TEST REPORT

UNE 217002

Inversores para conexión a la red de distribución
Ensayos de los requisitos de inyección de corriente continua a la red, generación de sobretensiones y sistema de detección de funcionamiento en isla

Report reference number..... :	**PVES2408WDG0290-3**
Date of issue..... ……..:	2024-11-01
Total number of pages..... ……..:	54
Testing laboratory name..... :	**Bureau Veritas Consumer Products Services Germany GmbH**
Address.....:	Businesspark A96, 86842 Türkheim, Germany
Accreditation.....:	ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-12024-03-00
Applicant's name ..... :	**Guangdong Felicity New Energy Co., Ltd.**
Address.....:	(KongGangBaiYun)No. 2, Donghua Huaye Road, Renhe Town, Baiyun Area Guangzhou Guangdong P.R. China
Test specification	
Standard .....:	UNE 217002:2020 Inversores para conexión a la red de distribución Ensayos de los requisitos de inyección de corriente continua a la red, generación de sobretensiones y sistema de detección de funcionamiento en isla TED/749/2020; RD 647/2020
Certificate ..... :	**Certificate of compliance**
Test report form number.....:	UNE 217002
Master TRF.....:	Bureau Veritas Consumer Products Services Germany GmbH
Test item description .....:	Photovoltaic (PV) and battery inverter
Trademark .....:	FelicityESS
Model / Type.....:	T-REX-25KHP3G01, T-REX-29K9HP3G01, T-REX-30KHP3G01, T-REX-40KHP3G01, T-REX-50KHP3G01

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Ratings .....:	**T-REX-25KHP3G01**	**T-REX-29K9HP3G01**	**T-REX-30KHP3G01**
Max. input DC voltage [V]..... :	1000		
MPP DC voltage range [V] ..... :	200-850		
Max. Input DC current [A] ..... :	36/36	36/36/36	36/36/36
Output AC voltage ..... :	230Vac, 50Hz, 3L/N/PE		
Nominal. Output AC current [A]:	36,3	43,4	43,5
Max. Output AC current [A] ..... :	39,9	43,4	47,8
Rated Output power [kW] ..... :	25,0	29,9	30,0
Max. Output power [kVA]..... :	27,5	29,9	33,0
Battery Voltage Range[V] ..... :	160-800		
Max. Battery Current[A] ..... :	50/50		

Ratings .....:	**T-REX-40KHP3G01**	**T-REX-50KHP3G01**
Max. input DC voltage [V]..... :	1000	
MPP DC voltage range [V] ..... :	200-850	
Max. Input DC current [A] ..... :	36/36/36/36	
Output AC voltage ..... :	230Vac, 50Hz, 3L/N/PE	
Nominal. Output AC current [A]:	58,0	72,5
Max. Output AC current [A] ..... :	63,8	79,7
Rated Output power [kW] ..... :	40,0	50,0
Max. Output power [kVA]..... :	44,0	55,0
Battery Voltage Range[V] ..... :	160-800	
Max. Battery Current[A] ..... :	50/50	

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Testing Location.....:	**Guangdong Felicity New Energy Co., Ltd.**
Address .....:	(KongGangBaiYun)No. 2, Donghua Huaye Road, Renhe Town, Baiyun Area Guangzhou Guangdong P.R. China
Tested by (name and signature) .....:	Chason Ye **Chason Ye** PV Project Engineer Digitally signed by Chason Ye DN: cn=Chason Ye, o=Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch, ou=New Energy, email=chason.ye@bureauveritas.com, c=CN Date: 2024.11.01 09:15:56 +08'00'
Approved by (name and signature) .....:	
Manufacturer's name .....:	**Guangdong Felicity New Energy Co., Ltd.**
Manufacturer address.....:	(KongGangBaiYun)No. 2, Donghua Huaye Road, Renhe Town, Baiyun Area Guangzhou Guangdong P.R. China
Factory's name .....:	**Guangdong Felicity New Energy Co., Ltd.**
Factory address.....:	(KongGangBaiYun)No. 2, Donghua Huaye Road, Renhe Town, Baiyun Area Guangzhou Guangdong P.R. China

Document History

Date	Internal reference	Modification / Change / Status	Revision
2024-11-01	Chason Ye	Initial report was written	0

Supplementary information:

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Test items particulars

Equipment mobility..... :	Permanent connection
Operating condition..... :	Continuous
Class of equipment ..... :	Class I
Protection against ingress of water.. :	IP65 according to EN 60529
Mass of equipment [kg]..... :	Approx. 85,6kg

Test case verdicts

Test case does not apply to the test object..... :	N/A
Test item does meet the requirement..... :	P(ass)
Test item does not meet the requirement..... :	F(ail)

Testing

Date of receipt of test item ..... :	2024-08-26
Date(s) of performance test ..... :	2024-08-26 to 2024-10-31

General remarks:

The test result presented in this report relate only to the object(s) tested,
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”(see Annex #)" refers to additional information appended to the report,
"(see appended table)" refers to a table appended to the report,

Throughout this report a comma is used as the decimal separator,

The IEC61727 does not provide any limits of accuracy for the utility voltage and frequency measurement of the PV-system, If nothing different stated at the test table the values for tolerances given in EN 50438, Table 2 are used,

Tolerances on trip values tabel 2 EN50438:

- Voltage: +/- 1% of the nominal voltage
- Frequency: +/- 0,5% of the nominal frequency
- Clearance time: +/- 10%

This Test Report consists of the following documents:

1. Test Results
2. Annex No. 1 – Datasheet of the relay
3. Annex No. 2 – Pictures of the unit
4. Annex No. 3 – Test equipment list

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Copy of marking plate:

FelicityESS™

T-REX-25KHP3G01	
Product Type	Hybrid Inverter
Protection Degree	IP65
Overvoltage-category	DC II; AC III
Ambient Temperture	–25°C~60°C,>50°C Derating
Warranty	5 years
Battery Input Data	
Battery Voltage Range	160~800Vd.c.
Max. Charging Current	50+50(A)
Max. Discharging Current	50+50(A)
PV String Input Data	
Max. DC Input Power	32.5 kW
Max. DC Input Voltage	1000Vd.c.
Min. DC Input Voltage	150Vd.c.
MPPT Range	200~850Vd.c.
Full Load DC Voltage Range	450~850Vd.c.
PV Input Current	36+36(A)
Max. PV Isc	55+55(A)
AC Output Data	
Rated AC Output Power	25 kW
Max. AC Output Power	27.5 kW
AC Output Rated Current	36.3 A
Max. AC Current	39.9 A
Rated AC Voltage	220/380,230/400 Vac(-20%~+15%)
AC Wiring Mode	L1/L2/L3/N/PE
Rated AC Frequency	50 /60 Hz(45~55Hz/55~65Hz)
Power Factor	0.8(leading) to 0.8(lagging)
Efficiency	
Max. Efficiency	97.60%
Euro Efficiency	97.00%
MPPT Efficiency	99.90%

CE RoHS

CAUTION:
- High Voltage,warning electric shock
- Keep the equipment well ventilated
- The capacitors store hazardous energy Do not touch while working !

Manufacturer:
Guangdong Felicity New Energy Co., Ltd
Address:
(KongGangBaiYun)No. 2, Donghua Huaye Road, Renhe Town, Baiyun Area, Guangzhou, Guangdong, P. R. CHINA

FelicityESS™

T-REX-29K9HP3G01	
Product Type	Hybrid Inverter
Protection Degree	IP65
Overvoltage-category	DC II; AC III
Ambient Temperture	–25°C~60°C,>50°C Derating
Warranty	5 years
Battery Input Data	
Battery Voltage Range	160~800Vd.c.
Max. Charging Current	50+50(A)
Max. Discharging Current	50+50(A)
PV String Input Data	
Max. DC Input Power	38.87 kW
Max. DC Input Voltage	1000Vd.c.
Min. DC Input Voltage	150Vd.c.
MPPT Range	200~850Vd.c.
Full Load DC Voltage Range	360~850Vd.c.
PV Input Current	36+36+36(A)
Max. PV Isc	55+55+55(A)
AC Output Data	
Rated AC Output Power	29.9 kW
Max. AC Output Power	29.9 kW
AC Output Rated Current	43.4 A
Max. AC Current	43.4 A
Rated AC Voltage	220/380,230/400 Vac(-20%~+15%)
AC Wiring Mode	L1/L2/L3/N/PE
Rated AC Frequency	50 /60 Hz(45~55Hz/55~65Hz)
Power Factor	0.8(leading) to 0.8(lagging)
Efficiency	
Max. Efficiency	97.60%
Euro Efficiency	97.00%
MPPT Efficiency	99.90%

CE RoHS

CAUTION:
- High Voltage,warning electric shock
- Keep the equipment well ventilated
- The capacitors store hazardous energy Do not touch while working !

Manufacturer:
Guangdong Felicity New Energy Co., Ltd
Address:
(KongGangBaiYun)No. 2, Donghua Huaye Road, Renhe Town, Baiyun Area, Guangzhou, Guangdong, P. R. CHINA

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T-REX-30KHP3G01

Product Type	Hybrid Inverter
Protection Degree	IP65
Overvoltage-category	DC II; AC III
Ambient Temperture	–25°C~60°C,>50°C Derating
Warranty	5 years
Battery Input Data	
Battery Voltage Range	160~800Vd.c.
Max. Charging Current	50+50(A)
Max. Discharging Current	50+50(A)
PV String Input Data	
Max. DC Input Power	39 kW
Max. DC Input Voltage	1000Vd.c.
Min. DC Input Voltage	150Vd.c.
MPPT Range	200~850Vd.c.
Full Load DC Voltage Range	360~850Vd.c.
PV Input Current	36+36+36(A)
Max. PV Isc	55+55+55(A)
AC Output Data	
Rated AC Output Power	30 kW
Max. AC Output Power	33 kW
AC Output Rated Current	43.5A
Max. AC Current	47.9A
Rated AC Voltage	220/380,230/400 Vac(-20%~+15%)
AC Wiring Mode	L1/L2/L3/N/PE
Rated AC Frequency	50 /60 Hz(45~55Hz/55~65Hz)
Power Factor	0.8(leading) to 0.8(lagging)
Efficiency	
Max. Efficiency	97.60%
Euro Efficiency	97.00%
MPPT Efficiency	99.90%

RoHS

CAUTION:
- High Voltage,warning electric shock
- Keep the equipment well ventilated
- The capacitors store hazardous energy Do not touch while working!

Manufacturer:
Guangdong Felicity New Energy Co., Ltd
Address:
(KongGangBaiYun)No. 2, Donghua Huaye Road, Renhe Town, Baiyun Area, Guangzhou, Guangdong, P. R. CHINA

FelicityESS™

T-REX-40KHP3G01

Product Type	Hybrid Inverter
Protection Degree	IP65
Overvoltage-category	DC II; AC III
Ambient Temperture	–25°C~60°C,>50°C Derating
Warranty	5 years
Battery Input Data	
Battery Voltage Range	160~800Vd.c.
Max. Charging Current	50+50(A)
Max. Discharging Current	50+50(A)
PV String Input Data	
Max. DC Input Power	52 kW
Max. DC Input Voltage	1000Vd.c.
Min. DC Input Voltage	150Vd.c.
MPPT Range	200~850Vd.c.
Full Load DC Voltage Range	360~850Vd.c.
PV Input Current	36+36+36+36(A)
Max. PV Isc	55+55+55+55(A)
AC Output Data	
Rated AC Output Power	40 kW
Max. AC Output Power	44 kW
AC Output Rated Current	58A
Max. AC Current	63.8A
Rated AC Voltage	220/380,230/400 Vac(-20%~+15%)
AC Wiring Mode	L1/L2/L3/N/PE
Rated AC Frequency	50 /60 Hz(45~55Hz/55~65Hz)
Power Factor	0.8(leading) to 0.8(lagging)
Efficiency	
Max. Efficiency	97.60%
Euro Efficiency	97.00%
MPPT Efficiency	99.90%

RoHS

CAUTION:
- High Voltage,warning electric shock
- Keep the equipment well ventilated
- The capacitors store hazardous energy Do not touch while working!

Manufacturer:
Guangdong Felicity New Energy Co., Ltd
Address:
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T-REX-50KHP3G01

Product Type	Hybrid Inverter
Protection Degree	IP65
Overvoltage-category	DC II; AC III
Ambient Temperture	–25°C~60°C,>50°C Derating
Warranty	5 years
Battery Input Data	
Battery Voltage Range	160~800Vd.c.
Max. Charging Current	50+50(A)
Max. Discharging Current	50+50(A)
PV String Input Data	
Max. DC Input Power	65 kW
Max. DC Input Voltage	1000Vd.c.
Min. DC Input Voltage	150Vd.c.
MPPT Range	200~850Vd.c.
Full Load DC Voltage Range	450~850Vd.c.
PV Input Current	36+36+36+36(A)
Max. PV Isc	55+55+55+55(A)
AC Output Data	
Rated AC Output Power	50 kW
Max. AC Output Power	55 kW
AC Output Rated Current	72.5 A
Max. AC Current	79.7 A
Rated AC Voltage	220/380,230/400 Vac(-20%~+15%)
AC Wiring Mode	L1/L2/L3/N/PE
Rated AC Frequency	50 /60 Hz(45~55Hz/55~65Hz)
Power Factor	0.8(leading) to 0.8(lagging)
Efficiency	
Max. Efficiency	97.60%
Euro Efficiency	97.00%
MPPT Efficiency	99.90%

RoHS

CAUTION:

- High Voltage,warning electric shock
- Keep the equipment well ventilated
- The capacitors store hazardous energy Do not touch while working!

Manufacturer:
Guangdong Felicity New Energy Co., Ltd
Address:
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General product information:

Hybrid inverter

358-S010005-02

FelicityESS™

USER GUIDE

T-REX-50KHP3G01
T-REX-40KHP3G01
T-REX-30KHP3G01
T-REX-29K9HP3G01
T-REX-25KHP3G01



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Appendix

Model	T-REX -50KHP3G01	T-REX -40KHP3G01	T-REX -30KHP3G01	T-REX -29K9HP3G01	T-REX -25KHP3G01
Battery Input Data					
Battery Type	LFP (LiFePO4)				
Battery Voltage Range	160~800Vd.c.				
Max. Charging Current	50+50(A)				
Max. Discharging Current	50+50(A)				
Number of battery input	2				
PV String Input Data					
Max. DC Input Power	65 kW	52 kW	39 kW	38. 87 kW	32. 5 kW
Max. DC Input Voltage	1000Vd.c.				
Min. DC Input Voltage	150Vd.c.				
Start-up Voltage	250Vd.c.				
Rated DC Input Voltage	600Vd.c.				
MPPT Range	200~850Vd.c.				
Full Load DC Voltage Range	450~850Vd.c.	360~850Vd.c.	360~850Vd.c.	360~850Vd.c.	450~850Vd.c.
PV Input Current	36+36+36+36(A)		36+36+36(A)		36+36(A)
Max. PV Isc	55+55+55+55(A)		55+55+55(A)		55+55(A)
No.of MPP Trackers	4		3		2
No.of Strings per MPP Tracker	2		2		2
AC Output Data					
Rated AC Output Power	50 kW	40 kW	30 kW	29. 9 kW	25 kW
Max. AC Output Power	55 kW	44 kW	33 kW	29. 9 kW	27. 5 kW
AC Output Rated Current	72.5 A	58 A	43. 5 A	43. 4 A	36.3 A
Max. AC Current	79.7 A	63.8 A	47. 9A	43. 4 A	39.9 A
Rated AC Voltage	220/380,230/400 Vac (-20%~+15%)				
AC Wiring Mode	3W+N+PE				
Rated AC Frequency	50 /60 Hz (45~55Hz/55~65Hz)				
THDI	<3% (At Rated Power)				
Power Factor	0.8(leading) to 0.8(lagging)				
Efficiency					
Max. Efficiency	97.60%				
Euro Efficiency	97.00%				
MPPT Efficiency	99.90%				

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Protection	
PV Input Lightning Protection	Integrated
PV String Input Reverse Polarity Protection	Integrated
Battery Input Lightning Protection	Integrated
Battery Input Reverse Polarity Protection	Integrated
Insulation Resistor Detection	Integrated
Residual Current Monitoring Unit	Integrated
Output Over Current Protection	Integrated
Output Shorted Protection	Integrated
Output Over Voltage Protection	Integrated
Anti-islanding Protection	Integrated
AC Output Lightning Protection	Integrated
Certification and Standards	
Grid Regulation	NRS 097-2-1,VDE4105,EN50549-1,AS 4777.2, G99/1,CEI 0-21,NC.RFG
Safety EMC / Standard	IEC/EN 61000-6-1/2/3/4,IEC/EN 62109-1,IEC/EN 62109-2
General Data	
Net Weight	85.6KG
Gross Weight	98.4KG
Product Dimension	940*582*340mm
Package Dimension	1110*770*463mm
Protection Degree	IP65
Operating Temperature Range	-25 to 60 ℃ (> 50 ℃ derating)
Humidity	0 ~ 95 % (No condensation)
Cooling	Smart cooling
Altitude	3000 m (> 2000 m derating)
Communication with BMS	RS485,CAN
Monitor module	WiFi/GPRS
Installation Style	Wall-mounted
Warranty[1]	10 years
[1]Conditions apply, refer to FelicityESS Warranty policy.	

Description of the power circuit:

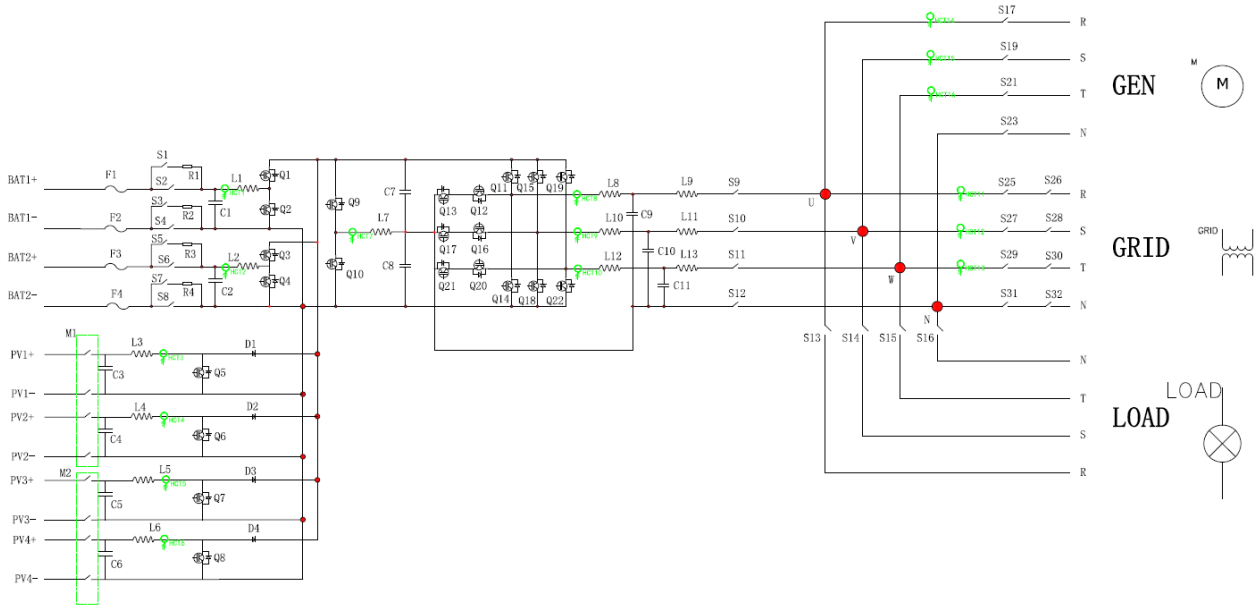


Figure 3 – Block Diagram

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Differences of the models:

The PGUs including model T-REX-25KHP3G01, T-REX-29K9HP3G01, T-REX-30KHP3G01, T-REX-40KHP3G01 and T-REX-50KHP3G01. All the models use the same control unit, control system, software, and similar hardware platform. The different powers are realized by software derating. The model T-REX-25KHP3G01 is equipped with two DC inputs and with two MPP trackers. The models T-REX-29K9HP3G01 and T-REX-30KHP3G01 are equipped with two DC inputs and with three MPP trackers. The models T-REX-40KHP3G01 and T-REX-50KHP3G01 are equipped with two DC inputs and with four MPP trackers.

The product was tested on:

Model:	T-REX-50KHP3G01	Serial number:	10020200824350074



Hardware version: V100

Master DSP Software (FW) version: V201
Slave DSP Software (FW) version: V101

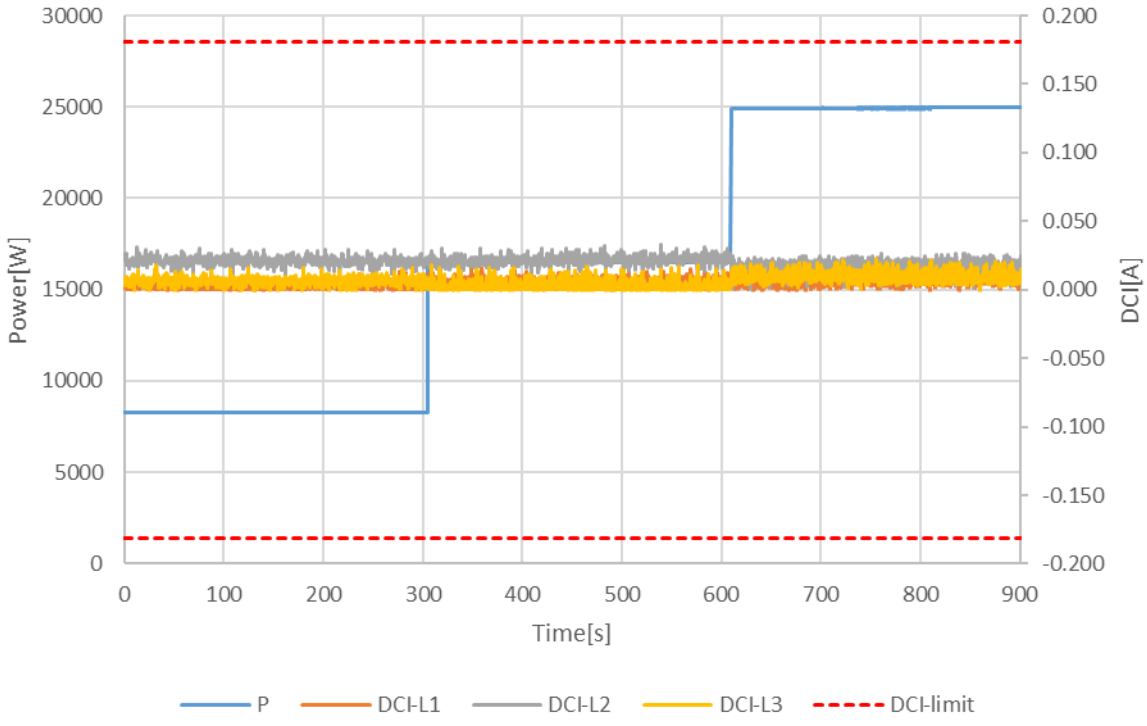
All tests were performed on T-REX-50KHP3G01. Tests of the EUT of T-REX-50KHP3G01 not applicable for the models T-REX-25KHP3G01, T-REX-29K9HP3G01, T-REX-30KHP3G01 and T-REX-40KHP3G01 were performed on the concerned models and a statement is given at the relevant test.

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UNE 217002:2020		
Article	**Test**	**Result**
5. Technical Requirements		
4.1	**Direct Current Injection into the Grid**	**P**
4.2	**Generation of Overvoltages**	**P**
4.3	**Island Operation Detection**	**P**
4.4	**Voltage and Frequency Disconnection**	**P**
4.5	**Power factor fixed**	**P**

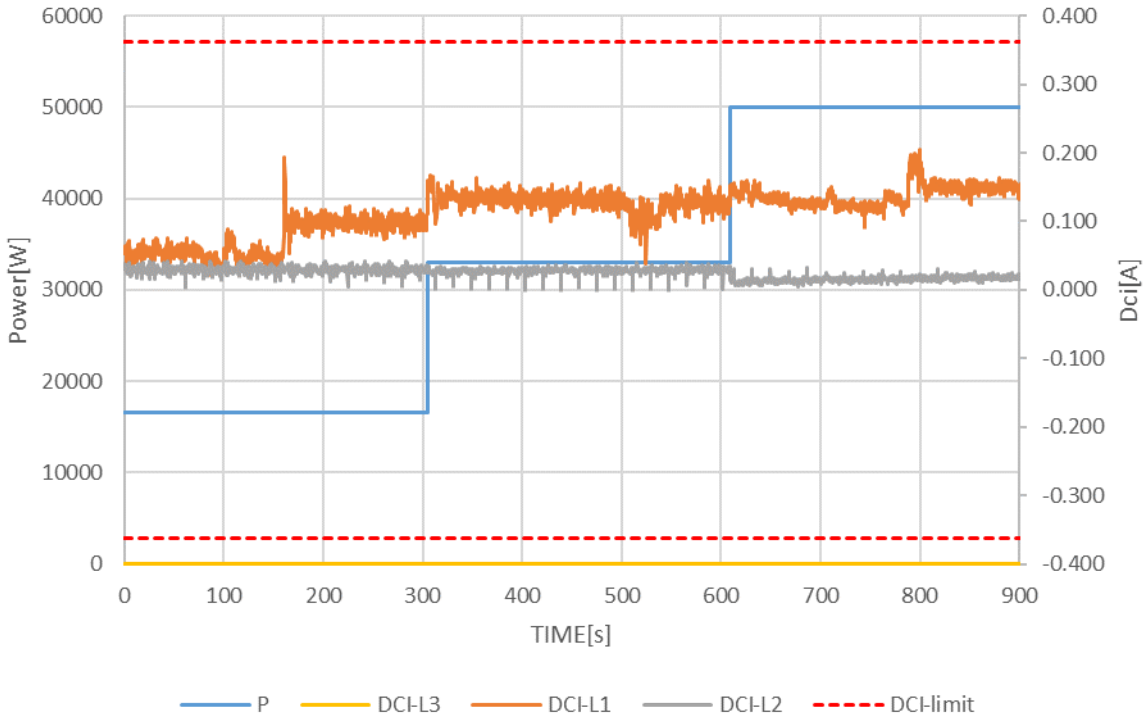
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4.1 Direct current injection into grid			P
Model: T-REX-25KHP3G01			
Test result:			
Power Level	33%	66%	100%
Watt(kW)	8,285	16,460	24,944
Vrms(V)	229,97	230,06	230,15
Arms(A)	12,025	23,857	36,135
PF	0,9997	1,0000	1,0000
Cosφ	0,9997	1,0000	1,0000
Idc (mA)	31	33	30
DC (%)	0,086	0,091	0,082



Model: T-REX-50KHP3G01			
Test result:			
Power Level	33%	66%	100%
Watt(kW)	16,544	32,973	49,967
Vrms(V)	230,06	230,24	230,40
Arms(A)	23,980	47,746	72,303
PF	0,9999	1,0000	1,0000
Cosφ	0,9999	1,0000	1,0000
Idc (mA)	194	167	204
DC (%)	0,268	0,230	0,282

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Note:
Test method refer UNE 217002:2020 4.1 & TED/749/2020 Anexo I clause 5.3
The investor must ensure that the direct current injected into the network does not exceed the limit value 0,5% of IAC;nom
Established by the implementing regulations.
For this purpose, the following test should be performed:
1) connect the generator to a grid whose dc voltage component is negligible to the Measurement effects, for example by separating other loads from the network with a separator transformer.
2) set the output power of the generator to an output power between 25% and 100% of its rated power.
3) wait the necessary time until the internal temperature of the generator reaches the regime Stationary (temperature variation less than 2 ° c in 15 min).
4) measure the value of the continuous component injected by the equipment into the network. The test is considered valid if the dc component, measured in an al window Less than 10 s, meets the applicable conformity requirements.
The tests had been performed on the T-REX-25KHP3G01 and T-REX-50KHP3G01 are valid for the T-REX-29K9HP3G01, T-REX-30KHP3G01 and T-REX-40KHP3G01 since it is almost same as in hardware and just power derated by software.

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4.2 Overvoltage Generation										**P**
Test: T-REX-50KHP3G01										
Duration (s)	Measured voltage(V)									Limit (Voltage)
	100+/-5% Output Power (VA) Test 1			100+/-5% Output Power (VA) Test 2			100+/-5% Output Power (VA) Test 3			
	L-N	L2-N	L3-N	L1-N	L2-N	L3-N	L1-N	L2-N	L3-N	
0,0002	6	-269	262	7	-256	247	7	-255	247	±910V
0,0006	5	-44	52	6	5	34	5	-1	33	±710V
0,002	6	-6	1	2	-5	-1	3	-7	-2	±580V
0,006	0	3	0	0	3	0	1	3	0	±470V
0,02	313	273	-353	299	287	-356	274	282	-369	±420V
0,06	286	249	-318	273	262	-321	250	257	-334	±390V
0,2	199	174	-205	190	182	-207	173	178	-217	±390V
0,6	73	65	-2	70	67	-57	63	64	-62	±390V

Note:

Test method refer UNE 217002:2020 4.2 & TED/749/2020 Anexo I clause 2.3.6.
The inverter must not generate surges in its alternating connection, complying with the limits. That the overvoltage limits are met admissible established in ITC-BT-40.
If the LV/HV step-up transformer the overvoltage limits are met admissible established in ITC-RAT-09.
1) The load initially connected to the network and generator set will be greater than 50% of the assigned power of the generator with a mains voltage between ±5% of its face value.
2) Open the S switch and disconnect the initial load so that it is connected to the generator a linear residual load that may not exceed 0.1% of the maximum output power of the generator.

3) Record the voltages at the output terminals of the generator, or of the transformer in the case of generators , from the moment of disconnection, with an sampling frequency of at least 10 kHz.

The tests had been performed on the T-REX-50KHP3G01 are valid for the T-REX-25KHP3G01, T-REX-29K9HP3G01, T-REX-30KHP3G01 and T-REX-40KHP3G01 since it is almost same as in hardware and just power derated by software.

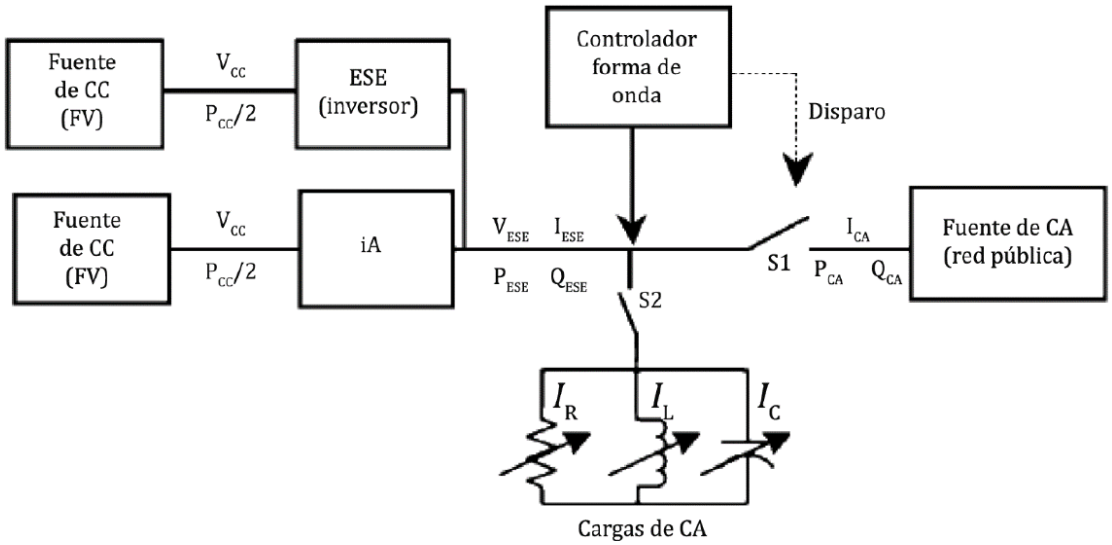
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4.3 Island Operation Detection	P

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



Note:
Test 1: Both inverters are feeding in parallel with Anti-Islanding detection activated.
Test 2: Both inverters are feeding in parallel with Anti-Islanding detection activated for the first inverter and Anti-Islanding detection deactivated for the second inverter.
Each inverter is generating 50% of the required test-bin.
The testing is based on EN 62116:2014.

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4.3 Islanding protection according table 6 - Load imbalance (real, reactive load) for test condition A (EUT ouput = 100%)	**P**

TEST 1

Test conditions	Frequency: 50+/-0,1Hz U_N=230+/-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) [% of nominal]	Q_{AC} 3) [% of nominal]	P_{EUT} [W]	V_{DC} [V]	Q_f [1]	Run on Time [ms]	Remarks5)
1	100	100	0	0	50000	650	1,000	547	BL
32	100	100	-10	-10	50000	650	1,052	167	IB
33	100	100	-10	-5	50000	650	1,080	200	IB
34	100	100	-10	0	50000	650	1,107	256	IB
35	100	100	-10	+5	50000	650	1,136	176	IB
36	100	100	-10	+10	50000	650	1,162	119	IB
37	100	100	-5	-10	50000	650	0,999	144	IB
4	100	100	-5	-5	50000	650	1,025	212	IB
5	100	100	-5	0	50000	650	1,051	286	IB
6	100	100	-5	+5	50000	650	1,079	265	IB
38	100	100	-5	+10	50000	650	1,103	173	IB
39	100	100	0	-10	50000	650	0,951	244	IB
7	100	100	0	-5	50000	650	0,976	392	IB
8	100	100	0	+5	50000	650	1,027	262	IB
40	100	100	0	+10	50000	650	1,050	202	IB
41	100	100	+5	-10	50000	650	0,902	156	IB
9	100	100	+5	-5	50000	650	0,925	252	IB
10	100	100	+5	0	50000	650	0,949	310	IB
11	100	100	+5	+5	50000	650	0,974	268	IB
42	100	100	+5	+10	50000	650	0,996	187	IB
43	100	100	+10	-10	50000	650	0,862	80	IB
44	100	100	+10	-5	50000	650	0,885	208	IB
45	100	100	+10	0	50000	650	0,907	221	IB
46	100	100	+10	+5	50000	650	0,931	177	IB

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47	100	100	+10	+10	50000	650	0,952	153	IB

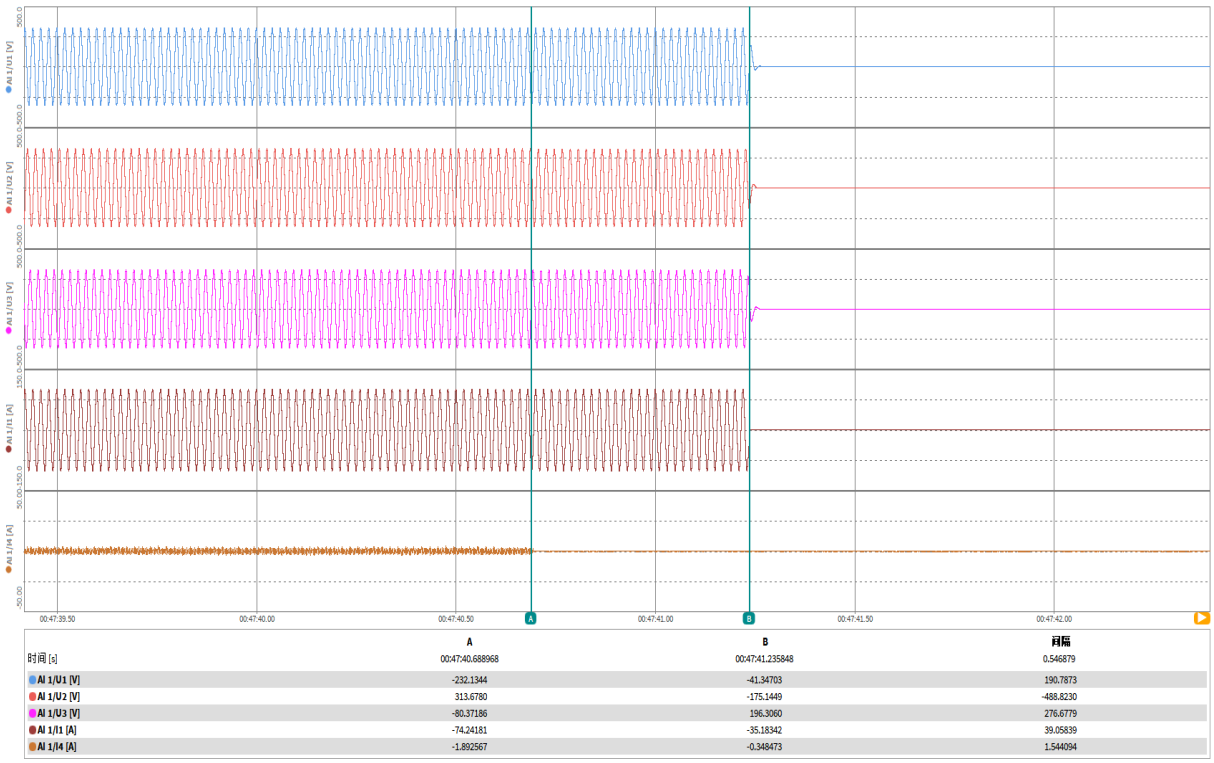
Fundamental of I_{AC} [4] at P_{AC} 0% and Q_{AC} 0% (mA)	L1:96/L2:168/L3:129						
Parameter at 0% per phase	L=	10,14	mH	R=	3,19	Ω	C= 998,86 µF

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 PEUT = 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.
The tests had been performed on the T-REX-50KHP3G01 are valid for the T-REX-25KHP3G01, T-REX-29K9HP3G01, T-REX-30KHP3G01 and T-REX-40KHP3G01 since it is almost same as in hardware and just power derated by software.

Disconnection at No. 1



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4.3 Islanding protection according Table 7 – Load imbalance (reactive load) for test condition B (EUT output = 50 % – 66 %)	**P**

Test conditions	Frequency: 50+/-0,1Hz U_N=230+/-3Vac Distortion factor of chokes < 2% Quality =1
Disconnection limit	2s (IEC 62116)

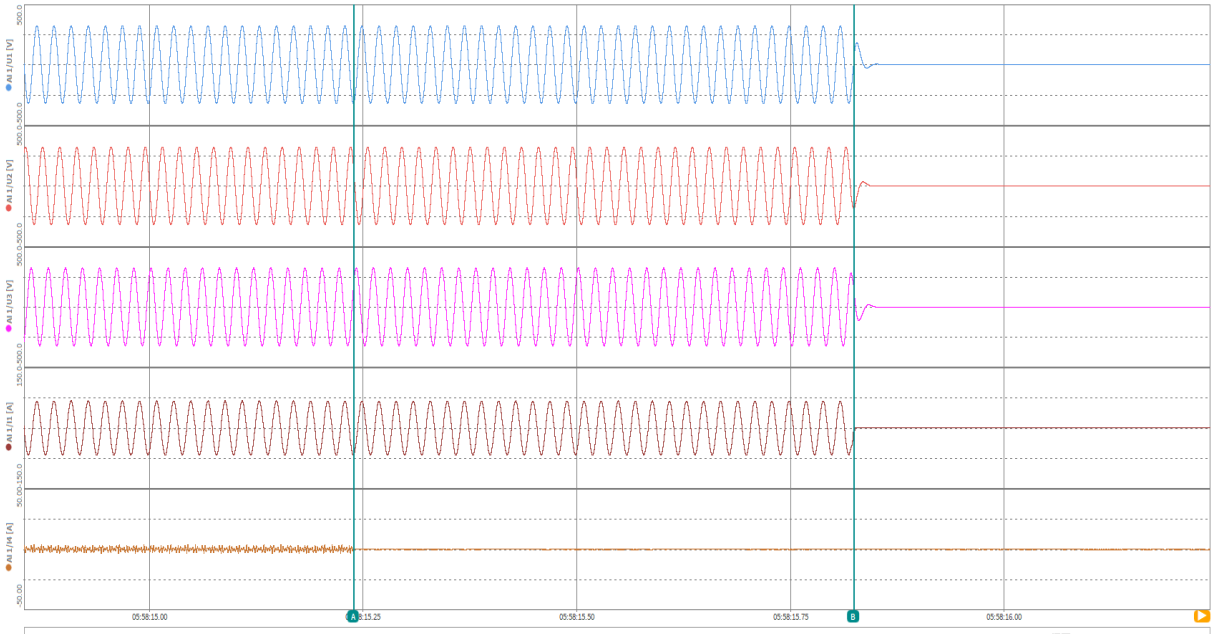
No.	P_{EUT} 1) [% of EUT rating]	Reactive load [% of Q_L in 6.1.d) 1]	P_{AC} 2) [% of nominal]	Q_{AC} 3) [% of nominal]	P_{EUT} [W]	V_{DC} [V]	Q_f [1]	Run on Time [ms]	Remarks5)
12	66	66	0	-5	33000	550	0,972	133	IB
13	66	66	0	-4	33000	550	0,977	189	IB
14	66	66	0	-3	33000	550	0,986	231	IB
15	66	66	0	-2	33000	550	0,991	249	IB
16	66	66	0	-1	33000	550	0,995	348	IB
2	66	66	0	0	33000	550	1,000	585	BL
17	66	66	0	1	33000	550	1,005	369	IB
18	66	66	0	2	33000	550	1,009	326	IB
19	66	66	0	3	33000	550	1,014	200	IB
20	66	66	0	4	33000	550	1,018	143	IB
21	66	66	0	5	33000	550	1,022	120	IB

Fundamental of I_{AC} at P_{AC} 0% and Q_{AC} 0% (mA)	L1:316/L2:166/L3:276		
Parameter at 0% per phase	L= 15,31 mH	R= 4,81 Ω	C= 661,89 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,
5) 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 % of maximum
EUT input voltage 6) = 50 % of rated input voltage range, ±10 %
6) Based on EUT rated input operating range, For example, If range is between X volts and Y volts, 50 % 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.
The tests had been performed on the T-REX-50KHP3G01 are valid for the T-REX-25KHP3G01, T-REX-29K9HP3G01, T-REX-30KHP3G01 and T-REX-40KHP3G01 since it is almost same as in hardware and just power derated by software.

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Disconnection at No. 2



时间 [s]	A 05:58:15.239201	B 05:58:15.823905	间隔 0.584704
AI 1/U1 [V]	-324.9016	25.52557	350.4272
AI 1/U2 [V]	151.7911	-185.1990	-336.9901
AI 1/U3 [V]	172.7169	162.2121	-10.50472
AI 1/I1 [A]	-67.81400	-8.478460	59.33554
AI 1/I4 [A]	0.014806	0.159001	0.144196

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4.3 Islanding protection according Table 7 – Load imbalance (reactive load) for test condition C (EUT output = 25 % – 33 %)	**P**

Test conditions	Frequency: 50+/-0,1Hz U_N=230+/-3Vac Distortion factor of chokes < 2% Quality =1
Disconnection limit	2s (IEC 62116)

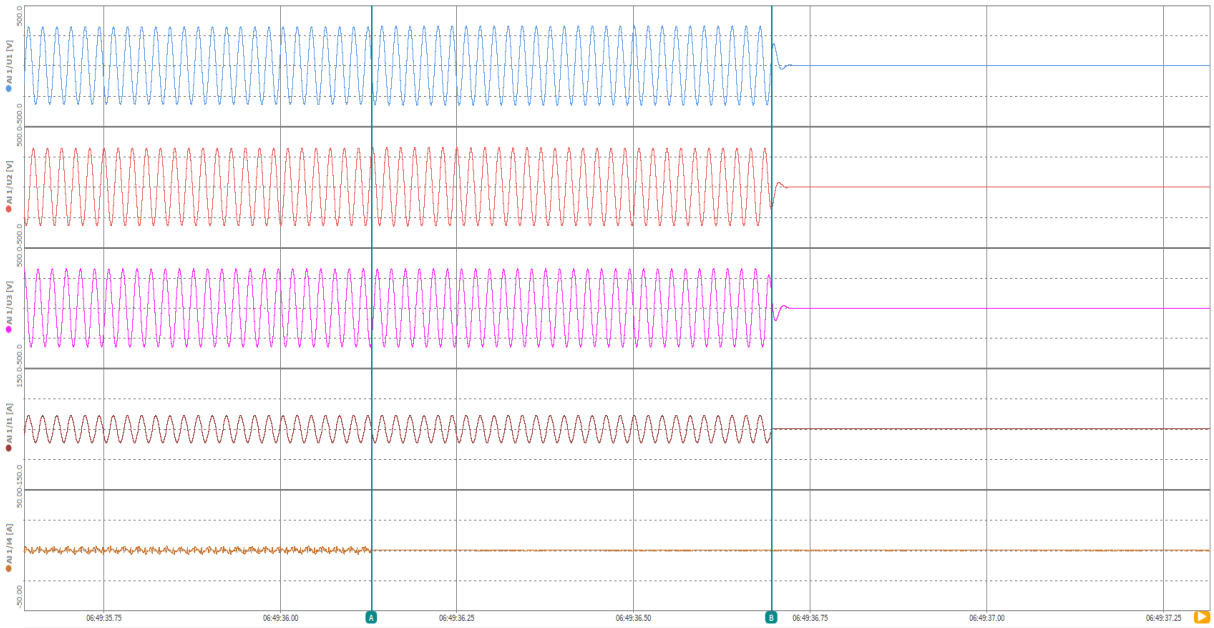
No.	P_{EUT} [1] [% of EUT rating]	Reactive load [% of Q_L in 6.1.d) 1]	P_{AC} [2] [% of nominal]	Q_{AC} [3] [% of nominal]	P_{EUT} [W]	V_{DC} [V]	Q_f [1]	Run on Time [ms]	Remarks[5]
22	33	33	0	-5	16500	320	0,972	113	IB
23	33	33	0	-4	16500	320	0,982	144	IB
24	33	33	0	-3	16500	320	0,982	220	IB
25	33	33	0	-2	16500	320	0,991	311	IB
26	33	33	0	-1	16500	320	0,991	348	IB
3	33	33	0	0	16500	320	1,000	566	BL
27	33	33	0	1	16500	320	1,009	434	IB
28	33	33	0	2	16500	320	1,009	235	IB
29	33	33	0	3	16500	320	1,018	179	IB
30	33	33	0	4	16500	320	1,018	150	IB
31	33	33	0	5	16500	320	1,027	105	IB

Fundamental of I_{AC} at P_{AC} 0% and Q_{AC} 0% (mA)	L1:133/L2:234/L3:248		
Parameter at 0% per phase	L= 90,53 mH	R= 27,55 Ω	C= 115,53 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 PEUT = 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.
The tests had been performed on the T-REX-50KHP3G01 are valid for the T-REX-25KHP3G01, T-REX-29K9HP3G01, T-REX-30KHP3G01 and T-REX-40KHP3G01 since it is almost same as in hardware and just power derated by software.

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Disconnection at No. 3



	A	B	间隔
时间 [s]	06:49:36.129980	06:49:36.695780	0.565800
AI 1/U1 [V]	-55.40681	102.6850	158.0918
AI 1/U2 [V]	306.0513	-190.6276	-496.6789
AI 1/U3 [V]	-247.8950	97.81862	345.7136
AI 1/I1 [A]	-6.243116	-1.598612	4.644504
AI 1/I4 [A]	-0.053215	-0.350833	-0.297618

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4.3 Islanding protection according table 6 - Load imbalance (real, reactive load) for test condition A (EUT ouput = 100%)	**P**

TEST 2

Test conditions	Frequency: 50+/-0,1Hz U_N=230+/-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) [% of nominal]	Q_{AC} 3) [% of nominal]	P_{EUT} [W]	V_{DC} [V]	Q_f [1]	Run on Time [ms]	Remarks5)
1	100	100	0	0	50000	650	1,000	370	BL
32	100	100	-10	-10	50000	650	1,052	123	IB
33	100	100	-10	-5	50000	650	1,080	132	IB
34	100	100	-10	0	50000	650	1,107	145	IB
35	100	100	-10	+5	50000	650	1,136	129	IB
36	100	100	-10	+10	50000	650	1,162	88	IB
37	100	100	-5	-10	50000	650	0,999	119	IB
4	100	100	-5	-5	50000	650	1,025	139	IB
5	100	100	-5	0	50000	650	1,051	284	IB
6	100	100	-5	+5	50000	650	1,079	138	IB
38	100	100	-5	+10	50000	650	1,103	79	IB
39	100	100	0	-10	50000	650	0,951	109	IB
7	100	100	0	-5	50000	650	0,970	124	IB
8	100	100	0	+5	50000	650	1,024	126	IB
40	100	100	0	+10	50000	650	1,050	109	IB
41	100	100	+5	-10	50000	650	0,902	83	IB
9	100	100	+5	-5	50000	650	0,925	140	IB
10	100	100	+5	0	50000	650	0,949	228	IB
11	100	100	+5	+5	50000	650	0,974	142	IB
42	100	100	+5	+10	50000	650	1,002	127	IB
43	100	100	+10	-10	50000	650	0,862	133	IB
44	100	100	+10	-5	50000	650	0,890	171	IB
45	100	100	+10	0	50000	650	0,907	212	IB
46	100	100	+10	+5	50000	650	0,931	141	IB

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47	100	100	+10	+10	50000	650	0,958	82	IB

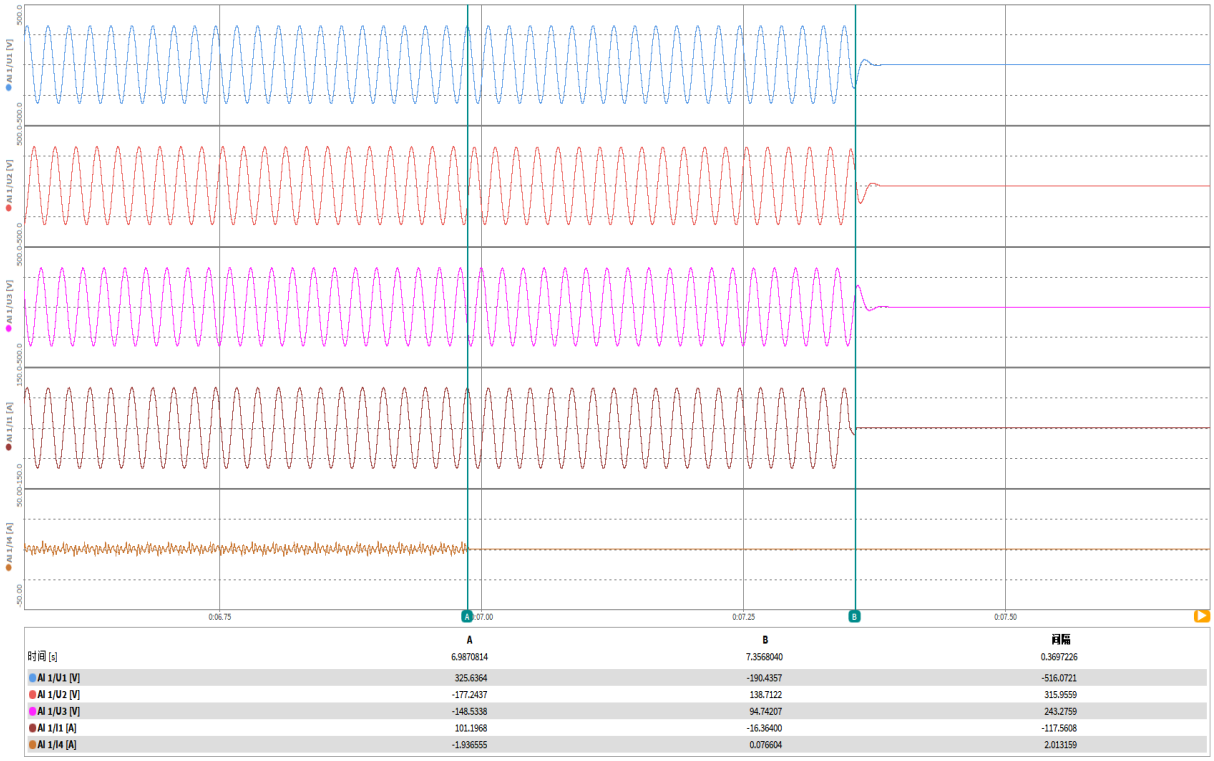
Fundamental of I_{AC} at P_{AC} 0% and Q_{AC} 0% (mA)	L1:827/L2:82/L3:288				
Parameter at 0% per phase	L=	10,14 mH	R=	3,19 Ω	C= 998,86 µF

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 PEUT = 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.
The tests had been performed on the T-REX-50KHP3G01 are valid for the T-REX-25KHP3G01, T-REX-29K9HP3G01, T-REX-30KHP3G01 and T-REX-40KHP3G01 since it is almost same as in hardware and just power derated by software.

Disconnection at No. 1



时间 [s]	A 6.9870814	B 7.3568040	间隔 0.3697226
AI 1/U1 [V]	325.6364	-190.4357	-516.0721
AI 1/U2 [V]	-177.2437	138.7122	315.9559
AI 1/U3 [V]	-148.5338	94.74207	243.2759
AI 1/I1 [A]	101.1968	-16.36400	-117.5608
AI 1/I4 [A]	-1.936555	0.076604	2.013159

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4.3 Islanding protection according Table 7 – Load imbalance (reactive load) for test condition B (EUT output = 50 % – 66 %)	**P**

Test conditions	Frequency: 50+/-0,1Hz U_N=230+/-3Vac Distortion factor of chokes < 2% Quality =1
Disconnection limit	2s (IEC 62116)

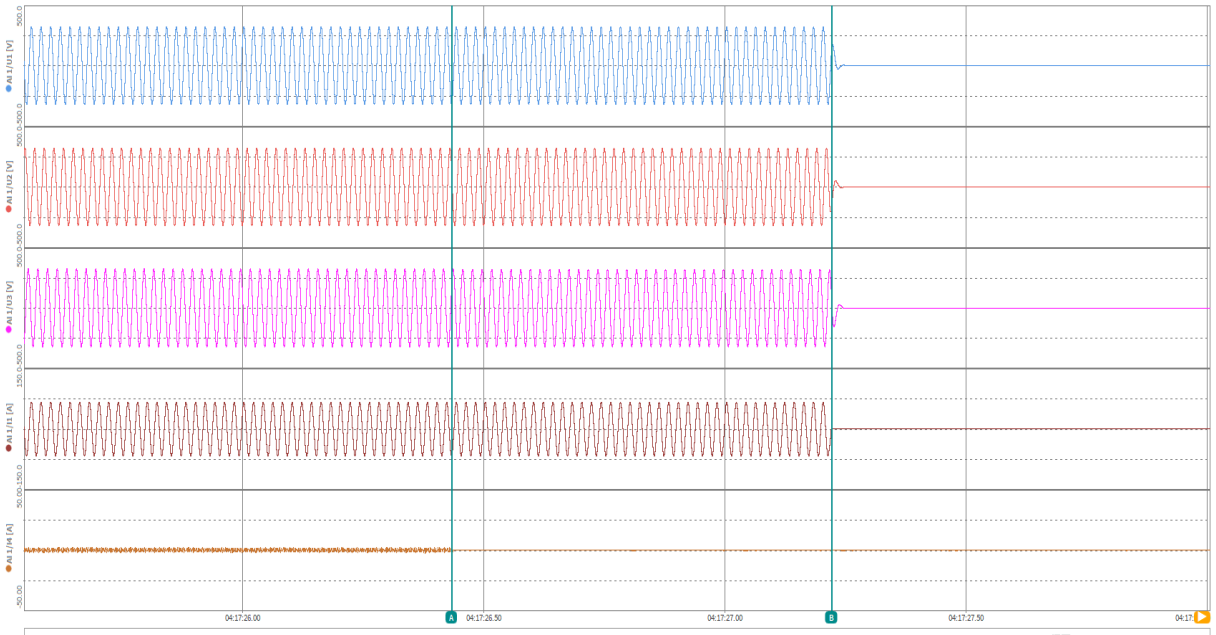
No.	P_{EUT} 1) [% of EUT rating]	Reactive load [% of Q_L in 6.1.d) 1]	P_{AC} 2) [% of nominal]	Q_{AC} 3) [% of nominal]	P_{EUT} [W]	V_{DC} [V]	Q_f [1]	Run on Time [ms]	Remarks5)
12	66	66	0	-5	33000	500	0,972	73	IB
13	66	66	0	-4	33000	500	0,982	111	IB
14	66	66	0	-3	33000	500	0,986	135	IB
15	66	66	0	-2	33000	500	0,991	212	IB
16	66	66	0	-1	33000	500	0,995	262	IB
2	66	66	0	0	33000	500	1,000	787	BL
17	66	66	0	1	33000	500	1,005	252	IB
18	66	66	0	2	33000	500	1,009	205	IB
19	66	66	0	3	33000	500	1,014	182	IB
20	66	66	0	4	33000	500	1,018	69	IB
21	66	66	0	5	33000	500	1,022	58	IB

Fundamental of I_{AC} at P_{AC} 0% and Q_{AC} 0% (mA)	L1:167/L2:127/L3:108		
Parameter at 0% per phase	L= 15,31 mH	R= 4,81 Ω	C= 661,89 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,
5) 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 % of maximum
EUT input voltage 6) = 50 % of rated input voltage range, ±10 %
6) Based on EUT rated input operating range, For example, If range is between X volts and Y volts, 50 % 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.
The tests had been performed on the T-REX-50KHP3G01 are valid for the T-REX-25KHP3G01, T-REX-29K9HP3G01, T-REX-30KHP3G01 and T-REX-40KHP3G01 since it is almost same as in hardware and just power derated by software.

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Disconnection at No. 2



时间 [s]	A 04:17:26.434598	B 04:17:27.221464	间隔 0.786866
AI 1/U1 [V]	-322.6314	150.3856	473.0170
AI 1/U2 [V]	122.6499	-176.8136	-299.4635
AI 1/U3 [V]	199.9383	69.92388	-130.0144
AI 1/I1 [A]	-66.56398	-0.186104	66.37787
AI 1/I4 [A]	-0.205779	-7.081e-3	0.198698

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4.3 Islanding protection according Table 7 – Load imbalance (reactive load) for test condition C (EUT output = 25 % – 33 %)	**P**

Test conditions	Frequency: 50+/-0,1Hz U_N=230+/-3Vac Distortion factor of chokes < 2% Quality =1
Disconnection limit	2s (IEC 62116)

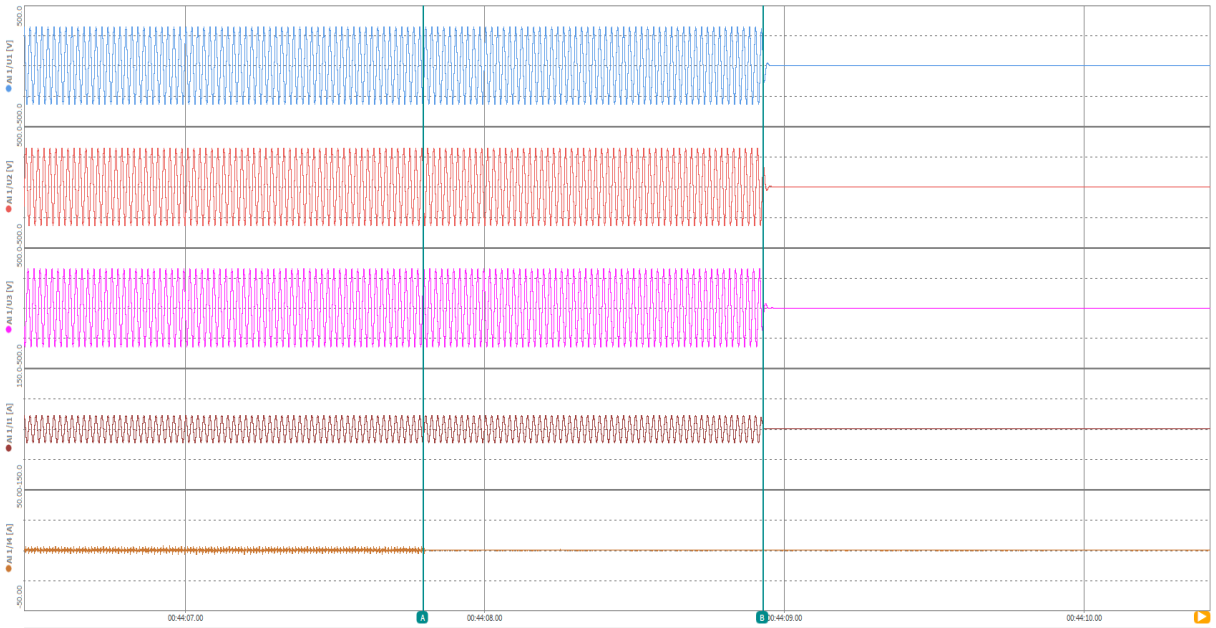
No.	P_{EUT} [1] [% of EUT rating]	Reactive load [% of Q_L in 6.1.d) 1]	P_{AC} [2] [% of nominal]	Q_{AC} [3] [% of nominal]	P_{EUT} [W]	V_{DC} [V]	Q_f [1]	Run on Time [ms]	Remarks[5]
22	33	33	0	-5	16500	320	0,972	100	IB
23	33	33	0	-4	16500	320	0,982	142	IB
24	33	33	0	-3	16500	320	0,982	179	IB
25	33	33	0	-2	16500	320	0,991	206	IB
26	33	33	0	-1	16500	320	0,991	314	IB
3	33	33	0	0	16500	320	1,000	1134	BL
27	33	33	0	1	16500	320	1,009	293	IB
28	33	33	0	2	16500	320	1,009	227	IB
29	33	33	0	3	16500	320	1,018	177	IB
30	33	33	0	4	16500	320	1,018	149	IB
31	33	33	0	5	16500	320	1,027	67	IB

Fundamental of I_{AC} at P_{AC} 0% and Q_{AC} 0% (mA)	L1:136/L2:202/L3:62		
Parameter at 0% per phase	L= 15,31 mH	R= 4,81 Ω	C= 661,89 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 PEUT = 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.
The tests had been performed on the T-REX-50KHP3G01 are valid for the T-REX-25KHP3G01, T-REX-29K9HP3G01, T-REX-30KHP3G01 and T-REX-40KHP3G01 since it is almost same as in hardware and just power derated by software.

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Disconnection at No. 3



	A	B	间隔
时间 [s]	00:44:07.794408	00:44:08.928018	1.133609
AI 1/U1 [V]	-323.2446	113.2100	436.4546
AI 1/U2 [V]	192.4272	101.0187	-91.40850
AI 1/U3 [V]	129.9405	-179.9989	-309.9394
AI 1/I1 [A]	-33.52959	12.07115	45.60075
AI 1/I4 [A]	0.550175	-0.162435	-0.712609

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4.4 Voltage and Frequency Disconnection	P

4.4.1 Voltage Monitoring L1 Phase

Test conditions:	Udc=650 Vdc Idc=77,00 Adc Pac=50000 W fac=50,00 Hz

	under voltage				over voltage (stage 1)			
Parameter	Voltage	Time			Voltage	Time		
Limit	**195,5 V**	**<= 1500 ms***			**253,0 V**	**<= 1500 ms**		
Trip value[V]	200,5 to 190,5	195,5	195,5	195,5	248,0 to 258,0	253,0	253,0	253,0
Disconnection time[ms]:	230 to 190,5	1456	1458	1455	230 to 258,0	1476	1459	1478
Reconnection time[s]:	**>=180 s**	195			**>=180 s**	194		

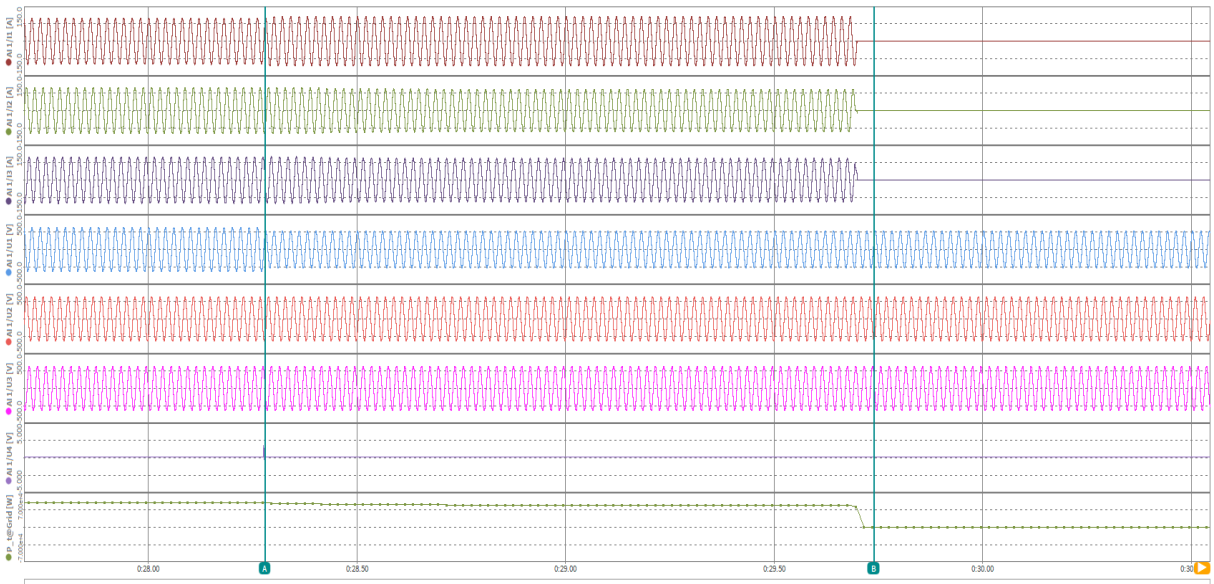
	over voltage (stage 2)			
Parameter	Voltage	Time (ms)		
Limit	**264,5 V**	**<= 200 ms**		
Trip value[V]	248,0 to 269,5	264,4	264,6	264,5
Disconnection time[ms]:	230 to 269,5	158	159	159
Reconnection time[s]:	**>=180 s**	194		

Note:
The test is based on the limits of TED/749:2020, RD647:2020.
The maximum and minimum voltage connection protection must be set to Un +10% (stage 1), Un +15% (stage 2) and Un -15%. The accuracy for the voltage measurement must be in a range of +/-2,3V (1% $U_{nom.}$).

* In case of facilities required to meet performance requirements against voltage sags. The time performance should be equal to 1,5 s.
The tests had been performed on the T-REX-50KHP3G01 are valid for the T-REX-25KHP3G01, T-REX-29K9HP3G01, T-REX-30KHP3G01 and T-REX-40KHP3G01 since it is almost same as in hardware and just power derated by software.

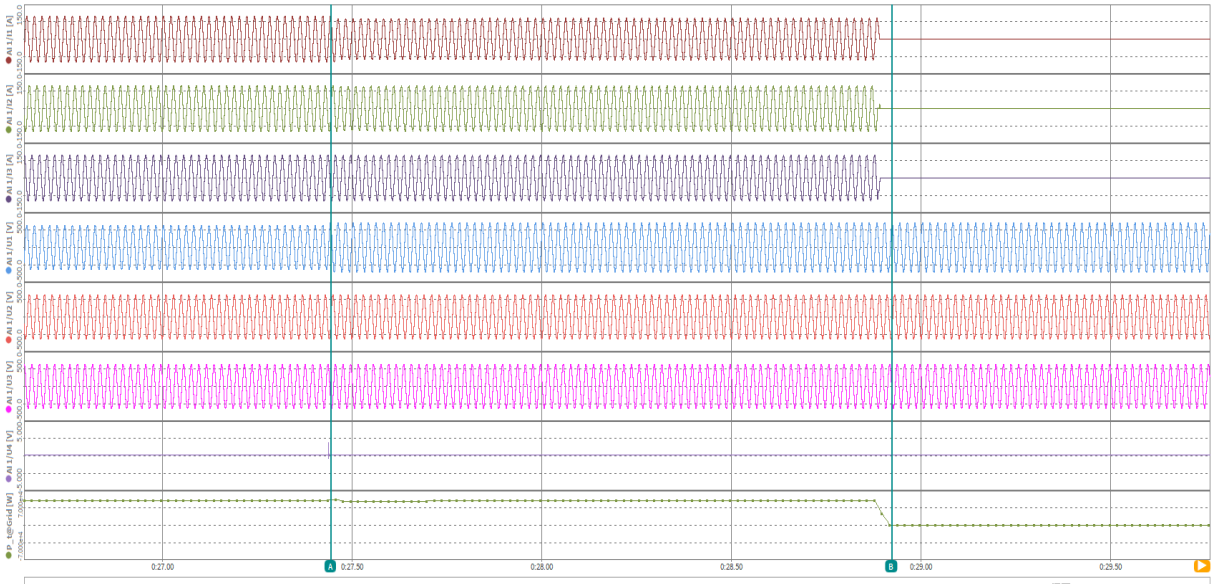
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under voltage:



时间 [s]	A 0:28.281172	B 0:29.739396	间隔 1.458224
AI 1/I1 [A]	73.98272	-0.570178	-74.55290
AI 1/I2 [A]	-98.71772	-5.216e-3	98.71251
AI 1/I3 [A]	28.00861	-2.528e-3	-28.01114
AI 1/U1 [V]	188.8464	53.73979	-135.1066
AI 1/U2 [V]	-315.0468	-307.7705	7.276297
AI 1/U3 [V]	87.89993	242.5795	154.6795
AI 1/U4 [V]	0.154257	0.157118	2.861e-3
P_t@Grid [W]	50037.60	-0.013347	-50037.61

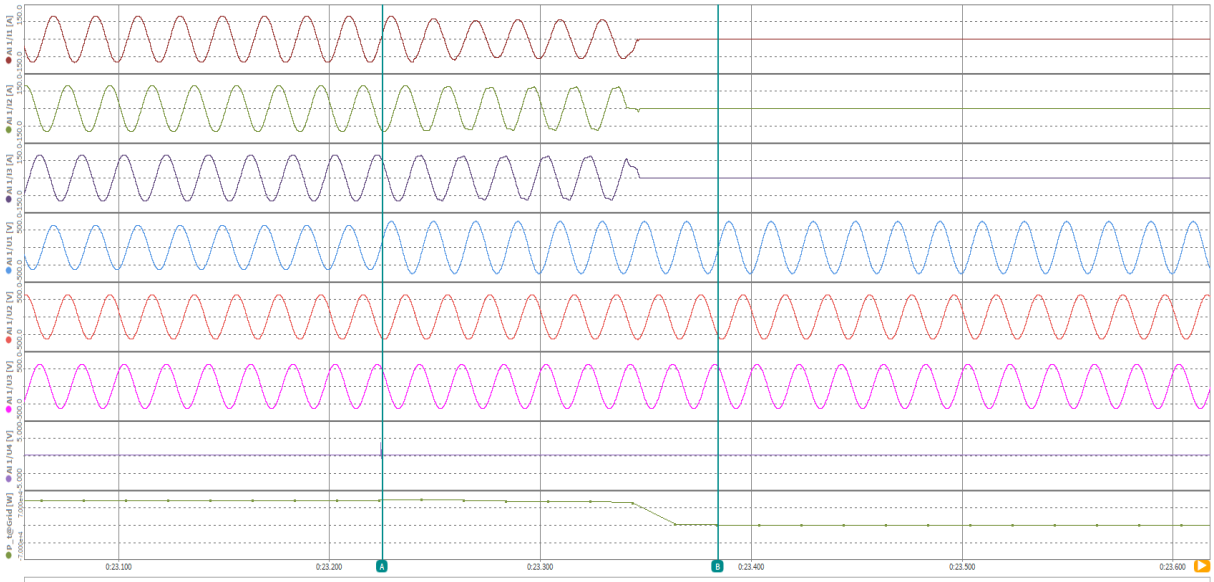
over voltage (stage 1):



时间 [s]	A 0:27.444247	B 0:28.922366	间隔 1.478120
AI 1/I1 [A]	100.2317	-0.015616	-100.2473
AI 1/I2 [A]	-61.95096	-6.347e-3	61.94461
AI 1/I3 [A]	-40.41613	-0.015830	40.40030
AI 1/U1 [V]	361.2190	269.4609	-91.75802
AI 1/U2 [V]	-198.2484	-309.0022	-110.7538
AI 1/U3 [V]	-124.5127	68.05420	192.5669
AI 1/U4 [V]	0.151873	0.152111	2.384e-4
P_t@Grid [W]	49955.57	-0.072616	-49955.64

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over voltage (stage 2):



	A	B	间隔
时间 [s]	0:23.2251776	0:23.3842145	0.1590369
AI 1/I1 [A]	24.97018	-4.172e-3	-24.97435
AI 1/I2 [A]	-98.59527	-2.189e-3	98.59308
AI 1/I3 [A]	72.06470	8.515e-3	-72.05619
AI 1/U1 [V]	106.2231	-2.327681	-108.5508
AI 1/U2 [V]	-315.8364	-279.9392	35.89726
AI 1/U3 [V]	225.2190	281.8146	56.59557
AI 1/U4 [V]	0.188112	0.152111	-0.036001
P_t@Grid [W]	49982.66	-4.018501	-49986.68

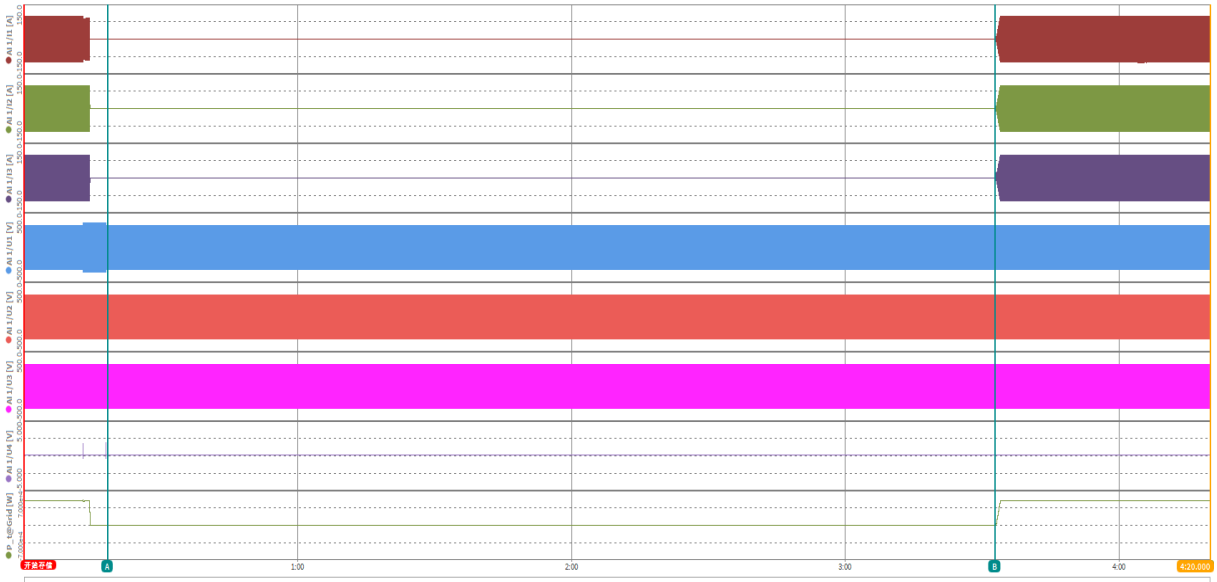
under voltage Reconnection



	A	B	间隔
时间 [s]	0:16.5003	3:31.5918	3:15.0915
AI 1/I1 [A]	-0.013856	5.117737	5.131593
AI 1/I2 [A]	-4.773e-3	-3.877919	-3.873146
AI 1/I3 [A]	-0.020589	1.729325	1.749914
AI 1/U1 [V]	-291.4357	267.1001	558.5358
AI 1/U2 [V]	21.18993	28.94354	7.753611
AI 1/U3 [V]	269.6371	-295.2221	-564.8592
AI 1/U4 [V]	0.159264	0.158310	-9.537e-4
P_t@Grid [W]	-0.066958	45.71480	45.78176

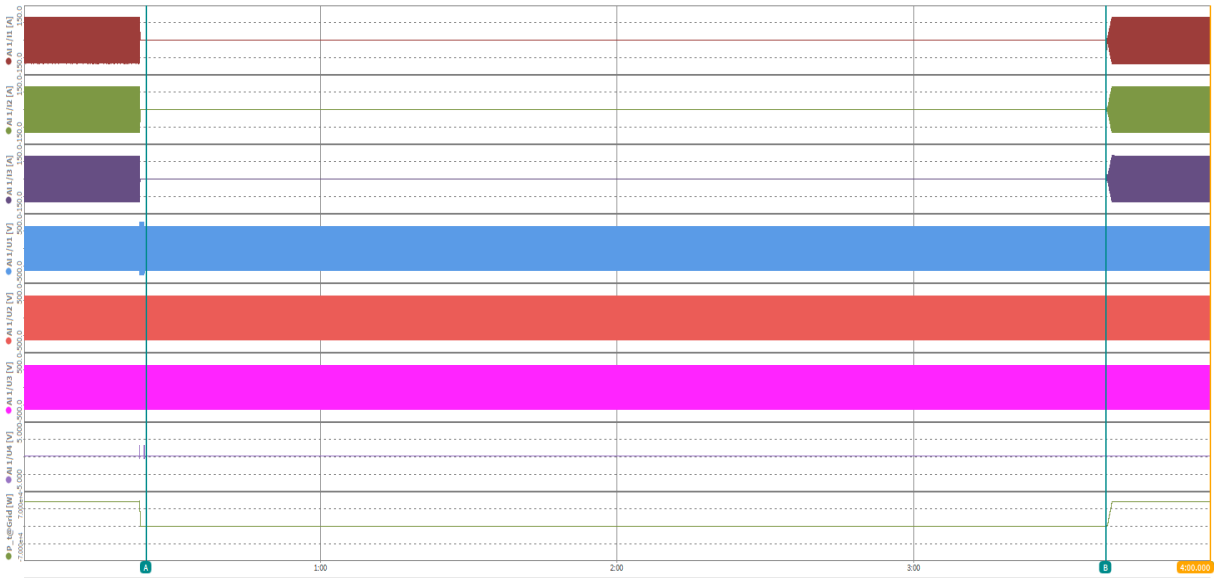
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over voltage Reconnection(stage 1)



	A	B	间隔
时间 [s]	0:18.3474	3:32.7986	3:14.4511
AI 1/I1 [A]	-0.114560	-0.086069	0.028491
AI 1/I2 [A]	-6.894e-3	-4.997e-3	1.897e-3
AI 1/I3 [A]	-0.014031	-9.834e-3	4.197e-3
AI 1/U1 [V]	316.6106	-318.1403	-634.7509
AI 1/U2 [V]	-220.7623	216.1815	436.9438
AI 1/U3 [V]	-96.02738	101.5229	197.5503
AI 1/U4 [V]	0.156641	0.159740	3.099e-3
P_t@Grid [W]	-0.171621	0.148022	0.319642

over voltage Reconnection(stage 2)



	A	B	间隔
时间 [s]	0:24.7527	3:38.8661	3:14.1134
AI 1/I1 [A]	-0.054206	0.039024	0.093230
AI 1/I2 [A]	-5.545e-3	-5.836e-3	-2.918e-4
AI 1/I3 [A]	-1.799e-3	1.079e-3	2.878e-3
AI 1/U1 [V]	-323.6652	256.5844	580.2496
AI 1/U2 [V]	185.0915	43.69927	-141.3922
AI 1/U3 [V]	138.3891	-300.4792	-438.8683
AI 1/U4 [V]	0.156164	0.164986	8.821e-3
P_t@Grid [W]	0.906671	0.658346	-0.248325

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4.4 Voltage and Frequency Disconnection	**P**

4.4.1 Voltage Monitoring L2 Phase

Test conditions:	Udc=650 Vdc Idc=77,00 Adc Pac=50000 W fac=50,00 Hz

	under voltage				**over voltage (stage 1)**			
Parameter	Voltage	Time			Voltage	Time		
Limit	**195,5 V**	**<= 1500 ms***			**253,0 V**	**<= 1500 ms**		
Trip value[V]	200,5 to 190,5	195,5	195,5	195,5	248,0 to 258,0	253,0	253,0	253,0
Disconnection time[ms]:	230 to 190,5	1456	1457	1456	230 to 258,0	1476	1457	1457
Reconnection time[s]:	**>=180 s**	195			**>=180 s**	194		

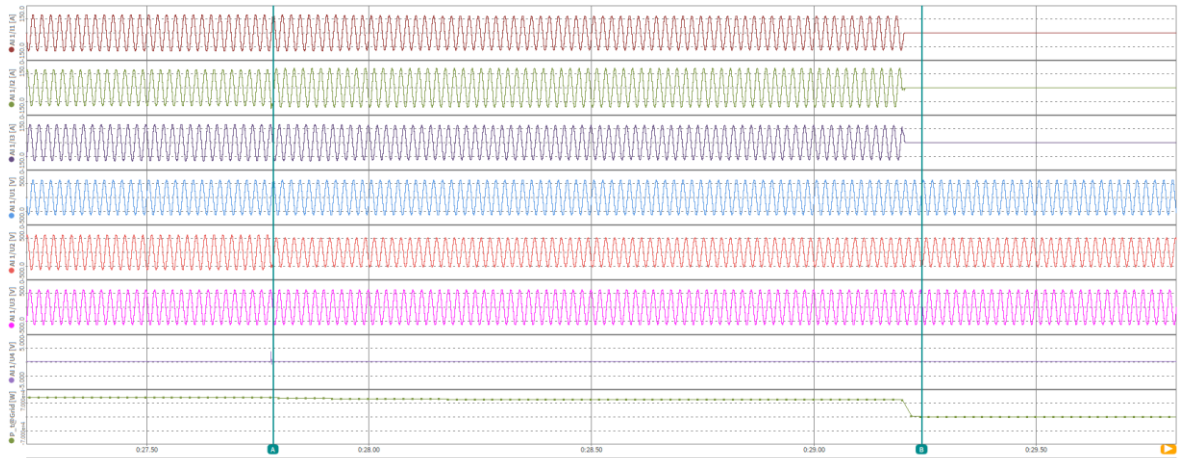
		over voltage (stage 2)		
Parameter		Voltage	Time (ms)	
Limit		**264,5 V**	**<= 200 ms**	
Trip value[V]		248,0 to 269,5	264,6	264,5	264,5
Disconnection time[ms]:		230 to 269,5	159	160	180
Reconnection time[s]:		**>=180 s**	194	

Note:
The test is based on the limits of TED/749:2020, RD647:2020.
The maximum and minimum voltage connection protection must be set to Un +10% (stage 1), Un +15% (stage 2) and Un -15%. The accuracy for the voltage measurement must be in a range of +/-2,3V (1% $U_{nom.}$).

* In case of facilities required to meet performance requirements against voltage sags. The time performance should be equal to 1,5 s.
The tests had been performed on the T-REX-50KHP3G01 are valid for the T-REX-25KHP3G01, T-REX-29K9HP3G01, T-REX-30KHP3G01 and T-REX-40KHP3G01 since it is almost same as in hardware and just power derated by software.

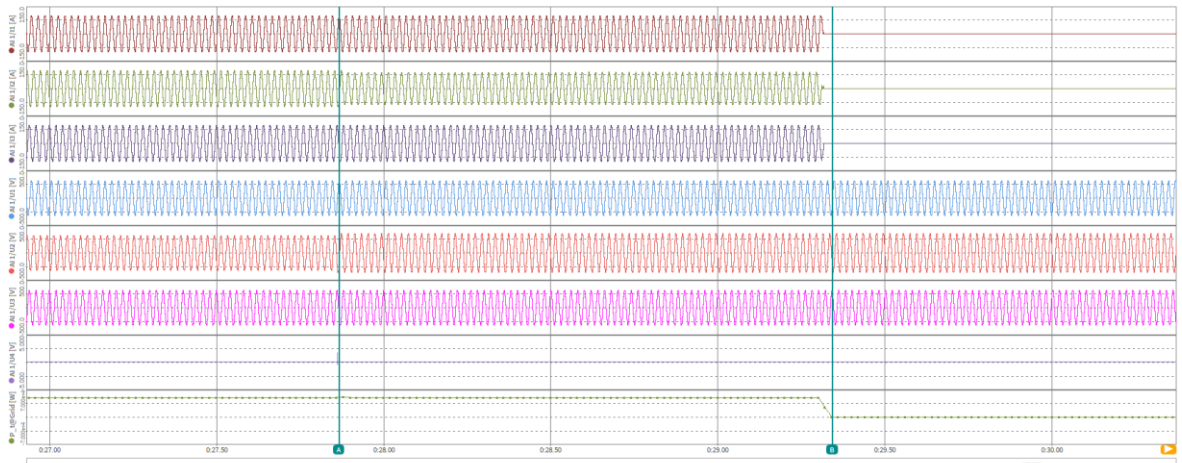
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under voltage:



时间 [s]	A 0:27.786254	B 0:29.243120	间隔 1.456866
AI 1/I1 [A]	100.6525	-0.242472	-100.8949
AI 1/I2 [A]	-41.96029	-2.262e-3	41.95803
AI 1/I3 [A]	-57.74198	6.381e-3	57.74836
AI 1/U1 [V]	324.5161	198.4425	-126.0736
AI 1/U2 [V]	-118.1214	-266.7487	-148.6273
AI 1/U3 [V]	-182.0696	122.9665	305.0361
AI 1/U4 [V]	0.155926	0.158548	2.623e-3
P_t@Grid [W]	50016.11	-0.294694	-50016.40

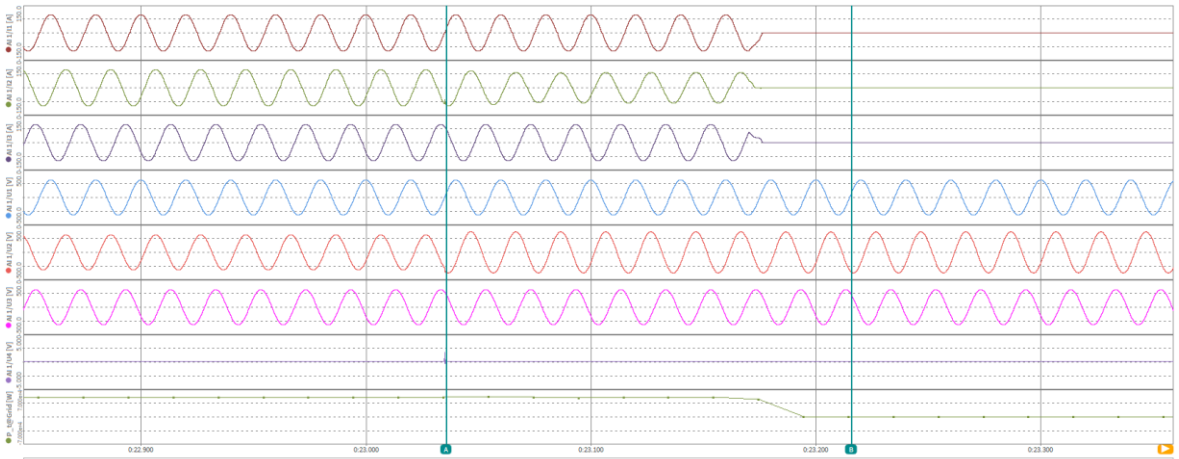
over voltage (stage 1):



时间 [s]	A 0:27.867580	B 0:29.343155	间隔 1.475574
AI 1/I1 [A]	100.9942	-0.014067	-101.0083
AI 1/I2 [A]	-62.96497	-5.216e-3	62.95976
AI 1/I3 [A]	-40.30640	-0.011873	40.29453
AI 1/U1 [V]	323.1321	21.12866	-302.0034
AI 1/U2 [V]	-217.3960	-326.2224	-108.8264
AI 1/U3 [V]	-129.0839	269.4421	398.5260
AI 1/U4 [V]	0.151873	0.153065	1.192e-3
P_t@Grid [W]	49952.09	-0.237470	-49952.32

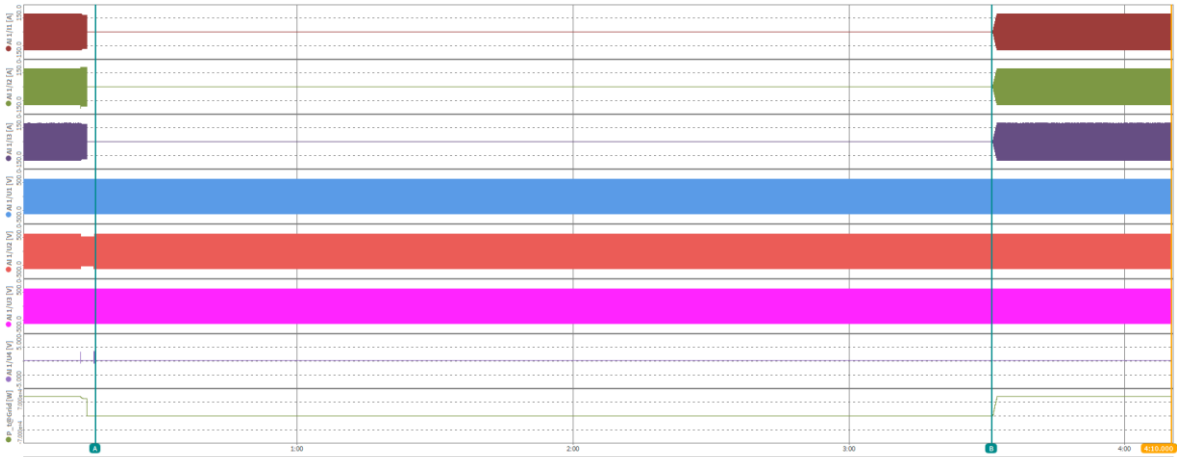
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over voltage (stage 2):



时间 [s]	A 0:23.0358121	B 0:23.2158423	间隔 0.1800302
AI 1/I1 [A]	23.04006	-0.041127	-23.08118
AI 1/I2 [A]	-96.97247	-3.028e-3	96.96944
AI 1/I3 [A]	73.68800	4.917e-3	-73.68308
AI 1/U1 [V]	78.96901	75.67311	-3.295899
AI 1/U2 [V]	-361.3227	-364.3306	-3.007889
AI 1/U3 [V]	235.6153	235.0526	-0.562668
AI 1/U4 [V]	0.174522	0.152111	-0.022411
P_t@Grid [W]	49928.71	-0.511248	-49929.22

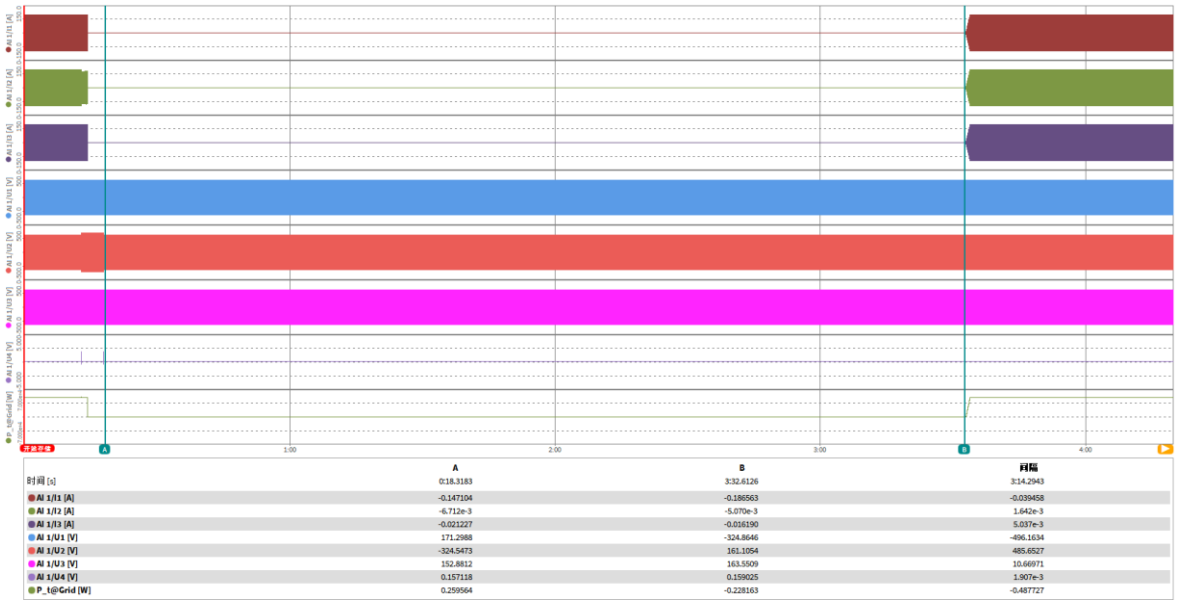
under voltage Reconnection



时间 [s]	A 0:16.1833	B 3:30.9963	间隔 3:14.8130
AI 1/I1 [A]	-0.017320	-0.010870	6.450e-3
AI 1/I2 [A]	-5.801e-3	-4.406e-3	1.395e-3
AI 1/I3 [A]	-0.017217	-0.018301	-1.084e-3
AI 1/U1 [V]	316.4499	-217.2394	-533.6893
AI 1/U2 [V]	-95.62135	-100.3163	-4.694939
AI 1/U3 [V]	-221.1039	317.4143	538.5182
AI 1/U4 [V]	0.162840	0.165224	2.384e-3
P_t@Grid [W]	-0.011651	-0.156848	-0.145197

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over voltage Reconnection(stage 1)



	A	B	间隔
时间 [s]	0:18.3183	3:32.6126	3:14.2943
AI 1/I1 [A]	-0.147104	-0.186563	-0.039458
AI 1/I2 [A]	-6.712e-3	-5.070e-3	1.642e-3
AI 1/I3 [A]	-0.021227	-0.016190	5.037e-3
AI 1/U1 [V]	171.2988	-324.8646	-496.1634
AI 1/U2 [V]	-324.5473	161.1054	485.6527
AI 1/U3 [V]	152.8812	163.5509	10.66971
AI 1/U4 [V]	0.157118	0.159025	1.907e-3
P_t@Grid [W]	0.259564	-0.228163	-0.487727

over voltage Reconnection(stage 2)



	A	B	间隔
时间 [s]	0:24.0290	3:38.2871	3:14.2581
AI 1/I1 [A]	-0.015736	-0.064850	-0.049114
AI 1/I2 [A]	-4.377e-3	-4.414e-3	-3.648e-5
AI 1/I3 [A]	4.917e-3	-3.358e-3	-8.275e-3
AI 1/U1 [V]	-306.4842	-270.4330	36.05128
AI 1/U2 [V]	60.23121	290.8864	230.6552
AI 1/U3 [V]	246.0926	-20.66779	-266.7604
AI 1/U4 [V]	0.158072	0.157118	-9.537e-4
P_t@Grid [W]	-1.581579	-1.028320	0.553259

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4.4 Voltage and Frequency Disconnection	P

4.4.1 Voltage Monitoring L3 Phase

Test conditions:	Udc=650 Vdc Idc=77,00 Adc Pac=50000 W fac=50,00 Hz

	under voltage				**over voltage (stage 1)**			
Parameter	Voltage	Time			Voltage	Time		
Limit	**195,5 V**	**<= 1500 ms***			**253,0 V**	**<= 1500 ms**		
Trip value[V]	200,5 to 190,5	195,6	195,6	195,6	248,0 to 258,0	253,0	253,0	253,0
Disconnection time[ms]:	230 to 190,5	1458	1479	1460	230 to 258,0	1479	1476	1459
Reconnection time[s]:	**>=180 s**	195			**>=180 s**	194		

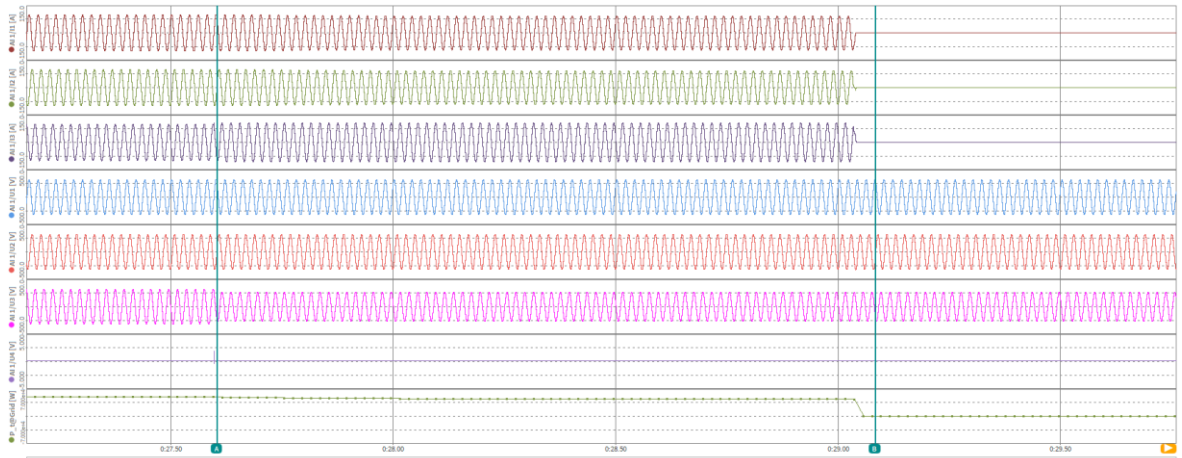
		over voltage (stage 2)		
Parameter		Voltage	Time (ms)	
Limit		**264,5 V**	**<= 200 ms**	
Trip value[V]		248,0 to 269,5	264,6	264,5	264,5
Disconnection time[ms]:		230 to 269,5	139	139	160
Reconnection time[s]:		**>=180 s**	195	

Note:
The test is based on the limits of TED/749:2020, RD647:2020.
The maximum and minimum voltage connection protection must be set to Un +10% (stage 1), Un +15% (stage 2) and Un -15%. The accuracy for the voltage measurement must be in a range of +/-2,3V (1% $U_{nom.}$).

* In case of facilities required to meet performance requirements against voltage sags. The time performance should be equal to 1,5 s.
The tests had been performed on the T-REX-50KHP3G01 are valid for the T-REX-25KHP3G01, T-REX-29K9HP3G01, T-REX-30KHP3G01 and T-REX-40KHP3G01 since it is almost same as in hardware and just power derated by software.

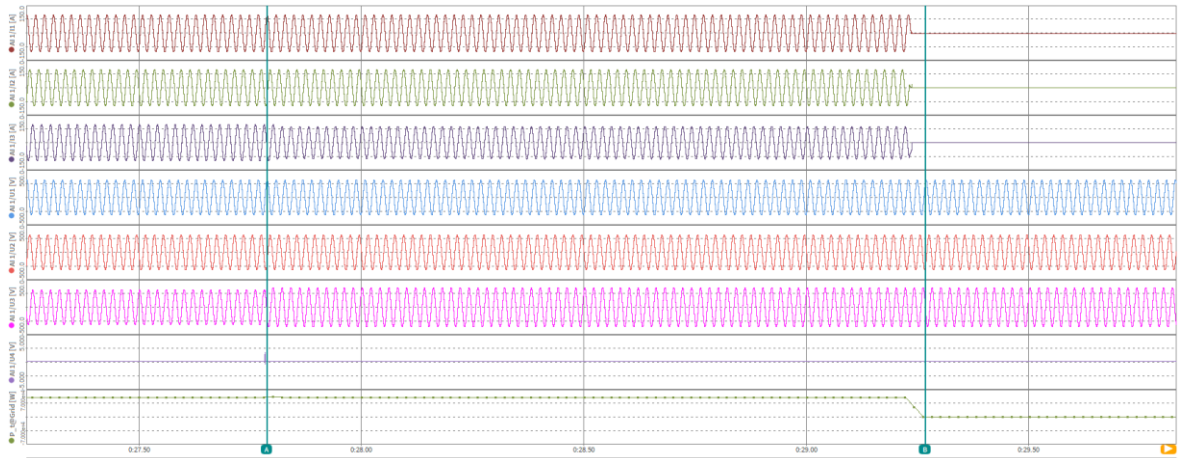
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under voltage:



时间 [s]	A 0:27.604588	B 0:29.083268	间隔 1.478680
AI 1/I1 [A]	99.80608	-0.483274	-100.2894
AI 1/I2 [A]	-35.29510	-3.794e-3	35.29130
AI 1/I3 [A]	-67.51171	1.806e-3	67.51351
AI 1/U1 [V]	321.4143	313.3190	-8.095265
AI 1/U2 [V]	-118.0193	-229.8274	-111.8081
AI 1/U3 [V]	-169.3120	-69.27205	100.0400
AI 1/U4 [V]	0.158548	0.159740	1.192e-3
P_t@Grid [W]	50034.58	-0.141344	-50034.72

over voltage (stage 1):



时间 [s]	A 0:27.788865	B 0:29.267546	间隔 1.478680
AI 1/I1 [A]	94.52427	-2.995253	-97.51952
AI 1/I2 [A]	-79.18479	-6.311e-3	79.17848
AI 1/I3 [A]	-12.76585	-0.015710	12.75014
AI 1/U1 [V]	306.9353	236.9149	-70.02044
AI 1/U2 [V]	-246.6557	-310.4201	-63.76434
AI 1/U3 [V]	-70.16111	82.09730	152.2584
AI 1/U4 [V]	0.152588	0.150442	-2.146e-3
P_t@Grid [W]	50043.85	-0.087469	-50043.94

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over voltage (stage 2):



时间 [s]	A 0:23.0890847	B 0:23.2488251	间隔 0.1597404
AI 1/I1 [A]	27.55189	-0.139952	-27.69184
AI 1/I2 [A]	-98.79042	-3.174e-3	98.78725
AI 1/I3 [A]	75.96801	5.636e-3	-75.96237
AI 1/U1 [V]	94.06090	71.19942	-22.86148
AI 1/U2 [V]	-315.7494	-309.8753	5.874157
AI 1/U3 [V]	265.2488	278.9695	13.72075
AI 1/U4 [V]	0.157118	0.155687	-1.431e-3
P_t@Grid [W]	50068.65	-4.911314	-50073.56

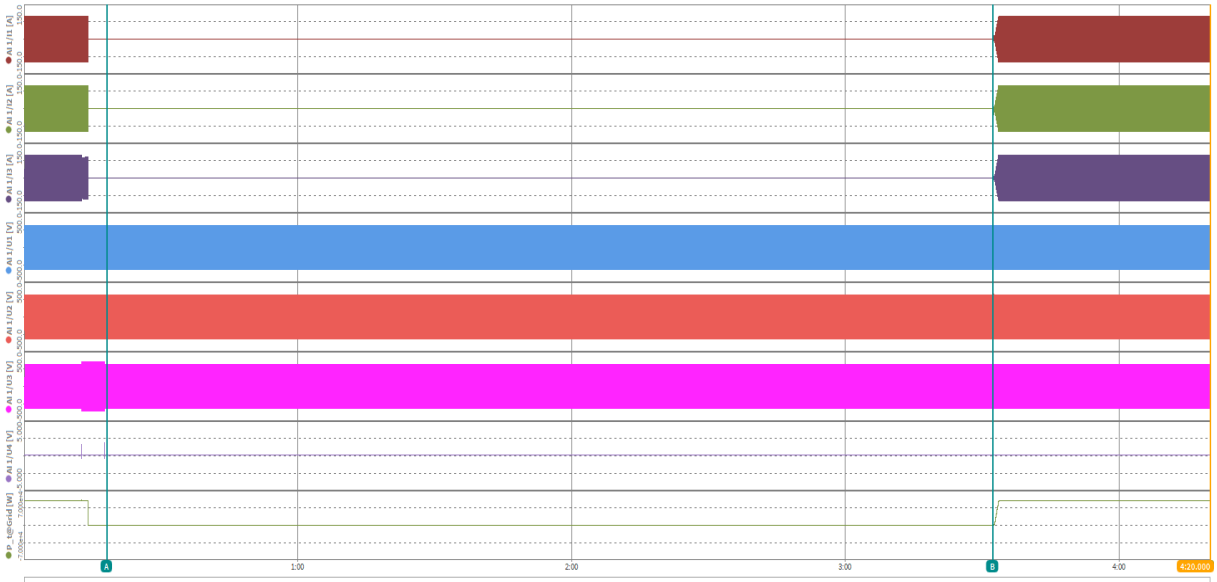
under voltage Reconnection



时间 [s]	A 0:16.4355	B 3:31.3161	间隔 3:14.8806
AI 1/I1 [A]	-0.022098	5.219865	5.241963
AI 1/I2 [A]	-5.397e-3	-11.08995	-11.08455
AI 1/I3 [A]	-0.022154	6.794250	6.816404
AI 1/U1 [V]	254.5517	231.4673	-23.08440
AI 1/U2 [V]	-301.8344	-313.0155	-11.18112
AI 1/U3 [V]	47.17446	81.31004	34.13558
AI 1/U4 [V]	0.157595	0.163555	5.960e-3
P_t@Grid [W]	-0.112653	4368.322	4368.434

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over voltage Reconnection(stage 1)



	A	B	间隔
时间 [s]	0:18.1906	3:32.3281	3:14.1375
AI 1/I1 [A]	-0.163078	-0.104070	0.059009
AI 1/I2 [A]	-7.587e-3	-7.296e-3	2.918e-4
AI 1/I3 [A]	-0.013791	-0.014751	-9.594e-4
AI 1/U1 [V]	298.0912	252.4111	-45.68005
AI 1/U2 [V]	-37.93621	-303.2069	-265.2707
AI 1/U3 [V]	-260.3445	50.43936	310.7839
AI 1/U4 [V]	0.152349	0.156403	4.053e-3
P_t@Grid [W]	0.019110	0.277623	0.258513

over voltage Reconnection(stage 2)



	A	B	间隔
时间 [s]	0:24.2268	3:38.7744	3:14.5476
AI 1/I1 [A]	-0.029087	-0.096321	-0.067234
AI 1/I2 [A]	-4.268e-3	-3.356e-3	9.120e-4
AI 1/I3 [A]	5.996e-3	5.157e-3	-8.395e-4
AI 1/U1 [V]	-267.4673	-27.91810	239.5492
AI 1/U2 [V]	293.2327	-266.1193	-559.3520
AI 1/U3 [V]	-25.83885	293.8862	319.7251
AI 1/U4 [V]	0.160694	0.162840	2.146e-3
P_t@Grid [W]	1.137154	-2.178658	-3.315813

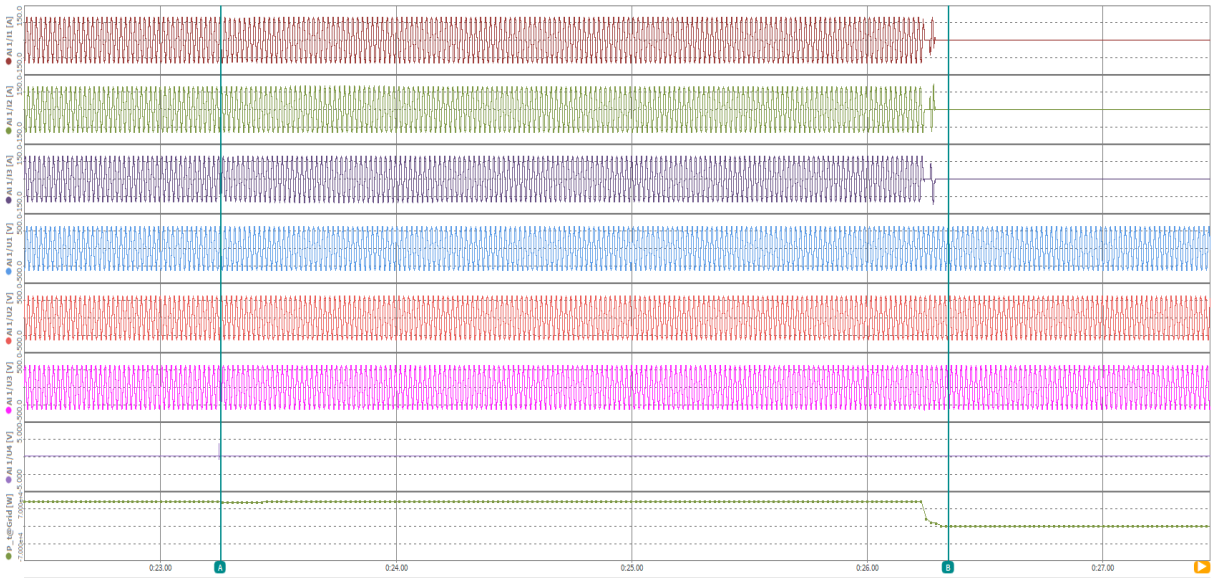
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4.4.2 Frequency monitoring									**P**
Model: T-REX-50KHP3G01									
Test conditions:	Udc=650 Vdc Idc=77,00 Adc Pac= 50000 W								
	under frequency				**over frequency**				
Parameter	Frequency [Hz]	Time			Frequency [Hz]	Time			
Output Voltage		**~85%U_N**	**U_N**	**~110%U_N**		**~85%U_N**	**U_N**	**~110%U_N**	
Limit	**48,0 Hz**	**at least 3 s**			**51,0 Hz**	**<= 500 ms**			
Trip value[Hz]	48,0	48,00	48,00	48,00	51,0	51,00	51,00	51,00	
Disconnection time[ms]:	48,5Hz to 48Hz	3053	3085	3041	50Hz to 51,0 Hz	449	469	448	
		3064	3089	3064		449	461	449	
Reconnection time[s]:	**>=180 s**	202			**>=180 s**	192			

Note:
The test is based on the limits of TED/749:2020, RD647:2020.
The maximum and minimum frequency connection protection must be set to 50,5 Hz and 48,0 Hz. For an under frequency failure the inverter has to stay connect for at least 3 s. After the 3 s the inverter has to disconnect immediately from the grid. The accuracy for the frequency measurement must be in a range of +/- 0,05 Hz.
The tests had been performed on the T-REX-50KHP3G01 are valid for the T-REX-25KHP3G01, T-REX-29K9HP3G01, T-REX-30KHP3G01 and T-REX-40KHP3G01 since it is almost same as in hardware and just power derated by software.

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Under frequency



时间 [s]	A 0:23.255609	B 0:26.344693	间隔 3.089083
AI 1/I1 [A]	90.52113	0.04785	-90.47534
AI 1/I2 [A]	-3.700187	-4.195e-3	3.695992
AI 1/I3 [A]	-86.58073	4.797e-4	86.58121
AI 1/U1 [V]	296.6869	319.2463	22.55941
AI 1/U2 [V]	-31.94881	-109.5975	-77.64864
AI 1/U3 [V]	-263.9060	-209.8100	54.09599
AI 1/U4 [V]	0.158548	0.157595	-9.537e-4
P_t@Grid [W]	50028.02	-0.951975	-50028.97

Over frequency



时间 [s]	A 0:22.7968874	B 0:23.2656783	间隔 0.4687909
AI 1/I1 [A]	72.07997	0.042464	-72.03750
AI 1/I2 [A]	-99.00386	-4.669e-3	98.99919
AI 1/I3 [A]	28.30723	-1.439e-3	-28.30867
AI 1/U1 [V]	227.3581	152.3070	-75.05107
AI 1/U2 [V]	-315.4514	-324.4508	-8.999348
AI 1/U3 [V]	88.15694	171.6368	83.47989
AI 1/U4 [V]	0.158072	0.155926	-2.146e-3
P_t@Grid [W]	49982.74	173.6992	-49809.04

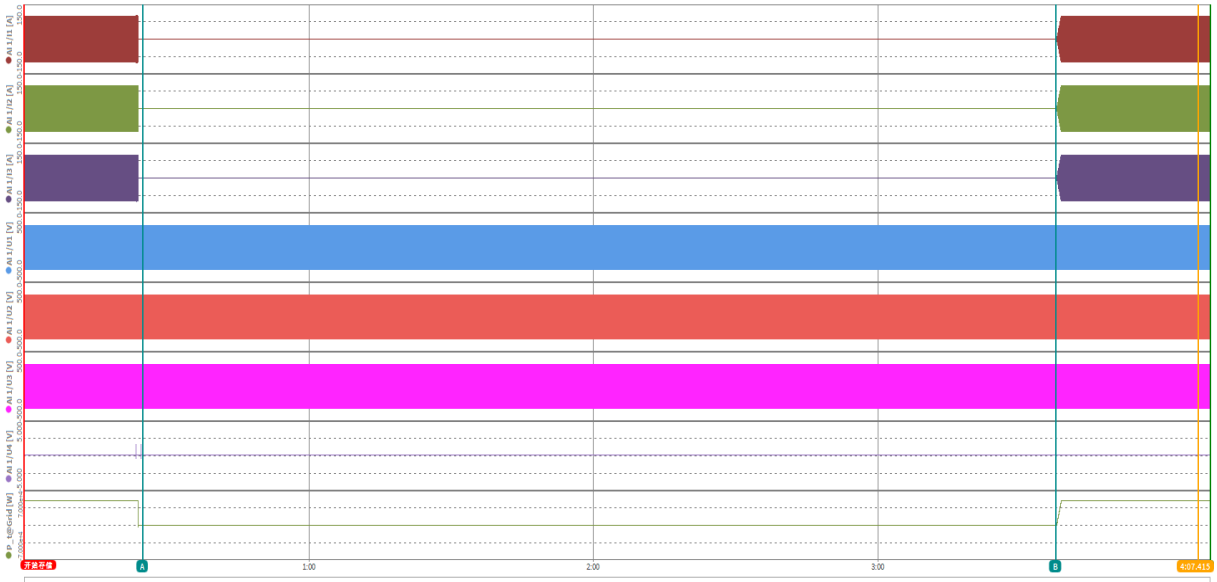
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Under frequency Reconnection



时间 [s]	A 0:28.3397	B 3:50.3904	间隔 3:22.0507
AI 1/I1 [A]	-0.089197	7.947e-3	0.097144
AI 1/I2 [A]	-6.019e-3	-3.137e-3	2.882e-3
AI 1/I3 [A]	-4.197e-3	5.157e-3	9.354e-3
AI 1/U1 [V]	-32.71842	-15.64121	17.07721
AI 1/U2 [V]	295.9681	-272.9926	-568.9607
AI 1/U3 [V]	-263.7208	288.5833	552.3041
AI 1/U4 [V]	0.158787	0.162363	3.576e-3
P_t@Grid [W]	-0.903966	-1.029234	-0.125268

Over frequency Reconnection



时间 [s]	A 0:25.0302	B 3:37.4306	间隔 3:12.4005
AI 1/I1 [A]	-0.016013	-5.219e-3	0.010794
AI 1/I2 [A]	-4.414e-3	-4.669e-3	-2.553e-4
AI 1/I3 [A]	2.159e-3	1.679e-3	-4.797e-4
AI 1/U1 [V]	283.3483	305.8832	22.53485
AI 1/U2 [V]	-4.348994	-59.06940	-54.72041
AI 1/U3 [V]	-279.0785	-247.4108	31.66771
AI 1/U4 [V]	0.156641	0.161409	4.768e-3
P_t@Grid [W]	-1.697452	3.323409	5.020861

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4.5 Power factor fixed	P

Model: T-REX-50KHP3G01

Test result:

Cos phi=1 no reactive power supply

Rating power (%)	Active power [kW]	Reactive power [kVar]	Power factor [cos φ]	Voltage [V]
5%	2,519	-0,264	0,9945	229,62
10%	5,007	-0,245	0,9988	229,65
20%	9,948	-0,204	0,9998	229,70
30%	14,993	-0,167	0,9999	229,75
40%	20,027	-0,131	1,0000	229,80
50%	25,014	-0,094	1,0000	229,85
60%	30,028	-0,052	1,0000	229,90
70%	35,062	-0,007	1,0000	229,96
80%	40,002	0,041	1,0000	230,01
90%	45,044	0,093	1,0000	230,07
100%	49,970	0,147	1,0000	230,13

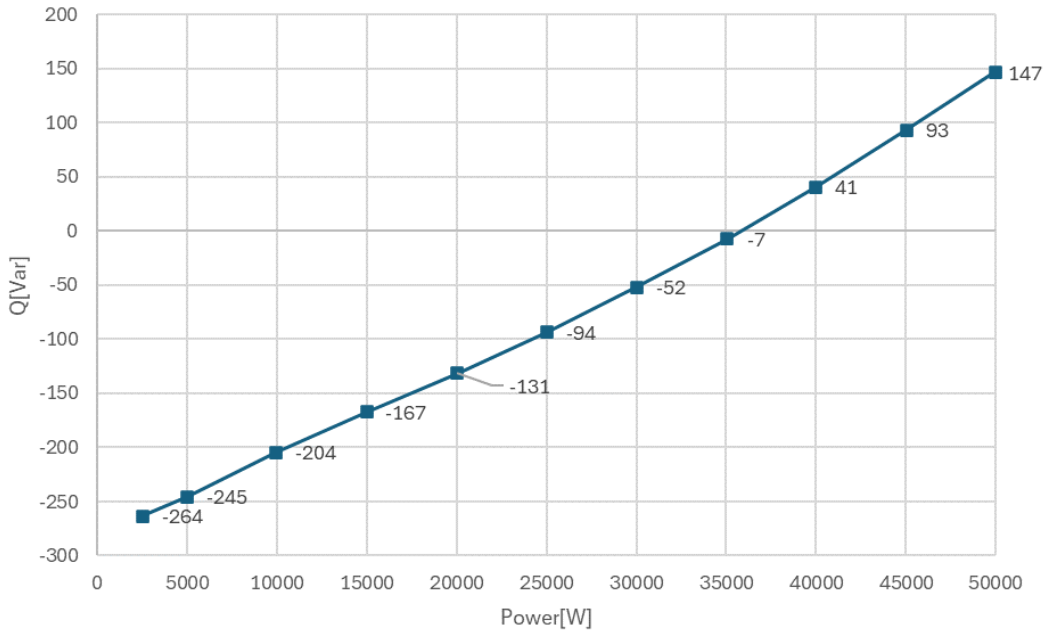
Assessment criterion:
The power factor resulting in each of the measurement points between 25 % and 100 % of the nominal power the power factor must be higher than 0,98.

Note:
a) 1 min-average-values shall be calculated using measurements at the basic frequency in a period of 200 ms
b) For each of the 10 active power levels, at least 3 under excited and 3 over excited reactive power levels shall be recorded.
c) 1 min-average-values have to be calculated using voltage measurements at the basic frequency in a period of 200 ms.
The tests had been performed on the T-REX-50KHP3G01 are valid for the T-REX-25KHP3G01, T-REX-29K9HP3G01, T-REX-30KHP3G01 and T-REX-40KHP3G01 since it is almost same as in hardware and just power derated by software.

Test:
The test method refer to Real Decreto 647/2020

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Graph of the setting accuracy:



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Annex 1

Datasheet of the relay

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CHAR Series 150A/200A LARGE POWER RELAY

Churod Electronics

FEATURES

- Outline dimension(47.7mm×40.1mm×51.8mm)
- 1 Form X arrangement
- Contact gap,4.0mm Min.
- Designed to meet UL/cUL,TUV requirements
- PCB terminal for the mounting
- RoHS compliance
- REACH SvHC compliance



File NO. E341422

File NO. R50316974

APPLICATION

Solar inverter

Inverter precharging circuit control

Industrial Control

COIL PARAMETER

Coil voltage	12VDC,24VDC,48VDC
Coil power	3.2W

CONTACT DATA

Type	CHAR-A200	CHAR-A150H
Contact arrangement	1 Form X	
Contact material	Ag Alloy	
Initial contact resistance	1mΩ max.@DC20A	
Max. switching voltage	830VAC	
Max. switching current	220A	180A
Max. switching power	182,600VA	149,400VA
Contact rating	Make 50A, Carry 200A, Break 50A 830VAC	Make 50A, Carry 150A, Break 50A 830VAC
Mechanical endurance	1,000,000 ops Min.(no load)	
Electrical endurance	30,000 ops Min.(Resistive load)	
Minimum load (reference value)	100mA @48VAC	

COIL DATA @23℃

CHAR				
Nominal coil voltage (VDC)	Nominal Current (mA)	Coil Resistance (Ω±10%)	Operate Voltage (VDC Max.)	Release Voltage (VDC Min.)
12	267	45	9	0.6
24	133	180	18	1.2
48	67	720	36	2.4

NOTE:

1) The above values is the initial values.

CHARACTERISTICS

Operate voltage		75% of nominal voltage or less
Release voltage		5% of nominal voltage or more
Operate time (At nominal voltage)		35ms max.
Release time(At nominal voltage)		30ms max.
Insulation resistance		1,000MΩ min. (at 1000 VDC)
Dielectric strength	Between coil and contacts	4,500 VAC, 50/60Hz (1min)
	Between open contacts	2,500 VAC, 50/60Hz (1min)
Surge voltage between coil and contacts		6,000V(1.2/50μs)
Vibration resistance	Destruction	10 to 55 Hz.,1.5mm double amplitude
	Malfunction	10 to 55 Hz.,1.5mm double amplitude
Shock resistance	Destruction	1,000 m/s2(100G approximately)
	Malfunction	100 m/s2(10G approximately)
Ambient temperature		Operating: -40~+85℃ (without icing or condensation)
Ambient humidity		Operating: 20% to 85% RH
Terminal		PCB terminals
Enclosure (94V-0 Flammability Ratings)		V: Vented(Flux-tight),plastic cover.(RT II)
Weight		Approx. 194g

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Annex 2

Pictures of the unit

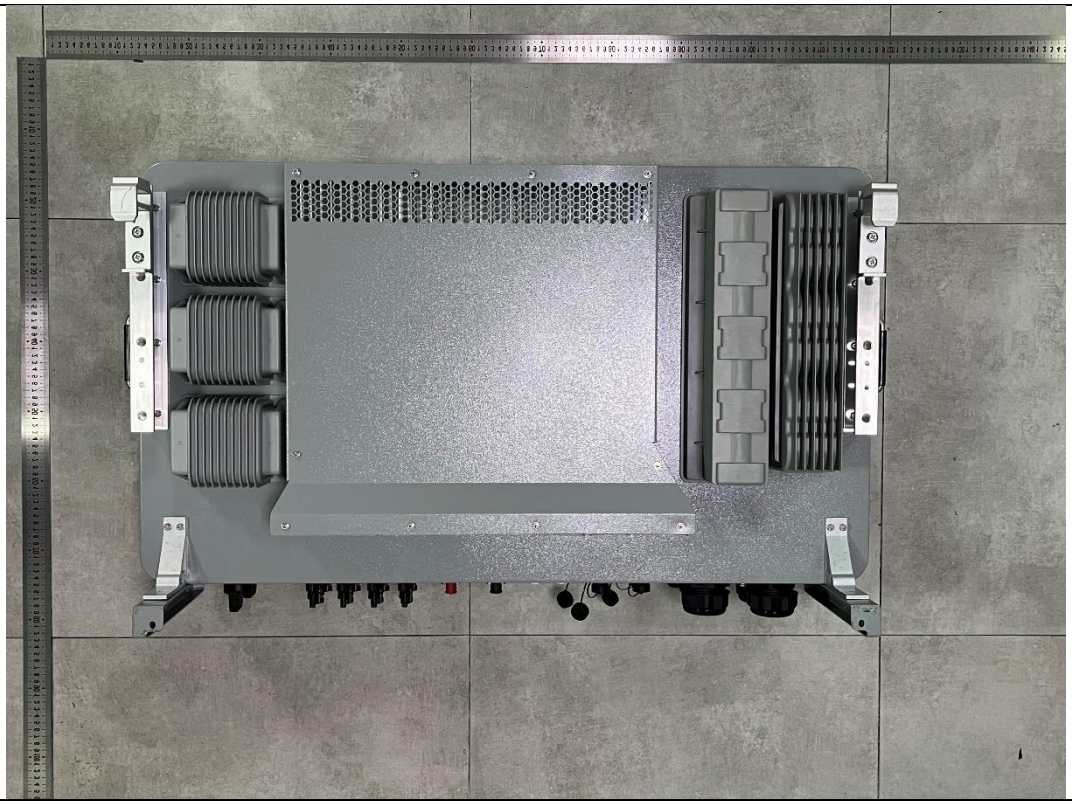
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Photo of EUT

Enclosure front view



Enclosure rear view



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Photo of EUT

Enclosure left view



Enclosure right view



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Photo of EUT

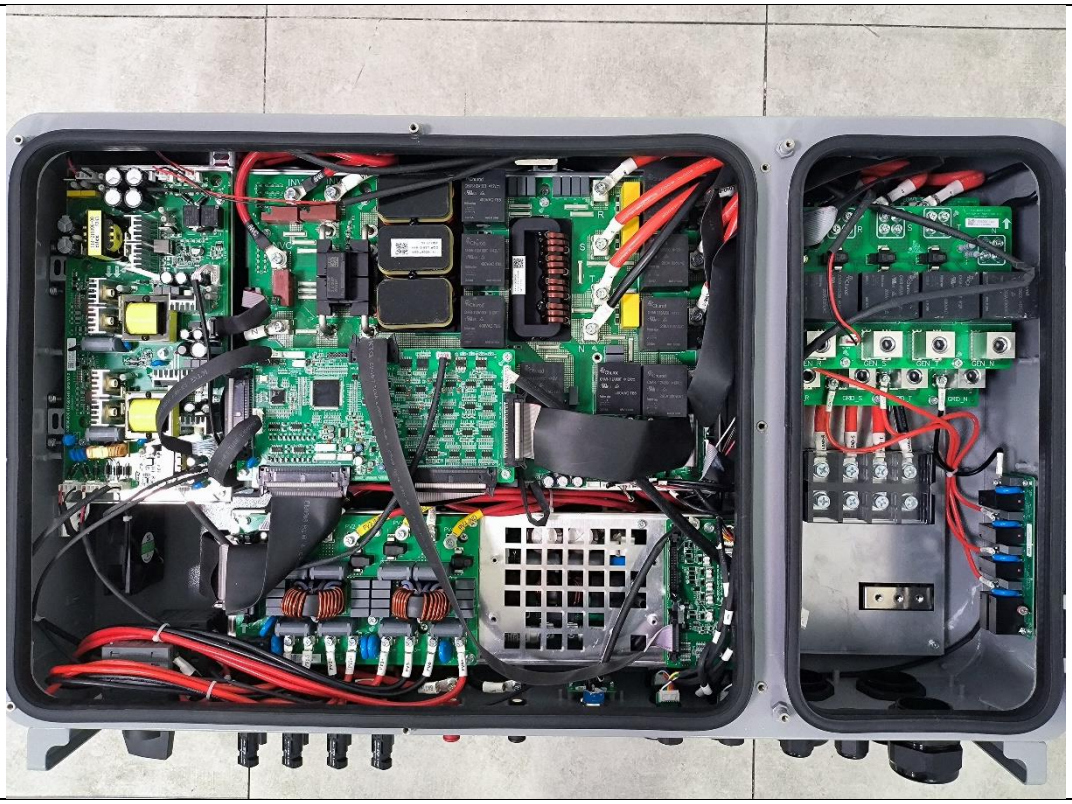
Enclosure top view



Enclosure bottom view



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Photo of EUT
Internal view


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Annex 3

Test Equipment list

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Date(s) of performance test: 2024-08-26 to 2024-10-31

Equipment	Internal No.	Manufacturer	Type	Serial No.	Next Calibration
Power Analyzer	FLS*YF0033	DEWESoft	TRTONet+1820-PA	C9220196-CHN	May. 25, 2025
AC Source	XNYYF0068	ACTIONPOWER	AGS-20-4505N	F2042D0013	Monitored by Power Analyzer
DC Simulation Power Supply	XNYYF0081	ACTIONPOWER	PRD1503E	B1042E1023	
	FLS*YF0196	ACTIONPOWER	PRD1503E	B2032I1977	
	FLS*YF0194	ACTIONPOWER	PRD1503E	B2032I1979	
	FLS*YF0191	ACTIONPOWER	PRD1503E	B2032I1990	
RLC Load	A7150027DG	EMAX	IMAX3350-100KW	202409023	
Current transducer	FLS*YF0046	CYBERTEK	CTA 200	CTA2200456	May. 25, 2025
	FLS*YF0049	CYBERTEK	CTA 200	CTA2100425	May. 25, 2025
	FLS*YF0051	CYBERTEK	CTA 200	CTA2200432	May. 25, 2025
	FLS*YF0040	CYBERTEK	CTA 200	CTA2100515	May. 25, 2025
	FLS*YF0045	CYBERTEK	CTA 200	CTA2100512	May. 25, 2025
	FLS*YF0047	CYBERTEK	CTA 200	CTA2100482	May. 25, 2025

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END OF TEST REPORT

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