TEST REPORT

UNE217001 IN

Requisitos y ensayos para sistemas que eviten el vertido de energía a la red de distribución

Report reference number..... :	**PVSP200511N080-7**
Date of issue.....:	2021-03-25
Total number of pages.....:	55
Testing laboratory name..... :	**Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch**
Address.....:	No. 96, Guantai Road (Houjie Section), Houjie Town, Dongguan City, Guangdong Province, 523942, People's Republic of China
Accreditation .....:	ilac-MRA ACCREDITED Certificate # 2951.01
Applicant's name ..... :	**Shenzhen SOFARSOLAR Co., Ltd.**
Address.....:	401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen, China
Test specification	
Standard .....:	UNE 217001 IN: 2015 Requirements and tests for systems intended to avoid the energy transmission to the distribution network (RD 244:2019)
Test Report Form No.....:	UNE 217001 IN VER.0
TRF Originator.....:	Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch
Master TRF.....:	Dated 2020-03-11
Test item description.....:	**Solar Grid-tied Inverter / Energy Meter / Current Transformer**
Trademark .....:	SOFAR SOLAR
Model / Type .....:	Solar Grid-tied Inverter : SOFAR 15KTLX-G3, SOFAR 17KTLX-G3, SOFAR 20KTLX-G3, SOFAR 22KTLX-G3, SOFAR 24KTLX-G3 Energy Meter : DTSU666 Current Transformer : HY94C5-200,AKH-0.66-K-Φ24

Ratings..... :	**SOFAR 15KTLX-G3**	**SOFAR 17KTLX-G3**	**SOFAR 20KTLX-G3**	**SOFAR 22KTLX-G3**	**SOFAR 24KTLX-G3**
Input DC voltage [V].....:	Max. 1100Vd.c.				
MPP DC voltage range [V].....:	140-1000Vd.c.				
Input DC current [A].....:	26,0A / 26,0A				
Isc PV [A].....:	36,0A / 36,0A				
Output AC voltage [V].....:	380/400Va.c., 3W+N+PE; 50/60Hz				
Rated Output AC current [A].....:	21,7	24,6	29,0	31,9	34,8
Max. Output AC current [A].....:	23,9	27,1	31,9	35,1	38,3
Rated Output power [kW] .....:	15,0	17,0	20,0	22,0	24,0
Max Output power [kVA].....:	16,5	18,7	22,0	24,2	26,4

Testing Location .....:	**Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch**
Address.....:	No. 96, Guantai Road (Houjie Section), Houjie Town, Dongguan City, Guangdong Province, 523942, People's Republic of China
Tested by (name and signature) .....:	Lukes Lin 
Approved by (name and signature) .....:	James Huang 
Manufacturer's name .....:	**Shenzhen SOFARSOLAR Co., Ltd.**
Manufacturer address.....:	401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen, China
Factory 's name .....:	**Dongguan SOFAR SOLAR Co.,Ltd.**
Factory address.....	1F - 6F, Building E, No. 1 JinQi Road, Bihu Industrial Park, Wulian Village, Fenggang Town, Dongguan City

Document History

Date	Internal reference	Modification / Change / Status	Revision
2021-03-25	Lukes Lin	Initial report was written	0

Test item particulars		
Equipment mobility	:	Permanent connection
Operating condition	:	Continuous
Class of equipment	:	Class I
Protection against ingress of water	:	IP65 according to EN 60529
Mass of equipment [kg]	:	Approx. 20,0 kg for SOFAR 15KTLX-G3; Approx. 22,0 kg for SOFAR 17KTLX-G3, SOFAR 20KTLX-G3; Approx. 23,0 kg for SOFAR 22KTLX-G3, SOFAR 24KTLX-G3;
Possible test case verdicts		
- test case does not apply to the test object	:	N/A
- test object does meet the requirement	:	P (Pass)
- test object does not meet the requirement	:	F (Fail)
Testing		
Date of receipt of test item	:	2020-11-20
Date (s) of performance of tests	:	2020-11-20 to 2021-03-10

General remarks

Preface:

The test results presented in this report relate only to the object(**s**) tested.

This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.

"(see Annex #)" refers to additional information appended to the report.
"(see appended table)" refers to a table appended to the report.

Throughout this report a ☒ comma / ☐ point is used as the decimal separator.

Description of the vector system to depict test results:

The regarded system of the voltage and current vectors is the generator reference system (Figure 1):

- If the inverter feeds to the grid the active power is measured with positive sign.
- If the load consumes from grid the active power is measured with negative sign.

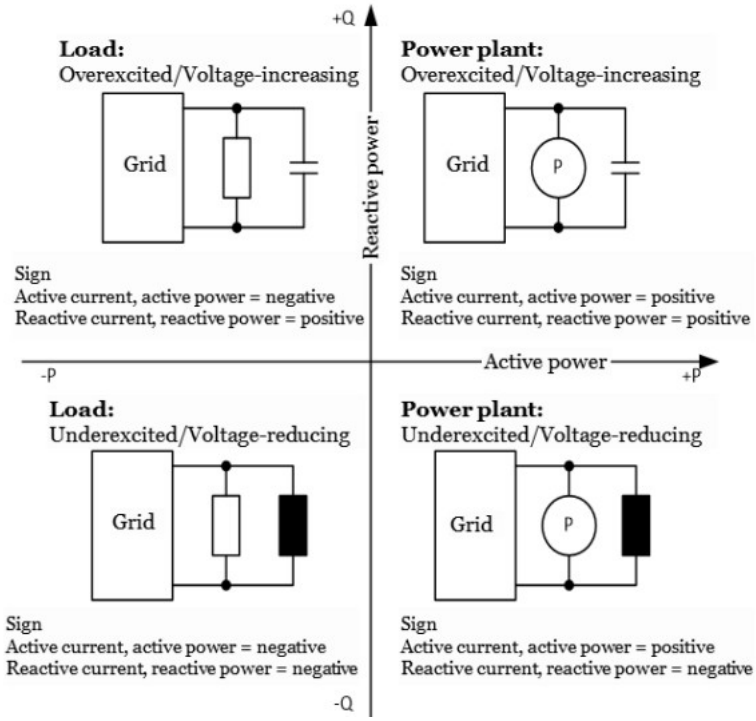


Figure 1 – Generator reference arrow system

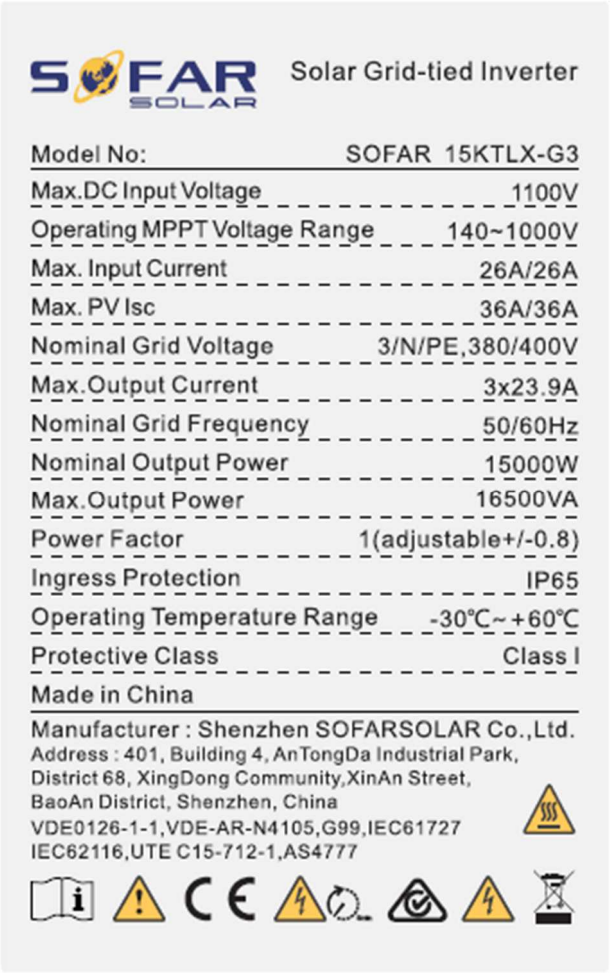
This report consists of the following documents and/or enclosures:

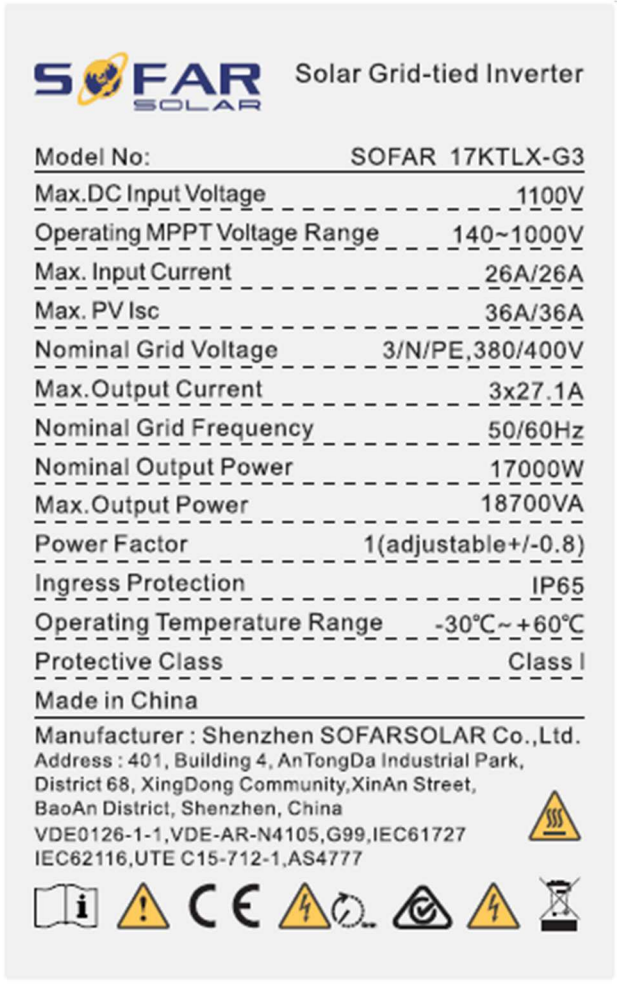
No.	Contents
1)	Basic outline of the system
2)	Power analyzer and class of measurement transformers for power measurement.
3)	Control element.
4)	Type of communications used between the different elements.
5)	Type generators for which the system is valid.
6)	Power of the type generator tested and generators / analyser's assimilated.
7)	Control algorithm
8)	Electric characteristics of the generator
9)	Maximum number of generators to be connected
5	Test
5.1	Tolerance in permanent mode
5.2	Response to load disconnections
5.3	Response to power increases in the primary energy source
5.4	Action in case of loss of communications
A.1	Annex 1 - Pictures of the unit
A.2	Annex 2 -Test Equipment list

Copy of marking plate

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.

Inverter





Copy of marking plate

SOFAR SOLAR Solar Grid-tied Inverter

Model No:	SOFAR 20KTLX-G3
Max.DC Input Voltage	1100V
Operating MPPT Voltage Range	140~1000V
Max. Input Current	26A/26A
Max. PV Isc	36A/36A
Nominal Grid Voltage	3/N/PE,380/400V
Max.Output Current	3x31.9A
Nominal Grid Frequency	50/60Hz
Nominal Output Power	20000W
Max.Output Power	22000VA
Power Factor	1(adjustable+/-0.8)
Ingress Protection	IP65
Operating Temperature Range	-30℃~+60℃
Protective Class	Class I

Made in China

Manufacturer : Shenzhen SOFARSOLAR Co.,Ltd.
Address : 401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community,XinAn Street, BaoAn District, Shenzhen, China
VDE0126-1-1,VDE-AR-N4105,G99,IEC61727
IEC62116,UTE C15-712-1,AS4777

SOFAR SOLAR Solar Grid-tied Inverter

Model No:	SOFAR 22KTLX-G3
Max.DC Input Voltage	1100V
Operating MPPT Voltage Range	140~1000V
Max. Input Current	26A/26A
Max. PV Isc	36A/36A
Nominal Grid Voltage	3/N/PE,380/400V
Max.Output Current	3x35.1A
Nominal Grid Frequency	50/60Hz
Nominal Output Power	22000W
Max.Output Power	24200VA
Power Factor	1(adjustable+/-0.8)
Ingress Protection	IP65
Operating Temperature Range	-30℃~+60℃
Protective Class	Class I

Made in China

Manufacturer : Shenzhen SOFARSOLAR Co.,Ltd.
Address : 401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community,XinAn Street, BaoAn District, Shenzhen, China
VDE0126-1-1,VDE-AR-N4105,G99,IEC61727
IEC62116,UTE C15-712-1,AS4777

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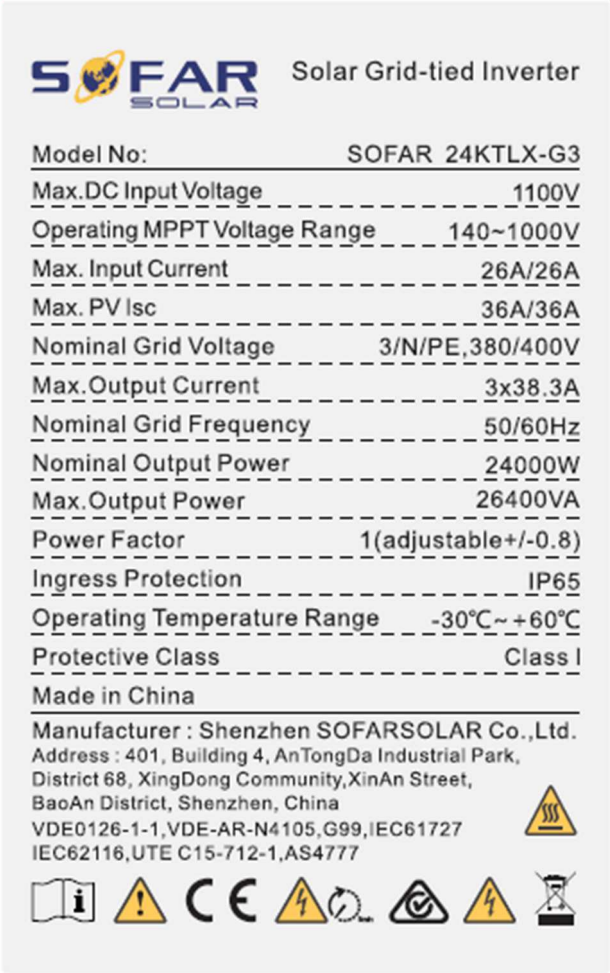

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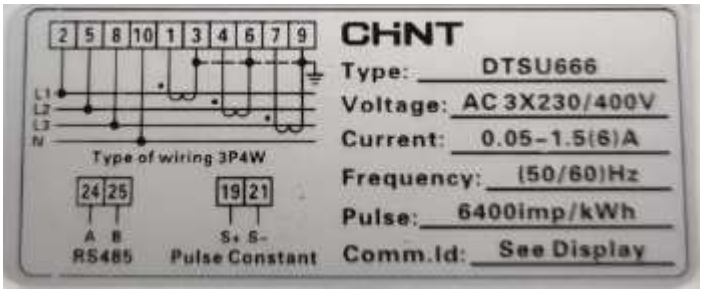
Energy Meter (DTSU666)



Current Transformer

General product information:

The Solar Grid-tied Inverter converts DC voltage into AC voltage.

The DC input of Solar Grid-tied Inverter can be supplied from PV array.

The Solar Grid-tied Inverter is a three-phase type.

The unit is providing EMC filtering at the output toward mains. The unit does not provide galvanic separation from input to output (transformerless). The output is switched off redundant by the high power switching bridge and a two relays. This assures that the opening of the output circuit will also operate in case of one error.

Description of the electrical circuit

The internal control is redundant built. It consists of Microcontroller DSP (U30) and DSP (U23).
The Main DSP(U30) control the relays by switching signals; measures the PV voltage, PV current, Bus voltage, grid voltage, frequency, AC current with injected DC and the array insulation resistance to ground. In addition it tests the Current Transformers and the RCMU circuit before each start up.
The slave DSP (U23) is measures the grid voltage, grid frequency, DCI and residual current, also can switch off the relays independently, and communicate with the Main DSP (U30) each other.
The current is measured by a Current Transformer. The AC current signal and the injected DC current signal are sent to the Main DPU (U30). The Main DSP (U30) tests and calibrates before each start up all Current Transformers.
The unit provides two relays in series in all output conductors. When single fault applied to one relay, alarm an error code in display panel, another redundant relay provides basic insulation maintained between the PV array and the mains. All the relays are tested before each start up.

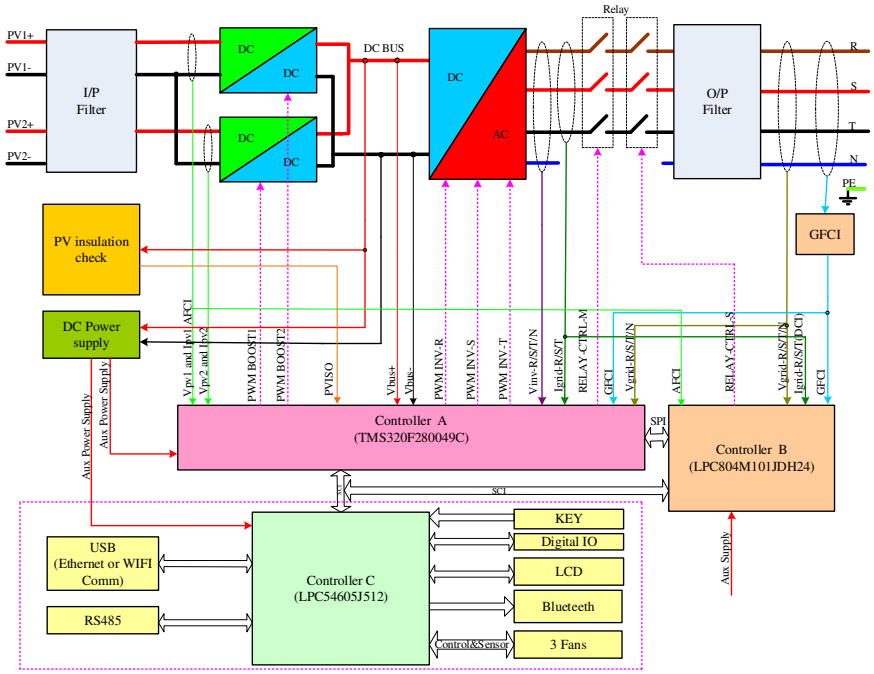


Figure 1 – Block diagram

General product information:

Description of the differences of the models within a series:

The models SOFAR 15KTLX-G3, SOFAR 17KTLX-G3, SOFAR 20KTLX-G3, SOFAR 22KTLX-G3 and SOFAR 24KTLX-G3 are use the identical hardware platform, control unit, control system and software except the output power derated by software and in following table descripts for different.

	SOFAR 15KTLX-G3	SOFAR 17KTLX-G3	SOFAR 20KTLX-G3	SOFAR 22KTLX-G3	SOFAR 24KTLX-G3
Thin-film capacitor of BUS	4pcs (110uF, 550V)	6pcs (110uF, 550V)			
INV IGBT (Q60, Q67, Q71 Q72, Q75, Q76)	6pcs 40A, 1200V	6pcs 75A, 1200V			
External Fan	1		2		

Description of test object(s):

The tests were performed on Solar Grid-tied Inverter SOFAR 24KTLX-G3 with the Energy Meter DTSU666 and Current Transformer HY94C5-200.

When the Energy Meter DTSU666 is used with the Current Transformer. The user can select the Current Transformer whose input current range is not greater than 5A .

Hardware version:

The products was tested on following HW revisions:

Hardware: V101

Energy Meter : ZTY8.067.2837V2

HY94C5-200 Current Transformer: D.02

AKH-0.66-K-Φ24 Current Transformer:N/A

Software (FW) version:

The products were tested on:

Solar inverter: V010000

Energy Meter : GF_DTSU666.001_230V1.5(6)A_V3.04

Current Transformer: N/A

1) Basic outline of the system	Informative

Application Scenarios

Scheme of Single machine photovoltaic power generation system: Solar inverter + Energy Meter + Current Transformer

The smart Energy Meter is used to realize power restriction for household energy management. It adopts RS485 communication, which can realize the electrical quantity measurement, energy metering function and in respond to the upper host for the real-time data query.

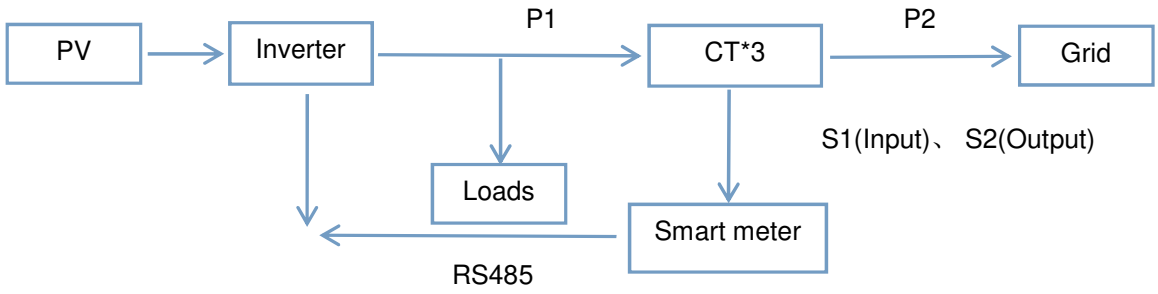


Figure 2 (Use CT)

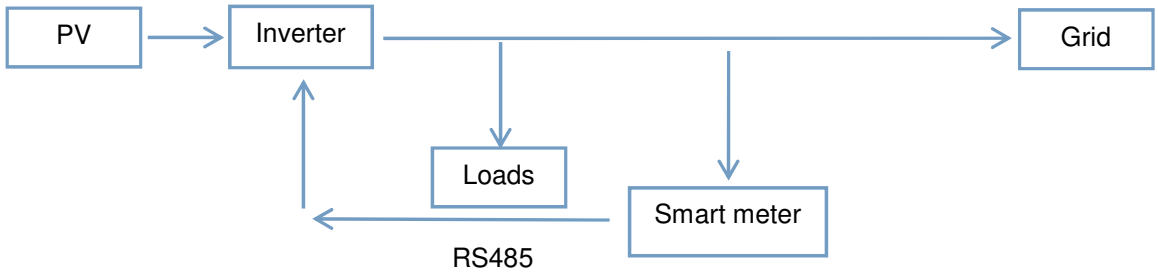


Figure 3 (Direct connection)

2) Power analyzer and class of measurement transformers for power measurement.			Informative
Energy Meter			
Model:			**DTSU666**
Environmental Specifications			
Regulated working temperature range		:	-10°C to +45°C
Electrical parameter			
Regulated working voltage range		:	0.9-1.1Un
Nominal voltage		:	3L+N/400Vac
Regulated working current range		:	0.05A-1.5(6)A
Nominal current		:	CT in:1.5A/6A
self -consumption		:	1.5W max
Data detection		:	Voltage/Current/Active Power/ Reactive Power/Power Factor/Frequency
Energy calculation		:	Active/Reactive Power energy
Precision	Voltage/Current	:	Class I
	Active Power	:	Class I
	Reactive Power	:	Class 2
Comm.	With Inverter	:	RS485(Bund Rate 9600/ModBus-RTU Protocol)

EMC Specifications		
EMC performance of the meter conforms to the following relevant technical standard: Emission: EN 61326-1:2013 EN 61000-3-2:2014 and EN 61000-3-3:2013 Immunity: EN 61326-1:2013 (IEC 61000-4-2：2008,IEC61000-4-3:2006+A2:2010, IEC 61000-4-4:2012, IEC 61000-4-5:2014, IEC 61000-4-6:2013, IEC 61000-4-8:2009, IEC 61000-4-11:2004)		
Current Transformer		
Model:		**HY94C5-200**
Rate Primary current,RMS,Ipr	:	Ipn = 200 A
Rated secondary current,RMS,Isr	:	Iout = 5 A
Rate frequency	:	50/60Hz
Working humidity	:	≤90%RH
Max cable outer diameter(mm)	:	Φ24
Weight	:	90g
R.m.s.voltage for AC isolation test	:	2kV(@50Hz,1min)
Altitude	:	≤1000m
Accuracy class@RL≤20Ω	:	0.5%
Rate Overload	:	1.2 x Ipr
Highest voltage for equipment	:	720V
Connecting wires of secondary winding	:	RVB 2*1.5mm^2 Red & Black (UL2468-16A)
Working temperature	:	-30°C ..+75°C
Storage temperature	:	-40°C ...+85°C

Current Transformer		
Model:		**AKH-0.66-K-Φ24**
Rated operation Voltage	:	AC 0.66kV
Rate frequency	:	50-60Hz
Working temperature	:	-30°C ..+70°C
Height above sea level	:	≤3000m
Power frequency withstand voltage	:	3000v/1min 50Hz
Max cable outer diameter(mm)	:	Φ24
Precision degree	:	1

3) Control element.	Informative

A typical installation consists of a solar Grid-tied Inverter **(SOFAR 24KTLX-G3)**, a smart power meter of type **DTSU666** using the ***HY94C5-200*** for current measurement.

(Note:When the Energy Meter **DTSU666** is used with the Current Transformer. The user can select the Current Transformer whose input current range is not greater than 5A .)

The smart power meter measures and monitors the power exchange between the client installtion and the grid, The energy generation and consumption balance at the interconnection point can be achieved via regulating the power output of the solar inverter by the smart power meter.

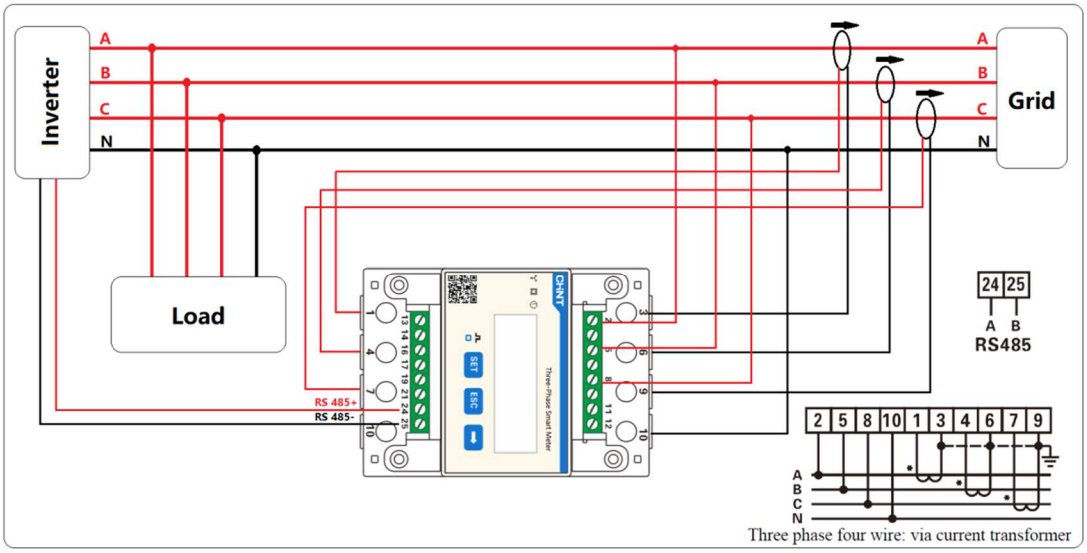


Figure 4：Scheme of DTSU666 typical installation(Use CT)

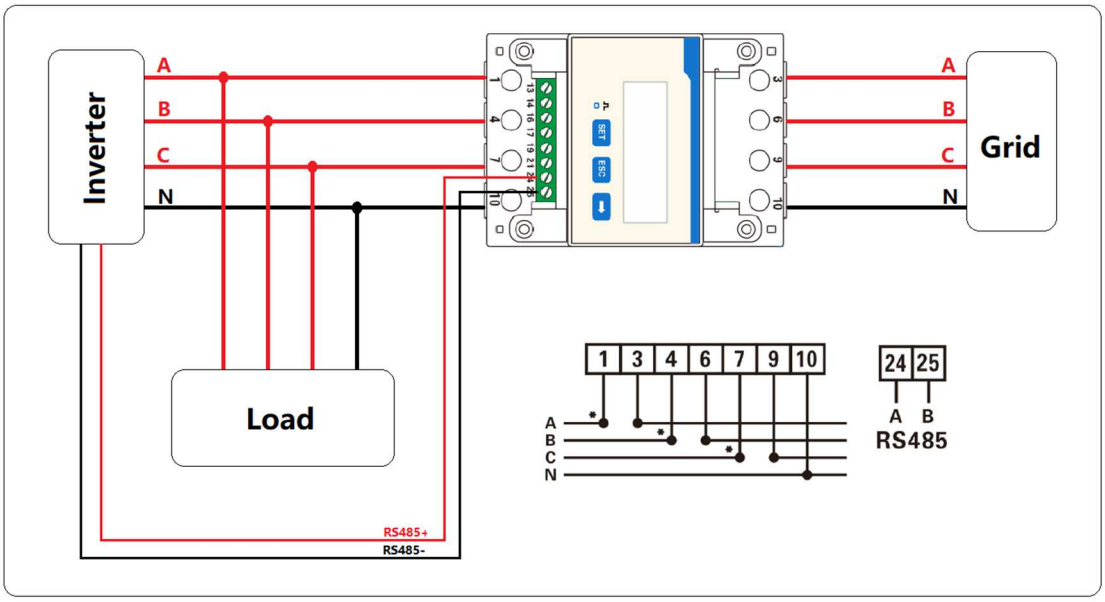
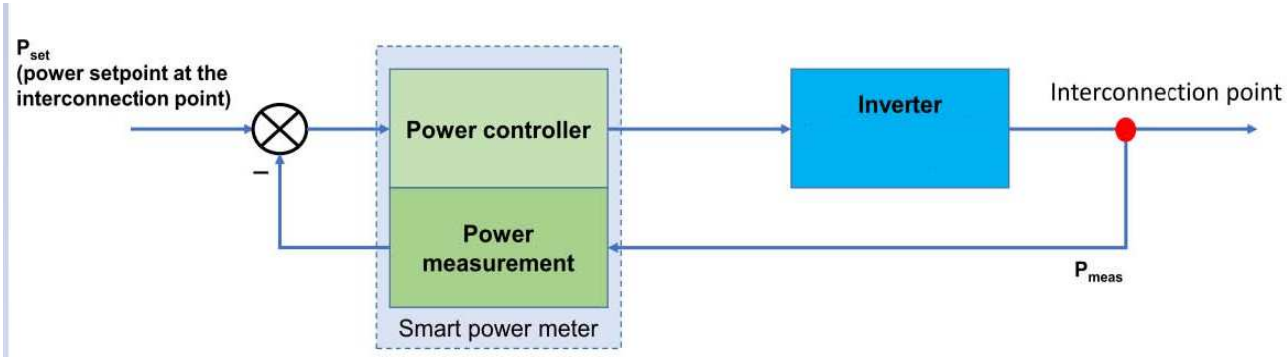


Figure 5：Scheme of DTSU666 typical installation(Direct connection)

4) Type of communications used between the different elements.	**Informative**
Inverter ↔ Energy Meter	
Inverter:	SOFAR 24KTLX-G3
Energy Meter :	DTSU666
Supported Communication Interface:	RS485
Communication protocol:	ModBus-RTU Protocol
Response time:	≤ 2s
Energy Meter and Current Transformer	
Energy Meter :	DTSU666
Current Transformer:	HY94C5-200 or AKH-0.66-K-Φ24
The Current Transformer HY94C5-200 is a passive electrical device that detects electric current in a wire, and generates a signal proportional to that current. The generated signal is an analog current. The generated signal will further analyzed in the DTSU666 with which the HY94C5-200 or AKH-0.66-K-Φ24 is connected.	
5) Type generators for which the system is valid.	**Informative**
Following Generators are Valid for the System:	
Inverter: SOFAR 15KTLX-G3, SOFAR 17KTLX-G3, SOFAR 20KTLX-G3, SOFAR 22KTLX-G3, SOFAR 24KTLX-G3	
Comment: The test have been Performed on the SOFAR 24KTLX-G3.	
6) Power of the type generator tested and generators / analyser's assimilated.	**Informative**
Note: The power rating of the generators can be found on page 2. The technical data of the Energy Meter and Current Transformer can be found on page 15-16.	

7) Control algorithm	Informative

The control algorithm of the system is described as follows:



The smart power meter provides following operation modes：

- Unlimited operation

  No power supply limitation. The inverter products power depending on available primary energy.

- Limited power operation

  Output power of the inverter is controlled:

  power injection to the grid lower ≤ defined power set point at the interconnection point

- Zero power injection

  Output power of the inverter is controlled. Energy generation and consumption balance at the interconnection point can be achieved. No power injection into grid.

8) Electric characteristics of the generator	Informative
Note: The electric characteristics of the generators can be found on page 2.	
9) Maximum number of generators to be connected	**N/A**

5. Test	P
5.1. Tolerance in permanent mode	**P**

a) Test 1 (Scheme of Single machine photovoltaic power generation system, see Figure 2)

Connection scheme:	Phase 1	Phase 2	Phase 3	Test 1	Test 2	Test 3	Result
Three Phase	P_{inv}%	P_{inv}%	P_{inv}%	P_{Grid} [kW]	P_{Grid} [kW]	P_{Grid} [kW]	
	90-100	90-100	90-100	-0,082	-0,055	-0,084	P
	10-20	10-20	10-20	-0,008	-0,001	0,007	P
	0	0	0	-0,064	-0,059	-0,058	P
	90-100	60-70	60-70	-2,459	-2,459	-2,465	P
	60-70	60-70	60-70	-0,079	-0,098	-0,057	P
	30-40	60-70	60-70	-5,161	-5,148	-5,157	P
	0	60-70	60-70	-10,664	-10,674	-10,652	P

Test procedure:

The test must be repeated with the different type generators that are going to be approved for the system, each of which can be tested separately.

To verify this condition, the following test is carried out, following the scheme shown in the different figures:

1. Connect the generator to a power source capable of supplying a power equal to or greater than the power of the generator to be tested.
2. Connect the generator to the network to be tested.
3. Set the load value according to the values indicated in table 1.
4. Wait a time of at least two seconds before beginning the measurement.

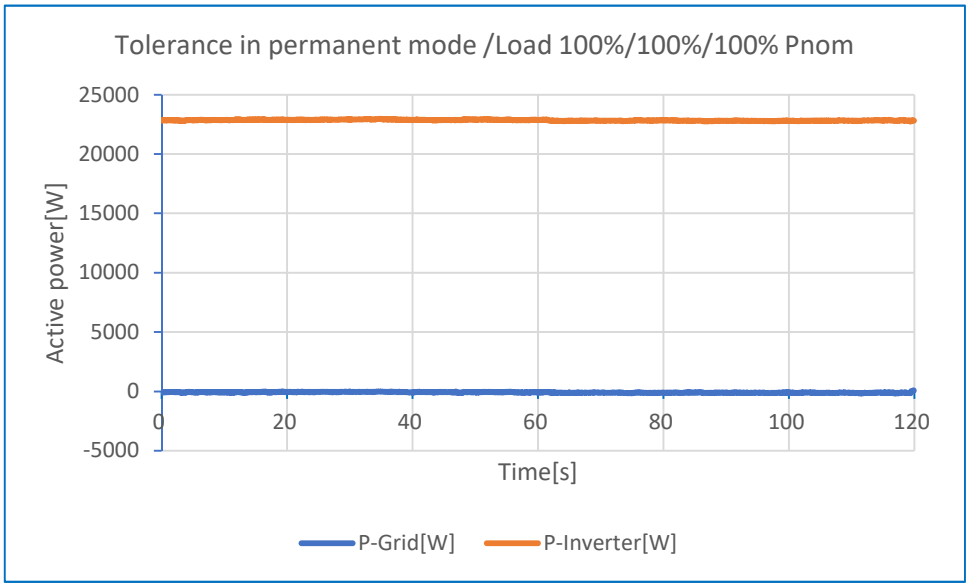
Measure the power exchanged at the test point, with an accuracy of at least 0,2%, making averages of 50ms.

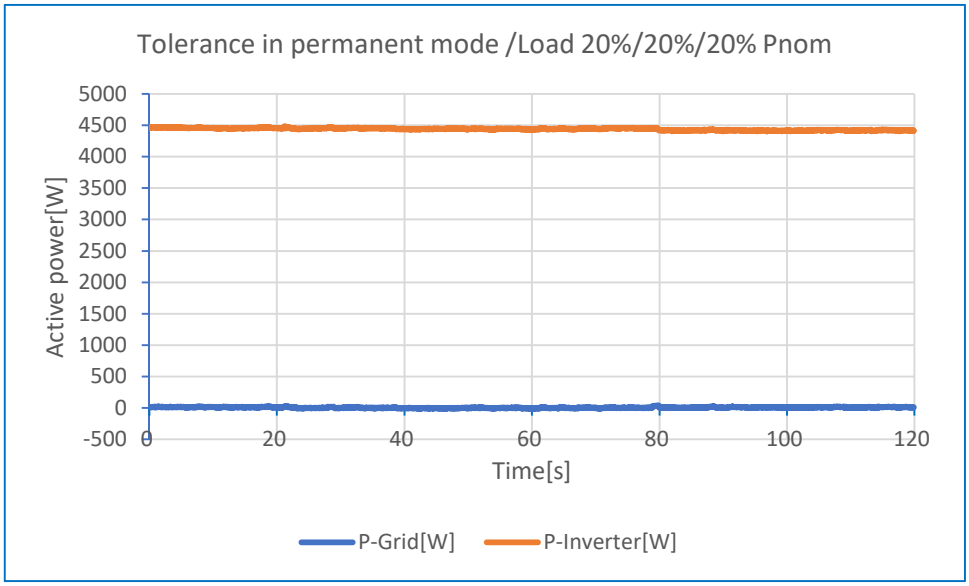
Assessment criterion:

At all times, the power measured at the point of consumption must be greater than the power generated. The margin of difference between consumption and generation must exceed the tolerance value of the measurement system, calculated as the sum of the tolerance of the power analyzer and the class of the measurement transformers included in the system.

Note:

In case of unbalanced load the inverter will not inject any power.


Tolerance in permanent mode /Load 100%/100%/100% Pnom
Active power[W]
25000
20000
15000
10000
5000
0
-5000
0
20
40
60
80
100
120
Time[s]
P-Grid[W]
P-Inverter[W]


Tolerance in permanent mode /Load 20%/20%/20% Pnom
Active power[W]
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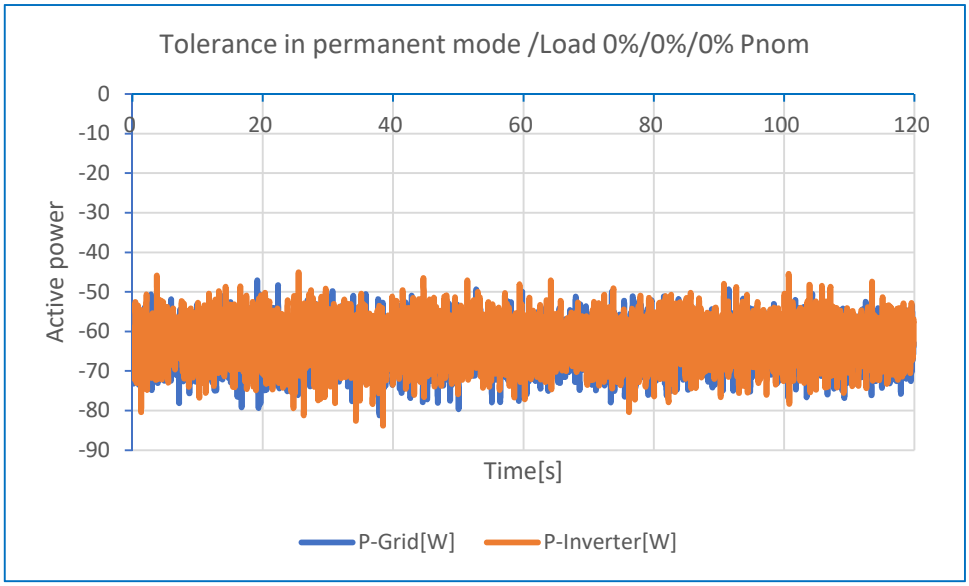
4500
4000
3500
3000
2500
2000
1500
1000
500
0
-500
0
20
40
60
80
100
120
Time[s]
P-Grid[W]
P-Inverter[W]


Tolerance in permanent mode /Load 0%/0%/0% Pnom
Active power
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-10
-20
-30
-40
-50
-60
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-90
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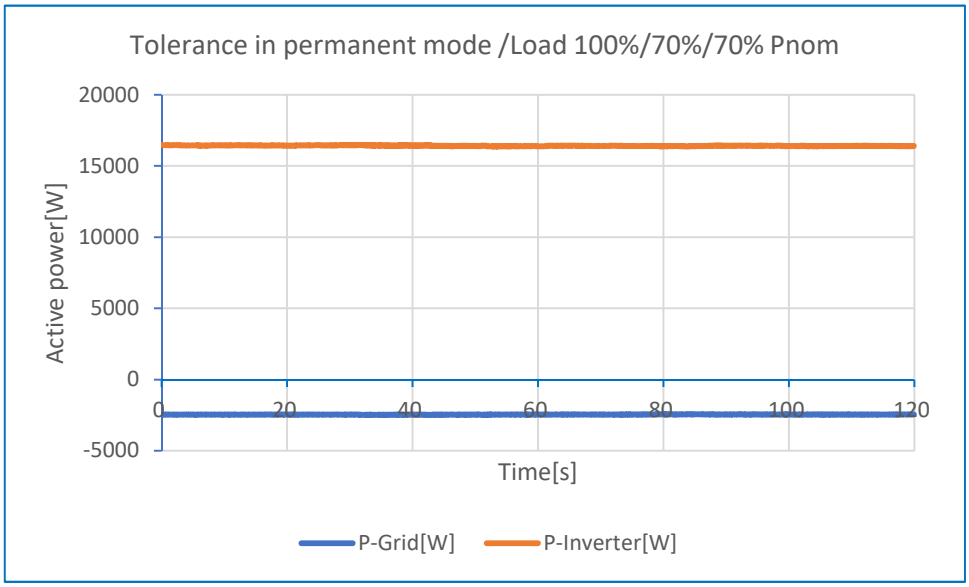
40
60
80
100
120
Time[s]
P-Grid[W]
P-Inverter[W]


Tolerance in permanent mode /Load 100%/70%/70% Pnom
Active power[W]
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10000
5000
0
-5000
0
20
40
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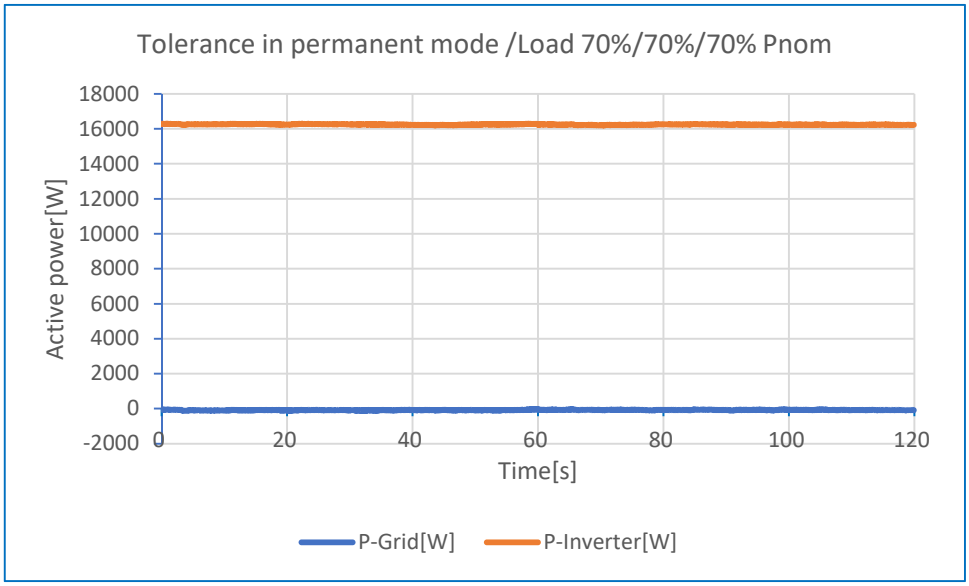
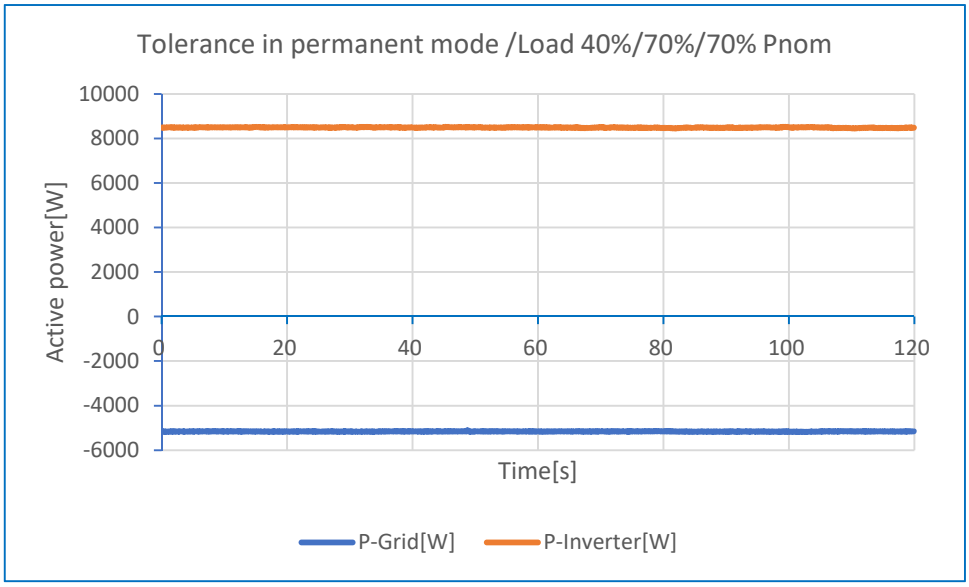
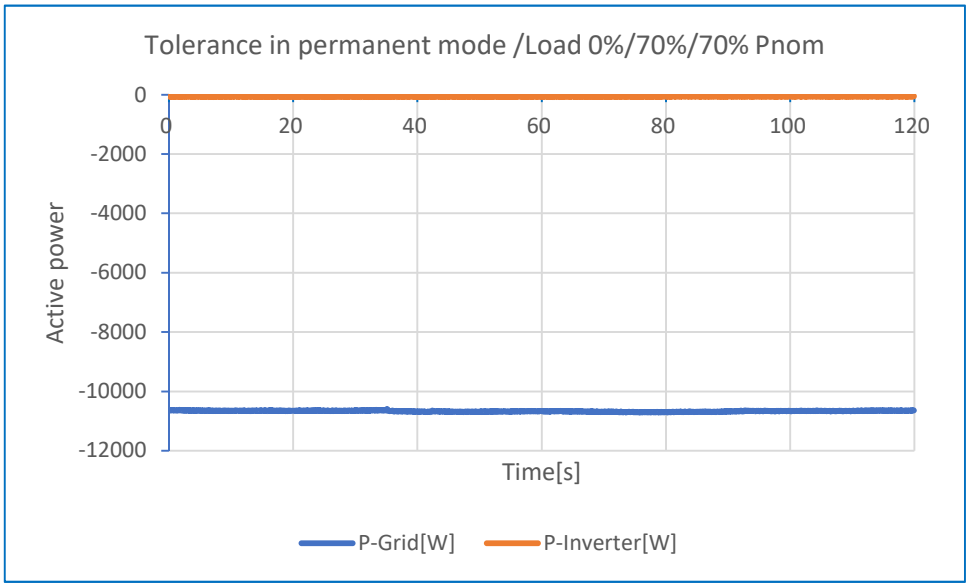
120
Time[s]
P-Grid[W]
P-Inverter[W]


Tolerance in permanent mode /Load 70%/70%/70% Pnom
Active power[W]
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
-2000
0
20
40
60
80
100
120
Time[s]
P-Grid[W]
P-Inverter[W]


Tolerance in permanent mode /Load 40%/70%/70% Pnom
Active power[W]
10000
8000
6000
4000
2000
0
-2000
-4000
-6000
0
20
40
60
80
100
120
Time[s]
P-Grid[W]
P-Inverter[W]



Test procedure:

The test must be repeated with the different type generators that are going to be approved for the system, each of which can be tested separately.

To verify this condition, the following test is carried out, following the scheme shown in the different figures:

5. Connect the generator to a power source capable of supplying a power equal to or greater than the power of the generator to be tested.
6. Connect the generator to the network to be tested.
7. Set the load value according to the values indicated in table 1.
8. Wait a time of at least two seconds before beginning the measurement.
9. Measure the power exchanged at the test point, with an accuracy of at least 0,2%, making averages of 50ms.

Assessment criterion:

At all times, the power measured at the point of consumption must be greater than the power generated. The margin of difference between consumption and generation must exceed the tolerance value of the measurement system, calculated as the sum of the tolerance of the power analyzer and the class of the measurement transformers included in the system.

Note:

In case of unbalanced load the inverter will not inject any power.

5.2. Response to load disconnections						P
a) Test 1 (Scheme of Single machine photovoltaic power generation system, see Figure 2)						
TEST	Initial load	Final load	Test 1	Test 2	Test 3	Result
	P_{inv}%	P_{inv}%	Response time in sec.	Response time in sec.	Response time in sec.	
1	90-100%	60-70%	1,15	1,80	1,50	P
2	90-100%	30-40%	1,15	1,45	1,30	P
3	90-100%	0%	1,05	1,30	1,30	P
4	60-70%	30-40%	1,30	1,15	1,20	P
5	60-70%	0%	1,65	1,70	1,75	P
6	30-40%	0%	1,50	1,40	1,10	P

Test procedure:

The test must be repeated with the different type generators that are going to be approved for the system, each of which can be tested separately.

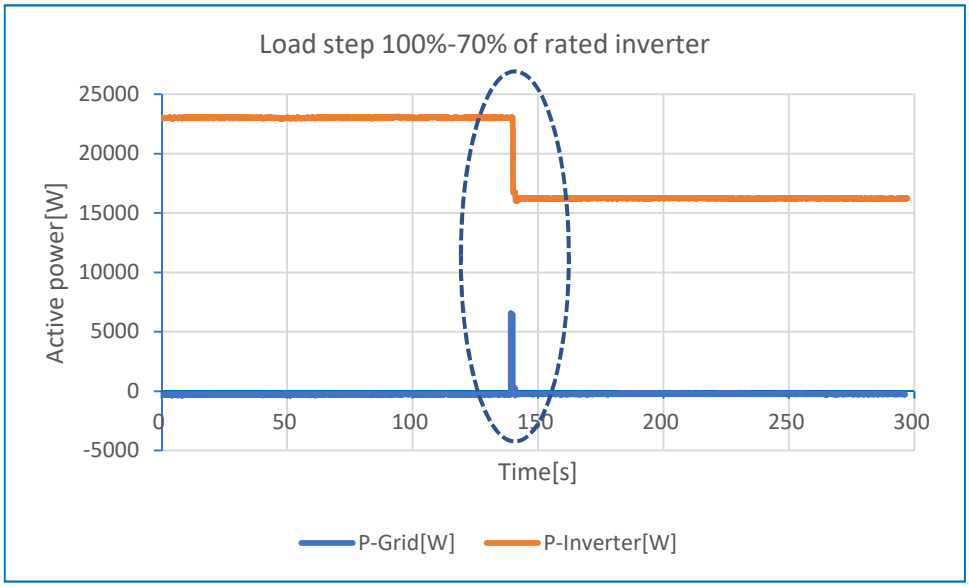
To verify this condition, the following test is carried out, following the scheme that corresponds to the system to be tested, shown in figures 1 to 4:

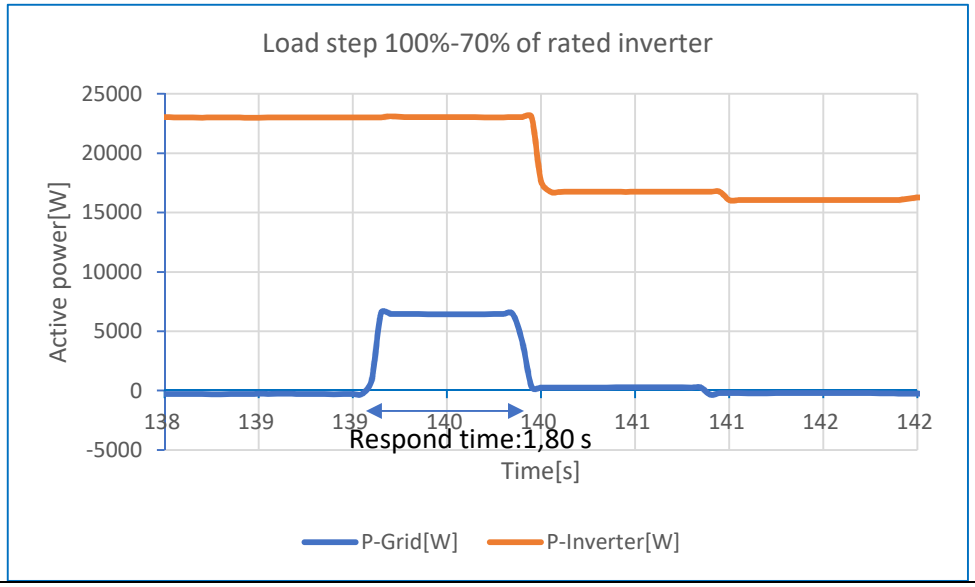
1. Connect the generator to a power source capable of supplying a power equal to or greater than the power of the generator to be tested.
2. Connect the generator to the network to be tested.
3. Carry out the load disconnections proposed in table 2.
4. Measure the power exchanged with the network, with an accuracy of at least 0,2%, making averages of 50ms in a time window of 2 min comprising at least one minute before and after the load disconnection.

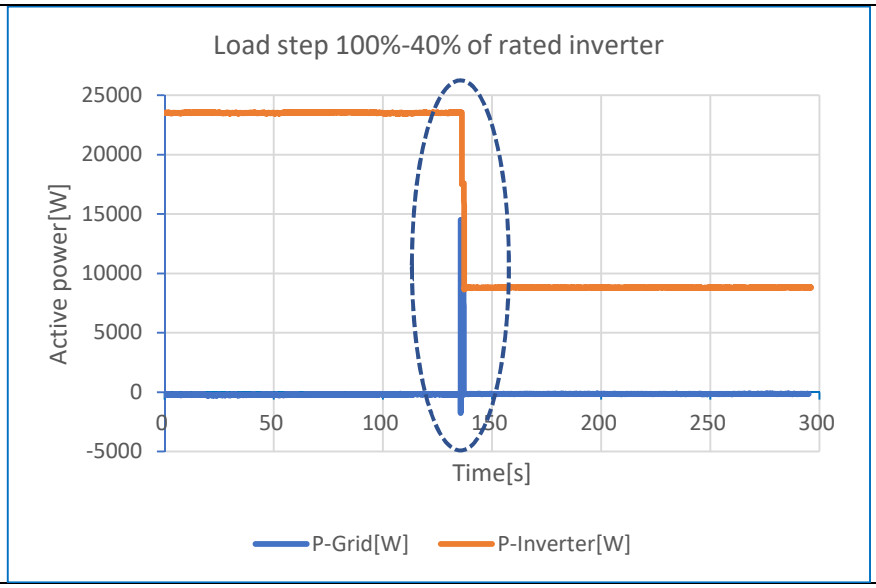
Assessment criterion:

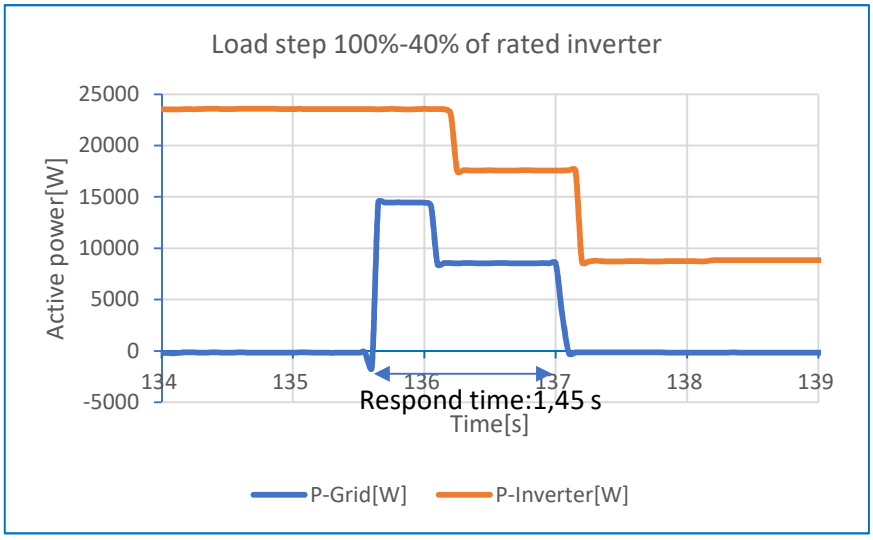
At all times, the power measured at the point of consumption must be greater than the power generated. The margin of difference between consumption and generation must exceed the tolerance value of the measurement system, calculated as the sum of the tolerance of the power analyzer and the class of the measurement transformers included in the system.

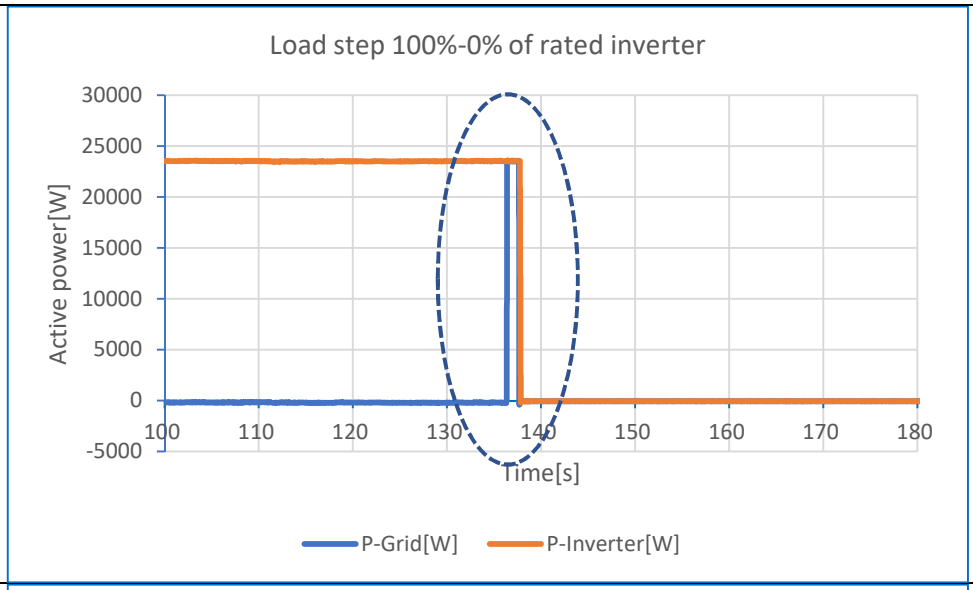
The breach of the previous requirement must be corrected in a time inferior to 2 s.

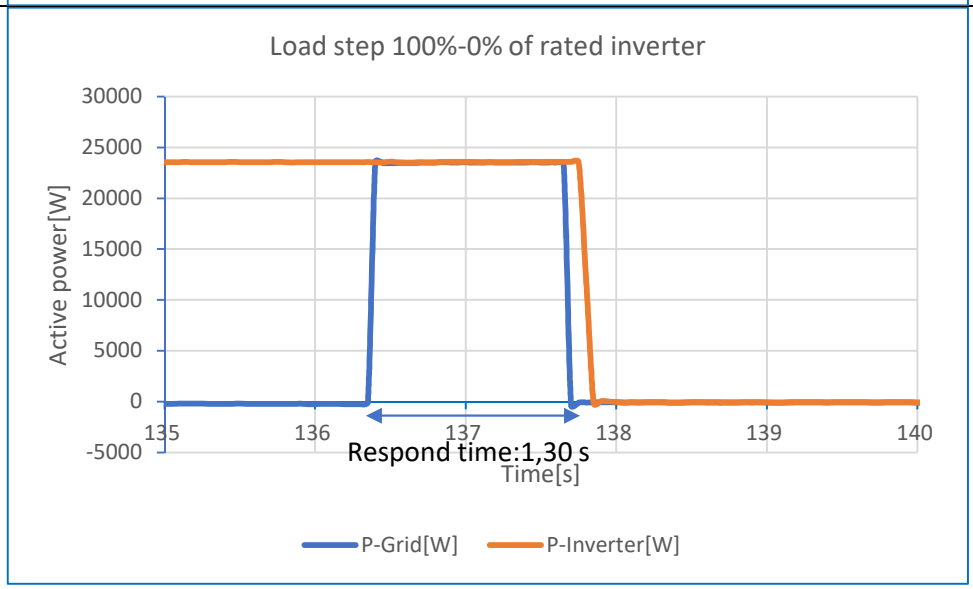

Load step 100%-70% of rated inverter
Active power[W]
25000
20000
15000
10000
5000
0
-5000
0
50
100
150
200
250
300
Time[s]
P-Grid[W]
P-Inverter[W]

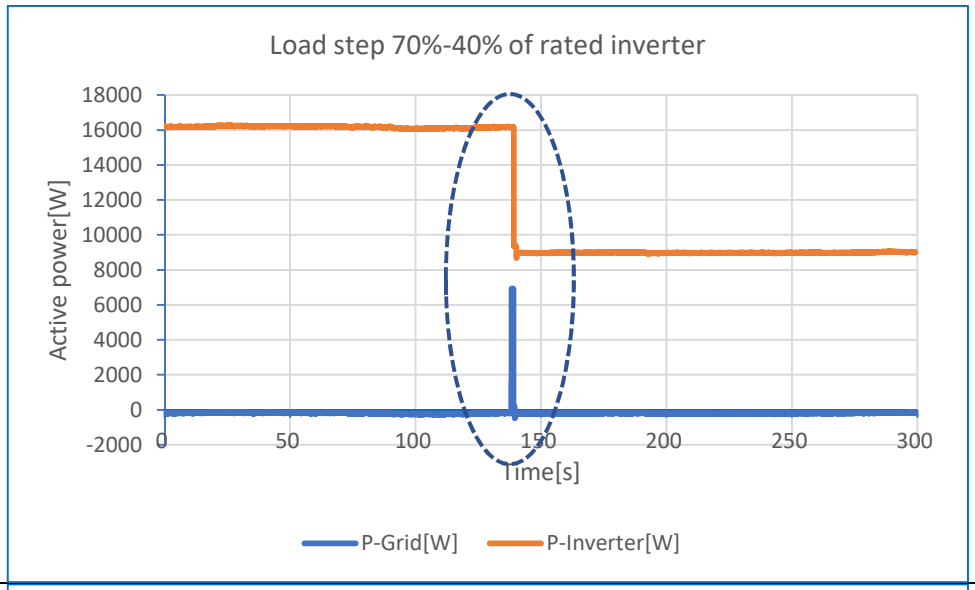

Load step 100%-70% of rated inverter
Active power[W]
25000
20000
15000
10000
5000
0
-5000
138
139
139
140
140
141
141
142
142
Respond time:1,80 s
Time[s]
P-Grid[W]
P-Inverter[W]

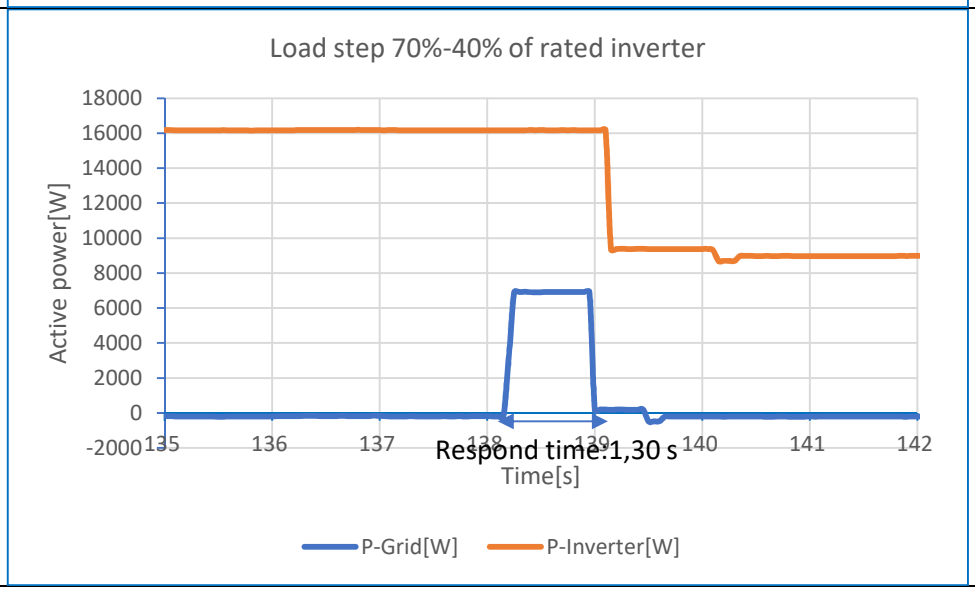

Load step 100%-40% of rated inverter
Active power[W]
25000
20000
15000
10000
5000
0
-5000
0
50
100
150
200
250
300
Time[s]
P-Grid[W]
P-Inverter[W]

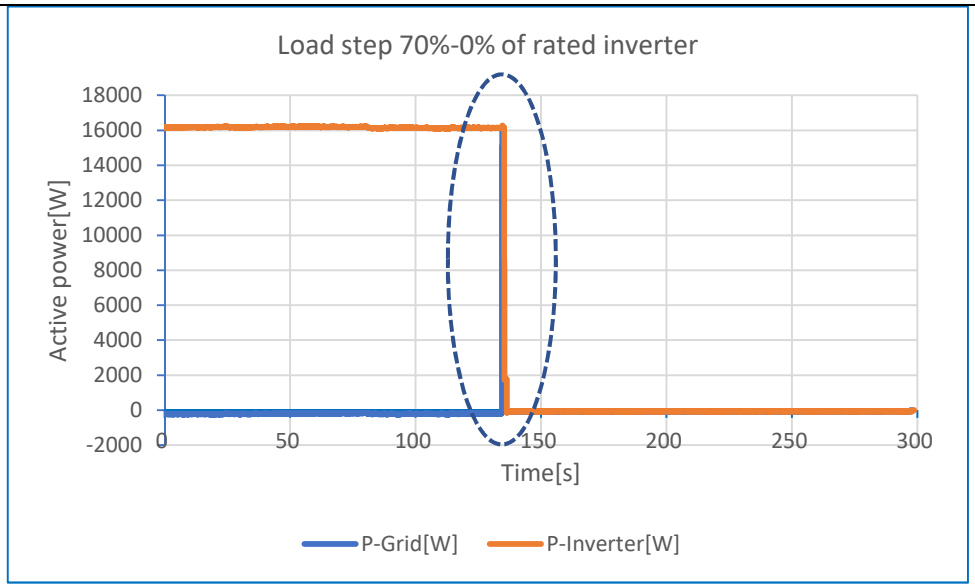

Load step 100%-40% of rated inverter
Active power[W]
25000
20000
15000
10000
5000
0
-5000
134
135
136
137
138
139
Respond time:1,45 s
Time[s]
P-Grid[W]
P-Inverter[W]

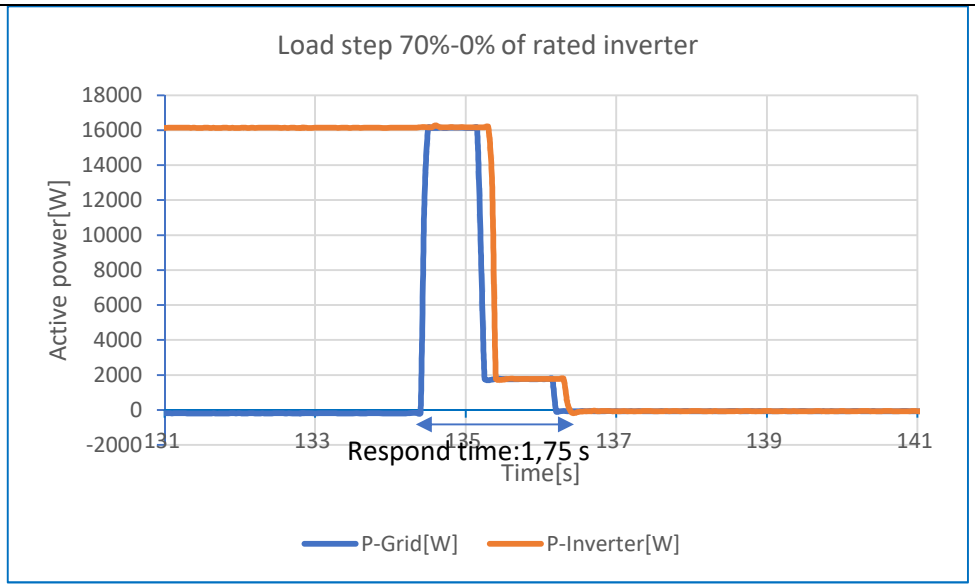

Load step 100%-0% of rated inverter
Active power[W]
30000
25000
20000
15000
10000
5000
0
-5000
100
110
120
130
140
150
160
170
180
Time[s]
P-Grid[W]
P-Inverter[W]

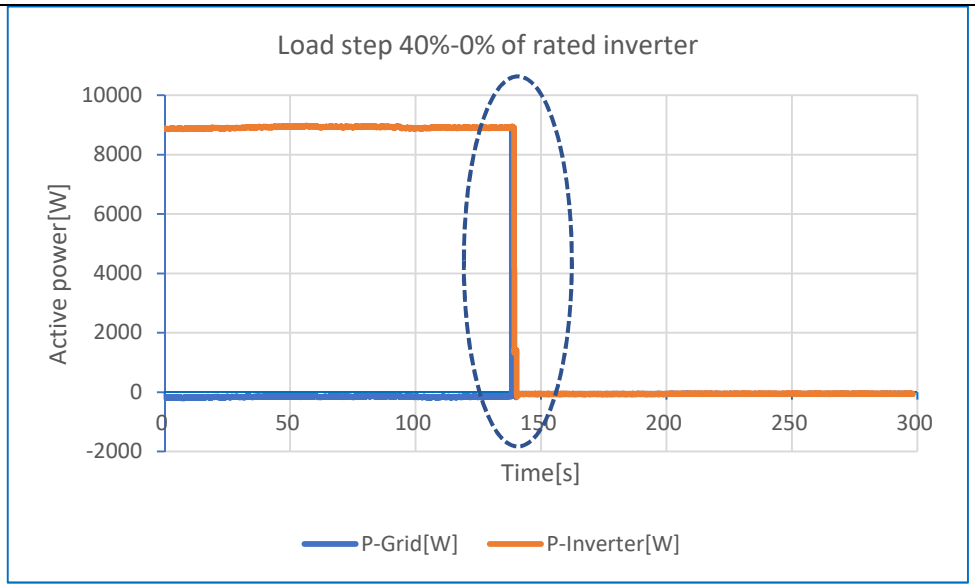

Load step 100%-0% of rated inverter
Active power[W]
30000
25000
20000
15000
10000
5000
0
-5000
135
136
137
138
139
140
Respond time:1,30 s
Time[s]
P-Grid[W]
P-Inverter[W]

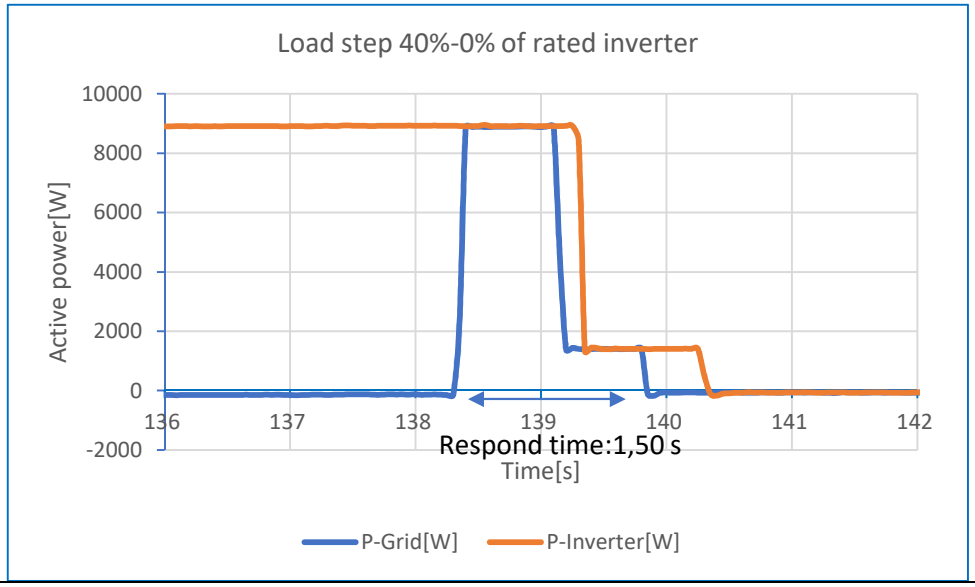

Load step 70%-40% of rated inverter
Active power[W]
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
-2000
0
50
100
150
200
250
300
Time[s]
P-Grid[W]
P-Inverter[W]


Load step 70%-40% of rated inverter
Active power[W]
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
-2000
135
136
137
138
139
140
141
142
Respond time:1,30 s
Time[s]
P-Grid[W]
P-Inverter[W]


Load step 70%-0% of rated inverter
Active power[W]
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
-2000
0
50
100
150
200
250
300
Time[s]
P-Grid[W]
P-Inverter[W]


Load step 70%-0% of rated inverter
Active power[W]
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
-2000
131
133
135
137
139
141
Respond time:1,75 s
Time[s]
P-Grid[W]
P-Inverter[W]





Test procedure:

The test must be repeated with the different type generators that are going to be approved for the system, each of which can be tested separately.

To verify this condition, the following test is carried out, following the scheme that corresponds to the system to be tested, shown in figures 1 to 4:

5. Connect the generator to a power source capable of supplying a power equal to or greater than the power of the generator to be tested.
6. Connect the generator to the network to be tested.
7. Carry out the load disconnections proposed in table 2.

Measure the power exchanged with the network, with an accuracy of at least 0,2%, making averages of 50ms in a time window of 2 min comprising at least one minute before and after the load disconnection.

Assessment criterion:

At all times, the power measured at the point of consumption must be greater than the power generated. The margin of difference between consumption and generation must exceed the tolerance value of the measurement system, calculated as the sum of the tolerance of the power analyzer and the class of the measurement transformers included in the system.

The breach of the previous requirement must be corrected in a time inferior to 2 s.

5.3. Response to power increases in the primary energy source						P
a) Test 1 (Scheme of Single machine photovoltaic power generation system, see Figure 2)						
Step	AC load	Power DC source	Test 1	Test 2	Test 3	Result
	P_{inv}%	P_{inv}%	Response time in sec.	Response time in sec.	Response time in sec.	
1	60-70%	40-50%	0,60	1,00	0,00	P
2	60-70%	90-100%				

Test procedure:

The power limitation system must guarantee that when there is an increase in power in the primary energy source, for example an increase in irradiance in a photovoltaic installation, leading to a situation in which there is more available energy than consumption, the generator resets its production coming back to the permanent regime in less than 2 s.

The test must be repeated with the different type generators that are going to be approved for the system, each of which can be tested separately.

To verify this condition, the following test is carried out, following the scheme shown in figures 1 to 4:

1. Connect the generator to a power source that supplies between 40% and 50% of the power of the generator to be tested.
2. Connect the generator to the network to be tested.
3. Connect a load that consumes between 60% and 70% of the power of the generator to be tested.
4. Increase by a step the power available in the power source above 90% of the nominal power of the generator to be tested.
5. Measure the power exchanged with the network, with an accuracy of at least 0.2%, making averages of 50 ms in a time window of 2 min comprising at least one minute before and after the increase of the generator power.

Repeat each of the tests three times.

Assessment criterion:

At all times, the power measured at the point of consumption must be greater than the power generated. The margin of difference between consumption and generation must exceed the tolerance value of the measurement system, calculated as the sum of the tolerance of the power analyzer and the class of the measurement transformers included in the system.

5.4. Action in case of loss of communications							P
a) Test 1 (Scheme of Single machine photovoltaic power generation system, see Figure 2)							
Step	AC load	Power DC source	Communication between energy meter and generator	Test 1	Test 2	Test 3	Result
	P_{inv}%	P_{inv}%		Response time in sec.	Response time in sec.	Response time in sec.	
1	60-70%	90-100%	Yes	1,80	1,66	1,64	P
2	60-70%	90-100%	No				

Note:

The generator must stop generating in case of loss of communication between the different elements of the system in less than 2 s time integrated in the same device.

To verify this condition, the following test is carried out, following the scheme shown in figures 1 to 4:

1 Connect the generator to a power source capable of supplying a power equal to or greater than the power of the generator to be tested.

2 Connect the generator to the indoor network to be tested.

3 Set a load of 60% and 70% of the rated power of the generator.

4 Cut off the communication between the control element and the power analyser.

5 Measure the elapsed time between the cut-off of the communication and the generator shutdown or total power limitation of the generator (0%).

6 Measure the power generated by the generator, with an accuracy of at least 0.2%, making means of 50 ms.

The test must be repeated 3 times.

The test is considered valid if the generator is disconnected or totally limits its generated power in less than 2 s. Repeat the test by cutting the communication between the control element and the generator.

Assessment criterion:

At all times, the power measured at the point of consumption must be greater than the power generated. The margin of difference between consumption and generation must exceed the tolerance value of the measurement system, calculated as the sum of the tolerance of the power analyzer and the class of the measurement transformers included in the system.

Annex No. 1

Pictures of the unit

Enclosure front view

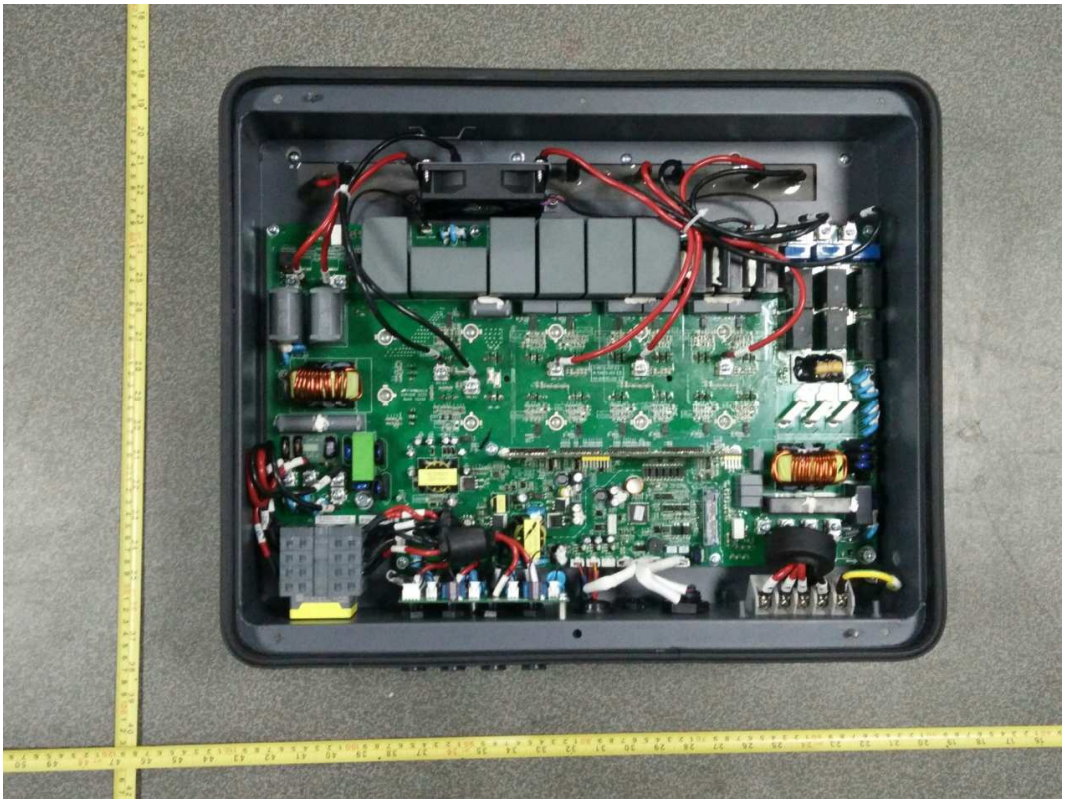
Enclosure side view

Enclosure bottom view SOFAR 15KTLX-G3, SOFAR 17KTLX-G3

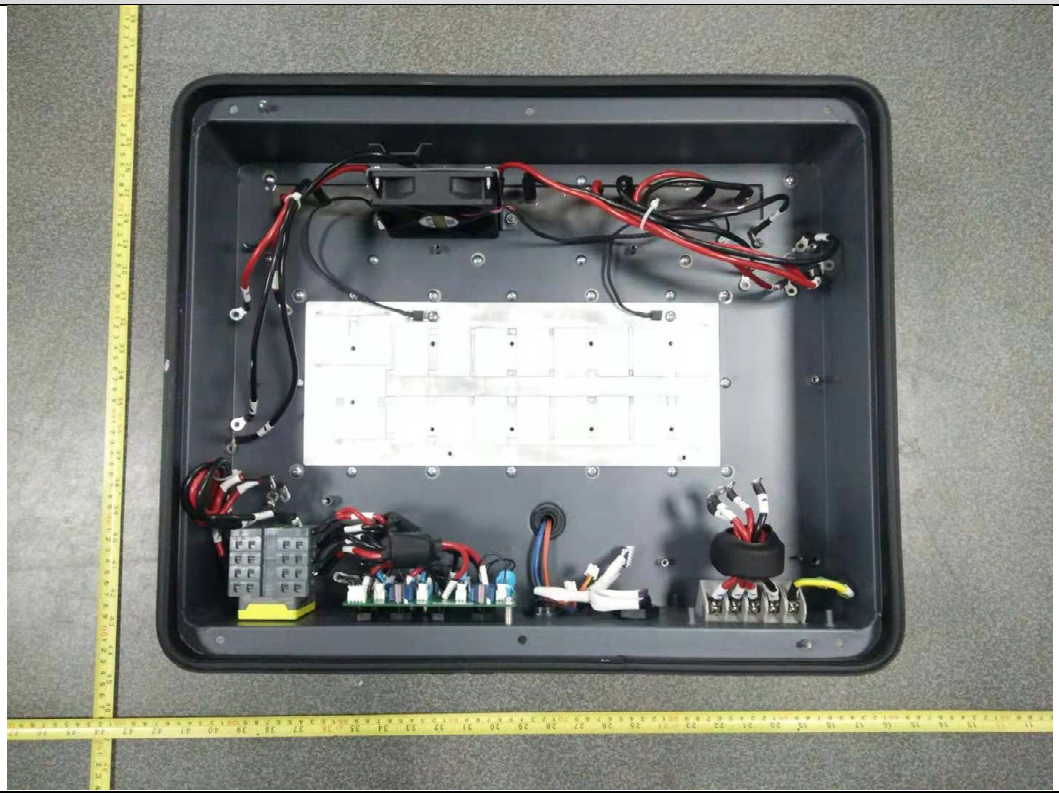
Enclosure bottom view SOFAR 20KTLX-G3, SOFAR 22KTLX-G3, SOFAR 24KTLX-G3


Enclosure rear view

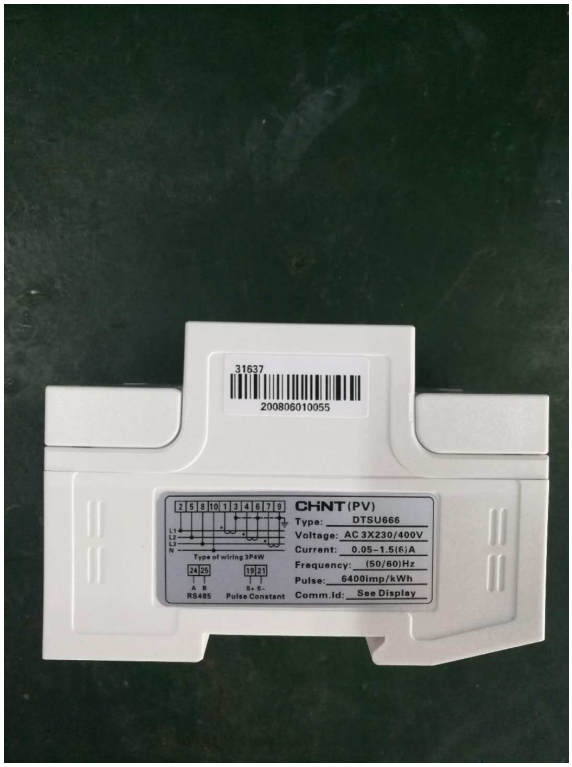
Internal view

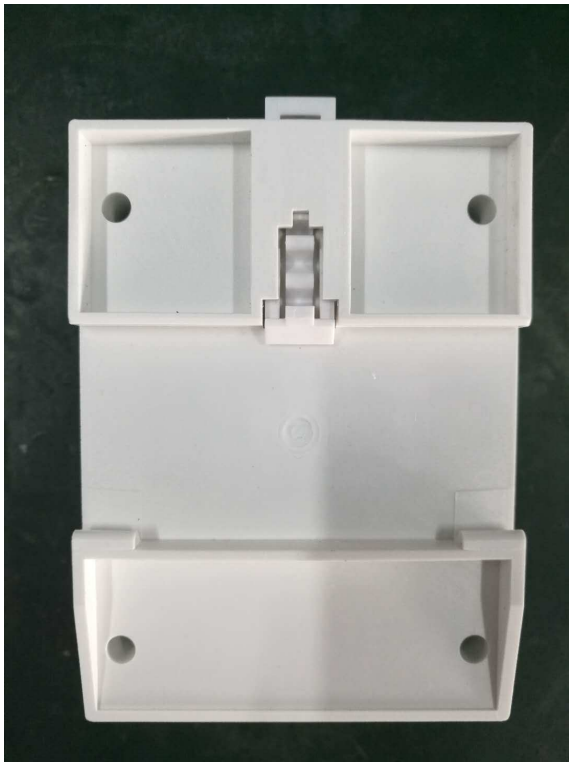


Internal view



Power Meter (DTSU666)



Energy Meter (DTSU666)



Current Transformer- **HY94C5-200**

Current Transformer- **AKH-0.66-K-Φ24**


DTSU666 Datasheet:

DTSU666 series three phase four wire electronic energy meter (Din-rail)

DSSU666 series three phase three wire electronic energy meter (Din-rail)

Manual

ZTY0.464.1002

Zhejiang Chint Instrument & Meter Co., Ltd.

July , 2020

Catalog

1. Brief Introduction

1.1. Main application & applicable range

DTSU666 series three phase four wire and DSSU666 series three phase three wire electronic energy meter (din-rail) (hereinafter referred to as the "instrument") is designed based on power monitoring and energy metering demands for electric power system, communication industry, construction industry, etc. as a new generation of intelligent instrument combining measurement and communication function, mainly applied into the measurement and display for the electric parameters in the electric circuit including three voltage, three current, active power, reactive power, frequency, positive& negative energy, four-quadrant energy, etc. Adopting the standard DIN35mm din rail mounting and modular design, it is characterized with small volume, easy installation and easy networking, widely applied into the internal energy monitoring and assessment for industrial and mining enterprises, hotels, schools, large public buildings.

Complied standards:

IEC 61010-1:2010《Safety requirements for electrical equipment for measurement，control and laboratory use Part1:General requirements》

IEC 61326-1:2013 《Electrical equipment for measurement，control and laboratory use –EMC requirements Part1:General requirements》

1.2. Product Features

1) Characterized with positive and reverse active power, combined active power, combined reactive power, four quadrant reactive power metering and storage function with combination mode character can be set.

2) RS485 communication interface, easy to exchange data with outside;

3) Adopting the standard DIN35mm din rail mounting and modular design, it is characterized with small volume, easy installation and easy networking.

1.3. Product Model

Table 1 product model and specification

Model	voltage（V）	Current（A）	Impulse constant		Accuracy class
			imp/kWh	imp/kvarh	
DTSU666	3×230/400	1.5(6)A	6400	6400	Active Class 0.5S, Reactive Class 2
		5(80)A	400	400	Active Class 1, Reactive Class 2
DSSU666	3×400	1.5(6)A	6400	6400	Active Class 0.5S, Reactive Class 2
		5(80)A	400	400	Active Class 1, Reactive Class 2

Note：1.5(6)A is Connection through current transformers, 5(80)A is direct access.

1.4. Temperature range

Regulated working temperature range: -10℃～+45℃;

Limited working temperature range: -25℃～+75℃;

Relative humidity(Annually average):≤75%;

Atmospheric pressure: 63.0kPa～106.0kPa(altitude 4km and below), excepting the requirements for special orders.

2. Working Principle

2.1. Working Principle

The instrument are composed of high accurately integrated circuit specially for measurement (ASIC) and managing MCU, memory chip, RS485 communication module, etc.

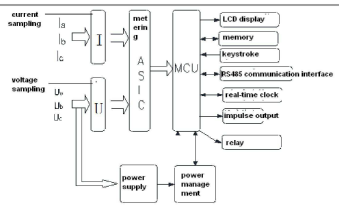


Figure 1 Working principle block diagramFigure 1

2.2. Principle for the main function module

The special metering integrated circuit (ASIC) integrated six load two order ∑-Δ type of A/D conversion, please take the digital signal processing measured by the voltage circuit as well as all the power, energy, effective values, power factor and frequency. This metering chip can measure the active power, reactive power, apparent power, active energy, reactive power, apparent energy of each phase and combined phase, and at the same time measuring current, voltage effective values, power factor, phase angle, frequency and other parameters, entirely satisfying the needs of power meter. The chip provides an SPI interface, convenient for metering parameters as well as parameter calibration between the management MCU.

3. Main Technical Performance & Parameters

3.1. limit of error caused by the current augment

Table 2 The limit value of the active percentage error of meters on balanced load

Meters for	Value of current	Power factor	Percentage error limits for meters of class		
			0.5S	Class 1	Class 2
Connection through current transformers	$0.01I_b \le I < 0.05I_n$	1	±1.0	±1.5	±2.0
	$0.05I_n \le I \le I_{max}$	1	±0.5	±1.0	±1.2
	$0.02I_n \le I < 0.1I_n$	0.5L、0.8C	±1.0	±1.5	±2.0
	$0.1I_n \le I \le I_{max}$	0.5L、0.8C	±1.0	±1.0	±1.2

Direct connection	$0.05I_b \le I < 0.1I_b$	1	-	±1.5	±2.0
	$0.1I_b \le I \le I_{max}$	1	-	±1.0	±1.2
	$0.01I_b \le I < 0.2I_b$	0.5L、0.8C	-	±1.5	±2.0
	$0.2I_b \le I \le I_{max}$	0.5L、0.8C	-	±1.0	±1.2
Note	I_n：secondary rated current of the current transformer; I_b：calibrated current of the meter; L:inductive；C：capacitive；				

Table 3 The limit value of the reactive percentage error of meters on balanced load

Value of current		sinφ （inductive or capacitive ）	Percentage error limits for meters of class
Direct connection	Connection through current transformers		Class 2
$0.05I_b \le I < 0.1I_b$	$0.02I_n \le I < 0.05I_n$	1	±2.5
$0.1I_b \le I < I_{max}$	$0.05I_n \le I \le I_{max}$	1	±2.0
$0.1I_b \le I < 0.2I_b$	$0.05I_n \le I < 0.1I_n$	0.5	±2.5
$0.2I_b \le I < I_{max}$	$0.1I_n \le I \le I_{max}$	0.5	±2.0
$0.2I_b \le I < I_{max}$	$0.1I_n \le I \le I_{max}$	0.25	±2.5

Table 4 The limit value of the reactive percentage error of meters on balanced load

Value of current		Power factor	Percentage error limits for meters of class		
Direct connection	Connection through		0.5S	Class 1	Class 2
$0.1\ I_b \le I \le I_{max}$	$0.05I_n \le I \le I_{max}$	1	±0.6	±2.0	±3.0
$0.2I_b \le I \le I_{max}$	$0.1I_n \le I \le I_{max}$	0.5L	±1.0	±2.0	±3.0

Table 5 The limit value of the reactive percentage error of meters on imbalanced load

Value of current		Power factor	Percentage error limits for meters of class
Direct connection	Direct connection		Class 2
$0.1\ I_b \le I \le I_{max}$	$0.05I_n \le I \le I_{max}$	1	±3.0
$0.2I_b \le I \le I_{max}$	$0.1I_n \le I \le I_{max}$	0.5	±3.0

3.2. Starting and no-load condition

3.2.1. Starting

Under the power factor of 1.0 and started current, the instrument can be started and continuously measure (for multiple phase instrument, it will bring balanced load). If the instrument is designed based on measurement for dual directional energy, then it is applicable for each direction of energy.

Table 6 start current

Meters for	Class of meter			Power factor
	0.5S	1	2	
Direct connection	-	$0.004I_b$	$0.005I_b$	1
Connection through current transformers	$0.001I_b$	$0.002I_b$	$0.003I_b$	1

3.2.2. Test of no-load condition

When the voltage is applied with no current flowing in the current circuit, the test output of the meter shall not produce more than one pulse.

For this test, the current circuit shall be open-circuit and a voltage of 115 % of the reference voltage shall be applied to the voltage circuits.

The minimum test period Δt shall be

$$\Delta t \ge \frac{600 \times 10^6}{k \cdot m \cdot U_n \cdot I_{max}} [\min] \quad \text{for meters of class 0.5S or 1}$$

$$\Delta t \ge \frac{480 \times 10^6}{k \cdot m \cdot U_n \cdot I_{max}} [\min] \quad \text{for meters of class 2}$$

k is the number of pulses emitted by the output device of the meter per kilovarhour(imp/kvar·h);
m is the number of measuring elements;
Un is the reference voltage in volts;
Imax is the maximum current in amperes.

3.3. Electrical parameters

Table 7 Electrical parameters

Regulated operating voltage range	0.9Un~1.1Un	
Extended operating voltage range	0.8Un~1.15Un	
Power consumption of voltage	≤1.5W 和 6VA	
Power consumption of current	Ib<10A	≤0.2VA
	Ib≥10A	≤0.4VA
Data storage time after power interruption	≥10 years	

4. Main function

4.1. Displayed function

From the displayed interface, the electrical parameter and energy data are all primary side data (that is, the multiplied by current and voltage ratios). The energy measuring value will be displayed seven bits, with the displaying range from 0.00kWh to 9999999MWh.

Figure 2 display

Table 8 Display interface

No.	Display interface	Instruction	No.	Display interface	Instruction
1	10000.00 kWh	Combined active energy =10000.00kWh	10	Ib 5.001 A	Phase B current =5.001A
2	10000.00 kWh	Positive active energy =10000.00kWh	11	IC 5.002 A	Phase C current =5.002A
3	2345.67 kM WAh varh	Reserve active energy =2345.67kWh	12	Pt 3.291 kW	Combined phase active power =3.291kW
4	NO. H000000	Protocol: DT/L645-2007 address = 000000000001	13	PA 1.090 kW	Phase A active power =1.090kW
5	NO. L000001		14	Pb 1.101 kW	Phase B active power =1.101kW

（4）	NO n1-9600	Protocol: MdoBus-RTU; address =001 Baudrate=9600 None parity, 2 stop bits	15	PC 1.100 kW	Phase C active power =1.100kW
（5）	NO ----001		16	Ft 0.500	Combined phase power factor PFt=0.500
6	UA 220.0 V	Phase A voltage =220.0V	17	FA 1.000	phase A power factor PFa=1.000
7	Ub 220.1 V	Phase B voltage =220.1V	18	Fb 0.500	Phase B power factor PFb=0.500
8	UC 220.2 V	Phase C voltage =220.20V	19	FC-0.500	phase A power factor PFc=-0.500
9	IA 5.000 A	Phase A current =5.001A			

NOTE：Protocol:DL/T645-2007 display 4 and 5，Protocol:Modbus-RTU display (4) and (5)

4.2. Programming function

4.2.1. Programming function

Table 9 Programming Parameter

Parameter	Value range	Description
Ct	1～9999	Current ratio, used for setting the input loop current ratio: When the current is connected to the line via the transformer, Ct=the rated current of the primary loop / the rated current of the secondary circuit; When the current is directly connected to the line, Ct shall be set as 1.
Pt	0.1～999.9	Voltage ratio, used for setting the voltage ratio of the input loop;

		When the voltage is connected to the line via the transformer, Pt= the rated voltage of the primary loop / the rated voltage of the secondary circuit; When the voltage is directly connected to the line, Pt shall be set as 1.0.
Prot	1：645; 2：n.2; 3：n.1; 4：E.1; 5：O.1;	Settings for communication stop bit and Parity bits： 1: DL/T645-2007 mode； 2: None parity, 2 stop bits, n.2; 3: None parity, 1 stop bit, n.1; 4: Even parity, 1 stop bit, E.1; 5: Odd parity, 1 stop bit, O.1;
bAud	0：1.200; 1：2.400; 2：4.800; 3：9.600;	Communication baud rate： 0：1.200 bps； 1：2.400 bps； 2：4.800 bps； 3：9.600 bps；
Addr	1～247	Communication address
nEt	0：n.34; 1：n.33;	Option for wiring mode: 0：n.34 represents three phase four wire; 1：n.33 represents three phase three wire.
CLrE	0:no；1:E	The setting is 1, representing the allowed instrument energy data clearance, which will be zero reset after clearing.
PLuS	0:P；1:Q； 2:S；	Pulse output: 0：active energy pulse; 1: reactive energy pulse; 2：Others.
diSP	0～30	Display in turns(second) 0：Timely display； 1～30：Time interval of actual display.
bLCd	0～30	Backlight lighting time control（minutes） 0：Normally light； 1～30：backlight lighting time without button operation

4.2.2. Programming operation

Button description: “SET” button represents “confirmation”, or “cursor shift” (when input digits), “ESC” button represents “exit”, “→” (“ ”) button represents “add”. The input code is (default 701).

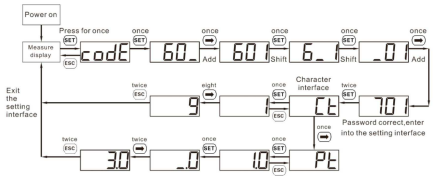


Figure 3 Setting examples for current and potential transformer ratio

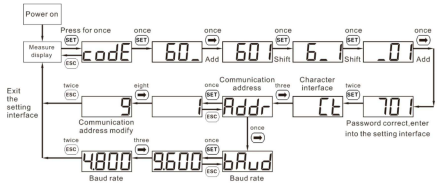


Figure 4 Setting examples for communication address and Baud Rate

When input digits, “SET” can be used as cursor “ – ”motion button; “→”is “add” button, “ESC ”is Exit the programming operation interface or switch to the character interface from digit modification interface, add from the beginning after setting the digit to the maximum value.

4.3. Communication function

Characterized with a RS485 communication interface, the baud rate can be changed between 1200bps, 2400bps, 4800bps and 9600bps. It conforms to DL/T645-2007 or ModBus-RTU protocol<the communication protocol of the multifunction energy meters> .

Factory default communication parameters is DL/T 645-2007 protocol, the default baud rate is 2400bps, with the calibration bit and stop bit to be E.1 and instrument address (please see instrument factory number or crystal display screen).

Customized communication parameter is ModBus-RTU protocol, the baud rate is 9600bps, with the calibration bit and stop bit to be n.1, and the instrument address to be 1(according to the request).

4.4. Energy measurement function

The horizontal axis of the measurement plane represents the current vector I (fixed on the horizontal axis), and the instantaneous voltage vector is used to represent the current power transmission. Compared with the current vector I, it has phase angleφ. The counter-clockwise direction φangle is positive.

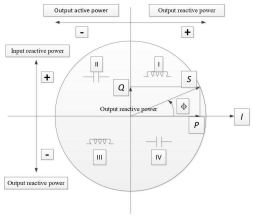


Figure 5 Measurement schematic diagram for energy four quadrants

Combined active energy=positive active energy + reverse active energy

Combined reactive 1 energy=I+IV； Combined reactive 2 energy=II+III.

5. Outline and installation size

Table 10 Installation size

Model	modulus	Outline size (length× width× height) mm	Installation size (din rail)
DTSU666	4	100×72×65	DIN35 din rail
DSSU666	4		

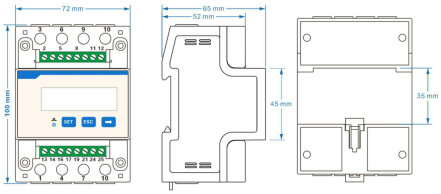


Figure 5 Outline size diagram

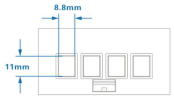


Figure 6 current cable terminal (Conductor Cross-sectional Area Range ≤16 mm^2)

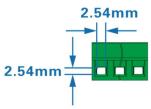


Figure 7 RS485 cable terminal (Conductor Cross-sectional Area Range 0.25-1mm2)

6. Installation and operation manual

6.1. Inspection Tips

When unpacking the carton, if the shell has obvious signs caused by severe impact or falling, please contact with the supplier as soon as possible.

After the instrument being removed from the packing box, it should be placed on a flat and safe plane, facing up, not overlaying for more than five layers. If not installed or used in a short time, the electric meter shall be packed and placed to the original packing box for storage.

6.2. Installation and tips

6.2.1. Installation and Inspection

If the model No or configuration in the original packing box is not in accordance with the requirement, please contact with the supplier. While, if the inner package or shell has been damaged after removing the instrument from the packing box, please do not install, power on the instrument, please contact with the supplier as soon as possible, instead.

6.2.2. Installation

It requires experienced electrician or professional personnel to install it and you must read this operation manual. During the installation, if the shell has obvious damage or marks caused by violent impact or falling, please do not install it or power on and contact with the supplier as soon as possible.

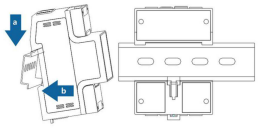


Figure 8

6.3. Typical wiring

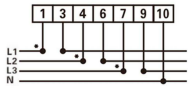


Figure 10 Three phase four wire: direct connect

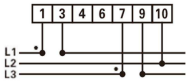


Figure 11 Three phase three wire: direct connect

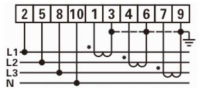


Figure 12 Three phase four wire: via current transformer

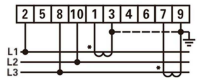


Figure 13 Three phase three wire: via current transformer

Figure 14

Figure 15

◆ Voltage signal (only for connection via current transformer)

2-------UA (Phase A voltage input terminal) 5 -------UB (Phase B voltage input terminal)

8-------UC (Phase C voltage input terminal) 10-------UN (Phase N voltage input terminal)

◆ Current signal:

1-------IA*(Phase A current input terminal) 3------IA (Phase A current output terminal)

4-------IB*(Phase B current input terminal) 6------IB (Phase B current output terminal)

7-------IC*(Phase C current input terminal) 9------IC(Phase C current output terminal)

◆ RS485 Communication wire

24-------A（RS485 Terminal A） 25-------B（RS485 Terminal B）

◆ Auxiliary function

19------ Active energy and reactive energy output high terminal

21------ Active energy and reactive energy output low terminal

NOTE:In the Figure 10、11、12、13, the L1、L2、L3 correspond to Phase A、Phase B、Phase C

7. Diagnosis, analysis and elimination for common faults

Fault phenomenon	Reason analysis	Elimination
No display when powered on	1、Incorrect wiring 2、Abnormal voltage for the instrument	1. If it is wrongly connected, please reconnect based on the right wiring mode (see the wiring diagram). 2. If the supplied voltage is abnormal, please choose the specified voltage. 3. If not the above problems, please contact with the local supplier.
Abnormal RS485 communication	1. RS485 communication cable is opened, short circuit or reversely connected. 2. Address, baud rate, data bit and check bit is not in accordance with the host computer. 3. The end of RS485 communication cable has not been matched with resistance (when the distance over than 100 meters) 4. Not matched with the communication protocol order of the host computer	1. If there is any problem with the communication cable, please change it. 2. Set the address, baud rate, data bit and check bit through buttons and confirm it is the same with the host computer, then set the operation to be “parameter settings”. 3. If the communication distance is over than 100 meters, and the communication parameter settings are the same as the host computer, but cannot be communicated, then please lower the baud rate or add a resistance of 120Ω at the start terminal and ending terminal.
Abnormal data for the electrical parameter (voltage, current, power, etc.)	1. The transformer's ratio hasn’t been set, and the instrument displays the	1. If setting the transformer ratio, please set the voltage ratio and current ratio based on

	secondary side data. 2. Wrong wiring.	"parameter setting" 2. If wrongly connected, please connect the voltage and current of phase A, B and C to the wiring terminal of the instrument.
Abnormal data for the electrical parameter read by communication (voltage, current, power, etc.)	1. Data read by communication is secondary side data, without transformer ratio. 2. Wrong analysis for data frame	1. Multiply the data read by communication with the voltage ratio and current ratio. 2. Analyze the data frame based on the format of the communication protocol, please pay attention to the mode of the big and small end of data.

8. Transportation & Storage

When transporting and unpacking the products, please confirm they are not severely impacted, transporting and storing based on Transportation, basic environmental conditions and testing methods for instrument and meters of JB/T9329-1999.

The instrument and accessories shall be stored in the dry and ventilated places, to avoid humidity and corrosive gas erosion, with the limited environmental temperature for storage to be -40℃～+70℃ and relative humidity not exceeding 85%.

9. Maintenance & Service

We guarantee free reparation and change for the multi-meter if found any unconformity with the standard, under circumstance of that the users fully comply with this instructions and complete seal after delivery within 18 months.

HY94C5-200 Datasheet：

SPECIFICATION	STMHALL	BEIJING STM MEASUREMENT & CONTROL TECHNOLOGY CO.,LTD
Model Name		Model Type
Split Core Current Transformer		HY94C5-x
		Version A.03

Features

For the measurement or control of AC current in power cables and equipment
Galvanic isolation between the primary and the secondary circuit
Split-core sturcture, easy to be mounted without primary conductor dismounting
Secondary connection: 2 x 1.5 mm^2 wires, red & black

Performance data

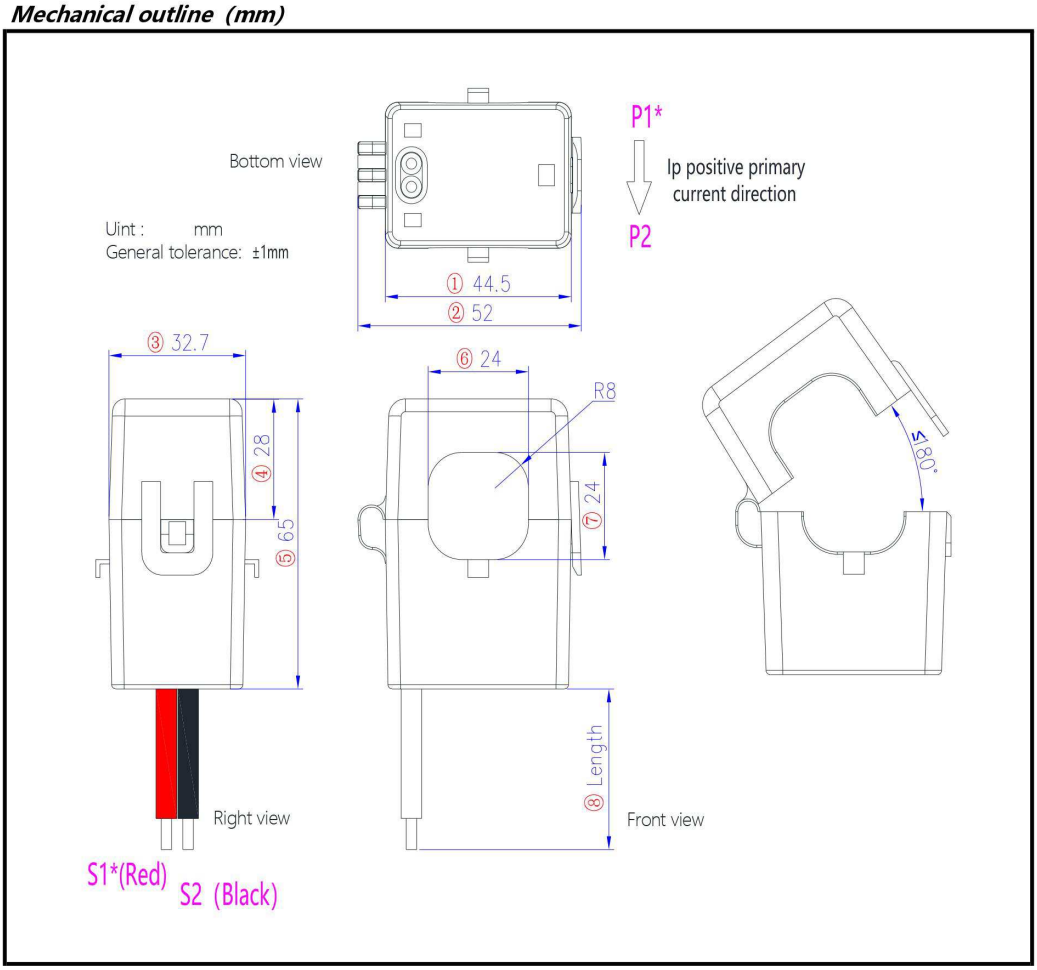
Model type	HY94C5-100	HY94C5-200	HY94C5-300	HY94C5-400	HY94C5-500	HY94C5-600
Rated primary current, RMS, Ipr	100A	200A	300A	400A	500A	600A
Rated burden	1VA					
Rated secondary current, RMS,Isr	5A					
Accuracy class @R_L≤20Ω	0.5 (IEC 60044-1:2003)					
Overload rating	1.2 x Ipr					
R.m.s.voltage for AC isolation test	2kV (@50Hz,1min)					
Highest voltage for equipment	0.72 kV					
Rated frequency	50/60Hz					
Aperture for primary conductor	24mm*24mm					
Length of secondary wires	1m ±3%					
Net weight	215g±5%					
Ambient operating temperature	-30℃...+75℃					
Altitude	≤1000m					
Environmental relative humidity	≤90%RH					
Working environment	No serious pollution,No strong vibration					
Insulated plastic case material	UL 94-V0					

Model type explanation

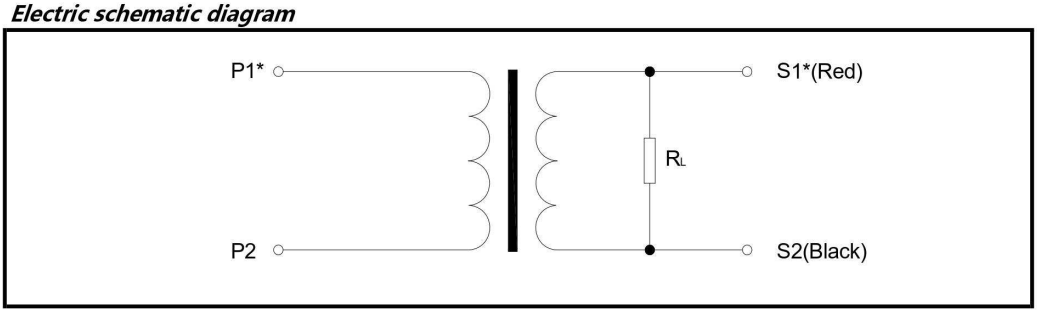
HY	Marking of STM transformer product
94	Housing case code
C	Current transducer
5	Rated secondary current
-x	- Rated primary current

www.bjstmck.com

Mechanical outline (mm)



Electric schematic diagram



AKH-0.66-K-Φ24 Datasheet：

Acrel

AKH-0.66/K-Φ Split current transformer

1. Product feature

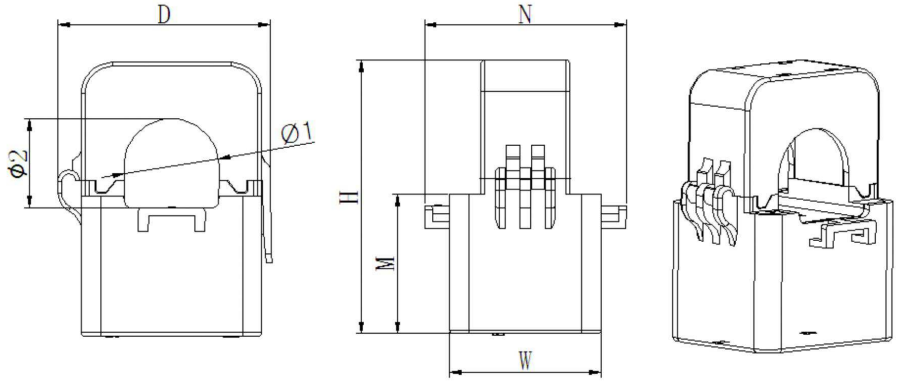
The appearance is nice and the installation and wiring are convenient. AKH-0.66/K-Φ series split current transformers are mainly used in reconstructing projects of urban and rural power grids. Product has the advantages of small size, high accuracy, strong load capacity, easy installation, etc.They save the manpower, material resources and financial resources and improve the efficiency of users.

2. Explanation for type

AKH – 0.66 – K – □–□

- Rated current ratio
- Specification
- Split
- Rated voltage,kV
- Code of product series

3. Spec. and size



Note: Primary current flow from P1 to P2. The black second wiring is S2,the red is S1.The outlet length is 1m ± 10cm.

Size（mm） / Type	Outline size					Through size		Tolerance
	W	H	D	M	N	Φ1	Φ2	
K-Φ24	39	70.5	55	36	52	24.5	23	±1
K-Φ36	42.5	81.5	67	40	56	33.5	35	

Acrel Co.,Ltd
Tel：0510-86179960 Fax：0510-86179835
Address：No5 DongmenRd,Nanzha Jiangyin Jiangsu E-mail：acrel010@VIP.163.com

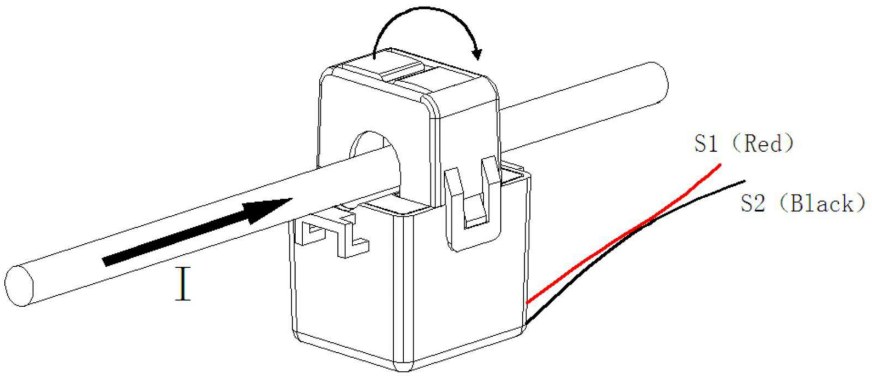
4. Cross-reference tables of spec. –parameter

Specification	Rated current ratio (A)	Precision degree		Straight-through tums	Max. cable outer diameter (mm)
		0. 5	1		
K-Φ24	(150-300) A/5 (1) A		√	1	Φ24
K-Φ36	(300-400) A/5 (1) A		√	1	Φ36
	(500-600) A/5 (1) A	√		1	

5. Technical indicators

- Rated operation voltage AC 0.66kV
- Rated frequency 50-60Hz
- Ambient air temperature -30℃-70℃
- Height above sea level≤3000m
- Power frequency withstand voltage 3000v/1min 50Hz
- Used in place without direct rain and snow,without severe pollution and acute shock

6. Installation



Acrel Co.,Ltd
Tel：0510-86179960 Fax：0510-86179835
Address：No5 DongmenRd,Nanzha Jiangyin Jiangsu E-mail：acrel010@VIP.163.com

Annex No. 2

Test Equipment list

Date(s) of performance of tests: 2020-11-20 to 2021-03-10

Equipment	Internal No.	Manufacturer	Type	Serial No.	Next Calibration date
Power Analyser	A4080002DG	YOKOGAWA	WT3000	91M210852	Jun. 16, 2021
AC Source	A7040019DG	Chroma	61512	61512000439	Monitored by Power Analyser
	A7040020DG	Chroma	61512	61512000438	
DC Simulation Power Supply	A7040015DG	Chroma	62150H-1000S	62150EF00488	
	A7040016DG	Chroma	62150H-1000S	62150EF00490	
	A7040017DG	Chroma	620028	620028EF00120	
RLC Load	A7150027DG	Qunling	ACLT-3803H	93VOO2869	
Eight Channel Digital Phosphor Oscilloscope	A4089017DG	YOKOGAWA	DL850	91N726247	Sep. 23, 2021
Oscilloscope probe	A4089008DG	Tektronix	TPP1000	C008230	Aug. 10, 2021
	A4089010DG	Tektronix	TPP1000	C008228	Aug. 10, 2021
	A4089011DG	Tektronix	TPP1000	C008229	Aug. 10, 2021
Current transducer	A1060007DG	YOKOGAWA	CT200	1130700012	Sep. 02, 2021
	A1060008DG	YOKOGAWA	CT200	1130700017	Sep. 02, 2021
	A1060012DG	YOKOGAWA	CT200	1130700018	Sep. 02, 2021
Power Analyser	//	ZLG	PA5000H	C820290908200 2110001	Mar. 02, 2021
Oscilloscope	//	Agilent	DS05014A	MY50070266	Jan. 05, 2022
Oscilloscope current probe	//	FLUKE	i1000S	29503223	Jan. 05, 2022
	//	FLUKE	iL000S	30413448	Jan. 05, 2022
	//	CYBERTEK	CP1000A	C181000929	Jan. 05, 2022
	//	CYBERTEK	CP1000A	C181000922	Jan. 05, 2022
	//	CYBERTEK	CP1000A	C191000141	Jan. 05, 2022
Oscilloscope voltage probe	//	SANHUA	SI-9110	152655	Jan. 05, 2022
	//	SANHUA	SI-9110	111134	Jan. 05, 2022
	//	SANHUA	SI-9110	111539	Jan. 05, 2022
	//	SIGLENT	DPB5150A	D15A150052	Jan. 05, 2022
	//	SIGLENT	DPB5150A	D15A200317	Jan. 05, 2022
	//	SIGLENT	DPB5150A	D15A200314	Jan. 05, 2022
	//	SIGLENT	DPB5150A	D15A150047	Jan. 05, 2022