EQUIPMENT CERTIFICATE

Certificate No.:	Issued:	Valid until:	GCC class
TC-GCC-DNVGL-SE-0124-08608-0	2022-03-16	Unlimited	TC_I

Issued for:

PV Inverters BLUE [3-25]KT-[M0/M1/M2/M3] (PPM Type A)

With specifications and software version as listed in Annex 2

Issued to:

Shenzhen Kstar New Energy Co., Ltd.

The 9th Floor, R&D Building, Kstar Industrial Park, Guangming Hi-tech Industrial Zone, 518107 Shenzhen, Guangdong P.R. China

According to:

DNVGL-SE-0124, 2016-03: Certification of Grid Code Compliance

PTPiREE, 2021-04: Conditions and procedures for using certificates in the process of connecting power generating modules to power networks

32016R0631, 2016-04: Requirements for Generators (NC RfG)

PSE, 2018-12: Requirements of general application resulting from Commission Regulation (EU) 2016/631 of 14 April 2016

detailed in Annex 1

Based on the document:

CR-GCC-DNVGL-SE-0124-08608-A072-0 Network Code Requirements for a PGU of Type A - Poland, Certification Report, dated 2022-03-16

Further assessment information, including scope and conditions, is found in Annex 1. Description of the PV inverters and type tests performed is found in Annex 2 and Annex 3 respectively.

Hamburg, 2022-03-16

For DNV Renewables Certification

Bente Vestergaard
Director and Service Line Leader Type and Component Certification

DAkkS Deutsche Akkreditierungsstelle D-ZE-11053-01-00

By DAkkS according DIN EN IEC/ISO 17065 accredited Certification Body for products. The accreditation is valid for the fields of certification listed in the certificate.

Hamburg, 2022-03-16

For DNV Renewables Certification

i.A. S. Ben Saad

Sofien Ben Saad
Project Manager

EQUIPMENT CERTIFICATE – ANNEX 1

Conditions, assessment criteria and scope of assessment

Provided that the conditions listed in section 1 are considered at project level, the PV inverters as further specified in Annex 2 comply with the requirements within scope of this certification, as specified in section 3.

1 Conditions

- Changes of the system design, hardware or the software of the certified PV inverters are to be approved by DNV.
- Inverter settings must finally be agreed and checked at project level to ensure grid code compliance, based on the requirements of relevant System Operator (SO). For the functionalities within scope of this certification, more information about the settings assessed is found in Control Settings in section 4.2 as well as the corresponding assessment sections 5.1-5.4 of the certification report CR-GCC-DNVGL-SE-0124-08608-A072-0.
- The capability of remote control has been shown on unit level but must finally be ensured at project level, considering any further requirements of relevant System Operator (SO) and the full communication network. For the functionalities within scope of this certification, this concerns remote cessation of active power and remote blocking and control of LFSM-O, as further described in section 5.3 and 5.4 of the certification report CR-GCC-DNVGL-SE-0124-08608-A072-0.

2 Assessment criteria and normative references for this certificate:

/A/ Service Specification DNVGL-SE-0124: Certification of Grid Code Compliance, DNV GL, March 2016

/B/ Conditions and procedures for using certificates in the process of connecting power generating modules to power networks, Warunki i procedury wykorzystania certyfikatów w procesie przyłączenia modułów wytwarzania energii do sieci elektroenergetycznych, version 1.2, PTPiREE, dated 2021-04-28, (in the following: PTPiREE 2021-04)

/C/ Requirements of general application resulting from Commission Regulation (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators (NC RfG) – as approved by the decision of the President of the Energy Regulatory Office DRE.WOSE.7128.550.2.2018.ZJ dated January 2nd 2019, Wymogi ogólnego stosowania wynikające z Rozporządzenia Komisji (UE) 2016/631 z dnia 14 kwietnia 2016 r. ustanawiającego kodeks sieci dotyczący wymogów w zakresie przyłączenia jednostek wytwórczych do sieci (NC RfG), PSE S.A., dated 2018-12-18 zatwierdzone Decyzją Prezesa Urzędu Regulacji Energetyki DRE.WOSE.7128.550.2.2018.ZJ z dnia 2 stycznia 2019 r, (in the following: PSE 2018-12)

/D/ Commission Regulation (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators, published in the Official Journal of the European Union L112/1, The European Comission, 27/04/2016. Document 32016R0631, (in the following: NC RfG)

3 Scope of assessment and results

The following functionalities have been assessed based on the rules for the use of equipment certificates for Power Park Modules (PPMs), as specified in chapter 7 and 9 of the PTPiREE 2021-04 /B/. The functions denoted “Not Applicable” in the table of chapter 7 has not been included.

Capability	NC RfG /D/	PSE 2018-12 /C/	Type A	Assessment result (*)
Frequency range	13.1 (a)	13.1 (a)(i)	x	Compliant
Rate of Change of Frequency (RoCoF) withstand capability, df/dt	13.1 (b)	13.1 (b)	x	Compliant
Remote cessation of active power	13.6	13.6	x	Compliant
Limited Frequency Sensitive Mode – Over Frequency (LFSM-O)	13.2	13.2 (a), (b), (f)	x	Compliant

(*) Please note also the corresponding conditions for compliance, as stated in section 1

Schematic description and technical data of the generating units

1 Schematic description of the generating unit

The SHENZHEN KSTAR NEW ENERGY solar inverter family BluE [3-25]KT-[M0/M1/M2/M3], consisting of: BluE-3KT, BluE-3.6KT, BluE-4KT, BluE-5KT, BluE-6KT, BluE-8KT, BluE-10KT, BluE-12KT, BluE-15KT, BluE-17KT, BluE-20KT, BluE-22KT, BluE-23KT, BluE-25KT convert electrical energy generated by photovoltaic modules (DC) to three-phase alternating current (AC).

They run at 400 V rated output voltage with a rated active power output of 3 kW to 25 kW. The different output power variants are achieved through derating via software.

Models BluE-3KT, BluE-3.6KT, BluE-4KT, BluE-5KT, BluE-6KT, BluE-8KT, BluE-10KT and BluE-12KT have 2 PV input strings, BluE-15KT have 3 PV input strings, BluE-17KT, BluE-20KT, BluE-22KT, BluE-23KT and BluE-25KT have 4 PV input strings. The variants with the different suffixes (i.e. -M0/M1/M2/M3) differ only in PV input parameters, including input current and number of strings. There is no further difference in the hardware or firmware used, as stated by the manufacturer.

The electrical data of the generating unit is summarized in the following section.

2 Technical data of main components

According to the documents provided by the manufacturer, the following components are used.

2.1 General Specifications

Generating Unit	**BluE-3KT**	**BluE-3.6KT**	**BluE-4KT**
No. of phases	3	3	3
Rated apparent power	3 kVA	3.6 kVA	4 kVA
Rated active power	3 kW	3.6 kW	4 kW
Rated AC-voltage (phase to phase)	400 Vac	400 Vac	400 Vac
Rated frequency	50 Hz	50 Hz	50 Hz

	BluE-5KT	**BluE-6KT**	**BluE-8KT**
No. of phases	3	3	3
Rated apparent power	5 kVA	6 kVA	8 kVA
Rated active power	5 kW	6 kW	8 kW
Rated AC-voltage (phase to phase)	400 Vac	400 Vac	400 Vac
Rated frequency	50 Hz	50 Hz	50 Hz

	BluE-10KT	**BluE-12KT**	**BluE-15KT**
No. of phases	3	3	3
Rated apparent power	10 kVA	12 kVA	15 kVA
Rated active power	10 kW	12 kW	15 kW
Rated AC-voltage (phase to phase)	400 Vac	400 Vac	400 Vac
Rated frequency	50 Hz	50 Hz	50 Hz

	BluE-17KT	BluE-20KT	BluE-22KT
No. of phases	3	3	3
Rated apparent power	17 kVA	20 kVA	22 kVA
Rated active power	17 kW	20 kW	22 kW
Rated AC-voltage (phase to phase)	400 Vac	400 Vac	400 Vac
Rated frequency	50 Hz	50 Hz	50 Hz

	BluE-23KT	BluE-25KT
No. of phases	3	3
Rated apparent power	23 kVA	25 kVA
Rated active power	23 kW	25 kW
Rated AC-voltage (phase to phase)	400 Vac	400 Vac
Rated frequency	50 Hz	50 Hz

2.2 DC Input

	BluE-[3-8]KT	BluE-[10-12]KT	BluE-15KT
Min. MPPT voltage	140V	140V	140V
Max. MPPT voltage	1000V	1000V	1000V
Max. DC input voltage	1100V	1100V	1100V
Max. DC input current	15A	18A	30A

	BluE-[17-20]KT	BluE [22-25]KT
Min. MPPT voltage	140V	140V
Max. MPPT voltage	1000V	1000V
Max. DC input voltage	1100V	1100V
Max. DC input current	30A	40A

2.3 Software Version

Firmware version	002
Software version	0.5.0

2.4 Unit transformer

The transformer is not part of the generating unit and consequently has not been part of the assessment.

2.6 Grid Protection

The protection is not part of certification scope

2.7 Control settings

The control interface allows for the selection of different parameter sets via the “GRID STD” field, which provide default settings based on specific grid codes and national requirements. For this certification report the parameter set called “23” in the display interface, was assessed for the functionalities within scope of this certification.

It should be noted that compliance can be achieved also with other parameter sets and control settings, but that changes to control settings will affect the inverter control behavior which can thus affect compliance. It should be noted the final settings must be agreed on project level in agreement with relevant system operator.

EQUIPMENT CERTIFICATE – ANNEX 2

Protection settings has not been part of the assessment. Since these could intervene with and affect the compliance of the assessed functionalities, this must be further assessed at project level.

EQUIPMENT CERTIFICATE – ANNEX 3

Type tests

1 Type tests

Tests were performed between 2021-09-26 and 2022-01-13 in the SHENZHEN KSTAR NEW ENERGY lab in Shenzhen in P.R. China. All tests were performed under ISO-17025 accreditation and they were performed on the BluE-25KT-M1 and BluE-3KT-M1 units.

The results used for assessment are documented in the measurement report(s) as specified below:

Scope	Reference
Frequency range	3.1 of /1/
Rate of Change of Frequency (RoCoF) withstand capability, df/dt	3.2 of /1/
Remote cessation of active power	3.3 of /1/
Limited Frequency Sensitive Mode – over frequency (LFSM-O)	3.4 of /1/

Test report(s)	Document number	Content
/1/	*10300711-SHA-TR-02-B*	Measurement of power control characteristics of a PV inverter of the type BluE-25KTM1 according to FGW TG3 Rev. 25 and Polish Grid Code

The tests results have been assessed against the requirements of PSE 2018-12 /C/ and NC RfG /D/. Further details are described in the corresponding certification report CR-GCC-DNVGL-SE-0124-08608-A072-0.