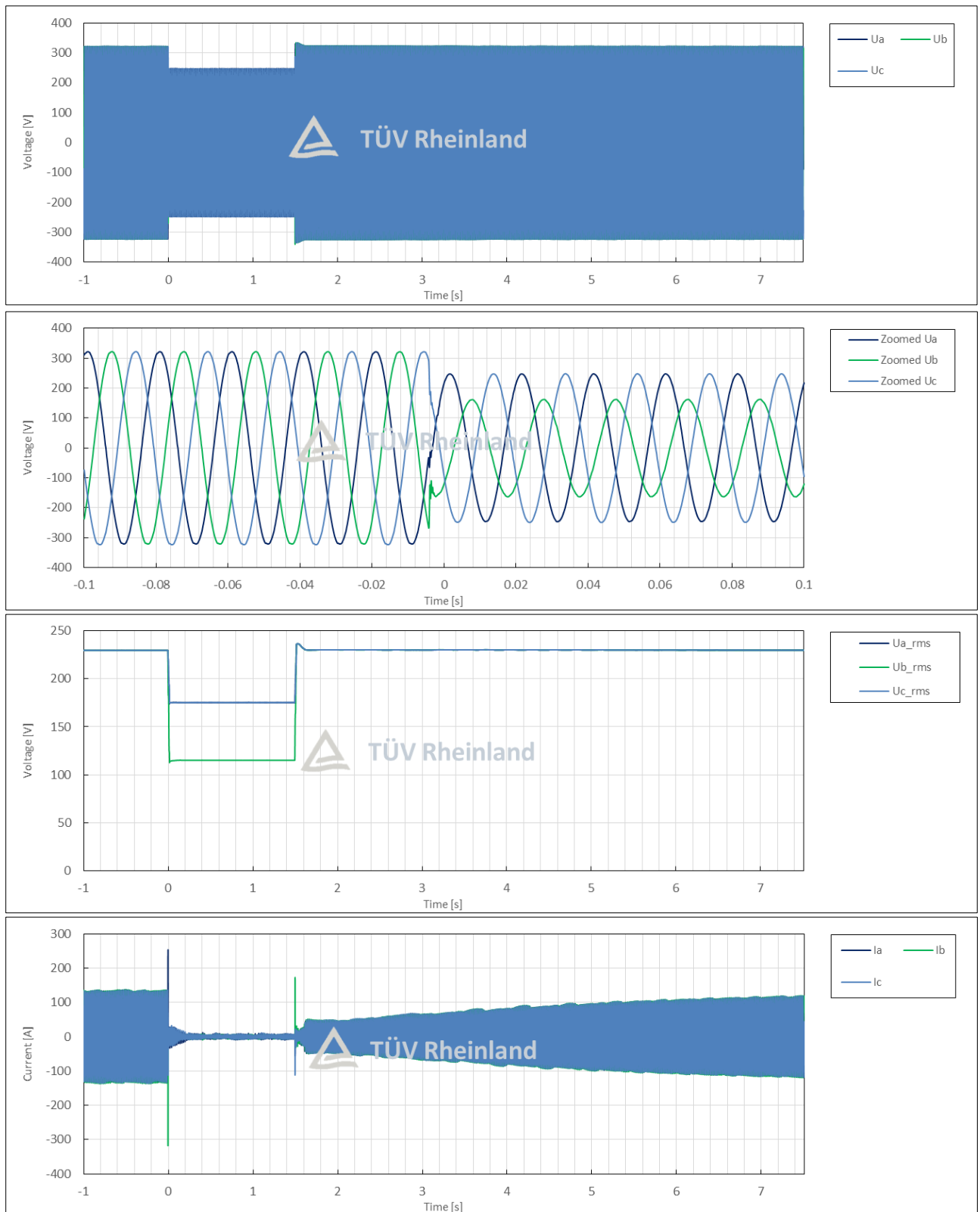


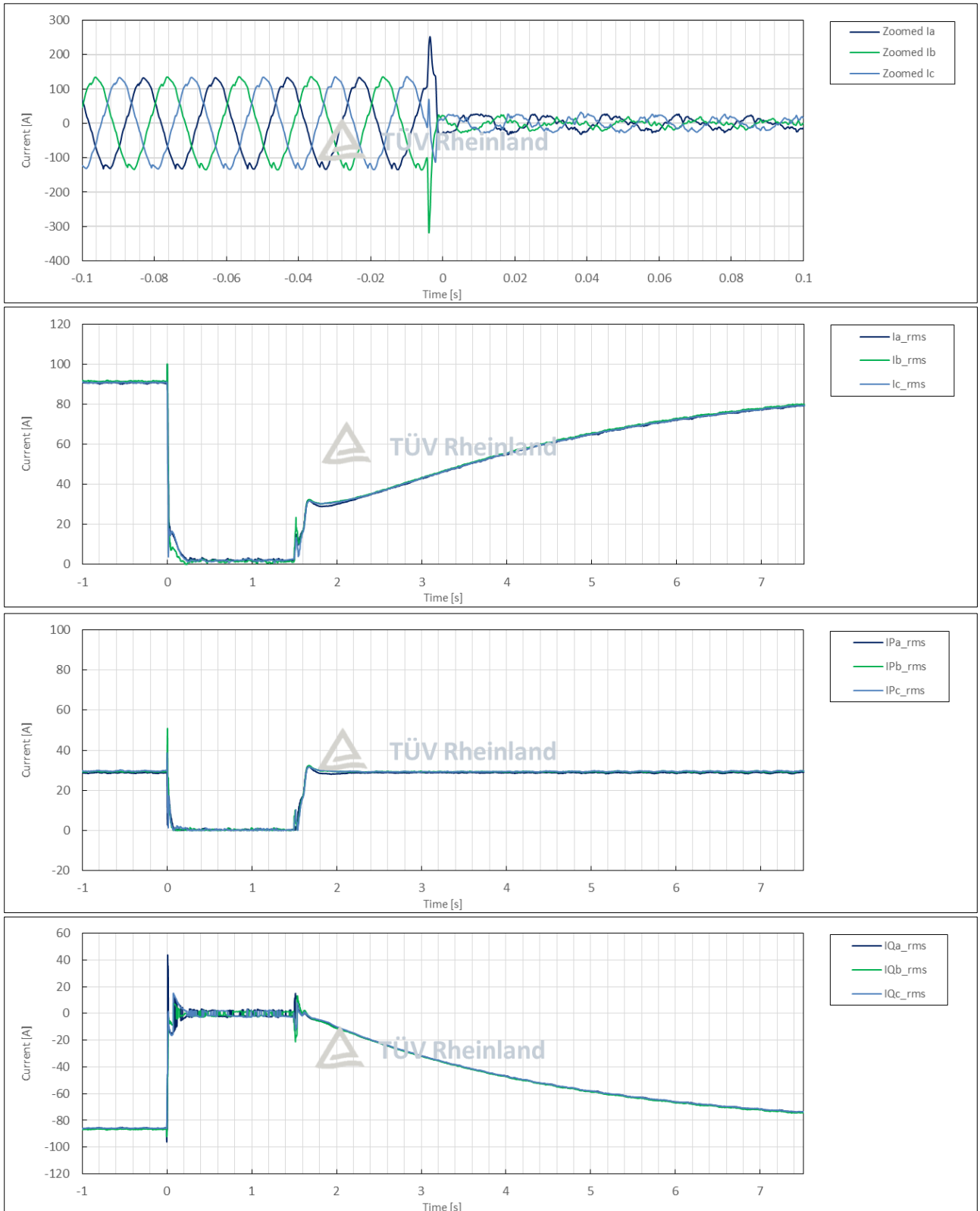
Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	3.4
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	13:00:24
	3	Fault type (phase)	--	--		2-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	0.50
	5	Setting dip duration		--		1508
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	1508
	8	Fault duration in empty load test	Total	--	ms	1508
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	0.50
	10		Pos.		p.u.	0.66
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.00
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	0.63
	13	Active power	Total	t1-10s to t1	p.u.	0.20
	14		Pos.			0.20
	15	Reactive power	Total	t1-10s to t1	p.u.	-0.59
	16		Pos.			-0.59
	17	Cosφ	--	t1-10s to t1	--	0.322
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	0.50
	19	Line current	Phase 1	t1+60ms	p.u.	0.11
	20		Phase 2			0.06
	21		Phase 3			0.11
	22	Line current	Phase 1	t1+100ms	p.u.	0.08
	23		Phase 2			0.04
	24		Phase 3			0.08
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	0.00
	26		Pos.			0.00
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.00
	28	Active power	Total	t2+3s to t2+10s	p.u.	0.20
	29		Pos.			0.20
	39	Active power rising time	Pos.	--	s	0.122
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	-0.51
	32		Pos.			-0.51
	33	Reactive power rising time	Pos.	--	s	8.826
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

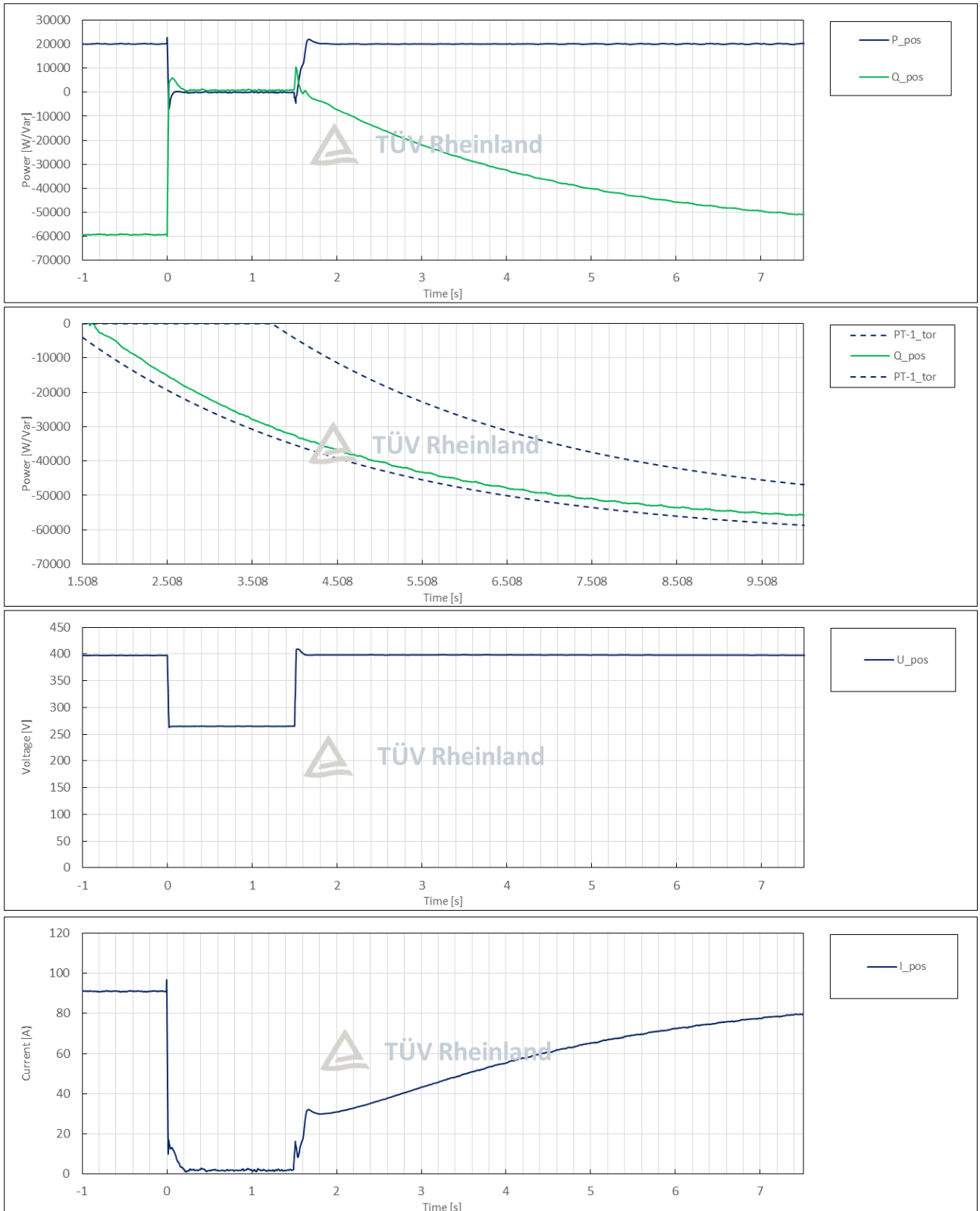
Test No. 3.4 idle test



Test No. 3.4 with PGU







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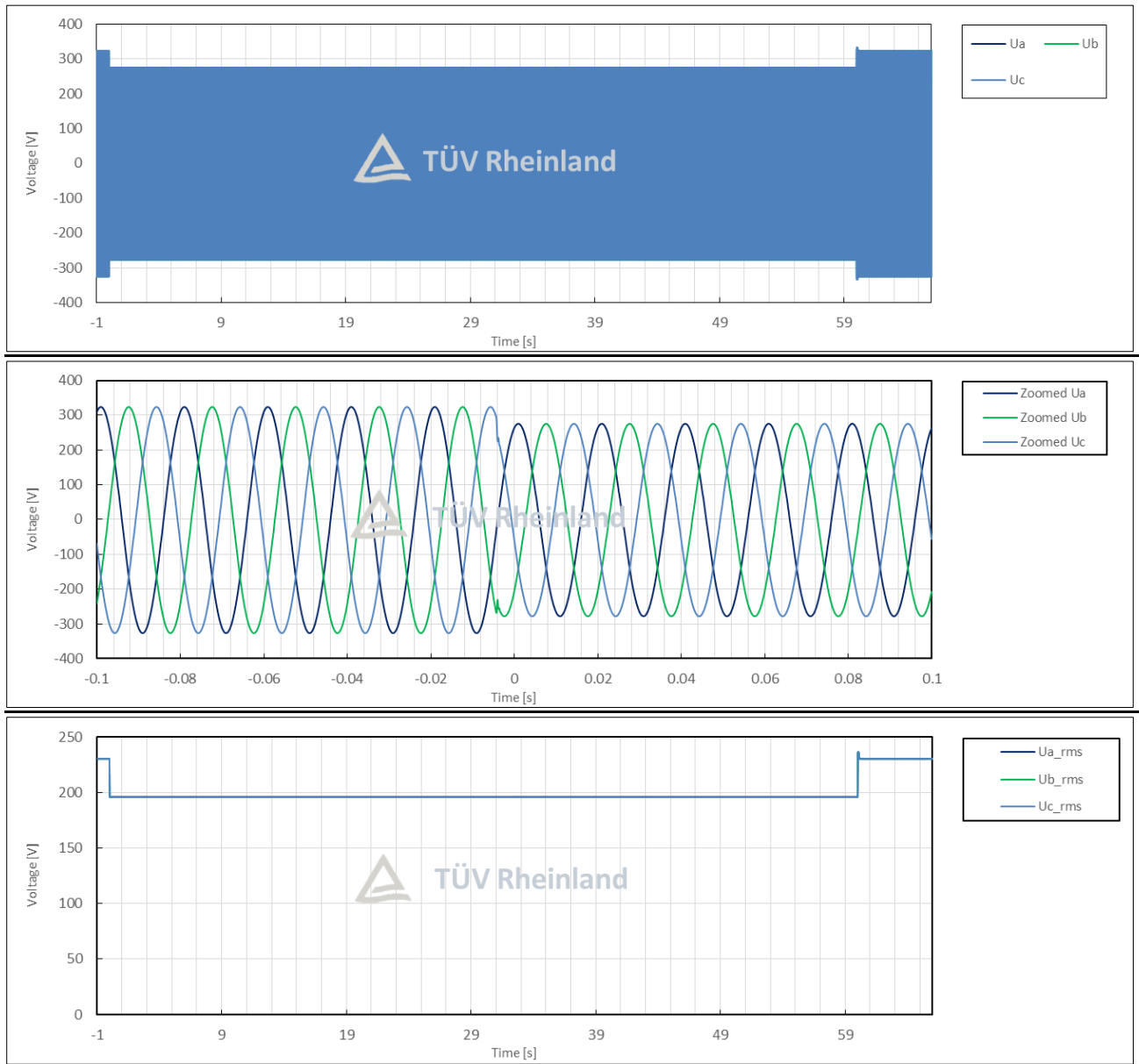
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Test report no.:

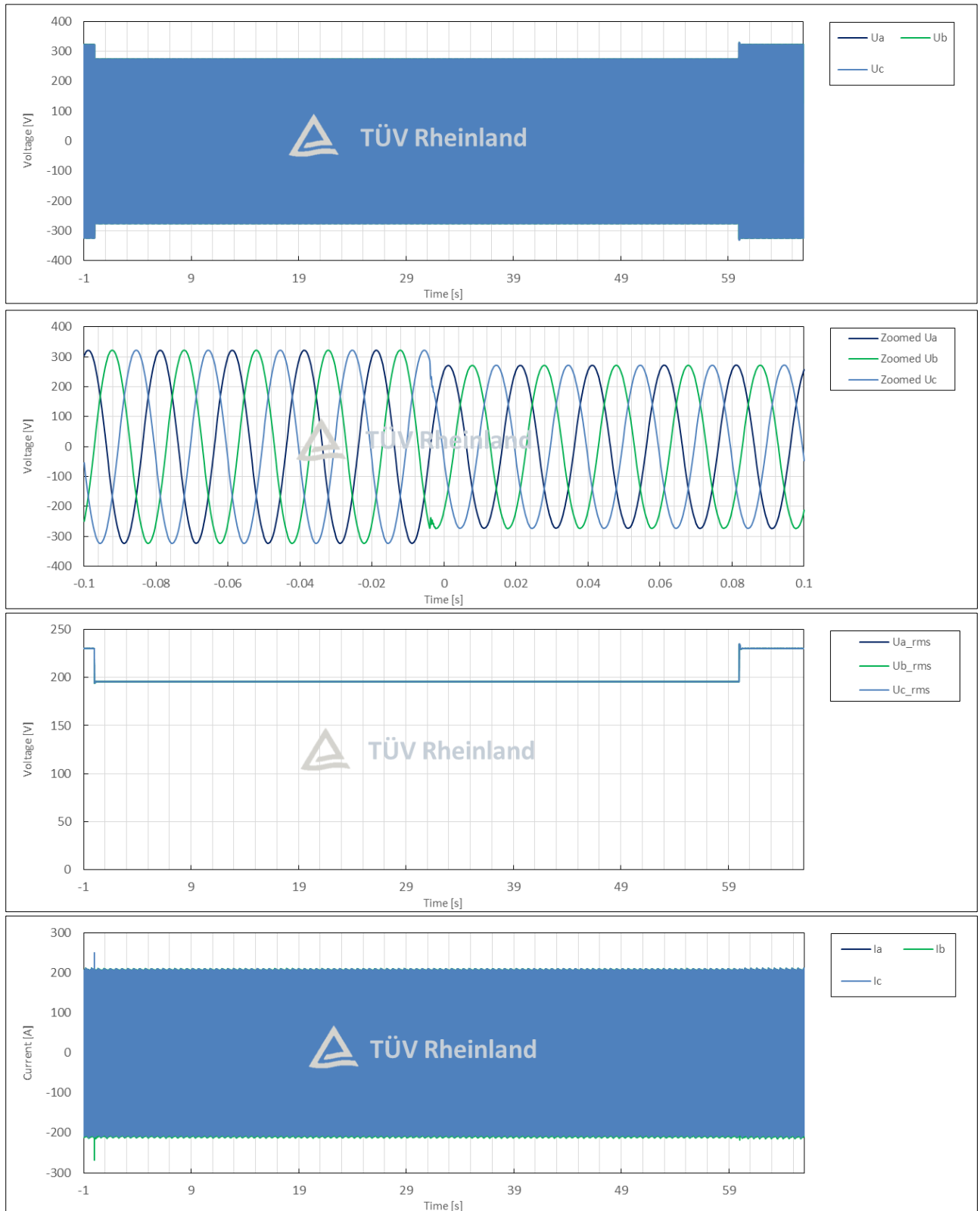
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Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	4.1
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	13:03:22
	3	Fault type (phase)	--	--		3-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	0.85
	5	Setting dip duration		--		60019
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	60019
	8	Fault duration in empty load test	Total	--	ms	60019
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	0.85
	10		Pos.		p.u.	0.85
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.00
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	1.00
	13	Active power	Total	t1-10s to t1	p.u.	1.00
	14		Pos.			1.00
	15	Reactive power	Total	t1-10s to t1	p.u.	0.00
	16		Pos.			0.00
	17	Cosφ	--	t1-10s to t1	--	1.000
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	0.85
	19	Line current	Phase 1	t1+60ms	p.u.	0.99
	20		Phase 2			1.00
	21		Phase 3			0.99
	22	Line current	Phase 1	t1+100ms	p.u.	1.00
	23		Phase 2			1.00
	24		Phase 3			1.00
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	0.85
	26		Pos.			0.85
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.00
	28	Active power	Total	t2+3s to t2+10s	p.u.	1.00
	29		Pos.			1.00
	39	Active power rising time	Pos.	--	s	0
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	0.00
	32		Pos.			0.00
	33	Reactive power rising time	Pos.	--	s	N/A
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

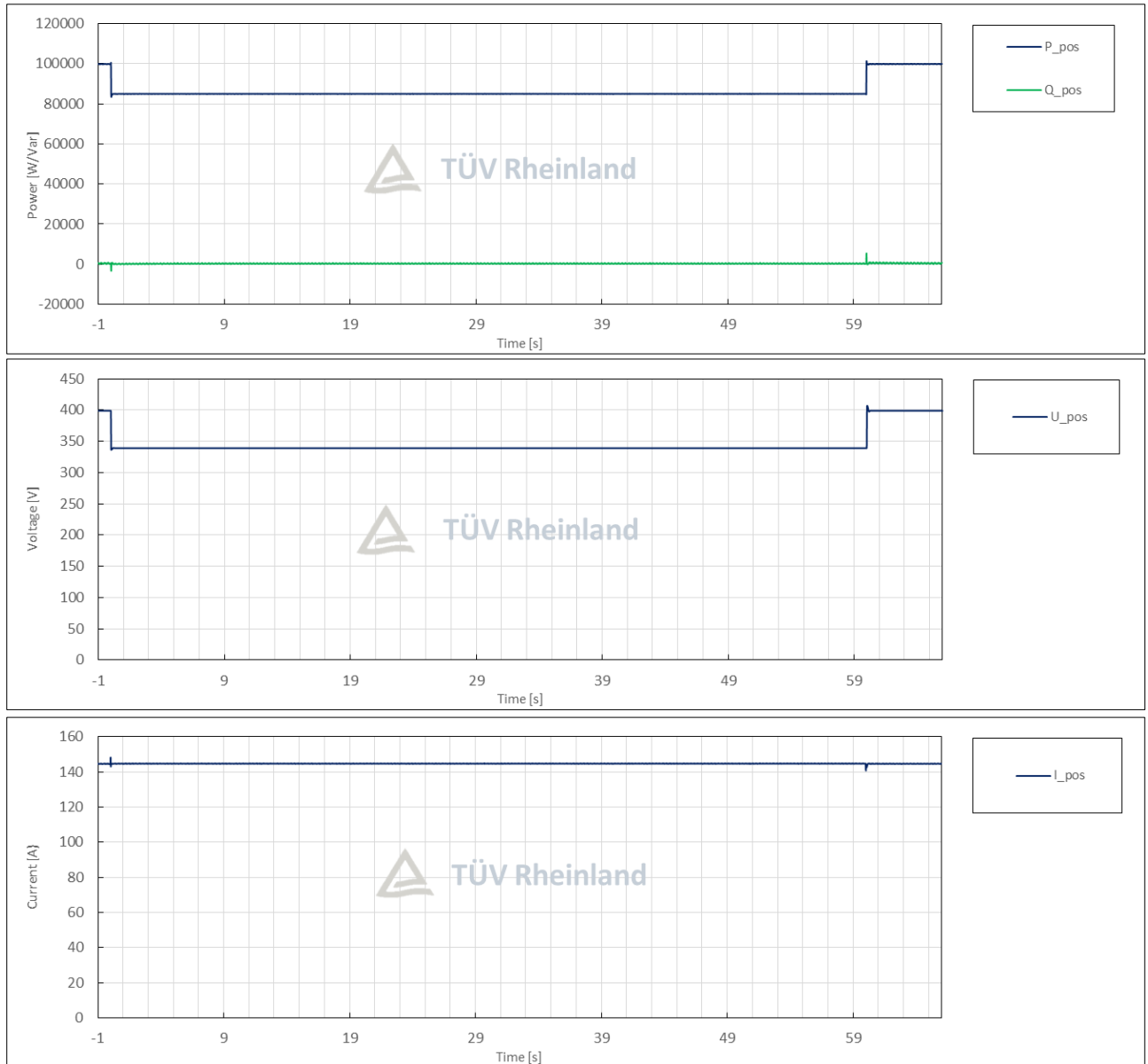
Test No. 4.1 idle test



Test No. 4.1 with PGU







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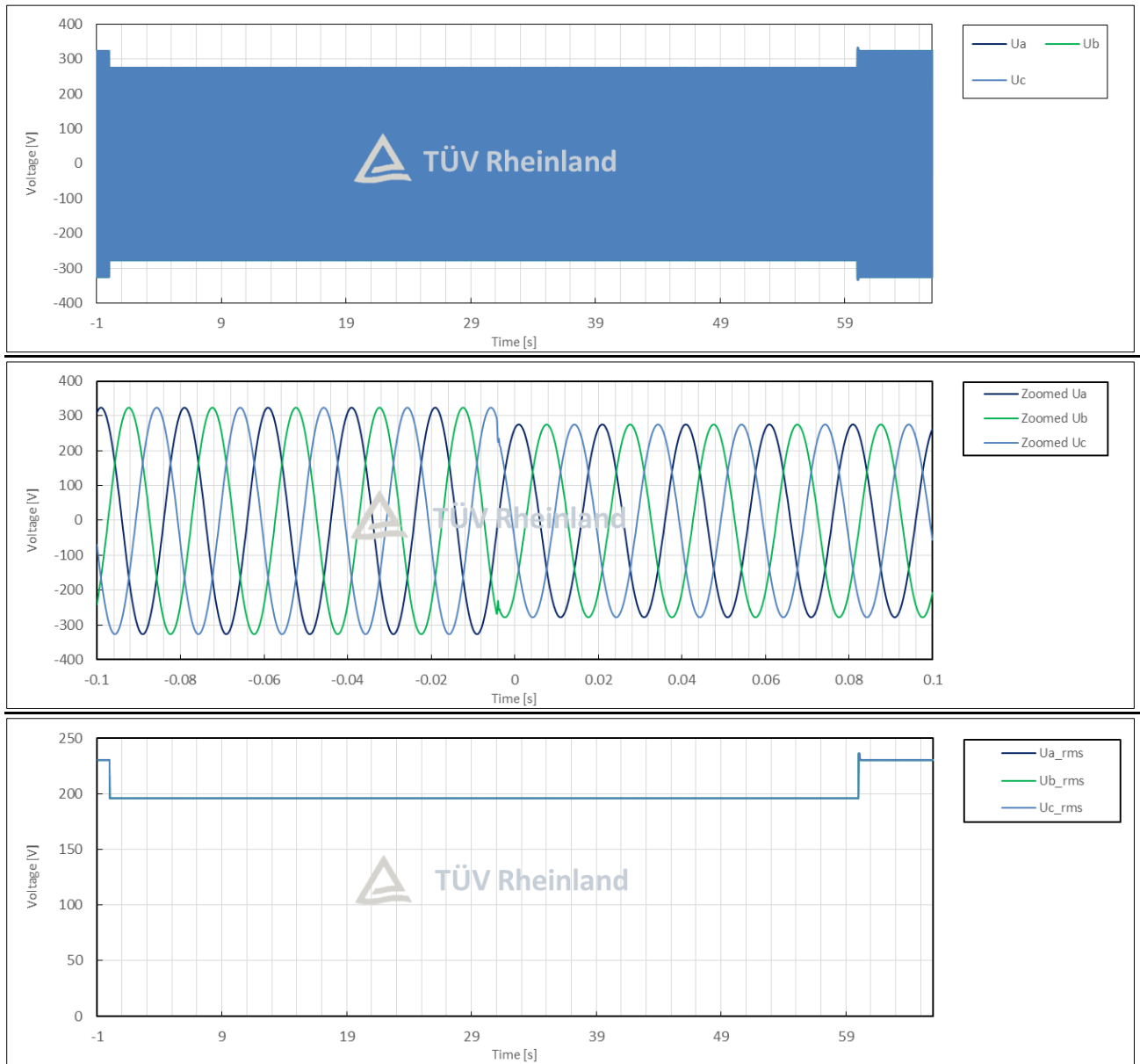
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Test report no.:

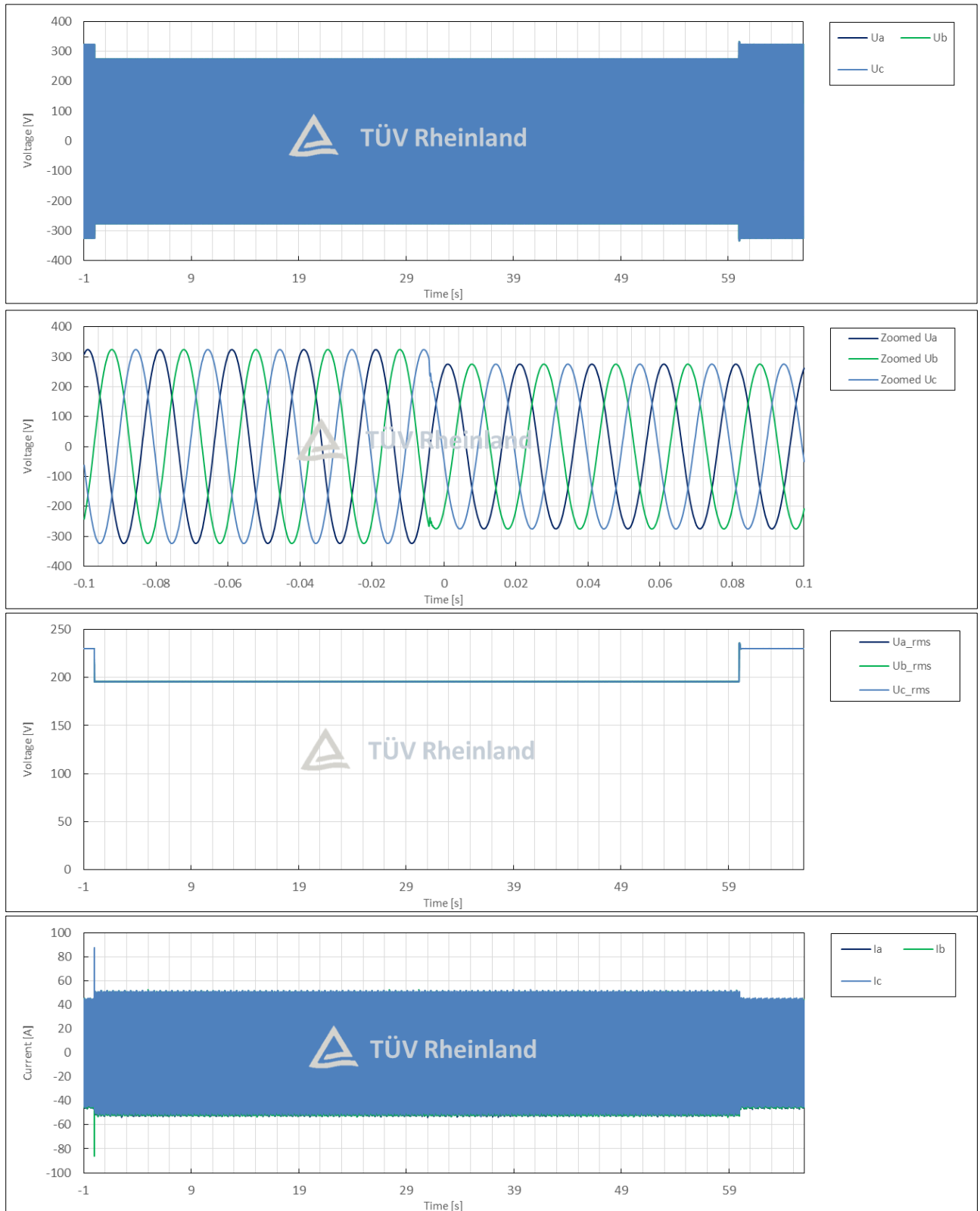
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Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	4.2
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	13:04:10
	3	Fault type (phase)	--	--		3-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	0.85
	5	Setting dip duration		--		60019
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	60019
	8	Fault duration in empty load test	Total	--	ms	60019
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	0.85
	10		Pos.		p.u.	0.85
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.00
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	0.20
	13	Active power	Total	t1-10s to t1	p.u.	0.20
	14		Pos.			0.20
	15	Reactive power	Total	t1-10s to t1	p.u.	0.00
	16		Pos.			0.00
	17	Cosφ	--	t1-10s to t1	--	1.000
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	0.85
	19	Line current	Phase 1	t1+60ms	p.u.	0.23
	20		Phase 2			0.23
	21		Phase 3			0.23
	22	Line current	Phase 1	t1+100ms	p.u.	0.24
	23		Phase 2			0.24
	24		Phase 3			0.23
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	0.20
	26		Pos.			0.20
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.00
	28	Active power	Total	t2+3s to t2+10s	p.u.	0.20
	29		Pos.			0.20
	39	Active power rising time	Pos.	--	s	N/A
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	0.00
	32		Pos.			0.00
	33	Reactive power rising time	Pos.	--	s	N/A
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

Test No. 4.2 idle test



Test No. 4.2 with PGU

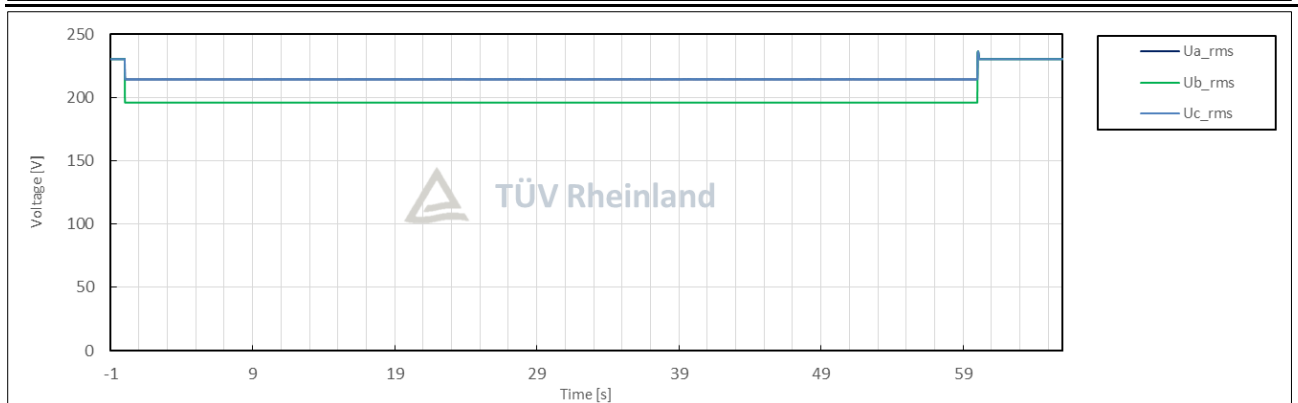
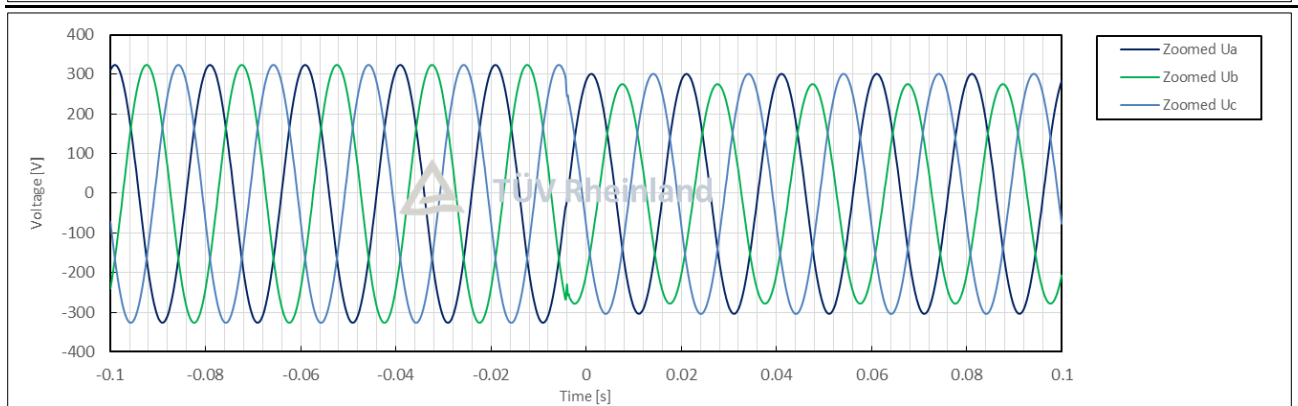
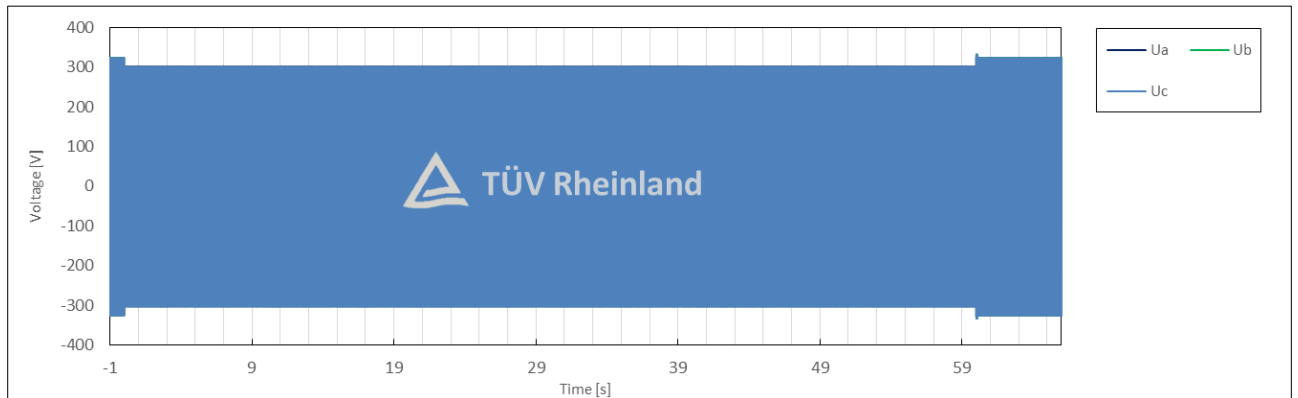




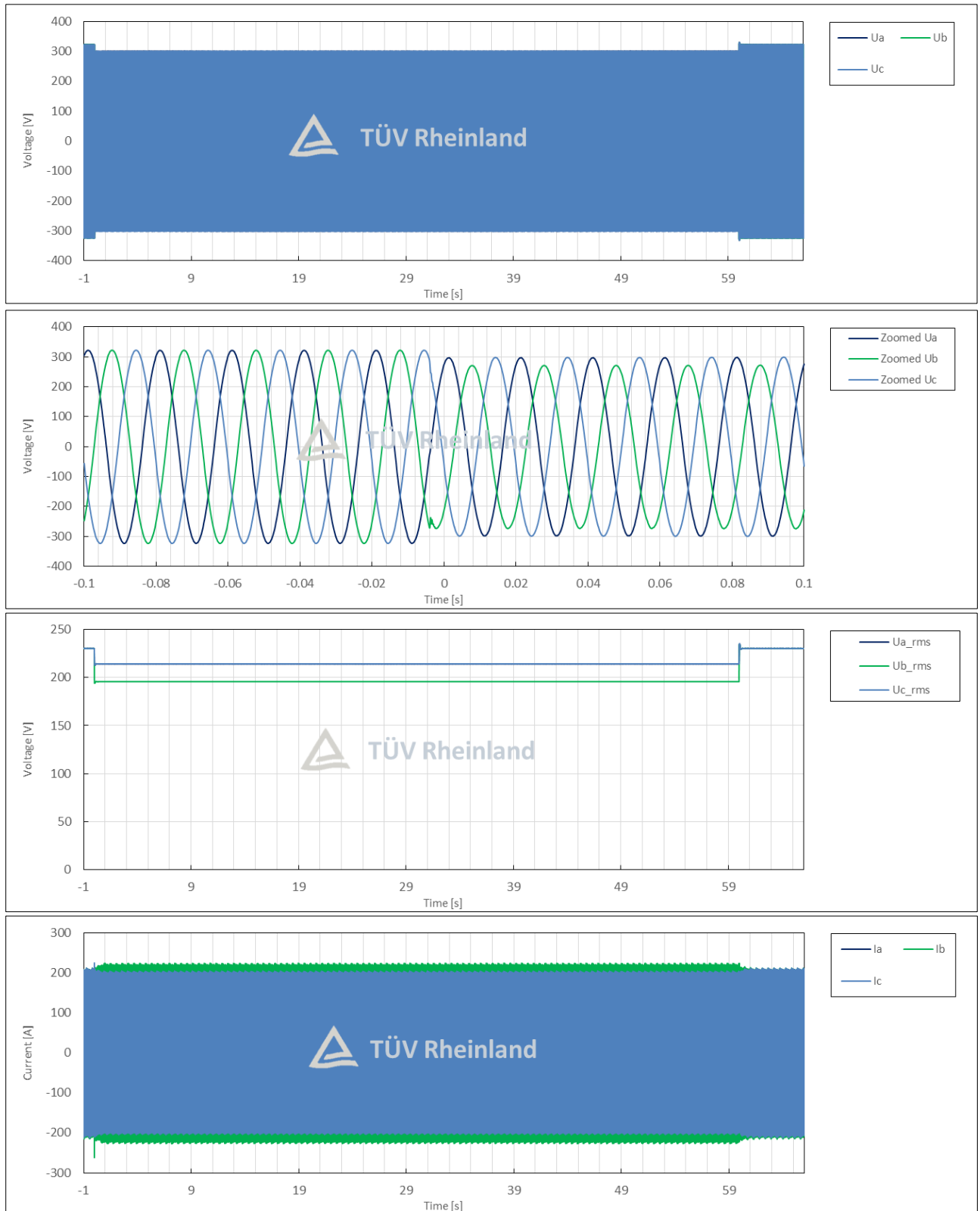


Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	4.3
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	13:02:56
	3	Fault type (phase)	--	--		2-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	0.85
	5	Setting dip duration		--		60017
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	60017
	8	Fault duration in empty load test	Total	--	ms	60017
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	0.85
	10		Pos.		p.u.	0.90
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.00
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	1.00
	13	Active power	Total	t1-10s to t1	p.u.	1.00
	14		Pos.			1.00
	15	Reactive power	Total	t1-10s to t1	p.u.	0.00
	16		Pos.			0.00
	17	Cosφ	--	t1-10s to t1	--	1.000
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	0.85
	19	Line current	Phase 1	t1+60ms	p.u.	0.98
	20		Phase 2			1.01
	21		Phase 3			1.00
	22	Line current	Phase 1	t1+100ms	p.u.	0.99
	23		Phase 2			1.02
	24		Phase 3			0.99
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	0.90
	26		Pos.			0.90
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.00
	28	Active power	Total	t2+3s to t2+10s	p.u.	1.00
	29		Pos.			1.00
	39	Active power rising time	Pos.	--	s	N/A
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	0.00
	32		Pos.			0.00
	33	Reactive power rising time	Pos.	--	s	N/A
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

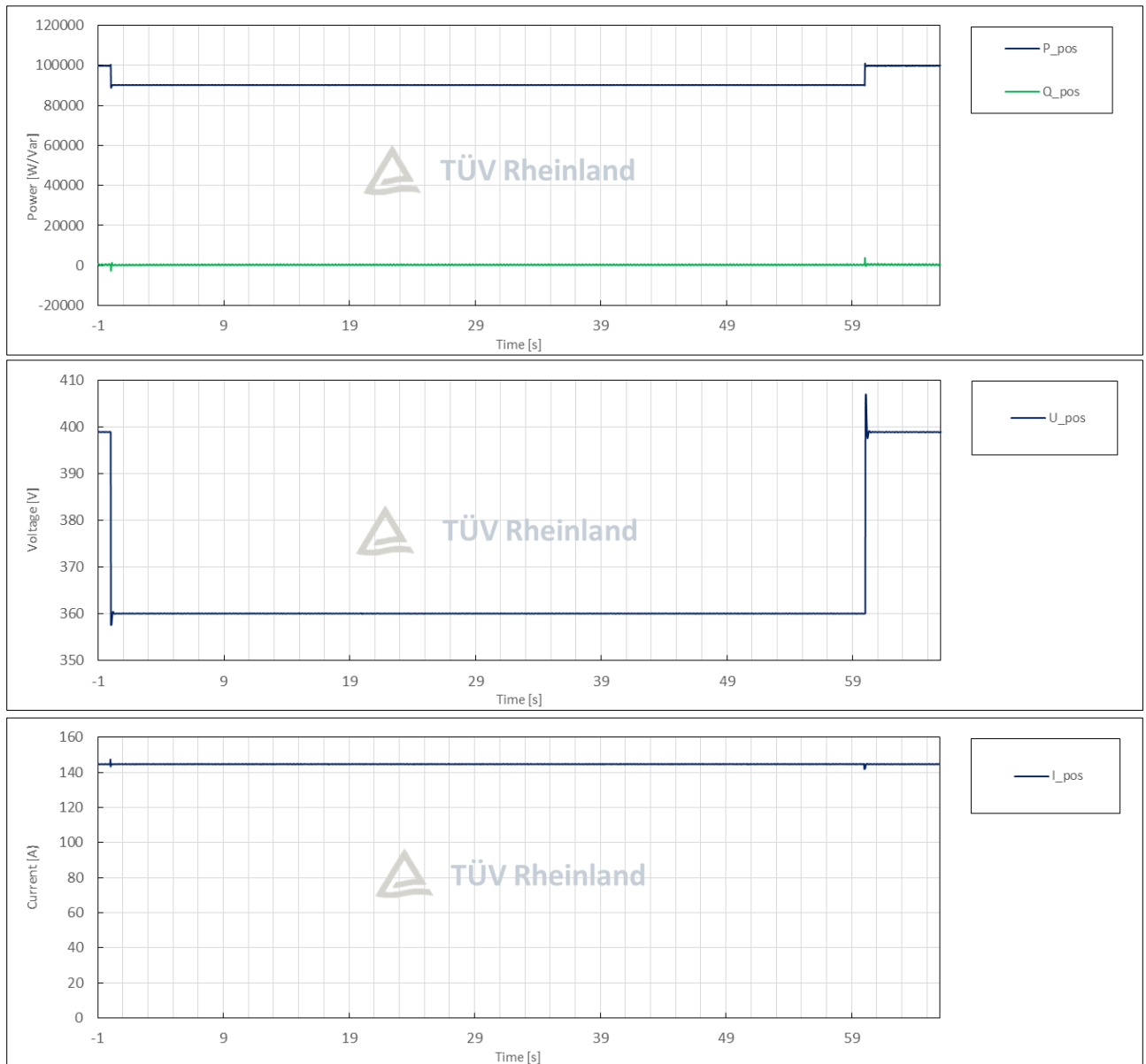
Test No. 4.3 idle test



Test No. 4.3 with PGU







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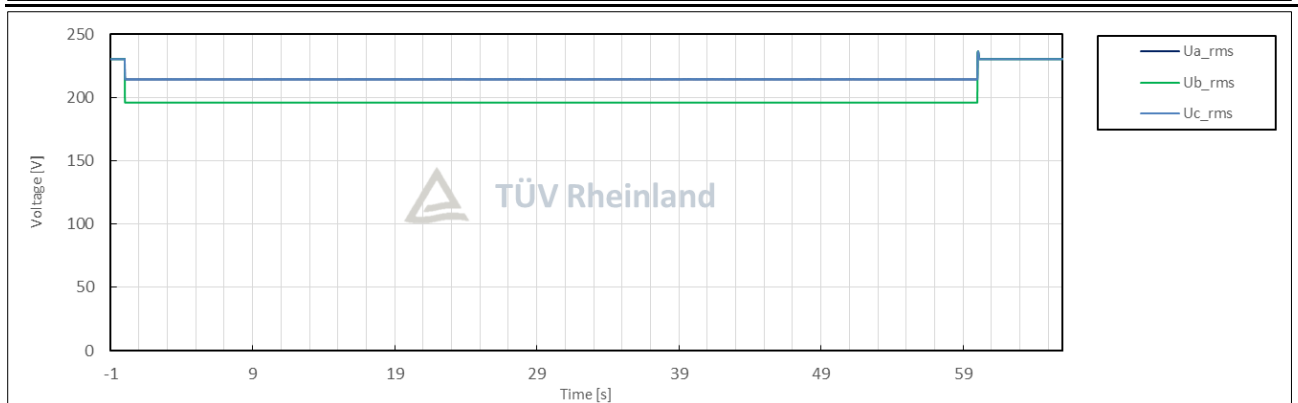
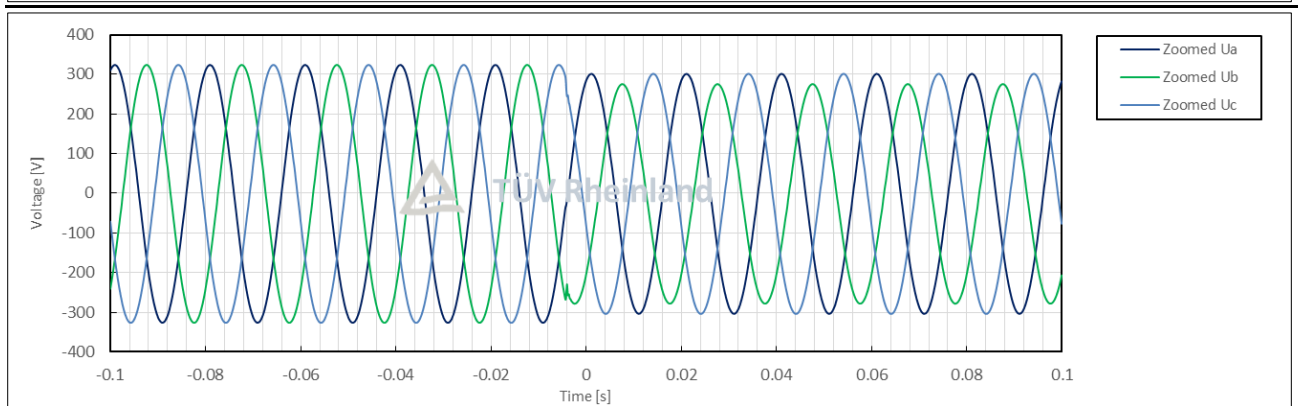
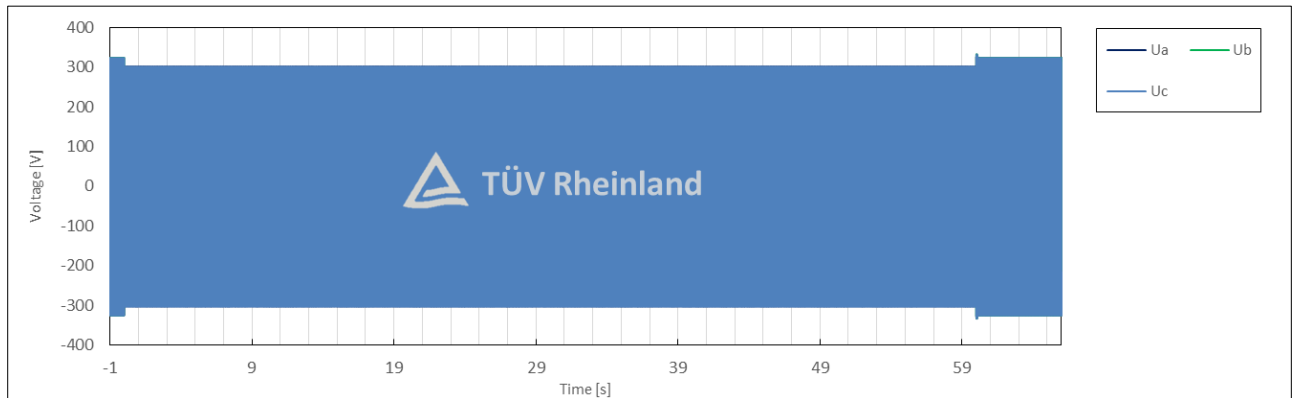
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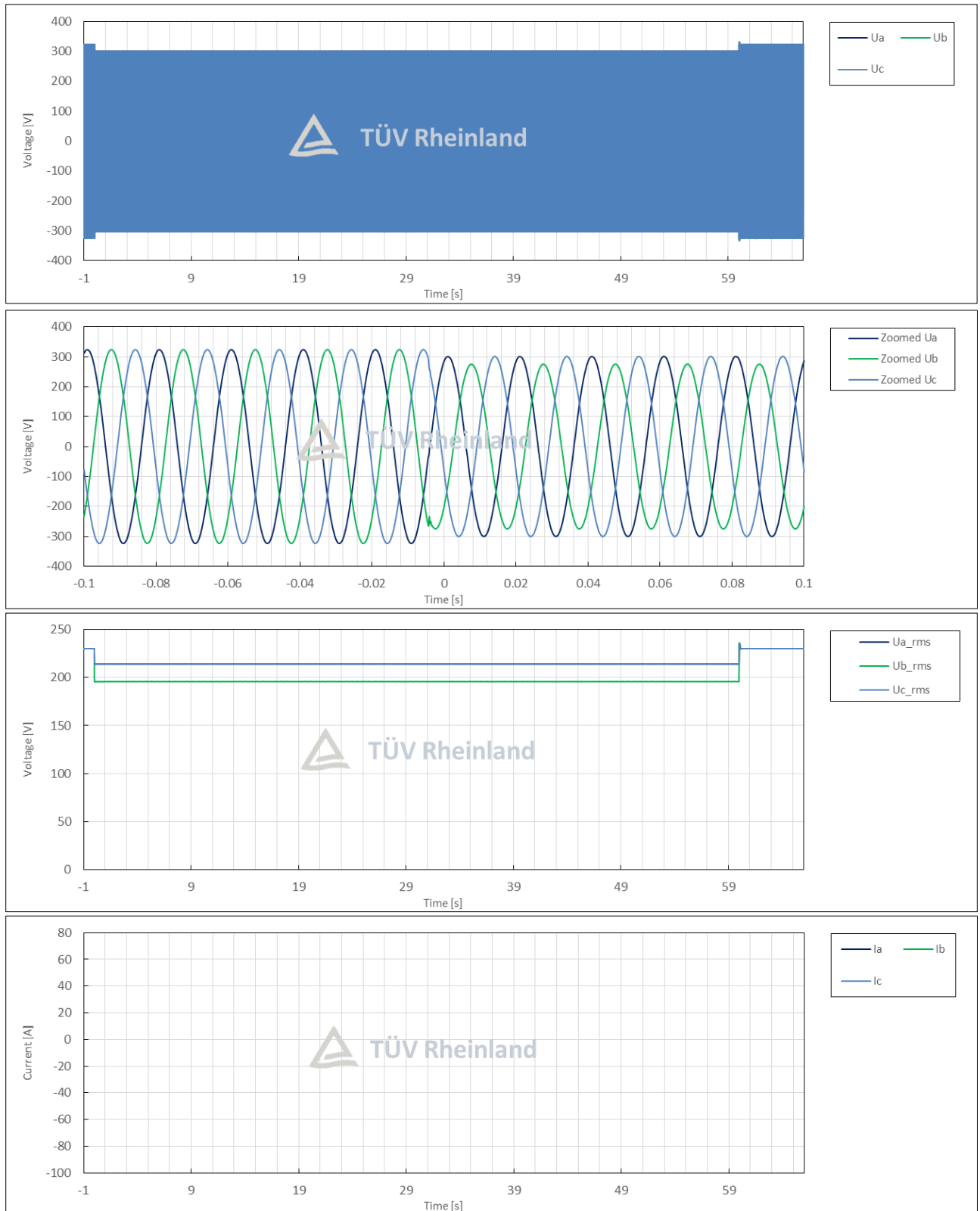
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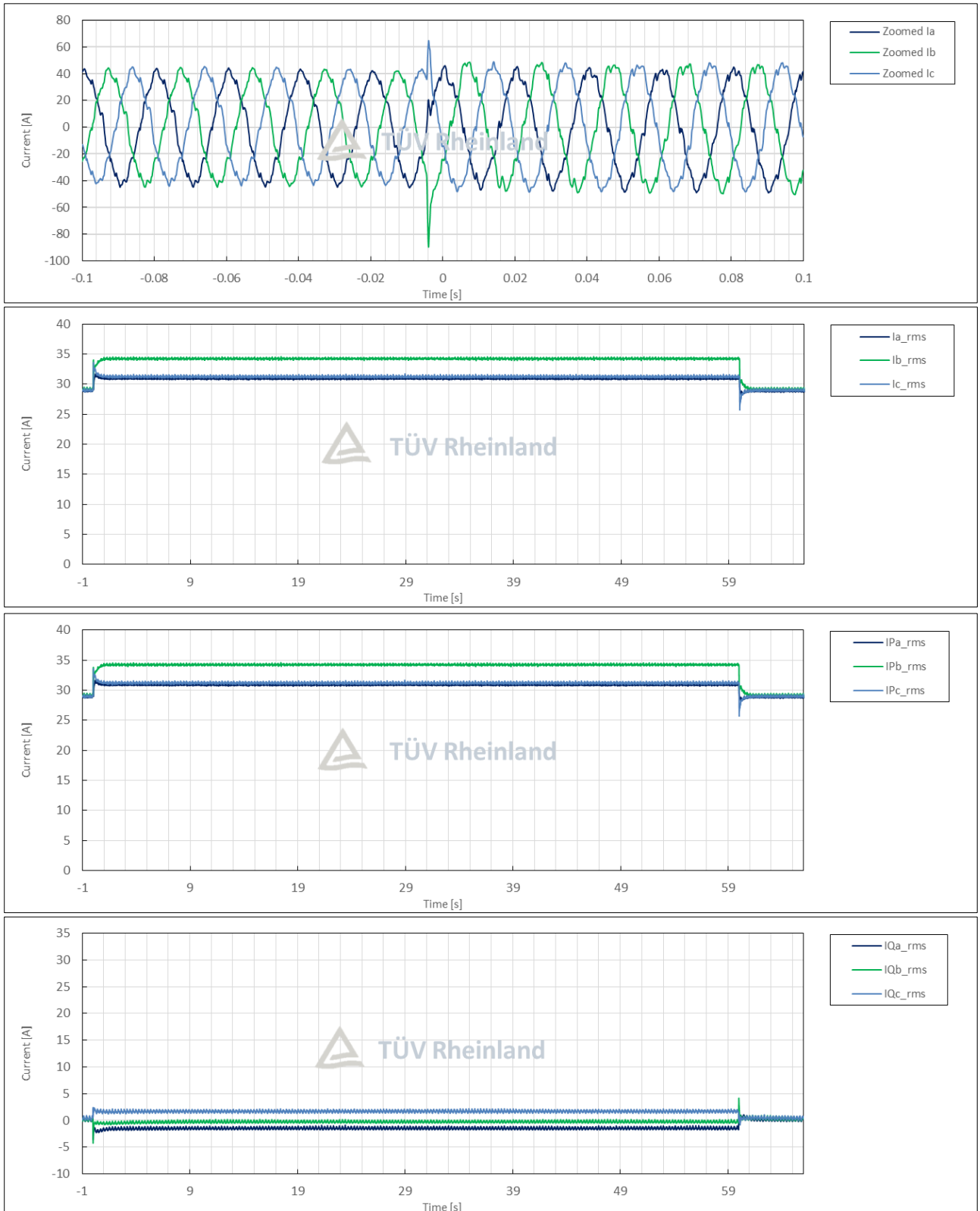
Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	4.4
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	13:03:46
	3	Fault type (phase)	--	--		2-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	0.85
	5	Setting dip duration		--		60017
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	60017
	8	Fault duration in empty load test	Total	--	ms	60017
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	0.85
	10		Pos.		p.u.	0.90
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.00
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	0.20
	13	Active power	Total	t1-10s to t1	p.u.	0.20
	14		Pos.			0.20
	15	Reactive power	Total	t1-10s to t1	p.u.	0.00
	16		Pos.			0.00
	17	Cosφ	--	t1-10s to t1	--	1.000
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	0.85
	19	Line current	Phase 1	t1+60ms	p.u.	0.21
	20		Phase 2			0.22
	21		Phase 3			0.23
	22	Line current	Phase 1	t1+100ms	p.u.	0.21
	23		Phase 2			0.23
	24		Phase 3			0.23
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	0.20
	26		Pos.			0.20
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.00
	28	Active power	Total	t2+3s to t2+10s	p.u.	0.20
	29		Pos.			0.20
	39	Active power rising time	Pos.	--	s	N/A
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	0.00
	32		Pos.			0.00
	33	Reactive power rising time	Pos.	--	s	N/A
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

Test No. 4.4 idle test



Test No. 4.4 with PGU





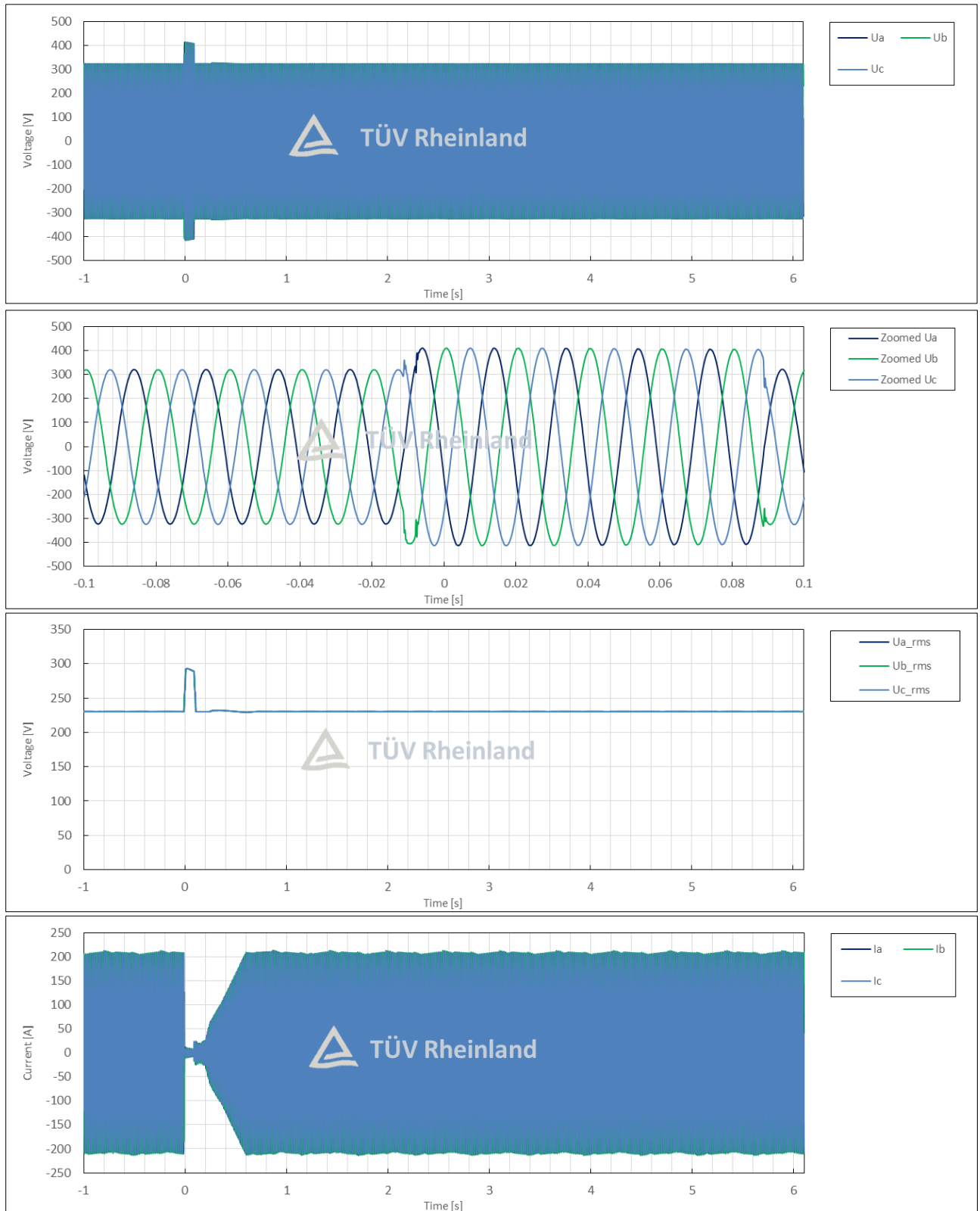


Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	5.1
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	13:00:06
	3	Fault type (phase)	--	--		3-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	1.22
	5	Setting dip duration		--		105
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	105
	8	Fault duration in empty load test	Total	--	ms	105
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	1.22
	10		Pos.		p.u.	1.21
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.00
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	1.00
	13	Active power	Total	t1-10s to t1	p.u.	1.00
	14		Pos.			1.00
	15	Reactive power	Total	t1-10s to t1	p.u.	0.00
	16		Pos.			0.00
	17	Cosφ	--	t1-10s to t1	--	1.000
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	1.21
	19	Line current	Phase 1	t1+60ms	p.u.	0.03
	20		Phase 2			0.03
	21		Phase 3			0.03
	22	Line current	Phase 1	t1+100ms	p.u.	0.02
	23		Phase 2			0.02
	24		Phase 3			0.02
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	0.00
	26		Pos.			0.00
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.00
	28	Active power	Total	t2+3s to t2+10s	p.u.	1.00
	29		Pos.			1.00
	39	Active power rising time	Pos.	--	s	0.46
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	0.01
	32		Pos.			0.01
	33	Reactive power rising time	Pos.	--	s	N/A
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

Test No. 5.1 idle test



Test No. 5.1 with PGU







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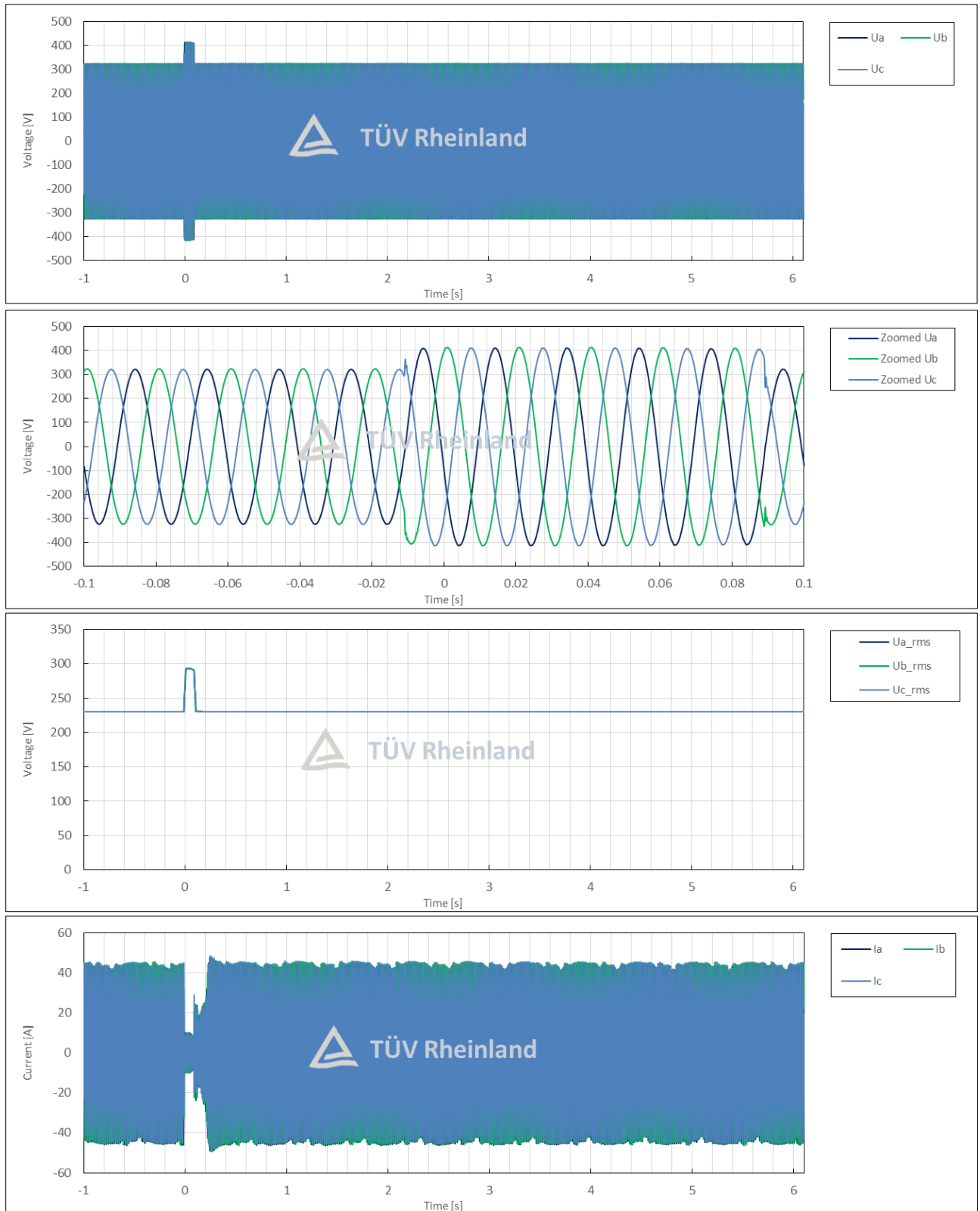
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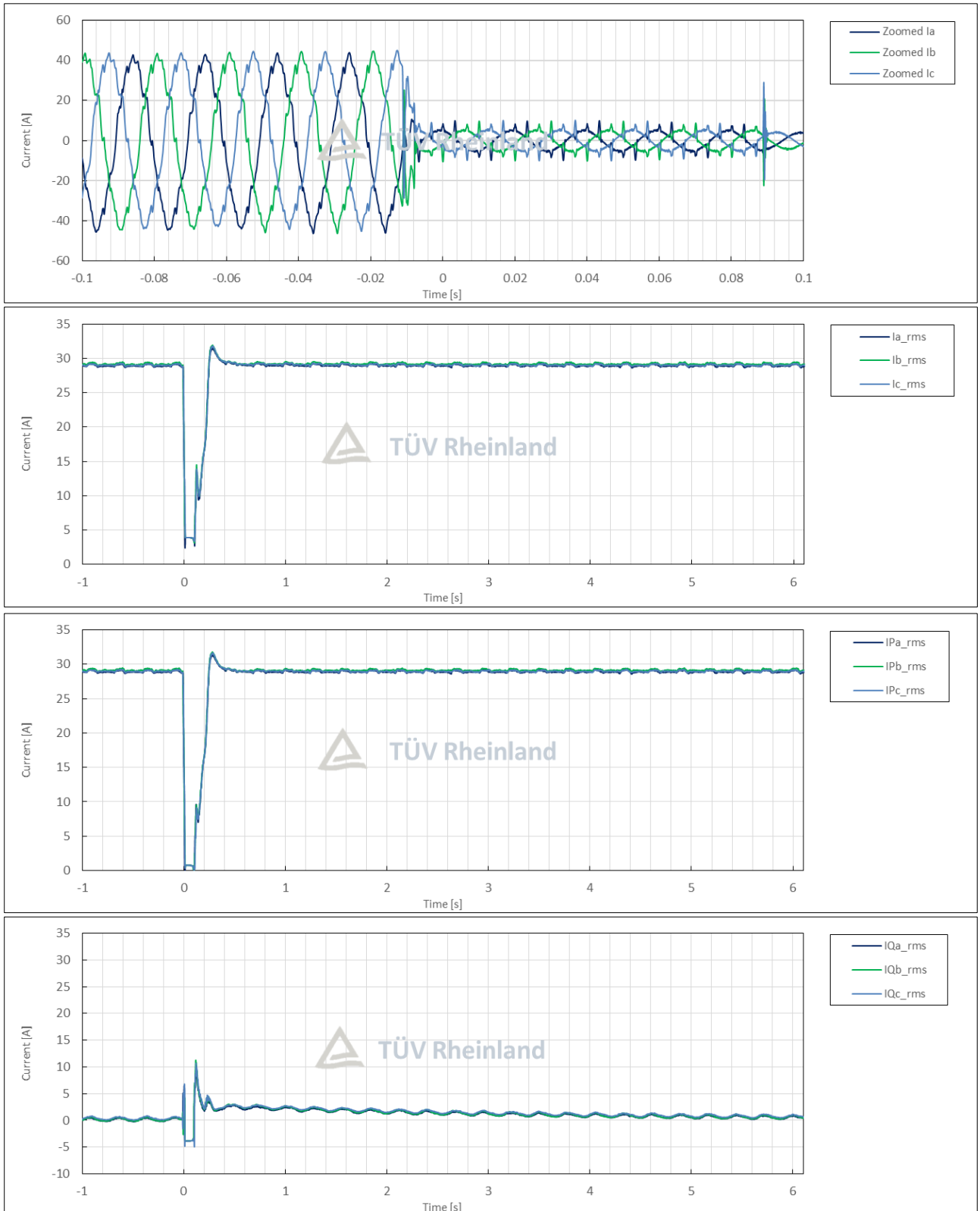
Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	5.2
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	12:59:34
	3	Fault type (phase)	--	--		3-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	1.22
	5	Setting dip duration		--		105
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	105
	8	Fault duration in empty load test	Total	--	ms	105
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	1.22
	10		Pos.		p.u.	1.21
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.00
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	0.20
	13	Active power	Total	t1-10s to t1	p.u.	0.20
	14		Pos.			0.20
	15	Reactive power	Total	t1-10s to t1	p.u.	0.00
	16		Pos.			0.00
	17	Cosφ	--	t1-10s to t1	--	1.000
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	1.22
	19	Line current	Phase 1	t1+60ms	p.u.	0.03
	20		Phase 2			0.03
	21		Phase 3			0.03
	22	Line current	Phase 1	t1+100ms	p.u.	0.02
	23		Phase 2			0.02
	24		Phase 3			0.02
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	0.00
	26		Pos.			0.00
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.00
	28	Active power	Total	t2+3s to t2+10s	p.u.	0.20
	29		Pos.			0.20
	39	Active power rising time	Pos.	--	s	0.131
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	0.00
	32		Pos.			0.00
	33	Reactive power rising time	Pos.	--	s	N/A
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

Test No. 5.2 idle test



Test No. 5.2 with PGU







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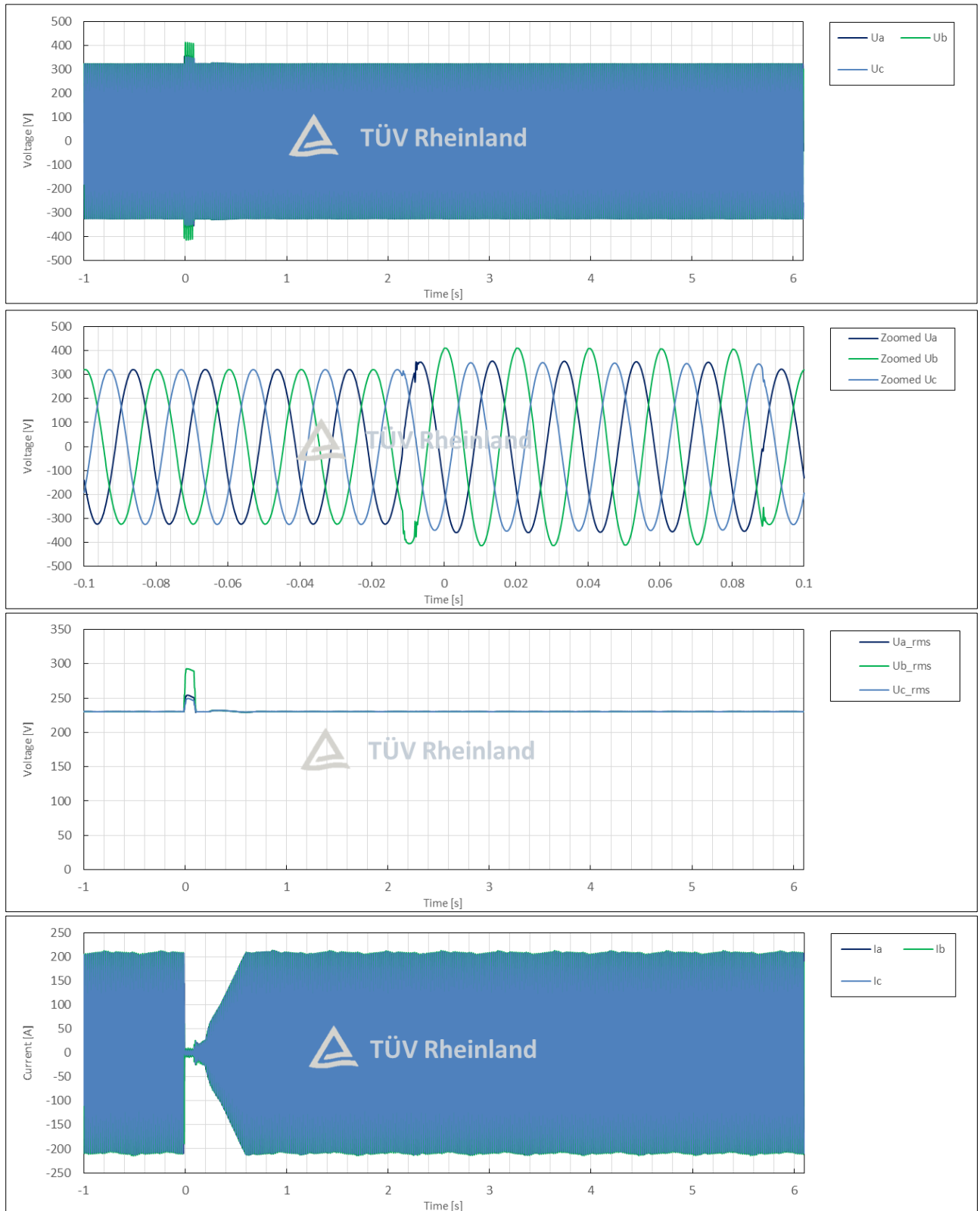
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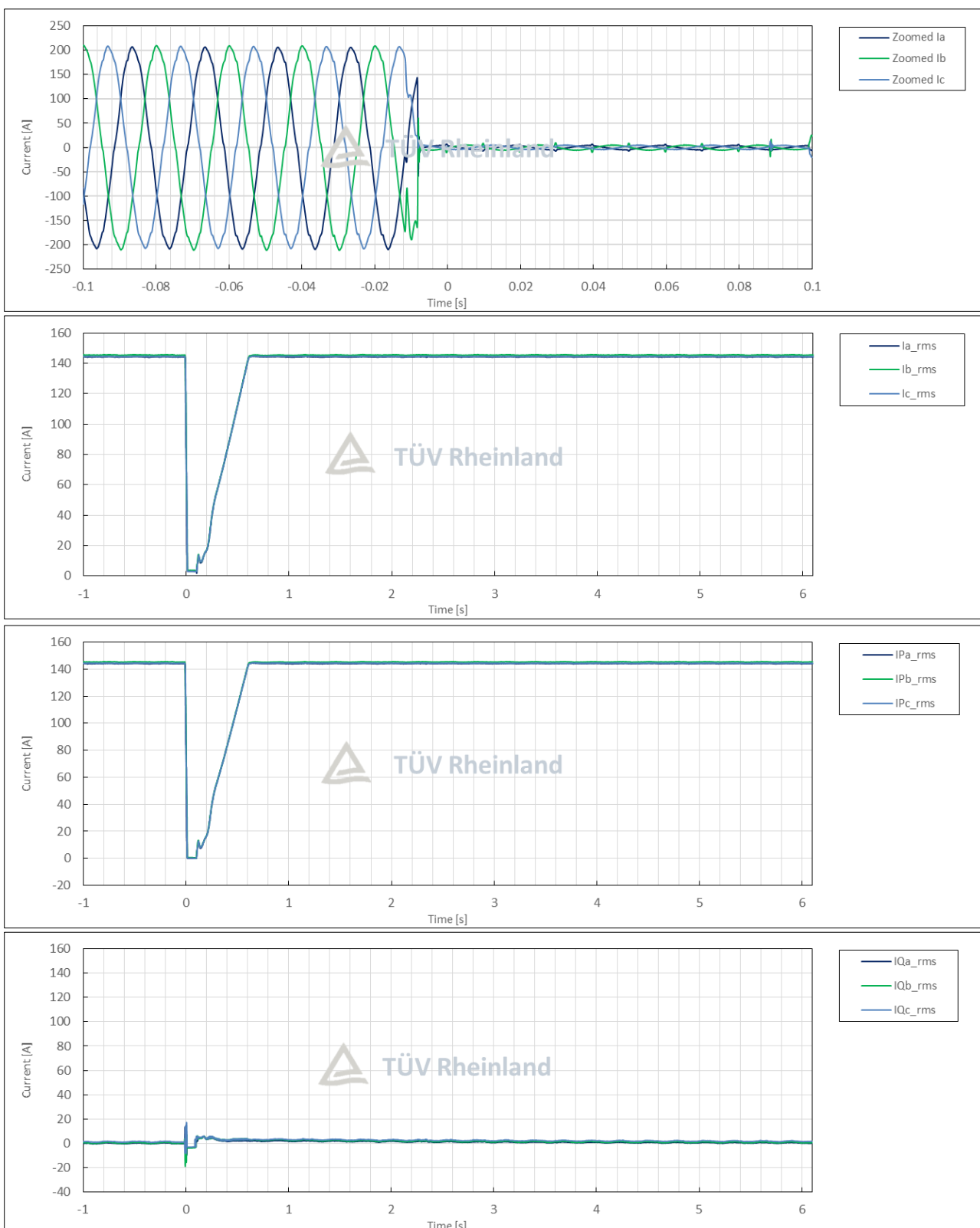
Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	5.3
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	12:59:46
	3	Fault type (phase)	--	--		2-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	1.21
	5	Setting dip duration		--		100
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	100
	8	Fault duration in empty load test	Total	--	ms	100
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	1.21
	10		Pos.		p.u.	1.11
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.00
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	1.00
	13	Active power	Total	t1-10s to t1	p.u.	1.00
	14		Pos.			1.00
	15	Reactive power	Total	t1-10s to t1	p.u.	0.00
	16		Pos.			0.00
	17	Cosφ	--	t1-10s to t1	--	1.000
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	1.21
	19	Line current	Phase 1	t1+60ms	p.u.	0.02
	20		Phase 2			0.03
	21		Phase 3			0.02
	22	Line current	Phase 1	t1+100ms	p.u.	0.02
	23		Phase 2			0.02
	24		Phase 3			0.02
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	0.00
	26		Pos.			0.00
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.00
	28	Active power	Total	t2+3s to t2+10s	p.u.	1.00
	29		Pos.			1.00
	39	Active power rising time	Pos.	--	s	0.461
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	0.01
	32		Pos.			0.01
	33	Reactive power rising time	Pos.	--	s	N/A
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

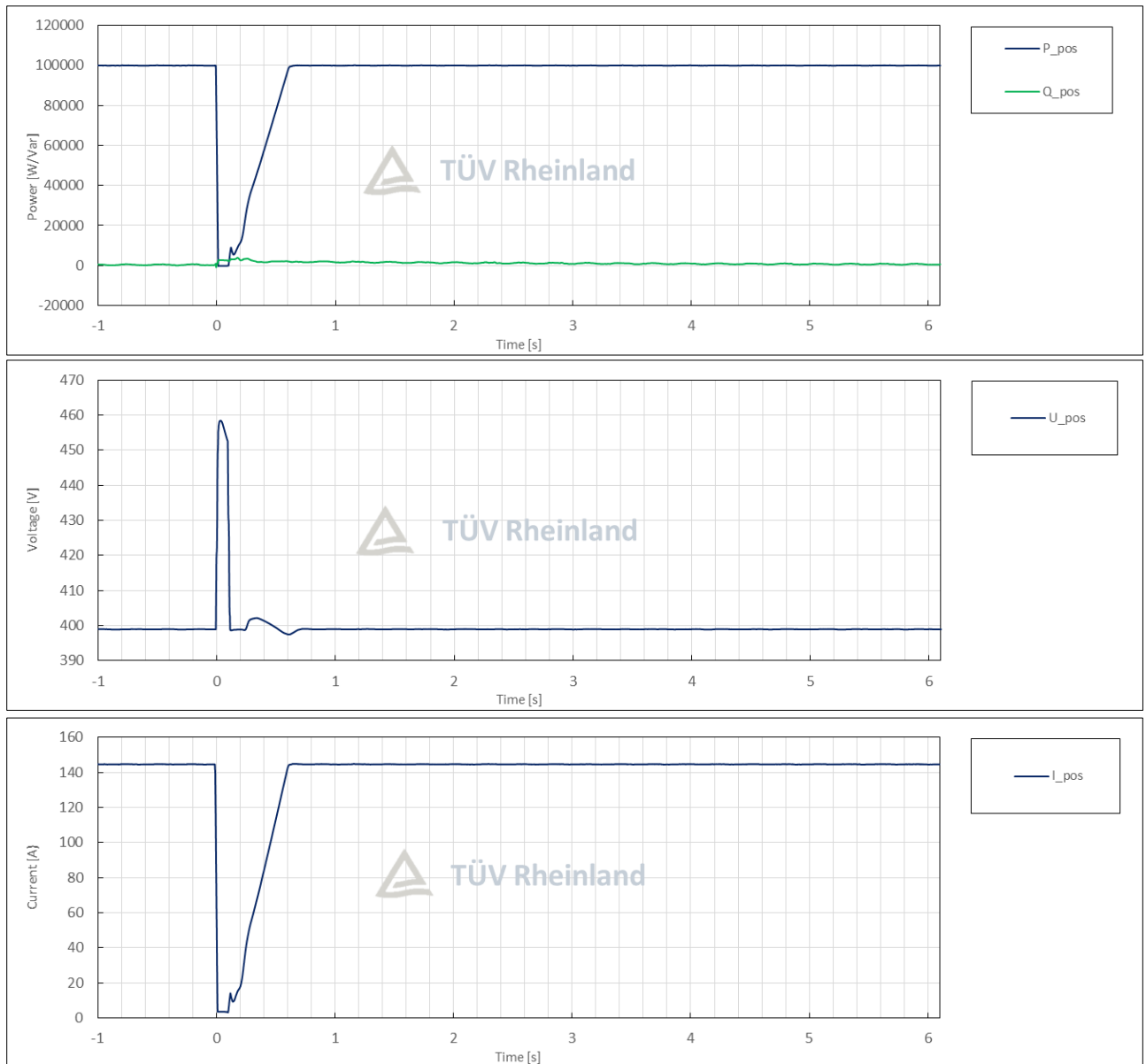
Test No. 5.3 idle test



Test No. 5.3 with PGU







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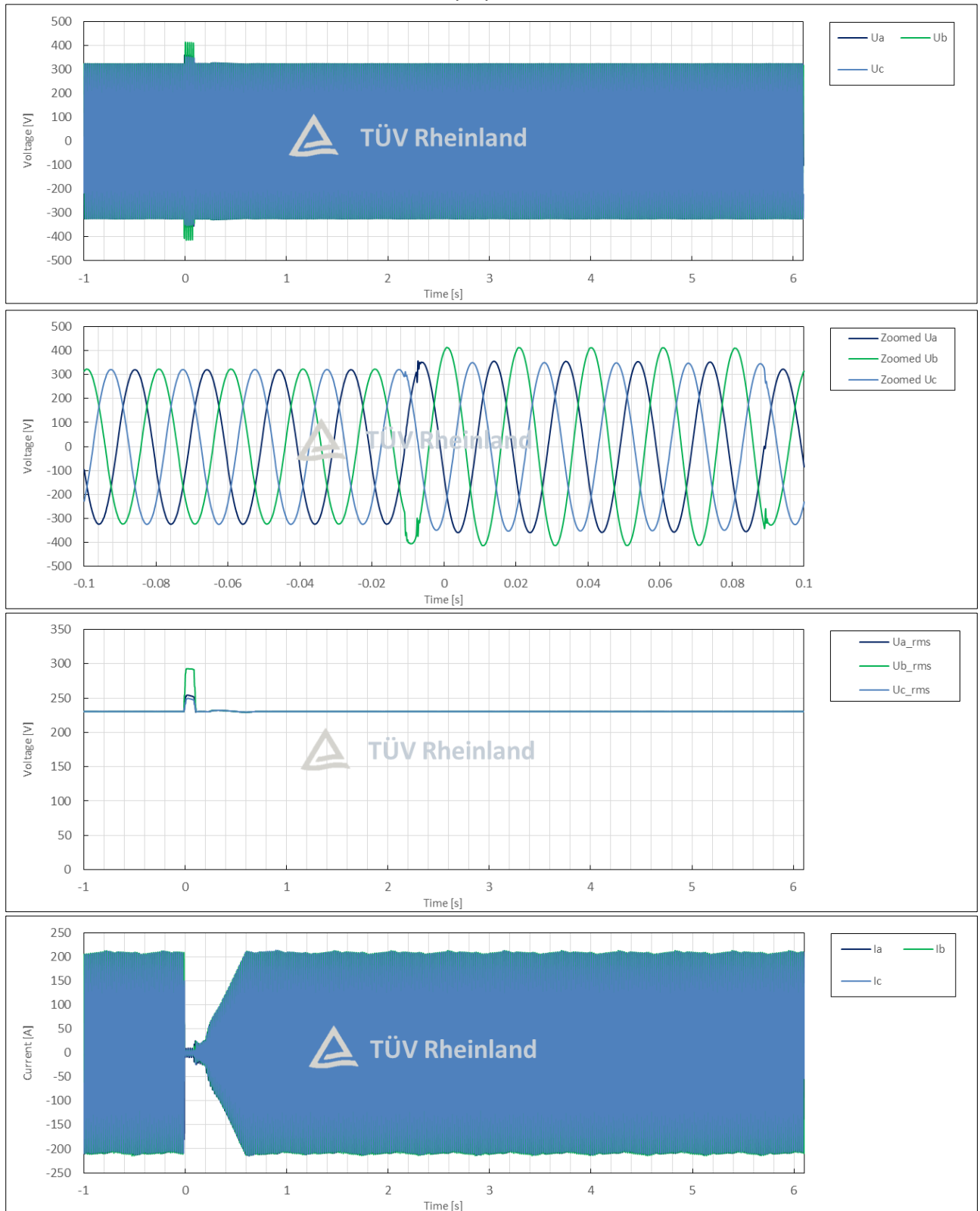
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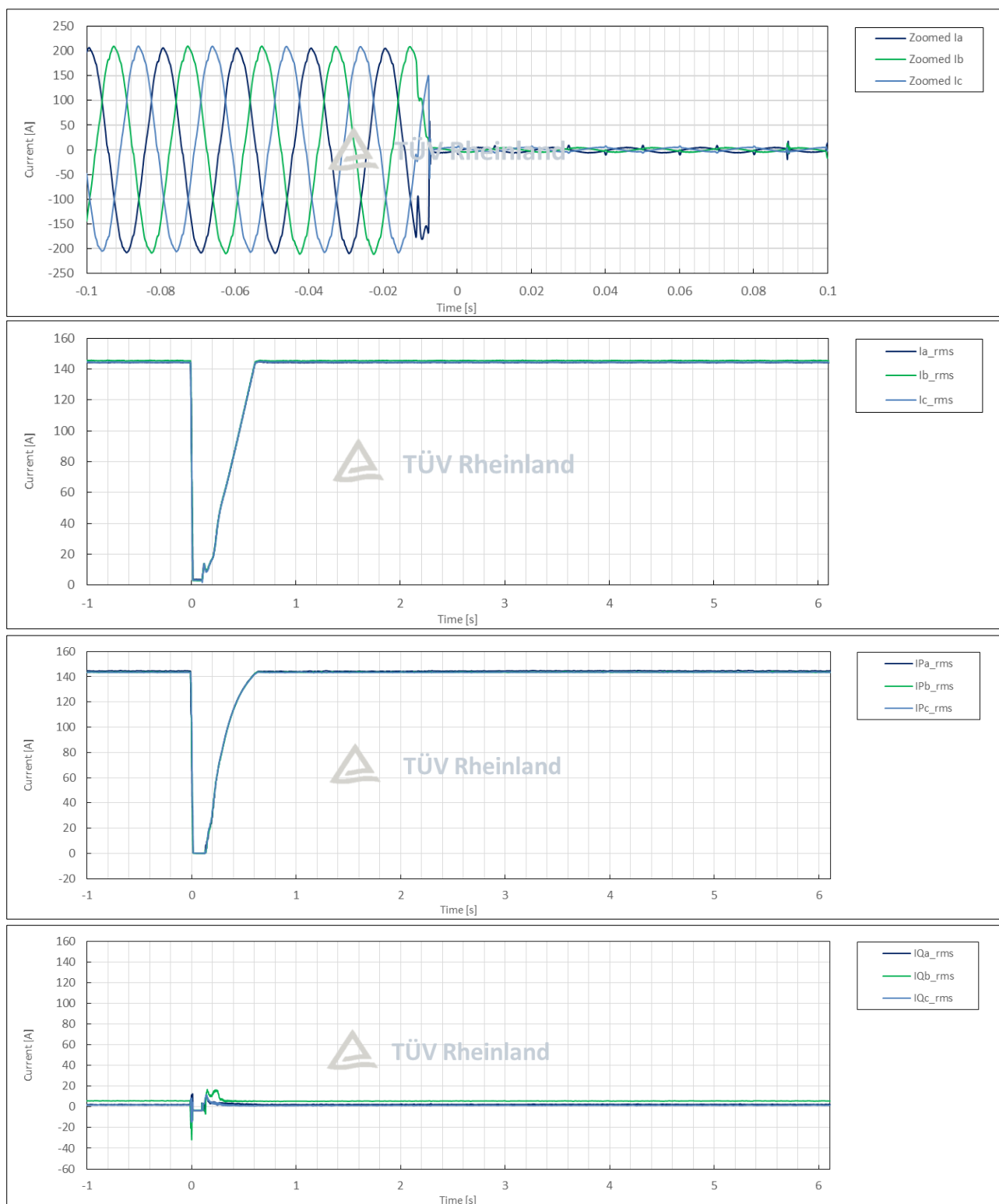
Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	5.3(D2)
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	13:06:40
	3	Fault type (phase)	--	--		2-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	1.21
	5	Setting dip duration		--		100
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	100
	8	Fault duration in empty load test	Total	--	ms	100
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	1.21
	10		Pos.		p.u.	1.11
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.00
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	0.99
	13	Active power	Total	t1-10s to t1	p.u.	0.99
	14		Pos.			0.99
	15	Reactive power	Total	t1-10s to t1	p.u.	0.02
	16		Pos.			0.02
	17	Cosφ	--	t1-10s to t1	--	1.000
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	1.21
	19	Line current	Phase 1	t1+60ms	p.u.	0.03
	20		Phase 2			0.02
	21		Phase 3			0.02
	22	Line current	Phase 1	t1+100ms	p.u.	0.02
	23		Phase 2			0.02
	24		Phase 3			0.02
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	0.02
	26		Pos.			-0.02
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.00
	28	Active power	Total	t2+3s to t2+10s	p.u.	1.00
	29		Pos.			1.00
	39	Active power rising time	Pos.	--	s	0.377
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	0.02
	32		Pos.			0.02
	33	Reactive power rising time	Pos.	--	s	N/A
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

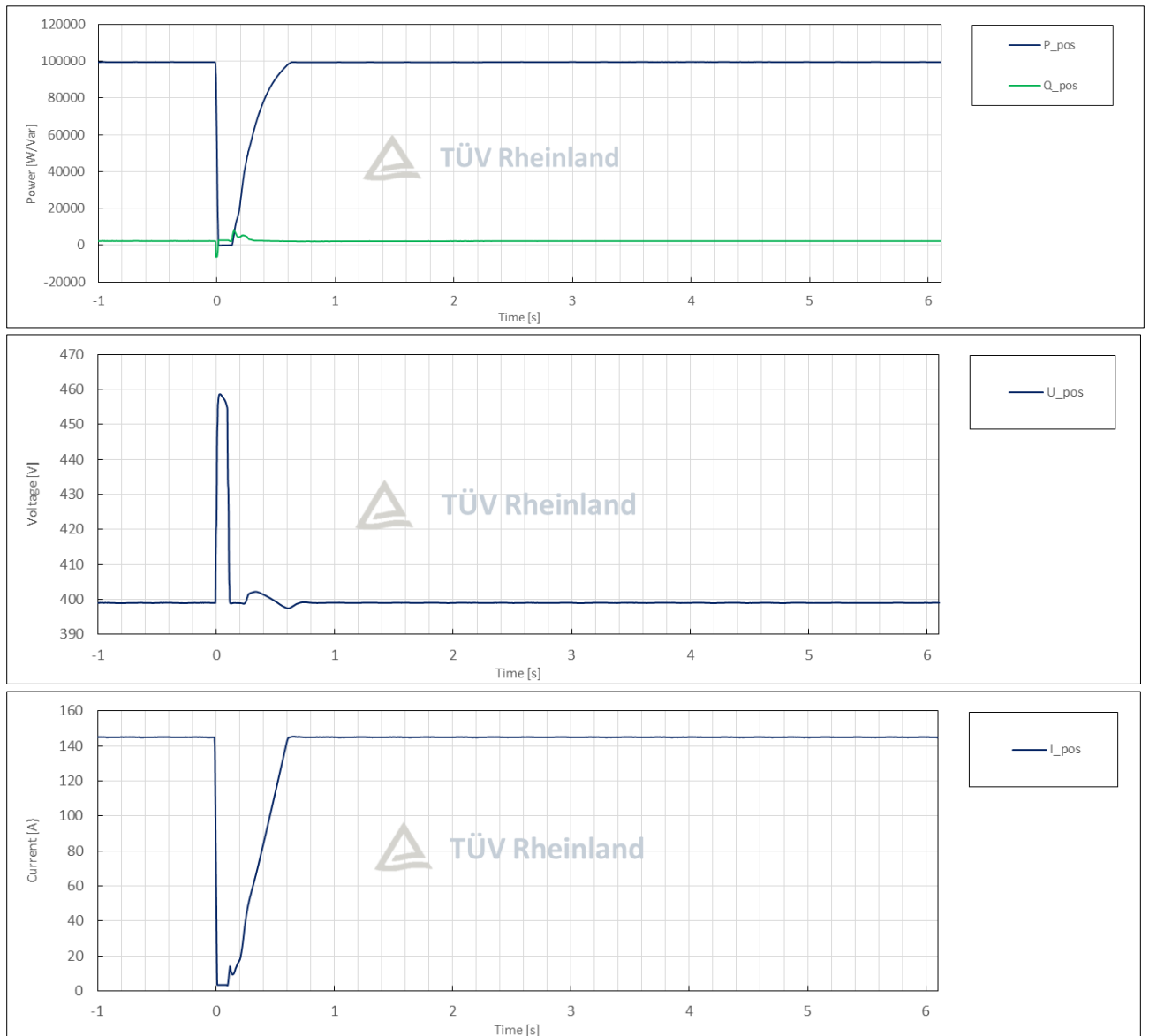
Test No. 5.3(D2) idle test



Test No. 5.3(D2) with PGU

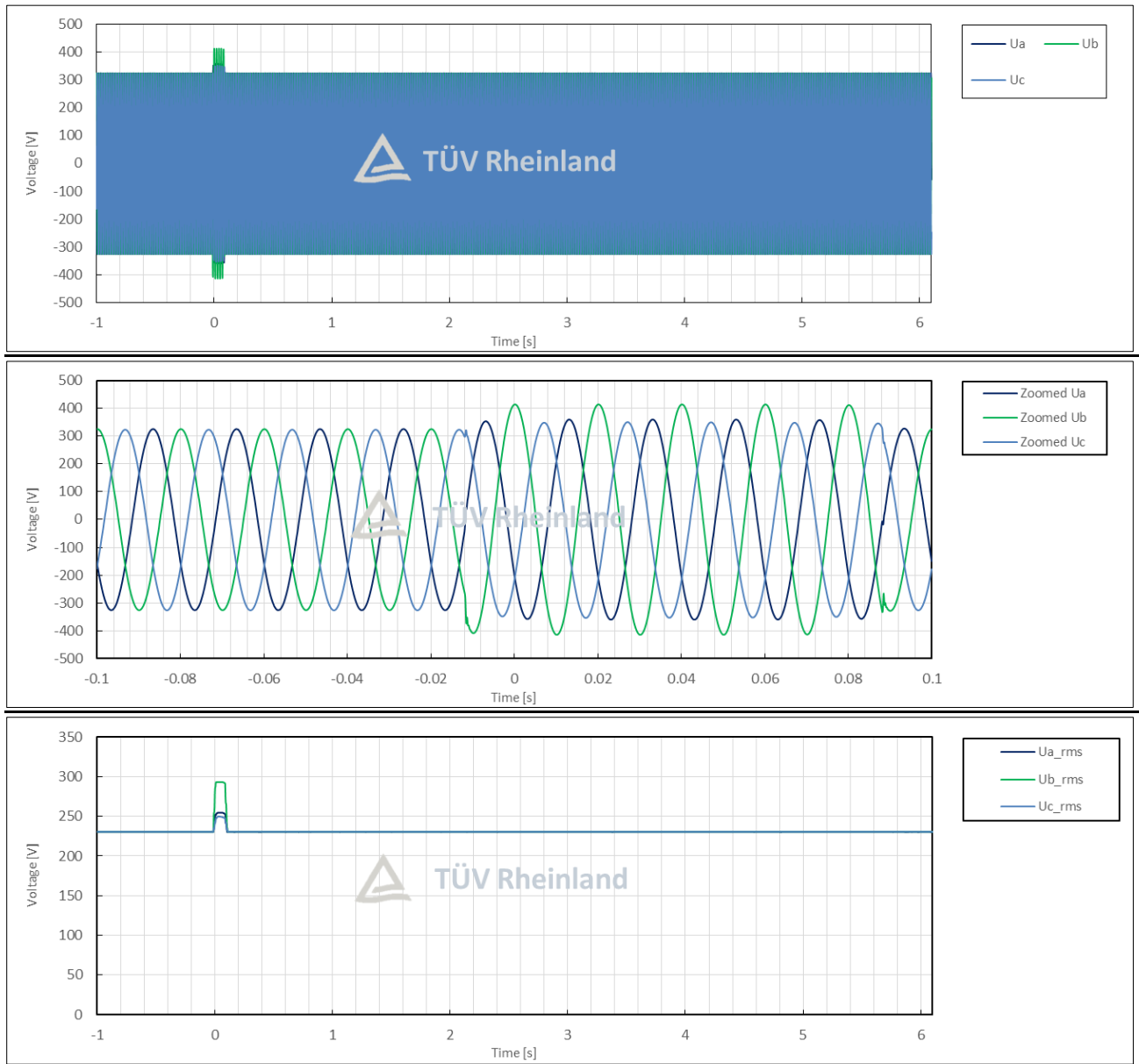




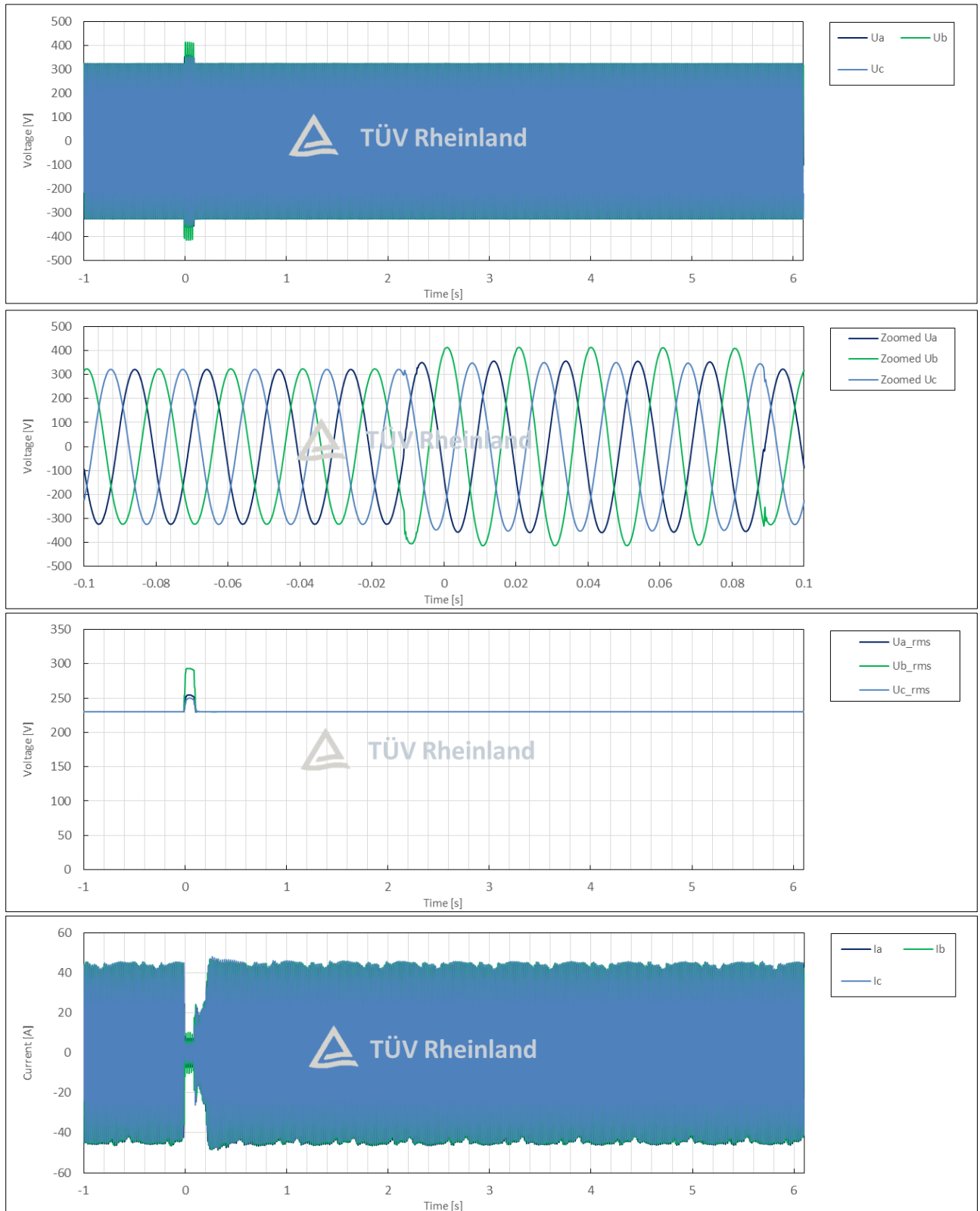


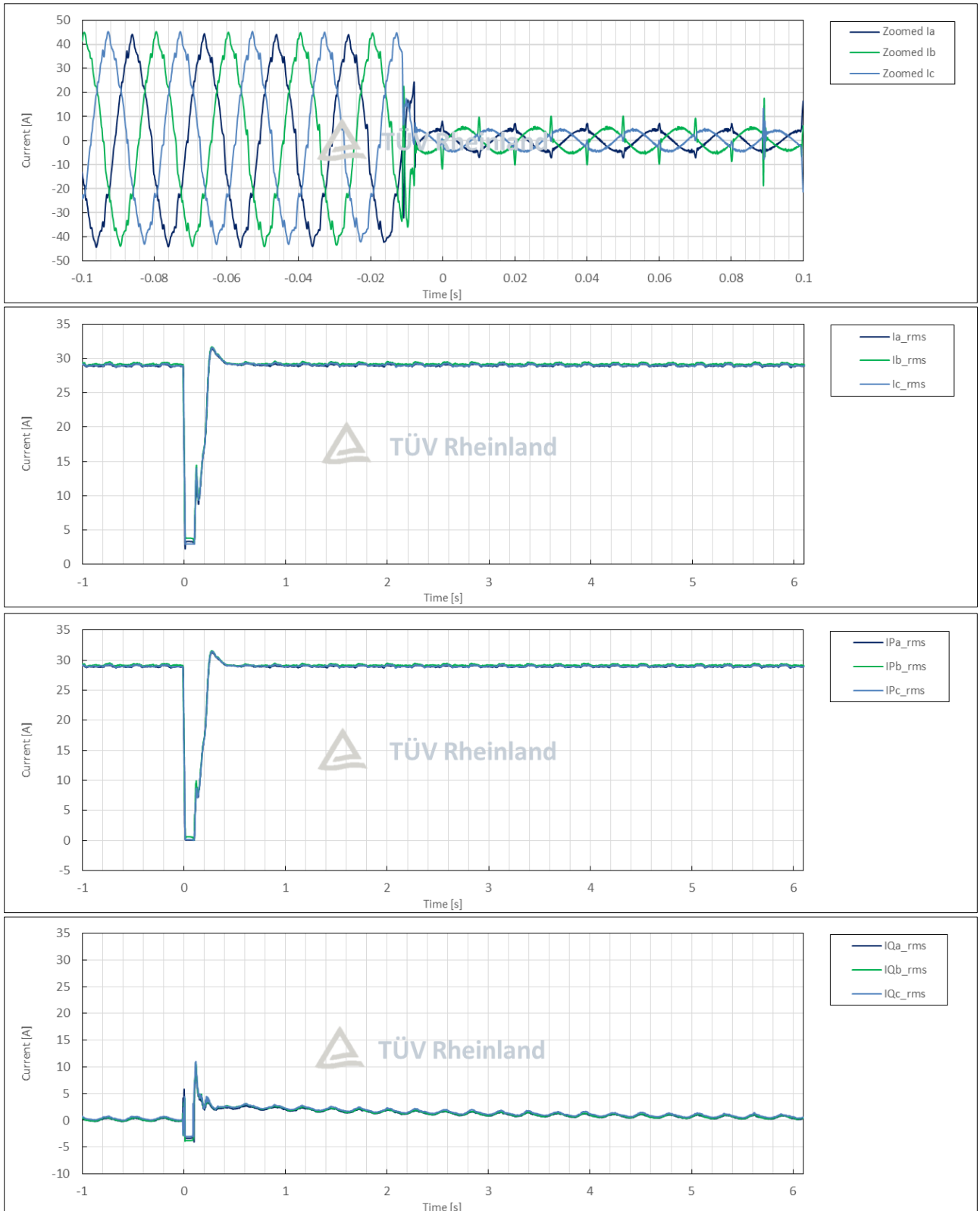
Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	5.4
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	12:59:24
	3	Fault type (phase)	--	--		2-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	1.21
	5	Setting dip duration		--		100
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	100
	8	Fault duration in empty load test	Total	--	ms	100
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	1.21
	10		Pos.		p.u.	1.11
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.00
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	0.20
	13	Active power	Total	t1-10s to t1	p.u.	0.20
	14		Pos.			0.20
	15	Reactive power	Total	t1-10s to t1	p.u.	0.00
	16		Pos.			0.00
	17	Cosφ	--	t1-10s to t1	--	1.000
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	1.21
	19	Line current	Phase 1	t1+60ms	p.u.	0.02
	20		Phase 2			0.03
	21		Phase 3			0.02
	22	Line current	Phase 1	t1+100ms	p.u.	0.02
	23		Phase 2			0.02
	24		Phase 3			0.02
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	0.00
	26		Pos.			0.00
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.00
	28	Active power	Total	t2+3s to t2+10s	p.u.	0.20
	29		Pos.			0.20
	39	Active power rising time	Pos.	--	s	0.133
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	0.00
	32		Pos.			0.00
	33	Reactive power rising time	Pos.	--	s	N/A
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

Test No. 5.4 idle test



Test No. 5.4 with PGU

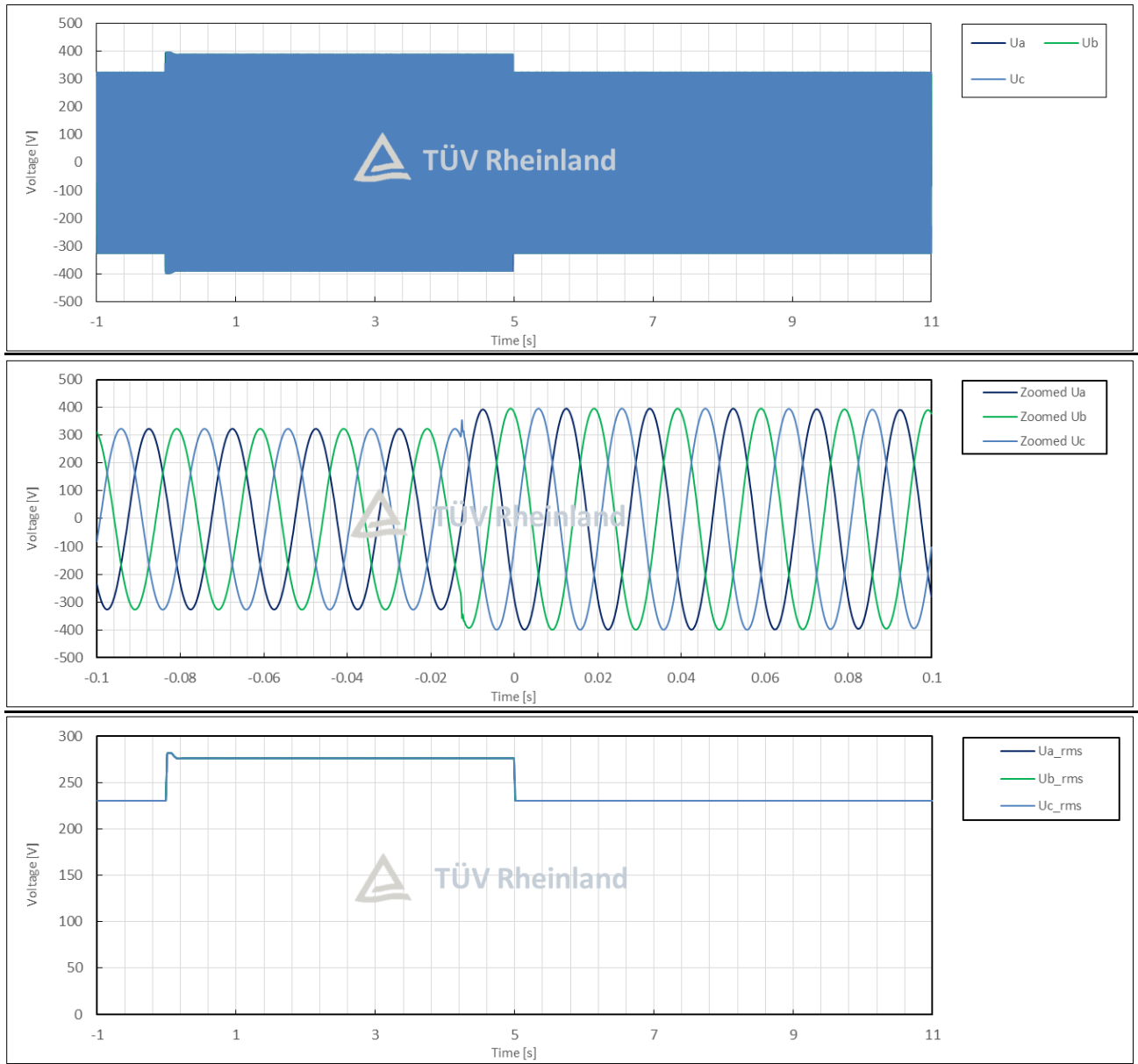




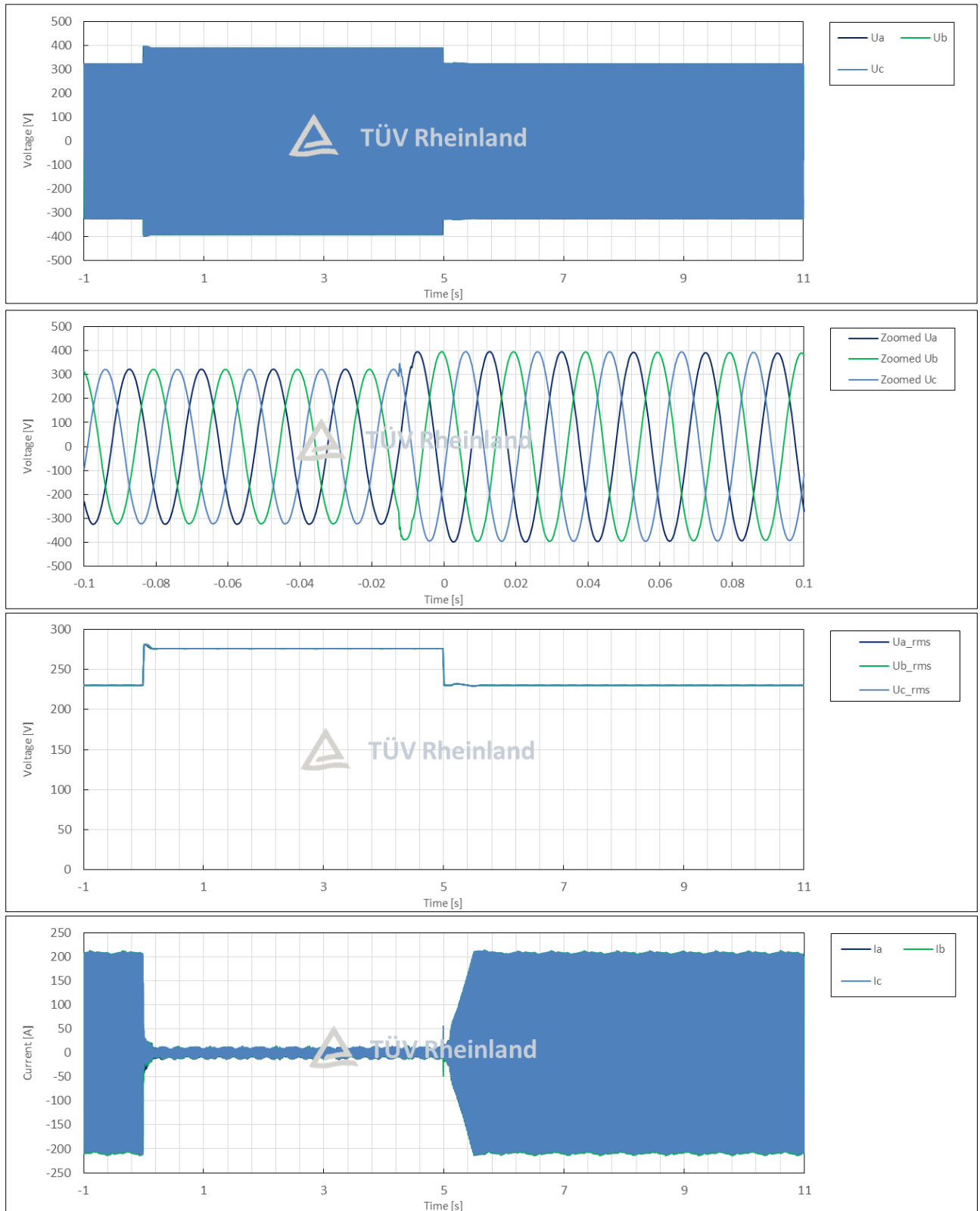


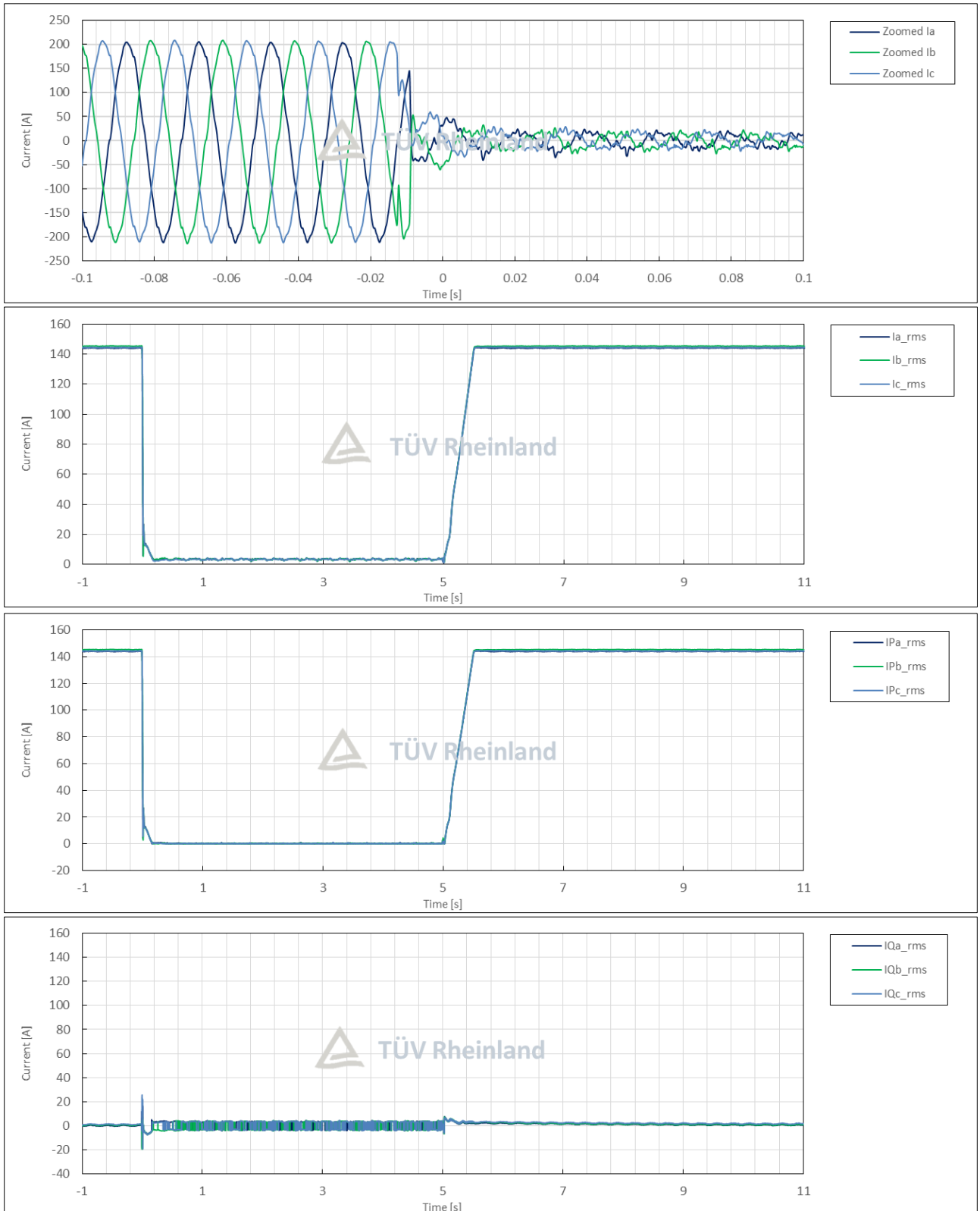
Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	6.1
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	13:04:34
	3	Fault type (phase)	--	--		3-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	1.20
	5	Setting dip duration		--		5000
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	5000
	8	Fault duration in empty load test	Total	--	ms	5000
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	1.20
	10		Pos.		p.u.	1.20
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.00
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	1.00
	13	Active power	Total	t1-10s to t1	p.u.	1.00
	14		Pos.			1.00
	15	Reactive power	Total	t1-10s to t1	p.u.	0.00
	16		Pos.			0.00
	17	Cosφ	--	t1-10s to t1	--	1.000
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	1.20
	19	Line current	Phase 1	t1+60ms	p.u.	0.09
	20		Phase 2			0.08
	21		Phase 3			0.08
	22	Line current	Phase 1	t1+100ms	p.u.	0.06
	23		Phase 2			0.06
	24		Phase 3			0.07
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	0.00
	26		Pos.			0.00
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.00
	28	Active power	Total	t2+3s to t2+10s	p.u.	1.00
	29		Pos.			1.00
	39	Active power rising time	Pos.	--	s	0.463
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	0.01
	32		Pos.			0.01
	33	Reactive power rising time	Pos.	--	s	N/A
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

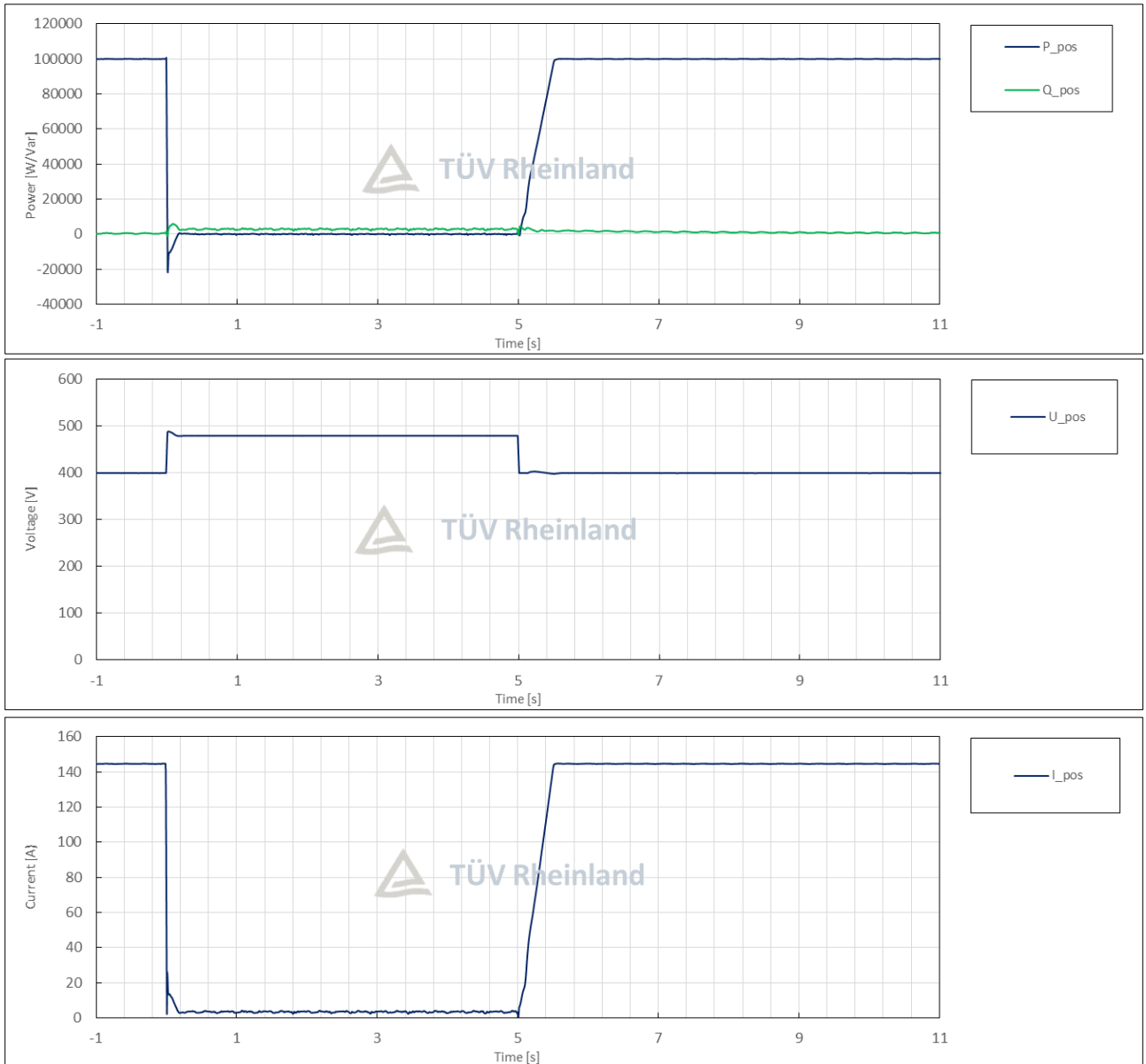
Test No. 6.1 idle test



Test No. 6.1 with PGU

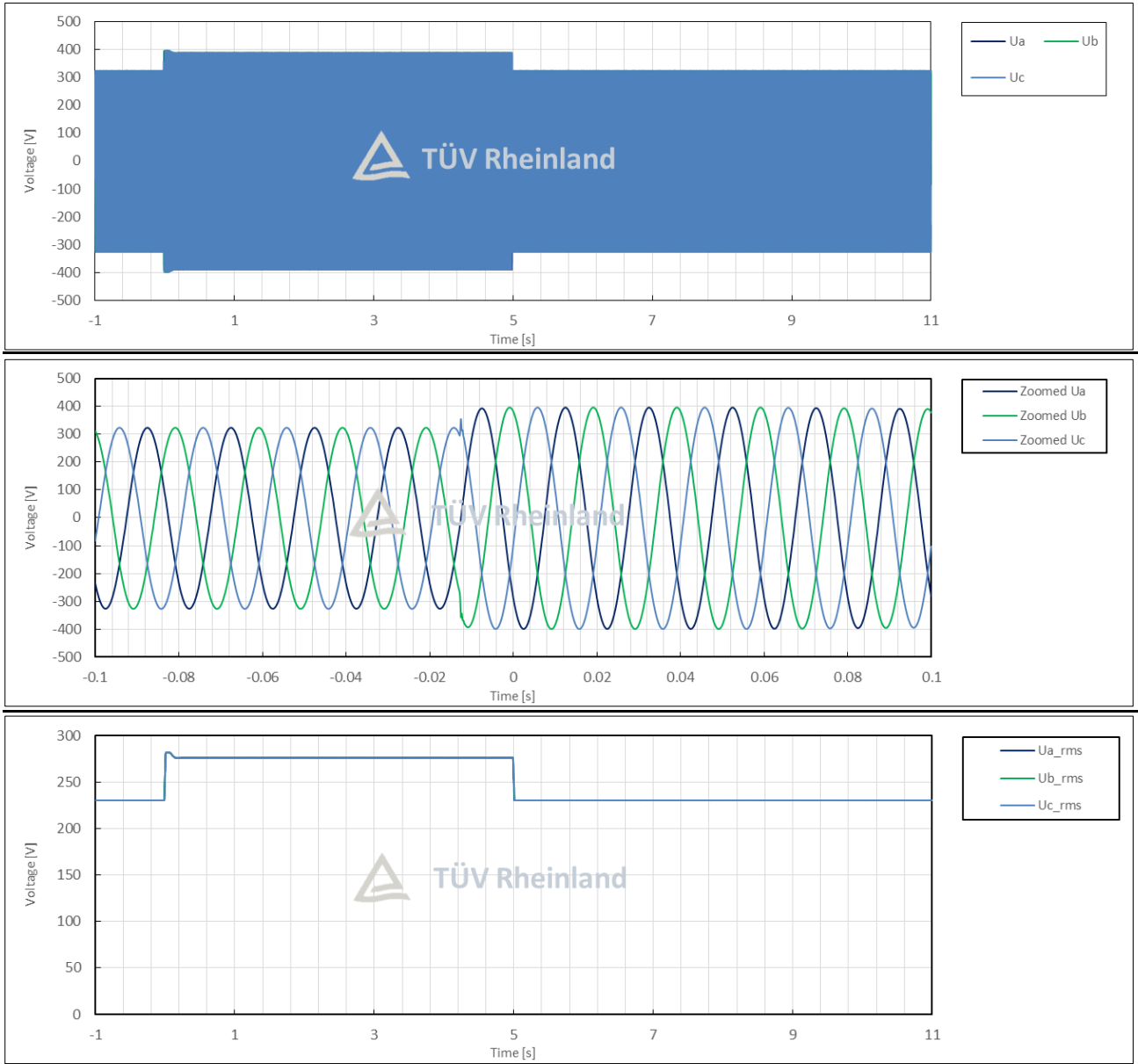




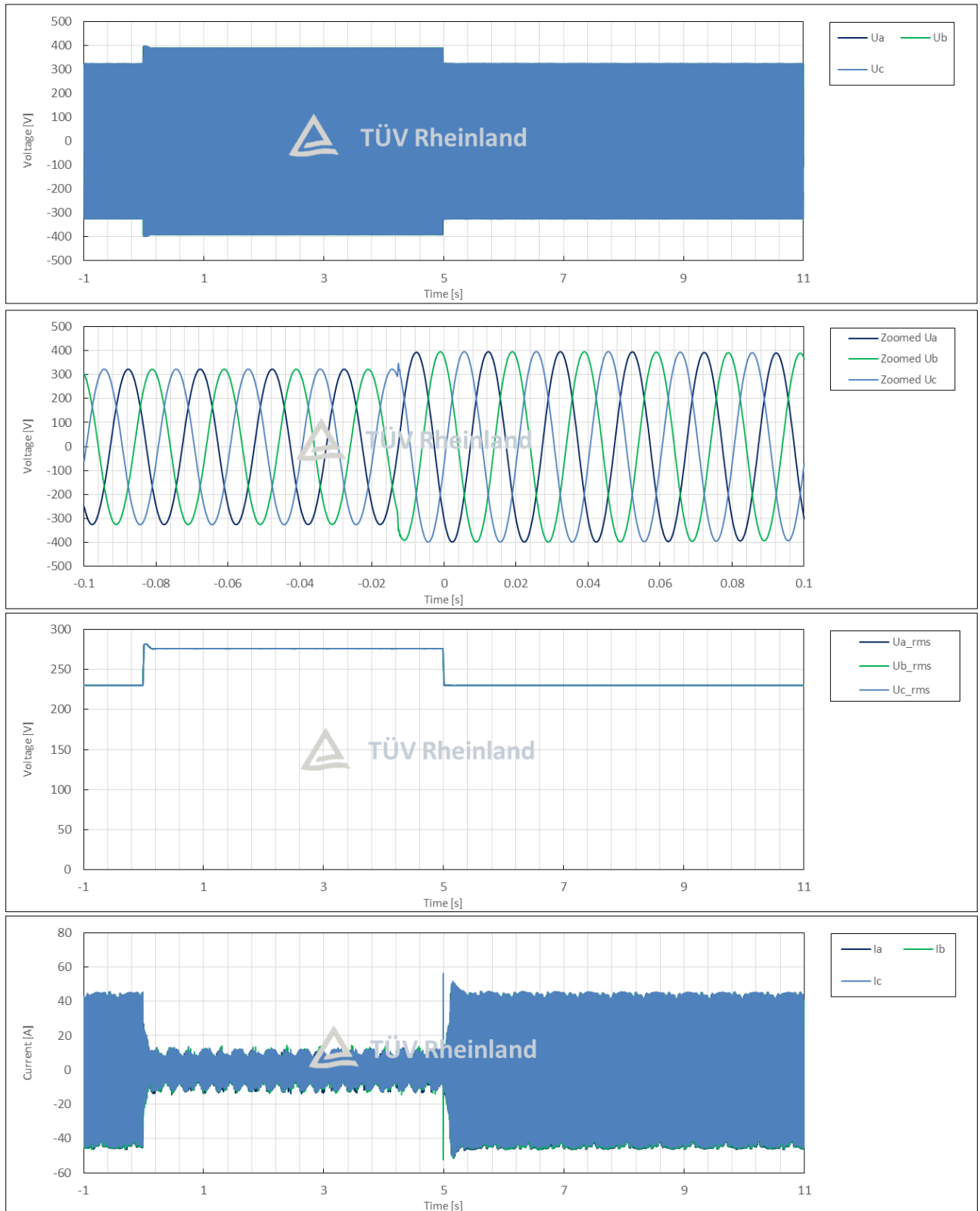


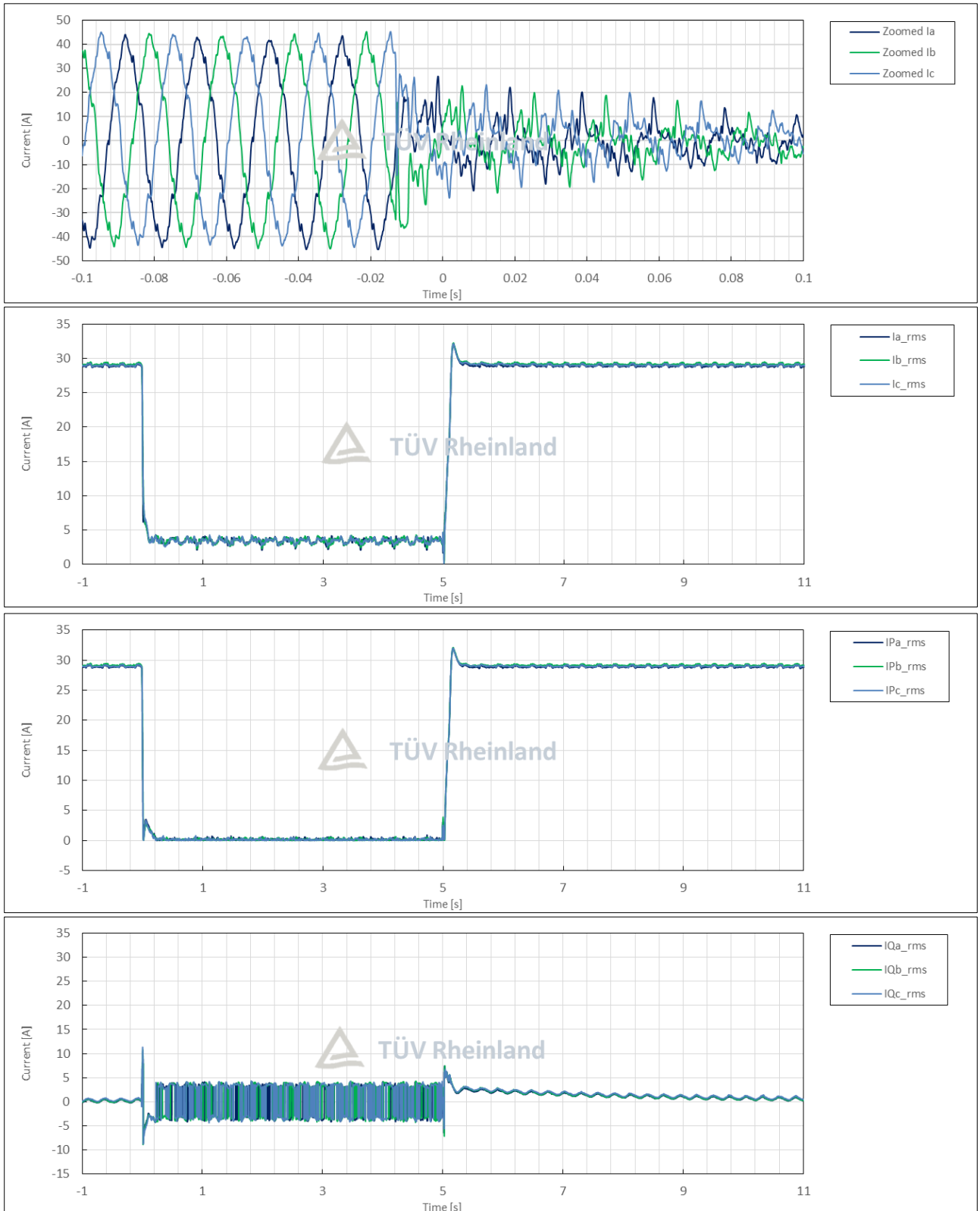
Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	6.2
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	13:04:56
	3	Fault type (phase)	--	--		3-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	1.20
	5	Setting dip duration		--		5000
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	5000
	8	Fault duration in empty load test	Total	--	ms	5000
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	1.20
	10		Pos.		p.u.	1.20
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.00
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	0.20
	13	Active power	Total	t1-10s to t1	p.u.	0.20
	14		Pos.			0.20
	15	Reactive power	Total	t1-10s to t1	p.u.	0.00
	16		Pos.			0.00
	17	Cosφ	--	t1-10s to t1	--	1.000
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	1.20
	19	Line current	Phase 1	t1+60ms	p.u.	0.04
	20		Phase 2			0.04
	21		Phase 3			0.04
	22	Line current	Phase 1	t1+100ms	p.u.	0.02
	23		Phase 2			0.02
	24		Phase 3			0.03
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	0.00
	26		Pos.			0.00
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.00
	28	Active power	Total	t2+3s to t2+10s	p.u.	0.20
	29		Pos.			0.20
	39	Active power rising time	Pos.	--	s	0.125
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	0.00
	32		Pos.			0.00
	33	Reactive power rising time	Pos.	--	s	N/A
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

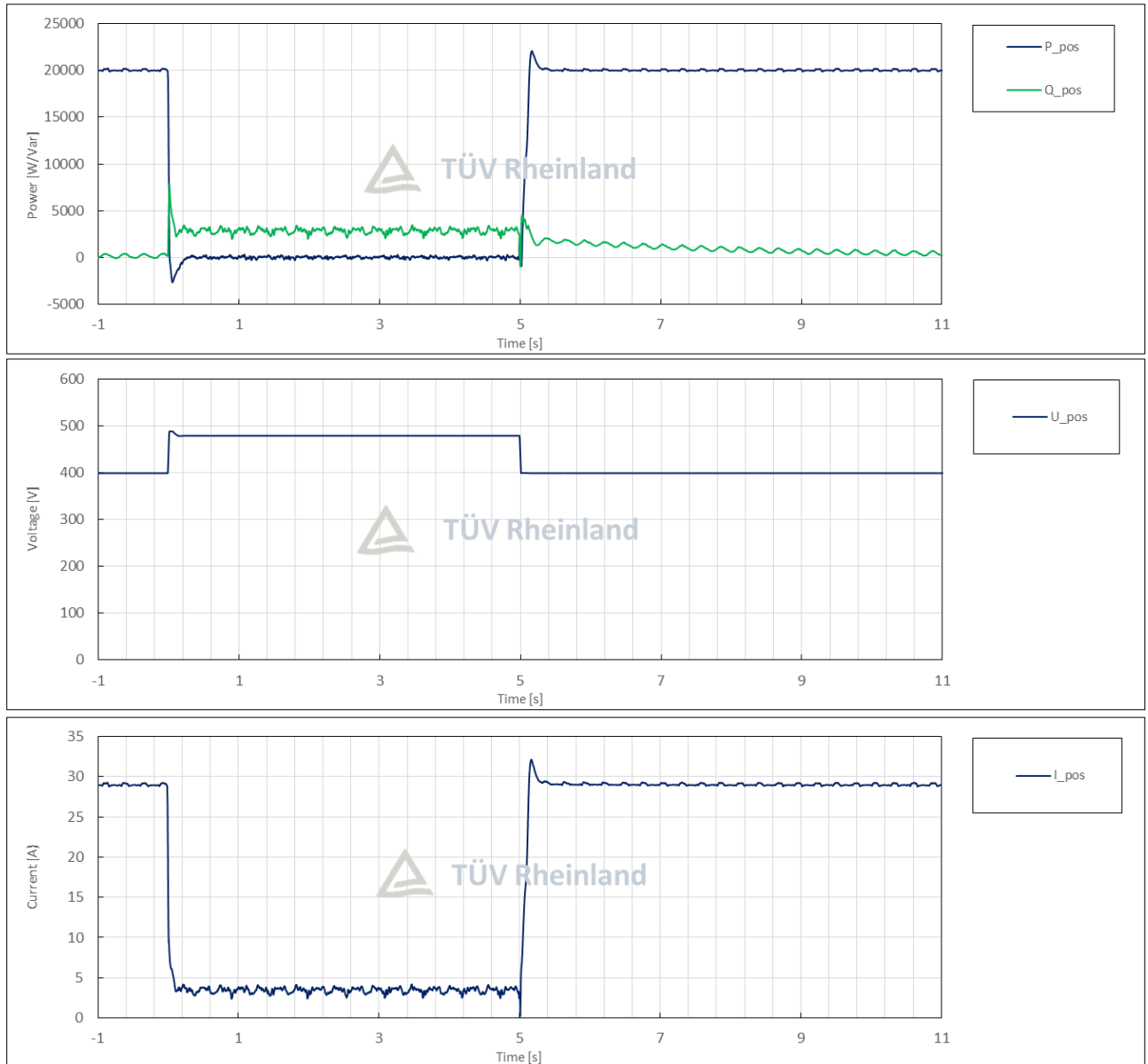
Test No. 6.2 idle test



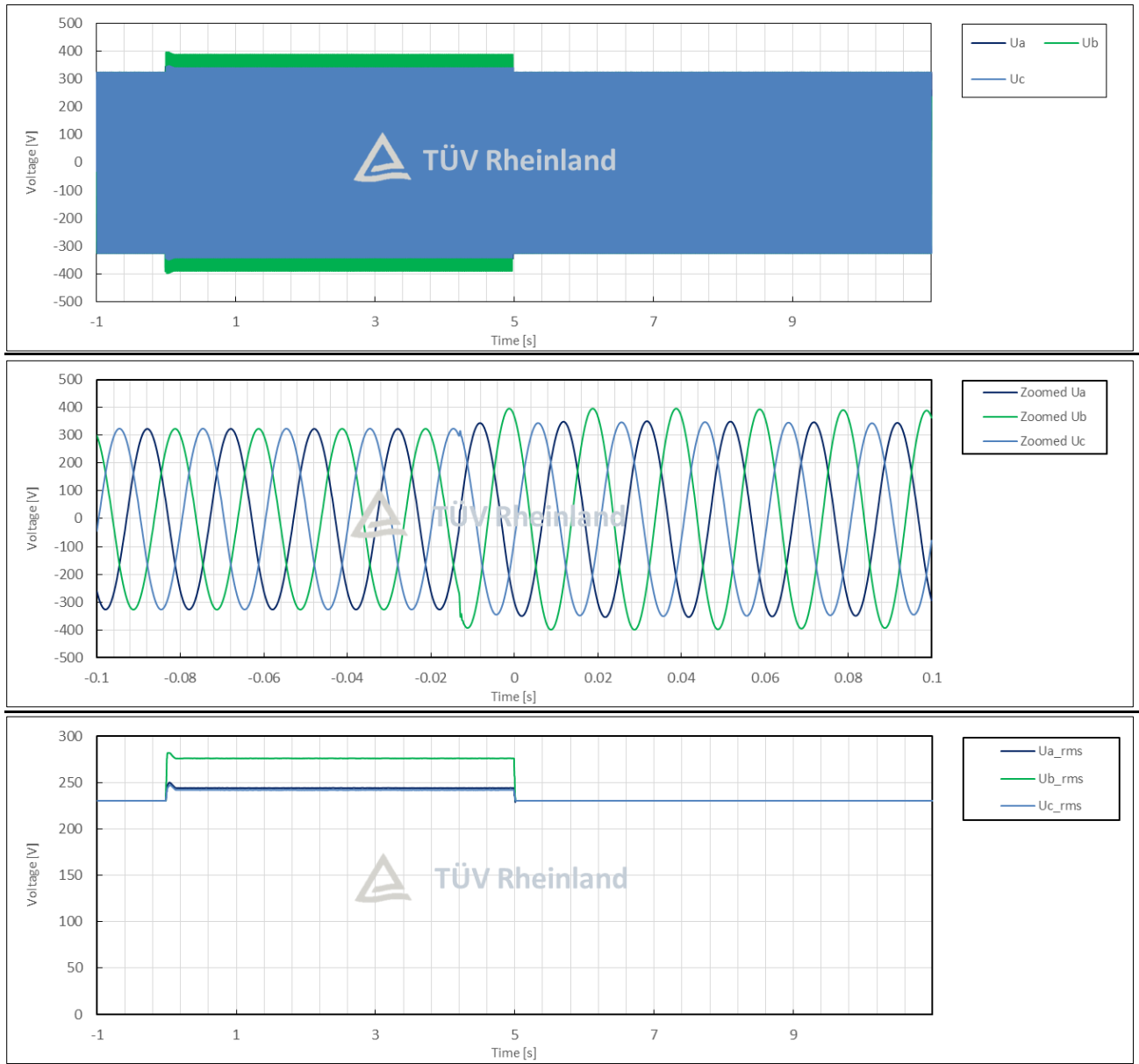
Test No. 6.2 with PGU



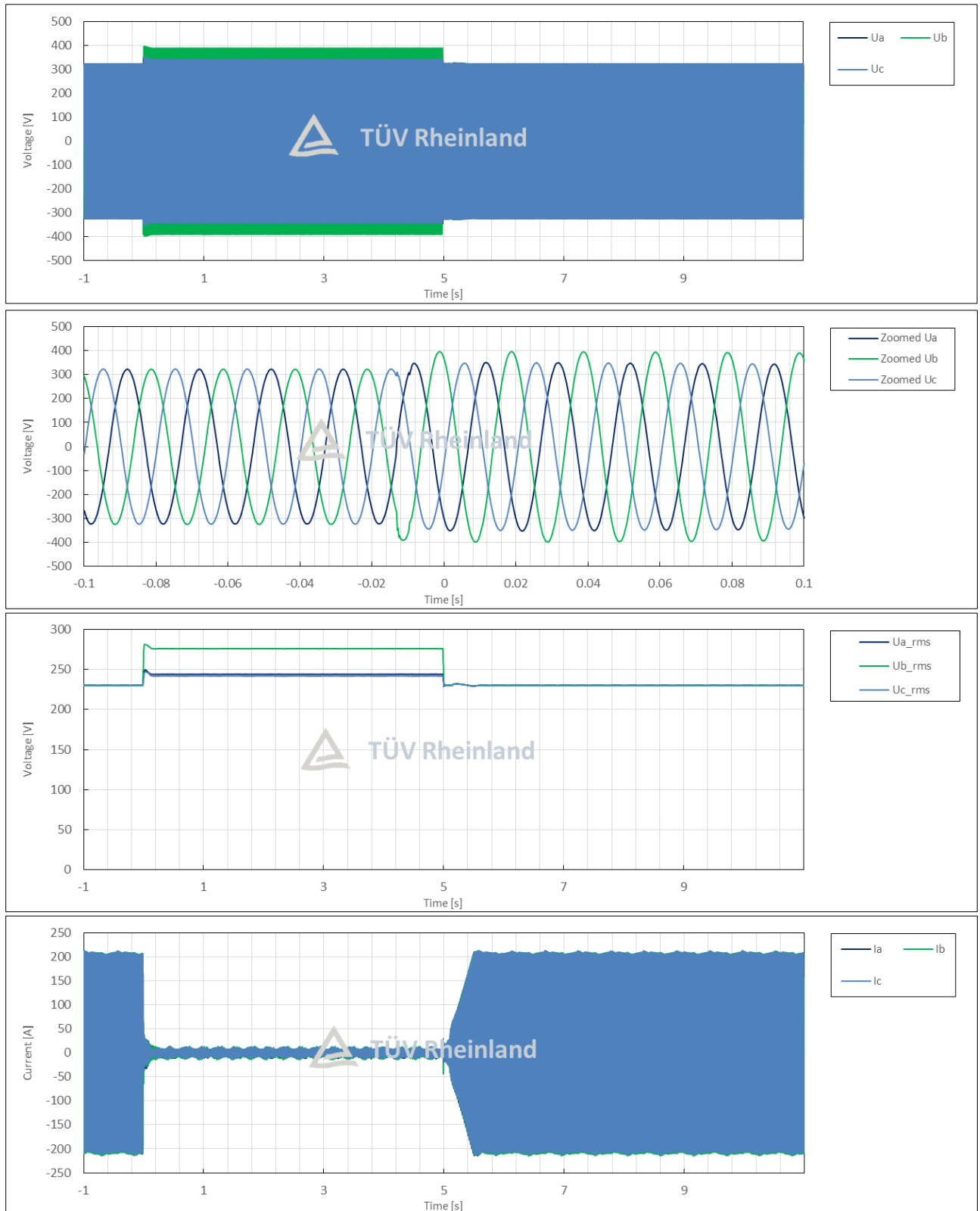


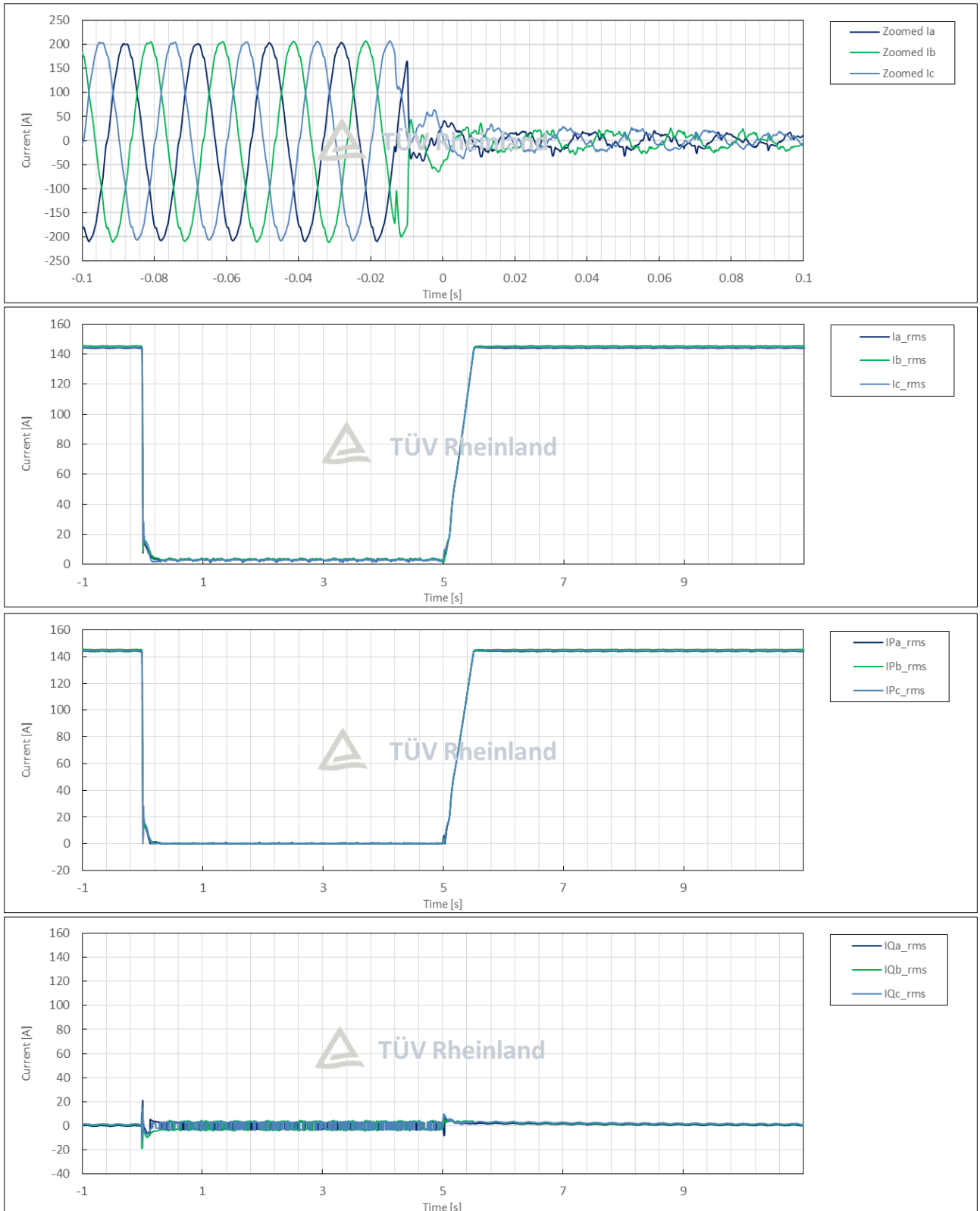


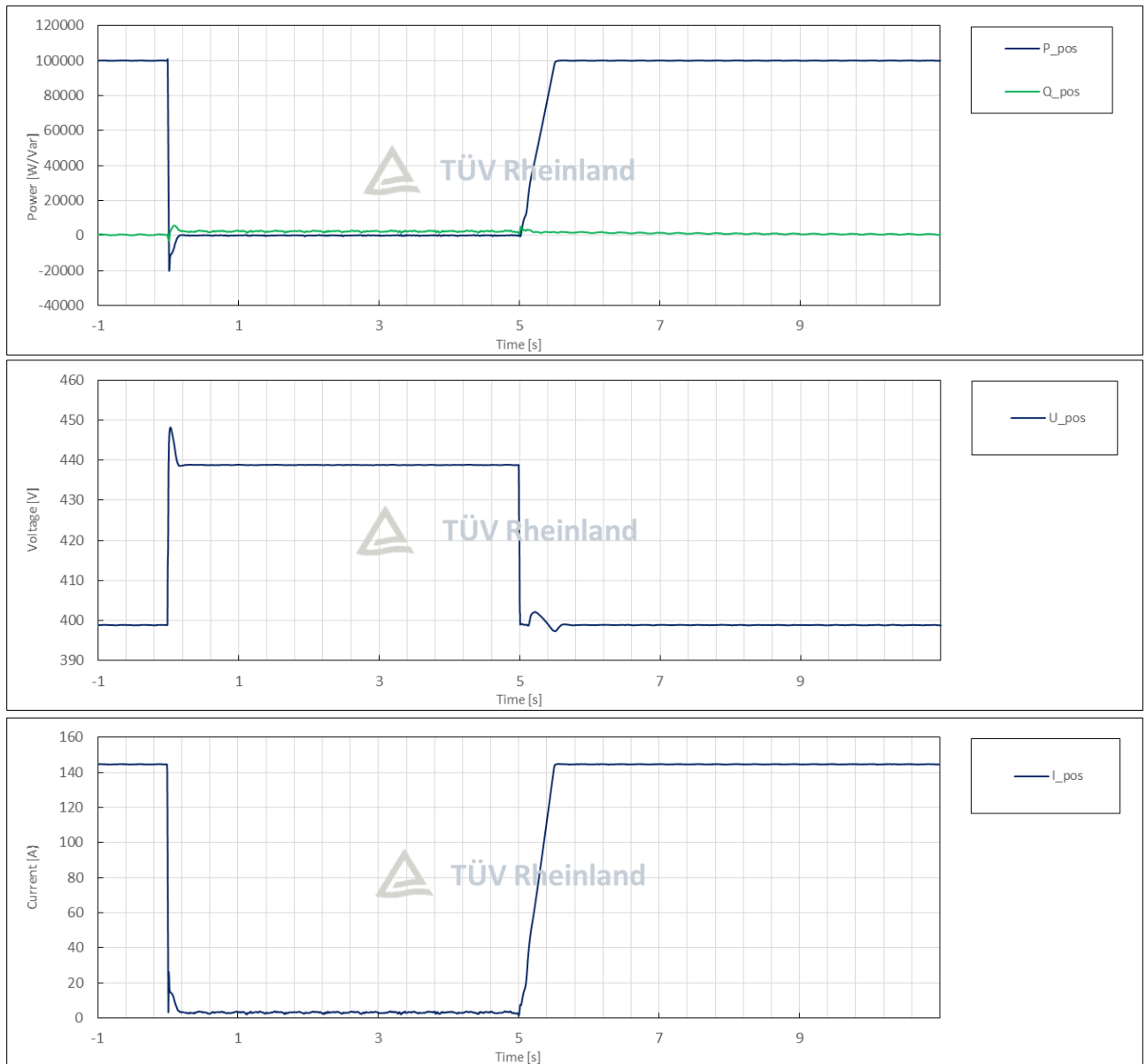
Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	6.3
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	13:04:20
	3	Fault type (phase)	--	--		2-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	1.20
	5	Setting dip duration		--		5004
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	5004
	8	Fault duration in empty load test	Total	--	ms	5004
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	1.20
	10		Pos.		p.u.	1.10
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.00
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	1.00
	13	Active power	Total	t1-10s to t1	p.u.	1.00
	14		Pos.			1.00
	15	Reactive power	Total	t1-10s to t1	p.u.	0.00
	16		Pos.			0.00
	17	Cosφ	--	t1-10s to t1	--	1.000
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	1.20
	19	Line current	Phase 1	t1+60ms	p.u.	0.08
	20		Phase 2			0.10
	21		Phase 3			0.10
	22	Line current	Phase 1	t1+100ms	p.u.	0.05
	23		Phase 2			0.07
	24		Phase 3			0.06
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	0.00
	26		Pos.			0.00
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.00
	28	Active power	Total	t2+3s to t2+10s	p.u.	1.00
	29		Pos.			1.00
	39	Active power rising time	Pos.	--	s	0.463
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	0.01
	32		Pos.			0.01
	33	Reactive power rising time	Pos.	--	s	N/A
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

Test No. 6.3 idle test


Test No. 6.3 with PGU

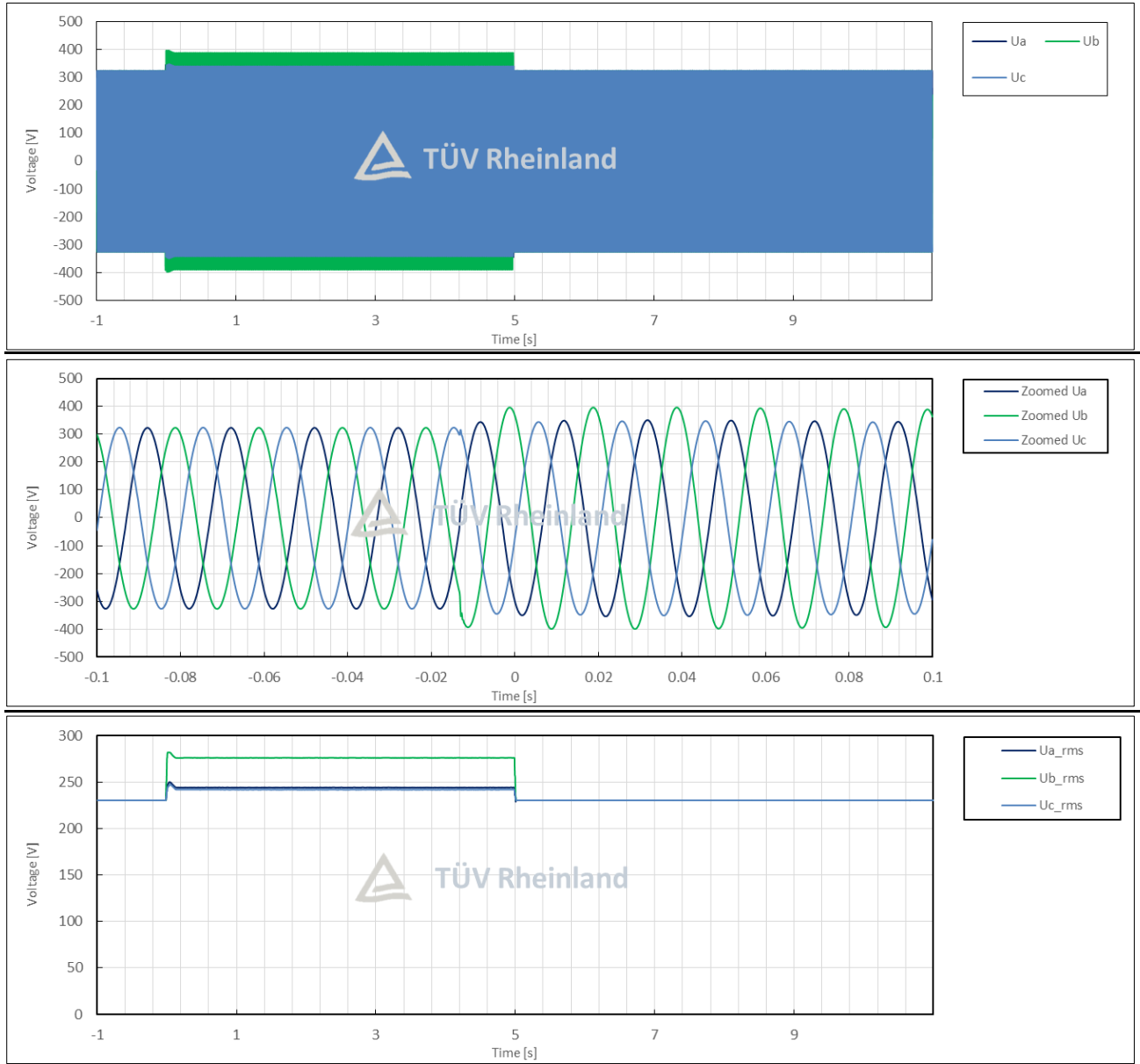




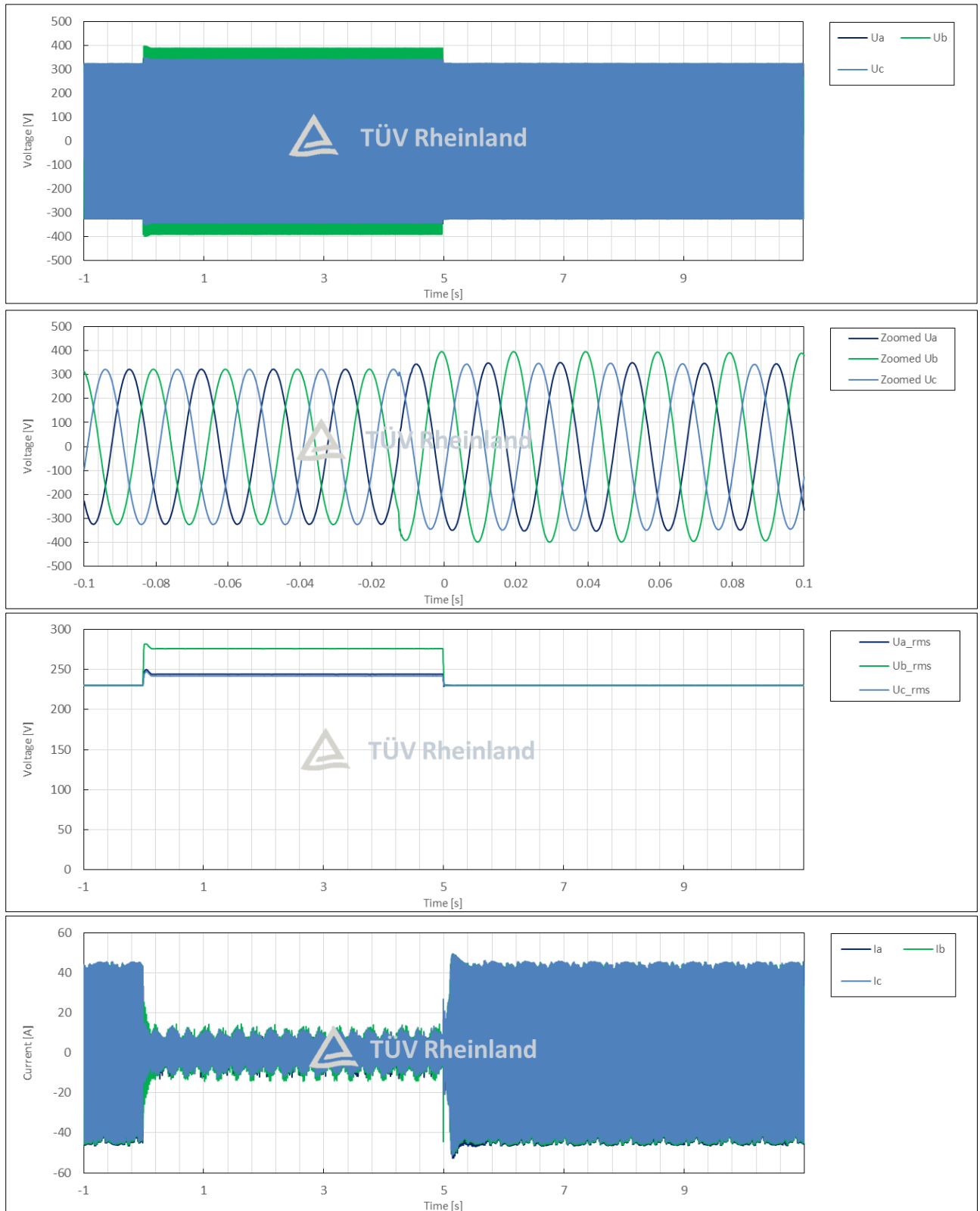


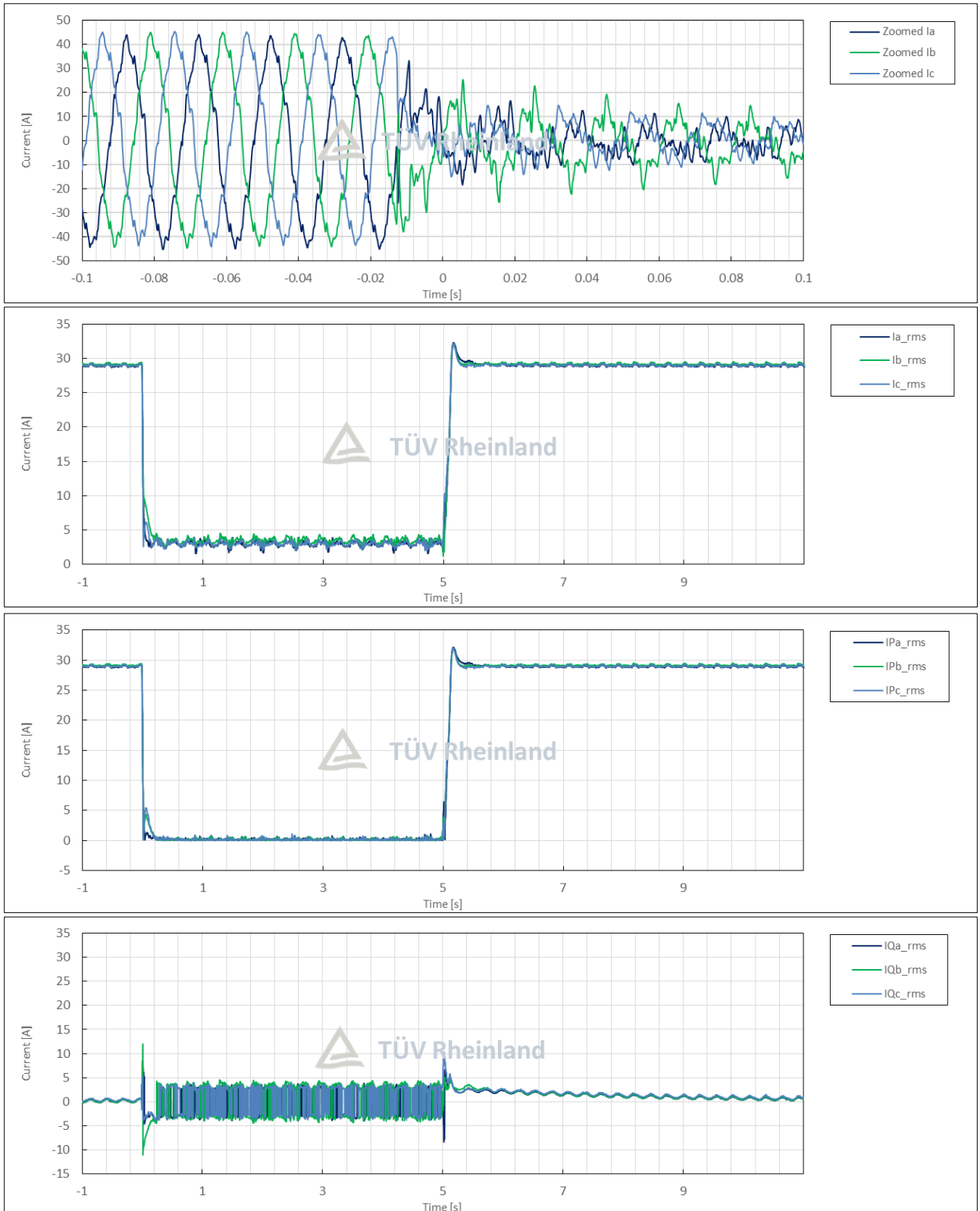
Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	6.4
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	13:04:44
	3	Fault type (phase)	--	--		2-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	1.20
	5	Setting dip duration		--		5004
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	5004
	8	Fault duration in empty load test	Total	--	ms	5004
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	1.20
	10		Pos.		p.u.	1.10
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.00
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	0.20
	13	Active power	Total	t1-10s to t1	p.u.	0.20
	14		Pos.			0.20
	15	Reactive power	Total	t1-10s to t1	p.u.	0.00
	16		Pos.			0.00
	17	Cosφ	--	t1-10s to t1	--	1.000
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	1.20
	19	Line current	Phase 1	t1+60ms	p.u.	0.02
	20		Phase 2			0.06
	21		Phase 3			0.04
	22	Line current	Phase 1	t1+100ms	p.u.	0.02
	23		Phase 2			0.04
	24		Phase 3			0.03
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	0.00
	26		Pos.			0.00
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.00
	28	Active power	Total	t2+3s to t2+10s	p.u.	0.20
	29		Pos.			0.20
	39	Active power rising time	Pos.	--	s	0.124
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	0.00
	32		Pos.			0.00
	33	Reactive power rising time	Pos.	--	s	N/A
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

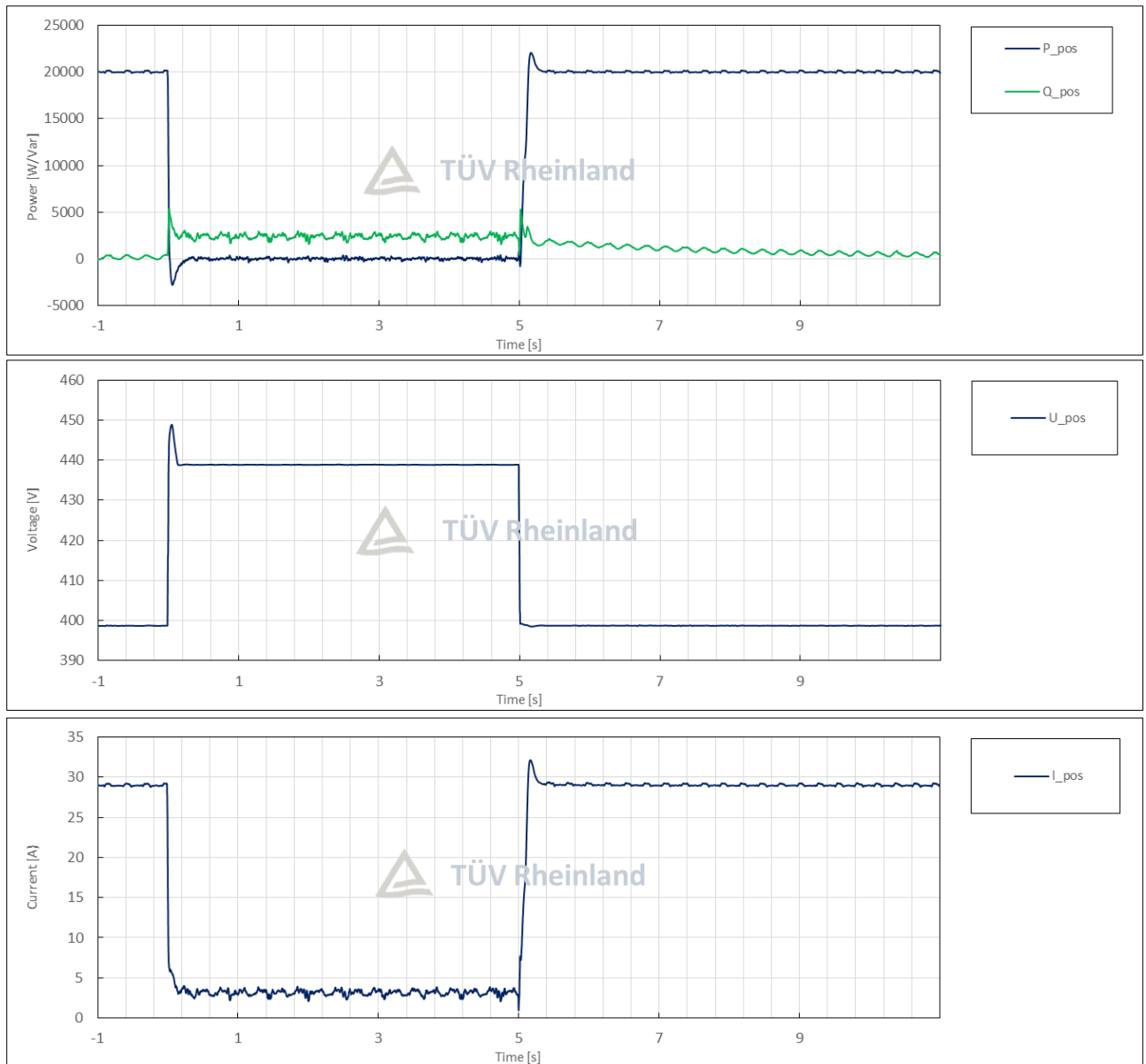
Test No. 6.4 idle test



Test No. 6.4 with PGU







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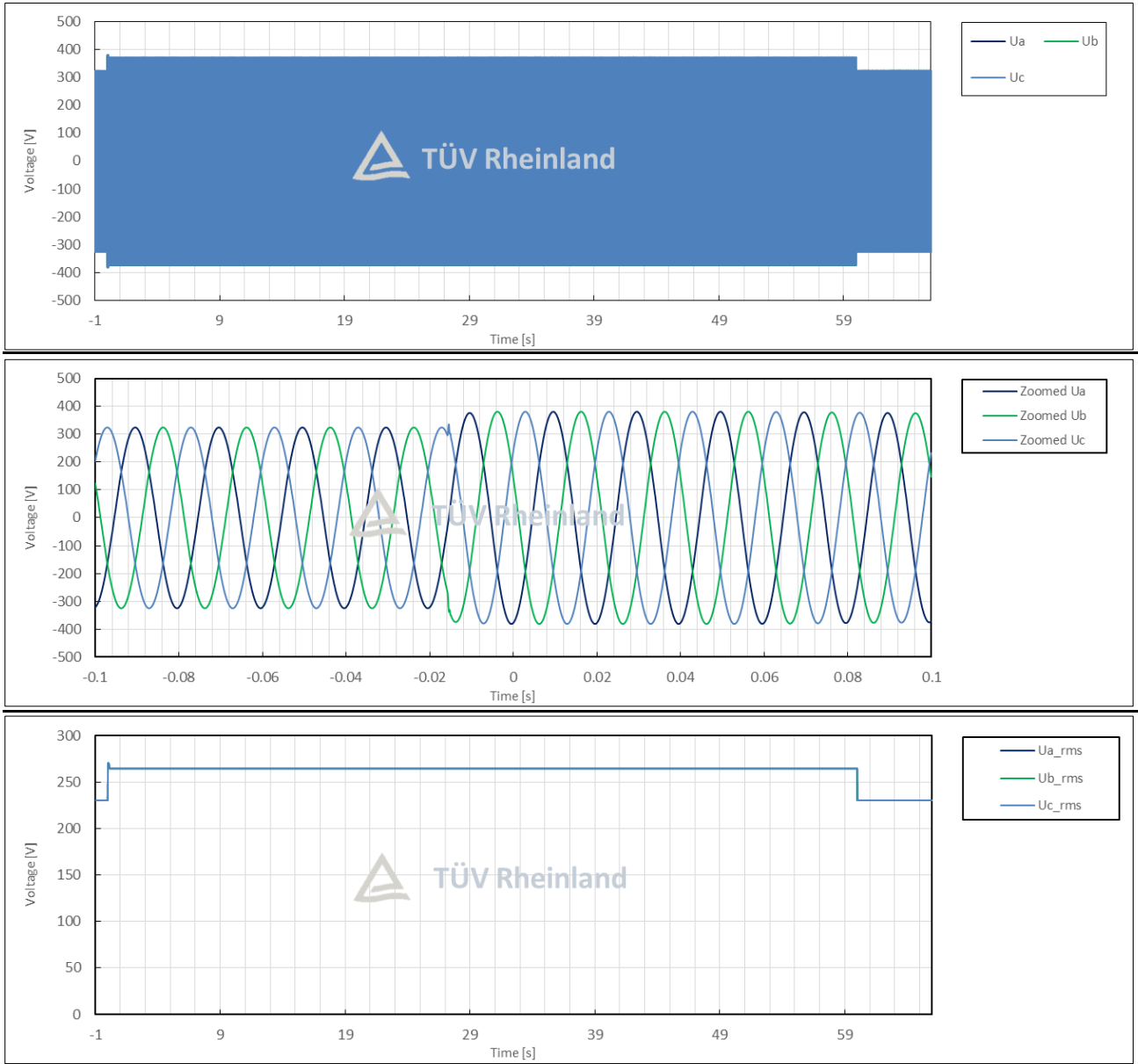
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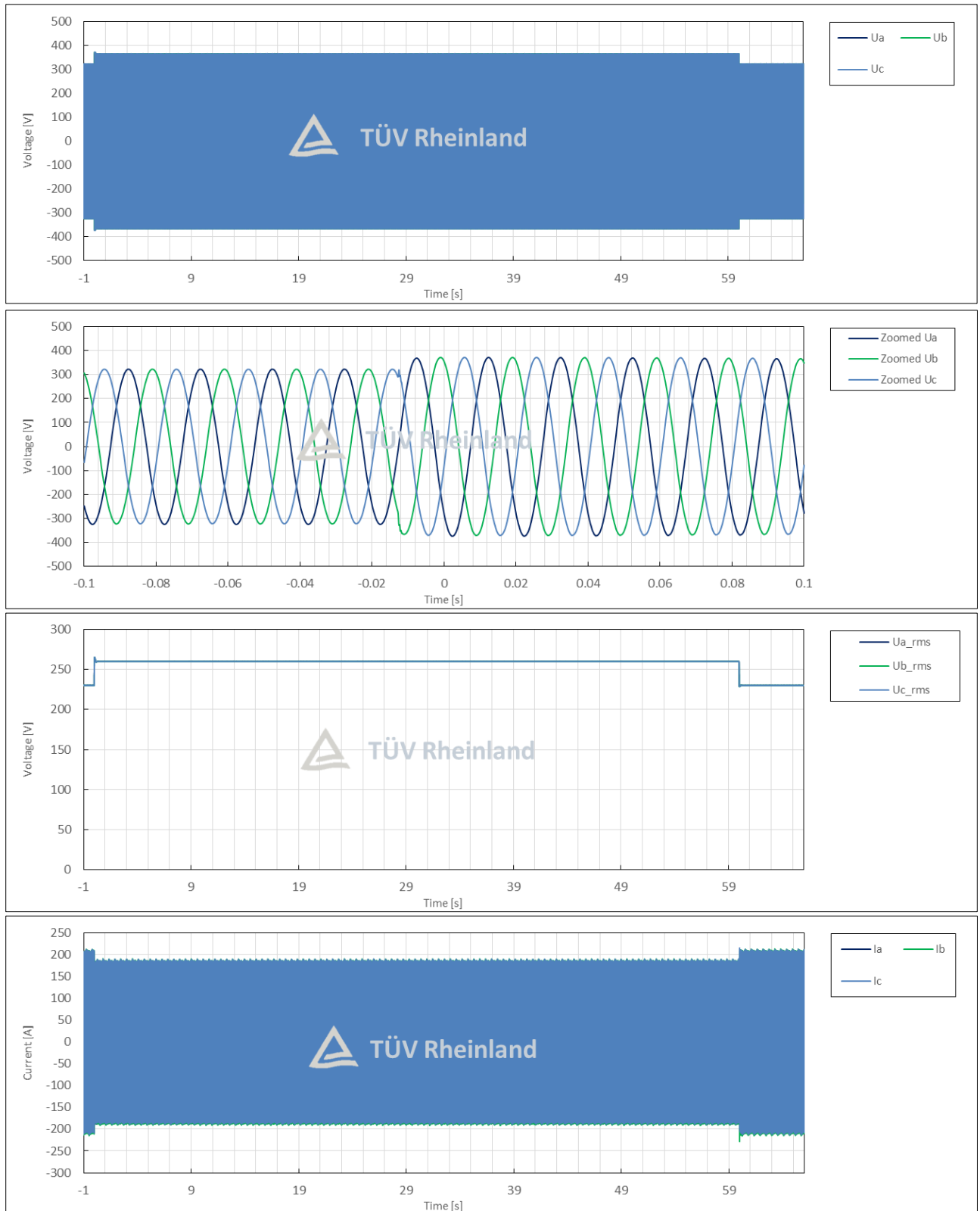
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Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	7.1
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	13:06:28
	3	Fault type (phase)	--	--		3-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	1.15
	5	Setting dip duration		--		60002
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	60002
	8	Fault duration in empty load test	Total	--	ms	60002
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	1.15
	10		Pos.		p.u.	1.15
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.00
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	1.00
	13	Active power	Total	t1-10s to t1	p.u.	1.00
	14		Pos.			1.00
	15	Reactive power	Total	t1-10s to t1	p.u.	0.00
	16		Pos.			0.00
	17	Cosφ	--	t1-10s to t1	--	1.000
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	1.13
	19	Line current	Phase 1	t1+60ms	p.u.	0.87
	20		Phase 2			0.88
	21		Phase 3			0.87
	22	Line current	Phase 1	t1+100ms	p.u.	0.87
	23		Phase 2			0.88
	24		Phase 3			0.88
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	1.00
	26		Pos.			1.00
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.00
	28	Active power	Total	t2+3s to t2+10s	p.u.	1.00
	29		Pos.			1.00
	39	Active power rising time	Pos.	--	s	N/A
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	0.00
	32		Pos.			0.00
	33	Reactive power rising time	Pos.	--	s	N/A
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

Test No. 7.1 idle test



Test No. 7.1 with PGU







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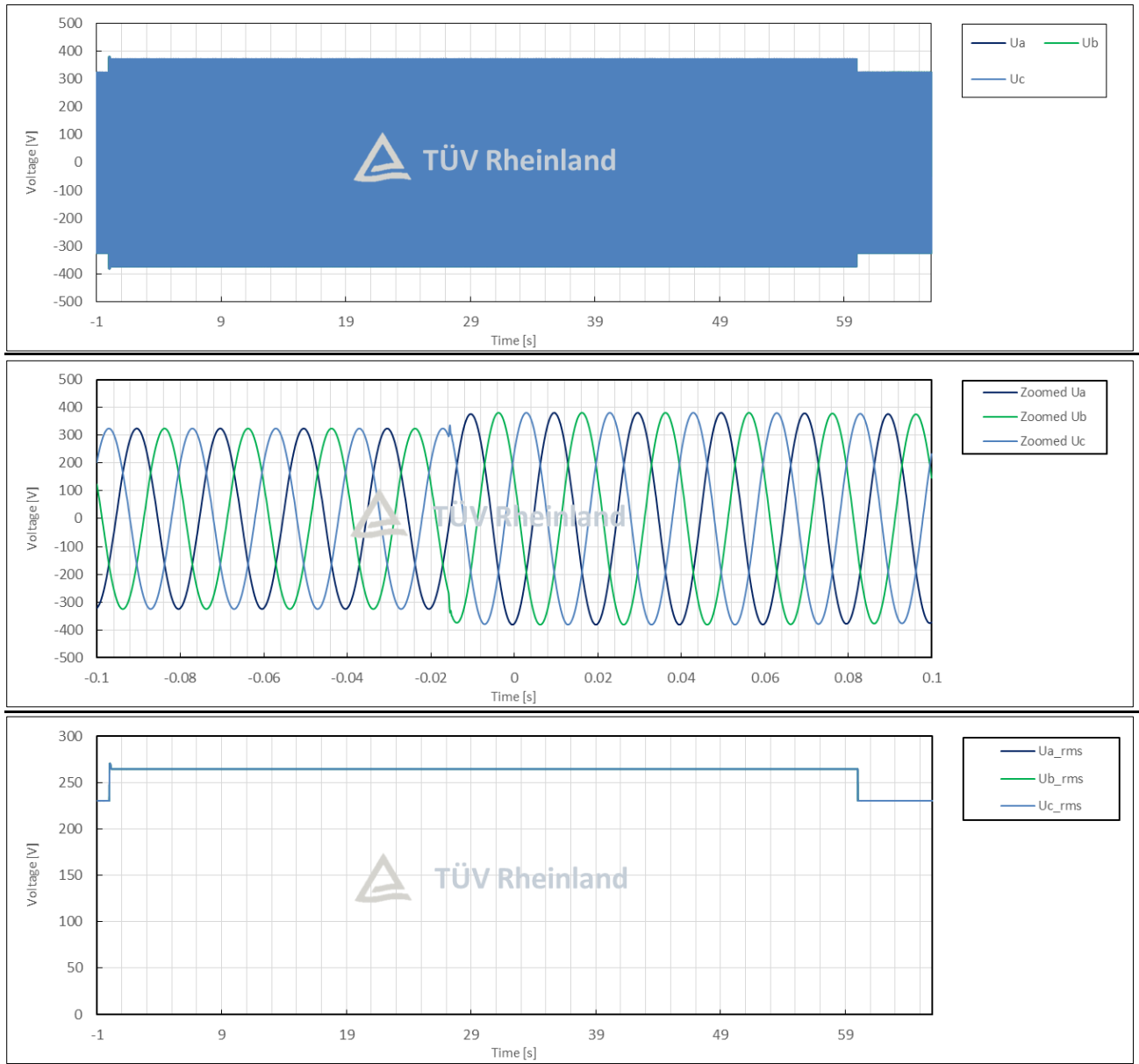
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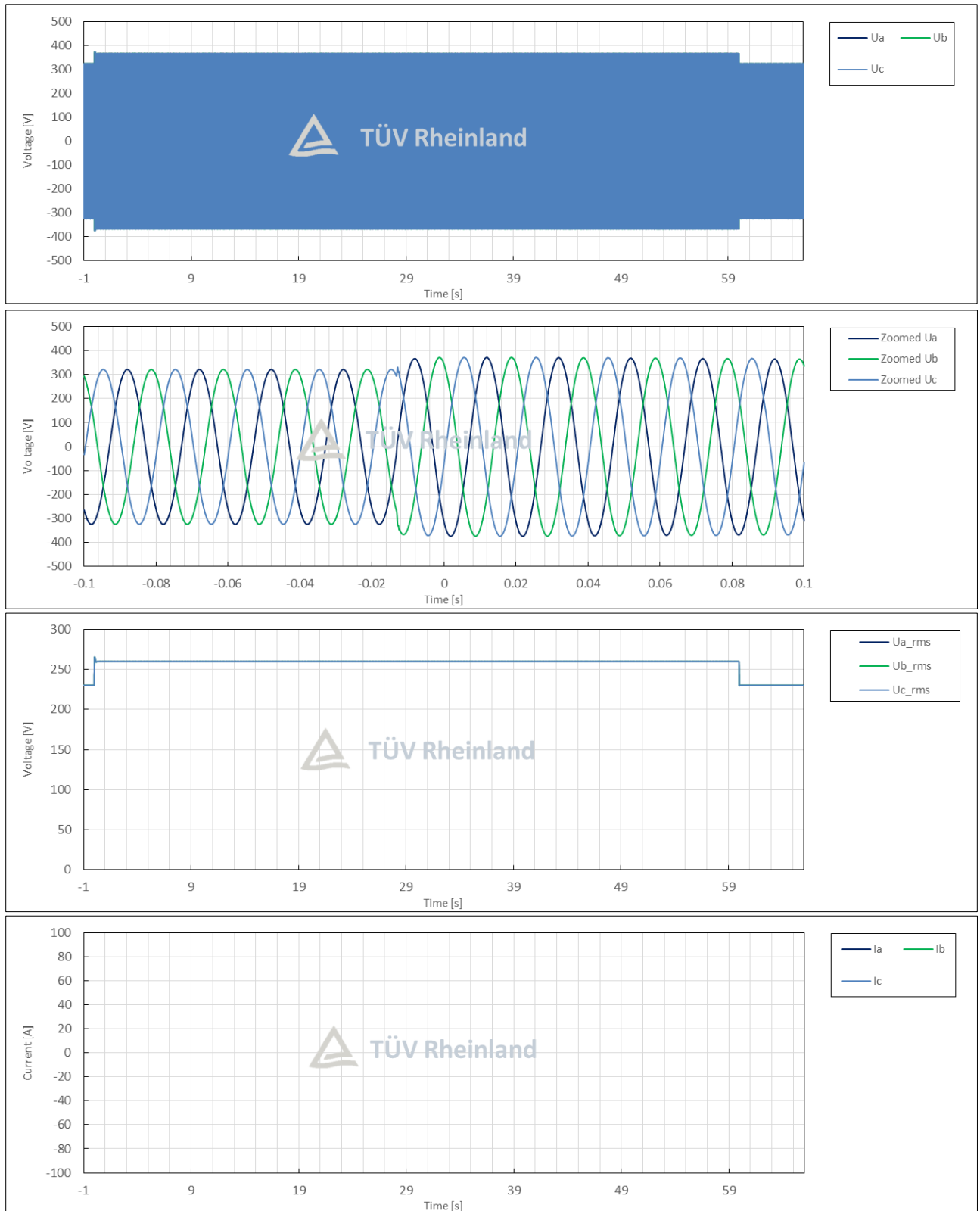
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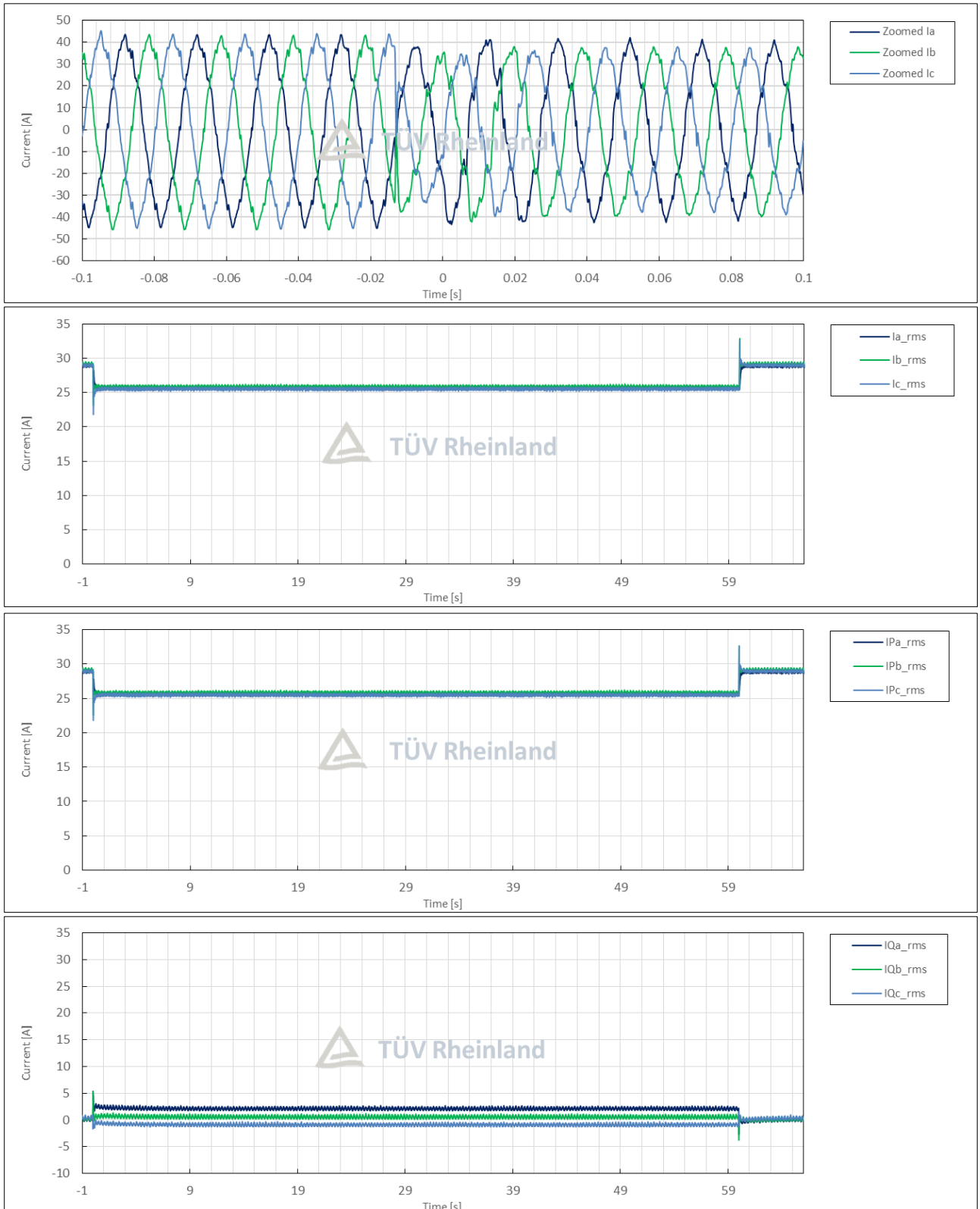
Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	7.2
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	13:05:46
	3	Fault type (phase)	--	--		3-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	1.15
	5	Setting dip duration		--		60002
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	60002
	8	Fault duration in empty load test	Total	--	ms	60002
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	1.15
	10		Pos.		p.u.	1.15
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.00
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	0.20
	13	Active power	Total	t1-10s to t1	p.u.	0.20
	14		Pos.			0.20
	15	Reactive power	Total	t1-10s to t1	p.u.	0.00
	16		Pos.			0.00
	17	Cosφ	--	t1-10s to t1	--	1.000
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	1.13
	19	Line current	Phase 1	t1+60ms	p.u.	0.19
	20		Phase 2			0.18
	21		Phase 3			0.17
	22	Line current	Phase 1	t1+100ms	p.u.	0.18
	23		Phase 2			0.18
	24		Phase 3			0.17
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	0.20
	26		Pos.			0.20
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.00
	28	Active power	Total	t2+3s to t2+10s	p.u.	0.20
	29		Pos.			0.20
	39	Active power rising time	Pos.	--	s	N/A
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	0.00
	32		Pos.			0.00
	33	Reactive power rising time	Pos.	--	s	N/A
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

Test No. 7.2 idle test



Test No. 7.2 with PGU







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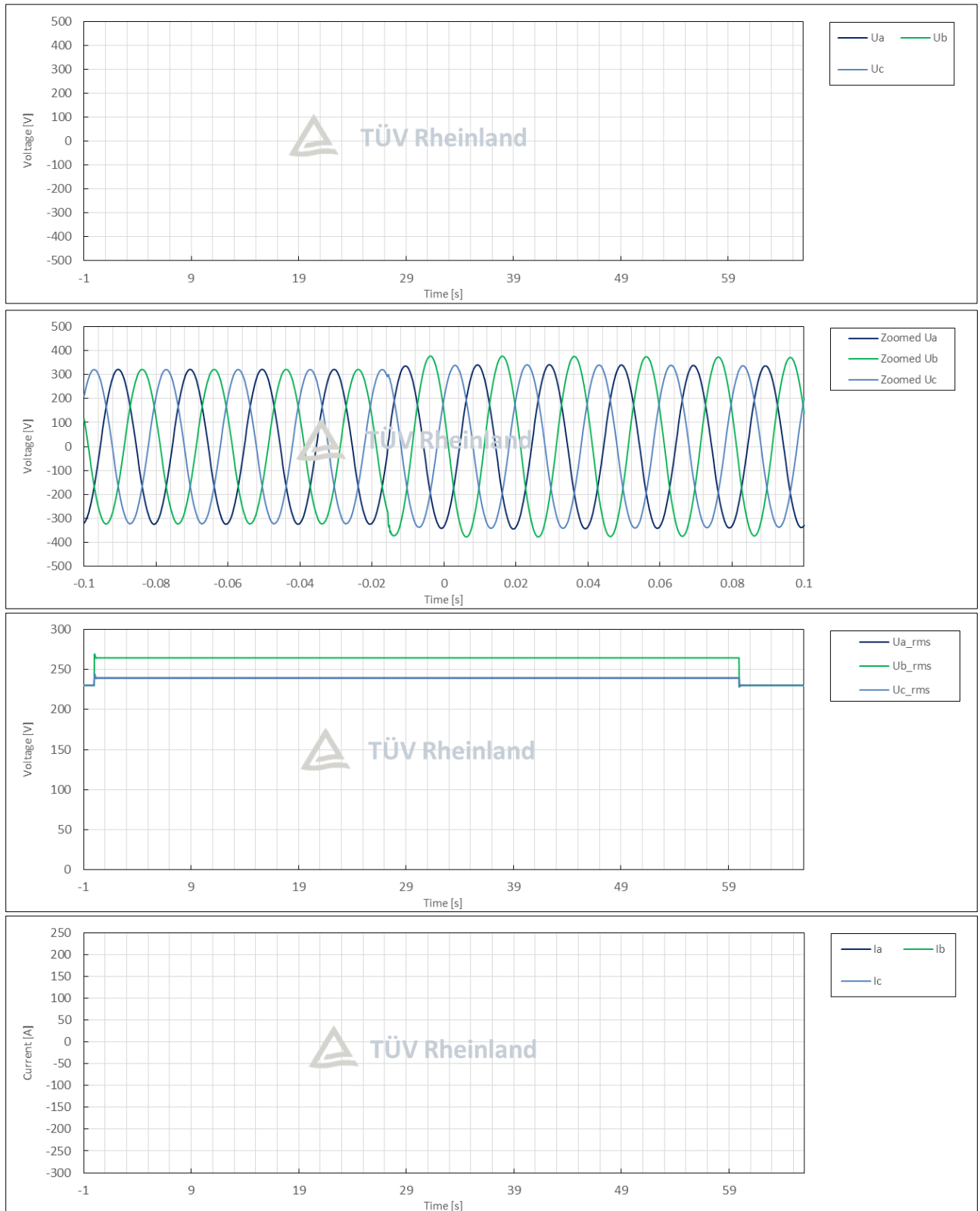
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Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	7.3
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	13:06:08
	3	Fault type (phase)	--	--		2-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	1.15
	5	Setting dip duration		--		60003
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	60003
	8	Fault duration in empty load test	Total	--	ms	60003
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	1.15
	10		Pos.		p.u.	1.07
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.00
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	1.00
	13	Active power	Total	t1-10s to t1	p.u.	1.00
	14		Pos.			1.00
	15	Reactive power	Total	t1-10s to t1	p.u.	0.00
	16		Pos.			0.00
	17	Cosφ	--	t1-10s to t1	--	1.000
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	1.15
	19	Line current	Phase 1	t1+60ms	p.u.	0.93
	20		Phase 2			0.91
	21		Phase 3			0.91
	22	Line current	Phase 1	t1+100ms	p.u.	0.93
	23		Phase 2			0.91
	24		Phase 3			0.92
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	1.00
	26		Pos.			1.00
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.00
	28	Active power	Total	t2+3s to t2+10s	p.u.	1.00
	29		Pos.			1.00
	39	Active power rising time	Pos.	--	s	N/A
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	0.00
	32		Pos.			0.00
	33	Reactive power rising time	Pos.	--	s	N/A
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

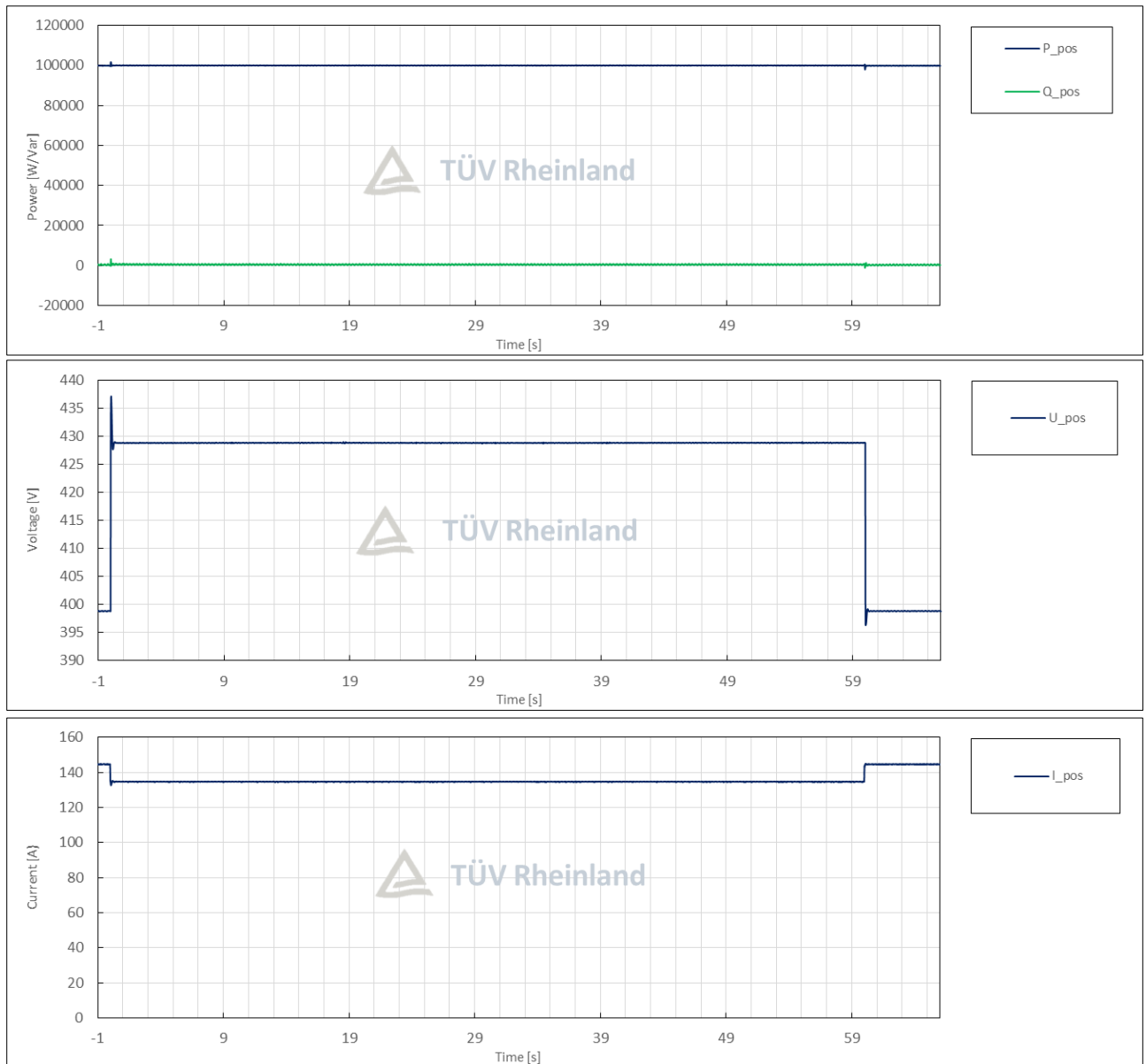
Test No. 7.3 idle test



Test No. 7.3 with PGU







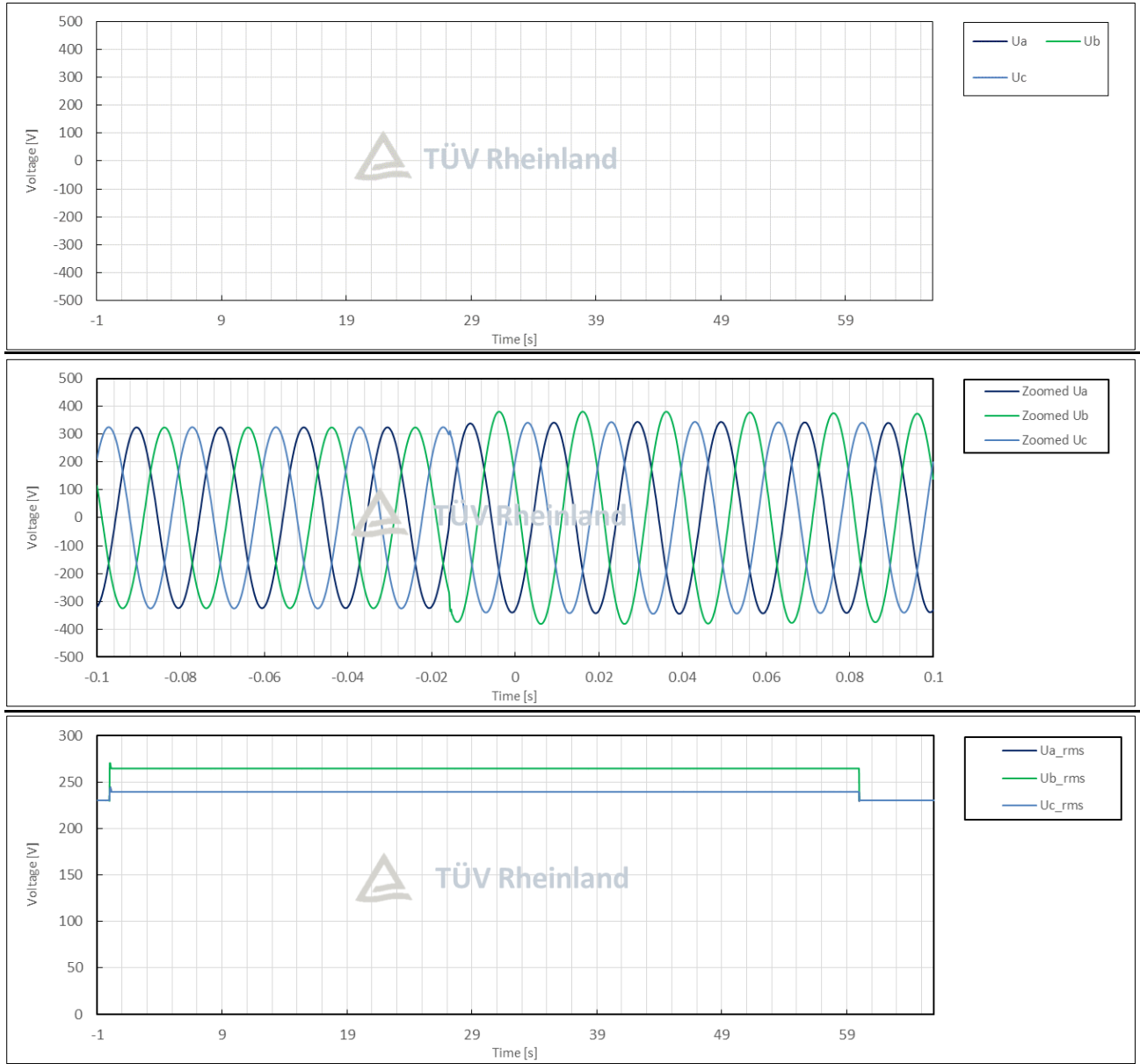
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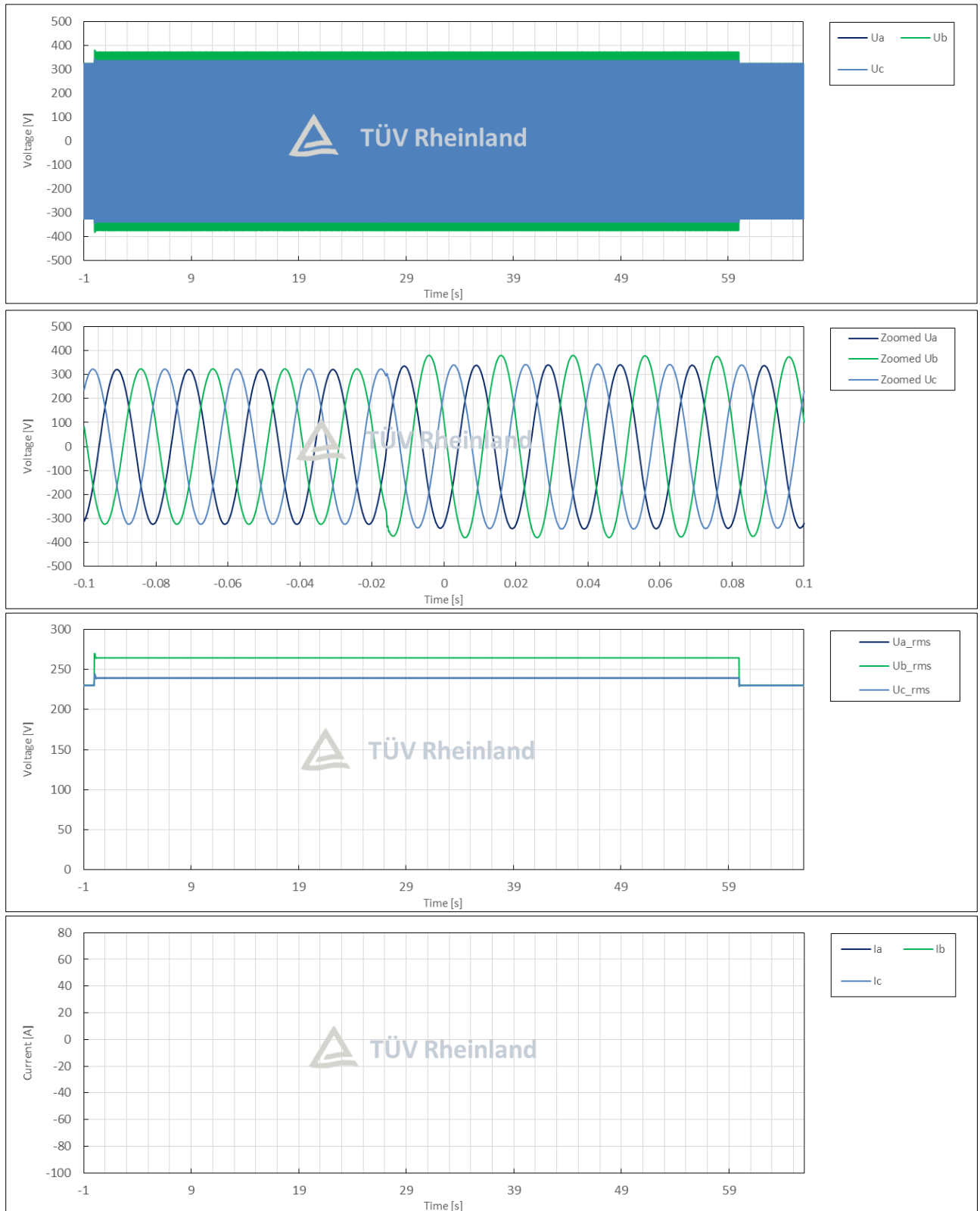
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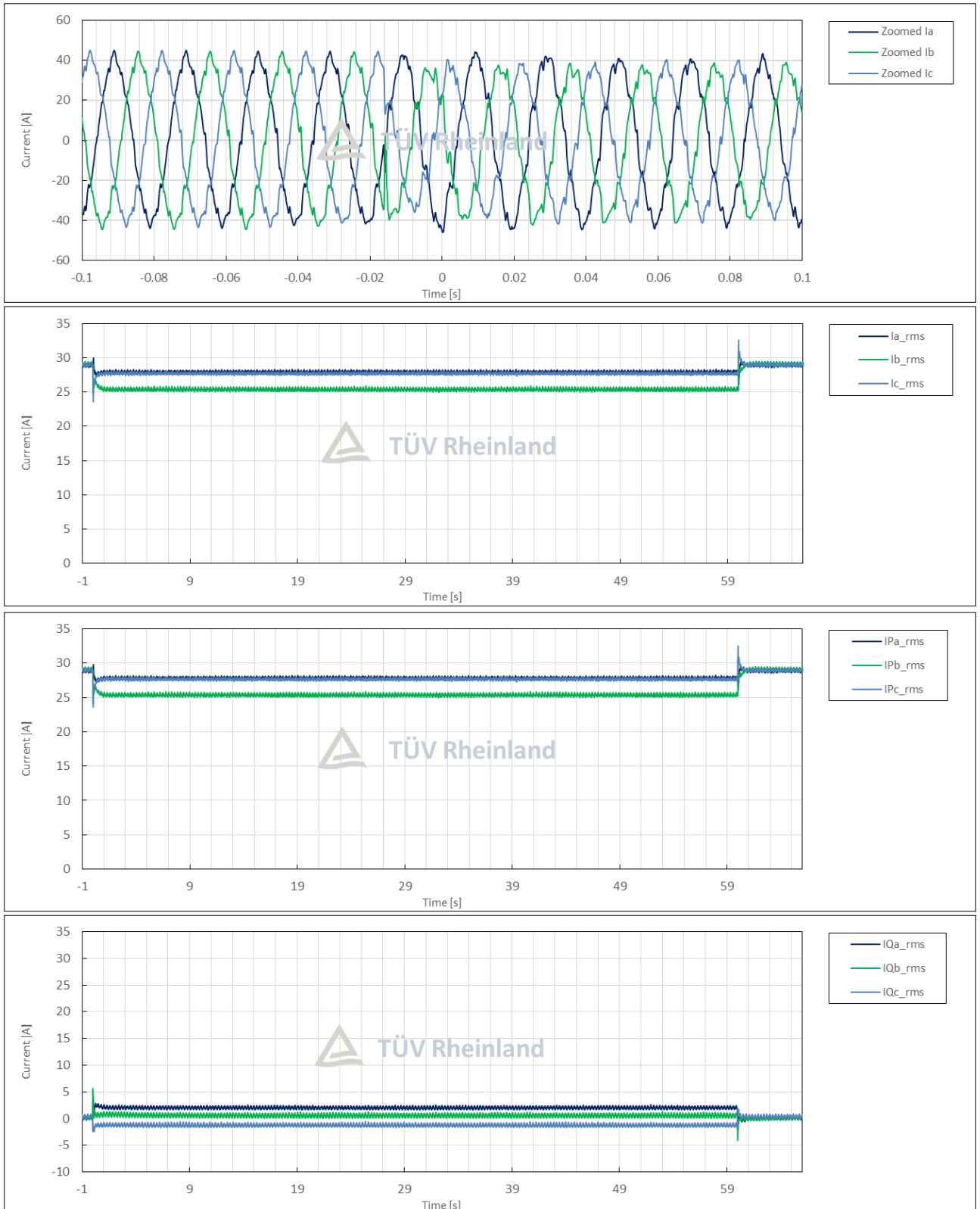
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Condition						Measurement
	No.	Parameter	Phase ref.	Time ref.	unit	
General Info.	0	Test number	--	--	--	7.4
	1	Date	--	--	dd.mm.yyyy	10.2023.26 1
	2	Time (start of test)	--	--	hh:mm:ss.f	13:05:20
	3	Fault type (phase)	--	--		2-phase fault
	4	Setting voltage depth	Line to line	--	p.u.	1.15
	5	Setting dip duration		--		60003
	6	Point of fault entry	Total	--	ms	0
	7	Point of fault clearance	Total	--	ms	60003
	8	Fault duration in empty load test	Total	--	ms	60003
	9	Voltage depth/height in empty load test	Total	t1+100ms to t2 and t1-10s to t1	p.u.	1.15
	10		Pos.		p.u.	1.07
Before dip <t1	11	Voltage	Line to neutral	t1-100s to t1	p.u.	1.00
	12	Current	Pos.	t1-500ms to t1-100ms	p.u.	0.20
	13	Active power	Total	t1-10s to t1	p.u.	0.20
	14		Pos.			0.20
	15	Reactive power	Total	t1-10s to t1	p.u.	0.00
	16		Pos.			0.00
	17	Cosφ	--	t1-10s to t1	--	1.000
During dip t1 to t2	18	Voltage	Line to neutral	t1+100ms to t2-20ms	p.u.	1.15
	19	Line current	Phase 1	t1+60ms	p.u.	0.20
	20		Phase 2			0.18
	21		Phase 3			0.18
	22	Line current	Phase 1	t1+100ms	p.u.	0.19
	23		Phase 2			0.18
	24		Phase 3			0.18
	25	Active power	Total	t1+100ms to t2-20ms	p.u.	0.20
	26		Pos.			0.20
After dip > t2	27	Voltage	Line to neutral	t2+3s to t2+10s	p.u.	1.00
	28	Active power	Total	t2+3s to t2+10s	p.u.	0.20
	29		Pos.			0.20
	39	Active power rising time	Pos.	--	s	N/A
	31	Reactive power	Total	t2+3s to t2+10s	p.u.	0.00
	32		Pos.			0.00
	33	Reactive power rising time	Pos.	--	s	N/A
	34	PGU does not disconnect from grid till 60s after fault	--	t2 to t2+60s	Yes / No	No

Test No. 7.4 idle test


Test No. 7.4 with PGU







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Revision History:

Date YYYY-MM-DD	Contents of modification (latest on top)	Prepared by	Approved by
2020-07-08	Originated and released into QM system	Tobias Yang	Weichun Li

PHOTO DOCUMENTATION

CN24E4X5 001

INPPCS-100/0.4-W-14-C1-OS, INPPCS-100/0.4-W-24-C1-OS

Langfang IN-Power Electric Co., Ltd.



This documentation consists of 22 pages (excluding this cover page).



Figure 1 Front view

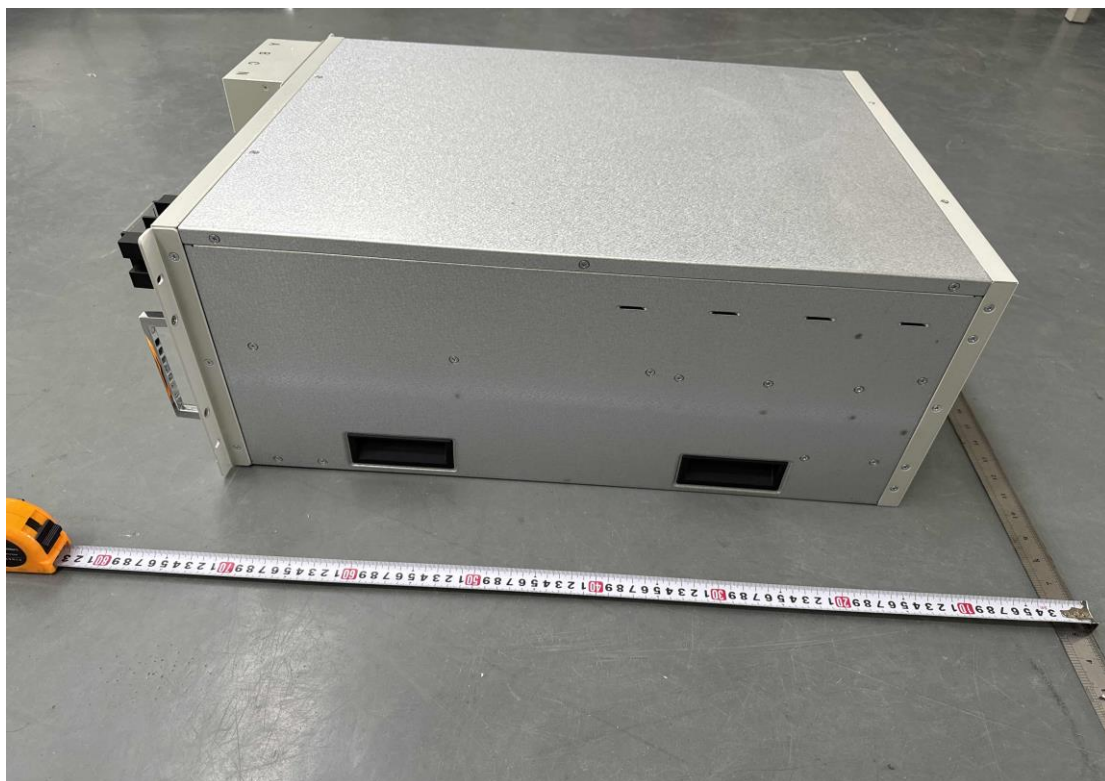


Figure 2 Left side view

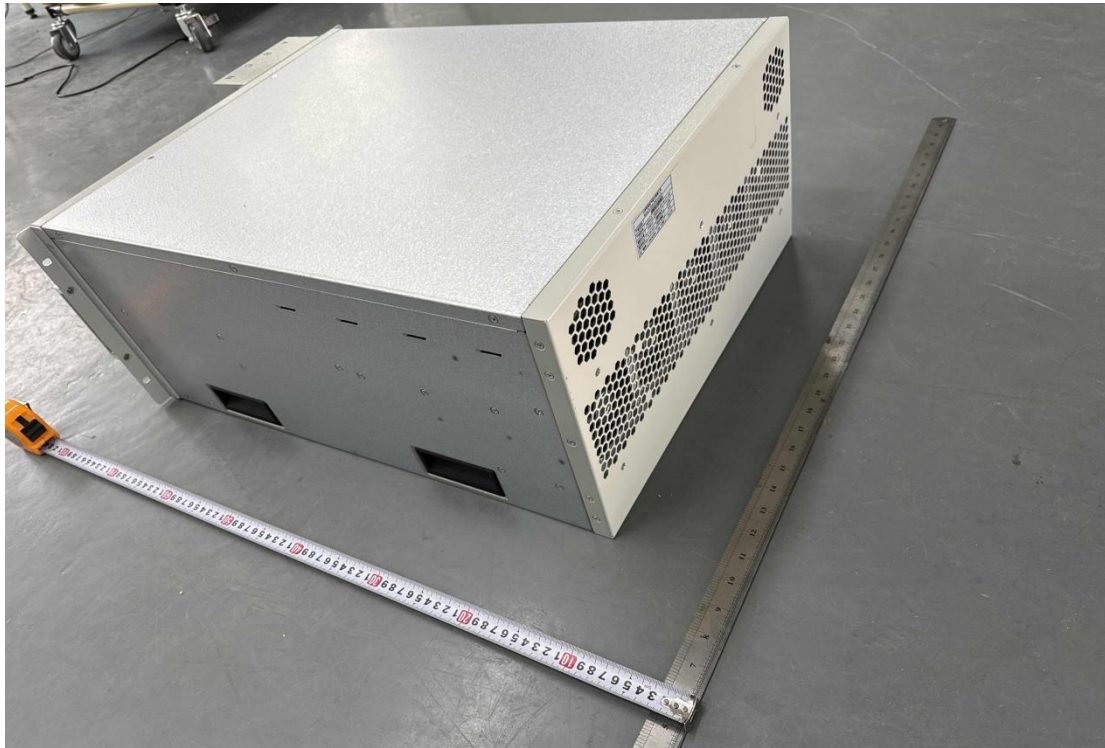


Figure 3 Left front side view 2



Figure 3 rear side view (INPPCS-100/0.4-W-14-C1-OS)



Figure 4 rear side view (INPPCS-100/0.4-W-24-C1-OS)

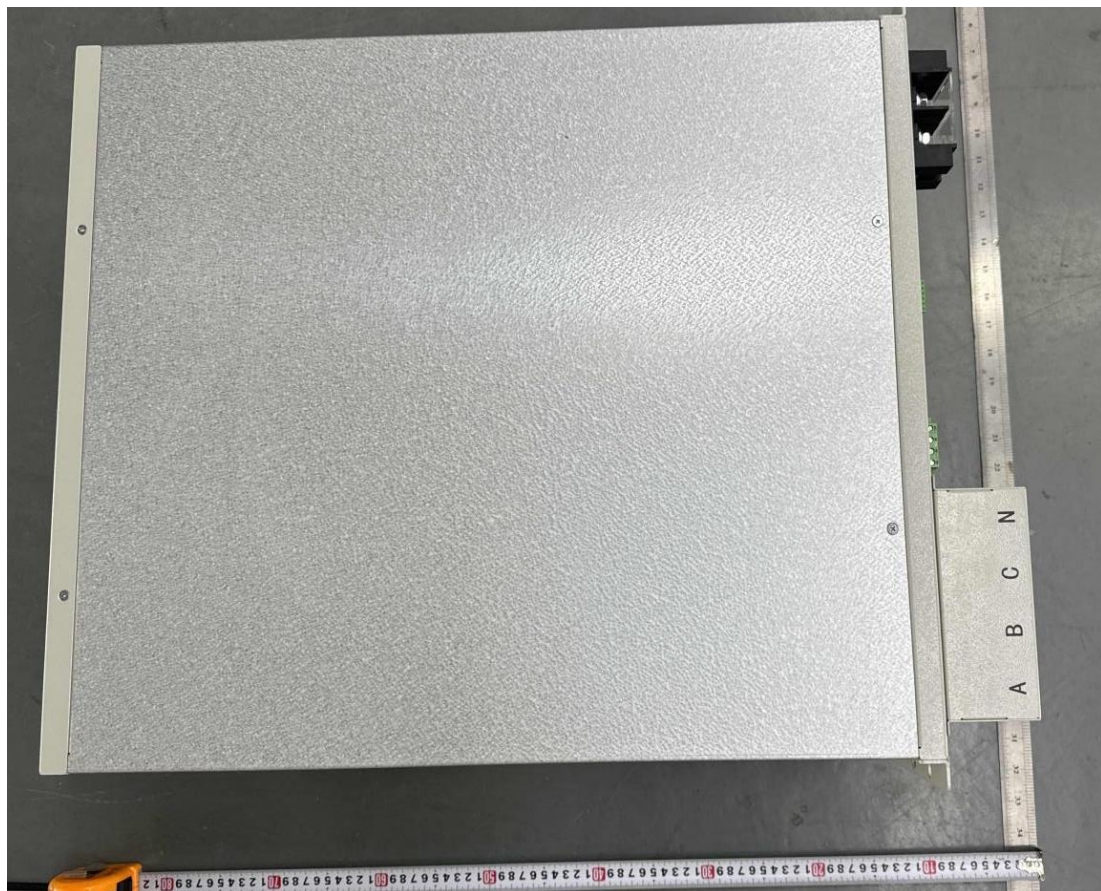


Figure 5 top view (INPPCS-100/0.4-W-14-C1-OS)



Figure 6 Inside view without upper enclosure

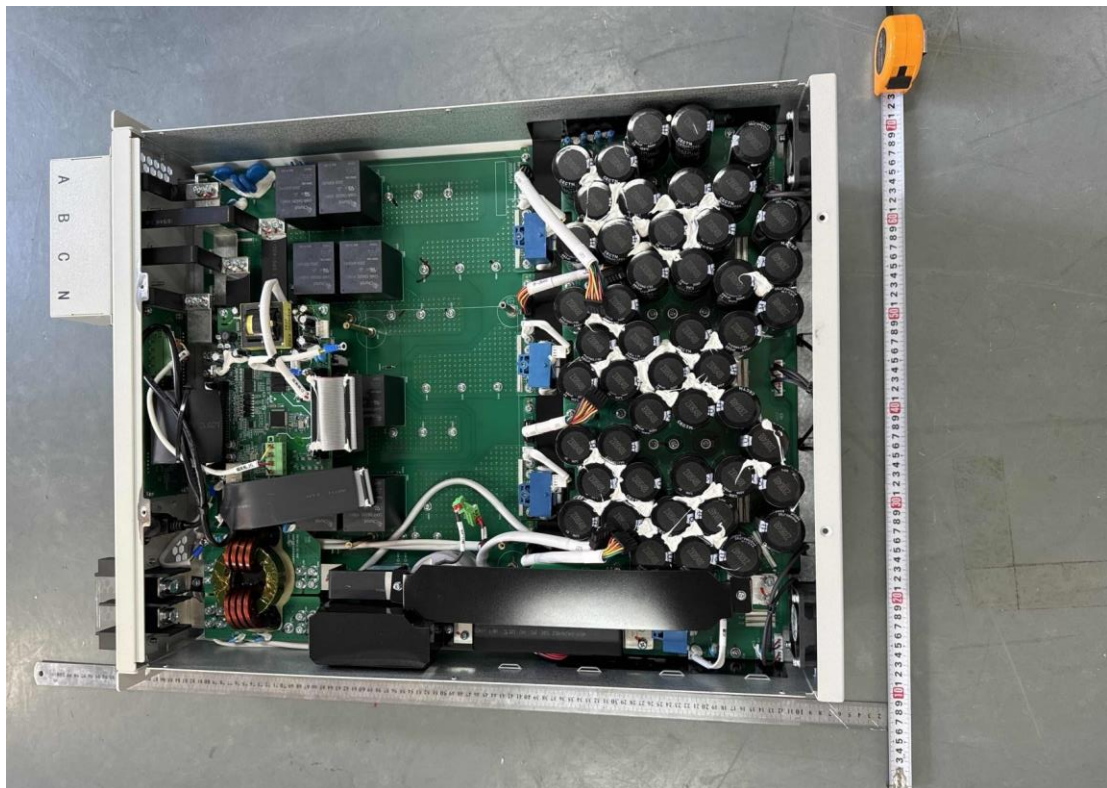


Figure 8 Inside view without control board



Figure 9 Inside view without control board, isolation board



Figure 10 Inside view without control board, isolation board, Capacitor board, and DC filter board

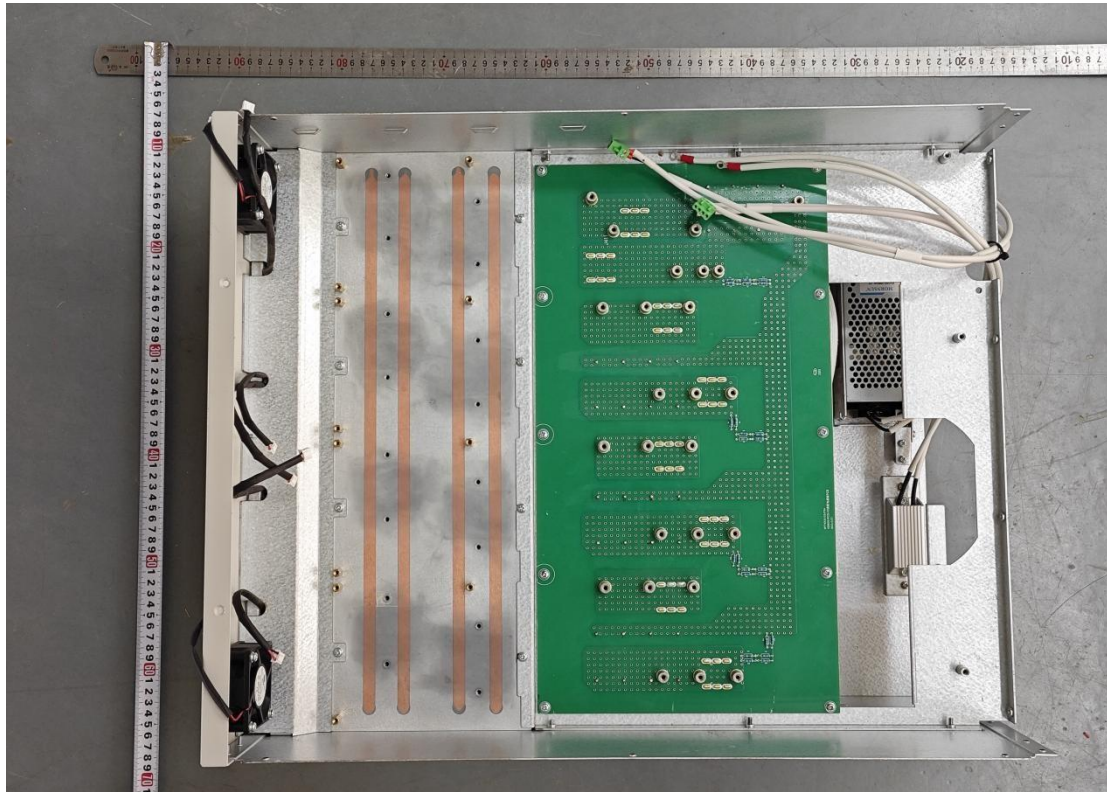


Figure 11 Inside view without control board, isolation board, Capacitor board, DC filter board, power board and relay board



Figure 12 Inside view of enclosure without PCBs

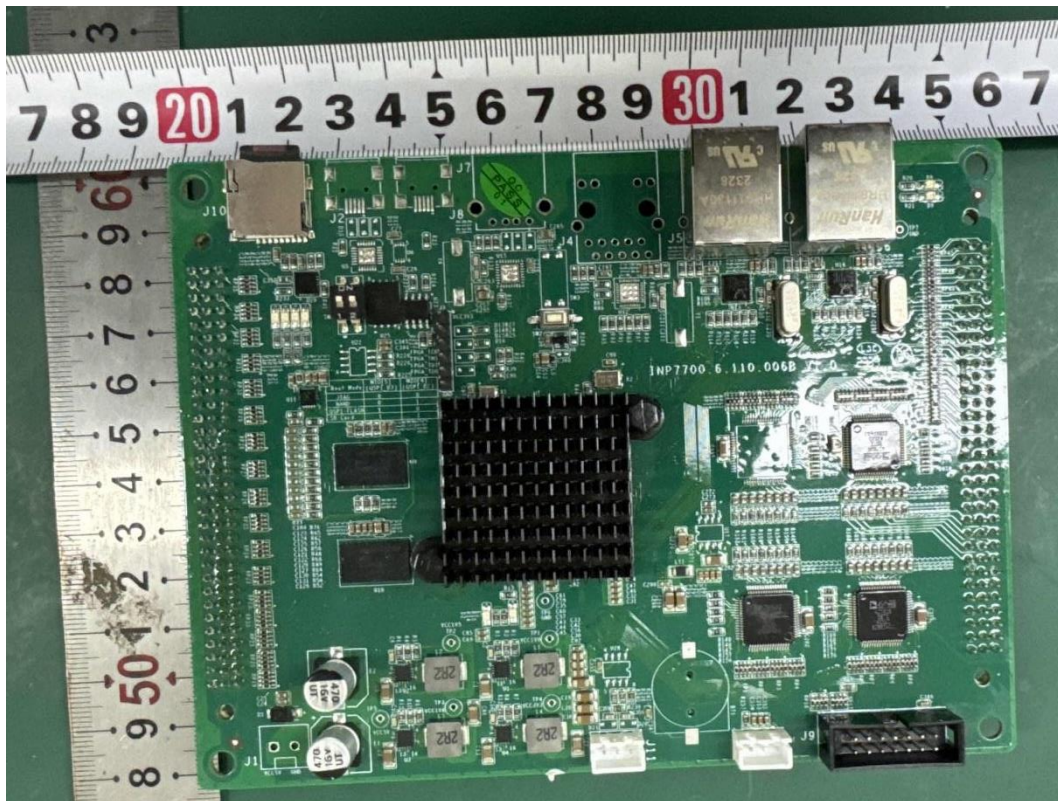


Figure 13 component side of core board

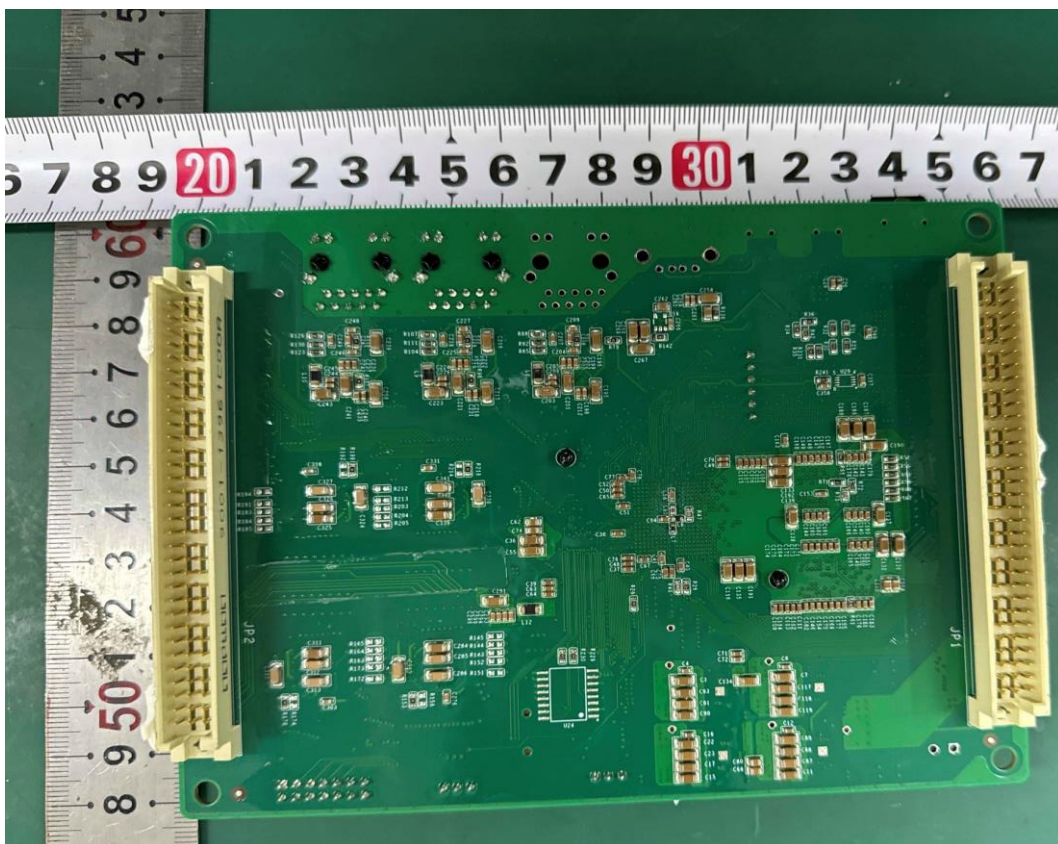


Figure 14 Trace side of core board

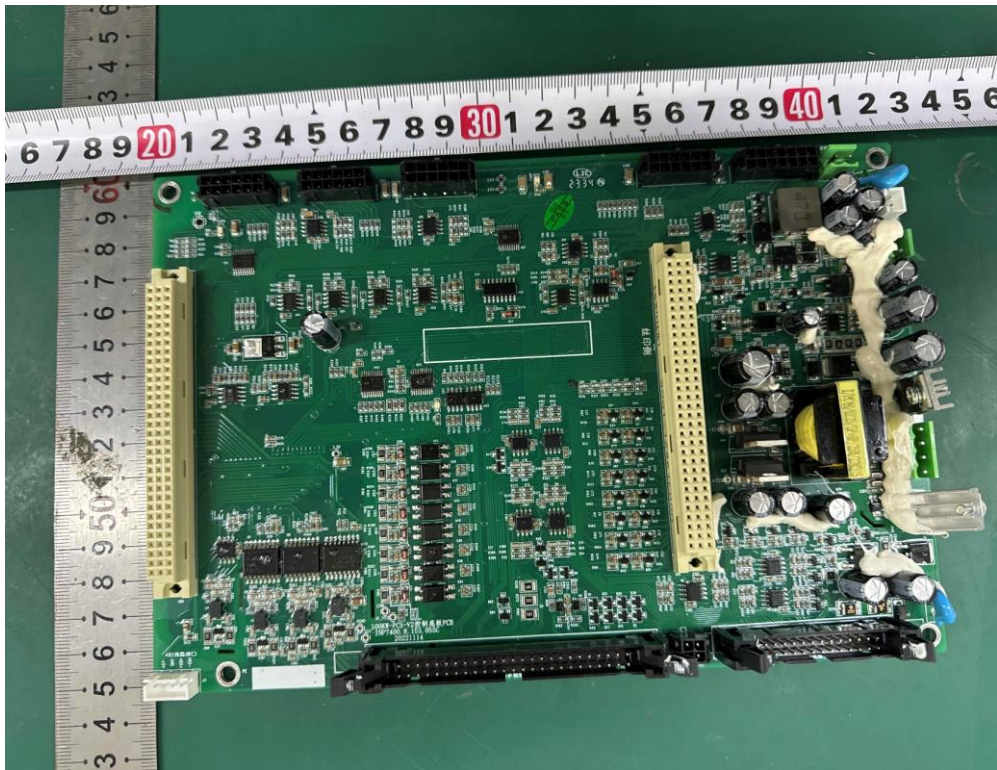


Figure 15 component side of control board

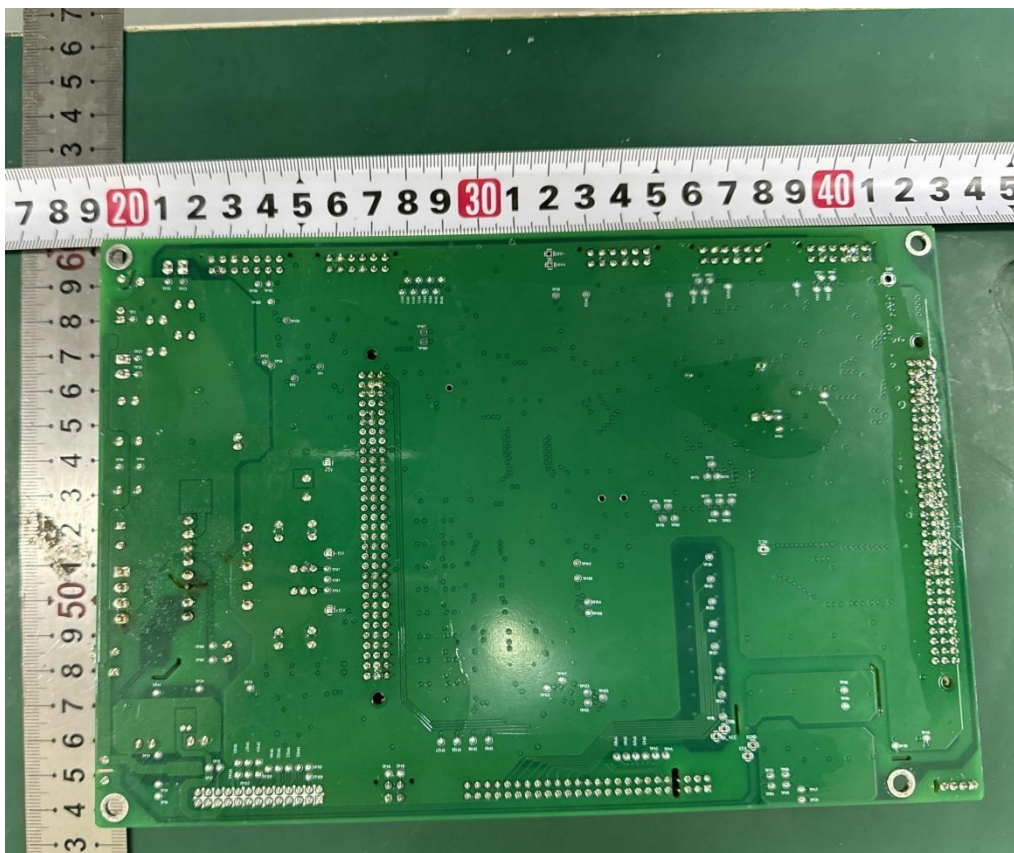


Figure 16 trace side of control board

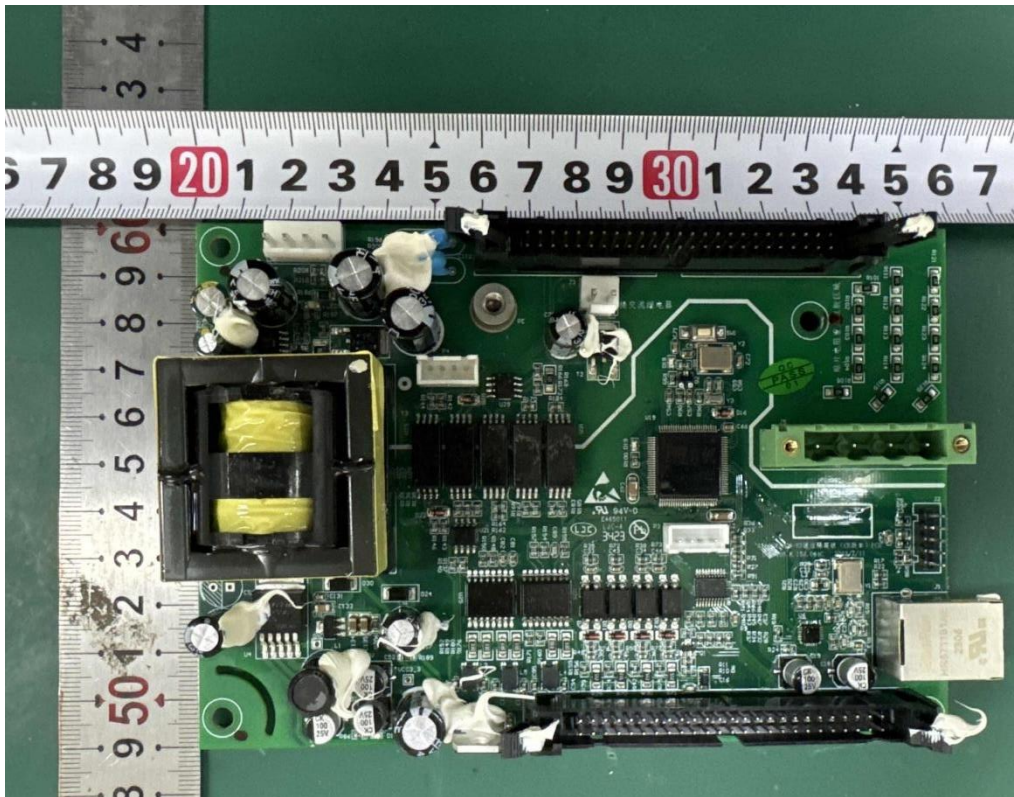


Figure 17 component side of isolation board

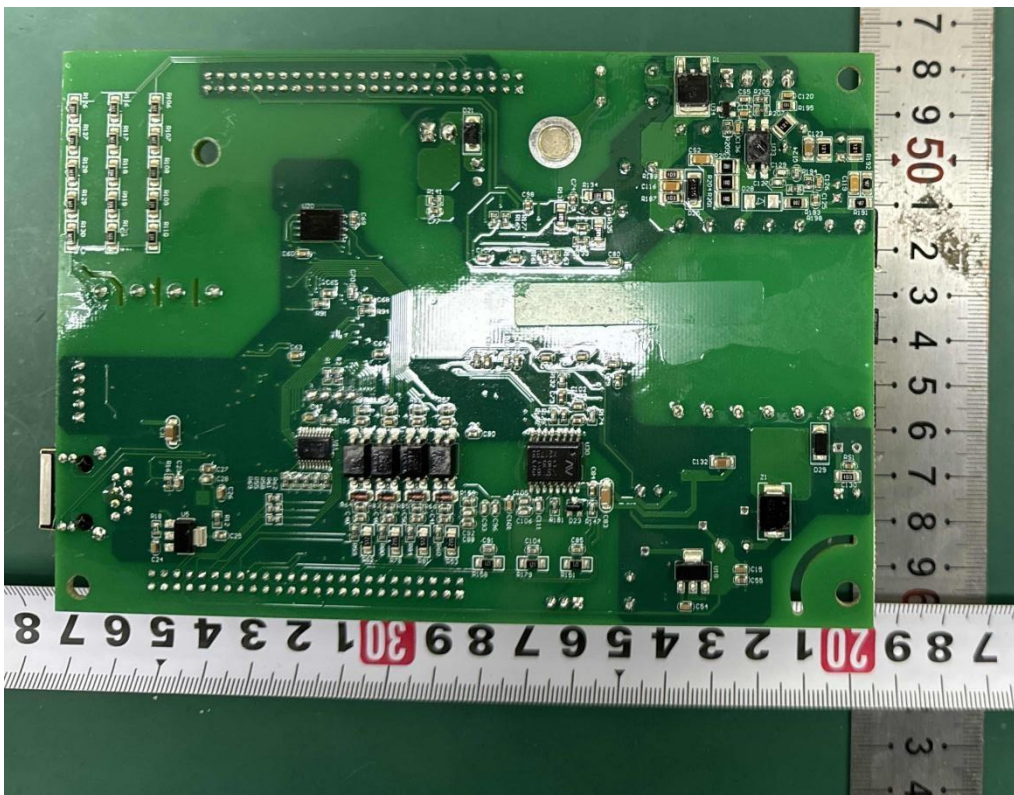


Figure 18 trace side of isolation board

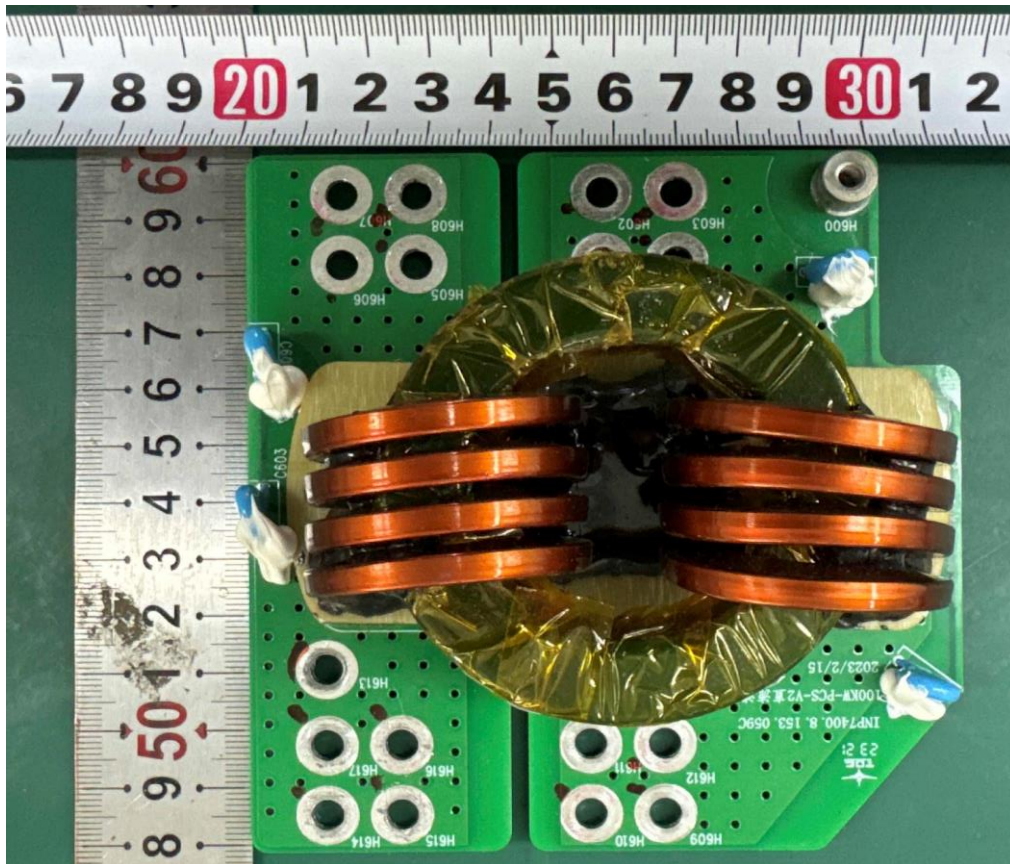


Figure 19 component side of DC filter board

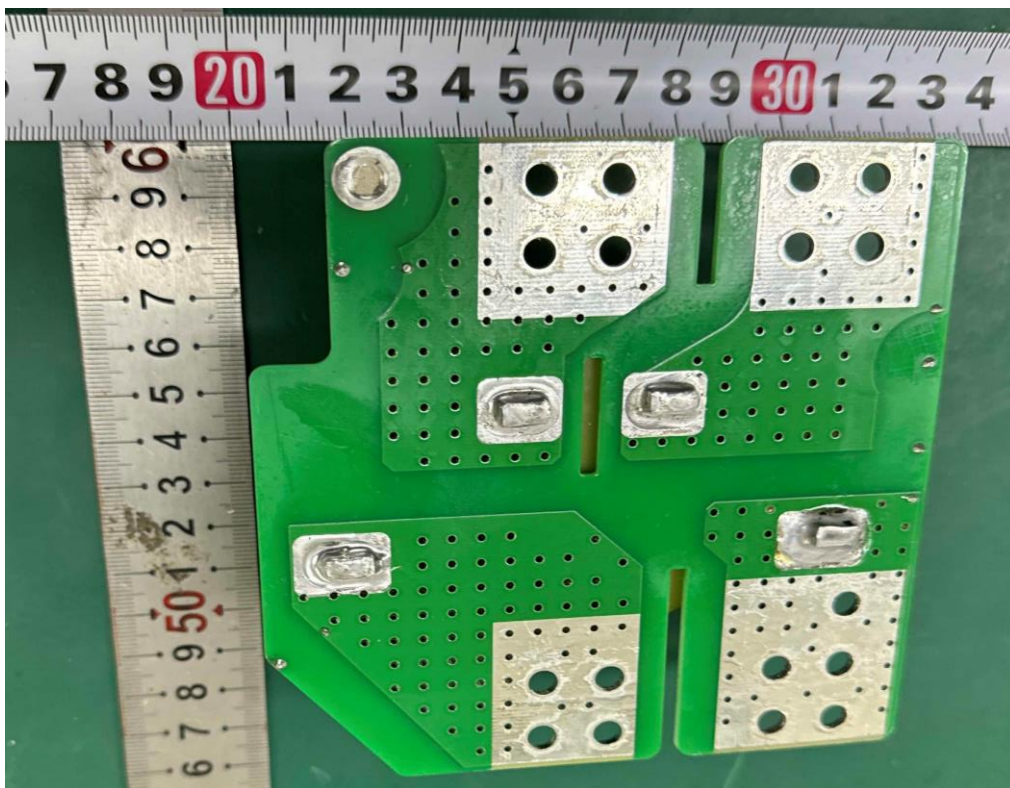


Figure 20 trace side of DC filter board



Figure 21 component side of capacitor board

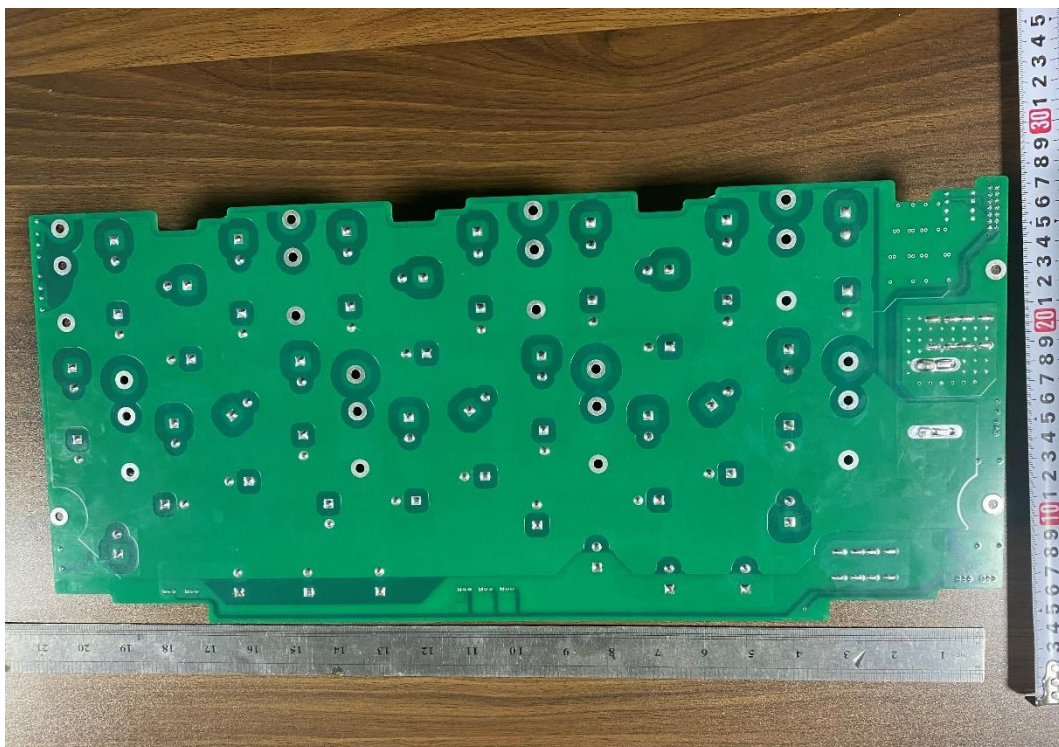


Figure 22 Trace side of capacitor board



Figure 23 component side of power board

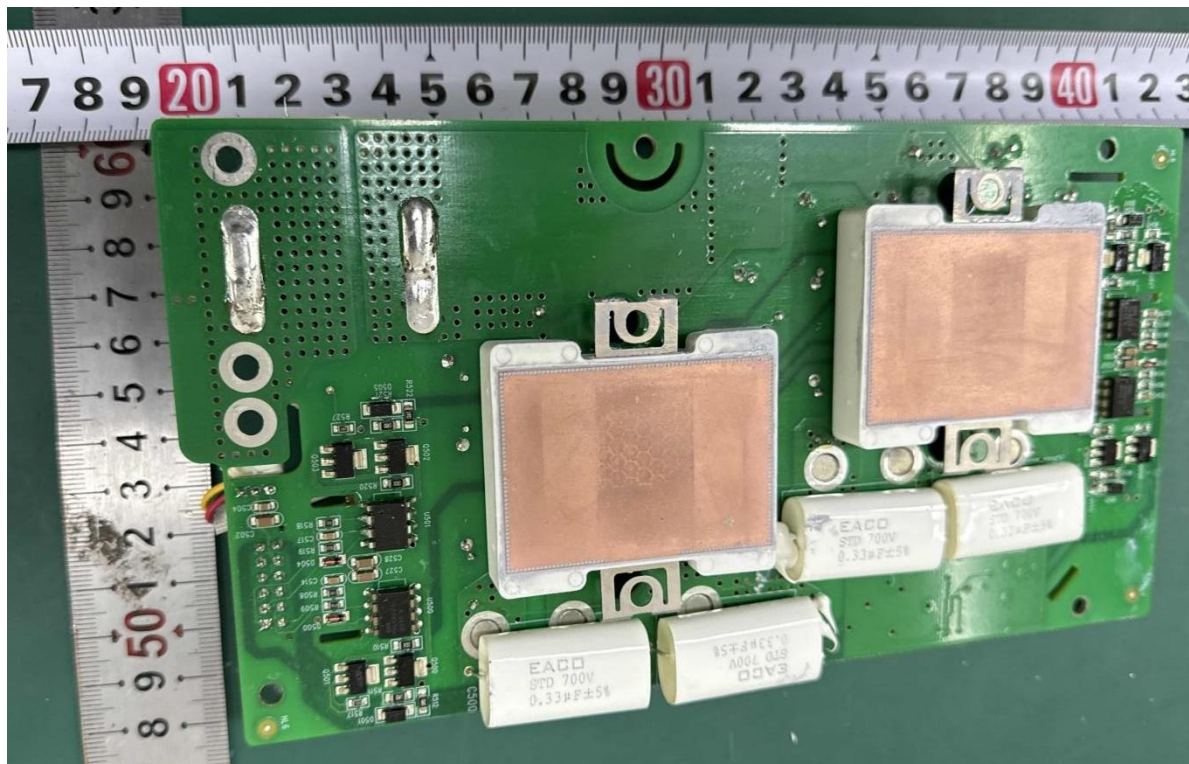


Figure 24 component side of power board

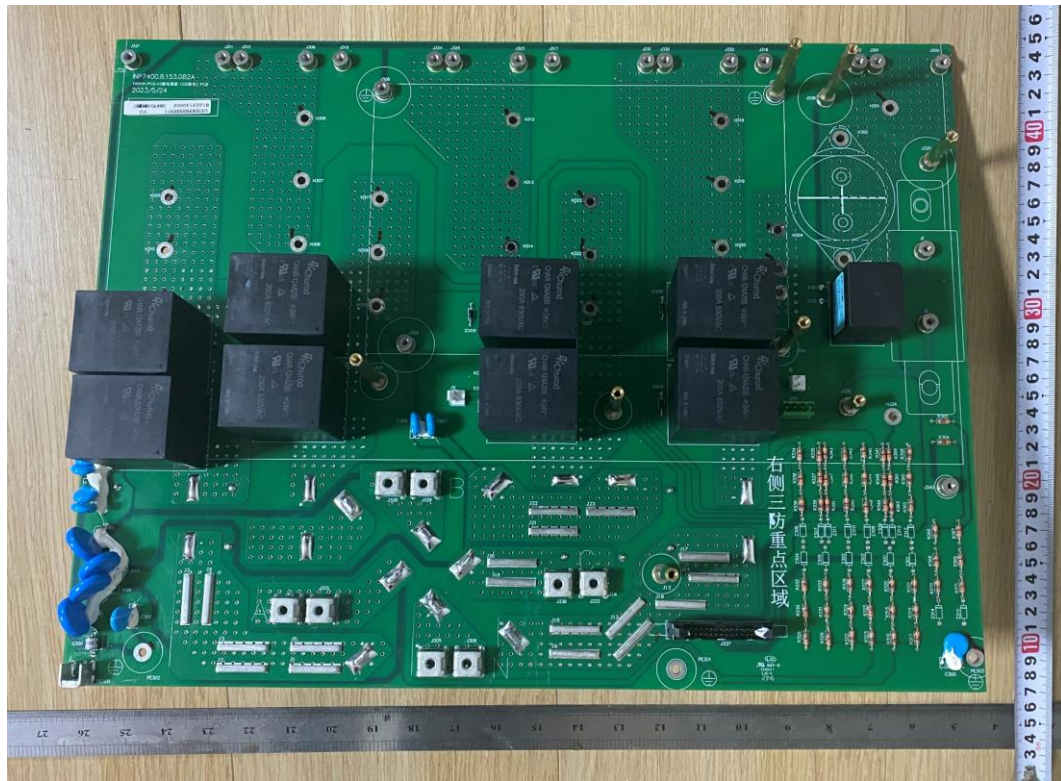


Figure 25 component side of relay board

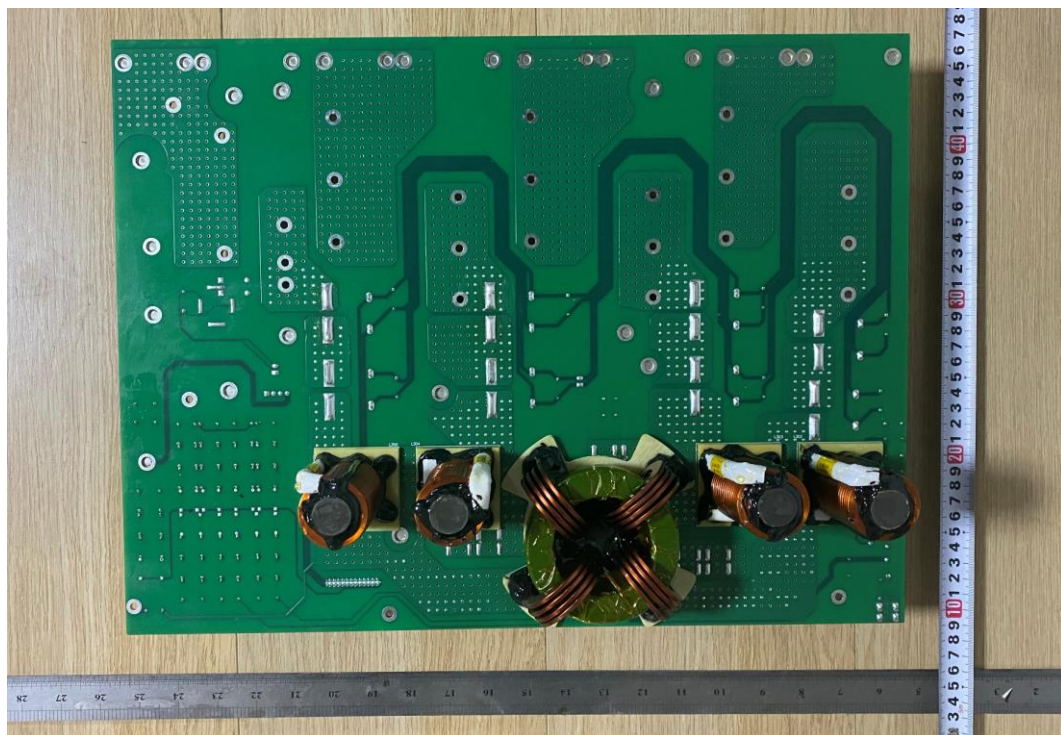


Figure 26 trace side of relay board

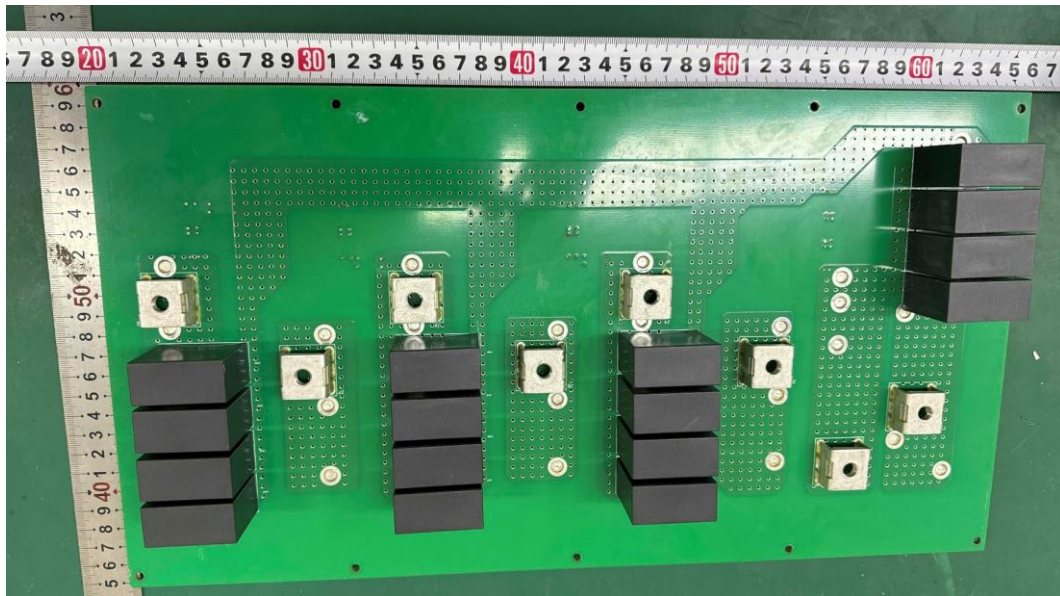


Figure 27 component side of relay board

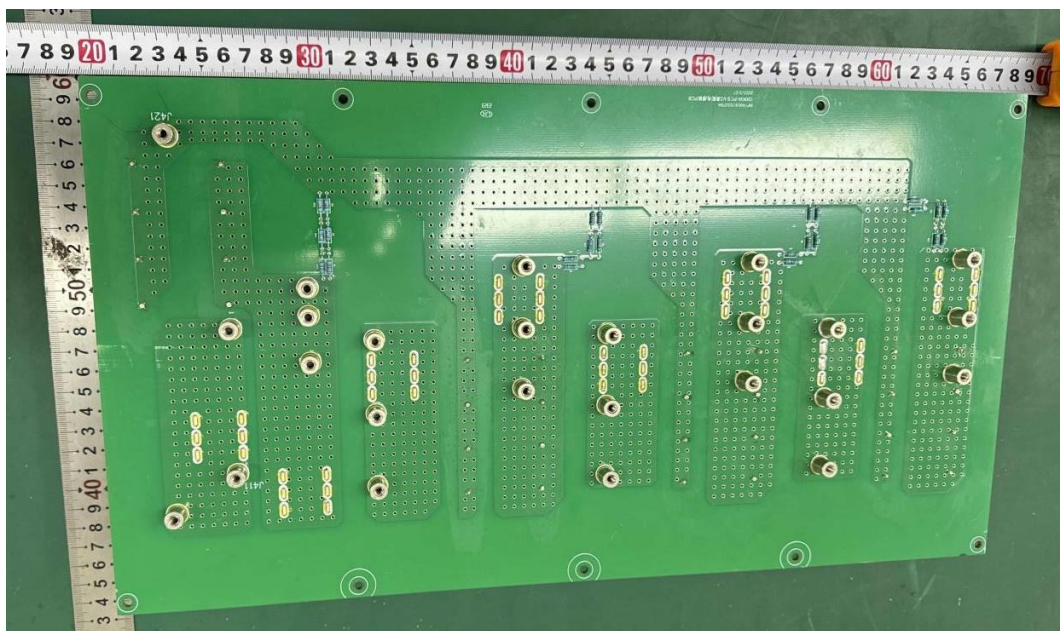


Figure 28 trace side of relay board

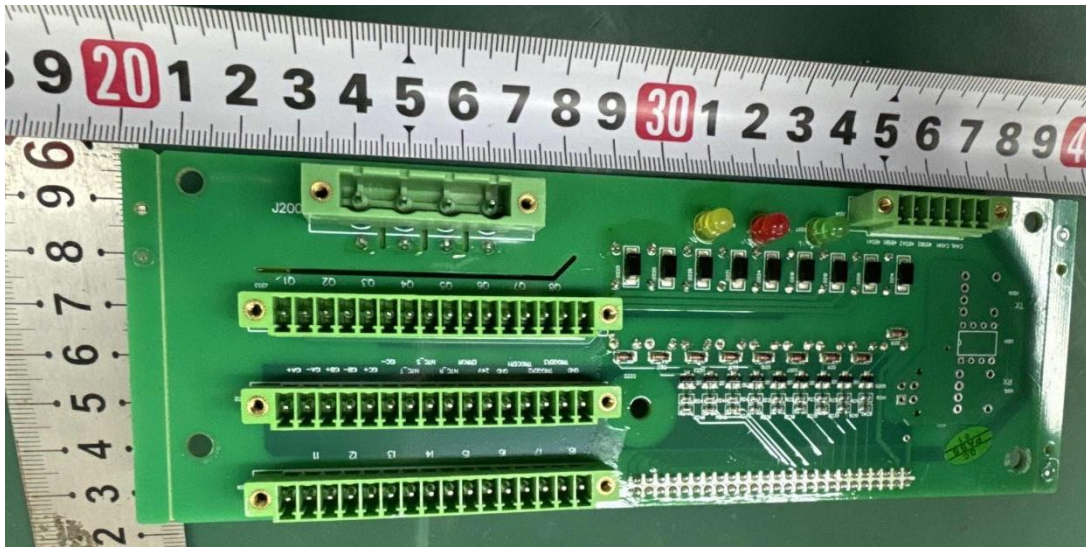


Figure 29 component side of terminal board

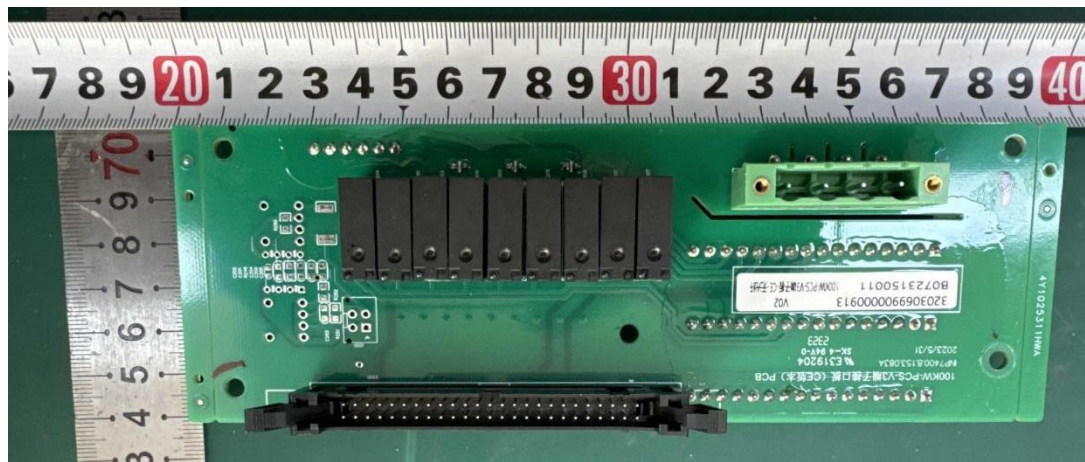


Figure 30 trace side of terminal board

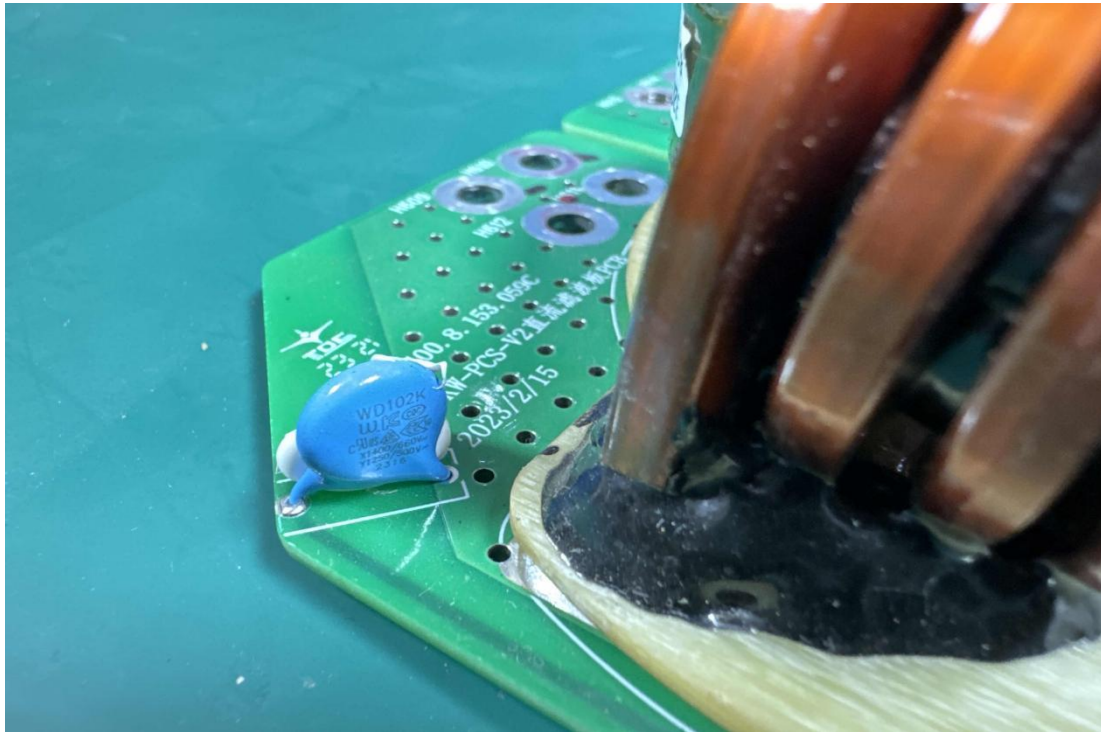


Figure 31 Y capacitor



Figure 32 Fan

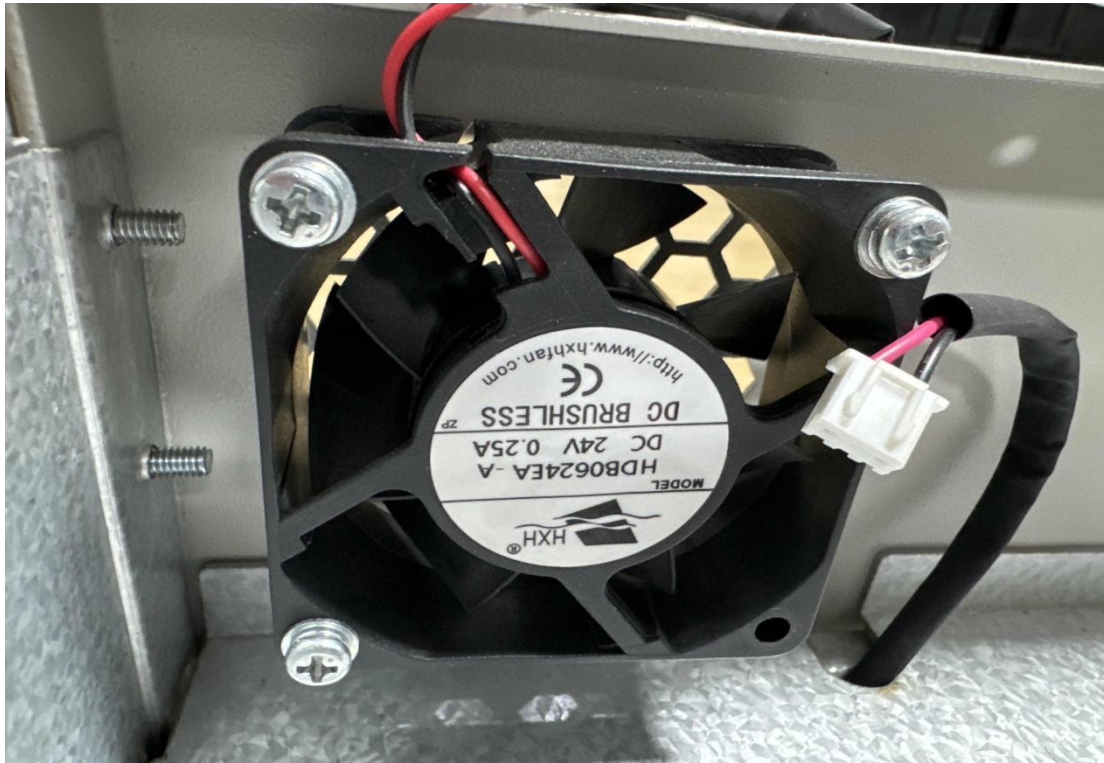


Figure 33 Fan

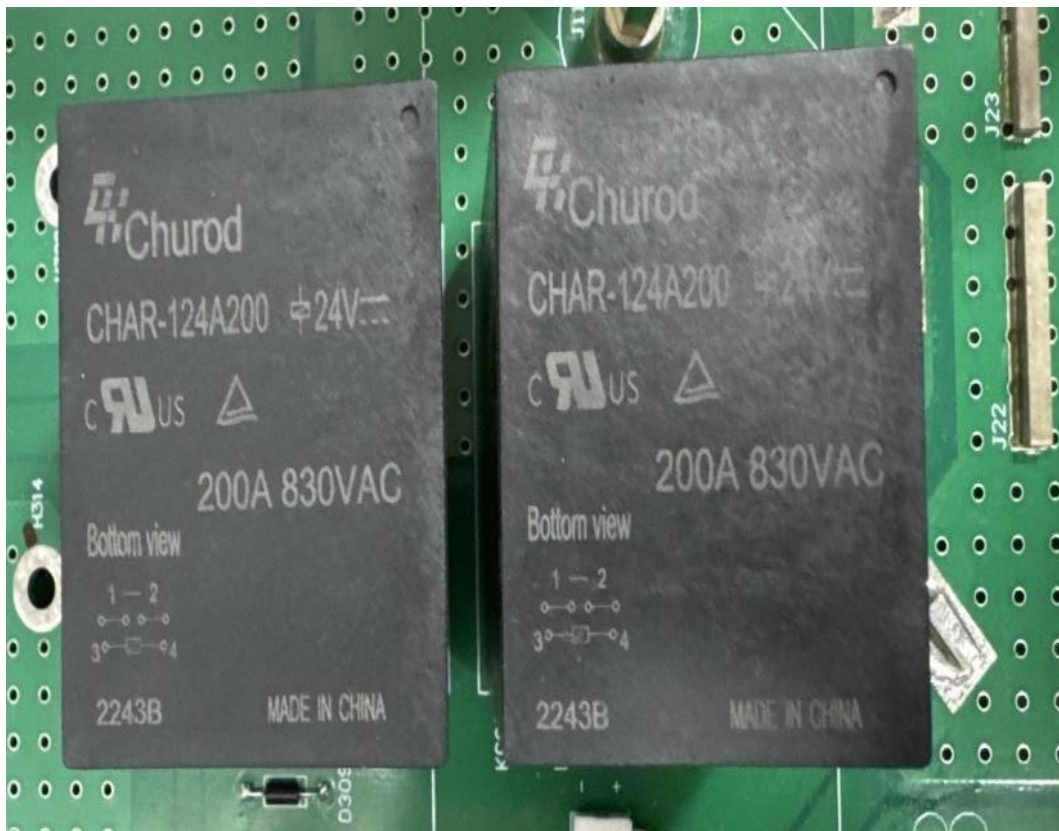


Figure 34 relay



Figure 35 DC contactor



Figure 36 Fuse



Figure 37 SPSCD power

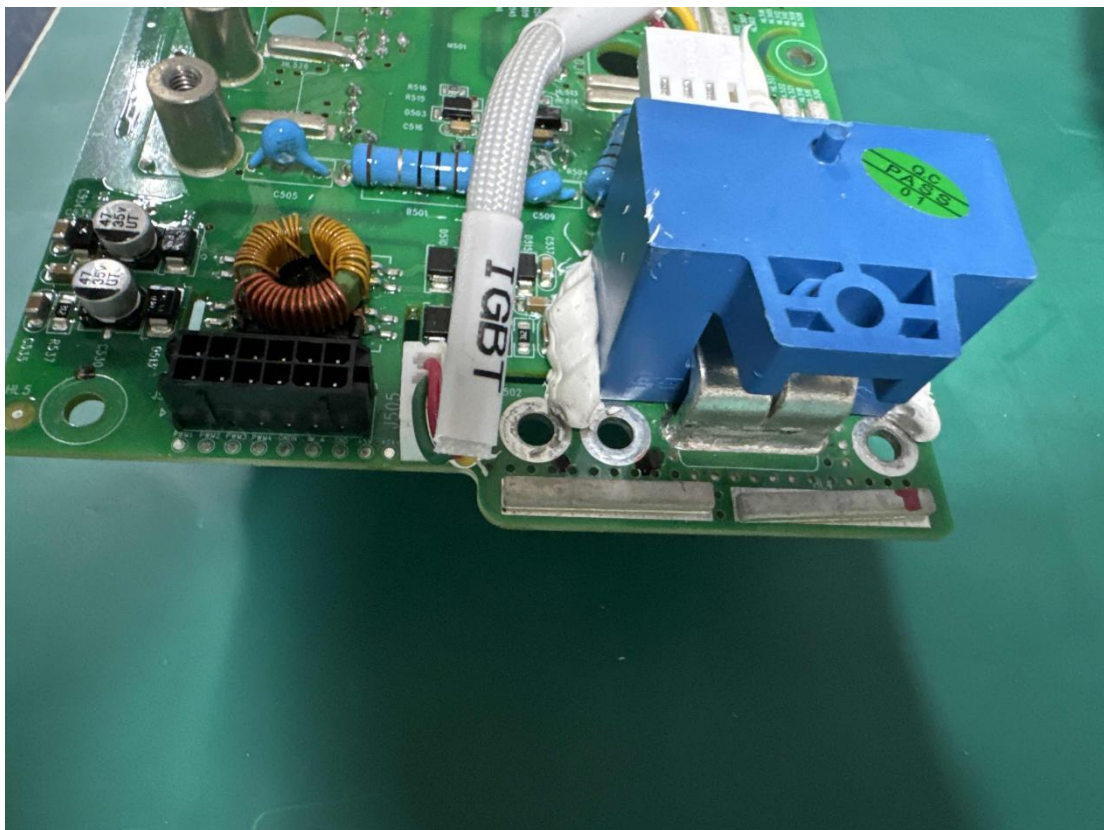


Figure 38 current sensor

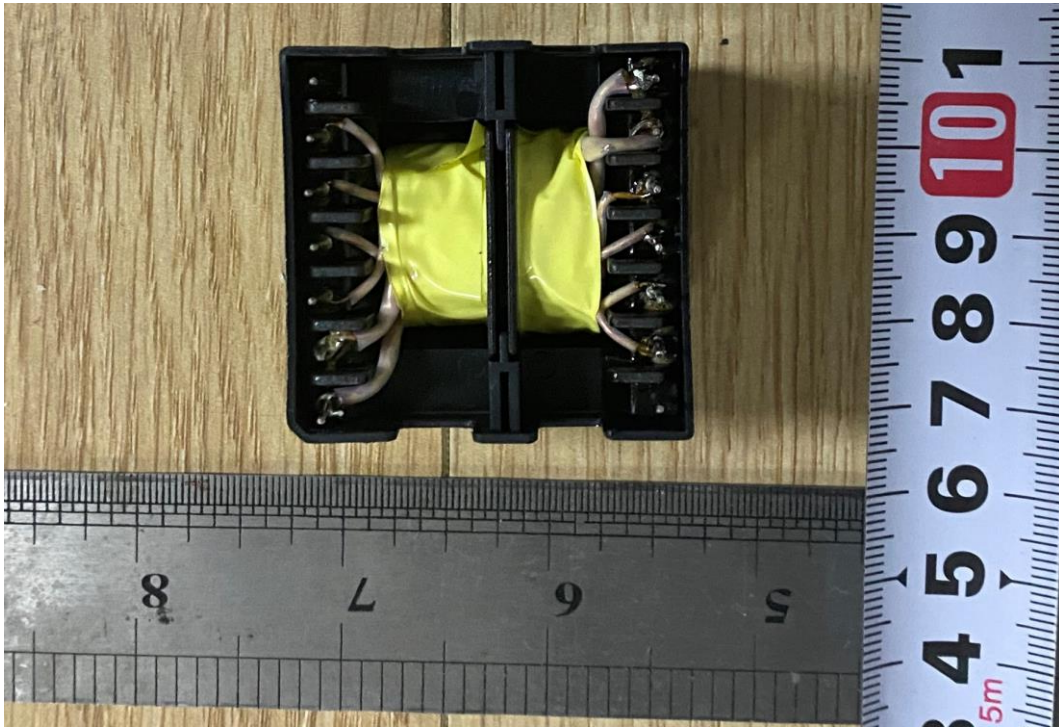


Figure 39 isolation transformer

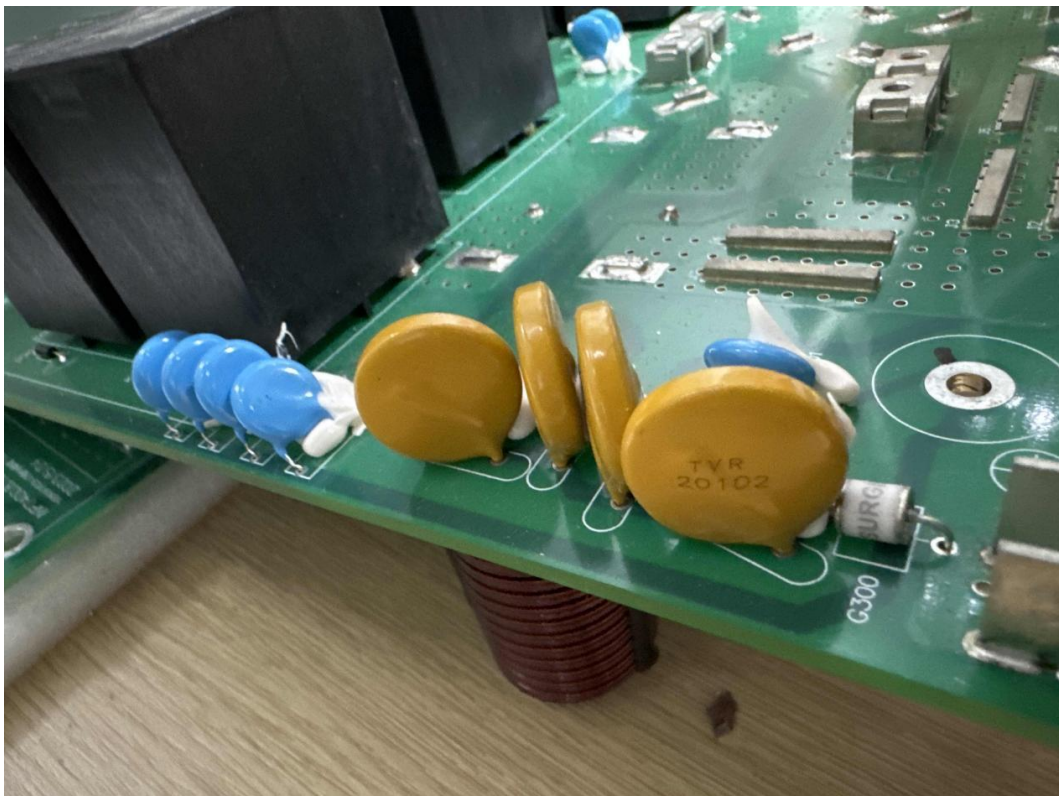


Figure 40 SPD

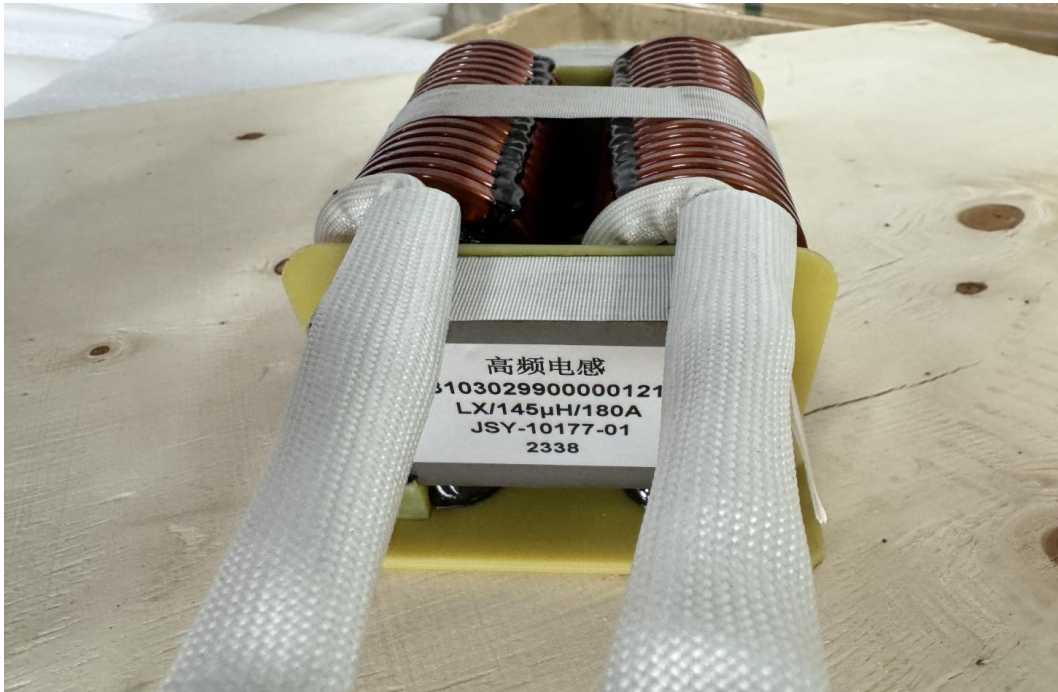


Figure 41 High frequency inductor

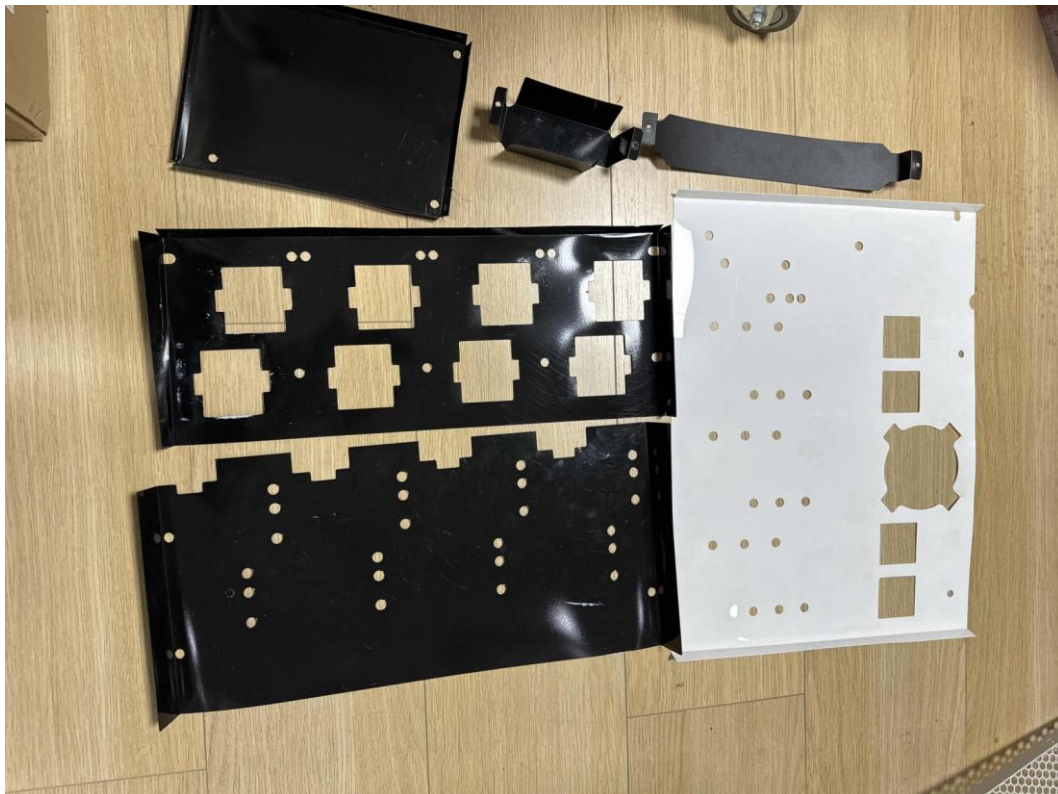


Figure 42 insulation sheets

Report Number: CN24E4X5 001

Model: INPPCS-100/0.4-W-14-C1-OS,
INPPCS-100/0.4-W-24-C1-OS

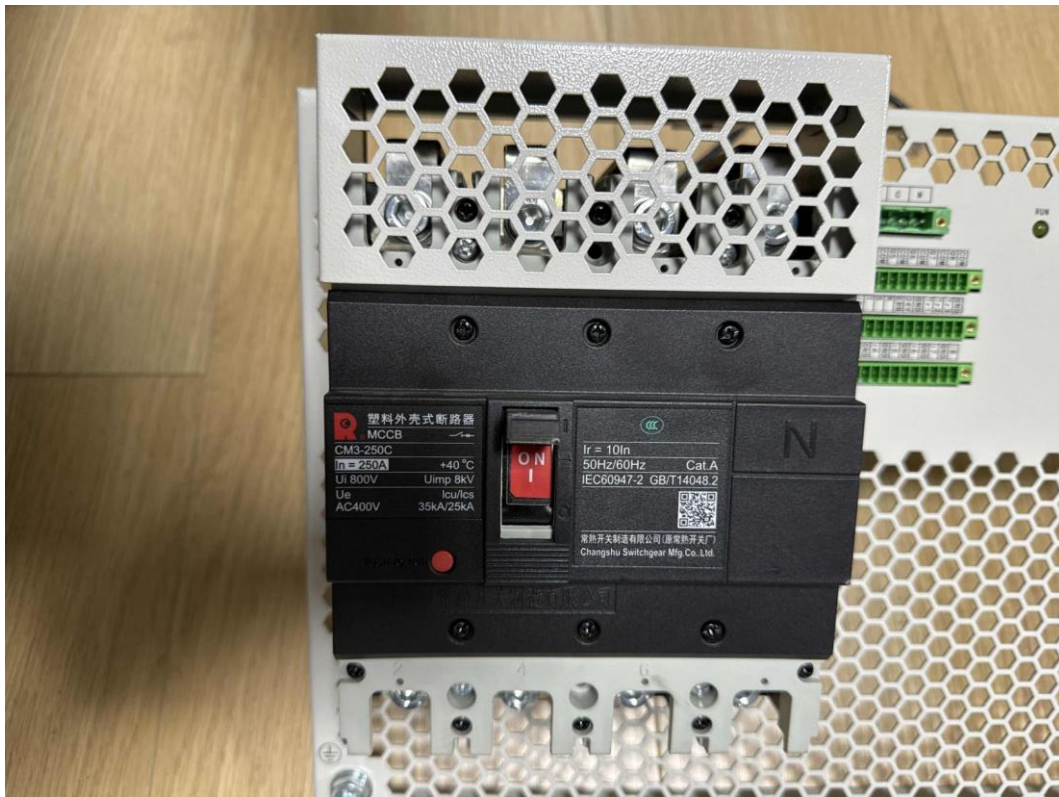


Figure 43 circuit breaker