



EXTRACT FROM REPORT N. 2222 / 0215 – TG3

REFERENCE STANDARD

FGW TG3: DETERMINATION OF THE ELECTRICAL CHARACTERISTICS OF POWER GENERATING UNITS AND SYSTEMS, STORAGE SYSTEMS AS WELL FOR THEIR COMPONENTS IN MV, HV AND EHV GRIDS.

(REV. 25 DATED ON 01/09/2018 + SUPPLEMENT 1 DATED ON 22/01/2019)

Reference Test Report Number: **2222 / 0215 – TG3**

Product Type: **3 Phase Grid Connected PV Inverter**

Tested Model.....: **SUNNY TRIPOWER STP 25-50**

Variant Models: **SUNNY TRIPOWER STP 12-50
SUNNY TRIPOWER STP 15-50
SUNNY TRIPOWER STP 20-50**

APPLICANT

Name.....: **SMA SOLAR TECHNOLOGY AG**

Address: **Sonnenallee 1, 34266 Niestetal (Germany)**

TESTING LABORATORY

Name.....: **SGS Tecnos, S.A. (Electrical Testing Laboratory)**

Address: **C/ Trespaderne, 29 - Edificio Barajas 1
28042 Madrid (Spain)**

Conducted (tested) by.....: **Miguel Rodriguez
(Project Engineer)**



Reviewed and Approved by: **Omar Kalim
(Technical Reviewer)**

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1 Scope

SGS Tecnos, S.A. (Electrical Testing Laboratory) has been contracted by SMA SOLAR TECHNOLOGY AG, in order to perform testing according to FGW-TG3: Technical Guidelines for Power Generating Units and Systems. TG3 (Revision 25 Dated 01/09/2018 + Supplement 1 Dated 22/01/2019): Determination of Electrical Characteristics of Power Generating Units and Systems, Storage Systems as well for their Components in MV, HV and EHV grids.

The following standards are covered with testing of FGW-TG3 (Revision 25 Dated 01/09/2018) (*):

- VDE-AR-N 4110: 2018-11. Technical requirements for the connection and operation of customer installations to the medium voltage network (TAR medium voltage).

This document is an extract from the test report 2222 / 0215 – TG3 compliant with the Annex B of FGW TG3 (Rev. 25 dated on 01/09/2018 + supplement 1 dated on 22/01/2019).

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2 General Information

2.1 Testing Period and Climatic conditions

The necessary testing has been performed between the 8th of February and the 28th of June 2022.
All the tests and checks have been performed at $25 \pm 10^{\circ}\text{C}$, $90 \text{ kPa} \pm 10 \text{ kPa}$ and $50\% \text{ RH} \pm 20\% \text{ RH}$.

SITE TEST

Name.....: **SMA SOLAR TECHNOLOGY AG**
Address.....: Sonnenallee 1, 34266 Niestetal (Germany)

2.2 Equipment under Testing

Information on this section provided by client

Apparatus type.....: Grid-Connected PV Inverter
Installation.....: 3 Phase ~ / Fixed installation
Manufacturer.....: SMA SOLAR TECHNOLOGY AG
Trademark.....: Sunny Tripower
Model / Type reference.....: STP 25-50
Serial Number.....: 3013848799
Software Version.....: 01.16.03.R (main processor firmware)
Rated Characteristics.....: Input: $1000 \text{ V}_{\text{dc,max}}$ ($430\text{-}800 \text{ V}_{\text{dc,MPPT}}$); 24 A_{dc} Max/MPPT; 3
MPP Trackers with 2 Strings per MPPT
Output: 3~+N 230/400Vac; 50/60 Hz; $36.6 \text{ A}_{\text{ac}}$ Max.;
25 kW; 25 kVA.

Date of manufacturing: 2022

Test item particulars

Input.....: DC PV
Output.....: 3 Phase ~+N+PE
Class of protection against electric shock...: Class I
Degree of protection against moisture.....: IP 65
Type of connection to the main supply.....: Three-phase – Fixed installation
Cooling group.....: Forced ventilation (Fan)
Modular.....: No
Internal Transformer.....: No

Note: Tests of clauses 4.3.1; 4.3.2 and 4.3.3 of FGW TG3 (rev. 25) have been repeated over variant models STP 20-50; STP 15-50 and STP 12-50.

In this case, the serial number of the EUT used for these measurements has been s/n no. 3013768558.
For these models the same PGU with the serial number previously mentioned has been adapted via software in order to meet with ratings of both of the mentioned variant models. In addition, these variant models share the same software and version with the fully tested model referred in this report, STP 25-50.
Refer to the page 7 of this document for the details about ratings of variant models.

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Copy of marking plate:



Note:

1. Label is attached on the side surface of enclosure and visible after installation.

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Examples of marking plate:



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Equipment under testing:

- **STP 25-50**

The variants models are:

- **STP 12-50**
- **STP 15-50**
- **STP 20-50**

Model Number	STP 12-50	STP 15-50	STP 20-50	STP 25-50
Max. PV input voltage	1000V _{dc}			
Operating MPPT voltage range	206 – 800 V _{dc}	257 – 800 V _{dc}	340 – 800 V _{dc}	430 – 800 V _{dc}
Rated input voltage	570 V _{dc}			
No. Of MPP inputs / No. Of strings per MPPT	3 / 2			
Max. input current per MPPT	24 A _{dc}			
Max. short-circuit current per MPP tracker	33 A _{dc}			
Rated grid voltage	3P/N/PE 220/380 V _{ac} 230/400 V _{ac} 240/415 V _{ac}			
Rated grid frequency	50Hz			
Rated output power	12000 W	15000 W	20000 W	25000 W
Max. output power	12000 VA	15000 VA	20000 VA	25000 VA
Max. AC output Current	3x36.6 A _{ac}	3x36.6 A _{ac}	3x36.6 A _{ac}	3x36.6 A _{ac}
Rated AC output Current	3x17.4 A _{ac}	3x21.7 A _{ac}	3x29.0 A _{ac}	3x36.2 A _{ac}
Power factor range	1 / 0 overexcited to 0 underexcited			

All tests performed have been performed on the model STP 25-50, except for 4.3.2 and 4.3.3 of FGW TG3, which have also been repeated on the models STP 12-50, STP 15-50 and STP 20-50.

The other test results on the model STP 25-50 are essentially valid for the derived models STP 12-50, STP 15-50 and STP 20-50.

The variants models have been included in this test report as they have the same following features as the tested model:

- Same connection system and hardware topology.
- Same control algorithm.
- Same Firmware Version.
- Output power within 1/10 and 2 times the rated output power or the EUT or Modular inverters.

The results obtained apply only to the particular sample tested that is the subject of the present test report. The most unfavorable result values of the verifications and tests performed are contained herein. Throughout this report a point (comma) is used as the decimal separator.

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2.2.1 Reference Values

Reference Values STP 25-50	
Rated power, P_n in kW	25
Rated apparent power, S_n in kVA	25
Rated wind speed (only WT), v_n in m/s	Not applicable
Rated current (determined), I_n in A	36.2
Rated output voltage, (phase to phase) U_n in Vac	230/400
Note: In this report p.u. values are calculated as follows: -For Active & Reactive Power p.u values are reference to P_n -For Currents p.u values, the reference is always I_n -For Voltages p.u values, the reference is always U_n	

Reference Values STP 20-50	
Rated power, P_n in kW	20
Rated apparent power, S_n in kVA	20
Rated wind speed (only WT), v_n in m/s	Not applicable
Rated current (determined), I_n in A	29.0
Rated output voltage, (phase to phase) U_n in Vac	230/400
Note: In this report p.u. values are calculated as follows: -For Active & Reactive Power p.u values are reference to P_n -For Currents p.u values, the reference is always I_n -For Voltages p.u values, the reference is always U_n	

Reference Values STP 15-50	
Rated power, P_n in kW	15
Rated apparent power, S_n in kVA	15
Rated wind speed (only WT), v_n in m/s	Not applicable
Rated current (determined), I_n in A	21.7
Rated output voltage, (phase to phase) U_n in Vac	230/400
Note: In this report p.u. values are calculated as follows: -For Active & Reactive Power p.u values are reference to P_n -For Currents p.u values, the reference is always I_n -For Voltages p.u values, the reference is always U_n	

Reference Values STP 12-50	
Rated power, P_n in kW	12
Rated apparent power, S_n in kVA	12
Rated wind speed (only WT), v_n in m/s	Not applicable
Rated current (determined), I_n in A	17.4
Rated output voltage, (phase to phase) U_n in Vac	230/400
Note: In this report p.u. values are calculated as follows: -For Active & Reactive Power p.u values are reference to P_n -For Currents p.u values, the reference is always I_n -For Voltages p.u values, the reference is always U_n	

2.2.2 Description of used Interface

For setting parameters, the following interface were used during testing:

Ethernet connection, communication protocol Modbus TCP.

According to Manufacturer information this interface it is also comparable with others interface available:
SMA WebUI

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3 Test Results

3.1 Nenndaten / Rated data:

For the model Sunny Tripower STP STP 25-50

Nennscheinleistung Sn Rated apparent power Sn	25 kVA	Nennstrom In Rated current In	36.2 A
Nennfrequenz fn Rated frequency fn	50 Hz	Nennspannung Un Rated voltage Un	230 / 400 V

For the model Sunny Tripower STP 20-50:

Nennscheinleistung Sn Rated apparent power Sn	20 kVA	Nennstrom In Rated current In	29.0 A
Nennfrequenz fn Rated frequency fn	50 Hz	Nennspannung Un Rated voltage Un	230 / 400 V

For the model Sunny Tripower STP STP 15-50

Nennscheinleistung Sn Rated apparent power Sn	15 kVA	Nennstrom In Rated current In	21.7 A
Nennfrequenz fn Rated frequency fn	50 Hz	Nennspannung Un Rated voltage Un	230 / 400 V

For the model Sunny Tripower STP 12-50:

Nennscheinleistung Sn Rated apparent power Sn	12 kVA	Nennstrom In Rated current In	17.4 A
Nennfrequenz fn Rated frequency fn	50 Hz	Nennspannung Un Rated voltage Un	230 / 400 V

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3.2 Power quality

3.2.1 Wirkleistungsspitzen / Power Peaks

Test results under are offered in the following table:

Wirkleistungsspitzen in kW / Power peaks in kW		Wirkleistungsspitzen in p.u. / Power peaks in p.u.		Anzahl 10-Minuten Datensätze in / Number of 10-minute data set
$p_{60} = P_{60}/P_n$	25126	$p_{60} = P_{60}/P_n$	1.01	2
$p_{60} = P_{60}/P_n$	25133	$p_{60} = P_{60}/P_n$	1.01	2
$p_{600} = P_{600}/P_n$	25125	$p_{600} = P_{600}/P_n$	1.01	2
$p_{600} = P_{600}/P_n$	25132	$p_{600} = P_{600}/P_n$	1.01	2

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3.2.2 Schalthandlungen / Switching Operation

- Test 1: Switching at $P_{\text{available}} < 10\% P_n$. Power gradient 25 % P_n /min.

Schalthandlungen / Case of switching operation	Einschalten bei $P_{\text{verfügbar}} < 10\% P_n$ (Einschaltwindgeschw.) / Start-up at $P_{\text{available}} < 10\% P_n$ (cut-in wind speed)			
Max Anz. Schalthandlungen / Max, number of switching operations, N_{10}	20			
Max Anz. Schalthandlungen / Max, number of switching operations, N_{120}	240			
Netzimpedanzwinkel / Grid impedance angle	30°	50°	70°	85°
Flickerformfaktor / Flicker step factor, $k_f (\Psi_k)$	0.076	0.076	0.071	0.071
Spannungsänderungsfaktor / Voltage change factor, $k_U (\Psi_k)$	0.141	0.124	0.077	0.060

- Test 2: Switching at $P_{\text{available}} < 10\% P_n$. Power gradient Maximum.

Schalthandlungen / Case of switching operation	Einschalten bei $P_{\text{verfügbar}} < 10\% P_n$ (Einschaltwindgeschw.) / Start-up at $P_{\text{available}} < 10\% P_n$ (cut-in wind speed)			
Max Anz. Schalthandlungen / Max, number of switching operations, N_{10}	20			
Max Anz. Schalthandlungen / Max, number of switching operations, N_{120}	240			
Netzimpedanzwinkel / Grid impedance angle	30°	50°	70°	85°
Flickerformfaktor / Flicker step factor, $k_f (\Psi_k)$	0.080	0.076	0.072	0.210
Spannungsänderungsfaktor / Voltage change factor, $k_U (\Psi_k)$	0.142	0.120	0.076	0.078

- Test 3: Switching at $P_{\text{available}} = P_n$. Power gradient 25 % P_n /min.

Schalthandlungen / Case of switching operation	Einschalten bei $P_{\text{verfügbar}} = P_n$ (Nennwindgeschwindigkeit) Start-up at $P_{\text{available}} = P_n$ (rated wind speed)			
Max Anz. Schalthandlungen / Max, number of switching operations, N_{10}	20			
Max Anz. Schalthandlungen / Max, number of switching operations, N_{120}	240			
Netzimpedanzwinkel / Grid impedance angle	30°	50°	70°	85°
Flickerformfaktor / Flicker step factor, $k_f (\Psi_k)$	0.076	0.076	0.072	0.075
Spannungsänderungsfaktor / Voltage change factor, $k_U (\Psi_k)$	0.213	0.178	0.129	0.093

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- Test 4: Switching at $P_{\text{available}} = P_n$. Power gradient Maximum.

Schalthandlungen / Case of switching operation	Einschalten bei $P_{\text{verfügbar}} - P_n$ (Nennwindgeschwindigkeit) Start-up at $P_{\text{available}} P_n$ (rated wind speed)			
Max Anz. Schalthandlungen / Max, number of switching operations, N_{10}	20			
Max Anz. Schalthandlungen / Max, number of switching operations, N_{120}	240			
Netzimpedanzwinkel / Grid impedance angle	30°	50°	70°	85°
Flickerformfaktor / Flicker step factor, $k_f (\Psi_k)$	0.201	0.183	0.123	0.083
Spannungsänderungsfaktor / Voltage change factor, $k_U (\Psi_k)$	0.973	0.788	0.490	0.245

- Test 5: Service shutdown at rated power (no emergency stop).

Schalthandlungen / Case of switching operation	Seviceabschaltung bei Nennleistung / Cut off at rated power			
Max Anz. Schalthandlungen / Max, number of switching operations, N_{10}	10			
Max Anz. Schalthandlungen / Max, number of switching operations, N_{120}	120			
Netzimpedanzwinkel / Grid impedance angle	30°	50°	70°	85°
Flickerformfaktor / Flicker step factor, $k_f (\Psi_k)$	0.873	0.717	0.467	0.293
Spannungsänderungsfaktor / Voltage change factor, $k_U (\Psi_k)$	1.076	0.840	0.702	0.620

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3.2.3 Unsymmetrie / Unbalances

Table of results

P_{DC}/P_{max}	P_{AC} [W]	$U_{1,+}$ [V]	$U_{1,-}$ [V]	$I_{1,+}$ [A]	$I_{1,-}$ [A]	u_i [%]
10 %	2500.146	398.448	0.076	4.515	0.025	0.551
20 %	4995.691	398.435	0.078	9.017	0.026	0.289
30 %	7520.494	398.437	0.082	13.564	0.028	0.204
40 %	10055.646	398.432	0.083	18.118	0.029	0.159
50 %	12503.541	398.423	0.084	22.499	0.031	0.137
60 %	15021.523	398.412	0.089	27.024	0.033	0.121
70 %	17498.121	398.410	0.090	31.473	0.035	0.110
80 %	20012.617	398.406	0.094	35.979	0.037	0.103
90 %	22508.566	398.400	0.099	36.425	0.038	0.105
100 %	25016.650	398.388	0.097	36.432	0.038	0.104
110 %	25136.189	398.399	0.100	36.430	0.038	0.105
120 %	25138.279	398.399	0.100	36.430	0.039	0.106

According to VDE-AR-N 4110: 2018-11, from the 10%P_n, the generating unit shall not exceed a maximum limit defined at 1.5%.

3.2.4 Flicker

Table of results for STP 25-50

[illegible]

Table of results for STP 20-50

[illegible]

Table of results for STP 15-50

[illegible]

Table of results for STP 12-50

[illegible]

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3.2.5 Stromharmonische / Current Harmonics

Test results for STP 25-50												
Pbin [%]	3	10	20	30	40	50	60	70	80	90	100	Max
Order	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n
1	3.01	9.96	19.77	29.63	39.39	48.77	58.27	67.65	76.89	86.07	95.10	95.10
2	0.05	0.04	0.05	0.04	0.05	0.04	0.05	0.04	0.10	0.07	0.13	0.13
3	0.01	0.04	0.05	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.05
4	0.03	0.02	0.01	0.03	0.04	0.04	0.04	0.04	0.07	0.05	0.04	0.07
5	0.04	0.05	0.03	0.04	0.06	0.06	0.06	0.07	0.07	0.07	0.08	0.08
6	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.02	0.02	0.02
7	0.08	0.08	0.08	0.08	0.10	0.11	0.11	0.12	0.12	0.12	0.12	0.12
8	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
9	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.02
10	0.01	0.02	0.02	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.02
11	0.15	0.18	0.18	0.18	0.17	0.20	0.21	0.22	0.23	0.23	0.23	0.23
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
13	0.10	0.08	0.10	0.13	0.13	0.14	0.15	0.16	0.17	0.17	0.17	0.17
14	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
16	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
17	0.04	0.05	0.06	0.06	0.08	0.08	0.09	0.09	0.10	0.10	0.10	0.10
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.03	0.04	0.05	0.05	0.06	0.06	0.07	0.08	0.08	0.08	0.08	0.08
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.02	0.02	0.04	0.05	0.05	0.05	0.06	0.07	0.07	0.08	0.08	0.08
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.02	0.04	0.04	0.05	0.05	0.05	0.06	0.07	0.07	0.07	0.08	0.08
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.01	0.02	0.03	0.03	0.04	0.04	0.05	0.05	0.06	0.06	0.07	0.07
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
31	0.01	0.01	0.03	0.03	0.03	0.04	0.04	0.05	0.06	0.06	0.06	0.06
32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35	0.03	0.01	0.01	0.02	0.03	0.03	0.04	0.05	0.06	0.06	0.07	0.07
36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
37	0.03	0.02	0.01	0.01	0.03	0.04	0.04	0.05	0.06	0.07	0.08	0.08
38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
41	0.04	0.02	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.09	0.10	0.10
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
43	0.04	0.04	0.03	0.03	0.03	0.04	0.05	0.06	0.08	0.09	0.10	0.10
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
45	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01
47	0.03	0.02	0.02	0.01	0.02	0.02	0.03	0.04	0.04	0.05	0.06	0.06
48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
49	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.03	0.03	0.04	0.04
50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
THDi	0.23	0.25	0.26	0.27	0.29	0.32	0.35	0.37	0.41	0.41	0.44	0.44

FGW-TG3+SP1

Test results for STP 20-50												
Pbin [%]	3	10	20	30	40	50	60	70	80	90	100	Max
Order	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n
1	3.02	10.02	19.84	29.79	39.38	47.97	57.46	66.89	76.27	85.55	94.75	94.75
2	0.09	0.09	0.10	0.11	0.16	0.12	0.14	0.13	0.11	0.11	0.13	0.16
3	0.14	0.12	0.15	0.13	0.14	0.12	0.11	0.10	0.10	0.08	0.07	0.15
4	0.07	0.03	0.04	0.08	0.10	0.09	0.09	0.09	0.07	0.08	0.07	0.10
5	0.06	0.07	0.06	0.06	0.08	0.08	0.09	0.09	0.08	0.08	0.08	0.09
6	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04
7	0.08	0.09	0.12	0.09	0.10	0.12	0.13	0.15	0.17	0.17	0.17	0.17
8	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04
9	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.02
10	0.03	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03
11	0.16	0.15	0.13	0.16	0.16	0.18	0.21	0.21	0.21	0.24	0.26	0.26
12	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
13	0.18	0.18	0.13	0.17	0.18	0.18	0.21	0.23	0.21	0.22	0.23	0.23
14	0.01	0.00	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01
15	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
16	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
17	0.06	0.10	0.10	0.13	0.13	0.12	0.12	0.15	0.15	0.14	0.14	0.15
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01
19	0.09	0.12	0.09	0.13	0.13	0.12	0.11	0.13	0.14	0.13	0.13	0.14
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
21	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
22	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
23	0.04	0.05	0.09	0.07	0.08	0.09	0.09	0.08	0.09	0.10	0.09	0.10
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01
25	0.03	0.06	0.07	0.07	0.07	0.07	0.08	0.07	0.08	0.09	0.09	0.09
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01
28	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
29	0.02	0.02	0.03	0.05	0.04	0.05	0.06	0.06	0.06	0.07	0.08	0.08
30	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01
31	0.01	0.02	0.03	0.03	0.03	0.05	0.05	0.06	0.06	0.07	0.07	0.07
32	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
33	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01
34	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
35	0.03	0.02	0.01	0.02	0.03	0.04	0.04	0.05	0.06	0.07	0.07	0.07
36	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01
37	0.04	0.04	0.01	0.01	0.03	0.03	0.04	0.05	0.06	0.07	0.08	0.08
38	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.01
39	0.02	0.02	0.02	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.02
40	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01
41	0.06	0.05	0.03	0.03	0.02	0.03	0.04	0.05	0.06	0.07	0.09	0.09
42	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.01
43	0.06	0.04	0.05	0.03	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.08
44	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01
45	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
46	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
47	0.05	0.04	0.03	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.04	0.05
48	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01
49	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03
50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
THDi	0.35	0.35	0.35	0.38	0.41	0.41	0.45	0.47	0.47	0.49	0.52	0.52

FGW-TG3+SP1

Test results for STP 15-50												
Pbin [%]	3	10	20	30	40	50	60	70	80	90	100	Max
Order	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n
1	3.04	9.98	19.98	29.76	39.23	48.58	58.07	67.33	76.65	85.77	94.85	94.85
2	0.09	0.09	0.08	0.06	0.10	0.07	0.07	0.15	0.12	0.09	0.07	0.15
3	0.04	0.05	0.07	0.07	0.06	0.06	0.05	0.05	0.04	0.05	0.05	0.07
4	0.05	0.04	0.05	0.04	0.03	0.05	0.05	0.03	0.05	0.07	0.07	0.07
5	0.06	0.07	0.06	0.04	0.05	0.07	0.08	0.10	0.10	0.10	0.10	0.10
6	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02
7	0.13	0.15	0.17	0.15	0.12	0.13	0.14	0.16	0.17	0.19	0.19	0.19
8	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
9	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
10	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
11	0.20	0.21	0.23	0.19	0.23	0.22	0.21	0.21	0.23	0.25	0.27	0.27
12	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
13	0.14	0.14	0.15	0.14	0.15	0.17	0.17	0.16	0.17	0.18	0.19	0.19
14	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
16	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.02
17	0.06	0.07	0.08	0.08	0.09	0.08	0.10	0.10	0.09	0.10	0.11	0.11
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.05	0.05	0.06	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.09	0.09
20	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01
23	0.02	0.03	0.05	0.05	0.04	0.06	0.06	0.07	0.07	0.07	0.08	0.08
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
25	0.02	0.03	0.03	0.04	0.05	0.06	0.06	0.07	0.07	0.07	0.08	0.08
26	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
28	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
29	0.01	0.01	0.02	0.04	0.04	0.04	0.05	0.05	0.06	0.06	0.06	0.06
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
31	0.02	0.01	0.01	0.01	0.03	0.04	0.04	0.04	0.05	0.05	0.06	0.06
32	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
34	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
35	0.04	0.03	0.02	0.03	0.03	0.03	0.03	0.04	0.04	0.05	0.05	0.05
36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
37	0.04	0.04	0.03	0.02	0.02	0.02	0.03	0.05	0.05	0.06	0.06	0.06
38	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01
39	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.01
40	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
41	0.06	0.05	0.04	0.03	0.02	0.03	0.04	0.04	0.06	0.06	0.07	0.07
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.01
43	0.05	0.05	0.04	0.02	0.03	0.03	0.04	0.04	0.05	0.06	0.07	0.07
44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.01
45	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01
46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01
47	0.03	0.03	0.04	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.04	0.04
48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
49	0.03	0.03	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.03
50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
THDi	0.33	0.35	0.37	0.33	0.36	0.36	0.37	0.41	0.42	0.45	0.47	0.47

FGW-TG3+SP1

Test results for STP 12-50												
Pbin [%]	3	10	20	30	40	50	60	70	80	90	100	Max
Order	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n	I _h /I _n
1	3.02	9.85	19.84	29.64	39.12	48.56	58.18	67.64	77.06	86.40	95.55	95.55
2	0.13	0.10	0.14	0.09	0.10	0.10	0.10	0.13	0.19	0.19	0.08	0.19
3	0.05	0.05	0.09	0.10	0.09	0.08	0.07	0.07	0.05	0.05	0.05	0.10
4	0.07	0.05	0.05	0.04	0.04	0.05	0.06	0.04	0.04	0.04	0.08	0.08
5	0.07	0.08	0.09	0.06	0.05	0.07	0.09	0.10	0.11	0.12	0.12	0.12
6	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02
7	0.16	0.17	0.16	0.22	0.17	0.16	0.16	0.17	0.19	0.22	0.21	0.22
8	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.02
9	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02
10	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
11	0.24	0.25	0.28	0.22	0.26	0.29	0.28	0.27	0.26	0.28	0.29	0.29
12	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
13	0.17	0.16	0.13	0.21	0.17	0.19	0.21	0.21	0.20	0.20	0.21	0.21
14	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
15	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
16	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
17	0.07	0.07	0.07	0.09	0.10	0.11	0.10	0.11	0.12	0.12	0.12	0.12
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.05	0.06	0.07	0.08	0.08	0.09	0.09	0.09	0.10	0.10	0.10	0.10
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01
22	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.01
23	0.03	0.03	0.04	0.05	0.06	0.05	0.08	0.08	0.08	0.09	0.09	0.09
24	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
25	0.02	0.03	0.06	0.06	0.06	0.07	0.07	0.08	0.08	0.09	0.09	0.09
26	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01
29	0.01	0.01	0.03	0.04	0.05	0.05	0.05	0.06	0.06	0.06	0.07	0.07
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.03	0.02	0.02	0.03	0.04	0.03	0.05	0.04	0.05	0.05	0.06	0.06
32	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.01
33	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01
34	0.01	0.01	0.01	0.00	0.01	0.01	0.00	0.01	0.01	0.01	0.00	0.01
35	0.05	0.04	0.02	0.02	0.01	0.03	0.03	0.04	0.04	0.05	0.05	0.05
36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01
37	0.06	0.05	0.03	0.03	0.03	0.02	0.02	0.04	0.04	0.06	0.06	0.06
38	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01
39	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01
40	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
41	0.08	0.06	0.03	0.05	0.03	0.03	0.04	0.03	0.04	0.06	0.07	0.08
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.01
43	0.07	0.06	0.06	0.03	0.05	0.04	0.04	0.03	0.05	0.06	0.06	0.07
44	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
45	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.00	0.01
46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01
47	0.05	0.04	0.03	0.04	0.02	0.02	0.02	0.03	0.02	0.03	0.03	0.05
48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
49	0.04	0.04	0.04	0.02	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.04
50	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
THDi	0.42	0.40	0.43	0.43	0.42	0.44	0.45	0.47	0.49	0.51	0.52	0.52

3.2.6 Zwischenharmonische / Interharmonics

[illegible]

Test results for STP 20-50												
Pbin [%]	3	10	20	30	40	50	60	70	80	90	100	Max
Order	I/I _n	I/I _n	I/I _n	I/I _n	I/I _n	I/I _n	I/I _n	I/I _n	I/I _n	I/I _n	I/I _n	I/I _n
1.5	0.03	0.03	0.03	0.03	0.04	0.04	0.05	0.05	0.04	0.04	0.05	0.05
2.5	0.05	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.05
3.5	0.06	0.05	0.06	0.06	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
4.5	0.03	0.02	0.03	0.03	0.03	0.03	0.04	0.04	0.03	0.04	0.04	0.04
5.5	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
6.5	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.02	0.03	0.03
7.5	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08
8.5	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.03	0.03	0.03
9.5	0.05	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
10.5	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
11.5	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
12.5	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
13.5	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
14.5	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
15.5	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
16.5	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
17.5	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
18.5	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
19.5	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01
20.5	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
21.5	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01
22.5	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01
23.5	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01
24.5	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01
25.5	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01
26.5	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01
27.5	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
28.5	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01
29.5	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
30.5	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
31.5	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01
32.5	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
33.5	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01
34.5	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
35.5	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01
36.5	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
37.5	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01
38.5	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
39.5	0.00	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
40.5	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
41.5	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
42.5	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
43.5	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
44.5	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
45.5	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.01
46.5	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
47.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
48.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
49.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Test results for STP 15-50												
Pbin [%]	3	10	20	30	40	50	60	70	80	90	100	Max
Order	I/In	I/In	I/In	I/In	I/In	I/In	I/In	I/In	I/In	I/In	I/In	I/In
1.5	0.29	0.02	0.03	0.02	0.03	0.03	0.03	0.04	0.04	0.04	0.03	0.29
2.5	0.04	0.02	0.03	0.02	0.02	0.03	0.03	0.04	0.04	0.04	0.03	0.04
3.5	0.30	0.02	0.03	0.02	0.02	0.03	0.03	0.04	0.04	0.04	0.04	0.30
4.5	0.04	0.02	0.03	0.02	0.02	0.02	0.03	0.03	0.04	0.04	0.03	0.04
5.5	0.04	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04
6.5	0.02	0.01	0.02	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02
7.5	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02
8.5	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02
9.5	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
10.5	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
11.5	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
12.5	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
13.5	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
14.5	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
15.5	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
16.5	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
17.5	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
18.5	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
19.5	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
20.5	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
21.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22.5	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
23.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26.5	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
27.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28.5	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
29.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30.5	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
31.5	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
32.5	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
33.5	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
34.5	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
35.5	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
36.5	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.01
37.5	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.01
38.5	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
39.5	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
40.5	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
41.5	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
42.5	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
43.5	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
44.5	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
45.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
46.5	0.00	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
47.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
48.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
49.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

[illegible]

3.2.7 Höhere Frequenzen / Higher Frequencies components

[illegible]

[illegible]

[illegible]

[illegible]

3.3 Grid Control Capability

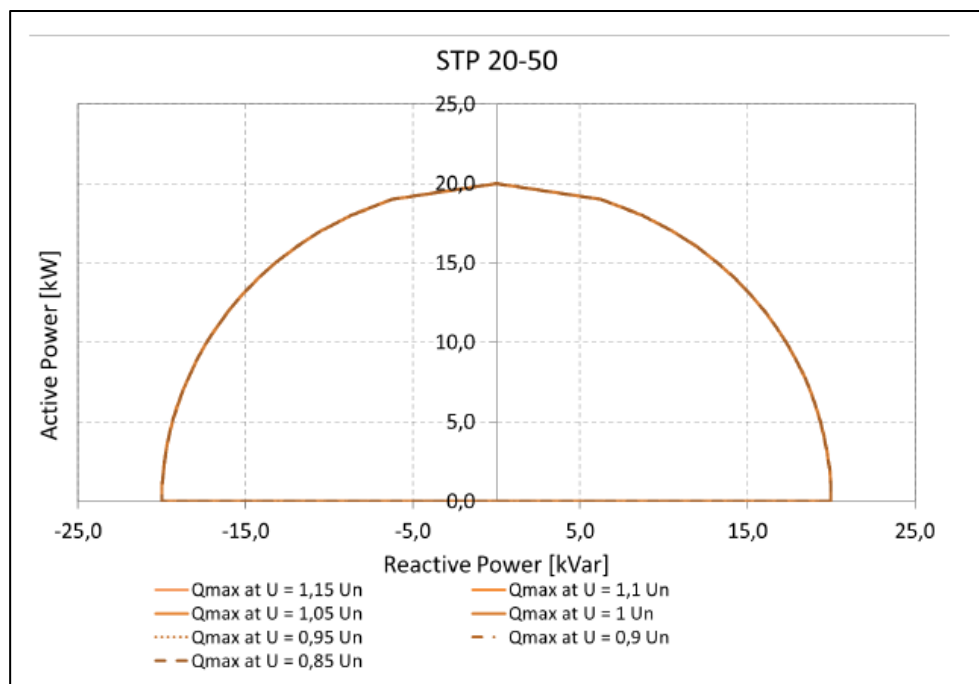
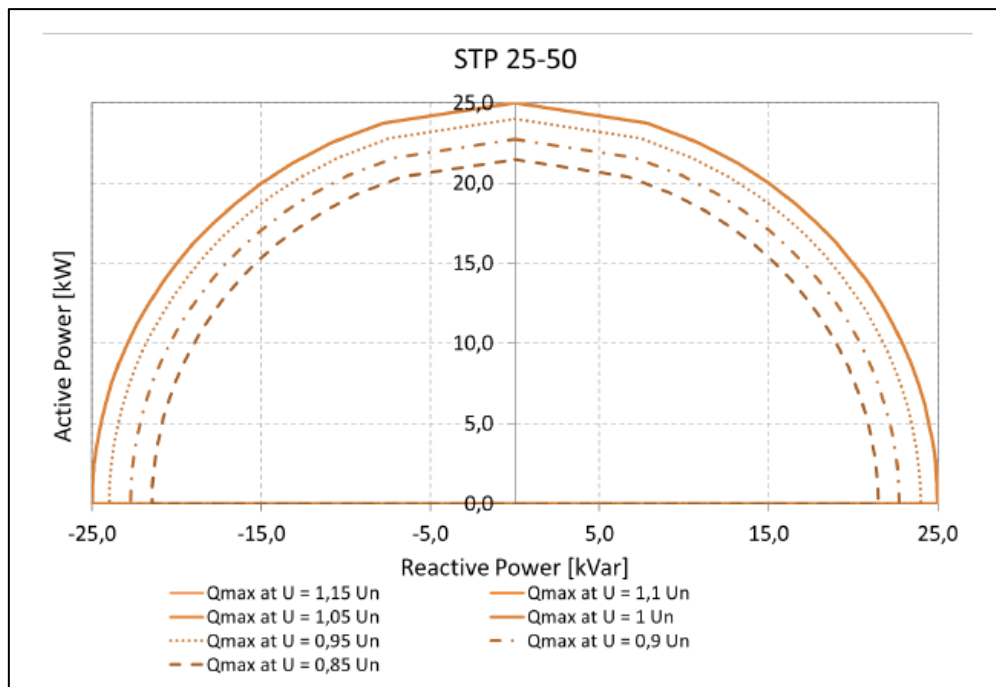
3.3.1 Wirkleistungs einspeisung in Abhängigkeit der Netzfrequenz / Active power vs frequency

Überfrequenz / overfrequency	Mittlerer Gradient der Wirkleistung sum Zeitpunkt der Frequenzüberhöhung / Mean power gradient at overfrequency	mittl. Gradient / mean gradient Test at 100%Pn: 40.02 % P _M /Hz	
	Max. Einschwingzeit / Max. Settling time	0.76 s	
	Gradient der Wirkleistung nach Rückkehr aus Überfrequenz / Power gradient after recovery of over frequency	mittl. Gradient / mean gradient 9.0 %Pn/Hz max. Gradient / max. gradient 9.0%Pn/Hz	
Unterfrequenz / underfrequency	Mittlerer Gradient der Wirkleistung sum Zeitpunkt der Frequenzunterschreitung / Mean power gradient at underfrequency	mittl. Gradient / mean gradient 40.46 % P _M /Hz	
	Max. Einschwingzeit / Max. Settling time	0.54 s	
	Gradient der Wirkleistung nach Rückkehr aus Unterfrequenz / Power gradient after recovery of under frequency	mittl. Gradient / mean gradient 9.0 %Pn/Hz max. Gradient / max. gradient 9.0 %Pn/Hz	
Die EZE kann mit reduzierter Leistung betrieben werden. / The unit is able to run at reduced power		☒ Ja / Yes	☐ Nein / No
Maximale Sollwertabweichung der Wirkleistung Max. deviation of power setting		Überschreitung / Exceeding 0.5 Pn	Unterschreitung / Undercut none
Trennung vom Nets bei Wirkleistungssollwertvorgabe von: Disconnection from the grid at external active power setpoints at:		-- % Pn No disconnection is recorded. Operation at 0%Pn is evidenced.	
Einschwingzeit der Leistung für einen Sollwertsprung mit minimalem Gradienten / Response time of the power output after a change in setpoint with minimal gradient		P0 -> Pmin	Zeit / time : 46.0 s Gradient: 0.33 % Pn / s
		Pmin -> P0	Zeit / time : 44.6 s Gradient: 0.33 % Pn / s
Einschwingzeit der Leistung für einen Sollwertsprung mit maximalem Gradienten / Response time of the power output after a change in setpoint with maximum gradient		P0 -> Pmin	Zeit / time : 131.0 s Gradient: 0.65 % Pn / s
		Pmin -> P0	Zeit / time : 129.4 s Gradient: 0.65 % Pn / s

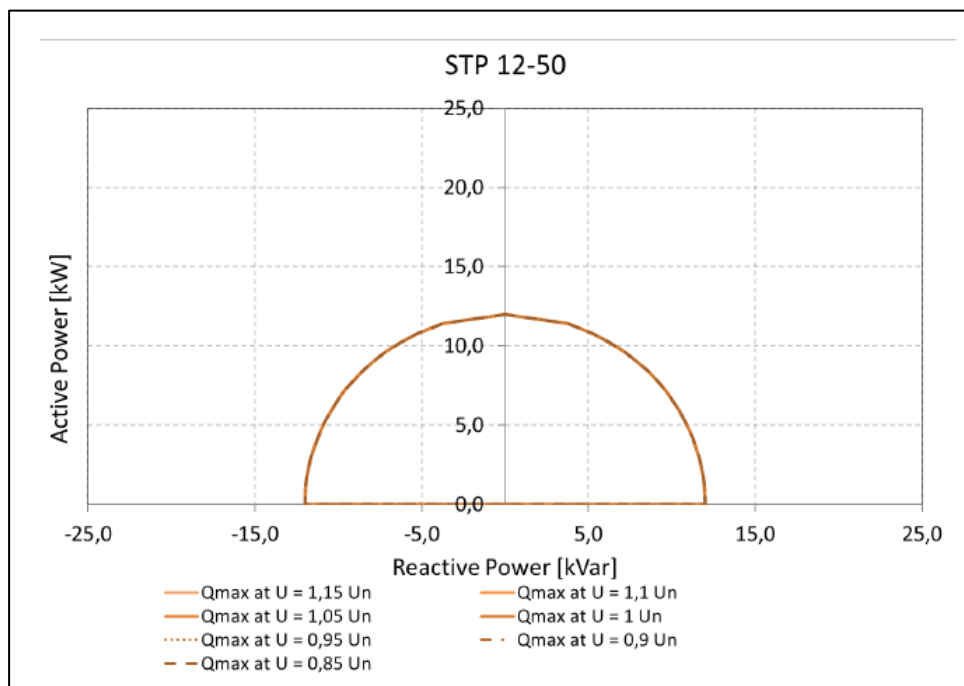
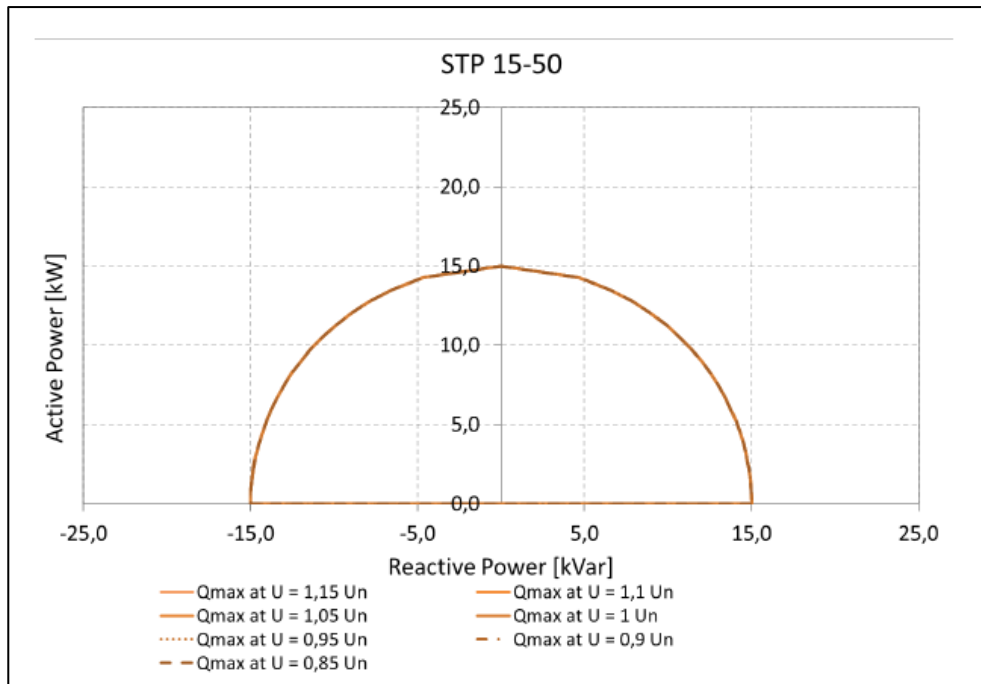
3.3.2 Blindleistungsbereitstellung / Provision of reactive power

The certified apparatus fulfils the following P-Q diagram at different voltage levels, as stated in Document reference [3]

For VDE-AR-N 4110 the voltage-dependent PQ diagram reactive power capability of STP 25-50, STP 20-50, STP 15-50 and STP 12-50 units is shown below:



FGW-TG3+SP1



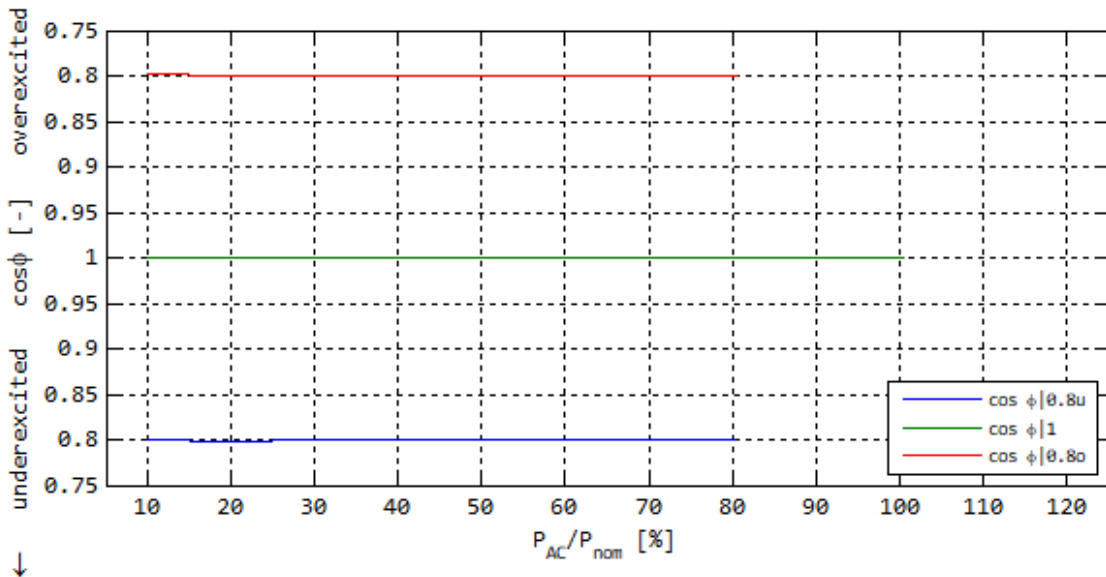
Blindleistungsregelung im Normalbetrieb und maximaler Blindleistungstellbereich / Control of reactive power in normal operation and maximum reactive power range	P/Pn	Qind	Q0	Qkap	P/Pn	Qind	Q0	Qkap
	10%	1.875	0	-1.875	70%	13.050	0	-13.050
	20%	3.750	0	-3.750	80%	14.900	0	-14.925
	30%	5.625	0	-5.625	90%	15.075	0	-15.100
	40%	7.525	0	-7.525	100%	--	-0.025	--
	50%	9.325	0	-9.325	110%	--	-0.025	--
	60%	11.200	0	-11.200	120%	--	--	--
Arbeitspunkte des spannungsabhängigen P-Q Diagramms / Working points of the voltage dependent P-Q diagram	AP / WP		U/Un in %		P/Pn in %		Q in kVAr	
	See measured points and results in the following pages of this annex							
Blindleistungsregelung durch Sollwertvorgabe / Control of reactive power through set point signal	☒Verschiebungsfaktor / power factor				☒Blindleistung / reactive power			
	Pbin bei / at Qmax				Maximum PF range: 0.8 Maximum Q range: 90%Sn			
Längste Einsschwingzeit / Longest response time	Parameter				Einschwingzeit / settling time			
	T < 6 s				8.6 s (maximum measured)			
	Standardzeit / standard time				--			
	T < 60 s				84.4 s (maximum measured)			
Einstellgenauigkeit des Verschiebungsfaktors bzw. Blindleistung / Positioning accuracy of power factor or reactive power	Sollwert / setpoint. Mode tested: <i>PF Const at 100%Pn</i>				Istwert / measured value			
	PF = 0.8 (Under excited)				0.800			
	PF = 0.8 (Over excited)				-0.799			
	PF = 1.0				1.000			
	Sollwert / setpoint. Mode tested: <i>PF Const at 50%Pn</i>				Istwert / measured value			
	PF = 0.8 (Under excited)				0.800			
	PF = 0.8 (Over excited)				-0.799			
	PF = 1.0				1.000			
	Sollwert / setpoint. Mode tested: <i>VAr Const at 50%Pn</i>				Istwert / measured value			
	25.000 kVAr				12.575 kVAr			
	-25.000 kVAr				-12.575 kVAr			
	0.000 kVAr				0.000 kVAr			
	Sollwert / setpoint. Mode tested: <i>VAr Const Nominal at 50%Pn</i>				Istwert / measured value			
	50%Sn				50.3 %Sn			
	-50%Sn				-50.3 %sn			
	0%Sn				0.0%Sn			
Anmerkung / remark	Soweit Q(U) und Q(P)- Regelung wurde, sind diese im Prüfbericht hinterlegt / See Q(U) and Q(P) in test report							

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In following charts, they are offered main results after performed tests included in the FGW TG3 test report.

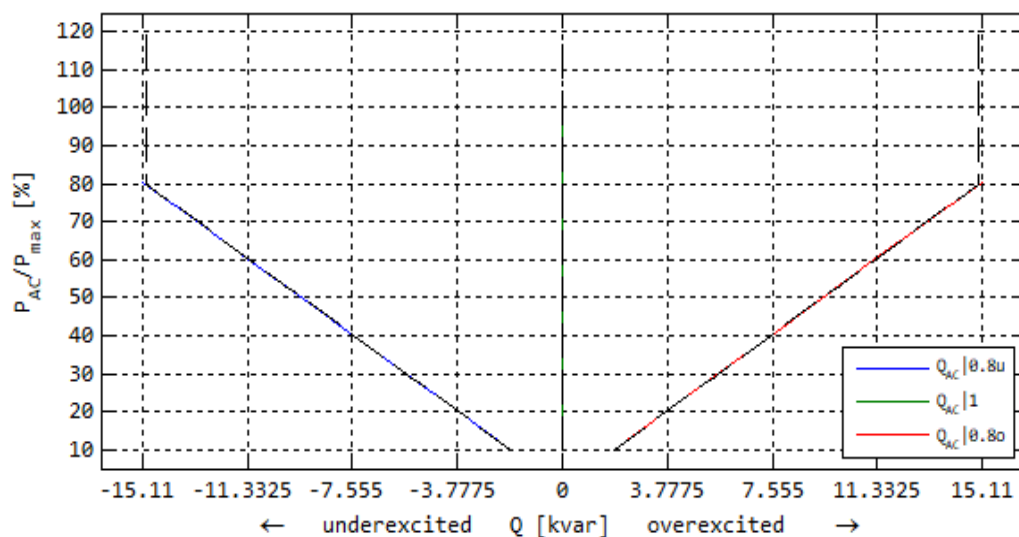
Active Power over Power Factor. Fixed Power Factor

Verification of reactive power (power factor, permitted deviation(max) = 0.01 @ $|P/P_{nom}| \geq 20\%$)
deviation of $\cos \phi_u$ (avg/max) = -0.001 / -0.001
deviation of $\cos \phi_0$ (avg/max) = 0.000 / 0.000
deviation of $\cos \phi_o$ (avg/max) = 0.000 / 0.001
overall deviation (avg/max) = -0.000 / 0.001 → ok



Active Power over Reactive Power. Fixed Power Factor

Verification of reactive power (reactive power, permitted deviation(max) = 2.00% @ $|P/P_{nom}| \geq 20\%$)
deviation of Q_u (avg/max) = -0.06 % / -0.43 %
deviation of Q_0 (avg/max) = -0.04 % / -0.08 %
deviation of Q_o (avg/max) = 0.04 % / -0.39 %
overall deviation (avg/max) = -0.02 % / -0.43 % → ok

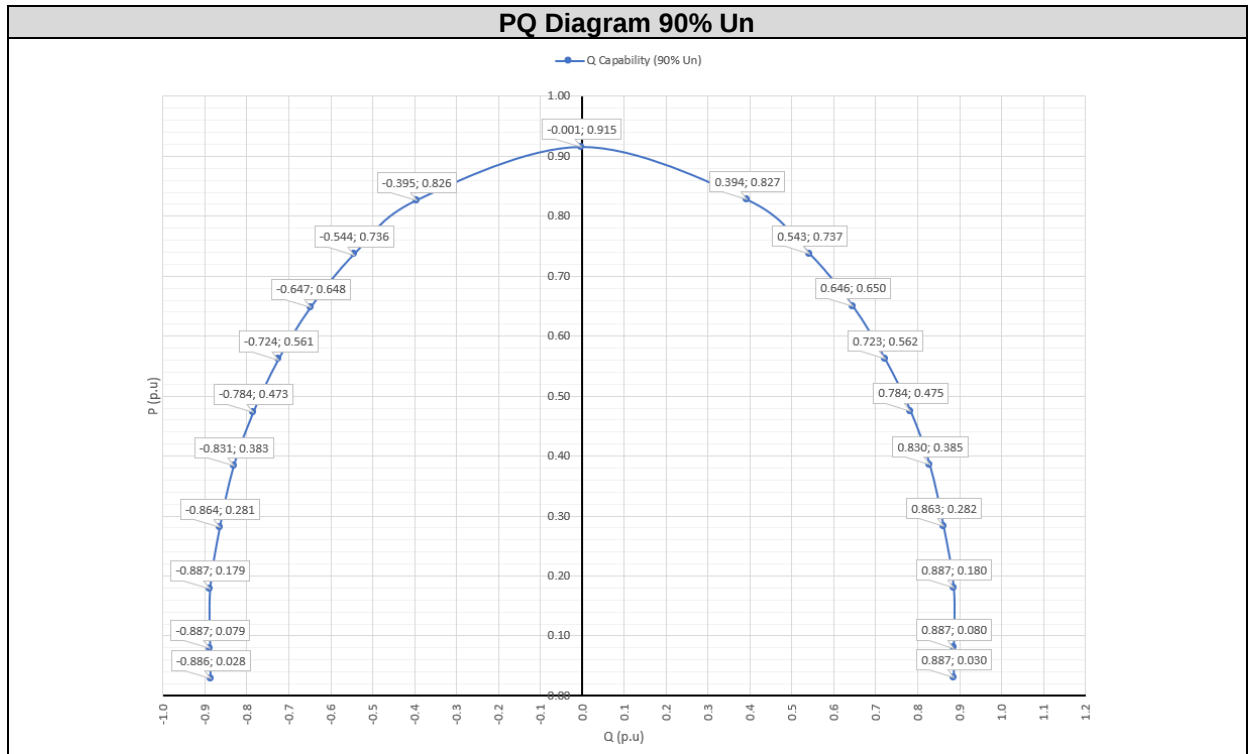


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The table below shows measured values for each power step tested to verify the voltage-dependent PQ diagram:

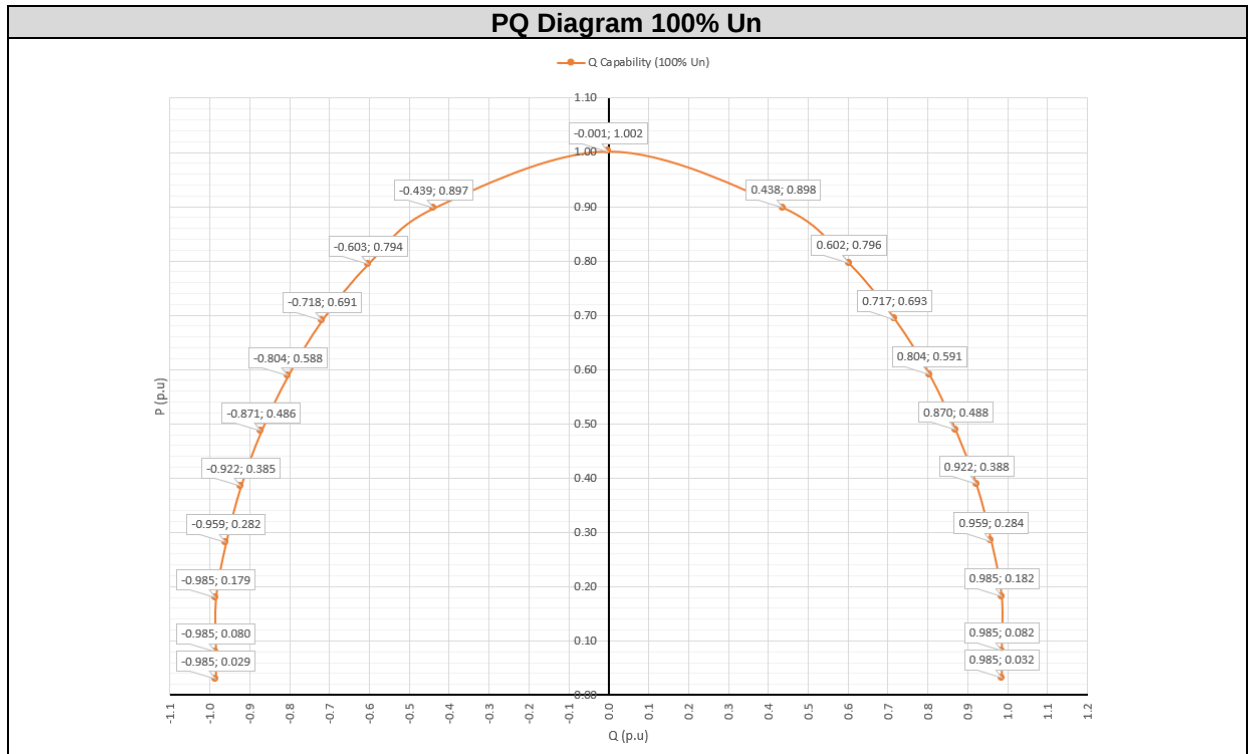
PQ Diagram 90% Un								
Step	V _{AC} (V)	P measured (kW)	P meas. (P/Sn)	S meas. (kVA)	S meas. (P/Sn)	Q meas. (kVAr)	Q meas. (P/Sn)	PF
1	358.6	0.743	0.030	22.180	0.887	22.168	0.887	0.034
2	358.6	2.008	0.080	22.258	0.890	22.165	0.887	0.090
3	358.6	4.508	0.180	22.618	0.905	22.163	0.887	0.199
4	358.6	7.060	0.282	22.708	0.908	21.583	0.863	0.311
5	358.6	9.613	0.385	22.868	0.915	20.750	0.830	0.420
6	358.6	11.863	0.475	22.903	0.916	19.590	0.784	0.518
7	358.6	14.053	0.562	22.900	0.916	18.080	0.723	0.614
8	358.6	16.240	0.650	22.895	0.916	16.140	0.646	0.709
9	358.6	18.435	0.737	22.893	0.916	13.570	0.543	0.805
10	358.6	20.663	0.827	22.888	0.916	9.845	0.394	0.903
11	358.6	22.883	0.915	22.883	0.915	-0.020	-0.001	1.000
12	358.6	20.640	0.826	22.883	0.915	-9.880	-0.395	0.902
13	358.6	18.405	0.736	22.885	0.915	-13.600	-0.544	0.804
14	358.6	16.203	0.648	22.888	0.916	-16.165	-0.647	0.708
15	358.6	14.013	0.561	22.890	0.916	-18.100	-0.724	0.612
16	358.6	11.818	0.473	22.893	0.916	-19.608	-0.784	0.516
17	358.6	9.585	0.383	22.868	0.915	-20.763	-0.831	0.419
18	358.6	7.020	0.281	22.703	0.908	-21.590	-0.864	0.309
19	358.6	4.463	0.179	22.610	0.904	-22.165	-0.887	0.197
20	358.6	1.968	0.079	22.248	0.890	-22.163	-0.887	0.089
21	358.6	0.693	0.028	22.173	0.887	-22.160	-0.886	0.031

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PQ Diagram 100% Un								
Step	V _{AC} (V)	P measured (kW)	P meas. (P/Sn)	S meas. (kVA)	S meas. (P/Sn)	Q meas. (kVAr)	Q meas. (P/Sn)	PF
1	398.4	0.800	0.032	24.650	0.986	24.625	0.985	0.032
2	398.4	2.050	0.082	24.725	0.989	24.625	0.985	0.083
3	398.4	4.550	0.182	25.050	1.002	24.625	0.985	0.182
4	398.4	7.100	0.284	25.000	1.000	23.975	0.959	0.284
5	398.4	9.700	0.388	25.000	1.000	23.050	0.922	0.388
6	398.4	12.200	0.488	24.950	0.998	21.750	0.870	0.489
7	398.4	14.775	0.591	24.925	0.997	20.100	0.804	0.592
8	398.4	17.325	0.693	24.925	0.997	17.925	0.717	0.695
9	398.4	19.900	0.796	24.950	0.998	15.050	0.602	0.797
10	398.4	22.450	0.898	24.975	0.999	10.950	0.438	0.899
11	398.4	25.050	1.002	25.050	1.002	-0.025	-0.001	1.000
12	398.4	22.425	0.897	24.975	0.999	-10.975	-0.439	0.898
13	398.4	19.850	0.794	24.925	0.997	-15.075	-0.603	0.796
14	398.4	17.275	0.691	24.925	0.997	-17.950	-0.718	0.694
15	398.4	14.700	0.588	24.925	0.997	-20.100	-0.804	0.590
16	398.4	12.150	0.486	24.925	0.997	-21.775	-0.871	0.487
17	398.4	9.625	0.385	24.975	0.999	-23.050	-0.922	0.385
18	398.4	7.050	0.282	25.000	1.000	-23.975	-0.959	0.282
19	398.4	4.475	0.179	25.025	1.001	-24.625	-0.985	0.179
20	398.4	2.000	0.080	24.700	0.988	-24.625	-0.985	0.081
21	398.4	0.725	0.029	24.625	0.985	-24.625	-0.985	0.029

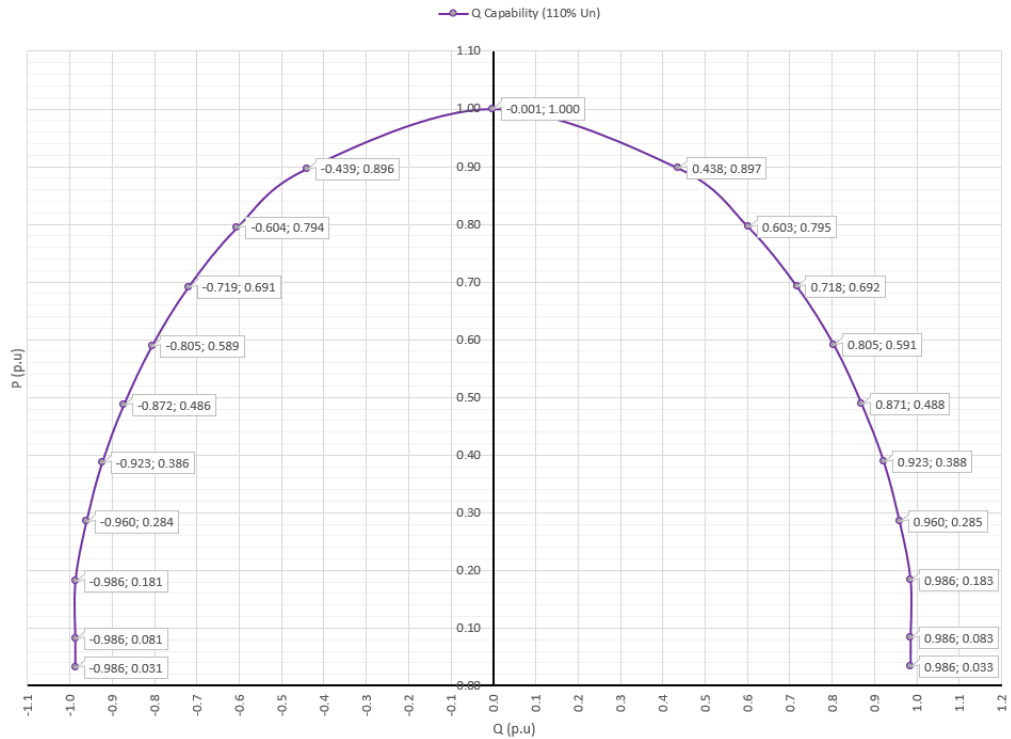
FGW-TG3+SP1



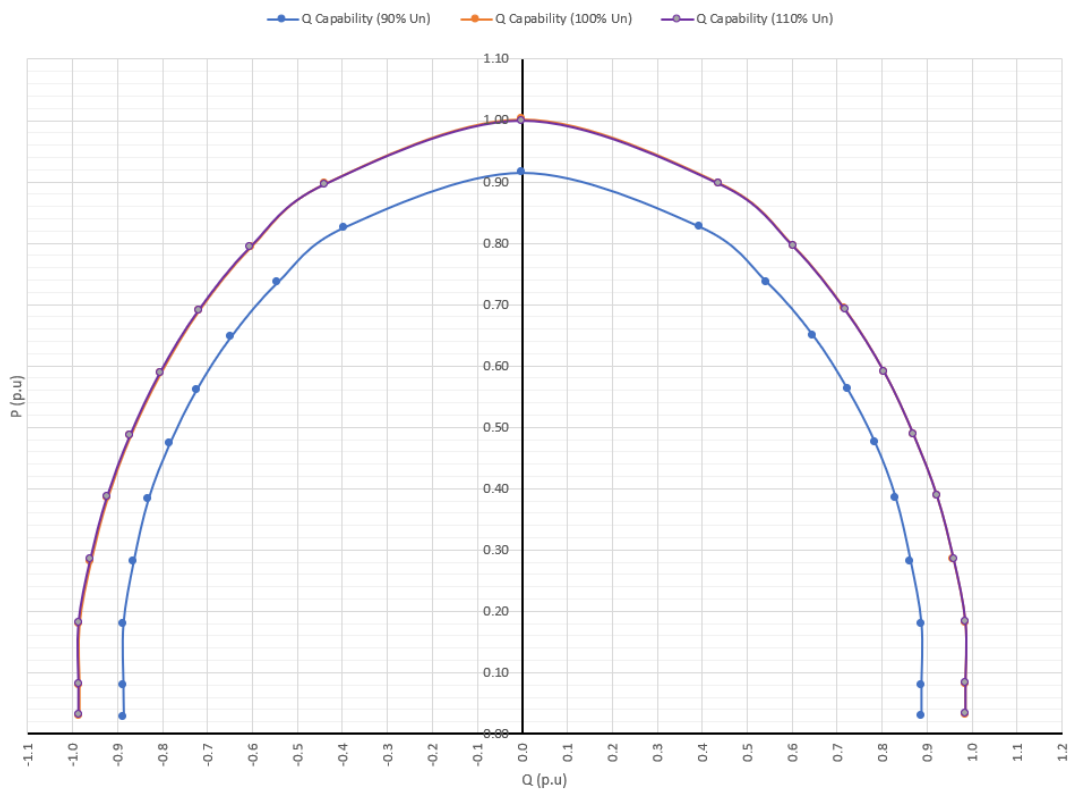
PQ Diagram 110% Un								
Step	V _{AC} (V)	P measured (kW)	P meas. (P/Sn)	S meas. (kVA)	S meas. (P/Sn)	Q meas. (kVar)	Q meas. (P/Sn)	PF
1	438.3	0.825	0.033	24.675	0.987	24.650	0.986	0.033
2	438.3	2.075	0.083	24.750	0.990	24.650	0.986	0.084
3	438.3	4.575	0.183	25.075	1.003	24.650	0.986	0.183
4	438.3	7.125	0.285	25.025	1.001	24.000	0.960	0.285
5	438.3	9.700	0.388	25.025	1.001	23.075	0.923	0.387
6	438.3	12.200	0.488	24.975	0.999	21.775	0.871	0.489
7	438.3	14.775	0.591	24.950	0.998	20.125	0.805	0.592
8	438.2	17.300	0.692	24.950	0.998	17.950	0.718	0.694
9	438.2	19.875	0.795	24.950	0.998	15.075	0.603	0.797
10	438.2	22.425	0.897	24.950	0.998	10.950	0.438	0.899
11	438.2	25.000	1.000	25.000	1.000	-0.025	-0.001	1.000
12	438.2	22.400	0.896	24.950	0.998	-10.975	-0.439	0.898
13	438.2	19.850	0.794	24.950	0.998	-15.100	-0.604	0.796
14	438.2	17.275	0.691	24.925	0.997	-17.975	-0.719	0.693
15	438.2	14.725	0.589	24.950	0.998	-20.125	-0.805	0.590
16	438.3	12.150	0.486	24.950	0.998	-21.800	-0.872	0.487
17	438.3	9.650	0.386	25.000	1.000	-23.075	-0.923	0.386
18	438.3	7.100	0.284	25.025	1.001	-24.000	-0.960	0.284
19	438.3	4.525	0.181	25.075	1.003	-24.650	-0.986	0.181
20	438.3	2.025	0.081	24.725	0.989	-24.650	-0.986	0.082
21	438.3	0.775	0.031	24.650	0.986	-24.650	-0.986	0.032

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PQ Diagram 110% Un



PQ Diagram Summary



Note: 90%Un and 110%Un voltage levels have been verified in this test, as per client request, nevertheless, Manufacturer Declaration includes PQ Diagram with declared voltages 85%Un and 115%Un.
See the point 3.2.2 of the this report for information of PQ voltage dependent curves declared by the manufacturer.

3.4 Protection system

3.4.1 Trennung der EZE vom Netz / Cut-off from grid

☒ Die Überprüfung der Gesamtwirkungskette führte zu einer erfolgreichen Abschaltung. The test of the whole trip circuit led to a successful shut down							
	Einstellwert Setting In pu oder/or [Hz]		Auslösewert / Release value In pu oder/or [Hz]		Abschaltzeit / Disconnection time [ms]		Rückfallverhältnis Disengaging ratio
	Schwelle / value	Zeit / Time (ms)	Min.	Max.	Min.	Max.	
Spannungssteigerungsschutz/ Overvoltage protection: U>	1.000	180000	0.999	1.004	179950	179950	☒≥0.98 ☐<0.98
	1.200	50	1.200	1.204	17	23	
Spannungssteigerungsschutz/ Overvoltage protection: U>>	1.000	59000	0.999	1.004	58950	58960	---
	1.300	50	1.300	1.306	15	23	
Spannungsrückgangsschutz/ Undervoltage protection: U<	0.200	50	0.194	0.196	31	32	☒≤1.02 ☐>1.02
	1.000	10000	0.994	0.996	9960	9970	
Spannungsrückgangsschutz/ Undervoltage protection: U<<	0.200	50	0.195	0.196	24	33	☒≤1.02 ☐>1.02
	1.000	10000	0.994	0.999	9960	9970	
Frequenzsteigerungsschutz/ Overfrequency protection: F>	50.00	10000	50.00		9960		---
	55.00	50	55.00		23		
Frequenzsteigerungsschutz/ Overfrequency protection: F>>	50.00	10000	50.00		9960		---
	55.00	50	55.00		29		
Frequenzrückgangsschutz/ Underfrequency protection: F<	44.00	10000	44.00		9960		---
	50.00	50	50.00		30		
Eigenzeit der Abschalteinheit / Operating time of a circuit breaker:	☐ aus Messung by measurement				☒ aus Prüfzertifikat by test certificate		
	According to the relay specification, the operation time of circuit breaker is: - Declared operate time given by the supplier: 40 ms at nominal coil voltage. - Declared release time given by the supplier: 5 ms at nominal coil voltage. See next page.						

AZSR235/250

50 A (35 A) POWER RELAY

FEATURES

- 50 Amp switching (AZSR250)
- 35 Amp switching (AZSR235)
- Wide contact gap > 1.85mm (AZSR250)
- Wide contact gap > 2.05mm (AZSR235)
- Holding power <100 mW
- Dielectric strength 5000 Vrms
- Isolation spacing greater than 10 mm
- Reinforced insulation, EN 60730-1 (VDE 0631, part 1), EN 60335-1 (VDE 0700, part 1)
- UL, CUR file E44211
- VDE certificate 40033251

CONTACTS

Arrangement	SPST (1 Form A) DPST (2 Form A)
Ratings	Resistive load: AZSR235 Max. switched power: 1050 W or 9695 VA Max. switched current: 35 A Max. switched voltage: 150 VDC* or 440 VAC AZSR250 Max. switched power: 1500 W or 13850 VA Max. switched current: 50 A Max. switched voltage: 150 VDC* or 440 VAC * Note: If switching voltage is greater than 30 VDC, special precautions must be taken. Please contact the factory.
Rated Load UL	AZSR235 35 A at 277 VAC, resistive AZSR250 50 A at 277 VAC, resistive
VDE	AZSR235 35 A at 263 VAC, test referring to AC-7a, 85°C AZSR250 50 A at 263 VAC, test referring to AC-7a, 85°C
Material	Silver tin oxide
Resistance	< 50 milliohms initially

COIL

Power At Pickup Voltage (typical)	270 mW (AZSR250)
Max. Continuous Dissipation	2.0 W at 20°C (68°F) ambient
Temperature Rise	15°C (27°F) at nominal coil voltage
Temperature	Max. 155°C (311°F) Class F

RoHS compliant !

GENERAL DATA

Life Expectancy Mechanical Electrical	Minimum operations 1 x 10 ⁶ 5 x 10 ⁴ at 35 A 250 VAC Res. (AZSR235) 5 x 10 ⁴ at 50 A 250 VAC Res. (AZSR250)
Operate Time (typical)	40 ms at nominal coil voltage
Release Time (typical)	5 ms at nominal coil voltage (with no coil suppression)
Dielectric Strength (at sea level for 1 min.)	5000 Vrms coil to contact 2500 Vrms between contact sets 2500 Vrms between open contacts
Insulation Resistance	1000 megohms min. at 20°C 500 VDC 50% RH
Insulation (according to DIN VDE 0110, IEC 60664-1)	C250 Overvoltage category: III Pollution degree: 3 Nominal voltage: 250 VAC
Dropout	Greater than 5% of nominal coil voltage
Ambient Temperature Operating	At nominal coil voltage -40°C (-40°F) to 85°C (185°F)
Vibration	0.062" (1.5 mm) DA at 10-55 Hz
Shock	10 g
Enclosure	PA
Terminals	Tinned copper alloy, P.C.
Max. Solder Temp.	270°C (518°F)
Max. Solder Time	5 seconds
Weight	105 grams
Packing unit in pcs	10 per inner carton / 100 per carton box

NOTES

1. All values at 20°C (68°F).
2. Relay may pull in with less than "Must Operate" value.
3. Specifications subject to change without notice.

ZETTLER electronics GmbH - A ZETTLER GROUP Company

Junkersstr. 3, D-82178 Puchheim, Germany

phone: +49 89 800 97-0 office@ZETTLERelectronics.com

fax: +49 89 800 97-200 www.ZETTLERelectronics.com

This product specification is to be used only together with the application notes which can be downloaded from <http://www.ZETTLERelectronics.com/pdfs/relais/ApplicationNotes.pdf>

2015-03-31

3.4.2 Zuschaltbedingungen / Cut-in conditions

Since this is optional testing, this test has not been performed as is an optional measurement according to point 4.5.1.1 of the standard.

3.4.3 Zuschaltbedingungen nach Auslösung des Entkupplungsschutzes / Cut-in conditions after tripping of protection

	Bereich / range In pu order/ or [Hz]	Zuschaltung erfolgte im angegebenen Bereich cut in occurred within the given range
Unterspannung / Undervoltage:	> 0,95	☐ nein / no ☒ ja / yes
Unterfrequenz / Underfrequency:	≥ 49,9	☐ nein / no ☒ ja / yes
Überfrequenz / Overfrequency:	≤ 50,1	☐ nein / no ☒ ja / yes

As evidenced in the evaluated documentation, the certified unit is able to follow a ramp gradient inside of the range 33%Pn/s – 66%Pn/s after the reconnection occurs.

3.5 Response during grid faults

The compliance with these requirements including all calculations defined in the FGW TR3 standard is stated in the attachment to the test report:

- 2222 / 0215-Att1 (Revision 0) : FGW-TG3: Grid Fault Tests Results

--- END OF THE EXTRACT OF THE TEST REPORT ---