

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..... :	6160543.50
Date of issue..... :	2023-06-29
Total number of pages..... :	104 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
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 :	PV Grid interactive inverter
Trade Mark..... :	
Manufacturer..... :	Same as applicant
Model/Type reference..... :	BNT030KTL, BNT036KTL, BNT040KTL, BNT050KTL, BNT060KTL
Ratings..... :	See product marking plate on page 4 and ratings of the test products in page 8.

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
☒	Testing Laboratory:	DEKRA Testing and Certification (Suzhou) Co., Ltd.
Testing location/ address		No. 99, Hongye Road, Suzhou Industrial Park Suzhou, 215006, P.R. China
☐	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>
☐	Testing procedure: CTF Stage 1:	
Testing location/ address		
Tested by (name, function, signature)		
Approved by (name, function, signature) ..		
☐	Testing procedure: CTF Stage 2:	
Testing location/ address		
Tested by (name + signature)		
Witnessed by (name, function, signature) ..		
Approved by (name, function, signature) ..		
☐	Testing procedure: CTF Stage 3:	
☐	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: Datasheet of the relay (4 pages) Annex 3: Pictures of the product (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

Copy of marking plate

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

Rating label:

Afore NEW ENERGY			
Mode:	030	036	040
BNTxxxKTL	☐	☐	☐
Pdc Max(W)	45000	54000	60000
Voc PV Max (V)	1100		
Vdc MPPT(V)	200-1000		
Idc Max (A)	38 x 2	38 x 3	
Isc PV Max (A)	48 x 2	48 x 3	
Pac Nom (W)	30000	36000	40000
Iac Max (A)	48	60	65
Vac Nom(V)	3P+N+PE / 3P+PE 230/400		
Mode:	050	060	
BNTxxxKTL	☐	☐	
Pdc Max(W)	75000	90000	
Voc PV Max (V)	1100		
Vdc MPPT(V)	200-1000		
Idc Max (A)	40 x 3	38 x 4	
Isc PV Max (A)	48 x 3	48 x 4	
Pac Nom (W)	50000	60000	
Iac Max (A)	80	96	
Vac Nom(V)	3P+N+PE / 3P+PE 230/400		
Fac Nom(Hz)	50/60		
Power Factor	1 (-0.8~+0.8 adjustable)		
Protective Class	I		
Operating temperature range	-25~+60°C (Derating 45°C)		
IP Degree	IP65		
S/N	T06041-03		
+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			

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.

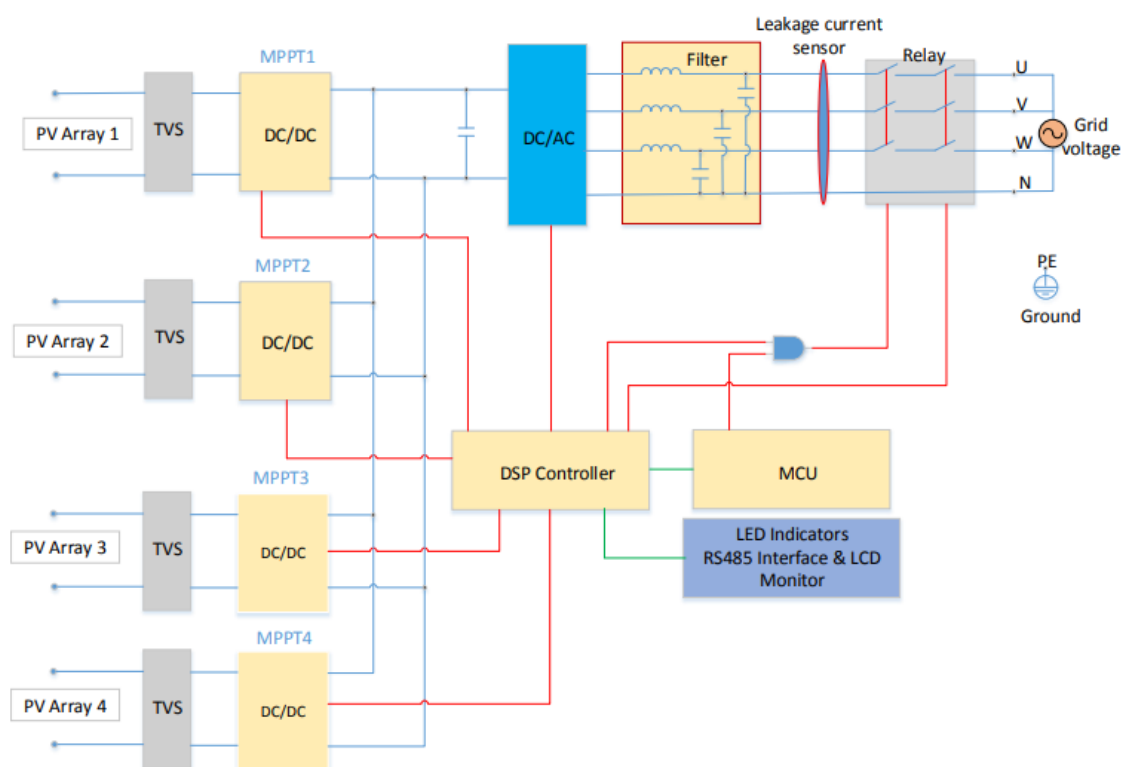
	WARNING:	POWER FED FROM MORE THAN ONE SOURCE
For continued protection against risk of fire, replace only with same type and ratings of fuse.		

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)	About 93			
Pollution degree	Outside PD3; Inside PD2			
IP protection class	IP65			
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: 2023-04-17 (samples provided by applicant)				
Date (s) of performance of tests: 2023-04-08 to 2023-05-21				
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. Throughout this report a ☐ comma / ☒ point is used as the decimal separator. Determination of the test result includes consideration of measurement uncertainty from the test equipment and methods. The accreditation of maximum capacity power in DEKRA Suzhou CNAS scope is less than 45kW.				
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 testing unit is a Class I grid-interactive PV inverter for outdoor installation (IP65). The unit is providing EMC filtering at the output toward mains. The unit does not provide galvanic separation from input to output (transformerless). The internal control is redundantly built. It contains a main DSP and a slave DSP. PE terminal on external and internal enclosure. The output is switched off redundant by the high power switching bridge and two relays. This assures that the opening of the output circuit will also operate in case of one is error.

Block diagram:**Model differences:**

All models are identical with hardware version and software version, the output power is derating by software.

Model BNT030KTL has 2 MPPT tracker with 5 input strings.

Model BNT036KTL and BNT040KTL has 3 MPPT trackers with 6 input strings.

Model BNT050KTL has 3 MPPT trackers with 7 input strings.

Model BNT060KTL has 4 MPPT trackers with 8 input strings.

Model BNT030KTL, BNT036KTL, BNT040KTL have 1 internal fan and 2 external fans .

Model BNT050KTL, BNT060KTL have 1 internal fan and 5 external fans

The product was tested on:

Hardware version: V06

Software version: V06

Static Conversion Device	Interface Protection	Interface Protection Device	Rotating Generator Device
Yes	No	No	No

Specifications table					
Model	BNT030KTL	BNT036KTL	BNT040KTL	BNT050KTL	BNT060KTL
PV input					
Max PV power (W)	45000	54000	60000	75000	90000
Vmax PV (Vdc) (absolute Max.)	1100	1100	1100	1100	1100
Isc PV (absolute Max.) (A)	48 x 2	48 x 3	48 x 3	48 x 3	48 x 4
Number MPP trackers	2	3	3	3	4
Number input strings	2/3	2/2/2	2/2/2	2/2/3	2/2/2/2
Max. PV input current / strings (A)	38 x 2	38 x 3	38 x 3	40 x 3	38 x 4
MPPT voltage range (Vdc)	200-1000	200-1000	200-1000	200-1000	200-1000
Vdc range @ full power (Vdc)	500-850	500-850	500-850	500-850	500-850
AC Grid (output)					
Normal AC Voltage (V _{AC})	3P+N+PE/3P+PE 230/400				
Frequency (Hz)	50 / 60				
Normal AC Current (A)	43.5	52.2	58	72.5	87
Max. cont. output current (A)	48	60	65	80	96
Normal Power (W)	30000	36000	40000	50000	60000
Rated Apparent Power (VA)	30000	36000	40000	50000	60000
Max. cont. Power (W)	30000	36000	40000	50000	60000
Max. cont. Apparent Power (VA)	30000	36000	40000	50000	60000
Power factor(adjustable)	1.0(-0.8~ +0.8)				
Others					
Protective class	Class I				
Ingress protection (IP)	IP65				
Temperature (°C)	-25°C to +60°C (Derating 45°C)				
Inverter Isolation	Non-isolated				
Overvoltage category	OVC III (AC Main), OVC II (PV)				
Software version	DSP:V06 CPLD:V06 HMI:V06				

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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)		☒
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	☒
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	☒
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	☒
N.4	<i>Verifica del campo di funzionamento in tensione e frequenza</i> (Verification of the operating range in voltage and frequency)	P	☒
N.5	<i>Verifica delle condizioni di sincronizzazione e presa di carico</i> (Synchronization and reconnection)	P	☒
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	☒
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	☒
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	☒
N.6.3	<i>Regolazione automatica di potenza reattiva secondo una curva caratteristica $\cos\phi = f(P)$</i> (Automatic adjustment of reactive power according to the characteristic curve $\cos\phi (P)$)	P	☒
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	☒
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	☒

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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	☒
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	☒
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	☒
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	☒
N.8	<i>Verifica della insensibilità alle variazioni di tensione (VFRT capability)</i> (Verification of insensitivity to voltage variations (VFRT capability))	P	☒
N.9	<i>Verifica della insensibilità alle richiusure automatiche in discordanza di fase</i> (Verification of insensitivity to mismatch in phase automatic reclosing)	P	☒

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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	BNT060KTL										
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	0.006	0.033	0.047	0.035	0.043	0.051	0.060	0.071	0.122	0.118	0.142
3	0.008	0.035	0.078	0.050	0.052	0.074	0.098	0.125	0.165	0.203	0.297
4	0.006	0.033	0.017	0.015	0.016	0.022	0.025	0.032	0.027	0.017	0.023
5	0.006	0.129	0.128	0.106	0.124	0.148	0.164	0.159	0.189	0.225	0.227
6	0.006	0.025	0.052	0.014	0.012	0.014	0.020	0.026	0.024	0.020	0.023
7	0.008	0.111	0.151	0.119	0.146	0.151	0.164	0.158	0.221	0.295	0.320
8	0.006	0.021	0.021	0.019	0.014	0.015	0.015	0.016	0.016	0.017	0.020
9	0.009	0.028	0.053	0.049	0.025	0.021	0.020	0.023	0.024	0.022	0.035
10	0.006	0.017	0.015	0.013	0.013	0.013	0.011	0.011	0.016	0.015	0.021
11	0.007	0.253	0.401	0.153	0.153	0.114	0.101	0.113	0.113	0.125	0.441
12	0.007	0.013	0.025	0.018	0.015	0.016	0.014	0.015	0.022	0.016	0.025
13	0.006	0.235	0.313	0.127	0.134	0.112	0.114	0.107	0.117	0.124	0.412
14	0.006	0.016	0.013	0.016	0.019	0.017	0.013	0.011	0.020	0.017	0.023
15	0.008	0.032	0.021	0.031	0.044	0.037	0.028	0.022	0.026	0.023	0.030
16	0.006	0.012	0.010	0.013	0.017	0.017	0.014	0.013	0.019	0.016	0.022
17	0.007	0.186	0.224	0.115	0.038	0.079	0.093	0.098	0.095	0.097	0.141
18	0.007	0.014	0.011	0.013	0.014	0.014	0.013	0.013	0.019	0.017	0.018
19	0.006	0.216	0.091	0.087	0.055	0.047	0.081	0.093	0.095	0.094	0.138
20	0.006	0.010	0.011	0.013	0.014	0.014	0.011	0.011	0.014	0.013	0.018
21	0.006	0.025	0.020	0.019	0.026	0.023	0.026	0.025	0.024	0.023	0.025
22	0.006	0.012	0.010	0.011	0.014	0.011	0.011	0.011	0.013	0.011	0.013
23	0.006	0.098	0.023	0.096	0.065	0.031	0.026	0.053	0.068	0.074	0.049
24	0.007	0.014	0.010	0.010	0.010	0.011	0.013	0.011	0.013	0.012	0.015
25	0.006	0.067	0.043	0.102	0.034	0.036	0.017	0.037	0.048	0.061	0.053
26	0.006	0.013	0.012	0.013	0.013	0.010	0.009	0.011	0.013	0.012	0.012
27	0.006	0.024	0.016	0.023	0.017	0.019	0.015	0.020	0.022	0.022	0.029
28	0.006	0.014	0.010	0.009	0.012	0.011	0.009	0.010	0.011	0.010	0.015
29	0.006	0.125	0.067	0.017	0.055	0.026	0.027	0.020	0.028	0.034	0.034
30	0.006	0.012	0.010	0.010	0.010	0.011	0.011	0.011	0.011	0.012	0.014
31	0.006	0.139	0.080	0.045	0.057	0.019	0.023	0.016	0.022	0.033	0.072
32	0.006	0.013	0.009	0.009	0.013	0.011	0.009	0.010	0.010	0.010	0.013
33	0.006	0.014	0.015	0.021	0.026	0.014	0.014	0.014	0.015	0.016	0.024
34	0.006	0.012	0.009	0.009	0.010	0.010	0.009	0.010	0.011	0.010	0.015
35	0.006	0.052	0.038	0.017	0.031	0.023	0.015	0.018	0.016	0.015	0.028
36	0.006	0.011	0.009	0.009	0.010	0.010	0.009	0.010	0.010	0.010	0.012
37	0.006	0.039	0.043	0.022	0.026	0.026	0.012	0.013	0.013	0.016	0.068
38	0.006	0.010	0.009	0.009	0.010	0.009	0.009	0.010	0.010	0.009	0.014
39	0.006	0.016	0.014	0.014	0.015	0.015	0.012	0.013	0.012	0.014	0.022
40	0.006	0.012	0.009	0.009	0.009	0.010	0.009	0.010	0.010	0.009	0.012
41	0.006	0.073	0.012	0.011	0.028	0.026	0.016	0.011	0.013	0.016	0.049

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Clause	Requirement - Test						Result - Remark				Verdict
42	0.006	0.011	0.009	0.009	0.009	0.009	0.009	0.010	0.010	0.010	0.012
43	0.006	0.085	0.017	0.012	0.030	0.019	0.015	0.014	0.015	0.012	0.026
44	0.006	0.010	0.008	0.009	0.010	0.009	0.008	0.009	0.010	0.009	0.012
45	0.006	0.013	0.014	0.011	0.017	0.014	0.013	0.012	0.012	0.014	0.020
46	0.006	0.011	0.009	0.010	0.009	0.009	0.009	0.009	0.009	0.009	0.011
47	0.006	0.022	0.021	0.019	0.020	0.013	0.020	0.013	0.013	0.011	0.040
48	0.006	0.010	0.009	0.008	0.009	0.009	0.009	0.010	0.010	0.011	0.012
49	0.006	0.032	0.040	0.011	0.024	0.015	0.013	0.012	0.011	0.016	0.023
50	0.006	0.009	0.008	0.009	0.010	0.009	0.009	0.009	0.010	0.010	0.010

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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 [%]
75	0.009	0.018	0.020	0.021	0.022	0.023	0.024	0.027	0.028	0.032	0.035
125	0.009	0.015	0.016	0.016	0.016	0.016	0.016	0.018	0.020	0.019	0.022
175	0.009	0.014	0.015	0.014	0.016	0.018	0.017	0.017	0.023	0.020	0.023
225	0.009	0.015	0.015	0.015	0.016	0.016	0.016	0.017	0.019	0.018	0.021
275	0.010	0.015	0.016	0.015	0.017	0.017	0.015	0.016	0.019	0.018	0.020
325	0.009	0.015	0.015	0.015	0.016	0.016	0.016	0.016	0.020	0.018	0.020
375	0.009	0.015	0.015	0.015	0.016	0.017	0.017	0.016	0.020	0.019	0.021
425	0.009	0.014	0.015	0.014	0.016	0.017	0.016	0.016	0.021	0.019	0.021
475	0.009	0.014	0.015	0.014	0.017	0.018	0.017	0.015	0.023	0.020	0.022
525	0.009	0.015	0.015	0.015	0.018	0.019	0.017	0.016	0.026	0.023	0.025
575	0.009	0.014	0.015	0.015	0.019	0.021	0.018	0.016	0.027	0.023	0.024
625	0.009	0.014	0.015	0.015	0.019	0.021	0.018	0.016	0.026	0.023	0.025
675	0.009	0.014	0.015	0.015	0.019	0.021	0.019	0.017	0.027	0.024	0.026
725	0.009	0.014	0.015	0.016	0.034	0.040	0.033	0.018	0.059	0.045	0.049
775	0.009	0.014	0.014	0.014	0.019	0.020	0.019	0.016	0.027	0.023	0.025
825	0.009	0.014	0.015	0.015	0.019	0.020	0.019	0.017	0.027	0.023	0.025
875	0.009	0.014	0.015	0.015	0.019	0.020	0.018	0.016	0.026	0.022	0.024
925	0.009	0.014	0.015	0.015	0.018	0.019	0.017	0.016	0.025	0.021	0.023
975	0.009	0.014	0.014	0.015	0.017	0.018	0.016	0.016	0.022	0.020	0.022
1025	0.009	0.014	0.014	0.014	0.016	0.017	0.015	0.016	0.020	0.019	0.020
1075	0.009	0.014	0.014	0.014	0.015	0.016	0.015	0.015	0.019	0.017	0.019
1125	0.009	0.014	0.014	0.014	0.015	0.015	0.014	0.016	0.018	0.017	0.018
1175	0.009	0.014	0.014	0.014	0.014	0.014	0.014	0.015	0.017	0.016	0.017
1225	0.009	0.014	0.014	0.014	0.014	0.014	0.014	0.015	0.016	0.016	0.017
1275	0.009	0.013	0.013	0.014	0.014	0.014	0.013	0.015	0.016	0.016	0.017
1325	0.009	0.013	0.014	0.013	0.013	0.014	0.013	0.014	0.015	0.015	0.016
1375	0.009	0.013	0.013	0.013	0.013	0.013	0.013	0.015	0.015	0.015	0.016
1425	0.009	0.013	0.013	0.013	0.013	0.013	0.013	0.015	0.015	0.016	0.017
1475	0.009	0.013	0.013	0.013	0.013	0.013	0.013	0.014	0.015	0.015	0.016
1525	0.009	0.012	0.013	0.013	0.013	0.013	0.013	0.014	0.015	0.015	0.016
1575	0.009	0.013	0.013	0.013	0.013	0.013	0.013	0.014	0.015	0.015	0.016
1625	0.009	0.012	0.013	0.013	0.013	0.013	0.013	0.014	0.014	0.015	0.016
1675	0.009	0.012	0.013	0.013	0.013	0.013	0.012	0.014	0.014	0.015	0.015
1725	0.009	0.012	0.013	0.013	0.013	0.013	0.013	0.015	0.014	0.015	0.016
1775	0.009	0.012	0.013	0.013	0.013	0.013	0.012	0.014	0.014	0.014	0.015
1825	0.009	0.012	0.013	0.013	0.013	0.013	0.012	0.014	0.014	0.015	0.015
1875	0.009	0.012	0.012	0.013	0.012	0.013	0.012	0.014	0.014	0.014	0.015
1925	0.009	0.012	0.013	0.013	0.013	0.013	0.012	0.014	0.014	0.015	0.015
1975	0.009	0.012	0.013	0.013	0.013	0.013	0.012	0.014	0.014	0.014	0.015

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 [%]
2.1	0.006	0.011	0.009	0.009	0.009	0.009	0.009	0.010	0.010	0.010	0.012
2.3	0.006	0.011	0.009	0.010	0.009	0.009	0.009	0.009	0.009	0.009	0.011
2.5	0.006	0.009	0.008	0.009	0.010	0.009	0.009	0.009	0.010	0.010	0.010
2.7	0.006	0.010	0.009	0.009	0.008	0.008	0.009	0.010	0.010	0.010	0.011
2.9	0.006	0.011	0.008	0.010	0.009	0.009	0.008	0.009	0.009	0.009	0.011
3.1	0.006	0.010	0.008	0.009	0.009	0.008	0.008	0.009	0.009	0.009	0.012
3.3	0.006	0.010	0.008	0.009	0.009	0.009	0.008	0.010	0.010	0.010	0.011
3.5	0.006	0.010	0.008	0.009	0.008	0.009	0.008	0.009	0.010	0.009	0.011
3.7	0.006	0.008	0.008	0.009	0.009	0.009	0.008	0.009	0.010	0.009	0.011
3.9	0.006	0.009	0.009	0.009	0.009	0.009	0.009	0.010	0.010	0.010	0.012
4.1	0.006	0.008	0.008	0.009	0.009	0.010	0.009	0.010	0.011	0.010	0.012
4.3	0.006	0.008	0.009	0.009	0.009	0.009	0.008	0.009	0.010	0.010	0.013
4.5	0.006	0.009	0.008	0.008	0.008	0.008	0.008	0.010	0.010	0.010	0.014
4.7	0.006	0.008	0.008	0.008	0.007	0.008	0.007	0.009	0.010	0.009	0.012
4.9	0.006	0.007	0.008	0.008	0.008	0.008	0.008	0.009	0.010	0.009	0.011
5.1	0.006	0.007	0.008	0.008	0.008	0.008	0.008	0.009	0.010	0.009	0.010
5.3	0.006	0.007	0.007	0.008	0.009	0.008	0.008	0.011	0.011	0.009	0.009
5.5	0.006	0.007	0.008	0.009	0.011	0.009	0.008	0.014	0.016	0.010	0.010
5.7	0.006	0.007	0.008	0.009	0.011	0.009	0.008	0.014	0.016	0.010	0.010
5.9	0.006	0.007	0.007	0.008	0.009	0.008	0.007	0.011	0.012	0.009	0.009
6.1	0.006	0.007	0.008	0.008	0.008	0.008	0.008	0.010	0.010	0.009	0.009
6.3	0.006	0.007	0.007	0.008	0.008	0.008	0.008	0.010	0.010	0.010	0.009
6.5	0.006	0.007	0.007	0.008	0.008	0.008	0.008	0.010	0.009	0.011	0.010
6.7	0.006	0.007	0.008	0.009	0.008	0.009	0.010	0.011	0.010	0.013	0.013
6.9	0.006	0.007	0.008	0.009	0.008	0.011	0.014	0.013	0.011	0.019	0.019
7.1	0.006	0.007	0.007	0.009	0.009	0.012	0.014	0.014	0.011	0.019	0.019
7.3	0.006	0.008	0.008	0.009	0.009	0.010	0.011	0.012	0.010	0.014	0.015
7.5	0.006	0.007	0.008	0.008	0.008	0.008	0.008	0.009	0.009	0.010	0.010
7.7	0.006	0.007	0.007	0.008	0.008	0.008	0.008	0.009	0.009	0.009	0.009
7.9	0.016	0.013	0.013	0.013	0.013	0.014	0.014	0.014	0.014	0.015	0.014
8.1	0.012	0.011	0.011	0.011	0.011	0.011	0.011	0.012	0.012	0.012	0.012
8.3	0.006	0.007	0.008	0.008	0.007	0.007	0.007	0.009	0.009	0.009	0.008
8.5	0.006	0.007	0.008	0.008	0.008	0.008	0.008	0.009	0.009	0.009	0.008
8.7	0.006	0.007	0.008	0.007	0.007	0.007	0.007	0.009	0.008	0.009	0.009
8.9	0.006	0.007	0.007	0.008	0.007	0.008	0.007	0.008	0.008	0.009	0.008
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	BNT060KTL										
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	0.004	0.034	0.028	0.032	0.041	0.047	0.053	0.057	0.103	0.074	0.139
3	0.004	0.120	0.124	0.032	0.052	0.063	0.079	0.123	0.193	0.251	0.367
4	0.004	0.032	0.020	0.022	0.024	0.028	0.030	0.034	0.027	0.015	0.028
5	0.004	0.067	0.077	0.094	0.124	0.156	0.167	0.150	0.200	0.246	0.240
6	0.004	0.021	0.048	0.022	0.012	0.010	0.013	0.013	0.013	0.014	0.018
7	0.006	0.092	0.083	0.137	0.178	0.162	0.161	0.157	0.202	0.259	0.233
8	0.004	0.011	0.017	0.013	0.014	0.012	0.011	0.012	0.012	0.012	0.014
9	0.006	0.036	0.084	0.047	0.028	0.028	0.026	0.017	0.015	0.019	0.056
10	0.004	0.009	0.009	0.013	0.011	0.011	0.008	0.008	0.011	0.014	0.019
11	0.005	0.239	0.407	0.123	0.122	0.108	0.103	0.111	0.125	0.133	0.406
12	0.004	0.010	0.027	0.031	0.019	0.011	0.011	0.017	0.022	0.016	0.029
13	0.004	0.228	0.232	0.078	0.107	0.107	0.116	0.114	0.126	0.129	0.425
14	0.004	0.010	0.010	0.009	0.010	0.011	0.010	0.010	0.012	0.010	0.012
15	0.005	0.037	0.043	0.045	0.036	0.026	0.017	0.011	0.016	0.018	0.047
16	0.004	0.009	0.008	0.010	0.008	0.011	0.009	0.008	0.011	0.011	0.013
17	0.005	0.197	0.249	0.098	0.015	0.070	0.081	0.084	0.089	0.083	0.154
18	0.004	0.014	0.011	0.017	0.016	0.014	0.011	0.012	0.017	0.019	0.022
19	0.004	0.165	0.080	0.048	0.032	0.044	0.075	0.086	0.092	0.101	0.144
20	0.004	0.009	0.008	0.009	0.008	0.008	0.007	0.008	0.010	0.012	0.014
21	0.004	0.027	0.025	0.038	0.027	0.023	0.017	0.017	0.015	0.014	0.033
22	0.004	0.010	0.008	0.008	0.008	0.008	0.008	0.008	0.010	0.009	0.011
23	0.004	0.126	0.026	0.090	0.045	0.031	0.031	0.048	0.063	0.069	0.053
24	0.004	0.012	0.009	0.014	0.008	0.009	0.011	0.011	0.010	0.009	0.014
25	0.004	0.090	0.023	0.085	0.015	0.034	0.025	0.039	0.049	0.059	0.060
26	0.004	0.009	0.008	0.008	0.006	0.007	0.007	0.008	0.009	0.010	0.010
27	0.004	0.027	0.029	0.031	0.022	0.015	0.013	0.014	0.014	0.012	0.015
28	0.003	0.009	0.007	0.007	0.008	0.007	0.007	0.007	0.008	0.007	0.010
29	0.004	0.120	0.055	0.021	0.037	0.014	0.021	0.021	0.030	0.034	0.062
30	0.004	0.010	0.010	0.008	0.007	0.009	0.008	0.007	0.008	0.008	0.010
31	0.004	0.112	0.055	0.031	0.048	0.013	0.020	0.021	0.028	0.037	0.076
32	0.004	0.009	0.007	0.006	0.006	0.007	0.006	0.007	0.008	0.007	0.009
33	0.004	0.026	0.027	0.022	0.019	0.014	0.010	0.010	0.011	0.010	0.015
34	0.004	0.009	0.006	0.006	0.007	0.006	0.006	0.007	0.008	0.007	0.010
35	0.004	0.072	0.044	0.028	0.021	0.018	0.011	0.016	0.018	0.020	0.044
36	0.004	0.010	0.007	0.006	0.012	0.009	0.007	0.007	0.007	0.007	0.008
37	0.004	0.035	0.035	0.020	0.015	0.024	0.010	0.014	0.017	0.019	0.078
38	0.004	0.007	0.006	0.007	0.006	0.006	0.006	0.007	0.007	0.007	0.009
39	0.004	0.018	0.021	0.018	0.017	0.012	0.010	0.011	0.012	0.013	0.021
40	0.004	0.007	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.007	0.009
41	0.004	0.077	0.017	0.017	0.016	0.015	0.011	0.008	0.009	0.012	0.050

CEI 0-16											
Clause	Requirement - Test						Result - Remark				Verdict
42	0.004	0.007	0.007	0.006	0.009	0.007	0.006	0.007	0.007	0.007	0.007
43	0.004	0.067	0.011	0.017	0.024	0.016	0.013	0.011	0.014	0.014	0.041
44	0.004	0.007	0.007	0.007	0.005	0.006	0.005	0.006	0.007	0.007	0.009
45	0.004	0.017	0.023	0.016	0.013	0.012	0.010	0.008	0.008	0.010	0.015
46	0.004	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.008
47	0.004	0.030	0.013	0.010	0.013	0.011	0.019	0.009	0.010	0.010	0.042
48	0.004	0.008	0.007	0.006	0.007	0.005	0.006	0.007	0.007	0.007	0.009
49	0.004	0.014	0.017	0.013	0.017	0.012	0.010	0.011	0.009	0.015	0.032
50	0.004	0.006	0.006	0.006	0.005	0.005	0.005	0.006	0.007	0.006	0.008

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 [%]
75	0.006	0.016	0.019	0.019	0.019	0.020	0.023	0.023	0.027	0.026	0.034
125	0.006	0.013	0.014	0.012	0.013	0.013	0.014	0.015	0.016	0.015	0.021
175	0.006	0.012	0.012	0.011	0.012	0.013	0.013	0.013	0.016	0.014	0.018
225	0.006	0.012	0.013	0.012	0.012	0.012	0.012	0.013	0.014	0.013	0.017
275	0.006	0.012	0.014	0.012	0.012	0.012	0.011	0.013	0.014	0.013	0.016
325	0.006	0.012	0.012	0.012	0.012	0.012	0.012	0.013	0.014	0.013	0.016
375	0.006	0.013	0.013	0.012	0.013	0.012	0.013	0.013	0.014	0.013	0.016
425	0.006	0.011	0.012	0.011	0.012	0.012	0.012	0.014	0.014	0.014	0.016
475	0.006	0.011	0.012	0.011	0.012	0.012	0.012	0.012	0.016	0.015	0.016
525	0.006	0.012	0.012	0.012	0.013	0.013	0.013	0.013	0.015	0.019	0.020
575	0.006	0.011	0.012	0.012	0.012	0.014	0.013	0.013	0.016	0.015	0.017
625	0.006	0.011	0.012	0.012	0.013	0.014	0.013	0.013	0.016	0.016	0.017
675	0.006	0.012	0.012	0.011	0.013	0.013	0.013	0.013	0.016	0.015	0.016
725	0.006	0.012	0.012	0.012	0.019	0.020	0.018	0.013	0.028	0.022	0.025
775	0.006	0.011	0.012	0.011	0.013	0.013	0.012	0.012	0.016	0.014	0.016
825	0.006	0.012	0.012	0.011	0.013	0.013	0.012	0.013	0.016	0.015	0.016
875	0.006	0.011	0.012	0.012	0.012	0.013	0.012	0.013	0.016	0.015	0.017
925	0.006	0.011	0.012	0.012	0.012	0.013	0.012	0.012	0.015	0.015	0.017
975	0.006	0.011	0.011	0.011	0.012	0.012	0.012	0.012	0.014	0.014	0.015
1025	0.006	0.011	0.011	0.010	0.012	0.012	0.011	0.012	0.013	0.016	0.016
1075	0.006	0.011	0.011	0.010	0.011	0.011	0.011	0.012	0.013	0.013	0.014
1125	0.006	0.011	0.010	0.010	0.010	0.011	0.011	0.012	0.012	0.013	0.013
1175	0.006	0.010	0.010	0.010	0.010	0.010	0.010	0.011	0.012	0.012	0.014
1225	0.006	0.010	0.010	0.010	0.010	0.010	0.010	0.011	0.012	0.012	0.013
1275	0.006	0.010	0.010	0.010	0.010	0.010	0.010	0.011	0.011	0.012	0.013
1325	0.006	0.010	0.010	0.010	0.010	0.010	0.010	0.011	0.011	0.011	0.013
1375	0.006	0.010	0.010	0.009	0.010	0.009	0.009	0.011	0.011	0.011	0.012
1425	0.006	0.010	0.010	0.009	0.009	0.009	0.009	0.011	0.011	0.011	0.012
1475	0.006	0.010	0.010	0.010	0.009	0.009	0.009	0.010	0.011	0.011	0.012
1525	0.006	0.009	0.009	0.010	0.009	0.009	0.009	0.010	0.011	0.011	0.013
1575	0.006	0.009	0.009	0.009	0.009	0.009	0.009	0.010	0.011	0.011	0.012
1625	0.006	0.009	0.009	0.009	0.009	0.009	0.009	0.010	0.010	0.011	0.012
1675	0.006	0.009	0.009	0.009	0.009	0.009	0.009	0.010	0.010	0.011	0.012
1725	0.006	0.009	0.009	0.009	0.009	0.009	0.009	0.010	0.010	0.011	0.011
1775	0.006	0.009	0.009	0.009	0.009	0.009	0.009	0.010	0.010	0.010	0.012
1825	0.006	0.009	0.009	0.009	0.009	0.009	0.009	0.010	0.010	0.011	0.012
1875	0.006	0.009	0.009	0.009	0.009	0.009	0.009	0.010	0.010	0.010	0.011
1925	0.006	0.009	0.009	0.009	0.009	0.009	0.009	0.010	0.010	0.011	0.012
1975	0.006	0.008	0.009	0.009	0.009	0.009	0.009	0.010	0.010	0.010	0.011

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 [%]
2.1	0.004	0.007	0.007	0.006	0.009	0.007	0.006	0.007	0.007	0.007	0.007
2.3	0.004	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.008
2.5	0.004	0.006	0.006	0.006	0.005	0.005	0.005	0.006	0.007	0.006	0.008
2.7	0.004	0.008	0.007	0.005	0.005	0.006	0.007	0.007	0.007	0.007	0.007
2.9	0.004	0.008	0.006	0.006	0.006	0.006	0.005	0.006	0.006	0.006	0.008
3.1	0.004	0.006	0.006	0.006	0.005	0.005	0.005	0.006	0.006	0.006	0.007
3.3	0.004	0.007	0.006	0.006	0.006	0.006	0.005	0.006	0.006	0.006	0.008
3.5	0.004	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.007	0.006	0.008
3.7	0.004	0.006	0.006	0.006	0.005	0.005	0.005	0.006	0.007	0.006	0.007
3.9	0.004	0.006	0.007	0.006	0.006	0.006	0.006	0.007	0.007	0.006	0.007
4.1	0.004	0.006	0.006	0.006	0.006	0.006	0.006	0.007	0.008	0.007	0.011
4.3	0.004	0.006	0.006	0.006	0.005	0.005	0.006	0.007	0.008	0.007	0.010
4.5	0.004	0.006	0.006	0.005	0.005	0.006	0.005	0.006	0.007	0.007	0.010
4.7	0.004	0.005	0.005	0.005	0.005	0.005	0.005	0.006	0.007	0.006	0.009
4.9	0.004	0.005	0.005	0.005	0.005	0.005	0.005	0.006	0.006	0.006	0.007
5.1	0.004	0.004	0.005	0.005	0.005	0.005	0.005	0.006	0.006	0.005	0.006
5.3	0.004	0.004	0.005	0.005	0.005	0.005	0.005	0.006	0.006	0.005	0.006
5.5	0.004	0.004	0.005	0.005	0.006	0.005	0.005	0.007	0.008	0.005	0.005
5.7	0.004	0.004	0.005	0.005	0.005	0.005	0.004	0.007	0.007	0.005	0.005
5.9	0.004	0.004	0.005	0.005	0.005	0.005	0.004	0.006	0.006	0.005	0.005
6.1	0.004	0.004	0.005	0.005	0.004	0.005	0.004	0.006	0.006	0.005	0.005
6.3	0.004	0.004	0.005	0.005	0.005	0.004	0.005	0.006	0.006	0.005	0.005
6.5	0.004	0.004	0.005	0.005	0.004	0.005	0.005	0.005	0.005	0.006	0.005
6.7	0.004	0.004	0.005	0.005	0.005	0.005	0.005	0.006	0.005	0.006	0.006
6.9	0.004	0.004	0.005	0.005	0.005	0.006	0.007	0.007	0.006	0.009	0.009
7.1	0.004	0.004	0.005	0.005	0.005	0.006	0.007	0.007	0.006	0.008	0.009
7.3	0.004	0.004	0.005	0.005	0.005	0.005	0.006	0.006	0.006	0.007	0.007
7.5	0.004	0.004	0.005	0.005	0.005	0.005	0.005	0.006	0.005	0.005	0.005
7.7	0.004	0.004	0.005	0.005	0.004	0.004	0.004	0.005	0.005	0.005	0.005
7.9	0.013	0.009	0.009	0.009	0.009	0.009	0.010	0.010	0.010	0.010	0.010
8.1	0.010	0.009	0.009	0.009	0.009	0.009	0.009	0.010	0.010	0.010	0.010
8.3	0.004	0.004	0.005	0.005	0.004	0.004	0.004	0.005	0.005	0.005	0.005
8.5	0.004	0.004	0.005	0.005	0.004	0.004	0.004	0.005	0.005	0.005	0.005
8.7	0.004	0.004	0.005	0.005	0.004	0.004	0.004	0.005	0.005	0.005	0.005
8.9	0.004	0.004	0.005	0.005	0.004	0.004	0.004	0.005	0.005	0.005	0.005
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	BNT060KTL										
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	0.005	0.038	0.031	0.047	0.043	0.038	0.040	0.053	0.069	0.079	0.052
3	0.006	0.132	0.034	0.072	0.108	0.136	0.181	0.269	0.377	0.477	0.614
4	0.005	0.015	0.014	0.019	0.022	0.026	0.023	0.026	0.026	0.014	0.033
5	0.006	0.172	0.070	0.081	0.104	0.148	0.178	0.186	0.223	0.271	0.183
6	0.006	0.011	0.022	0.017	0.012	0.011	0.013	0.018	0.021	0.021	0.015
7	0.007	0.132	0.167	0.158	0.161	0.150	0.165	0.153	0.192	0.259	0.302
8	0.005	0.014	0.015	0.011	0.009	0.010	0.010	0.011	0.013	0.013	0.017
9	0.008	0.043	0.041	0.024	0.019	0.019	0.017	0.016	0.017	0.014	0.033
10	0.005	0.015	0.016	0.020	0.017	0.011	0.010	0.011	0.015	0.014	0.019
11	0.006	0.202	0.451	0.160	0.136	0.109	0.102	0.108	0.123	0.138	0.393
12	0.006	0.013	0.011	0.018	0.016	0.016	0.016	0.015	0.018	0.015	0.020
13	0.006	0.279	0.255	0.093	0.112	0.109	0.116	0.109	0.118	0.122	0.423
14	0.005	0.018	0.011	0.013	0.015	0.013	0.011	0.012	0.017	0.017	0.021
15	0.007	0.024	0.042	0.025	0.019	0.019	0.017	0.015	0.019	0.016	0.023
16	0.006	0.013	0.010	0.017	0.015	0.013	0.012	0.012	0.016	0.013	0.021
17	0.007	0.211	0.264	0.132	0.036	0.091	0.097	0.091	0.092	0.098	0.157
18	0.006	0.010	0.012	0.010	0.012	0.014	0.011	0.010	0.016	0.015	0.021
19	0.006	0.193	0.063	0.056	0.056	0.030	0.066	0.090	0.096	0.102	0.162
20	0.006	0.009	0.010	0.011	0.013	0.012	0.010	0.011	0.013	0.013	0.019
21	0.006	0.020	0.026	0.026	0.019	0.016	0.016	0.018	0.017	0.016	0.020
22	0.006	0.009	0.010	0.013	0.014	0.011	0.010	0.011	0.013	0.011	0.014
23	0.006	0.112	0.010	0.126	0.064	0.027	0.038	0.063	0.075	0.078	0.044
24	0.006	0.010	0.010	0.012	0.009	0.010	0.009	0.010	0.011	0.010	0.013
25	0.006	0.083	0.044	0.065	0.028	0.037	0.017	0.030	0.043	0.057	0.072
26	0.006	0.011	0.010	0.010	0.011	0.010	0.008	0.009	0.010	0.010	0.013
27	0.006	0.017	0.018	0.019	0.015	0.014	0.012	0.013	0.012	0.014	0.014
28	0.006	0.010	0.010	0.009	0.010	0.010	0.009	0.010	0.010	0.010	0.015
29	0.006	0.133	0.084	0.031	0.051	0.023	0.023	0.021	0.034	0.041	0.057
30	0.006	0.010	0.009	0.010	0.009	0.009	0.009	0.009	0.010	0.010	0.012
31	0.006	0.105	0.052	0.029	0.047	0.016	0.021	0.019	0.020	0.027	0.060
32	0.006	0.010	0.008	0.008	0.012	0.009	0.008	0.009	0.010	0.009	0.012
33	0.006	0.027	0.018	0.017	0.014	0.012	0.010	0.012	0.010	0.012	0.013
34	0.005	0.011	0.008	0.008	0.012	0.009	0.008	0.009	0.010	0.010	0.013
35	0.005	0.064	0.057	0.029	0.036	0.021	0.013	0.016	0.016	0.020	0.038
36	0.006	0.008	0.009	0.008	0.009	0.009	0.008	0.009	0.010	0.009	0.011
37	0.006	0.049	0.021	0.009	0.018	0.025	0.013	0.016	0.015	0.016	0.066
38	0.005	0.010	0.008	0.008	0.009	0.009	0.008	0.009	0.009	0.009	0.012
39	0.005	0.014	0.019	0.016	0.012	0.012	0.010	0.011	0.010	0.011	0.014
40	0.005	0.010	0.008	0.008	0.009	0.009	0.008	0.009	0.009	0.009	0.011
41	0.005	0.089	0.011	0.014	0.029	0.024	0.013	0.011	0.012	0.012	0.050
42	0.006	0.008	0.008	0.008	0.008	0.008	0.008	0.009	0.009	0.009	0.010

CEI 0-16											
Clause	Requirement - Test						Result - Remark				Verdict
43	0.005	0.069	0.017	0.013	0.024	0.015	0.016	0.012	0.014	0.015	0.039
44	0.005	0.008	0.008	0.009	0.009	0.008	0.008	0.009	0.009	0.009	0.011
45	0.005	0.017	0.017	0.015	0.012	0.011	0.010	0.010	0.010	0.010	0.013
46	0.005	0.011	0.008	0.009	0.009	0.008	0.008	0.009	0.009	0.009	0.011
47	0.006	0.023	0.030	0.012	0.026	0.015	0.022	0.012	0.013	0.010	0.035
48	0.005	0.008	0.008	0.008	0.008	0.008	0.007	0.009	0.009	0.009	0.010
49	0.005	0.034	0.029	0.015	0.017	0.015	0.010	0.012	0.012	0.018	0.030
50	0.005	0.007	0.008	0.009	0.008	0.008	0.007	0.009	0.009	0.009	0.010

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	0.005	0.011	0.014	0.013	0.012	0.011	0.011	0.011	0.011	0.011	0.014
125	0.005	0.006	0.007	0.007	0.007	0.007	0.007	0.009	0.009	0.009	0.009
175	0.005	0.006	0.007	0.007	0.006	0.007	0.006	0.007	0.007	0.007	0.007
225	0.008	0.014	0.015	0.014	0.015	0.015	0.014	0.015	0.018	0.016	0.019
275	0.008	0.014	0.015	0.014	0.015	0.015	0.014	0.015	0.018	0.017	0.019
325	0.008	0.013	0.014	0.014	0.015	0.015	0.015	0.015	0.018	0.017	0.019
375	0.008	0.014	0.016	0.014	0.016	0.016	0.016	0.016	0.018	0.017	0.019
425	0.008	0.013	0.014	0.014	0.015	0.016	0.015	0.015	0.019	0.017	0.019
475	0.008	0.013	0.014	0.014	0.016	0.016	0.015	0.015	0.020	0.018	0.020
525	0.008	0.013	0.015	0.014	0.016	0.017	0.016	0.015	0.023	0.020	0.022
575	0.008	0.013	0.014	0.014	0.017	0.019	0.017	0.016	0.023	0.021	0.022
625	0.008	0.013	0.014	0.015	0.017	0.019	0.017	0.016	0.023	0.020	0.022
675	0.008	0.014	0.015	0.015	0.018	0.019	0.017	0.015	0.023	0.020	0.022
725	0.008	0.014	0.014	0.015	0.029	0.034	0.028	0.017	0.049	0.037	0.041
775	0.009	0.013	0.014	0.014	0.017	0.019	0.017	0.015	0.023	0.020	0.022
825	0.009	0.014	0.015	0.015	0.018	0.019	0.017	0.017	0.023	0.021	0.022
875	0.009	0.013	0.014	0.014	0.017	0.018	0.016	0.016	0.023	0.020	0.022
925	0.009	0.013	0.014	0.014	0.016	0.017	0.016	0.015	0.022	0.020	0.021
975	0.009	0.014	0.014	0.014	0.016	0.016	0.015	0.015	0.020	0.018	0.019
1025	0.009	0.013	0.014	0.014	0.015	0.015	0.014	0.015	0.018	0.018	0.019
1075	0.009	0.013	0.013	0.013	0.014	0.014	0.014	0.015	0.017	0.017	0.018
1125	0.009	0.013	0.014	0.014	0.014	0.014	0.014	0.015	0.016	0.016	0.017
1175	0.009	0.013	0.013	0.013	0.013	0.014	0.013	0.015	0.016	0.016	0.016
1225	0.009	0.013	0.013	0.013	0.013	0.013	0.013	0.015	0.016	0.016	0.017
1275	0.009	0.013	0.013	0.013	0.013	0.013	0.013	0.014	0.015	0.015	0.016
1325	0.009	0.013	0.013	0.013	0.013	0.013	0.013	0.014	0.014	0.015	0.016
1375	0.009	0.012	0.013	0.013	0.013	0.013	0.012	0.014	0.014	0.015	0.016
1425	0.009	0.013	0.013	0.013	0.013	0.013	0.013	0.014	0.014	0.014	0.015
1475	0.009	0.012	0.012	0.013	0.012	0.013	0.012	0.014	0.014	0.015	0.015
1525	0.009	0.012	0.012	0.013	0.013	0.013	0.013	0.014	0.014	0.015	0.016
1575	0.009	0.012	0.013	0.013	0.013	0.012	0.013	0.014	0.015	0.015	0.015
1625	0.009	0.012	0.012	0.013	0.012	0.012	0.012	0.014	0.014	0.015	0.015
1675	0.009	0.012	0.012	0.012	0.012	0.012	0.012	0.014	0.014	0.015	0.015
1725	0.009	0.012	0.013	0.013	0.012	0.012	0.012	0.014	0.014	0.014	0.015
1775	0.009	0.012	0.012	0.012	0.012	0.012	0.012	0.014	0.014	0.014	0.015
1825	0.009	0.012	0.012	0.013	0.012	0.012	0.012	0.014	0.014	0.014	0.015
1875	0.008	0.011	0.012	0.012	0.012	0.012	0.012	0.013	0.013	0.014	0.014
1925	0.009	0.011	0.012	0.012	0.012	0.012	0.012	0.013	0.013	0.014	0.015
1975	0.008	0.011	0.012	0.012	0.012	0.012	0.012	0.013	0.013	0.014	0.014

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	0.006	0.008	0.008	0.008	0.008	0.008	0.008	0.009	0.009	0.009	0.010
2.3	0.005	0.011	0.008	0.009	0.009	0.008	0.008	0.009	0.009	0.009	0.011
2.5	0.005	0.007	0.008	0.009	0.008	0.008	0.007	0.009	0.009	0.009	0.010
2.7	0.005	0.008	0.008	0.008	0.007	0.008	0.007	0.008	0.009	0.008	0.009
2.9	0.005	0.009	0.008	0.009	0.008	0.008	0.007	0.008	0.008	0.008	0.010
3.1	0.005	0.008	0.008	0.009	0.008	0.007	0.007	0.008	0.008	0.008	0.010
3.3	0.006	0.009	0.008	0.007	0.007	0.007	0.007	0.008	0.009	0.008	0.009
3.5	0.005	0.009	0.008	0.008	0.008	0.008	0.007	0.009	0.009	0.009	0.010
3.7	0.005	0.007	0.007	0.009	0.008	0.007	0.007	0.008	0.009	0.008	0.010
3.9	0.005	0.007	0.008	0.008	0.008	0.008	0.007	0.009	0.009	0.008	0.010
4.1	0.005	0.009	0.008	0.008	0.008	0.008	0.008	0.009	0.009	0.009	0.012
4.3	0.005	0.007	0.008	0.008	0.008	0.008	0.007	0.008	0.009	0.008	0.013
4.5	0.005	0.008	0.008	0.007	0.007	0.007	0.007	0.009	0.009	0.009	0.012
4.7	0.005	0.007	0.007	0.007	0.007	0.007	0.007	0.008	0.009	0.009	0.012
4.9	0.005	0.007	0.007	0.007	0.007	0.007	0.007	0.008	0.009	0.008	0.010
5.1	0.005	0.006	0.007	0.007	0.007	0.007	0.007	0.008	0.009	0.008	0.008
5.3	0.005	0.006	0.007	0.007	0.007	0.007	0.007	0.010	0.010	0.008	0.008
5.5	0.005	0.006	0.007	0.008	0.009	0.008	0.007	0.012	0.013	0.008	0.008
5.7	0.005	0.006	0.007	0.008	0.009	0.007	0.007	0.012	0.013	0.008	0.008
5.9	0.005	0.006	0.007	0.007	0.007	0.007	0.007	0.010	0.010	0.008	0.008
6.1	0.005	0.006	0.007	0.007	0.007	0.007	0.007	0.009	0.009	0.008	0.008
6.3	0.005	0.006	0.007	0.007	0.007	0.007	0.007	0.008	0.008	0.009	0.008
6.5	0.005	0.006	0.007	0.007	0.007	0.007	0.007	0.008	0.008	0.009	0.009
6.7	0.005	0.006	0.007	0.007	0.007	0.008	0.008	0.009	0.008	0.011	0.011
6.9	0.005	0.006	0.007	0.008	0.007	0.010	0.012	0.011	0.009	0.016	0.016
7.1	0.005	0.006	0.007	0.008	0.007	0.010	0.012	0.012	0.010	0.015	0.016
7.3	0.005	0.006	0.007	0.007	0.007	0.009	0.010	0.010	0.009	0.012	0.012
7.5	0.005	0.006	0.007	0.007	0.007	0.007	0.007	0.008	0.008	0.008	0.009
7.7	0.005	0.006	0.007	0.007	0.007	0.007	0.007	0.008	0.007	0.008	0.008
7.9	0.007	0.008	0.008	0.008	0.008	0.008	0.008	0.009	0.009	0.009	0.009
8.1	0.010	0.008	0.009	0.009	0.009	0.009	0.009	0.010	0.010	0.010	0.010
8.3	0.005	0.006	0.007	0.007	0.006	0.006	0.006	0.008	0.007	0.007	0.007
8.5	0.005	0.006	0.007	0.007	0.007	0.006	0.006	0.008	0.008	0.007	0.007
8.7	0.005	0.006	0.007	0.007	0.006	0.006	0.006	0.008	0.007	0.007	0.007
8.9	0.005	0.006	0.007	0.007	0.006	0.007	0.006	0.007	0.007	0.007	0.007
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 _{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 (ψ _k)		0.880	0.550	0.238	0.125
Voltage change factor, k _u (ψ _k)		0.866	1.126	1.386	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 (ψ _k)		2.938	1.691	0.610	0.444
Voltage change factor, k _u (ψ _k)		1.299	1.212	0.953	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 (ψ _k)		1.309	2.185	3.081	3.420
Voltage change factor, k _u (ψ _k)		1.039	1.386	0.866	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

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 – 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 (ψ _k)		0.453	0.323	0.203	0.151
Voltage change factor, k _u (ψ _k)		1.299	0.953	1.212	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 (ψ _k)		0.393	0.311	0.375	0.410
Voltage change factor, k _u (ψ _k)		1.386	1.212	0.866	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 (ψ _k)		1.015	0.989	0.970	0.916
Voltage change factor, k _u (ψ _k)		0.866	1.386	1.126	0.953
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
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 _{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 (ψ _k)		0.288	0.236	0.179	0.143
Voltage change factor, k _u (ψ _k)		1.299	1.126	1.299	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 (ψ _k)		0.323	0.335	0.404	0.436
Voltage change factor, k _u (ψ _k)		1.126	1.126	1.039	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 (ψ _k)		1.192	1.902	2.697	3.007
Voltage change factor, k _u (ψ _k)		0.866	1.039	1.126	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

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	BNT060KTL								
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	0.064	0.803	0.131	1.640	0.187	2.342	0.205	2.561
2	20	0.083	1.041	0.182	2.269	0.267	3.340	0.298	3.725
3	30	0.059	0.747	0.130	1.623	0.194	2.421	0.218	2.724
4	40	0.049	0.617	0.104	1.305	0.155	1.938	0.175	2.183
5	50	0.045	0.567	0.097	1.212	0.145	1.810	0.164	2.051
6	60	0.048	0.607	0.091	1.144	0.136	1.703	0.155	1.934
7	70	0.101	1.266	0.104	1.305	0.130	1.631	0.147	1.841
8	80	0.228	2.847	0.190	2.380	0.155	1.937	0.149	1.867
9	90	0.344	4.299	0.287	3.589	0.210	2.629	0.166	2.080
10	100	0.200	2.496	0.174	2.177	0.150	1.878	0.146	1.821
11	100	0.199	2.492	0.175	2.190	0.153	1.912	0.147	1.838
12	100	0.210	2.629	0.183	2.291	0.155	1.944	0.145	1.817
Network impedance angle		Measurements							
		P _{st}		P _{lt}		C ψ_k			
30°		0.344		0.344		4.299			
50°		3.589		3.589		3.589			
70°		0.267		0.267		3.340			
85°		0.298		0.298		3.725			
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	BNT060KTL									
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	0.019	0.245	0.027	0.337	0.035	0.437	0.037	0.467	
2	20	0.026	0.326	0.036	0.452	0.048	0.605	0.052	0.657	
3	30	0.03	0.383	0.035	0.440	0.041	0.516	0.044	0.549	
4	40	0.031	0.386	0.035	0.447	0.042	0.532	0.045	0.569	
5	50	0.026	0.324	0.032	0.404	0.041	0.513	0.044	0.559	
6	60	0.023	0.290	0.035	0.443	0.050	0.628	0.056	0.708	
7	70	0.097	1.212	0.081	1.018	0.072	0.908	0.075	0.944	
8	80	0.222	2.769	0.176	2.205	0.118	1.479	0.084	1.049	
9	90	0.339	4.229	0.276	3.441	0.186	2.320	0.112	1.404	
10	100	0.197	2.459	0.166	2.076	0.126	1.574	0.097	1.215	
11	100	0.195	2.434	0.163	2.036	0.120	1.507	0.090	1.130	
12	100	0.207	2.583	0.172	2.145	0.125	1.563	0.091	1.137	
Network impedance angle		Measurements								
		P _{st}		P _{lt}		C ψ_k				
30°		0.339		0.339		4.229				
50°		0.276		0.276		3.441				
70°		0.186		0.186		2.320				
85°		0.112		0.112		1.404				
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	BNT060KTL								
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	0.036	0.453	0.051	0.646	0.068	0.856	0.073	0.919
2	20	0.032	0.405	0.066	0.828	0.096	1.201	0.106	1.329
3	30	0.026	0.324	0.048	0.609	0.070	0.876	0.078	0.974
4	40	0.027	0.346	0.043	0.540	0.060	0.759	0.067	0.844
5	50	0.033	0.418	0.045	0.569	0.060	0.759	0.067	0.844
6	60	0.028	0.360	0.040	0.498	0.054	0.685	0.061	0.771
7	70	0.098	1.230	0.081	1.011	0.069	0.862	0.069	0.866
8	80	0.227	2.830	0.180	2.256	0.120	1.501	0.081	1.014
9	90	0.346	4.314	0.282	3.525	0.191	2.388	0.115	1.438
10	100	0.201	2.515	0.170	2.126	0.127	1.585	0.093	1.162
11	100	0.199	2.489	0.168	2.096	0.125	1.559	0.093	1.163
12	100	0.212	2.646	0.177	2.219	0.130	1.626	0.094	1.174
Network impedance angle		Measurements							
		P _{st}		P _{lt}		C ψ_k			
30°		0.346		0.346		4.314			
50°		0.282		0.282		3.525			
70°		0.130		0.130		2.388			
85°		0.115		0.115		1.438			
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	BNT060KTL							
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	84.98%	47.50	93.75%	0.9997	0.01%	-15% to +5%
2	110%	51.5	110.13%	51.50	100.24%	0.9997	0.24%	-5% to +5%

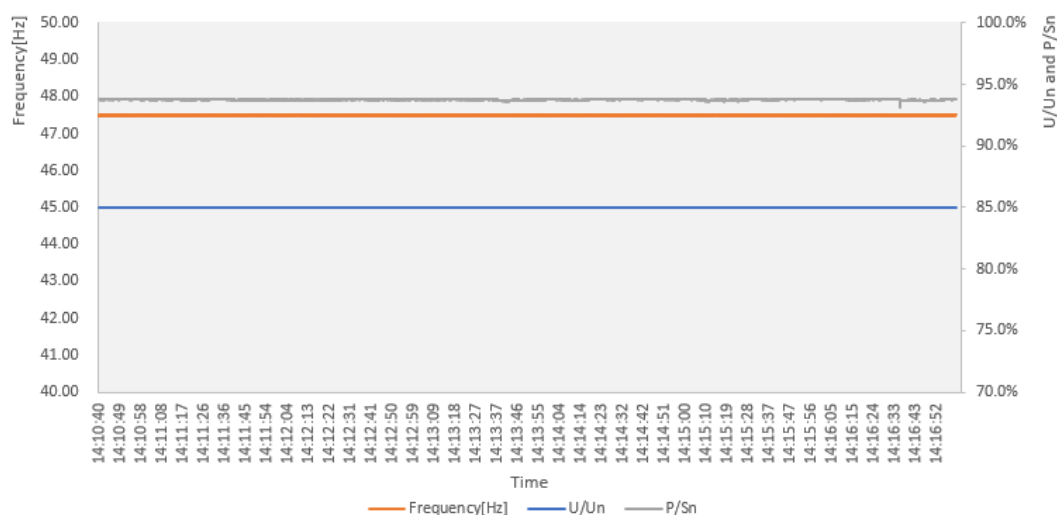
Note:

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

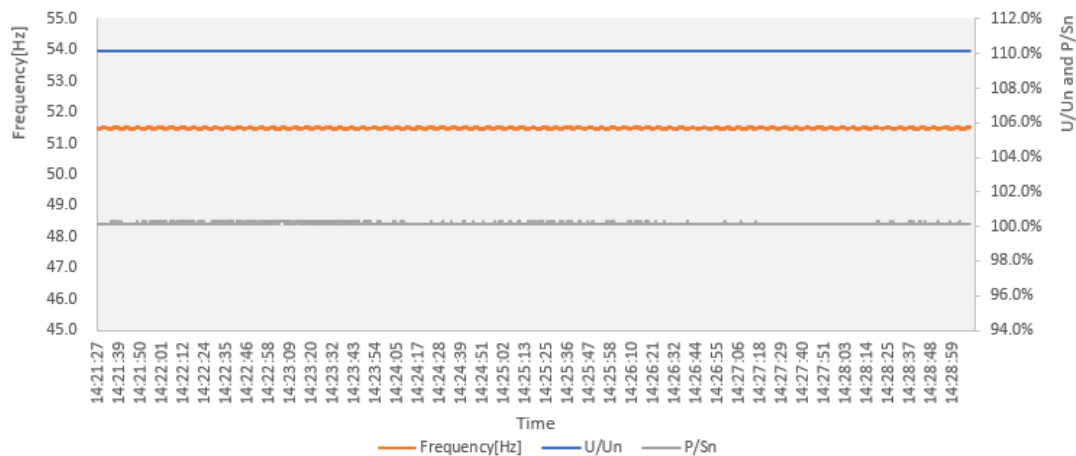
Test sequence 1: Unit can operate at reduced power of $P \geq 85\%S_n$.

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

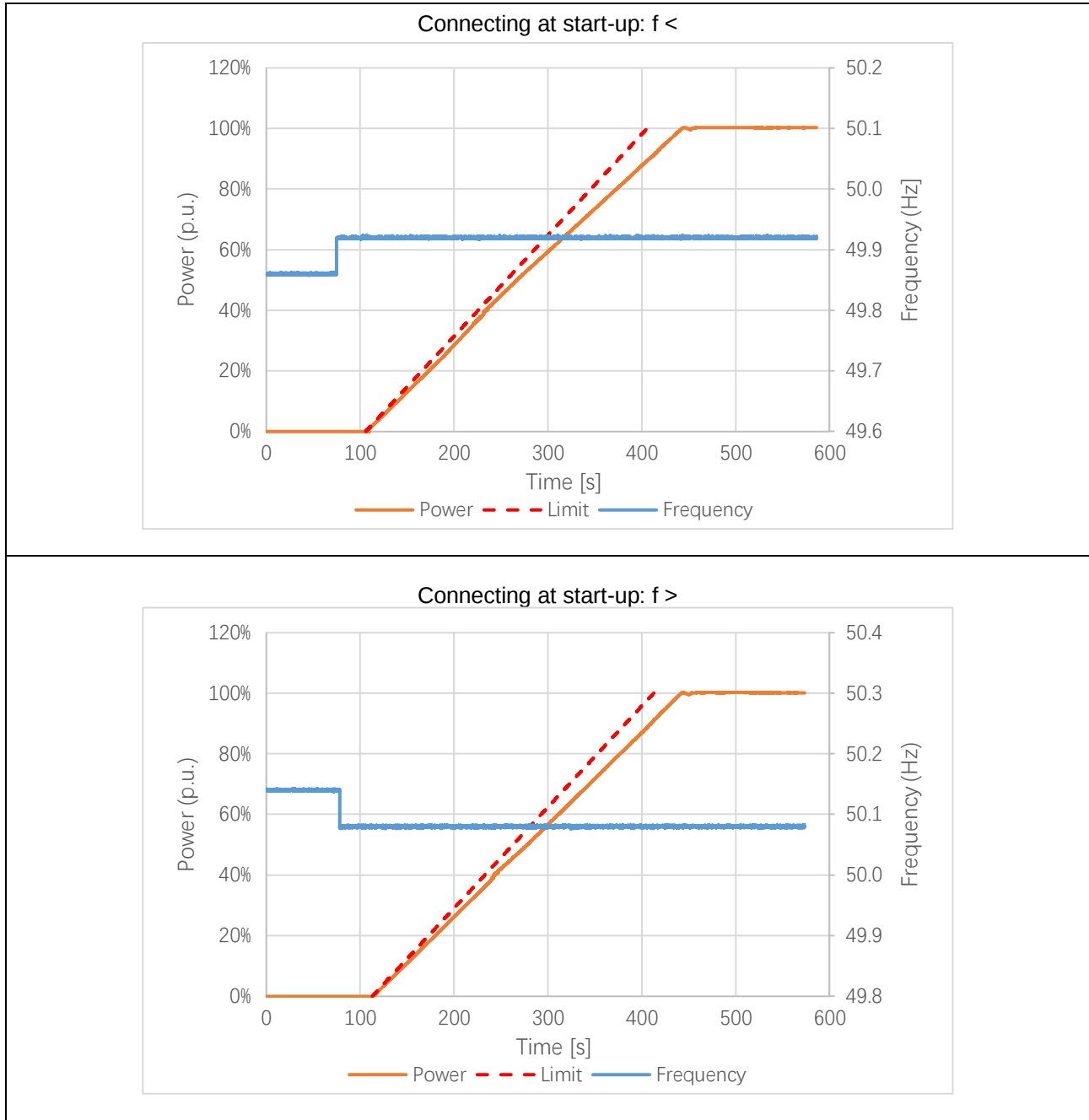
N.5	Tabella: Verifica delle condizioni di sincronizzazione e presa di carico Table: Synchronization and reconnection							P
Setting values for Synchronization:		Setting U< [V]:				90%Un		
		Setting U> [V]:				110%Un		
		Setting f< [Hz]:				49.9Hz		
		Setting f> [Hz]:				50.1Hz		
		Setting T _{connection} [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	88.97%	50.00	No connection	--	No connection	--	
Change to:								
≥ 91%	50	91.04%	50.00	32.2	18.42 %P _n /min	≥ 30s	20%	
Change to:								
> 111%	50	111.01%	50.00	No connection	--	No connection	--	
Change to:								
≤ 109%	50	108.97%	50.00	30.4	17.67%%P _n /min	≥ 30s	20%	
Change to:								
100%	< 49.88	99.97%	49.86	No connection	--	No connection	--	
Change to:								
100%	≥ 49.92	99.97%	49.92	30.9	17.50%P _n /min	≥ 30s	20%	
Change to:								
100%	> 50.12	99.98%	50.10	No connection	--	No connection	--	
Change to:								
100%	≤ 50.08	99.98%	50.08	34.7	18.04%P _n /min	≥ 30s	20%	

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

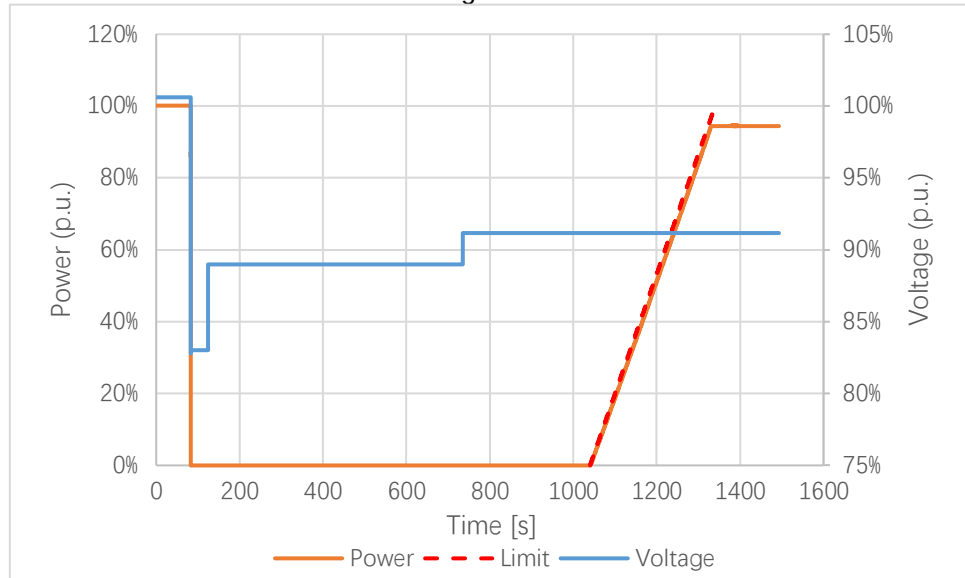
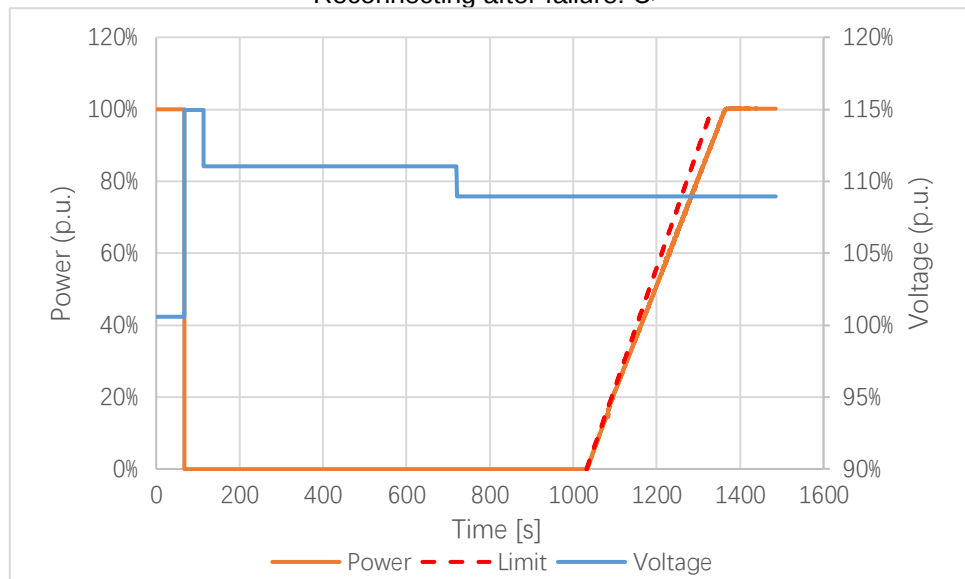
Test condition		Measurement				Limit	
U/U _n	F [Hz]	U/U _n	F [Hz]	Observation time [s]	Max. gradient P _n /min	Observation time	Max. gradient P _n /min
Test conditions: Reconnecting after failure:							
< 89%	50	88.97%	50.00	No connection	--	No connection	--
Change to:							
≥ 91%	50	91.18%	50.00	305.4	19.54%P _n /min	≥ 300s	20%
> 111%	50	111.06%	50.00	No connection	--	No connection	--
Change to:							
≤ 109%	50	108.97%	50.00	311.5	18.04%P _n /min	≥ 300s	20%
100%	< 49.88	99.96%	49.86	No connection	--	No connection	--
Change to:							
100%	≥ 49.92	99.96%	49.92	302.8	18.19%P _n /min	≥ 300s	20%
100%	> 50.12	99.98%	50.14	No connection	--	No connection	--
Change to:							
100%	≤ 50.08	99.98%	50.08	307.5	18.50%P _n /min	≥ 300s	20%

CEI 0-16																																			
Clause	Requirement - Test	Result - Remark	Verdict																																
Connecting at start-up: $U <$ The graph for the $U <$ scenario shows the system's response to a voltage drop. The voltage (blue solid line) starts at 89% and drops to 86% at 100s. Power (orange solid line) starts at 0% and begins to rise at 100s, reaching 90% at 400s. The power limit (red dashed line) starts at 100s and rises linearly to 91% at 400s. The power remains below the limit throughout the test. <table border="1"><thead><tr><th>Time (s)</th><th>Power (p.u.)</th><th>Limit (p.u.)</th><th>Voltage (p.u.)</th></tr></thead><tbody><tr><td>0</td><td>0%</td><td>-</td><td>89%</td></tr><tr><td>100</td><td>0%</td><td>0%</td><td>86%</td></tr><tr><td>200</td><td>20%</td><td>20%</td><td>86%</td></tr><tr><td>300</td><td>40%</td><td>40%</td><td>86%</td></tr><tr><td>400</td><td>90%</td><td>91%</td><td>86%</td></tr><tr><td>500</td><td>90%</td><td>-</td><td>86%</td></tr><tr><td>600</td><td>90%</td><td>-</td><td>86%</td></tr></tbody></table>				Time (s)	Power (p.u.)	Limit (p.u.)	Voltage (p.u.)	0	0%	-	89%	100	0%	0%	86%	200	20%	20%	86%	300	40%	40%	86%	400	90%	91%	86%	500	90%	-	86%	600	90%	-	86%
Time (s)	Power (p.u.)	Limit (p.u.)	Voltage (p.u.)																																
0	0%	-	89%																																
100	0%	0%	86%																																
200	20%	20%	86%																																
300	40%	40%	86%																																
400	90%	91%	86%																																
500	90%	-	86%																																
600	90%	-	86%																																
Connecting at start-up: $U >$ The graph for the $U >$ scenario shows the system's response to a voltage rise. The voltage (blue solid line) starts at 109% and rises to 111% at 100s. Power (orange solid line) starts at 0% and begins to rise at 100s, reaching 100% at 400s. The power limit (red dashed line) starts at 100s and rises linearly to 100% at 400s. The power remains below the limit throughout the test. <table border="1"><thead><tr><th>Time (s)</th><th>Power (p.u.)</th><th>Limit (p.u.)</th><th>Voltage (p.u.)</th></tr></thead><tbody><tr><td>0</td><td>0%</td><td>-</td><td>109%</td></tr><tr><td>100</td><td>0%</td><td>0%</td><td>111%</td></tr><tr><td>200</td><td>20%</td><td>20%</td><td>111%</td></tr><tr><td>300</td><td>40%</td><td>40%</td><td>111%</td></tr><tr><td>400</td><td>100%</td><td>100%</td><td>111%</td></tr><tr><td>500</td><td>100%</td><td>-</td><td>111%</td></tr><tr><td>600</td><td>100%</td><td>-</td><td>111%</td></tr></tbody></table>				Time (s)	Power (p.u.)	Limit (p.u.)	Voltage (p.u.)	0	0%	-	109%	100	0%	0%	111%	200	20%	20%	111%	300	40%	40%	111%	400	100%	100%	111%	500	100%	-	111%	600	100%	-	111%
Time (s)	Power (p.u.)	Limit (p.u.)	Voltage (p.u.)																																
0	0%	-	109%																																
100	0%	0%	111%																																
200	20%	20%	111%																																
300	40%	40%	111%																																
400	100%	100%	111%																																
500	100%	-	111%																																
600	100%	-	111%																																

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

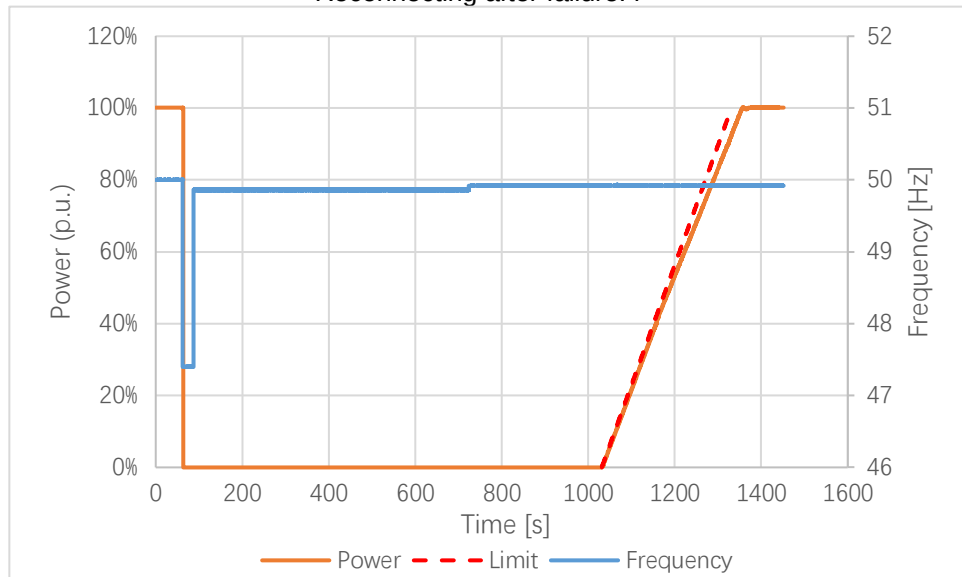
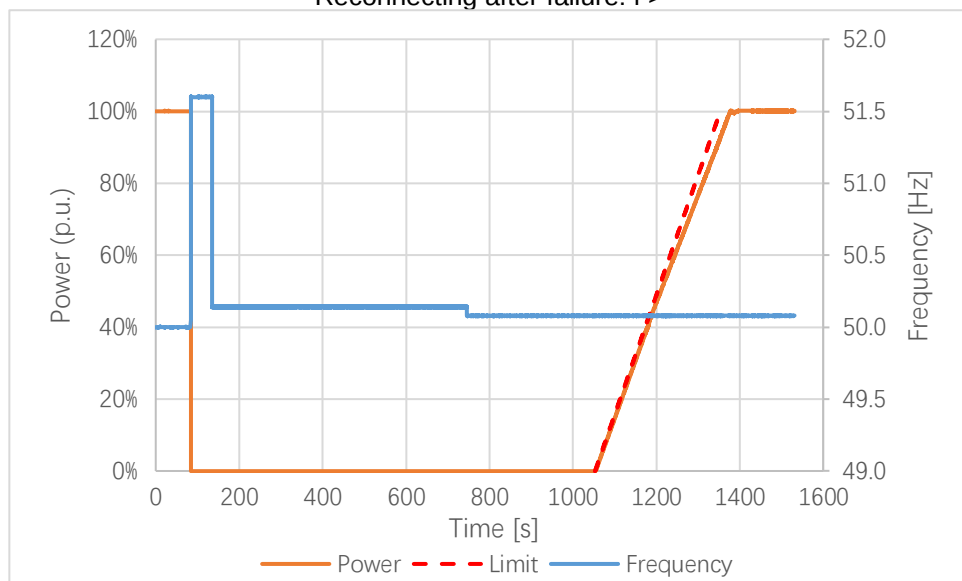


CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

Reconnecting after failure: $U <$ Reconnecting after failure: $U >$ 

CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Reconnecting after failure: $f <$ Reconnecting after failure: $f >$ 

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: BNT060KTL							
Test: Power generation plant < 400kW							
Reactive power production with set point Q = 0							
Power-Bin	Active Power		Reactive Power		DC Power		Power Factor
	kW	p.u.	kVar	p.u.	kW	p.u.	Cos φ
0% ± 5%	-	-	-	-	-	-	-
10% ± 5%	6.084	10.14%	0.3582	0.60%	0.6399	10.66%	0.9904
20% ± 5%	12.030	20.05%	-0.4408	-0.73%	12.695	21.16%	0.9975
30% ± 5%	18.074	30.12%	0.7417	1.24%	18.848	31.41%	0.9989
40% ± 5%	24.021	40.03%	0.5373	0.90%	25.040	41.73%	0.9991
50% ± 5%	29.978	49.96%	-0.4670	-0.78%	31.246	52.08%	0.9994
60% ± 5%	36.049	60.08%	0.9964	1.66%	37.569	62.62%	0.9995
70% ± 5%	42.056	70.09%	0.1202	0.20%	44.287	73.81%	0.9996
80% ± 5%	48.088	80.14%	-0.7190	-1.2%	50.633	84.39%	0.9997
90% ± 5%	54.149	90.25%	-1.0867	-1.81%	57.012	95.02%	0.9997
100% ± 5%	60.071	100.12%	-1.2808	-2.13%	63.247	105.4%	0.9997
Reactive power production with set point Q = -Q _{max}							
Power-Bin	Active Power		Reactive Power		DC Power		Power Factor
	kW	p.u.	kVar	p.u.	kW	p.u.	Cos φ
0% ± 5%	21.560	0.04%	-26.244	-43.74%	27.338	45.56%	0.0008
10% ± 5%	6.045	10.07%	-26.235	-43.72%	28.044	46.74%	0.2245
20% ± 5%	12.063	20.11%	-26.215	-43.69%	30.060	50.10%	0.4180
30% ± 5%	18.023	30.04%	-26.175	-43.63%	33.104	55.17%	0.5671
40% ± 5%	24.000	40.00%	-26.200	-43.67%	37.023	61.71%	0.6753
50% ± 5%	29.997	50.00%	-26.190	-43.65%	41.482	69.14%	0.7533
60% ± 5%	36.078	60.13%	-26.222	-43.70%	46.460	77.43%	0.8089
70% ± 5%	42.036	70.06%	-26.195	-43.66%	51.594	85.99%	0.8487
80% ± 5%	48.029	80.05%	-26.234	-43.72%	57.007	95.01%	0.8776
90% ± 5%	53.981	89.97%	-26.202	-43.67%	62.504	104.17%	0.8996
95% ± 5%	57.095	95.16%	-18.815	-31.36%	62.620	104.37%	0.9498
100% ± 5%	59.099	95.16%	-18.817	-31.36%	62.625	104.37%	0.9498

CEI 0-16							
Clause	Requirement - Test				Result - Remark		Verdict
Reactive power production with set point $Q = +Q_{\max}$							
Power-Bin	Active Power		Reactive Power		DC Power		Power Factor
	kW	p.u.	kVar	p.u.	kW	p.u.	Cos φ
0% $\pm$ 5%	0.448	0.98%	26.200	43.67%	0.466	0.78%	0.0171
10% $\pm$ 5%	6.045	10.08%	26.203	43.67%	6.297	10.50%	0.2248
20% $\pm$ 5%	12.049	20.08%	26.232	43.72%	12.551	20.92%	0.4174
30% $\pm$ 5%	18.018	30.03%	26.284	43.81%	18.769	31.28%	0.5654
40% $\pm$ 5%	24.063	40.11%	26.249	43.75%	25.067	41.78%	0.6758
50% $\pm$ 5%	30.035	50.06%	26.185	43.64%	31.286	52.14%	0.7537
60% $\pm$ 5%	36.113	60.19%	26.286	43.81%	37.618	62.70%	0.8085
70% $\pm$ 5%	42.067	70.11%	26.376	43.96%	43.820	73.03%	0.8472
80% $\pm$ 5%	48.107	80.18%	26.476	44.13%	50.111	83.52%	0.8761
90% $\pm$ 5%	54.046	90.08%	26.596	44.33%	56.298	93.83%	0.8972
95% $\pm$ 5%	57.012	95.02%	18.815	31.36%	59.388	98.98%	0.9496
100% $\pm$ 5%	57.711	96.18%	18.827	31.38%	60.115	100.19%	0.9507
Note: average values at 1 min calculated on the basis of the values measured to the fundamental frequency on a time window of 200 ms.							

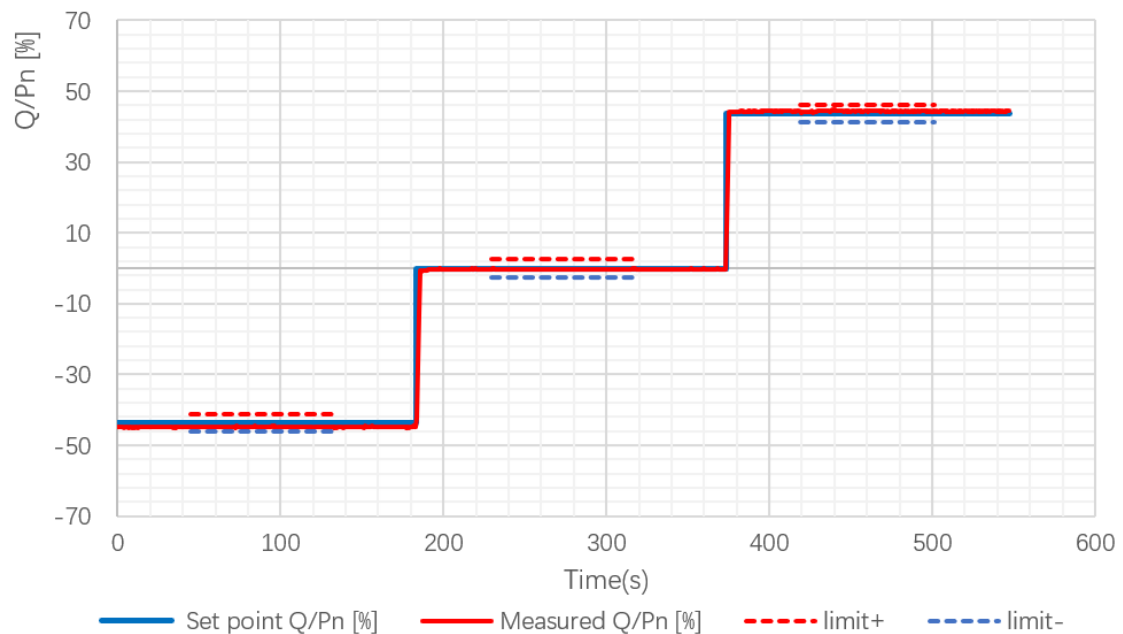
CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

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					Limit
	Q/S _{max}	P/S _{max}	Q/S _{max}	cosφ	I/I _n	U/U _n		ΔQ/S _{max}
	- 43.6%	50%	-43.61%	0.7559	133.32%	99.94%		-0.01%
0	1.51%		0.9995	99.65%	100.3%	1.51%		
+ 43.6%	43.59%		0.7533	131.71%	100.64%	-0.01%		
							ΔQ/S _{max}	
							≤ ±5%	

Note(s):

Possibility to control this function by an external signal.

Diagram

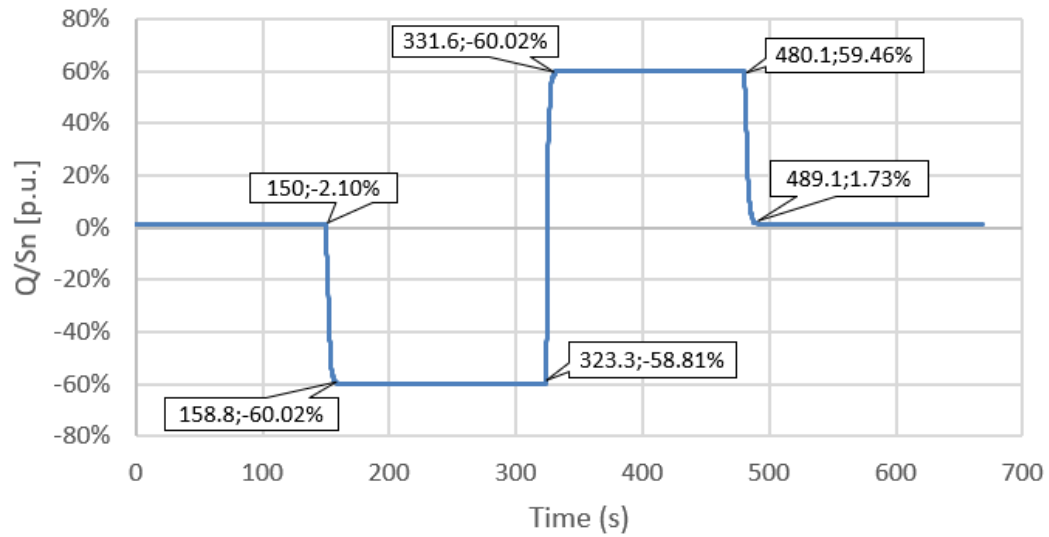
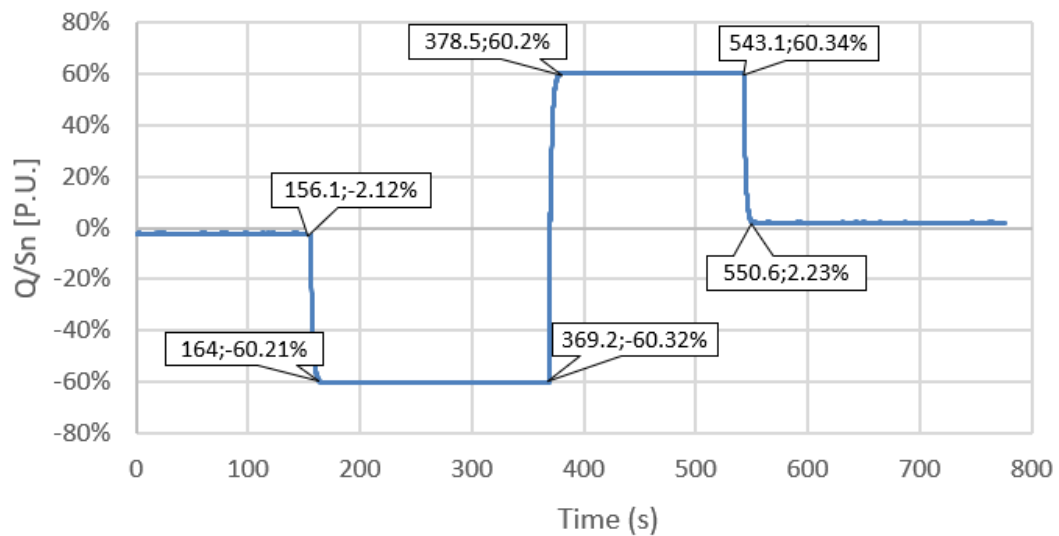


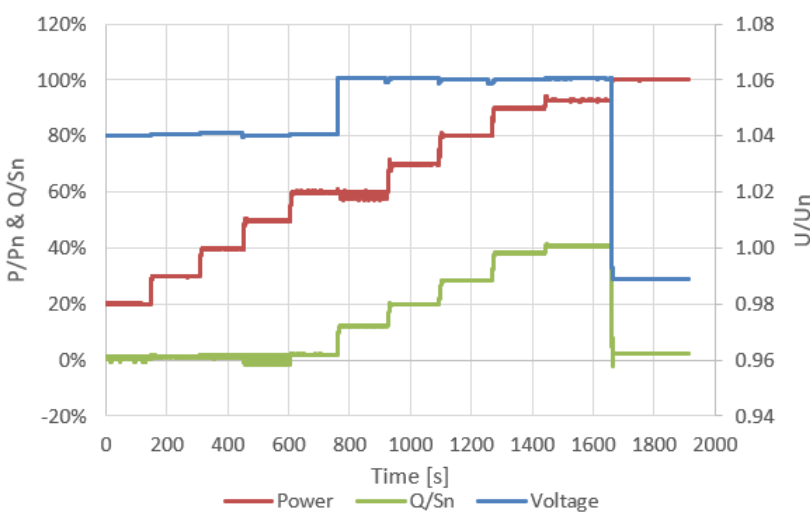
CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

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 < 400kW:									
Test Conditions		Measurements						Limit	
Q/S _n	P/P _n	Q/S _n	cosφ	I/I _n	U/U _n	ΔQ/S _n	Δ T _{settling}	ΔQ/S _n	Δ T _{settling}
Test 1:									
0	50%	1.51%	0.9995	49.78%	100.29%	1.51%	8.8	≤ ±5%	≤ 10s
- 60%		-60.07%	0.6443	78.72%	99.81%	-0.07%	8.3		
+ 60%		60.08%	0.6397	77.53%	100.78%	0.08%	9		
0		1.52%	0.9995	49.82%	100.30%	1.52%	--		
Test 2:									
0	100%	-2.13%	0.9998	100.37%	99.75%	-2.13%	7.9	≤ ±5%	≤ 10s
-60%		-60.31	0.7971	100.79%	99.13%	-0.31%	9.3		
+60%		60.34%	0.8051	101.61%	100.12%	0.34%	7.5		
0		2.13%	0.9998	100.06%	99.75%	2.13%	--		
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 $\cos\varphi = f(P)$ Table: Automatic adjustment of reactive power according to the characteristic curve $\cos\varphi (P)$							P
$\cos\varphi (P)$ 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 Conditions			Measurements					Limit
U/U _n	P/P _n	Excepted $\cos\varphi$	U/U _n	Active power P/P _n	Reactive power Q/S _n	$\cos\varphi$	$\Delta\cos\varphi$	$\Delta\cos\varphi$
104%	20%	1	104.20%	20.07%	1.17%	0.9972	-0.0028	$\leq \pm 0.01$
	30%	1	104.07%	29.89%	1.44%	0.9988	-0.0012	
	40%	1	104.13%	39.77%	1.28%	0.9992	-0.0008	
	50%	1	104.01%	49.79%	0.26%	0.9993	-0.0007	
	60%	1	104.08%	59.88%	1.92%	0.9995	-0.0005	
106%	60%	0.980	106.06%	59.89%	12.11%	0.9801	0.0001	
	70%	0.960	106.06%	69.87%	19.99%	0.9613	0.0013	
	80%	0.940	106.00%	80.17%	28.33%	0.9430	0.0030	
	90%	0.920	106.03%	91.53%	39.61%	0.9178	-0.0025	
	100%	0.915	106.05%	92.71%	40.78%	0.9154	0.0004	
99%	100%	1	98.90%	100.06%	1.99%	0.9997	0.0003	
Note(s): Possibility to control this function by an external signal.								
Diagram 								

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

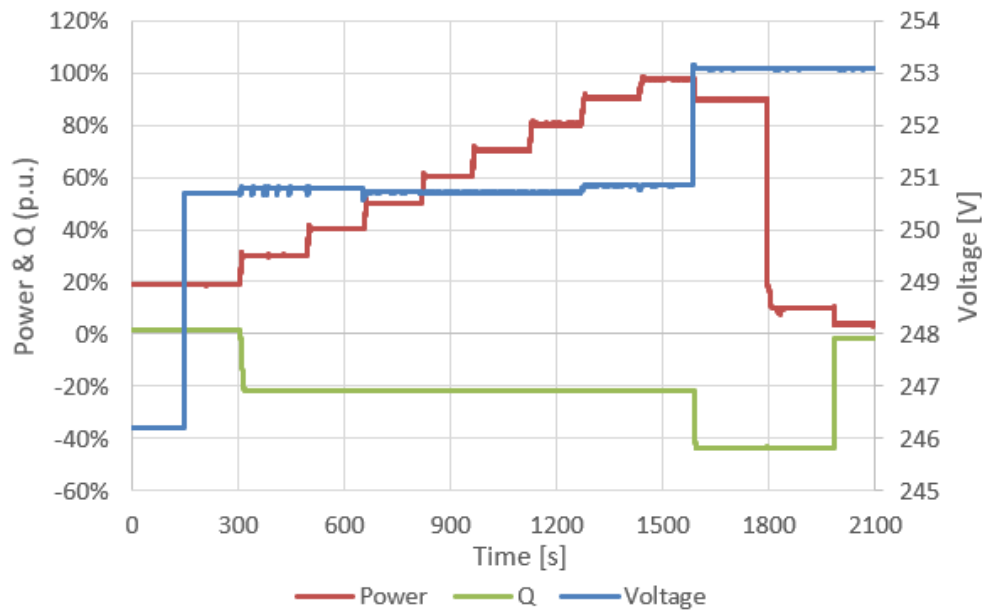
N.6.4		Tabella: Erogazione/assorbimento automatico di potenza reattiva secondo una curva caratteristica Q=f(V) Table: Automatic absorption of reactive power according to the characteristic curve Q(U)						P
Q(U) curve settings	Set points	P lock-in	P lock-out	Set points	V2i	V1i	V1s	V2s
	P/P _n	20%	5%	U/U _n	90%	92%	108%	110%
				Q/S _n	43.6%	0	0	-43.6%
Q _{min} reactive power in accordance to standard characteristic curve Q=f(V)								
P/P _n [%] Set-point	Vac [V] Set-point	P/P _n [%] measured	U/U _n [%] measured	Q/S _n [%] measured	Q [Var] expected	ΔQ [≤±2.5%P _n]		
< 20%	1.07V _n	18.89%	107.05%	1.63%	≈0(<±2.5%Sn)	1.63%		
< 20%	1.09V _n	18.88%	109.00%	1.67%	≈0(<±2.5%Sn)	1.67%		
< 20%-> 30%	1.09V _n	30.20%	108.90%	-21.35%	-0.5 Q _{min} (within 10s)	0.45%		
40%	1.09V _n	40.14%	109.03%	-21.77%	-0.5 Q _{min}	0.03%		
50%	1.09V _n	50.18%	109.00%	-21.77%	-0.5 Q _{min}	0.03%		
60%	1.09V _n	60.24%	108.97%	-21.79%	-0.5 Q _{min}	0.01%		
70%	1.09V _n	70.34%	108.95%	-21.83%	-0.5 Q _{min}	-0.03%		
80%	1.09V _n	80.28%	109.00%	-21.84%	-0.5 Q _{min}	-0.04%		
90%	1.09V _n	90.45%	109.06%	-21.84%	-0.5 Q _{min}	-0.04%		
100%	1.09V _n	97.73%	109.08%	-21.84%	-0.5 Q _{min}	-0.04%		
100%	1.1 V _n	89.75%	110.03%	-43.54%	- Q _{min}	0.06%		
100%->10%	1.1 V _n	10.03%	109.59%	-43.14%	- Q _{min}	0.46/%		
10%-> ≤5%	1.1 V _n	3.94%	109.88%	1.69%	≈0 (<±5%Sn)	1.69%		
Q _{max} reactive power in accordance to standard characteristic curve Q=f(V)								
P/P _n [%] Set-point	Vac [V] Set-point	P/P _n [%] measured	U/U _n [%] measured	Q/S _n [%] measured	Q [Var] expected	ΔQ [≤±2.5%P _n]		
< 20%	0.93V _n	18.94%	93.02%	1.28%	≈0 (<±2.5%Sn)	1.28%		
< 20%	0.91V _n	18.73%	91.02%	1.22%	≈0 (<±2.5%Sn)	1.22%		
< 20%-30%	0.91V _n	30.13%	91.27%	21.80%	-0.5 Q _{max} (within 10s)	0.00%		
40%	0.91V _n	40.10%	91.00%	21.86%	-0.5 Q _{max}	0.06%		
50%	0.91V _n	50.12%	91.00%	21.83%	-0.5 Q _{max}	0.03%		
60%	0.91V _n	60.16%	91.02%	21.75%	-0.5 Q _{max}	-0.05%		
70%	0.91V _n	70.25%	91.00%	21.81%	-0.5 Q _{max}	0.01%		
80%	0.91V _n	80.20%	91.03%	21.92%	-0.5 Q _{max}	0.12%		
90%	0.91V _n	90.36%	91.02%	22.04%	-0.5 Q _{max}	0.24%		
100%	0.91V _n	93.94%	91.04%	22.08%	-0.5 Q _{max}	0.28%		
100%	0.90V _n	91.36%	90.04%	43.53%	- Q _{max}	-0.07%		

CEI 0-16						
Clause	Requirement - Test				Result - Remark	Verdict
100%-10%	0.90V _n	9.75%	90.03%	43.45%	- Qmax	-0.15%
10%-5%	0.90V _n	4.04%	90.01%	0.42%	≈0(<±5%Sn)	-0.42%

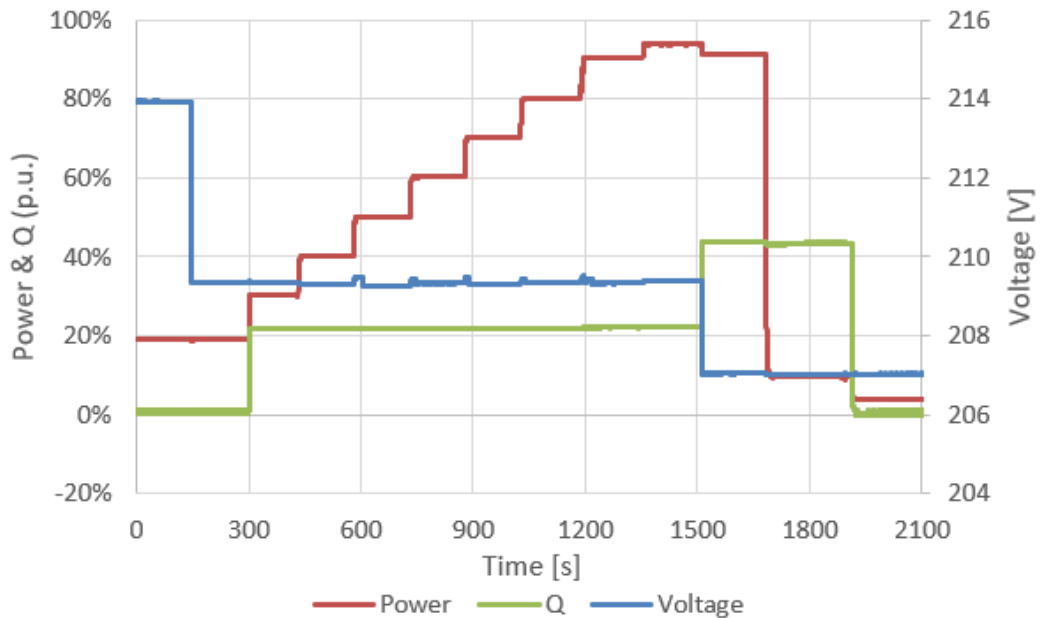
Note(s):

Possibility to control this function by an external signal.

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	
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 _{settling}	P/P _n	Δ T _{settling}	≤ 600s
108%	100%	108.01%	100.15%	0.9997	--	≤ ± 5%		
112%	≤ 20%	111.99%	19.14%	0.9942	270.6	≤ 20%		
108%	100%	108.01%	99.81%	0.9997	548.4	≤ ± 5%		

Diagram

Time [s]	Power (p.u.)	Voltage [V]
0	100%	248
100	100%	257
700	20%	257
850	20%	245
1500	100%	248

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 ₀ :			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	99.97%	--	--	--	-0.03%	≤ ± 2.5%,
2) 50.15	100%	50.15	99.95%	0	0	0	-0.05%	
3) 50.40	84.60%	50.40	83.19%	1.5	7	0.1	-1.41%	
4) 50.60	69.20%	50.60	67.76%	0.6	7	0.1	-1.44%	
5) 51.49	0.67%	51.49	0.73%	1.9	9.8	0.1	0.06%	
6) 50.11	0.67%	50.11	0.73%	0	0	0	0.06%	
7) 50.00	keep P _{min-o} 0.67%	50	0.73	--	--	--	0.06%	
	recover to 100%	50	100.07%	--	--	--	0.07%	
Test condition		Measurement					Limit	
6) 50.11 to 7) 50		Waiting time for keep P _{min-o} [s]:				303	≥ 300s	
		Max. power gradient		[P _e - P _{min-o}]/min:		19.67%	20% [P _e - P _{min-o}]/min	
		Max. power gradient		P _n /min:		19.80%	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	50.15%	--	--	--	0.15%	≤ ± 2.5%
2) 50.15	50%	50.15	50.16%	0	0	0	0.16%	
3) 50.40	42.3%	50.40	42.81%	0.4	1.5	0.1	0.51%	
4) 50.60	34.6%	50.60	35.31%	0.8	3.3	0.1	0.71%	
5) 51.49	0.34%	51.49	-0.17%	0.6	4.3	0.1	0.51%	
6) 50.11	0.34%	50.11	-0.16%	0	0	0	0.50%	

CEI 0-16								
Clause	Requirement - Test					Result - Remark		Verdict
7) 50.00	keep $P_{\min-o}$ 0.34%	50	-0.16%	--	--	--	0.50%	
	recover to 50%	50	50.12%	--	--	--	0.12%	

Test condition	Measurement			Limit
6) 50.11 to 7) 50	Waiting time for keep $P_{\min-o}$ [s]:		302	$\geq 300s$
	Max. power gradient	$[P_e - P_{\min-o}]/\text{min}$:	19.15%	20% $[P_e - P_{\min-o}]/\text{min}$
	Max. power gradient	P_n/min :	9.6%	10% P_n/min

Diagram of Sequence A

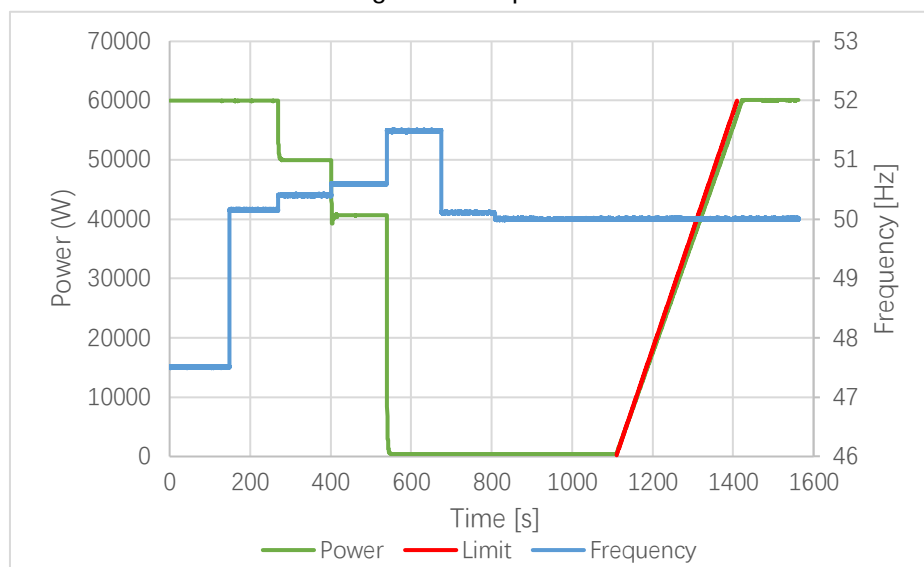
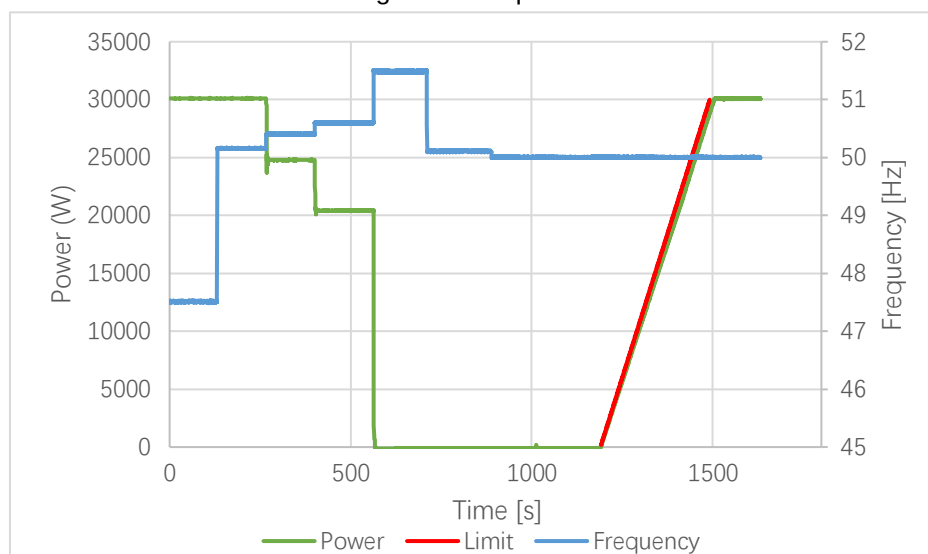


Diagram of Sequence B



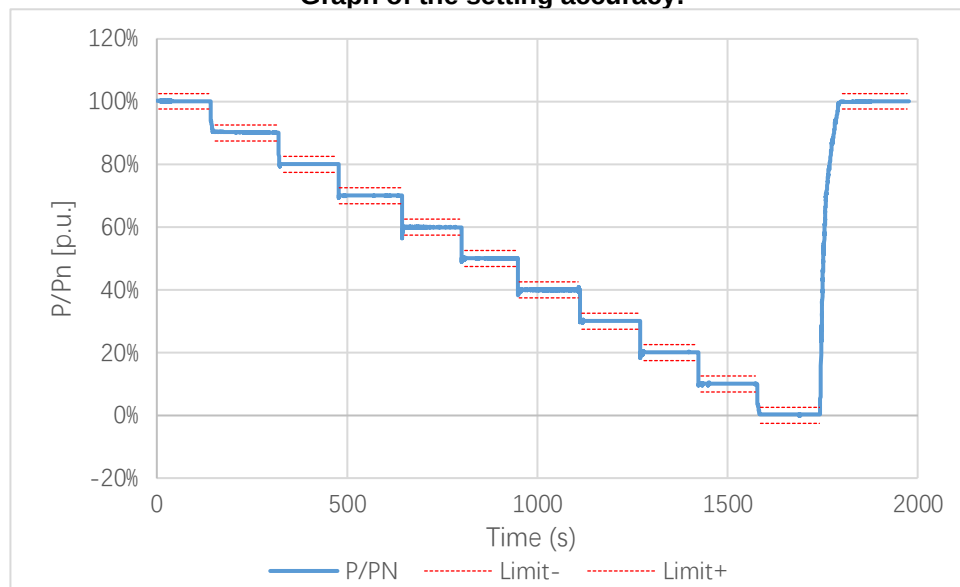
CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

N.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
Model:	BNT060KTL				
Test condition		Measurement			Limit
External command P/P _n	Target P/P _n	P/P _n	$\Delta P/P_n$	T _{settling} [s]	$\Delta P/P_n$
100%	100%	100.10%	0.10%	--	$\leq \pm 2.5\%$
90%	90%	90.19%	0.19%	5.9	
80%	80%	80.03%	0.03%	1.8	
70%	70%	70.02%	0.02%	1.0	
60%	60%	60.02%	0.02%	3.3	
50%	50%	50.02%	0.02%	0.8	
40%	40%	40.00%	0	1.6	
30%	30%	30.12%	0.12%	0.3	
20%	20%	20.15%	0.15%	1.2	
10%	10%	10.11%	0.11%	0.2	*
0%*	0%*	0.41	0.41%	6.8	
100%	100%	99.96%	-0.04%	56.5	$\pm 2.5\%$

Note(s):

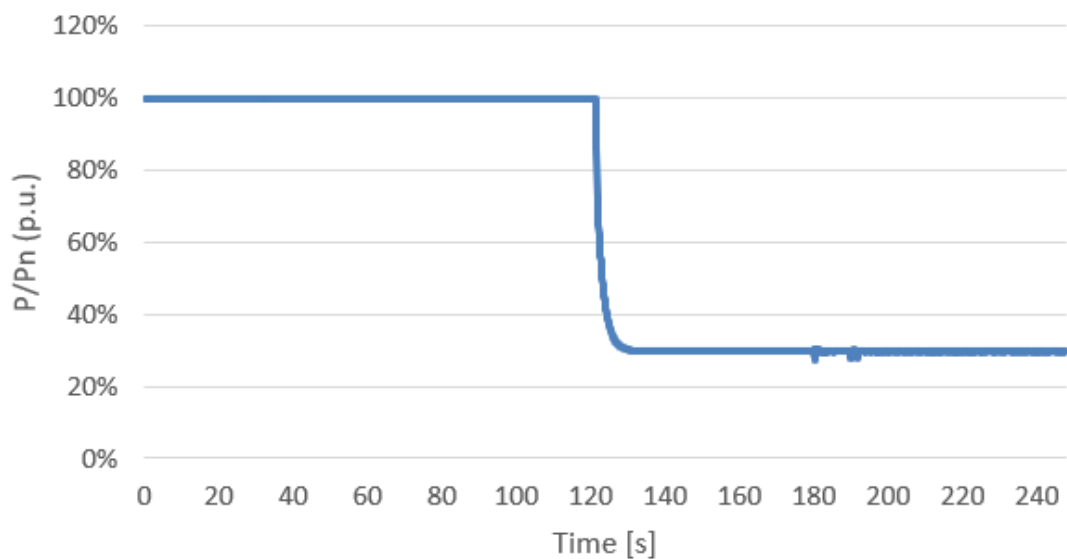
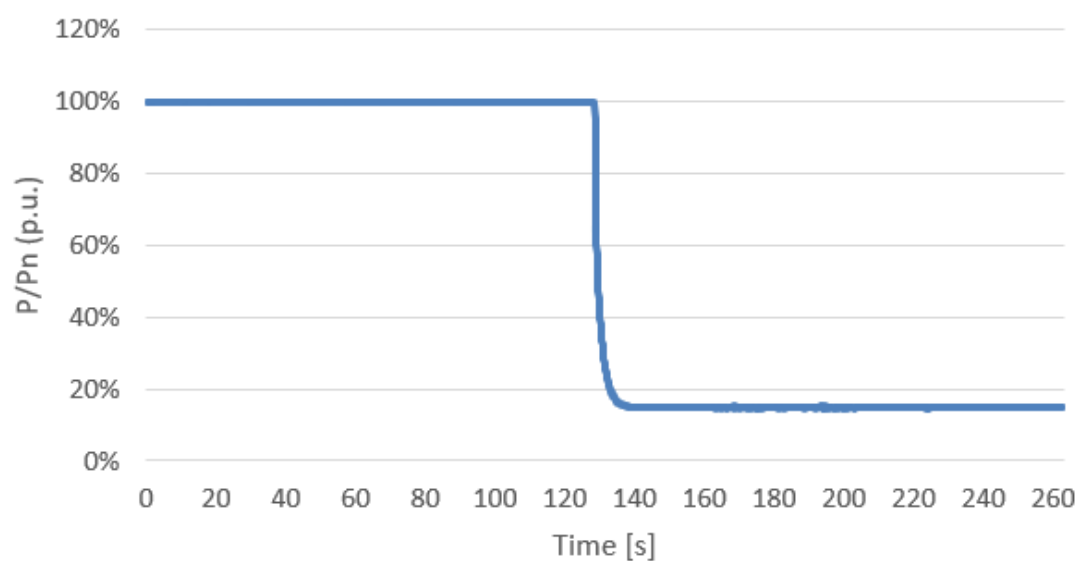
* Measured P shall be within 0-12.5%P_n while external command P/P_n is set less than 10%.

Graph of the setting accuracy:

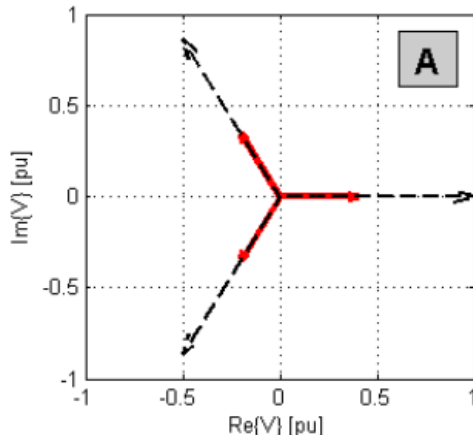


CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

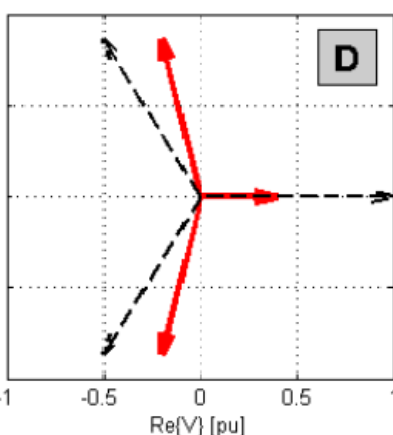
N.7.4.1	Tabella: Verifica del tempo di assestamento ad un comando di riduzione di Potenza Table: Verification of the settling time at a power reduction command)					P
	Test condition		Measurement		Limit	
External command P/P _n	Target P/P _n	P/P _n	T _{settling} [s]	ΔP/P _n	T _{settling} [s]	ΔP/P _n
100% to 30%	30%	29.68%	10.8	0.32%	≤ 50s	± 5%
100% to 15%	15%	14.80%	14.8	0.20%	≤ 60s	

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

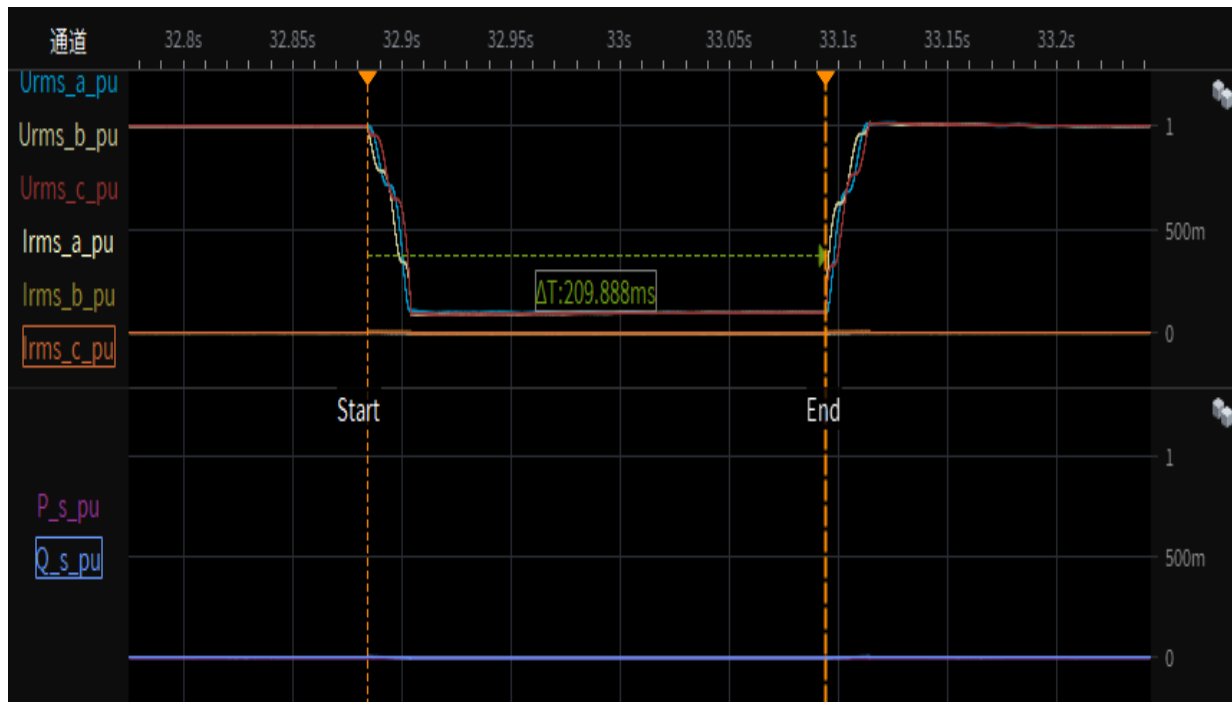
N.8		Tabella: Verifica della insensibilità alle variazioni di tensione (VFRT capability) Table: Verification of insensitivity to voltage variations (VFRT capability)				P
Test	Voltage dip/rise U/U _n [p.u.]	VRT fault type	Fault duration (t ₂ -t ₁) [ms]	P/P _n [p.u.]	Q/S _n [p.u.]	Test No.
1	0.10	A	200 + 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	
List of tests		Residual amplitude of phase-to-phase voltage V/V_{nom}	Drop duration limit [ms]	Measured drop duration [ms]
1s – three-phase symmetrical fault ($P = 0.1 - 0.3$)		$0.10 \pm 0.05 (V_1/V_n)$	200	210
1s – three-phase symmetrical fault ($P > 0.9$)		$0.10 \pm 0.05 (V_1/V_n)$	200	210
1a – two-phase asymmetrical fault ($P = 0.1 - 0.3$)		$0.10 \pm 0.05 (V_1/V_n)$	200	210
1a – two-phase asymmetrical fault ($P > 0.9$)		$0.10 \pm 0.05 (V_1/V_n)$	200	210
2s – three-phase symmetrical fault ($P = 0.1 - 0.3$)		$0.25 \pm 0.05 (V_2/V_n)$	400	410
2s – three-phase symmetrical fault ($P > 0.9$)		$0.25 \pm 0.05 (V_2/V_n)$	400	410
2a – two-phase asymmetrical fault ($P = 0.1 - 0.3$)		$0.25 \pm 0.05 (V_2/V_n)$	400	410
2a – two-phase asymmetrical fault ($P > 0.9$)		$0.25 \pm 0.05 (V_2/V_n)$	400	410
3s – three-phase symmetrical fault ($P = 0.1 - 0.3$)		$0.50 \pm 0.05 (V_3/V_n)$	850	859
3s – three-phase symmetrical fault ($P > 0.9$)		$0.50 \pm 0.05 (V_3/V_n)$	850	859
3a – two-phase asymmetrical fault ($P = 0.1 - 0.3$)		$0.50 \pm 0.05 (V_3/V_n)$	850	858
3a – two-phase asymmetrical fault ($P > 0.9$)		$0.50 \pm 0.05 (V_3/V_n)$	850	858
4s – three-phase symmetrical fault ($P = 0.1 - 0.3$)		$0.75 \pm 0.05 (V_4/V_n)$	1300	1310
4s – three-phase symmetrical fault ($P > 0.9$)		$0.75 \pm 0.05 (V_4/V_n)$	1300	1310
4a – two-phase asymmetrical fault ($P = 0.1 - 0.3$)		$0.75 \pm 0.05 (V_4/V_n)$	1300	1310
4a – two-phase asymmetrical fault ($P > 0.9$)		$0.75 \pm 0.05 (V_4/V_n)$	1300	1310
5s – three-phase symmetrical fault ($P > 0.9$)		$1.25 \pm 0.05 (V_5/V_n)$	100	110
6s – three-phase symmetrical fault ($P > 0.9$)		$1.20 \pm 0.05 (V_6/V_n)$	500	510
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.				

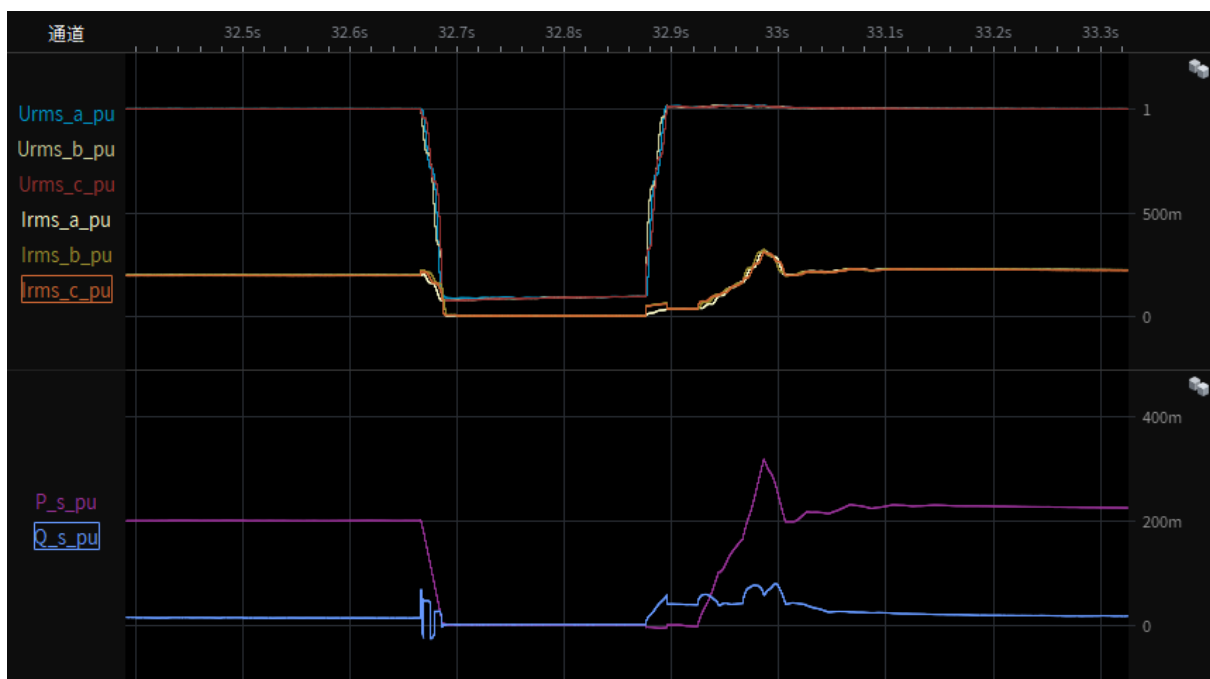
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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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)



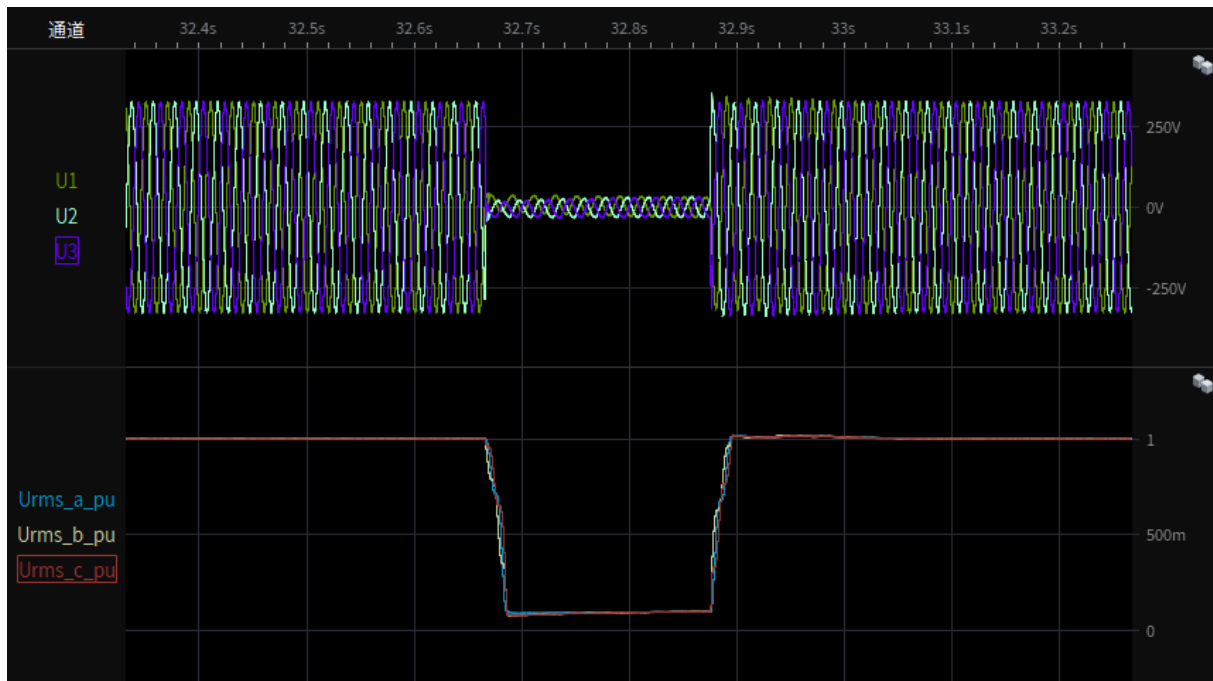
Test 1s-1-1.1 Depth of fault phase: 0.1p.u., three-phase-symmetrical (type A), 20% load
Test overview(voltage,current,active and reactive power)



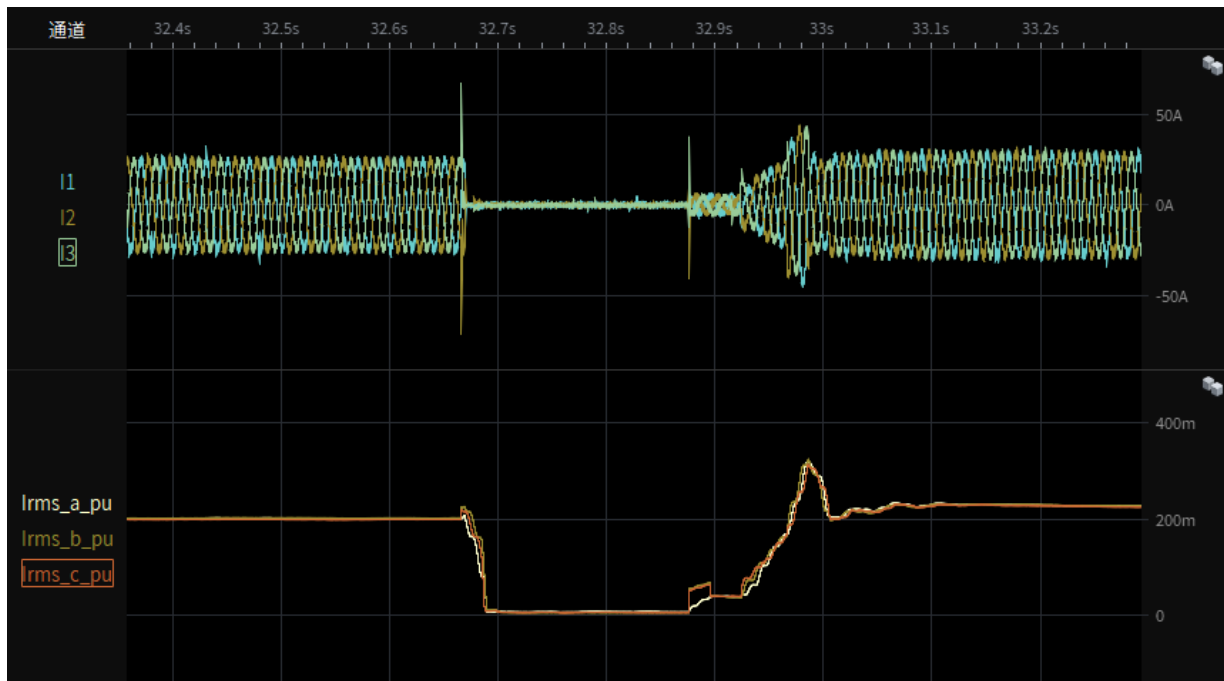
CEI 0-16

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



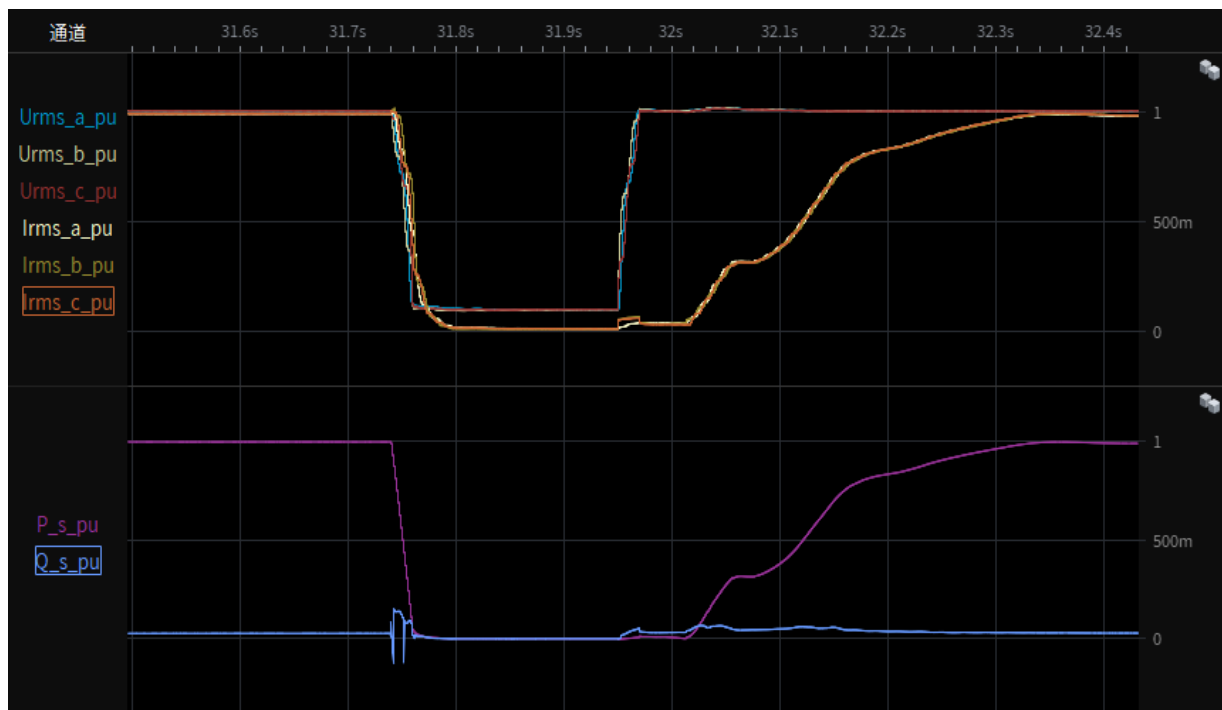
CEI 0-16

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



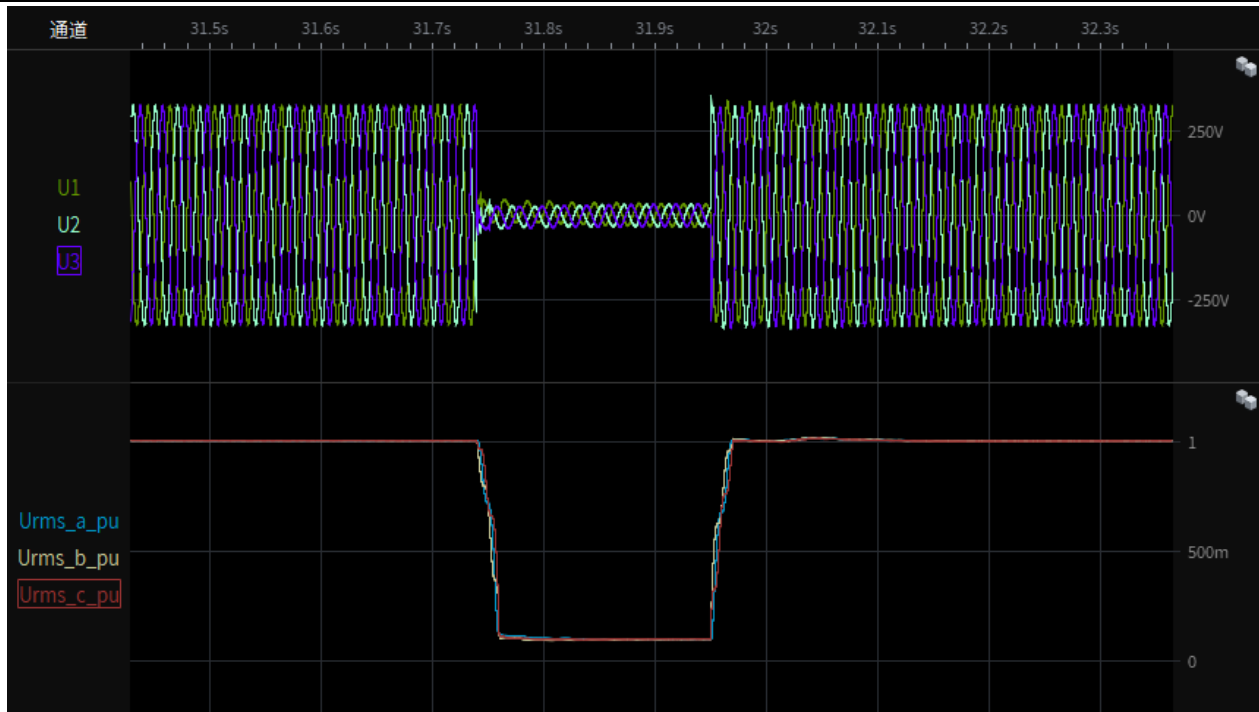
Test 1s-2-1.1 Depth of fault phase: 0.1p.u., three-phase-symmetrical (type A), 95% load
Test overview(voltage,current,active and reactive power)



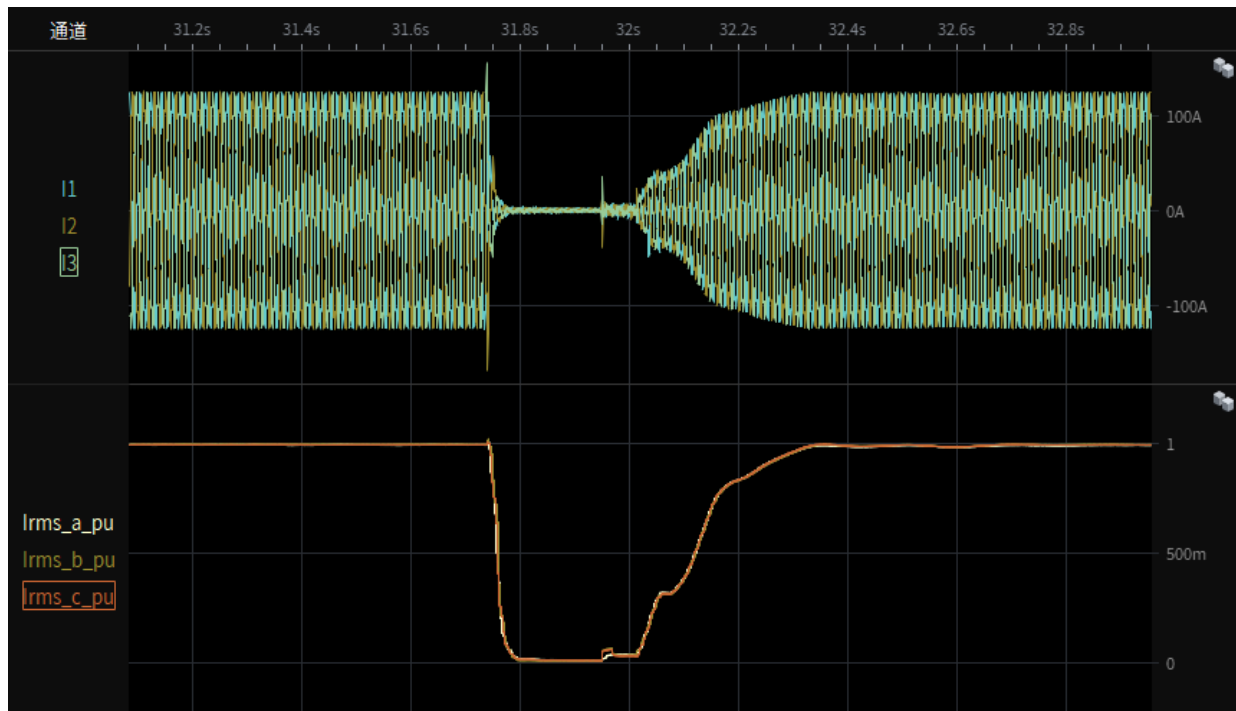
CEI 0-16

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



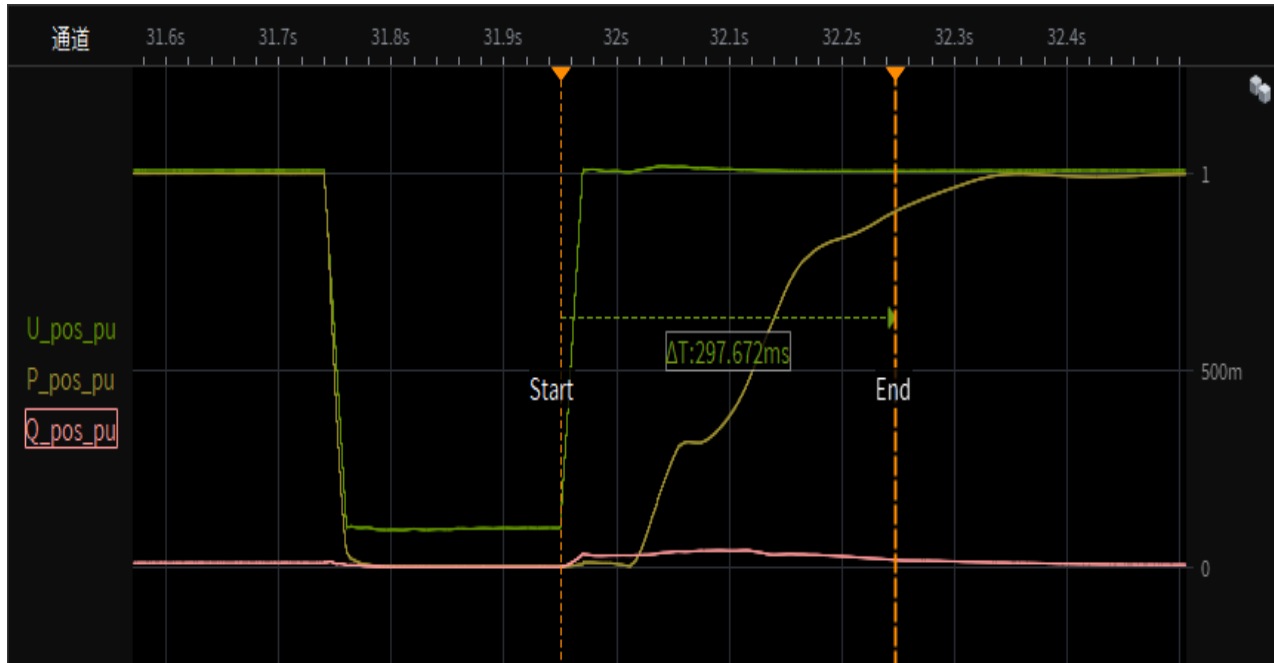
Test 1s-2-1.3 Depth of fault phase: 0.1p.u., three-phase-symmetrical (type A), 95% load
Instantaneous curve and RMS value of phase currents



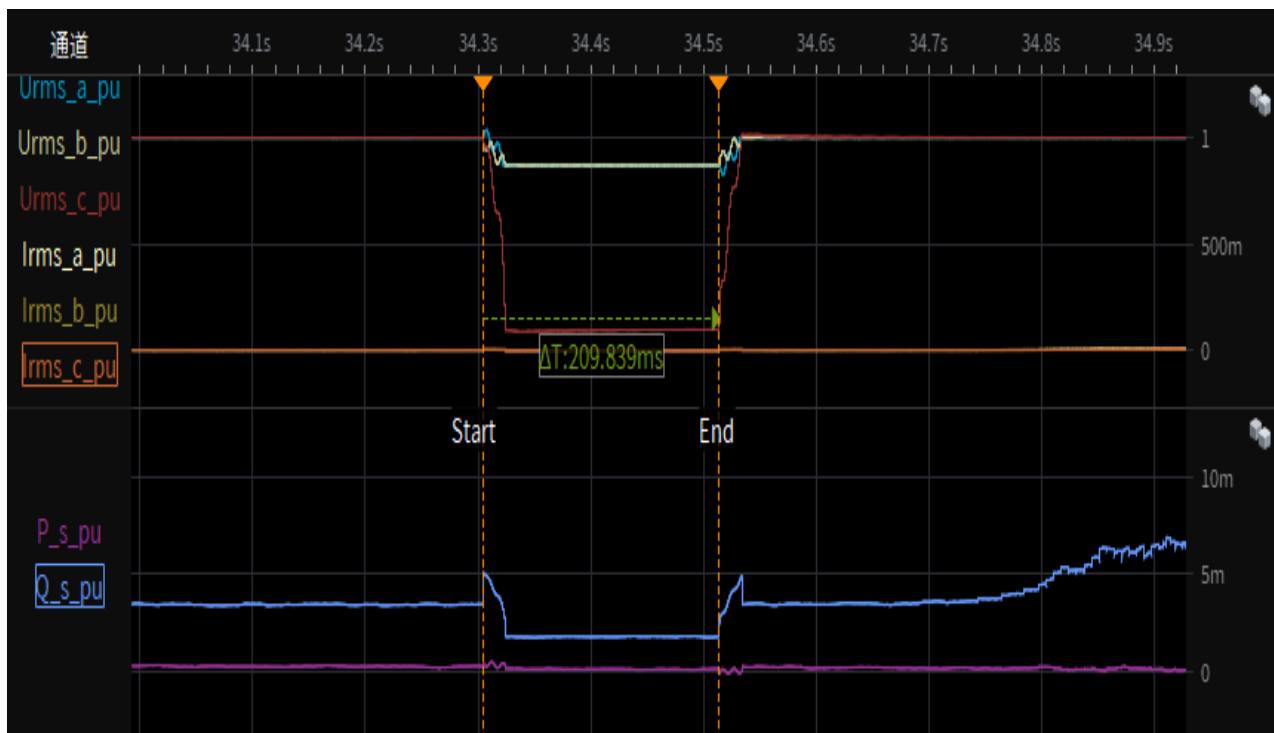
CEI 0-16

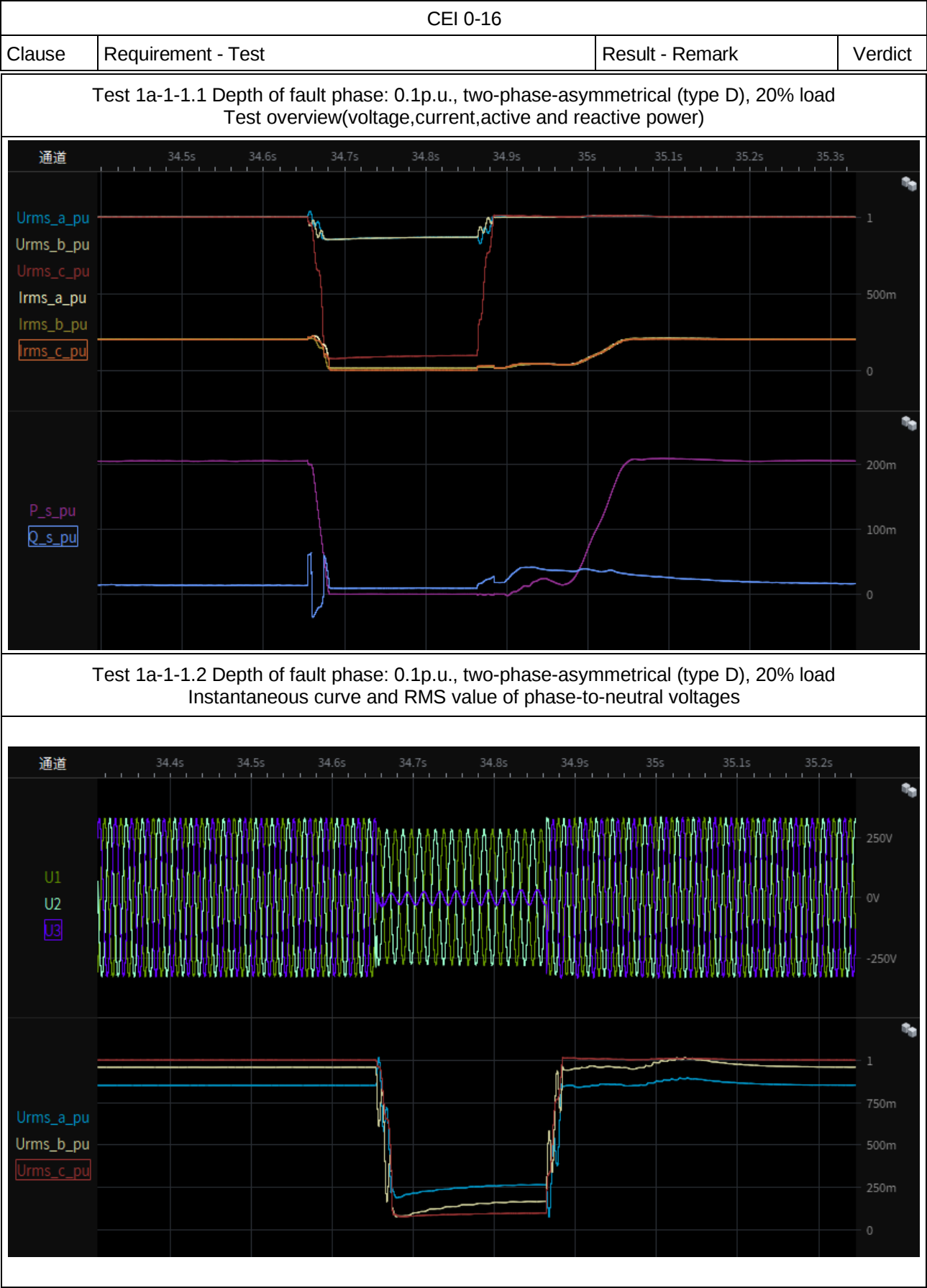
Clause	Requirement - Test	Result - Remark	Verdict
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Test 1s-2-1.4 Depth of fault phase: 0.1p.u., three-phase-symmetrical (type A),
95% load restoring time



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)

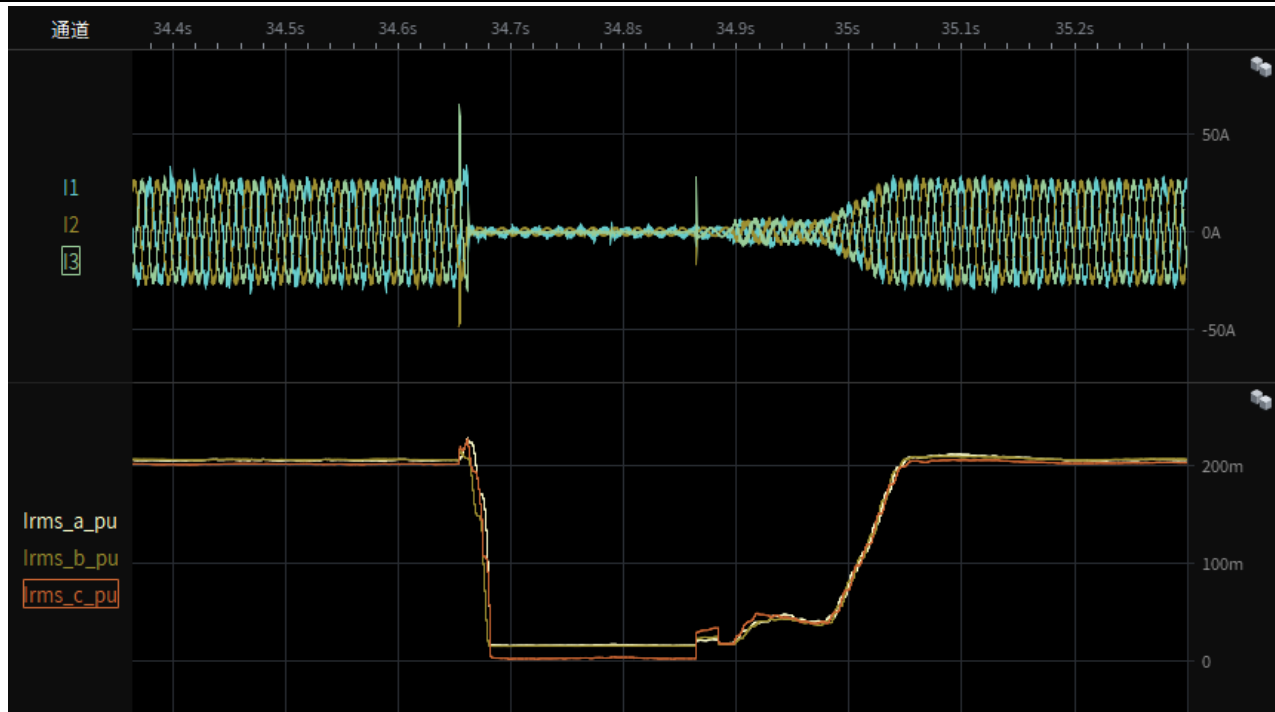




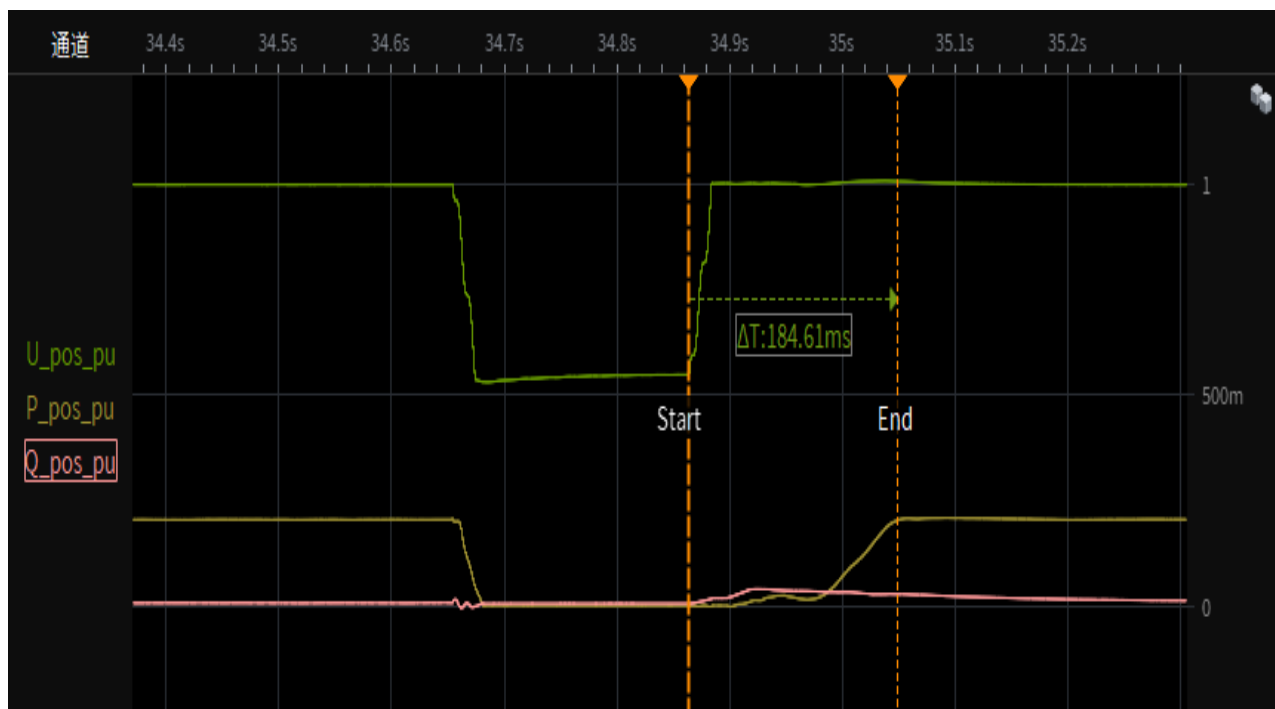
CEI 0-16

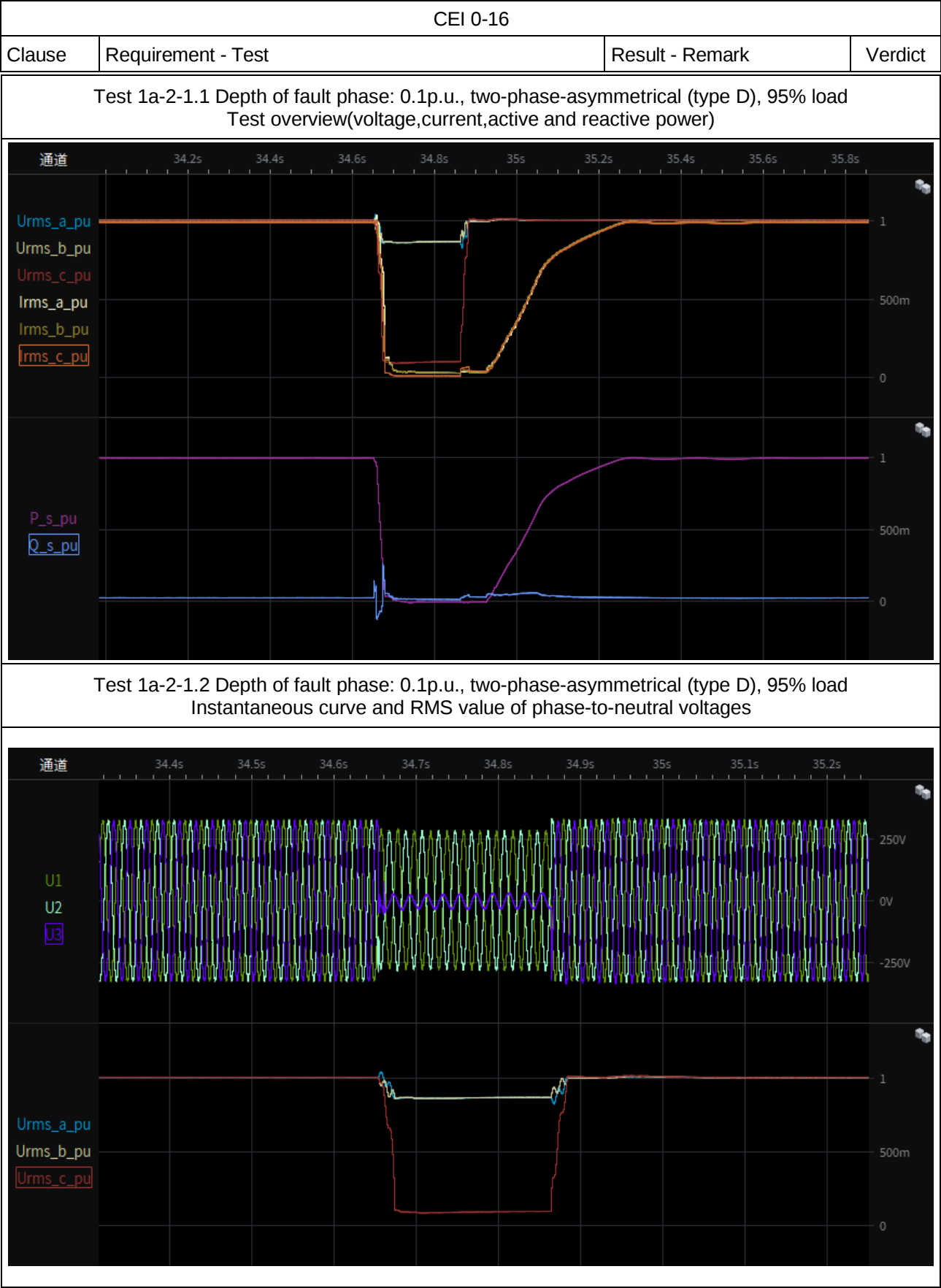
Clause	Requirement - Test	Result - Remark	Verdict
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Test 1a-1-1.3 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D), 20% load
Instantaneous curve and RMS value of phase currents



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

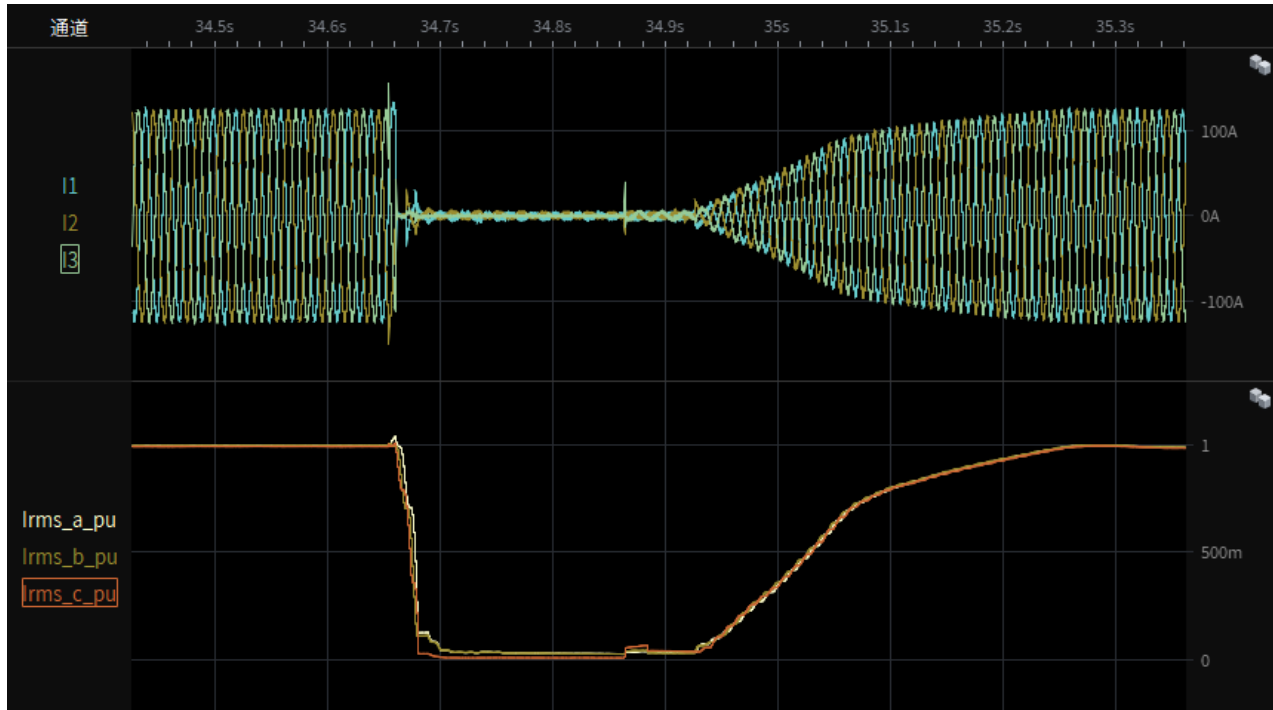




CEI 0-16

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



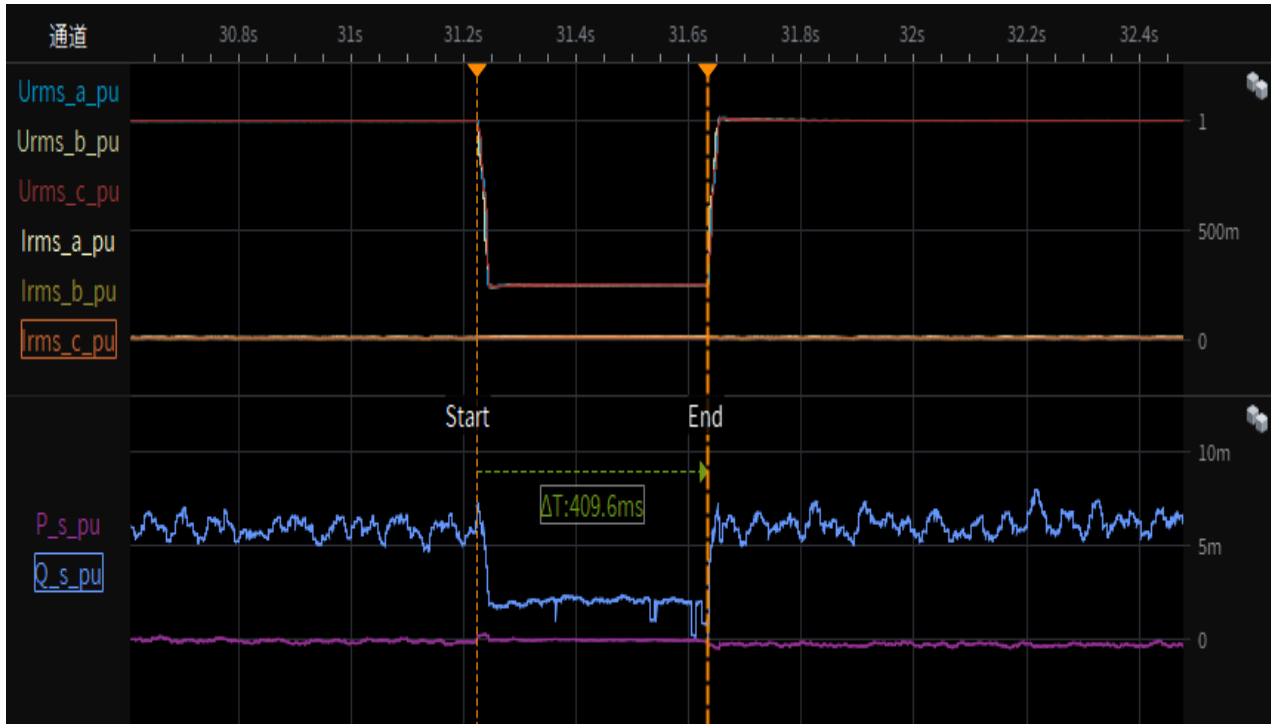
Test 1a-2-1.4 Depth of fault phase: 0.1p.u., two-phase-asymmetrical (type D),
95% load restoring time



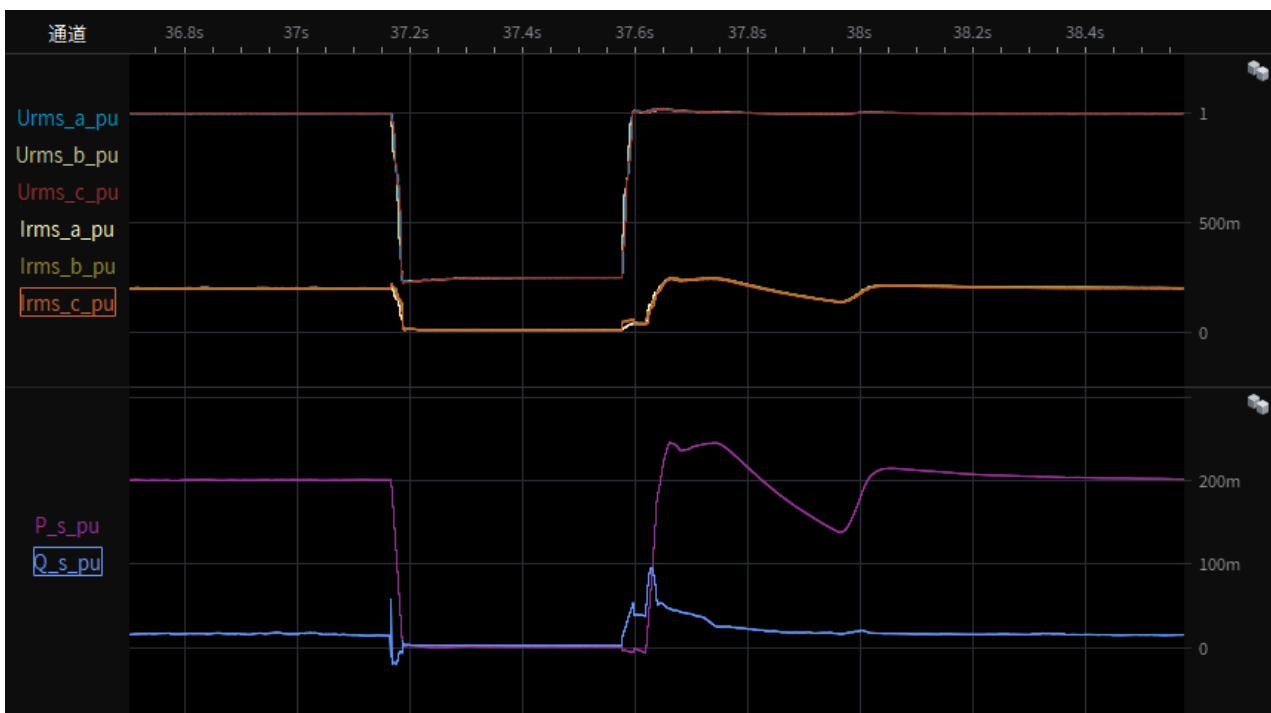
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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Test 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)



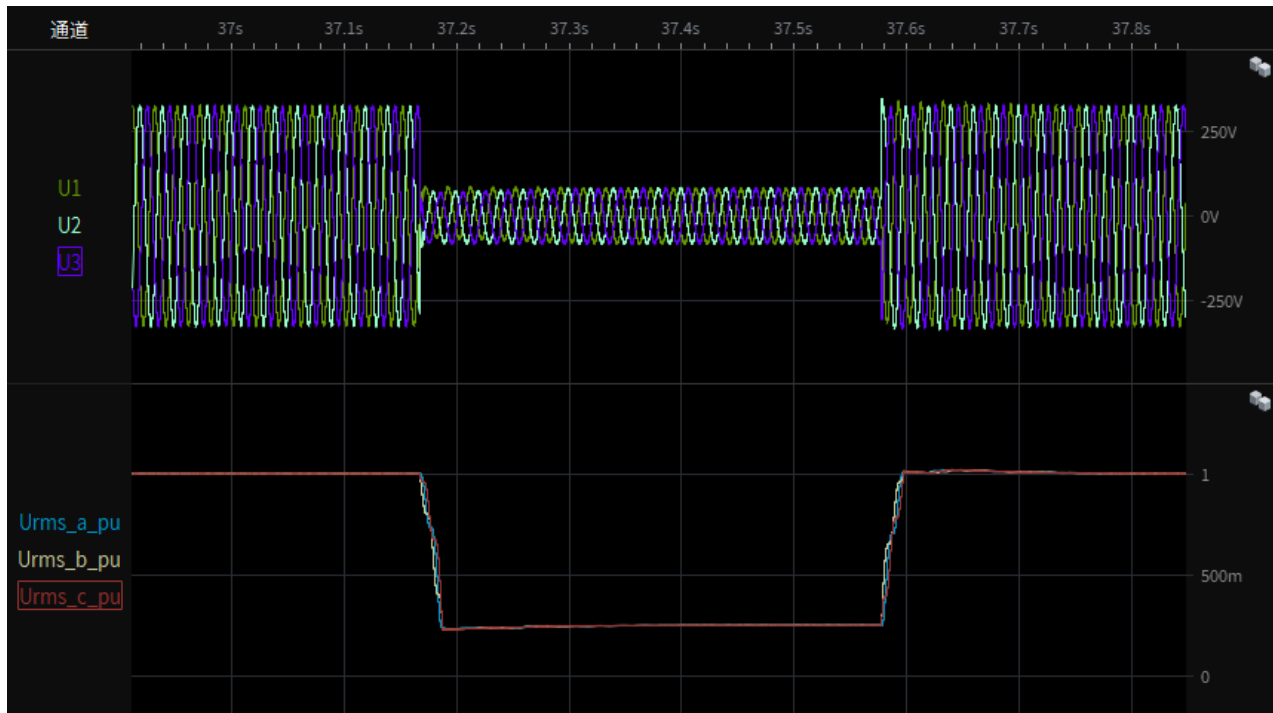
Test 2s-1-1.1 Depth of fault phase: 0.25p.u., three-phase-symmetrical (type A), 20% load
Test overview(voltage,current,active and reactive power)



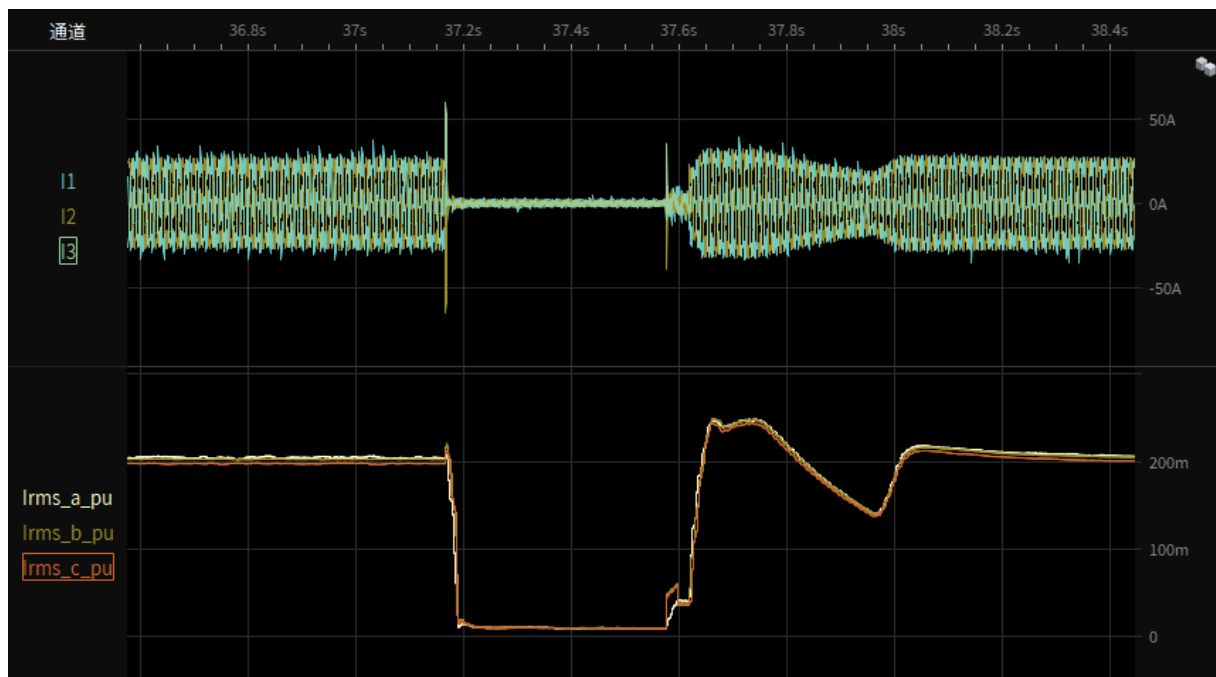
CEI 0-16

Clause	Requirement - Test	Result - Remark	Verdict
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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



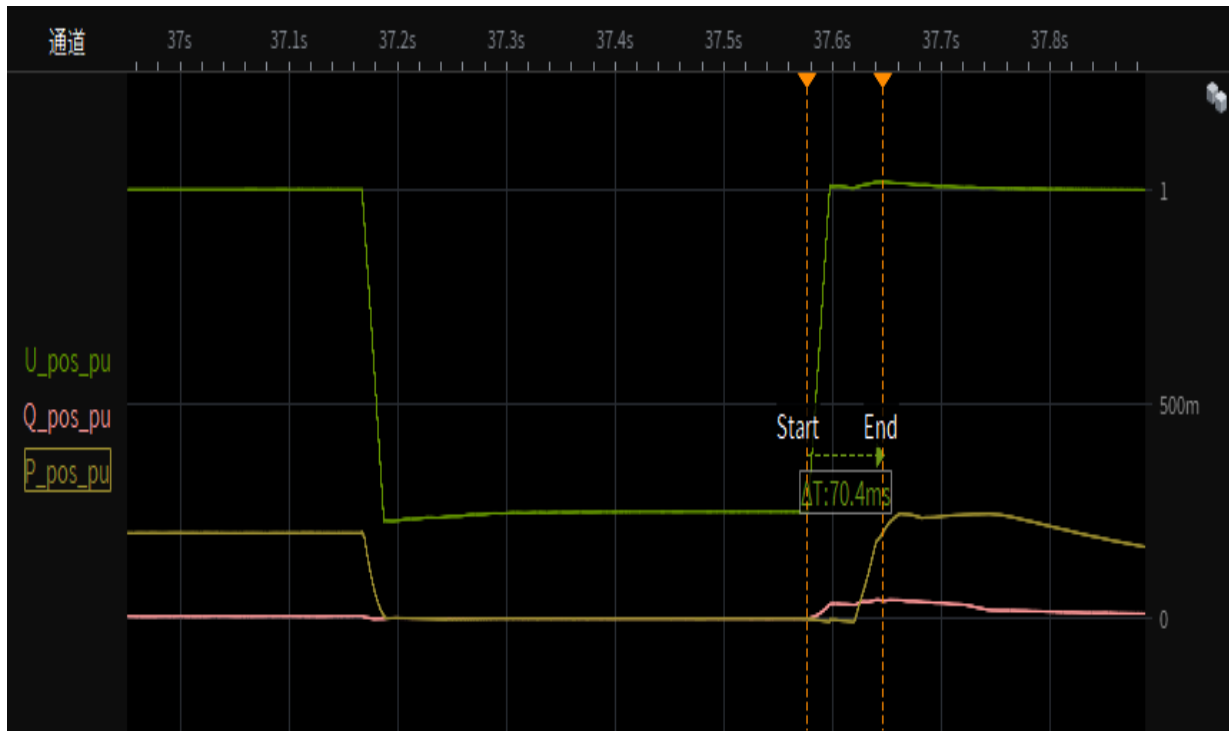
Test 2s-1-1.3 Depth of fault phase:0.25p.u., three-phase-symmetrical (type A), 20% load
Instantaneous curve and RMS value of phase currents



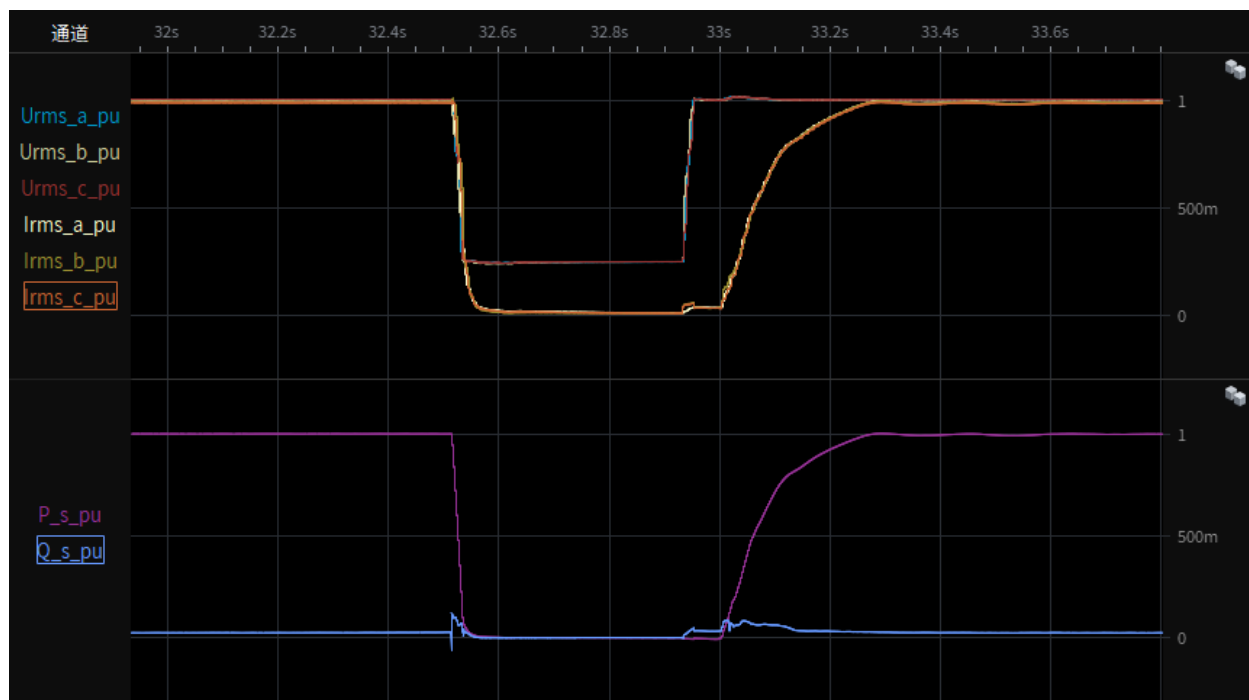
CEI 0-16

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



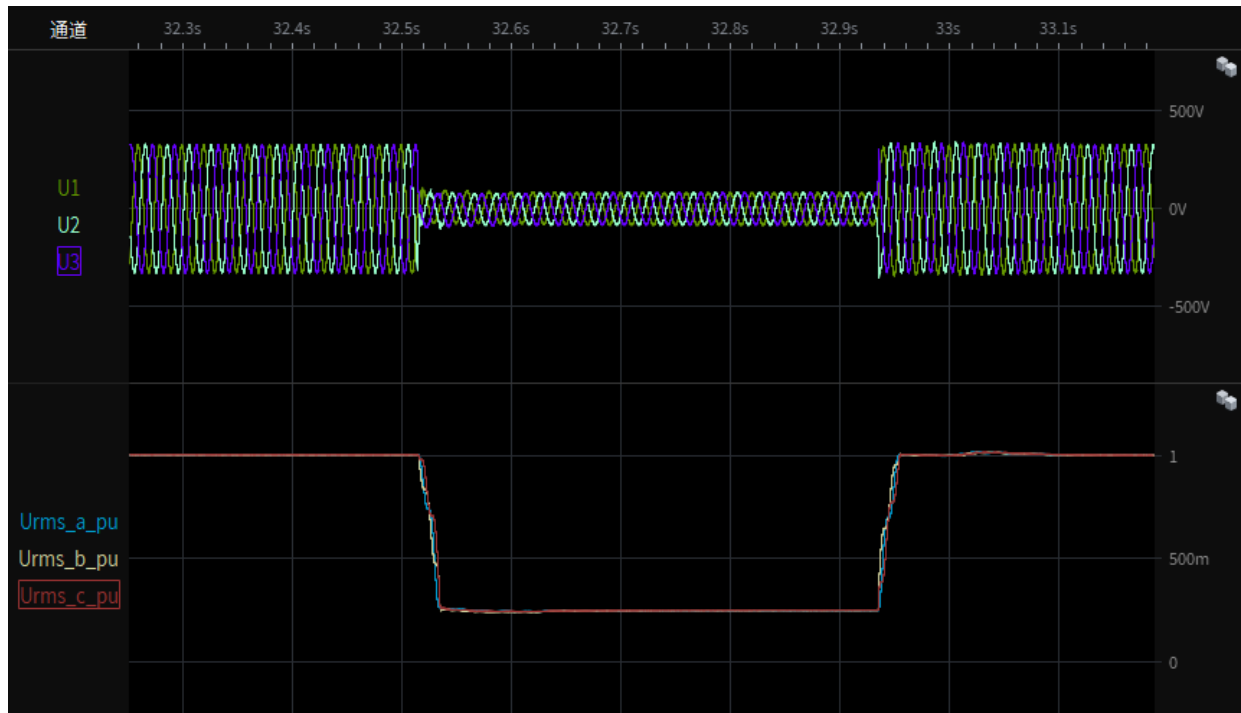
Test 2s-2-1.1 Depth of fault phase:0.25p.u., three-phase-symmetrical (type A), 95% load
Test overview(voltage,current,active and reactive power)



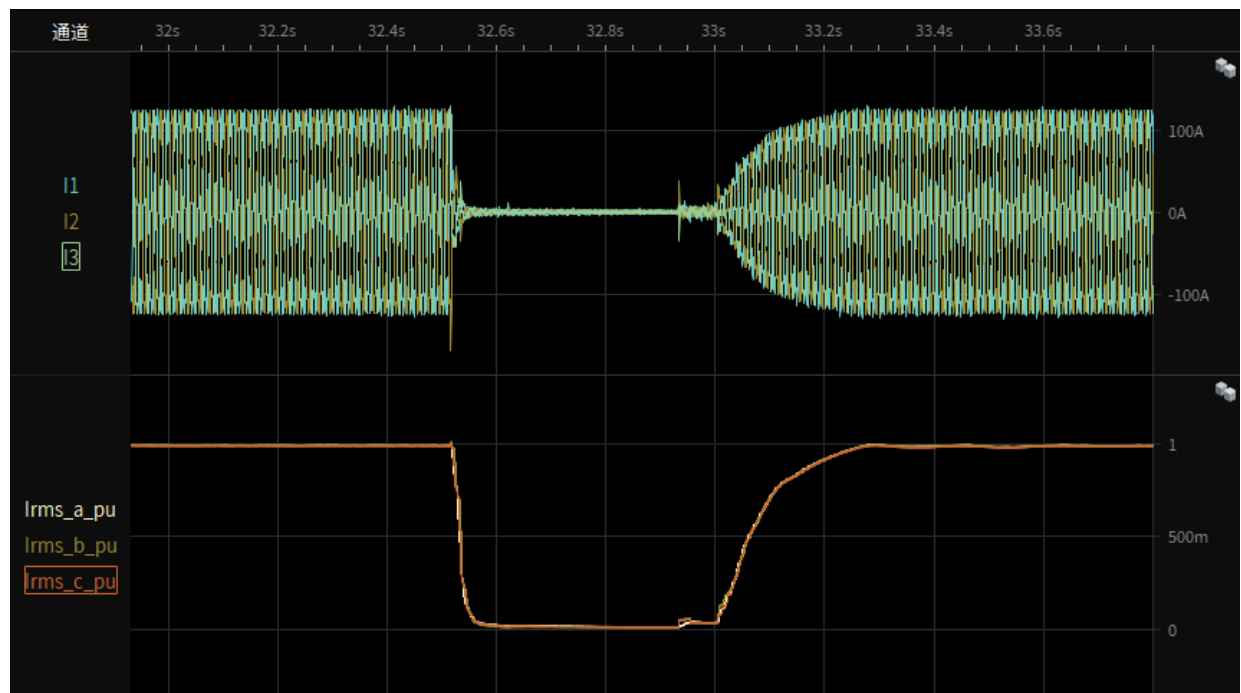
CEI 0-16

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

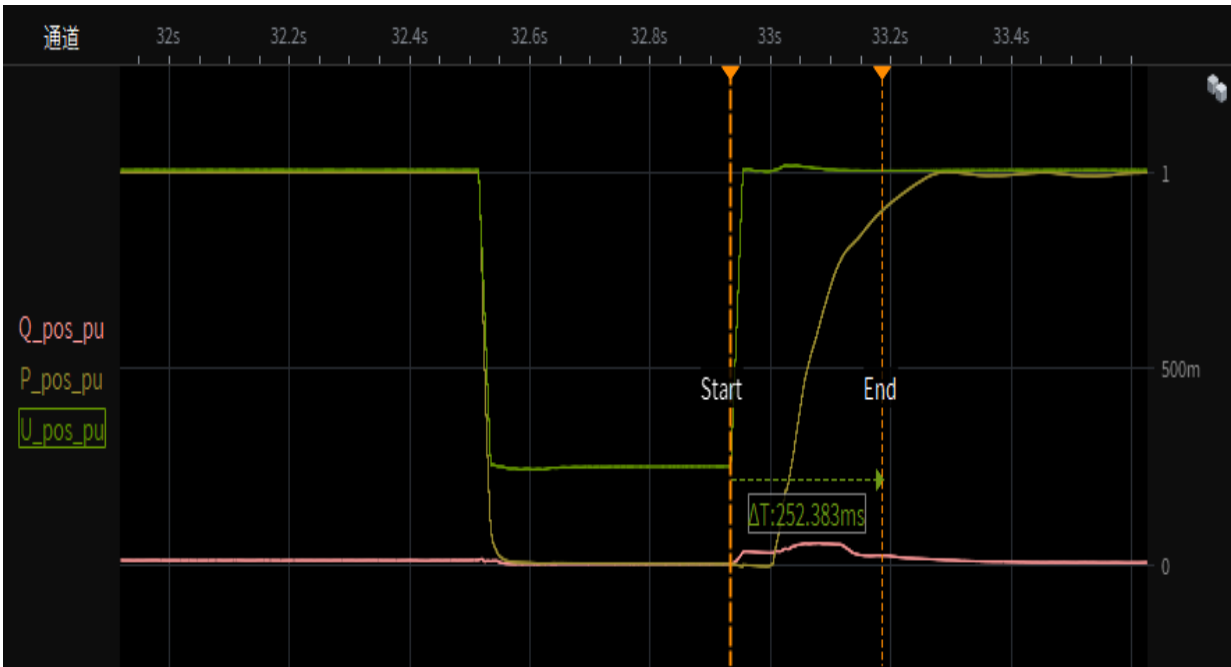


Test 2s-2-1.3 Depth of fault phase: 0.25p.u., three-phase-symmetrical (type A), 95% load
Instantaneous curve and RMS value of phase currents

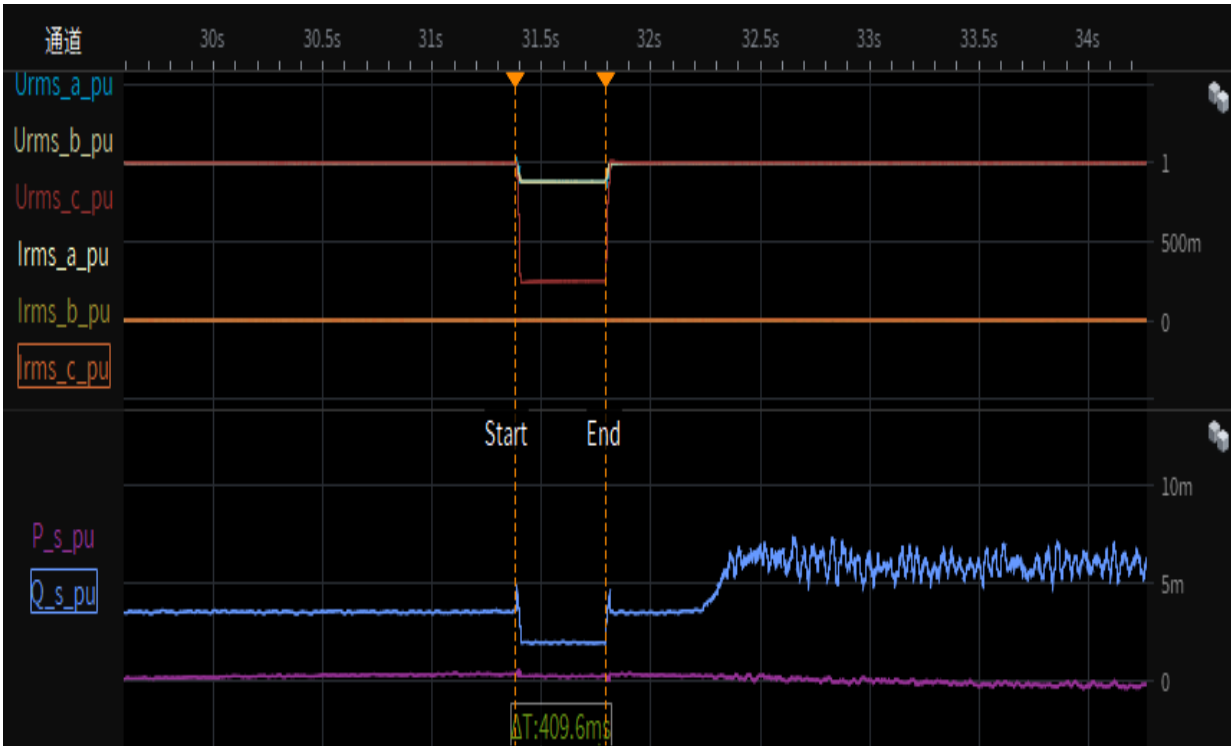


CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

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



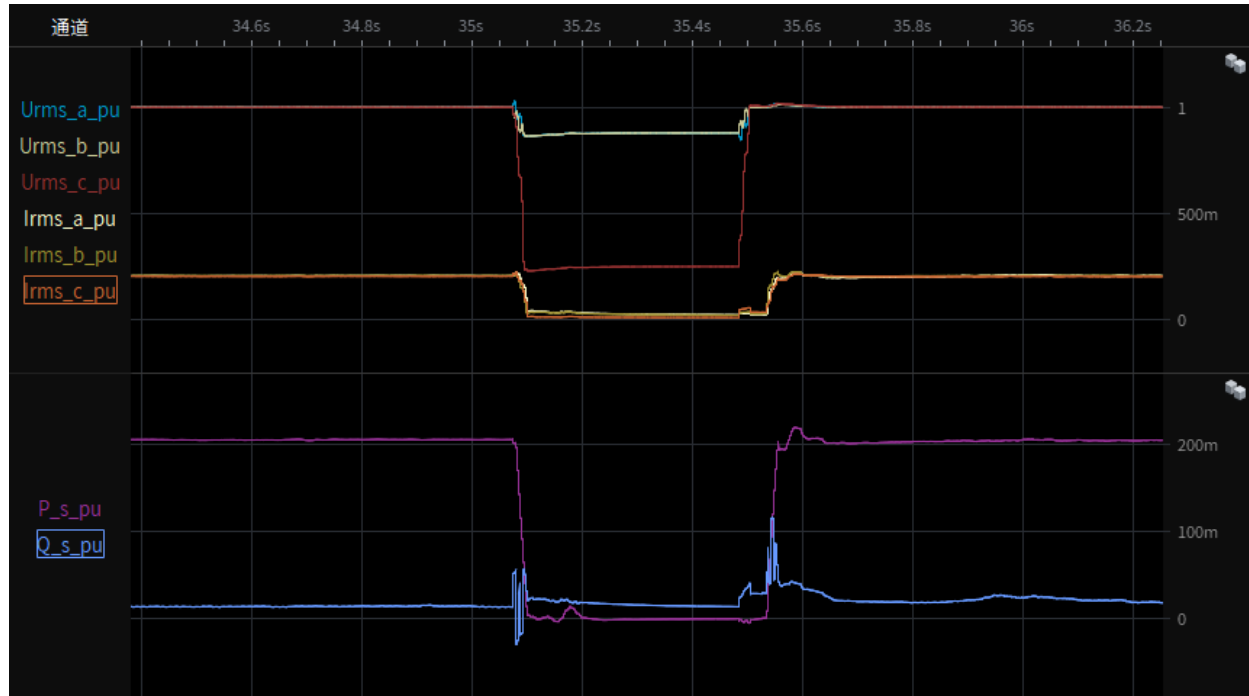
Test 2a-1.1 Depth of fault phase: 0.25p.u., two-phase-asymmetrical (type D), 0% load
Test overview(voltage,current,active and reactive power)



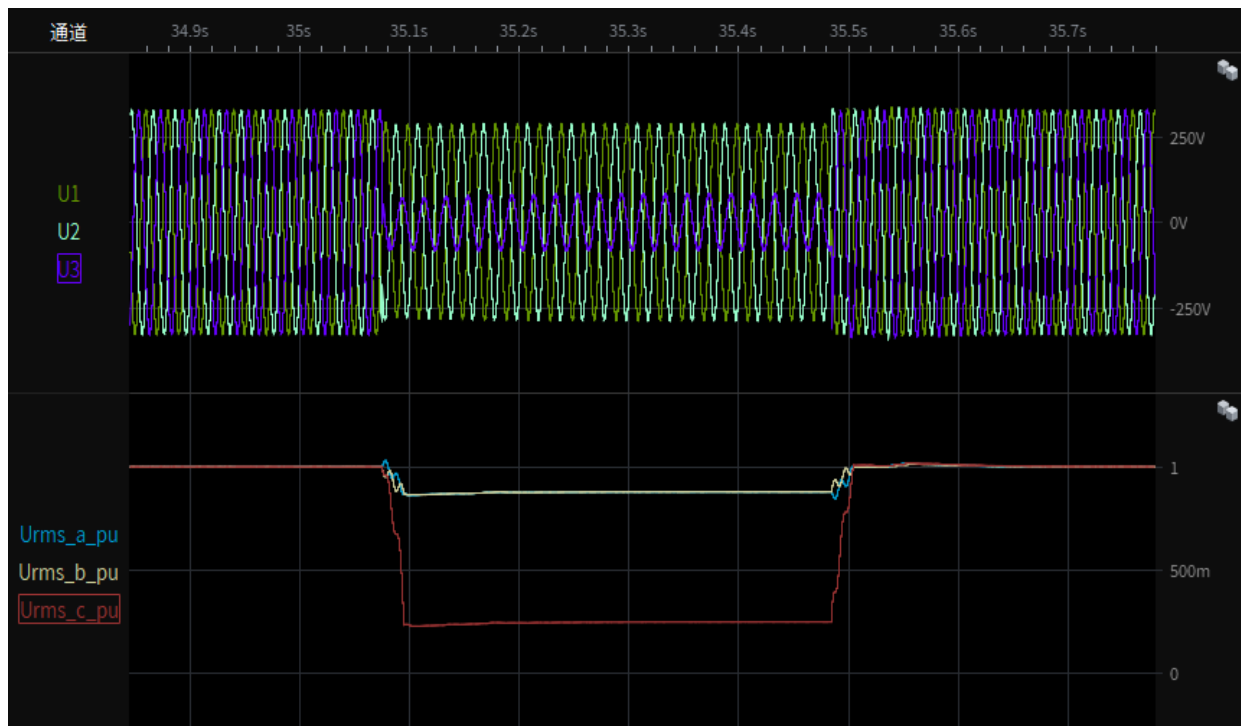
CEI 0-16

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)



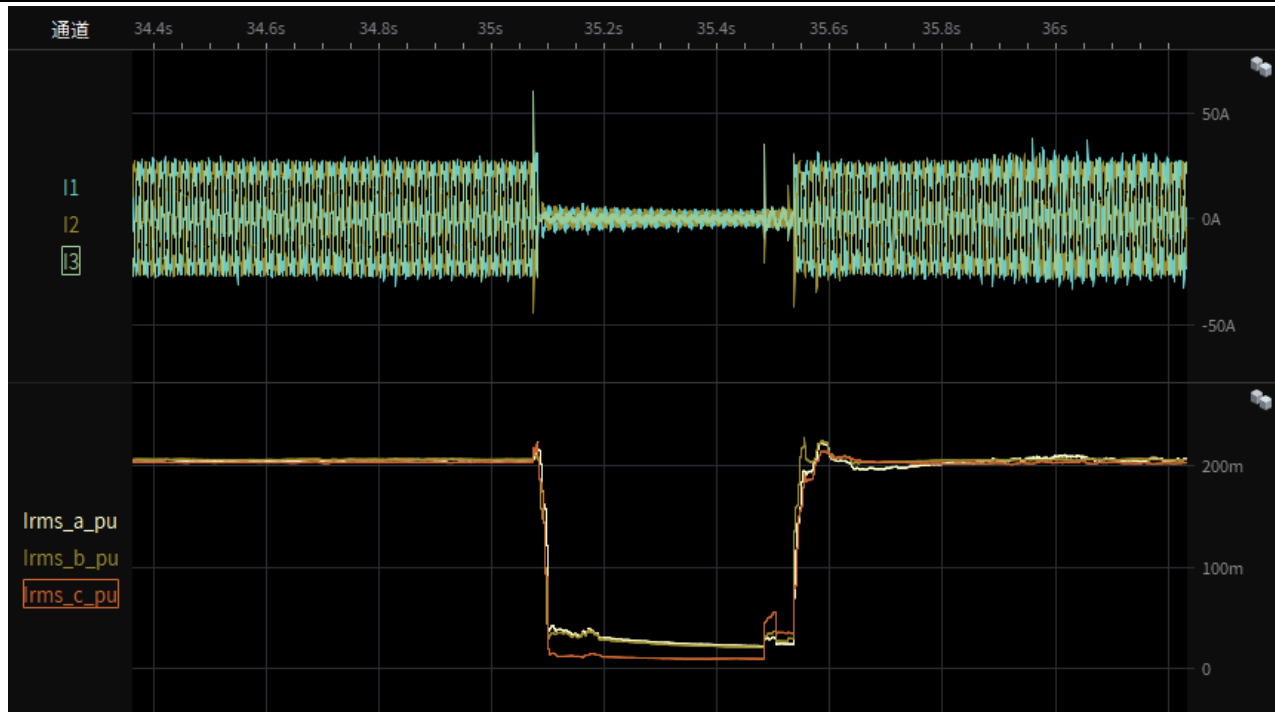
Test 2a-1-1.2 Depth of fault phase:0.25p.u., two-phase-asymmetrical (type D), 20% load
Instantaneous curve and RMS value of phase-to-neutral voltages



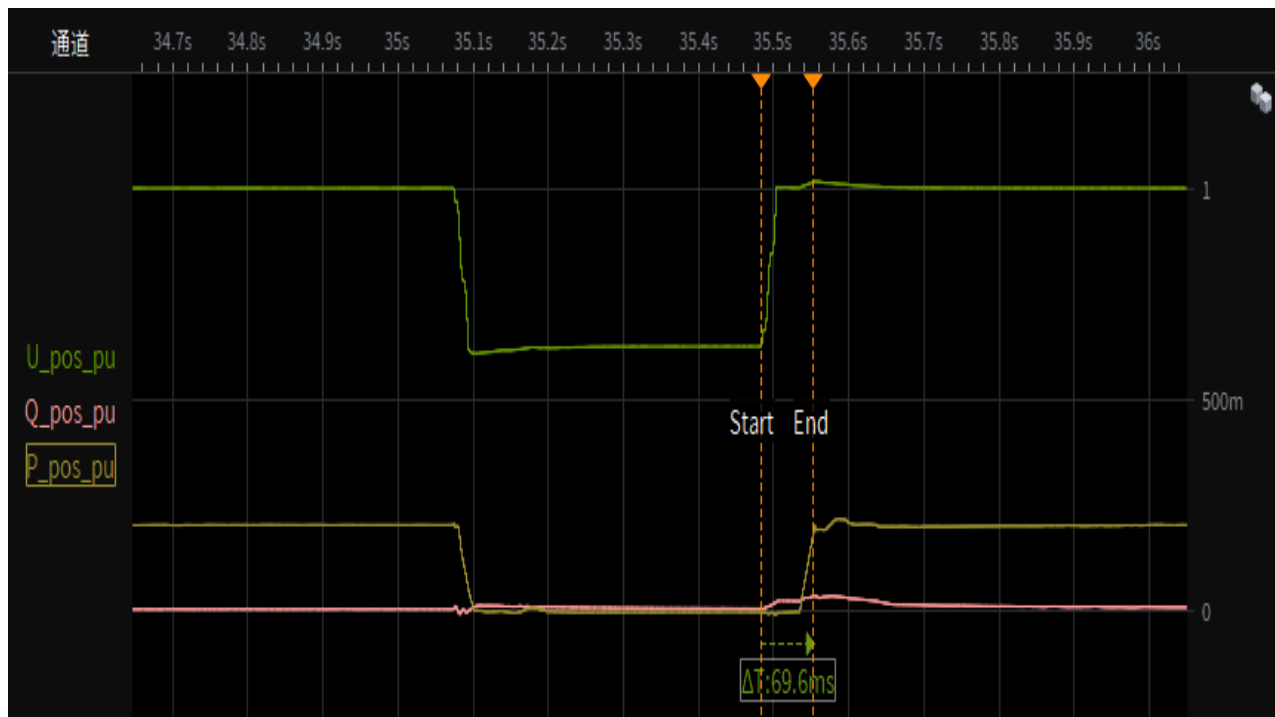
CEI 0-16

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



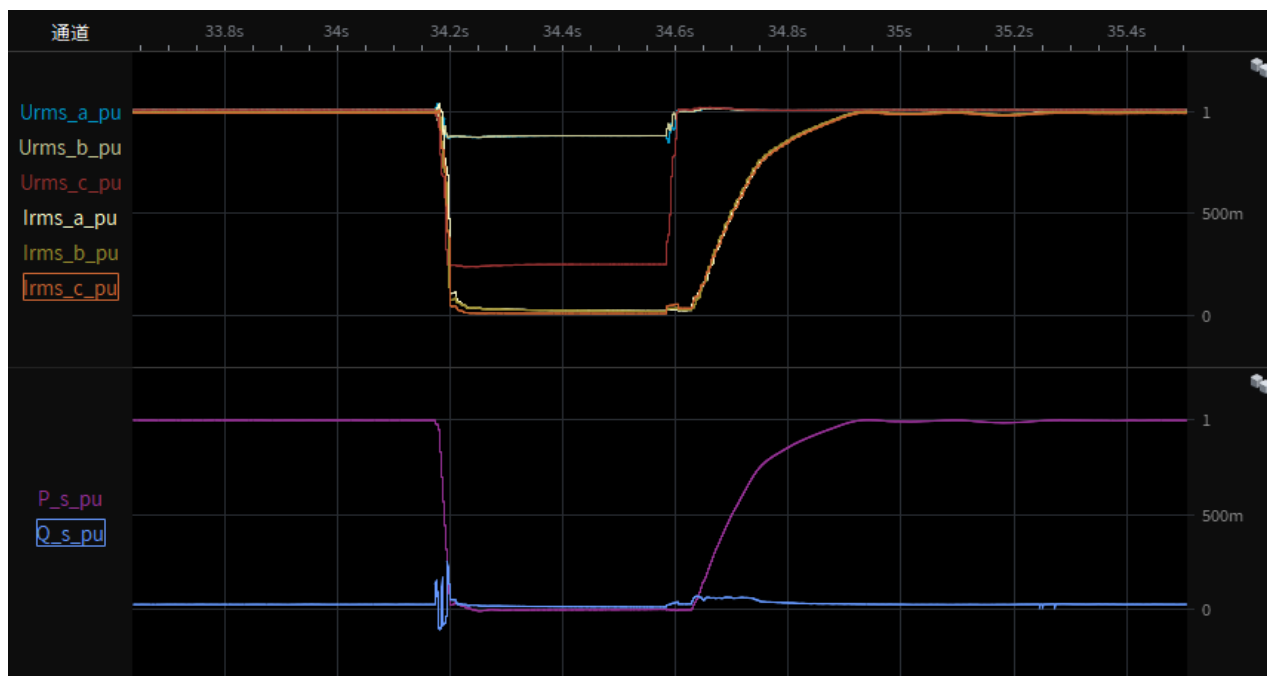
Test 2a-1-1.4 Depth of fault phase:0.25p.u., two-phase-asymmetrical (type D),
20% load restoring time



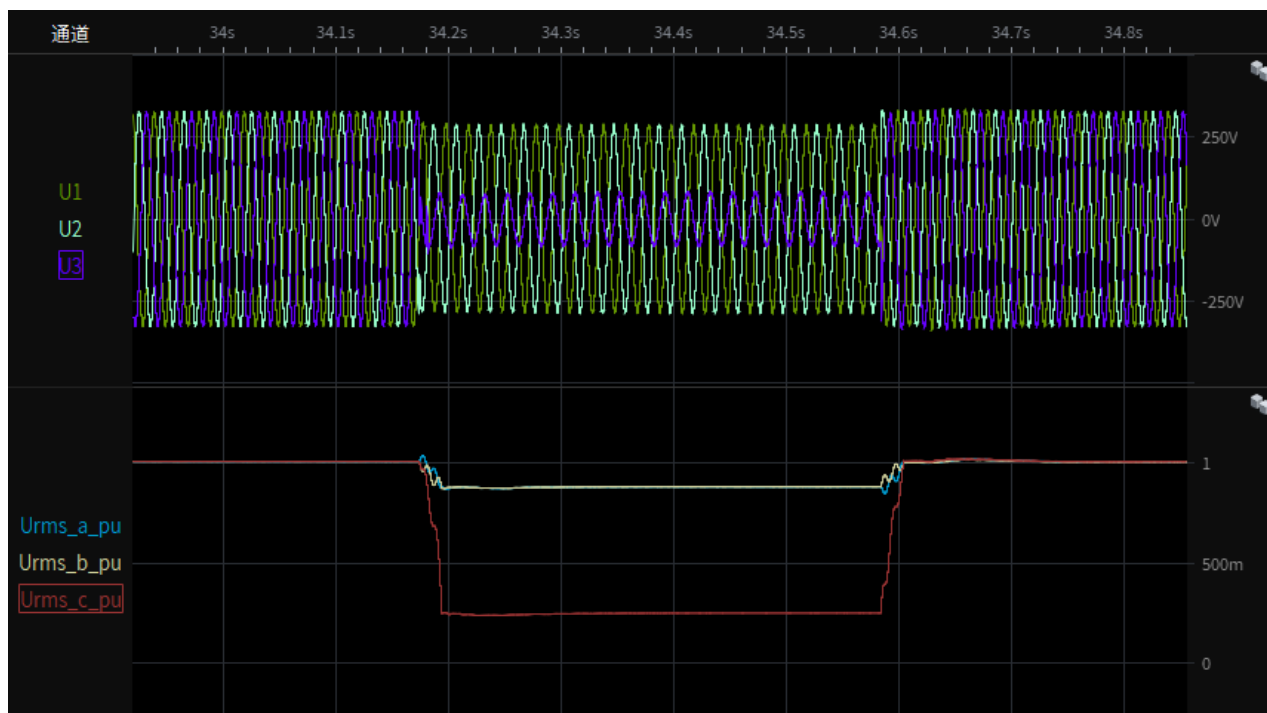
CEI 0-16

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)



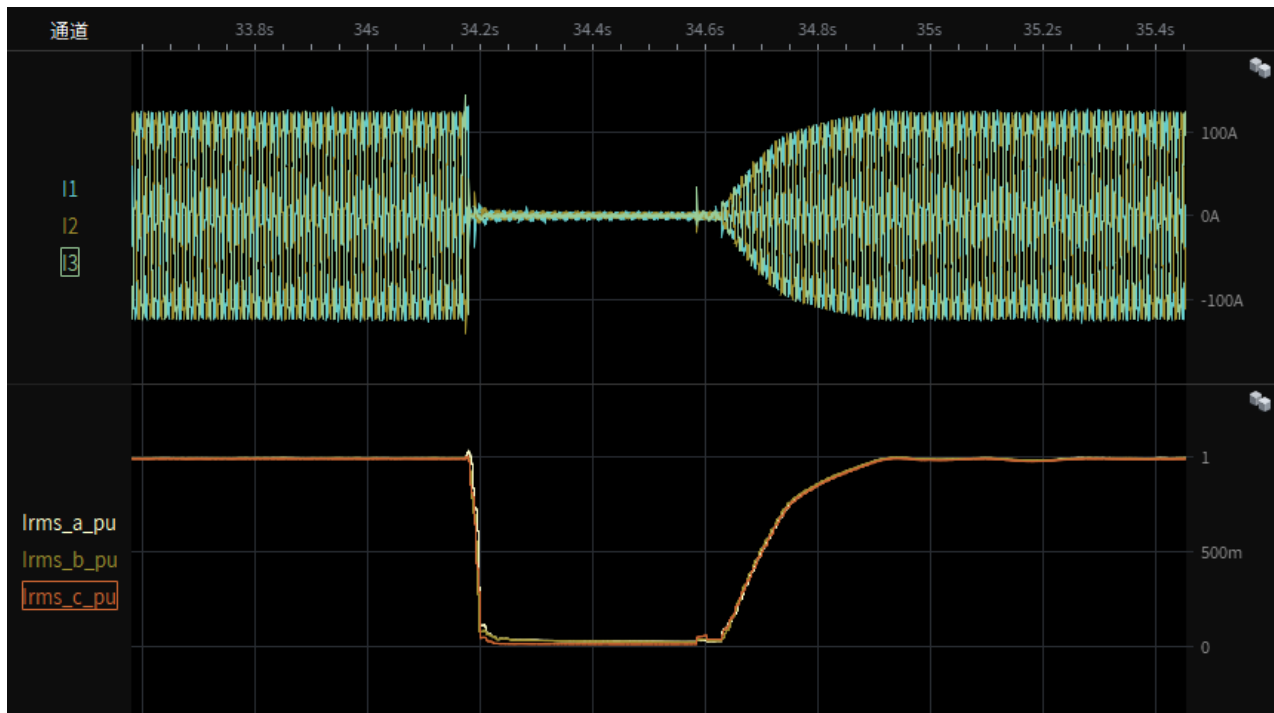
Test 2a-2-1.2 Depth of fault phase: 0.25p.u., two-phase-asymmetrical (type D), 95% load
Instantaneous curve and RMS value of phase-to-neutral voltages



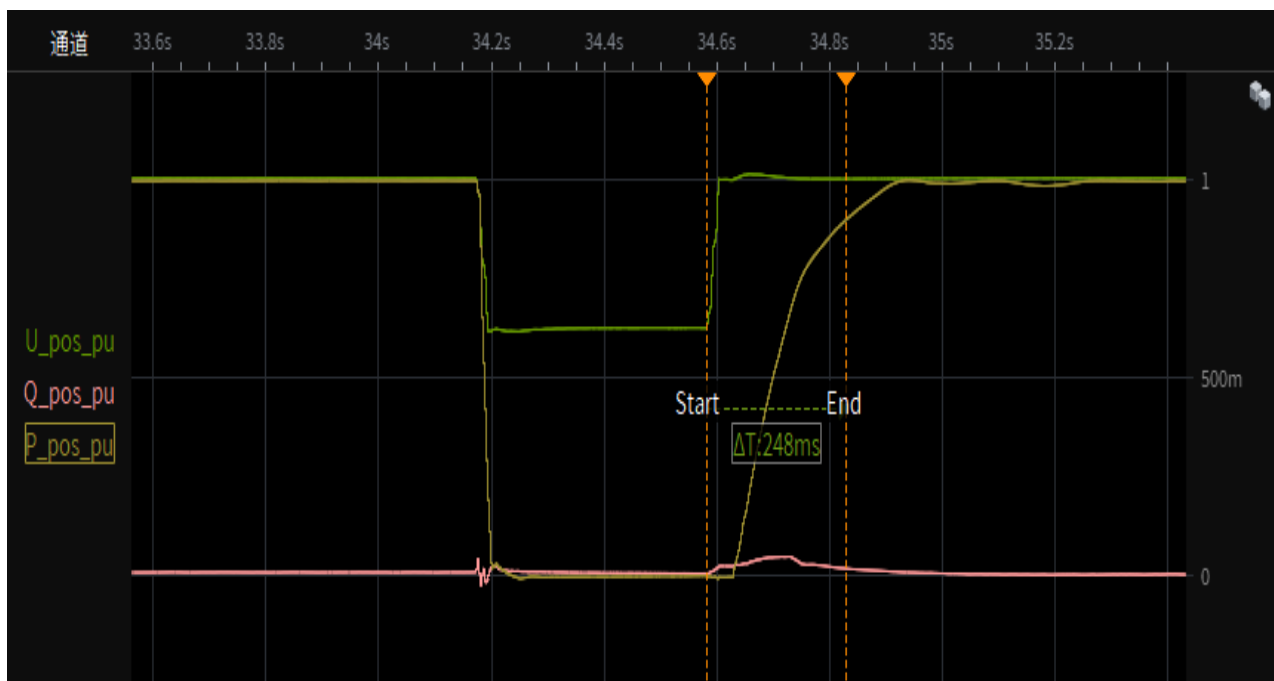
CEI 0-16

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



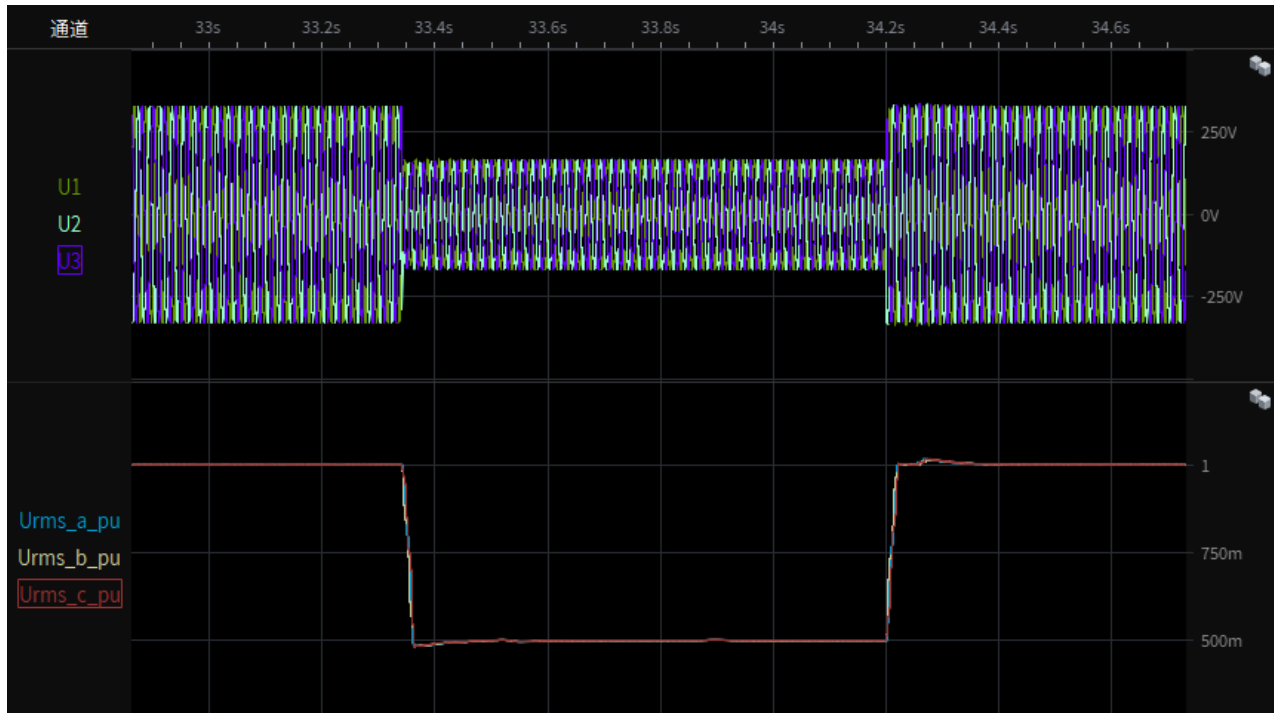
Test 2a-2-1.4 Depth of fault phase: 0.25p.u., two-phase-asymmetrical (type D),
95% load restoring time



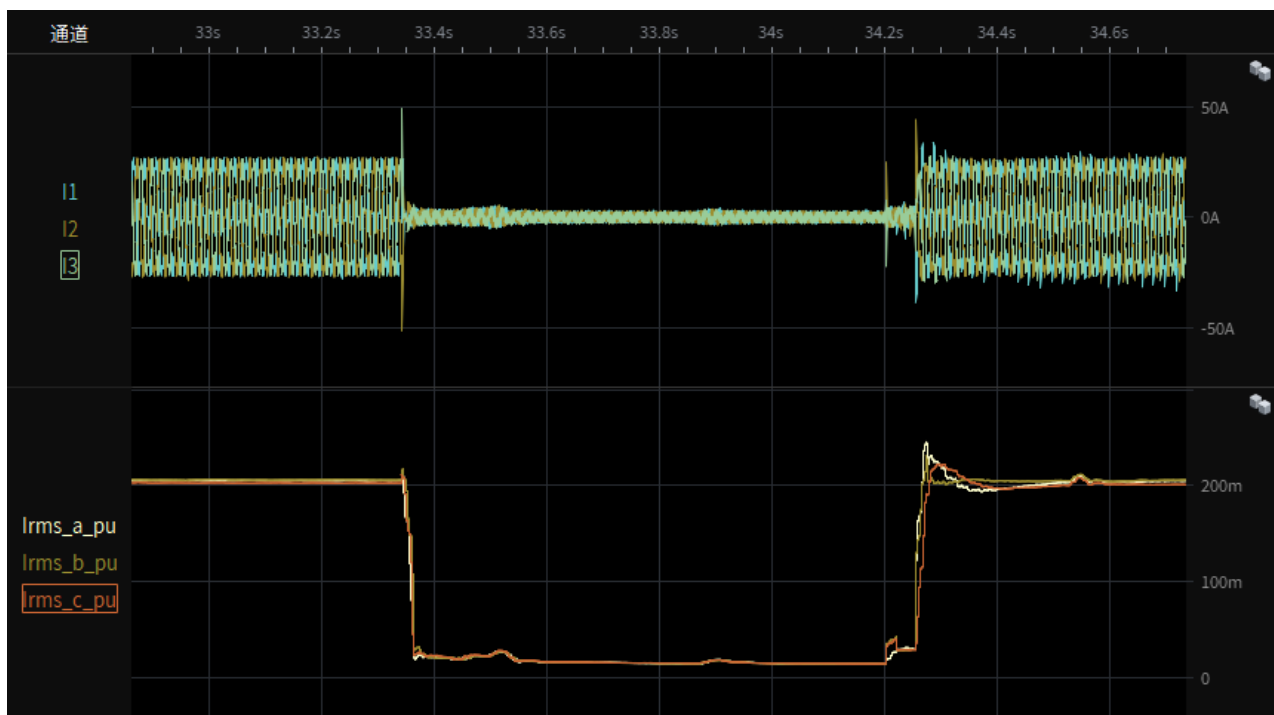
CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict
Test 3s-1.1 Depth of fault phase: 0.5p.u., three-phase-symmetrical (type A), 0% load Test overview(voltage,current,active and reactive power)			
Test 3s-1-1.1 Depth of fault phase: 0.5p.u., three-phase-symmetrical (type A), 20% load Test overview(voltage,current,active and reactive power)			

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

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

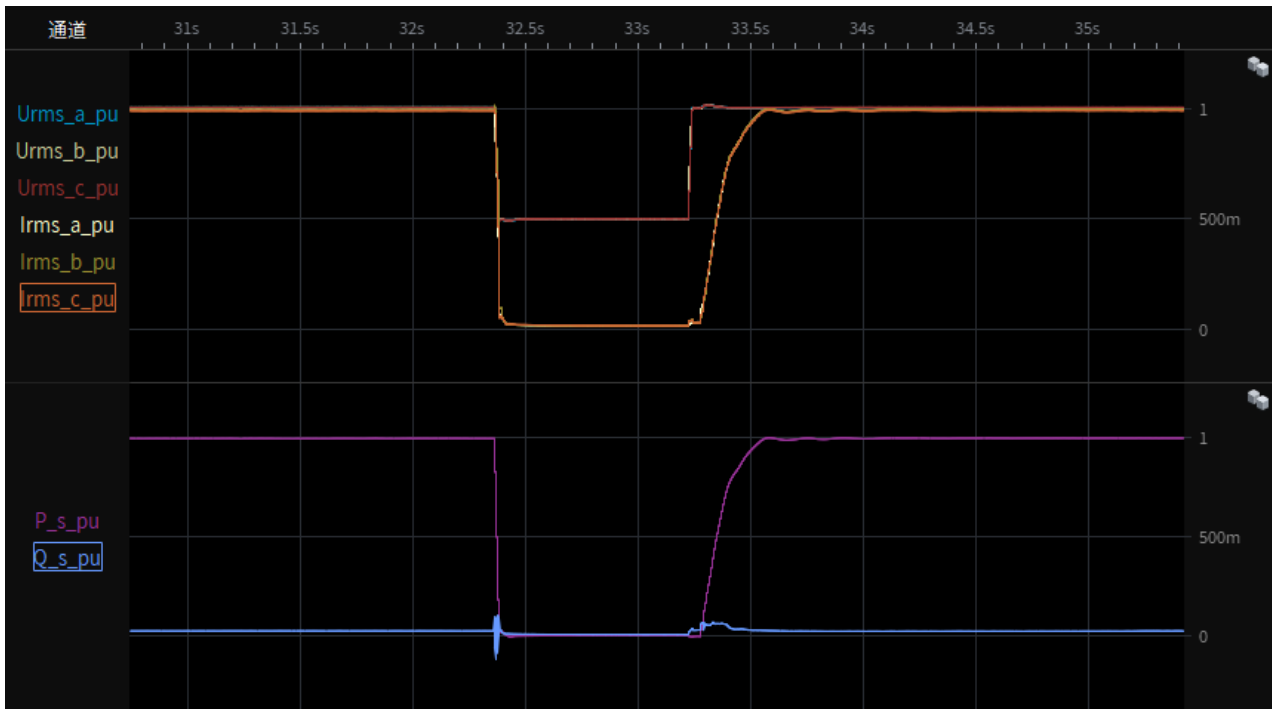


CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

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

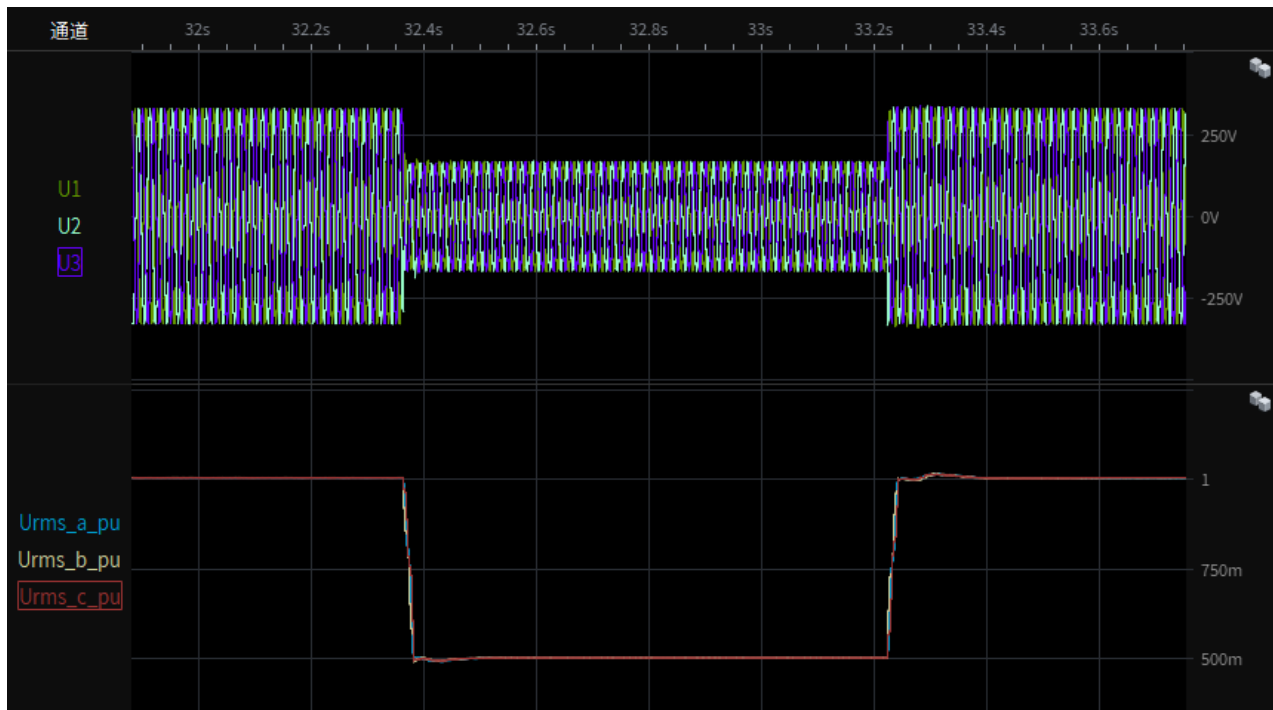


Test 3s-2-1.1 Depth of fault phase: 0.5p.u., three-phase-symmetrical (type A), 95% load
Test overview(voltage,current,active and reactive power)

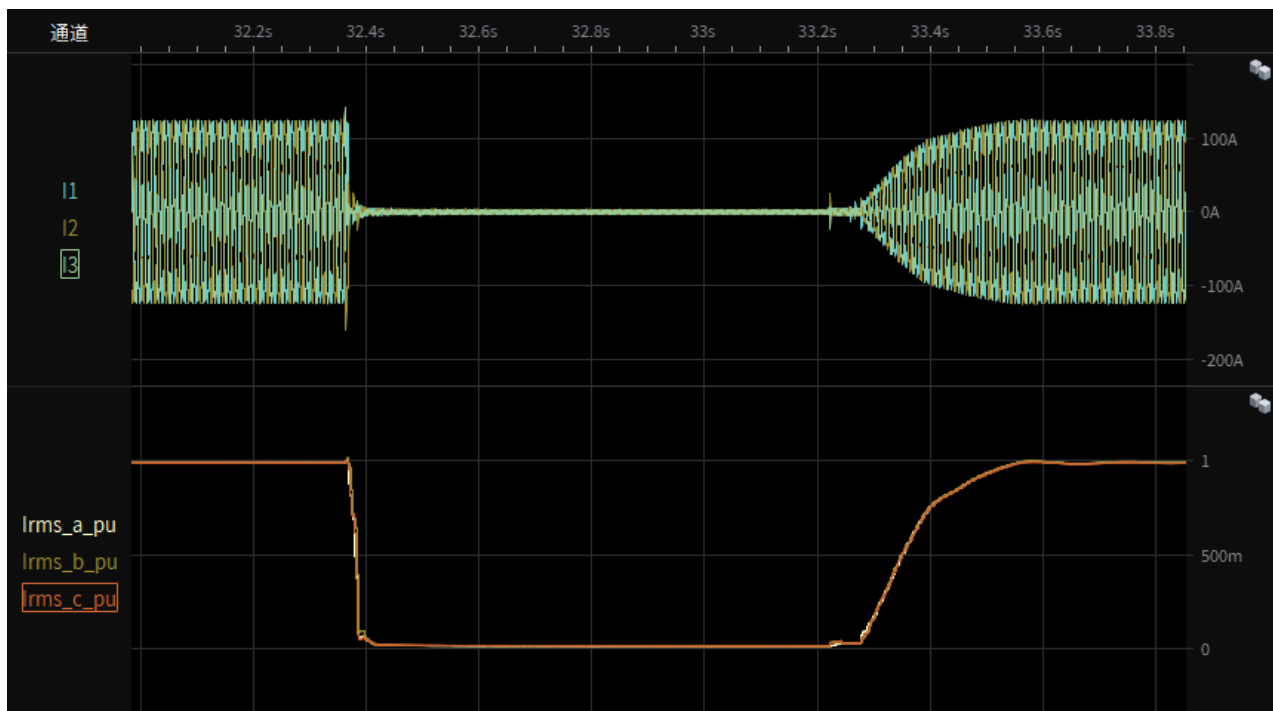


CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

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



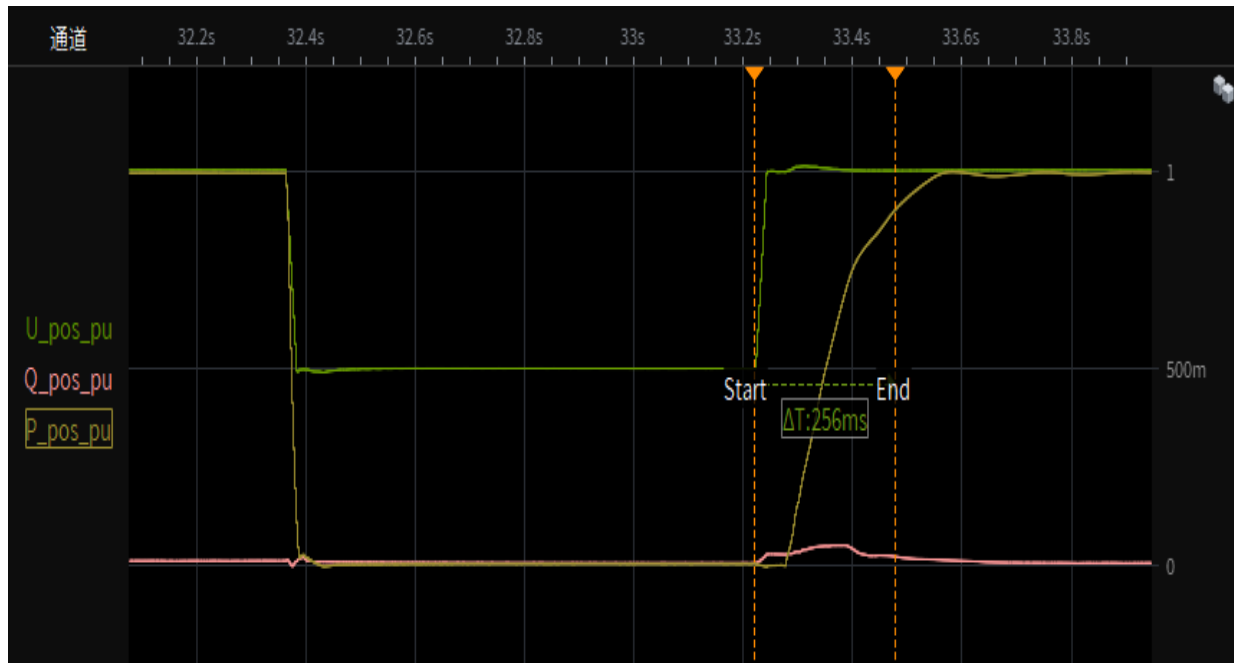
Test 3s-2-1.3 Depth of fault phase: 0.5p.u., three-phase-symmetrical (type A), 95% load
Instantaneous curve and RMS value of phase currents



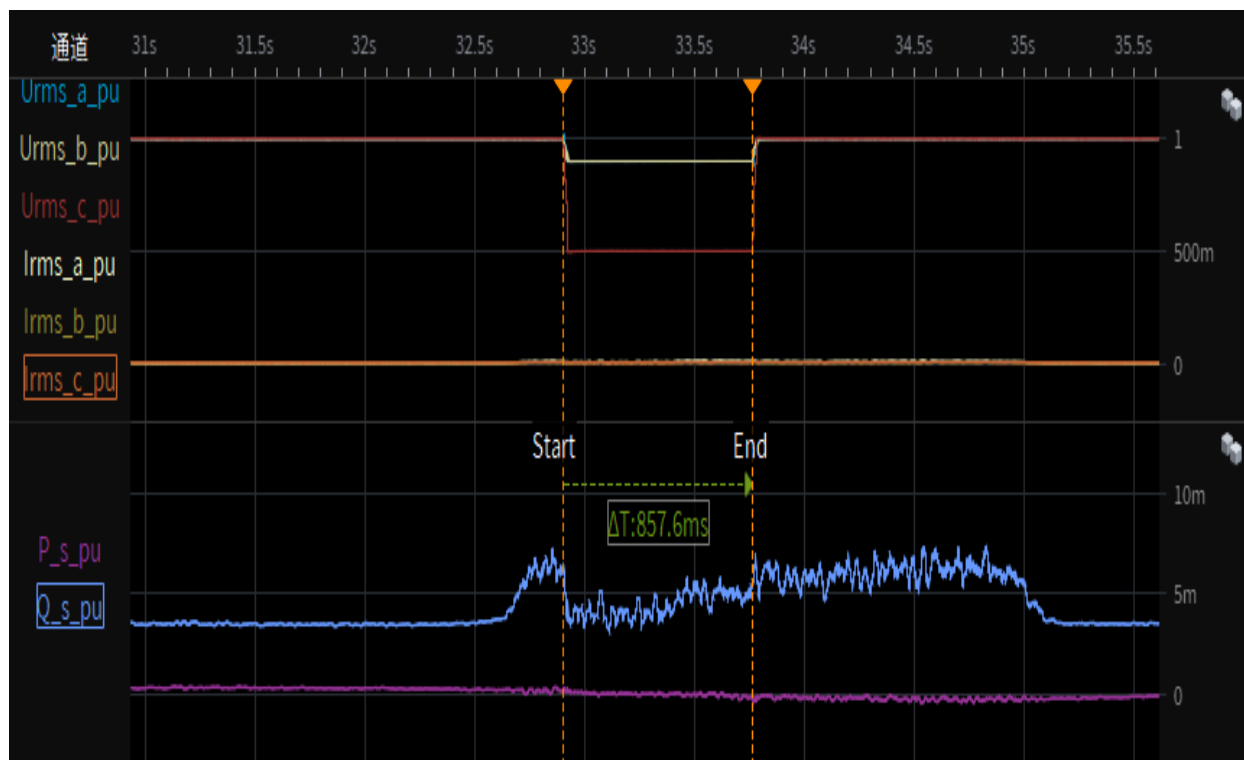
CEI 0-16

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



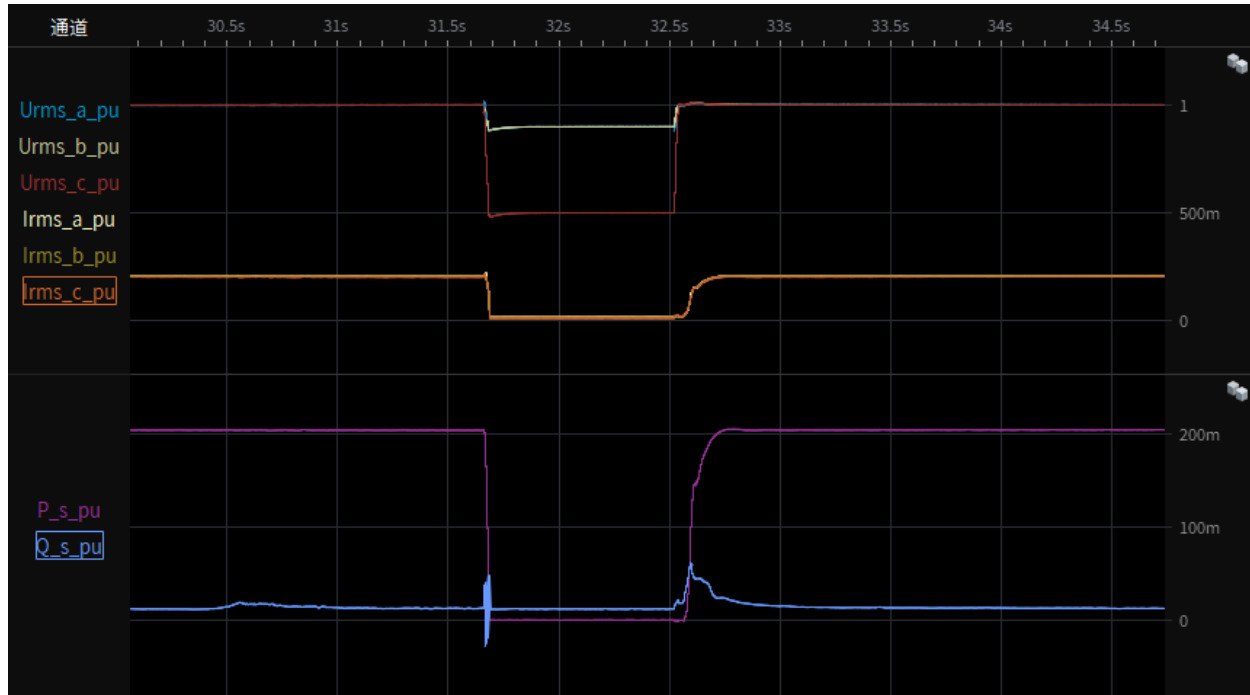
Test 3a-1.1 Depth of fault phase: 0.5p.u., two-phase-asymmetrical (type D), 0% load
Test overview(voltage,current,active and reactive power)



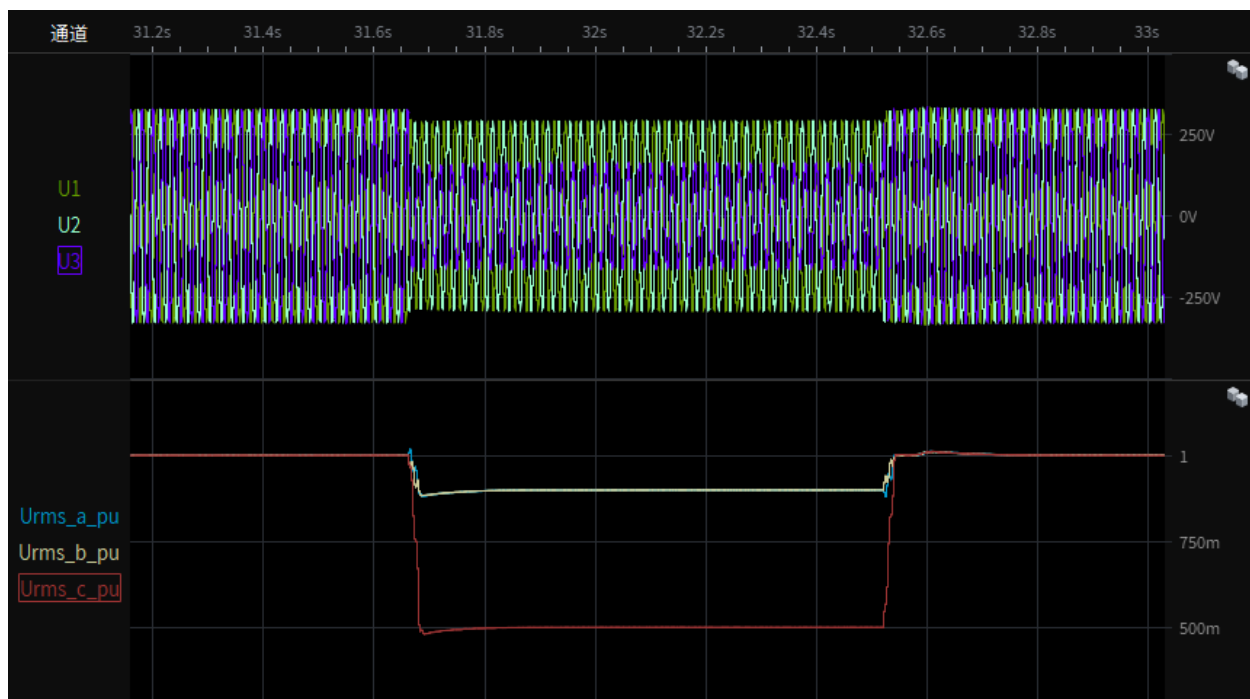
CEI 0-16

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)

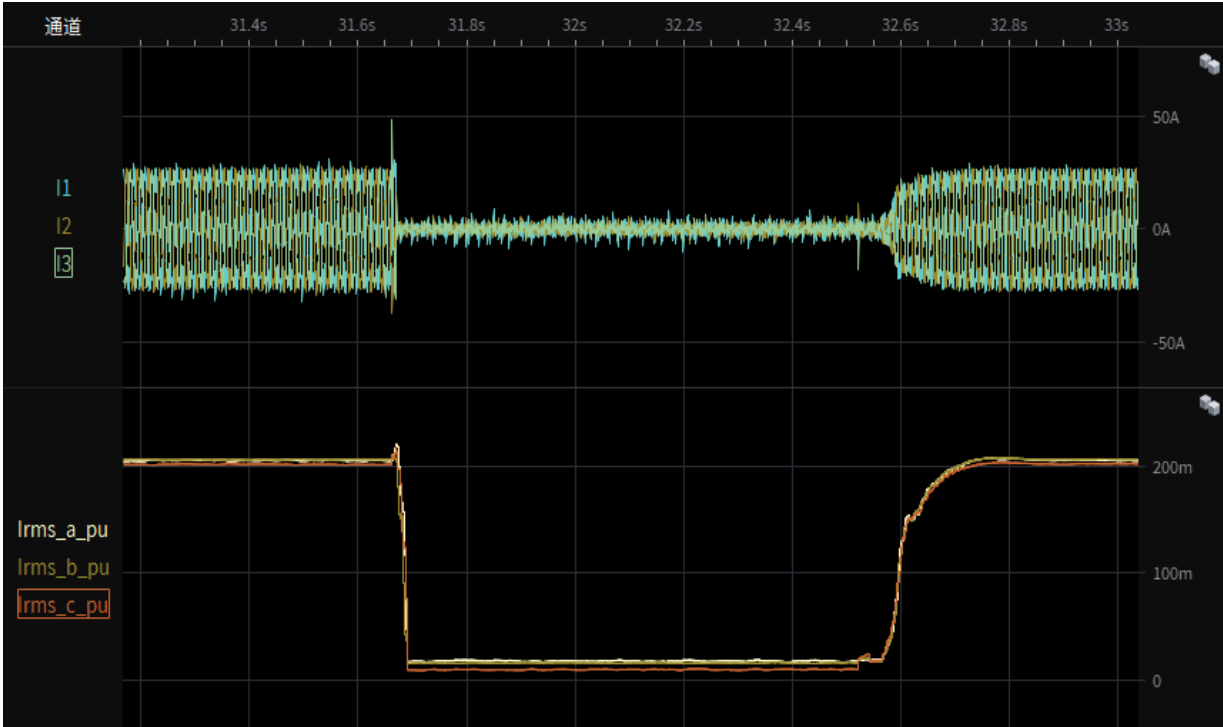


Test 3a-1-1.2 Depth of fault phase: 0.5p.u., two-phase-asymmetrical (type D), 20% load
Instantaneous curve and RMS value of phase-to-neutral voltages



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

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



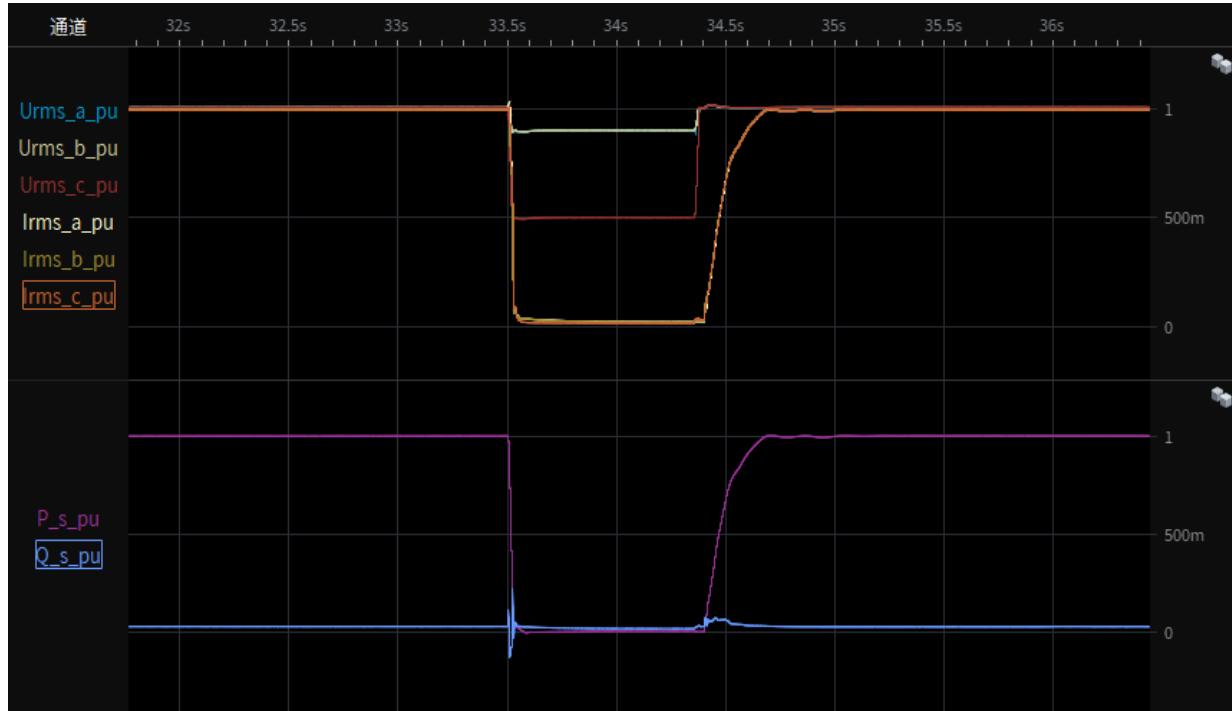
Test 3a-1-1.4 Depth of fault phase: 0.5p.u., two-phase-asymmetrical (type D),
20% load restoring time



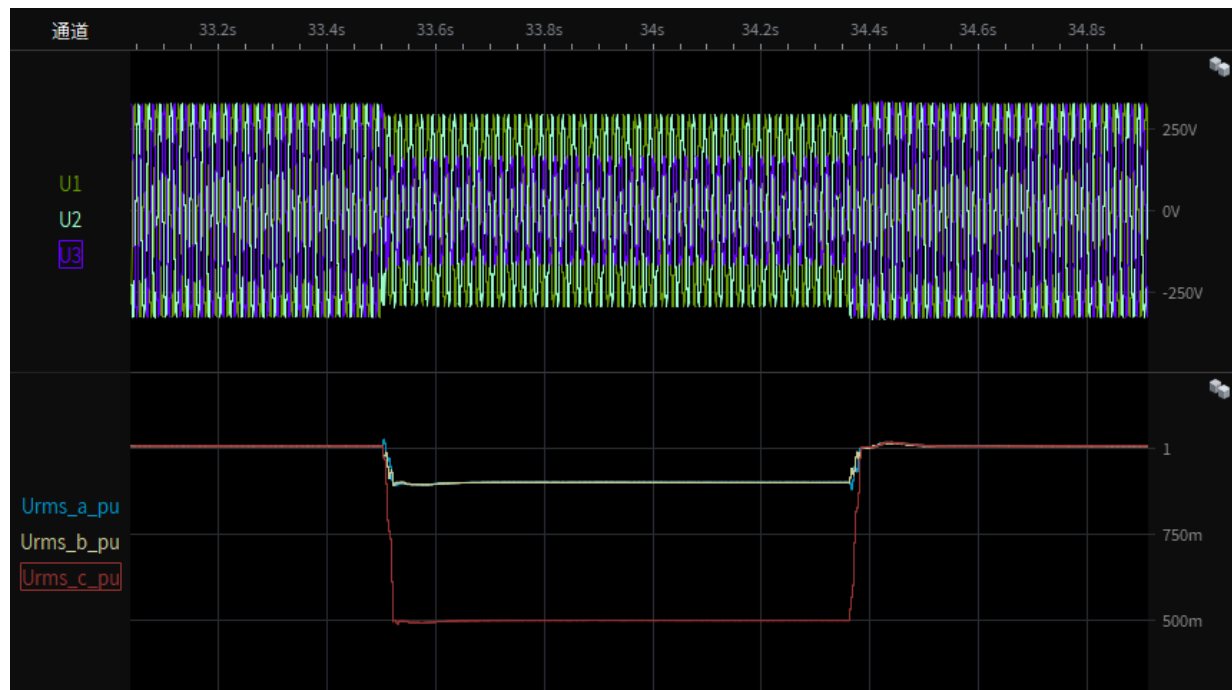
CEI 0-16

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)



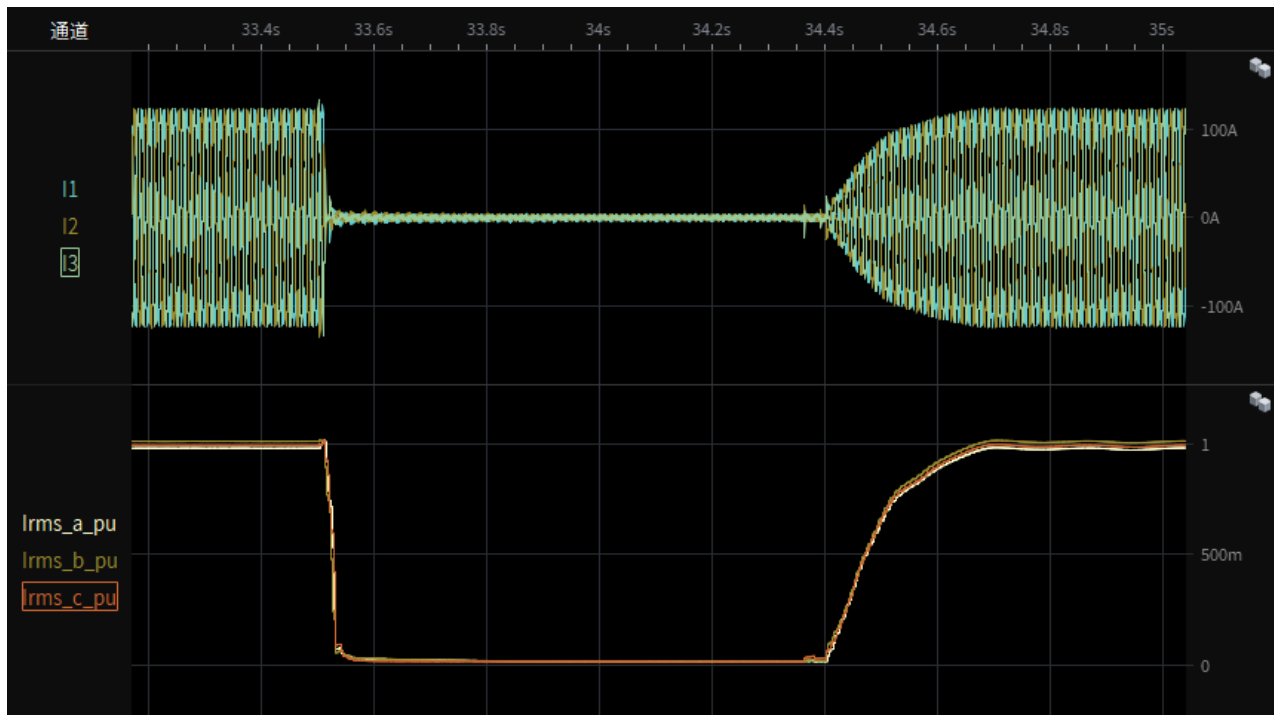
Test 3a-2-1.2 Depth of fault phase: 0.5p.u., two-phase-asymmetrical (type D), 95% load
Instantaneous curve and RMS value of phase-to-neutral voltages



CEI 0-16

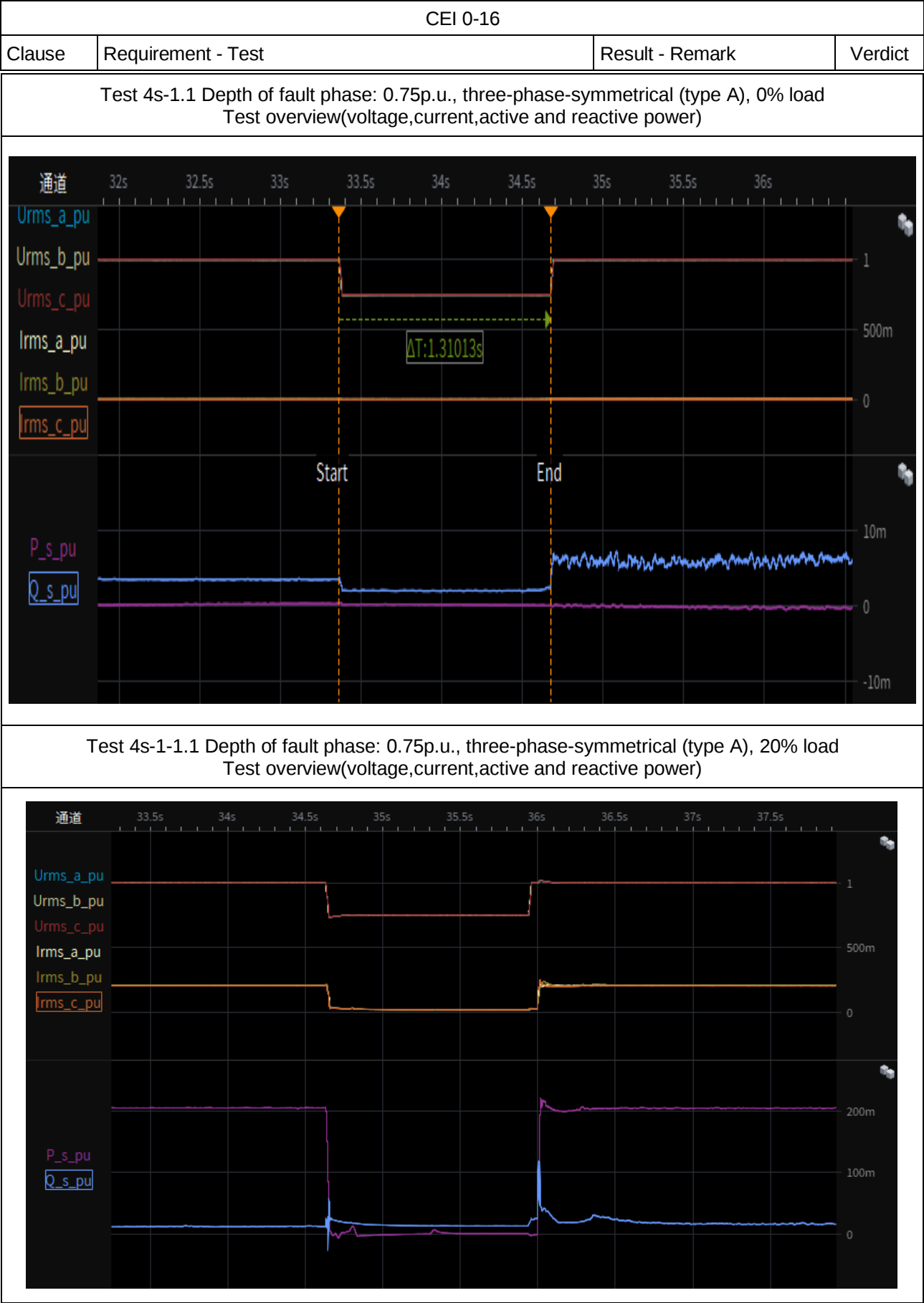
Clause	Requirement - Test	Result - Remark	Verdict
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Test 3a-2-1.3 Depth of fault phase: 0.5p.u., two-phase-asymmetrical (type D), 95% load
Instantaneous curve and RMS value of phase currents



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

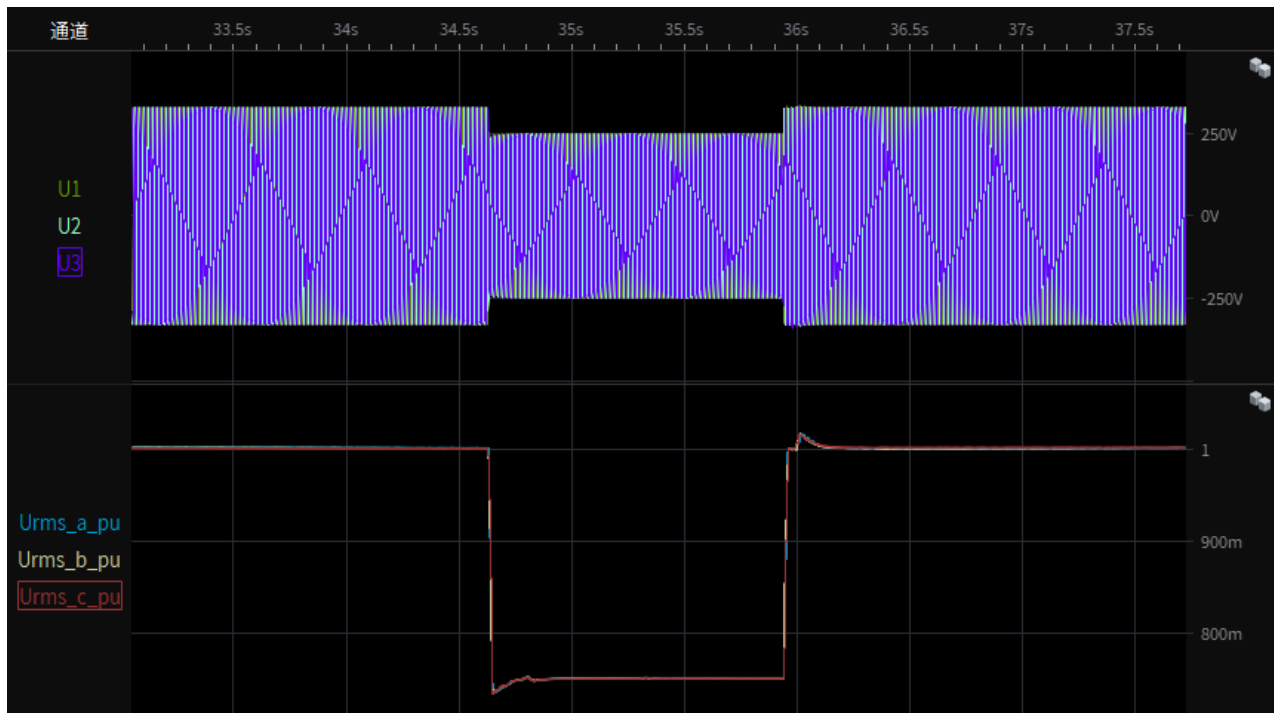




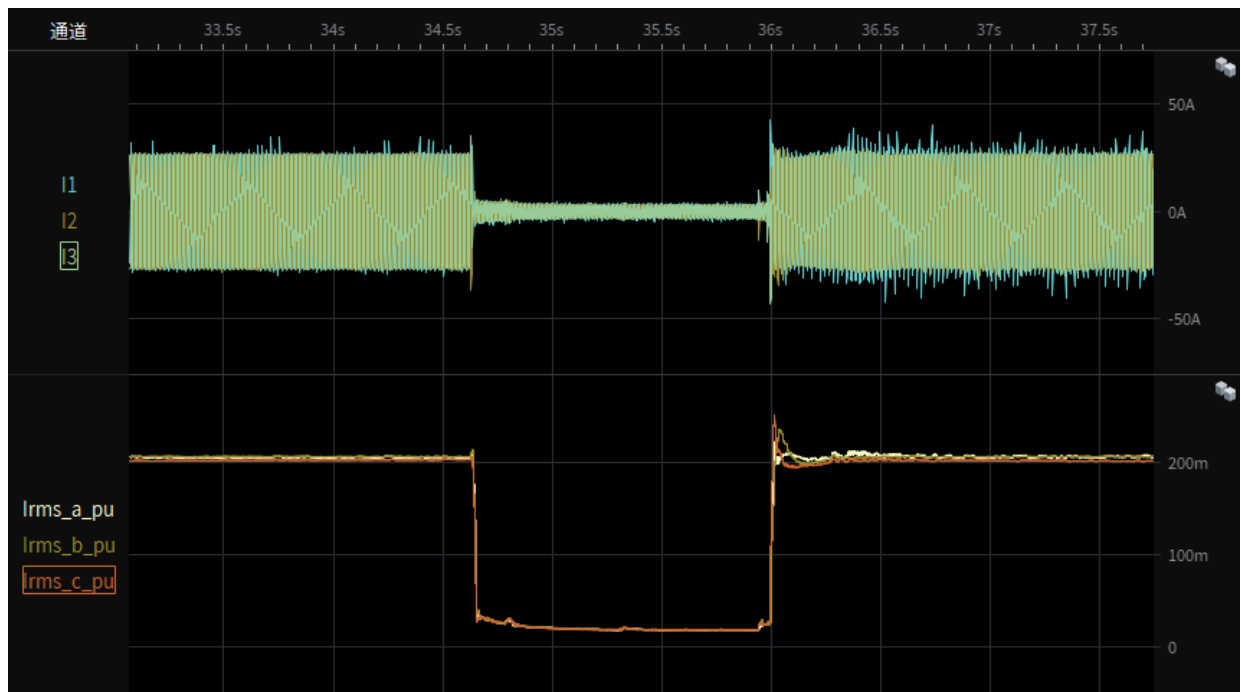
CEI 0-16

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



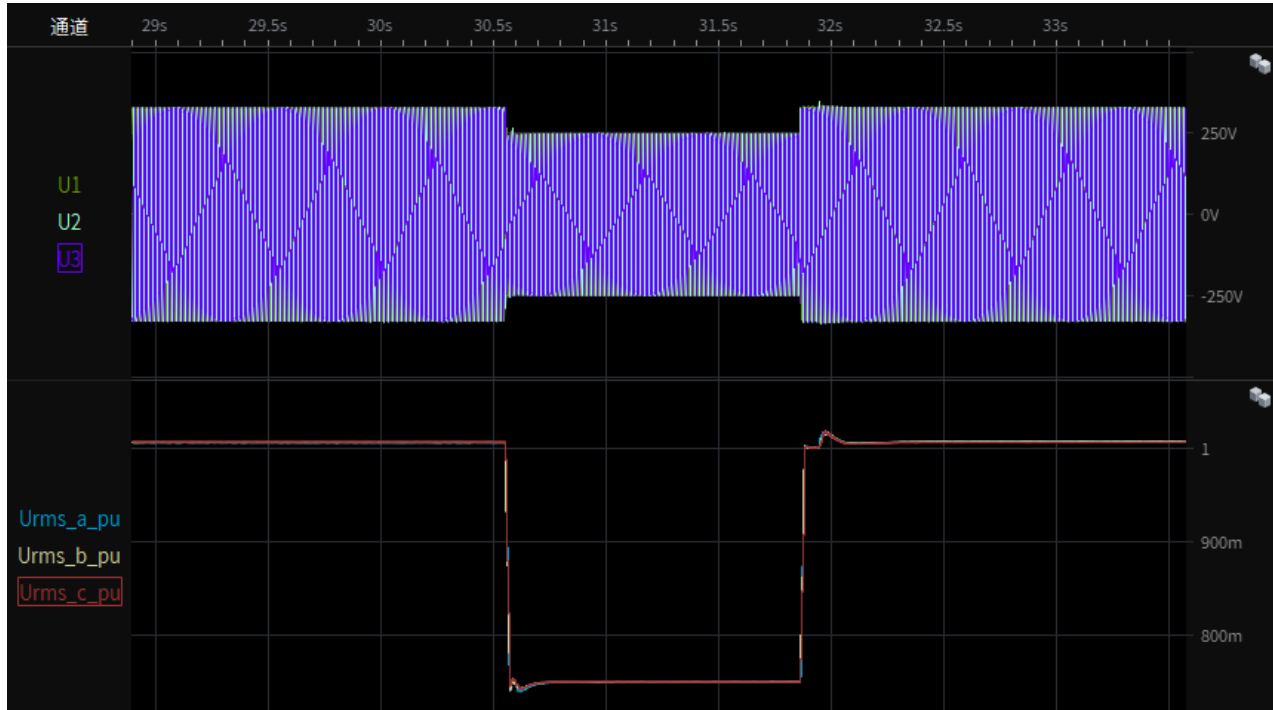
Test 4s-1-1.3 Depth of fault phase: 0.75p.u., three-phase-symmetrical (type A), 20% load
Instantaneous curve and RMS value of phase currents



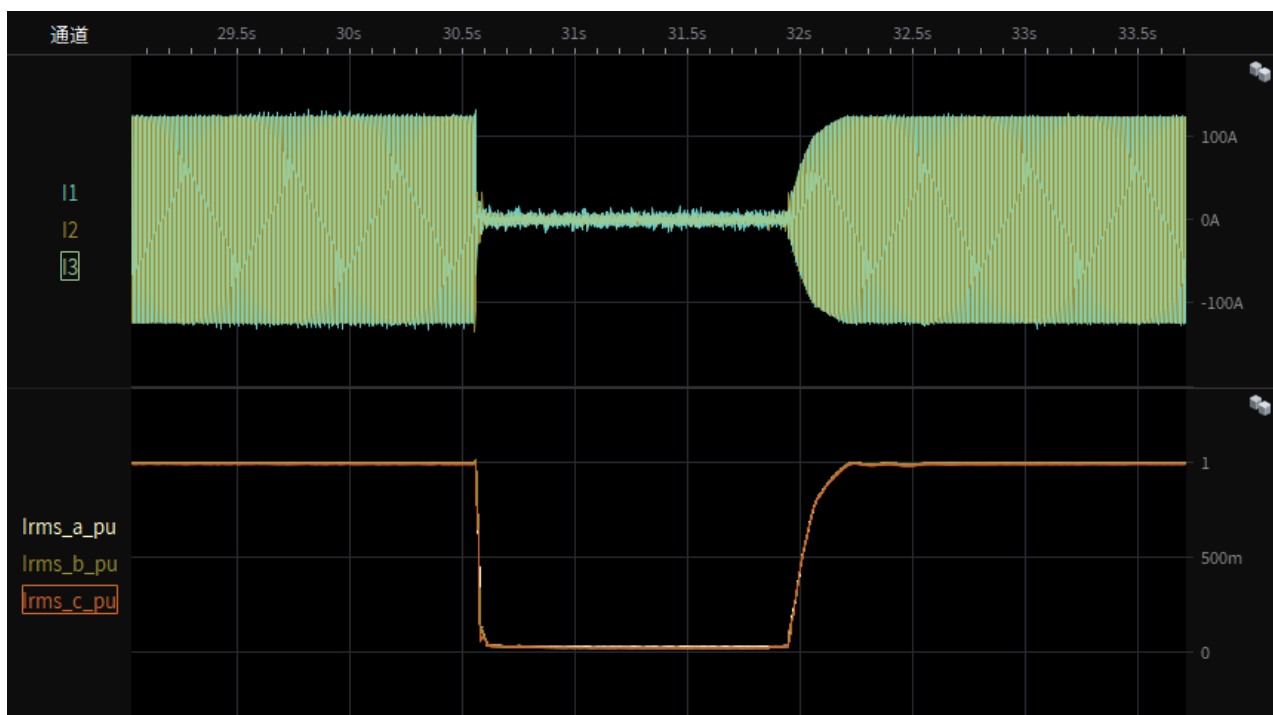
CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict
Test 4s-1-1.4 Depth of fault phase: 0.75p.u., three-phase-symmetrical (type A), 20% load restoring time			
通道 33.5s34s34.5s35s35.5s36s36.5s37s37.5s U_pos_pu Q_pos_pu P_pos_pu 1 500m 0 StaEnd ΔT:74.88ms			
Test 4s-2-1.1 Depth of fault phase: 0.75p.u., three-phase-symmetrical (type A), 95% load Test overview(voltage,current,active and reactive power)			
通道 27s28s29s30s31s32s33s34s35s36s Urms_a_pu Urms_b_pu Urms_c_pu Irms_a_pu Irms_b_pu Irms_c_pu P_s_pu Q_s_pu 1 500m 0			

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

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



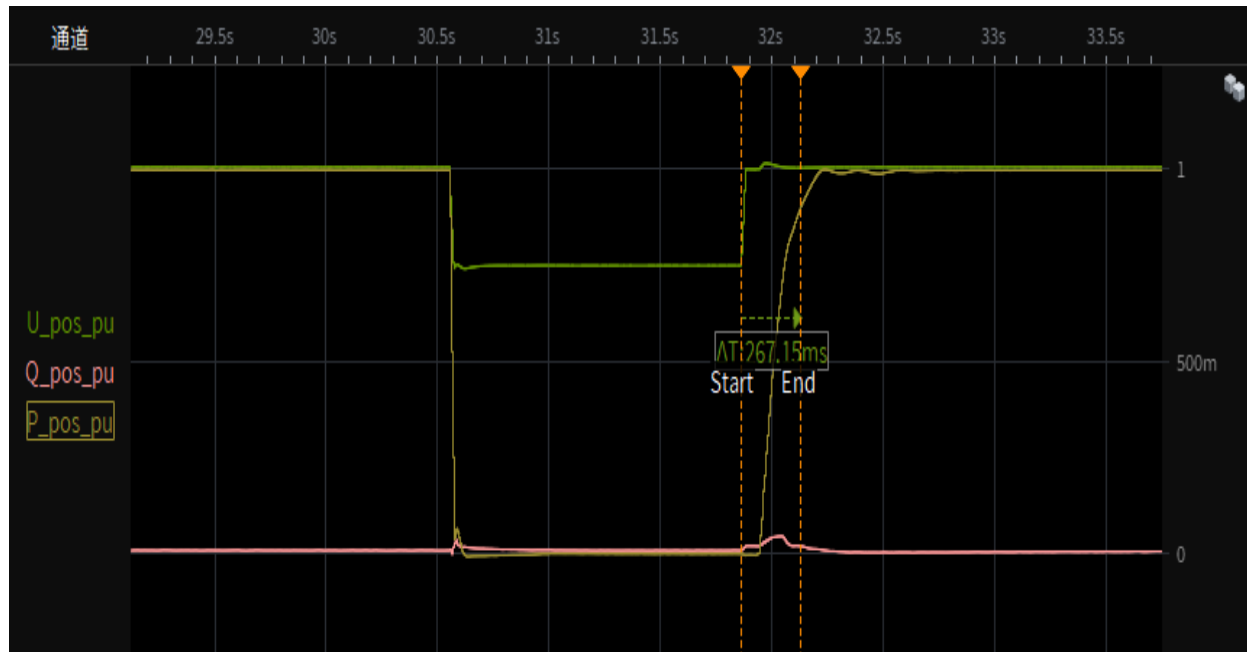
Test 4s-2-1.3 Depth of fault phase: 0.75p.u., three-phase-symmetrical (type A), 95% load
Instantaneous curve and RMS value of phase currents



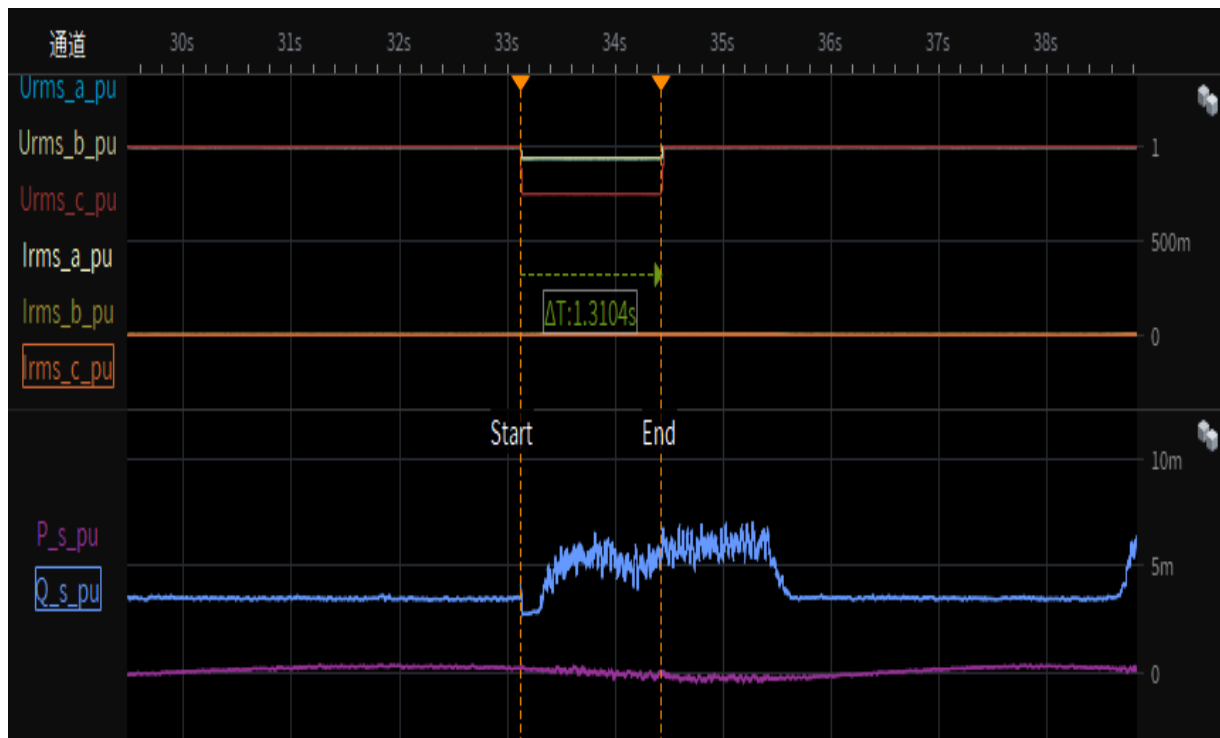
CEI 0-16

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)

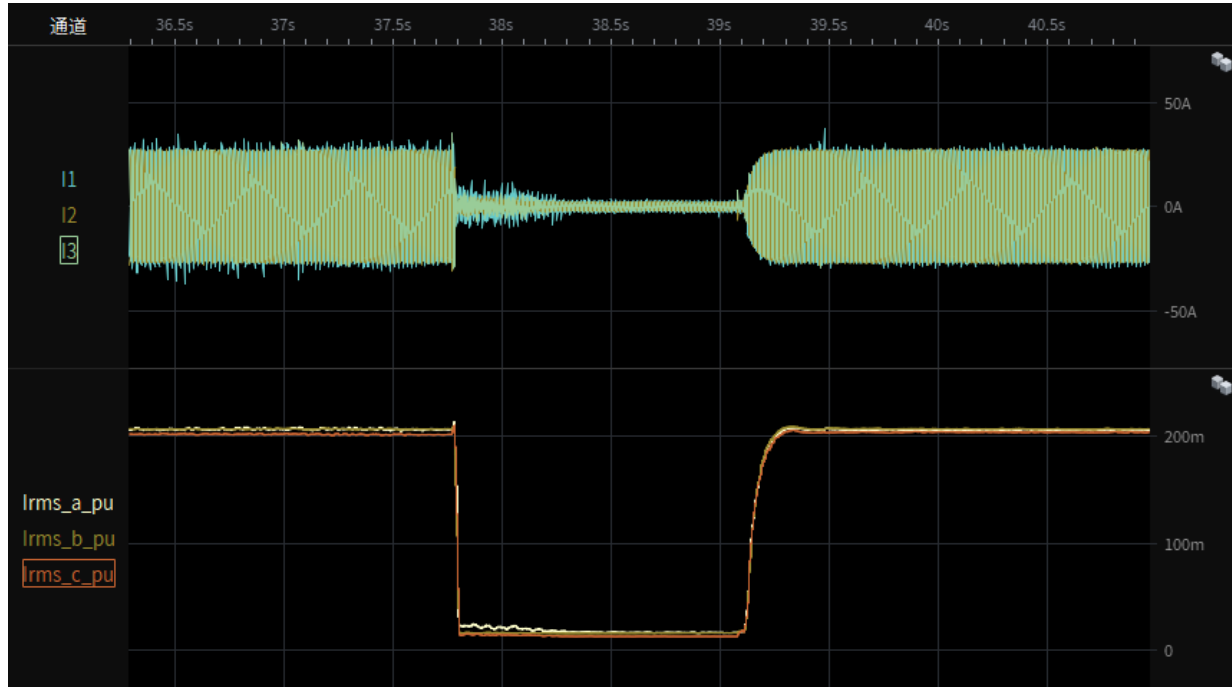


CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict
Test 4a-1-1.1 Depth of fault phase: 0.75p.u., two-phase-asymmetrical (type D), 20% load Test overview(voltage,current,active and reactive power)			
通道 36.5s37s37.5s38s38.5s39s39.5s40s40.5s Urms_a_pu Urms_b_pu Urms_c_pu Irms_a_pu Irms_b_pu Irms_c_pu P_s_pu Q_s_pu 1 500m 0 200m 100m 0			
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			
通道 36.5s37s37.5s38s38.5s39s39.5s40s40.5s U1 U2 U3 Urms_a_pu Urms_b_pu Urms_c_pu 250V 0V -250V 1 900m 800m			

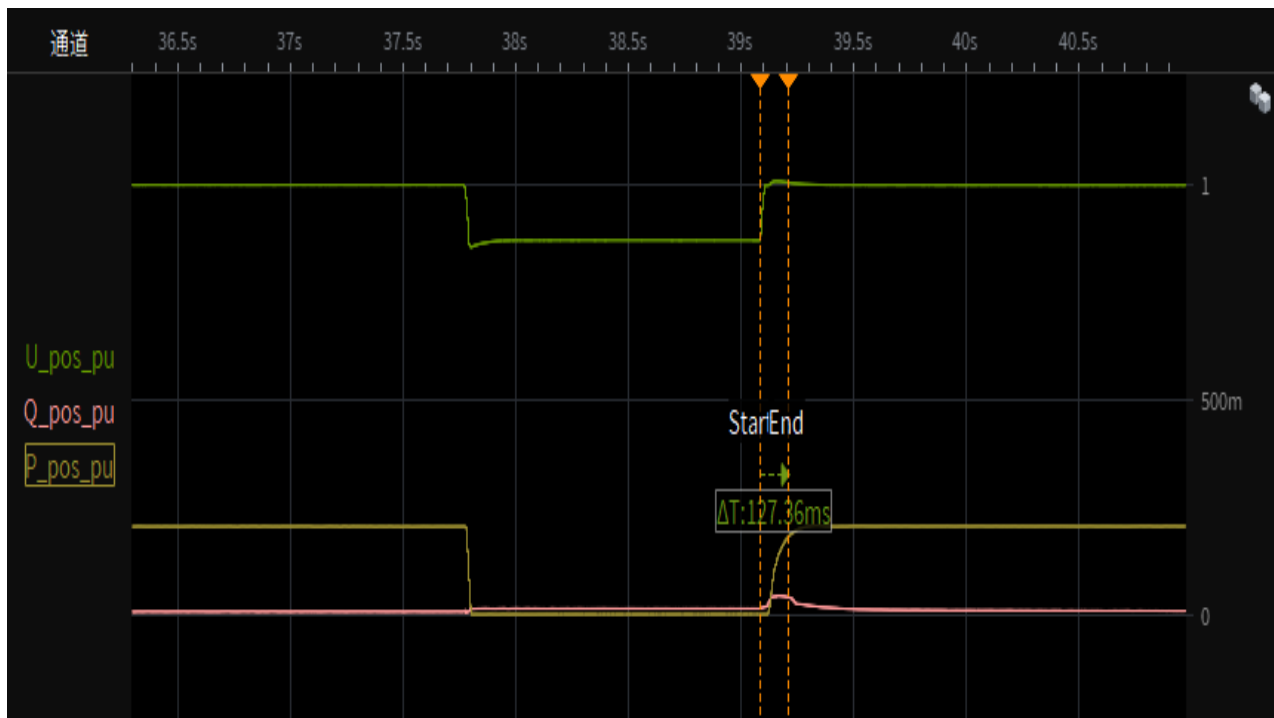
CEI 0-16

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



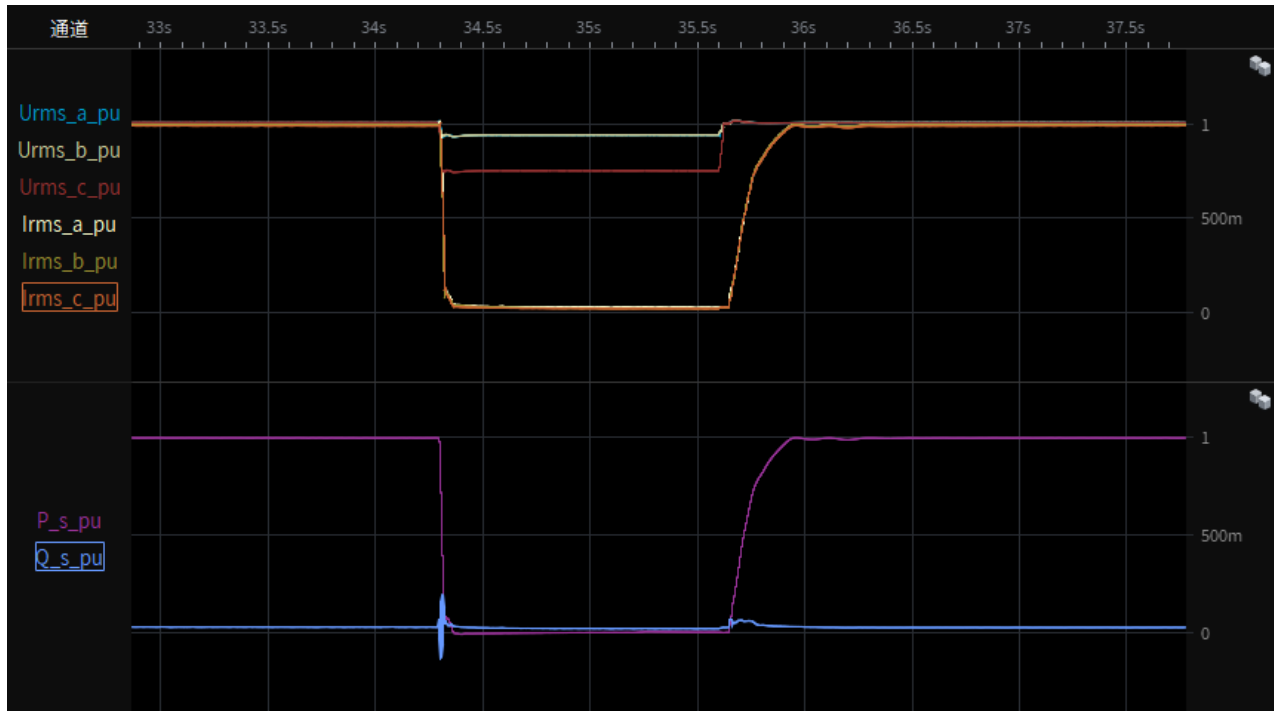
Test 4a-1-1.4 Depth of fault phase: 0.75p.u., two-phase-asymmetrical (type D),
20% load restoring time



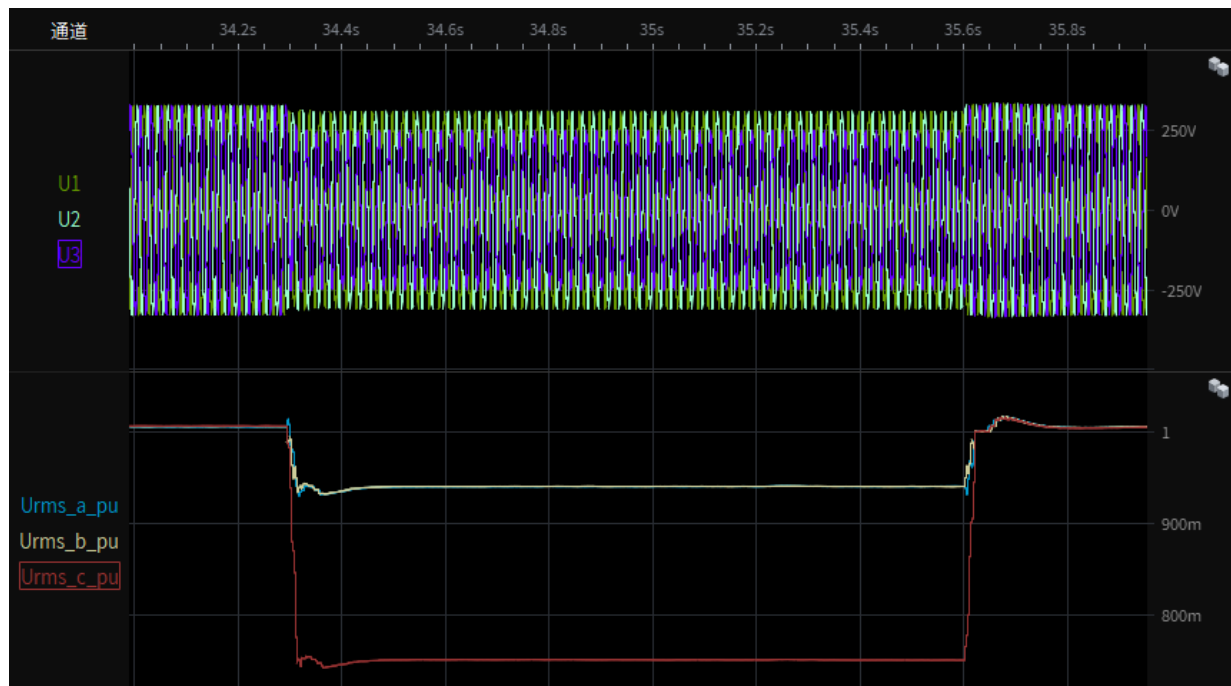
CEI 0-16

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)

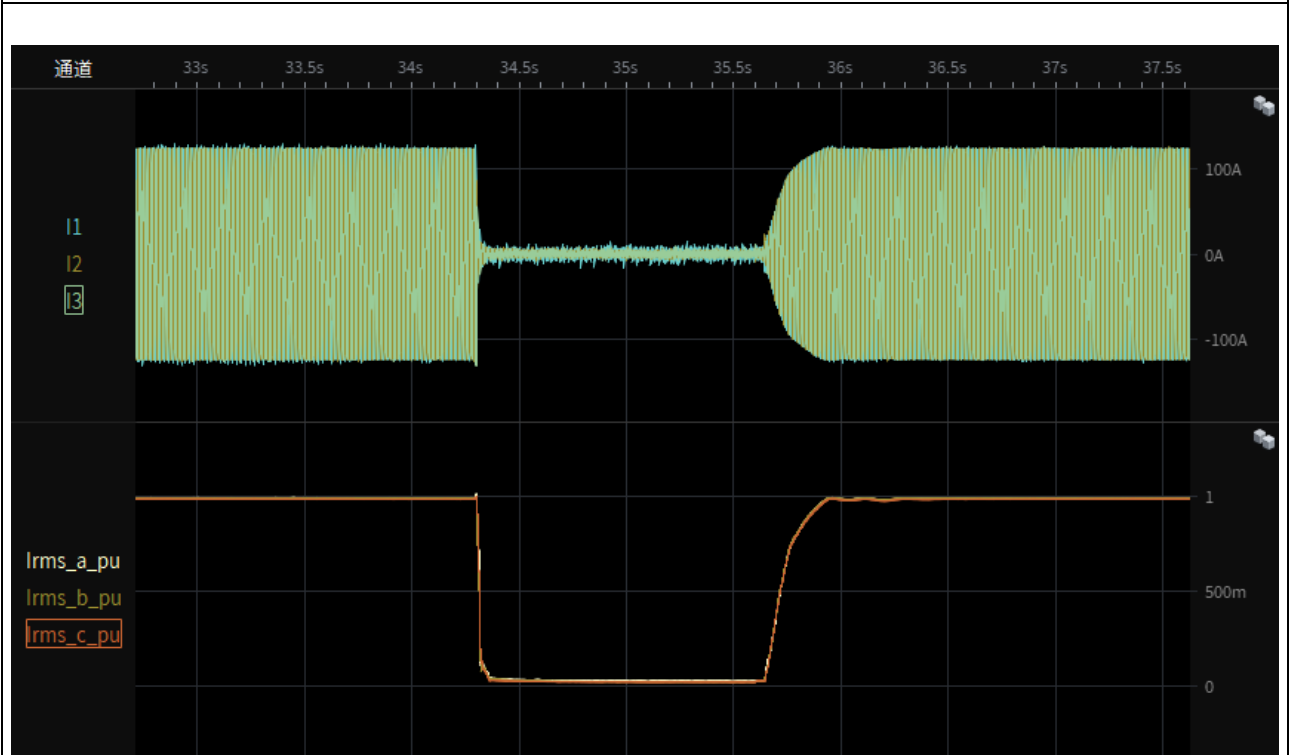


Test 4a-2-1.2 Depth of fault phase: 0.75p.u., two-phase-asymmetrical (type D), 95% load
Instantaneous curve and RMS value of phase-to-neutral voltages

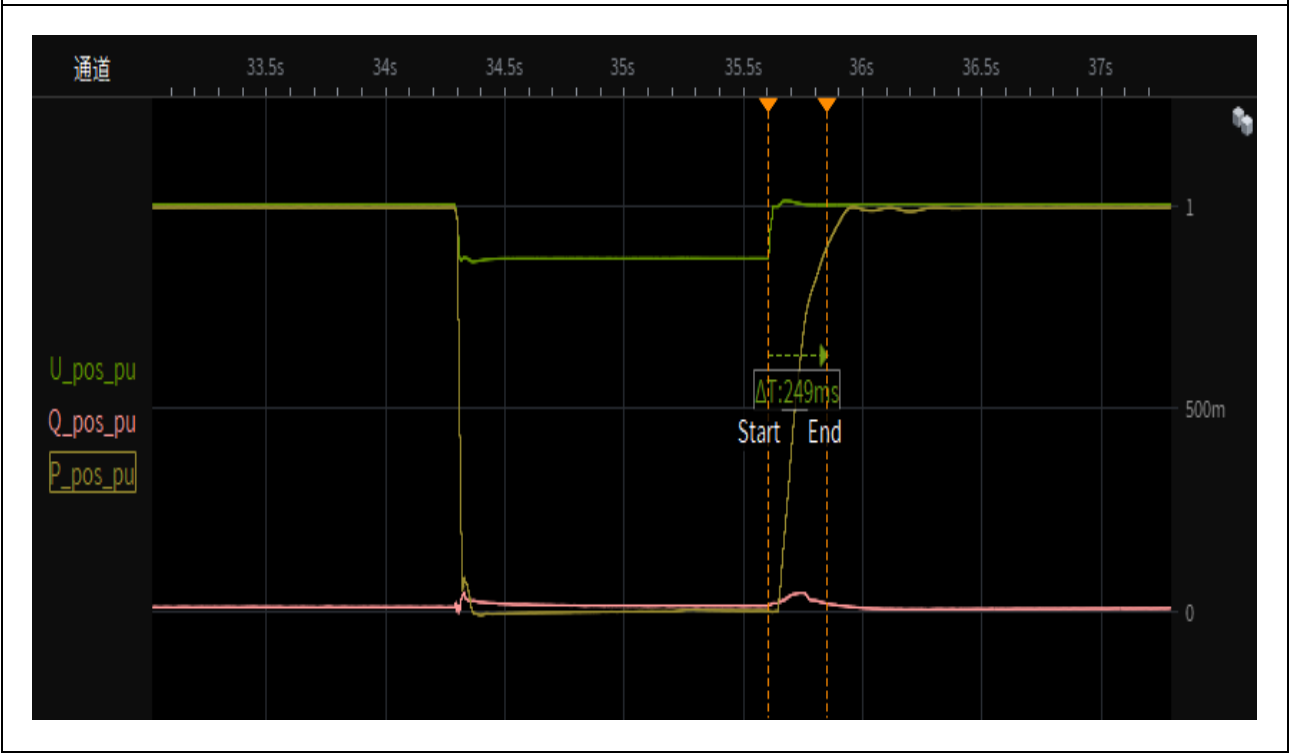


CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

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



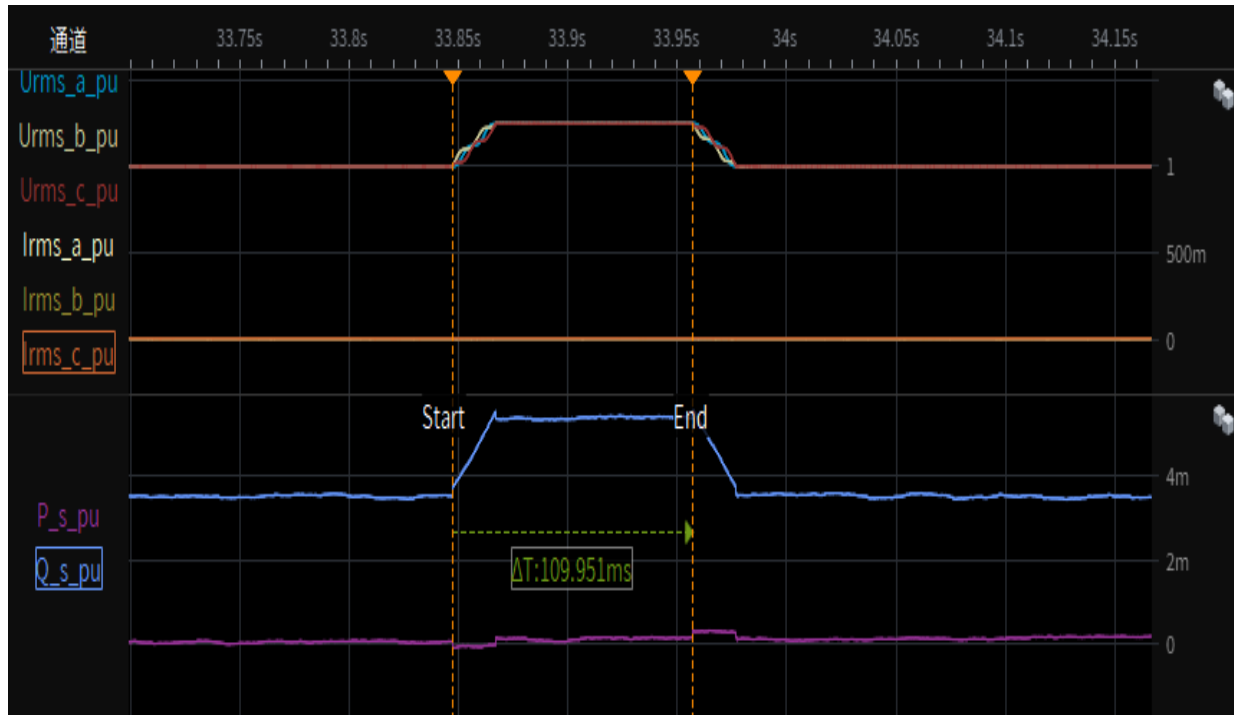
Test 4a-2-1.4 Depth of fault phase: 0.75p.u., two-phase-asymmetrical (type D),
95% load restoring time



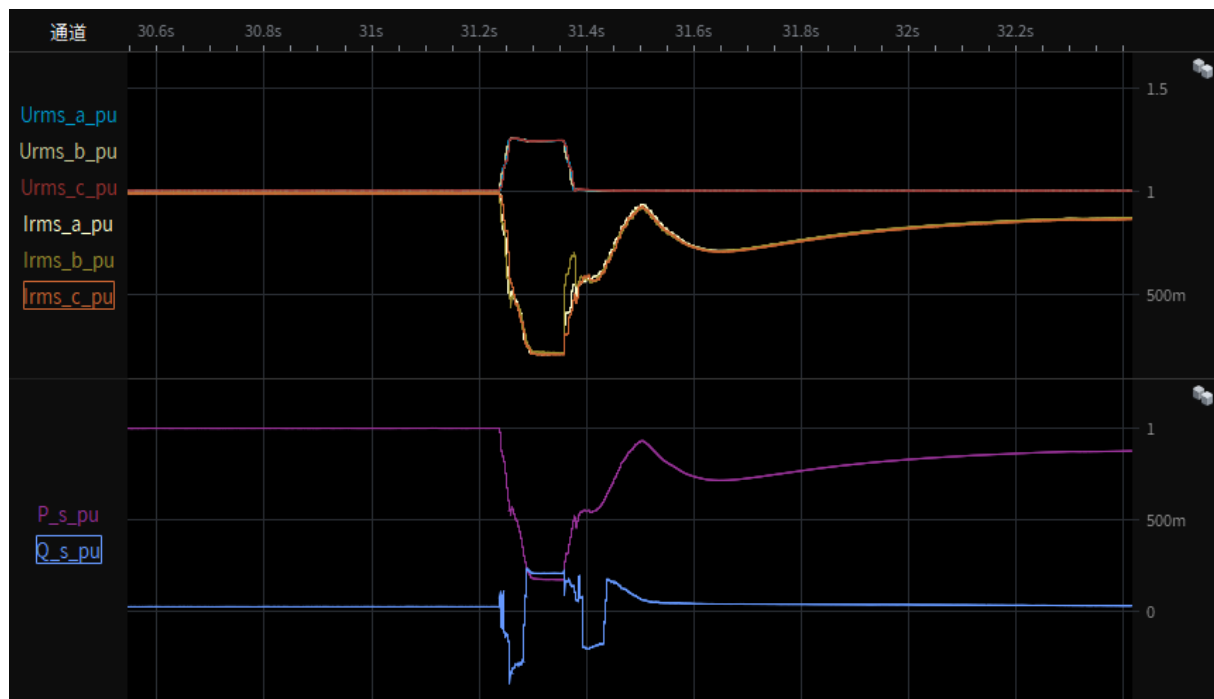
CEI 0-16

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)



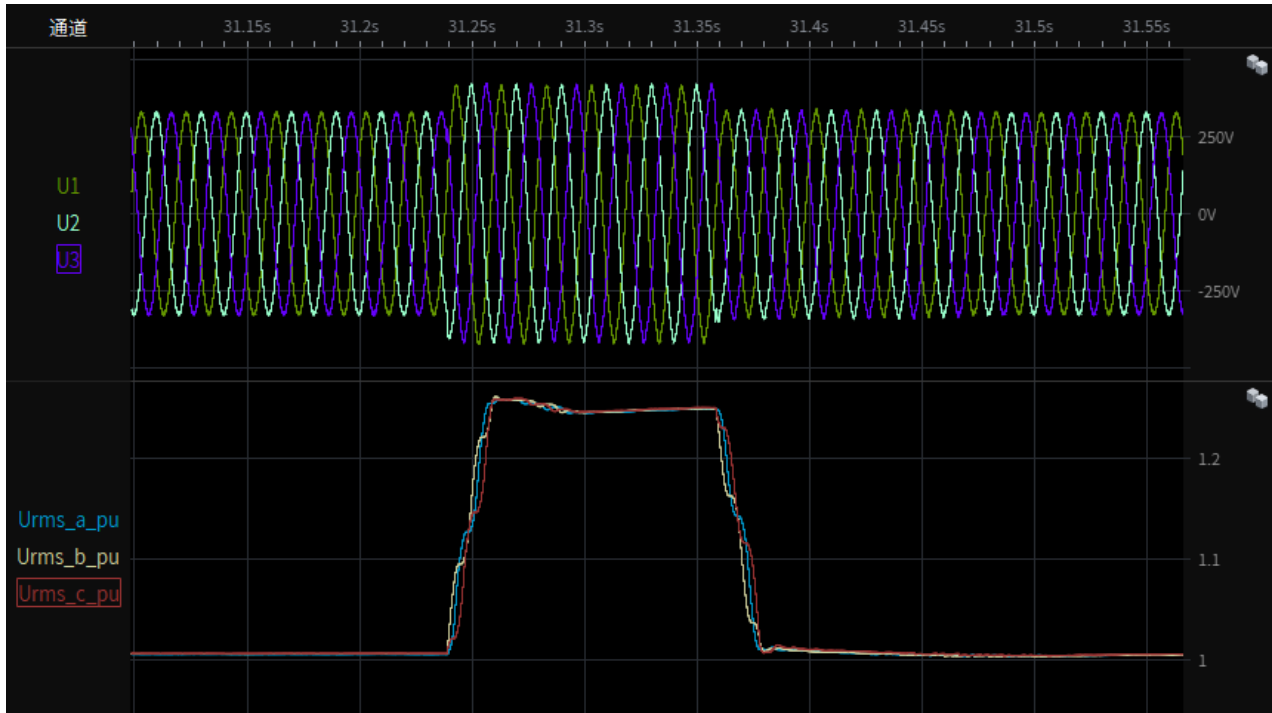
Test 5s-1-1.1 Depth of fault phase: 1.25p.u., HV three-phase symmetrical (type A), 95% load
Test overview(voltage,current,active and reactive power)



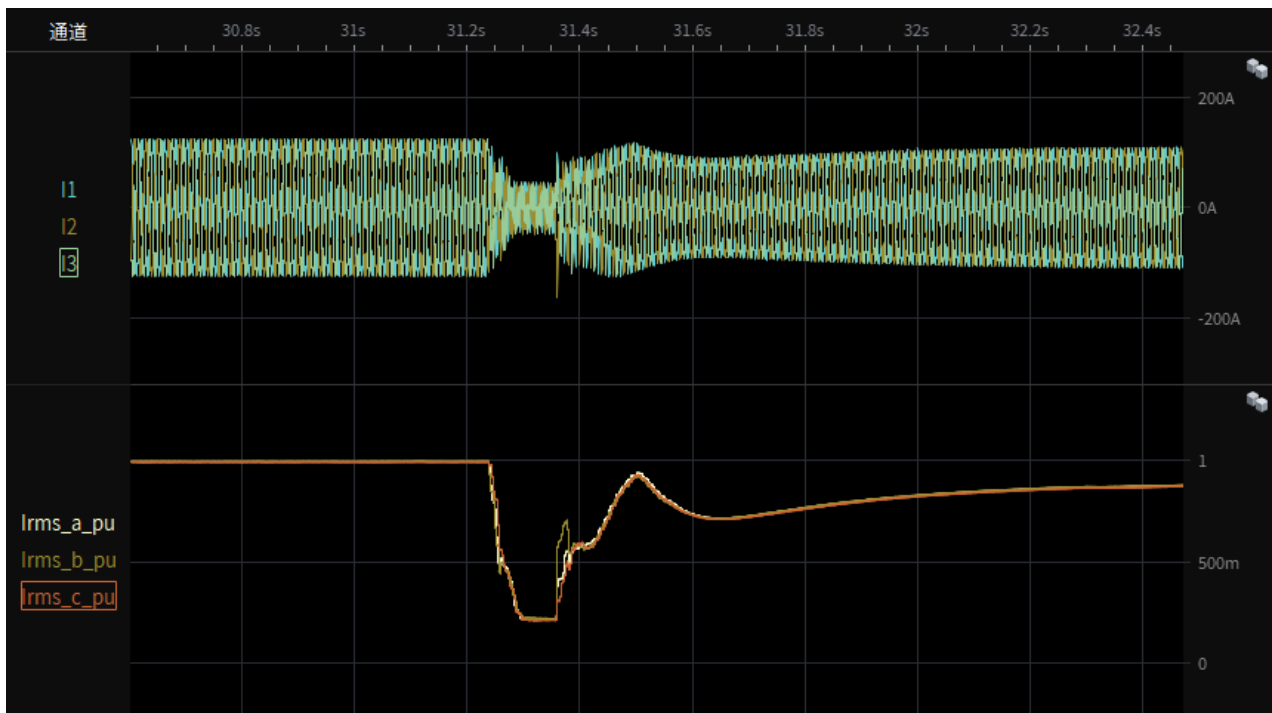
CEI 0-16

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

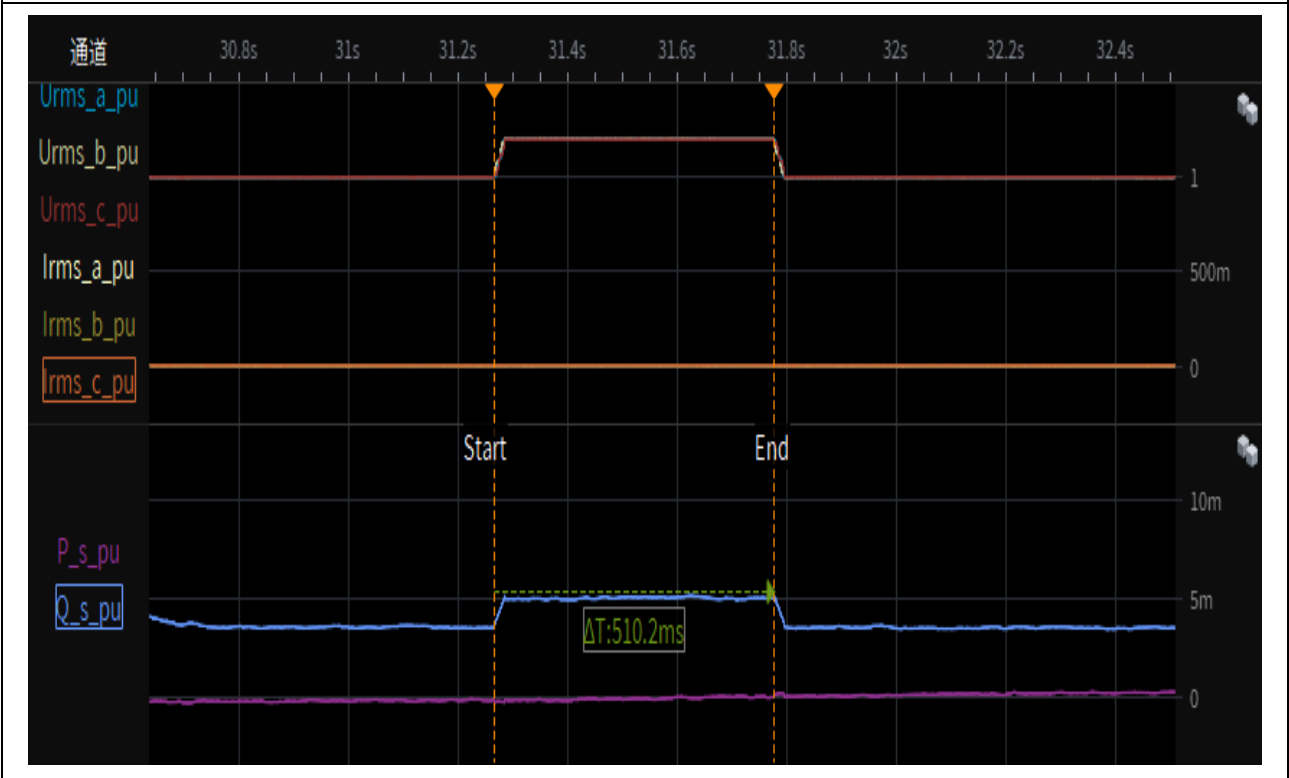


CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

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



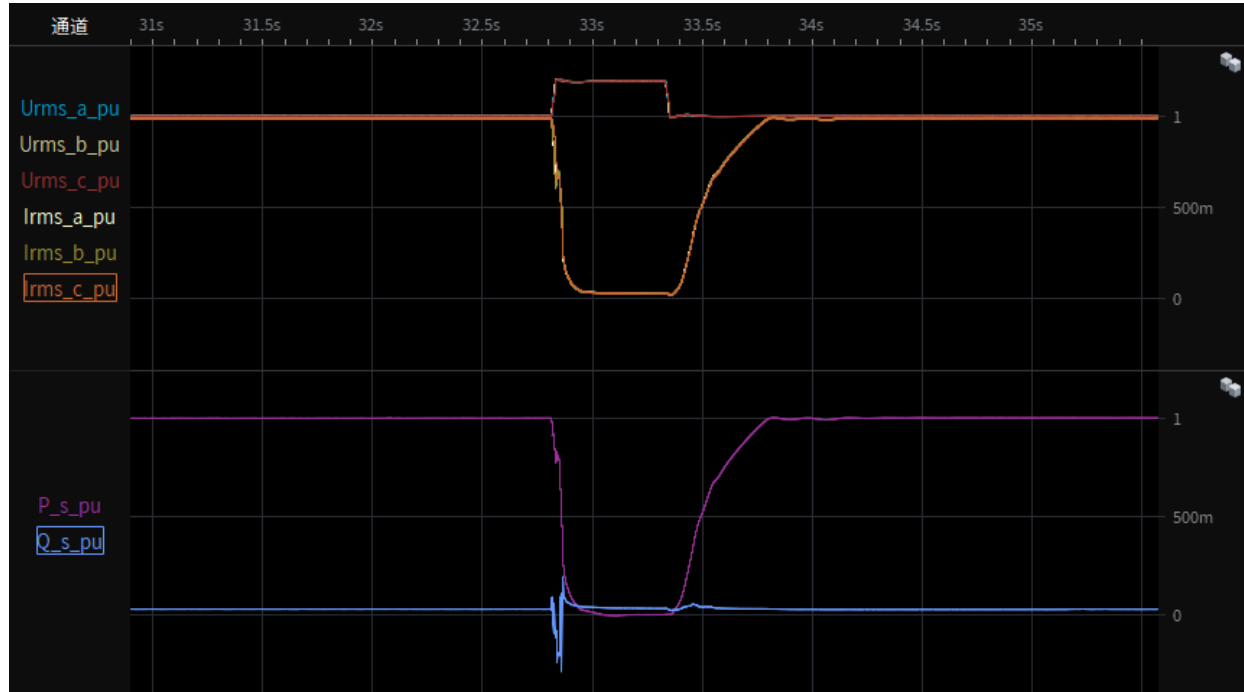
Test 6s-1.1 Depth of fault phase: 1.20p.u., HV three-phase symmetrical (type A), 0% load
Test overview(voltage,current,active and reactive power)



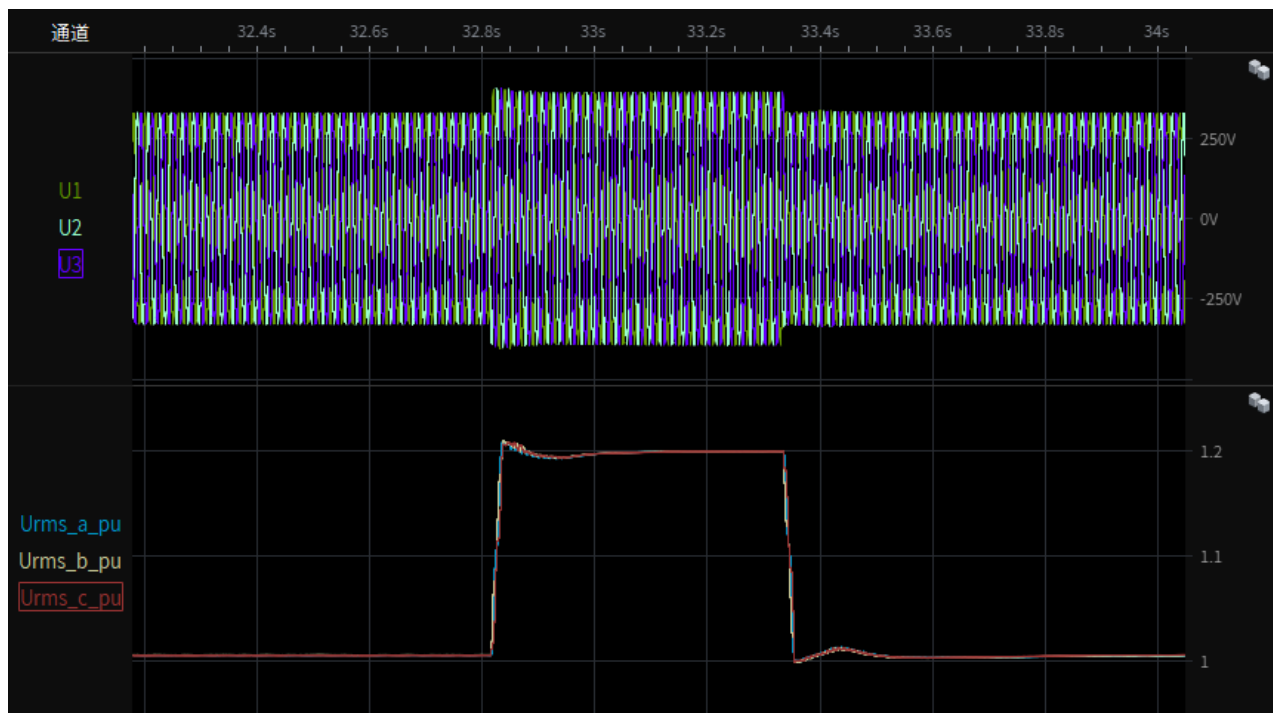
CEI 0-16

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)



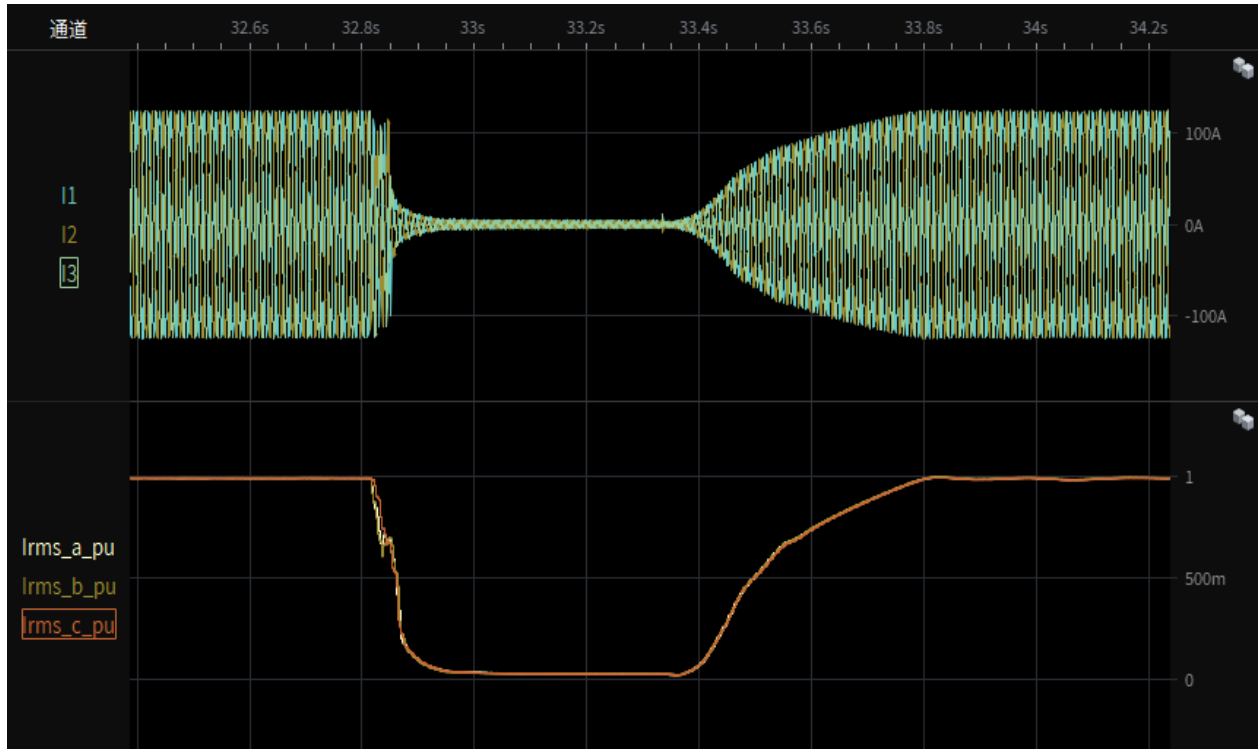
Test 6s-1-1.2 Depth of fault phase: 1.20p.u., HV three-phase symmetrical (type A), 95% load
Instantaneous curve and RMS value of phase-to-neutral voltages



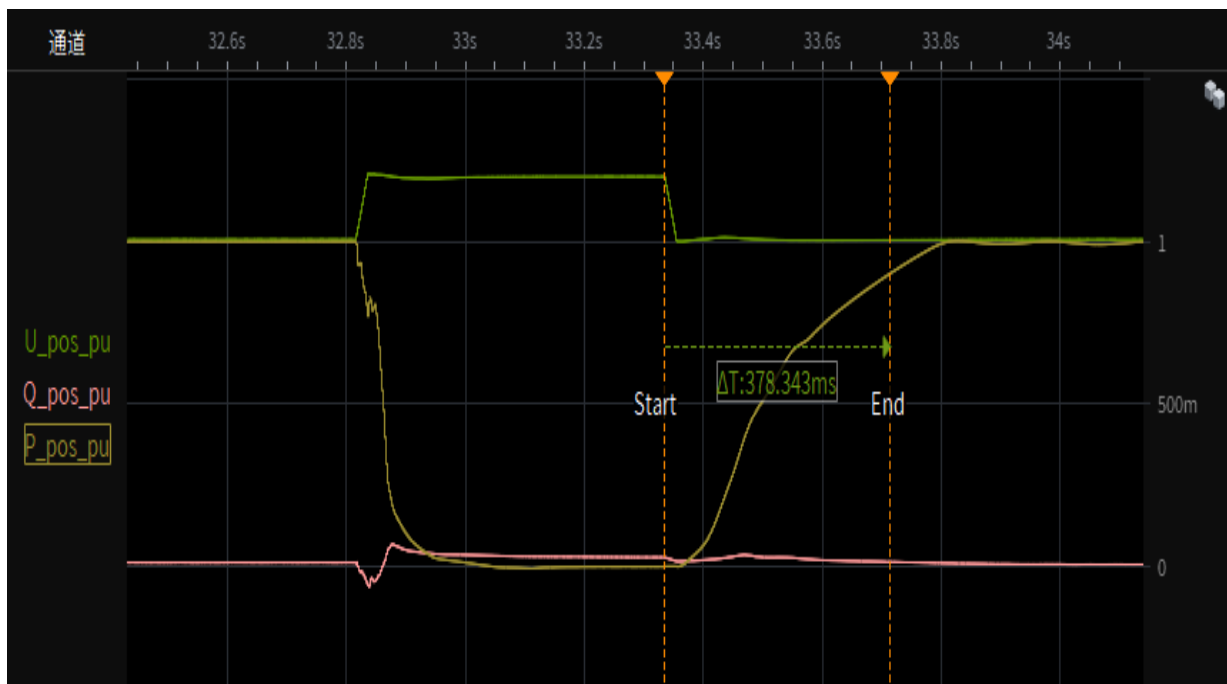
CEI 0-16

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



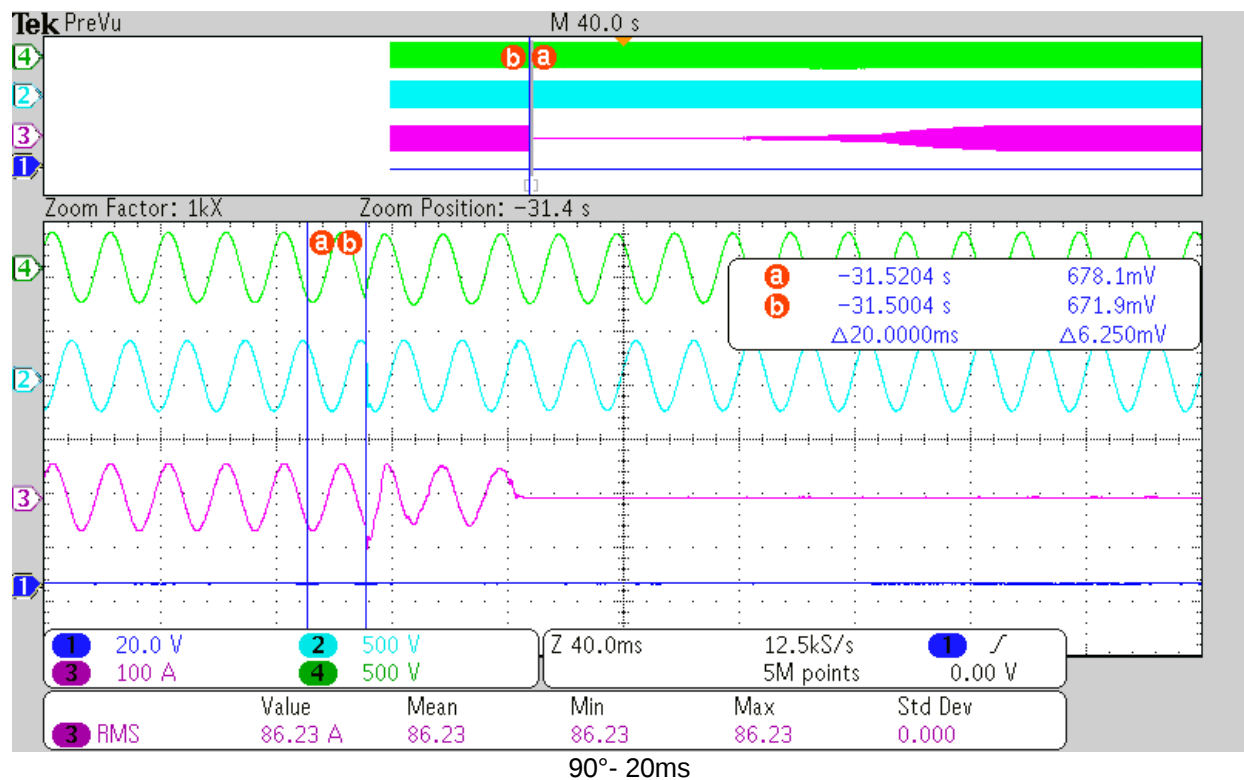
CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict

N.9	Tabella: Verifica della insensibilità alle richiusure automatiche in discordanza di fase Table: Verification of insensitivity to mismatch in phase automatic reclosing		P
Test condition		Test result	Limit
P/P _n	Phase shift angle [°]		
100%*	90	When the phase angle undergoes a sudden change, the inverter is disconnected from the grid, and then reconnected to the grid after the grid stabilizes.	The EUT must not be damaged following the tests. Switching off and tripping of any protections are allowed.
100%*	180	When the phase angle undergoes a sudden change, the inverter is disconnected from the grid, and then reconnected to the grid after the grid stabilizes.	

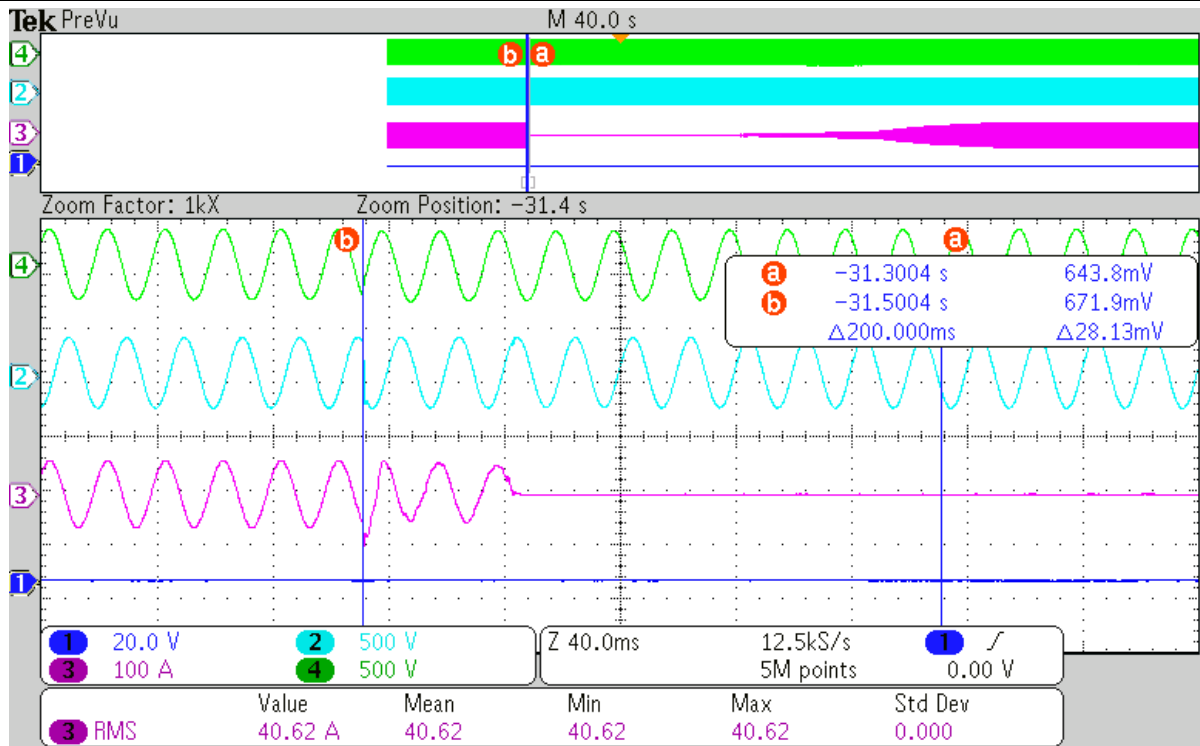
Note(s):

*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.

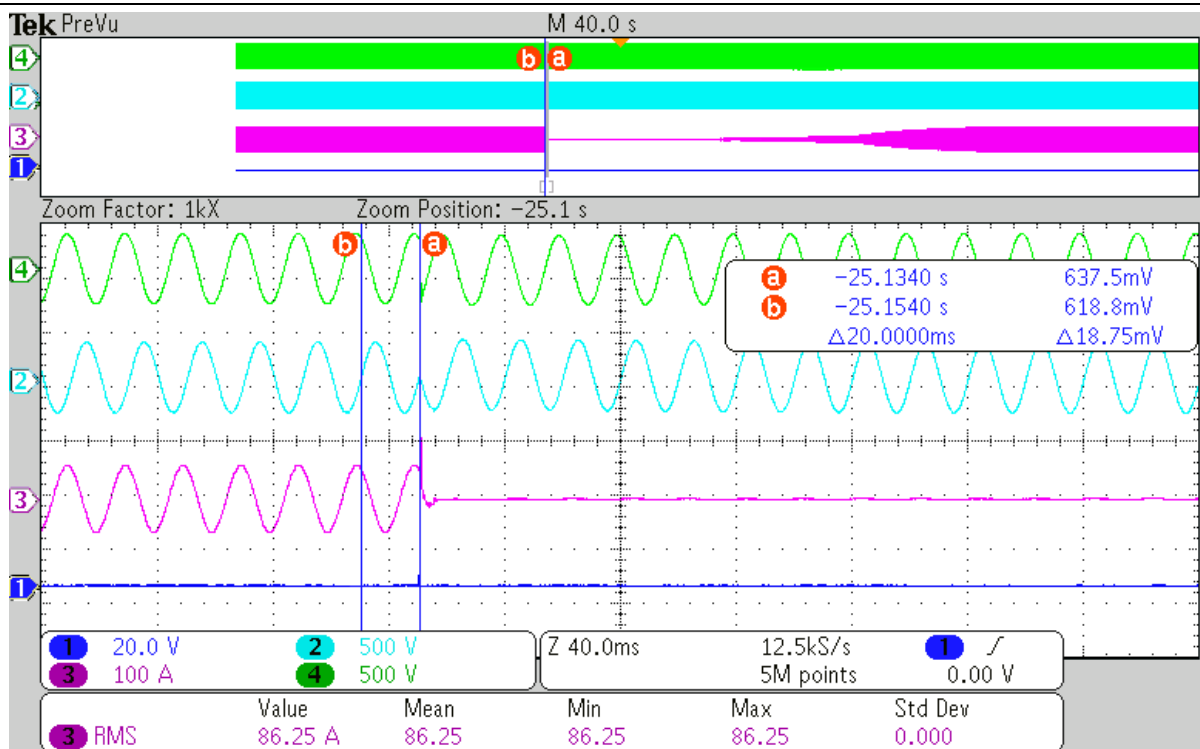
Diagram



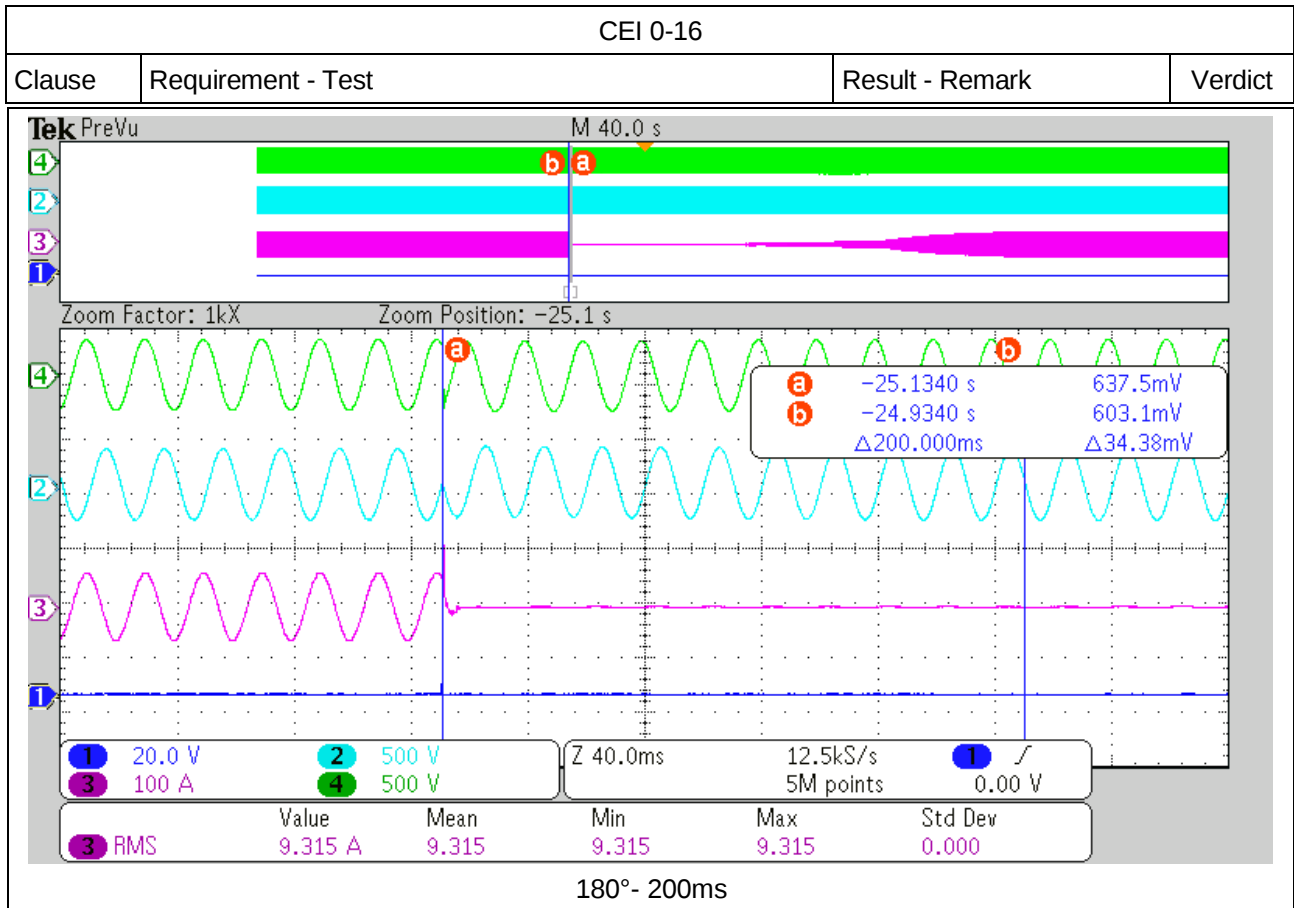
CEI 0-16			
Clause	Requirement - Test	Result - Remark	Verdict



90°- 200ms



180°- 20ms



Annex 1
ISO 9001 certificate

TRUSTED FOR OUR STANDARDS



Certificate of Registration

This is to certify that the
Quality Management System
of

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

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

Has been independently assessed and is
compliant with the requirements of:

ISO 9001:2015

For the following scope of activities:

R & D and Manufacture of Photovoltaic Inverter

Certificate Number: 1711077Q

Date of initial registration

10/07/2019

Certificate expiry

09/07/2023

(subject to the company maintaining its system to the required standard)



AUTHORISED SIGNATORY
Date of this certificate 11/11/2020, V1

During validity period of the certificate a surveillance audit should be carried out once within each 12 months. The label should be pasted on specified position of right side of the certificate then it is valid. The certificate can be checked out at China CNCA website(www.cnca.gov.cn) and ACM UK website(www.acmcert.com).



ACM-CCAS Limited, Unit 5 Merus Court, Meridian Business Park, Leicester, LE19 1RJ, UK
Local Office-ACM (CHINA) LIMITED, Rm B201, No 352, Waihuan Road, Minhang District, Shanghai 201199, China
T: +86 21 64305860 F: +86 21 64881096 W: www.acmcert.com.cn E: info@acmcert.com.cn

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Annex 2

Datasheet of the relay



Customer :

Type : 515H Series Relay

Revised :
Issued : 2017-11-06



■ Features

- Heavy duty 90A 600VAC power type.
- SPDM contact configuration with large contact gap 3.0mm version.
- Conforms to European photovoltaic standard IEC 62109-1.
- Coil holding voltage can be reduced to 50~55% of the nominal coil voltage for saving energy.
- High performance PCB power relay for photovoltaic power generation systems (solar inverter).
- Comply with RoHS-Directive 2011/65/EU.

■ Type List

Terminal style	Contact form	Designation (provided with)
		Flux tight
PCB terminal	1A (SPDM)	515H-1AH-F-C

■ Ordering Information

515H	-	1A	H	-	F	-	C
1		2	3		4		5

- | | | | |
|---------|---|------|---------------|
| 1. 515H | -- Basic series designation | 4. F | -- Class F |
| 2. 1A | -- Form A, Single-pole double make (SPDM) | 5. C | -- Flux tight |
| 3. H | -- Contact material Ag alloy | | |

■ Contact Rating

Rated load (Resistive)	90A 400VAC, On 1s / Off 9s, at 85°C, 1K ops.
	80A 400VAC, On 1s / Off 9s, at 85°C, 6K ops.
	Making 20A, Carrying 90A, Breaking 20A / 600VAC, On 1s / Off 9s, at 85°C, 30K ops.
Max. switching current	90A
Max. switching voltage	600VAC
Max. switching capacity	54,000VA

■ Coil Rating (DC)

Rated voltage (V)	Rated current ±10 % at 23 °C (mA)	Coil resistance ±10 % at 23 °C (Ω)	Pick up voltage (Max.) at 23 °C ⁽¹⁾	Drop out voltage (Min.) at 23 °C	Continuous voltage at 85 °C ⁽²⁾	Power consumption at rated / holding voltage
12	316.7	37.9	80 % of rated voltage	5 % of rated voltage	50~55 % of rated voltage	approx. 3.8W / 0.95W ⁽²⁾

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

(2) Coil holding voltage is 50~55% of nominal voltage after applying nominal voltage for 200ms.

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File No. DM51539



Customer :

Type : 515H Series Relay

Revised :

Issued : 2017-11-06

■ Specification

Contact material	Ag alloy	
Contact gap	3.0 mm Min	
Contact resistance ⁽¹⁾	100 mΩ Max. (at 1A/6VDC by 4-wire resistance measurement) 10mΩ Max. (By voltage drop 20A)	
Operate time ⁽¹⁾	30ms Max. (bounce time: 6ms Max.)	
Release time ⁽¹⁾	10ms 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)	
Weight	Approx. 100 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) Do not switch the contacts without any load as the contact resistance may become increased rapidly.

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

■ Insulation Data

Insulation resistance ⁽¹⁾	1000MΩ Min. (DC 500V)	
Surge voltage withstand ⁽¹⁾	Between contact and coil : 6KV (1.2x50) μ S	
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, 6.0mm / ≥ 8.0 mm (for 400VAC) Basic, ≥ 3.0mm / ≥ 6.0mm (for 600VAC)
	Between open contact	: Double / Reinforce, ≥ 3.0mm / ≥ 5.0mm
Rated insulation voltage	400V, 600V	
Rated impulse withstand voltage	4000V	
Pollution degree	2	
Rated voltage	230/400V	

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P. 2 / 4

File No. DM51539



Customer :

Type : 515H Series Relay

Revised :

Issued : 2017-11-06

Over voltage category	II
Compliant with European photovoltaic standard	
Contact gap	3.0mm (IEC 62109 and VDE 0126)

Note : (1) Initial value.

■ Safety Approval

Certified	UL / CUL	TUV
File No.	E88991	R50359333

■ Safety Approval Rating

UL / CUL	TUV
80A 400VAC ⁽¹⁾ 20A 600VAC, Resistive, Carrying current 90A ⁽¹⁾	90A 400VAC ⁽¹⁾ 80A 400VAC ⁽¹⁾ Making 20A, Carrying 90A, Breaking 20A /600VAC ⁽¹⁾

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

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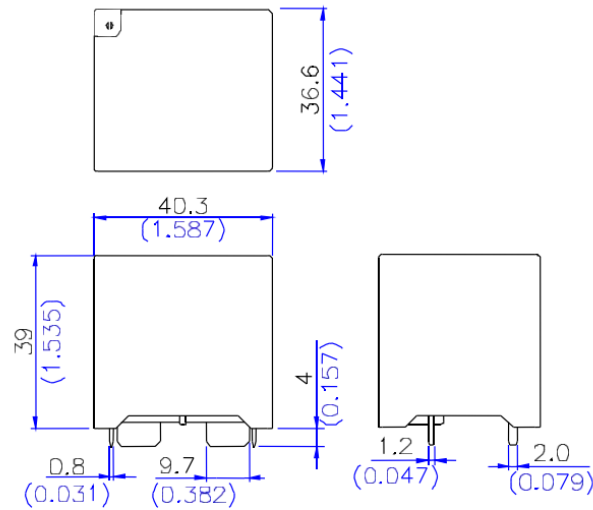
File No. DM51539



Customer :
Type : 515H Series Relay

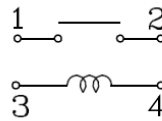
Revised :
Issued : 2017-11-06

■ Outline Dimensions

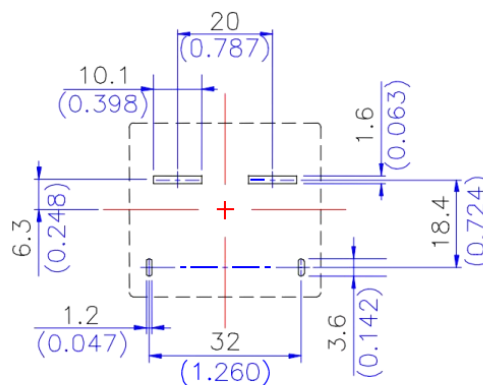


TOLERANCE:
LESS THAN: 1(0.039) $\pm$ 0.1(0.004)
5(0.197) $\pm$ 0.3(0.012)
20(0.787) $\pm$ 0.5(0.020)
MORE THAN: 20(0.787) $\pm$ 1(0.039)

■ Wiring Diagram
(Bottom view)



■ PC Board Layout
(Bottom view)



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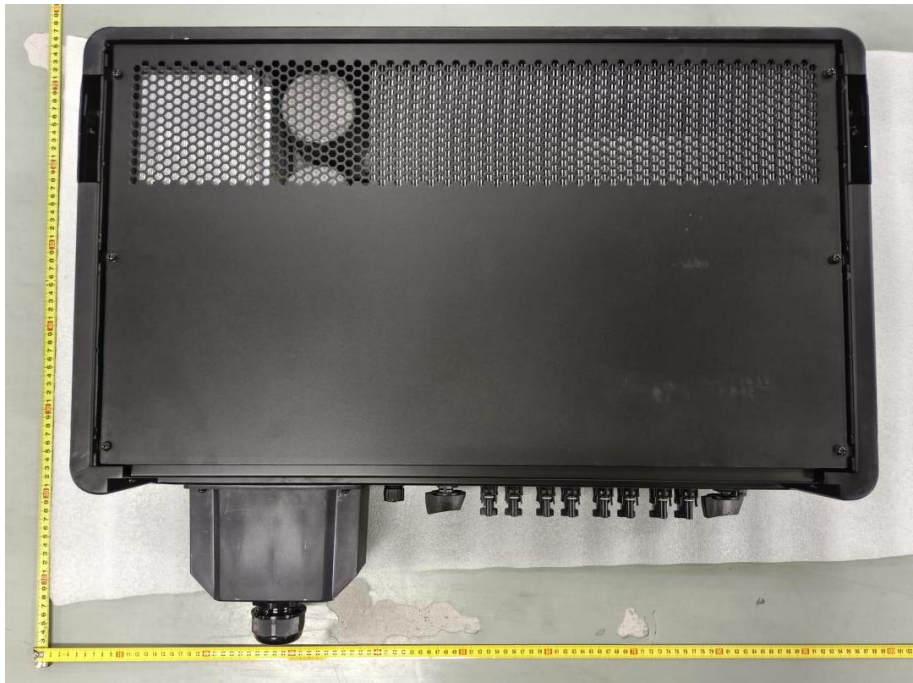
P. 4 / 4

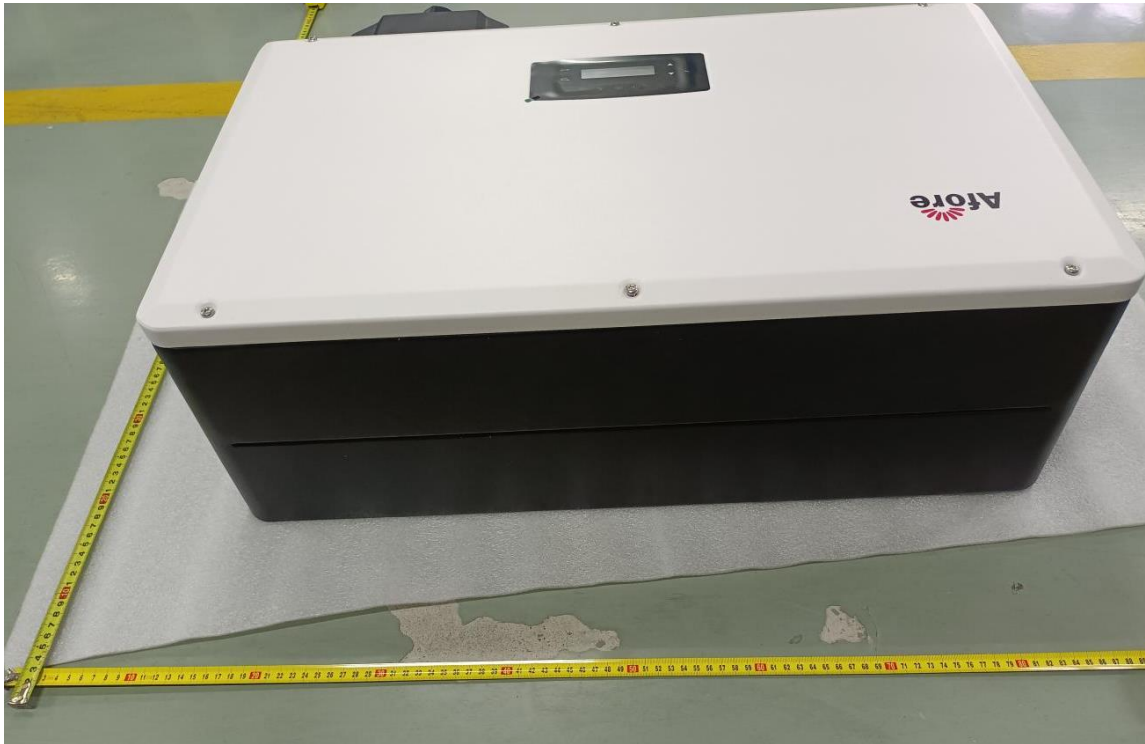
File No. DM51539

Annex 3
Pictures of the product
Enclosure – Front View

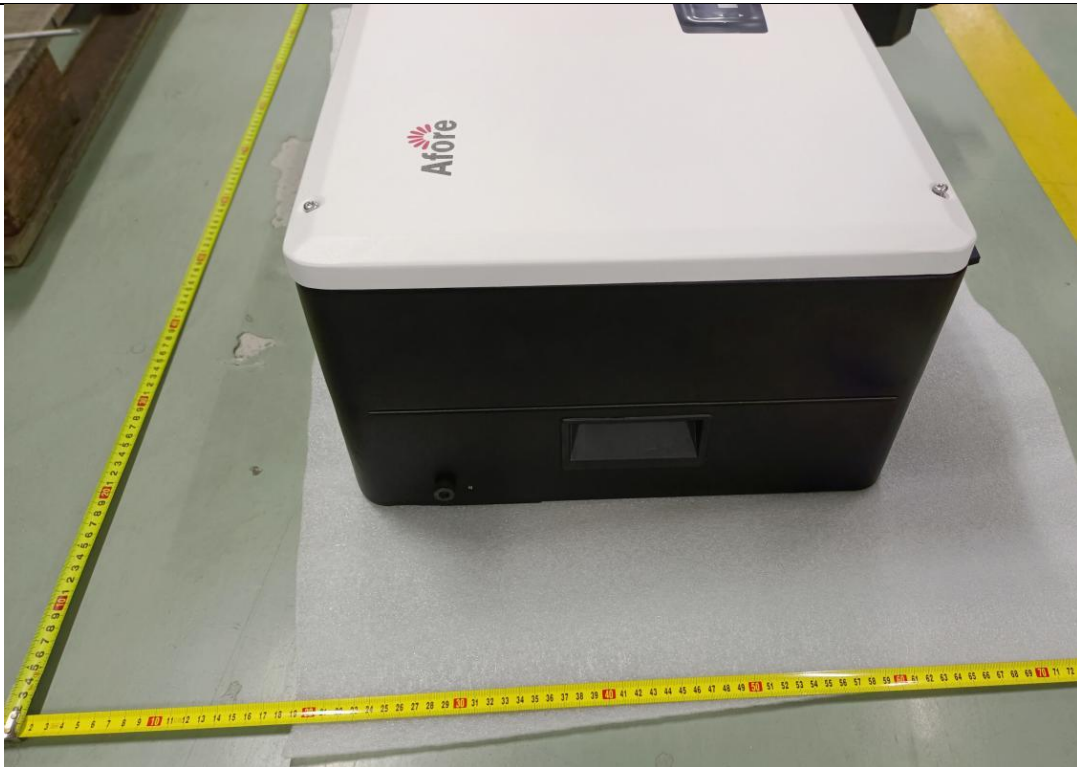


Enclosure – Rear View



Enclosure – Side View**Enclosure – Side View**

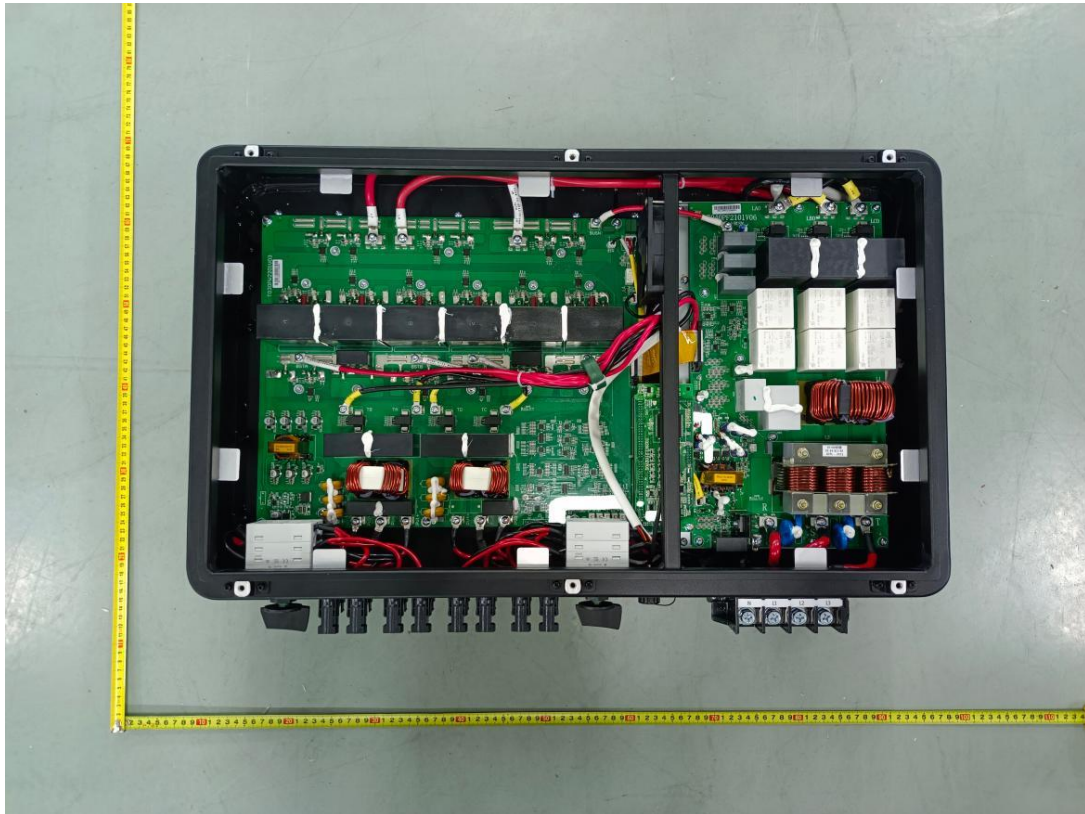
Enclosure – Side View



Enclosure – Side View



Internal view of inverter



--- End of test report---