

ANNEX TO THE CERTIFICATE

240282RECO03-M1-CER

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This document is created based on requirements of FGW Technical Guidelines for Power Generating Units, Systems and Storage Systems as well as for their Components. Part 8 (TG8). Certification of the Electrical Characteristics of Power Generating Units, Systems and Storage Systems as well as their Components on the Grid. Revision 09. Dated 01/02/2019.

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1 OVERVIEW OF THE FGW TR8 EVALUATION REPORT

This point of this annex of the certificate no. 240282RECO03-M1-CER contains the information of all items and documentation used for the evaluation of compliance of the certified product according to standards VDE-AR-N 4110: 2023-09 and VDE-AR-N 4120: 2018-11+A1: 2024-04, FGW-Richlinie TR 3 Rev. 26 and FGW-Richlinie TR 4 Rev. 10.

The information contained in this point is extracted from the SGS Evaluation Report Number: 240282RECO03-M1 rev 0 with date on 30/10/2024 according of FGW TR8 rev. 9.

The evaluation performed by SGS comprises the checking in compliance with following requirements:

Evaluation:	Remarks	Result		
Keys: P.....Pass. NC.....Not Comply NA.....Not Applicable				
Checking of the PGU tested	See point 1.1 of this document	☒ P	☐ NC	☐ NA
Checking of the variant models to be included in the certification process	See point 1.2 of this document	☒ P	☐ NC	☐ NA
Review Test Report according FGW TG3 per VDE-AR-N 4110: 2023-09 certification	See point 1.3 of this document	☒ P	☐ NC	☐ NA
Review Test Report according FGW TG3 per VDE-AR-N 4120: 2018-11+A1: 2024-04 certification	See point 1.2 of this document	☒ P	☐ NC	☐ NA
Review Test Report according FGW TG4.	See point 1.4 of this document	☒ P	☐ NC	☐ NA
Quality system certificate according to ISO 9001	See point 1.5 of this document	☒ P	☐ NC	☐ NA
Compromise letter of maintain ISO 9001 certified during the validity period of VDE certificate.	See point 1.6 of this document	☒ P	☐ NC	☐ NA
Compromise letter of product to certify is the same that the product tested, and transferability acceptance of non-tested PGU.	See point 1.7 of this document	☒ P	☐ NC	☐ NA

1.1 Information about the tested model.

Information appearing in the application form:

- **Date of the application form:** 30/10/2024
- **Applicant:** Zucchetti Centro Sistemi SpA ⁽¹⁾
- **License holder:** Zucchetti Centro Sistemi SpA
- **Factory:** Guangdong Sofar Smart Technology Co., Ltd.
No.1, Dongsheng North Road, Chenjiang Street, Zhongkai High-tech Zone, Huizhou City, China.
- **Product:**
 - Type: Grid-Connected PV Inverter
 - Trademark: SofarSolar
 - Base model: ZPM-PCS215K-R
 - Input: 1000-1500 V (1500 V Max.); 220 A Max.
 - Output: 3W+PE, 690 V; 50 Hz; 180 A Rated; 198 A Max.; 215 kW Rated; 237 kVA Max.
 - Control software version: V000001
 - Variant models: ZPM-PCS125K-R

Certification service applied:

Certification of Solar Grid-tied Inverter according to VDE-AR-N 4110 and VDE-AR-N 4120.

Information appearing in the test report according to FGW TG3:

- **License holder:** Zucchetti Centro Sistemi SpA
- **Product:**
 - Type: Grid-Connected PV Inverter
 - Trademark: ZCS
 - Base model: ZPM-PCS215K-R
 - Input: 1000-1500 V (1500 V Max.); 220 A Max.
 - Output: 3W+PE, 690 V; 50 Hz; 180 A Rated; 198 A Max.; 215 kW Rated; 237 kVA Max.
 - Control software version: V000001
 - Variant models: ZPM-PCS125K-R

Information appearing in the test report according to FGW TG4:

- Validation report number: 240282RECO03-TG4
- Issuance date: 17/10/2024
- Issued by: SGS Tecnos, S.A. (Electrical Testing Laboratory)
- Software type: Simulator for Grid Connected Power Conversion System
- Simulation platform: DiGSILENT PowerFactory 2024
- Used version of the simulation platform: Version 24.0.2.0
- Simulation Software File identification: PGU_125-215K-R.pfd
- Dynamic Simulation Model version: V2.1
- MD5 Checksum: CEF983EF1586538CB7E1A40721EF953E

Information of the user manual documentation of the dynamic simulation model:

- Document reference: "EBI125K-R_Digsilent_dynamic_mode_user_manual_20240918"
- Version: V1.0
- Issuance date: September, 2024
- Issued by: SofarSolar

⁽¹⁾ This is an application for issuance of co-license based on the certificate 240282RECO03-CER/E1.

As declared by the manufacturer, the model EBI 215K-R is totally equivalent to the co-licensed model ZPM-PCS215K-R. Technical ratings, Firmware and start-up and display menus are exactly the same and just the model reference name is different.

The holder of the FGW TG3 report above detailed authorizes the company listed as applicant to apply to use this report in order to apply for this certification.

1.2 Information about variant models to be included into the scope of the certification process.

Taking as reference the article 2.12.2 of the standard FGW TG8, revision 9, test results can be transferred from test reports to non-tested units taking into account following items:

- a) The design and the control engineering critical to the electrical characteristics including the software used are equivalent in both PGUs from a technical perspective.
- b) The test results for the smallest and the largest power version are available or alternatively the rated power of the power generation unit to be certified is between $1/\sqrt{10}$ times and twice (for Type 2 systems) of the rated power of the power generation unit to be measured.

- **Information of the base model:**

Brand name base model: ZPM-PCS215K-R
Rated output power base model [kW]: 215.0
Software version base model: V000001

After the characteristic given for the tested unit (s), test results can be transferred to other non-tested units of complying with the previously mentioned clause a), having output active power comprised between:

- Lower limit: 68.0 kW ($1/\sqrt{10}$ x Base model's Rated output power), and
- Upper limit: 430.0 kW (2 x Base model's Rated output power)

- **Information of the variant model:**

- Brand name variant model: ZPM-PCS125K-R
- Rated output power variant model [kW]: 125.0
- Software version variant model: V000001

As declared by the manufacturer, the model EBI 215K-R is totally equivalent to the co-licensed model ZPM-PCS215K-R. Technical ratings, Firmware and start-up and display menus are exactly the same and just the model reference name is different.

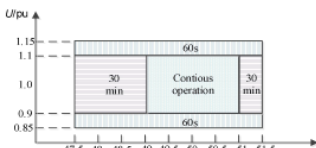
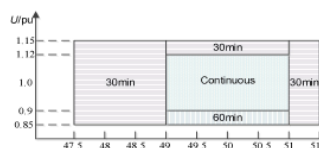
1.3 Summary of the evaluation of the test results

The following documentation is used for the evaluation:

- **Information of the test report:**
 - Test report number: 240282RECO03
 - Issuance date: 15/10/2024
 - Testing laboratory: SGS Tecnos, S.A. (Electrical Testing Laboratory).
 - Accreditation number of the laboratory: N° 5/LE011.

- **Information of the manufacturer declaration:**
 - Document reference name: "Declaration for ZPM-PCS215K-R/125K-R TR8"
 - Issuance date: 03/06/2024.
 - Issued by: Zucchetti Centro Sistemi SpA

As declared by the manufacturer, the model EBI 215K-R is totally equivalent to the co-licensed model ZPM-PCS215K-R.

FGW TG8		Title			Result
A.1.2.1 A.2.2.1		Physical part			--
A.1.2.1.1 A.2.2.1.1		Dimensioning of the equipment at the substation			--
		Not applicable to PGU			NA
A.1.2.2 A.2.2.2		Operating range			P
A.1.2.2.1 A.2.2.2.1		Quasi-steady-state operation			--
A.1.2.2.1.1 A.2.2.2.1.1		VDE 4110 Requirement Cl.	VDE 4110 Verification Cl.	Associated documents	Requirement needed
		10.2.1.2	11.2.3.1 11.2.4 11.2.5.5	TG3	☒ Manufacturer's declaration ☒ Test report
		VDE 4120 Requirement Cl.	VDE 4120 Verification Cl.	Associated documents	Requirement needed
		10.2.1.2	11.2.3.1 11.2.4 11.2.5.4	TG3	☒ Manufacturer's declaration ☒ Test report
<u>Evaluated documentation:</u>					
- Manufacturer declaration: "Declaration for ZPM-PCS215K-R/125K-R TR8". Dated on June 03rd, 2024. Compliance is evidenced by the information declared by the manufacturer in points 3.1.1 and 3.5.2 of this manufacturer declaration. <i>"For both VDE-AR-N 4110 and 4120, in the entire frequency range from 47.5Hz to 51.5Hz and voltages in the range of 85%Un to 115%Un at the ZPM-PCS215K-R/125K-R power conversion system (PCS) AC connection terminal, while voltage gradient <5%Un/min and a frequency gradient of 0.5%fn/min, for quasi-stationary operation, ZPM-PCS215K-R/125K-R power conversion system is able to in parallel operation with grid according to the minimum duration time Figure 1 above. When voltage changes at the PCS AC terminal in the amount of $\Delta U \leq 10\%Un$ with voltage gradients of $\geq 5\%Un/min$ within the voltage band from 90%Un to 110%Un occur, PCS has no reduction for active and reactive power and keep connected to the grid. The maximum ranges of operation for over/under voltage and over/under frequency and their relation to connection time, work inside the configuration of the protection settings: All adjustments outside of the recommended settings of both the VDE-AR-N 4110 and 4120 should be approved by the grid provider and also accorded with ZCS personnel."</i>					
Figure for both VDE-AR-N 4110 and 4120:  					
Figure 1 Quasi-stationary operation range for MODEL EBI 215K-R/125K-R In addition, the clause 3.5.2 of this manufacturer declaration contains details of the capability of the unit as a voltage-time characteristic curve. - Test Report: Test report no. 240282RECO03. Dated on 15/10/2024. Compliance is evidenced by test results provided in points 4.2.1.5 and 4.6 of this test report.					

FGW TG8	Title				Result
A.1.2.2 A.2.2.2	Operating range				P
A.1.2.2.2 A.2.2.2.2	Polar wheel and/or grid oscillation				--
A.1.2.2.2.1 A.2.2.2.2.1	VDE 4110 Requirement Cl.	VDE 4110 Verification Cl.	Associated documents	Requirement needed	NA
	10.2.1.3	11.2.3.2 11.2.3.3	--	☐ Manufacturer's declaration	
	VDE 4120 Requirement Cl.	VDE 4120 Verification Cl.	Associated documents	Requirement needed	
	10.2.1.3	11.2.3.2 11.2.3.3	--	☐ Manufacturer's declaration	
	Remarks: For Type 2 PGU no proof of polar wheel oscillations is required.				
A.1.2.3 A.2.2.3	System perturbations				P
A.1.2.3.1 A.2.2.3.1	Rapid voltage variations				--
A.1.2.3.1.1 A.2.2.3.1.1	VDE 4110 Requirement Cl.	VDE 4110 Verification Cl.	Associated documents	Requirement needed	P
	5.4.2	11.2.2.1	TG3	☒ Test report	
	VDE 4120 Requirement Cl.	VDE 4120 Verification Cl.	Associated documents	Requirement needed	
	5.4.2	11.2.2.1	TG3	☒ Test report	
	<u>Evaluated documentation:</u> - Test Report: Test report no. 240282RECO03. Dated on 15/10/2024. Compliance is evidenced by test results provided in the point 4.3.1 of this test report.				
A.1.2.3.2 A.2.2.3.2.	Flicker				--
A.1.2.3.2.1 A.2.2.3.2.1	VDE 4110 Requirement Cl.	VDE 4110 Verification Cl.	Associated documents	Requirement needed	P
	5.4.3	11.2.2.2	TG3	☒ Test report	
	VDE 4120 Requirement Cl.	VDE 4120 Verification Cl.	Associated documents	Requirement needed	
	5.4.3	11.2.2.2	TG3	☒ Test report	
	<u>Evaluated documentation:</u> - Test Report: Test report no. 240282RECO03. Dated on 15/10/2024. Compliance is evidenced by test results provided in the point 4.3.2 of this test report.				
A.1.2.3.3 A.2.2.3.3	Harmonics and Interharmonics				--
A.1.2.3.3.1 A.2.2.3.3.1	VDE 4110 Requirement Cl.	VDE 4110 Verification Cl.	Associated documents	Requirement needed	P
	5.4.4	11.2.2.3	TG3	☒ Test report	
	VDE 4120 Requirement Cl.	VDE 4120 Verification Cl.	Associated documents	Requirement needed	
	5.4.4	11.2.2.3	TG3	☒ Test report	
	<u>Evaluated documentation:</u> - Test Report: Test report no. 240282RECO03. Dated on 15/10/2024. Compliance is evidenced by test results provided in the points 4.3.3.1 to 4.3.3.4 of this test report.				

FGW TG8	Title	Result
A.1.2.3 A.2.2.3	System perturbations	P
A.1.2.3.4	Commutation notches	--

FGW TG8	Title				Result
A.2.2.3.4					
A.1.2.3.4.1 A.2.2.3.4.1	VDE 4110 Requirement Cl.	VDE 4110 Verification Cl.	Associated documents	Requirement needed	NA
	5.4.5	11.2.2.4	TG3	☐ Test report	
	VDE 4120 Requirement Cl.	VDE 4120 Verification Cl.	Associated documents	Requirement needed	
	5.4.5	11.2.2.4	TG3	☐ Test report	
	Remarks: Evidence only for converters with thyristors which use short-circuit current coming from the grid for commutation of the thyristors. The certified PCS doesn't have thyristors which use short-circuit current coming from the grid for commutation of the thyristors.				
A.1.2.3.5 A.2.2.3.5	Asymmetries				--
A.1.2.3.5.1 A.2.2.3.5.1	VDE 4110 Requirement Cl.	VDE 4110 Verification Cl.	Associated documents	Requirement needed	P
	5.4.6	11.2.2.5	TG3	☒ Test report	
	VDE 4120 Requirement Cl.	VDE 4120 Verification Cl.	Associated documents	Requirement needed	
	5.4.6	11.2.2.5	TG3	☒ Test report	
	Evaluated documentation: - Test Report: Test report no. 240282RECO03. Dated on 15/10/2024 Compliance is evidenced by test results provided in the point 4.3.4 of this test report.				
A.1.2.3.6 A.2.2.3.6	Audio frequency ripple control				--
	Not applicable to PGU / Storage Systems				NA
A.1.2.3.7 A.2.2.3.7	Carrier frequency use of the customer grid				--
	Not applicable to PGU / Storage Systems				NA

FGW TG8	Title				Result
A.1.2.4 A.2.2.4	Reactive power				P
A.1.2.4.1 A.2.2.4.1	Reactive power provision				--
A.1.2.4.1.1 A.2.2.4.1.1	VDE 4110 Requirement Cl.	VDE 4110 Verification Cl.	Associated documents	Requirement needed	P
	10.2.2.1 to 10.2.2.3	11.2.4	TG3	☒ Manufacturer's declaration ☒ Test report	
	VDE 4120 Requirement Cl.	VDE 4120 Verification Cl.	Associated documents	Requirement needed	
	10.2.2.1 to 10.2.2.3	11.2.4	TG3	☒ Manufacturer's declaration ☒ Test report	
	<u>Evaluated documentation:</u> - Manufacturer declaration: Baizhu's declaration "Declaration for ZPM-PCS215K-R/125K-R TR8". Dated on June 03rd, 2024. Compliance is evidenced by the information declared by the manufacturer in point 3.2.1 of this manufacturer declaration. - Test Report: Test report no. 240282RECO03. Dated on 15/10/2024 Compliance is evidenced by test results provided in points 4.2.1.1, 4.2.1.5, 4.2.2 and 4.2.4 of this test report.				
A.1.2.4.2 A.2.2.4.2	Procedure for reactive power provision				--
A.1.2.4.2.1 A.2.2.4.2.1	VDE 4110 Requirement Cl.	VDE 4110 Verification Cl.	Associated documents	Requirement needed	P
	10.2.2.4	--	TG3	☒ Manufacturer's declaration ☒ Test report	
	VDE 4120 Requirement Cl.	VDE 4120 Verification Cl.	Associated documents	Requirement needed	
	10.2.2.4	--	TG3	☒ Manufacturer's declaration ☒ Test report	
	<u>Evaluated documentation:</u> - Manufacturer declaration: Baizhu's declaration "Declaration for ZPM-PCS215K-R/125K-R TR8". Dated on June 03rd, 2024. Compliance is evidenced by the information declared by the manufacturer in point 3.2.2 of this manufacturer declaration. Among others, main points detailed by the manufacturer are: <i>"In the case of lost communication, PCS will response to the latest reactive demand."</i> - Test Report: Test report no. 240282RECO03. Dated on 15/10/2024				

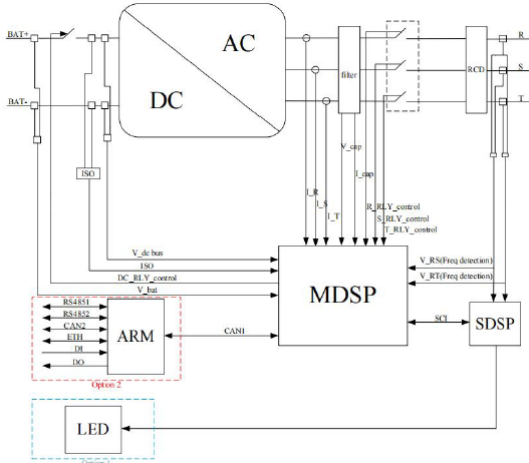
FGW TG8	Title				Result
A.1.2.5 A.2.2.5	Active power				P
A.1.2.5.1 A.2.2.5.1	General information and grid safety management				--
A.1.2.5.1.1 A.2.2.5.1.1	VDE 4110 Requirement Cl.	VDE 4110 Verification Cl.	Associated documents	Requirement needed	P
	10.2.4.1 and 10.2.4.2	11.2.7	TG3	☒ Manufacturer's declaration ☒ Test report	
	VDE 4120 Requirement Cl.	VDE 4120 Verification Cl.	Associated documents	Requirement needed	
	10.2.4.1 and 10.2.4.2	11.2.7	TG3	☒ Manufacturer's declaration ☒ Test report	
	<u>Evaluated documentation:</u> - Manufacturer declaration: Baizhu's declaration "Declaration for ZPM-PCS215K-R/125K-R TR8". Dated on June 03rd, 2024. Compliance is evidenced by the information declared by the manufacturer in point 3.3.1 of this manufacturer declaration. - Test Report: Test report no. 240282RECO03. Dated on 15/10/2024. Compliance is evidenced by test results provided in points 4.1.1 and 4.1.2.1 of this test report.				
A.1.2.5.2 A.2.2.5.2	Active power output as a function of grid frequency				--
A.1.2.5.2.1 A.2.2.5.2.1	VDE 4110 Requirement Cl.	VDE 4110 Verification Cl.	Associated documents	Requirement needed	P
	10.2.4.3	11.2.8	TG3	☒ Manufacturer's declaration ☒ Test report	
	VDE 4120 Requirement Cl.	VDE 4120 Verification Cl.	Associated documents	Requirement needed	
	10.2.4.3	11.2.8	TG3	☒ Manufacturer's declaration ☒ Test report	
	<u>Evaluated documentation:</u> - Manufacturer declaration: Baizhu's declaration "Declaration for ZPM-PCS215K-R/125K-R TR8". Dated on June 03rd, 2024. Compliance is evidenced by the information declared by the manufacturer in point 3.3.2 of this manufacturer declaration. For futher information see point 4.2 of this Annex. - Test Report: Test report no. 240282RECO03. Dated on 15/10/2024. Compliance is evidenced by test results provided in the point 4.1.3 of this test report.				

FGW TG8	Title				Result
A.1.2.6 A.2.2.6	Connection				P
A.1.2.6.1 A.2.2.6.1	Black start capability				--
	Not applicable to PGU				NA
A.1.2.6.2 A.2.2.6.2	Switching-in conditions				--
A.1.2.6.2.1 A.2.2.6.2.1	VDE 4110 Requirement Cl.	VDE 4110 Verification Cl.	Associated documents	Requirement needed	P
	10.4	11.2.11	TG 3	☒ Manufacturer's declaration ☒ Test report	
	VDE 4120 Requirement Cl.	VDE 4120 Verification Cl.	Associated documents	Requirement needed	
	10.4	11.2.11	TG 3	☒ Manufacturer's declaration ☒ Test report	
<u>Evaluated documentation:</u>					
- Manufacturer declaration: Baizhu's declaration "Declaration for ZPM-PCS215K-R/125K-R TR8". Dated on June 03rd, 2024. Compliance is evidenced by the information declared by the manufacturer in point 3.4.1 of this manufacturer declaration. <i>"We verify that connection of ZPM-PCS215K-R/125K-R is possible at 47.5-50.2Hz (± 0.1 Hz), 90% -110%Un (± 2%Un) for both VDE-AR-N 4110 and 4120. After the PCS trip for protection, when the voltage recovers to at least 95%Un and frequency is between 49.9~50.1Hz, until the stated stabilization time has passed, ZPM-PCS215K-R/125K-R has the setting of the delay time of recovery for both VDE-AR-N 4110 and 4120, the setting range is from 0 to 60 mins, default setting is 5 mins. For both VDE-AR-N 4110 and 4120, the model is integrated with intrinsic hardware protection only for over current, the protection is for hardware protection and is not settable. The protection default setting is 390.4A for 123.2us."</i> For futher information see point 4.2 of this Annex.					
A.1.2.7 A.2.2.7	FRT				P
A.1.2.7.1 A.2.2.7.1	Loss of static stability				--
A.1.2.7.1.1 A.2.2.7.1.1	VDE 4110 Requirement Cl.	VDE 4110 Verification Cl.	Associated documents	Requirement needed	NA
	10.2.1.3 10.5.2	11.2.12	--	--	
	VDE 4120 Requirement Cl.	VDE 4120 Verification Cl.	Associated documents	Requirement needed	
	10.2.1.3 10.5.2	11.2.12	--	--	
<u>Remarks:</u> No evidence necessary.					

FGW TG8	Title				Result	
A.1.2.7 A.2.2.7	FRT				P	
A.1.2.7.2 A.2.2.7.2	Island and partial grid operation capability				--	
A.1.2.7.2.1 A.2.2.7.2.1	VDE 4110 Requirement Cl.	VDE 4110 Verification Cl.	Associated documents	Requirement needed	NA	
	10.2.1.4	--	--	--		
	VDE 4120 Requirement Cl.	VDE 4120 Verification Cl.	Associated documents	Requirement needed		
	10.2.1.4	--	--	--		
<u>Remarks:</u> No requirements for island operation have been defined. Partial grid operation capability does not constitute a minimum requirement. The distribution grid operator may however require partial grid operation capability and the controller stability in individual cases. Only in this case do the following requirements apply. Here only optional characteristics of the PGU are shown, however not a declaration of conformity. <u>Evaluated documentation:</u> - Manufacturer declaration: Baizhu's declaration "Declaration for ZPM-PCS215K-R/125K-R TR8". Dated on June 03rd, 2024. Compliance is evidenced by the information declared by the manufacturer in point 3.5.1 of this manufacturer declaration. <i>"ZPM-PCS215K-R/125K-R detects island by reactive power disturbance. Once island detected, PGU disconnect from the grid."</i>						
A.1.2.7.3 A.2.2.7.3	Dynamic grid support					--
A.1.2.7.3.1 A.2.2.7.3.1	VDE 4110 Requirement Cl.	VDE 4110 Verification Cl.	Associated documents	Requirement needed		P
	10.2.1.2 10.2.3	11.2.5	TG 3	☒ Manufacturer's declaration ☒ Test report		
	VDE 4120 Requirement Cl.	VDE 4120 Verification Cl.	Associated documents	Requirement needed		
	10.2.1.2 10.2.3	11.2.5	TG 3	☒ Manufacturer's declaration ☒ Test report		
<u>Evaluated documentation:</u> - Manufacturer declaration: Baizhu's declaration "Declaration for ZPM-PCS215K-R/125K-R TR8". Dated on June 03rd, 2024. Compliance is evidenced by the information declared by the manufacturer in point 3.5.2 of this manufacturer declaration. <i>"For PGU with double-fed asynchronous machine, Baizhu VRT curve is shown as below, more details can be found in TR3 test report."</i> - Test Report: Compliance is evidenced by test results offered in the point 4.6 of the test report 240282RECO03, which refers to the attachment I of the report: 240282RECO03 These reports includes calculations of short-circuit AC currents.						

FGW TG8	Title				Result																
A.1.2.7 A.2.2.7	FRT				P																
A.1.2.7.4 A.2.2.7.4	Contribution to short-circuit current				--																
A.1.2.7.4.1 A.2.2.7.4.1	VDE 4110 Requirement Cl.	VDE 4110 Verification Cl.	Associated documents	Requirement needed	P																
	10.2.5.2	11.2.9	TG 3	☒ Manufacturer's declaration ☒ Test report																	
	VDE 4120 Requirement Cl.	VDE 4120 Verification Cl.	Associated documents	Requirement needed																	
	10.2.5.2	11.2.9	TG 3	☒ Manufacturer's declaration ☒ Test report																	
Evaluated documentation: - Manufacturer declaration: Baizhu's declaration "Declaration for ZPM-PCS215K-R/125K-R TR8". Dated on June 03rd, 2024. Compliance is evidenced by the information declared by the manufacturer in point 3.5.3 of this manufacturer declaration. <i>"These characteristic values were defined according to EN 60909-0 standard. I_p Peak short -circuit current: Maximum possible instantaneous value of the prospective short-circuit current. I_k"Initial symmetrical short-circuit current: RMS value of the AC symmetrical component (dynamic duration) of a prospective short-circuit current applicable at the instant of short circuit if the impedance remains at zero-time value. I_k Steady-state short-circuit current: RMS value of the short-circuit current (static duration) which remains after the decay of the transient phenomena. Note that I_p is given as an amplitude, where as the values for I_k"and I_k are RMS. "</i>																					
<table><tr><td></td><td>I_{sk}PF/A</td><td>I_{sk}2PF/A</td><td>I_{sk}1PF/A</td><td>I_p/A</td><td>I_k"/A</td><td>I_k/A</td><td>I_{max}/A</td></tr><tr><td>Sofar EBI 1215K-R/215-R</td><td>184.8</td><td>181.0</td><td>181.0</td><td>390.4</td><td>198.5</td><td>198.5</td><td>181.0</td></tr></table>							I _{sk} PF/A	I _{sk} 2PF/A	I _{sk} 1PF/A	I _p /A	I _k "/A	I _k /A	I _{max} /A	Sofar EBI 1215K-R/215-R	184.8	181.0	181.0	390.4	198.5	198.5	181.0
	I _{sk} PF/A	I _{sk} 2PF/A	I _{sk} 1PF/A	I _p /A		I _k "/A	I _k /A	I _{max} /A													
Sofar EBI 1215K-R/215-R	184.8	181.0	181.0	390.4		198.5	198.5	181.0													
- Test Report: Compliance is evidenced by test results offered in the point 4.6 of the test report 240282RECO03, which refers to the attachment I of the report: 240282RECO03 These reports includes calculations of short-circuit AC currents.																					
FGW TG8	Title					Result															
A.1.2.8 A.2.2.8	Protection				P																
A.1.2.8.1 A.2.2.8.1	Reserve protection concept				--																
	Not applicable to PGU / Storage Systems				NA																
A.1.2.8.2 A.2.2.8.2	Readability of protection settings				--																
A.1.2.8.2.1 A.2.2.8.2.1	VDE 4110 Requirement Cl.	VDE 4110 Verification Cl.	Associated documents	Requirement needed	P																
	6.3.3	11.2.10	--	☒ Manufacturer's declaration ☐ Or component certificate																	
	VDE 4120 Requirement Cl.	VDE 4120 Verification Cl.	Associated documents	Requirement needed																	
	6.3.3	11.2.10 11.4.17	--	☒ Manufacturer's declaration ☐ Or component certificate																	
Evaluated documentation: - Manufacturer declaration: Baizhu's declaration "Declaration for ZPM-PCS215K-R/125K-R TR8". Dated on June 03rd, 2024. Compliance is evidenced by the information declared by the manufacturer in point 3.6.1 of this manufacturer declaration. <i>"ZPM-PCS215K-R/125K-R's protection settings can be easily read and set by PC monitor."</i>																					

FGW TG8	Title				Result
A.1.2.8 A.2.2.8	Protection				P
A.1.2.8.3 A.2.2.8.3	Test terminal				--
A.1.2.8.3.1 A.2.2.8.3.1	VDE 4110 Requirement Cl.	VDE 4110 Verification Cl.	Associated documents	Requirement needed	P
	6.3.4.5	11.2.10	--	☒ Manufacturer's declaration	
	VDE 4120 Requirement Cl.	VDE 4120 Verification Cl.	Associated documents	Requirement needed	
	6.3.3.5	11.2.10	--	☒ Manufacturer's declaration	
	<u>Evaluated documentation:</u> - Manufacturer declaration: Baizhu's declaration "Declaration for ZPM-PCS215K-R/125K-R TR8". Dated on June 03rd, 2024. Compliance is evidenced by the information declared by the manufacturer in point 3.6.2 of this manufacturer declaration. <i>"ZPM-PCS215K-R/125K-R didn't provide testing terminal for protection test without disconnect the wires. "</i> The following deviation is stated in the main certificate, as informative: <i>"The certified product does not provide test terminal. A connecting terminal plate has to be installed separately, if necessary"</i>				
A.1.2.8.4 A.2.2.8.4	Operating range				--
A.1.2.8.4.1 A.2.2.8.4.1	VDE 4110 Requirement Cl.	VDE 4110 Verification Cl.	Associated documents	Requirement needed	P
	10.3.4.2.2	11.2.10	TG 3	☒ Manufacturer's declaration ☒ Test report	
	VDE 4120 Requirement Cl.	VDE 4120 Verification Cl.	Associated documents	Requirement needed	
	10.3.4.7	11.2.10	TG 3	☒ Manufacturer's declaration ☒ Test report	
	<u>Evaluated documentation:</u> - Manufacturer declaration: Baizhu's declaration "Declaration for ZPM-PCS215K-R/125K-R TR8". Dated on June 03rd, 2024. Compliance is evidenced by the information declared by the manufacturer in point 3.6.3 of this manufacturer declaration. <i>"There is no additional protection equipment present in ZPM-PCS215K-R/125K-R."</i> - Test Report: Test report no. 240282RECO03. Dated on 15/10/2024. Compliance is evidenced by test results provided in the point 4.4 of this test report.				
A.1.2.8.5 A.2.2.8.5	Voltage protection device and Q(U) protection				--
	Not applicable to PGU / Storage Systems				NA
A.1.2.8.6 A.2.2.8.6	Accuracy				--
A.1.2.8.6.1 A.2.2.8.6.1	VDE 4110 Requirement Cl.	VDE 4110 Verification Cl.	Associated documents	Requirement needed	P
	10.3.3.2	11.2.10	TG 3	☒ Test report	
	VDE 4120 Requirement Cl.	VDE 4120 Verification Cl.	Associated documents	Requirement needed	
	10.2.4.3 10.3.4.2	11.2.10	TG 3	☒ Test report	
	<u>Evaluated documentation:</u> - Test Report: Test report no. 240282RECO03. Dated on 15/10/2024. Compliance is evidenced by test results provided in the point 4.4 of this test report. For further details of control modes and interfaces see the point 4.2 of this document.				
EGW TG8	Title				Result

FGW TG8	Title				Result
A.1.2.8 A.2.2.8	Protection				P
A.1.2.8.7 A.2.2.8.7	Independence of the protection functions				--
A.1.2.8.7.1 A.2.2.8.7.1	VDE 4110 Requirement Cl.	VDE 4110 Verification Cl.	Associated documents	Requirement needed	P
	10.3.3.1	11.2.10	--	☒ Manufacturer's declaration	
	VDE 4120 Requirement Cl.	VDE 4120 Verification Cl.	Associated documents	Requirement needed	
	10.3.3.1	11.2.10	--	☒ Manufacturer's declaration	
<u>Evaluated documentation:</u> - Manufacturer declaration: Baizhu's declaration "Declaration for ZPM-PCS215K-R/125K-R TR8". Dated on June 03rd, 2024. Compliance is evidenced by the information declared by the manufacturer in point 3.6.4 of this manufacturer declaration. <i>"ZPM-PCS215K-R/125K-R PCS integrated self-protection function is independent of any control functions, control diagram as show in Figure 11.</i>  Figure 11 block diagram For further details of control modes and interfaces see the point 4.3 of this document.					
A.1.2.8.8 A.2.2.8.8	Protection monitoring				--
A.1.2.8.9 A.2.2.8.9	Own and auxiliary power supply				NA
A.1.2.8.9.1 A.2.2.8.9.1	VDE 4110 Requirement Cl.	VDE 4110 Verification Cl.	Associated documents	Requirement needed	P
	10.3.3.6	11.2.10	TG 3	☒ Manufacturer's declaration ☐ Component certificate	
	VDE 4120 Requirement Cl.	VDE 4120 Verification Cl.	Associated documents	Requirement needed	
	10.3.1	11.2.10	TG 3	☒ Manufacturer's declaration ☐ Component certificate	
<u>Evaluated documentation:</u> - Manufacturer declaration: Baizhu's declaration "Declaration for ZPM-PCS215K-R/125K-R TR8". Dated on June 03rd, 2024. Compliance is evidenced by the information declared by the manufacturer in point 3.6.5 of this manufacturer declaration. <i>"ZPM-PCS215K-R/125K-R protection system is power supplied by both AC and DC side, it's Network-independent auxiliary power supply to the protection equipment for at least 5 seconds. Failure of the auxiliary power supply of the protection equipment or the equipment control, respectively, causes the power generation to be switched</i>					

FGW TG8	Title				Result
	off without delay and triggering of the PGU's main switch. The protection equipment provided for meets the requirements for accuracy and setting ranges. (Voltage and current accuracy is ±1%, frequency accuracy is 0.01Hz) Operability of the protection functions shall be provided before the power generating units start feeding in power.“				
A.1.2.8.9.4	Fault logger				--
A.2.2.8.9.10	Not applicable to PGU				NA
FGW TG8	Title				Result
A.1.2.8 A.2.2.8	Protection				P
A.1.2.8.10 A.2.2.8.11	Coupling switch				--
A.1.2.8.9.1 A.2.2.8.9.1	VDE 4110 Requirement Cl.	VDE 4110 Verification Cl.	Associated documents	Requirement needed	P
	10.3 10.4.5	--	--	☒ Manufacturer's declaration	
Evaluated documentation: - Manufacturer declaration: Baizhu's declaration "Declaration for ZPM-PCS215K-R/125K-R TR8". Dated on June 03rd, 2024. Compliance is evidenced by the information declared by the manufacturer in point 3.6.6 of this manufacturer declaration.					

1.4 Summary of the evaluation of the validation results

The following documentation is used for the evaluation:

Information of the test report:

- Validation report number: 240282RECO03-TG4
- Issuance date: 17/10/2024
- Issued by: SGS Tecnos, S.A. (Electrical Testing Laboratory)
- Software type: Simulator for Grid Connected Power Conversion System
- Simulation platform: DlgSILENT PowerFactory 2024
- Used version of the simulation platform: Version 24.0.2.0
- Simulation Software File identification: PGU_125-215K-R.pfd
- Dynamic Simulation Model version: V2.1
- MD5 Checksum: CEF983EF1586538CB7E1A40721EF953E

Information of the user manual documentation of the dynamic simulation model:

- Document reference: "EBI125K-R_Digsilent_dynamic_mode_user_manual_20240918"
- Version: V1.0
- Issuance date: September, 2024
- Issued by: SofarSolar

FGW TG8	Title				Result
A.1.2.9 A.2.2.9	Simulation models				P
A.1.2.9.1 A.2.2.9.1	Requirements for simulation models				--
A.1.2.9.1.1 A.2.2.9.1.1	VDE 4110 Requirement Cl.	VDE 4110 Verification Cl.	Associated documents	Requirement needed	P
	10.6	11.2.6	TG4	☒ Validated model ☒ Validation report ☒ Model documentation	
<u>Evaluated documentation:</u> - Model Documentation: "HW00.V1". V1.0 dated on 08/05/2024 - Validation Report: Test report no. 240282RECO03 – TG4. Dated on 17/10/2024					

Information about the transferability of validation results to derived models:

The validation process according to FGW TG4 (rev. 10) has been completed over the dynamic simulation model for the Power Conversion System model ZPM-PCS215K-R. However, evaluation requirements detailed in the point 5.8.2 of FGW TG4 (Rev. 10), "*Transfer to other PGUs*", and the chapter 2.12.2 of FGW TG8 (rev. 9) have been considered for the transferability of this validation process to derived model, ZPM-PCS125K-R.

As detailed in the validation report no. 240282RECO03 – TG4, validation results obtained on the simulation model for ZPM-PCS215K-R are essentially valid for derived models ZPM-PCS125K-R. This is ensured since all these referred PV models are based on the same architecture and use the same control strategy. The different model types are achieved by modification of the nominal data in the simulation model.

As a basis for this evaluation, they have also been considered simulations of plausibility tests performed according to FGW TG4 (rev. 10) over the validated simulation model with repetitions of tests at reduced power levels which includes rated power levels of derived models. This includes the verification of following simulation cases over the dynamic simulation model of ZPM-PCS215K-R adapted to operate with generation capabilities of derived models ZPM-PCS125K-R.

- Verification of Voltage-Dependent PQ diagrams.

1.5 Evaluation of the ISO 9001 Quality Management System Certificate of manufacturers

Guangdong Sofar Smart Solar Technology Co., Ltd.

No. 1, Dongsheng North Road, Chenjiang Street, Zhongkai High-tech Zone, Huizhou City, China.



1.6 Compromise letter to maintain ISO 9001 during the validity period of certificate

Compromise letter

We **Shanghai Baizhu Chenghang New Energy Co., Ltd.**

Declare the maintenance of the quality system certified by a certification accredited company, according to the requirements of ISO 9001:2015, during the validity period of the certificate, at least 5 years.

We are also committed to require our assemblers to comply with the same standards of quality during that period.

Brand: **SOFAR**

Model:

EBI 125K-R, EBI 215K-R

Date: 2024/06/04

Name: Wang Hui
Charge Standard and Certification Manager
Signature:



1.7 Compromise letter of the certified product.

Compromise letter

We **Shenzhen SOFARSOLAR Co., Ltd.**

Hereby to authorize **Zucchetti Centro Sistemi SpA** to use following report and certificate which issued by SGS to apply Co-certificate

- **VDE-AR-N 4110:2023-09,**
- **VDE-AR-N 4120:2018-11+A1:2024-04**

Following point are also considered with this declaration in relation to the equivalence of models to certify by SGS:

- Sofar Solar will not change the products without prior informing **Zucchetti Centro Sistemi SpA** of proposed changes.

The difference between each model as following:

All the features and technical characteristics of the model:

EBI 125K-R is identical with ZPM-PCS125K-R except the model reference name;

EBI 215K-R is identical with ZPM-PCS215K-R except the model reference name.

For the avoidance of doubts, original co-licensed models above referred share the same Hardware and Firmware. They even share the same display and start-up menus for the configuration of the PV Inverter.

Signature 

Date: 2024-10-30

2 OVERVIEW OF RESULTS OF THE FGW TR3 TEST REPORT

Test Report Number: 240282RECO03 with date 15/10/2024 according of FGW TR3 rev. 26.
Period of measurement: The necessary testing has been performed between 5th May and 28th September 2024.

Tests in compliance with FGW TR3 rev. 26 have entirely been performed over the Power Conversion System model ZPM-PCS215K-R. However, test requirements of clauses 4.3.2, 4.3.3 and 4.3.4 of FGW TG3 have been repeated to get corresponding results over variant model ZPM-PCS125K-R.

2.1 NENNDATEN / RATED DATA:

For the model ZPM-PCS215K-R:

Nennscheinleistung S_n	215.0 kW	Nennstrom I_n	180.0 A
Nennfrequenz f_n rated frequency f_n	50 Hz	Nennspannung U_n rated Voltage U_n	690 V 3W+PE

For the model ZPM-PCS125K-R:

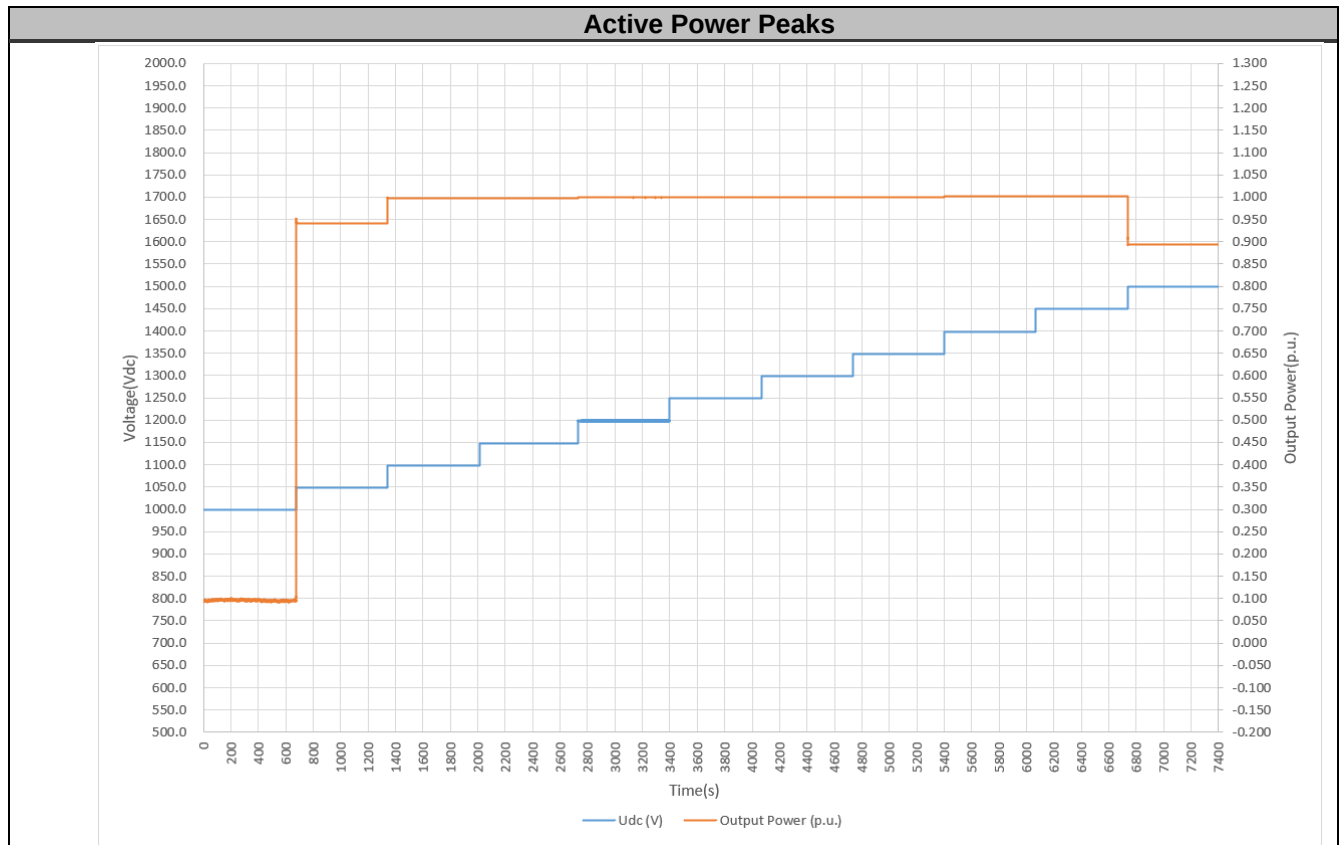
Nennscheinleistung S_n	125.0 kW	Nennstrom I_n	180.0 A
Nennfrequenz f_n rated frequency f_n	50 Hz	Nennspannung U_n rated Voltage U_n	400 V 3W+PE

2.2 Power quality

2.2.1 Wirkleistungsspitzen / Power Peaks

DC Voltage Meas. (V)	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 _{0.2}	P ₆₀	P ₆₀₀	p _{0.2}	P ₆₀	P ₆₀₀	P _{0.2}	P ₆₀	P ₆₀₀
999.8	20.170	20.431	20.645	0.094	0.095	0.096	11.0	11.0	11.0
1048.4	202.540	202.531	202.526	0.942	0.942	0.942			
1098.3	210.124	214.568	214.600	0.977	0.998	0.998			
1148.4	214.677	214.676	214.682	0.998	0.998	0.999			
1198.4	214.747	214.744	214.744	0.999	0.999	0.999			
1248.5	214.831	214.832	214.833	0.999	0.999	0.999			
1298.6	214.952	214.953	214.958	1.000	1.000	1.000			
1348.7	215.098	215.099	215.100	1.000	1.000	1.000			
1398.7	215.245	215.248	215.253	1.001	1.001	1.001			
1448.8	215.408	215.408	215.413	1.002	1.002	1.002			
1499.1	192.014	192.017	192.006	0.893	0.893	0.893			
999.8	20.170	20.431	20.645	0.094	0.095	0.096			
1048.4	202.540	202.531	202.526	0.942	0.942	0.942			
1098.3	210.124	214.568	214.600	0.977	0.998	0.998			
1148.4	214.677	214.676	214.682	0.998	0.998	0.999			
1198.4	214.747	214.744	214.744	0.999	0.999	0.999			
1248.5	214.831	214.832	214.833	0.999	0.999	0.999			
1298.6	214.952	214.953	214.958	1.000	1.000	1.000			
1348.7	215.098	215.099	215.100	1.000	1.000	1.000			
1398.7	215.245	215.248	215.253	1.001	1.001	1.001			
1448.8	215.408	215.408	215.413	1.002	1.002	1.002			
1499.1	192.014	192.017	192.006	0.893	0.893	0.893			

Note: As the manufacturer declared, the DC Voltage range is 1000 V to 1500 V while the DC Voltage range of the full load power is 1100 V to 1450 V.



Note: Results given are obtained after test results performed on the model ZPM-PCS215K-R . These test results for the model ZPM-PCS215K-R are essentially valid for the derived model ZPM-PCS125K-R, considering the evaluation offered in the point 1.2 of this document.

2.2.2 Schalthandlungen / Switching Operation

ZPM-PCS215K-R – Test 1					
Schalthandlungen / Case of switching operation	Einschalten bei $P_{available} < 10\% P_n$ / Switch-on at $P_{available} < 10\% P_n$				
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, $k_f (\Psi_k)$	Phase A	0.001	0.001	0.000	0.000
	Phase B	0.001	0.001	0.001	0.000
	Phase C	0.001	0.001	0.000	0.000
Spannungsänderungsfaktor / Voltage change factor, $k_U (\Psi_k)$	Phase A	0.108	0.108	0.108	0.108
	Phase B	0.118	0.118	0.118	0.118
	Phase C	0.084	0.084	0.084	0.084

ZPM-PCS215K-R – Test 2					
Schalthandlungen / Case of switching operation	Einschalten bei $P_{available} < 10\% P_n$ / Switch-on at $P_{available} < 10\% P_n$				
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, $k_f (\Psi_k)$	Phase A	0.001	0.001	0.000	0.000
	Phase B	0.001	0.001	0.000	0.000
	Phase C	0.001	0.001	0.000	0.000
Spannungsänderungsfaktor / Voltage change factor, $k_U (\Psi_k)$	Phase A	0.045	0.045	0.045	0.045
	Phase B	0.042	0.042	0.042	0.042
	Phase C	0.039	0.039	0.039	0.039

ZPM-PCS215K-R – Test 3					
Schalthandlungen / Case of switching operation	Einschalten bei $P_{available} < 10\% P_n$ / Switch-on at $P_{available} < 10\% P_n$				
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, $k_f (\Psi_k)$	Phase A	0.001	0.001	0.000	0.000
	Phase B	0.001	0.001	0.000	0.000
	Phase C	0.001	0.001	0.000	0.000
Spannungsänderungsfaktor / Voltage change factor, $k_U (\Psi_k)$	Phase A	0.043	0.043	0.043	0.043
	Phase B	0.041	0.041	0.041	0.041
	Phase C	0.041	0.041	0.041	0.041

ZPM-PCS215K-R – Test 4					
Schalthandlungen / Case of switching operation	Einschalten bei $P_{available} < 10\% P_n$ / Switch-on at $P_{available} < 10\% P_n$				
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, $k_f (\Psi_k)$	Phase A	0.001	0.001	0.000	0.000
	Phase B	0.001	0.001	0.000	0.000
	Phase C	0.001	0.001	0.000	0.000
Spannungsänderungsfaktor / Voltage change factor, $k_U (\Psi_k)$	Phase A	0.043	0.043	0.043	0.043
	Phase B	0.041	0.041	0.041	0.041
	Phase C	0.037	0.037	0.037	0.037

ZPM-PCS215K-R – Test 5					
Schalthandlungen / Case of switching operation	Einschalten bei $P_{available} < 10\% P_n$ / Switch-on at $P_{available} < 10\% P_n$				
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, $k_f (\Psi_k)$	Phase A	0.005	0.005	0.005	0.005
	Phase B	0.005	0.005	0.005	0.005
	Phase C	0.005	0.005	0.005	0.005
Spannungsänderungsfaktor / Voltage change factor, $k_U (\Psi_k)$	Phase A	0.043	0.043	0.043	0.043
	Phase B	0.041	0.041	0.041	0.041
	Phase C	0.006	0.006	0.006	0.006

Note: Results given are obtained after test results performed on the model ZPM-PCS215K-R . These test results for the model ZPM-PCS215K-R are essentially valid for the derived ZPM-PCS125K-R, considering the evaluation offered in the point 1.2 of this document.

ZPM-PCS215K-R – Test 1					
Schalthandlungen / Case of switching operation	Einschalten bei P_{av} verfügbar $P=100\%P_n$ / Switch-on at $P_{available}$ $P=100\%P_n$				
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, $k_f (\Psi_k)$	Phase A	0.000	0.000	0.000	0.000
	Phase B	0.000	0.000	0.000	0.000
	Phase C	0.000	0.000	0.000	0.000
Spannungsänderungsfaktor / Voltage change factor, $k_U (\Psi_k)$	Phase A	0.112	0.112	0.112	0.112
	Phase B	0.107	0.107	0.107	0.107
	Phase C	0.109	0.109	0.109	0.109

ZPM-PCS215K-R – Test 2					
Schalthandlungen / Case of switching operation	Einschalten bei P_{av} verfügbar $P=100\%P_n$ / Switch-on at $P_{available}$ $P=100\%P_n$				
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, $k_f (\Psi_k)$	Phase A	0.000	0.000	0.000	0.000
	Phase B	0.000	0.000	0.000	0.000
	Phase C	0.000	0.000	0.000	0.000
Spannungsänderungsfaktor / Voltage change factor, $k_U (\Psi_k)$	Phase A	0.113	0.113	0.113	0.113
	Phase B	0.110	0.110	0.110	0.110
	Phase C	0.106	0.106	0.106	0.106

ZPM-PCS215K-R – Test 3					
Schalthandlungen / Case of switching operation	Einschalten bei P_{av} verfügbar $P=100\%P_n$ / Switch-on at $P_{available}$ $P=100\%P_n$				
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, $k_f (\Psi_k)$	Phase A	0.000	0.000	0.000	0.000
	Phase B	0.000	0.000	0.000	0.000
	Phase C	0.000	0.000	0.000	0.000
Spannungsänderungsfaktor / Voltage change factor, $k_U (\Psi_k)$	Phase A	0.112	0.112	0.112	0.112
	Phase B	0.107	0.107	0.107	0.107
	Phase C	0.107	0.107	0.107	0.107

ZPM-PCS215K-R – Test 4					
Schalthandlungen / Case of switching operation	Einschalten bei P_{av} verfügbar $P=100\%P_n$ / Switch-on at $P_{available}$ $P=100\%P_n$				
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, $k_f (\Psi_k)$	Phase A	0.000	0.000	0.000	0.000
	Phase B	0.000	0.000	0.000	0.000
	Phase C	0.000	0.000	0.000	0.000
Spannungsänderungsfaktor / Voltage change factor, $k_U (\Psi_k)$	Phase A	0.078	0.078	0.078	0.078
	Phase B	0.072	0.072	0.072	0.072
	Phase C	0.070	0.070	0.070	0.070

ZPM-PCS215K-R – Test 5					
Schalthandlungen / Case of switching operation	Einschalten bei P_{av} verfügbar $P=100\%P_n$ / Switch-on at $P_{available}$ $P=100\%P_n$				
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, $k_f (\Psi_k)$	Phase A	0.000	0.000	0.000	0.000
	Phase B	0.000	0.000	0.000	0.000
	Phase C	0.000	0.000	0.000	0.000
Spannungsänderungsfaktor / Voltage change factor, $k_U (\Psi_k)$	Phase A	0.079	0.079	0.079	0.079
	Phase B	0.071	0.071	0.071	0.071
	Phase C	0.070	0.070	0.070	0.070

Note: Results given are obtained after test results performed on the model ZPM-PCS215K-R . These test results for the model ZPM-PCS215K-R are essentially valid for the derived ZPM-PCS125K-R, considering the evaluation offered in the point 1.2 of this document.

ZPM-PCS215K-R – Test 1					
Schalthandlungen / Case of switching operation	Betriebsabschaltung P=100%Pn / Service shutdown P=100%Pn				
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 (Ψ _k)	Phase A	0.001	0.001	0.000	0.000
	Phase B	0.001	0.001	0.000	0.000
	Phase C	0.001	0.001	0.000	0.000
Spannungsänderungsfaktor / Voltage change factor, k _U (Ψ _k)	Phase A	0.179	0.179	0.179	0.179
	Phase B	0.201	0.201	0.201	0.201
	Phase C	0.157	0.157	0.157	0.157

ZPM-PCS215K-R – Test 2					
Schalthandlungen / Case of switching operation	Betriebsabschaltung P=100%Pn / Service shutdown P=100%Pn				
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 (Ψ _k)	Phase A	0.001	0.001	0.001	0.001
	Phase B	0.000	0.000	0.000	0.000
	Phase C	0.001	0.001	0.000	0.000
Spannungsänderungsfaktor / Voltage change factor, k _U (Ψ _k)	Phase A	0.179	0.179	0.179	0.179
	Phase B	0.196	0.196	0.196	0.196
	Phase C	0.150	0.150	0.150	0.150

ZPM-PCS215K-R – Test 3					
Schalthandlungen / Case of switching operation	Betriebsabschaltung P=100%Pn / Service shutdown P=100%Pn				
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 (Ψ _k)	Phase A	0.001	0.001	0.001	0.001
	Phase B	0.000	0.000	0.000	0.000
	Phase C	0.001	0.001	0.000	0.000
Spannungsänderungsfaktor / Voltage change factor, k _U (Ψ _k)	Phase A	0.172	0.172	0.172	0.172
	Phase B	0.199	0.199	0.199	0.199
	Phase C	0.156	0.156	0.156	0.156

ZPM-PCS215K-R – Test 4					
Schalthandlungen / Case of switching operation	Betriebsabschaltung P=100%Pn / Service shutdown P=100%Pn				
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 (Ψ _k)	Phase A	0.001	0.001	0.000	0.000
	Phase B	0.001	0.001	0.000	0.000
	Phase C	0.001	0.001	0.000	0.000
Spannungsänderungsfaktor / Voltage change factor, k _u (Ψ _k)	Phase A	0.105	0.105	0.105	0.105
	Phase B	0.094	0.094	0.094	0.094
	Phase C	0.092	0.092	0.092	0.092

ZPM-PCS215K-R – Test 5					
Schalthandlungen / Case of switching operation	Betriebsabschaltung P=100%Pn / Service shutdown P=100%Pn				
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 (Ψ _k)	Phase A	0.001	0.001	0.000	0.000
	Phase B	0.001	0.001	0.000	0.000
	Phase C	0.001	0.001	0.000	0.000
Spannungsänderungsfaktor / Voltage change factor, k _u (Ψ _k)	Phase A	0.102	0.102	0.102	0.102
	Phase B	0.094	0.094	0.094	0.094
	Phase C	0.092	0.092	0.092	0.092

Note: Results given are obtained after test results performed on the model ZPM-PCS215K-R . These test results for the model ZPM-PCS215K-R are essentially valid for the derived ZPM-PCS125K-R, considering the evaluation offered in the point 1.2 of this document.

2.2.3 Unsymmetrie / Unbalances

Model: ZPM-PCS125K-R						
Pn (%)	V ₁₊ (V)	V ₁₋ (V)	I ₁₊ (A)	I ₁₋ (A)	U _i (%)	Test duration
110	231.148	0.201	198.867	1.441	0.725	600 s
100	231.045	0.173	180.861	1.175	0.649	600 s
90	230.917	0.173	158.014	0.970	0.614	600 s
80	230.857	0.161	144.819	0.900	0.621	600 s
70	230.765	0.156	126.744	0.844	0.666	600 s
60	230.674	0.146	108.694	0.778	0.715	600 s
50	230.584	0.142	90.617	0.711	0.785	600 s
40	230.499	0.138	72.565	0.646	0.890	600 s
30	230.412	0.142	54.443	0.593	1.090	600 s
20	230.328	0.139	36.323	0.530	1.459	600 s
10	230.221	0.125	18.118	0.266	1.468	600 s

Model: ZPM-PCS215K-R						
Pn (%)	V ₁₊ (V)	V ₁₋ (V)	I ₁₊ (A)	I ₁₋ (A)	U _i (%)	Test duration
110	236.9	399.497	0.559	89.398	0.823	600 s
100	216.0	399.351	0.427	81.529	0.510	600 s
90	194.4	399.279	0.415	73.394	0.426	600 s
80	172.8	399.209	0.409	65.252	0.388	600 s
70	151.2	399.132	0.419	57.108	0.346	600 s
60	129.6	399.044	0.399	48.959	0.320	600 s
50	108.0	398.944	0.396	40.806	0.280	600 s
40	86.4	398.852	0.393	32.651	0.255	600 s
30	64.8	398.753	0.393	24.490	0.227	600 s
20	43.2	398.662	0.385	16.349	0.186	600 s
10	22.1	398.574	0.372	8.342	0.101	600 s

According to VDE-AR-N 4110: 2023-09, from the 10%Pn, the generating unit shall not exceed a maximum limit defined at 1.5%.

2.2.4 Flicker

Model: ZPM-PCS215K-R					
Network impedance phase angle, Ψ_k	Phase	30°	50°	70°	85°
Average active power, P (%P _n)	Flicker coefficient, C (Ψ_k , P _{bin})				
0	A	0.007	0.007	0.007	0.007
	B	0.008	0.008	0.008	0.008
	C	0.008	0.007	0.007	0.007
10	A	0.095	0.098	0.095	0.096
	B	0.099	0.098	0.097	0.100
	C	0.098	0.096	0.096	0.096
20	A	0.007	0.007	0.007	0.007
	B	0.008	0.008	0.008	0.008
	C	0.008	0.008	0.008	0.008
30	A	0.008	0.007	0.007	0.007
	B	0.008	0.008	0.008	0.008
	C	0.008	0.008	0.008	0.008
40	A	0.008	0.007	0.007	0.007
	B	0.008	0.008	0.008	0.008
	C	0.008	0.008	0.008	0.008
50	A	0.007	0.007	0.007	0.007
	B	0.008	0.008	0.008	0.008
	C	0.008	0.008	0.008	0.008
60	A	0.007	0.007	0.007	0.007
	B	0.008	0.008	0.008	0.008
	C	0.008	0.008	0.007	0.007
70	A	0.007	0.007	0.007	0.007
	B	0.008	0.008	0.008	0.008
	C	0.008	0.008	0.008	0.007
80	A	0.007	0.007	0.007	0.007
	B	0.008	0.008	0.008	0.008
	C	0.008	0.007	0.007	0.007
90	A	0.007	0.007	0.007	0.007
	B	0.008	0.008	0.008	0.008
	C	0.007	0.007	0.008	0.008
92	A	0.012	0.013	0.014	0.014
	B	0.012	0.013	0.014	0.014
	C	0.012	0.013	0.014	0.014
95	A	0.012	0.013	0.014	0.015
	B	0.012	0.013	0.014	0.015
	C	0.012	0.013	0.015	0.015
100	A	0.008	0.008	0.008	0.008
	B	0.008	0.008	0.008	0.008
	C	0.008	0.008	0.008	0.008
Maximum Results	A	0.012	0.013	0.014	0.015

	B	0.012	0.013	0.014	0.015
	C	0.012	0.013	0.015	0.015

Model: ZPM-PCS125K-R					
Network impedance phase angle, Ψ_k	Phase	30°	50°	70°	85°
Average active power, P (%Pn)		Flicker coefficient, C (Ψ_k , P _{bin})			
0	A	0.007	0.007	0.007	0.007
	B	0.007	0.007	0.007	0.007
	C	0.007	0.007	0.007	0.007
10	A	0.008	0.008	0.008	0.008
	B	0.008	0.008	0.008	0.008
	C	0.008	0.008	0.008	0.008
20	A	0.009	0.009	0.009	0.009
	B	0.008	0.008	0.008	0.008
	C	0.008	0.008	0.008	0.008
30	A	0.010	0.010	0.010	0.010
	B	0.008	0.008	0.008	0.008
	C	0.009	0.009	0.009	0.009
40	A	0.011	0.011	0.011	0.011
	B	0.009	0.009	0.009	0.009
	C	0.009	0.009	0.009	0.009
50	A	0.012	0.012	0.012	0.012
	B	0.009	0.009	0.009	0.009
	C	0.009	0.009	0.009	0.009
60	A	0.011	0.011	0.011	0.011
	B	0.009	0.009	0.009	0.009
	C	0.009	0.009	0.009	0.009
70	A	0.011	0.011	0.011	0.011
	B	0.008	0.008	0.008	0.008
	C	0.010	0.010	0.010	0.010
80	A	0.010	0.010	0.010	0.010
	B	0.008	0.008	0.008	0.008
	C	0.010	0.010	0.010	0.010
90	A	0.009	0.010	0.010	0.010
	B	0.008	0.008	0.008	0.008
	C	0.009	0.009	0.009	0.009
92	A	0.012	0.013	0.014	0.015
	B	0.012	0.013	0.014	0.014
	C	0.012	0.013	0.014	0.014
95	A	0.012	0.013	0.014	0.015
	B	0.012	0.013	0.014	0.015
	C	0.012	0.013	0.015	0.015
100	A	0.008	0.008	0.008	0.008
	B	0.008	0.008	0.008	0.008
	C	0.009	0.009	0.009	0.009

Maximum Results	A	0.012	0.013	0.014	0.015
	B	0.012	0.013	0.014	0.015
	C	0.012	0.013	0.015	0.015

Note: The reported values shown are the most unfavourable values obtained for the models tested, as mentioned in the section 1.2 of this Annex, and these values are considered to be representative of emission values of all models included in this Annex.

2.2.5 Oberschwingungsmessungen / Current Harmonics

Model: ZPM-PCS125K-R															
Phase A															
P _n (%)	0	10	20	30	40	50	60	70	80	90	92	95	100	110	Max (%)
Nr./ Order	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	
2	0.089	0.093	0.101	0.091	0.095	0.099	0.164	0.142	0.059	0.119	0.091	0.104	0.091	0.153	0.164
3	0.093	0.074	0.034	0.040	0.051	0.059	0.065	0.085	0.024	0.049	0.213	0.253	0.213	0.083	0.253
4	0.071	0.115	0.144	0.144	0.137	0.120	0.048	0.083	0.093	0.053	0.027	0.034	0.027	0.040	0.144
5	0.317	0.686	0.496	0.419	0.440	0.498	0.567	0.650	0.085	0.078	0.168	0.186	0.168	0.067	0.686
6	0.009	0.021	0.020	0.018	0.017	0.017	0.022	0.020	0.010	0.011	0.010	0.012	0.010	0.014	0.022
7	0.059	0.472	0.439	0.329	0.252	0.215	0.194	0.174	0.117	0.119	0.087	0.080	0.087	0.118	0.472
8	0.023	0.023	0.037	0.030	0.022	0.024	0.025	0.024	0.027	0.018	0.010	0.012	0.010	0.015	0.037
9	0.021	0.030	0.042	0.038	0.036	0.036	0.033	0.031	0.029	0.030	0.033	0.037	0.033	0.028	0.042
10	0.007	0.037	0.026	0.017	0.023	0.020	0.023	0.023	0.033	0.021	0.011	0.012	0.011	0.016	0.037
11	0.038	0.087	0.221	0.255	0.190	0.133	0.095	0.068	0.132	0.118	0.158	0.160	0.158	0.106	0.255
12	0.009	0.019	0.020	0.020	0.018	0.018	0.020	0.020	0.014	0.015	0.014	0.013	0.014	0.016	0.020
13	0.173	0.205	0.257	0.330	0.298	0.249	0.206	0.175	0.140	0.134	0.115	0.110	0.115	0.112	0.330
14	0.009	0.058	0.033	0.026	0.025	0.022	0.026	0.022	0.013	0.014	0.013	0.014	0.013	0.015	0.058
15	0.018	0.033	0.025	0.029	0.031	0.033	0.032	0.033	0.025	0.029	0.039	0.043	0.039	0.026	0.043
16	0.012	0.070	0.040	0.030	0.019	0.023	0.024	0.021	0.009	0.010	0.010	0.011	0.010	0.010	0.070
17	0.087	0.158	0.239	0.279	0.311	0.287	0.255	0.217	0.141	0.130	0.172	0.172	0.172	0.120	0.311
18	0.007	0.020	0.019	0.015	0.015	0.015	0.018	0.016	0.010	0.010	0.010	0.010	0.010	0.011	0.020
19	0.103	0.031	0.115	0.127	0.186	0.188	0.170	0.145	0.168	0.156	0.140	0.135	0.140	0.153	0.188
20	0.008	0.039	0.027	0.029	0.023	0.021	0.022	0.018	0.010	0.010	0.009	0.010	0.009	0.011	0.039
21	0.017	0.027	0.020	0.025	0.026	0.026	0.025	0.026	0.021	0.024	0.035	0.039	0.035	0.026	0.039
22	0.013	0.033	0.018	0.020	0.018	0.021	0.025	0.019	0.011	0.013	0.009	0.010	0.009	0.014	0.033
23	0.088	0.066	0.098	0.093	0.160	0.211	0.221	0.204	0.259	0.243	0.283	0.285	0.283	0.223	0.285
24	0.006	0.020	0.016	0.013	0.012	0.014	0.013	0.013	0.008	0.009	0.009	0.010	0.009	0.010	0.020
25	0.139	0.089	0.129	0.186	0.246	0.318	0.346	0.341	0.242	0.228	0.225	0.220	0.225	0.209	0.346
26	0.008	0.049	0.016	0.017	0.018	0.016	0.018	0.017	0.010	0.011	0.007	0.008	0.007	0.014	0.049
27	0.013	0.021	0.014	0.022	0.021	0.022	0.021	0.022	0.019	0.022	0.025	0.027	0.025	0.022	0.027
28	0.015	0.043	0.026	0.020	0.014	0.013	0.013	0.014	0.009	0.009	0.007	0.008	0.007	0.011	0.043
29	0.146	0.120	0.016	0.067	0.078	0.132	0.175	0.189	0.177	0.171	0.200	0.201	0.200	0.151	0.201
30	0.008	0.015	0.011	0.011	0.010	0.010	0.011	0.011	0.007	0.008	0.006	0.007	0.006	0.009	0.015
31	0.046	0.123	0.085	0.085	0.072	0.094	0.140	0.168	0.174	0.173	0.165	0.163	0.165	0.169	0.174
32	0.009	0.059	0.032	0.020	0.012	0.014	0.012	0.011	0.007	0.007	0.006	0.006	0.006	0.008	0.059
33	0.013	0.016	0.015	0.018	0.018	0.016	0.016	0.016	0.014	0.017	0.020	0.022	0.020	0.020	0.022
34	0.006	0.038	0.026	0.014	0.012	0.011	0.013	0.012	0.007	0.008	0.005	0.006	0.005	0.010	0.038
35	0.054	0.067	0.059	0.054	0.041	0.050	0.089	0.126	0.137	0.140	0.153	0.156	0.153	0.136	0.156
36	0.007	0.015	0.010	0.011	0.010	0.010	0.011	0.011	0.009	0.009	0.005	0.006	0.005	0.010	0.015
37	0.107	0.070	0.142	0.122	0.098	0.086	0.052	0.031	0.106	0.109	0.109	0.109	0.109	0.105	0.142
38	0.007	0.038	0.028	0.016	0.011	0.013	0.011	0.011	0.008	0.009	0.005	0.005	0.005	0.009	0.038
39	0.012	0.019	0.013	0.016	0.016	0.016	0.015	0.015	0.010	0.013	0.012	0.014	0.012	0.014	0.019
40	0.010	0.041	0.027	0.019	0.014	0.012	0.010	0.009	0.007	0.007	0.005	0.005	0.005	0.009	0.041
41	0.050	0.071	0.136	0.138	0.114	0.113	0.092	0.063	0.076	0.079	0.095	0.098	0.095	0.076	0.138
42	0.007	0.012	0.007	0.007	0.006	0.006	0.007	0.007	0.006	0.007	0.004	0.005	0.004	0.008	0.012
43	0.063	0.063	0.038	0.041	0.019	0.020	0.015	0.028	0.083	0.087	0.086	0.088	0.086	0.092	0.092
44	0.009	0.028	0.016	0.014	0.011	0.009	0.008	0.008	0.006	0.006	0.005	0.006	0.005	0.007	0.028
45	0.012	0.011	0.011	0.010	0.011	0.011	0.012	0.012	0.011	0.012	0.011	0.012	0.011	0.013	0.013
46	0.007	0.013	0.017	0.014	0.013	0.012	0.010	0.008	0.006	0.006	0.005	0.006	0.005	0.008	0.017
47	0.017	0.055	0.026	0.034	0.027	0.026	0.026	0.018	0.059	0.066	0.079	0.082	0.079	0.070	0.082
48	0.010	0.012	0.010	0.010	0.009	0.010	0.010	0.010	0.010	0.011	0.004	0.005	0.004	0.012	0.012
49	0.030	0.077	0.058	0.080	0.081	0.077	0.073	0.060	0.051	0.051	0.059	0.058	0.059	0.053	0.081
50	0.006	0.014	0.011	0.009	0.010	0.008	0.010	0.008	0.005	0.006	0.003	0.003	0.003	0.007	0.014
TDC (%)	0.501	0.947	0.868	0.834	0.827	0.855	0.891	0.921	0.601	0.584	0.666	0.686	0.666	0.561	0.947

Model: ZPM-PCS125K-R															
Phase B															
P _n (%)	0	10	20	30	40	50	60	70	80	90	92	95	100	110	Max (%)
Nr./ Order	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	
2	0.062	0.095	0.111	0.114	0.127	0.122	0.056	0.092	0.123	0.067	0.172	0.216	0.172	0.049	0.216
3	0.020	0.045	0.059	0.060	0.063	0.066	0.066	0.065	0.034	0.061	0.347	0.439	0.347	0.162	0.439
4	0.063	0.131	0.127	0.119	0.117	0.106	0.064	0.087	0.077	0.056	0.025	0.034	0.025	0.034	0.131
5	0.313	0.632	0.481	0.403	0.425	0.483	0.556	0.637	0.085	0.070	0.170	0.183	0.170	0.065	0.637
6	0.010	0.022	0.020	0.024	0.024	0.024	0.021	0.023	0.019	0.025	0.013	0.019	0.013	0.023	0.025
7	0.072	0.383	0.394	0.294	0.216	0.173	0.161	0.148	0.106	0.095	0.106	0.100	0.106	0.073	0.394
8	0.019	0.037	0.040	0.031	0.029	0.028	0.024	0.030	0.024	0.017	0.013	0.017	0.013	0.017	0.040
9	0.026	0.023	0.026	0.030	0.030	0.032	0.033	0.034	0.032	0.031	0.037	0.044	0.037	0.052	0.052
10	0.009	0.045	0.032	0.021	0.025	0.020	0.022	0.021	0.025	0.016	0.016	0.017	0.016	0.014	0.045
11	0.036	0.117	0.234	0.284	0.220	0.164	0.118	0.089	0.156	0.149	0.150	0.145	0.150	0.147	0.284
12	0.010	0.018	0.019	0.020	0.019	0.021	0.021	0.022	0.015	0.015	0.021	0.021	0.021	0.016	0.022
13	0.161	0.180	0.222	0.302	0.270	0.223	0.187	0.156	0.121	0.116	0.144	0.144	0.144	0.102	0.302
14	0.012	0.065	0.030	0.027	0.026	0.024	0.022	0.022	0.014	0.014	0.017	0.019	0.017	0.017	0.065
15	0.016	0.022	0.022	0.028	0.029	0.029	0.031	0.030	0.017	0.017	0.059	0.067	0.059	0.028	0.067
16	0.015	0.079	0.040	0.035	0.025	0.026	0.019	0.019	0.009	0.009	0.016	0.019	0.016	0.011	0.079
17	0.095	0.158	0.246	0.301	0.337	0.313	0.281	0.247	0.169	0.160	0.173	0.173	0.173	0.146	0.337
18	0.007	0.017	0.016	0.018	0.018	0.020	0.021	0.019	0.010	0.010	0.019	0.019	0.019	0.012	0.021
19	0.102	0.031	0.096	0.114	0.172	0.173	0.155	0.132	0.152	0.142	0.177	0.179	0.177	0.135	0.179
20	0.013	0.034	0.030	0.029	0.022	0.023	0.018	0.017	0.010	0.011	0.015	0.016	0.015	0.013	0.034
21	0.018	0.017	0.018	0.022	0.023	0.023	0.022	0.023	0.014	0.014	0.047	0.055	0.047	0.016	0.055
22	0.011	0.043	0.021	0.019	0.019	0.019	0.019	0.017	0.010	0.011	0.014	0.018	0.014	0.015	0.043
23	0.116	0.080	0.095	0.096	0.162	0.215	0.225	0.206	0.272	0.262	0.266	0.265	0.266	0.245	0.272
24	0.007	0.015	0.014	0.014	0.014	0.017	0.019	0.018	0.009	0.009	0.017	0.019	0.017	0.011	0.019
25	0.158	0.077	0.123	0.167	0.229	0.302	0.330	0.325	0.225	0.211	0.237	0.235	0.237	0.193	0.330
26	0.009	0.062	0.022	0.016	0.016	0.016	0.015	0.015	0.009	0.010	0.012	0.013	0.012	0.014	0.062
27	0.012	0.016	0.015	0.018	0.019	0.018	0.018	0.018	0.013	0.013	0.036	0.041	0.036	0.015	0.041
28	0.017	0.056	0.026	0.021	0.014	0.016	0.013	0.013	0.007	0.008	0.011	0.013	0.011	0.009	0.056
29	0.146	0.103	0.022	0.066	0.076	0.132	0.178	0.194	0.185	0.181	0.184	0.184	0.184	0.170	0.194
30	0.008	0.017	0.012	0.012	0.010	0.011	0.012	0.013	0.008	0.009	0.013	0.014	0.013	0.011	0.017
31	0.041	0.142	0.087	0.089	0.069	0.084	0.130	0.157	0.166	0.162	0.171	0.172	0.171	0.158	0.172
32	0.011	0.065	0.036	0.020	0.013	0.014	0.011	0.012	0.007	0.007	0.009	0.010	0.009	0.009	0.065
33	0.012	0.012	0.017	0.018	0.018	0.017	0.016	0.017	0.012	0.012	0.024	0.028	0.024	0.015	0.028
34	0.009	0.043	0.026	0.014	0.011	0.013	0.012	0.011	0.007	0.007	0.008	0.009	0.008	0.009	0.043
35	0.049	0.063	0.061	0.068	0.056	0.062	0.096	0.133	0.143	0.147	0.140	0.142	0.140	0.150	0.150
36	0.006	0.013	0.010	0.011	0.010	0.011	0.011	0.011	0.008	0.009	0.010	0.011	0.010	0.011	0.013
37	0.111	0.075	0.139	0.127	0.105	0.093	0.060	0.037	0.100	0.102	0.110	0.111	0.110	0.100	0.139
38	0.008	0.045	0.029	0.019	0.014	0.013	0.012	0.011	0.009	0.009	0.008	0.009	0.008	0.010	0.045
39	0.012	0.014	0.014	0.014	0.014	0.013	0.013	0.012	0.008	0.009	0.019	0.023	0.019	0.011	0.023
40	0.010	0.052	0.028	0.019	0.014	0.012	0.009	0.009	0.006	0.006	0.006	0.007	0.006	0.008	0.052
41	0.059	0.056	0.136	0.147	0.125	0.123	0.101	0.072	0.079	0.084	0.087	0.088	0.087	0.088	0.147
42	0.008	0.011	0.008	0.008	0.007	0.008	0.008	0.009	0.007	0.008	0.007	0.008	0.007	0.009	0.011
43	0.054	0.072	0.035	0.043	0.022	0.023	0.017	0.026	0.079	0.083	0.083	0.085	0.083	0.090	0.090
44	0.012	0.028	0.019	0.017	0.013	0.011	0.008	0.008	0.006	0.006	0.004	0.004	0.004	0.008	0.028
45	0.011	0.011	0.013	0.013	0.013	0.013	0.012	0.013	0.009	0.010	0.016	0.018	0.016	0.012	0.018
46	0.008	0.016	0.016	0.014	0.012	0.011	0.009	0.009	0.006	0.006	0.007	0.008	0.007	0.008	0.016
47	0.022	0.057	0.024	0.034	0.027	0.030	0.031	0.023	0.065	0.073	0.072	0.074	0.072	0.082	0.082
48	0.009	0.010	0.008	0.008	0.008	0.008	0.008	0.008	0.007	0.008	0.007	0.007	0.007	0.010	0.010
49	0.033	0.079	0.060	0.081	0.084	0.081	0.078	0.064	0.045	0.044	0.056	0.057	0.056	0.050	0.084
50	0.008	0.015	0.011	0.011	0.012	0.010	0.007	0.008	0.005	0.006	0.005	0.006	0.005	0.009	0.015
TDC (%)	0.497	0.869	0.829	0.818	0.814	0.840	0.864	0.899	0.610	0.580	0.744	0.806	0.744	0.572	0.899

Model: ZPM-PCS125K-R															
Phase C															
P _n (%)	0	10	20	30	40	50	60	70	80	90	92	95	100	110	Max (%)
Nr./ Order	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	
2	0.083	0.063	0.056	0.041	0.036	0.049	0.135	0.098	0.077	0.119	0.114	0.145	0.114	0.177	0.177
3	0.084	0.061	0.088	0.090	0.100	0.109	0.111	0.117	0.015	0.015	0.174	0.223	0.174	0.085	0.223
4	0.075	0.130	0.144	0.142	0.138	0.127	0.036	0.084	0.107	0.053	0.017	0.016	0.017	0.023	0.144
5	0.310	0.651	0.462	0.397	0.424	0.486	0.565	0.651	0.057	0.033	0.054	0.046	0.054	0.016	0.651
6	0.008	0.017	0.020	0.020	0.022	0.022	0.026	0.025	0.018	0.019	0.018	0.028	0.018	0.016	0.028
7	0.064	0.431	0.414	0.306	0.232	0.187	0.174	0.165	0.153	0.147	0.125	0.131	0.125	0.164	0.431
8	0.020	0.039	0.040	0.029	0.025	0.025	0.022	0.024	0.021	0.016	0.009	0.009	0.009	0.013	0.040
9	0.034	0.024	0.043	0.046	0.044	0.042	0.038	0.039	0.049	0.054	0.026	0.030	0.026	0.077	0.077
10	0.009	0.038	0.022	0.019	0.024	0.019	0.026	0.020	0.032	0.021	0.009	0.008	0.009	0.016	0.038
11	0.043	0.094	0.216	0.259	0.192	0.138	0.094	0.065	0.145	0.135	0.113	0.110	0.113	0.155	0.259
12	0.009	0.020	0.020	0.022	0.019	0.021	0.020	0.021	0.015	0.015	0.016	0.017	0.016	0.016	0.022
13	0.158	0.216	0.243	0.326	0.292	0.247	0.209	0.172	0.140	0.137	0.162	0.162	0.162	0.139	0.326
14	0.014	0.065	0.032	0.024	0.022	0.024	0.028	0.022	0.014	0.014	0.013	0.013	0.013	0.015	0.065
15	0.021	0.022	0.021	0.029	0.028	0.030	0.031	0.029	0.024	0.025	0.025	0.030	0.025	0.039	0.039
16	0.008	0.066	0.039	0.031	0.021	0.023	0.025	0.019	0.010	0.009	0.009	0.010	0.009	0.010	0.066
17	0.097	0.165	0.222	0.280	0.311	0.283	0.253	0.223	0.163	0.152	0.135	0.130	0.135	0.146	0.311
18	0.008	0.017	0.020	0.015	0.016	0.016	0.018	0.018	0.010	0.010	0.012	0.012	0.012	0.012	0.020
19	0.104	0.046	0.111	0.136	0.194	0.196	0.177	0.154	0.174	0.166	0.187	0.186	0.187	0.154	0.196
20	0.010	0.047	0.027	0.031	0.019	0.021	0.021	0.019	0.009	0.010	0.009	0.010	0.009	0.012	0.047
21	0.014	0.023	0.020	0.029	0.029	0.031	0.029	0.031	0.025	0.027	0.014	0.018	0.014	0.032	0.032
22	0.011	0.029	0.021	0.020	0.019	0.019	0.022	0.020	0.012	0.012	0.009	0.011	0.009	0.015	0.029
23	0.105	0.071	0.088	0.089	0.157	0.206	0.213	0.195	0.256	0.246	0.243	0.238	0.243	0.234	0.256
24	0.007	0.013	0.014	0.014	0.013	0.015	0.015	0.014	0.008	0.008	0.009	0.010	0.009	0.010	0.015
25	0.157	0.087	0.125	0.177	0.245	0.318	0.350	0.345	0.243	0.233	0.259	0.260	0.259	0.214	0.350
26	0.011	0.067	0.022	0.016	0.016	0.015	0.019	0.015	0.009	0.010	0.008	0.009	0.008	0.013	0.067
27	0.013	0.017	0.016	0.018	0.019	0.018	0.019	0.020	0.019	0.019	0.014	0.017	0.014	0.023	0.023
28	0.014	0.060	0.029	0.023	0.016	0.017	0.012	0.013	0.009	0.010	0.006	0.007	0.006	0.011	0.060
29	0.154	0.124	0.022	0.054	0.066	0.125	0.168	0.183	0.171	0.165	0.172	0.170	0.172	0.158	0.183
30	0.007	0.012	0.010	0.011	0.010	0.011	0.012	0.011	0.007	0.007	0.008	0.008	0.008	0.010	0.012
31	0.051	0.130	0.089	0.098	0.082	0.103	0.141	0.173	0.178	0.180	0.187	0.189	0.187	0.176	0.189
32	0.012	0.065	0.031	0.016	0.012	0.013	0.011	0.010	0.007	0.007	0.006	0.007	0.006	0.009	0.065
33	0.016	0.013	0.017	0.016	0.015	0.017	0.015	0.017	0.016	0.016	0.008	0.010	0.008	0.020	0.020
34	0.007	0.036	0.025	0.016	0.012	0.013	0.012	0.011	0.007	0.008	0.005	0.006	0.005	0.009	0.036
35	0.048	0.076	0.067	0.068	0.049	0.048	0.083	0.117	0.134	0.136	0.130	0.131	0.130	0.138	0.138
36	0.006	0.011	0.011	0.010	0.009	0.010	0.010	0.010	0.007	0.007	0.006	0.006	0.006	0.009	0.011
37	0.111	0.086	0.136	0.122	0.101	0.092	0.059	0.037	0.108	0.112	0.124	0.127	0.124	0.110	0.136
38	0.006	0.049	0.027	0.018	0.014	0.012	0.011	0.011	0.007	0.008	0.006	0.006	0.006	0.010	0.049
39	0.013	0.017	0.013	0.014	0.014	0.013	0.014	0.014	0.010	0.012	0.010	0.011	0.010	0.014	0.017
40	0.012	0.045	0.029	0.019	0.012	0.011	0.011	0.009	0.007	0.007	0.004	0.004	0.004	0.008	0.045
41	0.065	0.057	0.133	0.142	0.120	0.119	0.097	0.068	0.071	0.074	0.081	0.082	0.081	0.077	0.142
42	0.008	0.011	0.008	0.007	0.007	0.007	0.007	0.008	0.006	0.006	0.004	0.004	0.004	0.008	0.011
43	0.056	0.070	0.037	0.043	0.021	0.022	0.019	0.033	0.081	0.090	0.095	0.098	0.095	0.096	0.098
44	0.009	0.029	0.017	0.015	0.012	0.010	0.009	0.008	0.006	0.006	0.005	0.005	0.005	0.007	0.029
45	0.009	0.011	0.012	0.012	0.012	0.012	0.010	0.012	0.012	0.013	0.011	0.012	0.011	0.015	0.015
46	0.006	0.015	0.017	0.014	0.012	0.010	0.010	0.009	0.006	0.006	0.003	0.003	0.003	0.007	0.017
47	0.020	0.044	0.026	0.040	0.034	0.034	0.034	0.024	0.058	0.064	0.067	0.068	0.067	0.074	0.074
48	0.014	0.014	0.015	0.014	0.014	0.013	0.014	0.014	0.014	0.015	0.004	0.004	0.004	0.016	0.016
49	0.032	0.081	0.061	0.083	0.085	0.081	0.080	0.066	0.050	0.049	0.066	0.067	0.066	0.054	0.085
50	0.007	0.016	0.010	0.010	0.011	0.009	0.008	0.008	0.005	0.006	0.004	0.005	0.004	0.008	0.016
TDC (%)	0.507	0.912	0.823	0.816	0.814	0.845	0.885	0.920	0.618	0.601	0.637	0.658	0.637	0.616	0.920

Model: ZPM-PCS215K-R															
Phase A															
P _n (%)	0	10	20	30	40	50	60	70	80	90	92	95	100	110	Max (%)
Nr./ Order	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	
2	0.100	0.043	0.100	0.102	0.109	0.095	0.118	0.128	0.114	0.105	0.112	0.126	0.112	0.091	0.128
3	0.055	0.113	0.059	0.096	0.100	0.107	0.064	0.054	0.034	0.055	0.196	0.232	0.196	0.053	0.232
4	0.120	0.047	0.106	0.100	0.103	0.071	0.115	0.141	0.091	0.076	0.043	0.046	0.043	0.078	0.141
5	0.269	0.037	0.551	0.426	0.271	0.239	0.203	0.145	0.121	0.091	0.232	0.243	0.232	0.058	0.551
6	0.014	0.029	0.012	0.016	0.012	0.012	0.013	0.013	0.014	0.014	0.011	0.011	0.011	0.016	0.029
7	0.229	0.550	0.163	0.288	0.182	0.201	0.220	0.204	0.171	0.160	0.145	0.131	0.145	0.140	0.550
8	0.048	0.015	0.049	0.035	0.034	0.017	0.036	0.050	0.023	0.015	0.015	0.014	0.015	0.017	0.050
9	0.036	0.023	0.045	0.075	0.048	0.045	0.091	0.112	0.082	0.085	0.065	0.070	0.065	0.064	0.112
10	0.041	0.021	0.060	0.030	0.035	0.020	0.048	0.064	0.036	0.027	0.013	0.015	0.013	0.028	0.064
11	0.241	0.310	0.482	0.246	0.071	0.049	0.141	0.189	0.189	0.178	0.214	0.218	0.214	0.159	0.482
12	0.014	0.008	0.020	0.015	0.016	0.016	0.016	0.017	0.017	0.018	0.017	0.017	0.017	0.018	0.020
13	0.217	0.113	0.332	0.375	0.174	0.062	0.109	0.186	0.193	0.195	0.131	0.122	0.131	0.148	0.375
14	0.016	0.012	0.030	0.020	0.024	0.019	0.017	0.017	0.018	0.018	0.017	0.018	0.017	0.018	0.030
15	0.031	0.016	0.033	0.040	0.059	0.071	0.039	0.067	0.078	0.092	0.066	0.073	0.066	0.055	0.092
16	0.013	0.013	0.038	0.013	0.013	0.016	0.014	0.014	0.014	0.013	0.012	0.014	0.012	0.014	0.038
17	0.210	0.087	0.086	0.378	0.321	0.219	0.125	0.152	0.163	0.171	0.181	0.185	0.181	0.169	0.378
18	0.011	0.013	0.012	0.012	0.013	0.013	0.013	0.014	0.014	0.015	0.013	0.013	0.013	0.015	0.015
19	0.186	0.177	0.138	0.207	0.298	0.241	0.145	0.134	0.174	0.199	0.152	0.148	0.152	0.200	0.298
20	0.011	0.011	0.012	0.012	0.013	0.014	0.014	0.013	0.014	0.015	0.015	0.016	0.015	0.016	0.016
21	0.022	0.020	0.044	0.025	0.046	0.038	0.035	0.034	0.048	0.062	0.043	0.049	0.043	0.053	0.062
22	0.009	0.011	0.029	0.013	0.016	0.014	0.014	0.013	0.014	0.014	0.021	0.022	0.021	0.015	0.029
23	0.236	0.220	0.351	0.199	0.287	0.348	0.304	0.163	0.193	0.249	0.264	0.275	0.264	0.281	0.351
24	0.009	0.008	0.012	0.011	0.011	0.012	0.011	0.012	0.012	0.013	0.009	0.010	0.009	0.014	0.014
25	0.213	0.141	0.261	0.214	0.161	0.265	0.289	0.139	0.151	0.215	0.193	0.194	0.193	0.253	0.289
26	0.009	0.011	0.011	0.012	0.013	0.013	0.012	0.012	0.012	0.013	0.020	0.021	0.020	0.014	0.021
27	0.017	0.017	0.027	0.020	0.034	0.052	0.027	0.033	0.034	0.043	0.031	0.035	0.031	0.041	0.052
28	0.009	0.009	0.021	0.011	0.011	0.013	0.011	0.011	0.011	0.012	0.014	0.015	0.014	0.015	0.021
29	0.144	0.064	0.177	0.226	0.095	0.127	0.215	0.118	0.112	0.156	0.153	0.160	0.153	0.179	0.226
30	0.008	0.010	0.011	0.011	0.011	0.011	0.011	0.010	0.011	0.012	0.006	0.007	0.006	0.013	0.013
31	0.140	0.181	0.172	0.197	0.163	0.102	0.201	0.149	0.124	0.166	0.130	0.133	0.130	0.218	0.218
32	0.009	0.010	0.010	0.011	0.011	0.011	0.010	0.010	0.011	0.011	0.007	0.007	0.007	0.012	0.012
33	0.017	0.019	0.028	0.029	0.034	0.033	0.032	0.030	0.029	0.035	0.019	0.020	0.019	0.032	0.035
34	0.008	0.011	0.014	0.012	0.011	0.010	0.010	0.011	0.010	0.012	0.006	0.007	0.006	0.012	0.014
35	0.096	0.168	0.109	0.115	0.182	0.101	0.124	0.122	0.123	0.149	0.101	0.107	0.101	0.180	0.182
36	0.011	0.011	0.012	0.013	0.013	0.013	0.012	0.012	0.013	0.014	0.005	0.005	0.005	0.015	0.015
37	0.082	0.069	0.107	0.155	0.154	0.091	0.085	0.103	0.085	0.098	0.078	0.079	0.078	0.129	0.155
38	0.009	0.012	0.011	0.012	0.012	0.011	0.012	0.012	0.012	0.013	0.005	0.005	0.005	0.014	0.014
39	0.015	0.024	0.023	0.023	0.030	0.025	0.025	0.029	0.026	0.031	0.019	0.020	0.019	0.030	0.031
40	0.008	0.011	0.012	0.010	0.009	0.010	0.009	0.010	0.010	0.011	0.005	0.006	0.005	0.012	0.012
41	0.055	0.095	0.117	0.128	0.065	0.070	0.036	0.077	0.079	0.088	0.075	0.077	0.075	0.103	0.128
42	0.007	0.010	0.008	0.009	0.008	0.008	0.008	0.009	0.009	0.010	0.004	0.004	0.004	0.012	0.012
43	0.049	0.103	0.067	0.071	0.054	0.062	0.028	0.091	0.093	0.092	0.074	0.077	0.074	0.123	0.123
44	0.007	0.011	0.008	0.009	0.008	0.009	0.010	0.010	0.010	0.010	0.006	0.006	0.006	0.011	0.011
45	0.015	0.024	0.021	0.018	0.019	0.031	0.019	0.028	0.024	0.028	0.017	0.018	0.017	0.029	0.031
46	0.006	0.011	0.010	0.008	0.008	0.008	0.008	0.009	0.009	0.010	0.005	0.005	0.005	0.012	0.012
47	0.035	0.109	0.021	0.042	0.054	0.029	0.029	0.061	0.067	0.072	0.058	0.060	0.058	0.098	0.109
48	0.009	0.012	0.008	0.009	0.010	0.011	0.011	0.012	0.013	0.014	0.005	0.005	0.005	0.016	0.016
49	0.031	0.059	0.031	0.041	0.052	0.034	0.041	0.063	0.064	0.058	0.061	0.063	0.061	0.074	0.074
50	0.006	0.010	0.007	0.006	0.007	0.007	0.007	0.008	0.009	0.010	0.006	0.007	0.006	0.011	0.011
TDC (%)	0.714	0.805	1.019	0.967	0.772	0.707	0.706	0.612	0.594	0.662	0.667	0.692	0.667	0.699	1.019

Model: ZPM-PCS215K-R															
Phase B															
P _n (%)	0	10	20	30	40	50	60	70	80	90	92	95	100	110	Max (%)
Nr./ Order	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	
2	0.091	0.060	0.109	0.089	0.098	0.073	0.105	0.116	0.096	0.089	0.155	0.193	0.155	0.093	0.193
3	0.019	0.175	0.030	0.030	0.042	0.051	0.058	0.074	0.066	0.083	0.257	0.332	0.257	0.138	0.332
4	0.098	0.031	0.094	0.097	0.094	0.084	0.101	0.110	0.090	0.077	0.034	0.039	0.034	0.061	0.110
5	0.301	0.149	0.532	0.354	0.320	0.342	0.296	0.241	0.183	0.157	0.305	0.318	0.305	0.118	0.532
6	0.015	0.048	0.024	0.022	0.013	0.016	0.015	0.014	0.017	0.022	0.024	0.026	0.024	0.021	0.048
7	0.236	0.456	0.135	0.283	0.237	0.241	0.216	0.159	0.158	0.127	0.192	0.185	0.192	0.113	0.456
8	0.040	0.024	0.046	0.039	0.033	0.017	0.034	0.047	0.024	0.017	0.025	0.027	0.025	0.021	0.047
9	0.026	0.033	0.020	0.031	0.042	0.047	0.039	0.036	0.039	0.037	0.087	0.094	0.087	0.055	0.094
10	0.037	0.028	0.040	0.029	0.032	0.019	0.046	0.061	0.031	0.024	0.024	0.029	0.024	0.024	0.061
11	0.246	0.318	0.584	0.225	0.143	0.021	0.179	0.240	0.240	0.238	0.212	0.212	0.212	0.219	0.584
12	0.015	0.009	0.022	0.015	0.018	0.016	0.017	0.018	0.018	0.018	0.029	0.031	0.029	0.018	0.031
13	0.218	0.121	0.295	0.389	0.207	0.112	0.065	0.107	0.127	0.120	0.187	0.190	0.187	0.128	0.389
14	0.014	0.020	0.029	0.019	0.022	0.019	0.018	0.017	0.019	0.020	0.023	0.025	0.023	0.019	0.029
15	0.023	0.038	0.026	0.028	0.035	0.032	0.025	0.027	0.024	0.028	0.077	0.090	0.077	0.036	0.090
16	0.011	0.022	0.029	0.012	0.014	0.018	0.015	0.016	0.014	0.014	0.019	0.023	0.019	0.014	0.029
17	0.213	0.122	0.048	0.398	0.323	0.251	0.093	0.145	0.201	0.220	0.195	0.201	0.195	0.205	0.398
18	0.011	0.014	0.012	0.012	0.014	0.015	0.014	0.014	0.015	0.015	0.023	0.026	0.023	0.015	0.026
19	0.187	0.178	0.165	0.175	0.274	0.263	0.164	0.123	0.125	0.142	0.179	0.188	0.179	0.167	0.274
20	0.012	0.010	0.013	0.013	0.015	0.015	0.014	0.013	0.015	0.016	0.019	0.020	0.019	0.016	0.020
21	0.018	0.021	0.023	0.030	0.028	0.024	0.025	0.026	0.026	0.032	0.056	0.066	0.056	0.033	0.066
22	0.010	0.013	0.021	0.015	0.017	0.015	0.015	0.014	0.014	0.015	0.022	0.024	0.022	0.013	0.024
23	0.242	0.214	0.369	0.221	0.267	0.357	0.326	0.154	0.185	0.259	0.248	0.256	0.248	0.316	0.369
24	0.010	0.010	0.011	0.011	0.013	0.013	0.012	0.012	0.012	0.013	0.016	0.019	0.016	0.014	0.019
25	0.210	0.150	0.250	0.223	0.136	0.228	0.287	0.156	0.136	0.181	0.197	0.203	0.197	0.217	0.287
26	0.010	0.016	0.013	0.013	0.015	0.015	0.013	0.012	0.013	0.014	0.021	0.023	0.021	0.014	0.023
27	0.017	0.022	0.026	0.021	0.025	0.024	0.024	0.023	0.023	0.028	0.030	0.037	0.030	0.028	0.037
28	0.010	0.011	0.017	0.012	0.012	0.014	0.011	0.011	0.012	0.013	0.015	0.016	0.015	0.015	0.017
29	0.150	0.070	0.209	0.228	0.094	0.108	0.235	0.146	0.093	0.145	0.133	0.137	0.133	0.201	0.235
30	0.009	0.009	0.011	0.012	0.012	0.011	0.011	0.011	0.011	0.012	0.010	0.011	0.010	0.012	0.012
31	0.131	0.177	0.166	0.171	0.151	0.093	0.178	0.135	0.132	0.155	0.118	0.122	0.118	0.189	0.189
32	0.009	0.009	0.011	0.013	0.012	0.012	0.011	0.011	0.011	0.012	0.007	0.008	0.007	0.012	0.013
33	0.016	0.021	0.023	0.023	0.021	0.024	0.021	0.025	0.025	0.027	0.024	0.028	0.024	0.024	0.028
34	0.008	0.012	0.012	0.012	0.011	0.011	0.010	0.010	0.011	0.012	0.006	0.007	0.006	0.011	0.012
35	0.100	0.161	0.098	0.120	0.188	0.101	0.131	0.146	0.113	0.128	0.089	0.091	0.089	0.188	0.188
36	0.009	0.011	0.010	0.012	0.012	0.011	0.011	0.011	0.011	0.012	0.006	0.007	0.006	0.012	0.012
37	0.076	0.047	0.101	0.151	0.118	0.087	0.062	0.080	0.095	0.101	0.065	0.065	0.065	0.111	0.151
38	0.010	0.014	0.012	0.014	0.014	0.013	0.013	0.013	0.013	0.014	0.006	0.006	0.006	0.014	0.014
39	0.015	0.026	0.026	0.022	0.019	0.018	0.019	0.026	0.024	0.027	0.015	0.017	0.015	0.022	0.027
40	0.008	0.014	0.010	0.012	0.010	0.010	0.009	0.010	0.010	0.011	0.006	0.006	0.006	0.011	0.014
41	0.056	0.093	0.126	0.136	0.067	0.092	0.044	0.085	0.076	0.071	0.066	0.064	0.066	0.106	0.136
42	0.007	0.010	0.008	0.009	0.008	0.009	0.008	0.009	0.009	0.010	0.005	0.006	0.005	0.010	0.010
43	0.046	0.111	0.067	0.061	0.053	0.042	0.025	0.075	0.098	0.100	0.061	0.061	0.061	0.115	0.115
44	0.008	0.012	0.009	0.009	0.009	0.010	0.009	0.010	0.010	0.010	0.007	0.007	0.007	0.010	0.012
45	0.015	0.024	0.020	0.017	0.015	0.016	0.019	0.025	0.023	0.026	0.014	0.016	0.014	0.025	0.026
46	0.007	0.011	0.008	0.008	0.009	0.008	0.008	0.010	0.009	0.010	0.007	0.006	0.007	0.011	0.011
47	0.034	0.096	0.017	0.044	0.063	0.030	0.031	0.060	0.074	0.066	0.057	0.057	0.057	0.096	0.096
48	0.008	0.011	0.008	0.008	0.009	0.009	0.009	0.010	0.011	0.012	0.006	0.006	0.006	0.012	0.012
49	0.028	0.052	0.027	0.046	0.036	0.026	0.033	0.053	0.062	0.060	0.055	0.053	0.055	0.061	0.062
50	0.006	0.010	0.007	0.007	0.008	0.008	0.008	0.009	0.009	0.010	0.006	0.007	0.006	0.010	0.010
TDC (%)	0.725	0.778	1.051	0.931	0.785	0.758	0.737	0.607	0.588	0.637	0.744	0.800	0.744	0.717	1.051

Model: ZPM-PCS215K-R															
Phase C															
P _n (%)	0	10	20	30	40	50	60	70	80	90	92	95	100	110	Max (%)
Nr./ Order	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	
2	0.075	0.036	0.085	0.105	0.109	0.106	0.114	0.125	0.109	0.107	0.083	0.105	0.083	0.128	0.128
3	0.061	0.128	0.055	0.109	0.118	0.123	0.091	0.096	0.045	0.043	0.145	0.164	0.145	0.095	0.164
4	0.112	0.056	0.113	0.102	0.103	0.068	0.115	0.145	0.086	0.069	0.033	0.032	0.033	0.068	0.145
5	0.296	0.112	0.460	0.423	0.350	0.314	0.251	0.174	0.137	0.096	0.148	0.137	0.148	0.068	0.460
6	0.010	0.026	0.020	0.015	0.013	0.015	0.015	0.014	0.016	0.015	0.021	0.026	0.021	0.015	0.026
7	0.297	0.595	0.076	0.204	0.200	0.279	0.285	0.256	0.233	0.217	0.215	0.219	0.215	0.231	0.595
8	0.036	0.023	0.042	0.031	0.031	0.017	0.034	0.046	0.022	0.015	0.019	0.021	0.019	0.015	0.046
9	0.043	0.029	0.049	0.093	0.073	0.025	0.066	0.098	0.074	0.085	0.048	0.051	0.048	0.094	0.098
10	0.037	0.018	0.039	0.032	0.036	0.018	0.040	0.053	0.027	0.020	0.017	0.018	0.017	0.022	0.053
11	0.256	0.324	0.513	0.274	0.153	0.043	0.125	0.159	0.186	0.180	0.147	0.137	0.147	0.206	0.513
12	0.014	0.009	0.016	0.016	0.017	0.017	0.017	0.018	0.017	0.017	0.020	0.022	0.020	0.018	0.022
13	0.241	0.123	0.408	0.380	0.249	0.117	0.084	0.161	0.194	0.196	0.211	0.213	0.211	0.188	0.408
14	0.015	0.016	0.025	0.019	0.019	0.017	0.020	0.020	0.018	0.019	0.015	0.016	0.015	0.019	0.025
15	0.029	0.031	0.040	0.042	0.048	0.055	0.049	0.078	0.077	0.090	0.024	0.028	0.024	0.078	0.090
16	0.011	0.016	0.039	0.012	0.014	0.016	0.015	0.016	0.013	0.013	0.011	0.013	0.011	0.014	0.039
17	0.220	0.116	0.104	0.372	0.336	0.278	0.121	0.109	0.155	0.170	0.157	0.152	0.157	0.191	0.372
18	0.011	0.009	0.012	0.012	0.014	0.014	0.014	0.013	0.014	0.014	0.015	0.017	0.015	0.015	0.017
19	0.204	0.207	0.129	0.209	0.294	0.290	0.153	0.102	0.164	0.197	0.199	0.204	0.199	0.212	0.294
20	0.011	0.010	0.014	0.013	0.014	0.014	0.013	0.013	0.014	0.014	0.016	0.016	0.016	0.016	0.016
21	0.024	0.021	0.048	0.029	0.038	0.039	0.036	0.036	0.045	0.061	0.027	0.029	0.027	0.065	0.065
22	0.010	0.014	0.032	0.014	0.016	0.014	0.014	0.014	0.014	0.014	0.022	0.024	0.022	0.015	0.032
23	0.246	0.229	0.337	0.221	0.248	0.336	0.330	0.181	0.161	0.218	0.231	0.231	0.231	0.279	0.337
24	0.009	0.008	0.011	0.011	0.012	0.012	0.012	0.012	0.012	0.013	0.010	0.012	0.010	0.014	0.014
25	0.222	0.132	0.283	0.237	0.120	0.242	0.307	0.165	0.127	0.189	0.219	0.228	0.219	0.247	0.307
26	0.009	0.015	0.011	0.012	0.012	0.012	0.011	0.011	0.012	0.012	0.021	0.022	0.021	0.013	0.022
27	0.020	0.017	0.023	0.022	0.034	0.049	0.030	0.032	0.036	0.047	0.017	0.017	0.017	0.044	0.049
28	0.008	0.010	0.020	0.011	0.012	0.013	0.011	0.011	0.012	0.013	0.016	0.016	0.016	0.014	0.020
29	0.145	0.074	0.191	0.206	0.095	0.090	0.218	0.142	0.099	0.126	0.132	0.133	0.132	0.174	0.218
30	0.009	0.009	0.012	0.011	0.011	0.011	0.010	0.011	0.011	0.011	0.007	0.007	0.007	0.012	0.012
31	0.140	0.183	0.170	0.191	0.159	0.063	0.195	0.162	0.115	0.143	0.132	0.140	0.132	0.208	0.208
32	0.009	0.010	0.010	0.013	0.011	0.011	0.010	0.011	0.011	0.012	0.007	0.007	0.007	0.012	0.013
33	0.018	0.023	0.025	0.031	0.035	0.028	0.035	0.037	0.027	0.036	0.019	0.019	0.019	0.036	0.037
34	0.008	0.010	0.014	0.012	0.011	0.011	0.010	0.011	0.010	0.011	0.005	0.006	0.005	0.011	0.014
35	0.093	0.163	0.090	0.105	0.155	0.100	0.112	0.123	0.127	0.131	0.092	0.095	0.092	0.162	0.163
36	0.010	0.010	0.011	0.012	0.011	0.011	0.011	0.012	0.012	0.012	0.005	0.005	0.005	0.013	0.013
37	0.078	0.053	0.105	0.151	0.132	0.091	0.082	0.096	0.088	0.085	0.073	0.077	0.073	0.120	0.151
38	0.008	0.013	0.010	0.013	0.011	0.011	0.011	0.012	0.012	0.012	0.006	0.006	0.006	0.013	0.013
39	0.017	0.026	0.024	0.026	0.034	0.025	0.023	0.035	0.025	0.030	0.017	0.016	0.017	0.030	0.035
40	0.007	0.012	0.011	0.011	0.009	0.010	0.009	0.010	0.010	0.011	0.005	0.005	0.005	0.012	0.012
41	0.050	0.088	0.102	0.119	0.052	0.068	0.028	0.061	0.084	0.081	0.069	0.070	0.069	0.087	0.119
42	0.007	0.010	0.009	0.009	0.008	0.008	0.008	0.009	0.009	0.010	0.005	0.005	0.005	0.012	0.012
43	0.045	0.104	0.062	0.063	0.051	0.063	0.022	0.077	0.097	0.091	0.062	0.063	0.062	0.115	0.115
44	0.007	0.011	0.009	0.009	0.008	0.009	0.009	0.010	0.010	0.010	0.007	0.007	0.007	0.010	0.011
45	0.015	0.026	0.018	0.018	0.019	0.028	0.018	0.031	0.025	0.028	0.016	0.016	0.016	0.031	0.031
46	0.006	0.011	0.010	0.008	0.008	0.008	0.008	0.009	0.009	0.010	0.005	0.005	0.005	0.011	0.011
47	0.029	0.102	0.019	0.045	0.045	0.017	0.025	0.045	0.074	0.075	0.056	0.058	0.056	0.079	0.102
48	0.012	0.015	0.011	0.012	0.013	0.014	0.014	0.014	0.016	0.017	0.005	0.005	0.005	0.019	0.019
49	0.026	0.065	0.024	0.043	0.044	0.024	0.038	0.053	0.066	0.056	0.056	0.056	0.056	0.064	0.066
50	0.006	0.011	0.008	0.007	0.007	0.007	0.008	0.009	0.010	0.010	0.005	0.006	0.005	0.010	0.011
TDC (%)	0.075	0.036	0.085	0.105	0.109	0.106	0.114	0.125	0.109	0.107	0.083	0.105	0.083	0.128	0.128

2.2.6 Oberschwingungsmessungen / Voltage Harmonics

Model: ZPM-PCS125K-R															
Phase A															
P _n (%)	0	10	20	30	40	50	60	70	80	90	92	95	100	110	Max (%)
Nr./ Order	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	
2	0.049	0.050	0.062	0.055	0.050	0.044	0.039	0.034	0.033	0.030	0.015	0.015	0.027	0.021	0.062
3	0.322	0.423	0.584	0.621	0.626	0.626	0.626	0.628	0.649	0.659	1.348	1.347	0.676	0.701	1.348
4	0.017	0.008	0.021	0.018	0.016	0.014	0.012	0.012	0.013	0.012	0.003	0.002	0.011	0.010	0.021
5	0.169	0.166	0.243	0.285	0.289	0.289	0.287	0.284	0.307	0.309	0.436	0.435	0.316	0.324	0.436
6	0.010	0.015	0.016	0.016	0.014	0.012	0.009	0.009	0.010	0.010	0.002	0.002	0.010	0.009	0.016
7	0.109	0.132	0.109	0.156	0.164	0.168	0.170	0.173	0.174	0.177	0.175	0.174	0.181	0.181	0.181
8	0.022	0.021	0.009	0.016	0.015	0.013	0.010	0.010	0.010	0.010	0.002	0.002	0.010	0.010	0.022
9	0.083	0.031	0.011	0.050	0.058	0.062	0.065	0.067	0.061	0.064	0.103	0.104	0.069	0.069	0.104
10	0.018	0.013	0.007	0.014	0.013	0.012	0.011	0.010	0.012	0.011	0.001	0.001	0.010	0.010	0.018
11	0.053	0.017	0.017	0.040	0.032	0.027	0.026	0.028	0.035	0.038	0.089	0.090	0.042	0.048	0.090
12	0.011	0.007	0.009	0.011	0.011	0.010	0.009	0.009	0.009	0.009	0.003	0.003	0.009	0.010	0.011
13	0.012	0.020	0.028	0.051	0.040	0.029	0.022	0.016	0.020	0.022	0.080	0.079	0.025	0.030	0.080
14	0.011	0.015	0.013	0.010	0.010	0.009	0.008	0.008	0.009	0.009	0.002	0.002	0.008	0.009	0.015
15	0.027	0.035	0.041	0.054	0.041	0.033	0.028	0.026	0.021	0.018	0.056	0.055	0.016	0.014	0.056
16	0.012	0.015	0.016	0.008	0.009	0.008	0.008	0.008	0.009	0.009	0.002	0.002	0.008	0.008	0.016
17	0.039	0.044	0.037	0.052	0.047	0.038	0.029	0.020	0.015	0.016	0.069	0.069	0.017	0.023	0.069
18	0.015	0.009	0.011	0.007	0.008	0.008	0.008	0.008	0.008	0.008	0.003	0.003	0.008	0.008	0.015
19	0.042	0.026	0.026	0.034	0.030	0.025	0.019	0.015	0.022	0.024	0.059	0.058	0.024	0.030	0.059
20	0.016	0.010	0.015	0.009	0.010	0.010	0.009	0.009	0.010	0.010	0.002	0.002	0.010	0.010	0.016
21	0.026	0.021	0.029	0.036	0.030	0.023	0.020	0.018	0.012	0.012	0.029	0.028	0.012	0.011	0.036
22	0.016	0.011	0.011	0.008	0.008	0.008	0.009	0.009	0.011	0.012	0.005	0.006	0.012	0.012	0.016
23	0.031	0.036	0.022	0.016	0.031	0.039	0.040	0.036	0.056	0.054	0.076	0.076	0.051	0.050	0.076
24	0.011	0.010	0.012	0.009	0.010	0.010	0.011	0.011	0.017	0.019	0.006	0.006	0.021	0.024	0.024
25	0.043	0.031	0.041	0.038	0.053	0.065	0.070	0.068	0.059	0.057	0.066	0.065	0.054	0.050	0.070
26	0.009	0.016	0.009	0.007	0.007	0.007	0.008	0.008	0.011	0.012	0.005	0.005	0.012	0.012	0.016
27	0.013	0.012	0.010	0.012	0.011	0.011	0.012	0.014	0.011	0.012	0.018	0.017	0.013	0.013	0.018
28	0.010	0.014	0.009	0.008	0.007	0.007	0.007	0.007	0.007	0.008	0.003	0.003	0.008	0.008	0.014
29	0.041	0.023	0.011	0.018	0.023	0.035	0.045	0.049	0.054	0.052	0.063	0.063	0.050	0.045	0.063
30	0.007	0.008	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.007	0.002	0.003	0.007	0.008	0.008
31	0.016	0.026	0.030	0.030	0.021	0.023	0.032	0.039	0.047	0.048	0.058	0.057	0.049	0.049	0.058
32	0.006	0.020	0.009	0.007	0.006	0.006	0.006	0.006	0.007	0.007	0.002	0.002	0.007	0.007	0.020
33	0.018	0.015	0.011	0.011	0.011	0.011	0.011	0.010	0.012	0.012	0.019	0.018	0.011	0.011	0.019
34	0.008	0.011	0.007	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.002	0.002	0.007	0.008	0.011
35	0.019	0.019	0.025	0.025	0.018	0.015	0.019	0.028	0.039	0.042	0.057	0.058	0.044	0.045	0.058
36	0.007	0.008	0.008	0.009	0.009	0.008	0.008	0.008	0.009	0.009	0.002	0.002	0.009	0.009	0.009
37	0.034	0.026	0.037	0.033	0.031	0.027	0.018	0.012	0.034	0.037	0.047	0.046	0.039	0.039	0.047
38	0.009	0.016	0.012	0.008	0.008	0.009	0.009	0.009	0.009	0.009	0.002	0.002	0.009	0.009	0.016
39	0.010	0.011	0.015	0.013	0.010	0.011	0.012	0.012	0.010	0.010	0.022	0.021	0.009	0.010	0.022
40	0.007	0.014	0.009	0.007	0.005	0.006	0.006	0.006	0.007	0.007	0.003	0.003	0.007	0.007	0.014
41	0.024	0.024	0.039	0.042	0.039	0.039	0.032	0.023	0.026	0.029	0.041	0.042	0.031	0.030	0.042
42	0.007	0.007	0.006	0.005	0.005	0.005	0.005	0.005	0.007	0.007	0.002	0.002	0.008	0.008	0.008
43	0.017	0.021	0.013	0.012	0.010	0.010	0.008	0.009	0.027	0.030	0.041	0.042	0.033	0.034	0.042
44	0.009	0.013	0.008	0.008	0.006	0.006	0.006	0.006	0.006	0.006	0.003	0.003	0.007	0.007	0.013
45	0.017	0.016	0.021	0.026	0.024	0.024	0.024	0.022	0.022	0.021	0.029	0.028	0.020	0.018	0.029
46	0.010	0.008	0.008	0.008	0.006	0.006	0.006	0.006	0.006	0.006	0.004	0.004	0.006	0.006	0.010
47	0.014	0.023	0.011	0.013	0.012	0.013	0.013	0.013	0.022	0.025	0.037	0.040	0.029	0.030	0.040
48	0.007	0.008	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.008	0.002	0.002	0.008	0.009	0.009
49	0.011	0.027	0.019	0.022	0.022	0.021	0.020	0.016	0.021	0.024	0.027	0.028	0.027	0.030	0.030
50	0.006	0.008	0.006	0.006	0.006	0.005	0.006	0.006	0.006	0.006	0.003	0.003	0.006	0.006	0.008
TDD(%)	0.416	0.494	0.658	0.721	0.726	0.726	0.726	0.726	0.757	0.768	1.451	1.450	0.787	0.812	1.451

Model: ZPM-PCS125K-R															
Phase B															
P _n (%)	0	10	20	30	40	50	60	70	80	90	92	95	100	110	Max
Nr./ Order	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	(%)
2	0.010	0.008	0.008	0.008	0.008	0.008	0.009	0.010	0.014	0.016	0.008	0.008	0.018	0.016	0.018
3	0.296	0.381	0.527	0.561	0.568	0.572	0.575	0.579	0.604	0.613	1.310	1.307	0.624	0.636	1.310
4	0.009	0.008	0.008	0.008	0.007	0.007	0.007	0.007	0.008	0.007	0.006	0.006	0.008	0.009	0.009
5	0.142	0.144	0.211	0.251	0.256	0.257	0.256	0.256	0.281	0.281	0.434	0.434	0.278	0.274	0.434
6	0.006	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.007	0.007	0.002	0.003	0.007	0.008	0.008
7	0.099	0.113	0.095	0.139	0.147	0.151	0.154	0.158	0.159	0.160	0.176	0.175	0.160	0.160	0.176
8	0.008	0.009	0.008	0.009	0.008	0.008	0.007	0.007	0.007	0.007	0.002	0.003	0.007	0.008	0.009
9	0.067	0.025	0.011	0.047	0.054	0.058	0.060	0.064	0.056	0.056	0.104	0.105	0.053	0.051	0.105
10	0.006	0.008	0.007	0.007	0.007	0.007	0.006	0.006	0.007	0.007	0.004	0.004	0.007	0.008	0.008
11	0.048	0.021	0.021	0.039	0.033	0.030	0.029	0.032	0.038	0.039	0.093	0.093	0.040	0.039	0.093
12	0.006	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.007	0.007	0.004	0.004	0.007	0.009	0.009
13	0.011	0.017	0.025	0.045	0.036	0.027	0.022	0.019	0.024	0.024	0.085	0.086	0.026	0.031	0.086
14	0.007	0.009	0.008	0.007	0.007	0.006	0.006	0.006	0.008	0.009	0.004	0.004	0.009	0.009	0.009
15	0.025	0.034	0.034	0.043	0.032	0.024	0.019	0.015	0.014	0.012	0.061	0.062	0.012	0.015	0.062
16	0.007	0.009	0.007	0.007	0.007	0.007	0.007	0.006	0.007	0.007	0.004	0.005	0.008	0.008	0.009
17	0.037	0.040	0.034	0.049	0.045	0.036	0.028	0.021	0.018	0.020	0.067	0.066	0.022	0.027	0.067
18	0.009	0.009	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.003	0.003	0.007	0.009	0.009
19	0.039	0.024	0.022	0.030	0.026	0.020	0.014	0.011	0.019	0.023	0.060	0.060	0.026	0.029	0.060
20	0.009	0.009	0.008	0.009	0.008	0.008	0.008	0.008	0.008	0.008	0.004	0.004	0.008	0.008	0.009
21	0.026	0.018	0.024	0.030	0.023	0.017	0.014	0.013	0.009	0.010	0.028	0.029	0.012	0.015	0.030
22	0.007	0.009	0.007	0.008	0.008	0.008	0.009	0.009	0.009	0.009	0.006	0.007	0.011	0.014	0.014
23	0.029	0.028	0.019	0.017	0.029	0.034	0.033	0.029	0.048	0.048	0.071	0.071	0.047	0.047	0.071
24	0.009	0.011	0.010	0.010	0.010	0.010	0.011	0.011	0.019	0.021	0.009	0.010	0.023	0.027	0.027
25	0.044	0.023	0.034	0.033	0.044	0.053	0.056	0.053	0.045	0.045	0.066	0.065	0.044	0.043	0.066
26	0.009	0.014	0.008	0.008	0.007	0.007	0.008	0.008	0.009	0.009	0.006	0.006	0.011	0.014	0.014
27	0.011	0.013	0.011	0.014	0.012	0.013	0.016	0.019	0.013	0.014	0.015	0.016	0.015	0.016	0.019
28	0.012	0.012	0.008	0.008	0.007	0.007	0.007	0.007	0.007	0.008	0.004	0.004	0.008	0.008	0.012
29	0.032	0.021	0.014	0.016	0.021	0.030	0.037	0.039	0.043	0.042	0.059	0.058	0.041	0.040	0.059
30	0.008	0.009	0.006	0.007	0.006	0.006	0.006	0.006	0.007	0.007	0.004	0.004	0.007	0.009	0.009
31	0.016	0.031	0.027	0.025	0.018	0.019	0.026	0.031	0.038	0.038	0.058	0.058	0.038	0.039	0.058
32	0.007	0.015	0.009	0.007	0.006	0.006	0.006	0.006	0.006	0.006	0.004	0.004	0.006	0.007	0.015
33	0.013	0.012	0.010	0.010	0.011	0.011	0.011	0.010	0.011	0.011	0.007	0.007	0.011	0.012	0.013
34	0.006	0.010	0.008	0.007	0.007	0.007	0.007	0.006	0.007	0.007	0.004	0.004	0.007	0.008	0.010
35	0.017	0.019	0.023	0.024	0.017	0.015	0.019	0.025	0.032	0.035	0.053	0.054	0.037	0.038	0.054
36	0.008	0.007	0.007	0.008	0.007	0.007	0.008	0.008	0.009	0.009	0.004	0.005	0.010	0.010	0.010
37	0.033	0.023	0.031	0.030	0.026	0.022	0.015	0.011	0.028	0.030	0.047	0.048	0.030	0.030	0.048
38	0.009	0.014	0.009	0.007	0.007	0.007	0.007	0.007	0.008	0.008	0.004	0.004	0.009	0.009	0.014
39	0.011	0.011	0.014	0.009	0.008	0.009	0.009	0.009	0.010	0.009	0.010	0.007	0.009	0.010	0.014
40	0.007	0.014	0.008	0.006	0.006	0.006	0.006	0.006	0.006	0.007	0.003	0.003	0.007	0.008	0.014
41	0.024	0.017	0.031	0.036	0.032	0.030	0.024	0.018	0.022	0.025	0.039	0.040	0.026	0.026	0.040
42	0.007	0.008	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.007	0.003	0.004	0.007	0.008	0.008
43	0.017	0.020	0.012	0.011	0.010	0.010	0.008	0.009	0.023	0.026	0.042	0.044	0.027	0.029	0.044
44	0.008	0.013	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.006	0.003	0.003	0.007	0.007	0.013
45	0.018	0.015	0.021	0.023	0.020	0.020	0.021	0.019	0.022	0.020	0.021	0.019	0.019	0.018	0.023
46	0.011	0.008	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.006	0.003	0.004	0.006	0.007	0.011
47	0.016	0.021	0.011	0.012	0.013	0.013	0.013	0.013	0.021	0.024	0.037	0.040	0.027	0.030	0.040
48	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.007	0.004	0.004	0.007	0.008	0.008
49	0.011	0.023	0.016	0.018	0.021	0.019	0.017	0.013	0.018	0.020	0.031	0.033	0.023	0.025	0.033
50	0.006	0.008	0.006	0.006	0.005	0.005	0.005	0.005	0.006	0.006	0.002	0.003	0.007	0.008	0.008
TDD(%)	0.372	0.438	0.586	0.646	0.654	0.658	0.661	0.665	0.699	0.708	1.416	1.412	0.717	0.727	1.416

Model: ZPM-PCS125K-R															
Phase C															
P _n (%)	0	10	20	30	40	50	60	70	80	90	92	95	100	110	Max
Nr./ Order	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	(%)
2	0.011	0.008	0.014	0.018	0.021	0.024	0.028	0.029	0.028	0.031	0.010	0.010	0.035	0.031	0.035
3	0.313	0.416	0.575	0.606	0.612	0.616	0.617	0.622	0.643	0.652	1.316	1.316	0.667	0.685	1.316
4	0.007	0.006	0.008	0.008	0.008	0.009	0.008	0.009	0.011	0.010	0.004	0.003	0.009	0.009	0.011
5	0.170	0.175	0.262	0.293	0.295	0.294	0.291	0.288	0.307	0.308	0.447	0.446	0.310	0.306	0.447
6	0.006	0.007	0.006	0.006	0.006	0.006	0.007	0.006	0.007	0.007	0.002	0.003	0.007	0.007	0.007
7	0.110	0.140	0.130	0.167	0.172	0.174	0.175	0.177	0.181	0.183	0.184	0.183	0.181	0.174	0.184
8	0.006	0.006	0.008	0.007	0.006	0.006	0.006	0.006	0.007	0.007	0.001	0.001	0.007	0.007	0.008
9	0.081	0.046	0.024	0.064	0.070	0.073	0.074	0.076	0.073	0.076	0.106	0.107	0.075	0.075	0.107
10	0.005	0.008	0.007	0.007	0.006	0.006	0.006	0.006	0.007	0.007	0.003	0.002	0.007	0.008	0.008
11	0.057	0.012	0.014	0.044	0.040	0.038	0.037	0.038	0.045	0.048	0.087	0.087	0.049	0.054	0.087
12	0.006	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.007	0.007	0.004	0.004	0.008	0.009	0.009
13	0.016	0.013	0.024	0.047	0.038	0.030	0.024	0.020	0.024	0.026	0.085	0.085	0.029	0.033	0.085
14	0.005	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.007	0.008	0.002	0.002	0.008	0.009	0.009
15	0.022	0.036	0.039	0.043	0.031	0.024	0.020	0.017	0.015	0.014	0.054	0.054	0.013	0.017	0.054
16	0.006	0.008	0.006	0.007	0.006	0.006	0.006	0.006	0.007	0.007	0.002	0.002	0.007	0.007	0.008
17	0.030	0.036	0.029	0.044	0.040	0.031	0.023	0.016	0.014	0.018	0.065	0.064	0.023	0.027	0.065
18	0.008	0.007	0.006	0.007	0.006	0.006	0.007	0.007	0.006	0.007	0.003	0.003	0.007	0.008	0.008
19	0.041	0.023	0.020	0.031	0.027	0.021	0.015	0.011	0.018	0.021	0.067	0.066	0.026	0.030	0.067
20	0.007	0.009	0.007	0.009	0.007	0.008	0.007	0.008	0.007	0.007	0.002	0.002	0.008	0.008	0.009
21	0.024	0.024	0.023	0.032	0.024	0.019	0.017	0.017	0.012	0.012	0.029	0.028	0.014	0.018	0.032
22	0.007	0.009	0.008	0.009	0.009	0.009	0.010	0.010	0.012	0.013	0.005	0.005	0.013	0.013	0.013
23	0.036	0.034	0.016	0.018	0.028	0.035	0.035	0.029	0.049	0.048	0.070	0.069	0.048	0.050	0.070
24	0.009	0.011	0.010	0.010	0.010	0.010	0.011	0.011	0.019	0.021	0.008	0.008	0.023	0.024	0.024
25	0.046	0.025	0.036	0.037	0.050	0.061	0.065	0.063	0.053	0.052	0.074	0.074	0.051	0.049	0.074
26	0.008	0.013	0.008	0.008	0.008	0.008	0.008	0.008	0.009	0.010	0.005	0.005	0.011	0.014	0.014
27	0.015	0.011	0.011	0.014	0.013	0.015	0.017	0.020	0.015	0.017	0.015	0.015	0.019	0.021	0.021
28	0.011	0.014	0.009	0.009	0.007	0.008	0.007	0.007	0.007	0.007	0.002	0.002	0.007	0.010	0.014
29	0.039	0.024	0.014	0.016	0.021	0.031	0.040	0.043	0.046	0.045	0.058	0.057	0.044	0.042	0.058
30	0.007	0.009	0.006	0.007	0.007	0.007	0.007	0.007	0.006	0.006	0.003	0.003	0.006	0.009	0.009
31	0.016	0.027	0.028	0.030	0.023	0.026	0.033	0.039	0.047	0.048	0.064	0.064	0.049	0.048	0.064
32	0.007	0.017	0.009	0.007	0.006	0.006	0.006	0.006	0.006	0.006	0.003	0.003	0.006	0.008	0.017
33	0.016	0.013	0.011	0.010	0.011	0.010	0.010	0.010	0.010	0.011	0.014	0.013	0.011	0.013	0.016
34	0.007	0.010	0.008	0.007	0.007	0.006	0.007	0.006	0.006	0.006	0.002	0.002	0.007	0.009	0.010
35	0.020	0.022	0.026	0.028	0.020	0.016	0.020	0.027	0.037	0.040	0.052	0.052	0.041	0.043	0.052
36	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.008	0.002	0.003	0.008	0.010	0.010
37	0.034	0.031	0.036	0.034	0.027	0.024	0.016	0.011	0.034	0.037	0.051	0.052	0.038	0.038	0.052
38	0.006	0.013	0.009	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.003	0.003	0.007	0.009	0.013
39	0.013	0.012	0.014	0.009	0.008	0.009	0.009	0.009	0.010	0.010	0.019	0.018	0.010	0.012	0.019
40	0.007	0.013	0.009	0.007	0.005	0.005	0.006	0.006	0.006	0.006	0.002	0.002	0.006	0.007	0.013
41	0.030	0.017	0.038	0.042	0.037	0.036	0.030	0.021	0.024	0.026	0.037	0.038	0.028	0.029	0.042
42	0.009	0.006	0.006	0.005	0.005	0.005	0.005	0.006	0.006	0.006	0.002	0.002	0.006	0.007	0.009
43	0.017	0.023	0.013	0.012	0.011	0.011	0.010	0.011	0.027	0.031	0.043	0.045	0.033	0.035	0.045
44	0.007	0.014	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.006	0.003	0.003	0.006	0.007	0.014
45	0.020	0.015	0.022	0.025	0.023	0.024	0.023	0.022	0.020	0.018	0.025	0.024	0.016	0.015	0.025
46	0.009	0.008	0.007	0.006	0.006	0.005	0.006	0.006	0.005	0.006	0.002	0.002	0.006	0.007	0.009
47	0.017	0.021	0.011	0.013	0.014	0.015	0.015	0.014	0.021	0.025	0.033	0.035	0.028	0.031	0.035
48	0.008	0.007	0.007	0.008	0.007	0.007	0.007	0.007	0.008	0.008	0.002	0.002	0.008	0.009	0.009
49	0.012	0.025	0.017	0.021	0.023	0.021	0.020	0.015	0.020	0.023	0.031	0.033	0.025	0.027	0.033
50	0.005	0.008	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.006	0.004	0.005	0.006	0.007	0.008
TDD(%)	0.405	0.489	0.656	0.711	0.716	0.719	0.720	0.723	0.753	0.763	1.427	1.426	0.777	0.791	1.427
Model: ZPM-PCS215K-R															

Phase A															
P _n (%)	0	10	20	30	40	50	60	70	80	90	92	95	100	110	Max
Nr./ Order	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	(%)
2	0.038	0.047	0.048	0.048	0.047	0.044	0.043	0.042	0.039	0.036	0.003	0.003	0.035	0.034	0.048
3	0.059	0.078	0.126	0.160	0.172	0.181	0.186	0.188	0.192	0.195	0.826	0.825	0.199	0.202	0.826
4	0.013	0.007	0.008	0.010	0.009	0.008	0.009	0.010	0.009	0.009	0.001	0.001	0.010	0.011	0.013
5	0.235	0.224	0.259	0.297	0.318	0.330	0.335	0.336	0.342	0.345	0.564	0.565	0.349	0.358	0.565
6	0.015	0.006	0.007	0.010	0.010	0.009	0.009	0.009	0.008	0.008	0.002	0.002	0.008	0.009	0.015
7	0.090	0.071	0.068	0.085	0.106	0.120	0.124	0.122	0.120	0.120	0.201	0.200	0.123	0.131	0.201
8	0.008	0.007	0.007	0.008	0.008	0.008	0.007	0.008	0.008	0.009	0.002	0.002	0.010	0.010	0.010
9	0.025	0.030	0.028	0.032	0.049	0.064	0.070	0.073	0.076	0.076	0.151	0.152	0.076	0.073	0.152
10	0.010	0.007	0.007	0.007	0.008	0.008	0.008	0.008	0.008	0.008	0.002	0.002	0.008	0.008	0.010
11	0.098	0.073	0.088	0.067	0.066	0.080	0.089	0.092	0.095	0.098	0.083	0.083	0.101	0.100	0.101
12	0.007	0.008	0.008	0.007	0.008	0.008	0.008	0.008	0.009	0.009	0.002	0.002	0.009	0.010	0.010
13	0.047	0.015	0.035	0.029	0.025	0.030	0.037	0.043	0.044	0.044	0.053	0.053	0.042	0.038	0.053
14	0.008	0.009	0.007	0.008	0.009	0.008	0.008	0.007	0.008	0.008	0.002	0.002	0.008	0.009	0.009
15	0.017	0.020	0.013	0.013	0.016	0.018	0.023	0.027	0.027	0.027	0.044	0.043	0.025	0.023	0.044
16	0.008	0.008	0.008	0.008	0.008	0.008	0.007	0.007	0.007	0.008	0.003	0.003	0.008	0.009	0.009
17	0.038	0.033	0.017	0.036	0.027	0.026	0.025	0.029	0.032	0.035	0.040	0.040	0.038	0.038	0.040
18	0.006	0.006	0.006	0.007	0.007	0.007	0.007	0.008	0.008	0.009	0.005	0.005	0.009	0.010	0.010
19	0.028	0.018	0.010	0.016	0.021	0.028	0.023	0.021	0.024	0.026	0.037	0.037	0.027	0.027	0.037
20	0.008	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.008	0.008	0.007	0.007	0.008	0.009	0.009
21	0.015	0.010	0.013	0.015	0.014	0.023	0.020	0.018	0.021	0.022	0.035	0.034	0.022	0.022	0.035
22	0.006	0.007	0.009	0.008	0.009	0.009	0.009	0.009	0.009	0.009	0.011	0.011	0.009	0.010	0.011
23	0.016	0.019	0.028	0.030	0.017	0.033	0.042	0.030	0.028	0.032	0.039	0.041	0.035	0.035	0.042
24	0.007	0.011	0.011	0.011	0.012	0.012	0.012	0.013	0.013	0.015	0.013	0.013	0.016	0.019	0.019
25	0.022	0.015	0.025	0.035	0.013	0.031	0.046	0.033	0.027	0.029	0.033	0.034	0.031	0.031	0.046
26	0.006	0.006	0.006	0.006	0.007	0.007	0.007	0.007	0.007	0.008	0.011	0.011	0.008	0.009	0.011
27	0.012	0.011	0.016	0.013	0.013	0.016	0.021	0.019	0.016	0.017	0.026	0.026	0.018	0.018	0.026
28	0.006	0.005	0.006	0.006	0.007	0.007	0.006	0.007	0.007	0.008	0.007	0.008	0.008	0.009	0.009
29	0.017	0.012	0.026	0.020	0.024	0.016	0.027	0.031	0.028	0.027	0.020	0.022	0.027	0.027	0.031
30	0.006	0.005	0.005	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.004	0.004	0.008	0.008	0.008
31	0.023	0.026	0.024	0.026	0.026	0.012	0.023	0.026	0.022	0.024	0.020	0.022	0.028	0.031	0.031
32	0.006	0.005	0.006	0.005	0.006	0.006	0.006	0.006	0.007	0.007	0.002	0.002	0.007	0.007	0.007
33	0.016	0.017	0.014	0.017	0.022	0.015	0.019	0.023	0.019	0.019	0.022	0.022	0.020	0.021	0.023
34	0.005	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.001	0.001	0.008	0.008	0.008
35	0.016	0.026	0.019	0.018	0.024	0.012	0.015	0.016	0.019	0.022	0.012	0.014	0.026	0.028	0.028
36	0.008	0.008	0.008	0.008	0.007	0.008	0.008	0.008	0.008	0.009	0.001	0.002	0.009	0.009	0.009
37	0.018	0.012	0.020	0.030	0.025	0.016	0.016	0.022	0.023	0.024	0.010	0.011	0.026	0.028	0.030
38	0.007	0.009	0.008	0.008	0.008	0.008	0.008	0.008	0.009	0.009	0.002	0.002	0.009	0.009	0.009
39	0.010	0.011	0.012	0.013	0.010	0.012	0.012	0.015	0.016	0.018	0.019	0.019	0.019	0.020	0.020
40	0.006	0.006	0.006	0.005	0.005	0.006	0.006	0.006	0.007	0.008	0.002	0.002	0.008	0.008	0.008
41	0.012	0.013	0.019	0.017	0.009	0.011	0.010	0.013	0.016	0.018	0.004	0.004	0.020	0.020	0.020
42	0.005	0.006	0.005	0.005	0.006	0.006	0.006	0.006	0.007	0.008	0.002	0.002	0.009	0.010	0.010
43	0.013	0.019	0.014	0.014	0.009	0.015	0.010	0.014	0.016	0.017	0.007	0.009	0.021	0.024	0.024
44	0.005	0.006	0.006	0.005	0.006	0.006	0.006	0.007	0.007	0.007	0.002	0.002	0.007	0.008	0.008
45	0.014	0.021	0.013	0.013	0.017	0.019	0.015	0.017	0.017	0.017	0.019	0.018	0.020	0.022	0.022
46	0.005	0.006	0.005	0.005	0.005	0.005	0.006	0.006	0.006	0.006	0.002	0.002	0.007	0.008	0.008
47	0.010	0.020	0.010	0.013	0.011	0.010	0.010	0.012	0.014	0.016	0.009	0.008	0.018	0.021	0.021
48	0.005	0.006	0.005	0.006	0.006	0.006	0.007	0.007	0.007	0.008	0.002	0.002	0.008	0.009	0.009
49	0.012	0.012	0.014	0.015	0.018	0.015	0.015	0.015	0.017	0.016	0.013	0.012	0.016	0.018	0.018
50	0.004	0.005	0.005	0.005	0.005	0.005	0.006	0.006	0.007	0.007	0.003	0.003	0.007	0.007	0.007
TDD(%)	0.297	0.278	0.326	0.373	0.399	0.422	0.434	0.437	0.443	0.449	1.042	1.042	0.457	0.467	1.042

Model: ZPM-PCS215K-R															
Phase B															
P _n (%)	0	10	20	30	40	50	60	70	80	90	92	95	100	110	Max
Nr./ Order	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	(%)
2	0.011	0.009	0.010	0.009	0.010	0.010	0.010	0.011	0.011	0.011	0.002	0.002	0.011	0.011	0.011
3	0.056	0.068	0.112	0.144	0.157	0.166	0.171	0.174	0.178	0.182	0.805	0.798	0.183	0.174	0.805
4	0.009	0.007	0.007	0.007	0.007	0.008	0.007	0.008	0.008	0.008	0.004	0.004	0.009	0.010	0.010
5	0.204	0.202	0.232	0.266	0.285	0.296	0.300	0.301	0.305	0.308	0.560	0.566	0.311	0.318	0.566
6	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.008	0.003	0.003	0.008	0.007	0.008
7	0.098	0.071	0.069	0.083	0.102	0.113	0.117	0.116	0.118	0.119	0.200	0.196	0.122	0.126	0.200
8	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.008	0.002	0.002	0.008	0.007	0.008
9	0.015	0.021	0.024	0.024	0.038	0.049	0.055	0.056	0.058	0.058	0.146	0.149	0.057	0.050	0.149
10	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.008	0.007	0.007	0.004	0.004	0.007	0.007	0.008
11	0.081	0.056	0.074	0.052	0.051	0.067	0.078	0.082	0.084	0.085	0.079	0.078	0.085	0.088	0.088
12	0.007	0.006	0.007	0.007	0.007	0.007	0.008	0.008	0.008	0.008	0.006	0.006	0.008	0.007	0.008
13	0.050	0.018	0.033	0.027	0.025	0.030	0.032	0.035	0.036	0.036	0.053	0.053	0.035	0.033	0.053
14	0.006	0.007	0.008	0.007	0.007	0.007	0.007	0.007	0.007	0.008	0.003	0.003	0.008	0.007	0.008
15	0.015	0.020	0.016	0.013	0.018	0.021	0.019	0.019	0.018	0.018	0.038	0.038	0.018	0.015	0.038
16	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.004	0.004	0.008	0.008	0.008
17	0.023	0.027	0.012	0.028	0.019	0.023	0.018	0.023	0.028	0.030	0.040	0.040	0.033	0.032	0.040
18	0.006	0.007	0.007	0.007	0.007	0.007	0.007	0.008	0.008	0.008	0.006	0.006	0.007	0.007	0.008
19	0.027	0.017	0.011	0.013	0.016	0.024	0.022	0.019	0.018	0.019	0.036	0.036	0.022	0.019	0.036
20	0.008	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.008	0.007	0.007	0.008
21	0.013	0.012	0.012	0.018	0.016	0.021	0.021	0.018	0.016	0.016	0.025	0.023	0.019	0.014	0.025
22	0.007	0.009	0.009	0.009	0.009	0.009	0.009	0.008	0.008	0.008	0.011	0.012	0.008	0.007	0.012
23	0.018	0.015	0.023	0.031	0.011	0.028	0.039	0.027	0.022	0.026	0.041	0.043	0.030	0.029	0.043
24	0.007	0.012	0.012	0.012	0.013	0.013	0.014	0.014	0.015	0.015	0.014	0.015	0.015	0.013	0.015
25	0.017	0.015	0.020	0.030	0.012	0.024	0.039	0.029	0.024	0.024	0.033	0.035	0.025	0.023	0.039
26	0.007	0.007	0.008	0.007	0.008	0.008	0.008	0.008	0.008	0.008	0.012	0.012	0.008	0.007	0.012
27	0.011	0.011	0.015	0.012	0.013	0.016	0.016	0.015	0.014	0.014	0.020	0.018	0.015	0.013	0.020
28	0.007	0.006	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.008	0.008	0.008	0.008	0.009	0.009
29	0.019	0.012	0.026	0.015	0.021	0.015	0.025	0.028	0.022	0.021	0.023	0.024	0.023	0.023	0.028
30	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.007	0.004	0.005	0.007	0.006	0.007
31	0.018	0.023	0.018	0.021	0.020	0.013	0.018	0.020	0.020	0.021	0.022	0.023	0.023	0.024	0.024
32	0.007	0.006	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.007	0.003	0.003	0.008	0.007	0.008
33	0.014	0.016	0.013	0.014	0.016	0.017	0.016	0.018	0.018	0.018	0.021	0.020	0.017	0.016	0.021
34	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.007	0.003	0.003	0.007	0.007	0.007
35	0.016	0.020	0.018	0.016	0.021	0.012	0.016	0.016	0.016	0.018	0.017	0.018	0.021	0.022	0.022
36	0.007	0.007	0.007	0.007	0.007	0.007	0.008	0.008	0.008	0.008	0.002	0.002	0.008	0.007	0.008
37	0.016	0.013	0.019	0.026	0.020	0.016	0.014	0.019	0.022	0.024	0.013	0.014	0.024	0.020	0.026
38	0.007	0.009	0.007	0.007	0.008	0.007	0.007	0.008	0.008	0.008	0.003	0.003	0.008	0.007	0.009
39	0.010	0.011	0.011	0.011	0.011	0.011	0.012	0.013	0.014	0.016	0.021	0.020	0.016	0.013	0.021
40	0.006	0.007	0.006	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.003	0.003	0.008	0.007	0.008
41	0.011	0.012	0.016	0.015	0.009	0.014	0.012	0.012	0.014	0.014	0.007	0.009	0.015	0.016	0.016
42	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.003	0.002	0.007	0.007	0.007
43	0.012	0.019	0.012	0.012	0.010	0.013	0.010	0.012	0.016	0.017	0.013	0.016	0.020	0.022	0.022
44	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.004	0.004	0.007	0.007	0.007
45	0.014	0.021	0.014	0.015	0.015	0.014	0.016	0.017	0.018	0.020	0.022	0.022	0.021	0.022	0.022
46	0.005	0.006	0.006	0.006	0.005	0.006	0.006	0.006	0.006	0.006	0.002	0.003	0.007	0.008	0.008
47	0.011	0.014	0.010	0.013	0.010	0.010	0.009	0.011	0.013	0.013	0.009	0.010	0.014	0.016	0.016
48	0.007	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.003	0.003	0.007	0.007	0.007
49	0.011	0.011	0.012	0.015	0.014	0.013	0.013	0.013	0.015	0.015	0.009	0.009	0.015	0.015	0.015
50	0.005	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.008	0.008	0.003	0.004	0.007	0.006	0.008
TDD(%)	0.263	0.246	0.290	0.331	0.356	0.378	0.389	0.392	0.397	0.404	1.022	1.019	0.408	0.410	1.022

Model: ZPM-PCS215K-R															
Phase C															
P _n (%)	0	10	20	30	40	50	60	70	80	90	92	95	100	110	Max (%)
Nr./ Order	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	U _h (%)	
2	0.008	0.008	0.008	0.008	0.008	0.009	0.009	0.010	0.012	0.013	0.003	0.003	0.014	0.016	0.016
3	0.051	0.074	0.121	0.155	0.167	0.176	0.181	0.185	0.191	0.194	0.772	0.770	0.195	0.193	0.772
4	0.007	0.007	0.007	0.008	0.008	0.008	0.009	0.009	0.009	0.009	0.002	0.002	0.009	0.010	0.010
5	0.219	0.222	0.252	0.291	0.312	0.322	0.327	0.328	0.329	0.331	0.573	0.574	0.334	0.342	0.574
6	0.006	0.006	0.006	0.007	0.007	0.007	0.007	0.007	0.007	0.008	0.003	0.003	0.008	0.008	0.008
7	0.091	0.083	0.069	0.086	0.106	0.117	0.122	0.122	0.123	0.127	0.195	0.194	0.134	0.145	0.195
8	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.003	0.003	0.008	0.008	0.008
9	0.019	0.032	0.032	0.039	0.054	0.063	0.068	0.069	0.070	0.067	0.150	0.151	0.064	0.059	0.151
10	0.006	0.006	0.006	0.006	0.007	0.006	0.007	0.007	0.007	0.007	0.002	0.002	0.007	0.007	0.007
11	0.095	0.070	0.088	0.063	0.065	0.076	0.084	0.089	0.094	0.097	0.082	0.082	0.099	0.095	0.099
12	0.006	0.006	0.007	0.007	0.007	0.007	0.007	0.007	0.008	0.008	0.002	0.002	0.008	0.008	0.008
13	0.051	0.018	0.042	0.030	0.033	0.034	0.037	0.040	0.042	0.042	0.054	0.054	0.042	0.043	0.054
14	0.006	0.006	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.002	0.002	0.007	0.007	0.007
15	0.017	0.018	0.015	0.014	0.020	0.024	0.020	0.019	0.020	0.019	0.045	0.045	0.019	0.018	0.045
16	0.006	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.001	0.001	0.007	0.008	0.008
17	0.039	0.032	0.013	0.033	0.027	0.032	0.025	0.027	0.032	0.036	0.036	0.036	0.039	0.039	0.039
18	0.006	0.006	0.006	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.004	0.004	0.007	0.008	0.008
19	0.031	0.022	0.012	0.017	0.019	0.030	0.024	0.021	0.023	0.025	0.038	0.039	0.028	0.028	0.039
20	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.008	0.008	0.007	0.008	0.008
21	0.013	0.012	0.011	0.015	0.019	0.020	0.021	0.020	0.019	0.021	0.033	0.032	0.021	0.021	0.033
22	0.006	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.007	0.012	0.012	0.007	0.007	0.012
23	0.014	0.017	0.026	0.028	0.012	0.029	0.041	0.030	0.025	0.028	0.039	0.040	0.031	0.031	0.041
24	0.007	0.011	0.010	0.010	0.011	0.011	0.012	0.012	0.013	0.014	0.014	0.014	0.014	0.016	0.016
25	0.020	0.014	0.024	0.033	0.012	0.023	0.043	0.032	0.023	0.023	0.034	0.036	0.025	0.026	0.043
26	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.007	0.013	0.013	0.007	0.007	0.013
27	0.011	0.012	0.019	0.013	0.017	0.021	0.017	0.016	0.017	0.017	0.024	0.024	0.016	0.015	0.024
28	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.007	0.009	0.009	0.007	0.007	0.009
29	0.016	0.012	0.024	0.016	0.021	0.018	0.023	0.029	0.025	0.024	0.024	0.025	0.023	0.023	0.029
30	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.007	0.004	0.004	0.007	0.007	0.007
31	0.019	0.025	0.018	0.023	0.021	0.012	0.022	0.024	0.021	0.022	0.020	0.022	0.025	0.028	0.028
32	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.007	0.002	0.002	0.007	0.007	0.007
33	0.015	0.019	0.013	0.017	0.015	0.022	0.020	0.018	0.020	0.020	0.022	0.022	0.018	0.017	0.022
34	0.006	0.007	0.007	0.006	0.006	0.006	0.006	0.007	0.007	0.007	0.002	0.002	0.007	0.007	0.007
35	0.016	0.023	0.018	0.016	0.021	0.014	0.019	0.019	0.021	0.021	0.018	0.019	0.022	0.024	0.024
36	0.007	0.007	0.007	0.007	0.007	0.007	0.008	0.008	0.008	0.008	0.002	0.002	0.008	0.008	0.008
37	0.017	0.013	0.020	0.028	0.022	0.018	0.017	0.023	0.026	0.025	0.009	0.010	0.025	0.024	0.028
38	0.005	0.008	0.007	0.007	0.007	0.007	0.007	0.008	0.008	0.008	0.002	0.002	0.008	0.008	0.008
39	0.011	0.013	0.012	0.012	0.014	0.014	0.017	0.017	0.018	0.019	0.020	0.020	0.018	0.017	0.020
40	0.006	0.007	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.007	0.002	0.002	0.007	0.007	0.007
41	0.012	0.013	0.015	0.016	0.010	0.013	0.012	0.014	0.019	0.019	0.007	0.008	0.017	0.017	0.019
42	0.005	0.006	0.005	0.005	0.005	0.006	0.006	0.006	0.007	0.007	0.002	0.002	0.007	0.007	0.007
43	0.012	0.020	0.012	0.014	0.011	0.017	0.011	0.014	0.019	0.020	0.007	0.008	0.023	0.025	0.025
44	0.005	0.006	0.005	0.005	0.005	0.005	0.006	0.006	0.007	0.007	0.002	0.002	0.007	0.007	0.007
45	0.014	0.022	0.014	0.015	0.016	0.012	0.015	0.017	0.018	0.021	0.021	0.021	0.022	0.021	0.022
46	0.005	0.006	0.005	0.005	0.005	0.005	0.006	0.006	0.006	0.007	0.002	0.002	0.007	0.007	0.007
47	0.010	0.018	0.010	0.013	0.011	0.010	0.011	0.012	0.016	0.018	0.008	0.009	0.018	0.018	0.018
48	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.007	0.002	0.002	0.007	0.007	0.007
49	0.010	0.012	0.013	0.016	0.016	0.012	0.013	0.014	0.017	0.018	0.012	0.011	0.017	0.016	0.018
50	0.005	0.006	0.005	0.005	0.006	0.006	0.006	0.007	0.008	0.007	0.002	0.003	0.007	0.006	0.008
TDD(%)	0.278	0.274	0.315	0.362	0.389	0.409	0.422	0.425	0.430	0.435	1.004	1.003	0.441	0.449	1.004

2.2.7 Zwischenharmonische / Interharmonics

Note: The reported values shown are the most unfavourable values obtained for the models tested, as mentioned in the section 1.2 of this Annex, and these values are considered to be representative of emission values of all models included in this Annex.

Model: ZPM-PCS125K-R															
Phase A															
P _n (%)	0	10	20	30	40	50	60	70	80	90	92	95	100	110	MAX (%)
F [Hz]	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	
75	0.035	0.038	0.041	0.044	0.047	0.051	0.054	0.057	0.059	0.061	0.027	0.030	0.066	0.070	0.070
125	0.029	0.032	0.035	0.035	0.036	0.037	0.038	0.039	0.037	0.037	0.025	0.026	0.039	0.040	0.040
175	0.024	0.029	0.032	0.033	0.033	0.034	0.035	0.035	0.030	0.030	0.018	0.019	0.030	0.031	0.035
225	0.023	0.029	0.033	0.034	0.034	0.035	0.035	0.035	0.030	0.030	0.021	0.021	0.030	0.030	0.035
275	0.022	0.027	0.031	0.032	0.032	0.032	0.032	0.032	0.028	0.028	0.021	0.021	0.029	0.029	0.032
325	0.019	0.025	0.028	0.029	0.029	0.030	0.029	0.030	0.024	0.024	0.014	0.015	0.024	0.025	0.030
375	0.019	0.025	0.028	0.028	0.029	0.029	0.029	0.029	0.024	0.024	0.016	0.016	0.024	0.025	0.029
425	0.019	0.026	0.031	0.033	0.033	0.034	0.033	0.034	0.028	0.028	0.022	0.022	0.029	0.029	0.034
475	0.017	0.023	0.027	0.028	0.028	0.029	0.029	0.029	0.022	0.022	0.015	0.015	0.023	0.023	0.029
525	0.018	0.026	0.029	0.031	0.031	0.031	0.031	0.031	0.026	0.026	0.019	0.019	0.026	0.026	0.031
575	0.017	0.023	0.026	0.028	0.028	0.029	0.029	0.029	0.024	0.024	0.017	0.017	0.024	0.024	0.029
625	0.016	0.022	0.025	0.027	0.026	0.027	0.027	0.027	0.021	0.021	0.014	0.014	0.021	0.021	0.027
675	0.017	0.022	0.026	0.027	0.028	0.028	0.028	0.028	0.022	0.022	0.015	0.015	0.022	0.022	0.028
725	0.015	0.023	0.026	0.029	0.029	0.030	0.029	0.029	0.022	0.022	0.016	0.016	0.022	0.023	0.030
775	0.017	0.023	0.027	0.029	0.029	0.029	0.029	0.030	0.024	0.024	0.019	0.019	0.024	0.025	0.030
825	0.015	0.021	0.023	0.025	0.025	0.026	0.025	0.025	0.019	0.019	0.012	0.012	0.019	0.020	0.026
875	0.016	0.025	0.027	0.029	0.029	0.029	0.029	0.029	0.023	0.023	0.019	0.019	0.024	0.024	0.029
925	0.016	0.022	0.024	0.027	0.027	0.027	0.027	0.028	0.023	0.023	0.018	0.018	0.023	0.024	0.028
975	0.014	0.020	0.022	0.024	0.024	0.024	0.024	0.024	0.018	0.018	0.012	0.012	0.018	0.019	0.024
1025	0.016	0.023	0.025	0.027	0.027	0.027	0.028	0.028	0.022	0.023	0.018	0.018	0.023	0.024	0.028
1075	0.015	0.021	0.024	0.026	0.025	0.026	0.026	0.026	0.022	0.022	0.018	0.018	0.023	0.024	0.026
1125	0.014	0.019	0.021	0.022	0.022	0.023	0.022	0.023	0.018	0.018	0.012	0.012	0.019	0.019	0.023
1175	0.015	0.021	0.023	0.024	0.024	0.024	0.024	0.024	0.021	0.021	0.016	0.016	0.021	0.022	0.024
1225	0.015	0.020	0.022	0.024	0.024	0.024	0.025	0.025	0.021	0.021	0.016	0.017	0.022	0.022	0.025
1275	0.014	0.018	0.019	0.020	0.020	0.021	0.021	0.021	0.016	0.016	0.010	0.011	0.017	0.017	0.021
1325	0.014	0.020	0.021	0.022	0.021	0.022	0.022	0.022	0.019	0.019	0.014	0.014	0.019	0.020	0.022
1375	0.013	0.018	0.019	0.020	0.020	0.020	0.020	0.020	0.017	0.017	0.012	0.012	0.017	0.018	0.020
1425	0.015	0.019	0.019	0.020	0.020	0.020	0.021	0.021	0.018	0.018	0.014	0.014	0.019	0.020	0.021
1475	0.014	0.017	0.018	0.019	0.019	0.019	0.020	0.020	0.016	0.016	0.010	0.010	0.017	0.017	0.020
1525	0.014	0.019	0.020	0.020	0.020	0.020	0.020	0.021	0.018	0.018	0.014	0.014	0.019	0.019	0.021
1575	0.014	0.017	0.018	0.019	0.019	0.019	0.019	0.020	0.017	0.017	0.013	0.013	0.018	0.018	0.020
1625	0.013	0.016	0.017	0.017	0.017	0.017	0.017	0.017	0.014	0.014	0.008	0.008	0.015	0.015	0.017
1675	0.014	0.018	0.018	0.018	0.018	0.019	0.019	0.019	0.017	0.017	0.012	0.012	0.017	0.018	0.019
1725	0.013	0.017	0.017	0.018	0.018	0.018	0.018	0.018	0.016	0.016	0.012	0.012	0.017	0.017	0.018
1775	0.012	0.016	0.016	0.016	0.016	0.016	0.017	0.017	0.015	0.015	0.008	0.009	0.015	0.016	0.017
1825	0.013	0.017	0.017	0.018	0.017	0.017	0.017	0.017	0.015	0.015	0.011	0.011	0.016	0.017	0.018
1875	0.013	0.017	0.016	0.017	0.016	0.017	0.017	0.017	0.015	0.016	0.012	0.012	0.016	0.017	0.017
1925	0.012	0.015	0.015	0.015	0.014	0.015	0.015	0.015	0.013	0.013	0.007	0.008	0.013	0.014	0.015
1975	0.012	0.016	0.015	0.015	0.015	0.040	0.016	0.016	0.015	0.015	0.009	0.010	0.015	0.016	0.040

Model: ZPM-PCS125K-R															
Phase B															
P _n (%)	0	10	20	30	40	50	60	70	80	90	92	95	100	110	MAX (%)
F [Hz]	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	
75	0.040	0.042	0.045	0.047	0.050	0.052	0.055	0.058	0.059	0.062	0.027	0.029	0.065	0.069	0.069
125	0.032	0.035	0.037	0.037	0.038	0.038	0.039	0.040	0.038	0.038	0.025	0.026	0.038	0.040	0.040
175	0.027	0.031	0.034	0.035	0.035	0.036	0.036	0.036	0.031	0.031	0.020	0.020	0.031	0.032	0.036
225	0.025	0.030	0.035	0.036	0.036	0.036	0.036	0.036	0.031	0.031	0.022	0.022	0.031	0.031	0.036
275	0.023	0.029	0.032	0.033	0.033	0.033	0.033	0.034	0.029	0.029	0.022	0.022	0.029	0.030	0.034
325	0.021	0.026	0.029	0.030	0.030	0.030	0.031	0.031	0.025	0.025	0.016	0.016	0.025	0.025	0.031
375	0.021	0.026	0.029	0.030	0.030	0.030	0.030	0.030	0.025	0.025	0.018	0.018	0.025	0.026	0.030
425	0.021	0.027	0.033	0.034	0.035	0.035	0.035	0.035	0.030	0.030	0.024	0.024	0.030	0.031	0.035
475	0.019	0.024	0.028	0.030	0.030	0.031	0.031	0.031	0.024	0.024	0.017	0.017	0.024	0.025	0.031
525	0.019	0.026	0.030	0.032	0.032	0.032	0.032	0.032	0.027	0.027	0.021	0.021	0.027	0.027	0.032
575	0.018	0.024	0.028	0.030	0.030	0.030	0.030	0.031	0.025	0.025	0.019	0.019	0.025	0.025	0.031
625	0.017	0.022	0.025	0.028	0.027	0.028	0.028	0.027	0.021	0.021	0.015	0.015	0.021	0.022	0.028
675	0.017	0.023	0.027	0.029	0.029	0.029	0.029	0.029	0.023	0.023	0.017	0.017	0.023	0.023	0.029
725	0.017	0.023	0.027	0.031	0.031	0.031	0.031	0.031	0.024	0.024	0.018	0.019	0.024	0.025	0.031
775	0.018	0.024	0.028	0.030	0.030	0.031	0.031	0.031	0.025	0.025	0.020	0.021	0.025	0.026	0.031
825	0.016	0.021	0.024	0.026	0.026	0.027	0.026	0.026	0.020	0.020	0.014	0.015	0.020	0.021	0.027
875	0.017	0.025	0.027	0.030	0.030	0.030	0.030	0.030	0.024	0.024	0.021	0.021	0.025	0.025	0.030
925	0.017	0.022	0.025	0.028	0.028	0.028	0.028	0.029	0.023	0.023	0.019	0.019	0.024	0.025	0.029
975	0.015	0.021	0.023	0.025	0.025	0.025	0.025	0.025	0.020	0.020	0.015	0.015	0.020	0.021	0.025
1025	0.017	0.024	0.026	0.028	0.028	0.028	0.028	0.029	0.023	0.023	0.020	0.020	0.024	0.025	0.029
1075	0.016	0.022	0.025	0.027	0.027	0.027	0.027	0.027	0.022	0.023	0.019	0.019	0.023	0.025	0.027
1125	0.015	0.020	0.022	0.023	0.023	0.023	0.023	0.023	0.019	0.019	0.013	0.014	0.019	0.021	0.023
1175	0.017	0.022	0.023	0.025	0.025	0.025	0.025	0.026	0.022	0.022	0.018	0.018	0.023	0.023	0.026
1225	0.016	0.021	0.023	0.025	0.025	0.025	0.026	0.026	0.022	0.022	0.018	0.018	0.023	0.024	0.026
1275	0.015	0.018	0.020	0.021	0.021	0.022	0.022	0.022	0.017	0.017	0.012	0.013	0.018	0.019	0.022
1325	0.015	0.020	0.021	0.022	0.022	0.022	0.023	0.023	0.019	0.019	0.016	0.016	0.020	0.021	0.023
1375	0.014	0.019	0.020	0.021	0.021	0.021	0.021	0.022	0.018	0.018	0.013	0.013	0.019	0.019	0.022
1425	0.016	0.019	0.020	0.021	0.021	0.021	0.021	0.022	0.019	0.019	0.015	0.015	0.019	0.021	0.022
1475	0.015	0.018	0.019	0.020	0.020	0.020	0.021	0.021	0.018	0.018	0.011	0.012	0.018	0.019	0.021
1525	0.015	0.020	0.020	0.021	0.021	0.021	0.021	0.022	0.019	0.019	0.015	0.015	0.020	0.021	0.022
1575	0.015	0.019	0.019	0.020	0.020	0.020	0.020	0.020	0.018	0.018	0.014	0.014	0.019	0.019	0.020
1625	0.014	0.017	0.018	0.018	0.018	0.018	0.018	0.018	0.015	0.015	0.010	0.010	0.016	0.017	0.018
1675	0.015	0.018	0.019	0.019	0.019	0.019	0.020	0.020	0.018	0.018	0.013	0.014	0.018	0.019	0.020
1725	0.014	0.017	0.018	0.019	0.018	0.019	0.019	0.019	0.017	0.017	0.013	0.013	0.018	0.019	0.019
1775	0.013	0.017	0.016	0.017	0.017	0.017	0.017	0.018	0.016	0.016	0.010	0.010	0.016	0.017	0.018
1825	0.014	0.017	0.018	0.018	0.018	0.018	0.018	0.018	0.016	0.016	0.012	0.012	0.017	0.018	0.018
1875	0.014	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.016	0.016	0.012	0.013	0.016	0.017	0.017
1925	0.013	0.016	0.015	0.015	0.015	0.015	0.015	0.015	0.013	0.013	0.009	0.009	0.014	0.015	0.016
1975	0.013	0.016	0.015	0.016	0.016	0.016	0.016	0.017	0.016	0.016	0.011	0.011	0.016	0.017	0.017

Model: ZPM-PCS125K-R															
Phase C															
P _n (%)	0	10	20	30	40	50	60	70	80	90	92	95	100	110	MAX (%)
F [Hz]	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	
75	0.033	0.036	0.038	0.041	0.043	0.046	0.049	0.053	0.054	0.057	0.028	0.030	0.060	0.064	0.064
125	0.027	0.031	0.033	0.034	0.034	0.035	0.036	0.036	0.034	0.035	0.025	0.026	0.035	0.035	0.036
175	0.023	0.028	0.031	0.032	0.032	0.033	0.033	0.033	0.027	0.027	0.018	0.019	0.027	0.028	0.033
225	0.022	0.028	0.032	0.033	0.033	0.034	0.034	0.034	0.028	0.028	0.021	0.021	0.028	0.028	0.034
275	0.021	0.027	0.030	0.031	0.032	0.032	0.032	0.032	0.027	0.027	0.022	0.023	0.028	0.028	0.032
325	0.019	0.024	0.028	0.029	0.029	0.030	0.030	0.030	0.024	0.024	0.017	0.017	0.024	0.024	0.030
375	0.019	0.024	0.027	0.028	0.028	0.028	0.028	0.029	0.023	0.023	0.017	0.017	0.023	0.024	0.029
425	0.019	0.027	0.031	0.033	0.033	0.034	0.034	0.034	0.029	0.029	0.023	0.023	0.029	0.029	0.034
475	0.017	0.023	0.027	0.028	0.028	0.029	0.029	0.029	0.022	0.022	0.016	0.016	0.022	0.023	0.029
525	0.018	0.026	0.029	0.030	0.030	0.031	0.030	0.031	0.025	0.025	0.020	0.020	0.026	0.026	0.031
575	0.016	0.024	0.027	0.029	0.030	0.030	0.030	0.030	0.025	0.025	0.019	0.020	0.024	0.025	0.030
625	0.016	0.022	0.025	0.027	0.027	0.027	0.027	0.027	0.021	0.021	0.015	0.016	0.021	0.021	0.027
675	0.016	0.022	0.025	0.027	0.027	0.028	0.028	0.027	0.021	0.021	0.016	0.016	0.022	0.022	0.028
725	0.015	0.023	0.026	0.029	0.030	0.030	0.030	0.030	0.023	0.023	0.018	0.018	0.023	0.024	0.030
775	0.017	0.024	0.027	0.029	0.030	0.030	0.030	0.030	0.024	0.024	0.020	0.020	0.025	0.025	0.030
825	0.014	0.020	0.023	0.025	0.025	0.026	0.026	0.025	0.019	0.019	0.014	0.014	0.020	0.020	0.026
875	0.016	0.025	0.027	0.030	0.030	0.030	0.030	0.030	0.025	0.025	0.021	0.021	0.025	0.025	0.030
925	0.016	0.022	0.025	0.027	0.028	0.028	0.028	0.028	0.023	0.023	0.019	0.019	0.024	0.024	0.028
975	0.014	0.020	0.022	0.024	0.025	0.025	0.025	0.025	0.019	0.019	0.014	0.014	0.019	0.019	0.025
1025	0.016	0.023	0.025	0.028	0.028	0.028	0.028	0.028	0.023	0.023	0.019	0.019	0.024	0.025	0.028
1075	0.015	0.021	0.024	0.026	0.026	0.026	0.027	0.027	0.022	0.023	0.019	0.019	0.023	0.024	0.027
1125	0.014	0.019	0.021	0.023	0.023	0.023	0.023	0.023	0.019	0.019	0.013	0.013	0.019	0.020	0.023
1175	0.015	0.022	0.023	0.025	0.025	0.026	0.025	0.026	0.022	0.022	0.017	0.018	0.023	0.023	0.026
1225	0.015	0.020	0.022	0.024	0.025	0.025	0.025	0.026	0.021	0.022	0.017	0.018	0.022	0.023	0.026
1275	0.014	0.018	0.019	0.021	0.021	0.021	0.022	0.022	0.017	0.017	0.012	0.012	0.017	0.018	0.022
1325	0.015	0.020	0.021	0.022	0.022	0.022	0.022	0.023	0.019	0.019	0.015	0.015	0.020	0.021	0.023
1375	0.013	0.018	0.019	0.020	0.020	0.021	0.021	0.021	0.018	0.018	0.013	0.013	0.018	0.019	0.021
1425	0.015	0.018	0.019	0.020	0.020	0.021	0.021	0.021	0.018	0.019	0.014	0.014	0.019	0.020	0.021
1475	0.014	0.017	0.018	0.019	0.019	0.020	0.020	0.021	0.017	0.017	0.011	0.011	0.017	0.018	0.021
1525	0.014	0.019	0.020	0.021	0.020	0.020	0.021	0.021	0.019	0.019	0.015	0.015	0.020	0.021	0.021
1575	0.014	0.018	0.019	0.019	0.019	0.020	0.020	0.020	0.017	0.017	0.013	0.014	0.018	0.019	0.020
1625	0.013	0.017	0.017	0.018	0.018	0.018	0.018	0.018	0.015	0.015	0.010	0.010	0.015	0.016	0.018
1675	0.014	0.018	0.018	0.019	0.019	0.019	0.019	0.020	0.017	0.018	0.013	0.013	0.018	0.019	0.020
1725	0.013	0.017	0.018	0.018	0.018	0.018	0.018	0.019	0.016	0.017	0.012	0.013	0.017	0.018	0.019
1775	0.012	0.016	0.016	0.017	0.017	0.017	0.017	0.018	0.015	0.016	0.009	0.009	0.016	0.016	0.018
1825	0.013	0.017	0.017	0.018	0.017	0.018	0.017	0.017	0.016	0.016	0.011	0.012	0.017	0.017	0.018
1875	0.013	0.017	0.016	0.017	0.017	0.017	0.017	0.017	0.015	0.016	0.012	0.012	0.016	0.017	0.017
1925	0.012	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.013	0.013	0.008	0.008	0.013	0.014	0.015
1975	0.012	0.016	0.040	0.016	0.015	0.016	0.016	0.016	0.015	0.016	0.010	0.010	0.016	0.016	0.040

Model: ZPM-PCS215K-R															
Phase A															
P _n (%)	0	10	20	30	40	50	60	70	80	90	92	95	100	110	MAX (%)
F [Hz]	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	
75	0.037	0.037	0.042	0.045	0.048	0.051	0.054	0.058	0.060	0.064	0.029	0.031	0.068	0.072	0.072
125	0.034	0.029	0.036	0.037	0.036	0.037	0.039	0.040	0.040	0.041	0.030	0.030	0.042	0.043	0.043
175	0.029	0.026	0.030	0.032	0.030	0.030	0.032	0.033	0.033	0.033	0.023	0.023	0.034	0.035	0.035
225	0.030	0.024	0.030	0.032	0.031	0.031	0.033	0.033	0.034	0.034	0.026	0.026	0.035	0.035	0.035
275	0.027	0.022	0.028	0.031	0.030	0.030	0.031	0.032	0.032	0.033	0.025	0.025	0.033	0.033	0.033
325	0.024	0.022	0.024	0.026	0.026	0.027	0.028	0.028	0.028	0.029	0.019	0.019	0.029	0.029	0.029
375	0.025	0.020	0.025	0.027	0.027	0.027	0.027	0.028	0.028	0.028	0.019	0.019	0.028	0.028	0.028
425	0.028	0.020	0.029	0.030	0.032	0.032	0.033	0.034	0.034	0.035	0.027	0.027	0.035	0.035	0.035
475	0.023	0.019	0.025	0.024	0.027	0.027	0.027	0.027	0.027	0.028	0.020	0.020	0.028	0.029	0.029
525	0.026	0.019	0.028	0.027	0.029	0.029	0.030	0.030	0.031	0.031	0.023	0.023	0.031	0.031	0.031
575	0.025	0.020	0.026	0.025	0.029	0.028	0.029	0.029	0.030	0.030	0.022	0.022	0.030	0.031	0.031
625	0.022	0.018	0.025	0.023	0.026	0.026	0.026	0.026	0.026	0.027	0.018	0.018	0.027	0.027	0.027
675	0.023	0.018	0.025	0.024	0.026	0.027	0.027	0.027	0.028	0.029	0.020	0.020	0.029	0.029	0.029
725	0.025	0.019	0.026	0.025	0.028	0.029	0.029	0.029	0.030	0.031	0.022	0.022	0.032	0.032	0.032
775	0.025	0.018	0.027	0.027	0.029	0.030	0.030	0.030	0.031	0.032	0.023	0.023	0.034	0.034	0.034
825	0.021	0.017	0.022	0.023	0.025	0.026	0.025	0.024	0.025	0.026	0.016	0.017	0.026	0.026	0.026
875	0.026	0.018	0.027	0.028	0.029	0.030	0.030	0.030	0.031	0.032	0.024	0.024	0.032	0.033	0.033
925	0.024	0.018	0.026	0.027	0.028	0.028	0.028	0.028	0.029	0.031	0.021	0.021	0.032	0.032	0.032
975	0.021	0.017	0.023	0.024	0.026	0.026	0.026	0.027	0.030	0.033	0.017	0.017	0.038	0.039	0.039
1025	0.025	0.018	0.026	0.028	0.029	0.030	0.030	0.030	0.032	0.034	0.023	0.023	0.034	0.035	0.035
1075	0.024	0.018	0.026	0.028	0.029	0.030	0.030	0.031	0.034	0.037	0.023	0.023	0.041	0.042	0.042
1125	0.021	0.017	0.024	0.024	0.025	0.027	0.026	0.025	0.025	0.026	0.016	0.016	0.027	0.028	0.028
1175	0.023	0.018	0.026	0.025	0.027	0.029	0.028	0.028	0.029	0.031	0.021	0.021	0.031	0.032	0.032
1225	0.023	0.018	0.026	0.026	0.027	0.028	0.028	0.027	0.029	0.031	0.021	0.021	0.032	0.034	0.034
1275	0.020	0.017	0.022	0.022	0.023	0.025	0.024	0.023	0.025	0.027	0.015	0.015	0.029	0.029	0.029
1325	0.022	0.018	0.024	0.024	0.026	0.026	0.026	0.026	0.028	0.029	0.018	0.019	0.029	0.030	0.030
1375	0.021	0.018	0.023	0.023	0.025	0.025	0.025	0.024	0.026	0.028	0.017	0.017	0.028	0.029	0.029
1425	0.021	0.017	0.024	0.025	0.025	0.024	0.025	0.024	0.025	0.026	0.017	0.017	0.028	0.029	0.029
1475	0.020	0.017	0.023	0.023	0.023	0.024	0.024	0.023	0.024	0.025	0.014	0.014	0.026	0.027	0.027
1525	0.021	0.020	0.024	0.025	0.026	0.025	0.026	0.026	0.027	0.028	0.018	0.018	0.029	0.030	0.030
1575	0.020	0.018	0.023	0.024	0.024	0.023	0.023	0.023	0.024	0.026	0.016	0.016	0.027	0.028	0.028
1625	0.018	0.018	0.020	0.023	0.023	0.022	0.022	0.022	0.023	0.024	0.012	0.012	0.025	0.025	0.025
1675	0.020	0.019	0.022	0.025	0.023	0.023	0.023	0.023	0.024	0.026	0.016	0.016	0.026	0.027	0.027
1725	0.019	0.019	0.021	0.023	0.023	0.022	0.022	0.022	0.023	0.025	0.015	0.015	0.026	0.026	0.026
1775	0.018	0.019	0.020	0.024	0.022	0.021	0.022	0.021	0.022	0.024	0.011	0.012	0.025	0.025	0.025
1825	0.018	0.019	0.021	0.024	0.022	0.022	0.022	0.022	0.023	0.025	0.014	0.014	0.026	0.026	0.026
1875	0.018	0.020	0.021	0.023	0.022	0.021	0.021	0.022	0.023	0.024	0.015	0.015	0.025	0.025	0.025
1925	0.016	0.018	0.018	0.021	0.019	0.019	0.019	0.019	0.020	0.021	0.011	0.011	0.022	0.022	0.022
1975	0.017	0.020	0.019	0.022	0.021	0.052	0.020	0.021	0.022	0.023	0.013	0.013	0.024	0.024	0.052

Model: ZPM-PCS215K-R															
Phase B															
P _n (%)	0	10	20	30	40	50	60	70	80	90	92	95	100	110	MAX (%)
F [Hz]	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	
75	0.041	0.041	0.045	0.048	0.049	0.053	0.056	0.059	0.061	0.064	0.029	0.030	0.067	0.069	0.069
125	0.037	0.032	0.038	0.039	0.037	0.038	0.040	0.040	0.041	0.042	0.030	0.030	0.042	0.042	0.042
175	0.031	0.028	0.032	0.034	0.031	0.032	0.034	0.034	0.034	0.035	0.024	0.024	0.035	0.035	0.035
225	0.032	0.025	0.032	0.034	0.032	0.033	0.035	0.035	0.035	0.035	0.027	0.027	0.035	0.035	0.035
275	0.029	0.023	0.029	0.031	0.030	0.031	0.033	0.033	0.033	0.033	0.026	0.026	0.033	0.033	0.033
325	0.025	0.022	0.025	0.027	0.027	0.028	0.029	0.029	0.028	0.029	0.020	0.020	0.029	0.029	0.029
375	0.026	0.021	0.026	0.028	0.028	0.029	0.029	0.029	0.029	0.029	0.021	0.021	0.029	0.029	0.029
425	0.030	0.022	0.030	0.031	0.033	0.035	0.035	0.035	0.035	0.036	0.029	0.029	0.036	0.036	0.036
475	0.025	0.020	0.026	0.026	0.028	0.029	0.029	0.029	0.029	0.029	0.022	0.022	0.029	0.030	0.030
525	0.027	0.020	0.029	0.028	0.030	0.030	0.031	0.031	0.031	0.032	0.025	0.025	0.031	0.032	0.032
575	0.027	0.020	0.028	0.027	0.030	0.030	0.030	0.030	0.030	0.031	0.024	0.024	0.031	0.031	0.031
625	0.023	0.018	0.025	0.024	0.026	0.026	0.027	0.026	0.026	0.027	0.019	0.019	0.027	0.027	0.027
675	0.024	0.018	0.026	0.025	0.027	0.028	0.029	0.028	0.029	0.029	0.021	0.021	0.030	0.029	0.030
725	0.026	0.020	0.027	0.026	0.030	0.031	0.031	0.031	0.031	0.032	0.025	0.025	0.032	0.032	0.032
775	0.026	0.018	0.029	0.029	0.031	0.031	0.031	0.031	0.031	0.032	0.024	0.025	0.033	0.032	0.033
825	0.022	0.018	0.023	0.024	0.026	0.027	0.025	0.026	0.026	0.026	0.018	0.018	0.027	0.027	0.027
875	0.027	0.019	0.027	0.028	0.031	0.032	0.030	0.031	0.031	0.032	0.025	0.025	0.032	0.033	0.033
925	0.025	0.018	0.027	0.028	0.030	0.030	0.029	0.028	0.030	0.031	0.022	0.022	0.033	0.032	0.033
975	0.023	0.018	0.025	0.026	0.028	0.028	0.028	0.029	0.031	0.035	0.019	0.019	0.039	0.036	0.039
1025	0.026	0.018	0.027	0.029	0.031	0.031	0.031	0.030	0.031	0.033	0.025	0.025	0.033	0.033	0.033
1075	0.025	0.019	0.027	0.029	0.030	0.030	0.030	0.031	0.032	0.036	0.024	0.024	0.039	0.036	0.039
1125	0.022	0.018	0.024	0.024	0.027	0.027	0.026	0.025	0.026	0.027	0.018	0.018	0.028	0.028	0.028
1175	0.024	0.018	0.026	0.026	0.028	0.029	0.029	0.028	0.029	0.030	0.022	0.022	0.031	0.032	0.032
1225	0.025	0.019	0.027	0.028	0.028	0.029	0.029	0.028	0.029	0.030	0.022	0.022	0.032	0.032	0.032
1275	0.021	0.017	0.023	0.023	0.025	0.026	0.025	0.025	0.026	0.028	0.016	0.017	0.030	0.027	0.030
1325	0.022	0.018	0.025	0.025	0.027	0.027	0.027	0.027	0.027	0.029	0.020	0.020	0.029	0.029	0.029
1375	0.022	0.019	0.025	0.025	0.026	0.026	0.026	0.025	0.026	0.028	0.018	0.019	0.029	0.027	0.029
1425	0.021	0.017	0.025	0.026	0.026	0.025	0.026	0.025	0.025	0.027	0.017	0.018	0.028	0.028	0.028
1475	0.021	0.018	0.024	0.025	0.025	0.024	0.025	0.024	0.024	0.026	0.015	0.015	0.027	0.026	0.027
1525	0.022	0.021	0.026	0.027	0.027	0.026	0.027	0.027	0.028	0.029	0.019	0.019	0.030	0.030	0.030
1575	0.021	0.019	0.024	0.026	0.025	0.024	0.023	0.024	0.025	0.026	0.017	0.017	0.027	0.027	0.027
1625	0.019	0.018	0.022	0.025	0.024	0.023	0.022	0.023	0.023	0.024	0.014	0.014	0.025	0.024	0.025
1675	0.020	0.019	0.023	0.026	0.024	0.024	0.024	0.024	0.024	0.026	0.017	0.017	0.027	0.027	0.027
1725	0.020	0.020	0.022	0.025	0.024	0.023	0.023	0.023	0.023	0.025	0.016	0.016	0.026	0.026	0.026
1775	0.018	0.020	0.021	0.025	0.023	0.022	0.022	0.022	0.022	0.024	0.012	0.012	0.025	0.025	0.025
1825	0.019	0.020	0.022	0.026	0.023	0.023	0.023	0.024	0.024	0.025	0.015	0.015	0.026	0.026	0.026
1875	0.019	0.020	0.021	0.025	0.023	0.022	0.022	0.023	0.023	0.024	0.016	0.016	0.025	0.025	0.025
1925	0.017	0.019	0.019	0.023	0.020	0.019	0.019	0.021	0.021	0.022	0.012	0.012	0.022	0.022	0.023
1975	0.017	0.021	0.020	0.023	0.022	0.020	0.020	0.022	0.022	0.023	0.013	0.014	0.024	0.024	0.024

Model: ZPM-PCS215K-R															
Phase C															
P _n (%)	0	10	20	30	40	50	60	70	80	90	92	95	100	110	MAX (%)
F [Hz]	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	
75	0.035	0.035	0.040	0.043	0.044	0.047	0.050	0.053	0.056	0.059	0.030	0.031	0.062	0.064	0.064
125	0.033	0.027	0.034	0.035	0.034	0.035	0.036	0.037	0.037	0.038	0.030	0.030	0.038	0.039	0.039
175	0.028	0.024	0.029	0.031	0.028	0.030	0.031	0.030	0.031	0.031	0.023	0.023	0.031	0.031	0.031
225	0.029	0.023	0.029	0.031	0.030	0.031	0.032	0.032	0.032	0.032	0.027	0.027	0.032	0.033	0.033
275	0.027	0.021	0.027	0.030	0.029	0.031	0.032	0.032	0.032	0.032	0.026	0.026	0.032	0.032	0.032
325	0.024	0.021	0.024	0.026	0.026	0.027	0.028	0.029	0.028	0.028	0.020	0.020	0.028	0.028	0.029
375	0.025	0.019	0.025	0.026	0.027	0.027	0.027	0.028	0.027	0.027	0.020	0.020	0.028	0.028	0.028
425	0.029	0.020	0.029	0.030	0.033	0.033	0.034	0.034	0.034	0.035	0.028	0.028	0.035	0.035	0.035
475	0.024	0.019	0.025	0.025	0.028	0.028	0.028	0.028	0.028	0.028	0.021	0.021	0.028	0.028	0.028
525	0.026	0.018	0.028	0.027	0.029	0.029	0.030	0.030	0.030	0.031	0.025	0.025	0.031	0.031	0.031
575	0.027	0.019	0.027	0.027	0.030	0.030	0.030	0.030	0.031	0.030	0.024	0.024	0.031	0.031	0.031
625	0.023	0.017	0.025	0.024	0.026	0.027	0.026	0.026	0.026	0.027	0.019	0.019	0.027	0.027	0.027
675	0.023	0.017	0.025	0.024	0.027	0.028	0.028	0.028	0.028	0.029	0.021	0.021	0.029	0.028	0.029
725	0.025	0.018	0.027	0.026	0.030	0.030	0.030	0.030	0.031	0.032	0.023	0.023	0.032	0.033	0.033
775	0.026	0.017	0.028	0.028	0.031	0.031	0.031	0.031	0.032	0.034	0.024	0.024	0.035	0.036	0.036
825	0.022	0.017	0.023	0.023	0.026	0.026	0.025	0.025	0.025	0.026	0.018	0.018	0.026	0.026	0.026
875	0.027	0.018	0.027	0.028	0.032	0.031	0.031	0.031	0.032	0.032	0.025	0.025	0.033	0.033	0.033
925	0.025	0.018	0.027	0.028	0.031	0.030	0.029	0.029	0.030	0.032	0.022	0.022	0.033	0.033	0.033
975	0.022	0.017	0.024	0.025	0.028	0.028	0.028	0.028	0.031	0.034	0.018	0.019	0.036	0.036	0.036
1025	0.025	0.018	0.027	0.028	0.031	0.031	0.030	0.031	0.032	0.034	0.024	0.024	0.035	0.036	0.036
1075	0.025	0.018	0.027	0.029	0.031	0.031	0.031	0.033	0.036	0.041	0.023	0.023	0.045	0.046	0.046
1125	0.022	0.017	0.024	0.024	0.027	0.027	0.026	0.025	0.026	0.027	0.017	0.018	0.028	0.028	0.028
1175	0.024	0.018	0.026	0.026	0.029	0.029	0.029	0.029	0.030	0.031	0.022	0.022	0.032	0.032	0.032
1225	0.024	0.019	0.028	0.027	0.029	0.029	0.029	0.029	0.030	0.032	0.022	0.022	0.032	0.033	0.033
1275	0.021	0.017	0.023	0.024	0.025	0.025	0.025	0.025	0.027	0.028	0.016	0.017	0.029	0.028	0.029
1325	0.022	0.018	0.025	0.026	0.027	0.027	0.026	0.027	0.028	0.029	0.019	0.019	0.030	0.030	0.030
1375	0.021	0.018	0.025	0.025	0.027	0.026	0.026	0.026	0.027	0.029	0.017	0.017	0.030	0.030	0.030
1425	0.021	0.017	0.025	0.026	0.026	0.025	0.025	0.025	0.026	0.027	0.017	0.018	0.028	0.028	0.028
1475	0.020	0.017	0.024	0.025	0.025	0.024	0.025	0.024	0.025	0.026	0.014	0.015	0.026	0.026	0.026
1525	0.022	0.020	0.026	0.027	0.027	0.026	0.026	0.028	0.028	0.029	0.019	0.019	0.030	0.030	0.030
1575	0.020	0.019	0.024	0.026	0.025	0.024	0.024	0.024	0.025	0.026	0.017	0.017	0.027	0.027	0.027
1625	0.019	0.018	0.022	0.025	0.024	0.023	0.022	0.023	0.024	0.025	0.013	0.013	0.026	0.026	0.026
1675	0.020	0.019	0.023	0.027	0.024	0.024	0.024	0.025	0.025	0.026	0.016	0.016	0.028	0.028	0.028
1725	0.019	0.020	0.022	0.025	0.023	0.023	0.023	0.023	0.024	0.025	0.015	0.016	0.026	0.026	0.026
1775	0.018	0.019	0.021	0.025	0.022	0.021	0.022	0.023	0.023	0.024	0.012	0.012	0.024	0.025	0.025
1825	0.018	0.020	0.021	0.026	0.023	0.022	0.022	0.024	0.024	0.025	0.014	0.014	0.026	0.026	0.026
1875	0.019	0.021	0.021	0.025	0.023	0.022	0.022	0.023	0.024	0.024	0.016	0.016	0.025	0.025	0.025
1925	0.016	0.019	0.019	0.023	0.020	0.019	0.019	0.021	0.021	0.022	0.011	0.012	0.022	0.022	0.023
1975	0.017	0.021	0.052	0.023	0.022	0.020	0.020	0.022	0.023	0.024	0.013	0.013	0.024	0.025	0.052

2.2.8 Höhere Frequenzen / Higher Frequencies components

Note: The reported values shown are the most unfavourable values obtained for the models tested, as mentioned in the section 1.2 of this Annex, and these values are considered to be representative of emission values of all models included in this Annex.

Model: ZPM-PCS125K-R															
Phase A															
P _{bin} (%)	0	10	20	30	40	50	60	70	80	90	92	95	100	110	MAX (%)
F [kHz]	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	
2.1	0.087	0.105	0.146	0.149	0.121	0.119	0.099	0.076	0.116	0.121	0.130	0.134	0.124	0.124	0.149
2.3	0.036	0.067	0.046	0.050	0.044	0.044	0.043	0.038	0.067	0.074	0.082	0.085	0.078	0.079	0.085
2.5	0.041	0.086	0.066	0.085	0.086	0.082	0.079	0.066	0.058	0.059	0.062	0.062	0.061	0.064	0.086
2.7	0.047	0.052	0.047	0.054	0.065	0.063	0.068	0.068	0.062	0.062	0.088	0.091	0.063	0.065	0.091
2.9	0.041	0.041	0.039	0.037	0.043	0.047	0.050	0.054	0.036	0.035	0.056	0.059	0.034	0.033	0.059
3.1	0.022	0.026	0.027	0.025	0.022	0.022	0.022	0.023	0.032	0.032	0.043	0.042	0.032	0.030	0.043
3.3	0.014	0.017	0.018	0.016	0.014	0.013	0.013	0.014	0.019	0.020	0.061	0.062	0.020	0.019	0.062
3.5	0.008	0.011	0.009	0.008	0.008	0.008	0.008	0.008	0.009	0.010	0.160	0.166	0.010	0.011	0.166
3.7	0.004	0.007	0.006	0.006	0.005	0.005	0.005	0.005	0.007	0.007	0.197	0.206	0.008	0.008	0.206
3.9	0.003	0.003	0.004	0.003	0.003	0.003	0.004	0.004	0.005	0.005	0.191	0.196	0.005	0.005	0.196
4.1	0.002	0.002	0.003	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.130	0.132	0.003	0.003	0.132
4.3	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.031	0.032	0.002	0.002	0.032
4.5	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.002	0.002	0.024	0.026	0.002	0.002	0.026
4.7	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.020	0.021	0.002	0.002	0.021
4.9	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.037	0.037	0.002	0.002	0.037
5.1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.036	0.036	0.001	0.001	0.036
5.3	0.001	0.001	0.002	0.001	0.001	0.001	0.002	0.003	0.005	0.006	0.017	0.017	0.007	0.007	0.017
5.5	0.001	0.001	0.002	0.002	0.001	0.002	0.002	0.004	0.005	0.006	0.015	0.014	0.007	0.007	0.015
5.7	0.001	0.002	0.002	0.002	0.002	0.002	0.003	0.004	0.005	0.006	0.018	0.017	0.007	0.007	0.018
5.9	0.002	0.002	0.003	0.002	0.002	0.003	0.003	0.004	0.005	0.006	0.017	0.016	0.007	0.007	0.017
6.1	0.002	0.002	0.003	0.003	0.003	0.003	0.004	0.005	0.005	0.007	0.016	0.015	0.007	0.007	0.016
6.3	0.002	0.004	0.003	0.004	0.003	0.004	0.004	0.004	0.005	0.006	0.019	0.018	0.007	0.007	0.019
6.5	0.002	0.003	0.003	0.003	0.003	0.002	0.003	0.004	0.005	0.007	0.017	0.016	0.007	0.008	0.017
6.7	0.003	0.004	0.005	0.005	0.004	0.004	0.004	0.004	0.006	0.007	0.015	0.015	0.008	0.008	0.015
6.9	0.004	0.005	0.006	0.005	0.004	0.004	0.004	0.005	0.007	0.008	0.019	0.018	0.008	0.008	0.019
7.1	0.004	0.005	0.006	0.005	0.005	0.005	0.005	0.007	0.008	0.009	0.019	0.019	0.009	0.009	0.019
7.3	0.007	0.008	0.007	0.007	0.007	0.008	0.009	0.010	0.009	0.009	0.018	0.018	0.009	0.009	0.018
7.5	0.007	0.007	0.008	0.007	0.009	0.010	0.011	0.011	0.009	0.010	0.028	0.028	0.011	0.011	0.028
7.7	0.005	0.009	0.007	0.009	0.009	0.009	0.009	0.008	0.008	0.009	0.025	0.024	0.009	0.009	0.025
7.9	0.003	0.006	0.005	0.005	0.005	0.005	0.005	0.005	0.008	0.008	0.026	0.025	0.009	0.009	0.026
8.1	0.006	0.008	0.010	0.010	0.008	0.008	0.007	0.005	0.009	0.010	0.032	0.030	0.010	0.011	0.032
8.3	0.006	0.005	0.008	0.007	0.005	0.005	0.004	0.004	0.007	0.008	0.025	0.024	0.008	0.008	0.025
8.5	0.003	0.004	0.004	0.003	0.003	0.003	0.005	0.007	0.007	0.008	0.025	0.024	0.008	0.008	0.025
8.7	0.005	0.006	0.004	0.004	0.004	0.005	0.007	0.009	0.009	0.009	0.028	0.026	0.010	0.010	0.028
8.9	0.003	0.003	0.003	0.004	0.005	0.007	0.007	0.008	0.006	0.007	0.028	0.026	0.007	0.007	0.028

Model: ZPM-PCS125K-R															
Phase B															
P _{bin} (%)	0	10	20	30	40	50	60	70	80	90	92	95	100	110	MAX (%)
F [kHz]	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	
2.1	0.087	0.102	0.146	0.158	0.132	0.130	0.108	0.084	0.116	0.122	0.122	0.126	0.126	0.130	0.158
2.3	0.039	0.069	0.045	0.051	0.045	0.047	0.046	0.041	0.072	0.080	0.077	0.079	0.085	0.090	0.090
2.5	0.045	0.089	0.068	0.087	0.090	0.086	0.084	0.070	0.053	0.053	0.061	0.062	0.056	0.062	0.090
2.7	0.051	0.055	0.049	0.059	0.069	0.069	0.075	0.076	0.064	0.064	0.080	0.083	0.066	0.070	0.083
2.9	0.043	0.039	0.039	0.039	0.046	0.050	0.054	0.058	0.038	0.037	0.055	0.058	0.036	0.036	0.058
3.1	0.022	0.023	0.026	0.024	0.021	0.019	0.020	0.021	0.029	0.029	0.042	0.042	0.029	0.028	0.042
3.3	0.014	0.018	0.018	0.016	0.013	0.012	0.013	0.015	0.020	0.021	0.063	0.064	0.020	0.019	0.064
3.5	0.008	0.011	0.009	0.008	0.008	0.008	0.008	0.009	0.010	0.011	0.178	0.185	0.011	0.011	0.185
3.7	0.005	0.007	0.006	0.006	0.005	0.005	0.005	0.005	0.006	0.007	0.230	0.244	0.008	0.009	0.244
3.9	0.003	0.003	0.004	0.003	0.003	0.003	0.003	0.004	0.004	0.005	0.216	0.226	0.005	0.005	0.226
4.1	0.002	0.003	0.003	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.151	0.155	0.003	0.003	0.155
4.3	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.032	0.033	0.002	0.002	0.033
4.5	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.023	0.024	0.002	0.002	0.024
4.7	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.018	0.019	0.001	0.001	0.019
4.9	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.040	0.040	0.001	0.001	0.040
5.1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.038	0.038	0.001	0.001	0.038
5.3	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.016	0.016	0.004	0.004	0.016
5.5	0.001	0.001	0.002	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.016	0.016	0.004	0.004	0.016
5.7	0.001	0.001	0.002	0.002	0.001	0.001	0.002	0.003	0.003	0.004	0.018	0.018	0.004	0.004	0.018
5.9	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.004	0.003	0.004	0.016	0.016	0.004	0.004	0.016
6.1	0.002	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.004	0.004	0.017	0.017	0.004	0.005	0.017
6.3	0.002	0.004	0.003	0.004	0.004	0.004	0.004	0.003	0.004	0.004	0.018	0.018	0.004	0.005	0.018
6.5	0.002	0.003	0.003	0.003	0.002	0.002	0.003	0.003	0.004	0.005	0.016	0.016	0.005	0.005	0.016
6.7	0.003	0.004	0.005	0.005	0.004	0.005	0.004	0.004	0.005	0.006	0.017	0.016	0.006	0.006	0.017
6.9	0.004	0.005	0.006	0.005	0.004	0.004	0.004	0.004	0.006	0.006	0.019	0.018	0.006	0.006	0.019
7.1	0.004	0.005	0.005	0.005	0.004	0.004	0.005	0.006	0.007	0.007	0.019	0.019	0.008	0.007	0.019
7.3	0.008	0.008	0.007	0.007	0.008	0.008	0.010	0.011	0.008	0.008	0.020	0.020	0.008	0.008	0.020
7.5	0.006	0.007	0.007	0.008	0.010	0.010	0.012	0.011	0.010	0.010	0.029	0.029	0.009	0.010	0.029
7.7	0.005	0.009	0.007	0.009	0.009	0.010	0.010	0.007	0.007	0.007	0.024	0.024	0.007	0.008	0.024
7.9	0.004	0.007	0.005	0.005	0.005	0.005	0.005	0.005	0.007	0.008	0.024	0.024	0.009	0.009	0.024
8.1	0.006	0.008	0.010	0.010	0.008	0.009	0.007	0.006	0.008	0.009	0.027	0.026	0.009	0.010	0.027
8.3	0.006	0.005	0.007	0.007	0.006	0.005	0.004	0.003	0.006	0.006	0.026	0.026	0.006	0.006	0.026
8.5	0.003	0.004	0.004	0.004	0.003	0.003	0.005	0.007	0.007	0.007	0.025	0.024	0.008	0.008	0.025
8.7	0.005	0.006	0.004	0.004	0.004	0.005	0.007	0.008	0.008	0.008	0.025	0.024	0.009	0.009	0.025
8.9	0.003	0.003	0.003	0.004	0.005	0.006	0.007	0.007	0.005	0.005	0.026	0.025	0.006	0.006	0.026

Model: ZPM-PCS125K-R															
Phase C															
P _{bin} (%)	0	10	20	30	40	50	60	70	80	90	92	95	100	110	MAX (%)
F [kHz]	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	
2.1	0.091	0.101	0.143	0.153	0.127	0.126	0.105	0.083	0.112	0.121	0.127	0.130	0.125	0.127	0.153
2.3	0.039	0.059	0.048	0.056	0.050	0.049	0.049	0.043	0.067	0.073	0.070	0.072	0.078	0.084	0.084
2.5	0.043	0.090	0.068	0.088	0.090	0.086	0.085	0.073	0.058	0.058	0.069	0.071	0.060	0.065	0.090
2.7	0.048	0.051	0.047	0.057	0.070	0.069	0.075	0.074	0.061	0.062	0.087	0.090	0.063	0.067	0.090
2.9	0.042	0.040	0.039	0.039	0.046	0.050	0.054	0.058	0.037	0.037	0.055	0.056	0.036	0.035	0.058
3.1	0.020	0.022	0.023	0.021	0.018	0.018	0.019	0.021	0.028	0.030	0.046	0.045	0.029	0.028	0.046
3.3	0.013	0.018	0.018	0.016	0.014	0.013	0.013	0.015	0.019	0.020	0.062	0.062	0.020	0.019	0.062
3.5	0.008	0.011	0.009	0.008	0.008	0.008	0.008	0.008	0.009	0.010	0.157	0.160	0.011	0.011	0.160
3.7	0.005	0.007	0.006	0.005	0.005	0.005	0.005	0.005	0.006	0.007	0.213	0.223	0.007	0.008	0.223
3.9	0.003	0.003	0.004	0.003	0.003	0.003	0.003	0.004	0.005	0.005	0.190	0.196	0.005	0.005	0.196
4.1	0.002	0.002	0.003	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.134	0.138	0.003	0.003	0.138
4.3	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.034	0.037	0.002	0.002	0.037
4.5	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.023	0.025	0.002	0.002	0.025
4.7	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.019	0.020	0.001	0.001	0.020
4.9	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.039	0.039	0.001	0.001	0.039
5.1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.038	0.038	0.000	0.001	0.038
5.3	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.003	0.016	0.015	0.003	0.004	0.016
5.5	0.001	0.001	0.002	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.016	0.016	0.003	0.004	0.016
5.7	0.001	0.002	0.002	0.002	0.001	0.001	0.002	0.002	0.003	0.003	0.018	0.017	0.003	0.004	0.018
5.9	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.016	0.015	0.004	0.004	0.016
6.1	0.003	0.003	0.002	0.003	0.003	0.003	0.004	0.004	0.004	0.004	0.017	0.016	0.004	0.005	0.017
6.3	0.002	0.003	0.003	0.003	0.004	0.004	0.004	0.003	0.004	0.004	0.018	0.017	0.004	0.004	0.018
6.5	0.002	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.004	0.004	0.017	0.016	0.005	0.005	0.017
6.7	0.003	0.004	0.005	0.005	0.004	0.004	0.004	0.003	0.005	0.005	0.016	0.016	0.005	0.006	0.016
6.9	0.004	0.005	0.006	0.005	0.004	0.004	0.004	0.004	0.006	0.006	0.019	0.018	0.006	0.006	0.019
7.1	0.004	0.004	0.005	0.005	0.004	0.004	0.004	0.005	0.007	0.007	0.019	0.018	0.007	0.007	0.019
7.3	0.008	0.008	0.007	0.007	0.008	0.008	0.010	0.011	0.008	0.008	0.019	0.018	0.008	0.007	0.019
7.5	0.008	0.007	0.006	0.008	0.010	0.010	0.011	0.011	0.009	0.010	0.029	0.028	0.010	0.010	0.029
7.7	0.005	0.009	0.007	0.009	0.009	0.009	0.009	0.008	0.007	0.007	0.026	0.025	0.007	0.007	0.026
7.9	0.004	0.006	0.005	0.006	0.006	0.005	0.005	0.004	0.007	0.007	0.028	0.028	0.008	0.008	0.028
8.1	0.006	0.007	0.010	0.010	0.009	0.009	0.007	0.005	0.008	0.009	0.034	0.032	0.010	0.009	0.034
8.3	0.006	0.006	0.007	0.007	0.006	0.005	0.004	0.003	0.006	0.006	0.026	0.025	0.007	0.006	0.026
8.5	0.003	0.005	0.004	0.004	0.003	0.003	0.004	0.006	0.007	0.007	0.026	0.025	0.007	0.007	0.026
8.7	0.005	0.006	0.004	0.004	0.004	0.005	0.007	0.008	0.008	0.008	0.029	0.026	0.009	0.008	0.029
8.9	0.003	0.003	0.003	0.004	0.005	0.007	0.008	0.007	0.006	0.006	0.027	0.025	0.006	0.006	0.027

Model: ZPM-PCS215K-R															
Phase A															
P _{bin} (%)	0	10	20	30	40	50	60	70	80	90	92	95	100	110	MAX (%)
F [kHz]	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	
2.1	0.082	0.148	0.141	0.153	0.095	0.103	0.062	0.128	0.131	0.137	0.109	0.113	0.158	0.169	0.169
2.3	0.051	0.121	0.048	0.060	0.069	0.058	0.053	0.081	0.085	0.092	0.066	0.068	0.105	0.116	0.121
2.5	0.047	0.078	0.048	0.053	0.065	0.052	0.057	0.076	0.078	0.075	0.068	0.069	0.084	0.093	0.093
2.7	0.053	0.090	0.065	0.060	0.054	0.073	0.078	0.085	0.089	0.085	0.082	0.085	0.091	0.099	0.099
2.9	0.043	0.059	0.053	0.046	0.044	0.046	0.051	0.051	0.053	0.052	0.068	0.070	0.053	0.055	0.070
3.1	0.026	0.037	0.032	0.032	0.029	0.031	0.036	0.039	0.043	0.041	0.066	0.068	0.040	0.043	0.068
3.3	0.015	0.020	0.018	0.019	0.017	0.017	0.019	0.022	0.025	0.024	0.095	0.099	0.024	0.026	0.099
3.5	0.010	0.015	0.012	0.011	0.011	0.011	0.012	0.014	0.016	0.017	0.192	0.200	0.018	0.020	0.200
3.7	0.016	0.025	0.018	0.017	0.017	0.017	0.018	0.019	0.021	0.023	0.430	0.446	0.025	0.027	0.446
3.9	0.012	0.019	0.013	0.013	0.013	0.013	0.013	0.014	0.015	0.016	0.351	0.366	0.018	0.021	0.366
4.1	0.005	0.007	0.005	0.005	0.005	0.005	0.005	0.006	0.006	0.007	0.135	0.138	0.007	0.009	0.138
4.3	0.002	0.003	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.050	0.050	0.003	0.004	0.050
4.5	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.042	0.043	0.002	0.002	0.043
4.7	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.037	0.038	0.002	0.002	0.038
4.9	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.072	0.072	0.002	0.002	0.072
5.1	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.073	0.073	0.001	0.001	0.073
5.3	0.003	0.002	0.001	0.001	0.002	0.002	0.003	0.005	0.005	0.005	0.025	0.026	0.005	0.006	0.026
5.5	0.003	0.002	0.002	0.002	0.002	0.002	0.003	0.005	0.005	0.005	0.021	0.022	0.005	0.006	0.022
5.7	0.003	0.003	0.002	0.002	0.002	0.003	0.004	0.005	0.006	0.005	0.022	0.022	0.006	0.007	0.022
5.9	0.003	0.004	0.003	0.002	0.003	0.003	0.004	0.005	0.006	0.005	0.019	0.019	0.006	0.006	0.019
6.1	0.003	0.004	0.004	0.003	0.003	0.004	0.005	0.007	0.007	0.007	0.020	0.021	0.007	0.008	0.021
6.3	0.005	0.008	0.005	0.005	0.006	0.005	0.006	0.007	0.008	0.008	0.021	0.021	0.009	0.010	0.021
6.5	0.006	0.010	0.006	0.006	0.006	0.007	0.007	0.008	0.009	0.010	0.019	0.019	0.010	0.012	0.019
6.7	0.004	0.006	0.005	0.005	0.004	0.005	0.005	0.007	0.008	0.008	0.020	0.020	0.008	0.010	0.020
6.9	0.005	0.005	0.005	0.006	0.006	0.005	0.006	0.007	0.008	0.008	0.020	0.019	0.008	0.009	0.020
7.1	0.006	0.008	0.006	0.007	0.007	0.007	0.008	0.009	0.010	0.010	0.025	0.025	0.010	0.011	0.025
7.3	0.008	0.010	0.009	0.008	0.008	0.008	0.010	0.010	0.010	0.011	0.049	0.050	0.010	0.011	0.050
7.5	0.008	0.013	0.011	0.009	0.008	0.011	0.012	0.014	0.013	0.013	0.058	0.061	0.014	0.015	0.061
7.7	0.006	0.009	0.007	0.006	0.008	0.007	0.007	0.009	0.010	0.010	0.070	0.072	0.010	0.012	0.072
7.9	0.005	0.011	0.004	0.006	0.007	0.006	0.005	0.008	0.009	0.010	0.061	0.062	0.010	0.012	0.062
8.1	0.006	0.011	0.010	0.010	0.007	0.007	0.004	0.010	0.011	0.010	0.033	0.034	0.011	0.013	0.034
8.3	0.005	0.005	0.006	0.008	0.008	0.006	0.005	0.008	0.007	0.007	0.033	0.034	0.008	0.009	0.034
8.5	0.005	0.008	0.005	0.006	0.008	0.005	0.006	0.007	0.007	0.008	0.045	0.046	0.009	0.010	0.046
8.7	0.007	0.007	0.008	0.009	0.006	0.005	0.010	0.008	0.007	0.008	0.058	0.059	0.010	0.011	0.059
8.9	0.005	0.004	0.006	0.005	0.004	0.006	0.007	0.005	0.005	0.006	0.067	0.068	0.007	0.008	0.068

Model: ZPM-PCS215K-R															
Phase B															
P _{bin} (%)	0	10	20	30	40	50	60	70	80	90	92	95	100	110	MAX (%)
F [kHz]	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	
2.1	0.082	0.152	0.150	0.157	0.096	0.110	0.067	0.122	0.133	0.133	0.095	0.094	0.151	0.165	0.165
2.3	0.051	0.111	0.046	0.062	0.076	0.052	0.054	0.079	0.091	0.086	0.066	0.066	0.094	0.111	0.111
2.5	0.046	0.074	0.045	0.058	0.054	0.048	0.052	0.069	0.076	0.077	0.063	0.062	0.080	0.082	0.082
2.7	0.055	0.093	0.064	0.059	0.057	0.076	0.083	0.085	0.095	0.087	0.082	0.083	0.089	0.100	0.100
2.9	0.044	0.059	0.055	0.049	0.046	0.052	0.055	0.053	0.057	0.052	0.069	0.071	0.051	0.052	0.071
3.1	0.026	0.034	0.031	0.031	0.027	0.029	0.033	0.036	0.038	0.038	0.071	0.072	0.037	0.038	0.072
3.3	0.015	0.020	0.018	0.019	0.017	0.017	0.019	0.022	0.025	0.024	0.104	0.108	0.023	0.024	0.108
3.5	0.010	0.016	0.012	0.011	0.011	0.011	0.012	0.014	0.015	0.017	0.215	0.228	0.020	0.022	0.228
3.7	0.016	0.023	0.017	0.017	0.016	0.016	0.016	0.017	0.018	0.020	0.443	0.465	0.023	0.028	0.465
3.9	0.013	0.021	0.014	0.014	0.014	0.014	0.014	0.014	0.016	0.017	0.324	0.345	0.020	0.024	0.345
4.1	0.005	0.008	0.006	0.006	0.006	0.006	0.006	0.006	0.007	0.008	0.145	0.149	0.008	0.010	0.149
4.3	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.056	0.057	0.003	0.003	0.057
4.5	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.045	0.046	0.002	0.002	0.046
4.7	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.037	0.036	0.002	0.002	0.037
4.9	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.073	0.072	0.001	0.001	0.073
5.1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.074	0.073	0.000	0.000	0.074
5.3	0.002	0.002	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.003	0.025	0.025	0.004	0.004	0.025
5.5	0.002	0.002	0.002	0.002	0.001	0.002	0.002	0.003	0.003	0.003	0.021	0.021	0.004	0.004	0.021
5.7	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.004	0.003	0.021	0.022	0.004	0.004	0.022
5.9	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.018	0.019	0.004	0.004	0.019
6.1	0.003	0.004	0.003	0.003	0.003	0.004	0.004	0.005	0.005	0.006	0.020	0.020	0.006	0.006	0.020
6.3	0.005	0.008	0.006	0.005	0.005	0.005	0.005	0.006	0.007	0.007	0.020	0.020	0.009	0.010	0.020
6.5	0.006	0.009	0.006	0.006	0.006	0.006	0.006	0.007	0.008	0.008	0.019	0.019	0.009	0.011	0.019
6.7	0.004	0.006	0.005	0.006	0.004	0.005	0.004	0.006	0.006	0.007	0.020	0.020	0.008	0.009	0.020
6.9	0.005	0.005	0.005	0.006	0.005	0.005	0.005	0.006	0.007	0.007	0.019	0.019	0.007	0.007	0.019
7.1	0.005	0.007	0.006	0.007	0.007	0.006	0.007	0.008	0.009	0.008	0.023	0.023	0.009	0.009	0.023
7.3	0.008	0.009	0.010	0.009	0.009	0.009	0.010	0.009	0.010	0.009	0.047	0.050	0.010	0.010	0.050
7.5	0.008	0.012	0.009	0.009	0.007	0.011	0.011	0.012	0.012	0.012	0.059	0.063	0.012	0.013	0.063
7.7	0.006	0.008	0.007	0.007	0.006	0.007	0.007	0.009	0.009	0.008	0.065	0.070	0.010	0.010	0.070
7.9	0.005	0.010	0.004	0.006	0.007	0.005	0.005	0.007	0.009	0.008	0.055	0.059	0.009	0.011	0.059
8.1	0.006	0.010	0.010	0.011	0.006	0.008	0.005	0.010	0.010	0.010	0.030	0.031	0.011	0.012	0.031
8.3	0.005	0.004	0.006	0.008	0.007	0.005	0.004	0.006	0.006	0.006	0.034	0.037	0.007	0.007	0.037
8.5	0.005	0.007	0.005	0.006	0.008	0.005	0.006	0.008	0.006	0.007	0.042	0.045	0.009	0.009	0.045
8.7	0.006	0.006	0.008	0.009	0.006	0.005	0.009	0.007	0.007	0.007	0.057	0.060	0.009	0.010	0.060
8.9	0.005	0.004	0.005	0.005	0.003	0.005	0.006	0.004	0.004	0.005	0.059	0.060	0.006	0.006	0.060

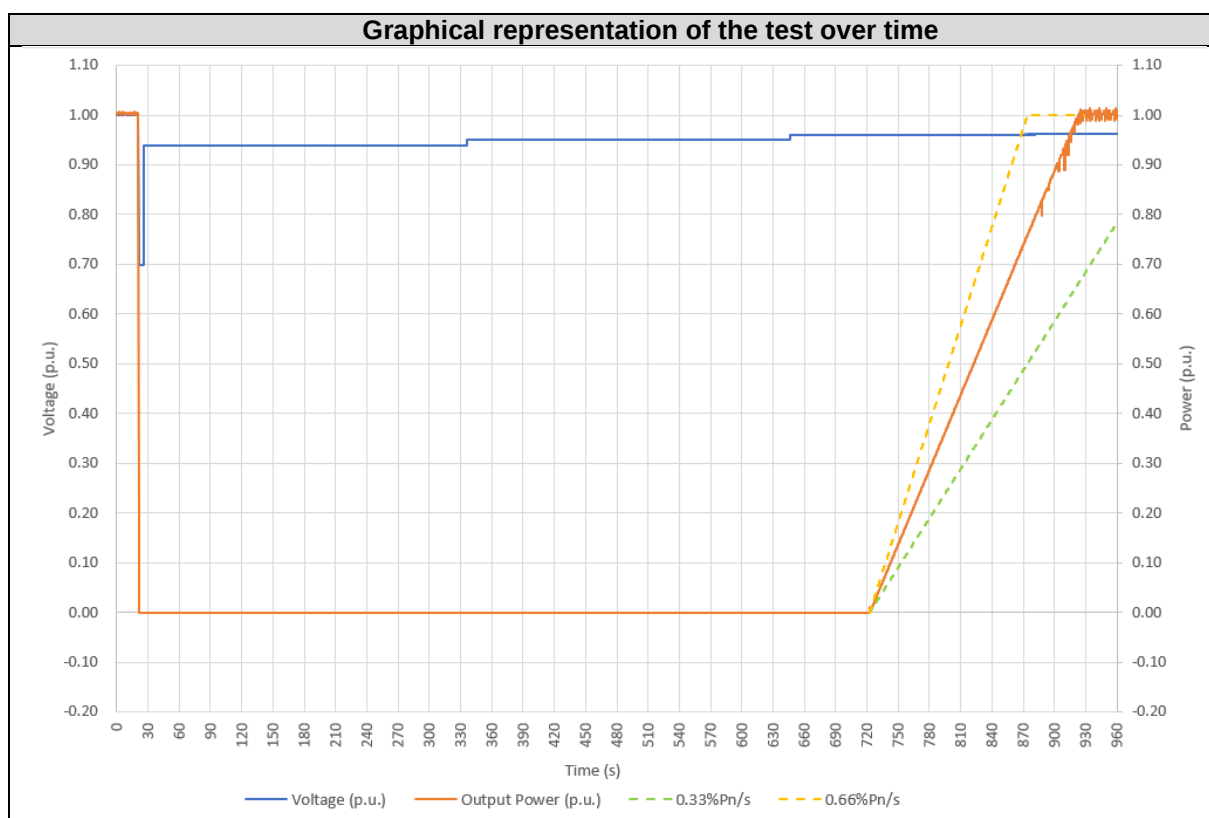
Model: ZPM-PCS215K-R															
Phase C															
P _{bin} (%)	0	10	20	30	40	50	60	70	80	90	92	95	100	110	MAX (%)
F [kHz]	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	I _h (%)	
2.1	0.076	0.144	0.127	0.143	0.085	0.102	0.057	0.109	0.137	0.132	0.097	0.099	0.139	0.154	0.154
2.3	0.048	0.116	0.046	0.063	0.064	0.053	0.053	0.072	0.092	0.095	0.064	0.066	0.096	0.101	0.116
2.5	0.045	0.083	0.045	0.056	0.062	0.047	0.057	0.071	0.081	0.076	0.064	0.064	0.080	0.086	0.086
2.7	0.051	0.083	0.060	0.054	0.053	0.071	0.076	0.078	0.090	0.086	0.081	0.083	0.083	0.089	0.090
2.9	0.046	0.065	0.057	0.051	0.048	0.052	0.053	0.053	0.057	0.056	0.063	0.065	0.054	0.053	0.065
3.1	0.024	0.036	0.028	0.029	0.026	0.029	0.031	0.035	0.039	0.038	0.073	0.074	0.035	0.036	0.074
3.3	0.016	0.021	0.019	0.018	0.017	0.017	0.017	0.021	0.024	0.025	0.082	0.084	0.023	0.022	0.084
3.5	0.010	0.016	0.013	0.012	0.011	0.012	0.012	0.014	0.015	0.017	0.219	0.225	0.020	0.025	0.225
3.7	0.016	0.024	0.017	0.017	0.017	0.017	0.017	0.018	0.020	0.022	0.480	0.495	0.025	0.029	0.495
3.9	0.013	0.021	0.014	0.014	0.014	0.014	0.014	0.015	0.017	0.018	0.372	0.387	0.020	0.023	0.387
4.1	0.005	0.008	0.006	0.006	0.006	0.006	0.006	0.006	0.007	0.008	0.138	0.142	0.008	0.009	0.142
4.3	0.002	0.003	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.056	0.057	0.003	0.003	0.057
4.5	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.041	0.041	0.002	0.002	0.041
4.7	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.034	0.034	0.002	0.002	0.034
4.9	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.075	0.074	0.001	0.002	0.075
5.1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.075	0.075	0.000	0.001	0.075
5.3	0.001	0.002	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.003	0.025	0.025	0.003	0.003	0.025
5.5	0.002	0.002	0.001	0.002	0.001	0.002	0.002	0.003	0.003	0.003	0.021	0.022	0.002	0.003	0.022
5.7	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.022	0.023	0.002	0.003	0.023
5.9	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.004	0.020	0.021	0.003	0.004	0.021
6.1	0.003	0.004	0.003	0.003	0.003	0.004	0.004	0.004	0.005	0.005	0.018	0.018	0.004	0.005	0.018
6.3	0.005	0.008	0.005	0.006	0.006	0.006	0.006	0.006	0.007	0.008	0.022	0.022	0.007	0.009	0.022
6.5	0.006	0.009	0.006	0.006	0.006	0.006	0.007	0.007	0.008	0.008	0.020	0.020	0.009	0.011	0.020
6.7	0.004	0.006	0.005	0.005	0.004	0.005	0.004	0.005	0.007	0.007	0.019	0.019	0.007	0.009	0.019
6.9	0.004	0.005	0.005	0.006	0.005	0.005	0.005	0.007	0.006	0.007	0.021	0.020	0.006	0.006	0.021
7.1	0.005	0.008	0.006	0.007	0.006	0.006	0.007	0.008	0.008	0.007	0.023	0.023	0.007	0.008	0.023
7.3	0.008	0.011	0.010	0.009	0.008	0.009	0.010	0.009	0.010	0.010	0.054	0.055	0.010	0.010	0.055
7.5	0.007	0.012	0.009	0.008	0.008	0.011	0.011	0.010	0.013	0.012	0.071	0.073	0.011	0.013	0.073
7.7	0.006	0.010	0.007	0.007	0.007	0.007	0.007	0.007	0.010	0.008	0.073	0.076	0.009	0.010	0.076
7.9	0.004	0.010	0.004	0.006	0.006	0.005	0.005	0.007	0.009	0.009	0.064	0.067	0.008	0.010	0.067
8.1	0.005	0.010	0.008	0.010	0.006	0.007	0.004	0.008	0.010	0.009	0.037	0.038	0.009	0.011	0.038
8.3	0.004	0.004	0.006	0.009	0.007	0.006	0.005	0.006	0.006	0.006	0.035	0.036	0.006	0.008	0.036
8.5	0.004	0.008	0.004	0.005	0.007	0.005	0.006	0.006	0.006	0.007	0.046	0.047	0.007	0.008	0.047
8.7	0.006	0.007	0.008	0.009	0.006	0.004	0.009	0.007	0.006	0.007	0.065	0.066	0.008	0.009	0.066
8.9	0.005	0.003	0.006	0.005	0.003	0.006	0.007	0.004	0.004	0.005	0.067	0.067	0.006	0.006	0.067

2.3 Grid Control Capability

2.3.1 Wirkleistungseinspeisung in Abhängigkeit der Netzfrequenz / Active power vs frequency

Überfrequenz / overfrequency	Mittlerer Gradient der Wirkleistung zum Zeitpunkt der Frequenzüberhöhung / Mean power gradient at overfrequency	mittl. Gradient / mean gradient 100.3 % P _M /Hz	
	Max. Einschwingzeit / Max. Settling time	0.5 s	
	Gradient der Wirkleistung nach Rückkehr aus Überfrequenz / Power gradient after recovery of over frequency	mittl. Gradient / mean gradient 10.0 %P _n /min max. Gradient / max. gradient 10.0 %P _n /min	
Unterfrequenz / underfrequency	Mittlerer Gradient der Wirkleistung zum Zeitpunkt der Frequenzunterschreitung / Mean power gradient at underfrequency	mittl. Gradient / mean gradient 100.3 % P _M /Hz	
	Max. Einschwingzeit / Max. Settling time	0.3 s	
	Gradient der Wirkleistung nach Rückkehr aus Unterfrequenz / Power gradient after recovery of under frequency	mittl. Gradient / mean gradient -9.3 %P _n /min max. Gradient / max. gradient -9.1 %P _n /min	
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 0.610 kW	Unterschreitung / Undercut -0.564
Trennung vom Netz bei Wirkleistungssollwertvorgabe von: Disconnection from the grid at external active power setpoints at:		-- % P _n No disconnection is recorded. Operation at 0%P _n 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	70.0%P _n -> 50.0%P _n	Zeit / time : 42.5s Gradient: -0.35 % P _n / s	
	50.0%P _n -> 70.0%P _n	Zeit / time : 42.1 s Gradient: 0.35 % P _n / s	
Einschwingzeit der Leistung für einen Sollwertsprung mit maximalem Gradienten / Response time of the power output after a change in setpoint with maximum gradient	90.0%P _n -> 10.0%P _n	Zeit / time : 115.8 s Gradient: -0.65 % P _n / s	
	10.0%P _n -> 90.0%P _n	Zeit / time : 115.5 s Gradient: 0.65 % P _n / s	

Note: These results are extracted from the test report no. 240282RECO03

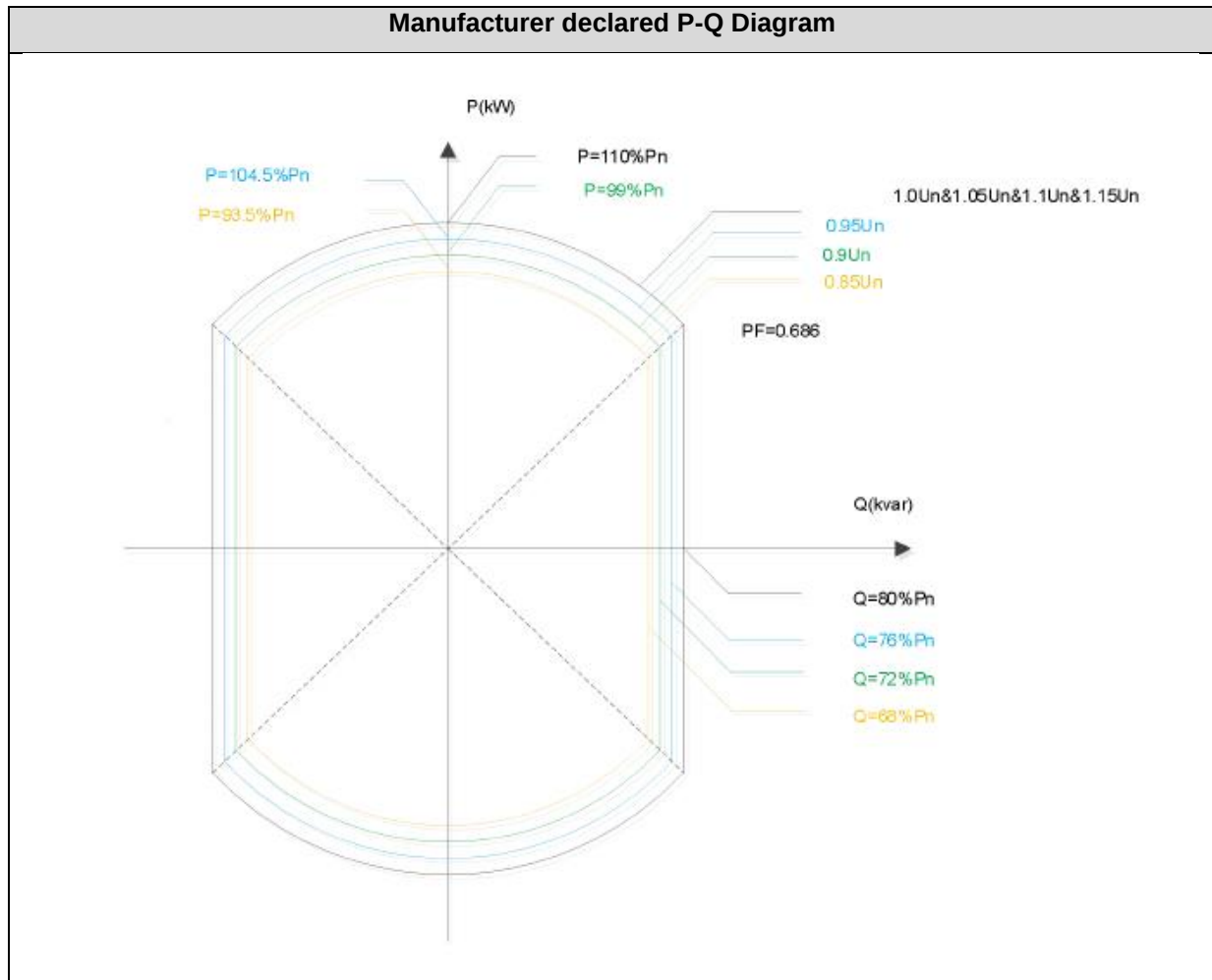


Note: These results are extracted from the test report no. 240282RECO03

2.3.2 Procedure for reactive power provision

The certified PV inverter fulfils the following P-Q diagram at different voltage levels, as stated in the Manufacturer Declaration SofarSolar's declaration "DECLARATION FOR ZPM-PCS215K-R/125K-R TR8". Dated on June 03rd, 2024. For VDE-AR-N 4110/4120, the voltage-dependent PQ diagram reactive power capability of ZPM-PCS215K-R/125K-R.

The certified Type 2 Inverter fulfils the following P-Q diagram at different voltage levels:

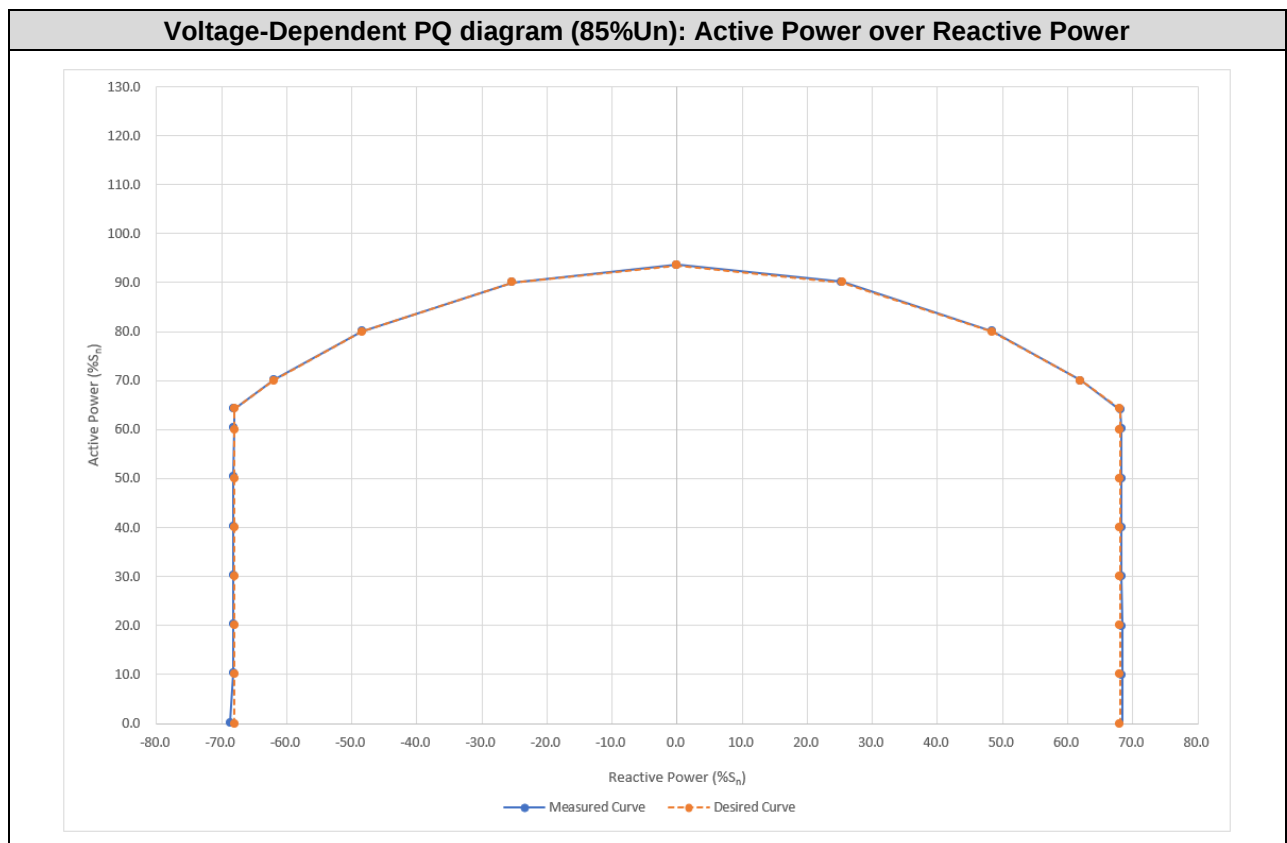
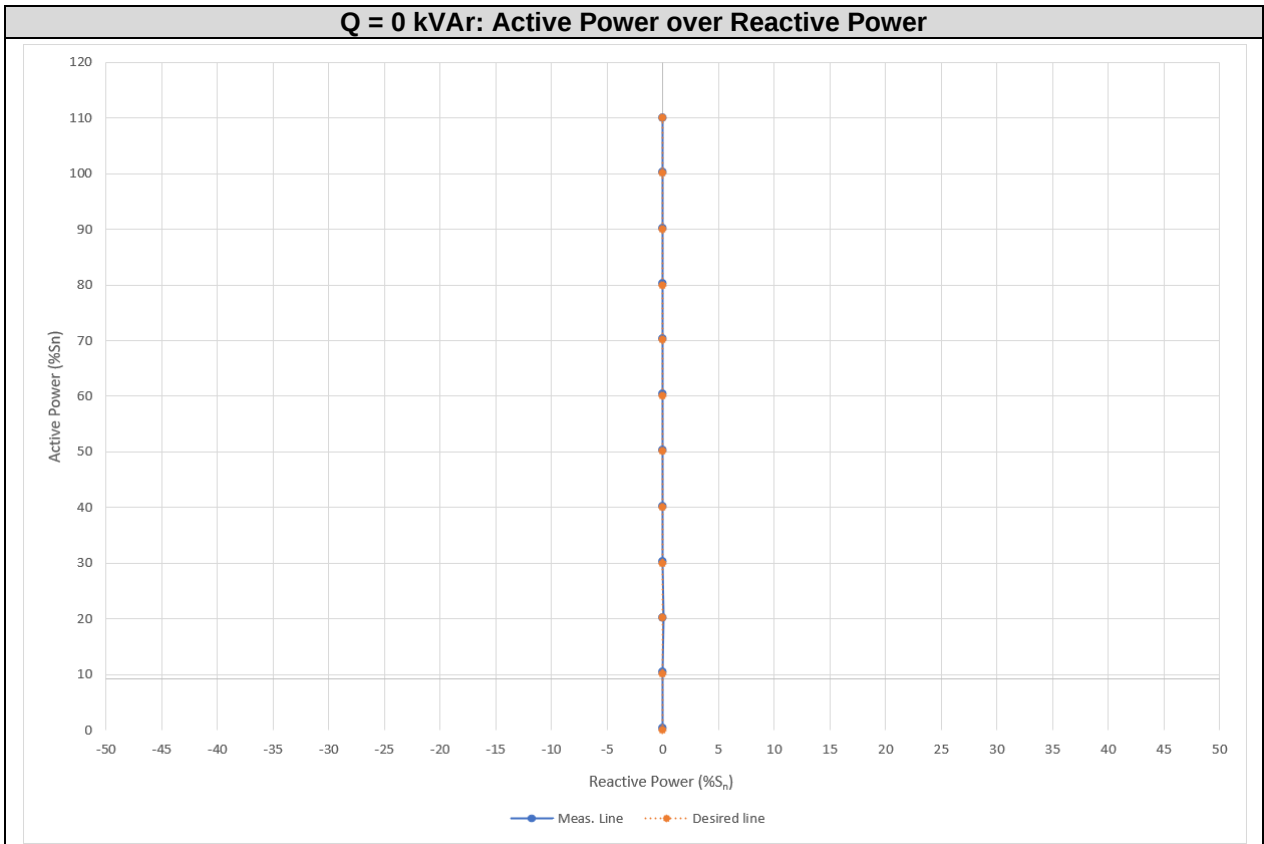


2.3.3 Blindleistungsbereitstellung / Provision of reactive power

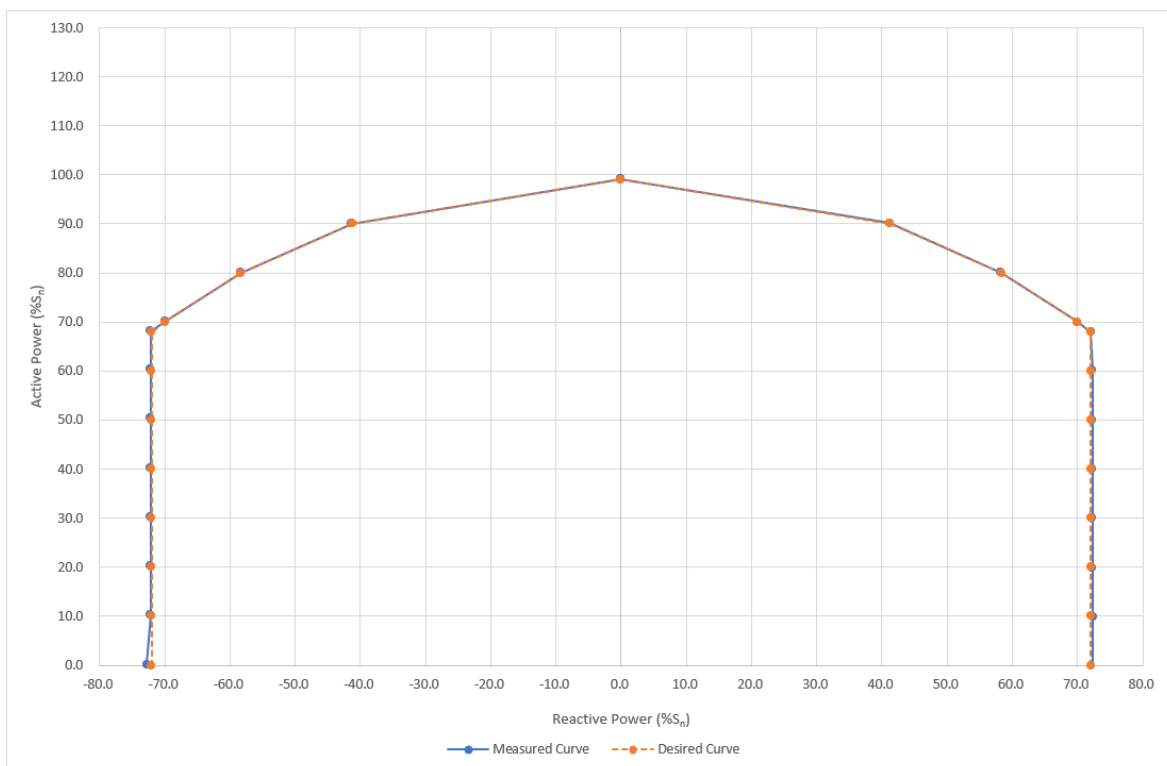
Blindleistungsregelung im Normalbetrieb und maximaler Blindleistungstellbreich / Control of reactive power in normal operation and maximum reactive power range	P/Pn	Qind (KVAR)	Q0 (KVAR)	Qkap (KVAR)	P/Pn	Qind (KVAR)	Q0 (KVAR)	Qkap (KVAR)
	0%	172.7	-0.3	-173.7	60%	172.4	-0.3	-172.6
	10%	172.7	-0.3	-172.6	70%	172.4	-0.3	-172.6
	20%	172.6	-0.2	-172.6	80%	162.7	-0.4	-162.4
	30%	172.5	-0.3	-172.6	90%	136.1	-0.6	-136.1
	40%	172.5	-0.3	-172.6	100%	98.5	-1.1	-98.9
	50%	172.5	-0.3	-172.6	110%	-0.4	-2.1	-0.4
	Q in kVAr (Qind & Qkap measured at ambient)							
Arbitspunkte des spannungsanhängigen 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				Q range at 50 %Pn is ± 80 %Pn			
Längste Einsschwingzeit / Longest response time	Parameter				Einsschwingzeit / settling time			
	T < 5 s				4.85 s			
	Standardzeit / standard time				--			
	T < 60 s				64.9 s			
Einstellgenauigkeit des Verschiebungsfaktors bzw. Blindleistung / Positioning accuracy of power factor or reactive power	Sollwert / setpoint				Istwert / measured value			
	+86.000 kVAr				+86.239 kVAr			
	0 kVAr				-0.254 kVAr			
	-86.000 kVAr				-86.657 kVAr			
Anmerkung / remark	Soweit Q(U) und Q(P)- Regelung wurde, sind diese im Prüfbericht hinterlegt / See Q(U) and Q(P) in test report							

Note: These results are extracted from the test report no. 240282RECO03

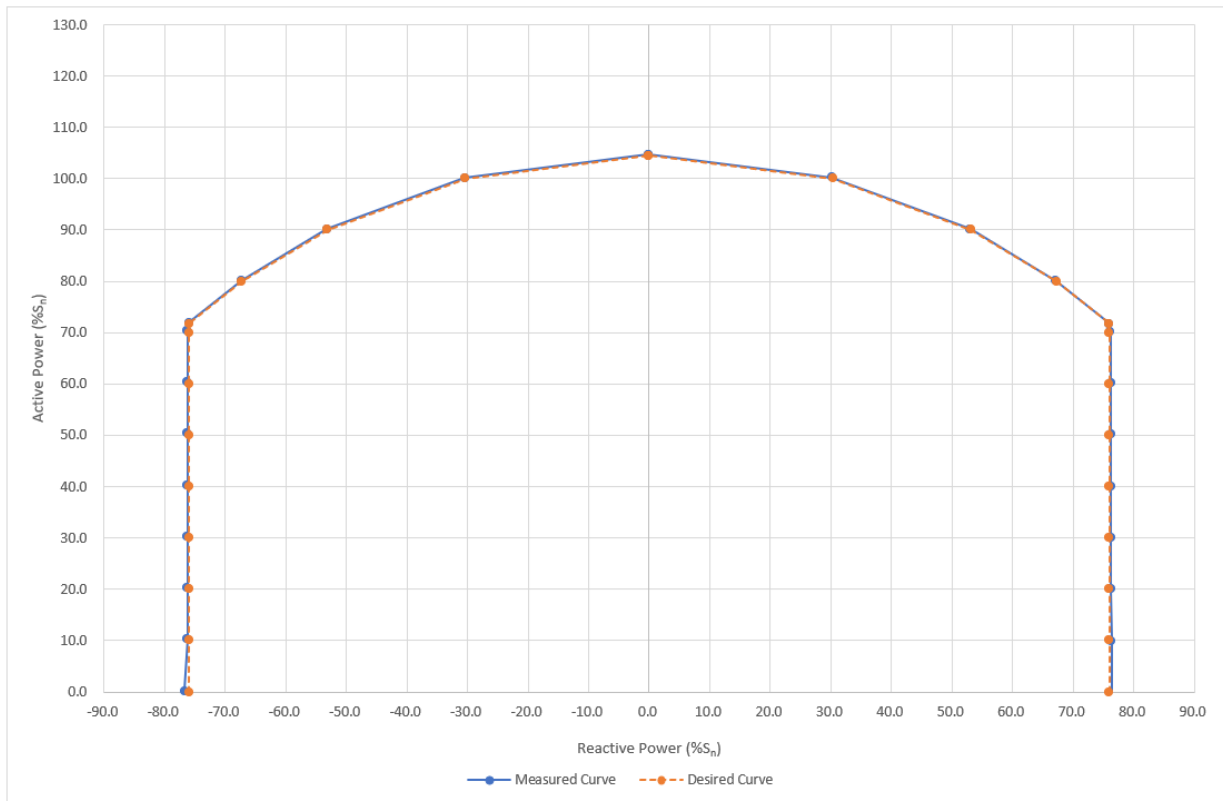
In following charts, they are offered main results after performed tests included in the FGW TG3 test report 240282RECO03.



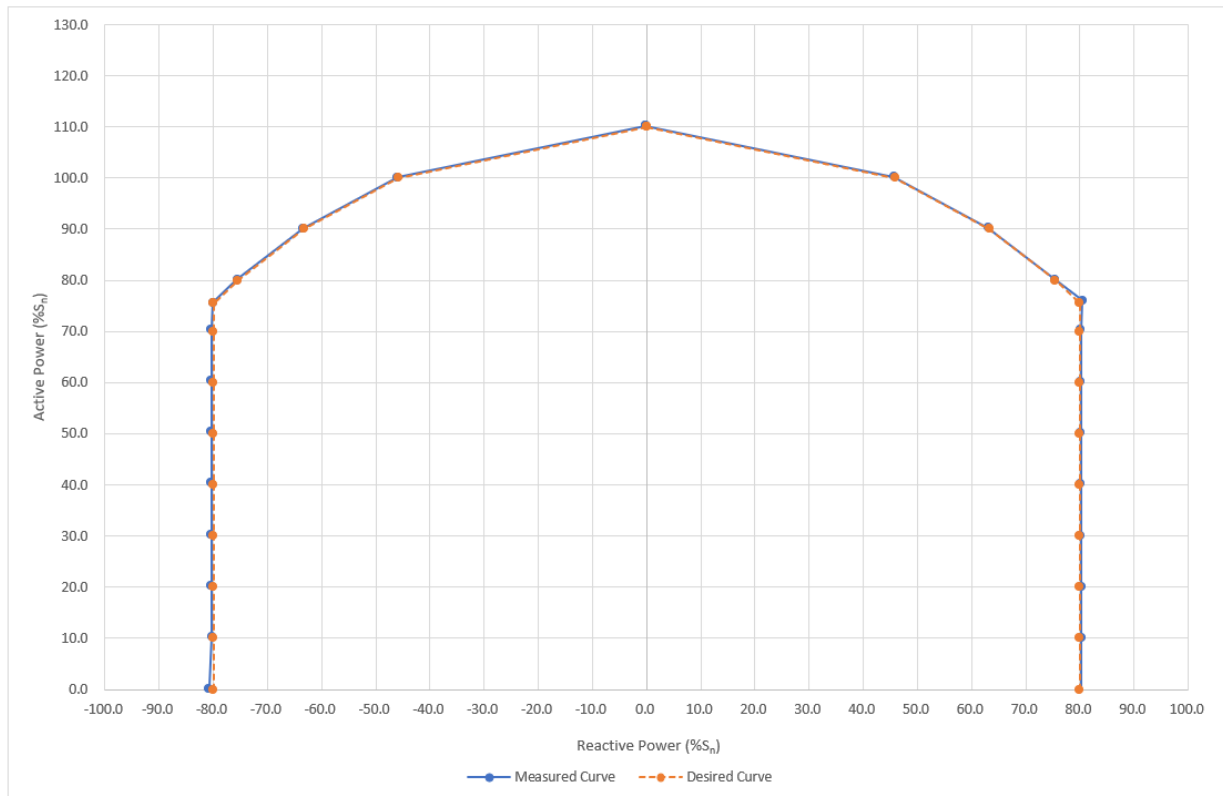
Voltage-Dependent PQ diagram (90%Un): Active Power over Reactive Power



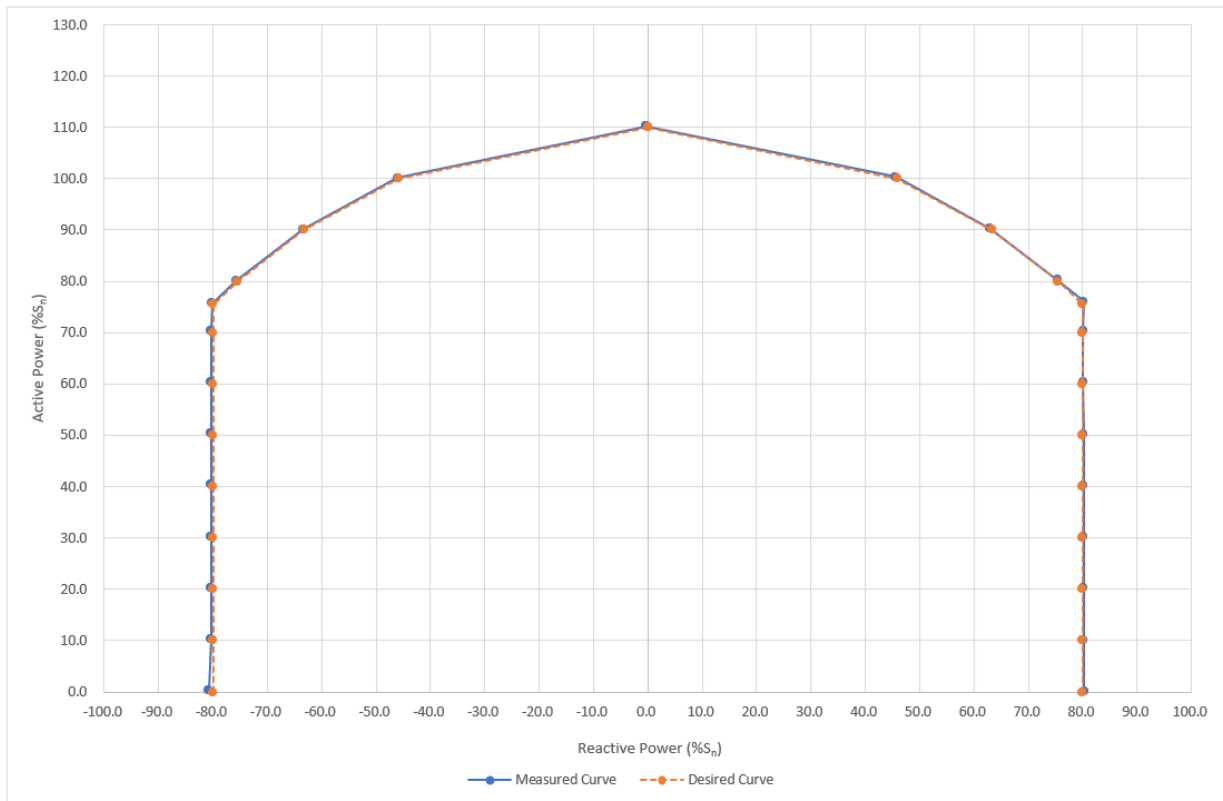
Voltage-Dependent PQ diagram (95%Un): Active Power over Reactive Power



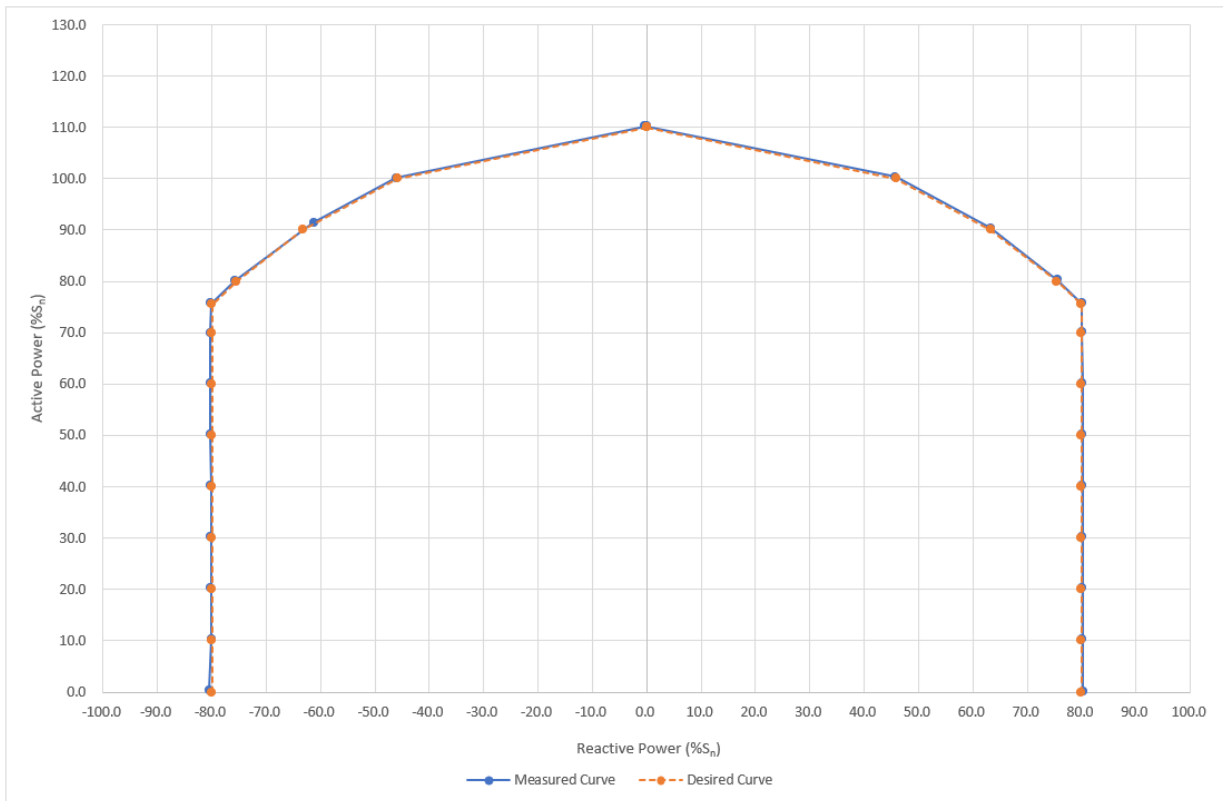
Voltage-Dependent PQ diagram (105%Un): Active Power over Reactive Power



Voltage-Dependent PQ diagram (110%Un): Active Power over Reactive Power



Voltage-Dependent PQ diagram (115%Un): Active Power over Reactive Power



The tables below show measured values for each power step tested to verify the voltage-dependent PQ diagram at different ambient temperature conditions:

Note: These results are extracted from the test report no. 240282RECO03

Voltage-Dependent PQ diagram (U = 85% Un) – Inductive							
P Desired (%P _n)	P measured (kW)	Q measured (kVAr)	S measured (kVA)	S deviation (kVA)	Power Factor (cos φ)	V _{AC} + (V)	Number of records
0	-0.5	147.1	147.1	+0.9	-0.003	339.0	1800
10	21.1	147.0	148.5	+0.7	0.142	339.1	1800
20	42.8	146.9	153.0	+0.6	0.279	339.2	1800
30	64.4	146.9	160.4	+0.6	0.401	339.3	1800
40	86.0	146.9	170.2	+0.6	0.505	339.5	1800
50	107.6	146.9	182.1	+0.6	0.591	339.6	1800
60	129.3	146.8	195.6	+0.7	0.661	339.7	1800
64.2	137.7	146.4	201.0	-0.1	0.685	339.5	1800
70	150.5	133.3	201.1	+0.0	0.749	339.6	1800
80	172.3	104.2	201.3	+0.3	0.856	339.7	1800
90	193.9	54.4	201.4	+0.4	0.963	339.7	1800
93.5	201.3	-0.1	201.3	+0.3	1.000	339.5	1800

Note: Deviations are calculated in relation to the theoretical P-Q curve provided by the manufacturer.

Voltage-Dependent PQ diagram (U = 85% Un) – Capacitive							
P Desired (%S _n)	P measured (kW)	Q measured (kVAr)	S measured (kVA)	S deviation (kVA)	Power Factor (cos φ)	V _{AC} + (V)	Number of records
0	0.4	-147.7	147.7	+1.5	0.003	338.4	1800
10	22.0	-146.6	148.2	+0.4	0.148	338.5	1800
20	43.6	-146.6	152.9	+0.5	0.285	338.6	1800
30	65.2	-146.6	160.4	+0.6	0.406	338.7	1800
40	86.7	-146.6	170.3	+0.7	0.509	338.8	1800
50	108.3	-146.5	182.2	+0.7	0.594	338.9	1800
60	129.8	-146.5	195.7	+0.8	0.663	339.0	1800
64.2	138.2	-146.4	201.4	+0.3	0.686	339.0	1800
70	150.8	-133.0	201.1	+0.1	0.750	339.1	1800
80	172.2	-104.1	201.3	+0.2	0.856	339.3	1800
90	193.7	-54.5	201.2	+0.2	0.963	339.4	1800
93.5	201.3	-0.1	201.3	+0.3	1.000	339.5	1800

Note: Deviations are calculated in relation to the theoretical P-Q curve provided by the manufacturer.

Voltage-Dependent PQ diagram (U = 90% Un) – Inductive							
P Desired (%Pn)	P measured (kW)	Q measured (kVAr)	S measured (kVA)	S deviation (kVA)	Power Factor (cos φ)	V _{AC} + (V)	Number of records
0	-0.4	155.6	155.6	+0.8	-0.003	359.0	1800
10	21.2	155.5	157.0	+0.7	0.135	359.1	1800
20	42.8	155.5	161.3	+0.6	0.266	359.2	1800
30	64.5	155.4	168.3	+0.6	0.383	359.3	1800
40	86.1	155.4	177.7	+0.6	0.484	359.4	1800
50	107.7	155.4	189.1	+0.6	0.570	359.5	1800
60	129.3	155.3	202.1	+0.6	0.640	359.6	1800
67.9	146.0	154.9	212.8	+0.0	0.686	359.7	1800
70	150.5	150.5	212.9	+0.0	0.707	359.7	1800
80	172.2	125.3	212.9	+0.1	0.809	359.8	1800
90	193.9	88.5	213.1	+0.3	0.910	359.8	1800
99	213.2	-0.2	213.2	+0.3	1.000	359.6	1800

Voltage-Dependent PQ diagram (U = 90% Un) – Capacitive							
P Desired (%Pn)	P measured (kW)	Q measured (kVAr)	S measured (kVA)	S deviation (kVA)	Power Factor (cos φ)	V _{AC} + (V)	Number of records
0	0.4	-156.4	156.4	+1.6	0.002	358.3	1800
10	22.0	-155.2	156.8	+0.5	0.140	358.4	1800
20	43.6	-155.3	161.3	+0.6	0.270	358.5	1800
30	65.2	-155.3	168.4	+0.7	0.387	358.6	1800
40	86.7	-155.2	177.8	+0.7	0.488	358.7	1800
50	108.3	-155.2	189.2	+0.8	0.572	358.9	1800
60	129.8	-155.2	202.3	+0.8	0.641	359.0	1800
67.9	146.5	-155.3	213.5	+0.7	0.686	358.9	1800
70	150.8	-150.4	213.0	+0.2	0.708	359.1	1800
80	172.2	-125.3	213.0	+0.1	0.808	359.3	1800
90	193.6	-89.0	213.1	+0.2	0.909	359.4	1800
99	213.2	-0.2	213.2	+0.3	1.000	359.6	1800

Note: Deviations are calculated in relation to the theoretical P-Q curve provided by the manufacturer.

Voltage-Dependent PQ diagram (U = 95% Un) – Inductive							
P Desired (%Pn)	P measured (kW)	Q measured (kVAr)	S measured (kVA)	S deviation (kVA)	Power Factor (cos φ)	V _{AC} + (V)	Number of records
0	-0.3	164.2	164.2	+0.8	-0.002	378.8	1800
10	21.3	164.1	165.5	+9.2	0.129	379.0	1800
20	42.9	164.0	169.6	+8.9	0.253	379.1	1800
30	64.6	164.0	176.2	+8.5	0.366	379.2	1800
40	86.2	164.0	185.2	+8.1	0.465	379.3	1800
50	107.8	163.9	196.2	+7.7	0.549	379.4	1800
60	129.4	163.9	208.8	+7.3	0.620	379.5	1800
70	151.0	163.8	222.8	+6.9	0.678	379.6	1800
71.7	154.3	163.4	224.8	+0.1	0.686	379.6	1800
80	172.3	144.5	224.8	+0.2	0.766	379.7	1800
90	194.0	114.1	225.0	+0.4	0.862	379.7	1800
100	215.6	65.0	225.2	+0.5	0.957	379.7	1800
104.5	225.1	-0.3	225.1	+0.5	1.000	379.5	1800

Voltage-Dependent PQ diagram (U = 95% Un) – Capacitive							
P Desired (%Pn)	P measured (kW)	Q measured (kVAr)	S measured (kVA)	S deviation (kVA)	Power Factor (cos φ)	V _{AC} + (V)	Number of records
0	0.4	-165.0	165.0	+1.6	0.003	378.1	1800
10	22.0	-163.9	165.3	+0.5	0.133	378.2	1800
20	43.6	-163.9	169.6	+0.6	0.257	378.3	1800
30	65.2	-163.9	176.4	+0.7	0.370	378.4	1800
40	86.7	-163.9	185.5	+0.8	0.468	378.5	1800
50	108.3	-163.9	196.4	+0.9	0.551	378.7	1800
60	129.8	-163.9	209.1	+0.9	0.621	378.8	1800
70	151.3	-163.8	223.0	+0.9	0.678	378.9	1800
71.7	154.6	-163.4	225.0	+0.3	0.687	379.1	1800
80	172.3	-144.6	225.0	+0.3	0.766	379.2	1800
90	193.8	-114.4	225.0	+0.4	0.861	379.3	1800
100	215.2	-65.4	225.0	+0.3	0.957	379.4	1800
104.5	225.1	-0.3	225.2	+0.5	1.000	379.6	1800

Note: Deviations are calculated in relation to the theoretical P-Q curve provided by the manufacturer.

Voltage-Dependent PQ diagram (U = 105% Un) – Inductive							
P Desired (%Pn)	P measured (kW)	Q measured (kVAr)	S measured (kVA)	S deviation (kVA)	Power Factor (cos ϕ)	V _{AC} + (V)	Number of records
0	0.0	172.7	172.7	+0.7	0.000	418.8	1800
10	21.6	172.6	173.9	+0.6	0.124	418.9	1800
20	43.2	172.5	177.8	+0.5	0.243	419.0	1800
30	64.8	172.5	184.2	+0.5	0.352	419.1	1800
40	86.4	172.4	192.9	+0.6	0.448	419.2	1800
50	108.0	172.4	203.4	+0.6	0.531	419.3	1800
60	129.6	172.4	215.7	+0.7	0.601	419.4	1800
70	151.2	172.3	229.3	+0.7	0.660	419.5	1800
75.5	163.6	173.0	238.1	+1.6	0.687	418.5	1800
80	172.4	162.1	236.6	+0.1	0.729	419.6	1800
90	194.0	135.6	236.7	+0.2	0.820	419.6	1800
100	215.6	98.1	236.9	+0.4	0.910	419.7	1800
110	236.9	-0.5	236.9	+0.4	1.000	419.6	1800

Voltage-Dependent PQ diagram (U = 105% Un) – Capacitive							
P Desired (%Pn)	P measured (kW)	Q measured (kVAr)	S measured (kVA)	S deviation (kVA)	Power Factor (cos ϕ)	V _{AC} + (V)	Number of records
0	0.4	-173.7	173.7	+1.7	0.002	418.3	1800
10	22.0	-172.7	174.1	+0.7	0.126	418.4	1800
20	43.6	-172.7	178.1	+0.8	0.245	418.5	1800
30	65.2	-172.7	184.6	+0.9	0.353	418.6	1800
40	86.7	-172.7	193.3	+1.0	0.449	418.7	1800
50	108.3	-172.7	203.9	+1.1	0.531	418.8	1800
60	129.8	-172.7	216.1	+1.1	0.601	418.8	1800
70	151.3	-172.7	229.6	+1.1	0.659	418.9	1800
75.5	162.7	-172.2	236.9	+0.4	0.687	418.8	1800
80	172.3	-162.5	236.9	+0.4	0.727	418.9	1800
90	193.7	-136.2	236.8	+0.3	0.818	419.1	1800
100	215.2	-98.9	236.8	+0.3	0.909	419.2	1800
110	236.9	-0.5	236.9	+0.4	1.000	419.5	1800

Note: Deviations are calculated in relation to the theoretical P-Q curve provided by the manufacturer.

Voltage-Dependent PQ diagram (U = 110% Un) – Inductive (Q=80%Pn)							
P Desired (%Pn)	P measured (kW)	Q measured (kVAr)	S measured (kVA)	S deviation (kVA)	Power Factor (cos φ)	V _{AC} + (V)	Number of records
0	0.2	172.5	172.5	+0.5	0.001	438.8	1800
10	21.8	172.4	173.8	+0.5	0.126	438.9	1800
20	43.4	172.4	177.8	+0.5	0.244	439.0	1800
30	65.0	172.3	184.2	+0.5	0.353	439.1	1800
40	86.6	172.3	192.8	+0.5	0.449	439.1	1800
50	108.2	172.3	203.4	+0.6	0.532	439.2	1800
60	129.8	172.3	215.7	+0.7	0.602	439.3	1800
70	151.4	172.2	229.3	+0.8	0.660	439.4	1800
75.5	163.7	172.3	237.6	+1.1	0.689	438.1	1800
80	172.5	162.0	236.6	+0.1	0.729	439.5	1800
90	194.1	135.4	236.7	+0.2	0.820	439.6	1800
100	215.7	98.0	236.9	+0.4	0.910	439.6	1800
110	237.0	-0.6	237.0	+0.5	1.000	439.5	1800

Voltage-Dependent PQ diagram (U = 110% Un) – Capacitive (Q=80%Pn)							
P Desired (%Pn)	P measured (kW)	Q measured (kVAr)	S measured (kVA)	S deviation (kVA)	Power Factor (cos φ)	V _{AC} + (V)	Number of records
0	0.5	-173.7	173.7	+1.7	0.003	438.3	1800
10	22.1	-172.7	174.1	+0.7	0.127	438.4	1800
20	43.7	-172.8	178.1	+0.8	0.245	438.5	1800
30	65.3	-172.8	184.6	+0.9	0.353	438.5	1800
40	86.8	-172.8	193.3	+1.0	0.449	438.6	1800
50	108.4	-172.8	203.9	+1.1	0.531	438.7	1800
60	129.9	-172.8	216.1	+1.1	0.601	438.8	1800
70	151.4	-172.8	229.6	+1.1	0.659	438.9	1800
75.5	162.7	-172.3	236.9	+0.4	0.687	438.7	1800
80	172.4	-162.6	236.9	+0.4	0.727	438.9	1800
90	193.8	-136.3	236.8	+0.3	0.818	439.0	1800
100	215.3	-99.0	236.8	+0.3	0.908	439.2	1800
110	237.0	-0.6	236.9	+0.4	1.000	439.5	1800

Note: Deviations are calculated in relation to the theoretical P-Q curve provided by the manufacturer.

Voltage-Dependent PQ diagram (U = 115% Un) – Inductive							
P Desired (%Pn)	P measured (kW)	Q measured (kVAr)	S measured (kVA)	S deviation (kVA)	Power Factor (cos φ)	V _{AC} + (V)	Number of records
0	0.4	172.5	172.5	+0.5	0.002	458.9	1800
10	22.0	172.5	173.9	+0.5	0.127	459.0	1800
20	43.5	172.4	177.8	+0.5	0.245	459.1	1800
30	65.0	172.3	184.2	+0.5	0.354	459.2	1800
40	86.5	172.3	192.9	+0.6	0.450	459.2	1800
50	108.0	172.3	203.4	+0.6	0.532	459.3	1800
60	129.5	172.3	215.6	+0.6	0.602	459.4	1800
70	151.0	172.2	229.2	+0.7	0.661	459.5	1800
75.5	162.8	172.2	237.2	+0.7	0.688	459.5	1800
80	172.6	162.5	237.2	+0.7	0.729	459.6	1800
90	194.2	136.0	237.3	+0.8	0.820	459.6	1800
100	215.7	98.5	237.5	+1.0	0.911	459.6	1800
110	237.1	-0.1	237.7	+1.2	1.000	459.6	1800

Voltage-Dependent PQ diagram (U = 115% Un) – Capacitive							
P Desired (%Pn)	P measured (kW)	Q measured (kVAr)	S measured (kVA)	S deviation (kVA)	Power Factor (cos φ)	V _{AC} + (V)	Number of records
0	0.6	-173.0	173.1	+1.1	0.003	457.3	1800
10	22.1	-172.2	173.6	+0.3	0.127	457.4	1800
20	43.7	-172.3	177.7	+0.5	0.246	457.5	1800
30	65.2	-172.4	184.3	+0.6	0.354	457.5	1800
40	86.6	-172.4	192.9	+0.6	0.449	457.6	1800
50	108.0	-172.5	203.5	+0.7	0.531	457.7	1800
60	129.4	-172.6	215.7	+0.7	0.600	457.8	1800
70	150.6	-172.6	229.1	+0.6	0.657	457.8	1800
75.5	162.8	-172.4	237.2	+0.7	0.687	458.9	1800
80	172.5	-162.7	237.2	+0.7	0.727	459.0	1800
90	196.7	-131.6	236.9	+0.4	0.826	459.1	1800
100	215.4	-99.1	237.1	+0.6	0.908	459.3	1800
110	237.1	-0.7	237.1	+0.6	1.000	459.6	1800

Note: Deviations are calculated in relation to the theoretical P-Q curve provided by the manufacturer.

2.4 Protection system

2.4.1 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 [s]		Rückfallverhältnis Disengaging ratio
	Schwelle / value	Zeit / time	Min.	Max.	Min.	Max.	
Spannungssteigerungsschutz/ Overvoltage protection: U>	1.000	180.000 s	1.000	1.001	178.000	179.000	☑≥0.98 ☐<0.98
	1.300	Min.	1.299	1.301	0.014	0.034	
Spannungssteigerungsschutz/ Overvoltage protection: U>>	1.000	0.100 s	0.995	1.002	0.085	0.093	---
	1.300	Min.	1.298	1.301	0.012	0.032	
Spannungsrückgangsschutz/ Undervoltage protection: U<	0100	Min.	0.103	0.104	0.028	0.031	☑≤1.02 ☐>1.02
	1.000	2.400 s	1.000	1.002	2.373	2.381	
Spannungsrückgangsschutz/ Undervoltage protection: U<<	0.100	Min.	0.103	0.104	0.025	0.030	☑≤1.02 ☐>1.02
	1.000	0.800 s	1.001	1.002	0.774	0.782	
Frequenzsteigerungsschutz/ Overfrequency protection: F>	50.50	5.000 s	50.50		4.988		---
	55.00	0.000 s	54.99		0.041		
Frequenzsteigerungsschutz/ Overfrequency protection: F>>	50.00	0.100 s	50.00		0.082		---
	55.00	0.000 s	54.99		0.049		
Frequenzrückgangsschutz/ Underfrequency protection: F<	45.00	0.000 s	45.00		0.045		---
	49.50	0.100	49.50		0.070		
Eigenzeit der Abschalteinheit / Operating time of a circuit breaker:	☑ aus Messung by measurement				☐ aus Prüfzertifikat by test certificate		
	According to the point 4.4.1 of the test report no. 240282RECO03, the measured circuit breaker operating time is 44 ms.						
	The PGU can either be assembled with following alternatives of the circuit breaker:						
	- Alternative: CHAR-112A200C with: - Declared operate time given by the supplier: 50 ms as maximum. - Declared release time given by the supplier: 10 ms as maximum.						
	See next pages.						

Note: The time accuracy is +50 ms due to relay delay. The setting time for the trigger has been established equal to the setting value. Therefore, some of the measured times are over the setting value but within the given tolerance.

Note: These results are extracted from the test report no. 240282RECO03

Supplier: Churod Electronics



RELAY OF SPECIFICATION

继电器规格书

(File No.:001000 / Version:03 / Issued Date: Jan.08th, 2021)

Product Description (品名) CHAR-112A200C
Part Number (编码)
Customer name (客户)

Customer Approval (客户批准)

STAMPING AREA (盖章处)

Issued (发行)	Checked (审核)	Approved (承认)
Yonghong.Li	—	Lucas.Liu



Max. breaking current	220A
最大切换电流	
Max. switching power	220,000VA
最大切换功率	
Rated switching power	200,000VA
额定切换功率	
Minimum applicable load	48VAC 100mA
最小使用负载	
Operate time	≤50ms
吸合时间	≤50ms
Operate bounce time	≤5ms
吸合回跳时间	
Release time	≤10ms
释放时间	≤10ms
Release bounce time	≤3ms
释放回跳时间	
Mechanical endurance	1million cycles, 150 cycles/minute
机械寿命	100 万次, 150 次/分钟
Electrical endurance (Resistive Load)	(1)1000VAC,Current: Making 55A/0.15s→Carrier 200A
电气寿命 (阻性负载)	/0.7s→Break 55A/0.15s, Coil:1s (12VDC/0.1s, → 6.6VDC~12VDC/0.9s) / 9s OFF, 30K cycles Ambient temperature 85°C 1000VAC, 电流: 启动时 55A/0.15s→通电时 200A /0.7s→分断时 55A/0.15s, 线圈通电 1s(12VDC/0.1s 后下 降至 6.6VDC~12VDC/0.9s 保持) / 9sOFF,30K cycles, 环 境温度 85°C (2)1000VAC,Current: 200A,Coil:1s (12VDC/0.1s, → 6.6VDC~12VDC/0.9s) / 9s OFF,100cycles Ambient temperature 85°C 1000VAC, 电流: 200A, 线圈通电 1s(12VDC/0.1s 后下 降至 6.6VDC~12VDC/0.9s 保持) / 9sOFF,100 次, 环境温 度 85°C
INSULATION PERFORMANCE 绝缘性能	
Dielectric strength	2500VAC 1minute, between open contacts
介电强度	2500VAC 1 分钟 (断开触点间)
	4000VAC 1minute, between coil to contacts
	4000VAC 1 分钟 (线圈与触点间)
Impulse withstand voltage	6KV (1.2/50 μs), between coil to contacts
耐浪涌电压	6KV (线圈与触点间)
Insulation resistance	100MQ at 1000VDC, between open contacts and coil to contacts
绝缘电阻	100MQ at 1000VDC (断开触点间及线圈与触点间)

2.4.2 Zuschaltbedingungen / Cut-in conditions

- For VDE-AR-N 4110: 2023-09

	Bereich / range In pu order/ or [Hz]	Zuschaltung erfolgte im angegebenen Bereich / cut in occurred within the given range	
Zpannung / Voltage:	0.90 – 1.10	☐ nein / no	☒ ja / yes
Frequenz / Frequency:	47.5 – 50.2	☐ nein / no	☒ ja / yes

- For VDE-AR-N 4120: 2018-11

	Bereich / range In pu order/ or [Hz]	Zuschaltung erfolgte im angegebenen Bereich / cut in occurred within the given range	
Zpannung / Voltage:	0.90 – 1.10	☐ nein / no	☒ ja / yes
Frequenz / Frequency:	47.5 – 51.0	☐ nein / no	☒ ja / yes

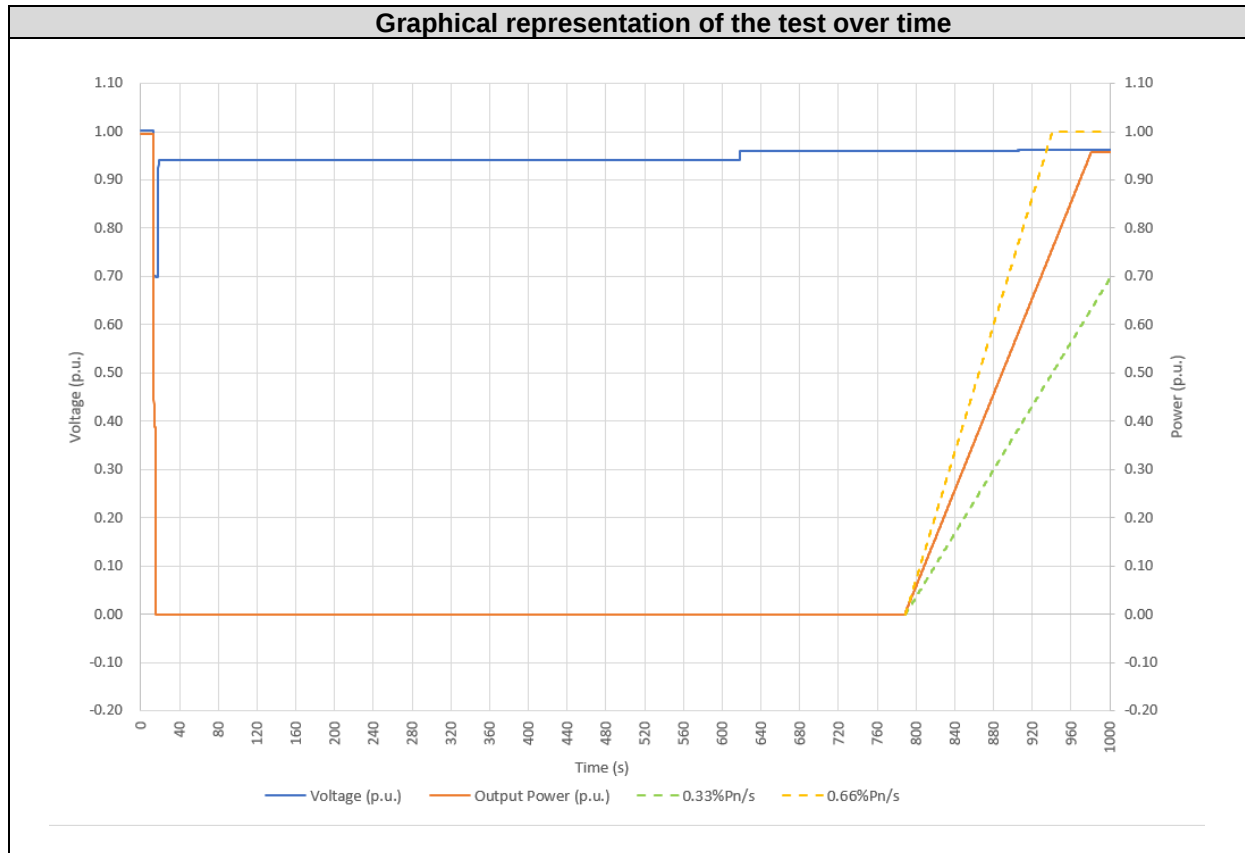
Note: These results are extracted from the test report no. 240282RECO03

2.4.3 Zuschaltbedingungen nach Auslösung des Entkopplungsschutzes / 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

Note: These results are extracted from the test report no. 240282RECO03

As evidenced in the FGW TG3 test report, the certified unit follows a ramp gradient inside of the range 33%Pn/s – 66%Pn/s after the reconnection occurs.



Note: These results are extracted from the test report no. 240282RECO03.

2.5 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:

- **240282RECO03 (Rev 0) ATTACHMENT I : FGW-TG3: Grid Fault Tests Results**
- **240282RECO03 : FGW-TG3: Grid Fault Tests Results**

Note: Results given are obtained after test results performed on the model ZPM-PCS215K-R. These test results for the model ZPM-PCS215K-R are essentially valid for the derived models ZPM-PCS125K-R considering the evaluation offered in the point 1.2 of this document.

The instantaneous values of AC currents and voltages are recorded synchronously with 50kHz (20µs). Positives sequence component are based on measurement of instantaneous voltages and currents are calculated according to IEC 61400-21 (2008).

Note: The reported values shown are the most unfavourable values obtained for the models tested, as mentioned in the section 1.2 of this Annex, and these values are considered to be representative of emission values of all models included in this Annex.

These characteristic values were defined according to EN 60909-0 standard.

I_p Peak short -circuit current: Maximum possible instantaneous value of the prospective short-circuit current. I_k'' Initial symmetrical short-circuit current: RMS value of the AC symmetrical component (dynamic duration) of a prospective short-circuit current applicable at the instant of short circuit if the impedance remains at zero-time value.

I_k Steady-state short-circuit current: RMS value of the short-circuit current (static duration) which remains after the decay of the transient phenomena.

Note that I_p is given as an amplitude, where as the values for I_k'' and I_k are RMS.

	I_{skPF}/A	I_{sk2PF}/A	I_{sk1PF}/A	I_p/A	I_k''/A	I_k/A	I_{max}/A
ZCS ZPM-PCS215K-R/125-R	184.8	181.0	181.0	390.4	198.5	198.5	181.0

3 OVERVIEW OF RESULTS OF THE FGW TR4 VALIDATION REPORT

Report Number: 240282RECO03– TG4 with date 17/10/2024 according FGW TR4 rev. 10.

Software Characteristics

- Validation report number: 240282RECO03-TG4
- Issuance date: 17/10/2024
- Issued by: SGS Tecnos, S.A. (Electrical Testing Laboratory)
- Software type: Simulator for Grid Connected Power Conversion System
- Simulation platform: DIgSILENT PowerFactory 2024
- Used version of the simulation platform: Version 24.0.2.0
- Simulation Software File identification: PGU_125-215K-R.pfd
- Dynamic Simulation Model version: V2.1
- MD5 Checksum: CEF983EF1586538CB7E1A40721EF953E

The model is in accordance with the requirements of the clause 5 of FGW TR4 rev.10. The validation of the dynamic simulation model has been performed in order to be compliant with evaluations required in the point 2.3.3 of the standard FGW TR8, rev9.

Requirements of the clause 11.2.6.3 of the standard VDE-AR-N 4110: 2023 and VDE-AR-N 4120:2018 have been considered for the evaluation process.

Deviations evaluated for MXE, ME and MAE calculations are in accordance with the chapter 5.3 of FGW TR4 rev.10.

The validation plan is according with the chapter 5.1 of FGW TR4 rev.10. where following tests have been used for validation:

- Validation requirements for voltage ride through:
This involves the validation of symmetrical and asymmetrical test cases defined in the table 4-69 of the chapter 4.6.3 of FGW TR3 rev.26 for Type 2 PGUs.
- Validation of P and Q setpoint control functions
This involves the validation of the dynamic response of the simulation model in front of P and Q changes commanded by set point. Test requirements offered in the chapter 4.2.4 of FGW TR3 rev.26 are considered.
- Validation requirements for reactive power control processes:
This involves the validation of accuracy requirements defined in chapters 4.2.5 (Q vs U) and 4.2.6 (Q vs P) of FGW TR3 rev.26.
- Verification of requirements for protective settings:
This involves the verification of the parameters for protection devices and settings declared by default for the certified product.

The validation overview for VRT cases is compliant with the Annex A.1.1, included in the report and compared with the validation overview in accordance with the table A-1. See FRT validation results in the point 2.1 of this document.

The main validation process detailed in the above referred report has been performed over the dynamic simulation model for ZPM-PCS215K-R . In addition, for this model, it has been performed the full list additional plausibility tests in accordance with the chapter 5.5 of FGW TR4 rev.10.

Apart of this, in order to verify the transferability of validation results to derived models, they have also been completed following simulation cases over the dynamic simulation model of ZPM-PCS215K-R adapted to operate with generation capabilities of derived model ZPM-PCS215K-R. See the information given in the point 1.4 of this document for further information.

- Verification of Voltage-Dependent PQ diagrams.

See further information of the dynamic simulation model and the software used in the point 4 of this annex.

3.1 Validation results

3.1.1 Validation overview

The following table shows the FRT validation results in terms of deviations as defined by the standard for the positive and negative sequences of currents and powers in symmetrical and asymmetrical fault conditions at nominal and partial power.

All deviations are in accordance to the regular maximum tolerances given by the standard

Test designation compliant with TG4 Rev.10 Response during grid faults. Table 4-82			Three phase voltage drops in positive phase sequence system											
			P			Q			Ia			Iq		
			MXE	ME	MAE	MXE	ME	MAE	MXE	ME	MAE	MXE	ME	MAE
Ures ≤ 5 % Un	In accordance with IEC	Pre	0.001	0.000	0.000	0.005	-0.003	0.003	0.001	-0.001	0.001	0.005	-0.003	0.003
00.3.FL.c		Fault	0.000	0.013	0.000	0.001	-0.001	0.000	0.012	0.011	0.004	0.004	0.019	0.003
3ph/100%/2		Post	0.001	-0.002	0.003	0.005	-0.002	0.005	0.002	-0.004	0.004	0.005	-0.004	0.004
Ures ≤ 5 % Un	In accordance with IEC	Pre	0.001	0.000	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0.001	0.001	0.001
00.3.PL.c		Fault	0.000	0.003	0.000	0.001	-0.001	0.000	0.013	0.005	0.005	0.004	0.019	0.002
3ph/20%/2		Post	0.001	-0.001	0.001	0.003	0.002	0.004	0.001	-0.001	0.001	0.003	-0.001	0.003
Ures 20-30 % Un	In accordance with IEC	Pre	0.001	-0.001	0.001	0.002	-0.001	0.001	0.002	-0.002	0.002	0.002	-0.001	0.001
25.3.FL.c		Fault	0.004	0.005	0.003	0.029	-0.025	0.027	0.016	-0.004	0.012	0.024	-0.012	0.024
3ph/100%/2		Post	0.001	-0.003	0.003	0.004	-0.002	0.004	0.002	-0.004	0.004	0.004	-0.004	0.004
Ures 20-30 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.002	0.002	0.002	0.001	0.000	0.000	0.002	0.002	0.002
25.3.PL.c		Fault	0.004	0.000	0.003	0.029	-0.025	0.027	0.017	-0.008	0.013	0.024	-0.013	0.023
3ph/20%/2		Post	0.000	-0.001	0.001	0.003	0.001	0.004	0.001	0.000	0.001	0.003	-0.001	0.004
Ures 45-60 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.002	-0.002	0.002	0.001	-0.001	0.001	0.002	-0.002	0.002
50.3.FL.c		Fault	0.009	0.000	0.007	0.066	-0.061	0.064	0.018	-0.005	0.015	0.026	-0.020	0.026
3ph/100%/2		Post	0.000	-0.002	0.002	0.005	-0.004	0.005	0.002	-0.003	0.003	0.005	-0.005	0.005
Ures 45-60 % Un	In accordance with IEC	Pre	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
50.3.PL.c		Fault	0.026	-0.002	0.007	0.065	-0.061	0.064	0.052	-0.005	0.015	0.026	-0.020	0.026
3ph/20%/2		Post	0.001	0.000	0.001	0.003	-0.001	0.003	0.001	0.000	0.002	0.003	-0.002	0.004
Ures 45-60 % Un	In accordance with IEC	Pre	0.001	-0.001	0.001	0.003	0.000	0.000	0.002	-0.002	0.002	0.003	0.000	0.000
50.3.FL.Lim.c		Fault	0.010	0.015	0.010	0.001	0.000	0.000	0.022	0.029	0.022	0.001	0.000	0.001
3ph/100%/2		Post	0.001	-0.011	0.012	0.003	0.000	0.001	0.002	-0.013	0.013	0.003	0.000	0.001
Ures 45-60 % Un	In accordance with IEC	Pre	0.002	-0.001	0.001	0.007	-0.005	0.005	0.003	0.002	0.002	0.009	-0.006	0.006
50.3.FL.OE.Lim.c		Fault	0.011	0.015	0.011	0.001	-0.001	0.000	0.023	0.027	0.022	0.001	-0.001	0.001
3ph/100%/2		Post	0.002	-0.012	0.012	0.008	-0.005	0.006	0.004	-0.009	0.013	0.009	-0.007	0.007
Ures 70-80 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.005	-0.002	0.002	0.001	-0.001	0.001	0.005	-0.002	0.002
75.3.FL.c		Fault	0.009	0.009	0.008	0.041	-0.037	0.039	0.009	0.008	0.008	0.054	-0.048	0.051
3ph/100%/2		Post	0.000	-0.001	0.001	0.005	-0.005	0.005	0.002	-0.002	0.002	0.005	-0.005	0.005
Ures 70-80 % Un	In accordance with IEC	Pre	0.031	0.000	0.000	0.003	0.001	0.001	0.010	0.000	0.000	0.004	0.001	0.001
75.3.PL.c		Fault	0.048	0.004	0.004	0.078	-0.038	0.039	0.007	0.004	0.004	0.095	-0.050	0.051
3ph/20%/2		Post	0.001	0.000	0.000	0.003	0.001	0.001	0.001	0.000	0.000	0.003	0.001	0.001
Ures 70-80 % Un	In accordance with IEC	Pre	0.031	0.000	0.000	0.013	0.001	0.001	0.011	-0.001	0.001	0.006	0.002	0.002
75.3.PL.OE.c		Fault	0.040	0.003	0.003	0.068	-0.033	0.034	0.009	0.002	0.002	0.145	-0.040	0.041
3ph/20%/2		Post	0.001	0.000	0.000	0.014	-0.002	0.003	0.001	-0.001	0.001	0.015	-0.001	0.002
Ures 70-80 % Un	In accordance with IEC	Pre	0.032	0.000	0.001	0.041	0.040	0.040	0.009	0.001	0.001	0.043	0.040	0.040
75.3.PL.UE.c		Fault	0.051	0.004	0.004	0.055	-0.008	0.008	0.007	0.004	0.004	0.154	-0.009	0.010
3ph/20%/2		Post	0.001	0.001	0.001	0.050	0.043	0.043	0.001	0.001	0.001	0.050	0.043	0.044
Ures 70-80 % Un	In accordance	Pre	0.001	0.000	0.000	0.002	0.001	0.001	0.000	0.000	0.000	0.002	0.001	0.001

75.3.PL.k4.c	with IEC	Fault	0.028	-0.006	0.011	0.102	-0.098	0.101	0.038	-0.008	0.015	0.154	-0.149	0.154
3ph/20%/4		Post	0.001	-0.001	0.001	0.002	-0.002	0.004	0.000	0.000	0.000	0.002	-0.003	0.005
Ures 75-85 % Un	In accordance with IEC	Pre	0.001	0.001	0.001	0.004	-0.002	0.002	0.001	0.000	0.000	0.004	-0.002	0.002
80.3.FL.Lim.c		Fault	0.110	0.010	0.009	0.065	-0.037	0.038	0.017	0.013	0.014	0.052	-0.047	0.049
3ph/100%/2		Post	0.001	0.001	0.001	0.005	-0.002	0.002	0.001	-0.001	0.001	0.005	-0.002	0.002
Ures 85-90 % Un	In accordance with IEC	Pre	0.018	0.001	0.001	0.004	0.002	0.002	0.004	0.001	0.001	0.005	0.002	0.002
85.3.PL_Long.c		Fault	0.025	0.015	0.015	0.066	-0.055	0.055	0.023	0.021	0.021	0.074	-0.072	0.072
3ph/20%/2		Post	0.001	0.001	0.001	0.003	0.001	0.002	0.001	0.001	0.001	0.003	0.001	0.002
Ures ≥ 110 % Un	In accordance with IEC	Pre	0.002	0.002	0.002	0.005	-0.002	0.002	0.001	0.000	0.000	0.005	-0.002	0.002
110.3.FL.c		Fault	0.005	0.004	0.004	0.016	-0.014	0.014	0.011	0.011	0.010	0.013	-0.011	0.011
3ph/100%/2		Post	0.002	0.002	0.002	0.004	-0.001	0.002	0.001	0.001	0.001	0.005	-0.001	0.002
Ures ≥ 110 % Un	In accordance with IEC	Pre	0.001	0.000	0.000	0.002	0.001	0.001	0.000	0.000	0.000	0.002	0.001	0.001
110.3.PL.c		Fault	0.003	-0.003	0.002	0.012	-0.010	0.010	0.001	-0.001	0.001	0.010	-0.008	0.008
3ph/20%/2		Post	0.001	0.001	0.001	0.003	0.002	0.002	0.001	0.000	0.000	0.003	0.002	0.002
Ures ≥ 110 % Un	In accordance with IEC	Pre	0.003	-0.003	0.003	0.000	0.000	0.000	0.003	-0.003	0.003	0.000	0.000	0.000
110_3_FL_Long.c		Fault	0.003	-0.003	0.003	0.023	0.023	0.023	0.003	-0.003	0.003	0.021	0.021	0.021
3ph/20%/2		Post	0.003	-0.003	0.003	0.000	0.000	0.000	0.003	-0.003	0.003	0.000	0.000	0.000
Ures ≤ 5 % Un	In accordance with IEC	Pre	0.003	-0.003	0.003	0.008	0.005	0.005	0.008	-0.008	0.008	0.008	0.005	0.005
00.3.FL.d		Fault	0.001	-0.015	0.000	0.001	-0.001	0.000	0.026	-0.034	0.018	0.002	0.024	0.001
3ph/100%/2		Post	0.004	-0.002	0.004	0.008	0.005	0.008	0.008	-0.007	0.009	0.008	0.003	0.007
Ures ≤ 5 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.002	0.001	0.001	0.001	-0.001	0.001	0.002	0.001	0.001
00.3.PL.d		Fault	0.001	-0.004	0.000	0.001	0.000	0.000	0.025	-0.023	0.017	0.002	0.026	0.001
3ph/20%/2		Post	0.001	0.000	0.000	0.002	0.001	0.004	0.001	-0.001	0.001	0.002	-0.001	0.003
Ures 20-30 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.008	0.006	0.006	0.005	-0.005	0.005	0.008	0.006	0.006
25.3.FL.d		Fault	0.002	-0.005	0.001	0.027	-0.025	0.027	0.011	0.000	0.007	0.024	-0.014	0.024
3ph/100%/2		Post	0.001	0.001	0.002	0.009	0.005	0.008	0.005	-0.004	0.006	0.009	0.004	0.008
Ures 20-30 % Un	In accordance with IEC	Pre	0.001	0.000	0.000	0.002	0.001	0.001	0.002	-0.001	0.001	0.002	0.001	0.001
25.3.PL.d		Fault	0.002	0.000	0.001	0.028	-0.025	0.027	0.011	0.007	0.007	0.024	-0.014	0.023
3ph/20%/2		Post	0.000	0.000	0.001	0.002	0.000	0.003	0.001	0.000	0.001	0.002	-0.001	0.003
Ures 45-60 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.007	0.005	0.005	0.005	-0.005	0.005	0.007	0.005	0.005
50.3.FL.d		Fault	0.043	-0.045	0.041	0.062	-0.060	0.062	0.086	-0.084	0.082	0.022	-0.017	0.021
3ph/100%/2		Post	0.000	0.001	0.001	0.008	0.004	0.007	0.005	-0.004	0.006	0.008	0.003	0.007
Ures 45-60 % Un	In accordance with IEC	Pre	0.001	0.000	0.000	0.002	0.001	0.001	0.002	-0.001	0.001	0.002	0.001	0.001
50.3.PL.d		Fault	0.030	-0.017	0.015	0.063	-0.061	0.063	0.059	-0.031	0.030	0.025	-0.019	0.024
3ph/20%/2		Post	0.001	0.000	0.001	0.002	0.000	0.003	0.002	-0.001	0.002	0.002	-0.001	0.004
Ures 45-60 % Un	In accordance with IEC	Pre	0.001	-0.001	0.001	0.005	0.005	0.005	0.005	-0.005	0.005	0.005	0.005	0.005
50.3.FL.Lim.d		Fault	0.012	0.006	0.011	0.001	0.000	0.000	0.023	0.016	0.022	0.001	0.001	0.001
3ph/100%/2		Post	0.001	0.010	0.011	0.008	0.005	0.005	0.005	0.006	0.015	0.008	0.005	0.005
Ures 45-60 % Un	In accordance with IEC	Pre	0.001	0.000	0.000	0.008	0.005	0.005	0.020	-0.019	0.019	0.003	0.000	0.000
50.3.FL.OE.Lim.d		Fault	0.012	0.006	0.011	0.001	-0.002	0.000	0.023	0.016	0.022	0.001	-0.002	0.001
3ph/100%/2		Post	0.002	0.011	0.011	0.008	0.005	0.006	0.020	-0.008	0.028	0.004	-0.001	0.002
Ures 70-80 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.008	0.006	0.006	0.001	0.001	0.001	0.008	0.006	0.006
75.3.FL.d		Fault	0.017	-0.016	0.015	0.030	-0.026	0.027	0.018	-0.016	0.016	0.037	-0.032	0.034
3ph/100%/2		Post	0.001	0.001	0.001	0.009	0.004	0.007	0.001	0.001	0.001	0.009	0.004	0.007
Ures 70-80 % Un	In accordance with IEC	Pre	0.011	0.000	0.000	0.003	0.002	0.002	0.011	-0.001	0.001	0.003	0.002	0.002
75.3.PL.d		Fault	0.054	-0.001	0.000	0.072	-0.038	0.038	0.006	0.000	0.000	0.146	-0.050	0.051
3ph/20%/2		Post	0.000	0.000	0.000	0.002	0.002	0.002	0.001	-0.001	0.001	0.002	0.002	0.002
Ures 70-80 % Un	In accordance with IEC	Pre	0.012	0.000	0.000	0.041	-0.040	0.040	0.009	0.001	0.001	0.041	-0.040	0.040
75.3.PL.OE.d		Fault	0.054	-0.001	0.001	0.109	-0.063	0.063	0.004	0.001	0.001	0.090	-0.080	0.080

3ph/20%/2		Post	0.001	0.000	0.000	0.045	-0.043	0.044	0.002	0.001	0.001	0.045	-0.043	0.043
Ures 70-80 % Un	In accordance with IEC	Pre	0.001	0.000	0.000	0.037	0.037	0.037	0.001	0.000	0.000	0.038	0.037	0.037
75.3.PL.UE.d		Fault	0.001	0.000	0.000	0.012	-0.010	0.011	0.002	0.001	0.001	0.016	-0.012	0.014
3ph/20%/2		Post	0.001	0.000	0.000	0.041	0.038	0.040	0.001	0.000	0.000	0.041	0.038	0.041
Ures 70-80 % Un	In accordance with IEC	Pre	0.002	-0.002	0.002	0.002	0.002	0.002	0.003	-0.003	0.003	0.002	0.002	0.002
75.3.PL.k4.d		Fault	0.049	-0.016	0.015	0.071	-0.067	0.070	0.065	-0.021	0.019	0.096	-0.091	0.095
3ph/20%/4		Post	0.002	-0.001	0.002	0.002	-0.001	0.004	0.003	-0.003	0.003	0.002	-0.002	0.005
Ures 75-85 % Un	In accordance with IEC	Pre	0.001	-0.001	0.001	0.005	0.003	0.003	0.005	0.005	0.005	0.005	0.003	0.003
80.3.FL.Lim.d		Fault	0.012	-0.012	0.011	0.029	-0.025	0.026	0.013	-0.012	0.012	0.035	-0.030	0.032
3ph/100%/2		Post	0.001	0.000	0.001	0.005	0.001	0.004	0.005	0.005	0.005	0.005	0.001	0.004
Ures 85-90 % Un	In accordance with IEC	Pre	0.024	0.000	0.000	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001
85.3.PL_Long.d		Fault	0.003	0.002	0.002	0.028	-0.026	0.026	0.003	0.002	0.002	0.033	-0.031	0.031
3ph/20%/2		Post	0.001	0.000	0.000	0.002	0.000	0.002	0.001	0.001	0.001	0.002	0.000	0.002
Ures ≥ 110 % Un	In accordance with IEC	Pre	0.052	-0.004	0.004	0.010	0.005	0.005	0.006	0.002	0.002	0.009	0.005	0.005
110.3.FL.d		Fault	0.030	-0.005	0.006	0.021	0.009	0.009	0.018	-0.010	0.010	0.012	0.009	0.009
3ph/100%/2		Post	0.004	-0.004	0.004	0.008	0.006	0.006	0.002	0.002	0.002	0.008	0.006	0.006
Ures ≥ 110 % Un	In accordance with IEC	Pre	0.010	0.000	0.000	0.002	0.001	0.001	0.006	0.002	0.002	0.002	0.001	0.001
110.3.PL.d		Fault	0.004	-0.003	0.004	0.032	-0.003	0.003	0.008	-0.005	0.005	0.019	-0.001	0.000
3ph/20%/2		Post	0.000	0.000	0.000	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Ures ≥ 110 % Un	In accordance with IEC	Pre	0.002	0.000	0.000	0.002	0.002	0.002	0.005	0.001	0.001	0.002	0.002	0.002
110_3_FL_Long.d		Fault	0.004	-0.003	0.003	0.114	-0.016	0.016	0.010	-0.004	0.004	0.093	-0.013	0.013
3ph/20%/2		Post	0.001	0.000	0.000	0.003	0.002	0.002	0.001	0.001	0.001	0.003	0.002	0.002

Test designation compliant with TG4 Rev.10 Response during grid faults. Table 4-82			Two phase voltage drops in positive phase sequence system											
			P			Q			Ia			Iq		
			MXE	ME	MAE	MXE	ME	MAE	MXE	ME	MAE	MXE	ME	MAE
Ures ≤ 5 % Un	In accordance with IEC	Pre	0.002	0.002	0.002	0.004	-0.002	0.002	0.002	-0.002	0.002	0.004	-0.002	0.002
00.2.FL.c		Fault	0.003	0.010	0.003	0.004	0.009	0.004	0.007	0.008	0.007	0.012	0.021	0.010
2ph/100%/2		Post	0.002	-0.001	0.004	0.005	-0.003	0.003	0.003	-0.005	0.005	0.005	-0.003	0.003
Ures ≤ 5 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0.001	0.001	0.001
00.2.PL.c		Fault	0.004	0.001	0.003	0.004	0.008	0.004	0.007	-0.001	0.007	0.012	0.020	0.011
2ph/20%/2		Post	0.001	0.000	0.001	0.003	0.000	0.002	0.001	0.000	0.001	0.003	0.000	0.002
Ures 20-30 % Un	In accordance with IEC	Pre	0.002	0.002	0.002	0.005	-0.002	0.002	0.002	-0.002	0.002	0.005	-0.002	0.002
25.2.FL.c		Fault	0.005	0.002	0.004	0.003	0.006	0.003	0.008	0.000	0.007	0.010	0.013	0.008
2ph/100%/2		Post	0.002	-0.001	0.004	0.005	-0.003	0.004	0.002	-0.004	0.004	0.005	-0.004	0.004
Ures 20-30 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.002	0.001	0.001	0.000	0.000	0.000	0.002	0.001	0.001
25.2.PL.c		Fault	0.005	-0.002	0.004	0.004	0.006	0.004	0.008	-0.004	0.007	0.011	0.013	0.009
2ph/20%/2		Post	0.000	0.000	0.001	0.003	0.000	0.002	0.000	0.000	0.001	0.003	-0.001	0.002
Ures 45-60 % Un	In accordance with IEC	Pre	0.002	0.002	0.002	0.005	-0.002	0.002	0.002	-0.002	0.002	0.005	-0.002	0.002
50.2.FL.c		Fault	0.007	0.000	0.005	0.024	-0.021	0.023	0.009	-0.001	0.007	0.034	-0.029	0.032
2ph/100%/2		Post	0.002	0.000	0.003	0.005	-0.004	0.004	0.002	-0.003	0.003	0.005	-0.004	0.004
Ures 45-60 % Un	In accordance with IEC	Pre	0.001	0.000	0.000	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001
50.2.PL.c		Fault	0.007	-0.004	0.006	0.026	-0.023	0.025	0.009	-0.005	0.007	0.038	-0.035	0.037
2ph/20%/2		Post	0.001	0.000	0.001	0.003	0.000	0.002	0.001	0.000	0.001	0.003	-0.001	0.002
Ures 45-60 % Un	In accordance with IEC	Pre	0.065	0.002	0.002	0.023	-0.002	0.002	0.017	-0.002	0.002	0.024	-0.002	0.002
50.2.FL.Lim.c		Fault	0.022	0.018	0.015	0.133	0.001	0.002	0.028	0.023	0.020	0.140	0.001	0.002
2ph/100%/2		Post	0.002	-0.006	0.009	0.005	-0.003	0.003	0.002	-0.009	0.009	0.005	-0.003	0.003
Ures 70-80 % Un	In accordance with IEC	Pre	0.002	0.002	0.002	0.006	-0.003	0.003	0.002	-0.002	0.002	0.006	-0.003	0.003
75.2.FL.c		Fault	0.056	0.056	0.055	0.018	-0.015	0.017	0.064	0.063	0.062	0.021	-0.018	0.019
2ph/100%/2		Post	0.002	0.001	0.003	0.006	-0.004	0.004	0.002	-0.003	0.003	0.006	-0.004	0.004
Ures 70-80 % Un	In accordance with IEC	Pre	0.027	0.000	0.001	0.007	0.001	0.001	0.008	0.000	0.001	0.007	0.001	0.001
75.2.PL.c		Fault	0.009	0.000	0.000	0.034	-0.021	0.021	0.013	0.001	0.001	0.030	-0.025	0.025
2ph/20%/2		Post	0.001	0.000	0.001	0.003	0.001	0.002	0.001	0.001	0.001	0.003	0.001	0.002
Ures 70-80 % Un	In accordance with IEC	Pre	0.001	-0.001	0.001	0.001	0.001	0.001	0.001	-0.001	0.001	0.001	0.001	0.001
75.2.PL.k4.c		Fault	0.010	-0.007	0.008	0.052	-0.046	0.048	0.011	-0.007	0.009	0.064	-0.057	0.060
2ph/20%/4		Post	0.001	-0.001	0.001	0.002	-0.001	0.003	0.001	-0.001	0.001	0.002	-0.001	0.003
Ures 75-85 % Un	In accordance with IEC	Pre	0.002	0.001	0.001	0.004	-0.002	0.002	0.003	-0.002	0.002	0.004	-0.002	0.002
80.2.FL.Lim.c		Fault	0.026	0.026	0.026	0.193	0.190	0.191	0.023	0.022	0.023	0.217	0.213	0.214
2ph/100%/0		Post	0.002	0.001	0.002	0.005	-0.002	0.002	0.003	-0.003	0.003	0.005	-0.002	0.002
Ures ≥ 110 % Un	In accordance with IEC	Pre	0.002	0.002	0.002	0.004	-0.001	0.001	0.004	-0.004	0.004	0.004	-0.001	0.001
110.2.FL.c		Fault	0.003	0.001	0.001	0.009	-0.006	0.006	0.009	0.007	0.007	0.008	-0.005	0.005
2ph/100%/2		Post	0.002	0.002	0.002	0.004	-0.001	0.001	0.004	-0.004	0.004	0.004	-0.001	0.001
Ures ≥ 110 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.002	0.002	0.002	0.001	0.000	0.000	0.002	0.002	0.002
110.2.PL.c		Fault	0.005	-0.003	0.003	0.007	-0.006	0.006	0.003	-0.002	0.002	0.007	-0.005	0.005
2ph/20%/2		Post	0.001	0.000	0.000	0.003	0.002	0.002	0.000	0.000	0.000	0.003	0.002	0.002
Ures ≤ 5 % Un	In accordance with IEC	Pre	0.003	-0.003	0.003	0.006	0.003	0.003	0.006	-0.006	0.006	0.006	0.003	0.003
00.2.FL.d		Fault	0.007	-0.038	0.006	0.005	0.016	0.004	0.014	-0.034	0.012	0.012	0.035	0.012
2ph/100%/2		Post	0.003	0.008	0.014	0.006	0.000	0.007	0.006	0.005	0.017	0.006	-0.003	0.009
Ures ≤ 5 % Un	In accordance with IEC	Pre	0.001	0.001	0.001	0.002	0.001	0.001	0.000	0.000	0.000	0.002	0.001	0.001
00.2.PL.d		Fault	0.007	0.003	0.006	0.005	0.008	0.004	0.014	0.009	0.012	0.012	0.020	0.011
2ph/20%/2		Post	0.001	0.001	0.001	0.002	0.000	0.002	0.000	0.001	0.001	0.002	0.000	0.002
Ures 20-30 % Un	In accordance	Pre	0.001	-0.001	0.001	0.007	0.006	0.006	0.003	-0.003	0.003	0.007	0.006	0.006

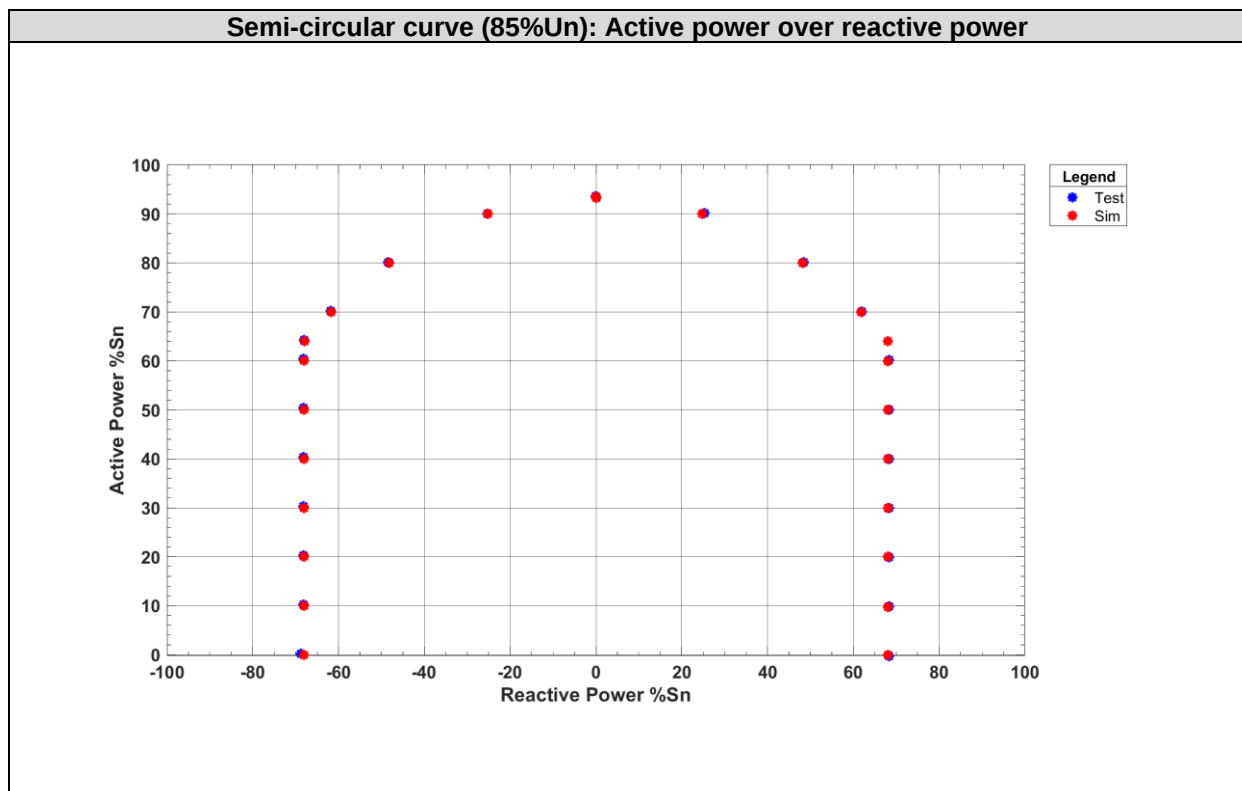
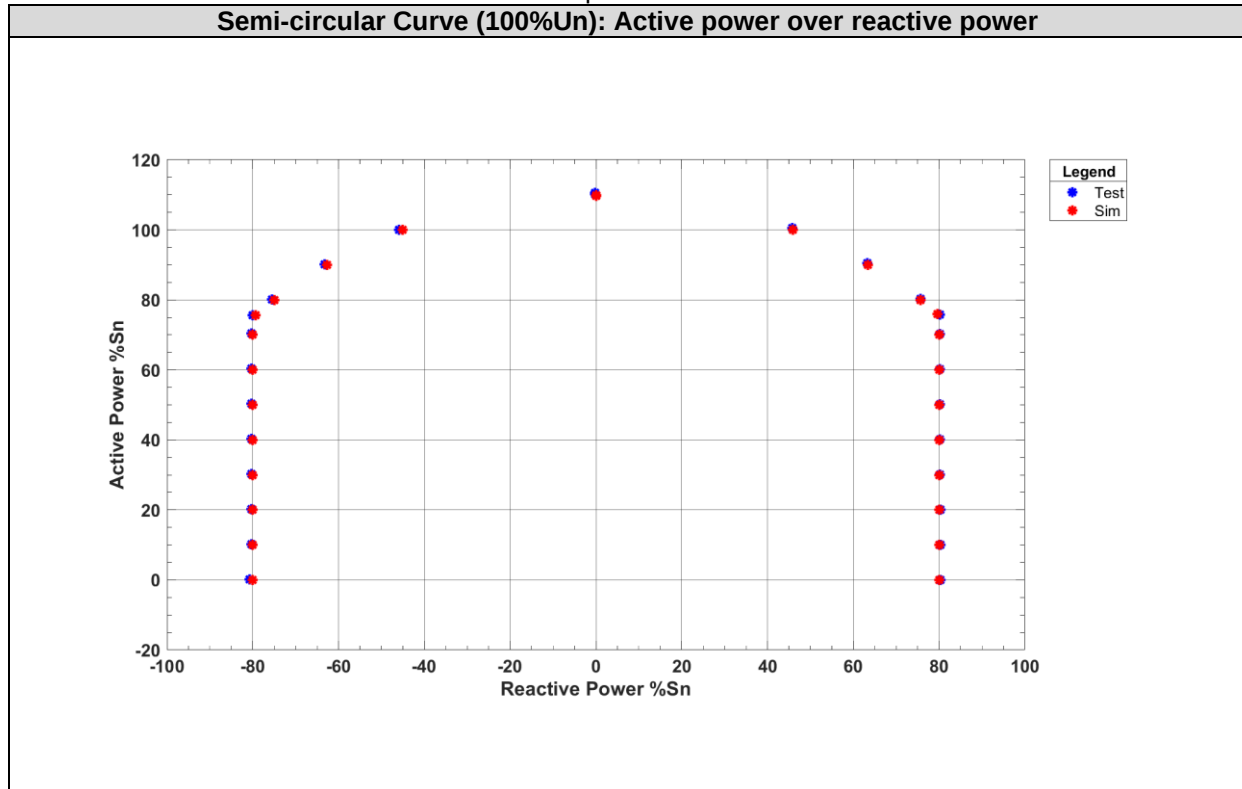
25.2.FL.d	with IEC	Fault	0.008	0.002	0.008	0.006	0.007	0.005	0.013	0.006	0.012	0.013	0.015	0.012
2ph/100%/2		Post	0.001	0.001	0.002	0.009	0.006	0.007	0.004	-0.002	0.005	0.009	0.005	0.007
Ures 20-30 % Un	In accordance with IEC	Pre	0.001	0.001	0.001	0.002	0.001	0.001	0.000	0.000	0.000	0.002	0.001	0.001
25.2.PL.d		Fault	0.009	0.006	0.008	0.005	0.007	0.004	0.014	0.010	0.012	0.011	0.014	0.011
2ph/20%/2		Post	0.001	0.001	0.001	0.002	0.000	0.002	0.000	0.001	0.001	0.002	0.000	0.002
Ures 45-60 % Un	In accordance with IEC	Pre	0.001	-0.001	0.001	0.009	0.006	0.006	0.003	-0.003	0.003	0.009	0.006	0.006
50.2.FL.d		Fault	0.008	-0.013	0.007	0.023	-0.020	0.022	0.010	-0.016	0.009	0.035	-0.030	0.033
2ph/100%/2		Post	0.001	-0.001	0.001	0.009	0.005	0.007	0.003	-0.003	0.004	0.009	0.005	0.008
Ures 45-60 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.002	0.001	0.001	0.001	-0.001	0.001	0.002	0.001	0.001
50.2.PL.d		Fault	0.008	-0.008	0.007	0.024	-0.022	0.023	0.011	-0.010	0.009	0.036	-0.033	0.035
2ph/20%/2		Post	0.000	0.000	0.001	0.002	0.000	0.002	0.001	-0.001	0.001	0.002	0.000	0.003
Ures 45-60 % Un	In accordance with IEC	Pre	0.001	-0.001	0.001	0.006	0.005	0.005	0.004	-0.004	0.004	0.006	0.005	0.005
50.2.FL.Lim.d		Fault	0.015	0.008	0.015	0.002	0.001	0.001	0.021	0.013	0.020	0.002	0.001	0.002
2ph/100%/2		Post	0.001	0.010	0.012	0.008	0.004	0.005	0.004	0.007	0.014	0.008	0.004	0.005
Ures 70-80 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.005	0.004	0.004	0.002	0.002	0.002	0.005	0.004	0.004
75.2.FL.d		Fault	0.065	-0.065	0.063	0.015	-0.011	0.012	0.073	-0.072	0.071	0.017	-0.013	0.014
2ph/100%/2		Post	0.000	0.001	0.001	0.007	0.004	0.005	0.002	0.003	0.003	0.007	0.004	0.005
Ures 70-80 % Un	In accordance with IEC	Pre	0.001	0.001	0.001	0.002	0.001	0.001	0.002	0.001	0.001	0.002	0.001	0.001
75.2.PL.d		Fault	0.002	0.000	0.000	0.017	-0.015	0.016	0.003	0.001	0.001	0.019	-0.016	0.017
2ph/20%/2		Post	0.001	0.001	0.001	0.002	0.000	0.002	0.002	0.002	0.002	0.002	0.000	0.002
Ures 70-80 % Un	In accordance with IEC	Pre	0.001	0.000	0.000	0.002	0.001	0.001	0.000	0.000	0.000	0.002	0.001	0.001
75.2.PL.k4.d		Fault	0.011	-0.009	0.009	0.038	-0.034	0.036	0.012	-0.011	0.010	0.047	-0.042	0.044
2ph/20%/4		Post	0.001	0.000	0.001	0.002	0.000	0.003	0.000	0.000	0.001	0.002	-0.001	0.003
Ures 75-85 % Un	In accordance with IEC	Pre	0.001	0.000	0.000	0.007	0.005	0.005	0.003	-0.003	0.003	0.007	0.005	0.005
80.2.FL.Lim.d		Fault	0.008	0.007	0.008	0.007	0.004	0.004	0.006	0.004	0.004	0.007	0.005	0.005
2ph/100%/0		Post	0.000	0.000	0.001	0.008	0.005	0.005	0.003	-0.003	0.003	0.008	0.005	0.005
Ures ≥ 110 % Un	In accordance with IEC	Pre	0.003	-0.003	0.003	0.008	0.005	0.005	0.006	-0.005	0.005	0.008	0.005	0.005
110.2.FL.d		Fault	0.005	-0.004	0.004	0.010	-0.007	0.007	0.009	-0.008	0.008	0.009	-0.006	0.006
2ph/100%/2		Post	0.003	-0.003	0.003	0.008	0.006	0.006	0.006	-0.005	0.005	0.008	0.006	0.006
Ures ≥ 110 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.003	0.002	0.002	0.001	-0.001	0.001	0.003	0.002	0.002
110.2.PL.d		Fault	0.004	-0.003	0.003	0.005	-0.003	0.003	0.005	-0.004	0.004	0.004	-0.003	0.003
2ph/20%/2		Post	0.000	0.000	0.000	0.003	0.002	0.002	0.001	-0.001	0.001	0.003	0.002	0.002

Test designation compliant with TG4 Rev.10 Response during grid faults. Table 4-82			Two phase voltage drops in negative phase sequence system											
			P			Q			Ia			Iq		
			MXE	ME	MAE	MXE	ME	MAE	MXE	ME	MAE	MXE	ME	MAE
Ures ≤ 5 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.005	0.005	0.002	0.001	0.001
00.2.FL.c		Fault	0.008	0.008	0.008	0.005	-0.007	0.004	0.016	0.017	0.016	0.013	-0.009	0.005
2ph/100%/2		Post	0.000	0.000	0.000	0.000	0.001	0.001	0.006	0.006	0.006	0.002	0.005	0.005
Ures ≤ 5 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-0.001	0.001	0.002	0.002	0.002
00.2.PL.c		Fault	0.008	0.007	0.008	0.004	-0.009	0.004	0.017	0.016	0.016	0.005	-0.014	0.004
2ph/20%/2		Post	0.000	0.000	0.000	0.000	0.001	0.001	0.002	-0.001	0.002	0.003	0.005	0.006
Ures 20-30 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.005	0.005	0.003	0.002	0.002
25.2.FL.c		Fault	0.006	0.005	0.005	0.005	-0.001	0.000	0.015	0.013	0.013	0.022	0.004	0.008
2ph/100%/2		Post	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.005	0.006	0.003	0.005	0.005
Ures 20-30 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-0.001	0.001	0.003	0.002	0.002
25.2.PL.c		Fault	0.005	0.005	0.005	0.001	-0.001	0.000	0.014	0.012	0.013	0.010	0.005	0.009
2ph/20%/2		Post	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-0.001	0.002	0.003	0.005	0.005
Ures 45-60 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.005	0.005	0.002	0.001	0.001
50.2.FL.c		Fault	0.003	0.002	0.002	0.016	0.015	0.016	0.011	0.009	0.009	0.063	0.058	0.061
2ph/100%/2		Post	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.005	0.006	0.003	0.004	0.004
Ures 45-60 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-0.001	0.001	0.002	0.002	0.002
50.2.PL.c		Fault	0.003	0.002	0.002	0.020	0.019	0.020	0.011	0.009	0.009	0.071	0.067	0.069
2ph/20%/2		Post	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-0.001	0.002	0.003	0.005	0.005
Ures 45-60 % Un	In accordance with IEC	Pre	0.001	0.000	0.000	0.001	0.000	0.000	0.014	0.006	0.006	0.010	0.001	0.001
50.2.FL.Lim.c		Fault	0.006	0.001	0.001	0.007	-0.007	0.007	0.045	0.004	0.004	0.028	-0.027	0.028
2ph/100%/2		Post	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.005	0.006	0.002	0.001	0.002
Ures 70-80 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.005	0.005	0.003	0.002	0.002
75.2.FL.c		Fault	0.000	0.000	0.000	0.002	0.002	0.002	0.002	0.000	0.001	0.017	0.014	0.016
2ph/100%/2		Post	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.005	0.005	0.003	0.003	0.003
Ures 70-80 % Un	In accordance with IEC	Pre	0.001	0.000	0.000	0.001	0.000	0.000	0.017	-0.001	0.002	0.018	0.002	0.002
75.2.PL.c		Fault	0.006	0.000	0.000	0.012	0.006	0.006	0.060	0.001	0.001	0.049	0.047	0.048
2ph/20%/2		Post	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-0.001	0.002	0.002	0.003	0.003
Ures 70-80 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.000	0.000	0.000	0.003	-0.002	0.002	0.001	0.001	0.001
75.2.PL.k4.c		Fault	0.001	0.000	0.000	0.017	0.017	0.017	0.005	0.002	0.002	0.111	0.104	0.107
2ph/20%/4		Post	0.000	0.000	0.000	0.000	0.000	0.000	0.003	-0.002	0.002	0.002	0.003	0.003
Ures 75-85 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.005	0.005	0.002	0.001	0.001
80.2.FL.Lim.c		Fault	0.000	0.000	0.000	0.022	-0.022	0.022	0.004	-0.003	0.003	0.215	-0.213	0.213
2ph/100%/0		Post	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.005	0.005	0.003	0.002	0.002
Ures ≥ 110 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.005	0.005	0.002	0.001	0.001
110.2.FL.c		Fault	0.001	0.000	0.000	0.002	-0.002	0.002	0.009	0.008	0.007	0.010	-0.008	0.008
2ph/100%/2		Post	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.005	0.005	0.003	0.002	0.002
Ures ≥ 110 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-0.001	0.001	0.002	0.002	0.002
110.2.PL.c		Fault	0.000	0.000	0.000	0.001	-0.001	0.001	0.008	0.006	0.006	0.003	0.001	0.001
2ph/20%/2		Post	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-0.001	0.001	0.003	0.002	0.002
Ures ≤ 5 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.004	0.004	0.007	-0.005	0.005
00.2.FL.d		Fault	0.008	0.005	0.008	0.005	-0.014	0.003	0.017	0.010	0.016	0.016	-0.024	0.003
2ph/100%/2		Post	0.000	0.000	0.000	0.000	0.003	0.003	0.006	0.004	0.005	0.007	0.003	0.014
Ures ≤ 5 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.000	0.000	0.000	0.001	-0.001	0.001	0.002	-0.002	0.002
00.2.PL.d		Fault	0.008	0.007	0.008	0.004	-0.009	0.004	0.017	0.015	0.016	0.004	-0.014	0.003
2ph/20%/2		Post	0.000	0.000	0.000	0.000	0.001	0.001	0.001	-0.001	0.001	0.002	0.002	0.005
Ures 20-30 % Un	In accordance	Pre	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.004	0.004	0.007	-0.006	0.006

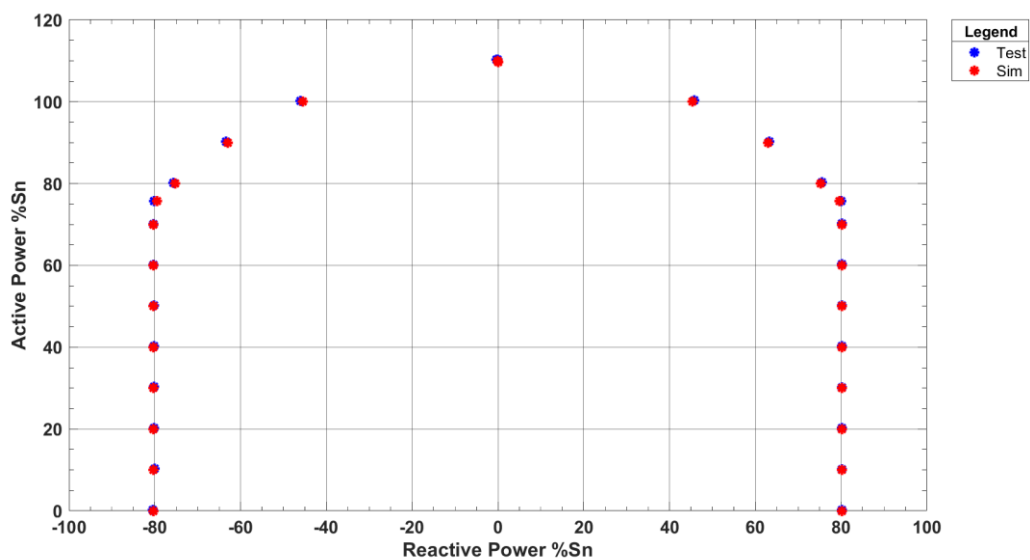
25.2.FL.d	with IEC	Fault	0.006	0.004	0.005	0.005	0.000	0.001	0.015	0.012	0.013	0.023	0.008	0.012
2ph/100%/2		Post	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.004	0.004	0.007	-0.003	0.009
Ures 20-30 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.000	0.000	0.000	0.001	-0.001	0.001	0.002	-0.002	0.002
25.2.PL.d		Fault	0.005	0.005	0.005	0.001	-0.001	0.001	0.014	0.013	0.013	0.011	0.005	0.010
2ph/20%/2	In accordance with IEC	Post	0.000	0.000	0.000	0.000	0.000	0.000	0.001	-0.001	0.001	0.002	0.002	0.005
Ures 45-60 % Un		Pre	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.003	0.003	0.007	-0.006	0.006
50.2.FL.d	In accordance with IEC	Fault	0.003	0.002	0.002	0.023	0.020	0.021	0.011	0.009	0.009	0.082	0.071	0.074
2ph/100%/2		Post	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.003	0.004	0.008	-0.004	0.009
Ures 45-60 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.000	0.000	0.000	0.001	-0.001	0.001	0.002	-0.002	0.002
50.2.PL.d		Fault	0.003	0.002	0.002	0.020	0.019	0.020	0.011	0.009	0.009	0.072	0.069	0.071
2ph/20%/2	In accordance with IEC	Post	0.000	0.000	0.000	0.000	0.000	0.000	0.001	-0.001	0.001	0.002	0.001	0.004
Ures 45-60 % Un		Pre	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.003	0.003	0.007	-0.006	0.006
50.2.FL.Lim.d	In accordance with IEC	Fault	0.001	0.001	0.001	0.007	-0.006	0.007	0.004	0.004	0.004	0.028	-0.026	0.028
2ph/100%/2		Post	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.003	0.004	0.008	-0.006	0.006
Ures 70-80 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.003	0.003	0.006	-0.006	0.006
75.2.FL.d		Fault	0.001	0.000	0.000	0.001	0.001	0.001	0.004	0.002	0.002	0.009	0.006	0.007
2ph/100%/2	In accordance with IEC	Post	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.004	0.004	0.007	-0.004	0.006
Ures 70-80 % Un		Pre	0.000	0.000	0.000	0.000	0.000	0.000	0.001	-0.001	0.001	0.002	-0.002	0.002
75.2.PL.d	In accordance with IEC	Fault	0.001	0.000	0.000	0.005	0.005	0.005	0.005	0.003	0.003	0.044	0.041	0.043
2ph/20%/2		Post	0.000	0.000	0.000	0.000	0.000	0.000	0.001	-0.001	0.001	0.002	0.000	0.003
Ures 70-80 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-0.001	0.001	0.002	-0.001	0.001
75.2.PL.k4.d		Fault	0.001	0.000	0.000	0.018	0.017	0.017	0.005	0.002	0.002	0.112	0.106	0.110
2ph/20%/4	In accordance with IEC	Post	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-0.001	0.002	0.002	0.001	0.003
Ures 75-85 % Un		Pre	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.003	0.003	0.007	-0.006	0.006
80.2.FL.Lim.d	In accordance with IEC	Fault	0.001	0.001	0.001	0.002	-0.002	0.002	0.008	0.007	0.007	0.016	-0.015	0.015
2ph/100%/0		Post	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.003	0.003	0.007	-0.006	0.006
Ures ≥ 110 % Un	In accordance with IEC	Pre	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.004	0.004	0.006	-0.005	0.005
110.2.FL.d		Fault	0.000	0.000	0.000	0.001	0.001	0.001	0.004	0.002	0.002	0.018	0.015	0.016
2ph/100%/2	In accordance with IEC	Post	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.004	0.004	0.007	-0.005	0.006
Ures ≥ 110 % Un		Pre	0.000	0.000	0.000	0.000	0.000	0.000	0.001	-0.001	0.001	0.002	-0.002	0.002
110.2.PL.d	In accordance with IEC	Fault	0.000	0.000	0.000	0.001	0.001	0.001	0.007	0.005	0.005	0.017	0.015	0.015
2ph/20%/2		Post	0.000	0.000	0.000	0.000	0.000	0.000	0.001	-0.001	0.001	0.002	-0.001	0.002

3.1.2 Simulation results of Voltage-Dependent PQ diagrams

Note: These results are extracted from the test report no. 240282RECO03-TG4



Semi-circular curve (115%Un): Active power over reactive power



3.2 Validation conclusion

Once done the entire tests required to carry out the comparison between simulation and real tests, it is demonstrated that the behaviours of the electronic equipment and its dynamic simulation model **FULLY COMPLIES** ⁽¹⁾ with validation requirements according to the specifications of the standard:

- FGW Technical Guidelines for Power Generating Units. Part 4 - Revision 10, dated on 05/04/2022 (FGW TG4 Rev.10): Demands on Modelling and Validating Simulation Models of the Electrical Characteristics of Power Generating Units and Systems, Storage Systems as well as their Components.

Using as reference following standard:

- VDE-AR-N 4110: 2023-09. Technical requirements for the connection and operation of customer installations to the medium voltage network (TAR medium voltage).
- VDE-AR-N 4120: 2018-11+A1:2024-04. Technical requirements for the connection and operation of customer installations to the high voltage network (TAR high voltage).

The Dynamic Simulation Model can be considered as validated to simulate with the required accuracy test cases over the models ZPM-PCS215K-R and ZPM-PCS125K-R.

⁽¹⁾ Simulation results offered in this validation report were obtained with the DIgSILENT PowerFactory 2024 Version 24.0.2.0. The validation report does not guarantee the compliance of upper version of DIgSILENT PowerFactory 2024 Version 24.0.2.0.

4 TECHNICAL DATA

4.1 TECHNICAL DATA

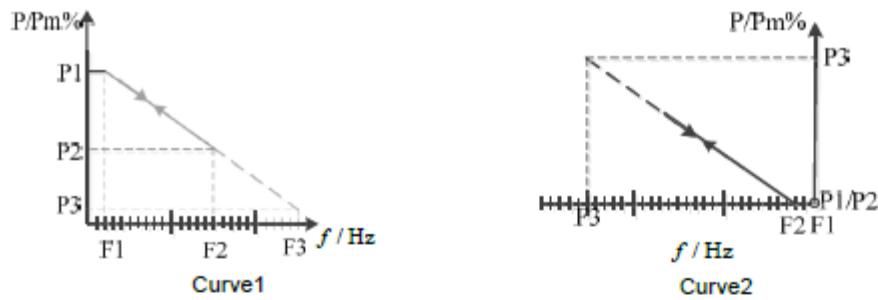
Model	ZPM-PCS125K-R	ZPM-PCS215K-R
DC side		
Maximum DC voltage	1200 V	1500 V
DC voltage operating range	600 – 1200 V	1000-1500 V
Maximum DC current	220 A	220 A
AC side		
Rated AC power	125 kW	215 kW
Maximum AC active power	138 kW	237 kW
Maximum AC apparent power	138 kVA	237 kVA
Rated AC current	180 A	180 A
Maximum AC current	198 A	198 A
Rated grid voltage	400 V, 3W+PE	690 V, 3W+PE
Rated grid frequency	50/60 Hz	50/60 Hz
Power factor	-1 ~ +1, adjustable	-1 ~ +1, adjustable
System characteristics		
Working environment temperature	-35 °C ~ +60 °C	
Cooling method	Temperature controlled forced air cooling	
Protection level	IP66	
Topology	Non-isolated	

4.2 Overview of important parameters of the generation unit

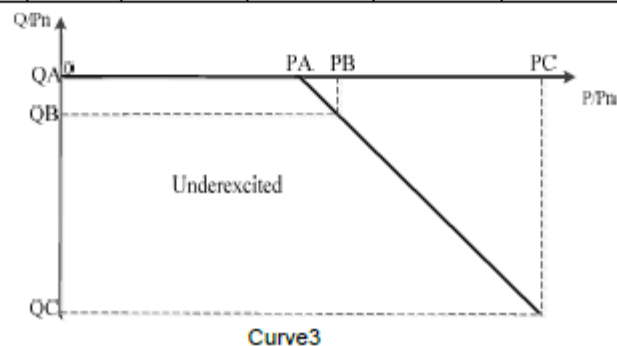
The settings may be specific for each project and need to be checked.

Parameter description	Unit	Default Value	Min.	Max.	Step- wide	Note
Behaviour in the event of disturbances in the network						
LVRT Voltage 1	Un%	25	0	200	1	
LVRT Time 1	ms	1450	0	65530	1	
LVRT Voltage 2	Un%	50	0	200	1	
LVRT Time 2	ms	2500	0	65530	1	
LVRT Voltage 3	Un%	75	0	200	1	
LVRT Time 3	ms	3100	0	65530	1	
LVRT Voltage 4	Un%	90	0	200	1	
LVRT Time 4	ms	60100	0	65530	1	
Zero Power mode	Un%	50	0	200	1	
LVRT Exit	Un%	91	0	200	1	
LVRT Exit Time	ms	0	0	65530	1	
HVRT Protection Level		4	1	4		
HVRT Voltage 1	Un%	125	0	200	1	
HVRT Time 1	ms	160	0	65530	1	
HVRT Voltage 2	Un%	120	0	200	1	
HVRT Time 2	ms	5100	0	65530	1	
HVRT Voltage 3	Un%	115	0	200	1	
HVRT Time 3	ms	5100	0	65530	1	
HVRT Voltage 4	Un%	110	0	200	1	
HVRT Time 4	ms	60100	0	65530	1	
Zero Current mode	Un%	120	0	200	1	
HVRT Exit	Un%	109	0	200	1	
HVRT Exit Time	ms	0	0	65530	1	
LVRT K Factor		2.0	0	10	0.1	
HVRT K Factor		2.0	0	10	0.1	
Gradient for active power increase after fault recovery	%Pn/min	3000	0	65530	1	
Active power by setpoint set						
Pac Limit	%Pn	0	-120	120	1	
Active speed control	On/Off	ON				
Active Power Decline Speed	%Pn/min	600000	10	600000	1	
Active Power Rising Speed	%Pn/min	600000	10	600000	1	
Description of interfaces		CAN				CAN, RS485, Ethernet
Behaviour at P=0		No active power output				

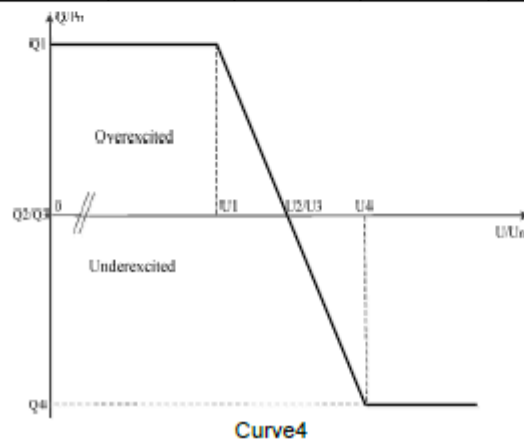
Parameter description	Unit	Default Value	Min.	Max.	Step- wide	Note
Active power reduction at overfrequency						
Over frequency derating	On/Off	On				
Gradient	%Pm/Hz	100	1	200	1	
F1	Hz	50.2	50.0	55.0	0.01	
P1	%Pm	100	-100	100	1	
F2	Hz	50.3	50.0	55.0	0.01	
P2	%Pm	90	-100	100	1	
F3	Hz	51.4	50.0	55.0	0.01	
P3	%Pm	-20	-100	100	1	
Active power drop rate in overfrequency drop	s	<1				
Active power restoration rate after overfrequency drop	%Pn/min	9	0	100	1	
Overfrequency drop curve		Curve1				
Underfrequency increment	On/Off	On				
Gradient	%Pm/Hz	100	1	200	1	
F1	Hz	50	45.0	50.0	0.01	
P1	%Pm	-100	-100	100	1	
F2	Hz	49.8	45.0	50.0	0.01	
P2	%Pm	-100	-100	100	1	
F3	Hz	47.8	45.0	50.0	0.01	
P3	%Pm	100	-100	100	1	
Active power rise rate in underfrequency drop	s	<1				
Active power restoration rate after underfrequency drop	%Pn/min	9	0	100	1	
Underfrequency drop curve		Curve2				
Others						
Islanding judge criteria (When select 'Frequency change protection')	On/Off	On (Size and direction of frequency change)				
Frequency change	Hz/s	2.5				
Protection time	s	0.06				



Parameter description	Unit	Default Value	Min.	Max.	Step- wide	Note
Reactive power supply						
Reactive power regulation mode (when select 'Reactive adjusting switch')	Off/Pf/Qt/Q(P)/Q(U)	Off				
Reactive power supply. Mode PF: The reactive power can be regulated by the parameter PF (Power Factor).						
PF (when select Pf).		1.00	-1	1	0.01	
Reactive power supply. Mode Qt: The reactive power can be regulated by the parameter 'Reactive power limit' (in %).						
Reactive power limit (when select Qt).	%Pn	0.00	0.00	100	0.01	
Reactive power supply. Mode Q(P): The reactive ratio or power factor changes with the output power of the PCS.						
Q(P) Curve (when select Q(P))		Curve3				
Active power ratioPA	%Pn	50	0	100	1	
Active power ratioPB	%Pn	80	0	100	1	
Active power ratioPC	%Pn	100	0	100	1	
Corresponding reactive ratio or power factor of active power ratio PA point	%Pn	0	-100	100	1	
Corresponding reactive ratio or power factor of active power ratio PB point	%Pn	-5	-100	100	1	
Corresponding reactive ratio or power factor of active power ratio PC point	%Pn	-80	-100	100	1	



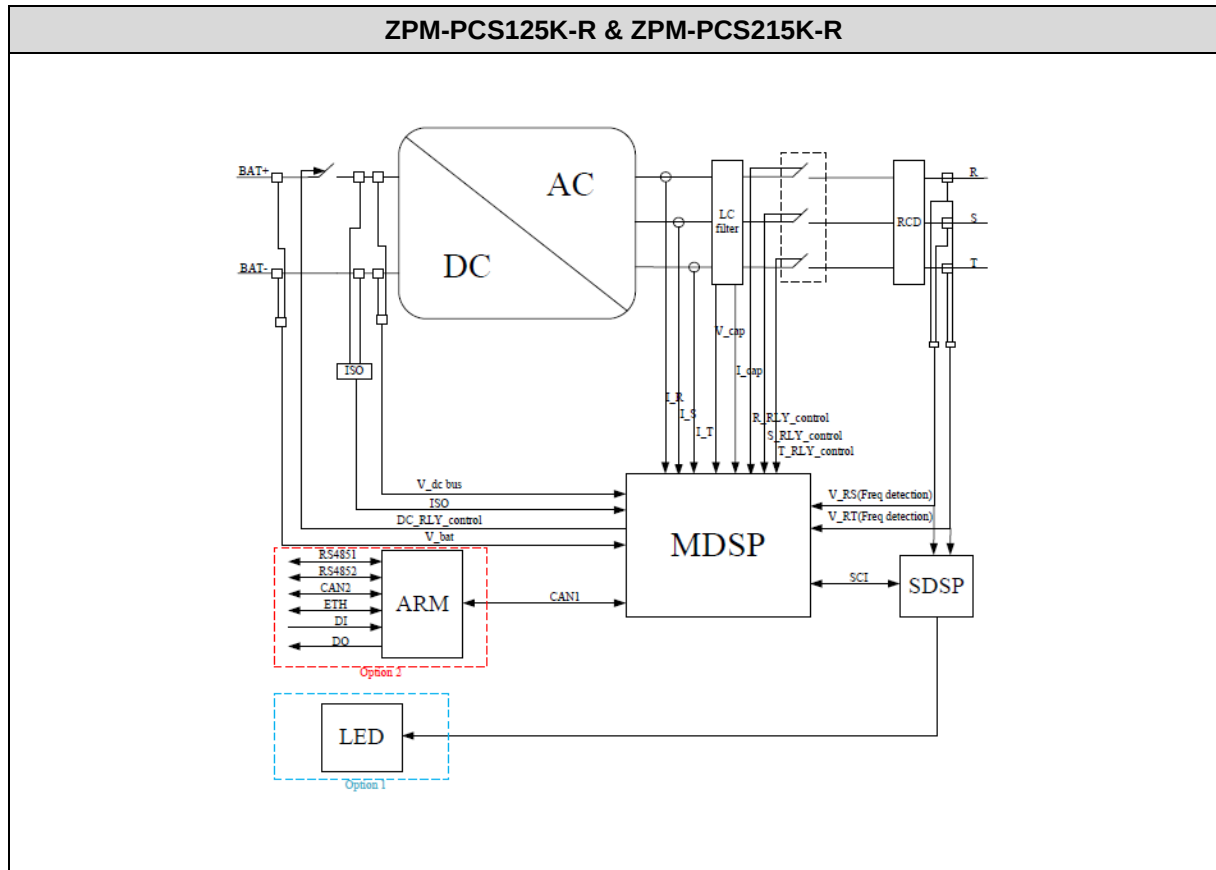
Parameter description	Unit	Default Value	Min.	Max.	Step- wide	Note
Reactive power supply. Mode Q(U): The reactive power changes with the grid voltage.						
Q(U) curve		Curve4				
Hysteretic proportion	%Un	0	0	5	1	
Voltage proportion U1	%Un	96	0	110	1	
Voltage proportion U2	%Un	100	0	110	1	
Voltage proportion U3	%Un	100	0	110	1	
Voltage proportion U4	%Un	104	0	110	1	
Corresponding reactive ratio of voltage proportion U1	%Pn	80	0	80	1	
Corresponding reactive ratio of voltage proportion U2	%Pn	0	0	80	1	
Corresponding reactive ratio of voltage proportion U3	%Pn	0	-80	0	1	
Corresponding reactive ratio of voltage proportion U4	%Pn	-80	-80	0	1	
Reactive response	On/Off	On				
Reactive response time	s	1	0	600	1	



Limits for re-energising (reconnection after fault event)						
Undervoltage Protection Recovery Value	V	218.5	23.0	230.0	0.1	
Overvoltage Protection Recovery Value	V	253.0	230.0	299.0	0.1	
Underfrequency Protection Recovery Value	Hz	49.9	0.0	50.0	0.01	
Overfrequency Protection Recovery Value	Hz	50.1	50.0	70.0	0.01	
Fault Recovery Time	s	300	0	80000	1	
Fault Recovery Active Soft Start	On/Off	On				
Fault Recovery Active Power Rising Rate	%Pn/min	30	1	80000	1	
Limits for connection (without previous trip)						
Grid Connection Condition		Grid normal range				
Grid Connection Voltage Minimum	V	207.0	23.0	230.0	0.1	
Max. Grid-connected Voltage	V	253.0	230.0	299.0	0.1	
Grid Connection Frequency Minimum	Hz	47.5	45.0	50.0	0.01	
Max. Grid-connected Frequency	Hz	50.2	50.0	55.0	0.01	
Grid Connection Detection Time	s	300	0	800	1	
Grid-connected Active Power Rising Rate	%Pn/min	30	1	80000	1	

Parameter description	Unit	Default Value	Min.	Max.	Step- wide	Note
Protective functions						
AC Over-voltage Level 1 Protection Value	V	264.5	230.0	299.0	0.1	
AC Over-voltage Level 1 Protection time	ms	140	0	65530	1	
AC Over-voltage Level 2 Protection Value	V	287.5	230.0	299.0	0.1	
AC Over-voltage Level 2 Protection time	ms	100	0	65530	1	
AC Under-voltage Level 1 Protection Value	V	184.0	23.0	230.0	0.1	
AC Under-voltage Level 1 Protection Time	ms	1000	0	65530	1	
AC Under-voltage Level 2 Protection Value	V	103.5	23.0	230.0	0.1	
AC Under-voltage Level 2 Protection Time	ms	300	0	65530	1	
Grid Overfrequency Level 1 Protection Value	Hz	51.5	50.0	70.0	0.1	
Grid Overfrequency Level 1 Protection Time	ms	100	0	65530	1	
Grid Overfrequency Level 2 Protection Value	Hz	52.5	50.0	70.0	0.1	
Grid Overfrequency Level 2 Protection Time	ms	60.0	0	65530	1	
AC Under-frequency Level 1 Protection Value	Hz	47.5	0.0	50.0	0.1	
AC Under-frequency Level 1 Protection Time	ms	100	0	65530	1	
AC Under-frequency Level 2 Protection Value	Hz	45.0	0.0	50.0	0.1	
AC Under-frequency Level 2 Protection Time	ms	60	0	65530	1	
Evaluation of conductor-conductor or conductor-earth voltage		conductor-earth voltage				
Logical AND or OR link		OR				
Self-protection over current (transient)	A	390	ZUCCHETTI CENTRO SISTEMI SpA Via Lungarno, 305/A 52028 TERRANUOVA B.NI (AR) P. I.V.A.: 01262190513			Protection time 123.2us

4.3 Electric scheme



4.4 Interfaces

Following interfaces for setting parameters (include the active power or reactive power) configurations are provided on the PGU level:

Interface for external reactive power command:RS485,PLC and Ethernet.

4.5 Manufacturer's certificates for certified PGUs according to FGW TG3

Manufacturer Certificate according to FGW TG3			
Model ZPM-PCS215K-R			
Annex A Manufacturer's certificate for PGUs			155
Herstellerbescheinigung zu spezifischen Daten eines Photovoltaik-Wechselrichters vom Type ZPM-PCS215K-R Manufacturer's certificate on specific data of a BI-DIRECTIONAL CONVERTER of the type VDE-AR-N 4110:2023-09 and VDE-AR-N 4120:2018-11+A1:2024-04 Datum / Date: 4/6/2024 Seite/Page 1/1			
1. Allgemeines und Ausgangsgrößen		General and Output values	
1 Hersteller	Zucchetti Centro Sistemi SpA	Manufacturer	
2 Typenbezeichnung	ZPM-PCS215K-R	type name	
3 Einspeisung (einphasig/dreiphasig)	three-phase	no. of phases (single-phase/three-phase)	
4 Nennscheinleistung	215 kVA	rated apparent power	
5 Nennwirkleistung	215 kW	rated active power	
6 AC-Nennspannung	400 V	rated AC-voltage	
7 AC-Nennfrequenz	50/60 Hz	rated frequency	
8 Beitrag zum Stoßkurzschlussstrom	0.394 kA	contribution to short circuit current	
2 DC Eingangsgrößen		DC Input	
1 Maximale Gleichspannung	1500 V	Maximum DC Voltage	
2 Arbeitsbereich der Gleichspannung	1000~1500 V	DC Voltage Working Range	
3 DC Voltage Full Power Working Range	1100~1400 V	DC Voltage Full-power Working Range	
4 Maximaler Gleichstrom	220 A	Maximum DC Current	
5 Max. Modulleistung	237 kW _p	max. peak power	
3 Wechselrichter-Leistungsteil		Converter-Power section	
1 Hersteller	Zucchetti Centro Sistemi SpA	Manufacturer	
2 Typenbezeichnung	ZPM-PCS215K-R	type name	
3 Nennscheinleistung	215 kVA	rated apparent power	
4 Art (HF/NF-Trafo, trafolos)	Without	generic type (HV/LV of Trans., without)	
5 Taktfrequenz	16.2 kHz	pulse rate of inverter	
6 Art der Leistungsregelung	Perturbation & Observation	generic type of power control	
7 Software-Version	V000001	software version	
4 Sonstige elektrische Komponenten		Other electric installations	
1 Art der Netzkopplung	breaker	generic type of interconnection	
2 - Hersteller	DONGGUAN CHUOD ELECTRONICS CO LTD	-manufacturer	
3 - Typenbezeichnung	CHAR-112A200C	-type	
4 Netzschutz integriert (Ja/Nein)	yes	integrated grid protection (yes/no)	
5 netzschutznersteier	DONGGUAN CHUOD ELECTRONICS CO LTD	grid protection manufacturer	
6 - Typenbezeichnung	CHAR-112A200C	-type	
7 - Einstellbereiche	Shown in appendix	-adjustment ranges	
8 Spannungssteigerungsschutz	480.0 V	overvoltage protection	
9 Spannungsrückgangsschutz	320.0 V	undervoltage protection	
10 Frequenzsteigerungsschutz	51.5 Hz	overfrequency protection	
11 Frequenzrückgangsschutz	47.5 Hz	underfrequency protection	
12 Typenbezeichnung der Abschalteneinheit	N/A	circuit breaker type	
13 Oberschwingungsfilter (ja/nein)	Yes	harmonic filter (yes / no)	
5 Typenprüfung		Type test	
1 Prüfbehörde	Societe Generale de Surveillance S.A.	testing authority	
2 Aktenzeichen	VDE-AR-N 4110:2018-11	reference	
3 Seriennummer des Wechselrichters	SH1046215KC238150017	serial number of converter	
Anschrift des Herstellers		Address of manufacturer	
Der Hersteller des BI-DIRECTIONAL CONVERTER bestätigt, dass der BI-DIRECTIONAL CONVERTER, dessen elektrischen Eigenschaften in den Prüfberichten abgebildet sind, hinsichtlich seiner technischen Daten mit den o.g. The manufacturer of the BI-DIRECTIONAL CONVERTER confirms that the BI-DIRECTIONAL CONVERTER whose power quality is measured and depicted in the test reports, is identical with the above entries with regard to its technical data		ZUCCHETTI CENTRO SISTEMI SpA Via Lungarno, 305/A 52028 TERRANUOVA B.NI (AR) P. I.V.A.: 01262190513	

Manufacturer Certificate according to FGW TG3			
Model ZPM-PCS125K-R			
Annex A Manufacturer's certificate for PGUs			155
Herstellerbescheinigung zu spezifischen Daten eines Photovoltaik-Wechselrichters vom Type ZPM-PCS125K-R Manufacturer's certificate on specific data of a BI-DIRECTIONAL CONVERTER of the type VDE-AR-N 4110:2023-09 and VDE-AR-N 4120:2018-11+A1:2024-04 Datum / Date: 4/6/2024 Seite/Page 1/1			
1. Allgemeines und Ausgangsgrößen		General and Output values	
1	Hersteller	Zucchetti Centro Sistemi SpA	Manufacturer
2	Typenbezeichnung	ZPM-PCS125K-R	type name
3	Einspeisung (einphasig/dreiphasig)	three-phase	no. of phases (single-phase/three-phase)
4	Nennscheinleistung	125 kVA	rated apparent power
5	Nennwirkleistung	125 kW	rated active power
6	AC-Nennspannung	230 V	rated AC-voltage
7	AC-Nennfrequenz	50/60 Hz	rated frequency
8	Beitrag zum Stoßkurzschlussstrom	0.394 kA	contribution to short circuit current
2 DC Eingangsgrößen		DC Input	
1	Maximale Gleichspannung	1200 V	Maximum DC Voltage
2	Arbeitsbereich der Gleichspannung	600~1200 V	DC Voltage Working Range
3	DC Voltage Full Power Working Range	650~1100 V	DC Voltage Full-power Working Range
4	Maximaler Gleichstrom	220 A	Maximum DC Current
5	Max. Modulleistung	138 kW _p	max. peak power
3 Wechselrichter-Leistungsteil		Converter-Power section	
1	Hersteller	Zucchetti Centro Sistemi SpA	Manufacturer
2	Typenbezeichnung	ZPM-PCS125K-R	type name
3	Nennscheinleistung	125 kVA	rated apparent power
4	Art (HF/NF-Trafo, trafolos)	Without	generic type (HV/LV of Trans., without)
5	Taktfrequenz	16.2 kHz	pulse rate of inverter
6	Art der Leistungsregelung (MPP-Tracking)	Perturbation & Observation	generic type of power control (MPP-Tracking)
7	Software-Version	V000001	software version
4 Sonstige elektrische Komponenten		Other electric installations	
1	Art der Netzkopplung	breaker	generic type of interconnection
2	Hersteller	DONGGUAN CHUOD ELECTRONICS CO LTD	Manufacturer
3	Typenbezeichnung	CHAR-112A200C	type
4	Netzschutz integriert (Ja/Nein)	yes	integrated grid protection (yes/no)
5	Netzschutzhersteller	DONGGUAN CHUOD ELECTRONICS CO LTD	grid protection manufacturer
6	Typenbezeichnung	CHAR-112A200C	type
7	Einstellbereiche	Shown in appendix	adjustment ranges
8	Spannungssteigerungsschutz	264.5 V	overvoltage protection
9	Spannungsrückgangsschutz	184.0 V	undervoltage protection
10	Frequenzsteigerungsschutz	51.5 Hz	overfrequency protection
11	Frequenzrückgangsschutz	47.5 Hz	underfrequency protection
12	Typenbezeichnung der Abschalteinheit	N/A	circuit breaker type
13	Oberschwingungsfilter (ja/nein)	Yes	harmonic filter (yes / no)
5 Typenprüfung		Type test	
1	Prüfbehörde	Societe Generale de Surveillance S.A.	testing authority
2	Aktenzeichen	VDE-AR-N 4110:2018-11	reference
3	Seriennummer des Wechselrichters	VDE-AR-N 4120:2018-11 SH1046125KC238150017	serial number of converter
ZUCCHETTI CENTRO SISTEMI SpA Via Lungarno, 305/A 52028 TERRANUOVA B.NI (AR) P. I.V.A.: 01262190513			
Anschrift des Herstellers Address of manufacturer			
Der Hersteller des BI-DIRECTIONAL CONVERTER bestätigt, dass der BI-DIRECTIONAL CONVERTER, dessen elektrischen Eigenschaften in den Prüfberichten abgebildet sind, hinsichtlich seiner technischen Daten mit den o.g. The manufacturer of the BI-DIRECTIONAL CONVERTER confirms that the BI-DIRECTIONAL CONVERTER whose power quality is measured and depicted in the test reports, is identical with the above entries with regard to its technical data			

4.6 BEHAVIOUR IN THE EVENT OF A FAILURE OF EITHER THE PGP CONTROLLER OR THE ASSOCIATED MEASUREMENT OR THE CONNECTION BETWEEN PGP CONTROLLER AND PGU

Communication interruption response function: when the inverter detects the communication interruption with the monitoring system, it needs to operate according to the preset active and reactive power.

If the inverter detects no valid data interaction with the monitoring system for a period of time, the communication is considered interrupted. Working according to preset active and reactive power configuration parameters. If the inverter detects that the communication is restored, the inverter will return to the active and reactive power parameters before the communication interruption.

When communication interruption is enabled, the interruption time shall be recorded. If the interruption time reaches the preset communication interruption time, the operation shall be conducted according to the preset active and reactive power parameters.

Under the condition of communication recovery enabling, the current state is in the state of communication interruption. When a normal communication message is received and the time reaches the set value of communication recovery time, the communication is considered restored. At this time, the inverter operates according to the active and reactive power parameters at the last communication time.

5 DYNAMIC SIMUALTION MODEL INFORMATION

5.1 Software Characteristics

- Software type: Simulator for Grid Connected Power Conversion System
- Simulation platform: DIgSILENT PowerFactory 2024
- Used version of the simulation platform: Version 24.0.2.0
- Simulation Software File identification: PGU_125-215K-R.pfd
- Dynamic Simulation Model version: V2.1
- MD5 Checksum: CEF983EF1586538CB7E1A40721EF953E

⁽¹⁾ Simulation results offered in this validation report were obtained with the DIgSILENT PowerFactory 2024 Version 24.0.2.0. The validation report does not guarantee the compliance of upper version of DIgSILENT PowerFactory 2024 Version 24.0.2.0.

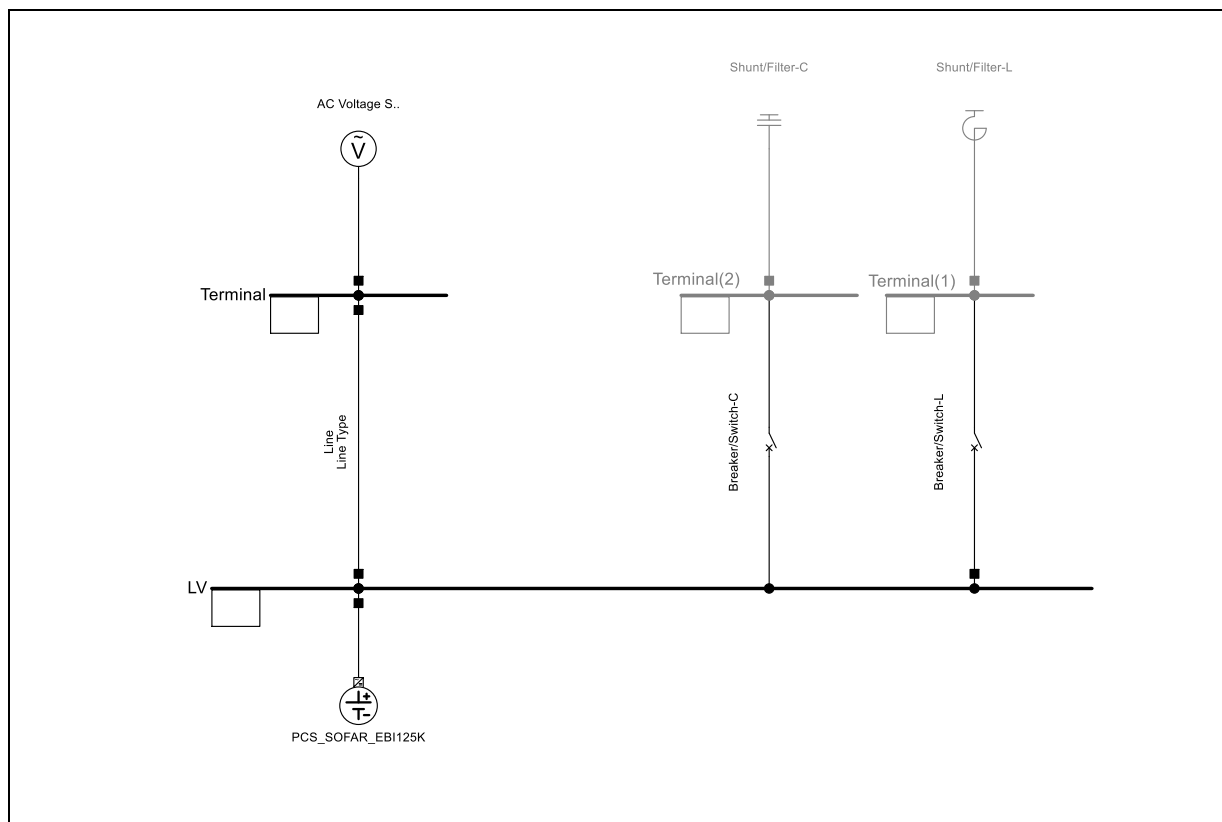
5.2 Software Information and Comments

As evidenced in the manufacturer's documentation and the validation report, the dynamic model could be completely able to represent the dynamic behaviours at the PV inverter terminal, and also be suitable for power grid studies. The dynamic model covered by the validation report is valid for fundamental frequency positive and negative sequence response. The dynamic model is developed with the following specifications in mind:

- The model is to be used primarily for power system stability studies and thus should represent all positive and negative sequence dynamics affected and relevant during:
 - Balanced and unbalanced short-circuits on the transmission grid (including voltage recovery)
 - Grid frequency disturbances
 - Reference value changes
- The model is for fundamental frequency positive and negative sequence response.
- The model is valid for typical power system frequency deviations.
- The model is able to handle numerically the simulation of phase jumps.
- The model is valid for steady state voltage deviations within the range from 0.9 p.u. to 1.1 p.u.
- The model is valid for dynamic voltage phenomena (e.g. faults) where the voltage can dip temporarily close to zero and up to 1.25 p.u..
- The typical dynamic simulation time frame of interest is from 5 seconds to 800 seconds.
- The model could work with integration time step range from 0.001s to 0.01s.
- The model could be initialized to a steady state from load flow solutions at full or partial nominal power.
- External conditions like solar radiation is taken into account through the available PV array conversion power.
- Over/under frequency and over/under voltage protections are modelled in the control model in order to allow a realistic representation of PV inverter disconnection following grid disturbances. This may be separate modules that connect to the main PV inverter model.
- The model includes the reactive power capability of the PV inverter.

5.3 Description of the model

The model has the following design:



The simulation step size and the short-circuit value of the grid used for the model validation of the inverter ZPM-PCS215K-R is in DigSILENT PowerFactory environment is the following:

	SCR implemented in the simulated grid	Sampling resolution of simulation results
Validation requirements for Voltage Ride Through (LVRT and HVRT)	20	1 kHz (Step size is 1 ms)
Validation of active power changes commanded by set point	20	1 Hz (Step size is 100 ms)
Validation of reactive power changes commanded by set point	20	1 Hz (Step size is 100 ms)
Validation requirements for Reactive Power Control processes (QvsU with the shortest settling time)	20	1 Hz (Step size is 100 ms)
Validation requirements for Reactive Power Control processes (QvsU with the longest settling time)	20	1 Hz (Step size is 100 ms)
Validation requirements for Reactive Power Control processes (QvsP)	20	1 Hz (Step size is 100 ms)

Verification of requirements for Protective Settings (Under/Over voltage cases)	20	1 Hz (Step size is 100 ms)
Plausibility checks	20 (*)	1 kHz (Step size is 1 ms)
U-P-Q (ZPM-PCS215K-R model)	502	1 Hz (Step size is 100 ms)
U-P-Q (ZPM-PCS125K-R model)	502	1 Hz (Step size is 100 ms)
Plausibility tests for typical PGS configurations. One-off voltage drops	20	1 kHz (Step size is 1 ms)
Plausibility tests for typical PGS configurations. Simulating an unsuccessful AR	20	1 kHz (Step size is 1 ms)

(*) Based on section **9.2.2.2 Plausibility test of the individual model in addition to the validation** of the standard FGW TG4 Rev.10, a grid SCR of five times the rated apparent power of the PGU at R/X ratio of 0.1 is recommended. However, if no successful simulation is possible with such grid short-circuit apparent power, a higher value may be selected as long as the manufacturer provides an explanation. The clarification provided to this certification body by the manufacturer is reported below.

(**) Based on section 9.2.2.3.1, the grid impedance can be calculated from a grid short-circuit apparent power to the value of 8 times the PGS rated apparent power at an R/X ratio of 0.1. If no successful simulation is possible with this grid short-circuit power, a higher short-circuit power may be selected with the manufacturer's confirmation. This is to be documented in the certificate.

(***) Based on section 9.2.2.3.2, the grid impedance can be calculated from a grid short-circuit apparent power to the value of 5 times the PGS rated apparent power at an R/X ratio of 0.1. If no successful simulation is possible with this grid short-circuit power, a higher short-circuit power may be selected with the manufacturer's confirmation. This is to be documented in the certificate.

Due to a weak network (because of the low SCR value) it is difficult to maintain the same voltage value in PGU terminal as in AC voltage terminal.

The SCR is calculated by:

$$SCR = M_{sk}/P_n$$

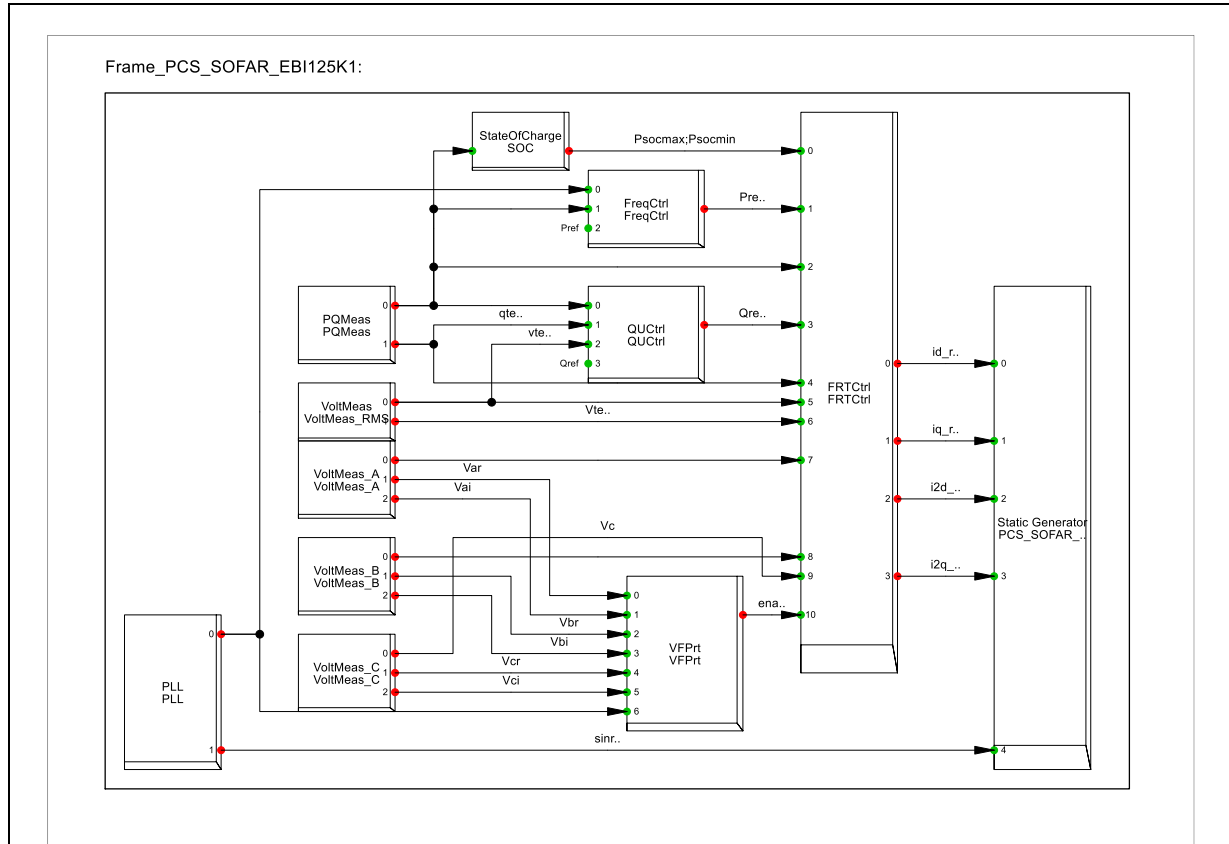
Where, M_{sk} is the short-circuit capacity of interconnected of point, P_n is the rated capacity of inverter.

And the impedance Z_k of grid is calculated by:

$$Z_k = U_g^2 / (SCR * P_n)$$

Where, U_g is the rated voltage of inverter. The R/X ratio is 0.1.

The composite model linked with the PCS-frame is shown hereafter:



This control system allows the user to set the main adjustable parameters of the following functionalities: LHVRT; active and reactive power changes commanded by setpoints; reactive power control function Q(U) and Q(P); protection setting validation; reactive power manipulating range checks; and plausibility checks.

For further information, please refer to the user manual "EBI125K-R_Digsilent_dynamic_mode_user_manual_20240918.pdf" (issued on September 2024) provided by the manufacturer.

The slack node has been configured for all the tests (apart from tests P1.06.a, and P4.06.a, where an absolute voltage phase angle of 30° is used) with the following configuration:

✓ AC Voltage Source - Grid\AC Voltage Source.ElmVac

Basic Data

Description

Load Flow

Short-Circuit VDE/IEC

Short-Circuit Complete

Short-Circuit ANSI

Short-Circuit IEC 61363

Short-Circuit DC

Positive Sequence

Voltage, Magnitude

1,

p.u.

Voltage, Angle

30,

deg

Controlled Node

▼ →

Grid\Terminal

Resistance, R1

0,01

Ohm

Reactance, X1

0,1

Ohm

	Name	Object	Obj...	Out ...	Exec...	Absol... h	Absolute ...	Absolute s	Even...	Fault... %	Affe...	Fault Ty...	Phases	Phase	Phases	Input	Resistance Ohm	Reactance Ohm	
▶	Short-Circuit Event	LV	16/1...	☐	01/0...	0	0	13.956		50			0	a-b	a	a,b	Resis...	0,0028	0,028
▶	Short-Circuit Event(1)	LV	16/1...	☐	01/0...	0	0	15.376		50			4	a-b	a	a,b	Resis...	0.01	0.1

The PCC of the plant is supposed to be located on the HV busbar of the transformer.

The electrical characteristics of the transformers and of the MV lines are reported in the following tables.

Transformers	Leakage x (p.u.)	Copper loss r (p.u.)	Rated apparent power (MVA)
Tuw	0.1	0.01	60
T01-T10	0.5	0.05	5

MV lines	Per unit length X (Ω /km)	Per unit length R (Ω /km)	Length (km)	Total x (p.u.)	Total r (p.u.)
L 01-02	1.41	1.41	0.15	0.005	0.005
L 01-03	0.84	0.84	0.25	0.005	0.005
L 02-04	0.0844	0.0844	5	0.01	0.01
L 03-05	0.0603	0.0603	7	0.01	0.01
L 06-07	0.422	0.422	1	0.01	0.01
L 06-08	0.281	0.281	1.5	0.01	0.01
L 07-09	0.053	0.053	8	0.01	0.01
L 08-10	0.063	0.063	10	0.015	0.015
L 11-01	2.11	2.11	1	0.05	0.05
L 11-06	1.69	1.69	2.5	0.1	0.1

The p.u. values reported in the tables are referred to the PGS rated active power of 47.40 MW.

--- END OF THE ANNEX TO CERTIFICATE ---