

Certificate No.: **AHC2407190100GC01**

Date of issue: 2024-08-27

Valid until: Indefinitely

Applicant: **EAST Group Co., Ltd.**

No.6 Northern Industry Road, Songshan Lake Sci. & Tech. Industrial Park, Dongguan City, Guangdong Province, China

Device Category: Inverter**Device Type:** Hybrid (PV with DC coupled Electricity Storage)☒ Type A ☐ Type B ☐ Type C ☐ Type D**Model(s):** **EAHI-6000-SL-S****Trademark:****EAST****Technical data:** Registered Capacity [kW]: 6.0

Nominal output AC voltage [V]: 230 (L + N + PE, 50 Hz)

(For further details see A.2 Technical data of the power generating unit(s) on p.2)

Software version: MCU SW Ver.1035 / DSP SW Ver.1037**Grid connection code:** **Engineering Recommendation G99**

Issue 1 - Amendment 10

4 March 2024

Requirements for the connection of generation equipment in parallel with public distribution networks on or after 27 April 2019

Certification scheme: **CMPD-01****Test report no.:** **HC2407190100GC01** (2024-08-25)

This certificate confirms that the above-mentioned generating unit(s) with corresponding software meet the requirements of the referenced grid connection code at the time of issuance of the certificate.

This certificate relates to type testing and does not imply LYNS's endorsement, approval, certification or on-going control of the product(s), either in terms of performance, design, manufacture or materials used. This certificate and the results stated herein relate solely to the sample product(s) tested and to the specific tests undertaken.

The certificate will remain valid for the stated period providing no changes are made to the product, production method etc. This certificate is only valid when this is also found at <http://www.lyns-tci.com/en/certificate-search> or contact Lyns-tci Technology Guangdong Co., Ltd..

This certificate is for the exclusive use of LYNS's Client and is provided pursuant to the agreement between LYNS and its Client. LYNS's responsibility and liability are limited to the terms and conditions of the agreement. LYNS assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned using this verification.

The certificate is comprised of 11 pages (including Annex of 10 pages).

Dongguan, 2024-08-27

**Dipl.-Ing. Weizhao Zheng**
Head of certification body

Certification body Lyns-tci Technology Guangdong Co., Ltd. accredited according to ISO/IEC 17065 for product certification.

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A.1 Revision history of the certificate

Rev. No.	Date	Changes
Rev. 0 (AHC2407190100GC01)	2024-08-27	Initial issue

A.2 Technical data of the power generating unit(s)

Model	EAHI-6000-SL-S
DC input (PV)	
Max. DC input voltage [V]	550
Operating MPPT voltage range [V]	100 ~ 540
Input DC current [A]	max. 15 / 15
Battery connection	
Battery voltage range [V]	40.8 ~ 57.6
Battery charging current [A]	max. 100
Battery discharging current [A]	max. 120
Battery type	Lithium-ion
AC connection	
Nominal output AC voltage [V]	230 (L + N + PE, 50 Hz)
Output AC current [A]	max. 26.09
Nominal active output power P_n [kW]	6.0
Registered Capacity ¹ P_{max} [kW]	6.0
Max. apparent power [kVA]	6.0
Operating temperature range	-25°C ~ +60°C
Degree of protection	IP66 (according to EN 60529)
Protection class	I (according to IEC 62109-1)
Over voltage category	AC: III; DC: II (according to IEC 62109-1)
Topology	PV to AC: no galvanic isolation Battery to PV/AC: high frequency isolated
Firmware version	MCU SW Ver.1035 / DSP SW Ver.1037
Manufacturer	EAST Group Co., Ltd. No.6 Northern Industry Road, Songshan Lake Sci. & Tech. Industrial Park, Dongguan City, Guangdong Province, China (The manufacturer has provided proof of certification of the quality management system of his production facility in accordance with ISO 9001)
Testing laboratory	LYNS-TCI TECHNOLOGY GUANGDONG CO., LTD. Room 1201, Unit 2, Building 18, No. 7, Science and Technology Boulevard, Houjie Town, Dongguan City, Guangdong, 523960 P.R. China (Accredited acc. ISO/IEC 17025: A2LA Accreditation no. 5200.02)
Testing location	Same as above
Date(s) of performance of tests	2024-07-23 - 2024-08-20

Note:

- For Power Park Module (Generating Unit) *EAHI-6000-SL-S* to meet the requirement:

¹ The stated values of "registered capacity" related to single Generating Unit.

Annex to the Certificate No.: AHC2407190100GC01

"When operating at Registered Capacity the Power Generating Module shall be capable of operating at a Power Factor within the range 0.95 lagging to 0.95 leading relative to the voltage waveform"

- a semi-permanent active power reduction to a value $P_{\max} \leq 5.7$ kW can be applied by software (the parameter setting needs to follow the manufacturer's guidance)
- or this need to be considered in the Power Generating Module design
- or otherwise agreed with the DNO
- Setting range of the Power Factor:
0.800 lagging to 0.800 leading

A.3 Extract of the test report no. HC2407190100GC01 (EREC G99, Form A2-3)

Note:

- The (full) tests were performed on EUT EAHI-6000-SL-S.
- The product was tested on:
EAHI-6000-SL-S
 - Serial No.: HI06CS230700041
 - Hardware version: MCU HW Ver.1 / DSP HW Ver.1
 - Firmware version: MCU SW Ver.1035 / DSP SW Ver.1037

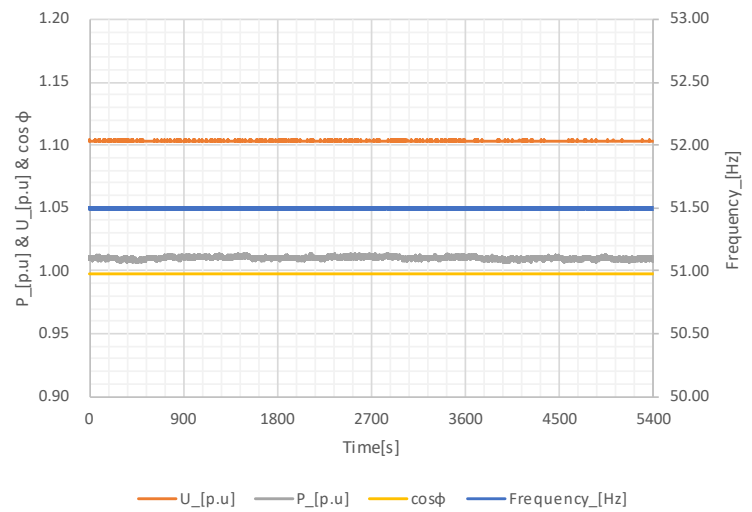
1. Operating Range	
<p>Test 1</p> <p>Voltage = 85% of nominal (195.5 V), Frequency = 47 Hz, Power Factor = 1, Period of test 20 s</p>	<p>Pass, no disconnection occurs.</p> 
<p>Test 2</p> <p>Voltage = 85% of nominal (195.5 V), Frequency = 47.5 Hz, Power Factor = 1, Period of test 90 minutes</p>	<p>Pass, no disconnection occurs.</p> 

1. Operating Range

Test 3

Voltage = 110% of nominal (253 V),
Frequency = 51.5 Hz,
Power Factor = 1,
Period of test 90 minutes

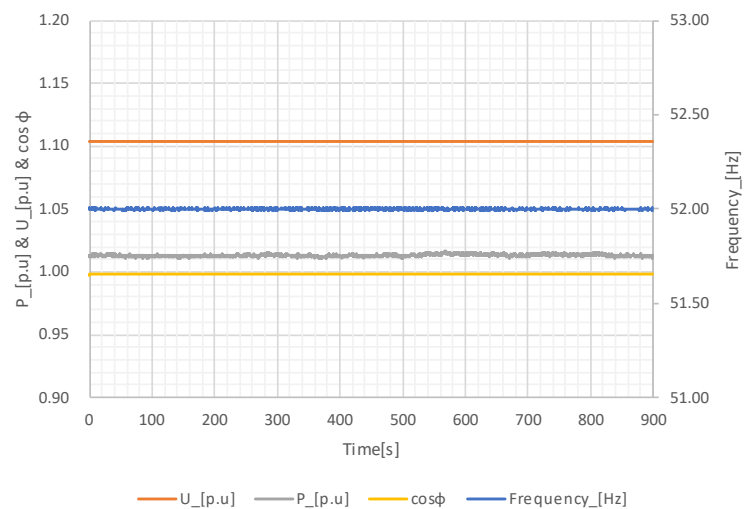
Pass, no disconnection occurs.



Test 4

Voltage = 110% of nominal (253 V),
Frequency = 52.0 Hz,
Power Factor = 1,
Period of test 15 minutes

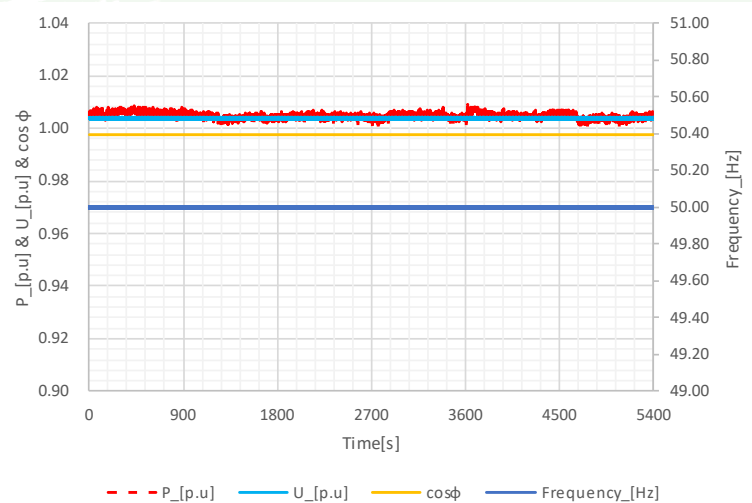
Pass, no disconnection occurs.



Test 5

Voltage = 100% of nominal (230 V),
Frequency = 50.0 Hz,
Power Factor = 1,
Period of test = 90 minutes

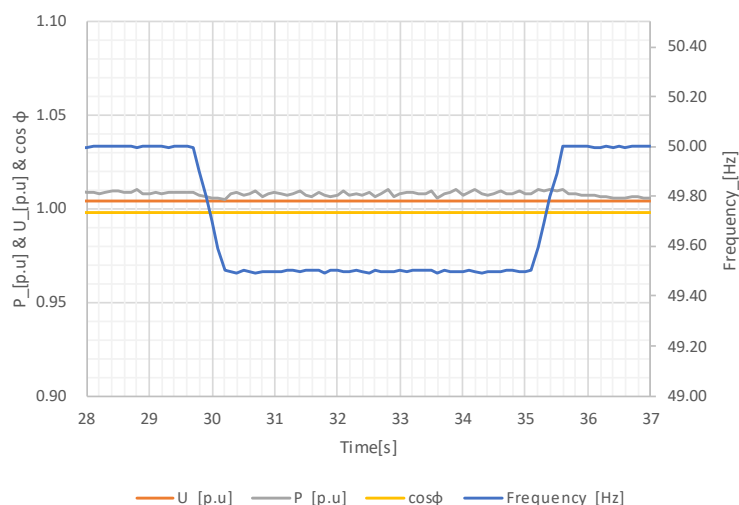
Pass, no disconnection occurs.



1. Operating Range
Test 6 RoCoF withstand

Confirm that the Power Generating Module is capable of staying connected to the Distribution Network and operate at rates of change of frequency up to 1 Hzs-1 as measured over a period of 500 ms. Note that this is not expected to be demonstrated on site.

Pass, no disconnection occurs.


2. Power Quality – Harmonics

Power Generating Module tested to BS EN 61000-3-12

Power Generating Module rating per phase (rpp)				6.0		kVA	Harmonic % = Measured Value (A) x 23/rating per phase (kVA)	
Single or three phase measurements (for single phase measurements, only complete L1 columns below).				three phases				
Harmonic	At 45-55% of Registered Capacity						Limit in BS EN 61000-3-12	
	Measured Value (MV) in Amps			Measured Value (MV) in %				
Order	L ₁	L ₂	L ₃	L ₁	L ₂	L ₃	1-phase	3-phases
2	0.014	---	---	0.054	---	---	8%	8%
3	0.117	---	---	0.449	---	---	21.6%	Not stated
4	0.009	---	---	0.035	---	---	4%	4%
5	0.077	---	---	0.295	---	---	10.7%	10.7%
6	0.023	---	---	0.088	---	---	2.67%	2.67%
7	0.054	---	---	0.207	---	---	7.2%	7.2%
8	0.006	---	---	0.023	---	---	2%	2%
9	0.056	---	---	0.215	---	---	3.8%	Not stated
10	0.008	---	---	0.031	---	---	1.6%	1.6%
11	0.044	---	---	0.169	---	---	3.1%	3.1%
12	0.009	---	---	0.035	---	---	1.33%	1.33%
13	0.030	---	---	0.115	---	---	2%	2%
THD	--	--	--	0.708	---	---	23%	13%
PWHD	--	--	--	1.204	---	---	23%	22%

2. Power Quality – Harmonics								
Harmonic	At 100% of Registered Capacity						Limit in BS EN 61000-3-12	
	Measured Value (MV) in Amps			Measured Value (MV) in %				
Order	L ₁	L ₂	L ₃	L ₁	L ₂	L ₃	1-phase	3-phases
2	0.021	---	---	0.081	---	---	8%	8%
3	0.432	---	---	1.656	---	---	21.6%	Not stated
4	0.008	---	---	0.031	---	---	4%	4%
5	0.090	---	---	0.345	---	---	10.7%	10.7%
6	0.008	---	---	0.031	---	---	2.67%	2.67%
7	0.114	---	---	0.437	---	---	7.2%	7.2%
8	0.026	---	---	0.100	---	---	2%	2%
9	0.054	---	---	0.207	---	---	3.8%	Not stated
10	0.007	---	---	0.027	---	---	1.6%	1.6%
11	0.064	---	---	0.245	---	---	3.1%	3.1%
12	0.007	---	---	0.027	---	---	1.33%	1.33%
13	0.051	---	---	0.196	---	---	2%	2%
THD	--	--	--	1.826	---	---	23%	13%
PWHD	--	--	--	1.661	---	---	23%	22%

3. Power Quality – Voltage fluctuations and Flicker									
Test start date		2024-08-08			Test end date			2024-08-09	
Test location		LYNS-TCI TECHNOLOGY GUANGDONG CO., LTD. (see <i>Testing location</i> on p.2)							
	Phase no.	Starting			Stopping			Running	
		d _{max} [%]	d _c [%]	d(t) [ms]	d _{max} [%]	d _c [%]	d(t) [ms]	P _{st}	P _{lt} 2 hours
Measured Values at test impedance	L1	1.352	0.404	0.000	0.534	0.429	0.000	0.144	0.073
	L2	--	--	--	--	--	--	--	--
	L3	--	--	--	--	--	--	--	--
	Overall worst case	1.352	0.404	0.000	0.534	0.429	0.000	0.144	0.073
Measured Values at test impedance	L1	1.352	0.404	0.000	0.534	0.429	0.000	0.144	0.073
	L2	--	--	--	--	--	--	--	--
	L3	--	--	--	--	--	--	--	--
	Overall worst case	1.352	0.404	0.000	0.534	0.429	0.000	0.144	0.073
Measured Values at test impedance	L1	--	--	--	--	--	--	--	--
	L2	--	--	--	--	--	--	--	--
	L3	--	--	--	--	--	--	--	--
	Overall worst case	--	--	--	--	--	--	--	--
Limits set under BS EN 61000-3-11		4	3.3	500 (3.3%)	4	3.3	500 (3.3%)	1.0	0.65

3. Power Quality – Voltage fluctuations and Flicker					
Test Impedance	R:	0.24	Ω	X:	0.15 Ω
Standard Impedance	R:	<input type="checkbox"/> 0.24 * <input checked="" type="checkbox"/> 0.4 ^	Ω	X:	<input type="checkbox"/> 0.15 * <input checked="" type="checkbox"/> 0.25 ^ Ω
Maximum Impedance	R:	--	Ω	X:	-- Ω
* <input type="checkbox"/> three-phase Power Generating Modules <input type="checkbox"/> split single phase Power Generating Modules ^ <input checked="" type="checkbox"/> single phase Power Generating Module <input type="checkbox"/> Power Generating Modules using two phases on a three-phase system					

4. Power Quality – DC injection			
Test power level	10%	55%	100%
Recorded DC value in Amps	0.023	0.027	0.058
as % of rated AC current	0.088	0.104	0.222
Limit [%]	0.25	0.25	0.25

5. Power Factor				
Voltage \ Output power		0.94 pu (216.2 V)	1 pu (230 V)	1.1 pu (253 V)
20%	Measured value	0.983	0.981	0.977
50%		0.997	0.997	0.996
75%		0.998	0.998	0.998
100%		0.998	0.998	0.998
Power Factor Limit		>0.95	>0.95	>0.95

6. Protection – Frequency tests						
Function	Setting		Trip test		"No trip tests"	
	Frequency	Time delay	Frequency	Time delay	Frequency / time	Confirm no trip
U/F stage 1	47.5 Hz	20 s	47.49 Hz	20.020 s	47.7 Hz 30 s	No trip occurred
U/F stage 2	47 Hz	0.5 s	47.01 Hz	0.535 s	47.2 Hz 19.5 s	No trip occurred
					46.8 Hz 0.45 s	No trip occurred
O/F	52 Hz	0.5 s	52.02 Hz	0.531 s	51.8 Hz 120.0 s	No trip occurred
					52.2 Hz 0.45 s	No trip occurred

7. Protection – Voltage tests							
Function		Setting		Trip test		“No trip tests”	
		Voltage	Time delay	Voltage	Time delay	Voltage / time	Confirm no trip
U/V	L1-N	0.8 pu (184 V)	2.5 s	183.47 V	2.501 s	188 V 5.0 s	No trip occurred
	L2-N			---	---		No trip occurred
	L3-N			---	---		No trip occurred
						180 V 2.45 s	No trip occurred
O/V stage 1	L1-N	1.14 pu (262.2 V)	1.0 s	262.52 V	1.019 s	258.2 V 5.0 s	No trip occurred
	L2-N			---	---		No trip occurred
	L3-N			---	---		No trip occurred
O/V stage 2	L1-N	1.19 pu (273.7 V)	0.5 s	273.97 V	0.528 s	269.7 V 0.95 s	No trip occurred
	L2-N			---	---		No trip occurred
	L3-N			---	---		No trip occurred
						277.7 V 0.45 s	No trip occurred

8. Protection – Loss of Mains test						
Test Power and imbalance	33% -5%Q (Test 22)	66% -5%Q (Test 12)	100% -5%P (Test 5)	33% +5%Q (Test 31)	66% +5%Q (Test 21)	100% +5%P (Test 10)
Trip time [s]	0.230	0.034	0.180	0.156	0.172	0.143
Trip time limit [s]	0.5					
Loss of Mains Protection, Vector Shift Stability test						
	Start Frequency		Change		Confirm no trip	
Positive Vector Shift	49.5 Hz		+50 degrees		No trip occurred	
Negative Vector Shift	50.5 Hz		- 50 degrees		No trip occurred	
Loss of Mains Protection, RoCoF Stability test						
Ramp range	Test frequency ramp:		Test Duration		Confirm no trip	
49.0 Hz to 51.0 Hz	+0.95 Hz/s		2.1 s		No trip occurred	
51.0 Hz to 49.0 Hz	-0.95 Hz/s		2.1 s		No trip occurred	

9. Limited Frequency Sensitive Mode – Overfrequency test				
Active Power response to rising frequency/time plots are attached if frequency injection tests are undertaken in accordance with Annex A.7.2.4.				N
Alternatively, test results should be noted below:				
Test sequence at Registered Capacity >80%	Measured Active Power Output [W]	Frequency [Hz]	Primary Power Source [W]	Active Power Gradient Droop
Step a) 50.00Hz ± 0.01Hz	6030	50.00	6600	---
Step b) 50.45Hz ± 0.05Hz	5948	50.45		---
Step c) 50.70Hz ± 0.10Hz	5640	50.70		9.74% ¹⁾
Step d) 51.15Hz ± 0.05Hz	5095	51.15		9.92% ²⁾
Step e) 50.70Hz ± 0.10Hz	5641	50.70		9.90% ³⁾
Step f) 50.45Hz ± 0.05Hz	5943	50.45		9.93% ⁴⁾
Step g) 50.00Hz ± 0.01Hz	6046	50.00		---
	1 st Droop (calculated using frequency and power between steps d) & b))			9.86%
	2 nd Droop (calculated using frequency and power between steps f) & d))			9.91%
Test sequence at Registered Capacity 40% - 60%	Measured Active Power Output [W]	Frequency [Hz]	Primary Power Source [W]	Active Power Gradient Droop
Step a) 50.00Hz ± 0.01Hz	3000	50.00	3300	---
Step b) 50.45Hz ± 0.05Hz	2969	50.45		---
Step c) 50.70Hz ± 0.10Hz	2665	50.70		9.86% ¹⁾
Step d) 51.15Hz ± 0.05Hz	2117	51.15		9.86% ²⁾
Step e) 50.70Hz ± 0.10Hz	2665	50.70		9.87% ³⁾
Step f) 50.45Hz ± 0.05Hz	2969	50.45		9.86% ⁴⁾
Step g) 50.00Hz ± 0.01Hz	2989	50.00		---
	1 st Droop (calculated using frequency and power between steps d) & b))			9.86%
	2 nd Droop (calculated using frequency and power between steps f) & d))			9.86%
Note:				
1) Droop calculated using frequency and power between steps b) & threshold frequency of 50.4 Hz				
2) Droop calculated using frequency and power between steps c) & b)				
3) Droop calculated using frequency and power between steps d) & c)				
4) Droop calculated using frequency and power between steps e) & d)				

9. Limited Frequency Sensitive Mode – Overfrequency test
⁵⁾ Droop calculated using frequency and power between steps f) & e)

10. Protection – Re-connection timer

Time delay setting	Measured delay	Checks on no reconnection when voltage or frequency is brought to just outside stage 1 limits of Table 10.1.			
20 s	29.4 s	At 1.16 pu (266.2 V LV connection)	At 0.78 pu (180.0 V LV connection)	At 47.4 Hz	At 52.1 Hz
Confirmation that the Power Generating Module does not re-connect.		No reconnection occurred	No reconnection occurred	No reconnection occurred	No reconnection occurred

11. Fault level contribution

For **Inverter** output

Time after fault	Volts	Amps
20 ms	L1: 162.0	L1: 0.0
	L2: ---	L2: ---
	L3: ---	L3: ---
100 ms	L1: 12.0	L1: 0.0
	L2: ---	L2: ---
	L3: ---	L3: ---
250 ms	L1: 1.0	L1: 1.0
	L2: ---	L2: ---
	L3: ---	L3: ---
500 ms	L1: 2.0	L1: 1.0
	L2: ---	L2: ---
	L3: ---	L3: ---
Time to trip	0.047	In seconds

12. Self-Monitoring solid state switching

It has been verified that in the event of the solid-state switching device failing to disconnect the **Power Park Module**, the voltage on the output side of the switching device is reduced to a value below 50 volts within 0.5 s.

NA

13. Wiring functional tests

Confirm that the relevant test schedule is attached (tests to be undertaken at time of commissioning)

NA

14. Logic interface (input port)

Confirm that an input port is provided and can be used to shut down the module

Yes

Provide high level description of logic interface, e.g. details in 11.1.3.1 such as AC or DC signal (the additional comments box below can be used)

Yes

For details see "Additional comments." Below.

15. Cyber security

Confirm that the **Power Generating Module** has been designed to comply with cyber security requirements, as detailed in 9.1.7.

Yes.

Note:

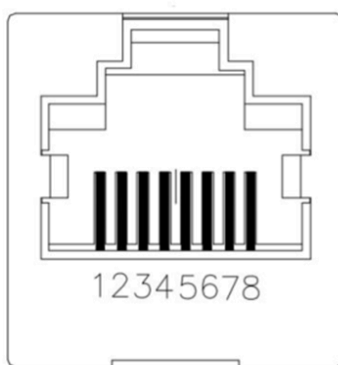
Manufacturer's declaration provided.

Additional comments:

High level description of logic interface:

The PGU equipped with a logic interface for ceasing active power output within 5 s following an instruction being received. The following is a possible configuration (if another configuration is required, this can be agreed with the manufacturer):

Used to connect to the upper computer. (Baud rate is set to 9600 in the communication setting column on the screen.). Connect the RS485 cable A and cable B to pin 5 and pin 4 of the RJ45 registered jack respectively, and the registered jack to the RS485 port on the housing.



Pin No.	Pin Name	Description	Connected to External communication port
5	A	RS485-A	Twisted pair differential transmission
4	B	RS485-B	Twisted pair differential transmission

The inverter is controlled externally through RS485

Pin	1	2	3	4	5	6	7	8
Definition	RS3_485-	RS3_485-	RS3_485-	RS3_485-	RS3_485+	RS3_485+	RS3_485+	RS3_485+