

EQUIPMENT CERTIFICATE

Certificate No.:	Issued:	Valid until:	GCC class
TC-GCC-DNVGL-SE-0124-07238-1	2021-10-25	Unlimited	TC _i

Issued for:

PV Inverters SUN2000-105KTL-H1 (PPM Type A,B,C,D)

With specifications and software version as listed in Annex 2

Manufacturer:

HUAWEI Technologies Co., Ltd
Bantlan, Longgang District,
Shenzhen 518129, P.R. China

Customer:

HUAWEI Polska Sp.z.o.o.
Horizon Plaza Building, Domaniewska 39A
Street, 02-672 Warsaw, Poland

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-0124-07238-A072-0 Network Code Requirements for a PGM of Types A-B-C-D - Poland, Certification Report, dated 2021-06-30

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, 2021-10-25
For DNV Renewables Certification

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For DNV Renewables Certification



Bente Vestergaard
Director and Service Line Leader Type
and Component Certification

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.

Liselotte Ulvgård
Project Manager

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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.

The customer, as specified on the front page of this certificate, is responsible for the certificate maintenance.

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 full 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 section 4.2 and sections 5.1-5.9 of the certification report CR-GCC-DNVGL-SE-0124-07238-A072-0.
- To ensure a compliant LFSM-O and LFSM-U* characteristic, the correct reference power for droop calculation must be used, either by using the POLAND 50549-MV800 parameter set (as can be chosen as “grid code” in control interface) or by manual parameter adjustments, which is not further described as part of this certification and needs to be assessed on project level. More information is found in section 4.2 and 5.10 of the certification report CR-GCC-DNVGL-SE-0124-07238-A072-0.

(* note that LFSM-U capability is only mandatory when used as Type C or D (thus with a gathered maximum capacity ≥ 10 MW or at voltages ≥ 110 kV at grid connection point).

Furthermore, if used as Type B, C or D (thus with a gathered maximum capacity ≥ 0.2 MW or at voltages ≥ 110 kV at grid connection point):

- To ensure correct fast fault current injection in negative sequence, the parameter named “*LVRT compensation power factor of reactive power in negative sequence*” must be set to the same parameter value (k-factor) as “*LVRT compensation power factor of reactive power in positive sequence*” in the control interface. More information about the required and implemented control is found in section 5.8.1 and 5.8.3.1 respectively in the certification report CR-GCC-DNVGL-SE-0124-07238-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)

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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	Type C	Type D	Assessment result (**)
Frequency range	13.1(a)	13.1 (a)(i)	x	X	x	x	Compliant
Rate of Change of Frequency (RoCoF) withstand capability, df/dt	13.1 (b)	13.1 (b)	x	X	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	x	x	Compliant
Limited Frequency Sensitive Mode – under frequency (LFSM-U)	15.2 (c)	15.2 (c)(i)			x	x	Compliant
Capability to withstand voltage dips for connection below 110 kV	14.3	14.3 (a)(i), (b)		X	x	x	Compliant
Capability to withstand voltage dips for connection above 110 kV	16.3	16.3 (a)(i), (c)				x	Compliant
Fast fault current injection, symmetric and asymmetric faults	20.2 (b), (c), 21.3 (e)	20.2 (b), (c), 21.3 (e)		X	x	x	Compliant
Active power recovery after fault clearance	20.3	20.3 (a)		X	x	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.

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Schematic description and technical data of the generating units

1 Schematic description of the generating unit

The Huawei solar inverter family H1V200, consisting of: SUN2000-105KTL-H1 converts electrical energy generated by photovoltaic modules (DC) to three-phase alternating current (AC). It runs at 800 V rated output voltage with a rated active power output of 105 kW.

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

No. of phases	3
Rated apparent power	116 kVA
Rated active power	105 kW
Rated AC-voltage (phase to phase)	800 Vac
Rated frequency	50Hz

2.2 DC Input

Min. MPPT voltage	600 V
Max. MPPT voltage	1500 V
Max. DC input voltage	1500 V
Max. DC input current	25 A x 6 strings

2.3 Software Version

Firmware version	V200R001C30SPC113
Software version	V200R001.C30.SPC[x] for $[x] \geq 113$, provided that updates to [x] would not have influence on the electrical behavior that was tested for the certified features. Any other update would need to be approved by DNV to ensure validity of certificate

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 parameter "grid code", which provide default parameter settings. For this assessment the parameters set named "POLAND 50549-MV800" in the interface, was assessed for the functionalities within scope of this certification. The settings are by default set to and match type D requirements, which will make them compliant also to the requirements of type A, B and C. 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.



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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. Final settings must be agreed on project level in agreement with relevant system operator.

Some of the tests used for the assessment, those presented in test report /1/ and /2/ listed in section 3 below, were performed using a different parameter set or with manual settings. In these cases, it has been assessed and confirmed by the manufacturer that the test result used are representative for the expected behaviour if using the "POLAND 50549-MV800" parameter set.

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Type tests

1 Type tests

The test results used for assessment are documented in the measurement report(s) as specified in the tables below. The tests presented in test reports /1/ and /2/ were performed from between 2020-02-07 - 2020-02-19 and 2020-04-15 - 2020-05-15 in the Huawei Technologies Co., Ltd. Lab in Shenzhen Lab by Bureau Veritas Test Lab in Germany, for certification according to standards EN 50549-2:2019 (for /1/) and FGW TG3 (for /2/). The test report /3/ were performed on between 2021-02-25 and 2021-03-23 at Shanghai Testing & Inspection Institute for Electrical Equipment Co., Ltd. (STIEE) in Shanghai (P.R. China).

All tests were performed under ISO-17025 accreditation and they were performed on the SUN2000-105KTL-H1 unit.

Scope	Reference
Frequency range	Section 4.7 of 2/
Rate of Change of Frequency (RoCoF) withstand capability, df/dt	Section 4.5.2 of /1/
Remote cessation of active power	Section 4.11.1 of /1/
Remote control of active power	Section 4.11.2 of /1/
Limited Frequency Sensitive Mode – over frequency (LFSM-O)	Section 5.1 of /3/
Limited Frequency Sensitive Mode – under frequency (LFSM-U)	Section 5.2 of /3/
Fault Ride Through (FRT)	Section 6.6 of /2/, Section 4 of /3/
Fast fault current injection, symmetric and asymmetric faults	Section 6.6 of /2/, Section 4 of /3/
Active power recovery after fault clearance	section 4 of /3/

Test report(s)	Document number	Content
/1/	18TH0387-EN50549-2_0	Requirements for generating plants of type A and B according to EN 50549-1:2019
/2/	18TH0387-TR3_0	Determination of electrical characteristics of power generating units and systems, storage systems as well as for their components in medium-, high and extra-high voltage grids, according to FGW TG3 rev. 25
/3/	10273052-A-4-A	Power Quality tests on a PV inverter of the type HUAWEI SUN2000-105KTL-H1 according to FGW TG3 Rev. 25 and Polish requirement

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-0124-07238-A072-0.