



TEST REPORT CEI 0-16 Reference technical rules for the connection of active and passive users to the MV networks of electrical distribution companies	
Report	
Report Number..... :	6261248.50
Date of issue..... :	2026-03-16
Total number of pages..... :	324 pages
Testing Laboratory :	DEKRA Testing and Certification (Suzhou) Co., Ltd.
Address..... :	No. 99, Hongye Road, Suzhou Industrial Park Suzhou, 215006, P.R. China
Applicant's name :	Afore New Energy Technology (Shanghai) Co., Ltd.
Address..... :	Building 7, No.333 Wanfang Rd, Minhang District, Shanghai, China
Test specification:	
Standard..... :	CEI 0-16:2022-03+ V1:2022-11+ V2:2023-05+ V3:2024-01+ V4:2025-02+ V5:2025-10
Test procedure..... :	Type test
Non-standard test method..... :	N/A
Test Report Form No. :	CEI 0-16_V2.0
Test Report Form(s) Originator..... :	DEKRA Testing and Certification (Suzhou) Co., Ltd.
Master TRF..... :	Dated 2022-12
Test item description :	Hybrid Inverter
Trade Mark..... :	
Manufacturer..... :	Same as applicant
Model/Type reference..... :	AF36K-TH, AF40K-TH, AF45K-TH, AF50K-TH, AF60K-TH; AF36K-TH-0, AF40K-TH-0, AF45K-TH-0, AF50K-TH-0, AF60K-TH-0;
Ratings..... :	See product marking plate on page 4 and ratings of the test products on page 8 to 10.

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
<input checked="" type="checkbox"/>	Testing Laboratory:	DEKRA Testing and Certification (Suzhou) Co., Ltd.
Testing location/ address		No. 99, Hongye Road, Suzhou Industrial Park Suzhou, 215006, P.R. China
<input type="checkbox"/>	Associated Testing Laboratory:	
Testing location/ address		
Tested by (name, function, signature)		Shine Yan (ENG) <i>Shine Yan</i>
Approved by (name, function, signature) ..		Sandy Qian (REW) <i>Sandy Qian</i>
<hr/>		
<input type="checkbox"/>	Testing procedure: CTF Stage 1:	
Testing location/ address		
Tested by (name, function, signature)		
Approved by (name, function, signature) ..		
<hr/>		
<input type="checkbox"/>	Testing procedure: CTF Stage 2:	
Testing location/ address		
Tested by (name + signature)		
Witnessed by (name, function, signature) ..		
Approved by (name, function, signature) ..		
<hr/>		
<input type="checkbox"/>	Testing procedure: CTF Stage 3:	
<input type="checkbox"/>	Testing procedure: CTF Stage 4:	
Testing location/ address		
Tested by (name, function, signature)		
Witnessed by (name, function, signature) ..		
Approved by (name, function, signature) ..		
Supervised by (name, function, signature) :		

List of Attachments (including a total number of pages in each attachment):	
Annex 1: ISO 9001 certificate (1 pages)	
Annex 2: IEC 62619 Certificate for used battery (1 pages)	
Annex 3: Datasheet of the relay (4 pages)	
Annex 4: Pictures of the unit (4 pages)	
Summary of testing:	
Tests performed (name of test and test clause): All applicable clauses were performed.	Testing location: DEKRA Testing and Certification (Suzhou) Co., Ltd. No.99, Hongye Road, Suzhou Industrial Park, Suzhou, Jiangsu, P.R. China
A.4.6 EMC tests (The EMC test reports provided by the customer)	<ol style="list-style-type: none"> Intertek Testing Services Shanghai Building No.86, 1198 Qinzhou Road (North), Caohejing Development Zone, Shanghai 200233, China Report No.: 2509B0702SHA-001 Accreditation Number: 3309.02 (A2LA-ILAC) Shanghai Inspection and Testing Institute of Instruments and Automation Systems Co., Ltd. No.103, Caobao Road, Xuhui District, Shanghai, China Report No.: J25-376-WT-06 Accreditation Number: L0130 (CNAS-ILAC)

Copy of marking plate
The artwork below may be only a draft.



Model: 36K 40K 45K 50K 60K
AFx-TH

PV Input

Vpv Max (V)	1000				
Vpv MPPT (V)	150-850				
Ipv Max (A)	40x4				
Isc Max (A)	48x4				
Ppv Max (kW)	72	80	90	100	100

Battery

Battery Type	Li-Ion/lead-acid etc.				
Vbat Range (V)	150-800				
Icc/Isc Max (A)	120				
Pcc/Pdc Max (kW)	36	40	45	50	60


AC Grid (input and output)

Vgrid Nom (V)	3P+N+PE/3P+PE 230/400				
fgrid Nom (Hz)	50				
Igrid Cont. (A)	81.9/60.5	91.1/67	102.3/75.5	113.7/83.5	136.5/96
Pgrid Nom (kW)	36	40	45	50	60
Sgrid Cont. (kVA)	54/39.6	60/44	67.5/49.5	75/55	90/66
Power Factor	1 (-0.8~+0.8 adjustable)				

AC Back-up


Vbackup Nom (V)	3P+N+PE/3P+PE 230/400				
fbackup Nom (Hz)	50				
Ibackup Cont. (A)	60.5	67	75.5	83.5	96
Sbackup Cont. (kVA)	36	40	45	50	60
Sbackup Peak (kVA)	39.6 (100%)	44 (100%)	49.5 (100%)	55 (100%)	66 (100%)
Protective Class	I				
IP Degree	IP66				
Operating temperature range	-25~+60°C (Derating 45°C)				

S/N
HT1370-01



RoHS

+86-21-54326236	+86-21-54326136	Afore New Energy Technology (Shanghai) Co., Ltd.
www.aforeenergy.com	info@aforeenergy.com	Building 7, No.333 Wanfang Rd, Minhang District, Shanghai, China. 201112



Model: 36K 40K 45K 50K 60K
AFx-TH-0

Battery

Battery Type	Li-Ion/lead-acid etc.				
Vbat Range (V)	150-800				
Icc/Isc Max (A)	120				
Pcc/Pdc Max (kW)	36/39.6	40/44	45/49.5	50/55	60/66


AC Grid (input and output)

Vgrid Nom (V)	3P+N+PE/3P+PE 230/400				
fgrid Nom (Hz)	50				
Igrid Cont. (A)	81.9/60.5	91.1/67	102.3/75.5	113.7/83.5	136.5/96
Pgrid Nom (kW)	36	40	45	50	60
Sgrid Cont. (kVA)	54/36	60/40	67.5/45	75/50	90/60
Power Factor	1 (-0.8~+0.8 adjustable)				

AC Back-up

Vbackup Nom (V)	3P+N+PE/3P+PE 230/400				
fbackup Nom (Hz)	50				
Ibackup Cont. (A)	60.5	67	75.5	83.5	96
Sbackup Cont. (kVA)	36	40	45	50	60
Sbackup Peak (kVA)	39.6 (100%)	44 (100%)	49.5 (100%)	55 (100%)	66 (100%)
Protective Class	I				
IP Degree	IP66				
Operating temperature range	-25~+60°C (Derating 45°C)				

S/N
HT1303-01



RoHS

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Warning Label:

WARNING

**Hot surfaces**

To reduce the risk of burns. Do not touch.

**Risk of electric shock**

Both AC and DC voltage sources are terminated inside this equipment. Each circuit must be individually disconnected before servicing and when the photovoltaic array is exposed to light, it supplies a DC voltage to this equipment.



Risk of electric shock from energy stored in capacitor. Do not remove cover until 5 minutes after disconnecting all sources of supply.



Risk of electric shock, do not remove cover. No user serviceable parts inside. Refer servicing to qualified service personnel.

**Check user manual before service**

Refer to the operation instruction.

**NO warranty for disassembled inverter**

Warranty doesn't provide for the inverter disassembled by non-authorized staff.

**WARNING:****POWER FED FROM MORE THAN ONE SOURCE**

For continued protection against risk of fire, replace only with same type and ratings of fuse.

Remark: According to customer's requirement, these models were evaluated under the grid frequency of 50 Hz.

Test item particulars:				
Equipment mobility	movable <u>fixed</u>	hand-held transportable	stationary for building-in	
Connection to the mains	pluggable equipment <u>permanent connection</u>		direct plug-in for building-in	
Environmental category	outdoor	indoor unconditional	<u>indoor</u> <u>conditional</u>	
Over voltage category Mains	OVC I	OVC II	<u>OVC III</u>	OVC IV
Over voltage category PV	OVC I	<u>OVC II</u>	OVC III	OVC IV
Mains supply tolerance (%).....	-90 / +110			
Tested for power systems	TN			
IT testing, phase-phase voltage (V).....	N/A			
Class of equipment.....	<u>Class I</u> Not classified	Class II	Class III	
Mass of equipment (kg)	81 kg			
Pollution degree	Outside PD3; Inside PD2			
IP protection class	IP66			
Possible test case verdicts:				
- test case does not apply to the test object	N/A			
- test object does meet the requirement.....	P (Pass)			
- test object does not meet the requirement	F (Fail)			
- this clause is information reference for installation.....	Info.			
Testing:				
Date of receipt of test item	2025-12-30 (samples provided by applicant)			
Date (s) of performance of tests	2025-12-31 to 2026-02-11			
General remarks:				
The test results presented in this report relate only to the object tested.				
This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.				
"(see Enclosure #)" refers to additional information appended to the report.				
"(see appended table)" refers to a table appended to the report.				
Use of uncertainty of measurement for decisions on conformity (decision rule):				
No decision rule is specified by this standard, when comparing the measurement result with the applicable limit according to the specification in that standard. The decisions on conformity are made without applying the measurement uncertainty ("simple acceptance" decision rule, previously known as "accuracy method").				
Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.				
Determination of the test result includes consideration of measurement uncertainty from the test equipment and methods.				
Name and address of factory (ies):				
Afore New Energy Technology (Shanghai) Co., Ltd.				
Building 7, No.333 Wanfang Rd, Minhang District, Shanghai, China				

General product information:

The products under test are three-phase storage inverter that convert DC voltage into AC voltage and feed it into the low-voltage public grid or store energy into battery.

The input and output are protected by varistors to earth. The unit is providing EMC filtering at the input and output towards mains. The output is switched off redundant by the high-power switching bridge and two relay in series. This assures that the opening of the output circuit will also operate in case of one error.

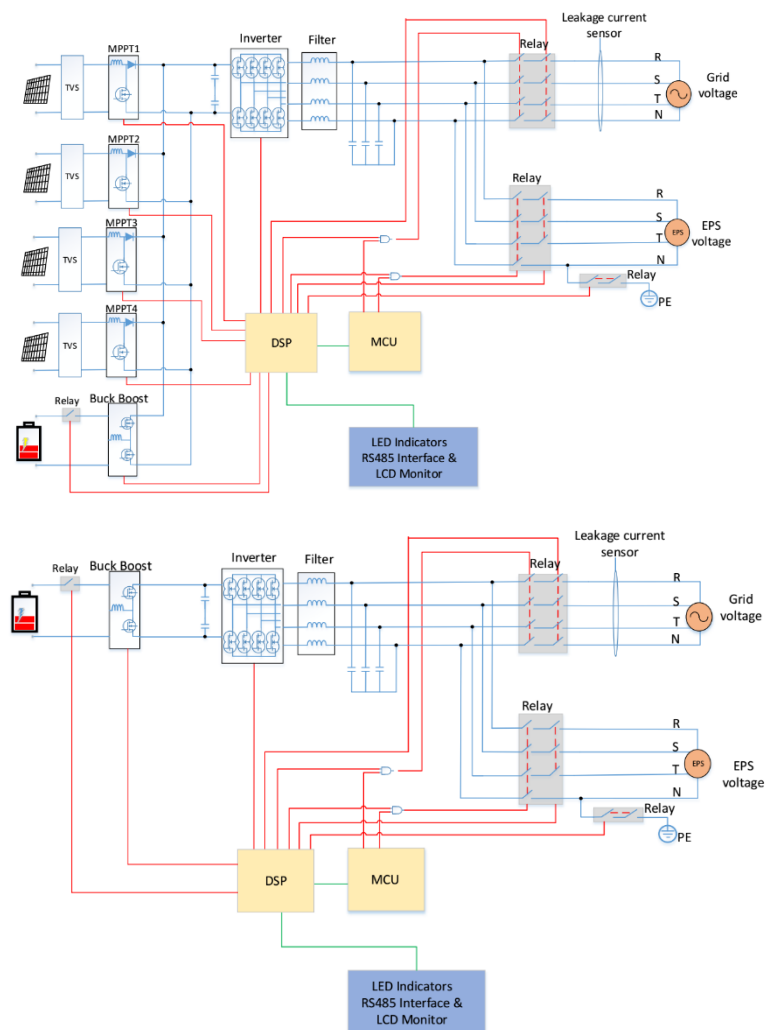
The battery port can be charged by the energy from either PV port or AC grid port. The storage inverter does not provide galvanic separation between the PV input and AC output circuit, the battery circuit also does not provide galvanic separation from the PV input or AC output circuit. The storage inverter also can operate under standalone mode beside the grid-connected mode.

Model difference:

All models are identical with hardware version and software version, the output power is derating by software. And differences between models are output rating, PV input string number and PV switch.

AF*-TH-0 (*=36K, 40K, 45K, 50K, 60K) have no PV and PV switch.

Model AF*-TH (*=36K, 40K, 45K, 50K, 60K) have 4 MPPT trackers with 8 input strings and 2 PV switches.

Block diagram

Model	AF36K-TH	AF40K-TH	AF45K-TH	AF50K-TH	AF60K-TH
PV input					
P pv Max (kW)	72	80	90	100	100
Vmax PV (Vdc) (absolute Max.)	1000				
Isc PV (absolute Max.) (A)	48*4				
Number MPP trackers	4				
Number input strings	2/2/2/2				
Max. PV input current (A)	40*4				
MPPT voltage range (Vdc)	150-850				
Vdc range @ full power (Vdc)	500-850				
Battery (charge/discharge)					
Battery type	Rechargeable Li-ion Battery/ LiFePO4/ Lead-acid				
Battery Normal Voltage Range (Vdc)	150-800 (Field adapt battery voltage range)				
Max charge/discharge Current(A)	120				
Max charge/discharge Power(kW)	36	40	45	50	60
AC Grid (input and output)					
Normal AC Voltage (Vac)	3P+N+PE/3P+PE 230/400				
Frequency (Hz)	50 / 60				
Normal AC Current (A)	52.2	58	65.3	72.5	87
Max. cont. input/output current (A)	81.9 / 60.5	91.1 / 67	102.3 / 75.5	113.7 / 83.5	136.5 / 96
Rated Power (kW)	36	40	45	50	60
Rated Apparent Power (kVA)	36	40	45	50	60
Max. cont. input/output Power (kW)	54 / 39.6	60 / 44	67.5 / 49.5	75 / 55	90 / 66
Max. cont. Apparent input/output Power (kVA)	54 / 39.6	60 / 44	67.5 / 49.5	75 / 55	90 / 66
Power factor(adjustable)	1.0(-0.8~ +0.8)				
AC Load output (stand-alone)					
Normal Voltage (Vac)	3P+N+PE/3P+PE 230/400				
Frequency (Hz)	50 / 60				
Nominal Current (A)	52.2	58	65.3	72.5	87
Max. cont. current (A)	60.5	67	75.5	83.5	96
Rated Apparent Power (kVA)	36	40	45	50	60
Max. cont. Power (kW)	36	40	45	50	60
Max. cont. Apparent Power (kVA)	36	40	45	50	60
Power factor	1.0				
Others					
Ingress protection (IP)	IP66				
Protective class	Class I				
Temperature (°C)	-25°C to +60°C (Derating 45°C)				
Inverter Isolation	Non-isolated (PV - AC - BAT)				
Overvoltage category	OVC III (AC Main), OVC II (DC)				

Model	AF36K-TH-0	AF40K-TH-0	AF45K-TH-0	AF50K-TH-0	AF60K-TH-0
Battery (charge/discharge)					
Battery type	Rechargeable Li-ion Battery/ LiFePO4/ Lead-acid				
Battery Normal Voltage Range (Vdc)	150-800 (Field adapt battery voltage range)				
Max charge/discharge Current(A)	120				
Max charge/discharge Power(kW)	36 / 39.6	40 / 44	45 / 49.5	50 / 55	60 / 66
AC Grid (input and output)					
Normal AC Voltage (Vac)	3P+N+PE/3P+PE 230/400				
Frequency (Hz)	50 / 60				
Normal AC Current (A)	52.2	58	65.3	72.5	87
Max. cont. input/output current (A)	81.9 / 60.5	91.1 / 67	102.3 / 75.5	113.7 / 83.5	136.5 / 96
Rated Power (kW)	36	40	45	50	60
Rated Apparent Power (kVA)	36	40	45	50	60
Max. cont. input/output Power (kW)	54 / 36	60 / 40	67.5 / 45	75 / 50	90 / 60
Max. cont. Apparent input/output Power (kVA)	54 / 36	60 / 40	67.5 / 45	75 / 50	90 / 60
Power factor(adjustable)	1.0(-0.8~ +0.8)				
AC Load output (stand-alone)					
Normal Voltage (Vac)	3P+N+PE/3P+PE 230/400				
Frequency (Hz)	50 / 60				
Nominal Current (A)	52.2	58	65.3	72.5	87
Max. cont. current (A)	60.5	67	75.5	83.5	96
Rated Apparent Power (kVA)	36	40	45	50	60
Max. cont. Power (kW)	36	40	45	50	60
Max. cont. Apparent Power (kVA)	36	40	45	50	60
Power factor	1.0				
Others					
Ingress protection (IP)	IP66				
Protective class	Class I				
Temperature (°C)	-25°C to +60°C (Derating 45°C)				
Inverter Isolation	Non-isolated (AC - BAT)				
Overvoltage category	OVC III (AC Main), OVC II (DC)				

The battery used for testing with the Hybrid Inverter covered by this certificate:*La batteria utilizzata per i test con l'invertitore ibrido coperto dal presente certificato:*

Manufacturer	Shenzhen Hailei New Energy Co., Ltd		
Battery Models	ATOM HS-15.36	ATOM HS-20.48	ATOM HS-25.6
Number of battery module in serials	3	4	5
Nominal Voltage	153.6 V	204.8 V	256.0 V
Nominal capacity	100 Ah		
Battery System Capacity	15.36 kWh	20.48 kWh	25.60 kWh
Battery Models	ATOM HS-30.72	ATOM HS-35.84	ATOM HS-40.96
Number of battery module in serials	6	7	8
Nominal Voltage	307.2 V	358.4 V	409.6 V
Nominal capacity	100 Ah		
Battery System Capacity	30.72 kWh	35.84 kWh	40.96 kWh
Remark: The CB test certificate No. of the battery: NL-114519 When the batteries are connected in parallel, the charge/ discharge current is superimposed and is limited by the maximum current of the battery port of the Hybrid Inverter. The batteries are not integrated into the Hybrid Inverter and must be installed according to the local regulations.			

Type of generating unit:

Tipologia di apparato:

Static Conversion Device <i>Dispositivo di conversione statica</i>	Interface Protection <i>Protezione di interfaccia</i>	Interface Protection Device <i>Dispositivo di interfaccia</i>	Rotating Generator Device <i>Dispositivo di generazione rotante</i>
Yes/Sì	No	No	No

Firmware: 1.03

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict
Clause	Test	Summary (P/F/N/Retest)	Checked
N.x	<i>per i generatori static e generatori eolici</i> (For static and wind generators)		<input checked="" type="checkbox"/>
N.3	<i>Misure per la qualità della tensione</i> (Measurement for voltage quality)		
N.3.1	<i>Misura di correnti armoniche</i> (Measurement for harmonics current according to IEC 61400-21, Clause 7.4)	P	<input checked="" type="checkbox"/>
N.3.2	<i>Misura di fluttuazioni di tensione dovute a manovre di sezionamento/separazione</i> (Measurement of voltage fluctuations caused by switching operations according to IEC 61400-21, Clause 7.3.4)	P	<input checked="" type="checkbox"/>
N.3.3	<i>Misura di fluttuazioni di tensione (flicker) in condizioni di funzionamento continuo</i> (Voltage fluctuations (Flickers) during continuous operation according to IEC 61400-21, Clause 6.3.2 and 7.3.3)	P	<input checked="" type="checkbox"/>
N.4	<i>Verifica del campo di funzionamento in tensione e frequenza</i> (Verification of the operating range in voltage and frequency)	P	<input checked="" type="checkbox"/>
N.5	<i>Verifica delle condizioni di sincronizzazione e presa di carico</i> (Synchronization and reconnection)	P	<input checked="" type="checkbox"/>
N.6	<i>Verifica dei requisiti costruttivi circa lo scambio di potenza reattiva</i> (Verification of the construction requirements regarding exchange of reactive power)		
N.6.1	<i>Verifica della capability di erogazione della potenza reattiva</i> (Verification of the reactive power capability)	P	<input checked="" type="checkbox"/>
N.6.2	<i>Scambio di potenza reattiva secondo un livello assegnato</i> (Exchange of reactive power according to an assigned level)		
N.6.2.1	<i>Modalità di esecuzione della prova e registrazione dei risultati applicabile a generatori statici (ipotesi di regolazione tramite Q)</i> (Method of carrying out the test and recording of the results applicable to static generators (hypothesis of regulation via Q))	P	<input checked="" type="checkbox"/>
N.6.2.3	<i>Tempo di risposta ad una variazione a gradino del livello assegnato</i> (Time response to a step change in the level assigned)	P	<input checked="" type="checkbox"/>
N.6.3	<i>Regolazione automatica di potenza reattiva secondo una curva caratteristica $\cos\varphi = f(P)$</i> (Automatic adjustment of reactive power according to the characteristic curve $\cos\varphi (P)$)	P	<input checked="" type="checkbox"/>
N.6.4	<i>Erogazione/assorbimento automatico di potenza reattiva secondo una curva caratteristica $Q=f(V)$</i> (Automatic absorption of reactive power according to the characteristic curve $Q(U)$)	P	<input checked="" type="checkbox"/>
N.7	<i>Verifica dei requisiti costruttivi circa la regolazione di potenza attiva</i> (Verification of the construction requirements regarding the regulation of active power)		
N.7.1	<i>Limitazione automatica in logica locale, per valori di tensione prossimi al 110% U_n</i> (Active power limitation for voltage values near to 110% U_n (characteristic curve $P(U)$))	P	<input checked="" type="checkbox"/>

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict
Clause	Test	Summary (P/F/N/Retest)	Checked
N.7.2	<i>Limitazione automatica per transitori di sovrافrequenza originatisi sulla rete (secondo quanto stabilito in 8.8.6.4.2 ed in Allegato J (par. J.3))</i> (Automatic limitation for over-frequency transients (LFSM-O) originating on the network (as established in 8.8.6.4.2 and in Annex J (par. J.3)))	P	<input checked="" type="checkbox"/>
N.7.3	<i>Incremento automatico per transitori di sottofrequenza originatisi sulla rete (secondo quanto stabilito in 8.8.6.4.3 ed in Allegato K)</i> Automatic increase for under-frequency transients originating on the network (as established in 8.8.6.4.3 and in Annex K)	P	<input checked="" type="checkbox"/>
N.7.4	<i>Verifica della limitazione della potenza attiva su comando esterno proveniente dal Distributore</i> (Verification of the active power limitation with external command from the Distributor)	P	<input checked="" type="checkbox"/>
N.7.4.1	<i>Verifica del tempo di assestamento ad un comando di riduzione di Potenza</i> (Verification of the settling time at a power reduction command)	P	<input checked="" type="checkbox"/>
N.8	<i>Verifica della insensibilità alle variazioni di tensione (VFRT capability)</i> (Verification of insensitivity to voltage variations (VFRT capability))	P	<input checked="" type="checkbox"/>
N.9	<i>Verifica della insensibilità alle richiuse automatiche in discordanza di fase</i> (Verification of insensitivity to mismatch in phase automatic reclosing)	P	<input checked="" type="checkbox"/>

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict
Clause	Test	Summary (P/F/N/Retest)	Checked
Nbis.x	per sistemi di accumulo (Le prescrizione del presente allegato si applicano anche qualora i sistemi di accumulo condividano il convertitore di accoppiamento alla rete con un generatore statico (tipicamente FV)) (for storage systems (The requirements of this annex also apply if the storage systems share the grid coupling converter with a static generator (typically PV)))		<input checked="" type="checkbox"/>
Nbis.3	Misure per la qualità della tensione (Measurement for voltage quality)		
Nbis.3.1	Misura di correnti armoniche (Measurement for harmonics current according to IEC 61400-21, Clause 7.4)		<input checked="" type="checkbox"/>
Nbis.3.2	Misura di fluttuazioni di tensione dovute a manovre di sezionamento/separazione (Measurement of voltage fluctuations caused by switching operations according to IEC 61400-21, Clause 7.3.4)		<input checked="" type="checkbox"/>
Nbis.3.3	Misura di fluttuazioni di tensione (flicker) in condizioni di funzionamento continuo (Voltage fluctuations (Flickers) during continuous operation according to IEC 61400-21, Clause 6.3.2 and 7.3.3)		<input checked="" type="checkbox"/>
Nbis.4	Verifica del campo di funzionamento in tensione e frequenza (Verification of the operating range in voltage and frequency)		<input checked="" type="checkbox"/>
Nbis.5	Verifica delle condizioni di sincronizzazione e presa di carico (Synchronization and reconnection)		
Nbis.5.1	Verifica delle condizioni di sincronizzazione (Check the synchronization conditions)		<input checked="" type="checkbox"/>
Nbis.5.2	Verifica della erogazione graduale della potenza attiva (presa di carico) (Verification of gradient supply of active power)		<input checked="" type="checkbox"/>
Nbis.6	Verifica dei requisiti costruttivi circa lo scambio di potenza reattiva (Verification of the construction requirements regarding exchange of reactive power)		
Nbis.6.1	Verifica della capability di erogazione della potenza reattiva (Verification of the reactive power capability)		<input checked="" type="checkbox"/>
Nbis.6.4	Modalità di esecuzione della prova e registrazione dei risultati applicabile a generatori statici (ipotesi di regolazione tramite Q) (Method of carrying out the test and recording of the results applicable to static generators (hypothesis of regulation via Q))		<input checked="" type="checkbox"/>
Nbis.6.5	Tempo di risposta ad una variazione a gradino del livello assegnato (Time response to a step change in the level assigned)		<input checked="" type="checkbox"/>
Nbis.6.6	Regolazione automatica di potenza reattiva secondo una curva caratteristica $\cos\phi = f(P)$ (Automatic adjustment of reactive power according to the characteristic curve $\cos\phi (P)$)		<input checked="" type="checkbox"/>
Nbis.6.8	Erogazione/assorbimento automatico di potenza reattiva secondo una curva caratteristica $Q=f(V)$ (Automatic absorption of reactive power according to the characteristic curve $Q(U)$)		<input checked="" type="checkbox"/>

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict
Clause	Test	Summary (P/F/N/Retest)	Checked
Nbis.7	Verifica dei requisiti costruttivi circa la regolazione di potenza attiva (Verification of the construction requirements regarding the regulation of active power)		
Nbis.7.1	Limitazione automatica in logica locale, per valori di tensione prossimi al 110% (Active power limitation for voltage values near to 110%Un (characteristic curve P(U)))		<input checked="" type="checkbox"/>
Nbis.7.2	Limitazione automatica per transitori di sovrافrequenza originatisi sulla rete (secondo quanto stabilito in 8.8.6.4.2 ed in Allegato J (par. J.3)) (Automatic limitation for over-frequency transients (LFSM-O) originating on the network (as established in 8.8.6.4.2 and in Annex J (par. J.3)))		<input checked="" type="checkbox"/>
Nbis.7.3	Incremento automatico per transitori di sottofrequenza originatisi sulla rete (secondo quanto stabilito in 8.8.6.4.3 ed in Allegato K) Automatic increase for under-frequency transients (LFSM-U) originating on the network (as established in 8.8.6.4.3 and in Annex K)		<input checked="" type="checkbox"/>
Nbis.7.4	Verifica della limitazione della potenza attiva su comando esterno proveniente dal Distributore (Verification of the active power limitation with external command from the Distributor)		<input checked="" type="checkbox"/>
Nbis.7.4.1	Verifica del tempo di assestamento ad un comando di riduzione di Potenza (Verification of the settling time at a power reduction command)		<input checked="" type="checkbox"/>
Nbis.8	Verifica della insensibilità alle variazioni di tensione (VFRT capability) (Verification of insensitivity to voltage variations (VFRT capability))		<input checked="" type="checkbox"/>
Nbis.9	Verifica della insensibilità alle richiuse automatiche in discordanza di fase (Verification of insensitivity to mismatch in phase automatic reclosing)		<input checked="" type="checkbox"/>

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

N.3.1	Tabella: Misura di correnti armoniche Table: Measurement for harmonics current according to IEC 61400-21, Clause 7.4										P
Model	AF60K-TH										
Reference standard: Each phase output current > 75A, The harmonic currents are measured per EN 61000-4-7.											
Harmonics - L1											
Active power P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100
Harmonic number	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
2	0.069	0.132	0.260	0.382	0.485	0.587	0.674	0.760	0.866	0.940	0.976
3	0.472	0.198	0.360	0.500	0.637	0.755	0.880	0.997	1.103	1.214	1.438
4	0.037	0.025	0.044	0.064	0.085	0.108	0.139	0.170	0.196	0.255	0.298
5	0.435	0.077	0.149	0.213	0.260	0.298	0.314	0.326	0.339	0.294	0.284
6	0.035	0.024	0.044	0.062	0.074	0.081	0.086	0.088	0.091	0.085	0.087
7	0.296	0.065	0.120	0.166	0.207	0.245	0.275	0.301	0.332	0.325	0.311
8	0.025	0.013	0.027	0.040	0.049	0.055	0.059	0.061	0.063	0.051	0.037
9	0.118	0.022	0.041	0.055	0.068	0.078	0.089	0.099	0.107	0.128	0.175
10	0.022	0.016	0.025	0.026	0.022	0.018	0.021	0.030	0.041	0.057	0.068
11	0.154	0.048	0.088	0.119	0.144	0.160	0.173	0.185	0.194	0.202	0.213
12	0.012	0.024	0.039	0.046	0.042	0.035	0.028	0.025	0.032	0.048	0.053
13	0.161	0.020	0.046	0.072	0.087	0.096	0.101	0.107	0.113	0.118	0.139
14	0.023	0.017	0.033	0.043	0.045	0.043	0.035	0.025	0.020	0.029	0.046
15	0.035	0.012	0.016	0.013	0.011	0.007	0.007	0.011	0.017	0.020	0.011
16	0.012	0.009	0.020	0.036	0.055	0.067	0.075	0.080	0.081	0.064	0.046
17	0.056	0.018	0.013	0.028	0.063	0.099	0.128	0.146	0.158	0.137	0.108
18	0.031	0.013	0.021	0.037	0.058	0.075	0.089	0.096	0.098	0.082	0.078
19	0.084	0.010	0.009	0.009	0.033	0.061	0.089	0.111	0.125	0.125	0.118
20	0.022	0.014	0.020	0.021	0.032	0.049	0.067	0.082	0.090	0.076	0.066
21	0.014	0.007	0.011	0.022	0.029	0.033	0.033	0.033	0.030	0.021	0.017
22	0.012	0.005	0.015	0.022	0.022	0.017	0.021	0.034	0.047	0.058	0.067
23	0.032	0.003	0.020	0.037	0.043	0.034	0.026	0.037	0.058	0.088	0.105
24	0.023	0.003	0.015	0.030	0.034	0.028	0.020	0.023	0.035	0.052	0.060
25	0.028	0.001	0.012	0.023	0.028	0.025	0.017	0.019	0.037	0.072	0.082
26	0.019	0.011	0.010	0.021	0.033	0.036	0.029	0.020	0.020	0.040	0.051
27	0.018	0.014	0.028	0.031	0.025	0.022	0.024	0.027	0.027	0.014	0.012
28	0.012	0.006	0.010	0.006	0.011	0.018	0.021	0.020	0.017	0.020	0.031
29	0.010	0.016	0.027	0.028	0.036	0.049	0.057	0.055	0.048	0.035	0.048
30	0.013	0.007	0.024	0.026	0.020	0.018	0.023	0.022	0.018	0.024	0.037
31	0.007	0.009	0.012	0.006	0.007	0.018	0.027	0.034	0.038	0.039	0.035
32	0.008	0.010	0.026	0.033	0.033	0.037	0.047	0.054	0.052	0.020	0.006
33	0.012	0.008	0.018	0.023	0.026	0.028	0.033	0.036	0.039	0.032	0.032
34	0.009	0.003	0.008	0.019	0.023	0.020	0.016	0.016	0.018	0.025	0.024
35	0.004	0.006	0.017	0.021	0.020	0.022	0.036	0.055	0.070	0.083	0.075
36	0.008	0.003	0.008	0.021	0.030	0.030	0.030	0.036	0.043	0.036	0.026
37	0.003	0.005	0.010	0.018	0.021	0.020	0.018	0.019	0.023	0.030	0.035
38	0.003	0.004	0.002	0.016	0.029	0.031	0.024	0.021	0.027	0.042	0.048
39	0.014	0.004	0.006	0.015	0.019	0.018	0.015	0.016	0.022	0.035	0.045
40	0.008	0.004	0.007	0.009	0.018	0.026	0.028	0.024	0.022	0.025	0.034
41	0.003	0.006	0.005	0.011	0.016	0.019	0.019	0.020	0.025	0.037	0.042

CEI 0-16											
Clause	Requirement - Test						Result - Remark				Verdict
42	0.004	0.004	0.007	0.007	0.016	0.027	0.031	0.031	0.029	0.032	0.029
43	0.004	0.006	0.011	0.012	0.016	0.021	0.025	0.027	0.028	0.022	0.015
44	0.004	0.002	0.008	0.010	0.007	0.019	0.032	0.035	0.029	0.022	0.026
45	0.015	0.003	0.008	0.007	0.011	0.017	0.019	0.018	0.015	0.010	0.012
46	0.006	0.003	0.007	0.013	0.014	0.017	0.027	0.034	0.033	0.023	0.019
47	0.006	0.003	0.008	0.008	0.006	0.010	0.014	0.019	0.021	0.019	0.023
48	0.004	0.004	0.007	0.012	0.012	0.010	0.019	0.027	0.029	0.021	0.025
49	0.006	0.004	0.010	0.015	0.016	0.017	0.019	0.022	0.024	0.022	0.023
50	0.005	0.003	0.004	0.009	0.017	0.016	0.015	0.026	0.034	0.024	0.017

Intern-harmonics - L1											
Active power P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100
Frequency [Hz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
75	0.005	0.003	0.006	0.008	0.012	0.013	0.016	0.016	0.020	0.026	0.029
125	0.006	0.006	0.014	0.022	0.029	0.030	0.029	0.031	0.064	0.078	0.068
175	0.005	0.002	0.003	0.004	0.006	0.006	0.008	0.008	0.010	0.013	0.014
225	0.009	0.003	0.004	0.006	0.008	0.009	0.010	0.011	0.013	0.014	0.016
275	0.005	0.001	0.003	0.004	0.005	0.006	0.006	0.007	0.009	0.010	0.012
325	0.005	0.001	0.003	0.004	0.005	0.006	0.006	0.007	0.008	0.010	0.011
375	0.005	0.001	0.003	0.003	0.004	0.005	0.006	0.007	0.008	0.009	0.010
425	0.007	0.002	0.004	0.005	0.006	0.007	0.008	0.009	0.011	0.011	0.013
475	0.005	0.001	0.003	0.004	0.004	0.005	0.006	0.006	0.007	0.008	0.010
525	0.005	0.001	0.003	0.004	0.004	0.005	0.006	0.007	0.007	0.008	0.009
575	0.005	0.001	0.003	0.004	0.004	0.005	0.005	0.006	0.007	0.008	0.009
625	0.006	0.002	0.003	0.004	0.005	0.005	0.006	0.007	0.008	0.009	0.010
675	0.005	0.001	0.003	0.003	0.004	0.005	0.005	0.006	0.007	0.007	0.009
725	0.005	0.001	0.003	0.003	0.004	0.005	0.005	0.006	0.007	0.008	0.009
775	0.004	0.001	0.002	0.003	0.004	0.005	0.005	0.006	0.007	0.008	0.009
825	0.004	0.001	0.002	0.003	0.004	0.005	0.005	0.006	0.007	0.007	0.009
875	0.004	0.001	0.002	0.003	0.004	0.005	0.005	0.006	0.007	0.008	0.009
925	0.004	0.001	0.002	0.003	0.004	0.005	0.005	0.006	0.007	0.007	0.008
975	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.007	0.007	0.008
1025	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.007	0.007	0.008
1075	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.006	0.007	0.008
1125	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.005	0.006	0.007	0.007
1175	0.004	0.001	0.002	0.003	0.004	0.004	0.004	0.005	0.006	0.007	0.008
1225	0.004	0.001	0.002	0.003	0.004	0.004	0.004	0.005	0.006	0.007	0.008
1275	0.004	0.001	0.002	0.003	0.004	0.004	0.004	0.005	0.006	0.007	0.007
1325	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.006	0.006	0.007
1375	0.004	0.001	0.002	0.003	0.004	0.004	0.004	0.005	0.006	0.006	0.007
1425	0.004	0.001	0.002	0.003	0.004	0.004	0.004	0.005	0.006	0.006	0.007
1475	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.006	0.006	0.007
1525	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.006	0.006	0.007
1575	0.004	0.001	0.002	0.003	0.004	0.005	0.005	0.006	0.006	0.007	0.007
1625	0.004	0.001	0.002	0.003	0.004	0.005	0.005	0.006	0.006	0.007	0.007
1675	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.007	0.007	0.008
1725	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.007	0.007	0.009

CEI 0-16											
Clause	Requirement - Test							Result - Remark			Verdict
Intern-harmonics - L1											
Active power P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100
Frequency [Hz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
1775	0.004	0.001	0.002	0.003	0.003	0.004	0.004	0.006	0.006	0.007	0.010
1825	0.004	0.001	0.002	0.003	0.003	0.004	0.004	0.006	0.006	0.008	0.010
1875	0.004	0.001	0.002	0.003	0.004	0.004	0.004	0.005	0.006	0.007	0.010
1925	0.004	0.001	0.002	0.003	0.003	0.004	0.005	0.005	0.006	0.007	0.010
1975	0.004	0.001	0.002	0.003	0.004	0.004	0.004	0.005	0.006	0.007	0.009

Higher frequencies - L1											
Active power P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100
Frequency [kHz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
2.1	0.011	0.010	0.017	0.021	0.029	0.044	0.056	0.058	0.057	0.060	0.062
2.3	0.020	0.007	0.016	0.022	0.024	0.029	0.042	0.052	0.052	0.040	0.044
2.5	0.021	0.008	0.015	0.024	0.032	0.034	0.035	0.045	0.054	0.045	0.042
2.7	0.019	0.008	0.017	0.022	0.027	0.033	0.034	0.036	0.042	0.050	0.049
2.9	0.027	0.008	0.016	0.024	0.026	0.032	0.037	0.037	0.037	0.044	0.049
3.1	0.031	0.009	0.017	0.024	0.031	0.034	0.043	0.051	0.050	0.040	0.042
3.3	0.029	0.009	0.019	0.024	0.030	0.033	0.034	0.045	0.054	0.046	0.046
3.5	0.039	0.011	0.023	0.035	0.038	0.045	0.048	0.050	0.056	0.057	0.058
3.7	0.052	0.014	0.027	0.042	0.046	0.052	0.065	0.072	0.075	0.077	0.070
3.9	0.056	0.019	0.036	0.049	0.063	0.067	0.064	0.068	0.070	0.068	0.078
4.1	0.119	0.029	0.049	0.064	0.073	0.077	0.077	0.081	0.080	0.079	0.086
4.3	0.034	0.010	0.019	0.025	0.029	0.035	0.038	0.040	0.045	0.050	0.059
4.5	0.017	0.004	0.009	0.011	0.013	0.014	0.016	0.019	0.024	0.029	0.040
4.7	0.013	0.003	0.006	0.008	0.010	0.011	0.013	0.016	0.016	0.018	0.023
4.9	0.010	0.003	0.004	0.007	0.008	0.009	0.009	0.012	0.013	0.013	0.016
5.1	0.008	0.002	0.004	0.005	0.006	0.007	0.008	0.010	0.011	0.012	0.013
5.3	0.007	0.002	0.004	0.005	0.006	0.007	0.008	0.010	0.010	0.011	0.012
5.5	0.007	0.002	0.003	0.005	0.006	0.007	0.007	0.010	0.010	0.010	0.011
5.7	0.006	0.002	0.003	0.005	0.006	0.006	0.007	0.010	0.010	0.011	0.011
5.9	0.008	0.002	0.004	0.005	0.006	0.008	0.007	0.011	0.011	0.011	0.010
6.1	0.006	0.002	0.003	0.004	0.005	0.006	0.007	0.009	0.009	0.010	0.010
6.3	0.006	0.002	0.003	0.004	0.005	0.006	0.007	0.009	0.009	0.010	0.010
6.5	0.006	0.002	0.003	0.004	0.005	0.006	0.007	0.009	0.009	0.010	0.010
6.7	0.006	0.002	0.003	0.004	0.005	0.006	0.007	0.009	0.009	0.010	0.010
6.9	0.006	0.002	0.003	0.004	0.005	0.006	0.007	0.009	0.009	0.010	0.010
7.1	0.006	0.002	0.003	0.004	0.005	0.006	0.007	0.009	0.009	0.010	0.010
7.3	0.006	0.002	0.003	0.004	0.005	0.006	0.006	0.009	0.009	0.009	0.010
7.5	0.006	0.002	0.003	0.004	0.005	0.006	0.007	0.009	0.009	0.009	0.010
7.7	0.008	0.002	0.004	0.006	0.006	0.008	0.008	0.010	0.011	0.011	0.011
7.9	0.010	0.003	0.005	0.007	0.008	0.009	0.010	0.012	0.013	0.013	0.013
8.1	0.011	0.003	0.005	0.007	0.009	0.010	0.011	0.013	0.014	0.014	0.015
8.3	0.006	0.002	0.003	0.004	0.005	0.006	0.007	0.009	0.009	0.009	0.010

CEI 0-16												
Clause	Requirement - Test										Result - Remark	Verdict
Higher frequencies - L1												
Active power P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100	
Frequency [kHz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	
8.5	0.006	0.002	0.003	0.005	0.005	0.006	0.007	0.009	0.009	0.009	0.010	
8.7	0.006	0.002	0.003	0.005	0.005	0.006	0.007	0.009	0.009	0.009	0.010	
8.9	0.006	0.002	0.003	0.005	0.005	0.006	0.007	0.009	0.009	0.009	0.010	
Note(s): It is carried out in accordance to EN 61000-4-7. The worst case of three phases has been choose.												

N.3.1	Tabella: Misura di correnti armoniche Table: Measurement for harmonics current according to IEC 61400-21, Clause 7.4										P
Model	AF60K-TH										
Reference standard: Each phase output current > 75A, The harmonic currents are measured per EN 61000-4-7.											
Harmonics -L2											
Active power P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100
Harmonic number	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
2	0.067	0.119	0.220	0.298	0.356	0.398	0.436	0.468	0.522	0.638	0.882
3	0.396	0.200	0.370	0.518	0.658	0.781	0.912	1.046	1.179	1.440	1.787
4	0.073	0.026	0.049	0.075	0.109	0.148	0.197	0.268	0.364	0.588	0.838
5	0.362	0.084	0.160	0.227	0.291	0.349	0.413	0.477	0.552	0.716	0.935
6	0.076	0.036	0.067	0.097	0.127	0.153	0.179	0.208	0.247	0.339	0.445
7	0.292	0.057	0.107	0.157	0.209	0.258	0.312	0.363	0.417	0.526	0.632
8	0.030	0.011	0.023	0.034	0.047	0.059	0.069	0.078	0.090	0.097	0.130
9	0.098	0.023	0.044	0.062	0.078	0.090	0.102	0.111	0.114	0.110	0.133
10	0.031	0.021	0.033	0.034	0.031	0.025	0.022	0.020	0.021	0.036	0.049
11	0.149	0.035	0.067	0.094	0.113	0.129	0.140	0.150	0.156	0.132	0.133
12	0.023	0.041	0.070	0.083	0.085	0.076	0.063	0.049	0.037	0.022	0.034
13	0.155	0.022	0.050	0.080	0.100	0.116	0.121	0.121	0.119	0.096	0.109
14	0.013	0.020	0.042	0.056	0.065	0.066	0.061	0.053	0.046	0.025	0.025
15	0.046	0.018	0.027	0.032	0.037	0.039	0.042	0.040	0.033	0.015	0.018
16	0.018	0.007	0.022	0.041	0.059	0.070	0.073	0.073	0.069	0.043	0.037
17	0.056	0.008	0.004	0.015	0.035	0.055	0.065	0.070	0.068	0.045	0.049
18	0.057	0.021	0.029	0.046	0.075	0.105	0.125	0.137	0.144	0.116	0.092
19	0.071	0.010	0.019	0.019	0.017	0.027	0.045	0.064	0.082	0.087	0.085
20	0.010	0.011	0.015	0.015	0.024	0.040	0.053	0.065	0.072	0.070	0.065
21	0.019	0.017	0.028	0.035	0.038	0.040	0.043	0.051	0.063	0.071	0.072
22	0.006	0.005	0.020	0.028	0.026	0.023	0.032	0.046	0.059	0.073	0.069
23	0.031	0.005	0.015	0.022	0.027	0.032	0.041	0.055	0.068	0.088	0.093
24	0.048	0.006	0.025	0.047	0.053	0.047	0.043	0.059	0.087	0.124	0.136
25	0.015	0.005	0.007	0.011	0.016	0.020	0.022	0.032	0.046	0.069	0.069
26	0.015	0.005	0.004	0.012	0.019	0.019	0.013	0.011	0.025	0.050	0.063
27	0.014	0.016	0.026	0.040	0.051	0.058	0.057	0.049	0.041	0.034	0.039
28	0.016	0.009	0.016	0.015	0.020	0.028	0.032	0.027	0.015	0.014	0.028
29	0.010	0.011	0.022	0.026	0.030	0.033	0.037	0.037	0.032	0.024	0.022

CEI 0-16											
Clause	Requirement - Test						Result - Remark				Verdict
30	0.029	0.016	0.023	0.024	0.041	0.063	0.079	0.083	0.074	0.030	0.030
31	0.006	0.007	0.013	0.016	0.020	0.027	0.038	0.047	0.057	0.054	0.042
32	0.013	0.006	0.016	0.022	0.018	0.011	0.009	0.014	0.020	0.025	0.031
33	0.013	0.006	0.003	0.003	0.012	0.026	0.041	0.050	0.053	0.046	0.030
34	0.014	0.004	0.014	0.024	0.027	0.027	0.033	0.039	0.041	0.025	0.012
35	0.004	0.005	0.008	0.012	0.014	0.013	0.011	0.010	0.010	0.012	0.011
36	0.017	0.003	0.008	0.022	0.030	0.026	0.020	0.030	0.043	0.047	0.048
37	0.004	0.005	0.005	0.006	0.010	0.011	0.010	0.011	0.011	0.007	0.029
38	0.006	0.004	0.004	0.012	0.019	0.021	0.018	0.020	0.028	0.035	0.031
39	0.014	0.004	0.007	0.003	0.010	0.014	0.012	0.007	0.008	0.019	0.029
40	0.009	0.005	0.004	0.006	0.012	0.017	0.015	0.012	0.014	0.029	0.039
41	0.005	0.003	0.009	0.010	0.006	0.007	0.010	0.012	0.012	0.011	0.016
42	0.008	0.004	0.010	0.008	0.006	0.018	0.026	0.026	0.021	0.019	0.027
43	0.004	0.002	0.007	0.010	0.004	0.005	0.006	0.005	0.010	0.017	0.015
44	0.005	0.004	0.006	0.005	0.005	0.010	0.014	0.016	0.015	0.015	0.017
45	0.015	0.002	0.005	0.011	0.009	0.007	0.016	0.019	0.016	0.012	0.025
46	0.007	0.004	0.007	0.006	0.004	0.005	0.008	0.010	0.011	0.012	0.011
47	0.008	0.003	0.006	0.010	0.014	0.011	0.005	0.005	0.005	0.009	0.009
48	0.009	0.006	0.007	0.011	0.016	0.016	0.013	0.020	0.026	0.025	0.018
49	0.006	0.002	0.005	0.005	0.009	0.008	0.009	0.011	0.009	0.012	0.018
50	0.006	0.004	0.006	0.006	0.006	0.006	0.006	0.008	0.009	0.010	0.012

Intern-harmonics -L2

Active power P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100
Frequency [Hz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
75	0.005	0.003	0.005	0.009	0.011	0.013	0.018	0.016	0.023	0.034	0.040
125	0.009	0.007	0.016	0.024	0.029	0.030	0.029	0.030	0.065	0.075	0.065
175	0.006	0.002	0.003	0.005	0.006	0.007	0.008	0.009	0.012	0.021	0.025
225	0.008	0.002	0.004	0.006	0.007	0.008	0.009	0.010	0.014	0.021	0.022
275	0.005	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009	0.013	0.014
325	0.008	0.002	0.004	0.005	0.007	0.008	0.010	0.010	0.011	0.015	0.016
375	0.005	0.001	0.003	0.004	0.005	0.005	0.006	0.007	0.008	0.010	0.011
425	0.006	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.010	0.012	0.011
475	0.005	0.001	0.003	0.004	0.004	0.005	0.006	0.006	0.007	0.008	0.009
525	0.006	0.002	0.003	0.004	0.006	0.006	0.007	0.008	0.009	0.009	0.010
575	0.005	0.001	0.003	0.003	0.004	0.005	0.005	0.006	0.007	0.007	0.008
625	0.005	0.001	0.003	0.004	0.004	0.005	0.006	0.006	0.008	0.008	0.008
675	0.005	0.001	0.002	0.003	0.004	0.005	0.005	0.006	0.007	0.007	0.008
725	0.005	0.001	0.003	0.004	0.005	0.005	0.006	0.006	0.007	0.008	0.008
775	0.004	0.001	0.002	0.003	0.004	0.005	0.005	0.006	0.007	0.008	0.008
825	0.004	0.001	0.002	0.003	0.004	0.005	0.005	0.006	0.007	0.007	0.008
875	0.004	0.001	0.002	0.003	0.004	0.005	0.005	0.006	0.007	0.007	0.007
925	0.004	0.001	0.002	0.003	0.004	0.005	0.005	0.006	0.007	0.007	0.007
975	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.007	0.007	0.007
1025	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.007	0.007	0.007
1075	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.006	0.007	0.007
1125	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.006	0.007	0.007
1175	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.006	0.007	0.007

CEI 0-16												
Clause	Requirement - Test										Result - Remark	Verdict
Intern-harmonics -L2												
Active power P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100	
Frequency [Hz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	
1225	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.006	0.007	0.007	
1275	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.005	0.006	0.007	0.007	
1325	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.005	0.006	0.006	0.006	
1375	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.005	0.006	0.006	0.006	
1425	0.004	0.001	0.002	0.003	0.004	0.005	0.005	0.006	0.006	0.006	0.006	
1475	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.006	0.006	0.006	
1525	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.006	0.007	0.006	
1575	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.007	0.007	0.007	
1625	0.004	0.001	0.002	0.003	0.003	0.004	0.004	0.006	0.006	0.007	0.007	
1675	0.004	0.001	0.002	0.003	0.003	0.004	0.004	0.005	0.006	0.007	0.007	
1725	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.006	0.007	0.008	
1775	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.006	0.007	0.008	
1825	0.004	0.001	0.002	0.003	0.003	0.004	0.004	0.006	0.006	0.007	0.008	
1875	0.004	0.001	0.002	0.003	0.003	0.004	0.004	0.006	0.006	0.007	0.008	
1925	0.004	0.001	0.002	0.003	0.003	0.004	0.004	0.005	0.006	0.007	0.008	
1975	0.004	0.001	0.002	0.003	0.003	0.004	0.004	0.005	0.005	0.006	0.008	

Higher frequencies -L2											
Active power P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100
Frequency [kHz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
2.1	0.014	0.008	0.017	0.018	0.013	0.024	0.033	0.035	0.032	0.034	0.041
2.3	0.022	0.008	0.013	0.020	0.024	0.023	0.025	0.033	0.036	0.034	0.037
2.5	0.022	0.007	0.012	0.013	0.019	0.020	0.019	0.027	0.034	0.034	0.036
2.7	0.023	0.007	0.013	0.018	0.019	0.026	0.029	0.027	0.029	0.031	0.034
2.9	0.029	0.008	0.015	0.018	0.023	0.026	0.031	0.034	0.036	0.040	0.040
3.1	0.031	0.008	0.015	0.018	0.019	0.020	0.028	0.038	0.041	0.046	0.054
3.3	0.028	0.011	0.020	0.027	0.028	0.034	0.036	0.039	0.042	0.044	0.043
3.5	0.042	0.011	0.023	0.028	0.032	0.033	0.037	0.045	0.055	0.053	0.056
3.7	0.056	0.014	0.024	0.034	0.039	0.042	0.044	0.048	0.057	0.060	0.068
3.9	0.111	0.030	0.052	0.067	0.074	0.080	0.083	0.086	0.088	0.091	0.086
4.1	0.072	0.015	0.026	0.035	0.042	0.044	0.049	0.056	0.056	0.066	0.072
4.3	0.040	0.010	0.018	0.023	0.028	0.031	0.032	0.038	0.042	0.050	0.057
4.5	0.016	0.005	0.009	0.013	0.014	0.018	0.021	0.024	0.029	0.031	0.038
4.7	0.011	0.003	0.006	0.008	0.010	0.011	0.013	0.015	0.016	0.019	0.020
4.9	0.009	0.003	0.005	0.006	0.008	0.008	0.010	0.012	0.012	0.014	0.015
5.1	0.008	0.002	0.004	0.006	0.007	0.008	0.008	0.011	0.012	0.012	0.013
5.3	0.007	0.002	0.004	0.005	0.006	0.007	0.007	0.010	0.010	0.011	0.011
5.5	0.006	0.002	0.003	0.004	0.006	0.006	0.007	0.009	0.010	0.010	0.011
5.7	0.006	0.002	0.004	0.005	0.006	0.007	0.007	0.010	0.010	0.011	0.011
5.9	0.007	0.002	0.004	0.005	0.006	0.007	0.007	0.010	0.010	0.011	0.010
6.1	0.006	0.002	0.003	0.004	0.005	0.006	0.007	0.009	0.009	0.010	0.010

CEI 0-16												
Clause	Requirement - Test										Result - Remark	Verdict
Higher frequencies -L2												
Active power P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100	
Frequency [kHz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	
6.3	0.006	0.002	0.003	0.004	0.005	0.006	0.006	0.009	0.009	0.010	0.010	
6.5	0.006	0.002	0.003	0.004	0.005	0.006	0.006	0.009	0.009	0.010	0.010	
6.7	0.006	0.002	0.003	0.004	0.005	0.006	0.006	0.009	0.009	0.010	0.010	
6.9	0.006	0.002	0.003	0.004	0.005	0.006	0.006	0.009	0.009	0.010	0.010	
7.1	0.006	0.002	0.003	0.004	0.005	0.006	0.006	0.009	0.009	0.010	0.010	
7.3	0.006	0.002	0.003	0.004	0.005	0.006	0.006	0.009	0.009	0.010	0.010	
7.5	0.006	0.002	0.003	0.004	0.005	0.006	0.007	0.009	0.009	0.010	0.010	
7.7	0.008	0.002	0.004	0.005	0.007	0.008	0.008	0.010	0.011	0.011	0.011	
7.9	0.010	0.003	0.005	0.007	0.008	0.010	0.011	0.013	0.013	0.014	0.014	
8.1	0.011	0.003	0.005	0.007	0.009	0.010	0.011	0.014	0.014	0.015	0.015	
8.3	0.007	0.002	0.004	0.005	0.006	0.007	0.007	0.010	0.010	0.011	0.011	
8.5	0.007	0.002	0.004	0.005	0.006	0.007	0.008	0.010	0.011	0.011	0.011	
8.7	0.007	0.002	0.004	0.005	0.006	0.007	0.008	0.010	0.011	0.011	0.011	
8.9	0.007	0.002	0.004	0.005	0.006	0.007	0.008	0.010	0.010	0.011	0.011	
Note(s): It is carried out in accordance to EN 61000-4-7. The worst case of three phases has been choose.												

N.3.1	Tabella: Misura di correnti armoniche Table: Measurement for harmonics current according to IEC 61400-21, Clause 7.4										P
Model	AF60K-TH										
Reference standard: Each phase output current > 75A, The harmonic currents are measured per EN 61000-4-7.											
Harmonics -L3											
Active power P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100
Harmonic number	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
2	0.042	0.148	0.299	0.452	0.608	0.761	0.916	1.067	1.231	1.386	1.505
3	0.468	0.191	0.348	0.484	0.619	0.738	0.865	0.980	1.080	1.160	1.313
4	0.022	0.023	0.041	0.052	0.060	0.068	0.075	0.084	0.095	0.099	0.093
5	0.374	0.096	0.187	0.264	0.327	0.377	0.416	0.450	0.487	0.478	0.510
6	0.048	0.013	0.025	0.037	0.046	0.056	0.063	0.067	0.070	0.057	0.066
7	0.297	0.057	0.110	0.160	0.209	0.257	0.301	0.342	0.378	0.387	0.401
8	0.030	0.010	0.017	0.028	0.041	0.056	0.072	0.087	0.101	0.114	0.125
9	0.104	0.008	0.016	0.025	0.037	0.049	0.066	0.085	0.102	0.144	0.199
10	0.017	0.020	0.026	0.027	0.026	0.026	0.032	0.038	0.043	0.045	0.045
11	0.144	0.038	0.066	0.082	0.087	0.092	0.093	0.099	0.108	0.127	0.149
12	0.012	0.014	0.021	0.024	0.023	0.020	0.014	0.016	0.024	0.042	0.049
13	0.172	0.028	0.063	0.097	0.123	0.136	0.146	0.146	0.143	0.138	0.148
14	0.014	0.018	0.035	0.046	0.051	0.050	0.049	0.045	0.036	0.023	0.031
15	0.036	0.005	0.013	0.018	0.022	0.022	0.022	0.025	0.025	0.027	0.048
16	0.007	0.010	0.019	0.035	0.049	0.058	0.060	0.056	0.051	0.038	0.028

CEI 0-16											
Clause	Requirement - Test							Result - Remark			Verdict
17	0.049	0.012	0.015	0.034	0.060	0.083	0.102	0.113	0.117	0.103	0.095
18	0.025	0.006	0.003	0.015	0.033	0.051	0.066	0.076	0.080	0.069	0.060
19	0.096	0.018	0.022	0.021	0.042	0.077	0.111	0.138	0.155	0.146	0.125
20	0.007	0.011	0.014	0.013	0.022	0.039	0.052	0.064	0.075	0.071	0.067
21	0.018	0.001	0.005	0.003	0.006	0.015	0.024	0.031	0.037	0.037	0.035
22	0.018	0.008	0.022	0.029	0.024	0.021	0.031	0.049	0.067	0.079	0.079
23	0.029	0.003	0.015	0.026	0.024	0.023	0.038	0.064	0.093	0.119	0.117
24	0.024	0.004	0.006	0.016	0.022	0.020	0.012	0.010	0.020	0.033	0.034
25	0.034	0.009	0.015	0.036	0.049	0.053	0.052	0.056	0.067	0.091	0.108
26	0.009	0.003	0.011	0.024	0.030	0.029	0.024	0.023	0.027	0.044	0.053
27	0.020	0.012	0.017	0.014	0.009	0.010	0.011	0.010	0.011	0.024	0.038
28	0.024	0.013	0.015	0.017	0.032	0.045	0.050	0.046	0.035	0.025	0.031
29	0.011	0.006	0.011	0.005	0.008	0.023	0.037	0.047	0.051	0.057	0.067
30	0.021	0.007	0.024	0.028	0.024	0.016	0.018	0.019	0.015	0.012	0.027
31	0.009	0.011	0.025	0.032	0.041	0.057	0.073	0.078	0.073	0.045	0.049
32	0.013	0.002	0.005	0.006	0.007	0.017	0.031	0.041	0.043	0.031	0.022
33	0.012	0.009	0.024	0.034	0.040	0.043	0.045	0.045	0.043	0.026	0.026
34	0.017	0.002	0.016	0.026	0.026	0.021	0.028	0.042	0.049	0.036	0.026
35	0.005	0.004	0.013	0.026	0.036	0.041	0.047	0.056	0.062	0.051	0.048
36	0.015	0.004	0.004	0.015	0.021	0.018	0.017	0.030	0.046	0.054	0.052
37	0.004	0.004	0.012	0.025	0.033	0.034	0.038	0.051	0.066	0.084	0.083
38	0.013	0.003	0.004	0.009	0.017	0.020	0.016	0.012	0.013	0.014	0.009
39	0.013	0.003	0.006	0.015	0.026	0.032	0.034	0.036	0.042	0.048	0.062
40	0.012	0.004	0.007	0.005	0.018	0.027	0.024	0.018	0.022	0.037	0.045
41	0.004	0.004	0.010	0.015	0.021	0.030	0.039	0.043	0.046	0.050	0.055
42	0.009	0.002	0.008	0.005	0.009	0.020	0.023	0.020	0.016	0.014	0.015
43	0.005	0.004	0.008	0.010	0.018	0.027	0.033	0.035	0.037	0.043	0.045
44	0.011	0.002	0.006	0.010	0.008	0.015	0.024	0.025	0.024	0.017	0.017
45	0.015	0.002	0.004	0.007	0.009	0.016	0.025	0.032	0.035	0.029	0.026
46	0.008	0.002	0.005	0.012	0.009	0.007	0.019	0.025	0.024	0.011	0.015
47	0.005	0.005	0.008	0.012	0.018	0.021	0.026	0.033	0.040	0.039	0.038
48	0.006	0.002	0.003	0.009	0.010	0.007	0.012	0.020	0.022	0.013	0.012
49	0.009	0.003	0.007	0.012	0.014	0.016	0.023	0.030	0.035	0.036	0.041
50	0.010	0.003	0.004	0.008	0.014	0.014	0.014	0.023	0.030	0.021	0.018

Intern-harmonics -L3

Active power P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100
Frequency [Hz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
75	0.005	0.003	0.006	0.009	0.012	0.013	0.016	0.019	0.021	0.026	0.027
125	0.008	0.007	0.016	0.025	0.031	0.033	0.032	0.034	0.068	0.084	0.073
175	0.005	0.002	0.003	0.005	0.006	0.007	0.008	0.009	0.011	0.013	0.013
225	0.006	0.002	0.003	0.004	0.006	0.007	0.008	0.009	0.010	0.011	0.013
275	0.006	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.010	0.010	0.011
325	0.007	0.002	0.004	0.005	0.006	0.007	0.008	0.009	0.010	0.011	0.012
375	0.005	0.001	0.003	0.004	0.005	0.005	0.006	0.007	0.008	0.008	0.009
425	0.005	0.001	0.003	0.004	0.005	0.006	0.006	0.007	0.009	0.009	0.010
475	0.005	0.001	0.003	0.004	0.004	0.005	0.006	0.007	0.008	0.008	0.009
525	0.006	0.002	0.003	0.004	0.005	0.006	0.006	0.007	0.008	0.009	0.009
575	0.005	0.001	0.003	0.004	0.004	0.005	0.006	0.006	0.007	0.007	0.008
625	0.005	0.001	0.003	0.004	0.004	0.005	0.006	0.006	0.007	0.008	0.008

CEI 0-16												
Clause	Requirement - Test										Result - Remark	Verdict
Intern-harmonics -L3												
Active power P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100	
Frequency [Hz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	
675	0.005	0.001	0.003	0.003	0.004	0.005	0.006	0.006	0.007	0.007	0.008	
725	0.005	0.002	0.003	0.004	0.005	0.005	0.006	0.006	0.007	0.008	0.008	
775	0.005	0.001	0.003	0.004	0.004	0.005	0.005	0.006	0.007	0.007	0.008	
825	0.005	0.001	0.002	0.003	0.004	0.005	0.005	0.006	0.007	0.007	0.008	
875	0.005	0.001	0.002	0.003	0.004	0.005	0.005	0.006	0.007	0.008	0.008	
925	0.005	0.001	0.002	0.003	0.004	0.005	0.006	0.006	0.007	0.008	0.008	
975	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.007	0.007	0.007	
1025	0.004	0.001	0.002	0.003	0.004	0.005	0.005	0.006	0.007	0.007	0.007	
1075	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.007	0.007	0.007	
1125	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.006	0.007	0.007	
1175	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.006	0.007	0.007	
1225	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.006	0.007	0.007	
1275	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.006	0.006	0.007	
1325	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.006	0.007	0.007	
1375	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.006	0.006	0.006	
1425	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.006	0.006	0.006	
1475	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.006	0.006	0.006	
1525	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.006	0.006	0.006	
1575	0.004	0.001	0.002	0.003	0.004	0.005	0.005	0.006	0.006	0.006	0.006	
1625	0.004	0.001	0.002	0.003	0.004	0.005	0.005	0.006	0.007	0.007	0.007	
1675	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.007	0.007	0.008	
1725	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.007	0.008	0.008	
1775	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.007	0.007	0.009	
1825	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.006	0.007	0.009	
1875	0.004	0.001	0.002	0.003	0.004	0.004	0.004	0.006	0.006	0.007	0.009	
1925	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.006	0.006	0.007	0.009	
1975	0.004	0.001	0.002	0.003	0.004	0.004	0.005	0.005	0.006	0.006	0.008	

CEI 0-16												
Clause	Requirement - Test										Result - Remark	Verdict
Higher frequencies-L3												
Active power P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100	
Frequency [kHz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	
2.1	0.018	0.007	0.017	0.022	0.032	0.049	0.061	0.065	0.067	0.071	0.077	
2.3	0.021	0.007	0.012	0.021	0.025	0.030	0.044	0.057	0.063	0.053	0.053	
2.5	0.024	0.006	0.012	0.018	0.027	0.031	0.033	0.045	0.058	0.056	0.056	
2.7	0.023	0.007	0.013	0.019	0.024	0.033	0.039	0.043	0.050	0.058	0.061	
2.9	0.026	0.006	0.010	0.015	0.019	0.023	0.032	0.037	0.041	0.048	0.053	
3.1	0.031	0.007	0.012	0.017	0.024	0.029	0.036	0.046	0.049	0.047	0.054	
3.3	0.033	0.008	0.013	0.019	0.023	0.032	0.035	0.045	0.054	0.051	0.060	
3.5	0.035	0.009	0.015	0.022	0.030	0.033	0.039	0.042	0.050	0.051	0.049	
3.7	0.053	0.013	0.025	0.036	0.048	0.057	0.069	0.080	0.091	0.091	0.084	
3.9	0.087	0.029	0.050	0.065	0.077	0.087	0.090	0.097	0.104	0.098	0.092	
4.1	0.070	0.018	0.031	0.041	0.048	0.054	0.056	0.060	0.064	0.067	0.067	
4.3	0.047	0.012	0.021	0.028	0.033	0.038	0.043	0.048	0.056	0.063	0.070	
4.5	0.019	0.004	0.008	0.011	0.014	0.016	0.019	0.022	0.026	0.030	0.039	
4.7	0.013	0.003	0.006	0.007	0.009	0.011	0.013	0.016	0.016	0.019	0.022	
4.9	0.011	0.003	0.004	0.006	0.008	0.009	0.010	0.013	0.013	0.015	0.017	
5.1	0.010	0.002	0.004	0.006	0.007	0.008	0.009	0.011	0.011	0.012	0.013	
5.3	0.008	0.002	0.004	0.005	0.006	0.007	0.009	0.011	0.011	0.011	0.012	
5.5	0.008	0.002	0.004	0.005	0.006	0.007	0.008	0.010	0.010	0.011	0.012	
5.7	0.007	0.002	0.004	0.005	0.006	0.007	0.008	0.010	0.010	0.011	0.012	
5.9	0.009	0.002	0.004	0.006	0.006	0.008	0.008	0.011	0.011	0.012	0.011	
6.1	0.007	0.002	0.003	0.005	0.006	0.006	0.007	0.010	0.010	0.010	0.010	
6.3	0.007	0.002	0.003	0.005	0.006	0.006	0.007	0.009	0.010	0.010	0.010	
6.5	0.007	0.002	0.003	0.005	0.006	0.006	0.007	0.009	0.010	0.010	0.010	
6.7	0.007	0.002	0.003	0.004	0.005	0.006	0.007	0.009	0.010	0.010	0.010	
6.9	0.007	0.002	0.003	0.004	0.005	0.006	0.007	0.009	0.010	0.010	0.010	
7.1	0.007	0.002	0.003	0.004	0.005	0.006	0.007	0.009	0.010	0.010	0.010	
7.3	0.007	0.002	0.003	0.004	0.005	0.006	0.007	0.009	0.010	0.010	0.010	
7.5	0.007	0.002	0.003	0.004	0.005	0.006	0.007	0.009	0.010	0.010	0.010	
7.7	0.008	0.002	0.004	0.005	0.006	0.007	0.008	0.010	0.011	0.011	0.011	
7.9	0.008	0.002	0.004	0.005	0.006	0.007	0.008	0.010	0.011	0.011	0.011	
8.1	0.009	0.003	0.004	0.006	0.007	0.008	0.010	0.012	0.012	0.012	0.013	
8.3	0.007	0.002	0.003	0.005	0.005	0.006	0.007	0.009	0.009	0.010	0.010	
8.5	0.007	0.002	0.003	0.005	0.005	0.006	0.007	0.009	0.010	0.010	0.010	
8.7	0.007	0.002	0.003	0.005	0.006	0.006	0.007	0.009	0.010	0.010	0.010	
8.9	0.007	0.002	0.003	0.005	0.005	0.006	0.008	0.009	0.009	0.010	0.010	
Note(s): It is carried out in accordance to EN 61000-4-7. The worst case of three phases has been choose.												

CEI 0-16											
Clause	Requirement - Test								Result - Remark		Verdict
N.3.1	Tabella: Misura di correnti armoniche Table: Measurement for harmonics current according to IEC 61400-21, Clause 7.4										P
Model	AF36K-TH										
Reference standard: Each phase output current > 75A, The harmonic currents are measured per EN 61000-4-7.											
Harmonics - L1											
Active power P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100
Harmonic number	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
2	0.103	0.095	0.345	0.457	0.569	0.694	0.844	0.991	1.125	1.257	1.388
3	0.711	0.707	0.891	0.996	1.081	1.117	1.127	1.142	1.153	1.169	1.193
4	0.022	0.227	0.136	0.159	0.163	0.148	0.131	0.124	0.113	0.112	0.117
5	0.926	1.281	1.092	0.829	0.564	0.404	0.334	0.319	0.325	0.350	0.380
6	0.072	0.152	0.054	0.093	0.116	0.118	0.114	0.106	0.093	0.086	0.087
7	0.661	0.394	0.717	0.667	0.500	0.352	0.268	0.221	0.195	0.178	0.159
8	0.035	0.048	0.033	0.029	0.063	0.076	0.074	0.060	0.046	0.043	0.045
9	0.142	0.064	0.160	0.174	0.128	0.070	0.034	0.021	0.022	0.039	0.064
10	0.017	0.126	0.041	0.032	0.071	0.077	0.068	0.060	0.045	0.033	0.025
11	0.288	0.301	0.149	0.285	0.289	0.217	0.160	0.121	0.099	0.096	0.095
12	0.017	0.037	0.030	0.011	0.041	0.047	0.047	0.042	0.035	0.037	0.037
13	0.211	0.206	0.164	0.140	0.209	0.179	0.141	0.099	0.064	0.033	0.017
14	0.029	0.021	0.056	0.035	0.021	0.057	0.070	0.067	0.065	0.070	0.073
15	0.048	0.059	0.037	0.071	0.084	0.043	0.011	0.015	0.027	0.040	0.053
16	0.037	0.043	0.047	0.038	0.028	0.053	0.046	0.043	0.040	0.044	0.047
17	0.106	0.137	0.162	0.079	0.080	0.101	0.090	0.069	0.048	0.031	0.027
18	0.034	0.051	0.017	0.032	0.013	0.025	0.032	0.035	0.034	0.037	0.036
19	0.089	0.125	0.103	0.107	0.049	0.085	0.098	0.092	0.086	0.082	0.081
20	0.034	0.035	0.016	0.049	0.026	0.028	0.050	0.052	0.046	0.041	0.042
21	0.011	0.038	0.050	0.009	0.048	0.031	0.014	0.018	0.021	0.029	0.037
22	0.044	0.016	0.014	0.047	0.009	0.048	0.051	0.050	0.046	0.042	0.039
23	0.056	0.064	0.060	0.080	0.067	0.056	0.067	0.077	0.086	0.095	0.099
24	0.033	0.032	0.022	0.012	0.030	0.017	0.019	0.028	0.032	0.037	0.043
25	0.046	0.069	0.081	0.075	0.085	0.076	0.088	0.094	0.093	0.085	0.087
26	0.024	0.019	0.037	0.022	0.060	0.023	0.048	0.058	0.061	0.065	0.064
27	0.016	0.026	0.041	0.058	0.025	0.059	0.043	0.018	0.016	0.028	0.038
28	0.036	0.037	0.048	0.027	0.032	0.034	0.047	0.047	0.047	0.049	0.050
29	0.031	0.035	0.043	0.040	0.061	0.047	0.049	0.051	0.042	0.042	0.059
30	0.025	0.015	0.017	0.016	0.027	0.016	0.035	0.050	0.057	0.055	0.043
31	0.023	0.032	0.032	0.040	0.053	0.050	0.045	0.059	0.081	0.108	0.127
32	0.018	0.015	0.011	0.016	0.020	0.018	0.015	0.014	0.030	0.051	0.075
33	0.019	0.024	0.019	0.039	0.042	0.045	0.055	0.074	0.083	0.079	0.066
34	0.018	0.030	0.019	0.022	0.029	0.016	0.036	0.055	0.064	0.075	0.086
35	0.013	0.016	0.014	0.025	0.025	0.033	0.034	0.049	0.069	0.089	0.107
36	0.013	0.016	0.018	0.021	0.020	0.013	0.023	0.034	0.039	0.047	0.063
37	0.012	0.017	0.015	0.019	0.023	0.029	0.032	0.039	0.051	0.063	0.079
38	0.010	0.015	0.027	0.027	0.018	0.027	0.020	0.031	0.035	0.037	0.037
39	0.016	0.019	0.023	0.018	0.012	0.018	0.018	0.025	0.039	0.051	0.062
40	0.009	0.017	0.016	0.014	0.011	0.011	0.017	0.026	0.028	0.031	0.036
41	0.009	0.009	0.010	0.015	0.022	0.028	0.034	0.040	0.048	0.056	0.065
42	0.010	0.018	0.013	0.012	0.012	0.021	0.018	0.027	0.031	0.033	0.035

CEI 0-16											
Clause	Requirement - Test							Result - Remark			Verdict
43	0.018	0.008	0.009	0.011	0.019	0.018	0.020	0.024	0.027	0.033	0.040
44	0.014	0.017	0.017	0.014	0.020	0.026	0.015	0.019	0.026	0.034	0.039
45	0.015	0.024	0.014	0.012	0.016	0.012	0.013	0.013	0.016	0.018	0.022
46	0.013	0.012	0.012	0.010	0.009	0.013	0.013	0.025	0.029	0.033	0.036
47	0.014	0.010	0.008	0.015	0.023	0.021	0.029	0.029	0.033	0.040	0.046
48	0.014	0.017	0.018	0.016	0.016	0.021	0.014	0.020	0.023	0.025	0.028
49	0.018	0.013	0.009	0.010	0.014	0.017	0.018	0.025	0.030	0.035	0.043
50	0.018	0.021	0.024	0.025	0.024	0.018	0.017	0.016	0.026	0.036	0.043

Intern-harmonics - L1											
Active power P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100
Frequency [Hz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
75	0.022	0.025	0.030	0.031	0.037	0.044	0.046	0.093	0.065	0.086	0.066
125	0.016	0.018	0.022	0.025	0.029	0.035	0.039	0.056	0.056	0.065	0.065
175	0.012	0.013	0.014	0.013	0.015	0.016	0.017	0.024	0.021	0.022	0.022
225	0.012	0.013	0.013	0.013	0.014	0.014	0.014	0.020	0.018	0.019	0.017
275	0.012	0.012	0.013	0.013	0.013	0.013	0.014	0.019	0.016	0.018	0.017
325	0.013	0.014	0.014	0.014	0.014	0.014	0.015	0.019	0.017	0.019	0.017
375	0.011	0.012	0.012	0.012	0.012	0.012	0.013	0.016	0.014	0.015	0.014
425	0.010	0.011	0.011	0.011	0.011	0.012	0.012	0.015	0.014	0.014	0.013
475	0.010	0.011	0.011	0.011	0.012	0.012	0.012	0.015	0.013	0.014	0.013
525	0.011	0.012	0.012	0.012	0.013	0.013	0.013	0.016	0.014	0.015	0.014
575	0.010	0.010	0.010	0.011	0.011	0.011	0.011	0.013	0.012	0.013	0.012
625	0.009	0.010	0.010	0.010	0.011	0.011	0.011	0.013	0.012	0.012	0.011
675	0.009	0.010	0.010	0.010	0.010	0.011	0.011	0.013	0.012	0.012	0.011
725	0.009	0.010	0.010	0.010	0.011	0.011	0.011	0.013	0.012	0.012	0.012
775	0.009	0.010	0.010	0.010	0.010	0.010	0.010	0.012	0.011	0.011	0.011
825	0.009	0.010	0.010	0.010	0.010	0.010	0.011	0.012	0.011	0.011	0.011
875	0.009	0.009	0.010	0.010	0.010	0.010	0.010	0.012	0.011	0.011	0.011
925	0.009	0.010	0.010	0.010	0.010	0.010	0.010	0.012	0.011	0.011	0.011
975	0.009	0.010	0.010	0.010	0.010	0.010	0.010	0.012	0.011	0.011	0.011
1025	0.009	0.009	0.010	0.010	0.010	0.010	0.010	0.012	0.011	0.011	0.010
1075	0.009	0.010	0.010	0.010	0.010	0.010	0.010	0.011	0.011	0.011	0.011
1125	0.009	0.010	0.010	0.010	0.010	0.010	0.011	0.011	0.011	0.011	0.011
1175	0.009	0.009	0.010	0.010	0.010	0.010	0.010	0.012	0.010	0.011	0.011
1225	0.009	0.010	0.010	0.010	0.010	0.010	0.011	0.012	0.011	0.011	0.011
1275	0.009	0.009	0.010	0.010	0.010	0.010	0.011	0.012	0.011	0.012	0.011
1325	0.009	0.010	0.010	0.010	0.010	0.010	0.011	0.012	0.011	0.011	0.011
1375	0.009	0.010	0.010	0.010	0.010	0.010	0.011	0.012	0.011	0.011	0.011
1425	0.009	0.009	0.010	0.010	0.010	0.010	0.011	0.012	0.011	0.011	0.011
1475	0.009	0.009	0.010	0.010	0.010	0.010	0.011	0.012	0.011	0.011	0.011
1525	0.009	0.009	0.010	0.010	0.010	0.010	0.011	0.012	0.012	0.012	0.012
1575	0.009	0.009	0.010	0.010	0.010	0.010	0.011	0.012	0.012	0.013	0.013
1625	0.009	0.009	0.010	0.010	0.010	0.010	0.010	0.011	0.011	0.012	0.012
1675	0.009	0.009	0.010	0.010	0.010	0.010	0.010	0.011	0.011	0.012	0.012
1725	0.009	0.009	0.010	0.009	0.010	0.010	0.010	0.011	0.012	0.011	0.013
1775	0.009	0.009	0.009	0.009	0.009	0.009	0.010	0.011	0.010	0.012	0.012

CEI 0-16												
Clause	Requirement - Test										Result - Remark	Verdict
Intern-harmonics - L1												
Active power P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100	
Frequency [Hz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	
1825	0.009	0.009	0.010	0.009	0.010	0.009	0.010	0.011	0.010	0.011	0.012	
1875	0.009	0.009	0.009	0.009	0.009	0.010	0.010	0.010	0.010	0.011	0.011	
1925	0.009	0.009	0.009	0.009	0.009	0.009	0.010	0.010	0.010	0.010	0.010	
1975	0.009	0.009	0.009	0.009	0.010	0.010	0.010	0.010	0.010	0.011	0.010	

Higher frequencies - L1											
Active power P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100
Frequency [kHz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
2.1	0.033	0.034	0.033	0.033	0.042	0.051	0.051	0.062	0.072	0.083	0.095
2.3	0.034	0.039	0.035	0.034	0.039	0.040	0.043	0.051	0.057	0.064	0.072
2.5	0.040	0.042	0.045	0.043	0.041	0.036	0.037	0.045	0.056	0.064	0.075
2.7	0.040	0.040	0.035	0.034	0.038	0.041	0.047	0.051	0.059	0.069	0.078
2.9	0.038	0.034	0.038	0.035	0.035	0.035	0.040	0.041	0.045	0.047	0.054
3.1	0.040	0.040	0.041	0.037	0.033	0.034	0.037	0.038	0.044	0.051	0.058
3.3	0.036	0.034	0.034	0.034	0.031	0.032	0.035	0.037	0.040	0.045	0.053
3.5	0.037	0.039	0.040	0.039	0.038	0.036	0.039	0.039	0.043	0.042	0.044
3.7	0.138	0.139	0.139	0.140	0.141	0.142	0.142	0.142	0.145	0.146	0.147
3.9	0.118	0.119	0.120	0.120	0.120	0.120	0.122	0.123	0.125	0.128	0.131
4.1	0.039	0.038	0.038	0.040	0.040	0.042	0.043	0.045	0.041	0.041	0.041
4.3	0.041	0.044	0.047	0.049	0.053	0.050	0.049	0.057	0.052	0.052	0.050
4.5	0.040	0.038	0.040	0.044	0.045	0.048	0.049	0.056	0.055	0.056	0.058
4.7	0.049	0.049	0.052	0.066	0.069	0.071	0.071	0.075	0.069	0.075	0.079
4.9	0.043	0.041	0.045	0.054	0.066	0.082	0.087	0.098	0.111	0.112	0.114
5.1	0.045	0.045	0.049	0.061	0.073	0.080	0.089	0.093	0.105	0.109	0.108
5.3	0.040	0.042	0.045	0.046	0.055	0.060	0.064	0.069	0.072	0.077	0.083
5.5	0.037	0.040	0.041	0.044	0.047	0.049	0.050	0.052	0.053	0.056	0.059
5.7	0.034	0.034	0.034	0.036	0.037	0.040	0.042	0.044	0.045	0.047	0.048
5.9	0.029	0.030	0.032	0.034	0.037	0.037	0.039	0.039	0.039	0.040	0.041
6.1	0.030	0.032	0.032	0.033	0.033	0.034	0.036	0.037	0.037	0.038	0.039
6.3	0.031	0.030	0.030	0.031	0.032	0.033	0.035	0.036	0.036	0.036	0.037
6.5	0.028	0.028	0.029	0.030	0.031	0.032	0.033	0.034	0.033	0.033	0.033
6.7	0.027	0.029	0.030	0.030	0.030	0.031	0.031	0.031	0.031	0.032	0.032
6.9	0.027	0.028	0.028	0.028	0.028	0.029	0.029	0.030	0.030	0.030	0.030
7.1	0.026	0.026	0.026	0.026	0.027	0.028	0.029	0.029	0.029	0.030	0.030
7.3	0.025	0.026	0.025	0.026	0.027	0.027	0.028	0.029	0.029	0.029	0.029
7.5	0.025	0.025	0.025	0.026	0.026	0.026	0.028	0.028	0.028	0.028	0.028
7.7	0.024	0.025	0.025	0.025	0.026	0.026	0.028	0.028	0.028	0.028	0.028
7.9	0.024	0.025	0.025	0.026	0.026	0.026	0.027	0.027	0.027	0.027	0.027
8.1	0.025	0.025	0.025	0.026	0.026	0.026	0.026	0.026	0.026	0.027	0.027
8.3	0.025	0.025	0.025	0.025	0.026	0.026	0.026	0.026	0.027	0.027	0.027

CEI 0-16											
Clause	Requirement - Test								Result - Remark		Verdict
Higher frequencies - L1											
Active power P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100
Frequency [kHz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
8.5	0.025	0.025	0.025	0.026	0.025	0.026	0.026	0.027	0.026	0.027	0.027
8.7	0.024	0.025	0.025	0.025	0.025	0.026	0.026	0.026	0.026	0.026	0.027
8.9	0.025	0.025	0.025	0.025	0.026	0.026	0.026	0.027	0.026	0.027	0.027
Note(s): It is carried out in accordance to EN 61000-4-7. The worst case of three phases has been choose.											

N.3.1	Tabella: Misura di correnti armoniche Table: Measurement for harmonics current according to IEC 61400-21, Clause 7.4										P
Model	AF36K-TH										
Reference standard: Each phase output current > 75A, The harmonic currents are measured per EN 61000-4-7.											
Harmonics -L2											
Active power P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100
Harmonic number	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
2	0.127	0.254	0.300	0.404	0.524	0.664	0.807	0.911	0.971	1.013	1.062
3	0.778	0.843	0.946	1.037	1.104	1.130	1.154	1.173	1.222	1.282	1.345
4	0.049	0.200	0.053	0.055	0.079	0.083	0.079	0.071	0.044	0.035	0.062
5	0.984	1.293	1.109	0.863	0.623	0.488	0.423	0.418	0.421	0.436	0.459
6	0.042	0.140	0.097	0.163	0.201	0.183	0.164	0.143	0.123	0.103	0.093
7	0.656	0.454	0.701	0.630	0.469	0.359	0.304	0.275	0.263	0.279	0.304
8	0.024	0.085	0.023	0.081	0.124	0.124	0.110	0.104	0.103	0.095	0.090
9	0.153	0.095	0.170	0.171	0.134	0.098	0.080	0.060	0.036	0.027	0.032
10	0.007	0.114	0.044	0.025	0.064	0.091	0.083	0.078	0.084	0.095	0.102
11	0.312	0.308	0.188	0.292	0.295	0.250	0.202	0.163	0.136	0.113	0.089
12	0.018	0.058	0.073	0.021	0.080	0.093	0.094	0.086	0.079	0.069	0.061
13	0.196	0.218	0.169	0.159	0.195	0.175	0.152	0.127	0.104	0.086	0.075
14	0.030	0.040	0.065	0.026	0.053	0.072	0.069	0.062	0.057	0.051	0.049
15	0.062	0.094	0.072	0.076	0.065	0.056	0.049	0.042	0.046	0.051	0.060
16	0.029	0.054	0.045	0.054	0.011	0.059	0.075	0.079	0.078	0.075	0.074
17	0.112	0.145	0.159	0.104	0.075	0.103	0.116	0.108	0.093	0.079	0.065
18	0.025	0.059	0.032	0.063	0.009	0.042	0.061	0.067	0.069	0.066	0.062
19	0.082	0.131	0.107	0.087	0.083	0.077	0.071	0.061	0.053	0.043	0.037
20	0.036	0.033	0.027	0.049	0.015	0.045	0.056	0.057	0.059	0.060	0.057
21	0.022	0.039	0.033	0.034	0.026	0.027	0.027	0.023	0.025	0.027	0.028
22	0.035	0.043	0.037	0.046	0.039	0.020	0.048	0.059	0.062	0.061	0.059
23	0.049	0.076	0.066	0.067	0.072	0.048	0.066	0.074	0.067	0.064	0.069
24	0.024	0.024	0.044	0.024	0.035	0.011	0.030	0.050	0.060	0.063	0.067
25	0.047	0.060	0.052	0.061	0.068	0.067	0.050	0.049	0.055	0.063	0.072
26	0.031	0.047	0.043	0.042	0.024	0.034	0.044	0.041	0.038	0.034	0.032
27	0.017	0.029	0.037	0.043	0.055	0.044	0.045	0.036	0.029	0.024	0.027
28	0.023	0.012	0.015	0.019	0.042	0.018	0.032	0.049	0.059	0.061	0.064

CEI 0-16											
Clause	Requirement - Test						Result - Remark				Verdict
29	0.027	0.042	0.047	0.042	0.056	0.072	0.062	0.072	0.083	0.093	0.092
30	0.018	0.012	0.020	0.011	0.031	0.018	0.025	0.041	0.049	0.044	0.035
31	0.029	0.026	0.035	0.047	0.031	0.062	0.058	0.058	0.069	0.077	0.086
32	0.016	0.028	0.015	0.027	0.042	0.037	0.062	0.087	0.103	0.110	0.113
33	0.021	0.027	0.032	0.035	0.030	0.056	0.052	0.046	0.050	0.062	0.067
34	0.013	0.018	0.016	0.026	0.021	0.021	0.022	0.034	0.042	0.041	0.033
35	0.017	0.019	0.020	0.015	0.023	0.035	0.042	0.039	0.048	0.069	0.094
36	0.009	0.010	0.022	0.024	0.020	0.026	0.028	0.042	0.056	0.065	0.072
37	0.017	0.022	0.010	0.013	0.022	0.030	0.041	0.038	0.038	0.041	0.044
38	0.006	0.008	0.020	0.017	0.012	0.016	0.016	0.028	0.039	0.044	0.048
39	0.022	0.026	0.012	0.014	0.019	0.016	0.024	0.021	0.021	0.024	0.033
40	0.007	0.018	0.023	0.021	0.019	0.026	0.025	0.031	0.043	0.049	0.052
41	0.014	0.009	0.009	0.018	0.026	0.020	0.033	0.030	0.025	0.029	0.041
42	0.008	0.011	0.014	0.017	0.021	0.022	0.031	0.034	0.044	0.050	0.056
43	0.012	0.008	0.012	0.019	0.021	0.026	0.041	0.048	0.049	0.051	0.053
44	0.011	0.010	0.010	0.012	0.015	0.012	0.017	0.024	0.034	0.040	0.041
45	0.023	0.019	0.023	0.019	0.016	0.011	0.019	0.016	0.014	0.012	0.010
46	0.012	0.018	0.021	0.019	0.024	0.016	0.021	0.023	0.029	0.033	0.034
47	0.013	0.012	0.011	0.009	0.012	0.021	0.027	0.033	0.031	0.031	0.039
48	0.010	0.012	0.014	0.018	0.019	0.016	0.027	0.027	0.028	0.030	0.033
49	0.013	0.010	0.009	0.009	0.017	0.022	0.029	0.037	0.039	0.037	0.037
50	0.013	0.010	0.010	0.013	0.014	0.009	0.017	0.014	0.021	0.028	0.032

Intern-harmonics -L2

Active power P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100
Frequency [Hz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
75	0.020	0.025	0.027	0.029	0.036	0.036	0.052	0.087	0.066	0.079	0.075
125	0.013	0.015	0.018	0.021	0.025	0.028	0.037	0.044	0.050	0.056	0.063
175	0.010	0.012	0.012	0.012	0.012	0.013	0.015	0.021	0.018	0.020	0.020
225	0.015	0.015	0.016	0.016	0.016	0.016	0.019	0.021	0.021	0.022	0.022
275	0.009	0.010	0.011	0.011	0.011	0.011	0.013	0.015	0.014	0.015	0.016
325	0.010	0.010	0.011	0.011	0.011	0.010	0.012	0.014	0.013	0.014	0.014
375	0.009	0.010	0.010	0.010	0.010	0.010	0.011	0.013	0.012	0.013	0.014
425	0.012	0.013	0.014	0.014	0.014	0.014	0.015	0.017	0.016	0.017	0.017
475	0.008	0.009	0.009	0.009	0.009	0.009	0.010	0.012	0.011	0.012	0.012
525	0.009	0.009	0.009	0.009	0.010	0.010	0.011	0.011	0.011	0.012	0.012
575	0.008	0.009	0.009	0.009	0.009	0.009	0.010	0.011	0.011	0.011	0.011
625	0.010	0.010	0.010	0.010	0.011	0.011	0.012	0.012	0.012	0.012	0.012
675	0.008	0.009	0.009	0.009	0.009	0.009	0.009	0.010	0.010	0.010	0.010
725	0.008	0.009	0.009	0.009	0.009	0.009	0.009	0.010	0.010	0.010	0.010
775	0.008	0.008	0.008	0.008	0.008	0.009	0.009	0.010	0.009	0.009	0.010
825	0.008	0.009	0.009	0.008	0.008	0.009	0.009	0.010	0.010	0.010	0.010
875	0.008	0.008	0.009	0.008	0.008	0.008	0.009	0.010	0.009	0.009	0.010
925	0.008	0.008	0.008	0.008	0.008	0.009	0.009	0.009	0.009	0.009	0.009
975	0.008	0.008	0.009	0.008	0.008	0.008	0.009	0.009	0.009	0.009	0.009
1025	0.008	0.008	0.008	0.008	0.009	0.008	0.009	0.009	0.009	0.009	0.009
1075	0.007	0.008	0.008	0.008	0.008	0.008	0.009	0.009	0.009	0.009	0.009
1125	0.008	0.008	0.008	0.008	0.008	0.008	0.009	0.009	0.009	0.010	0.010

CEI 0-16												
Clause	Requirement - Test										Result - Remark	Verdict
Intern-harmonics -L2												
Active power P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100	
Frequency [Hz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	
1175	0.008	0.008	0.008	0.009	0.008	0.008	0.009	0.009	0.009	0.009	0.010	
1225	0.008	0.008	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.010	
1275	0.008	0.008	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.010	0.009	
1325	0.008	0.008	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	
1375	0.007	0.008	0.009	0.009	0.009	0.009	0.009	0.010	0.009	0.010	0.009	
1425	0.007	0.008	0.009	0.009	0.009	0.009	0.009	0.010	0.010	0.010	0.010	
1475	0.007	0.008	0.009	0.009	0.009	0.009	0.010	0.010	0.010	0.010	0.010	
1525	0.007	0.008	0.009	0.009	0.009	0.010	0.010	0.010	0.010	0.010	0.010	
1575	0.007	0.008	0.009	0.009	0.009	0.009	0.010	0.011	0.010	0.011	0.011	
1625	0.007	0.008	0.008	0.009	0.009	0.009	0.009	0.010	0.011	0.010	0.011	
1675	0.007	0.008	0.008	0.008	0.008	0.008	0.009	0.010	0.010	0.010	0.012	
1725	0.007	0.008	0.008	0.008	0.008	0.008	0.009	0.009	0.009	0.010	0.011	
1775	0.007	0.007	0.008	0.008	0.008	0.008	0.008	0.009	0.009	0.010	0.010	
1825	0.007	0.008	0.008	0.008	0.008	0.008	0.008	0.009	0.009	0.009	0.010	
1875	0.007	0.008	0.008	0.008	0.008	0.008	0.008	0.009	0.009	0.009	0.009	
1925	0.007	0.008	0.008	0.008	0.008	0.008	0.008	0.009	0.009	0.009	0.009	
1975	0.007	0.008	0.008	0.008	0.008	0.008	0.008	0.009	0.009	0.009	0.009	

Higher frequencies -L2											
Active power P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100
Frequency [kHz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
2.1	0.028	0.026	0.029	0.037	0.045	0.045	0.066	0.073	0.081	0.089	0.098
2.3	0.036	0.036	0.040	0.039	0.041	0.038	0.051	0.055	0.056	0.059	0.066
2.5	0.038	0.037	0.034	0.035	0.038	0.037	0.048	0.051	0.056	0.061	0.067
2.7	0.032	0.029	0.029	0.030	0.033	0.038	0.045	0.059	0.062	0.060	0.063
2.9	0.037	0.036	0.040	0.036	0.037	0.038	0.039	0.046	0.046	0.046	0.053
3.1	0.037	0.037	0.034	0.036	0.037	0.034	0.037	0.043	0.046	0.047	0.052
3.3	0.032	0.030	0.029	0.029	0.030	0.031	0.033	0.042	0.050	0.047	0.045
3.5	0.037	0.038	0.039	0.034	0.035	0.033	0.037	0.043	0.048	0.047	0.047
3.7	0.107	0.107	0.107	0.109	0.110	0.109	0.110	0.110	0.113	0.113	0.115
3.9	0.109	0.110	0.111	0.111	0.110	0.112	0.113	0.117	0.120	0.120	0.119
4.1	0.033	0.033	0.035	0.035	0.037	0.039	0.040	0.039	0.046	0.045	0.046
4.3	0.039	0.040	0.041	0.047	0.047	0.052	0.053	0.050	0.055	0.049	0.050
4.5	0.032	0.032	0.038	0.043	0.044	0.048	0.053	0.055	0.059	0.056	0.050
4.7	0.044	0.047	0.053	0.055	0.062	0.070	0.075	0.073	0.082	0.083	0.086
4.9	0.041	0.040	0.042	0.053	0.065	0.073	0.084	0.091	0.106	0.105	0.107
5.1	0.040	0.039	0.043	0.052	0.067	0.082	0.092	0.102	0.112	0.114	0.117
5.3	0.037	0.039	0.042	0.050	0.057	0.059	0.063	0.067	0.073	0.078	0.084
5.5	0.035	0.036	0.038	0.042	0.044	0.045	0.047	0.050	0.052	0.055	0.059
5.7	0.030	0.031	0.030	0.031	0.034	0.037	0.040	0.041	0.042	0.045	0.046

CEI 0-16												
Clause	Requirement - Test										Result - Remark	Verdict
Higher frequencies -L2												
Active power P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100	
Frequency [kHz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	
5.9	0.025	0.027	0.030	0.033	0.036	0.037	0.037	0.037	0.036	0.037	0.037	
6.1	0.028	0.028	0.030	0.030	0.031	0.030	0.031	0.031	0.032	0.033	0.034	
6.3	0.027	0.026	0.025	0.026	0.027	0.027	0.029	0.031	0.032	0.032	0.031	
6.5	0.024	0.024	0.025	0.026	0.026	0.027	0.028	0.028	0.028	0.028	0.028	
6.7	0.022	0.024	0.024	0.025	0.025	0.025	0.025	0.026	0.026	0.027	0.027	
6.9	0.024	0.025	0.024	0.024	0.024	0.024	0.024	0.025	0.026	0.026	0.027	
7.1	0.022	0.021	0.021	0.022	0.023	0.024	0.025	0.025	0.025	0.026	0.026	
7.3	0.020	0.021	0.021	0.022	0.022	0.023	0.024	0.024	0.024	0.024	0.024	
7.5	0.021	0.021	0.021	0.022	0.022	0.022	0.023	0.023	0.023	0.023	0.023	
7.7	0.020	0.020	0.021	0.021	0.021	0.022	0.022	0.022	0.023	0.023	0.023	
7.9	0.020	0.020	0.020	0.021	0.021	0.022	0.022	0.022	0.022	0.022	0.023	
8.1	0.020	0.021	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	
8.3	0.020	0.021	0.021	0.021	0.021	0.022	0.022	0.022	0.022	0.022	0.022	
8.5	0.020	0.021	0.020	0.021	0.021	0.022	0.022	0.022	0.022	0.022	0.022	
8.7	0.021	0.021	0.021	0.021	0.021	0.022	0.022	0.022	0.022	0.022	0.022	
8.9	0.020	0.020	0.021	0.021	0.021	0.022	0.022	0.022	0.022	0.023	0.023	
Note(s): It is carried out in accordance to EN 61000-4-7. The worst case of three phases has been choose.												

N.3.1	Tabella: Misura di correnti armoniche Table: Measurement for harmonics current according to IEC 61400-21, Clause 7.4										P
Model	AF36K-TH										
Reference standard: Each phase output current > 75A, The harmonic currents are measured per EN 61000-4-7.											
Harmonics -L3											
Active power P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100
Harmonic number	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
2	0.107	0.160	0.309	0.346	0.368	0.404	0.426	0.459	0.494	0.558	0.645
3	0.656	0.668	0.896	1.012	1.071	1.116	1.180	1.252	1.329	1.423	1.524
4	0.084	0.138	0.154	0.242	0.263	0.235	0.232	0.250	0.272	0.309	0.356
5	0.893	1.260	1.039	0.760	0.557	0.466	0.421	0.400	0.384	0.381	0.379
6	0.105	0.261	0.053	0.162	0.219	0.223	0.211	0.201	0.192	0.182	0.170
7	0.651	0.447	0.705	0.630	0.475	0.359	0.271	0.218	0.192	0.176	0.168
8	0.062	0.062	0.025	0.087	0.138	0.130	0.128	0.132	0.130	0.132	0.129
9	0.147	0.153	0.155	0.127	0.105	0.096	0.081	0.064	0.041	0.028	0.045
10	0.016	0.115	0.054	0.040	0.102	0.110	0.115	0.121	0.123	0.126	0.127
11	0.288	0.304	0.180	0.256	0.243	0.205	0.169	0.129	0.098	0.092	0.100
12	0.033	0.091	0.121	0.027	0.102	0.149	0.157	0.155	0.151	0.144	0.139
13	0.205	0.236	0.179	0.156	0.163	0.167	0.146	0.116	0.099	0.087	0.083

CEI 0-16											
Clause	Requirement - Test						Result - Remark				Verdict
14	0.020	0.016	0.066	0.023	0.045	0.060	0.074	0.084	0.078	0.068	0.059
15	0.077	0.054	0.090	0.067	0.056	0.082	0.081	0.072	0.066	0.067	0.073
16	0.028	0.047	0.050	0.043	0.022	0.041	0.061	0.075	0.070	0.062	0.055
17	0.100	0.108	0.134	0.091	0.075	0.071	0.069	0.058	0.042	0.035	0.033
18	0.058	0.104	0.061	0.091	0.021	0.081	0.110	0.118	0.117	0.116	0.116
19	0.090	0.109	0.093	0.095	0.064	0.045	0.064	0.064	0.058	0.047	0.044
20	0.024	0.010	0.011	0.043	0.016	0.020	0.039	0.053	0.057	0.059	0.058
21	0.030	0.025	0.027	0.060	0.014	0.048	0.063	0.061	0.056	0.054	0.052
22	0.029	0.013	0.028	0.033	0.025	0.014	0.024	0.040	0.047	0.053	0.052
23	0.046	0.074	0.063	0.059	0.085	0.078	0.055	0.052	0.050	0.051	0.047
24	0.051	0.044	0.060	0.074	0.058	0.056	0.083	0.096	0.097	0.093	0.085
25	0.049	0.044	0.054	0.036	0.072	0.060	0.042	0.043	0.052	0.060	0.064
26	0.020	0.024	0.018	0.012	0.014	0.026	0.023	0.031	0.040	0.046	0.049
27	0.020	0.025	0.047	0.030	0.061	0.045	0.060	0.070	0.065	0.055	0.043
28	0.021	0.010	0.026	0.016	0.020	0.019	0.014	0.024	0.029	0.025	0.024
29	0.025	0.036	0.037	0.059	0.036	0.061	0.055	0.051	0.057	0.067	0.072
30	0.028	0.022	0.037	0.032	0.050	0.055	0.068	0.087	0.106	0.120	0.131
31	0.021	0.025	0.024	0.032	0.018	0.033	0.033	0.027	0.029	0.044	0.067
32	0.013	0.010	0.019	0.029	0.035	0.037	0.026	0.037	0.040	0.031	0.016
33	0.022	0.023	0.026	0.033	0.021	0.041	0.039	0.024	0.031	0.056	0.080
34	0.011	0.014	0.016	0.027	0.024	0.044	0.040	0.047	0.063	0.077	0.088
35	0.006	0.007	0.012	0.012	0.018	0.023	0.035	0.038	0.035	0.032	0.033
36	0.008	0.019	0.027	0.032	0.020	0.042	0.038	0.041	0.052	0.065	0.081
37	0.009	0.010	0.015	0.008	0.020	0.014	0.025	0.025	0.019	0.014	0.014
38	0.010	0.021	0.019	0.020	0.020	0.036	0.035	0.029	0.033	0.039	0.046
39	0.015	0.014	0.008	0.007	0.010	0.010	0.014	0.022	0.025	0.024	0.019
40	0.009	0.012	0.016	0.015	0.019	0.021	0.029	0.024	0.021	0.022	0.028
41	0.018	0.015	0.010	0.014	0.013	0.016	0.018	0.025	0.024	0.018	0.016
42	0.014	0.017	0.025	0.020	0.024	0.026	0.029	0.027	0.032	0.035	0.037
43	0.017	0.010	0.009	0.015	0.013	0.016	0.019	0.023	0.018	0.016	0.023
44	0.012	0.019	0.020	0.022	0.022	0.018	0.026	0.020	0.017	0.017	0.018
45	0.013	0.012	0.013	0.008	0.011	0.008	0.009	0.010	0.017	0.026	0.035
46	0.012	0.017	0.018	0.019	0.016	0.013	0.023	0.021	0.013	0.011	0.014
47	0.021	0.013	0.015	0.011	0.014	0.020	0.016	0.026	0.030	0.024	0.017
48	0.019	0.024	0.025	0.028	0.027	0.020	0.032	0.032	0.032	0.036	0.040
49	0.016	0.009	0.014	0.007	0.009	0.024	0.020	0.026	0.024	0.020	0.018
50	0.012	0.013	0.013	0.019	0.017	0.017	0.025	0.026	0.019	0.015	0.015

CEI 0-16												
Clause	Requirement - Test										Result - Remark	Verdict
Intern-harmonics -L3												
Active power P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100	
Frequency [Hz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	
75	0.020	0.026	0.028	0.032	0.034	0.043	0.048	0.096	0.058	0.073	0.068	
125	0.016	0.020	0.023	0.027	0.030	0.037	0.041	0.056	0.051	0.057	0.063	
175	0.012	0.013	0.014	0.014	0.014	0.015	0.016	0.025	0.017	0.020	0.020	
225	0.013	0.016	0.016	0.016	0.015	0.016	0.017	0.023	0.018	0.018	0.020	
275	0.011	0.013	0.013	0.012	0.012	0.013	0.013	0.018	0.015	0.015	0.016	
325	0.014	0.015	0.016	0.015	0.015	0.015	0.016	0.020	0.017	0.018	0.018	
375	0.011	0.012	0.012	0.012	0.012	0.012	0.013	0.016	0.013	0.014	0.014	
425	0.011	0.013	0.013	0.013	0.013	0.013	0.014	0.016	0.014	0.014	0.014	
475	0.010	0.010	0.011	0.011	0.011	0.011	0.012	0.014	0.012	0.012	0.013	
525	0.011	0.013	0.013	0.013	0.013	0.013	0.014	0.016	0.014	0.015	0.015	
575	0.009	0.010	0.010	0.010	0.010	0.010	0.011	0.013	0.011	0.012	0.012	
625	0.009	0.010	0.010	0.010	0.011	0.011	0.011	0.013	0.012	0.012	0.012	
675	0.009	0.010	0.010	0.010	0.010	0.010	0.011	0.013	0.011	0.011	0.011	
725	0.009	0.010	0.010	0.010	0.010	0.010	0.011	0.012	0.011	0.012	0.011	
775	0.008	0.009	0.009	0.009	0.009	0.010	0.010	0.012	0.010	0.010	0.010	
825	0.008	0.009	0.009	0.009	0.009	0.010	0.010	0.012	0.010	0.011	0.011	
875	0.008	0.009	0.009	0.009	0.009	0.009	0.010	0.011	0.010	0.010	0.011	
925	0.009	0.009	0.009	0.010	0.010	0.009	0.010	0.012	0.010	0.011	0.011	
975	0.008	0.009	0.009	0.009	0.009	0.009	0.010	0.011	0.010	0.010	0.010	
1025	0.008	0.009	0.009	0.009	0.009	0.009	0.010	0.011	0.010	0.010	0.010	
1075	0.008	0.009	0.009	0.009	0.009	0.009	0.010	0.011	0.010	0.010	0.010	
1125	0.009	0.009	0.009	0.009	0.009	0.010	0.010	0.011	0.010	0.010	0.010	
1175	0.008	0.009	0.009	0.009	0.009	0.009	0.010	0.011	0.010	0.010	0.010	
1225	0.008	0.009	0.009	0.010	0.010	0.010	0.010	0.011	0.011	0.010	0.010	
1275	0.008	0.009	0.009	0.010	0.010	0.010	0.010	0.011	0.010	0.011	0.010	
1325	0.008	0.009	0.009	0.010	0.010	0.010	0.010	0.011	0.010	0.010	0.010	
1375	0.008	0.009	0.009	0.009	0.010	0.010	0.010	0.011	0.011	0.010	0.011	
1425	0.008	0.009	0.009	0.010	0.010	0.010	0.010	0.011	0.011	0.011	0.011	
1475	0.008	0.009	0.009	0.009	0.010	0.010	0.010	0.011	0.010	0.012	0.011	
1525	0.008	0.009	0.009	0.010	0.010	0.010	0.011	0.011	0.011	0.011	0.012	
1575	0.008	0.008	0.009	0.009	0.009	0.009	0.010	0.011	0.010	0.011	0.011	
1625	0.008	0.009	0.009	0.009	0.009	0.009	0.010	0.010	0.010	0.010	0.011	
1675	0.008	0.009	0.009	0.009	0.009	0.009	0.010	0.010	0.010	0.011	0.011	
1725	0.008	0.009	0.009	0.009	0.009	0.009	0.010	0.010	0.010	0.011	0.011	
1775	0.008	0.008	0.008	0.009	0.009	0.009	0.009	0.010	0.010	0.011	0.011	
1825	0.008	0.008	0.009	0.009	0.009	0.009	0.009	0.010	0.009	0.010	0.011	
1875	0.008	0.008	0.009	0.009	0.008	0.009	0.009	0.010	0.009	0.010	0.010	
1925	0.008	0.009	0.008	0.009	0.009	0.009	0.009	0.009	0.009	0.010	0.010	
1975	0.008	0.008	0.009	0.009	0.009	0.009	0.009	0.010	0.009	0.010	0.010	

CEI 0-16												
Clause	Requirement - Test										Result - Remark	Verdict
Higher frequencies-L3												
Active power P/P _n [%]	0	10	20	30	40	50	60	70	80	90	100	
Frequency [kHz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	
2.1	0.036	0.036	0.039	0.041	0.042	0.044	0.052	0.052	0.051	0.050	0.055	
2.3	0.038	0.040	0.042	0.041	0.041	0.038	0.048	0.052	0.053	0.056	0.062	
2.5	0.036	0.031	0.032	0.032	0.031	0.040	0.043	0.049	0.043	0.041	0.047	
2.7	0.036	0.037	0.038	0.035	0.038	0.041	0.044	0.049	0.048	0.044	0.042	
2.9	0.037	0.036	0.035	0.035	0.036	0.038	0.038	0.050	0.049	0.046	0.049	
3.1	0.038	0.037	0.030	0.029	0.032	0.032	0.034	0.040	0.038	0.035	0.040	
3.3	0.032	0.033	0.034	0.035	0.036	0.036	0.042	0.045	0.044	0.043	0.042	
3.5	0.038	0.038	0.033	0.034	0.036	0.036	0.041	0.047	0.046	0.042	0.043	
3.7	0.108	0.108	0.108	0.109	0.110	0.112	0.114	0.115	0.115	0.113	0.114	
3.9	0.120	0.121	0.123	0.124	0.123	0.123	0.125	0.127	0.125	0.126	0.127	
4.1	0.035	0.034	0.034	0.035	0.040	0.039	0.039	0.041	0.042	0.042	0.044	
4.3	0.039	0.038	0.040	0.040	0.040	0.044	0.040	0.042	0.042	0.045	0.047	
4.5	0.038	0.039	0.036	0.038	0.040	0.044	0.046	0.048	0.046	0.049	0.051	
4.7	0.048	0.048	0.048	0.051	0.058	0.063	0.064	0.066	0.077	0.077	0.072	
4.9	0.040	0.042	0.041	0.050	0.060	0.068	0.075	0.087	0.091	0.099	0.097	
5.1	0.039	0.041	0.044	0.060	0.079	0.086	0.099	0.109	0.117	0.119	0.119	
5.3	0.038	0.040	0.045	0.050	0.059	0.066	0.070	0.073	0.077	0.083	0.089	
5.5	0.037	0.037	0.040	0.045	0.048	0.049	0.052	0.055	0.057	0.059	0.064	
5.7	0.033	0.032	0.031	0.033	0.037	0.040	0.042	0.044	0.047	0.048	0.049	
5.9	0.028	0.030	0.033	0.036	0.037	0.039	0.039	0.039	0.039	0.039	0.041	
6.1	0.029	0.031	0.033	0.033	0.033	0.033	0.034	0.035	0.035	0.036	0.037	
6.3	0.029	0.030	0.029	0.029	0.030	0.031	0.033	0.034	0.035	0.035	0.035	
6.5	0.027	0.027	0.027	0.028	0.029	0.030	0.031	0.032	0.032	0.032	0.032	
6.7	0.025	0.026	0.028	0.028	0.029	0.029	0.030	0.030	0.030	0.031	0.032	
6.9	0.027	0.027	0.027	0.026	0.027	0.027	0.028	0.029	0.030	0.030	0.030	
7.1	0.024	0.024	0.024	0.025	0.026	0.027	0.028	0.029	0.029	0.029	0.029	
7.3	0.023	0.023	0.024	0.025	0.026	0.027	0.027	0.028	0.028	0.028	0.028	
7.5	0.023	0.024	0.024	0.024	0.025	0.025	0.026	0.026	0.027	0.027	0.027	
7.7	0.022	0.023	0.023	0.024	0.024	0.025	0.026	0.026	0.026	0.026	0.026	
7.9	0.022	0.022	0.023	0.024	0.024	0.025	0.025	0.026	0.026	0.026	0.025	
8.1	0.023	0.024	0.024	0.024	0.024	0.025	0.025	0.025	0.025	0.025	0.025	
8.3	0.022	0.022	0.023	0.024	0.024	0.024	0.025	0.025	0.025	0.025	0.025	
8.5	0.023	0.023	0.023	0.024	0.024	0.025	0.025	0.025	0.025	0.025	0.025	
8.7	0.023	0.024	0.024	0.024	0.024	0.025	0.025	0.025	0.025	0.026	0.026	
8.9	0.022	0.023	0.023	0.024	0.025	0.025	0.025	0.025	0.025	0.026	0.026	
Note(s): It is carried out in accordance to EN 61000-4-7. The worst case of three phases has been choose.												

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

N.3.2	Tabella: Misura di fluttuazioni di tensione dovute a manovre di sezionamento/separazione			P	
	Table: Measurement of voltage fluctuations caused by switching operations according to IEC 61400-21, Clause 7.3.4				
Voltage fluctuations caused by switching operations - L1					
Grid frequency f [Hz]		50			
Grid voltage U_n [V]		400			
Rated current I_n [A]		87			
Remarks:		K_{imax} : is the ratio between the measured I_{imax} and the I_{nom} (nominal current) of the device.			
Reactive set-point control, Q = 0					
Max. number of switching operations, N_{10}		1			
Max. number of switching operations, N_{120}		12			
Case of switching operation		Cut-in at 10% of rated power			
Grid impedance angle, ψ_k		30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$		0.823	0.814	0.808	0.808
Voltage change factor, $k_u(\psi_k)$		1.039	1.299	1.299	0.953
Maximum inrush current factor k_{imax}		0.091			
Reactive set-point control, Q = 0					
Max. number of switching operations, N_{10}		1			
Max. number of switching operations, N_{120}		12			
Case of switching operation		Cut-in at 100% of rated power			
Grid impedance angle		30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$		0.327	0.500	0.717	0.810
Voltage change factor, $k_u(\psi_k)$		1.212	1.299	0.866	1.386
Maximum inrush current factor k_{imax}		0.381			
Reactive set-point control, Q = 0					
Max. number of switching operations, N_{10}		1			
Max. number of switching operations, N_{120}		12			
Case of switching operation		Service disconnection			
Grid impedance angle		30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$		0.625	0.658	0.711	0.746
Voltage change factor, $k_u(\psi_k)$		1.126	1.039	1.126	0.866
Maximum inrush current factor k_{imax}		0.441			

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict
Worst case over all switching operations, k_{imax}		0.441	

N.3.2	Tabella: Misura di fluttuazioni di tensione dovute a manovre di sezionamento/separazione Table: Measurement of voltage fluctuations caused by switching operations according to IEC 61400-21, Clause 7.3.4	P
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Voltage fluctuations caused by switching operations – L2				
Grid frequency f [Hz]	50			
Grid voltage U_n [V]	400			
Rated current I_n [A]	87			
Remarks:	K_{imax} : is the ratio between the measured I_{imax} and the I_{nom} (nominal current) of the device.			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Cut-in at 10% of rated power			
Grid impedance angle, ψ_k	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.340	0.328	0.320	0.317
Voltage change factor, $k_u(\psi_k)$	0.866	0.866	1.299	0.953
Maximum inrush current factor k_{imax}	0.177			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Cut-in at 100% of rated power			
Grid impedance angle	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.808	0.801	0.804	0.808
Voltage change factor, $k_u(\psi_k)$	1.386	1.299	1.212	0.953
Maximum inrush current factor k_{imax}	0.651			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Service disconnection			
Grid impedance angle	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.838	0.817	0.820	0.829
Voltage change factor, $k_u(\psi_k)$	1.299	1.299	1.299	1.386
Maximum inrush current factor k_{imax}	0.807			

CEI 0-16					
Clause	Requirement - Test			Result - Remark	Verdict
Worst case over all switching operations, k_{imax}		0.807			
N.3.2	Tabella: Misura di fluttuazioni di tensione dovute a manovre di sezionamento/separazione Table: Measurement of voltage fluctuations caused by switching operations according to IEC 61400-21, Clause 7.3.4				P
Voltage fluctuations caused by switching operations – L3					
Grid frequency f [Hz]		50			
Grid voltage U_n [V]		400			
Rated current I_n [A]		87			
Remarks:		K_{imax} : is the ratio between the measured I_{imax} and the I_{nom} (nominal current) of the device.			
Reactive set-point control, $Q = 0$					
Max. number of switching operations, N_{10}		1			
Max. number of switching operations, N_{120}		12			
Case of switching operation		Cut-in at 10% of rated power			
Grid impedance angle, ψ_k		30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$		0.735	0.730	0.732	0.738
Voltage change factor, $k_u(\psi_k)$		1.126	1.299	1.212	0.866
Maximum inrush current factor k_{imax}		0.180			
Reactive set-point control, $Q = 0$					
Max. number of switching operations, N_{10}		1			
Max. number of switching operations, N_{120}		12			
Case of switching operation		Cut-in at 100% of rated power			
Grid impedance angle		30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$		0.731	0.753	0.793	0.814
Voltage change factor, $k_u(\psi_k)$		0.953	0.953	1.212	0.953
Maximum inrush current factor k_{imax}		0.436			
Reactive set-point control, $Q = 0$					
Max. number of switching operations, N_{10}		1			
Max. number of switching operations, N_{120}		12			
Case of switching operation		Service disconnection			
Grid impedance angle		30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$		0.426	0.464	0.516	0.546
Voltage change factor, $k_u(\psi_k)$		1.039	1.126	0.953	0.953
Maximum inrush current factor k_{imax}		0.859			

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

N.3.3	Tabella: Misura di fluttuazioni di tensione (flicker) in condizioni di funzionamento continuo Table: Voltage fluctuations (Flickers) during continuous operation according to IEC 61400-21, Clause 6.3.2 and 7.3.3	P
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Model	AF60K-TH
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Reference standard:
Each phase output current > 75A:
IEC 61400-21-1: Wind energy generation systems - Part 21-1: Measurement and assessment of electrical characteristics - Wind turbines

Test - L1

Grid impedance angle, ψ_k		30°		50°		70°		85°	
Test No.	P [%]	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)
1	10	0.677	0.033	0.683	0.034	0.692	0.034	0.695	0.034
2	20	1.291	0.064	1.286	0.064	1.287	0.064	1.288	0.064
3	30	0.549	0.027	0.547	0.027	0.553	0.027	0.555	0.027
4	40	0.751	0.037	0.762	0.038	0.774	0.038	0.779	0.338
5	50	1.177	0.058	1.192	0.059	1.217	0.060	1.233	0.061
6	60	0.603	0.03	0.621	0.031	0.653	0.032	0.671	0.033
7	70	1.107	0.055	1.141	0.057	1.179	0.058	1.195	0.059
8	80	1.003	0.050	1.043	0.052	1.088	0.054	1.110	0.055
9	90	0.529	0.026	0.604	0.030	0.727	0.036	0.789	0.039
10	100	0.576	0.028	0.693	0.034	0.841	0.042	0.908	0.045
11	100	0.634	0.031	0.760	0.038	0.915	0.045	0.983	0.049
12	100	0.686	0.034	0.772	0.038	0.898	0.044	0.961	0.048

Network impedance angle	Measurements		
	P _{st}	P _{It}	C ψ_k
30°	0.686	0.686	0.034
50°	0.772	0.772	0.038
70°	0.898	0.898	0.044
85°	0.961	0.961	0.048

Note(s):
The worst value of three phases shall be determined.

CEI 0-16									
Clause	Requirement - Test					Result - Remark			Verdict
N.3.3	Tabella: Misura di fluttuazioni di tensione (flicker) in condizioni di funzionamento continuo Table: Voltage fluctuations (Flickers) during continuous operation according to IEC 61400-21, Clause 6.3.2 and 7.3.3								P
Model	AF60K-TH								
Reference standard: Each phase output current > 75A: IEC 61400-21-1: Wind energy generation systems - Part 21-1: Measurement and assessment of electrical characteristics - Wind turbines									
Test – L2									
Grid impedance angle, ψ_k		30°		50°		70°		85°	
Test No.	P [%]	P_{st}	c(ψ_k)	P_{st}	c(ψ_k)	P_{st}	c(ψ_k)	P_{st}	c(ψ_k)
1	10	1.289	0.064	1.285	0.064	1.285	0.064	1.284	0.064
2	20	0.803	0.040	0.799	0.039	0.797	0.039	0.798	0.039
3	30	1.262	0.063	1.266	0.063	1.272	0.063	1.274	0.063
4	40	0.765	0.038	0.738	0.036	0.721	0.036	0.712	0.035
5	50	0.509	0.025	0.543	0.027	0.581	0.029	0.596	0.029
6	60	1.225	0.061	1.194	0.059	1.176	0.058	1.171	0.058
7	70	0.504	0.025	0.540	0.027	0.580	0.029	0.597	0.029
8	80	0.585	0.029	0.610	0.030	0.644	0.032	0.658	0.032
9	90	1.187	0.059	1.154	0.057	1.152	0.057	1.154	0.057
10	100	0.944	0.047	0.915	0.045	0.939	0.046	0.963	0.048
11	100	0.922	0.046	0.932	0.046	0.985	0.049	1.018	0.050
12	100	0.781	0.039	0.721	0.036	0.732	0.036	0.754	0.037
Network impedance angle		Measurements							
		P _{st}	P _{It}		C ψ_k				
30°		0.781	0.781		0.039				
50°		0.721	0.721		0.036				
70°		0.732	0.732		0.036				
85°		0.754	0.754		0.037				
Note(s): The worst value of three phases shall be determined.									

CEI 0-16									
Clause	Requirement - Test					Result - Remark			Verdict
N.3.3	Tabella: Misura di fluttuazioni di tensione (flicker) in condizioni di funzionamento continuo Table: Voltage fluctuations (Flickers) during continuous operation according to IEC 61400-21, Clause 6.3.2 and 7.3.3								P
Model	AF60K-TH								
Reference standard: Each phase output current > 75A: IEC 61400-21-1: Wind energy generation systems - Part 21-1: Measurement and assessment of electrical characteristics - Wind turbines									
Test – L3									
Grid impedance angle, ψ_k		30°		50°		70°		85°	
Test No.	P [%]	P_{st}	c(ψ_k)	P_{st}	c(ψ_k)	P_{st}	c(ψ_k)	P_{st}	c(ψ_k)
1	10	0.840	0.042	0.832	0.041	0.829	0.041	0.828	0.041
2	20	0.763	0.038	0.777	0.038	0.795	0.039	0.802	0.040
3	30	0.965	0.048	0.972	0.048	0.986	0.049	0.994	0.049
4	40	1.331	0.066	1.376	0.068	1.422	0.071	1.443	0.072
5	50	1.050	0.052	1.040	0.052	1.039	0.051	1.039	0.051
6	60	0.940	0.047	0.959	0.047	0.978	0.048	0.986	0.049
7	70	1.164	0.058	1.149	0.057	1.157	0.057	1.170	0.058
8	80	1.195	0.059	1.171	0.058	1.177	0.058	1.189	0.059
9	90	1.093	0.054	1.158	0.057	1.230	0.061	1.267	0.063
10	100	1.210	0.060	1.209	0.060	1.237	0.061	1.261	0.063
11	100	1.272	0.063	1.343	0.067	1.433	0.071	1.485	0.074
12	100	1.273	0.063	1.300	0.065	1.352	0.067	1.386	0.069
Network impedance angle		Measurements							
		P _{st}		P _{It}		C ψ_k			
30°		1.273		1.273		0.063			
50°		1.300		1.300		0.065			
70°		1.352		1.352		0.067			
85°		1.386		1.386		0.069			
Note(s): The worst value of three phases shall be determined.									

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

N.4	Tabella: Verifica del campo di funzionamento in tensione e frequenza Table: Verification of the operating range in voltage and frequency							P
Model	AF60K-TH							
Test sequence	Test condition		Measurement result					Limits
	U/U _n	f [Hz]	U/U _n	f [Hz]	P/S _n	Cosφ (PF)	ΔP/S _n	ΔP/S _n
1	85%	47.5	85.03%	47.48	93.77%	0.9995	-6.23%	-15% to +5%
2	110%	51.5	109.92%	51.48	100.12%	0.9997	0.12%	-5% to +5%

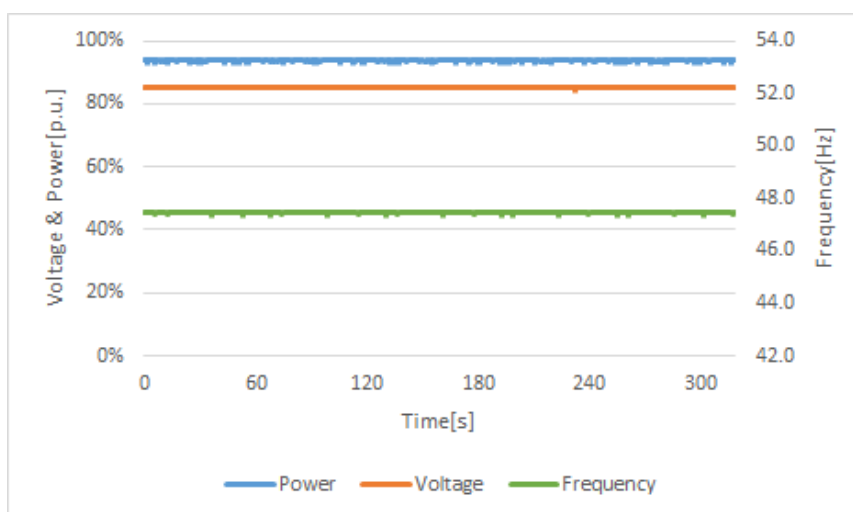
Note:

Function of interface protection and activating active power response to over/under-frequency and voltage should be disable.

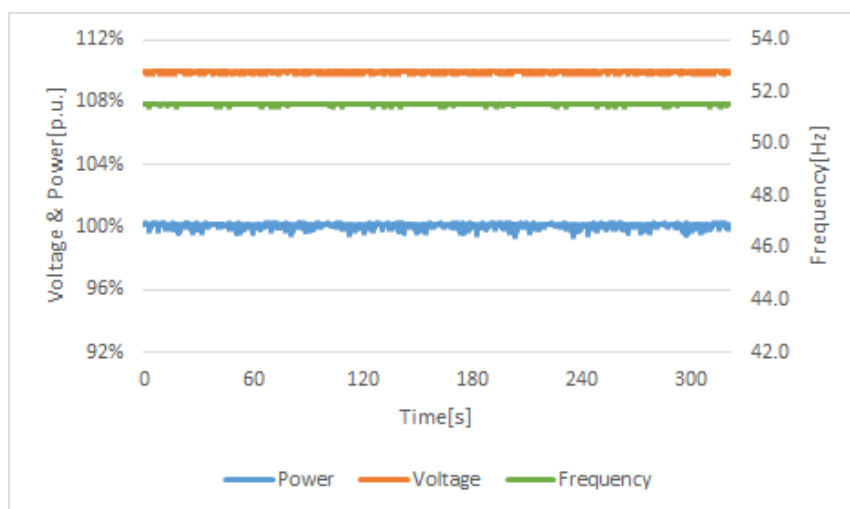
Test sequence 1: Unit can operate at reduced power of $P \geq 85\%S_n$.

Supplied power must remain stable within $\pm 5\% S_n$ at the entire duration.

Test 1



Test 2



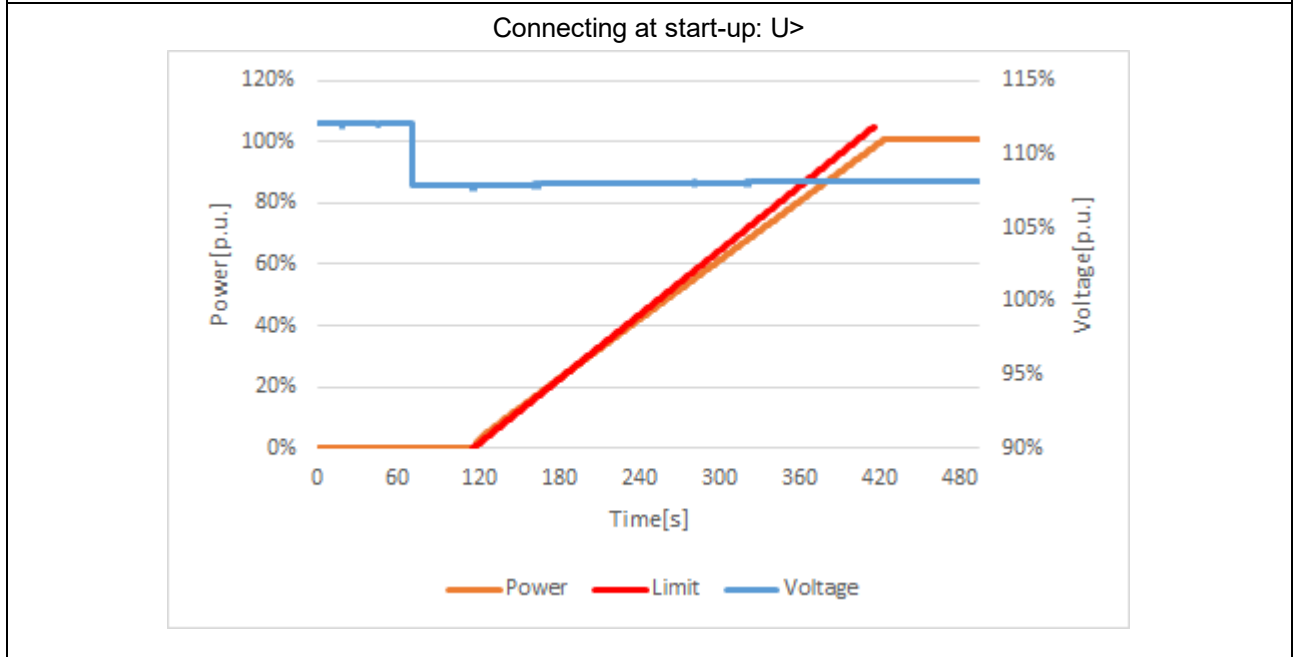
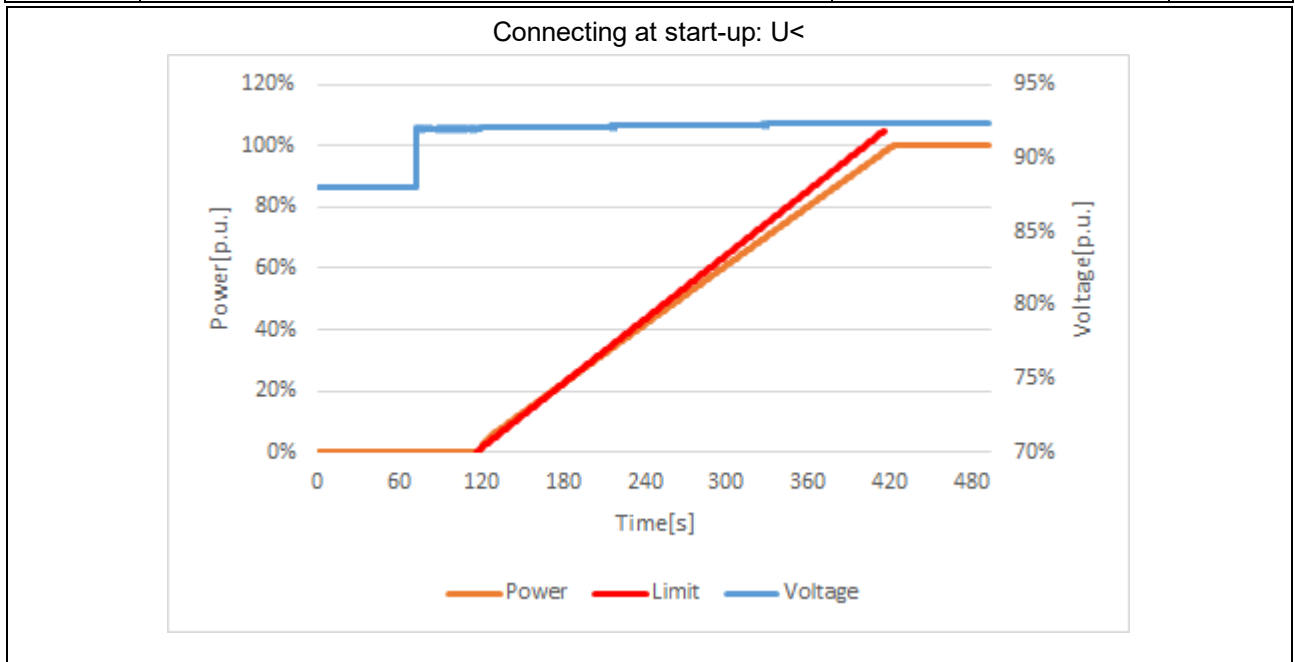
CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

N.5		Tabella: Verifica delle condizioni di sincronizzazione e presa di carico Table: Synchronization and reconnection						P	
Setting values for Synchronization:		Setting U< [V]:				90%Un			
		Setting U> [V]:				110%Un			
		Setting f< [Hz]:				49.9Hz			
		Setting f> [Hz]:				50.1Hz			
		Setting T _{connection} [s]:				30			
		Setting T _{reconnection} [s]:				300			
Test condition		Measurement				Limit			
U/U _n	F [Hz]	U/U _n	F [Hz]	Observation time [s]	Max. gradient P _n /min	Observation time	Max. gradient P _n /min		
Test conditions: connecting at start-up:									
< 89%	50	88.06%	50.00	83.6	--	No connection	--		
Change to:									
≥ 91%	50	92.03%	50.00	36.1	19.51%	≥ 30s	20%		
Change to:									
> 111%	50	112.25%	50.00	78.2	--	No connection	--		
Change to:									
≤ 109%	50	108.12%	50.00	35.7	19.39%	≥ 30s	20%		
Change to:									
100%	< 49.88	99.94%	49.87	81.2	--	No connection	--		
Change to:									
100%	≥ 49.92	99.97%	49.92	35.4	19.48%	≥ 30s	20%		
Change to:									
100%	> 50.12	99.95%	50.13	79.8	--	No connection	--		
Change to:									
100%	≤ 50.08	99.96%	50.08	36.4	19.21%	≥ 30s	20%		

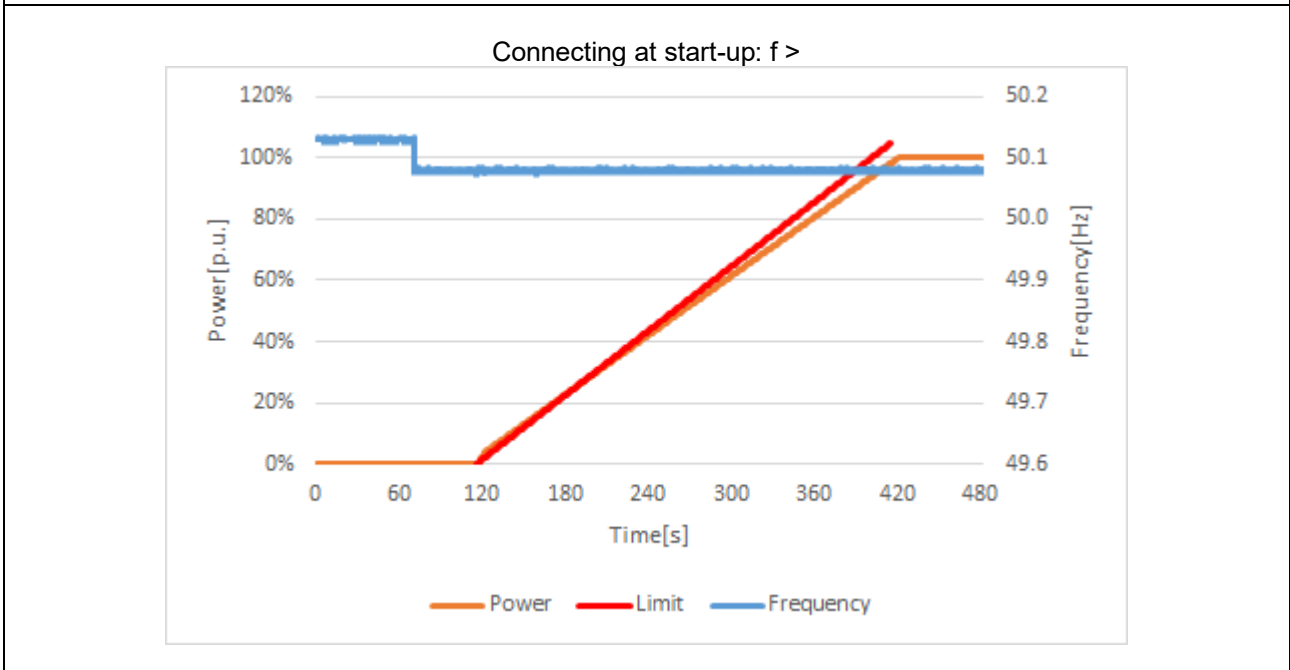
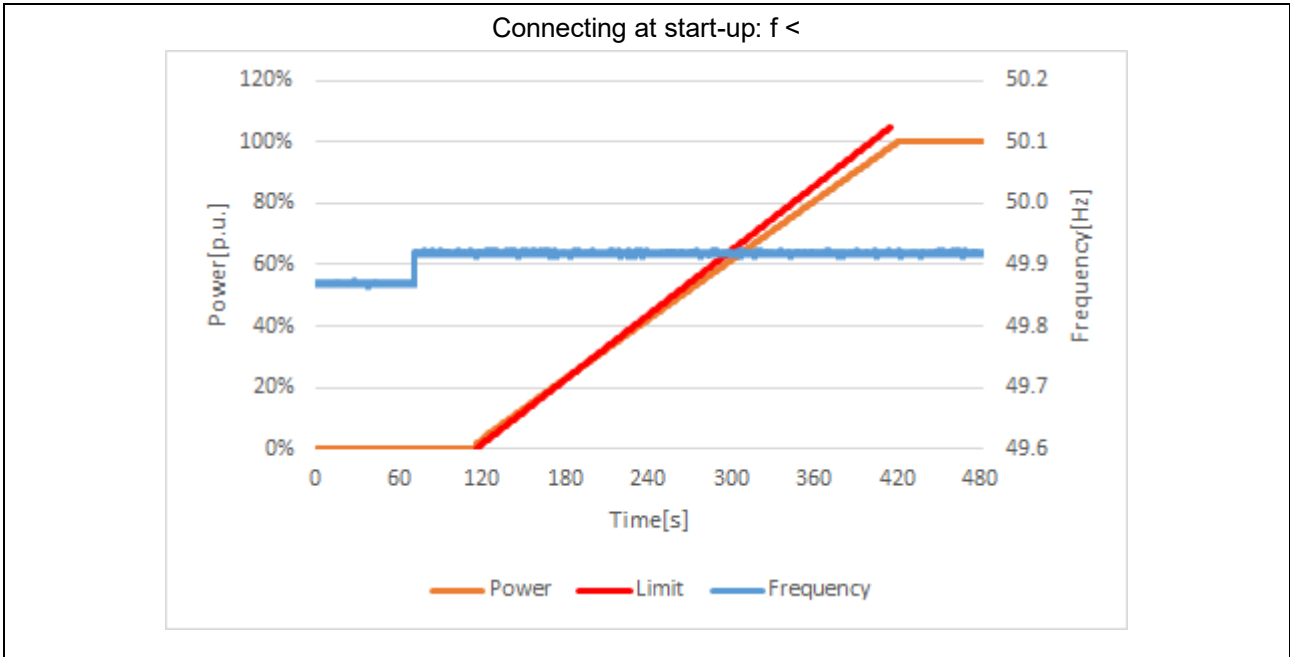
CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test condition		Measurement				Limit	
U/U _n	F [Hz]	U/U _n	F [Hz]	Observation time [s]	Max. gradient P _n /min	Observation time	Max. gradient P _n /min
Test conditions: Reconnecting after failure:							
< 89%	50	88.03%	50.00	612.3	--	No connection	--
Change to:							
≥ 91%	50	92.05%	50.00	308.9	19.27%	≥ 300s	20%
> 111%	50	112.04%	50.00	614.7	--	No connection	--
Change to:							
≤ 109%	50	108.09%	50.00	315.1	19.16%	≥ 300s	20%
100%	< 49.88	99.95%	49.87	616.7	--	No connection	--
Change to:							
100%	≥ 49.92	99.94%	49.92	312.4	19.21%	≥ 300s	20%
100%	> 50.12	99.97%	50.13	615.5	--	No connection	--
Change to:							
100%	≤ 50.08	99.95%	50.08	311.0	19.25%	≥ 300s	20%

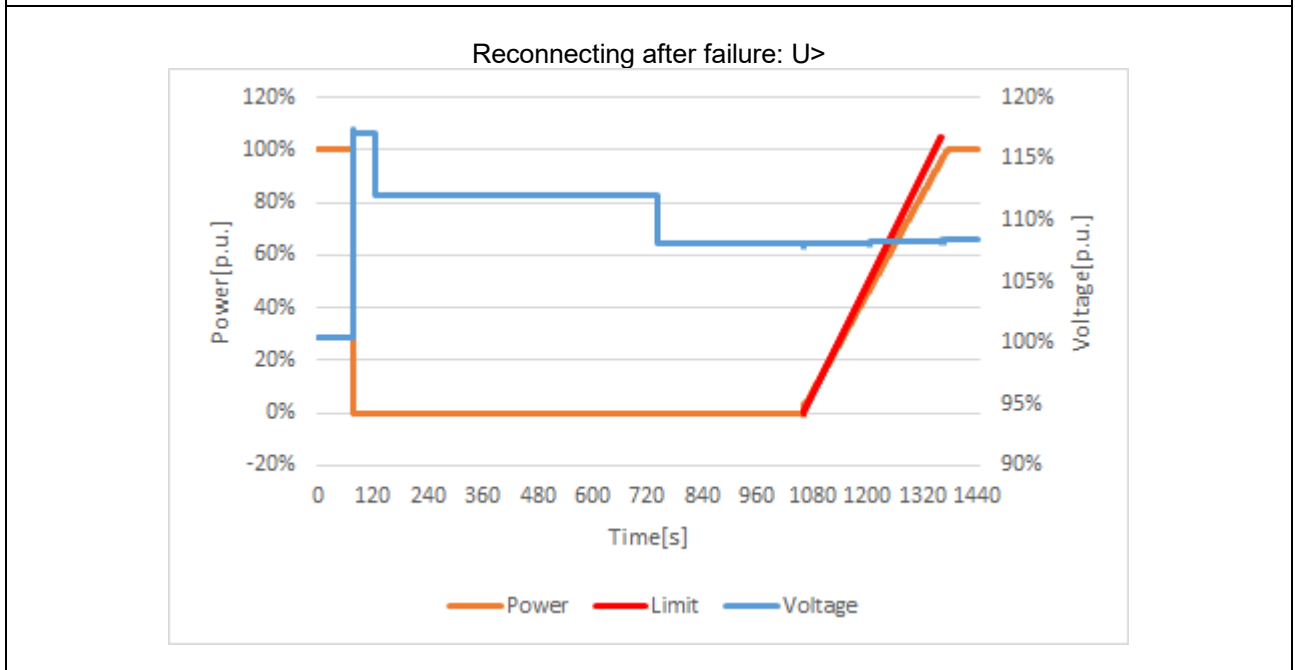
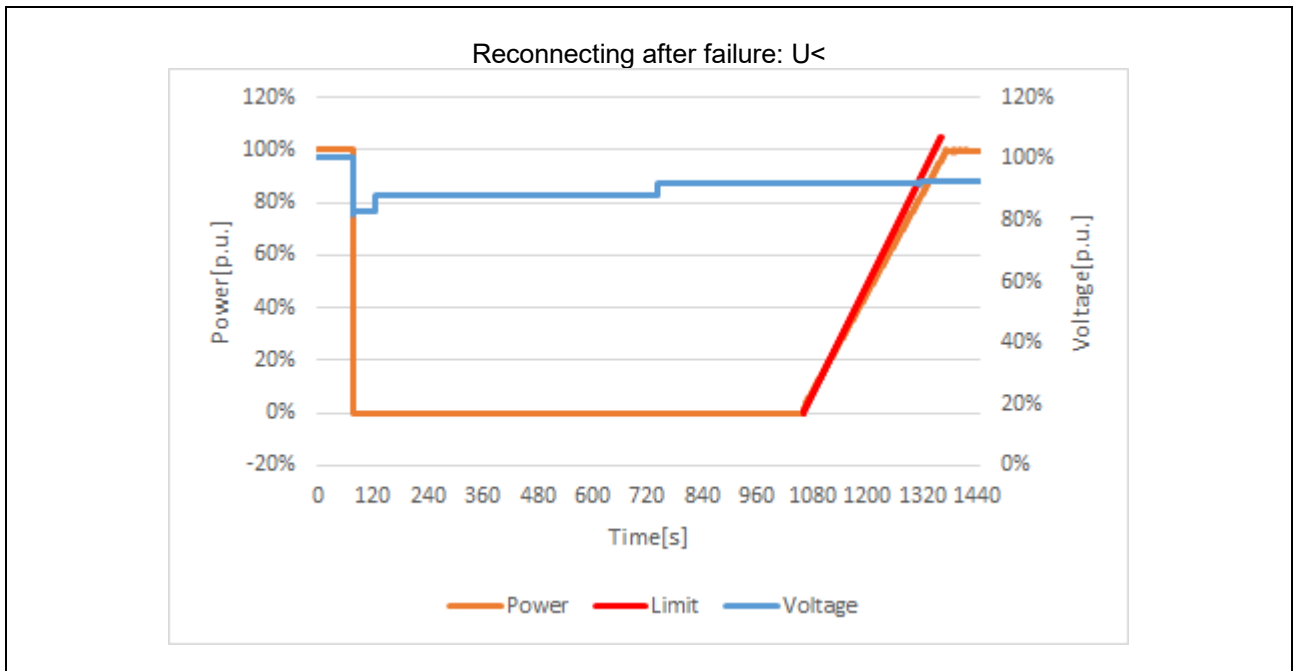
CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict



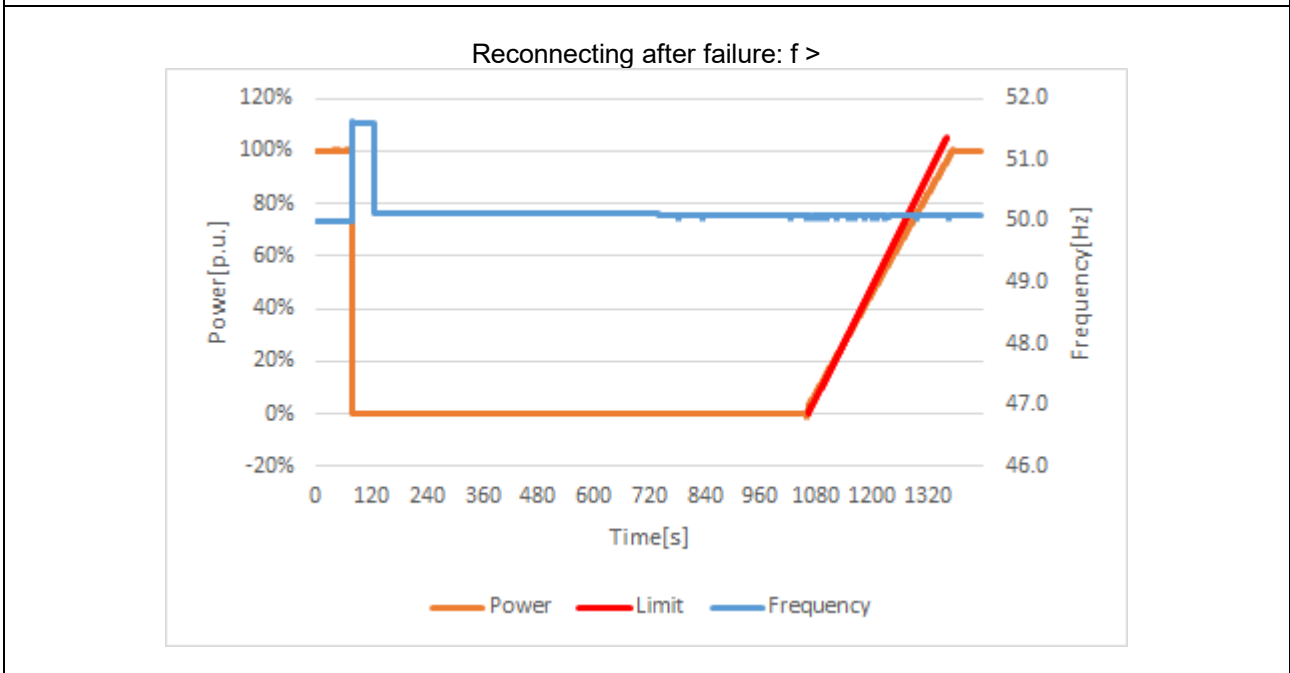
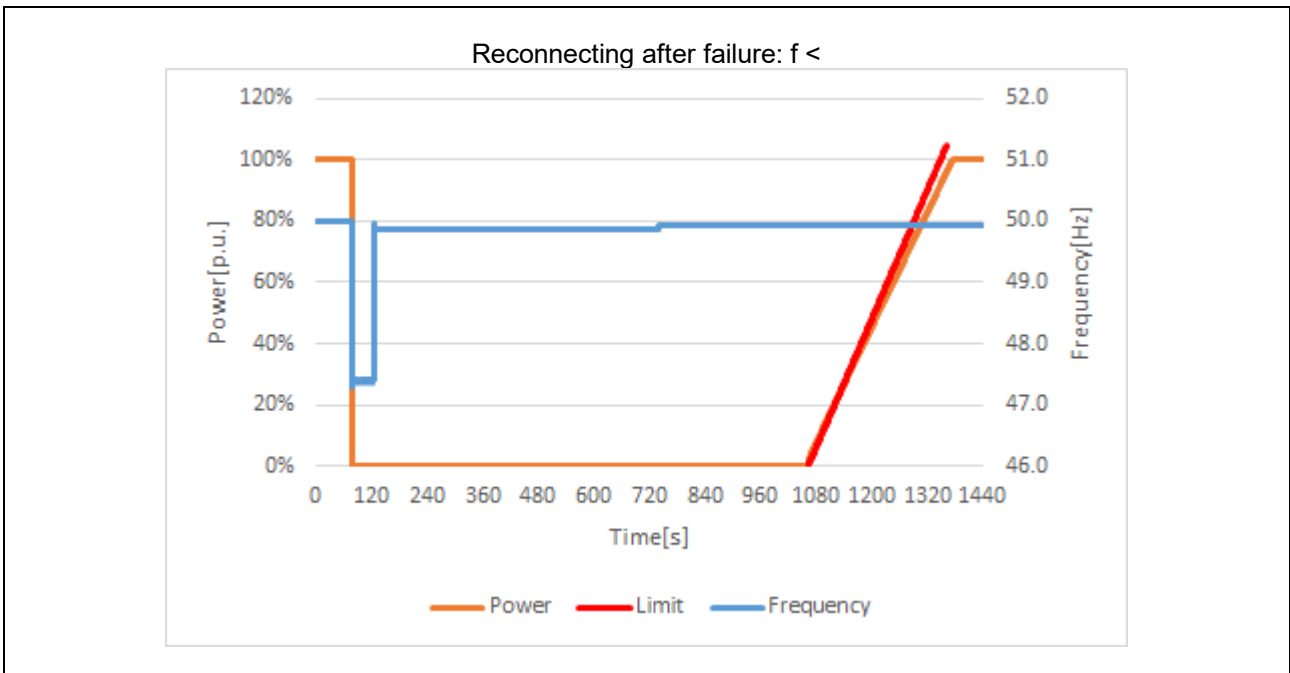
CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict



CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict



CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict



CEI 0-16										
Clause	Requirement - Test					Result - Remark			Verdict	
N.6.1	Verifica della capability di erogazione della potenza reattiva (Verification of the reactive power capability)									P
Model: AF60K-TH										
Test: Power generation plant $\geq 400\text{kW}$										
Test Conditions		Measurements								Limit
P/S _n	Q/S _n	Active Power		Reactive power		DC Power		Power Factor (cosφ)	ΔQ/S _n	ΔQ/S _n
		P [kW]	P/S _n [p.u.]	Q [kVar]	Q/S _n [p.u.]	P [kW]	P/S _n [p.u.]			
0%	0	0.09	0.16%	1.49	2.49%	0.10	0.16%	0.0651	2.49%	$\leq \pm 10\%$
10%		6.08	10.14%	1.51	2.51%	6.21	10.35%	0.9698	2.51%	$\leq \pm 5\%$
20%		12.03	20.05%	1.50	2.50%	12.28	20.46%	0.9920	2.50%	
30%		18.07	30.12%	1.51	2.52%	18.44	30.74%	0.9964	2.52%	
40%		24.02	40.04%	1.50	2.51%	24.51	40.85%	0.9980	2.51%	
50%		29.98	49.96%	1.50	2.50%	30.59	50.98%	0.9987	2.50%	
60%		36.05	60.08%	1.51	2.51%	36.78	61.31%	0.9991	2.51%	
70%		42.06	70.09%	1.50	2.50%	42.91	71.52%	0.9994	2.50%	
80%		48.09	80.15%	1.50	2.50%	49.07	81.78%	0.9995	2.50%	
90%		54.15	90.25%	1.51	2.51%	55.25	92.09%	0.9996	2.51%	
100%		59.97	99.95%	0.54	0.90%	61.19	101.98%	0.9999	0.90%	
0%	$\leq -99.5\%$	2.76	4.59%	-59.70	-99.50%	2.81	4.69%	0.0461	0.00%	--
10%	$\leq -99.5\%$	6.03	10.05%	-59.76	-99.59%	6.15	10.25%	0.1004	-0.09%	$\leq +5\%$
20%	$\leq -98.0\%$	12.05	20.08%	-58.87	-98.12%	12.29	20.49%	0.2005	-0.12%	
30%	$\leq -95.4\%$	18.08	30.14%	-57.26	-95.44%	18.45	30.75%	0.3011	-0.04%	
40%	$\leq -91.7\%$	24.07	40.12%	-55.04	-91.73%	24.56	40.94%	0.4007	-0.03%	
50%	$\leq -86.6\%$	30.07	50.11%	-51.96	-86.60%	30.68	51.13%	0.5008	0.00%	
60%	$\leq -80.0\%$	36.02	60.04%	-48.02	-80.04%	36.76	61.26%	0.6001	-0.04%	
70%	$\leq -71.4\%$	42.06	70.10%	-42.85	-71.42%	42.92	71.53%	0.7005	-0.02%	
80%	$\leq -60.0\%$	48.07	80.12%	-36.03	-60.05%	49.06	81.76%	0.8002	-0.05%	
90%	$\leq -43.6\%$	54.04	90.07%	-26.18	-43.64%	55.14	91.90%	0.8999	-0.04%	
95%	-31.2%	57.06	95.09%	-18.73	-31.21%	58.22	97.03%	0.9501	-0.01%	
100%	-31.2%	60.04	100.06%	-18.77	-31.28%	61.26	102.10%	0.9545	-0.08%	--
0%	$\geq 99.5\%$	0.14	0.24%	59.72	99.53%	0.15	0.24%	0.0024	0.03%	--
10%	$\geq 99.5\%$	6.06	10.10%	59.72	99.53%	6.19	10.31%	0.1010	0.03%	$\leq \pm 5\%$
20%	$\geq 98.0\%$	12.06	20.10%	58.85	98.09%	12.30	20.51%	0.2007	0.09%	
30%	$\geq 95.4\%$	18.07	30.11%	57.25	95.42%	18.44	30.73%	0.3009	0.02%	
40%	$\geq 91.7\%$	24.07	40.12%	55.07	91.79%	24.56	40.94%	0.4005	0.09%	

CEI 0-16										
Clause	Requirement - Test					Result - Remark			Verdict	
Test Conditions		Measurements								Limit
P/S _n	Q/S _n	Active Power		Reactive power		DC Power		Power Factor (cosφ)	ΔQ/S _n	ΔQ/S _n
		P [kW]	P/S _n [p.u.]	Q [kVar]	Q/S _n [p.u.]	P [kW]	P/S _n [p.u.]			
50%	≥ 86.6%	30.06	50.11%	51.99	86.66%	30.68	51.13%	0.5006	0.06%	
60%	≥ 80.0%	35.98	59.97%	48.05	80.08%	36.72	61.19%	0.5994	0.08%	
70%	≥ 71.4%	42.09	70.16%	42.88	71.47%	42.95	71.59%	0.7005	0.07%	
80%	≥ 60.0%	48.04	80.07%	36.03	60.05%	49.02	81.71%	0.8000	0.05%	
90%	≥ 43.6%	54.06	90.11%	26.17	43.62%	55.17	91.94%	0.9001	0.02%	
95%	31.2%	57.08	95.13%	18.71	31.19%	58.24	97.07%	0.9502	-0.01%	
100%	31.2%	60.07	100.12%	18.72	31.20%	61.30	102.16%	0.9547	0.00%	--

Note(s):
The limitation capacity of reactive power shall be met to Figure 16.
Q shall be have a "semicircular" capability while P is greater than 10%S_n.

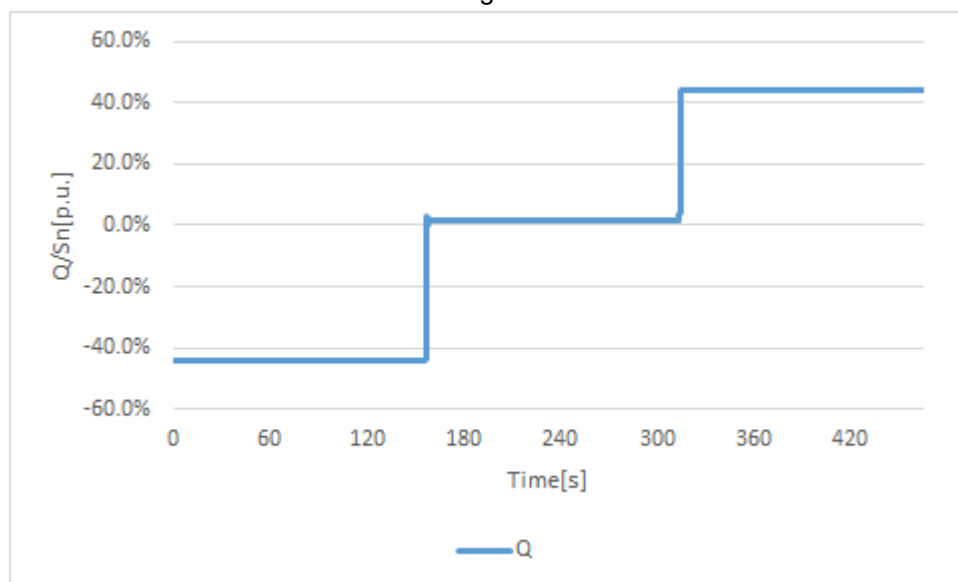
CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

N.6.2.1	Tabella: Modalità di esecuzione della prova e registrazione dei risultati applicabile a generatori statici (ipotesi di regolazione tramite Q) Table: Method of carrying out the test and recording of the results applicable to static generators (hypothesis of regulation via Q)						P
	Test Conditions		Measurements				
	Q/S _{max}	P/S _{max}	Q/S _{max}	cosφ	I/I _n	U/U _n	ΔQ/S _{max}
	- 43.6%	50%	-43.76%	0.7547	60.49%	99.94%	-0.16%
	0		1.52%	0.9995	45.13%	100.30%	1.52%
	+ 43.6%		43.63%	0.7527	59.73%	100.64%	0.03%
							≤ ±5%

Note(s):

Possibility to control this function by an external signal.

Diagram

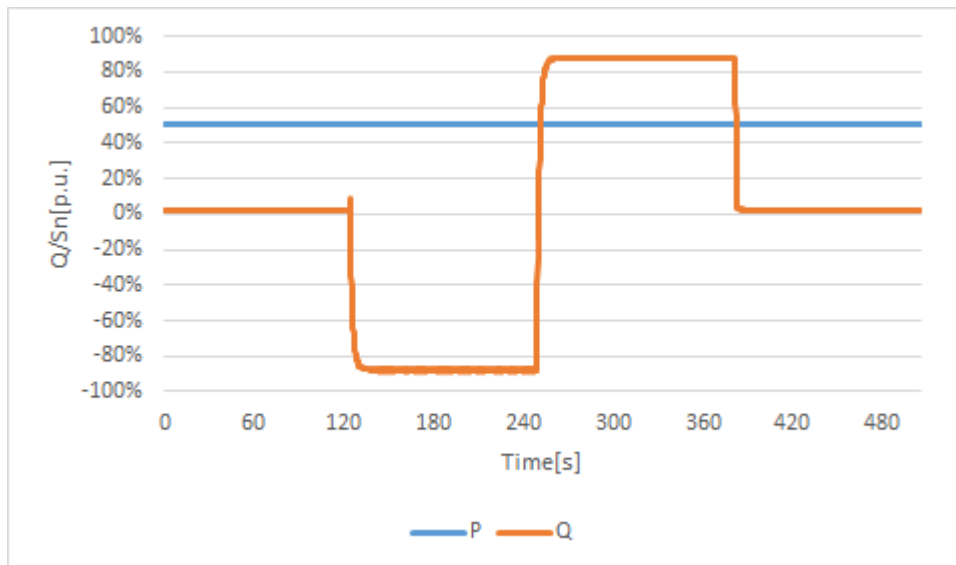
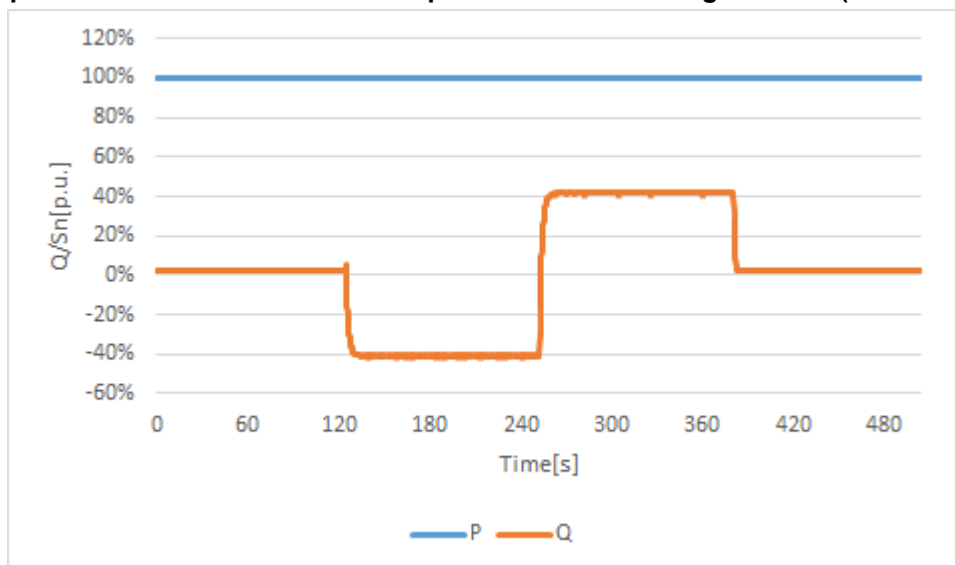


CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

N.6.2.3	Tabella: Tempo di risposta ad una variazione a gradino del livello assegnato Table: Time response to a step change in the level assigned								P	
Test: Power generation plant $\geq 400\text{kW}$:										
Test Conditions		Measurements						Limit		
Q/S _n	P/P _n	Q/S _n	cos ϕ	I/I _n	U/U _n	$\Delta Q/S_n$	$\Delta T_{\text{setting}}$	$\Delta Q/S_n$	$\Delta T_{\text{setting}}$	
Test 1:										
0	50%	1.80%	0.9952	45.47%	100.59%	1.80%	4.2	$\leq \pm 5\%$	$\leq 10\text{s}$	
-86.6%		-86.94%	0.4960	90.24%	100.60%	-0.34%	5.4			
+86.6%		86.71%	0.5030	90.45%	100.61%	0.11%	1.2			
0		2.55%	0.9985	45.26%	100.61%	2.55%	-			
Test 2:										
0	100%	2.28%	0.9996	90.40%	100.63%	2.28%	4.0	$\leq \pm 5\%$	$\leq 10\text{s}$	
-43.6%		-40.59%	0.9263	97.12%	100.64%	3.01%	5.2			
+43.6%		41.44%	0.9245	97.99%	100.64%	-2.16%	1.3			
0		2.58%	0.9996	90.40%	100.64%	2.58%	-			
Note(s): The test was conducted at 50% P _n (Test 1) and 100% P _n (Test 2). Possibility to control this function by an external signal.										

CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Graph 1: the reaction time after a step variation of the assigned level (50%-Test 1)**Graph 2: the reaction time after a step variation of the assigned level (100%-Test 2)**

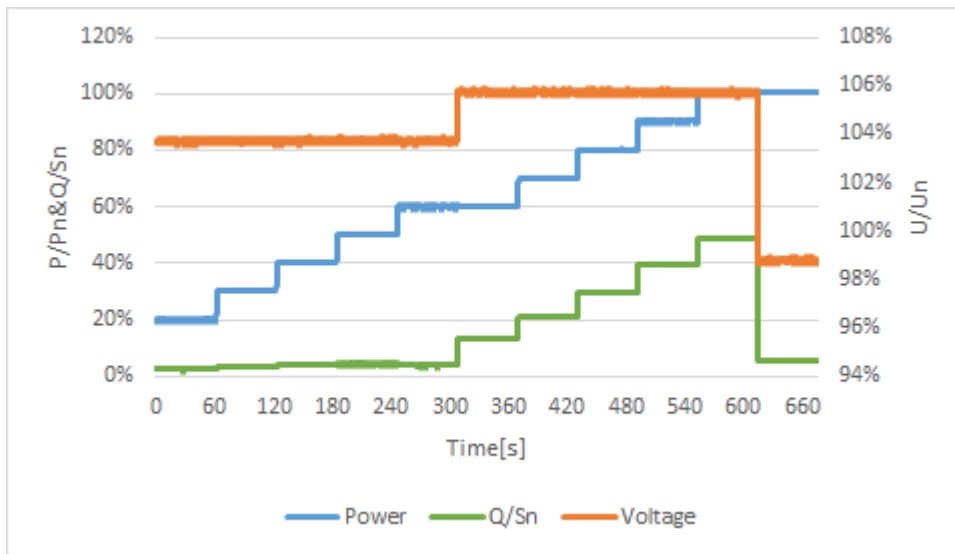
CEI 0-16								
Clause	Requirement - Test					Result - Remark		Verdict
N.6.3	Tabella: Regolazione automatica di potenza reattiva secondo una curva caratteristica $\cos\phi = f(P)$ Table: Automatic adjustment of reactive power according to the characteristic curve $\cos\phi (P)$							P
cos ϕ (P) curve settings	Set points	U lock-in	U lock-out	Set points		A	B	C
	P/P _n	105%	100%	P/P _n		20%	50%	100%
				Cos ϕ (i: inductive; c: capacitive)		1	1	0.9i
Test 1: 0.9i								
Test Conditions			Measurements					Limit
U/U _n	P/P _n	Excepted cos ϕ	U/U _n	Active power P/P _n	Reactive power Q/S _n	cos ϕ	Δ cos ϕ	Δ cos ϕ
104%	20%	1	103.73%	20.08%	2.40%	0.9930	-0.0070	$\leq \pm 0.01$
	30%	1	103.74%	30.12%	3.23%	0.9943	-0.0057	
	40%	1	103.74%	40.11%	3.92%	0.9953	-0.0047	
	50%	1	103.75%	50.25%	4.48%	0.9961	-0.0039	
	60%	1	103.74%	60.11%	3.86%	0.9979	-0.0021	
106%	60%	0.98	105.75%	60.32%	13.11%	0.9772	-0.0028	
	70%	0.96	105.75%	70.22%	21.11%	0.9577	-0.0023	
	80%	0.94	105.75%	80.23%	29.76%	0.9376	-0.0024	
	90%	0.92	105.74%	90.26%	39.43%	0.9164	-0.0036	
100%	0.90	105.72%	100.38%	48.71%	0.8996	-0.0004		
99%	100%	1	98.80%	100.65%	5.36%	0.9986	-0.0014	
Test Conditions			Measurements					Limit
U/U _n	P/P _n	Excepted cos ϕ	$\Delta T_{\text{settling}}$					$\Delta T_{\text{settling}}$
106%	60%	0.98	3.8					$\leq 10s$
	70%	0.96	4.5					
	80%	0.94	6.5					
	90%	0.92	7.4					
	100%	0.915	5.1					
99%	100%	1	6.3					

CEI 0-16								
Clause	Requirement - Test				Result - Remark			Verdict
Test 2: 0.9c								
cos ϕ (P) curve settings	U lock-in		105%Un					
	U lock-out		100%Un					
	Set points		A	B	C			
	P/P _n		20%	50%	100%			
	Cos ϕ (i: inductive; c: capacitive)		1	1	0.9c			
Test Conditions			Measurements					Limit
U/U _n	P/P _n	Excepted cos ϕ	U/U _n	P/P _n	Q/S _n	cos ϕ	Δ cos ϕ	Δ cos ϕ
104%	20%	1	103.74%	20.09%	-2.39%	0.9930	-0.0070	$\leq \pm 0.01$
	30%	1	103.75%	30.14%	-3.22%	0.9944	-0.0056	
	40%	1	103.76%	40.13%	-3.89%	0.9953	-0.0047	
	50%	1	103.77%	50.26%	-4.48%	0.9960	-0.0040	
	60%	1	103.75%	60.12%	-3.86%	0.9979	-0.0021	
106%	60%	0.98	105.76%	60.33%	-13.10%	0.9772	-0.0028	
	70%	0.96	105.76%	70.23%	-21.10%	0.9577	-0.0023	
	80%	0.94	105.76%	80.24%	-29.76%	0.9376	-0.0024	
	90%	0.92	105.75%	90.27%	-39.42%	0.9164	-0.0036	
	100%	0.90	105.74%	100.39%	-48.71%	0.8997	-0.0003	
99%	100%	1	98.82%	100.66%	-5.36%	0.9986	-0.0014	
Test Conditions			Measurements					Limit
U/U _n	P/P _n	Excepted cos ϕ	$\Delta T_{\text{settling}}$				$\Delta T_{\text{settling}}$	
106%	60%	0.98	5.9				$\leq 10\text{s}$	
	70%	0.96	4.7					
	80%	0.94	6.2					
	90%	0.92	8.1					
	100%	0.915	5.6					
99%	100%	1	6.8					
Note(s): Possibility to control this function by an external signal.								

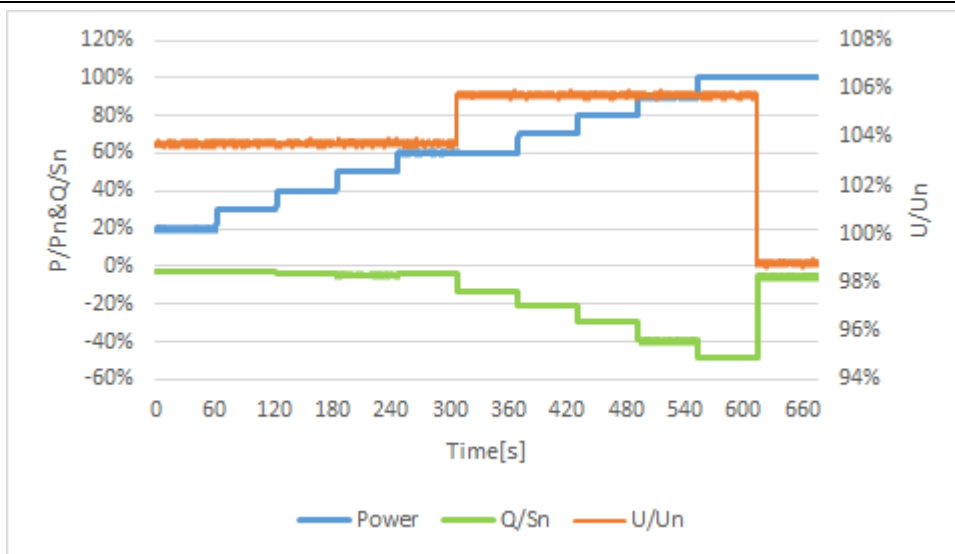
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 1: 0.9i



Test 2: 0.9c



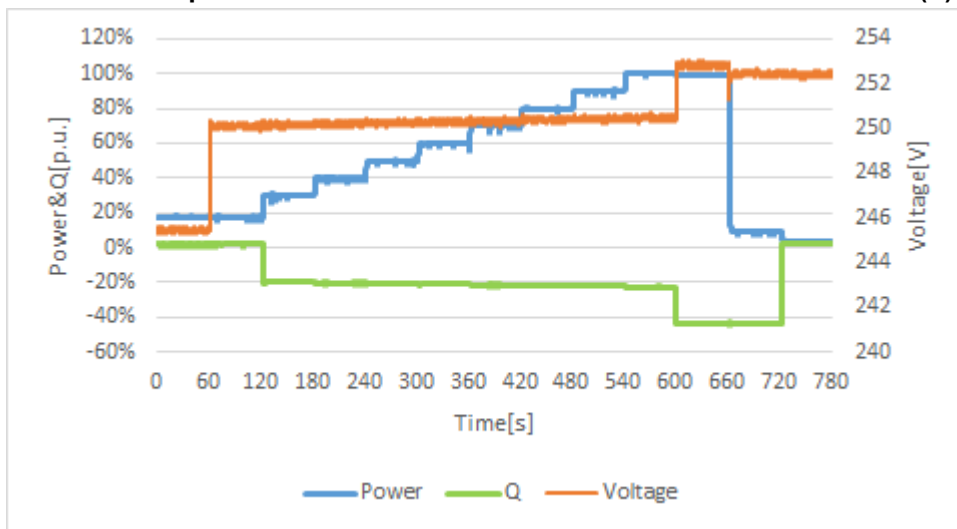
CEI 0-16								
Clause	Requirement - Test				Result - Remark			Verdict
N.6.4	Tabella: Erogazione/assorbimento automatico di potenza reattiva secondo una curva caratteristica Q=f(V) Table: Automatic absorption of reactive power according to the characteristic curve Q(U)							P
Q(U) curve settings	Set points	P lock-in	P lock-out	Set points	V2i	V1i	V1s	V2s
	P/P _n	20%	5%	U/U _n	90%	92%	108%	110%
				Q/S _n	43.6%	0	0	-43.6%
Test Conditions			Measurements					Limit
U/U _n	P/P _n	Excepted Q/S _n	U/U _n	P/P _n	Q/S _n	cosφ	ΔQ/S _n	ΔQ/S _n
107%	< 20%	0	106.91%	17.82%	1.86%	0.9946	1.86%	≤ ± 2%
109%	< 20%	-21.8%	108.91%	17.71%	1.87%	0.9945	1.87%	
	30%		108.93%	29.85%	-19.81%	0.8332	1.99%	
	40%		108.94%	39.81%	-20.17%	0.8921	1.63%	
	50%		108.96%	49.88%	-20.57%	0.9245	1.23%	
	60%		108.98%	59.86%	-20.99%	0.9437	0.81%	
	70%		108.99%	69.98%	-21.36%	0.9564	0.44%	
	80%		109.01%	80.00%	-21.50%	0.9657	0.30%	
	90%		109.02%	89.90%	-22.12%	0.9710	-0.32%	
110%	100%	-43.6%	109.04%	99.90%	-22.64%	0.9753	-0.84%	
	10%		110.04%	98.63%	-43.72%	0.9142	-0.12%	
	< 5%	0	109.91%	8.96%	-43.50%	0.2017	0.10%	
Test Conditions			Measurements					
U/U _n	P/P _n	Excepted Q/S _n	Δ T _{settling}					Δ T _{settling}
109%	30%	-21.8%	3.8					≤ 10s
110%	100%	-43.6%	4.2					
110%	< 5%	0	4.6					
Test Conditions			Measurements					Limit
U/U _n	P/P _n	Excepted Q/S _n	U/U _n	P/P _n	Q/S _n	cosφ	ΔQ/S _n	ΔQ/S _n
93%	< 20%	0	92.93%	18.23%	1.47%	0.9968	1.47%	≤ ± 2%
91%	< 20%	0	90.91%	18.32%	1.44%	0.9969	1.44%	
	30%	21.8%	90.94%	30.50%	22.77%	0.8014	0.97%	

CEI 0-16								
Clause	Requirement - Test					Result - Remark		Verdict
	40%		90.96%	40.49%	22.59%	0.8733	0.79%	
	50%		90.97%	50.54%	22.37%	0.9144	0.57%	
	60%		90.99%	60.56%	21.90%	0.9404	0.10%	
	70%		91.01%	70.64%	21.73%	0.9558	-0.07%	
	80%		91.03%	80.67%	21.69%	0.9657	-0.11%	
	90%		91.05%	90.51%	21.78%	0.9722	-0.02%	
	100%		91.05%	98.18%	21.69%	0.9764	-0.11%	
90%	100%	43.6%	90.03%	89.18%	44.11%	0.8962	0.51%	
	10%		89.88%	9.44%	44.70%	0.2046	1.10%	
	< 5%		0	89.87%	4.67%	1.50%	0.9522	
Test Conditions			Measurements				Limit	
U/U _n	P/P _n	Excepted Q/S _n	$\Delta T_{\text{settling}}$				$\Delta T_{\text{settling}}$	
91%	30%	-21.8%	5.9				≤ 10s	
90%	100%	-43.6%	5.3					
90%	< 5%	0	5.2					
Note(s): Possibility to control this function by an external signal.								

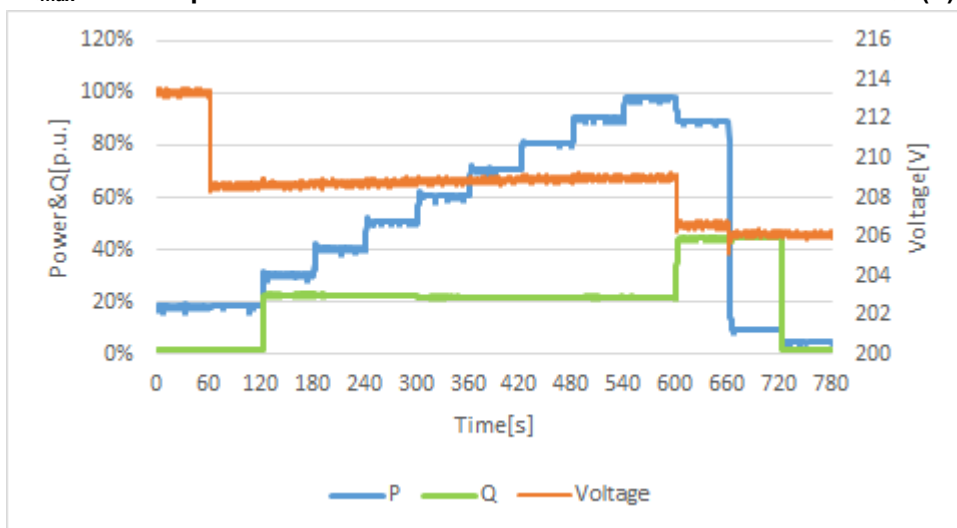
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Q_{min} reactive power in accordance to standard characteristic curve Q=f(V)



Q_{max} reactive power in accordance to standard characteristic curve Q=f(V)

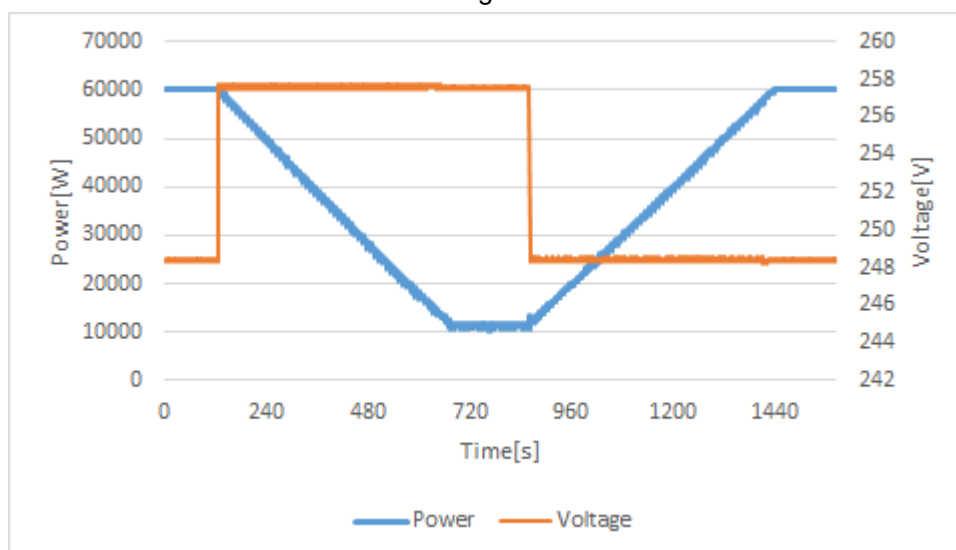


CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

N.7.1	Tabella: Limitazione automatica in logica locale, per valori di tensione prossimi al 110% Table: Active power limitation for voltage values near to 110%Un (characteristic curve P(U))	P
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P(U) curve settings		U/U _n	110%				
		P/P _n	≤ 20%				
Test Conditions		Measurements				Limit	
U/U _n	Excepted P/P _n	U/U _n [%]	P/P _n [%]	Cosφ	Δ T _{setting}	P/P _n	Δ T _{setting}
108%	100%	108.00%	100.15%	0.9997	136	≤ ± 5%	≤ 600s
112%	≤ 20%	112.01%	17.38%	0.9976	138	≤ 20%	
108%	100%	108.01%	100.11%	0.9991	141	≤ ± 5%	

Diagram



CEI 0-16								
Clause	Requirement - Test				Result - Remark			Verdict
N.7.2	Tabella: Limitazione automatica per transitori di sovrافrequenza originatisi sulla rete (secondo quanto stabilito in 8.8.6.4.2 ed in Allegato J (par. J.3)) Table: Automatic limitation for over-frequency transients (LFSM-O) originating on the network (as established in 8.8.6.4.2 and in Annex J (par. J.3))							P
Power output:		100% P _n						
Starting frequency f ₁ :		50.2Hz						
Deactivation threshold f _{stop} :		50.1Hz (Activated)						
Droop s _o :		2.6% (77%P _{ref} / Hz)						
Sequence A:								
Test condition		Measurement						Limit ΔP/P _n
f [Hz]	Target P/P _n	f [Hz]	P/P _n	T _{sr} [s]	T _{settling} [s]	T _d [s]	ΔP/P _n	
1) 47.51	100%	47.51	100.42%	--	--	--	0.42%	≤ ± 2.5%
2) 50.15	100%	50.15	99.39%	0	0	0	-0.61%	
3) 50.40	84.60%	50.40	84.48%	1.1	2.1	0.3	-0.12%	
4) 50.60	69.20%	50.60	69.29%	0.7	1.8	0.2	0.09%	
5) 51.49	0.67%	51.49	1.12%	0.9	2.6	0.2	0.45%	
6) 50.11	0.67%	50.11	0.80%	0	0	0	0.13%	
7) 50.00	keep P _{min-o} 0.67%	50.00	0.80%	--	--	--	0.13%	
	recover to 100%	50.00	100.09%	--	--	--	0.09%	
Test condition		Measurement					Limit	
6) 50.11 to 7) 50		Waiting time for keep P _{min-o} [s]:				336	≥ 300s	
		Max. power gradient		[P _e - P _{min-o}]/min:		19.12%	20% [P _e - P _{min-o}]/min	
		Max. power gradient		P _n /min:		19.36%	20% P _n /min	
Sequence B:								
Test condition		Measurement						Limit ΔP/P _n
f [Hz]	Target P/P _n	f [Hz]	P/P _n	T _{sr} [s]	T _{settling} [s]	T _d [s]	ΔP/P _n	
1) 47.51	50%	47.51	50.50%	--	--	--	0.50%	≤ ± 2.5%
2) 50.15	50%	50.15	50.45%	0	0	0	0.45%	
3) 50.40	42.3%	50.40	42.42%	0.5	1.9	0.2	0.12%	
4) 50.60	34.6%	50.60	34.82%	0.7	2.5	0.2	0.22%	
5) 51.49	0.34%	51.49	0.59%	0.4	3.2	0.2	0.25%	
6) 50.11	0.34%	50.11	0.39%	0	0	0	0.05%	

CEI 0-16

Clause	Requirement - Test	Result - Remark						Verdict
7) 50.00	keep P_{min-o} 0.34%	50.00	0.39%	--	--	--	0.05%	
	recover to 50%	50.00	50.65%	--	--	--	0.65%	

Test condition	Measurement			Limit
6) 50.11 to 7) 50	Waiting time for keep P_{min-o} [s]:		326	$\geq 300s$
	Max. power gradient	$[P_e - P_{min-o}]/min$:	19.25%	20% $[P_e - P_{min-o}]/min$
	Max. power gradient	P_n/min :	19.29%	10% P_n/min

Diagram of Sequence A

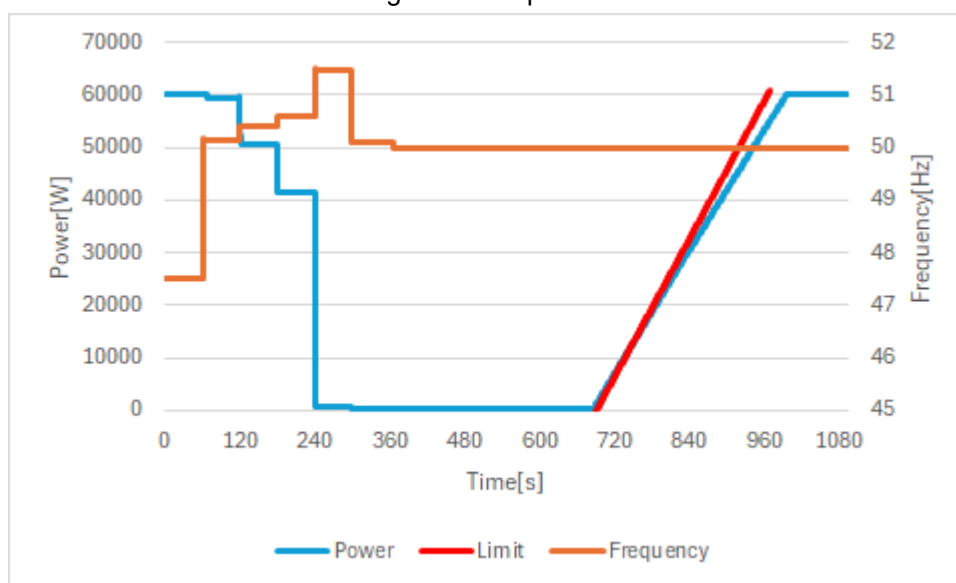
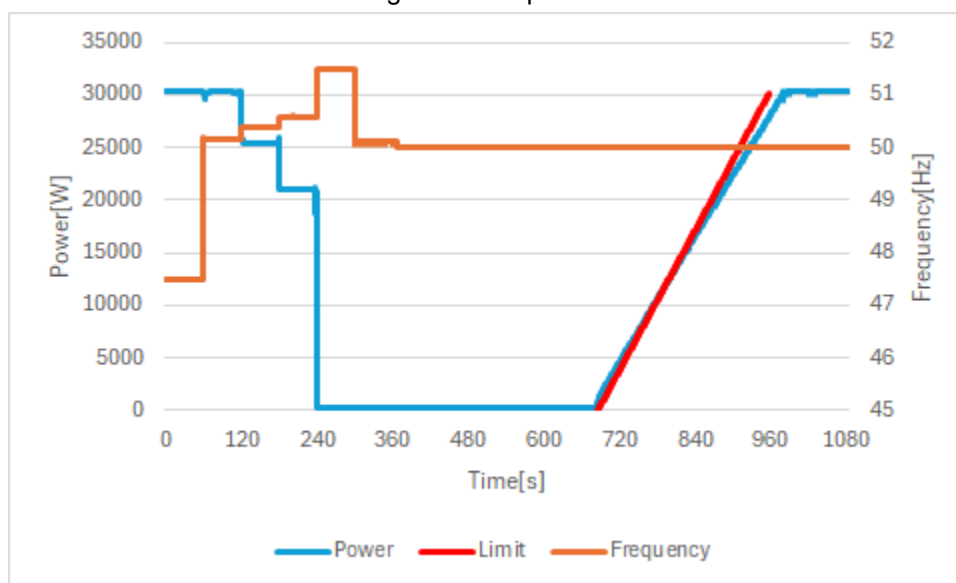


Diagram of Sequence B



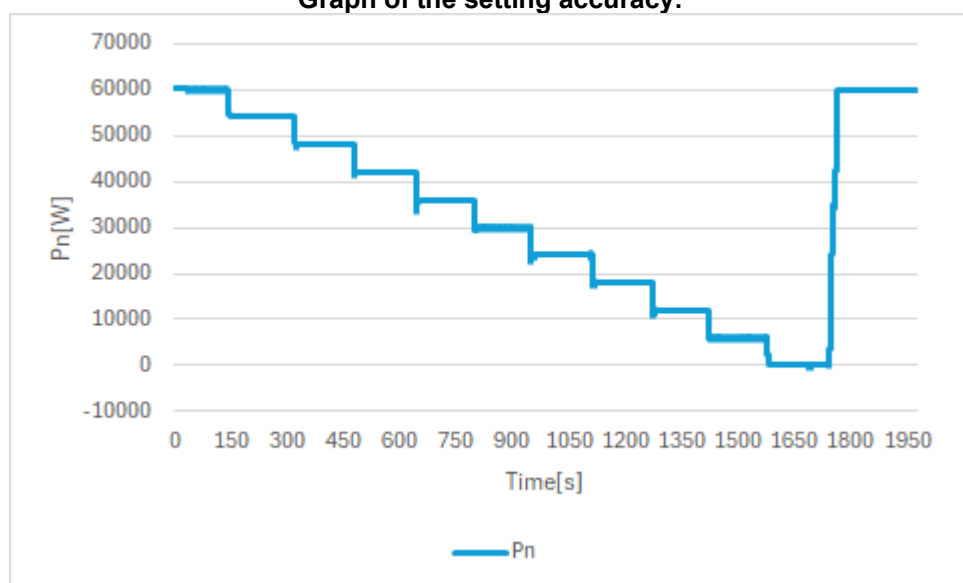
CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

External command P/P _n	Test condition		Measurement			Limit
	Target P/P _n	P/P _n	$\Delta P/P_n$	T _{settling} [s]	$\Delta P/P_n$	
100%	100%	100.01%	0.01%	-	$\leq \pm 2.5\%$	
90%	90%	90.25%	0.25%	3.1		
80%	80%	80.04%	0.04%	2.0		
70%	70%	70.01%	0.01%	1.7		
60%	60%	59.94%	-0.06%	1.6		
50%	50%	50.06%	0.06%	1.3		
40%	40%	39.99%	-0.01%	1.6		
30%	30%	30.10%	0.10%	1.5		
20%	20%	20.17%	0.17%	1.5		
10%	10%	10.08%	0.08%	2.0		
0%*	0%	0.50%	0.50%	1.5	*	
100%	100%	100.02%	0.02%	13.0	$\pm 2.5\%$	

Note(s):

* Measured P shall be within 0-12.5%P_n while external command P/P_n is set less than 10%.

Graph of the setting accuracy:

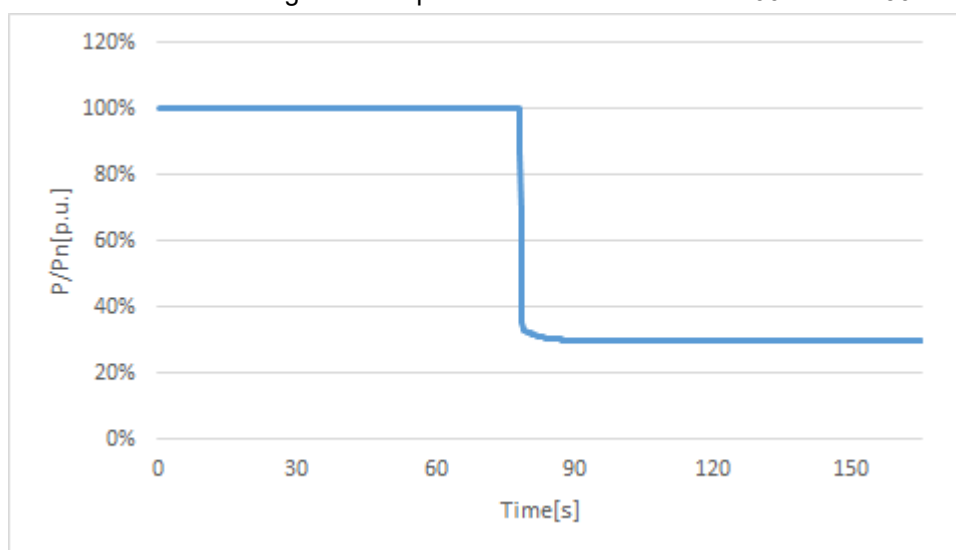


CEI 0-16

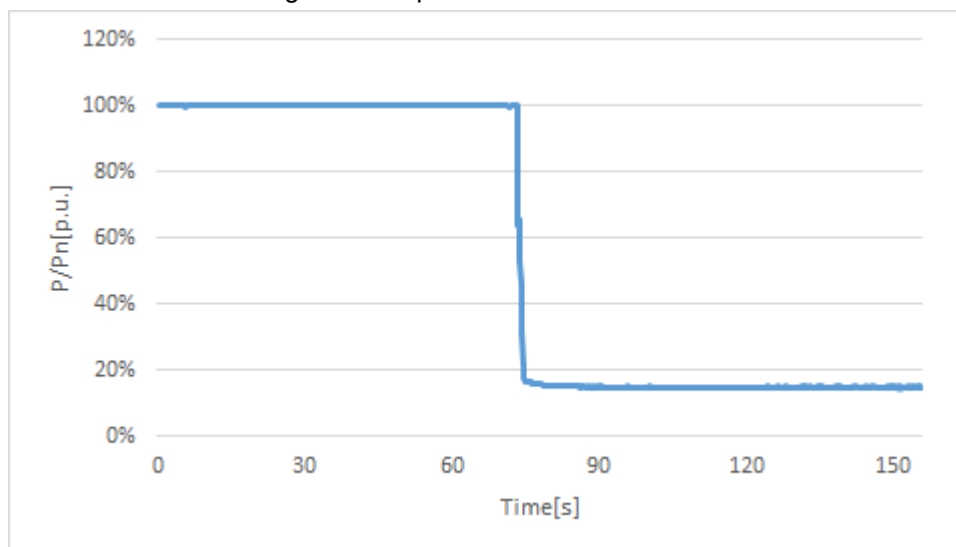
Clause	Requirement - Test	Result - Remark	Verdict
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N.7.4.1	Tabella: Verifica del tempo di assestamento ad un comando di riduzione di Potenza Table: Verification of the settling time at a power reduction command)					P
	Test condition		Measurement			
External command P/P _n	Target P/P _n	P/P _n	T _{settling} [s]	ΔP/P _n	T _{settling} [s]	ΔP/P _n
100% to 30%	30%	29.76%	3.6	-0.24%	≤ 50s	± 5%
100% to 15%	15%	14.84%	3.4	-0.16%	≤ 60s	

Verification of the settling time at a power reduction command 100% P_n to 30% P_n



Verification of the settling time at a power reduction command 100% P_n to 15% P_n



CEI 0-16								
Clause	Requirement - Test					Result - Remark		Verdict
N.8 Verifica della insensibilità alle variazioni di tensione (VFRT capability) (Verification of insensitivity to voltage variations (VFRT capability))								P
Test number	U		V		W		Type	Remark
	p.u.	Angle [°]	p.u.	Angle [°]	p.u.	Angle [°]		
Normal condition	1	0	1	240	1	120	A	Initial status
1s	0.10	0	0.10	240	0.10	120	A	LVRT
1a	0.87	27	0.87	213	0.10	120	D	
2s	0.25	0	0.25	240	0.25	120	A	
2a	0.88	22	0.88	218	0.25	120	D	
3s	0.50	0	0.50	240	0.50	120	A	
3a	0.90	14	0.90	226	0.50	120	D	
4s	0.75	0	0.75	240	0.75	120	A	
4a	0.94	7	0.94	233	0.75	120	D	
5s	1.20	0	1.20	240	1.20	120	A	OVRT
6s	1.25	0	1.25	240	1.25	120	A	

A

D

—●— Fault

- - -●- Normal

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

N.8		Tabella: Verifica della insensibilità alle variazioni di tensione (VFRT capability) Table: Verification of insensitivity to voltage variations (VFRT capability)				P
Test	Voltage dip/rise U/U _n [p.u.]	VRT fault type	Fault duration (t ₂ -t ₁) [ms]	P/P _n [p.u.]	Q/S _n [p.u.]	Test No.
1	0.10	A	200 + 20	0.1 to 0.3	0 to ± 0.1	1s.1
				0.9 to 1.1		1s.2
		D		0.1 to 0.3		1a.1
				0.9 to 1.1		1a.2
2	0.25	A	400 + 20	0.1 to 0.3	0 to ± 0.1	2s.1
				0.9 to 1.1		2s.2
		D		0.1 to 0.3		2a.1
				0.9 to 1.1		2a.2
3	0.50	A	850 + 20	0.1 to 0.3	0 to ± 0.1	3s.1
				0.9 to 1.1		3s.2
		D		0.1 to 0.3		3a.1
				0.9 to 1.1		3a.2
4	0.75	A	1300 + 20	0.1 to 0.3	0 to ± 0.1	4s.1
				0.9 to 1.1		4s.2
		D		0.1 to 0.3	0 to ± 0.1	4a.1
				0.9 to 1.1		4a.2
5	1.25	A	100 + 20	0.9 to 1.1*	0 to ± 0.1	5s
6	1.20	A	500 + 20	0.9 to 1.1*	0 to ± 0.1	6s

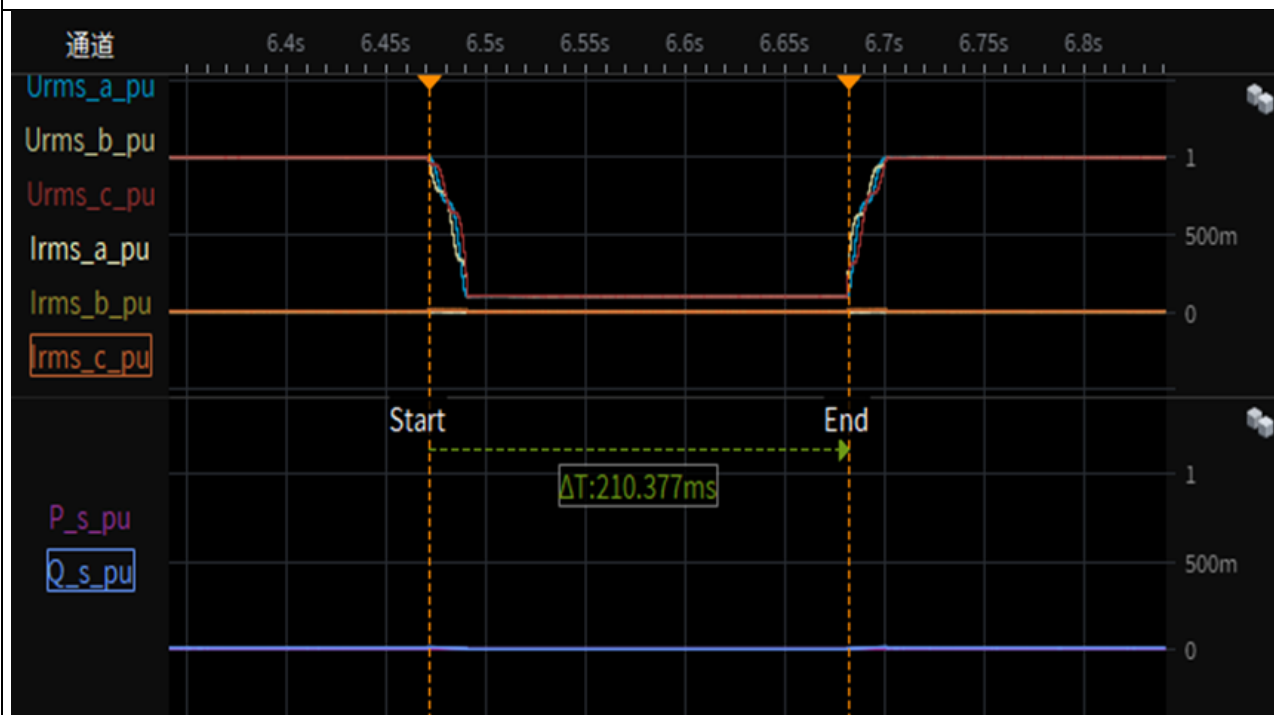
Note(s):
 Before EUT test, AC grid shall be measured and recorded test data in empty load test at each conditions of test numbers (1.x to 6.x) and VFRT fault types (A/D).
 Each case two consecutive tests must be completed successfully.
 * For large generator (> 100kW) it is allowed to carry out tests at reduced power, as long as it is greater than 30% of the rated power of the generator.

CEI 0-16				
Clause	Requirement - Test	Result - Remark		Verdict
List of tests	Residual amplitude of phase-to-phase voltage V/V_{nom}	Drop duration limit [ms]	Measured drop duration [ms]	Duration of restoring network [ms]
1s – three-phase symmetrical fault (P = 0.1 - 0.3)	$0.10 \pm 0.05 (V_1/V_n)$	200	210	141
1s – three-phase symmetrical fault (P > 0.9)	$0.10 \pm 0.05 (V_1/V_n)$	200	210	137
1a – two-phase asymmetrical fault (P = 0.1 - 0.3)	$0.10 \pm 0.05 (V_1/V_n)$	200	210	141
1a – two-phase asymmetrical fault (P > 0.9)	$0.10 \pm 0.05 (V_1/V_n)$	200	210	142
1a – D2 two-phase asymmetrical fault (P = 0.1 - 0.3)	$0.10 \pm 0.05 (V_1/V_n)$	200	210	137
1a – D2 two-phase asymmetrical fault (P > 0.9)	$0.10 \pm 0.05 (V_1/V_n)$	200	210	145
2s – three-phase symmetrical fault (P = 0.1 - 0.3)	$0.25 \pm 0.05 (V_2/V_n)$	400	410	150
2s – three-phase symmetrical fault (P > 0.9)	$0.25 \pm 0.05 (V_2/V_n)$	400	410	139
2a – two-phase asymmetrical fault (P = 0.1 - 0.3)	$0.25 \pm 0.05 (V_2/V_n)$	400	410	141
2a – two-phase asymmetrical fault (P > 0.9)	$0.25 \pm 0.05 (V_2/V_n)$	400	410	134
3s – three-phase symmetrical fault (P = 0.1 - 0.3)	$0.50 \pm 0.05 (V_3/V_n)$	850	860	136
3s – three-phase symmetrical fault (P > 0.9)	$0.50 \pm 0.05 (V_3/V_n)$	850	860	139
3a – two-phase asymmetrical fault (P = 0.1 - 0.3)	$0.50 \pm 0.05 (V_3/V_n)$	850	860	133
3a – two-phase asymmetrical fault (P > 0.9)	$0.50 \pm 0.05 (V_3/V_n)$	850	860	139
4s – three-phase symmetrical fault (P = 0.1 - 0.3)	$0.75 \pm 0.05 (V_4/V_n)$	1300	1310	125
4s – three-phase symmetrical fault (P > 0.9)	$0.75 \pm 0.05 (V_4/V_n)$	1300	1310	143
4a – two-phase asymmetrical fault (P = 0.1 - 0.3)	$0.75 \pm 0.05 (V_4/V_n)$	1300	1310	141
4a – two-phase asymmetrical fault (P > 0.9)	$0.75 \pm 0.05 (V_4/V_n)$	1300	1310	143
5s – three-phase symmetrical fault (P > 0.9)	$1.25 \pm 0.05 (V_5/V_n)$	100	110	142
6s – three-phase symmetrical fault (P > 0.9)	$1.20 \pm 0.05 (V_6/V_n)$	500	510	147

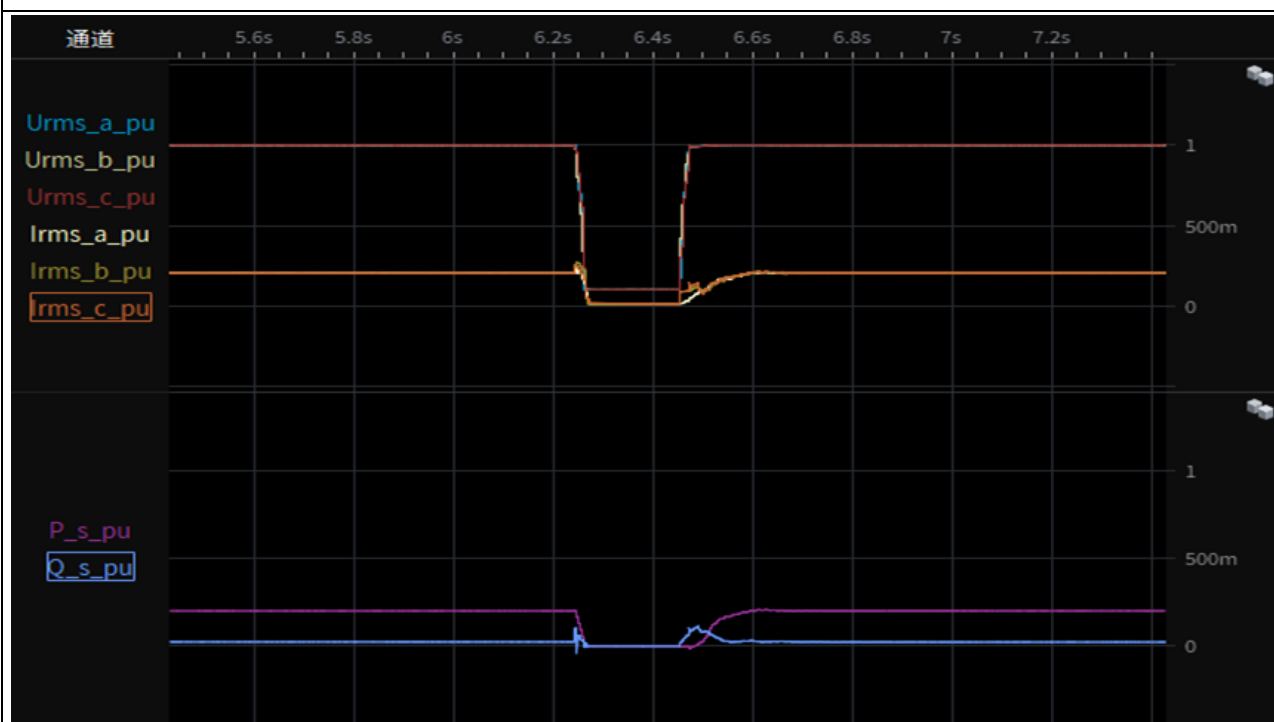
Note:
 (*) Regardless of the method used to simulate transients (simulator or impedance network), the rise and fall time of the voltage must be less than 10 ms
 The interface protection shall be disabled or adjusted to avoid spurious tripping during testing.
 The test conditions are performed as worst case conditions. The inverter feeds maximal active and reactive power during the complete test.

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test 1s-1-1-Depth of fault phase: 0.1p.u., three-phase-symmetrical (type A), 0% load
 Test overview(voltage,current,active and reactive power)



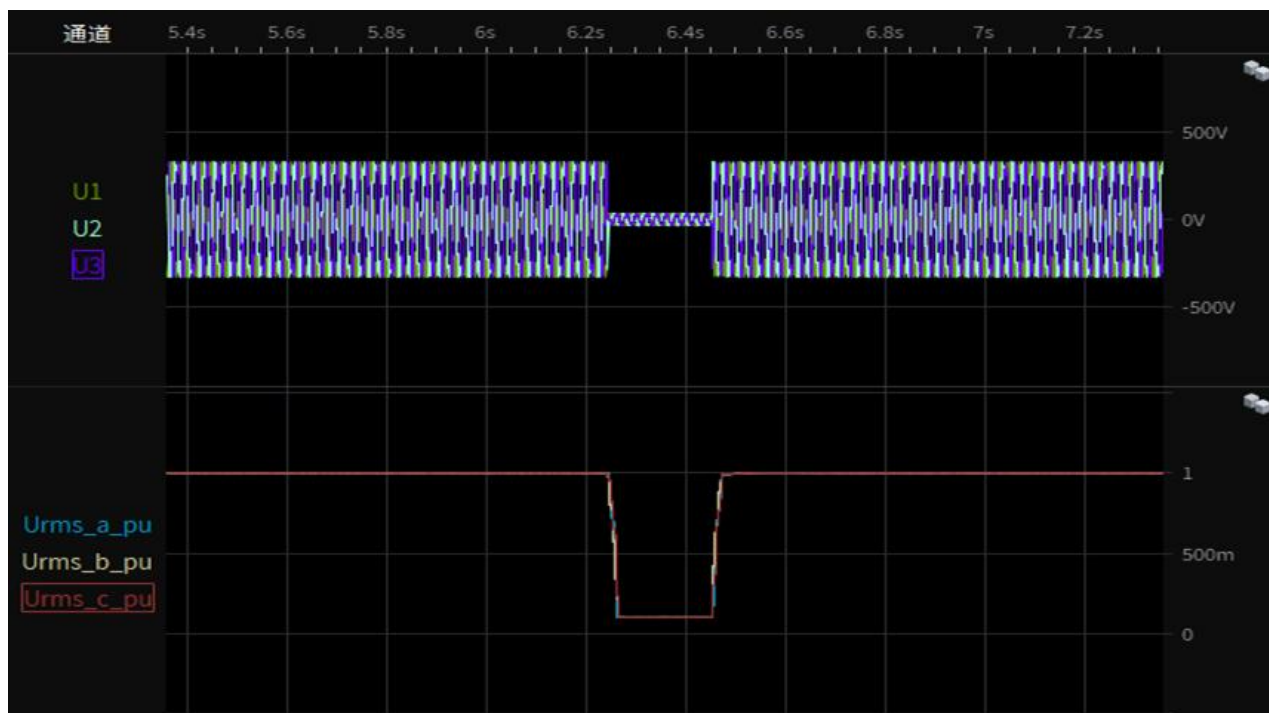
Test 1s-1-1.1 Depth of fault phase: 0.1p.u., three-phase-symmetrical (type A), 20% load
 Test overview(voltage,current,active and reactive power)



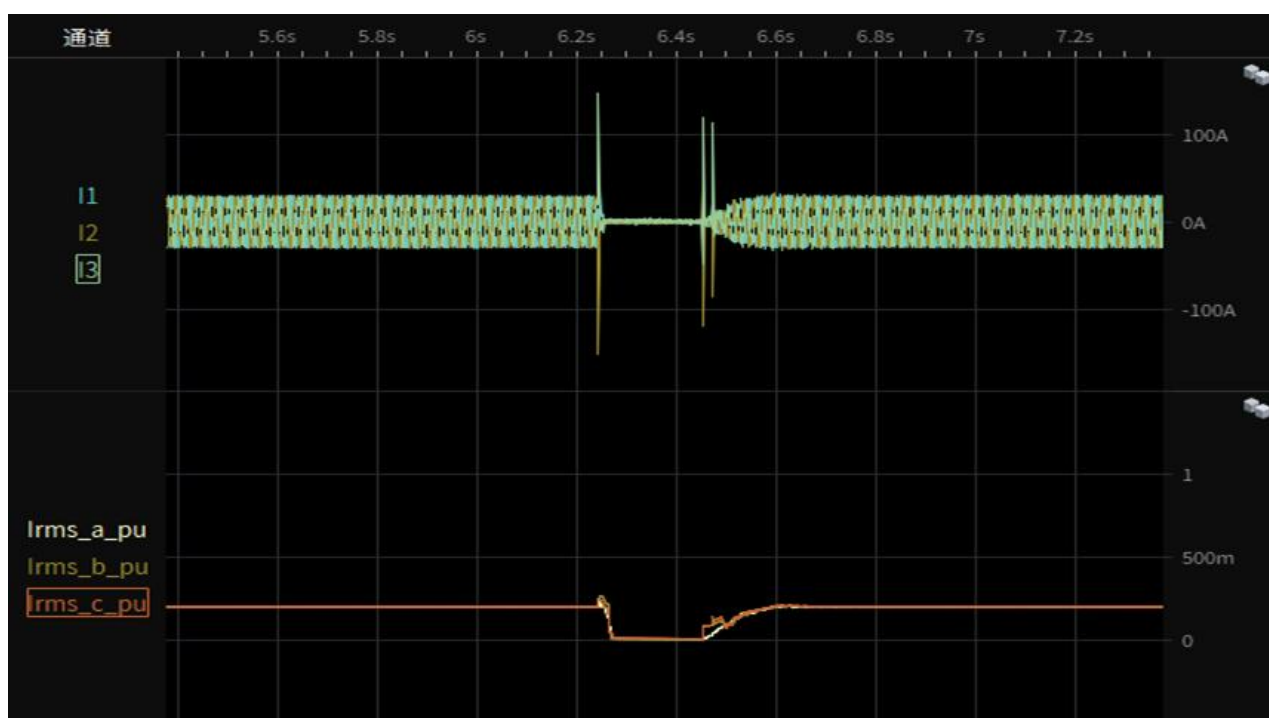
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 1s-1-1.2 Depth of fault phase: 0.1p.u., three-phase-symmetrical (type A), 20% load
Instantaneous curve and RMS value of phase-to-neutral voltages



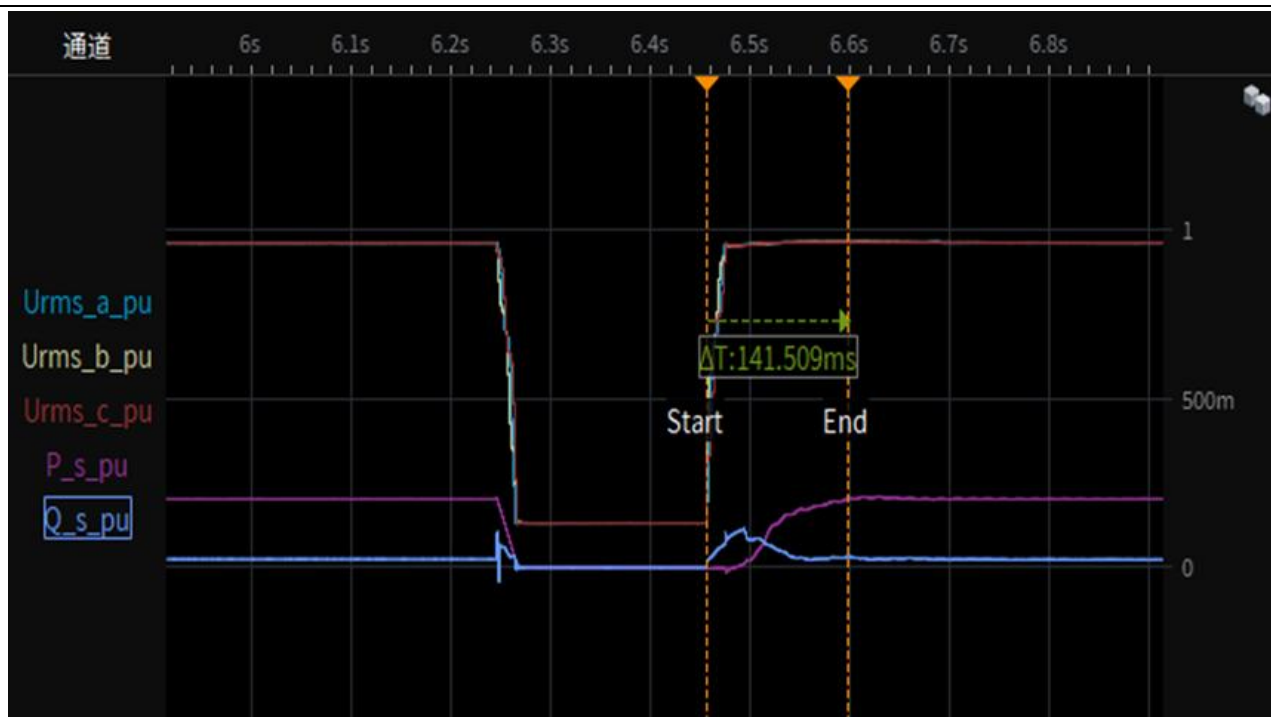
Test 1s-1-1.3 Depth of fault phase: 0.1p.u., three-phase-symmetrical (type A), 20% load
Instantaneous curve and RMS value of phase currents



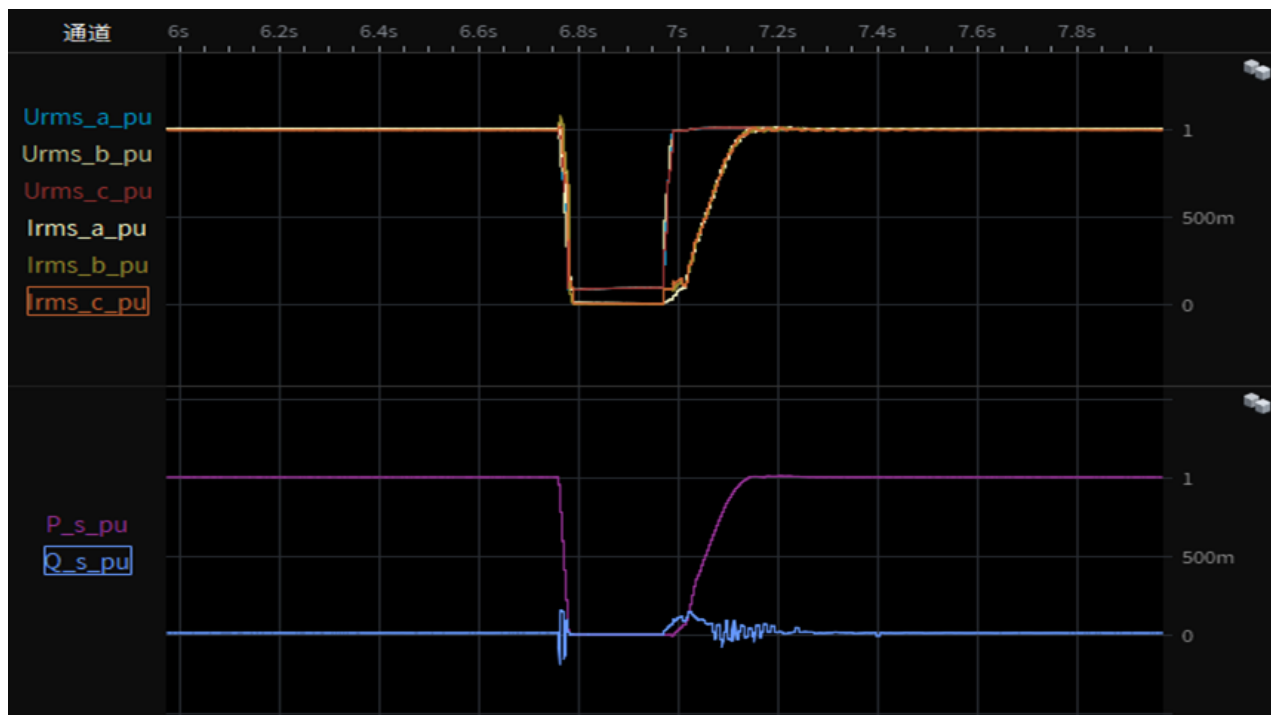
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 1s-1-1.4 Depth of fault phase: 0.1p.u., three-phase-symmetrical (type A),
20% load restoring time



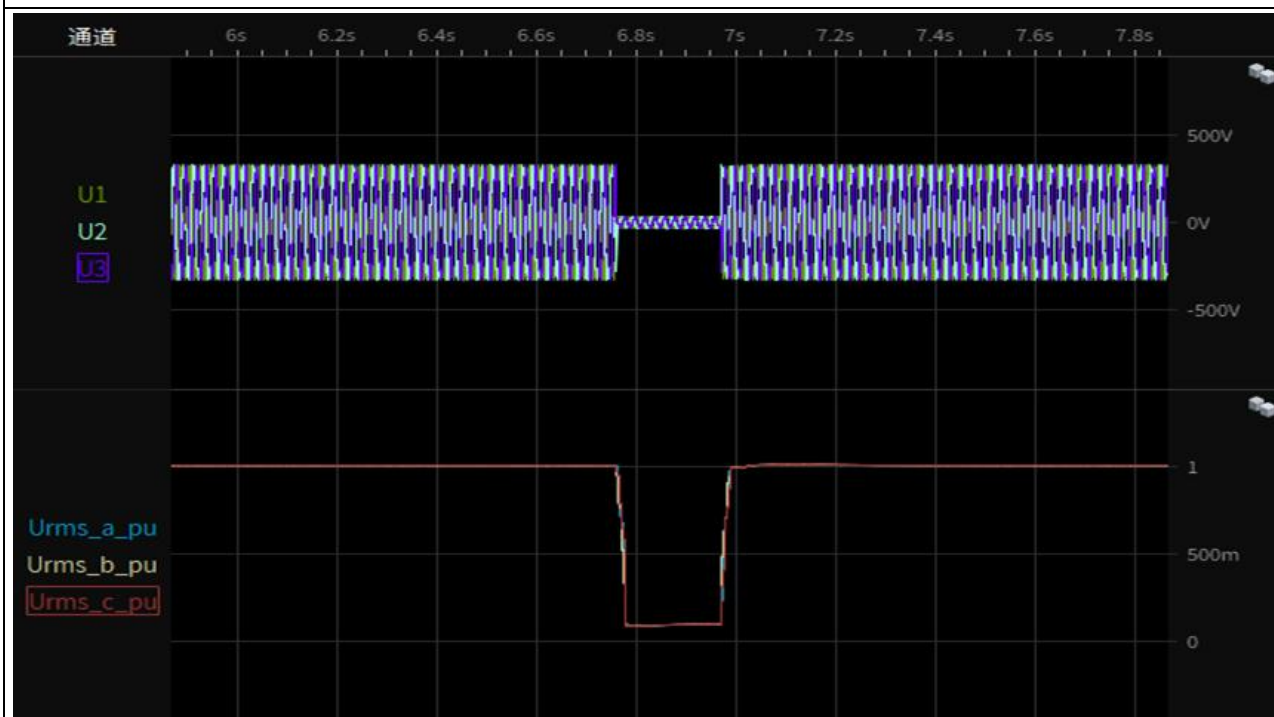
Test 1s-2-1.1 Depth of fault phase: 0.1p.u., three-phase-symmetrical (type A), 95% load
Test overview(voltage,current,active and reactive power)



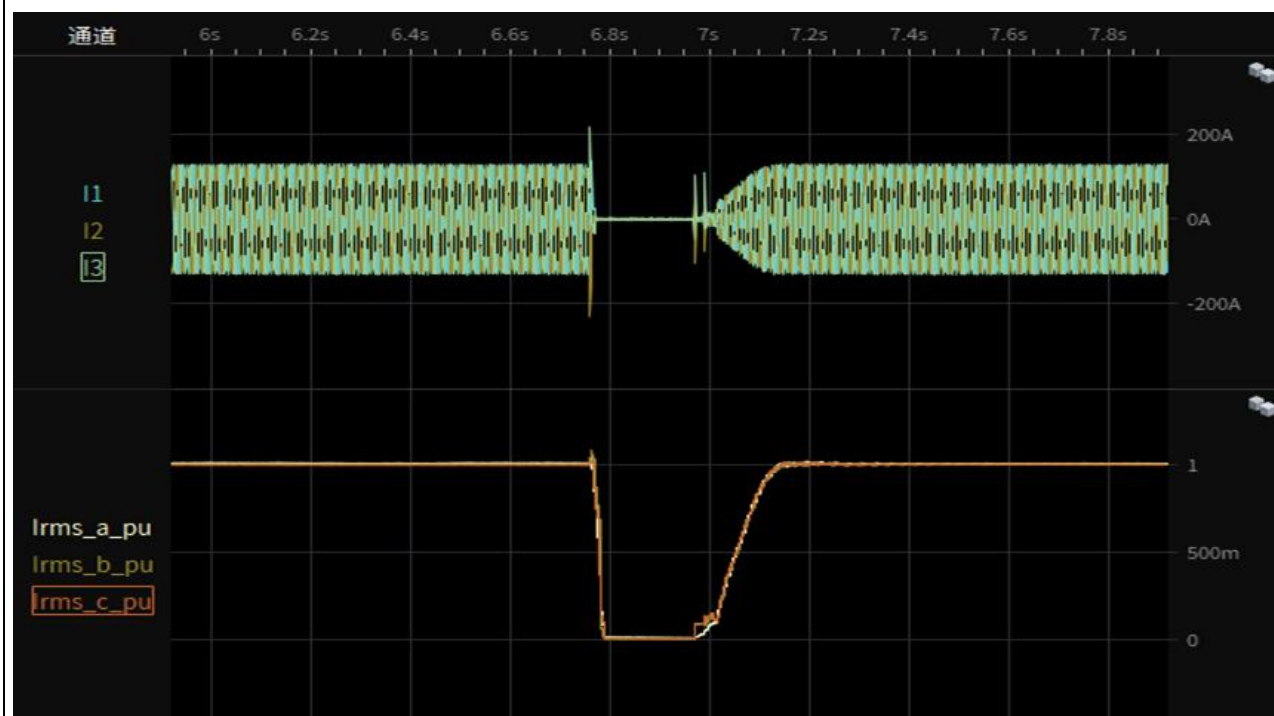
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 1s-2-1.2 Depth of fault phase: 0.1p.u., three-phase-symmetrical (type A), 95% load
Instantaneous curve and RMS value of phase-to-neutral voltages



Test 1s-2-1.3 Depth of fault phase: 0.1p.u., three-phase-symmetrical (type A), 95% load
Instantaneous curve and RMS value of phase currents



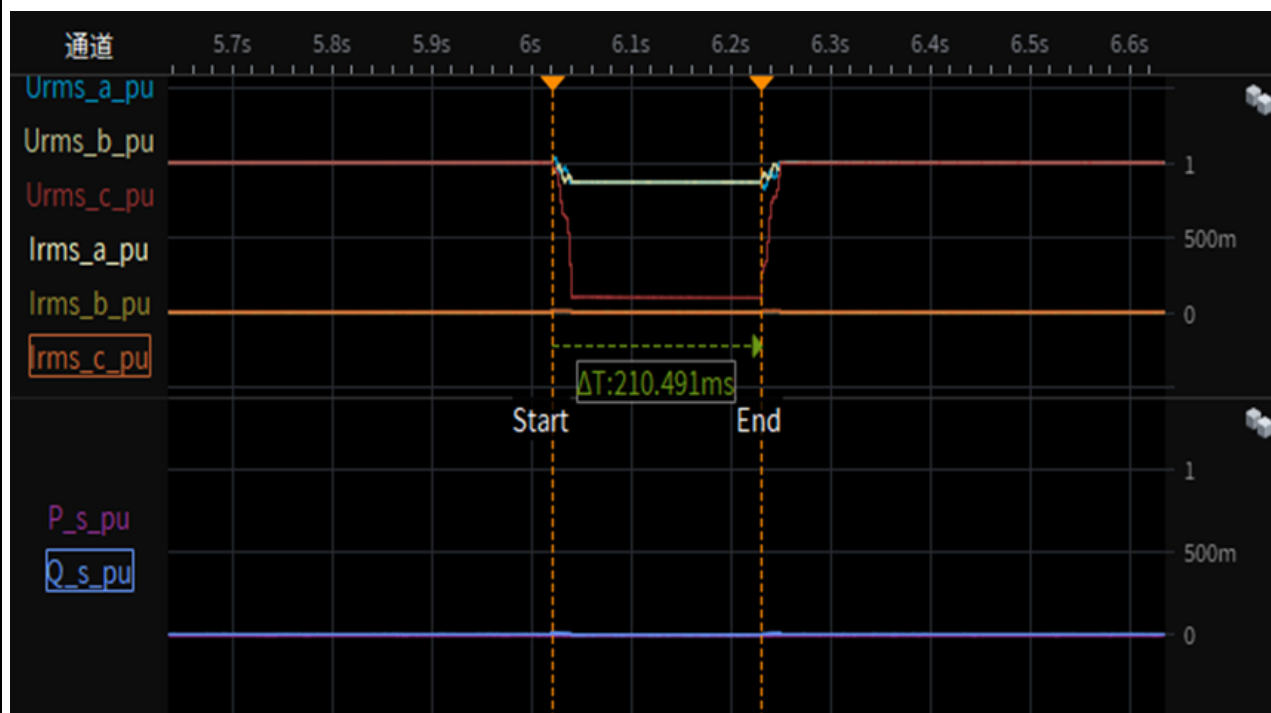
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 1s-2-1.4 Depth of fault phase: 0.1p.u., three-phase-symmetrical (type A),
95% load restoring time



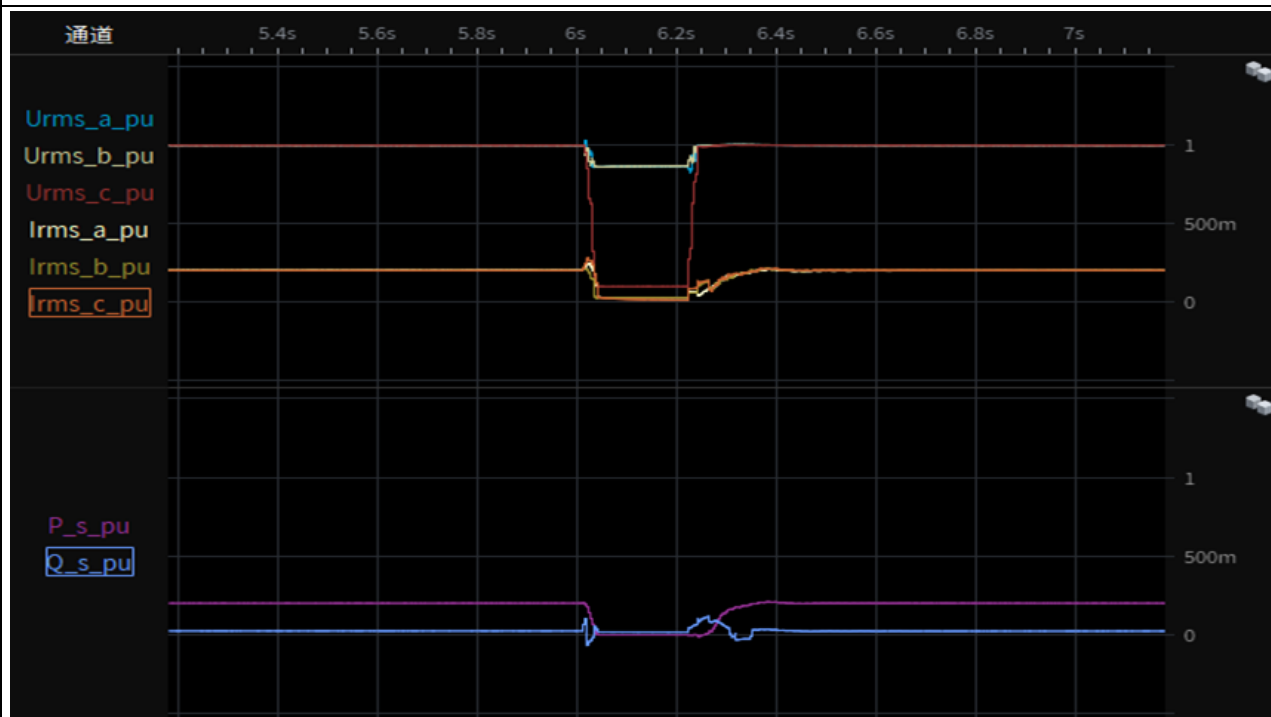
Test 1a-1.1 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 0% load
Test overview(voltage,current,active and reactive power)



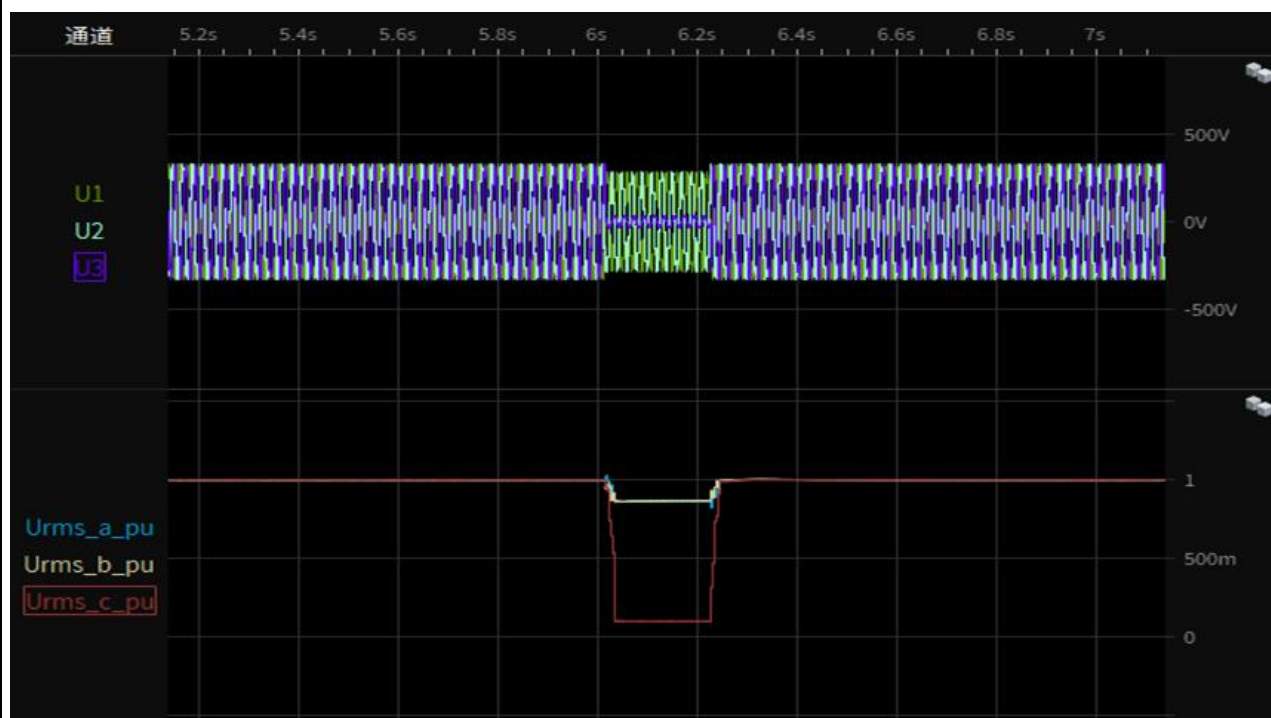
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 1a-1-1.1 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 20% load
Test overview(voltage,current,active and reactive power)



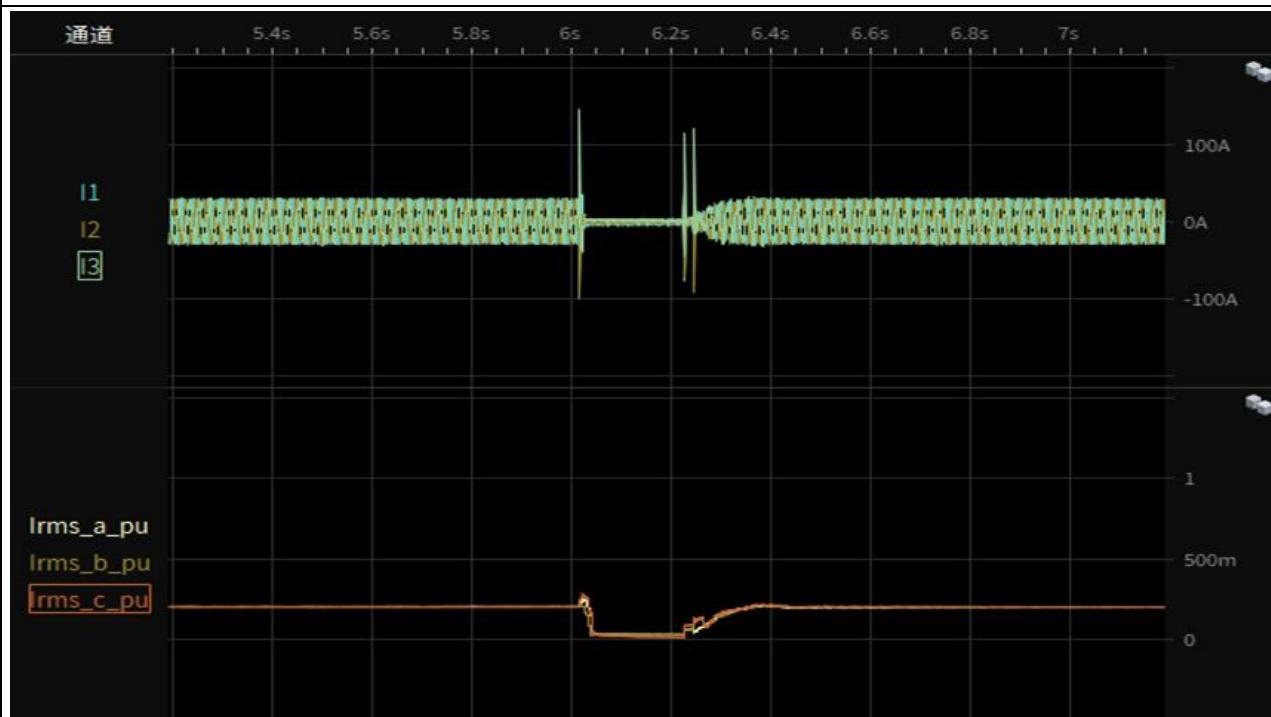
Test 1a-1-1.2 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 20% load
Instantaneous curve and RMS value of phase-to-neutral voltages



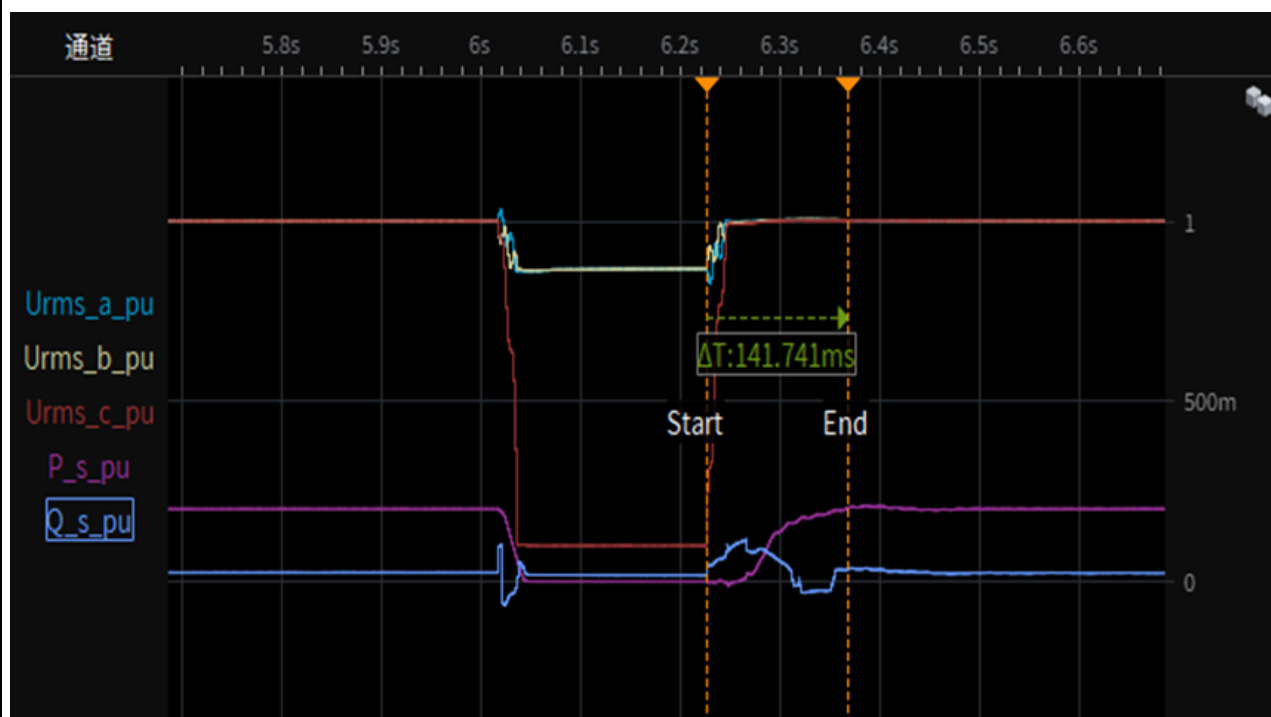
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 1a-1-1.3 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 20% load
Instantaneous curve and RMS value of phase currents



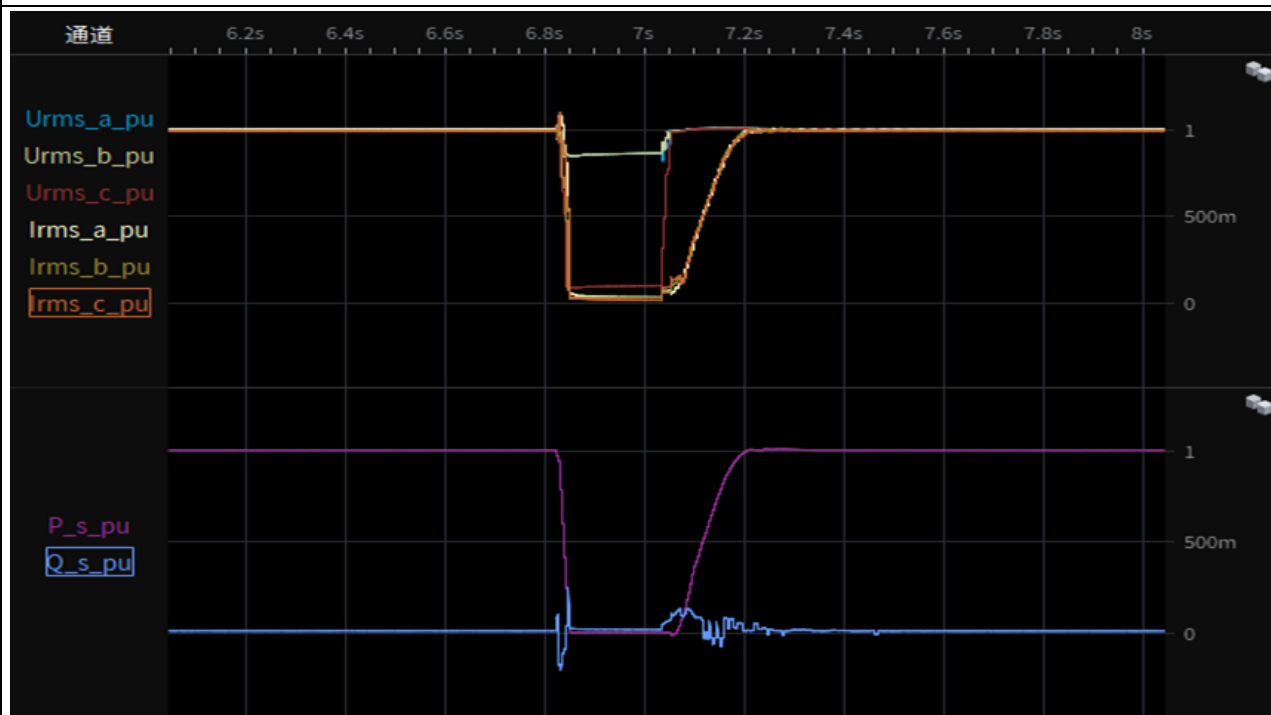
Test 1a-1-1.4 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D),
20% load restoring time



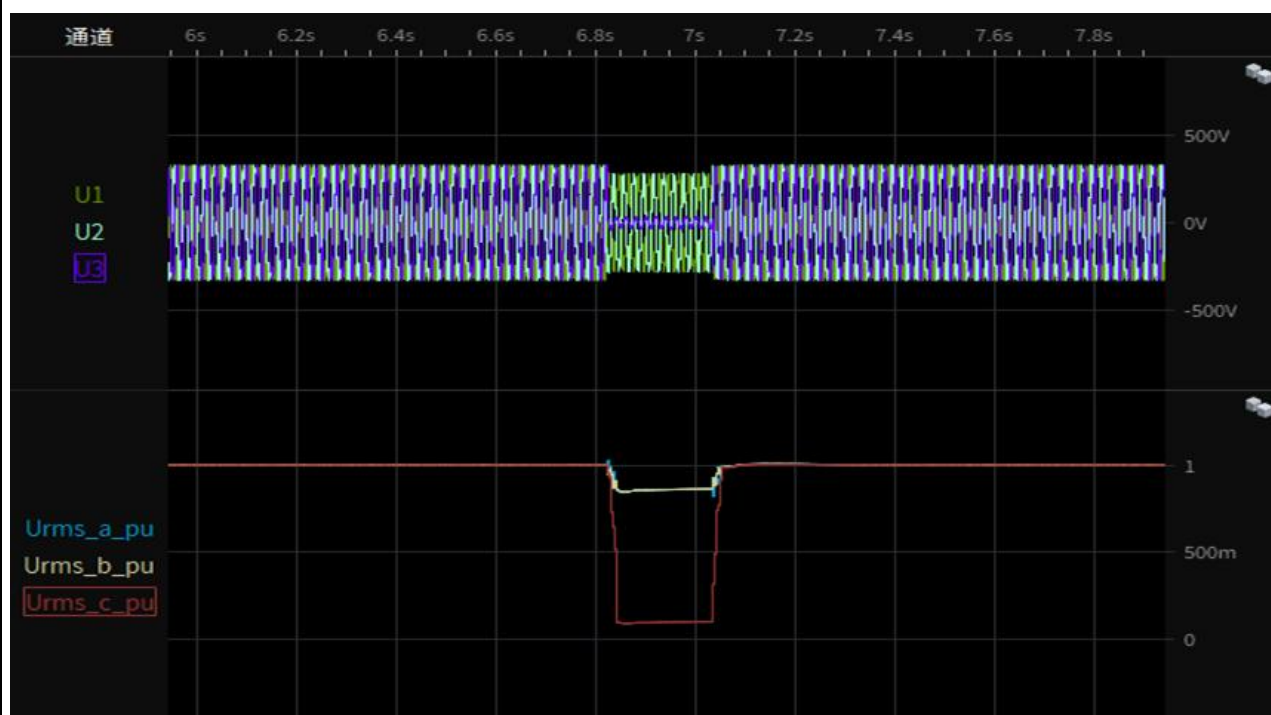
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 1a-2-1.1 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 95% load
Test overview(voltage,current,active and reactive power)



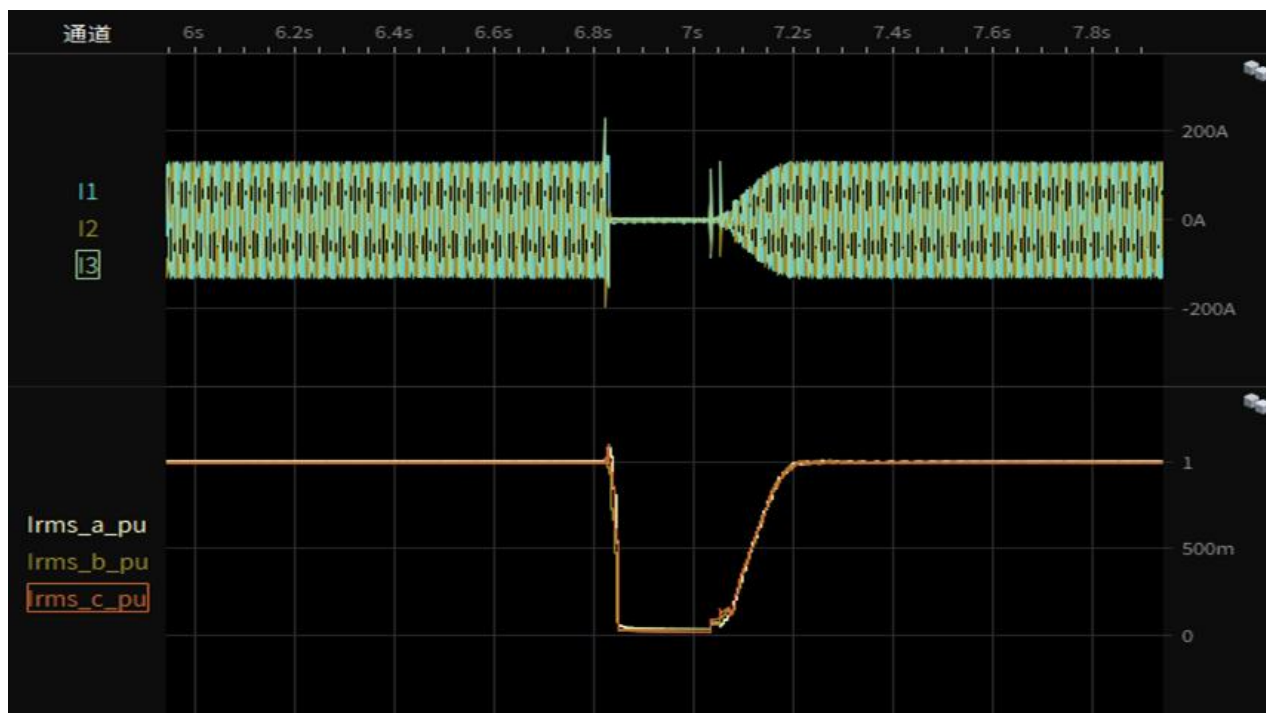
Test 1a-2-1.2 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 95% load
Instantaneous curve and RMS value of phase-to-neutral voltages



CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 1a-2-1.3 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 95% load
Instantaneous curve and RMS value of phase currents



Test 1a-2-1.4 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D),
95% load restoring time



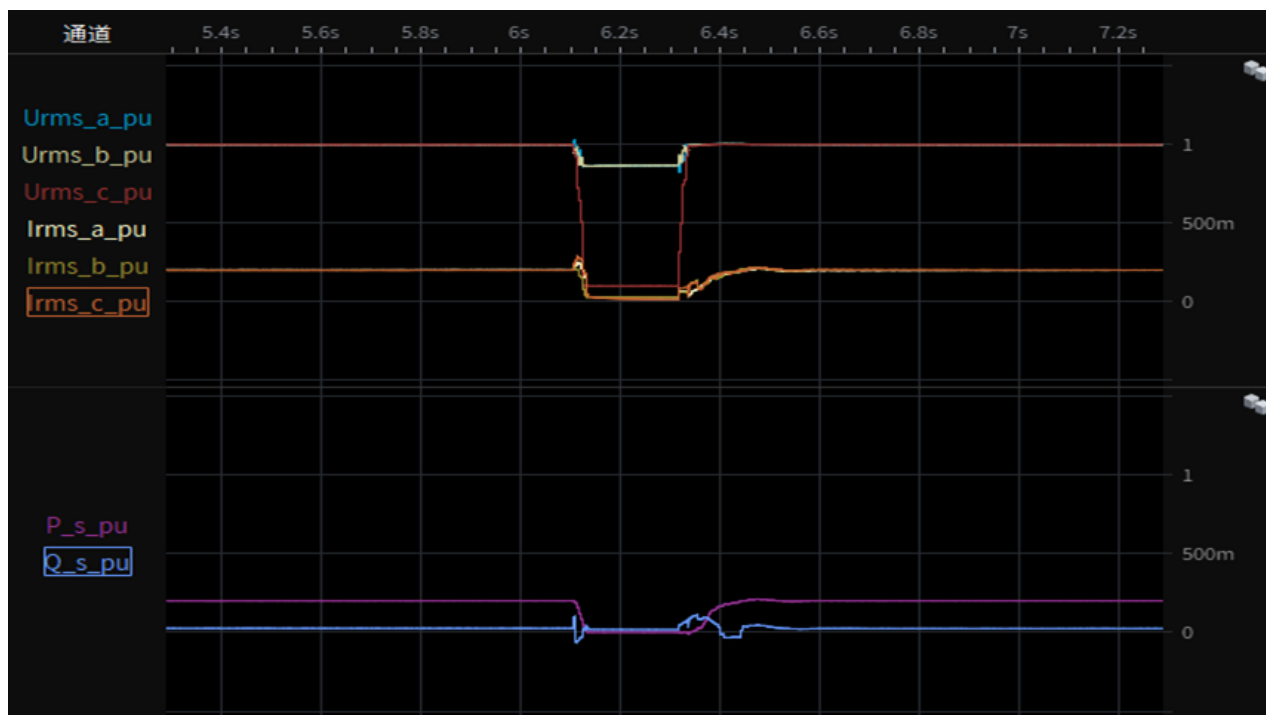
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 1a-D2-1.1 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 0% load
Test overview(voltage,current,active and reactive power)



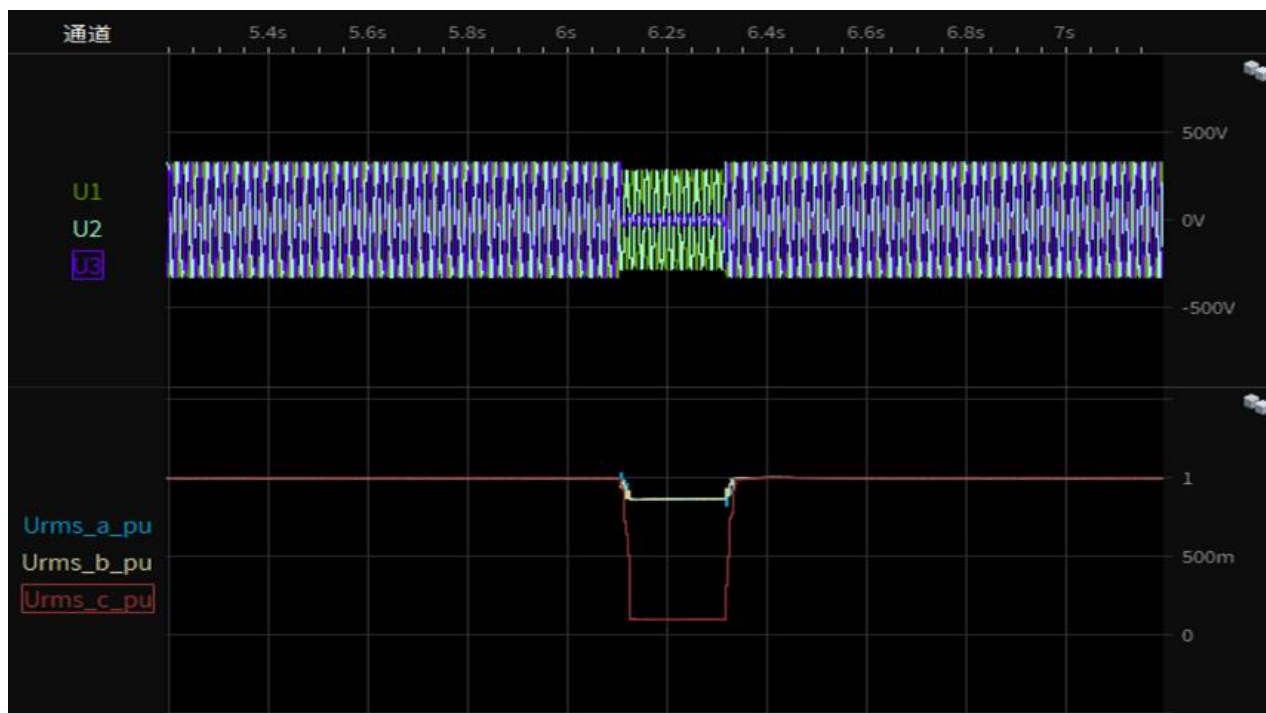
Test 1a-1-D2-1.1 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 20% load
Test overview(voltage,current,active and reactive power)



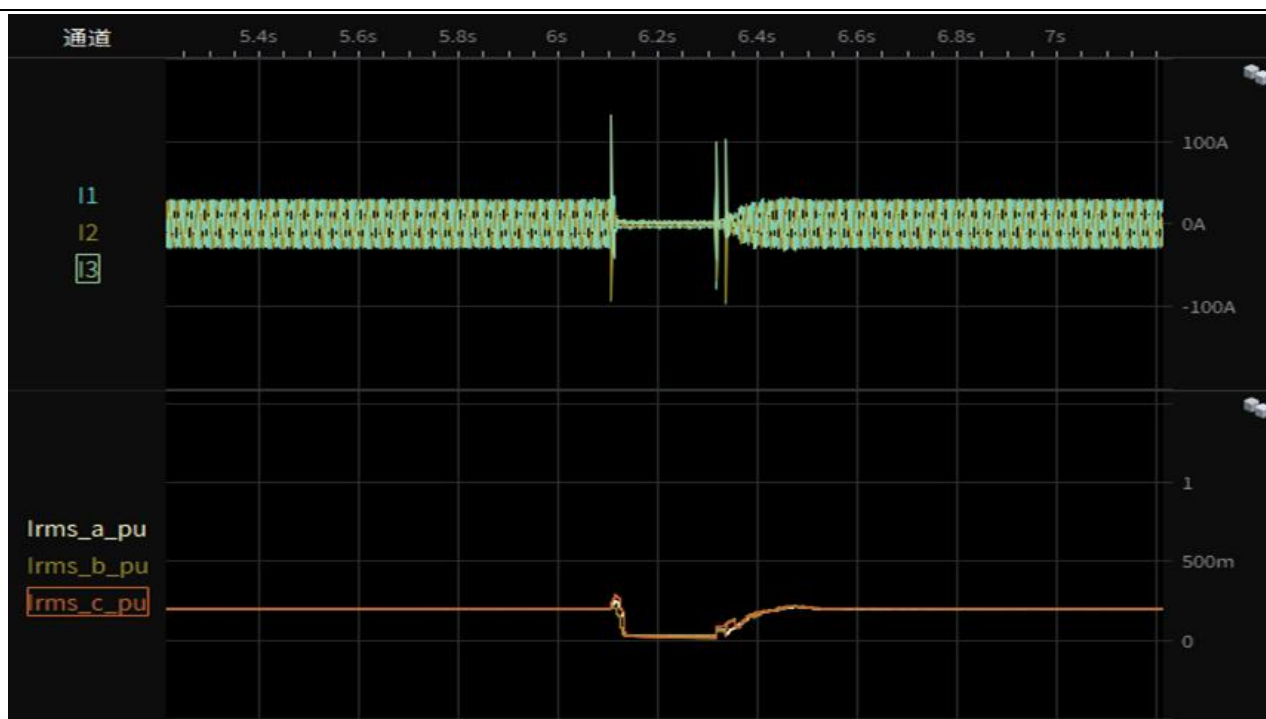
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 1a-1-D2-1.2 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 20% load
Instantaneous curve and RMS value of phase-to-neutral voltages



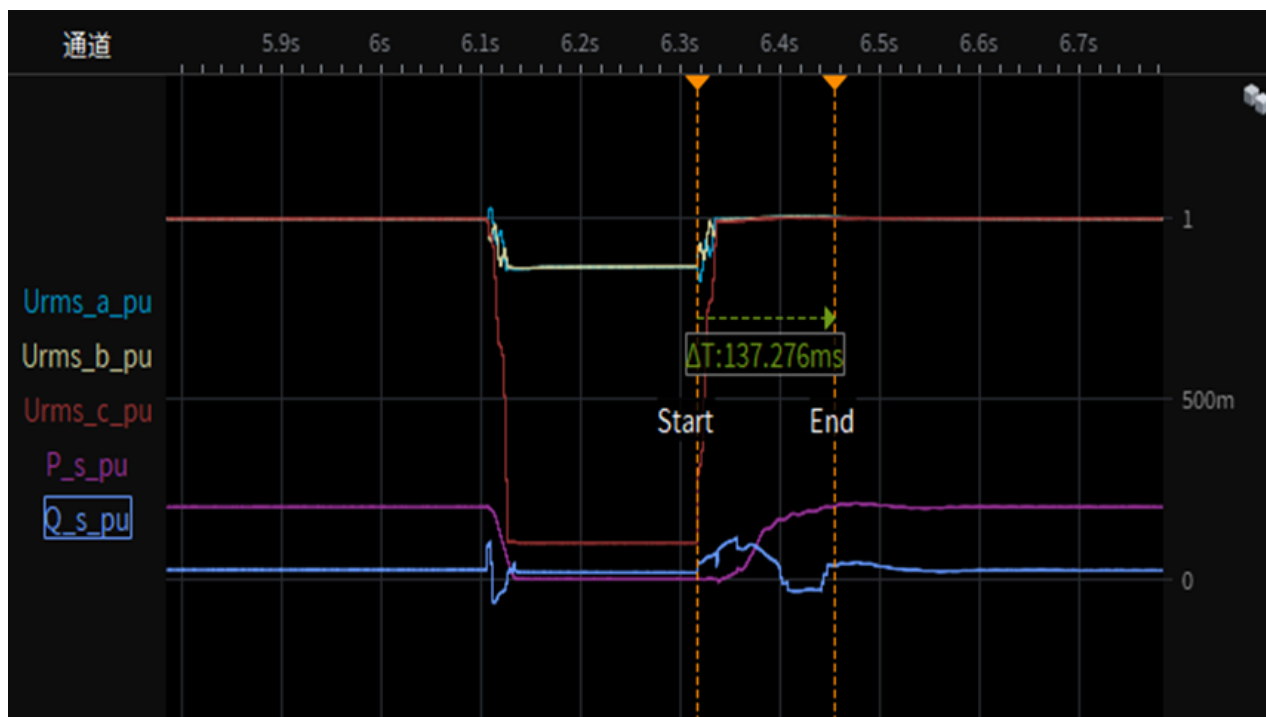
Test 1a-1-D2-1.3 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 20% load
Instantaneous curve and RMS value of phase currents



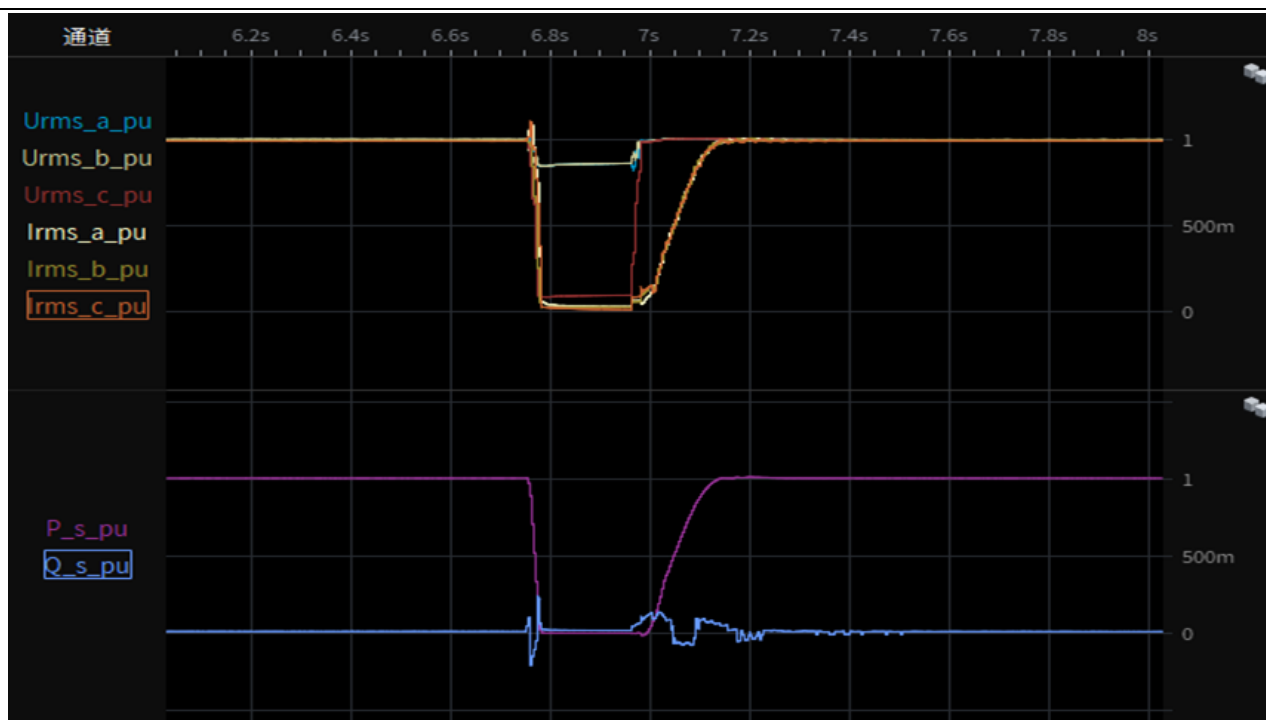
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 1a-1-D2-1.4 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D),
20% load restoring time



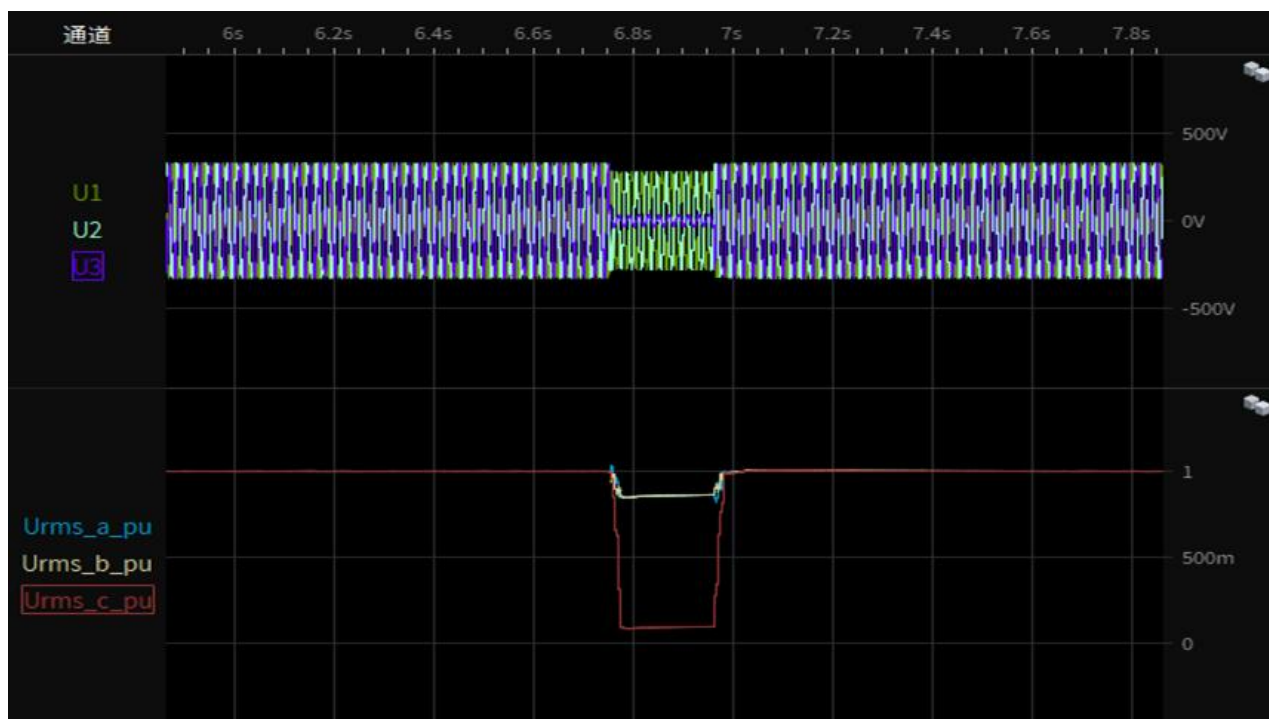
Test 1a-2-D2-1.1 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 95% load
Test overview(voltage,current,active and reactive power)



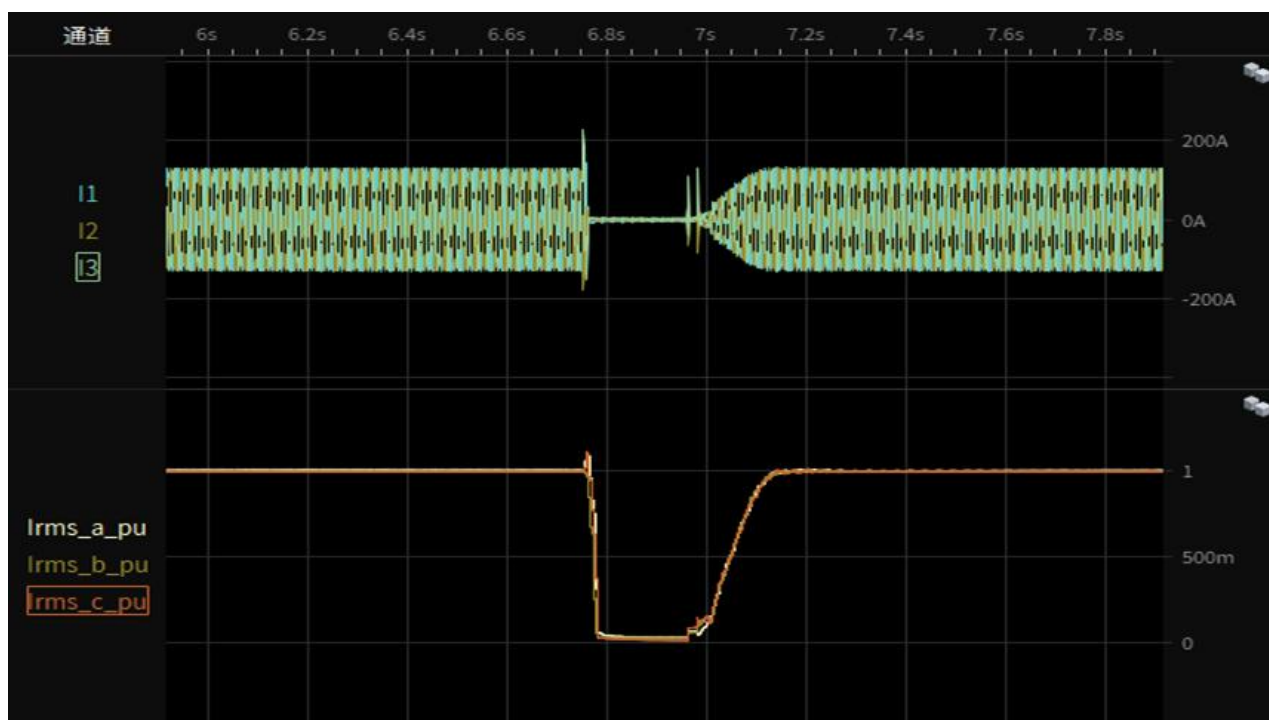
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 1a-2-D2-1.2 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 95% load
Instantaneous curve and RMS value of phase-to-neutral voltages

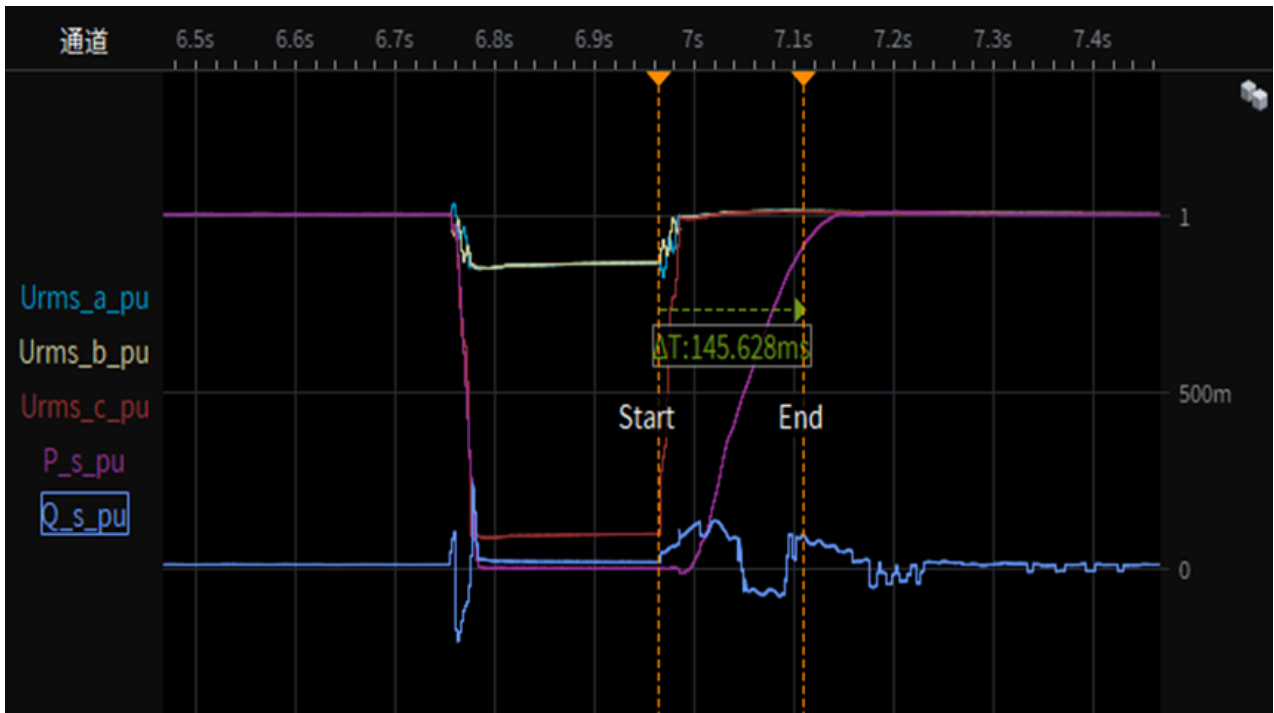


Test 1a-2-1.3 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 95% load
Instantaneous curve and RMS value of phase currents



CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test 1a-2-1.4 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 95% load restoring time



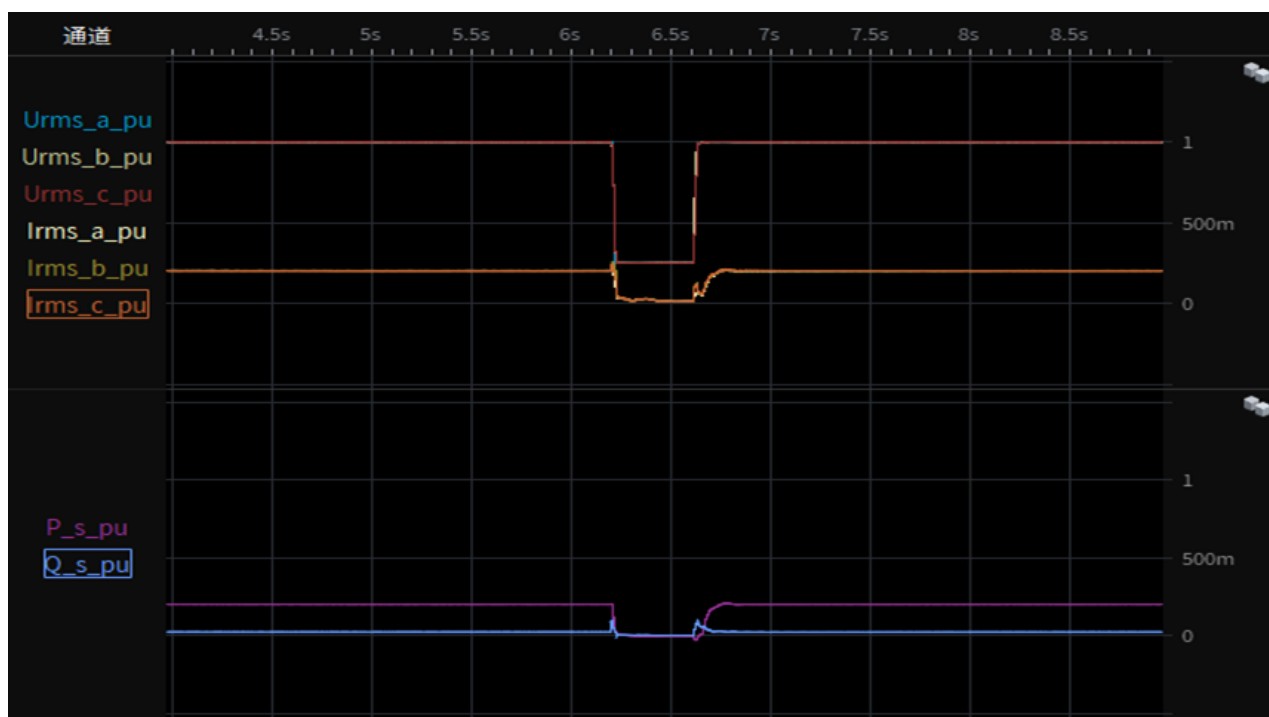
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 2s-1.1 Depth of fault phase: 0.25p.u., three-phase-symmetrical (type A), 0% load
Test overview(voltage,current,active and reactive power)

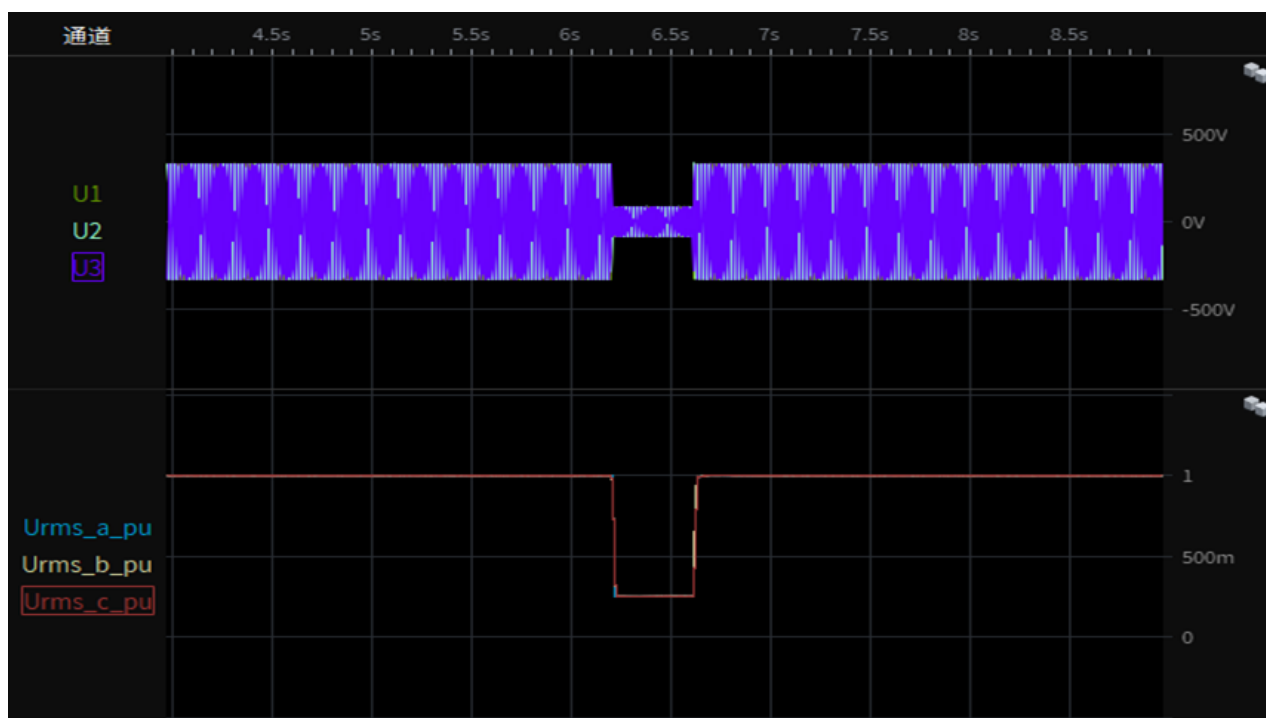


Test 2s-1-1.1 Depth of fault phase: 0.25p.u., three-phase-symmetrical (type A), 20% load
Test overview(voltage,current,active and reactive power)

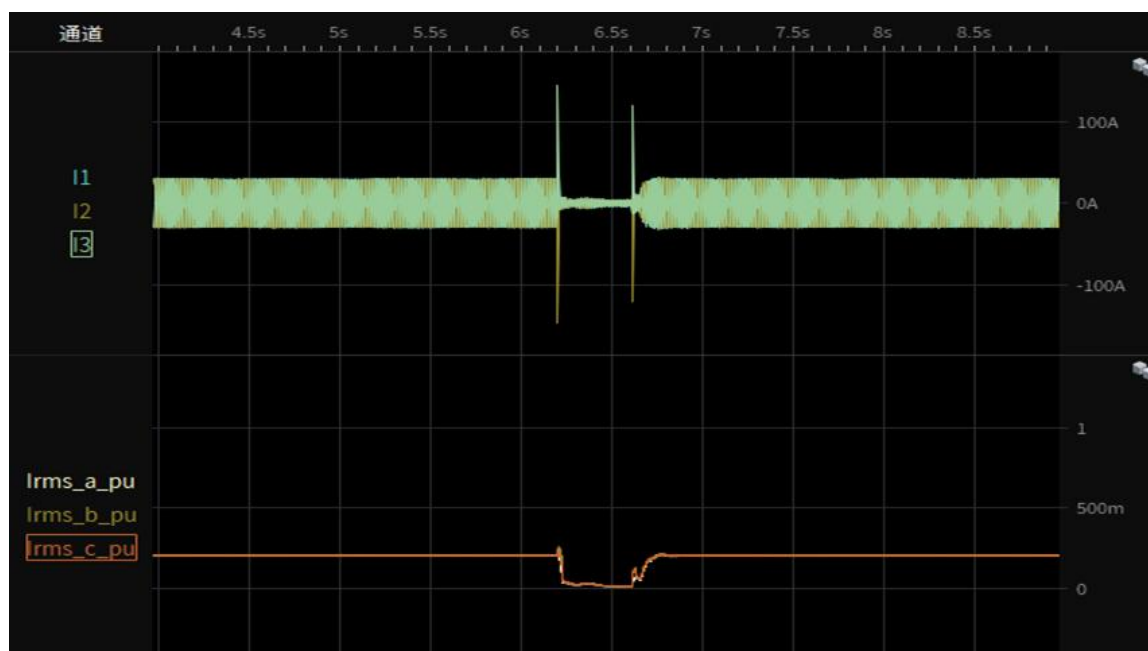


CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test 2s-1-1.2 Depth of fault phase:0.25p.u., three-phase-symmetrical (type A), 20% load
Instantaneous curve and RMS value of phase-to-neutral voltages



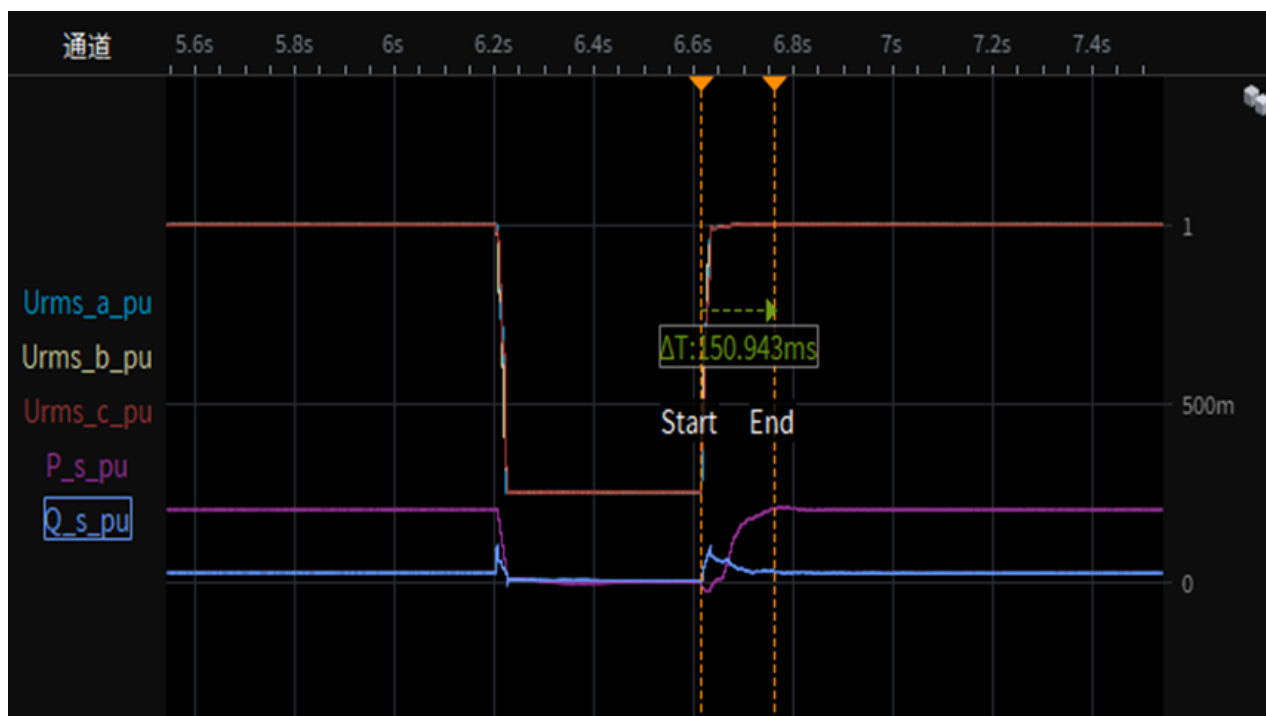
Test 2s-1-1.3 Depth of fault phase:0.25p.u., three-phase-symmetrical (type A), 20% load
Instantaneous curve and RMS value of phase currents



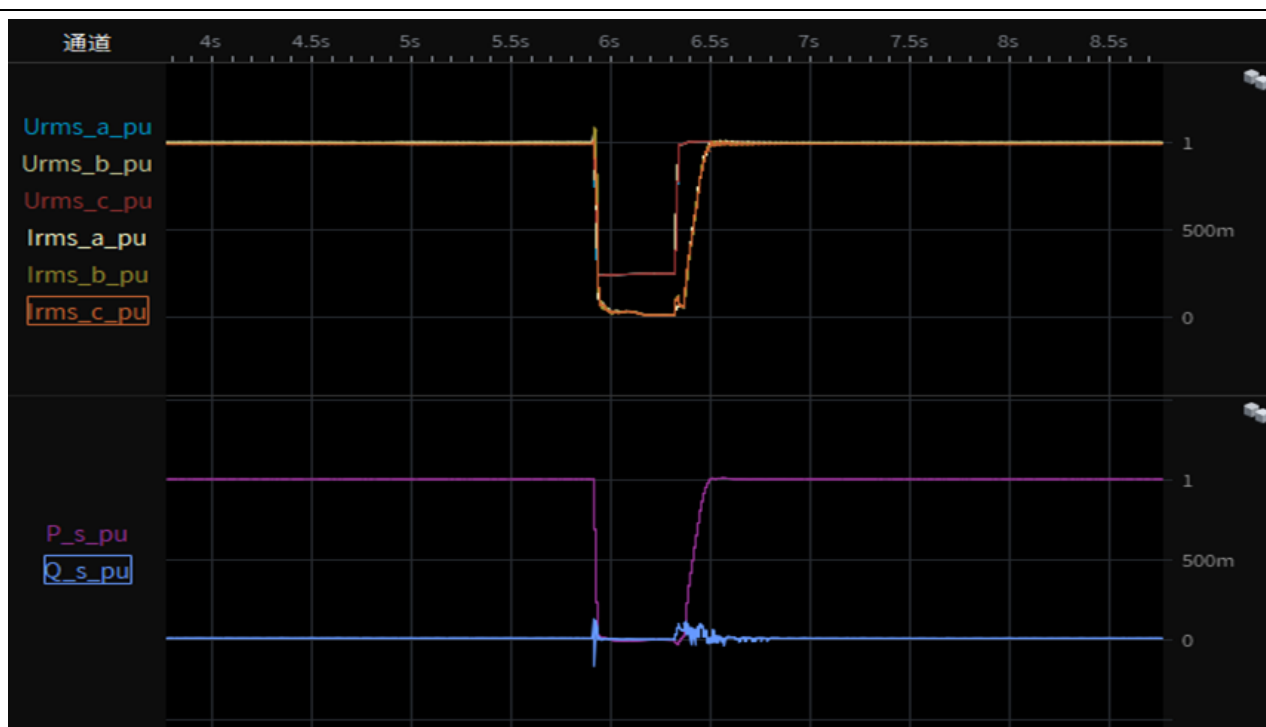
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 2s-1-1.4 Depth of fault phase:0.25p.u., three-phase-symmetrical (type A),
20% load restoring time



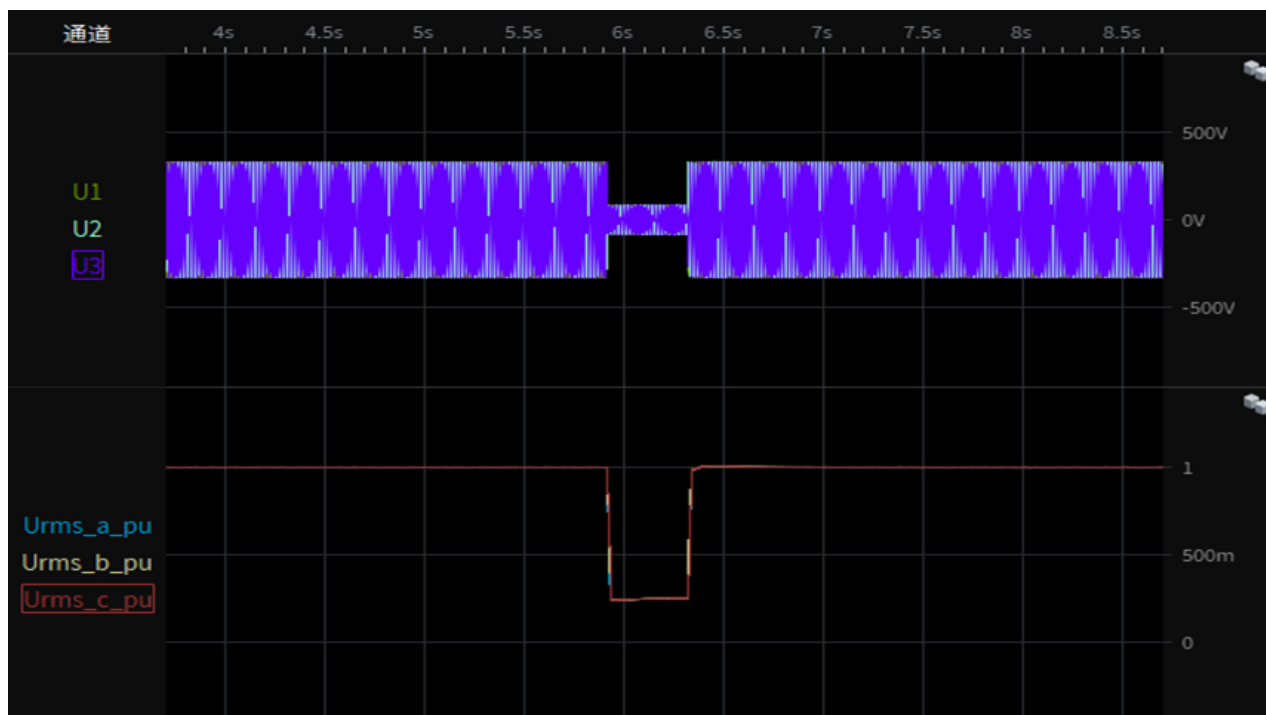
Test 2s-2-1.1 Depth of fault phase:0.25p.u., three-phase-symmetrical (type A), 95% load
Test overview(voltage,current,active and reactive power)



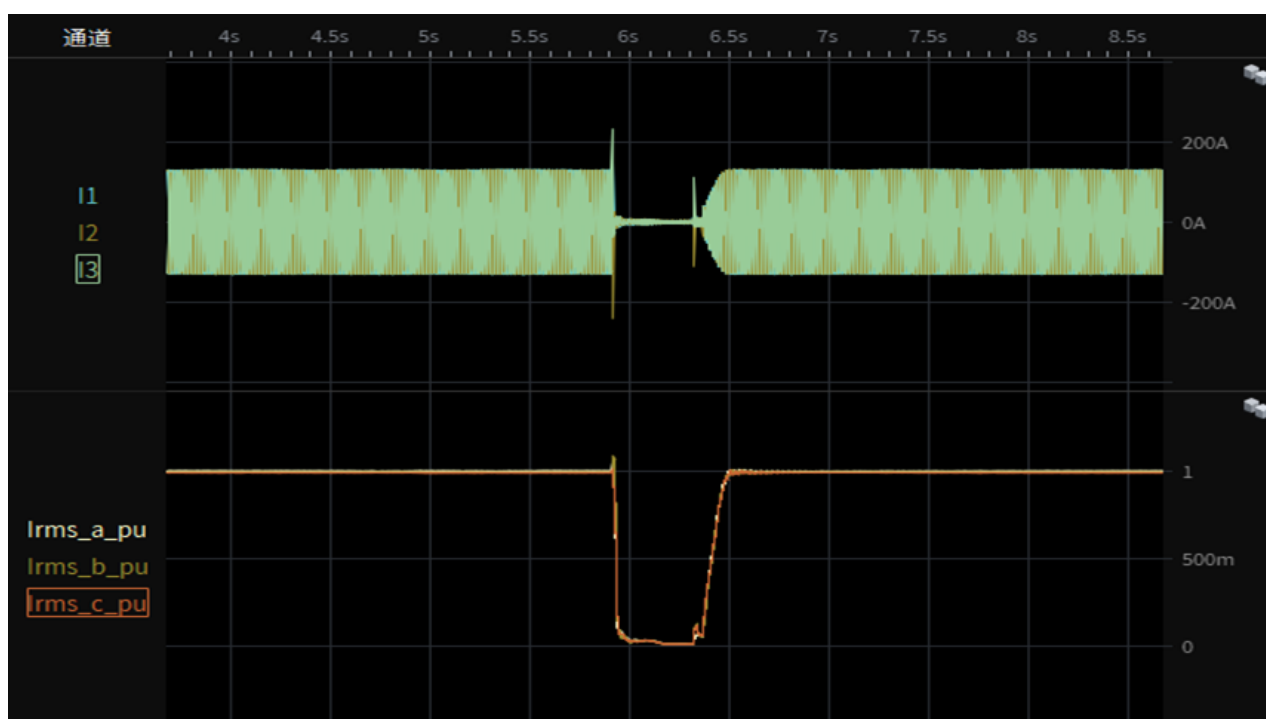
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 2s-2-1.2 Depth of fault phase: 0.25p.u., three-phase-symmetrical (type A), 95% load
Instantaneous curve and RMS value of phase-to-neutral voltages



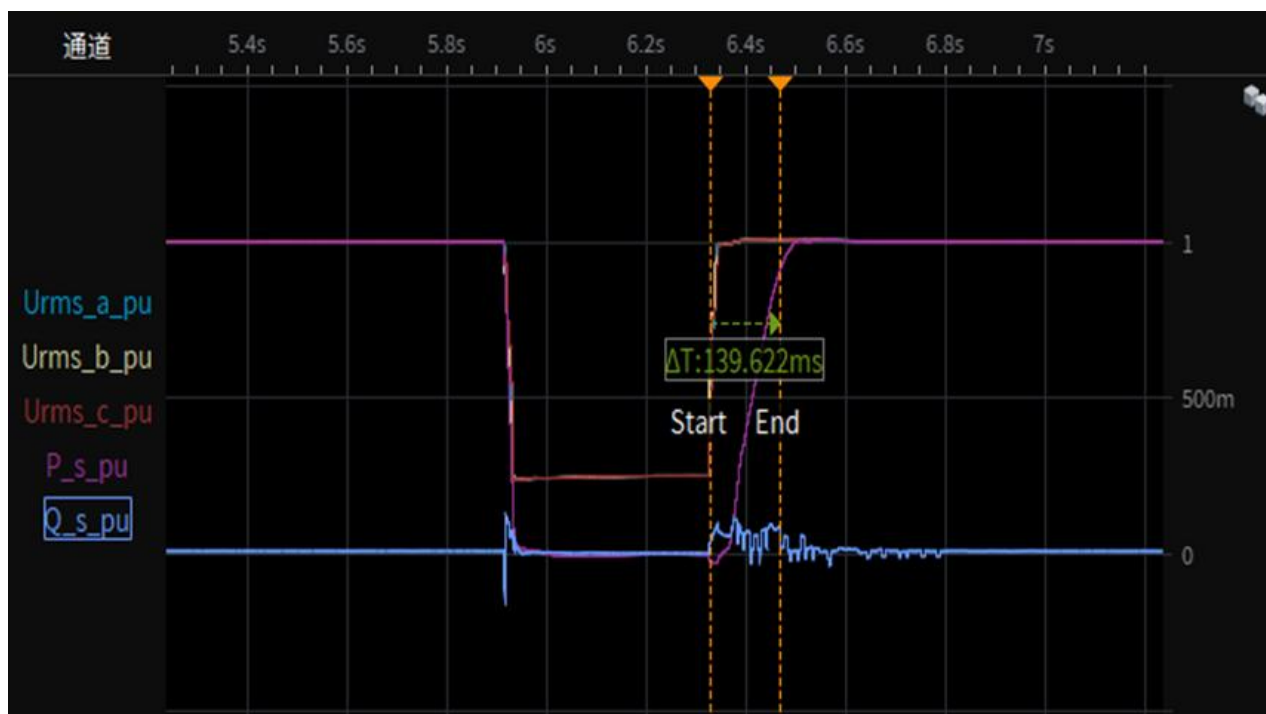
Test 2s-2-1.3 Depth of fault phase: 0.25p.u., three-phase-symmetrical (type A), 95% load
Instantaneous curve and RMS value of phase currents



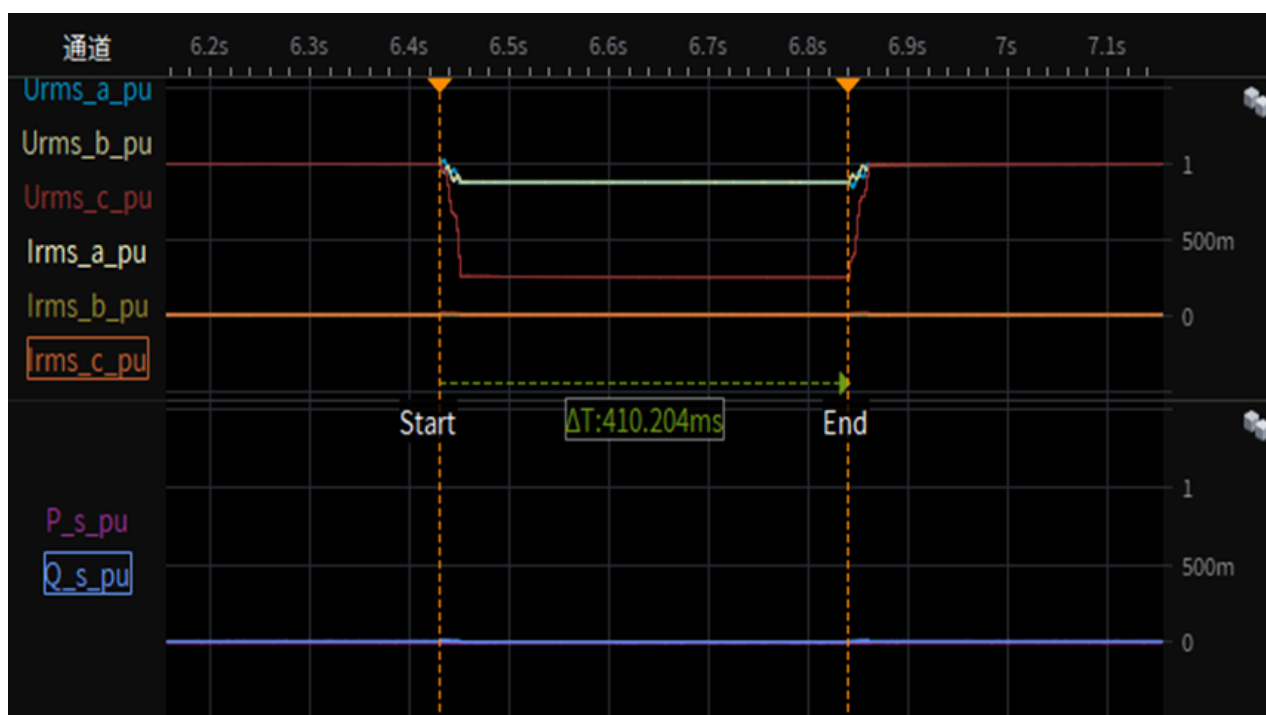
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 2s-2-1.4 Depth of fault phase: 0.25p.u., three-phase-symmetrical (type A), 95% load restoring time



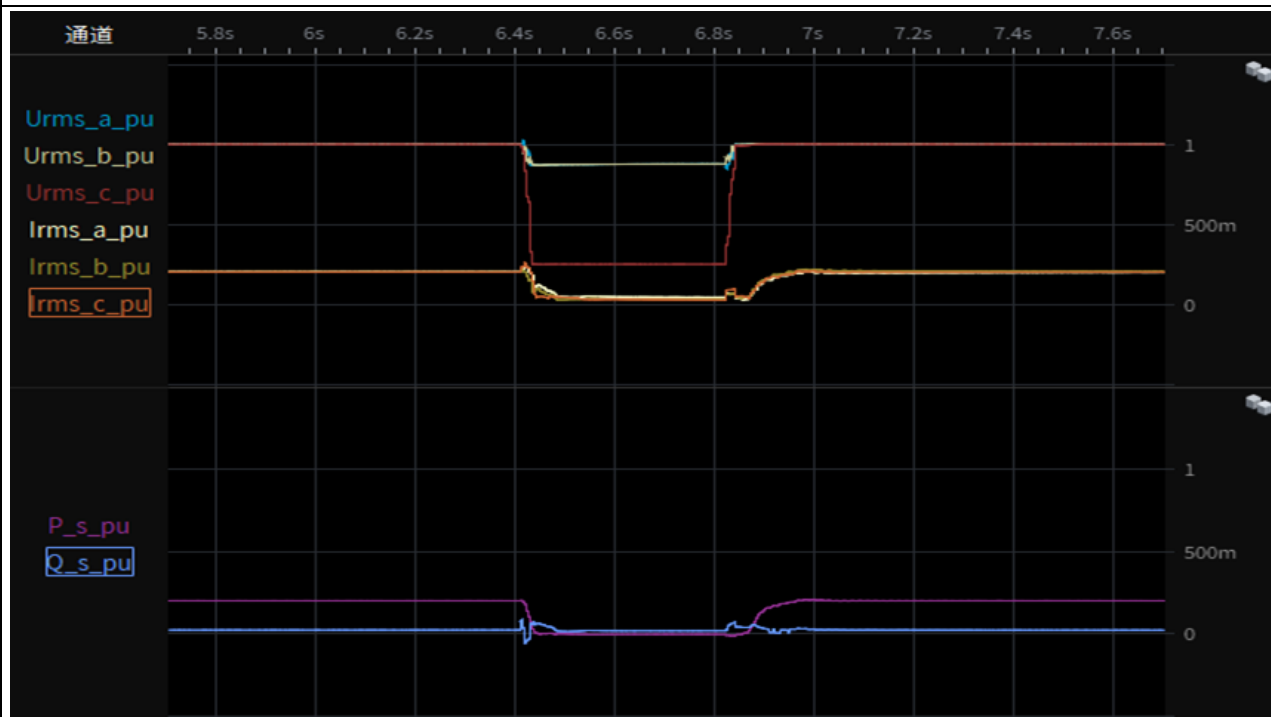
Test 2a-1.1 Depth of fault phase: 0.25p.u., two-phase-asymmetrical (type D), 0% load Test overview(voltage,current,active and reactive power)



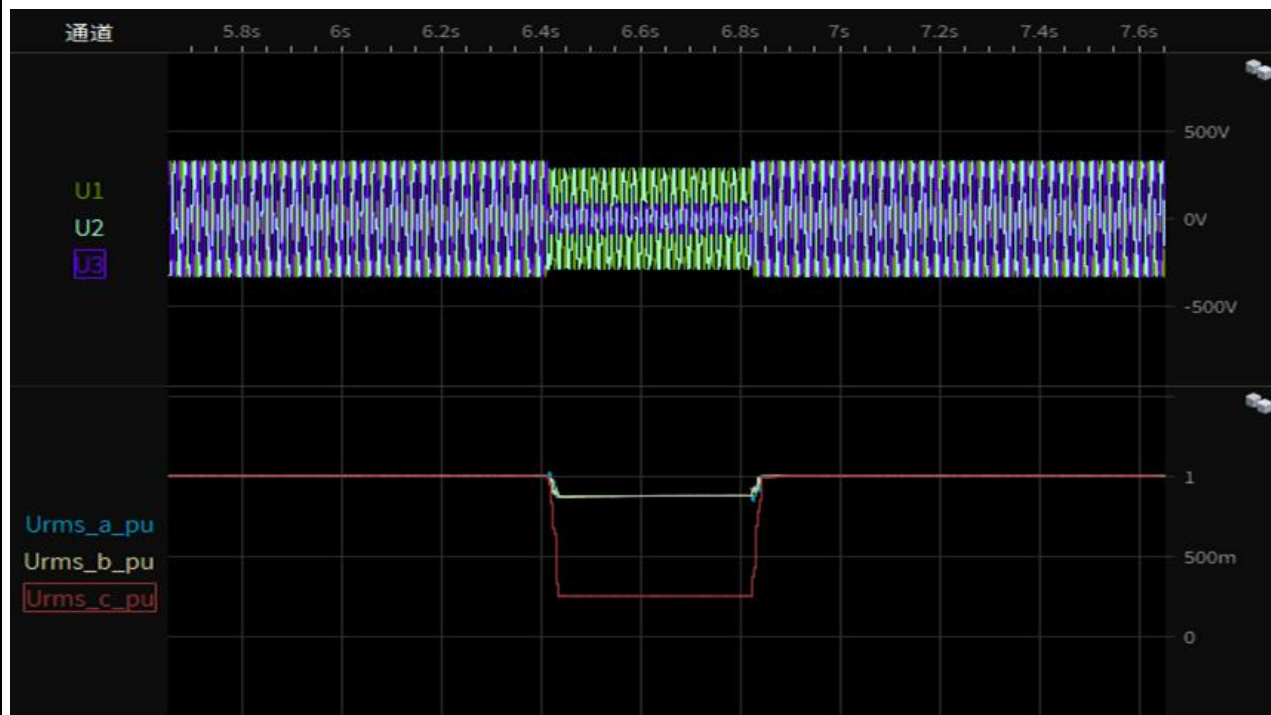
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 2a-1-1.1 Depth of fault phase:0.25p.u., two-phase-asymmetrical (type D), 20% load
Test overview(voltage,current,active and reactive power)



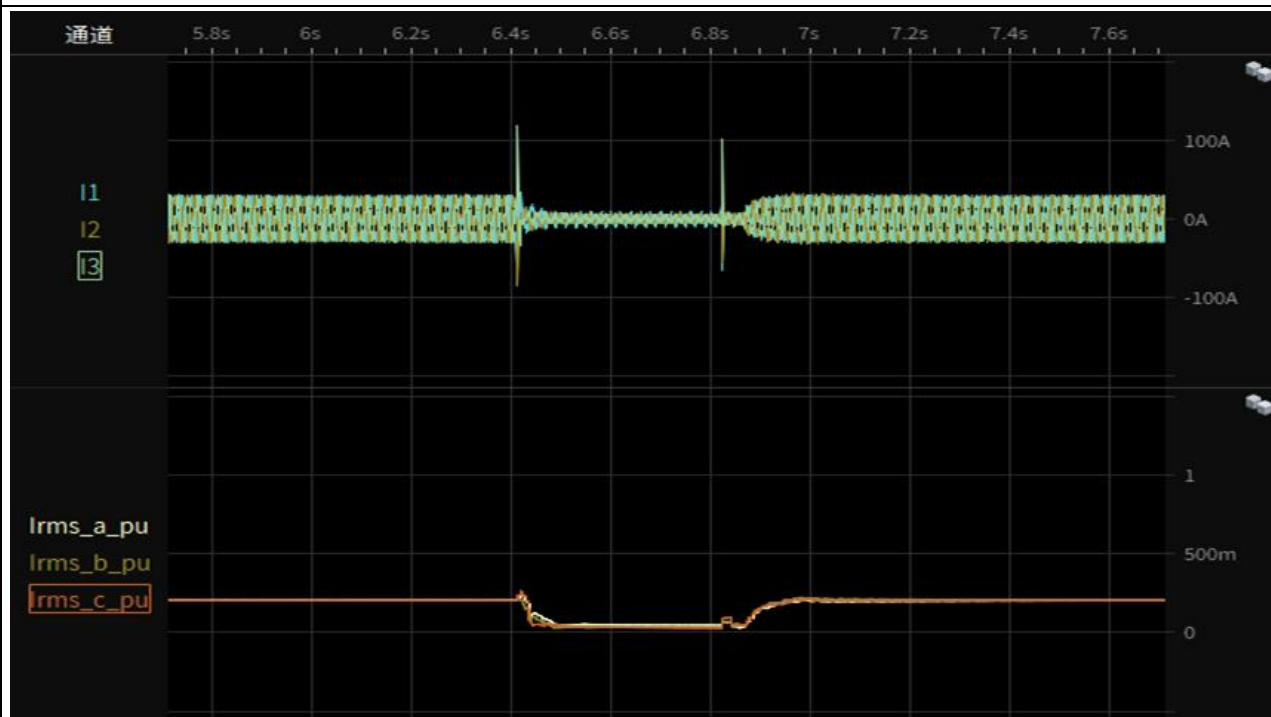
Test 2a-1-1.2 Depth of fault phase:0.25p.u., two-phase-asymmetrical (type D), 20% load
Instantaneous curve and RMS value of phase-to-neutral voltages



CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 2a-1-1.3 Depth of fault phase:0.25p.u., two-phase-asymmetrical (type D), 20% load
Instantaneous curve and RMS value of phase currents



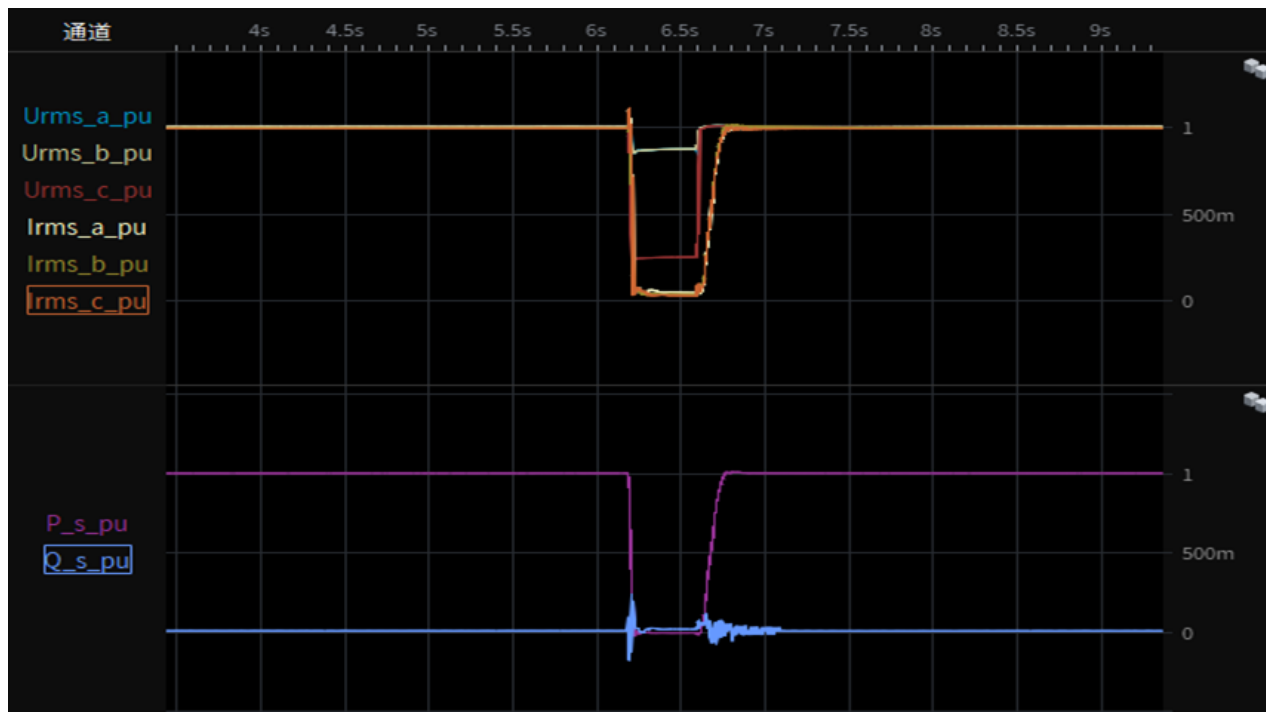
Test 2a-1-1.4 Depth of fault phase:0.25p.u., two-phase-asymmetrical (type D),
20% load restoring time



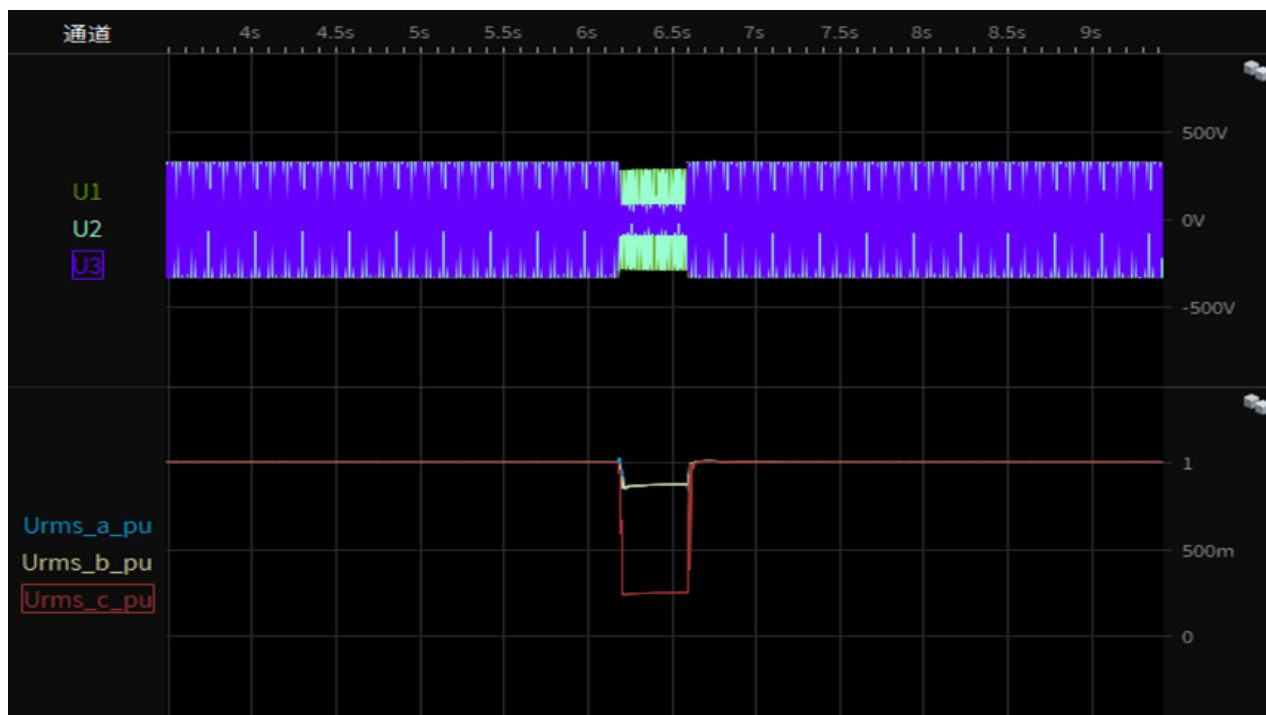
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 2a-2-1.1 Depth of fault phase:0.25p.u., two-phase-asymmetrical (type D), 95% load
Test overview(voltage,current,active and reactive power)



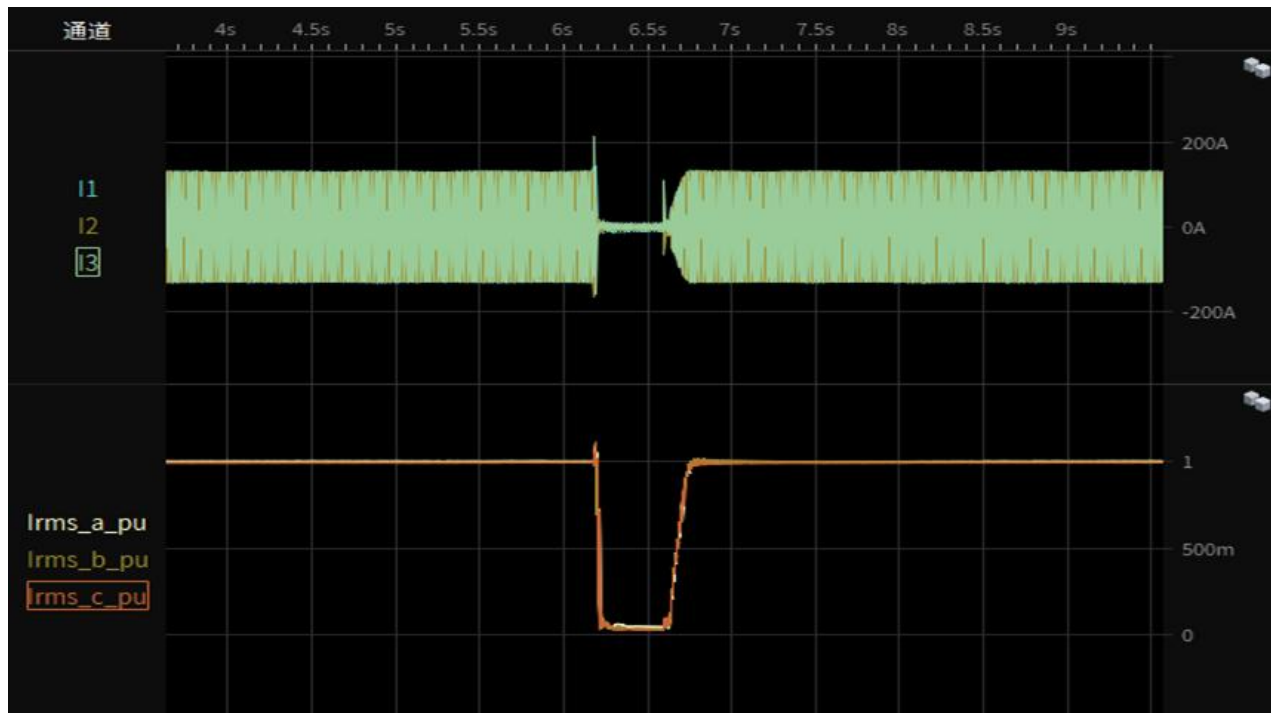
Test 2a-2-1.2 Depth of fault phase: 0.25p.u., two-phase-asymmetrical (type D), 95% load
Instantaneous curve and RMS value of phase-to-neutral voltages



CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 2a-2-1.3 Depth of fault phase:0.25p.u., two-phase-asymmetrical (type D), 95% load
Instantaneous curve and RMS value of phase currents



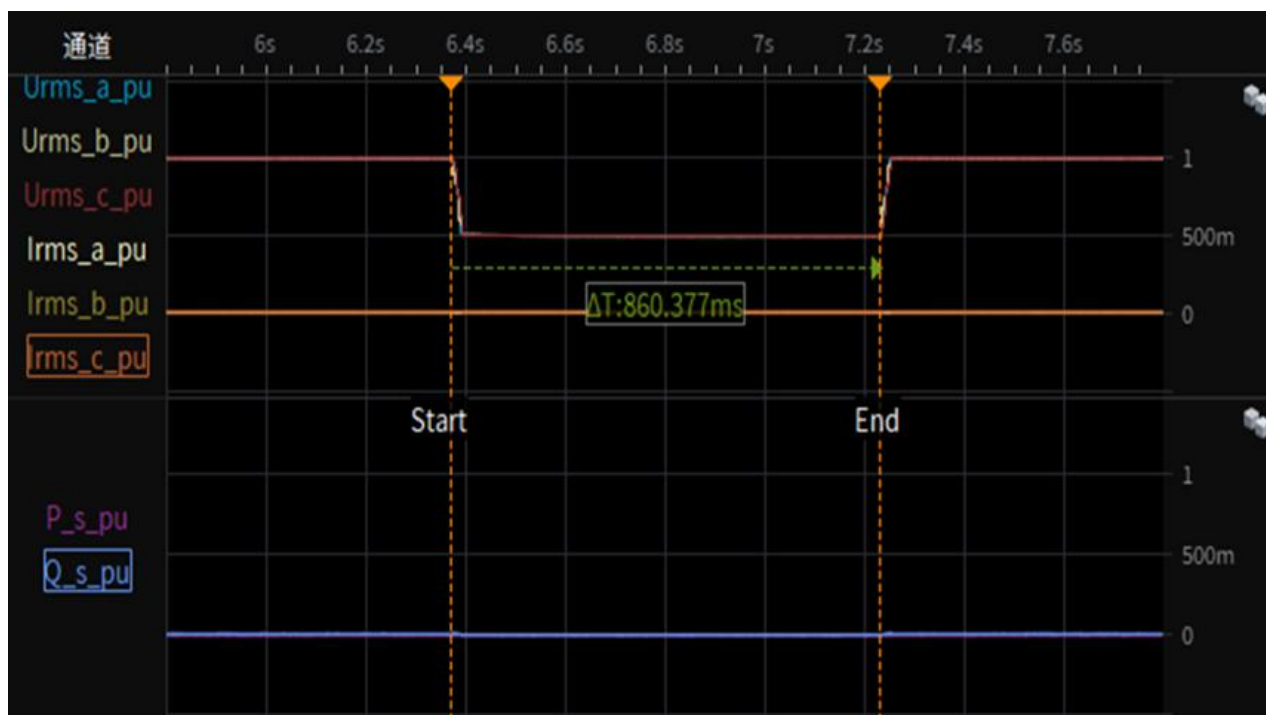
Test 2a-2-1.4 Depth of fault phase: 0.25p.u., two-phase-asymmetrical (type D),
95% load restoring time



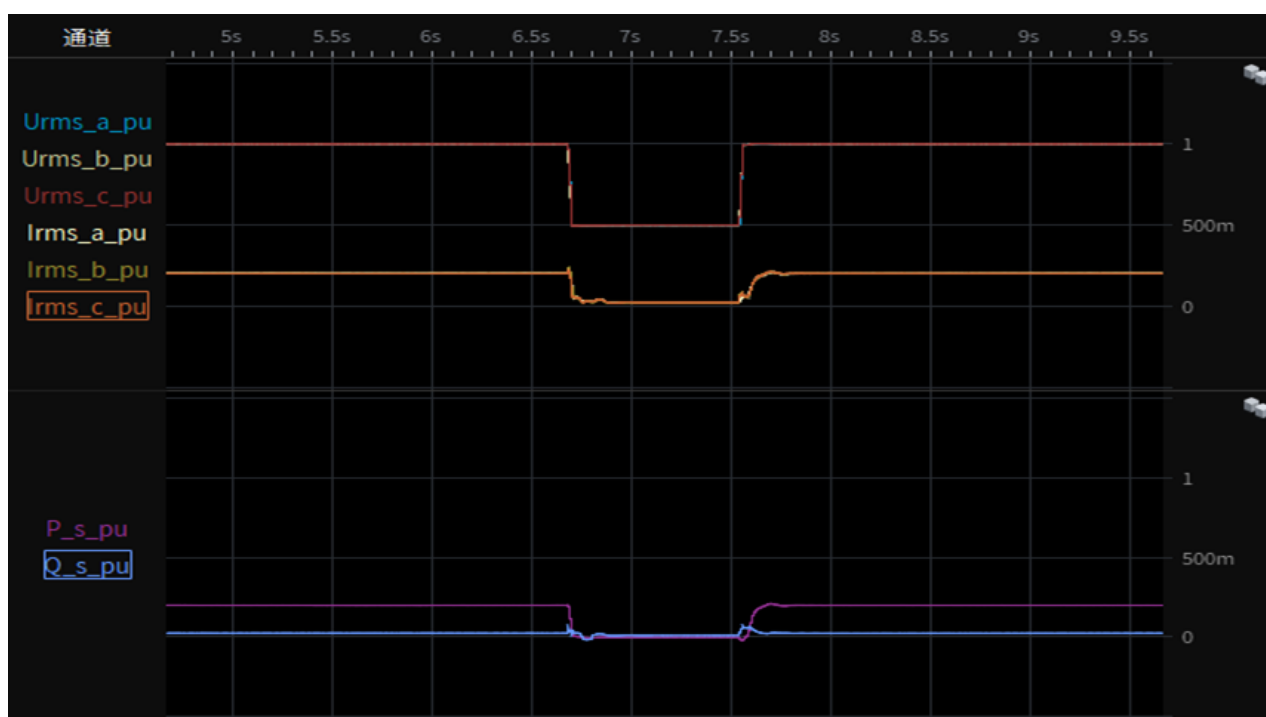
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 3s-1.1 Depth of fault phase: 0.5p.u., three-phase-symmetrical (type A), 0% load
 Test overview(voltage,current,active and reactive power)



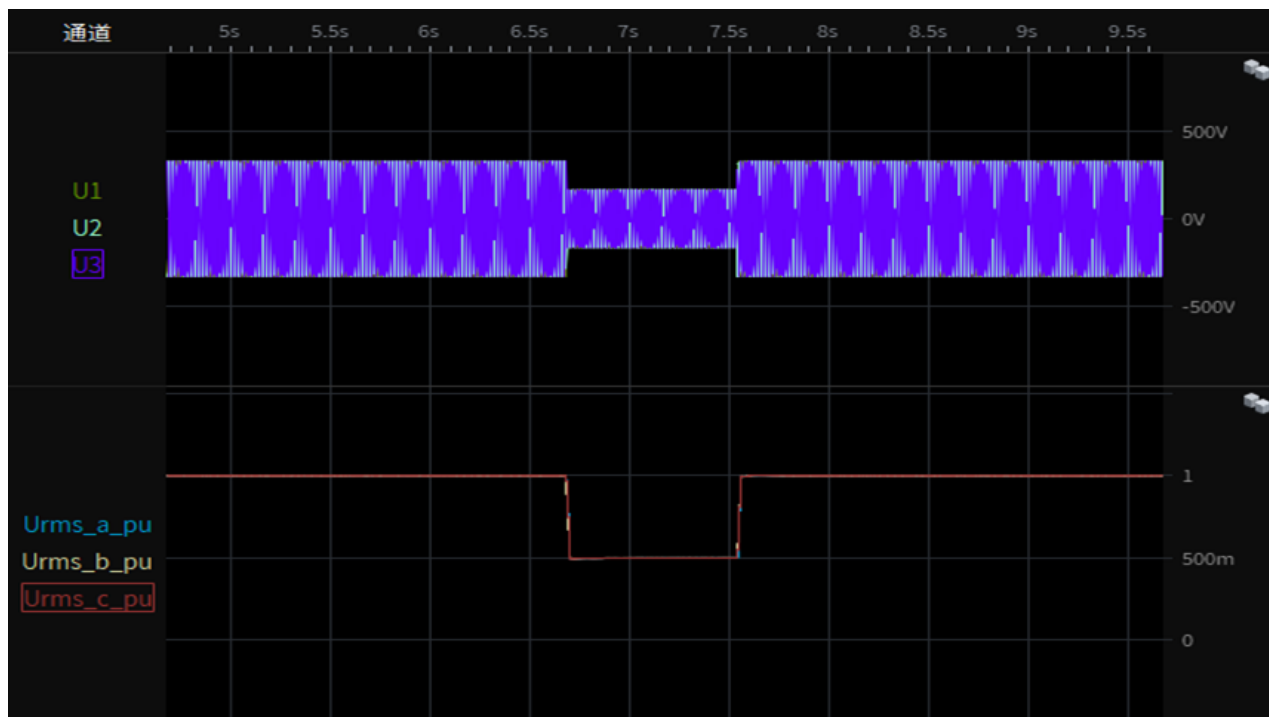
Test 3s-1-1.1 Depth of fault phase: 0.5p.u., three-phase-symmetrical (type A), 20% load
 Test overview(voltage,current,active and reactive power)



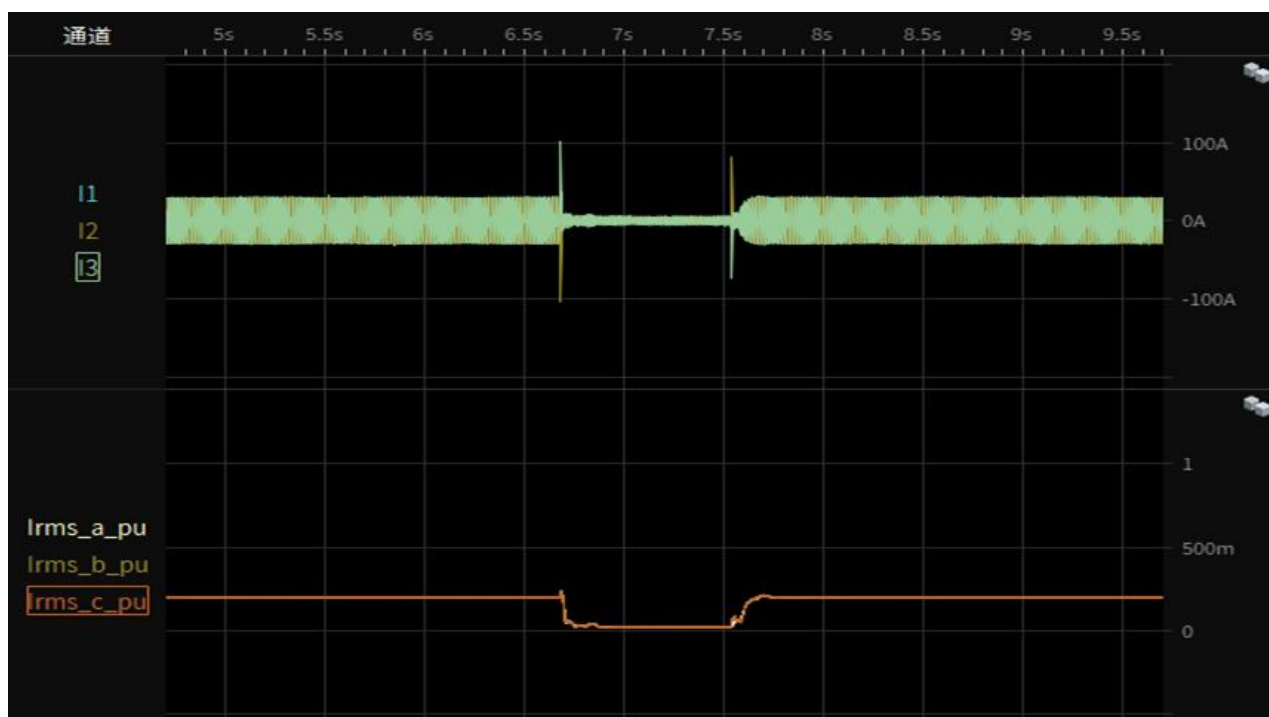
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 3s-1-1.2 Depth of fault phase: 0.5p.u., three-phase-symmetrical (type A), 20% load
Instantaneous curve and RMS value of phase-to-neutral voltages



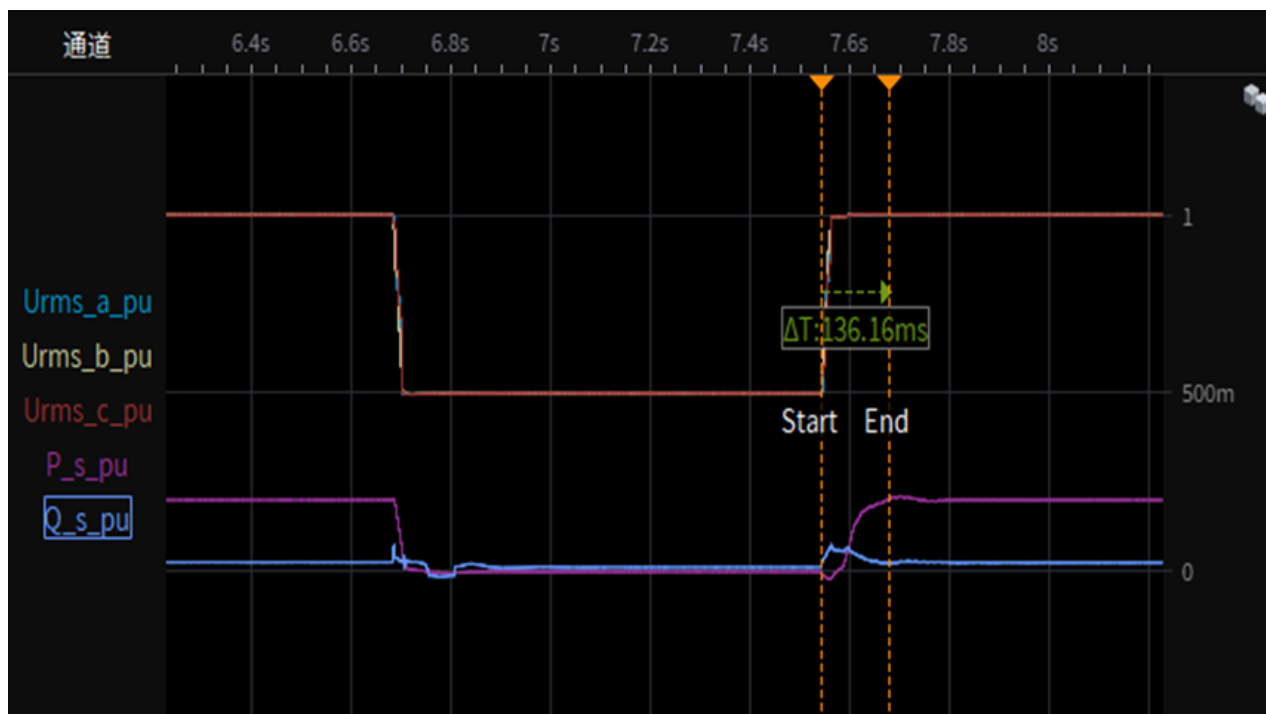
Test 3s-1-1.3 Depth of fault phase: 0.5p.u., three-phase-symmetrical (type A), 20% load
Instantaneous curve and RMS value of phase currents



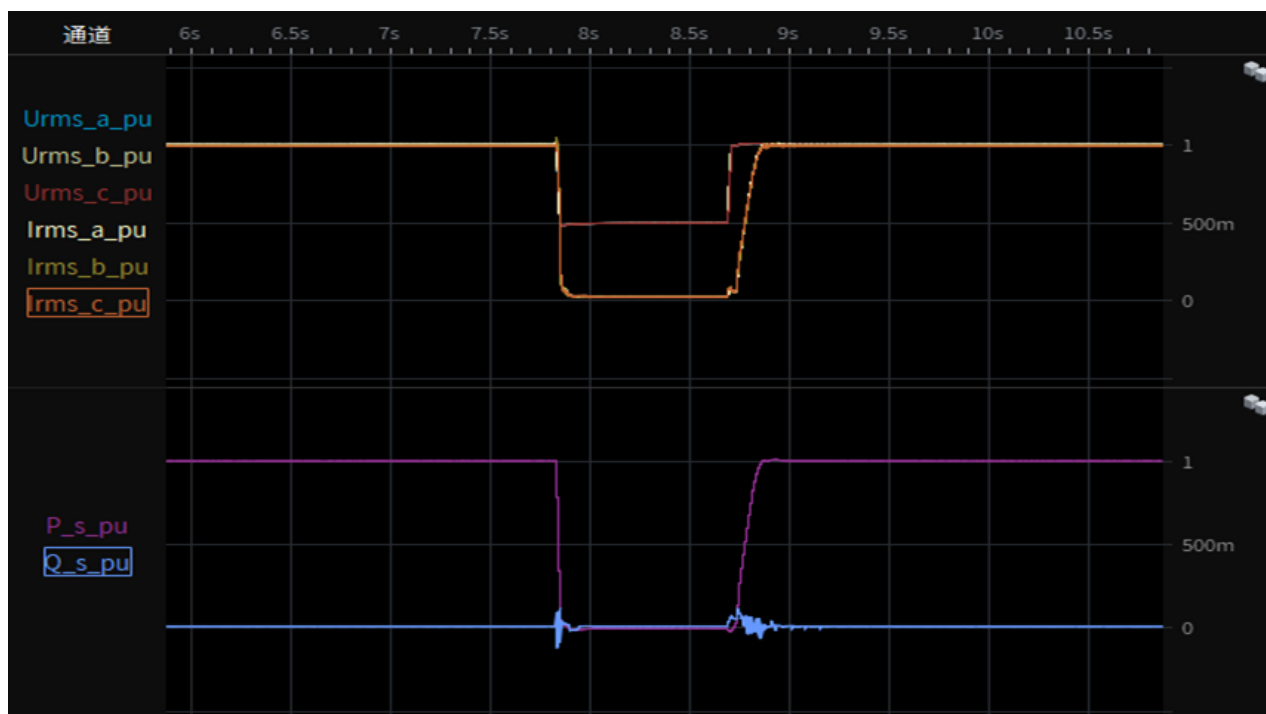
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 3s-1-1.4 Depth of fault phase: 0.5p.u., three-phase-symmetrical (type A), 20% load restoring time



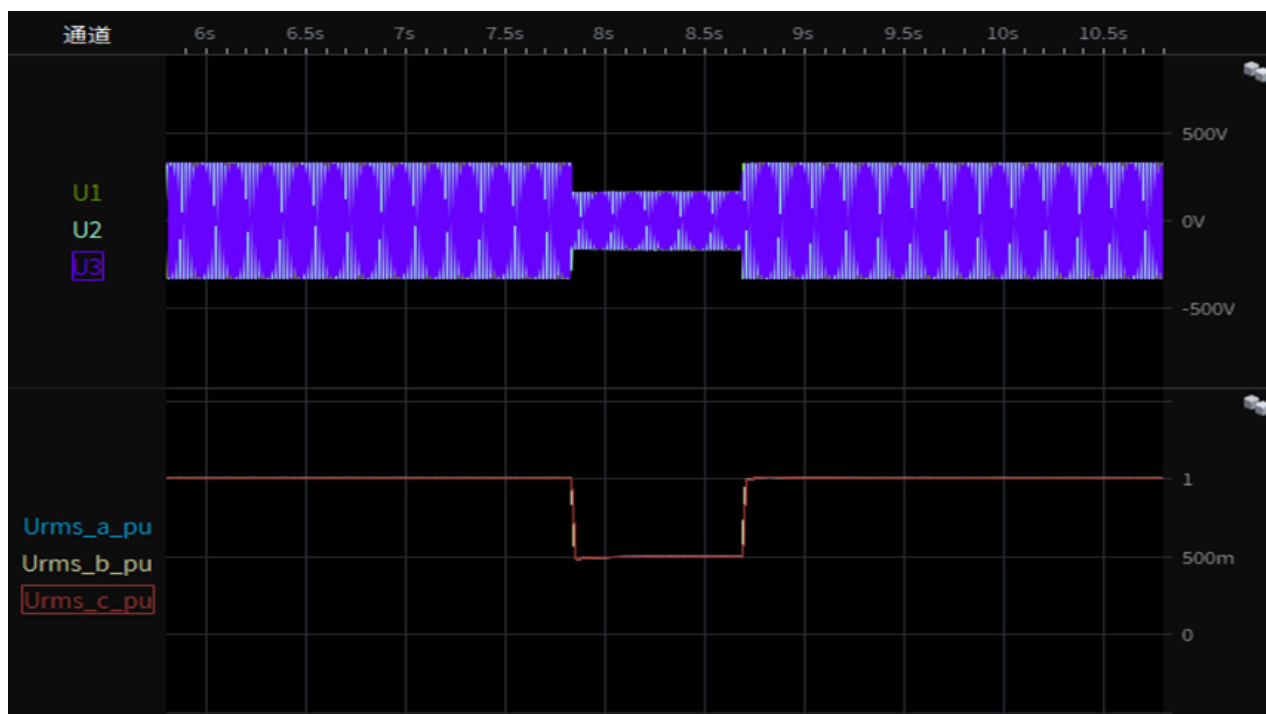
Test 3s-2-1.1 Depth of fault phase: 0.5p.u., three-phase-symmetrical (type A), 95% load Test overview(voltage,current,active and reactive power)



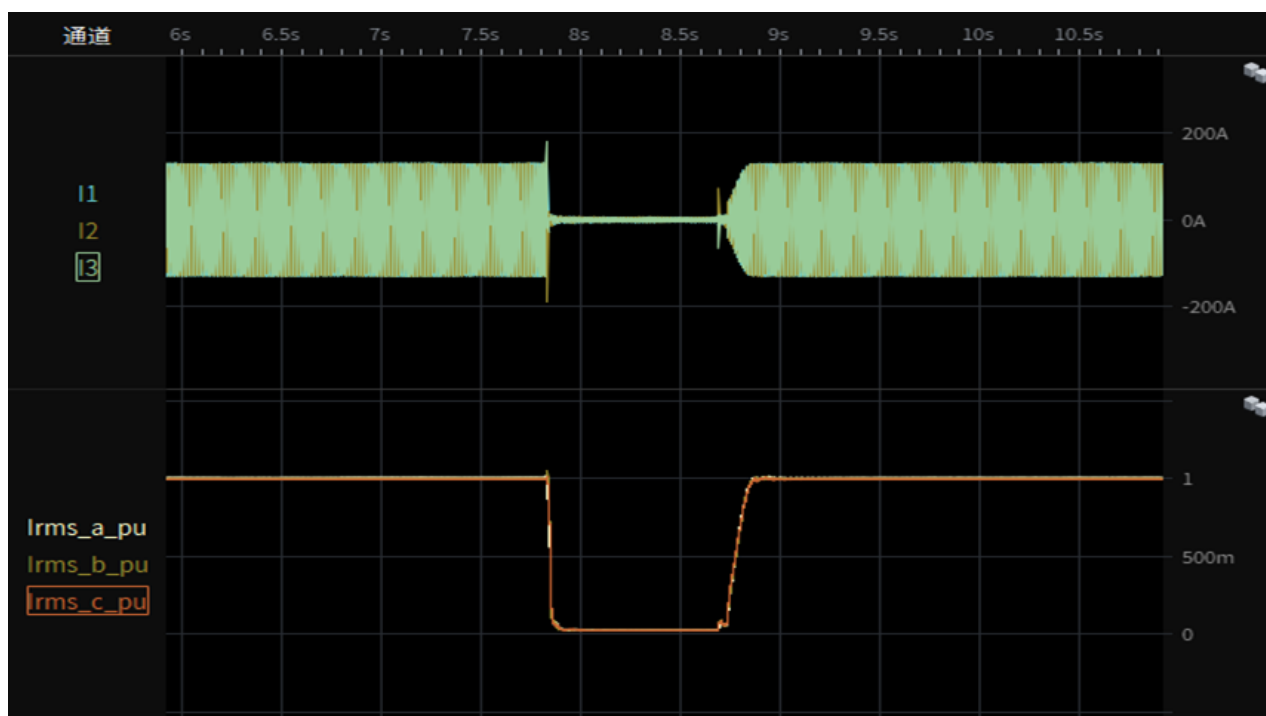
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 3s-2-1.2 Depth of fault phase: 0.5p.u., three-phase-symmetrical (type A), 95% load
Instantaneous curve and RMS value of phase-to-neutral voltages



Test 3s-2-1.3 Depth of fault phase: 0.5p.u., three-phase-symmetrical (type A), 95% load
Instantaneous curve and RMS value of phase currents



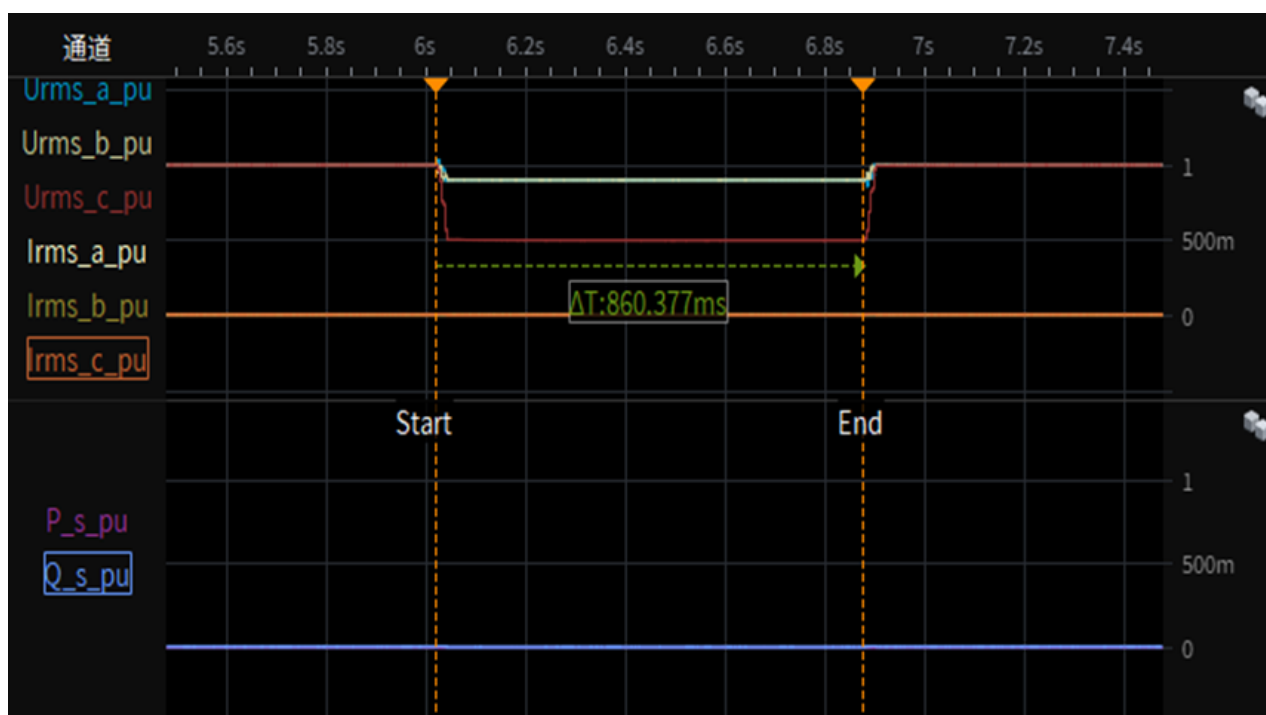
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 3s-2-1.4 Depth of fault phase: 0.5p.u., three-phase-symmetrical (type A),
95% load restoring time



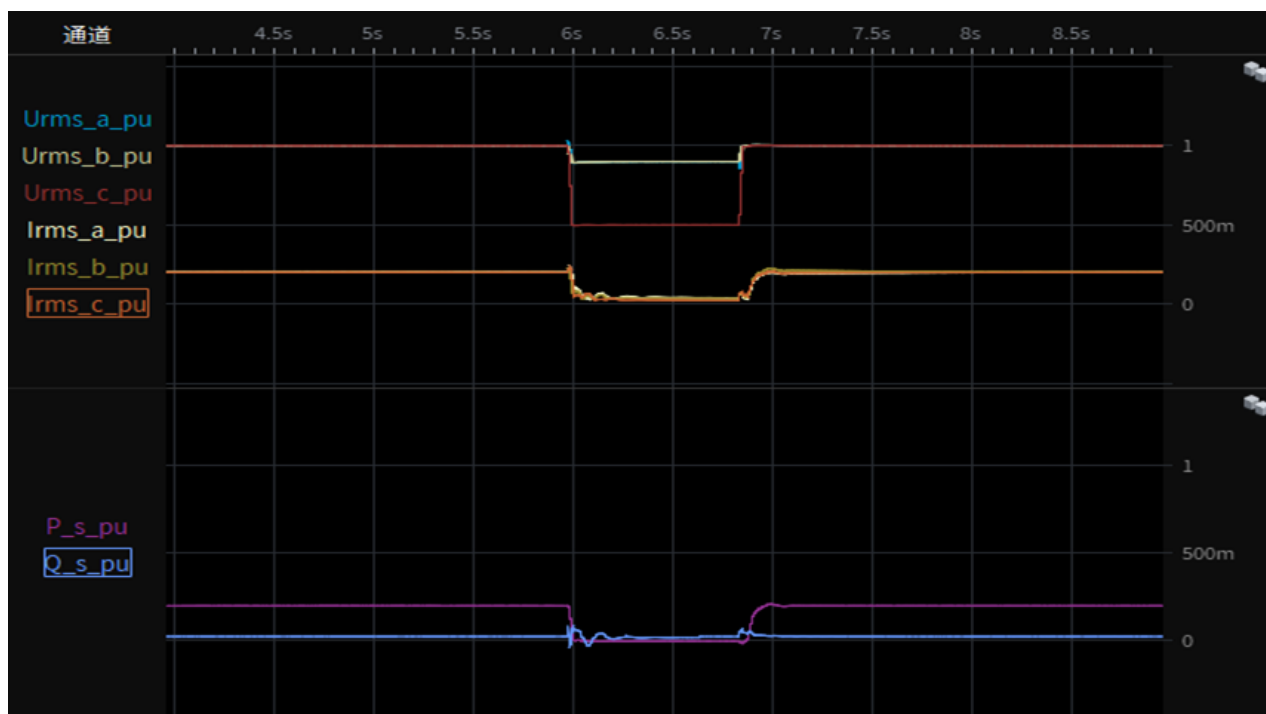
Test 3a-1.1 Depth of fault phase: 0.5p.u., two-phase-asymmetrical (type D), 0% load
Test overview(voltage,current,active and reactive power)



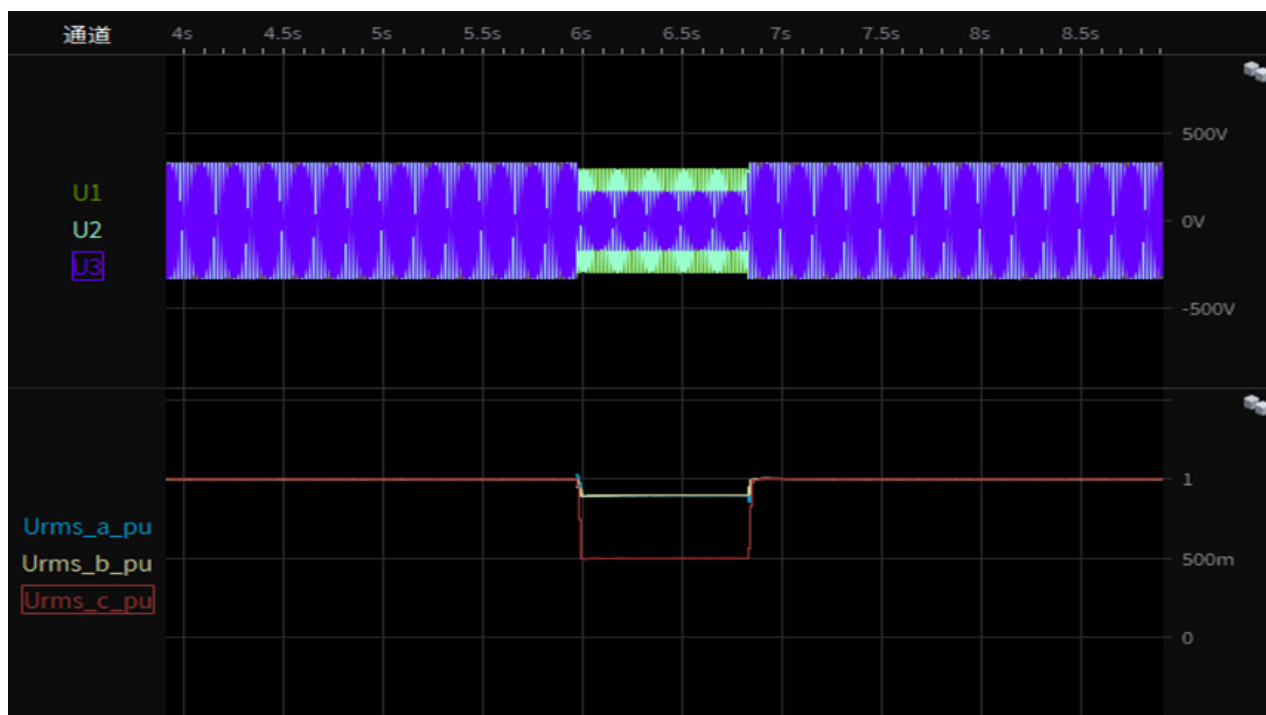
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 3a-1-1.1 Depth of fault phase: 0.5p.u., two-phase-asymmetrical (type D), 20% load
 Test overview(voltage,current,active and reactive power)



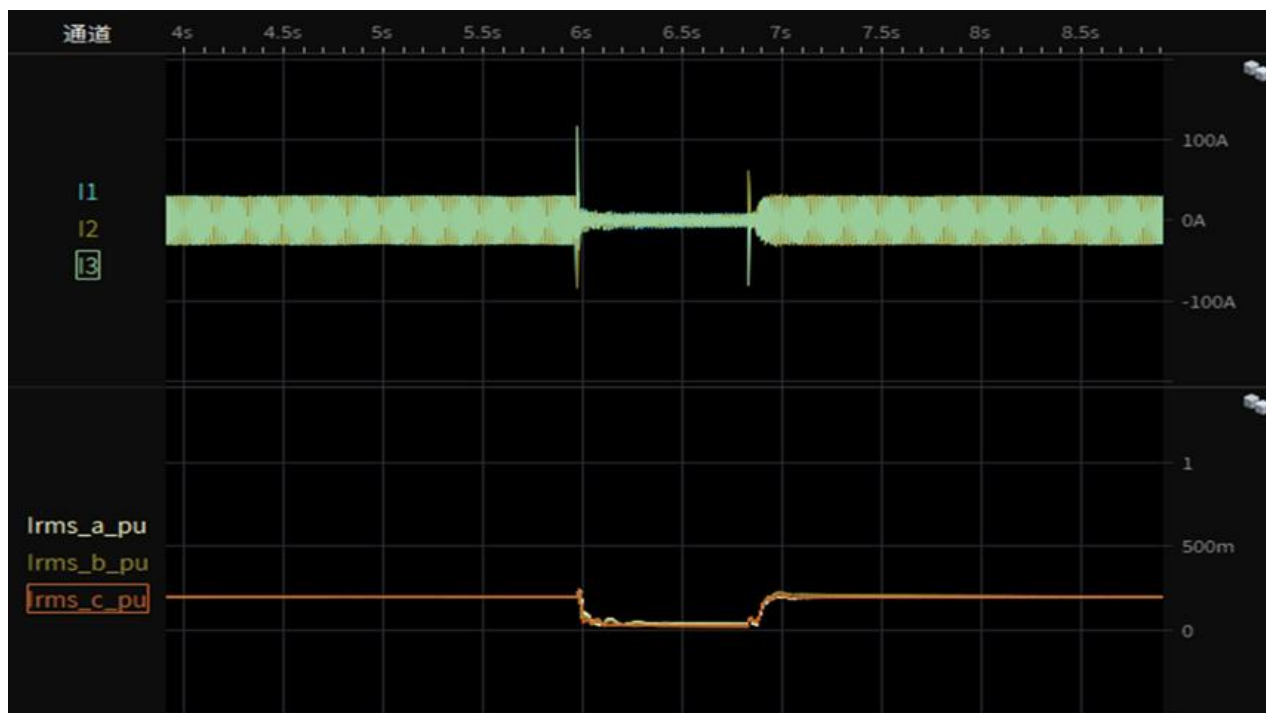
Test 3a-1-1.2 Depth of fault phase: 0.5p.u., two-phase-asymmetrical (type D), 20% load
 Instantaneous curve and RMS value of phase-to-neutral voltages



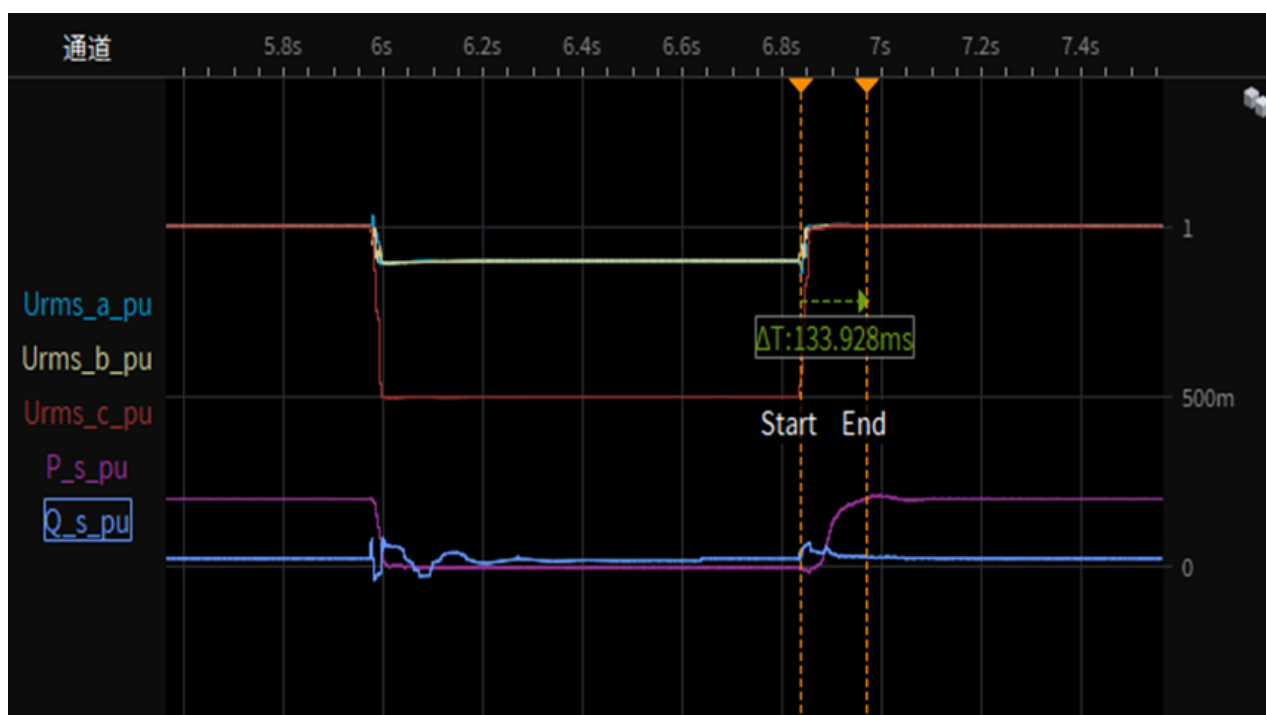
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 3a-1-1.3 Depth of fault phase: 0.5p.u., two-phase-asymmetrical (type D), 20% load
Instantaneous curve and RMS value of phase currents



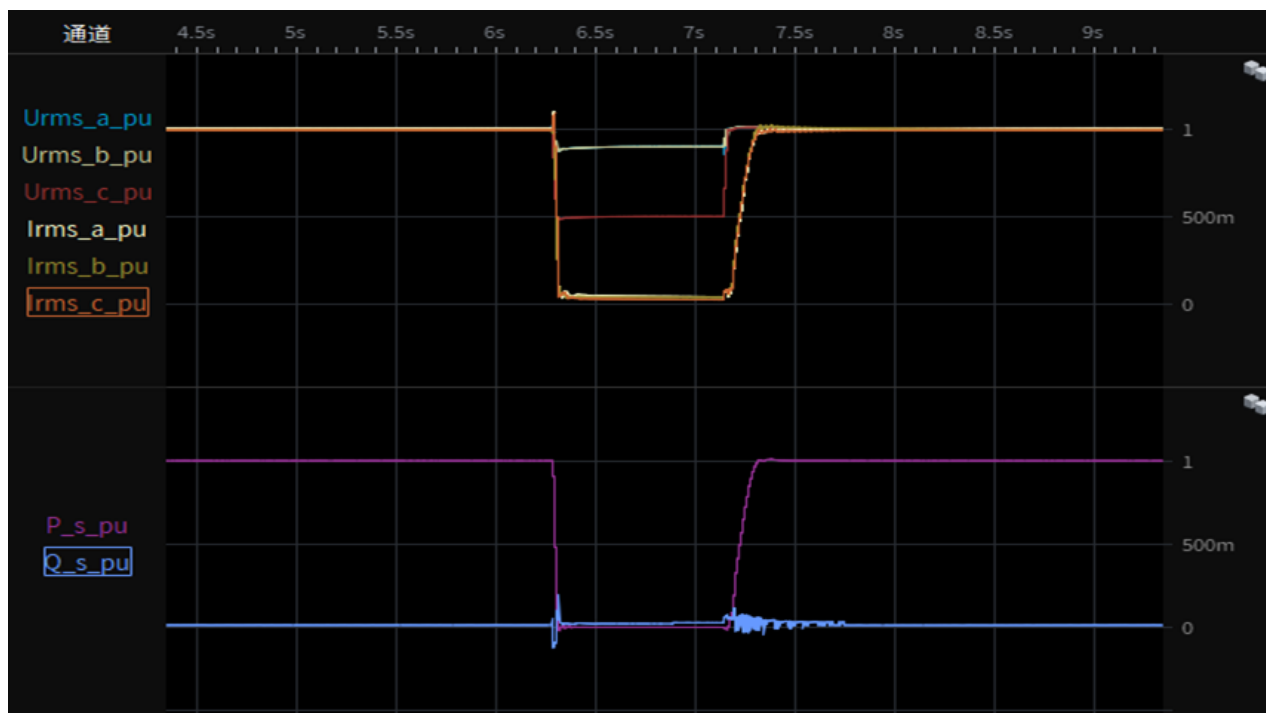
Test 3a-1-1.4 Depth of fault phase: 0.5p.u., two-phase-asymmetrical (type D),
20% load restoring time



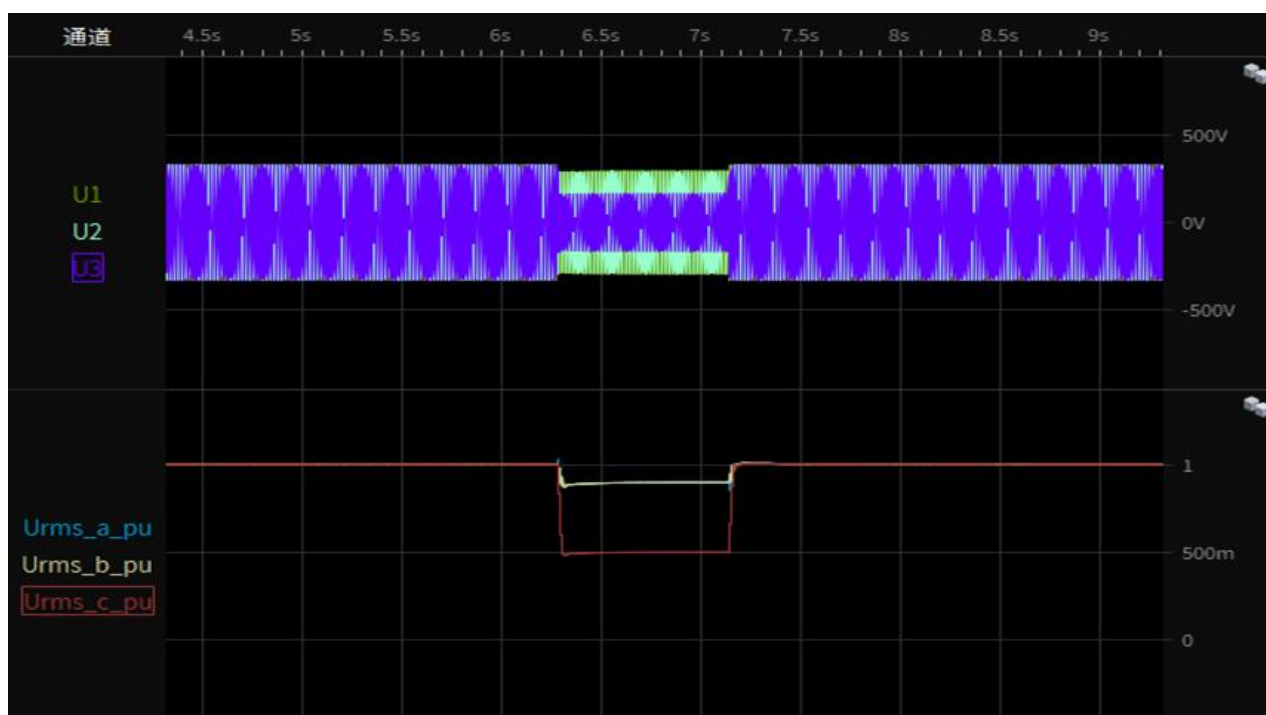
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 3a-2-1.1 Depth of fault phase: 0.5p.u., two-phase-asymmetrical (type D), 95% load
 Test overview(voltage,current,active and reactive power)



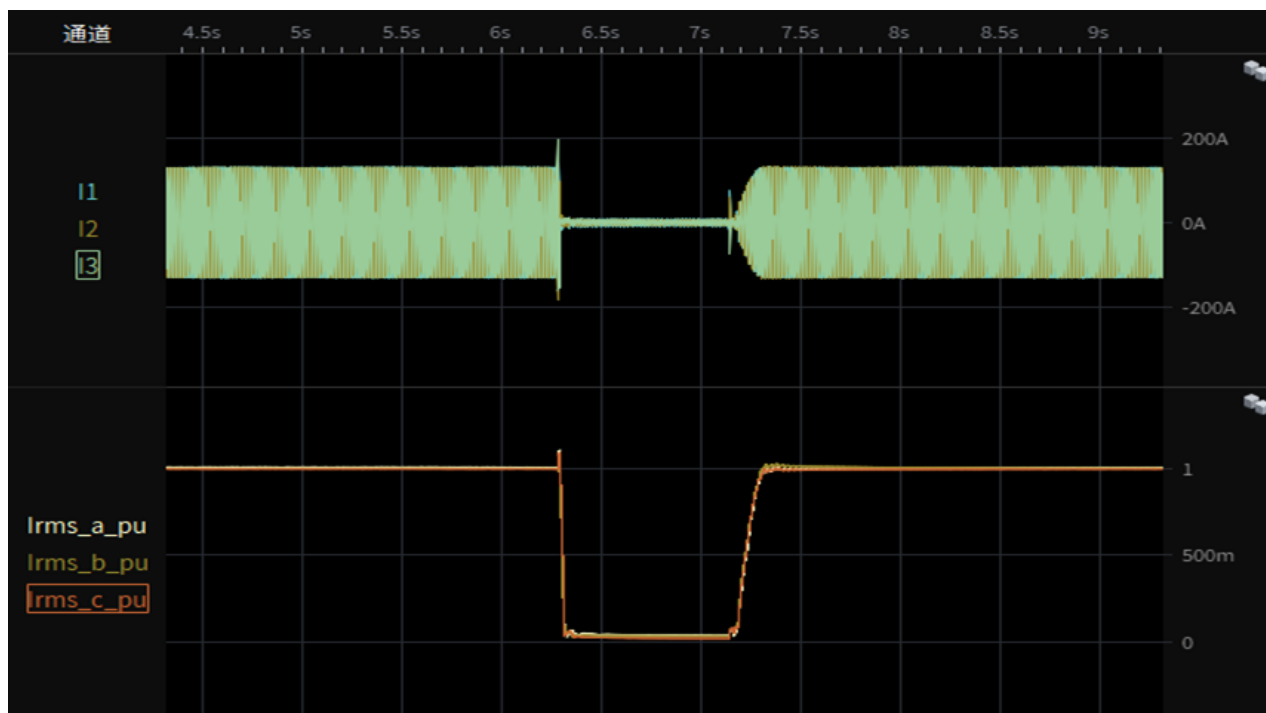
Test 3a-2-1.2 Depth of fault phase: 0.5p.u., two-phase-asymmetrical (type D), 95% load
 Instantaneous curve and RMS value of phase-to-neutral voltages



CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 3a-2-1.3 Depth of fault phase: 0.5p.u., two-phase-asymmetrical (type D), 95% load
Instantaneous curve and RMS value of phase currents



Test 3a-2-1.4 Depth of fault phase: 0.5p.u., two-phase-asymmetrical (type D),
95% load restoring time



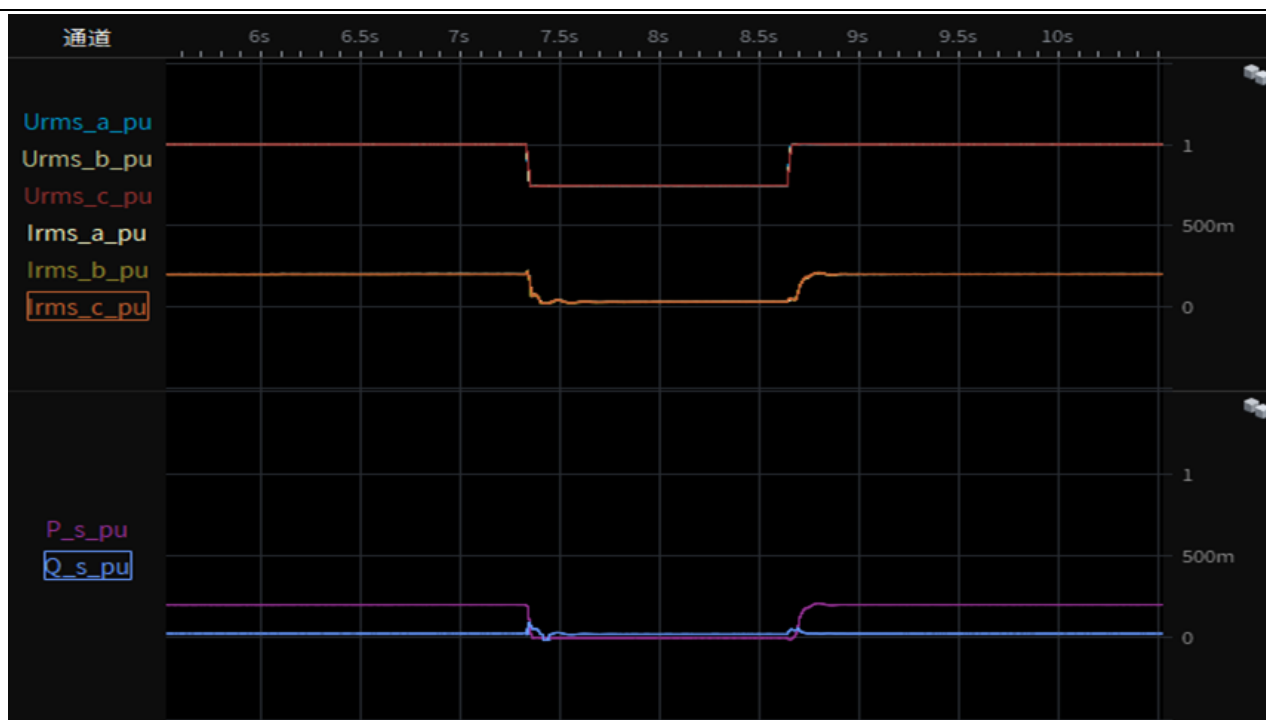
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 4s-1.1 Depth of fault phase: 0.75p.u., three-phase-symmetrical (type A), 0% load
Test overview(voltage,current,active and reactive power)



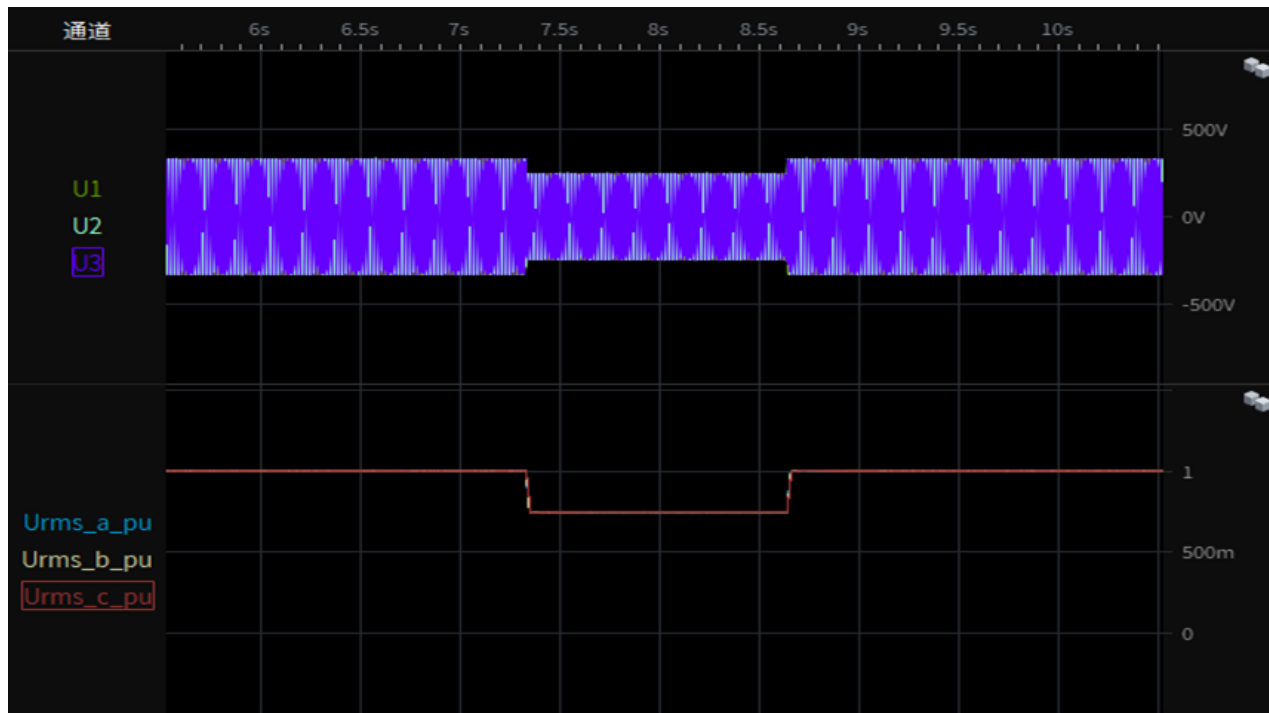
Test 4s-1-1.1 Depth of fault phase: 0.75p.u., three-phase-symmetrical (type A), 20% load
Test overview(voltage,current,active and reactive power)



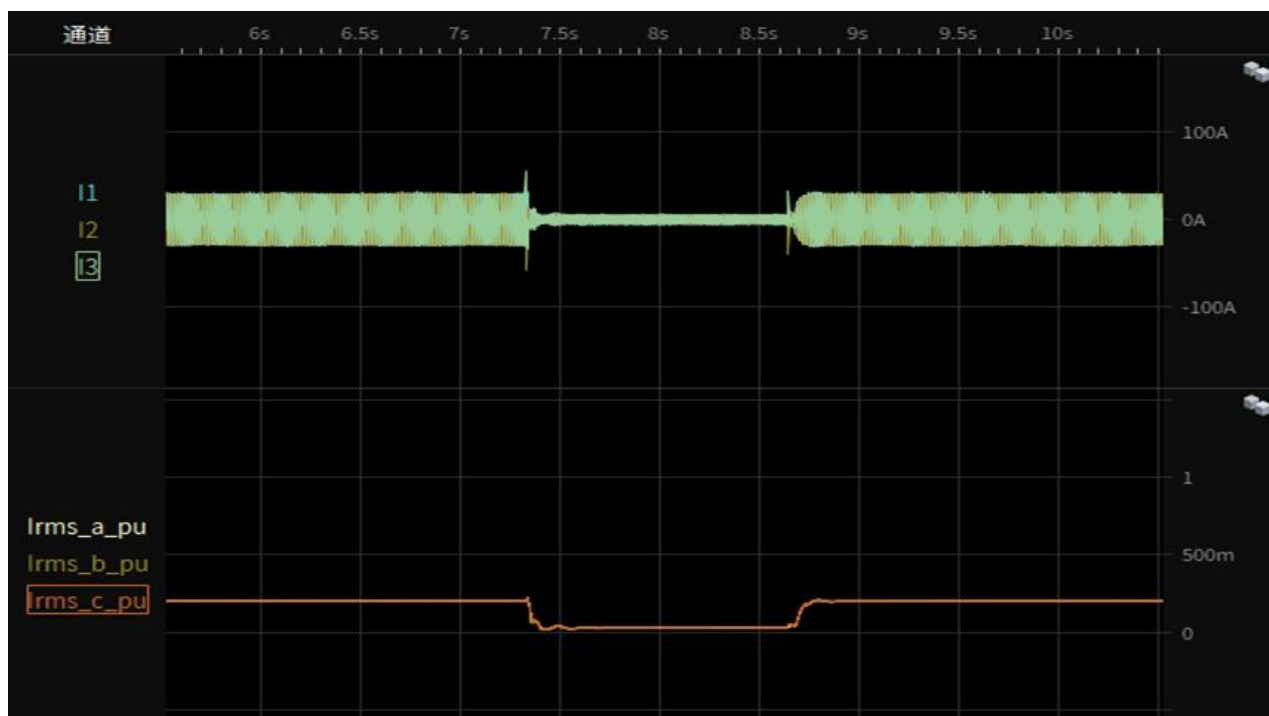
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 4s-1-1.2 Depth of fault phase: 0.75p.u., three-phase-symmetrical (type A), 20% load
Instantaneous curve and RMS value of phase-to-neutral voltages



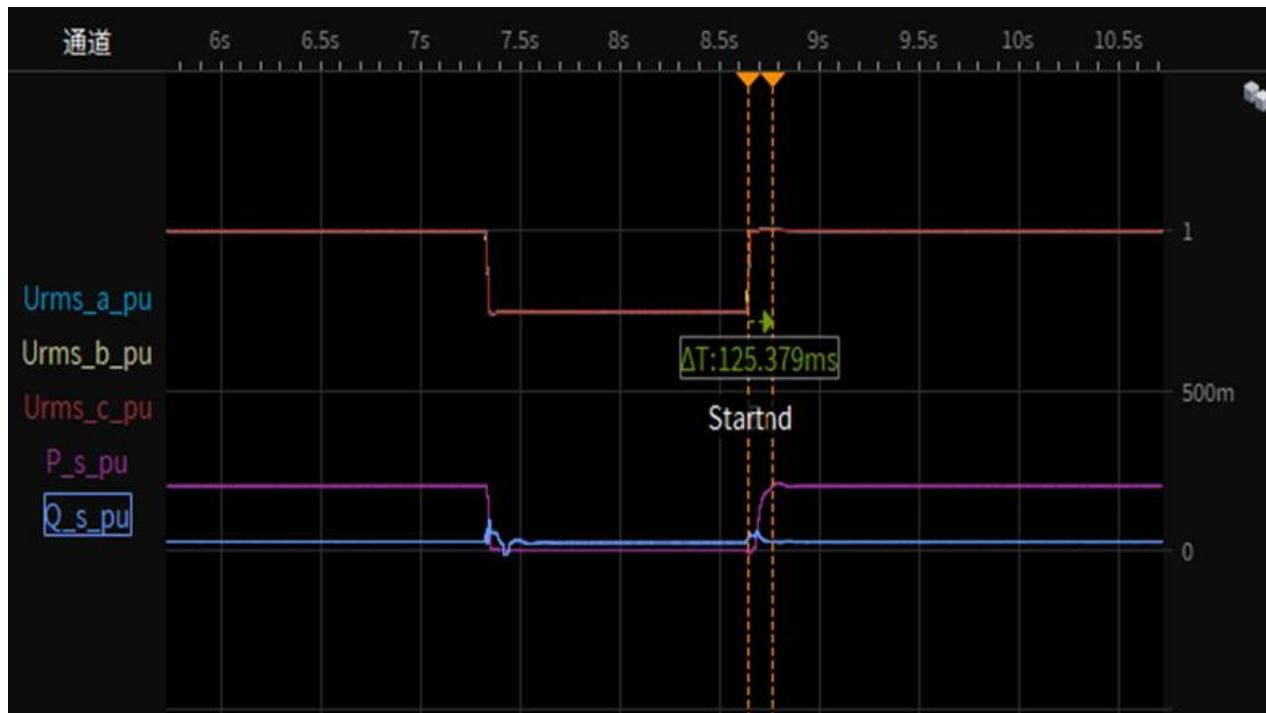
Test 4s-1-1.3 Depth of fault phase: 0.75p.u., three-phase-symmetrical (type A), 20% load
Instantaneous curve and RMS value of phase currents



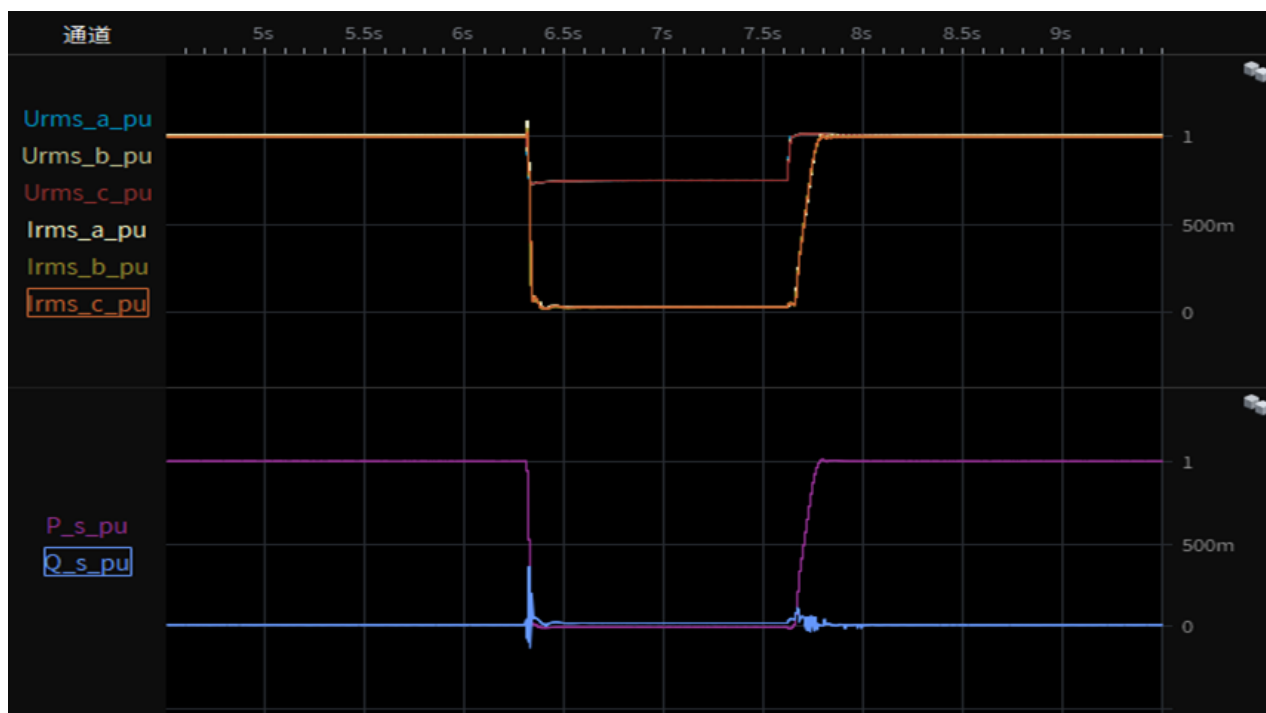
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 4s-1-1.4 Depth of fault phase: 0.75p.u., three-phase-symmetrical (type A),
20% load restoring time



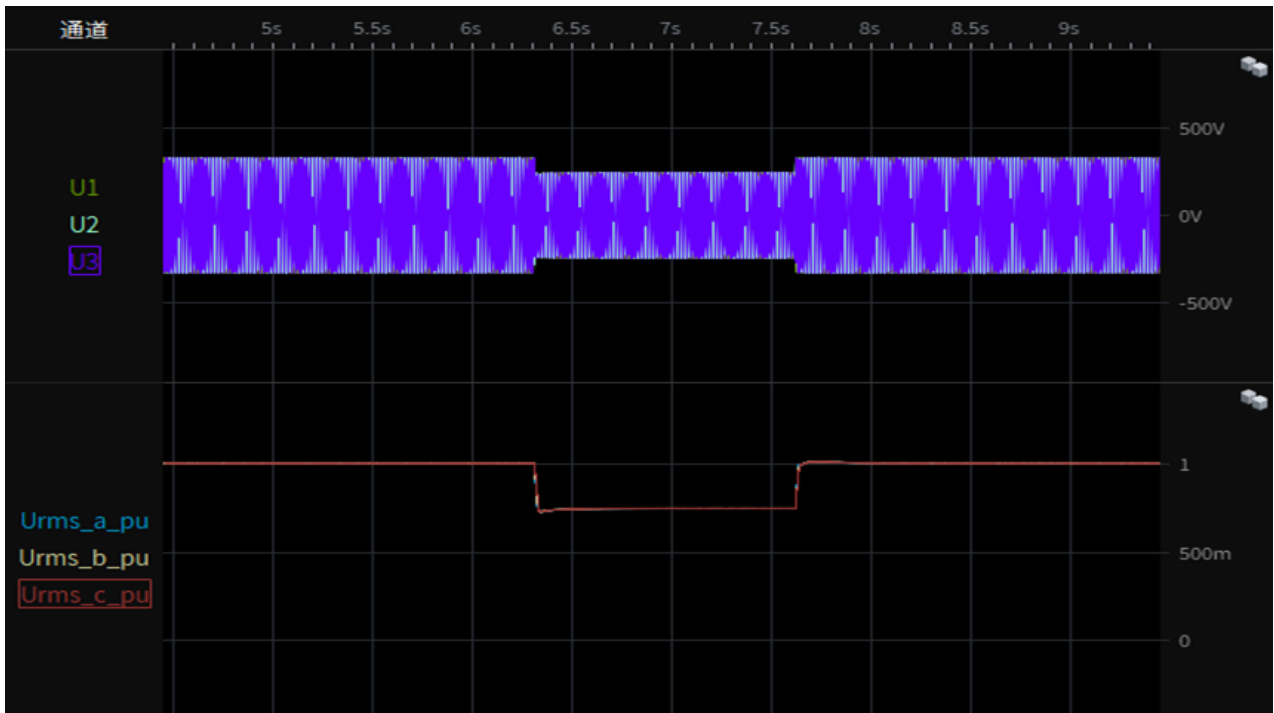
Test 4s-2-1.1 Depth of fault phase: 0.75p.u., three-phase-symmetrical (type A), 95% load
Test overview(voltage,current,active and reactive power)



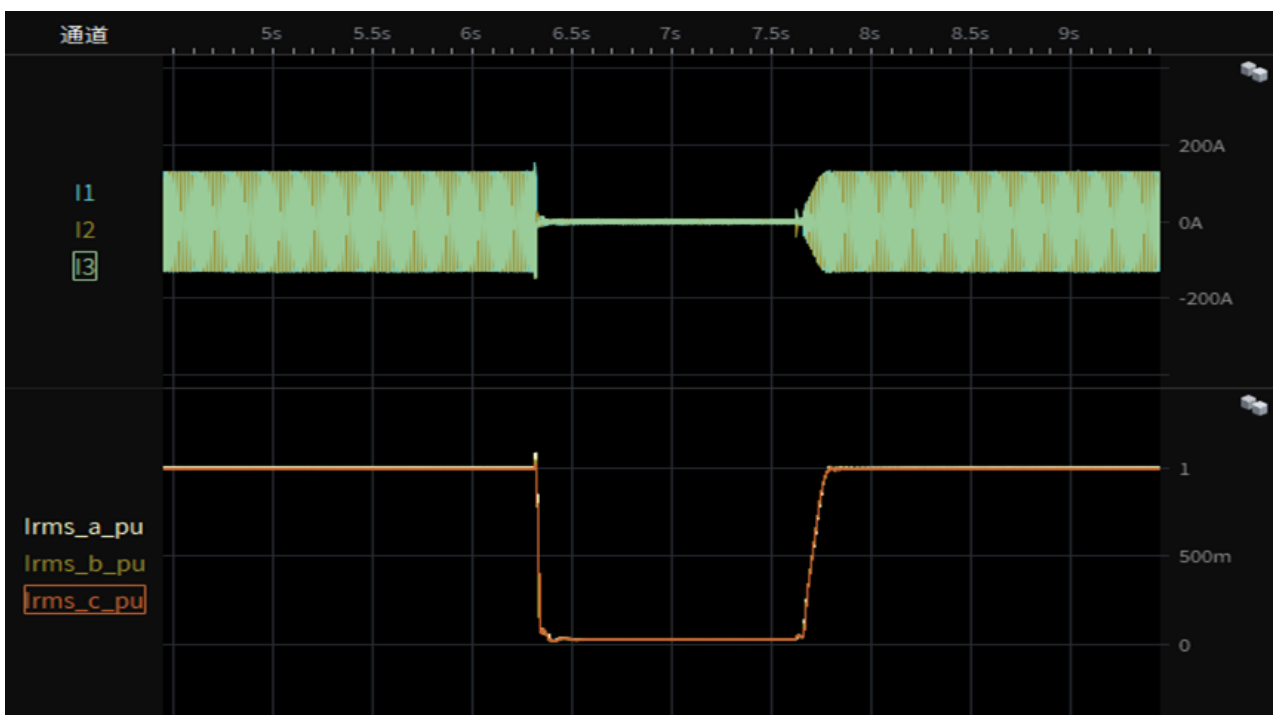
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 4s-2-1.2 Depth of fault phase: 0.75p.u., three-phase-symmetrical (type A), 95% load
Instantaneous curve and RMS value of phase-to-neutral voltages



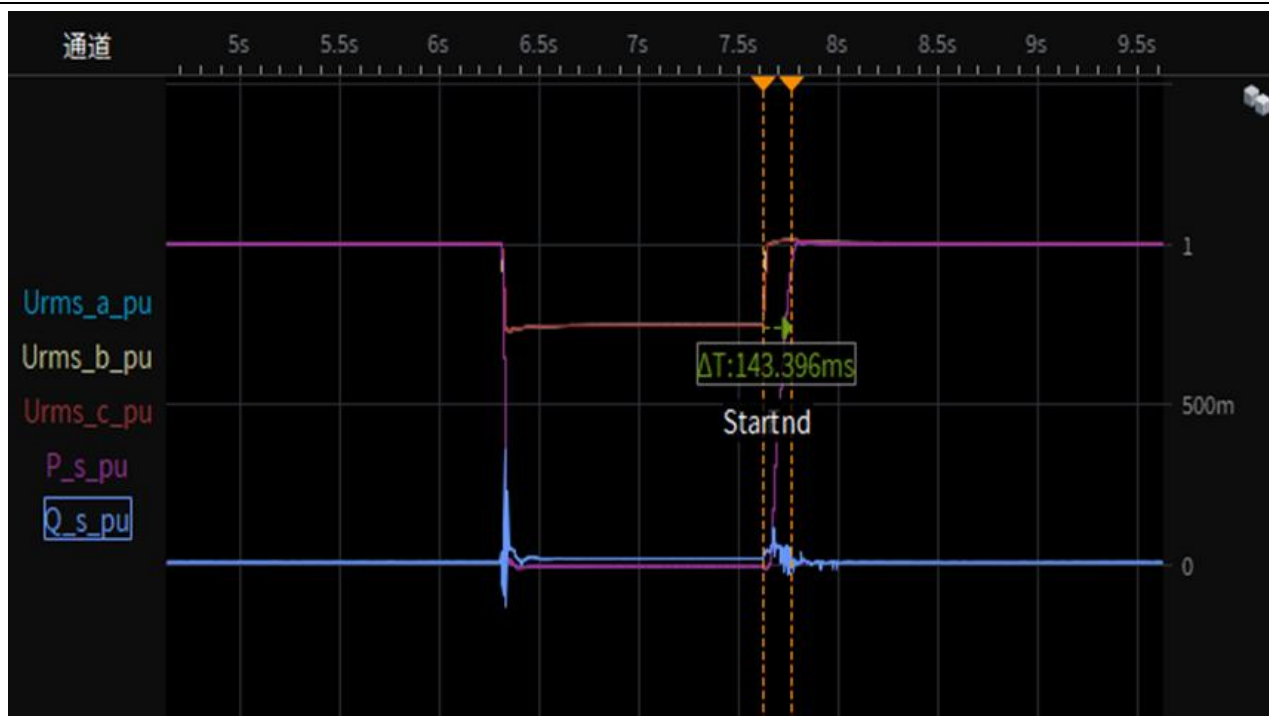
Test 4s-2-1.3 Depth of fault phase: 0.75p.u., three-phase-symmetrical (type A), 95% load
Instantaneous curve and RMS value of phase currents



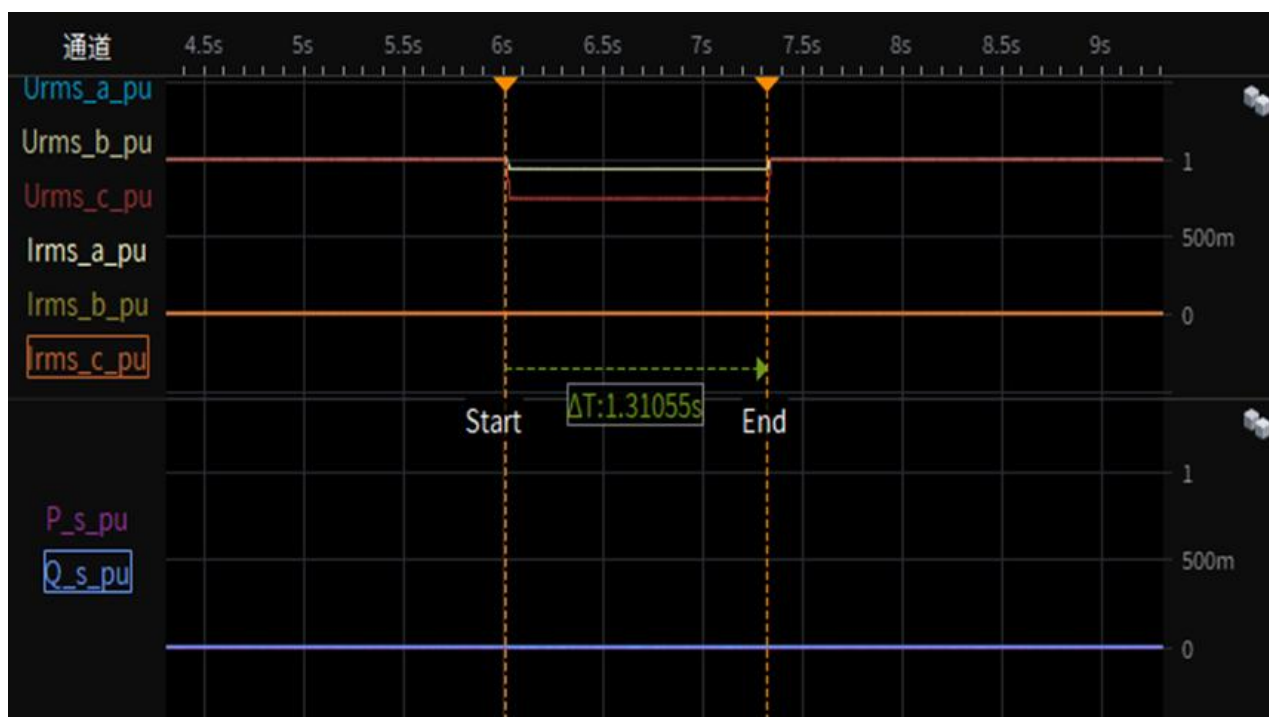
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 4s-2-1.4 Depth of fault phase: 0.75p.u., three-phase-symmetrical (type A),
95% load restoring time



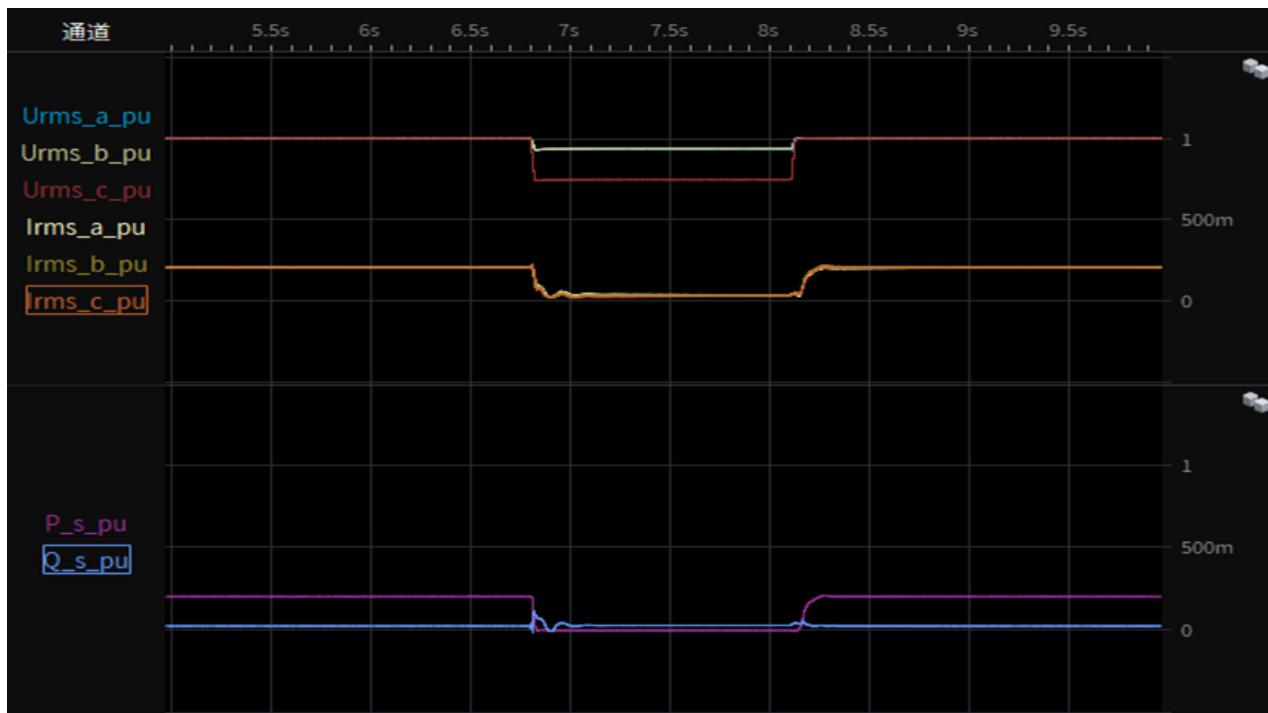
Test 4a-1.1 Depth of fault phase: 0.75p.u., two-phase-asymmetrical (type D), 0% load
Test overview(voltage,current,active and reactive power)



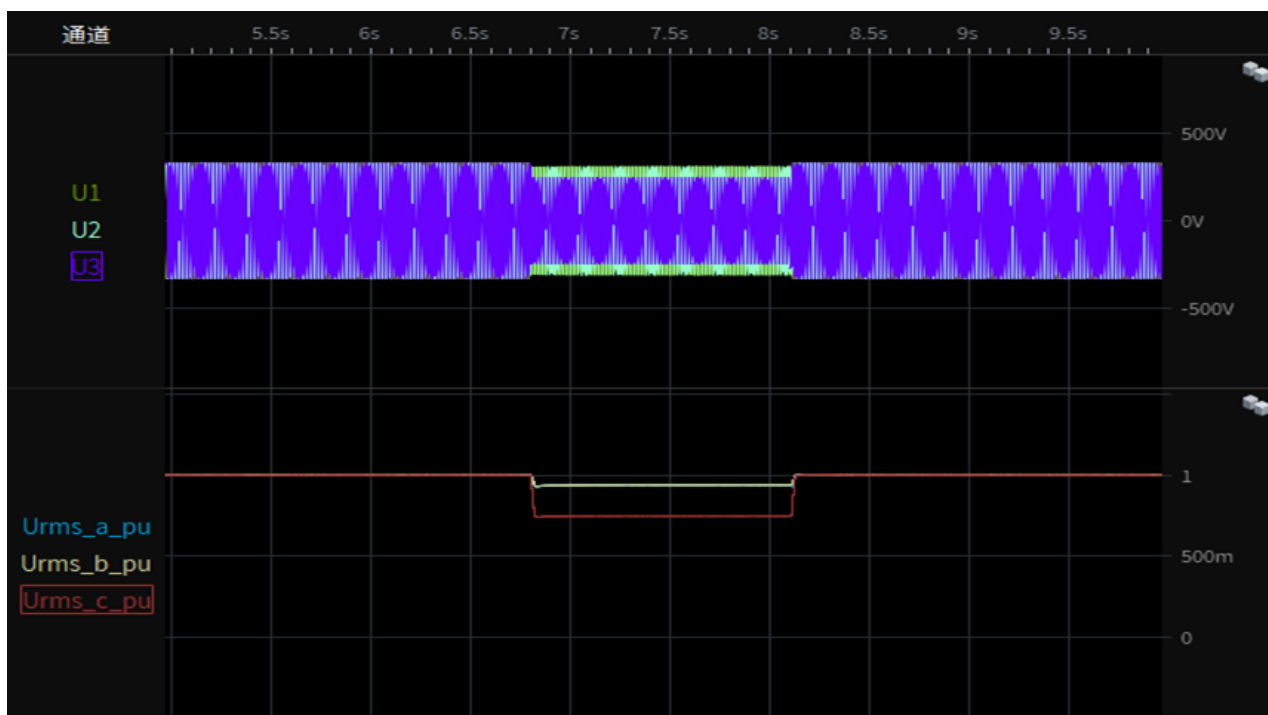
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 4a-1-1.1 Depth of fault phase: 0.75p.u., two-phase-asymmetrical (type D), 20% load
 Test overview(voltage,current,active and reactive power)



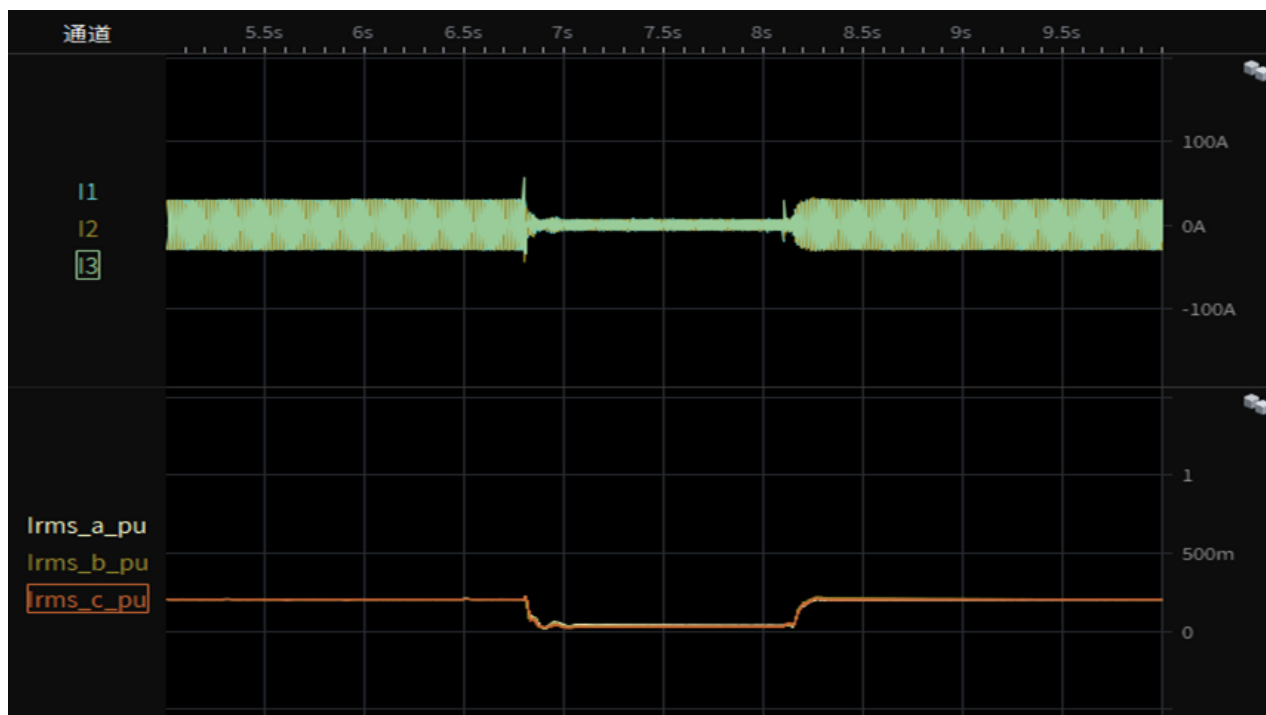
Test 4a-1-1.2 Depth of fault phase: 0.75p.u., two-phase-asymmetrical (type D), 20% load
 Instantaneous curve and RMS value of phase-to-neutral voltages



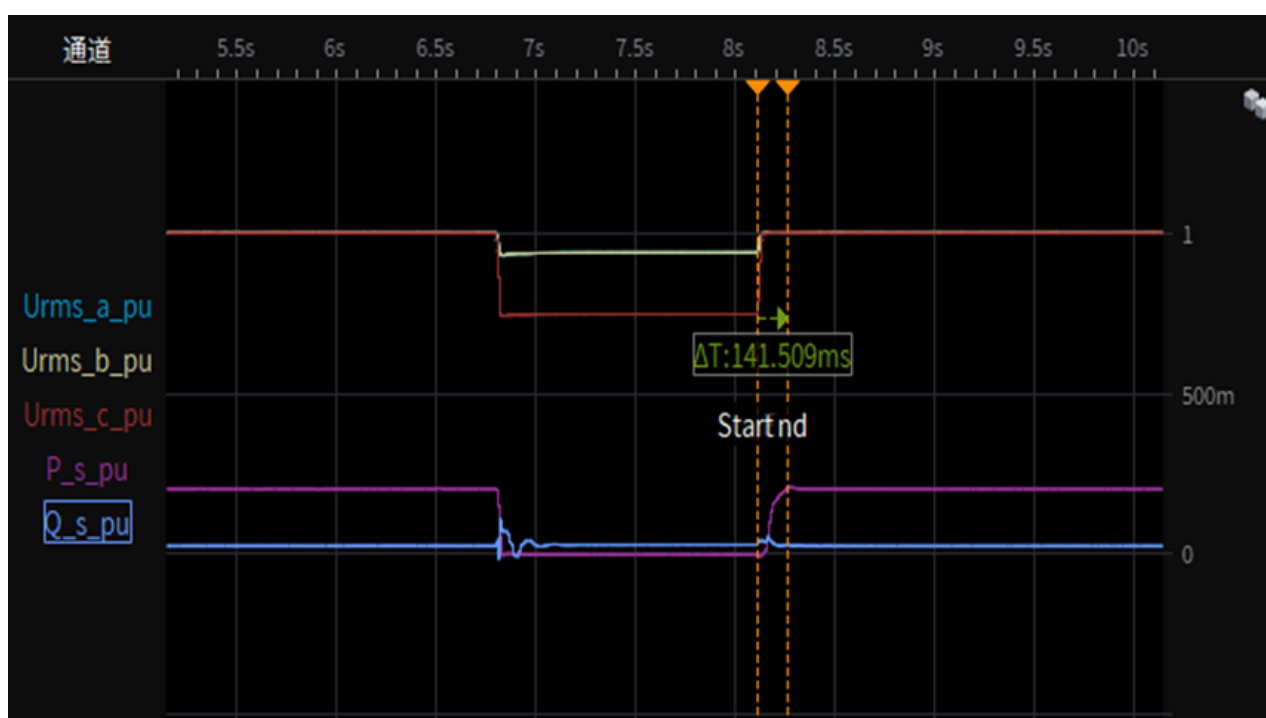
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 4a-1-1.3 Depth of fault phase: 0.75p.u., two-phase-asymmetrical (type D), 20% load
Instantaneous curve and RMS value of phase currents



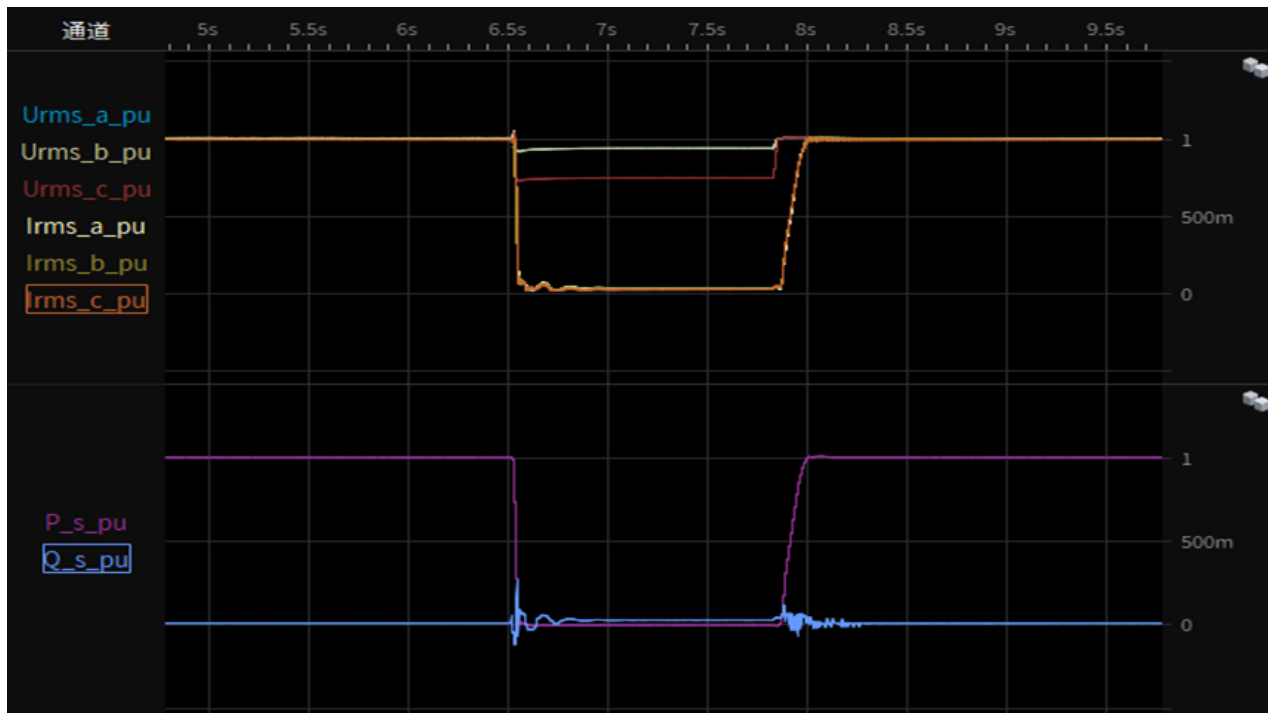
Test 4a-1-1.4 Depth of fault phase: 0.75p.u., two-phase-asymmetrical (type D),
20% load restoring time



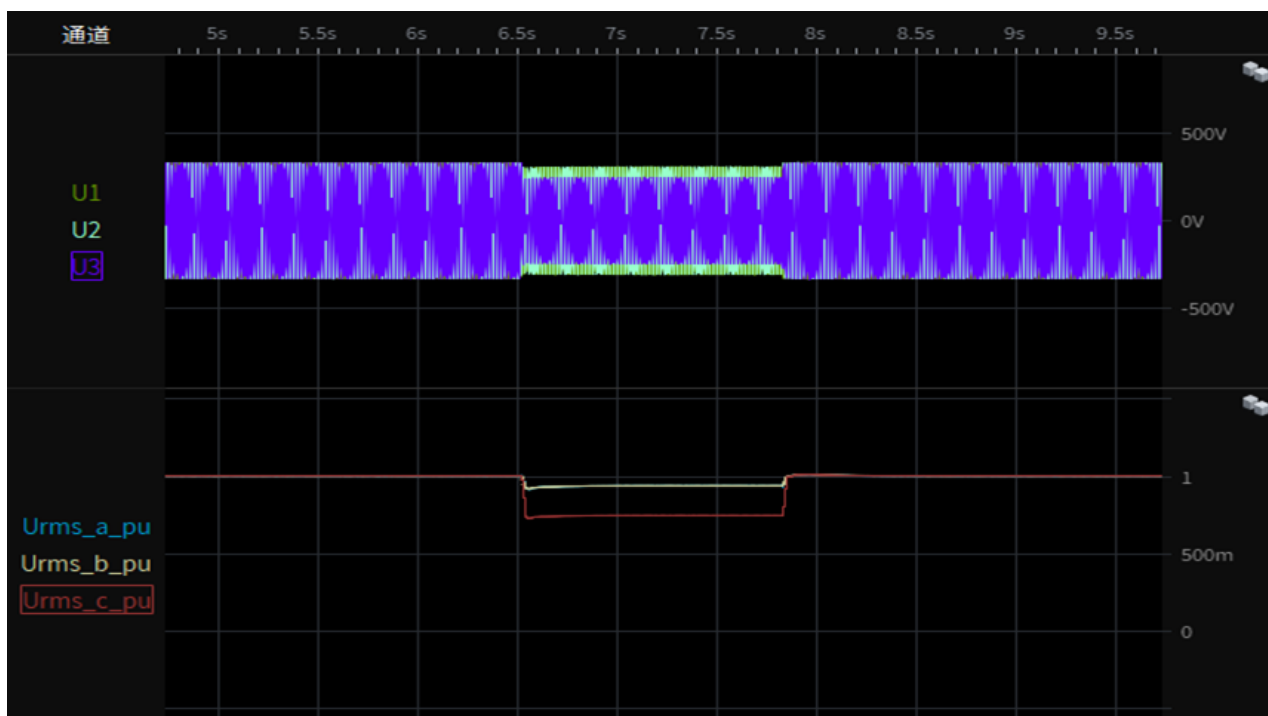
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 4a-2-1.1 Depth of fault phase: 0.75p.u., two-phase-asymmetrical (type D), 95% load
Test overview(voltage,current,active and reactive power)



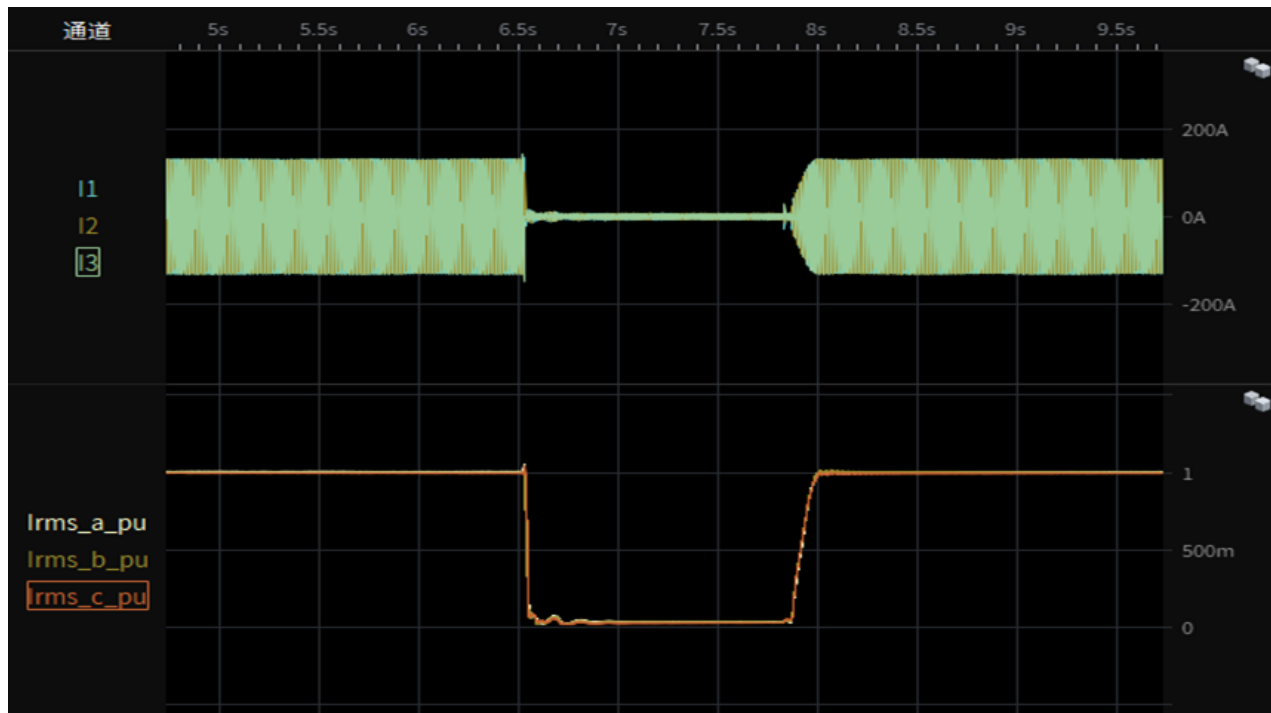
Test 4a-2-1.2 Depth of fault phase: 0.75p.u., two-phase-asymmetrical (type D), 95% load
Instantaneous curve and RMS value of phase-to-neutral voltages



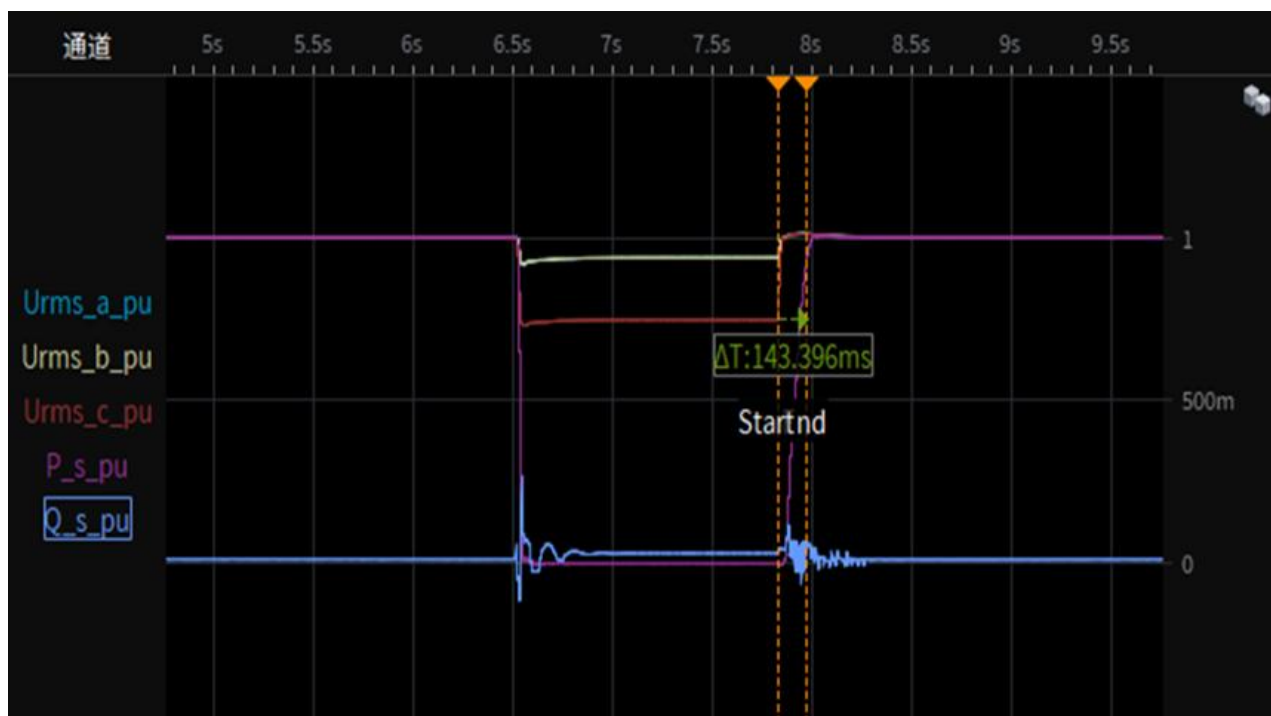
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 4a-2-1.3 Depth of fault phase: 0.75p.u., two-phase-asymmetrical (type D), 95% load
Instantaneous curve and RMS value of phase currents



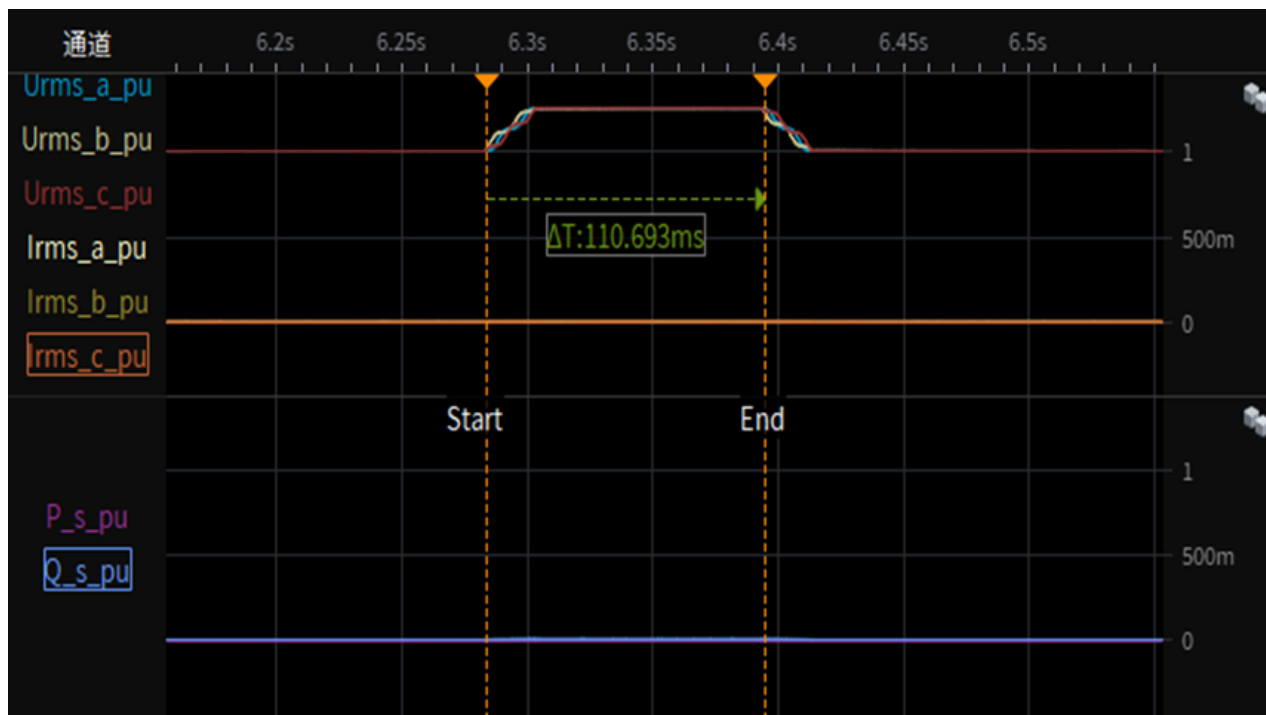
Test 4a-2-1.4 Depth of fault phase: 0.75p.u., two-phase-asymmetrical (type D),
95% load restoring time



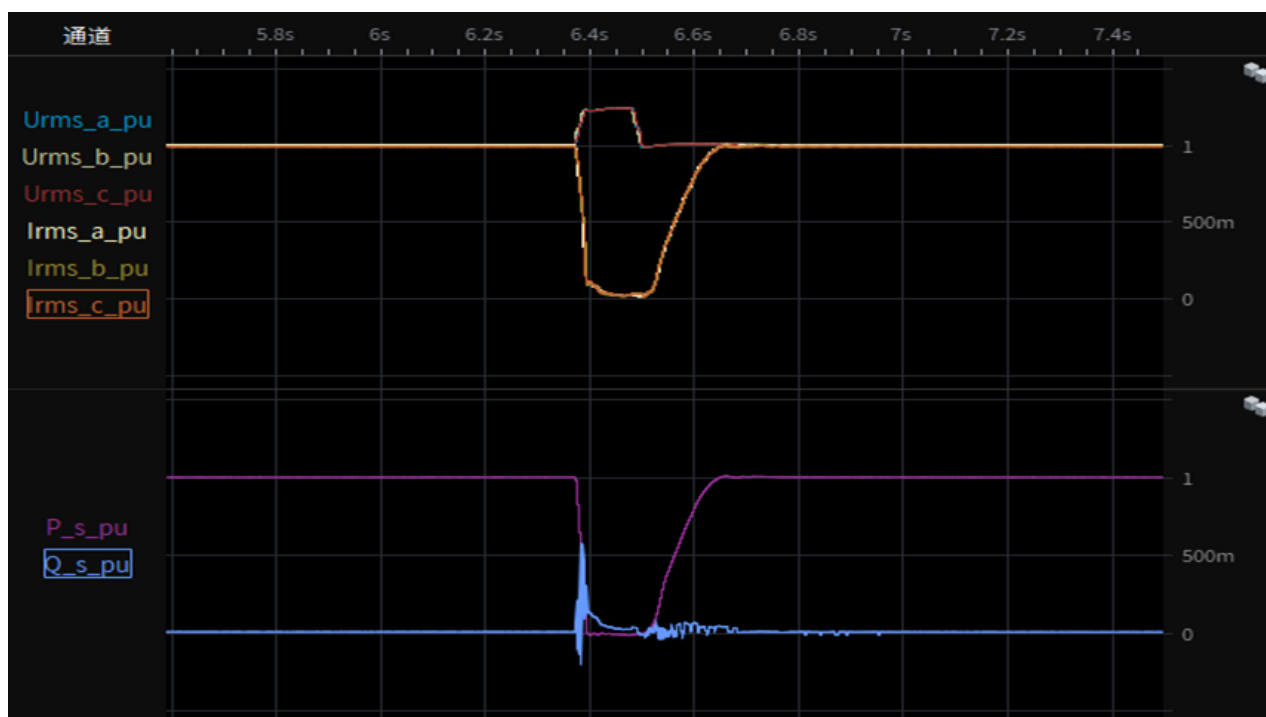
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 5s-1.1 Depth of fault phase: 1.25p.u., HV three-phase symmetrical (type A), 0% load
Test overview(voltage,current,active and reactive power)



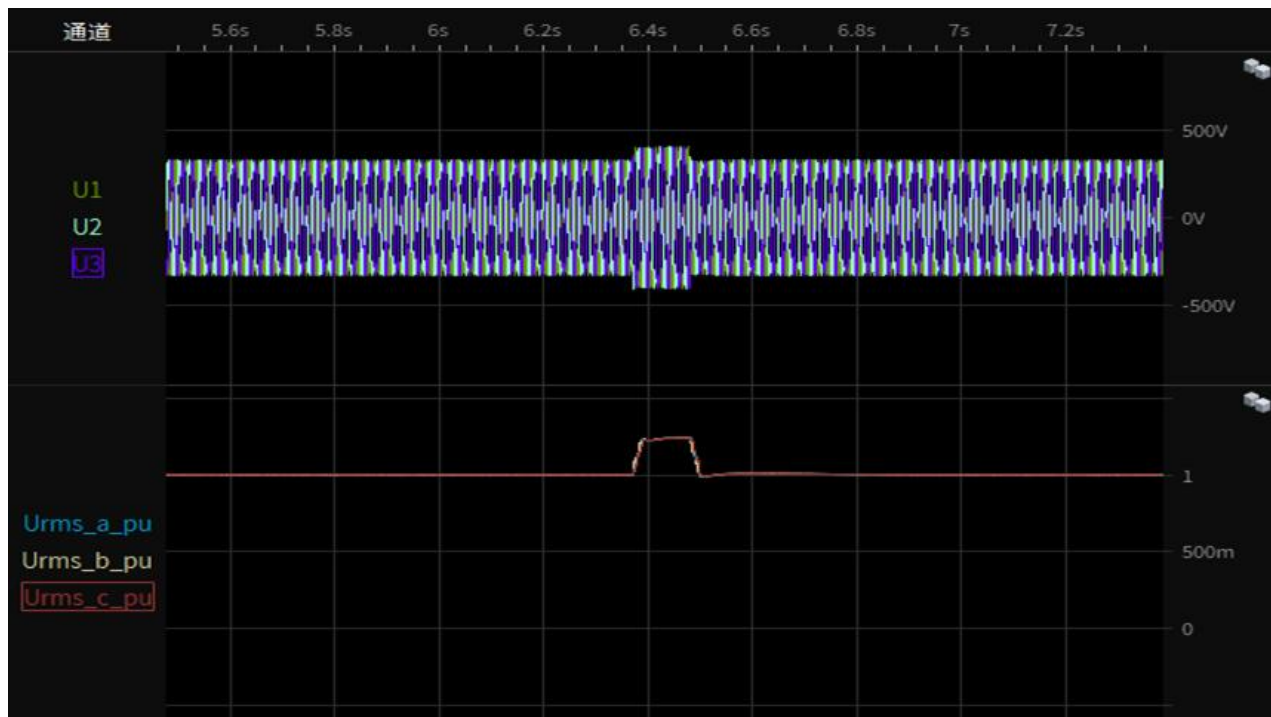
Test 5s-1-1.1 Depth of fault phase: 1.25p.u., HV three-phase symmetrical (type A), 95% load
Test overview(voltage,current,active and reactive power)



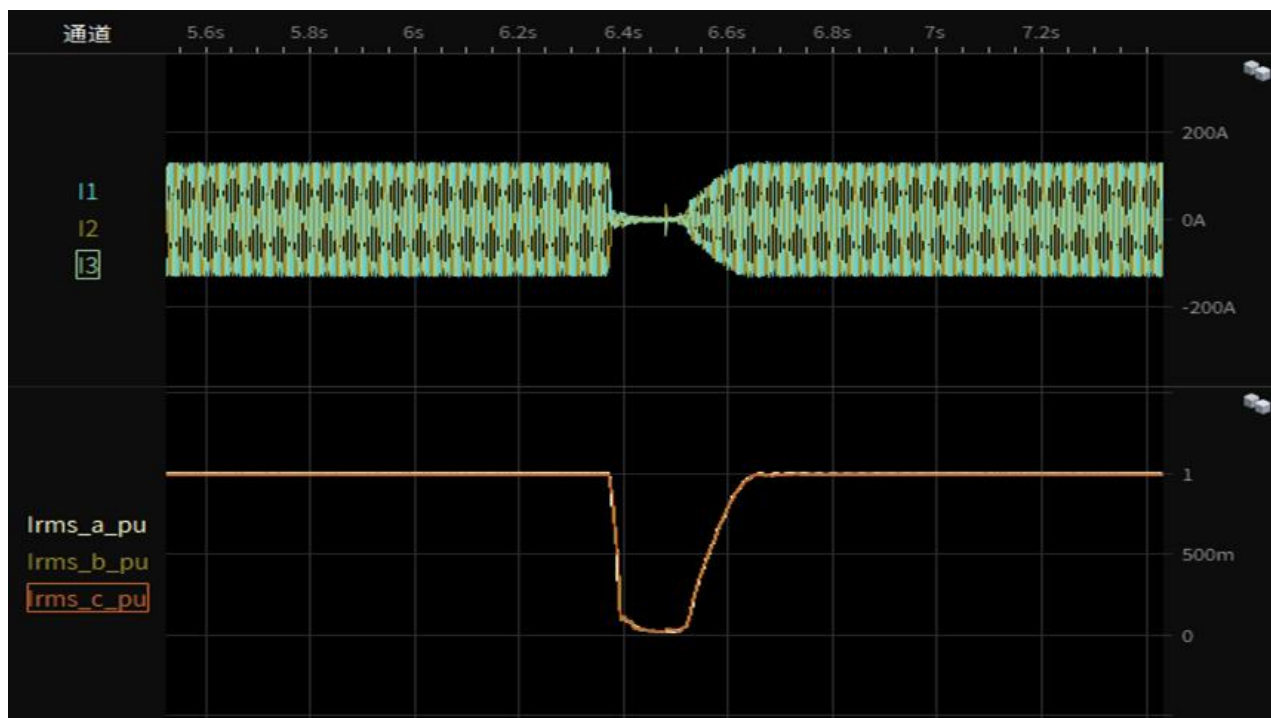
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 5s-1-1.2 Depth of fault phase: 1.25p.u., HV three-phase symmetrical (type A), 95% load
Instantaneous curve and RMS value of phase-to-neutral voltages



Test 5s-1-1.3 Depth of fault phase: 1.25p.u., HV three-phase symmetrical (type A), 95% load
Instantaneous curve and RMS value of phase currents



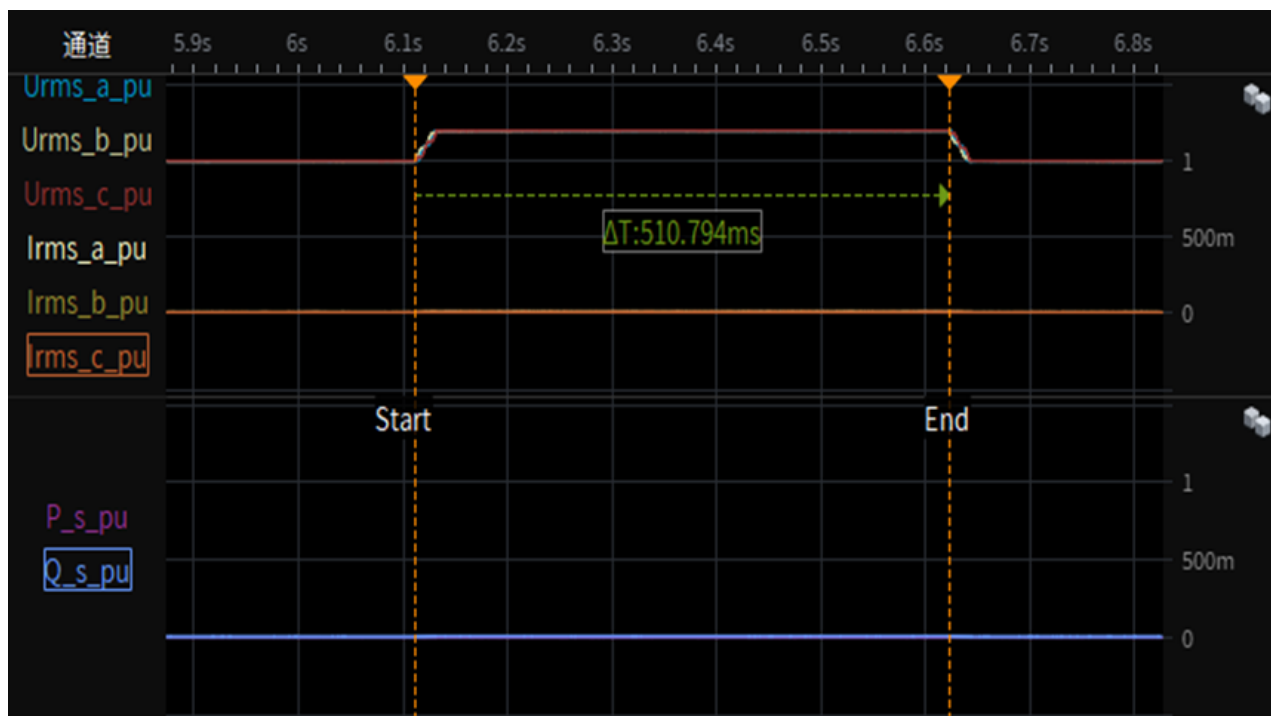
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 5s-1-1.4 Depth of fault phase: 1.25p.u., HV three-phase symmetrical (type A), 95% load restoring time



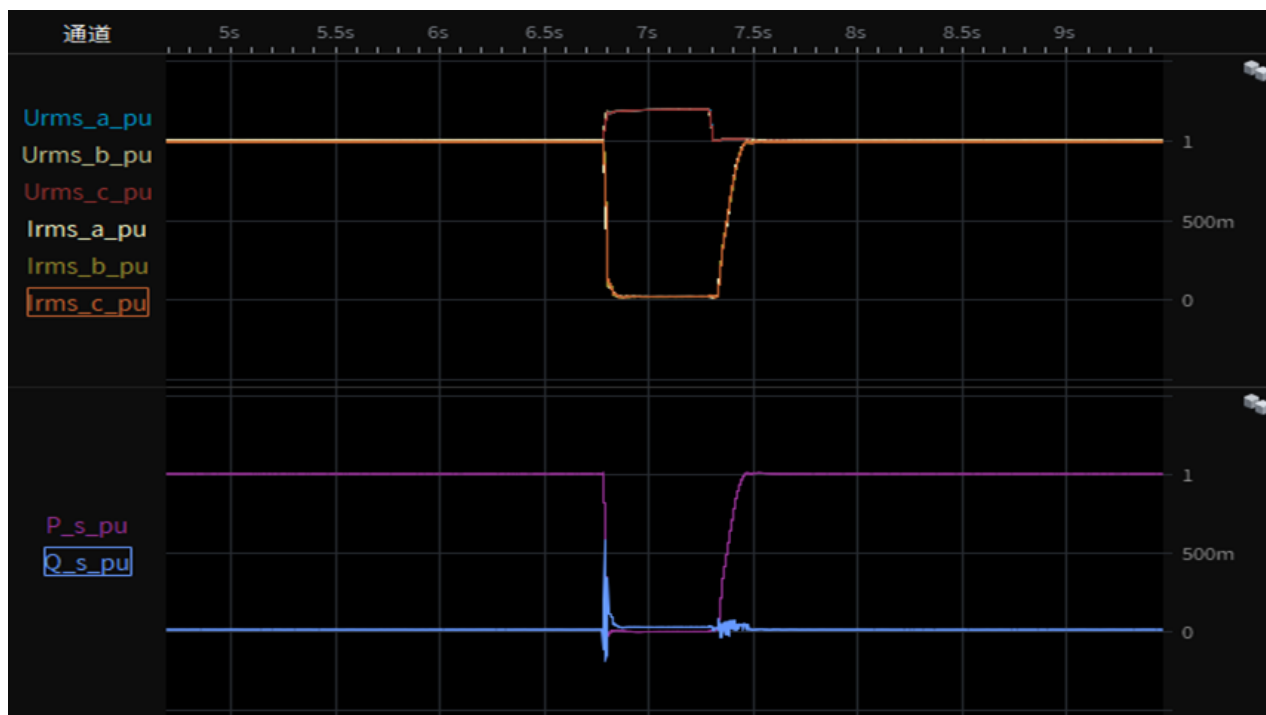
Test 6s-1.1 Depth of fault phase: 1.20p.u., HV three-phase symmetrical (type A), 0% load
Test overview(voltage,current,active and reactive power)



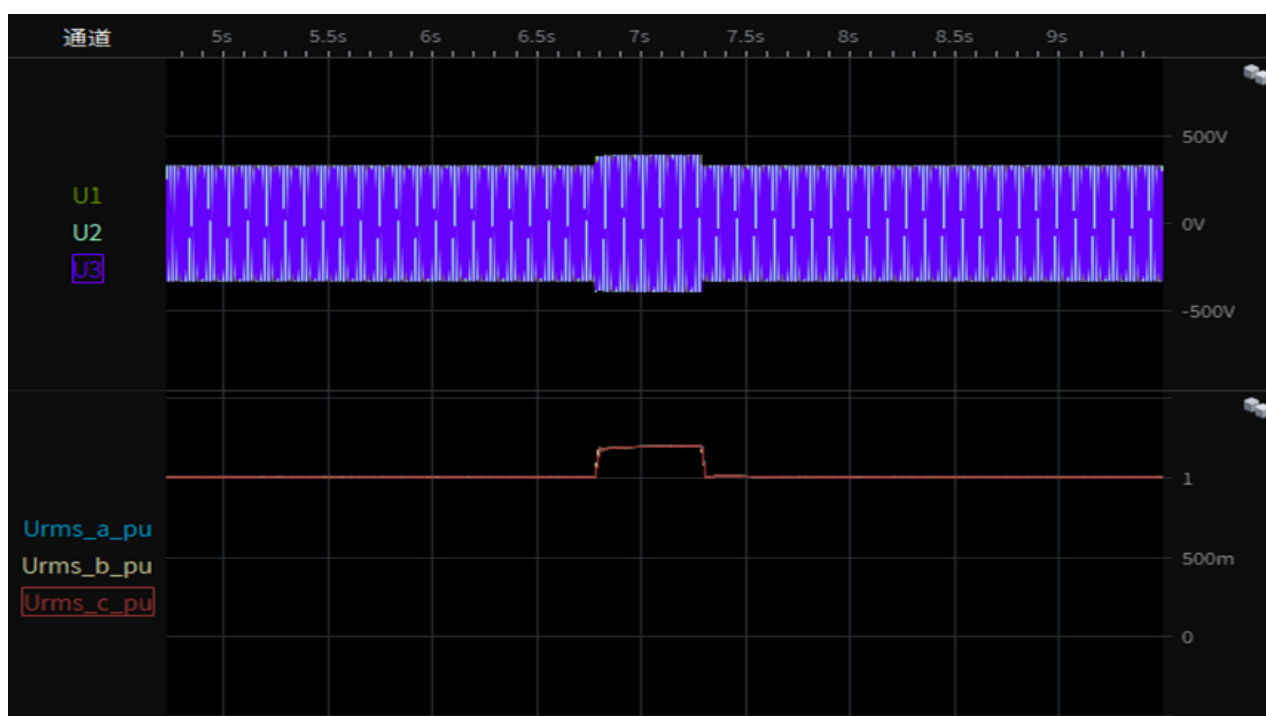
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 6s-1-1.1 Depth of fault phase: 1.20p.u., HV three-phase symmetrical (type A), 95% load
Test overview(voltage,current,active and reactive power)



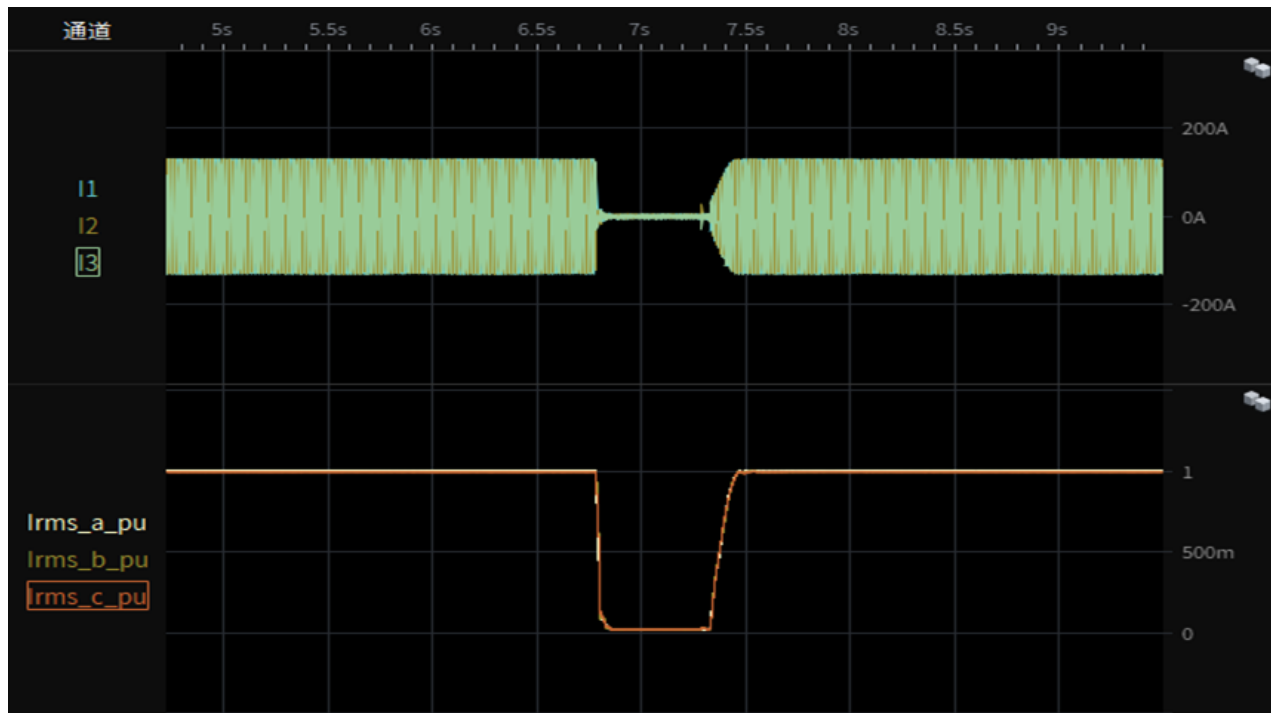
Test 6s-1-1.2 Depth of fault phase: 1.20p.u., HV three-phase symmetrical (type A), 95% load
Instantaneous curve and RMS value of phase-to-neutral voltages



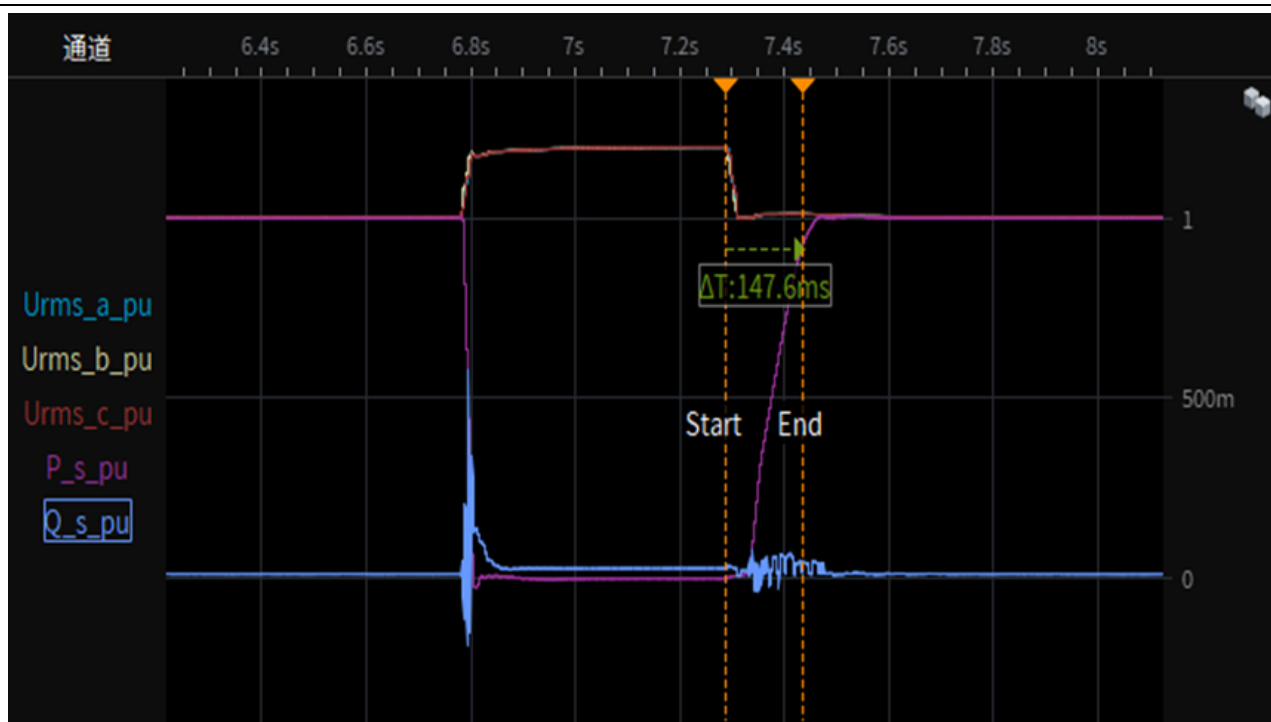
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 6s-1-1.3 Depth of fault phase: 1.20p.u., HV three-phase symmetrical (type A), 95% load
Instantaneous curve and RMS value of phase currents



Test 6s-1-1.4 Depth of fault phase: 1.20p.u., HV three-phase symmetrical (type A),
95% load restoring time



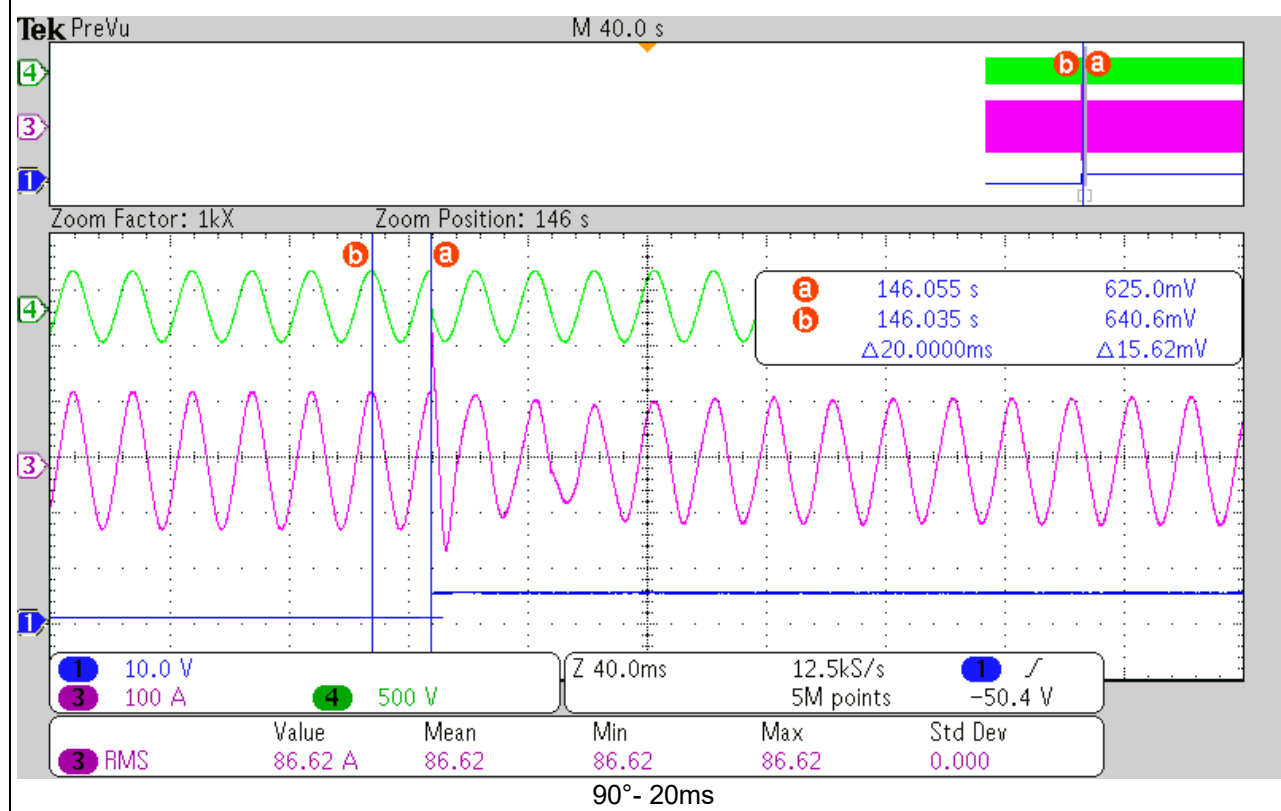
CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

N.9	Tabella: Verifica della insensibilità alle richiuse automatiche in discordanza di fase Table: Verification of insensitivity to mismatch in phase automatic reclosing		P
	Test condition	Test result	
P/P _n	Phase shift angle [°]		
100%*	90	The PV inverter continue to feed power to grid after phase angle shift has been performed. No damage, no hazard.	The EUT must not be damaged following the tests. Switching off and tripping of any protections are allowed.
100%*	180	The inverter is protected off the grid after performing the phase angle conversion and then reconnected to the grid to continue supplying power to the grid. No damage, no danger.	

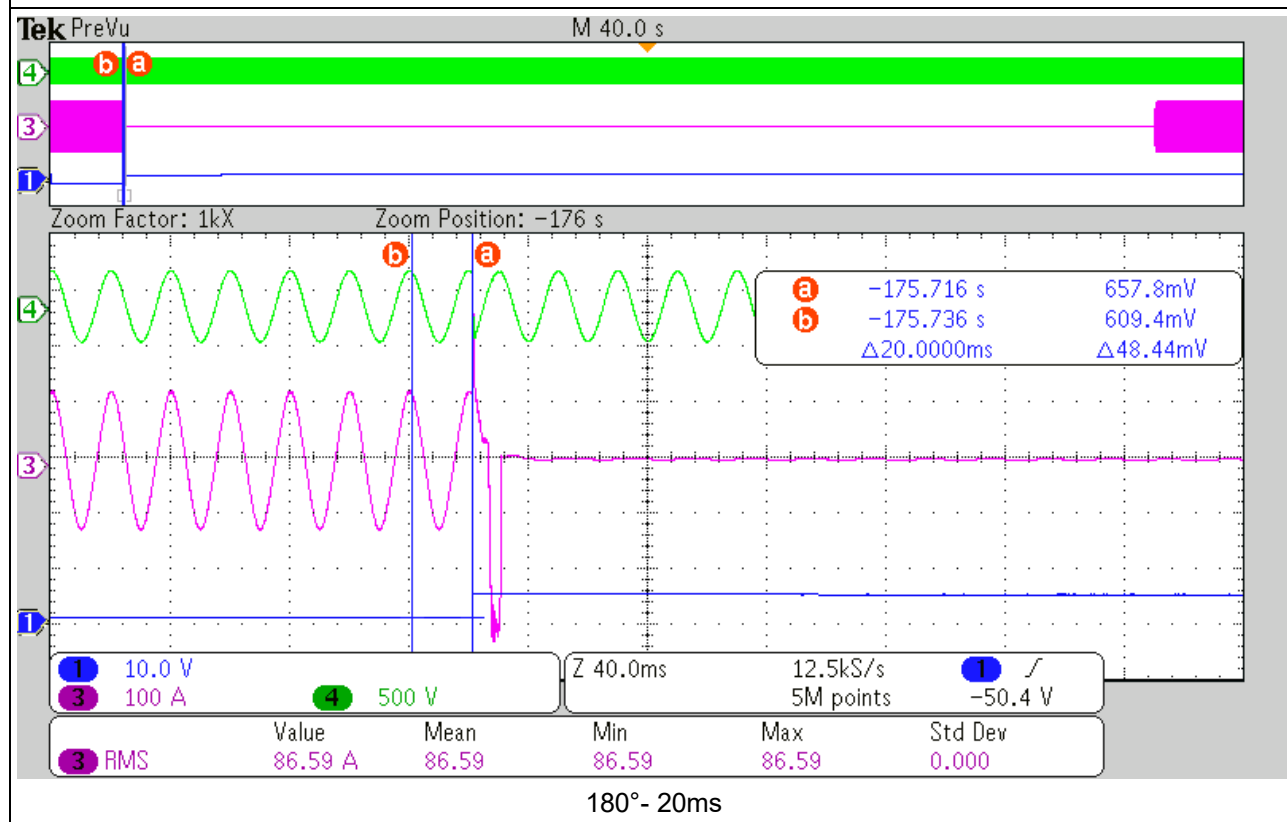
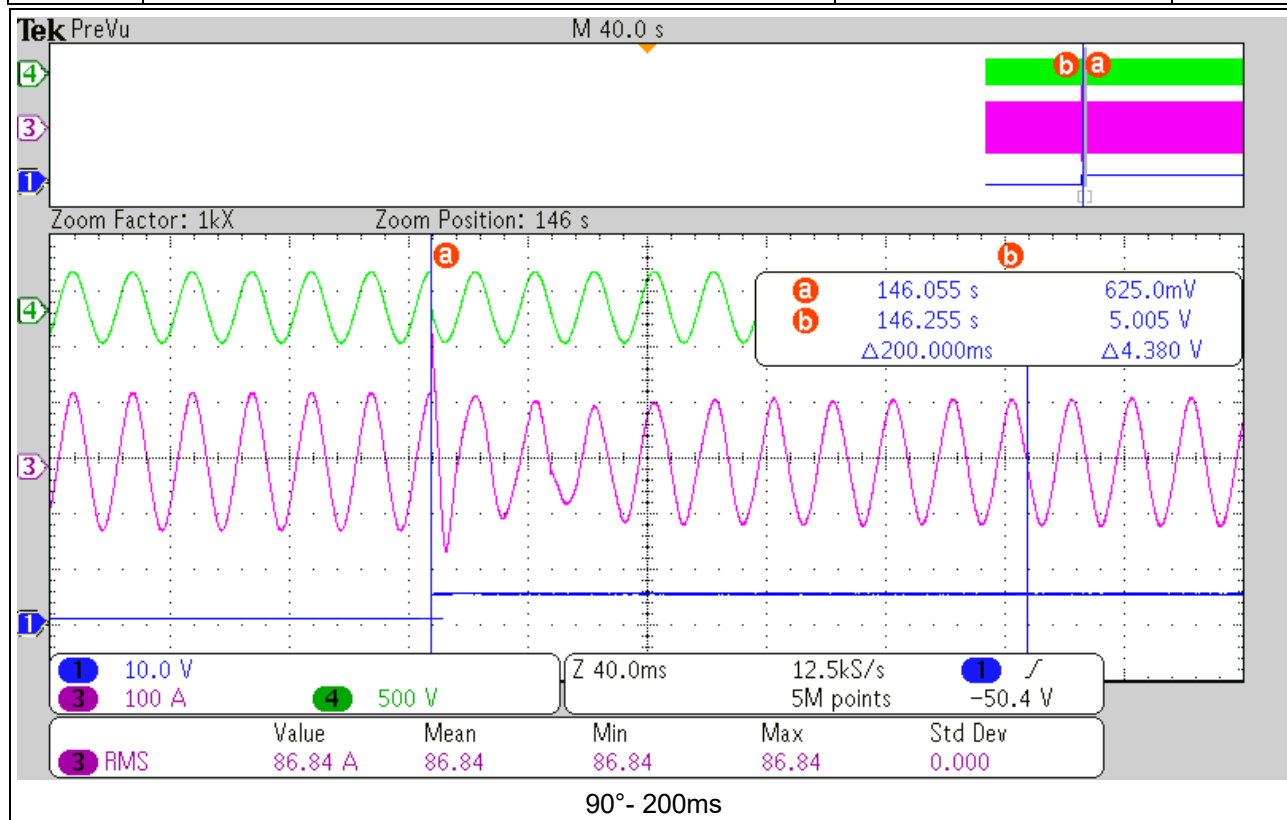
Note(s):

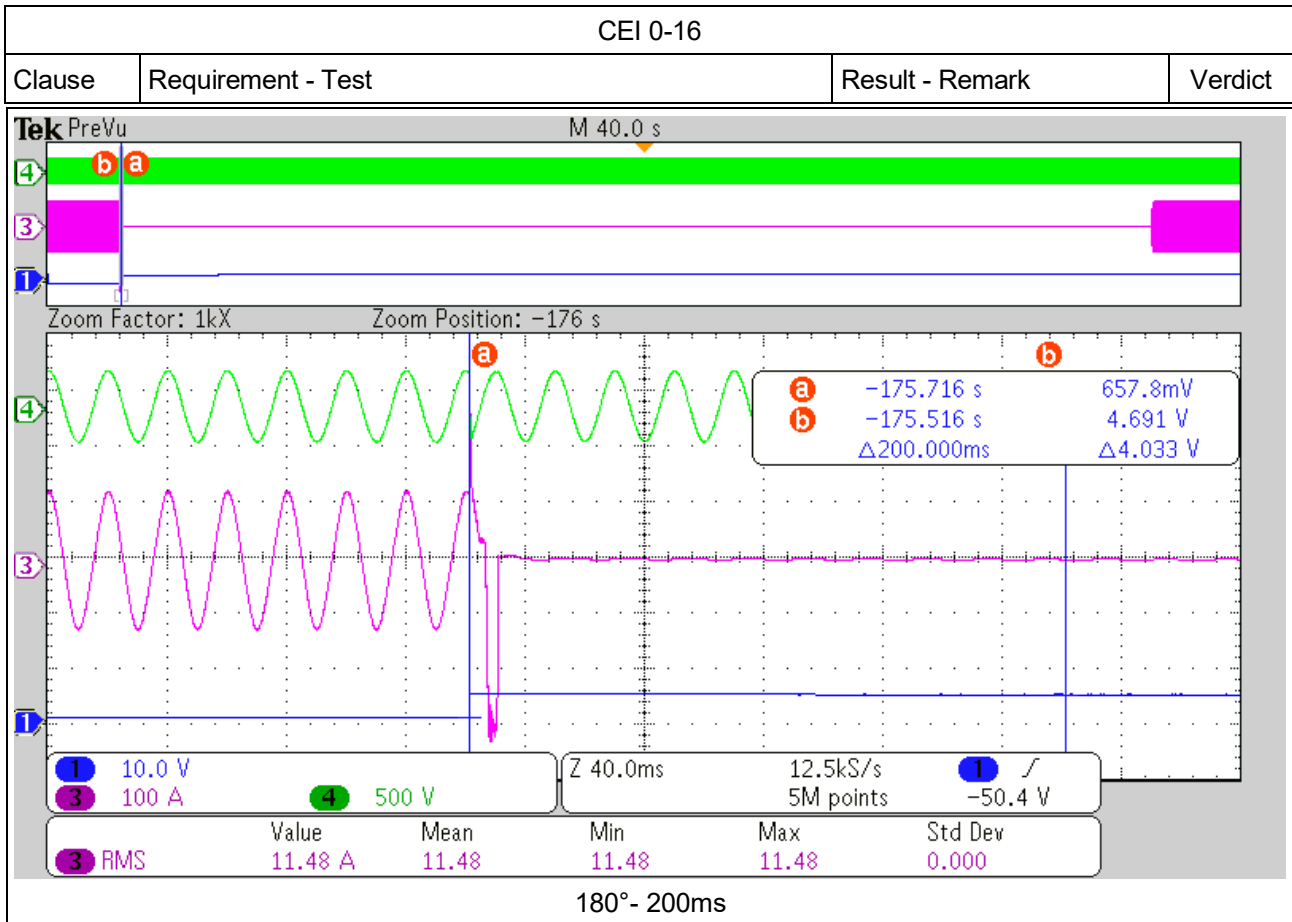
*If simulators of suitable size are not available, the use of this method is allowed by carrying out tests with a generator operating at reduced power, provided that the simulator is of at least 30kW size.

Diagram



CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict





CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict
Nbis.3.1	Tabella: Misura di correnti armoniche Table: Measurement for harmonics current according to IEC 61400-21, Clause 7.4		P
Reference standard: Each phase output current > 75A, The harmonic currents are measured per EN 61000-4-7.			
Note: The current harmonics, inter-harmonics and high-frequency harmonics have been measured and calculated for each power bin of 0% (1%-5%), 20%, 40%, ... 100% P _{NINV} .			

Harmonics and inter-harmonics-L1						AF60K-TH + ATOM HS-40.96						
Parameter	P=Discharge power						P=Charge power					
Active power P/P _{NINV} [%]	0	20	40	60	80	100	20	40	60	80	100	
Harmonic number	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	
1	1.118	18.293	36.589	54.797	73.044	91.206	18.422	36.721	55.011	73.409	91.736	
2	0.094	0.324	0.566	0.837	1.099	1.367	0.279	0.707	1.289	1.764	2.276	
3	0.521	0.714	0.841	0.864	0.910	0.978	0.241	0.087	0.249	0.490	0.607	
4	0.017	0.107	0.107	0.086	0.092	0.117	0.038	0.036	0.175	0.262	0.418	
5	0.694	0.697	0.283	0.249	0.304	0.392	1.074	1.374	1.508	1.556	1.688	
6	0.048	0.057	0.084	0.066	0.066	0.078	0.176	0.211	0.075	0.082	0.123	
7	0.490	0.528	0.240	0.147	0.115	0.094	0.610	0.786	0.915	0.979	0.986	
8	0.023	0.021	0.058	0.033	0.036	0.048	0.030	0.058	0.036	0.041	0.037	
9	0.104	0.134	0.041	0.016	0.062	0.125	0.139	0.117	0.228	0.240	0.196	
10	0.013	0.014	0.055	0.034	0.020	0.027	0.020	0.044	0.031	0.031	0.023	
11	0.214	0.187	0.149	0.077	0.074	0.087	0.303	0.356	0.474	0.483	0.479	
12	0.012	0.011	0.034	0.026	0.028	0.022	0.033	0.053	0.087	0.084	0.047	
13	0.153	0.075	0.125	0.049	0.017	0.052	0.255	0.219	0.334	0.359	0.359	
14	0.022	0.029	0.049	0.050	0.056	0.064	0.015	0.033	0.023	0.038	0.040	
15	0.034	0.036	0.022	0.020	0.045	0.070	0.031	0.039	0.072	0.081	0.061	
16	0.026	0.033	0.038	0.031	0.037	0.051	0.006	0.020	0.017	0.020	0.020	
17	0.078	0.087	0.077	0.037	0.025	0.042	0.161	0.143	0.198	0.225	0.233	
18	0.023	0.023	0.021	0.025	0.028	0.022	0.026	0.051	0.051	0.055	0.047	
19	0.063	0.095	0.070	0.066	0.060	0.046	0.111	0.126	0.162	0.185	0.183	
20	0.024	0.032	0.030	0.034	0.033	0.033	0.027	0.009	0.010	0.019	0.028	
21	0.007	0.017	0.018	0.016	0.032	0.044	0.006	0.013	0.018	0.014	0.019	
22	0.030	0.027	0.037	0.033	0.030	0.024	0.022	0.007	0.030	0.021	0.008	
23	0.041	0.046	0.044	0.065	0.073	0.068	0.049	0.096	0.099	0.128	0.127	
24	0.023	0.010	0.010	0.024	0.035	0.035	0.038	0.034	0.042	0.034	0.034	
25	0.033	0.038	0.059	0.068	0.067	0.072	0.032	0.099	0.094	0.099	0.097	
26	0.017	0.017	0.021	0.045	0.045	0.039	0.009	0.010	0.015	0.015	0.028	
27	0.012	0.022	0.042	0.012	0.032	0.046	0.025	0.007	0.029	0.027	0.011	
28	0.024	0.011	0.030	0.036	0.038	0.037	0.020	0.016	0.029	0.012	0.013	
29	0.023	0.038	0.033	0.031	0.054	0.076	0.030	0.072	0.063	0.078	0.078	
30	0.016	0.012	0.019	0.043	0.026	0.015	0.027	0.011	0.063	0.055	0.030	
31	0.018	0.042	0.035	0.061	0.099	0.082	0.030	0.052	0.059	0.092	0.082	
32	0.012	0.014	0.013	0.024	0.066	0.065	0.021	0.015	0.022	0.017	0.034	
33	0.014	0.033	0.034	0.063	0.040	0.026	0.023	0.039	0.039	0.040	0.019	
34	0.012	0.017	0.013	0.049	0.067	0.047	0.024	0.012	0.019	0.033	0.044	

CEI 0-16												
Clause	Requirement - Test						Result - Remark					Verdict
35	0.010	0.019	0.024	0.053	0.086	0.080	0.016	0.037	0.052	0.071	0.084	
36	0.008	0.013	0.009	0.029	0.056	0.087	0.022	0.015	0.021	0.021	0.118	
37	0.010	0.009	0.022	0.038	0.069	0.096	0.016	0.025	0.028	0.035	0.033	
38	0.007	0.011	0.015	0.026	0.024	0.018	0.011	0.011	0.018	0.016	0.062	
39	0.013	0.006	0.015	0.029	0.051	0.076	0.005	0.018	0.024	0.018	0.080	
40	0.006	0.008	0.008	0.021	0.029	0.044	0.011	0.007	0.018	0.018	0.059	
41	0.007	0.011	0.024	0.037	0.051	0.062	0.016	0.014	0.019	0.027	0.077	
42	0.007	0.009	0.013	0.023	0.025	0.015	0.013	0.014	0.024	0.023	0.012	
43	0.013	0.010	0.015	0.021	0.035	0.042	0.015	0.011	0.015	0.018	0.011	
44	0.011	0.017	0.018	0.020	0.029	0.018	0.010	0.005	0.012	0.010	0.010	
45	0.013	0.017	0.010	0.012	0.019	0.022	0.005	0.015	0.022	0.023	0.024	
46	0.010	0.008	0.008	0.022	0.027	0.020	0.010	0.006	0.012	0.012	0.008	
47	0.011	0.009	0.019	0.025	0.037	0.034	0.018	0.011	0.014	0.016	0.014	
48	0.010	0.012	0.014	0.017	0.020	0.012	0.015	0.008	0.013	0.012	0.008	
49	0.014	0.007	0.013	0.023	0.036	0.047	0.021	0.013	0.015	0.016	0.013	
50	0.013	0.013	0.016	0.020	0.032	0.018	0.013	0.009	0.010	0.008	0.017	

Note(s):
1. The limit of harmonic current shall be determined case by case per EN 61000-3-2 or EN 61000-3-12.
2. The worst value of three phases shall be determined.

Intern-harmonics-L1												
Parameter	P=Discharge power						P=Charge power					
	0	20	40	60	80	100	20	40	60	80	100	
Active power P/P _{NINV} [%]												
Frequency [Hz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	
75	0.015	0.041	0.053	0.051	0.109	0.131	0.028	0.033	0.120	0.062	0.106	
125	0.012	0.024	0.033	0.038	0.061	0.073	0.014	0.017	0.041	0.037	0.051	
175	0.009	0.013	0.015	0.014	0.025	0.030	0.011	0.012	0.024	0.025	0.037	
225	0.009	0.011	0.012	0.012	0.021	0.029	0.011	0.011	0.022	0.026	0.051	
275	0.008	0.011	0.011	0.011	0.019	0.023	0.010	0.011	0.020	0.019	0.029	
325	0.009	0.011	0.012	0.012	0.018	0.022	0.011	0.012	0.019	0.017	0.023	
375	0.008	0.011	0.010	0.010	0.016	0.020	0.010	0.010	0.017	0.015	0.020	
425	0.007	0.009	0.010	0.010	0.015	0.018	0.008	0.008	0.013	0.012	0.016	
475	0.007	0.009	0.009	0.009	0.014	0.016	0.008	0.009	0.013	0.012	0.015	
525	0.008	0.010	0.010	0.010	0.014	0.017	0.010	0.009	0.013	0.012	0.016	
575	0.007	0.009	0.009	0.009	0.012	0.015	0.008	0.008	0.015	0.012	0.014	
625	0.007	0.008	0.009	0.008	0.012	0.013	0.008	0.008	0.011	0.010	0.013	
675	0.007	0.008	0.009	0.008	0.011	0.013	0.008	0.008	0.012	0.010	0.013	
725	0.007	0.008	0.008	0.008	0.011	0.013	0.007	0.008	0.010	0.009	0.012	
775	0.007	0.008	0.008	0.008	0.010	0.012	0.007	0.007	0.009	0.009	0.011	
825	0.007	0.008	0.008	0.008	0.010	0.012	0.008	0.007	0.010	0.009	0.012	
875	0.007	0.008	0.008	0.008	0.010	0.011	0.007	0.007	0.011	0.009	0.011	
925	0.007	0.008	0.008	0.008	0.011	0.011	0.007	0.007	0.010	0.009	0.011	
975	0.007	0.008	0.008	0.008	0.010	0.011	0.007	0.007	0.010	0.009	0.011	
1025	0.007	0.007	0.008	0.008	0.010	0.011	0.007	0.007	0.008	0.009	0.010	
1075	0.007	0.008	0.008	0.008	0.010	0.011	0.007	0.007	0.008	0.009	0.010	
1125	0.007	0.007	0.008	0.008	0.010	0.011	0.007	0.007	0.009	0.009	0.010	
1175	0.007	0.008	0.008	0.008	0.010	0.011	0.007	0.007	0.009	0.009	0.010	
1225	0.007	0.007	0.008	0.008	0.010	0.011	0.007	0.008	0.009	0.009	0.010	
1275	0.007	0.008	0.008	0.008	0.010	0.011	0.007	0.008	0.009	0.009	0.011	

CEI 0-16												
Clause	Requirement - Test						Result - Remark					Verdict
1325	0.007	0.008	0.008	0.008	0.010	0.011	0.007	0.007	0.009	0.009	0.010	
1375	0.007	0.008	0.008	0.008	0.010	0.011	0.007	0.008	0.009	0.009	0.010	
1425	0.006	0.008	0.008	0.008	0.010	0.011	0.007	0.008	0.009	0.009	0.011	
1475	0.006	0.008	0.008	0.008	0.010	0.011	0.007	0.008	0.010	0.010	0.010	
1525	0.007	0.008	0.008	0.009	0.010	0.012	0.007	0.008	0.009	0.010	0.011	
1575	0.007	0.008	0.008	0.008	0.011	0.012	0.007	0.007	0.009	0.010	0.011	
1625	0.007	0.007	0.008	0.009	0.011	0.012	0.007	0.007	0.009	0.011	0.011	
1675	0.007	0.007	0.008	0.009	0.011	0.013	0.006	0.007	0.008	0.011	0.011	
1725	0.006	0.007	0.007	0.008	0.010	0.014	0.006	0.007	0.008	0.010	0.015	
1775	0.006	0.007	0.007	0.008	0.011	0.014	0.006	0.007	0.008	0.010	0.022	
1825	0.007	0.007	0.007	0.008	0.010	0.013	0.006	0.007	0.008	0.010	0.013	
1875	0.007	0.007	0.007	0.008	0.010	0.013	0.006	0.007	0.008	0.011	0.015	
1925	0.007	0.007	0.007	0.007	0.009	0.012	0.006	0.007	0.008	0.009	0.016	
1975	0.007	0.007	0.007	0.008	0.009	0.012	0.006	0.007	0.008	0.008	0.023	
Note(s): The worst value of three phases shall be determined.												

Higher frequencies-L1

Parameter	P=Discharge power						P=Charge power				
	0	20	40	60	80	100	20	40	60	80	100
Active power P/P _{NINV} [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
Frequency [kHz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
2.1	0.024	0.029	0.039	0.055	0.076	0.082	0.031	0.027	0.040	0.045	0.083
2.3	0.027	0.029	0.031	0.043	0.057	0.052	0.030	0.026	0.035	0.038	0.036
2.5	0.030	0.028	0.029	0.042	0.059	0.062	0.032	0.028	0.030	0.037	0.040
2.7	0.030	0.024	0.033	0.044	0.062	0.062	0.033	0.034	0.031	0.031	0.033
2.9	0.029	0.027	0.028	0.034	0.044	0.047	0.029	0.032	0.029	0.028	0.036
3.1	0.030	0.031	0.026	0.033	0.047	0.050	0.027	0.031	0.030	0.031	0.041
3.3	0.027	0.023	0.025	0.030	0.043	0.047	0.034	0.031	0.030	0.030	0.041
3.5	0.027	0.026	0.026	0.032	0.034	0.036	0.033	0.029	0.034	0.031	0.045
3.7	0.103	0.104	0.106	0.108	0.112	0.114	0.102	0.105	0.104	0.106	0.110
3.9	0.089	0.090	0.090	0.094	0.099	0.102	0.093	0.093	0.095	0.096	0.100
4.1	0.029	0.030	0.032	0.031	0.033	0.038	0.033	0.036	0.039	0.036	0.042
4.3	0.031	0.038	0.040	0.039	0.040	0.041	0.033	0.037	0.043	0.039	0.039
4.5	0.030	0.034	0.036	0.040	0.045	0.050	0.038	0.043	0.039	0.040	0.050
4.7	0.036	0.043	0.052	0.051	0.057	0.055	0.045	0.049	0.051	0.056	0.057
4.9	0.032	0.037	0.062	0.080	0.087	0.079	0.042	0.060	0.062	0.066	0.066
5.1	0.034	0.040	0.064	0.079	0.081	0.087	0.038	0.057	0.070	0.084	0.089
5.3	0.030	0.036	0.045	0.054	0.067	0.083	0.033	0.047	0.054	0.067	0.084
5.5	0.028	0.034	0.037	0.041	0.047	0.058	0.030	0.041	0.044	0.050	0.061
5.7	0.026	0.025	0.031	0.034	0.037	0.041	0.026	0.031	0.035	0.041	0.046
5.9	0.022	0.025	0.028	0.029	0.033	0.036	0.023	0.027	0.030	0.034	0.039
6.1	0.022	0.024	0.026	0.028	0.031	0.031	0.022	0.025	0.026	0.028	0.031
6.3	0.023	0.023	0.025	0.027	0.028	0.029	0.023	0.023	0.025	0.026	0.028
6.5	0.021	0.022	0.025	0.025	0.026	0.027	0.023	0.024	0.024	0.025	0.027
6.7	0.021	0.023	0.023	0.023	0.025	0.026	0.021	0.023	0.024	0.025	0.026
6.9	0.021	0.021	0.022	0.022	0.024	0.025	0.020	0.022	0.023	0.024	0.026
7.1	0.020	0.019	0.021	0.022	0.024	0.025	0.019	0.021	0.023	0.024	0.026
7.3	0.019	0.019	0.021	0.022	0.024	0.024	0.019	0.020	0.021	0.023	0.025

CEI 0-16												
Clause	Requirement - Test						Result - Remark					Verdict
7.5	0.019	0.019	0.020	0.021	0.023	0.024	0.018	0.020	0.021	0.023	0.024	
7.7	0.018	0.019	0.020	0.021	0.022	0.023	0.018	0.019	0.021	0.022	0.024	
7.9	0.018	0.019	0.020	0.020	0.022	0.023	0.018	0.019	0.020	0.022	0.023	
8.1	0.018	0.019	0.019	0.020	0.022	0.023	0.018	0.019	0.019	0.021	0.023	
8.3	0.018	0.019	0.019	0.020	0.021	0.023	0.018	0.019	0.019	0.021	0.022	
8.5	0.019	0.019	0.019	0.020	0.022	0.023	0.018	0.019	0.019	0.021	0.022	
8.7	0.019	0.019	0.019	0.020	0.021	0.022	0.018	0.019	0.020	0.021	0.022	
8.9	0.019	0.019	0.020	0.020	0.022	0.023	0.019	0.019	0.020	0.021	0.023	
Note(s): The worst value of three phases shall be determined.												

Harmonics and inter-harmonics-L2						AF60K-TH + ATOM HS-40.96						
Parameter	P=Discharge power						P=Charge power					
Active power P/P _{NINV} [%]	0	20	40	60	80	100	20	40	60	80	100	
Harmonic number	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	
1	1.071	18.256	36.385	54.493	72.470	90.427	18.165	36.429	54.614	72.866	91.083	
2	0.094	0.286	0.541	0.712	0.819	0.887	0.258	0.731	1.328	1.862	2.487	
3	0.560	0.742	0.847	0.919	1.042	1.178	0.355	0.087	0.135	0.328	0.585	
4	0.034	0.039	0.061	0.031	0.068	0.139	0.075	0.085	0.255	0.364	0.451	
5	0.733	0.715	0.350	0.318	0.358	0.420	1.113	1.315	1.444	1.497	1.601	
6	0.036	0.108	0.133	0.092	0.072	0.098	0.148	0.186	0.042	0.038	0.136	
7	0.490	0.506	0.254	0.198	0.242	0.287	0.615	0.869	0.991	0.989	0.984	
8	0.017	0.044	0.091	0.078	0.068	0.069	0.027	0.048	0.039	0.031	0.028	
9	0.115	0.131	0.070	0.028	0.033	0.081	0.130	0.111	0.217	0.232	0.196	
10	0.006	0.018	0.068	0.066	0.079	0.080	0.018	0.065	0.050	0.062	0.061	
11	0.231	0.196	0.175	0.100	0.057	0.041	0.304	0.333	0.448	0.473	0.464	
12	0.014	0.027	0.071	0.061	0.046	0.042	0.030	0.062	0.110	0.108	0.072	
13	0.145	0.102	0.126	0.078	0.052	0.033	0.264	0.258	0.356	0.381	0.387	
14	0.020	0.032	0.054	0.043	0.037	0.034	0.010	0.030	0.026	0.040	0.044	
15	0.046	0.051	0.042	0.034	0.048	0.065	0.035	0.043	0.067	0.077	0.062	
16	0.021	0.041	0.051	0.058	0.054	0.042	0.022	0.033	0.034	0.050	0.046	
17	0.082	0.098	0.082	0.070	0.045	0.027	0.152	0.143	0.203	0.226	0.222	
18	0.021	0.047	0.038	0.052	0.046	0.041	0.023	0.057	0.070	0.074	0.071	
19	0.060	0.078	0.054	0.040	0.026	0.030	0.111	0.118	0.150	0.181	0.188	
20	0.024	0.033	0.037	0.044	0.039	0.029	0.016	0.010	0.028	0.035	0.029	
21	0.016	0.024	0.022	0.019	0.023	0.027	0.013	0.016	0.015	0.012	0.019	
22	0.025	0.018	0.024	0.047	0.045	0.045	0.019	0.009	0.014	0.028	0.031	
23	0.037	0.043	0.039	0.050	0.057	0.061	0.039	0.100	0.105	0.118	0.109	
24	0.019	0.009	0.010	0.046	0.052	0.062	0.031	0.039	0.053	0.055	0.059	
25	0.035	0.041	0.044	0.043	0.057	0.057	0.033	0.085	0.076	0.106	0.111	
26	0.021	0.015	0.029	0.029	0.026	0.027	0.015	0.010	0.032	0.023	0.011	
27	0.013	0.030	0.032	0.021	0.021	0.025	0.017	0.009	0.024	0.025	0.009	
28	0.017	0.020	0.014	0.045	0.047	0.032	0.007	0.018	0.030	0.015	0.025	
29	0.021	0.038	0.052	0.063	0.067	0.047	0.028	0.062	0.059	0.072	0.074	
30	0.014	0.017	0.013	0.037	0.025	0.038	0.020	0.013	0.072	0.072	0.063	
31	0.021	0.025	0.047	0.051	0.067	0.078	0.024	0.062	0.066	0.086	0.081	
32	0.011	0.030	0.033	0.077	0.082	0.056	0.022	0.007	0.010	0.018	0.017	
33	0.015	0.020	0.043	0.038	0.053	0.049	0.019	0.035	0.040	0.039	0.020	

CEI 0-16												
Clause	Requirement - Test						Result - Remark					Verdict
34	0.009	0.021	0.015	0.031	0.021	0.044	0.018	0.014	0.027	0.015	0.049	
35	0.012	0.009	0.030	0.036	0.082	0.114	0.018	0.033	0.045	0.082	0.108	
36	0.007	0.015	0.021	0.043	0.056	0.042	0.018	0.014	0.020	0.027	0.044	
37	0.011	0.012	0.027	0.028	0.035	0.052	0.015	0.022	0.030	0.043	0.076	
38	0.005	0.007	0.013	0.029	0.038	0.059	0.011	0.008	0.022	0.019	0.059	
39	0.016	0.015	0.015	0.016	0.029	0.054	0.005	0.015	0.019	0.020	0.059	
40	0.006	0.011	0.021	0.032	0.039	0.036	0.007	0.008	0.018	0.018	0.050	
41	0.010	0.010	0.018	0.019	0.036	0.049	0.016	0.012	0.018	0.026	0.067	
42	0.006	0.013	0.022	0.033	0.045	0.044	0.010	0.016	0.029	0.036	0.024	
43	0.009	0.006	0.022	0.037	0.039	0.030	0.016	0.011	0.015	0.023	0.014	
44	0.009	0.013	0.012	0.026	0.030	0.021	0.006	0.005	0.016	0.019	0.013	
45	0.017	0.010	0.011	0.011	0.008	0.011	0.005	0.012	0.021	0.022	0.016	
46	0.010	0.019	0.015	0.022	0.024	0.019	0.009	0.005	0.016	0.015	0.009	
47	0.010	0.008	0.014	0.023	0.033	0.029	0.016	0.011	0.013	0.018	0.013	
48	0.008	0.011	0.015	0.021	0.027	0.027	0.013	0.008	0.018	0.025	0.019	
49	0.011	0.011	0.017	0.030	0.027	0.018	0.019	0.013	0.010	0.014	0.009	
50	0.010	0.008	0.010	0.016	0.025	0.023	0.010	0.008	0.014	0.015	0.010	

Note(s):
1. The limit of harmonic current shall be determined case by case per EN 61000-3-2 or EN 61000-3-12.
2. The worst value of three phases shall be determined.

Intern-harmonics-L2												
Parameter	P=Discharge power						P=Charge power					
	0	20	40	60	80	100	20	40	60	80	100	
Active power P/P _{NINV} [%]												
Frequency [Hz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	
75	0.014	0.037	0.048	0.058	0.105	0.128	0.028	0.033	0.124	0.059	0.114	
125	0.011	0.019	0.026	0.039	0.056	0.065	0.014	0.019	0.047	0.039	0.060	
175	0.008	0.011	0.013	0.014	0.024	0.028	0.009	0.011	0.025	0.025	0.042	
225	0.011	0.014	0.014	0.015	0.023	0.028	0.014	0.015	0.024	0.028	0.056	
275	0.007	0.009	0.010	0.012	0.017	0.021	0.010	0.009	0.021	0.017	0.026	
325	0.007	0.009	0.009	0.010	0.015	0.017	0.009	0.009	0.018	0.015	0.022	
375	0.007	0.010	0.008	0.010	0.014	0.018	0.009	0.009	0.019	0.014	0.020	
425	0.009	0.011	0.011	0.012	0.016	0.016	0.010	0.010	0.016	0.014	0.019	
475	0.006	0.008	0.008	0.009	0.012	0.013	0.007	0.008	0.012	0.010	0.014	
525	0.006	0.008	0.008	0.008	0.012	0.014	0.008	0.008	0.012	0.011	0.014	
575	0.006	0.008	0.008	0.008	0.011	0.012	0.007	0.007	0.013	0.010	0.013	
625	0.007	0.008	0.009	0.009	0.011	0.012	0.008	0.008	0.012	0.011	0.013	
675	0.006	0.007	0.007	0.008	0.010	0.011	0.007	0.007	0.012	0.009	0.013	
725	0.006	0.007	0.007	0.008	0.010	0.011	0.006	0.006	0.009	0.008	0.010	
775	0.006	0.007	0.007	0.007	0.009	0.010	0.006	0.006	0.009	0.008	0.010	
825	0.006	0.007	0.007	0.007	0.009	0.010	0.007	0.007	0.010	0.008	0.011	
875	0.006	0.007	0.007	0.007	0.009	0.009	0.006	0.006	0.009	0.008	0.010	
925	0.006	0.006	0.007	0.007	0.009	0.010	0.006	0.006	0.009	0.008	0.010	
975	0.006	0.007	0.006	0.007	0.009	0.009	0.006	0.006	0.009	0.008	0.010	
1025	0.005	0.006	0.006	0.007	0.008	0.009	0.006	0.006	0.008	0.007	0.009	
1075	0.005	0.006	0.006	0.007	0.009	0.009	0.006	0.006	0.008	0.007	0.009	
1125	0.005	0.006	0.006	0.007	0.008	0.009	0.006	0.006	0.008	0.008	0.009	
1175	0.005	0.007	0.006	0.007	0.008	0.009	0.006	0.006	0.008	0.007	0.010	
1225	0.006	0.006	0.007	0.007	0.008	0.009	0.006	0.006	0.008	0.008	0.009	

CEI 0-16												
Clause	Requirement - Test						Result - Remark					Verdict
1275	0.005	0.007	0.007	0.007	0.009	0.009	0.006	0.007	0.008	0.007	0.010	
1325	0.006	0.007	0.007	0.007	0.008	0.009	0.006	0.007	0.008	0.007	0.010	
1375	0.006	0.007	0.007	0.007	0.008	0.009	0.006	0.007	0.008	0.007	0.009	
1425	0.005	0.007	0.007	0.007	0.008	0.009	0.006	0.007	0.008	0.008	0.009	
1475	0.005	0.007	0.007	0.007	0.009	0.009	0.005	0.007	0.008	0.008	0.009	
1525	0.005	0.007	0.007	0.008	0.009	0.010	0.006	0.007	0.008	0.009	0.010	
1575	0.005	0.007	0.007	0.008	0.010	0.010	0.006	0.006	0.008	0.008	0.010	
1625	0.005	0.006	0.007	0.008	0.010	0.010	0.006	0.006	0.008	0.009	0.010	
1675	0.005	0.006	0.007	0.007	0.010	0.011	0.005	0.006	0.008	0.010	0.010	
1725	0.005	0.006	0.006	0.007	0.009	0.012	0.005	0.006	0.008	0.009	0.015	
1775	0.005	0.006	0.006	0.007	0.010	0.012	0.005	0.006	0.007	0.009	0.021	
1825	0.005	0.006	0.006	0.007	0.009	0.012	0.005	0.005	0.007	0.009	0.013	
1875	0.005	0.006	0.006	0.006	0.008	0.011	0.005	0.005	0.007	0.009	0.015	
1925	0.005	0.006	0.006	0.007	0.008	0.011	0.005	0.005	0.007	0.008	0.015	
1975	0.005	0.006	0.006	0.007	0.008	0.010	0.005	0.005	0.006	0.007	0.023	
Note(s): The worst value of three phases shall be determined.												

Higher frequencies-L2

Parameter	P=Discharge power						P=Charge power					
	0	20	40	60	80	100	20	40	60	80	100	
Active power P/P _{NINV} [%]	I [%]											
Frequency [kHz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
2.1	0.021	0.026	0.041	0.061	0.078	0.078	0.028	0.026	0.043	0.056	0.077	
2.3	0.027	0.029	0.031	0.042	0.053	0.048	0.025	0.022	0.037	0.043	0.035	
2.5	0.029	0.027	0.029	0.042	0.052	0.045	0.028	0.023	0.029	0.035	0.032	
2.7	0.025	0.022	0.029	0.046	0.050	0.050	0.030	0.029	0.027	0.031	0.033	
2.9	0.028	0.028	0.028	0.034	0.044	0.045	0.024	0.028	0.024	0.031	0.035	
3.1	0.027	0.024	0.026	0.034	0.042	0.036	0.026	0.024	0.027	0.033	0.032	
3.3	0.024	0.021	0.023	0.038	0.035	0.035	0.028	0.027	0.027	0.028	0.034	
3.5	0.027	0.029	0.027	0.036	0.036	0.037	0.029	0.025	0.030	0.034	0.037	
3.7	0.080	0.079	0.082	0.084	0.086	0.087	0.080	0.082	0.080	0.084	0.086	
3.9	0.083	0.082	0.083	0.090	0.090	0.092	0.084	0.084	0.085	0.086	0.089	
4.1	0.025	0.028	0.027	0.035	0.038	0.048	0.031	0.031	0.035	0.036	0.036	
4.3	0.029	0.033	0.038	0.042	0.042	0.045	0.034	0.034	0.037	0.035	0.040	
4.5	0.026	0.032	0.038	0.042	0.037	0.046	0.034	0.035	0.037	0.035	0.041	
4.7	0.033	0.042	0.054	0.059	0.061	0.057	0.043	0.042	0.045	0.055	0.047	
4.9	0.032	0.035	0.057	0.076	0.079	0.076	0.043	0.057	0.061	0.067	0.065	
5.1	0.031	0.034	0.065	0.084	0.085	0.086	0.039	0.054	0.069	0.081	0.081	
5.3	0.028	0.034	0.048	0.055	0.068	0.088	0.032	0.044	0.052	0.065	0.082	
5.5	0.027	0.031	0.034	0.039	0.048	0.059	0.027	0.035	0.039	0.043	0.054	
5.7	0.024	0.023	0.029	0.032	0.036	0.039	0.024	0.028	0.031	0.035	0.041	
5.9	0.019	0.024	0.028	0.027	0.029	0.032	0.022	0.024	0.027	0.029	0.033	
6.1	0.021	0.022	0.023	0.024	0.027	0.029	0.020	0.022	0.023	0.024	0.027	
6.3	0.021	0.019	0.021	0.024	0.024	0.025	0.020	0.020	0.022	0.022	0.024	
6.5	0.018	0.019	0.021	0.021	0.022	0.024	0.020	0.019	0.020	0.022	0.022	
6.7	0.017	0.019	0.019	0.020	0.022	0.023	0.018	0.019	0.019	0.021	0.022	
6.9	0.018	0.018	0.018	0.019	0.021	0.022	0.017	0.019	0.019	0.020	0.022	
7.1	0.017	0.016	0.018	0.019	0.020	0.021	0.017	0.017	0.019	0.019	0.021	

CEI 0-16												
Clause	Requirement - Test						Result - Remark					Verdict
7.3	0.015	0.016	0.018	0.018	0.019	0.020	0.016	0.017	0.018	0.019	0.020	
7.5	0.016	0.016	0.017	0.017	0.019	0.019	0.016	0.017	0.017	0.018	0.020	
7.7	0.015	0.016	0.016	0.017	0.018	0.019	0.015	0.016	0.017	0.018	0.019	
7.9	0.015	0.016	0.016	0.017	0.018	0.019	0.015	0.016	0.017	0.018	0.019	
8.1	0.016	0.016	0.016	0.016	0.018	0.019	0.015	0.016	0.016	0.018	0.019	
8.3	0.016	0.016	0.016	0.017	0.018	0.019	0.015	0.016	0.016	0.017	0.018	
8.5	0.016	0.016	0.016	0.017	0.018	0.019	0.015	0.016	0.016	0.017	0.018	
8.7	0.016	0.016	0.016	0.017	0.018	0.019	0.015	0.016	0.016	0.018	0.019	
8.9	0.015	0.016	0.016	0.017	0.018	0.019	0.016	0.016	0.017	0.018	0.019	

Note(s):
The worst value of three phases shall be determined.

Harmonics and inter-harmonics-L3						AF60K-TH + ATOM HS-40.96						
Parameter	P=Discharge power						P=Charge power					
Active power P/P _{NINV} [%]	0	20	40	60	80	100	20	40	60	80	100	
Harmonic number	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	
1	1.127	18.163	36.230	54.308	72.284	90.295	18.295	36.460	54.743	72.946	91.083	
2	0.073	0.232	0.300	0.362	0.534	0.837	0.298	0.273	0.214	0.304	0.736	
3	0.488	0.736	0.857	1.003	1.202	1.445	0.277	0.057	0.180	0.453	0.646	
4	0.056	0.159	0.171	0.205	0.298	0.426	0.103	0.080	0.326	0.430	0.651	
5	0.667	0.646	0.340	0.286	0.283	0.286	1.086	1.326	1.449	1.556	1.625	
6	0.071	0.094	0.164	0.145	0.123	0.102	0.118	0.189	0.093	0.119	0.054	
7	0.487	0.510	0.245	0.143	0.126	0.144	0.619	0.826	0.914	0.909	0.901	
8	0.044	0.046	0.097	0.099	0.097	0.116	0.022	0.022	0.042	0.050	0.057	
9	0.109	0.104	0.068	0.030	0.046	0.105	0.119	0.124	0.228	0.242	0.210	
10	0.012	0.012	0.084	0.092	0.096	0.092	0.016	0.009	0.024	0.015	0.014	
11	0.212	0.181	0.146	0.073	0.084	0.123	0.310	0.341	0.466	0.469	0.452	
12	0.024	0.042	0.115	0.112	0.101	0.101	0.031	0.066	0.080	0.047	0.016	
13	0.152	0.109	0.121	0.072	0.061	0.071	0.262	0.245	0.364	0.362	0.349	
14	0.012	0.035	0.049	0.058	0.043	0.044	0.012	0.022	0.033	0.020	0.010	
15	0.053	0.059	0.062	0.049	0.056	0.070	0.033	0.046	0.077	0.087	0.077	
16	0.019	0.042	0.036	0.051	0.041	0.030	0.011	0.014	0.026	0.010	0.020	
17	0.074	0.077	0.054	0.030	0.026	0.021	0.151	0.141	0.203	0.206	0.187	
18	0.040	0.073	0.070	0.087	0.086	0.085	0.035	0.061	0.046	0.037	0.036	
19	0.066	0.072	0.039	0.042	0.036	0.043	0.110	0.126	0.170	0.174	0.156	
20	0.016	0.033	0.019	0.042	0.045	0.054	0.008	0.016	0.027	0.011	0.022	
21	0.019	0.039	0.041	0.041	0.038	0.039	0.009	0.015	0.017	0.019	0.038	
22	0.020	0.016	0.011	0.036	0.038	0.036	0.008	0.014	0.022	0.010	0.027	
23	0.034	0.049	0.052	0.038	0.035	0.037	0.041	0.091	0.095	0.105	0.097	
24	0.034	0.034	0.050	0.073	0.060	0.051	0.015	0.042	0.036	0.009	0.021	
25	0.036	0.042	0.040	0.041	0.049	0.046	0.027	0.087	0.078	0.090	0.083	
26	0.013	0.010	0.018	0.030	0.038	0.038	0.008	0.008	0.016	0.015	0.027	
27	0.015	0.029	0.035	0.047	0.027	0.015	0.013	0.010	0.024	0.029	0.037	
28	0.015	0.009	0.012	0.021	0.022	0.031	0.008	0.008	0.015	0.016	0.036	
29	0.019	0.034	0.046	0.043	0.057	0.050	0.027	0.065	0.047	0.063	0.055	
30	0.018	0.029	0.042	0.081	0.098	0.082	0.018	0.015	0.059	0.039	0.026	
31	0.016	0.016	0.025	0.023	0.061	0.080	0.023	0.057	0.063	0.078	0.067	
32	0.008	0.025	0.022	0.029	0.015	0.037	0.007	0.009	0.028	0.028	0.037	

CEI 0-16												
Clause	Requirement - Test						Result - Remark					Verdict
33	0.016	0.013	0.033	0.024	0.068	0.077	0.020	0.035	0.036	0.056	0.064	
34	0.007	0.019	0.033	0.048	0.065	0.048	0.006	0.010	0.025	0.022	0.079	
35	0.005	0.006	0.021	0.027	0.028	0.025	0.021	0.035	0.048	0.063	0.045	
36	0.005	0.016	0.031	0.040	0.068	0.074	0.005	0.016	0.018	0.025	0.048	
37	0.007	0.011	0.015	0.015	0.012	0.029	0.021	0.023	0.027	0.020	0.065	
38	0.007	0.015	0.028	0.025	0.039	0.046	0.005	0.007	0.022	0.030	0.080	
39	0.012	0.009	0.007	0.019	0.012	0.028	0.005	0.016	0.023	0.018	0.068	
40	0.007	0.013	0.018	0.016	0.027	0.054	0.006	0.005	0.016	0.017	0.096	
41	0.013	0.007	0.010	0.018	0.014	0.016	0.018	0.013	0.020	0.012	0.036	
42	0.011	0.019	0.022	0.024	0.030	0.034	0.006	0.017	0.024	0.013	0.022	
43	0.013	0.007	0.011	0.013	0.022	0.027	0.017	0.010	0.017	0.015	0.027	
44	0.009	0.014	0.017	0.012	0.015	0.018	0.006	0.006	0.015	0.015	0.035	
45	0.011	0.009	0.006	0.013	0.028	0.034	0.005	0.015	0.023	0.027	0.037	
46	0.008	0.010	0.011	0.010	0.011	0.013	0.006	0.006	0.014	0.008	0.025	
47	0.015	0.009	0.014	0.022	0.011	0.009	0.019	0.011	0.014	0.008	0.017	
48	0.015	0.017	0.019	0.024	0.031	0.024	0.006	0.009	0.012	0.007	0.024	
49	0.013	0.008	0.016	0.018	0.016	0.023	0.019	0.013	0.014	0.010	0.020	
50	0.009	0.009	0.014	0.014	0.014	0.017	0.006	0.006	0.009	0.009	0.030	

Note(s):
1. The limit of harmonic current shall be determined case by case per EN 61000-3-2 or EN 61000-3-12.
2. The worst value of three phases shall be determined.

Intern-harmonics-L3												
Parameter	P=Discharge power						P=Charge power					
	0	20	40	60	80	100	20	40	60	80	100	
Active power P/P _{NINV} [%]												
Frequency [Hz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	
75	0.015	0.039	0.055	0.053	0.097	0.141	0.027	0.032	0.127	0.065	0.095	
125	0.013	0.024	0.036	0.039	0.053	0.074	0.016	0.018	0.047	0.039	0.049	
175	0.009	0.013	0.015	0.015	0.023	0.030	0.011	0.012	0.029	0.028	0.039	
225	0.010	0.013	0.015	0.014	0.021	0.031	0.013	0.013	0.025	0.025	0.048	
275	0.008	0.011	0.012	0.012	0.016	0.024	0.011	0.012	0.021	0.019	0.026	
325	0.010	0.012	0.013	0.013	0.018	0.023	0.013	0.013	0.021	0.018	0.023	
375	0.008	0.011	0.011	0.010	0.014	0.020	0.010	0.010	0.020	0.015	0.018	
425	0.008	0.010	0.011	0.011	0.014	0.017	0.009	0.010	0.015	0.012	0.014	
475	0.007	0.009	0.010	0.010	0.012	0.016	0.008	0.009	0.015	0.012	0.013	
525	0.008	0.010	0.011	0.011	0.014	0.017	0.010	0.010	0.015	0.013	0.015	
575	0.007	0.008	0.009	0.008	0.011	0.014	0.008	0.008	0.014	0.011	0.013	
625	0.007	0.008	0.009	0.009	0.011	0.013	0.008	0.008	0.013	0.011	0.013	
675	0.006	0.008	0.009	0.008	0.010	0.013	0.008	0.008	0.012	0.011	0.012	
725	0.007	0.008	0.008	0.008	0.010	0.012	0.007	0.007	0.010	0.010	0.011	
775	0.006	0.007	0.008	0.008	0.009	0.011	0.007	0.007	0.010	0.009	0.010	
825	0.006	0.007	0.008	0.008	0.010	0.011	0.007	0.007	0.010	0.009	0.011	
875	0.006	0.008	0.008	0.008	0.009	0.011	0.007	0.007	0.010	0.009	0.010	
925	0.006	0.008	0.008	0.008	0.010	0.011	0.007	0.007	0.010	0.009	0.010	
975	0.006	0.007	0.008	0.008	0.010	0.011	0.007	0.007	0.010	0.010	0.010	
1025	0.006	0.007	0.008	0.008	0.009	0.011	0.007	0.007	0.009	0.009	0.010	
1075	0.006	0.007	0.008	0.008	0.009	0.011	0.006	0.007	0.009	0.008	0.009	
1125	0.006	0.007	0.007	0.008	0.009	0.010	0.007	0.007	0.009	0.009	0.009	
1175	0.006	0.007	0.008	0.008	0.009	0.010	0.007	0.007	0.009	0.008	0.009	

CEI 0-16												
Clause	Requirement - Test						Result - Remark					Verdict
1225	0.006	0.007	0.008	0.008	0.009	0.010	0.007	0.007	0.009	0.008	0.010	
1275	0.006	0.007	0.008	0.008	0.009	0.010	0.007	0.007	0.009	0.008	0.010	
1325	0.006	0.007	0.008	0.008	0.009	0.010	0.007	0.007	0.008	0.008	0.010	
1375	0.006	0.007	0.008	0.008	0.009	0.010	0.006	0.007	0.009	0.008	0.009	
1425	0.006	0.007	0.008	0.008	0.009	0.010	0.007	0.007	0.009	0.008	0.009	
1475	0.006	0.007	0.008	0.008	0.010	0.010	0.007	0.007	0.009	0.009	0.009	
1525	0.006	0.007	0.008	0.008	0.009	0.011	0.006	0.007	0.010	0.009	0.010	
1575	0.006	0.007	0.007	0.008	0.010	0.011	0.006	0.007	0.009	0.009	0.010	
1625	0.006	0.007	0.007	0.008	0.009	0.011	0.006	0.007	0.009	0.010	0.010	
1675	0.006	0.007	0.007	0.008	0.010	0.012	0.006	0.007	0.008	0.010	0.011	
1725	0.006	0.007	0.007	0.008	0.010	0.012	0.006	0.007	0.008	0.010	0.015	
1775	0.006	0.007	0.007	0.007	0.010	0.012	0.006	0.006	0.008	0.009	0.021	
1825	0.006	0.007	0.007	0.007	0.009	0.012	0.006	0.006	0.008	0.010	0.012	
1875	0.006	0.007	0.007	0.007	0.009	0.012	0.006	0.006	0.007	0.010	0.014	
1925	0.006	0.007	0.007	0.007	0.009	0.012	0.006	0.006	0.008	0.009	0.016	
1975	0.006	0.007	0.007	0.007	0.008	0.011	0.006	0.006	0.007	0.008	0.023	
Note(s): The worst value of three phases shall be determined.												

Higher frequencies-L3

Parameter	P=Discharge power						P=Charge power				
	0	20	40	60	80	100	20	40	60	80	100
Active power P/P _{NINV} [%]											
Frequency [kHz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
2.1	0.027	0.029	0.035	0.038	0.046	0.054	0.029	0.027	0.042	0.032	0.066
2.3	0.029	0.028	0.031	0.040	0.048	0.049	0.025	0.025	0.036	0.034	0.057
2.5	0.027	0.023	0.028	0.031	0.041	0.050	0.025	0.025	0.030	0.036	0.058
2.7	0.027	0.028	0.032	0.036	0.035	0.044	0.030	0.031	0.025	0.029	0.058
2.9	0.028	0.027	0.028	0.037	0.038	0.041	0.025	0.029	0.028	0.034	0.060
3.1	0.028	0.022	0.026	0.028	0.034	0.046	0.025	0.029	0.027	0.031	0.055
3.3	0.022	0.024	0.028	0.033	0.032	0.037	0.030	0.029	0.027	0.037	0.059
3.5	0.027	0.027	0.030	0.035	0.034	0.038	0.031	0.028	0.034	0.035	0.049
3.7	0.081	0.080	0.084	0.086	0.086	0.093	0.080	0.083	0.083	0.085	0.091
3.9	0.091	0.091	0.092	0.094	0.097	0.101	0.093	0.094	0.096	0.099	0.105
4.1	0.025	0.027	0.027	0.031	0.036	0.044	0.031	0.031	0.036	0.041	0.045
4.3	0.028	0.028	0.032	0.031	0.039	0.052	0.031	0.034	0.037	0.042	0.049
4.5	0.028	0.028	0.031	0.033	0.041	0.046	0.035	0.038	0.036	0.044	0.044
4.7	0.035	0.039	0.048	0.056	0.056	0.062	0.047	0.047	0.047	0.049	0.055
4.9	0.030	0.033	0.052	0.068	0.072	0.073	0.040	0.057	0.059	0.065	0.068
5.1	0.030	0.038	0.069	0.088	0.089	0.085	0.036	0.058	0.073	0.086	0.088
5.3	0.029	0.037	0.049	0.058	0.071	0.087	0.033	0.045	0.054	0.068	0.087
5.5	0.028	0.033	0.038	0.043	0.051	0.062	0.029	0.038	0.043	0.049	0.059
5.7	0.024	0.024	0.031	0.035	0.038	0.042	0.026	0.030	0.034	0.039	0.042
5.9	0.021	0.027	0.029	0.029	0.032	0.035	0.023	0.026	0.029	0.031	0.034
6.1	0.022	0.025	0.025	0.026	0.029	0.030	0.021	0.024	0.025	0.027	0.030
6.3	0.022	0.022	0.024	0.026	0.027	0.028	0.021	0.022	0.024	0.025	0.027
6.5	0.020	0.021	0.023	0.024	0.025	0.027	0.022	0.022	0.022	0.024	0.025
6.7	0.019	0.021	0.022	0.023	0.025	0.027	0.020	0.022	0.022	0.024	0.025
6.9	0.020	0.020	0.021	0.022	0.024	0.025	0.019	0.022	0.022	0.023	0.024

CEI 0-16												
Clause	Requirement - Test						Result - Remark				Verdict	
7.1	0.018	0.019	0.021	0.021	0.022	0.024	0.018	0.020	0.021	0.022	0.023	
7.3	0.018	0.019	0.020	0.021	0.022	0.023	0.018	0.019	0.020	0.021	0.023	
7.5	0.017	0.018	0.019	0.020	0.021	0.022	0.018	0.019	0.019	0.021	0.022	
7.7	0.017	0.018	0.019	0.019	0.021	0.022	0.018	0.019	0.020	0.020	0.022	
7.9	0.016	0.018	0.019	0.019	0.021	0.021	0.017	0.018	0.019	0.020	0.021	
8.1	0.017	0.018	0.019	0.019	0.021	0.021	0.017	0.018	0.019	0.020	0.021	
8.3	0.017	0.018	0.018	0.019	0.020	0.021	0.017	0.018	0.019	0.020	0.021	
8.5	0.018	0.018	0.019	0.019	0.020	0.021	0.018	0.018	0.019	0.020	0.021	
8.7	0.018	0.018	0.019	0.019	0.021	0.021	0.018	0.018	0.019	0.020	0.021	
8.9	0.017	0.018	0.019	0.019	0.021	0.021	0.018	0.019	0.019	0.020	0.021	

Note(s):
The worst value of three phases shall be determined.

Harmonics and inter-harmonics-L1						AF60K-TH + ATOM HS-15.36						
Parameter	P=Discharge power						P=Charge power					
Active power P/P _{NINV} [%]	0	20	40	60	80	100	20	40	60	80	100	
Harmonic number	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	
1	3.576	18.689	36.784	55.196	73.182	91.658	18.875	37.040	55.192	73.486	91.581	
2	0.267	0.319	0.754	0.986	1.156	1.401	0.356	0.634	0.857	1.159	1.549	
3	1.727	1.383	2.042	2.257	2.462	2.607	1.660	1.116	0.832	0.386	0.219	
4	0.048	0.634	0.307	0.321	0.381	0.387	0.189	0.146	0.097	0.217	0.115	
5	2.237	2.975	2.777	2.336	1.778	1.269	1.951	2.792	3.341	3.730	4.076	
6	0.150	0.214	0.057	0.170	0.226	0.262	0.101	0.270	0.520	0.835	0.827	
7	1.584	0.972	1.579	1.722	1.477	1.127	1.493	1.644	1.883	2.122	2.297	
8	0.077	0.098	0.090	0.063	0.096	0.157	0.064	0.097	0.087	0.169	0.205	
9	0.332	0.121	0.330	0.427	0.391	0.279	0.399	0.542	0.480	0.171	0.133	
10	0.039	0.091	0.139	0.044	0.105	0.177	0.077	0.124	0.077	0.087	0.131	
11	0.694	0.732	0.432	0.538	0.740	0.660	1.068	1.021	0.977	0.941	0.981	
12	0.037	0.072	0.095	0.037	0.042	0.093	0.118	0.051	0.111	0.093	0.146	
13	0.500	0.335	0.565	0.216	0.432	0.495	0.688	0.792	0.821	0.753	0.680	
14	0.070	0.049	0.122	0.102	0.044	0.072	0.039	0.111	0.048	0.048	0.078	
15	0.110	0.143	0.164	0.089	0.204	0.186	0.176	0.067	0.086	0.105	0.104	
16	0.084	0.181	0.102	0.108	0.044	0.092	0.029	0.119	0.023	0.028	0.063	
17	0.255	0.376	0.303	0.326	0.138	0.207	0.346	0.355	0.498	0.549	0.534	
18	0.073	0.114	0.026	0.065	0.050	0.029	0.065	0.146	0.097	0.085	0.150	
19	0.208	0.254	0.152	0.320	0.192	0.135	0.285	0.204	0.330	0.432	0.438	
20	0.079	0.064	0.044	0.095	0.110	0.040	0.073	0.068	0.095	0.085	0.051	
21	0.024	0.065	0.065	0.077	0.067	0.111	0.029	0.061	0.021	0.067	0.079	
22	0.101	0.068	0.081	0.067	0.089	0.045	0.135	0.091	0.078	0.051	0.048	
23	0.132	0.233	0.209	0.118	0.197	0.144	0.141	0.211	0.148	0.241	0.318	
24	0.072	0.066	0.038	0.039	0.036	0.073	0.092	0.085	0.118	0.119	0.086	
25	0.107	0.166	0.192	0.114	0.230	0.185	0.103	0.165	0.115	0.152	0.247	
26	0.056	0.030	0.043	0.070	0.104	0.124	0.022	0.049	0.037	0.054	0.063	
27	0.033	0.034	0.097	0.041	0.134	0.069	0.045	0.049	0.083	0.041	0.026	
28	0.080	0.023	0.057	0.060	0.101	0.056	0.089	0.101	0.075	0.045	0.077	
29	0.074	0.095	0.082	0.136	0.090	0.146	0.089	0.052	0.112	0.066	0.145	
30	0.055	0.061	0.032	0.039	0.042	0.059	0.078	0.072	0.093	0.064	0.049	
31	0.056	0.092	0.105	0.145	0.071	0.132	0.048	0.027	0.097	0.051	0.099	

CEI 0-16												
Clause	Requirement - Test						Result - Remark					Verdict
32	0.041	0.026	0.045	0.041	0.025	0.043	0.066	0.029	0.068	0.041	0.046	
33	0.043	0.049	0.087	0.095	0.065	0.110	0.018	0.023	0.061	0.062	0.046	
34	0.041	0.043	0.053	0.050	0.032	0.071	0.073	0.053	0.077	0.052	0.039	
35	0.035	0.031	0.053	0.048	0.049	0.073	0.025	0.020	0.045	0.059	0.040	
36	0.028	0.019	0.043	0.036	0.034	0.051	0.056	0.052	0.064	0.070	0.046	
37	0.032	0.041	0.026	0.023	0.051	0.061	0.022	0.027	0.049	0.056	0.028	
38	0.024	0.050	0.027	0.031	0.066	0.057	0.044	0.052	0.024	0.062	0.032	
39	0.042	0.038	0.029	0.033	0.054	0.027	0.020	0.017	0.017	0.033	0.032	
40	0.020	0.045	0.026	0.027	0.036	0.030	0.040	0.049	0.030	0.055	0.031	
41	0.023	0.022	0.023	0.041	0.048	0.051	0.038	0.059	0.042	0.065	0.041	
42	0.022	0.043	0.038	0.034	0.043	0.033	0.039	0.046	0.043	0.064	0.053	
43	0.040	0.026	0.028	0.033	0.034	0.043	0.043	0.057	0.050	0.074	0.061	
44	0.031	0.057	0.062	0.057	0.052	0.037	0.032	0.018	0.038	0.046	0.047	
45	0.041	0.056	0.058	0.066	0.045	0.028	0.034	0.033	0.015	0.030	0.053	
46	0.030	0.038	0.040	0.028	0.033	0.023	0.029	0.021	0.038	0.043	0.048	
47	0.031	0.023	0.018	0.023	0.037	0.053	0.040	0.046	0.064	0.060	0.075	
48	0.031	0.048	0.028	0.032	0.028	0.030	0.028	0.026	0.050	0.057	0.060	
49	0.041	0.026	0.026	0.024	0.026	0.034	0.036	0.041	0.067	0.050	0.080	
50	0.041	0.043	0.041	0.033	0.037	0.050	0.021	0.023	0.038	0.028	0.040	

Note(s):

- The limit of harmonic current shall be determined case by case per EN 61000-3-2 or EN 61000-3-12.
- The worst value of three phases shall be determined.

Intern-harmonics-L1												
Parameter	P=Discharge power						P=Charge power					
	0	20	40	60	80	100	20	40	60	80	100	
Active power P/P _{NINV} [%]												
Frequency [Hz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	
75	0.055	0.056	0.071	0.102	0.092	0.132	0.060	0.087	0.138	0.189	0.118	
125	0.043	0.046	0.053	0.067	0.072	0.085	0.039	0.045	0.051	0.070	0.059	
175	0.030	0.031	0.031	0.036	0.033	0.043	0.030	0.033	0.037	0.053	0.041	
225	0.028	0.031	0.030	0.036	0.032	0.037	0.028	0.035	0.037	0.060	0.041	
275	0.027	0.030	0.029	0.036	0.031	0.033	0.028	0.036	0.046	0.042	0.038	
325	0.031	0.033	0.033	0.037	0.035	0.036	0.031	0.037	0.039	0.040	0.037	
375	0.026	0.026	0.027	0.033	0.029	0.032	0.026	0.033	0.037	0.038	0.034	
425	0.023	0.024	0.024	0.028	0.027	0.030	0.024	0.026	0.026	0.030	0.027	
475	0.024	0.024	0.026	0.028	0.026	0.029	0.024	0.027	0.029	0.033	0.028	
525	0.026	0.027	0.028	0.030	0.029	0.033	0.026	0.029	0.031	0.031	0.030	
575	0.022	0.024	0.023	0.026	0.026	0.028	0.023	0.030	0.027	0.029	0.027	
625	0.022	0.023	0.023	0.025	0.024	0.028	0.023	0.027	0.027	0.026	0.026	
675	0.023	0.022	0.023	0.026	0.025	0.027	0.023	0.028	0.026	0.029	0.026	
725	0.022	0.023	0.023	0.026	0.025	0.026	0.022	0.023	0.023	0.027	0.024	
775	0.021	0.021	0.022	0.024	0.024	0.025	0.022	0.022	0.023	0.024	0.023	
825	0.022	0.022	0.022	0.025	0.024	0.026	0.021	0.023	0.024	0.027	0.024	
875	0.022	0.022	0.023	0.025	0.023	0.025	0.022	0.024	0.024	0.026	0.024	
925	0.022	0.023	0.023	0.025	0.023	0.024	0.023	0.023	0.025	0.025	0.023	
975	0.022	0.022	0.022	0.025	0.023	0.024	0.022	0.023	0.024	0.026	0.024	
1025	0.021	0.021	0.023	0.024	0.023	0.024	0.022	0.022	0.023	0.024	0.023	
1075	0.022	0.021	0.022	0.024	0.024	0.025	0.022	0.022	0.022	0.024	0.022	
1125	0.022	0.022	0.023	0.024	0.024	0.024	0.022	0.023	0.023	0.024	0.023	

CEI 0-16												
Clause	Requirement - Test						Result - Remark					Verdict
1175	0.021	0.021	0.022	0.024	0.023	0.025	0.022	0.023	0.022	0.024	0.024	0.024
1225	0.022	0.023	0.023	0.024	0.024	0.025	0.022	0.023	0.022	0.024	0.024	0.024
1275	0.021	0.022	0.022	0.024	0.024	0.026	0.021	0.022	0.022	0.023	0.024	0.024
1325	0.021	0.021	0.022	0.023	0.024	0.025	0.021	0.022	0.022	0.024	0.023	0.023
1375	0.022	0.021	0.023	0.024	0.024	0.025	0.020	0.022	0.022	0.023	0.024	0.024
1425	0.021	0.021	0.023	0.024	0.024	0.025	0.021	0.022	0.022	0.023	0.023	0.023
1475	0.020	0.021	0.023	0.025	0.024	0.025	0.020	0.021	0.022	0.023	0.023	0.023
1525	0.022	0.022	0.023	0.025	0.025	0.025	0.021	0.022	0.022	0.023	0.023	0.023
1575	0.021	0.021	0.023	0.025	0.024	0.025	0.020	0.021	0.021	0.022	0.022	0.022
1625	0.021	0.020	0.022	0.023	0.023	0.025	0.020	0.020	0.021	0.022	0.022	0.022
1675	0.021	0.021	0.022	0.023	0.023	0.023	0.020	0.021	0.021	0.022	0.022	0.022
1725	0.020	0.021	0.022	0.023	0.023	0.023	0.020	0.021	0.021	0.021	0.021	0.021
1775	0.021	0.020	0.021	0.023	0.022	0.023	0.020	0.020	0.020	0.021	0.021	0.021
1825	0.021	0.020	0.021	0.023	0.023	0.023	0.020	0.021	0.021	0.021	0.021	0.021
1875	0.020	0.021	0.021	0.023	0.022	0.023	0.020	0.021	0.020	0.021	0.021	0.021
1925	0.021	0.021	0.021	0.023	0.022	0.023	0.020	0.020	0.020	0.021	0.021	0.021
1975	0.022	0.021	0.021	0.023	0.023	0.023	0.020	0.020	0.021	0.021	0.021	0.021

Note(s):
The worst value of three phases shall be determined.

Higher frequencies-L1

Parameter	P=Discharge power						P=Charge power				
	0	20	40	60	80	100	20	40	60	80	100
Active power P/P _{NINV} [%]											
Frequency [kHz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
2.1	0.077	0.092	0.095	0.099	0.103	0.097	0.088	0.106	0.097	0.135	0.112
2.3	0.083	0.101	0.093	0.097	0.088	0.086	0.081	0.080	0.102	0.109	0.129
2.5	0.096	0.100	0.095	0.077	0.082	0.092	0.076	0.077	0.100	0.087	0.116
2.7	0.095	0.087	0.086	0.086	0.092	0.094	0.077	0.089	0.096	0.107	0.114
2.9	0.092	0.092	0.086	0.098	0.092	0.089	0.086	0.087	0.093	0.103	0.087
3.1	0.095	0.096	0.102	0.087	0.086	0.082	0.083	0.087	0.087	0.088	0.086
3.3	0.087	0.090	0.077	0.079	0.070	0.073	0.087	0.098	0.107	0.102	0.107
3.5	0.087	0.083	0.086	0.092	0.089	0.087	0.097	0.102	0.107	0.101	0.110
3.7	0.330	0.328	0.334	0.330	0.336	0.334	0.328	0.324	0.325	0.325	0.327
3.9	0.283	0.289	0.286	0.289	0.287	0.288	0.294	0.292	0.293	0.299	0.303
4.1	0.091	0.089	0.089	0.090	0.095	0.095	0.098	0.105	0.106	0.110	0.108
4.3	0.097	0.102	0.102	0.123	0.125	0.120	0.101	0.105	0.103	0.096	0.103
4.5	0.092	0.090	0.090	0.102	0.107	0.109	0.104	0.108	0.120	0.129	0.131
4.7	0.115	0.115	0.120	0.137	0.154	0.164	0.130	0.138	0.143	0.146	0.152
4.9	0.100	0.096	0.101	0.119	0.143	0.168	0.110	0.121	0.130	0.148	0.169
5.1	0.109	0.108	0.114	0.128	0.147	0.171	0.104	0.110	0.118	0.140	0.159
5.3	0.093	0.096	0.101	0.110	0.120	0.140	0.093	0.096	0.104	0.122	0.133
5.5	0.087	0.095	0.095	0.101	0.111	0.120	0.088	0.088	0.094	0.105	0.116
5.7	0.080	0.082	0.080	0.084	0.087	0.092	0.081	0.079	0.082	0.088	0.092
5.9	0.069	0.069	0.074	0.079	0.084	0.089	0.072	0.073	0.074	0.079	0.085
6.1	0.071	0.074	0.073	0.076	0.079	0.081	0.069	0.069	0.070	0.074	0.077
6.3	0.073	0.072	0.070	0.073	0.074	0.079	0.076	0.074	0.074	0.073	0.072
6.5	0.067	0.065	0.066	0.070	0.072	0.077	0.067	0.069	0.073	0.077	0.076
6.7	0.064	0.066	0.069	0.072	0.074	0.075	0.064	0.065	0.067	0.070	0.072

CEI 0-16												
Clause	Requirement - Test						Result - Remark					Verdict
6.9	0.064	0.066	0.065	0.067	0.066	0.068	0.063	0.062	0.063	0.065	0.068	
7.1	0.062	0.061	0.059	0.062	0.063	0.065	0.063	0.062	0.061	0.063	0.064	
7.3	0.059	0.059	0.058	0.061	0.063	0.065	0.059	0.060	0.060	0.061	0.063	
7.5	0.058	0.059	0.058	0.061	0.061	0.064	0.059	0.059	0.059	0.060	0.061	
7.7	0.056	0.057	0.057	0.060	0.061	0.063	0.057	0.058	0.058	0.060	0.060	
7.9	0.056	0.058	0.058	0.060	0.061	0.062	0.057	0.058	0.059	0.059	0.059	
8.1	0.057	0.058	0.058	0.061	0.061	0.062	0.057	0.057	0.058	0.060	0.061	
8.3	0.058	0.059	0.058	0.061	0.061	0.061	0.059	0.058	0.057	0.059	0.060	
8.5	0.059	0.059	0.058	0.060	0.061	0.061	0.059	0.058	0.058	0.058	0.059	
8.7	0.058	0.059	0.058	0.061	0.060	0.061	0.059	0.058	0.058	0.058	0.059	
8.9	0.058	0.058	0.059	0.061	0.060	0.061	0.060	0.059	0.059	0.059	0.061	
Note(s): The worst value of three phases shall be determined.												

Harmonics and inter-harmonics-L2						AF60K-TH + ATOM HS-15.36					
Parameter	P=Discharge power						P=Charge power				
Active power P/P _{NINV} [%]	0	20	40	60	80	100	20	40	60	80	100
Harmonic number	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
1	3.430	18.658	36.699	54.786	72.764	91.310	18.533	36.591	54.771	72.947	90.746
2	0.304	0.745	0.620	0.870	1.045	1.301	0.437	0.664	0.796	1.023	1.510
3	1.858	1.646	2.202	2.354	2.525	2.644	1.792	1.400	1.181	0.776	0.489
4	0.106	0.545	0.191	0.120	0.150	0.197	0.117	0.162	0.237	0.226	0.190
5	2.370	3.097	2.805	2.384	1.873	1.435	2.131	2.976	3.476	3.774	3.994
6	0.113	0.205	0.171	0.325	0.437	0.488	0.100	0.218	0.432	0.736	0.733
7	1.575	0.992	1.606	1.660	1.385	1.066	1.532	1.683	1.907	2.156	2.449
8	0.059	0.243	0.115	0.112	0.239	0.308	0.052	0.150	0.094	0.112	0.148
9	0.370	0.187	0.391	0.421	0.385	0.294	0.403	0.549	0.442	0.157	0.148
10	0.018	0.162	0.126	0.060	0.083	0.182	0.093	0.035	0.045	0.133	0.192
11	0.749	0.697	0.535	0.575	0.728	0.687	1.075	1.037	0.992	0.923	0.944
12	0.043	0.126	0.199	0.112	0.080	0.213	0.087	0.050	0.097	0.120	0.170
13	0.468	0.429	0.564	0.311	0.443	0.461	0.682	0.791	0.848	0.817	0.781
14	0.068	0.059	0.156	0.122	0.041	0.143	0.023	0.064	0.031	0.052	0.080
15	0.153	0.176	0.186	0.158	0.180	0.142	0.176	0.123	0.118	0.095	0.128
16	0.069	0.160	0.050	0.135	0.093	0.056	0.050	0.108	0.070	0.075	0.063
17	0.267	0.353	0.313	0.344	0.203	0.191	0.351	0.319	0.465	0.517	0.497
18	0.064	0.108	0.043	0.143	0.117	0.033	0.041	0.111	0.081	0.099	0.155
19	0.194	0.262	0.204	0.268	0.183	0.205	0.286	0.227	0.328	0.445	0.468
20	0.083	0.066	0.084	0.094	0.087	0.052	0.102	0.092	0.058	0.038	0.021
21	0.056	0.092	0.067	0.080	0.087	0.050	0.035	0.041	0.045	0.059	0.070
22	0.080	0.095	0.098	0.036	0.130	0.069	0.086	0.039	0.062	0.092	0.053
23	0.118	0.213	0.209	0.128	0.180	0.161	0.136	0.192	0.112	0.219	0.297
24	0.063	0.061	0.075	0.051	0.089	0.067	0.096	0.073	0.089	0.130	0.100
25	0.112	0.144	0.141	0.122	0.133	0.173	0.101	0.165	0.111	0.175	0.258
26	0.074	0.080	0.104	0.027	0.110	0.045	0.095	0.102	0.059	0.051	0.060
27	0.041	0.075	0.072	0.098	0.090	0.125	0.039	0.051	0.053	0.040	0.020
28	0.055	0.060	0.048	0.067	0.039	0.093	0.023	0.030	0.027	0.049	0.049
29	0.066	0.107	0.097	0.129	0.097	0.147	0.069	0.044	0.103	0.067	0.138
30	0.047	0.026	0.032	0.064	0.040	0.073	0.056	0.062	0.064	0.068	0.061

CEI 0-16												
Clause	Requirement - Test						Result - Remark					Verdict
31	0.068	0.069	0.083	0.067	0.115	0.085	0.038	0.022	0.079	0.056	0.095	
32	0.038	0.080	0.072	0.103	0.055	0.096	0.073	0.050	0.078	0.039	0.038	
33	0.046	0.062	0.062	0.065	0.102	0.074	0.018	0.017	0.055	0.054	0.048	
34	0.032	0.024	0.063	0.056	0.039	0.053	0.031	0.019	0.051	0.046	0.033	
35	0.039	0.041	0.026	0.042	0.065	0.043	0.027	0.018	0.051	0.051	0.038	
36	0.023	0.048	0.038	0.032	0.052	0.050	0.030	0.028	0.050	0.061	0.034	
37	0.039	0.041	0.040	0.035	0.036	0.047	0.024	0.023	0.046	0.046	0.023	
38	0.015	0.046	0.024	0.030	0.046	0.029	0.021	0.023	0.029	0.048	0.023	
39	0.050	0.066	0.046	0.044	0.025	0.036	0.033	0.017	0.015	0.023	0.028	
40	0.018	0.040	0.048	0.050	0.068	0.048	0.036	0.040	0.018	0.053	0.032	
41	0.033	0.025	0.026	0.025	0.023	0.064	0.038	0.061	0.046	0.061	0.035	
42	0.019	0.040	0.036	0.049	0.044	0.050	0.026	0.033	0.028	0.059	0.047	
43	0.030	0.029	0.021	0.022	0.044	0.059	0.042	0.059	0.050	0.068	0.046	
44	0.027	0.023	0.027	0.042	0.033	0.032	0.014	0.021	0.023	0.036	0.041	
45	0.053	0.053	0.045	0.028	0.029	0.038	0.042	0.031	0.017	0.023	0.038	
46	0.030	0.047	0.038	0.054	0.049	0.051	0.022	0.015	0.032	0.035	0.046	
47	0.033	0.018	0.017	0.029	0.042	0.044	0.039	0.037	0.058	0.054	0.065	
48	0.026	0.026	0.032	0.032	0.054	0.055	0.015	0.018	0.041	0.047	0.053	
49	0.033	0.028	0.025	0.030	0.042	0.045	0.039	0.046	0.063	0.054	0.069	
50	0.032	0.023	0.024	0.024	0.037	0.038	0.016	0.016	0.031	0.025	0.037	

Note(s):
1. The limit of harmonic current shall be determined case by case per EN 61000-3-2 or EN 61000-3-12.
2. The worst value of three phases shall be determined.

Intern-harmonics-L2											
Parameter	P=Discharge power						P=Charge power				
	0	20	40	60	80	100	20	40	60	80	100
Active power P/P _{NINV} [%]											
Frequency [Hz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
75	0.044	0.051	0.066	0.104	0.090	0.129	0.056	0.091	0.141	0.184	0.111
125	0.038	0.038	0.044	0.057	0.059	0.078	0.035	0.046	0.056	0.076	0.062
175	0.024	0.025	0.028	0.033	0.031	0.038	0.024	0.030	0.039	0.044	0.036
225	0.038	0.036	0.040	0.046	0.041	0.045	0.036	0.044	0.052	0.074	0.049
275	0.023	0.028	0.026	0.029	0.026	0.031	0.024	0.034	0.041	0.045	0.035
325	0.024	0.024	0.026	0.028	0.026	0.029	0.023	0.029	0.032	0.041	0.032
375	0.022	0.022	0.024	0.029	0.024	0.028	0.023	0.030	0.035	0.037	0.030
425	0.030	0.029	0.033	0.034	0.033	0.037	0.028	0.032	0.035	0.037	0.033
475	0.019	0.020	0.021	0.024	0.022	0.025	0.020	0.025	0.025	0.030	0.024
525	0.021	0.021	0.022	0.024	0.023	0.027	0.021	0.025	0.026	0.028	0.025
575	0.020	0.020	0.020	0.023	0.022	0.025	0.020	0.026	0.026	0.031	0.023
625	0.023	0.022	0.024	0.026	0.025	0.028	0.023	0.026	0.026	0.029	0.026
675	0.019	0.019	0.020	0.022	0.021	0.024	0.020	0.025	0.025	0.028	0.022
725	0.018	0.019	0.020	0.021	0.020	0.022	0.019	0.020	0.022	0.025	0.020
775	0.018	0.018	0.019	0.021	0.019	0.021	0.019	0.020	0.020	0.023	0.020
825	0.019	0.020	0.020	0.021	0.020	0.022	0.019	0.021	0.023	0.026	0.022
875	0.019	0.019	0.019	0.021	0.020	0.021	0.019	0.020	0.022	0.025	0.020
925	0.018	0.019	0.020	0.021	0.019	0.021	0.019	0.020	0.022	0.023	0.021
975	0.019	0.018	0.019	0.021	0.020	0.021	0.019	0.020	0.022	0.025	0.021
1025	0.018	0.018	0.020	0.020	0.019	0.020	0.019	0.019	0.021	0.022	0.019
1075	0.018	0.018	0.019	0.020	0.020	0.021	0.019	0.019	0.020	0.022	0.020

CEI 0-16												
Clause	Requirement - Test						Result - Remark					Verdict
1125	0.019	0.019	0.020	0.021	0.020	0.020	0.019	0.020	0.021	0.023	0.020	
1175	0.018	0.019	0.020	0.020	0.020	0.021	0.019	0.020	0.020	0.023	0.020	
1225	0.018	0.018	0.020	0.020	0.020	0.021	0.019	0.020	0.020	0.022	0.020	
1275	0.018	0.018	0.020	0.020	0.020	0.021	0.018	0.020	0.020	0.022	0.021	
1325	0.018	0.018	0.020	0.021	0.021	0.022	0.019	0.022	0.022	0.023	0.021	
1375	0.018	0.018	0.020	0.021	0.020	0.022	0.018	0.019	0.020	0.021	0.021	
1425	0.018	0.018	0.020	0.021	0.020	0.023	0.018	0.019	0.019	0.020	0.021	
1475	0.018	0.018	0.020	0.021	0.021	0.022	0.018	0.018	0.019	0.021	0.020	
1525	0.018	0.018	0.020	0.021	0.021	0.022	0.018	0.018	0.019	0.020	0.020	
1575	0.018	0.018	0.020	0.021	0.020	0.022	0.018	0.018	0.019	0.020	0.020	
1625	0.018	0.018	0.019	0.020	0.020	0.021	0.017	0.018	0.019	0.020	0.019	
1675	0.018	0.018	0.019	0.020	0.019	0.020	0.017	0.017	0.018	0.019	0.018	
1725	0.018	0.018	0.019	0.020	0.019	0.019	0.016	0.017	0.018	0.018	0.018	
1775	0.018	0.018	0.018	0.019	0.018	0.020	0.016	0.017	0.018	0.018	0.017	
1825	0.018	0.018	0.019	0.019	0.019	0.019	0.016	0.017	0.018	0.019	0.017	
1875	0.018	0.018	0.018	0.019	0.018	0.019	0.016	0.017	0.018	0.018	0.017	
1925	0.018	0.018	0.018	0.018	0.018	0.019	0.016	0.017	0.018	0.018	0.018	
1975	0.018	0.018	0.018	0.019	0.018	0.020	0.016	0.017	0.018	0.018	0.018	

Note(s):
The worst value of three phases shall be determined.

Higher frequencies-L2											
Parameter	P=Discharge power						P=Charge power				
	0	20	40	60	80	100	20	40	60	80	100
Active power P/P _{NINV} [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
Frequency [kHz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
2.1	0.068	0.073	0.069	0.084	0.085	0.113	0.074	0.101	0.087	0.122	0.094
2.3	0.087	0.089	0.082	0.087	0.100	0.107	0.074	0.066	0.089	0.092	0.110
2.5	0.092	0.082	0.089	0.092	0.099	0.097	0.079	0.076	0.090	0.081	0.099
2.7	0.078	0.070	0.067	0.068	0.075	0.077	0.070	0.083	0.090	0.097	0.103
2.9	0.089	0.089	0.094	0.083	0.081	0.083	0.081	0.076	0.079	0.086	0.072
3.1	0.087	0.093	0.079	0.089	0.079	0.086	0.087	0.087	0.086	0.086	0.077
3.3	0.074	0.074	0.065	0.069	0.074	0.074	0.079	0.085	0.091	0.094	0.095
3.5	0.086	0.099	0.094	0.086	0.087	0.085	0.085	0.090	0.093	0.085	0.087
3.7	0.254	0.252	0.255	0.255	0.258	0.258	0.257	0.256	0.256	0.254	0.254
3.9	0.261	0.265	0.262	0.263	0.262	0.266	0.268	0.266	0.268	0.273	0.276
4.1	0.080	0.087	0.079	0.084	0.084	0.083	0.087	0.095	0.097	0.095	0.092
4.3	0.092	0.097	0.097	0.102	0.100	0.122	0.102	0.107	0.105	0.099	0.097
4.5	0.078	0.078	0.087	0.097	0.107	0.116	0.087	0.094	0.108	0.118	0.118
4.7	0.107	0.109	0.125	0.134	0.146	0.158	0.123	0.128	0.135	0.144	0.141
4.9	0.101	0.094	0.104	0.113	0.140	0.153	0.112	0.123	0.137	0.159	0.170
5.1	0.099	0.107	0.100	0.118	0.147	0.167	0.097	0.104	0.118	0.146	0.157
5.3	0.088	0.095	0.102	0.112	0.124	0.132	0.087	0.090	0.100	0.117	0.125
5.5	0.085	0.089	0.090	0.095	0.104	0.107	0.087	0.087	0.087	0.095	0.101
5.7	0.073	0.074	0.071	0.071	0.076	0.083	0.077	0.075	0.077	0.083	0.085
5.9	0.061	0.063	0.066	0.073	0.080	0.085	0.065	0.068	0.071	0.074	0.076
6.1	0.066	0.070	0.071	0.072	0.073	0.074	0.064	0.062	0.063	0.066	0.067
6.3	0.066	0.063	0.059	0.061	0.062	0.064	0.067	0.067	0.066	0.064	0.064
6.5	0.058	0.057	0.058	0.060	0.062	0.065	0.059	0.061	0.064	0.066	0.064

CEI 0-16												
Clause	Requirement - Test						Result - Remark				Verdict	
6.7	0.053	0.055	0.057	0.060	0.061	0.061	0.054	0.056	0.059	0.062	0.063	
6.9	0.057	0.059	0.059	0.058	0.057	0.057	0.056	0.054	0.054	0.055	0.057	
7.1	0.052	0.051	0.050	0.052	0.054	0.056	0.055	0.055	0.054	0.054	0.054	
7.3	0.048	0.049	0.049	0.052	0.053	0.054	0.049	0.051	0.051	0.053	0.054	
7.5	0.049	0.050	0.050	0.051	0.052	0.052	0.051	0.051	0.051	0.052	0.054	
7.7	0.047	0.049	0.048	0.051	0.051	0.053	0.048	0.049	0.050	0.051	0.051	
7.9	0.047	0.047	0.047	0.049	0.050	0.051	0.048	0.048	0.049	0.050	0.050	
8.1	0.049	0.050	0.050	0.051	0.051	0.051	0.048	0.048	0.049	0.050	0.051	
8.3	0.049	0.049	0.049	0.051	0.051	0.052	0.049	0.049	0.049	0.050	0.051	
8.5	0.049	0.049	0.048	0.050	0.050	0.051	0.049	0.049	0.049	0.050	0.051	
8.7	0.051	0.050	0.050	0.051	0.051	0.051	0.052	0.051	0.051	0.050	0.051	
8.9	0.049	0.049	0.049	0.050	0.050	0.051	0.049	0.049	0.051	0.051	0.052	
Note(s): The worst value of three phases shall be determined.												

Harmonics and inter-harmonics-L3						AF60K-TH + ATOM HS-15.36						
Parameter	P=Discharge power						P=Charge power					
Active power P/P _{NINV} [%]	0	20	40	60	80	100	20	40	60	80	100	
Harmonic number	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	
1	3.597	18.539	36.540	54.779	72.604	91.130	18.709	36.789	54.823	73.074	91.164	
2	0.250	0.621	0.625	0.778	0.784	0.853	0.551	0.745	0.932	1.173	1.067	
3	1.604	1.549	2.054	2.305	2.485	2.593	1.659	1.206	0.946	0.551	0.301	
4	0.187	0.488	0.255	0.473	0.603	0.607	0.291	0.353	0.336	0.333	0.110	
5	2.156	2.796	2.706	2.169	1.645	1.292	2.050	2.825	3.383	3.767	4.023	
6	0.239	0.348	0.183	0.252	0.450	0.529	0.279	0.189	0.328	0.693	0.702	
7	1.573	0.936	1.633	1.669	1.389	1.093	1.534	1.640	1.920	2.188	2.403	
8	0.143	0.182	0.115	0.119	0.261	0.327	0.065	0.089	0.069	0.082	0.066	
9	0.350	0.420	0.381	0.345	0.276	0.245	0.396	0.512	0.414	0.119	0.172	
10	0.037	0.159	0.141	0.040	0.165	0.249	0.108	0.087	0.057	0.040	0.020	
11	0.688	0.765	0.455	0.550	0.625	0.566	1.004	1.015	1.008	0.922	0.936	
12	0.077	0.181	0.312	0.172	0.088	0.277	0.194	0.038	0.096	0.150	0.205	
13	0.494	0.433	0.553	0.339	0.384	0.401	0.663	0.817	0.851	0.738	0.695	
14	0.043	0.082	0.156	0.135	0.033	0.117	0.025	0.055	0.041	0.034	0.044	
15	0.180	0.183	0.176	0.201	0.120	0.153	0.161	0.131	0.109	0.084	0.108	
16	0.060	0.142	0.067	0.143	0.046	0.065	0.050	0.061	0.039	0.031	0.020	
17	0.237	0.290	0.299	0.268	0.202	0.179	0.326	0.307	0.455	0.533	0.507	
18	0.133	0.223	0.032	0.227	0.146	0.082	0.040	0.128	0.104	0.167	0.207	
19	0.215	0.262	0.211	0.235	0.217	0.125	0.289	0.209	0.325	0.429	0.452	
20	0.055	0.045	0.083	0.092	0.076	0.039	0.046	0.023	0.026	0.025	0.016	
21	0.069	0.053	0.114	0.109	0.112	0.046	0.073	0.047	0.043	0.065	0.069	
22	0.066	0.058	0.085	0.030	0.074	0.051	0.061	0.025	0.026	0.025	0.031	
23	0.110	0.130	0.142	0.160	0.152	0.210	0.116	0.184	0.116	0.232	0.309	
24	0.118	0.134	0.171	0.066	0.194	0.122	0.113	0.088	0.042	0.119	0.137	
25	0.117	0.115	0.120	0.146	0.087	0.179	0.088	0.152	0.095	0.167	0.280	
26	0.045	0.052	0.037	0.039	0.031	0.047	0.033	0.059	0.031	0.035	0.044	
27	0.046	0.029	0.039	0.118	0.109	0.125	0.023	0.041	0.044	0.035	0.023	
28	0.052	0.030	0.037	0.036	0.042	0.046	0.036	0.035	0.023	0.038	0.043	
29	0.061	0.076	0.112	0.083	0.121	0.100	0.051	0.040	0.099	0.077	0.157	

CEI 0-16												
Clause	Requirement - Test						Result - Remark					Verdict
30	0.065	0.070	0.056	0.113	0.092	0.123	0.062	0.048	0.056	0.061	0.065	
31	0.052	0.034	0.058	0.034	0.063	0.055	0.041	0.025	0.080	0.068	0.115	
32	0.029	0.050	0.054	0.088	0.051	0.095	0.062	0.029	0.028	0.021	0.025	
33	0.050	0.023	0.046	0.032	0.083	0.057	0.032	0.020	0.061	0.056	0.042	
34	0.026	0.026	0.048	0.061	0.061	0.073	0.037	0.018	0.023	0.027	0.024	
35	0.016	0.020	0.020	0.023	0.046	0.044	0.023	0.019	0.064	0.061	0.041	
36	0.020	0.038	0.045	0.041	0.077	0.061	0.027	0.019	0.018	0.049	0.039	
37	0.022	0.052	0.021	0.037	0.029	0.042	0.029	0.027	0.064	0.055	0.028	
38	0.023	0.043	0.045	0.045	0.061	0.045	0.028	0.027	0.016	0.022	0.013	
39	0.036	0.022	0.042	0.033	0.020	0.024	0.036	0.031	0.017	0.032	0.027	
40	0.020	0.036	0.045	0.041	0.039	0.041	0.025	0.032	0.019	0.020	0.016	
41	0.040	0.032	0.026	0.022	0.030	0.040	0.036	0.060	0.047	0.075	0.043	
42	0.033	0.036	0.071	0.066	0.061	0.045	0.022	0.034	0.019	0.031	0.043	
43	0.041	0.047	0.032	0.026	0.028	0.039	0.038	0.065	0.052	0.077	0.051	
44	0.028	0.038	0.035	0.039	0.031	0.047	0.018	0.025	0.018	0.020	0.018	
45	0.033	0.027	0.019	0.018	0.017	0.029	0.039	0.031	0.018	0.032	0.046	
46	0.027	0.027	0.037	0.029	0.032	0.040	0.018	0.018	0.020	0.020	0.020	
47	0.047	0.026	0.023	0.026	0.029	0.031	0.038	0.051	0.067	0.067	0.080	
48	0.047	0.038	0.049	0.049	0.049	0.061	0.014	0.019	0.020	0.027	0.033	
49	0.041	0.024	0.018	0.028	0.023	0.028	0.036	0.046	0.065	0.056	0.077	
50	0.028	0.036	0.042	0.037	0.048	0.049	0.018	0.017	0.020	0.019	0.019	

Note(s):
1. The limit of harmonic current shall be determined case by case per EN 61000-3-2 or EN 61000-3-12.
2. The worst value of three phases shall be determined.

Intern-harmonics-L3												
Parameter	P=Discharge power						P=Charge power					
Active power P/P _{NINV} [%]	0	20	40	60	80	100	20	40	60	80	100	
Frequency [Hz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	
75	0.047	0.060	0.067	0.103	0.087	0.138	0.056	0.096	0.140	0.195	0.107	
125	0.046	0.051	0.055	0.066	0.072	0.093	0.043	0.054	0.059	0.082	0.059	
175	0.029	0.033	0.031	0.039	0.033	0.042	0.031	0.040	0.041	0.056	0.040	
225	0.034	0.038	0.038	0.041	0.038	0.041	0.035	0.045	0.047	0.074	0.043	
275	0.026	0.032	0.029	0.035	0.031	0.033	0.028	0.036	0.049	0.051	0.038	
325	0.035	0.036	0.038	0.039	0.036	0.038	0.034	0.039	0.043	0.049	0.044	
375	0.025	0.027	0.027	0.032	0.028	0.032	0.026	0.034	0.038	0.041	0.033	
425	0.026	0.028	0.029	0.031	0.030	0.033	0.027	0.030	0.031	0.036	0.031	
475	0.023	0.024	0.024	0.026	0.026	0.028	0.023	0.027	0.028	0.036	0.028	
525	0.027	0.029	0.029	0.032	0.030	0.034	0.027	0.031	0.032	0.036	0.031	
575	0.021	0.023	0.023	0.025	0.024	0.026	0.022	0.028	0.029	0.032	0.027	
625	0.022	0.023	0.024	0.026	0.025	0.028	0.022	0.026	0.029	0.031	0.026	
675	0.021	0.023	0.023	0.024	0.023	0.026	0.022	0.028	0.026	0.031	0.026	
725	0.021	0.022	0.023	0.025	0.023	0.026	0.022	0.024	0.025	0.028	0.023	
775	0.020	0.020	0.021	0.023	0.022	0.024	0.020	0.022	0.023	0.026	0.022	
825	0.021	0.021	0.021	0.023	0.022	0.024	0.021	0.023	0.025	0.028	0.023	
875	0.021	0.020	0.021	0.023	0.022	0.023	0.020	0.023	0.024	0.027	0.024	
925	0.021	0.022	0.022	0.023	0.022	0.023	0.021	0.023	0.026	0.027	0.023	
975	0.021	0.021	0.020	0.023	0.022	0.023	0.021	0.023	0.024	0.028	0.024	
1025	0.020	0.020	0.021	0.022	0.021	0.023	0.020	0.021	0.023	0.025	0.021	

CEI 0-16												
Clause	Requirement - Test						Result - Remark					Verdict
1075	0.020	0.020	0.021	0.022	0.022	0.023	0.021	0.021	0.022	0.025	0.021	
1125	0.021	0.020	0.022	0.023	0.022	0.023	0.021	0.022	0.022	0.026	0.022	
1175	0.020	0.020	0.021	0.023	0.022	0.023	0.020	0.022	0.022	0.025	0.023	
1225	0.020	0.020	0.021	0.023	0.023	0.024	0.020	0.022	0.023	0.026	0.022	
1275	0.020	0.020	0.021	0.023	0.023	0.024	0.020	0.022	0.022	0.025	0.023	
1325	0.020	0.020	0.021	0.023	0.023	0.024	0.020	0.022	0.023	0.024	0.022	
1375	0.020	0.020	0.021	0.023	0.022	0.024	0.020	0.021	0.021	0.023	0.022	
1425	0.020	0.020	0.020	0.023	0.023	0.023	0.020	0.021	0.021	0.024	0.022	
1475	0.019	0.020	0.020	0.023	0.023	0.024	0.020	0.020	0.021	0.023	0.023	
1525	0.020	0.020	0.021	0.023	0.023	0.024	0.019	0.020	0.021	0.022	0.022	
1575	0.020	0.019	0.020	0.022	0.022	0.023	0.019	0.020	0.020	0.022	0.021	
1625	0.019	0.019	0.020	0.021	0.021	0.022	0.019	0.020	0.020	0.022	0.020	
1675	0.020	0.019	0.020	0.021	0.020	0.021	0.018	0.019	0.020	0.021	0.020	
1725	0.019	0.019	0.020	0.021	0.021	0.021	0.018	0.019	0.020	0.021	0.020	
1775	0.019	0.019	0.019	0.020	0.020	0.021	0.018	0.018	0.019	0.020	0.019	
1825	0.020	0.019	0.019	0.022	0.021	0.022	0.018	0.019	0.020	0.021	0.020	
1875	0.019	0.019	0.019	0.020	0.020	0.021	0.018	0.019	0.019	0.021	0.020	
1925	0.020	0.019	0.019	0.020	0.020	0.021	0.018	0.019	0.020	0.022	0.020	
1975	0.020	0.019	0.019	0.020	0.020	0.021	0.019	0.019	0.019	0.021	0.020	

Note(s):
The worst value of three phases shall be determined.

Higher frequencies-L3												
Parameter	P=Discharge power						P=Charge power					
Active power P/P _{NINV} [%]	0	20	40	60	80	100	20	40	60	80	100	
Frequency [kHz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
2.1	0.084	0.089	0.099	0.096	0.092	0.097	0.072	0.107	0.087	0.124	0.092	
2.3	0.091	0.074	0.082	0.080	0.081	0.097	0.073	0.078	0.086	0.094	0.110	
2.5	0.087	0.077	0.079	0.082	0.084	0.084	0.078	0.083	0.087	0.080	0.100	
2.7	0.086	0.076	0.082	0.092	0.094	0.090	0.074	0.087	0.090	0.100	0.109	
2.9	0.090	0.082	0.086	0.075	0.077	0.080	0.084	0.082	0.082	0.091	0.078	
3.1	0.090	0.078	0.075	0.072	0.073	0.075	0.088	0.089	0.084	0.088	0.080	
3.3	0.070	0.073	0.070	0.085	0.078	0.084	0.079	0.087	0.095	0.098	0.100	
3.5	0.089	0.087	0.079	0.077	0.089	0.092	0.092	0.097	0.102	0.095	0.096	
3.7	0.257	0.256	0.257	0.254	0.260	0.262	0.259	0.258	0.257	0.258	0.259	
3.9	0.287	0.293	0.291	0.293	0.293	0.295	0.294	0.291	0.294	0.302	0.304	
4.1	0.082	0.085	0.076	0.081	0.089	0.087	0.088	0.096	0.100	0.100	0.097	
4.3	0.090	0.091	0.094	0.099	0.094	0.095	0.097	0.103	0.100	0.092	0.095	
4.5	0.089	0.093	0.085	0.089	0.095	0.100	0.088	0.092	0.110	0.120	0.116	
4.7	0.112	0.119	0.115	0.112	0.137	0.137	0.118	0.130	0.145	0.156	0.152	
4.9	0.095	0.096	0.096	0.103	0.126	0.145	0.099	0.109	0.125	0.151	0.165	
5.1	0.094	0.095	0.104	0.121	0.159	0.182	0.098	0.098	0.112	0.141	0.160	
5.3	0.090	0.091	0.102	0.109	0.124	0.150	0.092	0.096	0.105	0.119	0.130	
5.5	0.088	0.089	0.091	0.099	0.111	0.119	0.089	0.092	0.092	0.100	0.110	
5.7	0.077	0.076	0.074	0.077	0.084	0.092	0.080	0.082	0.084	0.087	0.091	
5.9	0.066	0.069	0.075	0.084	0.089	0.092	0.068	0.071	0.074	0.077	0.079	
6.1	0.068	0.072	0.076	0.080	0.080	0.080	0.066	0.066	0.068	0.072	0.074	
6.3	0.070	0.069	0.068	0.069	0.069	0.073	0.070	0.069	0.068	0.069	0.070	

CEI 0-16												
Clause	Requirement - Test						Result - Remark					Verdict
6.5	0.064	0.062	0.064	0.066	0.068	0.072	0.065	0.068	0.070	0.072	0.072	0.072
6.7	0.058	0.061	0.063	0.066	0.068	0.070	0.059	0.061	0.064	0.067	0.067	0.068
6.9	0.064	0.064	0.063	0.064	0.063	0.064	0.061	0.061	0.061	0.063	0.063	0.065
7.1	0.056	0.055	0.055	0.060	0.061	0.064	0.058	0.059	0.059	0.060	0.060	0.061
7.3	0.055	0.055	0.055	0.059	0.061	0.063	0.057	0.058	0.059	0.061	0.061	0.061
7.5	0.054	0.055	0.056	0.058	0.059	0.060	0.056	0.056	0.058	0.059	0.060	0.060
7.7	0.053	0.053	0.054	0.056	0.056	0.058	0.055	0.055	0.057	0.058	0.058	0.058
7.9	0.051	0.052	0.054	0.056	0.057	0.058	0.053	0.054	0.056	0.057	0.057	0.057
8.1	0.054	0.056	0.055	0.057	0.057	0.058	0.054	0.054	0.056	0.056	0.056	0.057
8.3	0.053	0.054	0.054	0.056	0.057	0.058	0.055	0.055	0.056	0.056	0.056	0.058
8.5	0.055	0.055	0.054	0.056	0.058	0.058	0.057	0.056	0.056	0.057	0.057	0.058
8.7	0.056	0.056	0.055	0.056	0.057	0.058	0.057	0.057	0.058	0.058	0.058	0.058
8.9	0.052	0.054	0.054	0.056	0.058	0.059	0.054	0.054	0.057	0.058	0.058	0.059

Note(s):
The worst value of three phases shall be determined.

Harmonics and inter-harmonics-L1						AF36K-TH + ATOM HS-15.36					
Parameter	P=Discharge power						P=Charge power				
Active power P/P _{NINV} [%]	0	20	40	60	80	100	20	40	60	80	100
Harmonic number	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
1	3.575	18.737	37.089	55.200	73.173	91.590	19.118	37.048	55.200	73.600	91.582
2	0.308	0.355	0.780	0.986	1.160	1.436	0.370	0.631	0.841	1.145	1.570
3	1.673	1.378	2.031	2.246	2.452	2.604	1.635	1.113	0.836	0.375	0.224
4	0.059	0.629	0.308	0.321	0.385	0.397	0.200	0.141	0.094	0.206	0.111
5	2.221	2.981	2.777	2.340	1.776	1.270	1.985	2.792	3.345	3.745	4.073
6	0.150	0.209	0.057	0.163	0.224	0.262	0.114	0.271	0.517	0.830	0.828
7	1.569	0.969	1.592	1.722	1.470	1.123	1.503	1.645	1.891	2.134	2.296
8	0.074	0.097	0.091	0.064	0.098	0.159	0.072	0.098	0.084	0.166	0.203
9	0.332	0.116	0.331	0.426	0.392	0.283	0.402	0.542	0.481	0.169	0.133
10	0.043	0.090	0.137	0.041	0.108	0.179	0.066	0.124	0.076	0.083	0.128
11	0.687	0.731	0.427	0.544	0.741	0.661	1.057	1.024	0.979	0.945	0.981
12	0.037	0.065	0.091	0.036	0.042	0.092	0.124	0.050	0.107	0.093	0.143
13	0.490	0.342	0.557	0.219	0.432	0.495	0.681	0.794	0.823	0.759	0.682
14	0.070	0.048	0.121	0.098	0.043	0.076	0.051	0.111	0.045	0.046	0.075
15	0.108	0.136	0.161	0.088	0.202	0.187	0.173	0.065	0.086	0.105	0.105
16	0.083	0.181	0.102	0.107	0.043	0.094	0.034	0.121	0.021	0.026	0.061
17	0.251	0.373	0.308	0.325	0.139	0.209	0.351	0.357	0.498	0.550	0.534
18	0.073	0.109	0.027	0.062	0.049	0.031	0.061	0.146	0.098	0.085	0.150
19	0.203	0.257	0.153	0.319	0.191	0.138	0.278	0.204	0.330	0.434	0.439
20	0.077	0.062	0.040	0.095	0.110	0.041	0.077	0.068	0.094	0.087	0.050
21	0.021	0.062	0.065	0.076	0.065	0.110	0.030	0.060	0.020	0.067	0.082
22	0.097	0.067	0.080	0.067	0.088	0.046	0.140	0.091	0.077	0.052	0.046
23	0.130	0.232	0.207	0.117	0.194	0.143	0.128	0.210	0.149	0.241	0.318
24	0.072	0.061	0.038	0.038	0.035	0.073	0.101	0.085	0.120	0.119	0.087
25	0.106	0.168	0.195	0.115	0.229	0.184	0.094	0.164	0.115	0.152	0.248
26	0.056	0.028	0.046	0.067	0.103	0.122	0.020	0.048	0.036	0.054	0.062
27	0.037	0.032	0.093	0.036	0.129	0.065	0.040	0.050	0.083	0.041	0.026
28	0.075	0.023	0.059	0.059	0.099	0.055	0.092	0.102	0.075	0.046	0.077

CEI 0-16												
Clause	Requirement - Test						Result - Remark					Verdict
29	0.072	0.094	0.077	0.135	0.089	0.145	0.084	0.051	0.112	0.066	0.146	
30	0.052	0.059	0.031	0.039	0.043	0.059	0.076	0.074	0.095	0.064	0.047	
31	0.057	0.093	0.103	0.144	0.072	0.133	0.041	0.026	0.097	0.051	0.099	
32	0.038	0.026	0.043	0.039	0.025	0.043	0.066	0.028	0.069	0.040	0.045	
33	0.044	0.049	0.085	0.094	0.065	0.110	0.018	0.023	0.061	0.061	0.046	
34	0.037	0.044	0.052	0.050	0.032	0.070	0.074	0.054	0.077	0.053	0.039	
35	0.033	0.029	0.053	0.046	0.049	0.074	0.028	0.021	0.045	0.059	0.040	
36	0.026	0.018	0.045	0.036	0.034	0.051	0.056	0.052	0.064	0.069	0.045	
37	0.031	0.041	0.026	0.023	0.052	0.061	0.023	0.026	0.047	0.056	0.027	
38	0.023	0.051	0.028	0.031	0.065	0.058	0.043	0.053	0.024	0.062	0.032	
39	0.043	0.040	0.027	0.033	0.055	0.029	0.020	0.017	0.017	0.033	0.032	
40	0.020	0.046	0.026	0.026	0.036	0.031	0.038	0.049	0.030	0.055	0.030	
41	0.023	0.022	0.023	0.041	0.048	0.052	0.039	0.058	0.042	0.065	0.041	
42	0.023	0.043	0.037	0.034	0.043	0.034	0.036	0.047	0.043	0.064	0.053	
43	0.041	0.026	0.028	0.033	0.035	0.043	0.043	0.056	0.049	0.073	0.060	
44	0.034	0.056	0.062	0.057	0.052	0.037	0.028	0.018	0.038	0.045	0.047	
45	0.041	0.058	0.061	0.067	0.046	0.028	0.035	0.033	0.015	0.030	0.051	
46	0.031	0.039	0.041	0.029	0.033	0.024	0.026	0.021	0.038	0.042	0.047	
47	0.033	0.023	0.018	0.023	0.038	0.053	0.039	0.045	0.065	0.060	0.075	
48	0.032	0.048	0.028	0.032	0.028	0.030	0.025	0.026	0.051	0.057	0.060	
49	0.043	0.027	0.026	0.023	0.026	0.035	0.037	0.040	0.067	0.051	0.080	
50	0.043	0.042	0.039	0.032	0.036	0.049	0.019	0.022	0.039	0.027	0.039	

Note(s):
1. The limit of harmonic current shall be determined case by case per EN 61000-3-2 or EN 61000-3-12.
2. The worst value of three phases shall be determined.

Intern-harmonics-L1												
Parameter	P=Discharge power						P=Charge power					
	0	20	40	60	80	100	20	40	60	80	100	
Active power P/P _{NINV} [%]												
Frequency [Hz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	
75	0.047	0.054	0.076	0.077	0.153	0.278	0.056	0.075	0.073	0.082	0.089	
125	0.037	0.046	0.054	0.061	0.085	0.114	0.038	0.040	0.040	0.044	0.045	
175	0.028	0.030	0.033	0.032	0.043	0.066	0.030	0.033	0.032	0.034	0.034	
225	0.027	0.029	0.033	0.031	0.038	0.050	0.028	0.032	0.031	0.033	0.033	
275	0.026	0.027	0.031	0.029	0.038	0.048	0.028	0.031	0.031	0.031	0.034	
325	0.030	0.031	0.035	0.033	0.038	0.047	0.030	0.033	0.033	0.033	0.034	
375	0.025	0.026	0.029	0.028	0.035	0.043	0.026	0.028	0.027	0.029	0.029	
425	0.022	0.023	0.025	0.026	0.030	0.037	0.023	0.025	0.024	0.026	0.026	
475	0.023	0.023	0.026	0.026	0.031	0.036	0.024	0.026	0.025	0.026	0.026	
525	0.025	0.027	0.028	0.028	0.032	0.037	0.026	0.028	0.027	0.028	0.028	
575	0.022	0.023	0.024	0.025	0.031	0.037	0.023	0.025	0.025	0.025	0.026	
625	0.021	0.021	0.024	0.023	0.027	0.033	0.023	0.024	0.024	0.024	0.025	
675	0.022	0.022	0.025	0.025	0.029	0.033	0.022	0.025	0.024	0.024	0.024	
725	0.021	0.022	0.023	0.023	0.026	0.031	0.021	0.023	0.023	0.023	0.023	
775	0.021	0.021	0.023	0.023	0.025	0.028	0.021	0.022	0.022	0.023	0.023	
825	0.020	0.022	0.023	0.023	0.025	0.029	0.021	0.023	0.022	0.023	0.023	
875	0.021	0.022	0.023	0.023	0.025	0.029	0.021	0.022	0.023	0.023	0.022	
925	0.020	0.022	0.023	0.023	0.025	0.028	0.021	0.022	0.023	0.023	0.024	
975	0.021	0.021	0.023	0.023	0.025	0.027	0.022	0.022	0.022	0.023	0.022	

CEI 0-16												
Clause	Requirement - Test							Result - Remark				Verdict
1025	0.020	0.020	0.022	0.023	0.024	0.027	0.020	0.022	0.021	0.022	0.022	0.022
1075	0.021	0.021	0.023	0.023	0.025	0.028	0.021	0.021	0.021	0.022	0.022	0.022
1125	0.020	0.021	0.023	0.023	0.025	0.026	0.022	0.022	0.022	0.023	0.023	0.023
1175	0.020	0.020	0.023	0.023	0.024	0.028	0.021	0.022	0.022	0.023	0.023	0.022
1225	0.021	0.021	0.023	0.023	0.025	0.028	0.021	0.022	0.022	0.023	0.023	0.023
1275	0.020	0.021	0.023	0.023	0.026	0.028	0.021	0.022	0.022	0.023	0.023	0.023
1325	0.020	0.020	0.023	0.023	0.025	0.027	0.021	0.022	0.022	0.023	0.023	0.023
1375	0.021	0.020	0.023	0.023	0.025	0.027	0.021	0.021	0.022	0.022	0.023	0.023
1425	0.020	0.020	0.022	0.023	0.025	0.027	0.020	0.021	0.021	0.022	0.023	0.023
1475	0.020	0.020	0.022	0.023	0.025	0.027	0.020	0.021	0.021	0.022	0.023	0.023
1525	0.020	0.020	0.023	0.023	0.025	0.026	0.020	0.021	0.022	0.022	0.023	0.023
1575	0.021	0.020	0.023	0.023	0.024	0.026	0.020	0.020	0.021	0.021	0.021	0.021
1625	0.020	0.020	0.023	0.023	0.024	0.026	0.020	0.020	0.020	0.021	0.021	0.021
1675	0.020	0.020	0.022	0.022	0.023	0.026	0.020	0.020	0.021	0.021	0.021	0.021
1725	0.020	0.020	0.022	0.022	0.023	0.025	0.019	0.020	0.020	0.021	0.020	0.020
1775	0.020	0.020	0.022	0.021	0.023	0.024	0.019	0.019	0.020	0.020	0.020	0.020
1825	0.021	0.020	0.022	0.022	0.023	0.024	0.020	0.020	0.020	0.020	0.020	0.020
1875	0.020	0.020	0.022	0.021	0.023	0.024	0.019	0.020	0.020	0.020	0.020	0.020
1925	0.020	0.020	0.021	0.022	0.023	0.024	0.020	0.020	0.020	0.021	0.020	0.020
1975	0.020	0.020	0.021	0.022	0.023	0.024	0.020	0.020	0.020	0.020	0.020	0.020

Note(s):
The worst value of three phases shall be determined.

Higher frequencies-L1											
Parameter	P=Discharge power						P=Charge power				
Active power P/P _{NINV} [%]	0	20	40	60	80	100	20	40	60	80	100
Frequency [kHz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
2.1	0.077	0.091	0.094	0.097	0.104	0.100	0.084	0.105	0.097	0.133	0.111
2.3	0.083	0.102	0.095	0.097	0.089	0.089	0.078	0.079	0.102	0.108	0.127
2.5	0.096	0.100	0.094	0.074	0.082	0.094	0.074	0.076	0.100	0.087	0.116
2.7	0.095	0.086	0.087	0.085	0.092	0.095	0.077	0.089	0.097	0.106	0.113
2.9	0.092	0.092	0.088	0.098	0.093	0.090	0.086	0.086	0.093	0.102	0.085
3.1	0.094	0.096	0.102	0.086	0.088	0.084	0.083	0.087	0.088	0.088	0.086
3.3	0.087	0.089	0.077	0.079	0.071	0.075	0.085	0.097	0.107	0.101	0.106
3.5	0.086	0.082	0.085	0.091	0.088	0.089	0.096	0.100	0.106	0.100	0.110
3.7	0.334	0.330	0.331	0.334	0.333	0.332	0.329	0.327	0.329	0.327	0.328
3.9	0.281	0.287	0.286	0.286	0.286	0.286	0.291	0.293	0.299	0.302	0.302
4.1	0.091	0.089	0.089	0.089	0.098	0.099	0.097	0.103	0.106	0.108	0.109
4.3	0.100	0.100	0.106	0.121	0.126	0.125	0.100	0.105	0.103	0.095	0.102
4.5	0.093	0.087	0.092	0.102	0.105	0.107	0.103	0.107	0.120	0.128	0.131
4.7	0.115	0.113	0.120	0.133	0.152	0.164	0.131	0.138	0.143	0.145	0.151
4.9	0.100	0.095	0.100	0.117	0.143	0.169	0.110	0.120	0.128	0.149	0.167
5.1	0.108	0.109	0.114	0.127	0.149	0.170	0.104	0.110	0.119	0.141	0.158
5.3	0.095	0.097	0.103	0.111	0.120	0.141	0.092	0.095	0.104	0.122	0.134
5.5	0.089	0.096	0.097	0.101	0.112	0.121	0.088	0.088	0.094	0.105	0.115
5.7	0.082	0.082	0.082	0.084	0.088	0.092	0.080	0.078	0.082	0.088	0.092
5.9	0.070	0.069	0.074	0.079	0.084	0.090	0.070	0.073	0.074	0.079	0.084
6.1	0.072	0.074	0.074	0.075	0.080	0.083	0.068	0.068	0.070	0.073	0.076

CEI 0-16												
Clause	Requirement - Test						Result - Remark					Verdict
6.3	0.074	0.071	0.070	0.072	0.075	0.079	0.074	0.075	0.074	0.073	0.072	
6.5	0.066	0.064	0.066	0.069	0.073	0.078	0.066	0.069	0.074	0.077	0.075	
6.7	0.065	0.065	0.069	0.071	0.074	0.075	0.063	0.064	0.067	0.070	0.071	
6.9	0.065	0.066	0.065	0.066	0.066	0.069	0.063	0.062	0.063	0.065	0.067	
7.1	0.062	0.060	0.060	0.061	0.063	0.066	0.061	0.062	0.061	0.063	0.064	
7.3	0.059	0.058	0.059	0.059	0.063	0.065	0.058	0.059	0.060	0.061	0.062	
7.5	0.058	0.057	0.059	0.060	0.061	0.064	0.057	0.059	0.059	0.060	0.061	
7.7	0.057	0.056	0.057	0.059	0.061	0.063	0.056	0.057	0.058	0.060	0.060	
7.9	0.057	0.057	0.059	0.059	0.061	0.063	0.056	0.057	0.059	0.059	0.059	
8.1	0.058	0.057	0.059	0.060	0.061	0.062	0.056	0.056	0.058	0.060	0.061	
8.3	0.059	0.058	0.058	0.059	0.061	0.061	0.057	0.057	0.057	0.059	0.059	
8.5	0.060	0.058	0.059	0.059	0.061	0.061	0.059	0.058	0.058	0.059	0.059	
8.7	0.059	0.057	0.058	0.059	0.060	0.061	0.058	0.058	0.058	0.059	0.060	
8.9	0.058	0.058	0.059	0.060	0.061	0.062	0.059	0.058	0.059	0.059	0.061	
Note(s): The worst value of three phases shall be determined.												

Harmonics and inter-harmonics-L2						AF36K-TH + ATOM HS-15.36						
Parameter	P=Discharge power						P=Charge power					
Active power P/P _{NINV} [%]	0	20	40	60	80	100	20	40	60	80	100	
Harmonic number	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	
1	3.423	18.699	36.985	54.782	72.756	91.173	18.773	36.600	54.782	73.084	90.772	
2	0.299	0.729	0.644	0.867	1.048	1.332	0.446	0.659	0.777	1.010	1.522	
3	1.790	1.631	2.176	2.331	2.506	2.628	1.773	1.399	1.177	0.767	0.483	
4	0.111	0.550	0.189	0.119	0.150	0.202	0.123	0.164	0.236	0.226	0.188	
5	2.346	3.090	2.799	2.385	1.877	1.444	2.162	2.976	3.483	3.785	4.000	
6	0.118	0.207	0.172	0.321	0.435	0.490	0.105	0.217	0.427	0.728	0.735	
7	1.567	0.992	1.611	1.662	1.384	1.062	1.544	1.686	1.913	2.167	2.448	
8	0.052	0.247	0.107	0.112	0.240	0.310	0.060	0.151	0.091	0.107	0.145	
9	0.368	0.194	0.391	0.421	0.383	0.294	0.405	0.549	0.443	0.155	0.147	
10	0.018	0.166	0.125	0.058	0.086	0.186	0.091	0.033	0.043	0.126	0.190	
11	0.739	0.700	0.533	0.579	0.727	0.684	1.063	1.038	0.993	0.927	0.946	
12	0.044	0.125	0.199	0.110	0.080	0.213	0.087	0.049	0.094	0.118	0.170	
13	0.465	0.436	0.555	0.315	0.445	0.459	0.674	0.792	0.849	0.820	0.779	
14	0.064	0.057	0.156	0.121	0.040	0.142	0.030	0.064	0.027	0.048	0.080	
15	0.150	0.175	0.183	0.158	0.177	0.141	0.169	0.122	0.118	0.094	0.130	
16	0.069	0.158	0.054	0.133	0.092	0.059	0.049	0.109	0.069	0.071	0.062	
17	0.263	0.352	0.319	0.344	0.207	0.192	0.354	0.321	0.467	0.520	0.498	
18	0.067	0.110	0.041	0.141	0.115	0.036	0.038	0.112	0.079	0.098	0.157	
19	0.194	0.266	0.207	0.267	0.183	0.203	0.284	0.228	0.330	0.446	0.469	
20	0.078	0.067	0.082	0.092	0.087	0.051	0.104	0.092	0.056	0.038	0.021	
21	0.051	0.089	0.066	0.079	0.086	0.049	0.035	0.040	0.043	0.059	0.072	
22	0.079	0.093	0.098	0.035	0.130	0.067	0.092	0.040	0.061	0.089	0.053	
23	0.119	0.211	0.206	0.129	0.182	0.163	0.126	0.192	0.113	0.219	0.298	
24	0.064	0.061	0.079	0.050	0.087	0.065	0.102	0.074	0.088	0.129	0.102	
25	0.113	0.144	0.140	0.120	0.129	0.169	0.094	0.165	0.111	0.174	0.259	
26	0.068	0.079	0.103	0.026	0.107	0.044	0.099	0.102	0.059	0.050	0.059	
27	0.042	0.072	0.066	0.093	0.086	0.120	0.034	0.051	0.053	0.039	0.019	

CEI 0-16												
Clause	Requirement - Test						Result - Remark					Verdict
28	0.054	0.057	0.045	0.065	0.041	0.092	0.021	0.030	0.026	0.048	0.049	
29	0.067	0.106	0.097	0.128	0.099	0.148	0.066	0.043	0.103	0.066	0.139	
30	0.046	0.027	0.031	0.064	0.041	0.076	0.055	0.062	0.063	0.067	0.061	
31	0.068	0.069	0.083	0.065	0.112	0.084	0.036	0.023	0.079	0.055	0.095	
32	0.034	0.079	0.069	0.101	0.054	0.095	0.072	0.050	0.078	0.038	0.038	
33	0.049	0.061	0.060	0.064	0.101	0.075	0.018	0.017	0.055	0.053	0.048	
34	0.030	0.024	0.064	0.056	0.039	0.054	0.031	0.019	0.051	0.044	0.033	
35	0.037	0.041	0.023	0.042	0.065	0.043	0.030	0.018	0.051	0.049	0.039	
36	0.021	0.047	0.041	0.033	0.051	0.051	0.027	0.028	0.049	0.060	0.033	
37	0.036	0.039	0.039	0.034	0.037	0.048	0.028	0.023	0.045	0.045	0.023	
38	0.015	0.046	0.023	0.029	0.046	0.030	0.018	0.024	0.029	0.048	0.022	
39	0.051	0.064	0.048	0.044	0.026	0.037	0.034	0.016	0.015	0.023	0.027	
40	0.019	0.042	0.045	0.049	0.068	0.049	0.032	0.040	0.018	0.052	0.031	
41	0.031	0.023	0.026	0.023	0.023	0.063	0.038	0.060	0.046	0.060	0.035	
42	0.019	0.040	0.035	0.049	0.045	0.051	0.023	0.033	0.028	0.058	0.046	
43	0.029	0.030	0.021	0.022	0.045	0.059	0.042	0.058	0.049	0.068	0.047	
44	0.027	0.023	0.027	0.042	0.033	0.034	0.014	0.021	0.023	0.035	0.040	
45	0.053	0.053	0.044	0.028	0.029	0.039	0.042	0.031	0.017	0.022	0.038	
46	0.032	0.048	0.040	0.053	0.048	0.051	0.018	0.015	0.032	0.035	0.046	
47	0.033	0.018	0.018	0.029	0.042	0.043	0.038	0.037	0.058	0.053	0.065	
48	0.026	0.026	0.032	0.032	0.054	0.055	0.015	0.018	0.041	0.047	0.053	
49	0.034	0.027	0.024	0.031	0.043	0.046	0.039	0.047	0.063	0.054	0.069	
50	0.032	0.023	0.024	0.024	0.036	0.040	0.019	0.017	0.030	0.024	0.037	

Note(s):

- The limit of harmonic current shall be determined case by case per EN 61000-3-2 or EN 61000-3-12.
- The worst value of three phases shall be determined.

Intern-harmonics-L2												
Parameter	P=Discharge power						P=Charge power					
	0	20	40	60	80	100	20	40	60	80	100	
Active power P/P _{NINV} [%]												
Frequency [Hz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	
75	0.047	0.050	0.064	0.075	0.141	0.289	0.049	0.066	0.079	0.076	0.090	
125	0.035	0.040	0.042	0.049	0.067	0.112	0.032	0.039	0.043	0.045	0.052	
175	0.024	0.025	0.027	0.028	0.040	0.059	0.023	0.027	0.031	0.027	0.031	
225	0.034	0.034	0.040	0.038	0.046	0.060	0.035	0.041	0.042	0.041	0.043	
275	0.023	0.027	0.030	0.026	0.031	0.039	0.023	0.028	0.026	0.029	0.029	
325	0.023	0.024	0.028	0.026	0.030	0.037	0.023	0.026	0.026	0.026	0.028	
375	0.021	0.021	0.025	0.024	0.030	0.039	0.021	0.026	0.024	0.025	0.028	
425	0.028	0.027	0.032	0.031	0.035	0.043	0.028	0.031	0.031	0.030	0.032	
475	0.019	0.020	0.021	0.021	0.025	0.032	0.020	0.021	0.021	0.021	0.023	
525	0.020	0.020	0.023	0.021	0.025	0.031	0.021	0.023	0.022	0.022	0.023	
575	0.019	0.020	0.021	0.021	0.026	0.033	0.021	0.023	0.022	0.021	0.022	
625	0.021	0.022	0.024	0.023	0.026	0.031	0.022	0.024	0.023	0.024	0.024	
675	0.019	0.018	0.022	0.020	0.024	0.030	0.019	0.022	0.022	0.021	0.021	
725	0.018	0.018	0.020	0.019	0.021	0.026	0.018	0.019	0.019	0.019	0.020	
775	0.018	0.018	0.019	0.020	0.021	0.025	0.018	0.019	0.019	0.019	0.019	
825	0.018	0.018	0.020	0.019	0.021	0.026	0.019	0.020	0.020	0.020	0.020	
875	0.018	0.019	0.020	0.020	0.022	0.025	0.019	0.020	0.019	0.020	0.020	
925	0.018	0.018	0.020	0.020	0.021	0.024	0.018	0.019	0.019	0.020	0.019	

CEI 0-16												
Clause	Requirement - Test						Result - Remark					Verdict
975	0.018	0.018	0.019	0.019	0.021	0.024	0.019	0.020	0.020	0.020	0.020	0.020
1025	0.018	0.018	0.020	0.019	0.020	0.023	0.018	0.019	0.019	0.019	0.019	0.019
1075	0.018	0.018	0.019	0.019	0.020	0.023	0.018	0.019	0.018	0.019	0.019	0.019
1125	0.018	0.018	0.020	0.019	0.021	0.023	0.019	0.019	0.019	0.019	0.019	0.019
1175	0.018	0.018	0.020	0.020	0.021	0.023	0.018	0.019	0.019	0.019	0.019	0.020
1225	0.017	0.018	0.020	0.020	0.022	0.023	0.018	0.019	0.019	0.020	0.020	0.019
1275	0.018	0.018	0.020	0.020	0.021	0.025	0.019	0.019	0.020	0.020	0.020	0.020
1325	0.018	0.018	0.020	0.020	0.023	0.023	0.019	0.020	0.020	0.020	0.020	0.020
1375	0.018	0.018	0.020	0.021	0.022	0.024	0.018	0.019	0.019	0.020	0.020	0.021
1425	0.017	0.017	0.019	0.020	0.022	0.024	0.017	0.018	0.018	0.020	0.020	0.020
1475	0.017	0.017	0.020	0.020	0.022	0.024	0.018	0.018	0.018	0.019	0.019	0.020
1525	0.017	0.017	0.020	0.020	0.021	0.024	0.017	0.018	0.018	0.018	0.018	0.019
1575	0.018	0.017	0.020	0.020	0.021	0.023	0.017	0.017	0.018	0.018	0.018	0.018
1625	0.017	0.017	0.019	0.020	0.021	0.023	0.017	0.017	0.018	0.018	0.018	0.018
1675	0.017	0.018	0.019	0.019	0.020	0.021	0.016	0.017	0.017	0.018	0.018	0.018
1725	0.017	0.017	0.019	0.019	0.020	0.021	0.016	0.016	0.017	0.017	0.017	0.017
1775	0.017	0.017	0.018	0.018	0.019	0.021	0.016	0.016	0.017	0.017	0.017	0.017
1825	0.017	0.017	0.018	0.018	0.019	0.021	0.016	0.017	0.017	0.017	0.017	0.017
1875	0.017	0.018	0.018	0.018	0.019	0.020	0.016	0.016	0.017	0.017	0.017	0.017
1925	0.017	0.017	0.018	0.018	0.019	0.020	0.017	0.017	0.017	0.018	0.018	0.017
1975	0.017	0.018	0.018	0.018	0.019	0.020	0.016	0.017	0.017	0.018	0.018	0.017

Note(s):
The worst value of three phases shall be determined.

Higher frequencies-L2											
Parameter	P=Discharge power						P=Charge power				
Active power P/P _{NINV} [%]	0	20	40	60	80	100	20	40	60	80	100
Frequency [kHz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
2.1	0.066	0.072	0.069	0.083	0.086	0.116	0.072	0.100	0.084	0.119	0.093
2.3	0.087	0.089	0.083	0.086	0.099	0.108	0.073	0.066	0.088	0.091	0.110
2.5	0.092	0.081	0.089	0.092	0.100	0.098	0.079	0.076	0.089	0.079	0.097
2.7	0.078	0.070	0.068	0.067	0.077	0.081	0.071	0.084	0.091	0.096	0.102
2.9	0.089	0.090	0.092	0.082	0.082	0.084	0.081	0.075	0.079	0.085	0.072
3.1	0.085	0.092	0.079	0.089	0.078	0.087	0.087	0.087	0.086	0.084	0.077
3.3	0.074	0.073	0.065	0.068	0.073	0.074	0.079	0.086	0.089	0.092	0.095
3.5	0.085	0.098	0.095	0.086	0.086	0.086	0.086	0.090	0.091	0.084	0.087
3.7	0.257	0.253	0.252	0.256	0.256	0.258	0.257	0.256	0.258	0.254	0.257
3.9	0.259	0.264	0.261	0.261	0.260	0.262	0.267	0.267	0.271	0.275	0.275
4.1	0.079	0.087	0.082	0.085	0.089	0.087	0.089	0.095	0.099	0.095	0.094
4.3	0.096	0.098	0.101	0.104	0.104	0.126	0.101	0.107	0.105	0.098	0.096
4.5	0.079	0.074	0.087	0.096	0.105	0.110	0.087	0.093	0.108	0.118	0.117
4.7	0.105	0.104	0.120	0.129	0.141	0.155	0.123	0.127	0.135	0.144	0.140
4.9	0.100	0.092	0.100	0.111	0.141	0.153	0.110	0.123	0.137	0.159	0.170
5.1	0.100	0.108	0.100	0.117	0.148	0.168	0.096	0.104	0.118	0.145	0.158
5.3	0.088	0.095	0.102	0.112	0.124	0.133	0.088	0.090	0.100	0.117	0.126
5.5	0.086	0.089	0.092	0.095	0.104	0.107	0.087	0.087	0.086	0.095	0.102
5.7	0.075	0.074	0.071	0.071	0.077	0.084	0.077	0.074	0.077	0.082	0.085
5.9	0.062	0.063	0.067	0.073	0.081	0.085	0.063	0.068	0.070	0.073	0.076

CEI 0-16												
Clause	Requirement - Test						Result - Remark					Verdict
6.1	0.066	0.070	0.072	0.072	0.074	0.075	0.064	0.062	0.062	0.064	0.066	
6.3	0.066	0.062	0.060	0.061	0.062	0.065	0.066	0.066	0.066	0.064	0.063	
6.5	0.058	0.057	0.058	0.060	0.063	0.065	0.059	0.060	0.064	0.066	0.064	
6.7	0.054	0.054	0.057	0.059	0.062	0.062	0.053	0.055	0.058	0.061	0.061	
6.9	0.058	0.060	0.059	0.058	0.058	0.058	0.056	0.055	0.054	0.055	0.056	
7.1	0.053	0.051	0.050	0.051	0.054	0.056	0.054	0.055	0.053	0.054	0.054	
7.3	0.049	0.049	0.049	0.051	0.053	0.055	0.049	0.049	0.051	0.052	0.054	
7.5	0.050	0.050	0.050	0.051	0.052	0.054	0.050	0.051	0.051	0.052	0.053	
7.7	0.047	0.048	0.049	0.050	0.051	0.053	0.047	0.048	0.049	0.050	0.050	
7.9	0.047	0.047	0.048	0.049	0.050	0.051	0.047	0.047	0.049	0.050	0.050	
8.1	0.049	0.050	0.051	0.051	0.052	0.052	0.048	0.048	0.049	0.050	0.050	
8.3	0.050	0.049	0.049	0.050	0.051	0.052	0.049	0.049	0.049	0.050	0.050	
8.5	0.049	0.049	0.048	0.049	0.050	0.051	0.049	0.049	0.049	0.050	0.050	
8.7	0.052	0.050	0.050	0.050	0.051	0.051	0.051	0.051	0.051	0.051	0.051	
8.9	0.049	0.049	0.049	0.050	0.051	0.052	0.049	0.049	0.049	0.051	0.051	

Note(s):
The worst value of three phases shall be determined.

Harmonics and inter-harmonics-L3						AF36K-TH + ATOM HS-15.36					
Parameter	P=Discharge power						P=Charge power				
	0	20	40	60	80	100	20	40	60	80	100
Active power P/P _{NINV} [%]											
Harmonic number	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
1	3.599	18.581	36.830	54.782	72.745	91.128	18.944	36.794	54.825	73.182	91.160
2	0.233	0.606	0.612	0.744	0.754	0.868	0.578	0.744	0.916	1.149	1.082
3	1.566	1.552	2.062	2.307	2.489	2.603	1.639	1.201	0.946	0.535	0.303
4	0.181	0.478	0.256	0.464	0.600	0.610	0.307	0.353	0.333	0.322	0.112
5	2.134	2.802	2.701	2.179	1.654	1.298	2.075	2.824	3.389	3.774	4.024
6	0.223	0.350	0.174	0.250	0.449	0.529	0.291	0.189	0.319	0.682	0.707
7	1.561	0.943	1.638	1.675	1.391	1.094	1.543	1.641	1.923	2.193	2.405
8	0.139	0.183	0.109	0.117	0.261	0.327	0.070	0.088	0.067	0.081	0.069
9	0.348	0.415	0.376	0.345	0.276	0.248	0.399	0.511	0.416	0.116	0.170
10	0.037	0.155	0.143	0.041	0.166	0.250	0.099	0.085	0.057	0.038	0.022
11	0.680	0.766	0.450	0.552	0.624	0.565	0.996	1.017	1.009	0.923	0.935
12	0.077	0.176	0.307	0.169	0.092	0.279	0.202	0.038	0.094	0.148	0.204
13	0.489	0.433	0.548	0.339	0.384	0.403	0.657	0.817	0.853	0.743	0.697
14	0.038	0.083	0.153	0.132	0.034	0.119	0.033	0.054	0.040	0.033	0.044
15	0.170	0.179	0.176	0.196	0.119	0.153	0.163	0.130	0.109	0.082	0.108
16	0.058	0.143	0.067	0.142	0.046	0.066	0.044	0.061	0.038	0.027	0.021
17	0.236	0.291	0.301	0.268	0.200	0.181	0.322	0.307	0.455	0.534	0.507
18	0.126	0.216	0.033	0.225	0.143	0.085	0.036	0.129	0.105	0.168	0.207
19	0.211	0.262	0.210	0.235	0.215	0.127	0.283	0.209	0.327	0.431	0.452
20	0.051	0.047	0.079	0.090	0.075	0.040	0.046	0.023	0.026	0.024	0.016
21	0.060	0.052	0.108	0.104	0.109	0.046	0.065	0.047	0.043	0.064	0.070
22	0.064	0.059	0.086	0.030	0.074	0.052	0.060	0.024	0.025	0.023	0.030
23	0.110	0.131	0.143	0.161	0.153	0.209	0.112	0.184	0.115	0.231	0.309
24	0.110	0.129	0.169	0.064	0.192	0.123	0.118	0.088	0.042	0.119	0.138
25	0.115	0.115	0.120	0.145	0.090	0.182	0.084	0.152	0.096	0.168	0.280
26	0.041	0.049	0.036	0.038	0.031	0.050	0.033	0.059	0.031	0.034	0.044

CEI 0-16												
Clause	Requirement - Test						Result - Remark					Verdict
27	0.048	0.028	0.037	0.112	0.103	0.120	0.023	0.040	0.043	0.035	0.023	
28	0.049	0.026	0.040	0.035	0.041	0.047	0.033	0.034	0.022	0.036	0.044	
29	0.061	0.078	0.113	0.083	0.120	0.100	0.043	0.038	0.098	0.075	0.158	
30	0.059	0.068	0.052	0.112	0.089	0.122	0.058	0.047	0.056	0.060	0.065	
31	0.051	0.033	0.060	0.035	0.063	0.057	0.039	0.025	0.079	0.067	0.116	
32	0.024	0.047	0.051	0.086	0.050	0.094	0.058	0.029	0.028	0.020	0.026	
33	0.052	0.023	0.046	0.032	0.083	0.059	0.031	0.020	0.060	0.055	0.042	
34	0.023	0.025	0.049	0.061	0.060	0.074	0.035	0.017	0.024	0.026	0.024	
35	0.017	0.021	0.019	0.023	0.046	0.044	0.024	0.019	0.063	0.060	0.041	
36	0.017	0.036	0.048	0.040	0.076	0.061	0.025	0.018	0.018	0.048	0.039	
37	0.024	0.052	0.022	0.036	0.030	0.042	0.031	0.027	0.064	0.054	0.028	
38	0.023	0.041	0.046	0.044	0.060	0.046	0.025	0.027	0.016	0.021	0.013	
39	0.037	0.023	0.043	0.034	0.021	0.025	0.038	0.031	0.018	0.031	0.026	
40	0.020	0.036	0.043	0.040	0.038	0.041	0.022	0.032	0.019	0.019	0.016	
41	0.040	0.031	0.025	0.022	0.028	0.040	0.038	0.059	0.047	0.075	0.043	
42	0.035	0.037	0.068	0.064	0.060	0.044	0.018	0.033	0.019	0.031	0.043	
43	0.041	0.046	0.032	0.026	0.027	0.040	0.038	0.065	0.053	0.077	0.051	
44	0.028	0.038	0.035	0.039	0.031	0.048	0.016	0.025	0.018	0.019	0.018	
45	0.035	0.028	0.019	0.019	0.018	0.031	0.038	0.032	0.019	0.032	0.046	
46	0.027	0.028	0.036	0.029	0.032	0.040	0.016	0.018	0.019	0.020	0.020	
47	0.047	0.025	0.025	0.026	0.028	0.032	0.040	0.051	0.065	0.066	0.080	
48	0.048	0.038	0.047	0.048	0.048	0.061	0.018	0.020	0.021	0.026	0.033	
49	0.041	0.023	0.018	0.027	0.024	0.028	0.037	0.047	0.065	0.056	0.077	
50	0.027	0.036	0.042	0.037	0.046	0.050	0.017	0.016	0.020	0.018	0.019	

Note(s):
1. The limit of harmonic current shall be determined case by case per EN 61000-3-2 or EN 61000-3-12.
2. The worst value of three phases shall be determined.

Intern-harmonics-L3											
Parameter	P=Discharge power						P=Charge power				
Active power P/P _{NINV} [%]	0	20	40	60	80	100	20	40	60	80	100
Frequency [Hz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
75	0.049	0.052	0.070	0.078	0.141	0.289	0.057	0.067	0.073	0.087	0.089
125	0.042	0.050	0.055	0.066	0.082	0.129	0.043	0.044	0.046	0.049	0.052
175	0.029	0.031	0.033	0.033	0.043	0.069	0.031	0.033	0.034	0.036	0.037
225	0.032	0.037	0.040	0.038	0.043	0.062	0.034	0.037	0.036	0.038	0.038
275	0.025	0.028	0.031	0.029	0.036	0.047	0.028	0.033	0.033	0.034	0.035
325	0.032	0.033	0.038	0.035	0.041	0.050	0.033	0.037	0.037	0.038	0.039
375	0.024	0.026	0.028	0.027	0.036	0.045	0.026	0.028	0.028	0.030	0.031
425	0.025	0.026	0.029	0.028	0.032	0.043	0.026	0.028	0.028	0.030	0.030
475	0.022	0.024	0.025	0.025	0.029	0.036	0.024	0.026	0.025	0.027	0.028
525	0.026	0.028	0.029	0.029	0.033	0.039	0.027	0.029	0.028	0.029	0.031
575	0.021	0.022	0.023	0.024	0.028	0.035	0.022	0.026	0.025	0.025	0.025
625	0.022	0.022	0.026	0.023	0.027	0.033	0.023	0.026	0.024	0.025	0.025
675	0.020	0.021	0.023	0.023	0.026	0.032	0.022	0.024	0.024	0.025	0.024
725	0.021	0.021	0.023	0.023	0.025	0.030	0.022	0.022	0.023	0.023	0.023
775	0.020	0.020	0.022	0.022	0.024	0.028	0.020	0.021	0.021	0.022	0.022
825	0.019	0.021	0.022	0.022	0.024	0.028	0.021	0.022	0.022	0.023	0.022
875	0.020	0.020	0.022	0.021	0.024	0.028	0.020	0.022	0.022	0.023	0.023

CEI 0-16												
Clause	Requirement - Test						Result - Remark					Verdict
925	0.020	0.021	0.023	0.022	0.024	0.027	0.021	0.022	0.022	0.023	0.022	0.022
975	0.020	0.020	0.022	0.022	0.024	0.027	0.021	0.022	0.023	0.023	0.023	0.023
1025	0.019	0.020	0.022	0.021	0.023	0.027	0.020	0.020	0.021	0.022	0.022	0.021
1075	0.019	0.020	0.021	0.021	0.023	0.026	0.020	0.021	0.021	0.022	0.022	0.021
1125	0.020	0.020	0.021	0.022	0.023	0.026	0.020	0.021	0.021	0.022	0.022	0.022
1175	0.019	0.020	0.022	0.021	0.023	0.027	0.020	0.021	0.021	0.022	0.022	0.021
1225	0.020	0.020	0.022	0.022	0.025	0.027	0.020	0.022	0.022	0.023	0.022	0.022
1275	0.019	0.019	0.022	0.023	0.024	0.028	0.020	0.021	0.022	0.022	0.022	0.022
1325	0.019	0.020	0.021	0.022	0.024	0.027	0.020	0.021	0.022	0.022	0.022	0.022
1375	0.019	0.019	0.021	0.022	0.024	0.027	0.020	0.020	0.021	0.022	0.022	0.022
1425	0.019	0.019	0.021	0.022	0.024	0.026	0.019	0.020	0.021	0.022	0.022	0.022
1475	0.019	0.019	0.021	0.022	0.023	0.026	0.019	0.020	0.021	0.021	0.021	0.022
1525	0.019	0.019	0.021	0.022	0.023	0.026	0.019	0.020	0.020	0.020	0.020	0.022
1575	0.019	0.019	0.020	0.021	0.023	0.025	0.018	0.019	0.020	0.020	0.020	0.021
1625	0.018	0.019	0.020	0.021	0.022	0.024	0.018	0.019	0.019	0.020	0.020	0.020
1675	0.018	0.019	0.020	0.021	0.022	0.024	0.018	0.018	0.019	0.019	0.019	0.020
1725	0.018	0.019	0.020	0.020	0.021	0.023	0.018	0.018	0.019	0.019	0.019	0.020
1775	0.018	0.018	0.019	0.020	0.021	0.023	0.018	0.018	0.019	0.019	0.019	0.019
1825	0.019	0.019	0.019	0.020	0.021	0.023	0.018	0.018	0.019	0.020	0.020	0.019
1875	0.019	0.019	0.020	0.020	0.022	0.023	0.018	0.018	0.019	0.020	0.020	0.019
1925	0.019	0.018	0.020	0.020	0.021	0.023	0.019	0.019	0.020	0.020	0.020	0.020
1975	0.019	0.019	0.020	0.020	0.021	0.023	0.018	0.018	0.019	0.019	0.019	0.019

Note(s):
The worst value of three phases shall be determined.

Higher frequencies-L3											
Parameter	P=Discharge power						P=Charge power				
Active power P/P _{NINV} [%]	0	20	40	60	80	100	20	40	60	80	100
Frequency [kHz]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
2.1	0.084	0.089	0.097	0.094	0.092	0.100	0.071	0.105	0.085	0.121	0.091
2.3	0.092	0.074	0.081	0.079	0.081	0.099	0.074	0.078	0.084	0.092	0.109
2.5	0.087	0.077	0.081	0.082	0.084	0.087	0.079	0.083	0.087	0.079	0.099
2.7	0.085	0.075	0.083	0.089	0.093	0.091	0.076	0.087	0.090	0.097	0.108
2.9	0.089	0.081	0.084	0.074	0.078	0.082	0.086	0.082	0.081	0.089	0.077
3.1	0.088	0.076	0.074	0.072	0.073	0.077	0.089	0.089	0.084	0.086	0.079
3.3	0.070	0.072	0.069	0.083	0.078	0.085	0.079	0.088	0.094	0.097	0.098
3.5	0.087	0.087	0.080	0.075	0.089	0.095	0.092	0.098	0.100	0.092	0.095
3.7	0.261	0.257	0.256	0.260	0.259	0.262	0.262	0.259	0.258	0.258	0.260
3.9	0.285	0.292	0.289	0.291	0.292	0.293	0.291	0.293	0.300	0.303	0.303
4.1	0.081	0.084	0.076	0.079	0.091	0.088	0.087	0.095	0.097	0.097	0.095
4.3	0.088	0.090	0.097	0.097	0.096	0.099	0.097	0.103	0.098	0.090	0.095
4.5	0.089	0.091	0.086	0.089	0.095	0.100	0.086	0.091	0.110	0.120	0.117
4.7	0.111	0.116	0.113	0.110	0.137	0.137	0.118	0.129	0.146	0.154	0.152
4.9	0.095	0.095	0.096	0.102	0.126	0.146	0.098	0.109	0.125	0.150	0.165
5.1	0.095	0.095	0.103	0.121	0.161	0.184	0.099	0.100	0.112	0.140	0.161
5.3	0.092	0.091	0.103	0.108	0.123	0.151	0.093	0.097	0.105	0.118	0.130
5.5	0.088	0.088	0.092	0.099	0.111	0.121	0.089	0.091	0.091	0.099	0.109
5.7	0.078	0.076	0.075	0.077	0.085	0.093	0.080	0.081	0.083	0.088	0.090

CEI 0-16												
Clause	Requirement - Test						Result - Remark				Verdict	
5.9	0.066	0.069	0.075	0.082	0.089	0.094	0.067	0.070	0.073	0.077	0.079	
6.1	0.069	0.073	0.077	0.078	0.080	0.082	0.066	0.066	0.067	0.072	0.073	
6.3	0.071	0.069	0.069	0.069	0.070	0.074	0.071	0.070	0.069	0.068	0.068	
6.5	0.064	0.063	0.064	0.066	0.069	0.072	0.064	0.066	0.070	0.071	0.071	
6.7	0.059	0.060	0.064	0.066	0.069	0.071	0.058	0.060	0.064	0.067	0.068	
6.9	0.064	0.064	0.063	0.064	0.064	0.066	0.061	0.061	0.061	0.062	0.064	
7.1	0.056	0.054	0.056	0.059	0.062	0.064	0.057	0.058	0.059	0.059	0.060	
7.3	0.056	0.054	0.056	0.058	0.062	0.064	0.055	0.057	0.059	0.060	0.060	
7.5	0.055	0.055	0.056	0.058	0.059	0.061	0.054	0.056	0.057	0.059	0.059	
7.7	0.053	0.053	0.055	0.056	0.057	0.059	0.054	0.055	0.056	0.057	0.057	
7.9	0.052	0.052	0.054	0.056	0.057	0.059	0.051	0.053	0.056	0.056	0.056	
8.1	0.054	0.056	0.056	0.057	0.058	0.059	0.053	0.054	0.055	0.056	0.056	
8.3	0.054	0.054	0.055	0.055	0.057	0.059	0.054	0.055	0.056	0.057	0.058	
8.5	0.056	0.055	0.056	0.056	0.058	0.060	0.056	0.056	0.056	0.057	0.057	
8.7	0.057	0.056	0.056	0.056	0.058	0.059	0.056	0.057	0.057	0.058	0.057	
8.9	0.053	0.054	0.055	0.056	0.059	0.060	0.054	0.054	0.056	0.058	0.058	
Note(s): The worst value of three phases shall be determined.												

CEI 0-16					
Clause	Requirement - Test	Result - Remark			Verdict
Voltage fluctuations caused by switching operations (P=Discharge power)					
AF60K-TH + ATOM HS-40.96-L1					
Grid frequency f [Hz]	50				
Grid voltage U_n [V]	400				
Rated current I_n [A]	87				
Remarks:	K_{imax} : is the ratio between the measured I_{imax} and the I_{nom} (nominal current) of the device.				
Reactive set-point control, Q = 0					
Max. number of switching operations, N_{10}	1				
Max. number of switching operations, N_{120}	12				
Case of switching operation	Cut-in at 10% of rated power				
Grid impedance angle, ψ_k	30°	50°	70°	85°	
Flicker step factor, $k_f(\psi_k)$	0.415	0.467	0.513	0.524	
Voltage change factor, $k_u(\psi_k)$	1.299	1.212	1.386	1.212	
Maximum inrush current factor k_{imax}	0.091				
Reactive set-point control, Q = 0					
Max. number of switching operations, N_{10}	1				
Max. number of switching operations, N_{120}	12				
Case of switching operation	Cut-in at 100% of rated power				
Grid impedance angle	30°	50°	70°	85°	
Flicker step factor, $k_f(\psi_k)$	0.794	0.824	0.877	0.907	
Voltage change factor, $k_u(\psi_k)$	1.126	0.953	1.039	0.866	
Maximum inrush current factor k_{imax}	0.381				
Reactive set-point control, Q = 0					
Max. number of switching operations, N_{10}	1				
Max. number of switching operations, N_{120}	12				
Case of switching operation	Service disconnection				
Grid impedance angle	30°	50°	70°	85°	
Flicker step factor, $k_f(\psi_k)$	0.844	0.854	0.867	0.872	
Voltage change factor, $k_u(\psi_k)$	1.039	1.039	1.386	1.126	
Maximum inrush current factor k_{imax}	0.441				
Worst case over all switching operations, k_{imax}	0.441				

CEI 0-16					
Clause	Requirement - Test	Result - Remark			Verdict
AF60K-TH + ATOM HS-40.96-L2					
Grid frequency f [Hz]	50				
Grid voltage U_n [V]	400				
Rated current I_n [A]	87				
Remarks:	K_{imax} : is the ratio between the measured I_{max} and the I_{nom} (nominal current) of the device.				
Reactive set-point control, Q = 0					
Max. number of switching operations, N_{10}	1				
Max. number of switching operations, N_{120}	12				
Case of switching operation	Cut-in at 10% of rated power				
Grid impedance angle, ψ_k	30°	50°	70°	85°	
Flicker step factor, $k_f(\psi_k)$	0.874	0.884	0.892	0.892	
Voltage change factor, $k_u(\psi_k)$	1.386	1.126	1.386	0.866	
Maximum inrush current factor k_{imax}	0.177				
Reactive set-point control, Q = 0					
Max. number of switching operations, N_{10}	1				
Max. number of switching operations, N_{120}	12				
Case of switching operation	Cut-in at 100% of rated power				
Grid impedance angle	30°	50°	70°	85°	
Flicker step factor, $k_f(\psi_k)$	0.764	0.765	0.776	0.783	
Voltage change factor, $k_u(\psi_k)$	0.866	1.126	1.126	1.126	
Maximum inrush current factor k_{imax}	0.651				
Reactive set-point control, Q = 0					
Max. number of switching operations, N_{10}	1				
Max. number of switching operations, N_{120}	12				
Case of switching operation	Service disconnection				
Grid impedance angle	30°	50°	70°	85°	
Flicker step factor, $k_f(\psi_k)$	0.360	0.394	0.437	0.459	
Voltage change factor, $k_u(\psi_k)$	1.039	1.126	1.039	1.126	
Maximum inrush current factor k_{imax}	0.807				
Worst case over all switching operations, k_{imax}					
0.807					

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

AF60K-TH + ATOM HS-40.96-L3				
Grid frequency f [Hz]	50			
Grid voltage U_n [V]	400			
Rated current I_n [A]	87			
Remarks:	K_{imax} : is the ratio between the measured I_{max} and the I_{nom} (nominal current) of the device.			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Cut-in at 10% of rated power			
Grid impedance angle, ψ_k	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.669	0.678	0.684	0.685
Voltage change factor, $k_u(\psi_k)$	1.386	1.126	1.039	1.039
Maximum inrush current factor k_{imax}	0.180			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Cut-in at 100% of rated power			
Grid impedance angle	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.306	0.316	0.355	0.382
Voltage change factor, $k_u(\psi_k)$	1.212	1.126	1.212	1.039
Maximum inrush current factor k_{imax}	0.436			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Service disconnection			
Grid impedance angle	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.667	0.629	0.608	0.602
Voltage change factor, $k_u(\psi_k)$	1.126	1.299	1.039	1.386
Maximum inrush current factor k_{imax}	0.859			
Worst case over all switching operations, k_{imax}				
0.859				

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

AF60K-TH + ATOM HS-15.36-L1

Grid frequency f [Hz]	50		
Grid voltage U_n [V]	400		
Rated current I_n [A]	22		
Remarks:	K_{imax} : is the ratio between the measured I_{max} and the I_{nom} (nominal current) of the device.		

Reactive set-point control, $Q = 0$

Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Cut-in at 10% of rated power			
Grid impedance angle, ψ_k	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.628	0.629	0.635	0.637
Voltage change factor, $k_u(\psi_k)$	1.126	1.126	1.039	0.953
Maximum inrush current factor k_{imax}	0.091			

Reactive set-point control, $Q = 0$

Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Cut-in at 100% of rated power			
Grid impedance angle	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.638	0.663	0.692	0.701
Voltage change factor, $k_u(\psi_k)$	0.866	0.953	1.386	1.299
Maximum inrush current factor k_{imax}	0.381			

Reactive set-point control, $Q = 0$

Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Service disconnection			
Grid impedance angle	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.601	0.599	0.599	0.598
Voltage change factor, $k_u(\psi_k)$	0.866	1.039	0.953	0.953
Maximum inrush current factor k_{imax}	0.441			

Worst case over all switching operations, k_{imax}	0.441			
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CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

AF60K-TH + ATOM HS-15.36-L2				
Grid frequency f [Hz]	50			
Grid voltage U_n [V]	400			
Rated current I_n [A]	22			
Remarks:	K_{imax} : is the ratio between the measured I_{max} and the I_{nom} (nominal current) of the device.			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Cut-in at 10% of rated power			
Grid impedance angle, ψ_k	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.890	0.894	0.893	0.888
Voltage change factor, $k_u(\psi_k)$	1.386	1.212	0.866	0.866
Maximum inrush current factor k_{imax}	0.177			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Cut-in at 100% of rated power			
Grid impedance angle	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.445	0.441	0.440	0.440
Voltage change factor, $k_u(\psi_k)$	1.386	1.386	1.126	1.299
Maximum inrush current factor k_{imax}	0.651			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Service disconnection			
Grid impedance angle	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.859	0.854	0.854	0.856
Voltage change factor, $k_u(\psi_k)$	0.866	1.039	1.212	1.126
Maximum inrush current factor k_{imax}	0.807			
Worst case over all switching operations, k_{imax}	0.807			

CEI 0-16					
Clause	Requirement - Test	Result - Remark			Verdict
AF60K-TH + ATOM HS-15.36-L3					
Grid frequency f [Hz]	50				
Grid voltage U_n [V]	400				
Rated current I_n [A]	22				
Remarks:	K_{imax} : is the ratio between the measured I_{max} and the I_{nom} (nominal current) of the device.				
Reactive set-point control, Q = 0					
Max. number of switching operations, N_{10}	1				
Max. number of switching operations, N_{120}	12				
Case of switching operation	Cut-in at 10% of rated power				
Grid impedance angle, ψ_k	30°	50°	70°	85°	
Flicker step factor, $k_f(\psi_k)$	0.366	0.371	0.378	0.381	
Voltage change factor, $k_u(\psi_k)$	1.212	1.299	1.212	1.126	
Maximum inrush current factor k_{imax}	0.180				
Reactive set-point control, Q = 0					
Max. number of switching operations, N_{10}	1				
Max. number of switching operations, N_{120}	12				
Case of switching operation	Cut-in at 100% of rated power				
Grid impedance angle	30°	50°	70°	85°	
Flicker step factor, $k_f(\psi_k)$	0.864	0.863	0.866	0.868	
Voltage change factor, $k_u(\psi_k)$	1.039	1.299	1.299	1.386	
Maximum inrush current factor k_{imax}	0.436				
Reactive set-point control, Q = 0					
Max. number of switching operations, N_{10}	1				
Max. number of switching operations, N_{120}	12				
Case of switching operation	Service disconnection				
Grid impedance angle	30°	50°	70°	85°	
Flicker step factor, $k_f(\psi_k)$	0.438	0.442	0.447	0.449	
Voltage change factor, $k_u(\psi_k)$	0.953	0.953	1.039	1.212	
Maximum inrush current factor k_{imax}	0.859				
Worst case over all switching operations, k_{imax}					
				0.859	

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

AF36K-TH + ATOM HS-15.36-L1				
Grid frequency f [Hz]	50			
Grid voltage U_n [V]	400			
Rated current I_n [A]	22			
Remarks:	K_{imax} : is the ratio between the measured I_{max} and the I_{nom} (nominal current) of the device.			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Cut-in at 10% of rated power			
Grid impedance angle, ψ_k	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.788	0.795	0.801	0.801
Voltage change factor, $k_u(\psi_k)$	1.299	0.953	1.299	1.039
Maximum inrush current factor k_{imax}	0.091			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Cut-in at 100% of rated power			
Grid impedance angle	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.701	0.700	0.704	0.706
Voltage change factor, $k_u(\psi_k)$	1.126	1.299	1.039	1.126
Maximum inrush current factor k_{imax}	0.381			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Service disconnection			
Grid impedance angle	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.584	0.583	0.584	0.583
Voltage change factor, $k_u(\psi_k)$	1.212	0.953	0.953	1.299
Maximum inrush current factor k_{imax}	0.441			
Worst case over all switching operations, k_{imax}				
				0.441

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

AF36K-TH + ATOM HS-15.36-L2				
Grid frequency f [Hz]	50			
Grid voltage U_n [V]	400			
Rated current I_n [A]	22			
Remarks:	K_{imax} : is the ratio between the measured I_{max} and the I_{nom} (nominal current) of the device.			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Cut-in at 10% of rated power			
Grid impedance angle, ψ_k	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.774	0.777	0.778	0.776
Voltage change factor, $k_u(\psi_k)$	1.126	1.126	1.126	1.126
Maximum inrush current factor k_{imax}	0.177			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Cut-in at 100% of rated power			
Grid impedance angle	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.827	0.831	0.837	0.842
Voltage change factor, $k_u(\psi_k)$	0.953	1.212	1.299	1.386
Maximum inrush current factor k_{imax}	0.651			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Service disconnection			
Grid impedance angle	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.872	0.868	0.867	0.867
Voltage change factor, $k_u(\psi_k)$	1.386	0.953	1.039	1.299
Maximum inrush current factor k_{imax}	0.807			
Worst case over all switching operations, k_{imax}	0.807			

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

AF36K-TH + ATOM HS-15.36-L3				
Grid frequency f [Hz]	50			
Grid voltage U_n [V]	400			
Rated current I_n [A]	22			
Remarks:	K_{imax} : is the ratio between the measured I_{max} and the I_{nom} (nominal current) of the device.			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Cut-in at 10% of rated power			
Grid impedance angle, ψ_k	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.330	0.337	0.336	0.329
Voltage change factor, $k_u(\psi_k)$	0.866	0.953	0.866	0.866
Maximum inrush current factor k_{imax}	0.180			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Cut-in at 100% of rated power			
Grid impedance angle	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.341	0.348	0.357	0.360
Voltage change factor, $k_u(\psi_k)$	0.866	1.212	1.299	0.866
Maximum inrush current factor k_{imax}	0.436			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Service disconnection			
Grid impedance angle	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.459	0.471	0.484	0.491
Voltage change factor, $k_u(\psi_k)$	0.953	0.953	1.212	1.126
Maximum inrush current factor k_{imax}	0.859			
Worst case over all switching operations, k_{imax}				
0.859				

CEI 0-16					
Clause	Requirement - Test	Result - Remark			Verdict
Voltage fluctuations caused by switching operations (P=Charge power for Bi-directional converter only)					
AF60K-TH + ATOM HS-40.96-L1					
Grid frequency f [Hz]	50				
Grid voltage U_n [V]	400				
Rated current I_n [A]	87				
Remarks:	$K_{I_{max}}$: is the ratio between the measured I_{max} and the I_{nom} (nominal current) of the device.				
Reactive set-point control, Q = 0					
Max. number of switching operations, N_{10}	1				
Max. number of switching operations, N_{120}	12				
Case of switching operation	Cut-in at 10% of rated power				
Grid impedance angle, ψ_k	30°	50°	70°	85°	
Flicker step factor, $k_f(\psi_k)$	0.533	0.525	0.520	0.519	
Voltage change factor, $k_u(\psi_k)$	0.866	0.953	0.866	0.953	
Maximum inrush current factor $k_{I_{max}}$	0.091				
Reactive set-point control, Q = 0					
Max. number of switching operations, N_{10}	1				
Max. number of switching operations, N_{120}	12				
Case of switching operation	Cut-in at 100% of rated power				
Grid impedance angle	30°	50°	70°	85°	
Flicker step factor, $k_f(\psi_k)$	0.894	0.894	0.904	0.911	
Voltage change factor, $k_u(\psi_k)$	1.039	0.953	1.039	1.039	
Maximum inrush current factor $k_{I_{max}}$	0.381				
Reactive set-point control, Q = 0					
Max. number of switching operations, N_{10}	1				
Max. number of switching operations, N_{120}	12				
Case of switching operation	Service disconnection				
Grid impedance angle	30°	50°	70°	85°	
Flicker step factor, $k_f(\psi_k)$	0.867	0.852	0.848	0.846	
Voltage change factor, $k_u(\psi_k)$	0.953	1.039	1.212	1.039	
Maximum inrush current factor $k_{I_{max}}$	0.441				
Worst case over all switching operations, $k_{I_{max}}$	0.441				

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

AF60K-TH + ATOM HS-40.96-L2				
Grid frequency f [Hz]	50			
Grid voltage U_n [V]	400			
Rated current I_n [A]	87			
Remarks:	K_{imax} : is the ratio between the measured I_{max} and the I_{nom} (nominal current) of the device.			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Cut-in at 10% of rated power			
Grid impedance angle, ψ_k	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.881	0.874	0.866	0.861
Voltage change factor, $k_u(\psi_k)$	1.212	1.212	1.212	0.866
Maximum inrush current factor k_{imax}	0.177			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Cut-in at 100% of rated power			
Grid impedance angle	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.561	0.598	0.642	0.666
Voltage change factor, $k_u(\psi_k)$	0.953	1.126	0.953	1.386
Maximum inrush current factor k_{imax}	0.651			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Service disconnection			
Grid impedance angle	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.402	0.410	0.428	0.442
Voltage change factor, $k_u(\psi_k)$	1.126	1.126	1.386	1.126
Maximum inrush current factor k_{imax}	0.807			
Worst case over all switching operations, k_{imax}	0.807			

CEI 0-16					
Clause	Requirement - Test	Result - Remark			Verdict
AF60K-TH + ATOM HS-40.96-L3					
Grid frequency f [Hz]	50				
Grid voltage U_n [V]	400				
Rated current I_n [A]	87				
Remarks:	K_{imax} : is the ratio between the measured I_{max} and the I_{nom} (nominal current) of the device.				
Reactive set-point control, Q = 0					
Max. number of switching operations, N_{10}	1				
Max. number of switching operations, N_{120}	12				
Case of switching operation	Cut-in at 10% of rated power				
Grid impedance angle, ψ_k	30°	50°	70°	85°	
Flicker step factor, $k_f(\psi_k)$	0.512	0.513	0.514	0.514	
Voltage change factor, $k_u(\psi_k)$	0.866	1.212	1.386	1.039	
Maximum inrush current factor k_{imax}	0.180				
Reactive set-point control, Q = 0					
Max. number of switching operations, N_{10}	1				
Max. number of switching operations, N_{120}	12				
Case of switching operation	Cut-in at 100% of rated power				
Grid impedance angle	30°	50°	70°	85°	
Flicker step factor, $k_f(\psi_k)$	0.455	0.452	0.472	0.487	
Voltage change factor, $k_u(\psi_k)$	1.126	1.039	1.212	1.126	
Maximum inrush current factor k_{imax}	0.436				
Reactive set-point control, Q = 0					
Max. number of switching operations, N_{10}	1				
Max. number of switching operations, N_{120}	12				
Case of switching operation	Service disconnection				
Grid impedance angle	30°	50°	70°	85°	
Flicker step factor, $k_f(\psi_k)$	0.667	0.672	0.683	0.689	
Voltage change factor, $k_u(\psi_k)$	1.039	0.953	1.039	0.953	
Maximum inrush current factor k_{imax}	0.859				
Worst case over all switching operations, k_{imax}	0.859				

CEI 0-16					
Clause	Requirement - Test	Result - Remark			Verdict
AF60K-TH + ATOM HS-15.36-L1					
Grid frequency f [Hz]	50				
Grid voltage U_n [V]	400				
Rated current I_n [A]	22				
Remarks:	K_{imax} : is the ratio between the measured I_{max} and the I_{nom} (nominal current) of the device.				
Reactive set-point control, Q = 0					
Max. number of switching operations, N_{10}	1				
Max. number of switching operations, N_{120}	12				
Case of switching operation	Cut-in at 10% of rated power				
Grid impedance angle, ψ_k	30°	50°	70°	85°	
Flicker step factor, $k_f(\psi_k)$	0.303	0.302	0.308	0.321	
Voltage change factor, $k_u(\psi_k)$	1.212	1.299	1.039	1.126	
Maximum inrush current factor k_{imax}	0.091				
Reactive set-point control, Q = 0					
Max. number of switching operations, N_{10}	1				
Max. number of switching operations, N_{120}	12				
Case of switching operation	Cut-in at 100% of rated power				
Grid impedance angle	30°	50°	70°	85°	
Flicker step factor, $k_f(\psi_k)$	0.852	0.842	0.837	0.835	
Voltage change factor, $k_u(\psi_k)$	1.039	0.953	1.126	1.126	
Maximum inrush current factor k_{imax}	0.381				
Reactive set-point control, Q = 0					
Max. number of switching operations, N_{10}	1				
Max. number of switching operations, N_{120}	12				
Case of switching operation	Service disconnection				
Grid impedance angle	30°	50°	70°	85°	
Flicker step factor, $k_f(\psi_k)$	0.789	0.787	0.790	0.792	
Voltage change factor, $k_u(\psi_k)$	1.039	0.866	1.212	1.386	
Maximum inrush current factor k_{imax}	0.441				
Worst case over all switching operations, k_{imax}	0.441				

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

AF60K-TH + ATOM HS-15.36-L2				
Grid frequency f [Hz]	50			
Grid voltage U_n [V]	400			
Rated current I_n [A]	22			
Remarks:	K_{imax} : is the ratio between the measured I_{max} and the I_{nom} (nominal current) of the device.			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Cut-in at 10% of rated power			
Grid impedance angle, ψ_k	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.822	0.825	0.829	0.831
Voltage change factor, $k_u(\psi_k)$	0.953	1.212	1.126	0.866
Maximum inrush current factor k_{imax}	0.177			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Cut-in at 100% of rated power			
Grid impedance angle	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.686	0.678	0.674	0.674
Voltage change factor, $k_u(\psi_k)$	1.386	0.953	1.126	1.039
Maximum inrush current factor k_{imax}	0.651			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Service disconnection			
Grid impedance angle	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.318	0.320	0.330	0.337
Voltage change factor, $k_u(\psi_k)$	1.039	1.039	1.039	1.386
Maximum inrush current factor k_{imax}	0.807			
Worst case over all switching operations, k_{imax}	0.807			

CEI 0-16					
Clause	Requirement - Test	Result - Remark			Verdict
AF60K-TH + ATOM HS-15.36-L3					
Grid frequency f [Hz]	50				
Grid voltage U_n [V]	400				
Rated current I_n [A]	22				
Remarks:	K_{imax} : is the ratio between the measured I_{max} and the I_{nom} (nominal current) of the device.				
Reactive set-point control, Q = 0					
Max. number of switching operations, N_{10}	1				
Max. number of switching operations, N_{120}	12				
Case of switching operation	Cut-in at 10% of rated power				
Grid impedance angle, ψ_k	30°	50°	70°	85°	
Flicker step factor, $k_f(\psi_k)$	0.723	0.723	0.726	0.731	
Voltage change factor, $k_u(\psi_k)$	0.953	1.039	1.212	1.039	
Maximum inrush current factor k_{imax}	0.180				
Reactive set-point control, Q = 0					
Max. number of switching operations, N_{10}	1				
Max. number of switching operations, N_{120}	12				
Case of switching operation	Cut-in at 100% of rated power				
Grid impedance angle	30°	50°	70°	85°	
Flicker step factor, $k_f(\psi_k)$	0.380	0.373	0.368	0.365	
Voltage change factor, $k_u(\psi_k)$	0.953	1.212	1.212	1.126	
Maximum inrush current factor k_{imax}	0.436				
Reactive set-point control, Q = 0					
Max. number of switching operations, N_{10}	1				
Max. number of switching operations, N_{120}	12				
Case of switching operation	Service disconnection				
Grid impedance angle	30°	50°	70°	85°	
Flicker step factor, $k_f(\psi_k)$	0.757	0.757	0.761	0.763	
Voltage change factor, $k_u(\psi_k)$	1.386	1.386	0.866	1.212	
Maximum inrush current factor k_{imax}	0.859				
Worst case over all switching operations, k_{imax}	0.859				

CEI 0-16					
Clause	Requirement - Test	Result - Remark			Verdict
AF36K-TH + ATOM HS-15.36-L1					
Grid frequency f [Hz]	50				
Grid voltage U_n [V]	400				
Rated current I_n [A]	22				
Remarks:	K_{imax} : is the ratio between the measured I_{max} and the I_{nom} (nominal current) of the device.				
Reactive set-point control, Q = 0					
Max. number of switching operations, N_{10}	1				
Max. number of switching operations, N_{120}	12				
Case of switching operation	Cut-in at 10% of rated power				
Grid impedance angle, ψ_k	30°	50°	70°	85°	
Flicker step factor, $k_f(\psi_k)$	0.533	0.534	0.536	0.538	
Voltage change factor, $k_u(\psi_k)$	1.126	1.299	0.866	0.866	
Maximum inrush current factor k_{imax}	0.091				
Reactive set-point control, Q = 0					
Max. number of switching operations, N_{10}	1				
Max. number of switching operations, N_{120}	12				
Case of switching operation	Cut-in at 100% of rated power				
Grid impedance angle	30°	50°	70°	85°	
Flicker step factor, $k_f(\psi_k)$	0.862	0.850	0.846	0.845	
Voltage change factor, $k_u(\psi_k)$	1.212	1.126	1.212	1.126	
Maximum inrush current factor k_{imax}	0.381				
Reactive set-point control, Q = 0					
Max. number of switching operations, N_{10}	1				
Max. number of switching operations, N_{120}	12				
Case of switching operation	Service disconnection				
Grid impedance angle	30°	50°	70°	85°	
Flicker step factor, $k_f(\psi_k)$	0.787	0.793	0.804	0.811	
Voltage change factor, $k_u(\psi_k)$	1.126	1.039	0.953	1.386	
Maximum inrush current factor k_{imax}	0.441				
Worst case over all switching operations, k_{imax}	0.441				

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

AF36K-TH + ATOM HS-15.36-L2				
Grid frequency f [Hz]	50			
Grid voltage U_n [V]	400			
Rated current I_n [A]	22			
Remarks:	K_{imax} : is the ratio between the measured I_{max} and the I_{nom} (nominal current) of the device.			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Cut-in at 10% of rated power			
Grid impedance angle, ψ_k	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.885	0.887	0.892	0.896
Voltage change factor, $k_u(\psi_k)$	1.299	1.039	1.386	0.953
Maximum inrush current factor k_{imax}	0.177			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Cut-in at 100% of rated power			
Grid impedance angle	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.570	0.578	0.586	0.588
Voltage change factor, $k_u(\psi_k)$	1.212	0.866	1.386	0.953
Maximum inrush current factor k_{imax}	0.651			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Service disconnection			
Grid impedance angle	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.308	0.304	0.305	0.305
Voltage change factor, $k_u(\psi_k)$	1.386	0.953	1.212	0.866
Maximum inrush current factor k_{imax}	0.807			
Worst case over all switching operations, k_{imax}				
				0.807

CEI 0-16				
Clause	Requirement - Test	Result - Remark		Verdict
AF36K-TH + ATOM HS-15.36-L3				
Grid frequency f [Hz]	50			
Grid voltage U_n [V]	400			
Rated current I_n [A]	22			
Remarks:	K_{imax} : is the ratio between the measured I_{max} and the I_{nom} (nominal current) of the device.			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Cut-in at 10% of rated power			
Grid impedance angle, ψ_k	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.509	0.512	0.514	0.516
Voltage change factor, $k_u(\psi_k)$	1.299	1.039	0.866	1.212
Maximum inrush current factor k_{imax}	0.180			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Cut-in at 100% of rated power			
Grid impedance angle	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.474	0.472	0.474	0.476
Voltage change factor, $k_u(\psi_k)$	1.039	0.866	1.299	1.126
Maximum inrush current factor k_{imax}	0.436			
Reactive set-point control, Q = 0				
Max. number of switching operations, N_{10}	1			
Max. number of switching operations, N_{120}	12			
Case of switching operation	Service disconnection			
Grid impedance angle	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.772	0.774	0.780	0.783
Voltage change factor, $k_u(\psi_k)$	1.386	1.212	1.212	1.386
Maximum inrush current factor k_{imax}	0.859			
Worst case over all switching operations, k_{imax}	0.859			

CEI 0-16									
Clause	Requirement - Test					Result - Remark			Verdict
Nbis.3.3	Tabella: Misura di fluttuazioni di tensione (flicker) in condizioni di funzionamento continuo Table: Voltage fluctuations (Flickers) during continuous operation according to IEC 61400-21, Clause 6.3.2 and 7.3.3								P
Reference standard: Each phase output current > 75A: IEC 61400-21-1: Wind energy generation systems - Part 21-1: Measurement and assessment of electrical characteristics - Wind turbines									
Test: P=Discharge power					AF60K-TH + ATOM HS-40.96-L1				
Grid impedance angle, ψ_k		30°		50°		70°		85°	
Test No.	P/P _{NINV} [%]	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)
1	10	1.274	0.063	1.269	0.063	1.269	0.063	1.270	0.063
2	20	0.510	0.025	0.515	0.025	0.530	0.026	0.538	0.026
3	30	0.941	0.047	0.949	0.047	0.960	0.048	0.962	0.048
4	40	0.961	0.048	0.965	0.048	0.976	0.048	0.981	0.049
5	50	1.299	0.064	1.316	0.065	1.334	0.066	1.343	0.067
6	60	0.989	0.049	0.965	0.048	0.954	0.047	0.951	0.047
7	70	1.285	0.064	1.288	0.064	1.293	0.064	1.295	0.064
8	80	0.588	0.029	0.630	0.031	0.677	0.033	0.696	0.034
9	90	1.306	0.065	1.337	0.066	1.367	0.068	1.373	0.068
10	100	1.283	0.064	1.293	0.064	1.313	0.065	1.326	0.066
11	100	1.311	0.065	1.342	0.067	1.375	0.068	1.387	0.069
12	100	1.320	0.066	1.351	0.067	1.387	0.069	1.403	0.070
Note(s): The worst value of three phases shall be determined.									
Reactive set-point control, Q = 0									
Grid impedance angle, ψ_k				30°	50°	70°	85°		
Flicker coefficient, c(ψ_k)				0.066	0.067	0.069	0.070		
Short-term flicker, P _{st}				1.320	1.351	1.387	1.403		

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test: P=Discharge power					L2				
Grid impedance angle, ψ_k		30°		50°		70°		85°	
Test No.	P/P _{NINV} [%]	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)
1	10	0.683	0.034	0.680	0.034	0.679	0.033	0.677	0.033
2	20	1.226	0.061	1.226	0.061	1.229	0.061	1.230	0.061
3	30	1.273	0.063	1.272	0.063	1.273	0.063	1.275	0.063
4	40	1.269	0.063	1.264	0.063	1.259	0.062	1.257	0.062
5	50	0.813	0.040	0.806	0.040	0.802	0.040	0.801	0.040
6	60	1.235	0.061	1.229	0.061	1.227	0.061	1.226	0.061
7	70	0.895	0.044	0.909	0.045	0.927	0.046	0.936	0.046
8	80	0.953	0.047	0.951	0.047	0.959	0.047	0.965	0.048
9	90	0.554	0.027	0.607	0.030	0.659	0.032	0.683	0.034
10	100	0.667	0.033	0.695	0.034	0.728	0.036	0.741	0.037
11	100	0.698	0.034	0.732	0.036	0.771	0.038	0.789	0.039
12	100	0.740	0.037	0.772	0.038	0.810	0.040	0.827	0.041

Note(s): The worst value of three phases shall be determined.

Reactive set-point control, Q = 0

Grid impedance angle, ψ_k	30°	50°	70°	85°
Flicker coefficient, c(ψ_k)	0.037	0.038	0.040	0.041
Short-term flicker, P _{st}	0.740	0.772	0.810	0.827

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test: P=Discharge power						L3				
Grid impedance angle, ψ_k		30°		50°		70°		85°		
Test No.	P/P _{NINV} [%]	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	
1	10	0.844	0.042	0.855	0.042	0.864	0.043	0.865	0.043	
2	20	1.037	0.051	1.044	0.052	1.059	0.052	1.071	0.053	
3	30	0.589	0.029	0.590	0.029	0.603	0.030	0.613	0.030	
4	40	0.566	0.028	0.578	0.028	0.595	0.029	0.605	0.030	
5	50	0.673	0.033	0.641	0.032	0.627	0.031	0.625	0.031	
6	60	0.532	0.026	0.567	0.028	0.609	0.030	0.629	0.031	
7	70	0.591	0.029	0.586	0.029	0.597	0.029	0.607	0.030	
8	80	1.265	0.063	1.274	0.063	1.292	0.064	1.299	0.064	
9	90	0.958	0.047	0.908	0.045	0.884	0.044	0.881	0.044	
10	100	0.821	0.041	0.783	0.039	0.779	0.038	0.785	0.039	
11	100	0.753	0.037	0.682	0.034	0.665	0.033	0.673	0.033	
12	100	0.735	0.036	0.699	0.034	0.718	0.035	0.738	0.036	
Note(s): The worst value of three phases shall be determined.										
Reactive set-point control, Q = 0										
Grid impedance angle, ψ_k				30°	50°	70°	85°			
Flicker coefficient, c(ψ_k)				0.036	0.034	0.035	0.036			
Short-term flicker, P _{st}				0.735	0.699	0.718	0.738			

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test: P=Discharge power					AF60K-TH + ATOM HS-15.36-L1				
Grid impedance angle, ψ_k		30°		50°		70°		85°	
Test No.	P/P _{NINV} [%]	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)
1	10	0.525	0.026	0.540	0.027	0.548	0.027	0.545	0.027
2	20	0.712	0.035	0.724	0.036	0.731	0.036	0.728	0.036
3	30	0.674	0.033	0.685	0.034	0.697	0.034	0.701	0.035
4	40	1.049	0.052	1.040	0.052	1.038	0.051	1.039	0.051
5	50	0.780	0.039	0.791	0.039	0.804	0.040	0.809	0.040
6	60	0.640	0.032	0.635	0.031	0.632	0.031	0.630	0.031
7	70	0.607	0.030	0.606	0.030	0.608	0.030	0.609	0.030
8	80	0.906	0.045	0.903	0.045	0.909	0.045	0.913	0.045
9	90	1.293	0.064	1.281	0.064	1.273	0.063	1.267	0.063
10	100	1.144	0.057	1.140	0.057	1.141	0.057	1.143	0.057
11	100	1.134	0.056	1.111	0.055	1.096	0.054	1.092	0.054
12	100	1.132	0.056	1.119	0.055	1.110	0.055	1.107	0.055

Note(s): The worst value of three phases shall be determined.

Reactive set-point control, Q = 0

Grid impedance angle, ψ_k	30°	50°	70°	85°
Flicker coefficient, c(ψ_k)	0.056	0.055	0.055	0.055
Short-term flicker, P _{st}	1.132	1.119	1.110	1.107

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test: P=Discharge power					L2				
Grid impedance angle, ψ_k		30°		50°		70°		85°	
Test No.	P/P _{NINV} [%]	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)
1	10	1.003	0.050	1.001	0.050	1.002	0.050	1.004	0.050
2	20	0.840	0.042	0.829	0.041	0.821	0.041	0.815	0.040
3	30	1.296	0.064	1.299	0.064	1.302	0.065	1.303	0.065
4	40	1.223	0.061	1.234	0.061	1.243	0.062	1.246	0.062
5	50	0.731	0.036	0.725	0.036	0.722	0.036	0.722	0.036
6	60	1.261	0.063	1.237	0.061	1.220	0.061	1.215	0.060
7	70	0.897	0.044	0.881	0.044	0.874	0.043	0.872	0.043
8	80	0.572	0.028	0.571	0.028	0.579	0.028	0.586	0.029
9	90	0.789	0.039	0.809	0.040	0.823	0.041	0.826	0.041
10	100	1.155	0.057	1.158	0.057	1.163	0.058	1.166	0.058
11	100	1.159	0.057	1.160	0.058	1.164	0.058	1.166	0.058
12	100	1.165	0.058	1.174	0.058	1.183	0.059	1.188	0.059

Note(s): The worst value of three phases shall be determined.

Reactive set-point control, Q = 0

Grid impedance angle, ψ_k	30°	50°	70°	85°
Flicker coefficient, c(ψ_k)	0.058	0.058	0.059	0.059
Short-term flicker, P _{st}	1.165	1.174	1.183	1.188

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test: P=Discharge power					L3				
Grid impedance angle, ψ_k		30°		50°		70°		85°	
Test No.	P/P _{NINV} [%]	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)
1	10	1.245	0.062	1.247	0.062	1.246	0.062	1.244	0.062
2	20	1.290	0.064	1.294	0.064	1.298	0.064	1.300	0.065
3	30	0.854	0.042	0.871	0.043	0.885	0.044	0.888	0.044
4	40	0.486	0.024	0.495	0.024	0.510	0.025	0.515	0.025
5	50	1.304	0.065	1.302	0.065	1.301	0.065	1.299	0.064
6	60	0.882	0.044	0.886	0.044	0.894	0.044	0.897	0.044
7	70	1.279	0.063	1.278	0.063	1.280	0.064	1.282	0.064
8	80	1.296	0.064	1.293	0.064	1.292	0.064	1.289	0.064
9	90	0.786	0.039	0.792	0.039	0.803	0.040	0.810	0.040
10	100	0.491	0.024	0.492	0.024	0.504	0.025	0.506	0.025
11	100	0.486	0.024	0.491	0.024	0.499	0.024	0.501	0.025
12	100	0.457	0.022	0.465	0.023	0.486	0.024	0.497	0.024
Note(s): The worst value of three phases shall be determined.									
Reactive set-point control, Q = 0									
Grid impedance angle, ψ_k		30°		50°		70°		85°	
Flicker coefficient, c(ψ_k)		0.022		0.023		0.024		0.024	
Short-term flicker, P _{st}		0.457		0.465		0.486		0.497	

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test: P=Discharge power					AF36K-TH + ATOM HS-15.36-L1				
Grid impedance angle, ψ_k		30°		50°		70°		85°	
Test No.	P/P _{NINV} [%]	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)
1	10	0.503	0.025	0.510	0.025	0.515	0.025	0.515	0.025
2	20	0.727	0.036	0.742	0.037	0.752	0.037	0.751	0.037
3	30	0.627	0.031	0.611	0.030	0.606	0.030	0.607	0.030
4	40	1.033	0.051	1.047	0.052	1.061	0.053	1.067	0.053
5	50	0.819	0.040	0.832	0.041	0.843	0.042	0.846	0.042
6	60	0.621	0.031	0.626	0.031	0.635	0.031	0.638	0.031
7	70	0.649	0.032	0.669	0.033	0.689	0.034	0.695	0.034
8	80	0.886	0.044	0.883	0.044	0.883	0.044	0.884	0.044
9	90	1.335	0.066	1.302	0.065	1.270	0.063	1.247	0.062
10	100	1.119	0.055	1.124	0.056	1.130	0.056	1.133	0.056
11	100	1.116	0.055	1.118	0.055	1.122	0.056	1.123	0.056
12	100	1.185	0.059	1.191	0.059	1.201	0.060	1.206	0.060
Note(s): The worst value of three phases shall be determined.									
Reactive set-point control, Q = 0									
Grid impedance angle, ψ_k		30°		50°		70°		85°	
Flicker coefficient, c(ψ_k)		0.059		0.059		0.060		0.060	
Short-term flicker, P _{st}		1.185		1.191		1.201		1.206	

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test: P=Discharge power					L2				
Grid impedance angle, ψ_k		30°		50°		70°		85°	
Test No.	P/P _{NINV} [%]	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)
1	10	0.972	0.048	0.978	0.048	0.989	0.049	1.000	0.050
2	20	0.825	0.041	0.830	0.041	0.832	0.041	0.829	0.041
3	30	1.290	0.064	1.295	0.064	1.300	0.065	1.300	0.065
4	40	1.216	0.060	1.207	0.060	1.203	0.060	1.203	0.060
5	50	0.727	0.036	0.738	0.036	0.750	0.037	0.754	0.037
6	60	1.268	0.063	1.268	0.063	1.272	0.063	1.275	0.063
7	70	0.894	0.044	0.898	0.044	0.904	0.045	0.905	0.045
8	80	0.613	0.030	0.614	0.030	0.625	0.031	0.631	0.031
9	90	0.733	0.036	0.759	0.037	0.788	0.039	0.806	0.040
10	100	1.177	0.058	1.164	0.058	1.154	0.057	1.150	0.057
11	100	1.185	0.059	1.180	0.059	1.179	0.058	1.177	0.058
12	100	1.103	0.055	1.094	0.054	1.089	0.054	1.088	0.054
Note(s): The worst value of three phases shall be determined.									
Reactive set-point control, Q = 0									
Grid impedance angle, ψ_k		30°		50°		70°		85°	
Flicker coefficient, c(ψ_k)		0.055		0.054		0.054		0.054	
Short-term flicker, P _{st}		1.103		1.094		1.089		1.088	

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test: P=Discharge power						L3			
Grid impedance angle, ψ_k		30°		50°		70°		85°	
Test No.	P/P _{NINV} [%]	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)
1	10	1.294	0.064	1.292	0.064	1.282	0.064	1.268	0.063
2	20	1.330	0.066	1.353	0.067	1.368	0.068	1.367	0.068
3	30	0.896	0.044	0.911	0.045	0.924	0.046	0.925	0.046
4	40	0.492	0.024	0.492	0.024	0.503	0.025	0.505	0.025
5	50	1.307	0.065	1.326	0.066	1.343	0.067	1.349	0.067
6	60	0.908	0.045	0.899	0.044	0.894	0.044	0.892	0.044
7	70	1.295	0.064	1.305	0.065	1.317	0.065	1.320	0.066
8	80	1.288	0.064	1.274	0.063	1.264	0.063	1.260	0.063
9	90	0.694	0.034	0.707	0.035	0.730	0.036	0.747	0.037
10	100	0.469	0.023	0.471	0.023	0.489	0.024	0.497	0.024
11	100	0.449	0.022	0.452	0.022	0.470	0.023	0.483	0.024
12	100	0.470	0.023	0.491	0.024	0.522	0.026	0.535	0.026

Note(s): The worst value of three phases shall be determined.

Reactive set-point control, Q = 0

Grid impedance angle, ψ_k	30°	50°	70°	85°
Flicker coefficient, c(ψ_k)	0.023	0.024	0.026	0.026
Short-term flicker, P _{st}	0.470	0.491	0.522	0.535

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test: P=Charge power (Bi-directional converter only)					AF60K-TH + ATOM HS-40.96-L1				
Grid impedance angle, ψ_k		30°		50°		70°		85°	
Test No.	P/P _{NINV} [%]	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)
1	10	1.258	0.062	1.258	0.062	1.264	0.063	1.270	0.063
2	20	1.260	0.063	1.261	0.063	1.263	0.063	1.264	0.063
3	30	1.298	0.064	1.312	0.065	1.329	0.066	1.341	0.067
4	40	0.502	0.025	0.497	0.024	0.495	0.024	0.489	0.024
5	50	1.042	0.052	1.033	0.051	1.032	0.051	1.033	0.051
6	60	0.963	0.048	0.983	0.049	1.006	0.050	1.017	0.050
7	70	1.206	0.060	1.215	0.060	1.238	0.061	1.251	0.062
8	80	0.987	0.049	1.037	0.051	1.091	0.054	1.118	0.055
9	90	1.155	0.057	1.120	0.056	1.111	0.055	1.118	0.055
10	100	0.532	0.026	0.593	0.029	0.669	0.033	0.707	0.035
11	100	0.548	0.027	0.607	0.030	0.674	0.033	0.707	0.035
12	100	0.535	0.026	0.583	0.029	0.648	0.032	0.687	0.034

Note(s): The worst value of three phases shall be determined.

Reactive set-point control, Q = 0

Grid impedance angle, ψ_k	30°	50°	70°	85°
Flicker coefficient, c(ψ_k)	0.026	0.029	0.032	0.034
Short-term flicker, P _{st}	0.535	0.583	0.648	0.687

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test: P=Charge power (Bi-directional converter only)						L2			
Grid impedance angle, ψ_k		30°		50°		70°		85°	
Test No.	P/P _{NINV} [%]	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)
1	10	0.885	0.044	0.878	0.043	0.871	0.043	0.867	0.043
2	20	0.996	0.049	1.000	0.050	1.004	0.050	1.006	0.050
3	30	0.745	0.037	0.752	0.037	0.761	0.038	0.766	0.038
4	40	1.149	0.057	1.185	0.059	1.228	0.061	1.256	0.062
5	50	1.229	0.061	1.239	0.061	1.249	0.062	1.255	0.062
6	60	0.558	0.027	0.547	0.027	0.549	0.027	0.552	0.027
7	70	1.055	0.052	1.046	0.052	1.044	0.052	1.045	0.052
8	80	0.606	0.030	0.630	0.031	0.657	0.032	0.668	0.033
9	90	1.008	0.050	1.037	0.051	1.067	0.053	1.083	0.054
10	100	1.062	0.053	1.036	0.051	1.031	0.051	1.034	0.051
11	100	1.030	0.051	0.986	0.049	0.965	0.048	0.958	0.047
12	100	1.029	0.051	0.989	0.049	0.974	0.048	0.972	0.048
Note(s): The worst value of three phases shall be determined.									
Reactive set-point control, Q = 0									
Grid impedance angle, ψ_k		30°		50°		70°		85°	
Flicker coefficient, c(ψ_k)		0.051		0.049		0.048		0.048	
Short-term flicker, P _{st}		1.029		0.989		0.974		0.972	

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test: P=Charge power (Bi-directional converter only)						L3			
Grid impedance angle, ψ_k		30°		50°		70°		85°	
Test No.	P/P _{NINV} [%]	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)
1	10	0.670	0.033	0.674	0.033	0.682	0.034	0.687	0.034
2	20	0.540	0.027	0.537	0.026	0.542	0.027	0.548	0.027
3	30	0.813	0.040	0.799	0.039	0.792	0.039	0.786	0.039
4	40	1.152	0.057	1.148	0.057	1.142	0.057	1.133	0.056
5	50	0.515	0.025	0.538	0.026	0.567	0.028	0.581	0.029
6	60	1.266	0.063	1.273	0.063	1.286	0.064	1.293	0.064
7	70	0.476	0.023	0.489	0.024	0.534	0.026	0.560	0.028
8	80	1.256	0.062	1.253	0.062	1.263	0.063	1.267	0.063
9	90	0.577	0.028	0.633	0.031	0.701	0.035	0.733	0.036
10	100	1.229	0.061	1.264	0.063	1.303	0.065	1.324	0.066
11	100	1.209	0.060	1.215	0.060	1.233	0.061	1.245	0.062
12	100	1.266	0.063	1.315	0.065	1.372	0.068	1.400	0.070

Note(s): The worst value of three phases shall be determined.

Reactive set-point control, Q = 0

Grid impedance angle, ψ_k	30°	50°	70°	85°
Flicker coefficient, c(ψ_k)	0.063	0.065	0.068	0.070
Short-term flicker, P _{st}	1.266	1.315	1.372	1.400

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test: P=Charge power (Bi-directional converter only)						AF60K-TH + ATOM HS-15.36-L1				
Grid impedance angle, ψ_k		30°		50°		70°		85°		
Test No.	P/P _{NINV} [%]	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	
1	10	0.451	0.022	0.451	0.022	0.456	0.022	0.466	0.023	
2	20	1.060	0.053	1.050	0.052	1.039	0.051	1.033	0.051	
3	30	1.183	0.059	1.189	0.059	1.199	0.059	1.206	0.060	
4	40	0.648	0.032	0.652	0.032	0.659	0.032	0.663	0.033	
5	50	0.772	0.038	0.778	0.038	0.788	0.039	0.795	0.039	
6	60	0.927	0.046	0.944	0.047	0.961	0.048	0.969	0.048	
7	70	0.993	0.049	1.005	0.050	1.022	0.051	1.033	0.051	
8	80	0.952	0.047	0.979	0.048	1.010	0.050	1.025	0.051	
9	90	1.312	0.065	1.340	0.067	1.370	0.068	1.384	0.069	
10	100	0.652	0.032	0.644	0.032	0.647	0.032	0.650	0.032	
11	100	0.635	0.031	0.646	0.032	0.668	0.033	0.682	0.034	
12	100	0.647	0.032	0.645	0.032	0.648	0.032	0.650	0.032	
Note(s): The worst value of three phases shall be determined.										
Reactive set-point control, Q = 0										
Grid impedance angle, ψ_k				30°	50°	70°	85°			
Flicker coefficient, c(ψ_k)				0.032	0.032	0.032	0.032			
Short-term flicker, P _{st}				0.647	0.645	0.648	0.650			

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test: P=Charge power (Bi-directional converter only)						L2			
Grid impedance angle, ψ_k		30°		50°		70°		85°	
Test No.	P/P _{NINV} [%]	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)
1	10	1.083	0.054	1.084	0.054	1.090	0.054	1.098	0.054
2	20	1.214	0.060	1.215	0.060	1.219	0.060	1.224	0.061
3	30	1.115	0.055	1.119	0.055	1.124	0.056	1.126	0.056
4	40	0.872	0.043	0.875	0.043	0.880	0.044	0.884	0.044
5	50	0.737	0.036	0.730	0.036	0.728	0.036	0.729	0.036
6	60	0.600	0.030	0.589	0.029	0.584	0.029	0.584	0.029
7	70	0.502	0.025	0.503	0.025	0.514	0.025	0.525	0.026
8	80	0.593	0.029	0.586	0.029	0.582	0.029	0.580	0.029
9	90	0.720	0.036	0.742	0.037	0.764	0.038	0.774	0.038
10	100	1.284	0.064	1.269	0.063	1.259	0.062	1.257	0.062
11	100	1.286	0.064	1.283	0.064	1.281	0.064	1.280	0.064
12	100	1.274	0.063	1.254	0.062	1.240	0.062	1.234	0.061

Note(s): The worst value of three phases shall be determined.

Reactive set-point control, Q = 0

Grid impedance angle, ψ_k	30°	50°	70°	85°
Flicker coefficient, c(ψ_k)	0.063	0.062	0.062	0.061
Short-term flicker, P _{st}	1.274	1.254	1.240	1.234

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test: P=Charge power (Bi-directional converter only)						L3			
Grid impedance angle, ψ_k		30°		50°		70°		85°	
Test No.	P/P _{NINV} [%]	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)
1	10	1.210	0.060	1.205	0.060	1.196	0.059	1.189	0.059
2	20	0.505	0.025	0.514	0.025	0.530	0.026	0.542	0.027
3	30	0.469	0.023	0.473	0.023	0.489	0.024	0.503	0.025
4	40	1.266	0.063	1.263	0.063	1.268	0.063	1.274	0.063
5	50	1.289	0.064	1.278	0.063	1.270	0.063	1.267	0.063
6	60	1.276	0.063	1.275	0.063	1.278	0.063	1.281	0.064
7	70	1.277	0.063	1.277	0.063	1.277	0.063	1.274	0.063
8	80	1.253	0.062	1.239	0.061	1.231	0.061	1.229	0.061
9	90	0.815	0.040	0.817	0.040	0.827	0.041	0.834	0.041
10	100	0.928	0.046	0.944	0.047	0.963	0.048	0.973	0.048
11	100	0.907	0.045	0.944	0.047	0.984	0.049	1.002	0.050
12	100	0.896	0.044	0.897	0.044	0.902	0.045	0.904	0.045

Note(s): The worst value of three phases shall be determined.

Reactive set-point control, Q = 0

Grid impedance angle, ψ_k	30°	50°	70°	85°
Flicker coefficient, c(ψ_k)	0.044	0.044	0.045	0.045
Short-term flicker, P _{st}	0.896	0.897	0.902	0.904

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test: P=Charge power (Bi-directional converter only)						AF36K-TH + ATOM HS-15.36-L1			
Grid impedance angle, ψ_k		30°		50°		70°		85°	
Test No.	P/P _{NINV} [%]	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)
1	10	0.458	0.022	0.463	0.023	0.475	0.023	0.488	0.024
2	20	1.060	0.053	1.057	0.052	1.058	0.052	1.061	0.053
3	30	1.196	0.059	1.178	0.058	1.162	0.058	1.157	0.057
4	40	1.033	0.051	1.047	0.052	1.061	0.053	1.067	0.053
5	50	0.763	0.038	0.763	0.038	0.768	0.038	0.773	0.038
6	60	0.888	0.044	0.888	0.044	0.893	0.044	0.897	0.044
7	70	1.016	0.050	1.025	0.051	1.036	0.051	1.043	0.052
8	80	0.946	0.047	0.933	0.046	0.922	0.046	0.917	0.045
9	90	1.333	0.066	1.336	0.068	1.339	0.066	1.339	0.066
10	100	0.673	0.033	0.675	0.033	0.680	0.034	0.680	0.034
11	100	0.618	0.030	0.620	0.031	0.630	0.031	0.637	0.031
12	100	0.613	0.030	0.611	0.030	0.614	0.030	0.615	0.030

Note(s): The worst value of three phases shall be determined.

Reactive set-point control, Q = 0

Grid impedance angle, ψ_k	30°	50°	70°	85°
Flicker coefficient, c(ψ_k)	0.030	0.030	0.030	0.030
Short-term flicker, P _{st}	0.613	0.611	0.614	0.615

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test: P=Charge power (Bi-directional converter only)						L2			
Grid impedance angle, ψ_k		30°		50°		70°		85°	
Test No.	P/P _{NINV} [%]	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)
1	10	1.099	0.054	1.105	0.055	1.117	0.055	1.127	0.056
2	20	1.240	0.062	1.245	0.062	1.251	0.062	1.254	0.062
3	30	1.079	0.053	1.085	0.054	1.094	0.054	1.099	0.055
4	40	1.216	0.060	1.207	0.060	1.203	0.060	1.203	0.060
5	50	0.765	0.038	0.769	0.038	0.778	0.038	0.783	0.039
6	60	0.616	0.030	0.613	0.030	0.619	0.030	0.626	0.031
7	70	0.520	0.026	0.516	0.025	0.516	0.025	0.517	0.025
8	80	0.634	0.031	0.637	0.031	0.642	0.032	0.643	0.032
9	90	0.666	0.033	0.674	0.033	0.692	0.034	0.706	0.035
10	100	1.191	0.059	1.211	0.060	1.242	0.062	1.269	0.063
11	100	1.249	0.062	1.234	0.061	1.226	0.061	1.227	0.061
12	100	1.257	0.062	1.249	0.062	1.248	0.062	1.249	0.062

Note(s): The worst value of three phases shall be determined.

Reactive set-point control, Q = 0

Grid impedance angle, ψ_k	30°	50°	70°	85°
Flicker coefficient, c(ψ_k)	0.062	0.062	0.062	0.062
Short-term flicker, P _{st}	1.257	1.249	1.248	1.249

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test: P=Charge power (Bi-directional converter only)					L3				
Grid impedance angle, ψ_k		30°		50°		70°		85°	
Test No.	P/P _{NINV} [%]	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)	P _{st}	c(ψ_k)
1	10	1.177	0.058	1.175	0.058	1.174	0.058	1.178	0.058
2	20	0.479	0.023	0.475	0.023	0.479	0.023	0.488	0.024
3	30	0.497	0.024	0.505	0.025	0.524	0.026	0.534	0.026
4	40	0.492	0.024	0.492	0.024	0.503	0.025	0.505	0.025
5	50	1.296	0.064	1.291	0.064	1.288	0.064	1.287	0.064
6	60	1.282	0.064	1.275	0.063	1.272	0.063	1.271	0.063
7	70	1.242	0.062	1.249	0.062	1.258	0.062	1.263	0.063
8	80	1.250	0.062	1.255	0.062	1.269	0.063	1.279	0.063
9	90	0.846	0.042	0.820	0.041	0.803	0.040	0.795	0.039
10	100	0.997	0.049	0.990	0.049	0.985	0.049	0.976	0.048
11	100	0.920	0.046	0.945	0.047	0.971	0.048	0.982	0.049
12	100	0.917	0.045	0.920	0.046	0.926	0.046	0.930	0.046

Note(s): The worst value of three phases shall be determined.

Reactive set-point control, Q = 0

Grid impedance angle, ψ_k	30°	50°	70°	85°
Flicker coefficient, c(ψ_k)	0.045	0.046	0.046	0.046
Short-term flicker, P _{st}	0.917	0.920	0.926	0.930

CEI 0-16								
Clause	Requirement - Test				Result - Remark			Verdict
Nbis.4	Tabella: Prove a piena potenza su rete simulate Table: Tests at full power on simulated grid							P
Test sequence	Test condition		Measurement result					Limits
	U/U _n	f [Hz]	U/U _n	f [Hz]	P/P _{NINV}	Cosφ (PF)	ΔP/S _n	ΔP/S _n
1	85%	47.5	85.03%	47.49	100.11%	0.9995	0.11%	-15% to +5%
2	110%	51.5	109.92%	51.49	100.12%	0.9997	0.12%	-5% to +5%
3	85%	47.5	84.99%	47.48	-100.32%	-0.9996	-0.32%	-15% to +5%
4	110%	51.5	109.94%	51.49	-100.13%	-0.9996	-0.13%	-5% to +5%
<p>Note:</p> <p>Function of interface protection and activating active power response to over/under-frequency and voltage should be disable.</p> <p>Test sequence 1, 3: Unit can operate at reduced power of $P \geq 85\%S_n$.</p> <p>Supplied power must remain stable within $\pm 5\% S_n$ at the entire duration</p>								
Diagram of Test 1								
<p>The graph displays three parameters over a 300-second period:</p> <ul style="list-style-type: none"> Power (blue line): Maintains a constant value of 100% p.u. Voltage (orange line): Maintains a constant value of approximately 85% p.u. Frequency (green line): Maintains a constant value of approximately 47.5 Hz. 								

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Diagram of Test 2:

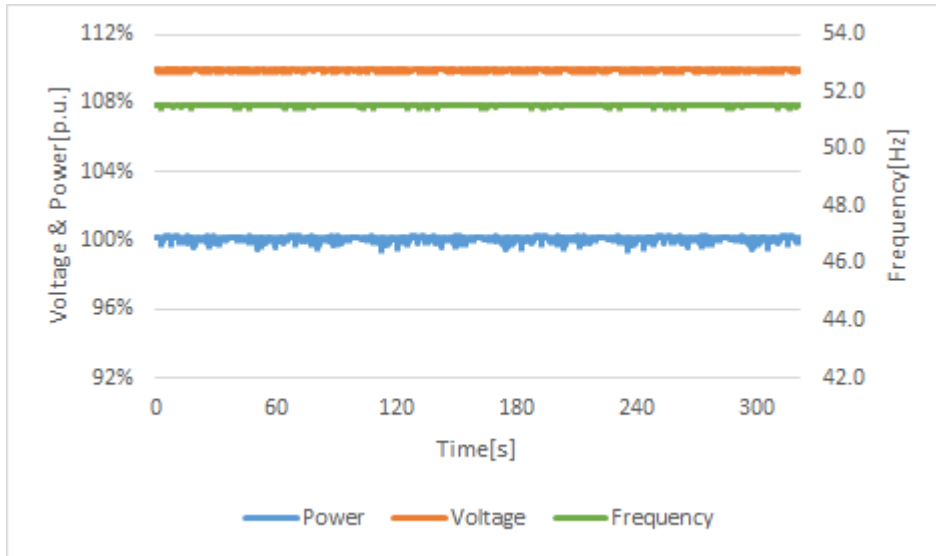
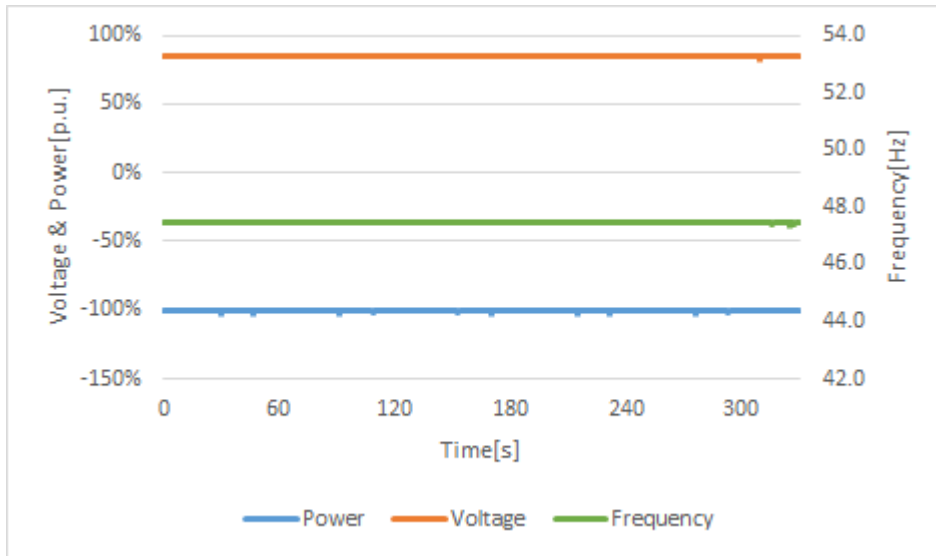
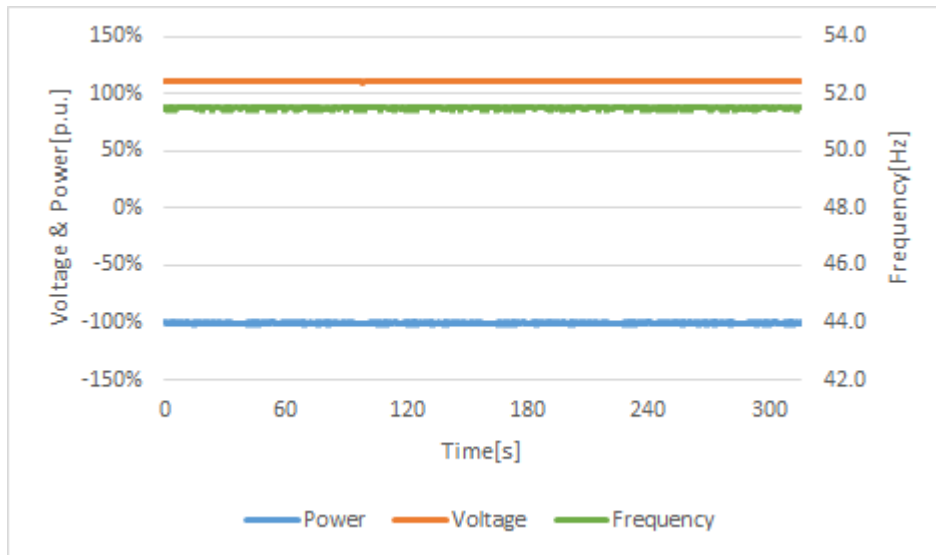


Diagram of Test 3:



CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Diagram of Test 4:



CEI 0-16							
Clause	Requirement - Test				Result - Remark		Verdict
Nbis.5	Tabella: Verifica delle condizioni di sincronizzazione e presa di carico Table: Synchronization and reconnection						P
Setting values for Synchronization:	Setting U< [V]:			207V			
	Setting U> [V]:			253V			
	Setting f< [Hz]:			49.9Hz			
	Setting f> [Hz]:			50.1Hz			
	Setting T _{connection} [s]:			30s			
	Setting T _{reconnection} [s]:			300s			
Test: P=Discharge power					AF60K-TH + ATOM HS-40.96		
Test condition		Measurement				Limit	
U/U _n	F [Hz]	U/U _n	F [Hz]	Observation time [s]	Max. gradient P _{NINV} /min	Observation time	Max. gradient P _{NINV} /min
Test conditions: connecting at start-up:							
< 89%	50	88.02%	50.00	79.8	--	No connection	--
Change to:							
≥ 91%	50	92.05%	50.00	35.2	19.22%	≥ 30s	≤ 20%
Change to:							
> 111%	50	112.06	50.00	78.4	--	No connection	--
Change to:							
≤ 109%	50	108.20	50.00	36.8	19.11%	≥ 30s	≤ 20%
Change to:							
100%	< 49.88	99.98%	49.86	80.5	--	No connection	--
Change to:							
100%	≥ 49.92	99.97%	49.92	34.6	19.20%	≥ 30s	≤ 20%
Change to:							
100%	> 50.12	99.95%	50.13	78.9	--	No connection	--
Change to:							
100%	≤ 50.08	99.99%	50.08	35.3	19.13%	≥ 30s	≤ 20%

CEI 0-16							
Clause	Requirement - Test				Result - Remark		Verdict
Test conditions: Reconnecting after failure:							
< 89%	50	88.14%	50.00	612.4	--	No connection	--
Change to:							
≥ 91%	50	92.16%	50.00	311.5	19.21%	≥ 300s	≤ 20%
> 111%	50	112.11%	50.00	612.7	--	No connection	--
Change to:							
≤ 109%	50	108.20%	50.00	315.4	19.18%	≥ 300s	≤ 20%
100%	< 49.88	99.92%	49.87	620.4	--	No connection	--
Change to:							
100%	≥ 49.92	99.94%	49.92	314.5	19.24%	≥ 300s	≤ 20%
100%	> 50.12	99.98%	50.13	617.8	--	No connection	--
Change to:							
100%	≤ 50.08	99.93%	50.08	315.0	19.13%	≥ 300s	≤ 20%
Test: P=Discharge power					AF60K-TH + ATOM HS-15.36		
Test condition		Measurement				Limit	
U/U _n	F [Hz]	U/U _n	F [Hz]	Observation time [s]	Max. gradient P _{NINV} /min	Observation time	Max. gradient P _{NINV} /min
Test conditions: connecting at start-up:							
< 89%	50	88.12%	50.00	82.1	--	No connection	--
Change to:							
≥ 91%	50	92.03%	50.00	35.9	19.35%	≥ 30s	≤ 20%
Change to:							
> 111%	50	112.07%	50.00	81.3	--	No connection	--
Change to:							
≤ 109%	50	108.25%	50.00	34.9	19.24%	≥ 30s	≤ 20%

CEI 0-16							
Clause	Requirement - Test				Result - Remark		Verdict
100%	< 49.88	99.98%	49.87	79.9	--	No connection	--
Change to:							
100%	≥ 49.92	99.96%	49.92	33.8	19.33%	≥ 30s	≤ 20%
Change to:							
100%	> 50.12	99.93%	50.13	80.4	--	No connection	--
Change to:							
100%	≤ 50.08	99.94%	50.08	34.8	19.20%	≥ 30s	≤ 20%
Test conditions: Reconnecting after failure:							
< 89%	50	88.17%	50.00	613.5	--	No connection	--
Change to:							
≥ 91%	50	92.07%	50.00	320.4	19.21%	≥ 300s	≤ 20%
> 111%	50	112.16%	50.00	621.7	--	No connection	--
Change to:							
≤ 109%	50	108.09%	50.00	315.2	19.26%	≥ 300s	≤ 20%
100%	< 49.88	99.93%	49.87	613.8	--	No connection	--
Change to:							
100%	≥ 49.92	99.94%	49.92	319.0	19.18%	≥ 300s	≤ 20%
100%	> 50.12	99.97%	50.13	624.7	--	No connection	--
Change to:							
100%	≤ 50.08	99.92%	50.08	312.7	19.22%	≥ 300s	≤ 20%

CEI 0-16							
Clause	Requirement - Test					Result - Remark	Verdict
Test: P=Discharge power						AF36K-TH + ATOM HS-15.36	
Test condition		Measurement				Limit	
U/U _n	F [Hz]	U/U _n	F [Hz]	Observation time [s]	Max. gradient P _{NINV} /min	Observation time	Max. gradient P _{NINV} /min
Test conditions: connecting at start-up:							
< 89%	50	88.24%	50.00	80.1	--	No connection	--
Change to:							
≥ 91%	50	92.11%	50.00	34.3	19.15%	≥ 30s	≤ 20%
Change to:							
> 111%	50	112.05%	50.00	79.4	--	No connection	--
Change to:							
≤ 109%	50	108.15%	50.00	33.0	19.21%	≥ 30s	≤ 20%
Change to:							
100%	< 49.88	99.95%	49.87	79.5	--	No connection	--
Change to:							
100%	≥ 49.92	99.97%	49.92	36.4	19.23%	≥ 30s	≤ 20%
Change to:							
100%	> 50.12	99.93%	50.13	79.4	--	No connection	--
Change to:							
100%	≤ 50.08	99.97%	50.08	35.4	19.24%	≥ 30s	≤ 20%

CEI 0-16							
Clause	Requirement - Test				Result - Remark		Verdict
Test conditions: Reconnecting after failure:							
< 89%	50	88.15%	50.00	621.0	--	No connection	--
Change to:							
≥ 91%	50	92.14%	50.00	319.4	19.15%	≥ 300s	≤ 20%
> 111%	50	112.23%	50.00	619.5	--	No connection	--
Change to:							
≤ 109%	50	108.22%	50.00	320.4	19.24%	≥ 300s	≤ 20%
100%	< 49.88	99.93%	49.87	623.3	--	No connection	--
Change to:							
100%	≥ 49.92	99.95%	49.92	315.9	19.17%	≥ 300s	≤ 20%
100%	> 50.12	99.97%	50.13	619.8	--	No connection	--
Change to:							
100%	≤ 50.08	99.93%	50.08	317.4	19.18%	≥ 300s	≤ 20%
Test: P=Charge power (Bi-directional converter only)					AF60K-TH + ATOM HS-40.96		
Test condition		Measurement				Limit	
U/U _n	F [Hz]	U/U _n	F [Hz]	Observation time [s]	Max. gradient P _{NINV} /min	Observation time	Max. gradient P _{NINV} /min
Test conditions: connecting at start-up:							
< 89%	50	88.16%	50.00	78.4	--	No connection	--
Change to:							
≥ 91%	50	92.15%	50.00	36.4	19.28%	≥ 30s	≤ 20%
Change to:							
> 111%	50	112.13%	50.00	80.7	--	No connection	--
Change to:							
≤ 109%	50	108.25%	50.00	36.1	19.36%	≥ 30s	≤ 20%

CEI 0-16							
Clause	Requirement - Test				Result - Remark		Verdict
100%	< 49.88	99.94%	49.87	77.9	--	No connection	--
Change to:							
100%	≥ 49.92	99.95%	49.92	35.2	19.15%	≥ 30s	≤ 20%
Change to:							
100%	> 50.12	99.98%	50.13	81.4	--	No connection	--
Change to:							
100%	≤ 50.08	99.93%	50.08	36.9	19.24%	≥ 30s	≤ 20%
Test conditions: Reconnecting after failure:							
< 89%	50	88.16%	50.00	623.5	--	No connection	--
Change to:							
≥ 91%	50	92.06%	50.00	315.7	19.18%	≥ 300s	≤ 20%
> 111%	50	112.09%	50.00	621.3	--	No connection	--
Change to:							
≤ 109%	50	108.23%	50.00	319.3	19.21%	≥ 300s	≤ 20%
100%	< 49.88	99.97%	49.87	618.0	--	No connection	--
Change to:							
100%	≥ 49.92	99.93%	49.92	321.4	19.17%	≥ 300s	≤ 20%
100%	> 50.12	99.92%	50.13	619.4	--	No connection	--
Change to:							
100%	≤ 50.08	99.95%	50.08	315.6	19.23%	≥ 300s	≤ 20%

CEI 0-16							
Clause	Requirement - Test				Result - Remark		Verdict
Test: P=Charge power (Bi-directional converter only)					AF60K-TH + ATOM HS-15.36		
Test condition		Measurement				Limit	
U/U _n	F [Hz]	U/U _n	F [Hz]	Observation time [s]	Max. gradient P _{NINV} /min	Observation time	Max. gradient P _{NINV} /min
Test conditions: connecting at start-up:							
< 89%	50	88.17%	50.00	79.3	--	No connection	--
Change to:							
≥ 91%	50	92.15%	50.00	34.5	19.16%	≥ 30s	≤ 20%
Change to:							
> 111%	50	112.03%	50.00	80.1	--	No connection	--
Change to:							
≤ 109%	50	108.24%	50.00	36.4	19.23%	≥ 30s	≤ 20%
Change to:							
100%	< 49.88	99.97%	49.87	78.6	--	No connection	--
Change to:							
100%	≥ 49.92	99.93%	49.92	34.9	19.18%	≥ 30s	≤ 20%
Change to:							
100%	> 50.12	99.95%	50.13	80.2	--	No connection	--
Change to:							
100%	≤ 50.08	99.92%	50.08	35.9	19.10%	≥ 30s	≤ 20%

CEI 0-16							
Clause	Requirement - Test				Result - Remark		Verdict
Test conditions: Reconnecting after failure:							
< 89%	50	88.16%	50.00	622.4	--	No connection	--
Change to:							
≥ 91%	50	92.17%	50.00	319.5	19.24%	≥ 300s	≤ 20%
> 111%	50	112.20%	50.00	617.7	--	No connection	--
Change to:							
≤ 109%	50	108.19%	50.00	320.1	19.16%	≥ 300s	≤ 20%
100%	< 49.88	99.98%	49.87	622.2	--	No connection	--
Change to:							
100%	≥ 49.92	99.95%	49.92	311.7	19.25%	≥ 300s	≤ 20%
100%	> 50.12	99.93%	50.13	613.4	--	No connection	--
Change to:							
100%	≤ 50.08	99.94%	50.08	315.9	19.22%	≥ 300s	≤ 20%
Test: P=Charge power (Bi-directional converter only)					AF36K-TH + ATOM HS-15.36		
Test condition		Measurement				Limit	
U/U _n	F [Hz]	U/U _n	F [Hz]	Observation time [s]	Max. gradient P _{NINV} /min	Observation time	Max. gradient P _{NINV} /min
Test conditions: connecting at start-up:							
< 89%	50	88.14%	50.00	81.4	--	No connection	--
Change to:							
≥ 91%	50	92.16%	50.00	34.9	19.13%	≥ 30s	≤ 20%
Change to:							
> 111%	50	112.23%	50.00	82.0	--	No connection	--
Change to:							
≤ 109%	50	108.25%	50.00	36.4	19.24%	≥ 30s	≤ 20%
Change to:							
100%	< 49.88	99.94%	49.87	79.4	--	No connection	--

CEI 0-16							
Clause	Requirement - Test				Result - Remark		Verdict
Change to:							
100%	≥ 49.92	99.97%	49.92	35.1	19.24%	≥ 30s	≤ 20%
Change to:							
100%	> 50.12	99.94%	50.13	76.5	--	No connection	--
Change to:							
100%	≤ 50.08	99.95%	50.08	36.7	19.14%	≥ 30s	≤ 20%
Test conditions: Reconnecting after failure:							
< 89%	50	88.16%	50.00	615.3	--	No connection	--
Change to:							
≥ 91%	50	92.08%	50.00	321.4	19.24%	≥ 300s	≤ 20%
> 111%	50	112.12%	50.00	620.1	--	No connection	--
Change to:							
≤ 109%	50	108.13%	50.00	315.7	19.16%	≥ 300s	≤ 20%
100%	< 49.88	99.95%	49.87	619.8	--	No connection	--
Change to:							
100%	≥ 49.92	99.96%	49.92	324.6	19.23%	≥ 300s	≤ 20%
100%	> 50.12	99.92%	50.13	617.2	--	No connection	--
Change to:							
100%	≤ 50.08	99.93%	50.08	311.4	19.17%	≥ 300s	≤ 20%

CEI 0-16										
Clause	Requirement - Test							Result - Remark		Verdict
Nbis.6.1	Tabella: Verifica della capability di erogazione della potenza reattiva Table: Verification of the reactive power capability								P	
Test: Power generation plant \geq 400kW						AF60K-TH + ATOM HS-40.96				
Test Conditions		Measurements								Limit
P/S _n	Q/S _n	Active Power		Reactive power		DC Power		Power Factor (cos ϕ)	$\Delta Q/S_n$	$\Delta Q/S_n$
		P [kW]	P/S _n [p.u.]	Q [kVar]	Q/S _n [p.u.]	P [kW]	P/S _n [p.u.]			
P=Charge power (Bi-directional converter only)										
100%	0	-48.02	-100%	-0.57	-0.9%	-47.06	-98%	-0.9995	-0.94%	$\leq \pm 5\%$
90%		-43.31	-90%	-1.55	-2.6%	-42.44	-88%	-0.9993	-2.59%	
80%		-38.44	-80%	-1.70	-2.8%	-37.67	-78%	-0.9990	-2.83%	
70%		-33.62	-70%	-1.58	-2.6%	-32.95	-69%	-0.9989	-2.63%	
60%		-28.87	-60%	-1.46	-2.4%	-28.29	-59%	-0.9987	-2.44%	
50%		-24.02	-50%	-1.34	-2.2%	-23.54	-49%	-0.9984	-2.24%	
40%		-19.22	-40%	-1.22	-2.0%	-18.84	-39%	-0.9980	-2.04%	
30%		-14.43	-30%	-1.12	-1.9%	-14.14	-29%	-0.9970	-1.87%	
20%		-9.64	-20%	-1.02	-1.7%	-9.45	-20%	-0.9944	-1.71%	
10%		-4.86	-10%	-0.95	-1.6%	-4.77	-10%	-0.9815	-1.58%	
0%		-0.01	0%	-0.95	-1.6%	0.01	-0.01%	-0.0001	-1.58%	$\leq \pm 10\%$
P=Discharge power										
0	0	0.07	0%	1.49	2.5%	0.08	0.01%	0.0520	2.49%	$\leq \pm 10\%$
10%		4.87	10%	1.51	2.5%	4.97	10%	0.9541	2.51%	$\leq \pm 5\%$
20%		9.62	20%	1.50	2.5%	9.82	20%	0.9876	2.50%	
30%		14.46	30%	1.51	2.5%	14.75	31%	0.9944	2.52%	
40%		19.22	40%	1.50	2.5%	19.61	41%	0.9968	2.51%	
50%		23.98	50%	1.50	2.5%	24.47	51%	0.9980	2.50%	
60%		28.84	60%	1.50	2.5%	29.43	61%	0.9986	2.51%	
70%		33.64	70%	1.50	2.5%	34.33	72%	0.9990	2.50%	
80%		38.47	80%	1.50	2.5%	39.26	82%	0.9992	2.50%	
90%		43.32	90%	1.51	2.5%	44.20	92%	0.9993	2.51%	
100%		47.97	100%	0.54	0.9%	48.95	102%	0.9995	0.90%	

CEI 0-16										
Clause	Requirement - Test						Result - Remark			Verdict
P=Charge power (Bi-directional converter only)										
100%	-31.2%	-48.05	-100%	-18.77	-31.3%	-47.08	-98%	-0.9314	-0.08%	--
95%	-31.2%	-45.63	-95%	-18.81	-31.3%	-44.72	-93%	-0.9245	-0.15%	≤ ±5%
90%	≤ -43.6%	-43.26	-90%	-26.16	-43.6%	-42.40	-88%	-0.8557	-0.01%	
80%	≤ -60.0%	-38.47	-80%	-36.05	-60.1%	-37.70	-79%	-0.7297	-0.08%	
70%	≤ -71.4%	-33.63	-70%	-42.87	-71.4%	-32.96	-69%	-0.6172	-0.05%	
60%	≤ -80.0%	-28.87	-60%	-48.04	-80.1%	-28.30	-59%	-0.5151	-0.07%	
50%	≤ -86.6%	-24.03	-50%	-52.01	-86.7%	-23.55	-49%	-0.4194	-0.08%	
40%	≤ -91.7%	-19.27	-40%	-55.05	-91.7%	-18.88	-39%	-0.3303	-0.04%	
30%	≤ -95.4%	-14.43	-30%	-57.26	-95.4%	-14.14	-29%	-0.2443	-0.04%	
20%	≤ -98.0%	-9.64	-20%	-58.88	-98.1%	-9.45	-20%	-0.1616	-0.13%	
10%	≤ -99.5%	-4.84	-10%	-59.71	-99.5%	-4.74	-10%	-0.0808	-0.01%	
0%	≤ -99.5%	-2.20	-5%	-59.70	-99.5%	-2.16	-5%	-0.0369	0.00%	--
P=Discharge power										
0	≤ -99.5%	2.16	5%	-59.70	-99.5%	2.20	5%	0.0369	0.00%	--
10%	≤ -99.5%	4.82	10%	-59.76	-99.6%	4.92	10%	0.0804	-0.09%	≤ ±5%
20%	≤ -98.0%	9.64	20%	-58.87	-98.1%	9.83	20%	0.1616	-0.12%	
30%	≤ -95.4%	14.47	30%	-57.26	-95.4%	14.76	31%	0.2449	-0.04%	
40%	≤ -91.7%	19.26	40%	-55.04	-91.7%	19.65	41%	0.3302	-0.03%	
50%	≤ -86.6%	24.05	50%	-51.96	-86.6%	24.54	51%	0.4201	0.00%	
60%	≤ -80.0%	28.82	60%	-48.02	-80.0%	29.41	61%	0.5146	-0.04%	
70%	≤ -71.4%	33.65	70%	-42.85	-71.4%	34.33	72%	0.6175	-0.02%	
80%	≤ -60.0%	38.46	80%	-36.03	-60.1%	39.24	82%	0.7297	-0.05%	
90%	≤ -43.6%	43.23	90%	-26.18	-43.6%	44.11	92%	0.8553	-0.04%	
95%	-31.2%	45.64	95%	-18.73	-31.2%	46.58	97%	0.9251	-0.01%	
100%	-31.2%	48.03	100%	-18.77	-31.3%	49.01	102%	0.9313	-0.08%	--

CEI 0-16										
Clause	Requirement - Test					Result - Remark				Verdict
P=Charge power (Bi-directional converter only)										
100%	31.2%	-48.06	-100%	18.73	31.2%	-47.10	-98%	-0.9317	0.02%	≤ ±5%
95%	31.2%	-45.63	-95%	18.71	31.2%	-44.72	-93%	-0.9253	-0.02%	
90%	≥ 43.6%	-43.24	-90%	26.17	43.6%	-42.38	-88%	-0.8555	0.02%	
80%	≥ 60.0%	-38.45	-80%	36.03	60.0%	-37.68	-78%	-0.7297	0.05%	
70%	≥ 71.4%	-33.63	-70%	42.87	71.5%	-32.96	-69%	-0.6172	0.05%	
60%	≥ 80.0%	-28.85	-60%	48.04	80.1%	-28.27	-59%	-0.5148	0.07%	
50%	≥ 86.6%	-24.05	-50%	52.00	86.7%	-23.56	-49%	-0.4197	0.07%	
40%	≥ 91.7%	-19.24	-40%	55.05	91.8%	-18.85	-39%	-0.3299	0.05%	
30%	≥ 95.4%	-14.46	-30%	57.29	95.5%	-14.17	-30%	-0.2447	0.09%	
20%	≥ 98.0%	-9.65	-20%	58.90	98.2%	-9.45	-20%	-0.1616	0.16%	
10%	≥ 99.5%	-4.82	-10%	59.80	99.7%	-4.73	-10%	-0.0810	0.16%	≤ ±10%
0%	≥ 99.5%	-0.11	0%	59.72	99.5%	-0.11	-0.23%	-0.0019	0.03%	
P=Discharge power										
0	≥ 99.5%	0.11	0%	59.72	99.5%	0.12	0.24%	0.0019	0.03%	≤ ±10%
10%	≥ 99.5%	4.85	10%	59.72	99.5%	4.95	10%	0.0809	0.03%	≤ ±5%
20%	≥ 98.0%	9.65	20%	58.85	98.1%	9.84	21%	0.1617	0.09%	
30%	≥ 95.4%	14.45	30%	57.25	95.4%	14.75	31%	0.2448	0.02%	
40%	≥ 91.7%	19.26	40%	55.07	91.8%	19.65	41%	0.3300	0.09%	
50%	≥ 86.6%	24.05	50%	52.00	86.7%	24.54	51%	0.4197	0.07%	
60%	≥ 80.0%	28.78	60%	48.05	80.1%	29.37	61%	0.5139	0.08%	
70%	≥ 71.4%	33.67	70%	42.88	71.5%	34.36	72%	0.6176	0.07%	
80%	≥ 60.0%	38.43	80%	36.03	60.1%	39.22	82%	0.7295	0.05%	
90%	≥ 43.6%	43.25	90%	26.17	43.6%	44.13	92%	0.8555	0.02%	
95%	31.2%	45.66	95%	18.71	31.2%	46.59	97%	0.9253	-0.01%	
100%	31.2%	48.06	100%	18.72	31.2%	49.04	102%	0.9318	0.00%	

CEI 0-16										
Clause	Requirement - Test							Result - Remark		Verdict
Test: Power generation plant $\geq 400\text{kW}$							AF60K-TH + ATOM HS-15.36			
Test Conditions		Measurements								Limit
P/S _n	Q/S _n	Active Power		Reactive power		DC Power		Power Factor (cos ϕ)	$\Delta Q/S_n$	$\Delta Q/S_n$
		P [kW]	P/S _n [p.u.]	Q [kVar]	Q/S _n [p.u.]	P [kW]	P/S _n [p.u.]			
P=Charge power (Bi-directional converter only)										
100%	0	-15.01	-100%	-0.57	-0.9%	-14.71	-98%	-0.9990	-0.95%	$\leq \pm 5\%$
90%		-13.53	-90%	-1.55	-2.6%	-13.26	-88%	-0.9934	-2.59%	
80%		-12.01	-80%	-1.70	-2.8%	-11.77	-78%	-0.9901	-2.83%	
70%		-10.51	-70%	-1.58	-2.6%	-10.30	-69%	-0.9889	-2.63%	
60%		-9.02	-60%	-1.46	-2.4%	-8.84	-59%	-0.9871	-2.44%	
50%		-7.51	-50%	-1.34	-2.2%	-7.36	-49%	-0.9844	-2.24%	
40%		-6.01	-40%	-1.22	-2.0%	-5.89	-39%	-0.9799	-2.04%	
30%		-4.51	-30%	-1.12	-1.9%	-4.42	-29%	-0.9705	-1.87%	
20%		-3.01	-20%	-1.02	-1.7%	-2.95	-20%	-0.9468	-1.71%	
10%		-1.52	-10%	-0.95	-1.6%	-1.49	-10%	-0.8481	-1.58%	
0%		0.00	0%	-0.95	-1.6%	0.00	-0.01%	-0.0003	-1.58%	$\leq \pm 10\%$
P=Discharge power										
0	0	0.02	0%	1.49	2.5%	0.02	0.16%	0.0162	2.49%	$\leq \pm 10\%$
10%		1.52	10%	1.51	2.5%	1.55	10%	0.7140	2.51%	$\leq \pm 5\%$
20%		3.01	20%	1.50	2.5%	3.07	20%	0.8932	2.50%	
30%		4.52	30%	1.51	2.5%	4.61	31%	0.9470	2.52%	
40%		6.01	40%	1.50	2.5%	6.13	41%	0.9691	2.51%	
50%		7.49	50%	1.50	2.5%	7.65	51%	0.9799	2.50%	
60%		9.01	60%	1.50	2.5%	9.20	61%	0.9858	2.51%	
70%		10.51	70%	1.50	2.5%	10.73	72%	0.9897	2.50%	
80%		12.02	80%	1.50	2.5%	12.27	82%	0.9920	2.50%	
90%		13.54	90%	1.51	2.5%	13.81	92%	0.9936	2.51%	
100%		14.99	100%	0.54	0.9%	15.30	102%	0.9993	0.90%	

CEI 0-16										
Clause	Requirement - Test						Result - Remark			Verdict
P=Charge power (Bi-directional converter only)										
100%	-31.2%	-15.01	-100%	-18.77	-31.3%	-14.71	-98%	-0.6247	-0.08%	--
95%	-31.2%	-14.26	-95%	-18.81	-31.3%	-13.97	-93%	-0.6041	-0.15%	≤ ±5%
90%	≤ -43.6%	-13.52	-90%	-26.16	-43.6%	-13.25	-88%	-0.4591	-0.01%	
80%	≤ -60.0%	-12.02	-80%	-36.05	-60.1%	-11.78	-79%	-0.3164	-0.08%	
70%	≤ -71.4%	-10.51	-70%	-42.87	-71.4%	-10.30	-69%	-0.2381	-0.05%	
60%	≤ -80.0%	-9.02	-60%	-48.04	-80.1%	-8.84	-59%	-0.1846	-0.07%	
50%	≤ -86.6%	-7.51	-50%	-51.97	-86.6%	-7.36	-49%	-0.1430	-0.02%	
40%	≤ -91.7%	-6.02	-40%	-55.05	-91.7%	-5.90	-39%	-0.1087	-0.04%	
30%	≤ -95.4%	-4.51	-30%	-57.26	-95.4%	-4.42	-29%	-0.0785	-0.04%	
20%	≤ -98.0%	-3.01	-20%	-58.88	-98.1%	-2.95	-20%	-0.0511	-0.13%	
10%	≤ -99.5%	-1.51	-10%	-59.71	-99.5%	-1.48	-10%	-0.0253	-0.01%	
0%	≤ -99.5%	-0.69	-5%	-59.70	-99.5%	-0.68	-5%	-0.0115	0.00%	--
P=Discharge power										
0	≤ -99.5%	0.69	5%	-59.70	-99.5%	0.68	5%	0.0115	0.00%	--
10%	≤ -99.5%	1.51	10%	-59.76	-99.6%	1.54	10%	0.0252	-0.09%	≤ ±5%
20%	≤ -98.0%	3.01	20%	-58.87	-98.1%	3.07	20%	0.0511	-0.12%	
30%	≤ -95.4%	4.52	30%	-57.27	-95.5%	4.61	31%	0.0787	-0.05%	
40%	≤ -91.7%	6.02	40%	-55.04	-91.7%	6.14	41%	0.1087	-0.03%	
50%	≤ -86.6%	7.52	50%	-51.96	-86.6%	7.67	51%	0.1432	0.00%	
60%	≤ -80.0%	9.01	60%	-48.03	-80.1%	9.19	61%	0.1843	-0.06%	
70%	≤ -71.4%	10.51	70%	-42.85	-71.4%	10.73	72%	0.2383	-0.02%	
80%	≤ -60.0%	12.02	80%	-36.03	-60.1%	12.26	82%	0.3164	-0.05%	
90%	≤ -43.6%	13.51	90%	-26.18	-43.6%	13.79	92%	0.4585	-0.04%	
95%	-31.2%	14.26	95%	-18.73	-31.2%	14.55	97%	0.6060	-0.01%	
100%	-31.2%	15.01	100%	-18.77	-31.3%	15.32	102%	0.6246	-0.08%	--

CEI 0-16										
Clause	Requirement - Test					Result - Remark				Verdict
P=Charge power (Bi-directional converter only)										
100%	31.2%	-15.02	-100%	18.73	31.2%	-14.72	-98%	-0.6255	0.02%	≤ ±5%
95%	31.2%	-14.26	-95%	18.71	31.2%	-13.97	-93%	-0.6062	-0.02%	
90%	≥ 43.6%	-13.51	-90%	26.17	43.6%	-13.24	-88%	-0.4588	0.02%	
80%	≥ 60.0%	-12.02	-80%	36.03	60.1%	-11.78	-79%	-0.3164	0.05%	
70%	≥ 71.4%	-10.51	-70%	42.87	71.5%	-10.30	-69%	-0.2381	0.06%	
60%	≥ 80.0%	-9.02	-60%	48.04	80.1%	-8.84	-59%	-0.1844	0.07%	
50%	≥ 86.6%	-7.51	-50%	52.01	86.7%	-7.36	-49%	-0.1430	0.09%	
40%	≥ 91.7%	-6.01	-40%	55.05	91.8%	-5.89	-39%	-0.1086	0.05%	
30%	≥ 95.4%	-4.52	-30%	57.29	95.5%	-4.43	-30%	-0.0786	0.09%	
20%	≥ 98.0%	-3.01	-20%	58.90	98.2%	-2.95	-20%	-0.0511	0.16%	
10%	≥ 99.5%	-1.51	-10%	59.76	99.6%	-1.48	-10%	-0.0252	0.09%	
0%	≥ 99.5%	-0.04	0%	59.72	99.5%	-0.04	0%	-0.0006	0.03%	≤ ±10%
P=Discharge power										
0	≥ 99.5%	0.04	0%	59.72	99.5%	0.04	0%	0.0006	0.03%	≤ ±10%
10%	≥ 99.5%	1.52	10%	59.73	99.5%	1.55	10%	0.0254	0.05%	≤ ±5%
20%	≥ 98.0%	3.01	20%	58.85	98.1%	3.08	21%	0.0512	0.09%	
30%	≥ 95.4%	4.52	30%	57.25	95.4%	4.61	31%	0.0787	0.02%	
40%	≥ 91.7%	6.02	40%	55.07	91.8%	6.14	41%	0.1086	0.09%	
50%	≥ 86.6%	7.52	50%	52.01	86.7%	7.67	51%	0.1430	0.08%	
60%	≥ 80.0%	9.00	60%	48.05	80.1%	9.18	61%	0.1840	0.08%	
70%	≥ 71.4%	10.52	70%	42.89	71.5%	10.74	72%	0.2383	0.09%	
80%	≥ 60.0%	12.01	80%	36.03	60.1%	12.26	82%	0.3162	0.06%	
90%	≥ 43.6%	13.52	90%	26.17	43.6%	13.79	92%	0.4588	0.02%	
95%	31.2%	14.27	95%	18.71	31.2%	14.56	97%	0.6063	-0.01%	
100%	31.2%	15.02	100%	18.72	31.2%	15.32	102%	0.6258	0.00%	

CEI 0-16										
Clause	Requirement - Test							Result - Remark		Verdict
Test: Power generation plant \geq 400kW							AF36K-TH + ATOM HS-15.36			
Test Conditions		Measurements								Limit
P/S _n	Q/S _n	Active Power		Reactive power		DC Power		Power Factor (cos ϕ)	Δ Q/S _n	Δ Q/S _n
		P [kW]	P/S _n [p.u.]	Q [kVar]	Q/S _n [p.u.]	P [kW]	P/S _n [p.u.]			
P=Charge power (Bi-directional converter only)										
100%	0	-15.01	-100%	-0.34	-0.9%	-14.71	-98%	-0.9999	-0.94%	$\leq \pm 5\%$
90%		-13.53	-90%	-0.93	-2.6%	-13.26	-88%	-0.9976	-2.59%	
80%		-12.01	-80%	-1.02	-2.8%	-11.77	-78%	-0.9964	-2.83%	
70%		-10.51	-70%	-0.95	-2.6%	-10.30	-69%	-0.9959	-2.63%	
60%		-9.02	-60%	-0.88	-2.4%	-8.84	-59%	-0.9953	-2.44%	
50%		-7.51	-50%	-0.81	-2.2%	-7.36	-49%	-0.9943	-2.24%	
40%		-6.01	-40%	-0.73	-2.0%	-5.89	-39%	-0.9926	-2.04%	
30%		-4.51	-30%	-0.67	-1.9%	-4.42	-29%	-0.9891	-1.87%	
20%		-3.01	-20%	-0.61	-1.7%	-2.95	-20%	-0.9798	-1.71%	
10%		-1.52	-10%	-0.57	-1.6%	-1.49	-10%	-0.9363	-1.58%	
0%		0.00	0%	-0.57	-1.6%	0.00	0%	-0.0009	-1.58%	$\leq \pm 10\%$
P=Discharge power										
0	0	0.02	0%	0.90	2.5%	0.02	0.16%	0.0271	2.49%	$\leq \pm 10\%$
10%		1.52	10%	0.90	2.5%	1.55	10%	0.8588	2.51%	$\leq \pm 5\%$
20%		3.01	20%	0.90	2.5%	3.07	20%	0.9567	2.50%	
30%		4.52	30%	0.91	2.5%	4.61	31%	0.9798	2.52%	
40%		6.01	40%	0.90	2.5%	6.13	41%	0.9885	2.51%	
50%		7.49	50%	0.90	2.5%	7.65	51%	0.9926	2.50%	
60%		9.01	60%	0.90	2.5%	9.20	61%	0.9948	2.51%	
70%		10.51	70%	0.90	2.5%	10.73	72%	0.9962	2.50%	
80%		12.02	80%	0.90	2.5%	12.27	82%	0.9971	2.50%	
90%		13.54	90%	0.90	2.5%	13.81	92%	0.9977	2.51%	
100%		14.99	100%	0.32	0.9%	15.30	102%	0.9997	0.90%	

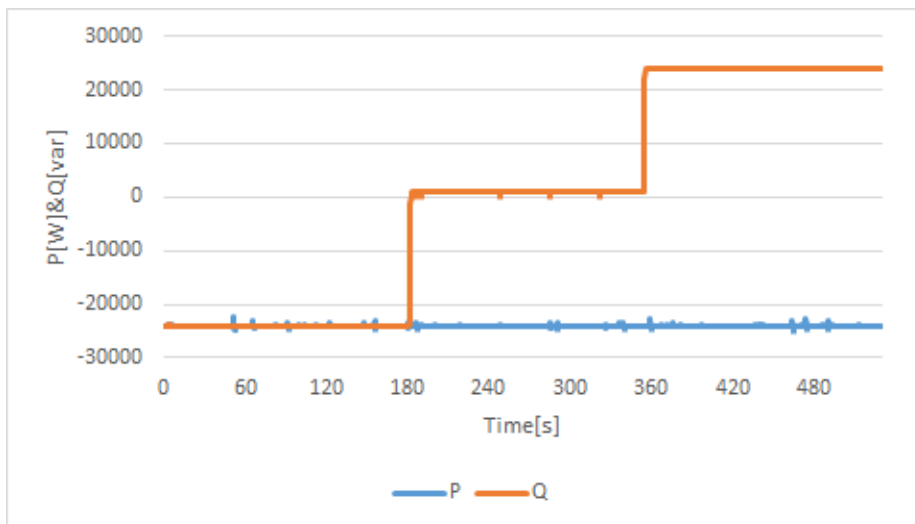
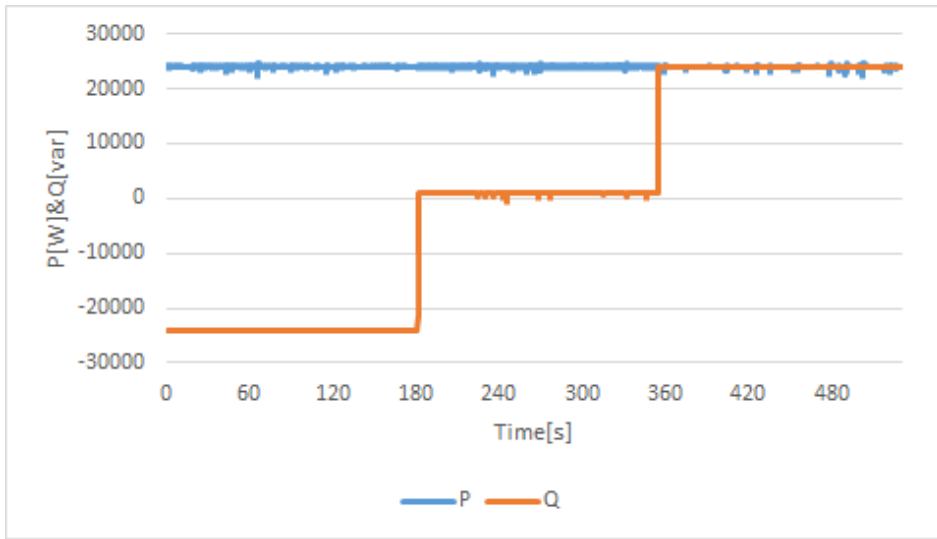
CEI 0-16										
Clause	Requirement - Test						Result - Remark			Verdict
P=Charge power (Bi-directional converter only)										
100%	-31.2%	-15.01	-100%	-11.26	-31.3%	-14.71	-98%	-0.8000	-0.08%	--
95%	-31.2%	-14.26	-95%	-11.29	-31.3%	-13.97	-93%	-0.7841	-0.15%	≤ ±5%
90%	≤ -43.6%	-13.52	-90%	-15.70	-43.6%	-13.25	-88%	-0.6526	-0.01%	
80%	≤ -60.0%	-12.02	-80%	-21.63	-60.1%	-11.78	-79%	-0.4858	-0.08%	
70%	≤ -71.4%	-10.51	-70%	-25.72	-71.5%	-10.30	-69%	-0.3783	-0.05%	
60%	≤ -80.0%	-9.02	-60%	-28.83	-80.1%	-8.84	-59%	-0.2987	-0.07%	
50%	≤ -86.6%	-7.51	-50%	-31.20	-86.7%	-7.36	-49%	-0.2340	-0.05%	
40%	≤ -91.7%	-6.02	-40%	-33.03	-91.7%	-5.90	-39%	-0.1793	-0.04%	
30%	≤ -95.4%	-4.51	-30%	-34.36	-95.4%	-4.42	-29%	-0.1301	-0.04%	
20%	≤ -98.0%	-3.01	-20%	-35.33	-98.1%	-2.95	-20%	-0.0850	-0.13%	
10%	≤ -99.5%	-1.51	-10%	-35.82	-99.5%	-1.48	-10%	-0.0422	-0.01%	
0%	≤ -99.5%	-0.69	-5%	-35.82	-99.5%	-0.67	-4%	-0.0192	0.00%	--
P=Discharge power										
0	≤ -99.5%	0.69	5%	-35.82	-99.5%	0.68	5%	0.0192	0.00%	--
10%	≤ -99.5%	1.51	10%	-35.85	-99.6%	1.54	10%	0.0420	-0.10%	≤ ±5%
20%	≤ -98.0%	3.01	20%	-35.32	-98.1%	3.07	20%	0.0850	-0.12%	
30%	≤ -95.4%	4.52	30%	-34.38	-95.5%	4.61	31%	0.1304	-0.09%	
40%	≤ -91.7%	6.02	40%	-33.02	-91.7%	6.14	41%	0.1793	-0.03%	
50%	≤ -86.6%	7.52	50%	-31.18	-86.6%	7.67	51%	0.2344	0.00%	
60%	≤ -80.0%	9.01	60%	-28.83	-80.1%	9.19	61%	0.2981	-0.10%	
70%	≤ -71.4%	10.51	70%	-25.71	-71.4%	10.73	72%	0.3785	-0.02%	
80%	≤ -60.0%	12.02	80%	-21.62	-60.1%	12.26	82%	0.4859	-0.05%	
90%	≤ -43.6%	13.51	90%	-15.71	-43.6%	13.79	92%	0.6520	-0.04%	
95%	-31.2%	14.26	95%	-11.24	-31.2%	14.55	97%	0.7856	-0.01%	
100%	-31.2%	15.01	100%	-11.26	-31.3%	15.32	102%	0.7999	-0.08%	--

CEI 0-16										
Clause	Requirement - Test				Result - Remark				Verdict	
P=Charge power (Bi-directional converter only)										
100%	31.2%	-15.02	-100%	11.24	31.2%	-14.72	-98%	-0.8006	0.02%	≤ ±5%
95%	31.2%	-14.26	-95%	11.22	31.2%	-13.97	-93%	-0.7858	-0.02%	
90%	≥ 43.6%	-13.51	-90%	15.70	43.6%	-13.24	-88%	-0.6523	0.02%	
80%	≥ 60.0%	-12.02	-80%	21.62	60.0%	-11.78	-79%	-0.4858	0.05%	
70%	≥ 71.4%	-10.51	-70%	25.72	71.5%	-10.30	-69%	-0.3782	0.05%	
60%	≥ 80.0%	-9.02	-60%	28.83	80.1%	-8.83	-59%	-0.2985	0.08%	
50%	≥ 86.6%	-7.51	-50%	31.22	86.7%	-7.36	-49%	-0.2340	0.13%	
40%	≥ 91.7%	-6.01	-40%	33.03	91.8%	-5.89	-39%	-0.1791	0.05%	
30%	≥ 95.4%	-4.52	-30%	34.38	95.5%	-4.43	-30%	-0.1303	0.09%	
20%	≥ 98.0%	-3.01	-20%	35.34	98.2%	-2.95	-20%	-0.0850	0.16%	
10%	≥ 99.5%	-1.51	-10%	35.83	99.5%	-1.45	-10%	-0.0420	0.02%	≤ ±10%
0%	≥ 99.5%	-0.04	0%	35.83	99.5%	-0.04	-0.24%	-0.0010	0.04%	
P=Discharge power										
0	≥ 99.5%	0.03	0%	35.83	99.5%	0.04	0.24%	0.0010	0.03%	≤ ±10%
10%	≥ 99.5%	1.52	10%	35.85	99.6%	1.55	10%	0.0422	0.09%	≤ ±5%
20%	≥ 98.0%	3.01	20%	35.31	98.1%	3.08	21%	0.0851	0.09%	
30%	≥ 95.4%	4.52	30%	34.35	95.4%	4.61	31%	0.1304	0.02%	
40%	≥ 91.7%	6.02	40%	33.04	91.8%	6.14	41%	0.1792	0.09%	
50%	≥ 86.6%	7.52	50%	31.22	86.7%	7.67	51%	0.2341	0.11%	
60%	≥ 80.0%	9.00	60%	28.83	80.1%	9.18	61%	0.2979	0.08%	
70%	≥ 71.4%	10.52	70%	25.75	71.5%	10.74	72%	0.3783	0.12%	
80%	≥ 60.0%	12.01	80%	21.62	60.1%	12.26	82%	0.4857	0.06%	
90%	≥ 43.6%	13.52	90%	15.70	43.6%	13.79	92%	0.6523	0.02%	
95%	31.2%	14.27	95%	11.23	31.2%	14.56	97%	0.7859	-0.01%	
100%	31.2%	15.02	100%	11.23	31.2%	15.32	102%	0.8008	0.00%	
Note(s): The limitation capacity of reactive power shall be met to Figure 16 or better. Q shall be have a "semicircular" capability while P is greater than 10%S _n for Discharge power and/or charge power.										

CEI 0-16							
Clause	Requirement - Test					Result - Remark	Verdict
Nbis.6.4	Tabella: Modalità di esecuzione della prova e registrazione dei risultati applicabile a generatori statici (ipotesi di regolazione tramite Q) Table: Method of carrying out the test and recording of the results applicable to static generators (hypothesis of regulation via Q)						P
Test Conditions		Measurements					Limit
Q/S _n	P/P _{NINV}	Q/S _n	cosφ	I/I _n	U/U _n	ΔQ/S _n	ΔQ/S _n
P=Discharge power							
-40%	50%	-40.06%	0.7079	51.17%	100.45%	-0.06%	≤ ±2%
0		1.64%	0.9992	36.30%	100.44%	1.64%	
+40%		39.88%	0.7087	50.99%	100.43%	-0.12%	
P=Charge power (Bi-directional converter only)							
-40%	50%	-39.96%	-0.7086	51.08%	100.47%	0.04%	≤ ±2%
0		1.64%	-0.9992	36.28%	100.46%	1.64%	
+40%		39.89%	-0.7084	50.98%	100.45%	-0.11%	
Note(s):							
Possibility to control this function by an external signal.							

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

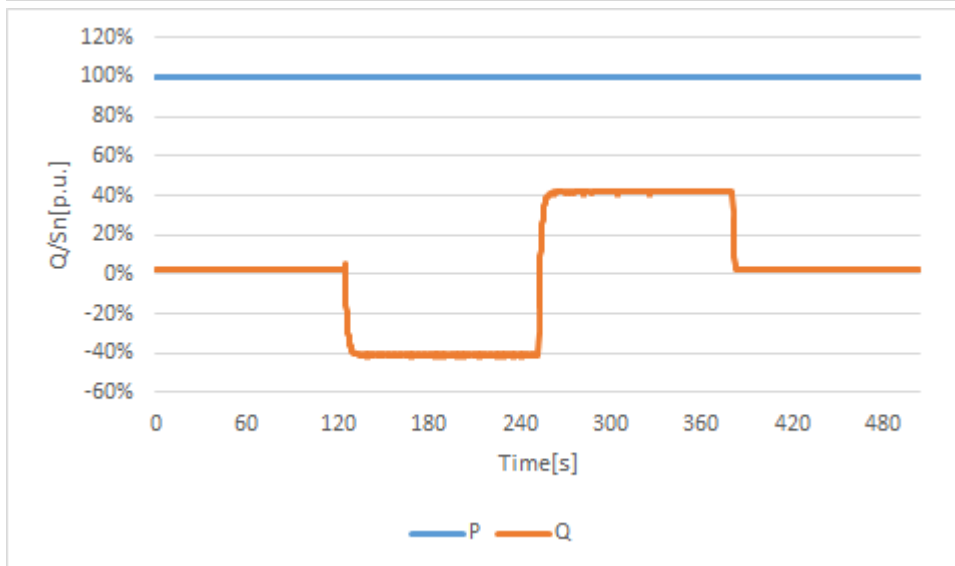
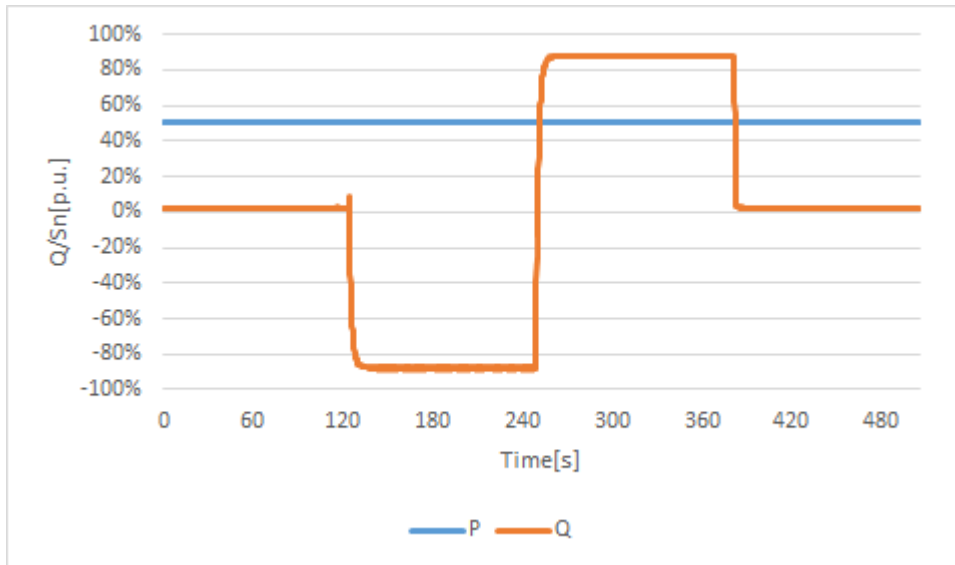
Diagram



CEI 0-16									
Clause	Requirement - Test						Result - Remark		Verdict
Nbis.6.5	Tabella: Tempo di risposta ad una variazione a gradino del livello assegnato Table: Time response to a step change in the level assigned							P	
Test: Power generation plant $\geq 400\text{kW}$									
Test Conditions		Measurements						Limit	
Q/S _n	P/P _n	Q/S _n	cos ϕ	I/I _n	U/U _n	$\Delta Q/S_n$	$\Delta T_{\text{settling}}$	$\Delta Q/S_n$	$\Delta T_{\text{settling}}$
Test 1: P=Discharge power									
0	50%	1.80%	0.9935	36.5%	100.3%	1.80%	4.2	$\leq \pm 5\%$	$\leq 10\text{s}$
-86.6%		-86.84%	0.4164	86.1%	100.6%	-0.24%	5.4		
+86.6%		86.52%	0.4236	86.1%	100.8%	-0.08%	1.2		
0		2.51%	0.9979	36.2%	100.5%	2.51%	-		
Test 2: P=Discharge power									
0	100%	2.28%	0.9993	72.3%	100.6%	2.28%	4.0	$\leq \pm 5\%$	$\leq 10\text{s}$
-43.6%		-40.51%	0.8918	80.7%	100.6%	3.09%	5.2		
+43.6%		41.36%	0.8892	81.5%	100.6%	-2.24%	1.3		
0		2.54%	0.9994	72.3%	100.6%	2.54%	-		
Test: Power generation plant $\geq 400\text{kW}$ (Bi-directional converter only)									
Test Conditions		Measurements						Limit	
Q/S _n	P/P _n	Q/S _n	cos ϕ	I/I _n	U/U _n	$\Delta Q/S_n$	$\Delta T_{\text{settling}}$	$\Delta Q/S_n$	$\Delta T_{\text{settling}}$
Test 1: P=Charge power									
0	50%	1.79%	-0.9935	36.4%	100.7%	1.79%	4.2	$\leq \pm 5\%$	$\leq 10\text{s}$
-86.6%		-86.83%	-0.4164	86.2%	100.5%	-0.23%	5.4		
+86.6%		86.53%	-0.4236	86.2%	100.3%	-0.07%	1.7		
0		2.50%	-0.9979	36.3%	100.4%	2.50%	-		
Test 2: P=Charge power									
0	100%	2.27%	-0.9993	72.2%	100.3%	2.27%	3.8	$\leq \pm 5\%$	$\leq 10\text{s}$
-43.6%		-40.50%	-0.8918	80.6%	100.4%	3.10%	4.9		
+43.6%		41.38%	-0.8892	81.4%	100.5%	-2.22%	1.5		
0		2.50%	-0.9994	72.2%	100.6%	2.50%	-		
Note(s):									
The test was conducted at 50% P _{NINV} (Test 1) and 100% P _{NINV} (Test 2) of output power for discharge power and/or charge power (Bi-directional converter only).									
Possibility to control this function by an external signal.									

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Diagram



CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict
	<p>The figure contains two vertically stacked line graphs. Both graphs plot Q/Sn [p.u.] on the y-axis against Time [s] on the x-axis, ranging from 0 to 480 seconds. Each graph shows two data series: P (blue line) and Q (orange line). The top graph shows Q stepping from 0% to -80% at approximately 120s, then from -80% to 80% at approximately 240s, and finally from 80% back to 0% at approximately 360s. The P series remains constant at -50% throughout the test. The bottom graph shows Q stepping from 0% to -40% at approximately 120s, then from -40% to 40% at approximately 240s, and finally from 40% back to 0% at approximately 360s. The P series remains constant at -100% throughout the test.</p>		

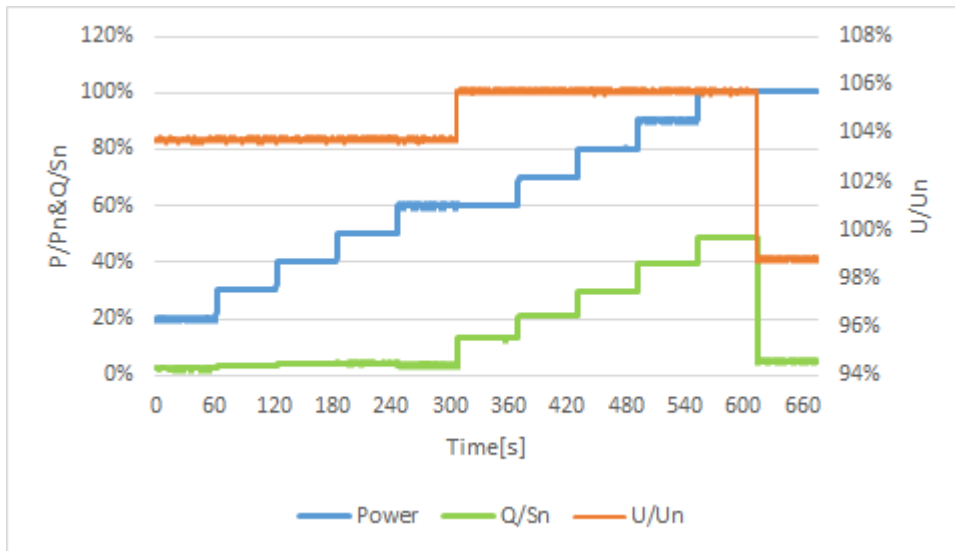
CEI 0-16								
Clause	Requirement - Test					Result - Remark	Verdict	
Nbis.6.6	Tabella: Regolazione automatica di potenza reattiva secondo una curva caratteristica $\cos\phi = f(P)$ Table: Automatic adjustment of reactive power according to the characteristic curve $\cos\phi (P)$						P	
Test 1: 0.9i				AF60K-TH + ATOM HS-40.96				
cos ϕ (P) curve settings	U lock-in		105%Un					
	U lock-out		100%Un					
	Set points		A	B		C		
	P/P _n		20%	50%		100%		
	Cos ϕ (i: inductive; c: capacitive)		1	1		0.9i		
Test Conditions			Measurements					Limit
U/U _n	P/P _{NINV}	Excepted cos ϕ	U/U _n	P/P _{NINV}	Q/S _n	cos ϕ	$\Delta\cos\phi$	$\Delta\cos\phi$
104%	20%	1	103.74%	20.08%	2.38%	0.993	-0.007	$\leq \pm 0.01$
	30%	1	103.75%	30.12%	3.20%	0.994	-0.006	
	40%	1	103.76%	40.11%	3.88%	0.995	-0.005	
	50%	1	103.76%	50.25%	4.42%	0.996	-0.004	
	60%	1	103.75%	60.11%	3.77%	0.998	-0.002	
106%	60%	0.98	105.76%	60.30%	13.06%	0.977	-0.003	
	70%	0.96	105.76%	70.20%	21.07%	0.958	-0.002	
	80%	0.94	105.76%	80.23%	29.74%	0.938	-0.002	
	90%	0.92	105.75%	90.26%	39.41%	0.916	-0.004	
	100%	0.90	105.74%	100.38%	48.69%	0.900	0.000	
99%	100%	1	98.82%	100.65%	5.16%	0.999	-0.001	
Test Conditions			Measurements					Limit
U/U _n	P/P _{NINV}	Excepted cos ϕ	$\Delta T_{\text{settling}}$					$\Delta T_{\text{settling}}$
106%	60%	0.98	3.1					$\leq 10s$
	70%	0.96	4.8					
	80%	0.94	2.9					
	90%	0.92	3.4					
	100%	0.915	5.1					
99%	100%	1	3.7					

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

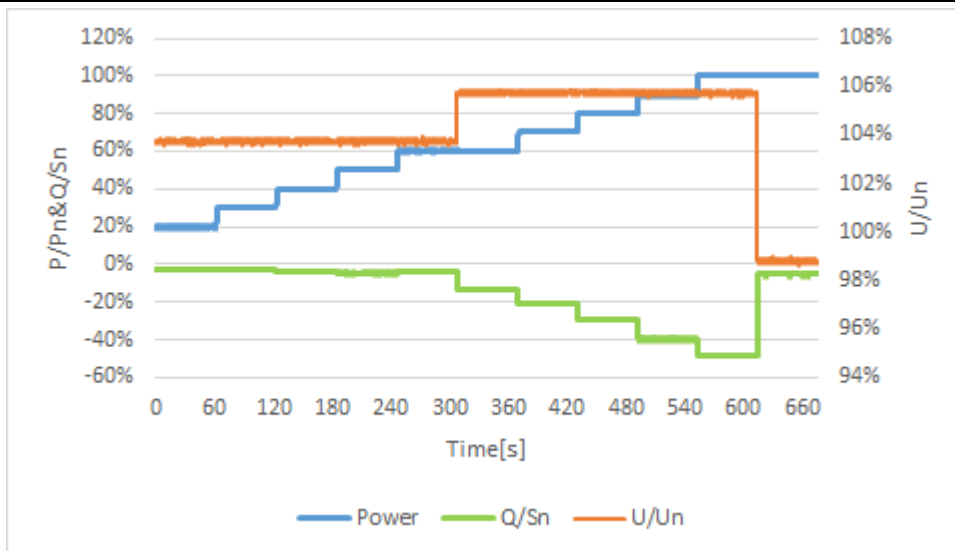
Test 2: 0.9c								
c cos ϕ (P) curve settings	U lock-in		105%Un					
	U lock-out		100%Un					
	Set points		A	B	C			
	P/P _n		20%	50%	100%			
	Cos ϕ (i: inductive; c: capacitive)		1	1	0.9c			
Test Conditions			Measurements					Limit
U/U _n	P/P _{NINV}	Excepted cos ϕ	U/U _n	P/P _{NINV}	Q/S _n	cos ϕ	Δ cos ϕ	Δ cos ϕ
104%	20%	1	103.75%	20.08%	-2.43%	0.993	-0.007	$\leq \pm 0.01$
	30%	1	103.76%	30.13%	-3.22%	0.994	-0.006	
	40%	1	103.77%	40.11%	-3.91%	0.995	-0.005	
	50%	1	103.77%	50.25%	-4.48%	0.996	-0.004	
	60%	1	103.76%	60.11%	-3.79%	0.998	-0.002	
106%	60%	0.98	105.77%	60.31%	-13.11%	0.977	-0.003	
	70%	0.96	105.77%	70.22%	-21.12%	0.958	-0.002	
	80%	0.94	105.77%	80.23%	-29.78%	0.938	-0.002	
	90%	0.92	105.76%	90.26%	-39.45%	0.916	-0.004	
	100%	0.90	105.75%	100.38%	-48.73%	0.900	0.000	
99%	100%	1	98.83%	100.65%	-5.18%	0.999	-0.001	
Test Conditions			Measurements					Limit
U/U _n	P/P _n	Excepted cos ϕ	$\Delta T_{\text{settling}}$					$\Delta T_{\text{settling}}$
106%	60%	0.98	3.2					$\leq 10\text{s}$
	70%	0.96	3.8					
	80%	0.94	4.3					
	90%	0.92	3.5					
	100%	0.915	2.1					
99%	100%	1	4.5					
Note(s):								
Possibility to control this function by an external signal.								
For this function, P _{NINV} is only considered to maximum active discharge power.								

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test 1: 0.9i



Test 2: 0.9c



CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

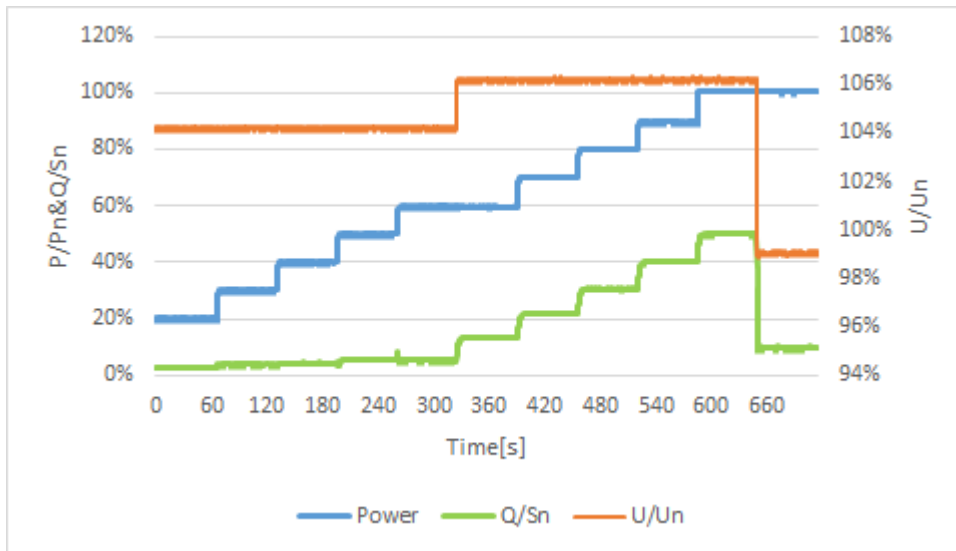
Test 1: 0.9i			AF60K-TH + ATOM HS-15.36					
cos ϕ (P) curve settings	U lock-in	105%Un						
	U lock-out	100%Un						
	Set points	A	B	C				
	P/P _n	20%	50%	100%				
	Cos ϕ (i: inductive; c: capacitive)	1	1	0.9i				
Test Conditions			Measurements					Limit
U/U _n	P/P _{NINV}	Excepted cos ϕ	U/U _n	P/P _{NINV}	Q/S _n	cos ϕ	Δ cos ϕ	Δ cos ϕ
104%	20%	1	104.19%	20.12%	2.64%	0.992	-0.008	$\leq \pm 0.01$
	30%	1	104.20%	30.05%	3.83%	0.992	-0.008	
	40%	1	104.21%	39.99%	4.32%	0.994	-0.006	
	50%	1	104.21%	49.89%	5.38%	0.994	-0.006	
	60%	1	104.22%	59.73%	5.29%	0.996	-0.004	
106%	60%	0.98	106.19%	59.63%	12.95%	0.977	-0.003	
	70%	0.96	106.20%	70.00%	21.70%	0.955	-0.005	
	80%	0.94	106.20%	79.83%	30.41%	0.934	-0.006	
	90%	0.92	106.20%	89.61%	39.86%	0.914	-0.006	
	100%	0.90	106.21%	100.60%	49.77%	0.896	-0.004	
99%	100%	1	99.06%	100.42%	10.18%	0.994	-0.006	
Test Conditions			Measurements					Limit
U/U _n	P/P _{NINV}	Excepted cos ϕ	$\Delta T_{\text{settling}}$					$\Delta T_{\text{settling}}$
106%	60%	0.98	4.2					$\leq 10\text{s}$
	70%	0.96	3.6					
	80%	0.94	4.8					
	90%	0.92	4.0					
	100%	0.915	3.6					
99%	100%	1	3.9					

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

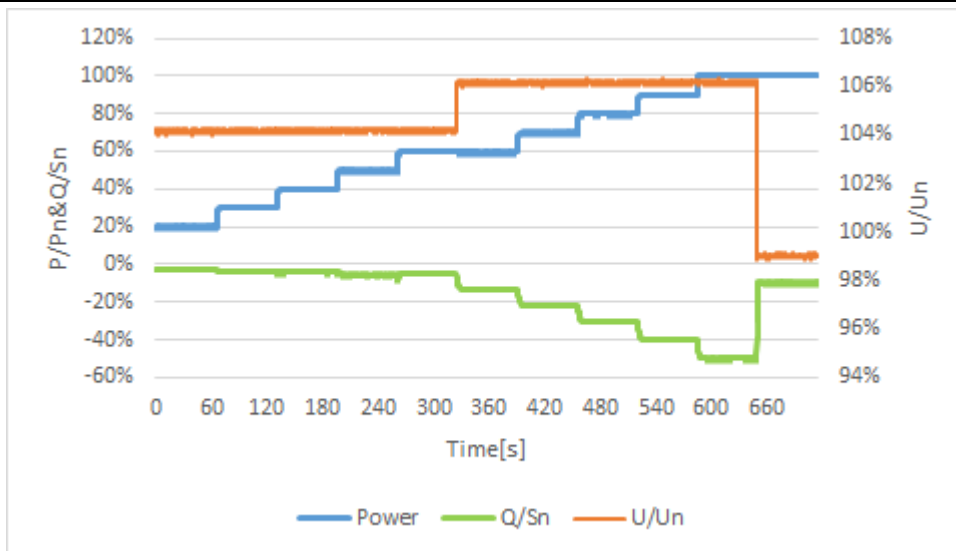
Test 2: 0.9c								
c cos ϕ (P) curve settings	U lock-in		105%Un					
	U lock-out		100%Un					
	Set points		A	B	C			
	P/P _n		20%	50%	100%			
	Cos ϕ (i: inductive; c: capacitive)		1	1	0.9c			
Test Conditions			Measurements					Limit
U/U _n	P/P _{NINV}	Excepted cos ϕ	U/U _n	P/P _{NINV}	Q/S _n	cos ϕ	Δ cos ϕ	Δ cos ϕ
104%	20%	1	104.18%	20.06%	-2.67%	0.991	-0.009	$\leq \pm 0.01$
	30%	1	104.18%	29.97%	-3.81%	0.992	-0.008	
	40%	1	104.19%	39.92%	-4.32%	0.994	-0.006	
	50%	1	104.19%	49.82%	-5.39%	0.994	-0.006	
	60%	1	104.20%	59.65%	-5.31%	0.996	-0.004	
106%	60%	0.98	106.18%	59.56%	-13.02%	0.977	-0.003	
	70%	0.96	106.18%	69.94%	-21.74%	0.955	-0.005	
	80%	0.94	106.18%	79.76%	-30.44%	0.934	-0.006	
	90%	0.92	106.19%	89.54%	-39.89%	0.913	-0.007	
	100%	0.90	106.19%	100.53%	-49.80%	0.896	-0.004	
99%	100%	1	99.04%	100.36%	-10.21%	0.994	-0.006	
Test Conditions			Measurements					Limit
U/U _n	P/P _n	Excepted cos ϕ	Δ T _{settling}					Δ T _{settling}
106%	60%	0.98	3.5					$\leq 10s$
	70%	0.96	3.6					
	80%	0.94	4.7					
	90%	0.92	3.5					
	100%	0.915	2.5					
99%	100%	1	3.4					
Note(s):								
Possibility to control this function by an external signal.								
For this function, P _{NINV} is only considered to maximum active discharge power.								

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test 1: 0.9i



Test 2: 0.9c



CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

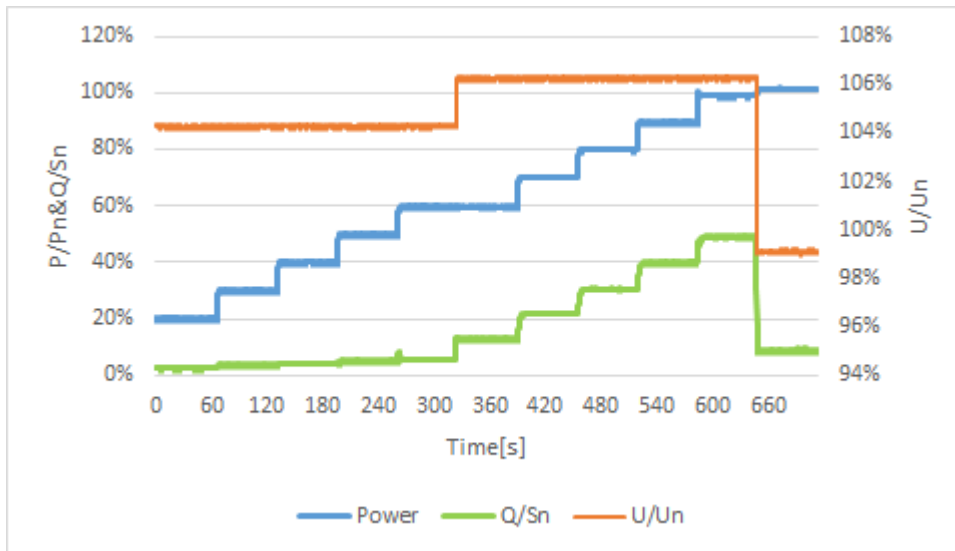
Test 1: 0.9i			AF36K-TH + ATOM HS-15.36					
cos ϕ (P) curve settings	U lock-in	105%Un						
	U lock-out	100%Un						
	Set points	A	B	C				
	P/P _n	20%	50%	100%				
	Cos ϕ (i: inductive; c: capacitive)	1	1	0.9i				
Test Conditions			Measurements					Limit
U/U _n	P/P _{NINV}	Excepted cos ϕ	U/U _n	P/P _{NINV}	Q/S _n	cos ϕ	Δ cos ϕ	Δ cos ϕ
104%	20%	1	104.27%	20.12%	2.63%	0.992	-0.008	$\leq \pm 0.01$
	30%	1	104.28%	30.02%	3.74%	0.992	-0.008	
	40%	1	104.29%	39.98%	4.32%	0.994	-0.006	
	50%	1	104.29%	49.88%	5.16%	0.995	-0.005	
	60%	1	104.30%	59.72%	5.71%	0.995	-0.005	
106%	60%	0.98	106.26%	59.62%	12.97%	0.977	-0.003	
	70%	0.96	106.27%	70.00%	21.58%	0.956	-0.004	
	80%	0.94	106.28%	79.81%	30.28%	0.935	-0.005	
	90%	0.92	106.28%	89.58%	39.73%	0.914	-0.006	
	100%	0.90	106.29%	99.06%	48.91%	0.897	-0.003	
99%	100%	1	99.13%	101.24%	9.01%	0.996	-0.004	
Test Conditions			Measurements					Limit
U/U _n	P/P _{NINV}	Excepted cos ϕ	Δ T _{settling}					Δ T _{settling}
106%	60%	0.98	3.9					$\leq 10s$
	70%	0.96	4.2					
	80%	0.94	4.1					
	90%	0.92	3.7					
	100%	0.915	4.0					
99%	100%	1	3.5					

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

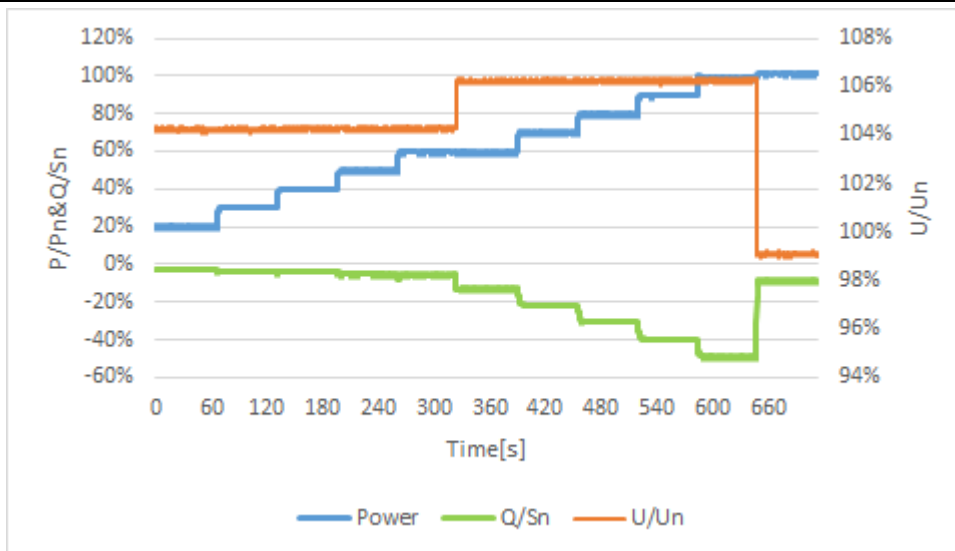
Test 2: 0.9c								
c cos ϕ (P) curve settings	U lock-in		105%Un					
	U lock-out		100%Un					
	Set points		A	B	C			
	P/P _n		20%	50%	100%			
	Cos ϕ (i: inductive; c: capacitive)		1	1	0.9c			
Test Conditions			Measurements					Limit
U/U _n	P/P _{NINV}	Excepted cos ϕ	U/U _n	P/P _{NINV}	Q/S _n	cos ϕ	Δ cos ϕ	Δ cos ϕ
104%	20%	1	104.25%	20.01%	-2.58%	0.992	-0.008	$\leq \pm 0.01$
	30%	1	104.26%	29.91%	-3.69%	0.992	-0.008	
	40%	1	104.27%	39.87%	-4.26%	0.994	-0.006	
	50%	1	104.27%	49.78%	-5.12%	0.995	-0.005	
	60%	1	104.28%	59.61%	-5.66%	0.995	-0.005	
106%	60%	0.98	106.24%	59.49%	-12.94%	0.977	-0.003	
	70%	0.96	106.25%	69.89%	-21.55%	0.956	-0.004	
	80%	0.94	106.25%	79.71%	-30.26%	0.935	-0.005	
	90%	0.92	106.25%	89.46%	-39.72%	0.914	-0.006	
	100%	0.90	106.26%	98.93%	-48.88%	0.897	-0.003	
99%	100%	1	99.10%	101.11%	-8.96%	0.996	-0.004	
Test Conditions			Measurements					Limit
U/U _n	P/P _n	Excepted cos ϕ	Δ T _{settling}					Δ T _{settling}
106%	60%	0.98	4.6					$\leq 10s$
	70%	0.96	3.6					
	80%	0.94	3.7					
	90%	0.92	3.9					
	100%	0.915	3.5					
99%	100%	1	4.1					
Note(s):								
Possibility to control this function by an external signal.								
For this function, P _{NINV} is only considered to maximum active discharge power.								

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test 1: 0.9i



Test 2: 0.9c



CEI 0-16								
Clause	Requirement - Test				Result - Remark			Verdict
Nbis.6.8	Tabella: Erogazione/assorbimento automatico di potenza reattiva secondo una curva caratteristica Q=f(V) Table: Automatic absorption of reactive power according to the characteristic curve Q(U)							P
Q(U) curve settings	Set points	P lock-in	P lock-out	Set points	V2i	V1i	V1s	V2s
	P/P _{NINV}	20%	5%	U/U _n	90%	92%	108%	110%
				Q/S _n	43.6%	0	0	-43.6%
Test: P=Discharge power (k = +0.1)								
Test Conditions			Measurements					Limit
U/U _n	P/P _{NINV}	Excepted Q/S _n	U/U _n	P/P _{NINV}	Q/S _n	cosφ	ΔQ/S _n	ΔQ/S _n
107%	< 20%	0.1* Q _{max}	106.84%	18.08%	4.36%	0.9574	0.00%	≤ ± 2%
109%	< 20%	-0.4* Q _{max}	108.84%	18.20%	4.37%	0.9578	0.01%	
	30%		108.83%	29.89%	-17.43%	0.8080	0.01%	
	40%		108.84%	39.97%	-17.43%	0.8780	0.01%	
	50%		108.85%	50.03%	-17.42%	0.9169	0.02%	
	60%		108.85%	60.11%	-17.41%	0.9403	0.03%	
	70%		108.86%	70.14%	-17.41%	0.9551	0.03%	
	80%		108.86%	79.90%	-17.48%	0.9646	-0.04%	
	90%		108.87%	89.87%	-17.48%	0.9717	-0.04%	
100%	108.88%	99.44%	-17.51%	0.9765	-0.07%			
110%	100%	-0.9* Q _{max}	109.86%	99.45%	-39.01%	0.8977	0.23%	
	10%		109.80%	9.07%	-39.16%	0.1823	0.08%	
	< 5%	0.1* Q _{max}	109.85%	4.54%	3.58%	0.6268	-0.78%	

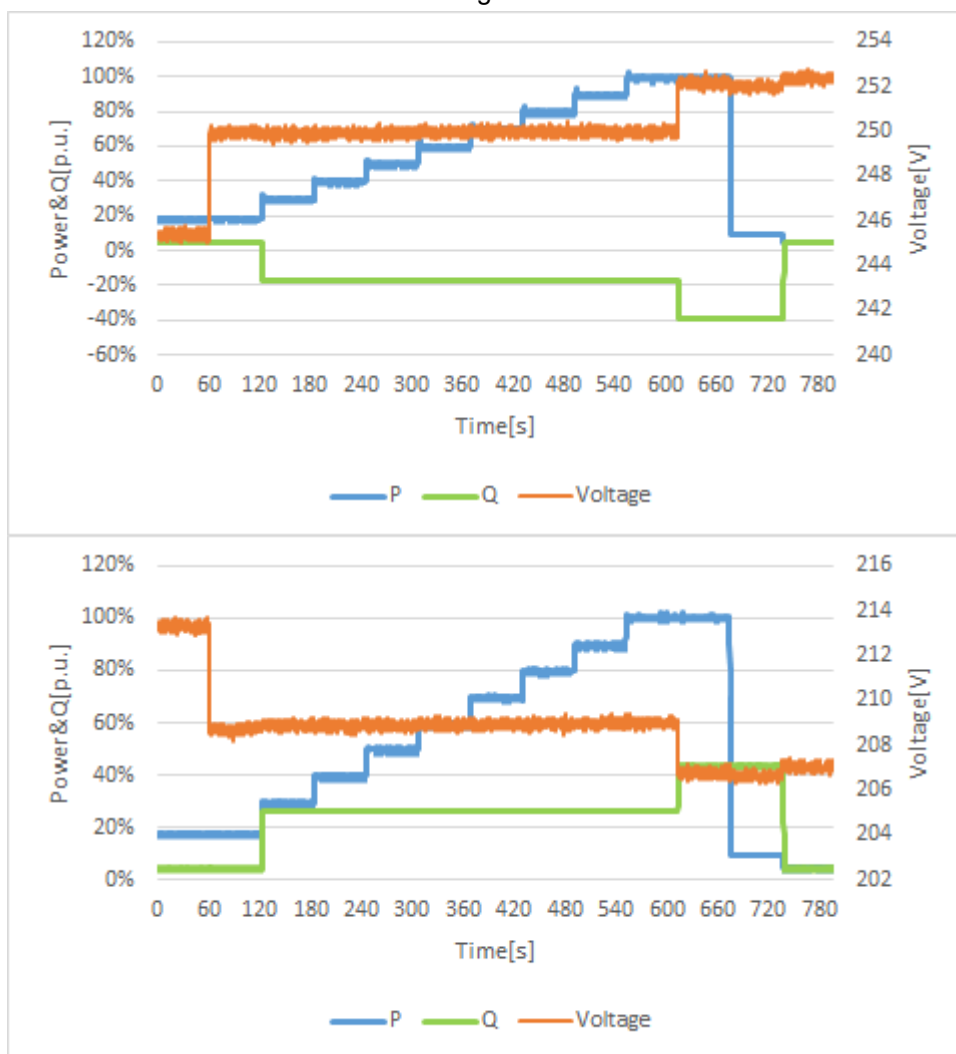
CEI 0-16								
Clause	Requirement - Test					Result - Remark		Verdict
Test Conditions			Measurements					Limit
U/U _n	P/P _{NINV}	Excepted Q/S _n	$\Delta T_{\text{settling}}$					$\Delta T_{\text{settling}}$
109%	30%	-0.4* Qmax	3.8					≤ 10s
110%	100%	-0.9* Qmax	4.2					
110%	< 5%	0.1* Qmax	3.9					
Test Conditions			Measurements					Limit
U/U _n	P/P _{NINV}	Excepted Q/S _n	U/U _n	P/P _{NINV}	Q/S _n	cosφ	$\Delta Q/S_n$	$\Delta Q/S_n$
93%	< 20%	0.1* Qmax	92.89%	17.88%	4.37%	0.9563	0.01%	≤ ± 2%
91%	< 20%	0.6* Qmax	90.90%	17.89%	4.36%	0.9566	0.00%	
	30%		90.94%	29.51%	26.16%	0.6699	0.00%	
	40%		90.94%	40.03%	26.15%	0.7745	-0.01%	
	50%		90.94%	50.12%	26.15%	0.8376	-0.01%	
	60%		90.95%	59.91%	26.14%	0.8779	-0.02%	
	70%		90.96%	69.95%	26.13%	0.9061	-0.03%	
	80%		90.97%	79.98%	26.13%	0.9258	-0.03%	
	90%		90.97%	89.97%	26.15%	0.9399	-0.01%	
90%	100%	Qmax	89.99%	100.30%	43.38%	0.8796	-0.22%	
	10%		89.92%	9.23%	43.60%	0.1669	0.00%	
	< 5%	0.1* Qmax	90.00%	4.48%	5.15%	0.6187	0.79%	

CEI 0-16			
Clause	Requirement - Test		Result - Remark
Test Conditions		Measurements	
U/U _n	P/P _{NINV}	Excepted Q/S _n	$\Delta T_{\text{setting}}$
91%	30%	0.6* Q _{max}	4.1
90%	100%	Q _{max}	3.5
90%	< 5%	0.1* Q _{max}	3.6
			Limit
			$\Delta T_{\text{setting}}$
			≤ 10s

Note(s):

Possibility to control this function by an external signal.

Diagram



CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

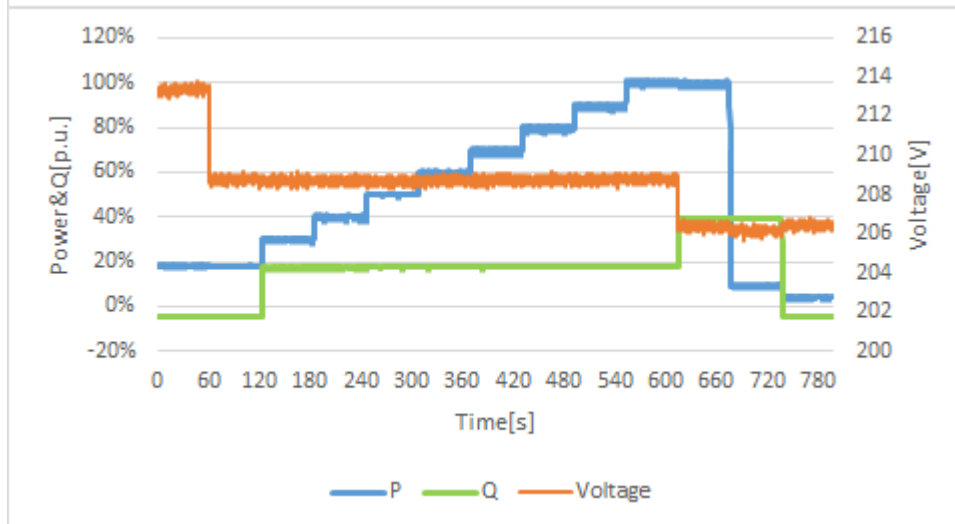
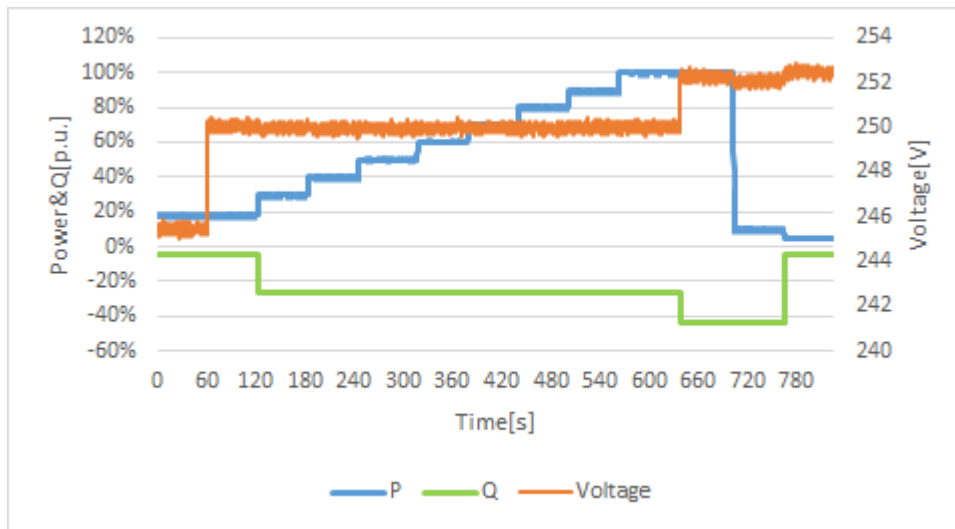
Test: P=Discharge power (k = -0.1)								
Test Conditions			Measurements					Limit
U/U _n	P/P _{NINV}	Excepted Q/S _n	U/U _n	P/P _{NINV}	Q/S _n	cosφ	ΔQ/S _n	ΔQ/S _n
107%	< 20%	-0.1* Q _{max}	106.90%	17.83%	-4.35%	0.9565	0.01%	≤ ± 2%
109%	< 20%	-0.1* Q _{max}	108.89%	17.98%	-4.35%	0.9573	0.01%	
	30%	-0.6* Q _{max}	108.88%	30.08%	-26.14%	0.6773	0.02%	
	40%		108.89%	39.91%	-26.14%	0.7738	0.02%	
	50%		108.89%	49.96%	-26.13%	0.8370	0.03%	
	60%		108.90%	60.27%	-26.13%	0.8792	0.03%	
	70%		108.91%	70.06%	-26.14%	0.9063	0.02%	
	80%		108.92%	80.33%	-26.14%	0.9263	0.02%	
	90%		108.92%	90.10%	-26.14%	0.9401	0.02%	
100%	108.93%		100.03%	-26.14%	0.9506	0.02%		
110%	100%	-Q _{max}	109.91%	99.95%	-43.42%	0.8788	0.18%	
	10%		109.85%	9.84%	-43.77%	0.1770	-0.17%	
	< 5%	-0.1* Q _{max}	109.91%	4.52%	-4.77%	0.6275	-0.41%	
Test Conditions			Measurements					Limit
U/U _n	P/P _{NINV}	Excepted Q/S _n	Δ T _{setting}					Δ T _{setting}
109%	30%	-0.6* Q _{max}	4.0					≤ 10s
110%	100%	-Q _{max}	3.9					
110%	< 5%	-0.1* Q _{max}	3.5					

CEI 0-16								
Clause	Requirement - Test				Result - Remark			Verdict
Test Conditions			Measurements					Limit
U/U _n	P/P _{NINV}	Excepted Q/S _n	U/U _n	P/P _{NINV}	Q/S _n	cosφ	ΔQ/S _n	ΔQ/S _n
93%	< 20%	-0.1* Qmax	92.93%	18.16%	-4.36%	0.9579	0.00%	≤ ± 5%
91%	< 20%	0.4* Qmax	90.93%	18.06%	-4.35%	0.9575	0.01%	
	30%		90.93%	29.95%	17.39%	0.8093	-0.05%	
	40%		90.93%	40.02%	17.42%	0.8783	-0.02%	
	50%		90.94%	49.87%	17.46%	0.9161	0.02%	
	60%		90.95%	59.92%	17.47%	0.9395	0.03%	
	70%		90.95%	69.94%	17.48%	0.9545	0.04%	
	80%		90.96%	79.97%	17.48%	0.9646	0.04%	
	90%		90.97%	89.71%	17.49%	0.9716	0.05%	
90%	100%	0.9*Qmax	89.96%	100.05%	39.01%	0.8988	-0.23%	
	10%		89.89%	9.21%	39.10%	0.1853	-0.14%	
	< 5%	-0.1* Qmax	89.92%	4.13%	-4.22%	0.6058	0.14%	
Test Conditions			Measurements					
U/U _n	P/P _{NINV}	Excepted Q/S _n	Δ T _{setting}					Δ T _{setting}
91%	30%	0.4* Qmax	3.5					≤ 10s
90%	100%	0.9* Qmax	3.7					
90%	< 5%	-0.1* Qmax	3.6					
Note(s):								
Possibility to control this function by an external signal.								

CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Diagram



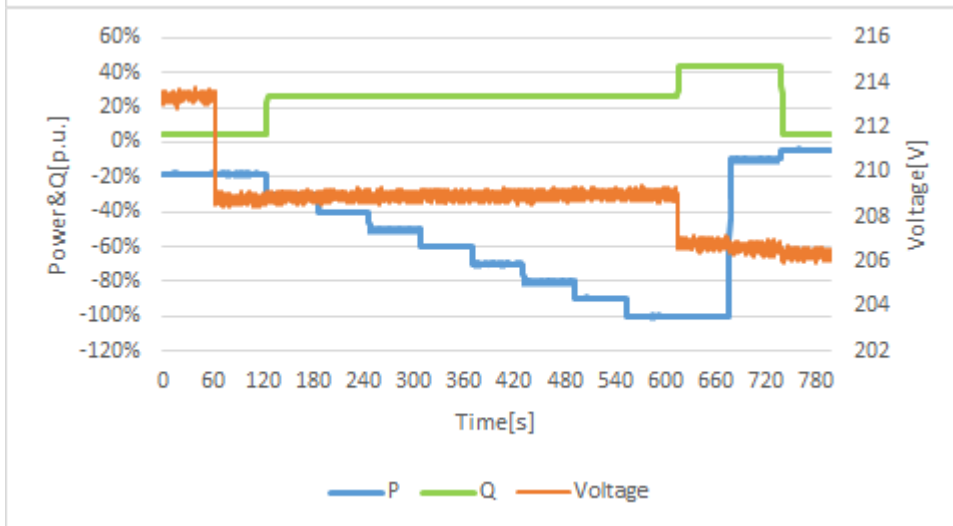
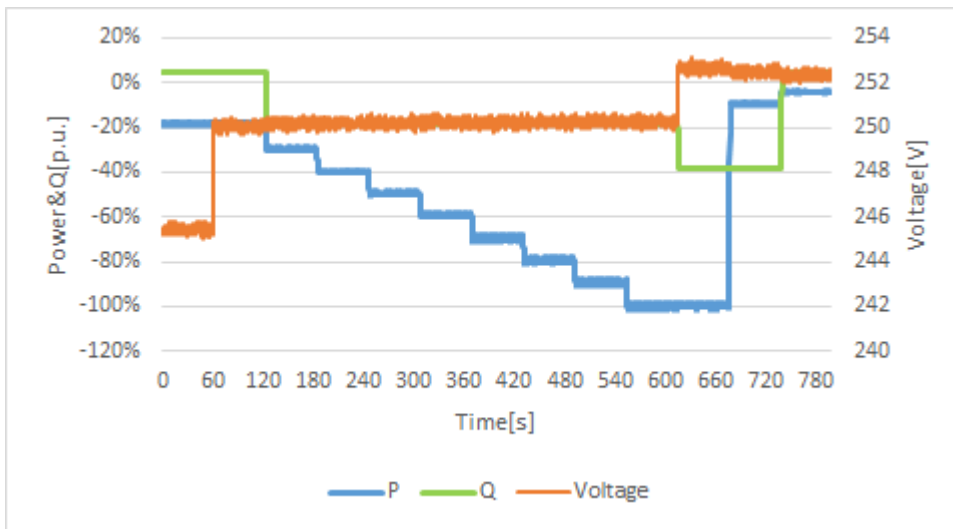
CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test: P=Charge power (k = +0.1 for Bi-directional converter only)								
Test Conditions			Measurements					Limit
U/U _n	P/P _{NINV}	Excepted Q/S _n	U/U _n	P/P _{NINV}	Q/S _n	cosφ	ΔQ/S _n	ΔQ/S _n
107%	< 20%	0.1* Qmax	106.89%	-18.13%	4.59%	-0.9534	0.23%	≤ ± 2%
109%	< 20%	-0.4* Qmax	108.87%	-18.06%	4.59%	-0.9531	0.23%	
	30%		108.89%	-30.08%	-18.40%	-0.7944	-0.96%	
	40%		108.90%	-39.91%	-18.43%	-0.8661	-0.99%	
	50%		108.91%	-49.98%	-18.41%	-0.9083	-0.97%	
	60%		108.91%	-59.76%	-18.41%	-0.9332	-0.97%	
	70%		108.92%	-69.78%	-18.42%	-0.9496	-0.98%	
	80%		108.93%	-80.03%	-18.42%	-0.9610	-0.98%	
	90%		108.94%	-89.80%	-18.42%	-0.9687	-0.98%	
100%	108.94%	-100.20%	-18.42%	-0.9746	-0.98%			
110%	100%	-0.9* Qmax	109.95%	-99.92%	-38.06%	-0.9028	1.18%	
	10%		109.90%	-9.27%	-38.36%	-0.1899	0.88%	
	< 5%	0.1* Qmax	109.87%	-4.02%	3.79%	-0.5950	-0.57%	
Test Conditions			Measurements					Limit
U/U _n	P/P _{NINV}	Excepted Q/S _n	Δ T _{setting}					Δ T _{setting}
109%	30%	-0.4* Qmax	4.5					≤ 10s
110%	100%	-0.9* Qmax	4.1					
110%	< 5%	0.1* Qmax	3.9					

CEI 0-16								
Clause	Requirement - Test				Result - Remark			Verdict
Test Conditions			Measurements					Limit
U/U _n	P/P _{NINV}	Excepted Q/S _n	U/U _n	P/P _{NINV}	Q/S _n	cosφ	ΔQ/S _n	ΔQ/S _n
93%	< 20%	0.1* Qmax	92.93%	-18.05%	4.36%	-0.9572	0.00%	≤ ± 2%
91%	< 20%	0.6* Qmax	90.94%	-18.03%	4.38%	-0.9569	0.02%	
	30%		90.96%	-30.12%	26.12%	-0.6780	-0.04%	
	40%		90.97%	-40.01%	26.14%	-0.7745	-0.02%	
	50%		90.98%	-50.07%	26.13%	-0.8375	-0.03%	
	60%		90.98%	-60.14%	26.16%	-0.8786	0.00%	
	70%		90.99%	-69.84%	26.14%	-0.9058	-0.02%	
	80%		91.00%	-79.99%	26.13%	-0.9258	-0.03%	
	90%		91.01%	-89.97%	26.15%	-0.9399	-0.01%	
100%	91.02%	-99.95%	26.14%	-0.9505	-0.02%			
90%	100%	Qmax	90.03%	-99.97%	43.41%	-0.8788	-0.19%	
	10%		89.96%	-9.76%	43.78%	-0.1755	0.18%	
	< 5%	0.1* Qmax	89.92%	-4.29%	5.15%	-0.5873	0.79%	
Test Conditions			Measurements					Limit
U/U _n	P/P _{NINV}	Excepted Q/S _n	Δ T _{setting}					Δ T _{setting}
91%	30%	0.6* Qmax	3.8					≤ 10s
90%	100%	Qmax	3.6					
90%	< 5%	0.1* Qmax	3.7					
Note(s):								
Possibility to control this function by an external signal.								

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Diagram



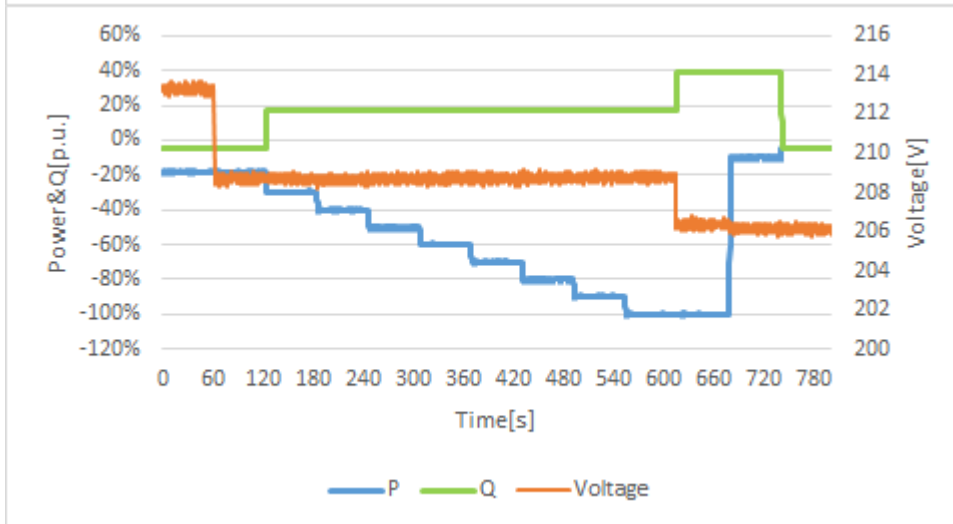
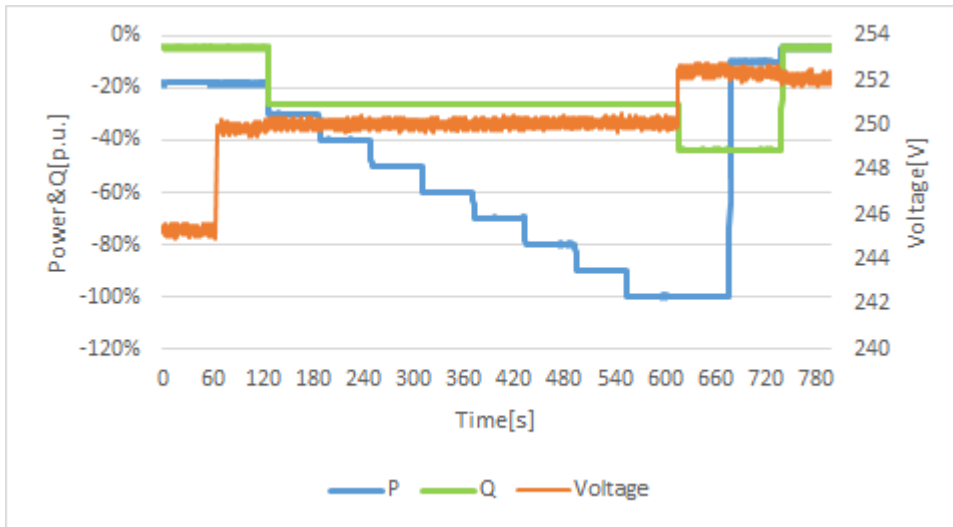
CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test: P=Charge power (k = -0.1 for Bi-directional converter only)								
Test Conditions			Measurements					Limit
U/U _n	P/P _{NINV}	Excepted Q/S _n	U/U _n	P/P _{NINV}	Q/S _n	cosφ	ΔQ/S _n	ΔQ/S _n
107%	< 20%	-0.1* Qmax	106.86%	-18.00%	-4.37%	-0.9569	-0.01%	≤ ± 2%
109%	< 20%	-0.1* Qmax	108.86%	-18.08%	-4.38%	-0.9572	-0.02%	
	30%	-0.6* Qmax	108.89%	-29.91%	-26.14%	-0.6753	0.02%	
	40%		108.89%	-39.89%	-26.16%	-0.7734	0.00%	
	50%		108.90%	-50.04%	-26.16%	-0.8371	0.00%	
	60%		108.91%	-60.08%	-26.17%	-0.8783	-0.01%	
	70%		108.91%	-69.95%	-26.17%	-0.9058	-0.01%	
	80%		108.92%	-79.93%	-26.17%	-0.9255	-0.01%	
	90%		108.93%	-89.87%	-26.17%	-0.9397	-0.01%	
100%	108.93%		-99.75%	-26.16%	-0.9502	0.00%		
110%	100%	-Qmax	109.93%	-99.88%	-43.39%	-0.8787	0.21%	
	10%		109.88%	-9.76%	-43.66%	-0.1760	-0.06%	
	< 5%	-0.1* Qmax	109.85%	-4.43%	-4.92%	-0.6174	-0.56%	
Test Conditions			Measurements					Limit
U/U _n	P/P _{NINV}	Excepted Q/S _n	Δ T _{setting}					Δ T _{setting}
109%	30%	-0.6* Qmax	4.0					≤ 10s
110%	100%	-Qmax	3.9					
110%	< 5%	-0.1* Qmax	3.6					

CEI 0-16								
Clause	Requirement - Test					Result - Remark		Verdict
Test Conditions			Measurements					Limit
U/U _n	P/P _{NINV}	Excepted Q/S _n	U/U _n	P/P _{NINV}	Q/S _n	cosφ	ΔQ/S _n	ΔQ/S _n
93%	< 20%	-0.1* Qmax	92.90%	-18.00%	-4.35%	-0.9573	0.01%	≤ ± 5%
91%	< 20%	0.4* Qmax	90.91%	-18.02%	-4.35%	-0.9573	0.01%	
	30%		90.91%	-29.88%	17.43%	-0.8080	-0.01%	
	40%		90.92%	-39.91%	17.44%	-0.8775	0.00%	
	50%		90.92%	-50.06%	17.45%	-0.9168	0.01%	
	60%		90.93%	-60.02%	17.45%	-0.9398	0.01%	
	70%		90.93%	-69.91%	17.47%	-0.9545	0.03%	
	80%		90.94%	-79.90%	17.47%	-0.9646	0.03%	
	90%		90.95%	-89.83%	17.48%	-0.9717	0.04%	
100%	90.96%	-99.90%	17.45%	-0.9770	0.01%			
90%	100%	0.9*Qmax	89.94%	-99.87%	38.95%	-0.8987	-0.29%	
	10%		89.87%	-9.76%	39.27%	-0.1951	0.03%	
	< 5%	-0.1* Qmax	89.86%	-4.56%	-3.77%	-0.6352	0.59%	
Test Conditions			Measurements					Limit
U/U _n	P/P _{NINV}	Excepted Q/S _n	Δ T _{setting}					Δ T _{setting}
91%	30%	0.4* Qmax	4.3					≤ 10s
90%	100%	0.9* Qmax	3.6					
90%	< 5%	-0.1* Qmax	3.7					
Note(s):								
Possibility to control this function by an external signal.								

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Diagram

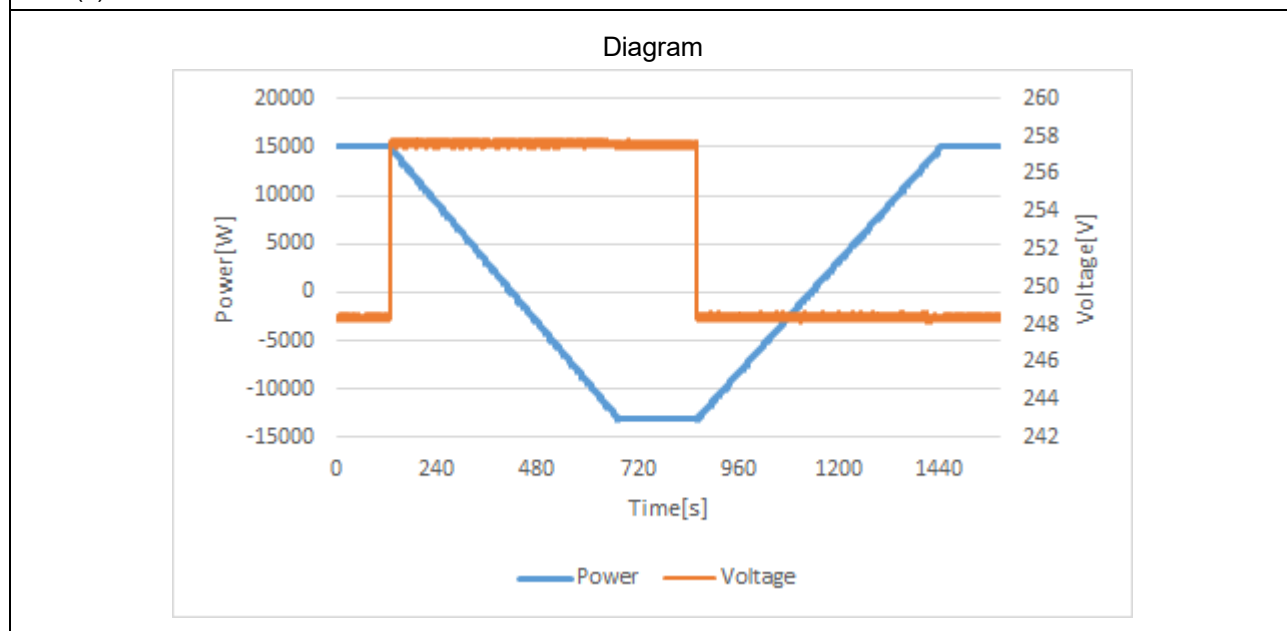


CEI 0-16							
Clause	Requirement - Test					Result - Remark	Verdict
Nbis.7.1	Tabella: Limitazione automatica in logica locale, per valori di tensione prossimi al 110% Table: Active power limitation for voltage values near to 110%Un (characteristic curve P(U))						P
Test: Bi-directional converter only				AF60K-TH + ATOM HS-40.96			
P(U) curve settings		U/U _n		110%			
		P/P _{NINV}		≤ -80%			
Test Conditions		Measurements				Limit	
U/U _n	Excepted P/P _{NINV}	U/U _n	P/P _{NINV}	cosφ	Δ T _{settling}	P/P _{NINV}	Δ T _{settling}
108%	100%	108.00%	100.15%	0.9997	136	≤ ± 5%	≤ 300s
112%	≤ -80%	112.01%	-86.73%	0.9976	134	≤ -80%	
108%	100%	108.01%	100.12%	0.9991	129	≤ ± 5%	
Note(s):							
Diagram							
<p>The diagram is a line graph with two y-axes and one x-axis. The x-axis is labeled 'Time[s]' and ranges from 0 to 1440 with major ticks every 240 units. The left y-axis is labeled 'Power[W]' and ranges from -50000 to 60000 with major ticks every 10000 units. The right y-axis is labeled 'Voltage[V]' and ranges from 242 to 260 with major ticks every 2 units. There are two data series: 'Power' (blue line) and 'Voltage' (orange line). The Voltage starts at 258V, drops to 248V at 120s, and returns to 258V at 960s. The Power starts at 45000W, drops to -45000W at 120s, and returns to 45000W at 960s. A legend at the bottom indicates 'Power' with a blue line and 'Voltage' with an orange line.</p>							

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test: Bi-directional converter only			AF60K-TH + ATOM HS-15.36				
P(U) curve settings		U/U _n		110%			
		P/P _{NINV}		≤ -80%			
Test Conditions		Measurements				Limit	
U/U _n	Excepted P/P _{NINV}	U/U _n	P/P _{NINV}	cosφ	Δ T _{settling}	P/P _{NINV}	Δ T _{settling}
108%	100%	108.00%	100.15%	0.9997	141	≤ ± 5%	≤ 300s
112%	≤ -80%	112.01%	-86.79%	0.9976	135	≤ -80%	
108%	100%	108.01%	100.17%	0.9991	137	≤ ± 5%	

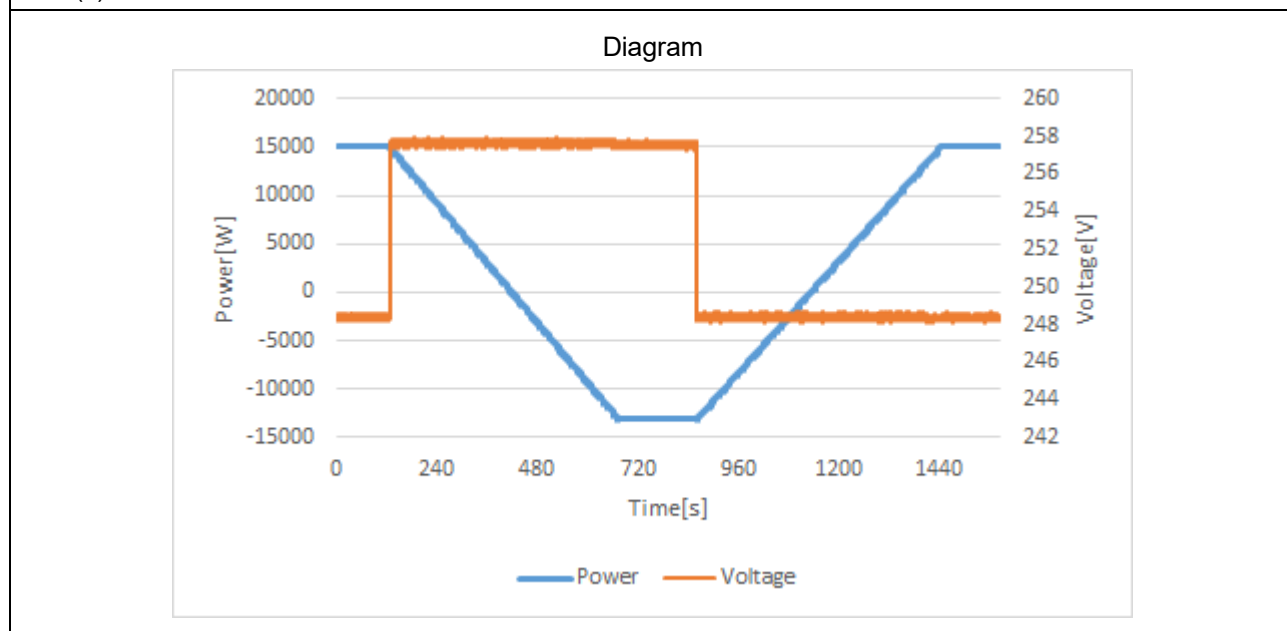
Note(s):



CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test: Bi-directional converter only		AF36K-TH + ATOM HS-15.36					
P(U) curve settings		U/U _n		110%			
		P/P _{NINV}		≤ -80%			
Test Conditions		Measurements				Limit	
U/U _n	Excepted P/P _{NINV}	U/U _n	P/P _{NINV}	cosφ	Δ T _{settling}	P/P _{NINV}	Δ T _{settling}
108%	100%	108.00%	100.15%	0.9997	145	≤ ± 5%	≤ 300s
112%	≤ -80%	112.01%	-86.84%	0.9976	139	≤ -80%	
108%	100%	108.01%	100.21%	0.9991	138	≤ ± 5%	

Note(s):



CEI 0-16								
Clause	Requirement - Test				Result - Remark			Verdict
Test: Bi-directional converter only				AF60K-TH + ATOM HS-40.96				
Starting frequency f_1 :			50.2Hz					
Deactivation threshold f_{stop} :			50.1Hz (Activated)					
Droop s_o :			--					
Sequence A:								
Test condition		Measurement						Limit $\Delta P/S_n$
f [Hz]	Target P/P _{NINV}	f [Hz]	P/P _{NINV}	T _{sr} [s]	T _{settling} [s]	T _d [s]	$\Delta P/S_n$	
1) 47.51	100%	47.51	100.03%	--	--	--	0.03%	$\leq \pm 2.5\%$
2) 50.15	100%	50.15	100.04%	0	0	0	0.04%	
3) 50.40	69.20%	50.40	68.96%	1.9	0.4	0.7	-0.24%	
4) 50.60	38.40%	50.60	37.60%	1.3	0.6	1.8	-0.80%	
5) 51.49	-98.66%	51.49	-97.49%	1.2	1.7	0.2	1.17%	
6) 50.11	-98.66%	50.11	-98.40%	0	0	0	0.26%	
7) 50.00	keep P _{min-o} -98.66%	50.00	-98.40%	--	--	--	0.26%	
	recover to 100%	50.00	100.19%	--	--	--	0.19%	
Test condition		Measurement					Limit	
6) 50.11 to 7) 50		Waiting time for keep P _{min-o} [s]:				319	$\geq 300s$	
		Max. power gradient	[P _e - P _{min-o}]/min:		19.13%	$\leq 20\% [P_e - P_{min-o}]/min$		
			S _n /min:		19.25%	$\leq 20\% S_n /min$		

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Sequence B:								
Test condition		Measurement						Limit $\Delta P/S_n$
f [Hz]	*Target P/P _{NINV}	f [Hz]	P/P _{NINV}	T _{sr} [s]	T _{settling} [s]	T _d [s]	$\Delta P/S_n$	
1) 47.51	50%	47.51	50.02%	--	--	--	0.02%	$\leq \pm 2.5\%$
2) 50.15	50%	50.15	50.03%	0	0	0	0.03%	
3) 50.40	27%	50.40	27.29%	0.7	0.2	0.9	0.29%	
4) 50.60	4%	50.60	3.35%	0.6	0.7	0.5	-0.65%	
5) 51.49	-98.35%	51.49	-99.39%	0.5	1.4	0.7	-1.04%	
6) 50.11	-98.35%	50.11	-98.93%	0	0	0	-0.58%	
7) 50.00	keep P _{min-o} -98.35%	50.00	-98.93%	--	--	--	-0.58%	
	recover to 50%	50.00	49.44%	--	--	--	-0.56%	
Test condition		Measurement					Limit	
6) 50.11 to 7) 50		Waiting time for keep P _{min-o} [s]:					331	$\geq 300s$
		Max. power gradient	[P _e - P _{min-o}]/min:		19.22%	$\leq 20\%$ [P _e - P _{min-o}]/min		
			S _n /min:		19.20%	$\leq 20\%$ S _n /min		

CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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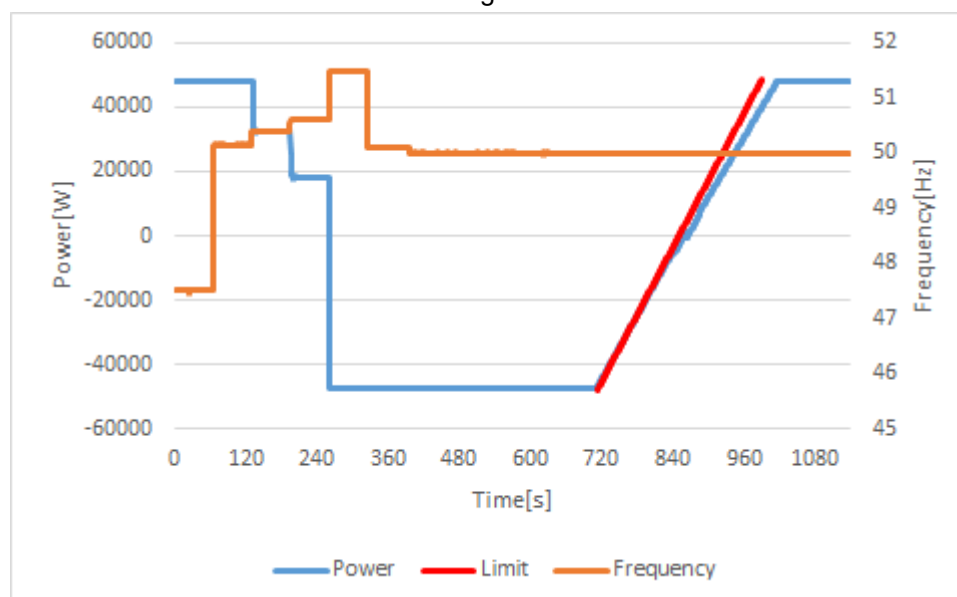
Sequence C:

Test condition		Measurement						Limit $\Delta P/S_n$
f [Hz]	*Target P/P _{NINV}	f [Hz]	P/P _{NINV}	T _{sr} [s]	T _{settling} [s]	T _d [s]	$\Delta P/S_n$	
1) 47.51	0%	47.51	-0.02%	--	--	--	-0.02%	$\leq \pm 2.5\%$
2) 50.15	0%	50.15	-0.02%	0	0	0	-0.02%	
3) 50.40	-15.40%	50.40	-14.47%	1.1	1.8	1.8	0.93%	
4) 50.60	-30.80%	50.60	-29.85%	0.1	0.8	1.6	0.95%	
5) 51.49	-99.33%	51.49	-99.30%	0.5	0.8	1.6	0.03%	
6) 50.11	-99.33%	50.11	-99.64%	0	0	0	-0.31%	
7) 50.00	keep P _{min-o} -99.33%	50.00	-99.64%	--	--	--	-0.31%	
	recover to 0%	50.00	0.09%	--	--	--	0.09%	
Test condition		Measurement					Limit	
6) 50.11 to 7) 50	Waiting time for keep P _{min-o} [s]:					317	$\geq 300s$	
	Max. power gradient	[P _e - P _{min-o}]/min:		19.12%		$\leq 20\%$ [P _e - P _{min-o}]/min		
		S _n /min:		19.22%		$\leq 19.87\% S_n$ /min		

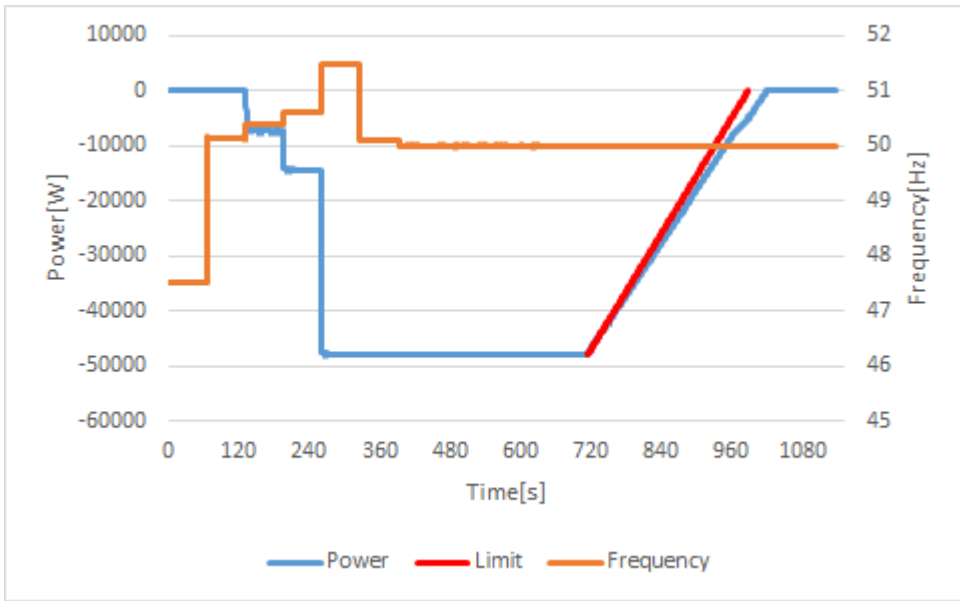
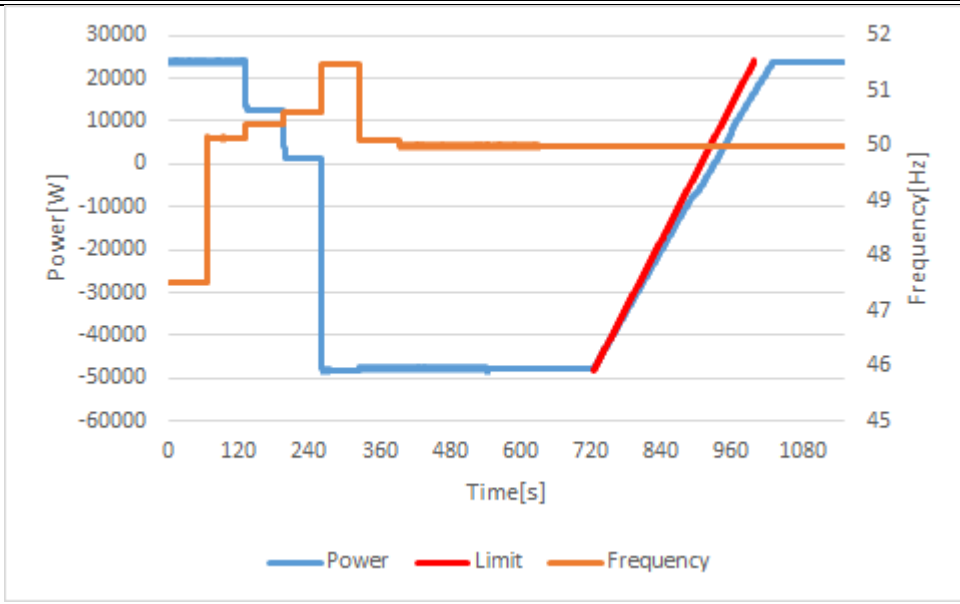
Note(s):

*Rated 100% P_{CMAX} = -100 % P_{NINV}

Diagram



CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict



CEI 0-16								
Clause	Requirement - Test				Result - Remark			Verdict
Test: Bi-directional converter only					AF60K-TH + ATOM HS-15.36			
Starting frequency f_1 :			50.2Hz					
Deactivation threshold f_{stop} :			50.1Hz (Activated)					
Droop s_o :			--					
Sequence A:								
Test condition		Measurement						Limit $\Delta P/S_n$
f [Hz]	Target P/P _{NINV}	f [Hz]	P/P _{NINV}	T _{sr} [s]	T _{settling} [s]	T _d [s]	$\Delta P/S_n$	
1) 47.51	100%	47.51	100.03%	--	--	--	0.03%	$\leq \pm 2.5\%$
2) 50.15	100%	50.15	100.04%	0	0	0	0.04%	
3) 50.40	69.20%	50.40	68.96%	1.9	0.4	1.4	-0.24%	
4) 50.60	38.40%	50.60	37.60%	0.6	1.4	0.6	-0.80%	
5) 51.49	-98.66%	51.49	-97.49%	1.4	0.2	0.4	1.17%	
6) 50.11	-98.66%	50.11	-98.40%	0	0	0	0.26%	
7) 50.00	keep P _{min-o} -98.66%	50.00	-98.40%	--	--	--	0.26%	
	recover to 100%	50.00	100.22%	--	--	--	0.22%	
Test condition		Measurement					Limit	
6) 50.11 to 7) 50		Waiting time for keep P _{min-o} [s]:				324	$\geq 300s$	
		Max. power gradient	[P _e - P _{min-o}]/min:		19.22%	$\leq 20\% [P_e - P_{min-o}]/min$		
			S _n /min:		19.19%	$\leq 20\% S_n /min$		

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Sequence B:								
Test condition		Measurement						Limit $\Delta P/S_n$
f [Hz]	*Target P/P _{NINV}	f [Hz]	P/P _{NINV}	T _{sr} [s]	T _{settling} [s]	T _d [s]	$\Delta P/S_n$	
1) 47.51	50%	47.51	50.02%	--	--	--	0.02%	$\leq \pm 2.5\%$
2) 50.15	50%	50.15	50.03%	0	0	0	0.03%	
3) 50.40	27%	50.40	27.29%	1.5	1.8	1.8	0.29%	
4) 50.60	4%	50.60	3.35%	1.1	1.0	1.7	-0.65%	
5) 51.49	-98.35%	51.49	-99.40%	1.9	0.6	0.8	-1.05%	
6) 50.11	-98.35%	50.11	-98.93%	0	0	0	-0.58%	
7) 50.00	keep P _{min-o} -98.35%	50.00	-98.93%	--	--	--	-0.58%	
	recover to 50%	50.00	49.47%	--	--	--	-0.53%	
Test condition		Measurement					Limit	
6) 50.11 to 7) 50		Waiting time for keep P _{min-o} [s]:					334	$\geq 300s$
		Max. power gradient	[P _e - P _{min-o}]/min:		19.22%	$\leq 20\%$ [P _e - P _{min-o}]/min		
			S _n /min:		19.18%	$\leq 20\%$ S _n /min		

CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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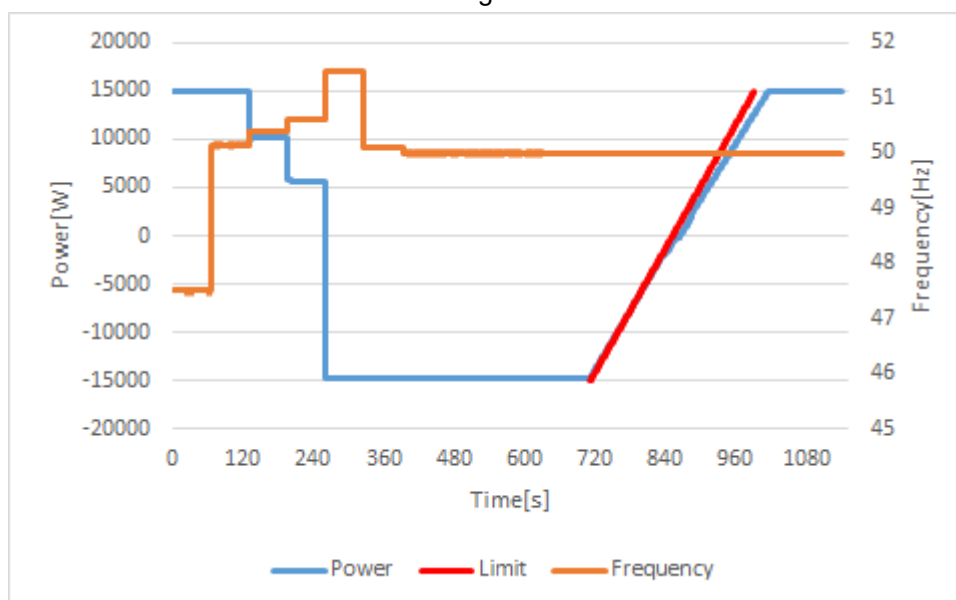
Sequence C:

Test condition		Measurement						Limit $\Delta P/S_n$
f [Hz]	*Target P/P _{NINV}	f [Hz]	P/P _{NINV}	T _{sr} [s]	T _{settling} [s]	T _d [s]	$\Delta P/S_n$	
1) 47.51	0%	47.51	-0.02%	--	--	--	-0.02%	$\leq \pm 2.5\%$
2) 50.15	0%	50.15	-0.02%	0	0	0	-0.02%	
3) 50.40	-15.40%	50.40	-14.47%	0.9	1.7	1.1	0.93%	
4) 50.60	-30.80%	50.60	-29.85%	0.3	0.3	0.1	0.95%	
5) 51.49	-99.33%	51.49	-99.31%	1.5	0.4	1.5	0.02%	
6) 50.11	-99.33%	50.11	-99.65%	0	0	0	-0.32%	
7) 50.00	keep P _{min-o} -99.33%	50.00	-99.65%	--	--	--	-0.32%	
	recover to 0%	50.00	0.13%	--	--	--	0.13%	
Test condition		Measurement				Limit		
6) 50.11 to 7) 50		Waiting time for keep P _{min-o} [s]:				324	$\geq 300s$	
		Max. power gradient	[P _e - P _{min-o}]/min:		19.18%	$\leq 20\%$ [P _e - P _{min-o}]/min		
			S _n /min:		19.16%	$\leq 19.87\%$ S _n /min		

Note(s):

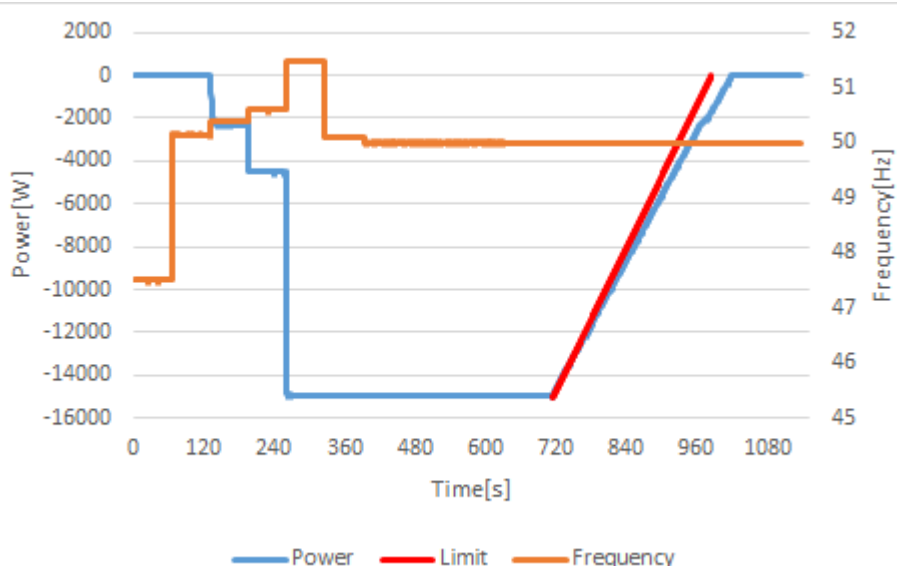
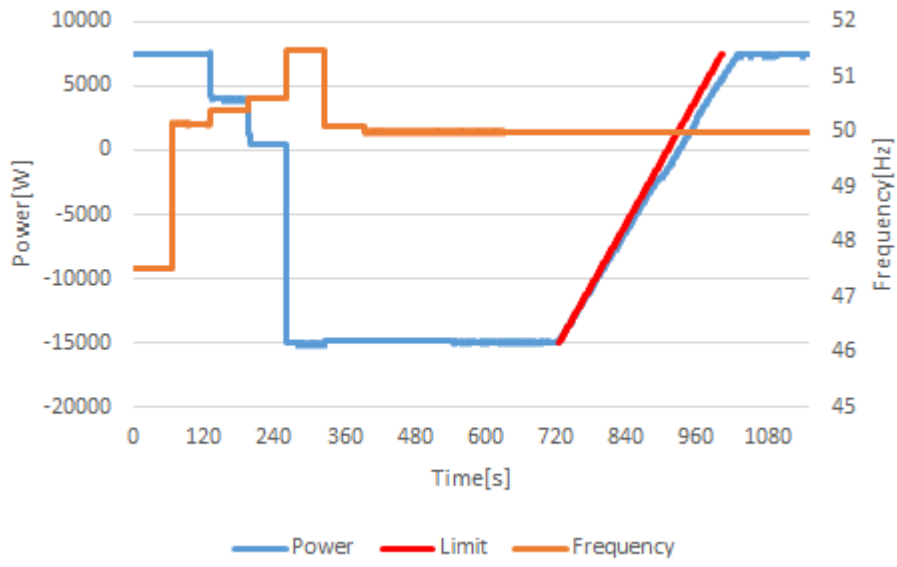
*Rated 100% P_{C MAX} = -100 % P_{NINV}

Diagram



CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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CEI 0-16								
Clause	Requirement - Test				Result - Remark			Verdict
Test: Bi-directional converter only					AF36K-TH + ATOM HS-15.36			
Starting frequency f_1 :			50.2Hz					
Deactivation threshold f_{stop} :			50.1Hz (Activated)					
Droop s_o :			--					
Sequence A:								
Test condition		Measurement						Limit $\Delta P/S_n$
f [Hz]	Target P/P _{NINV}	f [Hz]	P/P _{NINV}	T _{sr} [s]	T _{settling} [s]	T _d [s]	$\Delta P/S_n$	
1) 47.51	100%	47.51	100.03%	--	--	--	0.03%	$\leq \pm 2.5\%$
2) 50.15	100%	50.15	100.04%	0	0	0	0.04%	
3) 50.40	69.20%	50.40	68.96%	1.3	0.7	0.9	-0.24%	
4) 50.60	38.40%	50.60	37.60%	1.2	1.8	1.6	-0.80%	
5) 51.49	-98.66%	51.49	-97.49%	1.1	1.3	1.1	1.17%	
6) 50.11	-98.66%	50.11	-98.40%	0	0	0	0.26%	
7) 50.00	keep P _{min-o} -98.66%	50.00	-98.40%	--	--	--	0.26%	
	recover to 100%	50.00	100.27%	--	--	--	0.27%	
Test condition		Measurement					Limit	
6) 50.11 to 7) 50		Waiting time for keep P _{min-o} [s]:					330	$\geq 300s$
		Max. power gradient	[P _e - P _{min-o}]/min:		19.28%	$\leq 20\% [P_e - P_{min-o}]/min$		
			S _n /min:		19.27%	$\leq 20\% S_n /min$		

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Sequence B:								
Test condition		Measurement						Limit $\Delta P/S_n$
f [Hz]	*Target P/P _{NINV}	f [Hz]	P/P _{NINV}	T _{sr} [s]	T _{settling} [s]	T _d [s]	$\Delta P/S_n$	
1) 47.51	50%	47.51	50.02%	--	--	--	0.02%	$\leq \pm 2.5\%$
2) 50.15	50%	50.15	50.03%	0	0	0	0.03%	
3) 50.40	27%	50.40	27.29%	1.5	1.3	1.5	0.29%	
4) 50.60	4%	50.60	3.35%	1.1	1.0	1.0	-0.65%	
5) 51.49	-98.35%	51.49	-99.40%	1.8	0.9	1.8	-1.05%	
6) 50.11	-98.35%	50.11	-98.93%	0	0	0	-0.58%	
7) 50.00	keep P _{min-o} -98.35%	50.00	-98.93%	--	--	--	-0.58%	
	recover to 50%	50.00	49.53%	--	--	--	-0.47%	
Test condition		Measurement					Limit	
6) 50.11 to 7) 50		Waiting time for keep P _{min-o} [s]:					328	$\geq 300s$
		Max. power gradient	[P _e - P _{min-o}]/min:		19.19%	$\leq 20\% [P_e - P_{min-o}]/min$		
			S _n /min:		19.27%	$\leq 20\% S_n /min$		

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

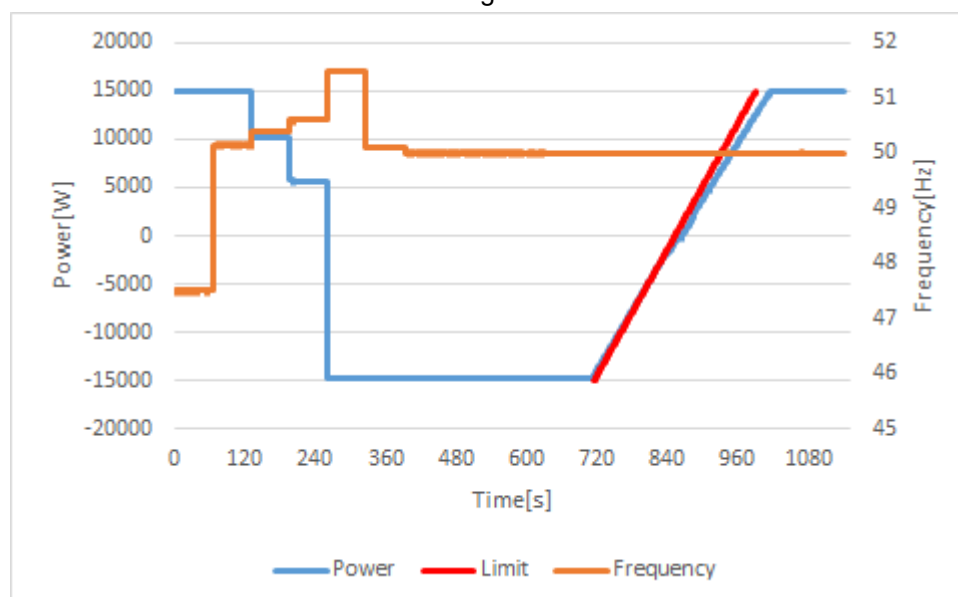
Sequence C:

Test condition		Measurement						Limit $\Delta P/S_n$
f [Hz]	*Target P/P _{NINV}	f [Hz]	P/P _{NINV}	T _{sr} [s]	T _{settling} [s]	T _d [s]	$\Delta P/S_n$	
1) 47.51	0%	47.51	-0.02%	--	--	--	-0.02%	$\leq \pm 2.5\%$
2) 50.15	0%	50.15	-0.02%	0	0	0	-0.02%	
3) 50.40	-15.40%	50.40	-14.47%	0.3	0.1	0.5	0.93%	
4) 50.60	-30.80%	50.60	-29.85%	0.6	1.9	0.3	0.95%	
5) 51.49	-99.33%	51.49	-99.31%	1.3	1.1	0.2	0.02%	
6) 50.11	-99.33%	50.11	-99.64%	0	0	0	-0.31%	
7) 50.00	keep P _{min-o} -99.33%	50.00	-99.64%	--	--	--	-0.31%	
	recover to 0%	50.00	0.18%	--	--	--	0.18%	
Test condition		Measurement				Limit		
6) 50.11 to 7) 50		Waiting time for keep P _{min-o} [s]:				331	$\geq 300s$	
		Max. power gradient		[P _e - P _{min-o}]/min:	19.28%	$\leq 20\%$ [P _e - P _{min-o}]/min		
				S _n /min:	19.29%	$\leq 19.87\% S_n$ /min		

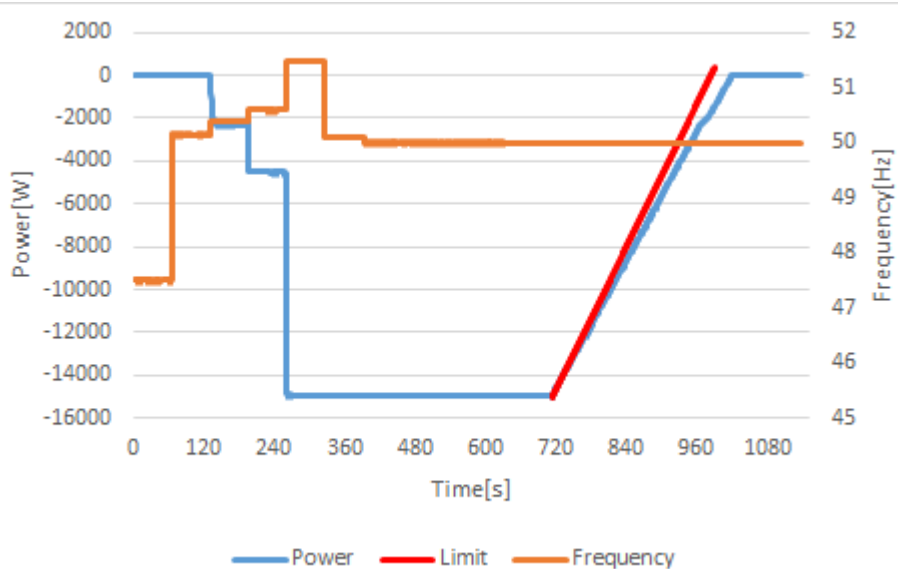
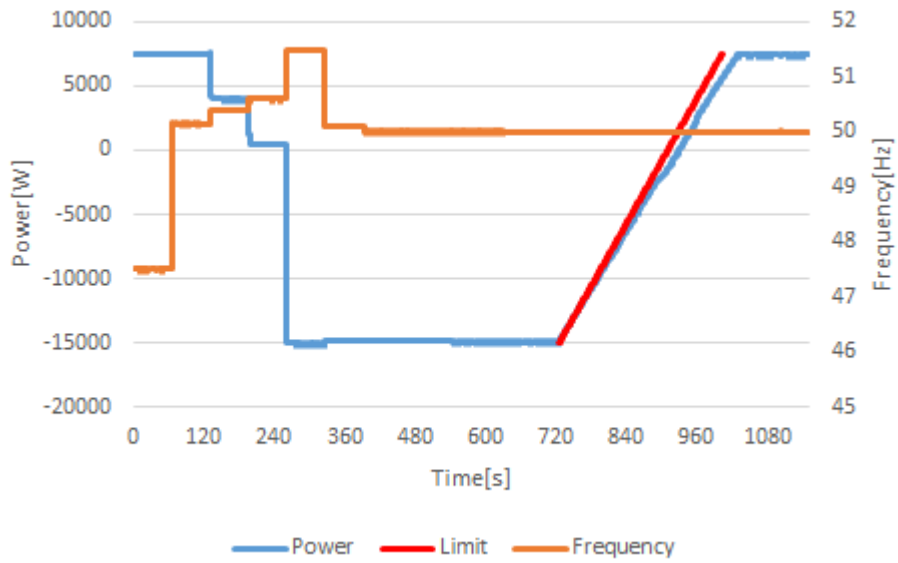
Note(s):

*Rated 100% P_CMAX = -100 % P_{NINV}

Diagram



CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict



CEI 0-16								
Clause	Requirement - Test				Result - Remark			Verdict
Nbis.7.3	Tabella: Incremento automatico per transitori di sottofrequenza originatisi sulla rete (secondo quanto stabilito in 8.8.6.4.3 ed in Allegato K) Table: Automatic increase for under-frequency transients (LFSM-U) originating on the network (as established in 8.8.6.4.3 and in Annex K)							P
Test: Bi-directional converter only				AF60K-TH + ATOM HS-40.96				
Starting frequency f_1 :			49.8Hz					
Deactivation threshold f_{stop} :			49.9Hz (Activated)					
Droop s:			--					
Sequence A:								
Test condition		Measurement						Limit $\Delta P/S_n$
f [Hz]	Target P/P_{NINV}	f [Hz]	P/P_{NINV}	T_{sr} [s]	$T_{settling}$ [s]	T_d [s]	$\Delta P/P_{NINV}$	
1) 51.49	50%	51.49	50.30%	--	--	--	0.30%	$\leq \pm 2.5\%$
2) 49.85	50%	49.85	50.30%	0	0	0	0.30%	
3) 49.80	50%	49.80	50.63%	1.6	0.6	1.0	0.63%	
4) 49.40	78.60%	49.40	78.85%	0.6	2.1	1.7	0.25%	
5) 49.11	99.34%	49.11	99.84%	1.3	1.0	1.6	0.50%	
6) 49.89	99.34%	49.89	99.93%	0	0	0	0.59%	
7) 50.00	keep P_{e-max} 99.34%	50.00	99.93%	--	--	--	0.59%	
	recover to 50%	50.00	50.19%	--	--	--	0.19%	
Test condition		Measurement					Limit	
6) 49.89 to 7) 50		Waiting time for keep P_{e-max} [s]:				324	$\geq 300s$	
		Max. power gradient		$[P_{ref} - P_{e-max}]/min$:		19.24%	$\leq 20\% [P_{ref} - P_{e-max}]/min$	
				S_n /min :		19.26%	$\leq 9.87\% S_n /min$	

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Sequence B:								
Test condition		Measurement						Limit $\Delta P/S_n$
f [Hz]	Target P/P _{NINV}	f [Hz]	P/P _{NINV}	T _{sr} [s]	T _{settling} [s]	T _d [s]	$\Delta P/P_{NINV}$	
1) 51.49	0%	51.49	-0.04%	--	--	--	-0.04%	$\leq \pm 2.5\%$
2) 49.85	0%	49.85	-0.06%	0	0	0	-0.06%	
3) 49.80	0%	49.80	0.51%	0.6	0.9	0.7	0.51%	
4) 49.40	57.2%	49.40	57.45%	2.3	1.1	1.4	0.25%	
5) 49.11	98.67%	49.11	100.04%	2.2	2.1	1.9	1.37%	
6) 49.89	98.67%	49.89	100.18%	0	0	0	1.51%	
7) 50.00	keep P _{e-max} 98.67%	50.00	100.18%	--	--	--	1.51%	
	recover to 0%	50.00	-0.15%	--	--	--	-0.15%	
Test condition		Measurement					Limit	
6) 49.89 to 7) 50		Waiting time for keep P _{e-max} [s]:					331	$\geq 300s$
		Max. power gradient	[P _{ref} - P _{e-max}]/min:		19.24%	$\leq 20\%[P_{ref} - P_{e-max}]/min:$		
			S _n /min:		19.16%	$\leq 19.73\%S_n /min$		

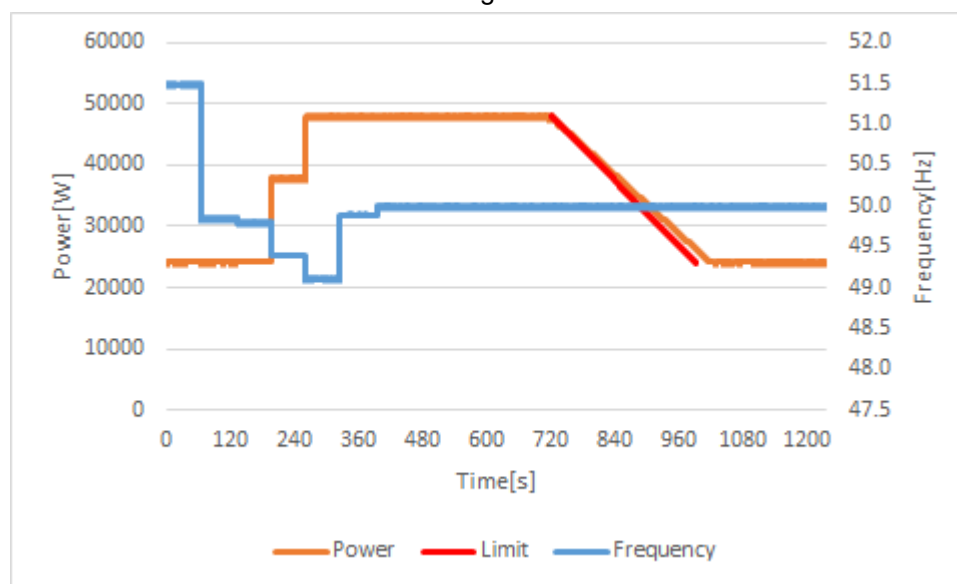
CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Sequence C:

Test condition		Measurement						Limit $\Delta P/S_n$
f [Hz]	Target P/P _{NINV}	f [Hz]	P/P _{NINV}	T _{sr} [s]	T _{settling} [s]	T _d [s]	$\Delta P/P_{NINV}$	
1) 51.49	-100%	51.49	-100.45%	--	--	--	-0.45%	$\leq \pm 2.5\%$
2) 49.85	-100%	49.85	-100.85%	0	0	0	-0.85%	
3) 49.80	-100%	49.80	-100.14%	0.6	2.1	2.1	-0.14%	
4) 49.40	14.29%	49.40	14.53%	0.9	0.7	1.8	0.24%	
5) 49.11	97.14%	49.11	99.03%	1.9	1.2	0.7	1.89%	
6) 49.89	97.14%	49.89	99.38%	0	0	0	2.24%	
7) 50.00	keep P _{e-max} 97.14%	50.00	99.38%	--	--	--	2.24%	
	recover to -100%	50.00	-100.54%	--	--	--	-0.54%	
Test condition		Measurement					Limit	
6) 49.89 to 7) 50		Waiting time for keep P _{e-max} [s]:					325	$\geq 300s$
		Max. power gradient	[P _{ref} - P _{e-max}]/min:		19.24%	$\leq 20\%[P_{ref} - P_{e-max}]/min:$		
			S _n /min:		19.29%	$\leq 20\%S_n /min$		

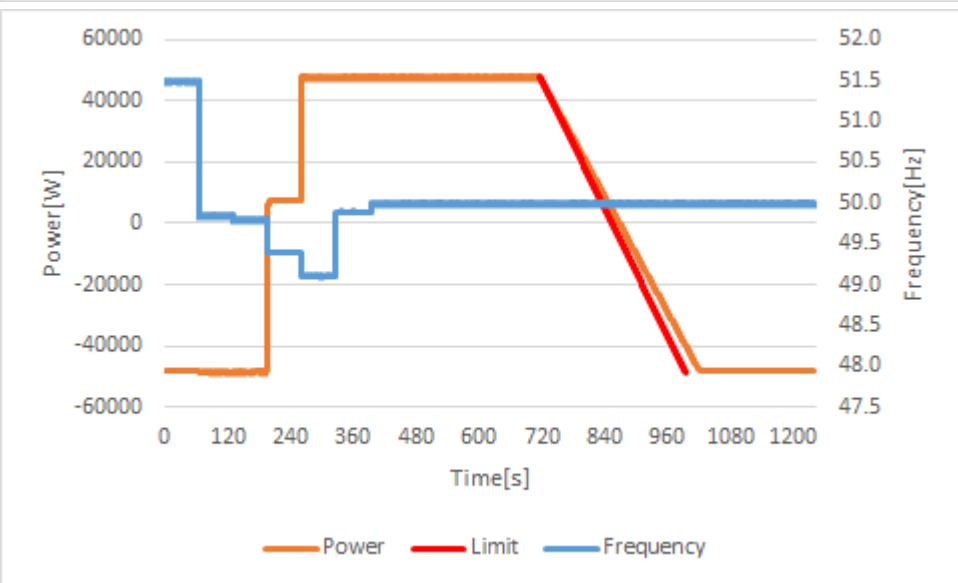
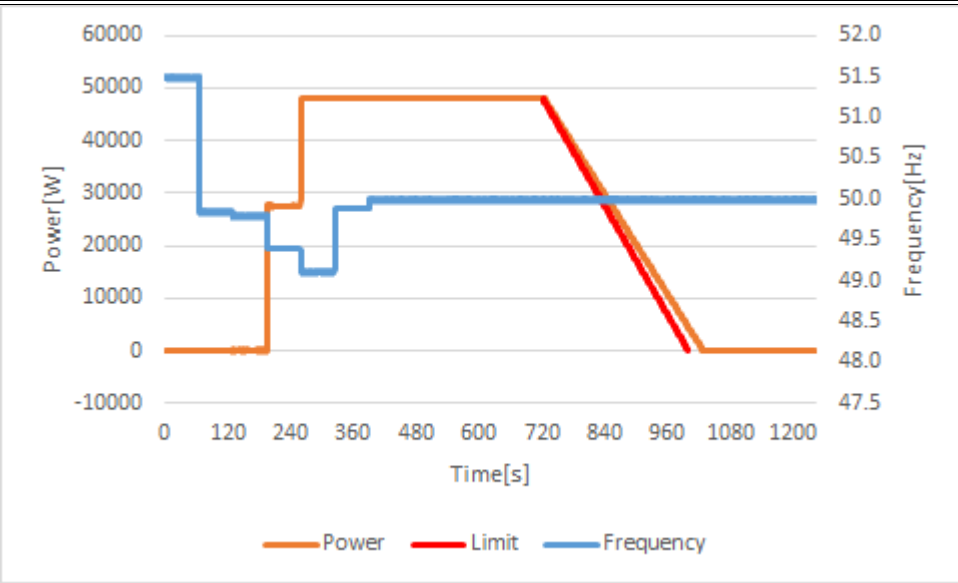
Note(s):

Diagram



CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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CEI 0-16								
Clause	Requirement - Test				Result - Remark			Verdict
Test: Bi-directional converter only					AF60K-TH + ATOM HS-15.36			
Starting frequency f_1 :			49.8Hz					
Deactivation threshold f_{stop} :			49.9Hz (Activated)					
Droop s:			--					
Sequence A:								
Test condition		Measurement						Limit $\Delta P/S_n$
f [Hz]	Target P/P _{NINV}	f [Hz]	P/P _{NINV}	T _{sr} [s]	T _{setting} [s]	T _d [s]	$\Delta P/P_{NINV}$	
1) 51.49	50%	51.49	50.30%	--	--	--	0.30%	$\leq \pm 2.5\%$
2) 49.85	50%	49.85	50.30%	0	0	0	0.30%	
3) 49.80	50%	49.80	50.63%	2.1	1.6	0.6	0.63%	
4) 49.40	78.60%	49.40	78.85%	2.0	1.2	0.7	0.25%	
5) 49.11	99.34%	49.11	99.85%	2.3	0.7	1.4	0.51%	
6) 49.89	99.34%	49.89	99.93%	0	0	0	0.59%	
7) 50.00	keep P _{e-max} 99.34%	50.00	99.93%	--	--	--	0.59%	
	recover to 50%	50.00	50.13%	--	--	--	0.13%	
Test condition		Measurement					Limit	
6) 49.89 to 7) 50		Waiting time for keep P _{e-max} [s]:					330	$\geq 300s$
		Max. power gradient	[P _{ref} - P _{e-max}]/min:		19.27%	$\leq 20\% [P_{ref} - P_{e-max}]/min$		
			S _n /min:		19.16%	$\leq 9.87\% S_n /min$		

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Sequence B:								
Test condition		Measurement						Limit $\Delta P/S_n$
f [Hz]	Target P/P _{NINV}	f [Hz]	P/P _{NINV}	T _{sr} [s]	T _{settling} [s]	T _d [s]	$\Delta P/P_{NINV}$	
1) 51.49	0%	51.49	-0.03%	--	--	--	-0.03%	$\leq \pm 2.5\%$
2) 49.85	0%	49.85	-0.06%	0	0	0	-0.06%	
3) 49.80	0%	49.80	0.51%	2.1	1.7	2.3	0.51%	
4) 49.40	57.2%	49.40	57.45%	0.9	2.0	2.2	0.25%	
5) 49.11	98.67%	49.11	100.04%	2.1	2.4	1.8	1.37%	
6) 49.89	98.67%	49.89	100.18%	0	0	0	1.51%	
7) 50.00	keep P _{e-max} 98.67%	50.00	100.18%	--	--	--	1.51%	
	recover to 0%	50.00	-0.21%	--	--	--	-0.21%	
Test condition		Measurement					Limit	
6) 49.89 to 7) 50		Waiting time for keep P _{e-max} [s]:				324	$\geq 300s$	
		Max. power gradient	[P _{ref} - P _{e-max}]/min:		19.22%	$\leq 20\%[P_{ref} - P_{e-max}]/min:$		
			S _n /min:		19.30%	$\leq 19.73\%S_n /min$		

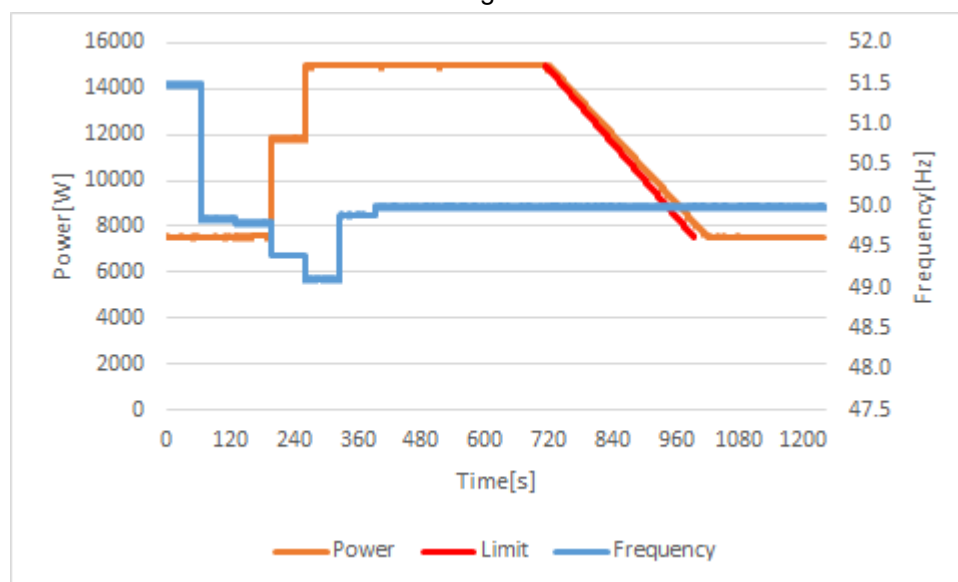
CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Sequence C:

Test condition		Measurement						Limit $\Delta P/S_n$
f [Hz]	Target P/P _{NINV}	f [Hz]	P/P _{NINV}	T _{sr} [s]	T _{settling} [s]	T _d [s]	$\Delta P/P_{NINV}$	
1) 51.49	-100%	51.49	-100.45%	--	--	--	-0.45%	$\leq \pm 2.5\%$
2) 49.85	-100%	49.85	-100.85%	0	0	0	-0.85%	
3) 49.80	-100%	49.80	-100.14%	2.1	1.8	1.0	-0.14%	
4) 49.40	14.29%	49.40	14.53%	1.9	1.6	1.0	0.24%	
5) 49.11	97.14%	49.11	99.03%	0.7	2.0	0.8	1.89%	
6) 49.89	97.14%	49.89	99.38%	0	0	0	2.24%	
7) 50.00	keep P _{e-max} 97.14%	50.00	99.38%	--	--	--	2.24%	
	recover to -100%	50.00	-100.59%	--	--	--	-0.59%	
Test condition		Measurement					Limit	
6) 49.89 to 7) 50		Waiting time for keep P _{e-max} [s]:					335	$\geq 300s$
		Max. power gradient	[P _{ref} - P _{e-max}]/min:		19.30%	$\leq 20\%[P_{ref} - P_{e-max}]/min:$		
			S _n /min:		19.28%	$\leq 20\%S_n /min$		

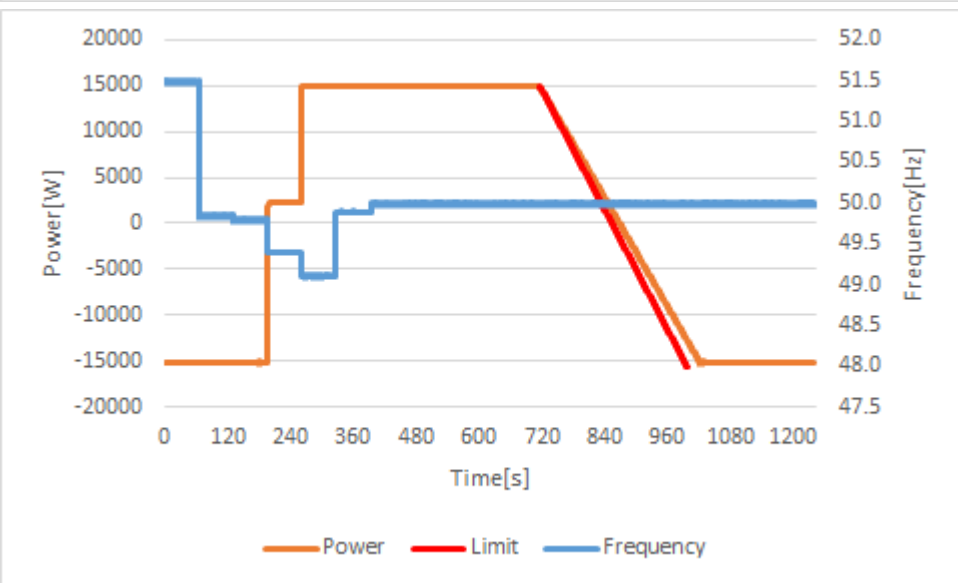
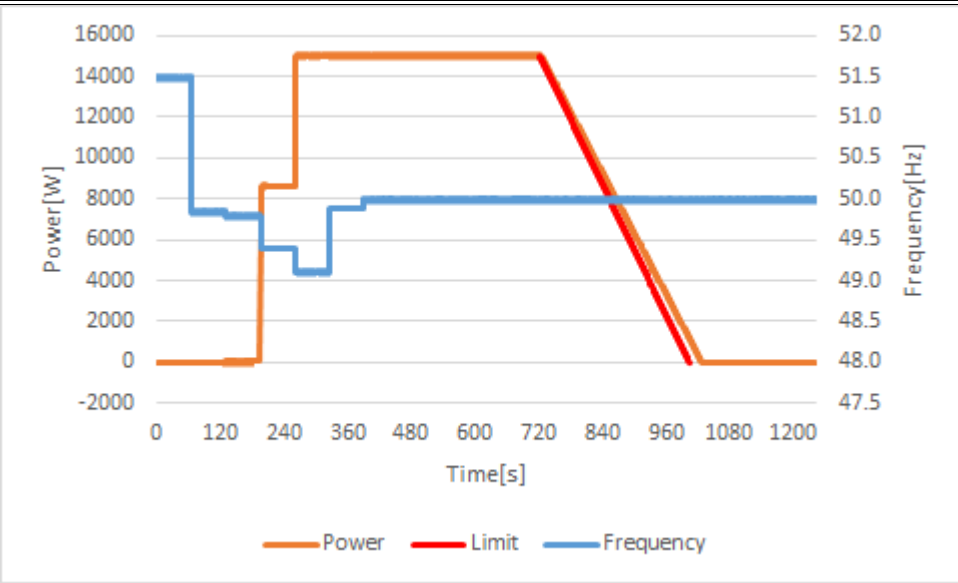
Note(s):

Diagram



CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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CEI 0-16								
Clause	Requirement - Test				Result - Remark			Verdict
Test: Bi-directional converter only					AF36K-TH + ATOM HS-15.36			
Starting frequency f_1 :			49.8Hz					
Deactivation threshold f_{stop} :			49.9Hz (Activated)					
Droop s:			--					
Sequence A:								
Test condition		Measurement						Limit $\Delta P/S_n$
f [Hz]	Target P/P _{NINV}	f [Hz]	P/P _{NINV}	T _{sr} [s]	T _{settling} [s]	T _d [s]	$\Delta P/P_{NINV}$	
1) 51.49	50%	51.49	50.30%	--	--	--	0.30%	$\leq \pm 2.5\%$
2) 49.85	50%	49.85	50.30%	0	0	0	0.30%	
3) 49.80	50%	49.80	50.63%	1.3	2.2	0.7	0.63%	
4) 49.40	78.60%	49.40	78.85%	1.8	0.7	1.7	0.25%	
5) 49.11	99.34%	49.11	99.85%	0.8	2.0	2.1	0.51%	
6) 49.89	99.34%	49.89	99.93%	0	0	0	0.59%	
7) 50.00	keep P _{e-max} 99.34%	50.00	99.93%	--	--	--	0.59%	
	recover to 50%	50.00	50.06%	--	--	--	0.06%	
Test condition		Measurement					Limit	
6) 49.89 to 7) 50		Waiting time for keep P _{e-max} [s]:					329	$\geq 300s$
		Max. power gradient		[P _{ref} - P _{e-max}]/min:		19.27%	$\leq 20\%$ [P _{ref} - P _{e-max}]/min	
				S _n /min:		19.19%	$\leq 9.87\% S_n$ /min	

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Sequence B:								
Test condition		Measurement						Limit $\Delta P/S_n$
f [Hz]	Target P/P _{NINV}	f [Hz]	P/P _{NINV}	T _{sr} [s]	T _{settling} [s]	T _d [s]	$\Delta P/P_{NINV}$	
1) 51.49	0%	51.49	-0.03%	--	--	--	-0.03%	$\leq \pm 2.5\%$
2) 49.85	0%	49.85	-0.06%	0	0	0	-0.06%	
3) 49.80	0%	49.80	0.51%	1.8	2.3	1.3	0.51%	
4) 49.40	57.2%	49.40	57.45%	2.4	0.9	1.2	0.25%	
5) 49.11	98.67%	49.11	100.04%	1.4	0.8	0.6	1.37%	
6) 49.89	98.67%	49.89	100.18%	0	0	0	1.51%	
7) 50.00	keep P _{e-max} 98.67%	50.00	100.18%	--	--	--	1.51%	
	recover to 0%	50.00	-0.24%	--	--	--	-0.24%	
Test condition		Measurement					Limit	
6) 49.89 to 7) 50		Waiting time for keep P _{e-max} [s]:					327	$\geq 300s$
		Max. power gradient	[P _{ref} - P _{e-max}]/min:		19.18%	$\leq 20\%[P_{ref} - P_{e-max}]/min:$		
			S _n /min:		19.16%	$\leq 19.73\%S_n /min$		

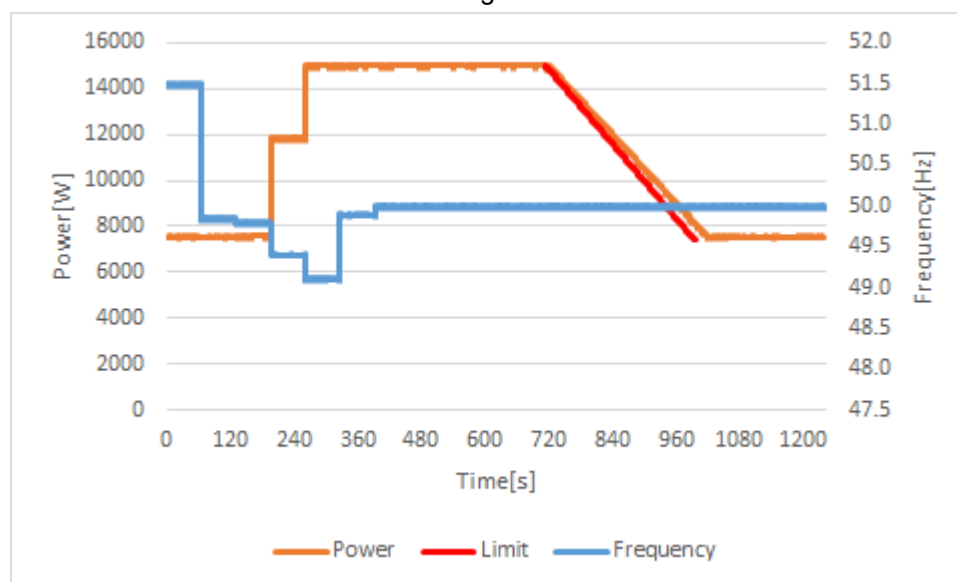
CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Sequence C:

Test condition		Measurement						Limit $\Delta P/S_n$
f [Hz]	Target P/P _{NINV}	f [Hz]	P/P _{NINV}	T _{sr} [s]	T _{settling} [s]	T _d [s]	$\Delta P/P_{NINV}$	
1) 51.49	-100%	51.49	-100.46%	--	--	--	-0.46%	$\leq \pm 2.5\%$
2) 49.85	-100%	49.85	-100.85%	0	0	0	-0.85%	
3) 49.80	-100%	49.80	-100.14%	1.6	1.6	0.7	-0.14%	
4) 49.40	14.29%	49.40	14.52%	0.8	2.0	0.8	0.23%	
5) 49.11	97.14%	49.11	99.03%	1.4	1.3	1.8	1.89%	
6) 49.89	97.14%	49.89	99.38%	0	0	0	2.24%	
7) 50.00	keep P _{e-max} 97.14%	50.00	99.38%	--	--	--	2.24%	
	recover to -100%	50.00	-100.65%	--	--	--	-0.65%	
Test condition		Measurement					Limit	
6) 49.89 to 7) 50		Waiting time for keep P _{e-max} [s]:					327	$\geq 300s$
		Max. power gradient	[P _{ref} - P _{e-max}]/min:		19.24%	$\leq 20\%[P_{ref} - P_{e-max}]/min:$		
			S _n /min:		19.26%	$\leq 20\%S_n /min$		

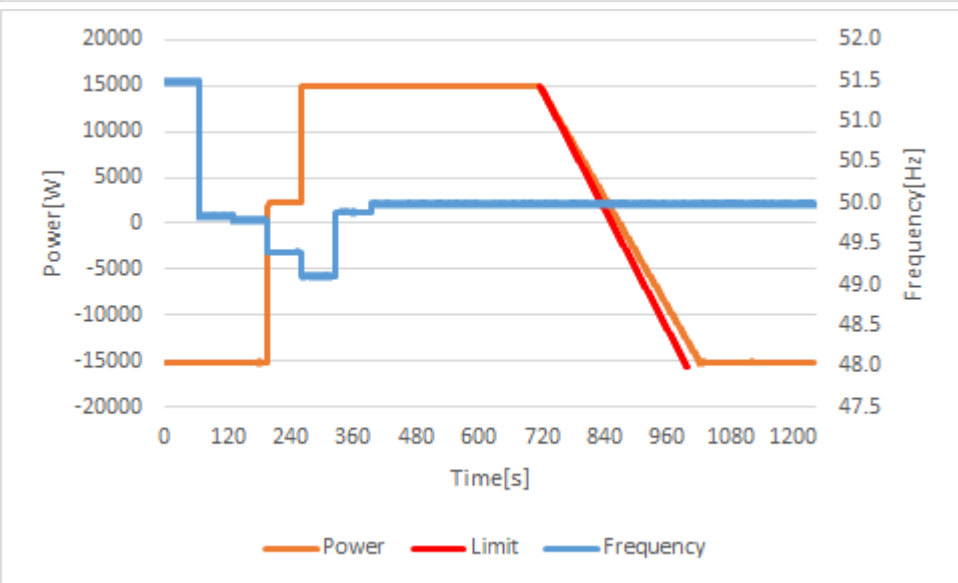
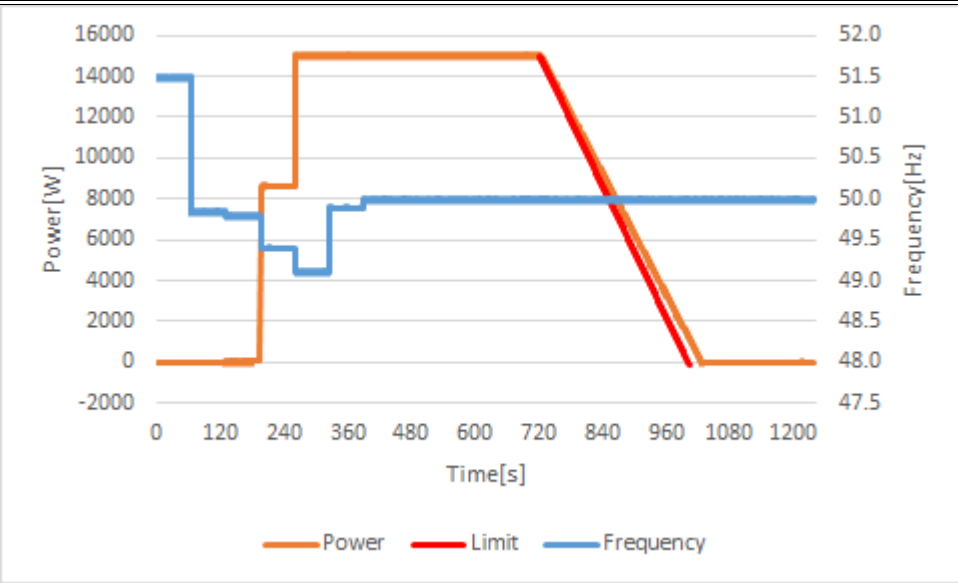
Note(s):

Diagram



CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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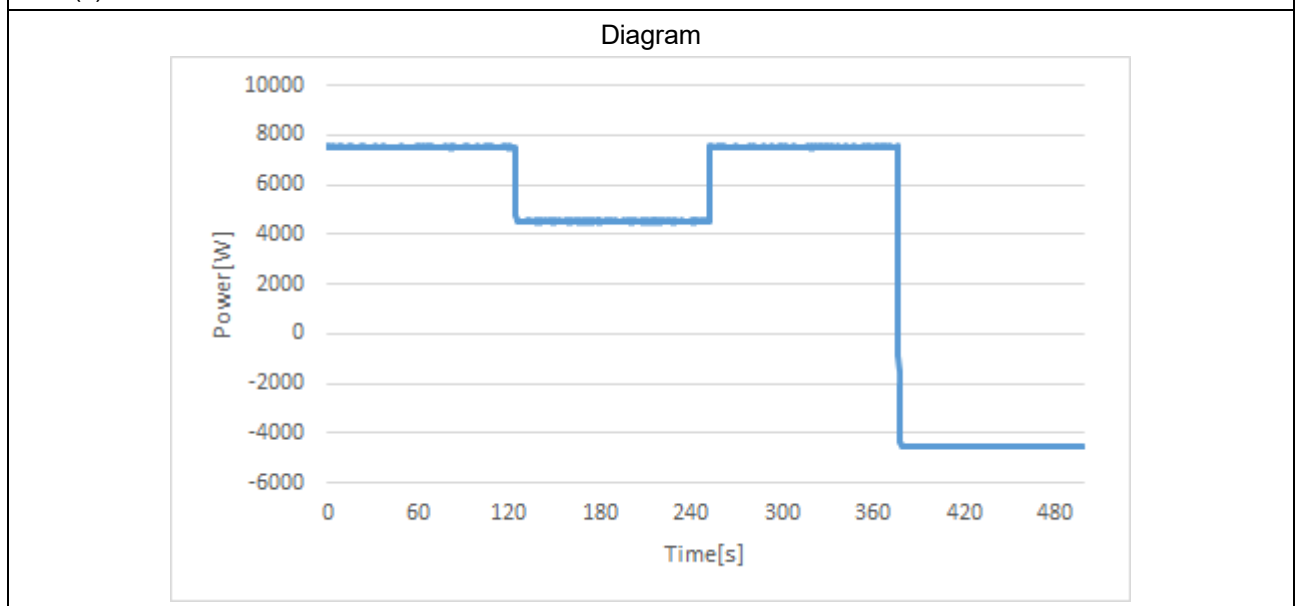


CEI 0-16					
Clause	Requirement - Test			Result - Remark	Verdict
Nbis.7.4	Tabella: Verifica della limitazione della potenza attiva su comando esterno proveniente dal Distributore Table: Verification of the active power limitation with external command from the Distributor				P
Test: Bi-directional converter only			AF60K-TH + ATOM HS-40.96		
Test condition		Measurement			Limit
External command P/P _{NINV}	Target P/P _{NINV}	P/P _{NINV}	$\Delta P/P_{NINV}$	T _{settling} [s]	$\Delta P/S_n$
50%	50%	50.09%	0.09%	--	$\leq \pm 2.5\%$
30%	30%	30.27%	0.27%	0.5	
50%	50%	50.11%	0.11%	0.2	
-30%	-30%	-30.08%	-0.08%	0.9	
Note(s):					
Diagram					

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test: Bi-directional converter only		AF60K-TH + ATOM HS-15.36			
Test condition		Measurement			Limit
External command P/P _{NINV}	Target P/P _{NINV}	P/P _{NINV}	$\Delta P/P_{NINV}$	T _{settling} [s]	$\Delta P/S_n$
50%	50%	50.21%	0.21%	--	$\leq \pm 2.5\%$
30%	30%	30.30%	0.30%	0.4	
50%	50%	50.21%	0.21%	0.6	
-30%	-30%	-30.31%	-0.31%	0.4	

Note(s):

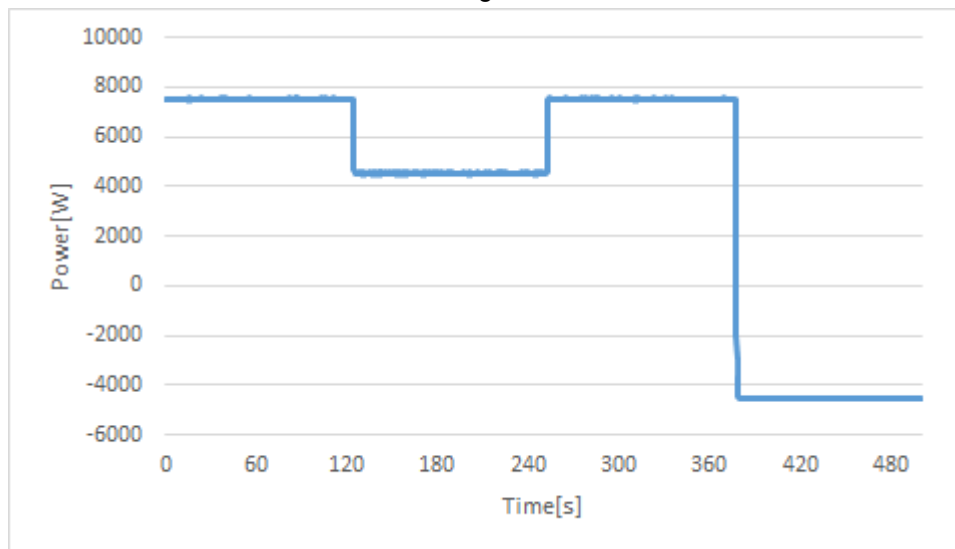


CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test: Bi-directional converter only		AF36K-TH + ATOM HS-15.36			
Test condition		Measurement			Limit
External command P/P _{NINV}	Target P/P _{NINV}	P/P _{NINV}	$\Delta P/P_{NINV}$	T _{settling} [s]	$\Delta P/S_n$
50%	50%	50.20%	0.20%	--	$\leq \pm 2.5\%$
30%	30%	30.29%	0.29%	0.2	
50%	50%	50.20%	0.20%	0.7	
-30%	-30%	-30.32%	-0.32%	0.1	

Note(s):

Diagram



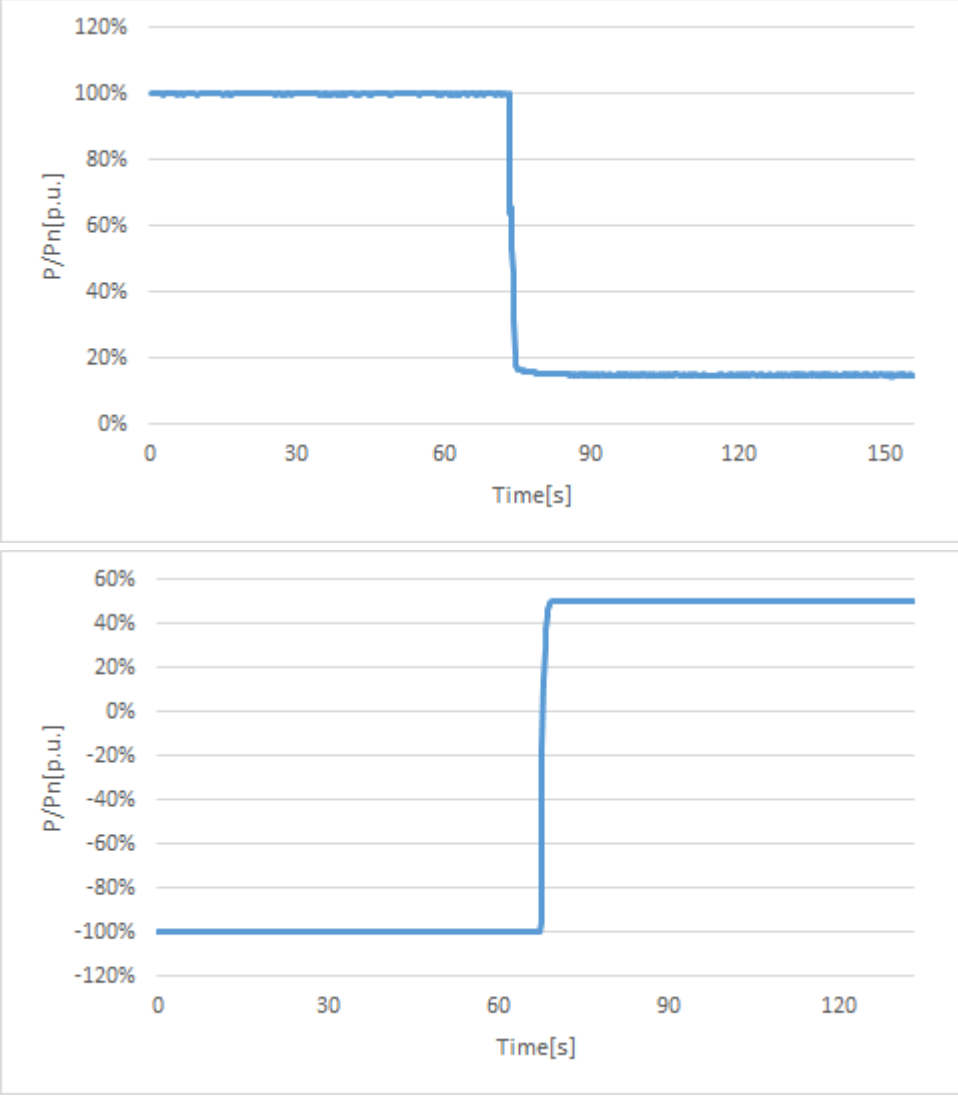
CEI 0-16						
Clause	Requirement - Test			Result - Remark		Verdict
Nbis.7.4.1	Tabella: Verifica del tempo di assestamento ad un comando di riduzione di Potenza Table: Verification of the settling time at a power reduction command)					P
Bi-directional converter only:			AF60K-TH + ATOM HS-40.96			
Test condition		Measurement			Limit	
External command P/P _{NINV}	Target P/P _{NINV}	P/P _n	T _{settling} [s]	ΔP/P _{NINV}	T _{settling} [s]	ΔP/S _n
100% to -30%	-30%	-30.16%	0.2	-0.16%	≤ 50s	± 5%
100% to 15%	15%	14.84%	3.8	-0.16%	≤ 60s	
-100% to 50%	50%	49.99%	0.2	-0.01%	≤ 50s	
Note(s):						
Diagram						

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Bi-directional converter only:		AF60K-TH + ATOM HS-15.36				
Test condition		Measurement			Limit	
External command P/P _{NINV}	Target P/P _{NINV}	P/P _n	T _{setting} [s]	ΔP/P _{NINV}	T _{setting} [s]	ΔP/S _n
100% to -30%	-30%	-30.39%	1.8	-0.39%	≤ 50s	± 5%
100% to 15%	15%	14.85%	3.6	-0.15%	≤ 60s	
-100% to 50%	50%	50.31%	1.4	0.31%	≤ 50s	

Note(s):

Diagram	

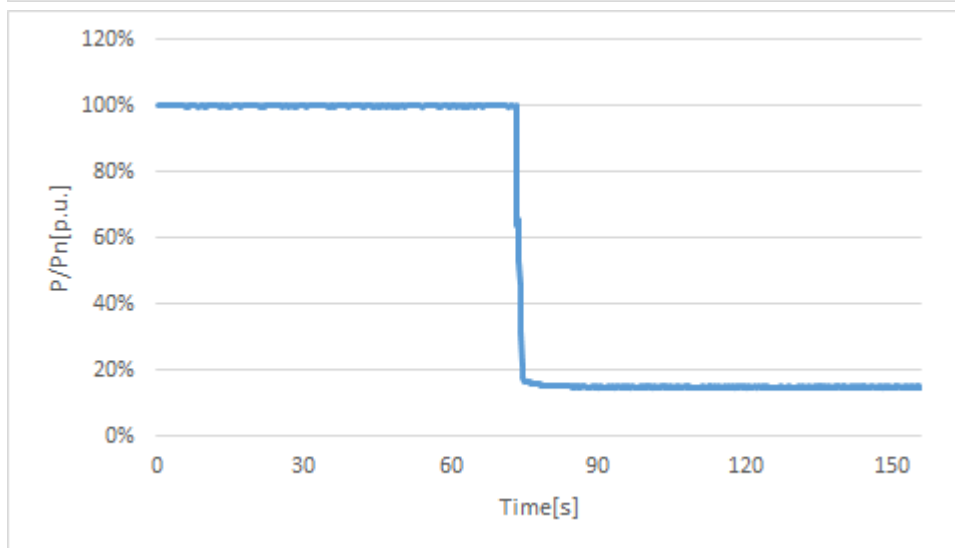
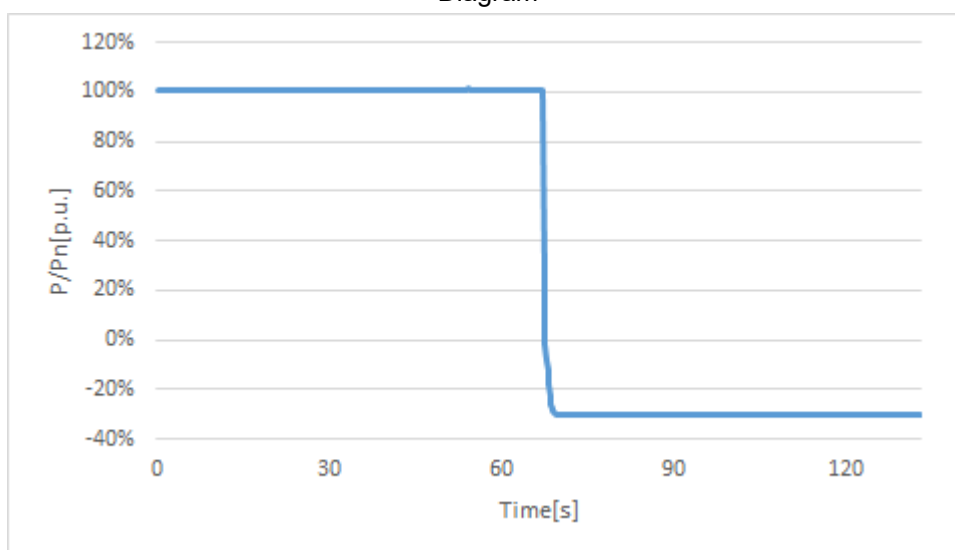
CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict
	 <p>The figure consists of two vertically stacked line graphs. Both graphs plot the power ratio P/P_n in per unit (p.u.) on the y-axis against Time in seconds (s) on the x-axis. The top graph's y-axis ranges from 0% to 120% in 20% increments, and its x-axis ranges from 0 to 150 seconds in 30-second increments. The data shows a constant value of 100% until approximately 70 seconds, where it drops sharply to about 15% and remains constant thereafter. The bottom graph's y-axis ranges from -120% to 60% in 20% increments, and its x-axis ranges from 0 to 120 seconds in 30-second increments. The data shows a constant value of -100% until approximately 70 seconds, where it rises sharply to about 50% and remains constant thereafter.</p>		

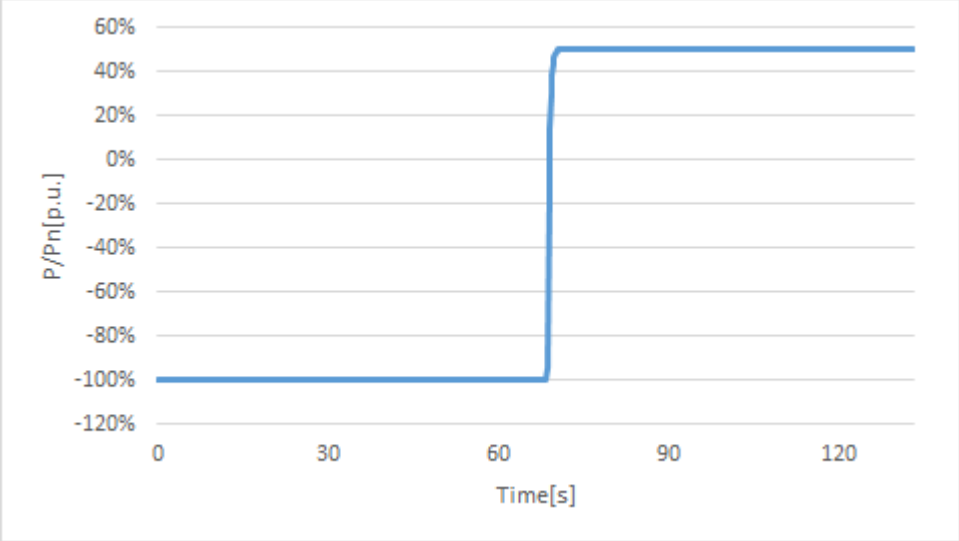
CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Bi-directional converter only:		AF36K-TH + ATOM HS-15.36				
Test condition		Measurement			Limit	
External command P/P _{NINV}	Target P/P _{NINV}	P/P _n	T _{setting} [s]	ΔP/P _{NINV}	T _{setting} [s]	ΔP/S _n
100% to -30%	-30%	-30.39%	1.8	-0.39%	≤ 50s	± 5%
100% to 15%	15%	14.84%	4.0	-0.16%	≤ 60s	
-100% to 50%	50%	50.31%	1.4	0.31%	≤ 50s	

Note(s):

Diagram



CEI 0-16																					
Clause	Requirement - Test	Result - Remark	Verdict																		
	 <p>The graph displays the ratio P/P_n in per unit (p.u.) over time in seconds. The vertical axis (y-axis) is labeled P/P_n[p.u.] and ranges from -120% to 60% with major grid lines every 20%. The horizontal axis (x-axis) is labeled Time[s] and ranges from 0 to 120 with major ticks every 30 seconds. The data series is a blue line that starts at -100% at time 0 and remains constant until approximately 65 seconds. At this point, it rises sharply to approximately 50% and remains constant at that level until the end of the test at approximately 135 seconds.</p> <table border="1"><caption>Approximate data points from the graph</caption><thead><tr><th>Time [s]</th><th>P/P_n [p.u.]</th></tr></thead><tbody><tr><td>0</td><td>-100%</td></tr><tr><td>30</td><td>-100%</td></tr><tr><td>60</td><td>-100%</td></tr><tr><td>65</td><td>-100%</td></tr><tr><td>65</td><td>50%</td></tr><tr><td>90</td><td>50%</td></tr><tr><td>120</td><td>50%</td></tr><tr><td>135</td><td>50%</td></tr></tbody></table>	Time [s]	P/P_n [p.u.]	0	-100%	30	-100%	60	-100%	65	-100%	65	50%	90	50%	120	50%	135	50%		
Time [s]	P/P_n [p.u.]																				
0	-100%																				
30	-100%																				
60	-100%																				
65	-100%																				
65	50%																				
90	50%																				
120	50%																				
135	50%																				

CEI 0-16						
Clause	Requirement - Test			Result - Remark	Verdict	
Nbis.8	Tabella: Verifica della insensibilità alle variazioni di tensione (VFRT capability) Table: Verification of insensitivity to voltage variations (VFRT capability)				P	
Test	Voltage dip/rise U/U_n [p.u.]	VRT fault type	Fault duration (t_2-t_1) [ms]	P/P_{NINV} [p.u.]	Q/S_n [p.u.]	Test No.
1	0.10	A	200 + 20	0.9 to 1.1	0 to ± 0.1	1s.1
				0.1 to 0.3		1s.2
		D1		0.9 to 1.1		1a.1
				0.1 to 0.3		1a.2
		D2		0.9 to 1.1		1a.1.D2
				0.1 to 0.3		1a.2.D2
2	0.25	A	400 + 20	0.9 to 1.1	0 to ± 0.1	2s.1
				0.1 to 0.3		2s.2
		D1		0.9 to 1.1		2a.1
				0.1 to 0.3		2a.2
3	0.50	A	800 + 20	0.9 to 1.1	0 to ± 0.1	3s.1
				0.1 to 0.3		3s.2
		D1		0.9 to 1.1		3a.1
				0.1 to 0.3		3a.2
4	0.75	A	1300 + 20	0.9 to 1.1	0 to ± 0.1	4s.1
				0.1 to 0.3		4s.2
		D1		0.9 to 1.1		4a.1
				0.1 to 0.3		4a.2
5	1.25	A	100 + 20	0.9 to 1.1*	0 to ± 0.1	5s.1
6	1.20	A	500 + 20	0.9 to 1.1*	0 to ± 0.1	6s.1
<p>Note(s):</p> <p>Before EUT test, AC grid shall be measured and recorded test data in empty load test at each conditions of test numbers (1.x to 6.x) and VFRT fault types (A/D1/D2).</p> <p>Each case two consecutive tests must be completed successfully.</p> <p>* For large generator (> 100kW) it is allowed to carry out tests at reduced power, as long as it is greater than 30% of the rated power of the generator.</p>						

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

List of tests	Residual amplitude of phase-to-phase voltage V/V_{nom}	Drop duration limit [ms]	Measured drop duration [ms]	Duration of restoring network [ms]
1s – three-phase symmetrical fault (P = 0.1 - 0.3)	$0.10 \pm 0.05 (V_1/V_n)$	200	210	136
1s – three-phase symmetrical fault (P > 0.9)	$0.10 \pm 0.05 (V_1/V_n)$	200	210	141
1a – two-phase asymmetrical fault (P = 0.1 - 0.3)	$0.10 \pm 0.05 (V_1/V_n)$	200	210	138
1a – two-phase asymmetrical fault (P > 0.9)	$0.10 \pm 0.05 (V_1/V_n)$	200	210	145
1a – D2 two-phase asymmetrical fault (P = 0.1 - 0.3)	$0.10 \pm 0.05 (V_1/V_n)$	200	210	140
1a – D2 two-phase asymmetrical fault (P > 0.9)	$0.10 \pm 0.05 (V_1/V_n)$	200	210	140
2s – three-phase symmetrical fault (P = 0.1 - 0.3)	$0.25 \pm 0.05 (V_2/V_n)$	400	410	140
2s – three-phase symmetrical fault (P > 0.9)	$0.25 \pm 0.05 (V_2/V_n)$	400	410	142
2a – two-phase asymmetrical fault (P = 0.1 - 0.3)	$0.25 \pm 0.05 (V_2/V_n)$	400	410	141
2a – two-phase asymmetrical fault (P > 0.9)	$0.25 \pm 0.05 (V_2/V_n)$	400	410	139
3s – three-phase symmetrical fault (P = 0.1 - 0.3)	$0.50 \pm 0.05 (V_3/V_n)$	850	860	142
3s – three-phase symmetrical fault (P > 0.9)	$0.50 \pm 0.05 (V_3/V_n)$	850	860	140
3a – two-phase asymmetrical fault (P = 0.1 - 0.3)	$0.50 \pm 0.05 (V_3/V_n)$	850	860	145
3a – two-phase asymmetrical fault (P > 0.9)	$0.50 \pm 0.05 (V_3/V_n)$	850	860	142
4s – three-phase symmetrical fault (P = 0.1 - 0.3)	$0.75 \pm 0.05 (V_4/V_n)$	1300	1310	140
4s – three-phase symmetrical fault (P > 0.9)	$0.75 \pm 0.05 (V_4/V_n)$	1300	1310	138
4a – two-phase asymmetrical fault (P = 0.1 - 0.3)	$0.75 \pm 0.05 (V_4/V_n)$	1300	1310	142
4a – two-phase asymmetrical fault (P > 0.9)	$0.75 \pm 0.05 (V_4/V_n)$	1300	1310	138
5s – three-phase symmetrical fault (P > 0.9)	$1.25 \pm 0.05 (V_5/V_n)$	100	110	141
6s – three-phase symmetrical fault (P > 0.9)	$1.20 \pm 0.05 (V_6/V_n)$	500	510	139

Note:

(*) Regardless of the method used to simulate transients (simulator or impedance network), the rise and fall time of the voltage must be less than 10 ms

The interface protection shall be disabled or adjusted to avoid spurious tripping during testing.

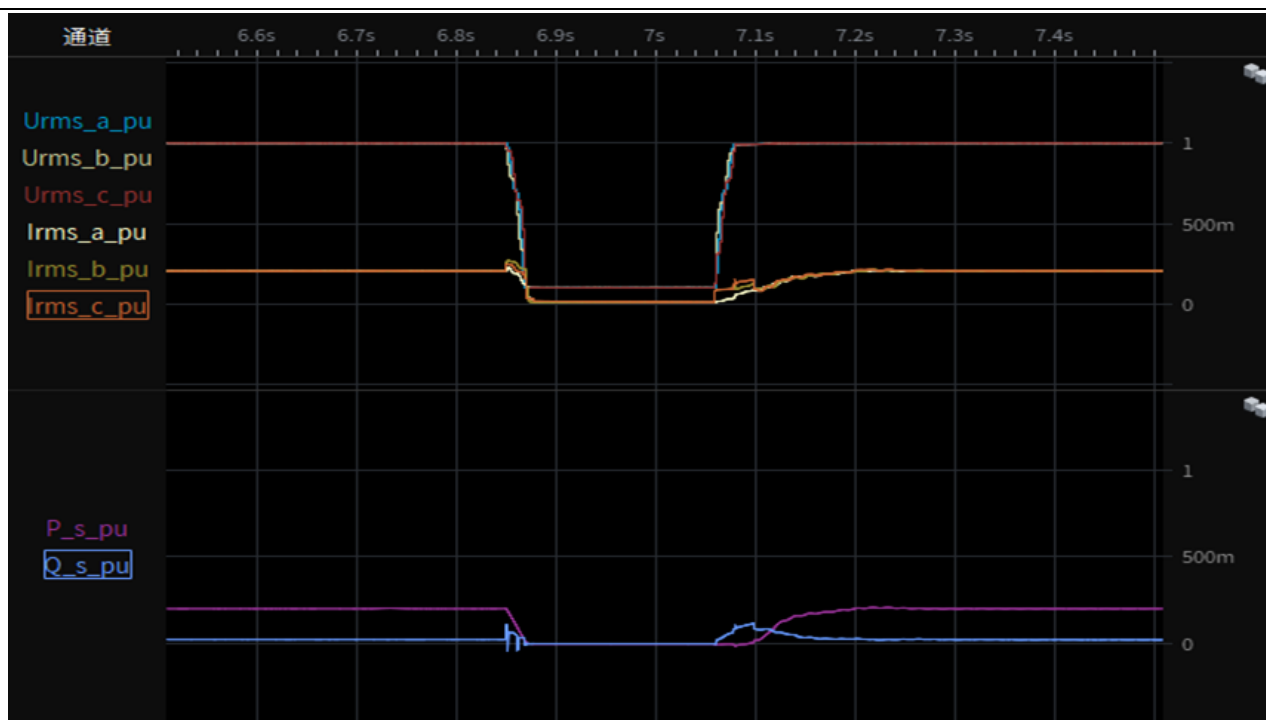
The test conditions are performed as worst case conditions. The inverter feeds maximal active and reactive power during the complete test.

CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test 1s-1.1-Depth of fault phase: 0.1p.u., three-phase-symmetrical (type A), 0% load
 Test overview(voltage,current,active and reactive power)



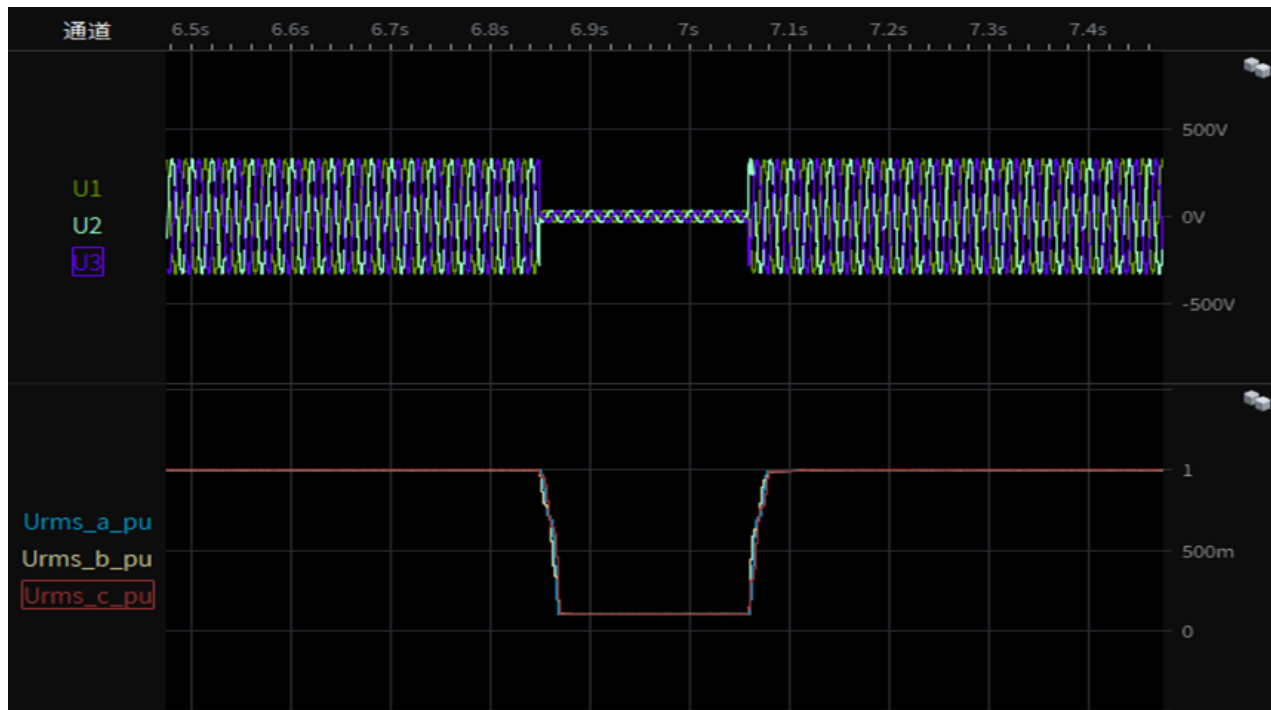
Test 1s-1-1.1 Depth of fault phase: 0.1p.u., three-phase-symmetrical (type A), 20% load
 Test overview(voltage,current,active and reactive power)



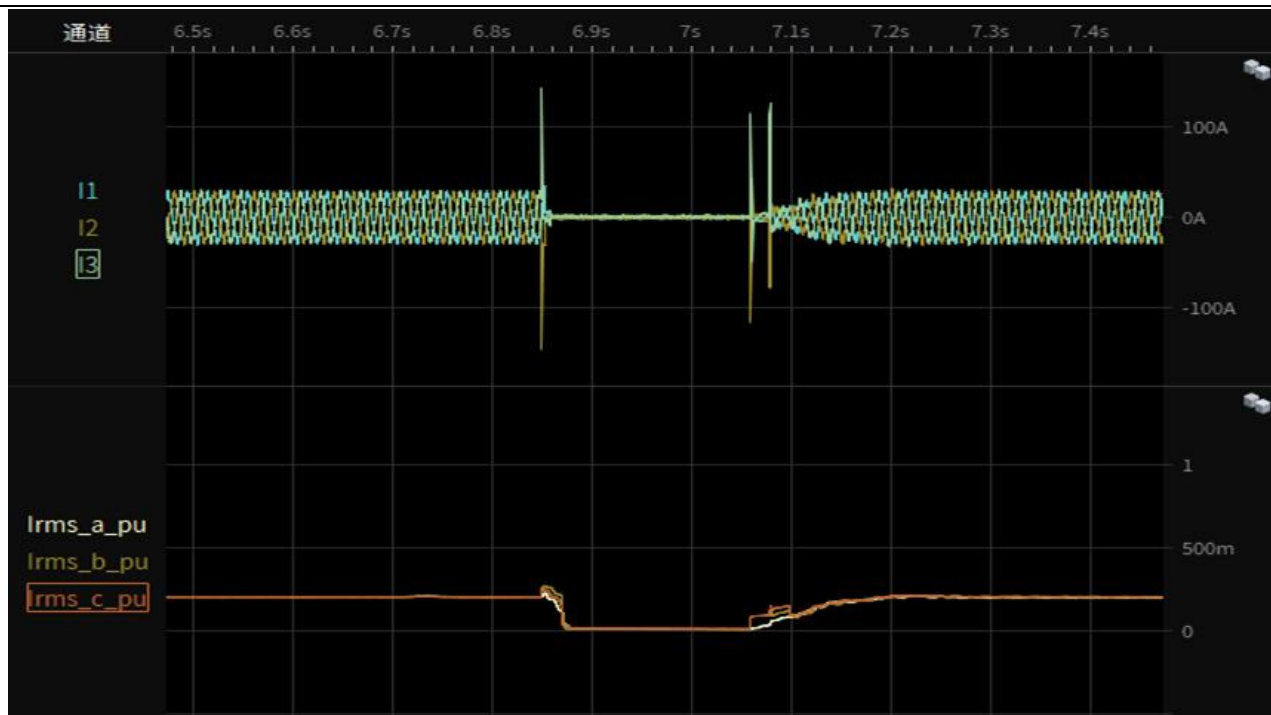
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 1s-1-1.2 Depth of fault phase: 0.1p.u., three-phase-symmetrical (type A), 20% load
Instantaneous curve and RMS value of phase-to-neutral voltages

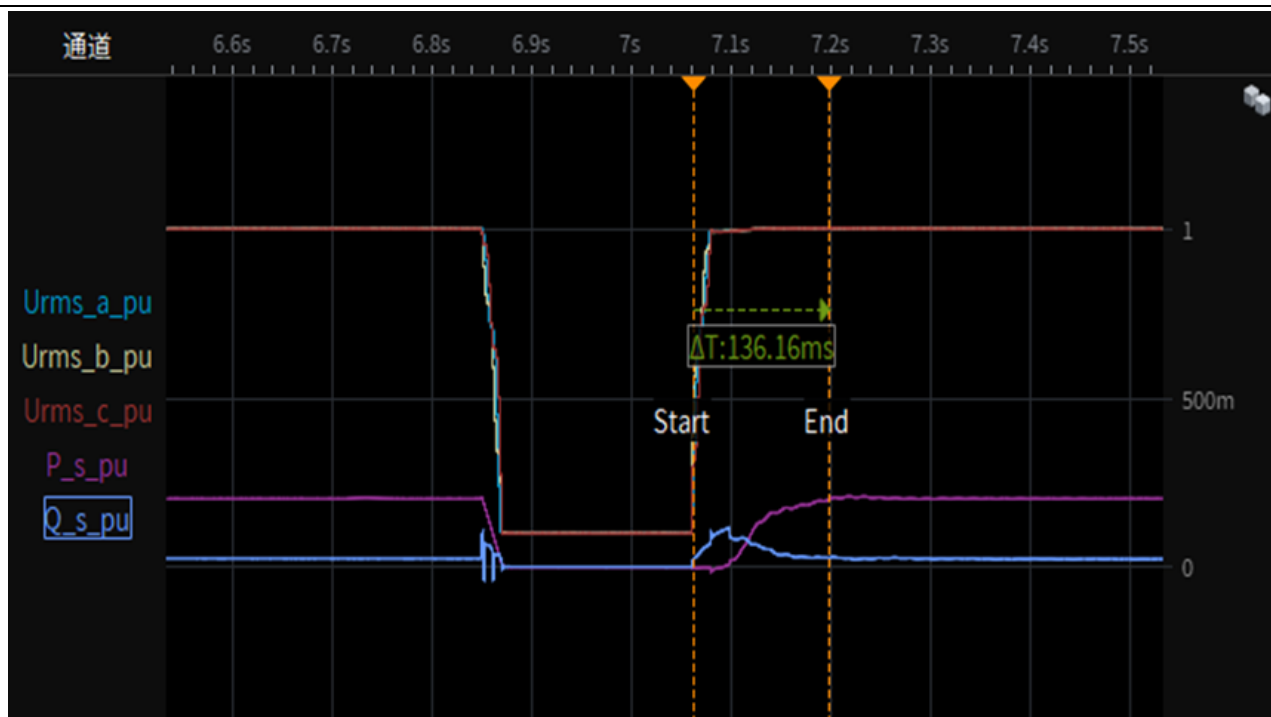


Test 1s-1-1.3 Depth of fault phase: 0.1p.u., three-phase-symmetrical (type A), 20% load
Instantaneous curve and RMS value of phase currents

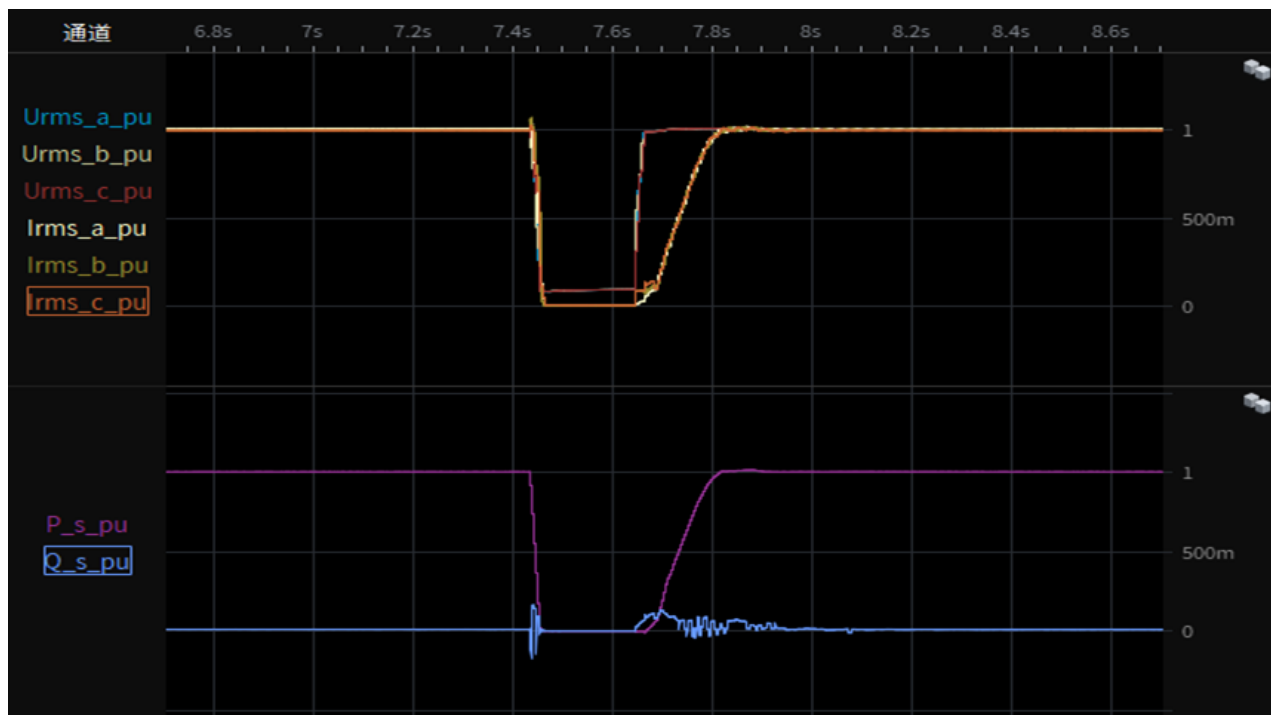


CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test 1s-1-1.4 Depth of fault phase: 0.1p.u., three-phase-symmetrical (type A), 20% load restoring time



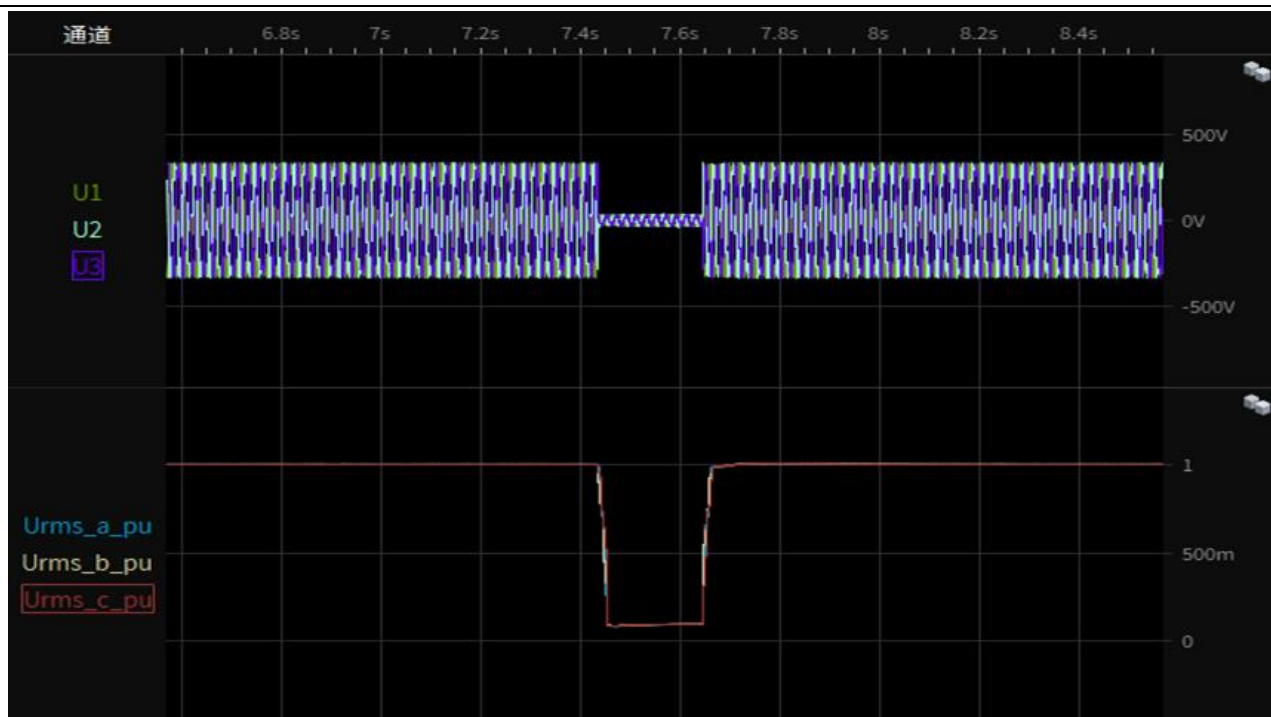
Test 1s-2-1.1 Depth of fault phase: 0.1p.u., three-phase-symmetrical (type A), 95% load Test overview(voltage,current,active and reactive power)



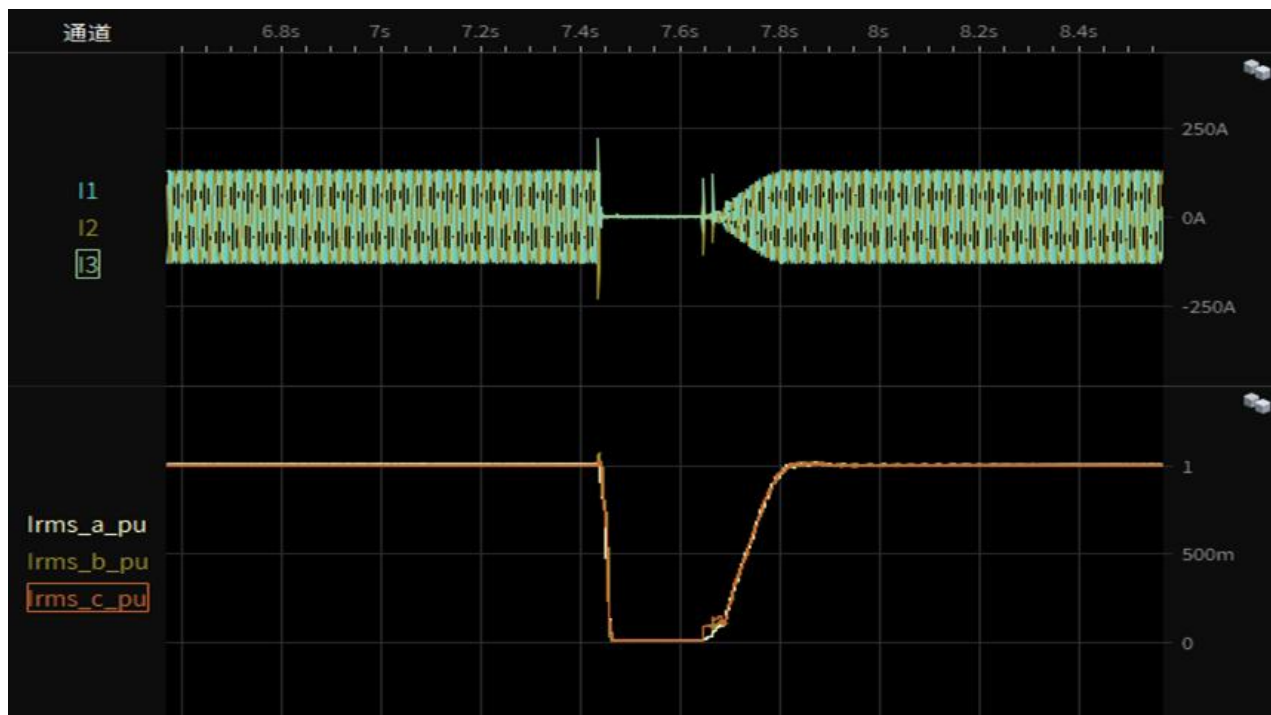
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 1s-2-1.2 Depth of fault phase: 0.1p.u., three-phase-symmetrical (type A), 95% load
Instantaneous curve and RMS value of phase-to-neutral voltages



Test 1s-2-1.3 Depth of fault phase: 0.1p.u., three-phase-symmetrical (type A), 95% load
Instantaneous curve and RMS value of phase currents

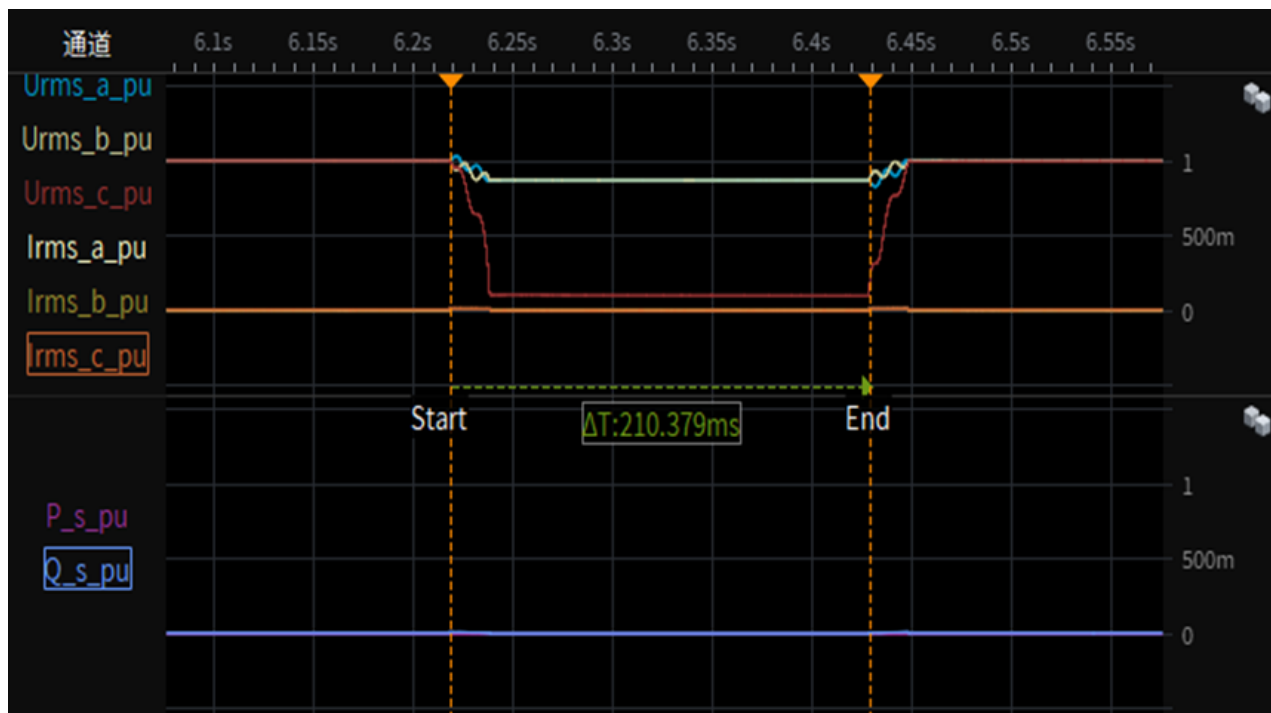


CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test 1s-2-1.4 Depth of fault phase: 0.1p.u., three-phase-symmetrical (type A), 95% load restoring time



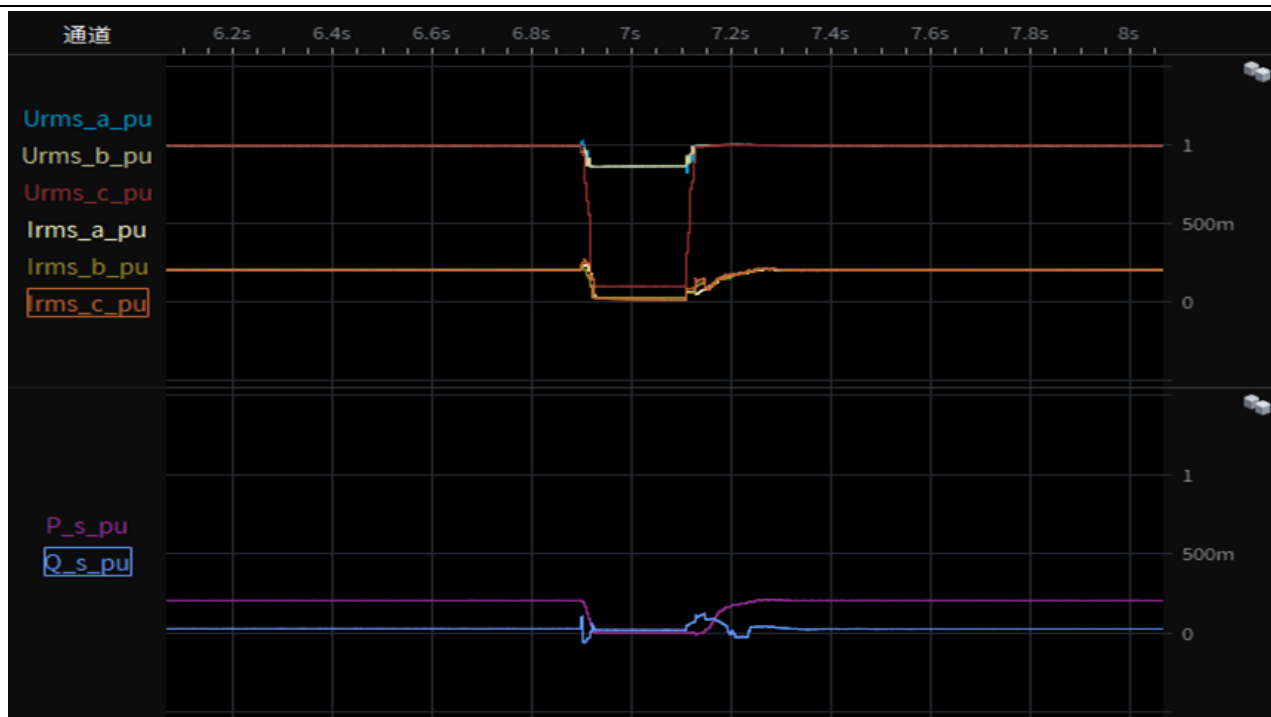
Test 1a-1.1 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 0% load Test overview(voltage,current,active and reactive power)



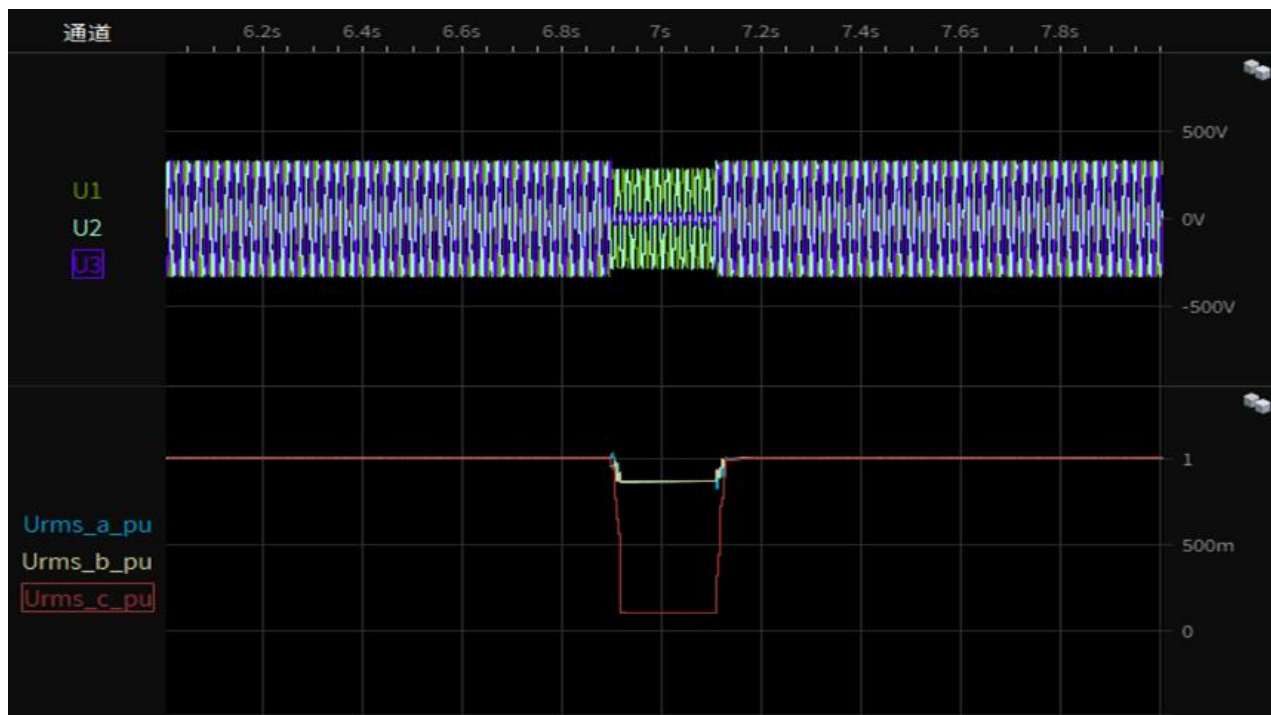
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 1a-1-1.1 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 20% load
 Test overview(voltage,current,active and reactive power)



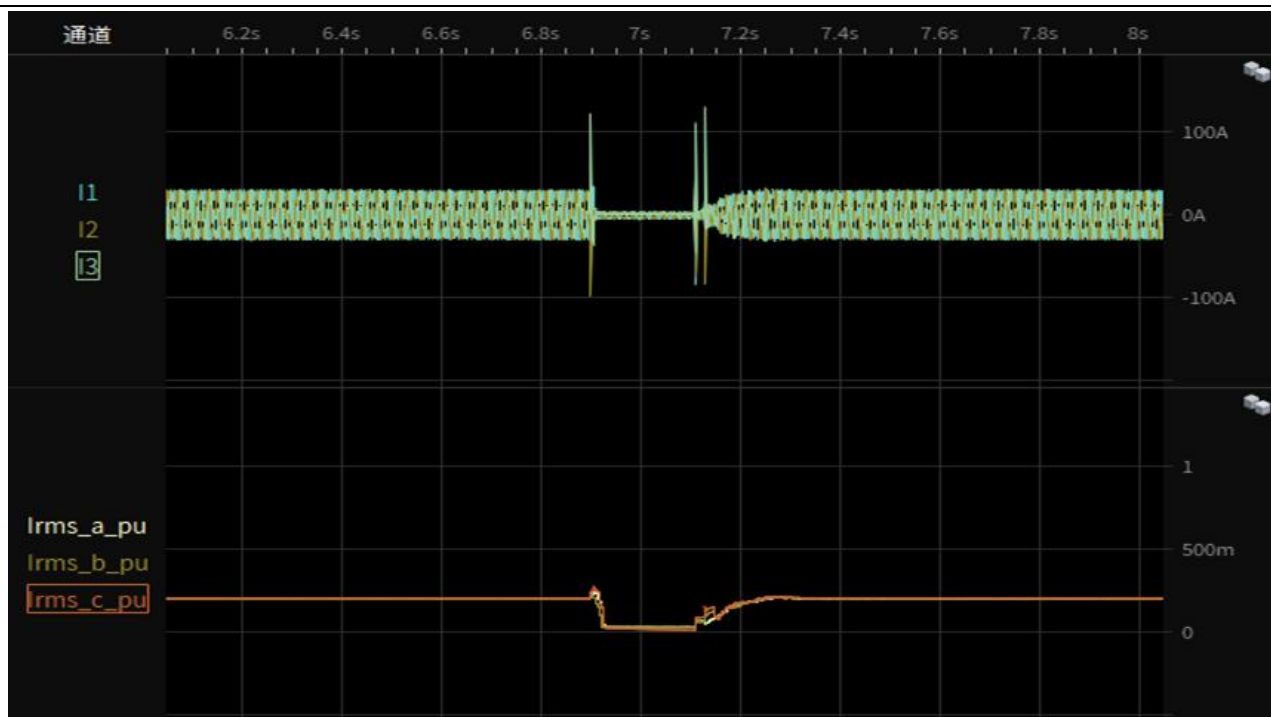
Test 1a-1-1.2 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 20% load
 Instantaneous curve and RMS value of phase-to-neutral voltages



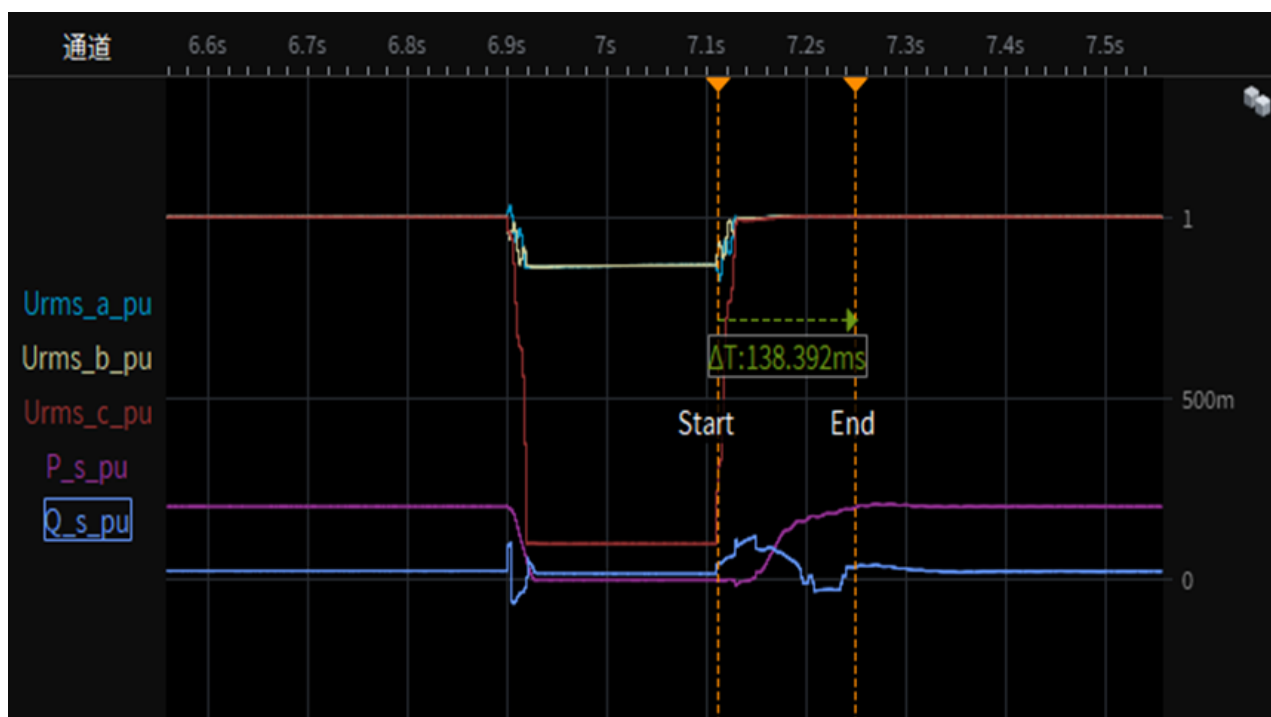
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 1a-1-1.3 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 20% load
Instantaneous curve and RMS value of phase currents



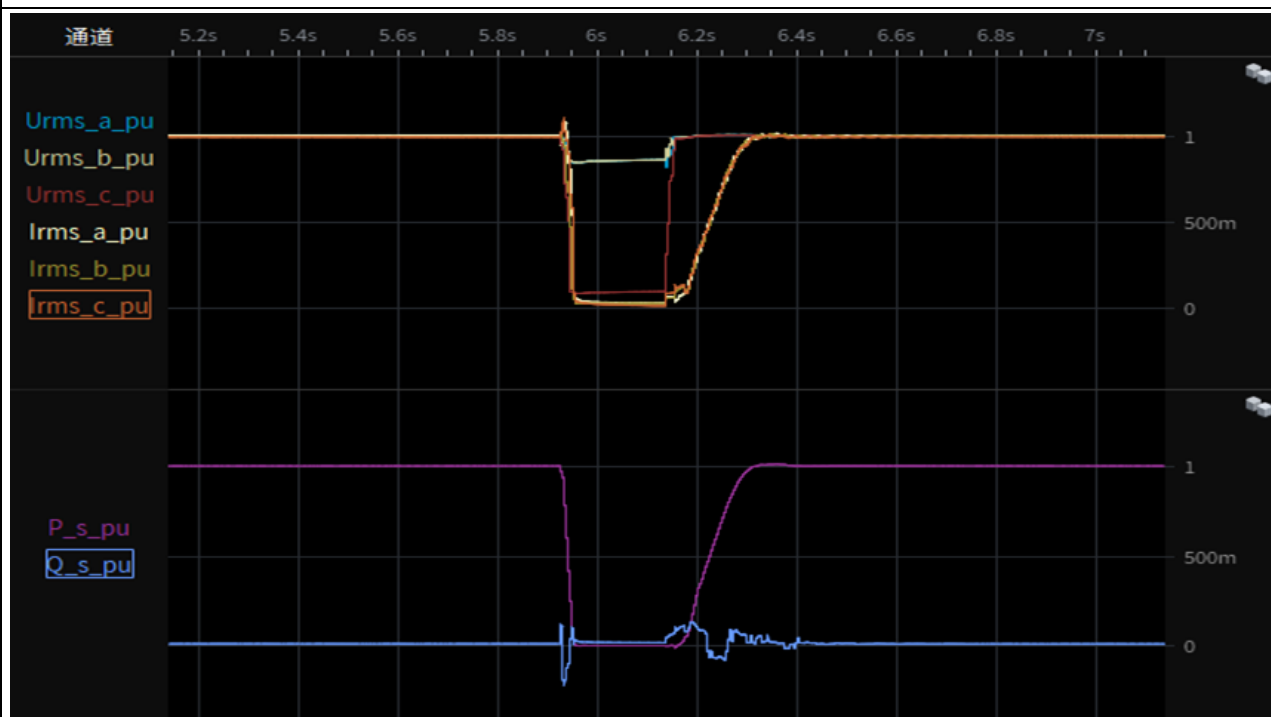
Test 1a-1-1.4 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D),
20% load restoring time



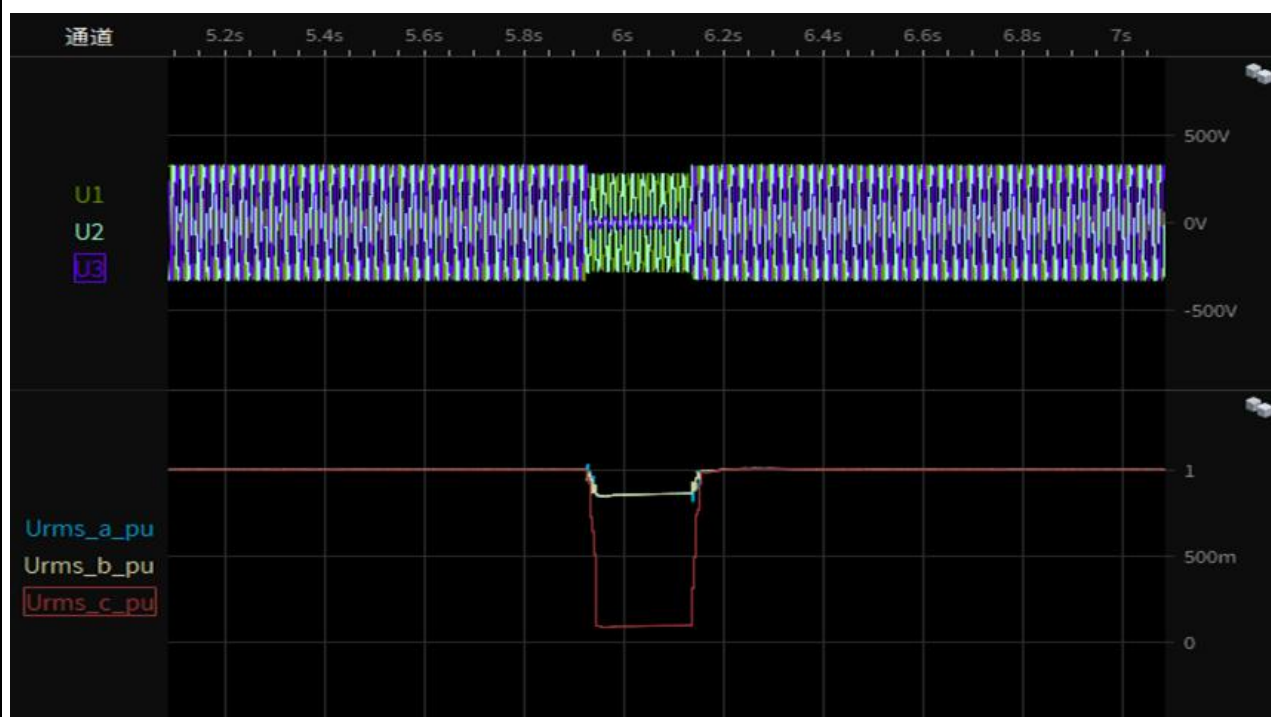
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 1a-2-1.1 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 95% load
 Test overview(voltage,current,active and reactive power)



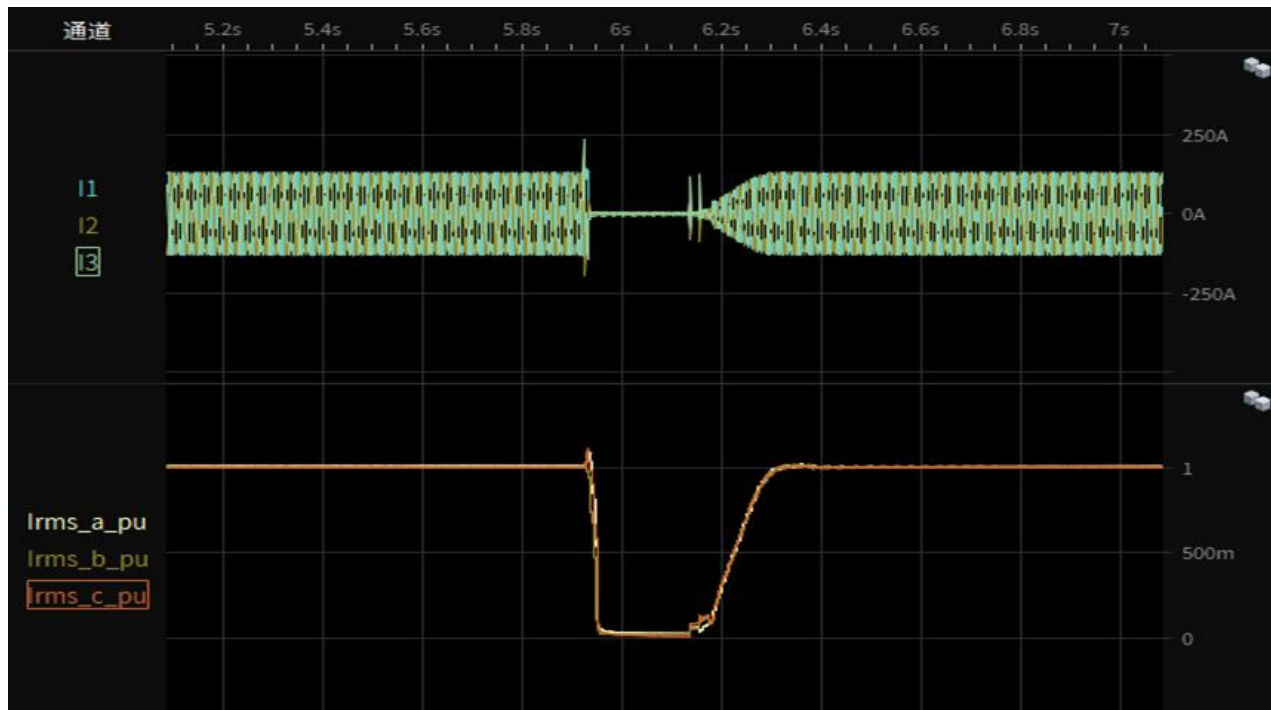
Test 1a-2-1.2 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 95% load
 Instantaneous curve and RMS value of phase-to-neutral voltages



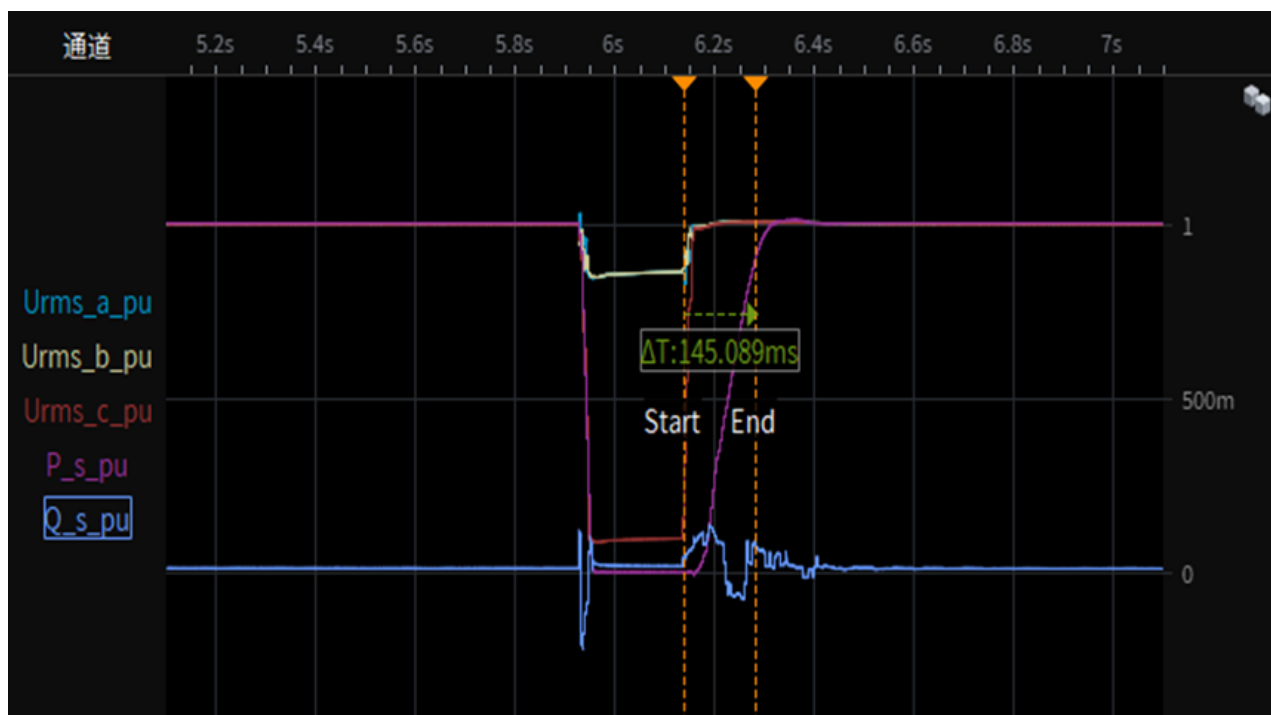
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 1a-2-1.3 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 95% load
Instantaneous curve and RMS value of phase currents



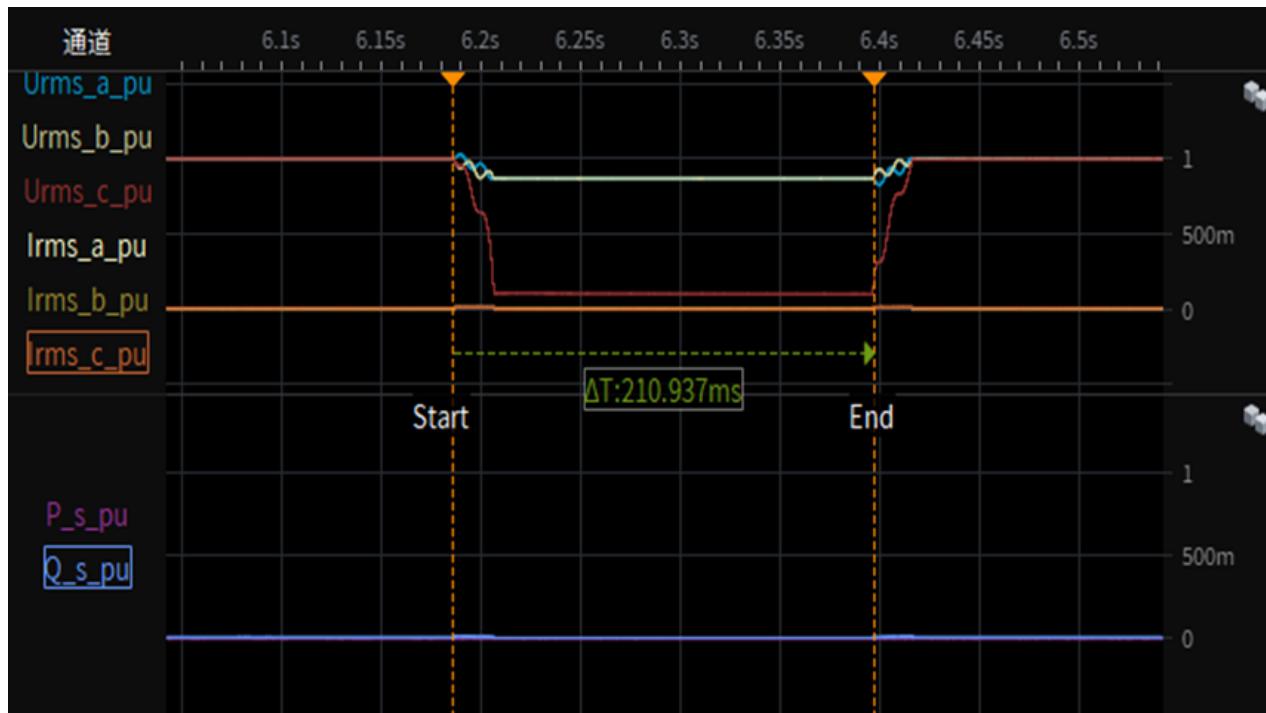
Test 1a-2-1.4 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D),
95% load restoring time



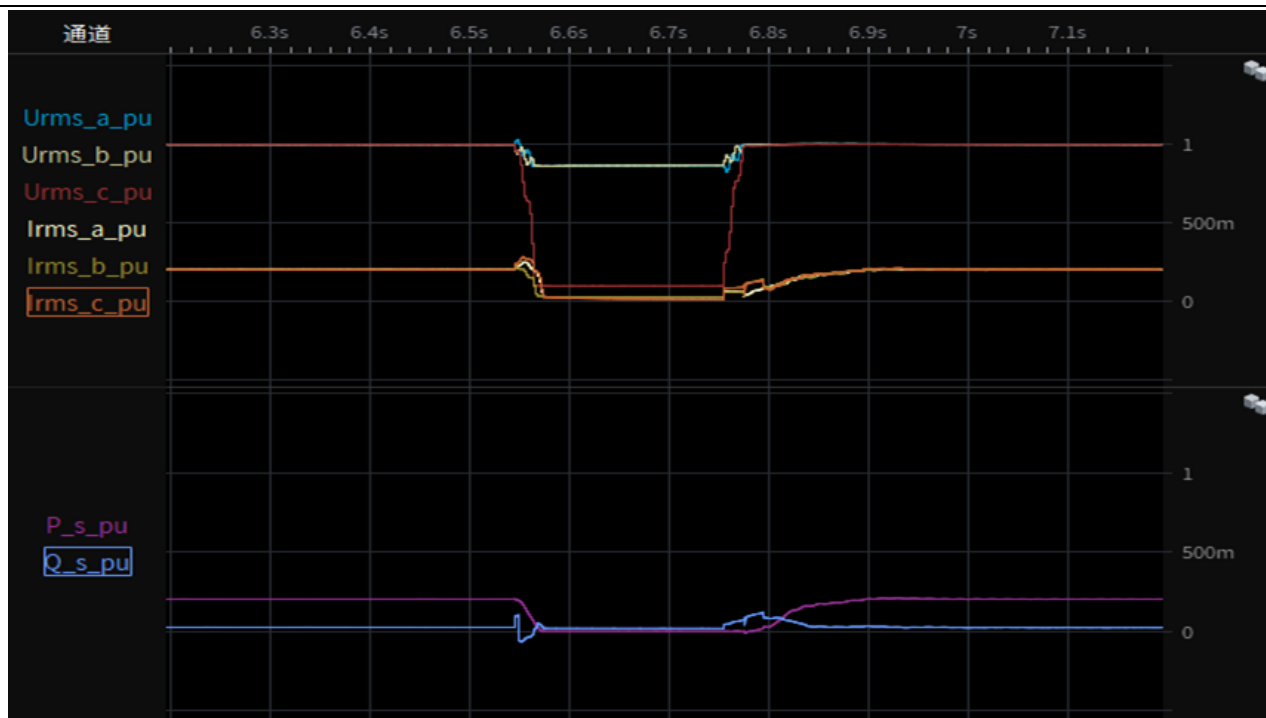
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 1a-D2-1.1 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 0% load
Test overview(voltage,current,active and reactive power)



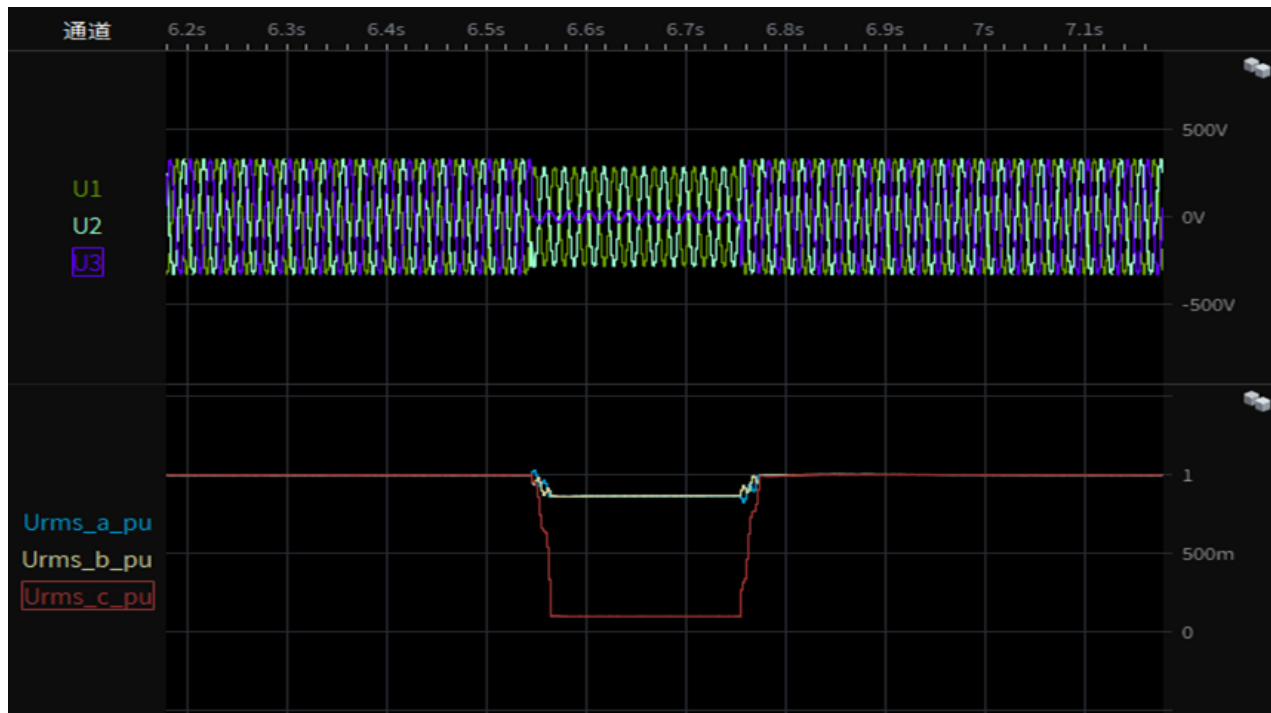
Test 1a-1-D2-1.1 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 20% load
Test overview(voltage,current,active and reactive power)



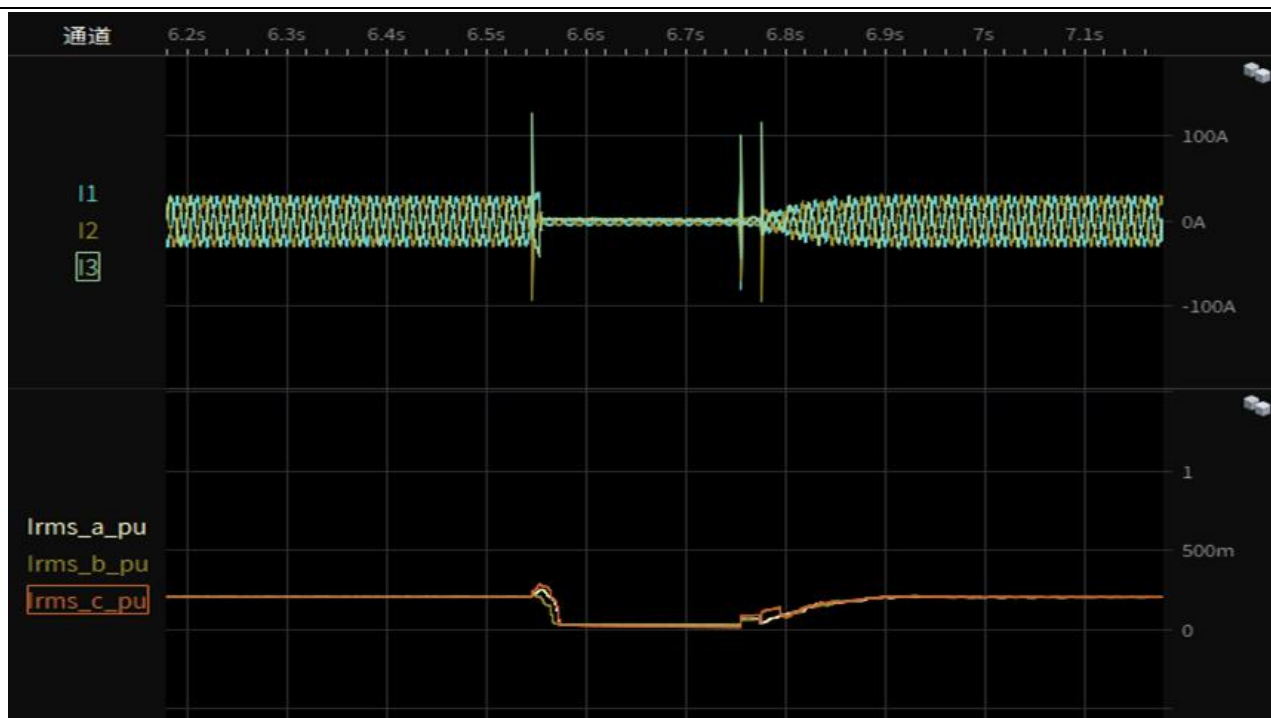
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 1a-1-D2-1.2 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 20% load
Instantaneous curve and RMS value of phase-to-neutral voltages



Test 1a-1-D2-1.3 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 20% load
Instantaneous curve and RMS value of phase currents



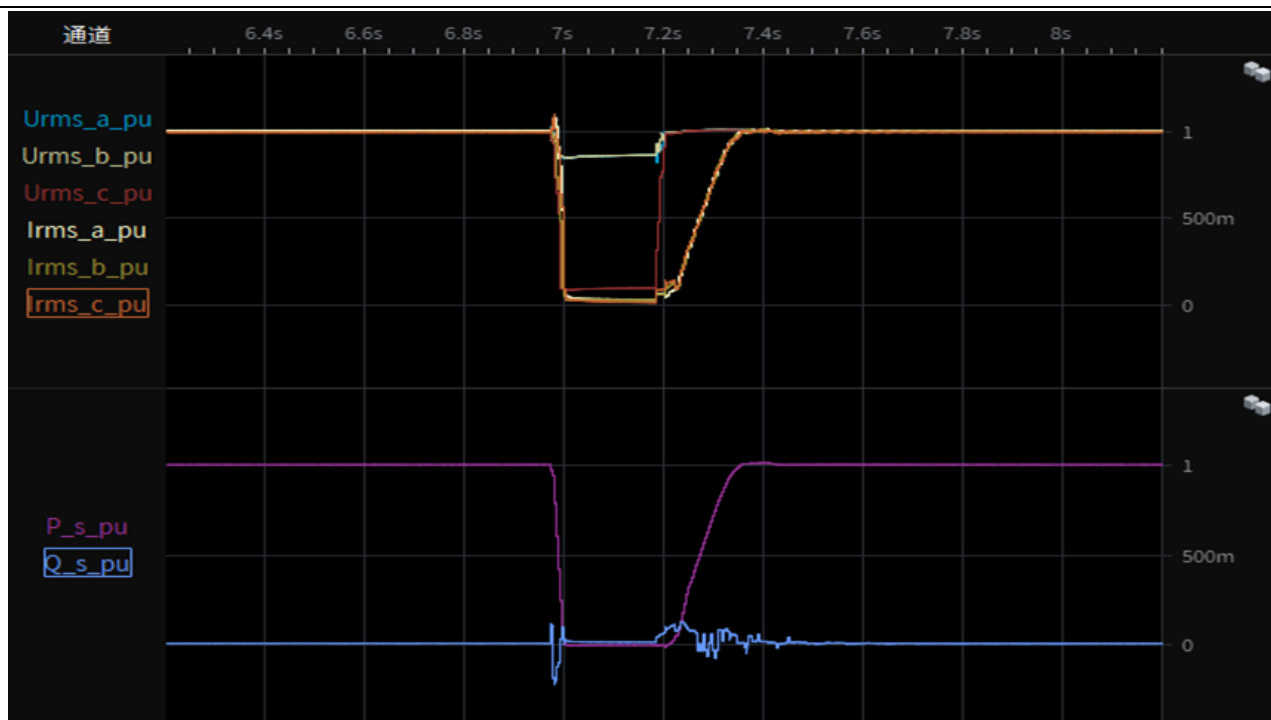
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 1a-1-D2-1.4 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D),
20% load restoring time



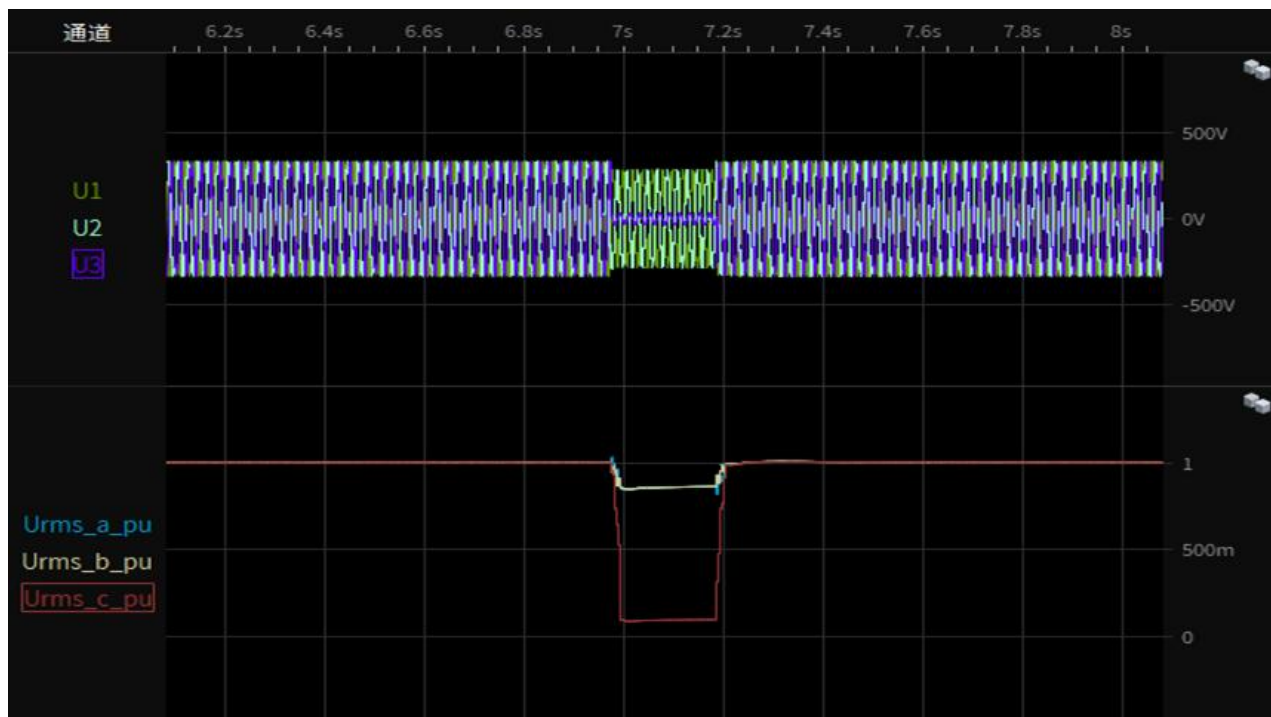
Test 1a-2-D2-1.1 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 95% load
Test overview(voltage,current,active and reactive power)



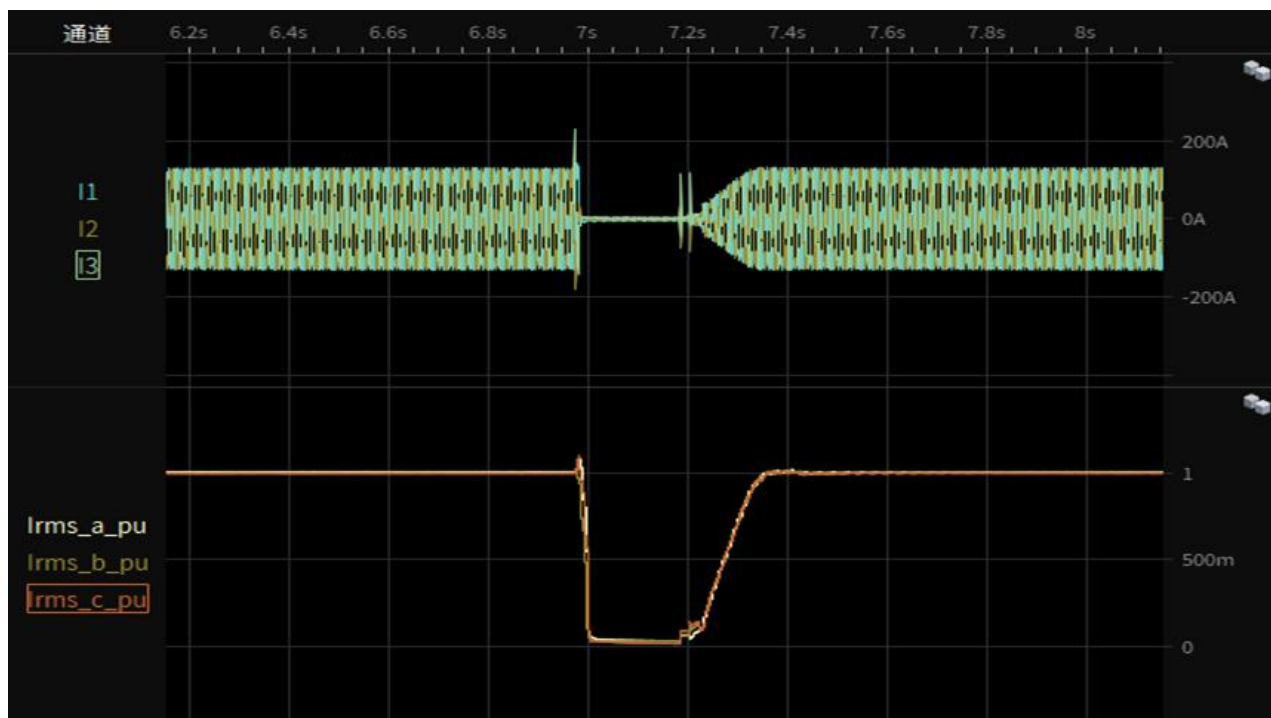
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 1a-2-D2-1.2 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 95% load
Instantaneous curve and RMS value of phase-to-neutral voltages



Test 1a-2-1.3 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 95% load
Instantaneous curve and RMS value of phase currents



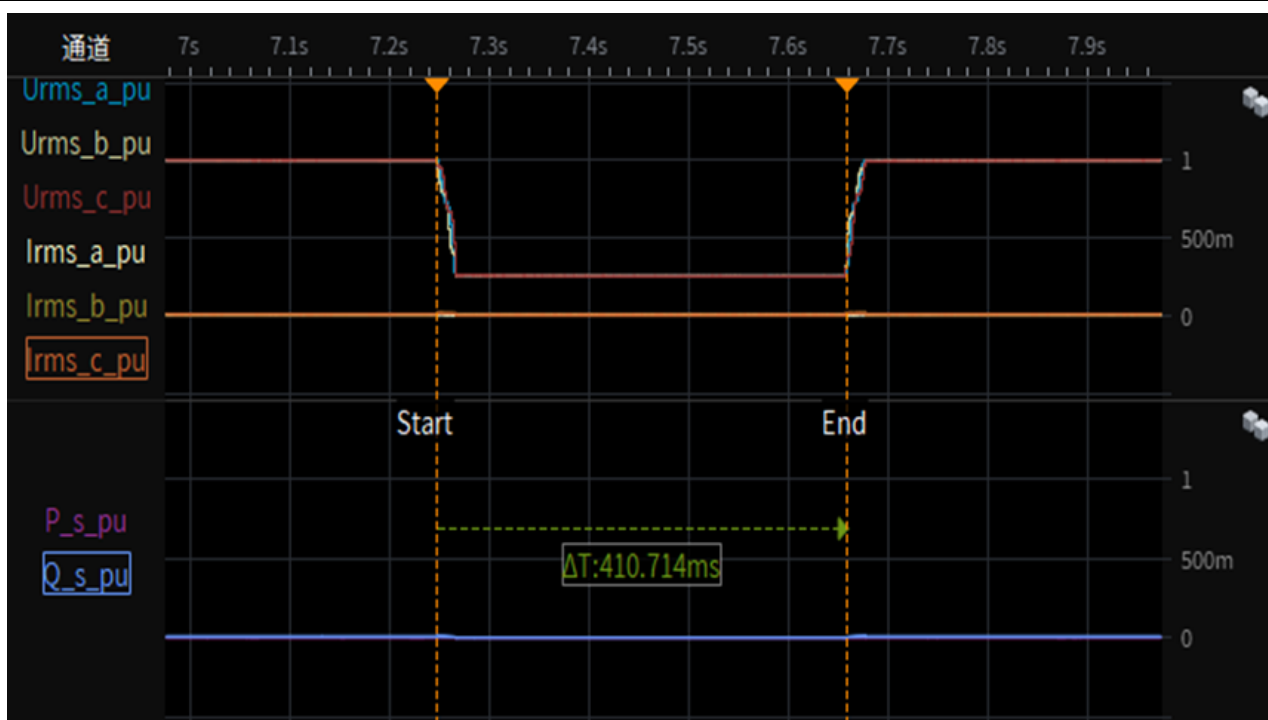
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 1a-2-1.4 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 95% load restoring time



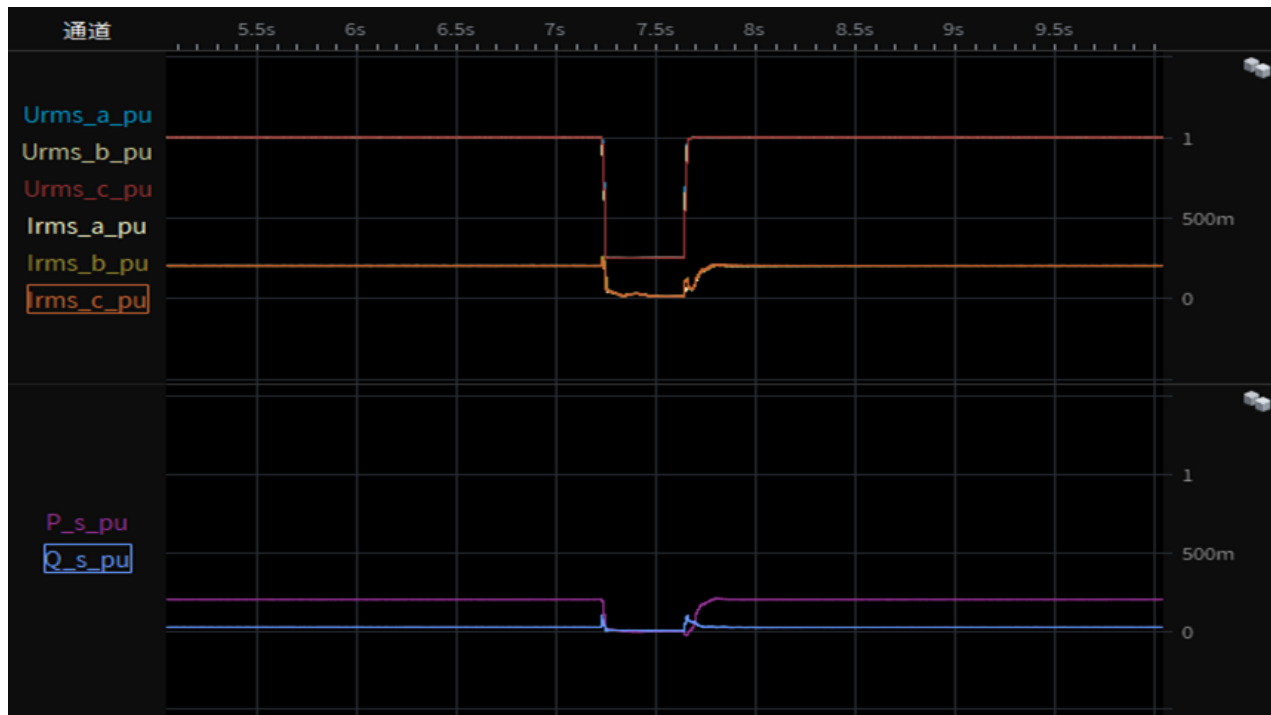
Test 2s-1.1 Depth of fault phase: 0.25p.u., three-phase-symmetrical (type A), 0% load
Test overview(voltage,current,active and reactive power)



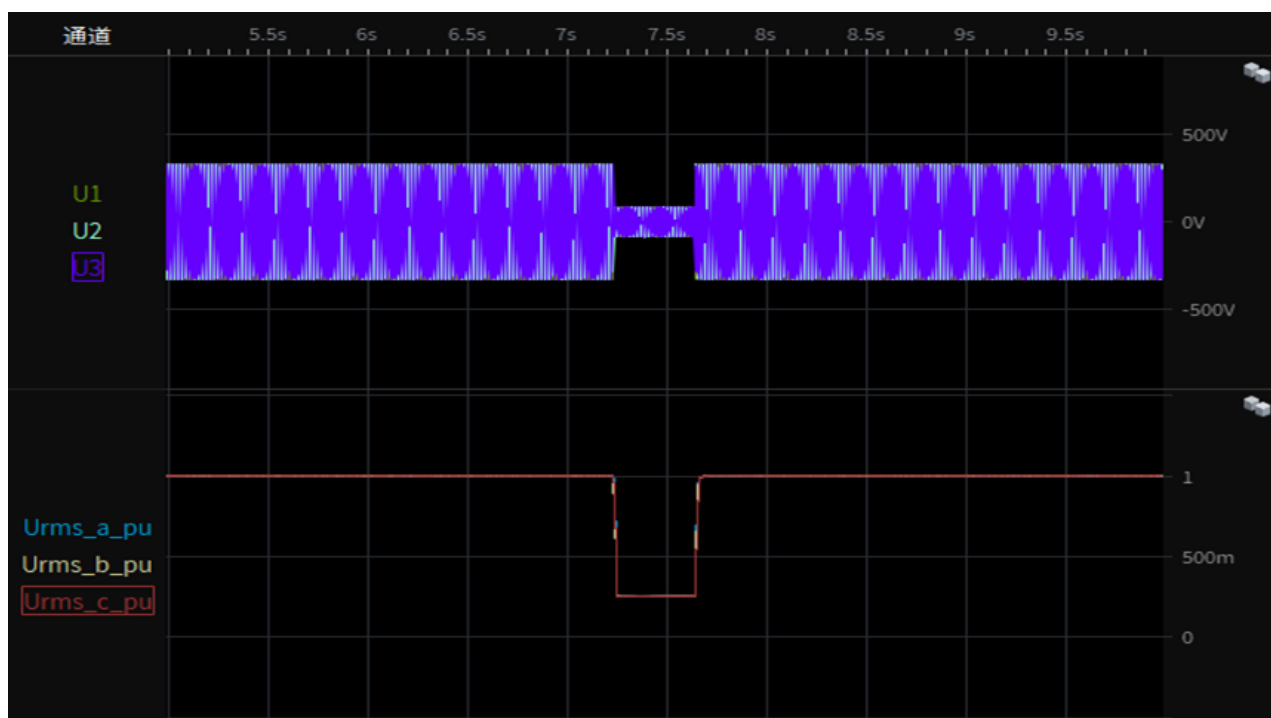
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 2s-1-1.1 Depth of fault phase: 0.25p.u., three-phase-symmetrical (type A), 20% load
 Test overview(voltage,current,active and reactive power)



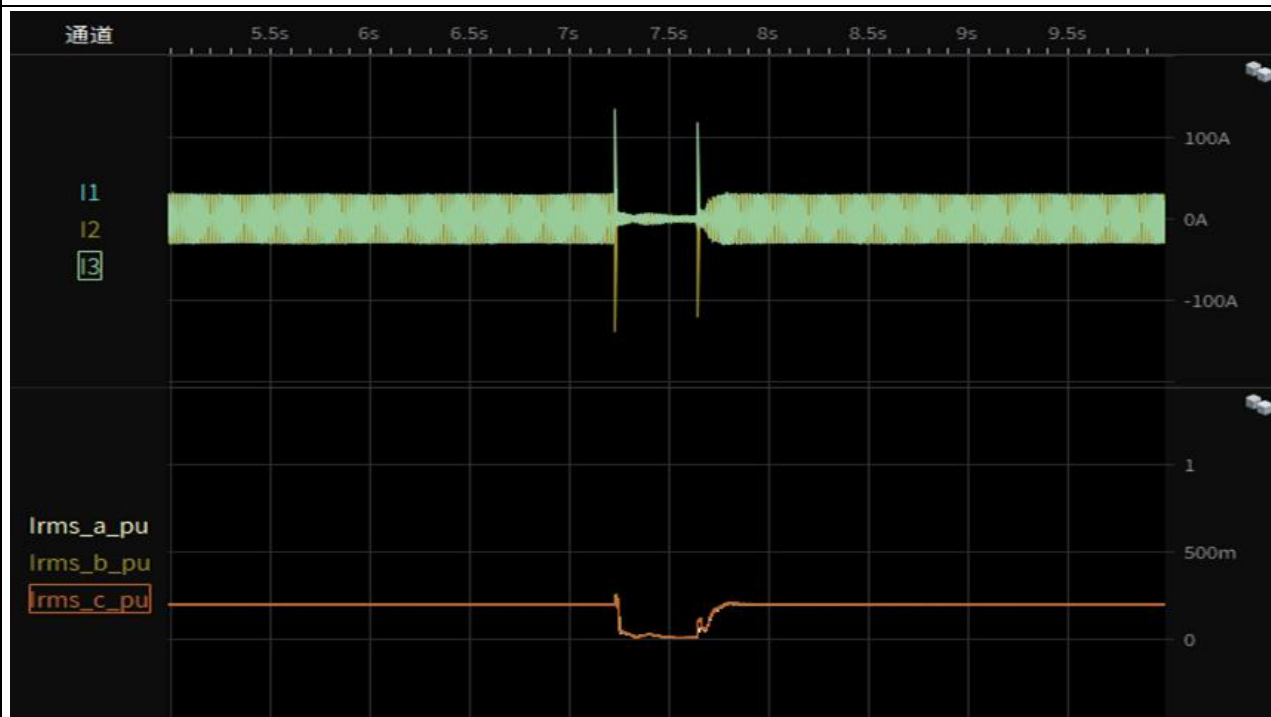
Test 2s-1-1.2 Depth of fault phase:0.25p.u., three-phase-symmetrical (type A), 20% load
 Instantaneous curve and RMS value of phase-to-neutral voltages



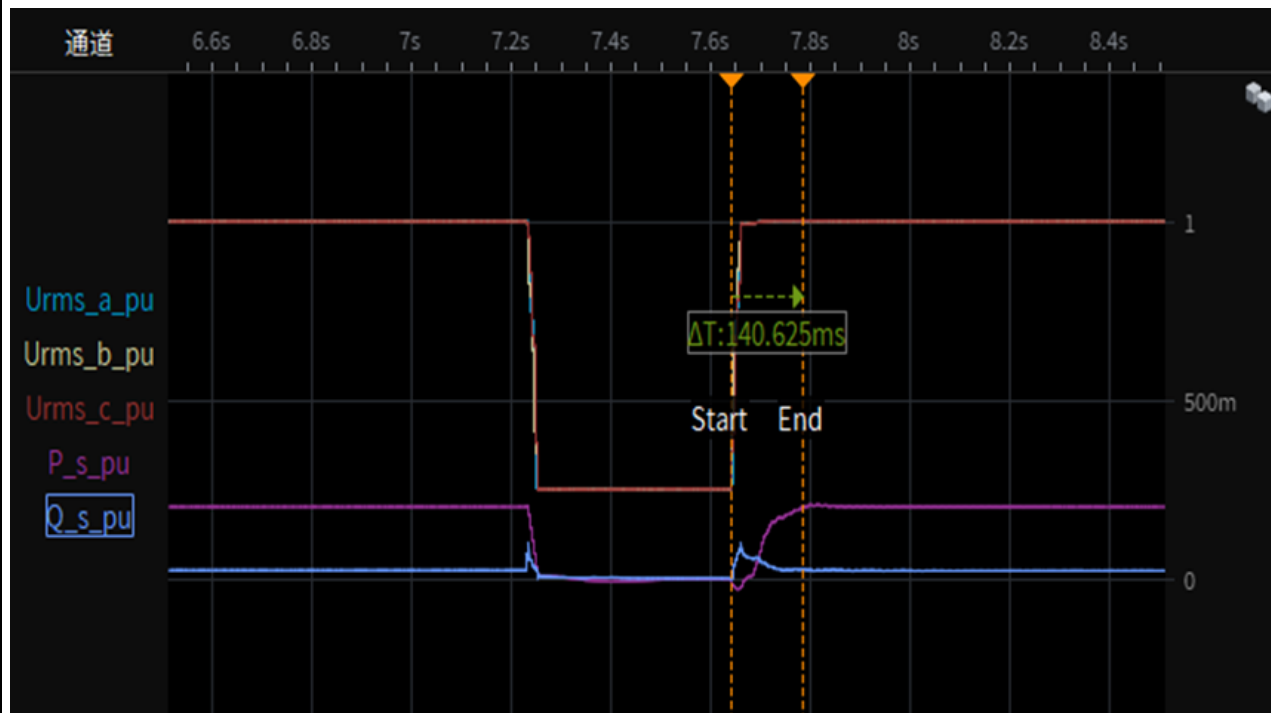
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 2s-1-1.3 Depth of fault phase:0.25p.u., three-phase-symmetrical (type A), 20% load
Instantaneous curve and RMS value of phase currents



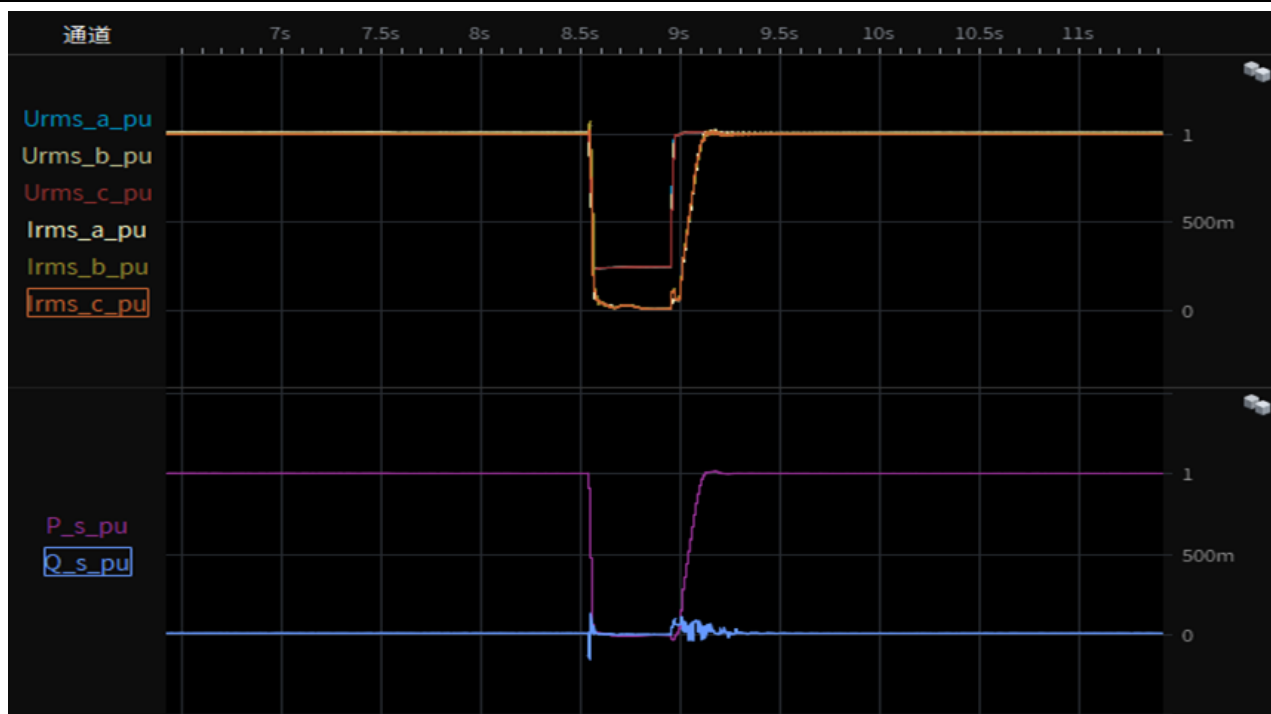
Test 2s-1-1.4 Depth of fault phase:0.25p.u., three-phase-symmetrical (type A),
20% load restoring time



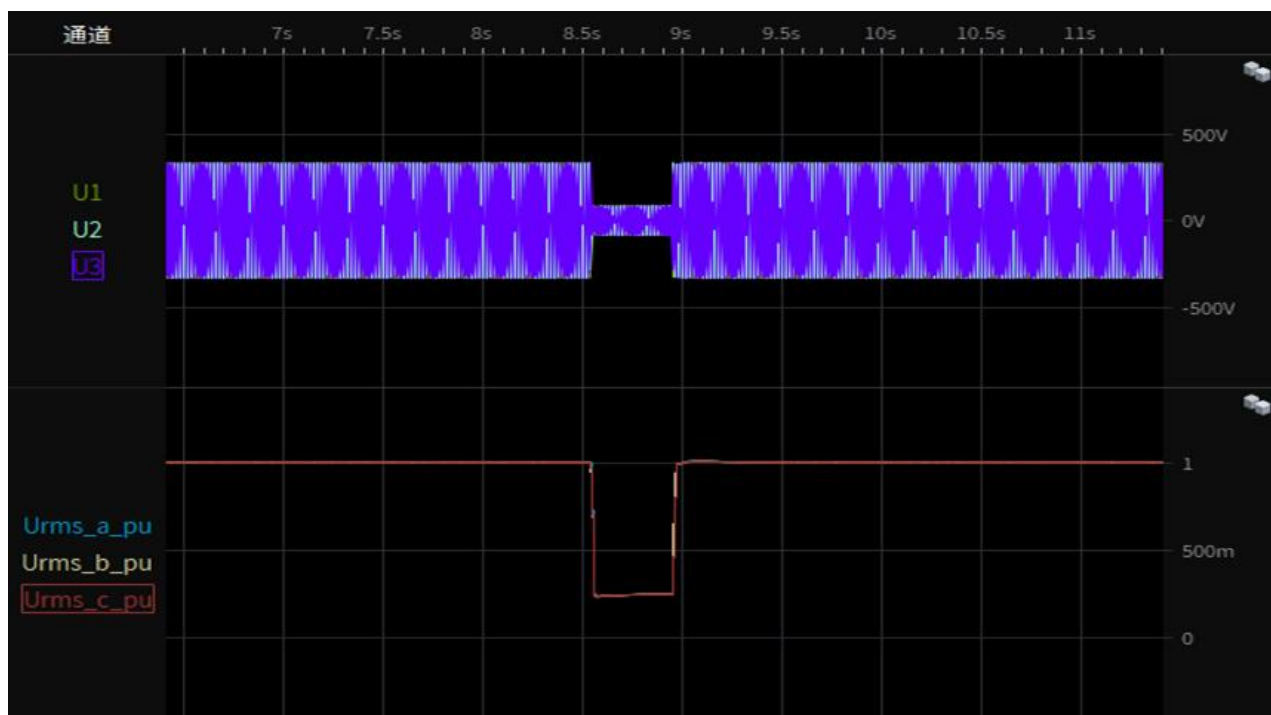
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 2s-2-1.1 Depth of fault phase:0.25p.u., three-phase-symmetrical (type A), 95% load
 Test overview(voltage,current,active and reactive power)



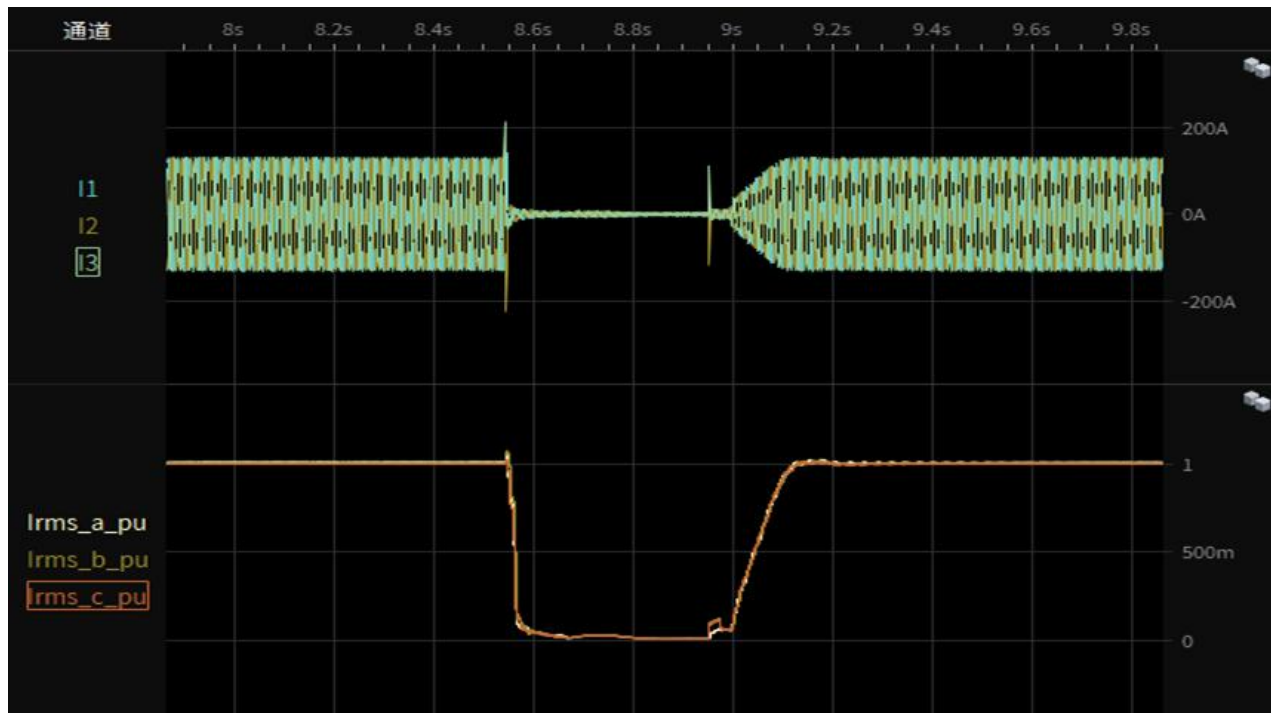
Test 2s-2-1.2 Depth of fault phase: 0.25p.u., three-phase-symmetrical (type A), 95% load
 Instantaneous curve and RMS value of phase-to-neutral voltages



CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 2s-2-1.3 Depth of fault phase: 0.25p.u., three-phase-symmetrical (type A), 95% load
Instantaneous curve and RMS value of phase currents



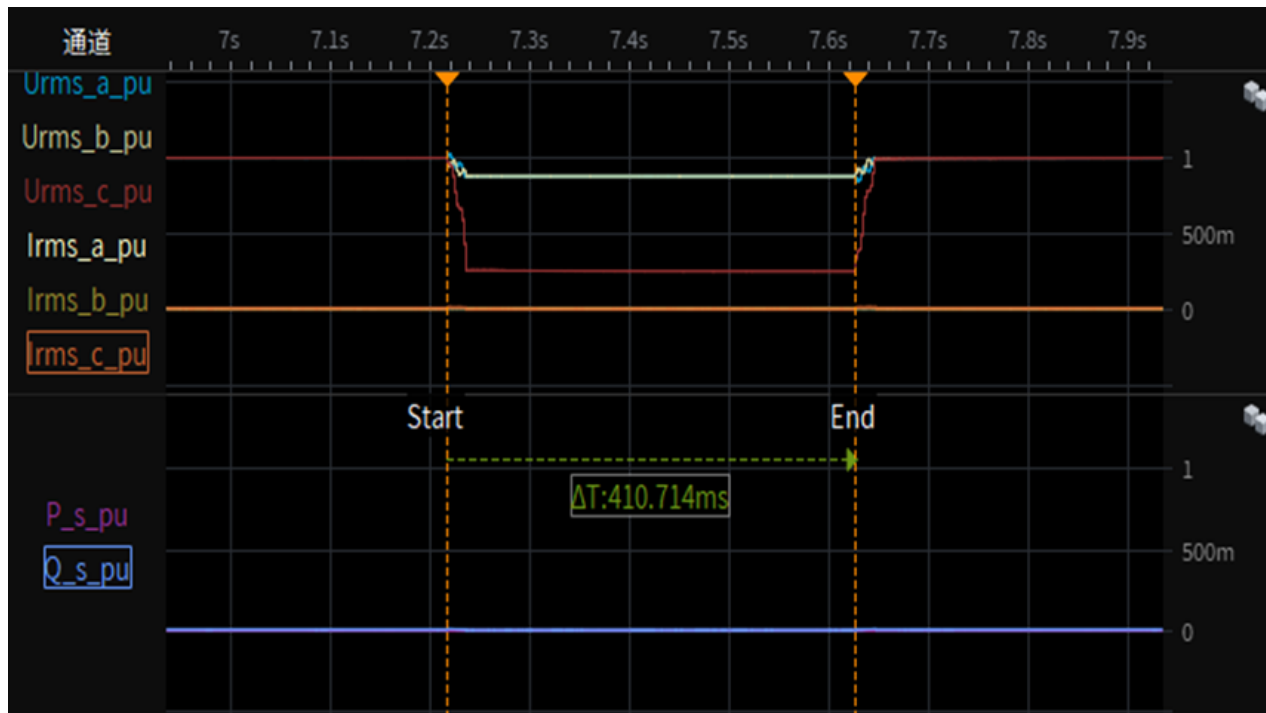
Test 2s-2-1.4 Depth of fault phase: 0.25p.u., three-phase-symmetrical (type A),
95% load restoring time



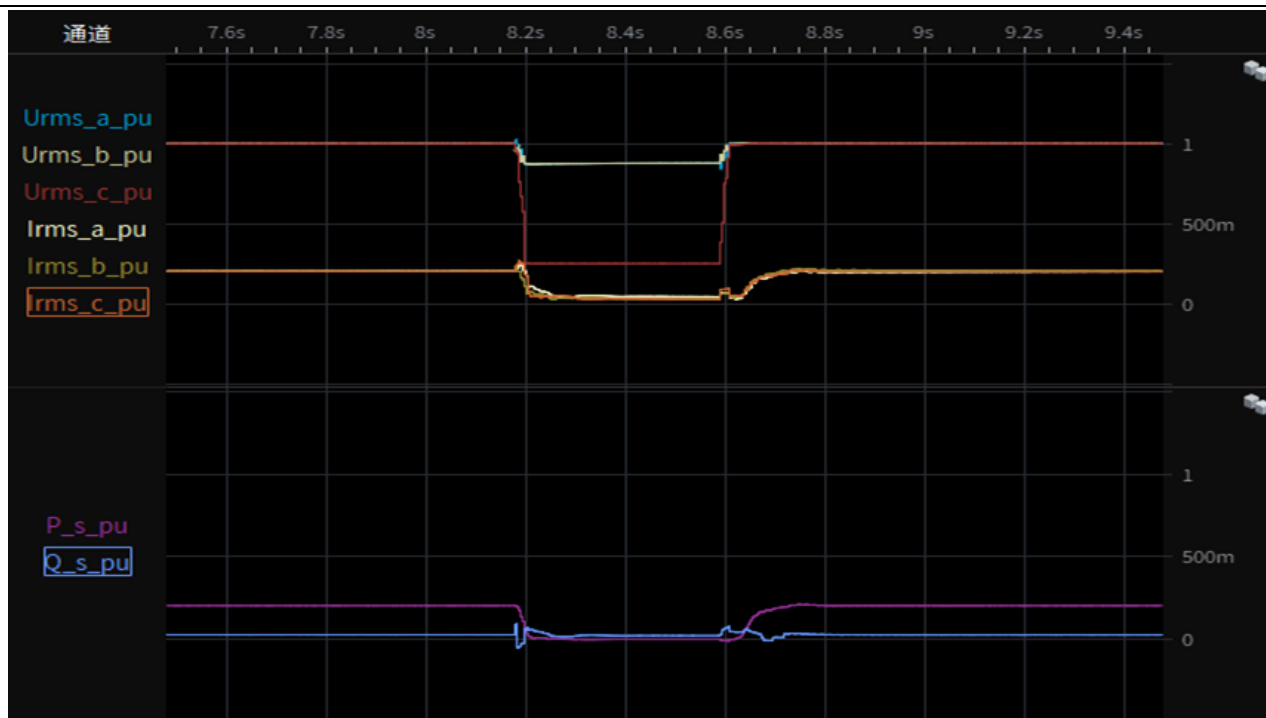
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 2a-1.1 Depth of fault phase: 0.25p.u., two-phase-asymmetrical (type D), 0% load
 Test overview(voltage,current,active and reactive power)



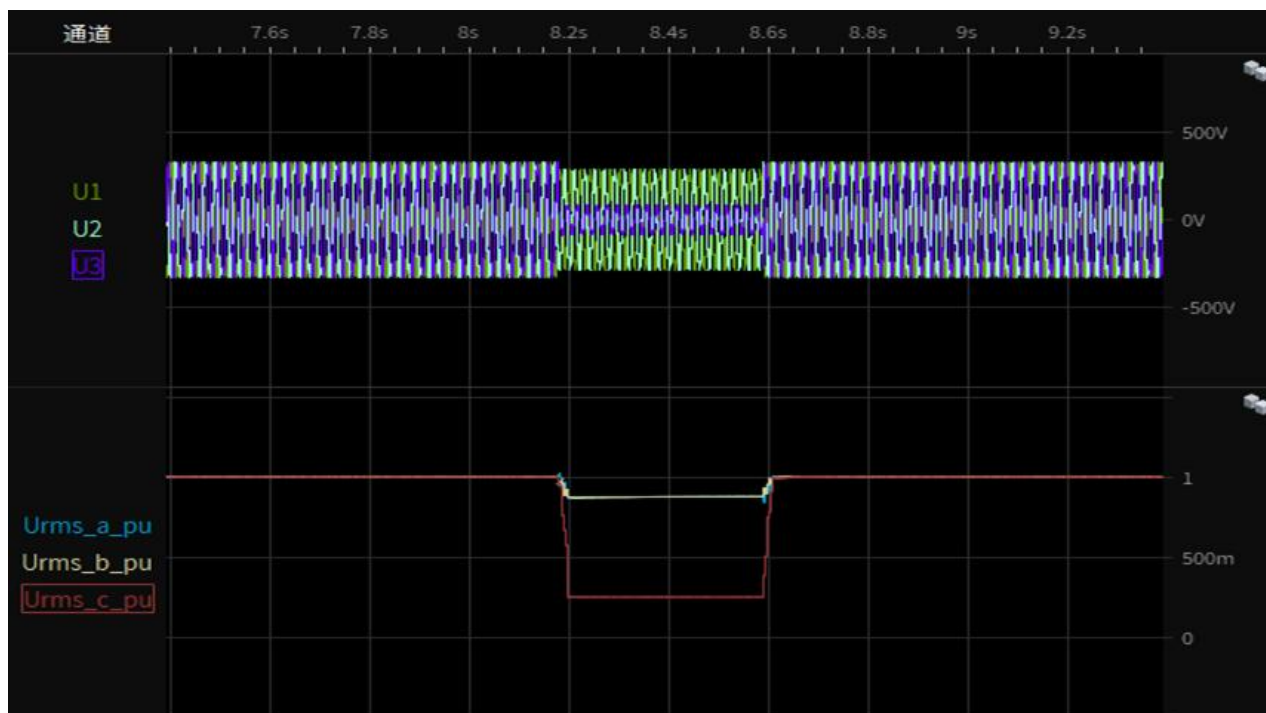
Test 2a-1-1.1 Depth of fault phase:0.25p.u., two-phase-asymmetrical (type D), 20% load
 Test overview(voltage,current,active and reactive power)



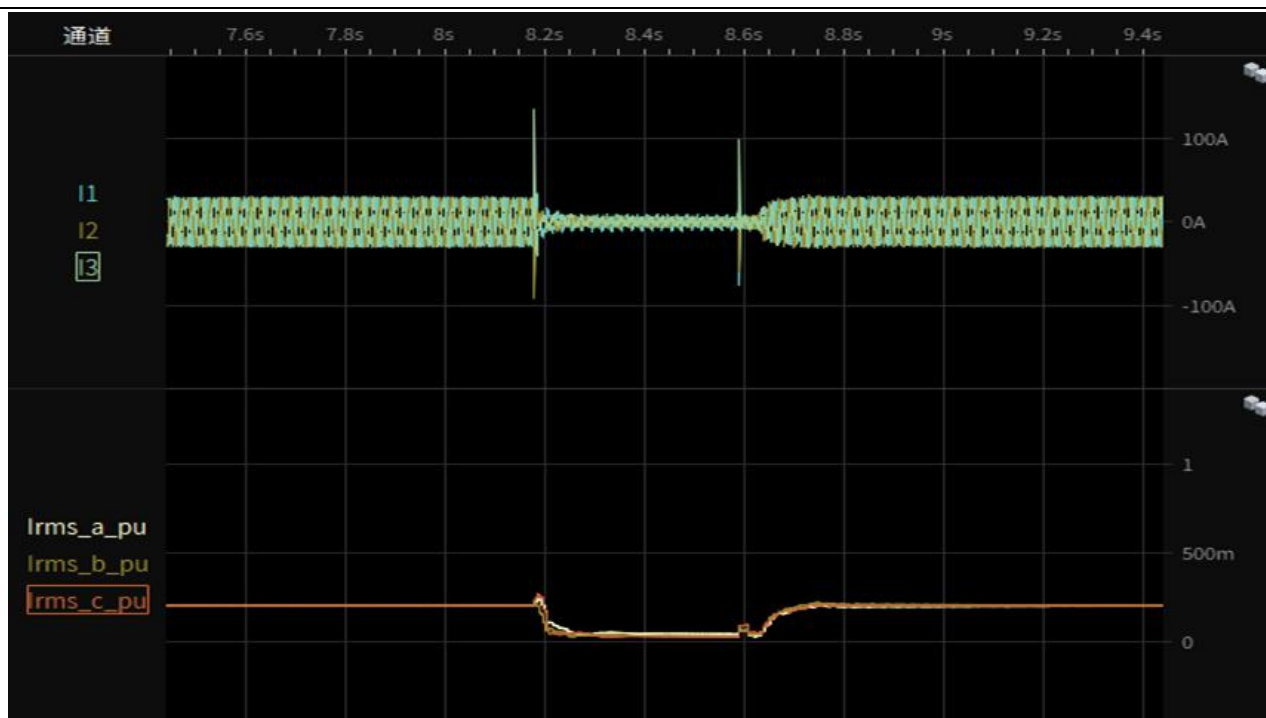
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 2a-1-1.2 Depth of fault phase:0.25p.u., two-phase-asymmetrical (type D), 20% load
Instantaneous curve and RMS value of phase-to-neutral voltages



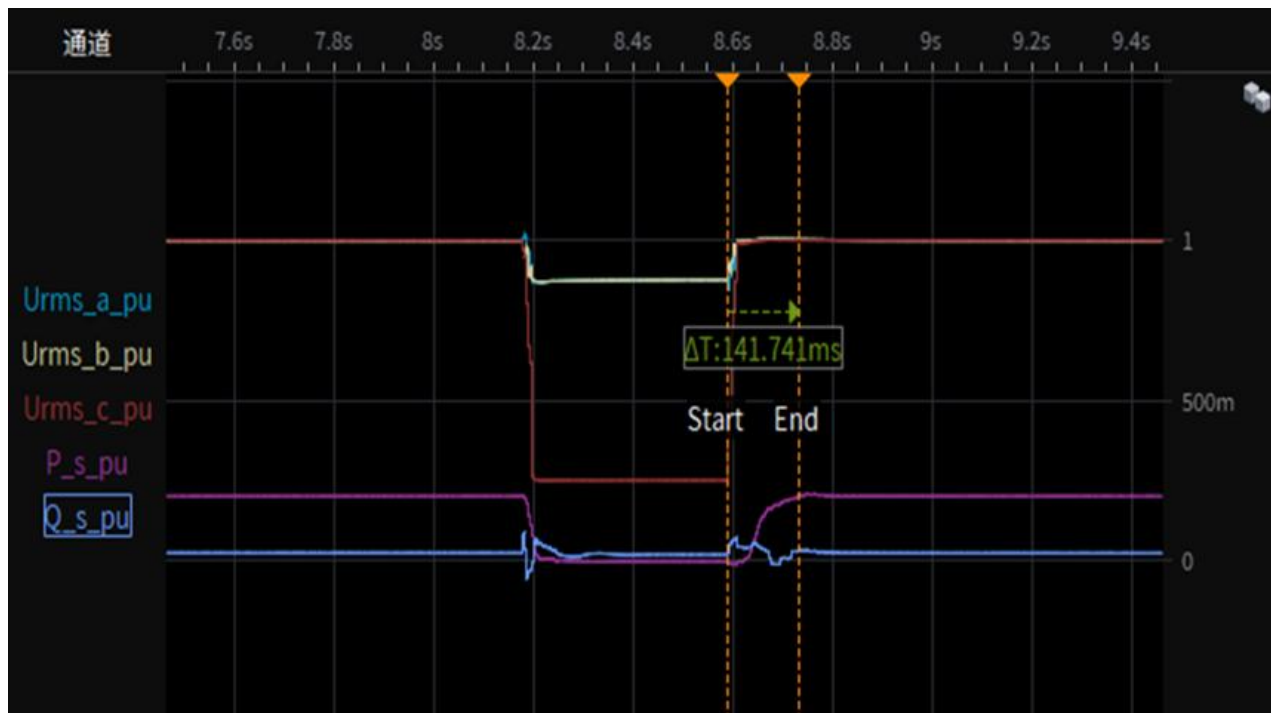
Test 2a-1-1.3 Depth of fault phase:0.25p.u., two-phase-asymmetrical (type D), 20% load
Instantaneous curve and RMS value of phase currents



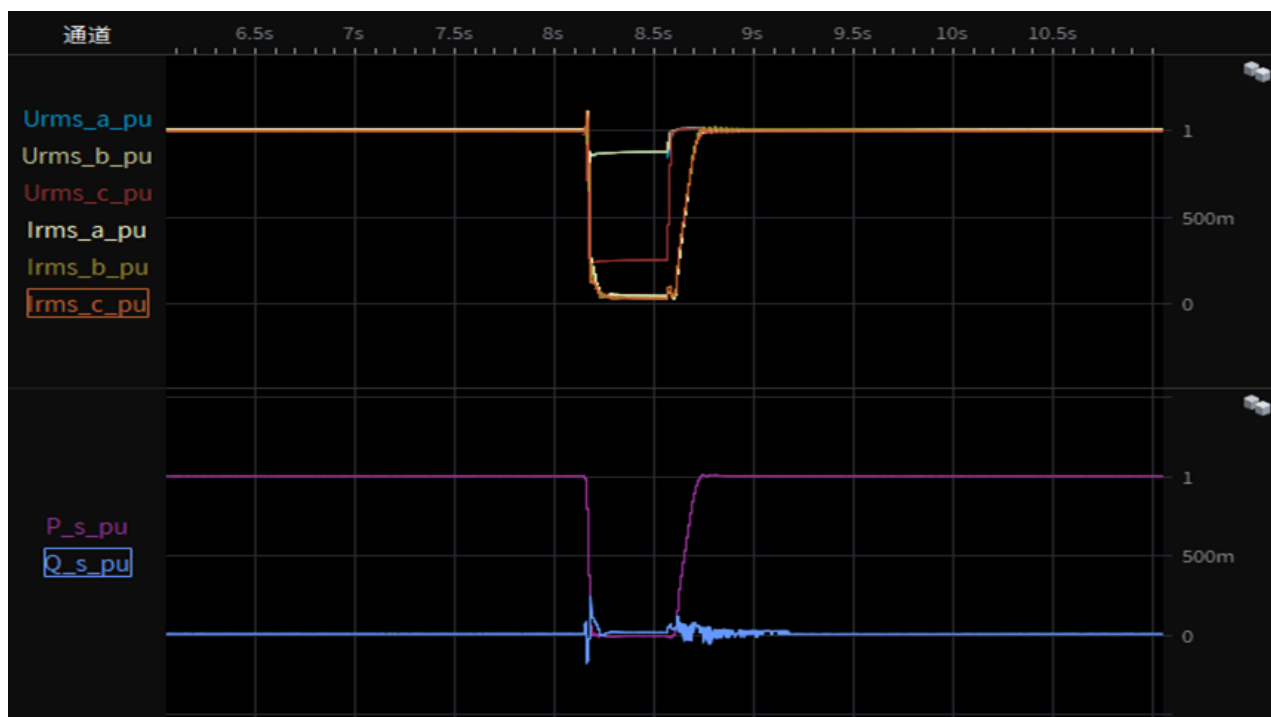
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 2a-1-1.4 Depth of fault phase:0.25p.u., two-phase-asymmetrical (type D),
20% load restoring time



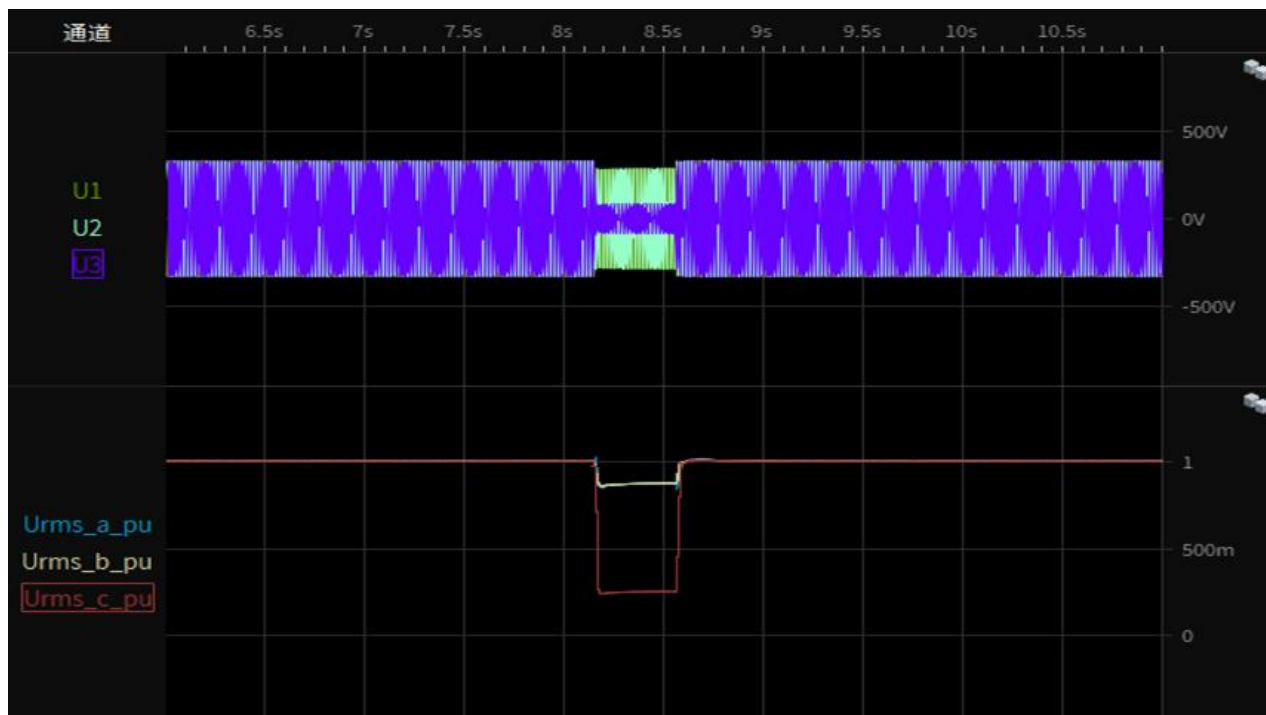
Test 2a-2-1.1 Depth of fault phase:0.25p.u., two-phase-asymmetrical (type D), 95% load
Test overview(voltage,current,active and reactive power)



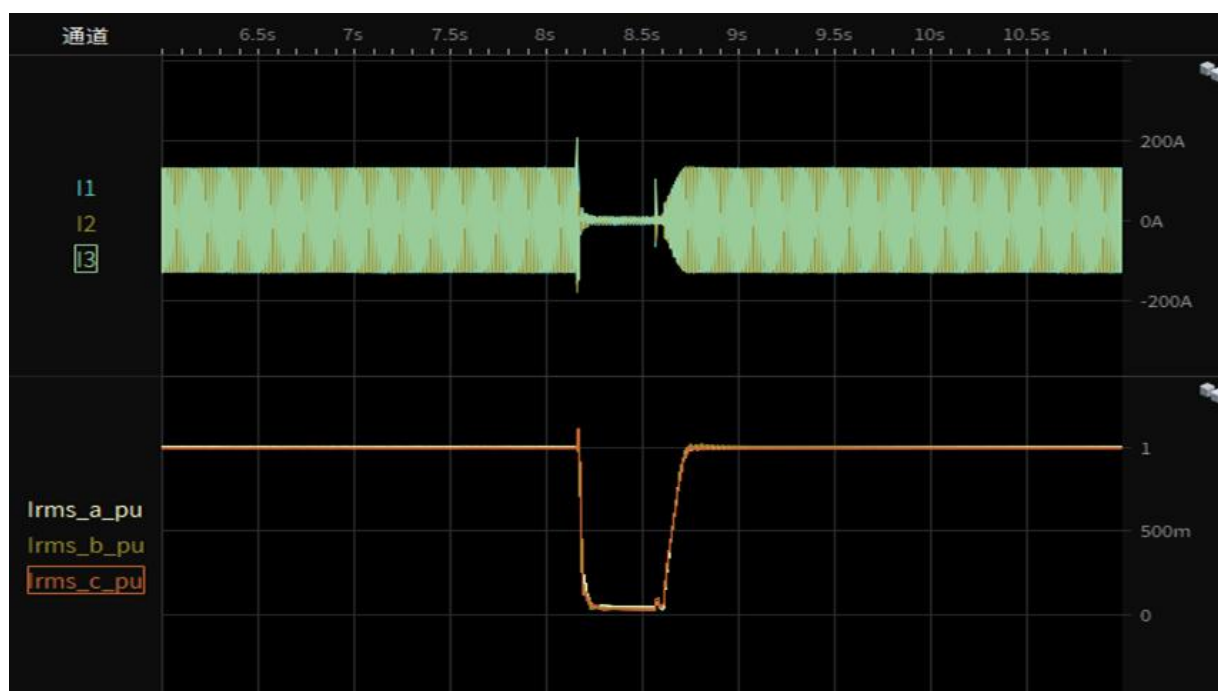
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 2a-2-1.2 Depth of fault phase: 0.25p.u., two-phase-asymmetrical (type D), 95% load
Instantaneous curve and RMS value of phase-to-neutral voltages



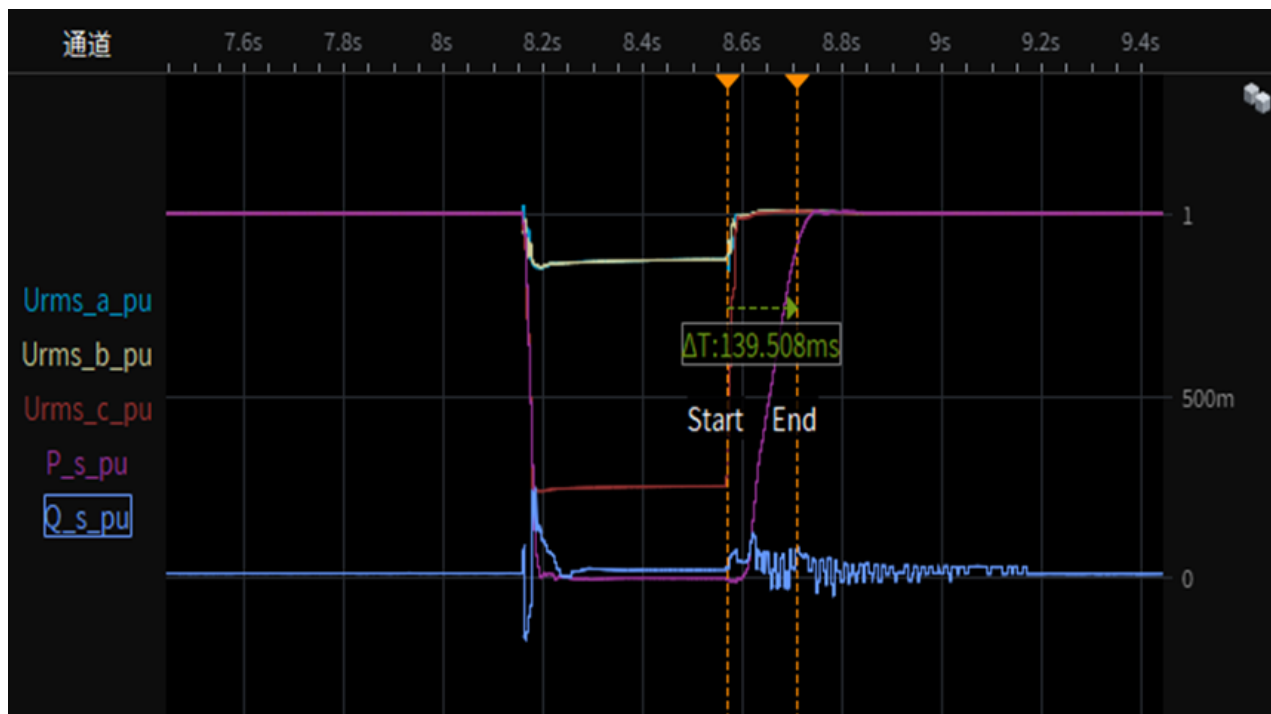
Test 2a-2-1.3 Depth of fault phase:0.25p.u., two-phase-asymmetrical (type D), 95% load
Instantaneous curve and RMS value of phase currents



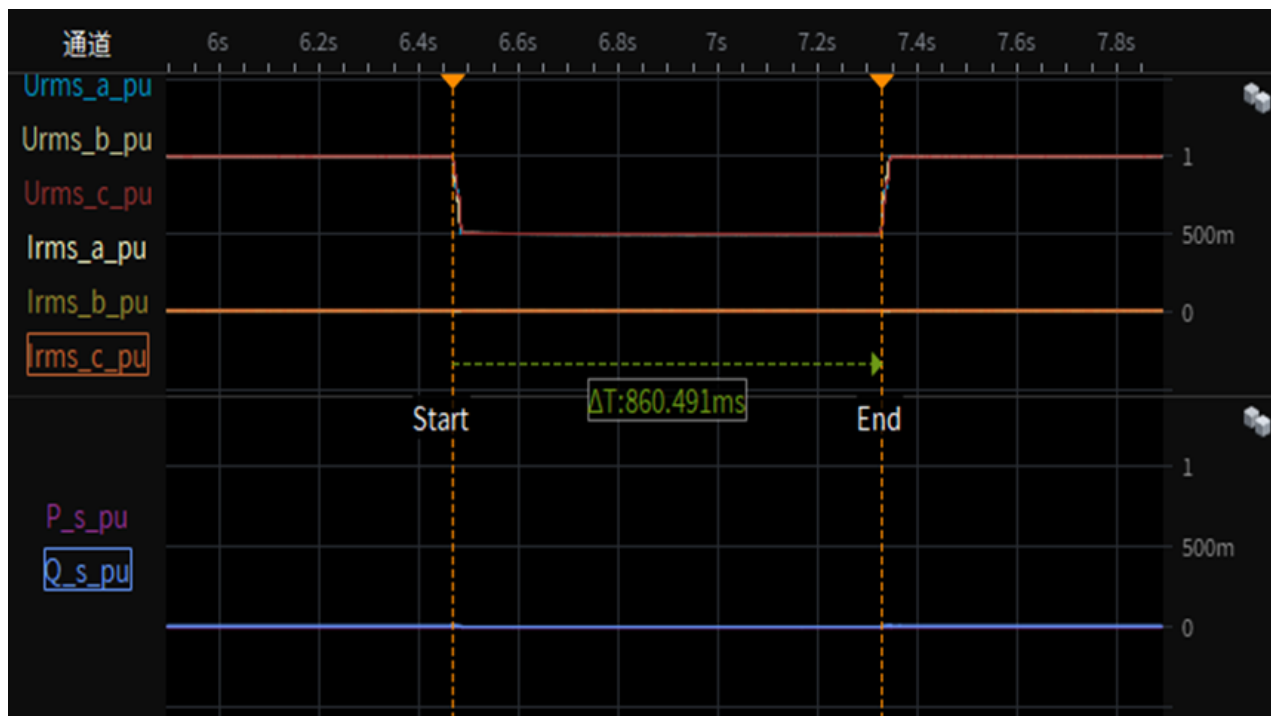
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 2a-2-1.4 Depth of fault phase: 0.25p.u., two-phase-asymmetrical (type D), 95% load restoring time



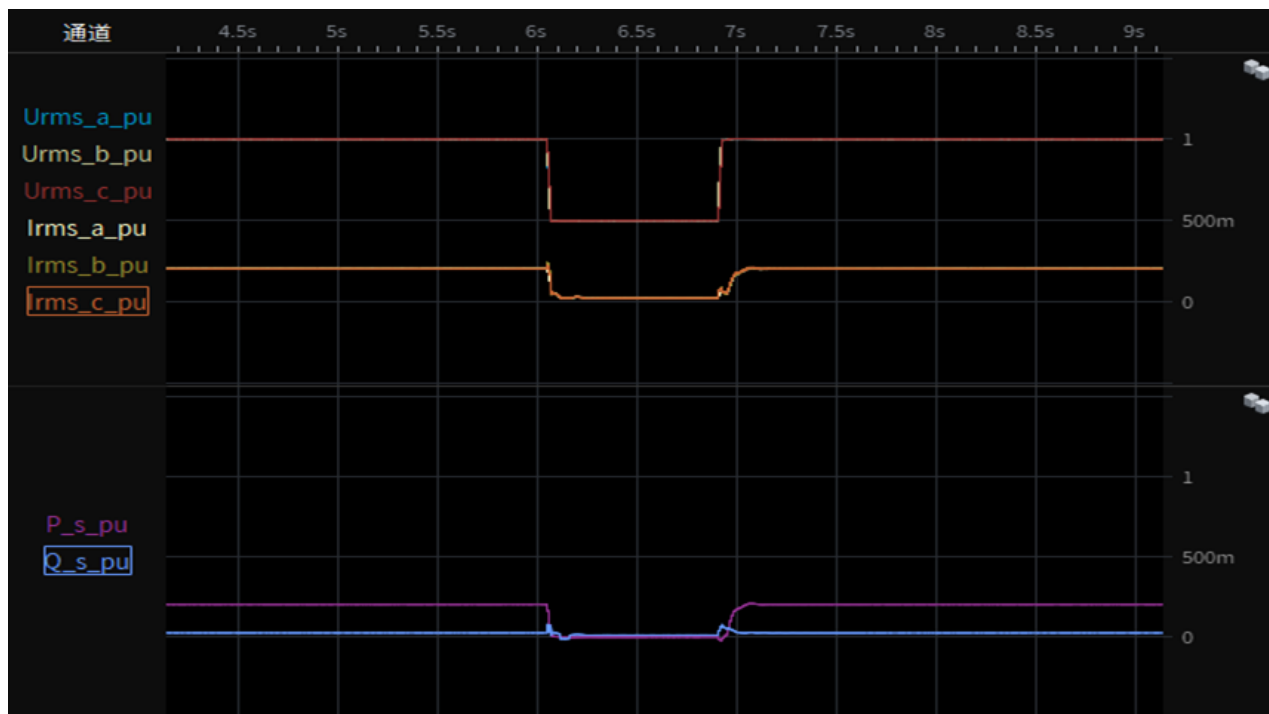
Test 3s-1.1 Depth of fault phase: 0.5p.u., three-phase-symmetrical (type A), 0% load
Test overview(voltage,current,active and reactive power)



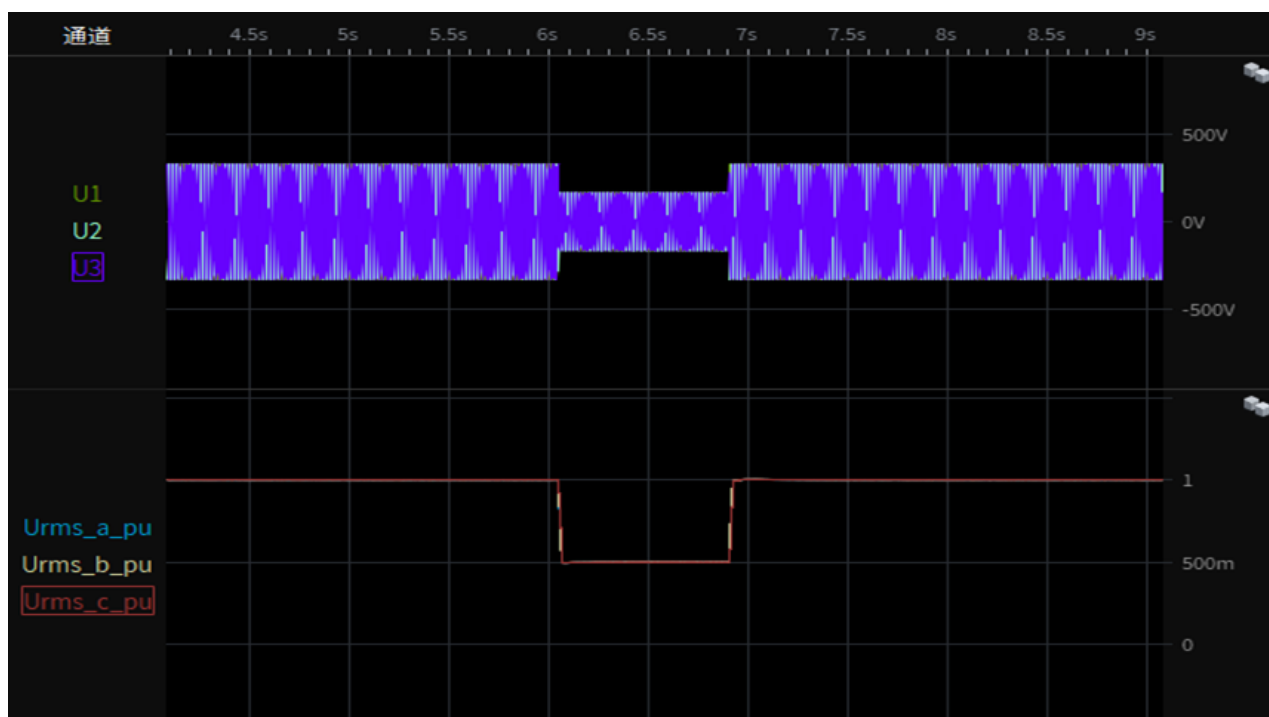
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 3s-1-1.1 Depth of fault phase: 0.5p.u., three-phase-symmetrical (type A), 20% load
Test overview(voltage,current,active and reactive power)



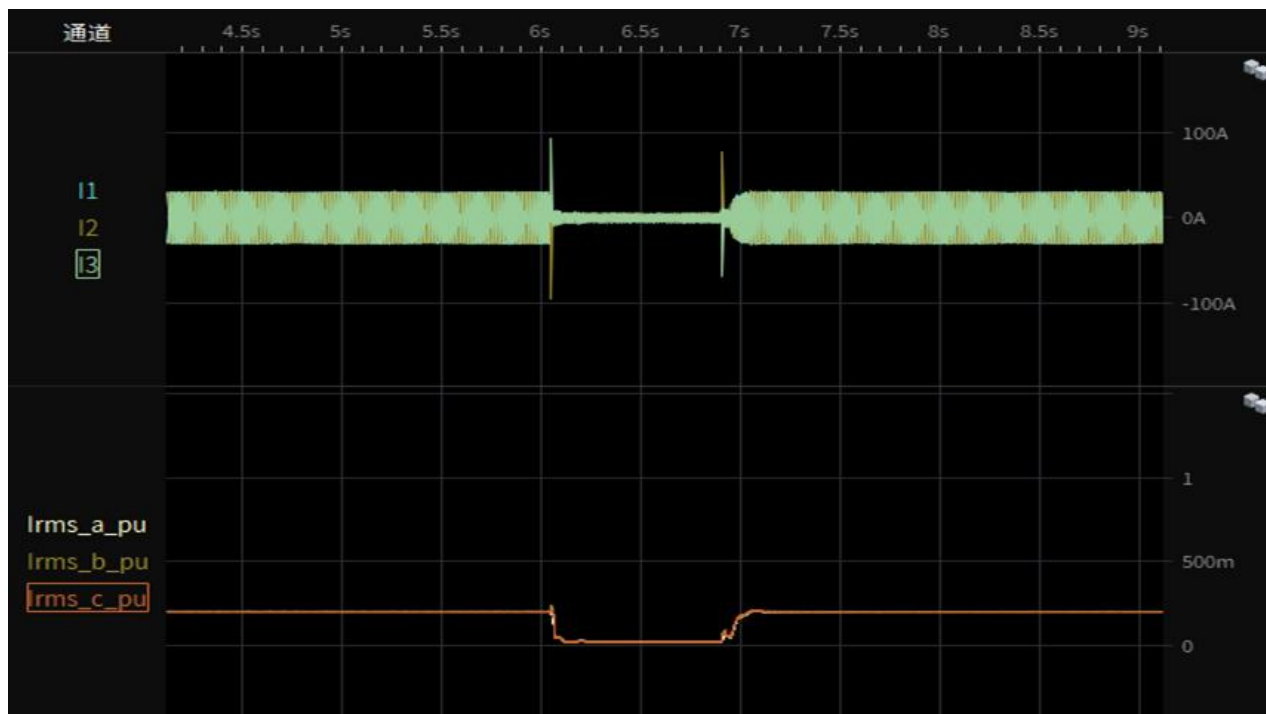
Test 3s-1-1.2 Depth of fault phase: 0.5p.u., three-phase-symmetrical (type A), 20% load
Instantaneous curve and RMS value of phase-to-neutral voltages



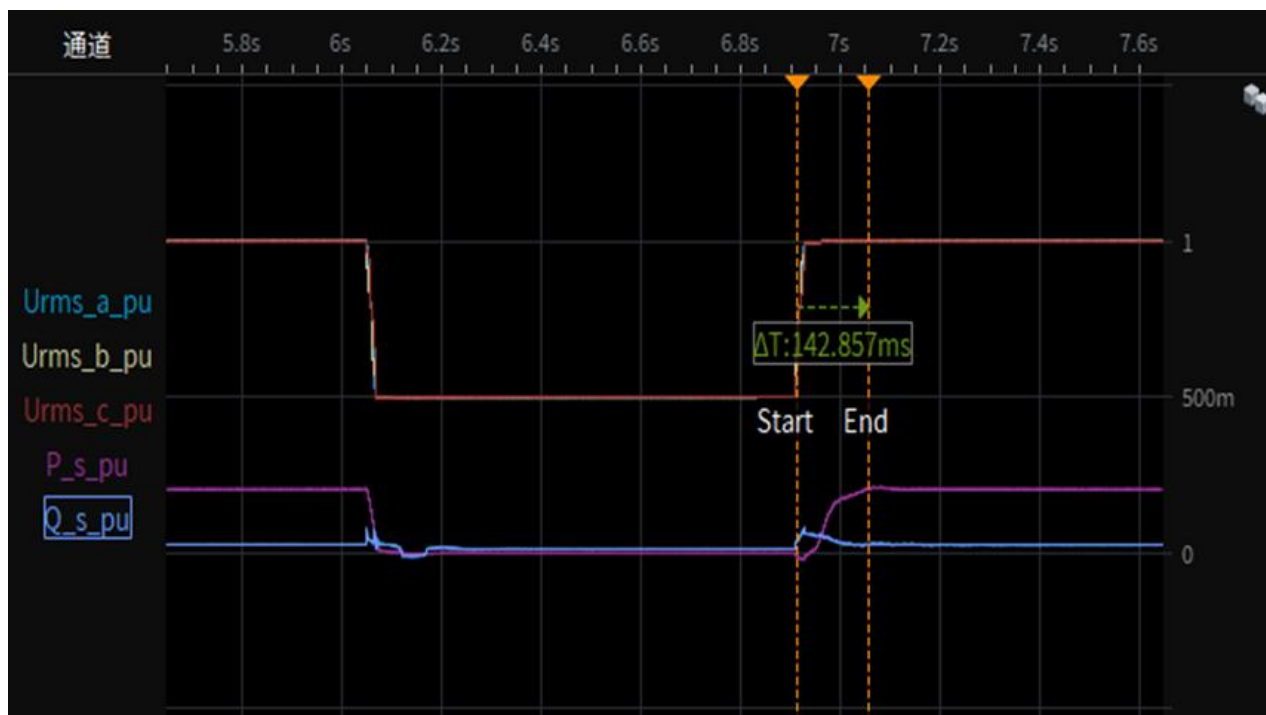
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 3s-1-1.3 Depth of fault phase: 0.5p.u., three-phase-symmetrical (type A), 20% load
Instantaneous curve and RMS value of phase currents



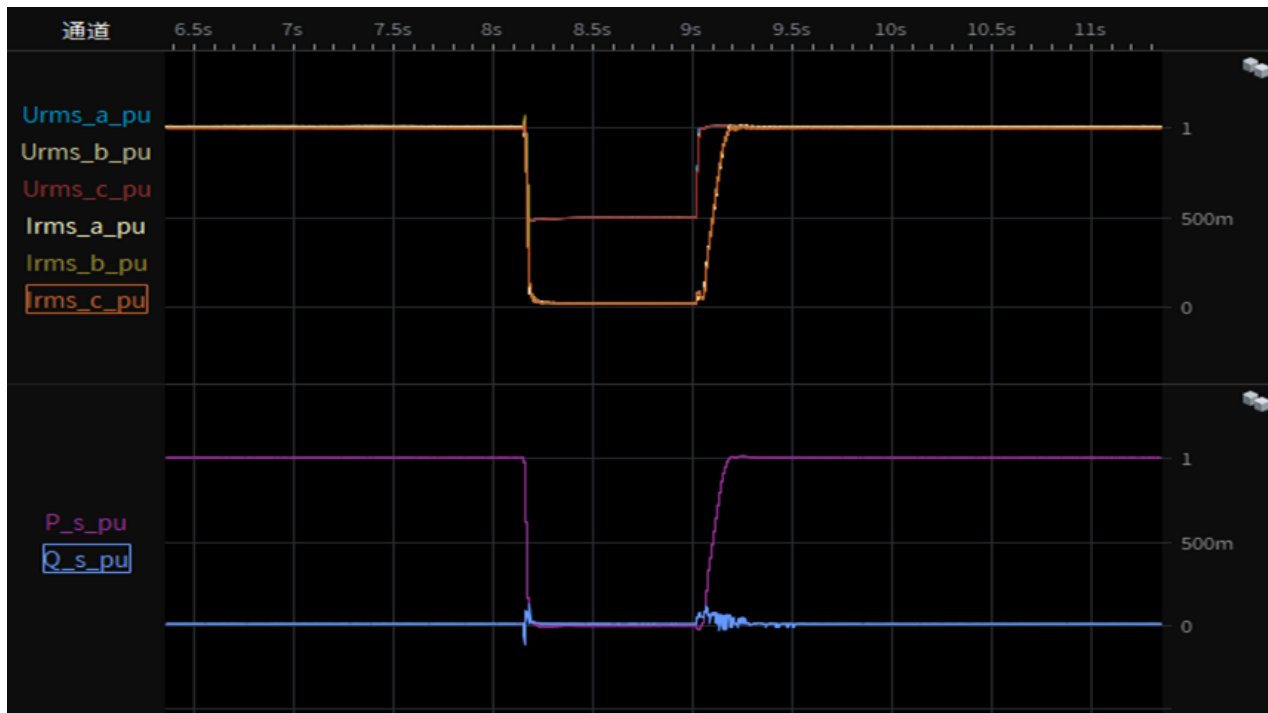
Test 3s-1-1.4 Depth of fault phase: 0.5p.u., three-phase-symmetrical (type A),
20% load restoring time



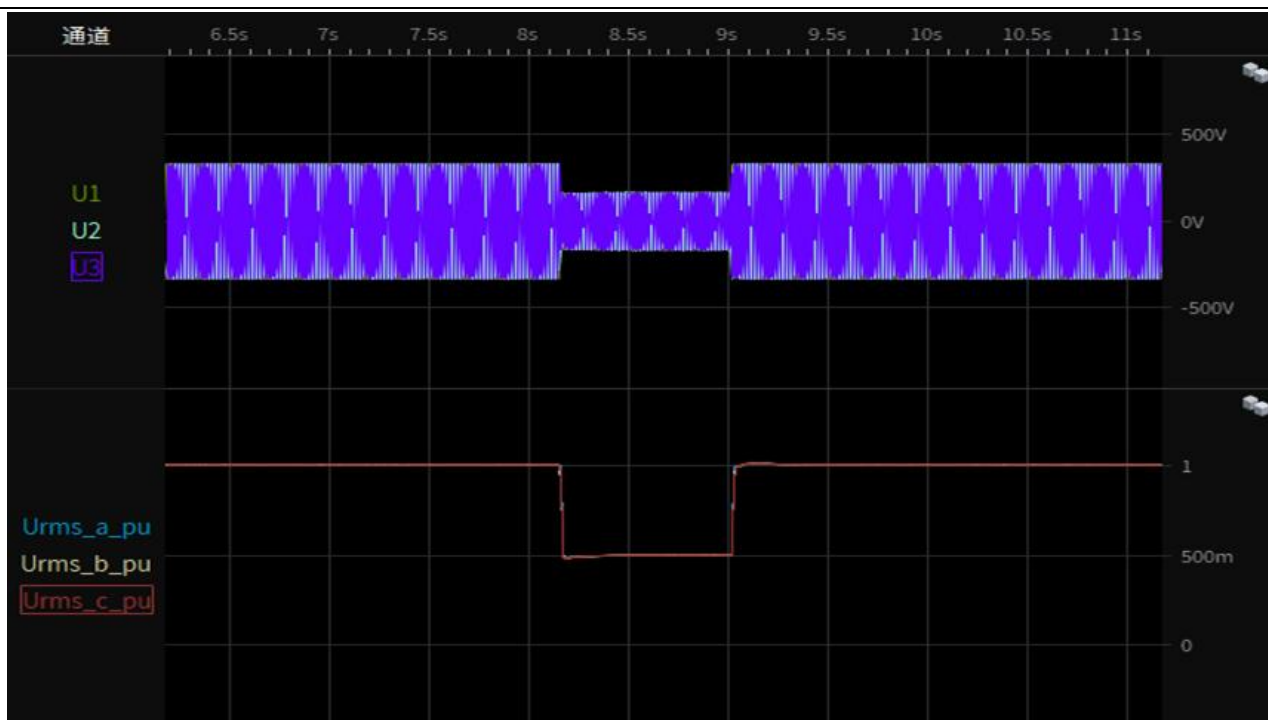
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 3s-2-1.1 Depth of fault phase: 0.5p.u., three-phase-symmetrical (type A), 95% load
 Test overview(voltage,current,active and reactive power)

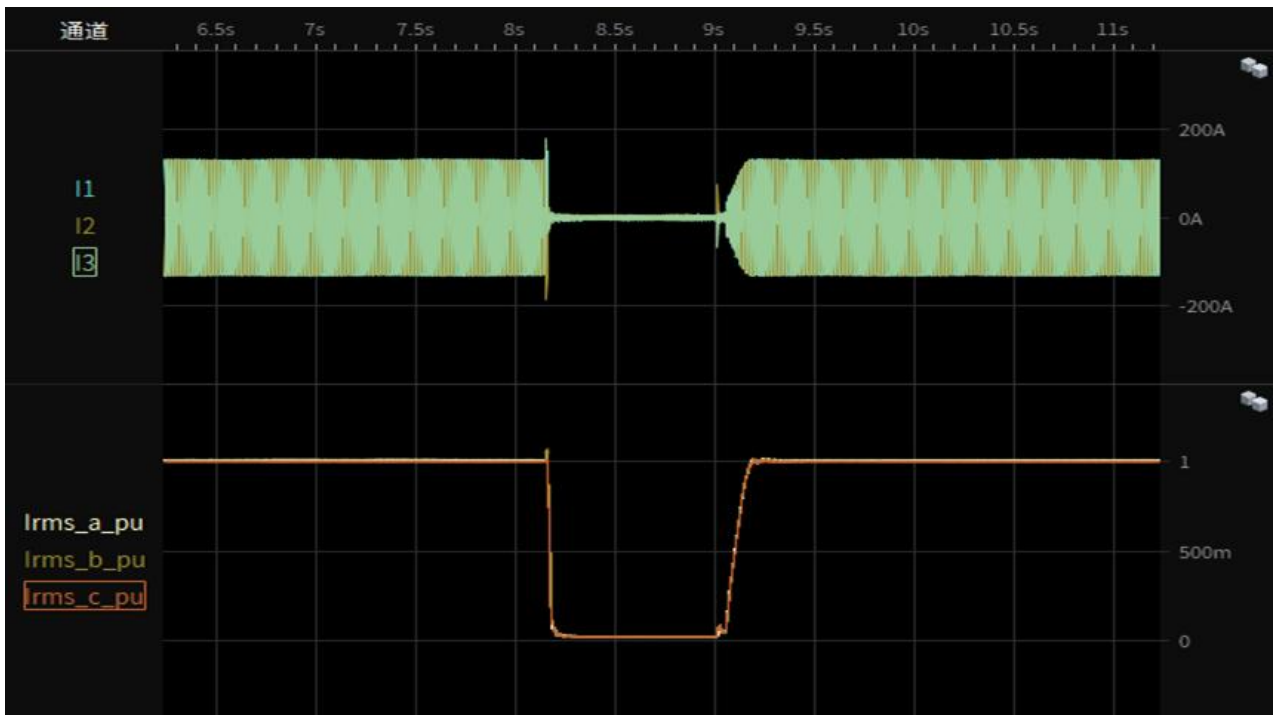


Test 3s-2-1.2 Depth of fault phase: 0.5p.u., three-phase-symmetrical (type A), 95% load
 Instantaneous curve and RMS value of phase-to-neutral voltages

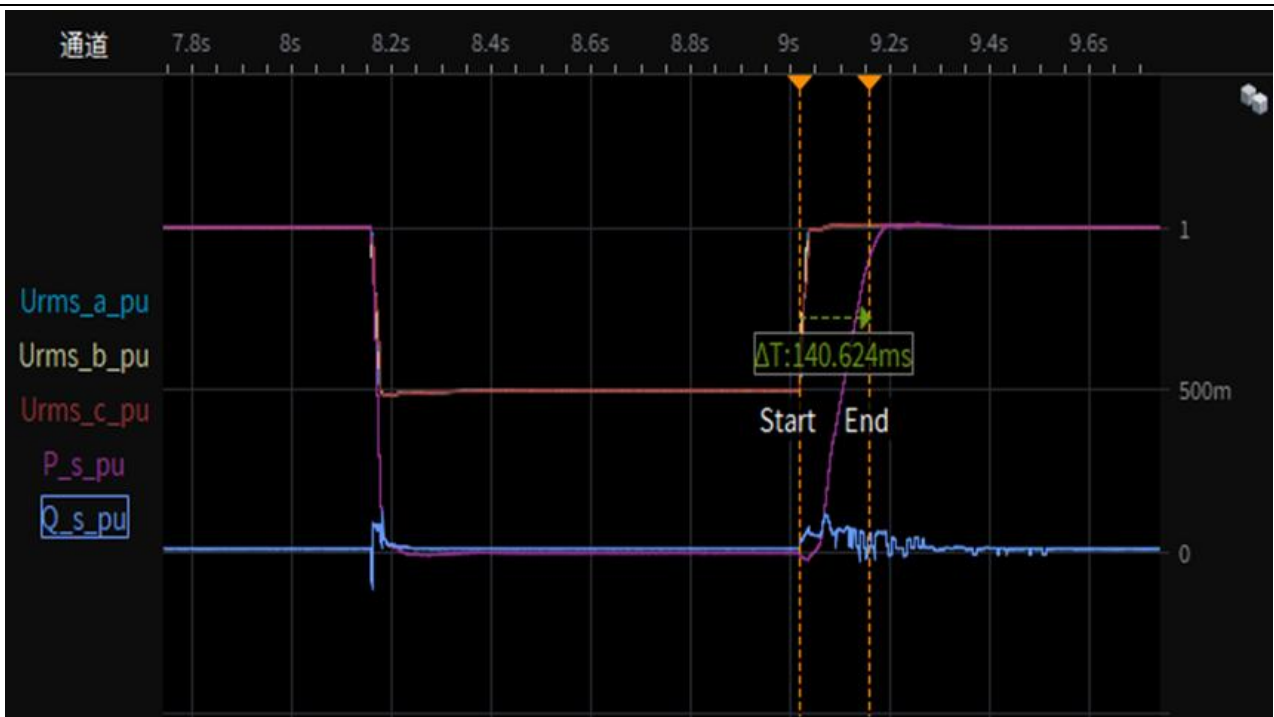


CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test 3s-2-1.3 Depth of fault phase: 0.5p.u., three-phase-symmetrical (type A), 95% load
Instantaneous curve and RMS value of phase currents



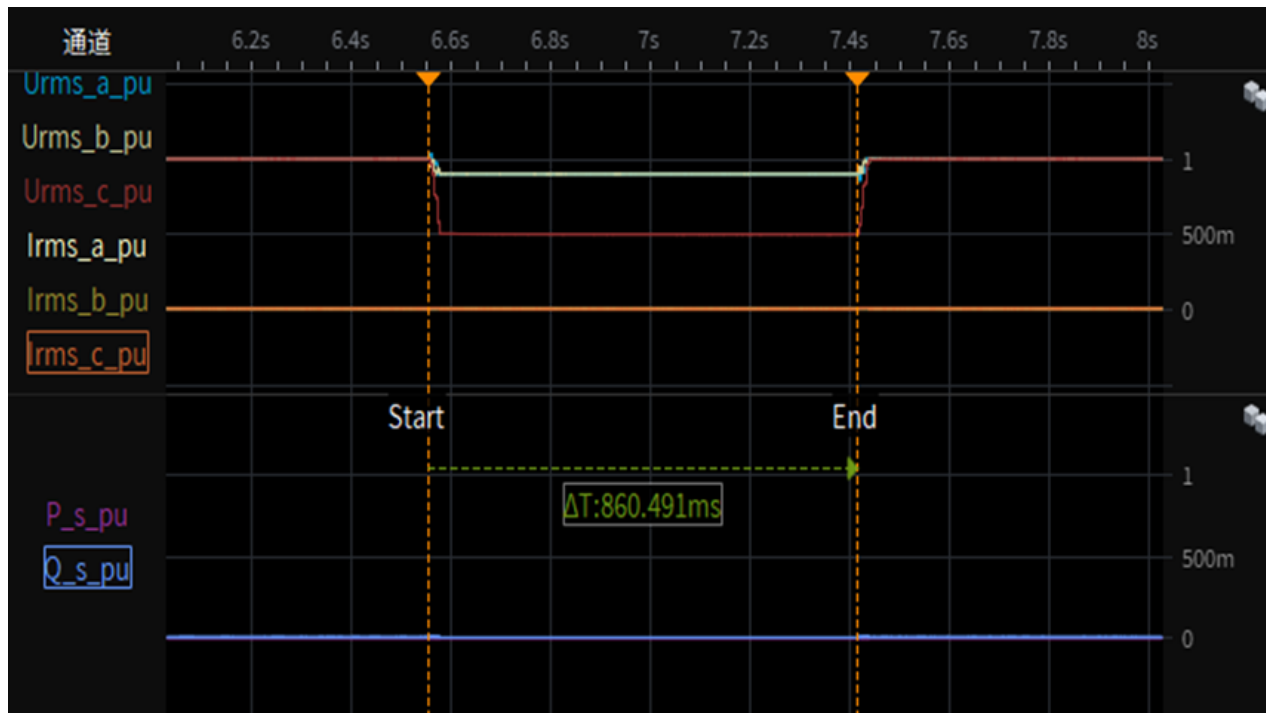
Test 3s-2-1.4 Depth of fault phase: 0.5p.u., three-phase-symmetrical (type A),
95% load restoring time



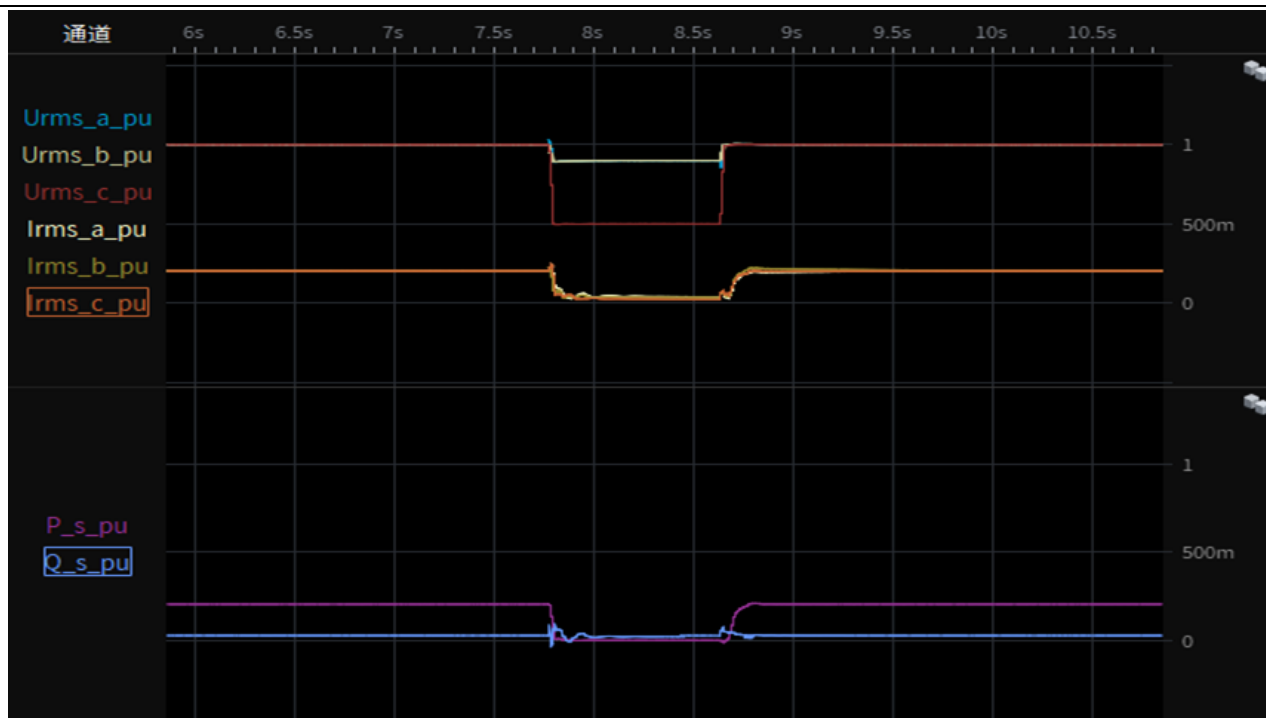
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 3a-1.1 Depth of fault phase: 0.5p.u., two-phase-asymmetrical (type D), 0% load
Test overview(voltage,current,active and reactive power)



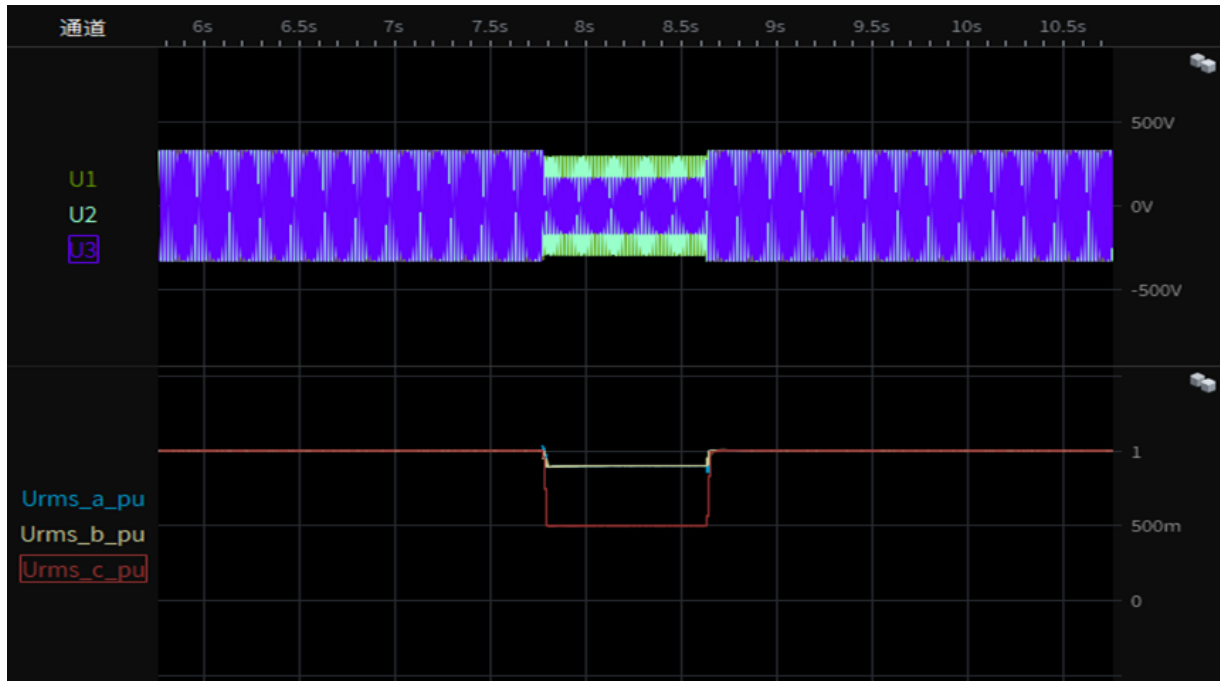
Test 3a-1-1.1 Depth of fault phase: 0.5p.u., two-phase-asymmetrical (type D), 20% load
Test overview(voltage,current,active and reactive power)



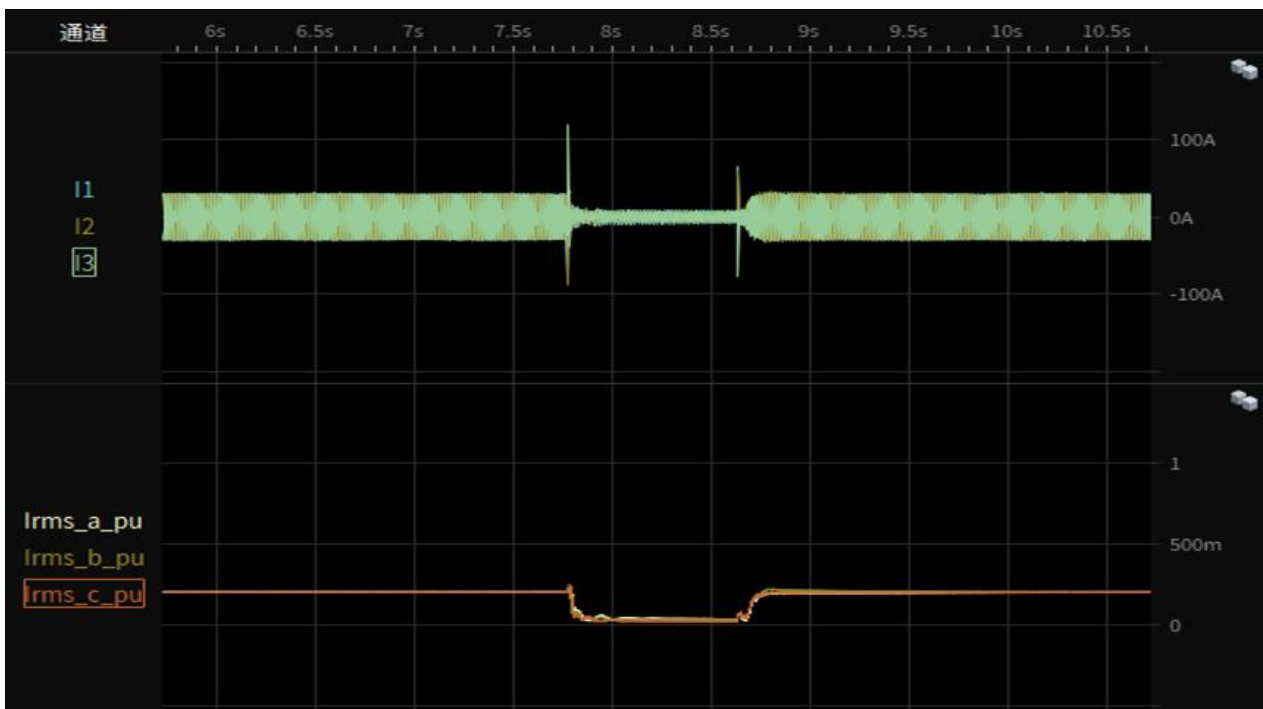
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 3a-1-1.2 Depth of fault phase: 0.5p.u., two-phase-asymmetrical (type D), 20% load
Instantaneous curve and RMS value of phase-to-neutral voltages



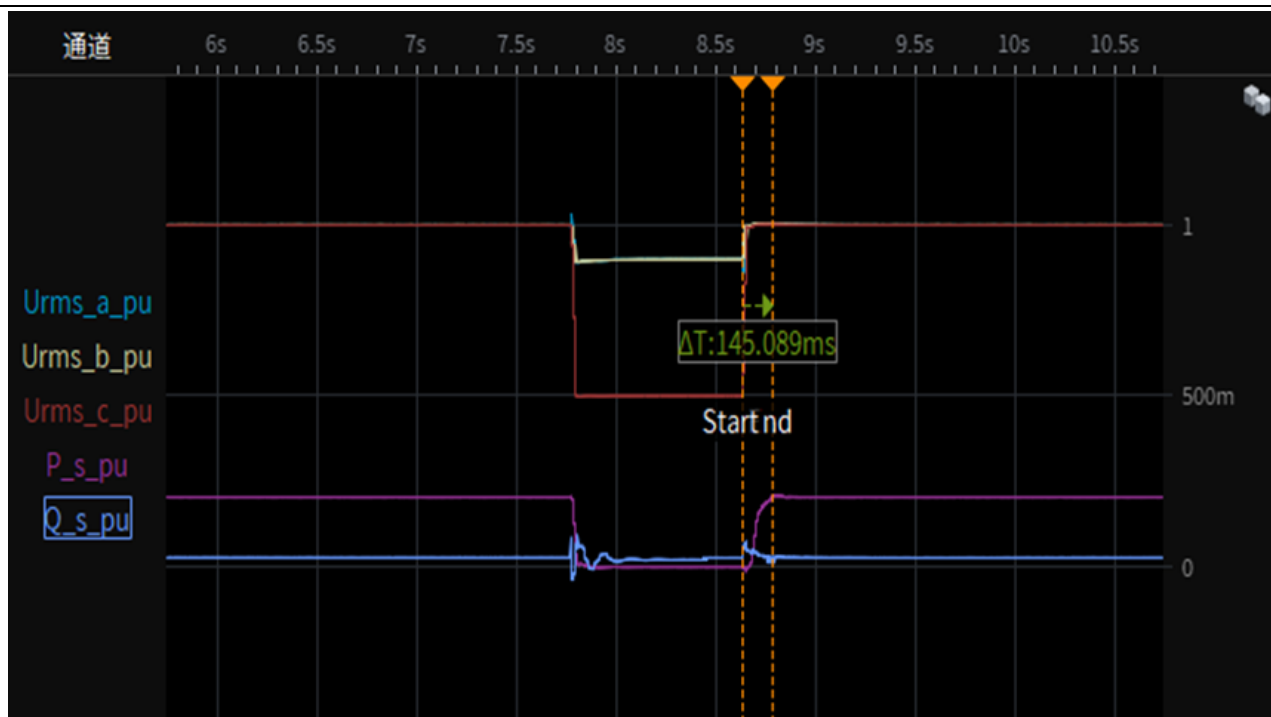
Test 3a-1-1.3 Depth of fault phase: 0.5p.u., two-phase-asymmetrical (type D), 20% load
Instantaneous curve and RMS value of phase currents



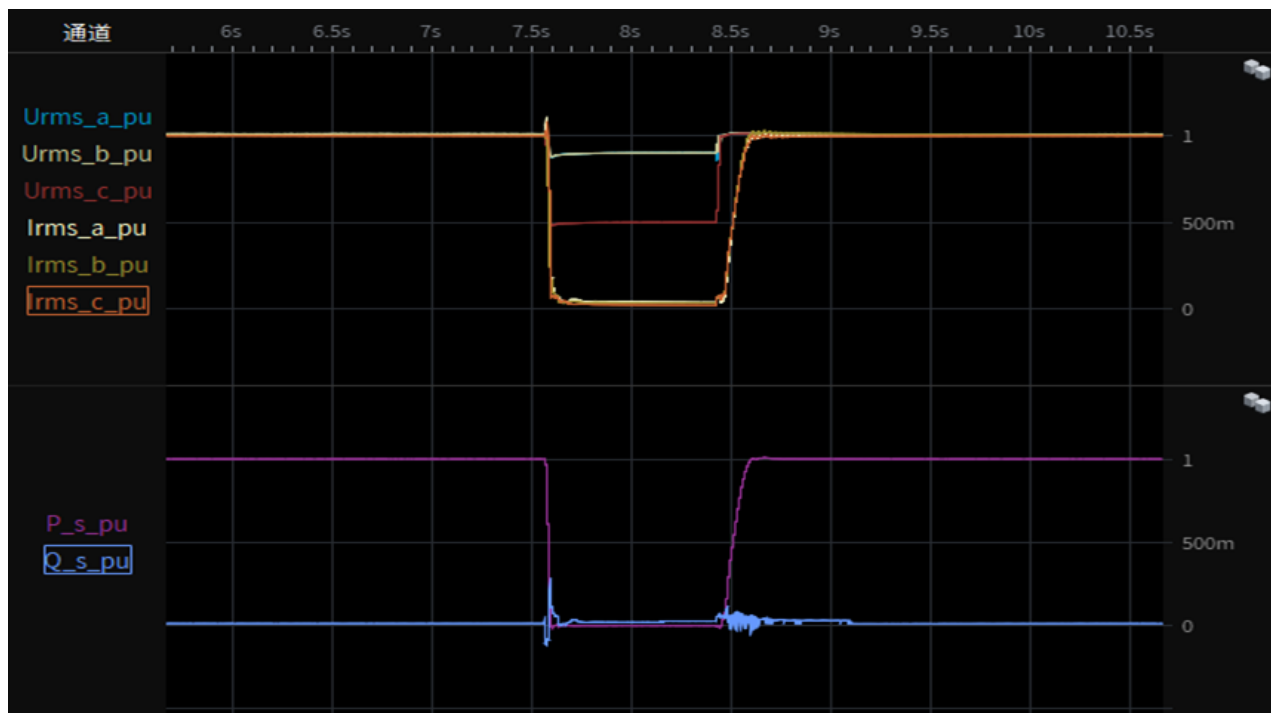
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 3a-1-1.4 Depth of fault phase: 0.5p.u., two-phase-asymmetrical (type D),
20% load restoring time



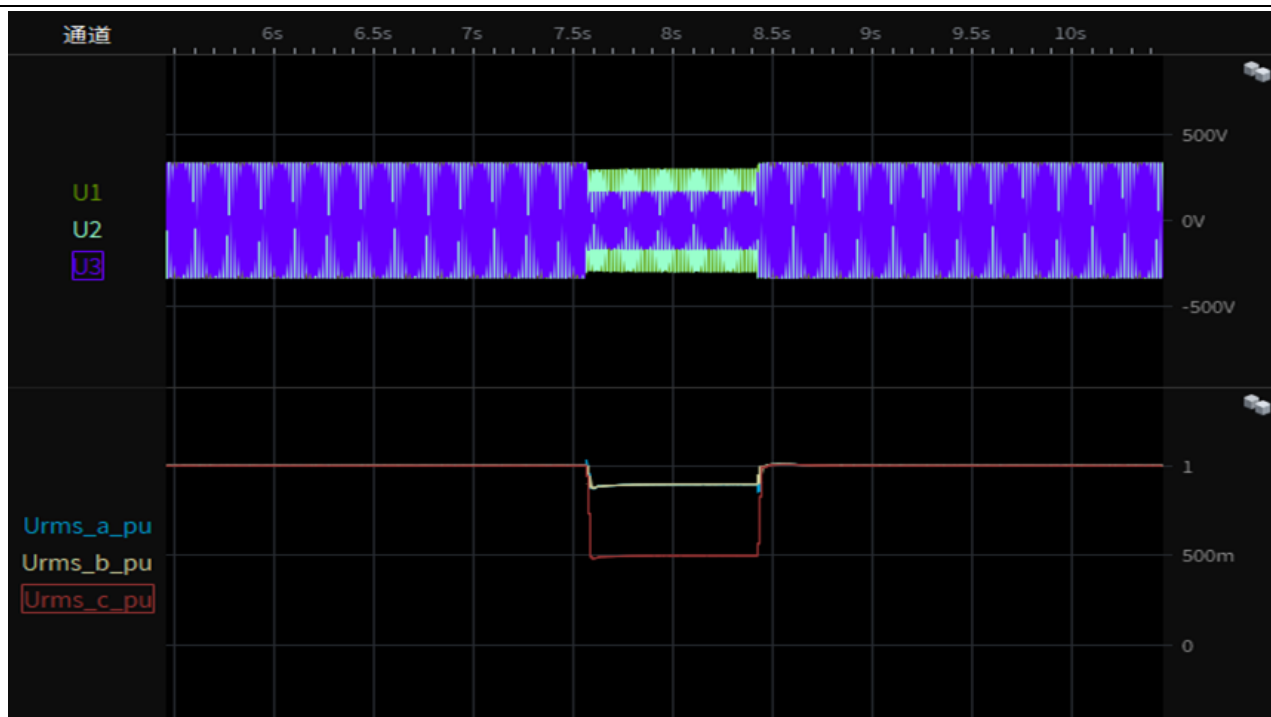
Test 3a-2-1.1 Depth of fault phase: 0.5p.u., two-phase-asymmetrical (type D), 95% load
Test overview(voltage,current,active and reactive power)



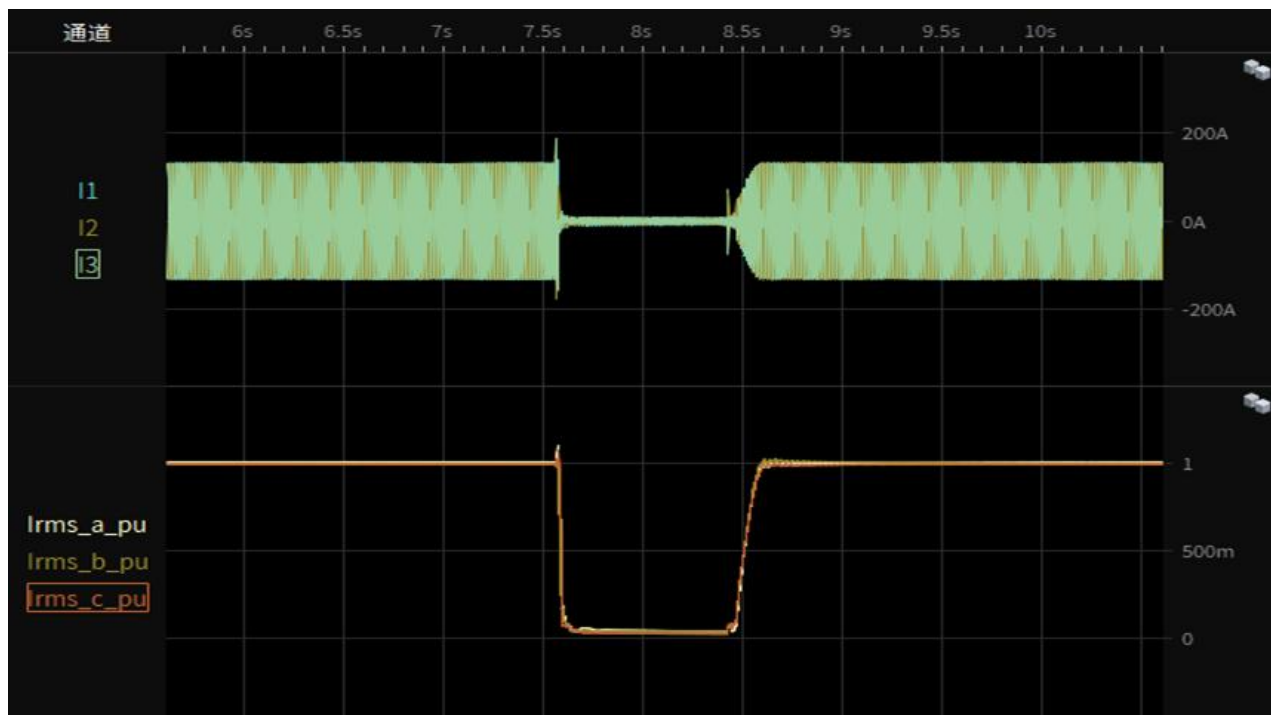
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 3a-2-1.2 Depth of fault phase: 0.5p.u., two-phase-asymmetrical (type D), 95% load
Instantaneous curve and RMS value of phase-to-neutral voltages



Test 3a-2-1.3 Depth of fault phase: 0.5p.u., two-phase-asymmetrical (type D), 95% load
Instantaneous curve and RMS value of phase currents



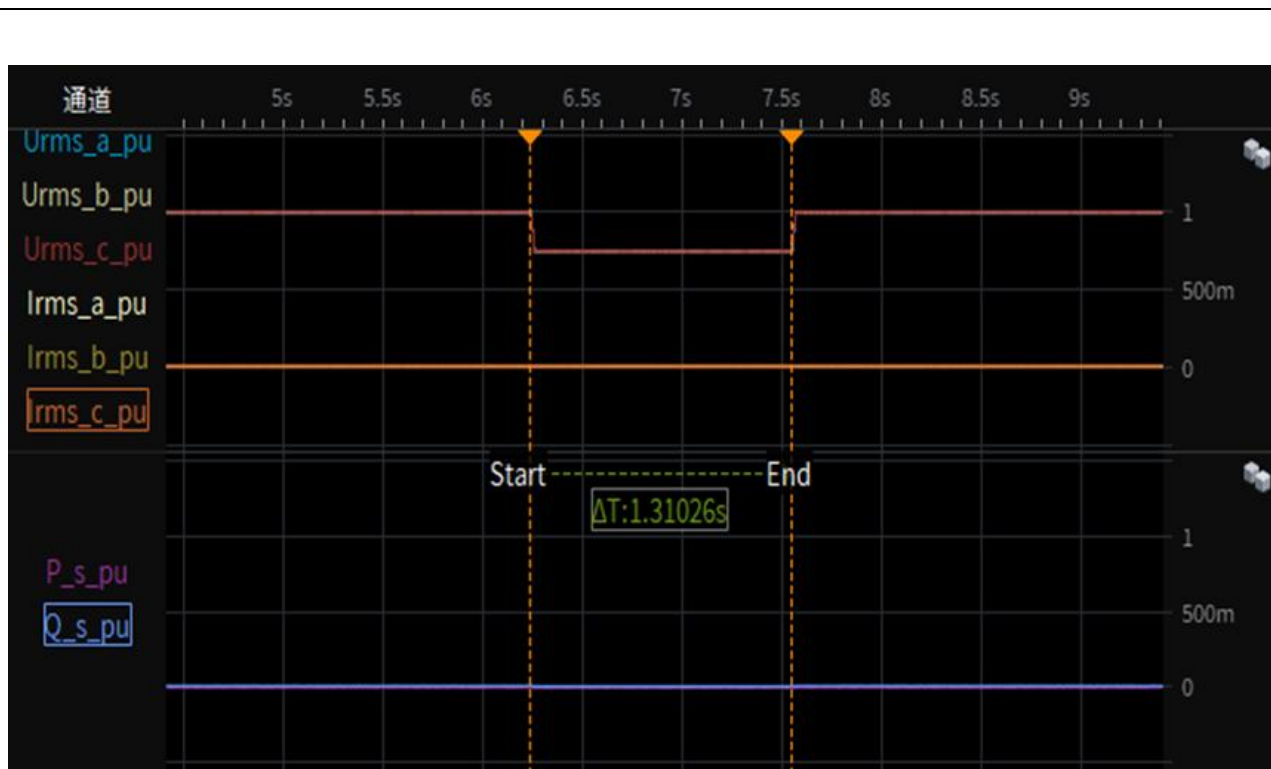
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 3a-2-1.4 Depth of fault phase: 0.5p.u., two-phase-asymmetrical (type D), 95% load restoring time



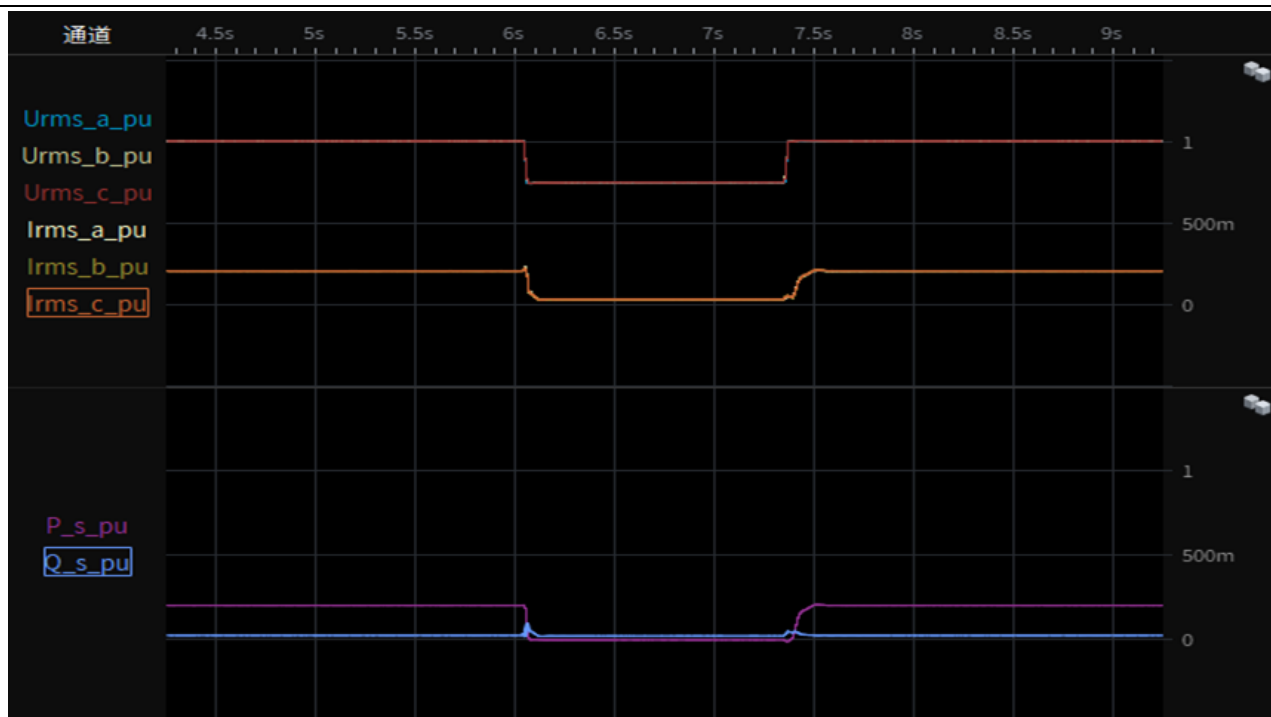
Test 4s-1.1 Depth of fault phase: 0.75p.u., three-phase-symmetrical (type A), 0% load Test overview(voltage,current,active and reactive power)



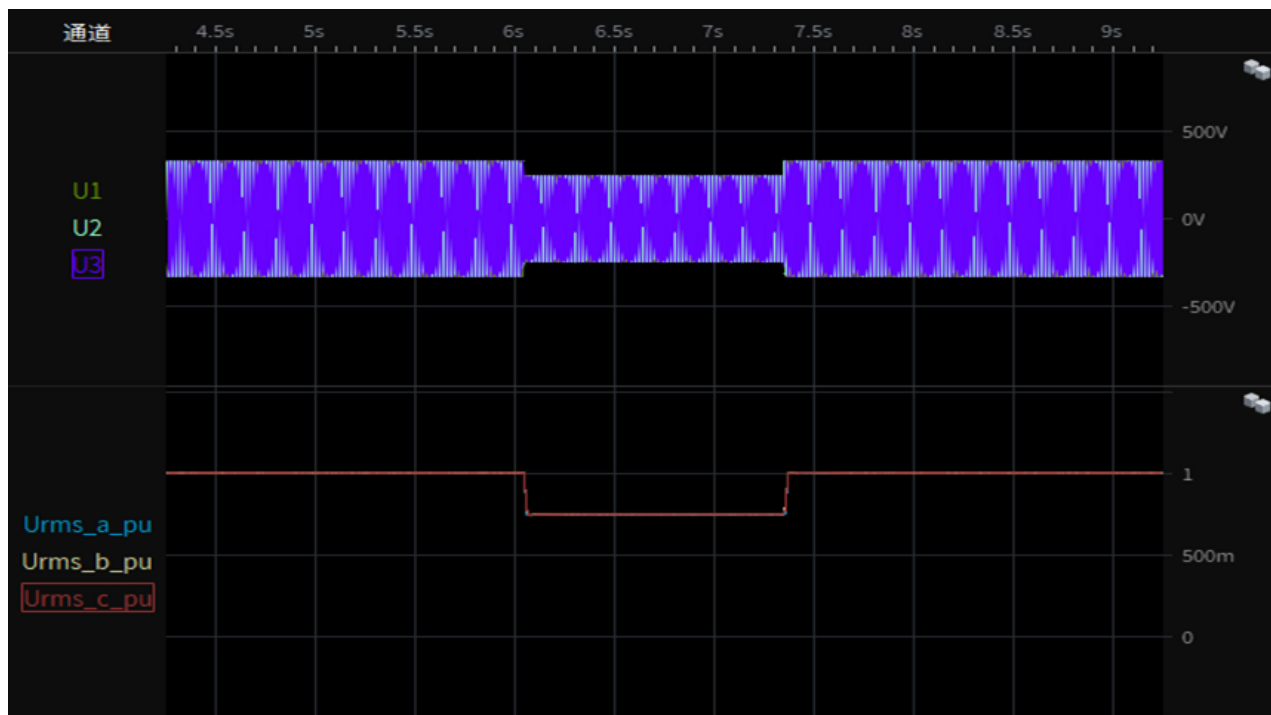
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 4s-1-1.1 Depth of fault phase: 0.75p.u., three-phase-symmetrical (type A), 20% load
 Test overview(voltage,current,active and reactive power)



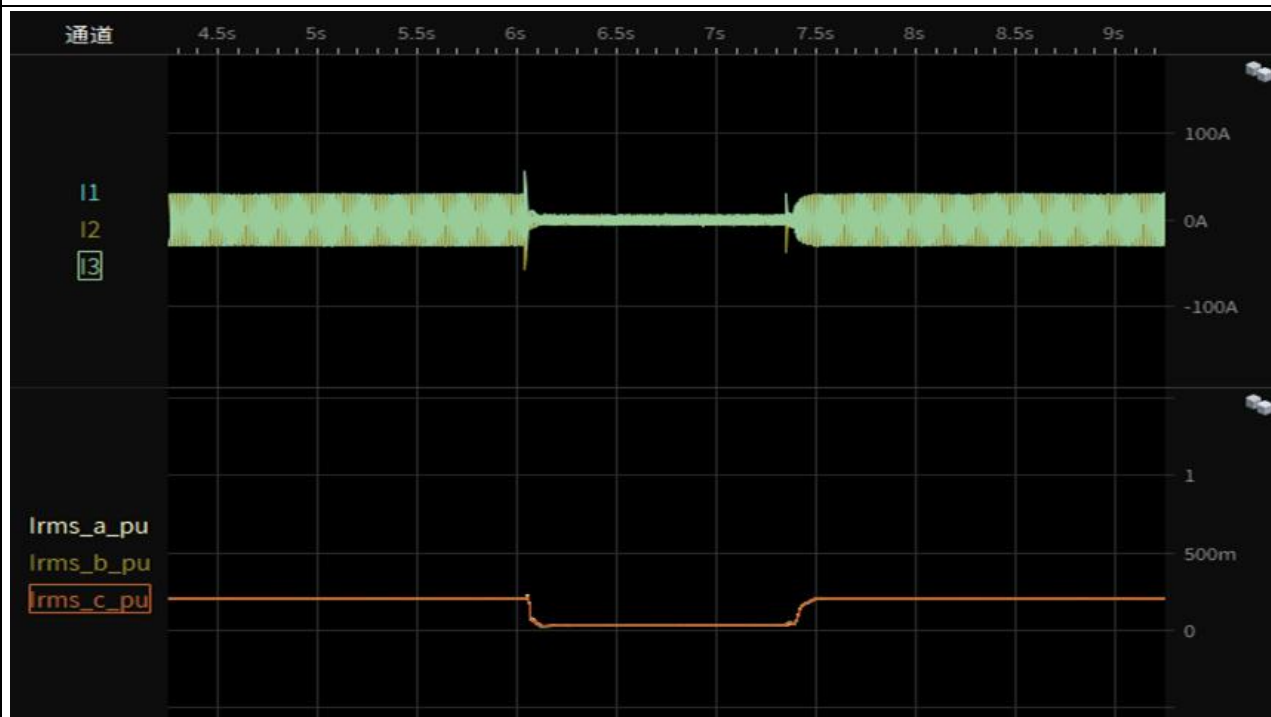
Test 4s-1-1.2 Depth of fault phase: 0.75p.u., three-phase-symmetrical (type A), 20% load
 Instantaneous curve and RMS value of phase-to-neutral voltages



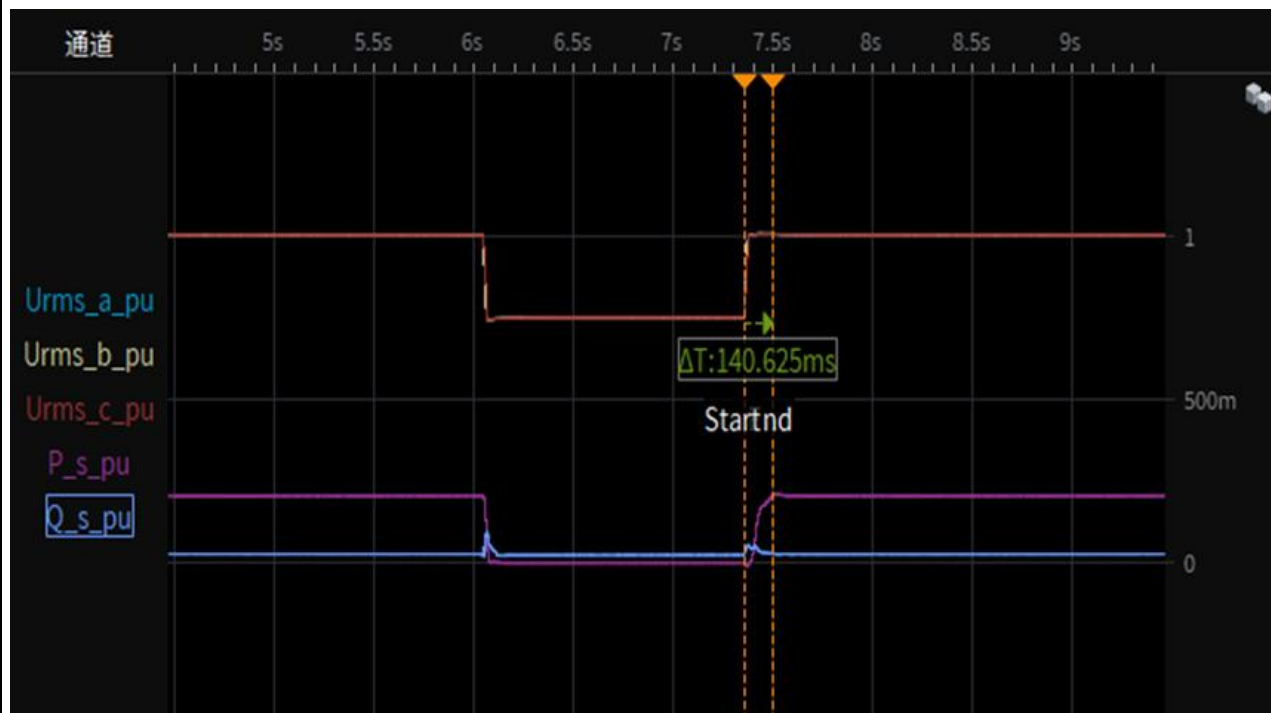
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 4s-1-1.3 Depth of fault phase: 0.75p.u., three-phase-symmetrical (type A), 20% load
Instantaneous curve and RMS value of phase currents



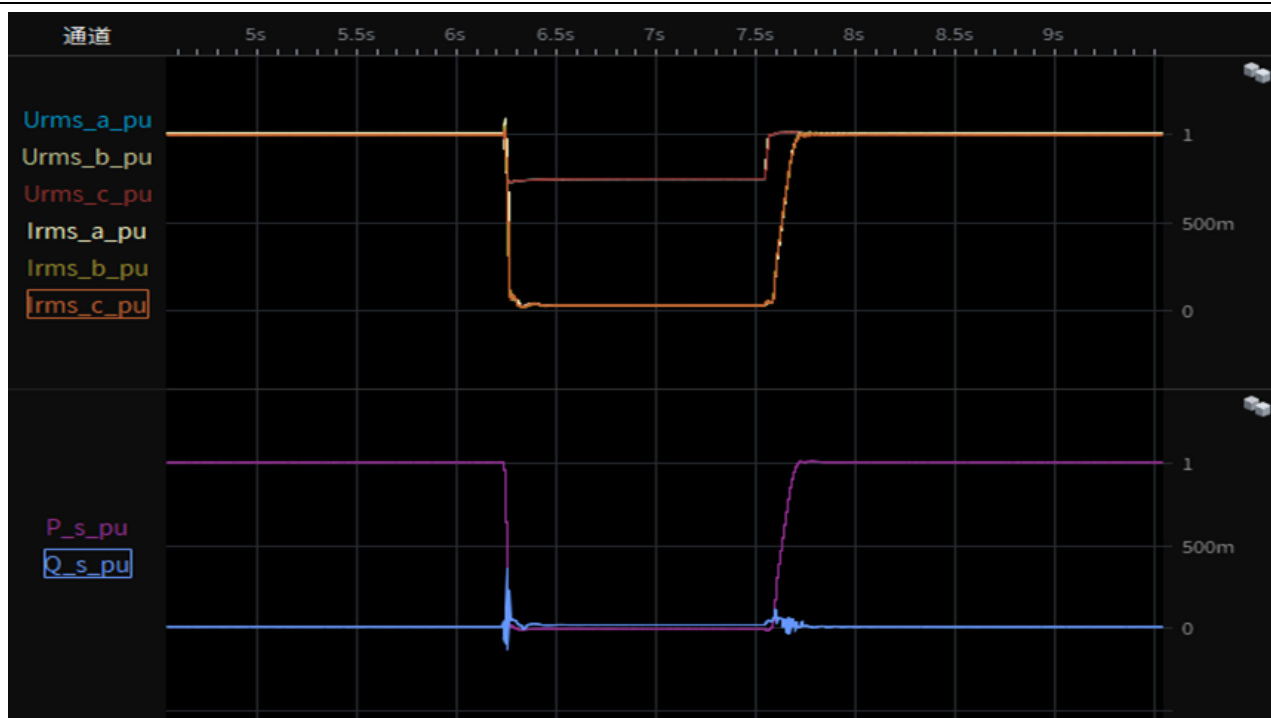
Test 4s-1-1.4 Depth of fault phase: 0.75p.u., three-phase-symmetrical (type A),
20% load restoring time



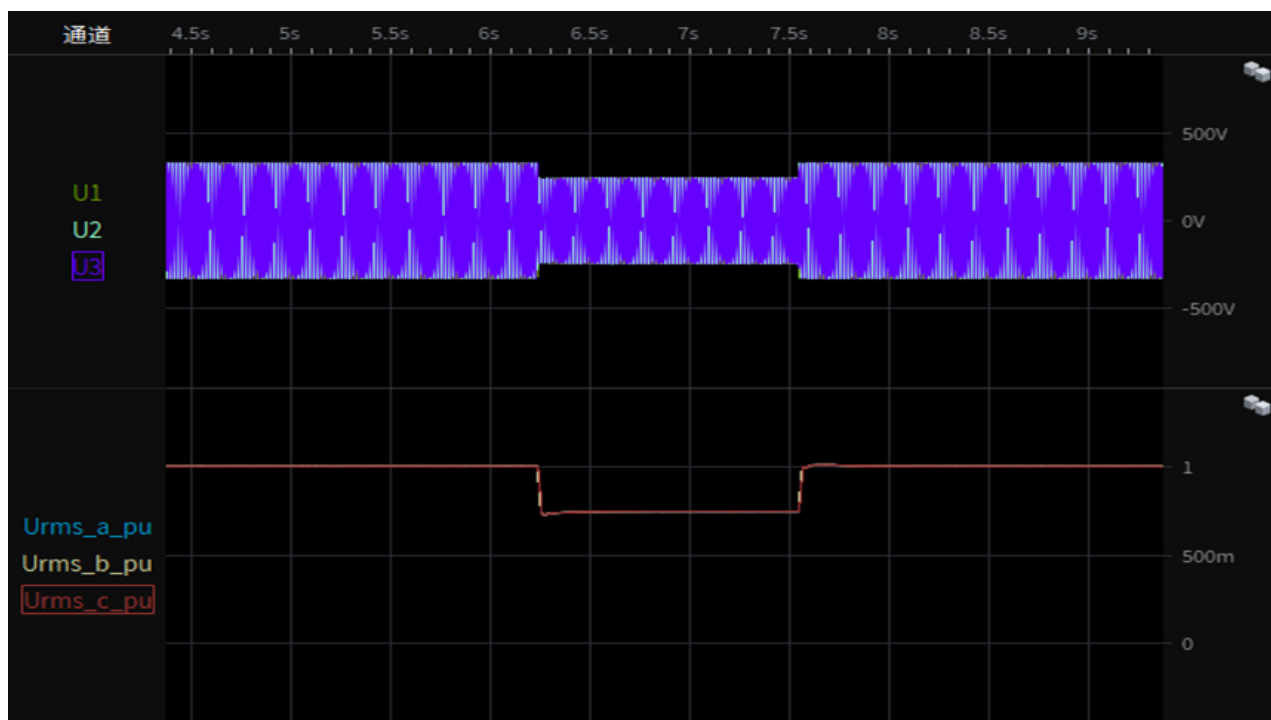
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 4s-2-1.1 Depth of fault phase: 0.75p.u., three-phase-symmetrical (type A), 95% load
 Test overview(voltage,current,active and reactive power)



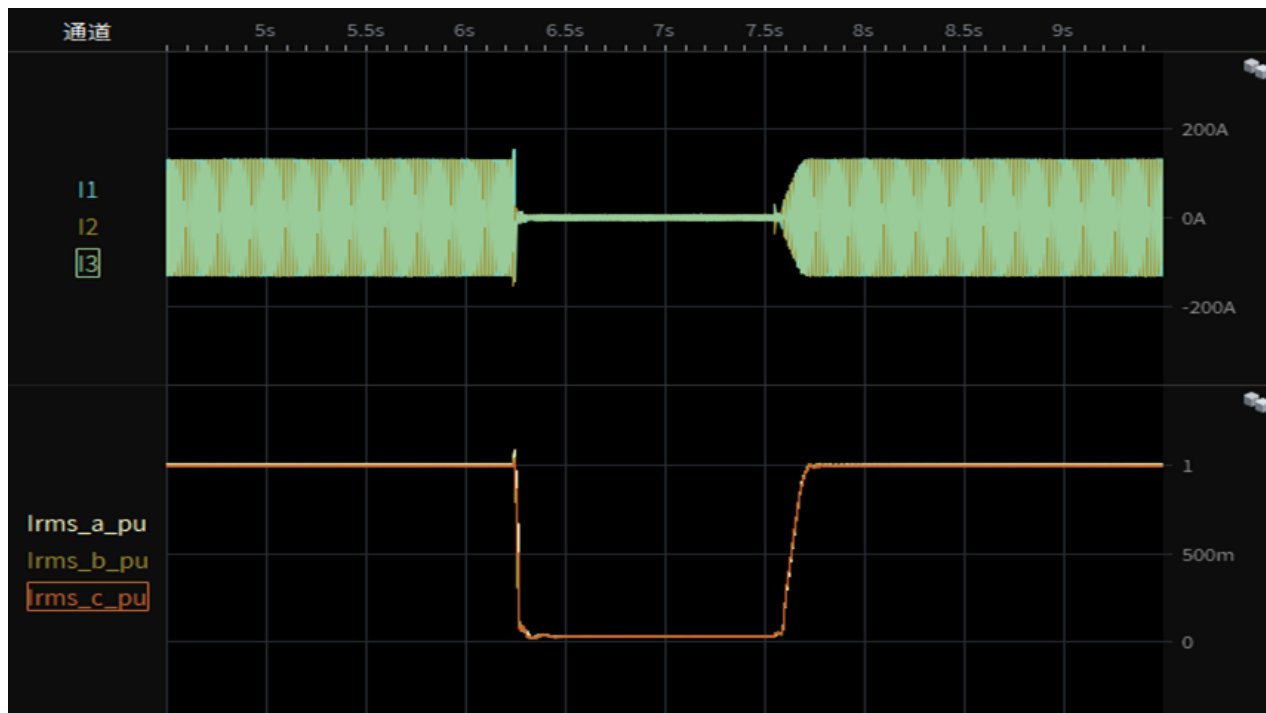
Test 4s-2-1.2 Depth of fault phase: 0.75p.u., three-phase-symmetrical (type A), 95% load
 Instantaneous curve and RMS value of phase-to-neutral voltages



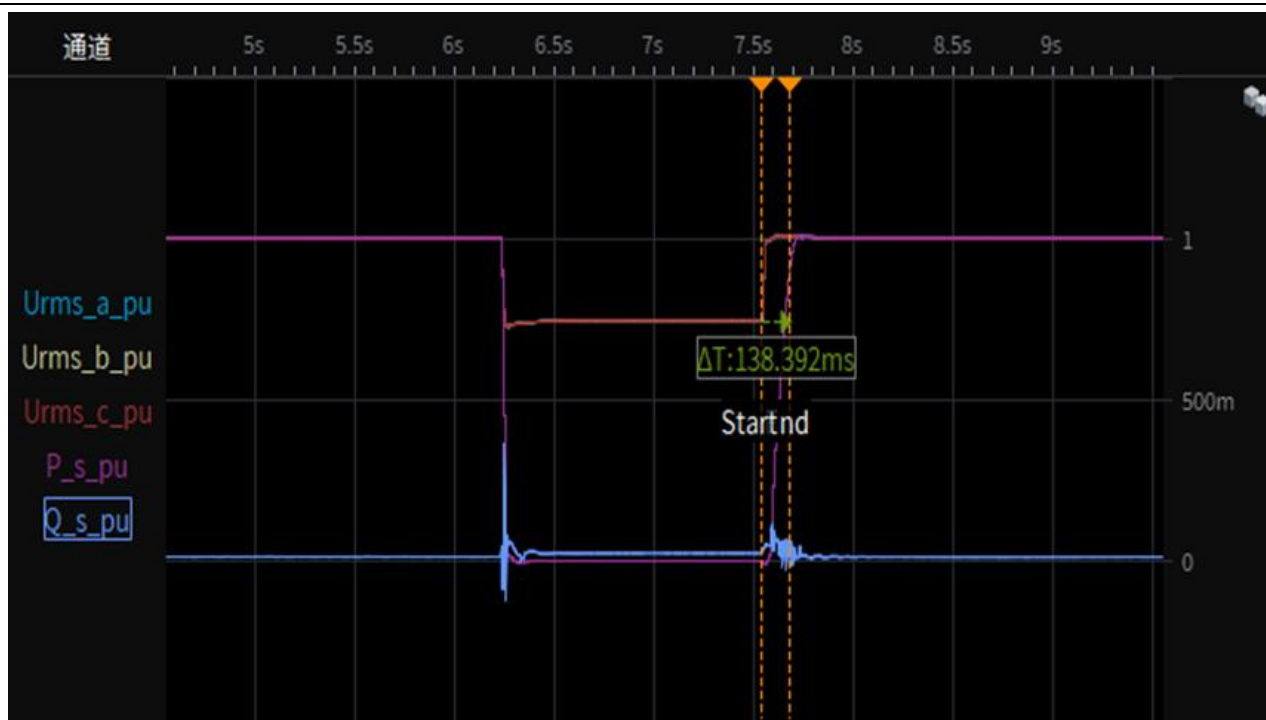
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 4s-2-1.3 Depth of fault phase: 0.75p.u., three-phase-symmetrical (type A), 95% load
Instantaneous curve and RMS value of phase currents



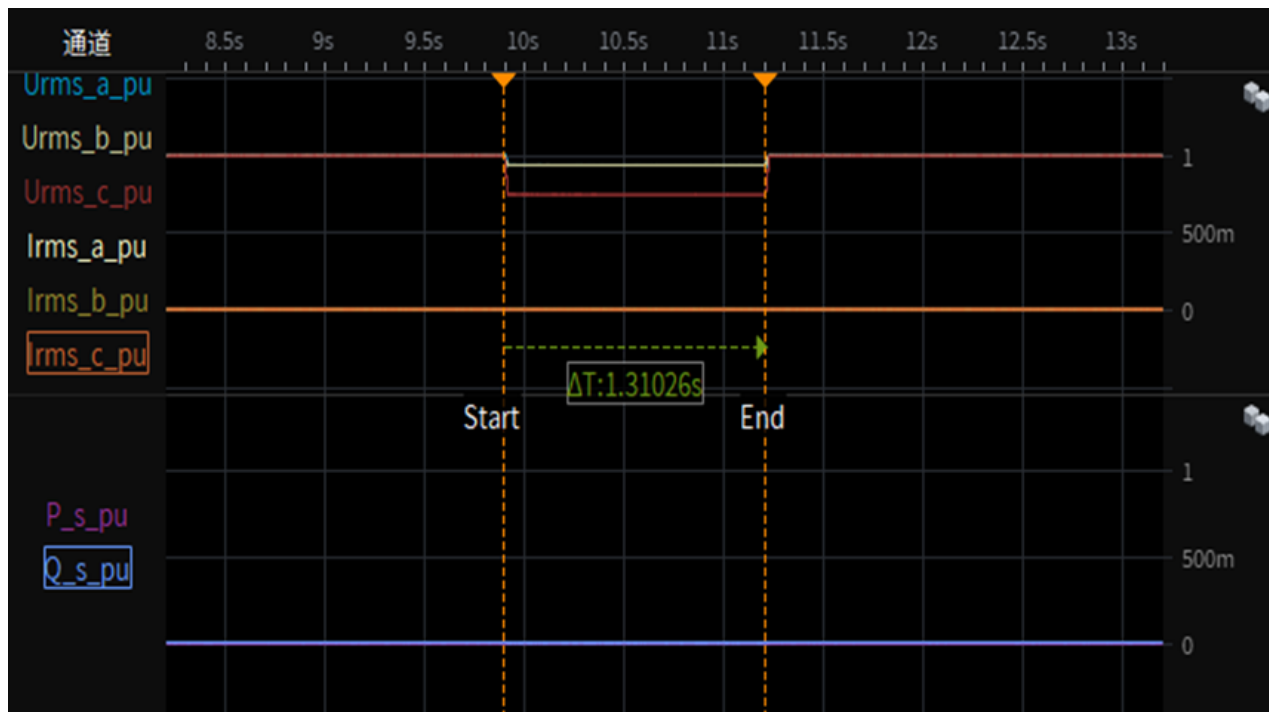
Test 4s-2-1.4 Depth of fault phase: 0.75p.u., three-phase-symmetrical (type A),
95% load restoring time



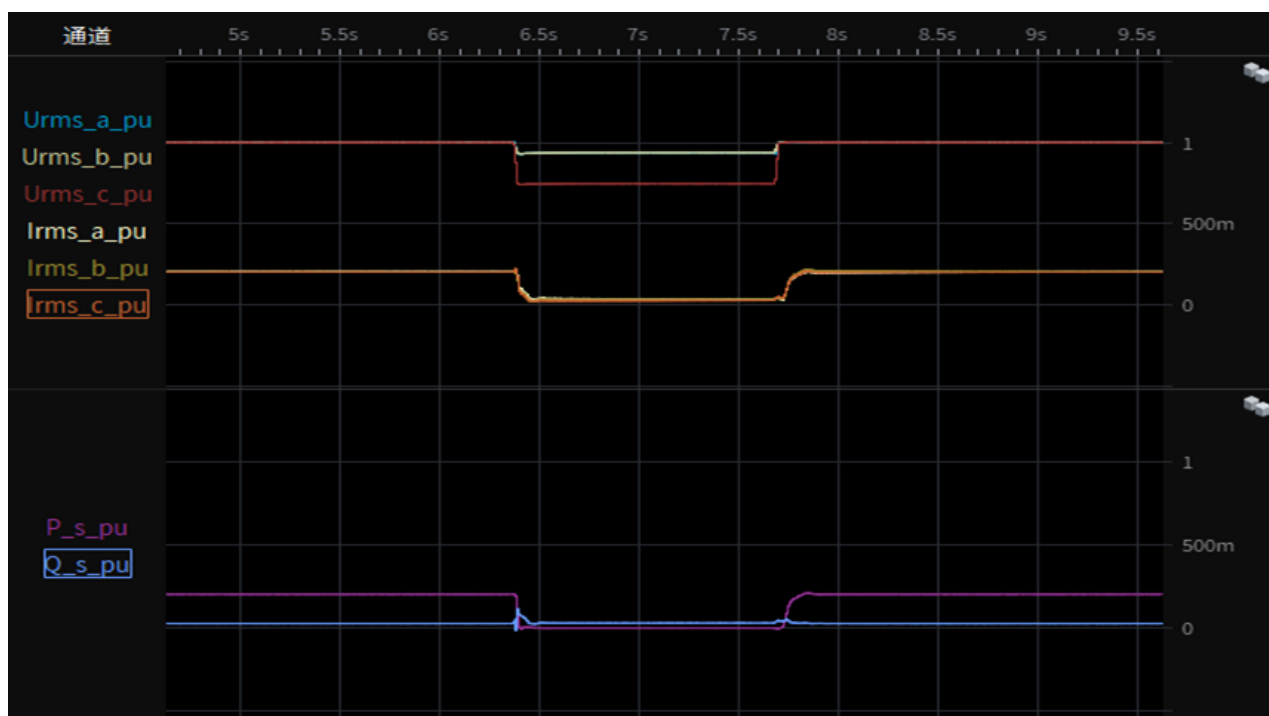
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 4a-1.1 Depth of fault phase: 0.75p.u., two-phase-asymmetrical (type D), 0% load
Test overview(voltage,current,active and reactive power)



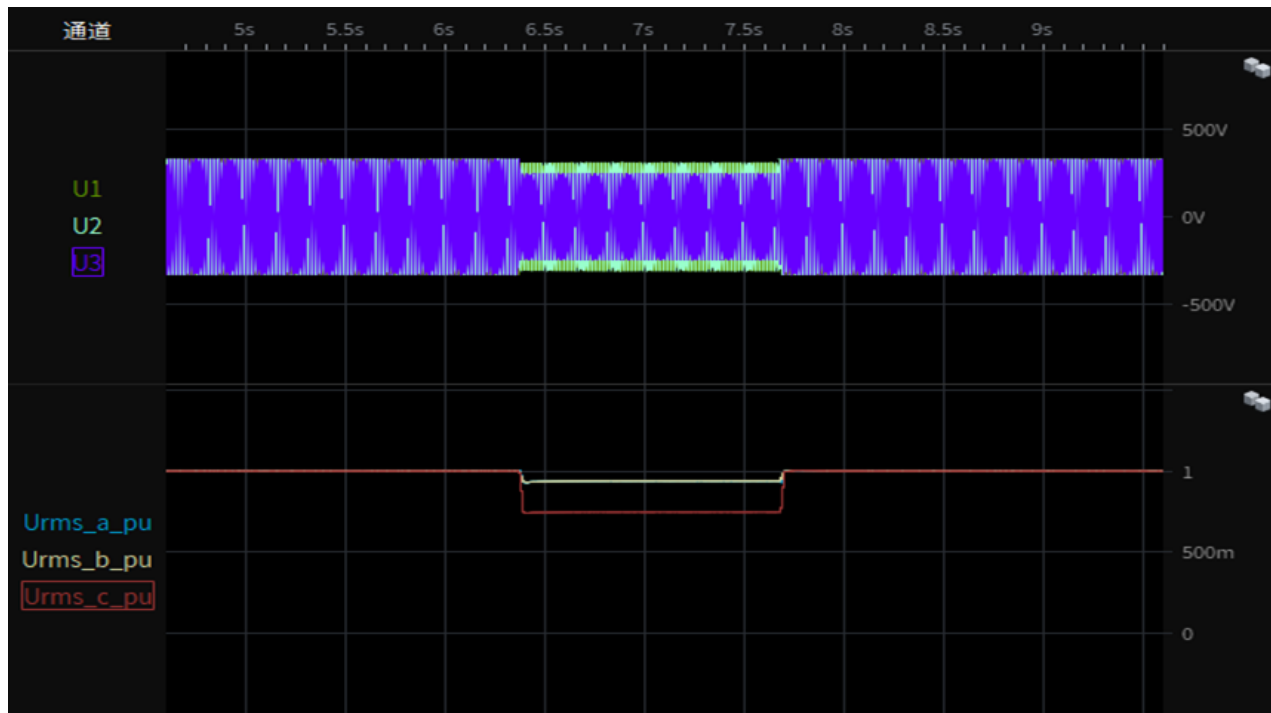
Test 4a-1-1.1 Depth of fault phase: 0.75p.u., two-phase-asymmetrical (type D), 20% load
Test overview(voltage,current,active and reactive power)



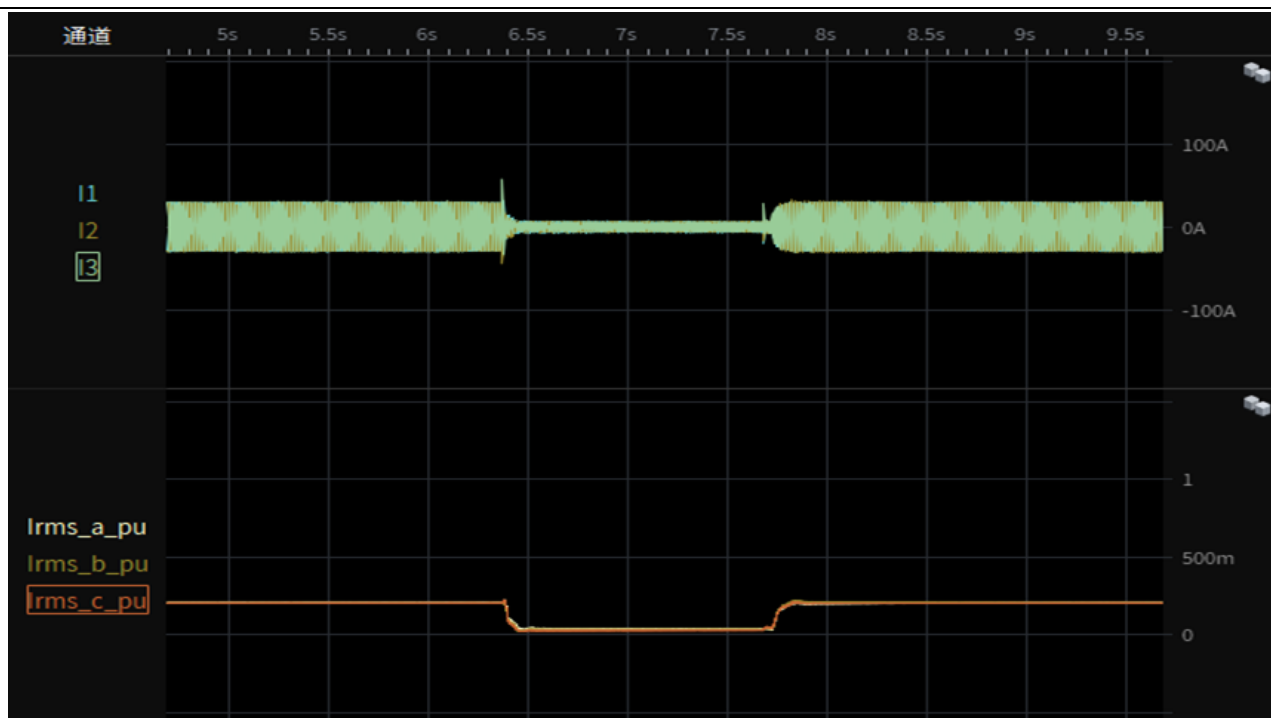
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 4a-1-1.2 Depth of fault phase: 0.75p.u., two-phase-asymmetrical (type D), 20% load
Instantaneous curve and RMS value of phase-to-neutral voltages



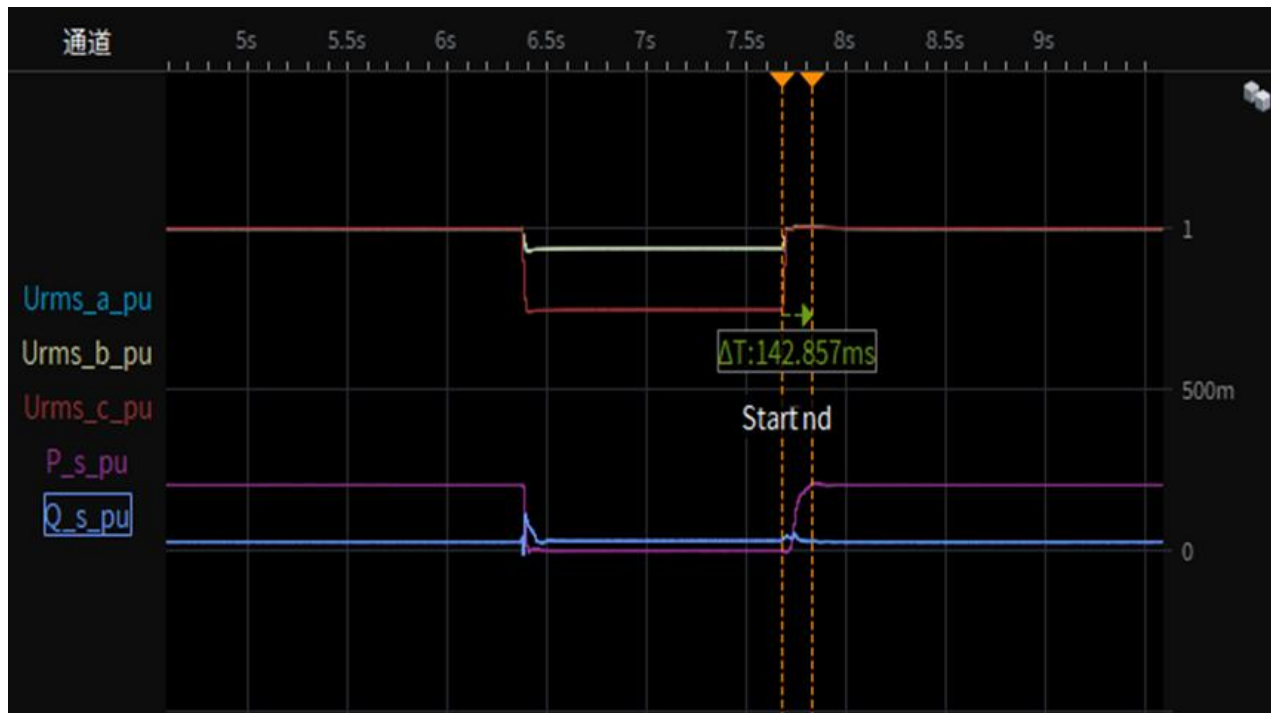
Test 4a-1-1.3 Depth of fault phase: 0.75p.u., two-phase-asymmetrical (type D), 20% load
Instantaneous curve and RMS value of phase currents



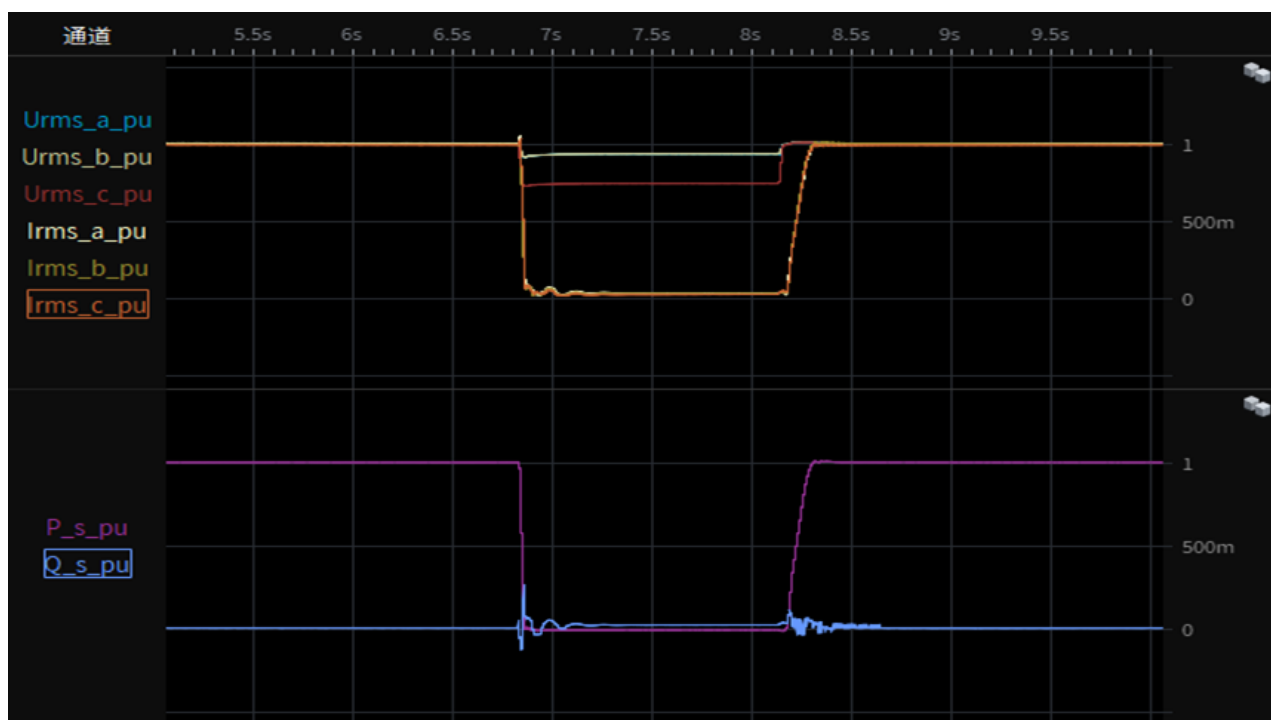
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 4a-1-1.4 Depth of fault phase: 0.75p.u., two-phase-asymmetrical (type D), 20% load restoring time



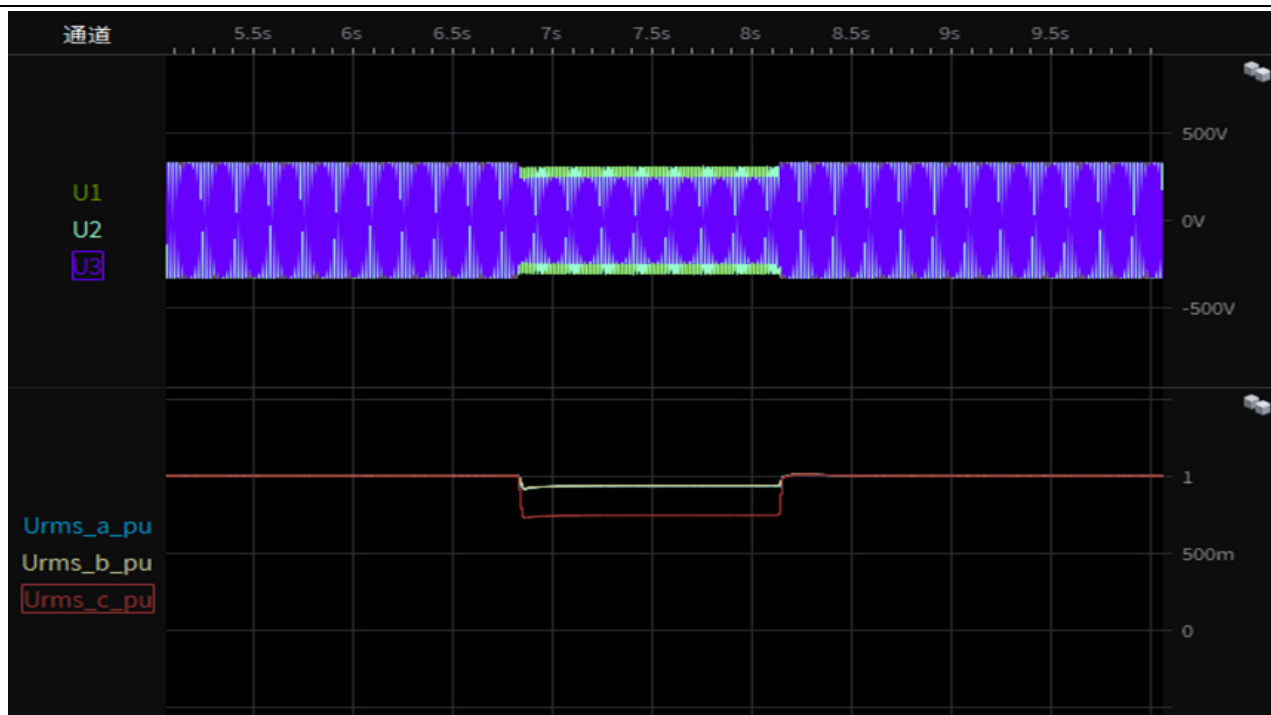
Test 4a-2-1.1 Depth of fault phase: 0.75p.u., two-phase-asymmetrical (type D), 95% load Test overview(voltage,current,active and reactive power)



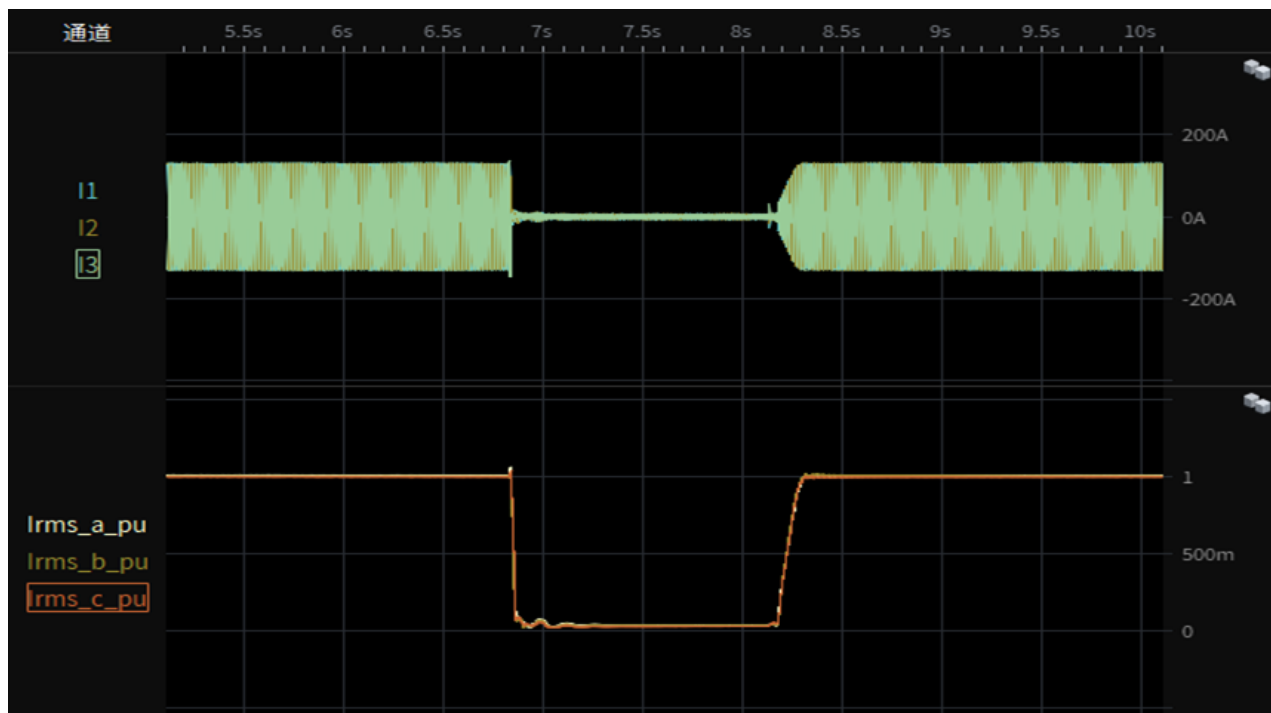
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 4a-2-1.2 Depth of fault phase: 0.75p.u., two-phase-asymmetrical (type D), 95% load
Instantaneous curve and RMS value of phase-to-neutral voltages



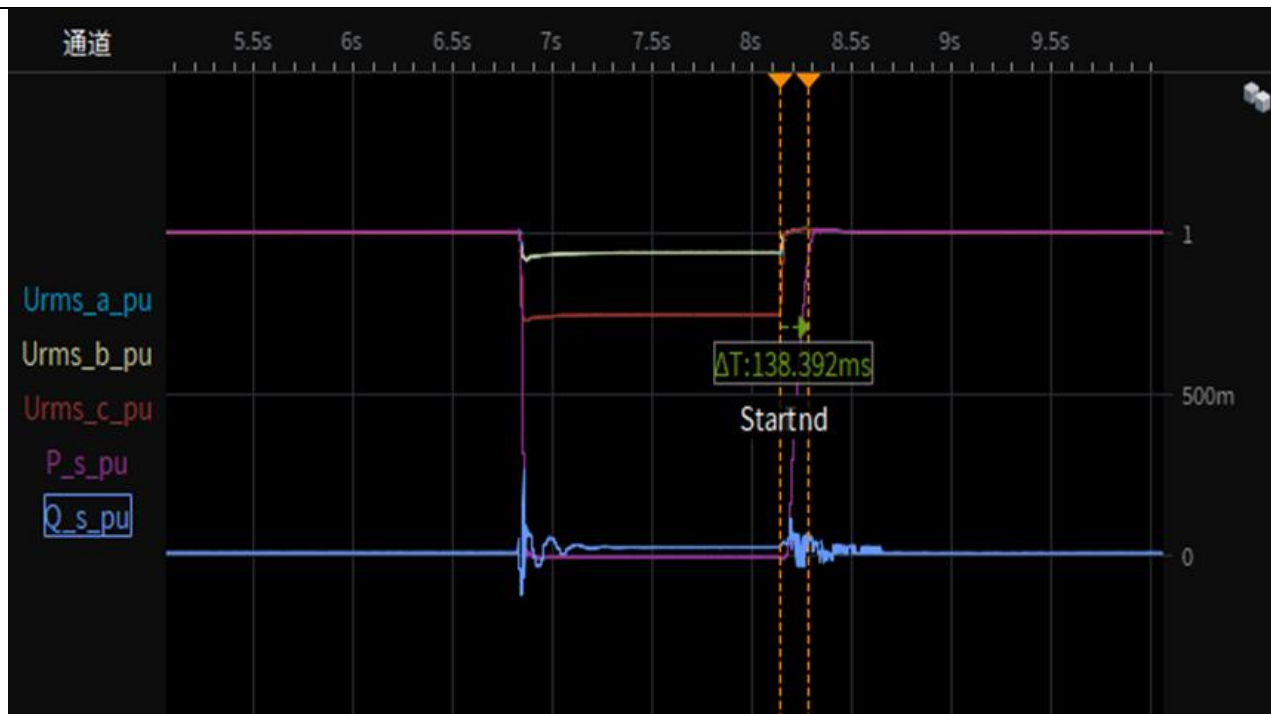
Test 4a-2-1.3 Depth of fault phase: 0.75p.u., two-phase-asymmetrical (type D), 95% load
Instantaneous curve and RMS value of phase currents



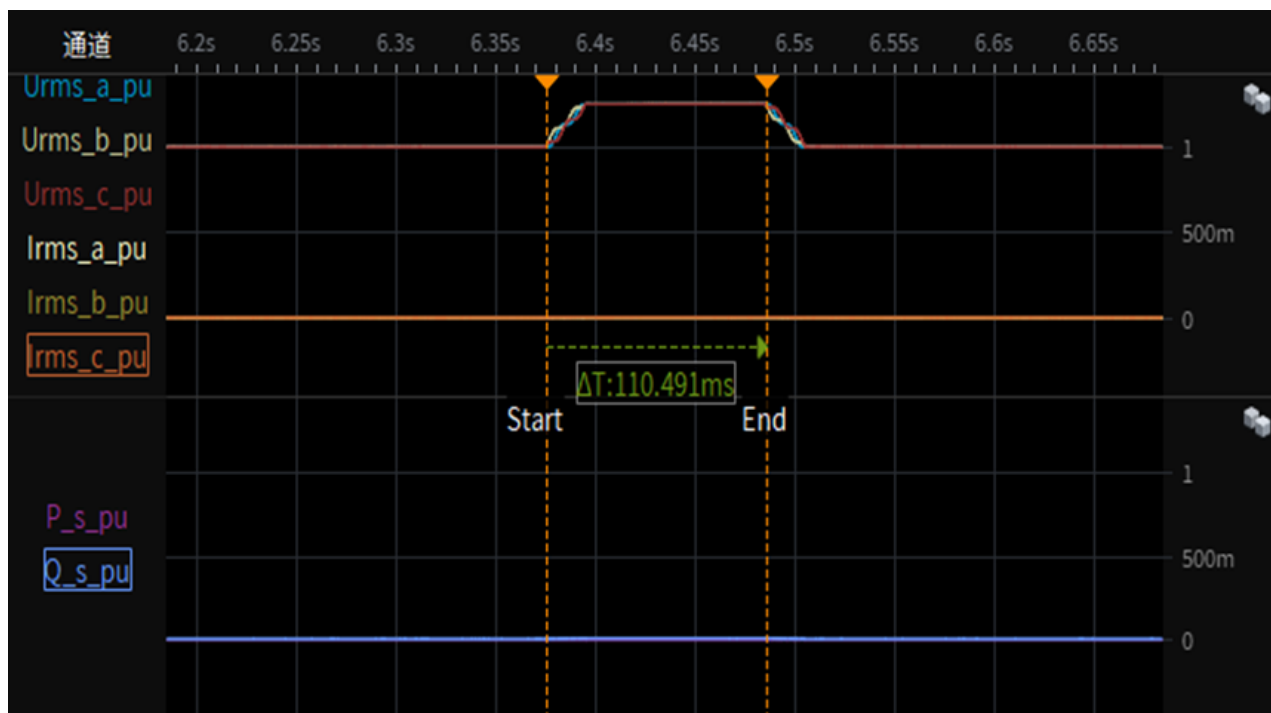
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 4a-2-1.4 Depth of fault phase: 0.75p.u., two-phase-asymmetrical (type D), 95% load restoring time



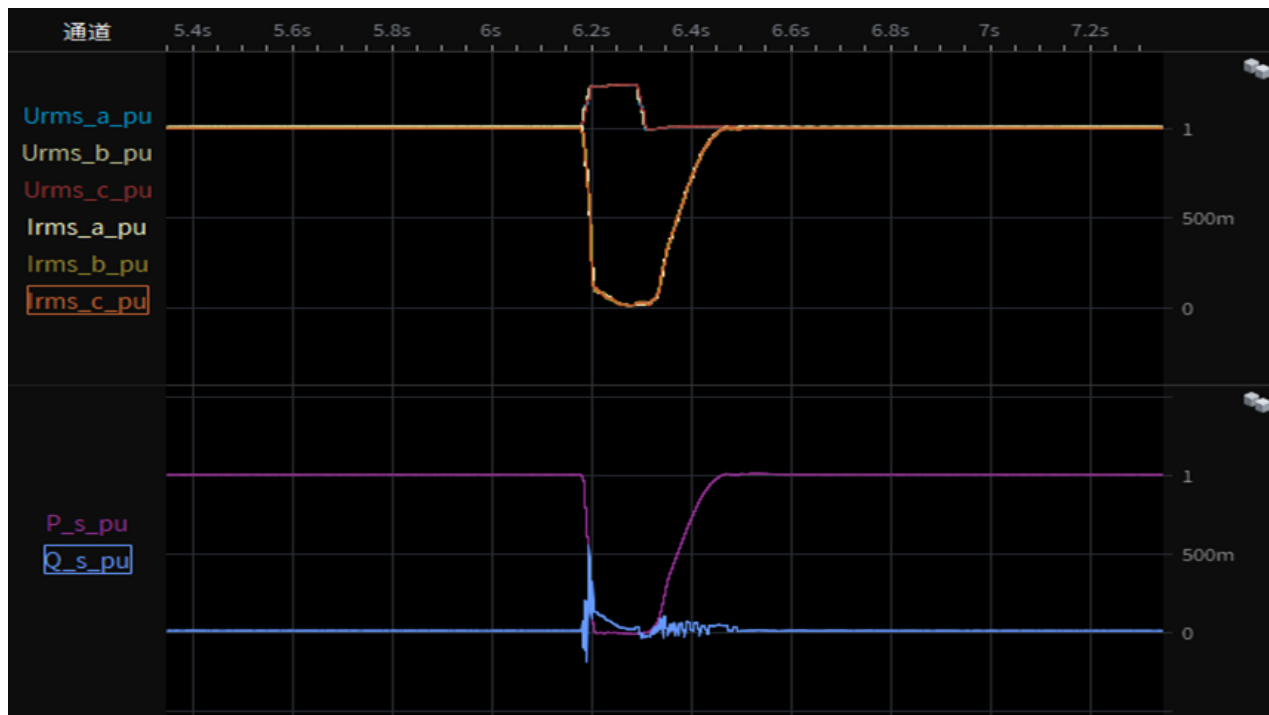
Test 5s-1.1 Depth of fault phase: 1.25p.u., HV three-phase symmetrical (type A), 0% load Test overview(voltage,current,active and reactive power)



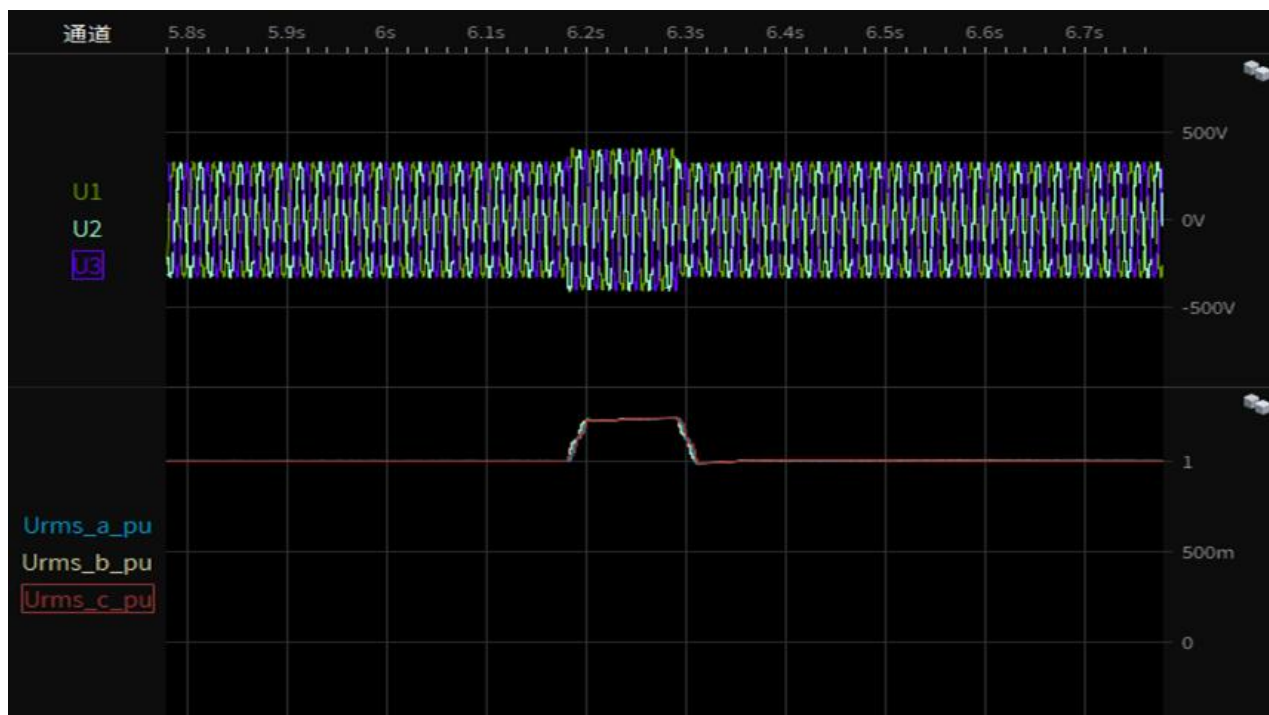
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 5s-1-1.1 Depth of fault phase: 1.25p.u., HV three-phase symmetrical (type A), 95% load
Test overview(voltage,current,active and reactive power)



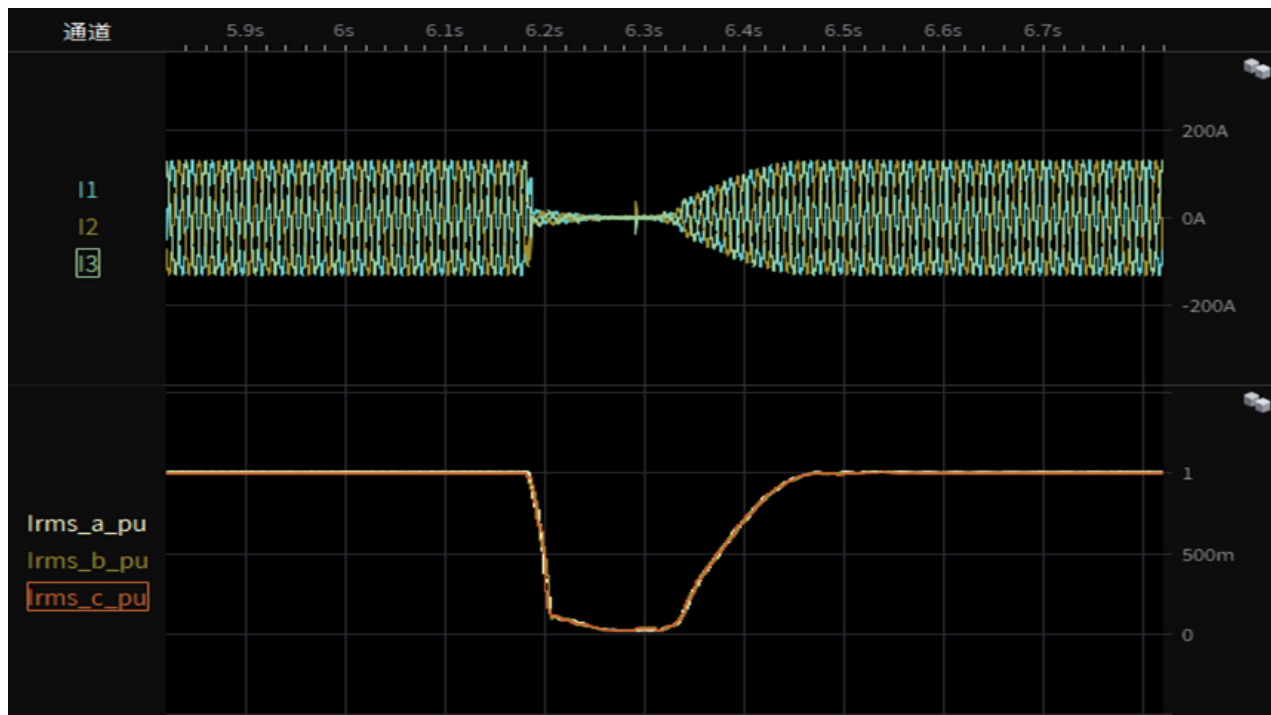
Test 5s-1-1.2 Depth of fault phase: 1.25p.u., HV three-phase symmetrical (type A), 95% load
Instantaneous curve and RMS value of phase-to-neutral voltages



CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 5s-1-1.3 Depth of fault phase: 1.25p.u., HV three-phase symmetrical (type A), 95% load
Instantaneous curve and RMS value of phase currents



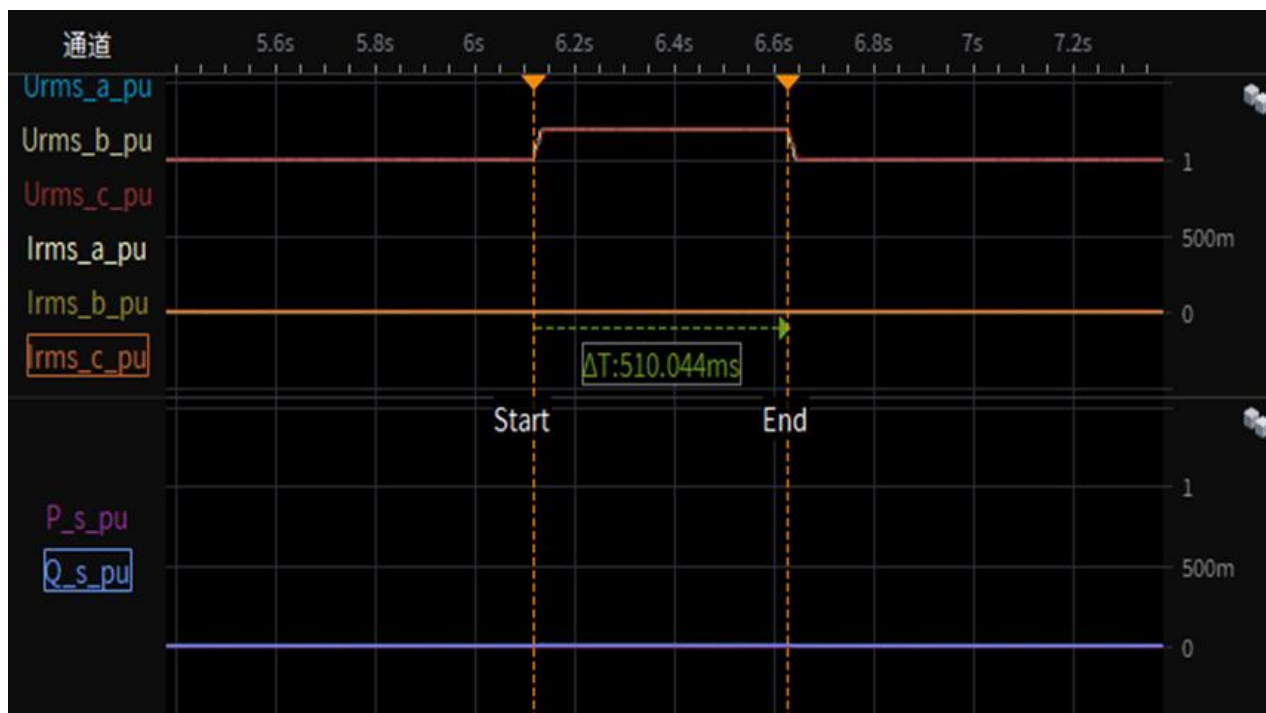
Test 5s-1-1.4 Depth of fault phase: 1.25p.u., HV three-phase symmetrical (type A),
95% load restoring time



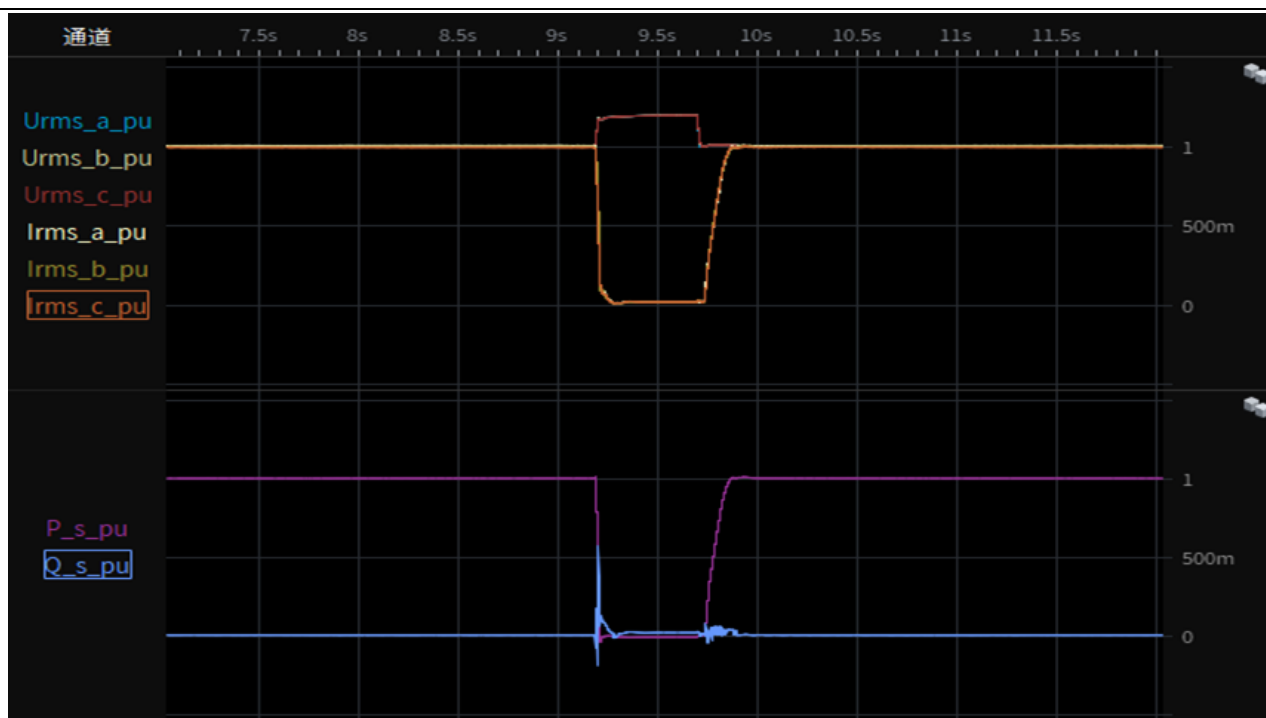
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 6s-1.1 Depth of fault phase: 1.20p.u., HV three-phase symmetrical (type A), 0% load
 Test overview(voltage,current,active and reactive power)



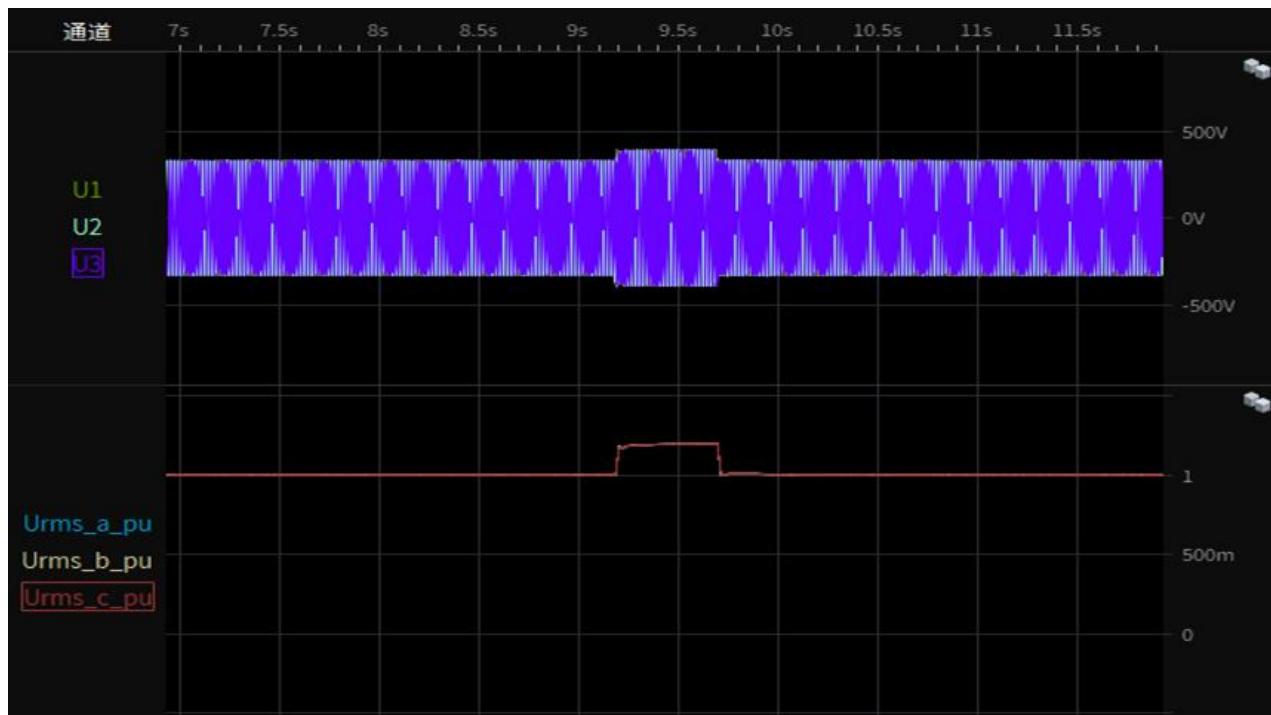
Test 6s-1-1.1 Depth of fault phase: 1.20p.u., HV three-phase symmetrical (type A), 95% load
 Test overview(voltage,current,active and reactive power)



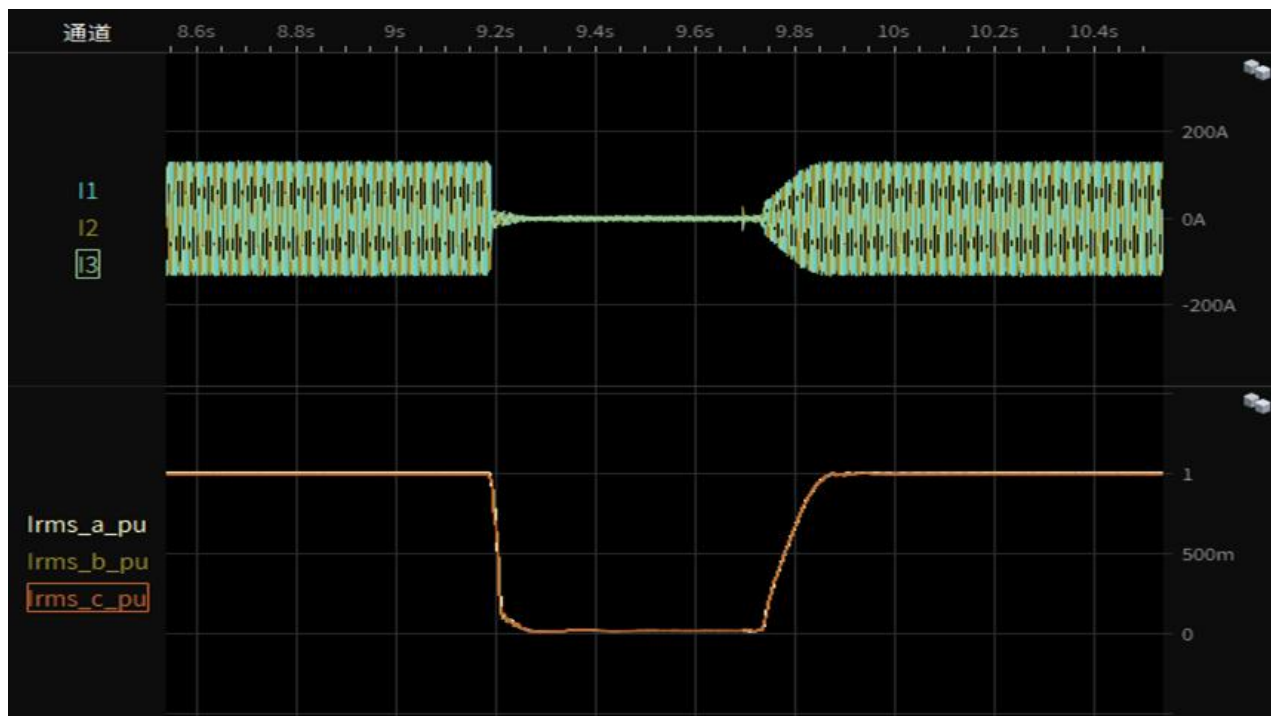
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 6s-1-1.2 Depth of fault phase: 1.20p.u., HV three-phase symmetrical (type A), 95% load
Instantaneous curve and RMS value of phase-to-neutral voltages



Test 6s-1-1.3 Depth of fault phase: 1.20p.u., HV three-phase symmetrical (type A), 95% load
Instantaneous curve and RMS value of phase currents



CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Test 6s-1-1.4 Depth of fault phase: 1.20p.u., HV three-phase symmetrical (type A), 95% load restoring time



CEI 0-16

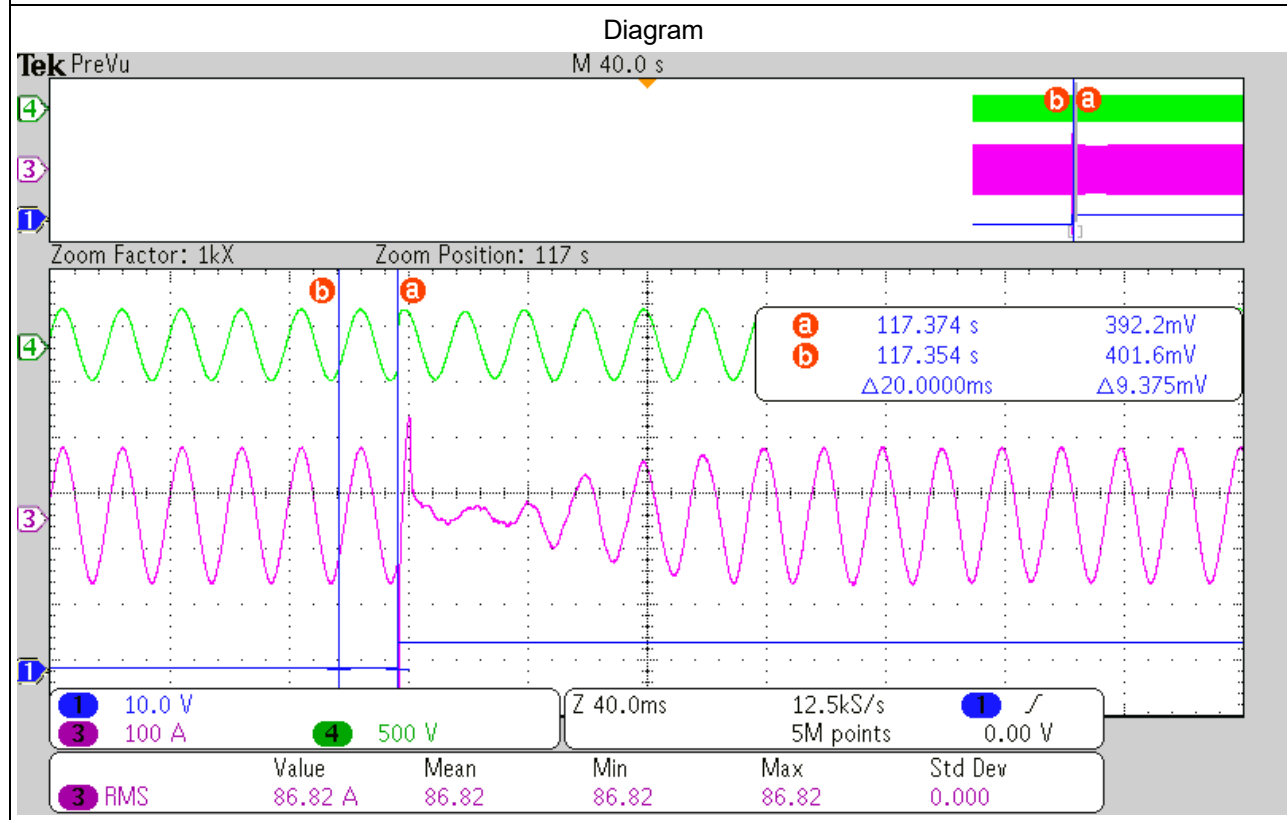
Clause	Requirement - Test	Result - Remark	Verdict
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Nbis.9	Tabella: Verifica della insensibilità alle richiuse automatiche in discordanza di fase Table: Verification of insensitivity to mismatch in phase automatic reclosing		P
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Test condition		Test result	Limit
P/P _n	Phase shift angle [°]		
100%*	90	The PV inverter continue to feed power to grid after phase angle shift has been performed. No damage, no hazard.	The EUT must not be damaged following the tests. Switching off and tripping of any protections are allowed.
100%*	180	The inverter is protected off the grid after performing the phase angle conversion and then reconnected to the grid to continue supplying power to the grid. No damage, no danger.	

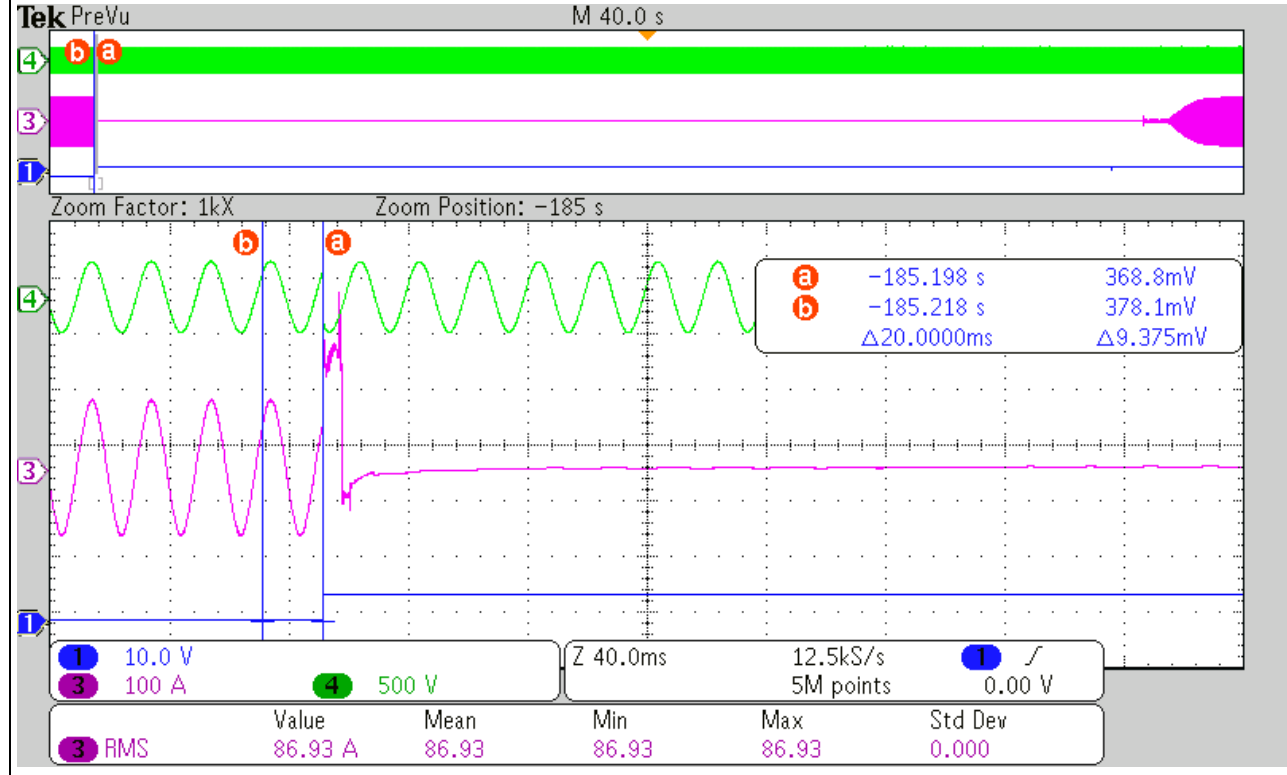
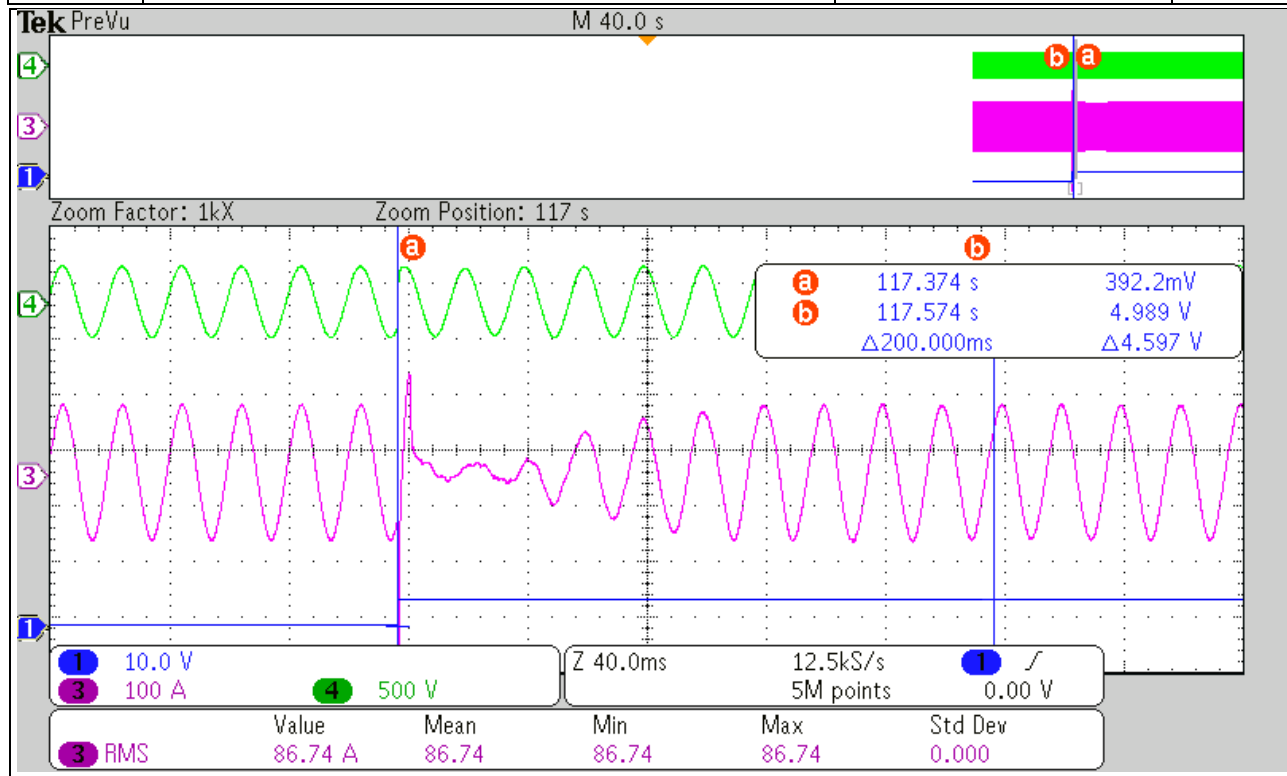
Note(s):

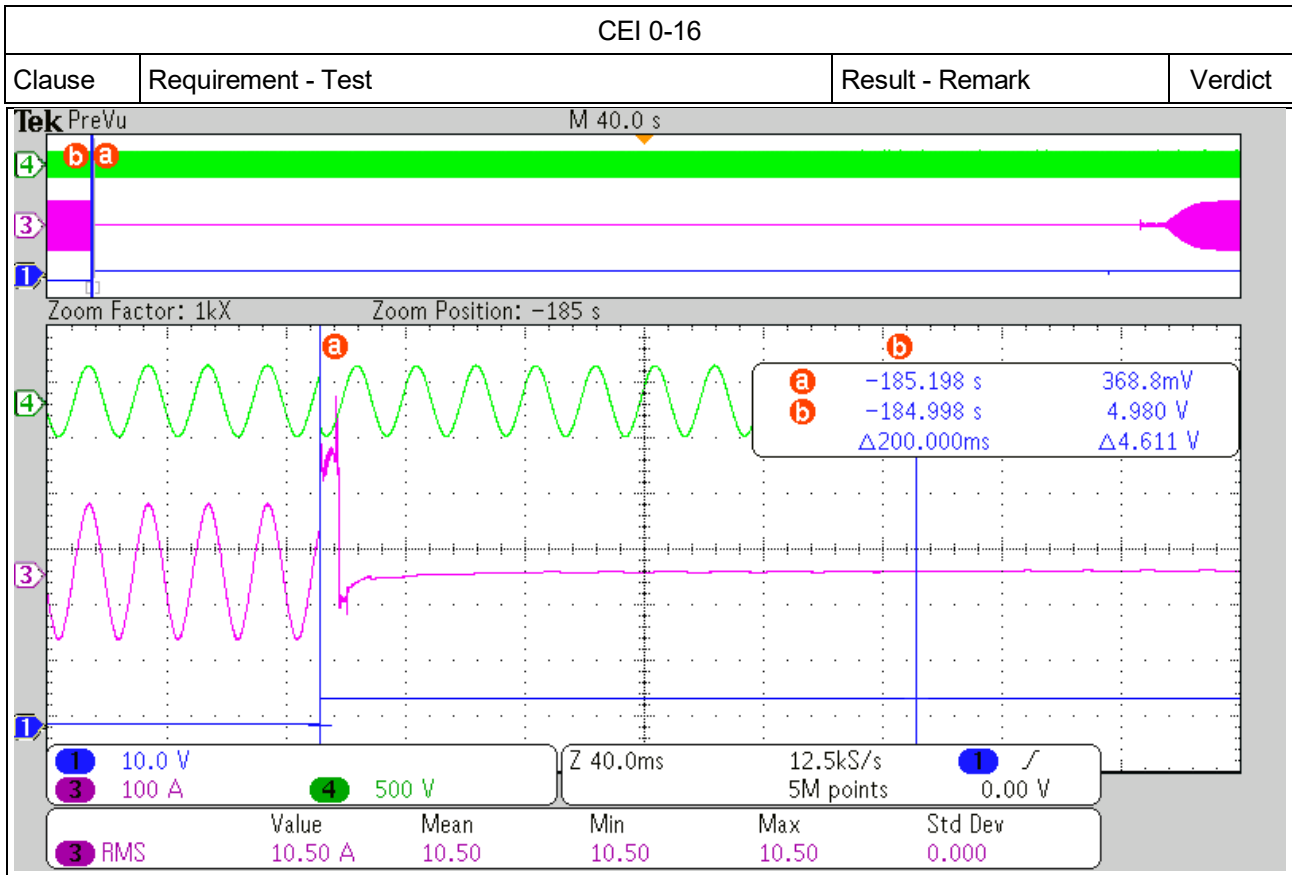
*If simulators of suitable size are not available, the use of this method is allowed by carrying out tests with a generator operating at reduced power, provided that the simulator is of at least 30kW size.



CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Annex 1
ISO 9001 certificate

CERTIFICATE



Quality Management System ISO 9001:2015

AFORE NEW ENERGY TECHNOLOGY (SHANGHAI) CO.,LTD.

Certificate No.: 24CN34507669Q
Unified social credit code: 91310000561932991K
Registered Address: Building 7, No.333, Wanfang Road, Minhang
 District, Shanghai
Office & Production Address: Building 7, No.333, Wanfang Road, Minhang
 District, Shanghai, China

Certification Scope: R & D and Manufacture of Photovoltaic Inverter

IAF 19

This is to certify that the quality management system established and implemented by the above organization meets the standard requirements.
 During the validity period of the certificate, the surveillance audit should be carried out once a year and pass the audit, the certificate will continue to be valid.
 The certificate can be checked out at the certification body website (www.acmchina.com) and CNCA website (www.cnca.gov.cn).

Date of first registration 10/07/2017
Date of this certificate 04/07/2024
Date of expiry 09/07/2026



Certificate query



General Manager

ACM INTERNATIONAL CERTIFICATION LIMITED
 41 Devonshire Street, Ground Floor, Office 1 London, United Kingdom, W1G 7AJ
 Local Office-ACM (CHINA) LIMITED, Rm B201, Building 2, No 352, Waihuan Road, Minhang District, Shanghai 201199, China
 T: +86 21-64305860 F: +86 21-64881096 W: www.acmchina.com E: info@acmcert.com.cn

Annex 2
IEC 62619 Certificate for used battery

	<table border="1"> <tr> <td data-bbox="1043 297 1316 347">Ref. Certif. No.</td> </tr> <tr> <td data-bbox="1043 347 1316 414">NL-114519</td> </tr> </table>	Ref. Certif. No.	NL-114519																				
Ref. Certif. No.																							
NL-114519																							
<p align="center">IEC SYSTEM FOR MUTUAL RECOGNITION OF TEST CERTIFICATES FOR ELECTRICAL EQUIPMENT (IECEE) CB SCHEME</p>																							
<p>CB TEST CERTIFICATE</p> <table border="0"> <tr> <td data-bbox="279 638 654 667">Product</td> <td data-bbox="654 638 1316 667">Rechargeable Lithium Ion Battery Module</td> </tr> <tr> <td data-bbox="279 683 654 712">Name and address of the applicant</td> <td data-bbox="654 683 1316 757">Shenzhen Hailei New Energy Co., Ltd Room 101, Building A, No.7, Xiusheng 1st road, Xiuxin Community, Kengzi Street, Pingshan District, Shenzhen City, Guangdong Province, China</td> </tr> <tr> <td data-bbox="279 772 654 801">Name and address of the manufacturer</td> <td data-bbox="654 772 1316 846">Shenzhen Hailei New Energy Co., Ltd Room 101, Building A, No.7, Xiusheng 1st road, Xiuxin Community, Kengzi Street, Pingshan District, Shenzhen City, Guangdong Province, China</td> </tr> <tr> <td data-bbox="279 862 654 891">Name and address of the factory</td> <td data-bbox="654 862 1316 936">Shenzhen Hailei New Energy Co., Ltd Room 101, Building A, No.7, Xiusheng 1st road, Xiuxin Community, Kengzi Street, Pingshan District, Shenzhen City, Guangdong Province, China</td> </tr> <tr> <td data-bbox="279 952 654 981"><i>When more than one factory</i></td> <td data-bbox="654 952 1316 981"><input type="checkbox"/> Additional information on page 2</td> </tr> <tr> <td data-bbox="279 996 654 1025">Ratings and principal characteristics</td> <td data-bbox="654 996 1316 1048">Product data Ratings: 51,2 Vdc, 100 Ah, 5,12 kWh</td> </tr> <tr> <td data-bbox="279 1064 654 1093">Trademark / Brand (if any)</td> <td data-bbox="654 1064 1316 1137">  Hailei </td> </tr> <tr> <td data-bbox="279 1153 654 1182">Customer's Testing Facility (CTF) Stage used</td> <td data-bbox="654 1153 1316 1182"></td> </tr> <tr> <td data-bbox="279 1198 654 1227">Model / Type Ref.</td> <td data-bbox="654 1198 1316 1227">HS-512100</td> </tr> <tr> <td data-bbox="279 1243 654 1272">Additional information</td> <td data-bbox="654 1243 1316 1272"><input type="checkbox"/> Additional information on page 2</td> </tr> <tr> <td data-bbox="279 1288 654 1384">A sample of the product was tested and found to be in conformity with As shown in the Test Report Ref. No. which forms part of this Certificate</td> <td data-bbox="654 1288 1316 1384">IEC 62619:2022 6206809.50</td> </tr> </table>		Product	Rechargeable Lithium Ion Battery Module	Name and address of the applicant	Shenzhen Hailei New Energy Co., Ltd Room 101, Building A, No.7, Xiusheng 1st road, Xiuxin Community, Kengzi Street, Pingshan District, Shenzhen City, Guangdong Province, China	Name and address of the manufacturer	Shenzhen Hailei New Energy Co., Ltd Room 101, Building A, No.7, Xiusheng 1st road, Xiuxin Community, Kengzi Street, Pingshan District, Shenzhen City, Guangdong Province, China	Name and address of the factory	Shenzhen Hailei New Energy Co., Ltd Room 101, Building A, No.7, Xiusheng 1st road, Xiuxin Community, Kengzi Street, Pingshan District, Shenzhen City, Guangdong Province, China	<i>When more than one factory</i>	<input type="checkbox"/> Additional information on page 2	Ratings and principal characteristics	Product data Ratings: 51,2 Vdc, 100 Ah, 5,12 kWh	Trademark / Brand (if any)	 Hailei	Customer's Testing Facility (CTF) Stage used		Model / Type Ref.	HS-512100	Additional information	<input type="checkbox"/> Additional information on page 2	A sample of the product was tested and found to be in conformity with As shown in the Test Report Ref. No. which forms part of this Certificate	IEC 62619:2022 6206809.50
Product	Rechargeable Lithium Ion Battery Module																						
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<p>This CB Test Certificate is issued by the National Certification Body</p>																							
<p>DEKRA Certification B.V. Meander 1051 6825 MJ Arnhem Netherlands</p> <p>Date: 2025-02-13</p>	<p align="right">  Signature: Matilde Tonsi </p> <p align="right">  </p> <p align="right">Page 1 of 1</p>																						

Annex 3 Datasheet of the relay

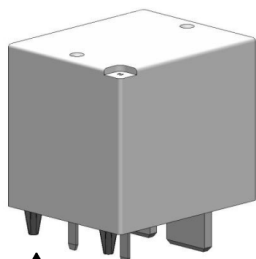


Customer :

Type : 511Z Series Relay

Revised : 2019-06-25

Issued : 2018-11-21



■ Features

- Heavy duty 200A 830VAC power type.
- SPDM contact configuration with large contact gap 4.0mm version.
- Conforms to European photovoltaic standard IEC 62109-1.
- Coil holding voltage can be reduced to 50~65% of the nominal coil voltage for saving energy.
- High performance PCB power relay for photovoltaic power generation systems (solar inverter).
- RoHS Compliant.

■ Type List

Terminal style	Contact form	Designation (provided with)
		Flux tight
PCB terminal	1A (SPDM)	511ZP-1AD-F-C M06

■ Ordering Information

511Z P - 1A D - F - C XXX
 1 2 3 4 5 6 7 8

- | | |
|-------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| 1. 511Z -- Basic series designation | 5. F -- Class F |
| 2. P -- PCB terminal | 6. C -- Flux tight |
| 3. 1A -- Form A, Single-pole double make (SPDM) | 7. XXX --Special code |
| 4. D -- Contact material Ag alloy | 8. <input type="checkbox"/> -- Coil voltage (please refer to the coil rating data for the availability) |

■ Contact Rating

Rated load (Resistive)	Making 30A, Carrying 180A, Breaking 30A / 800VAC, On 1s/Off 9s, at 85°C, 30K ops.
	Making 30A, Carrying 200A, Breaking 30A / 800VAC, On 1s/Off 9s, at 70°C, 30K ops.
	200A 800VAC, On 1s/Off 9s, at 85°C, 10 ops.
Max. switching current	200A
Max. switching voltage	800VAC
Min. applicable load	1A 6VDC

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File No. DM51176



Customer :

Type : 511Z Series Relay

Revised : 2019-06-25

Issued : 2018-11-21

■ Coil Rating (DC)

Rated voltage (V)	Rated current $\pm 10\%$ at 23°C (mA)	Coil resistance $\pm 10\%$ at 23°C (Ω)	Pick up Voltage (Max.) at 23°C ⁽¹⁾	Drop out Voltage (Min.) at 23°C	Continuous voltage at -40~+85°C ⁽²⁾	Power consumption at rated / holding voltage
12	352.9	34	85 % of rated voltage	5 % of rated voltage	50~65 % of rated voltage	approx. 4.2W / 1.05W~1.78W ⁽²⁾

Notes : (1) To energize relay properly apply 100%~120% nominal coil voltage for 200ms.

(2) Coil holding voltage is 50~65% of nominal voltage after applying nominal voltage for 200ms.

■ Specification

Contact material	Ag alloy	
Contact gap	4.0mm Min	
Contact resistance ⁽¹⁾	100m Ω Max. (1A/6VDC by 4 pipes m Ω meter) 6m Ω Max. (By voltage drop 20A)	
Operate time ⁽¹⁾	50ms Max.	
Operate bounce time ⁽¹⁾	10ms Max.	
Release time ⁽¹⁾	30ms Max.	
Vibration resistance	Operating extremes	10~50Hz , amplitude 1.5 mm
	Damage limits	10~50Hz , amplitude 1.5 mm
Shock resistance	Operating extremes	10G
	Damage limits	100G
Life expectancy	Mechanical	1,000,000 ops. (frequency 9,000 ops./hr)
Operating ambient temperature	-40~+85°C (no freezing) for 180A -40~+70°C (no freezing) for 200A	
Weight	Approx. 180 g	

Note : (1) Initial value. Operate and release time excluding contact bounce.

(2) Unless otherwise specified, all tests are under room temperature and humidity.

(3) Consider the heat of PCB is necessary, please check the actual condition of PCB.

(4) Applying no diode to this relay. The life expectancy will be lower when a diode is used. To use a varistor (ZNR) could absorb the coil surge of relay that is recommended.

(5) Do not use the relay exceeding the coil rating, contact rating and life expectancy, or this may cause the risk of overheating.

(6) To assure optimum performance, avoid the relay from dropping, hitting, or other unnecessary shocks.

(7) All loads are based on 95 mm² harnesses and bus bars.

(8) Please pay attention to the phenomenon of freezing in the low temperature environment below 0°C. Please evaluate the actual use of the environment.

(9) The thermal endurance of magnet wire is 180°C.

(10) Solder resistance: Place the relay terminal in 270 ° C tin solution for 7 seconds. After standing for 2

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File No. DM51176



Customer :

Type : 511Z Series Relay

Revised : 2019-06-25

Issued : 2018-11-21

hours in normal temperature and humidity, the structure and characteristics should not be abnormal.

To re-weld, please wait 30 minutes before proceeding.

(11) Please contact Song Chuan for the detailed information.

■ Insulation Data

Insulation resistance ⁽¹⁾	1000MΩ Min. (DC 500V)
Dielectric strength ⁽¹⁾	Between open contact : AC 2000V, 50/60Hz 1 min.
	Between contact and coil : AC 4000V, 50/60Hz 1 min.
Insulation of IEC 61810-1	
Clearance / creepage distances	Between coil to contact : Double/Reinforce, ≥ 3.0mm / ≥ 16.6mm (for 830VAC)
	Between open contact : Basic, ≥ 3.0mm / ≥ 12.5mm (for 830VAC)
Rated insulation voltage	250V, 400V, 690V, 830V
Rated impulse withstand voltage	2500V
Pollution degree	2
Rated voltage	230/400/690V/830V
Overvoltage category	II
Compliant with European photovoltaic standard	
Contact gap	4.0mm (IEC 62109 and VDE 0126)

Note : (1) Initial value.

■ Safety Approval

Certified	UL / CUL	TUV
File No.	E88991	R50267102

■ Safety Approval Rating

UL / CUL	TUV
30A 830VAC, Resistive, Carrying current 200A ⁽¹⁾	Making 30A , Carrying 180A , Breaking 30A /830VAC ; T85 ⁽¹⁾ Making 30A , Carrying 200A , Breaking 30A /830VAC ; T70 ⁽¹⁾

Note : (1) With 50%~55% modulation of nominal coil voltage.

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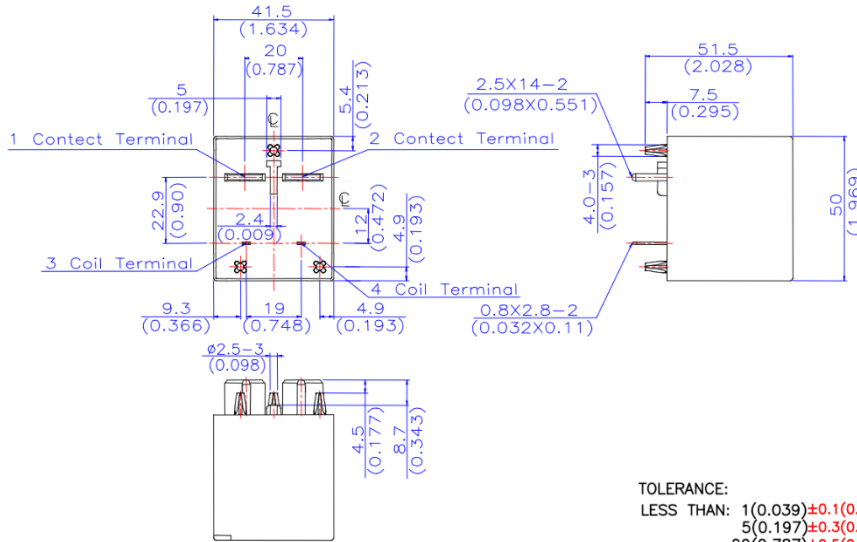
File No. DM51176



Customer :
Type : 511Z Series Relay

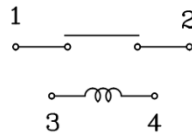
Revised : 2019-06-25
Issued : 2018-11-21

■ Outline Dimensions

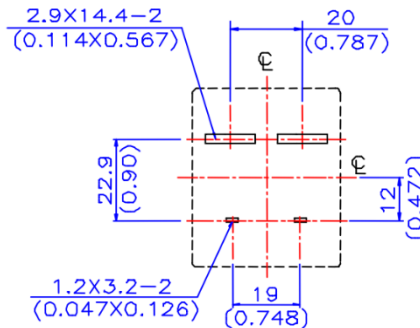


TOLERANCE:
LESS THAN: 1(0.039)±0.1(0.004)
5(0.197)±0.3(0.012)
20(0.787)±0.5(0.020)
MORE THAN:20(0.787)±1(0.039)

■ Wiring Diagram
(Bottom view)



■ PC Board Layout
(Bottom view)



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File No. DM51176

**Annex 4
Pictures of the unit**

Overview - AF60K-TH



Overview - AF60K-TH-0



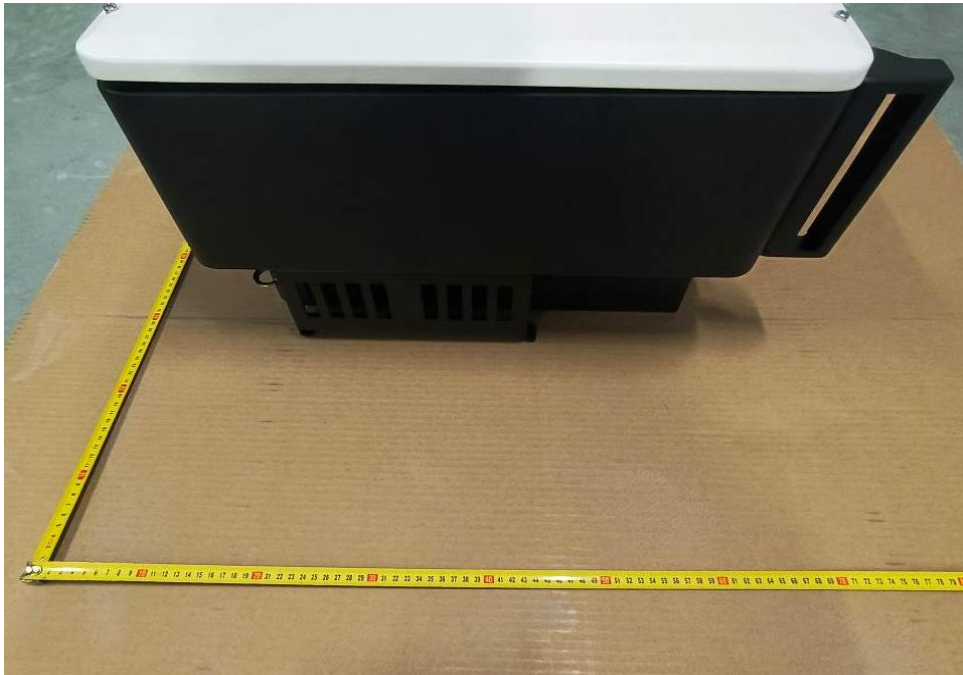
Overview - AF60K-TH



Overview - AF60K-TH-0



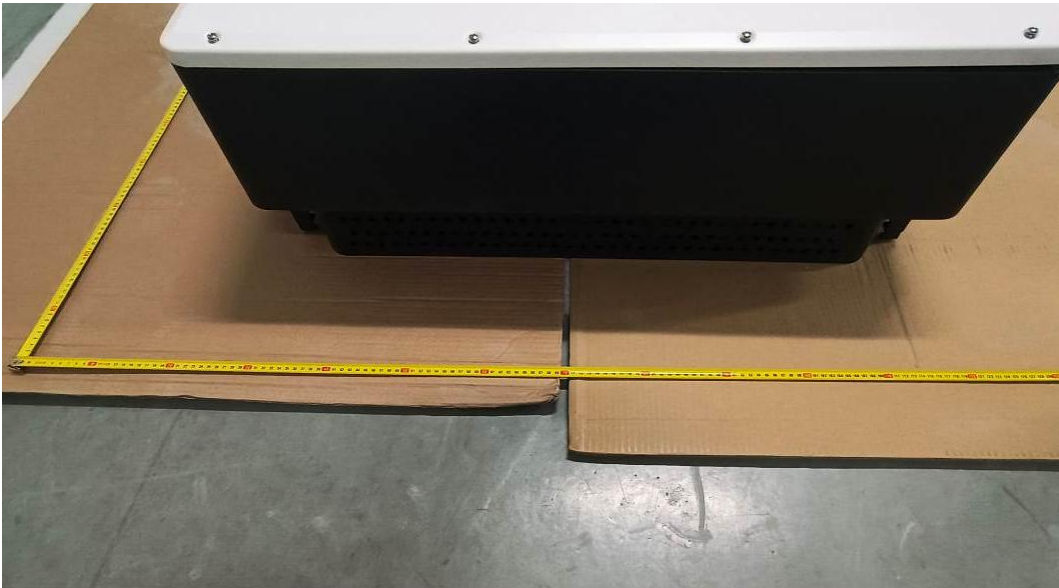
Overview



Overview



Overview



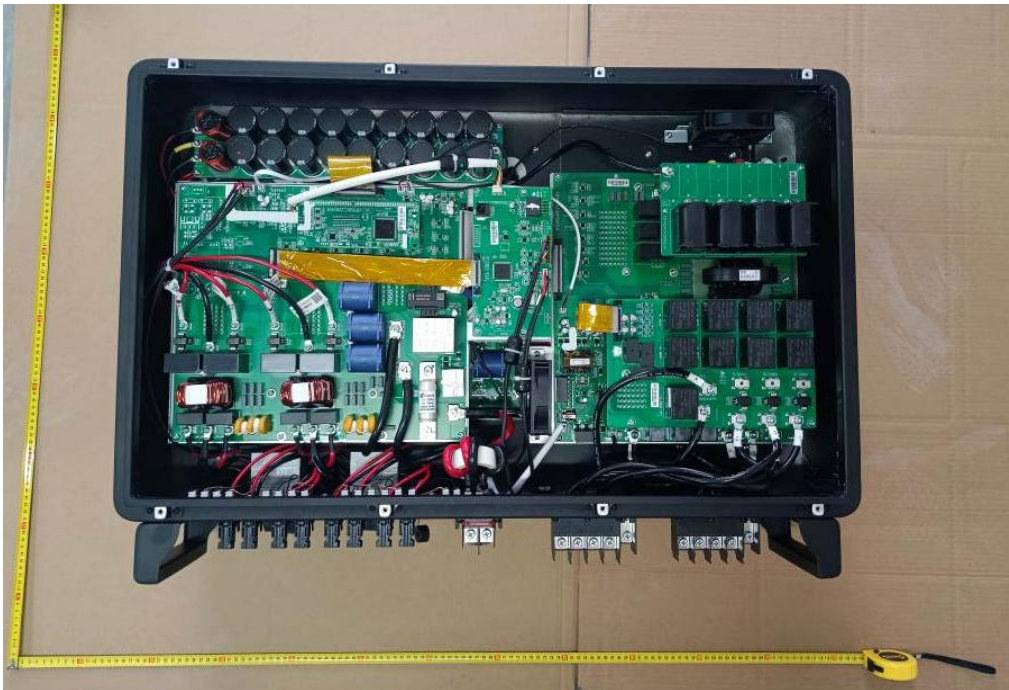
Overview - AF60K-TH



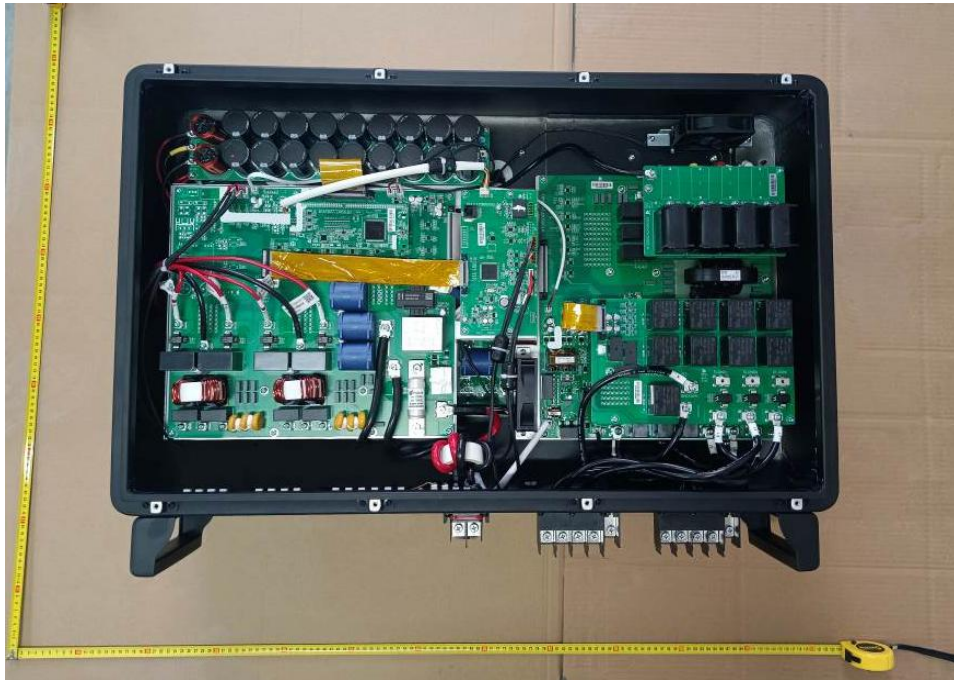
Overview - AF60K-TH-0



Internal view- AF60K-TH



Internal view - AF60K-TH-0



--- End of test report---