# EQUIPMENT CERTIFICATE

| Certificate No.: | Issued: | Valid until: | GCC class |
|---|---|---|---|
| TC-GCC-DNVGL-SE-0124-08053-0 | 2022-04-13 | Unlimited | $TC_I$ |

Issued for:

## PV Inverters MAX [100-133]KTL3-X (PPM Type A, B)

With specifications and software version as listed in Annex 2

Issued to:

## Shenzhen Growatt New Energy Co., Ltd.

4-13/F, Building A, Sino-German (Europe) Industrial Park, Hangcheng Ave,Bao'an District, Shenzhen, 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-0124-08053-A072-0 Network Code Requirements for a PGU of Type A, B - Poland, Certification Report, dated 2022-04-13

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, 2022-04-13**

**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, 2022-04-13**

**For DNV Renewables Certification**

**Aleksandra Voss**
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 - 5.8 of the certification report CR-GCC-DNVGL-SE-0124-08053-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, these concerns:
  - Remote cessation of active power,
  - Remote set-point control of active power,
  - Remote blocking and control of LFSM-O

  as further described in section 5.3 - 5.5 of the certification report CR-GCC-DNVGL-SE-0124-08053-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 Commission, 27/04/2016. Document 32016R0631, (in the following: NC RfG)

# EQUIPMENT CERTIFICATE – ANNEX 1



## 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 | Type B | Assessment result (**) |
|---|---|---|---|---|---|
| Frequency range | 13.1(a) | 13.1(a)(i) | x | x | Compliant |
| Rate of Change of Frequency (RoCoF) withstand capability, df/dt | 13.1(b) | 13.1(b) | x | x | Compliant |
| Remote cessation of active power | 13.6 | 13.6 | x | x | Compliant |
| Remote control of active power | 14.2 | 14.2(b) | | x | Compliant |
| Limited Frequency Sensitive Mode – over frequency (LFSM-O) | 13.2 (*) | 13.2(a), (b), (f) | x | x | Compliant |
| Capability to withstand voltage dips for connection below 110 kV | 14.3 | 14.3(a)(i), (b) | | x | Compliant |
| Fast fault current injection, symmetric and asymmetric faults | 20.2(b), (c) | 20.2(b), (c) | | x | Compliant |
| Active power recovery after fault clearance | 20.3 | 20.3(a) | | x | Compliant |

*(*) Article 13.2(b) only applicable for type A PPMs according to NC RfG.*

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

# EQUIPMENT CERTIFICATE – ANNEX 2



**Schematic description and technical data of the generating units**

## 1 Schematic description of the generating unit

The GROWATT solar inverter family MAX [100-133]KTL3-X, consisting of: MAX 100KTL3-X LV, MAX 110KTL3-X LV, MAX 120KTL3-X LV, MAX 125KTL3-X LV and MAX 133KTL3-X LV 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 100 kW to 133 kW. The different output power variants are achieved through derating via software. 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 | MAX 100KTL3-X LV | MAX 110KTL3-X LV | MAX 120KTL3-X LV | MAX 125KTL3-X LV | MAX 133KTL3-X LV |
|---|---|---|---|---|---|
| No. of phases | 3 phases | 3 phases | 3 phases | 3 phases | 3 phases |
| Rated apparent power | 100 kVA | 110 kVA | 120 kVA | 125 kVA | 133 kVA |
| Rated active power | 100 kW | 110 kW | 120 kW | 125 kW | 133 kW |
| Rated AC-voltage | 400 Vac | 400 Vac | 400 Vac | 400 Vac | 400 Vac |
| Rated frequency | 50 Hz | 50 Hz | 50 Hz | 50 Hz | 50 Hz |

### 2.2 DC Input

| Generating Unit | MAX [100-133]KTL3-X |
|---|---|
| Min. MPPT voltage | 180 Vdc |
| Max. MPPT voltage | 1000 Vdc |
| Max. DC input voltage | 1100 Vdc |
| Max. DC input current | 32 A |

### 2.3 Software Version

| | |
|---|---|
| Firmware version | TN1.0 |
| Software version | TN1.0 |

### 2.4 Unit transformer

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

### 2.5 Grid Protection

The protection is not part of certification scope

### 2.6 Control settings

The control interface allows for the selection of different parameter sets via Shinebus application or WebAPP interface. At Shinebus, the field “Mode” in the “Settings” tab can be set to “S23B00D00T00P0FU01M0532”, to enable settings for Poland.

WebAPP interface allows to change by selecting “Ploand (S23)”. The parameter set provides default settings based on specific grid codes and national requirements. For this certification report the parameter set called “Ploand (S23)” in the WebAPP or “S23B00D00T00P0FU01M0532” in Shinebus was assessed for the functionalities within scope of this certification. The settings are by default set to and match type B requirements, which will make them compliant also to the requirements of type A.

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 behaviour which can thus affect compliance. It should be noted the final settings must be agreed on project level in agreement with relevant system operator.

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 2021-10-27 and 2021-11-25 in the GROWATT lab in Shenzhen in P.R. China.

All tests were performed under ISO-17025 accreditation and they were performed on the MAX 133KTL3-X LV unit.

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

| Scope | Reference |
|---|---|
| Frequency range | Section 3.1 of /1/ |
| Rate of Change of Frequency (RoCoF) withstand capability, df/dt | Section 3.2 of /1/ |
| Remote cessation of active power | Section 3.3 of /1/ |
| Remote control of active power | Section 3.4 of /1/ |
| Limited Frequency Sensitive Mode – over frequency (LFSM-O) | Section 3.5 of /1/ |
| Fault Ride Through (FRT) | Section 4 of /1/ |
| Fast fault current injection, symmetric and asymmetric faults | Section 4 of /1/ |
| Active power recovery after fault clearance | Section 4 of /1/ |

| Test report(s) | Document number | Content |
|---|---|---|
| /1/ | *10298225-SHA-TR-03-A* | Measurement of power control characteristics and FRT capability of a PV inverter of the type MAX 133KTL3-X LV 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-0124-08053-A072-0.