

TYPE CERTIFICATE

Certificate No.:
TC-GCC-TR8-04062-1

Issued:
2018-07-26

Valid until:
2023-07-19

Issued for:

**Huawei SUN2000-33KTL-A, SUN2000-36KTL
and SUN2000-42KTL**

Specified in Annex 2

Issued to:

Huawei Technologies Co., Ltd.

Bantian, Longgang District
Shenzen, 518129
P.R.China

According to:

**VDE-AR-N 4120:2015-01 TCC High Voltage
FGW TG8:2016-12 Technical Guidelines for Power
Generating Units and Farms, Part 8**

Based on the documents:

CR-GCC-TR8-04062-A065-0
CR-GCC-TR8-04062-A066-1
CR-GCC-TR8-04062-A067-1

Certification Report: Model Validation GCC, dated 2018-07-20
Certification Report: Fault Ride Through, dated 2018-07-26
Certification Report: Control behavior and other Grid Code
Requirements, dated 2018-07-26

The generating unit complies with the requirements of VDE-AR-N 4120 and the complementary documents stated in Annex 1, provided the conditions of Annex 1 are considered at project level. The simulation model and the measurement reports of the type tests are cited in Annex 3.

Changes of the system design, software or the manufacturer's quality system are to be approved by DNV GL.

Hamburg, 2018-07-26

For DNV GL Renewables Certification

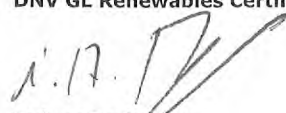

Mike Wöbeking
Service Area Leader



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, 2018-07-26

DNV GL Renewables Certification


Rainer Beckmann
Project Manager

TYPE CERTIFICATE – ANNEX 1

Certificate No.: TC-GCC-TR8-04062-1

Page 2 of 7

Conditions and assessment criteria

1 Conditions

- The components listed in Annex 2 shall be used. Changes of the simulation model, system design, software or the manufacturer's quality system are to be approved by DNV GL.
- The display to check the protection settings, as well as the test terminals used to enable inspections without disconnecting any wires, are missing. This is not in agreement with the requirements of the VDE-AR-N 4120 /D/. Therefore, the following should be taken into account:
 - o With regard to the protection settings, the operator of the PV-plant is responsible to provide a proper solution to assess the correct settings of the generating unit. If requested by the grid operator, it might therefore be necessary to provide such a device (e.g. tablet or smartphone) with the corresponding application, which is either to be stored on site or need to be provided on demand.
 - o With regard to the missing test terminals, the consequences need to be investigated on project level. Depending on the requirements of the corresponding grid operator, an additional "intermediate" protective disconnection device on the low-voltage side of the transformer might be necessary.
- In general, it needs to be investigated on project level whether a permanent reduction of the rated active power is necessary to meet the reactive power requirement at the grid connection point. This applies especially to the inverters SUN2000-36KTL and SUN2000-42KTL running in PQ-Mode 1.
- The "enable-reconnection"- signal is not implemented in the inverter. Therefore, this function must be implemented at project level (e.g. a protection relay at the low-voltage side of the transformer).
- For assessments related to of project certification, the simulation model of the SUN2000-33KTL-A, SUN2000-36KTL and SUN2000-42KTL shall only be used in the certified version. For clear identification, a checksum (MD5) (see Appendix 3, Section 2, Table 1) was assigned to the model.

TYPE CERTIFICATE - ANNEX 1

Certificate No.: TC-GCC-TR8-04062-1

Page 3 of 7

2 The assessment criteria and normative references for this certificate are:

- /A/ Technische Richtlinie für Erzeugungseinheiten und -anlagen, Teil 3: Bestimmung der elektrischen Eigenschaften von Erzeugungseinheiten und -anlagen am Mittel-, Hoch- und Höchstspannungsnetz, Fördergesellschaft Windenergie und andere Erneuerbare Energien (FGW), Revision 23, vom 01.05.2013
(FGW Technical Guidelines, Part 3: Determination of the electrical behaviour of generating units, in following: FGW TG3)
- /B/ Technische Richtlinie für Erzeugungseinheiten und -anlagen, Teil 4: Anforderungen an Modellierung und Validierung von Simulationsmodellen der elektrischen Eigenschaften von Erzeugungseinheiten und -anlagen, Fördergesellschaft Windenergie und andere Erneuerbare Energien (FGW), Revision 8, vom 01.12.2016
(FGW Technical Guidelines, Part 4: Demands on modelling and validation of simulation models of generating units and systems in following: FGW TG4)
- /C/ Technische Richtlinie für Erzeugungseinheiten und -anlagen, Teil 8: Zertifizierung der elektrischen Eigenschaften von Erzeugungseinheiten und -anlagen am Mittel-, Hoch- und Höchstspannungsnetz, Fördergesellschaft Windenergie und andere Erneuerbare Energien (FGW), Revision 8, vom 01.03.2016
(FGW Technical Guidelines, Part 8: Certification of the electrical behaviour of generating units in following: FGW TG8)
- /D/ VDE-AR-N 4120, Technische Bedingungen für den Anschluss und Betrieb von Kundenanlagen an das Hochspannungsnetz (TAB Hochspannung), VDE Verband der Elektrotechnik Elektronik Informationstechnik e.V., vom Januar 2015
(VDE-AR-N 4120, Technical requirements for the connection and operation of customer installations to the high-voltage network (TCC High-Voltage), in the following: VDE-AR-N 4120)
- /E/ Technische Richtlinie für Erzeugungseinheiten und -anlagen, Teil 3: Bestimmung der elektrischen Eigenschaften von Erzeugungseinheiten und -anlagen am Mittel-, Hoch- und Höchstspannungsnetz, Fördergesellschaft Windenergie und andere Erneuerbare Energien (FGW), Revision 24, vom 01.03.2016
(FGW Technical Guidelines, Part 3: Determination of the electrical behaviour of generating units, in following: FGW TG3)

TYPE CERTIFICATE - ANNEX 2

Certificate No.: TC-GCC-TR8-04062-1

Page 4 of 7

Schematic description and technical data of the generating unit

1 Schematic description of the generating unit

The generating units Huawei SUN2000-33KTL-A, SUN2000-36KTL and SUN2000-42KTL convert electrical energy generated by photovoltaic modules (DC) to three-phase alternating current (AC). A power control on the DC side is implemented by a Maximum Power Point (MPP) tracking. The SUN2000-33KTL-A is running at 400V rated output voltage, the SUN2000-36KTL is running at 400V and 480V rated output voltage and the SUN2000-42KTL is running at 480 V rated output voltage. All three inverters are technically equal, according to the definition in FGW TG8 /C/. The SUN2000-36KTL and the SUN2000-42KTL the maximum active power limit can also be increased up to the apparent power limits of 40 kVA and 47 kVA (PQ-Mode 1, note that this does not apply for the SUN2000-33KTL-A)

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

2 Technical data and main components

2.1 General data

Generating Unit	SUN2000-33KTL-A	SUN2000-36KTL	SUN2000-42KTL
No. of phases	3- phase	3- phase	3- phase
Rated apparent power	33 kVA	40 kVA	47 kVA
Rated active power*)	30 kW	36 kW (PQ-Mode 2) (40 kW @ cos φ=1, PQ-Mode 1)	42 kW (PQ-Mode 2) (47 kW @ cos φ=1, PQ-Mode 1)
Rated AC-voltage (phase to phase)	400 V	400 V / 480 V	480 V
Rated frequency	50 Hz	50 Hz	50 Hz
Rated current	43,5 A	52,0 A (@ 400 V) 43,4 A (@ 480 V)	50,6 A
Contribution to short circuit current**)	48 A	57,8 A (@ 400 V) 48,2 A (@ 480 V)	56,6 A

*) The specified rated active power values allow for a power factor of 0.9 at full load and rated voltage (PQ-Mode 2). For the SUN2000-36KTL and -42KTL it is possible to increase the rated active power by parameterization up to the rated apparent power (PQ-Mode 1). Therefore, the required reactive power capability on project level needs to be considered, as an increasing of rated active power decreases the reactive power capability (down to zero at full load in case of PQ-Mode 1).

***) Based on manufacturer information. The measured values during the voltage dip tests are contained in CR-GCC-TR8-04062-A066-1, Section 4.7.

TYPE CERTIFICATE - ANNEX 2

Certificate No.: TC-GCC-TR8-04062-1

Page 5 of 7

2.2 DC input

Generating Unit	SUN2000-33KTL-A	SUN2000-36KTL	SUN2000-42KTL
Min. MPP - voltage	200 V	200 V	200 V
Max. MPP - voltage	1000 V	1000 V	1000 V
Max. DC input voltage	1100 V	1100 V	1100 V
Max. DC input current	88 A	88 A	88 A

2.3 Inverter power section

Manufacturer	Huawei	Huawei	Huawei
Type name	SUN2000-33KTL-A	SUN2000-36KTL	SUN2000-42KTL
Generic type	Transformerless	Transformerless	Transformerless
Pulse rate of inverter	16 kHz	16 kHz	16 kHz
Generic type of power control	MPP- Tracking	MPP- Tracking	MPP- Tracking
Software version	V200R002	V200R002	V200R002

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 grid protection is integrated into the control of the generating unit.

2.6 Disconnection device

Manufacturer	Panasonic	Panasonic	Panasonic
Type name	HE1AN-W-DC12V-Y6	HE1AN-W-DC12V-Y6	HE1AN-W-DC12V-Y6

TYPE CERTIFICATE – ANNEX 3

Certificate No.: TC-GCC-TR8-04062-1

Page 6 of 7

Type tests and validated simulation model

1 Type tests of the generating unit

The measurements were performed according to FGW TG3 /A/ and /E/ using SUN2000-36KTL and SUN2000 42KTL photovoltaic inverters of Huawei in Shanghai, China. The FRT measurement results for the SUN2000-36KTL are documented in the measurement report GLGH-4280 17 14669 294-A-0001-A and the measurement results for the SUN 2000-36KTL for control behaviour and other Grid Code requirements are documented in the measurement reports GLGH-4280 17 14669 294-A-0002-A and GLGH-4280 16 13964 294-A-0002-C. The measurement results for the SUN 2000-42KTL for control behaviour and other Grid Code requirements are documented in the measurement report GLGH-4280 18 14989 294-A-0005-A.

The inverters SUN2000-33KTL-A, SUN2000-36KTL and SUN2000-42KTL were tested and certified for the default rated active power of 30kW, 36 kW and 42 kW (PQ-Mode 2). But for the SUN2000-36KTL and the SUN2000-42KTL the maximum active power limit can also be increased up to the apparent power limit of 40 kVA and 47 kVA (PQ-Mode 1, this does not apply for the SUN2000-33KTL-A). As this reduces the theoretical reactive power capability at full load to zero, details on this issue can be found in the report CR-GCC-TR8-04062-A067-1, chapter 4.7. Therefore, the measurements of the reactive power capability have been performed for two different configurations:

1. SUN2000-36KTL running at 36 kW rated power (400 V rated output voltage)
2. SUN2000-36KTL running at 40 kW rated power (400 V rated output voltage)
3. SUN2000-42KTL running at 42kW rated power

The PQ-Modes could be set on the SUN2000 APP, the SmartLogger or the network management system (NMS).

In the view of DNV GL, the FRT tests fulfil the VDE-AR-N 4120 /D/.

Specific results from the measurement reports can be found in our test reports CR-GCC-TR8-04062-A066-1 and CR-GCC-TR8-04062-A067-1.

Measurement no.	Extract no.	Content
GLGH-4280 17 14669 294-A-0001-A	-	Low Voltage Ride Through- tests for SUN2000-36KTL
GLGH-4280 17 14669 294-A-0002-A	GLGH-4280 17 14669 294-S-0001-A	Active power reduction at over frequency for SUN2000-36KTL
GLGH-4280 16 13964 294-A-0002-C	GLGH-4280 16 13964 294-S-0001-B	Power quality tests for SUN2000-36KTL
GLGH-4280 18 14989 294-A-0005-A	GLGH-4280-18-14989 294-S-002-A	Control behaviour tests and power quality for SUN2000-42KTL

All tests according FGW TG3 /A/ and /E/ were assessed according FGW TG8 /C/ and in compliance with VDE-AR-N 4120 /D/.