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Evaluation Report
No. TRPVP11144/25E/001

Commission testing for Power Conversion System

Applicant: **Jiangsu Weiheng Intelligent Technology Co., Ltd.**
Sheng Xiang, Yaxi Community, Luoshe Town, Huishan District, 214000
Wuxi, Jiangsu Province, PEOPLE'S REPUBLIC OF CHINA

File No.: PVP11144/25E-001

Designed: by: Allen Zhang Digitally signed by Allen Zhang Date: 2026.03.25 09:33:52 +08'00'

Reviewed: by: Iris Zheng Digitally signed by Iris Zheng Date: 2026.03.25 18:02:04 +08'00'

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TÜVNORD

Evaluation Report

File No.: PVP11144/25E-001 Report No.: TRPVP11144/25E/001

Applicant ..... :	**Jiangsu Weiheng Intelligent Technology Co., Ltd.** Sheng Xiang, Yaxi Community, Luoshe Town, Huishan District, 214000 Wuxi, Jiangsu Province, PEOPLE'S REPUBLIC OF CHINA
Manufacturer ..... :	**Jiangsu Weiheng Intelligent Technology Co., Ltd.** Sheng Xiang, Yaxi Community, Luoshe Town, Huishan District, 214000 Wuxi, Jiangsu Province, PEOPLE'S REPUBLIC OF CHINA
Factory..... :	**Jiangsu Weiheng Intelligent Technology Co., Ltd.** Sheng Xiang, Yaxi Community, Luoshe Town, Huishan District, 214000 Wuxi, Jiangsu Province, PEOPLE'S REPUBLIC OF CHINA
Order No. ..... :	HZHZPVP11144/25E
Date of Application [YYYY-MM-DD]..... :	2025-12-30
Product(s) ..... :	Power Conversion System
Model type(s)..... :	**TAA-105kW-01, TAA-105kW-11, TAA-125kW-01, TAA-125kW-11**
Type of examination ..... :	Commission testing only
Certification program: ..... :	BOS-P-01 Rev. 01
Certification fundamental(s)..... :	EN 50549-1:2019+A1:2023 EN 50549-10:2022
Testing Period [YYYY-MM-DD] start/end..... :	2026-01-06/2026-03-17
Testing Laboratory..... :	**Dongguan BALUN Testing Technology Co., Ltd.** Room 104, 204, 205, Building 1, No. 6, Industrial South Road, Songshan Lake District, Dongguan, Guangdong, China
Annex(es) ..... :	Annex 1: Test report no. BL-DG2630055-201 (264 pages)

Test results listed in this test report refer exclusively to the mentioned test sample.

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The submitted test samples as described in the reports hereunder are in compliance with the requirements / are tested according to the requirements:

EN 50549-1:2019+A1:2023 “Requirements for generating plants to be connected in parallel with distribution networks - Part 1: Connection to a LV distribution network — Generating plants up to and including Type B”;

EN 50549-10:2022 “Requirements for generating plants to be connected in parallel with distribution networks - Part 10: Tests for conformity assessment of generating units”.

中国认可
国际互认
检测
TESTING
CNAS L14701

TEST REPORT

Application number:	PVP11144/25E-001
Applicant:	Jiangsu Weiheng Intelligent Technology Co., Ltd.
Address:	Sheng Xiang, Yaxi Community, Luoshe Town, Huishan District, 214000 Wuxi, Jiangsu Province, PEOPLE'S REPUBLIC OF CHINA
Equipment Type:	Power Conversion System
Model Name Under Test:	TAA-125kW-11
Model Name:	TAA-105kW-01, TAA-105kW-11, TAA-125kW-01, TAA-125kW-11
Brand Name:	WHES
Ratings:	See copy of marking label and model list.
Test Standard:	**EN 50549-1:2019+A1:2023** **EN 50549-10:2022**
Sample Arrival Date:	Jan. 05, 2026
Test Date:	Jan. 06, 2026 to Mar. 17, 2026
Date of Issue:	Mar. 23, 2026

ISSUED BY:

Dongguan BALUN Testing Technology Co., Ltd.

Tested by: Leo Sun

Leo Sun

Checked by: Jin Huang

Jin Huang

Approved by: Tao Zheng

Tao Zheng

Revision History

Version	Issue Date	Revisions Content
Rev. 01	Mar. 23, 2026	Initial Issue

-Note:

For reports with CNAS mark, the ownership of accreditation is under "BALUN". "TÜV NORD" is not owing the accreditation.

Summary of testing:

All the tests results confirmed to the requirements of the standard.

Tests performed (name of test and test clause):	**Testing location:**
5.2 Normal operating range 5.3 Immunity to disturbances 5.4 Active response to frequency deviation 5.5 Power specification and response to voltage variations 5.6 Voltage related active power reduction - P(U) 5.7 EMC and power quality 5.8 Interface protection 5.9 Connection and reconnection 5.10 Active power reduction on set point 5.11 Remote information exchange 5.12 Requirements regarding single fault tolerance of interface protection system and interface switch	Dongguan BALUN Testing Technology Co., Ltd. Room 104, 204, 205, Building 1, No. 6, Industrial South Road, Songshan Lake District, Dongguan, Guangdong, China

☒ **The product fulfils the requirements of EN 50549-1: 2019+A1:2023, EN 50549-10:2022**

Copy of marking plate:

The following nameplates are based on actual shipment and the parameter information will not change.

WHES

Power Conversion System

Model:	TAA-105kW-01
S/N:	

DC Terminal	
Operating Range	615-950V*
Max .Voltage	950V
Max .Current	171A

AC Terminal	
Nominal Voltage	230V / 400V, 3W+N+PE / 3W+PE
Nominal Operating Frequency	50/60Hz
Rated Power	105kW
Max. Apparent Power	115.5kVA
Max. Current	167A
Power Factor Range	1(lagging)-1(leading)

General	
Protective Class	I
Operating Temperature Range	-30 - +55℃
Enclosure	IP20
Overvoltage Category	II(DC),III(AC)
Altitude	2000m
*When the system wiring is 3P+N+PE,the DC full load operating voltage is 680-950V.	

Jiangsu Weiheng Intelligent Technology Co., Ltd.

Made in China

Sheng Xiang,Yaxi Community,Luoshe Town, Huishan District, 214000,Wuxi City, Jiangsu Province,P.R. China

WHES

Power Conversion System

Model:	TAA-105kW-11
S/N:	

DC Terminal	
Operating Range	615-950V*
Max .Voltage	950V
Max .Current	171A

AC Terminal	
Nominal Voltage	230V / 400V, 3W+N+PE / 3W+PE
Nominal Operating Frequency	50/60Hz
Rated Power	105kW
Max. Apparent Power	115.5kVA
Max. Current	167A
Power Factor Range	1(lagging)-1(leading)

General	
Protective Class	I
Operating Temperature Range	-30 - +55℃
Enclosure	IP20
Overvoltage Category	II(DC),III(AC)
Altitude	2000m
*When the system wiring is 3P+N+PE,the DC full load operating voltage is 680-950V.	

Jiangsu Weiheng Intelligent Technology Co., Ltd.

Made in China

Sheng Xiang,Yaxi Community,Luoshe Town, Huishan District, 214000,Wuxi City, Jiangsu Province,P.R. China

WHES

Power Conversion System

Model:	TAA-125kW-01
S/N:	

DC Terminal	
Operating Range	615-950V*
Max .Voltage	950V
Max .Current	203A

AC Terminal	
Nominal Voltage	230V / 400V, 3W+N+PE / 3W+PE
Nominal Operating Frequency	50/60Hz
Rated Power	125kW
Max. Apparent Power	138kVA
Max. Current	200A
Power Factor Range	1(lagging)-1(leading)

General	
Protective Class	I
Operating Temperature Range	-30 - +55℃
Enclosure	IP20
Overvoltage Category	II(DC),III(AC)
Altitude	2000m
*When the system wiring is 3P+N+PE,the DC full load operating voltage is 680-950V.	

Jiangsu Weiheng Intelligent Technology Co., Ltd.

Made in China

Sheng Xiang,Yaxi Community,Luoshe Town, Huishan District, 214000,Wuxi City, Jiangsu Province,P.R. China

WHES

Power Conversion System

Model:	TAA-125kW-11
S/N:	

DC Terminal	
Operating Range	615-950V*
Max .Voltage	950V
Max .Current	203A

AC Terminal	
Nominal Voltage	230V / 400V, 3W+N+PE / 3W+PE
Nominal Operating Frequency	50/60Hz
Rated Power	125kW
Max. Apparent Power	138kVA
Max. Current	200A
Power Factor Range	1(lagging)-1(leading)

General	
Protective Class	I
Operating Temperature Range	-30 - +55℃
Enclosure	IP20
Overvoltage Category	II(DC),III(AC)
Altitude	2000m
*When the system wiring is 3P+N+PE,the DC full load operating voltage is 680-950V.	

Jiangsu Weiheng Intelligent Technology Co., Ltd.

Made in China

Sheng Xiang,Yaxi Community,Luoshe Town, Huishan District, 214000,Wuxi City, Jiangsu Province,P.R. China

Note: Fixed PF mode conducted under the PF from 0.8 lagging to 0.8 leading; All other reactive power mode conducted from $Q_{max.}$ +75000Var to Q_{min}. -75000Var.

Test item particulars..... :	
Equipment mobility ..... :	Permanent connection
Operating condition..... :	Continuous
Class of equipment..... :	Class I
Mass of equipment (kg) ..... :	See model list.
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 was not evaluated for the requirement:	N/E
- test object does not meet the requirement.....:	F (Fail)

General remarks:	
"(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.**	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided ..... :	☐ **Yes** ☒ **Not applicable**
When differences exist; they shall be identified in the General product information section.	
Name and address of Manufacturer (ies)..... :	**Jiangsu Weiheng Intelligent Technology Co., Ltd.** Sheng Xiang, Yaxi Community, Luoshe Town, Huishan District, 214000 Wuxi, Jiangsu Province, PEOPLE'S REPUBLIC OF CHINA
Name and address of factory (ies) ..... :	**Jiangsu Weiheng Intelligent Technology Co., Ltd.** Sheng Xiang, Yaxi Community, Luoshe Town, Huishan District, 214000 Wuxi, Jiangsu Province, PEOPLE'S REPUBLIC OF CHINA

General product information:

The unit under test (EUT) is power conversion system. During inverter, which convert the variable DC power generated from the Batteries to the stable utility AC power which can be fed into the commercial electrical grid or off-grid load. When charging, the grid converts the alternating current into direct current into the battery through the Power Conversion System.
The maximum ambient temperature allowed by the manufacturer's specifications is 55°C (derating at 45°C).
The unit is an AC/DC convert module, additional automatic disconnection protection devices should be installed in final whole system according to the local requirement.

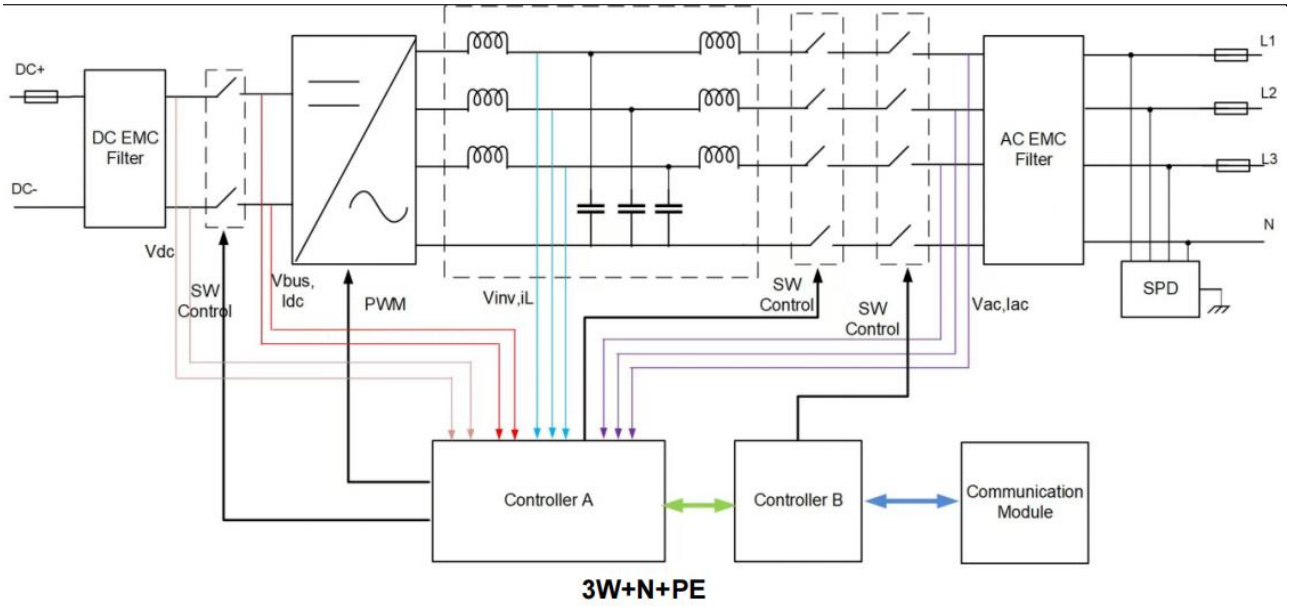
Differences of the models:
The engineering samples of Power Conversion System products:
The models TAA-125kW-01, TAA-125kW-11, TAA-105kW-01, TAA-105kW-11 are same as the hardware and software, expect the output voltage is different due to be adjusted by software. The difference between having the suffix '-11' and having the suffix '-01' is the difference in the way the wires come out and the terminals on the DC side. Among them, having the suffix '-01' adopts the front outlet mode, while having the suffix '-11' adopts the rear outlet mode.

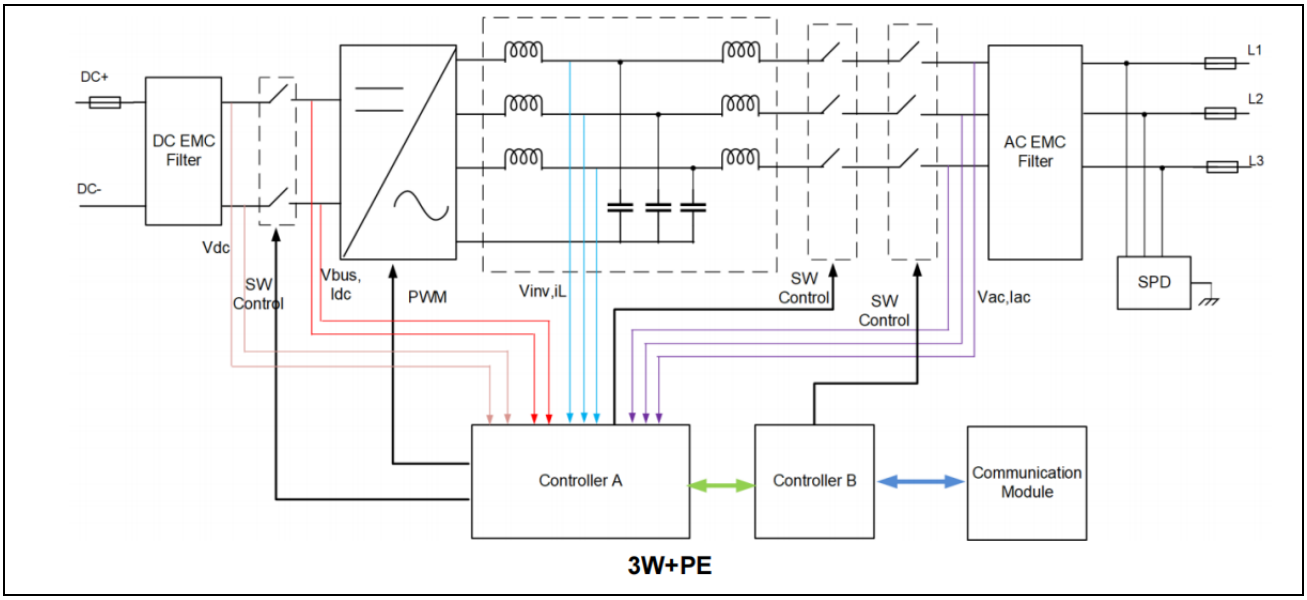
If no specification, all the tests are conducted on model TAA-125kW-11.

Software Version: V100B000D000

Hardware Version: A00

The topology diagram:




DC+
DC-
DC EMC Filter
Vdc
SW Control
Vbus, Idc
PWM
Vinv,iL
SW Control
SW Control
Vac,Iac
AC EMC Filter
L1
L2
L3
SPD
Controller A
Controller B
Communication Module
3W+PE

Model list:

Model or Type designation	TAA-105kW-01 TAA-105kW-11	TAA-125kW-01 TAA-125kW-11
DC terminal		
Voltage Range [Vd.c.]	615-950(3W+PE)/650-950(3W+N+PE)	
Full load voltage Range [Vd.c.]	615-950(3W+PE)/680-950(3W+N+PE)	
Max. Current [Ad.c.]	171	203
Overvoltage Category (OVC)	II	
AC terminal		
Rated Voltage [Va.c.]	230V / 400V, 3W+N+PE / 3W+PE	
Rated Frequency [Hz]	50Hz/60Hz	
Rated Charge/Discharge Power [kW]	105	125
Max. Charge/Discharge Apparent Power [kVA]	115.5	138
Max. Charge/Discharge Apparent Current [Aa.c.]	167	200
Power Factor cosφ [λ]	0.8 lagging – 0.8 leading	
Overvoltage Category (OVC)	III	
System		
Type of converter	Non-Isolated	
Protective Class	I	
Enclosure Protection (IP)	IP20	
Pollution degree	External PD3, Internal PD2	
Operating Temperature Range [ºC]	-30 ~ 55	
Size W*H*D [mm]	For model TAA-105kW-01 and TAA-125kW-01: 520*232*725 For model TAA-105kW-11 and TAA-125kW-11: 520*232*785	
Weight [kg]	For model TAA-105kW-01 and TAA-125kW-01: 69 For model TAA-105kW-11 and TAA-125kW-11: 74.5	

EN 50549-1:2019 & EN 50549-10:2022			
Clause(s) / subclause(s) of EN 50549-1:2019	**Clause(s) / subclause(s) of EN 50549-10:2022**	**Remark**	**Verdict**
4.4.2 Operating frequency range	5.2.1 Frequency operating range		P
4.4.3 Minimal requirement for active power delivery at underfrequency	5.2.1 Frequency operating range		P
4.4.4 Continuous Operating voltage range	5.2.2 Voltage operating range		P
4.5.2 Rate of change of frequency (ROCOF) immunity	5.3.1 Immunity to disturbances - Rate of change of frequency (ROCOF)		P
4.5.3.2 Generating plant with non-synchronous generating technology	5.3.3 Immunity to disturbances - Fault ride through, over-voltage (OVRT) and under-voltage (UVRT)		P
4.5.3.3 Generating plant with synchronous generating technology	5.3.3 Immunity to disturbances - Fault ride through, over-voltage (OVRT) and under-voltage (UVRT)		N/A
4.5.4 Over-voltage ride through (OVRT)	5.3.3 Immunity to disturbances - Fault ride through, over-voltage (OVRT) and under-voltage (UVRT)		P
4.6.1 Power response to over-frequency	5.4.3.2 Power response to over-frequencies		P
4.6.2 Power response to under-frequency	5.4.3.3 Power response to under-frequencies		P
4.7.2.2 Voltage support by reactive power, Capabilities	5.5.1 Power capabilities assessment		P
4.7.2.3 Voltage support by reactive power, control modes	5.5.2 Voltage support by reactive power - test to determine the reactive power control modes		P
4.7.2.3.2 Setpoint control modes	5.5.2.3 Verification procedure for Set point control		P
4.7.2.3.3 Voltage related control mode	5.5.2.5 Verification procedure for power related control modes for reactive power		P
4.7.2.3.4 Power related control mode	5.5.2.5 Verification procedure for power related control modes for reactive power		P

4.7.4.2.2 Zero current mode for converter connected generating technology	5.5.2.5 Verification procedure for power related control modes for reactive power		P
4.9.3 Requirements on voltage and frequency protection	5.8.3 Verification procedure for generating plants to be connected to a LV distribution network with Interface protection as internal device. 5.8.4 Verification procedure for generating plants to be connected to a LV distribution network with Interface protection as dedicated device		P
4.9.4.2 4.9.4 Means to detect island situation	5.8.6 Islanding detection		P
4.10.2 Automatic reconnection after tripping	5.9.3 Automatic reconnection after tripping		P
4.10.3 Starting to generate electrical power	5.9.4 Starting to generate electrical power		P
4.11.1 Ceasing active power	5.10 Active power reduction on set point		P
4.11.2 Reduction of active power on set point	5.10 Active power reduction on set point		P
4.12 Remote information exchange	5.11 Remote information exchange		P
4.13 Requirements regarding single fault tolerance of interface protection system and interface switch	5.12 Requirements regarding single fault tolerance of interface protection system and interface switch		P

General remarks:

The uncertainty of the measurement was not given in test report. Please see below information of measurement uncertainty:

- - Voltage

Type A uncertainty:u(Xi)=0.012 combined standard uncertainty: Uc（%）=0.29

Expansion uncertainty: U（%）=0.58 (factor k=2)

- - Current

Type A uncertainty:u(Xi)=0.011 combined standard uncertainty: Uc（%）=0.49

Expansion uncertainty: U（%）=0.98 (factor k=2)

- - Power

Type A uncertainty:u(Xi)=0.017 combined standard uncertainty: Uc（%）=0.29

Expansion uncertainty: U（%）=0.59 (factor k=2)

- - harmonics

Error in Measurement: 0.04%

- - flicker

Error in Measurement: 0.04%

- - current transducer

Expansion uncertainty:

DC current Urel =0.7%(factor k=2) AC current Urel =0.7%(factor k=2)

combined standard uncertainty: Uc（%）=0.49

EN 50549-10:2022		
Clause	Test items	Remark
5.2	**Normal operating range**	
5.2.1	Frequency operating range	P
5.2.2	Voltage operating range	P

5.2.1 Frequency operating range 5.2.2 Voltage operating range			P
Setting values	Over-voltage [V]:	253.0	
	Under-voltage [V]:	195.5	
	Over-frequency [Hz]:	51.5	
	Under-frequency [Hz]:	47.5	

- Test 1: U = 230.0 V; f = 47.5 Hz; P = 1.00 S_n; cosφ = 1;
- Test 2: U = 230.0 V; f = 48.5 Hz; P = 1.00 S_n; cosφ = 1;
- Test 3: U = 230.0 V; f = 51.5 Hz; P = 1.00 S_n; cosφ = 1;
- Test 4: U = 230.0 V; f = 47.0 Hz; P = 1.00 S_n; cosφ = 1;
- Test 5: U = 230.0 V; f = 52.0 Hz; P = 1.00 S_n; cosφ = 1;
- Test 6-1: U = 195.5 V; f = 50.0 Hz; P = 1.00 S_n; cosφ = 1;

  Test 6-2: U = 230.0 V; f = 50.0 Hz; P = 1.00 S_n; cosφ = 1;

  Test 6-3: U = 253.0 V; f = 50.0 Hz; P = 1.00 S_n; cosφ = 1;

  Test 6-4: U = 230.0 V; f = 50.0 Hz; P = 1.00 S_n; cosφ = 1;

Test :

Test sequence	Voltage [V]	Frequency [Hz]	Output power [W]	Cos φ
1	230.1	47.50	125012	0.9999
2	230.4	48.50	125041	0.9999
3	230.7	51.50	125167	0.9999
4	230.3	47.00	124985	0.9999
5	230.8	52.00	125199	0.9998
6	195.6	50.00	116287	0.9999
	230.5	50.00	125179	0.9999
	253.3	50.00	125029	0.9999
	230.1	50.00	125185	0.9999

Note:

Operating points test 1, test 2, test 3, test 4, test 5 and test 6 must be kept for at least 30 minutes.

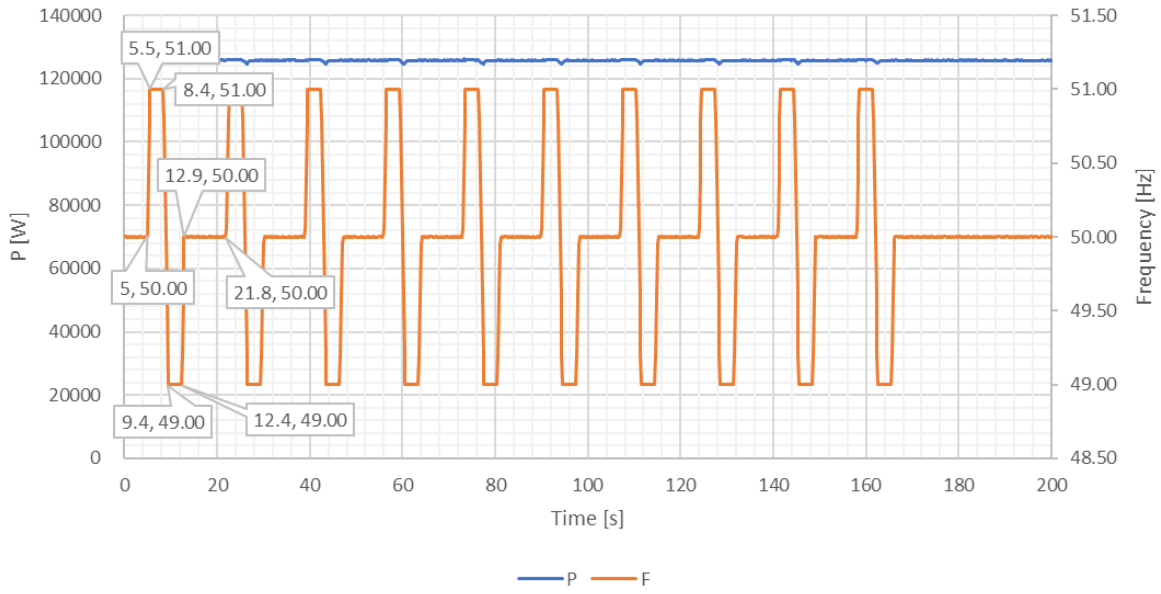
During the tests the interface protection and activating active power response to over/under frequency and voltage shall be disabled.

Operation at reduced power is allowed during test 6, equal to the maximum power that can be supplied on reaching the maximum output current limit (P ≥ 0.85 S_n).

The power supplied by the primary energy source shall be kept stable with a maximum error of 2 % x Sn

EN 50549-10:2022		
Clause	**Test items**	**Remark**
5.3	**Immunity to disturbances**	
5.3.1	Rate of change of frequency (ROCOF)	P
5.3.2	Phase jump	P
5.3.3	Fault ride through, over-voltage (OVRT) and under-voltage (UVRT)	P

5.3.1 Rate of change of frequency (RoCoF)	P



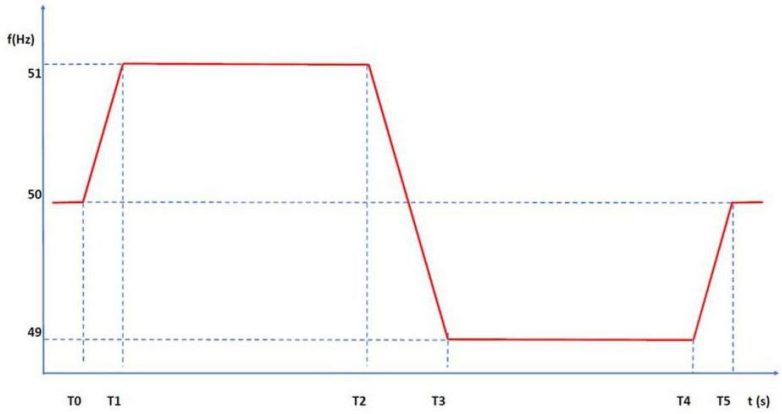
	Start Frequency	Change	End Frequency	Confirm no trip
T0	50Hz	Hold 3s	50Hz	No trip
T0 to T1	50Hz	+2Hz/sec	51Hz	No trip
T1 to T2	51Hz	Hold 3s	51Hz	No trip
T2 to T3	51Hz	-2Hz/sec	49Hz	No trip
T3 to T4	49Hz	Hold 3s	49Hz	No trip
T4 to T5	49Hz	+2Hz/sec	50Hz	No trip
T5	50Hz	Hold 6s	50Hz	No trip

Note:

The test shall be conducted on a grid simulator able to control the frequency within the required range and with the required dynamic. Initial status of the generating unit before the test shall be as follows:

The generating unit, connected to a grid simulator, shall be operating between 100 % and 80 % of the nominal power with an active factor equal to 1.

Then the test shall be conducted following the sequence represented in the Figure 4 below.



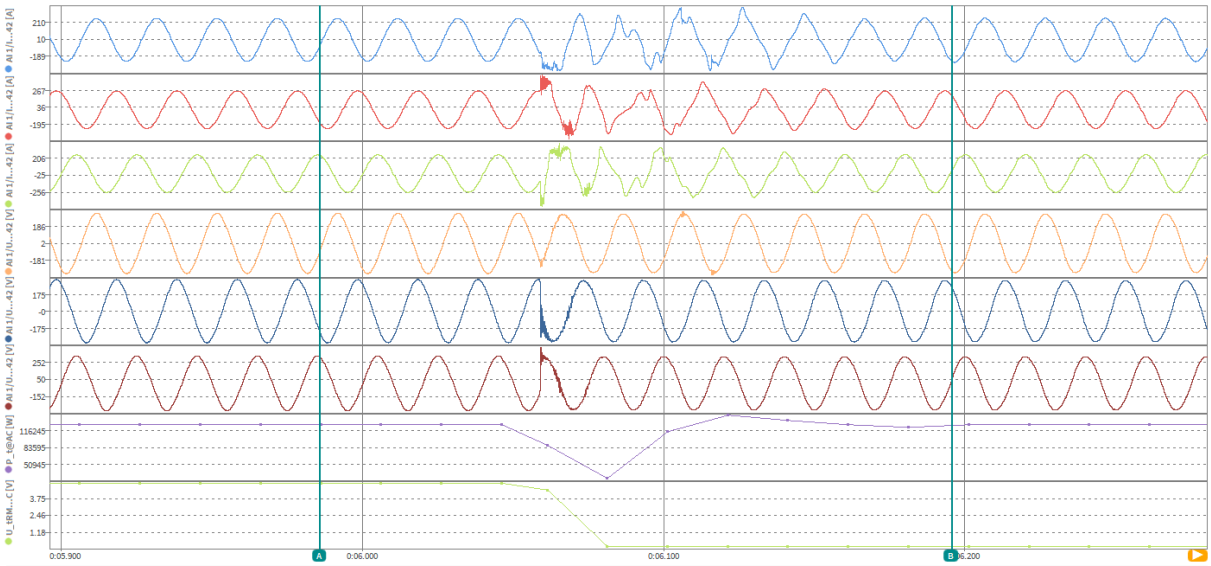
During the Overfrequency and Underfrequency verification, once the higher, respectively, lower values of frequency have been reached, the frequency shall be maintained for a time period equal or longer than 3 s which normally corresponds to the time requested by the system to stabilize during a real event.

During the test, the frequency, RMS voltage, RMS current and active and reactive power measured at the output terminals of the generating unit shall be recorded as 10 cycle average values.

During the tests the interface protection and activating active power response to over/under frequency and voltage shall be disabled.

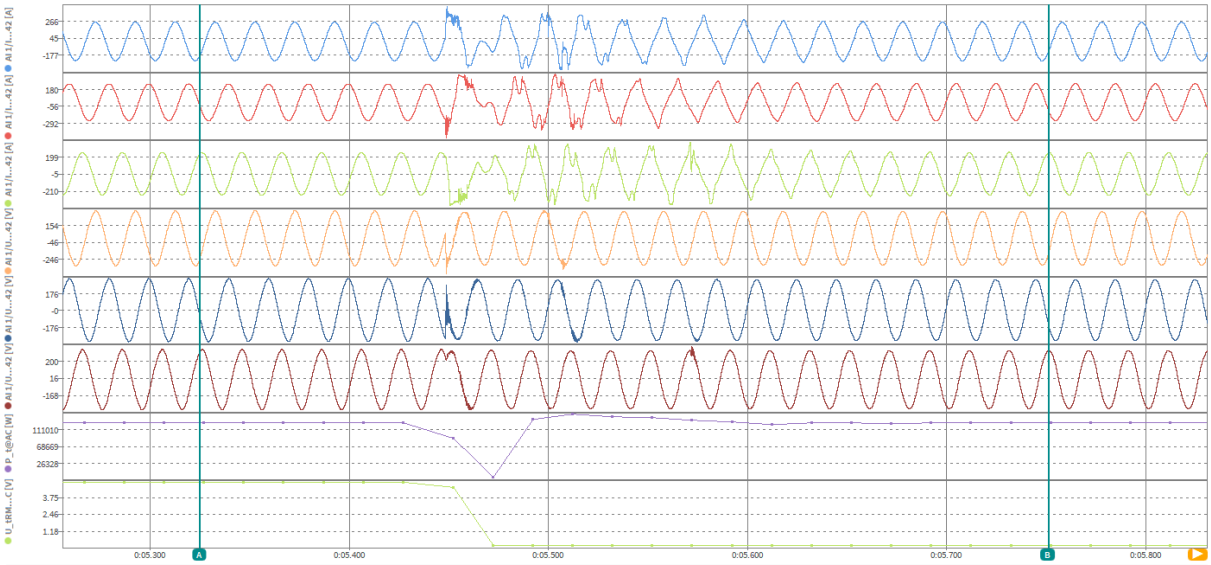
5.3.2 Phase jump			P
Test results			
Test 1:			
P_{EMAX} in %	**Phase shift angle**		**Result an**
100% ±5%	90° to 0°	L1-N	Unit normal use, no damage, no hazard.
		L2-N	Unit normal use, no damage, no hazard.
		L3-N	Unit normal use, no damage, no hazard.
		L1-L2	Unit normal use, no damage, no hazard.
		L2-L3	Unit normal use, no damage, no hazard.
		L3-L1	Unit normal use, no damage, no hazard.
		L1+L2+L3	Unit normal use, no damage, no hazard.
Test 2:			
P_{EMAX} in %	**Phase shift angle**		**Result**
100% ±5%	0° to 90°	L1-N	Unit normal use, no damage, no hazard.
		L2-N	Unit normal use, no damage, no hazard.
		L3-N	Unit normal use, no damage, no hazard.
		L1-L2	Unit normal use, no damage, no hazard.
		L2-L3	Unit normal use, no damage, no hazard.
		L3-L1	Unit normal use, no damage, no hazard.
		L1+L2+L3	Unit normal use, no damage, no hazard.
Test 3:			
P_{EMAX} in %	**Phase shift angle**		**Result**
100% ±5%	180° to 0°	L1-N	Unit shut down, no damage, no hazard.
		L2-N	Unit shut down, no damage, no hazard.
		L3-N	Unit shut down, no damage, no hazard.
		L1-L2	Unit normal use, no damage, no hazard.
		L2-L3	Unit shut down, no damage, no hazard.
		L3-L1	Unit shut down, no damage, no hazard.
		L1+L2+L3	Unit shut down, no damage, no hazard.
Test 4:			
P_{EMAX} in %	**Phase shift angle**		**Result**
100% ±5%	0° to 180°	L1-N	Unit shut down, no damage, no hazard.
		L2-N	Unit normal use, no damage, no hazard.
		L3-N	Unit normal use, no damage, no hazard.
		L1-L2	Unit shut down, no damage, no hazard.
		L2-L3	Unit normal use, no damage, no hazard.
		L3-L1	Unit shut down, no damage, no hazard.
		L1+L2+L3	Unit shut down, no damage, no hazard.
Limit	The generation must be no damage		

Test 1: 90° to 0°



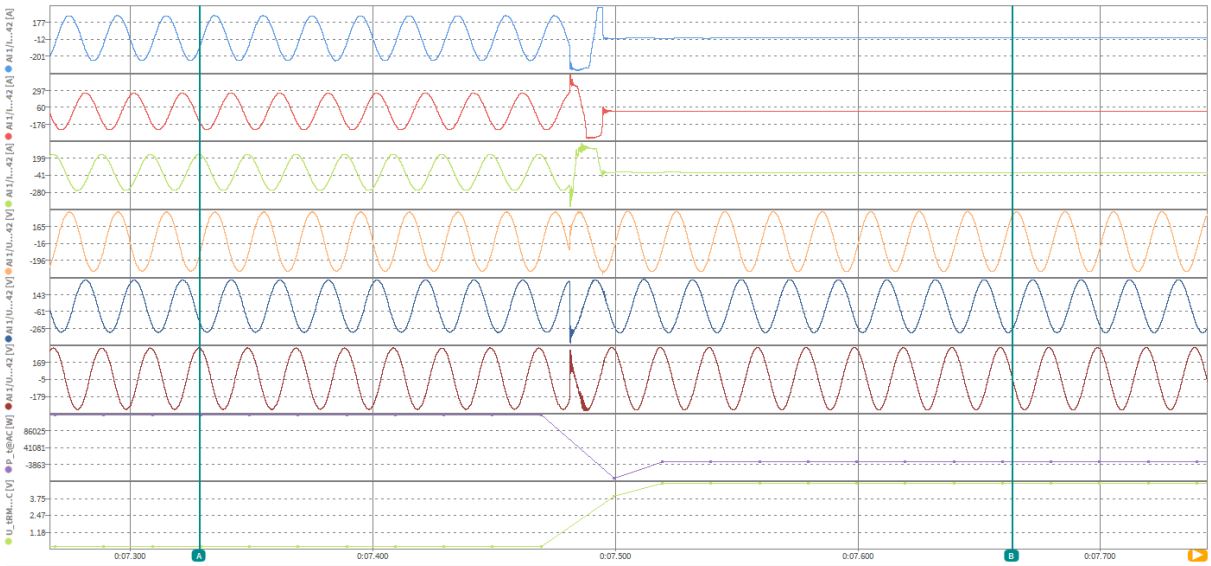
	A	B	间隔	有效值
时间 [s]	5.9859420	6.1955856	0.2096436	
AI 1/I1@TRIONet3_1342 [A]	-66.59782	-247.4623	-180.8645	194.8550
AI 1/I2@TRIONet3_1342 [A]	-186.2618	198.3866	384.6483	197.1851
AI 1/I3@TRIONet3_1342 [A]	249.5501	25.22087	-224.3292	195.9305
AI 1/U1@TRIONet3_1342 [V]	-81.29216	-307.1032	-225.8110	227.9593
AI 1/U2@TRIONet3_1342 [V]	-223.7432	251.1981	474.9413	232.0304
AI 1/U3@TRIONet3_1342 [V]	320.6120	36.38101	-284.2310	230.8206
P_t@AC [W]	126515.2	122414.3	-4100.945	119384.1
U_tRMS@DC [V]	4.915920	0.012073	-4.903847	3.417835

Test 2: 0° to 90°



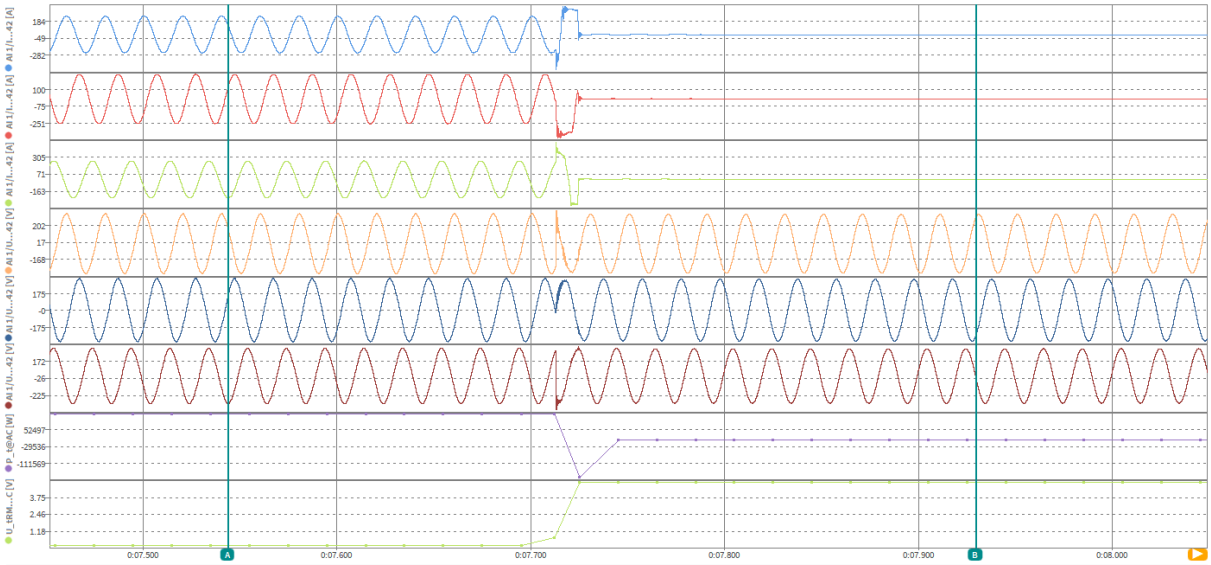
	A	B	间隔	有效值
时间 [s]	5.3252000	5.7509000	0.4257000	
AI 1/I1@TRIONet3_1342 [A]	-193.8679	-154.4587	39.40928	191.3923
AI 1/I2@TRIONet3_1342 [A]	-42.62531	-96.49337	-53.86806	195.4858
AI 1/I3@TRIONet3_1342 [A]	241.8580	254.2148	12.35676	192.9722
AI 1/U1@TRIONet3_1342 [V]	-251.1263	-204.0143	47.11199	230.2671
AI 1/U2@TRIONet3_1342 [V]	-61.70845	-133.2975	-71.58900	229.2609
AI 1/U3@TRIONet3_1342 [V]	303.0598	316.9925	13.93271	231.0802
P_t@AC [W]	126681.1	126100.9	-580.1953	125354.0
U_tRMS@DC [V]	4.915884	0.011356	-4.904529	2.932257

Test 3: 180° to 0°



	A	B	间隔	有效值
时间 [s]	7.3288000	7.6635554	0.3347554	
AI 1/I1@TRIONet3_1342 [A]	-105.5924	-1.222491	104.3699	137.0072
AI 1/I2@TRIONet3_1342 [A]	-156.3537	-0.995517	155.3582	141.7280
AI 1/I3@TRIONet3_1342 [A]	254.8223	-2.035260	-256.8575	138.1768
AI 1/U1@TRIONet3_1342 [V]	-137.5251	281.0047	418.5298	229.3298
AI 1/U2@TRIONet3_1342 [V]	-192.7855	-280.9756	-88.19008	230.4005
AI 1/U3@TRIONet3_1342 [V]	321.5332	1.639843	-319.8934	229.9021
P_t@AC [W]	126540.3	0.430168	-126539.9	90094.56
U_tRMS@DC [V]	0.013532	4.916076	4.902544	3.405153

Test 4: 0° to 180°



	A	B	间隔	有效值
时间 [s]	7.5441000	7.9295286	0.3854286	
AI 1/I1@TRIONet3_1342 [A]	130.1473	-1.185775	-131.3331	132.8801
AI 1/I2@TRIONet3_1342 [A]	124.5731	-0.976324	-125.5494	134.3422
AI 1/I3@TRIONet3_1342 [A]	-262.0554	-1.991868	260.0635	133.2112
AI 1/U1@TRIONet3_1342 [V]	164.2912	295.0683	130.7771	229.5468
AI 1/U2@TRIONet3_1342 [V]	150.8062	-264.5204	-415.3266	230.2577
AI 1/U3@TRIONet3_1342 [V]	-331.2164	-29.53983	301.6765	229.9343
P_t@AC [W]	126703.3	2.356072	-126700.9	96253.95
U_tRMS@DC [V]	0.012748	4.916094	4.903347	3.560271

5.3.3 Fault ride through, over-voltage (OVRT) and under-voltage (UVRT)	P

General:

To define the effect of the generating unit on the voltage magnitude, the short circuit power of the test setup shall be in the range of 2 times to 40 times the nominal power of the generating unit. The X/R ratio of the test impedance shall be at least 3.

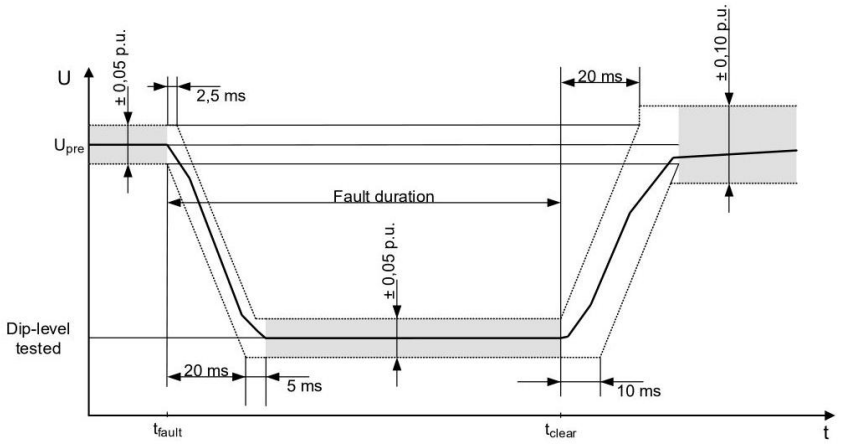


Figure 5 - Tolerances of the positive sequence voltage for the undervoltage event

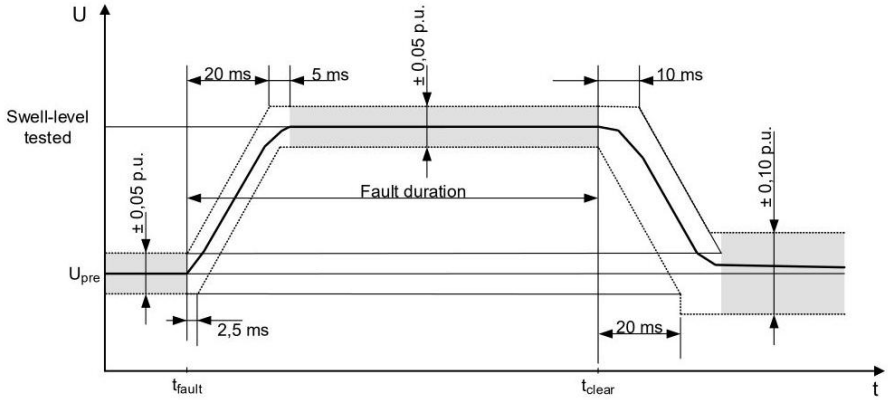


Figure 6 - Tolerances of the positive sequence voltage for the overvoltage event

Each test according to Table 4 and Table 5 represents one point in the voltage-time diagram to be verified e.g. Figure 6, 7, 8 of EN 50549-1:2019 and EN 50549-2:2019. If the voltage-time diagram includes vertical sections as Figure 7 and 8 of EN 50549-1:2019 and EN 50549-2:2019, the voltage level and duration according to Table 4 and Table 5 shall be chosen in a way that the most severe voltage level at this duration shall be tested. For each vertical section at least one test shall be included. If necessary additional tests shall be added to Table 4 and Table 5.

If the test is intended to provide evidence of controlled short circuit current contribution, at least the voltage levels for undervoltage according to Table 4 and at least the voltage levels for overvoltage according to Table 5 shall be tested, with each level tested for (at least) a symmetric event and an asymmetric event (simulated two- phase fault).

Table 4 specifies magnitudes for the undervoltage testing. Voltage levels refer to no-load-tests. Umin is the minimum voltage the generating unit can ride through, UVRC is the under voltage range capability calculated as U_{uvRc} = Un-Umin (see Figure 7).

Table 5 specifies magnitudes for the overvoltage testing. Voltage levels refer to no-load-tests. Umax is the maximum voltage the generating unit can ride through, UOVRC is the over voltage range capability calculated as UOVRC = Umax-Un (see Figure 7)

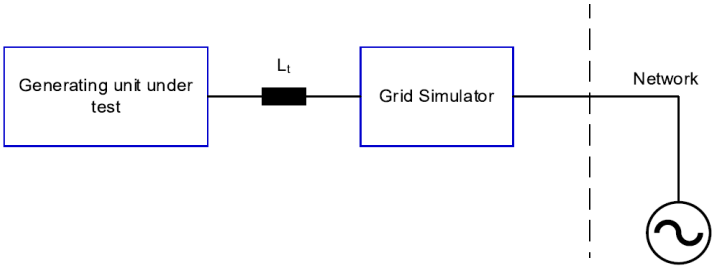


Figure A.3 — Example test setup with AC grid simulator

Regarding phase relationship in the test event:

1) Symmetrical three-phase fault (Table 4, tests VD1, 2, 3, 4, 5), see Figure A.4.

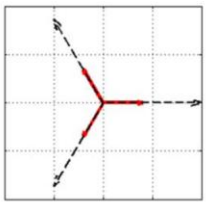


Figure A.4 — Vectorial representation of a symmetrical three-phase fault

2) asymmetric two-phase fault (Table 4, Tests VD 6, 7, 8, 9, 10), see Figure A.5.

A fault in the medium voltage or high voltage grid is causing a variation in LV in voltage amplitude as well as phase relationship (the case considered envisages a Dy transformer to connect the generator to the MV line or secondary station).

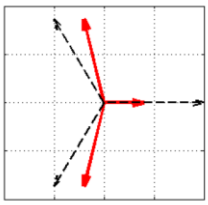


Figure A.5 — Vectorial representation of an asymmetric two-phase fault

During the asymmetric two-phase fault, the residual amplitude of the 3 voltages and phase shifts shall conform to the values given in the following Table A.1 and Table A.2.

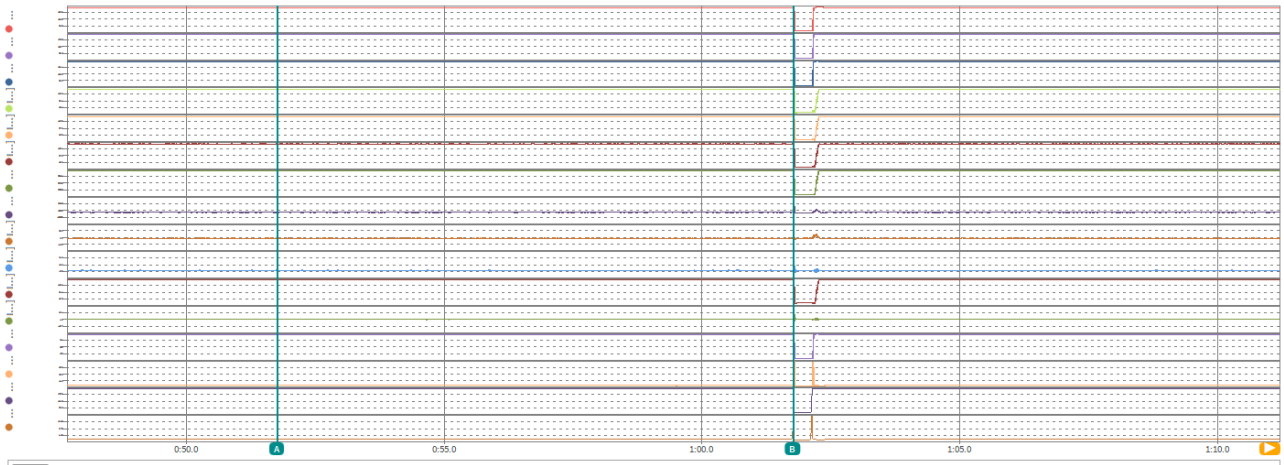
Graph of LVRT test one							
List of tests Voltage dip	**to (p.u.)**	**Limit for fault duration [ms]**	**Duration fault [ms]**	**Recover time [ms]**	**Limit percentage of Injected current after 60ms [p.u. In]**	**Percentage of Injected current after 60ms [p.u. In]**	**Result***
Symmetrical Three phase fault - UVRT							
VD1.0 (P = 0)	0.05	≥ 250	360	--	--	--	P
VD1.1 (P = 1)	0.05	≥ 250	361	125	≤0.1 p.u	0.05	P
VD1.2 (P = 0.2)	0.05	≥ 250	360	77	≤0.1 p.u	0.04	P
VD2.0 (P = 0)	0.25	≥950	1050	--	--	--	P
VD2.1 (P = 1)	0.25	≥950	1049	126	≤0.1 p.u	0.03	P
VD2.2 (P = 0.2)	0.25	≥950	1053	78	≤0.1 p.u	0.03	P
VD3.0 (P =0)	0.52	≥1800	1900	--	--	--	--
VD3.1 (P = 1)	0.52	≥1800	1900	126	≤0.1 p.u	0.03	P
VD3.2 (P = 0.2)	0.52	≥1800	1900	79	≤0.1 p.u	0.03	P
VD4.0 (P = 0)	0.76	≥2700	2800	--	--	--	--
VD4.1 (P = 1)	0.76	≥2700	2800	128	≤0.1 p.u	0.04	P
VD4.2 (P = 0.2)	0.76	≥2700	2800	78	≤0.1 p.u	0.03	P
VD5.0 (P = 0)	0.90	≥60020	60150	--	--	--	--
VD5.1 (P = 1)	0.90	≥60020	60119	60	--	1.08	P
VD5.2 (P = 0.2)	0.90	≥60020	60022	111	--	0.21	P
Asymmetrical Two-phase fault - UVRT							

VD6.0 (P = 0)	0.05	≥ 250	360	--	--	--	P
VD6.1 (P = 1)	0.05	≥ 250	361	135	≤0.1 p.u	0.05	P
VD6.2 (P = 0.2)	0.05	≥ 250	360	94	≤0.1 p.u	0.04	P
VD7.0 (P = 0)	0.25	≥950	1050	--	--	--	--
VD7.1 (P = 1)	0.25	≥950	1050	137	≤0.1 p.u	0.05	P
VD7.2 (P = 0.2)	0.25	≥950	1050	92	≤0.1 p.u	0.04	P
VD8.0 (P = 0)	0.52	≥1800	1900	--	--	--	--
VD8.1 (P = 1)	0.52	≥1800	1900	131	≤0.1 p.u	0.04	P
VD8.2 (P = 0.2)	0.52	≥1800	1900	93	≤0.1 p.u	0.03	P
VD9.0 (P = 1)	0.76	≥2700	2800	--	--	--	--
VD9.1 (P = 1)	0.76	≥2700	2800	130	≤0.1 p.u	0.04	P
VD9.2 (P = 0.2)	0.76	≥2700	2800	89	≤0.1 p.u	0.04	P
VD10.0 (P = 1)	0.90	≥60020	60150	--	--	--	--
VD10.1 (P = 1)	0.90	≥60020	60120	61	--	1.08	P
VD10.2 (P = 0.2)	0.90	≥60020	60119	97	--	0.21	P
Symmetrical Three phase fault - OVRT							
VS1.0 (P = 0)	1.25	≥ 120	220	--	--	--	--
VS1.1 (P = 1)	1.25	≥ 120	221	127	≤0.1 p.u	0.02	P
VS1.2 (P = 0.2)	1.25	≥ 120	220	84	≤0.1 p.u	0.02	P
VS2.1.0 (P = 0)	1.20	≥ 5020	5100	--	--	--	--

VS2.1.1 (P = 1)	1.20	≥ 5020	5122	126	≤0.1 p.u	0.04	P
VS2.1.2 (P = 0.2)	1.20	≥ 5020	5115	85	≤0.1 p.u	0.02	P
VS2.2.0 (P = 0)	1.15	≥60020	60150	--	--	--	--
VS2.2.1 (P = 1)	1.15	≥60020	60113	125	--	0.88	P
VS2.2.2 (P = 0.2)	1.15	≥60020	60117	238	--	0.18	P
Asymmetrical Two-phase fault - OVRT							
VS3.0 (P = 0)	1.25	≥ 120	220	--	--	--	--
VS3.1 (P = 1)	1.25	≥ 120	220	134	≤0.1 p.u	0.03	P
VS3.2 (P = 0.2)	1.25	≥ 120	220	85	≤0.1 p.u	0.02	P
VS4.1.0 (P = 0)	1.20	≥ 5020	5100	--	--	--	--
VS4.1.1 (P = 1)	1.20	≥ 5020	5121	131	≤0.1 p.u	0.02	P
VS4.1.2 (P = 0.2)	1.20	≥ 5020	5119	84	≤0.1 p.u	0.02	P
VS4.2.0 (P = 0)	1.15	≥60020	60150	--	--	--	--
VS4.2.1 (P = 1)	1.15	≥60020	60126	146	--	0.97	P
VS4.2.2 (P = 0.2)	1.15	≥60020	60119	201	--	0.19	P
Note:							

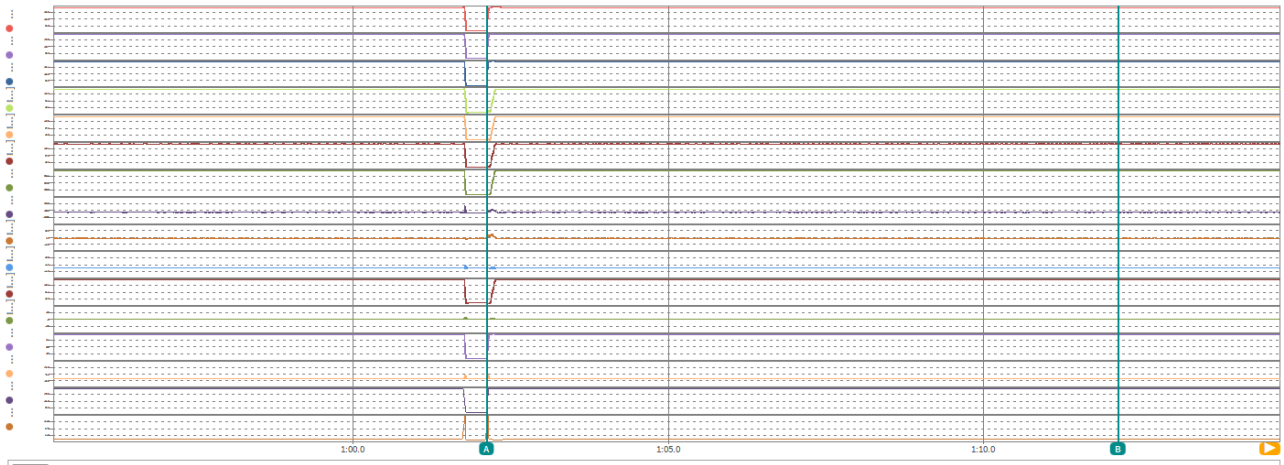
Test - VD1.1

Before fault



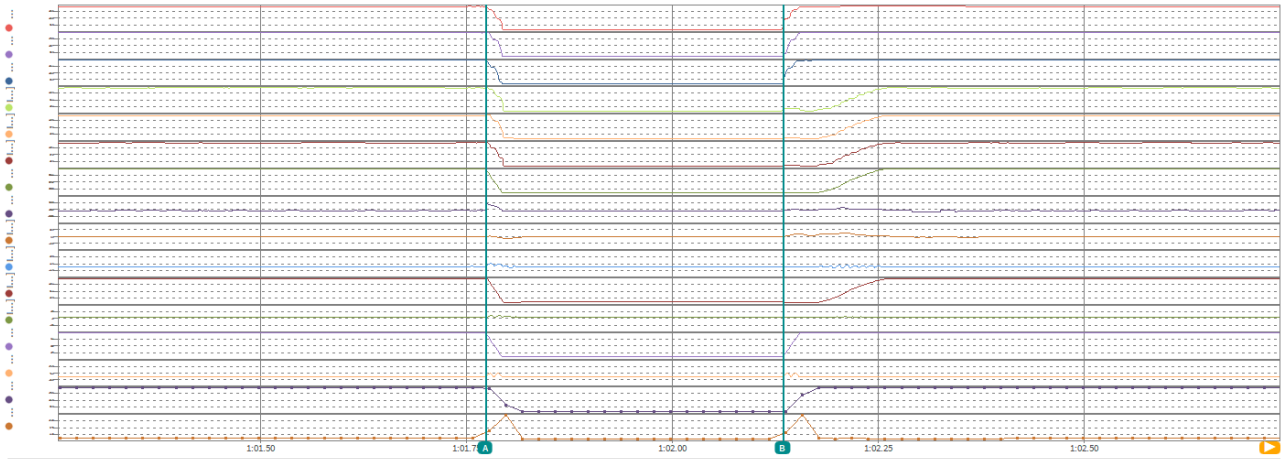
	A	B	间隔	有效值
时间 [s]	0:51.773600	1:01.773600	0:10.000000	
U1_tRMS_rc@AC [V]	230.4878	230.5248	0.037033	230.4958
U2_tRMS_rc@AC [V]	229.7668	229.7610	-5.722e-3	229.7846
U3_tRMS_rc@AC [V]	229.7266	229.7527	0.026062	229.6947
I1_tRMS_rc@AC [A]	180.6953	179.6683	-1.026978	180.1568
I2_tRMS_rc@AC [A]	181.2023	181.8404	0.638184	181.7583
I3_tRMS_rc@AC [A]	183.7408	185.1387	1.397903	184.3232
P_t_rc@AC [W]	125470.0	125711.1	241.1016	125606.5
Q_t_rc@AC [var]	-2371.809	2395.227	4767.036	2333.280
I_fund_Q_SYM+_rc@AC [A]	-0.346310	0.270845	0.617155	0.559978
I_fund_Q_SYM-_rc@AC [A]	0.577235	0.352543	-0.224692	0.513304
I_fund_P_SYM+_rc@AC [A]	181.8448	182.1828	0.337997	182.0478
I_fund_P_SYM-_rc@AC [A]	-0.294176	-1.275456	-0.981280	0.995184
U_fund_SYM+_rc@AC [V]	398.3546	398.3884	0.033813	398.3508
U_fund_SYM-_rc@AC [V]	1.024280	1.048558	0.024278	1.069247
U+ [V]	230.0062	229.9648	-0.041423	229.9949
U- [V]	0.602741	0.682014	0.079274	0.609227

After fault



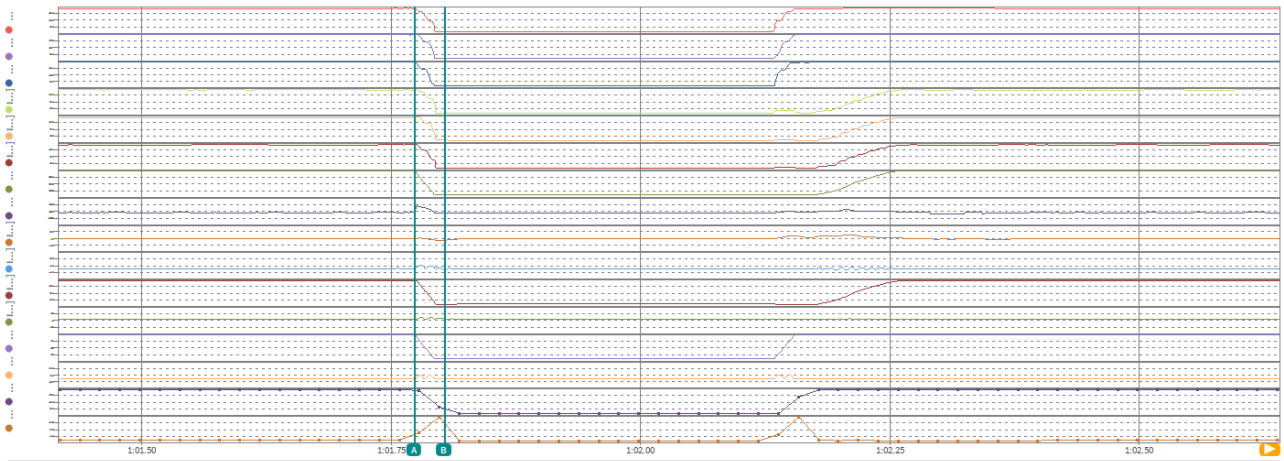
	A	B	间隔	有效值
时间 [s]	1:02.134600	1:12.134600	0:10.000000	
U1_tRMS_rc@AC [V]	11.38610	230.4626	219.0765	230.3732
U2_tRMS_rc@AC [V]	11.41106	229.7388	218.3277	229.6599
U3_tRMS_rc@AC [V]	11.36896	229.7257	218.3568	229.6168
I1_tRMS_rc@AC [A]	6.811606	179.2117	172.4001	179.2748
I2_tRMS_rc@AC [A]	6.863028	180.7798	173.9167	180.8638
I3_tRMS_rc@AC [A]	7.129604	182.9385	175.8089	183.3884
P_t_rc@AC [W]	205.8001	124832.4	124626.6	124988.8
Q_t_rc@AC [var]	117.3938	2594.447	2477.053	2603.250
I_fund_Q_SYM+_rc@AC [A]	0.768423	0.436341	-0.332082	0.943672
I_fund_Q_SYM-_rc@AC [A]	-0.403870	0.205259	0.609128	0.536202
I_fund_P_SYM+_rc@AC [A]	5.945261	180.9405	174.9952	181.1336
I_fund_P_SYM-_rc@AC [A]	0.281604	-1.042774	-1.324378	0.995426
U_fund_SYM+_rc@AC [V]	19.68935	398.3238	378.6344	398.1050
U_fund_SYM-_rc@AC [V]	0.046969	1.024618	0.977649	2.165926
U+ [V]	11.32969	229.9939	218.6642	229.4495
U- [V]	0.171693	0.647803	0.476110	1.009440

Duration fault time



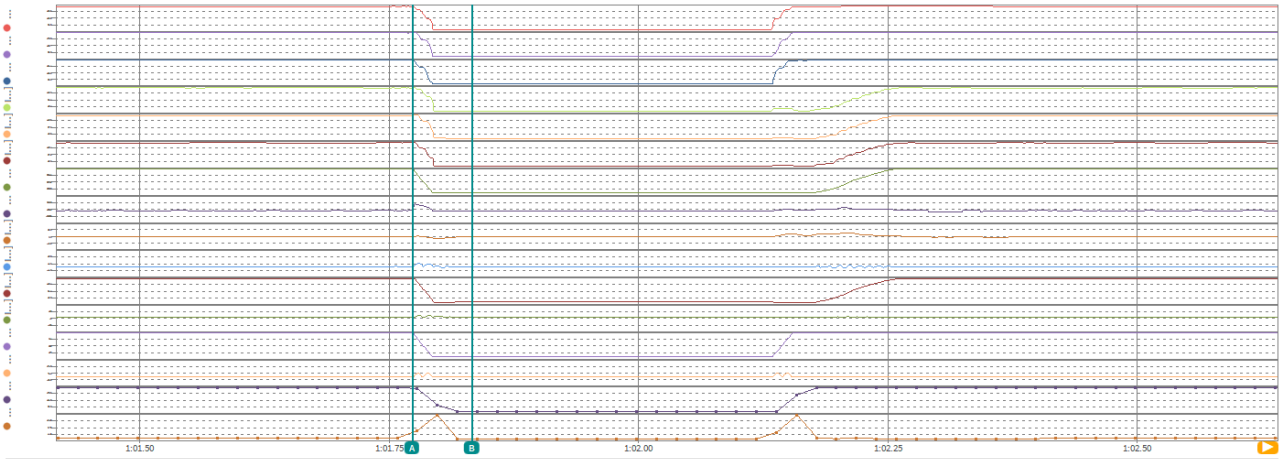
	A	B	间隔	有效值
时间 [s]	1:01.773600	1:02.134600	0.361000	
U1_tRMS_rc@AC [V]	230.5248	11.38610	-219.1387	43.50103
U2_tRMS_rc@AC [V]	229.7610	11.41106	-218.3500	45.99255
U3_tRMS_rc@AC [V]	229.7527	11.36896	-218.3837	41.33497
I1_tRMS_rc@AC [A]	179.6683	6.811606	-172.8567	37.60317
I2_tRMS_rc@AC [A]	181.8404	6.863028	-174.9774	38.64268
I3_tRMS_rc@AC [A]	185.1387	7.129604	-178.0091	35.81689
P_t_rc@AC [W]	125711.1	205.8001	-125505.3	19663.62
Q_t_rc@AC [var]	2395.227	117.3938	-2277.833	7129.815
I_fund_Q_SYM+_rc@AC [A]	0.270845	0.768423	0.497578	1.040802
I_fund_Q_SYM-_rc@AC [A]	0.352543	-0.403870	-0.756413	2.083354
I_fund_P_SYM+_rc@AC [A]	182.1828	5.945261	-176.2375	31.14530
I_fund_P_SYM-_rc@AC [A]	-1.275456	0.281604	1.557060	4.883333
U_fund_SYM+_rc@AC [V]	398.3884	19.68935	-378.6991	65.79895
U_fund_SYM-_rc@AC [V]	1.048558	0.046969	-1.001589	10.25374
U+ [V]	229.9648	11.32969	-218.6351	76.11612
U- [V]	0.682014	0.171693	-0.510322	4.288784

0-30ms



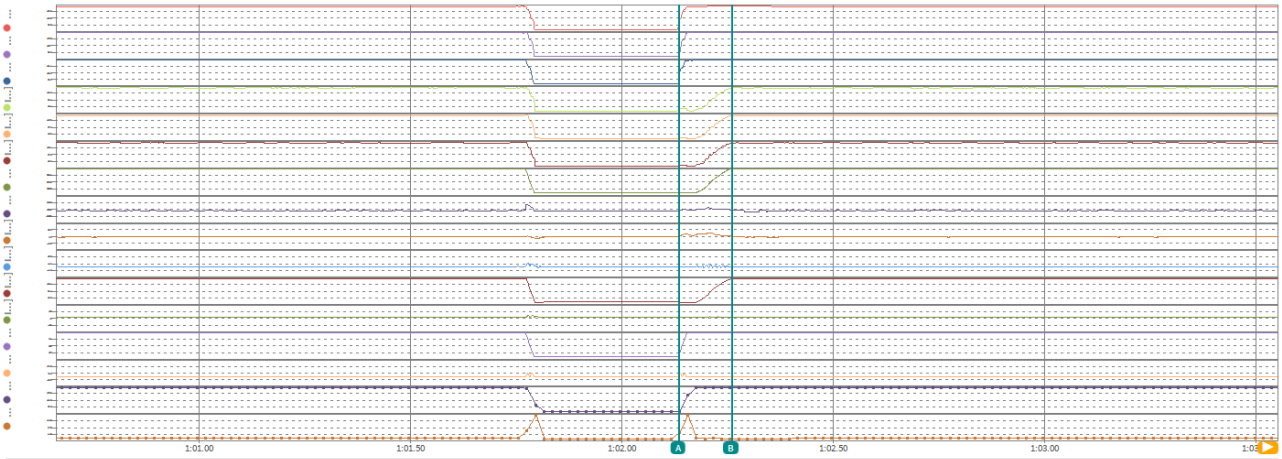
	A	B	间隔	有效值
时间 [s]	1:01.773600	1:01.803600	0.030000	
U1_tRMS_rc@AC [V]	230.5248	10.02392	-220.5009	143.8593
U2_tRMS_rc@AC [V]	229.7610	10.59251	-219.1685	152.6676
U3_tRMS_rc@AC [V]	229.7527	10.27121	-219.4814	136.2394
I1_tRMS_rc@AC [A]	179.6683	6.647239	-173.0210	126.6386
I2_tRMS_rc@AC [A]	181.8404	14.07233	-167.7681	130.1552
I3_tRMS_rc@AC [A]	185.1387	6.256277	-178.8825	120.3721
P_t_rc@AC [W]	125711.1	-15.98611	-125727.1	67191.92
Q_t_rc@AC [var]	2395.227	-279.4955	-2674.722	24361.02
I_fund_Q_SYM+_rc@AC [A]	0.270845	-3.722214	-3.993059	2.192640
I_fund_Q_SYM-_rc@AC [A]	0.352543	-2.418726	-2.771269	6.819544
I_fund_P_SYM+_rc@AC [A]	182.1828	-0.901322	-183.0841	104.7926
I_fund_P_SYM-_rc@AC [A]	-1.275456	5.911439	7.186895	16.50131
U_fund_SYM+_rc@AC [V]	398.3884	17.72137	-380.6671	215.3779
U_fund_SYM-_rc@AC [V]	1.048558	0.722777	-0.325781	35.03500
U+ [V]	229.9648	72.77249	-157.1923	189.7379
U- [V]	0.682014	17.56693	16.88492	10.79156

0-60ms



	A	B	间隔	有效值
时间 [s]	1:01.773600	1:01.833600	0.060000	
U1_tRMS_rc@AC [V]	230.5248	12.06287	-218.4619	102.8698
U2_tRMS_rc@AC [V]	229.7610	11.82991	-217.9311	109.1325
U3_tRMS_rc@AC [V]	229.7527	11.82974	-217.9229	97.45178
I1_tRMS_rc@AC [A]	179.6683	7.616936	-172.0513	90.35618
I2_tRMS_rc@AC [A]	181.8404	6.836845	-175.0036	92.97320
I3_tRMS_rc@AC [A]	185.1387	8.306680	-176.8321	85.94110
P_t_rc@AC [W]	125711.1	230.8431	-125480.3	47899.84
Q_t_rc@AC [var]	2395.227	142.0115	-2253.215	17366.88
I_fund_Q_SYM+_rc@AC [A]	0.270845	0.193630	-0.077214	1.882318
I_fund_Q_SYM-_rc@AC [A]	0.352543	0.381238	0.028695	5.024308
I_fund_P_SYM+_rc@AC [A]	182.1828	6.394076	-175.7887	74.76526
I_fund_P_SYM-_rc@AC [A]	-1.275456	0.120088	1.395545	11.85569
U_fund_SYM+_rc@AC [V]	398.3884	20.58936	-377.7991	154.1658
U_fund_SYM-_rc@AC [V]	1.048558	0.102773	-0.945785	24.97645
U+ [V]	229.9648	10.86642	-219.0984	164.4077
U- [V]	0.682014	0.235252	-0.446762	9.346504

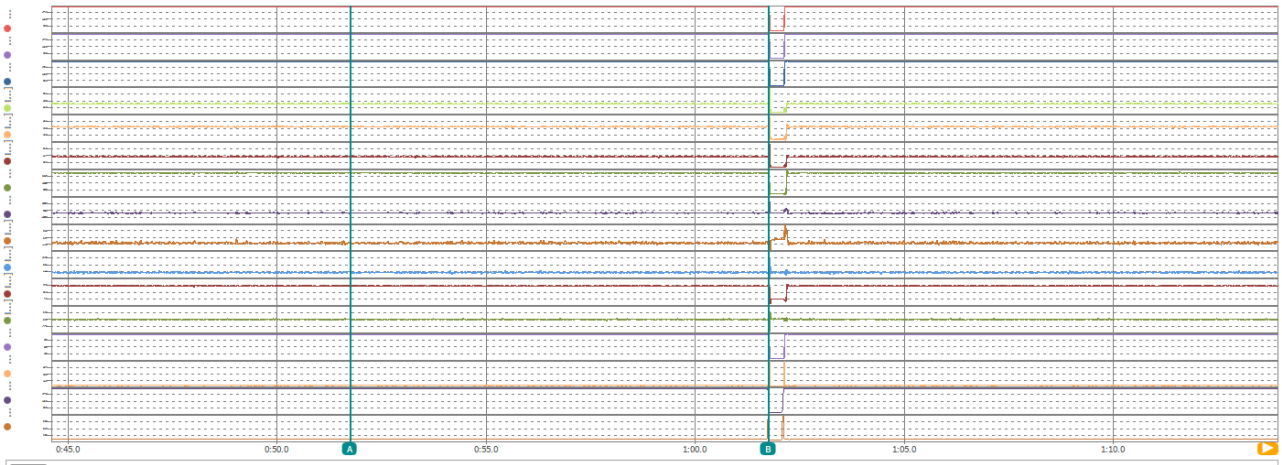
Recover time – Active power



	A	B	间隔	有效值
时间 [s]	1:02.134600	1:02.259600	0.125000	
U1_tRMS_rc@AC [V]	11.38610	231.7230	220.3369	219.7585
U2_tRMS_rc@AC [V]	11.41106	231.0900	219.6789	218.0483
U3_tRMS_rc@AC [V]	11.36896	232.4965	221.1276	221.9491
I1_tRMS_rc@AC [A]	6.811606	179.8330	173.0214	90.11537
I2_tRMS_rc@AC [A]	6.863028	178.3788	171.5158	90.72797
I3_tRMS_rc@AC [A]	7.129604	181.4007	174.2711	91.32112
P_t_rc@AC [W]	205.8001	124858.7	124652.9	62083.54
Q_t_rc@AC [var]	117.3938	7232.578	7115.184	10944.57
I_fund_Q_SYM+_rc@AC [A]	0.768423	3.170436	2.402014	6.917308
I_fund_Q_SYM-_rc@AC [A]	-0.403870	0.260681	0.664550	2.107153
I_fund_P_SYM+_rc@AC [A]	5.945261	179.5556	173.6103	89.15558
I_fund_P_SYM-_rc@AC [A]	0.281604	1.224833	0.943229	2.276415
U_fund_SYM+_rc@AC [V]	19.68935	401.4276	381.7382	376.0275
U_fund_SYM-_rc@AC [V]	0.046969	0.651210	0.604241	16.79331
U+ [V]	11.32969	232.3842	221.0545	185.2525
U- [V]	0.171693	0.534464	0.362772	6.771378

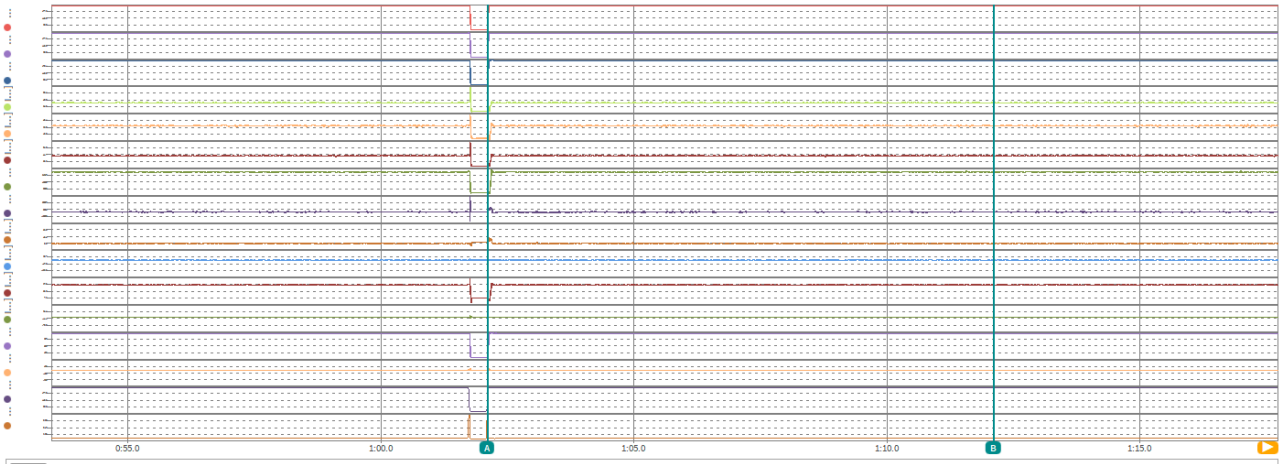
Test - VD1.2

Before fault



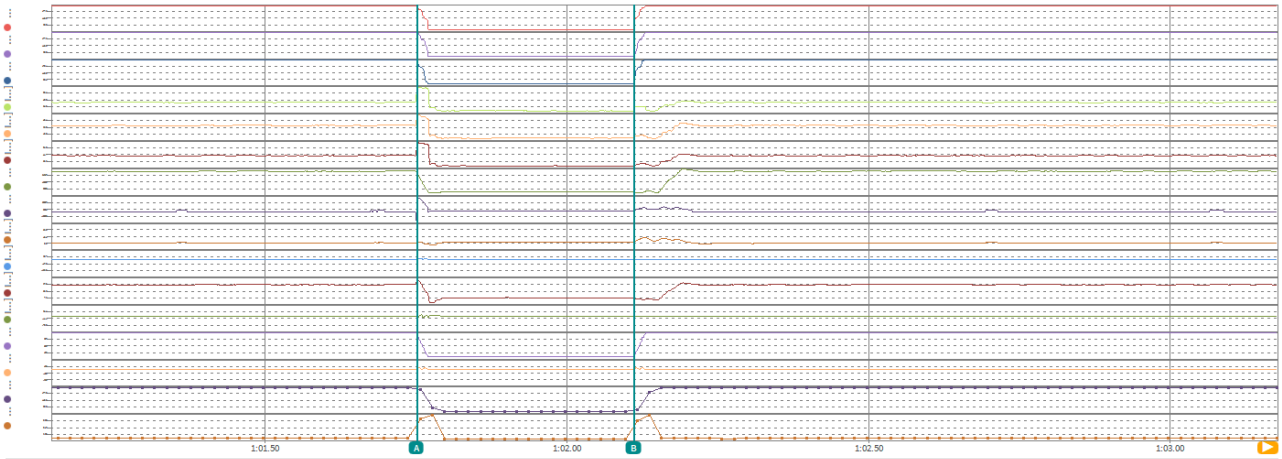
	A	B	间隔	有效值
时间 [s]	0:51.751700	1:01.751700	0:10.000000	
U1_tRMS_rc@AC [V]	230.2810	230.2463	-0.034698	230.2475
U2_tRMS_rc@AC [V]	229.8040	229.6911	-0.112915	229.7486
U3_tRMS_rc@AC [V]	229.5053	229.5028	-2.441e-3	229.5432
I1_tRMS_rc@AC [A]	35.69534	37.67910	1.983757	36.44995
I2_tRMS_rc@AC [A]	37.49485	36.54226	-0.952591	36.72187
I3_tRMS_rc@AC [A]	35.77535	37.46173	1.686386	37.35552
P_t_rc@AC [W]	24969.09	25575.05	605.9590	25329.13
Q_t_rc@AC [var]	-1974.744	-2164.471	-189.7267	1913.925
I_fund_Q_SYM+_rc@AC [A]	-0.462433	-1.366262	-0.903828	0.778896
I_fund_Q_SYM-_rc@AC [A]	-0.520513	0.266721	0.787234	0.391966
I_fund_P_SYM+_rc@AC [A]	36.20974	37.09228	0.882534	36.73332
I_fund_P_SYM-_rc@AC [A]	-0.521653	0.674817	1.196471	0.428468
U_fund_SYM+_rc@AC [V]	398.1322	398.0453	-0.086975	398.1025
U_fund_SYM-_rc@AC [V]	0.962886	1.066749	0.103863	0.983765
U+ [V]	229.8810	229.9170	0.035981	229.8514
U- [V]	0.593988	0.615762	0.021774	0.567663

After fault



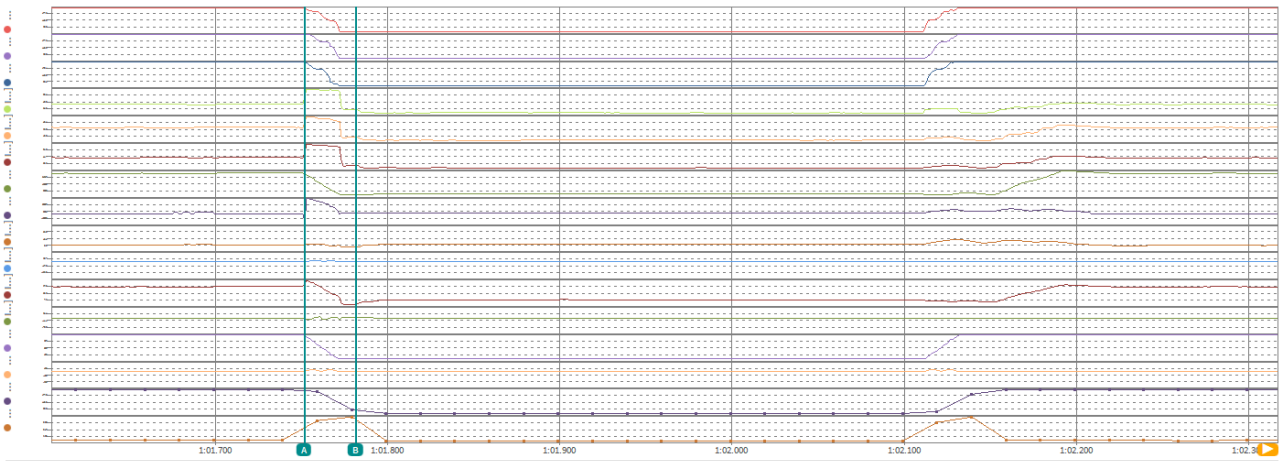
	A	B	间隔	有效值
时间 [s]	1:02.111700	1:12.111700	0:10.000000	
U1_tRMS_rc@AC [V]	7.246471	230.2618	223.0153	230.1027
U2_tRMS_rc@AC [V]	7.229450	229.7306	222.5012	229.6009
U3_tRMS_rc@AC [V]	7.091512	229.5802	222.4887	229.4633
I1_tRMS_rc@AC [A]	7.337796	37.23013	29.89234	36.43825
I2_tRMS_rc@AC [A]	8.089833	35.87458	27.78475	36.60323
I3_tRMS_rc@AC [A]	5.284009	37.41084	32.12683	37.26634
P_t_rc@AC [W]	125.1231	25335.15	25210.02	25259.22
Q_t_rc@AC [var]	81.14124	-1854.799	-1935.940	2134.269
I_fund_Q_SYM+_rc@AC [A]	1.290130	-0.443902	-1.734031	0.976637
I_fund_Q_SYM-_rc@AC [A]	-0.322170	0.710373	1.032543	0.396753
I_fund_P_SYM+_rc@AC [A]	5.633770	36.73972	31.10595	36.63096
I_fund_P_SYM-_rc@AC [A]	0.392340	-0.130333	-0.522673	0.427023
U_fund_SYM+_rc@AC [V]	12.34342	398.1220	385.7786	397.8268
U_fund_SYM-_rc@AC [V]	0.066781	0.943733	0.876952	2.157143
U+ [V]	7.115900	229.8840	222.7681	229.3251
U- [V]	0.029759	0.577976	0.548216	0.920499

Duration fault time



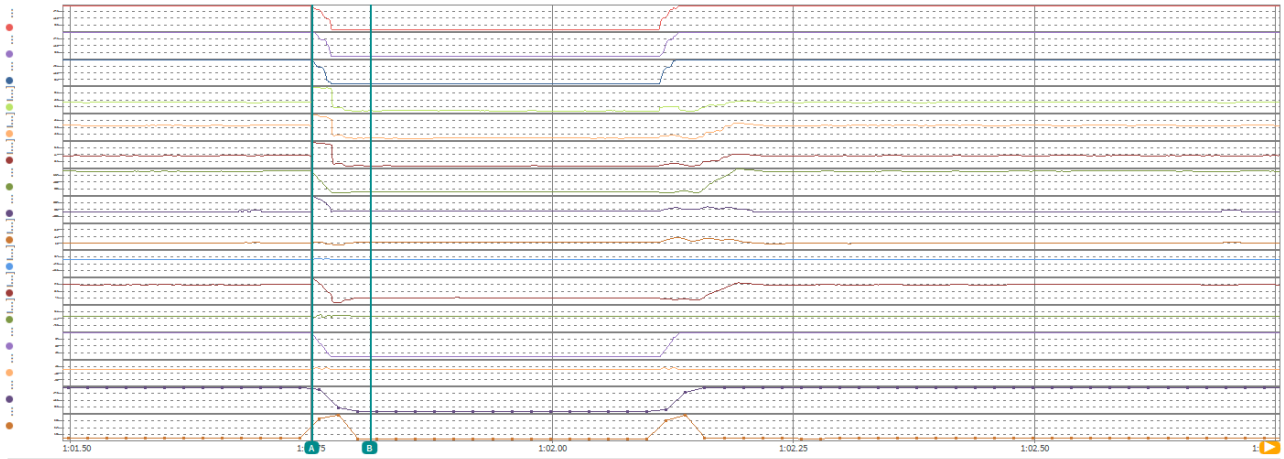
	A	B	间隔	有效值
时间 [s]	1:01.751700	1:02.111700	0.360000	
U1_tRMS_rc@AC [V]	230.2463	7.246471	-222.9999	40.61453
U2_tRMS_rc@AC [V]	229.6911	7.229450	-222.4617	43.05852
U3_tRMS_rc@AC [V]	229.5028	7.091512	-222.4113	38.01644
I1_tRMS_rc@AC [A]	37.67910	7.337796	-30.34130	21.94525
I2_tRMS_rc@AC [A]	36.54226	8.089833	-28.45242	15.75427
I3_tRMS_rc@AC [A]	37.46173	5.284009	-32.17773	18.79676
P_t_rc@AC [W]	25575.05	125.1231	-25449.93	3781.485
Q_t_rc@AC [var]	-2164.471	81.14124	2245.612	7333.808
I_fund_Q_SYM+_rc@AC [A]	-1.366262	1.290130	2.656391	1.494860
I_fund_Q_SYM-_rc@AC [A]	0.266721	-0.322170	-0.588891	2.597330
I_fund_P_SYM+_rc@AC [A]	37.09228	5.633770	-31.45851	10.08010
I_fund_P_SYM-_rc@AC [A]	0.674817	0.392340	-0.282477	2.923565
U_fund_SYM+_rc@AC [V]	398.0453	12.34342	-385.7018	59.75352
U_fund_SYM-_rc@AC [V]	1.066749	0.066781	-0.999969	10.29539
U+ [V]	229.9170	7.115900	-222.8011	72.79843
U- [V]	0.615762	0.029759	-0.586003	3.845898

0-30ms



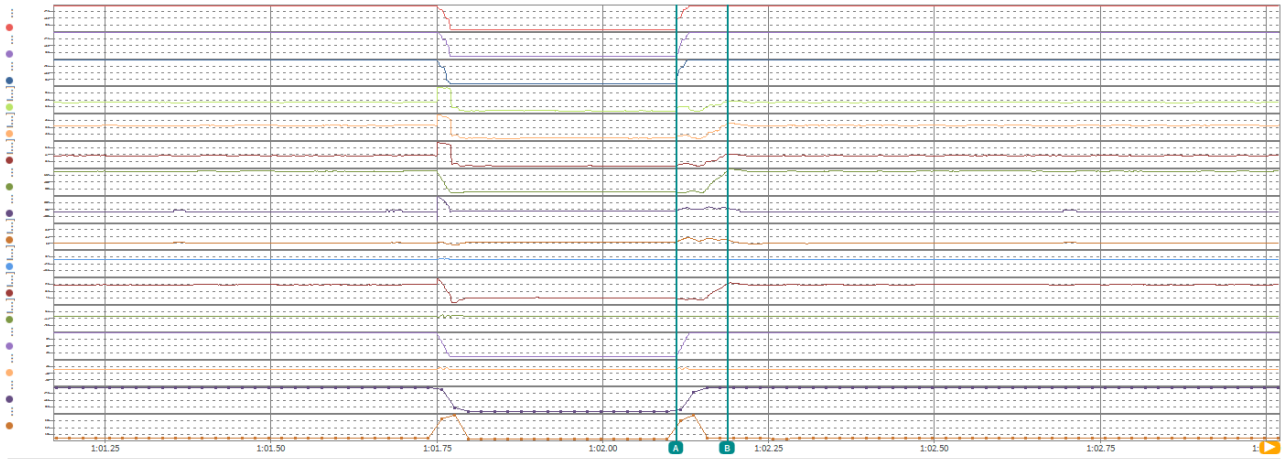
	A	B	间隔	有效值
时间 [s]	1:01.751700	1:01.781700	0.030000	
U1_tRMS_rc@AC [V]	230.2463	6.385317	-223.8610	136.5898
U2_tRMS_rc@AC [V]	229.6911	6.841364	-222.8497	145.0611
U3_tRMS_rc@AC [V]	229.5028	6.729687	-222.7731	127.6428
I1_tRMS_rc@AC [A]	37.67910	18.54184	-19.13726	70.52653
I2_tRMS_rc@AC [A]	36.54226	13.86854	-22.67372	47.53036
I3_tRMS_rc@AC [A]	37.46173	12.80400	-24.65774	60.96238
P_t_rc@AC [W]	25575.05	-85.74345	-25660.79	12897.98
Q_t_rc@AC [var]	-2164.471	-286.9036	1877.567	25024.86
I_fund_Q_SYM+_rc@AC [A]	-1.366262	-4.397448	-3.031186	2.523480
I_fund_Q_SYM-_rc@AC [A]	0.266721	2.733435	2.466715	8.682956
I_fund_P_SYM+_rc@AC [A]	37.09228	-5.449063	-42.54134	29.15366
I_fund_P_SYM-_rc@AC [A]	0.674817	9.399644	8.724826	9.243170
U_fund_SYM+_rc@AC [V]	398.0453	11.35764	-386.6876	199.9145
U_fund_SYM-_rc@AC [V]	1.066749	0.617924	-0.448825	35.13103
U+ [V]	229.9170	46.50431	-183.4127	182.4694
U- [V]	0.615762	12.92178	12.30602	9.677373

0-60ms



	A	B	间隔	有效值
时间 [s]	1:01.751700	1:01.811700	0.060000	
U1_tRMS_rc@AC [V]	230.2463	7.236119	-223.0102	97.49608
U2_tRMS_rc@AC [V]	229.6911	7.212031	-222.4791	103.5287
U3_tRMS_rc@AC [V]	229.5028	7.102721	-222.4001	91.12761
I1_tRMS_rc@AC [A]	37.67910	7.710344	-29.96876	50.65724
I2_tRMS_rc@AC [A]	36.54226	7.888464	-28.65379	34.40281
I3_tRMS_rc@AC [A]	37.46173	6.613139	-30.84860	43.75273
P_t_rc@AC [W]	25575.05	126.3682	-25448.68	9194.917
Q_t_rc@AC [var]	-2164.471	97.57632	2262.047	17839.99
I_fund_Q_SYM+_rc@AC [A]	-1.366262	0.722083	2.088345	2.076203
I_fund_Q_SYM-_rc@AC [A]	0.266721	0.465752	0.199031	6.287952
I_fund_P_SYM+_rc@AC [A]	37.09228	5.642525	-31.44975	20.98063
I_fund_P_SYM-_rc@AC [A]	0.674817	0.222973	-0.451844	6.990712
U_fund_SYM+_rc@AC [V]	398.0453	12.34373	-385.7015	142.7660
U_fund_SYM-_rc@AC [V]	1.066749	0.053024	-1.013725	25.04493
U+ [V]	229.9170	6.847558	-223.0695	158.0602
U- [V]	0.615762	0.203617	-0.412145	8.381469

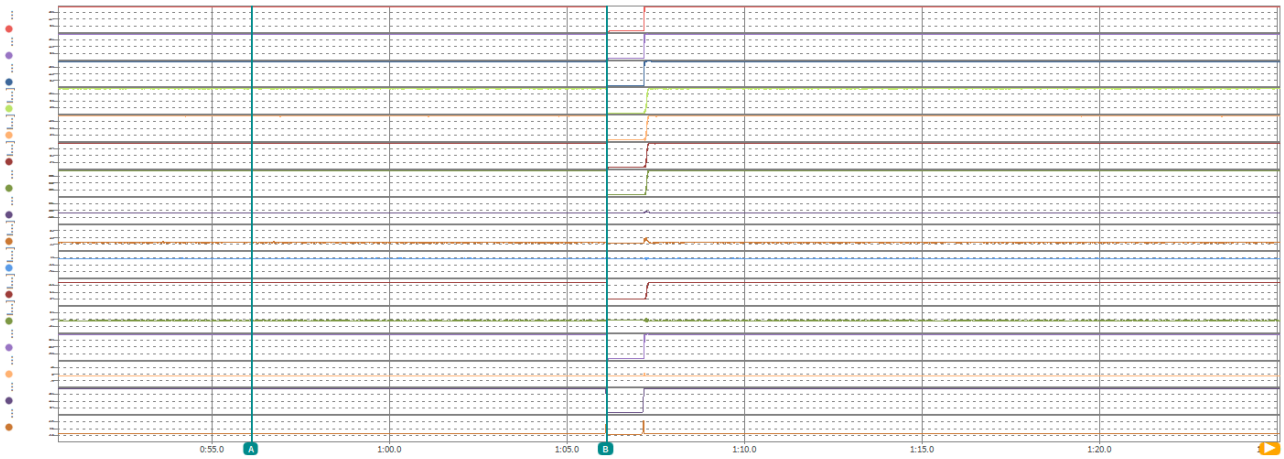
Recover time – Active power



	A	B	间隔	有效值
时间 [s]	1:02.111700	1:02.188700	0.077000	
U1_tRMS_rc@AC [V]	7.246471	229.8328	222.5864	212.1763
U2_tRMS_rc@AC [V]	7.229450	229.6738	222.4444	209.8551
U3_tRMS_rc@AC [V]	7.091512	232.7689	225.6774	215.1311
I1_tRMS_rc@AC [A]	7.337796	36.73190	29.39410	21.75685
I2_tRMS_rc@AC [A]	8.089833	39.81411	31.72428	19.07227
I3_tRMS_rc@AC [A]	5.284009	41.43151	36.14750	19.32325
P_t_rc@AC [W]	125.1231	25705.26	25580.14	10566.03
Q_t_rc@AC [var]	81.14124	8985.304	8904.162	8002.669
I_fund_Q_SYM+_rc@AC [A]	1.290130	5.631765	4.341636	6.124895
I_fund_Q_SYM-_rc@AC [A]	-0.322170	2.351088	2.673258	1.114866
I_fund_P_SYM+_rc@AC [A]	5.633770	37.09784	31.46407	15.31029
I_fund_P_SYM-_rc@AC [A]	0.392340	1.374312	0.981972	1.056761
U_fund_SYM+_rc@AC [V]	12.34342	399.6813	387.3379	359.3452
U_fund_SYM-_rc@AC [V]	0.066781	1.412107	1.345326	21.76947
U+ [V]	7.115900	230.4097	223.2938	168.1365
U- [V]	0.029759	0.480010	0.450251	7.279844

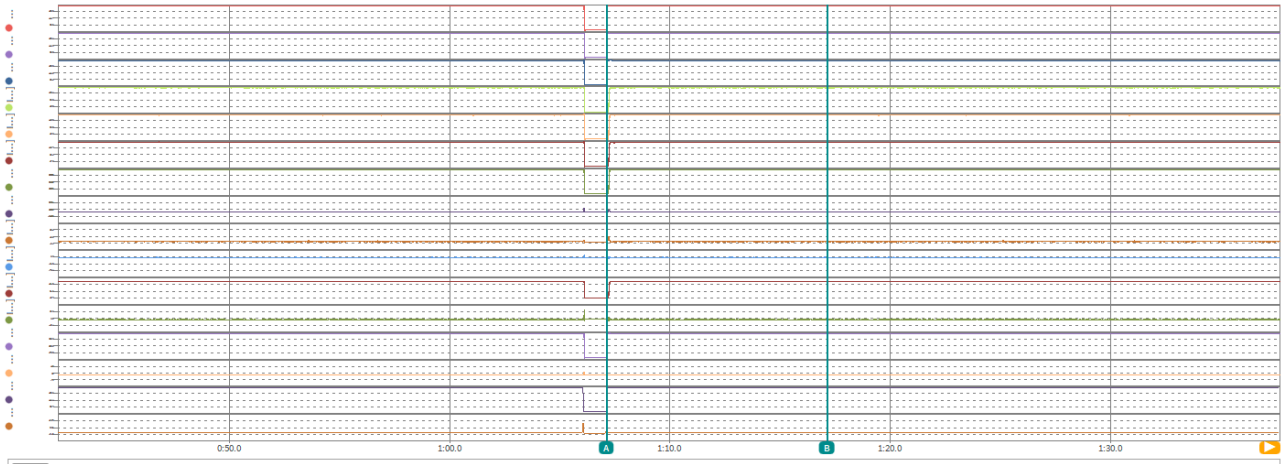
Test – VD2.1

Before fault



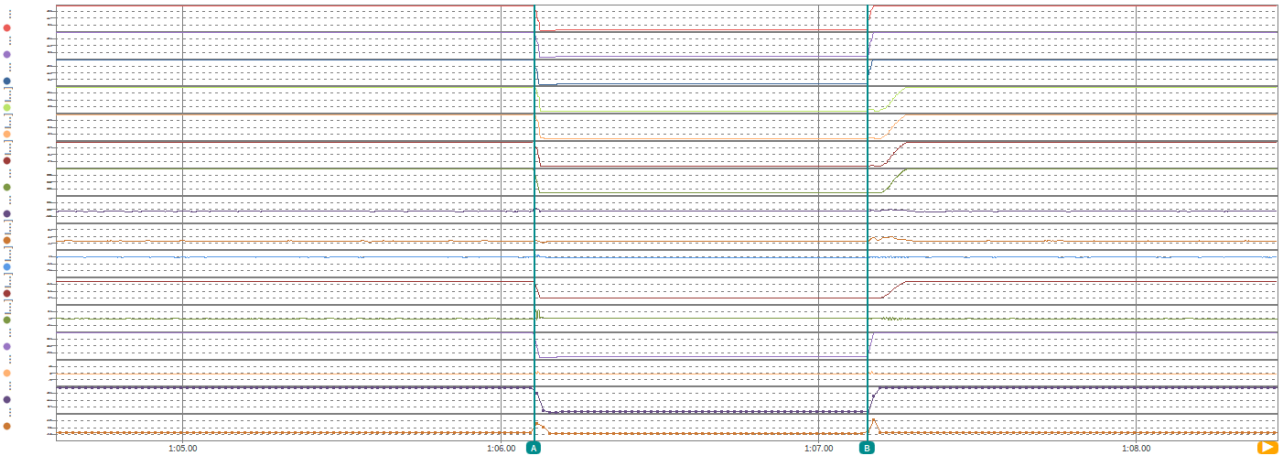
	A	B	间隔	有效值
时间 [s]	0:56.10630	1:06.10630	0:10.00000	
U1_tRMS_rc@AC [V]	230.5614	229.9370	-0.624344	230.5131
U2_tRMS_rc@AC [V]	229.7784	230.0063	0.227921	229.8089
U3_tRMS_rc@AC [V]	229.6980	229.9908	0.292740	229.6903
I1_tRMS_rc@AC [A]	179.5074	177.9677	-1.539673	179.6416
I2_tRMS_rc@AC [A]	181.9162	181.3764	-0.539810	181.3899
I3_tRMS_rc@AC [A]	184.1744	183.8554	-0.319031	183.8770
P_t_rc@AC [W]	125471.3	124896.6	-574.7422	125304.5
Q_t_rc@AC [var]	2300.762	2624.492	323.7300	2474.462
I_fund_Q_SYM+_rc@AC [A]	0.347977	0.430422	0.082445	0.572721
I_fund_Q_SYM-_rc@AC [A]	0.186833	-1.585392	-1.772225	0.571697
I_fund_P_SYM+_rc@AC [A]	181.8351	181.0197	-0.815445	181.6007
I_fund_P_SYM-_rc@AC [A]	-1.060410	-0.949089	0.111321	1.072673
U_fund_SYM+_rc@AC [V]	398.3878	398.3114	-0.076324	398.3728
U_fund_SYM-_rc@AC [V]	1.056024	0.202187	-0.853837	1.075010
U+ [V]	230.0138	229.9877	-0.026057	230.0074
U- [V]	0.625780	0.802132	0.176353	0.620473

After fault



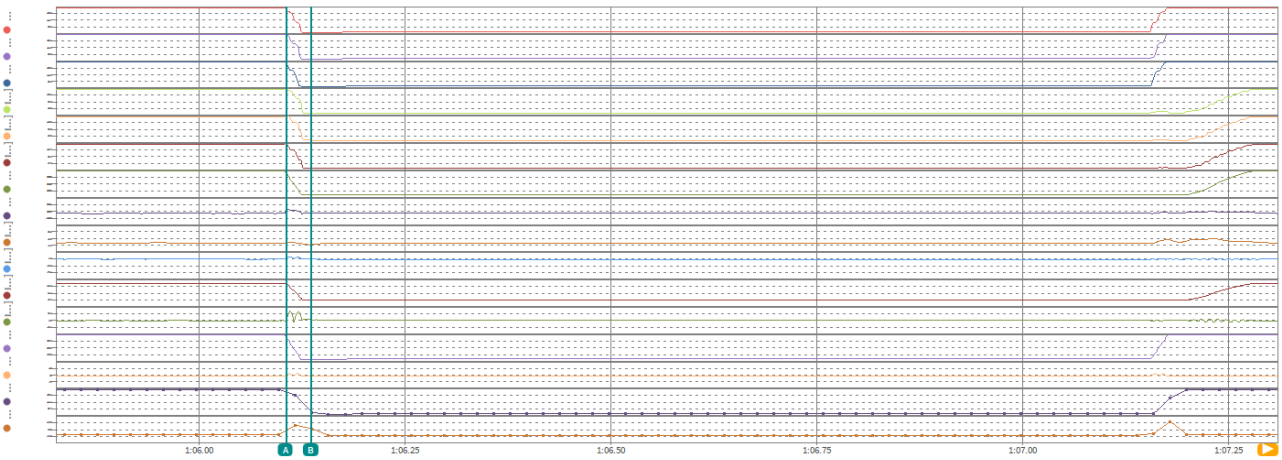
	A	B	间隔	有效值
时间 [s]	1:07.15530	1:17.15530	0:10.00000	
U1_tRMS_rc@AC [V]	57.34788	230.4494	173.1016	230.3938
U2_tRMS_rc@AC [V]	57.25552	229.7228	172.4673	229.6687
U3_tRMS_rc@AC [V]	57.25724	229.6413	172.3840	229.5927
I1_tRMS_rc@AC [A]	5.099914	179.0069	173.9070	178.7285
I2_tRMS_rc@AC [A]	5.492230	180.0923	174.6001	180.5443
I3_tRMS_rc@AC [A]	5.026059	183.3443	178.3183	182.9677
P_t_rc@AC [W]	805.2813	124696.9	123891.6	124692.0
Q_t_rc@AC [var]	-389.9033	2729.463	3119.367	2656.486
I_fund_Q_SYM+_rc@AC [A]	-0.583372	0.406310	0.989682	0.914361
I_fund_Q_SYM-_rc@AC [A]	-0.426580	0.771825	1.198405	0.591488
I_fund_P_SYM+_rc@AC [A]	4.668456	180.7712	176.1028	180.7041
I_fund_P_SYM-_rc@AC [A]	0.167683	-1.335530	-1.503213	1.094148
U_fund_SYM+_rc@AC [V]	99.20364	398.2583	299.0547	398.1290
U_fund_SYM-_rc@AC [V]	0.186264	1.082212	0.895948	1.819865
U+ [V]	57.28185	230.0121	172.7302	229.4801
U- [V]	0.184667	0.617468	0.432801	0.924466

Duration fault time



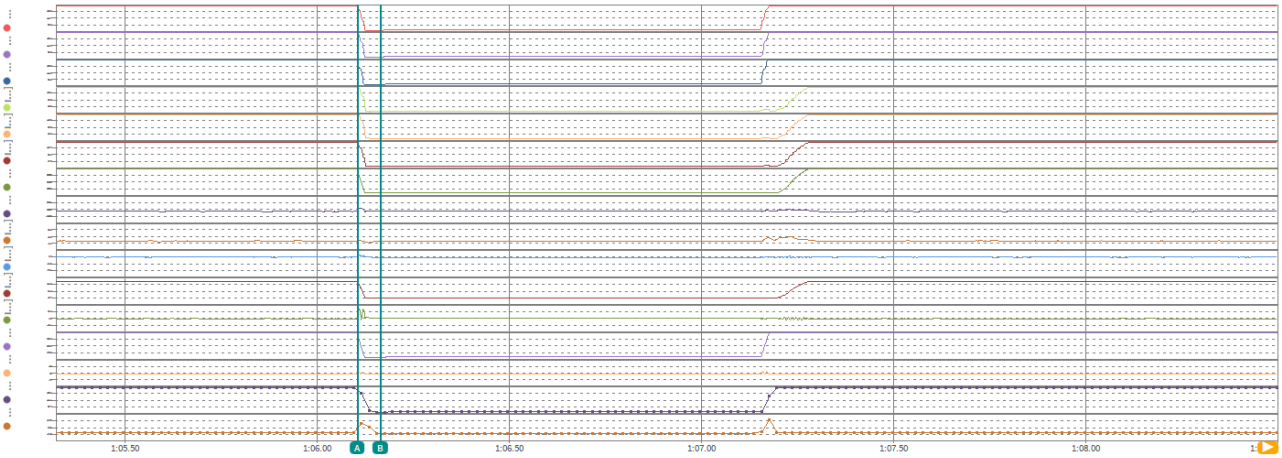
	A	B	间隔	有效值
时间 [s]	1:06.10630	1:07.15530	1.04900	
U1_tRMS_rc@AC [V]	229.9370	57.34788	-172.5891	61.40741
U2_tRMS_rc@AC [V]	230.0063	57.25552	-172.7508	61.86707
U3_tRMS_rc@AC [V]	229.9908	57.25724	-172.7335	60.64378
I1_tRMS_rc@AC [A]	177.9677	5.099914	-172.8678	21.08591
I2_tRMS_rc@AC [A]	181.3764	5.492230	-175.8842	21.84018
I3_tRMS_rc@AC [A]	183.8554	5.026059	-178.8293	19.77563
P_t_rc@AC [W]	124896.6	805.2813	-124091.3	10717.58
Q_t_rc@AC [var]	2624.492	-389.9033	-3014.395	4032.898
I_fund_Q_SYM+_rc@AC [A]	0.430422	-0.583372	-1.013794	0.606204
I_fund_Q_SYM-_rc@AC [A]	-1.585392	-0.426580	1.158812	1.313424
I_fund_P_SYM+_rc@AC [A]	181.0197	4.668456	-176.3512	17.31422
I_fund_P_SYM-_rc@AC [A]	-0.949089	0.167683	1.116772	2.803113
U_fund_SYM+_rc@AC [V]	398.3114	99.20364	-299.1078	104.7628
U_fund_SYM-_rc@AC [V]	0.202187	0.186264	-0.015923	4.784743
U+ [V]	229.9877	57.28185	-172.7058	69.55220
U- [V]	0.802132	0.184667	-0.617465	1.836163

0-30ms



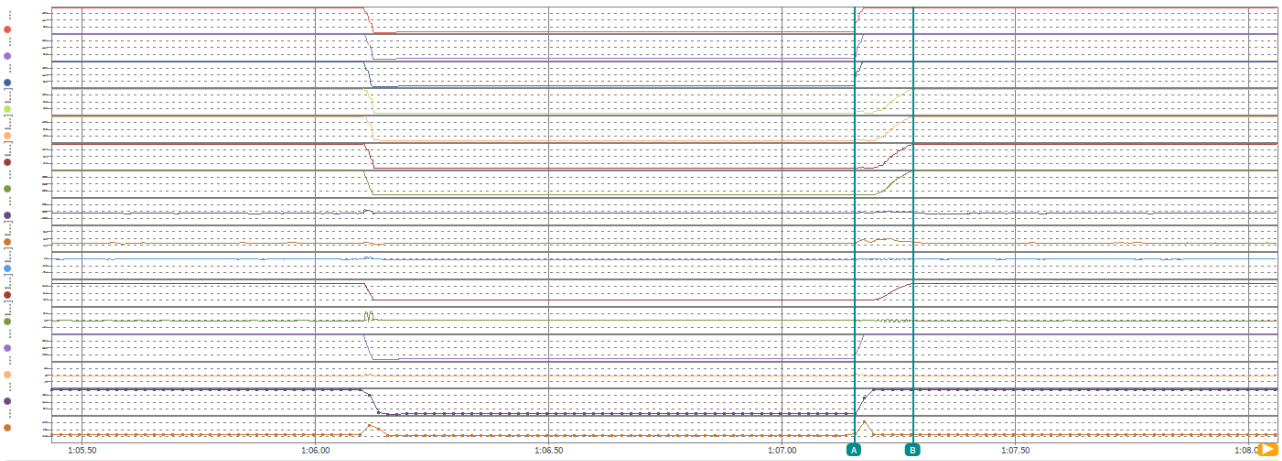
	A	B	间隔	有效值
时间 [s]	1:06.10630	1:06.13730	0.03100	
U1_tRMS_rc@AC [V]	229.9370	53.70061	-176.2364	139.3238
U2_tRMS_rc@AC [V]	230.0063	53.54573	-176.4606	147.5180
U3_tRMS_rc@AC [V]	229.9908	54.05649	-175.9343	132.0903
I1_tRMS_rc@AC [A]	177.9677	5.066205	-172.9015	117.4349
I2_tRMS_rc@AC [A]	181.3764	11.64116	-169.7353	121.3544
I3_tRMS_rc@AC [A]	183.8554	6.609991	-177.2454	109.8845
P_t_rc@AC [W]	124896.6	-194.9265	-125091.5	61233.40
Q_t_rc@AC [var]	2624.492	-1237.447	-3861.939	23000.43
I_fund_Q_SYM+_rc@AC [A]	0.430422	-3.087065	-3.517487	2.065337
I_fund_Q_SYM-_rc@AC [A]	-1.585392	3.169846	4.755237	7.055482
I_fund_P_SYM+_rc@AC [A]	181.0197	-1.251613	-182.2713	95.78766
I_fund_P_SYM-_rc@AC [A]	-0.949089	3.541972	4.491061	15.98253
U_fund_SYM+_rc@AC [V]	398.3114	93.11095	-305.2005	220.9397
U_fund_SYM-_rc@AC [V]	0.202187	0.360749	0.158562	27.34539
U+ [V]	229.9877	190.6383	-39.34944	211.2313
U- [V]	0.802132	11.36002	10.55789	8.052745

0-60ms



	A	B	间隔	有效值
时间 [s]	1:06.10630	1:06.16630	0.06000	
U1_tRMS_rc@AC [V]	229.9370	55.63873	-174.2983	107.7333
U2_tRMS_rc@AC [V]	230.0063	55.75395	-174.2523	113.2986
U3_tRMS_rc@AC [V]	229.9908	55.25814	-174.7326	102.8180
I1_tRMS_rc@AC [A]	177.9677	4.933407	-173.0343	85.10974
I2_tRMS_rc@AC [A]	181.3764	5.670235	-175.7062	88.00794
I3_tRMS_rc@AC [A]	183.8554	5.065939	-178.7895	79.65927
P_t_rc@AC [W]	124896.6	761.2308	-124135.3	44351.76
Q_t_rc@AC [var]	2624.492	-422.3791	-3046.871	16665.76
I_fund_Q_SYM+_rc@AC [A]	0.430422	-0.342979	-0.773400	1.708901
I_fund_Q_SYM-_rc@AC [A]	-1.585392	-0.460297	1.125095	5.219631
I_fund_P_SYM+_rc@AC [A]	181.0197	4.554985	-176.4647	69.40689
I_fund_P_SYM-_rc@AC [A]	-0.949089	0.467169	1.416258	11.60526
U_fund_SYM+_rc@AC [V]	398.3114	96.20545	-302.1060	172.8265
U_fund_SYM-_rc@AC [V]	0.202187	0.485167	0.282980	19.80739
U+ [V]	229.9877	54.48968	-175.4980	155.1025
U- [V]	0.802132	0.192588	-0.609544	6.651073

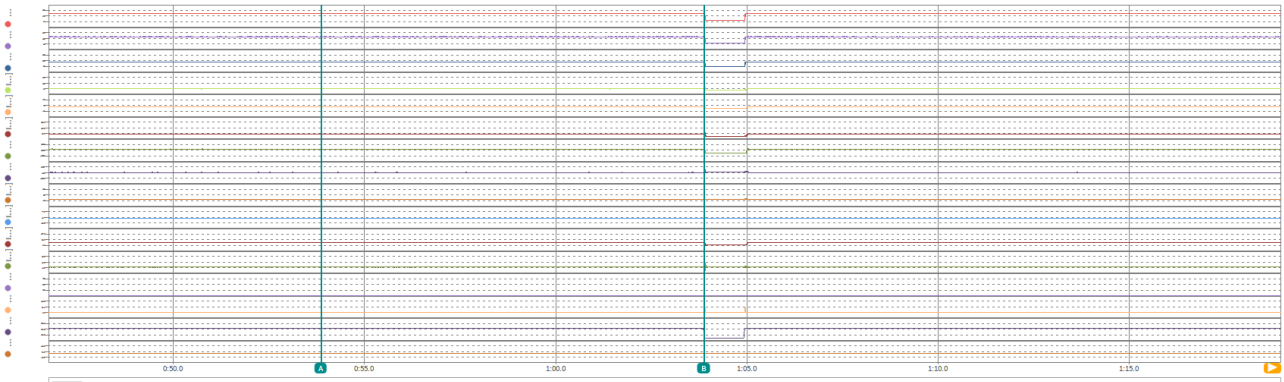
Recover time – Active power



	A	B	间隔	有效值
时间 [s]	1:07.15530	1:07.28130	0.12600	
U1_tRMS_rc@AC [V]	57.34788	231.8269	174.4790	220.3902
U2_tRMS_rc@AC [V]	57.25552	231.2504	173.9949	218.7483
U3_tRMS_rc@AC [V]	57.25724	230.8098	173.5525	220.7597
I1_tRMS_rc@AC [A]	5.099914	178.4145	173.3146	89.36921
I2_tRMS_rc@AC [A]	5.492230	180.1273	174.6351	90.23958
I3_tRMS_rc@AC [A]	5.026059	182.3085	177.2824	90.89430
P_t_rc@AC [W]	805.2813	124882.1	124076.8	61663.52
Q_t_rc@AC [var]	-389.9033	7284.506	7674.410	10273.84
I_fund_Q_SYM+_rc@AC [A]	-0.583372	2.868436	3.451808	6.350515
I_fund_Q_SYM-_rc@AC [A]	-0.426580	0.579611	1.006191	2.115331
I_fund_P_SYM+_rc@AC [A]	4.668456	179.9555	175.2870	88.81760
I_fund_P_SYM-_rc@AC [A]	0.167683	-0.878899	-1.046582	2.175249
U_fund_SYM+_rc@AC [V]	99.20364	400.6028	301.3991	377.9019
U_fund_SYM-_rc@AC [V]	0.186264	0.881257	0.694993	13.10301
U+ [V]	57.28185	231.3723	174.0904	193.8103
U- [V]	0.184667	0.581547	0.396879	5.475932

Test – VD2.2

Before fault

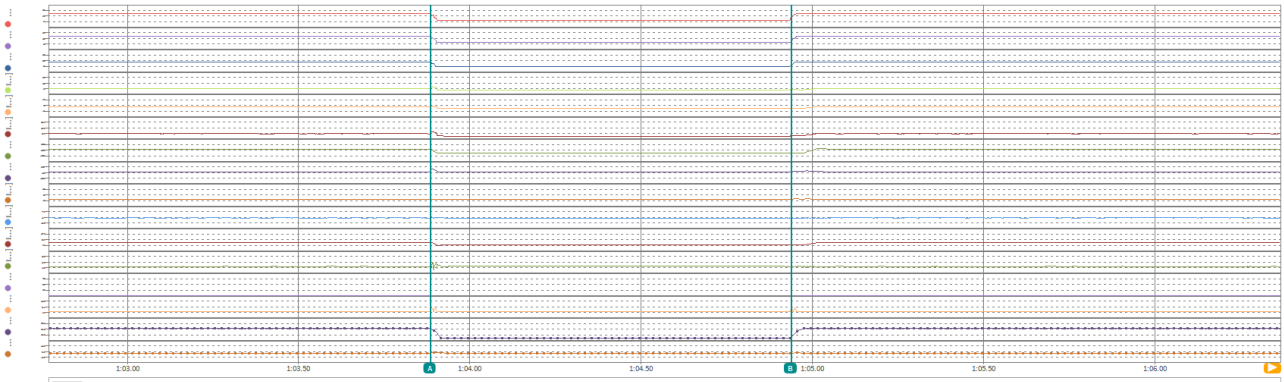


时间 [s]	A 0:53.875799	B 1:03.884649	间隔 0:10.008851	有效值
U1_tRMS_rc@AC [V]	230.2565	230.3983	0.141754	230.2394
U2_tRMS_rc@AC [V]	229.7169	229.1861	-0.530807	229.7426
U3_tRMS_rc@AC [V]	229.5636	229.9415	0.377838	229.5392
I1_tRMS_rc@AC [A]	36.10262	36.37988	0.277260	36.38724
I2_tRMS_rc@AC [A]	35.56330	36.59443	1.031132	36.57859
I3_tRMS_rc@AC [A]	38.05379	36.82457	-1.229218	37.36792
P_t_rc@AC [W]	25163.21	25171.04	7.830078	25296.63
Q_t_rc@AC [var]	-1663.176	-1813.550	-150.3734	1758.987
I_fund_Q_SYM+_rc@AC [A]	-0.447973	-0.754381	-0.306408	0.704296
I_fund_Q_SYM-_rc@AC [A]	0.647047	-0.170920	-0.817968	0.256017
I_fund_P_SYM+_rc@AC [A]	36.49140	36.49662	5.219e-3	36.68733
I_fund_P_SYM-_rc@AC [A]	-0.127605	-0.204913	-0.077308	0.312999
U_fund_SYM+_rc@AC [V]	398.1010	398.0686	-0.032349	398.0920
U_fund_SYM-_rc@AC [V]	1.037461	1.194274	0.156814	0.986414
U+ [V]	229.8497	229.8437	-5.991e-3	229.8453
U- [V]	0.592127	0.763476	0.171349	0.569322

After fault

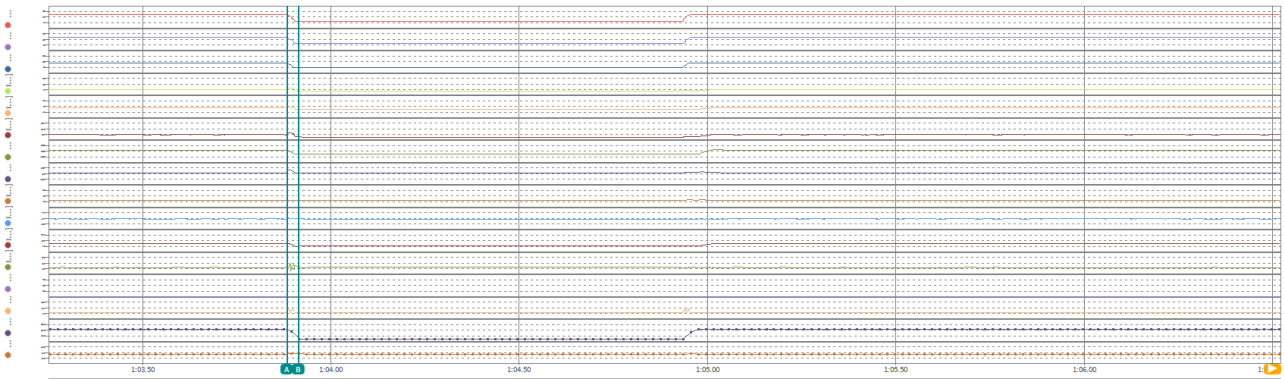
时间 [s]	A 1:04.933560	B 1:14.997902	间隔 0:10.064342	有效值
U1_tRMS_rc@AC [V]	57.64848	230.2317	172.5832	230.0770
U2_tRMS_rc@AC [V]	57.03712	229.7568	172.7196	229.5619
U3_tRMS_rc@AC [V]	57.15512	229.5042	172.3490	229.3802
I1_tRMS_rc@AC [A]	5.468700	35.67530	30.20660	36.29136
I2_tRMS_rc@AC [A]	4.646758	36.45956	31.81281	36.66399
I3_tRMS_rc@AC [A]	4.699374	37.46246	32.76309	37.26322
P_t_rc@AC [W]	773.7505	25126.83	24353.08	25254.91
Q_t_rc@AC [var]	-349.1844	-1757.305	-1408.120	1935.681
I_fund_Q_SYM+_rc@AC [A]	-0.418031	-0.727067	-0.309036	0.915609
I_fund_Q_SYM-_rc@AC [A]	-0.311370	0.164964	0.476334	0.205113
I_fund_P_SYM+_rc@AC [A]	4.492345	36.44418	31.95184	36.62884
I_fund_P_SYM-_rc@AC [A]	0.088709	-0.436070	-0.524779	0.302929
U_fund_SYM+_rc@AC [V]	99.19843	398.0758	298.8773	397.7652
U_fund_SYM-_rc@AC [V]	0.784058	0.982108	0.198050	1.760109
U+ [V]	57.27995	229.8227	172.5428	229.3049
U- [V]	0.191258	0.581458	0.390200	0.871614

Duration fault time



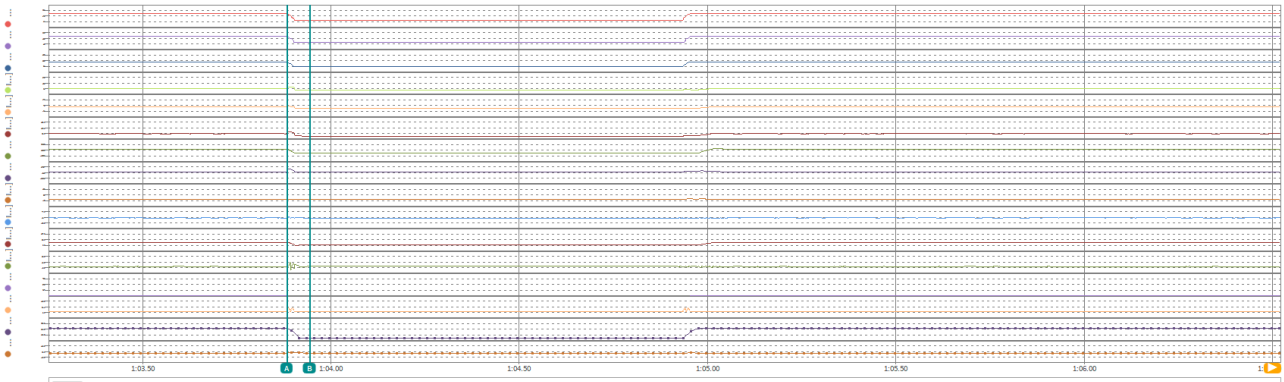
时间 [s]	A 1:03.884680	B 1:04.937625	间隔 1.052945	有效值
U1_tRMS_rc@AC [V]	230.3983	57.62066	-172.7776	62.43151
U2_tRMS_rc@AC [V]	229.1861	57.59185	-171.5942	62.92073
U3_tRMS_rc@AC [V]	229.9415	57.34836	-172.5931	61.74490
I1_tRMS_rc@AC [A]	36.37988	5.886425	-30.49345	10.92824
I2_tRMS_rc@AC [A]	36.59443	4.804948	-31.78948	8.321467
I3_tRMS_rc@AC [A]	36.82457	4.854372	-31.97020	9.825634
P_t_rc@AC [W]	25171.04	754.9235	-24416.12	2756.653
Q_t_rc@AC [var]	-1813.550	-479.4326	1334.117	3343.910
I_fund_Q_SYM+_rc@AC [A]	-0.754381	-0.502050	0.252331	0.476556
I_fund_Q_SYM-_rc@AC [A]	-0.170920	0.082668	0.253588	1.068570
I_fund_P_SYM+_rc@AC [A]	36.49662	4.432544	-32.06407	6.431906
I_fund_P_SYM-_rc@AC [A]	-0.204913	0.290741	0.495654	1.102277
U_fund_SYM+_rc@AC [V]	398.0686	99.52999	-298.5386	106.6873
U_fund_SYM-_rc@AC [V]	1.194274	0.225327	-0.968947	4.702315
U+ [V]	229.8437	57.27995	-172.5637	69.51390
U- [V]	0.763476	0.191258	-0.572218	1.823615

0-30ms



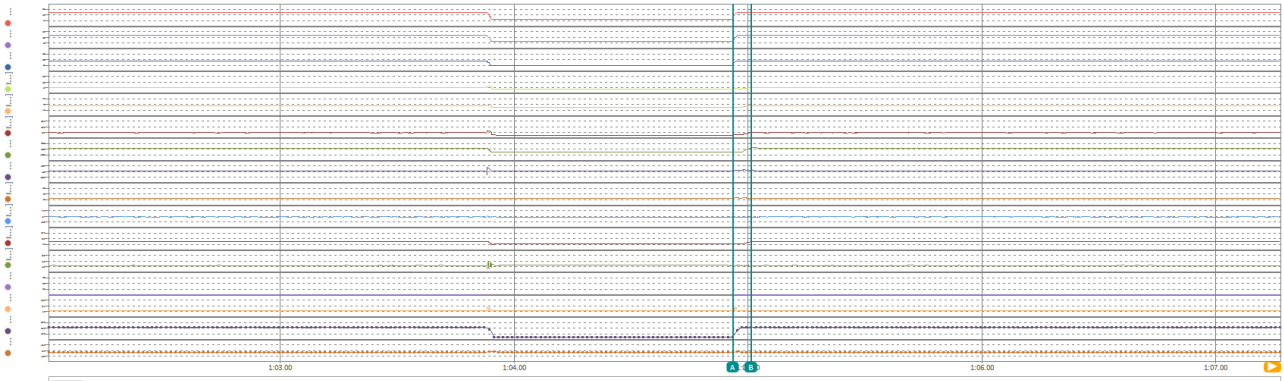
时间 [s]	A 1:03.884680	B 1:03.915521	间隔 0.030841	有效值
U1_tRMS_rc@AC [V]	230.3983	55.90002	-174.4982	153.4931
U2_tRMS_rc@AC [V]	229.1861	55.86087	-173.3252	161.4805
U3_tRMS_rc@AC [V]	229.9415	56.09961	-173.8419	147.6859
I1_tRMS_rc@AC [A]	36.37988	7.469217	-28.91066	54.23948
I2_tRMS_rc@AC [A]	36.59443	8.666816	-27.92762	39.75521
I3_tRMS_rc@AC [A]	36.82457	11.45412	-25.37045	48.93305
P_t_rc@AC [W]	25171.04	-399.2195	-25570.26	15214.11
Q_t_rc@AC [var]	-1813.550	-1491.741	321.8087	19053.00
I_fund_Q_SYM+_rc@AC [A]	-0.754381	-1.255422	-0.501041	0.540983
I_fund_Q_SYM-_rc@AC [A]	-0.170920	4.990062	5.160983	5.771856
I_fund_P_SYM+_rc@AC [A]	36.49662	-2.435120	-38.93174	26.94989
I_fund_P_SYM-_rc@AC [A]	-0.204913	3.269993	3.474906	5.757770
U_fund_SYM+_rc@AC [V]	398.0686	96.89908	-301.1696	249.1390
U_fund_SYM-_rc@AC [V]	1.194274	0.342260	-0.852015	26.92651
U+ [V]	229.8437	189.2577	-40.58600	210.5310
U- [V]	0.763476	11.56393	10.80046	8.194737

0-60ms



时间 [s]	A 1:03.884680	B 1:03.945164	间隔 0.060484	有效值
U1_tRMS_rc@AC [V]	230.3983	55.35270	-175.0456	116.8933
U2_tRMS_rc@AC [V]	229.1861	55.39453	-173.7916	122.2825
U3_tRMS_rc@AC [V]	229.9415	55.03475	-174.9067	112.9571
I1_tRMS_rc@AC [A]	36.37988	5.444086	-30.93579	39.11650
I2_tRMS_rc@AC [A]	36.59443	4.400853	-32.19358	28.82298
I3_tRMS_rc@AC [A]	36.82457	5.035981	-31.78859	35.40414
P_t_rc@AC [W]	25171.04	668.3887	-24502.66	10934.95
Q_t_rc@AC [var]	-1813.550	-478.9616	1334.588	13699.11
I_fund_Q_SYM+_rc@AC [A]	-0.754381	-0.663610	0.090771	0.831334
I_fund_Q_SYM-_rc@AC [A]	-0.170920	-0.039320	0.131601	4.357974
I_fund_P_SYM+_rc@AC [A]	36.49662	4.022426	-32.47419	19.45941
I_fund_P_SYM-_rc@AC [A]	-0.204913	0.451090	0.656004	4.281400
U_fund_SYM+_rc@AC [V]	398.0686	95.70421	-302.3644	191.1423
U_fund_SYM-_rc@AC [V]	1.194274	0.378775	-0.815499	19.34531
U+ [V]	229.8437	55.71004	-174.1337	154.8631
U- [V]	0.763476	0.124161	-0.639315	6.607729

Recover time – Active power



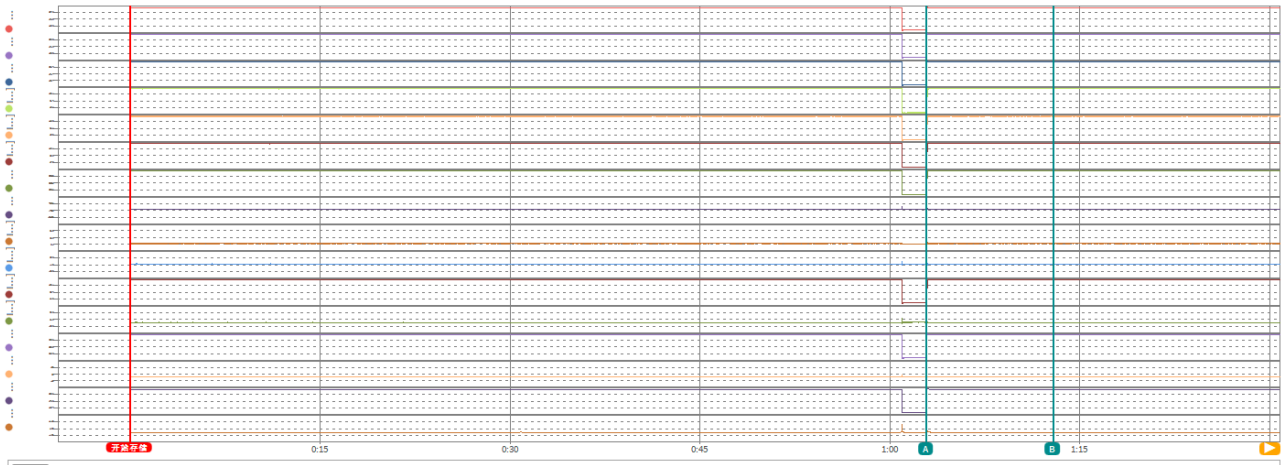
时间 [s]	A 1:04.937499	B 1:05.015090	间隔 0.077591	有效值
U1_tRMS_rc@AC [V]	57.62066	230.0311	172.4104	214.8595
U2_tRMS_rc@AC [V]	57.59185	229.8316	172.2398	212.4191
U3_tRMS_rc@AC [V]	57.34836	229.3960	172.0476	216.0470
I1_tRMS_rc@AC [A]	5.886425	36.13383	30.24740	20.10377
I2_tRMS_rc@AC [A]	4.804948	39.42439	34.61944	18.69034
I3_tRMS_rc@AC [A]	4.854372	39.53357	34.67919	18.66726
P_t_rc@AC [W]	754.9235	25424.21	24669.28	10622.95
Q_t_rc@AC [var]	-479.4326	7264.582	7744.014	7127.734
I_fund_Q_SYM+_rc@AC [A]	-0.502050	4.306932	4.808982	5.687338
I_fund_Q_SYM-_rc@AC [A]	0.082668	-1.317936	-1.400604	0.903790
I_fund_P_SYM+_rc@AC [A]	4.432544	36.86716	32.43461	15.46319
I_fund_P_SYM-_rc@AC [A]	0.290741	-1.129373	-1.420114	1.001932
U_fund_SYM+_rc@AC [V]	99.52999	397.9378	298.4078	366.3315
U_fund_SYM-_rc@AC [V]	0.225327	0.785736	0.560409	16.60678
U+ [V]	57.27995	229.2703	171.9903	167.9140
U- [V]	0.191258	0.383306	0.192049	6.730660

Test – VD3.1

Before fault

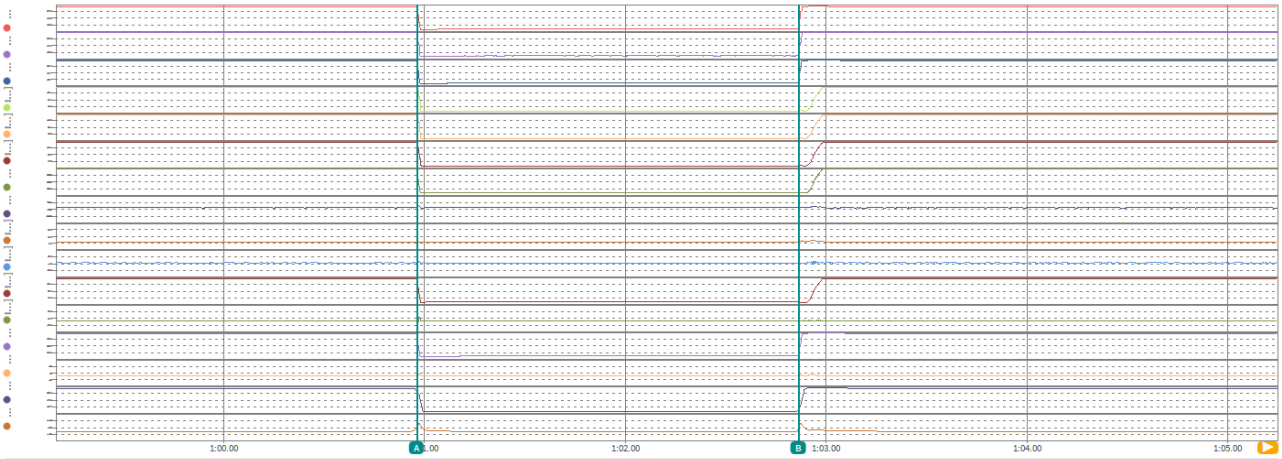
	A	B	间隔	有效值
时间 [s]	0:50.96460	1:00.96460	0:10.00000	
U1_tRMS_rc@AC [V]	230.5045	230.5370	0.032471	230.5083
U2_tRMS_rc@AC [V]	229.7968	229.7796	-0.017227	229.8183
U3_tRMS_rc@AC [V]	229.7076	229.6656	-0.041977	229.6958
I1_tRMS_rc@AC [A]	179.7836	178.9954	-0.788239	179.4229
I2_tRMS_rc@AC [A]	181.6070	181.6926	0.085571	181.3073
I3_tRMS_rc@AC [A]	183.8617	183.8844	0.022705	183.6118
P_t_rc@AC [W]	125390.1	125230.8	-159.3672	125180.1
Q_t_rc@AC [var]	2121.453	1968.403	-153.0502	2281.229
I_fund_Q_SYM+_rc@AC [A]	0.365079	0.418136	0.053057	0.448120
I_fund_Q_SYM-_rc@AC [A]	0.154398	0.364289	0.209891	0.383078
I_fund_P_SYM+_rc@AC [A]	181.7250	181.4978	-0.227188	181.4182
I_fund_P_SYM-_rc@AC [A]	-0.914400	-1.040097	-0.125696	1.008220
U_fund_SYM+_rc@AC [V]	398.3712	398.3531	-0.018188	398.3788
U_fund_SYM-_rc@AC [V]	1.065763	1.562102	0.496339	1.073300
U+ [V]	230.0153	230.0077	-7.616e-3	230.0108
U- [V]	0.616741	0.890872	0.274131	0.619232

After fault



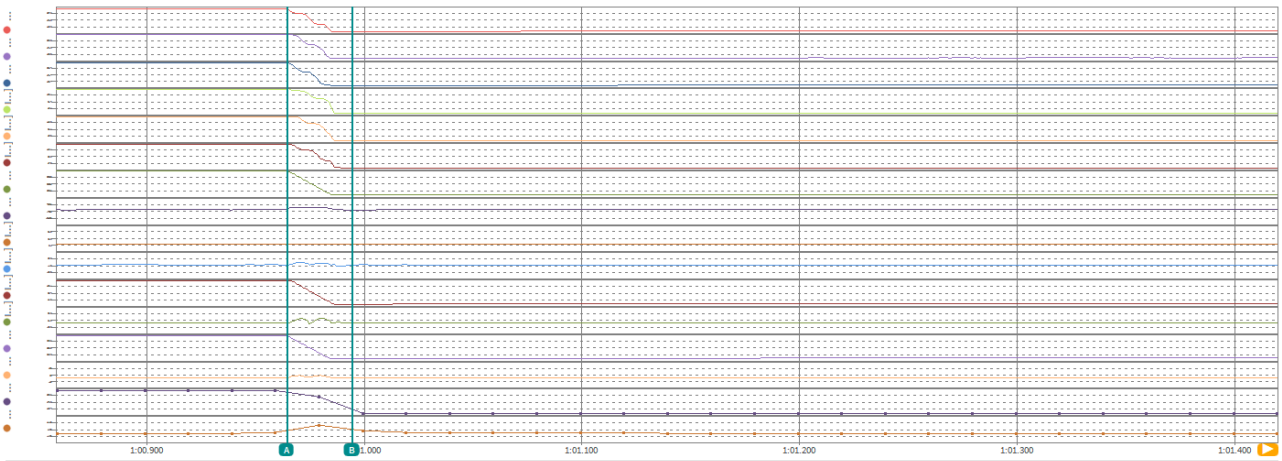
	A	B	间隔	有效值
时间 [s]	1:02.86460	1:12.86460	0:10.00000	
U1_tRMS_rc@AC [V]	115.3025	230.5130	115.2105	230.4836
U2_tRMS_rc@AC [V]	114.7294	229.8007	115.0713	229.7049
U3_tRMS_rc@AC [V]	114.1883	229.6947	115.5065	229.6603
I1_tRMS_rc@AC [A]	5.277460	178.8065	173.5290	178.4628
I2_tRMS_rc@AC [A]	5.140130	181.4194	176.2793	180.5218
I3_tRMS_rc@AC [A]	5.342096	183.7560	178.4139	182.8828
P_t_rc@AC [W]	1581.563	125095.8	123514.3	124618.3
Q_t_rc@AC [var]	-876.5641	2207.774	3084.339	2584.755
I_fund_Q_SYM+_rc@AC [A]	-0.620856	0.651823	1.272679	0.853934
I_fund_Q_SYM-_rc@AC [A]	0.037707	0.256777	0.219070	0.456216
I_fund_P_SYM+_rc@AC [A]	4.586672	181.2984	176.7117	180.5832
I_fund_P_SYM-_rc@AC [A]	0.231242	-1.198217	-1.429459	1.079506
U_fund_SYM+_rc@AC [V]	198.7144	398.3706	199.6561	398.2619
U_fund_SYM-_rc@AC [V]	0.979702	1.059532	0.079830	1.486940
U+ [V]	114.7398	229.9841	115.2443	229.7328
U- [V]	0.396133	0.625668	0.229535	0.765566

Duration fault time



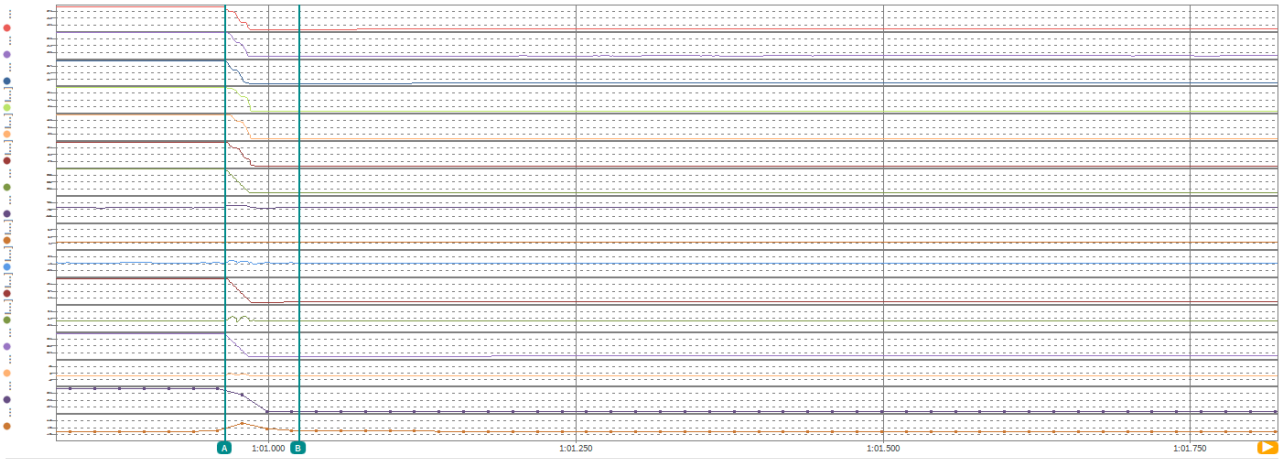
	A	B	间隔	有效值
时间 [s]	1:00.96460	1:02.86460	1.90000	
U1_tRMS_rc@AC [V]	230.5370	115.3025	-115.2345	115.9345
U2_tRMS_rc@AC [V]	229.7796	114.7294	-115.0502	115.6989
U3_tRMS_rc@AC [V]	229.6656	114.1883	-115.4774	115.0369
I1_tRMS_rc@AC [A]	178.9954	5.277460	-173.7179	16.11138
I2_tRMS_rc@AC [A]	181.6926	5.140130	-176.5524	16.14764
I3_tRMS_rc@AC [A]	183.8844	5.342096	-178.5423	15.28670
P_t_rc@AC [W]	125230.8	1581.563	-123649.2	8484.131
Q_t_rc@AC [var]	1968.403	-876.5641	-2844.967	3292.229
I_fund_Q_SYM+_rc@AC [A]	0.418136	-0.620856	-1.038992	0.676377
I_fund_Q_SYM-_rc@AC [A]	0.364289	0.037707	-0.326582	0.739051
I_fund_P_SYM+_rc@AC [A]	181.4978	4.586672	-176.9111	13.34746
I_fund_P_SYM-_rc@AC [A]	-1.040097	0.231242	1.271338	2.034604
U_fund_SYM+_rc@AC [V]	398.3531	198.7144	-199.6386	199.9545
U_fund_SYM-_rc@AC [V]	1.562102	0.979702	-0.582400	2.525789
U+ [V]	230.0077	114.7398	-115.2679	117.5312
U- [V]	0.890872	0.396133	-0.494739	1.096643

0-30ms



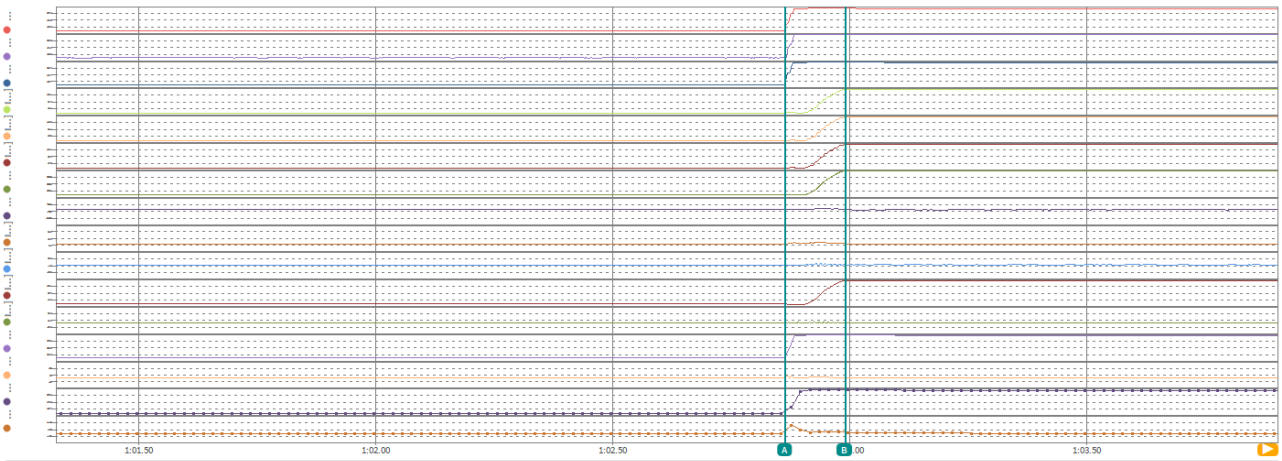
	A	B	间隔	有效值
时间 [s]	1:00.96460	1:00.99460	0.03000	
U1_tRMS_rc@AC [V]	230.5370	111.1125	-119.4245	164.0784
U2_tRMS_rc@AC [V]	229.7796	110.9137	-118.8659	169.4044
U3_tRMS_rc@AC [V]	229.6656	111.1398	-118.5258	158.4030
I1_tRMS_rc@AC [A]	178.9954	5.969216	-173.0262	119.6058
I2_tRMS_rc@AC [A]	181.6926	6.747627	-174.9449	120.2401
I3_tRMS_rc@AC [A]	183.8844	8.492198	-175.3922	112.1029
P_t_rc@AC [W]	125230.8	-876.2567	-126107.0	65334.99
Q_t_rc@AC [var]	1968.403	-2186.426	-4154.829	24842.29
I_fund_Q_SYM+_rc@AC [A]	0.418136	-0.818425	-1.236561	1.507399
I_fund_Q_SYM-_rc@AC [A]	0.364289	-3.296681	-3.660970	5.646245
I_fund_P_SYM+_rc@AC [A]	181.4978	-2.642687	-184.1405	98.48074
I_fund_P_SYM-_rc@AC [A]	-1.040097	-3.029600	-1.989503	15.74482
U_fund_SYM+_rc@AC [V]	398.3531	192.3472	-206.0059	275.7965
U_fund_SYM-_rc@AC [V]	1.562102	0.056845	-1.505257	18.70173
U+ [V]	230.0077	197.0541	-32.95363	214.1657
U- [V]	0.890872	9.114712	8.223840	6.475786

0-60ms



	A	B	间隔	有效值
时间 [s]	1:00.96460	1:01.02460	0.06000	
U1_tRMS_rc@AC [V]	230.5370	113.3385	-117.1985	140.9943
U2_tRMS_rc@AC [V]	229.7796	113.2837	-116.4959	144.0503
U3_tRMS_rc@AC [V]	229.6656	108.9557	-120.7099	136.8747
I1_tRMS_rc@AC [A]	178.9954	5.801508	-173.1939	85.33751
I2_tRMS_rc@AC [A]	181.6926	5.951619	-175.7409	85.80550
I3_tRMS_rc@AC [A]	183.8844	6.214273	-177.6701	80.02291
P_t_rc@AC [W]	125230.8	1756.446	-123474.3	46581.64
Q_t_rc@AC [var]	1968.403	-974.8438	-2943.246	17740.98
I_fund_Q_SYM+_rc@AC [A]	0.418136	-0.416452	-0.834589	1.234049
I_fund_Q_SYM-_rc@AC [A]	0.364289	0.039386	-0.324903	4.087737
I_fund_P_SYM+_rc@AC [A]	181.4978	5.222242	-176.2755	70.23833
I_fund_P_SYM-_rc@AC [A]	-1.040097	0.178514	1.218610	11.29599
U_fund_SYM+_rc@AC [V]	398.3531	193.7394	-204.6136	238.7446
U_fund_SYM-_rc@AC [V]	1.562102	2.849962	1.287860	13.38355
U+ [V]	230.0077	111.5390	-118.4688	171.3138
U- [V]	0.890872	0.772153	-0.118719	4.870942

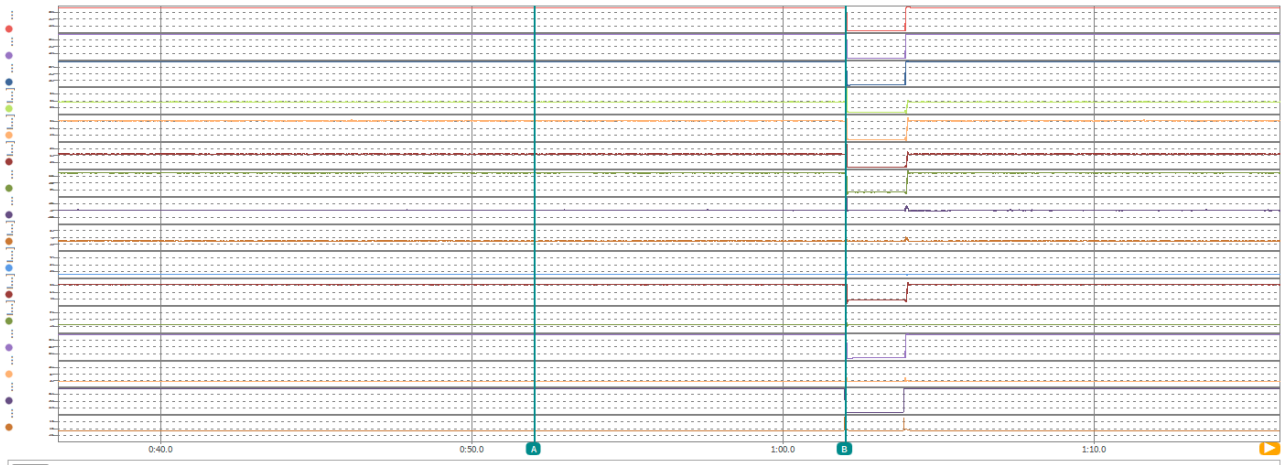
Recover time – Active power



	A	B	间隔	有效值
时间 [s]	1:02.86460	1:02.99060	0.12600	
U1_tRMS_rc@AC [V]	115.3025	234.8807	119.5782	226.2532
U2_tRMS_rc@AC [V]	114.7294	231.0920	116.3626	221.6177
U3_tRMS_rc@AC [V]	114.1883	232.5228	118.3346	224.9076
I1_tRMS_rc@AC [A]	5.277460	175.4466	170.1691	89.86029
I2_tRMS_rc@AC [A]	5.140130	180.2598	175.1197	91.00660
I3_tRMS_rc@AC [A]	5.342096	181.0133	175.6712	91.77901
P_t_rc@AC [W]	1581.563	124754.4	123172.9	62835.30
Q_t_rc@AC [var]	-876.5641	7082.775	7959.339	10082.33
I_fund_Q_SYM+_rc@AC [A]	-0.620856	2.759750	3.380606	6.304797
I_fund_Q_SYM-_rc@AC [A]	0.037707	0.856278	0.818571	2.120206
I_fund_P_SYM+_rc@AC [A]	4.586672	178.6070	174.0204	89.66742
I_fund_P_SYM-_rc@AC [A]	0.231242	-1.548848	-1.780090	2.150000
U_fund_SYM+_rc@AC [V]	198.7144	403.2648	204.5504	387.0925
U_fund_SYM-_rc@AC [V]	0.979702	2.489469	1.509768	9.061632
U+ [V]	114.7398	233.6891	118.9493	207.8071
U- [V]	0.396133	1.773642	1.377510	3.738043

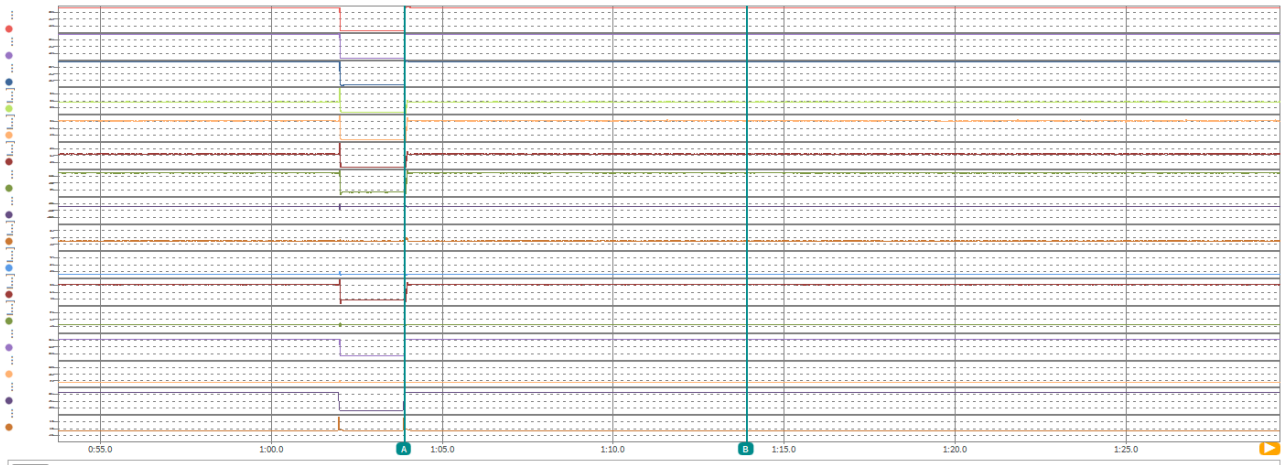
Test – VD3.2

Before fault



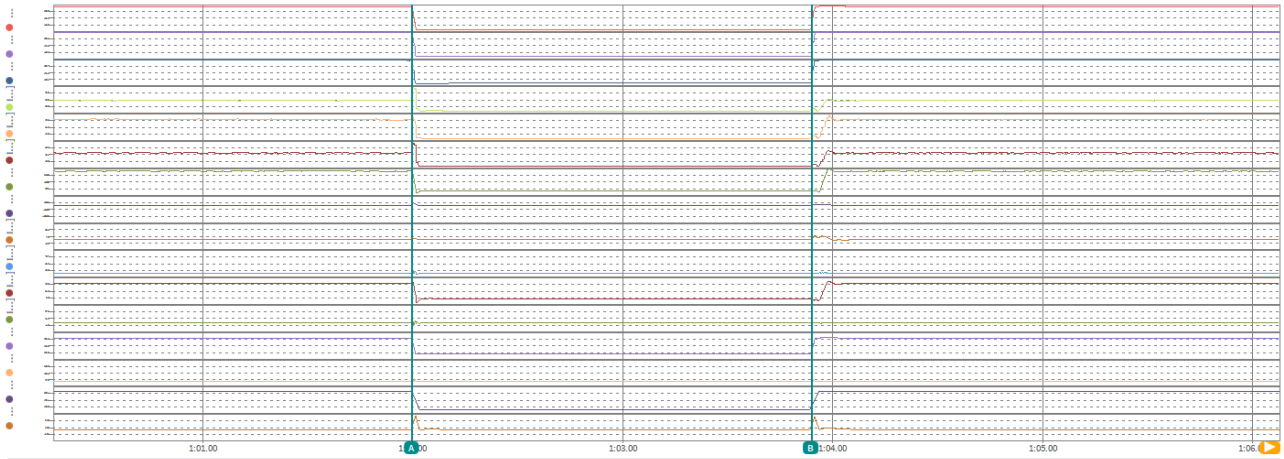
	A	B	间隔	有效值
时间 [s]	0:51.99890	1:01.99890	0:10.00000	
U1_tRMS_rc@AC [V]	230.2086	230.0043	-0.204391	230.2321
U2_tRMS_rc@AC [V]	229.7126	229.4605	-0.252151	229.7306
U3_tRMS_rc@AC [V]	229.5211	230.1121	0.590973	229.5330
I1_tRMS_rc@AC [A]	36.20380	36.54458	0.340775	36.38824
I2_tRMS_rc@AC [A]	36.28864	36.55294	0.264305	36.68740
I3_tRMS_rc@AC [A]	37.37733	37.47089	0.093563	37.29113
P_t_rc@AC [W]	25192.44	25351.18	158.7402	25307.01
Q_t_rc@AC [var]	-1693.151	-1805.143	-111.9921	1711.603
I_fund_Q_SYM+_rc@AC [A]	-0.584345	-1.064807	-0.480462	0.665654
I_fund_Q_SYM-_rc@AC [A]	0.203406	0.422750	0.219344	0.183785
I_fund_P_SYM+_rc@AC [A]	36.53996	36.76141	0.221451	36.70381
I_fund_P_SYM-_rc@AC [A]	-0.123295	0.349590	0.472886	0.238416
U_fund_SYM+_rc@AC [V]	398.0467	398.1180	0.071289	398.0775
U_fund_SYM-_rc@AC [V]	0.948742	0.858083	-0.090658	0.985216
U+ [V]	229.8243	229.8447	0.020414	229.8368
U- [V]	0.569008	0.662554	0.093547	0.567797

After fault



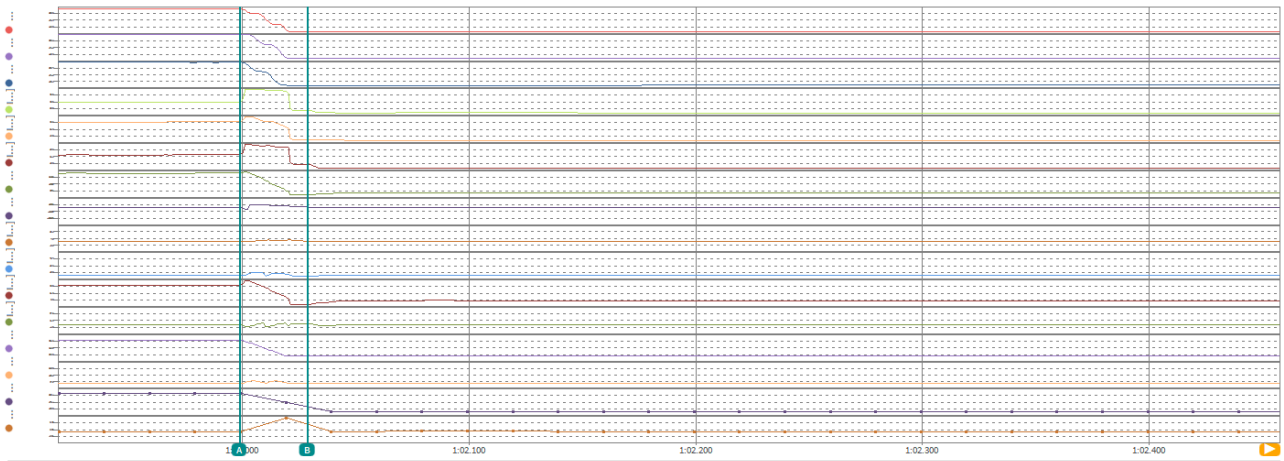
	A	B	间隔	有效值
时间 [s]	1:03.89890	1:13.89890	0:10.00000	
U1_tRMS_rc@AC [V]	115.1894	230.1803	114.9908	230.1857
U2_tRMS_rc@AC [V]	114.8232	229.7301	114.9069	229.6145
U3_tRMS_rc@AC [V]	114.2366	229.5329	115.2963	229.4610
I1_tRMS_rc@AC [A]	5.723090	36.06512	30.34203	36.27718
I2_tRMS_rc@AC [A]	5.042294	36.95754	31.91525	36.62917
I3_tRMS_rc@AC [A]	5.628618	36.55208	30.92346	37.22982
P_t_rc@AC [W]	1673.302	25122.65	23449.35	25238.16
Q_t_rc@AC [var]	-859.6498	-1722.652	-863.0023	1955.871
I_fund_Q_SYM+_rc@AC [A]	-0.614141	-0.840836	-0.226696	0.852743
I_fund_Q_SYM-_rc@AC [A]	1.080e-3	-0.279704	-0.280783	0.217356
I_fund_P_SYM+_rc@AC [A]	4.853852	36.44006	31.58621	36.60056
I_fund_P_SYM-_rc@AC [A]	0.203654	-0.114880	-0.318533	0.277824
U_fund_SYM+_rc@AC [V]	198.7349	398.0471	199.3122	397.9255
U_fund_SYM-_rc@AC [V]	0.854301	0.960533	0.106233	1.417801
U+ [V]	114.7717	229.8289	115.0572	229.4171
U- [V]	0.352135	0.544388	0.192253	0.780463

Duration fault time



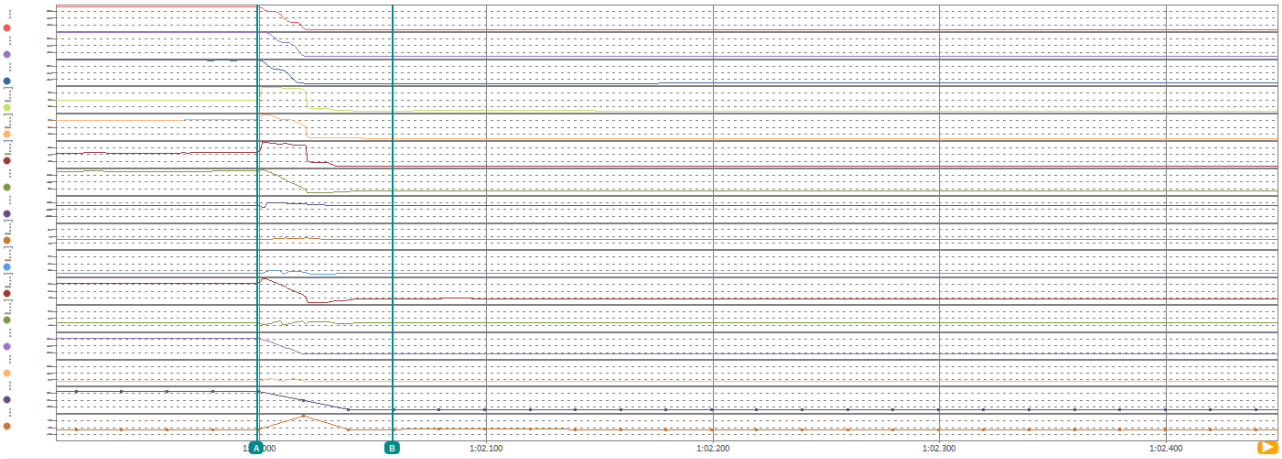
	A	B	间隔	有效值
时间 [s]	1:01.99890	1:03.89890	1.90000	
U1_tRMS_rc@AC [V]	230.0043	115.1894	-114.8148	116.0304
U2_tRMS_rc@AC [V]	229.4605	114.8232	-114.6373	115.8648
U3_tRMS_rc@AC [V]	230.1121	114.2366	-115.8755	115.2412
I1_tRMS_rc@AC [A]	36.54458	5.723090	-30.82149	9.541072
I2_tRMS_rc@AC [A]	36.55294	5.042294	-31.51065	6.479476
I3_tRMS_rc@AC [A]	37.47089	5.628618	-31.84228	8.466116
P_t_rc@AC [W]	25351.18	1673.302	-23677.88	2656.852
Q_t_rc@AC [var]	-1805.143	-859.6498	945.4935	2680.967
I_fund_Q_SYM+_rc@AC [A]	-1.064807	-0.614141	0.450666	0.655211
I_fund_Q_SYM-_rc@AC [A]	0.422750	1.080e-3	-0.421670	0.954339
I_fund_P_SYM+_rc@AC [A]	36.76141	4.853852	-31.90756	5.946002
I_fund_P_SYM-_rc@AC [A]	0.349590	0.203654	-0.145937	0.925783
U_fund_SYM+_rc@AC [V]	398.1180	198.7349	-199.3831	200.2379
U_fund_SYM-_rc@AC [V]	0.858083	0.854301	-3.783e-3	2.464157
U+ [V]	229.8447	114.7717	-115.0730	118.8995
U- [V]	0.662554	0.352135	-0.310420	1.294602

0-30ms



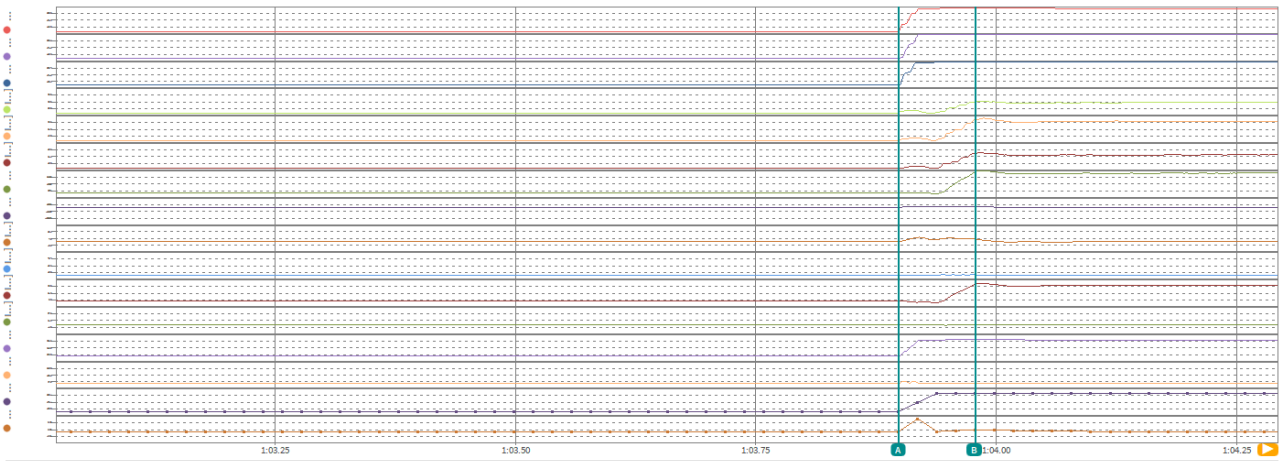
	A	B	间隔	有效值
时间 [s]	1:01.99890	1:02.02890	0.03000	
U1_tRMS_rc@AC [V]	230.0043	113.1791	-116.8251	168.4650
U2_tRMS_rc@AC [V]	229.4605	113.5284	-115.9321	174.2623
U3_tRMS_rc@AC [V]	230.1121	113.2661	-116.8460	163.5134
I1_tRMS_rc@AC [A]	36.54458	12.37532	-24.16926	60.08059
I2_tRMS_rc@AC [A]	36.55294	6.455826	-30.09711	32.24325
I3_tRMS_rc@AC [A]	37.47089	14.68618	-22.78471	48.82962
P_t_rc@AC [W]	25351.18	-1264.089	-26615.27	16408.12
Q_t_rc@AC [var]	-1805.143	3580.397	5385.541	19694.55
I_fund_Q_SYM+_rc@AC [A]	-1.064807	0.021346	1.086153	1.420393
I_fund_Q_SYM-_rc@AC [A]	0.422750	-3.671633	-4.094384	7.197317
I_fund_P_SYM+_rc@AC [A]	36.76141	-3.762761	-40.52417	28.07238
I_fund_P_SYM-_rc@AC [A]	0.349590	7.296969	6.947379	6.652462
U_fund_SYM+_rc@AC [V]	398.1180	196.2763	-201.8417	284.9117
U_fund_SYM-_rc@AC [V]	0.858083	0.298220	-0.559863	18.48358
U+ [V]	229.8447	172.4866	-57.35809	212.4537
U- [V]	0.662554	12.00799	11.34543	6.958944

0-60ms



	A	B	间隔	有效值
时间 [s]	1:01.99890	1:02.05890	0.06000	
U1_tRMS_rc@AC [V]	230.0043	113.0526	-116.9516	144.0082
U2_tRMS_rc@AC [V]	229.4605	112.8415	-116.6190	147.3529
U3_tRMS_rc@AC [V]	230.1121	109.8732	-120.2389	140.5640
I1_tRMS_rc@AC [A]	36.54458	5.944783	-30.59980	43.10508
I2_tRMS_rc@AC [A]	36.55294	5.015890	-31.53705	23.33741
I3_tRMS_rc@AC [A]	37.47089	6.006995	-31.46390	35.19029
P_t_rc@AC [W]	25351.18	1553.535	-23797.65	11723.90
Q_t_rc@AC [var]	-1805.143	-1090.525	714.6188	14105.84
I_fund_Q_SYM+_rc@AC [A]	-1.064807	-0.820136	0.244671	1.196022
I_fund_Q_SYM-_rc@AC [A]	0.422750	0.117396	-0.305354	5.311548
I_fund_P_SYM+_rc@AC [A]	36.76141	4.615294	-32.14612	20.15004
I_fund_P_SYM-_rc@AC [A]	0.349590	1.558e-3	-0.348032	5.082631
U_fund_SYM+_rc@AC [V]	398.1180	193.8495	-204.2685	244.9827
U_fund_SYM-_rc@AC [V]	0.858083	2.030921	1.172838	13.19844
U+ [V]	229.8447	113.3567	-116.4880	192.5224
U- [V]	0.662554	0.215315	-0.447239	6.027584

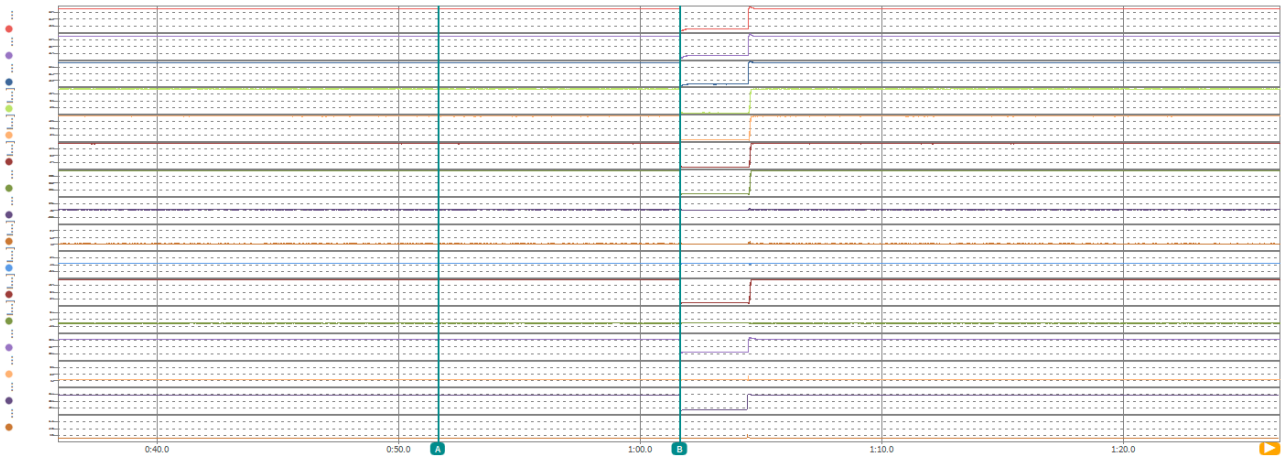
Recover time – Active power



	A	B	间隔	有效值
时间 [s]	1:03.89890	1:03.97790	0.07900	
U1_tRMS_rc@AC [V]	115.1894	235.8757	120.6863	218.6658
U2_tRMS_rc@AC [V]	114.8232	229.7027	114.8795	214.2929
U3_tRMS_rc@AC [V]	114.2366	232.9335	118.6969	218.3022
I1_tRMS_rc@AC [A]	5.723090	36.23902	30.51593	18.17510
I2_tRMS_rc@AC [A]	5.042294	39.00394	33.96164	17.30376
I3_tRMS_rc@AC [A]	5.628618	40.02535	34.39673	18.34494
P_t_rc@AC [W]	1673.302	25995.77	24322.47	10605.07
Q_t_rc@AC [var]	-859.6498	6640.290	7499.939	6246.972
I_fund_Q_SYM+_rc@AC [A]	-0.614141	4.596547	5.210688	5.199090
I_fund_Q_SYM-_rc@AC [A]	1.080e-3	1.241377	1.240297	0.970187
I_fund_P_SYM+_rc@AC [A]	4.853852	37.21565	32.36180	15.24279
I_fund_P_SYM-_rc@AC [A]	0.203654	-1.433533	-1.637187	0.915821
U_fund_SYM+_rc@AC [V]	198.7349	403.2818	204.5469	373.8128
U_fund_SYM-_rc@AC [V]	0.854301	3.604396	2.750096	11.12139
U+ [V]	114.7717	231.4551	116.6834	179.7285
U- [V]	0.352135	1.595940	1.243805	5.128864

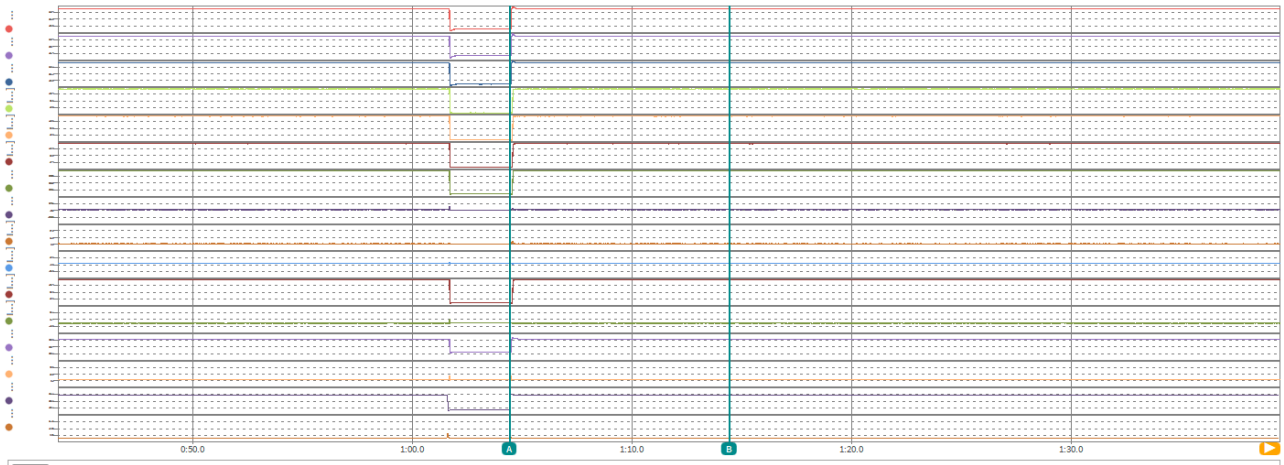
Test – VD4.1

Before fault



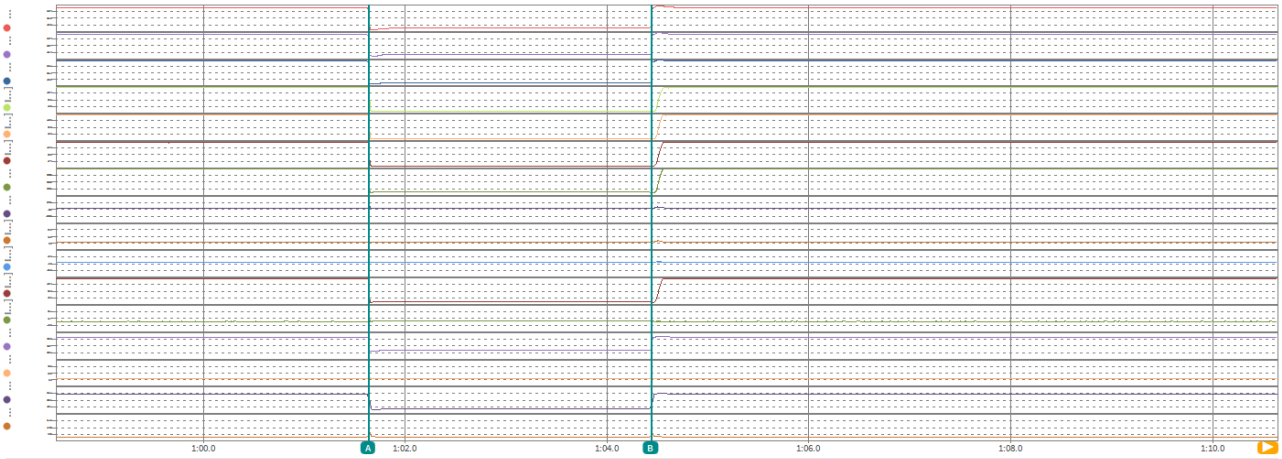
	A	B	间隔	有效值
时间 [s]	0:51.63970	1:01.63970	0:10.00000	
U1_tRMS_rc@AC [V]	230.5223	230.4733	-0.048935	230.5118
U2_tRMS_rc@AC [V]	229.8518	229.7955	-0.056366	229.8141
U3_tRMS_rc@AC [V]	229.7045	229.7093	4.837e-3	229.6965
I1_tRMS_rc@AC [A]	179.5123	178.6882	-0.824081	179.4416
I2_tRMS_rc@AC [A]	180.9079	180.7850	-0.122879	181.1835
I3_tRMS_rc@AC [A]	183.8318	184.6812	0.849365	183.6202
P_t_rc@AC [W]	125168.0	125118.0	-49.99219	125154.9
Q_t_rc@AC [var]	2378.434	2804.881	426.4468	2426.521
I_fund_Q_SYM+_rc@AC [A]	0.364037	0.432583	0.068547	0.578675
I_fund_Q_SYM-_rc@AC [A]	0.669178	0.456286	-0.212892	0.544354
I_fund_P_SYM+_rc@AC [A]	181.3854	181.3399	-0.045471	181.3813
I_fund_P_SYM-_rc@AC [A]	-0.953807	-1.508082	-0.554275	0.998195
U_fund_SYM+_rc@AC [V]	398.4113	398.3529	-0.058380	398.3788
U_fund_SYM-_rc@AC [V]	1.074746	1.059577	-0.015169	1.076519
U+ [V]	230.0302	230.0203	-9.899e-3	230.0110
U- [V]	0.604195	0.629532	0.025337	0.621300

After fault



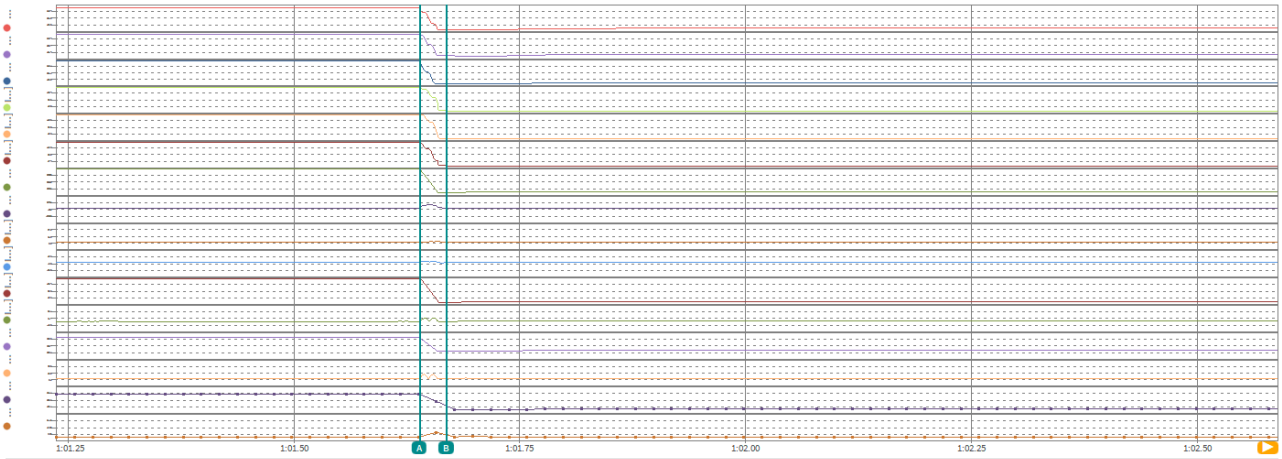
	A	B	间隔	有效值
时间 [s]	1:04.44070	1:14.44070	0:10.00000	
U1_tRMS_rc@AC [V]	172.5930	230.5312	57.93816	230.5174
U2_tRMS_rc@AC [V]	172.1507	229.8049	57.65425	229.8321
U3_tRMS_rc@AC [V]	171.8245	229.7356	57.91103	229.6932
I1_tRMS_rc@AC [A]	4.711617	178.3364	173.6247	178.4955
I2_tRMS_rc@AC [A]	4.804440	181.0284	176.2240	180.2948
I3_tRMS_rc@AC [A]	4.857415	184.3738	179.5164	182.7125
P_t_rc@AC [W]	2086.942	125038.3	122951.4	124540.5
Q_t_rc@AC [var]	-1330.344	2838.594	4168.938	2716.560
I_fund_Q_SYM+_rc@AC [A]	-0.735070	1.112938	1.848008	0.907882
I_fund_Q_SYM-_rc@AC [A]	-0.232526	0.756804	0.989330	0.560558
I_fund_P_SYM+_rc@AC [A]	4.037549	181.2034	177.1659	180.4572
I_fund_P_SYM-_rc@AC [A]	0.091927	-1.771066	-1.862993	1.078190
U_fund_SYM+_rc@AC [V]	298.2318	398.4071	100.1754	398.3862
U_fund_SYM-_rc@AC [V]	0.556488	1.075034	0.518546	1.193618
U+ [V]	172.1760	230.0246	57.84866	229.9130
U- [V]	0.521224	0.632606	0.111382	0.678020

Duration fault time



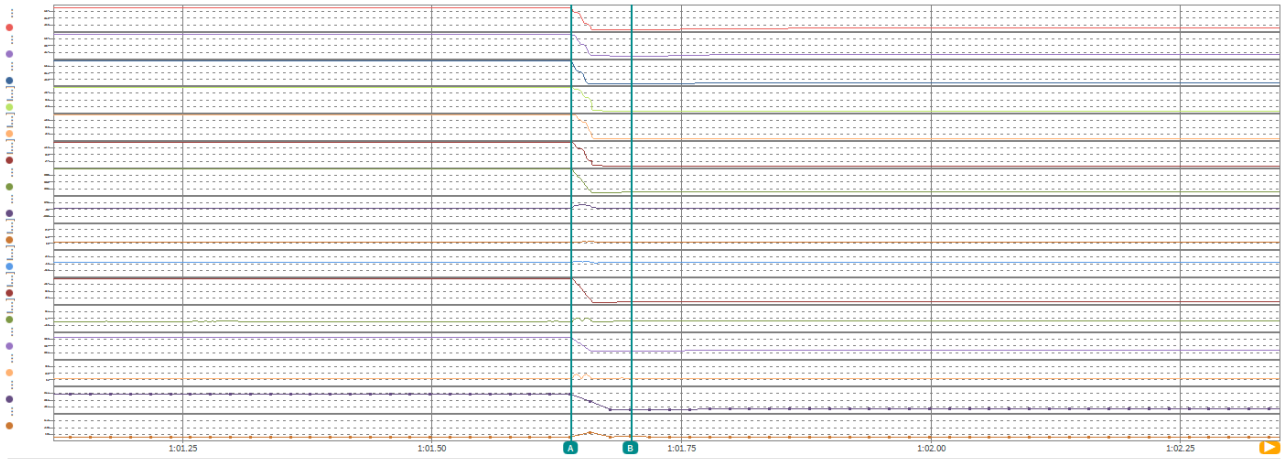
	A	B	间隔	有效值
时间 [s]	1:01.63970	1:04.43970	2.80000	
U1_tRMS_rc@AC [V]	230.4733	172.5892	-57.88412	172.6560
U2_tRMS_rc@AC [V]	229.7955	172.1482	-57.64729	172.1446
U3_tRMS_rc@AC [V]	229.7093	171.8223	-57.88701	171.9516
I1_tRMS_rc@AC [A]	178.6882	4.628260	-174.0599	13.56861
I2_tRMS_rc@AC [A]	180.7850	4.904451	-175.8806	13.59941
I3_tRMS_rc@AC [A]	184.6812	4.811572	-179.8696	12.96267
P_t_rc@AC [W]	125118.0	2093.145	-123024.8	7502.077
Q_t_rc@AC [var]	2804.881	-1311.004	-4115.885	3559.567
I_fund_Q_SYM+_rc@AC [A]	0.432583	-0.656752	-1.089336	0.808209
I_fund_Q_SYM-_rc@AC [A]	0.456286	-0.327608	-0.783894	0.561353
I_fund_P_SYM+_rc@AC [A]	181.3399	4.050184	-177.2897	11.40355
I_fund_P_SYM-_rc@AC [A]	-1.508082	-0.021395	1.486688	1.674496
U_fund_SYM+_rc@AC [V]	398.3529	298.2267	-100.1262	298.3183
U_fund_SYM-_rc@AC [V]	1.059577	0.590675	-0.468901	1.356674
U+ [V]	230.0203	172.1915	-57.82884	173.1637
U- [V]	0.629532	0.542827	-0.086706	0.736669

0-30ms



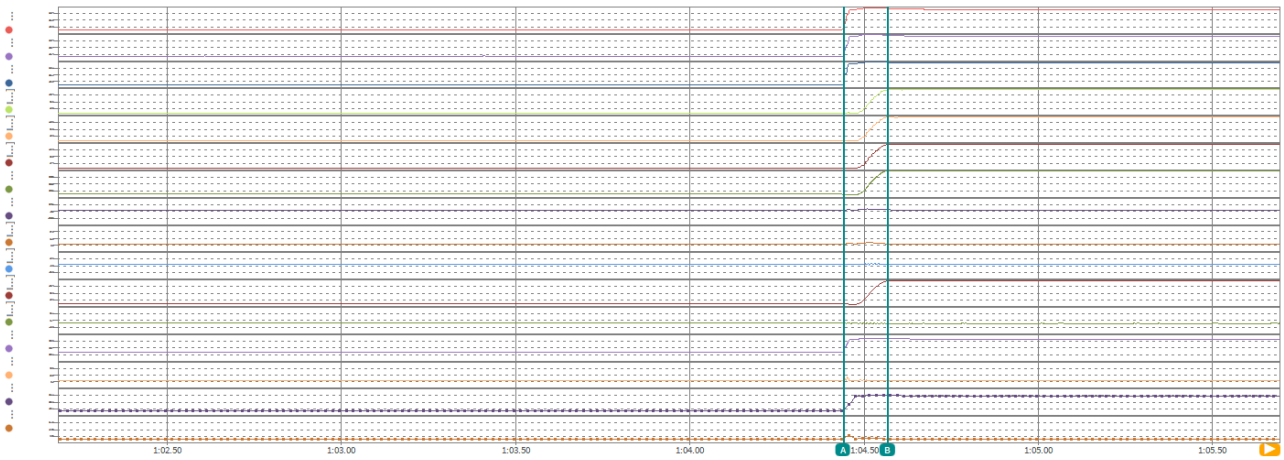
	A	B	间隔	有效值
时间 [s]	1:01.63970	1:01.66970	0.03000	
U1_tRMS_rc@AC [V]	230.4733	168.1901	-62.28323	193.5879
U2_tRMS_rc@AC [V]	229.7955	168.1273	-61.66817	196.6022
U3_tRMS_rc@AC [V]	229.7093	168.2528	-61.45653	190.9784
I1_tRMS_rc@AC [A]	178.6882	9.153954	-169.5342	120.6685
I2_tRMS_rc@AC [A]	180.7850	6.380311	-174.4047	120.1926
I3_tRMS_rc@AC [A]	184.6812	11.20945	-173.4717	112.1291
P_t_rc@AC [W]	125118.0	-2082.602	-127200.6	68232.00
Q_t_rc@AC [var]	2804.881	3987.197	1182.316	30997.17
I_fund_Q_SYM+_rc@AC [A]	0.432583	0.782552	0.349968	2.851697
I_fund_Q_SYM-_rc@AC [A]	0.456286	-3.963254	-4.419540	4.880508
I_fund_P_SYM+_rc@AC [A]	181.3399	-4.139134	-185.4790	100.6873
I_fund_P_SYM-_rc@AC [A]	-1.508082	-3.632303	-2.124221	15.69085
U_fund_SYM+_rc@AC [V]	398.3529	291.3080	-107.0449	333.6487
U_fund_SYM-_rc@AC [V]	1.059577	0.256869	-0.802707	9.808542
U+ [V]	230.0203	200.9937	-29.02662	220.7638
U- [V]	0.629532	6.315504	5.685972	3.682569

0-60ms



	A	B	间隔	有效值
时间 [s]	1:01.63970	1:01.69970	0.06000	
U1_tRMS_rc@AC [V]	230.4733	167.3611	-63.11226	181.4288
U2_tRMS_rc@AC [V]	229.7955	164.9482	-64.84729	182.3077
U3_tRMS_rc@AC [V]	229.7093	168.6731	-61.03622	180.2874
I1_tRMS_rc@AC [A]	178.6882	6.602894	-172.0853	86.15013
I2_tRMS_rc@AC [A]	180.7850	6.764716	-174.0203	85.77397
I3_tRMS_rc@AC [A]	184.6812	6.735949	-177.9452	80.06767
P_t_rc@AC [W]	125118.0	2904.784	-122213.2	48657.06
Q_t_rc@AC [var]	2804.881	-1682.896	-4487.777	22172.96
I_fund_Q_SYM+_rc@AC [A]	0.432583	-0.623989	-1.056572	2.092920
I_fund_Q_SYM-_rc@AC [A]	0.456286	-0.111627	-0.567914	3.563968
I_fund_P_SYM+_rc@AC [A]	181.3399	5.795233	-175.5447	71.82061
I_fund_P_SYM-_rc@AC [A]	-1.508082	0.037236	1.545318	11.28365
U_fund_SYM+_rc@AC [V]	398.3529	289.2370	-109.1159	313.0515
U_fund_SYM-_rc@AC [V]	1.059577	1.808419	0.748842	7.074917
U+ [V]	230.0203	168.2536	-61.76670	208.8775
U- [V]	0.629532	0.253944	-0.375588	3.191725

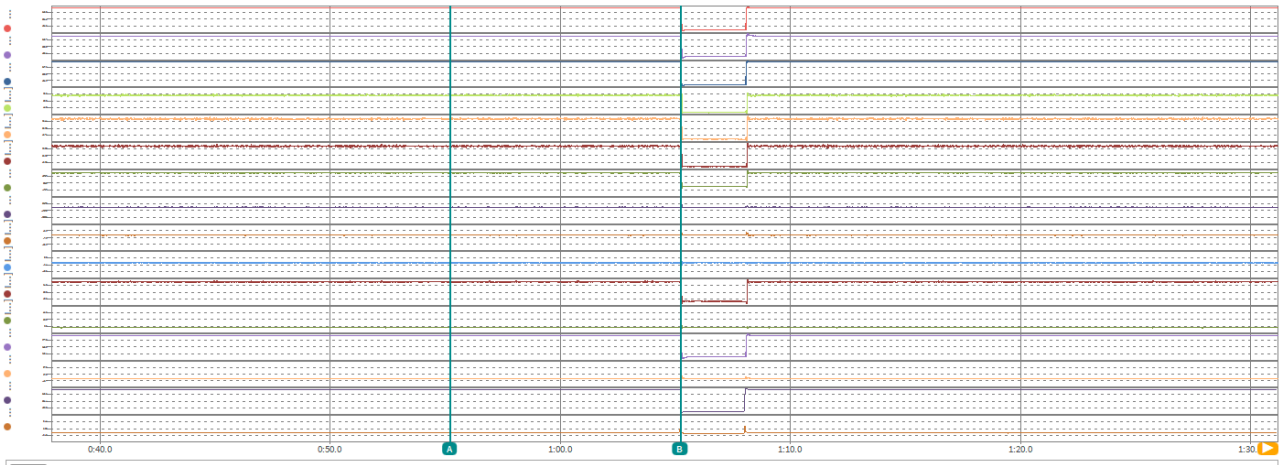
Recover time – Active power



	A	B	间隔	有效值
时间 [s]	1:04.44070	1:04.56870	0.12800	
U1_tRMS_rc@AC [V]	172.5930	233.9736	61.38058	228.8567
U2_tRMS_rc@AC [V]	172.1507	233.8047	61.65405	228.6542
U3_tRMS_rc@AC [V]	171.8245	232.1284	60.30385	227.7143
I1_tRMS_rc@AC [A]	4.711617	175.9905	171.2788	92.68134
I2_tRMS_rc@AC [A]	4.804440	179.1654	174.3609	93.66598
I3_tRMS_rc@AC [A]	4.857415	181.3694	176.5120	94.90602
P_t_rc@AC [W]	2086.942	124964.7	122877.8	65089.74
Q_t_rc@AC [var]	-1330.344	7127.757	8458.101	9984.339
I_fund_Q_SYM+_rc@AC [A]	-0.735070	2.486809	3.221879	6.195671
I_fund_Q_SYM-_rc@AC [A]	-0.232526	-0.951162	-0.718636	2.190312
I_fund_P_SYM+_rc@AC [A]	4.037549	178.5459	174.5083	92.62549
I_fund_P_SYM-_rc@AC [A]	0.091927	-1.354062	-1.445989	2.101698
U_fund_SYM+_rc@AC [V]	298.2318	404.0800	105.8482	395.2874
U_fund_SYM-_rc@AC [V]	0.556488	1.687992	1.131504	4.474125
U+ [V]	172.1760	234.1484	61.97249	220.6519
U- [V]	0.521224	0.947141	0.425917	2.255540

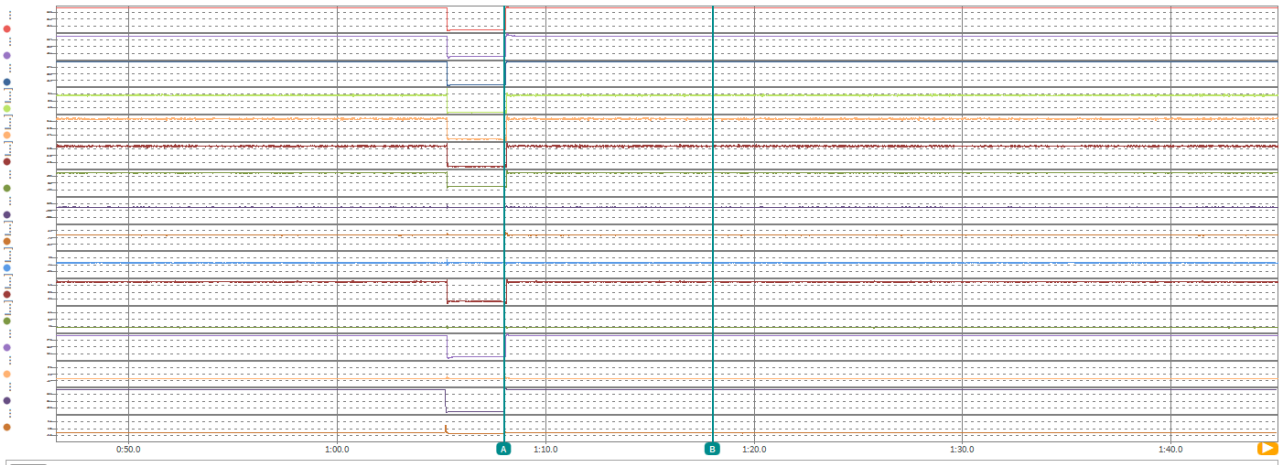
Test – VD4.2

Before fault



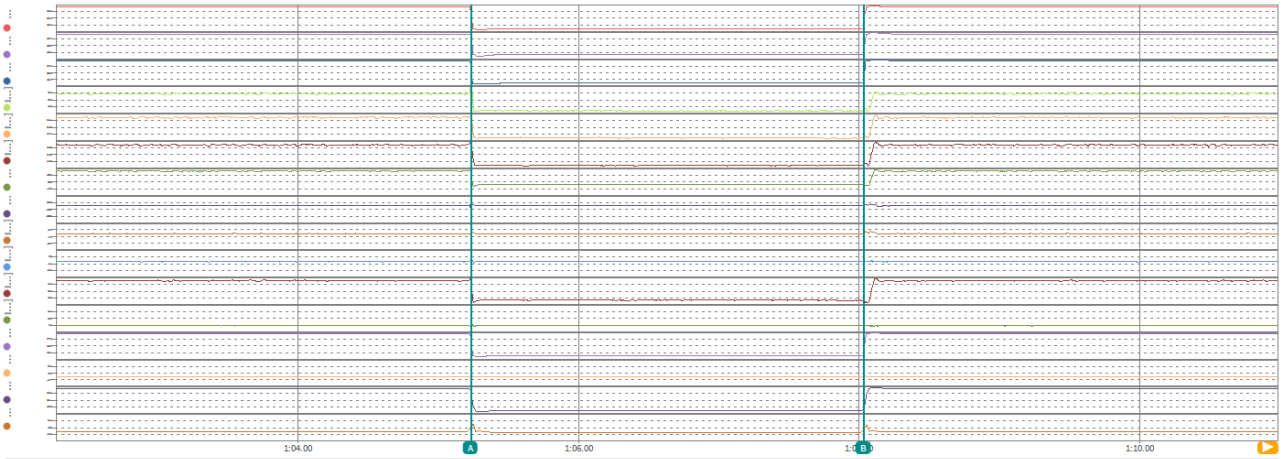
	A	B	间隔	有效值
时间 [s]	0:55.23260	1:05.23260	0:10.00000	
U1_tRMS_rc@AC [V]	230.2621	230.2630	9.003e-4	230.2341
U2_tRMS_rc@AC [V]	229.7316	229.7244	-7.278e-3	229.7354
U3_tRMS_rc@AC [V]	229.5352	229.6428	0.107559	229.5317
I1_tRMS_rc@AC [A]	36.38727	37.59978	1.212513	36.44947
I2_tRMS_rc@AC [A]	36.19676	36.72093	0.524170	36.70917
I3_tRMS_rc@AC [A]	37.82093	38.35094	0.530003	37.32204
P_t_rc@AC [W]	25326.42	25814.47	488.0527	25321.87
Q_t_rc@AC [var]	-1575.654	-2109.818	-534.1641	1857.464
I_fund_Q_SYM+_rc@AC [A]	-0.445455	-0.493561	-0.048106	0.718576
I_fund_Q_SYM-_rc@AC [A]	0.382929	0.448871	0.065942	0.354491
I_fund_P_SYM+_rc@AC [A]	36.72942	37.42924	0.699821	36.72484
I_fund_P_SYM-_rc@AC [A]	-0.167126	0.288877	0.456003	0.360271
U_fund_SYM+_rc@AC [V]	398.0968	398.1536	0.056854	398.0806
U_fund_SYM-_rc@AC [V]	0.990877	1.264850	0.273973	0.984385
U+ [V]	229.8300	229.8914	0.061405	229.8386
U- [V]	0.589603	0.562547	-0.027056	0.568232

After fault



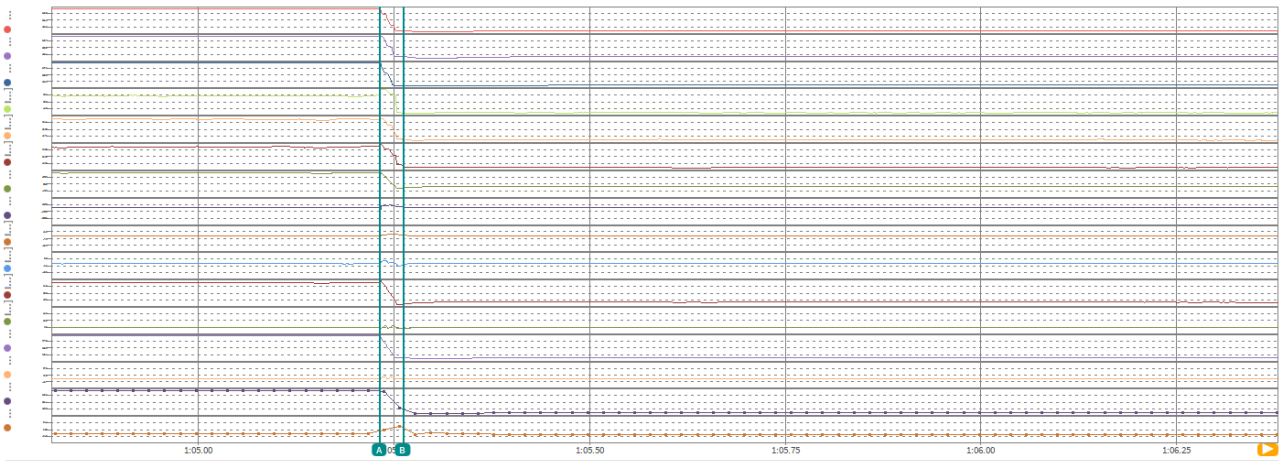
	A	B	间隔	有效值
时间 [s]	1:08.03360	1:18.03360	0:10.00000	
U1_tRMS_rc@AC [V]	172.5998	230.3061	57.70631	230.2165
U2_tRMS_rc@AC [V]	172.0715	229.7617	57.69020	229.7304
U3_tRMS_rc@AC [V]	171.8720	229.5741	57.70212	229.5085
I1_tRMS_rc@AC [A]	5.039494	36.80710	31.76760	36.31466
I2_tRMS_rc@AC [A]	5.280435	36.53630	31.25586	36.56580
I3_tRMS_rc@AC [A]	5.832987	38.03839	32.20541	37.25897
P_t_rc@AC [W]	2464.103	25542.17	23078.06	25237.24
Q_t_rc@AC [var]	-1289.150	-1780.819	-491.6692	1982.773
I_fund_Q_SYM+_rc@AC [A]	-0.857604	-0.466587	0.391017	0.879926
I_fund_Q_SYM-_rc@AC [A]	-0.085252	0.276592	0.361843	0.381313
I_fund_P_SYM+_rc@AC [A]	4.766592	37.03642	32.26983	36.59678
I_fund_P_SYM-_rc@AC [A]	-0.027178	-0.018159	9.019e-3	0.402232
U_fund_SYM+_rc@AC [V]	298.2182	398.1621	99.94391	398.0499
U_fund_SYM-_rc@AC [V]	0.481349	1.017733	0.536383	1.102505
U+ [V]	172.2121	229.8568	57.64471	229.6540
U- [V]	0.475632	0.588863	0.113231	0.606556

Duration fault time



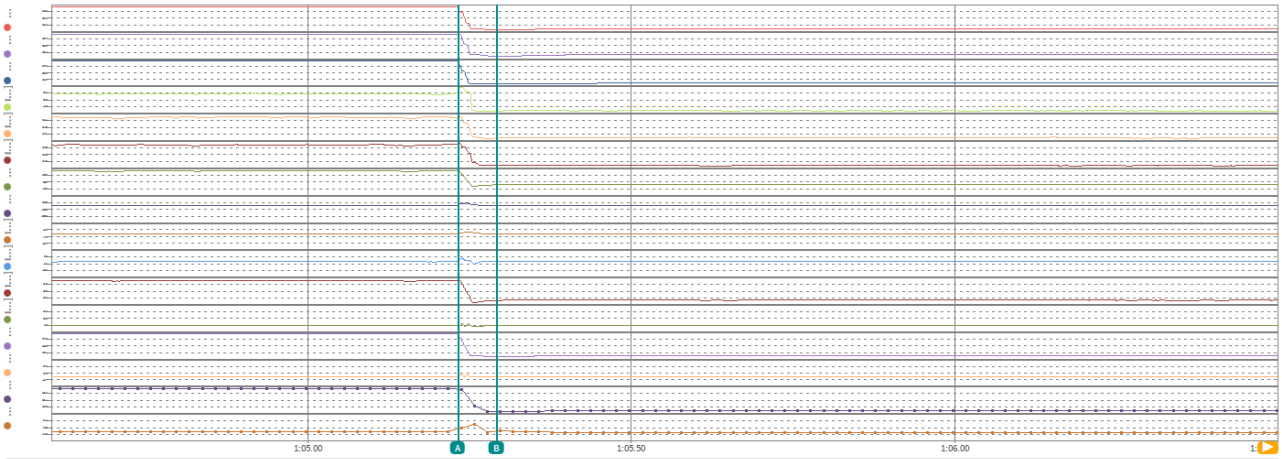
	A	B	间隔	有效值
时间 [s]	1:05.23260	1:08.03260	2.80000	
U1_tRMS_rc@AC [V]	230.2630	172.6208	-57.64217	172.7180
U2_tRMS_rc@AC [V]	229.7244	172.0598	-57.66455	172.2597
U3_tRMS_rc@AC [V]	229.6428	171.8764	-57.76637	172.0491
I1_tRMS_rc@AC [A]	37.59978	4.984627	-32.61516	6.845062
I2_tRMS_rc@AC [A]	36.72093	5.299210	-31.42172	6.181210
I3_tRMS_rc@AC [A]	38.35094	5.845904	-32.50503	6.883567
P_t_rc@AC [W]	25814.47	2449.745	-23364.73	3086.316
Q_t_rc@AC [var]	-2109.818	-1307.861	801.9569	1843.812
I_fund_Q_SYM+_rc@AC [A]	-0.493561	-0.858672	-0.365111	0.723323
I_fund_Q_SYM-_rc@AC [A]	0.448871	-0.043255	-0.492126	0.457043
I_fund_P_SYM+_rc@AC [A]	37.42924	4.738781	-32.69046	5.644578
I_fund_P_SYM-_rc@AC [A]	0.288877	-0.093564	-0.382442	0.440989
U_fund_SYM+_rc@AC [V]	398.1536	298.2266	-99.92700	298.4801
U_fund_SYM-_rc@AC [V]	1.264850	0.555546	-0.709304	1.306611
U+ [V]	229.8914	172.2121	-57.67934	173.0895
U- [V]	0.562547	0.475632	-0.086915	0.634666

0-30ms



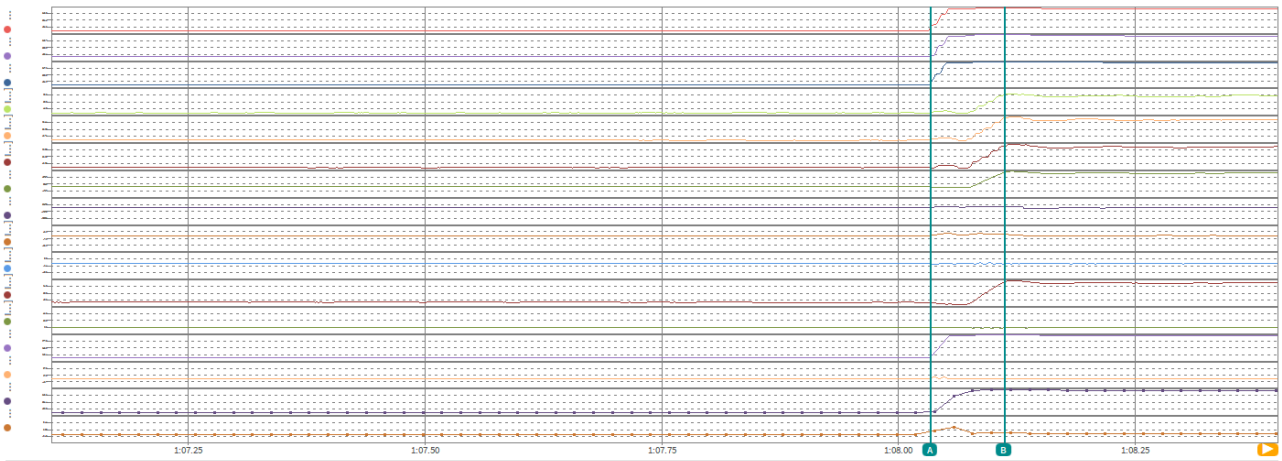
	A	B	间隔	有效值
时间 [s]	1:05.23260	1:05.26260	0.03000	
U1_tRMS_rc@AC [V]	230.2630	170.9531	-59.30991	195.6231
U2_tRMS_rc@AC [V]	229.7244	170.8291	-58.89523	198.2353
U3_tRMS_rc@AC [V]	229.6428	170.6810	-58.96179	192.6023
I1_tRMS_rc@AC [A]	37.59978	5.528308	-32.07148	36.52848
I2_tRMS_rc@AC [A]	36.72093	6.256892	-30.46404	26.23192
I3_tRMS_rc@AC [A]	38.35094	9.740557	-28.61038	28.84285
P_t_rc@AC [W]	25814.47	467.0838	-25347.39	15347.69
Q_t_rc@AC [var]	-2109.818	3646.677	5756.495	11239.96
I_fund_Q_SYM+_rc@AC [A]	-0.493561	1.213485	1.707046	2.834531
I_fund_Q_SYM-_rc@AC [A]	0.448871	-4.063831	-4.512702	3.593137
I_fund_P_SYM+_rc@AC [A]	37.42924	0.901523	-36.52772	23.16753
I_fund_P_SYM-_rc@AC [A]	0.288877	-2.362948	-2.651826	3.480389
U_fund_SYM+_rc@AC [V]	398.1536	295.8652	-102.2884	336.9629
U_fund_SYM-_rc@AC [V]	1.264850	0.470930	-0.793920	9.510656
U+ [V]	229.8914	184.9897	-44.90176	214.9736
U- [V]	0.562547	4.239625	3.677078	2.832447

0-60ms



	A	B	间隔	有效值
时间 [s]	1:05.23260	1:05.29260	0.06000	
U1_tRMS_rc@AC [V]	230.2630	168.6264	-61.63663	183.4525
U2_tRMS_rc@AC [V]	229.7244	166.2635	-63.46082	184.1467
U3_tRMS_rc@AC [V]	229.6428	169.7042	-59.93857	181.9784
I1_tRMS_rc@AC [A]	37.59978	5.506780	-32.09300	26.28005
I2_tRMS_rc@AC [A]	36.72093	5.081828	-31.63910	19.04164
I3_tRMS_rc@AC [A]	38.35094	6.134583	-32.21635	21.07678
P_t_rc@AC [W]	25814.47	2269.855	-23544.62	11011.57
Q_t_rc@AC [var]	-2109.818	-1664.209	445.6090	8162.146
I_fund_Q_SYM+_rc@AC [A]	-0.493561	-1.146788	-0.653227	2.112657
I_fund_Q_SYM-_rc@AC [A]	0.448871	-0.073233	-0.522104	2.666113
I_fund_P_SYM+_rc@AC [A]	37.42924	4.491447	-32.93780	16.69642
I_fund_P_SYM-_rc@AC [A]	0.288877	0.325163	0.036285	2.672076
U_fund_SYM+_rc@AC [V]	398.1536	291.3221	-106.8315	316.3993
U_fund_SYM-_rc@AC [V]	1.264850	1.737531	0.472681	6.857334
U+ [V]	229.8914	170.4187	-59.47269	204.7459
U- [V]	0.562547	0.491856	-0.070691	2.465268

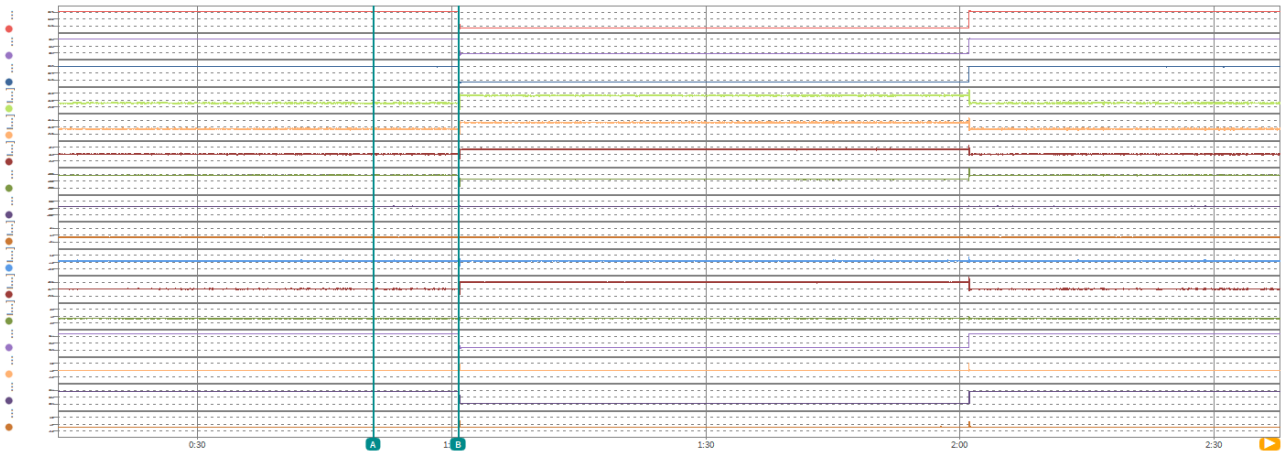
Recover time – Active power



	A	B	间隔	有效值
时间 [s]	1:08.03360	1:08.11160	0.07800	
U1_tRMS_rc@AC [V]	172.5998	234.2076	61.60783	224.4515
U2_tRMS_rc@AC [V]	172.0715	235.0816	63.01015	223.9518
U3_tRMS_rc@AC [V]	171.8720	232.1042	60.23221	223.9349
I1_tRMS_rc@AC [A]	5.039494	36.38573	31.34624	17.32073
I2_tRMS_rc@AC [A]	5.280435	38.41183	33.13139	17.03024
I3_tRMS_rc@AC [A]	5.832987	38.29572	32.46274	18.00143
P_t_rc@AC [W]	2464.103	25845.43	23381.33	10832.76
Q_t_rc@AC [var]	-1289.150	5577.165	6866.315	5432.282
I_fund_Q_SYM+_rc@AC [A]	-0.857604	4.071396	4.929000	4.704455
I_fund_Q_SYM-_rc@AC [A]	-0.085252	-1.212464	-1.127212	0.899838
I_fund_P_SYM+_rc@AC [A]	4.766592	36.84187	32.07528	15.48484
I_fund_P_SYM-_rc@AC [A]	-0.027178	-0.450246	-0.423068	0.824529
U_fund_SYM+_rc@AC [V]	298.2182	404.9458	106.7277	387.6301
U_fund_SYM-_rc@AC [V]	0.481349	1.959918	1.478569	5.536661
U+ [V]	172.2121	232.9163	60.70417	206.7867
U- [V]	0.475632	1.233650	0.758018	2.077601

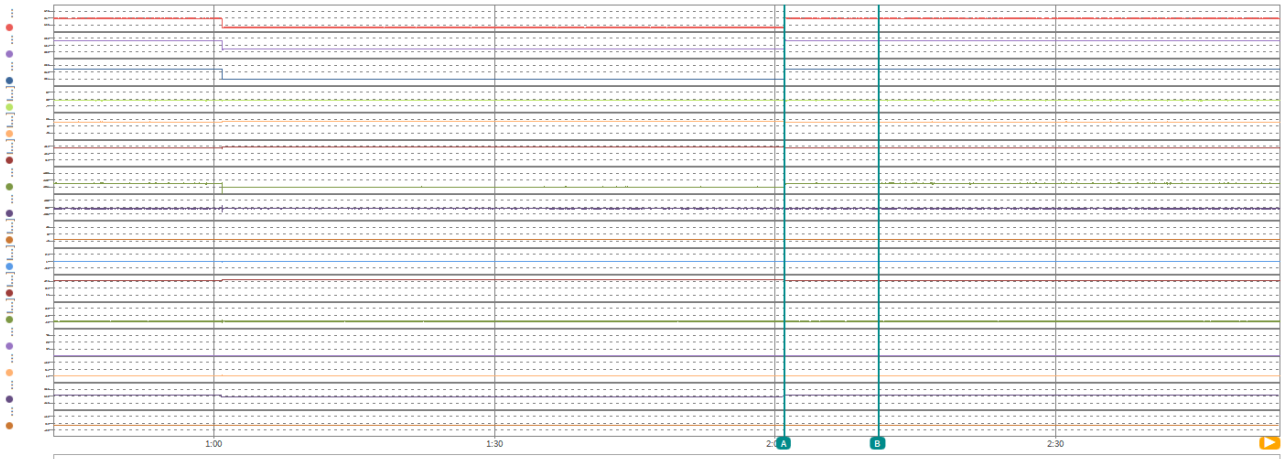
Test – VD5.1

Before fault



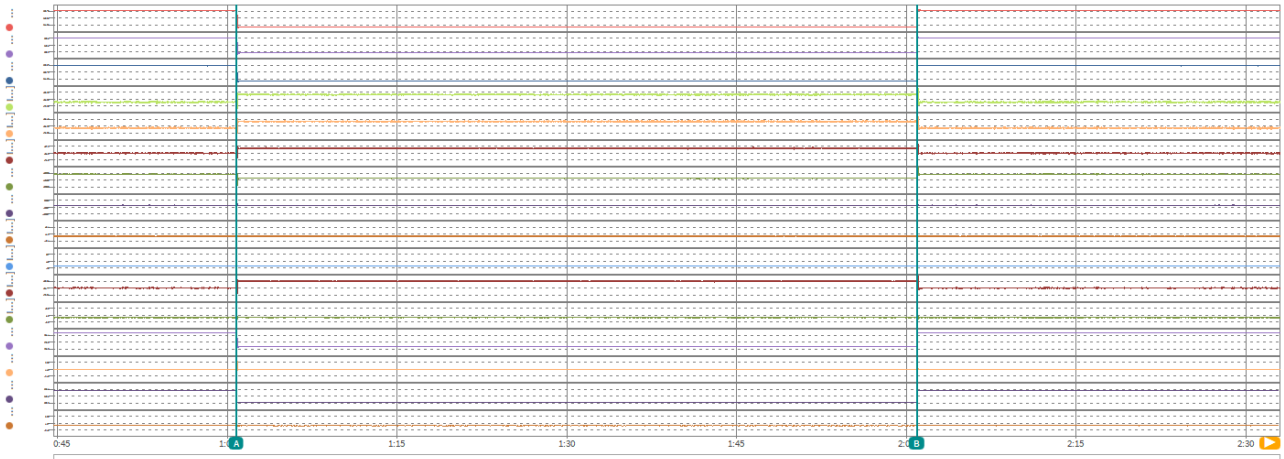
时间 [s]	A 0:50.84192	B 1:00.84467	间隔 0:10.00275	有效值
U1_tRMS_rc@AC [V]	230.5750	230.5127	-0.062286	230.5150
U2_tRMS_rc@AC [V]	229.8156	229.8230	7.431e-3	229.8084
U3_tRMS_rc@AC [V]	229.7192	229.7043	-0.014923	229.7115
I1_tRMS_rc@AC [A]	179.9310	179.6486	-0.282440	179.7367
I2_tRMS_rc@AC [A]	182.2049	181.8943	-0.310547	181.5839
I3_tRMS_rc@AC [A]	184.3626	184.0359	-0.326675	183.9627
P_t_rc@AC [W]	125688.9	125471.3	-217.6641	125397.8
Q_t_rc@AC [var]	2446.880	2087.210	-359.6692	2338.290
I_fund_Q_SYM+_rc@AC [A]	0.213604	0.516867	0.303262	0.525221
I_fund_Q_SYM-_rc@AC [A]	0.341977	0.100579	-0.241398	0.445775
I_fund_P_SYM+_rc@AC [A]	182.1335	181.8329	-0.300583	181.7303
I_fund_P_SYM-_rc@AC [A]	-1.020466	-1.185912	-0.165447	1.005383
U_fund_SYM+_rc@AC [V]	398.4293	398.3880	-0.041290	398.3860
U_fund_SYM-_rc@AC [V]	1.102027	1.300065	0.198038	1.074946
U+ [V]	230.0264	230.0227	-3.751e-3	230.0151
U- [V]	0.620636	0.618052	-2.584e-3	0.620497

After fault



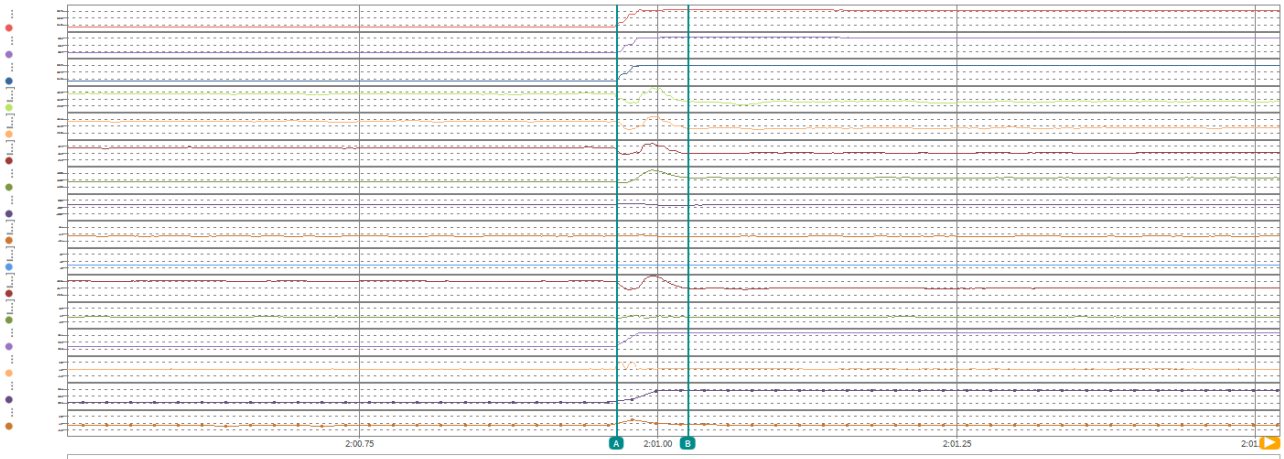
时间 [s]	A 2:00.96505	B 2:11.03658	间隔 0:10.07153	有效值
U1_tRMS_rc@AC [V]	207.4897	230.5158	23.02618	230.5016
U2_tRMS_rc@AC [V]	206.8091	229.8275	23.01834	229.8238
U3_tRMS_rc@AC [V]	206.6650	229.6641	22.99908	229.6915
I1_tRMS_rc@AC [A]	189.9683	179.6548	-10.31348	179.6771
I2_tRMS_rc@AC [A]	191.3015	181.8264	-9.475159	181.5173
I3_tRMS_rc@AC [A]	193.2328	183.1297	-10.10312	183.9333
P_t_rc@AC [W]	118890.0	125235.0	6344.984	125355.7
Q_t_rc@AC [var]	2376.455	2514.188	137.7332	2471.914
I_fund_Q_SYM+_rc@AC [A]	0.982002	0.346216	-0.635786	0.539828
I_fund_Q_SYM-_rc@AC [A]	0.123962	-0.379160	-0.503122	0.455542
I_fund_P_SYM+_rc@AC [A]	191.4673	181.5002	-9.967148	181.6758
I_fund_P_SYM-_rc@AC [A]	-1.129680	-0.610583	0.519097	1.030720
U_fund_SYM+_rc@AC [V]	358.5056	398.3708	39.86523	398.3749
U_fund_SYM-_rc@AC [V]	0.836163	1.058651	0.222488	1.091266
U+ [V]	206.9703	230.0075	23.03725	229.9542
U- [V]	0.590311	0.650252	0.059941	0.626576

Duration fault time



时间 [s]	A 1:00.84551	B 2:00.96479	间隔 1:00.11928	有效值
U1_tRMS_rc@AC [V]	229.6840	207.4386	-22.24539	207.4894
U2_tRMS_rc@AC [V]	229.7028	206.8017	-22.90111	206.7929
U3_tRMS_rc@AC [V]	229.4256	206.6619	-22.76373	206.6804
I1_tRMS_rc@AC [A]	181.2900	190.0719	8.781967	189.7819
I2_tRMS_rc@AC [A]	181.9318	191.2312	9.299408	191.1580
I3_tRMS_rc@AC [A]	184.4946	193.2724	8.777771	193.7575
P_t_rc@AC [W]	125656.8	118893.5	-6763.305	118932.3
Q_t_rc@AC [var]	5031.144	2378.066	-2653.077	2244.774
I_fund_Q_SYM+_rc@AC [A]	0.325168	0.925031	0.599862	0.657428
I_fund_Q_SYM-_rc@AC [A]	0.306384	0.450406	0.144021	0.525444
I_fund_P_SYM+_rc@AC [A]	182.4877	191.4927	9.005005	191.5333
I_fund_P_SYM-_rc@AC [A]	-0.867166	-1.062254	-0.195088	0.898416
U_fund_SYM+_rc@AC [V]	397.6544	358.4704	-39.18408	358.5066
U_fund_SYM-_rc@AC [V]	0.703071	0.799202	0.096130	1.037587
U+ [V]	230.0227	206.9703	-23.05240	207.0000
U- [V]	0.618052	0.590311	-0.027741	0.598071

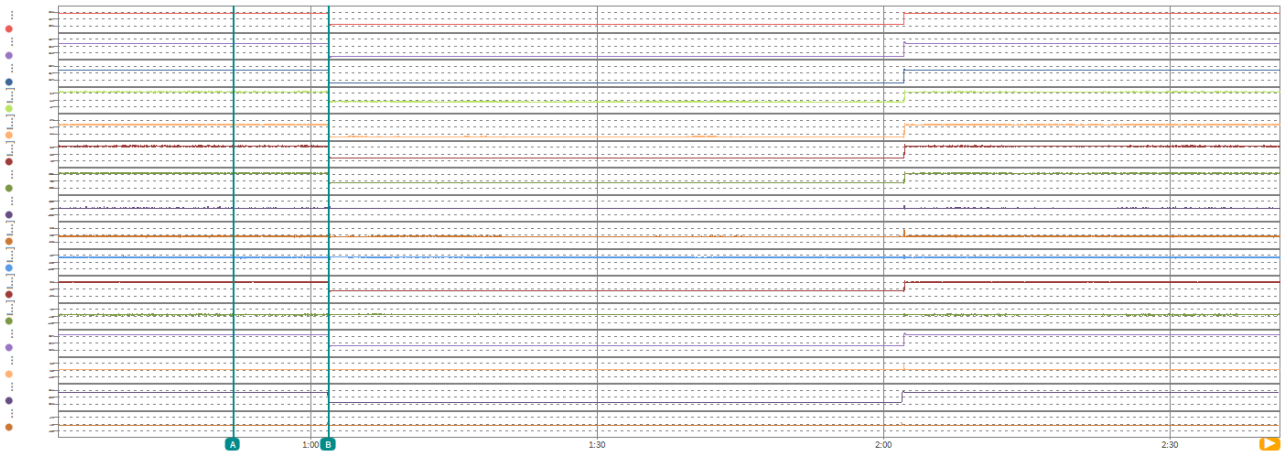
Recover time – Active power



时间 [s]	A 2:00.96579	B 2:01.02547	间隔 0.05968	有效值
U1_tRMS_rc@AC [V]	207.4897	231.3462	23.85655	226.9072
U2_tRMS_rc@AC [V]	206.8091	231.2682	24.45911	225.9245
U3_tRMS_rc@AC [V]	206.6650	229.8810	23.21603	226.3464
I1_tRMS_rc@AC [A]	189.9683	180.3713	-9.596939	186.5804
I2_tRMS_rc@AC [A]	191.3015	181.1192	-10.18234	187.6312
I3_tRMS_rc@AC [A]	193.2328	183.2254	-10.00732	190.2660
P_t_rc@AC [W]	118890.0	125681.6	6791.586	127528.5
Q_t_rc@AC [var]	2376.455	-3675.984	-6052.439	9262.924
I_fund_Q_SYM+_rc@AC [A]	0.982002	-1.803818	-2.785819	2.798251
I_fund_Q_SYM-_rc@AC [A]	0.123962	0.471750	0.347789	1.512978
I_fund_P_SYM+_rc@AC [A]	191.4673	181.4935	-9.973831	187.8140
I_fund_P_SYM-_rc@AC [A]	-1.129680	-0.640440	0.489240	1.684156
U_fund_SYM+_rc@AC [V]	358.5056	399.8066	41.30103	392.0062
U_fund_SYM-_rc@AC [V]	0.836163	1.448258	0.612095	2.652468
U+ [V]	206.9703	230.3828	23.41249	220.0943
U- [V]	0.590311	0.775061	0.184750	1.150386

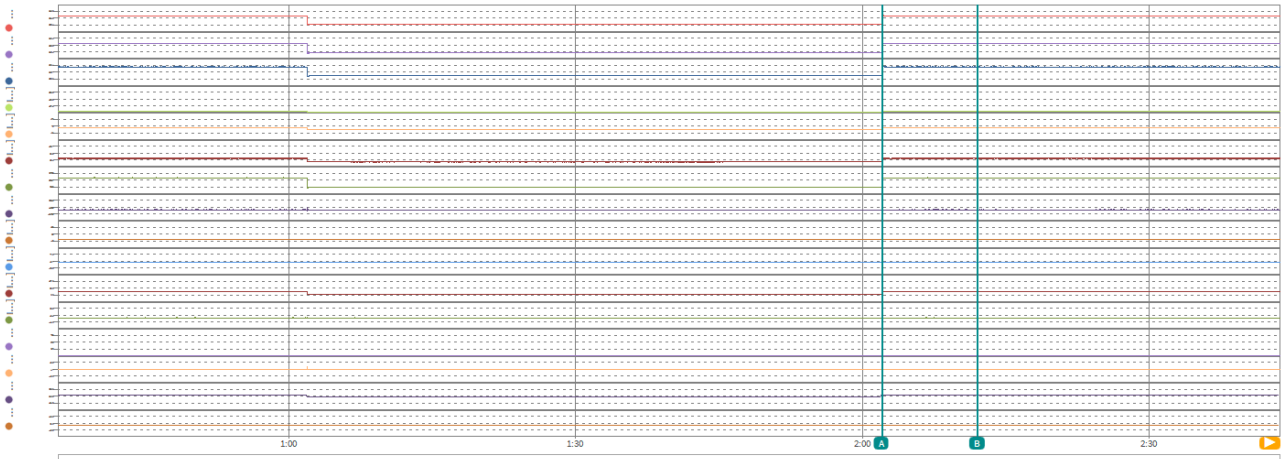
Test – VD5.2

Before fault



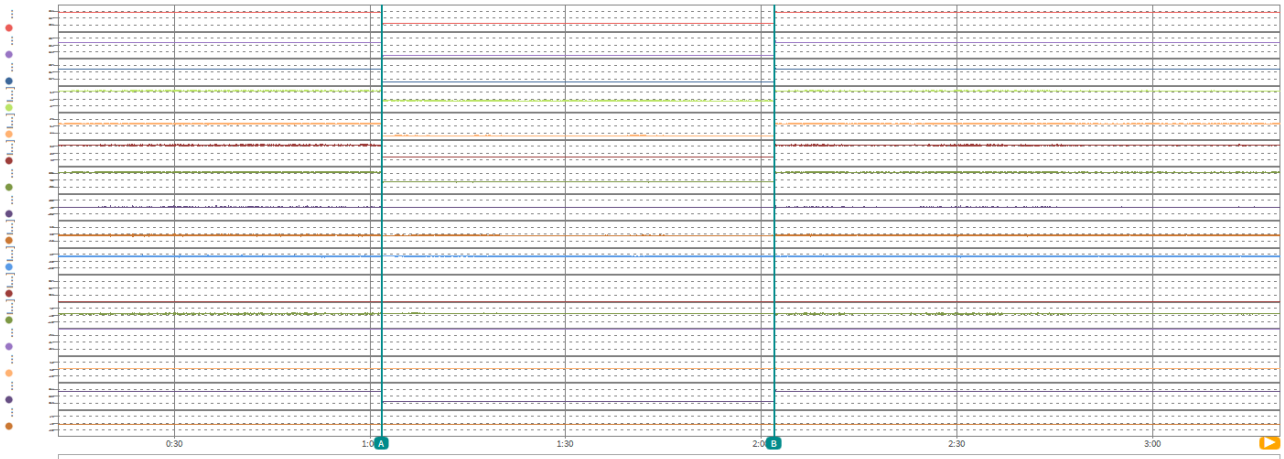
时间 [s]	A 0:51.9228	B 1:01.9235	间隔 0:10.0007	有效值
U1_tRMS_rc@AC [V]	230.3118	230.2078	-0.104004	230.2355
U2_tRMS_rc@AC [V]	229.7357	229.7153	-0.020386	229.7218
U3_tRMS_rc@AC [V]	229.4923	229.5781	0.085815	229.5259
I1_tRMS_rc@AC [A]	37.78179	35.85109	-1.930702	36.36240
I2_tRMS_rc@AC [A]	36.92523	36.39893	-0.526302	36.63698
I3_tRMS_rc@AC [A]	37.32127	37.34504	0.023773	37.25003
P_t_rc@AC [W]	25664.01	25119.60	-544.4063	25269.75
Q_t_rc@AC [var]	-2097.471	-1857.597	239.8740	1833.164
I_fund_Q_SYM+_rc@AC [A]	-0.970492	-0.617230	0.353262	0.760703
I_fund_Q_SYM-_rc@AC [A]	0.209436	0.298955	0.089519	0.344887
I_fund_P_SYM+_rc@AC [A]	37.21894	36.43260	-0.786339	36.65062
I_fund_P_SYM-_rc@AC [A]	0.451535	-0.400745	-0.852280	0.376422
U_fund_SYM+_rc@AC [V]	398.1031	398.0811	-0.022003	398.0702
U_fund_SYM-_rc@AC [V]	1.000601	0.972557	-0.028043	0.974679
U+ [V]	229.8346	229.8136	-0.020984	229.8327
U- [V]	0.583904	0.512232	-0.071672	0.562658

After fault



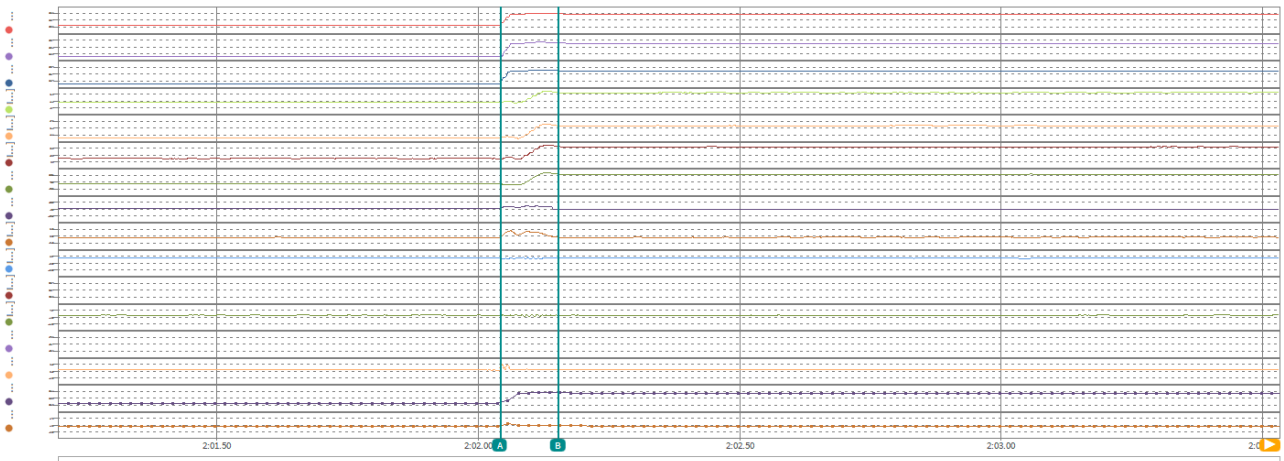
时间 [s]	A 2:02.0434	B 2:12.0877	间隔 0:10.0443	有效值
U1_tRMS_rc@AC [V]	207.1158	230.2098	23.09407	230.2258
U2_tRMS_rc@AC [V]	206.6378	229.7691	23.13129	229.7208
U3_tRMS_rc@AC [V]	206.3834	229.5575	23.17413	229.5269
I1_tRMS_rc@AC [A]	5.261216	36.80571	31.54449	36.10979
I2_tRMS_rc@AC [A]	5.550494	36.73112	31.18063	36.46748
I3_tRMS_rc@AC [A]	6.058699	37.91196	31.85326	37.05782
P_t_rc@AC [W]	3177.371	25544.89	22367.52	25116.74
Q_t_rc@AC [var]	-1436.572	-1903.135	-466.5631	2010.318
I_fund_Q_SYM+_rc@AC [A]	-0.922922	-0.475657	0.447265	0.863440
I_fund_Q_SYM-_rc@AC [A]	2.335e-3	0.123437	0.121102	0.359652
I_fund_P_SYM+_rc@AC [A]	5.122713	37.04774	31.92503	36.42539
I_fund_P_SYM-_rc@AC [A]	-0.184444	-0.224896	-0.040452	0.390231
U_fund_SYM+_rc@AC [V]	358.0316	398.1009	40.06931	398.0641
U_fund_SYM-_rc@AC [V]	0.736163	0.907711	0.171548	0.995334
U+ [V]	206.7382	229.8613	23.12308	229.7810
U- [V]	0.490174	0.558385	0.068212	0.572107

Duration fault time



时间 [s]	A 1:01.9236	B 2:02.0423	间隔 1:00.1187	有效值
U1_tRMS_rc@AC [V]	230.2078	207.1232	-23.08455	207.1273
U2_tRMS_rc@AC [V]	229.7153	206.6319	-23.08342	206.6512
U3_tRMS_rc@AC [V]	229.5781	206.3832	-23.19495	206.4126
I1_tRMS_rc@AC [A]	35.85109	5.248457	-30.60263	5.600993
I2_tRMS_rc@AC [A]	36.39893	5.609650	-30.78928	5.546096
I3_tRMS_rc@AC [A]	37.34504	6.022591	-31.32245	6.084022
P_t_rc@AC [W]	25119.60	3185.780	-21933.82	3215.896
Q_t_rc@AC [var]	-1857.597	-1423.068	434.5289	1533.740
I_fund_Q_SYM+_rc@AC [A]	-0.617230	-0.876326	-0.259096	0.973256
I_fund_Q_SYM-_rc@AC [A]	0.298955	-0.027549	-0.326504	0.176437
I_fund_P_SYM+_rc@AC [A]	36.43260	5.136487	-31.29611	5.178428
I_fund_P_SYM-_rc@AC [A]	-0.400745	-0.208053	0.192691	0.161099
U_fund_SYM+_rc@AC [V]	398.0811	358.0327	-40.04843	358.0632
U_fund_SYM-_rc@AC [V]	0.972557	0.809011	-0.163547	0.897636
U+ [V]	229.8136	206.7382	-23.07544	206.7428
U- [V]	0.512232	0.490174	-0.022058	0.517210

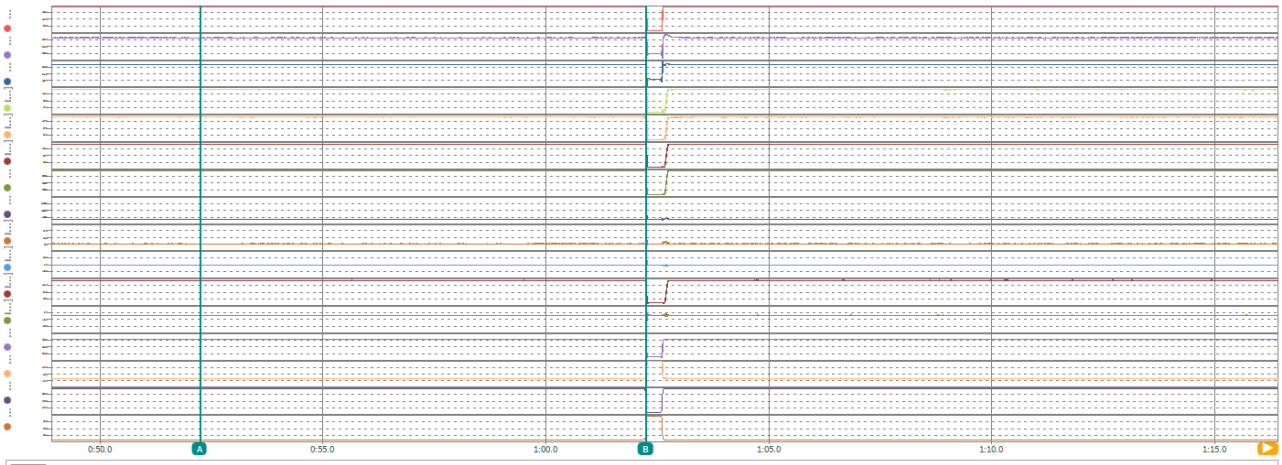
Recover time – Active power



时间 [s]	A 2:02.0423	B 2:02.1538	间隔 0.1115	有效值
U1_tRMS_rc@AC [V]	207.1232	231.6043	24.48108	228.8583
U2_tRMS_rc@AC [V]	206.6319	231.4199	24.78804	228.4948
U3_tRMS_rc@AC [V]	206.3832	230.7289	24.34570	228.0556
I1_tRMS_rc@AC [A]	5.248457	36.45391	31.20545	24.97184
I2_tRMS_rc@AC [A]	5.609650	36.15344	30.54379	25.31646
I3_tRMS_rc@AC [A]	6.022591	38.39374	32.37115	26.07735
P_t_rc@AC [W]	3185.780	25475.34	22289.56	16990.05
Q_t_rc@AC [var]	-1423.068	-3139.458	-1716.390	4899.293
I_fund_Q_SYM+_rc@AC [A]	-0.876326	-0.739626	0.136700	3.873617
I_fund_Q_SYM-_rc@AC [A]	-0.027549	0.582146	0.609695	0.809853
I_fund_P_SYM+_rc@AC [A]	5.136487	36.71918	31.58269	24.41750
I_fund_P_SYM-_rc@AC [A]	-0.208053	-0.386307	-0.178253	0.692531
U_fund_SYM+_rc@AC [V]	358.0327	400.5354	42.50278	395.6592
U_fund_SYM-_rc@AC [V]	0.809011	0.992962	0.183951	1.963944
U+ [V]	206.7382	232.2225	25.48431	224.4049
U- [V]	0.490174	0.660535	0.170361	0.992978

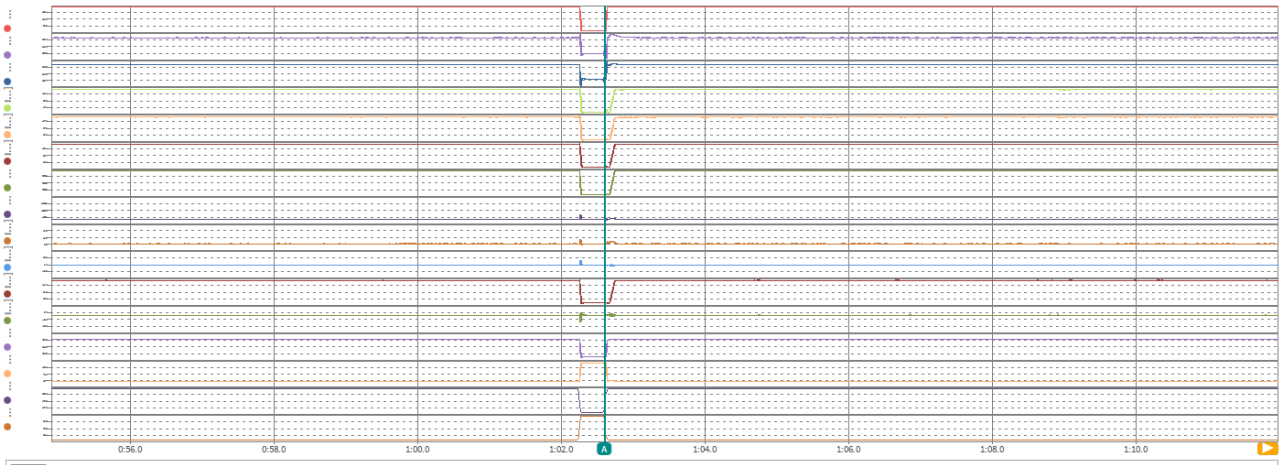
Test – VD6.1

Before fault



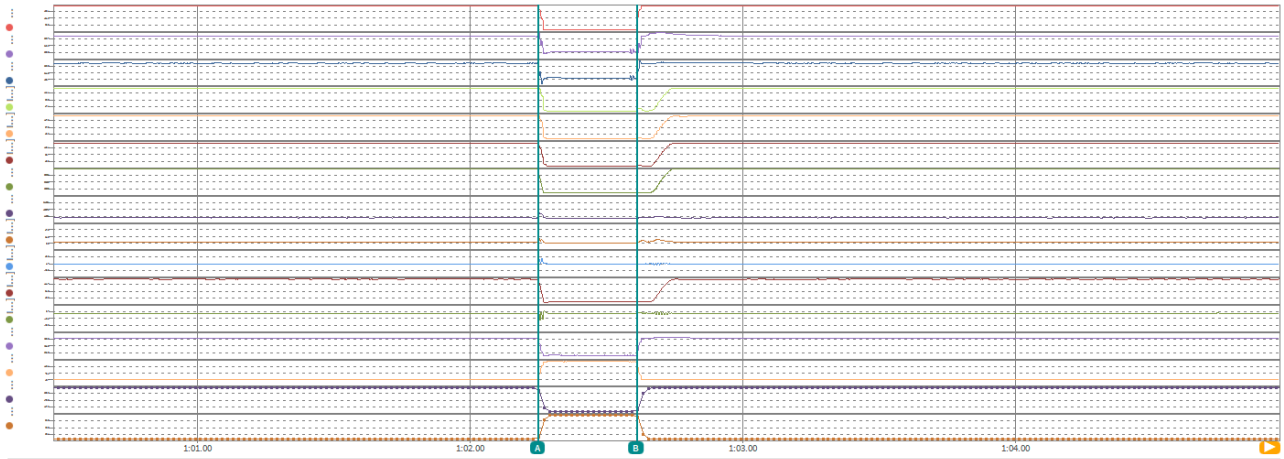
	A	B	间隔	有效值
时间 [s]	0:52.25070	1:02.25070	0:10.00000	
U1_tRMS_rc@AC [V]	230.3491	230.3935	0.044418	230.4470
U2_tRMS_rc@AC [V]	229.7279	229.7145	-0.013412	229.7348
U3_tRMS_rc@AC [V]	229.6560	229.7602	0.104263	229.6562
I1_tRMS_rc@AC [A]	179.9122	179.3056	-0.606598	179.7943
I2_tRMS_rc@AC [A]	181.3505	181.7062	0.355713	181.5608
I3_tRMS_rc@AC [A]	184.0962	183.3418	-0.754349	184.0481
P_t_rc@AC [W]	125361.7	125156.0	-205.6641	125392.2
Q_t_rc@AC [var]	2295.177	2240.837	-54.33936	2195.733
I_fund_Q_SYM+_rc@AC [A]	0.105651	0.057996	-0.047655	0.496277
I_fund_Q_SYM-_rc@AC [A]	0.371441	0.209331	-0.162110	0.437745
I_fund_P_SYM+_rc@AC [A]	181.7570	181.4260	-0.330963	181.7737
I_fund_P_SYM-_rc@AC [A]	-0.968035	-1.271828	-0.303793	1.001388
U_fund_SYM+_rc@AC [V]	398.2119	398.2888	0.076904	398.2722
U_fund_SYM-_rc@AC [V]	0.985537	1.022079	0.036542	1.057658
U+ [V]	229.9702	229.9402	-0.029991	229.9494
U- [V]	0.638232	0.656241	0.018008	0.609612

After fault



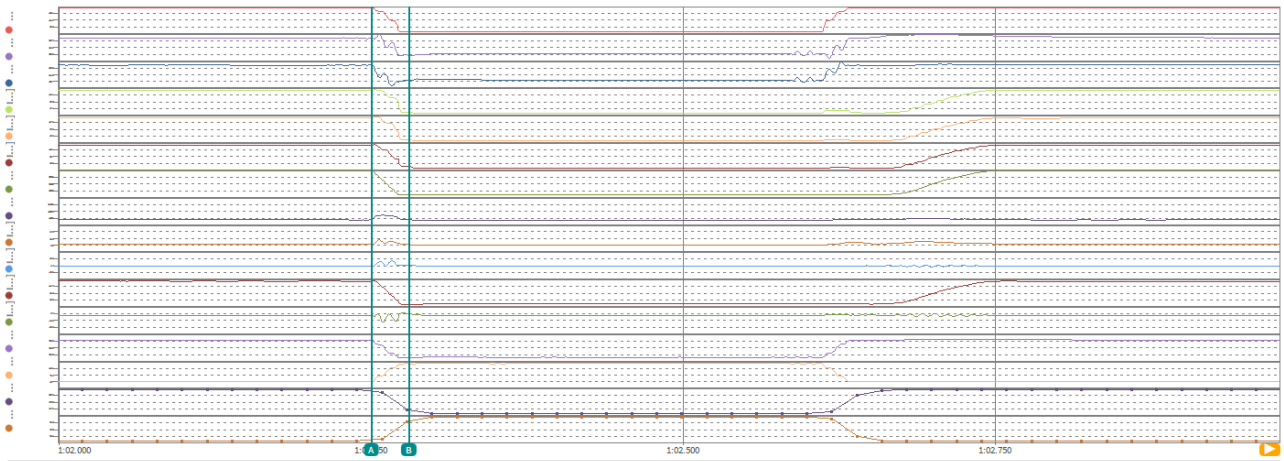
	A	B	间隔	有效值
时间 [s]	1:02.61170	1:12.61170	0:10.00000	
U1_tRMS_rc@AC [V]	11.46573	230.4144	218.9486	230.3255
U2_tRMS_rc@AC [V]	199.1820	229.7337	30.55171	229.7769
U3_tRMS_rc@AC [V]	199.4006	229.6440	30.24339	229.6573
I1_tRMS_rc@AC [A]	7.453919	179.8177	172.3638	178.7968
I2_tRMS_rc@AC [A]	7.307543	181.3309	174.0233	180.5256
I3_tRMS_rc@AC [A]	5.178473	183.4268	178.2483	183.0398
P_t_rc@AC [W]	1850.510	125194.4	123343.9	124703.0
Q_t_rc@AC [var]	-1788.563	2173.806	3962.370	2542.769
I_fund_Q_SYM+_rc@AC [A]	-1.326154	0.396209	1.722363	0.872665
I_fund_Q_SYM-_rc@AC [A]	0.735419	0.326565	-0.408854	0.555143
I_fund_P_SYM+_rc@AC [A]	5.793376	181.4955	175.7022	180.7480
I_fund_P_SYM-_rc@AC [A]	-0.764316	-0.961742	-0.197425	1.054224
U_fund_SYM+_rc@AC [V]	209.3732	398.2456	188.8724	398.1608
U_fund_SYM-_rc@AC [V]	189.0122	1.060893	-187.9513	5.480638
U+ [V]	120.5797	229.9550	109.3753	229.6246
U- [V]	108.8391	0.610758	-108.2283	6.746952

Duration fault time



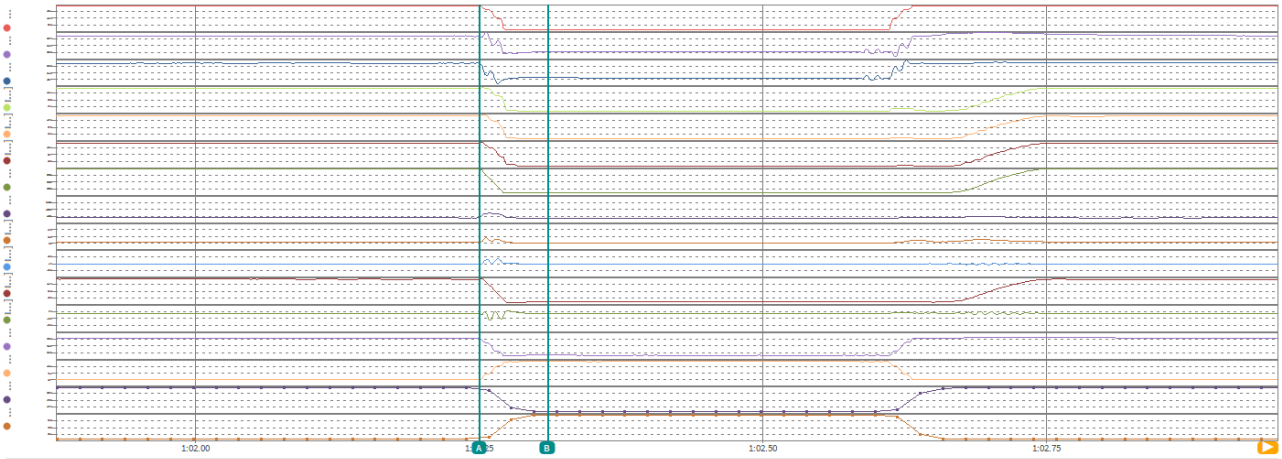
	A	B	间隔	有效值
时间 [s]	1:02.25070	1:02.61170	0.36100	
U1_tRMS_rc@AC [V]	230.3935	11.46573	-218.9278	44.00458
U2_tRMS_rc@AC [V]	229.7145	199.1820	-30.53247	200.5283
U3_tRMS_rc@AC [V]	229.7602	199.4006	-30.35966	200.1317
I1_tRMS_rc@AC [A]	179.3056	7.453919	-171.8517	39.46182
I2_tRMS_rc@AC [A]	181.7062	7.307543	-174.3987	39.47281
I3_tRMS_rc@AC [A]	183.3418	5.178473	-178.1634	36.91651
P_t_rc@AC [W]	125156.0	1850.510	-123305.5	20104.77
Q_t_rc@AC [var]	2240.837	-1788.563	-4029.401	12616.15
I_fund_Q_SYM+_rc@AC [A]	0.057996	-1.326154	-1.384150	2.709518
I_fund_Q_SYM-_rc@AC [A]	0.209331	0.735419	0.526089	4.791657
I_fund_P_SYM+_rc@AC [A]	181.4260	5.793376	-175.6326	32.18650
I_fund_P_SYM-_rc@AC [A]	-1.271828	-0.764316	0.507512	3.458555
U_fund_SYM+_rc@AC [V]	398.2888	209.3732	-188.9155	217.5175
U_fund_SYM-_rc@AC [V]	1.022079	189.0122	187.9901	184.8363
U+ [V]	229.9402	120.5797	-109.3605	136.7491
U- [V]	0.656241	108.8391	108.1829	102.1550

0-30ms



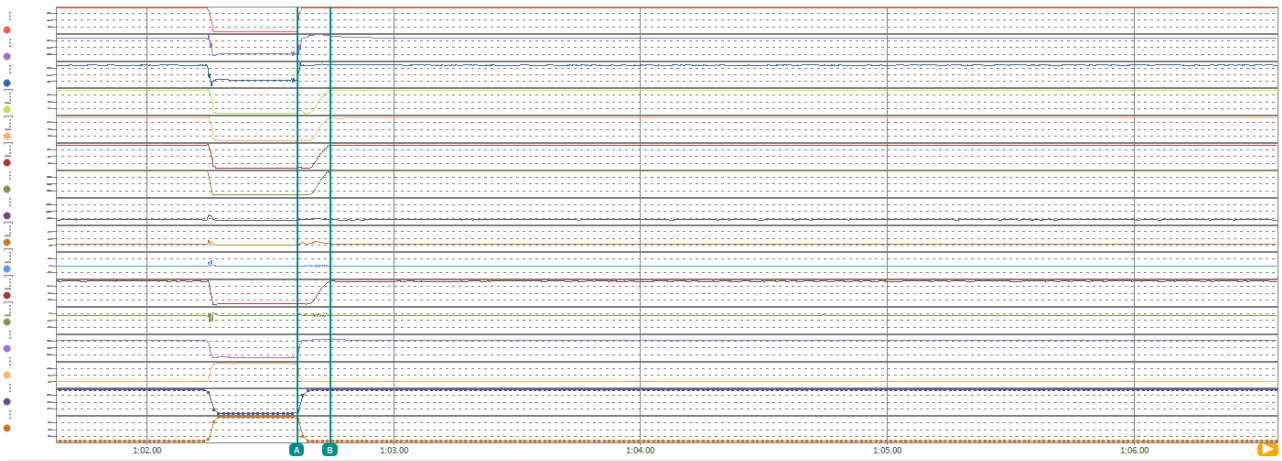
	A	B	间隔	有效值
时间 [s]	1:02.25070	1:02.28070	0.03000	
U1_tRMS_rc@AC [V]	230.3935	9.923079	-220.4704	145.6090
U2_tRMS_rc@AC [V]	229.7145	196.0124	-33.70207	215.5044
U3_tRMS_rc@AC [V]	229.7602	198.7494	-31.01086	205.0398
I1_tRMS_rc@AC [A]	179.3056	12.35269	-166.9529	132.5240
I2_tRMS_rc@AC [A]	181.7062	10.39536	-171.3109	132.7153
I3_tRMS_rc@AC [A]	183.3418	18.65647	-164.6854	124.7430
P_t_rc@AC [W]	125156.0	58.37298	-125097.6	68426.55
Q_t_rc@AC [var]	2240.837	5867.867	3627.029	42649.16
I_fund_Q_SYM+_rc@AC [A]	0.057996	-0.841027	-0.899023	8.058036
I_fund_Q_SYM-_rc@AC [A]	0.209331	6.228949	6.019618	16.16732
I_fund_P_SYM+_rc@AC [A]	181.4260	-5.544316	-186.9703	108.3280
I_fund_P_SYM-_rc@AC [A]	-1.271828	6.068104	7.339932	11.42269
U_fund_SYM+_rc@AC [V]	398.2888	206.2013	-192.0875	289.9457
U_fund_SYM-_rc@AC [V]	1.022079	188.4377	187.4156	132.3288
U+ [V]	229.9402	140.1544	-89.78580	201.1410
U- [V]	0.656241	87.68924	87.03300	50.97049

0-60ms



	A	B	间隔	有效值
时间 [s]	1:02.25070	1:02.31070	0.06000	
U1_tRMS_rc@AC [V]	230.3935	12.00361	-218.3899	104.1144
U2_tRMS_rc@AC [V]	229.7145	199.3954	-30.31908	207.0695
U3_tRMS_rc@AC [V]	229.7602	201.2969	-28.46332	203.0177
I1_tRMS_rc@AC [A]	179.3056	7.939249	-171.3663	94.61239
I2_tRMS_rc@AC [A]	181.7062	8.253643	-173.4526	94.72930
I3_tRMS_rc@AC [A]	183.3418	5.868844	-177.4730	89.09508
P_t_rc@AC [W]	125156.0	2187.759	-122968.2	48784.99
Q_t_rc@AC [var]	2240.837	-1937.586	-4178.424	30466.00
I_fund_Q_SYM+_rc@AC [A]	0.057996	-1.547631	-1.605627	5.891247
I_fund_Q_SYM-_rc@AC [A]	0.209331	0.924571	0.715240	11.59088
I_fund_P_SYM+_rc@AC [A]	181.4260	6.455706	-174.9703	77.27470
I_fund_P_SYM-_rc@AC [A]	-1.271828	-0.518826	0.753001	8.273356
U_fund_SYM+_rc@AC [V]	398.2888	210.7959	-187.4929	253.6074
U_fund_SYM-_rc@AC [V]	1.022079	189.5918	188.5697	162.7757
U+ [V]	229.9402	120.5060	-109.4342	184.3195
U- [V]	0.656241	109.0730	108.4168	70.16212

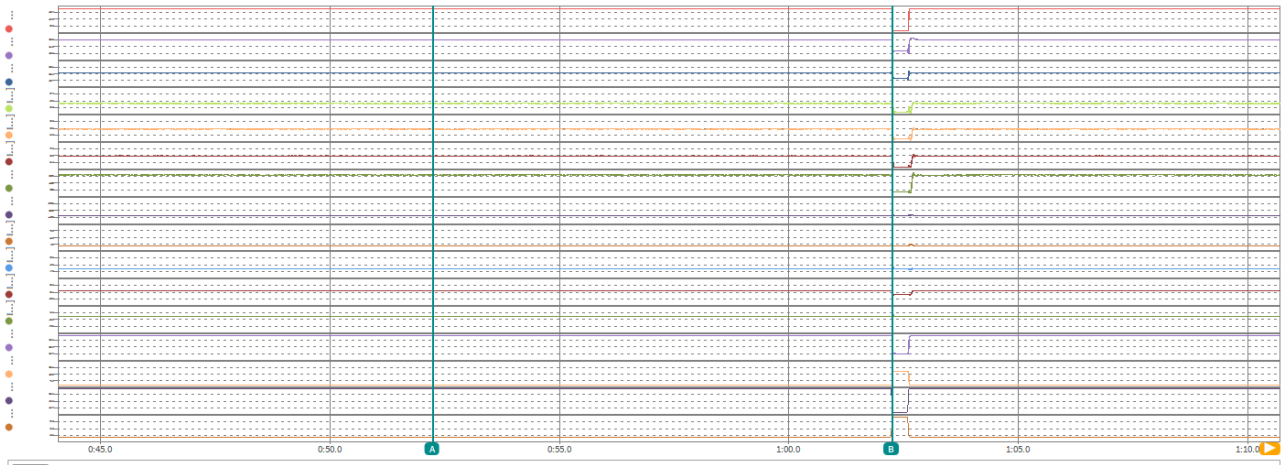
Recover time – Active power



	A	B	间隔	有效值
时间 [s]	1:02.61170	1:02.74670	0.13500	
U1_tRMS_rc@AC [V]	11.46573	231.7738	220.3080	220.1589
U2_tRMS_rc@AC [V]	199.1820	233.8890	34.70700	229.8474
U3_tRMS_rc@AC [V]	199.4006	230.9981	31.59750	228.6667
I1_tRMS_rc@AC [A]	7.453919	178.9016	171.4477	87.12934
I2_tRMS_rc@AC [A]	7.307543	177.2441	169.9366	87.37873
I3_tRMS_rc@AC [A]	5.178473	181.7294	176.5510	88.39117
P_t_rc@AC [W]	1850.510	124695.9	122845.4	60215.18
Q_t_rc@AC [var]	-1788.563	7124.441	8913.004	10150.83
I_fund_Q_SYM+_rc@AC [A]	-1.326154	2.724595	4.050749	5.920154
I_fund_Q_SYM-_rc@AC [A]	0.735419	0.335270	-0.400150	2.388949
I_fund_P_SYM+_rc@AC [A]	5.793376	178.9849	173.1915	86.26102
I_fund_P_SYM-_rc@AC [A]	-0.764316	-1.522037	-0.757721	2.171930
U_fund_SYM+_rc@AC [V]	209.3732	402.2046	192.8314	386.9449
U_fund_SYM-_rc@AC [V]	189.0122	1.658563	-187.3536	46.11609
U+ [V]	120.5797	232.6441	112.0643	206.9122
U- [V]	108.8391	1.192430	-107.6467	53.17416

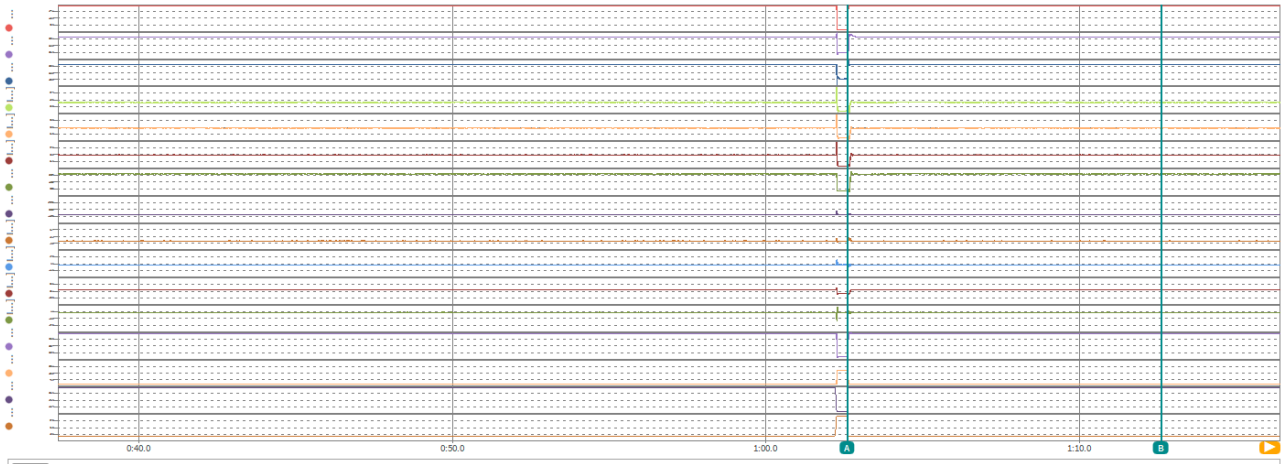
Test – VD6.2

Before fault



	A	B	间隔	有效值
时间 [s]	0:52.24430	1:02.24430	0:10.00000	
U1_tRMS_rc@AC [V]	230.3011	230.2736	-0.027435	230.2400
U2_tRMS_rc@AC [V]	229.7235	229.7112	-0.012329	229.7318
U3_tRMS_rc@AC [V]	229.4561	229.5184	0.062302	229.5250
I1_tRMS_rc@AC [A]	36.31777	36.45409	0.136318	36.29722
I2_tRMS_rc@AC [A]	36.77820	37.17310	0.394897	36.63549
I3_tRMS_rc@AC [A]	36.82399	37.06992	0.245930	37.28816
P_t_rc@AC [W]	25209.15	25381.04	171.8965	25273.41
Q_t_rc@AC [var]	-1638.325	-1756.069	-117.7434	1711.003
I_fund_Q_SYM+_rc@AC [A]	-0.620135	-0.760342	-0.140207	0.700358
I_fund_Q_SYM-_rc@AC [A]	-0.092300	-0.037095	0.055205	0.199983
I_fund_P_SYM+_rc@AC [A]	36.56236	36.81200	0.249638	36.65533
I_fund_P_SYM-_rc@AC [A]	-0.025991	-0.145672	-0.119681	0.273718
U_fund_SYM+_rc@AC [V]	398.0688	398.0822	0.013397	398.0780
U_fund_SYM-_rc@AC [V]	1.031696	0.990534	-0.041163	0.978464
U+ [V]	229.8359	229.8303	-5.613e-3	229.8372
U- [V]	0.584037	0.632371	0.048335	0.564756

After fault

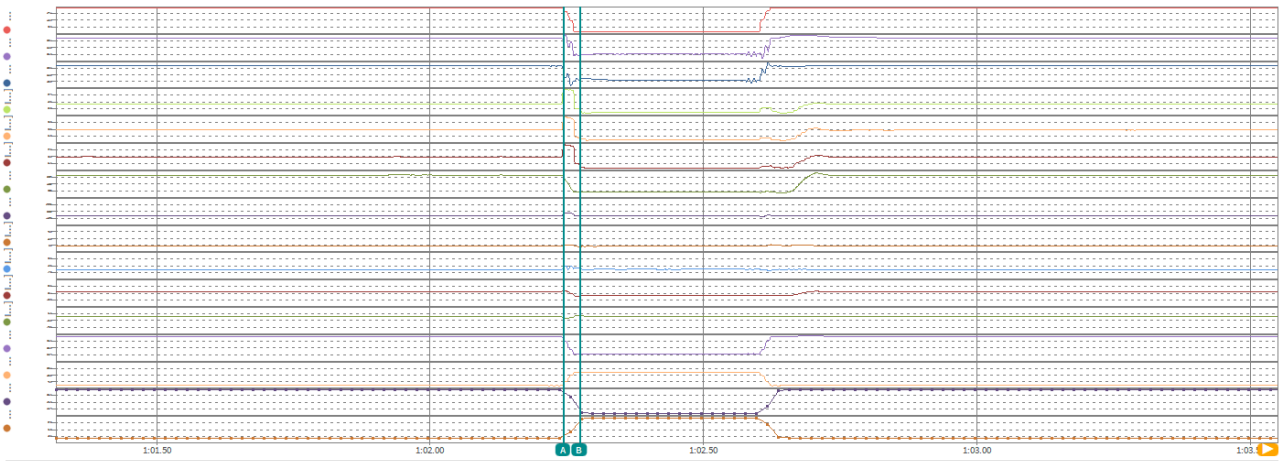


	A	B	间隔	有效值
时间 [s]	1:02.60430	1:12.60430	0:10.00000	
U1_tRMS_rc@AC [V]	7.239050	230.2464	223.0074	230.0999
U2_tRMS_rc@AC [V]	199.3058	229.7233	30.41751	229.7415
U3_tRMS_rc@AC [V]	199.4633	229.5518	30.08847	229.5082
I1_tRMS_rc@AC [A]	7.912449	36.54286	28.63041	36.28265
I2_tRMS_rc@AC [A]	7.677662	36.29124	28.61358	36.47184
I3_tRMS_rc@AC [A]	5.599009	37.30905	31.71004	37.10284
P_t_rc@AC [W]	1995.568	25249.77	23254.20	25171.54
Q_t_rc@AC [var]	-1825.056	-1818.424	6.631714	1950.334
I_fund_Q_SYM+_rc@AC [A]	-1.440218	-0.773085	0.667133	0.931655
I_fund_Q_SYM-_rc@AC [A]	0.787322	0.282544	-0.504778	0.263694
I_fund_P_SYM+_rc@AC [A]	6.147130	36.62007	30.47294	36.50629
I_fund_P_SYM-_rc@AC [A]	-0.551180	-0.221813	0.329367	0.319709
U_fund_SYM+_rc@AC [V]	204.3758	398.0926	193.7168	397.9268
U_fund_SYM-_rc@AC [V]	194.3783	0.968373	-193.4099	5.368623
U+ [V]	117.7951	229.8376	112.0424	229.5430
U- [V]	112.0226	0.570908	-111.4517	6.153852

Duration fault time

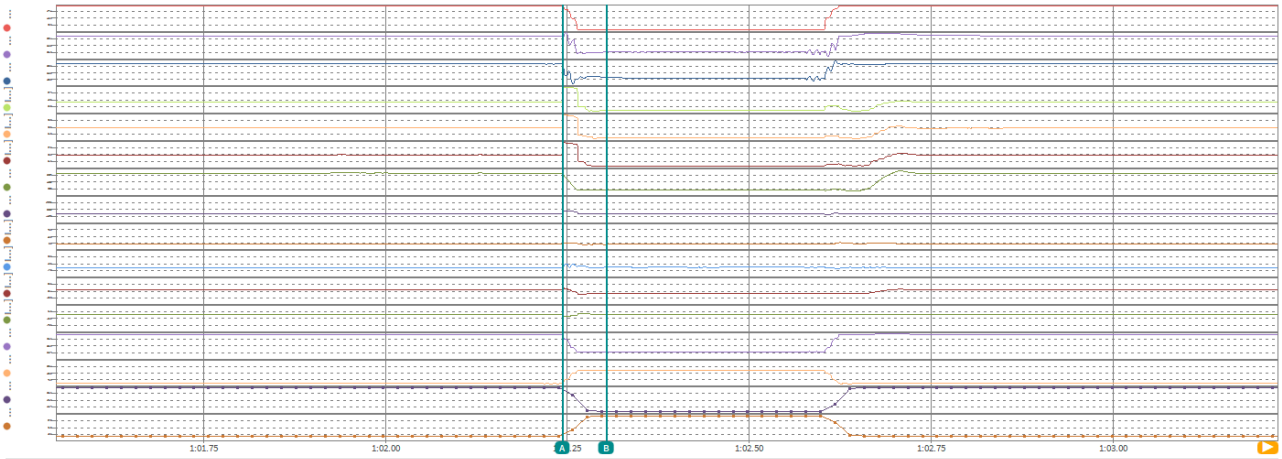
	A	B	间隔	有效值
时间 [s]	1:02.24430	1:02.60430	0.36000	
U1_tRMS_rc@AC [V]	230.2736	7.239050	-223.0346	40.13845
U2_tRMS_rc@AC [V]	229.7112	199.3058	-30.40546	200.5987
U3_tRMS_rc@AC [V]	229.5184	199.4633	-30.05513	200.3577
I1_tRMS_rc@AC [A]	36.45409	7.912449	-28.54164	21.94038
I2_tRMS_rc@AC [A]	37.17310	7.677662	-29.49543	19.01774
I3_tRMS_rc@AC [A]	37.06992	5.599009	-31.47091	17.84445
P_t_rc@AC [W]	25381.04	1995.568	-23385.48	4311.922
Q_t_rc@AC [var]	-1756.069	-1825.056	-68.98682	9874.474
I_fund_Q_SYM+_rc@AC [A]	-0.760342	-1.440218	-0.679876	1.955790
I_fund_Q_SYM-_rc@AC [A]	-0.037095	0.787322	0.824417	2.331354
I_fund_P_SYM+_rc@AC [A]	36.81200	6.147130	-30.66487	10.24056
I_fund_P_SYM-_rc@AC [A]	-0.145672	-0.551180	-0.405508	3.589215
U_fund_SYM+_rc@AC [V]	398.0822	204.3758	-193.7064	211.8490
U_fund_SYM-_rc@AC [V]	0.990534	194.3783	193.3877	190.6899
U+ [V]	229.8303	117.7951	-112.0352	131.5856
U- [V]	0.632371	112.0226	111.3902	106.2999

0-30ms



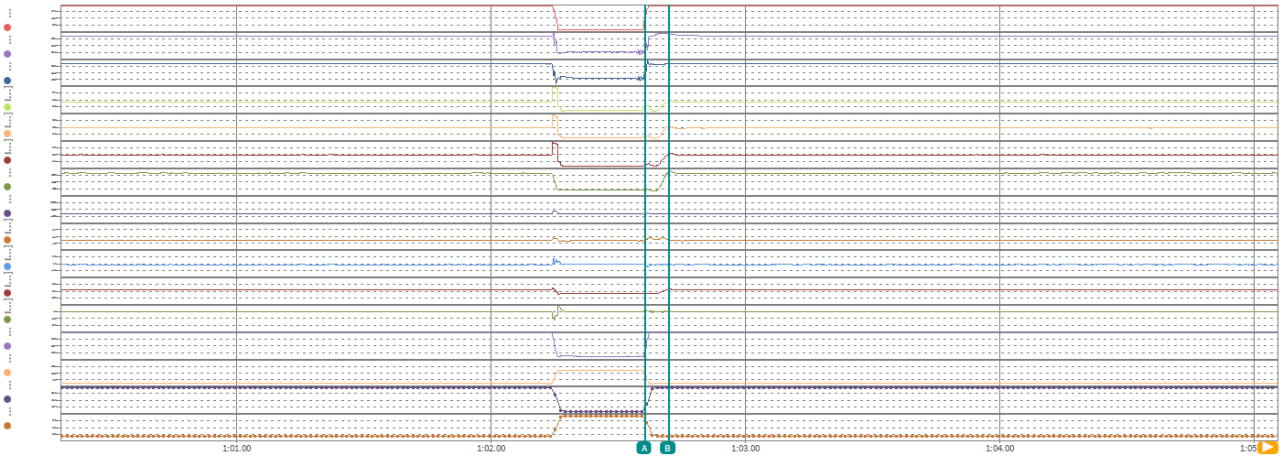
	A	B	间隔	有效值
时间 [s]	1:02.24430	1:02.27430	0.03000	
U1_tRMS_rc@AC [V]	230.2736	6.341629	-223.9320	134.9380
U2_tRMS_rc@AC [V]	229.7112	195.6311	-34.08015	215.1624
U3_tRMS_rc@AC [V]	229.5184	200.2044	-29.31404	204.4863
I1_tRMS_rc@AC [A]	36.45409	20.92506	-15.52903	70.63799
I2_tRMS_rc@AC [A]	37.17310	13.64266	-23.53043	59.22210
I3_tRMS_rc@AC [A]	37.06992	17.10462	-19.96530	57.71037
P_t_rc@AC [W]	25381.04	1422.543	-23958.50	13035.87
Q_t_rc@AC [var]	-1756.069	6061.357	7817.426	33088.31
I_fund_Q_SYM+_rc@AC [A]	-0.760342	-2.947109	-2.186767	4.401317
I_fund_Q_SYM-_rc@AC [A]	-0.037095	5.715014	5.752109	7.355306
I_fund_P_SYM+_rc@AC [A]	36.81200	-6.268886	-43.08088	28.84957
I_fund_P_SYM-_rc@AC [A]	-0.145672	10.48423	10.62990	11.66369
U_fund_SYM+_rc@AC [V]	398.0822	201.6705	-196.4117	278.0487
U_fund_SYM-_rc@AC [V]	0.990534	193.6344	192.6438	143.8679
U+ [V]	229.8303	195.0804	-34.74993	213.1646
U- [V]	0.632371	35.82028	35.18791	25.33271

0-60ms



	A	B	间隔	有效值
时间 [s]	1:02.24430	1:02.30430	0.06000	
U1_tRMS_rc@AC [V]	230.2736	7.184484	-223.0892	96.31737
U2_tRMS_rc@AC [V]	229.7112	199.0463	-30.66493	206.9844
U3_tRMS_rc@AC [V]	229.5184	201.8649	-27.65358	203.5813
I1_tRMS_rc@AC [A]	36.45409	7.638526	-28.81556	50.67513
I2_tRMS_rc@AC [A]	37.17310	7.933352	-29.23974	42.64291
I3_tRMS_rc@AC [A]	37.06992	6.071674	-30.99825	41.49301
P_t_rc@AC [W]	25381.04	1955.750	-23425.30	9366.346
Q_t_rc@AC [var]	-1756.069	-2086.286	-330.2172	23671.98
I_fund_Q_SYM+_rc@AC [A]	-0.760342	-2.058712	-1.298370	3.429503
I_fund_Q_SYM-_rc@AC [A]	-0.037095	1.025255	1.062351	5.346487
I_fund_P_SYM+_rc@AC [A]	36.81200	5.915528	-30.89647	20.75074
I_fund_P_SYM-_rc@AC [A]	-0.145672	-0.445363	-0.299691	8.705797
U_fund_SYM+_rc@AC [V]	398.0822	205.5594	-192.5228	244.9508
U_fund_SYM-_rc@AC [V]	0.990534	195.3498	194.3592	171.2443
U+ [V]	229.8303	118.6143	-111.2160	173.1370
U- [V]	0.632371	112.9487	112.3163	80.13164

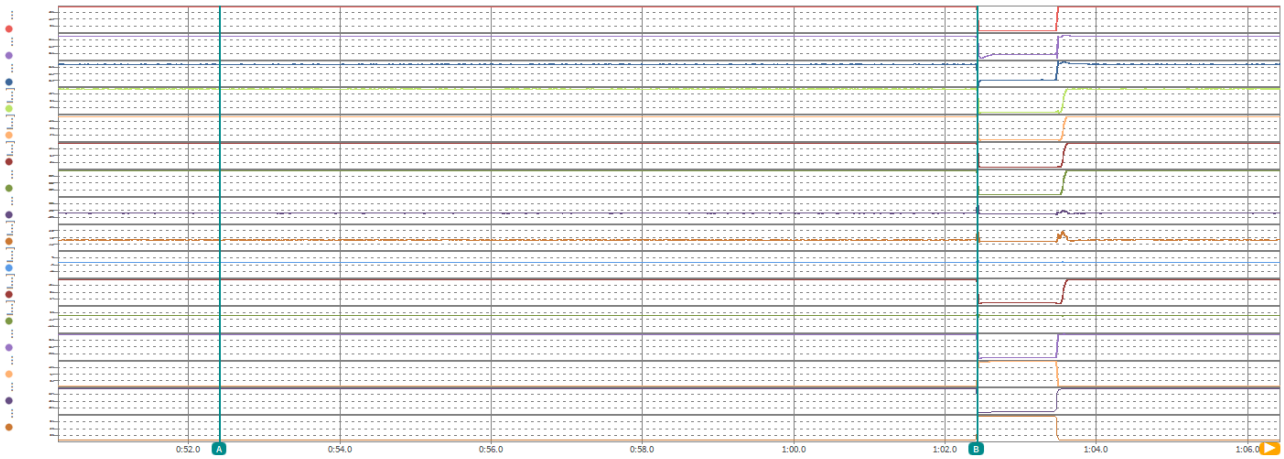
Recover time – Active power



	A	B	间隔	有效值
时间 [s]	1:02.60430	1:02.69830	0.09400	
U1_tRMS_rc@AC [V]	7.239050	230.1616	222.9225	215.6077
U2_tRMS_rc@AC [V]	199.3058	234.6257	35.31992	227.4217
U3_tRMS_rc@AC [V]	199.4633	229.6126	30.14931	227.4078
I1_tRMS_rc@AC [A]	7.912449	37.56815	29.65570	20.36547
I2_tRMS_rc@AC [A]	7.677662	38.68564	31.00798	17.88189
I3_tRMS_rc@AC [A]	5.599009	38.00510	32.40609	17.23429
P_t_rc@AC [W]	1995.568	25788.53	23792.96	10494.04
Q_t_rc@AC [var]	-1825.056	5877.555	7702.611	6586.700
I_fund_Q_SYM+_rc@AC [A]	-1.440218	3.455594	4.895812	4.742591
I_fund_Q_SYM-_rc@AC [A]	0.787322	0.073041	-0.714281	1.643573
I_fund_P_SYM+_rc@AC [A]	6.147130	37.12518	30.97805	15.21710
I_fund_P_SYM-_rc@AC [A]	-0.551180	-0.386991	0.164188	1.068362
U_fund_SYM+_rc@AC [V]	204.3758	400.9083	196.5325	379.9424
U_fund_SYM-_rc@AC [V]	194.3783	2.715658	-191.6626	54.15257
U+ [V]	117.7951	230.6596	112.8645	196.7300
U- [V]	112.0226	2.029329	-109.9933	61.33323

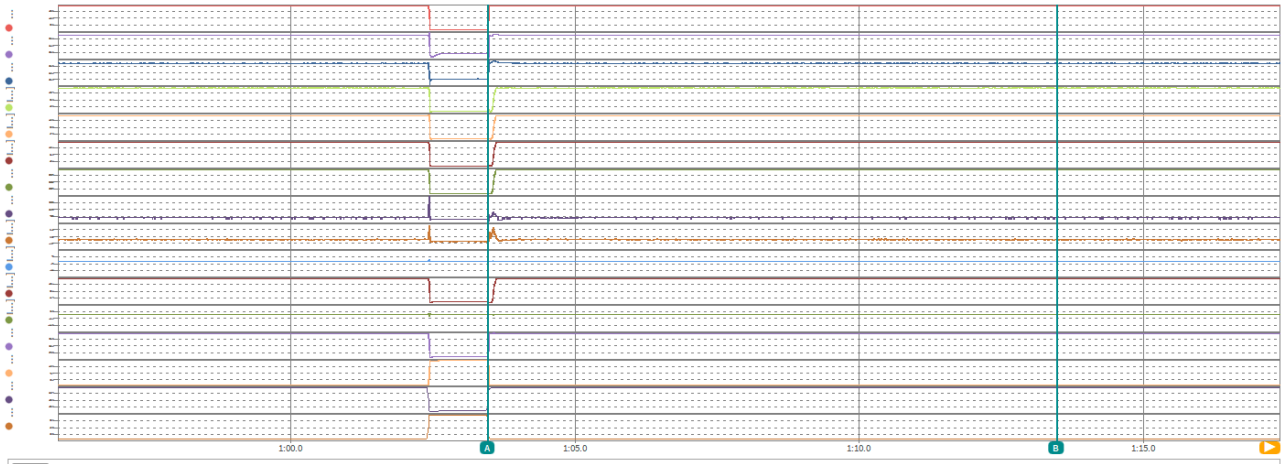
Test – VD7.1

Before fault



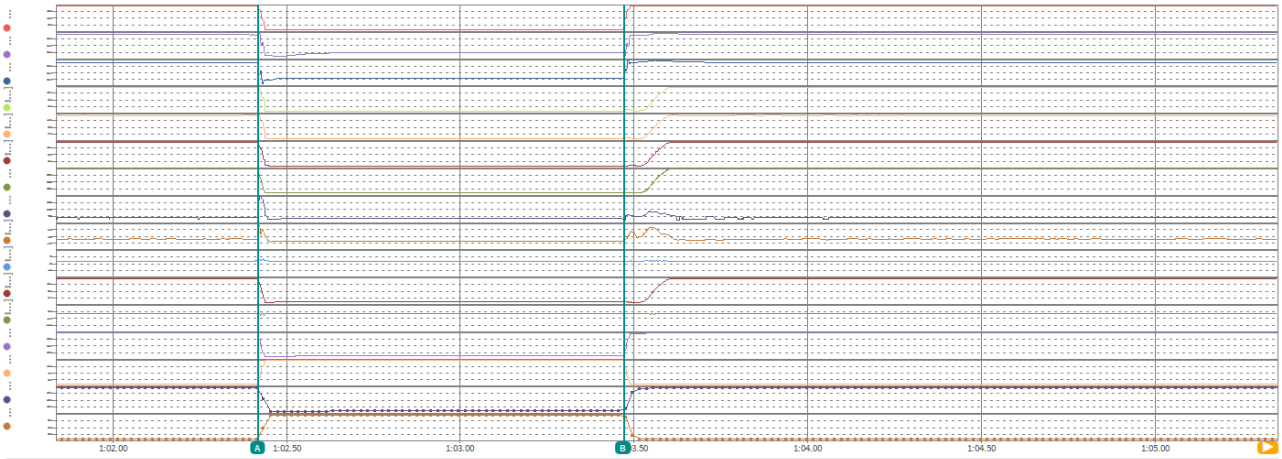
	A	B	间隔	有效值
时间 [s]	0:52.42030	1:02.42030	0:10.00000	
U1_tRMS_rc@AC [V]	230.4448	229.8824	-0.562347	230.4525
U2_tRMS_rc@AC [V]	229.7249	229.6962	-0.028717	229.7543
U3_tRMS_rc@AC [V]	229.6086	230.1492	0.540665	229.6617
I1_tRMS_rc@AC [A]	179.4736	179.3775	-0.096161	179.4660
I2_tRMS_rc@AC [A]	181.2834	181.7399	0.456421	181.2924
I3_tRMS_rc@AC [A]	184.1983	184.5517	0.353439	183.7130
P_t_rc@AC [W]	125275.2	125437.4	162.2578	125183.6
Q_t_rc@AC [var]	2368.956	2105.333	-263.6223	2194.219
I_fund_Q_SYM+_rc@AC [A]	0.582966	0.396001	-0.186965	0.468233
I_fund_Q_SYM-_rc@AC [A]	0.402360	1.591873	1.189514	0.403947
I_fund_P_SYM+_rc@AC [A]	181.6229	181.8536	0.230652	181.4636
I_fund_P_SYM-_rc@AC [A]	-1.211822	-0.216715	0.995107	0.989080
U_fund_SYM+_rc@AC [V]	398.2377	398.1929	-0.044830	398.2897
U_fund_SYM-_rc@AC [V]	1.038630	0.228505	-0.810125	1.049647
U+ [V]	229.9370	229.9201	-0.016860	229.9594
U- [V]	0.581257	0.737221	0.155964	0.605674

After fault



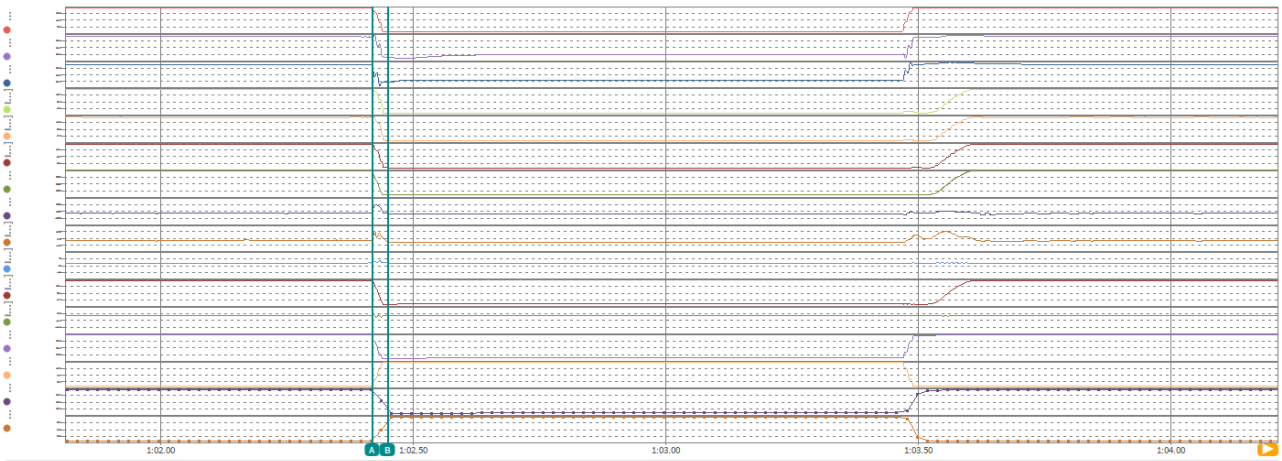
	A	B	间隔	有效值
时间 [s]	1:03.47030	1:13.47030	0:10.00000	
U1_tRMS_rc@AC [V]	57.32144	230.3559	173.0344	230.3404
U2_tRMS_rc@AC [V]	201.8786	229.8006	27.92198	229.7309
U3_tRMS_rc@AC [V]	202.1920	229.6788	27.48679	229.6931
I1_tRMS_rc@AC [A]	5.418160	179.4568	174.0387	178.5695
I2_tRMS_rc@AC [A]	6.919752	181.1195	174.1998	180.3232
I3_tRMS_rc@AC [A]	5.206074	183.0683	177.8622	182.7359
P_t_rc@AC [W]	2245.936	124986.8	122740.9	124536.5
Q_t_rc@AC [var]	-1604.437	2259.619	3864.056	2466.786
I_fund_Q_SYM+_rc@AC [A]	-1.111375	0.444217	1.555592	0.830794
I_fund_Q_SYM-_rc@AC [A]	0.574897	0.031728	-0.543169	0.482702
I_fund_P_SYM+_rc@AC [A]	5.105689	181.1846	176.0789	180.5061
I_fund_P_SYM-_rc@AC [A]	0.146208	-0.788479	-0.934687	1.002601
U_fund_SYM+_rc@AC [V]	249.1707	398.2706	149.0999	398.1877
U_fund_SYM-_rc@AC [V]	150.6535	0.999608	-149.6539	4.372401
U+ [V]	143.7934	229.9720	86.17859	229.6893
U- [V]	86.78754	0.604187	-86.18335	5.311344

Duration fault time



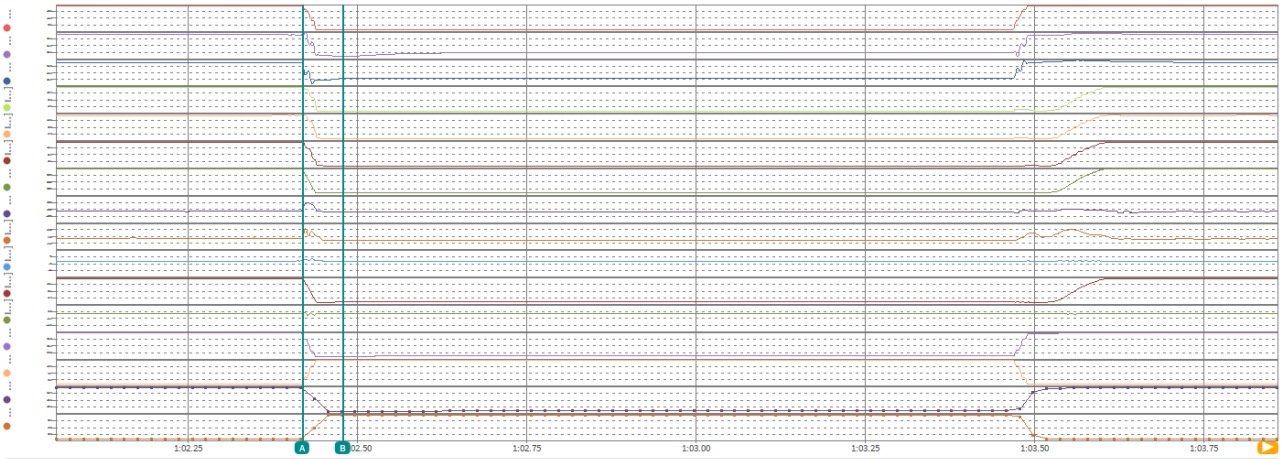
	A	B	间隔	有效值
时间 [s]	1:02.42030	1:03.47030	1.05000	
U1_tRMS_rc@AC [V]	229.8824	57.32144	-172.5610	61.65754
U2_tRMS_rc@AC [V]	229.6962	201.8786	-27.81758	201.3346
U3_tRMS_rc@AC [V]	230.1492	202.1920	-27.95720	201.7110
I1_tRMS_rc@AC [A]	179.3775	5.418160	-173.9593	20.98032
I2_tRMS_rc@AC [A]	181.7399	6.919752	-174.8201	22.19119
I3_tRMS_rc@AC [A]	184.5517	5.206074	-179.3456	19.61431
P_t_rc@AC [W]	125437.4	2245.936	-123191.5	11327.76
Q_t_rc@AC [var]	2105.333	-1604.437	-3709.770	6106.444
I_fund_Q_SYM+_rc@AC [A]	0.396001	-1.111375	-1.507376	1.531882
I_fund_Q_SYM-_rc@AC [A]	1.591873	0.574897	-1.016976	2.805570
I_fund_P_SYM+_rc@AC [A]	181.8536	5.105689	-176.7479	17.48852
I_fund_P_SYM-_rc@AC [A]	-0.216715	0.146208	0.362922	1.558783
U_fund_SYM+_rc@AC [V]	398.1929	249.1707	-149.0222	250.3186
U_fund_SYM-_rc@AC [V]	0.228505	150.6535	150.4250	149.0194
U+ [V]	229.9201	143.7934	-86.12669	146.5666
U- [V]	0.737221	86.78754	86.05031	85.15450

0-30ms



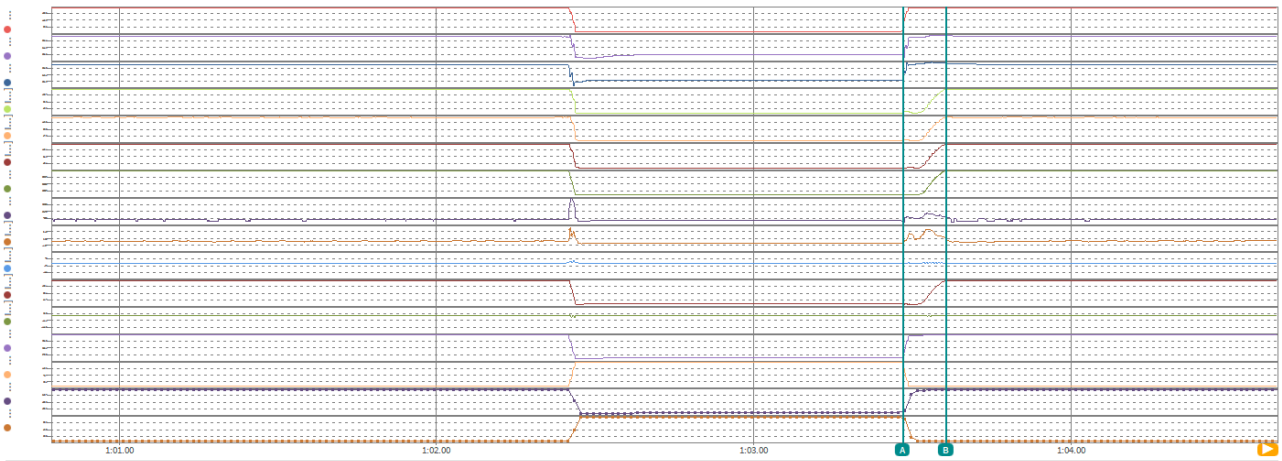
	A	B	间隔	有效值
时间 [s]	1:02.42030	1:02.45030	0.03000	
U1_tRMS_rc@AC [V]	229.8824	53.72330	-176.1591	144.5682
U2_tRMS_rc@AC [V]	229.6962	197.5776	-32.11856	214.1641
U3_tRMS_rc@AC [V]	230.1492	197.9791	-32.17015	205.3496
I1_tRMS_rc@AC [A]	179.3775	3.546435	-175.8310	118.2085
I2_tRMS_rc@AC [A]	181.7399	6.534872	-175.2050	123.1101
I3_tRMS_rc@AC [A]	184.5517	10.23284	-174.3189	110.1591
P_t_rc@AC [W]	125437.4	-420.4735	-125857.9	64782.68
Q_t_rc@AC [var]	2105.333	3482.264	1376.931	34218.29
I_fund_Q_SYM+_rc@AC [A]	0.396001	-0.465380	-0.861381	5.857426
I_fund_Q_SYM-_rc@AC [A]	1.591873	1.637615	0.045742	15.93134
I_fund_P_SYM+_rc@AC [A]	181.8536	-2.385059	-184.2386	97.75063
I_fund_P_SYM-_rc@AC [A]	-0.216715	2.227364	2.444078	8.999520
U_fund_SYM+_rc@AC [V]	398.1929	242.7730	-155.4199	302.8785
U_fund_SYM-_rc@AC [V]	0.228505	149.2447	149.0162	109.3461
U+ [V]	229.9201	189.5053	-40.41481	210.6840
U- [V]	0.737221	39.87621	39.13899	28.20156

0-60ms



	A	B	间隔	有效值
时间 [s]	1:02.42030	1:02.48030	0.06000	
U1_tRMS_rc@AC [V]	229.8824	55.68259	-174.1998	109.9827
U2_tRMS_rc@AC [V]	229.6962	195.5926	-34.10361	205.6948
U3_tRMS_rc@AC [V]	230.1492	201.5405	-28.60875	202.5697
I1_tRMS_rc@AC [A]	179.3775	5.058630	-174.3188	84.30939
I2_tRMS_rc@AC [A]	181.7399	8.144623	-173.5952	87.86545
I3_tRMS_rc@AC [A]	184.5517	5.984531	-178.5672	78.64393
P_t_rc@AC [W]	125437.4	2471.168	-122966.3	46190.01
Q_t_rc@AC [var]	2105.333	-1839.795	-3945.128	24446.14
I_fund_Q_SYM+_rc@AC [A]	0.396001	-1.085986	-1.481987	4.271648
I_fund_Q_SYM-_rc@AC [A]	1.591873	0.865370	-0.726503	11.36281
I_fund_P_SYM+_rc@AC [A]	181.8536	5.628138	-176.2254	69.71683
I_fund_P_SYM-_rc@AC [A]	-0.216715	0.352686	0.569401	6.452034
U_fund_SYM+_rc@AC [V]	398.1929	244.7890	-153.4039	275.3413
U_fund_SYM-_rc@AC [V]	0.228505	148.4830	148.2545	130.2279
U+ [V]	229.9201	140.8115	-89.10863	179.1212
U- [V]	0.737221	85.81622	85.07900	63.88841

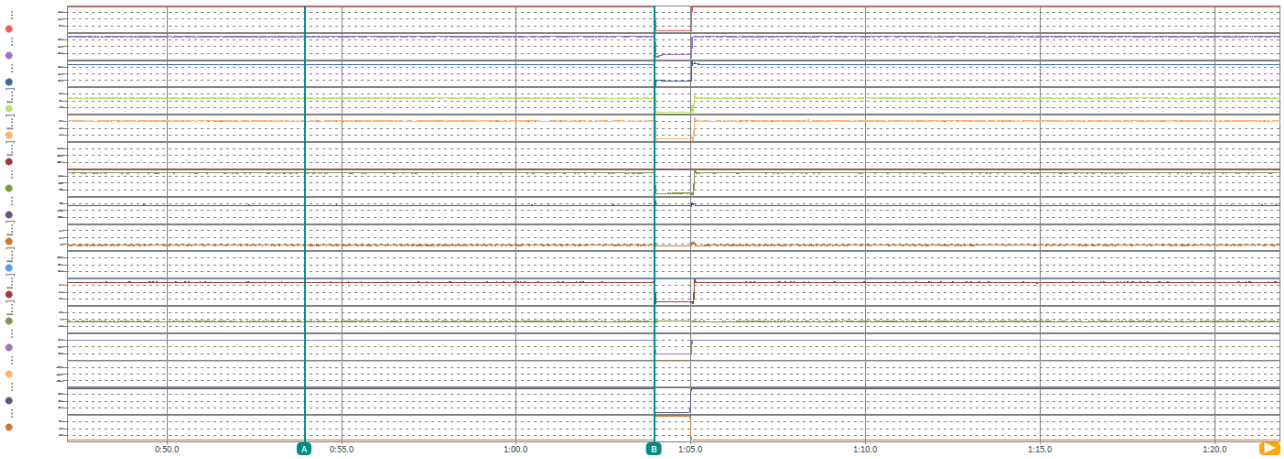
Recover time – Active power



	A	B	间隔	有效值
时间 [s]	1:03.47030	1:03.60730	0.13700	
U1_tRMS_rc@AC [V]	57.32144	231.8229	174.5015	221.4363
U2_tRMS_rc@AC [V]	201.8786	231.1487	29.27008	227.1153
U3_tRMS_rc@AC [V]	202.1920	232.0565	29.86444	230.2702
I1_tRMS_rc@AC [A]	5.418160	177.7810	172.3628	87.79905
I2_tRMS_rc@AC [A]	6.919752	180.3969	173.4771	88.85604
I3_tRMS_rc@AC [A]	5.206074	182.2334	177.0274	89.62950
P_t_rc@AC [W]	2245.936	125009.2	122763.3	60970.72
Q_t_rc@AC [var]	-1604.437	6921.243	8525.680	9767.342
I_fund_Q_SYM+_rc@AC [A]	-1.111375	2.951210	4.062585	5.802385
I_fund_Q_SYM-_rc@AC [A]	0.574897	1.062831	0.487934	2.127194
I_fund_P_SYM+_rc@AC [A]	5.105689	179.8535	174.7478	87.55486
I_fund_P_SYM-_rc@AC [A]	0.146208	-1.228711	-1.374919	2.226576
U_fund_SYM+_rc@AC [V]	249.1707	401.2646	152.0938	388.8759
U_fund_SYM-_rc@AC [V]	150.6535	0.618823	-150.0347	36.14297
U+ [V]	143.7934	232.1371	88.34372	211.2512
U- [V]	86.78754	0.381300	-86.40624	41.76044

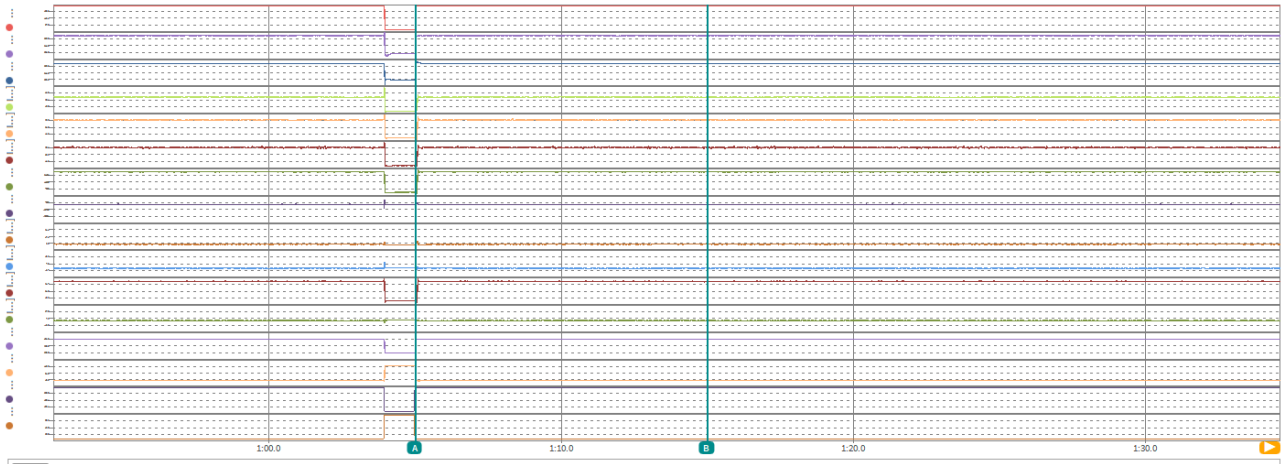
Test – VD7.2

Before fault



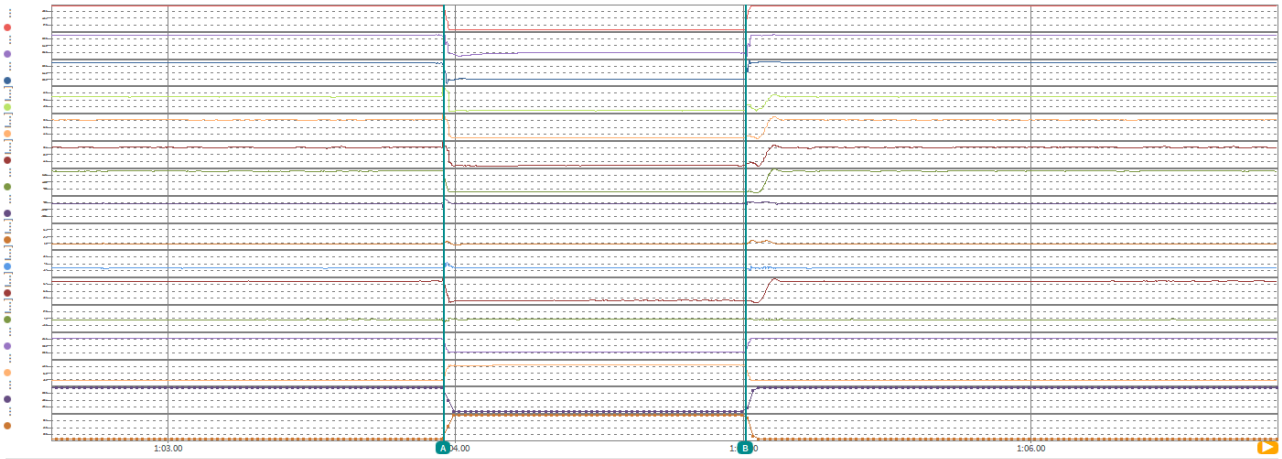
	A	B	间隔	有效值
时间 [s]	0:53.95970	1:03.95970	0:10.00000	
U1_tRMS_rc@AC [V]	230.2387	229.6317	-0.606949	230.2348
U2_tRMS_rc@AC [V]	229.7611	229.9127	0.151611	229.7344
U3_tRMS_rc@AC [V]	229.5285	229.8936	0.365051	229.5319
I1_tRMS_rc@AC [A]	36.41151	36.21798	-0.193527	36.40601
I2_tRMS_rc@AC [A]	36.46259	36.80647	0.343880	36.60108
I3_tRMS_rc@AC [A]	37.63346	36.95124	-0.682220	37.17185
P_t_rc@AC [W]	25335.48	25196.89	-138.5898	25261.89
Q_t_rc@AC [var]	-1794.742	-1971.722	-176.9796	1730.291
I_fund_Q_SYM+_rc@AC [A]	-0.813278	-1.173318	-0.360040	0.758411
I_fund_Q_SYM-_rc@AC [A]	0.196552	0.047923	-0.148628	0.260527
I_fund_P_SYM+_rc@AC [A]	36.74439	36.54194	-0.202454	36.63853
I_fund_P_SYM-_rc@AC [A]	-0.408398	0.025293	0.433691	0.309461
U_fund_SYM+_rc@AC [V]	398.0963	398.0211	-0.075256	398.0806
U_fund_SYM-_rc@AC [V]	1.001949	0.259688	-0.742261	0.974803
U+ [V]	229.8296	229.8309	1.279e-3	229.8388
U- [V]	0.553600	0.648152	0.094553	0.562344

After fault



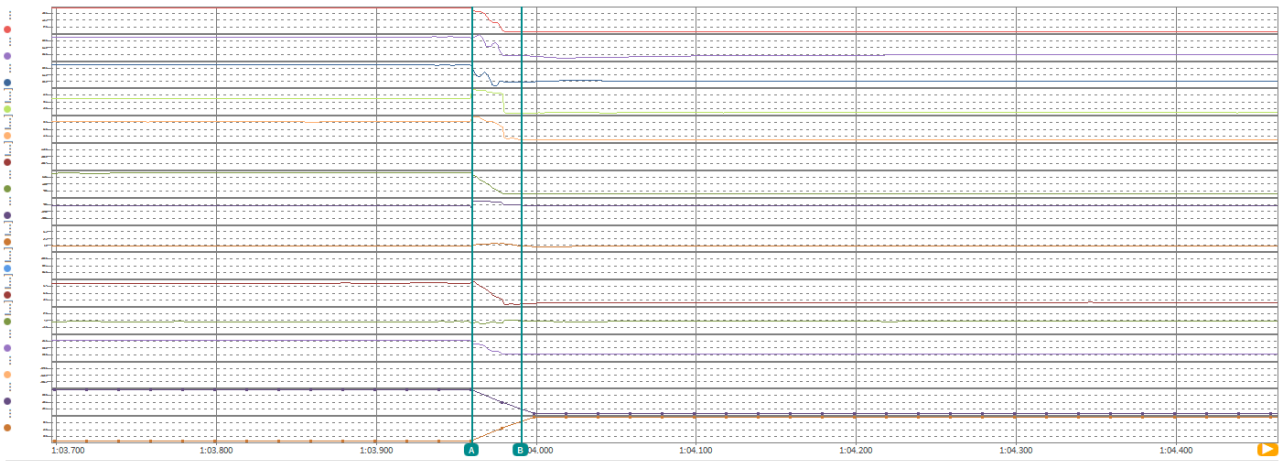
	A	B	间隔	有效值
时间 [s]	1:05.00970	1:15.00970	0:10.00000	
U1_tRMS_rc@AC [V]	57.32252	230.2029	172.8804	230.1148
U2_tRMS_rc@AC [V]	202.0302	229.7080	27.67784	229.6886
U3_tRMS_rc@AC [V]	202.2489	229.5040	27.25508	229.5395
I1_tRMS_rc@AC [A]	4.712133	36.40135	31.68922	36.30944
I2_tRMS_rc@AC [A]	6.830428	36.30782	29.47739	36.50899
I3_tRMS_rc@AC [A]	5.865578	37.18567	31.32009	37.06619
P_t_rc@AC [W]	2307.884	25191.49	22883.61	25176.83
Q_t_rc@AC [var]	-1648.839	-1777.918	-129.0789	1958.609
I_fund_Q_SYM+_rc@AC [A]	-1.307277	-0.354276	0.953000	0.918438
I_fund_Q_SYM-_rc@AC [A]	0.290627	0.231403	-0.059224	0.296677
I_fund_P_SYM+_rc@AC [A]	5.008229	36.53976	31.53153	36.51425
I_fund_P_SYM-_rc@AC [A]	0.541512	-0.266464	-0.807976	0.349715
U_fund_SYM+_rc@AC [V]	249.2332	398.0307	148.7975	397.9490
U_fund_SYM-_rc@AC [V]	150.6228	0.995899	-149.6269	4.188938
U+ [V]	143.7974	229.8381	86.04066	229.5589
U- [V]	86.78812	0.558441	-86.22968	5.194599

Duration fault time



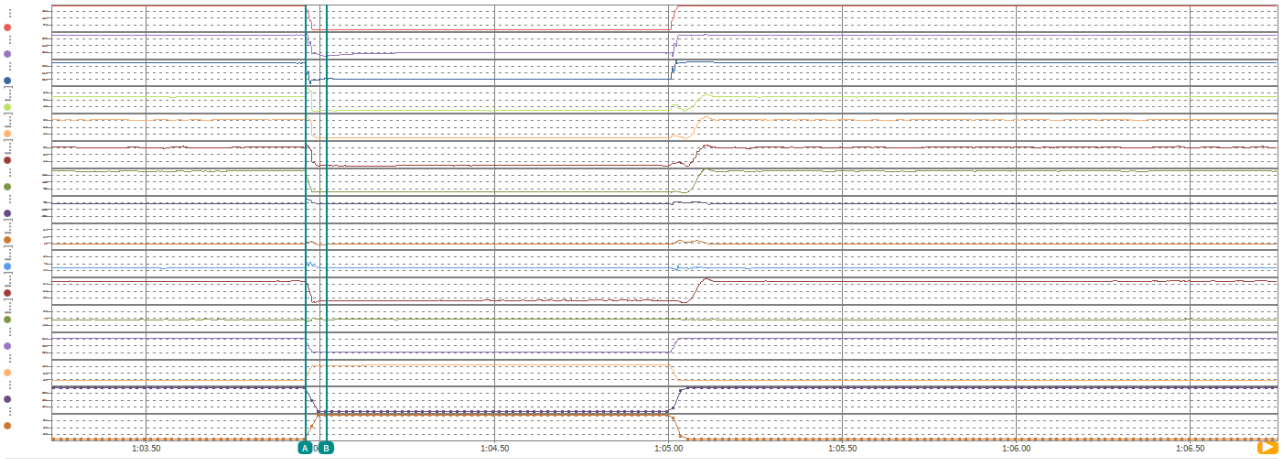
	A	B	间隔	有效值
时间 [s]	1:03.96000	1:05.00970	1.04970	
U1_tRMS_rc@AC [V]	229.6317	57.32252	-172.3092	61.46583
U2_tRMS_rc@AC [V]	229.9127	202.0302	-27.88249	201.6079
U3_tRMS_rc@AC [V]	229.8936	202.2489	-27.64465	201.9206
I1_tRMS_rc@AC [A]	36.21798	4.712133	-31.50585	8.710891
I2_tRMS_rc@AC [A]	36.80647	6.830428	-29.97604	8.613277
I3_tRMS_rc@AC [A]	36.95124	5.865578	-31.08566	7.834038
P_t_rc@AC [W]	25196.89	2307.884	-22889.01	3128.687
Q_t_rc@AC [var]	-1971.722	-1648.839	322.8832	3271.633
I_fund_Q_SYM+_rc@AC [A]	-1.173318	-1.307277	-0.133959	1.487244
I_fund_Q_SYM-_rc@AC [A]	0.047923	0.290627	0.242703	1.017520
I_fund_P_SYM+_rc@AC [A]	36.54194	5.008229	-31.53371	6.083158
I_fund_P_SYM-_rc@AC [A]	0.025293	0.541512	0.516219	0.832878
U_fund_SYM+_rc@AC [V]	398.0211	249.2332	-148.7878	250.5419
U_fund_SYM-_rc@AC [V]	0.259688	150.6228	150.3631	149.2532
U+ [V]	229.8125	143.7974	-86.01514	146.5892
U- [V]	0.601717	86.78812	86.18640	85.33295

0-30ms



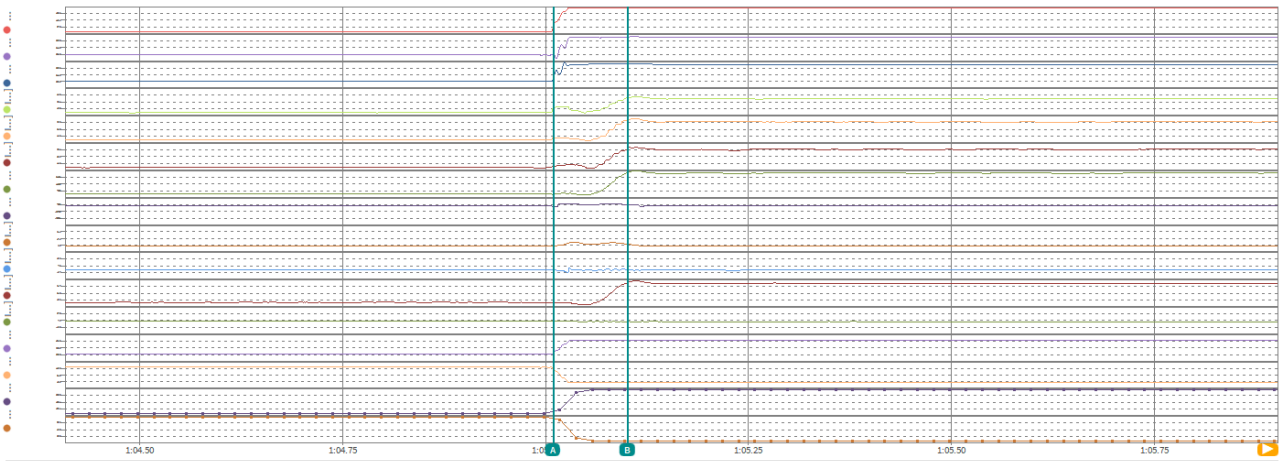
	A	B	间隔	有效值
时间 [s]	1:03.96000	1:03.99070	0.03070	
U1_tRMS_rc@AC [V]	229.6317	56.22215	-173.4096	139.5885
U2_tRMS_rc@AC [V]	229.9127	200.5283	-29.38440	214.7550
U3_tRMS_rc@AC [V]	229.8936	200.3865	-29.50705	206.1627
I1_tRMS_rc@AC [A]	36.21798	3.447042	-32.77094	42.27440
I2_tRMS_rc@AC [A]	36.80647	7.090025	-29.71644	31.41214
I3_tRMS_rc@AC [A]	36.95124	6.708573	-30.24266	31.32637
P_t_rc@AC [W]	25196.89	1533.744	-23663.15	12983.25
Q_t_rc@AC [var]	-1971.722	2531.480	4503.202	16093.95
I_fund_Q_SYM+_rc@AC [A]	-1.173318	-0.677089	0.496229	2.873793
I_fund_Q_SYM-_rc@AC [A]	0.047923	2.321909	2.273986	5.339042
I_fund_P_SYM+_rc@AC [A]	36.54194	1.873320	-34.66862	21.67582
I_fund_P_SYM-_rc@AC [A]	0.025293	2.793390	2.768097	4.005052
U_fund_SYM+_rc@AC [V]	398.0211	247.1701	-150.8510	300.9477
U_fund_SYM-_rc@AC [V]	0.259688	150.1868	149.9271	113.1737
U+ [V]	229.8125	184.1638	-45.64873	208.2428
U- [V]	0.601717	46.47257	45.87085	32.86382

0-60ms



	A	B	间隔	有效值
时间 [s]	1:03.96000	1:04.02000	0.06000	
U1_tRMS_rc@AC [V]	229.6317	55.50350	-174.1282	108.1824
U2_tRMS_rc@AC [V]	229.9127	196.8703	-33.04237	207.2294
U3_tRMS_rc@AC [V]	229.8936	202.4592	-27.43437	203.9333
I1_tRMS_rc@AC [A]	36.21798	5.142292	-31.07569	30.77902
I2_tRMS_rc@AC [A]	36.80647	6.541879	-30.26459	23.19058
I3_tRMS_rc@AC [A]	36.95124	5.690300	-31.26094	23.02019
P_t_rc@AC [W]	25196.89	1877.615	-23319.28	9485.544
Q_t_rc@AC [var]	-1971.722	-1975.400	-3.678345	11736.17
I_fund_Q_SYM+_rc@AC [A]	-1.173318	-2.182469	-1.009151	2.580226
I_fund_Q_SYM-_rc@AC [A]	0.047923	0.715901	0.667978	3.906680
I_fund_P_SYM+_rc@AC [A]	36.54194	4.381755	-32.16018	15.91156
I_fund_P_SYM-_rc@AC [A]	0.025293	0.059344	0.034051	3.031436
U_fund_SYM+_rc@AC [V]	398.0211	245.8522	-152.1689	276.3156
U_fund_SYM-_rc@AC [V]	0.259688	149.6432	149.3835	131.8997
U+ [V]	229.8125	142.0268	-87.78579	178.3542
U- [V]	0.601717	86.51499	85.91327	65.48400

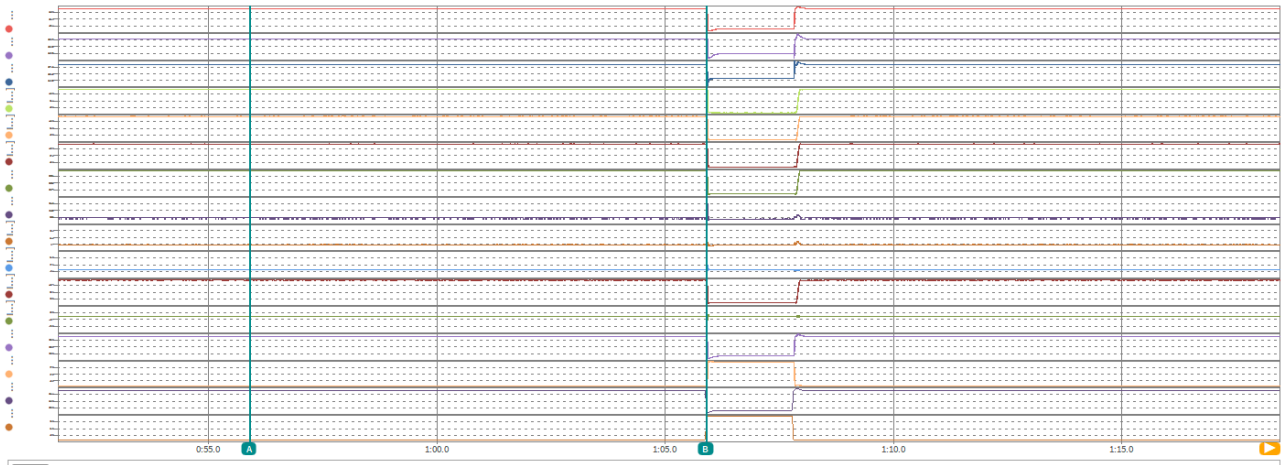
Recover time – Active power



	A	B	间隔	有效值
时间 [s]	1:05.00970	1:05.10170	0.09200	
U1_tRMS_rc@AC [V]	57.32252	230.2200	172.8975	216.6076
U2_tRMS_rc@AC [V]	202.0302	229.8975	27.86729	224.9013
U3_tRMS_rc@AC [V]	202.2489	232.0128	29.76390	228.8924
I1_tRMS_rc@AC [A]	4.712133	37.71427	33.00213	18.43478
I2_tRMS_rc@AC [A]	6.830428	38.18691	31.35648	17.54943
I3_tRMS_rc@AC [A]	5.865578	37.12919	31.26361	17.39379
P_t_rc@AC [W]	2307.884	25553.99	23246.10	10467.99
Q_t_rc@AC [var]	-1648.839	5191.990	6840.829	5935.956
I_fund_Q_SYM+_rc@AC [A]	-1.307277	3.354987	4.662263	4.564166
I_fund_Q_SYM-_rc@AC [A]	0.290627	0.046748	-0.243879	1.331066
I_fund_P_SYM+_rc@AC [A]	5.008229	36.90990	31.90167	15.18408
I_fund_P_SYM-_rc@AC [A]	0.541512	-0.756583	-1.298096	1.061309
U_fund_SYM+_rc@AC [V]	249.2332	399.5978	150.3646	382.6849
U_fund_SYM-_rc@AC [V]	150.6228	0.799136	-149.8237	42.26243
U+ [V]	143.7974	230.3771	86.57968	204.6755
U- [V]	86.78812	0.565701	-86.22242	47.19245

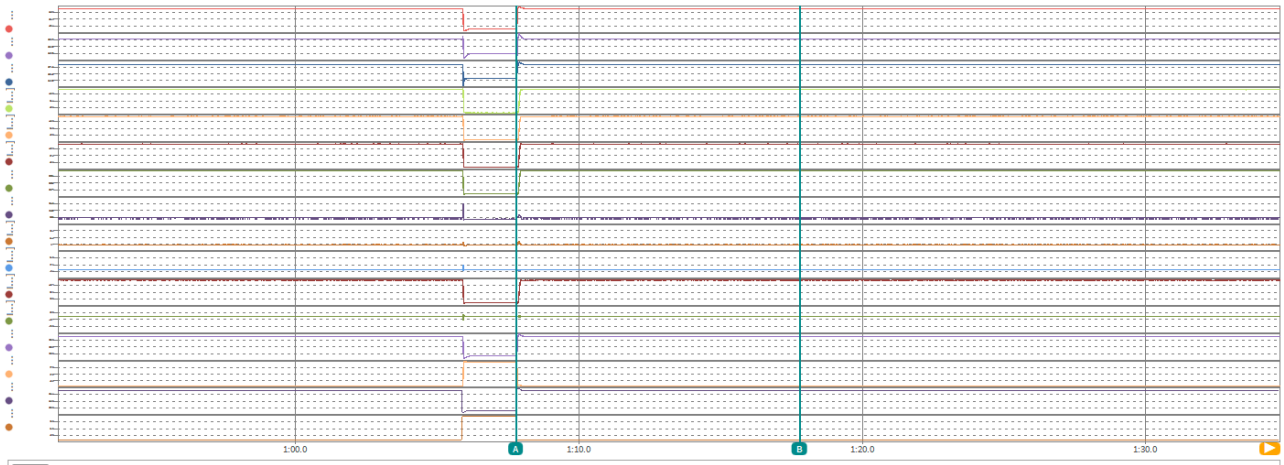
Test – VD8.1

Before fault



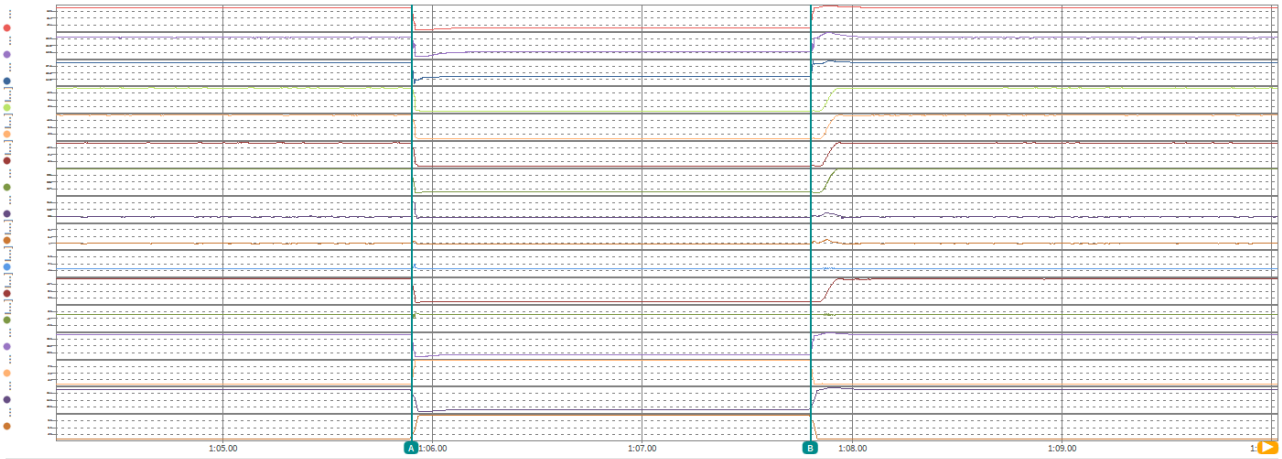
	A	B	间隔	有效值
时间 [s]	0:55.90320	1:05.90320	0:10.00000	
U1_tRMS_rc@AC [V]	230.4776	229.9974	-0.480209	230.4877
U2_tRMS_rc@AC [V]	229.8089	229.5809	-0.227936	229.7883
U3_tRMS_rc@AC [V]	229.6768	229.4238	-0.253036	229.6733
I1_tRMS_rc@AC [A]	179.9652	180.9728	1.007629	179.6611
I2_tRMS_rc@AC [A]	181.5676	181.8956	0.327957	181.4211
I3_tRMS_rc@AC [A]	184.1052	184.8182	0.712997	183.8685
P_t_rc@AC [W]	125470.5	125698.0	227.5625	125304.0
Q_t_rc@AC [var]	2127.547	4669.709	2542.162	2414.530
I_fund_Q_SYM+_rc@AC [A]	0.380770	0.050787	-0.329983	0.578699
I_fund_Q_SYM-_rc@AC [A]	0.442672	0.476014	0.033342	0.571794
I_fund_P_SYM+_rc@AC [A]	181.8535	182.5093	0.655807	181.6168
I_fund_P_SYM-_rc@AC [A]	-0.871151	-0.779708	0.091443	1.035667
U_fund_SYM+_rc@AC [V]	398.3447	397.7429	-0.601746	398.3365
U_fund_SYM-_rc@AC [V]	1.046401	0.607840	-0.438561	1.071770
U+ [V]	229.9839	230.0009	0.017074	229.9865
U- [V]	0.609597	0.605594	-4.003e-3	0.618614

After fault



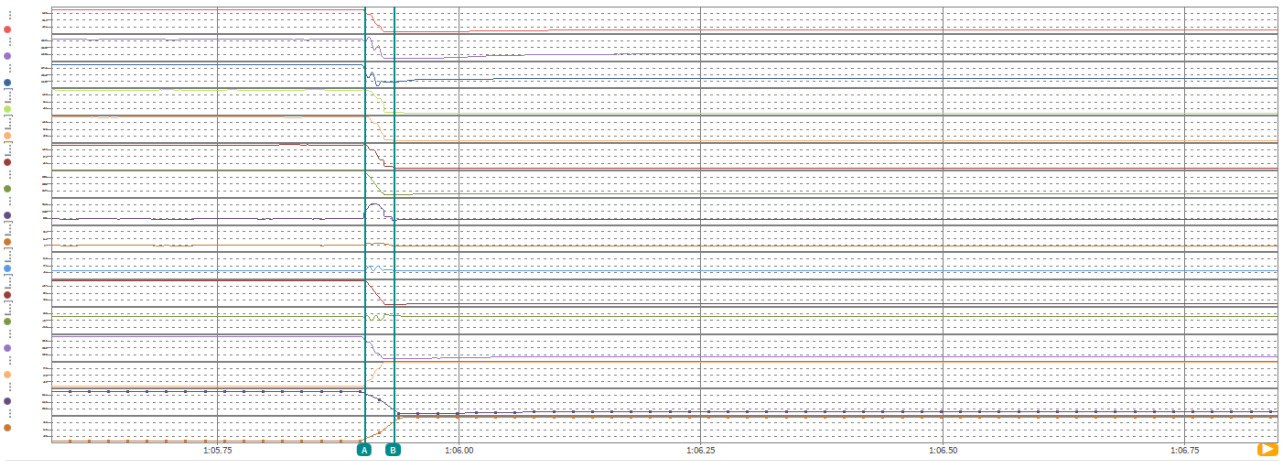
	A	B	间隔	有效值
时间 [s]	1:07.80320	1:17.80320	0:10.00000	
U1_tRMS_rc@AC [V]	172.7514	230.4844	57.73296	230.4870
U2_tRMS_rc@AC [V]	215.6603	229.7947	14.13445	229.8055
U3_tRMS_rc@AC [V]	215.6215	229.6555	14.03404	229.6941
I1_tRMS_rc@AC [A]	4.281791	180.3960	176.1142	178.6889
I2_tRMS_rc@AC [A]	5.724089	181.0206	175.2965	180.4606
I3_tRMS_rc@AC [A]	4.973786	185.1505	180.1767	182.9145
P_t_rc@AC [W]	2325.253	125677.0	123351.8	124649.7
Q_t_rc@AC [var]	-1968.493	2234.183	4202.677	2617.342
I_fund_Q_SYM+_rc@AC [A]	-0.870302	0.153522	1.023824	0.936203
I_fund_Q_SYM-_rc@AC [A]	0.453506	1.304390	0.850884	0.581527
I_fund_P_SYM+_rc@AC [A]	3.937184	182.1593	178.2221	180.6470
I_fund_P_SYM-_rc@AC [A]	0.088131	-0.946975	-1.035106	1.074949
U_fund_SYM+_rc@AC [V]	341.4101	398.3276	56.91757	398.3482
U_fund_SYM-_rc@AC [V]	73.56891	1.101124	-72.46778	2.227941
U+ [V]	196.8709	229.9815	33.11057	229.9222
U- [V]	42.39056	0.647386	-41.74318	2.347925

Duration fault time



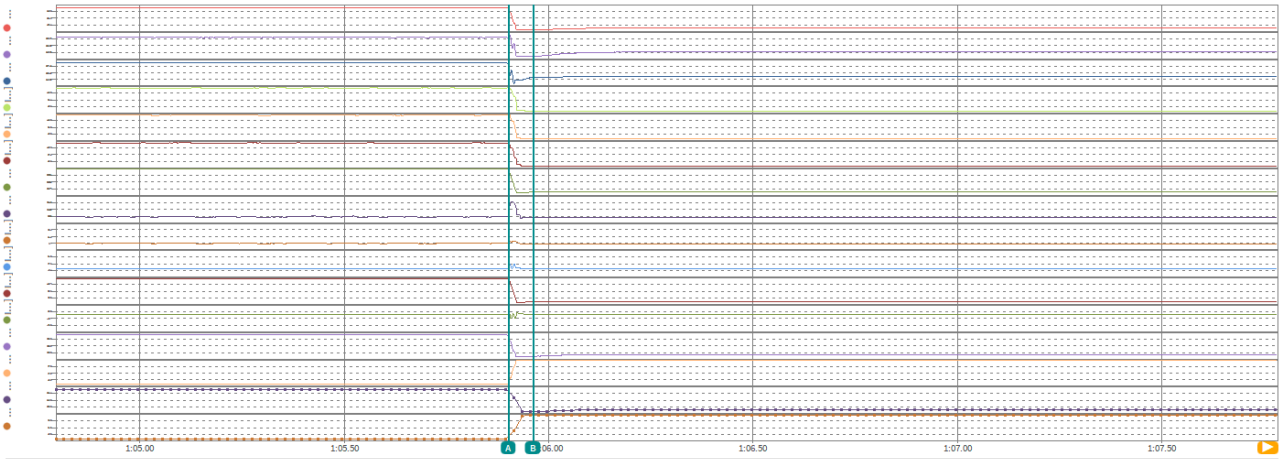
	A	B	间隔	有效值
时间 [s]	1:05.90320	1:07.80320	1.90000	
U1_tRMS_rc@AC [V]	229.9974	172.7514	-57.24597	172.6552
U2_tRMS_rc@AC [V]	229.5809	215.6603	-13.92064	215.3627
U3_tRMS_rc@AC [V]	229.4238	215.6215	-13.80229	215.4365
I1_tRMS_rc@AC [A]	180.9728	4.281791	-176.6910	16.01005
I2_tRMS_rc@AC [A]	181.8956	5.724089	-176.1715	16.18548
I3_tRMS_rc@AC [A]	184.8182	4.973786	-179.8444	15.27148
P_t_rc@AC [W]	125698.0	2325.253	-123372.8	8636.871
Q_t_rc@AC [var]	4669.709	-1968.493	-6638.202	5542.982
I_fund_Q_SYM+_rc@AC [A]	0.050787	-0.870302	-0.921089	1.146719
I_fund_Q_SYM-_rc@AC [A]	0.476014	0.453506	-0.022508	1.943486
I_fund_P_SYM+_rc@AC [A]	182.5093	3.937184	-178.5721	13.08375
I_fund_P_SYM-_rc@AC [A]	-0.779708	0.088131	0.867839	1.427363
U_fund_SYM+_rc@AC [V]	397.7429	341.4101	-56.33286	340.9576
U_fund_SYM-_rc@AC [V]	0.607840	73.56891	72.96107	73.21343
U+ [V]	230.0009	196.8709	-33.13001	197.2846
U- [V]	0.605594	42.39056	41.78497	42.00029

0-30ms



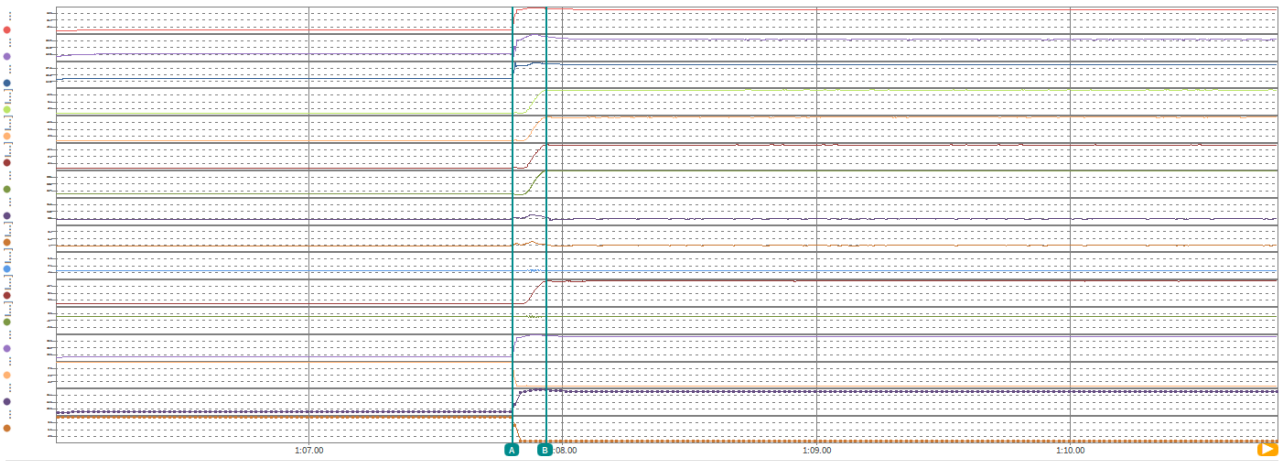
	A	B	间隔	有效值
时间 [s]	1:05.90320	1:05.93320	0.03000	
U1_tRMS_rc@AC [V]	229.9974	168.2428	-61.75459	191.3893
U2_tRMS_rc@AC [V]	229.5809	211.4137	-18.16725	220.4656
U3_tRMS_rc@AC [V]	229.4238	211.6532	-17.77055	215.0787
I1_tRMS_rc@AC [A]	180.9728	10.07620	-170.8966	120.8577
I2_tRMS_rc@AC [A]	181.8956	8.999932	-172.8957	118.4974
I3_tRMS_rc@AC [A]	184.8182	16.49110	-168.3271	112.6762
P_t_rc@AC [W]	125698.0	-2483.547	-128181.6	64970.15
Q_t_rc@AC [var]	4669.709	-6639.030	-11308.74	40742.34
I_fund_Q_SYM+_rc@AC [A]	0.050787	-0.882080	-0.932866	5.162563
I_fund_Q_SYM-_rc@AC [A]	0.476014	2.867086	2.391071	14.56156
I_fund_P_SYM+_rc@AC [A]	182.5093	-5.700496	-188.2098	97.32650
I_fund_P_SYM-_rc@AC [A]	-0.779708	5.426234	6.205942	10.89880
U_fund_SYM+_rc@AC [V]	397.7429	334.0344	-63.70850	356.1689
U_fund_SYM-_rc@AC [V]	0.607840	72.96001	72.35217	54.45753
U+ [V]	230.0009	216.7587	-13.24219	223.4779
U- [V]	0.605594	15.12245	14.51685	10.70176

0-60ms



	A	B	间隔	有效值
时间 [s]	1:05.90320	1:05.96320	0.06000	
U1_tRMS_rc@AC [V]	229.9974	167.3852	-62.61224	180.1694
U2_tRMS_rc@AC [V]	229.5809	211.4137	-18.16727	216.0132
U3_tRMS_rc@AC [V]	229.4238	214.8477	-14.57605	214.1956
I1_tRMS_rc@AC [A]	180.9728	6.637468	-174.3353	86.29800
I2_tRMS_rc@AC [A]	181.8956	7.488352	-174.4072	84.59342
I3_tRMS_rc@AC [A]	184.8182	6.293677	-178.5245	80.46378
P_t_rc@AC [W]	125698.0	3248.647	-122449.4	46335.56
Q_t_rc@AC [var]	4669.709	-2412.287	-7081.996	29145.02
I_fund_Q_SYM+_rc@AC [A]	0.050787	-1.255990	-1.306777	3.815511
I_fund_Q_SYM-_rc@AC [A]	0.476014	0.860583	0.384569	10.39370
I_fund_P_SYM+_rc@AC [A]	182.5093	5.756559	-176.7527	69.43001
I_fund_P_SYM-_rc@AC [A]	-0.779708	-0.616634	0.163074	7.912331
U_fund_SYM+_rc@AC [V]	397.7429	335.3943	-62.34866	345.7494
U_fund_SYM-_rc@AC [V]	0.607840	74.40992	73.80208	64.61617
U+ [V]	230.0009	193.2011	-36.79985	209.0325
U- [V]	0.605594	42.56731	41.96172	30.58999

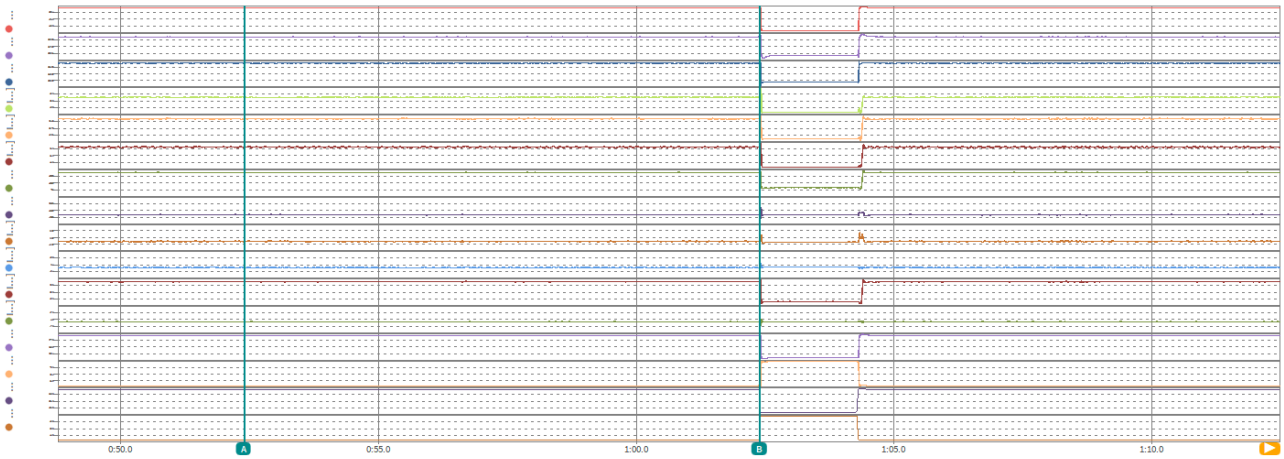
Recover time – Active power



	A	B	间隔	有效值
时间 [s]	1:07.80320	1:07.93420	0.13100	
U1_tRMS_rc@AC [V]	172.7514	233.8344	61.08298	228.9959
U2_tRMS_rc@AC [V]	215.6603	232.7854	17.12509	230.5505
U3_tRMS_rc@AC [V]	215.6215	231.2868	15.66528	229.8601
I1_tRMS_rc@AC [A]	4.281791	176.4933	172.2115	88.69881
I2_tRMS_rc@AC [A]	5.724089	179.1135	173.3894	89.75359
I3_tRMS_rc@AC [A]	4.973786	182.6238	177.6500	91.05210
P_t_rc@AC [W]	2325.253	125020.7	122695.5	62127.05
Q_t_rc@AC [var]	-1968.493	6766.224	8734.717	9608.295
I_fund_Q_SYM+_rc@AC [A]	-0.870302	3.197679	4.067981	6.078946
I_fund_Q_SYM-_rc@AC [A]	0.453506	0.285069	-0.168437	2.100669
I_fund_P_SYM+_rc@AC [A]	3.937184	179.1315	175.1943	88.73373
I_fund_P_SYM-_rc@AC [A]	0.088131	-1.233479	-1.321610	2.160561
U_fund_SYM+_rc@AC [V]	341.4101	402.9255	61.51547	397.2918
U_fund_SYM-_rc@AC [V]	73.56891	1.814028	-71.75488	17.04168
U+ [V]	196.8709	233.6834	36.81253	223.9527
U- [V]	42.39056	1.249246	-41.14132	19.17089

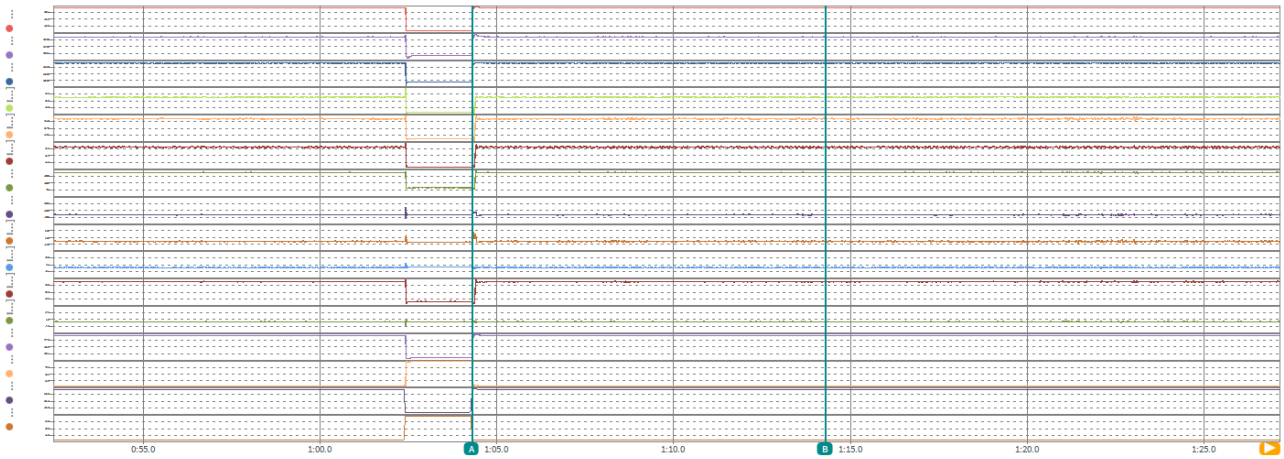
Test – VD8.2

Before fault



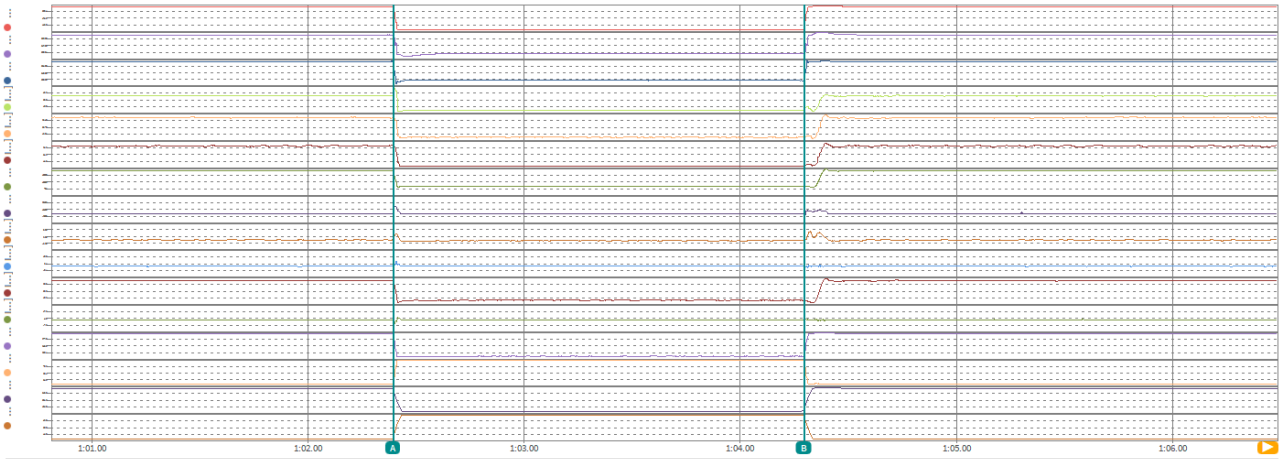
	A	B	间隔	有效值
时间 [s]	0:52.39640	1:02.39640	0:10.00000	
U1_tRMS_rc@AC [V]	230.2319	229.9491	-0.282776	230.2347
U2_tRMS_rc@AC [V]	229.7203	229.4308	-0.289520	229.7419
U3_tRMS_rc@AC [V]	229.4741	230.1766	0.702499	229.5350
I1_tRMS_rc@AC [A]	36.12893	36.60033	0.471401	36.33839
I2_tRMS_rc@AC [A]	36.79246	35.69223	-1.100231	36.69405
I3_tRMS_rc@AC [A]	36.64520	38.19359	1.548386	37.23163
P_t_rc@AC [W]	25099.36	25339.67	240.3047	25282.49
Q_t_rc@AC [var]	-2002.678	-1696.304	306.3738	1724.947
I_fund_Q_SYM+_rc@AC [A]	-0.992687	-0.564301	0.428385	0.696790
I_fund_Q_SYM-_rc@AC [A]	-0.075748	0.243799	0.319547	0.225987
I_fund_P_SYM+_rc@AC [A]	36.40693	36.74203	0.335098	36.66765
I_fund_P_SYM-_rc@AC [A]	-0.023621	0.562215	0.585836	0.308849
U_fund_SYM+_rc@AC [V]	398.0376	398.1059	0.068298	398.0866
U_fund_SYM-_rc@AC [V]	0.985608	0.825474	-0.160134	0.983061
U+ [V]	229.8475	229.8450	-2.494e-3	229.8421
U- [V]	0.579990	0.734791	0.154801	0.566770

After fault



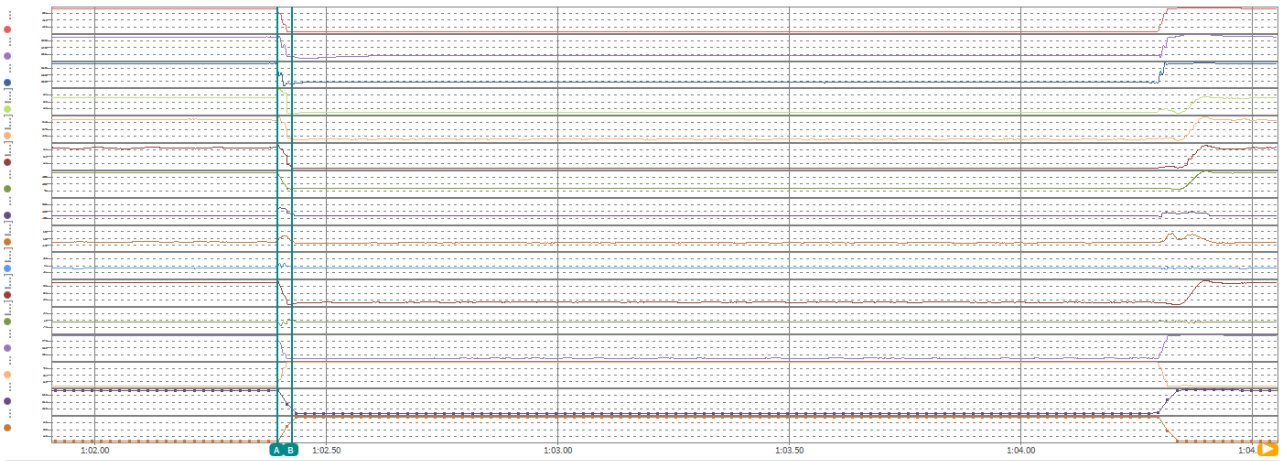
	A	B	间隔	有效值
时间 [s]	1:04.29740	1:14.29740	0:10.00000	
U1_tRMS_rc@AC [V]	115.3353	230.2249	114.8896	230.1940
U2_tRMS_rc@AC [V]	206.0770	229.7376	23.66060	229.7445
U3_tRMS_rc@AC [V]	205.8278	229.5264	23.69861	229.5224
I1_tRMS_rc@AC [A]	5.503277	36.03336	30.53008	36.20028
I2_tRMS_rc@AC [A]	6.795186	36.91198	30.11680	36.50023
I3_tRMS_rc@AC [A]	5.485179	38.03566	32.55048	37.07465
P_t_rc@AC [W]	2657.634	25457.66	22800.03	25156.94
Q_t_rc@AC [var]	-1717.042	-1570.141	146.9009	1924.709
I_fund_Q_SYM+_rc@AC [A]	-1.197866	-0.387902	0.809964	0.816551
I_fund_Q_SYM-_rc@AC [A]	0.606559	0.259220	-0.347340	0.308334
I_fund_P_SYM+_rc@AC [A]	5.117807	36.92443	31.80662	36.48149
I_fund_P_SYM-_rc@AC [A]	0.115542	-0.757143	-0.872685	0.350406
U_fund_SYM+_rc@AC [V]	297.3809	398.0739	100.6930	398.0391
U_fund_SYM-_rc@AC [V]	98.92776	0.957471	-97.97029	2.952138
U+ [V]	171.8242	229.8407	58.01658	229.6264
U- [V]	57.40584	0.559512	-56.84633	3.817422

Duration fault time



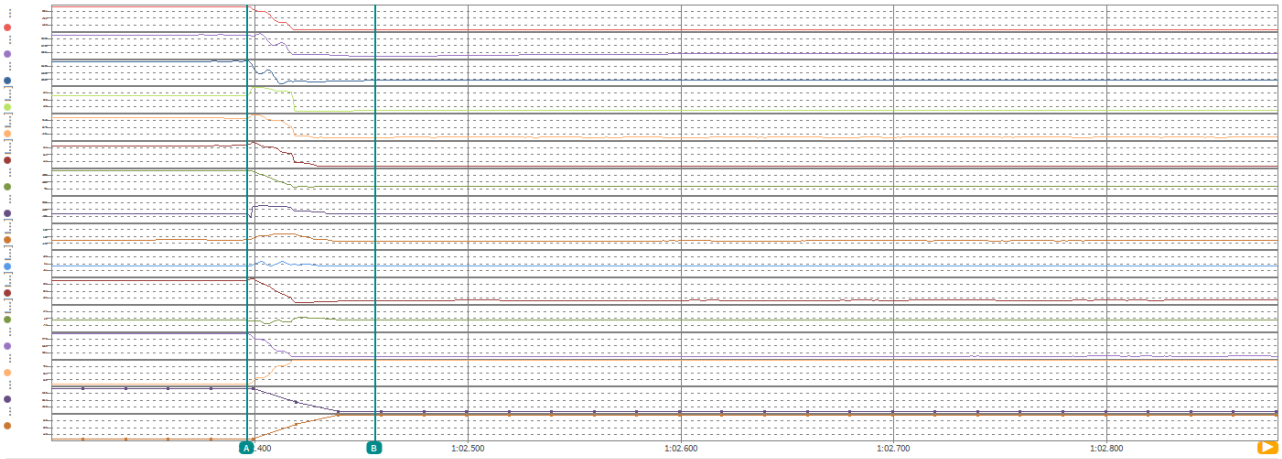
	A	B	间隔	有效值
时间 [s]	1:02.39640	1:04.29640	1.90000	
U1_tRMS_rc@AC [V]	229.9491	115.1956	-114.7535	116.0530
U2_tRMS_rc@AC [V]	229.4308	206.4008	-23.03003	206.3554
U3_tRMS_rc@AC [V]	230.1766	205.9026	-24.27399	206.4322
I1_tRMS_rc@AC [A]	36.60033	5.480042	-31.12029	7.604826
I2_tRMS_rc@AC [A]	35.69223	6.838280	-28.85395	7.733251
I3_tRMS_rc@AC [A]	38.19359	5.508897	-32.68469	6.849093
P_t_rc@AC [W]	25339.67	2664.940	-22674.73	3258.273
Q_t_rc@AC [var]	-1696.304	-1729.571	-33.26697	2565.251
I_fund_Q_SYM+_rc@AC [A]	-0.564301	-1.190113	-0.625812	1.389639
I_fund_Q_SYM-_rc@AC [A]	0.243799	0.627861	0.384062	0.774821
I_fund_P_SYM+_rc@AC [A]	36.74203	5.135235	-31.60680	5.904181
I_fund_P_SYM-_rc@AC [A]	0.562215	0.106579	-0.455636	0.533044
U_fund_SYM+_rc@AC [V]	398.1059	297.4481	-100.6578	298.0668
U_fund_SYM-_rc@AC [V]	0.825474	99.13705	98.31158	98.89934
U+ [V]	229.8450	171.8242	-58.02082	173.3488
U- [V]	0.734791	57.40584	56.67105	56.54017

0-30ms



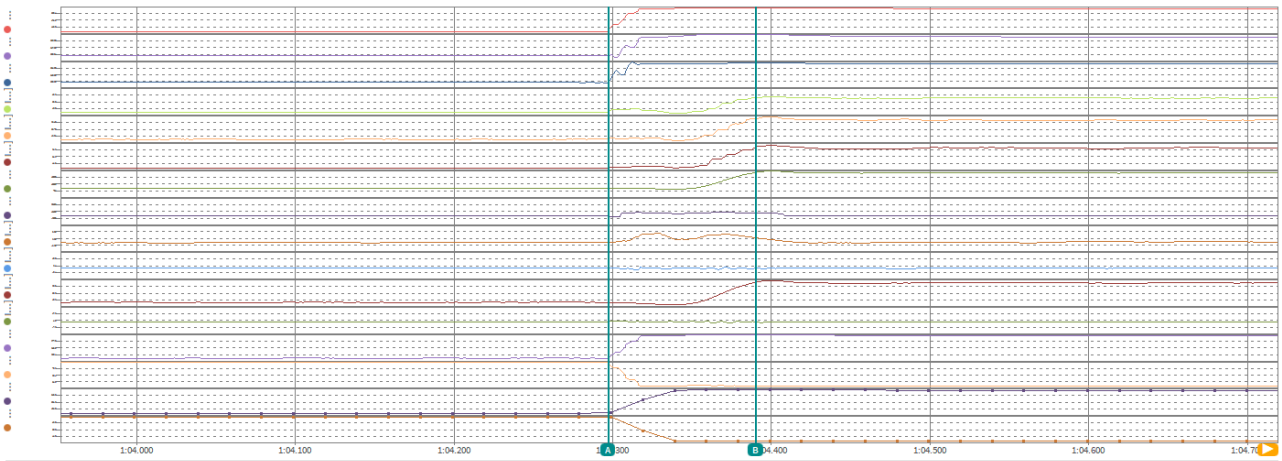
	A	B	间隔	有效值
时间 [s]	1:02.39640	1:02.42640	0.03000	
U1_tRMS_rc@AC [V]	229.9491	113.7436	-116.2056	168.4802
U2_tRMS_rc@AC [V]	229.4308	205.2017	-24.22906	217.9928
U3_tRMS_rc@AC [V]	230.1766	205.0431	-25.13350	211.9445
I1_tRMS_rc@AC [A]	36.60033	4.620166	-31.98016	41.09288
I2_tRMS_rc@AC [A]	35.69223	7.854626	-27.83760	29.58043
I3_tRMS_rc@AC [A]	38.19359	8.773530	-29.42006	29.97537
P_t_rc@AC [W]	25339.67	1437.780	-23901.89	14799.37
Q_t_rc@AC [var]	-1696.304	3664.266	5360.570	14477.17
I_fund_Q_SYM+_rc@AC [A]	-0.564301	1.136991	1.701292	3.472600
I_fund_Q_SYM-_rc@AC [A]	0.243799	3.070237	2.826438	4.461886
I_fund_P_SYM+_rc@AC [A]	36.74203	1.464590	-35.27744	22.98033
I_fund_P_SYM-_rc@AC [A]	0.562215	3.956313	3.394099	3.750769
U_fund_SYM+_rc@AC [V]	398.1059	295.4006	-102.7053	337.0782
U_fund_SYM-_rc@AC [V]	0.825474	99.23013	98.40466	70.62374
U+ [V]	229.8450	194.7495	-35.09550	218.5965
U- [V]	0.734791	34.58850	33.85371	19.98617

0-60ms



	A	B	间隔	有效值
时间 [s]	1:02.39640	1:02.45640	0.06000	
U1_tRMS_rc@AC [V]	229.9491	112.9614	-116.9877	144.0727
U2_tRMS_rc@AC [V]	229.4308	202.6808	-26.74995	211.1769
U3_tRMS_rc@AC [V]	230.1766	206.4157	-23.76085	208.8469
I1_tRMS_rc@AC [A]	36.60033	5.374732	-31.22560	29.48464
I2_tRMS_rc@AC [A]	35.69223	6.121596	-29.57063	21.49740
I3_tRMS_rc@AC [A]	38.19359	5.744907	-32.44868	21.78869
P_t_rc@AC [W]	25339.67	2234.033	-23105.63	10638.44
Q_t_rc@AC [var]	-1696.304	-2052.431	-356.1267	10442.97
I_fund_Q_SYM+_rc@AC [A]	-0.564301	-1.873740	-1.309439	2.701527
I_fund_Q_SYM-_rc@AC [A]	0.243799	0.230826	-0.012974	3.238261
I_fund_P_SYM+_rc@AC [A]	36.74203	4.417583	-32.32445	16.57346
I_fund_P_SYM-_rc@AC [A]	0.562215	-0.108081	-0.670296	2.887550
U_fund_SYM+_rc@AC [V]	398.1059	294.3221	-103.7838	316.9866
U_fund_SYM-_rc@AC [V]	0.825474	99.07961	98.25414	85.79040
U+ [V]	229.8450	170.5139	-59.33107	207.6224
U- [V]	0.734791	57.22592	56.49113	33.44079

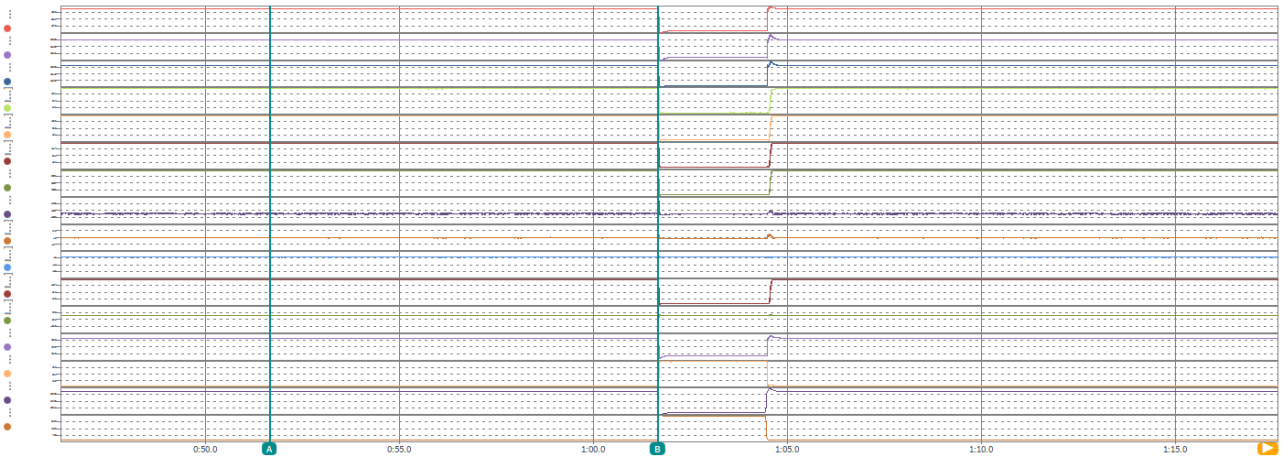
Recover time – Active power



	A	B	间隔	有效值
时间 [s]	1:04.29740	1:04.39040	0.09300	
U1_tRMS_rc@AC [V]	115.3353	235.0432	119.7079	222.0947
U2_tRMS_rc@AC [V]	206.0770	233.2535	27.17651	227.8314
U3_tRMS_rc@AC [V]	205.8278	230.5188	24.69093	227.7338
I1_tRMS_rc@AC [A]	5.503277	37.28190	31.77863	17.31885
I2_tRMS_rc@AC [A]	6.795186	37.82463	31.02945	16.96204
I3_tRMS_rc@AC [A]	5.485179	36.82572	31.34054	16.84451
P_t_rc@AC [W]	2657.634	25595.03	22937.40	10491.26
Q_t_rc@AC [var]	-1717.042	4977.894	6694.936	5329.061
I_fund_Q_SYM+_rc@AC [A]	-1.197866	3.019702	4.217568	4.280070
I_fund_Q_SYM-_rc@AC [A]	0.606559	-0.059546	-0.666105	1.023025
I_fund_P_SYM+_rc@AC [A]	5.117807	36.61063	31.49282	15.05064
I_fund_P_SYM-_rc@AC [A]	0.115542	0.363562	0.248020	0.792170
U_fund_SYM+_rc@AC [V]	297.3809	403.4573	106.0764	389.3004
U_fund_SYM-_rc@AC [V]	98.92776	2.782641	-96.14512	28.69225
U+ [V]	171.8242	232.7333	60.90916	208.9469
U- [V]	57.40584	1.956869	-55.44897	34.48847

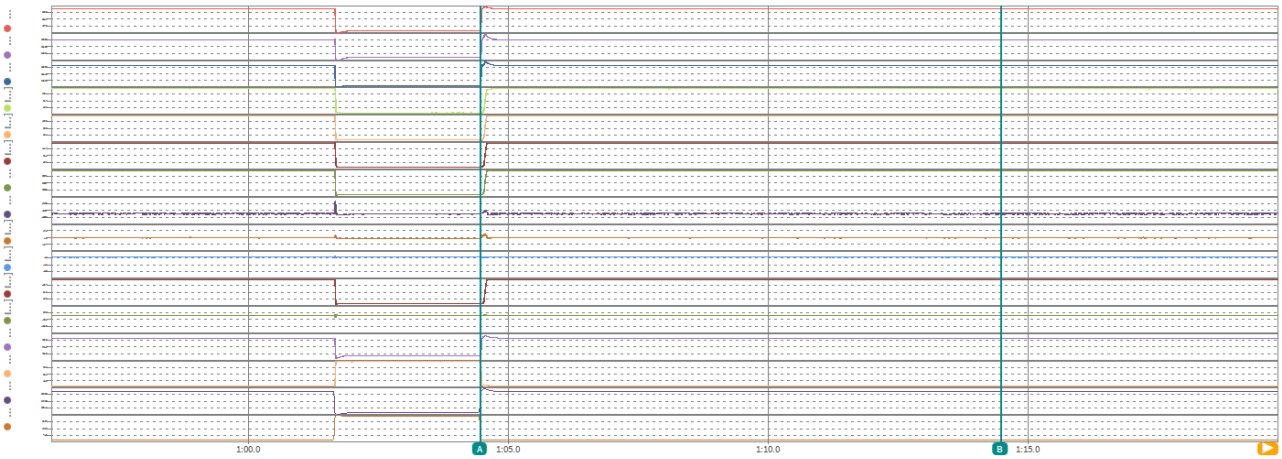
Test – VD9.1

Before fault



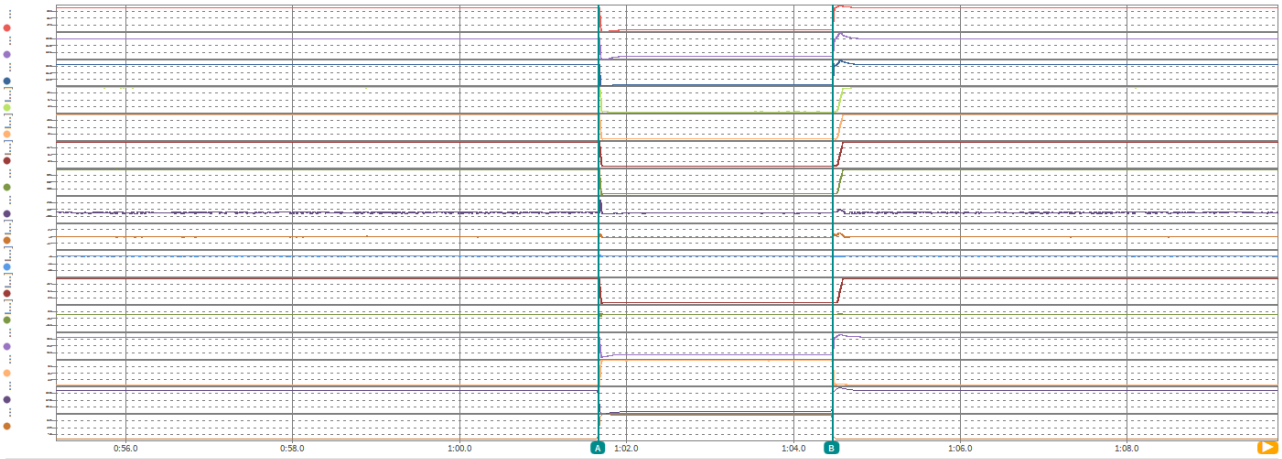
	A	B	间隔	有效值
时间 [s]	0:51.66630	1:01.66630	0:10.00000	
U1_tRMS_rc@AC [V]	230.4273	230.4975	0.070145	230.4689
U2_tRMS_rc@AC [V]	229.8419	229.8521	0.010193	229.7948
U3_tRMS_rc@AC [V]	229.6712	229.7598	0.088684	229.6736
I1_tRMS_rc@AC [A]	178.8683	178.2188	-0.649475	179.2499
I2_tRMS_rc@AC [A]	179.9184	181.1269	1.208511	181.0562
I3_tRMS_rc@AC [A]	182.8653	183.6982	0.832901	183.4357
P_t_rc@AC [W]	124547.5	124900.1	352.6094	125025.9
Q_t_rc@AC [var]	2250.596	2106.684	-143.9119	2312.818
I_fund_Q_SYM+_rc@AC [A]	0.145795	0.711052	0.565257	0.547570
I_fund_Q_SYM-_rc@AC [A]	0.552674	0.253608	-0.299066	0.444743
I_fund_P_SYM+_rc@AC [A]	180.5231	180.9899	0.466736	181.2170
I_fund_P_SYM-_rc@AC [A]	-0.853405	-1.282601	-0.429195	1.003542
U_fund_SYM+_rc@AC [V]	398.3315	398.4288	0.097290	398.3296
U_fund_SYM-_rc@AC [V]	1.012065	1.077233	0.065168	1.065466
U+ [V]	229.9760	229.9880	0.012027	229.9824
U- [V]	0.607257	0.594644	-0.012613	0.614937

After fault



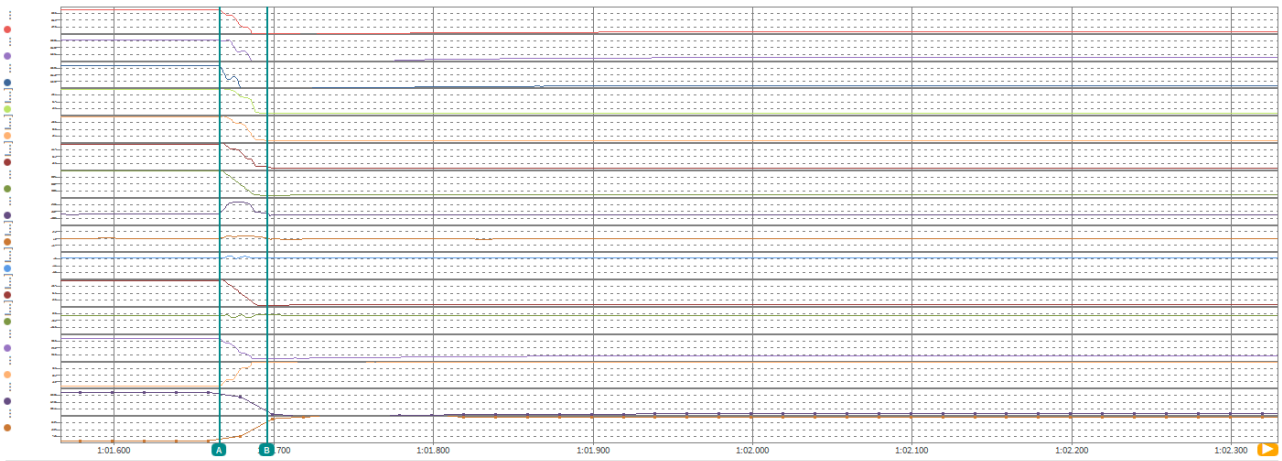
	A	B	间隔	有效值
时间 [s]	1:04.46730	1:14.46730	0:10.00000	
U1_tRMS_rc@AC [V]	172.6009	230.4385	57.83755	230.4752
U2_tRMS_rc@AC [V]	215.6461	229.7725	14.12643	229.8169
U3_tRMS_rc@AC [V]	215.5191	229.6681	14.14906	229.6899
I1_tRMS_rc@AC [A]	4.757352	177.2417	172.4844	178.3329
I2_tRMS_rc@AC [A]	5.671530	181.4669	175.7953	180.1586
I3_tRMS_rc@AC [A]	5.343035	180.7515	175.4084	182.5879
P_t_rc@AC [W]	2702.289	124023.3	121321.0	124425.0
Q_t_rc@AC [var]	-1705.898	2679.890	4385.788	2531.228
I_fund_Q_SYM+_rc@AC [A]	-0.913060	0.805772	1.718832	0.862761
I_fund_Q_SYM-_rc@AC [A]	0.379600	-0.973521	-1.353121	0.507766
I_fund_P_SYM+_rc@AC [A]	4.470436	179.7787	175.3082	180.3217
I_fund_P_SYM-_rc@AC [A]	0.176779	-1.213493	-1.390272	1.058135
U_fund_SYM+_rc@AC [V]	346.6348	398.2968	51.66199	398.3505
U_fund_SYM-_rc@AC [V]	51.50069	1.012065	-50.48863	1.746295
U+ [V]	200.0940	229.9276	29.83367	229.9190
U- [V]	29.49506	0.619367	-28.87569	1.808159

Duration fault time



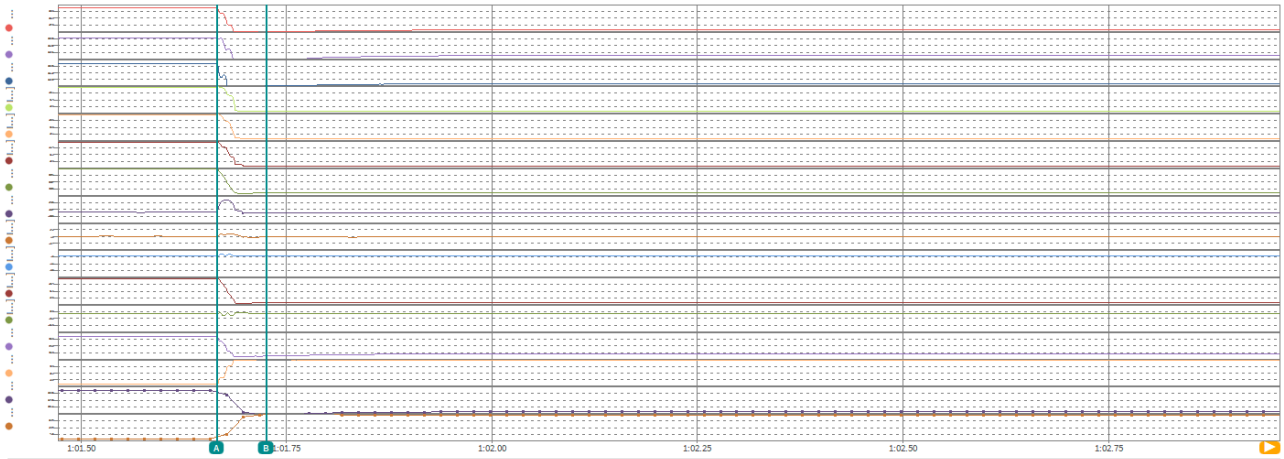
	A	B	间隔	有效值
时间 [s]	1:01.66630	1:04.46630	2.80000	
U1_tRMS_rc@AC [V]	230.4975	172.5773	-57.92015	172.6494
U2_tRMS_rc@AC [V]	229.8521	215.6378	-14.21431	215.5472
U3_tRMS_rc@AC [V]	229.7598	215.5183	-14.24150	215.4863
I1_tRMS_rc@AC [A]	178.2188	4.789134	-173.4297	14.36033
I2_tRMS_rc@AC [A]	181.1269	5.663187	-175.4637	14.00673
I3_tRMS_rc@AC [A]	183.6982	5.359532	-178.3387	13.67673
P_t_rc@AC [W]	124900.1	2698.926	-122201.2	7934.828
Q_t_rc@AC [var]	2106.684	-1724.395	-3831.079	4452.217
I_fund_Q_SYM+_rc@AC [A]	0.711052	-0.938021	-1.649073	1.073761
I_fund_Q_SYM-_rc@AC [A]	0.253608	0.366904	0.113297	1.481534
I_fund_P_SYM+_rc@AC [A]	180.9899	4.465672	-176.5242	11.95994
I_fund_P_SYM-_rc@AC [A]	-1.282601	0.172171	1.454772	1.200100
U_fund_SYM+_rc@AC [V]	398.4288	346.5981	-51.83063	346.5209
U_fund_SYM-_rc@AC [V]	1.077233	51.40255	50.32531	51.02294
U+ [V]	229.9880	200.0940	-29.89408	200.3650
U- [V]	0.594644	29.49506	28.90041	29.31733

0-30ms



	A	B	间隔	有效值
时间 [s]	1:01.66630	1:01.69630	0.03000	
U1_tRMS_rc@AC [V]	230.4975	168.2212	-62.27632	194.1896
U2_tRMS_rc@AC [V]	229.8521	211.5621	-18.28998	220.4511
U3_tRMS_rc@AC [V]	229.7598	211.6301	-18.12976	217.1341
I1_tRMS_rc@AC [A]	178.2188	8.543046	-169.6758	128.2966
I2_tRMS_rc@AC [A]	181.1269	7.718882	-173.4080	121.6384
I3_tRMS_rc@AC [A]	183.6982	16.14338	-167.5548	118.7464
P_t_rc@AC [W]	124900.1	-2149.960	-127050.0	70726.42
Q_t_rc@AC [var]	2106.684	6119.907	4013.223	38879.07
I_fund_Q_SYM+_rc@AC [A]	0.711052	0.800630	0.089578	4.908339
I_fund_Q_SYM-_rc@AC [A]	0.253608	4.800843	4.547235	13.52478
I_fund_P_SYM+_rc@AC [A]	180.9899	-4.365777	-185.3556	105.0397
I_fund_P_SYM-_rc@AC [A]	-1.282601	4.438325	5.720926	11.07748
U_fund_SYM+_rc@AC [V]	398.4288	339.4590	-58.96976	362.5022
U_fund_SYM-_rc@AC [V]	1.077233	51.08839	50.01116	36.58220
U+ [V]	229.9880	223.5169	-6.471150	226.7756
U- [V]	0.594644	6.141261	5.546617	4.362837

0-60ms



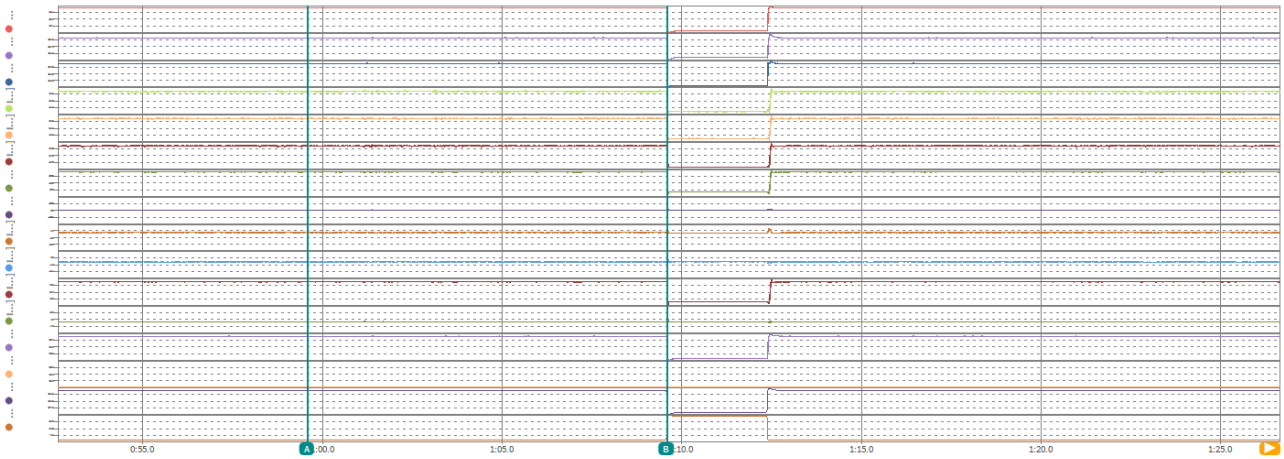
	A	B	间隔	有效值
时间 [s]	1:01.66630	1:01.72630	0.06000	
U1_tRMS_rc@AC [V]	230.4975	167.1312	-63.36624	181.6820
U2_tRMS_rc@AC [V]	229.8521	212.0672	-17.78493	216.1692
U3_tRMS_rc@AC [V]	229.7598	214.0537	-15.70613	215.0194
I1_tRMS_rc@AC [A]	178.2188	6.380672	-171.8382	91.58480
I2_tRMS_rc@AC [A]	181.1269	6.691429	-174.4354	86.80321
I3_tRMS_rc@AC [A]	183.6982	6.557937	-177.1403	84.82021
P_t_rc@AC [W]	124900.1	3281.924	-121618.2	50437.00
Q_t_rc@AC [var]	2106.684	-2086.815	-4193.499	27820.91
I_fund_Q_SYM+_rc@AC [A]	0.711052	-0.921618	-1.632670	3.658196
I_fund_Q_SYM-_rc@AC [A]	0.253608	0.372706	0.119098	9.683761
I_fund_P_SYM+_rc@AC [A]	180.9899	5.616063	-175.3738	74.92049
I_fund_P_SYM-_rc@AC [A]	-1.282601	-0.364730	0.917871	8.049226
U_fund_SYM+_rc@AC [V]	398.4288	340.5385	-57.89026	351.5906
U_fund_SYM-_rc@AC [V]	1.077233	52.47232	51.39508	44.60985
U+ [V]	229.9880	196.2593	-33.72873	212.6543
U- [V]	0.594644	29.68825	29.09361	20.37139

Recover time – Active power

	A	B	间隔	有效值
时间 [s]	1:04.46730	1:04.59730	0.13000	
U1_tRMS_rc@AC [V]	172.6009	233.7963	61.19537	228.8461
U2_tRMS_rc@AC [V]	215.6461	232.4163	16.77017	230.4985
U3_tRMS_rc@AC [V]	215.5191	231.5208	16.00171	229.9416
I1_tRMS_rc@AC [A]	4.757352	176.4897	171.7323	91.99939
I2_tRMS_rc@AC [A]	5.671530	179.7073	174.0358	93.56588
I3_tRMS_rc@AC [A]	5.343035	182.3114	176.9684	94.51390
P_t_rc@AC [W]	2702.289	125079.0	122376.7	64606.43
Q_t_rc@AC [var]	-1705.898	6316.143	8022.041	9648.150
I_fund_Q_SYM+_rc@AC [A]	-0.913060	2.344946	3.258007	6.054797
I_fund_Q_SYM-_rc@AC [A]	0.379600	-0.206851	-0.586451	2.103373
I_fund_P_SYM+_rc@AC [A]	4.470436	179.2581	174.7877	92.28990
I_fund_P_SYM-_rc@AC [A]	0.176779	-1.135120	-1.311899	2.193191
U_fund_SYM+_rc@AC [V]	346.6348	402.8258	56.19101	397.5991
U_fund_SYM-_rc@AC [V]	51.50069	1.781690	-49.71900	12.11596
U+ [V]	200.0940	233.7224	33.62848	223.7263
U- [V]	29.49506	1.196310	-28.29875	14.38926

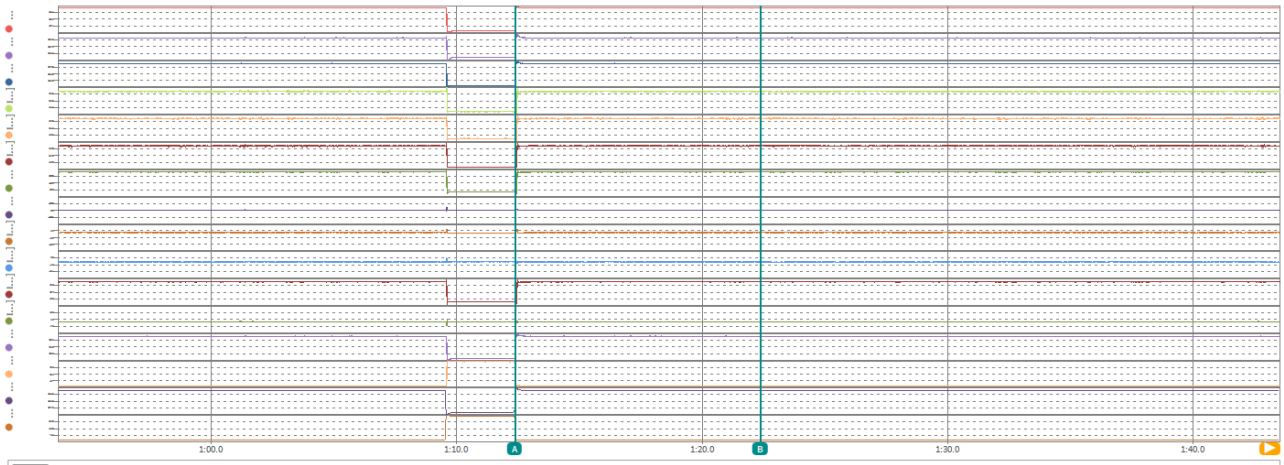
Test – VD9.2

Before fault



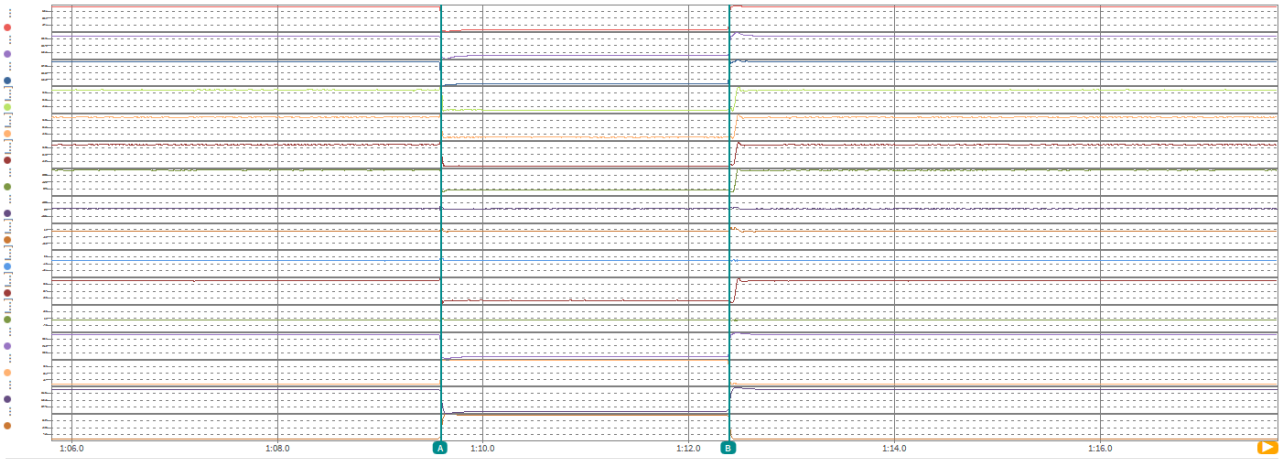
	A	B	间隔	有效值
时间 [s]	0:59.59070	1:09.59070	0:10.00000	
U1_tRMS_rc@AC [V]	230.2286	230.1996	-0.028992	230.2348
U2_tRMS_rc@AC [V]	229.7025	229.7248	0.022247	229.7417
U3_tRMS_rc@AC [V]	229.5058	229.5429	0.037140	229.5399
I1_tRMS_rc@AC [A]	36.16418	36.00002	-0.164165	36.41387
I2_tRMS_rc@AC [A]	36.72663	36.63237	-0.094254	36.71455
I3_tRMS_rc@AC [A]	36.50777	37.19757	0.689804	37.19526
P_t_rc@AC [W]	25096.95	25180.39	83.43945	25295.40
Q_t_rc@AC [var]	-1487.109	-1748.013	-260.9044	1743.086
I_fund_Q_SYM+_rc@AC [A]	-0.604685	-0.653940	-0.049255	0.738072
I_fund_Q_SYM-_rc@AC [A]	-0.138699	0.020768	0.159467	0.233354
I_fund_P_SYM+_rc@AC [A]	36.40252	36.52087	0.118347	36.68596
I_fund_P_SYM-_rc@AC [A]	-0.287272	-0.366764	-0.079492	0.305410
U_fund_SYM+_rc@AC [V]	398.0436	398.0605	0.016907	398.0893
U_fund_SYM-_rc@AC [V]	0.928997	1.268405	0.339408	0.975653
U+ [V]	229.8537	229.8211	-0.032597	229.8437
U- [V]	0.541232	0.586544	0.045312	0.563036

After fault



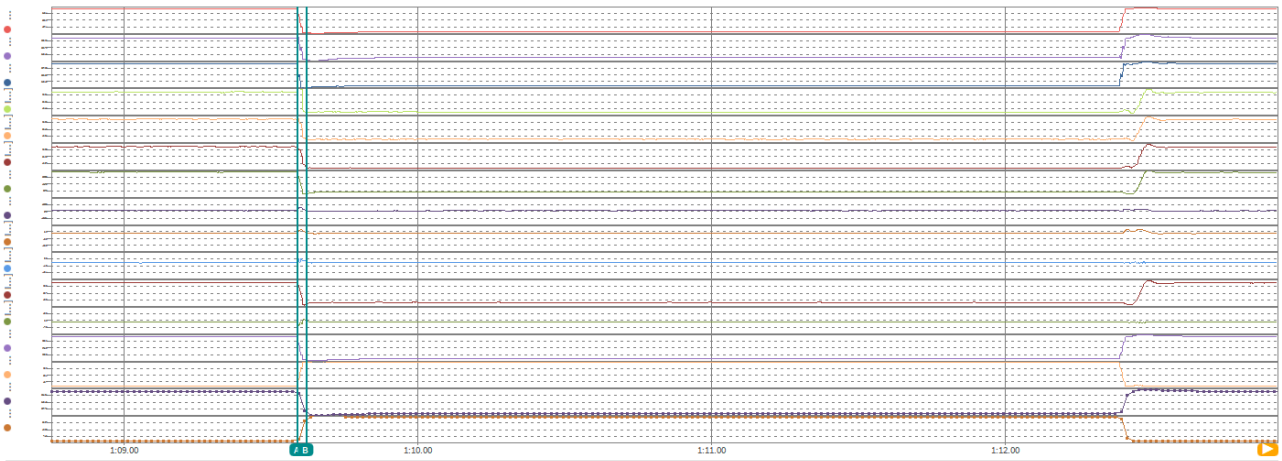
	A	B	间隔	有效值
时间 [s]	1:12.39070	1:22.39070	0:10.00000	
U1_tRMS_rc@AC [V]	172.6041	230.2639	57.65973	230.2187
U2_tRMS_rc@AC [V]	215.7530	229.7514	13.99843	229.7493
U3_tRMS_rc@AC [V]	215.6206	229.5911	13.97055	229.5372
I1_tRMS_rc@AC [A]	5.547209	36.20523	30.65803	36.20611
I2_tRMS_rc@AC [A]	6.611318	37.03022	30.41890	36.58292
I3_tRMS_rc@AC [A]	5.761580	37.45504	31.69346	37.04391
P_t_rc@AC [W]	3142.788	25386.53	22243.74	25173.07
Q_t_rc@AC [var]	-1808.922	-1706.887	102.0353	1904.432
I_fund_Q_SYM+_rc@AC [A]	-1.168060	-0.713298	0.454762	0.865167
I_fund_Q_SYM-_rc@AC [A]	0.237162	0.030588	-0.206575	0.212975
I_fund_P_SYM+_rc@AC [A]	5.209435	36.81299	31.60355	36.50557
I_fund_P_SYM-_rc@AC [A]	0.131707	-0.340802	-0.472509	0.313927
U_fund_SYM+_rc@AC [V]	346.7549	398.1415	51.38660	398.0783
U_fund_SYM-_rc@AC [V]	51.56276	0.968466	-50.59429	1.709819
U+ [V]	200.1494	229.8327	29.68326	229.7540
U- [V]	29.54009	0.546624	-28.99347	1.873113

Duration fault time



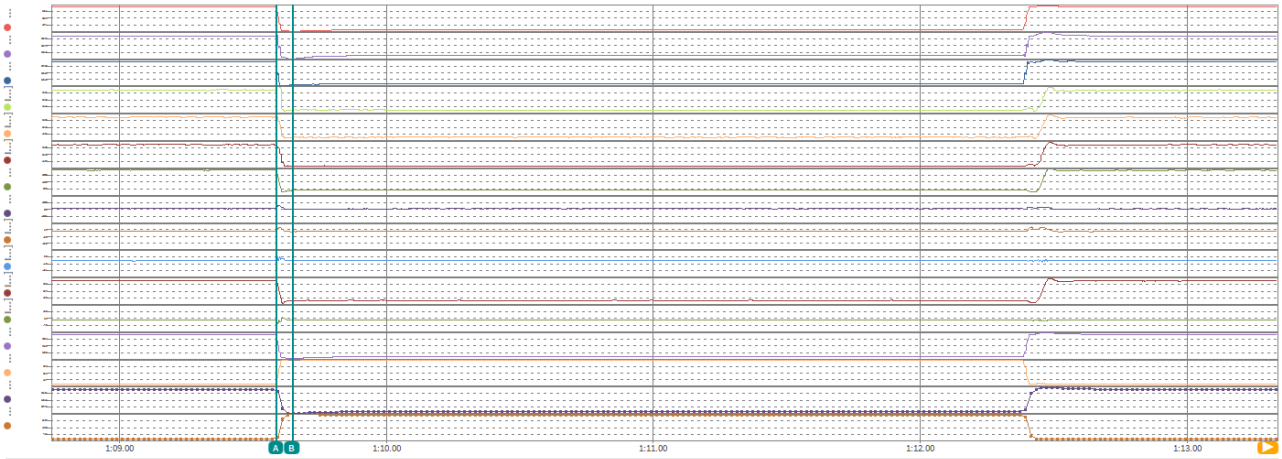
	A	B	间隔	有效值
时间 [s]	1:09.59070	1:12.39070	2.80000	
U1_tRMS_rc@AC [V]	230.1996	172.6041	-57.59546	172.7269
U2_tRMS_rc@AC [V]	229.7248	215.7530	-13.97177	215.6707
U3_tRMS_rc@AC [V]	229.5429	215.6206	-13.92236	215.5954
I1_tRMS_rc@AC [A]	36.00002	5.547209	-30.45281	6.770064
I2_tRMS_rc@AC [A]	36.63237	6.611318	-30.02106	7.273899
I3_tRMS_rc@AC [A]	37.19757	5.761580	-31.43599	6.638007
P_t_rc@AC [W]	25180.39	3142.788	-22037.60	3524.443
Q_t_rc@AC [var]	-1748.013	-1808.922	-60.90918	2338.131
I_fund_Q_SYM+_rc@AC [A]	-0.653940	-1.168060	-0.514120	1.326375
I_fund_Q_SYM-_rc@AC [A]	0.020768	0.237162	0.216394	0.440481
I_fund_P_SYM+_rc@AC [A]	36.52087	5.209435	-31.31144	5.755413
I_fund_P_SYM-_rc@AC [A]	-0.366764	0.131707	0.498471	0.467246
U_fund_SYM+_rc@AC [V]	398.0605	346.7549	-51.30563	346.7012
U_fund_SYM-_rc@AC [V]	1.268405	51.56276	50.29435	51.05704
U+ [V]	229.8211	200.1494	-29.67165	200.5116
U- [V]	0.586544	29.54009	28.95355	29.31639

0-30ms



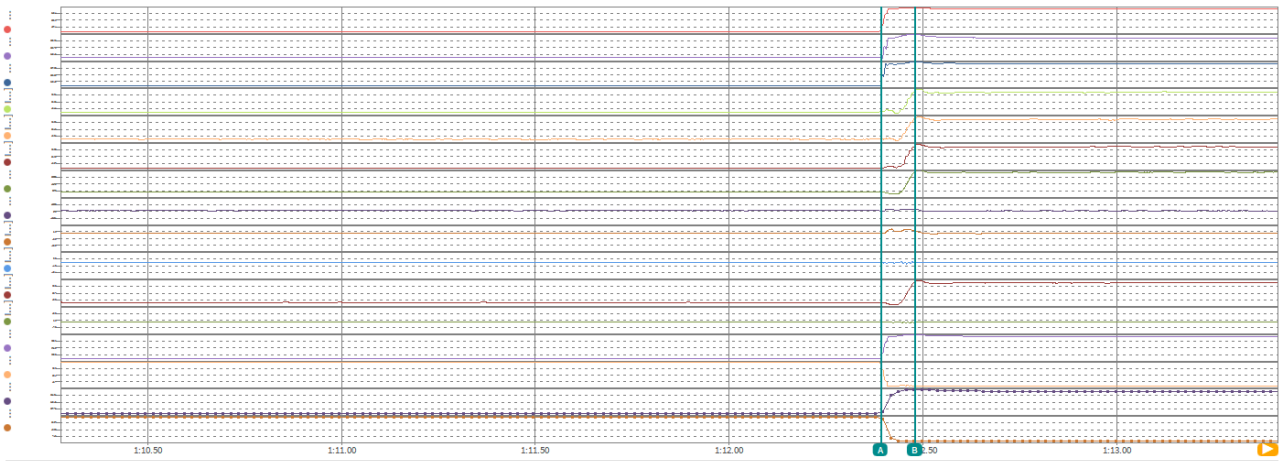
	A	B	间隔	有效值
时间 [s]	1:09.59070	1:09.62070	0.03000	
U1_tRMS_rc@AC [V]	230.1996	171.0901	-59.10947	194.0472
U2_tRMS_rc@AC [V]	229.7248	214.3580	-15.36679	221.6744
U3_tRMS_rc@AC [V]	229.5429	214.2250	-15.31789	218.2713
I1_tRMS_rc@AC [A]	36.00002	5.984969	-30.01505	36.28751
I2_tRMS_rc@AC [A]	36.63237	6.858761	-29.77361	27.14965
I3_tRMS_rc@AC [A]	37.19757	8.837739	-28.35984	27.30803
P_t_rc@AC [W]	25180.39	918.5997	-24261.79	14702.23
Q_t_rc@AC [var]	-1748.013	4290.224	6038.237	12897.15
I_fund_Q_SYM+_rc@AC [A]	-0.653940	0.718492	1.372432	3.886740
I_fund_Q_SYM-_rc@AC [A]	0.020768	3.268242	3.247474	3.788581
I_fund_P_SYM+_rc@AC [A]	36.52087	0.992459	-35.52841	22.20580
I_fund_P_SYM-_rc@AC [A]	-0.366764	3.597820	3.964584	3.934017
U_fund_SYM+_rc@AC [V]	398.0605	344.2219	-53.83862	363.9072
U_fund_SYM-_rc@AC [V]	1.268405	51.23909	49.97068	37.54353
U+ [V]	229.8211	203.5599	-26.26117	220.3291
U- [V]	0.586544	25.14124	24.55469	14.66480

0-60ms



时间 [s]	A	B	间隔	有效值
	1:09.59070	1:09.65070	0.06000	
U1_tRMS_rc@AC [V]	230.1996	168.7138	-61.48582	182.5979
U2_tRMS_rc@AC [V]	229.7248	213.2119	-16.51285	217.7840
U3_tRMS_rc@AC [V]	229.5429	215.0836	-14.45930	216.5015
I1_tRMS_rc@AC [A]	36.00002	5.955389	-30.04463	26.13352
I2_tRMS_rc@AC [A]	36.63237	6.254374	-30.37800	19.79390
I3_tRMS_rc@AC [A]	37.19757	6.339740	-30.85783	19.96814
P_t_rc@AC [W]	25180.39	2851.086	-22329.31	10613.21
Q_t_rc@AC [var]	-1748.013	-2361.124	-613.1111	9371.518
I_fund_Q_SYM+_rc@AC [A]	-0.653940	-1.637073	-0.983133	2.902092
I_fund_Q_SYM-_rc@AC [A]	0.020768	-0.075817	-0.096585	2.766081
I_fund_P_SYM+_rc@AC [A]	36.52087	4.844140	-31.67673	16.06451
I_fund_P_SYM-_rc@AC [A]	-0.366764	-0.308193	0.058571	3.003901
U_fund_SYM+_rc@AC [V]	398.0605	342.7006	-55.35995	353.9850
U_fund_SYM-_rc@AC [V]	1.268405	52.27596	51.00755	45.05436
U+ [V]	229.8211	198.5473	-31.27382	215.0905
U- [V]	0.586544	29.64602	29.05948	19.51958

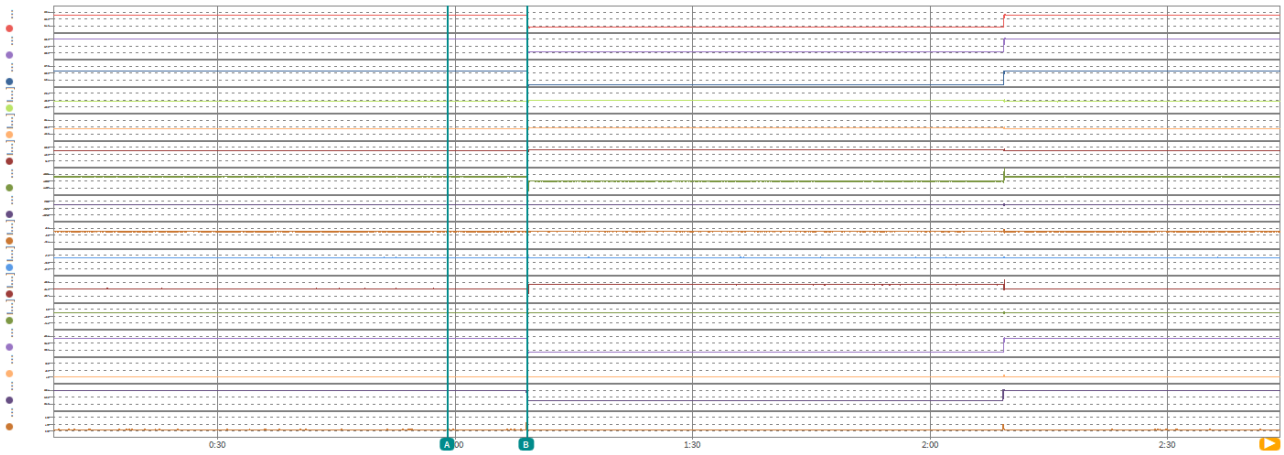
Recover time – Active power



时间 [s]	A	B	间隔	有效值
	1:12.39070	1:12.47970	0.08900	
U1_tRMS_rc@AC [V]	172.6041	233.9973	61.39314	225.3707
U2_tRMS_rc@AC [V]	215.7530	232.4904	16.73734	228.6219
U3_tRMS_rc@AC [V]	215.6206	230.8175	15.19691	228.5235
I1_tRMS_rc@AC [A]	5.547209	36.72529	31.17808	16.12773
I2_tRMS_rc@AC [A]	6.611318	38.68331	32.07199	16.57600
I3_tRMS_rc@AC [A]	5.761580	37.22602	31.46444	17.08605
P_t_rc@AC [W]	3142.788	25662.13	22519.35	10375.08
Q_t_rc@AC [var]	-1808.922	5179.048	6987.971	4952.745
I_fund_Q_SYM+_rc@AC [A]	-1.168060	3.594035	4.762095	4.170287
I_fund_Q_SYM-_rc@AC [A]	0.237162	-1.122038	-1.359200	0.920167
I_fund_P_SYM+_rc@AC [A]	5.209435	36.79125	31.58182	14.91553
I_fund_P_SYM-_rc@AC [A]	0.131707	-0.335802	-0.467508	0.840665
U_fund_SYM+_rc@AC [V]	346.7549	402.5862	55.83130	393.5245
U_fund_SYM-_rc@AC [V]	51.56276	2.130360	-49.43240	14.82775
U+ [V]	200.1494	231.4357	31.28630	218.3685
U- [V]	29.54009	1.352108	-28.18798	17.88208

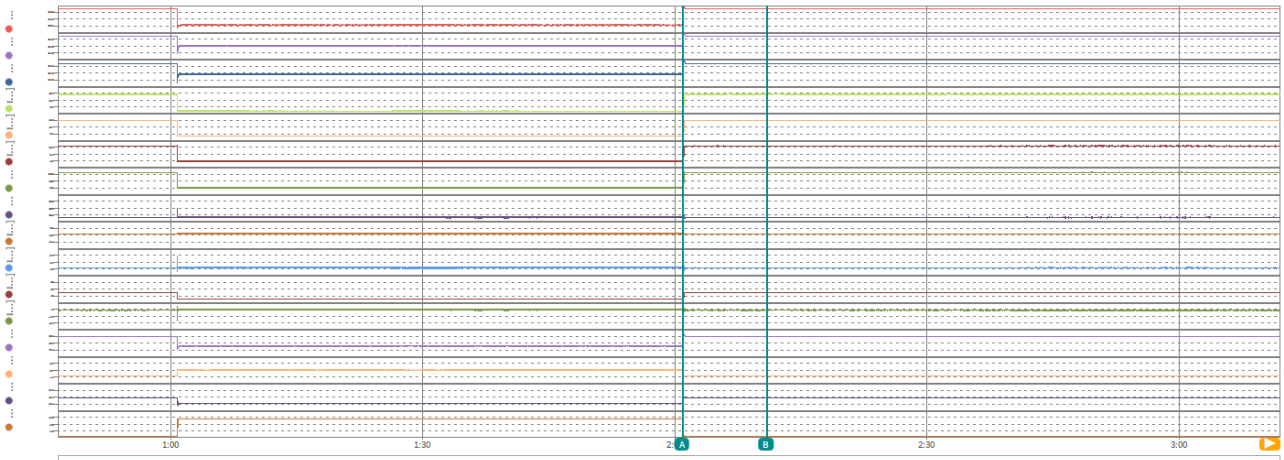
Test – VD10.1

Before fault



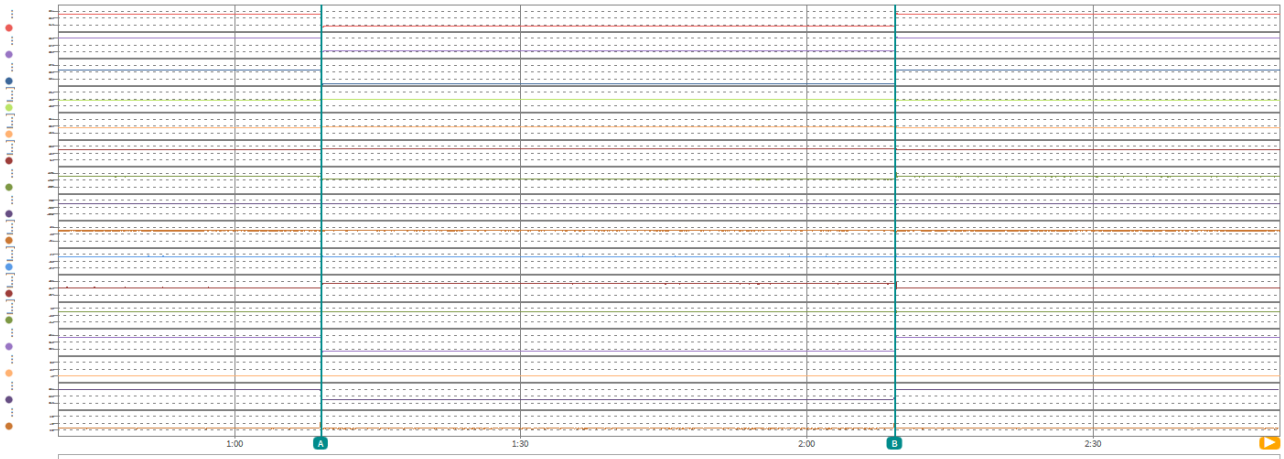
时间 [s]	A 0:59.1063	B 1:09.1074	间隔 0:10.0011	有效值
U1_tRMS_rc@AC [V]	230.5099	229.5941	-0.915787	230.5262
U2_tRMS_rc@AC [V]	229.8808	229.7284	-0.152420	229.8495
U3_tRMS_rc@AC [V]	229.6618	229.4095	-0.252350	229.7279
I1_tRMS_rc@AC [A]	178.6912	181.6380	2.946838	179.5753
I2_tRMS_rc@AC [A]	181.3297	181.7255	0.395782	181.3306
I3_tRMS_rc@AC [A]	183.8398	184.3972	0.557358	183.7904
P_t_rc@AC [W]	125074.0	125602.7	528.7500	125276.6
Q_t_rc@AC [var]	2309.386	6145.376	3835.990	2270.084
I_fund_Q_SYM+_rc@AC [A]	0.465687	0.284585	-0.181102	0.506739
I_fund_Q_SYM-_rc@AC [A]	0.218098	0.512407	0.294309	0.409047
I_fund_P_SYM+_rc@AC [A]	181.2557	182.4564	1.200760	181.5357
I_fund_P_SYM-_rc@AC [A]	-1.208914	-0.670442	0.538472	0.943819
U_fund_SYM+_rc@AC [V]	398.3966	397.6028	-0.793854	398.4257
U_fund_SYM-_rc@AC [V]	1.079454	0.617784	-0.461670	1.064442
U+ [V]	230.0444	230.0802	0.035809	230.0380
U- [V]	0.607129	0.600568	-6.561e-3	0.614433

After fault



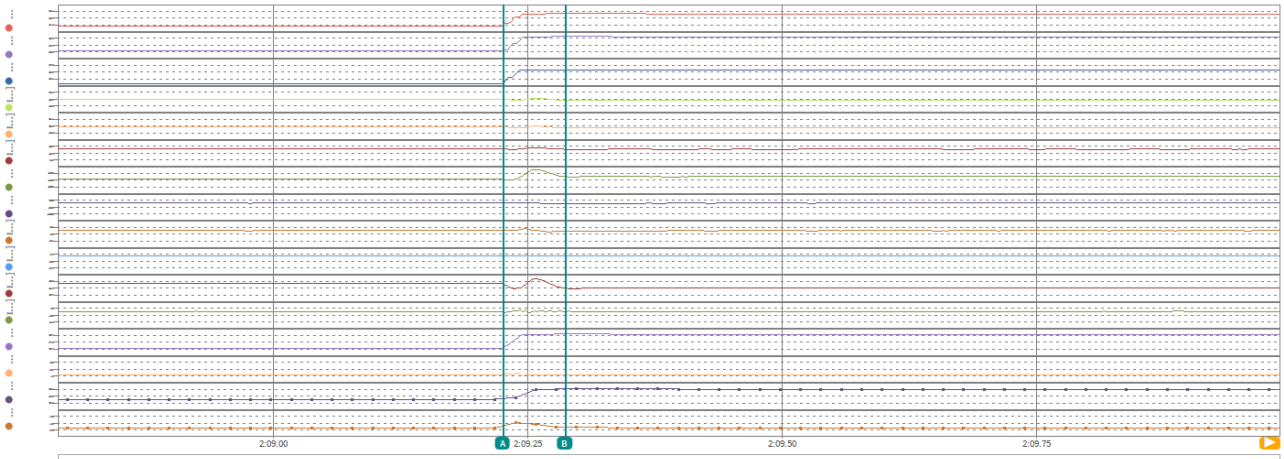
时间 [s]	A 2:00.9384	B 2:10.9546	间隔 0:10.0162	有效值
U1_tRMS_rc@AC [V]	207.0206	230.6511	23.63052	230.6327
U2_tRMS_rc@AC [V]	224.9130	229.9432	5.030121	230.0018
U3_tRMS_rc@AC [V]	224.8106	229.8771	5.066513	229.9090
I1_tRMS_rc@AC [A]	5.482876	180.1384	174.6556	178.8896
I2_tRMS_rc@AC [A]	5.540987	182.0906	176.5496	180.4208
I3_tRMS_rc@AC [A]	5.973527	184.0615	178.0880	182.6017
P_t_rc@AC [W]	311.4035	125709.4	125397.9	124713.2
Q_t_rc@AC [var]	3711.178	-2340.122	-6051.300	2492.215
I_fund_Q_SYM+_rc@AC [A]	3.044442	-0.027834	-3.072276	0.918394
I_fund_Q_SYM-_rc@AC [A]	-0.287759	-0.016966	0.270793	0.436669
I_fund_P_SYM+_rc@AC [A]	0.449790	182.0662	181.6164	180.6004
I_fund_P_SYM-_rc@AC [A]	0.371042	-1.041791	-1.412833	0.879948
U_fund_SYM+_rc@AC [V]	378.8878	398.6376	19.74979	398.6785
U_fund_SYM-_rc@AC [V]	20.68563	1.134160	-19.55147	1.221485
U+ [V]	218.8989	230.1935	11.29460	230.1431
U- [V]	11.87238	0.608920	-11.26346	0.997065

Duration fault time



时间 [s]	A 1:09.1079	B 2:09.2277	间隔 1:00.1197	有效值
U1_tRMS_rc@AC [V]	229.5941	207.6218	-21.97232	207.4932
U2_tRMS_rc@AC [V]	229.7284	206.8505	-22.87796	-
U3_tRMS_rc@AC [V]	229.4095	206.7195	-22.69002	206.7023
I1_tRMS_rc@AC [A]	181.6380	189.9209	8.282883	190.0579
I2_tRMS_rc@AC [A]	181.7255	191.7811	10.05557	191.4217
I3_tRMS_rc@AC [A]	184.3972	194.5366	10.13942	194.1224
P_t_rc@AC [W]	125602.7	119295.4	-6307.359	119130.1
Q_t_rc@AC [var]	6145.376	2230.075	-3915.302	2194.314
I_fund_Q_SYM+_rc@AC [A]	0.284585	0.501098	0.216513	0.620803
I_fund_Q_SYM-_rc@AC [A]	0.512407	0.437142	-0.075265	0.504836
I_fund_P_SYM+_rc@AC [A]	182.4564	192.0500	9.593536	191.8361
I_fund_P_SYM-_rc@AC [A]	-0.670442	-1.354200	-0.683758	0.897332
U_fund_SYM+_rc@AC [V]	397.6028	358.6361	-38.96667	358.5351
U_fund_SYM-_rc@AC [V]	0.617784	0.938064	0.320280	1.034108
U+ [V]	230.0802	206.9994	-23.08077	207.0173
U- [V]	0.600568	0.605386	4.818e-3	0.595975

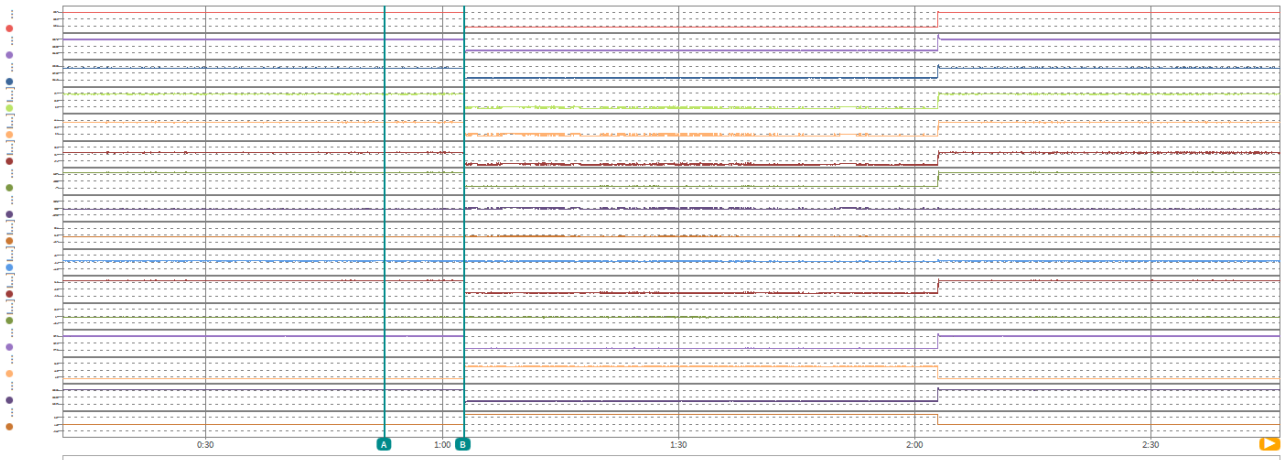
Recover time – Active power



时间 [s]	A 2:09.2262	B 2:09.2874	间隔 0.0613	有效值
U1_tRMS_rc@AC [V]	207.5225	231.3993	23.87680	226.6442
U2_tRMS_rc@AC [V]	206.8069	231.3681	24.56126	225.7220
U3_tRMS_rc@AC [V]	206.6942	229.9833	23.28914	226.1080
I1_tRMS_rc@AC [A]	189.9351	178.9991	-10.93596	188.5185
I2_tRMS_rc@AC [A]	191.8611	181.2798	-10.58131	189.4470
I3_tRMS_rc@AC [A]	194.5351	183.6407	-10.89436	192.2463
P_t_rc@AC [W]	119283.9	125531.8	6247.820	128698.0
Q_t_rc@AC [var]	2147.438	-4045.725	-6193.163	9532.155
I_fund_Q_SYM+_rc@AC [A]	0.555937	-1.811610	-2.367547	2.823932
I_fund_Q_SYM-_rc@AC [A]	0.667162	0.136335	-0.530827	1.602295
I_fund_P_SYM+_rc@AC [A]	192.0832	181.2121	-10.87105	189.7009
I_fund_P_SYM-_rc@AC [A]	-1.247033	-1.076952	0.170081	1.826105
U_fund_SYM+_rc@AC [V]	358.5408	399.9536	41.41278	391.6016
U_fund_SYM-_rc@AC [V]	0.831403	1.411014	0.579611	2.619548
U+ [V]	206.9994	230.3435	23.34412	219.5555
U- [V]	0.605386	0.759954	0.154568	1.109196

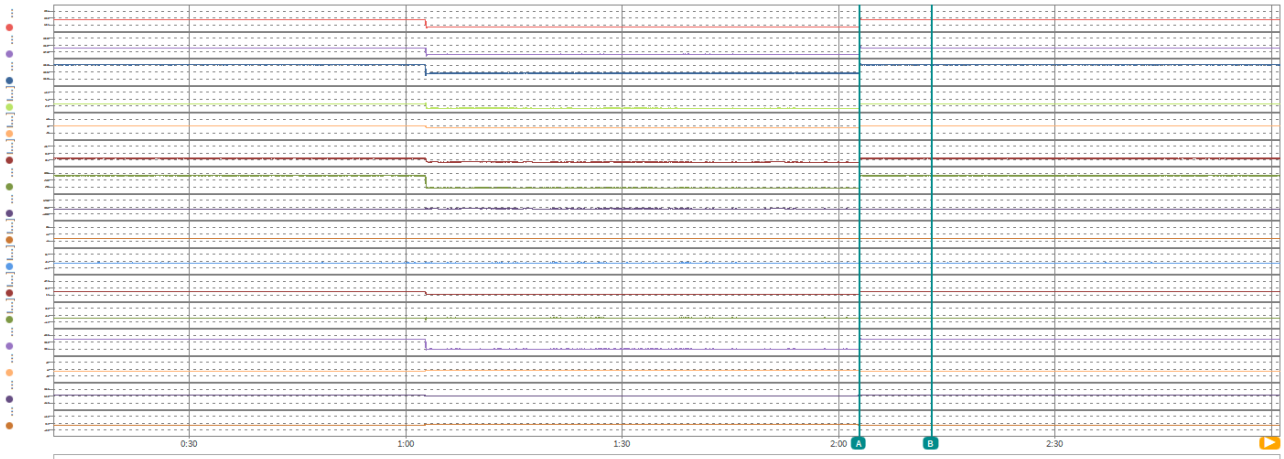
Test – VD10.2

Before fault



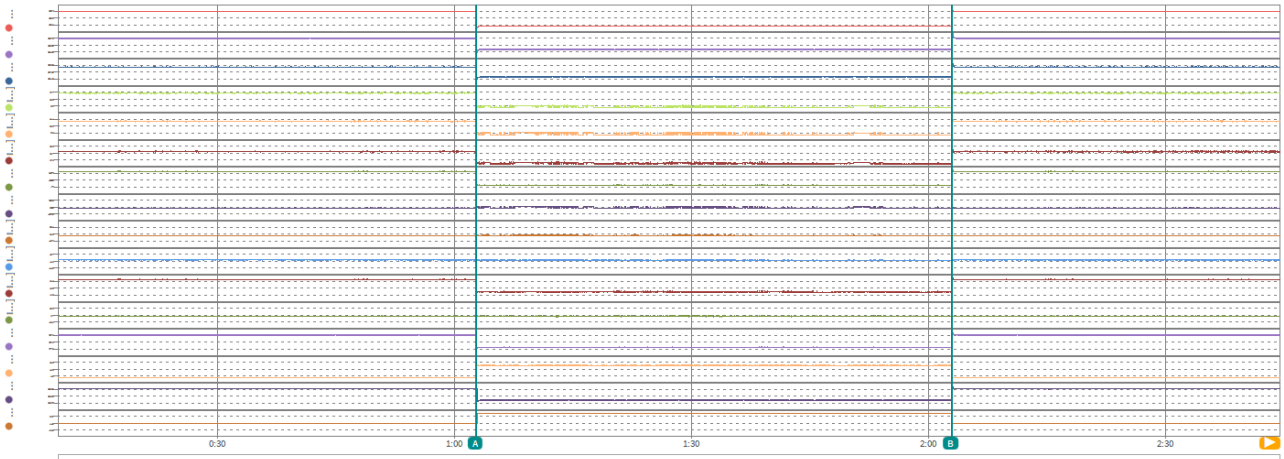
时间 [s]	A	B	间隔	有效值
	0:52.7347	1:02.7396	0:10.0049	
U1_tRMS_rc@AC [V]	230.2476	230.2788	0.031158	230.2324
U2_tRMS_rc@AC [V]	229.7610	229.7407	-0.020279	229.7348
U3_tRMS_rc@AC [V]	229.5095	229.5984	0.088943	229.5406
I1_tRMS_rc@AC [A]	37.03160	37.24747	0.215866	36.35972
I2_tRMS_rc@AC [A]	36.53582	37.12114	0.585320	36.65363
I3_tRMS_rc@AC [A]	37.88420	38.07144	0.187233	37.22798
P_t_rc@AC [W]	25549.73	25785.87	236.1445	25275.21
Q_t_rc@AC [var]	-1837.643	-1771.904	65.73914	1751.600
I_fund_Q_SYM+_rc@AC [A]	-0.636514	-0.202665	0.433849	0.673215
I_fund_Q_SYM-_rc@AC [A]	0.337249	0.144360	-0.192888	0.274664
I_fund_P_SYM+_rc@AC [A]	37.05366	37.39016	0.336498	36.65706
I_fund_P_SYM-_rc@AC [A]	3.846e-3	-3.701e-3	-7.547e-3	0.304431
U_fund_SYM+_rc@AC [V]	398.0901	398.1479	0.057800	398.0844
U_fund_SYM-_rc@AC [V]	0.995220	1.048870	0.053650	0.975004
U+ [V]	229.8547	229.8427	-0.011976	229.8409
U- [V]	0.550059	0.544619	-5.440e-3	0.562765

After fault



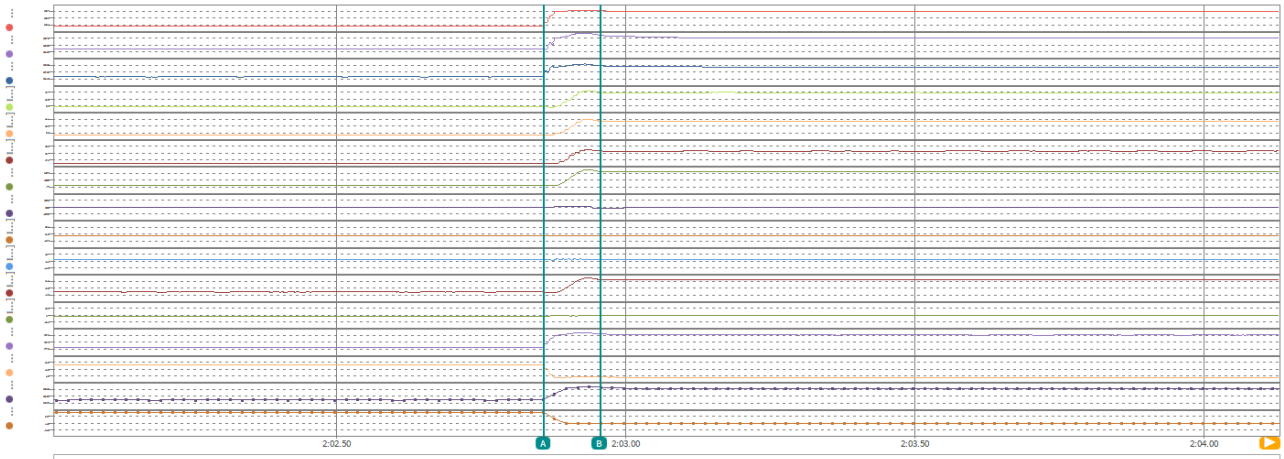
时间 [s]	A	B	间隔	有效值
	2:02.8449	2:12.8880	0:10.0432	
U1_tRMS_rc@AC [V]	207.0885	230.2173	23.12872	230.2049
U2_tRMS_rc@AC [V]	225.0440	229.7394	4.695374	229.7477
U3_tRMS_rc@AC [V]	224.8534	229.5369	4.683502	229.5367
I1_tRMS_rc@AC [A]	4.981475	35.89599	30.91452	36.23405
I2_tRMS_rc@AC [A]	2.521030	37.69616	35.17513	36.50422
I3_tRMS_rc@AC [A]	5.022418	37.13245	32.11003	37.09494
P_t_rc@AC [W]	1803.839	25366.45	23562.61	25170.31
Q_t_rc@AC [var]	-2046.840	-2028.601	18.23901	1929.778
I_fund_Q_SYM+_rc@AC [A]	-1.091766	-0.508865	0.582902	0.865450
I_fund_Q_SYM-_rc@AC [A]	-0.980390	-0.299282	0.681108	0.248973
I_fund_P_SYM+_rc@AC [A]	2.823425	36.79079	33.96737	36.50235
I_fund_P_SYM-_rc@AC [A]	-1.453901	-0.381374	1.072527	0.344212
U_fund_SYM+_rc@AC [V]	379.0359	398.0766	19.04071	398.0722
U_fund_SYM-_rc@AC [V]	20.73754	0.912348	-19.82519	1.360298
U+ [V]	218.8493	229.8201	10.97076	229.8082
U- [V]	11.87766	0.527862	-11.34980	0.965134

Duration fault time



时间 [s]	A 1:02.7403	B 2:02.8592	间隔 1:00.1189	有效值
U1_tRMS_rc@AC [V]	229.0316	207.1425	-21.88916	207.1396
U2_tRMS_rc@AC [V]	229.3509	224.9854	-4.365570	225.0122
U3_tRMS_rc@AC [V]	229.1452	224.8669	-4.278275	224.8401
I1_tRMS_rc@AC [A]	39.23602	5.154155	-34.08186	6.278029
I2_tRMS_rc@AC [A]	37.81223	2.512601	-35.29963	5.334913
I3_tRMS_rc@AC [A]	39.13067	5.115558	-34.01511	6.625105
P_t_rc@AC [W]	26267.46	1791.069	-24476.39	1880.325
Q_t_rc@AC [var]	-4349.686	-2130.405	2219.281	3487.475
I_fund_Q_SYM+_rc@AC [A]	-0.138114	-1.217912	-1.079798	3.964494
I_fund_Q_SYM-_rc@AC [A]	0.590785	-0.925891	-1.516676	0.683644
I_fund_P_SYM+_rc@AC [A]	38.28848	2.811698	-35.47678	2.906781
I_fund_P_SYM-_rc@AC [A]	-0.773667	-1.598892	-0.825225	1.187055
U_fund_SYM+_rc@AC [V]	396.8878	379.0422	-17.84558	379.0315
U_fund_SYM-_rc@AC [V]	0.458924	20.69715	20.23822	20.55341
U+ [V]	229.8357	218.8493	-10.98642	218.8439
U- [V]	0.555388	11.87766	11.32227	11.86482

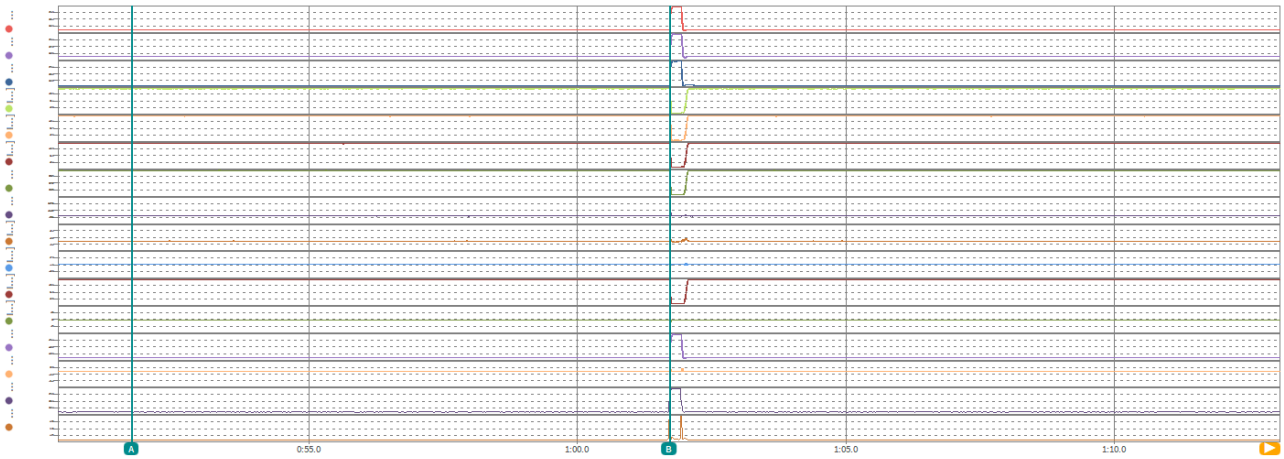
Recover time – Active power



时间 [s]	A 2:02.8585	B 2:02.9556	间隔 0.0971	有效值
U1_tRMS_rc@AC [V]	207.1468	231.7756	24.62877	228.6349
U2_tRMS_rc@AC [V]	224.9843	231.0683	6.083969	230.0290
U3_tRMS_rc@AC [V]	224.8685	230.1812	5.312637	229.8011
I1_tRMS_rc@AC [A]	5.136020	36.57287	31.43685	26.93121
I2_tRMS_rc@AC [A]	2.504481	37.54680	35.04232	26.42460
I3_tRMS_rc@AC [A]	5.121134	37.72370	32.60256	27.18973
P_t_rc@AC [W]	1784.813	25676.42	23891.61	18081.19
Q_t_rc@AC [var]	-2130.039	-2865.853	-735.8135	4487.394
I_fund_Q_SYM+_rc@AC [A]	-1.207897	-0.840315	0.367582	3.318851
I_fund_Q_SYM-_rc@AC [A]	-0.931332	-0.046107	0.885226	0.940737
I_fund_P_SYM+_rc@AC [A]	2.801555	37.04728	34.24572	26.02671
I_fund_P_SYM-_rc@AC [A]	-1.581866	-0.117264	1.464603	0.896694
U_fund_SYM+_rc@AC [V]	379.0408	400.1150	21.07419	397.4013
U_fund_SYM-_rc@AC [V]	20.61533	1.384973	-19.23035	6.182692
U+ [V]	218.8493	231.8162	12.96686	225.9905
U- [V]	11.87766	0.860322	-11.01734	7.214025

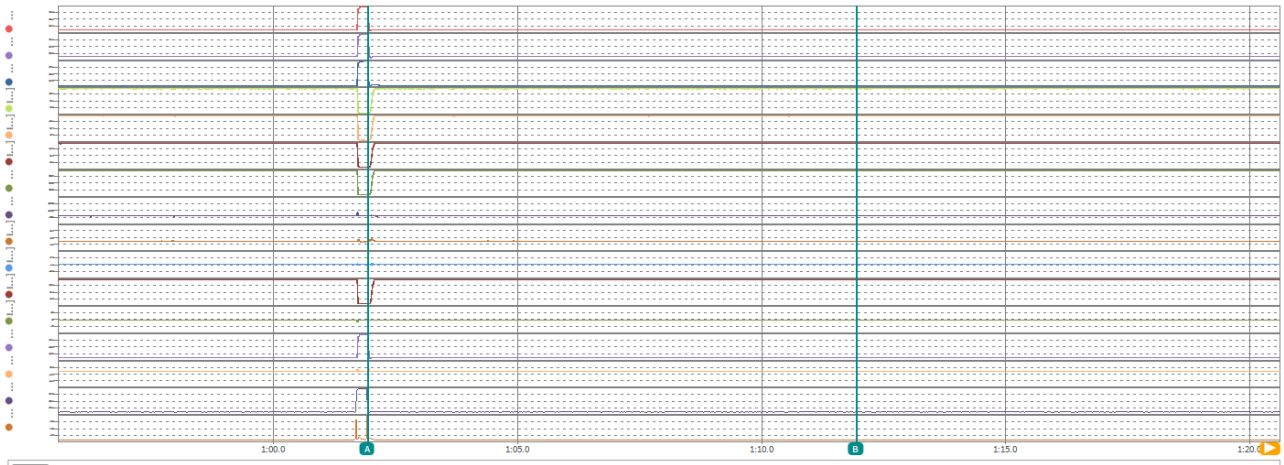
Test – VS1.1

Before fault



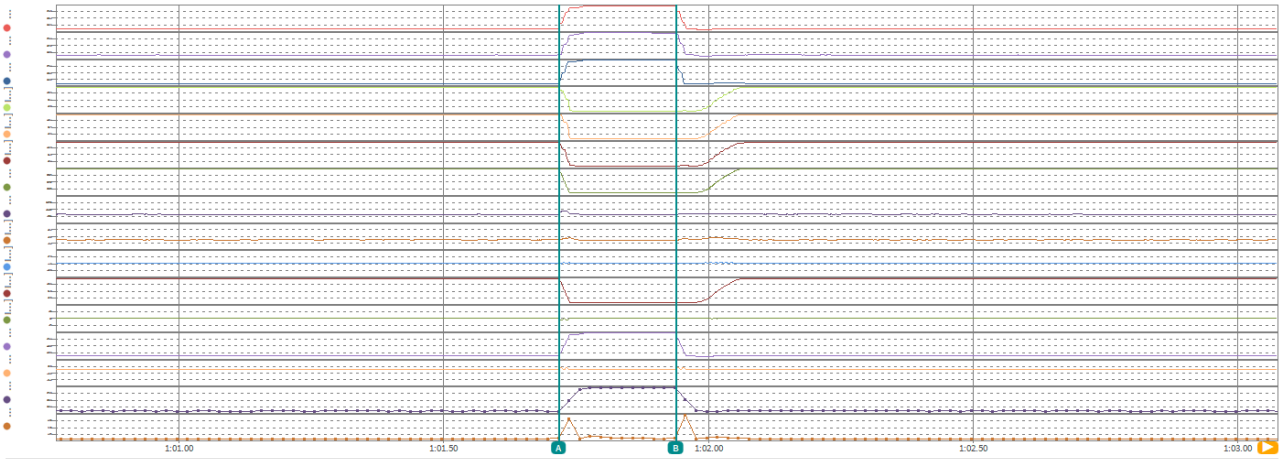
	A	B	间隔	有效值
时间 [s]	0:51.71850	1:01.71850	0:10.00000	
U1_tRMS_rc@AC [V]	230.5206	230.9157	0.395065	230.5137
U2_tRMS_rc@AC [V]	229.8185	230.0239	0.205338	229.8522
U3_tRMS_rc@AC [V]	229.8365	229.2717	-0.564835	229.8283
I1_tRMS_rc@AC [A]	179.7594	179.7791	0.019669	179.9687
I2_tRMS_rc@AC [A]	180.6909	181.3758	0.684952	181.2268
I3_tRMS_rc@AC [A]	183.9107	182.8414	-1.069366	183.5984
P_t_rc@AC [W]	125204.3	125137.6	-66.77344	125312.6
Q_t_rc@AC [var]	2715.589	2085.512	-630.0769	2430.858
I_fund_Q_SYM+_rc@AC [A]	0.635491	0.590435	-0.045056	0.598884
I_fund_Q_SYM-_rc@AC [A]	0.506063	-0.306637	-0.812700	0.567390
I_fund_P_SYM+_rc@AC [A]	181.4099	181.3049	-0.105072	181.5635
I_fund_P_SYM-_rc@AC [A]	-0.897572	-0.397166	0.500406	0.909822
U_fund_SYM+_rc@AC [V]	398.4667	398.4802	0.013458	398.4777
U_fund_SYM-_rc@AC [V]	1.074052	2.280990	1.206938	1.047911
U+ [V]	230.0712	230.0500	-0.021211	230.0680
U- [V]	0.593348	0.645236	0.051888	0.604570

After fault



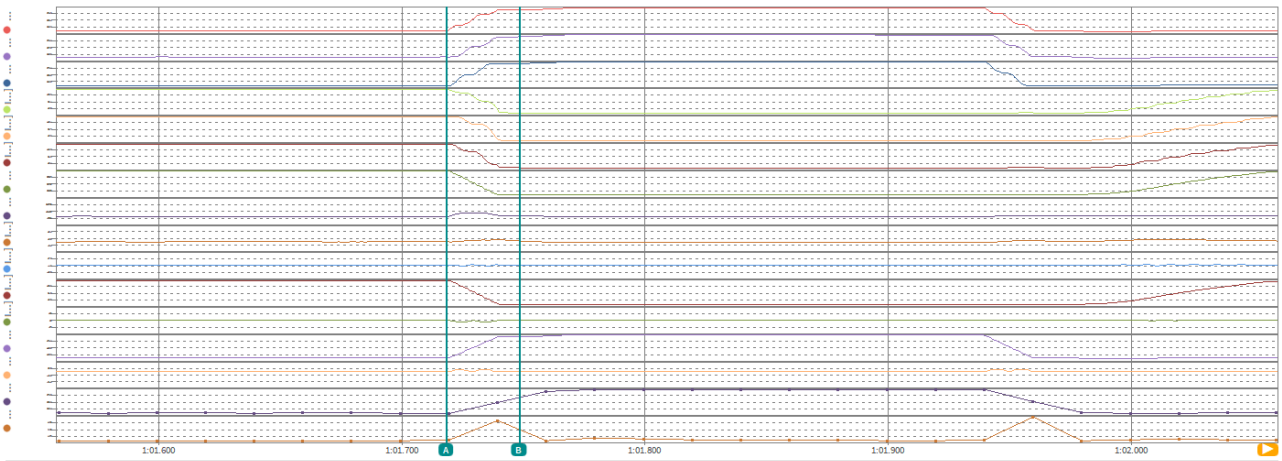
	A	B	间隔	有效值
时间 [s]	1:01.94004	1:11.94050	0:10.00046	
U1_tRMS_rc@AC [V]	287.8970	230.5048	-57.39220	230.5928
U2_tRMS_rc@AC [V]	287.4870	229.8665	-57.62057	229.9211
U3_tRMS_rc@AC [V]	287.1075	229.8602	-57.24727	229.9112
I1_tRMS_rc@AC [A]	2.576362	179.9434	177.3670	179.0627
I2_tRMS_rc@AC [A]	2.745440	180.8242	178.0787	180.3122
I3_tRMS_rc@AC [A]	3.099412	183.6364	180.5370	182.7225
P_t_rc@AC [W]	237.6381	125232.6	124995.0	124695.0
Q_t_rc@AC [var]	-2409.178	2309.583	4718.761	2573.841
I_fund_Q_SYM+_rc@AC [A]	-1.304483	0.532511	1.836994	0.852895
I_fund_Q_SYM-_rc@AC [A]	-0.431421	0.283867	0.715288	0.590365
I_fund_P_SYM+_rc@AC [A]	0.274949	181.4395	181.1646	180.6594
I_fund_P_SYM-_rc@AC [A]	0.039197	-0.922522	-0.961719	0.926727
U_fund_SYM+_rc@AC [V]	497.9556	398.4990	-99.45657	398.6069
U_fund_SYM-_rc@AC [V]	1.520032	1.029034	-0.490997	1.170879
U+ [V]	287.5023	230.0562	-57.44603	230.2637
U- [V]	0.737726	0.584651	-0.153075	0.663153

Duration fault time



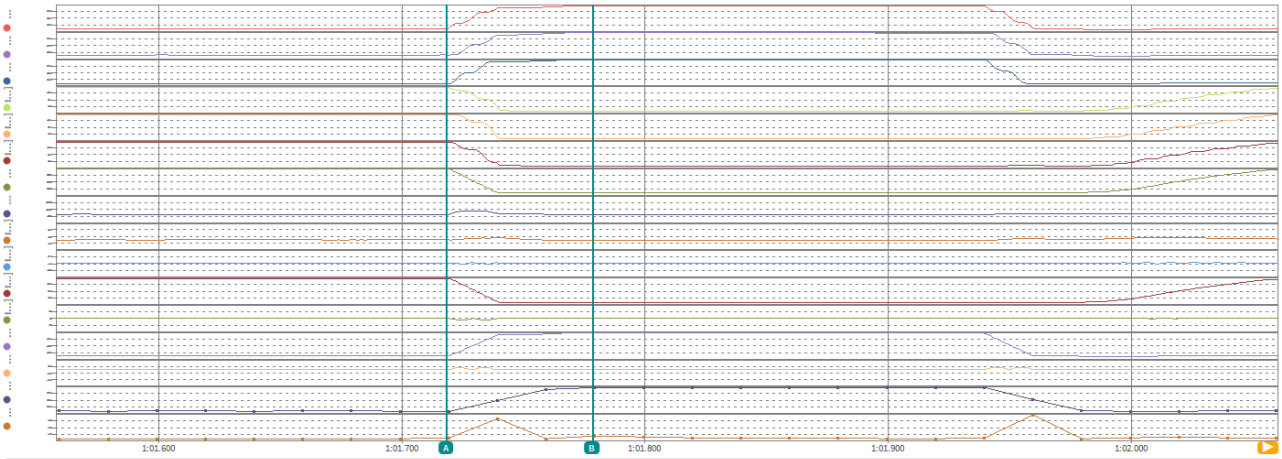
	A	B	间隔	有效值
时间 [s]	1:01.71850	1:01.93950	0.22100	
U1_tRMS_rc@AC [V]	230.9157	287.8970	56.98132	284.4008
U2_tRMS_rc@AC [V]	230.0239	287.4870	57.46317	284.3436
U3_tRMS_rc@AC [V]	229.2717	287.1075	57.83577	283.7400
I1_tRMS_rc@AC [A]	179.7791	2.576362	-177.2027	41.88373
I2_tRMS_rc@AC [A]	181.3758	2.745440	-178.6304	44.43384
I3_tRMS_rc@AC [A]	182.8414	3.099412	-179.7420	40.29166
P_t_rc@AC [W]	125137.6	237.6381	-124899.9	25130.10
Q_t_rc@AC [var]	2085.512	-2409.178	-4494.689	18239.50
I_fund_Q_SYM+_rc@AC [A]	0.590435	-1.304483	-1.894918	2.507600
I_fund_Q_SYM-_rc@AC [A]	-0.306637	-0.431421	-0.124784	1.391522
I_fund_P_SYM+_rc@AC [A]	181.3049	0.274949	-181.0299	36.18976
I_fund_P_SYM-_rc@AC [A]	-0.397166	0.039197	0.436363	5.663148
U_fund_SYM+_rc@AC [V]	398.4802	497.9556	99.47537	492.0504
U_fund_SYM-_rc@AC [V]	2.280990	1.520032	-0.760959	3.314801
U+ [V]	230.0500	287.4635	57.41353	275.9133
U- [V]	0.645236	0.637645	-7.592e-3	1.699526

0-30ms



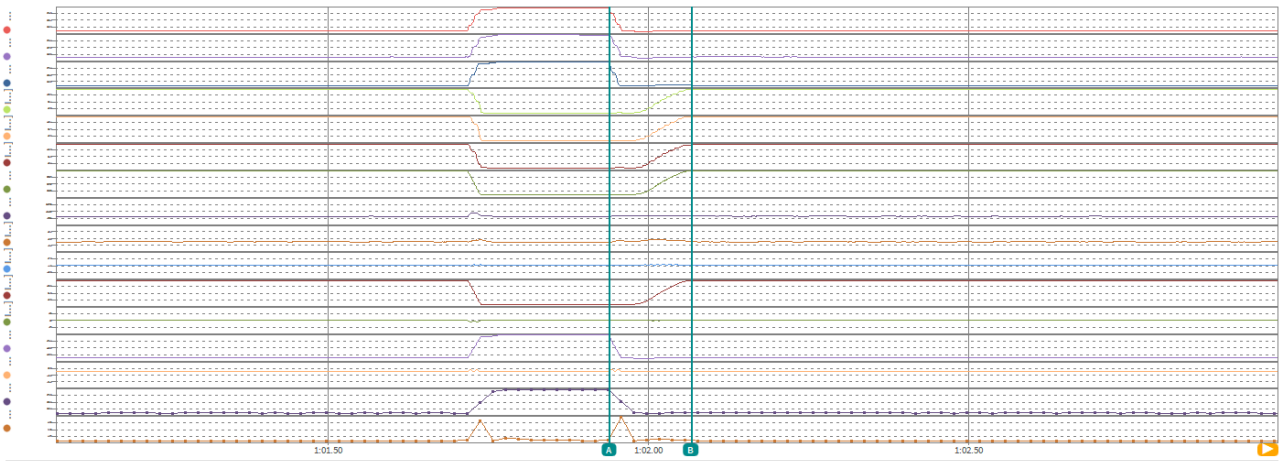
	A	B	间隔	有效值
时间 [s]	1:01.71850	1:01.74850	0.03000	
U1_tRMS_rc@AC [V]	230.9157	282.8396	51.92386	264.5490
U2_tRMS_rc@AC [V]	230.0239	282.9249	52.90103	261.4405
U3_tRMS_rc@AC [V]	229.2717	282.8058	53.53410	265.8593
I1_tRMS_rc@AC [A]	179.7791	3.178060	-176.6010	111.8922
I2_tRMS_rc@AC [A]	181.3758	5.232825	-176.1430	118.6885
I3_tRMS_rc@AC [A]	182.8414	10.12498	-172.7164	107.4375
P_t_rc@AC [W]	125137.6	-487.2608	-125624.8	67248.51
Q_t_rc@AC [var]	2085.512	5220.088	3134.576	48369.98
I_fund_Q_SYM+_rc@AC [A]	0.590435	3.875287	3.284852	5.738018
I_fund_Q_SYM-_rc@AC [A]	-0.306637	-3.003932	-2.697295	3.421257
I_fund_P_SYM+_rc@AC [A]	181.3049	-0.574711	-181.8796	96.84487
I_fund_P_SYM-_rc@AC [A]	-0.397166	0.729375	1.126541	15.13791
U_fund_SYM+_rc@AC [V]	398.4802	489.9184	91.43823	456.2118
U_fund_SYM-_rc@AC [V]	2.280990	0.958929	-1.322061	8.109066
U+ [V]	230.0500	256.9792	26.92917	239.3648
U- [V]	0.645236	5.256001	4.610765	3.086158

0-60ms



	A	B	间隔	有效值
时间 [s]	1:01.71850	1:01.77850	0.06000	
U1_tRMS_rc@AC [V]	230.9157	288.2502	57.33450	275.2082
U2_tRMS_rc@AC [V]	230.0239	289.6598	59.63596	274.0830
U3_tRMS_rc@AC [V]	229.2717	286.8733	57.60158	275.4195
I1_tRMS_rc@AC [A]	179.7791	2.515043	-177.2640	79.78613
I2_tRMS_rc@AC [A]	181.3758	2.967225	-178.4086	84.63863
I3_tRMS_rc@AC [A]	182.8414	3.923654	-178.9177	76.64765
P_t_rc@AC [W]	125137.6	167.0390	-124970.5	47940.32
Q_t_rc@AC [var]	2085.512	-2704.886	-4790.398	34538.35
I_fund_Q_SYM+_rc@AC [A]	0.590435	-1.448157	-2.038591	4.191227
I_fund_Q_SYM-_rc@AC [A]	-0.306637	-0.459182	-0.152545	2.526016
I_fund_P_SYM+_rc@AC [A]	181.3049	0.190851	-181.1140	69.03893
I_fund_P_SYM-_rc@AC [A]	-0.397166	0.222725	0.619891	10.80085
U_fund_SYM+_rc@AC [V]	398.4802	499.2786	100.7984	475.6660
U_fund_SYM-_rc@AC [V]	2.280990	1.848006	-0.432984	5.908148
U+ [V]	230.0500	283.2039	53.15392	251.0433
U- [V]	0.645236	0.523965	-0.121272	2.685501

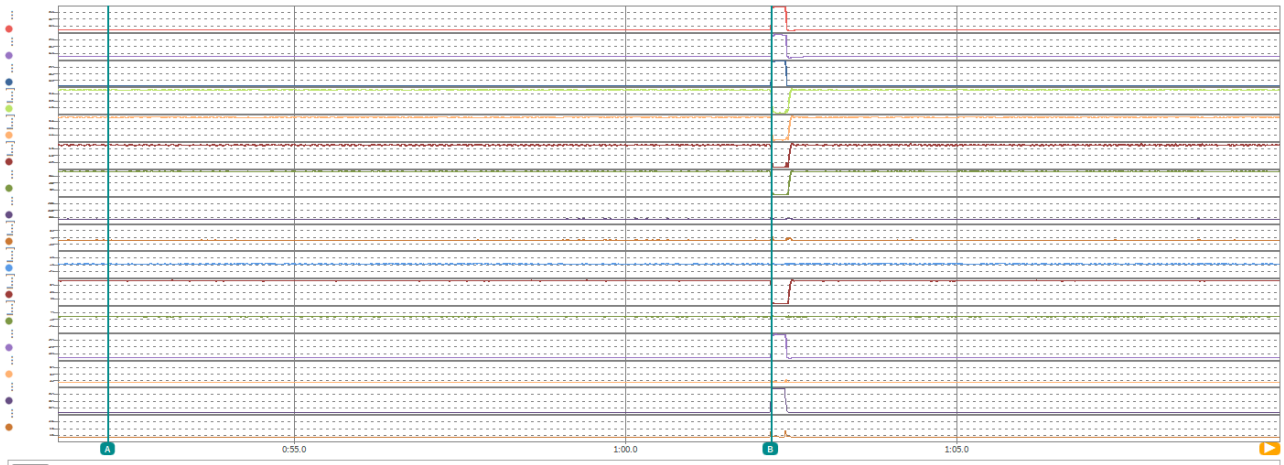
Recover time – Active power



	A	B	间隔	有效值
时间 [s]	1:01.94004	1:02.06750	0.12746	
U1_tRMS_rc@AC [V]	287.8970	231.4528	-56.44424	235.8599
U2_tRMS_rc@AC [V]	287.4870	229.9096	-57.57747	235.0908
U3_tRMS_rc@AC [V]	287.1075	231.0625	-56.04494	235.1312
I1_tRMS_rc@AC [A]	2.576362	178.3525	175.7761	92.97540
I2_tRMS_rc@AC [A]	2.745440	180.9841	178.2387	94.05768
I3_tRMS_rc@AC [A]	3.099412	179.9937	176.8943	94.64187
P_t_rc@AC [W]	237.6381	124324.3	124086.6	64278.30
Q_t_rc@AC [var]	-2409.178	6223.275	8632.453	9585.936
I_fund_Q_SYM+_rc@AC [A]	-1.304483	1.818806	3.123289	5.756598
I_fund_Q_SYM-_rc@AC [A]	-0.431421	-1.009010	-0.577589	2.167035
I_fund_P_SYM+_rc@AC [A]	0.274949	179.5399	179.2650	92.82259
I_fund_P_SYM-_rc@AC [A]	0.039197	-0.711098	-0.750295	2.107174
U_fund_SYM+_rc@AC [V]	497.9556	399.7610	-98.19452	407.3278
U_fund_SYM-_rc@AC [V]	1.520032	1.109280	-0.410751	4.852241
U+ [V]	287.5023	230.8966	-56.60569	243.0992
U- [V]	0.737726	0.708641	-0.029085	2.458767

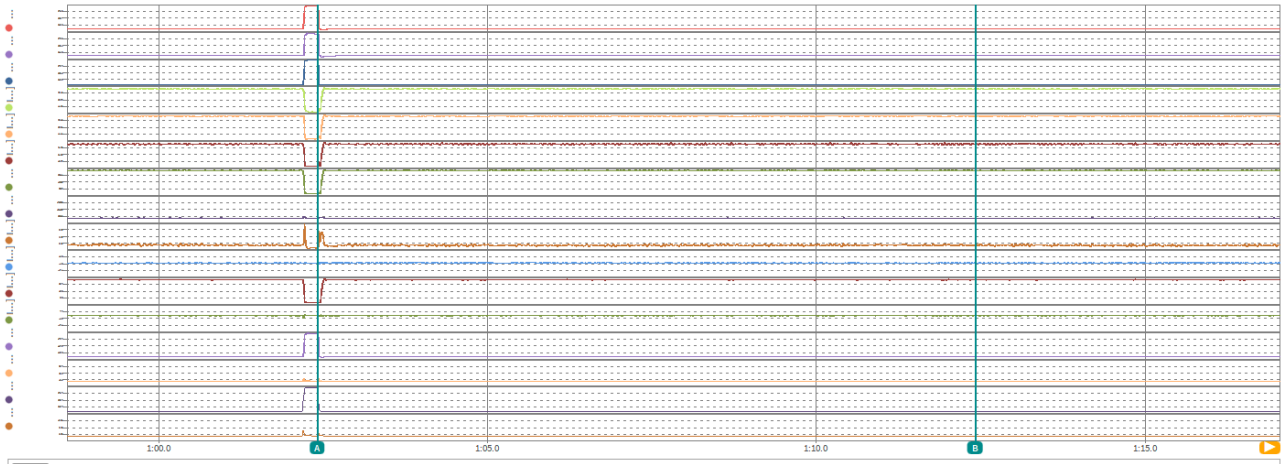
Test – VS1.2

Before fault



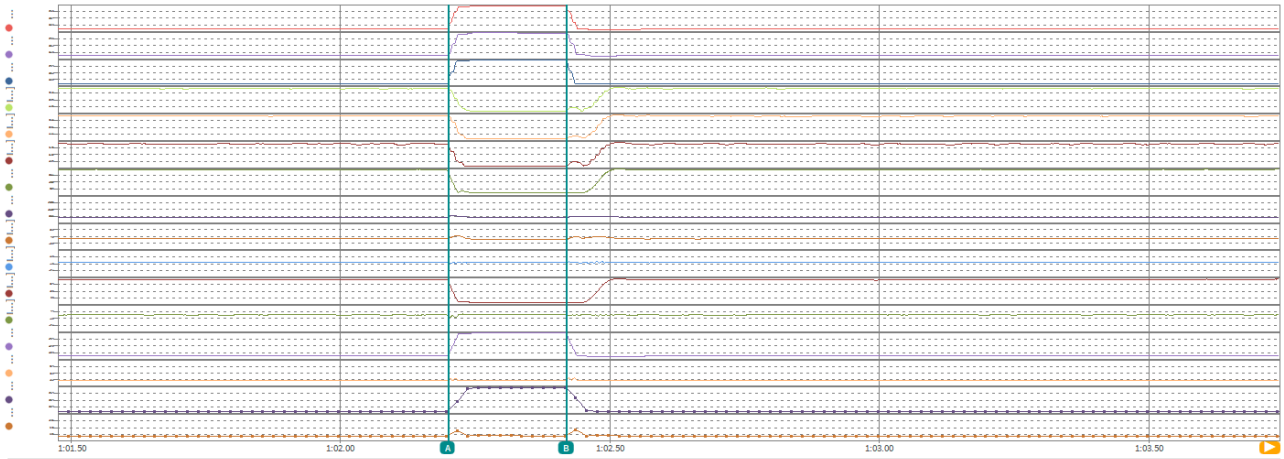
	A	B	间隔	有效值
时间 [s]	0:52.20030	1:02.20030	0:10.00000	
U1_tRMS_rc@AC [V]	230.2558	230.2304	-0.025314	230.2777
U2_tRMS_rc@AC [V]	229.7884	229.7334	-0.054916	229.7657
U3_tRMS_rc@AC [V]	229.5779	229.5443	-0.033585	229.6147
I1_tRMS_rc@AC [A]	36.49051	36.28772	-0.202789	36.70718
I2_tRMS_rc@AC [A]	36.74466	37.14740	0.402748	36.92135
I3_tRMS_rc@AC [A]	36.84245	36.62799	-0.214458	37.45509
P_t_rc@AC [W]	25248.67	25240.80	-7.863281	25476.12
Q_t_rc@AC [var]	-1670.319	-1674.485	-4.165649	1732.644
I_fund_Q_SYM+_rc@AC [A]	-0.678048	-0.470136	0.207912	0.677106
I_fund_Q_SYM-_rc@AC [A]	0.096813	-0.151675	-0.248488	0.213668
I_fund_P_SYM+_rc@AC [A]	36.61304	36.60809	-4.951e-3	36.94038
I_fund_P_SYM-_rc@AC [A]	0.095560	-0.355858	-0.451417	0.272152
U_fund_SYM+_rc@AC [V]	398.1505	398.0812	-0.069214	398.1710
U_fund_SYM-_rc@AC [V]	0.990622	0.663395	-0.327227	1.012335
U+ [V]	229.8667	229.8849	0.018218	229.8909
U- [V]	0.581075	0.592296	0.011221	0.584368

After fault



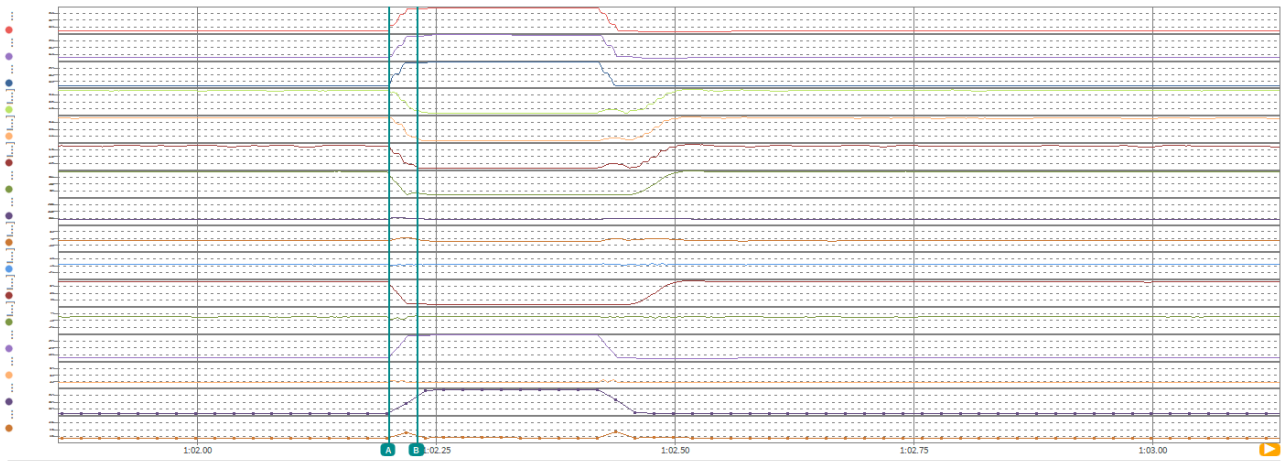
	A	B	间隔	有效值
时间 [s]	1:02.42130	1:12.42130	0:10.00000	
U1_tRMS_rc@AC [V]	287.1960	230.2194	-56.97661	230.3263
U2_tRMS_rc@AC [V]	287.5504	229.7731	-57.77731	229.8109
U3_tRMS_rc@AC [V]	286.9272	229.6733	-57.25383	229.6774
I1_tRMS_rc@AC [A]	4.021450	36.75088	32.72943	36.57654
I2_tRMS_rc@AC [A]	3.125448	36.85365	33.72820	36.83414
I3_tRMS_rc@AC [A]	4.527735	38.51468	33.98695	37.37308
P_t_rc@AC [W]	616.1785	25723.88	25107.70	25396.43
Q_t_rc@AC [var]	-3295.691	-1615.222	1680.469	1861.397
I_fund_Q_SYM+_rc@AC [A]	-2.086794	-0.345985	1.740809	0.801894
I_fund_Q_SYM-_rc@AC [A]	-0.091122	0.395050	0.486172	0.244661
I_fund_P_SYM+_rc@AC [A]	0.740732	37.30021	36.55947	36.82687
I_fund_P_SYM-_rc@AC [A]	0.180023	-0.462880	-0.642903	0.310231
U_fund_SYM+_rc@AC [V]	497.4408	398.1759	-99.26486	398.2576
U_fund_SYM-_rc@AC [V]	0.936411	0.954590	0.018179	1.139066
U+ [V]	287.6527	229.8614	-57.79125	230.0758
U- [V]	0.695917	0.549797	-0.146120	0.642149

Duration fault time



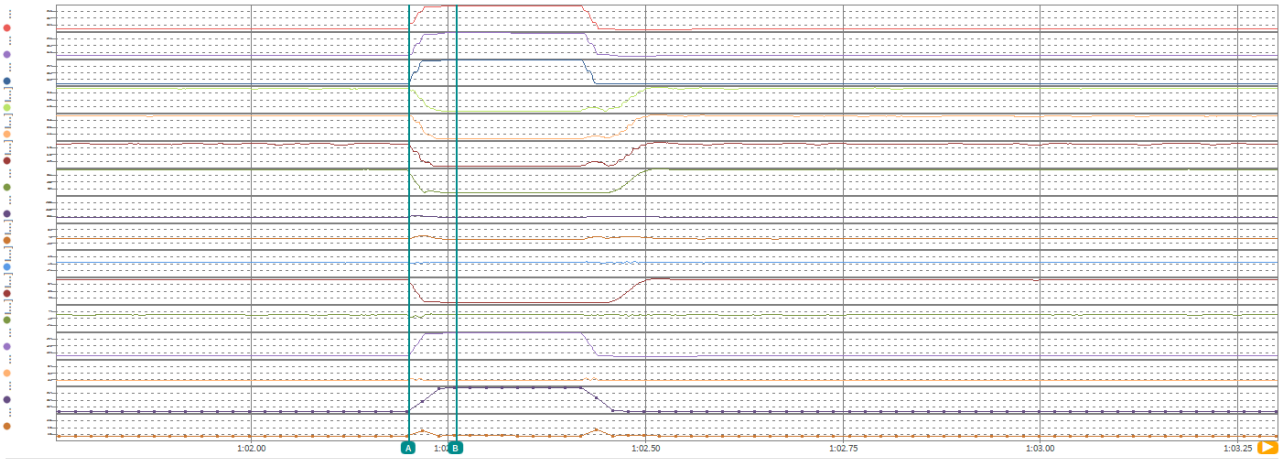
	A	B	间隔	有效值
时间 [s]	1:02.20030	1:02.42030	0.22000	
U1_tRMS_rc@AC [V]	230.2304	287.9771	57.74664	285.5411
U2_tRMS_rc@AC [V]	229.7334	287.6450	57.91151	285.4156
U3_tRMS_rc@AC [V]	229.5443	287.2141	57.66983	284.6552
I1_tRMS_rc@AC [A]	36.28772	2.942503	-33.34522	9.641833
I2_tRMS_rc@AC [A]	37.14740	3.155074	-33.99233	9.823481
I3_tRMS_rc@AC [A]	36.62799	3.752473	-32.87551	8.805715
P_t_rc@AC [W]	25240.80	433.5100	-24807.29	4708.020
Q_t_rc@AC [var]	-1674.485	-2799.309	-1124.825	5432.300
I_fund_Q_SYM+_rc@AC [A]	-0.470136	-2.029311	-1.559176	2.910809
I_fund_Q_SYM-_rc@AC [A]	-0.151675	-0.317450	-0.165776	0.412330
I_fund_P_SYM+_rc@AC [A]	36.60809	0.501569	-36.10652	6.815299
I_fund_P_SYM-_rc@AC [A]	-0.355858	-0.040206	0.315652	1.117261
U_fund_SYM+_rc@AC [V]	398.0812	498.1549	100.0737	493.8430
U_fund_SYM-_rc@AC [V]	0.663395	1.479805	0.816409	3.408099
U+ [V]	229.8849	287.6527	57.76772	280.8919
U- [V]	0.592296	0.695917	0.103621	1.737454

0-30ms



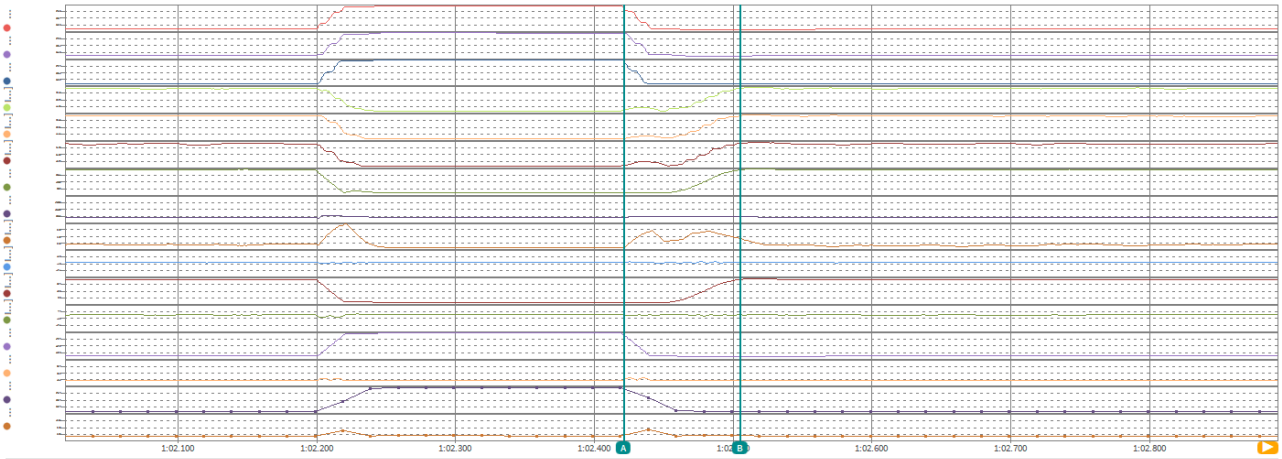
	A	B	间隔	有效值
时间 [s]	1:02.20030	1:02.23030	0.03000	
U1_tRMS_rc@AC [V]	230.2304	286.0867	55.85623	267.2217
U2_tRMS_rc@AC [V]	229.7334	285.6510	55.91759	264.4573
U3_tRMS_rc@AC [V]	229.5443	285.3635	55.81918	268.6225
I1_tRMS_rc@AC [A]	36.28772	6.755499	-29.53222	24.53529
I2_tRMS_rc@AC [A]	37.14740	8.000277	-29.14713	25.04321
I3_tRMS_rc@AC [A]	36.62799	6.260250	-30.36774	21.68118
P_t_rc@AC [W]	25240.80	2450.325	-22790.48	12447.70
Q_t_rc@AC [var]	-1674.485	5481.663	7156.148	12774.88
I_fund_Q_SYM+_rc@AC [A]	-0.470136	4.153260	4.623395	6.101196
I_fund_Q_SYM-_rc@AC [A]	-0.151675	-0.222637	-0.070963	0.869726
I_fund_P_SYM+_rc@AC [A]	36.60809	2.853218	-33.75487	18.08321
I_fund_P_SYM-_rc@AC [A]	-0.355858	1.975043	2.330901	2.920959
U_fund_SYM+_rc@AC [V]	398.0812	494.8441	96.76282	460.9966
U_fund_SYM-_rc@AC [V]	0.663395	1.283561	0.620165	8.244438
U+ [V]	229.8849	254.4194	24.53444	242.4627
U- [V]	0.592296	5.293676	4.701380	3.766551

0-60ms



	A	B	间隔	有效值
时间 [s]	1:02.20030	1:02.26030	0.06000	
U1_tRMS_rc@AC [V]	230.2304	289.5853	59.35489	277.5657
U2_tRMS_rc@AC [V]	229.7334	290.6558	60.92232	276.4819
U3_tRMS_rc@AC [V]	229.5443	287.6206	58.07626	277.5474
I1_tRMS_rc@AC [A]	36.28772	3.094493	-33.19323	17.72506
I2_tRMS_rc@AC [A]	37.14740	2.989783	-34.15762	18.02583
I3_tRMS_rc@AC [A]	36.62799	3.758499	-32.86949	15.66782
P_t_rc@AC [W]	25240.80	480.1674	-24760.64	8921.968
Q_t_rc@AC [var]	-1674.485	-2805.343	-1130.858	9339.136
I_fund_Q_SYM+_rc@AC [A]	-0.470136	-2.051246	-1.581110	4.515455
I_fund_Q_SYM-_rc@AC [A]	-0.151675	-0.109319	0.042355	0.662399
I_fund_P_SYM+_rc@AC [A]	36.60809	0.550920	-36.05717	12.93616
I_fund_P_SYM-_rc@AC [A]	-0.355858	0.193488	0.549346	2.118899
U_fund_SYM+_rc@AC [V]	398.0812	501.0565	102.9752	479.5948
U_fund_SYM-_rc@AC [V]	0.663395	2.031475	1.368080	6.027684
U+ [V]	229.8849	288.2344	58.34945	265.6437
U- [V]	0.592296	1.224862	0.632566	2.755557

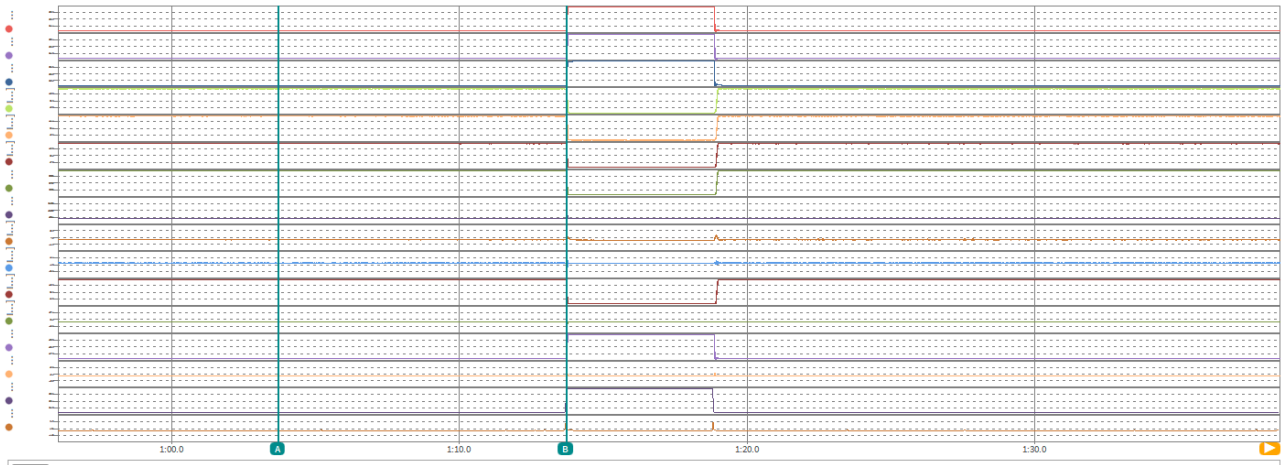
Recover time – Active power



	A	B	间隔	有效值
时间 [s]	1:02.42130	1:02.50530	0.08400	
U1_tRMS_rc@AC [V]	287.1960	229.1159	-58.08012	237.3833
U2_tRMS_rc@AC [V]	287.5504	227.2292	-60.32117	237.1770
U3_tRMS_rc@AC [V]	286.9272	230.0249	-56.90221	236.3311
I1_tRMS_rc@AC [A]	4.021450	36.65345	32.63200	18.45241
I2_tRMS_rc@AC [A]	3.125448	36.73594	33.61049	19.07765
I3_tRMS_rc@AC [A]	4.527735	38.95897	34.43123	19.49151
P_t_rc@AC [W]	616.1785	25345.75	24729.57	12024.15
Q_t_rc@AC [var]	-3295.691	4293.933	7589.624	5092.012
I_fund_Q_SYM+_rc@AC [A]	-2.086794	2.332547	4.419341	3.775683
I_fund_Q_SYM-_rc@AC [A]	-0.091122	0.755589	0.846711	0.993187
I_fund_P_SYM+_rc@AC [A]	0.740732	36.91647	36.17573	17.54497
I_fund_P_SYM-_rc@AC [A]	0.180023	0.124745	-0.055278	0.866870
U_fund_SYM+_rc@AC [V]	497.4408	396.2719	-101.1689	409.9476
U_fund_SYM-_rc@AC [V]	0.936411	1.489236	0.552825	5.911034
U+ [V]	287.6527	228.2007	-59.45201	248.6010
U- [V]	0.695917	0.899216	0.203299	2.817712

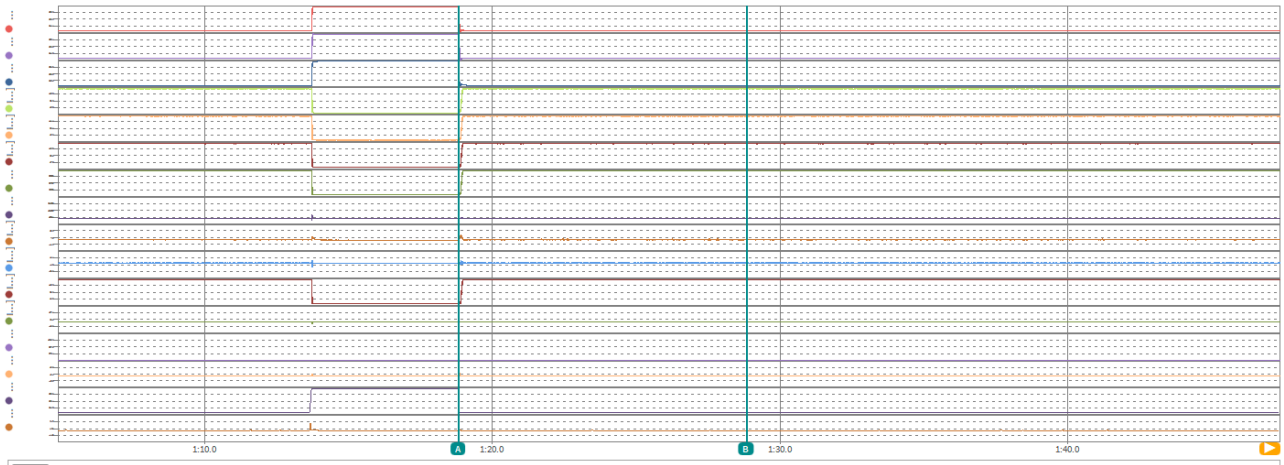
Test – VS2.1.1

Before fault



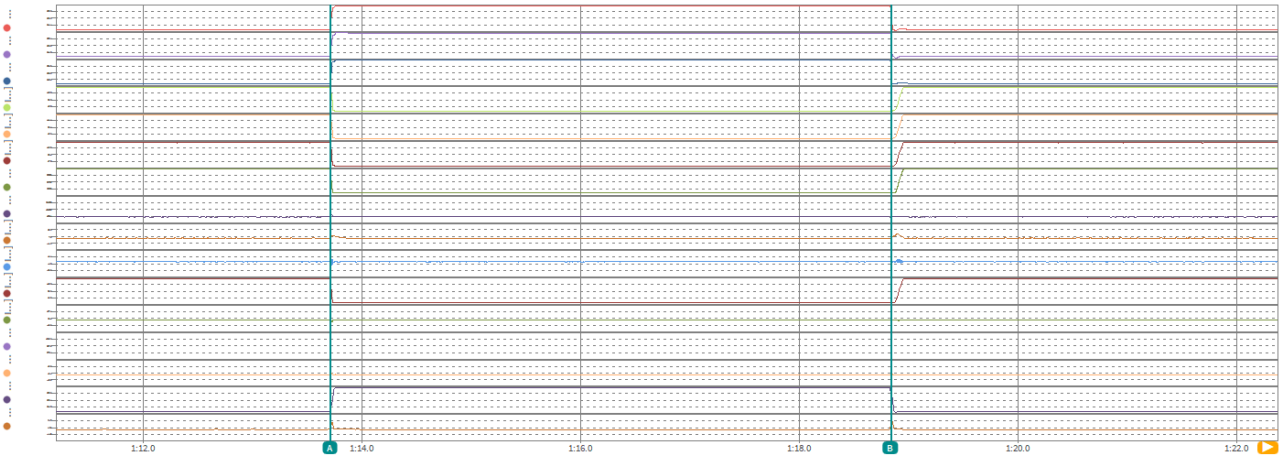
	A	B	间隔	有效值
时间 [s]	1:03.7188	1:13.7188	0:10.0000	
U1_tRMS_rc@AC [V]	230.5335	230.3481	-0.185394	230.5033
U2_tRMS_rc@AC [V]	229.8717	230.4549	0.583206	229.8549
U3_tRMS_rc@AC [V]	229.8078	229.5203	-0.287460	229.8132
I1_tRMS_rc@AC [A]	180.9088	181.2001	0.291351	180.6489
I2_tRMS_rc@AC [A]	181.7534	181.7516	-1.785e-3	181.7902
I3_tRMS_rc@AC [A]	184.0913	183.3969	-0.694351	184.2719
P_t_rc@AC [W]	125770.2	125696.5	-73.64063	125749.8
Q_t_rc@AC [var]	2295.354	2323.317	27.96362	2423.689
I_fund_Q_SYM+_rc@AC [A]	0.288691	0.183323	-0.105368	0.526265
I_fund_Q_SYM-_rc@AC [A]	0.312018	-0.635670	-0.947688	0.562552
I_fund_P_SYM+_rc@AC [A]	182.2211	182.0913	-0.129791	182.2029
I_fund_P_SYM-_rc@AC [A]	-0.552476	-0.380640	0.171836	0.877109
U_fund_SYM+_rc@AC [V]	398.4886	398.5467	0.058105	398.4647
U_fund_SYM-_rc@AC [V]	1.067839	1.697398	0.629559	1.052354
U+ [V]	230.0454	230.0401	-5.238e-3	230.0604
U- [V]	0.583787	0.606851	0.023064	0.607365

After fault



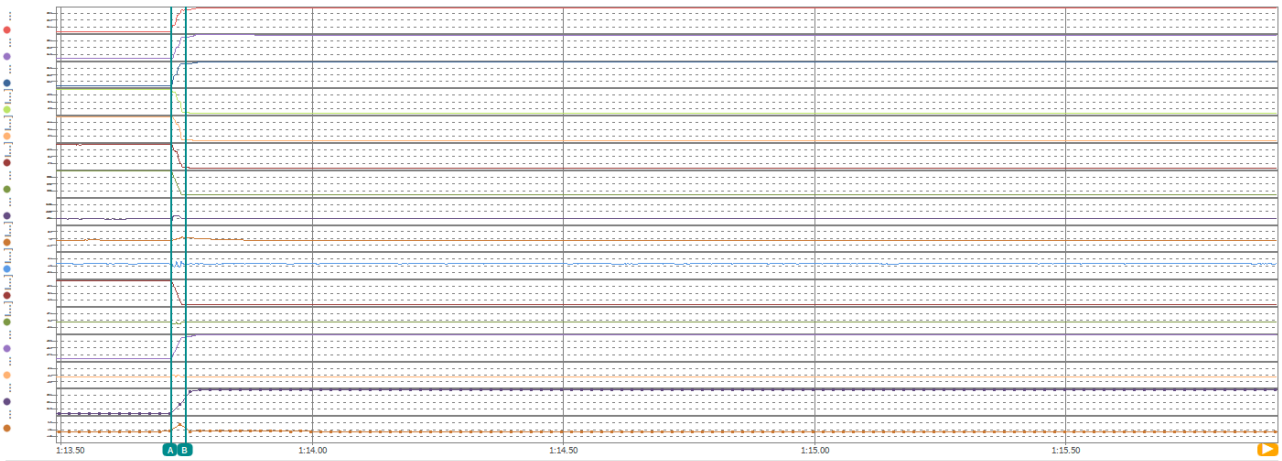
	A	B	间隔	有效值
时间 [s]	1:18.8408	1:28.8408	0:10.0000	
U1_tRMS_rc@AC [V]	276.2571	230.5129	-45.74416	230.5741
U2_tRMS_rc@AC [V]	275.8422	229.8623	-45.97997	229.9207
U3_tRMS_rc@AC [V]	275.6714	229.8310	-45.84038	229.8935
I1_tRMS_rc@AC [A]	2.171229	179.9906	177.8193	179.8226
I2_tRMS_rc@AC [A]	2.437315	182.1195	179.6822	180.9488
I3_tRMS_rc@AC [A]	3.437706	183.8608	180.4231	183.4443
P_t_rc@AC [W]	587.6532	125589.0	125001.3	125175.9
Q_t_rc@AC [var]	-2140.611	2267.587	4408.198	2768.577
I_fund_Q_SYM+_rc@AC [A]	-1.010017	0.102550	1.112567	1.128457
I_fund_Q_SYM-_rc@AC [A]	0.033162	0.168238	0.135076	0.687002
I_fund_P_SYM+_rc@AC [A]	0.708901	181.9592	181.2503	181.3591
I_fund_P_SYM-_rc@AC [A]	-0.018047	-0.654160	-0.636113	0.964221
U_fund_SYM+_rc@AC [V]	477.9095	398.4850	-79.42453	398.5870
U_fund_SYM-_rc@AC [V]	1.242364	1.053241	-0.189124	1.130299
U+ [V]	275.9207	230.0630	-45.85769	230.2308
U- [V]	0.598733	0.613642	0.014909	0.641829

Duration fault time



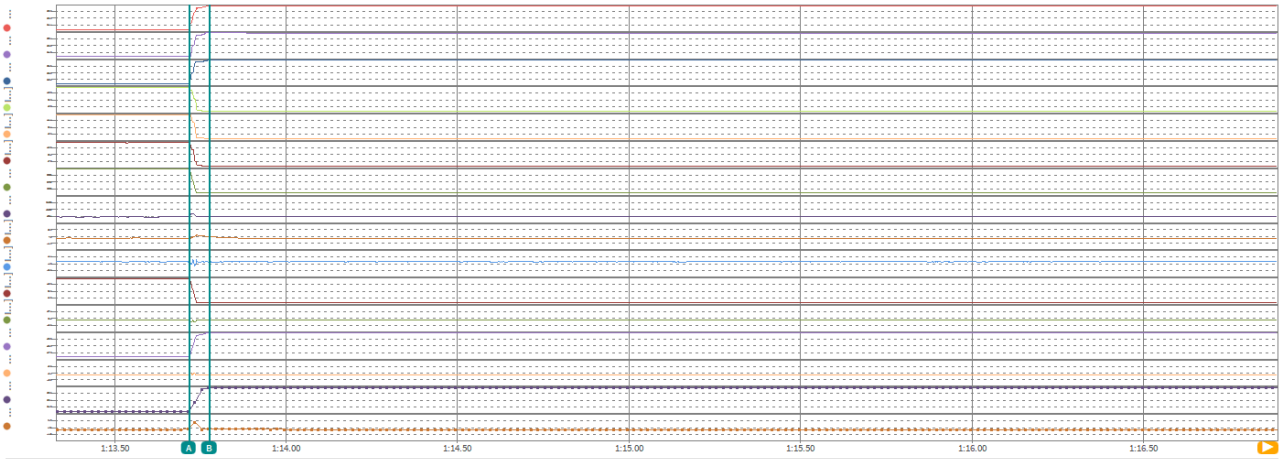
	A	B	间隔	有效值
时间 [s]	1:13.7188	1:18.8408	5.1220	
U1_tRMS_rc@AC [V]	230.3481	276.2571	45.90895	276.1303
U2_tRMS_rc@AC [V]	230.4549	275.8422	45.38736	275.6738
U3_tRMS_rc@AC [V]	229.5203	275.6714	46.15111	275.5180
I1_tRMS_rc@AC [A]	181.2001	2.171229	-179.0289	9.867237
I2_tRMS_rc@AC [A]	181.7516	2.437315	-179.3143	10.14367
I3_tRMS_rc@AC [A]	183.3969	3.437706	-179.9592	9.850195
P_t_rc@AC [W]	125696.5	587.6532	-125108.9	5905.114
Q_t_rc@AC [var]	2323.317	-2140.611	-4463.929	4215.990
I_fund_Q_SYM+_rc@AC [A]	0.183323	-1.010017	-1.193340	1.230342
I_fund_Q_SYM-_rc@AC [A]	-0.635670	0.033162	0.668832	0.446894
I_fund_P_SYM+_rc@AC [A]	182.0913	0.708901	-181.3824	8.474580
I_fund_P_SYM-_rc@AC [A]	-0.380640	-0.018047	0.362593	1.070828
U_fund_SYM+_rc@AC [V]	398.5467	477.9095	79.36282	477.6471
U_fund_SYM-_rc@AC [V]	1.697398	1.242364	-0.455034	1.138661
U+ [V]	230.0401	275.9207	45.88053	275.4678
U- [V]	0.606851	0.598733	-8.118e-3	0.646012

0-30ms



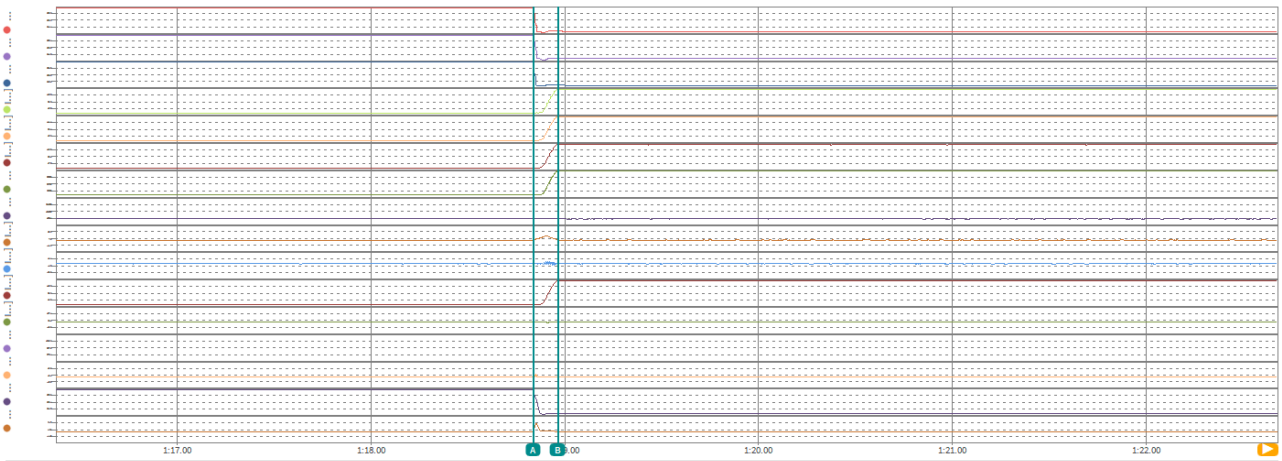
	A	B	间隔	有效值
时间 [s]	1:13.7188	1:13.7488	0.0300	
U1_tRMS_rc@AC [V]	230.3481	271.5938	41.24568	254.9190
U2_tRMS_rc@AC [V]	230.4549	271.3723	40.91742	252.1824
U3_tRMS_rc@AC [V]	229.5203	271.4734	41.95308	255.6226
I1_tRMS_rc@AC [A]	181.2001	8.807605	-172.3925	123.1397
I2_tRMS_rc@AC [A]	181.7516	9.101584	-172.6500	126.3901
I3_tRMS_rc@AC [A]	183.3969	10.14020	-173.2567	117.3422
P_t_rc@AC [W]	125696.5	880.7017	-124815.8	75379.71
Q_t_rc@AC [var]	2323.317	7563.702	5240.385	45814.59
I_fund_Q_SYM+_rc@AC [A]	0.183323	8.747230	8.563907	5.766805
I_fund_Q_SYM-_rc@AC [A]	-0.635670	-0.377139	0.258531	5.521069
I_fund_P_SYM+_rc@AC [A]	182.0913	1.078673	-181.0126	108.4043
I_fund_P_SYM-_rc@AC [A]	-0.380640	-0.148008	0.232631	13.65871
U_fund_SYM+_rc@AC [V]	398.5467	470.2116	71.66489	439.7270
U_fund_SYM-_rc@AC [V]	1.697398	0.839401	-0.857997	6.483106
U+ [V]	230.0401	247.7314	17.69127	236.0959
U- [V]	0.606851	4.225030	3.618179	2.493985

0-60ms



	A	B	间隔	有效值
时间 [s]	1:13.7188	1:13.7788	0.0600	
U1_tRMS_rc@AC [V]	230.3481	276.5034	46.15532	264.3956
U2_tRMS_rc@AC [V]	230.4549	277.4701	47.01523	263.2923
U3_tRMS_rc@AC [V]	229.5203	275.2294	45.70906	264.3678
I1_tRMS_rc@AC [A]	181.2001	5.390797	-175.8094	87.91829
I2_tRMS_rc@AC [A]	181.7516	6.412263	-175.3394	90.26511
I3_tRMS_rc@AC [A]	183.3969	6.542576	-176.8544	83.84157
P_t_rc@AC [W]	125696.5	1116.736	-124579.8	53742.20
Q_t_rc@AC [var]	2323.317	4945.990	2622.672	32940.93
I_fund_Q_SYM+_rc@AC [A]	0.183323	5.311996	5.128673	6.335352
I_fund_Q_SYM-_rc@AC [A]	-0.635670	-0.161748	0.473923	3.940123
I_fund_P_SYM+_rc@AC [A]	182.0913	1.342588	-180.7487	77.28489
I_fund_P_SYM-_rc@AC [A]	-0.380640	0.506189	0.886829	9.741259
U_fund_SYM+_rc@AC [V]	398.5467	478.7360	80.18930	456.9749
U_fund_SYM-_rc@AC [V]	1.697398	1.633453	-0.063945	4.750056
U+ [V]	230.0401	271.5619	41.52173	245.4433
U- [V]	0.606851	0.557738	-0.049113	2.177783

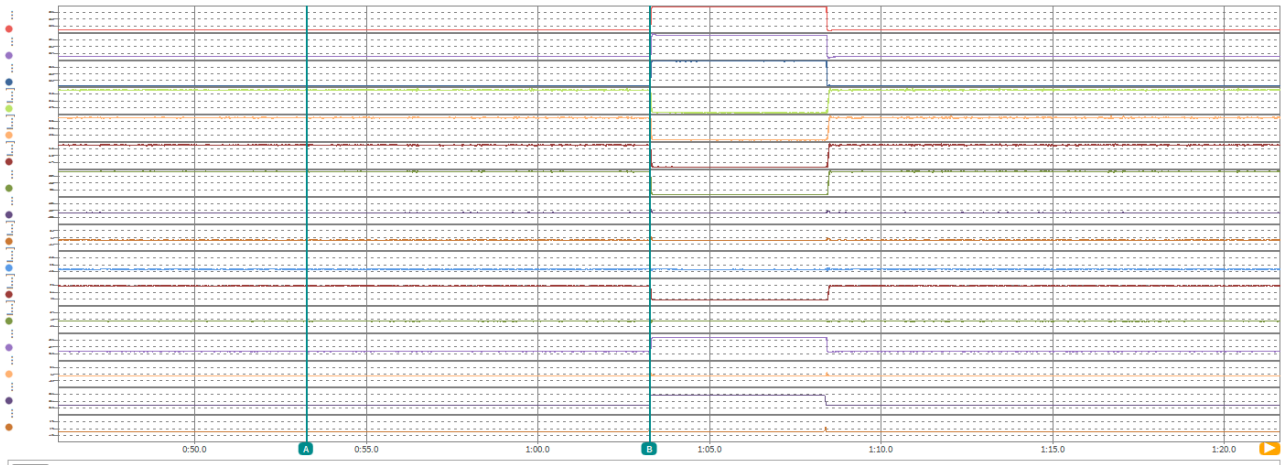
Recover time – Active power



	A	B	间隔	有效值
时间 [s]	1:18.8408	1:18.9668	0.1260	
U1_tRMS_rc@AC [V]	276.2571	231.6141	-44.64296	235.2878
U2_tRMS_rc@AC [V]	275.8422	230.3320	-45.51021	234.5643
U3_tRMS_rc@AC [V]	275.6714	231.2477	-44.42371	234.6447
I1_tRMS_rc@AC [A]	2.171229	179.9676	177.7963	90.95290
I2_tRMS_rc@AC [A]	2.437315	181.0894	178.6520	91.96901
I3_tRMS_rc@AC [A]	3.437706	182.0929	178.6552	92.85735
P_t_rc@AC [W]	587.6532	125330.6	124742.9	62861.79
Q_t_rc@AC [var]	-2140.611	6562.862	8703.473	10369.74
I_fund_Q_SYM+_rc@AC [A]	-1.010017	2.375307	3.385324	8.148034
I_fund_Q_SYM-_rc@AC [A]	0.033162	0.573114	0.539952	2.140104
I_fund_P_SYM+_rc@AC [A]	0.708901	180.7873	180.0784	90.65348
I_fund_P_SYM-_rc@AC [A]	-0.018047	-0.037923	-0.019876	2.119397
U_fund_SYM+_rc@AC [V]	477.9095	400.2039	-77.70557	406.5278
U_fund_SYM-_rc@AC [V]	1.242364	0.924761	-0.317603	3.979852
U+ [V]	275.9207	231.1931	-44.72753	241.1597
U- [V]	0.598733	0.638696	0.039963	1.961382

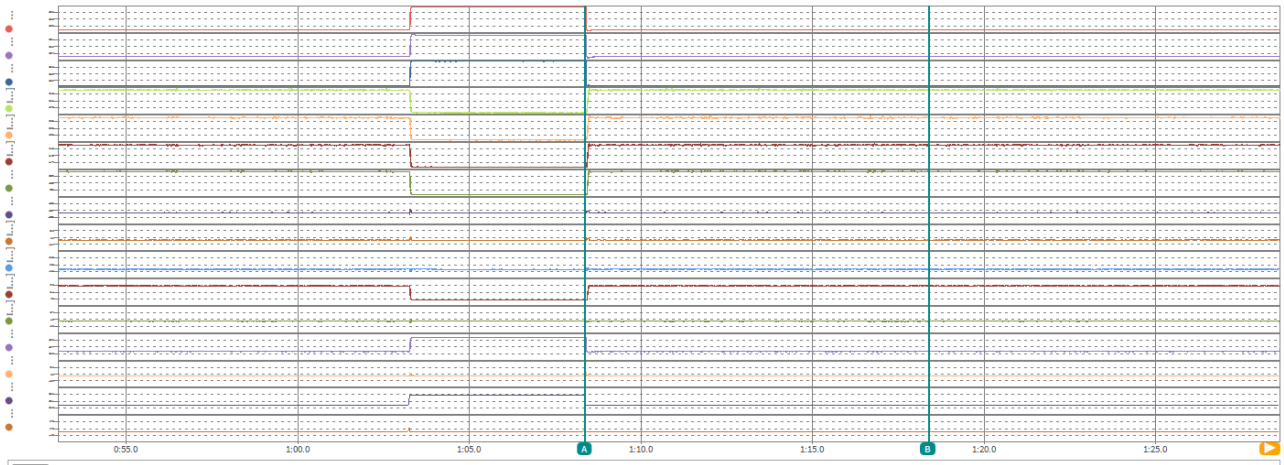
Test – VS2.1.2

Before fault



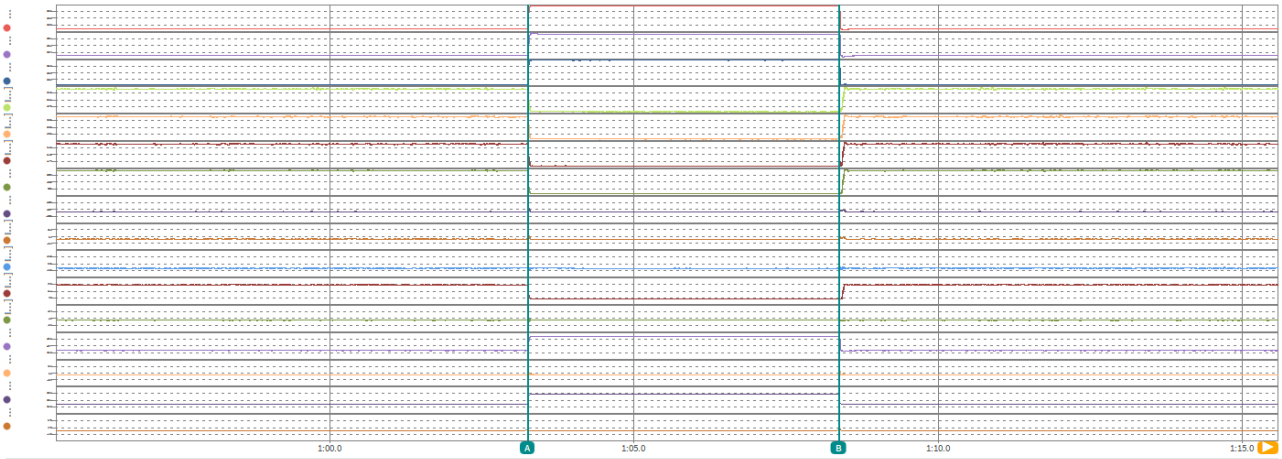
	A	B	间隔	有效值
时间 [s]	0:53.2558	1:03.2558	0:10.0000	
U1_tRMS_rc@AC [V]	230.3107	230.2832	-0.027420	230.2631
U2_tRMS_rc@AC [V]	229.8480	229.7443	-0.103699	229.7685
U3_tRMS_rc@AC [V]	229.6869	229.6468	-0.040100	229.6152
I1_tRMS_rc@AC [A]	37.53939	36.41600	-1.123398	36.64874
I2_tRMS_rc@AC [A]	37.48211	36.06231	-1.419800	36.85089
I3_tRMS_rc@AC [A]	38.24125	37.83649	-0.404755	37.34797
P_t_rc@AC [W]	25963.02	25298.90	-664.1191	25423.77
Q_t_rc@AC [var]	-2057.563	-1761.207	296.3561	1701.690
I_fund_Q_SYM+_rc@AC [A]	-1.275795	-0.798928	0.476866	0.714306
I_fund_Q_SYM-_rc@AC [A]	0.280045	0.232953	-0.047092	0.247578
I_fund_P_SYM+_rc@AC [A]	37.64064	36.68365	-0.956993	36.86549
I_fund_P_SYM-_rc@AC [A]	-0.150519	-0.362422	-0.211902	0.289072
U_fund_SYM+_rc@AC [V]	398.2780	398.1785	-0.099487	398.1648
U_fund_SYM-_rc@AC [V]	0.966126	0.687284	-0.278842	0.990892
U+ [V]	229.8952	229.8786	-0.016646	229.8873
U- [V]	0.573744	0.609068	0.035324	0.571978

After fault



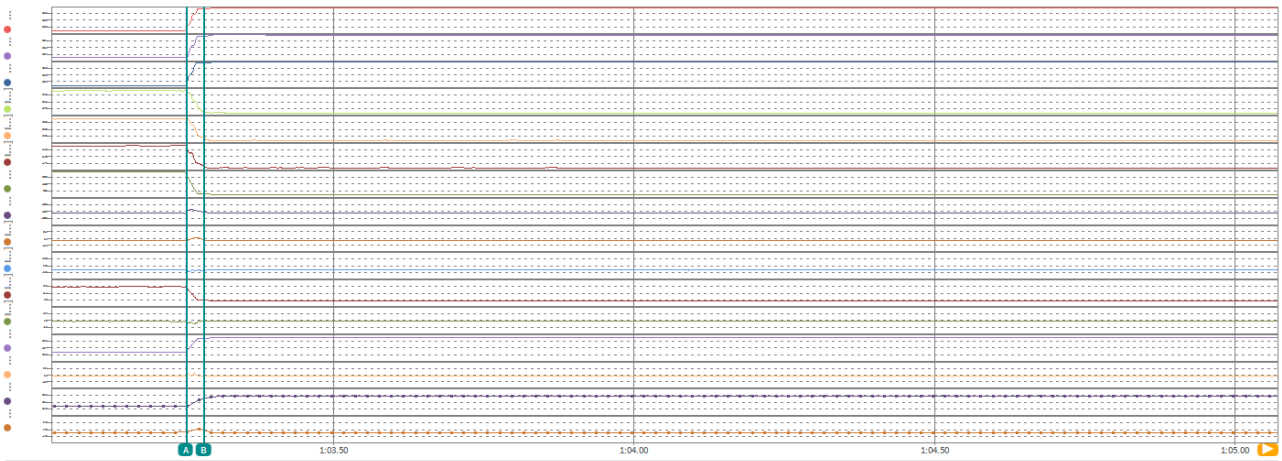
	A	B	间隔	有效值
时间 [s]	1:08.3768	1:18.3768	0:10.0000	
U1_tRMS_rc@AC [V]	274.3421	230.2837	-44.05838	230.3114
U2_tRMS_rc@AC [V]	275.5663	229.7607	-45.80563	229.8035
U3_tRMS_rc@AC [V]	274.9514	229.6118	-45.33960	229.6580
I1_tRMS_rc@AC [A]	3.917478	36.77800	32.86052	36.58550
I2_tRMS_rc@AC [A]	2.203161	36.91795	34.71479	36.74031
I3_tRMS_rc@AC [A]	3.906364	37.31156	33.40520	37.35131
P_t_rc@AC [W]	354.6744	25461.66	25106.98	25370.85
Q_t_rc@AC [var]	-2732.988	-1707.437	1025.552	1879.686
I_fund_Q_SYM+_rc@AC [A]	-1.045013	-1.067590	-0.022576	0.844180
I_fund_Q_SYM-_rc@AC [A]	0.445504	0.028726	-0.416777	0.323305
I_fund_P_SYM+_rc@AC [A]	0.478102	36.92080	36.44270	36.78927
I_fund_P_SYM-_rc@AC [A]	-0.060939	-0.145439	-0.084500	0.331188
U_fund_SYM+_rc@AC [V]	476.0874	398.1706	-77.91684	398.2349
U_fund_SYM-_rc@AC [V]	0.966602	1.001202	0.034600	1.090418
U+ [V]	275.9296	229.8974	-46.03223	230.1090
U- [V]	0.579850	0.583814	3.964e-3	0.612486

Duration fault time



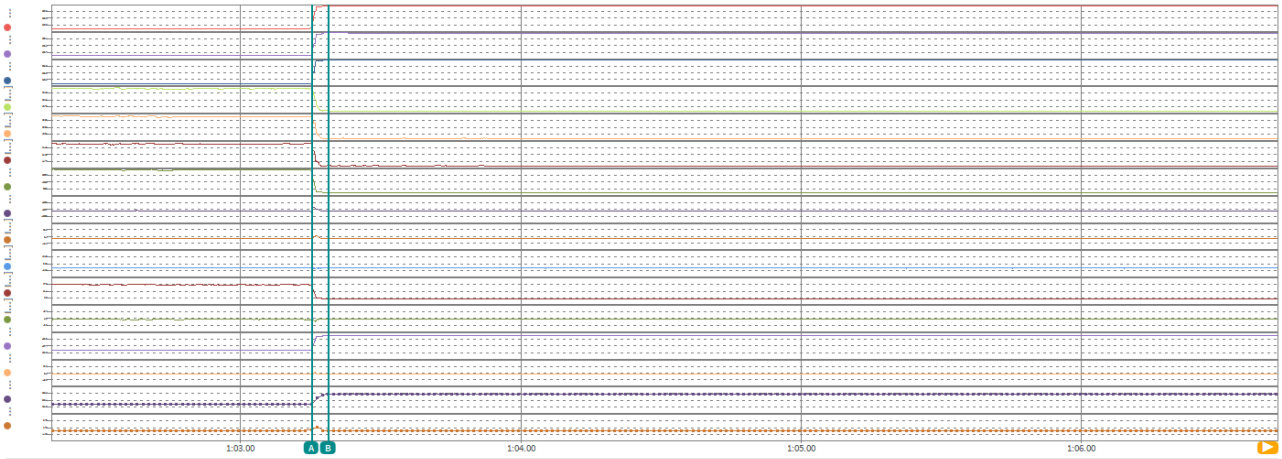
	A	B	间隔	有效值
时间 [s]	1:03.2558	1:08.3708	5.1150	
U1_tRMS_rc@AC [V]	230.2832	276.2997	46.01648	276.2007
U2_tRMS_rc@AC [V]	229.7443	275.8640	46.11974	275.7413
U3_tRMS_rc@AC [V]	229.6468	275.6710	46.02417	275.5856
I1_tRMS_rc@AC [A]	36.41600	2.423841	-33.99216	3.046426
I2_tRMS_rc@AC [A]	36.06231	2.228830	-33.83348	3.042671
I3_tRMS_rc@AC [A]	37.83649	3.019624	-34.81687	3.872037
P_t_rc@AC [W]	25298.90	152.7960	-25146.11	1004.076
Q_t_rc@AC [var]	-1761.207	-2111.462	-350.2555	2453.534
I_fund_Q_SYM+_rc@AC [A]	-0.798928	-1.002299	-0.203371	1.248139
I_fund_Q_SYM-_rc@AC [A]	0.232953	-0.287160	-0.520113	0.189421
I_fund_P_SYM+_rc@AC [A]	36.68365	0.181800	-36.50185	1.439678
I_fund_P_SYM-_rc@AC [A]	-0.362422	0.141551	0.503973	0.257112
U_fund_SYM+_rc@AC [V]	398.1785	477.9471	79.76865	477.7654
U_fund_SYM-_rc@AC [V]	0.687284	1.256707	0.569423	1.140317
U+ [V]	229.8786	275.9296	46.05104	275.5579
U- [V]	0.609068	0.579850	-0.029218	0.633018

0-30ms



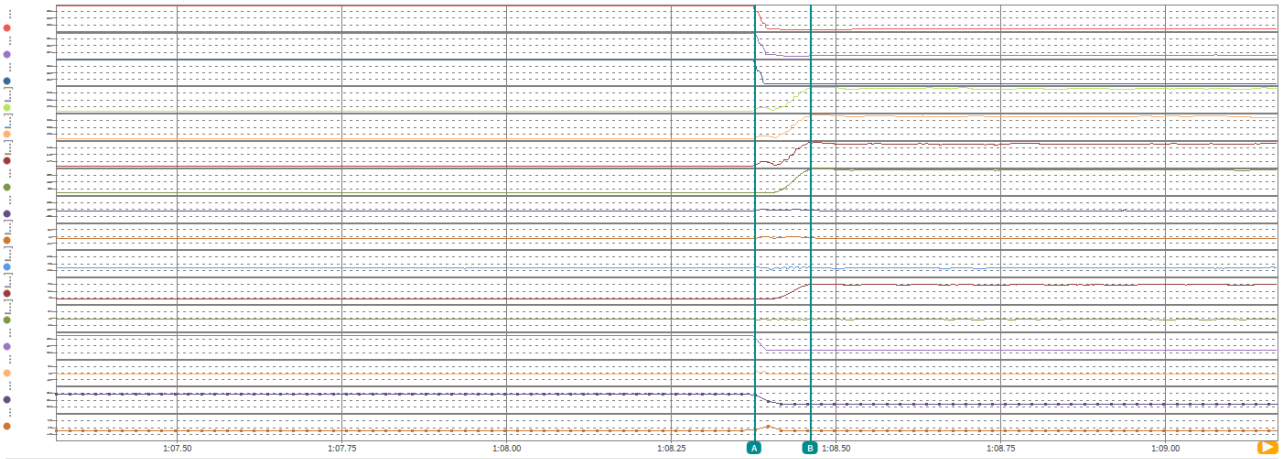
	A	B	间隔	有效值
时间 [s]	1:03.2558	1:03.2858	0.0300	
U1_tRMS_rc@AC [V]	230.2832	274.5718	44.28854	260.0349
U2_tRMS_rc@AC [V]	229.7443	274.1407	44.39644	257.6112
U3_tRMS_rc@AC [V]	229.6468	273.9062	44.25940	260.7921
I1_tRMS_rc@AC [A]	36.41600	5.050056	-31.36594	23.04984
I2_tRMS_rc@AC [A]	36.06231	7.150693	-28.91162	23.97911
I3_tRMS_rc@AC [A]	37.83649	6.545088	-31.29141	21.93597
P_t_rc@AC [W]	25298.90	1740.982	-23557.92	12587.62
Q_t_rc@AC [var]	-1761.207	4835.791	6596.998	11361.81
I_fund_Q_SYM+_rc@AC [A]	-0.798928	3.296733	4.095662	5.576115
I_fund_Q_SYM-_rc@AC [A]	0.232953	-0.589141	-0.822094	1.187343
I_fund_P_SYM+_rc@AC [A]	36.68365	2.109243	-34.57440	18.18318
I_fund_P_SYM-_rc@AC [A]	-0.362422	1.421886	1.784308	2.704481
U_fund_SYM+_rc@AC [V]	398.1785	474.9350	76.75650	448.7378
U_fund_SYM-_rc@AC [V]	0.687284	1.167276	0.479991	6.497965
U+ [V]	229.8786	260.2138	30.33524	240.7183
U- [V]	0.609068	3.478156	2.869088	2.169352

0-60ms



	A	B	间隔	有效值
时间 [s]	1:03.2558	1:03.3158	0.0600	
U1_tRMS_rc@AC [V]	230.2832	277.4302	47.14700	268.0380
U2_tRMS_rc@AC [V]	229.7443	278.4593	48.71501	267.0678
U3_tRMS_rc@AC [V]	229.6468	275.9439	46.29706	267.8288
I1_tRMS_rc@AC [A]	36.41600	3.294995	-33.12100	16.60702
I2_tRMS_rc@AC [A]	36.06231	2.961617	-33.10070	17.25836
I3_tRMS_rc@AC [A]	37.83649	4.097178	-33.73932	15.89185
P_t_rc@AC [W]	25298.90	230.7997	-25068.10	8995.797
Q_t_rc@AC [var]	-1761.207	-2860.115	-1098.908	8341.258
I_fund_Q_SYM+_rc@AC [A]	-0.798928	-1.875186	-1.076258	4.116846
I_fund_Q_SYM-_rc@AC [A]	0.232953	0.121647	-0.111306	0.865550
I_fund_P_SYM+_rc@AC [A]	36.68365	0.275341	-36.40831	12.98513
I_fund_P_SYM-_rc@AC [A]	-0.362422	-0.135463	0.226959	1.943808
U_fund_SYM+_rc@AC [V]	398.1785	480.2554	82.07693	463.2257
U_fund_SYM-_rc@AC [V]	0.687284	1.781220	1.093936	4.779333
U+ [V]	229.8786	274.5940	44.71540	249.6186
U- [V]	0.609068	0.744860	0.135792	1.915273

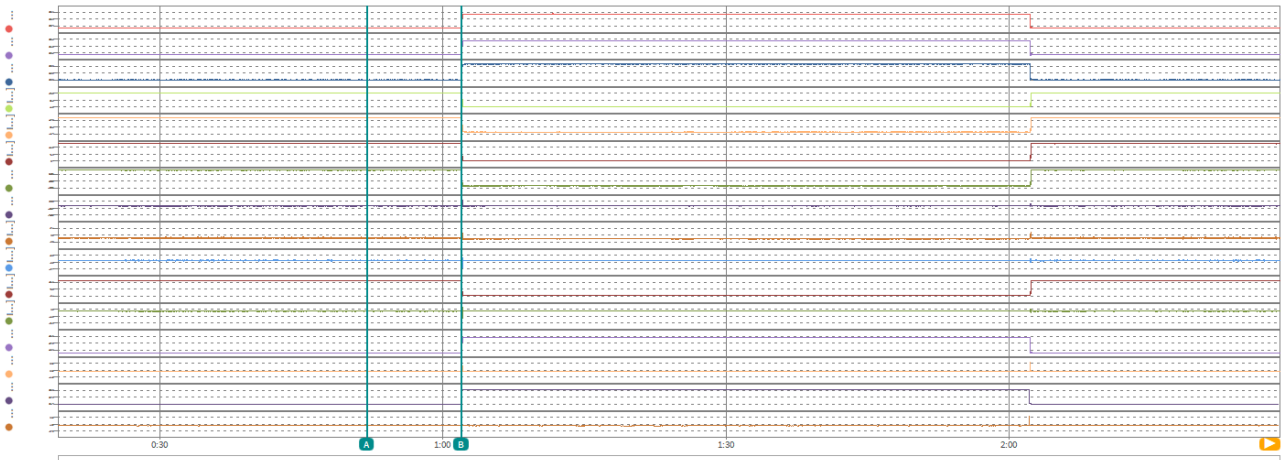
Recover time – Active power



	A	B	间隔	有效值
时间 [s]	1:08.3768	1:08.4618	0.0850	
U1_tRMS_rc@AC [V]	274.3421	229.6956	-44.64648	235.5195
U2_tRMS_rc@AC [V]	275.5663	228.0636	-47.50266	235.2418
U3_tRMS_rc@AC [V]	274.9514	230.2579	-44.69354	234.7642
I1_tRMS_rc@AC [A]	3.917478	36.68484	32.76736	18.45733
I2_tRMS_rc@AC [A]	2.203161	37.24900	35.04584	18.96493
I3_tRMS_rc@AC [A]	3.906364	39.11624	35.20987	19.92312
P_t_rc@AC [W]	354.6744	25589.49	25234.81	12203.41
Q_t_rc@AC [var]	-2732.988	4177.964	6910.952	4889.196
I_fund_Q_SYM+_rc@AC [A]	-1.045013	2.470546	3.515560	3.678946
I_fund_Q_SYM-_rc@AC [A]	0.445504	0.972753	0.527249	0.987718
I_fund_P_SYM+_rc@AC [A]	0.478102	37.18239	36.70429	17.76144
I_fund_P_SYM-_rc@AC [A]	-0.060939	-0.220955	-0.160016	0.772698
U_fund_SYM+_rc@AC [V]	476.0874	397.2219	-78.86551	407.0309
U_fund_SYM-_rc@AC [V]	0.966602	1.237699	0.271097	4.728790
U+ [V]	275.9296	228.9737	-46.95588	248.0339
U- [V]	0.579850	0.779074	0.199224	1.918775

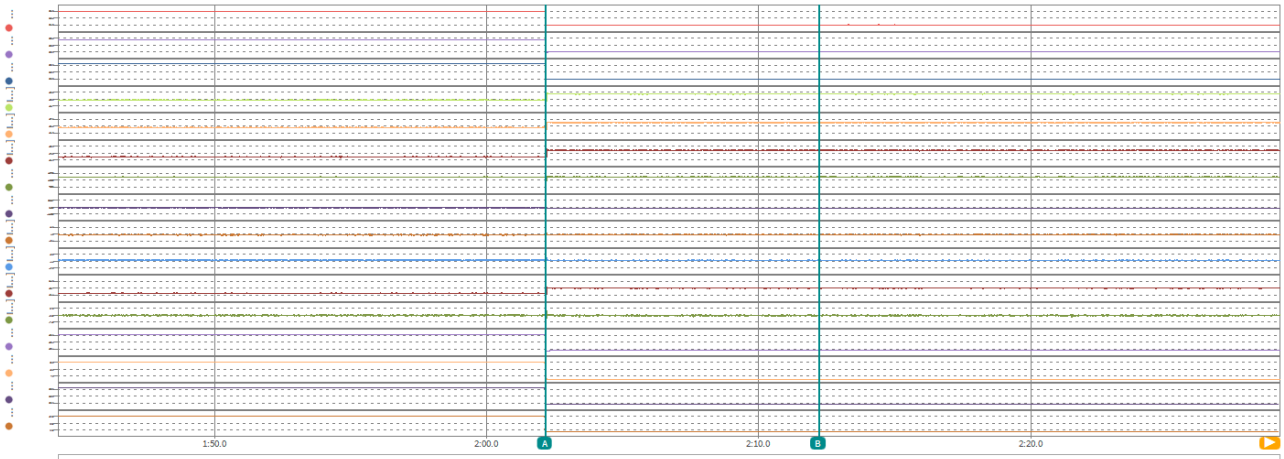
Test – VS2.2.1

Before fault



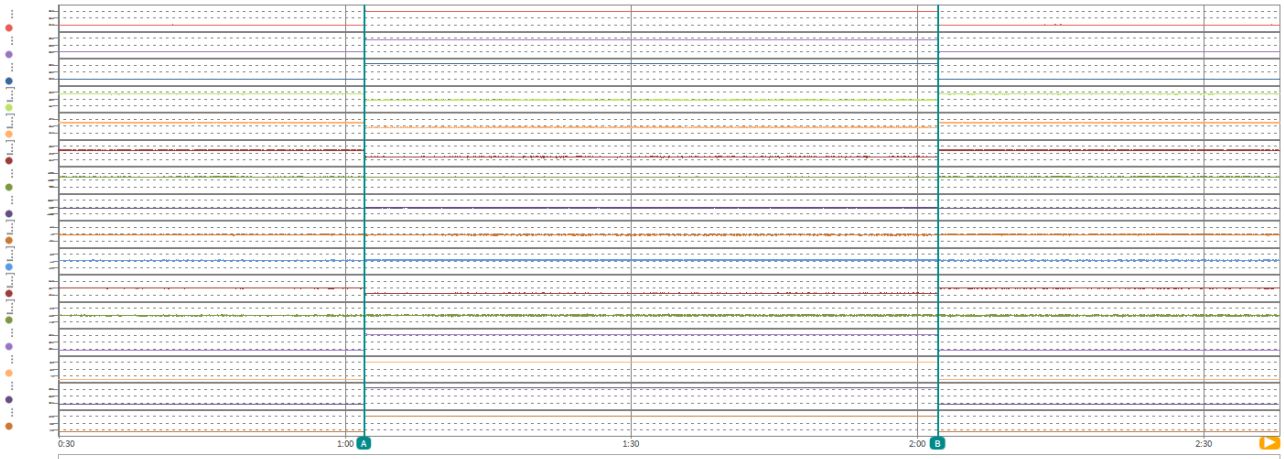
时间 [s]	A 0:51.9942	B 1:01.9988	间隔 0:10.0046	有效值
U1_tRMS_rc@AC [V]	230.4840	230.8650	0.380966	230.5101
U2_tRMS_rc@AC [V]	229.8667	230.0432	0.176453	229.8482
U3_tRMS_rc@AC [V]	229.7885	229.3211	-0.467392	229.8248
I1_tRMS_rc@AC [A]	180.4835	181.1430	0.659531	180.2714
I2_tRMS_rc@AC [A]	180.9359	181.9858	1.049866	181.4655
I3_tRMS_rc@AC [A]	184.2522	184.1007	-0.151535	183.9598
P_t_rc@AC [W]	125502.3	125883.9	381.6016	125519.9
Q_t_rc@AC [var]	2574.608	2152.628	-421.9802	2354.217
I_fund_Q_SYM+_rc@AC [A]	1.093695	0.453362	-0.640333	0.596449
I_fund_Q_SYM-_rc@AC [A]	0.736367	0.121429	-0.614939	0.557349
I_fund_P_SYM+_rc@AC [A]	181.8532	182.3840	0.530762	181.8667
I_fund_P_SYM-_rc@AC [A]	-1.081214	-0.410949	0.670265	0.903305
U_fund_SYM+_rc@AC [V]	398.4464	398.4929	0.046570	398.4713
U_fund_SYM-_rc@AC [V]	0.989958	2.340888	1.350930	1.045025
U+ [V]	230.0384	230.0948	0.056453	230.0642
U- [V]	0.611943	0.617081	5.138e-3	0.603047

After fault



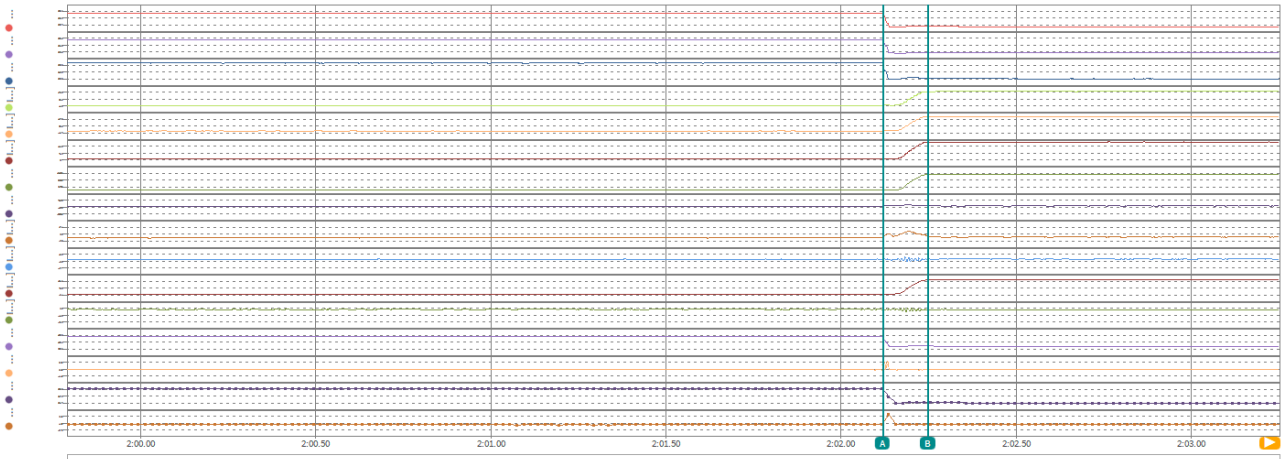
时间 [s]	A 2:02.1668	B 2:12.2113	间隔 0:10.0445	有效值
U1_tRMS_rc@AC [V]	265.0911	230.6365	-34.45467	230.6576
U2_tRMS_rc@AC [V]	264.6359	229.9915	-34.64441	230.0344
U3_tRMS_rc@AC [V]	264.5383	229.8138	-34.72450	229.9073
I1_tRMS_rc@AC [A]	155.3683	180.3240	24.95561	179.3759
I2_tRMS_rc@AC [A]	157.3544	180.4496	23.09526	180.9349
I3_tRMS_rc@AC [A]	159.9047	183.9233	24.01868	183.0967
P_t_rc@AC [W]	124650.5	125329.3	678.7734	125056.2
Q_t_rc@AC [var]	10935.70	2741.703	-8193.998	2718.633
I_fund_Q_SYM+_rc@AC [A]	0.179410	0.824256	0.644846	0.640567
I_fund_Q_SYM-_rc@AC [A]	0.666472	0.772823	0.106351	0.606702
I_fund_P_SYM+_rc@AC [A]	157.5082	181.5250	24.01675	181.0963
I_fund_P_SYM-_rc@AC [A]	-1.019917	-0.866386	0.153531	0.964890
U_fund_SYM+_rc@AC [V]	456.8380	398.6202	-58.21783	398.7074
U_fund_SYM-_rc@AC [V]	28.83652	1.113109	-27.72341	1.450805
U+ [V]	263.7795	230.1694	-33.61017	230.2935
U- [V]	16.79610	0.620836	-16.17526	1.184685

Duration fault time



时间 [s]	A 1:02.0491	B 2:02.1625	间隔 1:00.1133	有效值
U1_tRMS_rc@AC [V]	230.6322	265.0864	34.45422	265.0932
U2_tRMS_rc@AC [V]	230.0753	264.6494	34.57408	264.6429
U3_tRMS_rc@AC [V]	229.8385	264.5475	34.70898	264.4860
I1_tRMS_rc@AC [A]	181.0289	155.5999	-25.42894	155.5183
I2_tRMS_rc@AC [A]	181.5324	156.6565	-24.87596	156.5464
I3_tRMS_rc@AC [A]	183.3666	159.4516	-23.91505	159.6279
P_t_rc@AC [W]	125637.0	124431.2	-1205.766	124398.3
Q_t_rc@AC [var]	2504.975	10683.52	8178.543	10887.43
I_fund_Q_SYM+_rc@AC [A]	0.731132	0.413627	-0.317505	0.477632
I_fund_Q_SYM-_rc@AC [A]	0.411452	0.759884	0.348432	0.935227
I_fund_P_SYM+_rc@AC [A]	181.9427	157.2003	-24.74243	157.1952
I_fund_P_SYM-_rc@AC [A]	-0.422490	-0.457701	-0.035211	0.762024
U_fund_SYM+_rc@AC [V]	398.6786	456.8620	58.18344	456.8331
U_fund_SYM-_rc@AC [V]	0.810841	29.01264	28.20180	29.08668
U+ [V]	230.1652	263.7795	33.61430	263.7458
U- [V]	0.625870	16.79610	16.17023	16.78967

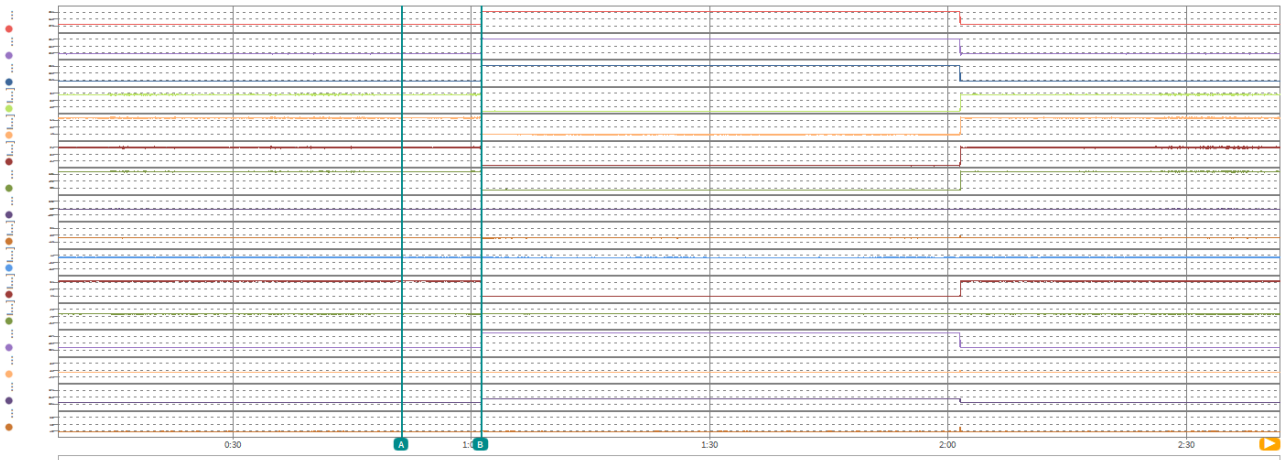
Recover time – Active power



时间 [s]	A 2:02.1193	B 2:02.2488	间隔 0.1296	有效值
U1_tRMS_rc@AC [V]	264.7928	231.9268	-32.86601	234.2447
U2_tRMS_rc@AC [V]	264.1946	230.7355	-33.45909	233.5311
U3_tRMS_rc@AC [V]	264.2148	231.3827	-32.83206	233.5403
I1_tRMS_rc@AC [A]	2.186995	178.2711	176.0842	94.96771
I2_tRMS_rc@AC [A]	2.569581	181.0252	178.4556	96.28673
I3_tRMS_rc@AC [A]	3.459345	181.9144	178.4551	96.87042
P_t_rc@AC [W]	578.6095	125059.9	124481.3	66026.67
Q_t_rc@AC [var]	-2093.492	6059.622	8153.114	9520.264
I_fund_Q_SYM+_rc@AC [A]	-1.104724	1.924206	3.028930	5.862154
I_fund_Q_SYM-_rc@AC [A]	0.129063	0.157171	0.028108	2.122672
I_fund_P_SYM+_rc@AC [A]	0.726419	180.1747	179.4483	95.01389
I_fund_P_SYM-_rc@AC [A]	-0.196658	-1.026141	-0.829483	2.074098
U_fund_SYM+_rc@AC [V]	457.9514	400.6956	-57.25574	404.7839
U_fund_SYM-_rc@AC [V]	1.177594	1.091865	-0.085729	3.059308
U+ [V]	264.3952	231.6223	-32.77287	241.4523
U- [V]	0.602220	0.618645	0.016425	1.489004

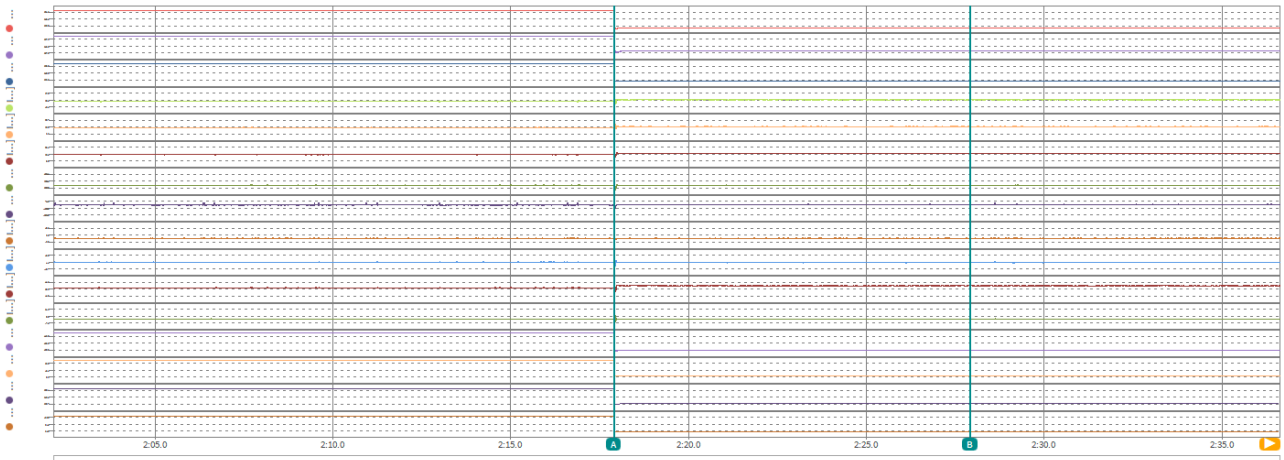
Test – VS2.2.2

Before fault



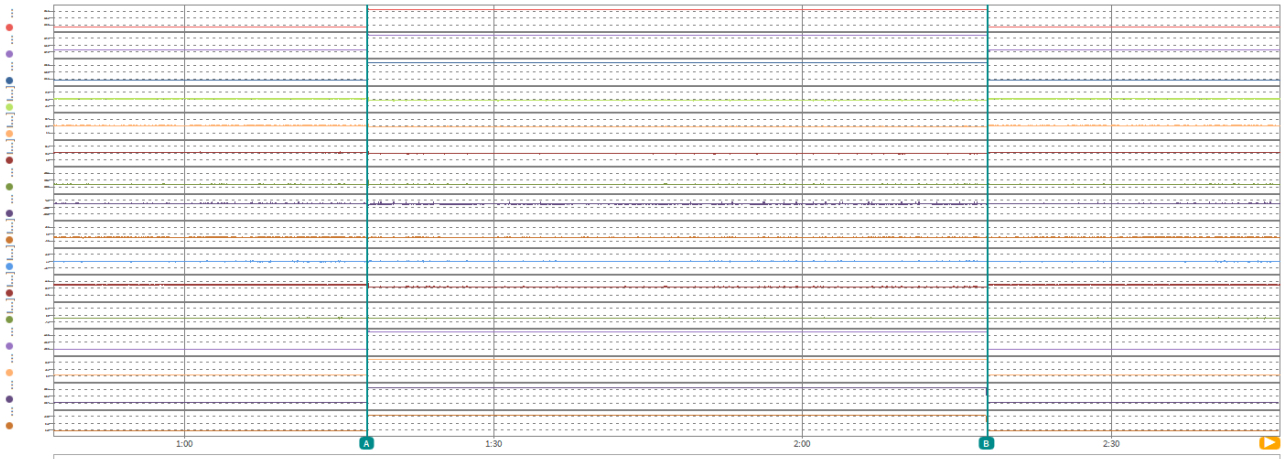
时间 [s]	A 0:51.2854	B 1:01.2876	间隔 0:10.0022	有效值
U1_tRMS_rc@AC [V]	230.1963	230.2418	0.045502	230.2538
U2_tRMS_rc@AC [V]	229.7413	229.7479	6.607e-3	229.7561
U3_tRMS_rc@AC [V]	229.6502	229.5422	-0.108047	229.6095
I1_tRMS_rc@AC [A]	36.77751	36.39967	-0.377842	36.67263
I2_tRMS_rc@AC [A]	37.03434	36.76609	-0.268250	36.88402
I3_tRMS_rc@AC [A]	37.70645	37.61998	-0.086472	37.38387
P_t_rc@AC [W]	25586.45	25413.30	-173.1563	25445.98
Q_t_rc@AC [var]	-1554.975	-1590.677	-35.70239	1676.509
I_fund_Q_SYM+_rc@AC [A]	-0.502215	-0.659031	-0.156815	0.635688
I_fund_Q_SYM-_rc@AC [A]	0.051539	0.245317	0.193778	0.226094
I_fund_P_SYM+_rc@AC [A]	37.10452	36.85722	-0.247299	36.89864
I_fund_P_SYM-_rc@AC [A]	-0.224411	-0.284818	-0.060407	0.221368
U_fund_SYM+_rc@AC [V]	398.1306	398.0965	-0.034149	398.1490
U_fund_SYM-_rc@AC [V]	0.952230	0.787043	-0.165187	0.998754
U+ [V]	229.8556	229.8694	0.013862	229.8782
U- [V]	0.591736	0.588524	-3.212e-3	0.576583

After fault



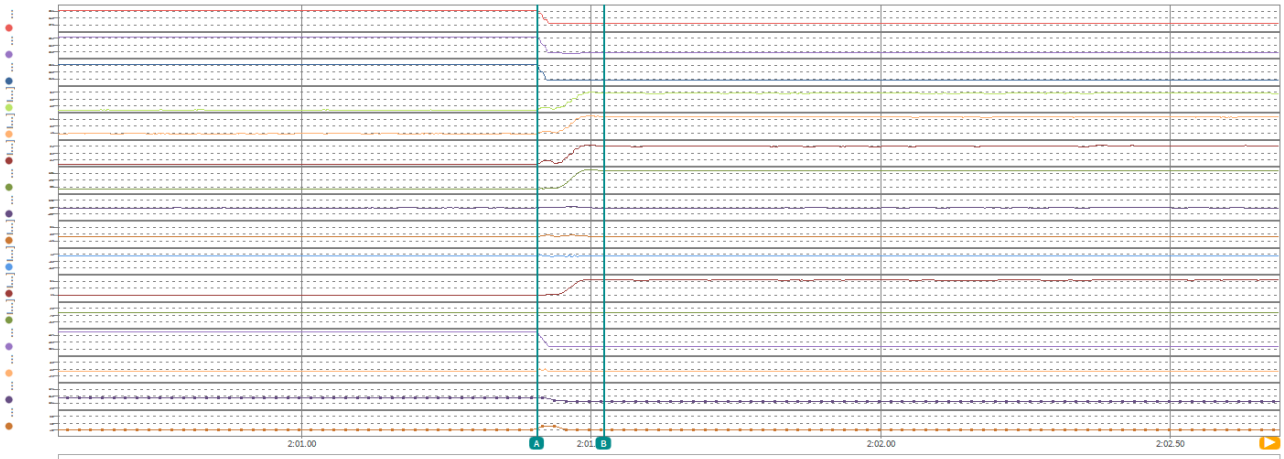
时间 [s]	A 2:17.9112	B 2:27.9244	间隔 0:10.0132	有效值
U1_tRMS_rc@AC [V]	264.7429	230.3195	-34.42332	230.3086
U2_tRMS_rc@AC [V]	264.4232	229.8020	-34.62117	229.8473
U3_tRMS_rc@AC [V]	264.2433	229.5822	-34.66115	229.6460
I1_tRMS_rc@AC [A]	31.25916	37.30737	6.048216	36.62747
I2_tRMS_rc@AC [A]	30.84738	37.17971	6.332331	36.75315
I3_tRMS_rc@AC [A]	33.72191	37.68045	3.958542	37.28775
P_t_rc@AC [W]	25181.85	25742.05	560.2012	25376.00
Q_t_rc@AC [var]	-2855.081	-1527.740	1327.341	1889.446
I_fund_Q_SYM+_rc@AC [A]	-0.229251	-0.722668	-0.493417	0.765197
I_fund_Q_SYM-_rc@AC [A]	1.025197	0.147054	-0.878143	0.368891
I_fund_P_SYM+_rc@AC [A]	31.85897	37.32292	5.463947	36.78877
I_fund_P_SYM-_rc@AC [A]	-0.329629	-0.076040	0.253589	0.429586
U_fund_SYM+_rc@AC [V]	456.3336	398.1977	-58.13586	398.2494
U_fund_SYM-_rc@AC [V]	29.14258	0.968585	-28.17399	1.519181
U+ [V]	263.4780	229.8793	-33.59869	230.0433
U- [V]	16.87108	0.545993	-16.32509	1.257787

Duration fault time



时间 [s]	A 1:17.7996	B 2:17.9162	间隔 1:00.1166	有效值
U1_tRMS_rc@AC [V]	230.2096	264.7478	34.53816	264.7458
U2_tRMS_rc@AC [V]	229.9030	264.4404	34.53741	264.4639
U3_tRMS_rc@AC [V]	229.5364	264.2252	34.68875	264.1924
I1_tRMS_rc@AC [A]	36.56203	31.33290	-5.229126	31.75934
I2_tRMS_rc@AC [A]	37.17753	31.16450	-6.013035	31.39987
I3_tRMS_rc@AC [A]	37.17411	33.36887	-3.805241	32.88155
P_t_rc@AC [W]	25451.66	25179.32	-272.3457	25229.92
Q_t_rc@AC [var]	-1519.330	-2965.656	-1446.326	2915.684
I_fund_Q_SYM+_rc@AC [A]	-0.685263	-0.427873	0.257390	0.875515
I_fund_Q_SYM-_rc@AC [A]	0.127208	0.887937	0.760729	0.475107
I_fund_P_SYM+_rc@AC [A]	36.90463	31.86090	-5.043724	31.91875
I_fund_P_SYM-_rc@AC [A]	-0.201380	-0.342002	-0.140622	0.283690
U_fund_SYM+_rc@AC [V]	398.1647	456.3344	58.16971	456.3378
U_fund_SYM-_rc@AC [V]	0.814796	29.09119	28.27640	29.21708
U+ [V]	229.8908	263.4780	33.58719	263.4546
U- [V]	0.574462	16.87108	16.29662	16.86348

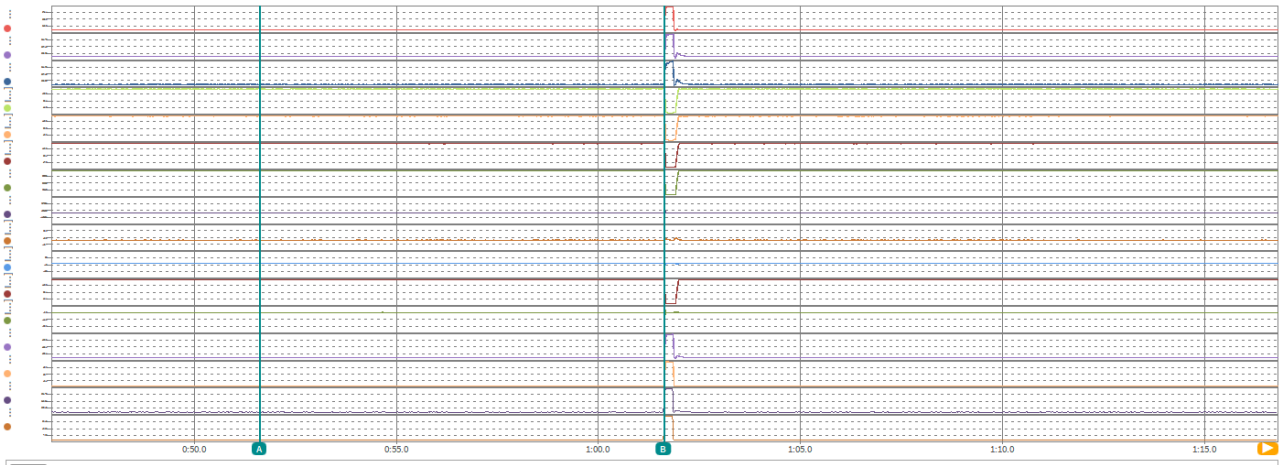
Recover time – Active power



时间 [s]	A 2:01.4076	B 2:01.5227	间隔 0.1151	有效值
U1_tRMS_rc@AC [V]	264.7481	230.0763	-34.67183	233.8008
U2_tRMS_rc@AC [V]	264.2598	228.9628	-35.29697	233.2081
U3_tRMS_rc@AC [V]	264.1521	229.9100	-34.24210	233.1787
I1_tRMS_rc@AC [A]	1.858379	37.15906	35.30068	25.08388
I2_tRMS_rc@AC [A]	1.871636	37.50438	35.63275	25.51214
I3_tRMS_rc@AC [A]	2.990130	37.36744	34.37731	26.04844
P_t_rc@AC [W]	398.7970	25561.73	25162.93	16971.83
Q_t_rc@AC [var]	-1731.108	-2917.434	-1186.326	4673.913
I_fund_Q_SYM+_rc@AC [A]	-0.881777	-1.310853	-0.429076	3.456180
I_fund_Q_SYM-_rc@AC [A]	8.038e-3	0.043420	0.035382	0.807786
I_fund_P_SYM+_rc@AC [A]	0.501405	37.10026	36.59886	24.62470
I_fund_P_SYM-_rc@AC [A]	-0.058928	-0.274964	-0.216037	0.757354
U_fund_SYM+_rc@AC [V]	457.9276	397.7621	-60.16550	404.1213
U_fund_SYM-_rc@AC [V]	1.163698	0.949069	-0.214629	3.224680
U+ [V]	264.4064	229.7967	-34.60968	239.6906
U- [V]	0.587195	0.575113	-0.012081	1.303538

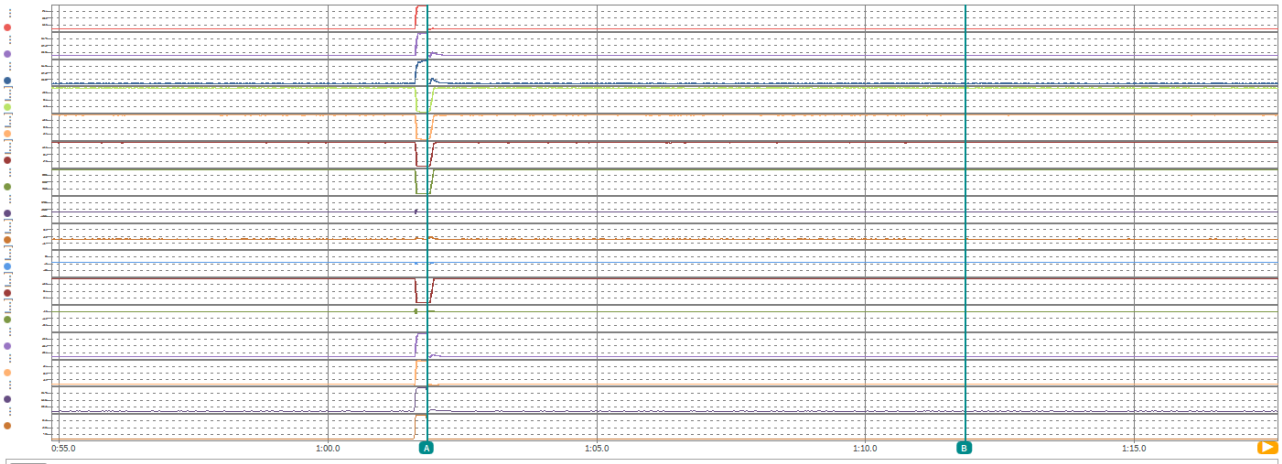
Test – VS3.1

Before fault



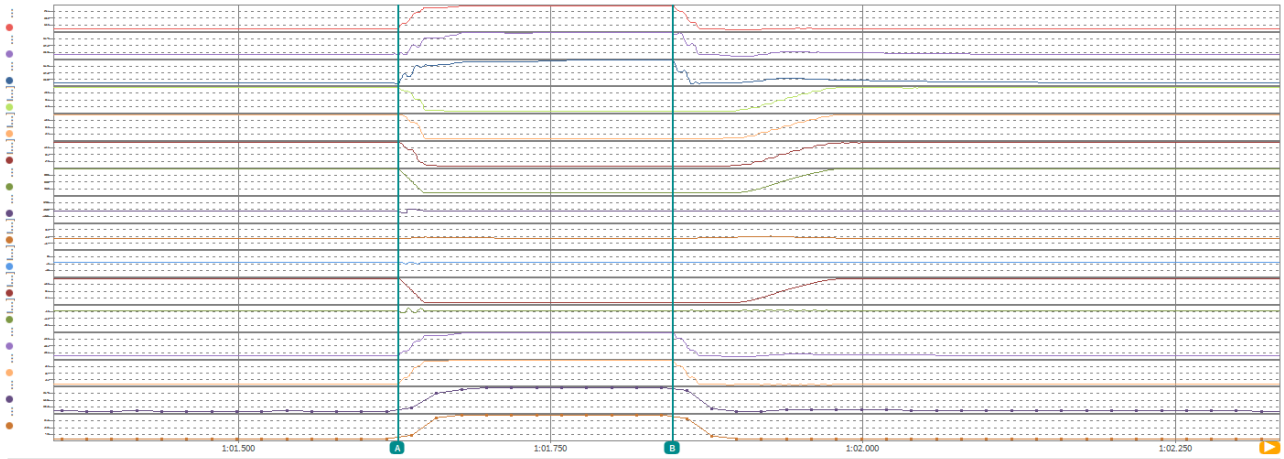
	A	B	间隔	有效值
时间 [s]	0:51.6276000	1:01.6276000	0:10.0000000	
U1_tRMS_rc@AC [V]	230.5064	230.7385	0.232101	230.5011
U2_tRMS_rc@AC [V]	229.8634	230.1937	0.330307	229.8534
U3_tRMS_rc@AC [V]	229.8772	229.2273	-0.649826	229.8123
I1_tRMS_rc@AC [A]	180.1798	178.9458	-1.233978	179.8301
I2_tRMS_rc@AC [A]	180.2759	180.6190	0.343109	181.1145
I3_tRMS_rc@AC [A]	182.6698	181.4894	-1.180374	183.4766
P_t_rc@AC [W]	124942.7	124440.2	-502.4922	125221.8
Q_t_rc@AC [var]	2253.407	2694.242	440.8352	2441.934
I_fund_Q_SYM+_rc@AC [A]	0.348712	0.849236	0.500523	0.598950
I_fund_Q_SYM-_rc@AC [A]	0.588257	-0.265799	-0.854056	0.508092
I_fund_P_SYM+_rc@AC [A]	181.0132	180.3008	-0.712326	181.4393
I_fund_P_SYM-_rc@AC [A]	-0.792460	0.340050	1.132510	0.879173
U_fund_SYM+_rc@AC [V]	398.5083	398.4492	-0.059174	398.4621
U_fund_SYM-_rc@AC [V]	1.005666	2.157033	1.151367	1.048848
U+ [V]	230.0468	230.0660	0.019194	230.0589
U- [V]	0.592272	0.635616	0.043344	0.605242

After fault



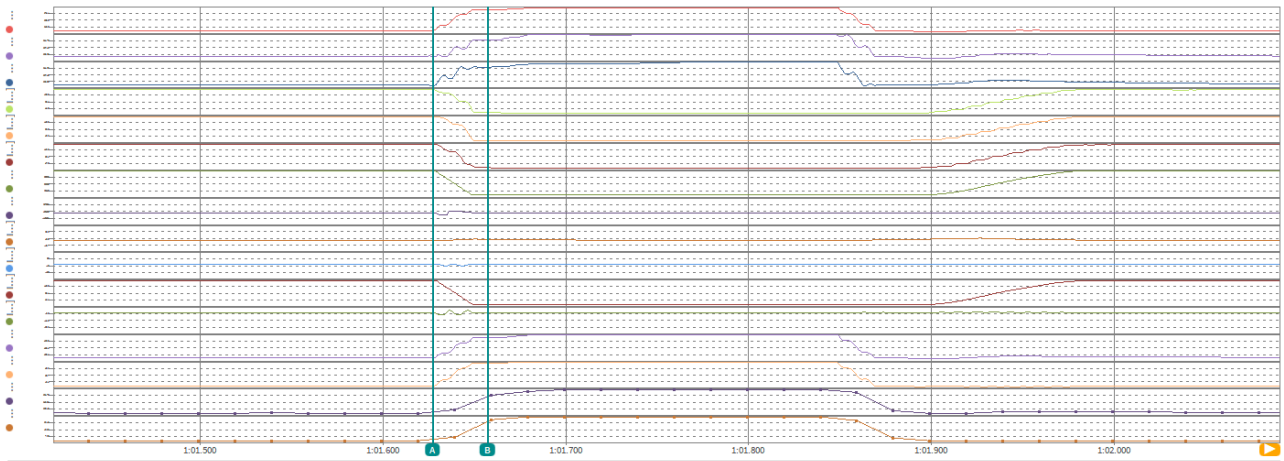
	A	B	间隔	有效值
时间 [s]	1:01.8476000	1:11.8476000	0:10.0000000	
U1_tRMS_rc@AC [V]	287.7775	230.4949	-57.28259	230.5845
U2_tRMS_rc@AC [V]	245.9237	229.8482	-16.07553	229.8960
U3_tRMS_rc@AC [V]	245.4442	229.8283	-15.61591	229.8612
I1_tRMS_rc@AC [A]	2.070642	178.5958	176.5252	178.8289
I2_tRMS_rc@AC [A]	2.297746	181.2459	178.9481	180.1467
I3_tRMS_rc@AC [A]	3.770657	183.4981	179.7274	182.3995
P_t_rc@AC [W]	750.1500	124961.2	124211.0	124523.4
Q_t_rc@AC [var]	-1946.923	3015.093	4962.016	2769.387
I_fund_Q_SYM+_rc@AC [A]	-0.085596	1.222620	1.308216	1.116012
I_fund_Q_SYM-_rc@AC [A]	0.115613	0.439425	0.323813	0.574694
I_fund_P_SYM+_rc@AC [A]	0.961213	181.0621	180.1009	180.4123
I_fund_P_SYM-_rc@AC [A]	0.031342	-1.188500	-1.219841	0.934280
U_fund_SYM+_rc@AC [V]	448.2231	398.4649	-49.75824	398.5578
U_fund_SYM-_rc@AC [V]	51.53758	1.017554	-50.52003	1.871381
U+ [V]	258.7297	230.0672	-28.66254	230.1960
U- [V]	29.70502	0.613109	-29.09191	1.861178

Duration fault time



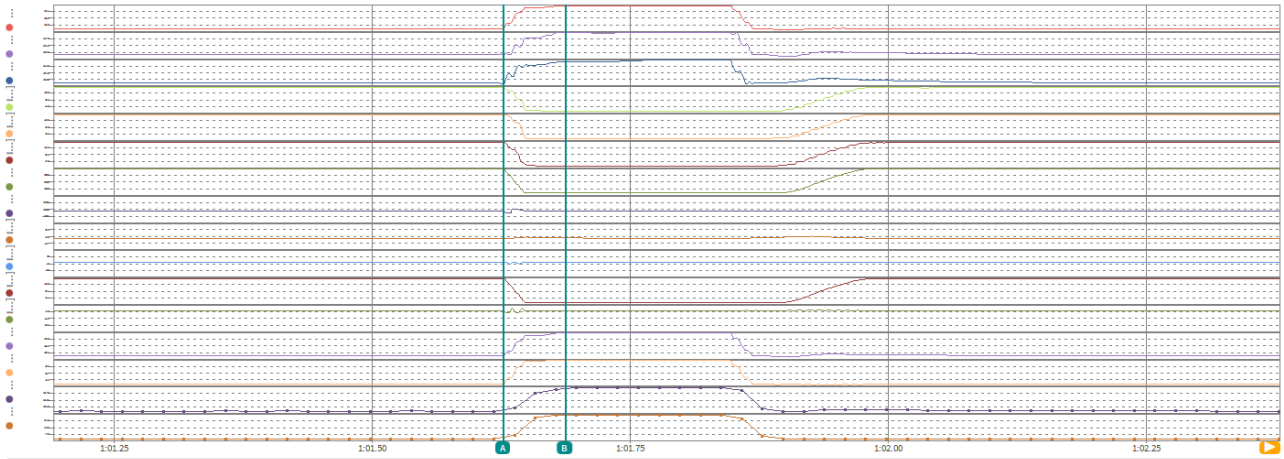
	A	B	间隔	有效值
时间 [s]	1:01.6276000	1:01.8476000	0.2200000	
U1_tRMS_rc@AC [V]	230.7385	287.7775	57.03906	284.3038
U2_tRMS_rc@AC [V]	230.1937	245.9237	15.73006	244.0590
U3_tRMS_rc@AC [V]	229.2273	245.4442	16.21689	243.5913
I1_tRMS_rc@AC [A]	178.9458	2.070642	-176.8752	42.62244
I2_tRMS_rc@AC [A]	180.6190	2.297746	-178.3213	44.86868
I3_tRMS_rc@AC [A]	181.4894	3.770657	-177.7188	40.85300
P_t_rc@AC [W]	124440.2	750.1500	-123690.1	25631.58
Q_t_rc@AC [var]	2694.242	-1946.923	-4641.165	16388.43
I_fund_Q_SYM+_rc@AC [A]	0.849236	-0.085596	-0.934831	3.446461
I_fund_Q_SYM-_rc@AC [A]	-0.265799	0.115613	0.381411	4.549820
I_fund_P_SYM+_rc@AC [A]	180.3008	0.961213	-179.3396	36.92945
I_fund_P_SYM-_rc@AC [A]	0.340050	0.031342	-0.308708	3.257781
U_fund_SYM+_rc@AC [V]	398.4492	448.2231	49.77396	444.0576
U_fund_SYM-_rc@AC [V]	2.157033	51.53758	49.38055	49.76814
U+ [V]	230.0660	258.7297	28.66376	253.4748
U- [V]	0.635616	29.70502	29.06941	26.97977

0-30ms



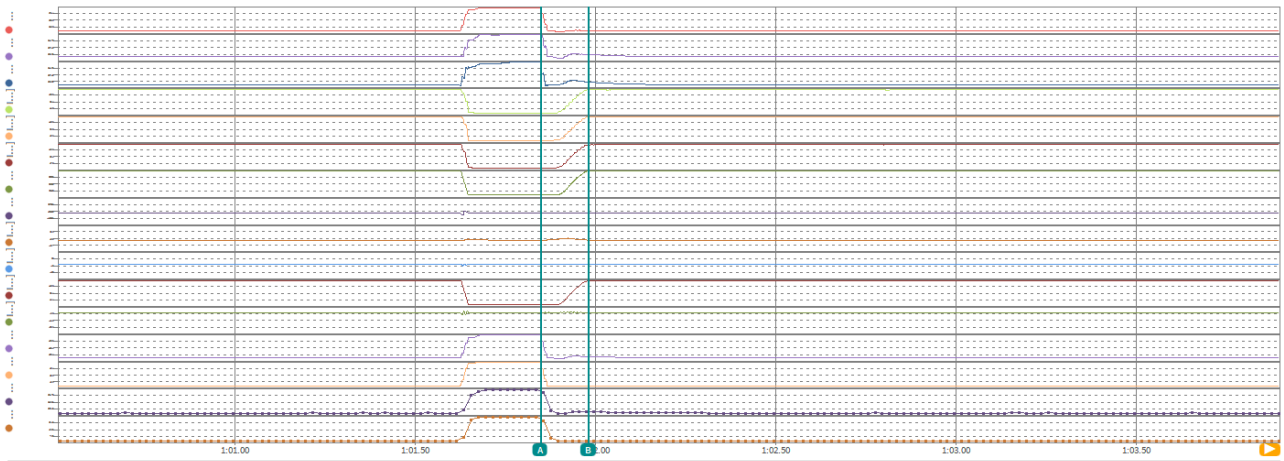
	A	B	间隔	有效值
时间 [s]	1:01.6276000	1:01.6576000	0.0300000	
U1_tRMS_rc@AC [V]	230.7385	283.0758	52.33734	263.7889
U2_tRMS_rc@AC [V]	230.1937	241.8347	11.64101	236.0903
U3_tRMS_rc@AC [V]	229.2273	241.7834	12.55602	237.9682
I1_tRMS_rc@AC [A]	178.9458	8.377268	-170.5685	113.4120
I2_tRMS_rc@AC [A]	180.6190	7.177315	-173.4417	119.4778
I3_tRMS_rc@AC [A]	181.4894	9.382600	-172.1068	108.3894
P_t_rc@AC [W]	124440.2	658.9534	-123781.3	68405.48
Q_t_rc@AC [var]	2694.242	6341.538	3647.295	43104.97
I_fund_Q_SYM+_rc@AC [A]	0.849236	7.660076	6.810840	5.470524
I_fund_Q_SYM-_rc@AC [A]	-0.265799	0.707093	0.972891	12.11589
I_fund_P_SYM+_rc@AC [A]	180.3008	0.908876	-179.3920	98.56569
I_fund_P_SYM-_rc@AC [A]	0.340050	-0.441696	-0.781746	8.690017
U_fund_SYM+_rc@AC [V]	398.4492	441.0499	42.60071	424.5091
U_fund_SYM-_rc@AC [V]	2.157033	50.53088	48.37385	36.03371
U+ [V]	230.0660	233.6687	3.602729	231.8743
U- [V]	0.635616	5.205750	4.570134	3.708358

0-60ms



	A	B	间隔	有效值
时间 [s]	1:01.6276000	1:01.6876000	0.0600000	
U1_tRMS_rc@AC [V]	230.7385	288.6198	57.88135	274.8453
U2_tRMS_rc@AC [V]	230.1937	245.6462	15.45253	239.9462
U3_tRMS_rc@AC [V]	229.2273	244.2093	14.98196	240.4717
I1_tRMS_rc@AC [A]	178.9458	5.303091	-173.6427	80.99030
I2_tRMS_rc@AC [A]	180.6190	5.026258	-175.5928	85.27845
I3_tRMS_rc@AC [A]	181.4894	6.265891	-175.2235	77.44354
P_t_rc@AC [W]	124440.2	934.4606	-123505.8	48768.76
Q_t_rc@AC [var]	2694.242	4192.571	1498.329	30939.42
I_fund_Q_SYM+_rc@AC [A]	0.849236	4.729290	3.880055	5.778645
I_fund_Q_SYM-_rc@AC [A]	-0.265799	0.291935	0.557733	8.648864
I_fund_P_SYM+_rc@AC [A]	180.3008	1.203681	-179.0972	70.27013
I_fund_P_SYM-_rc@AC [A]	0.340050	-0.017253	-0.357303	6.196915
U_fund_SYM+_rc@AC [V]	398.4492	447.8109	49.36172	434.4560
U_fund_SYM-_rc@AC [V]	2.157033	52.39553	50.23850	44.25671
U+ [V]	230.0660	256.1103	26.04430	243.2190
U- [V]	0.635616	29.46566	28.83005	19.92967

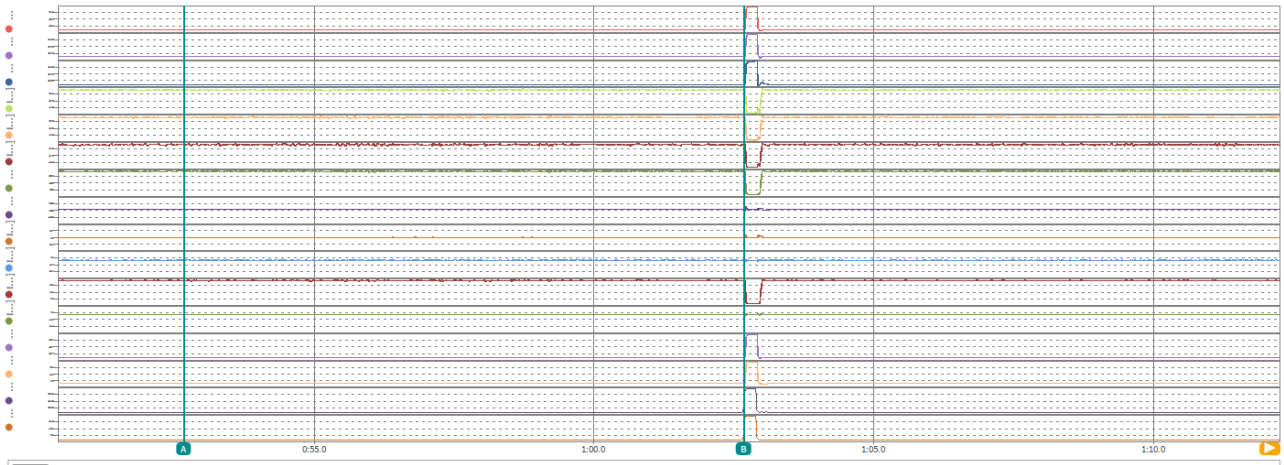
Recover time – Active power



	A	B	间隔	有效值
时间 [s]	1:01.8476000	1:01.9816000	0.1340000	
U1_tRMS_rc@AC [V]	287.7775	231.4934	-56.28412	236.0896
U2_tRMS_rc@AC [V]	245.9237	231.3617	-14.56204	232.1517
U3_tRMS_rc@AC [V]	245.4442	231.7611	-13.68315	232.0365
I1_tRMS_rc@AC [A]	2.070642	179.1397	177.0690	87.88004
I2_tRMS_rc@AC [A]	2.297746	179.3999	177.1022	88.36718
I3_tRMS_rc@AC [A]	3.770657	179.9574	176.1867	89.49922
P_t_rc@AC [W]	750.1500	124474.8	123724.6	60716.68
Q_t_rc@AC [var]	-1946.923	7203.393	9150.316	10133.33
I_fund_Q_SYM+_rc@AC [A]	-0.085596	2.929389	3.014984	8.039458
I_fund_Q_SYM-_rc@AC [A]	0.115613	0.096659	-0.018954	1.754261
I_fund_P_SYM+_rc@AC [A]	0.961213	179.1862	178.2250	87.32692
I_fund_P_SYM-_rc@AC [A]	0.031342	0.243921	0.212580	2.342746
U_fund_SYM+_rc@AC [V]	448.2231	401.0256	-47.19754	403.9343
U_fund_SYM-_rc@AC [V]	51.53758	0.493991	-51.04359	13.37965
U+ [V]	258.7297	231.6521	-27.07763	237.7276
U- [V]	29.70502	0.247710	-29.45731	13.94059

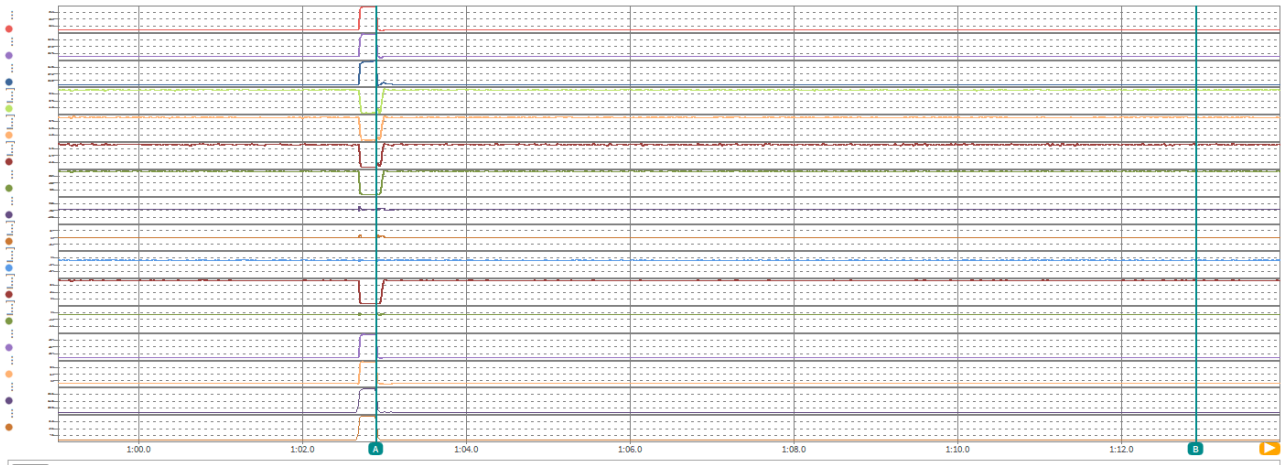
Test – VS3.2

Before fault



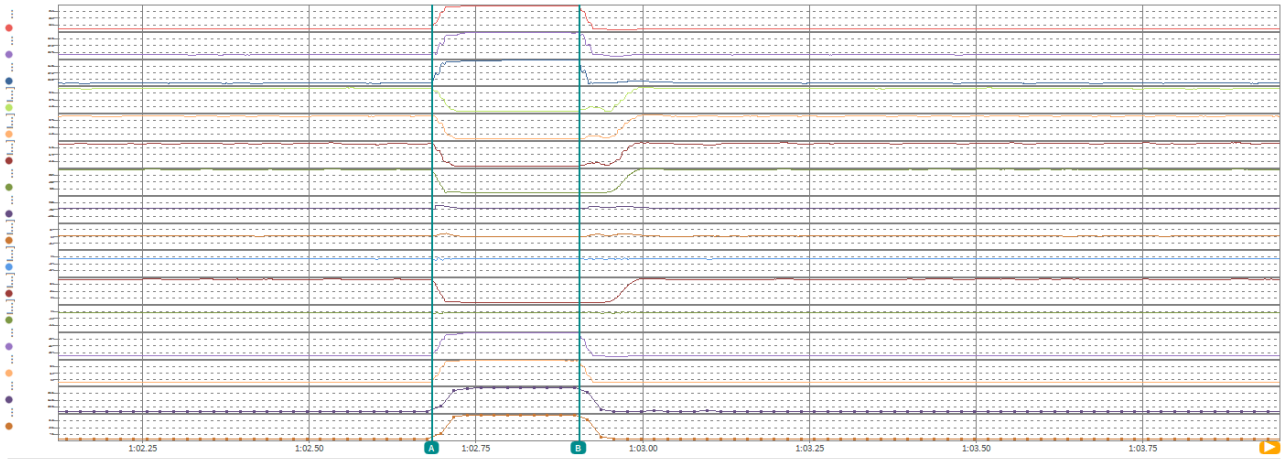
	A	B	间隔	有效值
时间 [s]	0:52.68510	1:02.68510	0:10.00000	
U1_tRMS_rc@AC [V]	230.3003	230.2524	-0.047943	230.2730
U2_tRMS_rc@AC [V]	229.7309	229.8491	0.118149	229.7678
U3_tRMS_rc@AC [V]	229.6077	229.6353	0.027603	229.6173
I1_tRMS_rc@AC [A]	37.17854	36.62372	-0.554817	36.94380
I2_tRMS_rc@AC [A]	36.93471	36.93573	1.022e-3	37.00933
I3_tRMS_rc@AC [A]	38.32550	38.11572	-0.209778	37.67832
P_t_rc@AC [W]	25796.69	25625.29	-171.4004	25597.69
Q_t_rc@AC [var]	-1613.490	-1597.750	15.73987	1792.014
I_fund_Q_SYM+_rc@AC [A]	-0.543223	-0.619946	-0.076723	0.745857
I_fund_Q_SYM-_rc@AC [A]	0.370140	0.320794	-0.049346	0.330192
I_fund_P_SYM+_rc@AC [A]	37.40515	37.15275	-0.252399	37.11659
I_fund_P_SYM-_rc@AC [A]	-0.150288	-0.108495	0.041792	0.350547
U_fund_SYM+_rc@AC [V]	398.1599	398.2139	0.054047	398.1713
U_fund_SYM-_rc@AC [V]	1.050300	0.700928	-0.349372	1.016553
U+ [V]	229.9127	229.8759	-0.036795	229.8911
U- [V]	0.595003	0.607712	0.012709	0.586875

After fault



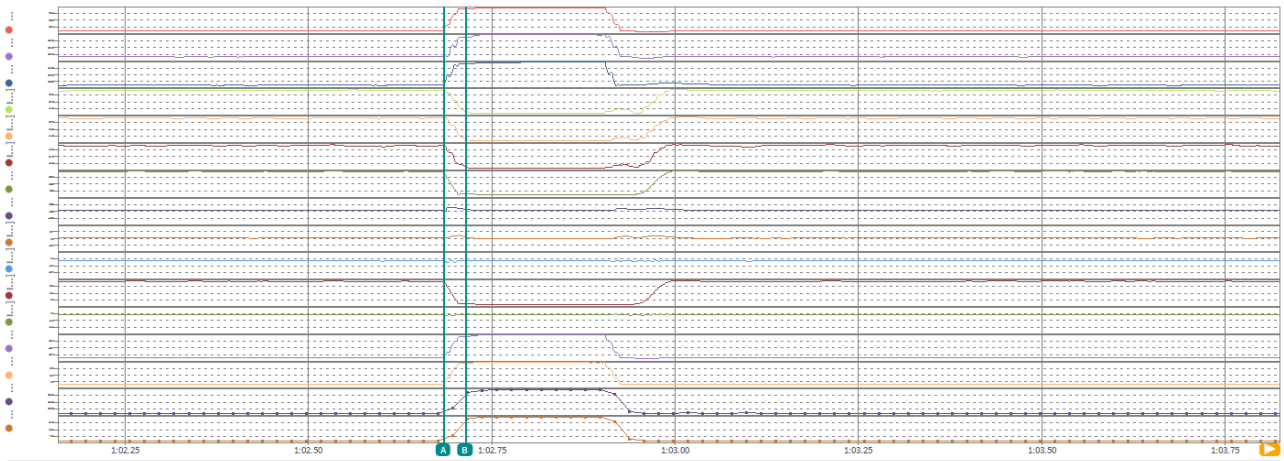
	A	B	间隔	有效值
时间 [s]	1:02.90710	1:12.90710	0:10.00000	
U1_tRMS_rc@AC [V]	287.2793	230.2385	-57.04082	230.3281
U2_tRMS_rc@AC [V]	245.5669	229.7708	-15.79604	229.7883
U3_tRMS_rc@AC [V]	244.9687	229.5462	-15.42244	229.6443
I1_tRMS_rc@AC [A]	3.981794	37.05030	33.06850	36.80254
I2_tRMS_rc@AC [A]	3.195530	37.00104	33.80551	36.90853
I3_tRMS_rc@AC [A]	4.899233	37.18393	32.28470	37.54177
P_t_rc@AC [W]	600.6281	25498.71	24898.08	25503.79
Q_t_rc@AC [var]	-3070.570	-1875.560	1195.010	1895.664
I_fund_Q_SYM+_rc@AC [A]	-1.830761	-0.657920	1.172841	0.813306
I_fund_Q_SYM-_rc@AC [A]	0.104423	0.039583	-0.064839	0.250810
I_fund_P_SYM+_rc@AC [A]	0.773668	36.97895	36.20529	36.98026
I_fund_P_SYM-_rc@AC [A]	0.423623	-0.108360	-0.531983	0.299651
U_fund_SYM+_rc@AC [V]	447.4827	398.1124	-49.37027	398.2263
U_fund_SYM-_rc@AC [V]	50.66977	1.005955	-49.66381	1.707438
U+ [V]	258.9529	229.8713	-29.08162	230.0058
U- [V]	29.73757	0.594060	-29.14351	1.803430

Duration fault time



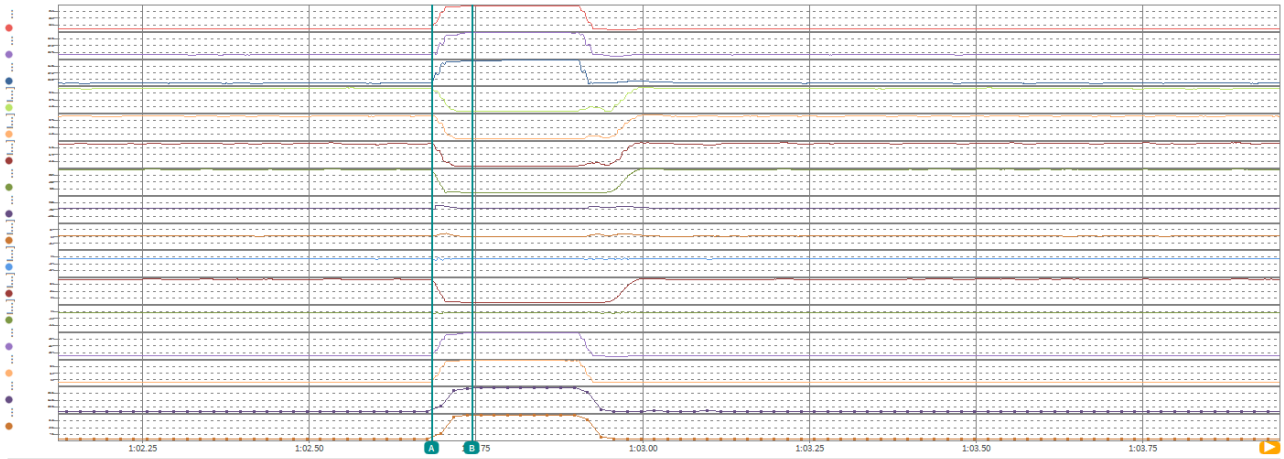
	A	B	间隔	有效值
时间 [s]	1:02.68510	1:02.90510	0.22000	
U1_tRMS_rc@AC [V]	230.2524	287.9704	57.71803	285.2749
U2_tRMS_rc@AC [V]	229.8491	246.0592	16.21017	244.9691
U3_tRMS_rc@AC [V]	229.6353	245.6284	15.99318	244.4162
I1_tRMS_rc@AC [A]	36.62372	2.800098	-33.82362	9.726458
I2_tRMS_rc@AC [A]	36.93573	2.802146	-34.13358	9.936292
I3_tRMS_rc@AC [A]	38.11572	3.930315	-34.18540	9.399623
P_t_rc@AC [W]	25625.29	370.2734	-25255.02	5096.347
Q_t_rc@AC [var]	-1597.750	-2433.225	-835.4750	4790.536
I_fund_Q_SYM+_rc@AC [A]	-0.619946	-1.798669	-1.178723	2.526197
I_fund_Q_SYM-_rc@AC [A]	0.320794	0.060663	-0.260132	0.771126
I_fund_P_SYM+_rc@AC [A]	37.15275	0.464225	-36.68853	7.386011
I_fund_P_SYM-_rc@AC [A]	-0.108495	0.101882	0.210377	0.737081
U_fund_SYM+_rc@AC [V]	398.2139	448.5143	50.30035	445.6052
U_fund_SYM-_rc@AC [V]	0.700928	51.58287	50.88194	49.94307
U+ [V]	229.8759	258.9529	29.07698	254.5120
U- [V]	0.607712	29.73757	29.12986	27.19430

0-30ms



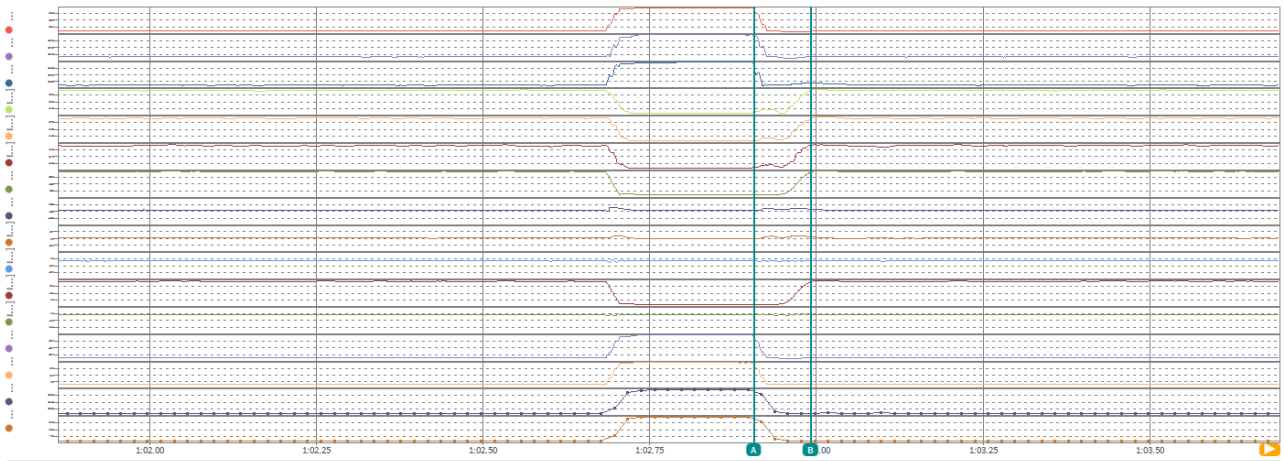
	A	B	间隔	有效值
时间 [s]	1:02.68510	1:02.71510	0.03000	
U1_tRMS_rc@AC [V]	230.2524	285.8786	55.62624	265.4351
U2_tRMS_rc@AC [V]	229.8491	244.4615	14.61241	237.7628
U3_tRMS_rc@AC [V]	229.6353	244.1145	14.47929	239.5306
I1_tRMS_rc@AC [A]	36.62372	5.305773	-31.31795	24.96844
I2_tRMS_rc@AC [A]	36.93573	7.688081	-29.24765	25.50148
I3_tRMS_rc@AC [A]	38.11572	6.840721	-31.27500	23.14454
P_t_rc@AC [W]	25625.29	1922.507	-23702.78	13545.66
Q_t_rc@AC [var]	-1597.750	4687.217	6284.967	11246.99
I_fund_Q_SYM+_rc@AC [A]	-0.619946	3.832201	4.452146	5.176287
I_fund_Q_SYM-_rc@AC [A]	0.320794	-0.787872	-1.108666	2.012596
I_fund_P_SYM+_rc@AC [A]	37.15275	2.381952	-34.77080	19.65437
I_fund_P_SYM-_rc@AC [A]	-0.108495	0.924759	1.033254	1.873003
U_fund_SYM+_rc@AC [V]	398.2139	445.5072	47.29330	427.2617
U_fund_SYM-_rc@AC [V]	0.700928	51.05331	50.35239	36.24220
U+ [V]	229.8759	235.7403	5.864446	232.8266
U- [V]	0.607712	6.861901	6.254188	4.871088

0-60ms



	A	B	间隔	有效值
时间 [s]	1:02.68510	1:02.74510	0.06000	
U1_tRMS_rc@AC [V]	230.2524	289.5691	59.31673	276.5946
U2_tRMS_rc@AC [V]	229.8491	246.6069	16.75784	241.6204
U3_tRMS_rc@AC [V]	229.6353	244.8890	15.25375	242.0116
I1_tRMS_rc@AC [A]	36.62372	2.731880	-33.89184	17.96167
I2_tRMS_rc@AC [A]	36.93573	2.979773	-33.95596	18.34882
I3_tRMS_rc@AC [A]	38.11572	4.083727	-34.03199	16.75625
P_t_rc@AC [W]	25625.29	237.3809	-25387.91	9691.329
Q_t_rc@AC [var]	-1597.750	-2514.782	-917.0323	8224.299
I_fund_Q_SYM+_rc@AC [A]	-0.619946	-1.952135	-1.332189	3.859422
I_fund_Q_SYM-_rc@AC [A]	0.320794	0.138446	-0.182348	1.462638
I_fund_P_SYM+_rc@AC [A]	37.15275	0.266590	-36.88616	14.04919
I_fund_P_SYM-_rc@AC [A]	-0.108495	0.307069	0.415564	1.376101
U_fund_SYM+_rc@AC [V]	398.2139	449.3080	51.09402	437.2819
U_fund_SYM-_rc@AC [V]	0.700928	52.49144	51.79052	44.55490
U+ [V]	229.8759	258.2047	28.32881	245.0730
U- [V]	0.607712	29.81537	29.20765	20.58130

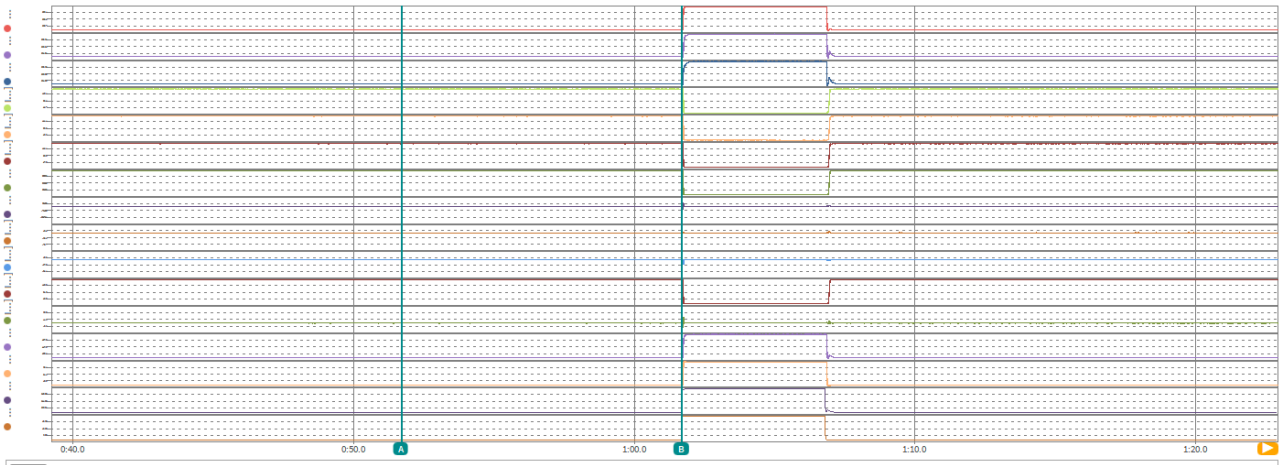
Recover time – Active power



	A	B	间隔	有效值
时间 [s]	1:02.90710	1:02.99210	0.08500	
U1_tRMS_rc@AC [V]	287.2793	229.3035	-57.97585	237.1783
U2_tRMS_rc@AC [V]	245.5669	229.9110	-15.65588	231.9662
U3_tRMS_rc@AC [V]	244.9687	231.2355	-13.73318	231.4060
I1_tRMS_rc@AC [A]	3.981794	35.87410	31.89231	16.52664
I2_tRMS_rc@AC [A]	3.195530	34.27795	31.08242	16.08498
I3_tRMS_rc@AC [A]	4.899233	38.50879	33.60955	17.67824
P_t_rc@AC [W]	600.6281	24523.13	23922.50	10328.71
Q_t_rc@AC [var]	-3070.570	4918.645	7989.215	5173.668
I_fund_Q_SYM+_rc@AC [A]	-1.830761	3.924151	5.754912	4.052641
I_fund_Q_SYM-_rc@AC [A]	0.104423	0.328110	0.223687	0.826987
I_fund_P_SYM+_rc@AC [A]	0.773668	35.50540	34.73173	14.97616
I_fund_P_SYM-_rc@AC [A]	0.423623	1.650931	1.227308	1.192868
U_fund_SYM+_rc@AC [V]	447.4827	398.6279	-48.85480	403.9650
U_fund_SYM-_rc@AC [V]	50.66977	0.492346	-50.17742	14.90613
U+ [V]	258.9529	229.1056	-29.84730	240.8437
U- [V]	29.73757	0.391143	-29.34643	17.10028

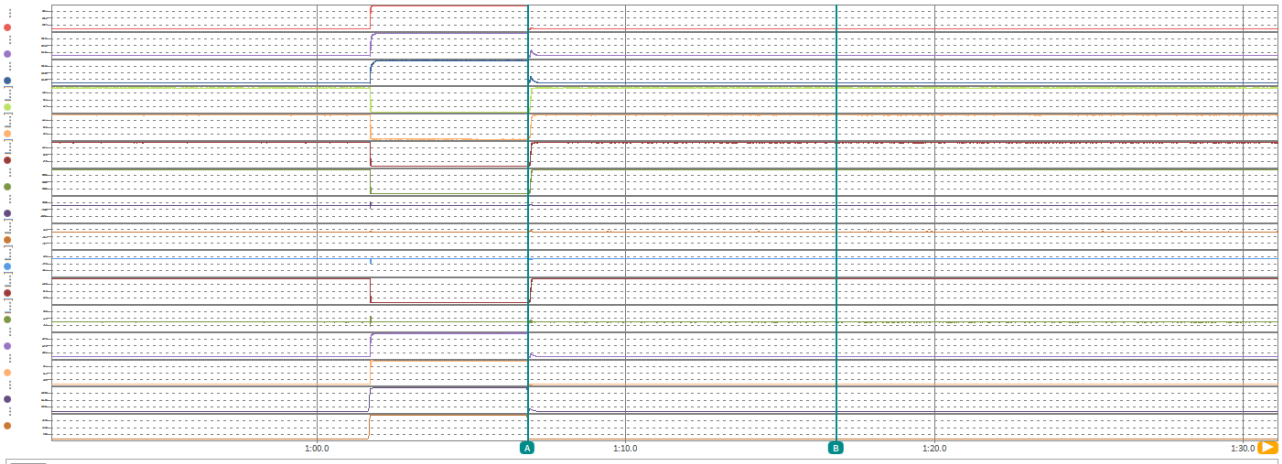
Test – VS4.1.1

Before fault



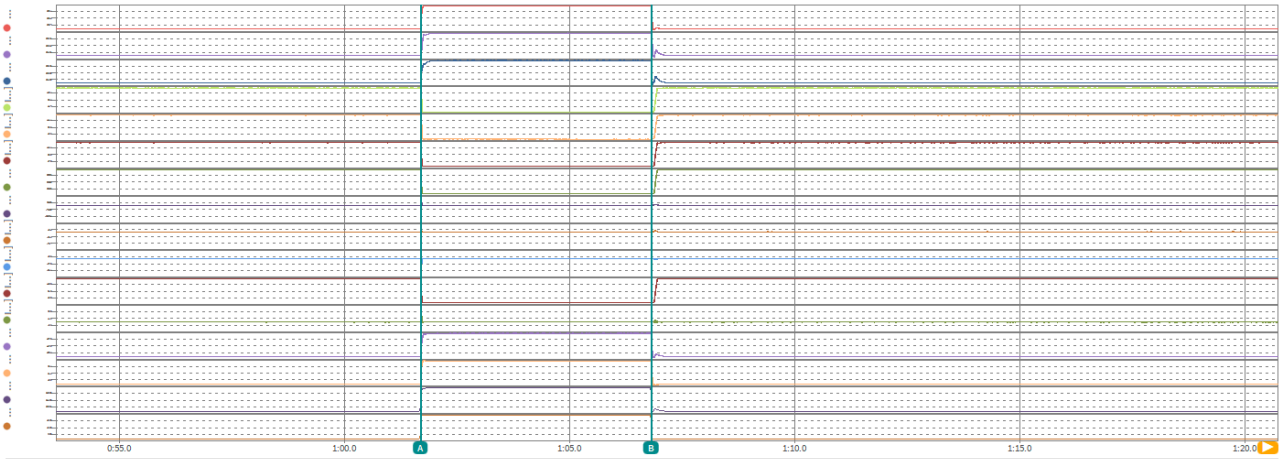
	A	B	间隔	有效值
时间 [s]	0:51.70710	1:01.70710	0:10.00000	
U1_tRMS_rc@AC [V]	230.5557	230.4135	-0.142227	230.5253
U2_tRMS_rc@AC [V]	229.9042	230.4425	0.538361	229.8678
U3_tRMS_rc@AC [V]	229.8289	229.3914	-0.437531	229.8338
I1_tRMS_rc@AC [A]	180.5517	180.3747	-0.176987	180.3753
I2_tRMS_rc@AC [A]	182.0968	181.9531	-0.143692	181.5100
I3_tRMS_rc@AC [A]	184.0079	183.8032	-0.204712	184.0256
P_t_rc@AC [W]	125762.5	125630.5	-131.9844	125579.1
Q_t_rc@AC [var]	2236.615	2397.240	160.6252	2261.913
I_fund_Q_SYM+_rc@AC [A]	0.742424	0.942816	0.200392	0.515800
I_fund_Q_SYM-_rc@AC [A]	0.381931	-0.988846	-1.370777	0.496709
I_fund_P_SYM+_rc@AC [A]	182.1913	182.0139	-0.177490	181.9409
I_fund_P_SYM-_rc@AC [A]	-0.606624	-0.446840	0.159784	0.822584
U_fund_SYM+_rc@AC [V]	398.5321	398.5027	-0.029449	398.4968
U_fund_SYM-_rc@AC [V]	1.062444	1.870785	0.808341	1.058181
U+ [V]	230.0993	230.0865	-0.012750	230.0790
U- [V]	0.621954	0.624003	2.049e-3	0.610780

After fault



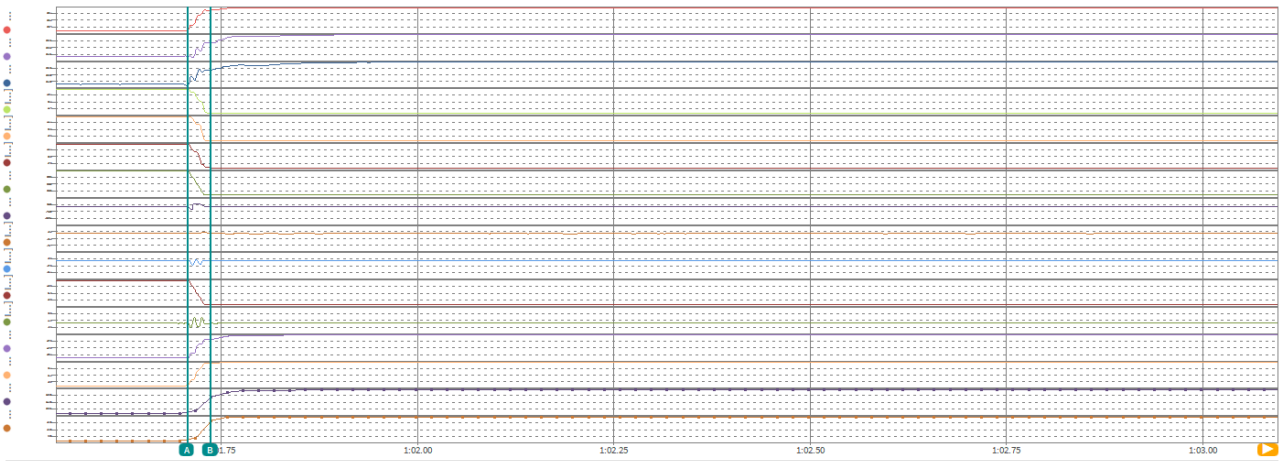
	A	B	间隔	有效值
时间 [s]	1:06.82810	1:16.82810	0:10.00000	
U1_tRMS_rc@AC [V]	276.2304	230.5677	-45.66270	230.6026
U2_tRMS_rc@AC [V]	241.3598	229.9143	-11.44551	229.9053
U3_tRMS_rc@AC [V]	241.0841	229.8030	-11.28107	229.8782
I1_tRMS_rc@AC [A]	2.282909	180.9534	178.6705	179.4778
I2_tRMS_rc@AC [A]	2.563620	180.8858	178.3222	180.6192
I3_tRMS_rc@AC [A]	3.441479	184.6426	181.2011	183.0864
P_t_rc@AC [W]	116.2858	125711.0	125594.7	124955.3
Q_t_rc@AC [var]	-2075.795	-2778.655	-702.8591	2583.453
I_fund_Q_SYM+_rc@AC [A]	-1.055050	-0.059313	0.995737	0.882973
I_fund_Q_SYM-_rc@AC [A]	-0.122849	1.138797	1.261646	0.611926
I_fund_P_SYM+_rc@AC [A]	0.155018	182.1147	181.9597	181.0207
I_fund_P_SYM-_rc@AC [A]	-0.043321	-0.261858	-0.218537	0.904674
U_fund_SYM+_rc@AC [V]	437.0301	398.5299	-38.50015	398.5853
U_fund_SYM-_rc@AC [V]	41.19316	1.122698	-40.07047	1.635532
U+ [V]	252.3482	230.1158	-22.23239	230.1950
U- [V]	23.73581	0.607914	-23.12789	1.554188

Duration fault time



	A	B	间隔	有效值
时间 [s]	1:01.70710	1:06.82810	5.12100	
U1_tRMS_rc@AC [V]	230.4135	276.2304	45.81693	276.1285
U2_tRMS_rc@AC [V]	230.4425	241.3598	10.91728	241.3033
U3_tRMS_rc@AC [V]	229.3914	241.0841	11.69270	241.0105
I1_tRMS_rc@AC [A]	180.3747	2.282909	-178.0918	9.657349
I2_tRMS_rc@AC [A]	181.9531	2.563620	-179.3895	10.09954
I3_tRMS_rc@AC [A]	183.8032	3.441479	-180.3617	9.700029
P_t_rc@AC [W]	125630.5	116.2858	-125514.2	5716.778
Q_t_rc@AC [var]	2397.240	-2075.795	-4473.036	3924.365
I_fund_Q_SYM+_rc@AC [A]	0.942816	-1.055050	-1.997865	1.394990
I_fund_Q_SYM-_rc@AC [A]	-0.988846	-0.122849	0.865997	0.971602
I_fund_P_SYM+_rc@AC [A]	182.0139	0.155018	-181.8588	8.243712
I_fund_P_SYM-_rc@AC [A]	-0.446840	-0.043321	0.403519	0.703935
U_fund_SYM+_rc@AC [V]	398.5027	437.0301	38.52744	436.8857
U_fund_SYM-_rc@AC [V]	1.870785	41.19316	39.32238	41.07037
U+ [V]	230.0865	252.3482	22.26169	252.1319
U- [V]	0.624003	23.73581	23.11181	23.64857

0-30ms



	A	B	间隔	有效值
时间 [s]	1:01.70710	1:01.73710	0.03000	
U1_tRMS_rc@AC [V]	230.4135	271.2270	40.81351	254.8477
U2_tRMS_rc@AC [V]	230.4425	237.1517	6.709213	233.2599
U3_tRMS_rc@AC [V]	229.3914	237.0439	7.652542	234.5274
I1_tRMS_rc@AC [A]	180.3747	4.441284	-175.9334	120.6087
I2_tRMS_rc@AC [A]	181.9531	4.582610	-177.3705	125.4093
I3_tRMS_rc@AC [A]	183.8032	9.513342	-174.2899	115.5158
P_t_rc@AC [W]	125630.5	-878.3387	-126508.9	73427.89
Q_t_rc@AC [var]	2397.240	4460.799	2063.559	42387.12
I_fund_Q_SYM+_rc@AC [A]	0.942816	3.642220	2.699404	4.439363
I_fund_Q_SYM-_rc@AC [A]	-0.988846	-2.473712	-1.484866	12.34143
I_fund_P_SYM+_rc@AC [A]	182.0139	-1.000374	-183.0142	105.8987
I_fund_P_SYM-_rc@AC [A]	-0.446840	-1.972519	-1.525679	8.910125
U_fund_SYM+_rc@AC [V]	398.5027	429.3971	30.89444	416.3226
U_fund_SYM-_rc@AC [V]	1.870785	40.09640	38.22561	27.77601
U+ [V]	230.0865	232.2029	2.116341	231.1471
U- [V]	0.624003	3.612337	2.988334	2.592138

0-60ms

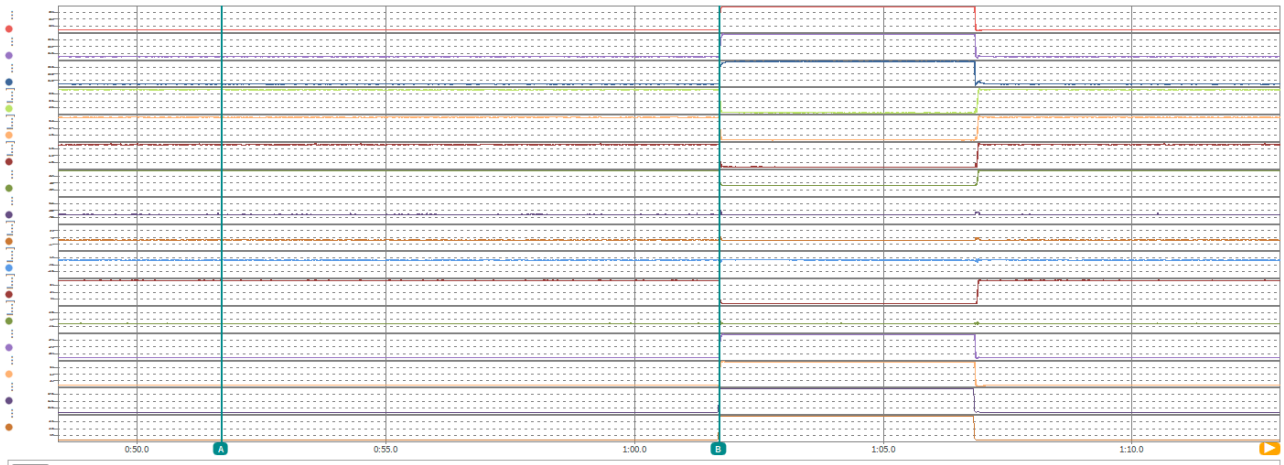
	A	B	间隔	有效值
时间 [s]	1:01.70710	1:01.76710	0.06000	
U1_tRMS_rc@AC [V]	230.4135	276.2312	45.81766	264.3115
U2_tRMS_rc@AC [V]	230.4425	240.3895	9.946976	235.9766
U3_tRMS_rc@AC [V]	229.3914	239.3996	10.00826	236.3573
I1_tRMS_rc@AC [A]	180.3747	2.480210	-177.8945	85.99954
I2_tRMS_rc@AC [A]	181.9531	2.713370	-179.2398	89.42732
I3_tRMS_rc@AC [A]	183.8032	4.130568	-179.6726	82.41860
P_t_rc@AC [W]	125630.5	33.15783	-125597.4	52345.48
Q_t_rc@AC [var]	2397.240	-2325.997	-4723.237	30271.06
I_fund_Q_SYM+_rc@AC [A]	0.942816	-1.660155	-2.602971	3.339354
I_fund_Q_SYM-_rc@AC [A]	-0.988846	-0.015827	0.973020	8.819914
I_fund_P_SYM+_rc@AC [A]	182.0139	0.048477	-181.9654	75.49324
I_fund_P_SYM-_rc@AC [A]	-0.446840	-0.050049	0.396791	6.375262
U_fund_SYM+_rc@AC [V]	398.5027	435.4967	36.99408	424.3257
U_fund_SYM-_rc@AC [V]	1.870785	41.72818	39.85739	34.93910
U+ [V]	230.0865	249.2428	19.15626	239.4169
U- [V]	0.624003	23.54882	22.92482	15.70234

Recover time – Active power

	A	B	间隔	有效值
时间 [s]	1:06.82810	1:06.95910	0.13100	
U1_tRMS_rc@AC [V]	276.2304	231.7075	-44.52290	235.3800
U2_tRMS_rc@AC [V]	241.3598	231.5613	-9.798538	232.0008
U3_tRMS_rc@AC [V]	241.0841	231.8343	-9.249817	231.8590
I1_tRMS_rc@AC [A]	2.282909	177.7528	175.4699	87.18635
I2_tRMS_rc@AC [A]	2.563620	179.0408	176.4771	87.63580
I3_tRMS_rc@AC [A]	3.441479	181.2681	177.8266	89.02803
P_t_rc@AC [W]	116.2858	124471.8	124355.5	60460.65
Q_t_rc@AC [var]	-2075.795	7022.607	9098.403	9511.812
I_fund_Q_SYM+_rc@AC [A]	-1.055050	3.222240	4.277290	5.926203
I_fund_Q_SYM-_rc@AC [A]	-0.122849	0.029448	0.152297	1.973634
I_fund_P_SYM+_rc@AC [A]	0.155018	179.0559	178.9009	86.83615
I_fund_P_SYM-_rc@AC [A]	-0.043321	-1.029800	-0.986479	2.229018
U_fund_SYM+_rc@AC [V]	437.0301	401.3075	-35.72263	403.4627
U_fund_SYM-_rc@AC [V]	41.19316	0.619585	-40.57358	10.94635
U+ [V]	252.3482	232.4007	-19.94753	237.0873
U- [V]	23.73581	0.221357	-23.51445	12.11888

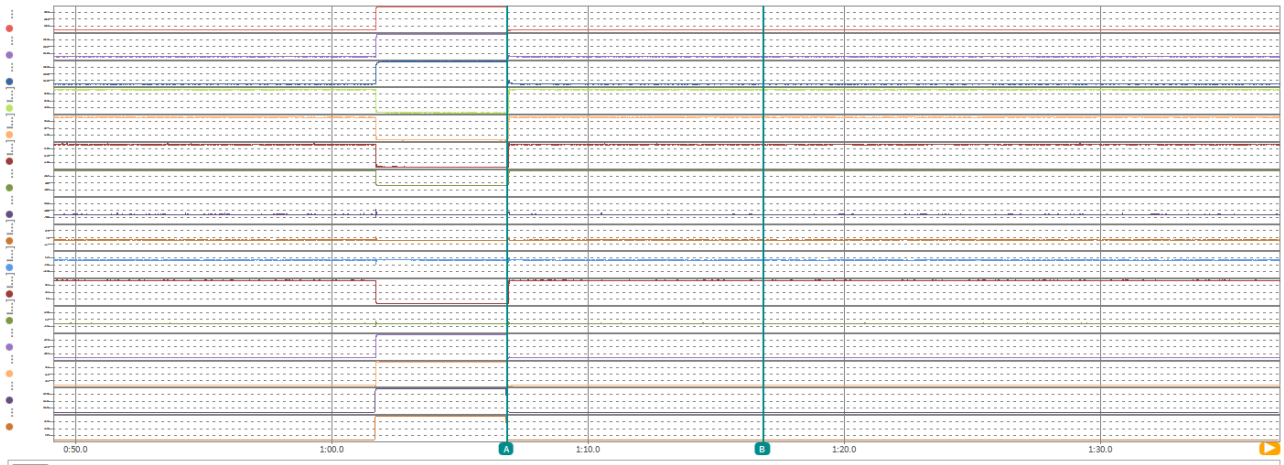
Test – VS4.1.2

Before fault



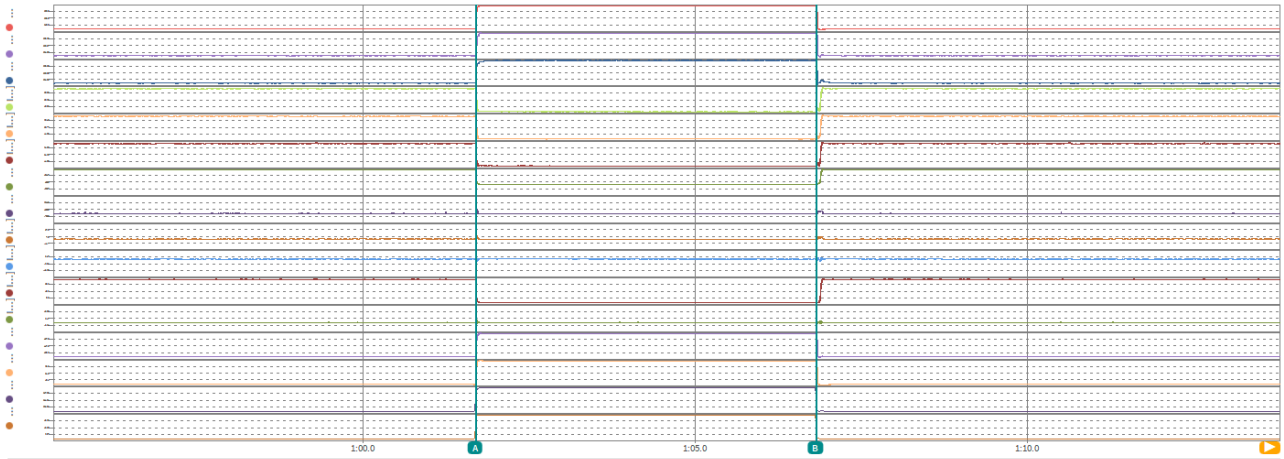
	A	B	间隔	有效值
时间 [s]	0:51.70330	1:01.70430	0:10.00100	
U1_tRMS_rc@AC [V]	230.2974	230.3113	0.013916	230.2793
U2_tRMS_rc@AC [V]	229.7620	229.7383	-0.023773	229.7688
U3_tRMS_rc@AC [V]	229.6583	229.6281	-0.030228	229.6170
I1_tRMS_rc@AC [A]	36.95295	36.51095	-0.442005	36.81357
I2_tRMS_rc@AC [A]	36.71788	36.43465	-0.283230	36.97548
I3_tRMS_rc@AC [A]	37.63976	37.75848	0.118725	37.56374
P_t_rc@AC [W]	25513.38	25388.71	-124.6719	25540.57
Q_t_rc@AC [var]	-1989.473	-1761.300	228.1729	1710.462
I_fund_Q_SYM+_rc@AC [A]	-0.584483	-0.533129	0.051354	0.727754
I_fund_Q_SYM-_rc@AC [A]	0.302561	0.188062	-0.114499	0.202997
I_fund_P_SYM+_rc@AC [A]	36.99319	36.81443	-0.178764	37.03356
I_fund_P_SYM-_rc@AC [A]	-0.149625	-0.390866	-0.241240	0.246688
U_fund_SYM+_rc@AC [V]	398.2054	398.1797	-0.025635	398.1752
U_fund_SYM-_rc@AC [V]	0.991178	0.762104	-0.229074	1.015553
U+ [V]	229.9255	229.9063	-0.019243	229.8934
U- [V]	0.568992	0.587893	0.018901	0.586209

After fault



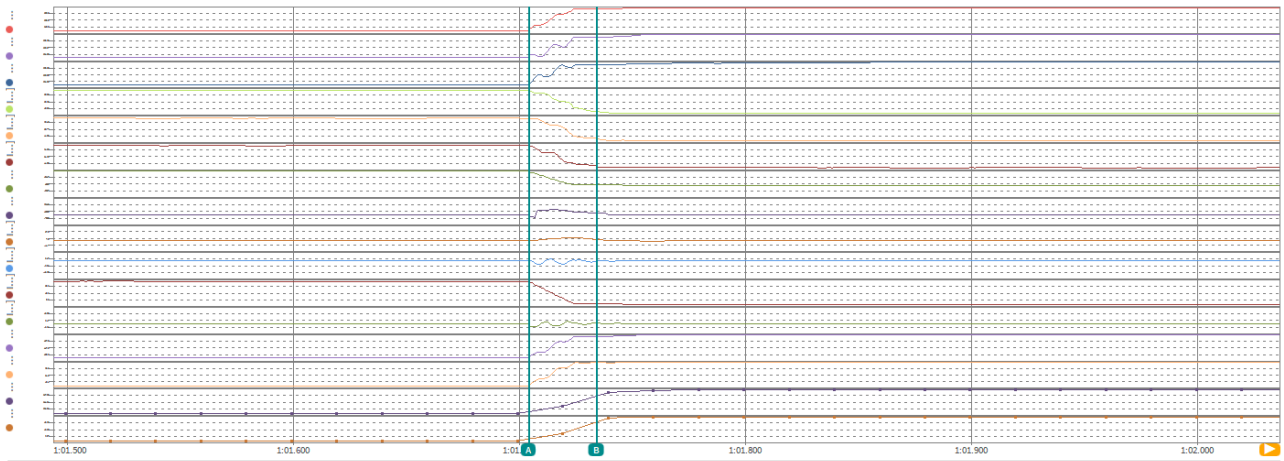
	A	B	间隔	有效值
时间 [s]	1:06.82430	1:16.82430	0:10.00000	
U1_tRMS_rc@AC [V]	276.2604	230.2481	-46.01227	230.3273
U2_tRMS_rc@AC [V]	241.3458	229.7614	-11.58435	229.7849
U3_tRMS_rc@AC [V]	241.1078	229.5954	-11.51242	229.6423
I1_tRMS_rc@AC [A]	2.422396	36.98351	34.56111	36.76052
I2_tRMS_rc@AC [A]	2.512261	37.15988	34.64762	36.92388
I3_tRMS_rc@AC [A]	3.260986	36.62537	33.36438	37.46752
P_t_rc@AC [W]	248.4712	25401.52	25153.04	25484.98
Q_t_rc@AC [var]	-2046.758	-1758.424	288.3346	1852.482
I_fund_Q_SYM+_rc@AC [A]	-1.274163	-1.103548	0.170615	0.837582
I_fund_Q_SYM-_rc@AC [A]	0.028980	5.735e-3	-0.023245	0.211759
I_fund_P_SYM+_rc@AC [A]	0.328438	36.83484	36.50640	36.95214
I_fund_P_SYM-_rc@AC [A]	-0.048916	0.164418	0.213333	0.241719
U_fund_SYM+_rc@AC [V]	437.0690	398.1408	-38.92816	398.2241
U_fund_SYM-_rc@AC [V]	41.29630	1.017679	-40.27862	1.513410
U+ [V]	252.3477	229.8856	-22.46209	229.9777
U- [V]	23.72786	0.595732	-23.13213	1.425833

Duration fault time



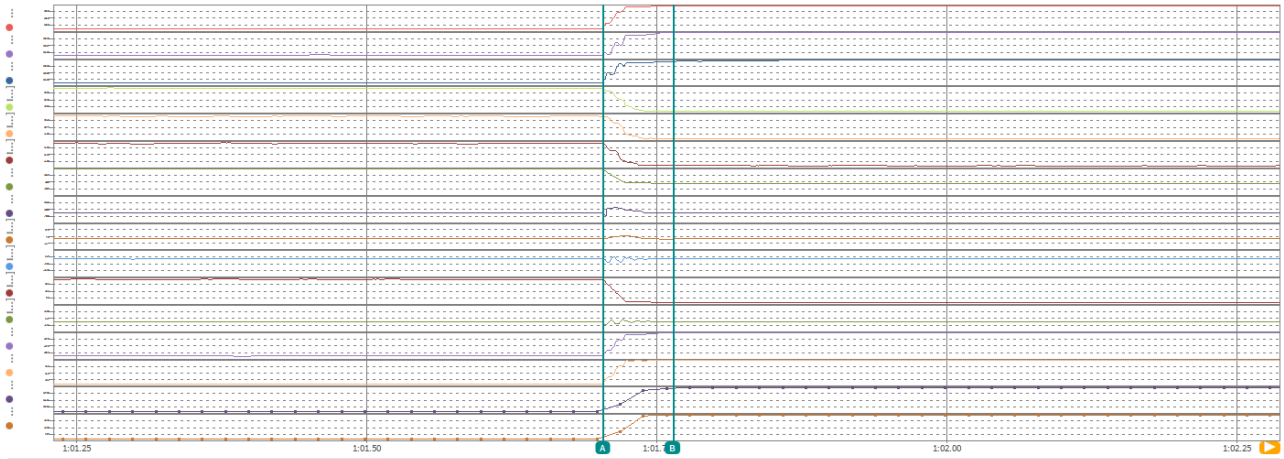
	A	B	间隔	有效值
时间 [s]	1:01.70430	1:06.82330	5.11900	
U1_tRMS_rc@AC [V]	230.3113	276.2653	45.95404	276.1956
U2_tRMS_rc@AC [V]	229.7383	241.3577	11.61940	241.3448
U3_tRMS_rc@AC [V]	229.6281	241.1099	11.48178	241.0597
I1_tRMS_rc@AC [A]	36.51095	2.430969	-34.07998	3.129782
I2_tRMS_rc@AC [A]	36.43465	2.507740	-33.92691	3.293854
I3_tRMS_rc@AC [A]	37.75848	3.266112	-34.49237	3.987210
P_t_rc@AC [W]	25388.71	256.4692	-25132.24	1030.098
Q_t_rc@AC [var]	-1761.300	-2048.353	-287.0531	2355.088
I_fund_Q_SYM+_rc@AC [A]	-0.533129	-1.277711	-0.744582	1.587679
I_fund_Q_SYM-_rc@AC [A]	0.188062	0.026219	-0.161843	0.276156
I_fund_P_SYM+_rc@AC [A]	36.81443	0.337701	-36.47673	1.475716
I_fund_P_SYM-_rc@AC [A]	-0.390866	-0.036872	0.353993	0.167302
U_fund_SYM+_rc@AC [V]	398.1797	437.0730	38.89325	436.9776
U_fund_SYM-_rc@AC [V]	0.762104	41.23929	40.47719	41.07568
U+ [V]	229.9063	252.3477	22.44138	252.1963
U- [V]	0.587893	23.72786	23.13997	23.65706

0-30ms



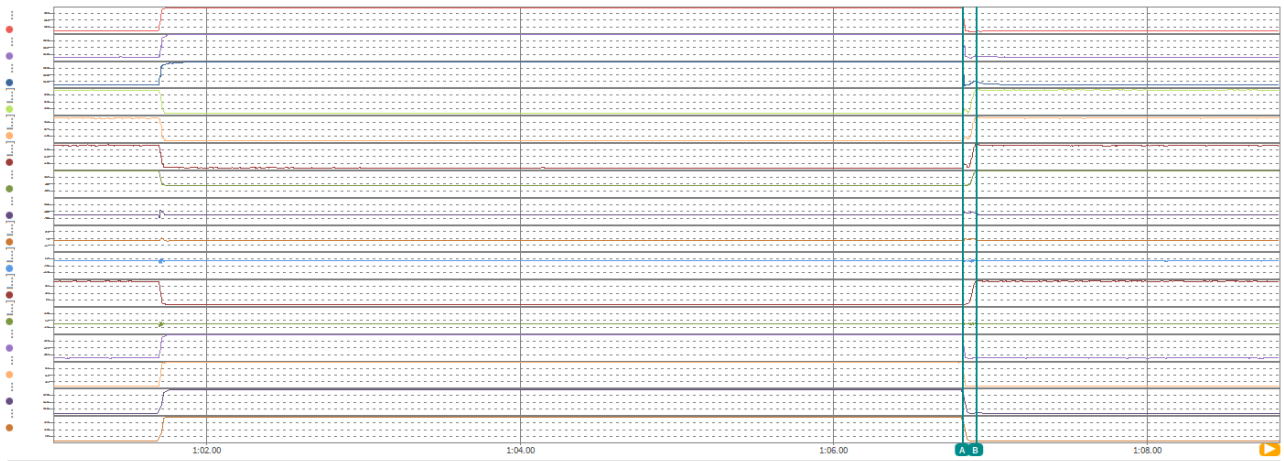
	A	B	间隔	有效值
时间 [s]	1:01.70430	1:01.73430	0.03000	
U1_tRMS_rc@AC [V]	230.3113	274.5997	44.28845	260.3362
U2_tRMS_rc@AC [V]	229.7383	239.8370	10.09875	235.7662
U3_tRMS_rc@AC [V]	229.6281	239.5398	9.911728	236.9073
I1_tRMS_rc@AC [A]	36.51095	4.988978	-31.52197	22.90870
I2_tRMS_rc@AC [A]	36.43465	6.358890	-30.07576	23.60457
I3_tRMS_rc@AC [A]	37.75848	5.863458	-31.89503	21.59292
P_t_rc@AC [W]	25388.71	1764.347	-23624.36	12509.73
Q_t_rc@AC [var]	-1761.300	3920.924	5682.224	10270.12
I_fund_Q_SYM+_rc@AC [A]	-0.533129	2.733135	3.266264	5.056391
I_fund_Q_SYM-_rc@AC [A]	0.188062	-0.559363	-0.747425	2.025013
I_fund_P_SYM+_rc@AC [A]	36.81443	2.242928	-34.57150	18.09248
I_fund_P_SYM-_rc@AC [A]	-0.390866	1.043151	1.434016	1.782210
U_fund_SYM+_rc@AC [V]	398.1797	434.3194	36.13965	422.1978
U_fund_SYM-_rc@AC [V]	0.762104	40.98042	40.21832	30.55216
U+ [V]	229.9063	236.4176	6.511298	233.1847
U- [V]	0.587893	7.894985	7.307091	5.598053

0-60ms



	A	B	间隔	有效值
时间 [s]	1:01.70430	1:01.76430	0.06000	
U1_tRMS_rc@AC [V]	230.3113	277.4915	47.18018	268.2017
U2_tRMS_rc@AC [V]	229.7383	241.5729	11.83467	238.2392
U3_tRMS_rc@AC [V]	229.6281	240.3132	10.68506	238.4115
I1_tRMS_rc@AC [A]	36.51095	2.969581	-33.54137	16.49347
I2_tRMS_rc@AC [A]	36.43465	3.027375	-33.40728	16.99917
I3_tRMS_rc@AC [A]	37.75848	4.211653	-33.54683	15.68083
P_t_rc@AC [W]	25388.71	556.1217	-24832.58	8946.020
Q_t_rc@AC [var]	-1761.300	-2506.529	-745.2284	7538.410
I_fund_Q_SYM+_rc@AC [A]	-0.533129	-2.033403	-1.500274	3.795072
I_fund_Q_SYM-_rc@AC [A]	0.188062	0.391787	0.203726	1.474877
I_fund_P_SYM+_rc@AC [A]	36.81443	0.724013	-36.09041	12.93083
I_fund_P_SYM-_rc@AC [A]	-0.390866	0.084283	0.475149	1.289738
U_fund_SYM+_rc@AC [V]	398.1797	437.4248	39.24503	429.0146
U_fund_SYM-_rc@AC [V]	0.762104	41.98972	41.22762	36.34737
U+ [V]	229.9063	251.7190	21.81272	242.1675
U- [V]	0.587893	23.96450	23.37661	17.00422

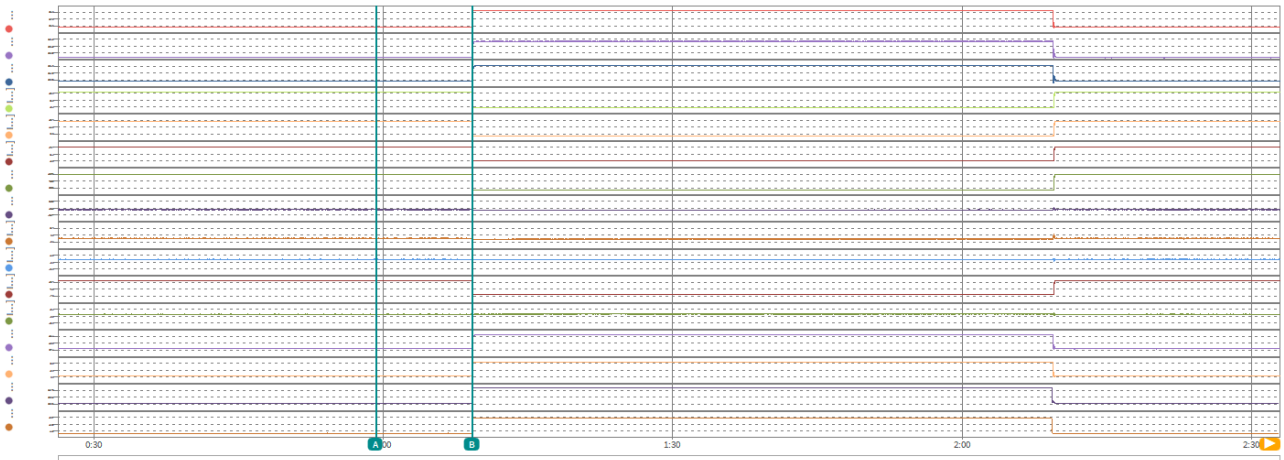
Recover time – Active power



	A	B	间隔	有效值
时间 [s]	1:06.82430	1:06.90830	0.08400	
U1_tRMS_rc@AC [V]	276.2604	229.8241	-46.43636	236.0140
U2_tRMS_rc@AC [V]	241.3458	230.3071	-11.03865	231.5696
U3_tRMS_rc@AC [V]	241.1078	231.3380	-9.769821	231.0975
I1_tRMS_rc@AC [A]	2.422396	36.49769	34.07529	17.31845
I2_tRMS_rc@AC [A]	2.512261	35.40613	32.89387	16.99080
I3_tRMS_rc@AC [A]	3.260986	38.57832	35.31733	17.49739
P_t_rc@AC [W]	248.4712	25036.17	24787.69	10786.76
Q_t_rc@AC [var]	-2046.758	4664.387	6711.145	5054.483
I_fund_Q_SYM+_rc@AC [A]	-1.274163	3.465917	4.740080	4.153837
I_fund_Q_SYM-_rc@AC [A]	0.028980	0.049124	0.020145	0.894639
I_fund_P_SYM+_rc@AC [A]	0.328438	36.19212	35.86368	15.61420
I_fund_P_SYM-_rc@AC [A]	-0.048916	1.088179	1.137095	0.831842
U_fund_SYM+_rc@AC [V]	437.0690	399.2162	-37.85278	403.0573
U_fund_SYM-_rc@AC [V]	41.29630	0.317173	-40.97912	12.26312
U+ [V]	252.3477	229.7549	-22.59278	237.7606
U- [V]	23.72786	0.208569	-23.51929	13.03783

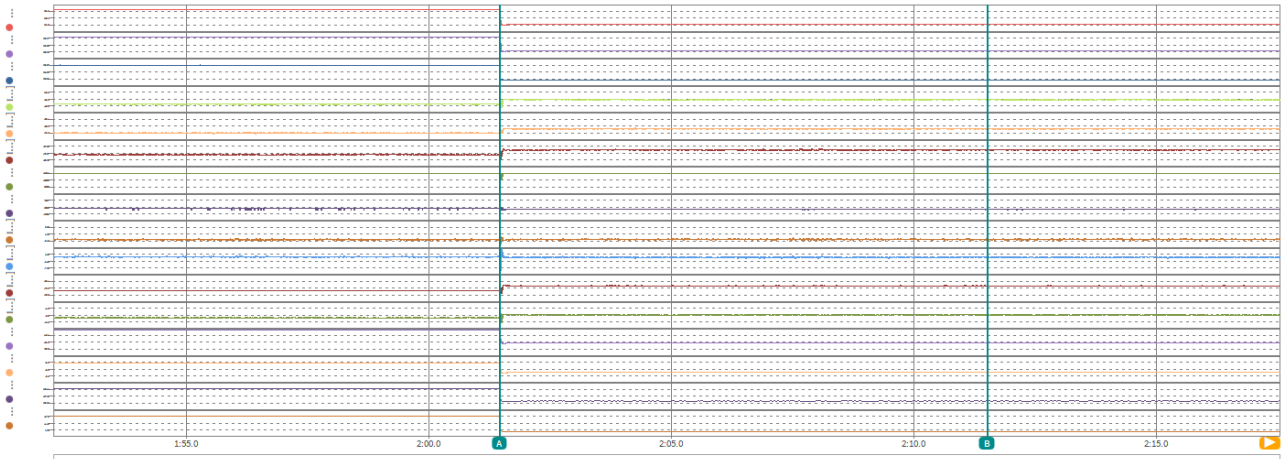
Test – VS4.2.1

Before fault



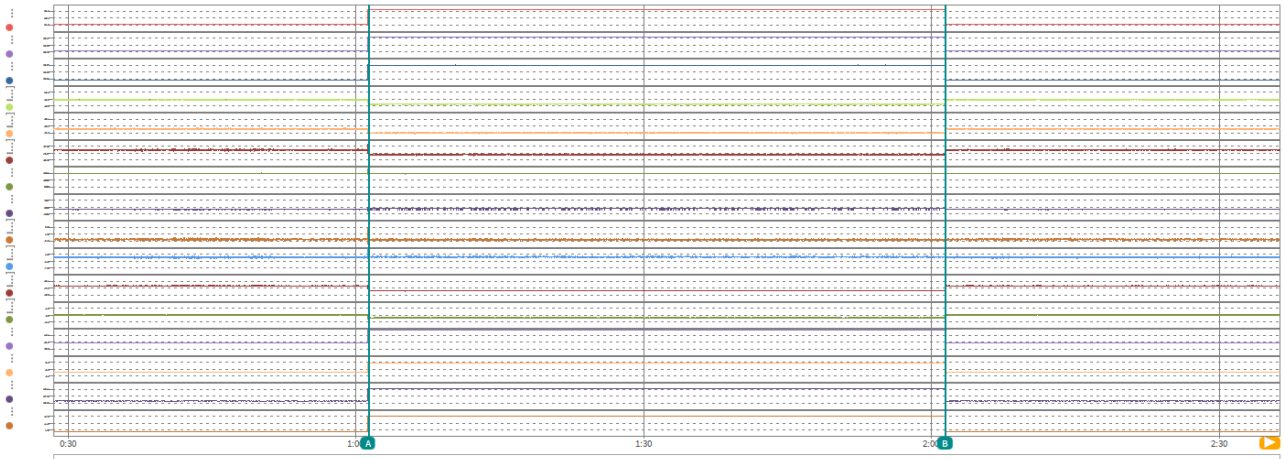
时间 [s]	A 0:59.2706	B 1:09.2709	间隔 0:10.0003	有效值
U1_tRMS_rc@AC [V]	230.5766	230.9820	0.405472	230.5343
U2_tRMS_rc@AC [V]	229.8366	229.8463	9.735e-3	229.8644
U3_tRMS_rc@AC [V]	229.8470	229.3311	-0.515900	229.8366
I1_tRMS_rc@AC [A]	180.1177	180.9549	0.837204	179.9136
I2_tRMS_rc@AC [A]	181.9585	182.6584	0.699875	181.3150
I3_tRMS_rc@AC [A]	184.3413	183.0637	-1.277603	183.5899
P_t_rc@AC [W]	125706.4	125747.5	41.10156	125327.9
Q_t_rc@AC [var]	1975.927	-1967.186	-3943.113	2321.773
I_fund_Q_SYM+_rc@AC [A]	0.418345	-0.017869	-0.436214	0.532335
I_fund_Q_SYM-_rc@AC [A]	0.631598	-0.097112	-0.728711	0.478667
I_fund_P_SYM+_rc@AC [A]	182.1166	182.2013	0.084717	181.5752
I_fund_P_SYM-_rc@AC [A]	-1.162715	0.103427	1.266142	0.894267
U_fund_SYM+_rc@AC [V]	398.5157	398.4540	-0.061646	398.5017
U_fund_SYM-_rc@AC [V]	1.136717	2.454177	1.317460	1.060240
U+ [V]	230.1164	230.0606	-0.055792	230.0819
U- [V]	0.616199	0.606084	-0.010115	0.611720

After fault



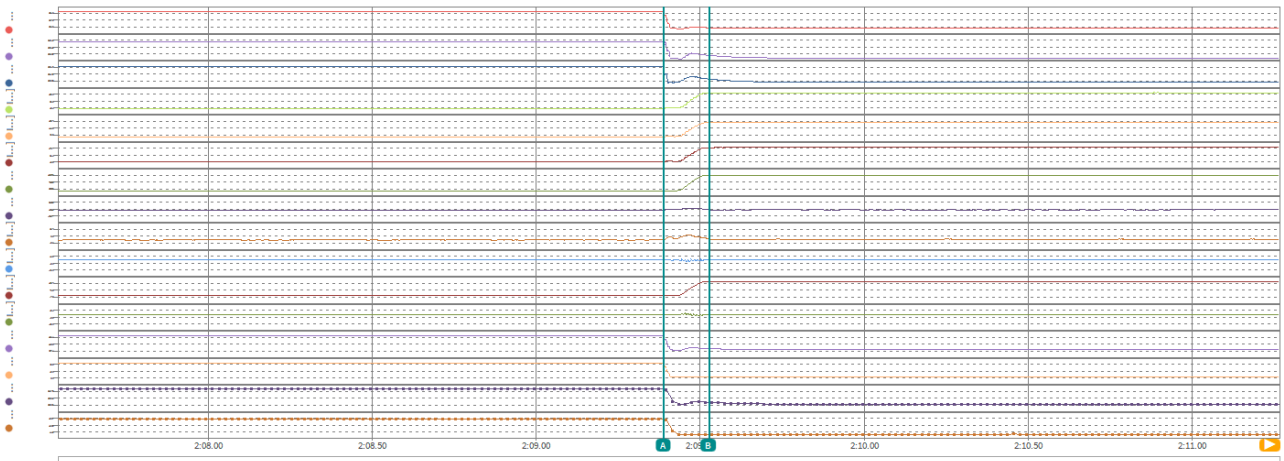
时间 [s]	A 2:01.4648	B 2:11.5095	间隔 0:10.0447	有效值
U1_tRMS_rc@AC [V]	265.0445	230.6375	-34.40692	230.6351
U2_tRMS_rc@AC [V]	239.3285	230.0263	-9.302216	229.9972
U3_tRMS_rc@AC [V]	239.1013	229.9086	-9.192703	229.8874
I1_tRMS_rc@AC [A]	155.5760	179.5111	23.93518	179.3180
I2_tRMS_rc@AC [A]	173.8130	180.4063	6.593216	180.7630
I3_tRMS_rc@AC [A]	175.4995	182.9843	7.484818	182.8417
P_t_rc@AC [W]	124581.1	124947.6	366.5391	124938.9
Q_t_rc@AC [var]	7306.382	2358.731	-4947.651	2415.583
I_fund_Q_SYM+_rc@AC [A]	0.323172	0.654024	0.330851	0.580509
I_fund_Q_SYM-_rc@AC [A]	0.299192	0.390433	0.091241	0.488621
I_fund_P_SYM+_rc@AC [A]	168.2695	180.9370	12.66745	180.9413
I_fund_P_SYM-_rc@AC [A]	-6.113988	-0.816860	5.297128	0.966400
U_fund_SYM+_rc@AC [V]	428.5211	398.6961	-29.82504	398.6636
U_fund_SYM-_rc@AC [V]	32.12204	1.036689	-31.08535	1.497339
U+ [V]	247.4477	230.1561	-17.29158	230.2180
U- [V]	18.64188	0.605734	-18.03615	1.241916

Duration fault time



时间 [s]	A 1:01.3414	B 2:01.4670	间隔 1:00.1256	有效值
U1_tRMS_rc@AC [V]	230.6375	265.0096	34.37210	265.0514
U2_tRMS_rc@AC [V]	229.9461	239.3354	9.389389	239.3534
U3_tRMS_rc@AC [V]	229.8874	239.0971	9.209686	239.1189
I1_tRMS_rc@AC [A]	179.4835	155.6234	-23.86009	155.2904
I2_tRMS_rc@AC [A]	180.2544	173.8469	-6.407455	173.3168
I3_tRMS_rc@AC [A]	183.2529	175.4398	-7.813156	176.0477
P_t_rc@AC [W]	124950.5	124585.2	-365.2734	124514.3
Q_t_rc@AC [var]	2317.625	7260.597	4942.972	7491.206
I_fund_Q_SYM+_rc@AC [A]	0.639017	0.255070	-0.383947	0.448377
I_fund_Q_SYM-_rc@AC [A]	0.816877	0.244114	-0.572763	0.677629
I_fund_P_SYM+_rc@AC [A]	180.9661	168.2732	-12.69286	168.1883
I_fund_P_SYM-_rc@AC [A]	-0.794793	-5.933989	-5.139196	6.292487
U_fund_SYM+_rc@AC [V]	398.6363	428.5275	29.89124	428.5649
U_fund_SYM-_rc@AC [V]	0.864067	32.42367	31.55960	32.32738
U+ [V]	230.1538	247.4477	17.29387	247.4335
U- [V]	0.628774	18.64188	18.01311	18.66136

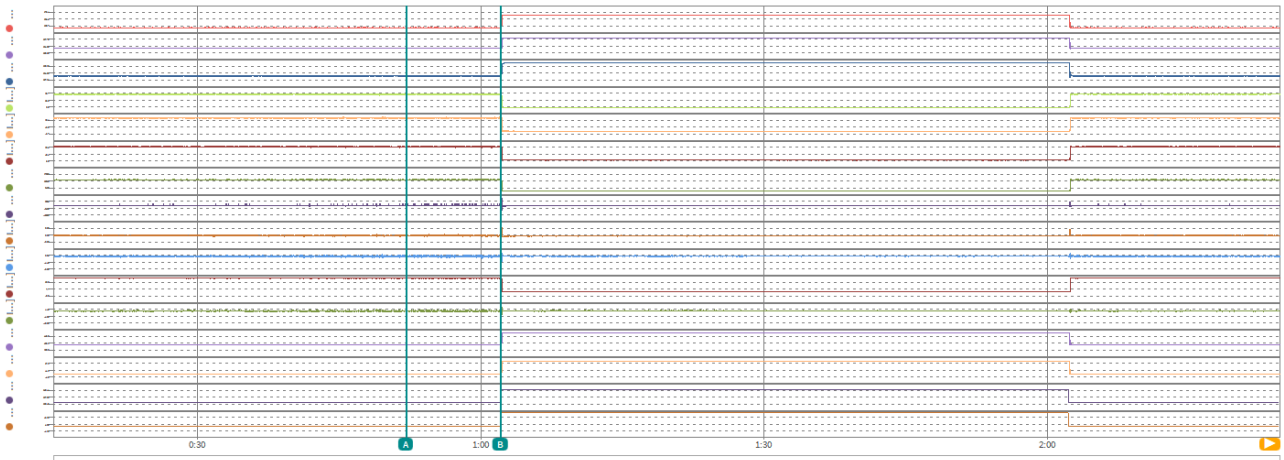
Recover time – Active power



时间 [s]	A 2:09.3898	B 2:09.5268	间隔 0.1371	有效值
U1_tRMS_rc@AC [V]	264.8174	231.9216	-32.89580	234.4798
U2_tRMS_rc@AC [V]	239.0963	231.5267	-7.569534	231.9250
U3_tRMS_rc@AC [V]	238.8208	231.6321	-7.188736	231.7628
I1_tRMS_rc@AC [A]	1.889684	179.1261	177.2365	97.28218
I2_tRMS_rc@AC [A]	1.957781	180.4227	178.4649	98.01559
I3_tRMS_rc@AC [A]	2.950864	181.0384	178.0876	98.86577
P_t_rc@AC [W]	34.04621	125125.1	125091.0	67587.04
Q_t_rc@AC [var]	-1672.901	5597.622	7270.523	9462.849
I_fund_Q_SYM+_rc@AC [A]	-0.882981	1.278889	2.161870	5.895702
I_fund_Q_SYM-_rc@AC [A]	-0.101361	0.133906	0.235268	2.051800
I_fund_P_SYM+_rc@AC [A]	0.046373	180.0038	179.9574	97.06727
I_fund_P_SYM-_rc@AC [A]	-0.032175	-0.586156	-0.553980	2.065672
U_fund_SYM+_rc@AC [V]	428.0915	401.2943	-26.79724	402.9361
U_fund_SYM-_rc@AC [V]	32.64605	0.721835	-31.92421	8.648191
U+ [V]	247.1061	231.9537	-15.15242	235.3677
U- [V]	18.81333	0.441917	-18.37141	9.139450

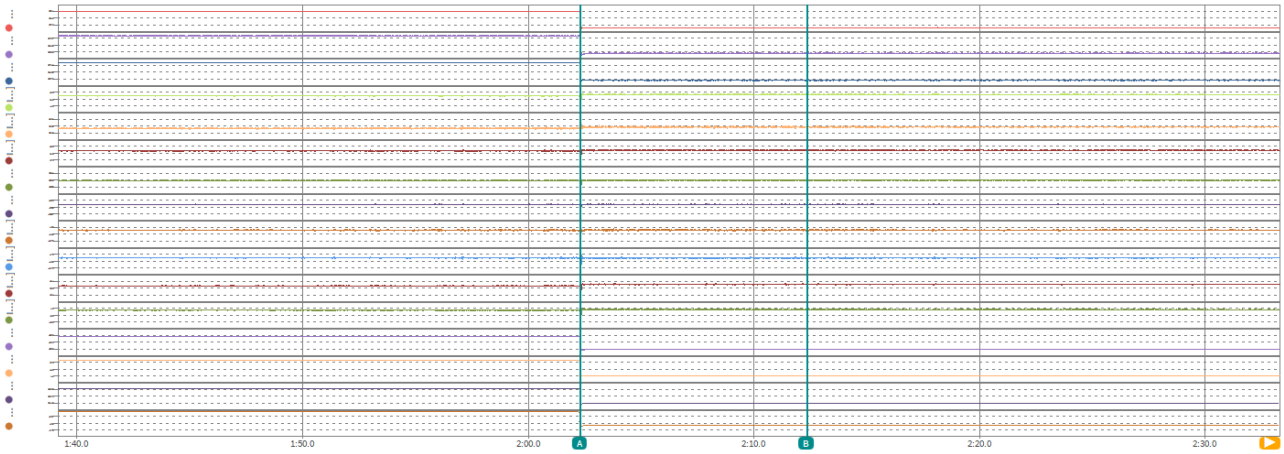
Test – VS4.2.2

Before fault



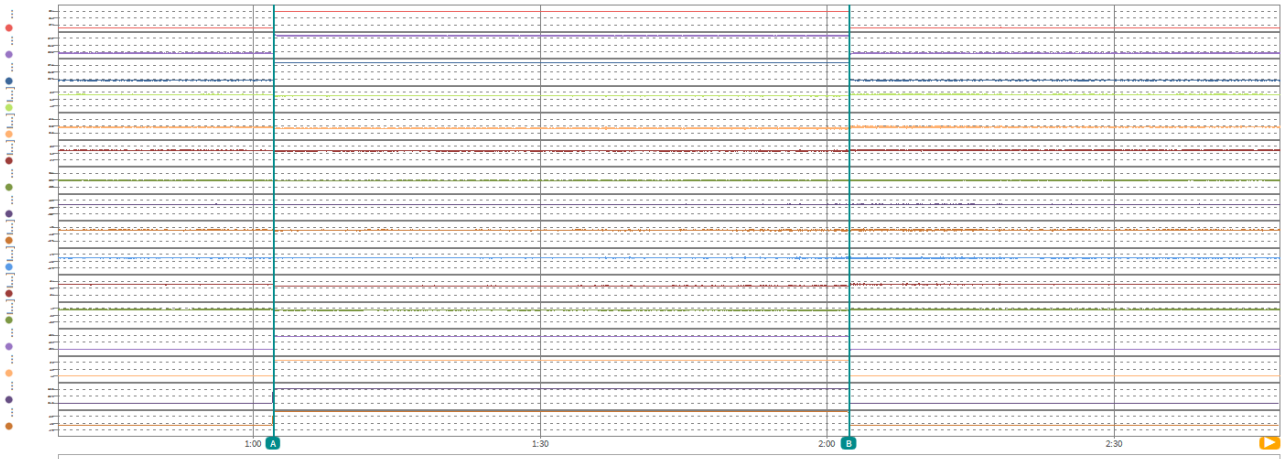
时间 [s]	A 0:52.1449	B 1:02.1490	间隔 0:10.0041	有效值
U1_tRMS_rc@AC [V]	230.4116	230.2795	-0.132126	230.2899
U2_tRMS_rc@AC [V]	229.7350	229.7886	0.053528	229.7708
U3_tRMS_rc@AC [V]	229.7232	229.6757	-0.047485	229.6207
I1_tRMS_rc@AC [A]	37.69198	35.45394	-2.238041	36.55682
I2_tRMS_rc@AC [A]	36.36045	37.24476	0.884312	36.80860
I3_tRMS_rc@AC [A]	38.29679	37.33107	-0.965717	37.35556
P_t_rc@AC [W]	25762.26	25222.43	-539.8281	25381.12
Q_t_rc@AC [var]	-1945.294	-1937.989	7.304810	1898.480
I_fund_Q_SYM+_rc@AC [A]	-0.262509	-1.019015	-0.756506	0.742059
I_fund_Q_SYM-_rc@AC [A]	0.851102	-0.321343	-1.172445	0.335862
I_fund_P_SYM+_rc@AC [A]	37.34489	36.56936	-0.775528	36.80121
I_fund_P_SYM-_rc@AC [A]	-0.231505	-0.859308	-0.627803	0.359170
U_fund_SYM+_rc@AC [V]	398.2932	398.2193	-0.073914	398.1845
U_fund_SYM-_rc@AC [V]	1.046441	0.705436	-0.341005	1.022765
U+ [V]	229.9220	229.9442	0.022160	229.8987
U- [V]	0.558787	0.558890	1.029e-4	0.590380

After fault



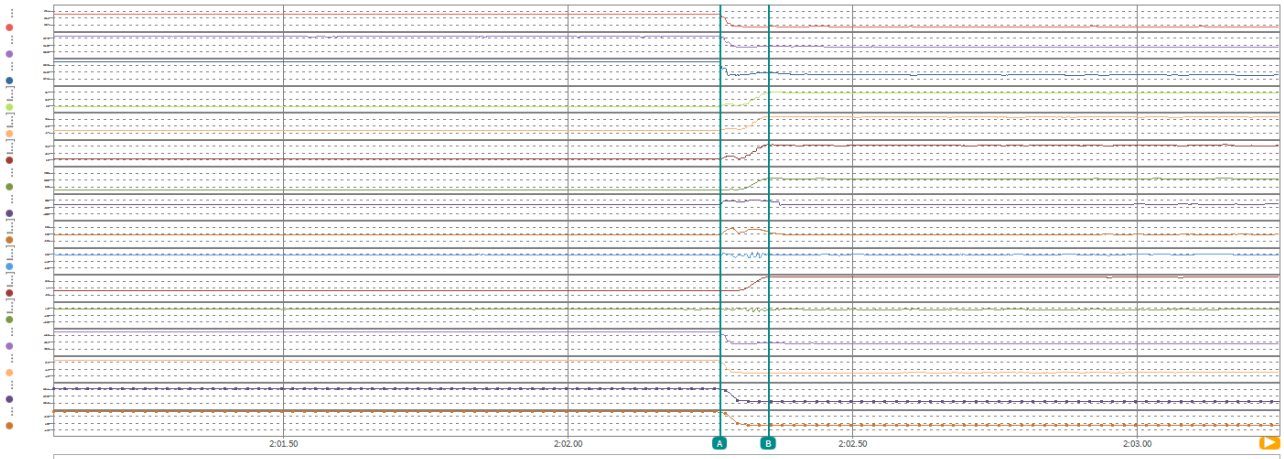
时间 [s]	A 2:02.3033	B 2:12.3415	间隔 0:10.0382	有效值
U1_tRMS_rc@AC [V]	264.7862	230.2084	-34.57776	230.3324
U2_tRMS_rc@AC [V]	239.0651	229.7614	-9.303680	229.8081
U3_tRMS_rc@AC [V]	238.8640	229.6107	-9.253265	229.6280
I1_tRMS_rc@AC [A]	31.98706	36.89292	4.905857	36.88117
I2_tRMS_rc@AC [A]	34.93513	36.71745	1.782318	37.18236
I3_tRMS_rc@AC [A]	36.32450	37.53933	1.214832	37.65835
P_t_rc@AC [W]	25354.16	25478.87	124.7070	25610.63
Q_t_rc@AC [var]	-2705.588	-1888.256	817.3318	1946.877
I_fund_Q_SYM+_rc@AC [A]	-0.862465	-0.599440	0.263025	0.695632
I_fund_Q_SYM-_rc@AC [A]	6.930e-3	0.160128	0.153198	0.455098
I_fund_P_SYM+_rc@AC [A]	34.27650	36.94862	2.672115	37.13011
I_fund_P_SYM-_rc@AC [A]	-1.181224	0.012235	1.193459	0.491096
U_fund_SYM+_rc@AC [V]	428.0781	398.1267	-29.95135	398.2319
U_fund_SYM-_rc@AC [V]	32.37067	0.946211	-31.42446	1.701058
U+ [V]	247.1700	229.8622	-17.30787	229.9651
U- [V]	18.74368	0.561654	-18.18203	1.299083

Duration fault time



时间 [s]	A 1:02.1879	B 2:02.3070	间隔 1:00.1191	有效值
U1_tRMS_rc@AC [V]	230.3307	264.8224	34.49162	264.7759
U2_tRMS_rc@AC [V]	229.8307	239.0711	9.240356	239.1250
U3_tRMS_rc@AC [V]	229.5796	238.8801	9.300583	238.8403
I1_tRMS_rc@AC [A]	36.90007	32.46391	-4.436153	31.76232
I2_tRMS_rc@AC [A]	37.12604	34.92034	-2.205696	35.21865
I3_tRMS_rc@AC [A]	37.21447	36.91566	-0.298813	36.22639
P_t_rc@AC [W]	25515.09	25645.75	130.6641	25363.03
Q_t_rc@AC [var]	-1758.349	-2465.889	-707.5400	2467.800
I_fund_Q_SYM+_rc@AC [A]	-0.466532	-1.006534	-0.540002	0.783020
I_fund_Q_SYM-_rc@AC [A]	0.132817	0.334988	0.202170	0.280988
I_fund_P_SYM+_rc@AC [A]	36.98987	34.65369	-2.336182	34.30043
I_fund_P_SYM-_rc@AC [A]	0.158112	-0.985347	-1.143459	1.364228
U_fund_SYM+_rc@AC [V]	398.2179	428.1208	29.90292	428.1037
U_fund_SYM-_rc@AC [V]	0.851154	32.53495	31.68380	32.45321
U+ [V]	229.8911	247.1700	17.27898	247.1655
U- [V]	0.557762	18.74368	18.18592	18.73302

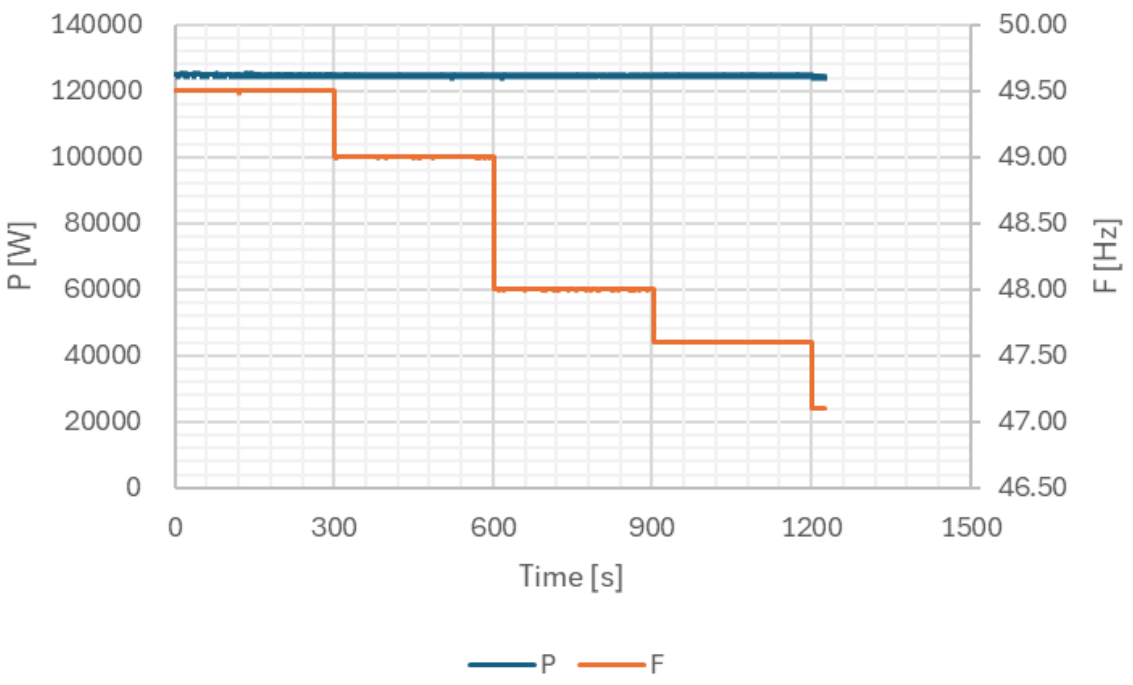
Recover time – Active power



时间 [s]	A 2:02.2679	B 2:02.3532	间隔 0.0853	有效值
U1_tRMS_rc@AC [V]	264.7567	230.3342	-34.42252	235.2966
U2_tRMS_rc@AC [V]	239.0914	230.5662	-8.525208	231.5358
U3_tRMS_rc@AC [V]	238.7765	231.2824	-7.494034	231.0673
I1_tRMS_rc@AC [A]	1.916109	36.59291	34.67681	18.10887
I2_tRMS_rc@AC [A]	1.965031	37.21074	35.24571	18.85364
I3_tRMS_rc@AC [A]	3.426329	39.42162	35.99529	19.42169
P_t_rc@AC [W]	61.51693	25788.86	25727.34	12012.62
Q_t_rc@AC [var]	-1794.197	4181.519	5975.716	4927.831
I_fund_Q_SYM+_rc@AC [A]	-1.051574	2.425305	3.476879	3.853314
I_fund_Q_SYM-_rc@AC [A]	0.252975	0.775932	0.522957	1.024137
I_fund_P_SYM+_rc@AC [A]	0.077638	37.24910	37.17146	17.36623
I_fund_P_SYM-_rc@AC [A]	0.032102	-0.348616	-0.380717	0.810375
U_fund_SYM+_rc@AC [V]	428.0368	399.6288	-28.40802	402.7113
U_fund_SYM-_rc@AC [V]	32.57568	0.244870	-32.33081	10.60845
U+ [V]	247.0928	230.0161	-17.07678	236.7887
U- [V]	18.78678	0.166745	-18.62003	11.17693

4.4.3	Minimal requirement for active power delivery at under-frequency	P

Graph of frequency a) to b) to c) to d) to e):



	Switch to:				
5-min mean value (each)	a) 49.50 [Hz]	b) 49.00 [Hz]	c) 48.00 [Hz]	d) 47.60 [Hz]	e) 47.10 [Hz]
Frequency [Hz]:	49.50	49.00	48.00	47.60	47.10
Active power [W]:	124928	124740	124667	124718	124573
$\Delta P/P_M$ [%] per 1 Hz:	--	0.21	0.27	0.23	0.34

Test:

Operating points a) to d) must be kept for at least 5 minutes.

Operating points e) must be kept for at least 20s.

The test must be carried out at 100% P_n.

With a programmable AC source, the PGU is operated at 100% P_n and 49.50 ± 0.01 Hz, Since then the frequency has changed to 49.00Hz, 48.00Hz, 47.60Hz, 47.10Hz, A 5-min mean value is recorded both before and after the frequency change.

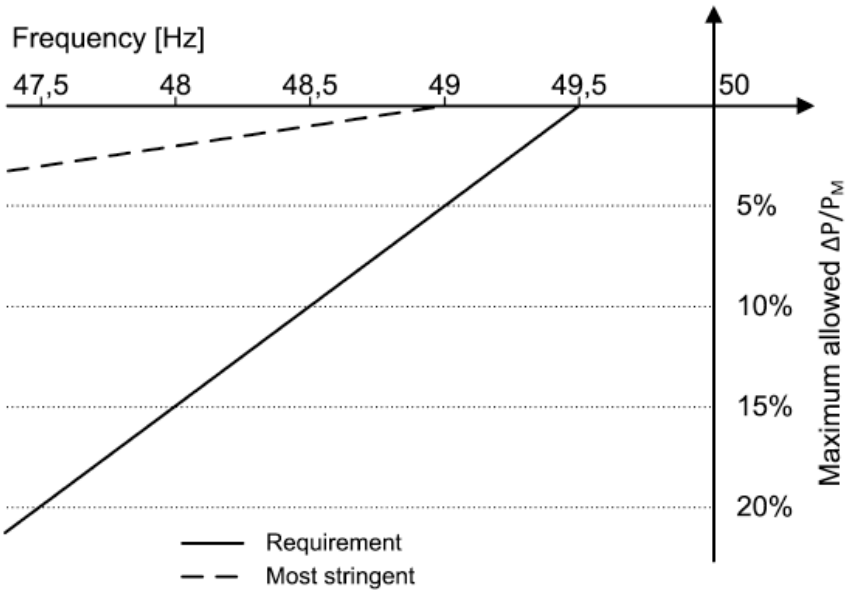
Assessment criterion:

The test is passed when the micro-generator

- The frequency should then be set to 49.5 Hz for 5 minutes. The output should remain at 100% of

registered Capacity.

- The frequency should then be set to 49.0 Hz and once the output has stabilised, held at this frequency for 5 minutes. The Active Power output must not be below 99% of registered Capacity.
- The frequency should then be set to 48.0 Hz and once the output has stabilised, held at this frequency for 5 minutes. The Active Power output must not be below 97% of registered Capacity.
- The frequency should then be set to 47.6 Hz and once the output has stabilised, held at this frequency for 5 minutes. The Active Power output must not be below 96.2% of registered Capacity.
- The frequency should then be set to 47.1 Hz and held at this frequency for 20s. The Active Power output must not be below 95.0% of registered Capacity and the Synchronous Power Generating Module must not trip in less than the 20s



Maximum allowable power reduction in case of under-frequency

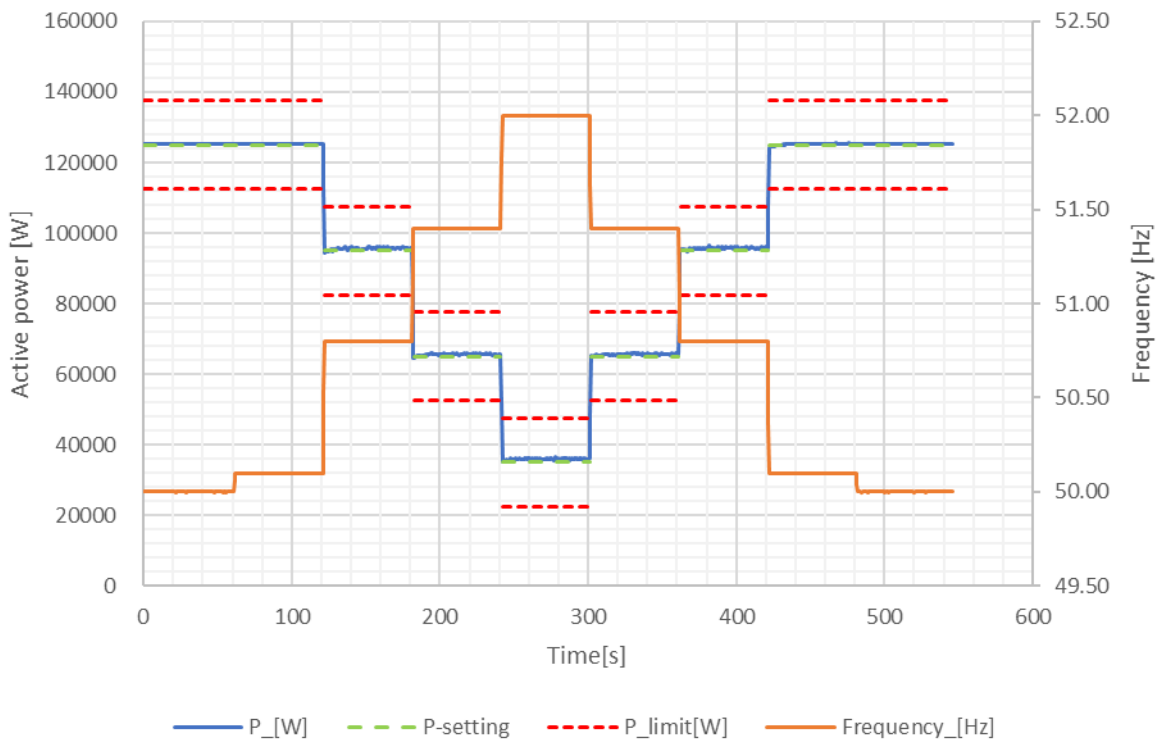
EN 50549-10:2022		
Clause	**Test items**	**Remark**
5.4	**Active response to frequency deviation**	
5.4.3.2	Power response to over-frequencies	P
5.4.3.3	Power response to under-frequencies	P

5.4.3.2 Power response to over-frequency (For system with energy storage)									P
Test:									
1-min mean value [Hz]:	a) 50.00 ±0.01	b) 50.10 ±0.01	c) 50.80 ±0.01	e) 51.40 ±0.01	d) 52.00 ±0.01	f) 51.40 ±0.01	g) 50.80 ±0.01	h) 50.10 ±0.01	i) 50.00 ±0.01
1. Measurement a) to i): Active power output =100% P_{Emax} s=5% (40% P_{ref} / Hz), threshold frequency for start/return: 50.2Hz, $P_{ref}=P_M$									
Frequency [Hz]:	50.00	50.10	50.80	51.40	52.00	51.40	50.80	50.10	50.00
P_M [W]:	125000	125000	95000	65000	35000	65000	95000	125000	125000
P_{E60} [W]:	125182	125224	95638	65631	35974	65674	95698	125218	125262
$\Delta P_{E60}/P_M$ [%]:	0.15	0.18	0.51	0.51	0.78	0.54	0.56	0.17	0.21
Dead time(≤2s)	-	-	0.2	0.2	0.2	0.2	0.2	-	-
Step response time (≤30s)	-	-	0.4	0.4	0.6	0.2	0.2	-	-
Setting time(s)	-	-	0.4	0.4	0.6	0.2	0.2	-	-
Limit $\Delta P/P_{1min}$:	± 10 % of P_{Emax}								
Test:									
1-min mean value [Hz]:	a) 50.00 ±0.01	b) 50.10 ±0.01	c) 50.80 ±0.01	e) 51.40 ±0.01	d) 52.00 ±0.01	f) 51.40 ±0.01	g) 50.80 ±0.01	h) 50.10 ±0.01	i) 50.00 ±0.01
2. Measurement a) to i): Active power output 50% after freezing = 100% P_{Emax} s=5% (40% P_{ref} / Hz), threshold frequency for start/return: 50.2Hz, $P_{ref}=P_M$									
Frequency [Hz]:	50.00	50.10	50.80	51.40	52.00	51.40	50.80	50.10	50.00
P_M [W]:	62500	62500	32500	2500	-27500	2500	32500	125000	125000
P_{E60} [W]:	62575	62595	33088	2937	-26676	2897	33145	125708	125630
$\Delta P_{E60}/P_M$ [%]:	0.06	0.08	0.47	0.35	0.66	0.32	0.52	0.57	0.50
Dead time(≤2s)	-	-	0.2	0.2	0.4	0.2	0.2	-	-
Step response time (≤30s)	-	-	0.4	0.6	0.8	0.4	0.2	-	-
Setting time(s)	-	-	0.4	0.6	0.8	0.4	0.2	-	-
Limit $\Delta P/P_{1min}$:	± 10 % of P_{Emax}, ≤ 10% P_{Emax} /min								

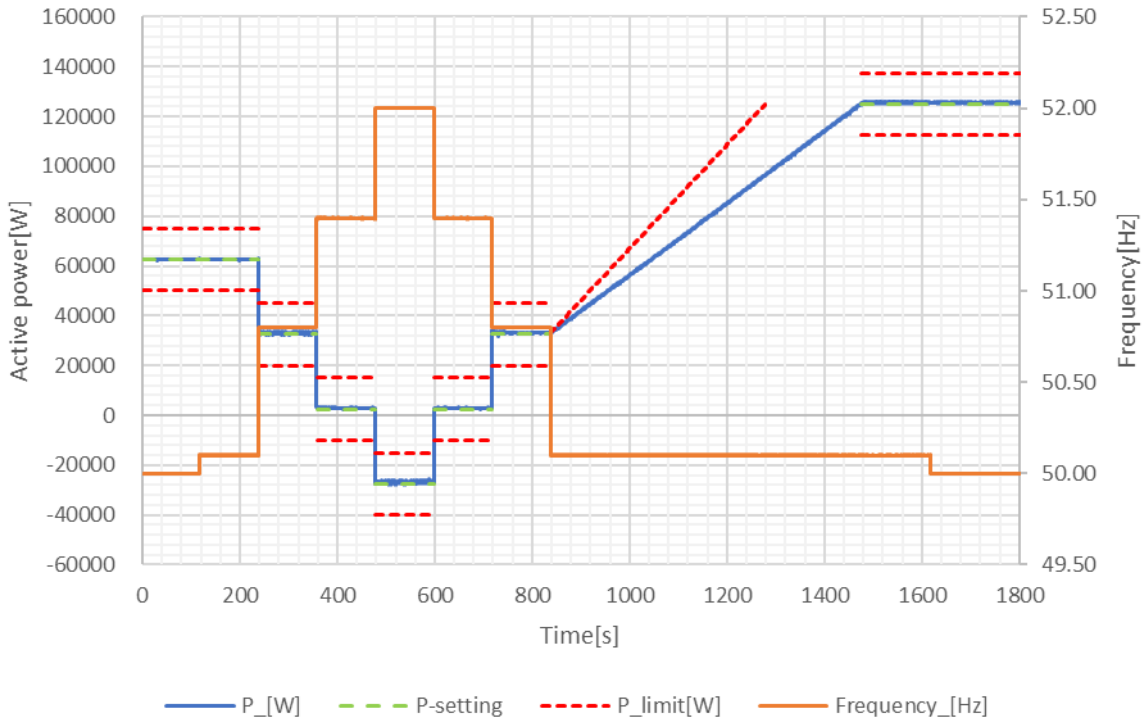
Test:									
1-min mean value [Hz]:	a) 50.00 ±0.01	b) 50.10 ±0.01	c) 50.80 ±0.01	e) 51.40 ±0.01	d) 52.00 ±0.01	f) 51.40 ±0.01	g) 50.80 ±0.01	h) 50.10 ±0.01	i) 50.00 ±0.01
3. Measurement a) to i): Active power output -50% s=5%(40% Pref / Hz), threshold frequency for start/return: 50.2Hz, Pref=P_{Max}									
Frequency [Hz]:	50.00	50.10	50.80	51.40	52.00	51.40	50.80	50.10	50.00
P_M [W]:	-62500	-62500	-92500	-122500	-125000	-122500	-92500	-62500	-62500
P_{E60} [W]:	-62784	-62830	-92372	-122856	-125289	-122847	-92391	-62773	-62790
$\Delta P_{E60}/P_M$ [%]:	0.23	0.26	0.10	0.28	0.23	0.28	0.09	0.22	0.23
Dead time(≤2s)	-	-	0.2	0.2	0.2	0.2	0.2	0.2	-
Step response time (≤30s)	-	-	0.4	0.2	0.6	0.2	0.6	0.4	-
Setting time(s)	-	-	0.4	0.2	0.6	0.2	0.6	0.4	-
Limit $\Delta P/P_{1min}$:	± 10 % of P_{Emax}								
Test:									
1-min mean value [Hz]:	a) 50.00 ±0.01	b) 50.10 ±0.01	c) 50.80 ±0.01	e) 51.40 ±0.01	d) 52.00 ±0.01	f) 51.40 ±0.01	g) 50.80 ±0.01	h) 50.10 ±0.01	i) 50.00 ±0.01
4. Measurement a) to i): Active power output 60% s=2%(100% Pref / Hz), threshold frequency for start/return: 50.5Hz, Pref=P_{Max}									
Frequency [Hz]:	50.00	50.25	51.00	51.50	52.00	51.50	51.00	50.40	50.00
P_M [W]:	75000	75000	12500	-50000	-112500	-112500	-112500	75000	75000
P_{E60} [W]:	74706	74704	13511	-48891	-113172	-113264	-113276	74792	74806
$\Delta P_{E60}/P_M$ [%]:	0.23	0.24	0.81	0.89	0.54	0.61	0.62	0.17	0.16
Dead time(≤2s)	-	-	0.2	0.2	0.2	-	-	-	-
Step response time (≤30s)	-	-	1.2	0.8	0.6	-	-	-	-
Setting time(s)	-	-	1.2	0.8	0.6	-	-	-	-
Limit $\Delta P/P_{1min}$:	± 10 % of P_{Emax}, ≤ 10% P_{Emax} /min, hold 1s								

Test:									
1-min mean value [Hz]:	a) 50.00 ±0.01	b) 50.10 ±0.01	c) 50.80 ±0.01	e) 51.40 ±0.01	d) 52.00 ±0.01	f) 51.40 ±0.01	g) 50.80 ±0.01	h) 50.10 ±0.01	i) 50.00 ±0.01
5. Measurement a) to i): Active power output 40% s=12% (16.67% P_{ref} / Hz), threshold frequency for start: 50.2Hz, for return: 50.05Hz, $P_{ref}=P_M$, hold 600s									
Frequency [Hz]:	50.00	50.10	50.80	51.40	52.00	51.40	50.80	50.10	50.00
P_M [W]:	50000	50000	37500	25000	12500	12500	12500	12500	50000
P_{E60} [W]:	49968	49975	37653	25200	12453	12440	12472	12477	49941
$\Delta P_{E60}/P_M$ [%]:	0.03	0.02	0.12	0.16	0.04	0.05	0.02	0.02	0.05
Dead time(≤2s)	-	-	0.2	0.2	0.2	-	-	-	-
Step response time (≤30s)	-	-	0.6	1.0	1.0	-	-	-	-
Setting time(s)	-	-	0.6	1.0	1.0	-	-	-	-
Limit $\Delta P/P_{1min}$:	± 10 % of P_{Emax}, ≤ 10% P_{Emax} /min, hold 600s								

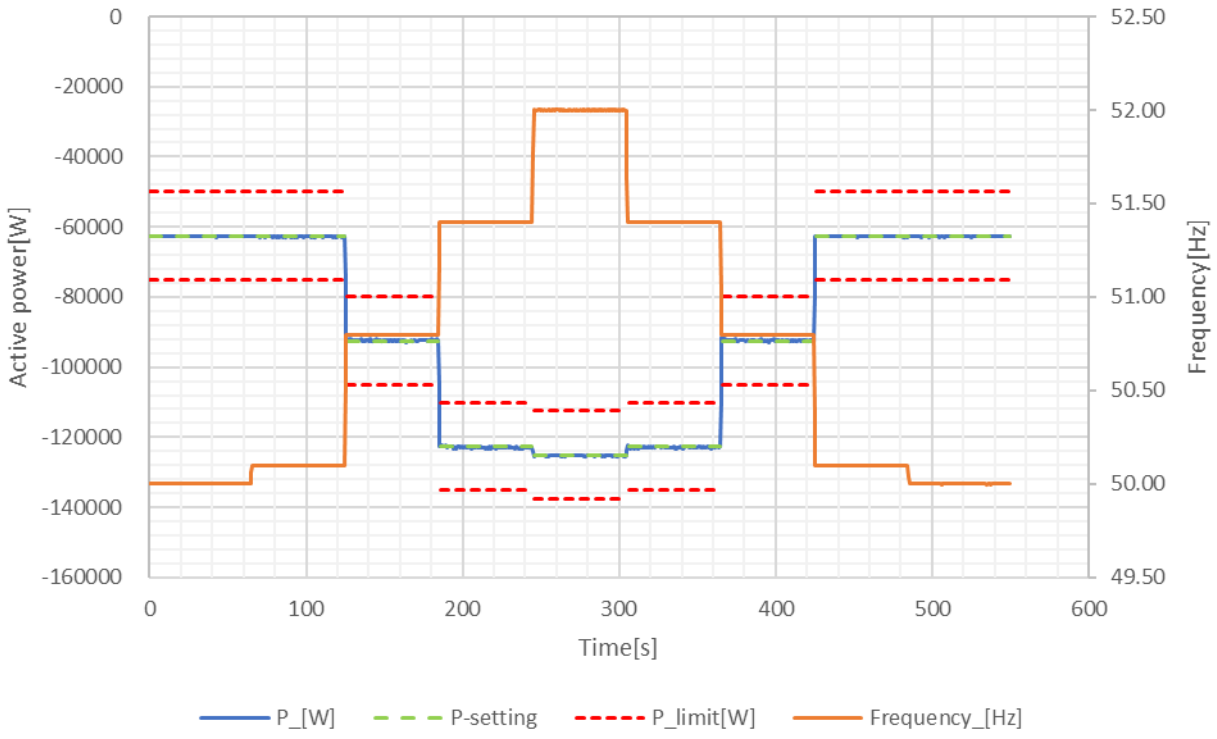
Graph of Measurement 1.: Active power output 100% P_{Emax}



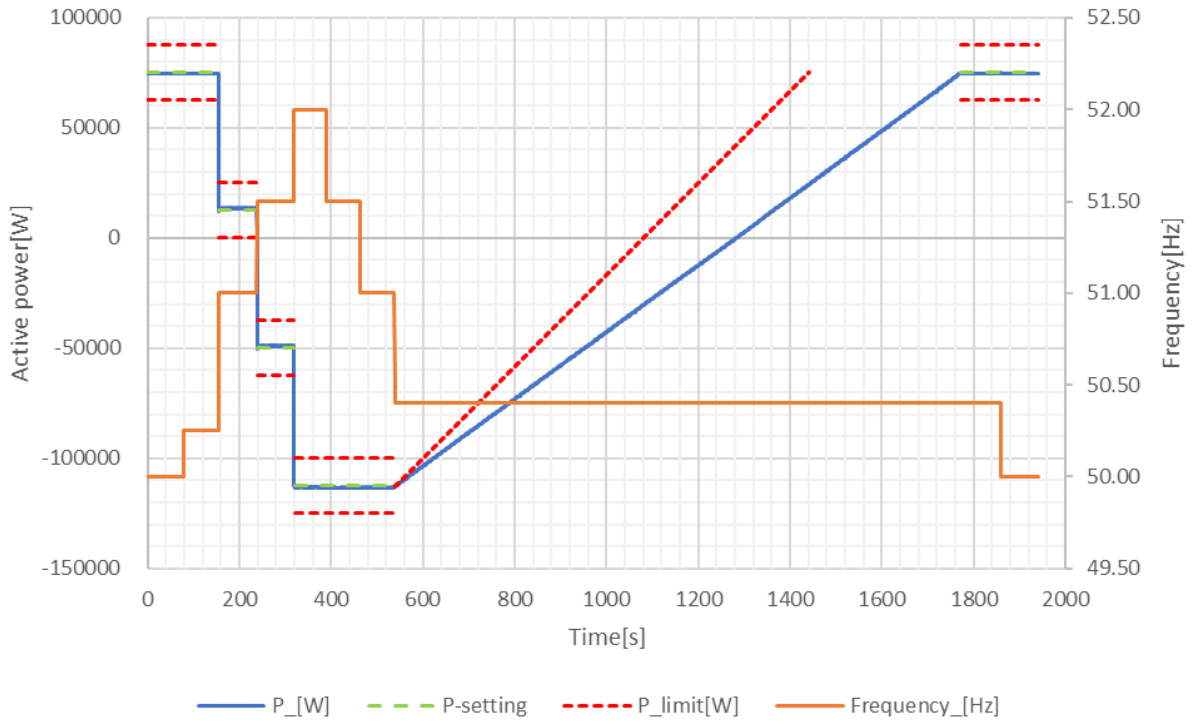
Graph of Measurement 2.: Active power output 50% P_{Emax}



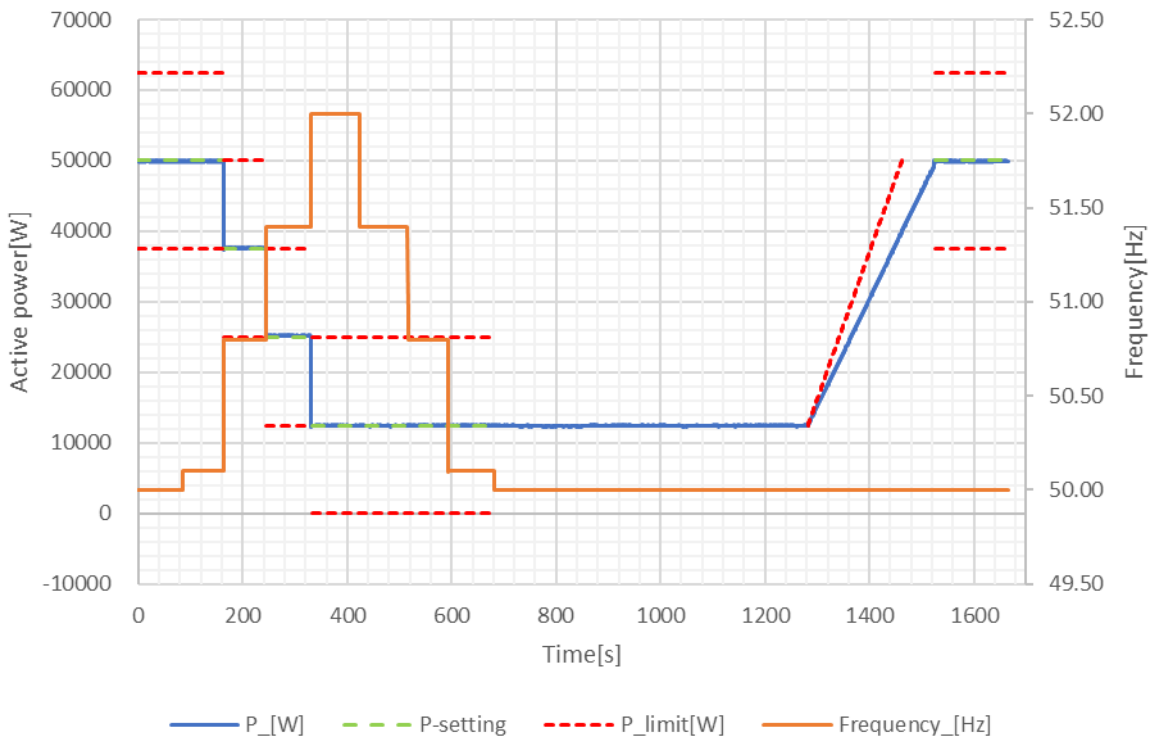
Graph of Measurement 3.: Active power output -50% P_{Emax}



Graph of Measurement 4.: Active power output 60% P_{Emax}



Graph of Measurement 5.: Active power output 40% P_{Emax}



Notes:

Setting (a) for other non-synchronous generating technology

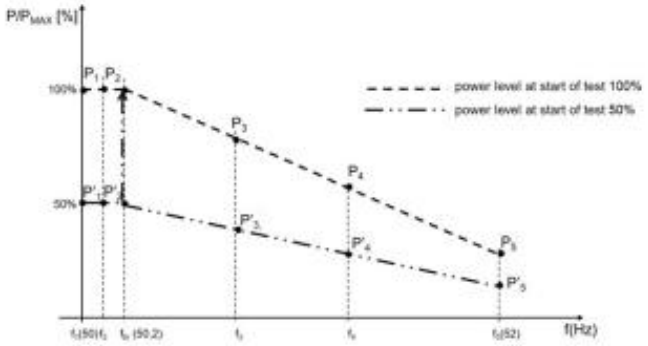


Figure 19 — Other non-synchronous generating technology ($P_{ref} = P_M$) without configured deactivation threshold, setting (a), example

Setting (b) other non-synchronous generating technology

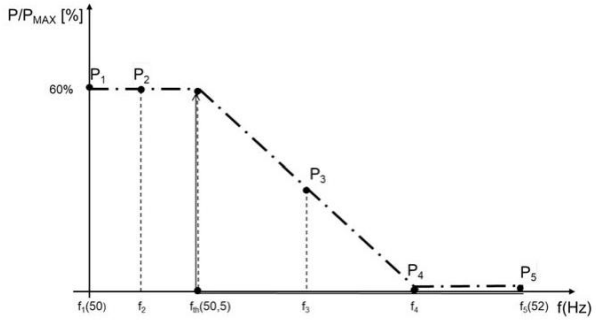


Figure 20 — Other non-synchronous generating technology ($P_{ref} = P_M$) with configured deactivation threshold, setting (b), example

Setting (c) other non-synchronous generating technology

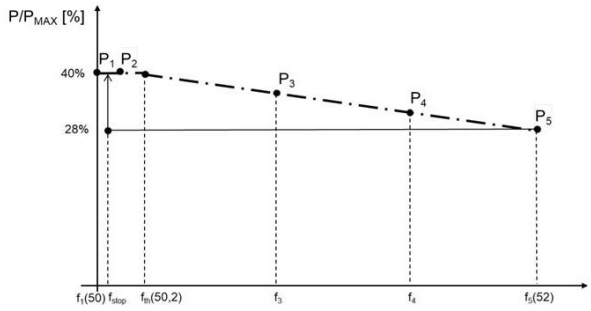
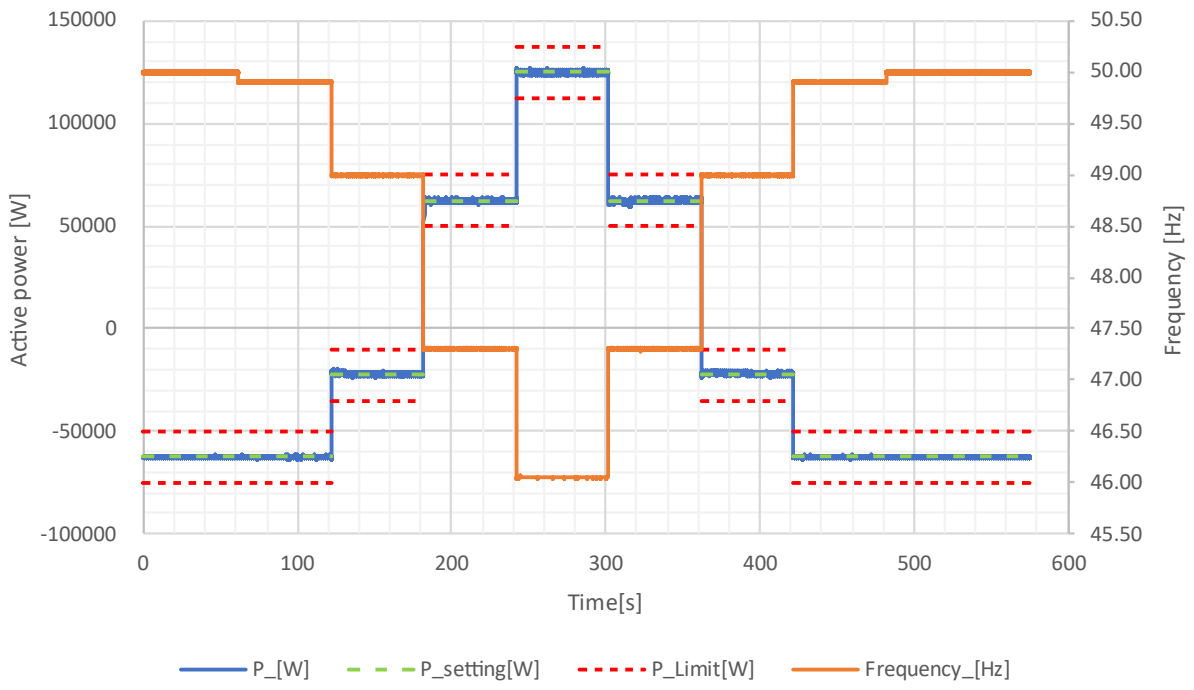


Figure 21 — Other non-synchronous generating technology ($P_{ref} = P_M$) with configured deactivation threshold, setting (c), example

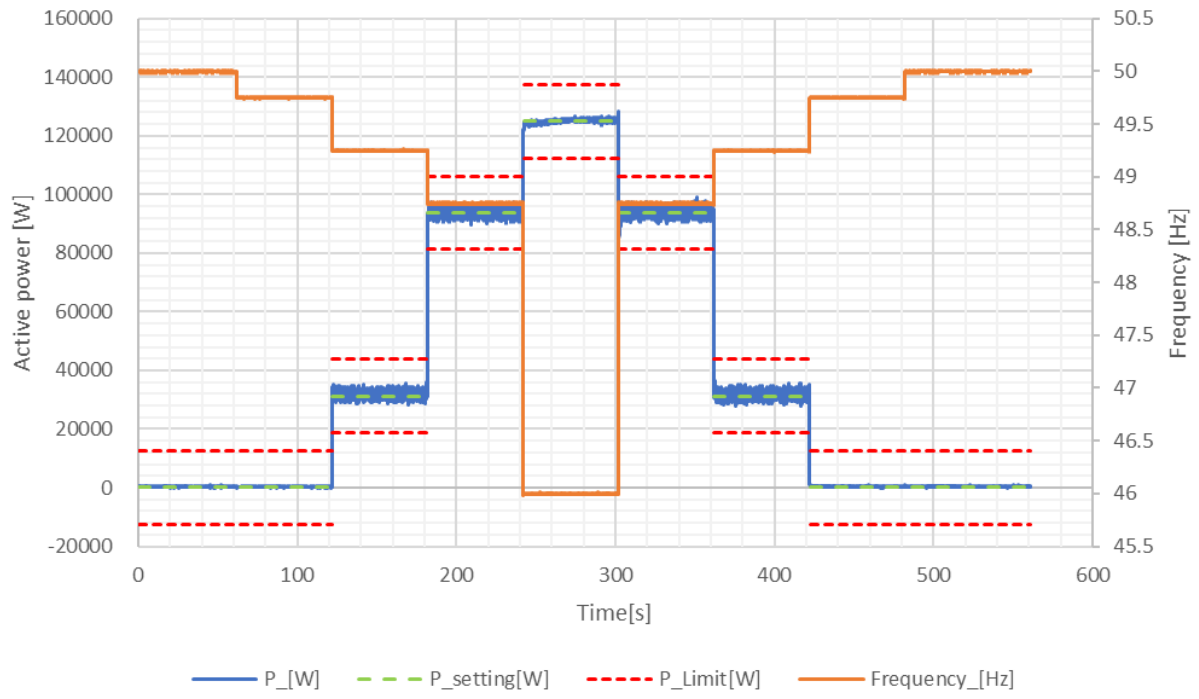
5.4.3.3 Power response to under-frequency (For system with energy storage)									P
Test a:									
1-min mean value [Hz]:	a) 50.00 ±0.01	b) 49.90 ±0.01	c) 49.00 ±0.01	e) 47.30 ±0.01	d) 46.05 ±0.01	f) 47.30 ±0.01	g) 49.00 ±0.01	h) 49.90 ±0.01	i) 50.00 ±0.01
1. Measurement a) to i): Active power output =-50% P_{Emax} s=5% (40% P_{ref} / Hz), threshold frequency for start/return: 49.8Hz, $P_{ref}=P_{Emax}$									
Frequency [Hz]:	50.00	49.90	49.00	47.30	46.05	47.30	49.00	49.90	50.00
P_M [W]:	-62500	-62500	-22500	62500	125000	62500	-22500	-62500	-62500
P_{E60} [W]:	-62716	-62699	-22163	62285	124965	62411	-21907	-62677	-62696
$\Delta P_{E60}/P_M$ [%]:	0.17	0.16	0.27	0.17	0.03	0.07	0.47	0.14	0.16
Dead time(≤2s)	-	-	0.4	0.4	0.2	0.4	0.2	0.2	-
Step response time(≤30s)	-	-	2.2	2.4	2.2	1.6	1.2	1.2	-
Setting time(s)	-	-	2.2	2.4	2.2	1.6	1.2	1.2	-
Limit $\Delta P/P_{1min}$:	± 10 % of P_{Emax}								
Test b:									
1-min mean value [Hz]:	a) 50.00 ±0.01	b) 49.75 ±0.01	c) 49.25 ±0.01	e) 48.75 ±0.01	d) 46.00 ±0.01	f) 48.75 ±0.01	g) 49.25 ±0.01	h) 49.75 ±0.01	i) 50.00 ±0.01
2. Measurement a) to i): Active power output =0% P_{Emax} s=2% (100% P_{ref} / Hz), threshold frequency for start/return: 49.5Hz, $P_{ref}=P_{Emax}$									
Frequency [Hz]:	50.00	49.75	49.25	48.75	46.00	48.75	49.25	49.75	50.00
P_M [W]:	0	0	31250	93750	125000	93750	31250	0	0
P_{E60} [W]:	383	296	31847	93870	125098	93969	31854	426	430
$\Delta P_{E60}/P_M$ [%]:	0.31	0.24	0.48	0.10	0.08	0.18	0.48	0.34	0.34
Dead time(≤2s)	-	-	0.4	0.2	0.4	0.4	0.6	0.4	-
Step response time(≤30s)	-	-	2.6	1.8	1.2	1.2	1.2	0.8	-
Setting time(s)	-	-	2.6	1.8	1.2	1.2	1.2	0.8	-
Limit $\Delta P/P_{1min}$:	± 10 % of P_{Emax}								

Test c:									
1-min mean value [Hz]:	a) 50.00 ±0.01	b) 49.90 ±0.01	c) 49.20 ±0.01	e) 47.40 ±0.01	d) 46.00 ±0.01	f) 47.40 ±0.01	g) 49.20 ±0.01	h) 49.90 ±0.01	i) 50.00 ±0.01
3. Measurement a) to i): Active power output =50% P_{Emax} s=12% (16.67% P_{ref} / Hz), threshold frequency for start/return: 49.8Hz, P_{ref}=P_{Emax}									
Frequency [Hz]:	50.00	49.90	49.20	47.40	46.00	47.40	49.20	49.90	50.00
P_M [W]:	62500	62500	75000	112500	125000	112500	75000	62500	62500
P_{E60} [W]:	62598	62572	75299	112824	125620	112759	75266	62531	62569
$\Delta P_{E60}/P_M$ [%]:	0.08	0.06	0.24	0.26	0.50	0.21	0.21	0.02	0.06
Dead time(≤2s)	-	-	0.2	0.4	0.4	0.4	0.2	0.2	-
Step response time(≤30s)	-	-	1.2	2.4	0.6	0.8	0.4	0.6	-
Setting time(s)	-	-	1.2	2.4	0.6	0.8	0.4	0.6	-
Limit $\Delta P/P_{1min}$:	± 10 % of P_{Emax}								

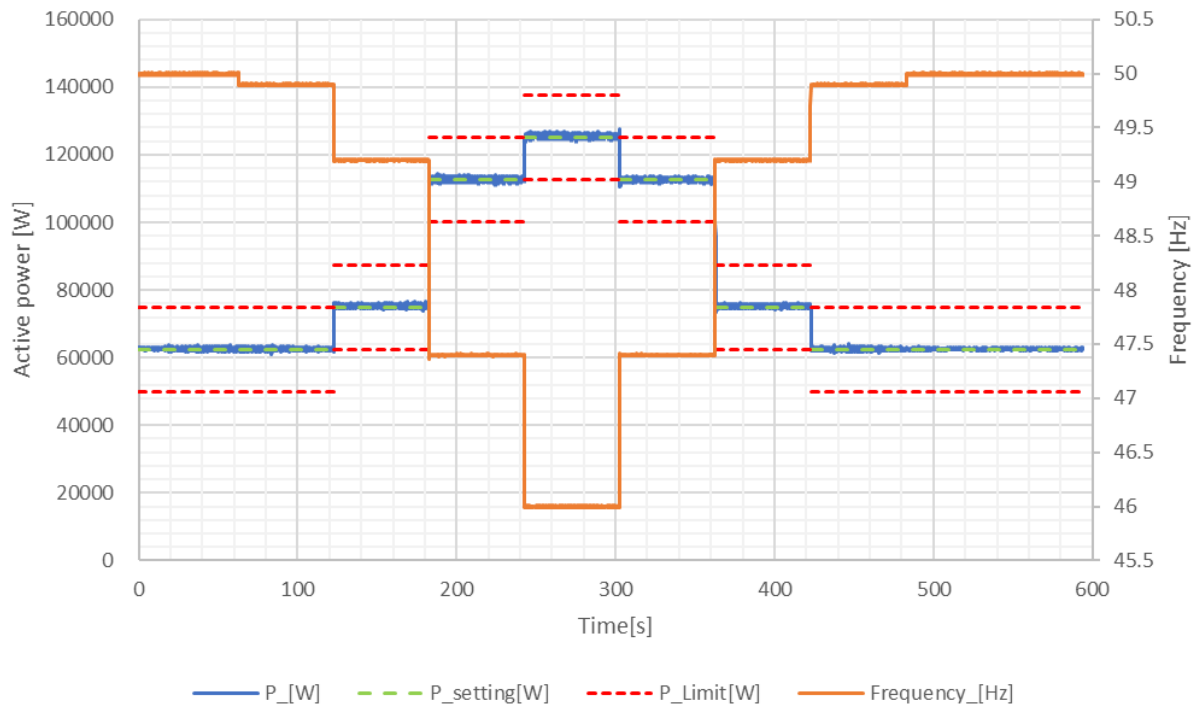
Graph of Measurement 1.: Active power output -50% P_{Emax}



Graph of Measurement 2.: Active power output 0% P_{Emax}



Graph of Measurement 3.: Active power output 50% P_{Emax}



Notes:

Setting (a) for other generators

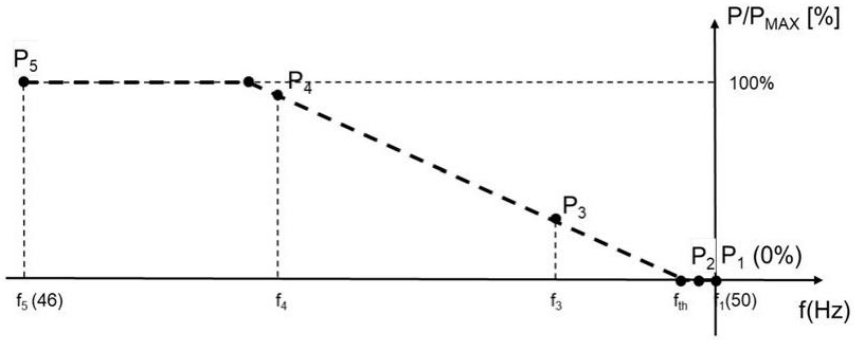


Figure 25 — Other generators: default values, example for interval frequency 46 – 50 Hz, setting (a)

Setting (b) other generators

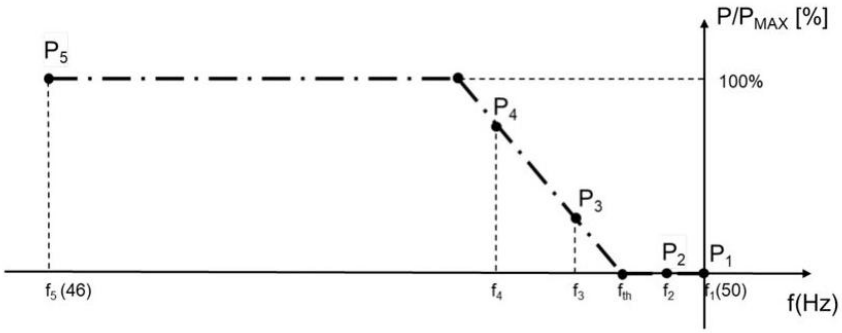


Figure 23 — Pref = Pmax, s = 2 %, fth = 49,5Hz, example for interval frequency 46 – 50 Hz, setting (b)

Setting (c) other generators

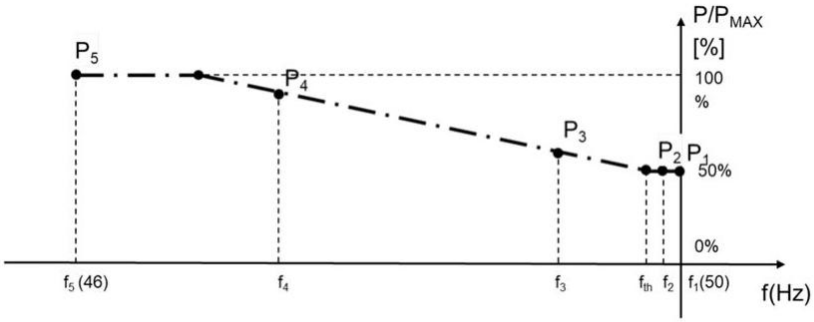


Figure 24 — Pref = Pmax, s = 12 %, fth = 49,8Hz, example for interval frequency 46 – 50 Hz, setting (c)

EN 50549-10:2022		
Clause	**Test items**	**Remark**
5.5	**Power specification and response to voltage variations**	
5.5.1	Power capabilities assessment - voltage support by reactive power	P
5.5.2	Voltage support by reactive power - test to determine the reactive power control modes	
5.5.2.3	Verification procedure for Set point control	P
5.5.2.4	Verification procedure for voltage related control mode for reactive power Q(U)	P
5.5.2.5	Verification procedure for power related control modes for reactive power	P

5.5.1 Power capabilities assessment - voltage support by reactive power 5.5.1.3 Verification procedure to determine the power capability (active, reactive, apparent) at nominal voltage					P
Q_{max} [Var]	75000	**Q_{min} [Var]**	-75000		
Q = 0 reactive power					
Rating power [%]	Active power [W]	Reactive power [Var]	Power factor [cos φ]	Voltage [V]	ΔQ ≤ 2%Smax
10%	12942	1665	0.9914	229.93	1.33
20%	25590	1851	0.9972	229.96	1.48
30%	37773	1723	0.9989	229.99	1.38
40%	50646	41	0.9992	230.01	0.03
50%	63020	-685	0.9995	230.03	0.55
60%	75597	-1537	0.9997	230.05	1.23
70%	87963	-2081	0.9997	230.05	1.66
80%	100220	-2235	0.9997	230.04	1.79
90%	112996	-2262	0.9998	230.04	1.81
100%	125200	-2429	0.9998	230.02	1.94
Q_{max}* under-excited					
Rating power [%]	Active power [W]	Reactive power [Var]	Power factor [cos φ]	Voltage [V]	ΔQ ≤ 2%Smax
10%	12489	-75637	0.1629	229.85	0.51
20%	25298	-75580	0.3174	229.89	0.46
30%	37960	-75626	0.4486	229.93	0.50
40%	50563	-75605	0.5559	229.98	0.48
50%	63171	-75653	0.6409	230.02	0.52
60%	75848	-75662	0.7080	230.06	0.53
70%	88460	-75632	0.7601	230.10	0.51
80%	101170	-75671	0.8008	230.15	0.54
90%	113880	-75724	0.8327	230.19	0.58
100%**	114965	-75719	0.8351	230.20	0.58

Q_{max}* over-excited					
Rating power [%]	Active power [W]	Reactive power [Var]	Power factor [cos φ]	Voltage [V]	ΔQ ≤ 2%Smax
10%	12246	75180	0.1608	230.10	0.14
20%	24863	75288	0.3136	230.15	0.23
30%	37447	75345	0.4451	230.19	0.28
40%	50065	75424	0.5530	230.23	0.34
50%	62780	75609	0.6388	230.28	0.49
60%	75443	75730	0.7058	230.32	0.58
70%	88188	75803	0.7584	230.37	0.64
80%	100844	75835	0.7992	230.41	0.67
90%	113722	76127	0.8310	230.46	0.90
100%**	114709	76047	0.8335	230.46	0.84

* Q_{max} is equal to 60%Pn.
**Due to the limit of max. apparent power, it can't reach target output power.

Assessment criterion:

The following shall be considered: Measurements shall be sampled during continuous operation only. Measurements shall be recorded and evaluated as 1 min average values. For the determination of the dynamic behaviour, 1 period RMS values shall be evaluated. During the test, the generated active power shall be kept stable within ± 5 %*Sn compared to the value set for the entire duration of each test sequence. The active and reactive power shall be calculated based on the positive sequence component of the fundamental of the voltages and currents at the generating unit terminals. The active factor shall be calculated based on the positive sequence component of the fundamental of the voltages and currents at the generating unit terminals. The active power, reactive power and the active factor, frequency, RMS voltage, RMS current at the generating unit terminals shall be recorded during tests.

Verification procedure to determine the power capability (active, reactive, apparent) at 5.5.1.3The verification shall be conducted operating the EUT at nominal voltage and frequency and different active power levels as follows: The generating unit manufacturer shall provide the capability curve (Figure 26 gives a graphical representation of the minimum and optional capabilities at nominal voltage). The maximum underexcited and overexcited reactive power shall be measured over a period of 1 min for each 10 % of Pn, from 0 % to maximum active power as declared by manufacturer. The values P_{max}, S_{max} and $Q_{max\ over}$ and $Q_{max\ under}$ shall be measured over a period of 10 min.

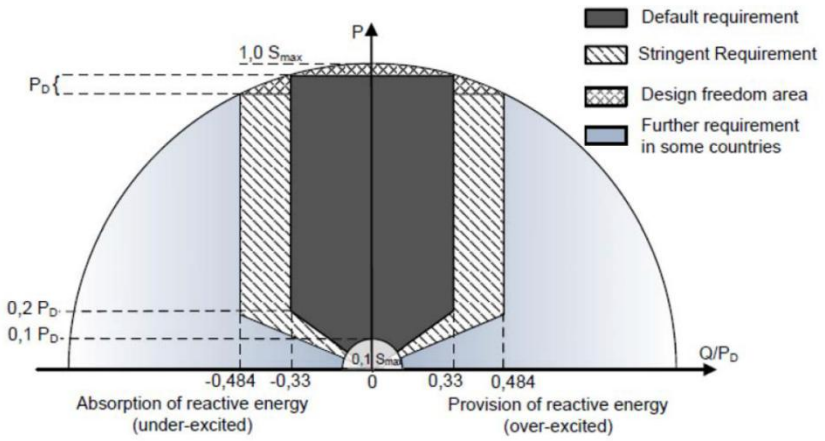


Figure 26 — reactive power capability at nominal voltage

5.5.1 Power capabilities assessment - voltage support by reactive power 5.5.1.6 Verification procedure for reactive power capability considering voltage range				P
Power factor [cos φ]	0.8 lagging to 0.8 leading			
Test: 85%U_n				
Inductive supply reactive power				
Rating power [%]	Voltage [V]	Active power [W]	Reactive power [Var]	Power factor [cos φ]
0%	195.1	6278	-4683	0.8016
10%	195.3	12714	-9620	0.7974
20%	195.3	25239	-18947	0.7997
30%	195.4	37658	-28294	0.7995
40%	195.4	50365	-37707	0.8005
50%	195.4	62673	-46811	0.8012
60%	195.3	75153	-56114	0.8013
70%	195.3	87576	-65312	0.8016
80%*	195.3	93050	-69305	0.8020
90%*	195.3	93122	-69377	0.8019
100%*	195.3	93174	-69442	0.8018
Capacitive supply reactive power				
Rating power [%]	Voltage [V]	Active power [W]	Reactive power [Var]	Power factor [cos φ]
0%	195.1	6212	4594	0.8040
10%	195.3	12648	9285	0.8061
20%	195.2	25177	18587	0.8045
30%	195.2	37685	28017	0.8025
40%	195.2	50303	37484	0.8019
50%	195.1	62733	46705	0.8021
60%	195.1	75155	56047	0.8016
70%	195.0	87596	65206	0.8022
80%*	195.0	93028	69193	0.8024
90%*	195.0	93060	69215	0.8024
100%*	195.0	93065	69213	0.8024

Test: 90%U_n				
Inductive supply reactive power				
Rating power [%]	Voltage [V]	Active power [W]	Reactive power [Var]	Power factor [cos φ]
0%	206.6	6347	-4669	0.8055
10%	206.8	12686	-9534	0.7994
20%	206.9	25119	-18867	0.7996
30%	206.9	37675	-28231	0.8002
40%	206.9	50468	-37728	0.8009
50%	206.9	62916	-47031	0.8010
60%	206.9	75458	-56356	0.8012
70%	206.8	87925	-65617	0.8014
80%	206.8	98612	-73523	0.8017
90%*	206.8	98617	-73521	0.8017
100%*	206.8	98697	-73582	0.8017
Capacitive supply reactive power				
Rating power [%]	Voltage [V]	Active power [W]	Reactive power [Var]	Power factor [cos φ]
0%	206.6	6257	4661	0.8019
10%	206.8	12672	9294	0.8064
20%	206.8	25228	18626	0.8045
30%	206.7	37817	28149	0.8022
40%	206.7	50397	37537	0.8020
50%	206.7	62937	46934	0.8016
60%	206.6	75413	56155	0.8021
70%	206.5	87735	65390	0.8018
80%	206.5	98574	73318	0.8024
90%*	206.5	98617	73355	0.8024
100%*	206.5	98658	73398	0.8023

Test: 95%U_n				
Inductive supply reactive power				
Rating power [%]	Voltage [V]	Active power [W]	Reactive power [Var]	Power factor [cos φ]
0%	218.1	6184	-4614	0.8014
10%	218.4	12629	-9358	0.8034
20%	218.4	25271	-18658	0.8045
30%	218.4	37769	-27731	0.8061
40%	218.4	50344	-36941	0.8062
50%	218.4	62971	-46042	0.8072
60%	218.4	75463	-55233	0.8069
70%	218.4	87892	-64234	0.8074
80%	218.3	100222	-73145	0.8077
90%*	218.3	104501	-76213	0.8080
100%*	218.3	104889	-76495	0.8080
Capacitive supply reactive power				
Rating power [%]	Voltage [V]	Active power [W]	Reactive power [Var]	Power factor [cos φ]
0%	218.2	6580	4772	0.8095
10%	218.3	12835	9567	0.8017
20%	218.3	25316	18912	0.8011
30%	218.3	37832	28285	0.8009
40%	218.2	50226	37584	0.8006
50%	218.2	62830	47033	0.8005
60%	218.1	75394	56423	0.8006
70%	218.1	87727	65611	0.8008
80%	218.0	100342	74979	0.8011
90%*	218.0	104011	77717	0.8011
100%*	218.0	104062	77761	0.8011

Test: 100%U_n				
Inductive supply reactive power				
Rating power [%]	Voltage [V]	Active power [W]	Reactive power [Var]	Power factor [cos φ]
0%	229.7	6114	-4519	0.8042
10%	229.9	12646	-9409	0.8023
20%	229.9	25244	-18704	0.8035
30%	229.9	37587	-27934	0.8026
40%	229.9	50140	-37332	0.8021
50%	229.9	62670	-46759	0.8015
60%	229.9	75162	-56052	0.8016
70%	229.9	87731	-65349	0.8020
80%	229.9	100137	-74512	0.8023
90%*	229.9	109827	-81755	0.8022
100%*	229.9	109897	-81793	0.8022
Capacitive supply reactive power				
Rating power [%]	Voltage [V]	Active power [W]	Reactive power [Var]	Power factor [cos φ]
0%	229.7	6115	4561	0.8015
10%	229.8	12839	9622	0.8002
20%	229.8	25272	18890	0.8010
30%	229.8	37627	28152	0.8007
40%	229.8	50231	37547	0.8010
50%	229.7	62858	47087	0.8003
60%	229.7	75400	56349	0.8010
70%	229.6	87977	65816	0.8007
80%	229.6	100438	75065	0.8010
90%*	229.5	109386	81748	0.8010
100%*	229.5	109434	81774	0.8011

Test: 105%U_n				
Inductive supply reactive power				
Rating power [%]	Voltage [V]	Active power [W]	Reactive power [Var]	Power factor [cos φ]
0%	241.2	6102	-4545	0.8019
10%	241.4	12828	-9444	0.8053
20%	241.4	25344	-18719	0.8044
30%	241.5	37918	-27832	0.8061
40%	241.5	50503	-37027	0.8065
50%	241.5	63033	-46476	0.8049
60%	241.5	75271	-55455	0.8051
70%	241.5	87916	-64634	0.8057
80%	241.4	100214	-73683	0.8057
90%	241.4	110736	-81932	0.8039
100%*	241.4	110750	-81936	0.8039
Capacitive supply reactive power				
Rating power [%]	Voltage [V]	Active power [W]	Reactive power [Var]	Power factor [cos φ]
0%	241.3	6081	4514	0.8028
10%	241.4	12726	9360	0.8056
20%	241.4	25214	18707	0.8031
30%	241.4	37973	28244	0.8024
40%	241.3	50454	37625	0.8016
50%	241.3	62890	46986	0.8011
60%	241.3	75641	56518	0.8011
70%	241.2	87964	65737	0.8010
80%	241.2	100480	74981	0.8014
90%	241.1	111055	81868	0.8049
100%*	241.1	111059	81867	0.8049

Test: 110%U_n				
Inductive supply reactive power				
Rating power [%]	Voltage [V]	Active power [W]	Reactive power [Var]	Power factor [cos φ]
0%	252.8	6097	-4475	0.8061
10%	253.0	12844	-9467	0.8049
20%	253.0	25382	-18511	0.8080
30%	253.0	37994	-27748	0.8076
40%	253.0	50728	-37084	0.8073
50%	253.0	63117	-46304	0.8063
60%	253.0	75375	-55268	0.8064
70%	253.0	89246	-65385	0.8067
80%	253.0	100469	-73651	0.8065
90%	252.9	111203	-81458	0.8067
100%*	252.9	111269	-81487	0.8068
Capacitive supply reactive power				
Rating power [%]	Voltage [V]	Active power [W]	Reactive power [Var]	Power factor [cos φ]
0%	252.8	6077	4472	0.8053
10%	252.9	12669	9442	0.8018
20%	252.9	25148	18568	0.8045
30%	252.9	37902	27800	0.8063
40%	252.8	50441	37081	0.8057
50%	252.8	62882	46290	0.8053
60%	252.8	75580	55536	0.8058
70%	252.7	87940	64635	0.8058
80%	252.7	100480	73780	0.8060
90%	252.6	111015	81543	0.8059
100%*	252.6	111103	81618	0.8059
Note: * Due to the limit of max apparent power or max output current, it can't reach target output power.				

Assessment criterion:

The power factor resulting in each of the measurement points between 10 % and 90 % of the nominal power is equal to or lower than 0.90 both in over excited and under excited operation.

Test method:

The voltage dependency of PQ-characteristic shall be evaluated according to the following procedures:
Non-synchronous generating units:

The manufacturer shall provide a characteristic or model of the voltage dependency of the reactive power capability represented in a P-Q diagram at different voltage values (e.g. 110 % Un, 100 %Un and 90 % Un); the voltage dependency can be also represented in the form of a U-Q/P diagram.

For the verification the following applies:two tests shall be conducted at the maximum power as verified according to 5.5.1.3. and for each Q and $Q_{max\ under}$. In case of generating units operating in a Q-priority mode, the test shall be conducted with an active factor not below $0{,}9._{max\ over}$. The tests shall be conducted for under voltage and over voltage. The voltage level shall be chosen to show the declared characteristic. If the declared characteristic does not show a voltage dependency, the voltage deviation shall be at least 5 % of nominal voltage.

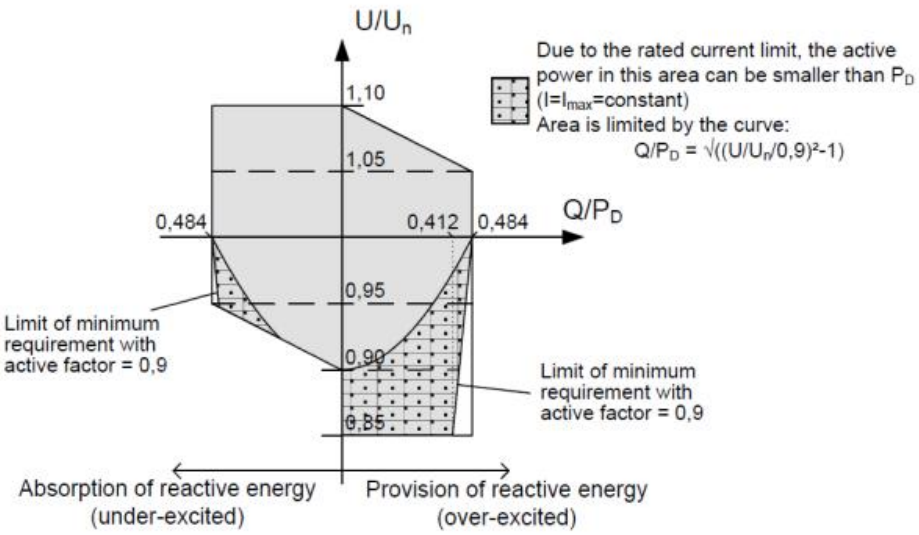


Figure 30 — Example: U-Q normalized diagram taken from the EN 50549-1

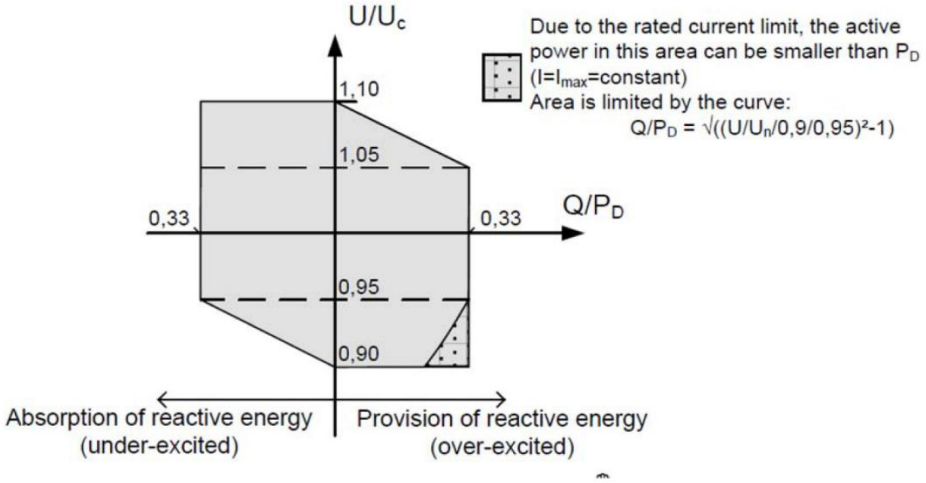


Figure 31 — Example of U-Q normalized diagram taken from the EN 50549-2

5.5.2.3.2 Reactive power set point control accuracy							P
Q_{max} [Var]	75000			**Q_{min} [Var]**		-75000	
Test no.1: Test for reactive power set point control accuracy							
Test: 50%P_{Emax}±10%Pn							
Reactive power step Q/Pn(p.u.)	Voltage	Set point value		Measure value		Deviation	
	(%)	Var	Q/P_n (%)	Var	Q/P_n (%)	Var	Q/S_n (%)
Q=0	100.1	0	0	-798	-0.64	798	0.64
Q_{max} (over-excited)	100.1	75000	60.0	75322	60.26	322	0.26
Q_{min} (under-excited)	100.0	-75000	-60.0	-75575	-60.46	575	0.46
Q=0	100.1	0	0	-801	-0.64	801	0.64
ΔLimit Q≤2%S_{max}							

Test no.2: Test for reactive power set point control accuracy			
50±10%Pn (Tau=3s) shortest time constant (not longer than 3s)			
Reactive power set point step p.u.	Generating unit response time setting	Measured response behaviour	
		dead time	response time/ settling time
Q=0→Q=$Q_{max\ over}$	9s	0.2	9.8
Q=$Q_{max\ over}$ →Q=$Q_{min\ under}$	9s	0.2	9.4
Q=$Q_{min\ under}$ →Q=0	9s	0.2	9.6
50±10%Pn (Tau=60s) (if longest time>60s, then test 60s)			
Reactive power set point step p.u.	Generating unit response time setting	Measured response behaviour	
		dead time	response time/ settling time
Q=0→Q=$Q_{max\ over}$	180s	0.4	171.8
Q=$Q_{max\ over}$ →Q=$Q_{min\ under}$	180s	0.6	176.0
Q=$Q_{min\ under}$ →Q=0	180s	0.6	181.6
-Note:			

Diagram for 50%P_n (Tau=3s) 0 → $Q_{max\ over}$

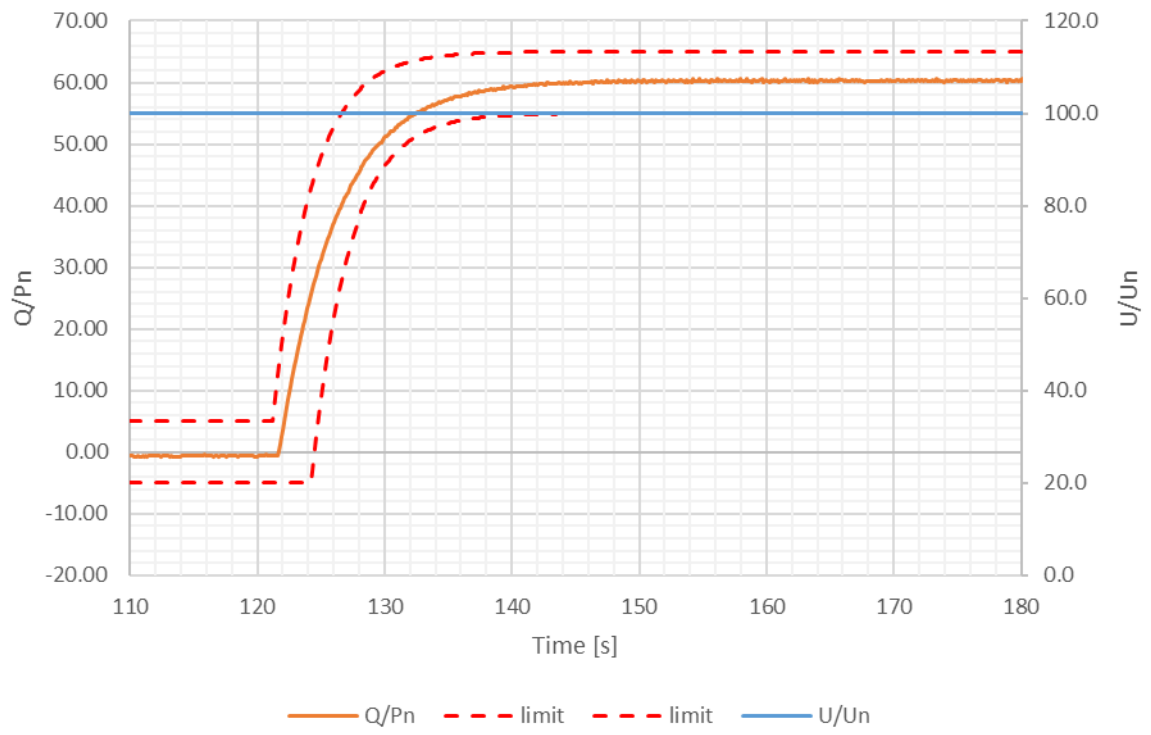


Diagram for 50%P_n (Tau=3s) $Q_{max\ over}$→ $Q_{min\ under}$

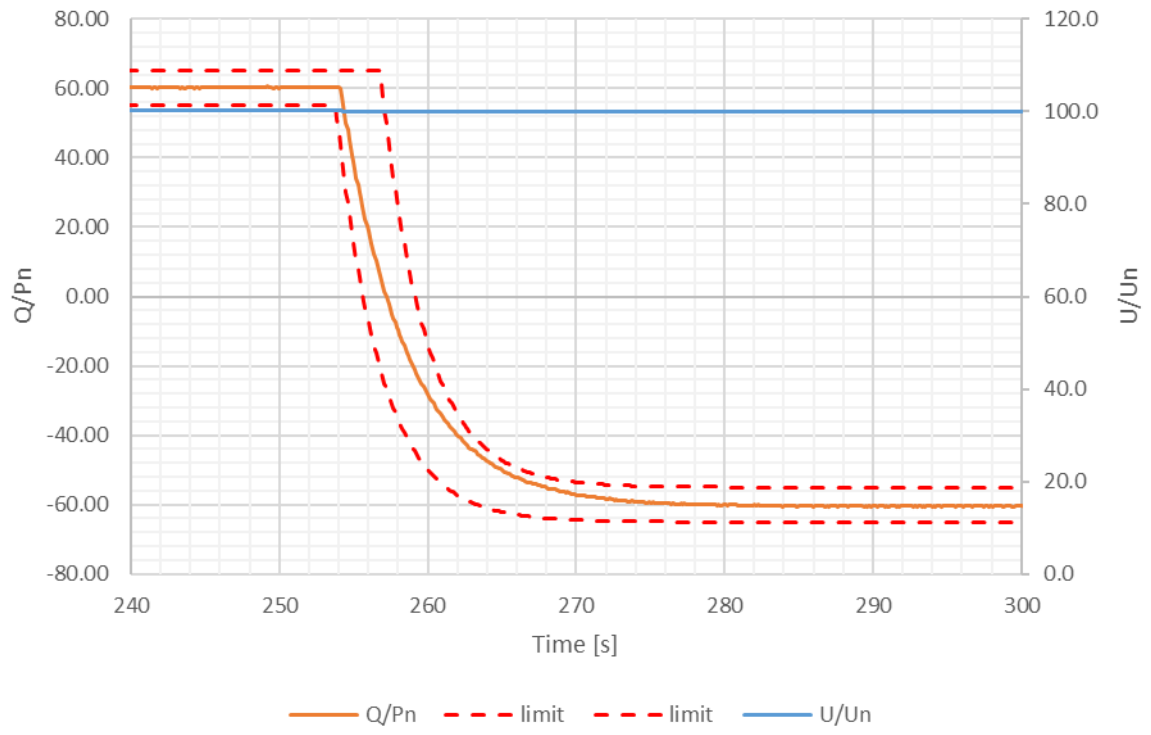


Diagram for 50%P_n (Tau=3s)) $Q_{min\ under} \rightarrow 0$

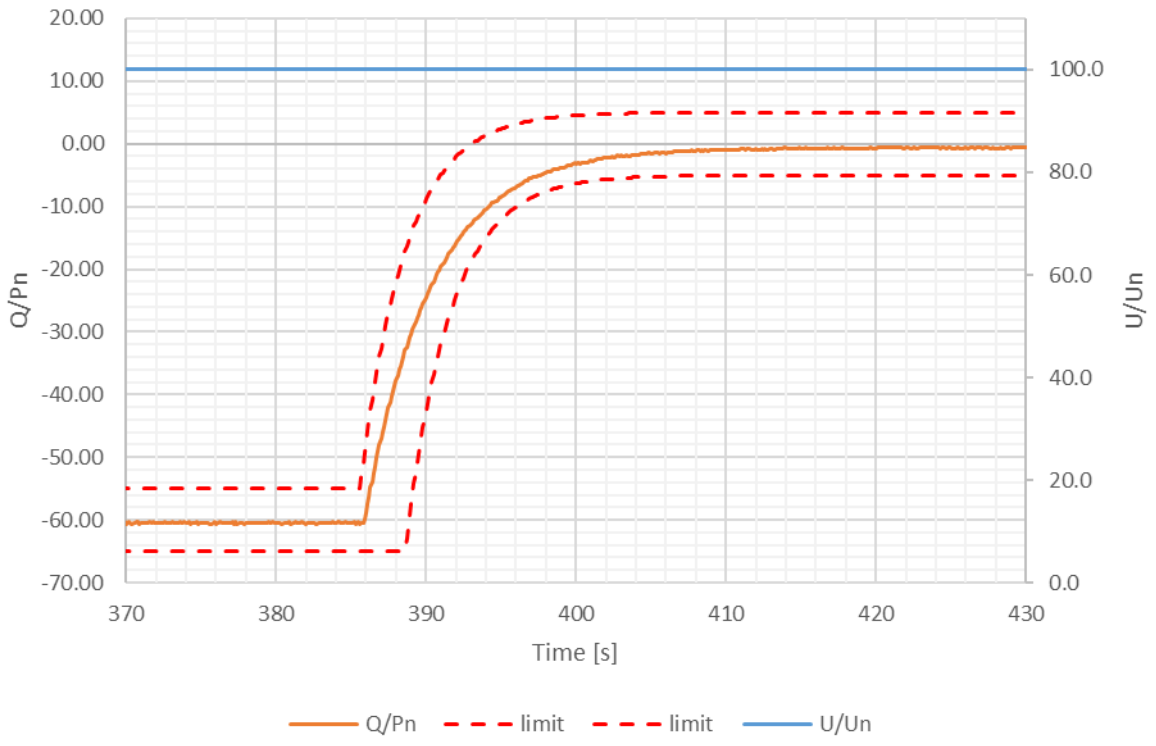


Diagram for 50%P_n (Tau=60s) $0 \rightarrow Q_{max\ over}$

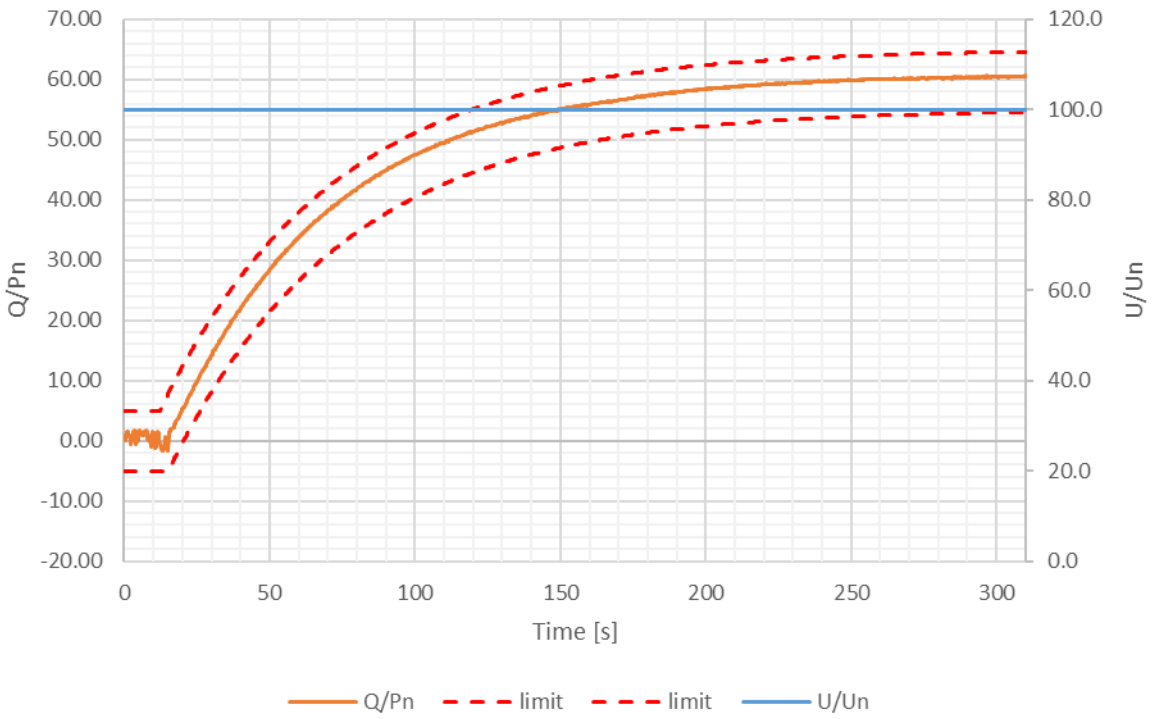


Diagram for 50%P_n (Tau=60s) $Q_{max\ over} \rightarrow Q_{min\ under}$

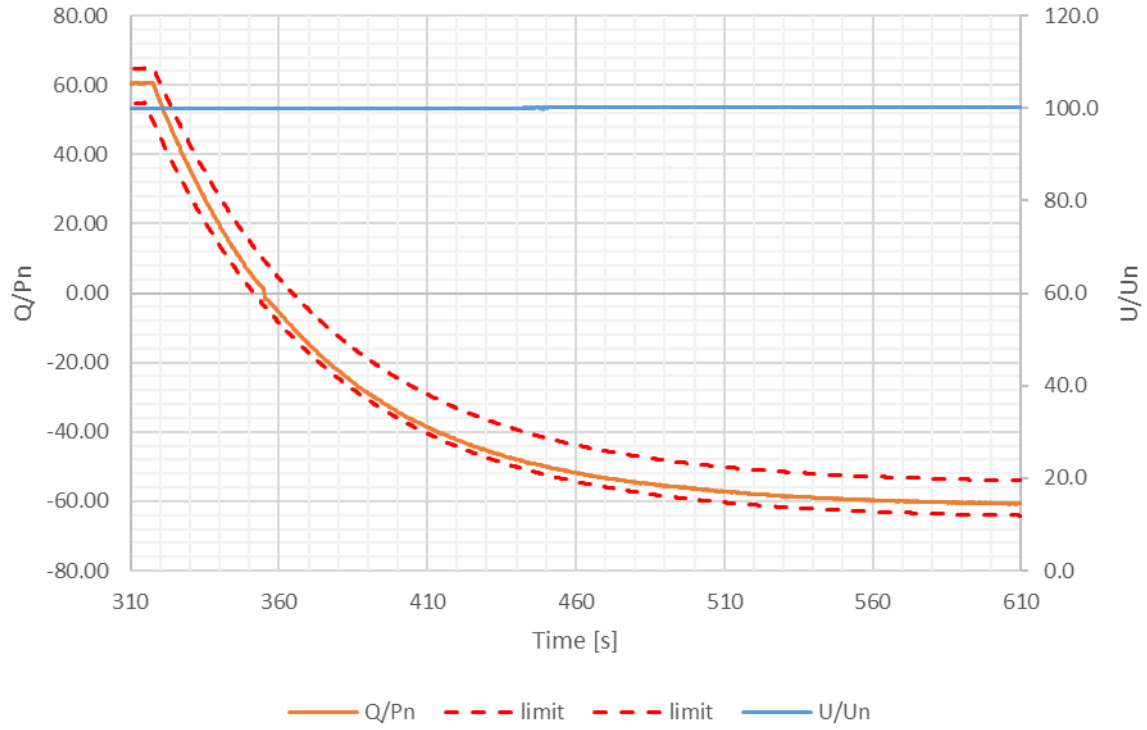
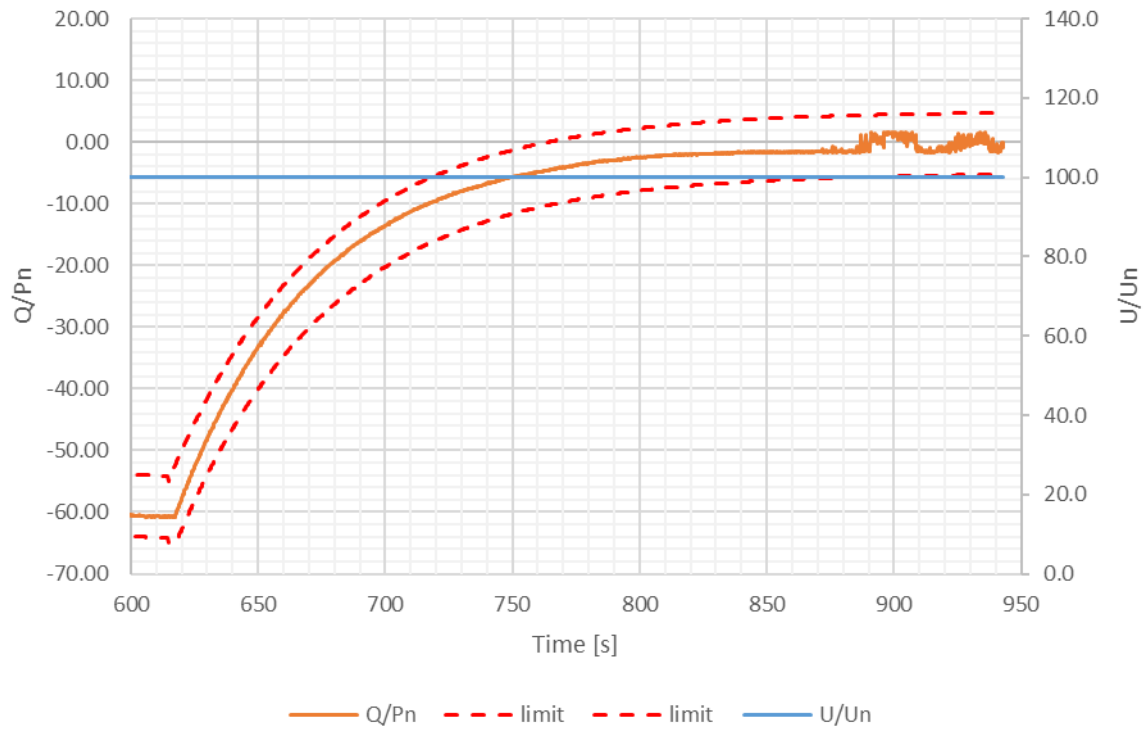


Diagram for 50%P_n (Tau=60s) $Q_{min\ under} \rightarrow 0$



5.5.2.4 Verification procedure for voltage related control mode for reactive power Q(U) 5.5.2.4.2 Test procedure for steady-state behaviour							P
Q_{max} [Var]		75000		Q_{min} [Var]		-75000	
Setting (a)							
Setting value		Measurement value					Limit
Un	Pn	Grid voltage(%)	Active power (%)	Reactive power (%)	Reactive power Target (%)	PF	ΔU≤±1%Un ΔQ≤±2%Sn or PF≥0.4
100%	100%	100.1	99.8	-0.7	0	0.9999	
103%	100%	103.1	100.1	-0.9	0	0.9999	
105%	100%	105.1	100.0	-1.5	0	0.9999	
106%	100%	106.1	100.0	-1.8	0	0.9999	
107%	100%	107.1	100.0	-49.5	-50%Qmax	0.9586	
108%	100%**	108.2	91.6	-99.3	-100%Qmax	0.8384	
110%	100%**	110.2	92.5	-99.2	-100%Qmax	0.8411	
112%	100%**	112.2	92.5	-99.3	-100%Qmax	0.8407	
115%	100%**	115.2	92.5	-99.0	-100%Qmax	0.8413	
112%	100%**	112.2	92.5	-99.3	-100%Qmax	0.8406	
110%	100%**	110.2	92.5	-99.2	-100%Qmax	0.8409	
108%	100%**	108.2	92.6	-99.3	-100%Qmax	0.841	
107%	100%	107.1	99.9	-49.5	-50%Qmax	0.9586	
106%	100%	106.1	100.0	-1.3	0	0.9999	
105%	100%	105.1	100.0	-0.7	0	0.9999	
103%	100%	103.1	100.1	-1.3	0	0.9999	
100%	100%	100.1	100.1	-1.8	0	0.9999	
97%	100%	97.1	100.1	-0.5	0	0.9999	
94%	100%	94.1	100.2	0.8	0	0.9999	
93%	100%	92.9	83.3	-99.4	100%Qmax	0.8131	
90%	100%	90.0	79.4	-99.2	100%Qmax	0.8004	
87%	100%	87.0	75.2	-99.2	100%Qmax	0.7841	
85%	100%	85.0	72.3	-99.3	100%Qmax	0.7718	
87%	100%	87.0	75.1	-99.3	100%Qmax	0.7834	
90%	100%	90.0	79.3	-99.3	100%Qmax	0.7996	
93%	100%	92.9	83.2	-99.3	100%Qmax	0.8133	
94%	100%	94.1	100.0	1.0	0	0.9999	
97%	100%	97.1	100.0	0.8	0	0.9999	

100%	100%	100.1	99.9	0.0	0	0.9999	
100%	20%	100.0	20.3	-1.5	0	0.9991	
103%	20%	103.0	20.3	-1.6	0	0.9989	
105%	20%	105.0	20.4	-1.6	0	0.9989	
106%	20%	106.0	20.4	-1.6	0	0.9989	
107%	20%	107.0	20.2	-49.2	-50%Qmax	0.5656	
108%	20%	108.1	20.2	-71.9	-100%Qmax*	0.4242	
110%	20%	110.1	20.3	-71.8	-100%Qmax*	0.4260	
112%	20%	112.1	20.2	-71.6	-100%Qmax*	0.4248	
115%	20%	115.1	20.2	-71.8	-100%Qmax*	0.4242	
112%	20%	112.1	20.2	-71.7	-100%Qmax*	0.4251	
110%	20%	110.1	20.3	-71.8	-100%Qmax*	0.4270	
108%	20%	108.1	20.2	-71.9	-100%Qmax*	0.4247	
107%	20%	107.0	20.3	-49.2	-50%Qmax	0.5661	
106%	20%	106.0	20.4	-1.8	0	0.9986	
105%	20%	105.0	20.3	-1.7	0	0.9988	
103%	20%	103.0	20.3	-1.6	0	0.9988	
100%	20%	100.0	20.4	-1.5	0	0.9990	
97%	20%	97.0	20.4	-1.4	0	0.9991	
94%	20%	94.0	20.2	-1.3	0	0.9992	
93%	20%	93.0	20.5	73.0	100%Qmax*	0.4241	
90%	20%	90.0	20.7	73.0	100%Qmax*	0.4267	
87%	20%	87.0	20.5	73.1	100%Qmax*	0.4240	
85%	20%	85.0	20.6	73.1	100%Qmax*	0.4256	
87%	20%	87.0	20.5	73.0	100%Qmax*	0.4240	
90%	20%	90.0	20.6	73.1	100%Qmax*	0.4252	
93%	20%	93.0	20.5	73.1	100%Qmax*	0.4234	
94%	20%	94.0	20.3	-1.4	0	0.9992	
97%	20%	97.0	20.4	-1.4	0	0.9991	
100%	20%	100.0	20.4	-1.4	0	0.9991	

Setting (c)							
Setting value		Measurement value					Limit
Un	Pn	Grid voltage(%)	Active power (%)	Reactive power (%)	Reactive power Target (%)	PF	ΔQ≤±2%Sn ΔU≤±1%Un
100%	100%	100.1	100.3	1.6	0	0.9999	
103%	100%	103.1	100.2	-3.2	-3%Qmax	0.9998	

105%	100%	105.1	100.2	-5.0	-5%Qmax	0.9995	
106%	100%	106.1	100.2	-6.0	-6%Qmax	0.9994	
107%	100%	107.0	100.2	-7.0	-7%Qmax	0.9991	
108%	100%	108.1	100.2	-8.1	-8%Qmax	0.9988	
110%	100%	110.1	100.2	-9.8	-10%Qmax	0.9983	
112%	100%	112.1	100.1	-9.9	-10%Qmax	0.9982	
115%	100%	115.1	100.2	-10.1	-10%Qmax	0.9982	
112%	100%	112.1	100.2	-9.8	-10%Qmax	0.9983	
110%	100%	110.1	100.2	-9.8	-10%Qmax	0.9983	
108%	100%	108.1	100.2	-8.1	-8%Qmax	0.9988	
107%	100%	107.0	100.2	-7.0	-7%Qmax	0.9991	
106%	100%	106.1	100.3	-6.0	-6%Qmax	0.9994	
105%	100%	105.1	100.2	-5.1	-5%Qmax	0.9995	
103%	100%	103.1	100.3	-3.4	-3%Qmax	0.9998	
100%	100%	100.1	100.3	1.6	0	0.9999	
97%	100%	97.1	100.3	-2.8	3%Qmax	0.9999	
94%	100%	94.1	100.3	-5.1	6%Qmax	0.9995	
93%	100%	93.1	100.4	-6.1	7%Qmax	0.9993	
90%	100%	90.1	98.2	-9.3	10%Qmax	0.9984	
87%	100%	87.1	94.9	-9.9	10%Qmax	0.9980	
85%	100%	85.1	92.8	-9.7	10%Qmax	0.9980	
87%	100%	87.1	94.9	-10.1	10%Qmax	0.9980	
90%	100%	90.1	98.1	-9.2	10%Qmax	0.9984	
93%	100%	93.1	100.3	-6.0	7%Qmax	0.9994	
94%	100%	94.1	100.2	-5.0	6%Qmax	0.9995	
97%	100%	97.1	100.1	-2.7	3%Qmax	0.9999	
100%	100%	100.1	100.1	1.7	0	0.9999	
100%	20%	100.0	20.5	1.7	0	0.9987	
103%	20%	103.0	20.5	-2.4	-3%Qmax	0.9976	
105%	20%	105.0	20.5	-3.8	-5%Qmax	0.9939	
106%	20%	106.0	20.5	-4.9	-6%Qmax	0.9898	
107%	20%	107.0	20.5	-6.0	-7%Qmax	0.9850	
108%	20%	108.0	20.5	-7.3	-8%Qmax	0.9782	
110%	20%	110.0	20.5	-9.1	-10%Qmax	0.9667	
112%	20%	112.0	20.5	-10.1	-10%Qmax	0.9590	
115%	20%	115.0	20.4	-10.3	-10%Qmax	0.9569	
112%	20%	112.0	20.5	-10.2	-10%Qmax	0.9582	

110%	20%	110.0	20.5	-9.1	-10%Qmax	0.9659
108%	20%	108.0	20.5	-7.3	-8%Qmax	0.9782
107%	20%	107.0	20.5	-6.0	-7%Qmax	0.9849
106%	20%	106.0	20.5	-5.2	-6%Qmax	0.9886
105%	20%	105.0	20.5	-4.2	-5%Qmax	0.9924
103%	20%	103.0	20.5	-2.4	-3%Qmax	0.9975
100%	20%	100.0	20.6	1.7	0	0.9988
97%	20%	97.0	20.6	1.8	3%Qmax	0.9987
94%	20%	94.0	20.5	4.1	6%Qmax	0.9928
93%	20%	93.0	20.6	5.1	7%Qmax	0.9892
90%	20%	90.0	20.5	8.5	10%Qmax	0.9707
87%	20%	87.0	20.5	9.6	10%Qmax	0.9629
85%	20%	85.0	20.5	9.3	10%Qmax	0.9648
87%	20%	87.0	20.5	9.6	10%Qmax	0.9629
90%	20%	90.0	20.5	8.6	10%Qmax	0.9701
93%	20%	93.0	20.5	5.1	7%Qmax	0.9892
94%	20%	94.0	20.5	4.1	6%Qmax	0.9929
97%	20%	97.0	20.5	1.7	3%Qmax	0.9988
100%	20%	100.0	20.6	1.3	0	0.9992

Test method:

Standard	Parameter	X1	X2	X3	X4
EN 50549-10: 2022 (Setting a)	U (U/Un)	93%	94%	106%	108%
	Q (Q/Qmax)	100%	0%	0%	-100%

Standard	Parameter	X1	X2	X3
EN 50549-10: 2022 (Setting b)	U (U/Un)	90%	100%	110%
	Q (Q/Qmax)	10%	0%	-10%

Assessment criterion:

The actual tested configuration shall be chosen according the principle of 4.4. If the conformity assessment is conducted for a specific grid code, the EUT control shall be configured as defined in this grid code. If thel conformity assessment is conducted in general, the configuration shall be chosen in a way that each parameter shall be tested once configured to its minimum and once to its maximum according to the principle given in Table 17 and Table 18.

Table 17 — Q(U) characteristic configuration

parameter of characteristic	Setting (a)	Setting (b)
dead band (horizontal section of the characteristic curve around U_n) db_{char}	as wide as possible but extending not more than from −6 %U_n to +6 %U_n.	0
minimum and maximum reactive power of the characteristic $Q_{max\ char}$ [a]	≥ 95 % of $Q_{max\ over}$ and $Q_{max\ under}$ respectively [b]	10 % of $Q_{max\ over}$ and $Q_{max\ under}$ respectively
Slope of the steepest section of the characteristic curve [a]	as steep as configurable, [c]	as flat as configurable [d]

[a] If an unsymmetrical configuration is possible, this shall be apparent in the chosen configuration by using different steepness and different values for maximum reactive power $Q_{max\ char}$ for over voltage and under voltage.

[b] if Q_{max}, based on the capability curve of the EUT, is above 60 %P_n, $Q_{max\ char}$ shall not exceed 60 % P_n.

[c] if the maximum configurable steepness exceeds 100 %Q_{max} / 1 %U_n the configured value during the test shall not exceed 100 %Q_{max} / 1 %U_n.

[d] if the minimum configurable steepness is below 1 %Q_{max} / 1 %U_n the configured value during the test shall not be below 1 %Q_{max} / 1 %U_n.

Note:

* Due to the limit of output current, it can't reach target output power.

5.5.2.4 Verification procedure for voltage related control mode for reactive power Q(U) 5.5.2.4.3 Test procedure for dynamic behaviour							P
Q_{max} [Var]		75000		**Q_{min} [Var]**		-75000	
Setting value		Measurement value					Limit
Un	Pn	Grid voltage(%)	Active power (%)	Reactive power (%Qmax)	Reactive power Target (%)	PF	ΔU≤±1%Un ΔQ≤±2%Sn or PF≥0.4
1: 100%	＞90%	100.1	100.87	-1.06	0	0.9998	
2: 107%	＞90%	107.1	100.86	-47.84	-50%Qmax	0.9616	
3: 109%	＞90%	108.8	93.61	-98.89	-100%Qmax	0.8444	
4: 109%	18%	108.6	18.07	-66.06*	-100%Qmax	0.4146	
5: 109%	3%	108.6	2.53	-1.81	0	0.8674	
6: 109%	22%	108.6	22.14	-80.41*	-100%Qmax	0.4169	
7: 109%	＞90%	108.8	94.60	-96.59	-100%Qmax	0.8525	
8: 100%	＞90%	100.1	100.89	-1.02	0%Qmax	0.9998	
9: 92%	＞90%	92.2	81.80**	99.71	100%Qmax	0.8070	
10: 92%	18%	92.0	17.82	63.57*	100% Qmax	0.4231	
11: 92%	3%	92.0	2.58	-1.03	0%Qmax	0.9397	
12: 92%	22%	92.0	21.86	77.62*	100%Qmax	0.4248	
13: 92%	＞90%	92.2	81.77**	99.94	100%Qmax	0.8063	
14: 93%	＞90%	93.2	83.22**	99.90	100%Qmax	0.8113	
15: 100%	＞90%	100.1	100.87	-0.92	0%	0.9998	

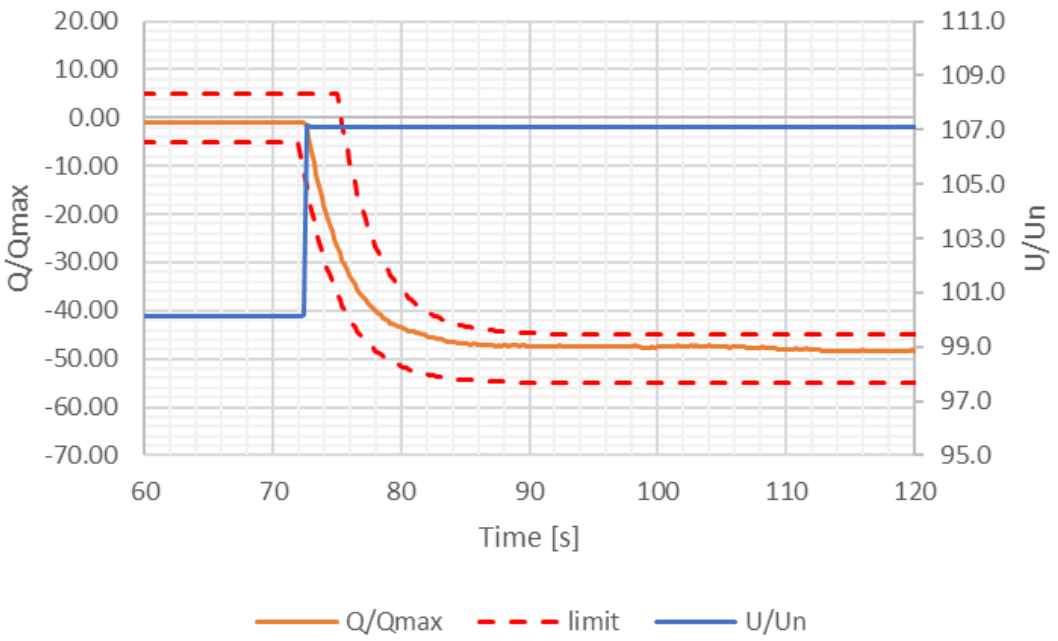
Note:

*cos φ⩾0.4 Priority

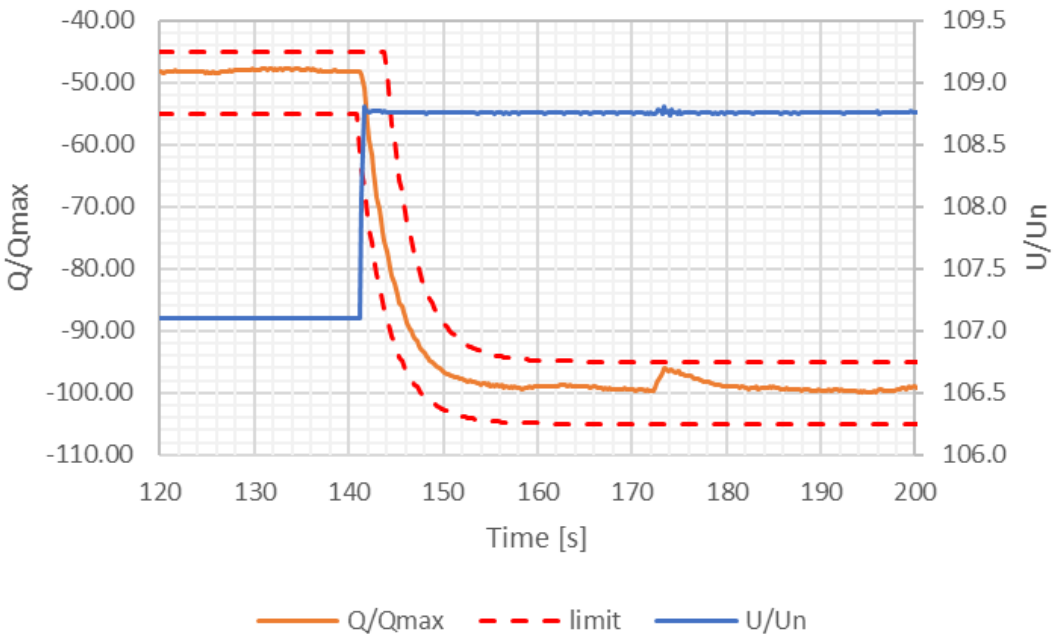
** Due to the limit of max output current, it can't reach target output power.

P lock-in: 20%Pn; P lock-out: 5%Pn.

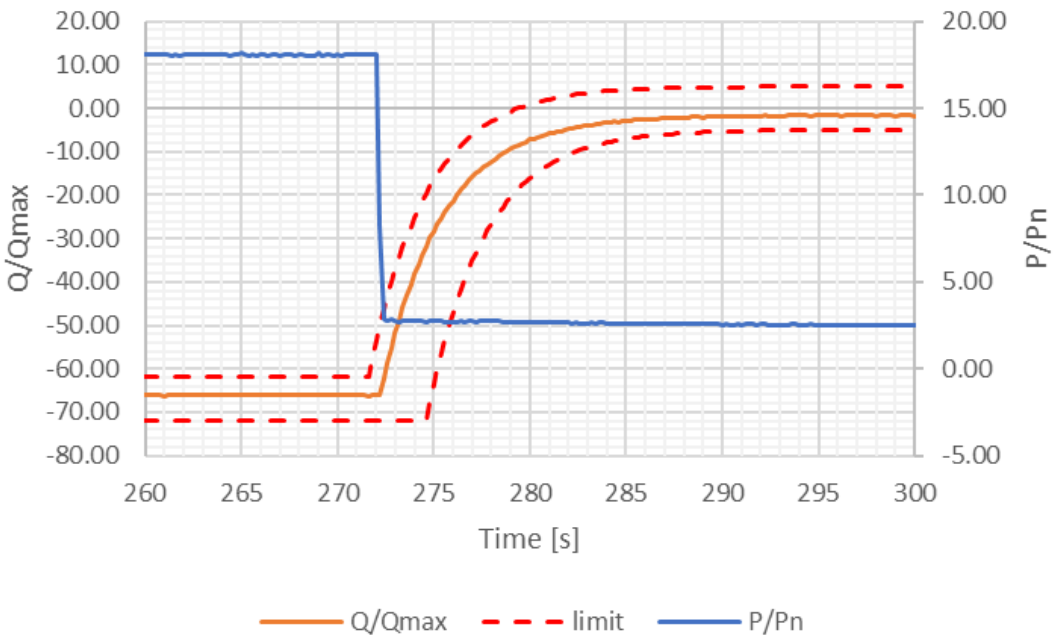
U/Un: 100%-107%



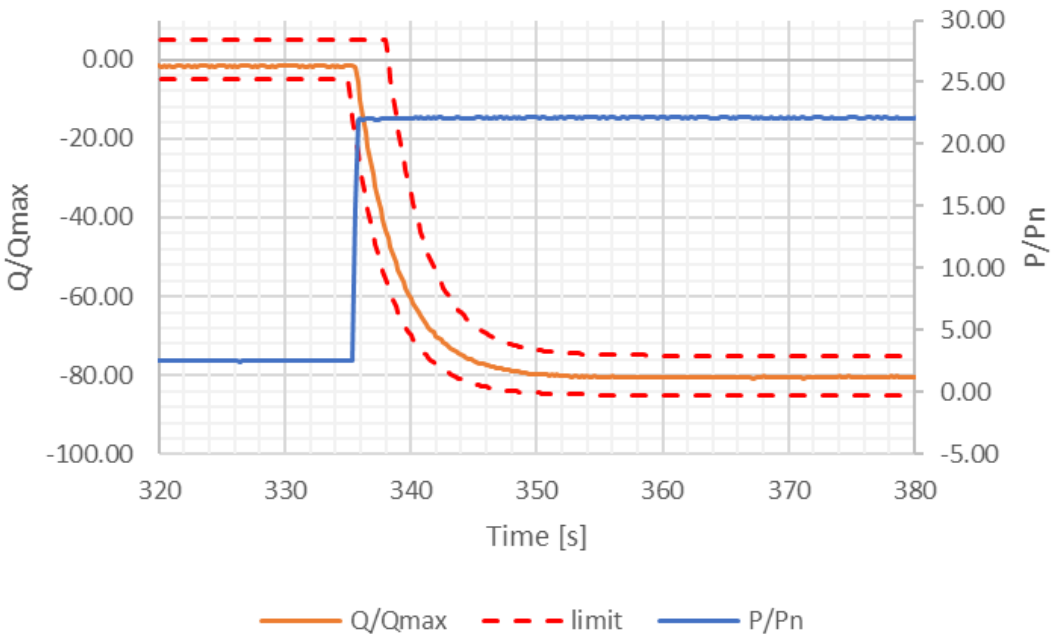
U/Un: 107%-109%



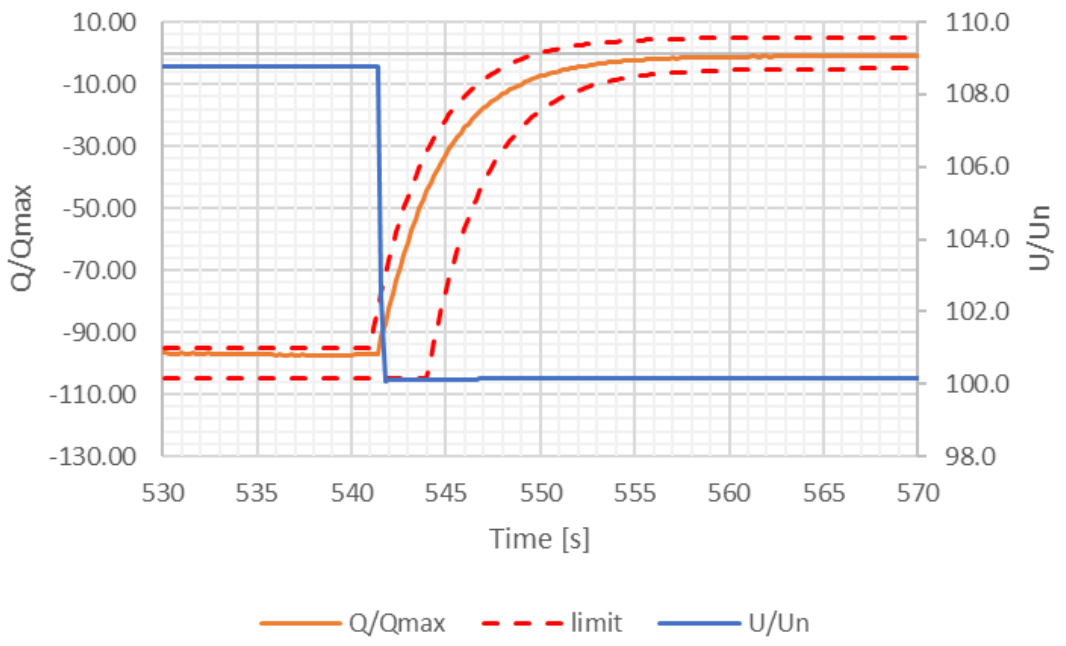
P/Pn:18%-3%



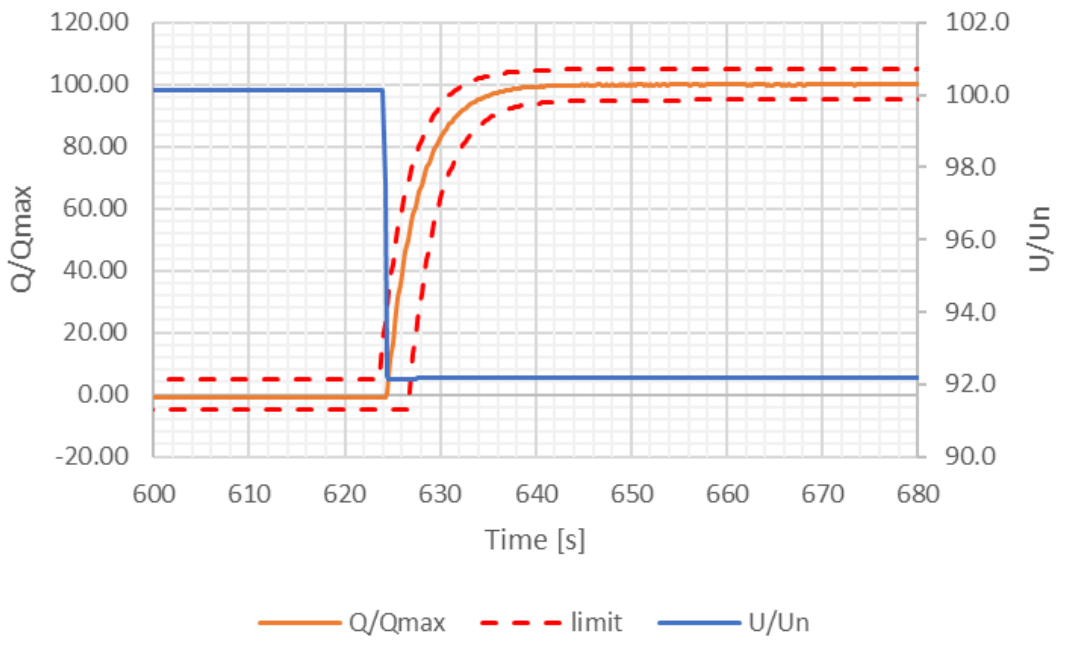
P/Pn:3%-22%



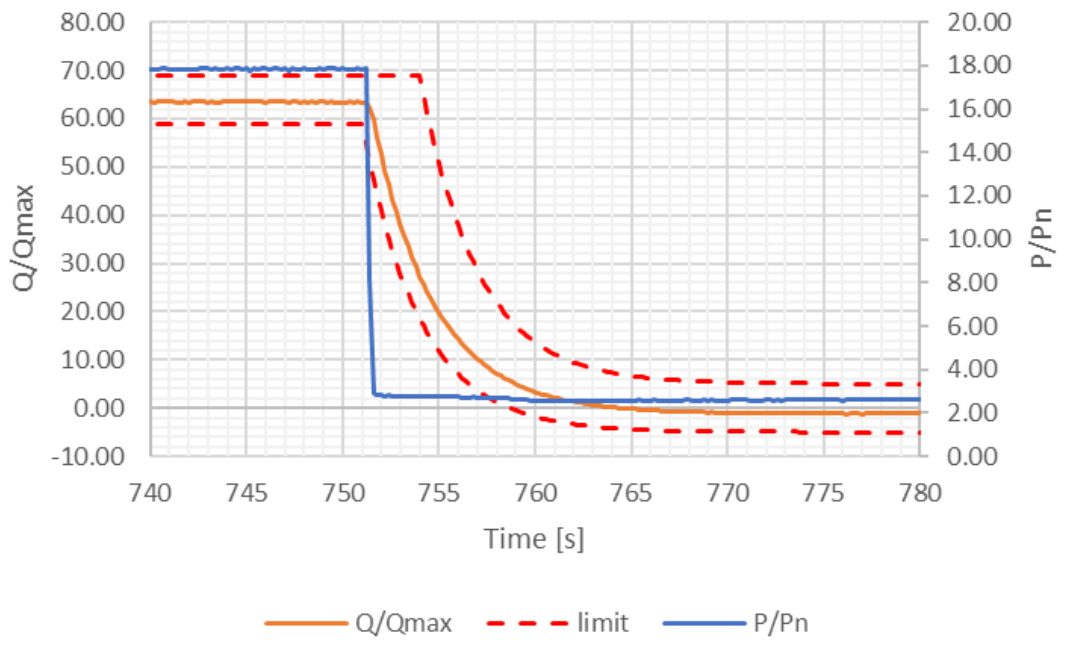
U/Un: 109%-100%



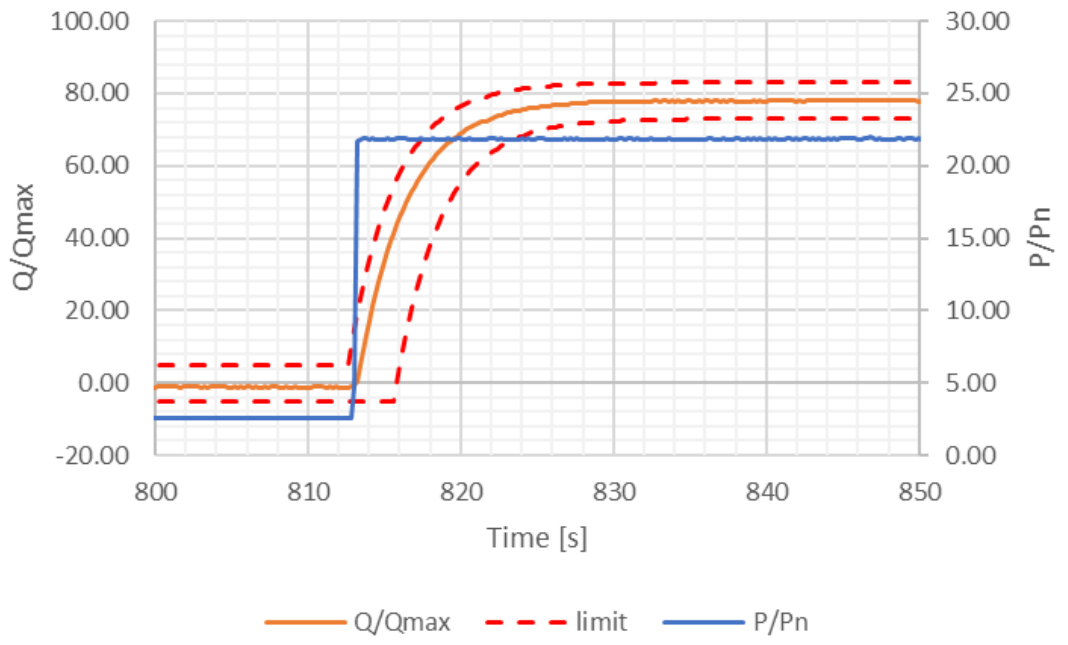
U/Un: 100%-92%



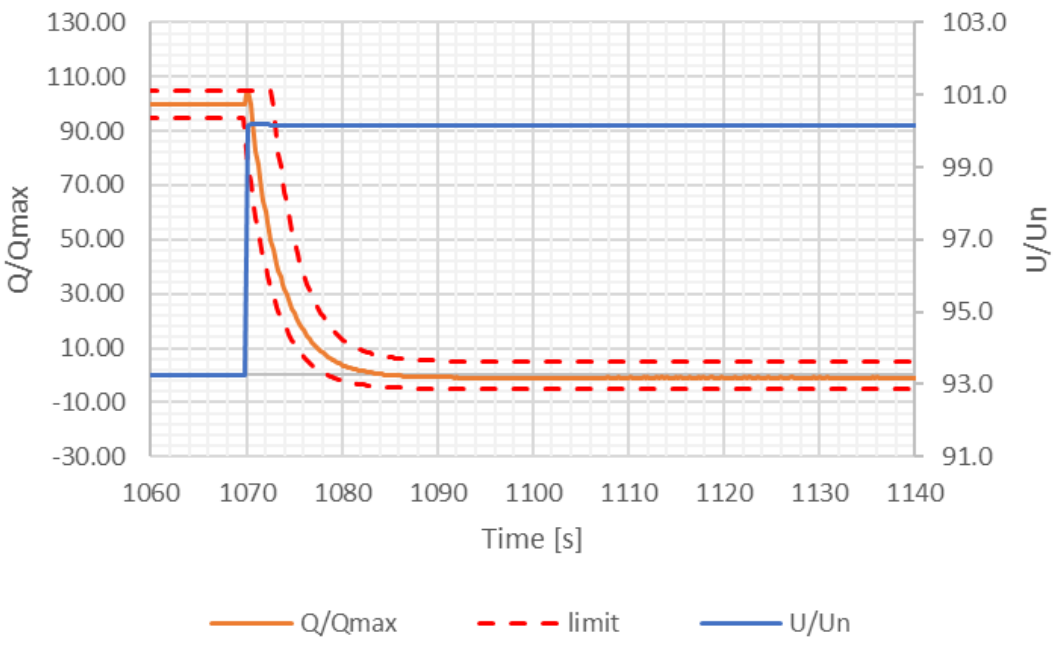
P/Pn:18%-3%



P/Pn:3%-22%



U/Un: 93%-100%


130.00
110.00
90.00
70.00
50.00
30.00
10.00
-10.00
-30.00
Q/Qmax
103.0
101.0
99.0
97.0
95.0
93.0
91.0
U/Un
1060
1070
1080
1090
1100
1110
1120
1130
1140
Time [s]
Q/Qmax
limit
U/Un

Test method:

Standard	Parameter	X1	X2	X3	X4
EN 50549-10: 2022 (Setting a)	U (U/Un)	93%	94%	106%	108%
	Q (Q/Qmax)	100%	0%	0%	-100%

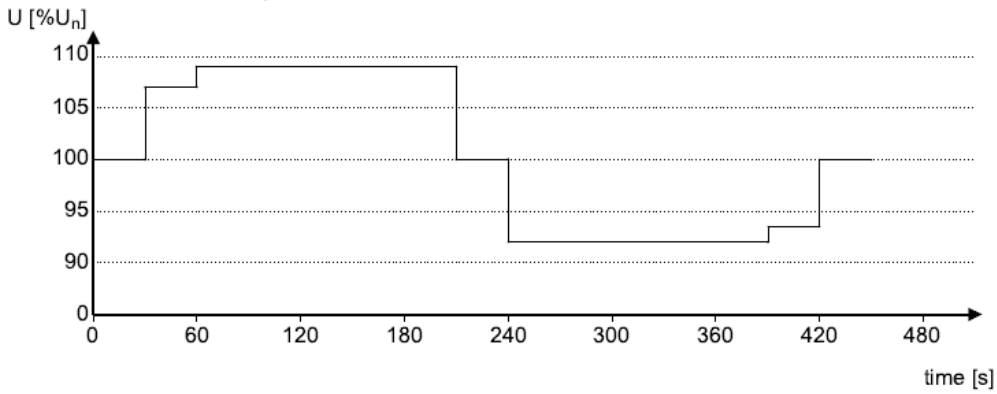


Figure 34 — Example voltage profile for setting (a) applied for the test of the dynamic behaviour of the Q(U), assuming < 30 s for stabilization of P and Q

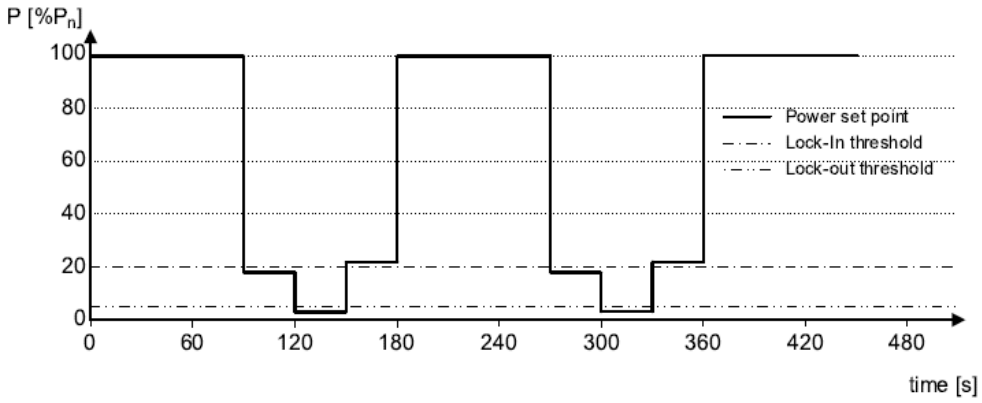


Figure 35 — Example active power set point profile for setting (a) applied for the test of the dynamic behaviour of the Q(U) control, assuming < 30 s for stabilization of P and Q

5.5.2.5 Verification procedure for power related control modes for reactive power 5.5.2.5.2 Test procedure for quasi-stationary behaviour										P
Test a):										
P_n/P [%]	10	20	30	40	50	60	70	80	90	100
30 s mean value	10% to 100% P_n									
U [V]:	230.0	229.9	229.9	230.0	230.0	230.0	230.1	230.1	230.0	230.0
P_{E30} [W]:	12711	25118	37891	50352	63004	75651	87956	100324	112892	115141
P_{E30} of P_n [%]:	10.17	20.09	30.31	40.28	50.40	60.52	70.36	80.26	90.31	92.11*
Q_{E30} [Var]:	75345	-1791	-1760	-1762	-1134	-773	252	724	-75179	-75121
Q_{E30} of P_n [%]:	60.28	-1.43	-1.41	-1.41	-0.91	-0.62	0.20	0.58	-60.14	-60.10
cos φ_{E30}:	0.1664	0.9974	0.9988	0.9993	0.9995	0.9997	0.9997	0.9997	0.8323	0.8375
Q_{E30} target [%]:	60	0	0	0	0	0	0	0	-60	-60
P_n/P [%]	100	90	80	70	60	50	40	30	20	10
30 s mean value	100% to 10% P_n									
U [V]:	230.0	230.0	230.1	230.1	230.1	230.0	230.0	229.9	229.9	230.0
P_{E30} [W]:	115053	112487	100276	87669	75239	62717	50139	37854	25268	12879
P_{E30} of P_n [%]:	92.04*	89.99	80.22	70.13	60.19	50.17	40.11	30.28	20.21	10.30
Q_{E30} [Var]:	-75095	-75081	1124	123	-864	-1414	-1669	-1825	-1801	75436
Q_{E30} of P_n [%]:	-60.08	-60.06	0.90	0.10	-0.69	-1.13	-1.34	-1.46	-1.44	60.35
cos φ_{E30}:	0.8374	0.8317	0.9998	0.9997	0.9996	0.9995	0.9992	0.9986	0.9975	0.1683
Q_{E30} target [%]:	-60	-60	0	0	0	0	0	0	0	60
Limit ΔQ:	±2%Smax									

Test c):										
P_n/P [%]	10	20	30	40	50	60	60	70	80	90
30 s mean value	10% to 100% to 10%									
U [V]:	239.1	239.1	239.1	239.2	239.2	239.3	243.8	243.8	243.8	243.8
P_{E30} [W]:	12639	25136	37827	50461	62858	75534	75554	88097	100620	113148
P_{E30} of P_n [%]:	10.11	20.11	30.26	40.37	50.29	60.43	60.44	70.48	80.50	90.52
Q_{E30} [Var]:	634	600	628	747	951	1559	-14092	-30730	-46912	-60601
Q_{E30} of P_n [%]:	0.51	0.48	0.50	0.60	0.76	1.25	-11.27	-24.58	-37.53	-48.48
cos φ_{E30}:	0.9987	0.9997	0.9999	0.9999	0.9999	0.9998	0.9830	0.9442	0.9063	0.8815
Q_{E30} target [%]:	0	0	0	0	0	0	-12	-24	-36	-48
P_n/P [%]	100	90	80	70	60	60	50	40	30	20
30 s mean value	10% to 100% to 10%									
U [V]:	243.8	243.8	243.8	243.8	243.8	227.7	227.7	227.7	227.6	227.6
P_{E30} [W]:	119017	112976	100148	87371	74970	75345	62766	50186	37743	25261
P_{E30} of P_n [%]:	95.21*	90.38	80.12	69.90	59.98	60.28	50.21	40.15	30.19	20.21
Q_{E30} [Var]:	-69047	-60542	-46136	-30943	-14370	2030	1370	773	726	676
Q_{E30} of P_n [%]:	-55.24*	-48.43	-36.91	-24.75	-11.50	1.62	1.10	0.62	0.58	0.54
cos φ_{E30}:	0.8650	0.8814	0.9083	0.9426	0.9821	0.9996	0.9998	0.9999	0.9998	0.9996
Q_{E30} target [%]:	-60	-48	-36	-24	-12	0	0	0	0	0
P_n/P [%]	10	--	--	--	--	--	--	--	--	--
30 s mean value	10% to 100% to 10%									
U [V]:	227.6	--	--	--	--	--	--	--	--	--
P_{E30} [W]:	12794	--	--	--	--	--	--	--	--	--
P_{E30} of P_n [%]:	10.24	--	--	--	--	--	--	--	--	--
Q_{E30} [Var]:	768	--	--	--	--	--	--	--	--	--
Q_{E30} of P_n [%]:	0.61	--	--	--	--	--	--	--	--	--
cos φ_{E30}:	0.9982	--	--	--	--	--	--	--	--	--
Q_{E30} target [%]:	0	--	--	--	--	--	--	--	--	--
Limit ΔQ:	±2%Smax									
* Due to the limit of output current, it can't reach target output power.										

Test method:

Table 19 — Q (P) or cos φ (P) characteristic configuration

parameter of characteristic	Setting (a)	Setting (b)	Setting (c)
minimum and maximum reactive power (Cos Φ [b]) of the characteristic $Q_{max\ char}$ [a]	≥ 95 % of $Q_{max\ over}$ and $Q_{max\ under}$ respectively but not more than 60 % P_n	10 % of $Q_{max\ over}$ and $Q_{max\ under}$ respectively	$Q_{max\ char\ over}$ = 0 %P_n $Q_{max\ char\ over}$ = 33 %P_n
Slope of the steepest section of the characteristic curve [a]	as steep as configurable, but not more than 200 %Q_{max} / 10 %P_n	as flat as configurable, but not less than 2 %Q_{max} / 10 %P_n	0 below 50 %P_n; 20 %Q_{max}/10 %P_n above 50 %P_n
Time constant	as fast as possible but not slower than 3 s	as slow as possible but not slower than 20 s [c]	3,33 s

[a] If multiple sections with different steepness are configurable, this shall be apparent in the chosen configuration by using different steepness and different values for maximum reactive power $Q_{max\ char\ over}$ and $Q_{max\ char\ under}$.

[b] The cos φ(P) characteristic shall be configured accordingly with the cos φ value representing the given reactive power value at P_n.

[c] The test is considered significant also for slower values of the time constant, as slow time constants are technically less demanding. 20 s is chosen to reduce test duration compared to 60 s as defined in EN 50549-2:2019.

Setting (c) represents a commonly applied characteristic.

Table 20 — cos φ (P) optional additional parameter configuration if applicable

parameter	Setting (a)	Setting (b)	
Lock-in voltage	deactivated	105 %U_n	
Lock-out voltage	deactivated	100 %U_n	

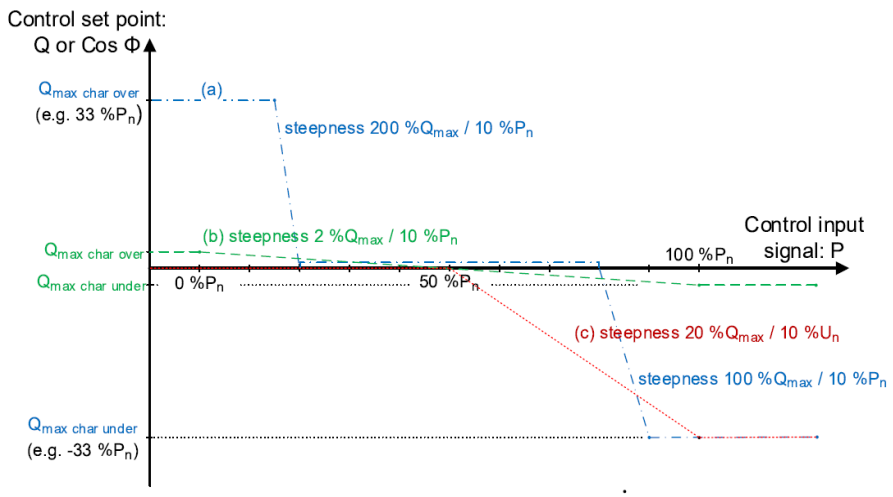


Figure 36 — Q (P) and cos φ (P) and example characteristics for setting (a), (b) and (c) for the test

Assessment criterion:

Test of the accuracy of the Q(P) cos φ (P) control shall be considered passed if:

The measured 30-s averages of the reactive power during steady-state conditions are within a tolerance band of ± 2% S_{max} around the reactive power set point resulting from the measured active power and the given cos φ (P) or Q (P) characteristic.

5.5.2.5 Verification procedure for power related control modes for reactive power 5.5.2.5.3 Test procedure for dynamic behaviour					P
Test a):					
P_{Emax}/P_n [%]	20	50	90	50	20
30 s mean value	20% to 50% to 90% to 50% to 20%				
U_{target} [V]:	230.0	230.0	230.0	230.0	230.0
U [V]:	230.0	230.1	230.1	230.1	230.0
P_{E30} [W]:	25859	64255	111698	64195	25792
P_{E30} of P_n [%]:	20.69	51.40	89.36	51.36	20.63
Q_{E30} [Var]:	-1506	-2004	-74683	-1944	-1453
Q_{E30} of P_n [%]:	-1.20	-1.60	-59.75	-1.56	-1.16
Q_{E30} target [%]:	0.00	0.00	-60.00	0.00	0.00
cos φ_{E30}:	0.9981	0.9994	0.8142	0.9995	0.9982

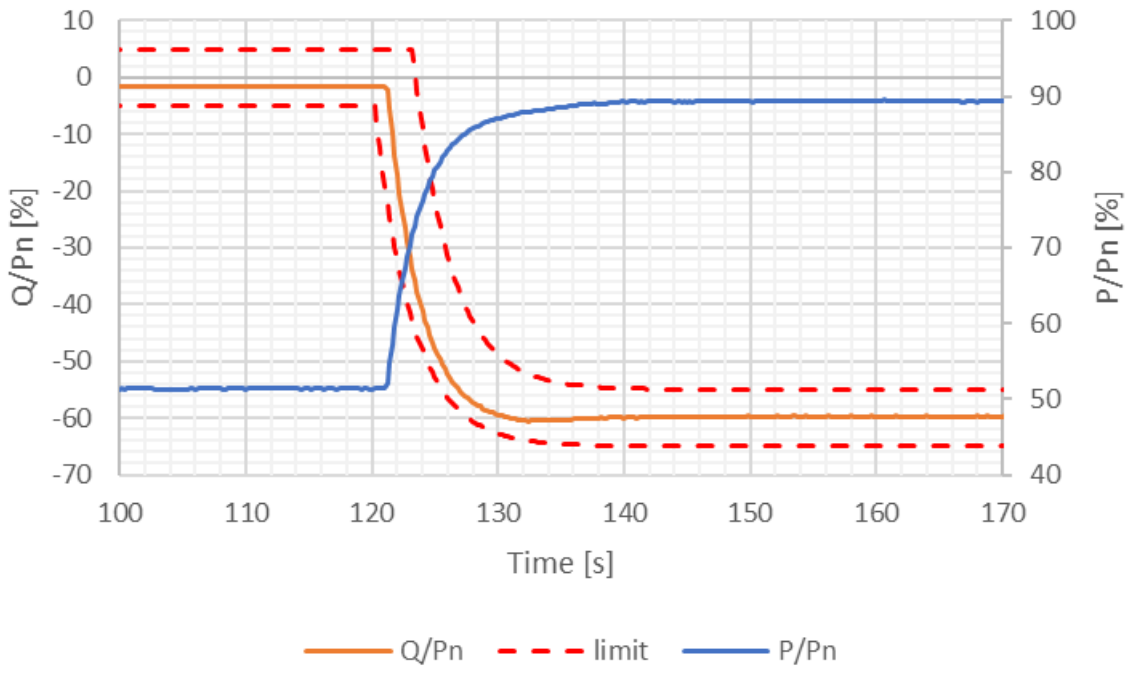
Test condition	$T_{dead\ time}$[s]	$T_{set\ time}$[s]	$T_{seting\ response\ time}$[s]
50% P_n-90% P_n	0.2	9.6	9.6
90% P_n-50% P_n	0.2	9.6	9.6
Limit:	PT1:3s ΔQ=± 5 % P_n, delay time <3s		

Test c):			
P_{Emax}/P_n [%]	20	50	90
30 s mean value	20% to 50% to 90% to 50% to 20%		
U_{target} [V]:	246.1	246.1	246.1
U [V]:	246.0	246.1	246.1
P_{E30} [W]:	25310	62715	112943
P_{E30} of P_n [%]:	20.25	50.17	90.35
Q_{E30} [Var]:	-628	-426	-60099
Q_{E30} of P_n [%]:	-0.50	-0.34	-48.08
Q_{E30} target [%]:	0.00	0.00	-48.00
cos φ_{E30}:	0.9977	0.9996	0.8607
P_{Emax}/P_n [%]	90	90	90
U_{target} [V]:	236.9	225.4	246.1
U [V]:	237.0	225.6	246.1

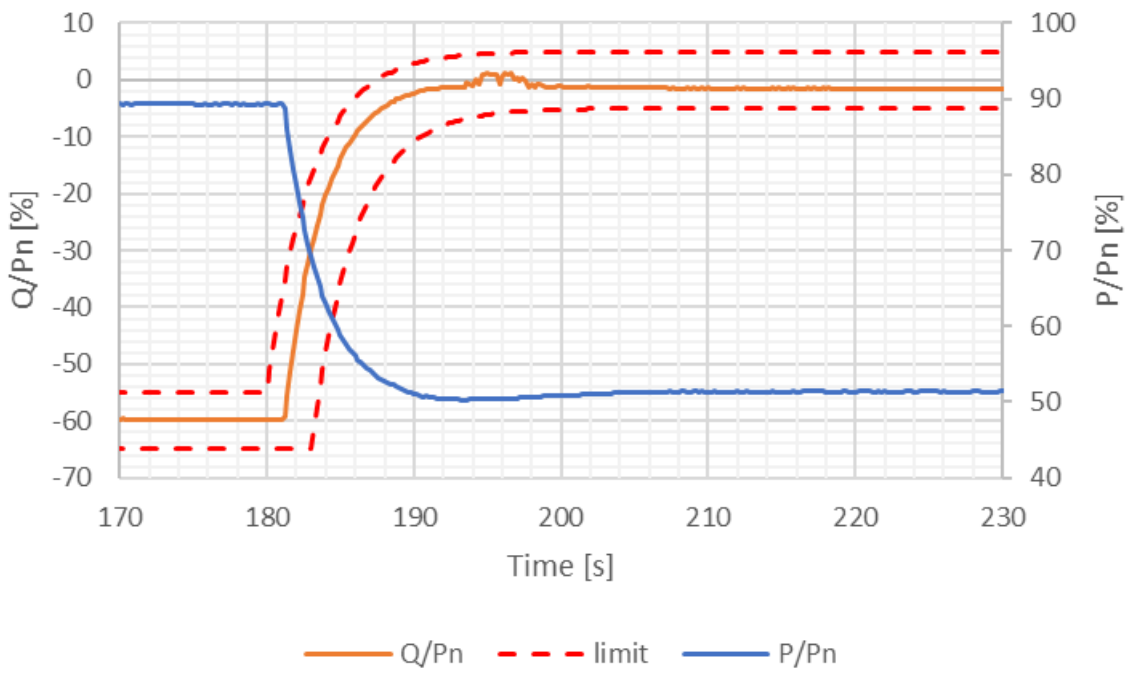
P_{E30} [W]:	112865	112476	112592
P_{E30} of P_n [%]:	90.29	89.98	90.07
Q_{E30} [Var]:	-60104	-242	-60087
Q_{E30} of P_n[%]:	-48.08	-0.19	-48.07
Q_{E30} target [%]:	-48.00	0.00	-48.00
cos φ_{E30}:	0.8605	0.9998	0.8600
P_{Emax}/P_n [%]	90	50	20
U_{target} [V]:	230.0	230.0	230.0
U [V]:	230.0	229.9	229.8
P_{E30} [W]:	112391	62696	25409
P_{E30} of P_n [%]:	89.91	50.16	20.33
Q_{E30} [Var]:	-210	-352	-495
Q_{E30} of Smax. [%]:	-0.17	-0.28	-0.40
Q_{E30} target [%]:	0.00	0.00	0.00
cos φ_{E30}:	0.9998	0.9997	0.9982
Test condition	$T_{dead\ time}$[s]	$T_{set\ time}$[s]	$T_{seting\ response\ time}$[s]
50% P_n-90% P_n (107%Un-107%Un)	0.2	9.8	9.8
90% P_n (103%Un-98%Un)	0.2	9.6	9.6
90% P_n (98%Un-107%Un)	0.4	9.6	9.6
90% P_n (107%Un-100%Un)	0.2	9.2	9.2
Limit:	Q PT1:3.33s, ΔQ=± 5 % Pn, delay time <3s		
Note:			

Test a:

50%Pn -> 90%Pn:

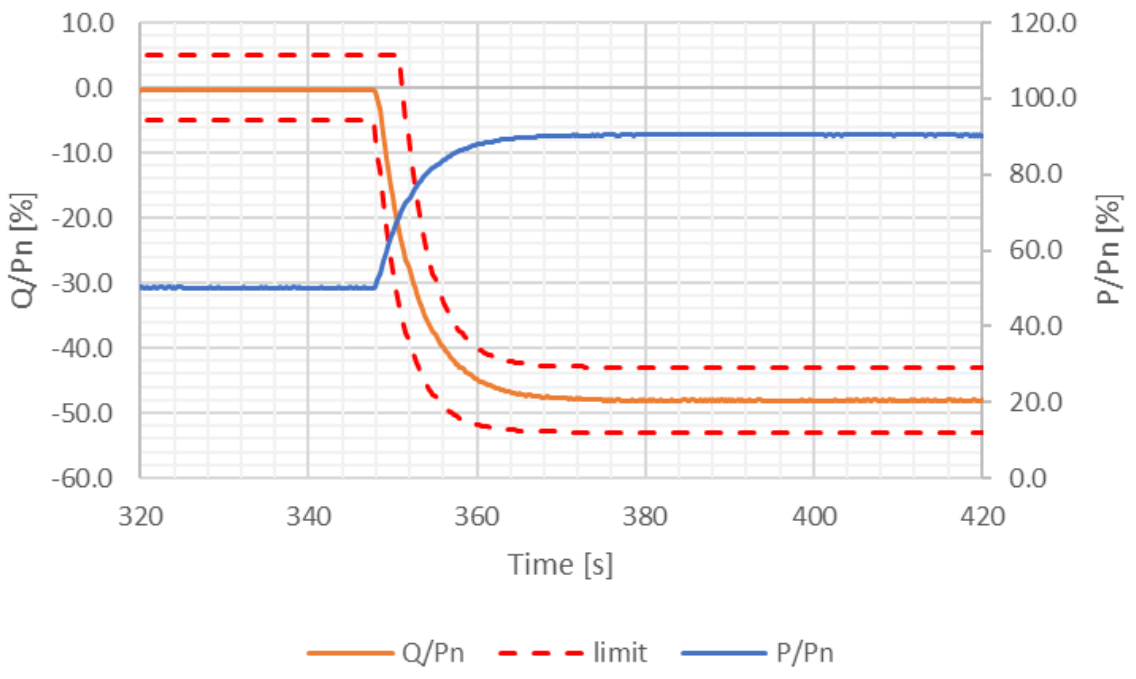


90%Pn -> 50%Pn:

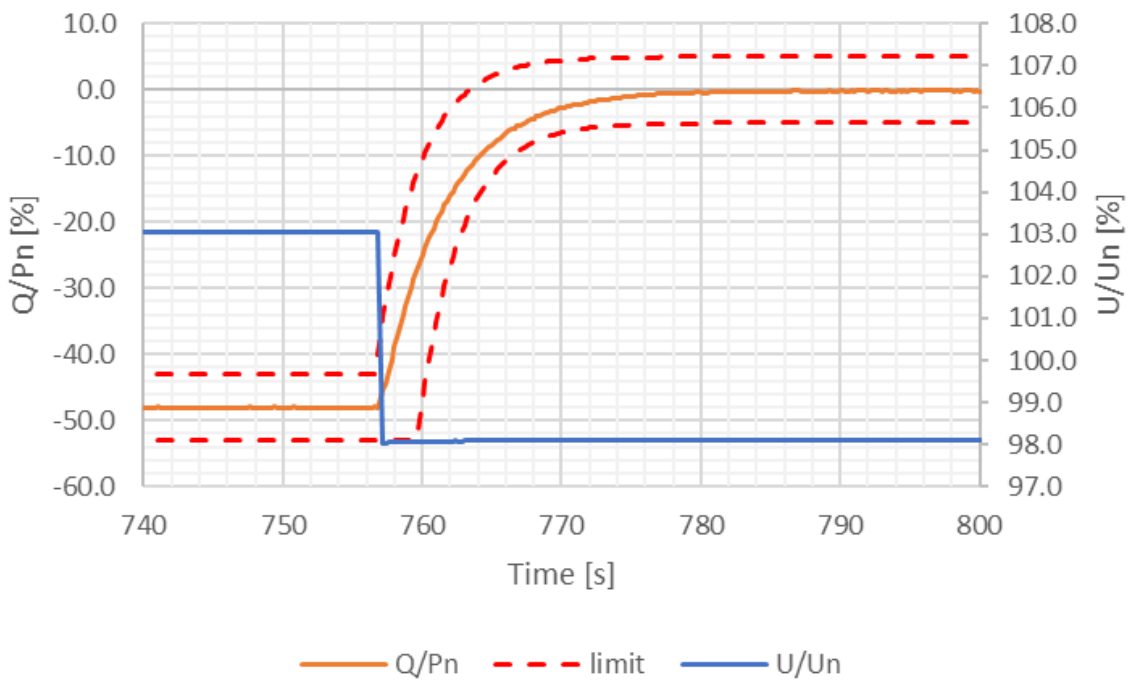


Test c:

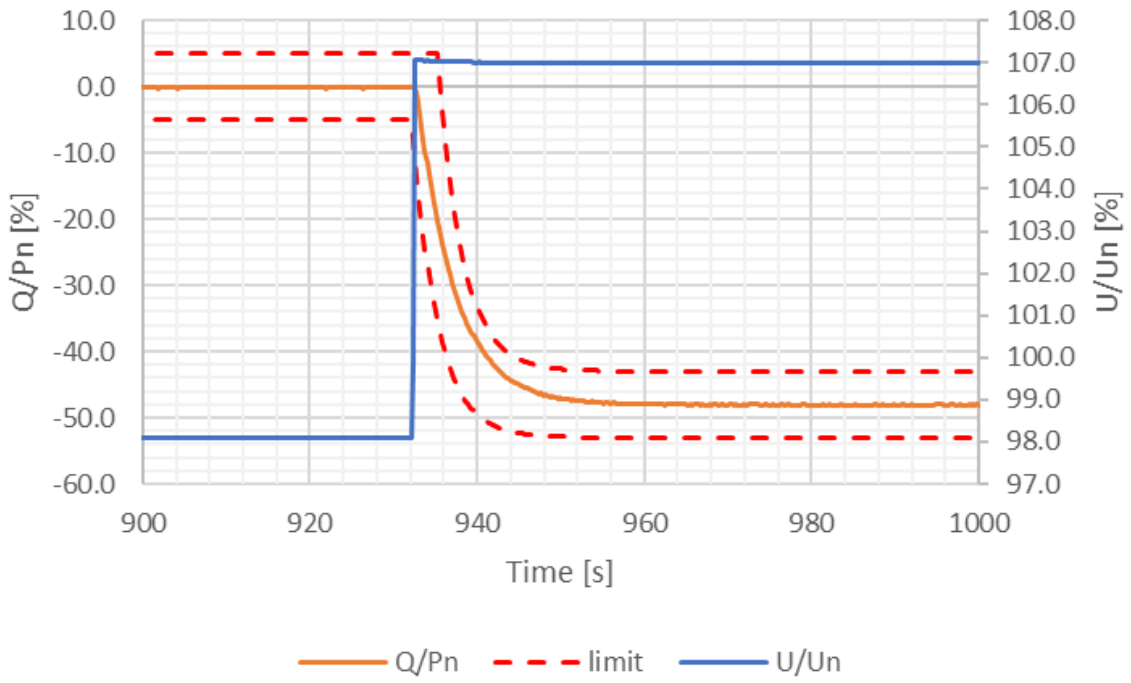
50%Pn -> 90%Pn



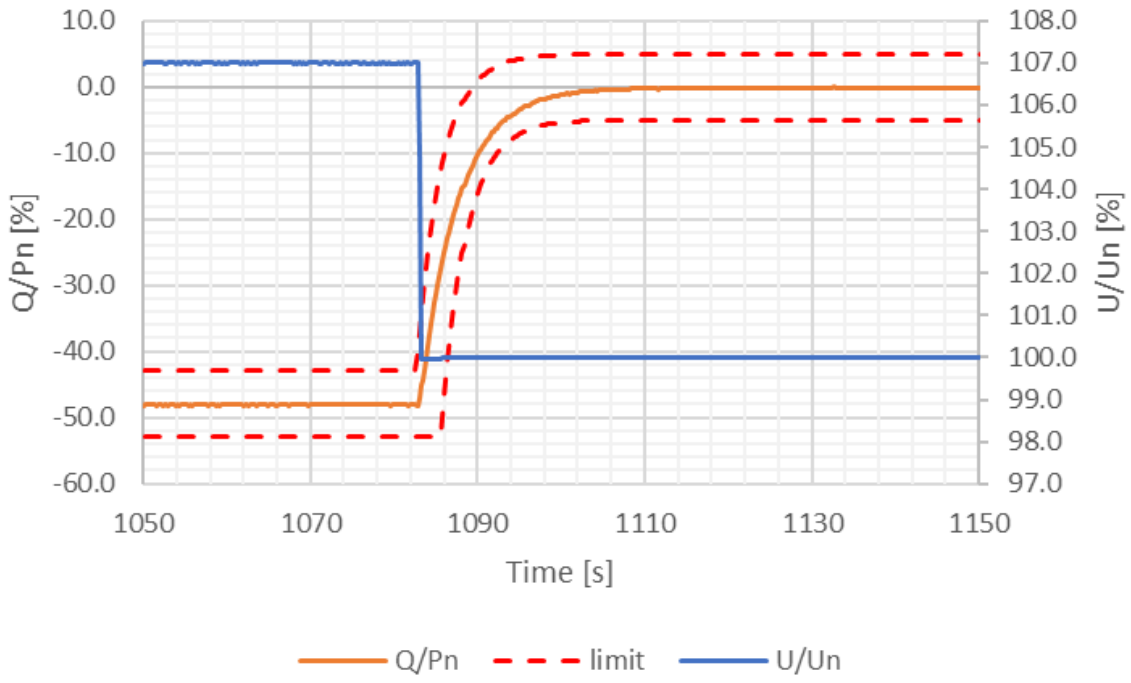
103%Un -> 98%Un



98%Un-> 107%Un



107%Un-> 100%Un



EN 50549-10:2022		
Clause	**Test items**	**Remark**
5.6	**Voltage related active power reduction - P(U)**	
5.6.3	Test procedure for steady-state behaviour	P
5.6.4	Test procedure for dynamic behaviour	P

5.6 Voltage related active power reduction (P(U) function) 5.6.3 Test procedure for steady-state behaviour				P
Test condition	100% Pn			
V_{Target} [%]	100	103	106	109
$V_{measured}$ [%]	100.12	103.03	106.02	109.07
$P_{measured}$ [%]	100.11	100.03	99.99	92.64*
$Q_{measured}$ [%]	1.59	1.59	1.60	-60.59
P_{Target} [%]	100.0	100.0	100.0	100.0
Q_{Target} [%]	0.0	0.0	0.0	-60.0
V_{Target} [%]	112	115	112	109
$V_{measured}$ [%]	112.04	114.97	112.04	109.07
$P_{measured}$ [%]	59.82	0.04	60.04	92.79*
$Q_{measured}$ [%]	-60.87	-60.98	-60.88	-60.66
P_{Target} [%]	60.0	0.0	60.0	100.0
Q_{Target} [%]	-60.0	-60.0	-60.0	-60.0
V_{Target} [%]	106		103	
$V_{measured}$ [%]	106.02		103.02	
$P_{measured}$ [%]	100.05		100.10	
$Q_{measured}$ [%]	1.64		1.58	
P_{Target} [%]	100.0		100.0	
Q_{Target} [%]	0.0		0.0	
Limits	ΔP=±2%Pn, ΔQ=±2%Smax, ΔU=±1%Un			

Assessment criterion:

P(U) setting

U/Un(%)	110	115
P/Pn(%)	100	0

Unless further requirements apply for a specific grid code, the test shall be considered passed if:

The measured 30-s averages of the active power (positive sequence components) during steady-stateconditions are within a tolerance band of ± 2% Smax and ± 1 %Un, of the set P(U) characteristic.

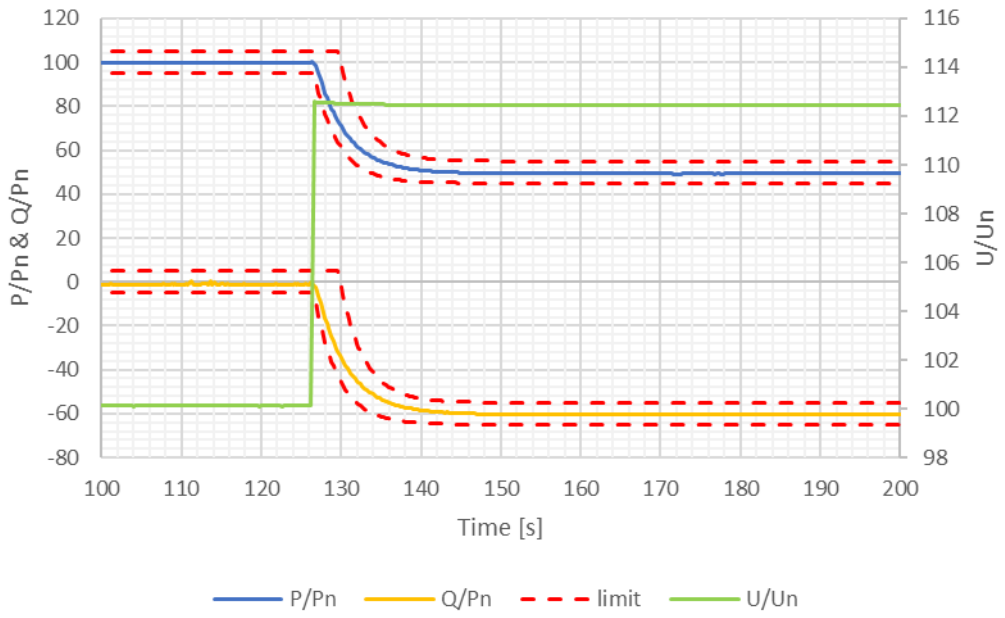
the time response of the active power during the measurement represents the applied configuration withinthe

tolerance band resulting from the behaviour of an equivalent first order filter element and the configuredtime constant tau. Accepted tolerances are -5 % Pn, for the active power values and 3 s for the time in case of a power decrease. +5 % Pn, for the active power values and 3 s for the time in case of a power increase. No discontinuities in the characteristic curve are detected and no oscillations of the active power after theend of the transient period of 5 τ as configured and no disconnection of the EUT occur. The settings of the function, as well as the enabling and disabling of the function, are field adjustable andmeans are provided to protect these from unpermitted interference (e.g. password or seal).
Note: *the active power can't reach because of the limit of output current.

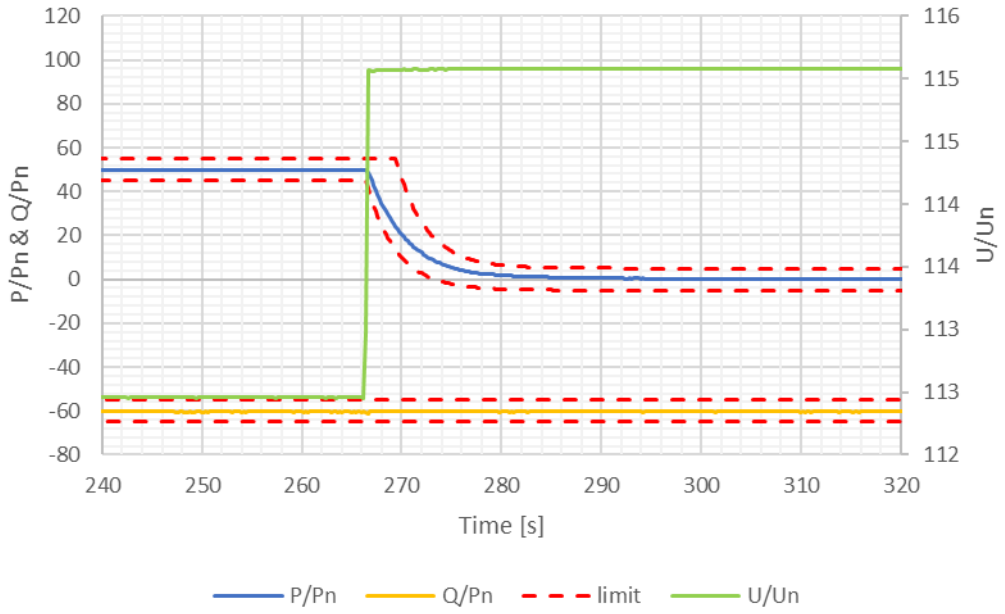
5.6 Voltage related active power reduction (P(U) function) 5.6.4 Test procedure for dynamic behaviour					P
Test condition	100% Pn				
	Step 1	Step 2	Step 3	Step 4	Step 5
V_{Target} [%]	100.0	112.5	115.0	112.5	100.0
$V_{measured}$ [%]	100.11	112.46	115.08	112.46	100.11
$P_{measured}$ [%]	99.83	49.47	0.12	49.79	99.89
$Q_{measured}$ [%]	-1.28	-60.34	-60.35	-60.36	-1.20
P_{Target} [%]	100.0	50.0	0.0	50.0	100.0
Q_{Target} [%]	0.0	-60.0	-60.0	-60.0	0.0
Limit	P: Tau=3s, Q: Tau=3s, ΔP=±2%Pn, ΔQ=±2%Smax, ΔU=±1%Un				

Test condition	100% Pn					
	Dead time[s]		response time[s]		settling time[s]	
	P	Q	P	Q	P	Q
Step 1- Step 2	0.8	0.8	9.8	9.8	9.8	9.8
Step 2- Step 3	0.4	-	9.2	-	9.2	-
Step 3- Step 4	0.4	-	9.2	-	9.2	-
Step 4- Step 5	0.4	0.4	9.8	9.8	9.8	9.8

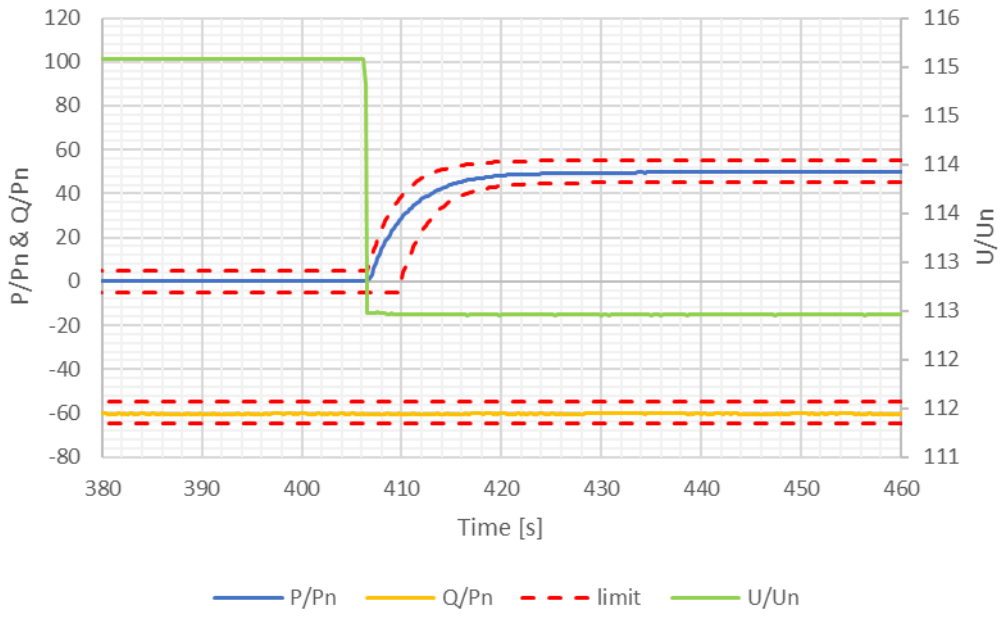
Step 1- Step 2



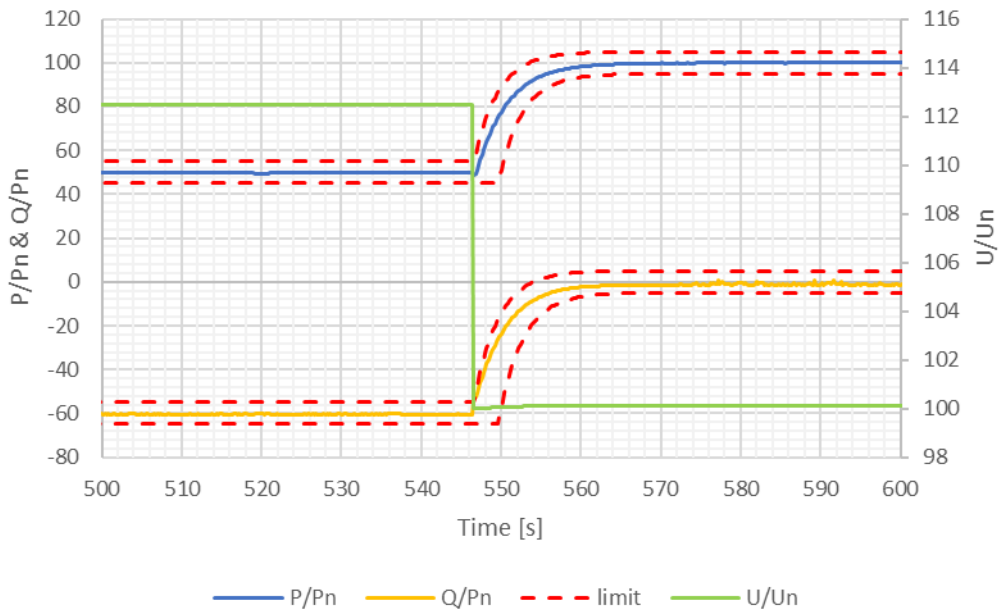
Step 2- Step 3



Step 3- Step 4



Step 4- Step 5



Assessment criterion:

P(U) setting

U/Un(%)	110	115
P/Pn(%)	100	0

Unless further requirements apply for a specific grid code, the test shall be considered passed if:

The measured 30-s averages of the active power (positive sequence components) during steady-stateconditions are within a tolerance band of ± 2% Smax and ± 1 %Un, of the set P(U) characteristic.

the time response of the active power during the measurement represents the applied configuration withinthe tolerance band resulting from the behaviour of an equivalent first order filter element and the configuredtime constant tau. Accepted tolerances are

-5 % Pn, for the active power values and 3 s for the time in case of a power decrease.

+5 % Pn, for the active power values and 3 s for the time in case of a power increase.

No discontinuities in the characteristic curve are detected and no oscillations of the active power after theend of the transient period of 5 τ as configured and no disconnection of the EUT occurs.

The settings of the function, as well as the enabling and disabling of the function, are field adjustable andmeans are provided to protect these from unpermitted interference (e.g. password or seal).

Note:

EN 50549-10:2022		
Clause	**Test items**	**Remark**
5.7	**EMC and power quality**	
5.7.1	EMC	P
5.7.2	Power Quality	
5.7.2.2	Verification procedure for harmonics, interharmonics and higher frequencies up to 9 kHz	P
5.7.2.3	Verification procedure for flicker and rapid voltage changes	P
5.7.2.3.2	Flicker - Generation units with a rated currents 75 A	N/A
5.7.2.3.3	Flicker - Generation units with a rated currents >75 A	P
5.7.2.3.4	Rapid voltage changes - Generation units with a rated current 75A	N/A
5.7.2.3.5	Rapid voltage changes - Generation units with a rated current> 75 A	P
5.7.2.4	Verification procedure for DC injection	P

5.7 EMC and power quality 5.7.2.2 Verification procedure for harmonics, interharmonics and higher frequencies up to 9 kHz							P
Model: TAA-125KW-11							
Power Level	**33%**		**66%**		**100%**		
Harmonic	**Current Magnitude (A)**	**% of Funda-mental**	**Current Magnitude (A)**	**% of Funda-mental**	**Current Magnitude (A)**	**% of Funda-mental**	**Harmonic Current Limits (%)**
2nd	0.206	0.346	0.365	0.304	0.406	0.224	8.000
3rd	0.266	0.447	0.165	0.138	0.319	0.176	N/A
4th	0.052	0.087	0.230	0.192	0.338	0.186	4.000
5th	0.209	0.351	0.177	0.148	0.187	0.103	10.700
6th	0.030	0.051	0.173	0.144	0.223	0.123	2.670
7th	0.277	0.465	0.203	0.170	0.274	0.151	7.200
8th	0.029	0.048	0.049	0.041	0.071	0.039	2.000
9th	0.284	0.476	0.131	0.109	0.150	0.083	N/A
10th	0.031	0.052	0.048	0.040	0.082	0.045	1.600
11th	0.850	1.428	0.909	0.758	1.219	0.672	3.100
12th	0.023	0.038	0.039	0.032	0.050	0.027	1.330
13th	0.565	0.949	0.523	0.437	0.671	0.370	2.000
14th	0.015	0.025	0.030	0.025	0.041	0.023	N/A
15th	0.353	0.592	0.384	0.321	0.442	0.244	N/A
16th	0.010	0.018	0.031	0.026	0.031	0.017	N/A
17th	0.337	0.566	0.378	0.315	0.372	0.205	N/A
18th	0.017	0.028	0.032	0.026	0.036	0.020	N/A
19th	0.307	0.515	0.323	0.270	0.303	0.167	N/A
20th	0.015	0.025	0.029	0.024	0.035	0.019	N/A
21st	0.220	0.369	0.268	0.224	0.253	0.140	N/A
22nd	0.009	0.016	0.028	0.024	0.028	0.015	N/A
23rd	0.172	0.289	0.254	0.212	0.251	0.138	N/A
24th	0.008	0.014	0.023	0.020	0.030	0.016	N/A
25th	0.139	0.233	0.215	0.180	0.222	0.122	N/A

26th	0.008	0.013	0.022	0.018	0.025	0.014	N/A
27th	0.109	0.183	0.176	0.147	0.189	0.104	N/A
28th	0.010	0.016	0.021	0.018	0.027	0.015	N/A
29th	0.095	0.160	0.164	0.137	0.182	0.101	N/A
30th	0.008	0.014	0.017	0.014	0.026	0.014	N/A
31st	0.094	0.159	0.145	0.121	0.163	0.090	N/A
32nd	0.008	0.013	0.017	0.014	0.021	0.012	N/A
33rd	0.081	0.136	0.127	0.106	0.140	0.077	N/A
34th	0.006	0.010	0.015	0.012	0.021	0.011	N/A
35th	0.061	0.102	0.126	0.105	0.137	0.075	N/A
36th	0.007	0.011	0.015	0.013	0.019	0.011	N/A
37th	0.060	0.101	0.122	0.102	0.126	0.070	N/A
38th	0.008	0.013	0.015	0.012	0.021	0.011	N/A
39th	0.055	0.092	0.114	0.095	0.114	0.063	N/A
40th	0.006	0.010	0.014	0.012	0.019	0.010	N/A
41st	0.040	0.066	0.111	0.092	0.121	0.067	N/A
42nd	0.007	0.012	0.013	0.011	0.019	0.011	N/A
43rd	0.044	0.074	0.104	0.087	0.124	0.069	N/A
44th	0.008	0.014	0.013	0.011	0.023	0.012	N/A
45th	0.054	0.091	0.100	0.084	0.123	0.068	N/A
46th	0.007	0.012	0.012	0.010	0.019	0.010	N/A
47th	0.035	0.058	0.091	0.076	0.129	0.071	N/A
48th	0.005	0.008	0.011	0.009	0.022	0.012	N/A
49th	0.028	0.047	0.078	0.065	0.131	0.072	N/A
50th	0.010	0.016	0.017	0.015	0.028	0.015	N/A
THD [%]	--	2.283	--	1.241	--	1.012	13
PWHD [%]	--	5.212	--	3.493	--	2.474	22

Note:

Samplerate：20 kHz

Choose the maximum value of three phases.

5.7 EMC and power quality 5.7.2.2 Verification procedure for harmonics, interharmonics and higher frequencies up to 9 kHz	P

The currents of the interharmonics to 2 kHz must be measured in accordance with DIN EN 61000-4-7 (VDE 0817-4-7), Annex A. The measurements of higher-frequency harmonic currents between 2 kHz and 9 kHz must be conducted in line with DIN EN 61000-4-7 (VDE 0847-4-7), Annex B.

Model: TAA-125KW-11

Harmonics

P/P_n [%]	0/5	10	20	30	40	50	60	70	80	90	100
Order	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]	I [%]
2	0.071	0.139	0.101	0.138	0.128	0.180	0.107	0.228	0.210	0.231	0.236
3	0.299	0.253	0.147	0.145	0.192	0.131	0.202	0.096	0.130	0.143	0.171
4	0.069	0.061	0.043	0.028	0.023	0.132	0.021	0.131	0.156	0.175	0.182
5	0.156	0.198	0.100	0.120	0.108	0.067	0.088	0.079	0.072	0.098	0.093
6	0.093	0.020	0.021	0.017	0.017	0.095	0.012	0.096	0.099	0.117	0.121
7	0.029	0.049	0.110	0.147	0.042	0.091	0.165	0.118	0.125	0.143	0.154
8	0.057	0.079	0.019	0.016	0.013	0.041	0.021	0.029	0.039	0.038	0.042
9	0.046	0.036	0.053	0.150	0.196	0.077	0.134	0.080	0.069	0.076	0.086
10	0.016	0.022	0.017	0.016	0.012	0.025	0.010	0.027	0.028	0.046	0.046
11	0.041	0.084	0.280	0.437	0.445	0.433	0.453	0.521	0.573	0.625	0.674
12	0.018	0.015	0.011	0.011	0.009	0.029	0.007	0.021	0.022	0.024	0.029
13	0.089	0.048	0.224	0.275	0.341	0.291	0.290	0.296	0.310	0.336	0.370
14	0.021	0.010	0.004	0.009	0.007	0.027	0.005	0.016	0.020	0.020	0.024
15	0.066	0.116	0.094	0.197	0.232	0.227	0.204	0.212	0.218	0.226	0.245
16	0.019	0.032	0.008	0.007	0.007	0.030	0.004	0.015	0.014	0.019	0.017
17	0.036	0.148	0.083	0.202	0.204	0.218	0.212	0.206	0.204	0.204	0.206
18	0.013	0.013	0.006	0.008	0.006	0.025	0.005	0.017	0.017	0.019	0.020
19	0.038	0.045	0.076	0.165	0.164	0.176	0.192	0.175	0.171	0.168	0.166
20	0.011	0.007	0.006	0.006	0.005	0.022	0.004	0.015	0.015	0.018	0.020
21	0.039	0.019	0.041	0.101	0.115	0.137	0.144	0.148	0.145	0.142	0.140
22	0.009	0.006	0.006	0.003	0.005	0.020	0.005	0.015	0.015	0.016	0.016
23	0.038	0.077	0.043	0.077	0.103	0.120	0.137	0.142	0.143	0.142	0.138
24	0.008	0.017	0.004	0.004	0.005	0.015	0.004	0.013	0.013	0.016	0.017
25	0.027	0.077	0.053	0.073	0.095	0.097	0.122	0.122	0.126	0.124	0.122

26	0.007	0.007	0.003	0.005	0.004	0.014	0.003	0.012	0.013	0.015	0.014
27	0.023	0.032	0.045	0.061	0.073	0.080	0.091	0.100	0.105	0.104	0.104
28	0.007	0.007	0.004	0.005	0.005	0.013	0.004	0.012	0.013	0.015	0.016
29	0.023	0.026	0.043	0.048	0.060	0.073	0.083	0.094	0.098	0.102	0.100
30	0.007	0.005	0.003	0.003	0.004	0.013	0.003	0.008	0.010	0.012	0.014
31	0.020	0.044	0.049	0.045	0.059	0.066	0.080	0.083	0.087	0.090	0.090
32	0.006	0.010	0.003	0.004	0.003	0.013	0.003	0.008	0.010	0.013	0.012
33	0.017	0.043	0.045	0.040	0.050	0.060	0.067	0.073	0.076	0.077	0.077
34	0.006	0.007	0.003	0.003	0.003	0.012	0.004	0.008	0.010	0.012	0.018
35	0.015	0.027	0.039	0.029	0.040	0.056	0.062	0.072	0.075	0.074	0.075
36	0.005	0.005	0.003	0.003	0.003	0.012	0.002	0.009	0.009	0.010	0.011
37	0.014	0.028	0.040	0.029	0.040	0.051	0.065	0.069	0.072	0.071	0.069
38	0.005	0.005	0.003	0.004	0.003	0.011	0.002	0.008	0.009	0.011	0.012
39	0.013	0.032	0.039	0.029	0.036	0.047	0.058	0.066	0.068	0.068	0.063
40	0.006	0.008	0.003	0.003	0.003	0.012	0.003	0.008	0.009	0.012	0.011
41	0.012	0.027	0.033	0.022	0.025	0.045	0.051	0.066	0.071	0.071	0.067
42	0.006	0.006	0.003	0.003	0.003	0.012	0.002	0.008	0.010	0.011	0.011
43	0.012	0.022	0.032	0.022	0.028	0.044	0.052	0.062	0.071	0.072	0.068
44	0.006	0.004	0.002	0.003	0.004	0.013	0.003	0.007	0.009	0.012	0.013
45	0.012	0.027	0.029	0.019	0.036	0.045	0.049	0.060	0.068	0.070	0.067
46	0.004	0.005	0.003	0.004	0.004	0.013	0.003	0.006	0.009	0.012	0.011
47	0.013	0.029	0.025	0.017	0.029	0.043	0.039	0.055	0.067	0.071	0.071
48	0.006	0.010	0.003	0.003	0.004	0.010	0.004	0.006	0.009	0.012	0.013
49	0.019	0.028	0.020	0.020	0.026	0.039	0.045	0.046	0.065	0.074	0.071
50	0.006	0.008	0.005	0.004	0.004	0.011	0.004	0.006	0.012	0.015	0.016
Interharmonics at continuous operation											
P/P_n [%]	0	10	20	30	40	50	60	70	80	90	100
f [Hz]	I_h [%]	I_h [%]	I_h [%]	I_h [%]	I_h [%]	I_h [%]	I_h [%]	I_h [%]	I_h [%]	I_h [%]	I_h [%]
75	0.082	0.193	0.107	0.268	0.307	0.288	0.303	0.294	0.178	0.194	0.182
125	0.070	0.138	0.123	0.184	0.146	0.259	0.147	0.318	0.181	0.116	0.118
175	0.060	0.100	0.091	0.105	0.095	0.177	0.092	0.182	0.207	0.133	0.120
225	0.047	0.071	0.071	0.079	0.081	0.088	0.074	0.096	0.141	0.089	0.076
275	0.041	0.059	0.039	0.048	0.051	0.085	0.080	0.145	0.143	0.148	0.129

325	0.027	0.048	0.029	0.034	0.032	0.050	0.032	0.054	0.066	0.108	0.069
375	0.027	0.041	0.026	0.030	0.028	0.047	0.028	0.052	0.055	0.082	0.081
425	0.026	0.034	0.025	0.028	0.026	0.037	0.025	0.038	0.041	0.050	0.079
475	0.020	0.034	0.018	0.025	0.022	0.038	0.020	0.041	0.042	0.044	0.066
525	0.016	0.027	0.016	0.021	0.021	0.022	0.019	0.026	0.026	0.026	0.035
575	0.015	0.022	0.014	0.020	0.019	0.019	0.015	0.021	0.022	0.023	0.025
625	0.013	0.019	0.013	0.017	0.018	0.018	0.014	0.019	0.018	0.020	0.019
675	0.013	0.018	0.013	0.016	0.018	0.017	0.013	0.017	0.016	0.018	0.018
725	0.013	0.018	0.013	0.016	0.017	0.017	0.014	0.017	0.017	0.018	0.018
775	0.014	0.017	0.013	0.015	0.016	0.016	0.013	0.016	0.016	0.017	0.018
825	0.015	0.021	0.019	0.015	0.015	0.016	0.012	0.015	0.015	0.015	0.017
875	0.013	0.017	0.011	0.014	0.014	0.014	0.012	0.014	0.014	0.014	0.017
925	0.013	0.015	0.010	0.013	0.012	0.013	0.010	0.013	0.012	0.012	0.014
975	0.013	0.014	0.011	0.014	0.013	0.014	0.010	0.013	0.012	0.011	0.013
1025	0.010	0.012	0.010	0.012	0.011	0.013	0.011	0.013	0.013	0.013	0.014
1075	0.008	0.012	0.009	0.011	0.010	0.011	0.009	0.011	0.011	0.011	0.011
1125	0.008	0.013	0.009	0.012	0.013	0.014	0.009	0.014	0.011	0.011	0.011
1175	0.008	0.011	0.009	0.010	0.010	0.011	0.009	0.011	0.011	0.010	0.011
1225	0.007	0.011	0.009	0.010	0.010	0.010	0.008	0.011	0.010	0.010	0.010
1275	0.008	0.011	0.008	0.010	0.010	0.009	0.008	0.010	0.010	0.010	0.014
1325	0.007	0.011	0.008	0.010	0.010	0.010	0.008	0.010	0.010	0.010	0.010
1375	0.008	0.010	0.010	0.011	0.010	0.009	0.008	0.010	0.010	0.009	0.010
1425	0.007	0.010	0.008	0.009	0.009	0.009	0.008	0.010	0.010	0.011	0.010
1475	0.008	0.011	0.008	0.009	0.010	0.009	0.007	0.009	0.009	0.010	0.009
1525	0.009	0.013	0.008	0.008	0.009	0.009	0.007	0.009	0.009	0.009	0.009
1575	0.008	0.013	0.008	0.009	0.010	0.009	0.008	0.009	0.009	0.009	0.009
1625	0.008	0.012	0.007	0.008	0.008	0.019	0.007	0.009	0.009	0.016	0.010
1675	0.009	0.010	0.008	0.009	0.009	0.010	0.009	0.009	0.021	0.022	0.011
1725	0.007	0.010	0.007	0.008	0.008	0.008	0.008	0.013	0.014	0.009	0.028
1775	0.007	0.009	0.008	0.008	0.008	0.008	0.007	0.020	0.009	0.009	0.009
1825	0.007	0.009	0.007	0.008	0.008	0.008	0.007	0.009	0.009	0.008	0.010
1875	0.007	0.009	0.008	0.008	0.008	0.008	0.007	0.008	0.008	0.008	0.008
1925	0.009	0.017	0.017	0.020	0.020	0.021	0.007	0.008	0.008	0.009	0.009
1975	0.008	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.009	0.010

Higher Frequencies components											
P/P_n [%]	0	10	20	30	40	50	60	70	80	90	100
f [kHz]	I_h [%]	I_h [%]	I_h [%]	I_h [%]	I_h [%]	I_h [%]	I_h [%]	I_h [%]	I_h [%]	I_h [%]	I_h [%]
2.1	0.025	0.041	0.049	0.036	0.042	0.067	0.075	0.093	0.103	0.105	0.099
2.3	0.025	0.047	0.043	0.032	0.050	0.067	0.064	0.084	0.099	0.104	0.101
2.5	0.042	0.048	0.039	0.034	0.038	0.060	0.078	0.066	0.092	0.112	0.114
2.7	0.050	0.061	0.048	0.038	0.041	0.069	0.072	0.099	0.058	0.072	0.110
2.9	0.032	0.043	0.031	0.027	0.030	0.061	0.051	0.092	0.090	0.061	0.046
3.1	0.022	0.023	0.023	0.023	0.023	0.038	0.036	0.055	0.085	0.086	0.061
3.3	0.017	0.017	0.019	0.019	0.019	0.019	0.035	0.023	0.048	0.068	0.068
3.5	0.025	0.028	0.024	0.023	0.022	0.021	0.041	0.030	0.028	0.055	0.070
3.7	0.039	0.040	0.034	0.041	0.031	0.039	0.034	0.055	0.048	0.037	0.058
3.9	0.043	0.042	0.039	0.046	0.040	0.048	0.042	0.056	0.071	0.064	0.059
4.1	0.052	0.056	0.048	0.060	0.049	0.052	0.093	0.086	0.131	0.124	0.104
4.3	0.053	0.066	0.052	0.050	0.050	0.047	0.065	0.065	0.085	0.102	0.094
4.5	0.118	0.100	0.069	0.065	0.071	0.068	0.072	0.086	0.081	0.097	0.090
4.7	0.083	0.074	0.049	0.066	0.073	0.078	0.053	0.081	0.087	0.093	0.095
4.9	0.106	0.114	0.098	0.106	0.115	0.167	0.147	0.237	0.266	0.258	0.226
5.1	0.081	0.088	0.078	0.081	0.085	0.108	0.103	0.149	0.173	0.171	0.154
5.3	0.018	0.020	0.014	0.016	0.017	0.018	0.016	0.021	0.029	0.036	0.043
5.5	0.011	0.017	0.014	0.015	0.016	0.016	0.011	0.016	0.021	0.027	0.031
5.7	0.011	0.012	0.011	0.011	0.011	0.010	0.009	0.013	0.016	0.021	0.022
5.9	0.009	0.010	0.011	0.011	0.011	0.009	0.010	0.010	0.011	0.014	0.015
6.1	0.015	0.013	0.015	0.014	0.014	0.014	0.012	0.013	0.014	0.016	0.020
6.3	0.066	0.063	0.062	0.066	0.071	0.085	0.085	0.105	0.119	0.136	0.158
6.5	0.058	0.056	0.057	0.059	0.063	0.073	0.074	0.089	0.099	0.111	0.126
6.7	0.011	0.010	0.012	0.011	0.011	0.010	0.010	0.010	0.010	0.010	0.011
6.9	0.006	0.006	0.007	0.007	0.007	0.006	0.007	0.007	0.008	0.009	0.009
7.1	0.006	0.006	0.006	0.007	0.007	0.006	0.007	0.007	0.008	0.009	0.009
7.3	0.005	0.006	0.007	0.007	0.007	0.007	0.007	0.007	0.008	0.009	0.010
7.5	0.005	0.005	0.006	0.006	0.007	0.006	0.007	0.007	0.007	0.007	0.007
7.7	0.005	0.005	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.008	0.008
7.9	0.005	0.005	0.006	0.006	0.007	0.006	0.007	0.008	0.009	0.009	0.009

8.1	0.005	0.005	0.006	0.006	0.006	0.005	0.006	0.006	0.007	0.007	0.007
8.3	0.005	0.005	0.006	0.006	0.006	0.005	0.006	0.006	0.006	0.006	0.006
8.5	0.005	0.005	0.006	0.007	0.007	0.005	0.007	0.006	0.006	0.007	0.007
8.7	0.006	0.006	0.007	0.007	0.007	0.006	0.007	0.007	0.007	0.007	0.006
8.9	0.005	0.006	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.006	0.006

Note:

The normalization current is 181.15A.

R_A=0.15 Ω j_{XA}=0.15 Ω

R_N=0.16 Ω j_{XN}=0.10 Ω

Samplerate：20 kHz

Choose the maxium value of three phases

5.7.2.3 Verification procedure for flicker and rapid voltage change 5.7.2.3.3 Flicker - Generation units with a rated current > 75 A	P

Model: TAA-125KW-11

Test:

Test conditions:	The objective of the test is to determine the system flicker coefficient c(Ψk) at the system impedance angles 30°, 50°, 70° and 85°. The flicker coefficient is determined according to the equation in 3.1.8.2. The system flicker coefficient c(Ψk) is determined for continuous operation without disturbances. It shall be normalized to the nominal apparent power. The apparent short-circuit power Sk shall be referenced to a symmetrical short-circuit of the test source for a three-phase EUT, and to the single-phase short-circuit power in the case of a single-phase EUT.

Test:

%Pn		Pst				Ficker coefficient, c(ψk)			
		30°	50°	70°	85°	30°	50°	70°	85°
0	L1	0.0010	0.0008	0.0009	0.0011	0.0330	0.0264	0.0297	0.0363
	L2	0.0010	0.0008	0.0010	0.0012	0.0330	0.0264	0.0330	0.0396
	L3	0.0010	0.0008	0.0009	0.0011	0.0330	0.0264	0.0297	0.0363
10	L1	0.0010	0.0010	0.0010	0.0010	0.0330	0.0330	0.0330	0.0330
	L2	0.0010	0.0010	0.0010	0.0009	0.0330	0.0330	0.0330	0.0297
	L3	0.0008	0.0008	0.0008	0.0008	0.0264	0.0264	0.0264	0.0264
20	L1	0.0009	0.0009	0.0009	0.0009	0.0297	0.0297	0.0297	0.0297
	L2	0.0008	0.0008	0.0008	0.0008	0.0264	0.0264	0.0264	0.0264
	L3	0.0008	0.0009	0.0009	0.0009	0.0264	0.0297	0.0297	0.0297
30	L1	0.0011	0.0011	0.0011	0.0011	0.0363	0.0363	0.0363	0.0363
	L2	0.0011	0.0011	0.0011	0.0011	0.0363	0.0363	0.0363	0.0363
	L3	0.0009	0.0009	0.0009	0.0009	0.0297	0.0297	0.0297	0.0297
40	L1	0.0009	0.0009	0.0009	0.0009	0.0297	0.0297	0.0297	0.0297
	L2	0.0009	0.0009	0.0009	0.0009	0.0297	0.0297	0.0297	0.0297
	L3	0.0009	0.0009	0.0009	0.0009	0.0297	0.0297	0.0297	0.0297
50	L1	0.0010	0.0010	0.0010	0.0010	0.0330	0.0330	0.0330	0.0330
	L2	0.0010	0.0010	0.0010	0.0009	0.0330	0.0330	0.0330	0.0297
	L3	0.0009	0.0009	0.0009	0.0009	0.0297	0.0297	0.0297	0.0297

60	**L1**	0.0011	0.0010	0.0010	0.0010	0.0363	0.0330	0.0330	0.0330
	L2	0.0010	0.0010	0.0010	0.0010	0.0330	0.0330	0.0330	0.0330
	L3	0.0010	0.0010	0.0009	0.0009	0.0330	0.0330	0.0297	0.0297
70	**L1**	0.0011	0.0010	0.0010	0.0010	0.0363	0.0330	0.0330	0.0330
	L2	0.0011	0.0010	0.0010	0.0010	0.0363	0.0330	0.0330	0.0330
	L3	0.0010	0.0010	0.0009	0.0009	0.0330	0.0330	0.0297	0.0297
80	**L1**	0.0010	0.0010	0.0010	0.0010	0.0330	0.0330	0.0330	0.0330
	L2	0.0010	0.0010	0.0010	0.0010	0.0330	0.0330	0.0330	0.0330
	L3	0.0009	0.0009	0.0009	0.0009	0.0297	0.0297	0.0297	0.0297
90	**L1**	0.0011	0.0010	0.0009	0.0009	0.0363	0.0330	0.0297	0.0297
	L2	0.0011	0.0010	0.0009	0.0009	0.0363	0.0330	0.0297	0.0297
	L3	0.0010	0.0010	0.0009	0.0009	0.0330	0.0330	0.0297	0.0297
100	**L1**	0.0012	0.0011	0.0010	0.0010	0.0396	0.0363	0.0330	0.0330
	L2	0.0011	0.0010	0.0010	0.0009	0.0363	0.0330	0.0330	0.0297
	L3	0.0011	0.0010	0.0009	0.0009	0.0363	0.0330	0.0297	0.0297

Test method:

Although EN IEC 61000-3-11 applies only to rated currents ≤ 75 A, flicker of the EUT with rated currents > 75 A is also determined according to DIN EN 61000-3-11.

For controllable generating units with rated currents > 75 A, at least 12 measurements of 10 min each shall be performed. One measurement shall be made for each of the 10 % active power bins from 0 % Pn or minimum regulating level, whichever is the higher to 90 % Pn and three measurements shall be made for the 10 % active power bin from 100 % Pn.

NOTE 2 This means the midpoints of the bins are near 0 % Pn, 10 % Pn, 20 % Pn to 100 % Pn of the EUT.

A measurement consists of determining the short-term flicker strength Pst as a 3-tuple (phases L1, L2 and L3).

The maximum over all Pst shall be selected as the value for the long-term flicker strength Plt.

Note:

Determination of the flicker coefficient: $c(\Psi_k) = P_{st,flc} \times \frac{S_{k,flc}}{S_n}$

Sk.fic/Sn set to 33.

5.7.2.3 Verification procedure for flicker and rapid voltage change 5.7.2.3.5 Rapid voltage changes - Generation units with a rated current > 75 A				P
Model: TAA-125KW-11				
Max, number of switching operations, N_{10}	10			
Max, number of switching operations, N_{120}	120			
Case of switching operation	Start up Cut-in at 10% of rated power			
Grid impedance angle, ψ_k	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.0012	0.0012	0.0011	0.0011
Voltage change factor, $k_u(\psi_k)$	0.0777			
Maximum inrush current factor k_{imax}	0.101			
Case of switching operation	Start-up Cut-in at 100% of rated power			
Grid impedance angle	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.0037	0.0030	0.0020	0.0016
Voltage change factor, $k_u(\psi_k)$	0.1597			
Maximum inrush current factor k_{imax}	0.671			
Case of switching operation	Service disconnection at rated power			
Grid impedance angle	30°	50°	70°	85°
Flicker step factor, $k_f(\psi_k)$	0.0010	0.0009	0.0008	0.0008
Voltage change factor, $k_u(\psi_k)$	0.137			
Maximum inrush current factor k_{imax}	0.700			
Worst-case over-all switching operations, k_{imax}	0.700			

Note:
- The maximum number *N*10m of the switching operation within a 10-minute period.
- The maximum number *N*120m of the switching operation within a 2-hour period.
- The flicker step factor *k*f(ψ k) for the network impedance phase angles ψ k = 30°, 50°, 70° and 85°.
- The voltage change factor *k*u(ψ k) for the network impedance phase angles ψ k = 30°, 50°, 70° and 85°.

Flicker step factor *k*f(ψ k)

$$k_f(\psi_k) = \frac{1}{130} \times \frac{S_{k,fic}}{S_n} \times P_{st,fic} \times T_p^{0,31}$$

Voltage change factor *k*u(ψ k)

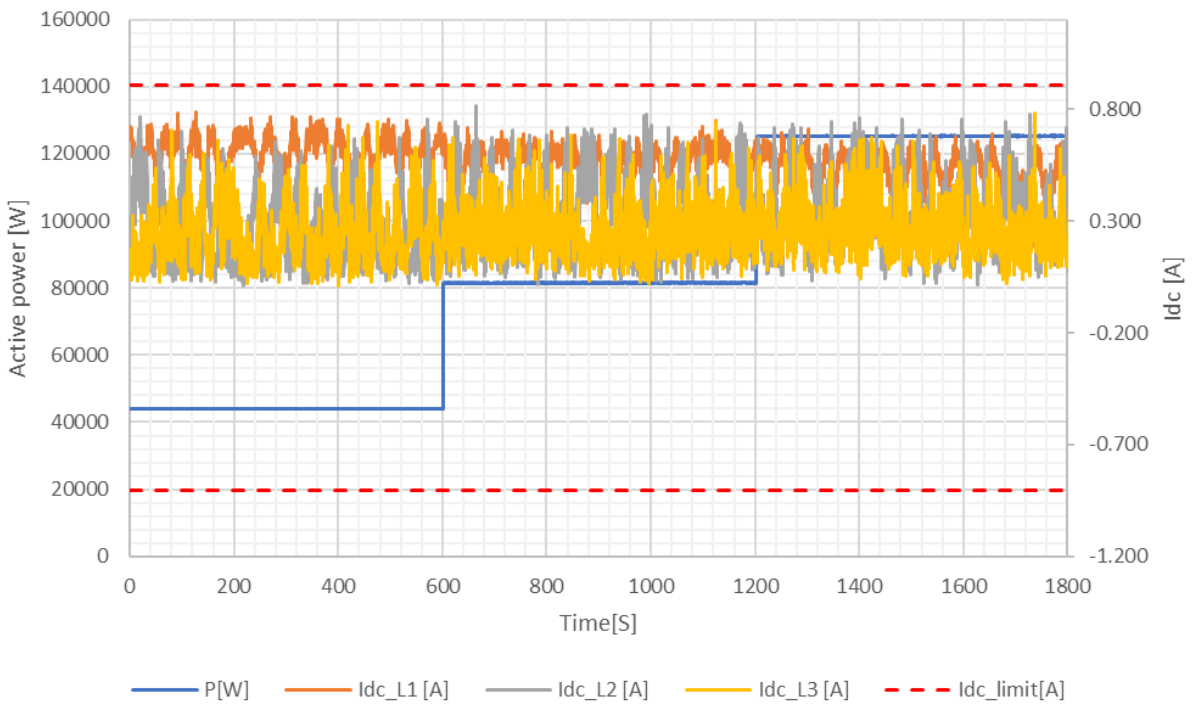
$$k_u(\psi_k) = \sqrt{3} \times \frac{U_{fic,max} - U_{fic,min}}{U_n} \times \frac{S_{k,fic}}{S_n}$$

*U*fic,min is the minimum one period RMS value of the voltage on the fictitious grid during the switching

operation;
*U*fic,max is the maximum one period RMS value of the voltage on the fictitious grid during the switching operation.
$S_{k,fic}/S_n$ in the fictitious grid was set to: 20.83
Choose the maxium value of three phases

5.7.2.4 verification procedure for DC injection			P
Model: TAA-125KW-11			
Protection limit	Tested at four power levels limit 0.5% of I_{AC};nom (0.9A)		
Output power limit	30%-40%	60%-70%	>95%
Output power(W)	43948	81534	125332
Max. test value [A] L1	0.786	0.751	0.710
Max. test value [A] L2	0.765	0.817	0.777
Max. test value [A] L3	0.744	0.745	0.784

Diagram of permanent dc-injection

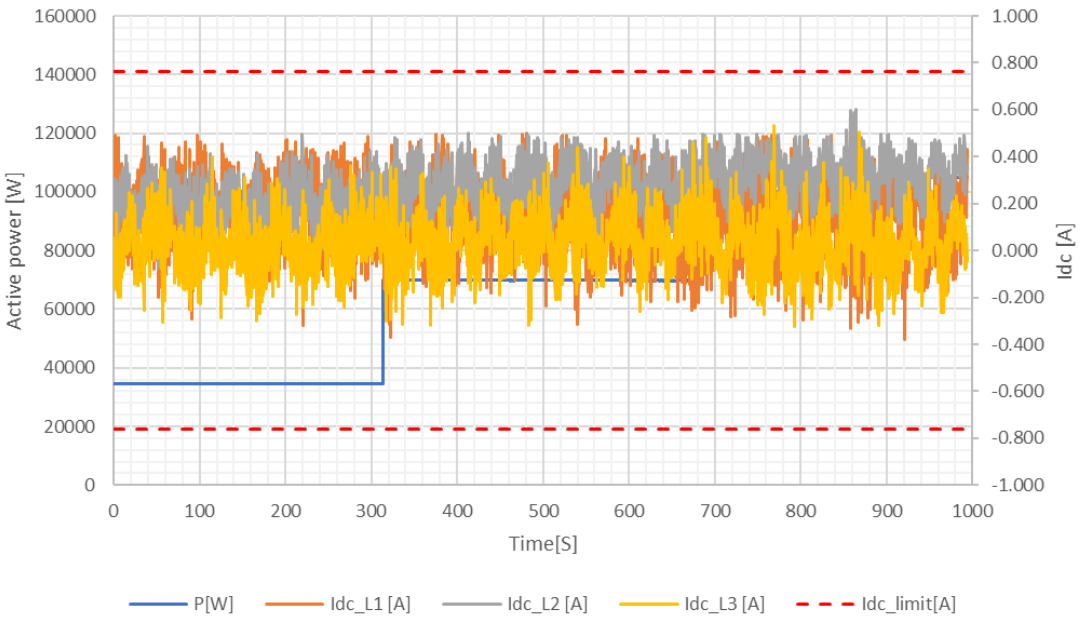


Note:

The average rms value of the mains currents and mains voltages for each phase during the measurement period and the averaged values of the individual DC current components for each phase as percentages of I_{rated} must be written down in the protocol.

5.7.2.4 verification procedure for DC injection			P
Model: TAA-105KW-11			
Protection limit	Tested at four power levels limit 0.5% of I_{AC};nom (0.761A)		
Output power limit	30%-40%	60%-70%	>95%
Output power(W)	34697	69789.27	104959
Max. test value [A] L1	0.492	0.498	0.492
Max. test value [A] L2	0.495	0.499	0.601
Max. test value [A] L3	0.397	0.457	0.534

Diagram of permanent dc-injection



Note:

The average rms value of the mains currents and mains voltages for each phase during the measurement period and the averaged values of the individual DC current components for each phase as percentages of I_{rated} must be written down in the protocol.

5.7.2	EMC and power quality Unbalance					P
Setting values	cos φ = 1			1.00		
	cos φ over-excited			+0.80		
	cos φ under-excited			-0.80		
Test:						
1-min mean value	L1	L2	L3	L1 – L2	L2 – L3	L3 – L1
a) cos φ = 1 at 100 % P_{rE} ± 5 % P_{Emax}						
S_{E60} [VA]	41646	41904	41935	258	31	289
	41640	41886	41925	246	39	285
	41601	41861	41906	260	45	305
	41613	41865	41917	252	52	304
	41575	41861	41911	286	50	336
cos φ_{E60}	0.9999					
max. asymmetry [VA]	336					
b) maximum under-excited (i) at 100 % P_{rE} ± 5 % P_{Emax}						
S_{E60} [VA]	45933	46175	46193	242	18	260
	45945	46198	46224	253	26	279
	45996	46207	46235	211	28	239
	45953	46189	46217	236	28	264
	45928	46192	46204	264	12	276
cos φ_{E60}	0.8025					
max. asymmetry [VA]	279					
c) maximum over-excited (c) at 100 % P_{rE} ± 5 % P_{Emax}						
S_{E60} [VA]	45740	46079	46177	339	98	437
	45732	46077	46159	345	82	427
	45738	46075	46168	337	93	430
	45731	46078	46170	347	92	439
	45719	46081	46158	362	77	439
cos φ_{E60}	0.8012					
max. asymmetry [VA]	439					
d) cos φ = 1 at 50 % P_{rE} ± 5 % P_{Emax}						
S_{E60} [VA]	20711	21020	21162	309	142	451
	20699	21020	21149	321	129	450

	20688	21030	21155	342	125	467
	20689	21034	21149	345	115	460
	20684	21025	21142	341	117	458
cos φ_{E60}	0.9996					
max. asymmetry [VA]	467					
e) maximum under-excited (i) at 50 % P_{rE} ± 5 % P_{Emax}						
S_{E60} [VA]	26097	26486	26594	389	108	497
	26089	26478	26602	389	124	513
	26078	26465	26598	387	133	520
	26084	26460	26599	376	139	515
	26096	26468	26601	372	133	505
cos φ_{E60}	0.7968					
max. asymmetry [VA]	520					
f) maximum over-excited (c) at 50 % P_{rE} ± 5 % P_{Emax}						
S_{E60} [VA]	25654	26021	26174	367	153	520
	25650	26023	26160	373	137	510
	25650	26031	26156	381	125	506
	25646	26031	26168	385	137	522
	25638	26025	26180	387	155	542
cos φ_{E60}:	0.8056					
max. asymmetry [VA]	542					
Limit:	≤5% S_{Emax} and ≤4600VA					

Test:

The maximum absolute difference between the apparent powers of the three phases is determined for each of the five measurements (1-min means) in the respective operating point. The maximum of these five values is again determined.

Assessment criterion:

The test is passed if the maximum value from the above measurements does not exceed 5 % S_{Emax} and ≤ 4600 VA.

4.9.3 Requirements on voltage and frequency protection Checklist			--
Several points to check			
Clause(s) / subclause(s) of this EN 50549-1:2019	**Parameter***	**Configurable value range**	**Value default**
5.2 Operating frequency range	47.0 – 47.5 Hz Duration	0 – 20 s	0s
	47.5 – 48.5 Hz Duration	30 – 90 min	30min
	48.5 – 49.0 Hz Duration	30 – 90 min	30min
	49.0 – 51.0 Hz Duration	not configurable	unlimited
	51.0 – 51.5 Hz Duration	30 – 90 min	30min
	51. 5 – 52 Hz Duration	0 – 15 min	0s
4.4.3 Minimal requirement for active power delivery at underfrequency	Reduction threshold	not configurable	49.5Hz
	Maximum reduction rate	not configurable	10% P_M/Hz
4.4.4 Continuous operating voltage range	Upper limit	not configurable	110% U_n
	Lower limit	not configurable	85% U_n
4.5.2 Rate of change of frequency (ROCOF) immunity	ROCOF withstand capability (defined with a sliding measurement window of 500 ms) non-synchronous generating technology: synchronous generating technology:	not configurable	2 Hz/s
4.5.3.2 Under-voltage ride through (UVRT) Generating plant with non-synchronous generating technology	Maximum power resumption time	not configurable	1 s
	Voltage-Time-Diagram	see Figure 6	Time [s] / U [p.u.] 0.0 / 0.2 0.15 / 0.2 1.5 / 0.85 180 / 0.85 180 / 0.9
4.5.3.3 Under-voltage ride through (UVRT)	Maximum power resumption time	not configurable	N/A

Generating plant with synchronous generating technology	Voltage-Time-Diagram	see Figure 7	N/A	
4.5.4 Over-voltage ride through (OVRT)	Voltage-Time-Diagram	not configurable see Figure 8	Time [s]	Time [s]
			0.0	1.25
			0.1	1.25
			0.1	1.20
			5.0	1.20
			5.0	1.15
			60	1.15
			60	1.10
4.6.1 Power response to overfrequency	Threshold frequency f_1	50.2 Hz – 52 Hz	50.2 Hz	
	Droop	2 % – 12 %	5 %	
	Power reference	P_M | P_{max}	P_{Max} for synchronous generating technology and EESS P_M for other non-synchronous generating technology	
	Intentional delay	0 – 2 s	0s	
	Deactivation threshold f_{stop}	50.0 Hz – f_1	deactivated	
	Deactivation time t_{stop}	0 – 600 s	-	
	Acceptance of staged disconnection	yes | no	yes	
4.6.2 Power response to underfrequency	Threshold frequency f_1	49.8 Hz – 46 Hz	49.8 Hz	
	Droop	2 – 12 %	5 %	
	Power reference	P_M | P_{max}	P_{max}	
	Intentional delay	0 – 2 s	0 s	
4.7.2.2 voltage support by Capabilities	Active factor/ reactive power (%Pd) range overexcited	0.9 – 1 / 48%P_d-0 0.95 – 1 / 33%P_d-0	0.90 – 1 / 48%Pd-0	
	Active factor/ reactive power (%Pd) range underexcited	0.9 – 1 / 48%Pd-0 0.95 – 1 / 33%Pd-0	0.90 – 1 / 48%Pd-0	
4.7.2.3 voltage support by reactive	Enabled control mode	Q setp.	Q set point	

power - Control modes		Q(U) Q(P) cos φ setp. cos φ (P)	
4.7.2.3.2 voltage support by reactive power - Set point control modes	Q set point and excitation	0 – 48 % P_D 0 – 33 % P_D	0
	cos φ setpoint and excitation	1 – 0.9	1
4.7.2.3.3 voltage support by reactive power - Voltage related control modes	Characteristic curve	-	Indicate default characteristic
	Time constant	3 s – 60 s	10 s
	Min cos φ	0.0 – 1	0.9
	Lock in power	0 % – 20 %	deactivated
	Lock out power	0 % – 20 %	deactivated
4.7.2.3.4 voltage support by reactive power - Power related control mode	Characteristic curve	-	Indicate default characteristic
4.7.4.2.2 Zero current mode for converter connected generating technology / Generating Plant with non-synchronous generator	Enabling	enable | disable	disabled
	Static voltage range overvoltage	100 % U_n – 120 % U_n	120 % U_n
	Static voltage range undervoltage	20 % U_n – 100 % U_n	50 % U_n
4.9.3 Requirements on voltage and frequency protection**	Threshold for protection as dedicated device [in A or kW. kVA]	16 A – 250 kVA	Interface protection integrated
	Undervoltage threshold stage 1	0.2 U_n – 1 U_n	0.85 Un
	Undervoltage operate time stage 1	0.1 s – 100 s	99 s
	Undervoltage threshold stage 2	0.2 U_n – 1 U_n	0.5 Un
	Undervoltage operate time stage 2	0.1 s – 5 s	4 s
	Overvoltage threshold stage 1	1.0 U_n – 1.2 U_n	1.2 Un
	Overvoltage operate time stage 1	0.1 s – 100 s	99 s
	Overvoltage threshold stage 2	1.0 U_n – 1.3 U_n	1.3 Un
	Overvoltage operate time stage 2	0.1 s – 5 s	4 s
	Overvoltage threshold 10 min mean protection	1.0 U_n – 1.15 U_n	1.10 Un

	Underfrequency threshold stage 1	47.0 Hz– 50.0 Hz	47.5 Hz
	Underfrequency operate time stage 1	0.1 s – 100 s	99 s
	Underfrequency threshold stage 2	47.0 Hz – 50.0 Hz	47 Hz
	Underfrequency operate time stage 2	0.1 s – 5 s	4 s
	Overfrequency threshold stage 1	50.0 Hz – 52.0 Hz	51.5 Hz
	Overfrequency operate time stage 1	0.1 s – 100 s	99 s
	Overfrequency threshold stage 2	50.0 Hz – 52.0 Hz	52 Hz
	Overfrequency operate time stage 2	0.1 s – 5 s	4 s
4.10.2 Automatic reconnection after tripping	Lower frequency	47.0 Hz – 50.0 Hz	49.5 Hz
	Upper frequency	50.0 Hz – 52.0 Hz	50.2 Hz
	Lower voltage	50 % U_n – 100 % U_n	85 % U_n
	Upper voltage	100 % U_n – 120 % U_n	110 % U_n
	Observation time	10 s – 600 s	60 s
	Active power increase gradient	6 % – 3000 %/min	10 %Pn /min
4.10.2 Automatic reconnection after tripping	Lower frequency	47.0 Hz – 50.0 Hz	49.5 Hz
	Upper frequency	50.0 Hz – 52.0 Hz	50.2 Hz
	Lower voltage	50 % U_n – 100 % U_n	85 % U_n
	Upper voltage	100 % U_n – 120 % U_n	110 % U_n
	Observation time	10 s – 600 s	60 s
	Active power increase gradient	6 % – 3000 %/min	10 % /min
4.10.3 Starting to generate electrical power	Lower frequency	47.0 Hz – 50.0 Hz	49.5 Hz
	Upper frequency	50.0 Hz – 52.0 Hz	50.1 Hz
	Lower voltage	50 % – 100 % U_n	85 % U_n
	Upper voltage	100 % – 120 % U_n	110 % U_n
	Observation time	10 s – 600 s	60 s
	Active power increase gradient	6 % – 3000 %/min	disabled
4.11.1 Ceasing active power	Activation option	--	Can be achieved by PGU. (Logic interface shall be specified by DNO)
4.11.2 Reduction of active power on set	Activation option	--	Can be achieved by PGU. (Definition shall be specified

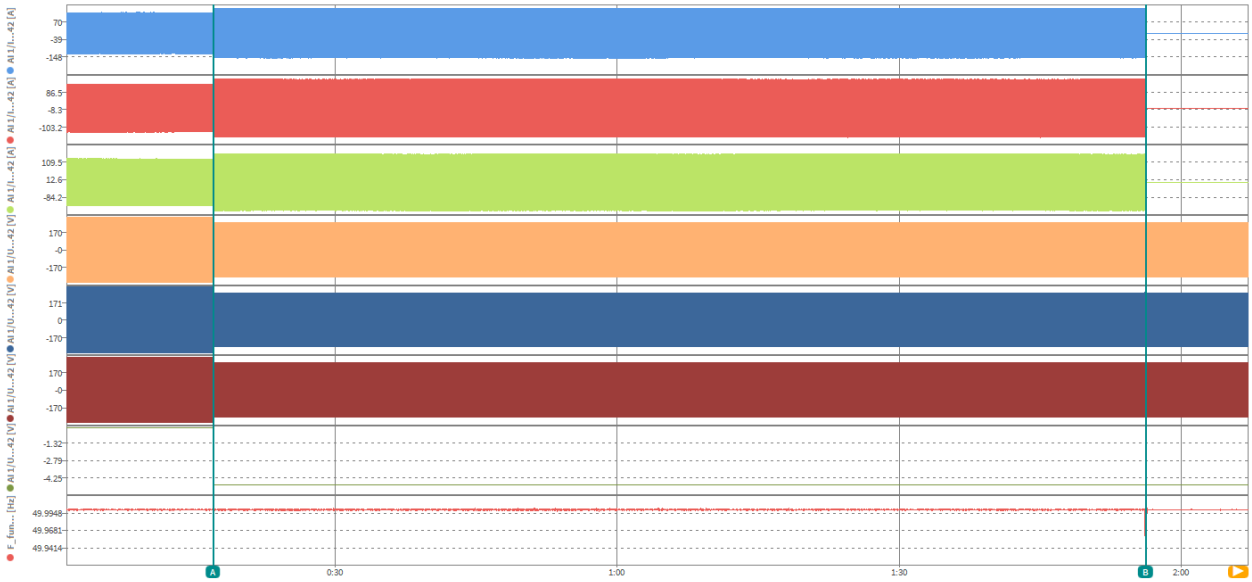
point			by DNO)
4.12 Remote information exchange	Activation option	--	Can be achieved by PGU. (Definition shall be specified by DNO)
*If additional parameters have been evaluated during test, these shall be added as additional lines in the table. **This can be used for manufacturer specific parameter descriptions.			

EN 50549-10:2022		
Clause	**Test items**	**Remark**
5.8	**Interface protection**	
5.8.3	Verification procedure for generating plants to be connected to a LV distribution network with Interface protection as internal device	
5.8.3.2	Voltage and frequency protections	P
5.8.3.3	Overvoltage 10 min mean protection	P
5.8.3.4	ROCOF protection	P
5.8.4	Verification procedure for generating plants to be connected to a LV distribution network with Interface protection as dedicated device	
5.8.5	Verification procedure for generating plants to be connected to a MV distribution network	
5.8.5.1	Voltage protections	N/A
5.8.5.2	Overvoltage 10 min mean protection	N/A
5.8.5.3	Frequency protections	N/A
5.8.6	Islanding detection	P

5.8 Interface protection 5.8.3.2 Voltage and frequency protections (Three-phase type, L1, L2, L3-N)				P
Test conditions	Output power: >=50%Pn, Frequency: 50+/-0.2Hz			
Stage 1	**Under-voltage**		**Over-voltage**	
Parameter	Voltage	Time	Voltage	Time
Limit	$0.85U_n \pm 1\%\ U_n$	99s ≤ t ≤ 100s	$1.2U_n \pm 1\%\ U_n$	99s ≤ t ≤ 100s
Trip value [V]	196.7		277.2	
	196.0		276.5	
	196.3		277.2	
Trip time [s]	U_n To $U_{th\text{-}low}$ – 5%Un	99.027	U_n To $U_{th\text{-}high}$ + 5%U_n	99.083
		99.014		99.054
		99.164		99.025
Stage 2	**Under-voltage**		**Over-voltage**	
Parameter	Voltage	Time	Voltage	Time
Limit	$0.5U_n \pm 1\%\ U_n$	4s ≤ t ≤ 5s	$1.3U_n \pm 1\%\ U_n$	4s ≤ t ≤ 5s
Trip value [V]	116.1		299.6	
	115.8		299.7	
	115.4		299.4	
Trip time [s]	U_n To $U_{th\text{-}low}$ – 5%Un	4.558	U_n To $U_{th\text{-}high}$ + 5%U_n	4.876
		4.549		4.830
		4.562		4.760

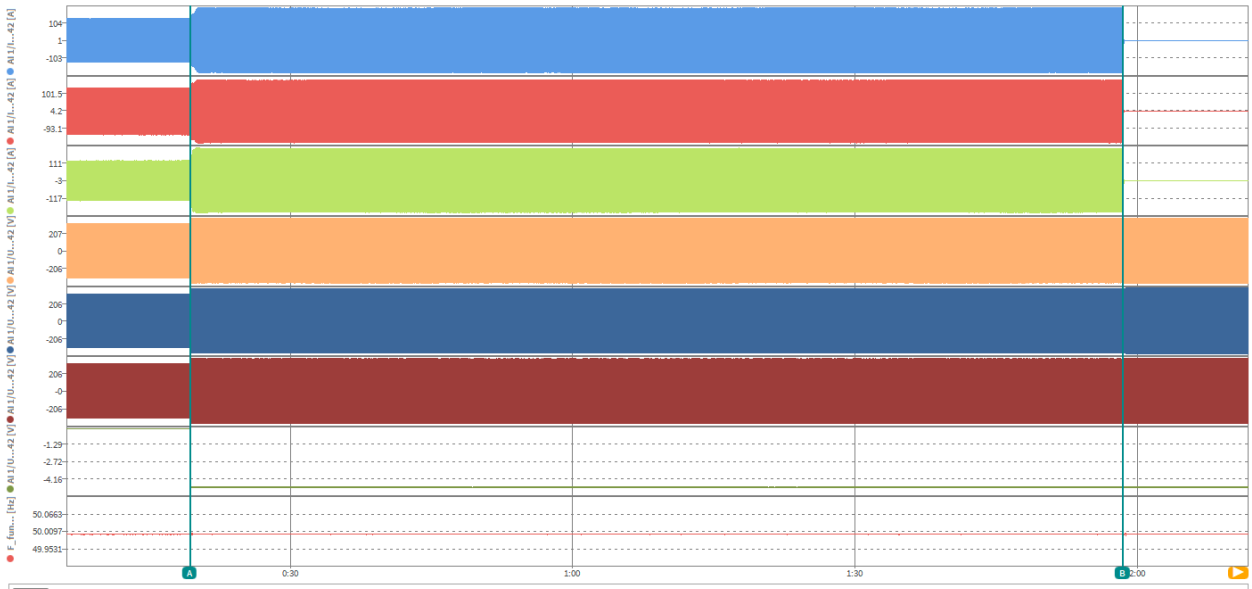
Scope pictures of the disconnection time

Under -voltage – Stage 1



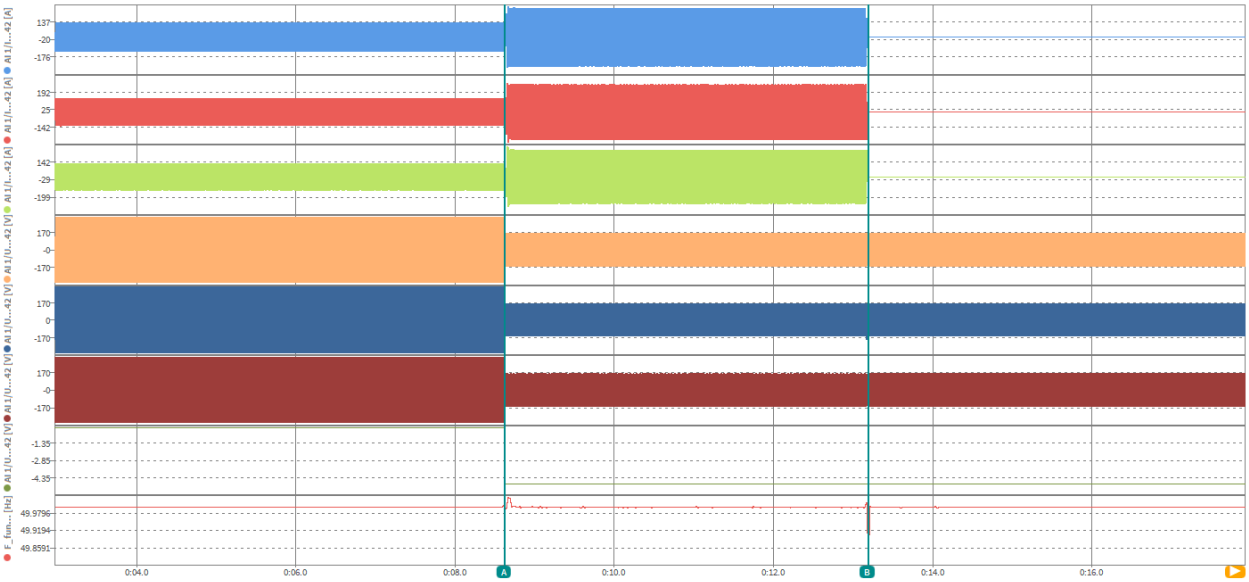
时间 [s]	A	B	间隔	有效值
	0:17.09480	1:56.25830	1:39.16350	
AI 1/I1@TRIONet3_1342 [A]	81.82097	-1.163244	-82.98421	110.3486
AI 1/I2@TRIONet3_1342 [A]	43.55073	-0.998855	-44.54959	111.9389
AI 1/I3@TRIONet3_1342 [A]	-136.2515	-1.913428	134.3380	111.0668
AI 1/U1@TRIONet3_1342 [V]	148.7060	-135.0153	-283.7212	190.0883
AI 1/U2@TRIONet3_1342 [V]	123.8403	268.1813	144.3410	190.0129
AI 1/U3@TRIONet3_1342 [V]	-267.4647	-135.7286	131.7360	190.0969
AI 1/U4@TRIONet3_1342 [V]	-4.916430	-4.915238	1.192e-3	4.916438
F_fund@AC [Hz]	50.00644	50.00019	-6.248e-3	50.00001

Over-voltage – Stage 1



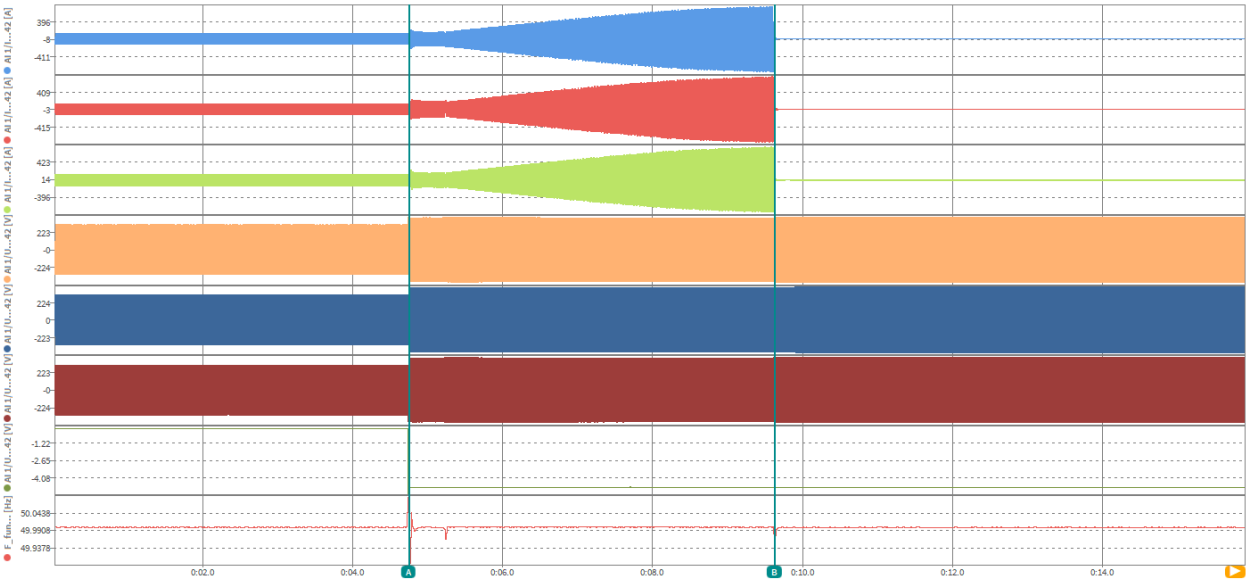
时间 [s]	A	B	间隔	有效值
	0:19.39690	1:58.48010	1:39.08320	
AI 1/I1@TRIONet3_1342 [A]	37.54008	-14.15837	-51.69845	102.9541
AI 1/I2@TRIONet3_1342 [A]	-3.739238	-5.503297	-1.764059	100.0780
AI 1/I3@TRIONet3_1342 [A]	28.23329	1.568794	-26.66450	98.75898
AI 1/U1@TRIONet3_1342 [V]	277.4365	379.7169	102.2804	276.9932
AI 1/U2@TRIONet3_1342 [V]	-373.5514	-114.4848	259.0666	276.9370
AI 1/U3@TRIONet3_1342 [V]	98.62114	-267.6931	-366.3142	277.0113
AI 1/U4@TRIONet3_1342 [V]	-4.907608	-4.915953	-8.345e-3	4.916990
F_fund@AC [Hz]	49.90194	50.00157	0.099632	50.00000

Under -voltage – Stage 2



	A	B	间隔	有效值
时间 [s]	8.62330	0:13.18530	4.56200	
AI 1/I1@TRIONet3_1342 [A]	-234.6674	-0.487328	234.1801	185.1799
AI 1/I2@TRIONet3_1342 [A]	343.0795	-0.045896	-343.1254	188.0832
AI 1/I3@TRIONet3_1342 [A]	-133.6763	-3.979564	129.6967	185.0551
AI 1/U1@TRIONet3_1342 [V]	-83.89926	-145.4036	-61.50437	114.3070
AI 1/U2@TRIONet3_1342 [V]	193.1875	128.0291	-65.15837	114.1700
AI 1/U3@TRIONet3_1342 [V]	-73.74454	15.94925	89.69379	114.2259
AI 1/U4@TRIONet3_1342 [V]	-4.919052	-4.915476	3.576e-3	4.917120
F_fund@AC [Hz]	50.00586	50.01728	0.011421	50.00037

Over-voltage – Stage 2

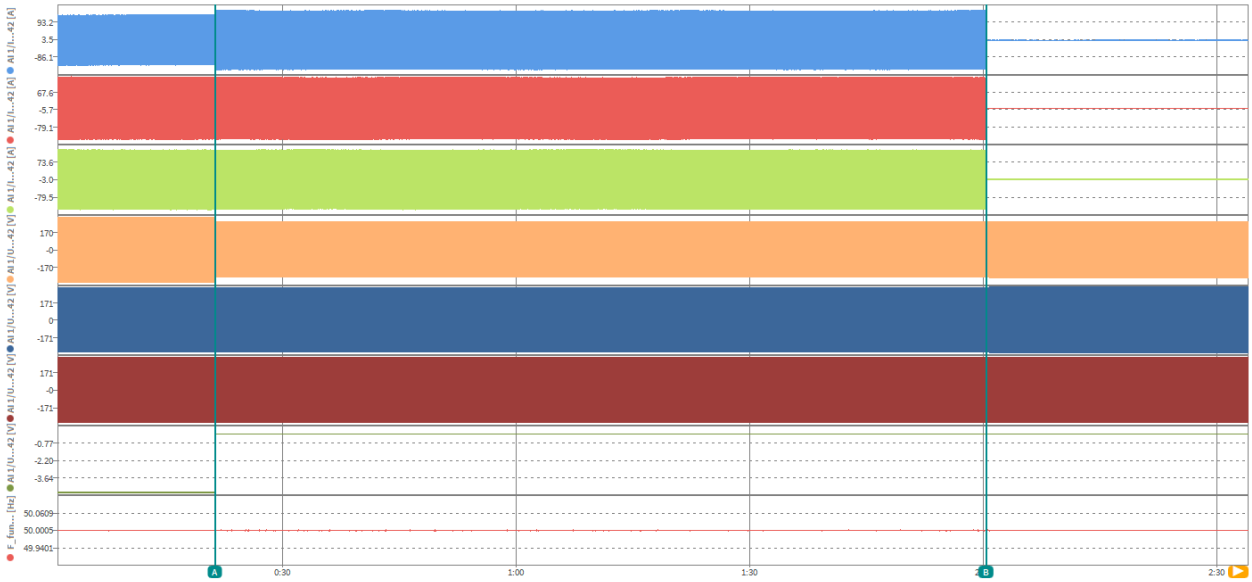


	A	B	间隔
时间 [s]	4.75560	9.63180	4.87620
AI 1/I1@TRIONet3_1342 [A]	127.4821	-7.177234	-134.6593
AI 1/I2@TRIONet3_1342 [A]	-82.11554	0.228643	82.34418
AI 1/I3@TRIONet3_1342 [A]	-43.72764	0.576615	44.30425
AI 1/U1@TRIONet3_1342 [V]	320.0507	95.34646	-224.7043
AI 1/U2@TRIONet3_1342 [V]	-202.7145	-407.4433	-204.7289
AI 1/U3@TRIONet3_1342 [V]	-122.4356	314.3642	436.7998
AI 1/U4@TRIONet3_1342 [V]	-0.462294	-4.903794	-4.441500
F_fund@AC [Hz]	50.09172	49.95726	-0.134460

5.8 Interface protection 5.8.3.2 Voltage and frequency protections (Three-phase type, L1-N)				P
Test conditions	Output power: >=50%Pn, Frequency: 50+/-0.2Hz			
Stage 1	**Under-voltage**		**Over-voltage**	
Parameter	Voltage	Time	Voltage	Time
Limit	$0.85U_n \pm 1\%\ U_n$	99s ≤ t ≤ 100s	$1.2U_n \pm 1\%\ U_n$	99s ≤ t ≤ 100s
Trip value [V]	196.5		277.7	
	197.1		277.3	
	196.8		277.4	
Trip time [s]	U_n To $U_{th\text{-}low}$ – 5%Un	99.004	U_n To $U_{th\text{-}high}$ + 5%U_n	99.031
		99.020		99.284
		99.007		99.325
Stage 2	**Under-voltage**		**Over-voltage**	
Parameter	Voltage	Time	Voltage	Time
Limit	$0.5U_n \pm 1\%\ U_n$	4s ≤ t ≤ 5s	$1.3U_n \pm 1\%\ U_n$	4s ≤ t ≤ 5s
Trip value [V]	115.9		300.0	
	116.6		299.9	
	116.7		300.5	
Trip time [s]	U_n To $U_{th\text{-}low}$ – 5%Un	4.582	U_n To $U_{th\text{-}high}$ + 5%U_n	4.551
		4.564		4.524
		4.539		4.646

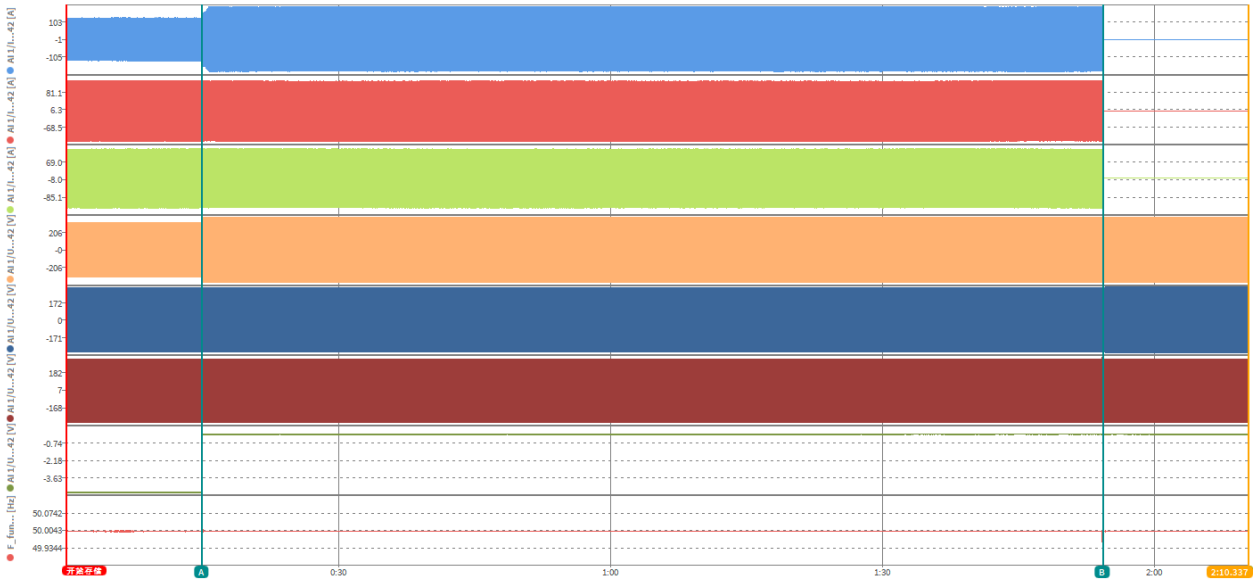
Scope pictures of the disconnection time

Under -voltage – Stage 1



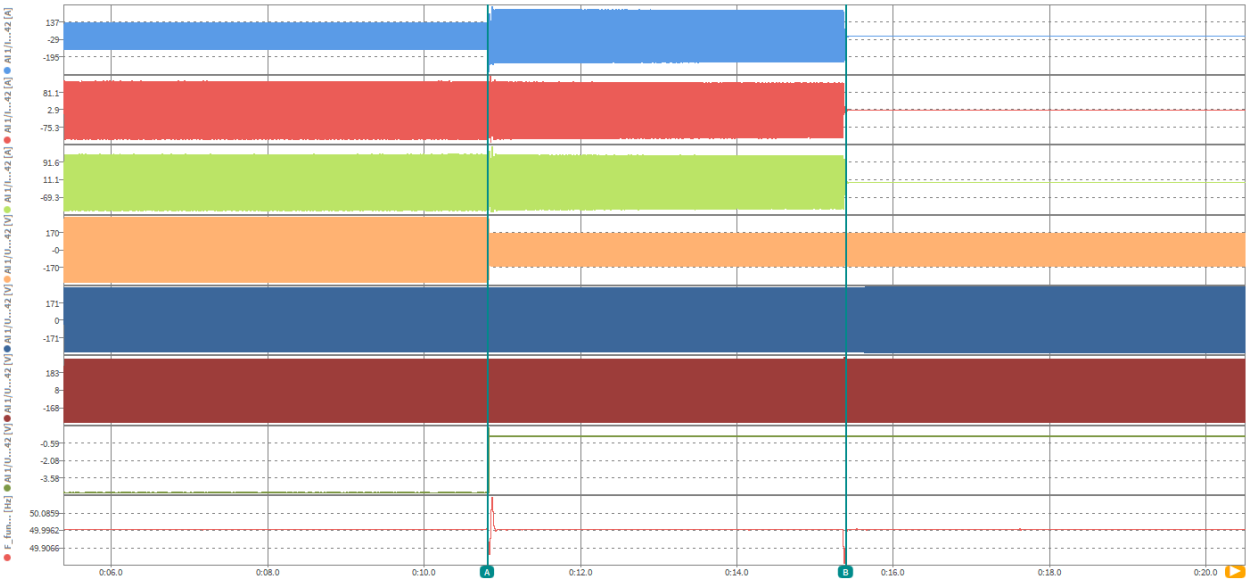
时间 [s]	A	B	间隔	有效值
	0:21.3893	2:00.4093	1:39.0200	
AI 1/I1@TRIONet3_1342 [A]	158.3856	-1.725674	-160.1113	107.2650
AI 1/I2@TRIONet3_1342 [A]	-79.01299	-3.814340	75.19865	91.94714
AI 1/I3@TRIONet3_1342 [A]	-43.48564	1.899243	45.38489	91.44617
AI 1/U1@TRIONet3_1342 [V]	271.7929	271.0757	-0.717163	195.1124
AI 1/U2@TRIONet3_1342 [V]	-201.5917	-208.6806	-7.088900	229.9107
AI 1/U3@TRIONet3_1342 [V]	-123.6401	-114.0220	9.618044	230.0686
AI 1/U4@TRIONet3_1342 [V]	-0.015020	-2.384e-3	0.012636	0.014395
F_fund@AC [Hz]	50.00324	49.99948	-3.757e-3	49.99996

Over-voltage – Stage 1



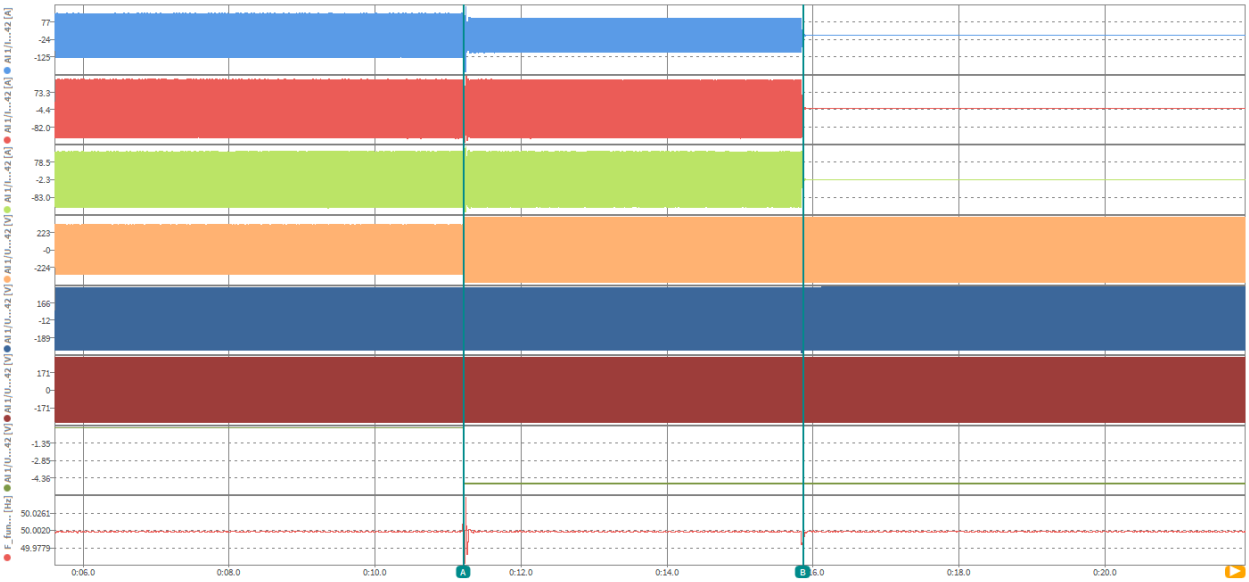
时间 [s]	A	B	间隔	有效值
	0:14.97410	1:54.29930	1:39.32520	
AI 1/I1@TRIONet3_1342 [A]	-94.45394	-1.184106	93.26983	104.0377
AI 1/I2@TRIONet3_1342 [A]	131.6819	-0.951290	-132.6332	91.81326
AI 1/I3@TRIONet3_1342 [A]	-50.15552	-2.062798	48.09273	91.47639
AI 1/U1@TRIONet3_1342 [V]	-254.9727	-289.9978	-35.02512	276.9594
AI 1/U2@TRIONet3_1342 [V]	318.5480	-69.97538	-388.5234	230.0213
AI 1/U3@TRIONet3_1342 [V]	-112.0768	309.2320	421.3088	230.0339
AI 1/U4@TRIONet3_1342 [V]	-0.011206	-0.010967	2.384e-4	0.014108
F_fund@AC [Hz]	49.99438	49.99998	5.600e-3	49.99995

Under -voltage – Stage 2



	A	B	间隔	有效值
时间 [s]	0:10.81570	0:15.39810	4.58240	
AI 1/I1@TRIONet3_1342 [A]	124.5873	0.201106	-124.3862	179.1079
AI 1/I2@TRIONet3_1342 [A]	-48.95222	-4.537821	44.41440	88.83379
AI 1/I3@TRIONet3_1342 [A]	-81.09665	-1.405239	79.69141	88.29601
AI 1/U1@TRIONet3_1342 [V]	319.9487	101.4376	-218.5111	114.7290
AI 1/U2@TRIONet3_1342 [V]	-118.7377	121.3739	240.1116	229.5741
AI 1/U3@TRIONet3_1342 [V]	-206.1188	-320.6895	-114.5706	230.1754
AI 1/U4@TRIONet3_1342 [V]	-4.901886	-0.010014	4.891873	0.207508
F_fund@AC [Hz]	50.00551	49.98256	-0.022949	49.99949

Over-voltage – Stage 2

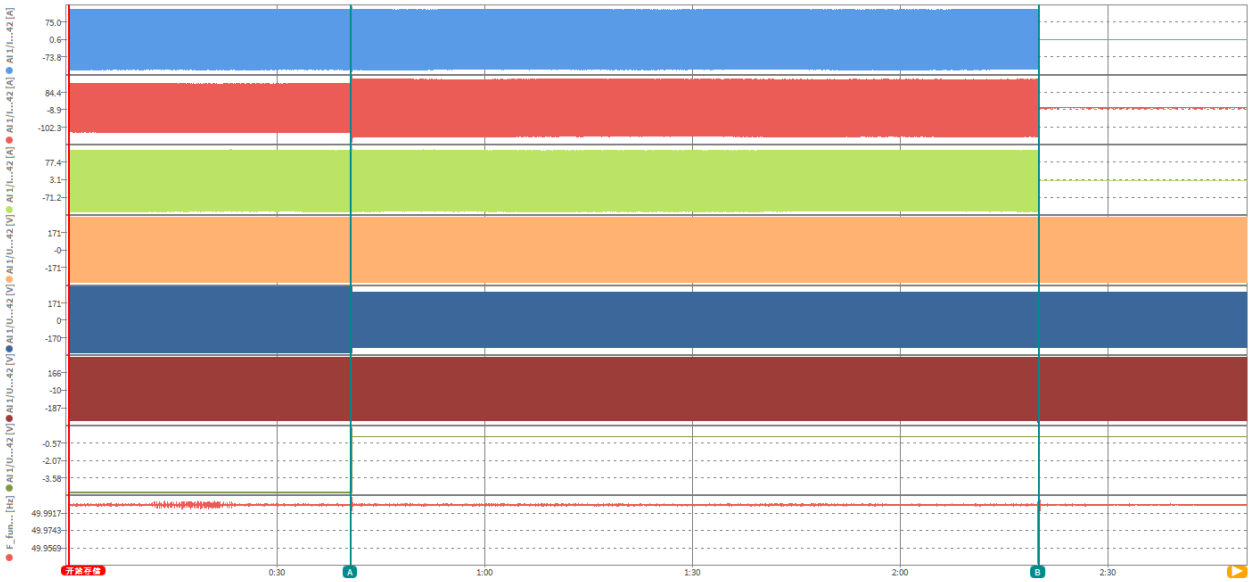


	A	B	间隔	有效值
时间 [s]	0:11.22030	0:15.86660	4.64630	
AI 1/I1@TRIONet3_1342 [A]	-9.535432	-0.398040	9.137393	69.36980
AI 1/I2@TRIONet3_1342 [A]	-115.4691	-5.217076	110.2520	91.81788
AI 1/I3@TRIONet3_1342 [A]	104.2422	0.754356	-103.4879	91.22135
AI 1/U1@TRIONet3_1342 [V]	-100.3795	416.1206	516.5000	299.8971
AI 1/U2@TRIONet3_1342 [V]	-237.7865	-113.7626	124.0239	230.0923
AI 1/U3@TRIONet3_1342 [V]	310.1118	-207.6278	-517.7396	229.9638
AI 1/U4@TRIONet3_1342 [V]	-4.902840	-4.914284	-0.011444	4.916257
F_fund@AC [Hz]	50.01023	49.98726	-0.022972	49.99978

5.8 Interface protection 5.8.3.2 Voltage and frequency protections (Three-phase type, L2-N)				P
Test conditions	Output power: >=50%Pn, Frequency: 50+/-0.2Hz			
Stage 1	**Under-voltage**		**Over-voltage**	
Parameter	Voltage	Time	Voltage	Time
Limit	$0.85U_n \pm 1\%\ U_n$	99s ≤ t ≤ 100s	$1.2U_n \pm 1\%\ U_n$	99s ≤ t ≤ 100s
Trip value [V]	195.4		276.2	
	196.0		276.8	
	195.3		276.5	
Trip time [s]	U_n To $U_{th\text{-}low}$ – 5%Un	99.339	U_n To $U_{th\text{-}high}$ + 5%U_n	99.215
		99.236		99.032
		99.023		99.027
Stage 2	**Under-voltage**		**Over-voltage**	
Parameter	Voltage	Time	Voltage	Time
Limit	$0.2U_n \pm 1\%\ U_n$	4s ≤ t ≤ 5s	$1.3U_n \pm 1\%\ U_n$	4s ≤ t ≤ 5s
Trip value [V]	115.3		299.3	
	115.5		299.7	
	115.5		298.9	
Trip time [s]	U_n To $U_{th\text{-}low}$ – 5%Un	4.551	U_n To $U_{th\text{-}high}$ + 5%U_n	4.602
		4.559		4.532
		4.570		4.582

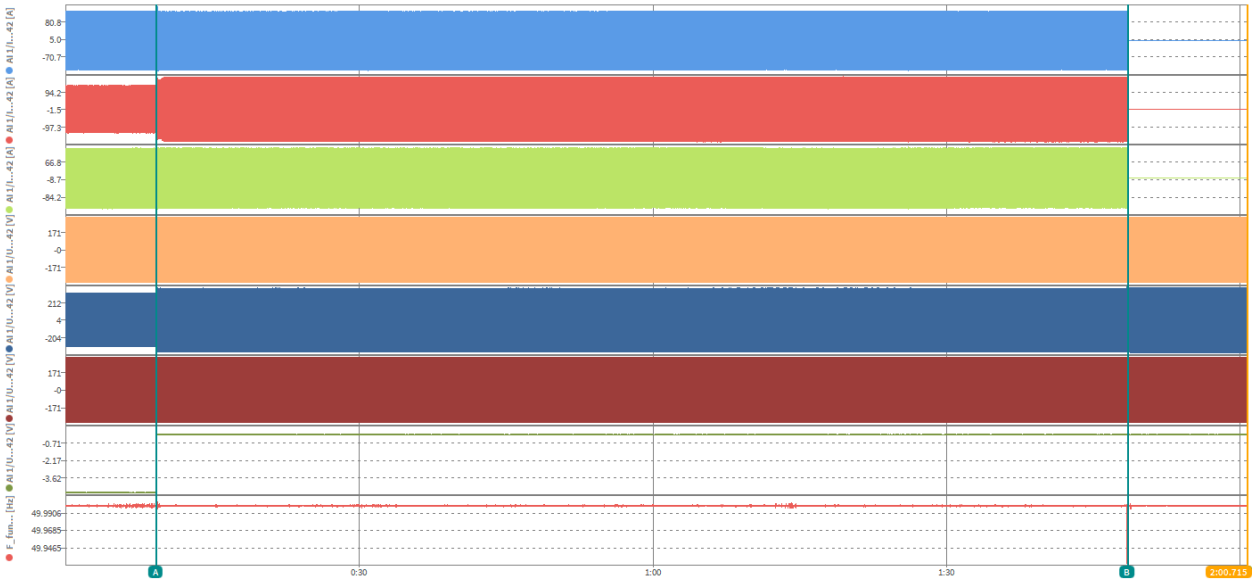
Scope pictures of the disconnection time

Under -voltage – Stage 1



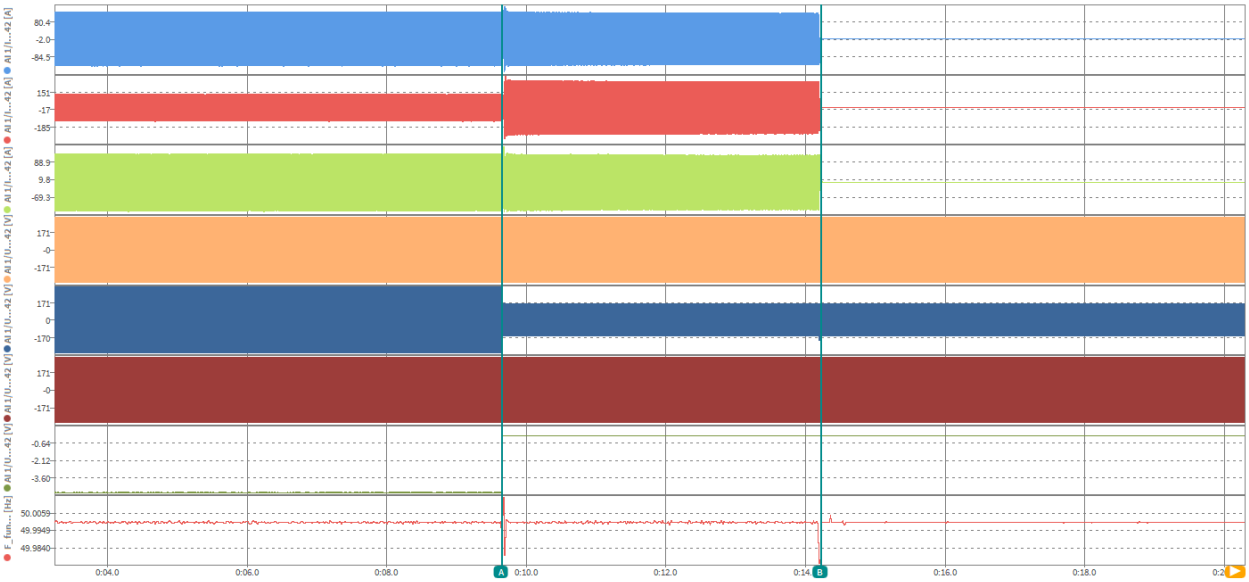
	A	B	间隔	有效值
时间 [s]	0:40.6270	2:19.9662	1:39.3392	
AI 1/I1@TRIONet3_1342 [A]	-129.6467	-1.170755	128.4759	90.46787
AI 1/I2@TRIONet3_1342 [A]	65.51218	-0.955463	-66.46765	108.8276
AI 1/I3@TRIONet3_1342 [A]	58.74801	-2.001882	-60.74989	91.65518
AI 1/U1@TRIONet3_1342 [V]	-323.9494	-311.6403	12.30908	230.0571
AI 1/U2@TRIONet3_1342 [V]	165.0629	198.2708	33.20790	195.1187
AI 1/U3@TRIONet3_1342 [V]	163.7149	78.98903	-84.72586	230.0005
AI 1/U4@TRIONet3_1342 [V]	-4.918099	-0.014782	4.903317	0.211647
F_fund@AC [Hz]	49.99996	50.00020	2.365e-4	49.99996

Over-voltage – Stage 1



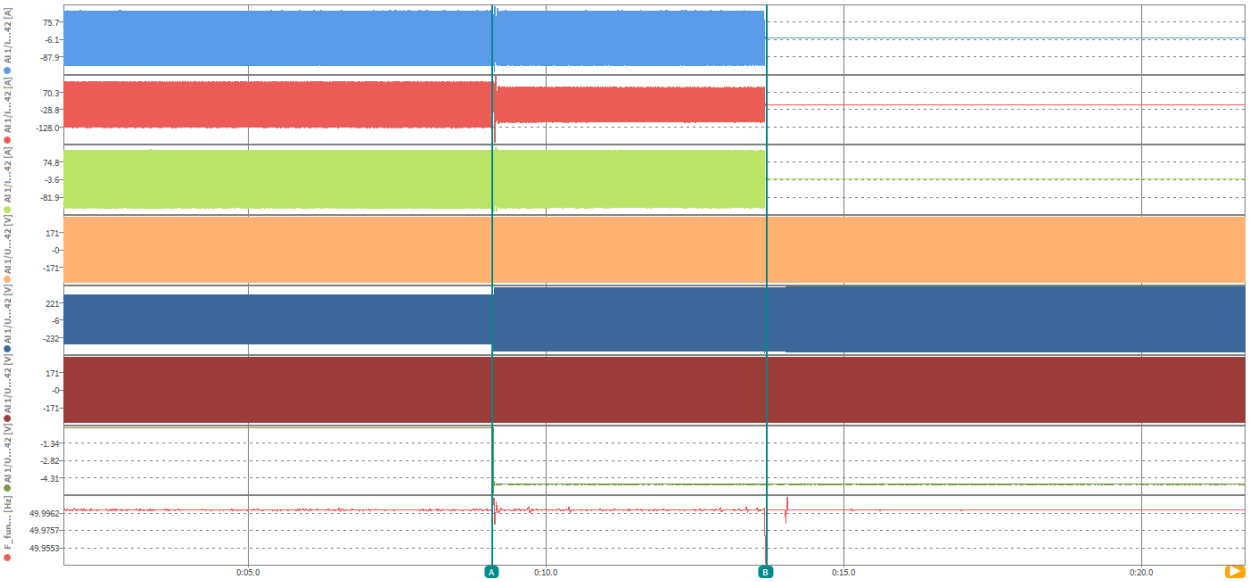
	A	B	间隔	有效值
时间 [s]	9.27320	1:48.48800	1:39.21480	
AI 1/I1@TRIONet3_1342 [A]	63.73644	-1.184106	-64.92055	90.50593
AI 1/I2@TRIONet3_1342 [A]	-131.3056	-0.955463	130.3501	101.2611
AI 1/I3@TRIONet3_1342 [A]	69.49175	-2.020240	-71.51199	91.10213
AI 1/U1@TRIONet3_1342 [V]	151.9110	-300.6597	-452.5707	230.0138
AI 1/U2@TRIONet3_1342 [V]	-323.5052	54.52848	378.0337	276.8684
AI 1/U3@TRIONet3_1342 [V]	177.4905	256.8314	79.34094	230.0998
AI 1/U4@TRIONet3_1342 [V]	-4.914761	-5.722e-3	4.909039	0.113620
F_fund@AC [Hz]	50.00095	50.00004	-9.117e-4	49.99995

Under -voltage – Stage 2



	A	B	间隔	有效值
时间 [s]	9.64710	0:14.21660	4.56950	
AI 1/I1@TRIONet3_1342 [A]	61.85723	-3.899455	-65.75668	87.54418
AI 1/I2@TRIONet3_1342 [A]	65.23681	0.528216	-64.70859	182.3036
AI 1/I3@TRIONet3_1342 [A]	-132.4780	-2.628565	129.8494	88.77669
AI 1/U1@TRIONet3_1342 [V]	167.0458	-210.1655	-377.2114	230.1654
AI 1/U2@TRIONet3_1342 [V]	163.0077	-54.52752	-217.5353	114.7456
AI 1/U3@TRIONet3_1342 [V]	-324.0960	317.5793	641.6753	229.7358
AI 1/U4@TRIONet3_1342 [V]	-4.913092	-0.022888	4.890204	0.221358
F_fund@AC [Hz]	50.00079	49.97406	-0.026730	49.99982

Over-voltage – Stage 2

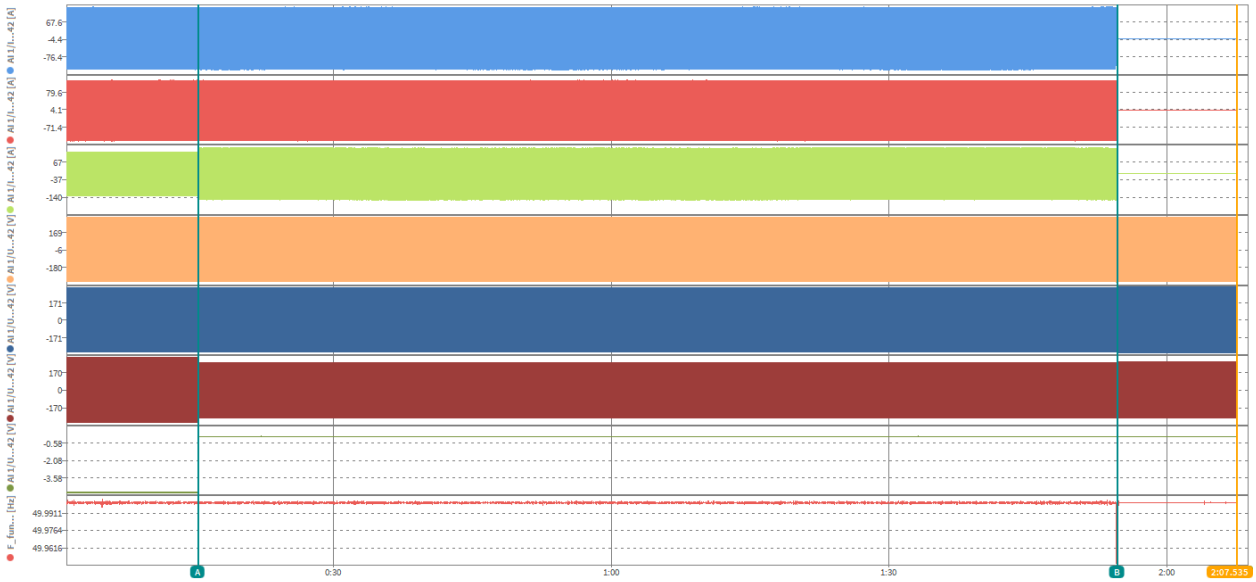


	A	B	间隔	有效值
时间 [s]	9.10470	0:13.70650	4.60180	
AI 1/I1@TRIONet3_1342 [A]	10.05781	-4.237414	-14.29522	90.44510
AI 1/I2@TRIONet3_1342 [A]	-119.9677	-1.669765	118.2979	70.43094
AI 1/I3@TRIONet3_1342 [A]	107.4524	1.554608	-105.8978	90.80129
AI 1/U1@TRIONet3_1342 [V]	27.67039	196.1911	168.5207	229.9561
AI 1/U2@TRIONet3_1342 [V]	-295.1093	-419.6229	-124.5136	299.6534
AI 1/U3@TRIONet3_1342 [V]	265.1518	127.9900	-137.1617	230.1035
AI 1/U4@TRIONet3_1342 [V]	-9.775e-3	-4.904032	-4.894257	4.906759
F_fund@AC [Hz]	50.00003	50.00051	4.807e-4	49.99972

5.8 Interface protection 5.8.3.2 Voltage and frequency protections (Three-phase type, L3-N)					P
Test conditions	Output power: >=50%Pn, Frequency: 50+/-0.2Hz				
Stage 1	**Under-voltage**		**Over-voltage**		
Parameter	Voltage	Time	Voltage	Time	
Limit	$0.85U_n \pm 1\%\ U_n$	99s ≤ t ≤ 100s	$1.2U_n \pm 1\%\ U_n$	99s ≤ t ≤ 100s	
Trip value [V]	196.3		276.2		
	195.6		275.9		
	195.4		275.8		
Trip time [s]	U_n To $U_{th\text{-}low}$ – 5%Un	99.184	U_n To $U_{th\text{-}high}$ + 5%U_n	99.212	
		99.087		99.041	
		99.160		99.124	
Stage 2	**Under-voltage**		**Over-voltage**		
Parameter	Voltage	Time	Voltage	Time	
Limit	$0.5U_n \pm 1\%\ U_n$	4s ≤ t ≤ 5s	$1.3U_n \pm 1\%\ U_n$	4s ≤ t ≤ 5s	
Trip value [V]	115.2		299.3		
	115.1		298.9		
	115.6		298.9		
Trip time [s]	U_n To $U_{th\text{-}low}$ – 5%Un	4.539	U_n To $U_{th\text{-}high}$ + 5%U_n	4.565	
		4.547		4.582	
		4.569		4.570	

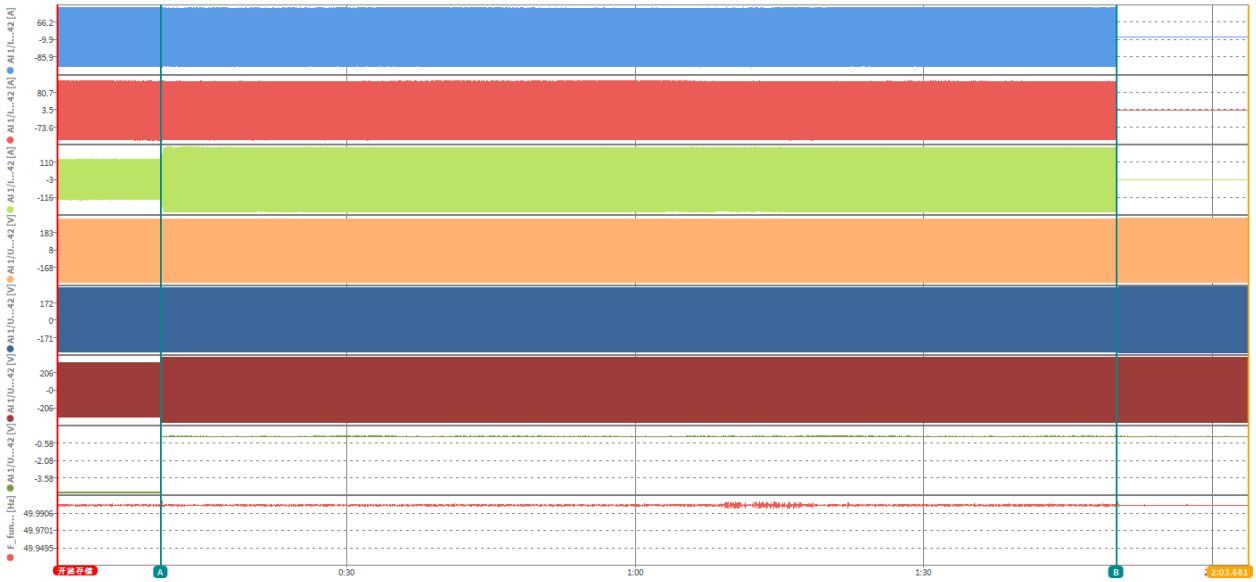
Scope pictures of the disconnection time

Under -voltage – Stage 1



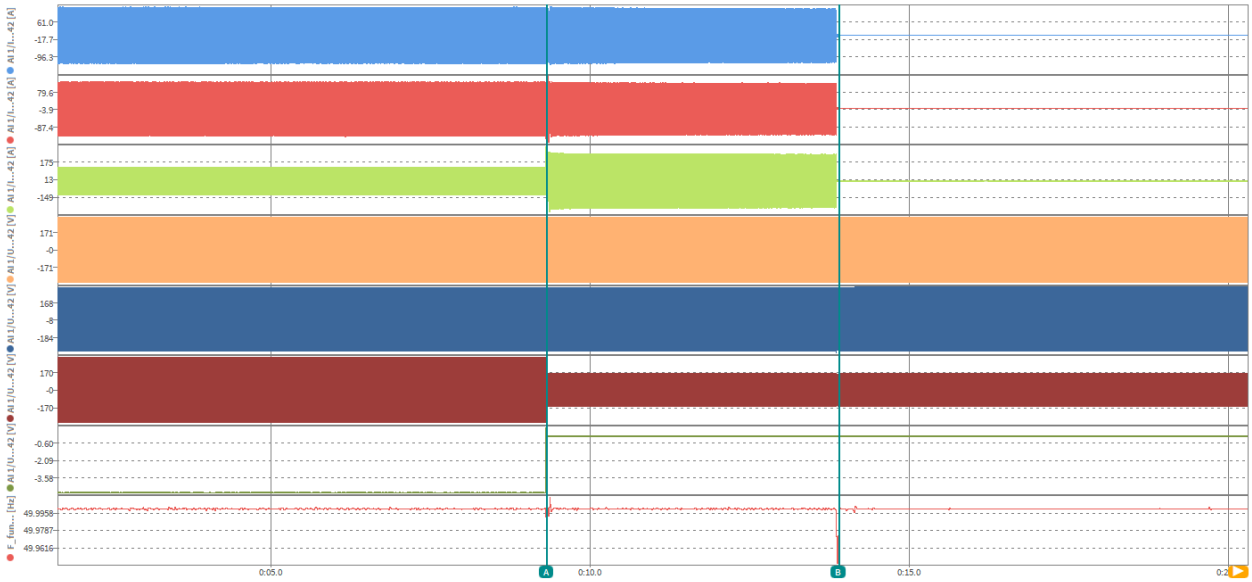
时间 [s]	A	B	间隔	有效值
	0:15.42870	1:54.61290	1:39.18420	
AI 1/I1@TRIONet3_1342 [A]	120.6102	-1.221657	-121.8319	90.63976
AI 1/I2@TRIONet3_1342 [A]	-103.9009	-0.945449	102.9555	91.75311
AI 1/I3@TRIONet3_1342 [A]	-11.39629	-2.028585	9.367705	107.9348
AI 1/U1@TRIONet3_1342 [V]	296.8083	208.5071	-88.30119	229.9845
AI 1/U2@TRIONet3_1342 [V]	-262.0227	114.0781	376.1008	229.9862
AI 1/U3@TRIONet3_1342 [V]	-28.92280	-270.9549	-242.0321	195.1270
AI 1/U4@TRIONet3_1342 [V]	-0.014067	-4.292e-3	9.775e-3	0.013727
F_fund@AC [Hz]	50.00442	49.99997	-4.452e-3	49.99996

Over-voltage – Stage 1



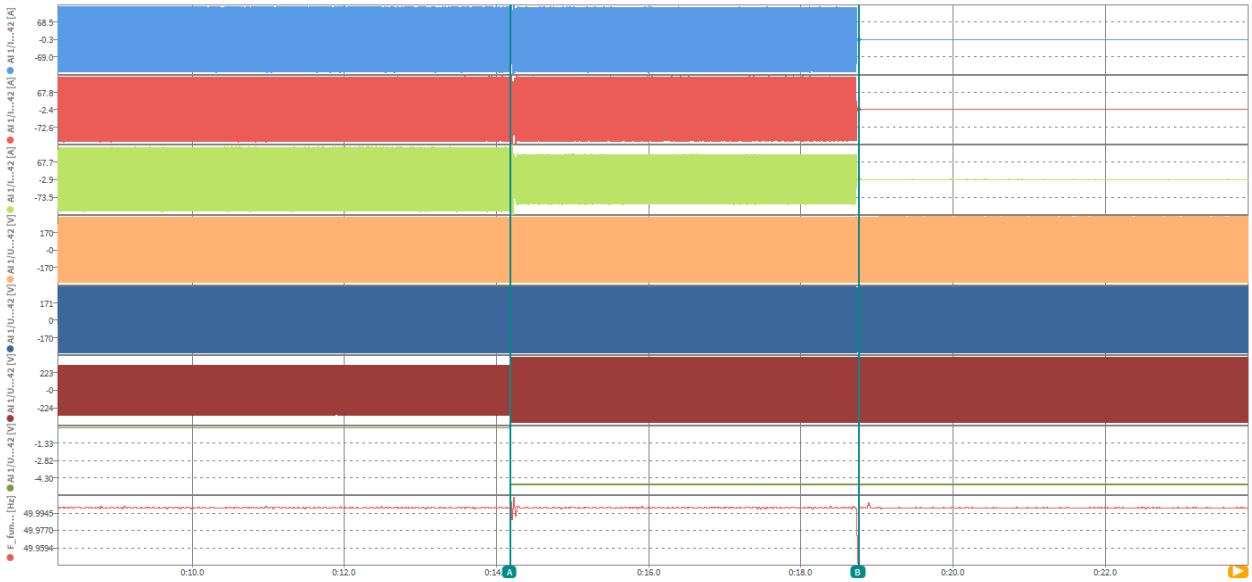
时间 [s]	A	B	间隔	有效值
	0:10.77300	1:49.98470	1:39.21170	
AI 1/I1@TRIONet3_1342 [A]	-123.5250	-1.191616	122.3334	90.36807
AI 1/I2@TRIONet3_1342 [A]	96.89892	-0.948787	-97.84771	91.80661
AI 1/I3@TRIONet3_1342 [A]	12.30586	-2.059460	-14.36532	100.1957
AI 1/U1@TRIONet3_1342 [V]	-307.1761	319.1414	626.3175	230.0838
AI 1/U2@TRIONet3_1342 [V]	244.1459	-110.5504	-354.6963	229.9554
AI 1/U3@TRIONet3_1342 [V]	77.18611	-254.0357	-331.2218	276.9803
AI 1/U4@TRIONet3_1342 [V]	-0.010490	-8.345e-3	2.146e-3	0.013724
F_fund@AC [Hz]	50.00063	50.00013	-4.997e-4	49.99995

Under -voltage – Stage 2



	A	B	间隔	有效值
时间 [s]	9.32420	0:13.89360	4.56940	
AI 1/I1@TRIONet3_1342 [A]	115.0135	-0.019193	-115.0327	87.79135
AI 1/I2@TRIONet3_1342 [A]	-88.73702	1.744032	90.48105	88.48275
AI 1/I3@TRIONet3_1342 [A]	-24.32549	-3.637433	20.68806	179.3267
AI 1/U1@TRIONet3_1342 [V]	322.5498	-312.5355	-635.0854	229.7214
AI 1/U2@TRIONet3_1342 [V]	-184.2921	231.6160	415.9081	230.0595
AI 1/U3@TRIONet3_1342 [V]	-72.13378	39.27851	111.4123	114.4339
AI 1/U4@TRIONet3_1342 [V]	-5.484e-3	-0.014782	-9.298e-3	0.014261
F_fund@AC [Hz]	49.99154	49.94619	-0.045349	49.99973

Over-voltage – Stage 2

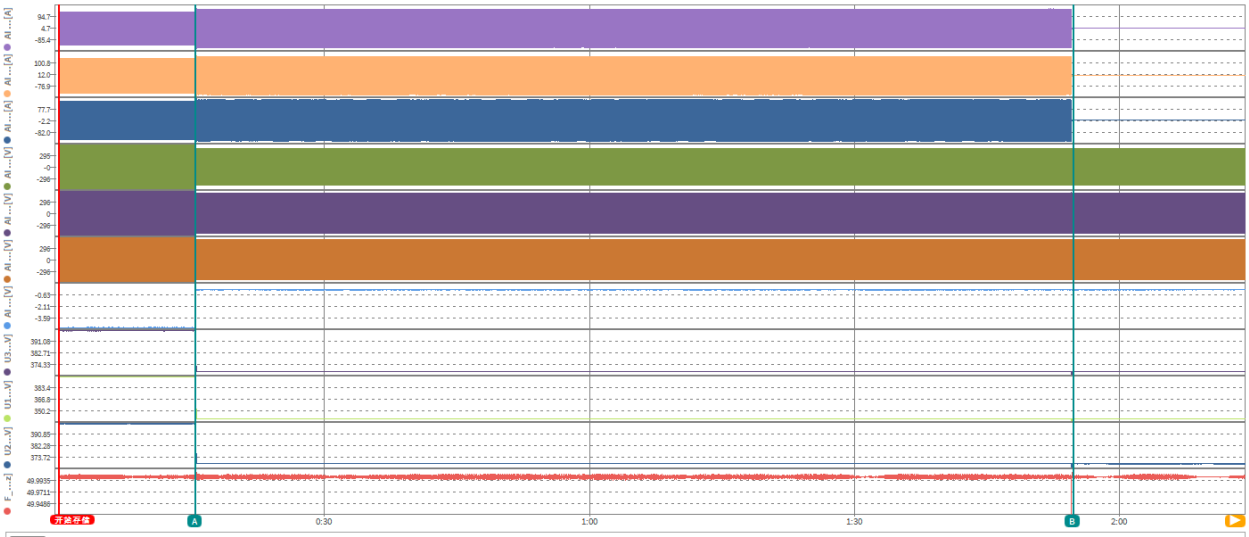


	A	B	间隔	有效值
时间 [s]	0:14.17910	0:18.76140	4.58230	
AI 1/I1@TRIONet3_1342 [A]	-69.11457	0.215292	69.32986	90.47857
AI 1/I2@TRIONet3_1342 [A]	129.9663	1.496196	-128.4701	91.77902
AI 1/I3@TRIONet3_1342 [A]	-72.47580	-7.391692	65.08410	70.23599
AI 1/U1@TRIONet3_1342 [V]	-159.1082	-303.9274	-144.8193	230.0977
AI 1/U2@TRIONet3_1342 [V]	324.1146	249.6512	-74.46337	229.9768
AI 1/U3@TRIONet3_1342 [V]	-170.9330	72.70408	243.6371	299.8651
AI 1/U4@TRIONet3_1342 [V]	-0.017405	-4.901171	-4.883766	4.915101
F_fund@AC [Hz]	49.99985	49.94359	-0.056263	49.99970

5.8 Interface protection 5.8.3.2 Voltage and frequency protections (Three-phase type, L1-L2)				P
Test conditions	Output power: >=50%Pn, Frequency: 50+/-0.2Hz			
Stage 1	**Under-voltage**		**Over-voltage**	
Parameter	Voltage	Time	Voltage	Time
Limit	$0.85U_n \pm 1\%\ U_n$	99s ≤ t ≤ 100s	$1.2U_n \pm 1\%\ U_n$	99s ≤ t ≤ 100s
Trip value [V]	340.5		480.6	
	340.9		480.6	
	340.6		480.4	
Trip time [s]	U_n To $U_{th\text{-}low}$ – 5%Un	99.054	U_n To $U_{th\text{-}high}$ + 5%U_n	99.259
		99.146		99.112
		99.300		99.169
Stage 2	**Under-voltage**		**Over-voltage**	
Parameter	Voltage	Time	Voltage	Time
Limit	$0.5U_n \pm 1\%\ U_n$	4s ≤ t ≤ 5s	$1.3U_n \pm 1\%\ U_n$	4s ≤ t ≤ 5s
Trip value [V]	201.3		520.6	
	200.6		521.0	
	200.3		520.7	
Trip time [s]	U_n To $U_{th\text{-}low}$ – 5%Un	4.586	U_n To $U_{th\text{-}high}$ + 5%U_n	4.581
		4.574		4.575
		4.574		4.560

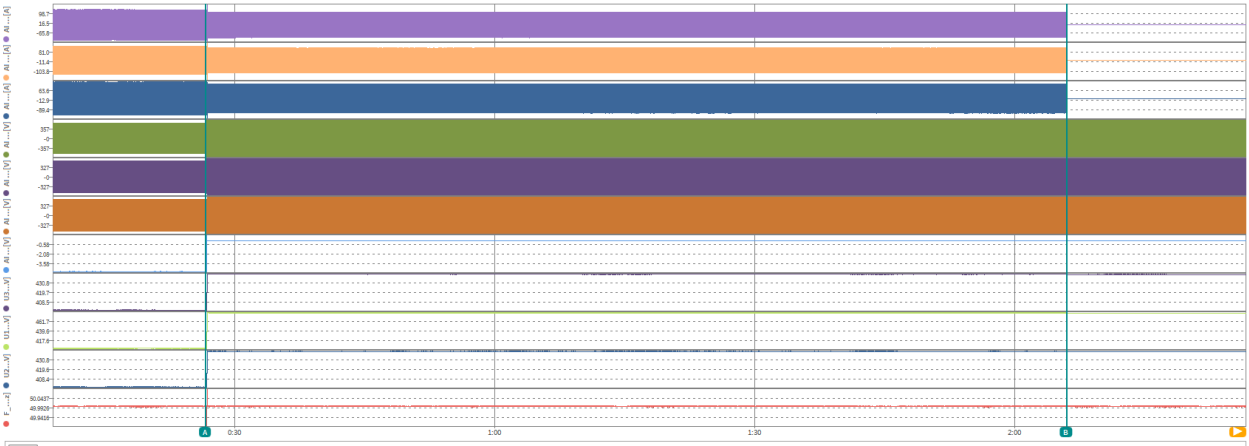
Scope pictures of the disconnection time

Under -voltage – Stage 1



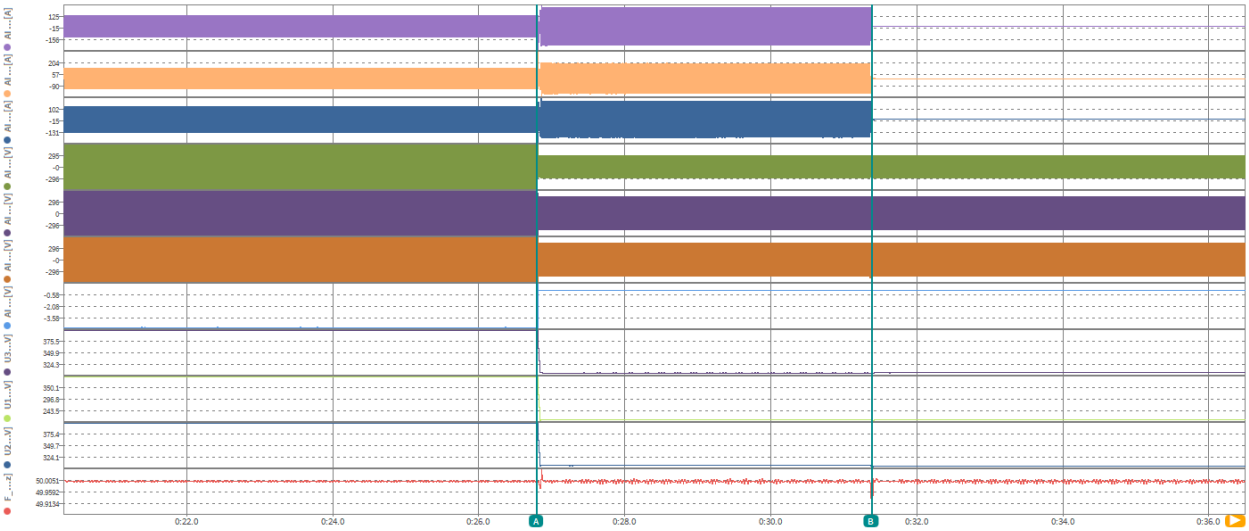
时间 [s]	A	B	间隔	有效值
	0:15.40660	1:54.70630	1:39.29970	
AI 1/I1@TRIONet3_1455 [A]	-109.8582	-1.194954	108.6632	103.7602
AI 1/I2@TRIONet3_1455 [A]	114.0330	-0.942111	-114.9751	102.9595
AI 1/I3@TRIONet3_1455 [A]	-8.204461	-2.002716	6.201744	100.1438
AI 1/U1@TRIONet3_1455 [V]	-561.6186	-470.1505	91.46810	337.7938
AI 1/U2@TRIONet3_1455 [V]	304.1718	315.0842	10.91242	368.5873
AI 1/U3@TRIONet3_1455 [V]	257.4234	155.0465	-102.3769	368.6962
AI 1/U4@TRIONet3_1455 [V]	-4.917860	-9.060e-3	4.908800	0.150439
U31_tRMS@AC [V]	398.4685	368.5360	-29.93253	368.6920
U12_tRMS@AC [V]	398.2182	337.2798	-60.93832	337.8225
U23_tRMS@AC [V]	398.4659	368.2801	-30.18585	368.6081
F_fund@AC [Hz]	50.00263	50.00143	-1.198e-3	49.99995

Over-voltage – Stage 1



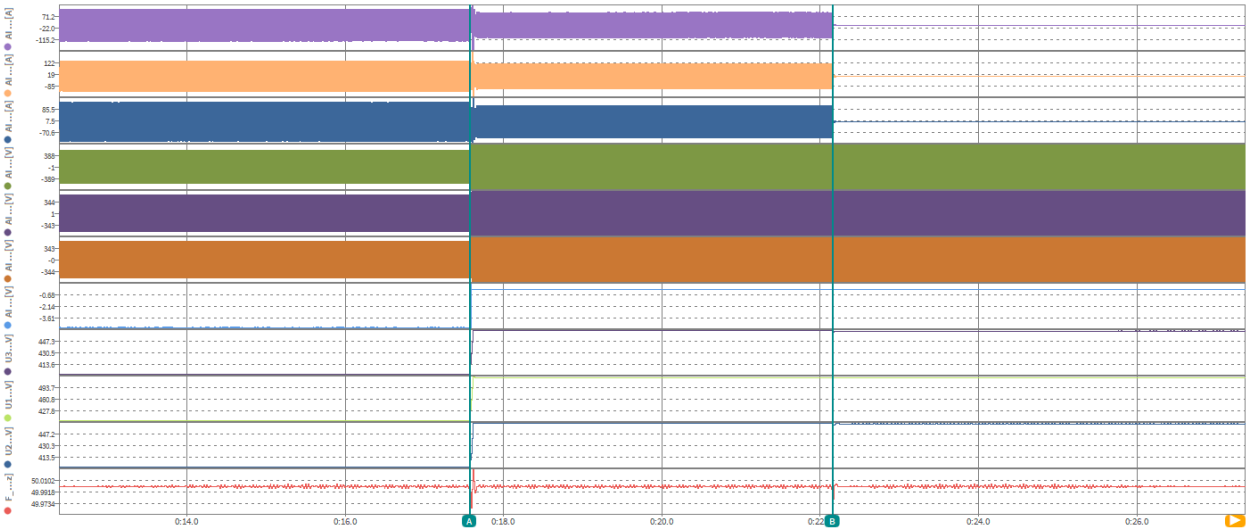
时间 [s]	A	B	间隔	有效值
	0:26.7106	2:05.9699	1:39.2593	
AI 1/I1@TRIONet3_1455 [A]	-15.50353	-1.166582	14.33694	77.06685
AI 1/I2@TRIONet3_1455 [A]	-103.0773	-0.971317	102.1060	83.45690
AI 1/I3@TRIONet3_1455 [A]	114.2483	-2.032757	-116.2810	80.76762
AI 1/U1@TRIONet3_1455 [V]	205.7638	70.62197	-135.1419	481.0857
AI 1/U2@TRIONet3_1455 [V]	-556.8533	-554.8179	2.035380	440.5939
AI 1/U3@TRIONet3_1455 [V]	351.1157	484.2253	133.1096	440.7671
AI 1/U4@TRIONet3_1455 [V]	-4.917145	-0.012636	4.904509	0.141453
U31_tRMS@AC [V]	398.5834	440.5817	41.99832	440.7412
U12_tRMS@AC [V]	398.1098	480.8571	82.74734	481.0769
U23_tRMS@AC [V]	398.4058	440.3356	41.92984	440.5951
F_fund@AC [Hz]	49.99934	50.00033	9.918e-4	49.99992

Under -voltage – Stage 2



	A	B	间隔	有效值
时间 [s]	0:26.79740	0:31.38320	4.58580	
AI 1/I1@TRIONet3_1455 [A]	94.34629	0.400543	-93.94575	161.2470
AI 1/I2@TRIONet3_1455 [A]	-126.4123	-2.581835	123.8304	135.0130
AI 1/I3@TRIONet3_1455 [A]	27.75848	-2.103686	-29.86217	131.1339
AI 1/U1@TRIONet3_1455 [V]	545.3773	4.134178	-541.2431	198.3852
AI 1/U2@TRIONet3_1455 [V]	-392.5019	401.8429	794.3447	303.5582
AI 1/U3@TRIONet3_1455 [V]	-152.9267	-406.0760	-253.1493	303.8863
AI 1/U4@TRIONet3_1455 [V]	-4.924536	-0.015020	4.909516	0.180774
U31_tRMS@AC [V]	398.5762	301.1148	-97.46136	304.3310
U12_tRMS@AC [V]	398.1953	195.2529	-202.9424	199.8993
U23_tRMS@AC [V]	398.3182	300.8391	-97.47906	304.3177
F_fund@AC [Hz]	49.99788	49.87194	-0.125938	49.99947

Over-voltage – Stage 2



	A	B	间隔	有效值
时间 [s]	0:17.577900	0:22.158500	4.580600	
AI 1/I1@TRIONet3_1455 [A]	-92.92687	-5.434871	87.49199	72.34240
AI 1/I2@TRIONet3_1455 [A]	-31.01790	3.487230	34.50513	79.61408
AI 1/I3@TRIONet3_1455 [A]	119.8701	-2.064467	-121.9345	76.41568
AI 1/U1@TRIONet3_1455 [V]	-145.6361	-61.62644	84.00965	522.3116
AI 1/U2@TRIONet3_1455 [V]	-398.3402	-503.5689	-105.2287	461.9351
AI 1/U3@TRIONet3_1455 [V]	544.0026	565.2032	21.20066	462.1706
AI 1/U4@TRIONet3_1455 [V]	-4.916191	-0.014544	4.901648	0.261548
U31_tRMS@AC [V]	398.5583	462.3298	63.77151	461.6445
U12_tRMS@AC [V]	398.0986	522.5649	124.4663	521.4139
U23_tRMS@AC [V]	398.4253	462.2124	63.78708	461.4434
F_fund@AC [Hz]	49.99711	49.99530	-1.808e-3	49.99997

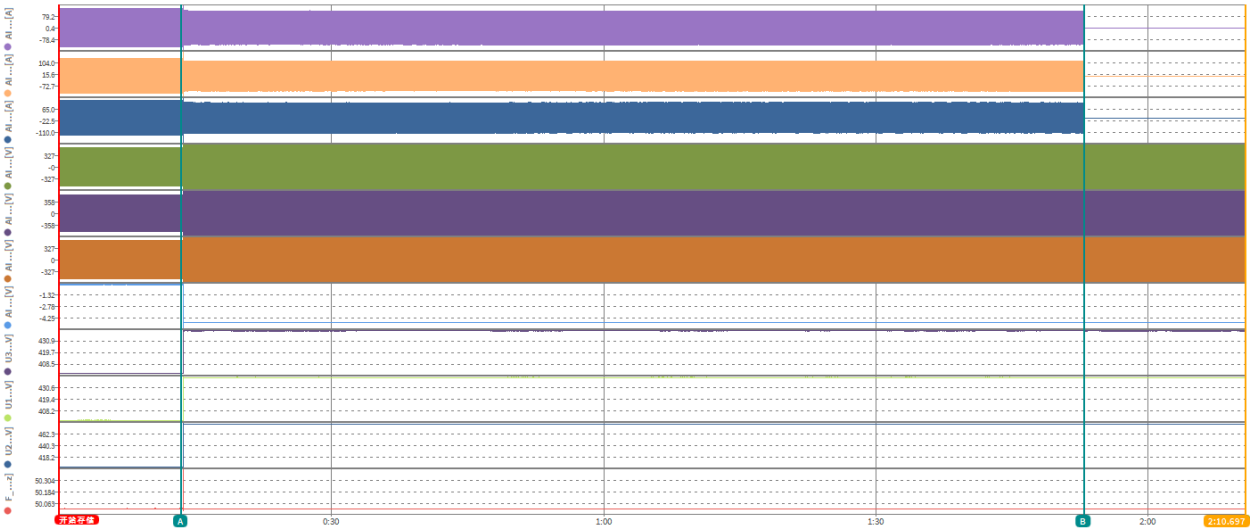
5.8 Interface protection 5.8.3.2 Voltage and frequency protections (Three-phase type, L2-L3)				P
Test conditions	Output power: >=50%Pn, Frequency: 50+/-0.2Hz			
Stage 1	**Under-voltage**		**Over-voltage**	
Parameter	Voltage	Time	Voltage	Time
Limit	$0.85U_n \pm 1\%\ U_n$	99s ≤ t ≤ 100s	$1.2U_n \pm 1\%\ U_n$	99s ≤ t ≤ 100s
Trip value [V]	341.2		481.1	
	341.1		481.2	
	340.8		480.6	
Trip time [s]	U_n To $U_{th\text{-}low}$ – 5%Un	99.233	U_n To $U_{th\text{-}high}$ + 5%U_n	99.440
		99.236		99.334
		99.129		99.368
Stage 2	**Under-voltage**		**Over-voltage**	
Parameter	Voltage	Time	Voltage	Time
Limit	$0.5U_n \pm 1\%\ U_n$	4s ≤ t ≤ 5s	$1.3U_n \pm 1\%\ U_n$	4s ≤ t ≤ 5s
Trip value [V]	201.1		521.6	
	200.9		521.3	
	200.9		521.4	
Trip time [s]	U_n To $U_{th\text{-}low}$ – 5%Un	4.554	U_n To $U_{th\text{-}high}$ + 5%U_n	4.551
		4.567		4.543
		4.567		4.568

Scope pictures of the disconnection time

Under -voltage – Stage 1

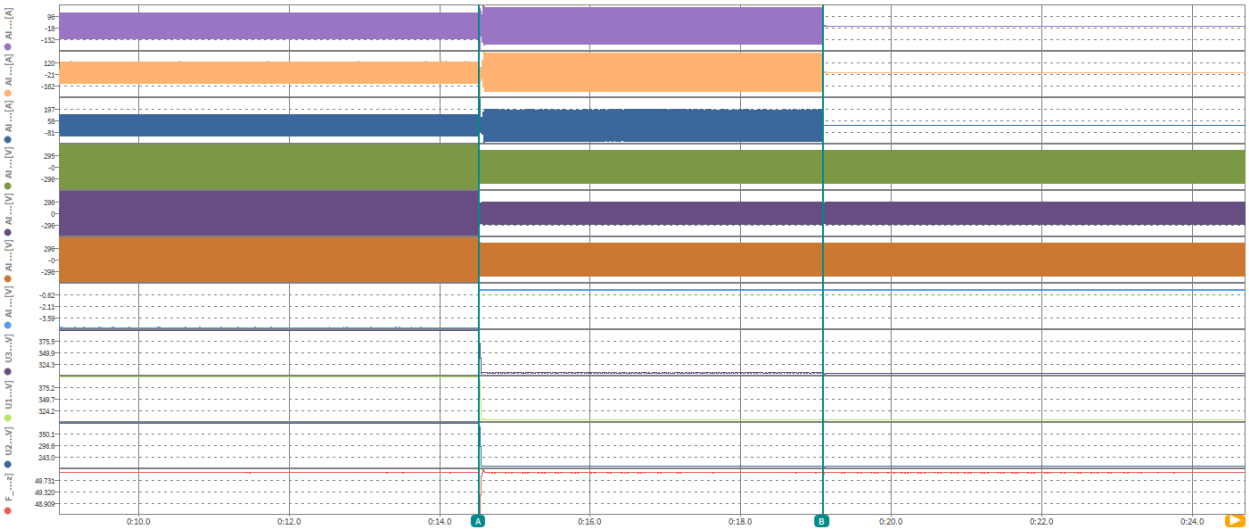
	A	B	间隔	有效值
时间 [s]	0:37.4231	2:16.6587	1:39.2356	
AI 1/I1@TRIONet3_1455 [A]	-125.1948	-1.178265	124.0165	99.55748
AI 1/I2@TRIONet3_1455 [A]	12.81655	-0.954628	-13.77118	107.0022
AI 1/I3@TRIONet3_1455 [A]	108.1208	-2.025247	-110.1461	100.2814
AI 1/U1@TRIONet3_1455 [V]	-336.4024	-443.6379	-107.2354	368.3237
AI 1/U2@TRIONet3_1455 [V]	-182.3742	409.3962	591.7704	337.9219
AI 1/U3@TRIONet3_1455 [V]	518.7466	34.20258	-484.5441	368.6886
AI 1/U4@TRIONet3_1455 [V]	-0.010967	-0.015736	-4.768e-3	0.013877
U31_tRMS@AC [V]	368.7756	368.5046	-0.270966	368.6751
U12_tRMS@AC [V]	368.5616	367.9688	-0.592804	368.3361
U23_tRMS@AC [V]	337.9714	337.5856	-0.385773	337.9249
F_fund@AC [Hz]	50.01779	50.00073	-0.017063	49.99994

Over-voltage – Stage 1



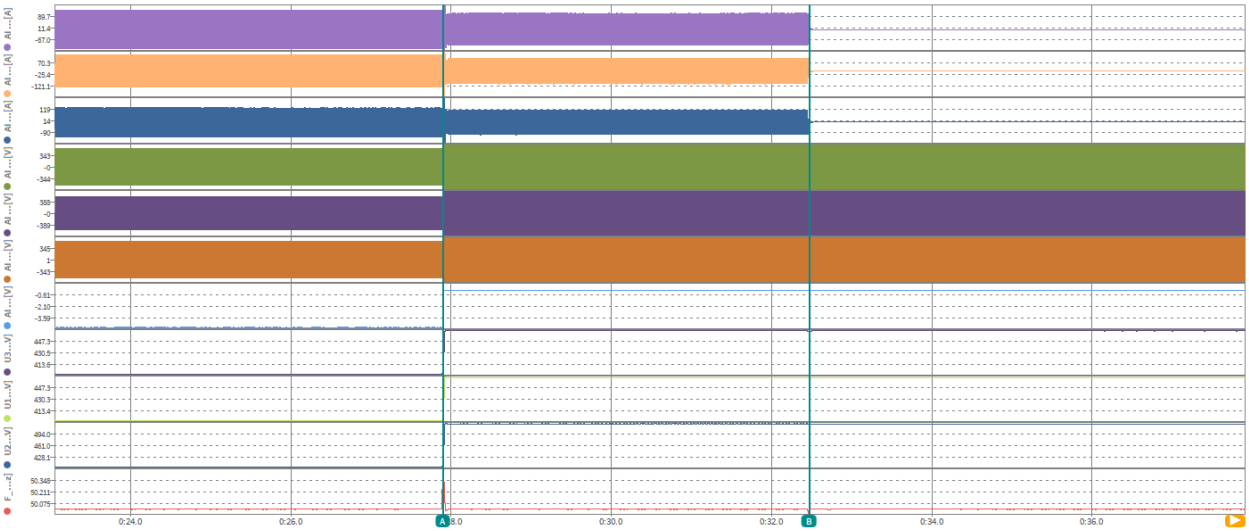
	A	B	间隔	有效值
时间 [s]	0:13.45930	1:52.89890	1:39.43960	
AI 1/I1@TRIONet3_1455 [A]	-62.85692	-1.178265	61.67865	79.71956
AI 1/I2@TRIONet3_1455 [A]	131.1095	-0.982165	-132.0916	80.23366
AI 1/I3@TRIONet3_1455 [A]	-72.44909	-2.049446	70.39965	81.17053
AI 1/U1@TRIONet3_1455 [V]	-478.0481	-482.4634	-4.415274	440.2837
AI 1/U2@TRIONet3_1455 [V]	499.5334	648.3794	148.8459	481.3803
AI 1/U3@TRIONet3_1455 [V]	-21.56735	-165.9980	-144.4306	440.7455
AI 1/U4@TRIONet3_1455 [V]	-0.013590	-4.915715	-4.902125	4.914920
U31_tRMS@AC [V]	398.5253	440.7060	42.18066	440.7131
U12_tRMS@AC [V]	398.2492	439.8861	41.63687	440.2770
U23_tRMS@AC [V]	398.3061	481.1950	82.88889	481.3643
F_fund@AC [Hz]	50.00398	49.99766	-6.317e-3	50.00001

Under -voltage – Stage 2



	A	B	间隔	有效值
时间 [s]	0:14.52030	0:19.08750	4.56720	
AI 1/I1@TRIONet3_1455 [A]	-50.92323	-4.161477	46.76175	130.8689
AI 1/I2@TRIONet3_1455 [A]	130.2358	1.387715	-128.8481	164.6338
AI 1/I3@TRIONet3_1455 [A]	-83.42565	-1.414418	82.01123	132.1647
AI 1/U1@TRIONet3_1455 [V]	-445.6775	-77.22569	368.4519	303.6268
AI 1/U2@TRIONet3_1455 [V]	521.7364	-238.3592	-760.0956	198.1198
AI 1/U3@TRIONet3_1455 [V]	-76.09201	315.5694	391.6614	303.7613
AI 1/U4@TRIONet3_1455 [V]	-4.914999	-0.012636	4.902363	0.136328
U31_tRMS@AC [V]	398.5056	303.7901	-94.71545	304.4859
U12_tRMS@AC [V]	398.2948	303.4769	-94.81784	304.3054
U23_tRMS@AC [V]	398.3878	198.1365	-200.2513	200.4677
F_fund@AC [Hz]	50.00326	49.99841	-4.852e-3	49.99361

Over-voltage – Stage 2

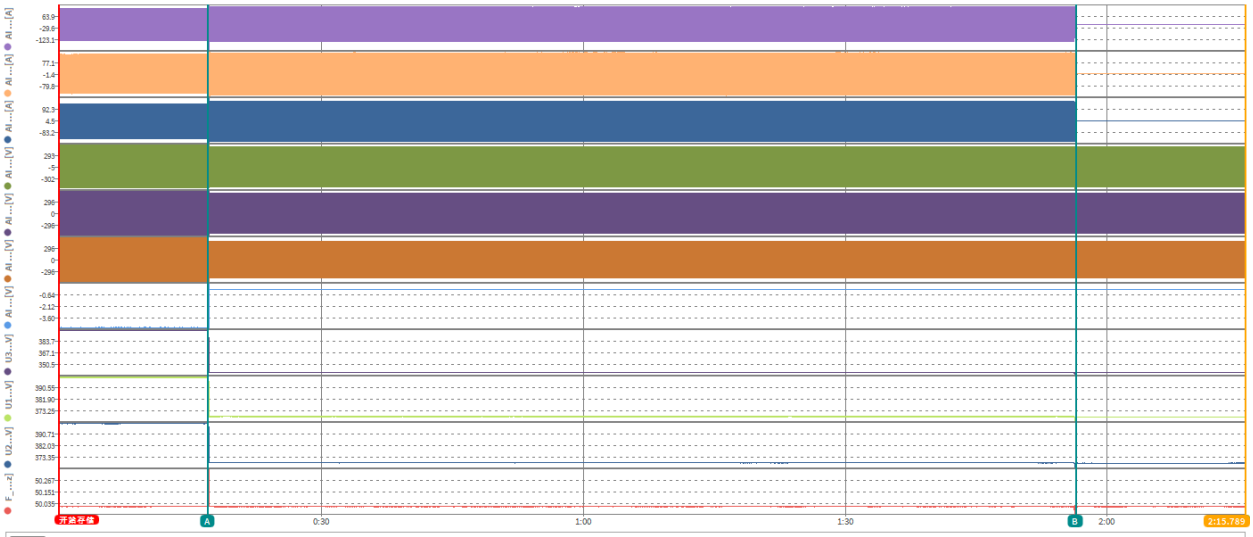


	A	B	间隔	有效值
时间 [s]	0:27.90740	0:32.47550	4.56810	
AI 1/I1@TRIONet3_1455 [A]	57.16586	3.020764	-54.14510	76.50909
AI 1/I2@TRIONet3_1455 [A]	-60.77576	-2.303124	58.47264	75.38278
AI 1/I3@TRIONet3_1455 [A]	-0.337958	-4.772306	-4.434347	76.87204
AI 1/U1@TRIONet3_1455 [V]	638.4006	-449.8163	-1088.217	461.8188
AI 1/U2@TRIONet3_1455 [V]	-534.0569	726.6925	1260.749	522.9249
AI 1/U3@TRIONet3_1455 [V]	-104.3983	-276.9201	-172.5218	462.3637
AI 1/U4@TRIONet3_1455 [V]	-0.015497	-0.016212	-7.153e-4	0.014876
U31_tRMS@AC [V]	400.4247	460.8546	60.42996	462.0173
U12_tRMS@AC [V]	400.0745	460.9935	60.91898	461.6283
U23_tRMS@AC [V]	400.9964	522.5541	121.5576	522.5277
F_fund@AC [Hz]	50.47127	49.95172	-0.519550	50.00253

5.8 Interface protection 5.8.3.2 Voltage and frequency protections (Three-phase type, L3-L1)					P
Test conditions	Output power: >=50%Pn, Frequency: 50+/-0.2Hz				
Stage 1	**Under-voltage**		**Over-voltage**		
Parameter	Voltage	Time	Voltage	Time	
Limit	$0.85U_n \pm 1\%\ U_n$	99s ≤ t ≤ 100s	$1.2U_n \pm 1\%\ U_n$	99s ≤ t ≤ 100s	
Trip value [V]	340.3		479.8		
	340.1		479.7		
	339.9		480.0		
Trip time [s]	U_n To $U_{th\text{-}low}$ – 5%Un	99.135	U_n To $U_{th\text{-}high}$ + 5%U_n	99.234	
		99.327		99.311	
		99.094		99.109	
Stage 2	**Under-voltage**		**Over-voltage**		
Parameter	Voltage	Time	Voltage	Time	
Limit	$0.5U_n \pm 1\%\ U_n$	4s ≤ t ≤ 5s	$1.3U_n \pm 1\%\ U_n$	4s ≤ t ≤ 5s	
Trip value [V]	200.1		520.3		
	200.8		520.1		
	200.2		520.4		
Trip time [s]	U_n To $U_{th\text{-}low}$ – 5%Un	4.556	U_n To $U_{th\text{-}high}$ + 5%U_n	4.566	
		4.572		4.558	
		4.569		4.570	

Scope pictures of the disconnection time

Under -voltage – Stage 1

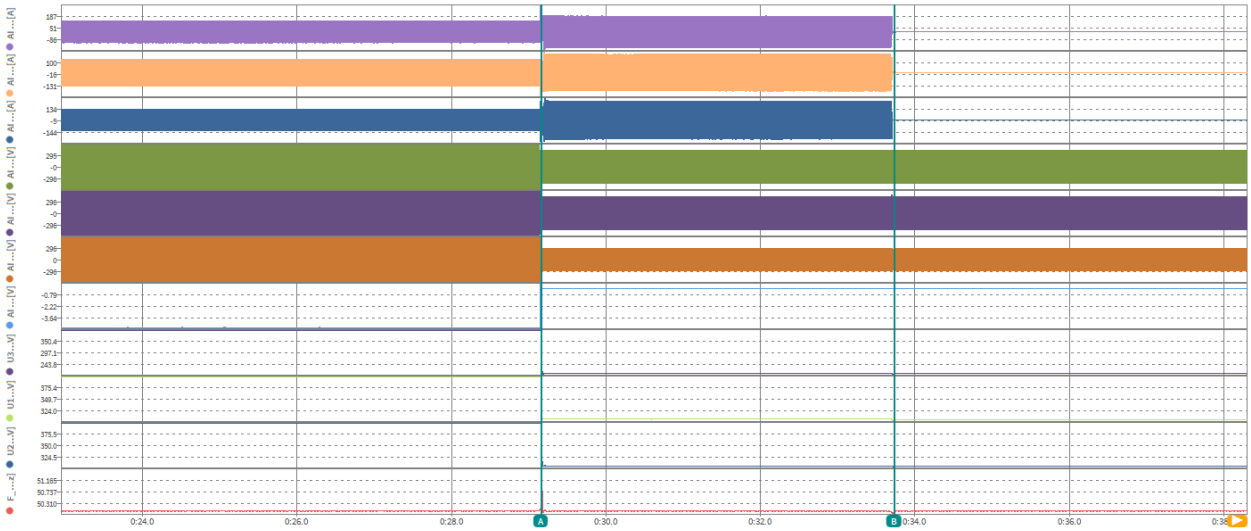


	A	B	间隔	有效值
时间 [s]	0:17.07750	1:56.40400	1:39.32650	
AI 1/I1@TRIONet3_1455 [A]	60.97687	-1.136541	-62.11341	99.24584
AI 1/I2@TRIONet3_1455 [A]	-132.4221	-0.963807	131.4583	102.7081
AI 1/I3@TRIONet3_1455 [A]	67.18028	-1.963496	-69.14378	104.3969
AI 1/U1@TRIONet3_1455 [V]	477.4077	39.13379	-438.2739	368.3819
AI 1/U2@TRIONet3_1455 [V]	-499.8985	400.7216	900.6200	368.5688
AI 1/U3@TRIONet3_1455 [V]	22.51363	-439.9395	-462.4532	338.0841
AI 1/U4@TRIONet3_1455 [V]	-4.919768	-0.010967	4.908800	0.133320
U31_tRMS@AC [V]	398.4945	337.8439	-60.65063	338.0847
U12_tRMS@AC [V]	398.0790	367.9909	-30.08810	368.3899
U23_tRMS@AC [V]	398.3697	368.4590	-29.91074	368.5889
F_fund@AC [Hz]	49.99982	49.99945	-3.700e-4	50.00003

Over-voltage – Stage 1

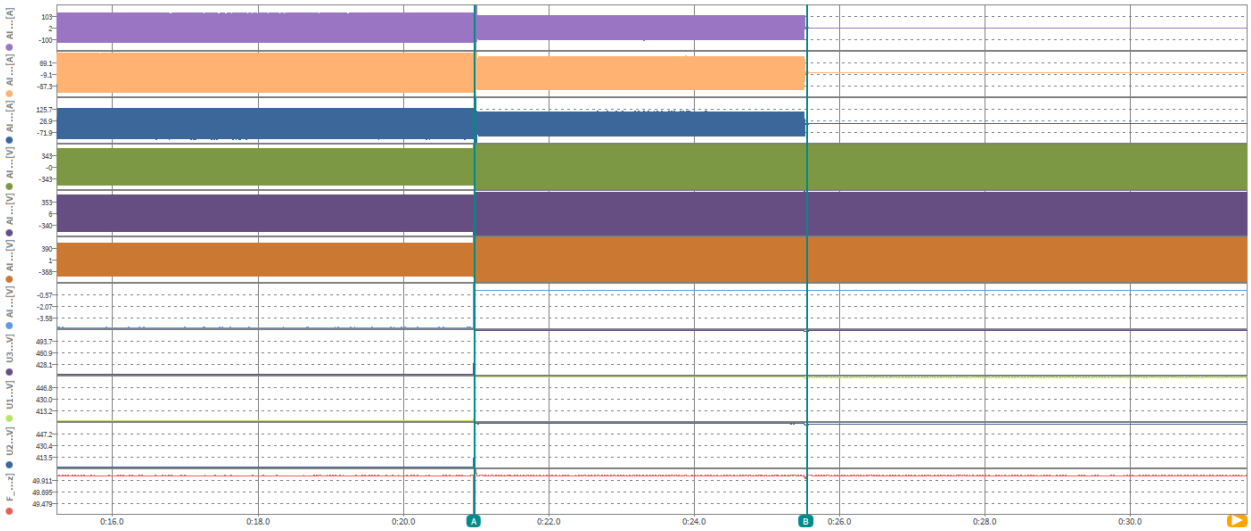
	A	B	间隔	有效值
时间 [s]	0:15.1786	1:54.4894	1:39.3108	
AI 1/I1@TRIONet3_1455 [A]	67.38305	-1.176596	-68.55965	80.32535
AI 1/I2@TRIONet3_1455 [A]	-141.4510	-0.998855	140.4522	83.75779
AI 1/I3@TRIONet3_1455 [A]	69.78715	-2.065301	-71.85245	77.57002
AI 1/U1@TRIONet3_1455 [V]	565.4927	-605.7811	-1171.274	440.3431
AI 1/U2@TRIONet3_1455 [V]	-468.1211	374.9497	843.0708	440.6270
AI 1/U3@TRIONet3_1455 [V]	-97.41068	230.8107	328.2213	481.6415
AI 1/U4@TRIONet3_1455 [V]	-4.916430	-4.910231	6.199e-3	4.917440
U31_tRMS@AC [V]	473.6382	481.5971	7.958984	481.6228
U12_tRMS@AC [V]	434.5279	440.1250	5.597107	440.3497
U23_tRMS@AC [V]	428.2441	440.3407	12.09656	440.6363
F_fund@AC [Hz]	49.54417	50.00154	0.457371	49.99983

Under -voltage – Stage 2



	A	B	间隔	有效值
时间 [s]	0:29.16470	0:33.73630	4.57160	
AI 1/I1@TRIONet3_1455 [A]	-64.78453	-1.297593	63.48694	130.3888
AI 1/I2@TRIONet3_1455 [A]	112.8481	-3.304482	-116.1525	133.2908
AI 1/I3@TRIONet3_1455 [A]	-52.22166	0.362158	52.58382	159.9600
AI 1/U1@TRIONet3_1455 [V]	-429.1840	389.9420	819.1259	303.5846
AI 1/U2@TRIONet3_1455 [V]	355.3279	-199.2805	-554.6084	303.4979
AI 1/U3@TRIONet3_1455 [V]	73.82799	-190.7318	-264.5598	198.0136
AI 1/U4@TRIONet3_1455 [V]	-0.021458	-1.907e-3	0.019550	0.014654
U31_tRMS@AC [V]	398.3759	195.6040	-202.7719	199.4406
U12_tRMS@AC [V]	398.5674	300.8105	-97.75699	304.0333
U23_tRMS@AC [V]	398.3501	301.4737	-96.87634	304.0698
F_fund@AC [Hz]	50.07535	49.98553	-0.089821	50.00668

Over-voltage – Stage 2

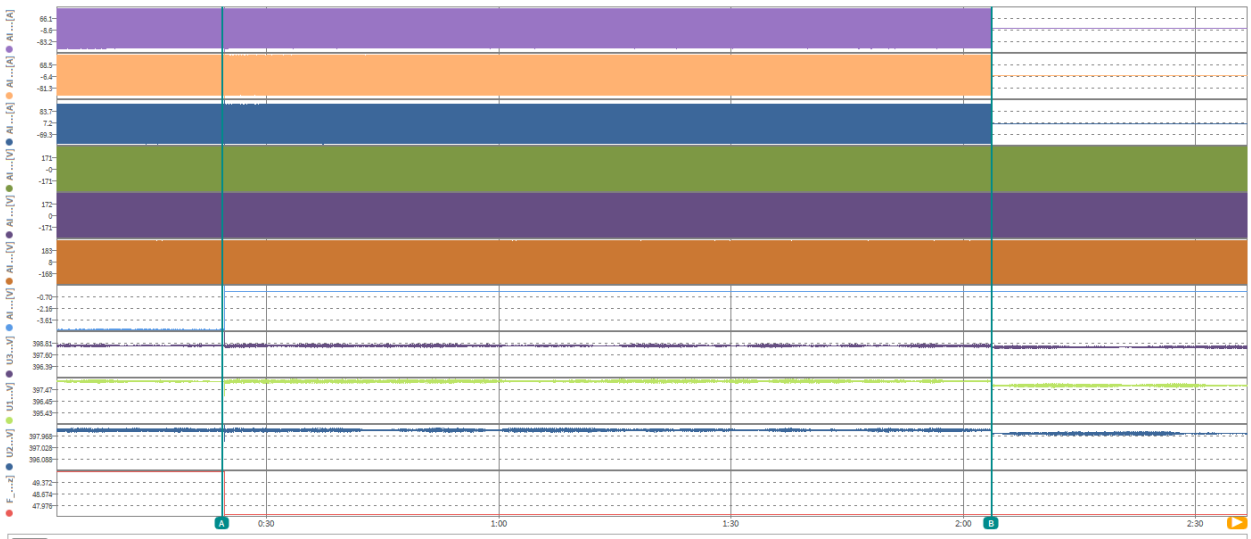


	A	B	间隔	有效值
时间 [s]	0:20.98110	0:25.55130	4.57020	
AI 1/I1@TRIONet3_1455 [A]	51.12517	-5.454898	-56.58007	76.95584
AI 1/I2@TRIONet3_1455 [A]	72.96229	2.649427	-70.31286	79.64539
AI 1/I3@TRIONet3_1455 [A]	-127.9610	-1.309276	126.6518	72.66894
AI 1/U1@TRIONet3_1455 [V]	64.53038	-31.80599	-96.33637	461.8236
AI 1/U2@TRIONet3_1455 [V]	586.4258	-596.4876	-1182.913	462.1538
AI 1/U3@TRIONet3_1455 [V]	-651.0384	628.3141	1279.353	523.1518
AI 1/U4@TRIONet3_1455 [V]	-0.018358	-0.018358	0.000000	0.014439
U31_tRMS@AC [V]	429.3556	521.3071	91.95151	522.7579
U12_tRMS@AC [V]	400.3036	459.4897	59.18604	461.6034
U23_tRMS@AC [V]	411.3365	460.6387	49.30215	461.9562
F_fund@AC [Hz]	49.28399	49.94451	0.660522	49.99709

5.8 Interface protection 5.8.3.2 Voltage and frequency protections				P
Test conditions	Output power: ≥50%Pn U_n = 1.0U_n			
Stage 1	**Under-frequency**		**Over-frequency**	
Parameter	Frequency	Time	Frequency	Time
Limit	47.50 Hz±0.05 Hz	99s ≤ t ≤ 100s	51.50 Hz±0.05 Hz	99s ≤ t ≤ 100s
Trip value [Hz]	47.51		51.50	
	47.50		51.50	
	47.50		51.50	
Trip time [s]	50.0 Hz To 47.4 Hz	99.084	50.0 Hz To 51.6 Hz	99.086
		99.048		99.146
		99.264		99.177
Stage 2	**Under-frequency**		**Over-frequency**	
Parameter	Frequency	Time	Frequency	Time
Limit	47.00 Hz±0.05 Hz	4s ≤ t ≤ 5s	52.00 Hz±0.05 Hz	4s ≤ t ≤ 5s
Trip value [Hz]	47.01		52.01	
	47.00		52.00	
	47.00		52.00	
Trip time [s]	50.0 Hz To 46.9 Hz	4.623	50.0 Hz To 52.1 Hz	4.564
		4.599		4.580
		4.604		4.558

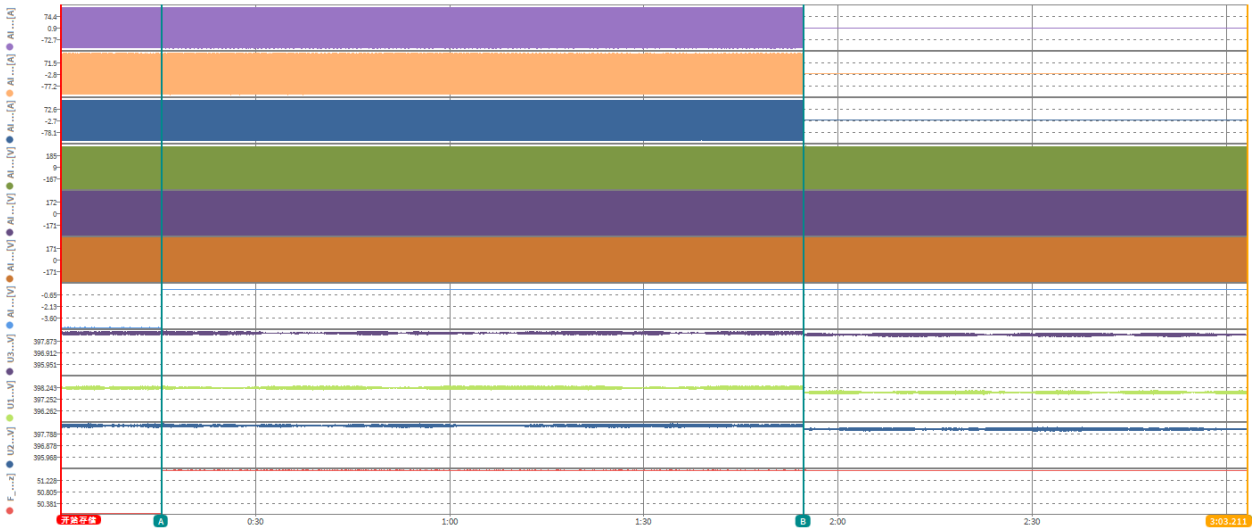
Scope pictures of the disconnection time

Under-frequency stage1



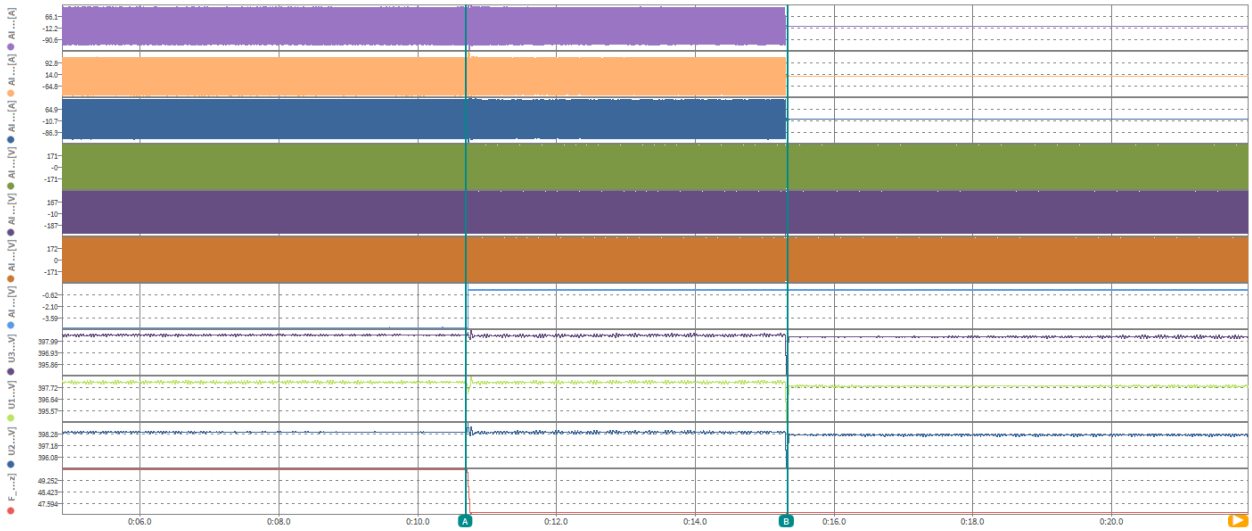
	A	B	间隔	有效值
时间 [s]	0:24.36740	2:03.63140	1:39.26400	
AI 1/I1@TRIONet3_1455 [A]	119.7416	-1.218319	-120.9599	90.79142
AI 1/I2@TRIONet3_1455 [A]	-33.71823	-0.965476	32.75275	92.22525
AI 1/I3@TRIONet3_1455 [A]	-92.69238	-2.067804	90.62458	91.82622
AI 1/U1@TRIONet3_1455 [V]	312.3851	-324.0142	-636.3993	230.0274
AI 1/U2@TRIONet3_1455 [V]	-82.96299	147.5387	230.5017	229.9663
AI 1/U3@TRIONet3_1455 [V]	-233.1801	179.1153	412.2954	230.0488
AI 1/U4@TRIONet3_1455 [V]	-4.919291	-0.013351	4.905939	0.184315
U31_tRMS@AC [V]	398.5483	398.0208	-0.527496	398.5228
U12_tRMS@AC [V]	398.2094	397.3922	-0.817108	398.2079
U23_tRMS@AC [V]	398.5735	397.7847	-0.788757	398.4337
F_fund@AC [Hz]	50.00007	47.39974	-2.600330	47.40458

Over-frequency stage1



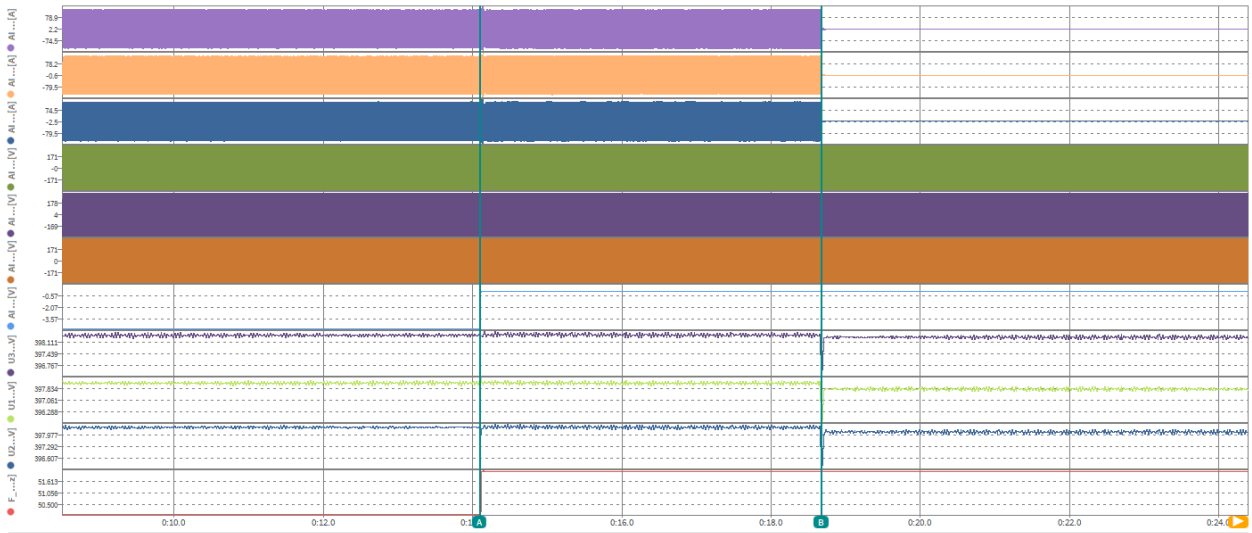
	A	B	间隔	有效值
时间 [s]	0:15.5158	1:54.6929	1:39.1771	
AI 1/I1@TRIONet3_1455 [A]	-98.68301	-1.159906	97.52310	90.76679
AI 1/I2@TRIONet3_1455 [A]	121.1318	-0.983834	-122.1156	92.27602
AI 1/I3@TRIONet3_1455 [A]	-28.19908	-2.107859	26.09122	91.82488
AI 1/U1@TRIONet3_1455 [V]	-248.7471	278.4257	527.1728	230.0346
AI 1/U2@TRIONet3_1455 [V]	305.2545	-283.5050	-588.7595	229.9676
AI 1/U3@TRIONet3_1455 [V]	-59.78608	5.460501	65.24659	230.0503
AI 1/U4@TRIONet3_1455 [V]	-4.926205	-0.013590	4.912615	0.030315
U31_tRMS@AC [V]	398.4277	398.4817	0.053986	398.5416
U12_tRMS@AC [V]	398.1484	397.8189	-0.329529	398.2012
U23_tRMS@AC [V]	398.3760	398.2190	-0.157013	398.4393
F_fund@AC [Hz]	50.00015	51.59964	1.599491	51.59937

Under-frequency stage2



	A	B	间隔	有效值
时间 [s]	0:10.69950	0:15.32220	4.62270	
AI 1/I1@TRIONet3_1455 [A]	105.8043	-5.028487	-110.8328	90.37231
AI 1/I2@TRIONet3_1455 [A]	-118.3146	-0.633359	117.6813	91.70011
AI 1/I3@TRIONet3_1455 [A]	5.851269	0.716806	-5.134464	91.33131
AI 1/U1@TRIONet3_1455 [V]	268.8749	131.7616	-137.1133	230.0131
AI 1/U2@TRIONet3_1455 [V]	-292.1026	-320.5524	-28.44978	229.9166
AI 1/U3@TRIONet3_1455 [V]	24.84799	192.9317	168.0837	230.0666
AI 1/U4@TRIONet3_1455 [V]	-4.917145	-0.011206	4.905939	0.427166
U31_tRMS@AC [V]	398.5962	394.8929	-3.703339	398.4987
U12_tRMS@AC [V]	398.2657	394.6024	-3.663269	398.1749
U23_tRMS@AC [V]	398.4065	395.0925	-3.313995	398.4135
F_fund@AC [Hz]	49.99905	46.84422	-3.154831	46.94211

Over-frequency stage2



	A	B	间隔	有效值
时间 [s]	0:14.09980	0:18.68000	4.58020	
AI 1/I1@TRIONet3_1455 [A]	-105.1509	-0.744343	104.4066	90.69774
AI 1/I2@TRIONet3_1455 [A]	117.7789	-4.455209	-122.2341	92.23135
AI 1/I3@TRIONet3_1455 [A]	-14.16421	1.199126	15.36334	91.82716
AI 1/U1@TRIONet3_1455 [V]	-265.2807	320.2944	585.5751	230.0700
AI 1/U2@TRIONet3_1455 [V]	294.6878	-132.1685	-426.8563	229.9478
AI 1/U3@TRIONet3_1455 [V]	-32.26876	-190.5811	-158.3123	229.9937
AI 1/U4@TRIONet3_1455 [V]	-4.913092	-0.014305	4.898787	0.171589
U31_tRMS@AC [V]	398.5463	396.1585	-2.387787	398.5184
U12_tRMS@AC [V]	398.3199	395.5883	-2.731628	398.1845
U23_tRMS@AC [V]	398.4543	395.9870	-2.467316	398.4215
F_fund@AC [Hz]	49.99953	52.03582	2.036289	52.08315

5.8 Interface protection 5.8.3.2.4 Reset time and reset ratio								P
Test conditions	Output power: >=50%Pn, Frequency: 50+/-0,2Hz							
Stage 1	**Under-voltage**			**Over-voltage**				
Parameter	Voltage /Time			Voltage /Time				
Setting value	0.85U_n / 99000ms			1.2U_n / 99000ms				
1.00Un→0.82Un(98940ms)→0.87Un(99200ms)→1.00Un	Phase	Reset time	Result	1.00Un→1.23Un(98940ms)→1.18Un(99200ms)→1.00Un	Phase	Reset time	Result	
	L1-N, L2-N, L3-N	≤50ms	No trip		L1-N, L2-N, L3-N	≤50ms	No trip	
	L1-N	≤50ms	No trip		L1-N	≤50ms	No trip	
	L2-N	≤50ms	No trip		L2-N	≤50ms	No trip	
	L3-N	≤50ms	No trip		L3-N	≤50ms	No trip	
	L1-L2	≤50ms	No trip		L1-L2	≤50ms	No trip	
	L2-L3	≤50ms	No trip		L2-L3	≤50ms	No trip	
	L3-L1	≤50ms	No trip		L3-L1	≤50ms	No trip	
Stage 2	**Under-voltage**			**Over-voltage**				
Parameter	Voltage /Time			Voltage /Time				
Setting value	0.5U_n / 4000ms			1.3U_n / 4000ms				
1.00Un→0.47Un(3940ms)→0.52Un(4200ms)→1.00Un	Phase	Reset time	Result	1.00Un→1.33Un(3940ms)→1.28Un(4200ms)→1.00Un	Phase	Reset time	Result	
	L1-N, L2-N, L3-N	≤50ms	No trip		L1-N, L2-N, L3-N	≤50ms	No trip	
	L1-N	≤50ms	No trip		L1-N	≤50ms	No trip	
	L2-N	≤50ms	No trip		L2-N	≤50ms	No trip	
	L3-N	≤50ms	No trip		L3-N	≤50ms	No trip	
	L1-L2	≤50ms	No trip		L1-L2	≤50ms	No trip	
	L2-L3	≤50ms	No trip		L2-L3	≤50ms	No trip	
	L3-L1	≤50ms	No trip		L3-L1	≤50ms	No trip	
Stage 1	**Under-frequency**			**Over-frequency**				
Parameter	Frequency /Time			Frequency /Time				
Setting value	47.5Hz / 99000ms			51.5Hz / 99000ms				

50Hz→47.2Hz(98940ms)→47.7Hz(99200ms)→50Hz	Reset time	Result	50Hz→51.8Hz(98940ms)→51.3Hz(99200ms)→50Hz	Reset time	Result
	≤50ms	No trip		≤50ms	No trip
Stage 2	**Under-frequency**		**Over-frequency**		
Parameter	Frequency /Time		Frequency /Time		
Setting value	47.0Hz / 4000ms		52.0Hz / 4000ms		
50Hz→46.7Hz(3940ms)→47.2Hz(4200ms)→50Hz	Reset time	Result	50Hz→52.3Hz(3940ms)→51.8Hz(4200ms)→50Hz	Reset time	Result
	≤50ms	No trip		≤50ms	No trip

5.8.3.3 Overvoltage 10 min mean protection			P
Setting values of the protection:	Trip value Setting [V]	253	
	Setting $T_{disconnection\ trip\ value}$ [s]	600	
	Setting $T_{disconnection}$ [ms]	200	
Test:			
		Disconnection time [s]	Limit [s]
a)	The voltage is set to 100% U_n and held for 600 s. Thereafter the voltage is set to 112% U_n. Disconnection must take place within 600 s.		
	Phase L1-N	500.395	450s-550s
	Phase L2-N	499.916	
	Phase L3-N	498.864	
b)	The voltage is set to U_n for 600 s and then to 108% U_n for 600 s. No disconnection should take place.		
	Phase L1-N	No disconnection	Disconnection should not take place.
	Phase L2-N	No disconnection	
	Phase L3-N	No disconnection	
c)	The voltage is set to 106 % U_n and held for 600 s. Thereafter the voltage is set to 114 % U_n. The disconnection should last for half the period as in Point a)*		
	Phase L1-N	300.020	The disconnection time should be about 50 % of the value measured in a). *(225s-375s)
	Phase L2-N	299.389	
	Phase L3-N	300.337	

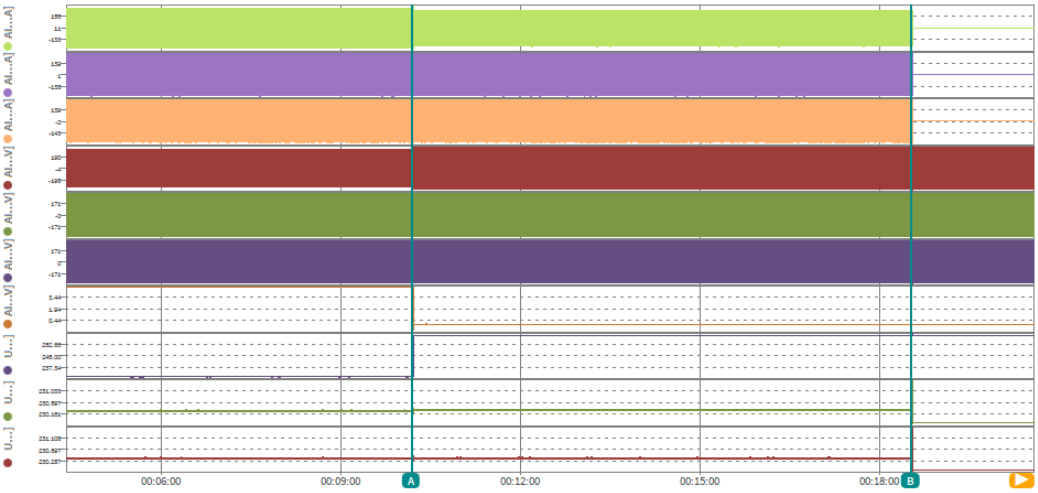
Test:
a) This test serves as proof of the measurement accuracy and the maximum set time.
b) This test serves as proof of the measurement accuracy
c) This test serves as proof of the correct formation of the 1-minute running mean value.

Assessment criterion:
The permitted tolerance between setting value and trip value of the voltage may not exceed ± 1 % of U_N.
Limit values:
Rise-in voltage protection 1.1 U_N after a max. 600 s, the switch off after 200 ms.

Note:
If only one integrated protection is used for the power generation systems, the value of the rise-in voltage protection of 1.1 U_N may not be changed.
*If the setting value is set to 600 s, then the disconnection time can be in the range between 225 s and 375 s.

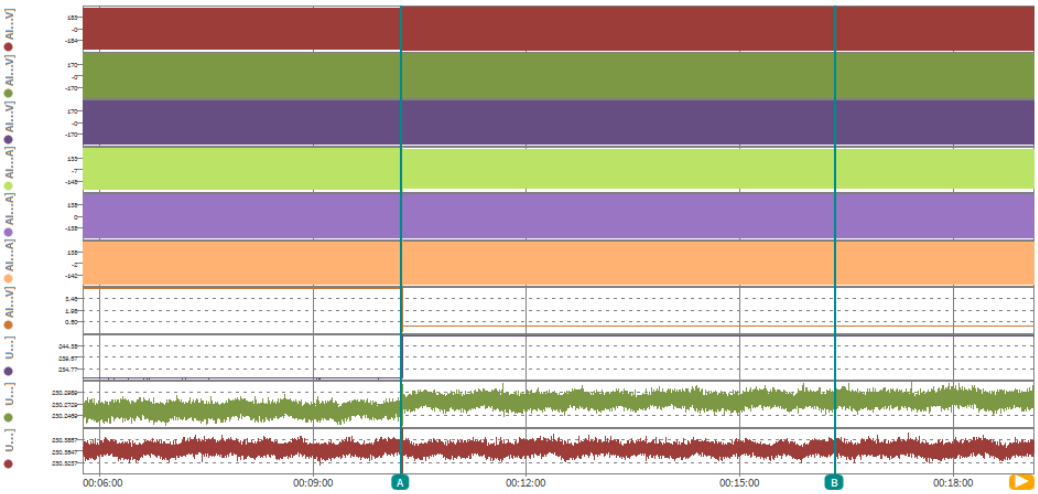
L1-N

Voltage: a) 112%Un



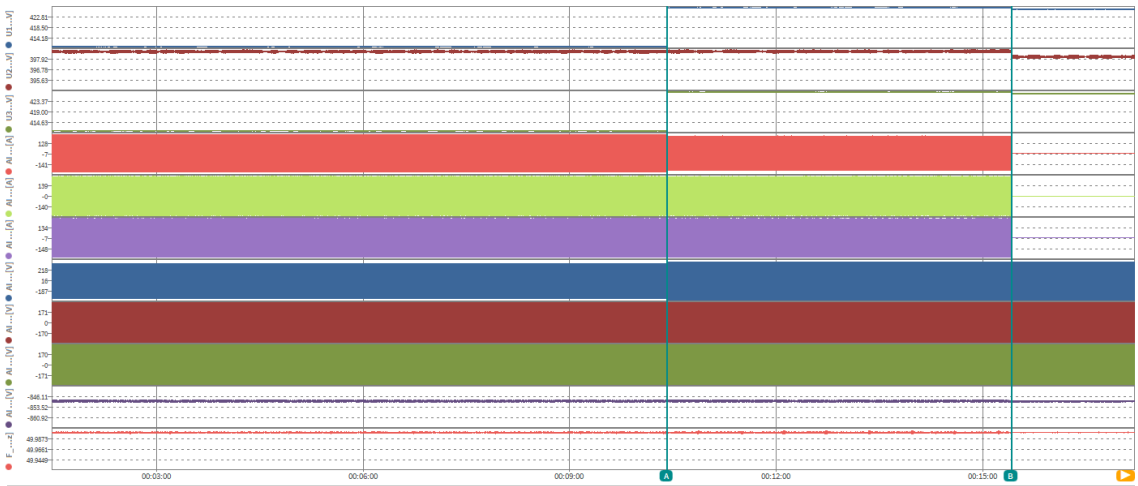
	A	B	间隔
时间 [s]	00:10:11.2851	00:18:31.6797	8:20.3946
AI 1/I1@TRIONet3_1342 [A]	-222.2639	-2.828002	219.4359
AI 1/I2@TRIONet3_1342 [A]	-4.386783	223.9429	228.3297
AI 1/I3@TRIONet3_1342 [A]	222.2331	-226.2836	-448.5166
AI 1/U1@TRIONet3_1342 [V]	-282.5458	12.81643	295.3623
AI 1/U2@TRIONet3_1342 [V]	7.025004	278.1625	271.1375
AI 1/U3@TRIONet3_1342 [V]	281.0633	-284.6584	-565.7218
AI 1/U4@TRIONet3_1342 [V]	4.783869	-0.125885	-4.909754
U1_tRMS@AC [V]	230.4949	258.4771	27.98219
U2_tRMS@AC [V]	230.2631	230.2974	0.034317
U3_tRMS@AC [V]	230.3682	230.3684	1.984e-4

Voltage: b) 108%Un



	A	B	间隔
时间 [s]	00:10:14.665	00:16:20.024	6:05.360
AI 1/U1@TRIONet3_1342 [V]	-125.2401	-238.9896	-113.7495
AI 1/U2@TRIONet3_1342 [V]	-212.0454	-101.7449	110.3005
AI 1/U3@TRIONet3_1342 [V]	317.7586	316.0882	-1.670361
AI 1/I1@TRIONet3_1342 [A]	-78.39382	-157.3459	-78.95208
AI 1/I2@TRIONet3_1342 [A]	-170.8642	-77.66533	93.19890
AI 1/I3@TRIONet3_1342 [A]	253.6040	249.9640	-3.639937
AI 1/U4@TRIONet3_1342 [V]	-0.125170	-0.123024	2.146e-3
U1_tRMS@AC [V]	248.5821	248.4834	-0.098724
U2_tRMS@AC [V]	230.2260	230.2736	0.047623
U3_tRMS@AC [V]	230.4009	230.3784	-0.022583

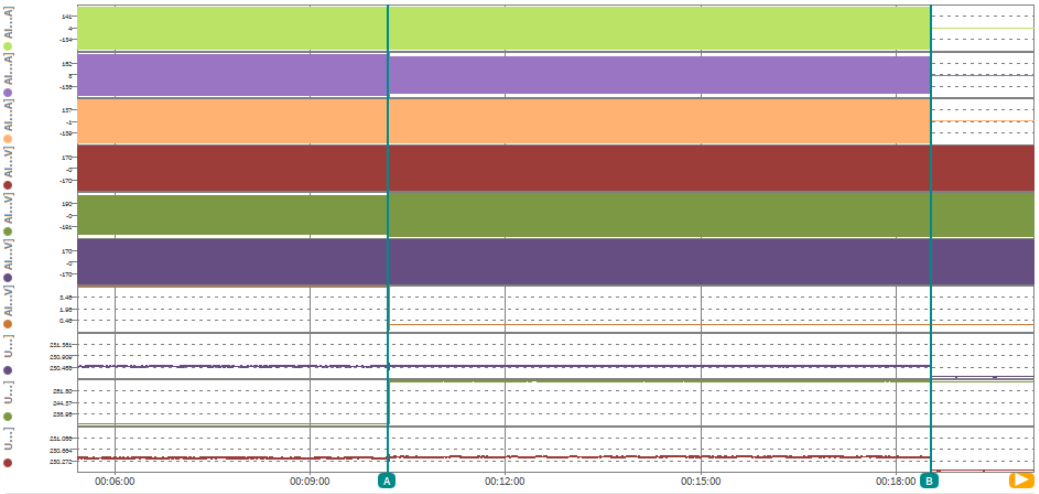
Voltage: c) 114%Un



	A	B	间隔
时间 [s]	00:10:24.671	00:15:24.691	5:00.020
U12_tRMS_rc@AC [V]	420.1506	426.5693	6.418732
U23_tRMS_rc@AC [V]	398.8503	398.8949	0.044556
U31_tRMS_rc@AC [V]	420.9724	427.2223	6.249969
AI 1/I1@TRIONet3_1455 [A]	184.5144	152.9199	-31.59452
AI 1/I2@TRIONet3_1455 [A]	-251.8399	-256.2242	-4.384280
AI 1/I3@TRIONet3_1455 [A]	51.54240	81.94364	30.40123
AI 1/U1@TRIONet3_1455 [V]	279.6951	250.5477	-29.14739
AI 1/U2@TRIONet3_1455 [V]	-307.0357	-316.8445	-9.808779
AI 1/U3@TRIONet3_1455 [V]	64.66604	101.3818	36.71575
AI 1/U4@TRIONet3_1455 [V]	-848.9273	-849.3002	-0.372887
F_fund@AC [Hz]	50.00647	50.00645	-1.907e-5

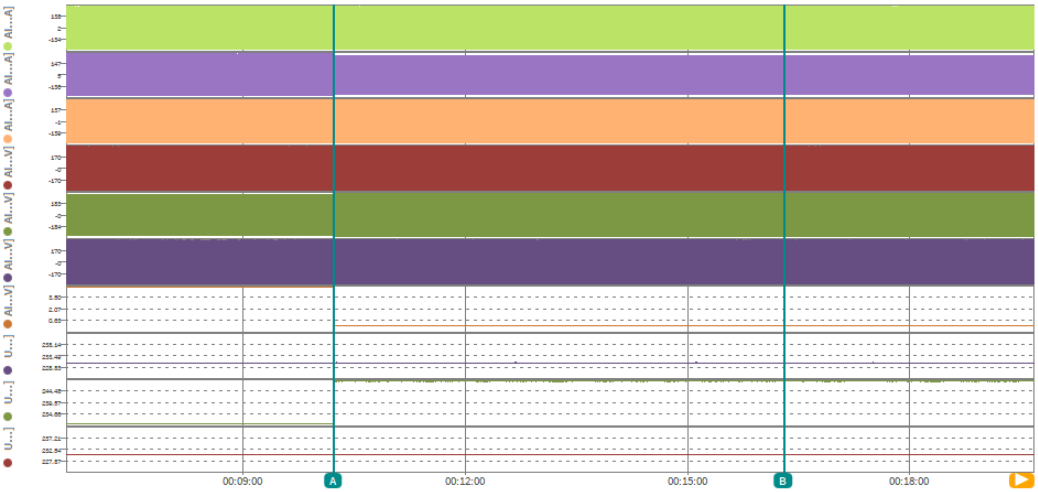
L2-N

Voltage: a) 112%Un



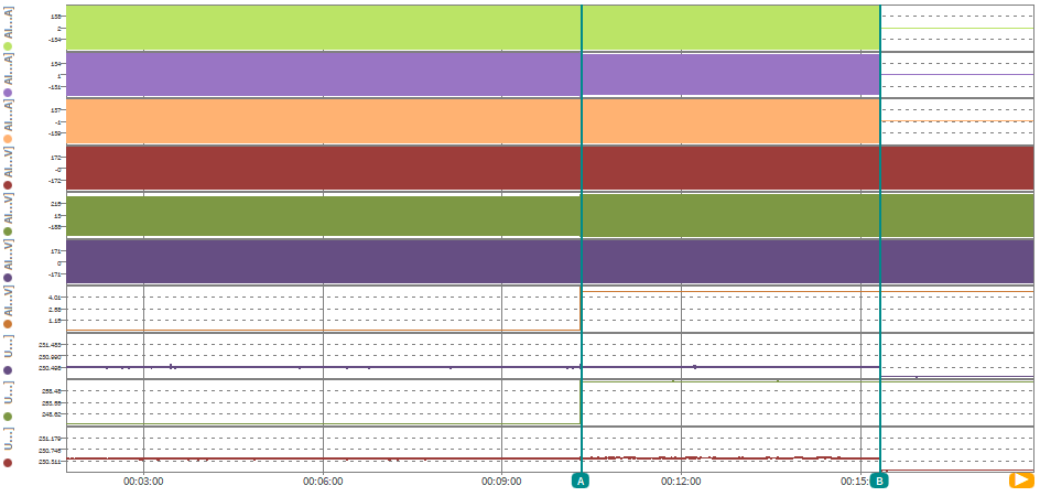
	A	B	间隔
时间 [s]	00:10:11.5768	00:18:31.4930	8:19.9162
AI 1/I1@TRIONet3_1342 [A]	250.7442	32.72271	-218.0215
AI 1/I2@TRIONet3_1342 [A]	-90.48272	-215.0825	-124.5998
AI 1/I3@TRIONet3_1342 [A]	-164.2720	205.8433	370.1153
AI 1/U1@TRIONet3_1342 [V]	318.9223	42.43446	-276.4878
AI 1/U2@TRIONet3_1342 [V]	-120.5411	-335.7384	-215.1973
AI 1/U3@TRIONet3_1342 [V]	-208.6799	258.2133	466.8932
AI 1/U4@TRIONet3_1342 [V]	4.786492	-0.123978	-4.910469
U1_tRMS@AC [V]	230.4620	230.4908	0.028809
U2_tRMS@AC [V]	230.2556	258.1550	27.89938
U3_tRMS@AC [V]	230.3526	230.3934	0.040817

Voltage: b) 108%Un



	A	B	间隔
时间 [s]	00:10:13.88860	00:16:17.98210	6:04.09350
AI 1/I1@TRIONet3_1342 [A]	-225.4566	237.4545	462.9112
AI 1/I2@TRIONet3_1342 [A]	202.5722	-42.42671	-244.9989
AI 1/I3@TRIONet3_1342 [A]	8.452297	-199.9512	-208.4035
AI 1/U1@TRIONet3_1342 [V]	-288.1086	304.5173	592.6259
AI 1/U2@TRIONet3_1342 [V]	296.6464	-66.99801	-363.6444
AI 1/U3@TRIONet3_1342 [V]	8.324147	-251.2231	-259.5472
AI 1/U4@TRIONet3_1342 [V]	-0.121593	-0.128031	-6.437e-3
U1_tRMS@AC [V]	230.4781	230.4926	0.014557
U2_tRMS@AC [V]	248.6856	248.7117	0.026154
U3_tRMS@AC [V]	230.3842	230.4018	0.017563

Voltage: c) 114%Un



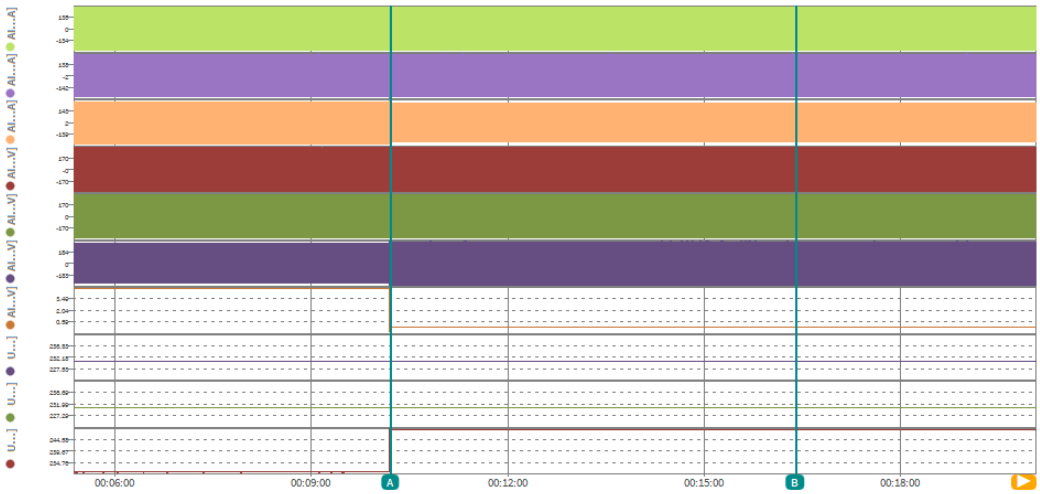
	A	B	间隔
时间 [s]	00:10:19.3612	00:15:18.7503	4:59.3891
AI 1/I1@TRIONet3_1342 [A]	-175.3211	61.81884	237.1400
AI 1/I2@TRIONet3_1342 [A]	234.5873	-218.8852	-453.4725
AI 1/I3@TRIONet3_1342 [A]	-68.93015	186.0941	255.0242
AI 1/U1@TRIONet3_1342 [V]	-229.8982	83.36974	313.2680
AI 1/U2@TRIONet3_1342 [V]	332.0749	-354.6925	-686.7674
AI 1/U3@TRIONet3_1342 [V]	-93.37473	234.6494	328.0242
AI 1/U4@TRIONet3_1342 [V]	-0.124931	4.783631	4.908562
U1_tRMS@AC [V]	230.4877	230.4958	8.133e-3
U2_tRMS@AC [V]	244.1810	262.6426	18.46159
U3_tRMS@AC [V]	230.3848	230.3943	9.460e-3

L3-N

Voltage: a) 112%Un

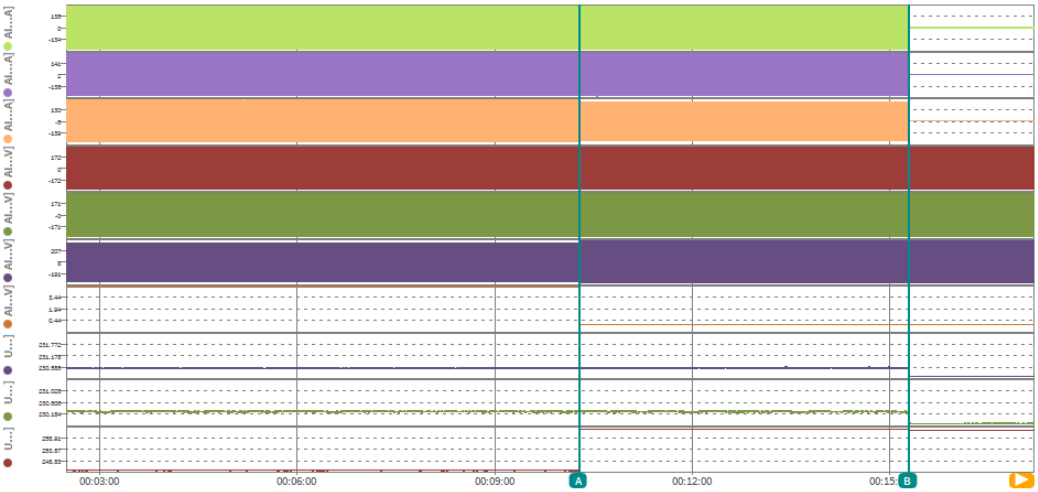
	A	B	间隔
时间 [s]	00:10:29.477	00:18:48.340	8:18.864
AI 1/I1@TRIONet3_1342 [A]	82.60036	0.156045	-82.44432
AI 1/I2@TRIONet3_1342 [A]	168.1914	0.108480	-168.0830
AI 1/I3@TRIONet3_1342 [A]	-227.7781	-0.186086	227.5920
AI 1/U1@TRIONet3_1342 [V]	111.7461	-134.6102	-246.3563
AI 1/U2@TRIONet3_1342 [V]	215.4186	322.3813	106.9627
AI 1/U3@TRIONet3_1342 [V]	-355.8507	-217.7665	138.0842
AI 1/U4@TRIONet3_1342 [V]	-0.127554	-0.127554	0.000000
U1_tRMS@AC [V]	230.5263	230.7247	0.198318
U2_tRMS@AC [V]	230.2654	230.3755	0.110062
U3_tRMS@AC [V]	258.2761	258.3062	0.030090

Voltage: b) 108%Un



	A	B	间隔
时间 [s]	00:10:13.3618	00:16:24.1028	6:10.7410
AI 1/I1@TRIONet3_1342 [A]	124.7993	115.0243	-9.774924
AI 1/I2@TRIONet3_1342 [A]	131.6310	141.3041	9.673119
AI 1/I3@TRIONet3_1342 [A]	-239.6609	-242.4238	-2.762914
AI 1/U1@TRIONet3_1342 [V]	165.0775	154.6629	-10.41460
AI 1/U2@TRIONet3_1342 [V]	168.2325	178.4437	10.21123
AI 1/U3@TRIONet3_1342 [V]	-349.0947	-348.7056	0.389099
AI 1/U4@TRIONet3_1342 [V]	-0.125885	-0.127077	-1.192e-3
U1_tRMS@AC [V]	230.5065	230.4984	-8.102e-3
U2_tRMS@AC [V]	230.2518	230.2624	0.010635
U3_tRMS@AC [V]	248.7984	248.8061	7.645e-3

Voltage: c) 114%Un



	A	B	间隔
时间 [s]	00:10:16.6881	00:15:17.0247	5:00.3366
AI 1/I1@TRIONet3_1342 [A]	-161.9405	0.054240	161.9947
AI 1/I2@TRIONet3_1342 [A]	255.8403	0.058413	-255.7819
AI 1/I3@TRIONet3_1342 [A]	-77.36326	-0.146031	77.21723
AI 1/U1@TRIONet3_1342 [V]	-211.2215	197.6364	408.8578
AI 1/U2@TRIONet3_1342 [V]	318.2414	130.9791	-187.2623
AI 1/U3@TRIONet3_1342 [V]	-134.4428	-367.0514	-232.6086
AI 1/U4@TRIONet3_1342 [V]	-0.127554	-0.123978	3.576e-3
U1_tRMS@AC [V]	230.5212	230.0633	-0.457825
U2_tRMS@AC [V]	230.2624	229.8157	-0.446777
U3_tRMS@AC [V]	262.7411	262.4197	-0.321411

5.8.3.4 ROCOF protect 5.8.3.4.1 Accuracy of the ROCOF setting values and operate time: verification method				P
Setting values	Frequency change df/dt [Hz/s] .....:			2.0Hz/s
	Disconnecting time [s] .....:			＜1s
Test:				
P_{Emax} in %	100% ±5%			
Test condition	Start Frequency	Change	End Frequency	Connection
Test 1: (*)	49.0 Hz	1.9Hz/s	50.9 Hz	Always connected
Test 2: (*)	49.0 Hz	2.1Hz/s	51.1 Hz	Disconnected at 0.9s
Test 3: (*)	51.0 Hz	1.9Hz/s	49.1 Hz	Always connected
Test 4: (*)	51.0 Hz	2.1Hz/s	48.9 Hz	Disconnected at 0.9s
Limit	disconnected time ＜1s			

Note:

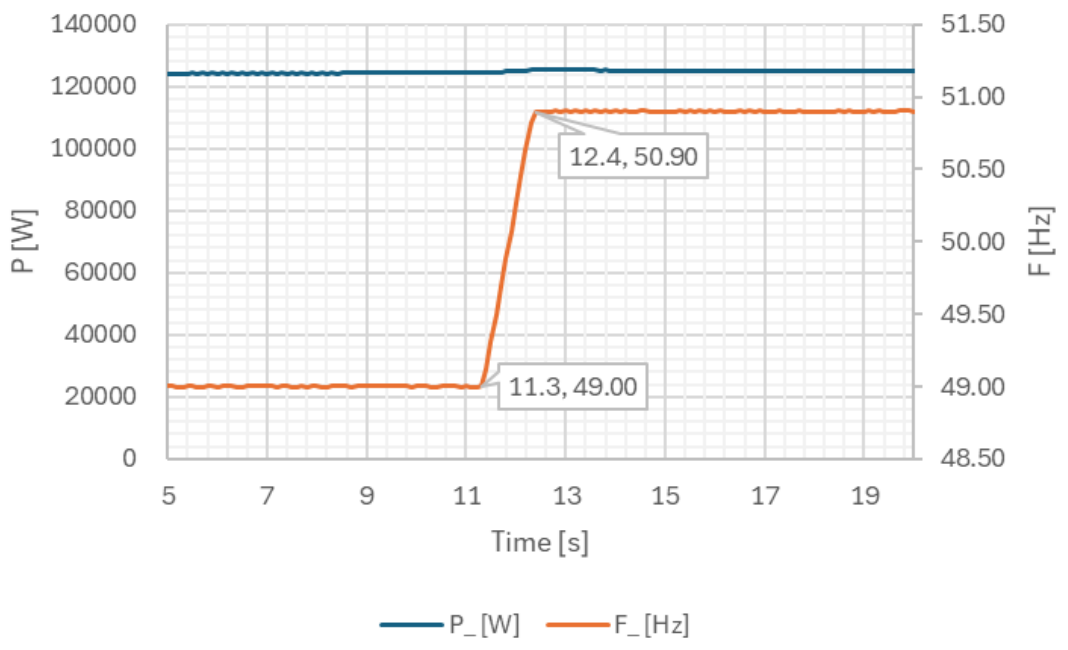
Table 30 — ROCOF protection test items, accuracy of the setting values and operate time measurements (1/2)

Test item	Protection function	ROCOF direction	Test signal start frequency (Hz)	ROCOF of the test (Hz/s)	Test signal end frequency (Hz)	Step remain times
RVAL POS 1	ROCOF	Increase	$fn - ROCOF \times 0,5\,s$	$ROCOF = G_S + 2 \times A_r$	$fn + ROCOF \times 0,5\,s$	$1\,s$
RVAL POS 2	ROCOF	Increase	$fn - ROCOF \times 0,5\,s$	$ROCOF = G_S - 2 \times A_r$	$fn - ROCOF \times 0,5\,s$	$1\,s$
RVAL NEG 1	ROCOF	Decrease	$fn + ROCOF \times 0,5\,s$	$ROCOF = G_S + 2 \times A_r$	$fn + ROCOF \times 0,5\,s$	$1\,s$
RVAl NEG 2	ROCOF	Decrease	$fn + ROCOF \times 0,5\,s$	$ROCOF = G_S - 2 \times A_r$	$fn - ROCOF \times 0,5\,s$	$1\,s$

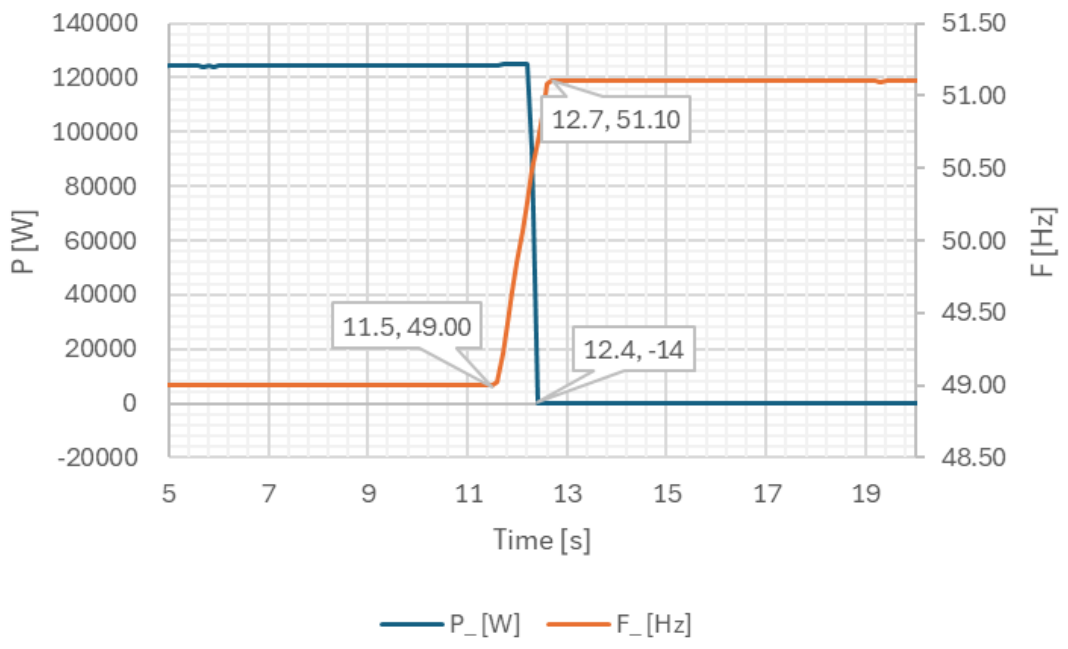
For each test the signal shall be applied and the ROCOF shall be increased or decreased, as appropriate, according to the criteria below (statements below apply for a positive ROCOF):

1. to start the test, a signal which is at frequency f = fn ± $ROCOF_{test}$X(Δt_2/2), where Δt_2 is defined inthe next step, is applied for Δt_1, equal to at least 1 s and longer than the time delay setting plus 200 ms;
2. then a ROCOF equal to the activation setting value minus twice its required accuracy, or if no requirementis made, twice the manufacturer stated accuracy, in direction of the setting value, is applied to the signaland shall be maintained constant for $\Delta t2=T_{op}-(T_{Res}+T_{ov})$ where T_{op} is the operate time, T_{Res} is the maximum required reset time and T_{ov} is the overshoot time, a tolerance margin equal to 10 ms
3. if the reset value is:
   within the band between the setting value and the setting values minus twice its required accuracy, then the signal is suddenly adjusted to the setting values minus twice its required accuracy (case shown in the Figure 42) for at least Δ_{t1}
4. below the setting value minus twice its accuracy, the signal is suddenly adjusted the reset value minus twice its accuracy for at least Δt_1.

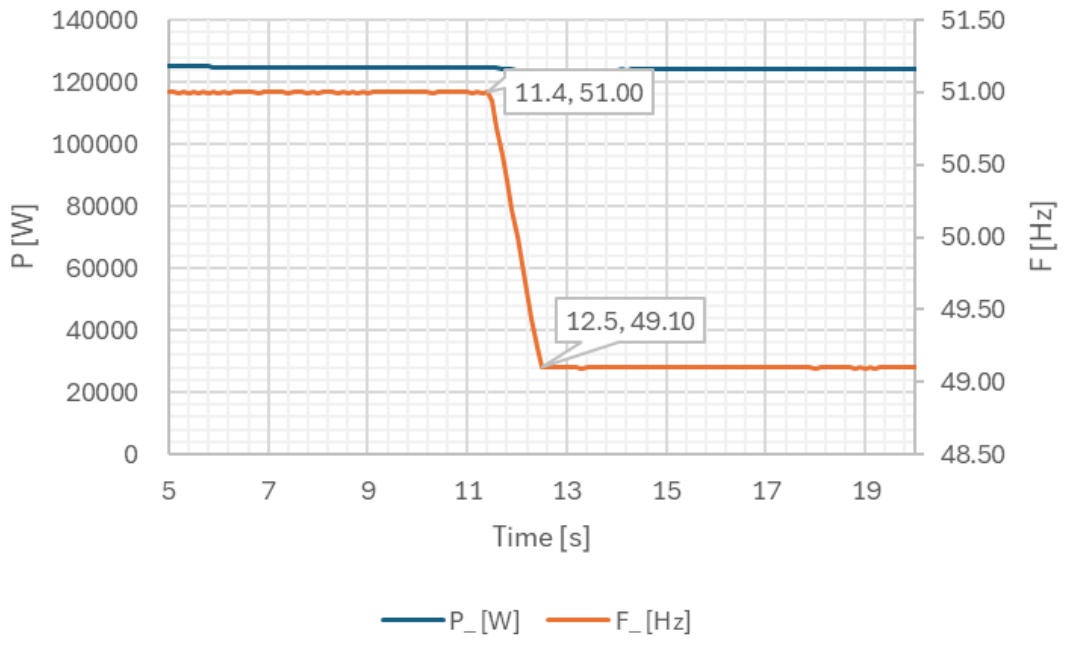
Test 1


140000
120000
100000
80000
60000
40000
20000
0
P [W]
51.50
51.00
50.50
50.00
49.50
49.00
48.50
F [Hz]
12.4, 50.90
11.3, 49.00
5
7
9
11
13
15
17
19
Time [s]
P_[W]
F_[Hz]

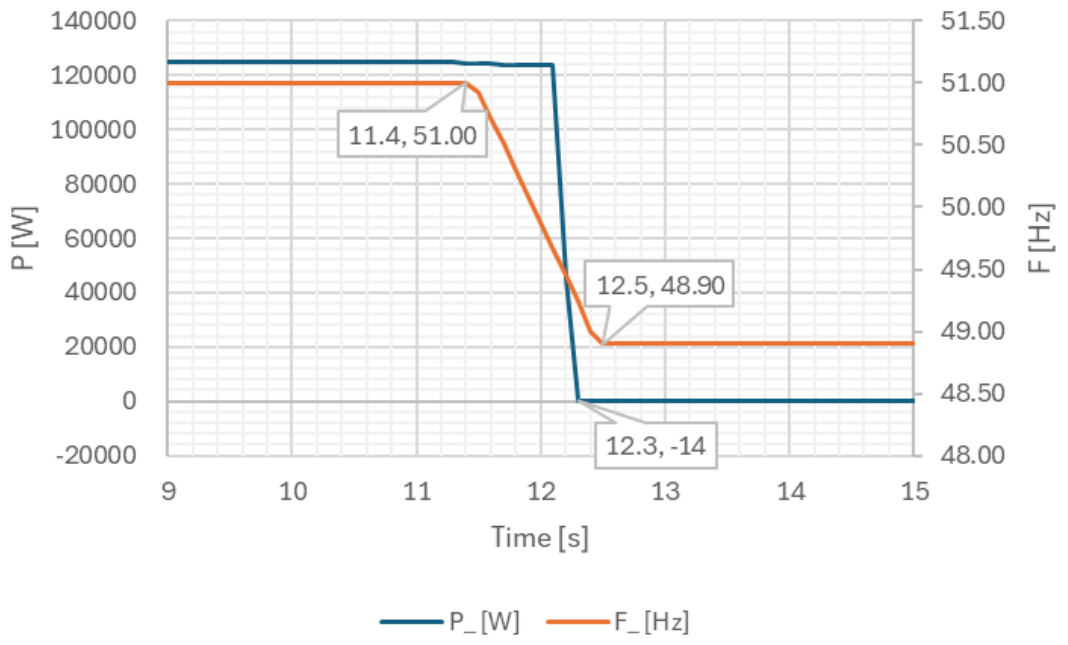
Test 2


140000
120000
100000
80000
60000
40000
20000
0
-20000
P [W]
51.50
51.00
50.50
50.00
49.50
49.00
48.50
F [Hz]
12.7, 51.10
11.5, 49.00
12.4, -14
5
7
9
11
13
15
17
19
Time [s]
P_[W]
F_[Hz]

Test 3


140000
120000
100000
80000
60000
40000
20000
0
P [W]
51.50
51.00
50.50
50.00
49.50
49.00
48.50
F [Hz]
11.4, 51.00
12.5, 49.10
5
7
9
11
13
15
17
19
Time [s]
P_ [W]
F_ [Hz]

Test 4


140000
120000
100000
80000
60000
40000
20000
0
-20000
P [W]
51.50
51.00
50.50
50.00
49.50
49.00
48.50
48.00
F [Hz]
11.4, 51.00
12.5, 48.90
12.3, -14
9
10
11
12
13
14
15
Time [s]
P_ [W]
F_ [Hz]

5.8.3.4 ROCOF protect 5.8.3.4.2 Reset time and reset ratio						P
Test conditions	Output power: >=50%Pn, Frequency: 50+/-0.2Hz					
	NOP POS		**NOP NEG**			
Parameter	ROCOF /Time		ROCOF /Time			
Setting value	2.0 Hz/s / 500ms		2.0 Hz/s / 500ms			
0Hz/s (49.56Hz hold at least 1s)→2.1 Hz/s (440ms)→1.9Hz/s(1000ms)	Reset time	Result	0Hz/s (50.44Hz hold at least 1s)→-2.1 Hz/s (440ms)→ -1.9Hz/s(1000ms)	Reset time	Result	
	≤50ms	No trip		≤50ms	No trip	
	≤50ms	No trip		≤50ms	No trip	
	≤50ms	No trip		≤50ms	No trip	

Assessment criterion:

Table 31 — ROCOF protection test items, reset time and reset ratio requirements (2/2) (under consideration)

Test-item		NOP POS	NOP NEG
Protection function		ROCOF	ROCOF
ROCOF direction		Increase ($G_S > 0$)	Decrease ($G_S < 0$)
Step 0	Test signal frequency (Hz)	$f_n - ROCOF_1\left(\frac{T_{Op} - T_{Res} - 10\,ms}{2}\right)$	$f_n + ROCOF_1\left(\frac{T_{Op} - T_{Res} - 10\,ms}{2}\right)$
	Remain time	$1\,s$	$1\,s$
Step 1	ROCOF (Hz/s)	$ROCOF_1 = G_S + 2 \times A_r$	$ROCOF_1 = G_S - 2 \times A_r$
	Remain time	$T_{Op} - T_{Res} - 10\,ms$	$T_{Op} - T_{Res} - 10\,ms$
	Test signal end frequency (Hz)	$f_{1-2} = f_n + Roc_1\left(\frac{T_{Op} - T_{Res} - 10\,ms}{2}\right)$	$f_{1-2} = f_n - ROCOF_1\left(\frac{T_{Op} - T_{Res} - 10\,ms}{2}\right)$
Step 2	ROCOF (Hz/s)	$ROCOF_2 = min\left(G_S - 2 \times Ac\ ,Res - 2 \times A_r\ \right)$	$ROCOF_2 = max\left(G_S + 2 \times A_r\ ,Res + 2 \times A_r\right)$
	Remain time	$1\,s$	$1\,s$
	Test signal end frequency (Hz)	$f_{1-2} + ROCOF_2 \times 1\,s$	$f_{1-2} - ROCOF_2 \times 1\,s$

.

5.8.6 Islanding detection

Test circuit and parameters

Parameter	Symbol	Units
EUT DC Input		
DC voltage	V_{DC}	V
DC Current	I_{DC}	A
DC Power	P_{DC}	W
EUT AC ouput		
AC voltage	V_{EUT}	V
AC current	I_{EUT}	A
Real power	P_{EUT}	W
Reactive power	Q_{EUT}	Var
Test Load		
Resistive load current	I_R	A
Inductive load current	I_L	A
Capacitive load current	I_C	A
AC (utility) power source		
Utility real power	P_{AC}	W
Utility reactive power	Q_{AC}	Var
Utility current	I_{AC}	A

Block diagram test circuit IEC 62116:2014

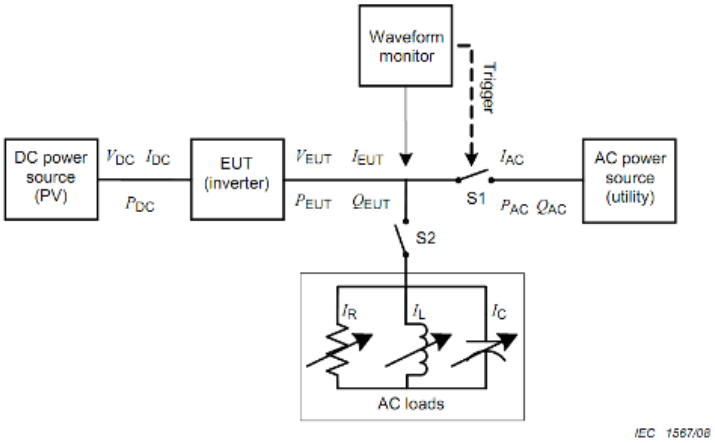


Figure 1 – Test circuit for islanding detection function in a power conditioner (inverter)

Load imbalance (real, reactive load) for test condition A (EUT output = 100%)									P
Test conditions			Frequency: 50+/-0.1Hz U_N=230±2.3Vac Distortion factor of chokes < 2% Quality = 1						
Disconnection limit			2s (IEC 62116)						
No.	P_{EUT} 1) [% of EUT rating]	Reactive load [% of Q_L in 6.1.d] 1]	P_{AC} 2) 5) (% of nominal)	Q_{AC} 3) 5) (% of nominal)	Run on Time [ms]	P_{EUT} Pre-phase [kW]	Q_f	V_{DC} [V]	Remarks 4)
1.	100	100	0	0	1850	125	1.000	740	Test A at BL
2.	100	100	0	-5	1192	125	0.975	740	Test A at IB
3.	100	100	0	+5	1166	125	1.025	740	Test A at IB
4.	100	100	-5	-5	1112	125	1.026	740	Test A at IB
5.	100	100	-5	0	1110	125	1.053	740	Test A at IB
6.	100	100	-5	+5	1174	125	1.079	740	Test A at IB
7.	100	100	+5	-5	1208	125	0.928	740	Test A at IB
8.	100	100	+5	0	964	125	0.952	740	Test A at IB
9.	100	100	+5	+5	1230	125	0.976	740	Test A at IB
10.	100	100	0	-10	950	125	0.949	740	Test A at IB
11.	100	100	0	+10	1160	125	1.049	740	Test A at IB
12.	100	100	-5	-10	1136	125	0.999	740	Test A at IB
13.	100	100	-5	+10	1170	125	1.104	740	Test A at IB
14.	100	100	+5	-10	1186	125	0.904	740	Test A at IB
15.	100	100	+5	+10	1180	125	0.999	740	Test A at IB
16.	100	100	-10	-10	830	125	1.054	740	Test A at IB
17.	100	100	-10	-5	1376	125	1.083	740	Test A at IB
18.	100	100	-10	0	1750	125	1.111	740	Test A at IB
19.	100	100	-10	+5	834	125	1.139	740	Test A at IB
20.	100	100	-10	+10	700	125	1.165	740	Test A at IB
21.	100	100	+10	-10	1172	125	0.862	740	Test A at IB
22.	100	100	+10	-5	988	125	0.886	740	Test A at IB

23.	100	100	+10	0	938	125	0.909	740	Test A at IB
24.	100	100	+10	+5	1380	125	0.932	740	Test A at IB
25.	100	100	+10	+10	1100	125	0.953	740	Test A at IB

Parameter at 0% per phase	L= 4.04 mH	R= 1.27 Ω	C= 2507.13 μF

Note:

RLC is adjusted to min. +/-1% of the inverter rated output power

1) P_{EUT}: EUT output power

2) P_{AC}: Real power flow at S1 in Figure 1. Positive means power from EUT to utility. Nominal is the 0 % test condition value.

3) Q_{AC}: Reactive power flow at S1 in Figure 1. Positive means power from EUT to utility. Nominal is the 0 % test condition value.

4) Fundamental of I_{AC} when RLC is adjusted

5) BL: Balance condition, IB: Imbalance condition.

Condition A:

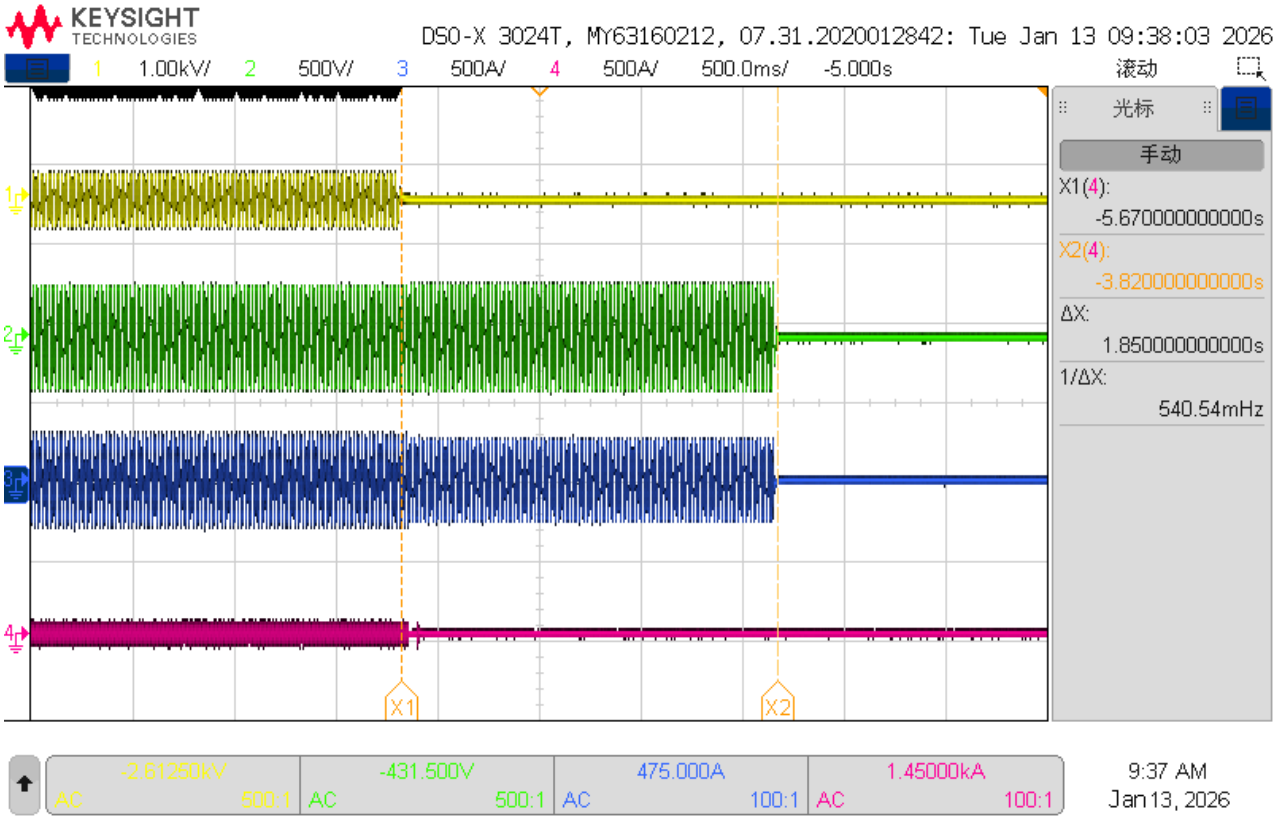
EUT output power P_{EUT} = Maximum 6)

EUT input voltage 6) = >75% of rated input voltage range

6) Maximum EUT output power condition should be achieved using the maximum allowable input power. Actual output power may exceed nominal rated output.

7) Based on EUT rated input operating range. For example, If range is between X volts and Y volts, 75 % of range =X + 0.75 × (Y – X). Y shall not exceed 0.8 × EUT maximum system voltage (i.e., maximum allowable array open circuit voltage). In any case, the EUT should not be operated outside of its allowable input voltage range.

Scope pictures of the disconnection time
Disconnection at No. 1



Note:

Yellow: Feedback current flows into the grid signal

Green: EUT output voltage

Blue: EUT output current

Pink: Grid input current

Load imbalance (reactive load) for test condition B (EUT output = 50 % – 66 %)									P
Test conditions			Frequency: 50+/-0.1Hz U_N=230±2.3Vac Distortion factor of chokes < 2% Quality = 1						
Disconnection limit			2s (IEC 62116)						
No.	P_{EUT} 1) [% of EUT rating]	Reactive load [% of Q_L in 6.1.d] 1]	P_{AC} 2) 5) (% of nominal)	Q_{AC} 3) 5) (% of nominal)	Run on Time [ms]	P_{EUT} Pre-phase [kW]	Q_f	V_{DC} [V]	Remarks 4)
1.	66	66	0	-5	1038	82.5	0.975	720	Test B at IB
2.	66	66	0	-4	1240	82.5	0.980	720	Test B at IB
3.	66	66	0	-3	1052	82.5	0.985	720	Test B at IB
4.	66	66	0	-2	1470	82.5	0.990	720	Test B at IB
5.	66	66	0	-1	1462	82.5	0.995	720	Test B at IB
6.	66	66	0	0	1790	82.5	1.000	720	Test B at BL
7.	66	66	0	1	1528	82.5	1.005	720	Test B at IB
8.	66	66	0	2	1418	82.5	1.010	720	Test B at IB
9.	66	66	0	3	1320	82.5	1.015	720	Test B at IB
10.	66	66	0	4	1200	82.5	1.020	720	Test B at IB
11.	66	66	0	5	982	82.5	1.025	720	Test B at IB
Parameter at 0% per phase			L= 6.12 mH		R= 1.92 Ω			C= 1654.73 μF	

Note:

RLC is adjusted to min. +/-1% of the inverter rated output power

1) P_{EUT}: EUT output power

2) P_{AC}: Real power flow at S1 in Figure 1. Positive means power from EUT to utility. Nominal is the 0 % test condition value.

3) Q_{AC}: Reactive power flow at S1 in Figure 1. Positive means power from EUT to utility. Nominal is the 0 % test condition value.

4) Fundamental of I_{AC} when RLC is adjusted

5) BL: Balance condition, IB: Imbalance condition.

Condition B:

EUT output power P_{EUT} = 50 % – 66 % 6) of maximum

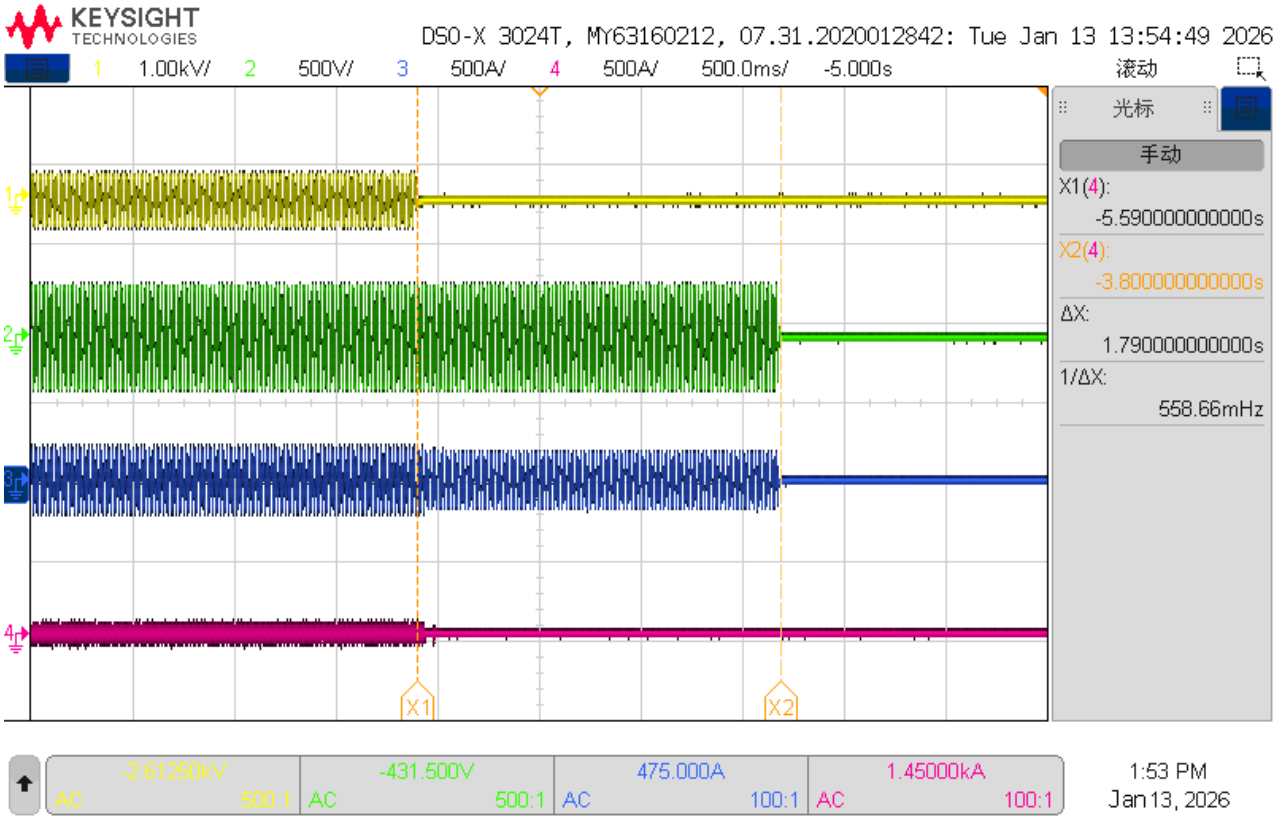
EUT input voltage [7] = 50 % of rated input voltage range

[6] Or minimum allowable EUT output level if greater than 66 %.

[7] Based on EUT rated input operating range. For example, If range is between X volts and Y volts, 20 % of range =X + 0.5 × (Y – X). Y shall not exceed 0.8 × EUT maximum system voltage (i.e., maximum allowable array open circuit voltage). In any case, the EUT should not be operated outside of its allowable input voltage range.

Scope pictures of the disconnection time

Disconnection at No. 6



Note:

Yellow: Feedback current flows into the grid signal

Green: EUT output voltage

Blue: EUT output current

Pink: Grid input current

Load imbalance (reactive load) for test condition C (EUT output = 25 % – 33 %)									P
Test conditions			Frequency: 50+/-0.1Hz U_N=230±2.3Vac Distortion factor of chokes < 2% Quality = 1						
Disconnection limit			2s (IEC 62116)						
No.	P_{EUT} 1) [% of EUT rating]	Reactive load [% of Q_L in 6.1.d] 1]	P_{AC} 2) 5) (% of nominal)	Q_{AC} 3) 5) (% of nominal)	Run on Time [ms]	P_{EUT} Pre-phase [kW]	Q_f	V_{DC} [V]	Remarks 4)
1.	33	33	0	-5	940	41.25	0.975	696	Test C at IB
2.	33	33	0	-4	1540	41.25	0.980	696	Test C at IB
3.	33	33	0	-3	1250	41.25	0.985	696	Test C at IB
4.	33	33	0	-2	1150	41.25	0.990	696	Test C at IB
5.	33	33	0	-1	1480	41.25	0.995	696	Test C at IB
6.	33	33	0	0	1580	41.25	1.000	696	Test C at BL
7.	33	33	0	1	1320	41.25	1.005	696	Test C at IB
8.	33	33	0	2	1128	41.25	1.010	696	Test C at IB
9.	33	33	0	3	1228	41.25	1.015	696	Test C at IB
10.	33	33	0	4	1360	41.25	1.020	696	Test C at IB
11.	33	33	0	5	916	41.25	1.025	696	Test C at IB
Parameter at 0% per phase			L= 6.12 mH		R= 1.92 Ω			C= 1654.73 μF	

Note:

RLC is adjusted to min. +/-1% of the inverter rated output power

1) P_{EUT}: EUT output power

2) P_{AC}: Real power flow at S1 in Figure 1. Positive means power from EUT to utility. Nominal is the 0 % test condition value.

3) Q_{AC}: Reactive power flow at S1 in Figure 1. Positive means power from EUT to utility. Nominal is the 0 % test condition value.

4) Fundamental of I_{AC} when RLC is adjusted

5) BL: Balance condition, IB: Imbalance condition.

Condition C:

EUT output power P_{EUT} = 25 % – 33 % 6) of maximum

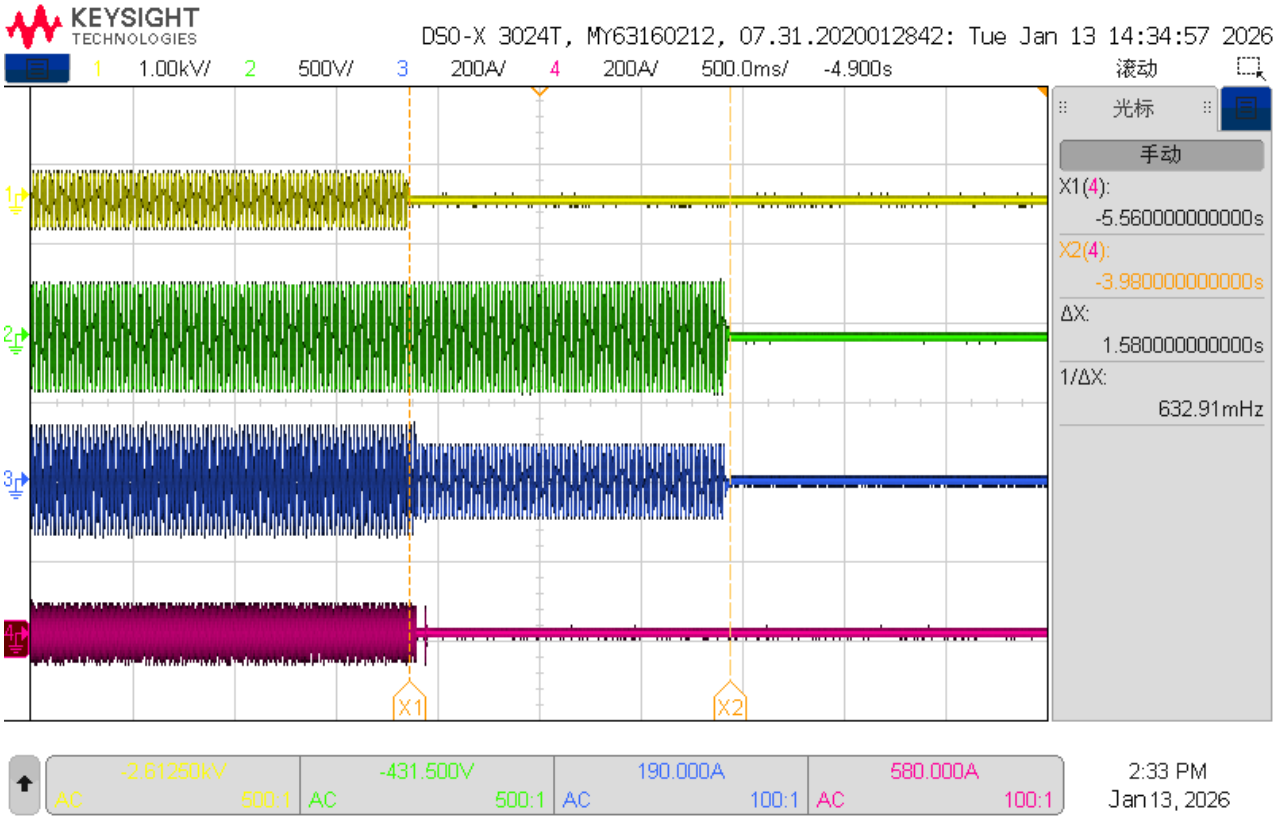
EUT input voltage [7] = <20 % of rated input voltage range

[6] Or minimum allowable EUT output level if greater than 33 %.

[7] Based on EUT rated input operating range. For example, If range is between X volts and Y volts, 20 % of range =X + 0.2 × (Y – X). Y shall not exceed 0.8 × EUT maximum system voltage (i.e., maximum allowable array open circuit voltage). In any case, the EUT should not be operated outside of its allowable input voltage range.

Scope pictures of the disconnection time

Disconnection at No. 6



Note:

Yellow: Feedback current flows into the grid signal

Green: EUT output voltage

Blue: EUT output current

Pink: Grid input current

EN 50549-10:2022		
Clause	**Test items**	**Remark**
5.9	**Connection and starting**	
5.9.3	Automatic reconnection after tripping	P
5.9.4	Starting to generate electrical power	P
5.9.7	Synchronisation	P

5.9 Connection and starting **5.9.3 Automatic reconnection after tripping** **5.9.4 Starting to generate electrical power**		**P**
Setting value	Min. voltage for connected to grid:	195.5V
	Max. voltage for connected to grid:	253.0V
	Min. Frequency for connected to grid:	49.50Hz
	Max. Frequency for connected to grid:	50.10Hz
	Observation time (≥60s):	60s

Test:

	Voltage conditons	
a) Start up for voltage range	<85% Un for twice of observation time	>110% Un for twice of observation time
Connection:	No connection	No connection
Limit	No connection allowed	
b) In voltage range at start-up	≥85% Un within twice setting observation time	≤110% Un within twice setting observation time
Reconnection time [s]	112.4	107.8
Limit:	Connected after setting observation time (≥60s)	
Gradient:	The maximum occurring active power gradient after connection respectively start generating electrical power is less than the configured maximum active power per minute Max gradient: disable. For recorded gradient see diagram below.	
c) In voltage range after voltage failure	≥85% Un within twice setting observation time	≤110% Un within twice setting observation time
Reconnection time [s]	114.0	114.6
Limit:	Reconnection after setting observation time (≥60s)	
Gradient:	For adjustable micro generators the maximum occurring active power gradient after connection respectively start generating electrical power is less than the configured maximum active power per minute Max gradient: 10%P_{Emax}/min. For non or partly adjustable generators the connection after trip of the interface protection is delayed by a randomised value between 1 min and 10 min. For recorded gradient see diagram below.	
	Frequency conditions	
d) Start up for frequency range	<49.50 Hz for twice of setting observation time	>50.10 Hz for twice of setting observation time
Connection:	No connection	No connection
Limit	No connection allowed	
e) In frequency range at start-up	≥49.50 Hz within twice setting observation time	≤50.10 Hz within twice setting observation time
Reconnection time [s]	105.2	107.2
Limit:	Connected after setting delay time(≥60s)	

Gradient:	The maximum occurring active power gradient after connection respectively start generating electrical power is less than the configured maximum active power per minute Max gradient: disable. For recorded gradient see diagram below.	
f) In frequency range after frequency failure	≥49.50 Hz within twice setting observation time	≤50.10 Hz within twice setting observation time
Reconnection time [s]	108.8	105.8
Limit:	Reconnection after setting observation time (≥60s)	
Gradient:	For adjustable micro generators the maximum occurring active power gradient after connection respectively start generating electrical power is less than the configured maximum active power per minute Max gradient: 10%Pn/min. For non or partly adjustable generators the connection after trip of the interface protection is delayed by a randomised value between 1 min and 10 min. For recorded gradient see diagram below.	

Test:

Test condition a), b), d) and e): Refer table 4

Test condition c) and f): Refer table 3

In order to avoid continuous starting and disengaging operations of the interface protection relay, the disengaging value of frequency and voltage functions shall be above 2 % deviating from the operate value.

Table 3 – Automatic reconnection after tripping

Parameter	Range	Default setting
Low frequency	47.0-50.0Hz	49.5Hz
High frequency	50.0-52.0Hz	50.2Hz
Low voltage	50%-100%U_n	85%U_n[a]/ 90%U_c[b]
High voltage	100%-120%U_n	110%U_n[a]/ 110%U_c[b]
Observation	10s-600s	60s
Active power	6%-3000%/minute	10%/minute

a: in case of EN 50549-1:2019

b: in case of EN 50549-2:2019

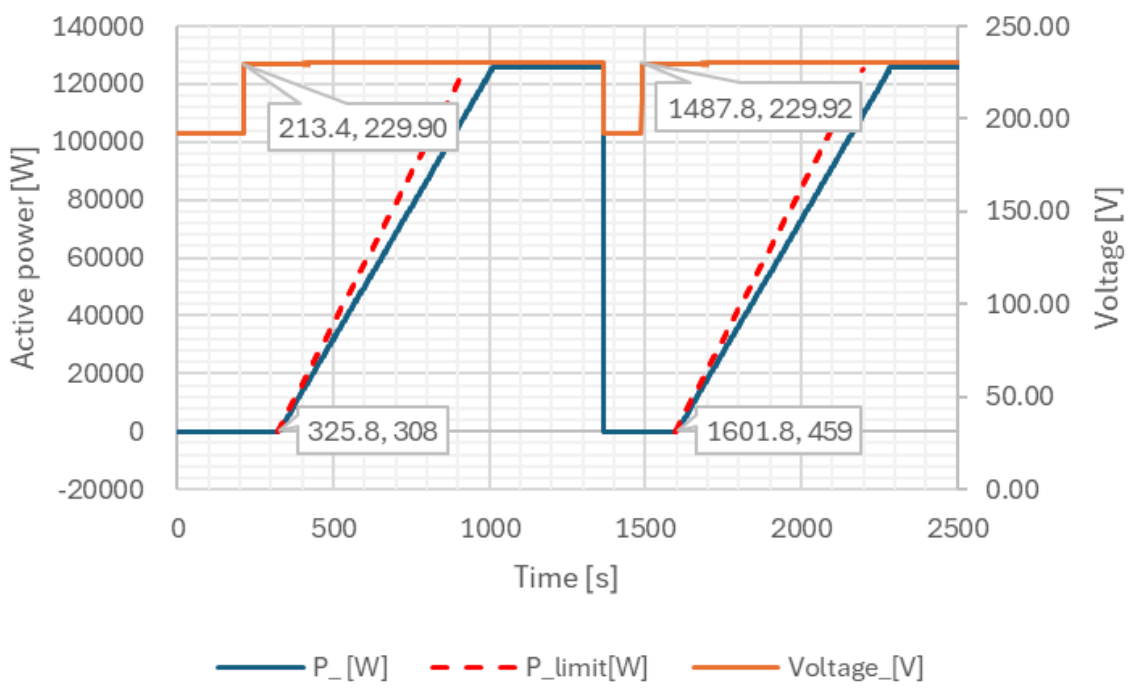
Table 4 – Starting to generate electric power

Parameter	Range	Default setting
Low frequency	47.0-50.0Hz	49.5Hz
High frequency	50.0-52.0Hz	50.1Hz
Low voltage	50%-100%U_n	85%U_n[a]/ 90%U_c[b]
High voltage	100%-120%U_n	110%U_n[a]/ 110%U_c[b]
Observation	10s-600s	60s
Active power	6%-3000%/minute	Disable

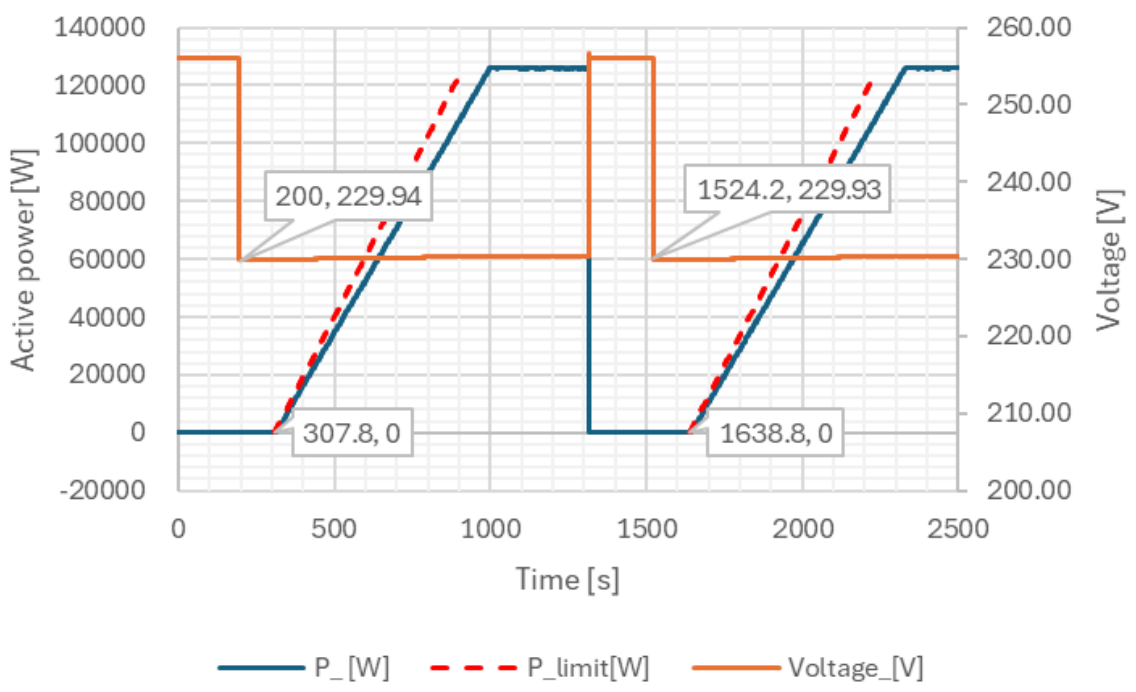
a: in case of EN 50549-1:2019

b: in case of EN 50549-2:2019

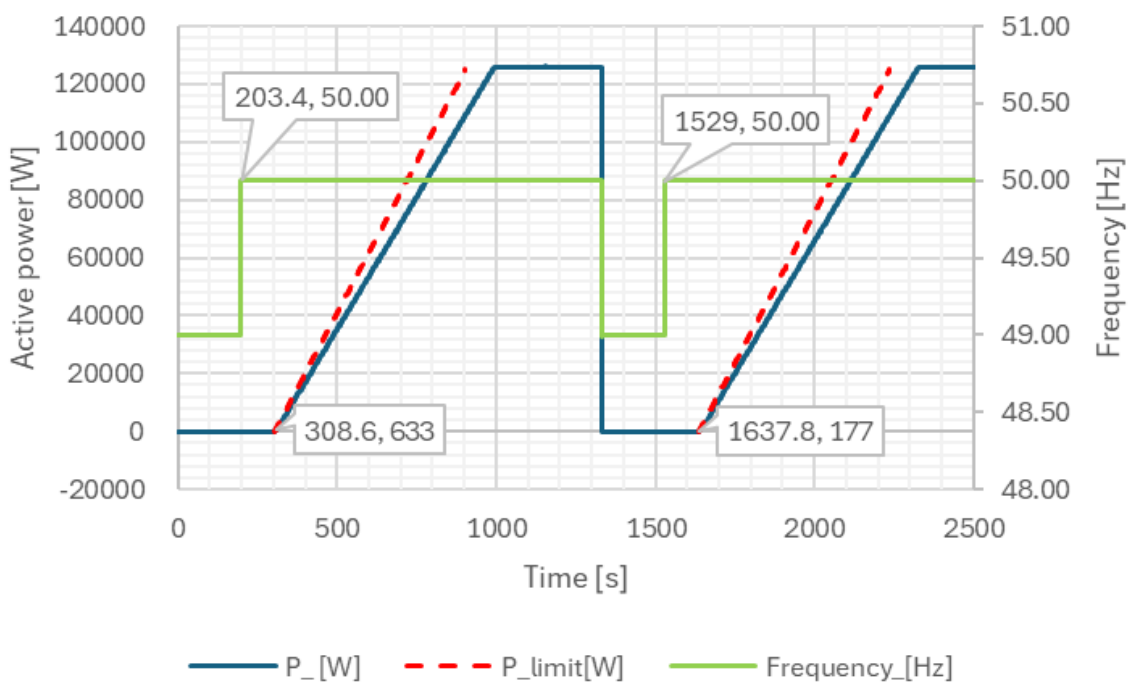
Graph of the gradual power supply: Test 1) for ≥ 85% U_n



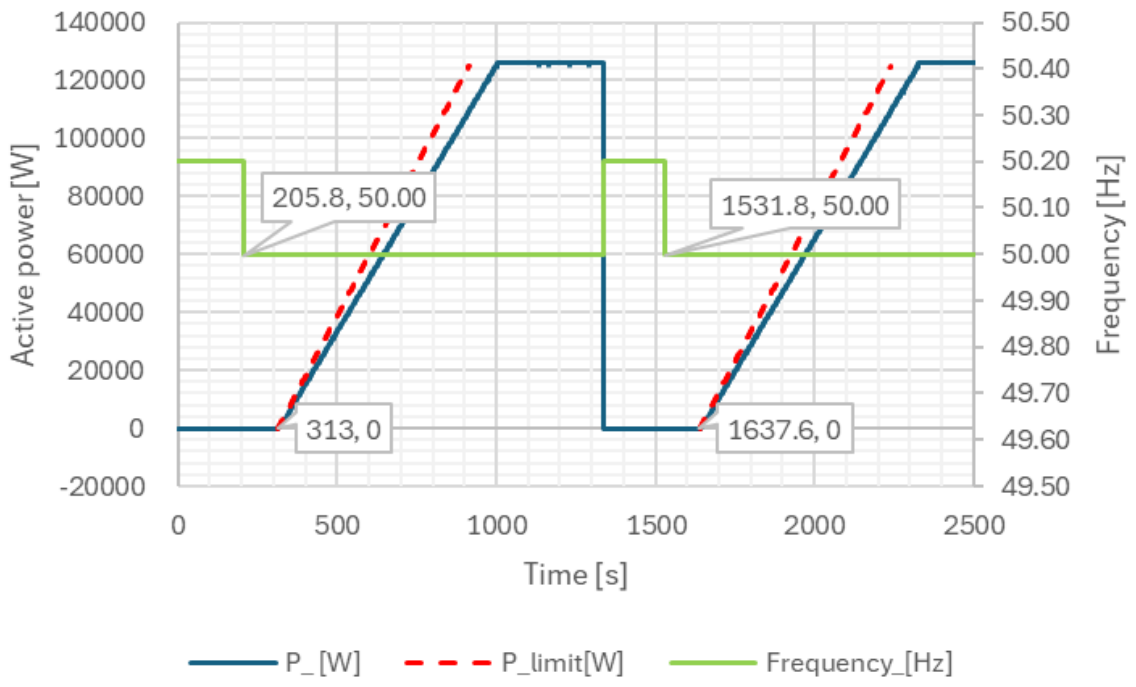
Graph of the gradual power supply: Test 2) for ≤ 110% U_n



Graph of the gradual power supply: Test 3) for ≥ 49.50Hz

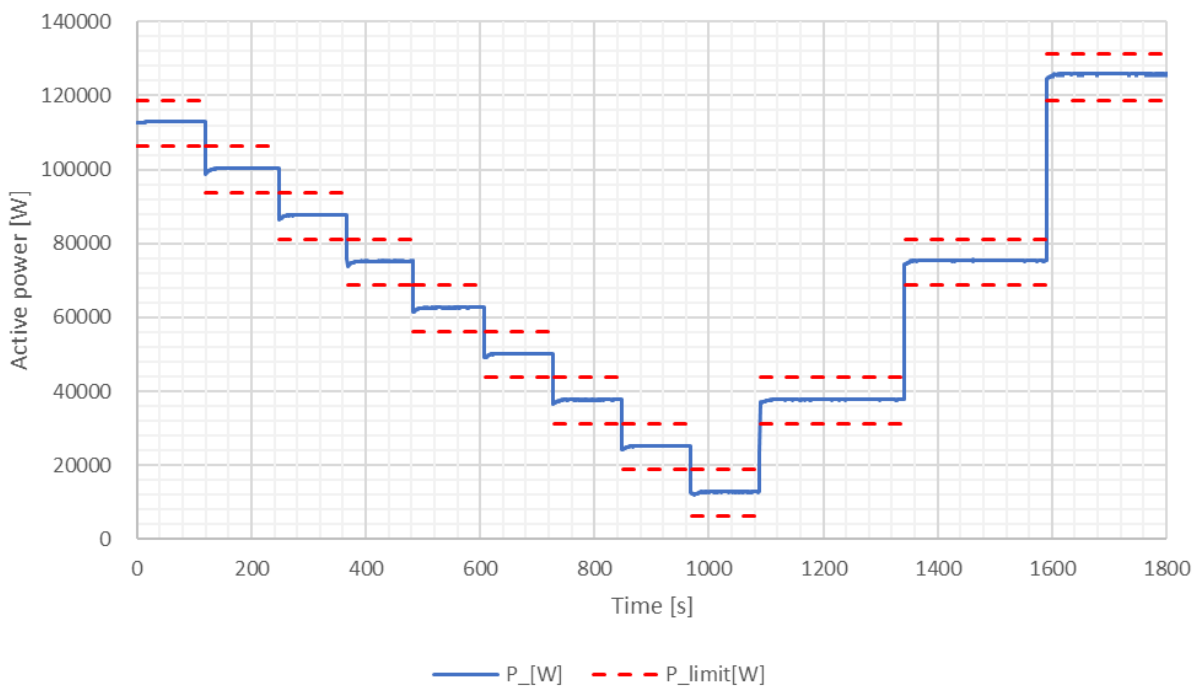


Graph of the gradual power supply: Test 4) for ≤ 50.10Hz



5.10 Active power reduction on set point 5.10.3.2 Verification of the accuracy						P
Test:						
Active power step [% of P_n]	Requested set point value		Actual value		Accuracy Actual value-set point	
	W	P/Pn[%]	W	P/Pn[%]	W	P/Pn[%]
90	112500	90.0	113003	90.40	503	0.40
80	100000	80.0	100322	80.26	322	0.26
70	87500	70.0	87677	70.14	177	0.14
60	75000	60.0	75156	60.12	156	0.12
50	62500	50.0	62602	50.08	102	0.08
40	50000	40.0	50111	40.09	111	0.09
30	37500	30.0	37681	30.14	181	0.14
20	25000	20.0	25190	20.15	190	0.15
10	12500	10.0	12752	10.20	252	0.20
Limit $\Delta P_{E60}/P_{Setpoint}$:	± 5 % of P_{Emax}					
30	37500	30.0	37751	30.20	251	0.20
60	75000	60.0	75330	60.26	330	0.26
100	125000	100.0	125833	100.67	833	0.67
Limit $\Delta P_{E60}/P_{Setpoint}$:	+ 5 % of P_{Emax}					

Graph of active power on set point



Assessment criterion:

a) for adjustable PGUs:

- no network disconnection
- the active power value does not exceed the setpoint by more than 5% P_{Emax}
- the setting time determined this way is ≤ 1min

b) For all other PGUs:

- the active power value does not exceed the setpoint by more than 5% P_{Emax} or
- the setpoint is fallen below within 5 minutes or the PGU has switched off

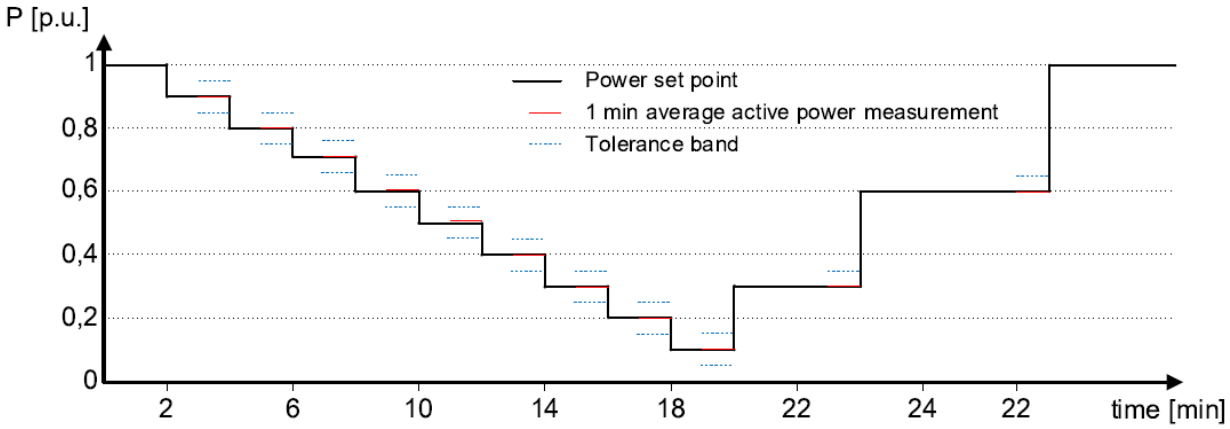


Figure 46 — Test results graph (example)

EN 50549-10:2022		
Clause	**Test items**	**Remark**
5.10	**Active power reduction on set point**	
5.10.3.2	Verification of the accuracy	P
5.10.3.3	Test procedure for dynamic behaviour	P
5.11	Remote information exchange	P

5.10 Active power reduction on set point 5.10.3.3 Verification procedure for dynamic behaviour			P
Test:1			
1-min mean value	100% of P_{Emax}	90% of P_{Emax}	10% of P_{Emax}
$P_{Setpoint}$[W]:	125000	112500	12500
P_{E60} [W]:	125165	113996	12844
$\Delta P_{E60}/P_{Setpoint}$ [%]:	100.13	91.20	10.28
Limit $\Delta P_{E60}/P_{Setpoint}$:	± 5%of P_{Emax}		
Condition	100% of P_{Emax} to 90% of P_{Emax}	90% of P_{Emax} to 10% of P_{Emax}	
Measurements $\Delta P/\Delta t$ [%P_{rE}/s]	0.502	0.482	
Limit $\Delta P/\Delta t$ [%P_{rE}/s]	0.33-0.66		
Test:2			
1-min mean value	100% of P_{Emax}	70% of P_{Emax}	50% of P_{Emax}
$P_{Setpoint}$[W]:	125000	87500	62500
P_{E60} [W]:	125192	88584	63235
$\Delta P_{E60}/P_{Setpoint}$ [%]:	100.15	70.87	50.59
Limit $\Delta P_{E60}/P_{Setpoint}$:	± 5%of P_{Emax}		
Condition	100% of P_{Emax} to 70% of P_{Emax}	90% of P_{Emax} to 50% of P_{Emax}	
Measurements $\Delta P/\Delta t$ [%P_{rE}/s]	0.483	0.484	
Limit $\Delta P/\Delta t$ [%P_{rE}/s]	0.33-0.66		

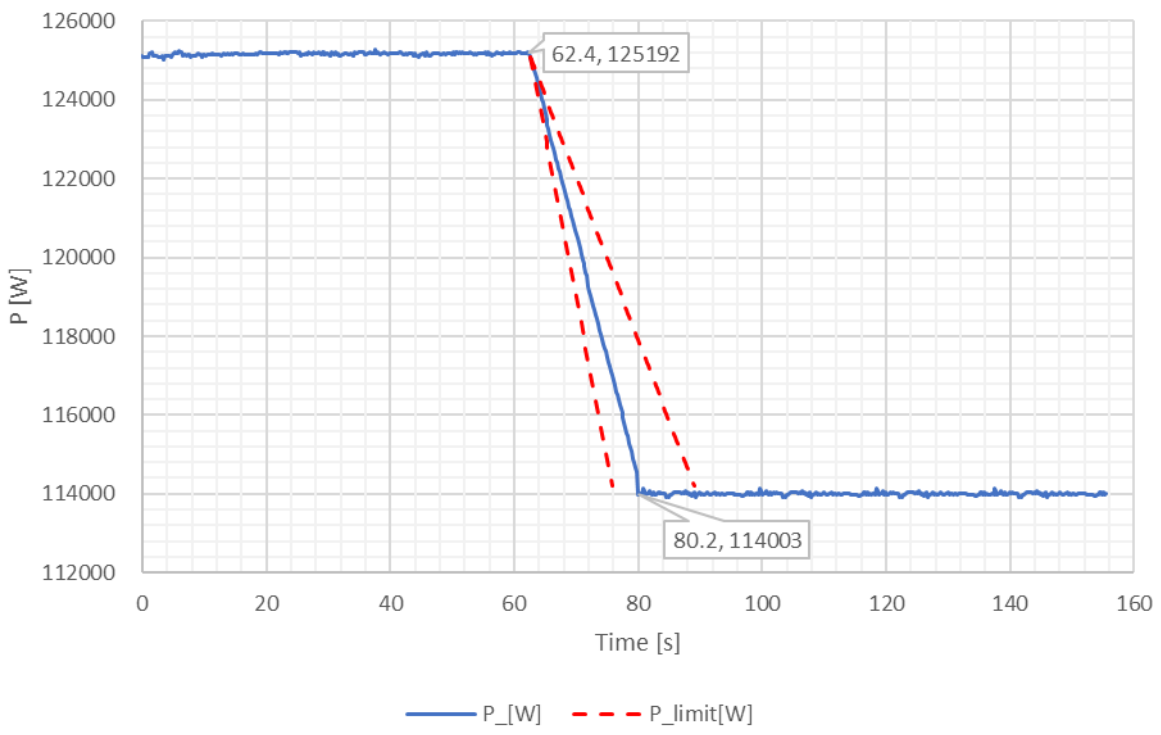
Test method:

The test shall be carried out starting from an initial condition with the generating unit running at 0.9 p.u. active power and applying a step of the active power set point from 0.9 p.u. down to 0.1 p.u. of nominal power or minimum regulating power, whatever is the higher.

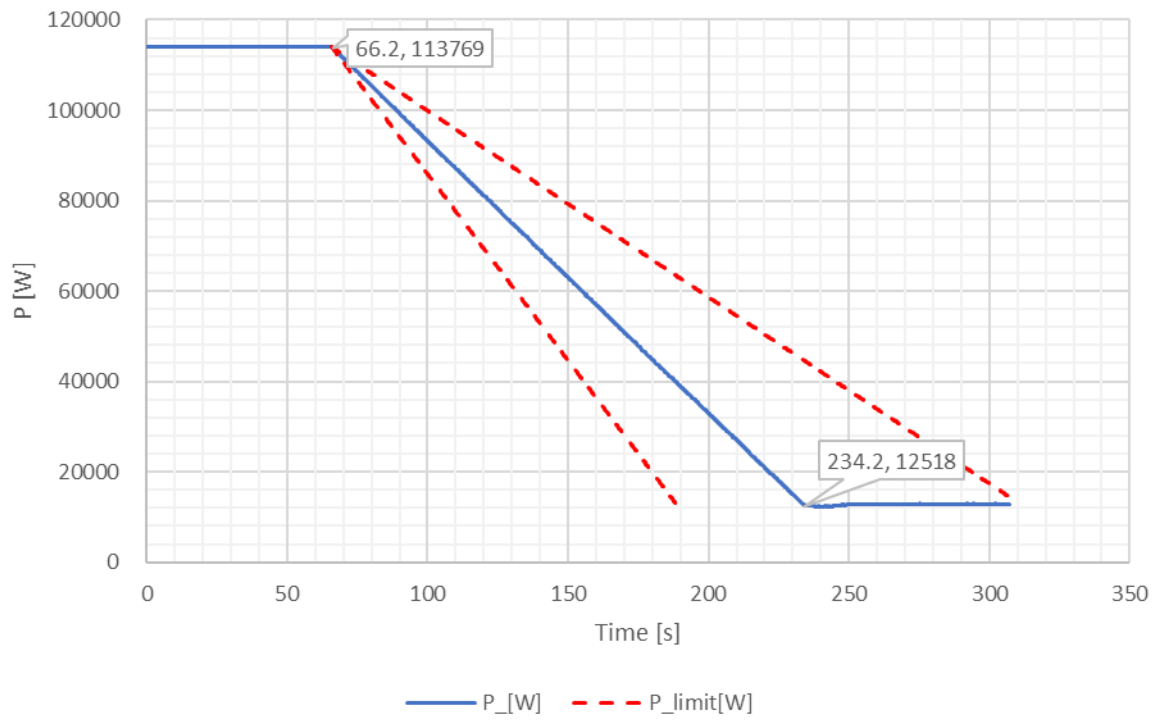
If this is not compatible with the specific test conditions, active power set point shall be stepped from 0.7 p.u. down to 0.5 p.u. of nominal power.

The step response behaviour is measured starting from the instance the set point change is transmitted to the EUT. For the step response time and the settling time a tolerance band of ± 5 % P_{Emax}, to the reactive power set point is considered.

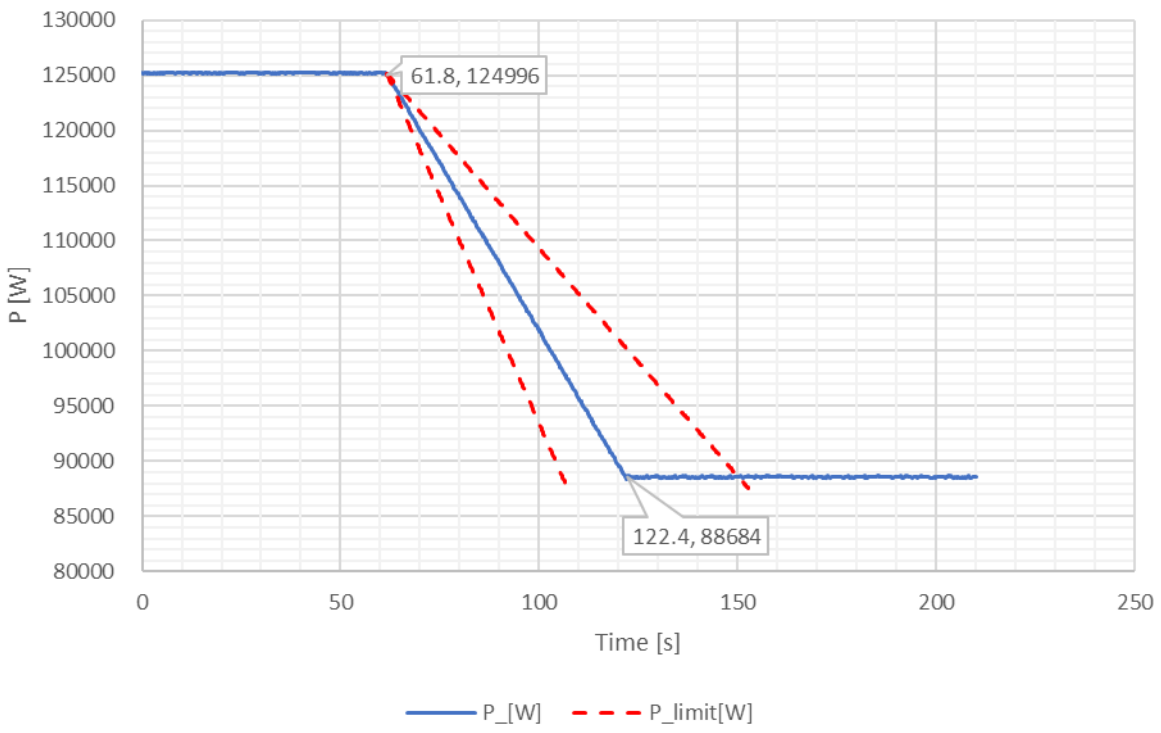
100% of P_{Emax} to 90% of P_{Emax}



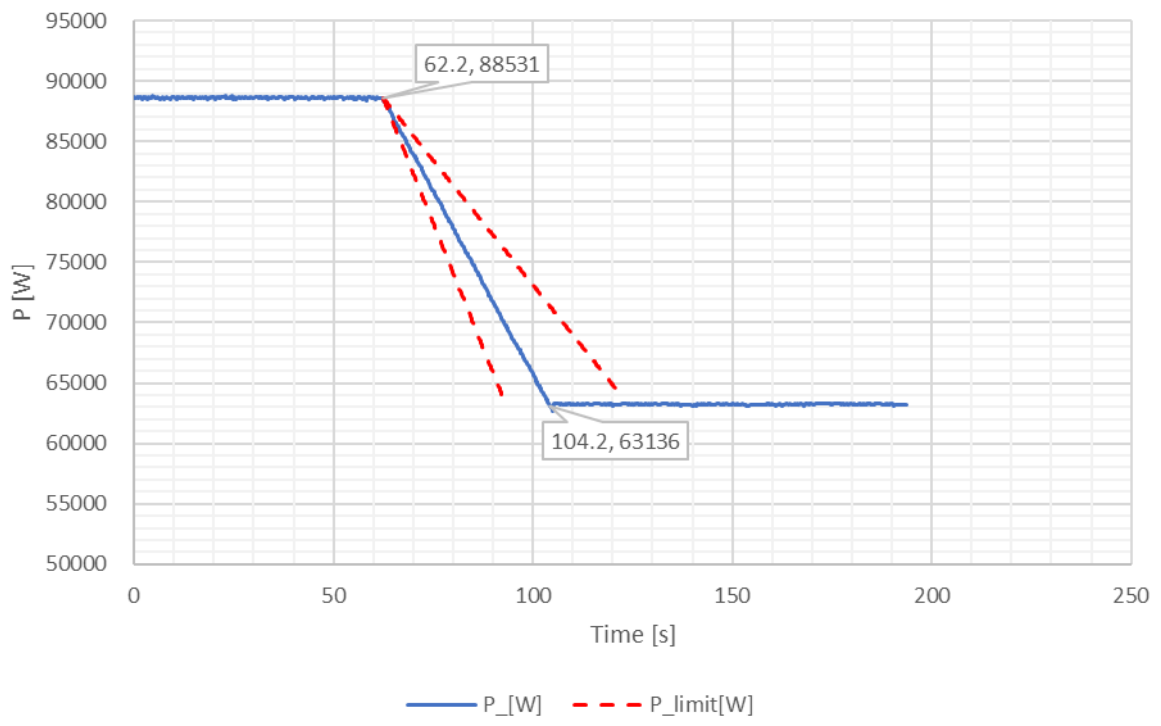
90% of P_{Emax} to 10% of P_{Emax}



100% of P_{Emax} to 70% of P_{Emax}



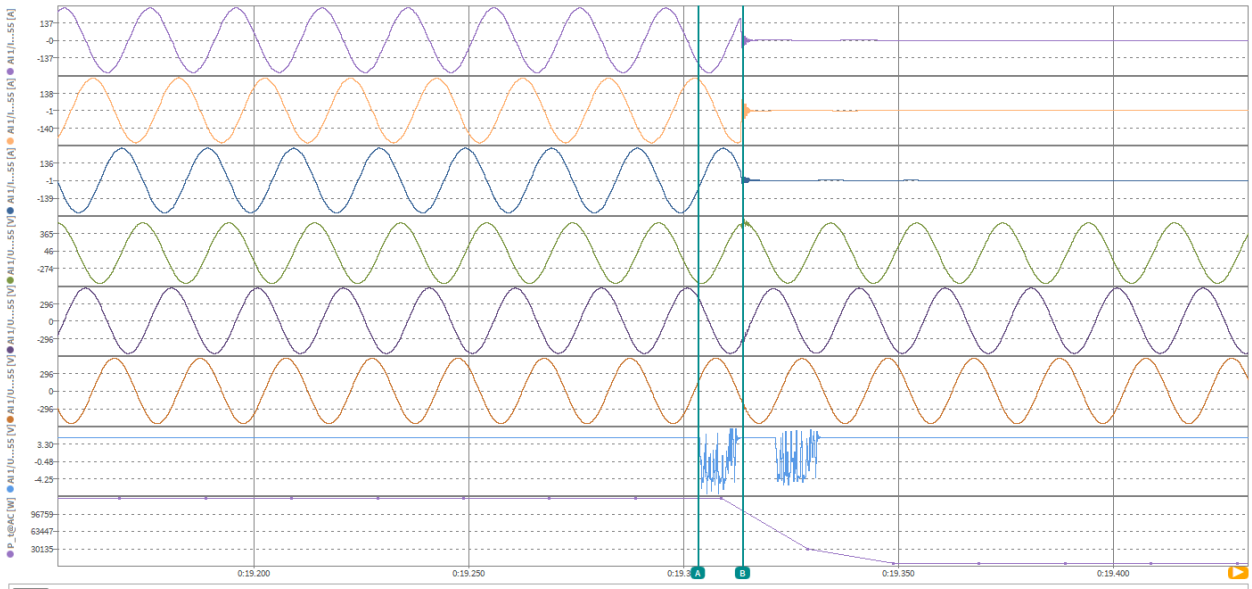
70% of P_{Emax} to 50% of P_{Emax}



5.11 Remote information exchange	P

Operating time of the monitoring device

Test:	Remote tripping signal for the external disconnection
Limit [ms]:	5000
Reaction time of the tripping value [ms]:	10



时间 [s]	A	B	间隔	有效值
	0:19.303500	0:19.313900	0.010400	
AI 1/I1@TRIONet3_1455 [A]	-192.2925	-9.578825	182.7136	177.5169
AI 1/I2@TRIONet3_1455 [A]	245.9611	13.18204	-232.7790	180.5270
AI 1/I3@TRIONet3_1455 [A]	-57.59812	-7.822276	49.77584	177.4382
AI 1/U1@TRIONet3_1455 [V]	-551.5633	445.6287	997.1920	405.5956
AI 1/U2@TRIONet3_1455 [V]	375.7067	-240.7932	-616.4999	395.6366
AI 1/U3@TRIONet3_1455 [V]	175.8833	-204.8984	-380.7817	391.8150
AI 1/U4@TRIONet3_1455 [V]	4.702091	4.684210	-0.017881	4.190471
P_t@AC [W]	126898.8	126774.2	-124.6016	126836.6

Note:

Generating plants shall be equipped with a logic interface (input port) in order to cease active power output within five seconds following an instruction being received at the input port. If required by the DSO, this includes remote operation.

EN 50549-10:2022		
Clause	**Test items**	**Remark**
5.12	**Requirements regarding single fault tolerance of interface protection system and interface switch**	
5.12.2	Single fault tolerance of the interface protection system	P
5.12.3	Single fault tolerance of the interface switch	P

5.12	Requirements regarding single fault tolerance of interface protection system and interface switch							P
		test voltage (V) .....:				See below		—
		Ambient temperature (°C) .....:				25°C, if not stated otherwise		
No.	Component No.	fault	test voltage (V)	test time	fuse No.	fuse current (A)	result	
M0, sampling board								
1.	DC sampling circuit, R104	O-C	800Vdc 400Vac	10min	-	-	The fault applied during operation, after applied the fault, the unit protected and software alarm code: 7 (battery low voltage). No hazard, can resettable.	
2.	DC sampling circuit, R104	S-C	800Vdc 400Vac	10min	-	-	The fault applied during operation, after applied the fault, the unit protected and software alarm code: 9 (battery over voltage). No hazard, can resettable.	
3.	Bus sampling circuit, R156	S-C	800Vdc 400Vac	10min	-	-	The fault applied during operation, after applied the fault, the unit protected and software alarm code: 4 & 6 (Bus over voltage and Bus unbalance). No hazard, can resettable.	
4.	AC sampling circuit, R691	S-C	800Vdc 400Vac	10min	-	-	The fault applied during operation, after applied the fault, the unit operated normally. No hazard.	
U1, Chip board								
5.	Power supply of U2 Chip, J1, Pin 37 & 45	S-C	800Vdc 400Vac	10min	-	-	The fault applied during operation, after applied the fault, the unit shut down. No hazard, can resettable.	
6.	Power supply of U3 Chip, J1, Pin 37 & 45	S-C	800Vdc 400Vac	10min	-	-	The fault applied during operation, after applied the fault, the unit shut down. No hazard, can resettable.	

M5, BUS balance Board							
7.	Current Sensor, T1, Pin 1 and 2	S-C	800Vdc 400Vac	10min	-	-	The fault applied during operation, after applied the fault, the unit operated normally. No hazard.
M1, convert power board							
8.	Driver circuit of IGBT, R319	S-C	800Vdc 400Vac	10min	-	-	The fault applied during operation, after applied the fault, the unit operated normally. No hazard.
9.	Bus Capacitor, C27	S-C	800Vdc 400Vac	10min	-	-	The fault applied during operation, after applied the fault, the capacitor C27 broken, and unit shut down. No hazard, damaged and cannot resettable
10.	Power supply ±15V of Current Sensor, J28	S-C	800Vdc 400Vac	10min	-	-	The fault applied during operation, after applied the fault, the unit shut down. No hazard, can resettable.
M2, AC/DC Power board							
11.	AC Relay RLY1, signal pin	S-C	800Vdc 400Vac	10min	-	-	The fault applied before operation, after applied the fault, the software alarm code: 5 (Bus under voltage) and cannot connect to grid. No hazard, can resettable.
12.	AC Relay RLY2, signal pin	S-C	800Vdc 400Vac	10min	-	-	The fault applied before operation, after applied the fault, the software alarm code: 5 (Bus under voltage) and cannot connect to grid. No hazard, can resettable.
13.	AC Relay RLY3, signal pin	S-C	800Vdc 400Vac	10min	-	-	The fault applied before operation, after applied the fault, the software alarm code: 5 (Bus under voltage) and cannot connect to grid. No hazard, can resettable.

14.	AC Relay RLY5, signal pin	S-C	800Vdc 400Vac	10min	-	-	The fault applied before operation, after applied the fault, the software alarm code: 5 (Bus under voltage) and cannot connect to grid. No hazard, can resettable.
15.	AC Relay RLY7, signal pin	S-C	800Vdc 400Vac	10min	-	-	The fault applied before operation, after applied the fault, the software alarm code: 5 (Bus under voltage) and cannot connect to grid. No hazard, can resettable.
M4, auxiliary power board							
16.	T1, pin 11 and 14, 24 power source	S-C	800Vdc 400Vac	10min	-	-	The fault applied during operation, after applied the fault, the unit operated normally. No hazard.
17.	T2, pin 9 and 10, driver circuit for Mosfet	S-C	800Vdc 400Vac	10min	-	-	The fault applied during operation, after applied the fault, the unit shut down. No hazard, can resettable.
18.	T4, pin 13 and 14, 15 power source	S-C	800Vdc 400Vac	10min	-	-	The fault applied during operation, after applied the fault, the unit shut down, no software alarm, LED alarm flash. No hazard, can resettable.
19.	AC Relay RLY16, signal pin	S-C	800Vdc 400Vac	10min	-	-	The fault applied during operation, after applied the fault, the unit protected and software alarm code: 8 (AC relay fault) and cannot connect to grid. No hazard, can resettable.
20.	DC contactor RLY17, signal pin	S-C	800Vdc 400Vac	10min	-	-	The fault applied during operation, after applied the fault, the unit protected and software alarm code: 6 (Positive and negative bus unbalanced fault). No hazard, can resettable.
21.	DC contactor on enclosure, signal pin	S-C	800Vdc 400Vac	10min	-	-	The fault applied during operation, after applied the fault, the unit protected and software alarm code: 6 (Positive and negative bus unbalanced fault). No hazard, can resettable.
Cooling							
22.	Fan	Bloc ked	800Vdc 400Vac	30min	-	-	The fault applied during operation, after applied the fault, the unit operated for 1minute, then software alarm code: 1

							(Fan fault of hardware). No hazard, can resettable.
23.	Fan driver circuit, M1 board, J24, pin 1 and 2	S-C	800Vdc 400Vac	10min	-	-	The fault applied during operation, after applied the fault, the unit operated for 1minute, then software alarm code: 1 (Fan fault of hardware). No hazard, can resettable.
General input and output							
24.	AC terminal (3 phase)	S-C	800Vdc 400Vac	10min	-	-	The fault applied during operation, after applied the fault, the unit protected and software alarm code: 0 & 1 (Phase A over voltage, Phase B over voltage). No hazard, can resettable.
25.	AC terminal – Phase A & Phase B	MIS	800Vdc 400Vac	10min	-	-	The fault applied during operation, after applied the fault, the unit protected and software alarm code: 8 (Grid phase wrong). No hazard, can resettable.
26.	AC terminal – Phase C	LP	800Vdc 400Vac	10min	-	-	The fault applied during operation, after applied the fault, the unit protected and software alarm code: 1 & 2 (Phase B over voltage, Phase C overvoltage). No hazard, can resettable.
27.	DC terminal	S-C	800Vdc 400Vac	10min	-	-	The fault applied before operation, after applied the fault, the software alarm code: 0 (pre-charge over time for Capacitor) and cannot connect to grid. No hazard, can resettable.
28.	DC terminal	RE	800Vdc 400Vac	10min	-	-	The fault applied before operation, after applied the fault, the software alarm code: 7 & 15 (Battery under voltage, Battery reverse) and cannot connect to grid. No hazard, can resettable.
29.	120% AC output	OL	800Vdc 400Vac	10min	-	-	The fault applied during operation, after applied the fault, the unit keep operated at 110%Pn. No hazard, can resettable.
30.	PE conductor	MIS S	800Vdc 400Vac	10min	-	-	Fault applied before operation, the unit can start up normally. No damage, no hazard.
Legend							

S-C	short-circuited	O-C	open-circuited
OL	Over-load.	MIS	Miss wiring
RE	Reverse polarity	LP	Loss of phase
Note(s): The electric strength test performed after fault condition test and see appended table 7.5.2 for detailed test conditions.			

5.12 Requirements regarding single fault tolerance of interface protection system and interface switch								P
No.	component No.	fault	test voltage (V)	test time	fuse No.	fuse current (A)	result	
a.	Error of an AD converter or measuring card for voltage measurement		DC:850V AC:230V	10s	--	--	The unit disconnect within 10 s, no damage, no fire, no hazard	
b.	malfunction or freezing of a microprocessor or PLC		DC:850V AC:230V	10s	--	--	The unit disconnect within 10 s, no damage, no fire, no hazard	
c.	Merging or jamming of the contacts of the switching output		DC:850V AC:230V	10s	--	--	The unit disconnect within 10 s, no damage, no fire, no hazard	
d.	overvoltage of the supply voltage		DC:850V AC:230V	10s	--	--	The unit disconnect within 10 s, no damage, no fire, no hazard	
e.	Cable break in connecting cables between the measuring input and the control output to the coupling switch		DC:850V AC:230V	10s	--	--	The unit disconnect within 10 s, no damage, no fire, no hazard	
f.	Failure of the supply voltage (auxiliary voltage)		DC:850V AC:230V	10s	--	--	The unit disconnect within 10 s, no damage, no fire, no hazard	

Pictures of the unit

Figure 1. Front view
(for model TAA-105KW-01, TAA-125KW-01)

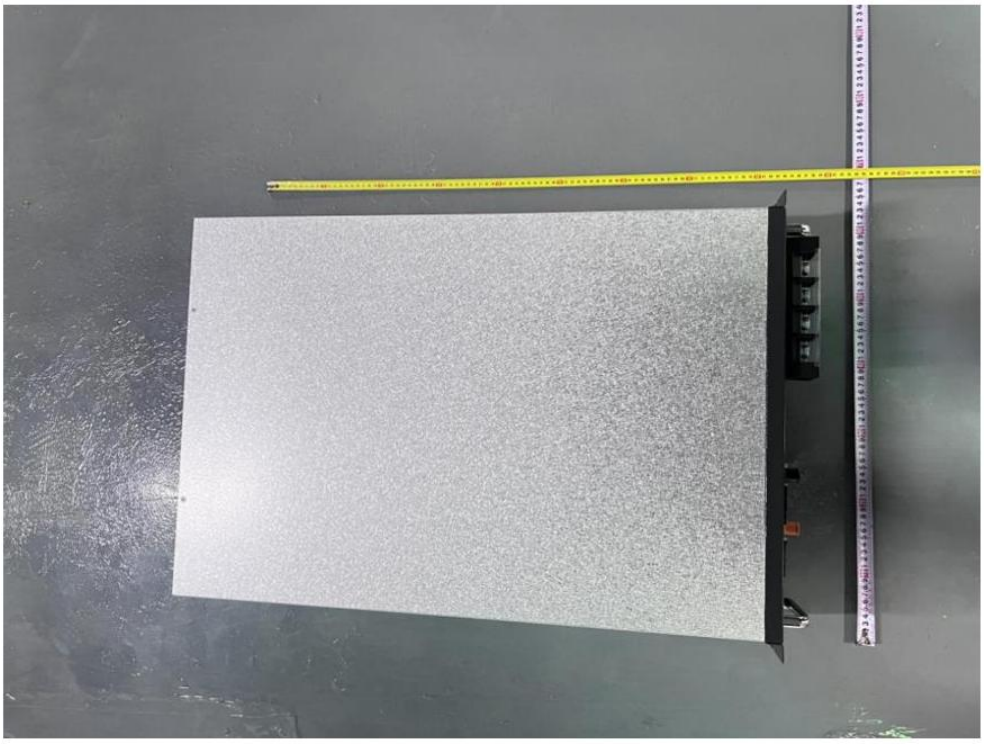


Figure 2. Top view
(for model TAA-105KW-01, TAA-125KW-01)

Pictures of the unit

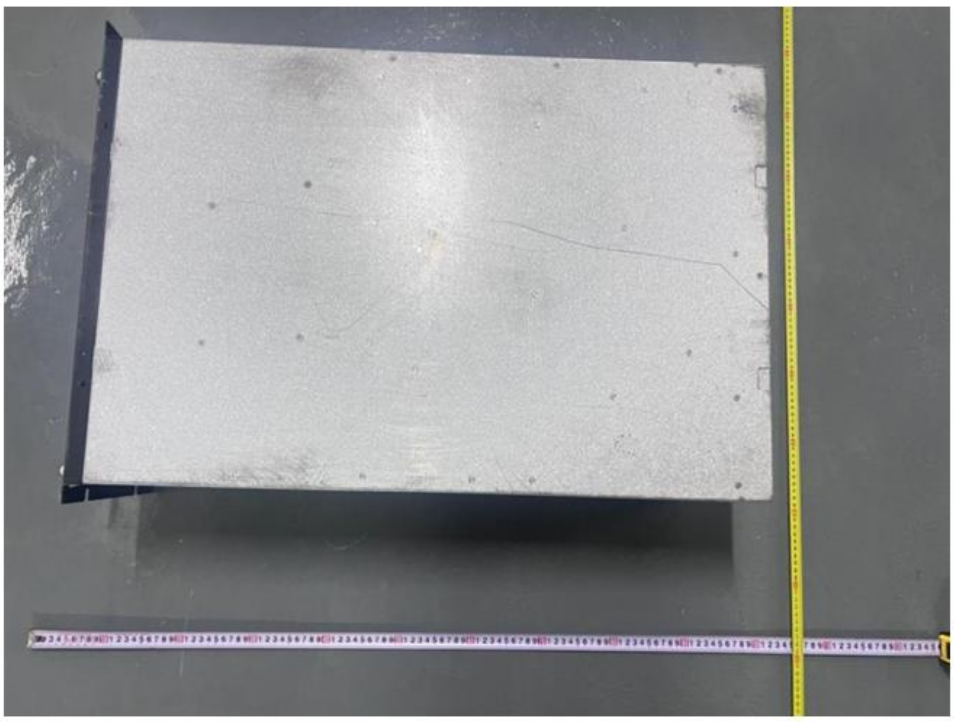


Figure 3. Bottom view
(for model TAA-105KW-01, TAA-125KW-01)

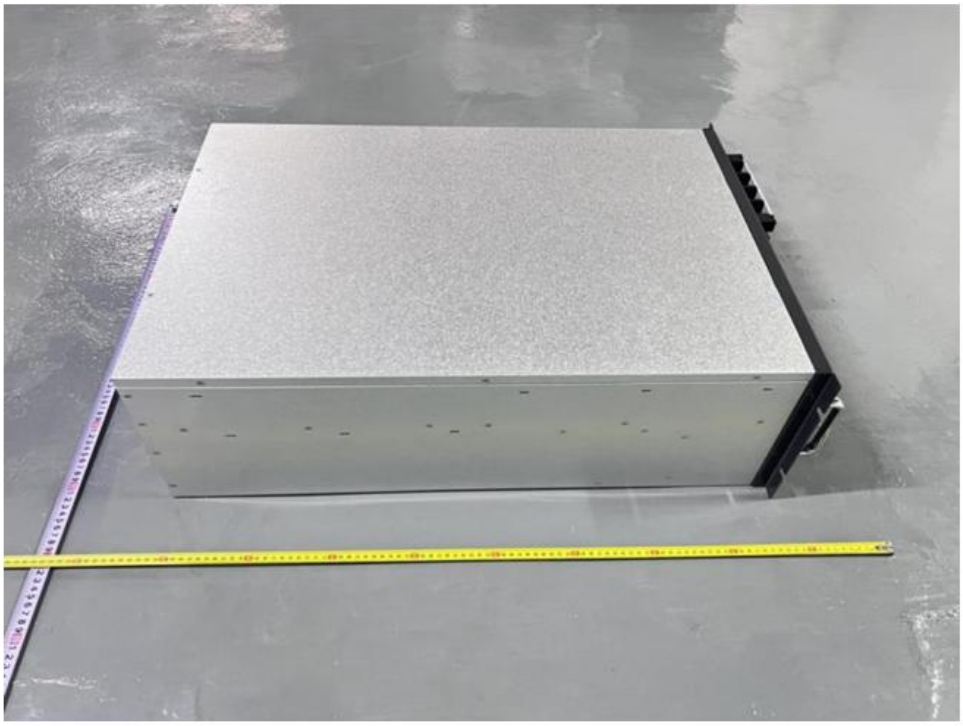


Figure 4. Right view
(for model TAA-105KW-01, TAA-125KW-01)

Pictures of the unit

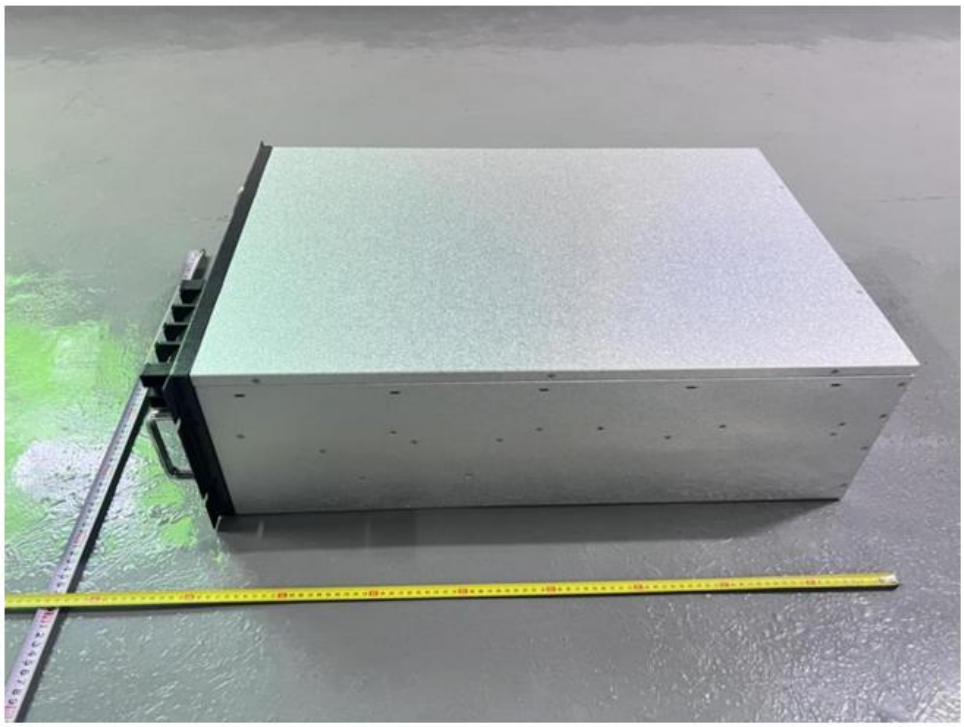


Figure 5. Left view
(for model TAA-105KW-01, TAA-125KW-01)

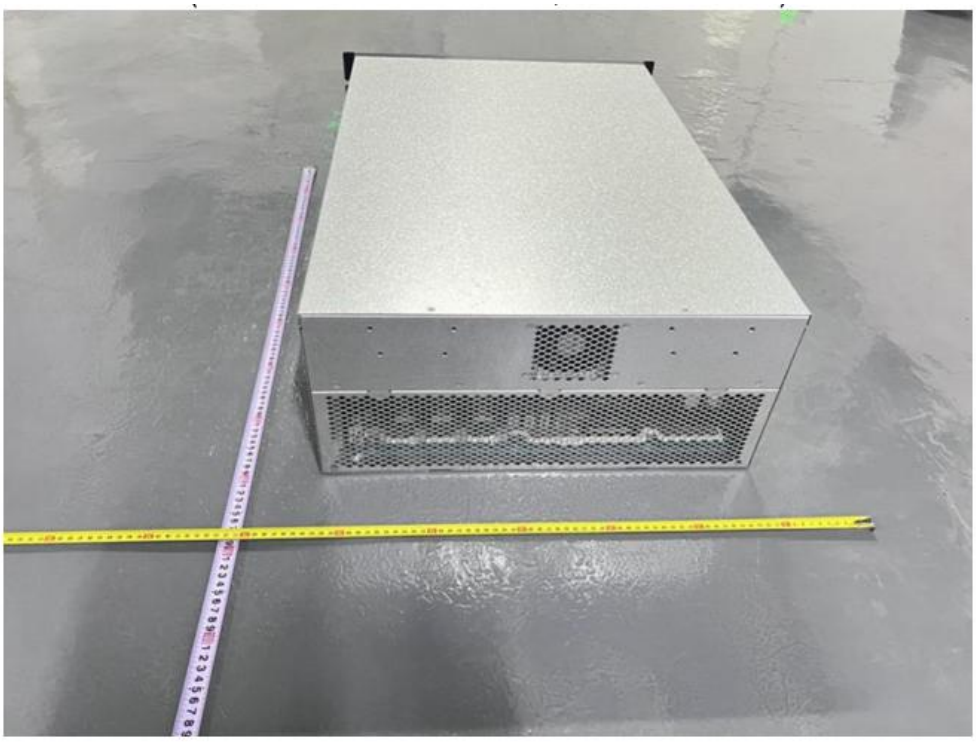


Figure 6. Back view
(for model TAA-105KW-01, TAA-125KW-01)

Pictures of the unit

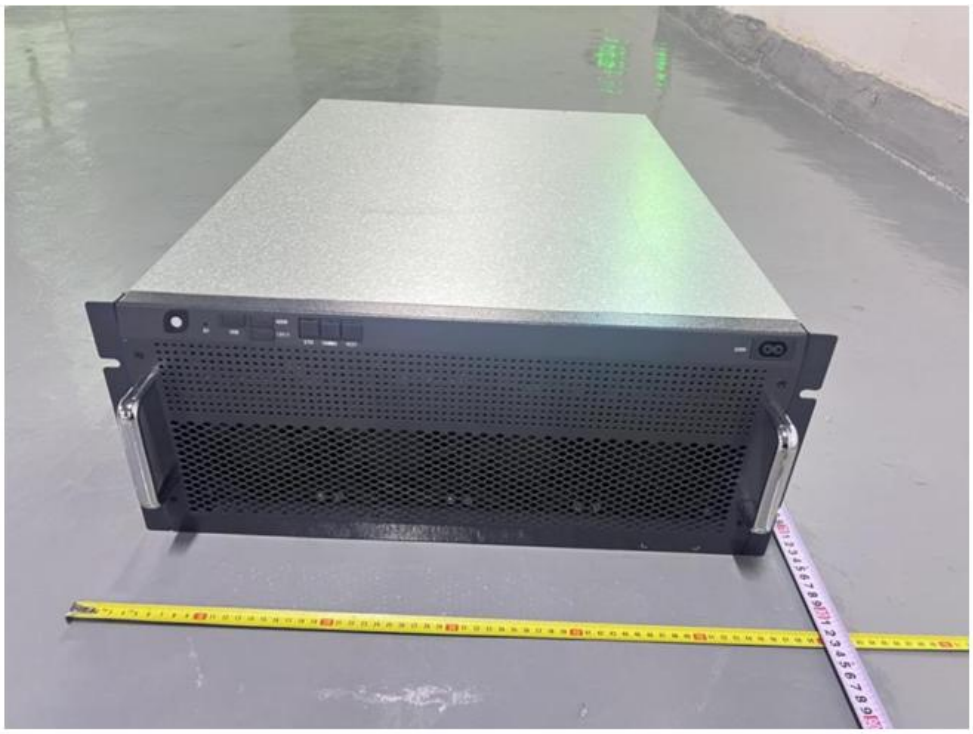


Figure 7. Front view
(for model TAA-105KW-11, TAA-125KW-11)

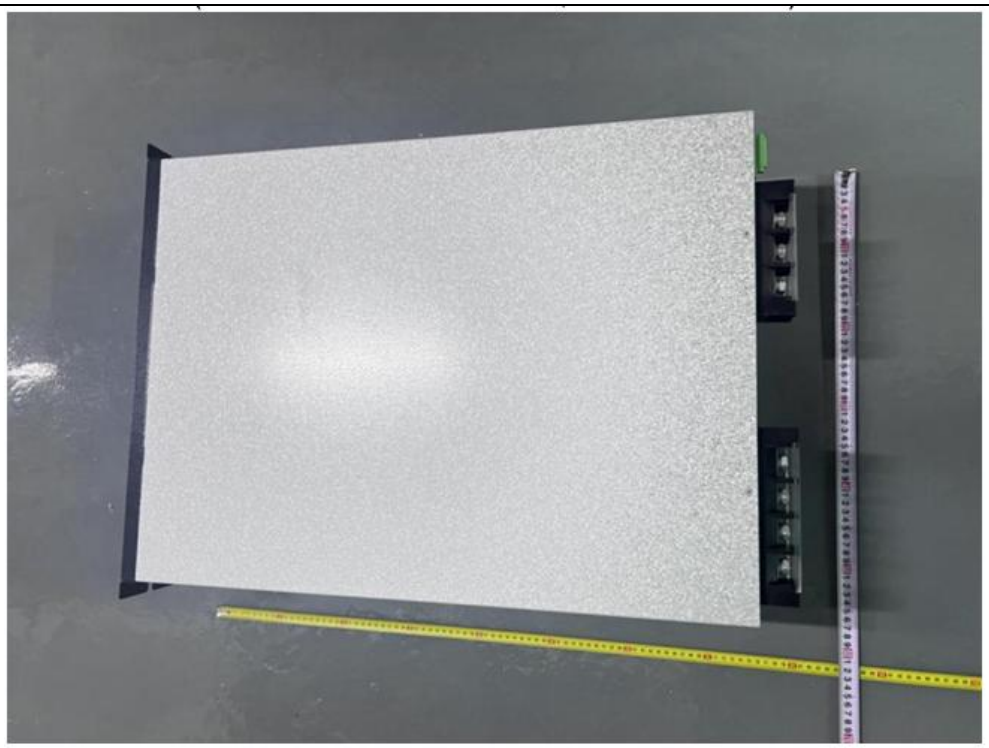


Figure 8. Top view
(for model TAA-105KW-11, TAA-125KW-11)

Pictures of the unit

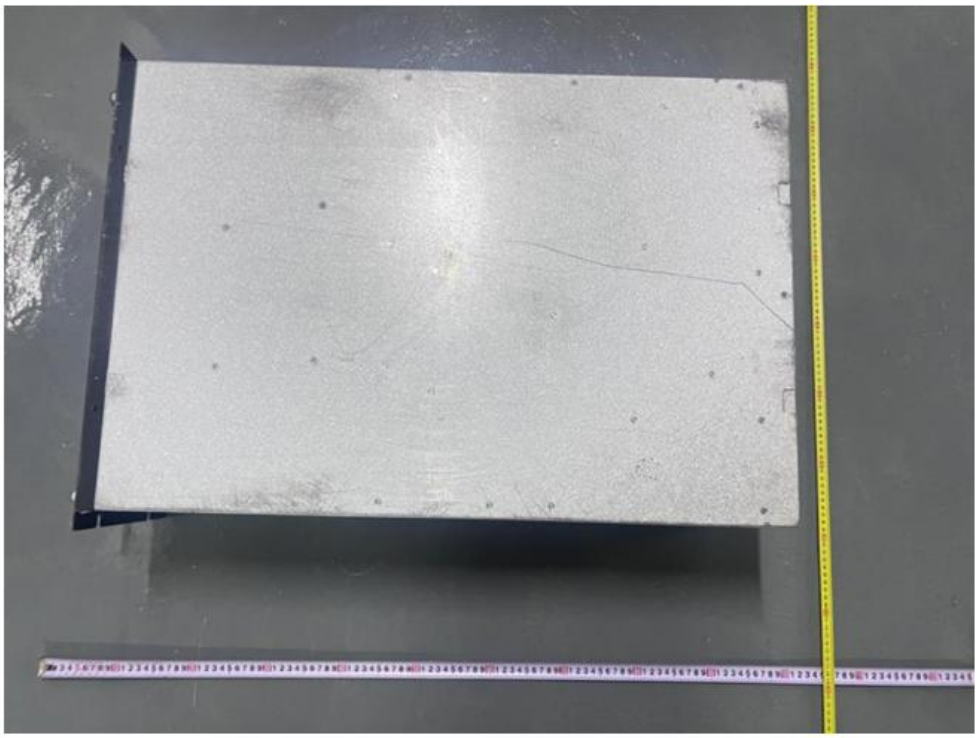


Figure 9. Bottom view

(for model TAA-105KW-11, TAA-125KW-11)

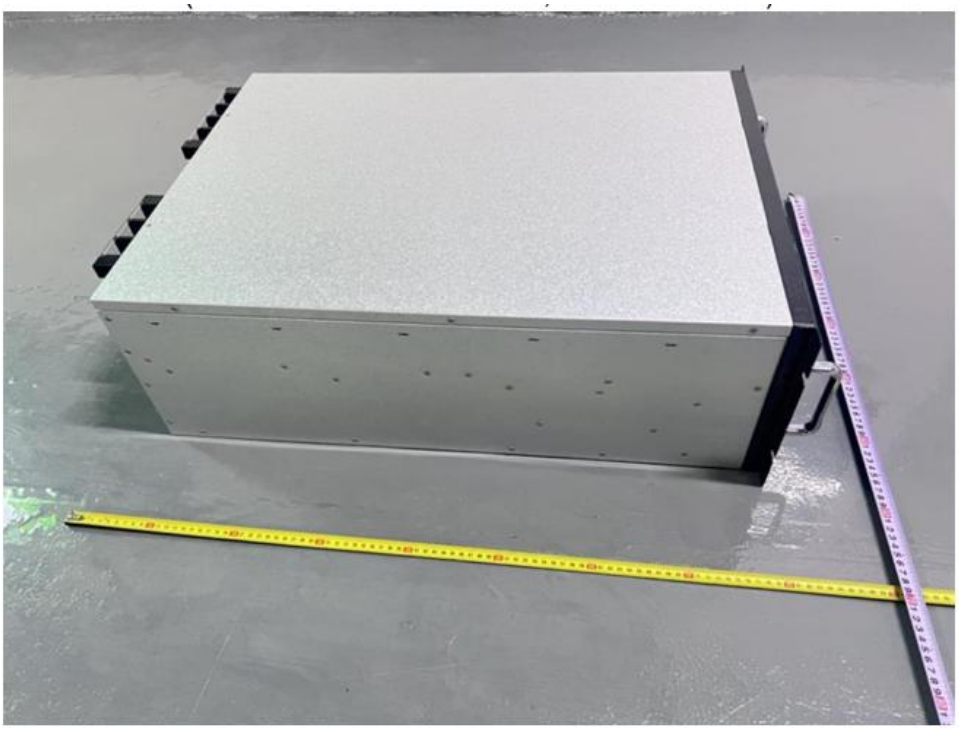


Figure 10. Right view

(for model TAA-105KW-11, TAA-125KW-11)

Pictures of the unit

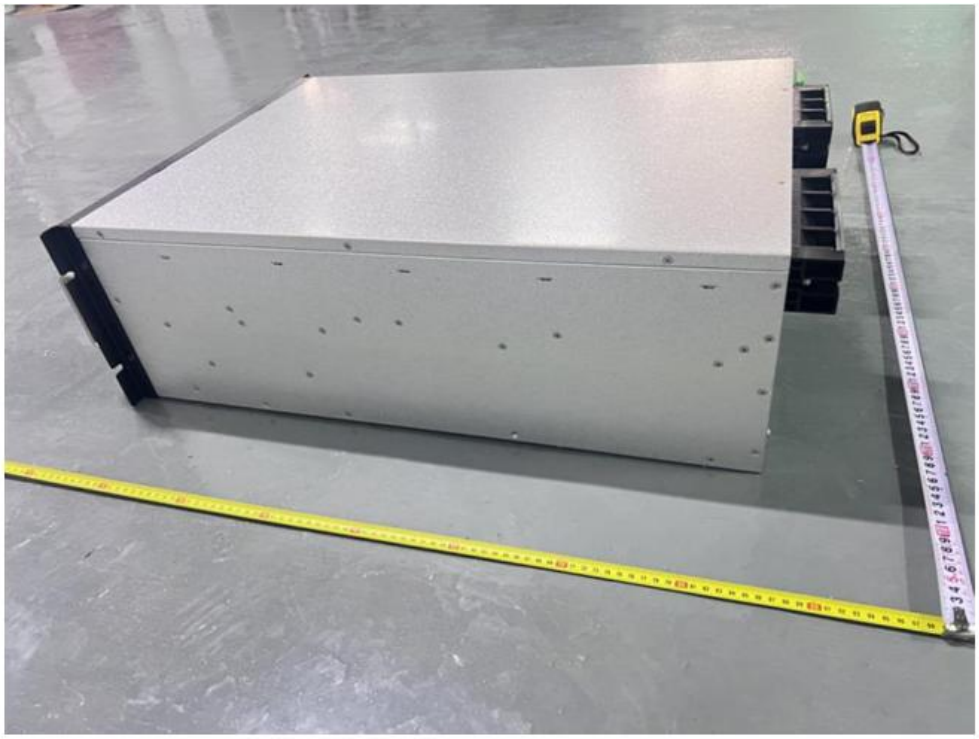


Figure 11. Left view

(for model TAA-105KW-11, TAA-125KW-11)

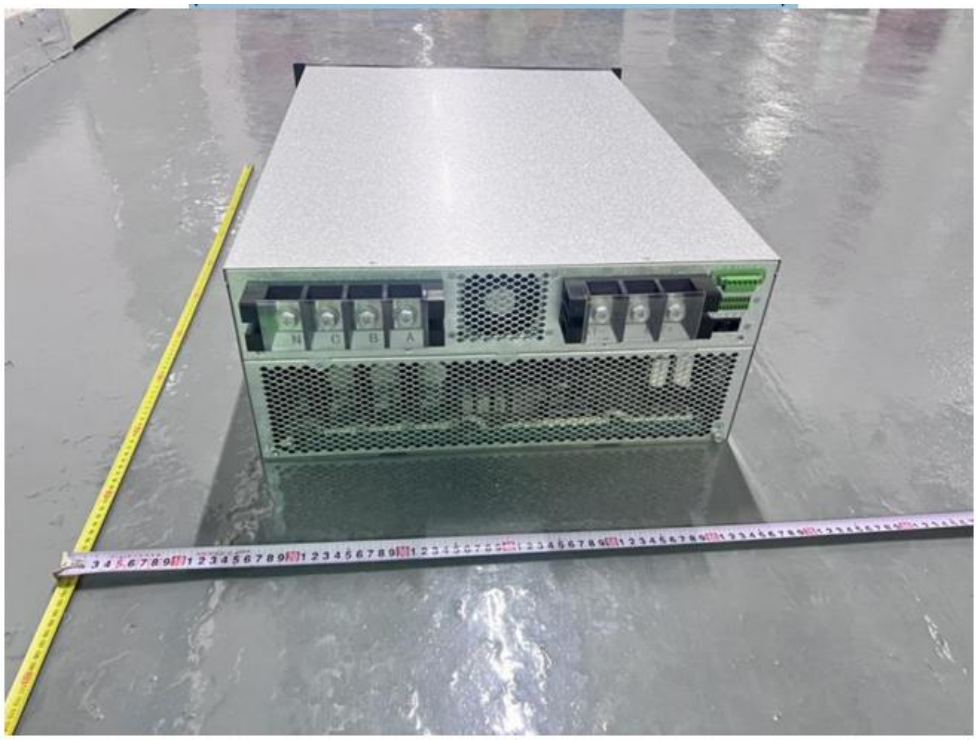


Figure 12. Back view

(for model TAA-105KW-11, TAA-125KW-11)

Pictures of the unit

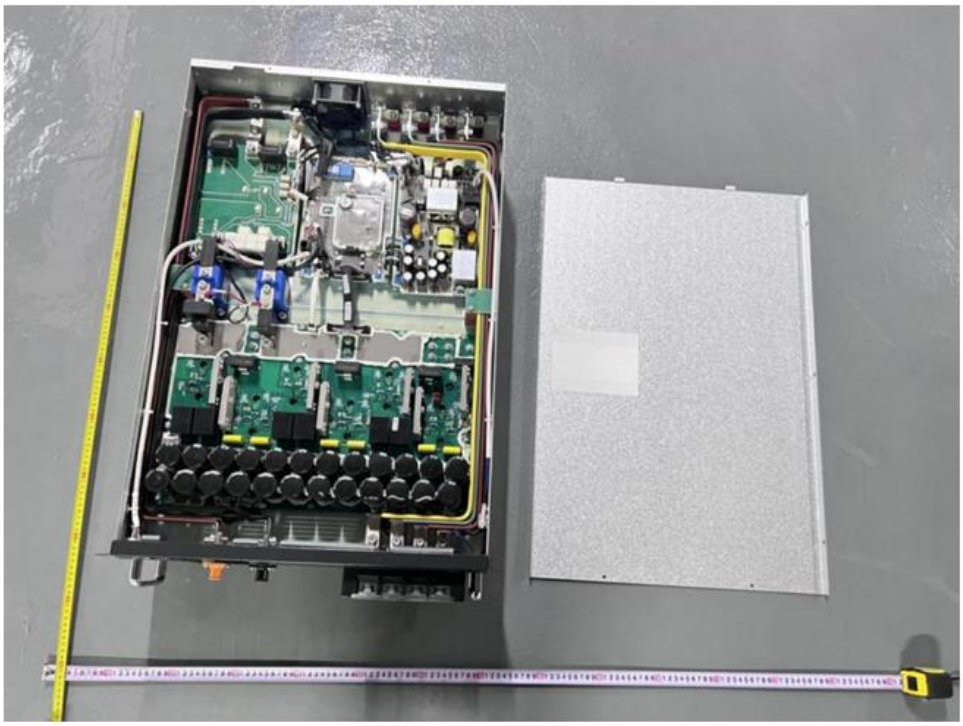


Figure 13. Opening view 1
(for model TAA-105KW-01, TAA-125KW-01)

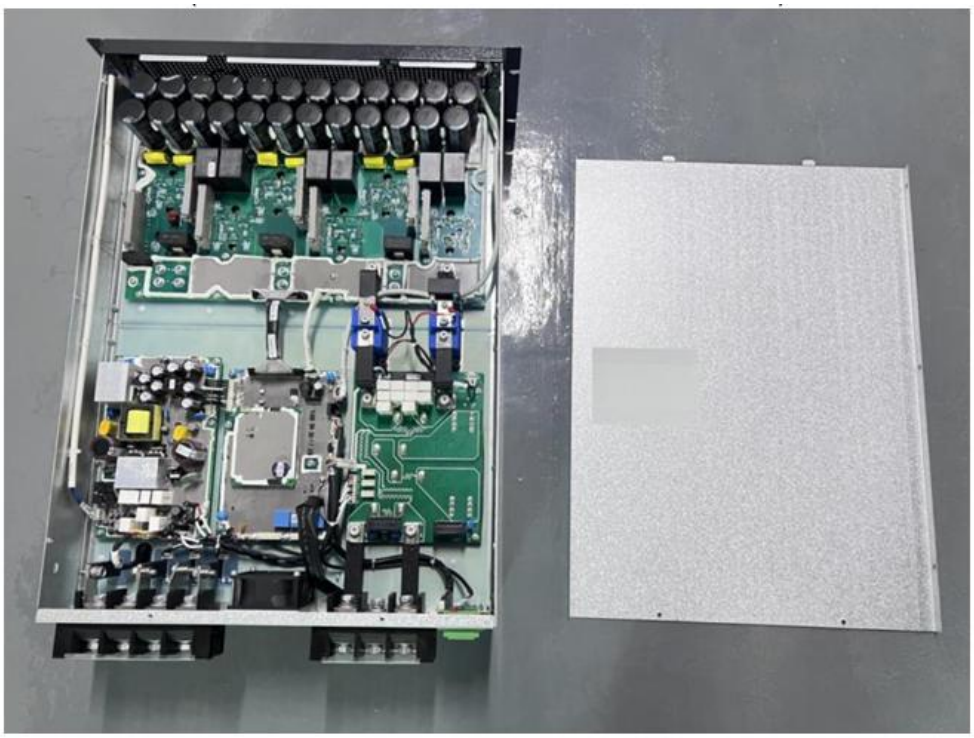


Figure 14. Opening view 2
(for model TAA-105KW-11, TAA-125KW-11)

Test Equipment list				
No	**Test Equipment**	**Equipment model**	**Equipment No.**	**Calibration due date**
1	AC source	WPLA-330200KVA	BZ-DGD-L204	2026/09/01
2	DC source	WPLA-150KW	BZ-DGD-L013	2026/07/29
3	RLC load	ACLT-38160H	BZ-DGD-L003	2026/09/01
4	Power analyzer	DEWE2-PA7	BZ-DGD-L119	2026/07/31
5	Current sensor	CT6863-05	BZ-DGD-L026-1	2027/01/11
6	Current sensor	CT6863-05	BZ-DGD-L026-2	2027/01/11
7	Current sensor	CT6863-05	BZ-DGD-L026-3	2027/01/11
8	Current sensor	CT6863-05	BZ-DGD-L026-4	2027/01/11
9	Oscilloscope	MS04054B	BZ-DGD-L064	2027/01/12

Statement

1. The laboratory guarantees the scientificity, accuracy and impartiality of the test, and is responsible for all the information in the report, except the information provided by the customer. The customer is responsible for the impact of the information provided on the validity of the results.

2. The report without China inspection body and laboratory Mandatory Approval (CMA) mark has no effect of proving to the society.

3. For the report with CNAS mark, the items marked with "☆" are not within the accredited scope.

4. This report is invalid if it is altered, without the signature of the testing and approval personnel, or without the “inspection and testing dedicated stamp” or test report stamp.

5. The test data and results are only valid for the tested samples provided by the customer.

6. This report shall not be partially reproduced without the written permission of the laboratory.

7. Any objection shall be raised to the laboratory within 30 days after receiving the report.

--- End of report---