TÜVRheinland®

TEST REPORT

IEC 61683:1999

Photovoltaic systems – Power conditioners – Procedure for measuring efficiency

Report reference no. ..... :	**28110977 002**
Tested by (name + signature)……..:	Salvo Tomarchio / Tester
Approved by (name + signature)……:	Marco Piva /TC
Date of issue ..... :	30/11/2017
Total number of pages ..... :	23
Testing Laboratory..... :	TUV Rheinland Italia s.r.l.
Address ..... :	Via E. Mattei, 3 – 20010 Pogliano Milanese (MI) - Italy
Applicant's name ..... :	Enphase Energy, New Zealand Ltd.
Address ..... :	1 Treffers Road, Wigram – 8042 Christchurch – New Zealand
Test item description ..... :	Solar Grid Tied Inverter
Trade Mark ..... :	[e]enphase ENERGY
Manufacturer ..... :	Enphase Energy, New Zealand Ltd.
Model/Type reference ..... :	IQ6 PLUS-72-2-INT
Ratings ..... :	Input MPPT: 27-45 Vdc Output: 230Vac; 50Hz; 290W phase-neutral
Sample..... :	Sample selected by customer
Samples received on..... :	30/10/2017
TUV reference samples ..... :	170602
Samples tested n. ..... :	01
Testing..... :	Type Test
Start Date: ..... :	02/11/2017
End Date: ..... :	07/11/2017

Testing procedure and testing location:			
☒	Testing Laboratory:	TUV Rheinland Italia S.r.l.	
Testing location/ address..... :		Via E. Mattei, 3 – 20010 Pogliano Milanese (MI) - Italy	
☐	Associated Laboratory:		
Testing location/ address.....:			
	Tested by (name + signature) .....:	Salvo Tomarchio / Tester	*(See first page)*
	Approved by (name + signature).....:	Marco Piva /TC	*(See first page)*
☐	**Testing procedure: TMP**		
Testing location/ address.....:			
	Tested by (name + signature) .....:		
	Approved by (name + signature).....:		
☐	**Testing procedure: WMT**		
Testing location/ address.....:			
	Tested by (name + signature) .....:		
	Witnessed by (name + signature).....:		
	Approved by (name + signature).....:		
☐	**Testing procedure: SMT**		
Testing location/ address.....:			
	Tested by (name + signature) .....:		
	Approved by (name + signature).....:		
	Supervised by (name + signature) ...:		
☐	**Testing procedure: RMT**		
Testing location/ address.....:			
	Tested by (name + signature) .....:		
	Approved by (name + signature).....:		
	Supervised by (name + signature) ...:		

Test item particulars:	
Equipment mobility..... :	☒ fixed
Connection to the mains ..... :	☒ permanent connection
Environmental category ..... :	☒ outdoor
Over voltage category Mains..... :	☒ OVC III
Over voltage category PV..... :	☒ OVC II
Mains supply tolerance (%) ..... :	N/A
Tested for power systems..... :	TN
IT testing, phase-phase voltage (V)..... :	No
Class of equipment..... :	☒ Class II
Pollution degree..... :	PD3
IP protection class ..... :	IP 67

Testing:

Date of receipt of test item(s) .....: (see first page)

Dates tests performed .....: (see first page)

Possible test case verdicts:

- test case does not apply to the test object .....: N/A
- test object does meet the requirement.....: Pass (P)
- test object was not evaluated for the requirement ..... : N/E
- test object does not meet the requirement.....: Fail (F)

General remarks:

"(see Attachment #)" refers to additional information appended to the report.
"(see appended table)" refers to a table appended to the report.
The tests results presented in this report relate only to the object tested.
This report shall not be reproduced except in full without the written approval of the testing laboratory.
List of test equipment must be kept on file and available for review.
Additional test data and/or information provided in the attachments to this report.
Throughout this report a ☐ comma / ☒ point is used as the decimal separator.
Throughout this report date are indicated as dd/mm/yyyy.

Devices above listed are also compliant to the IEC 61683:1999 and CEI EN 61683:2010 requirements.
These standards are completely the same of EN 61683:2000 without any additional requirements.

Description of EUT tested :

The **IQ6 Plus** Enphase Microinverter maximizes energy production by using a sophisticated Maximum Power Point Tracking (MPPT) algorithm. Each Enphase Microinverter individually connects to one PV module in your array. This configuration enables an individual MPPT to control each PV module, ensuring that maximum power available from each PV module is exported to the utility grid regardless of the performance of the other PV modules in the array. While an individual PV module in the array may be affected by shading, soiling, orientation, or PV module mismatch, each Enphase Microinverter ensures top performance for its associated PV moduleEUT is provided of PV connectors for DC input supply, internal terminal block for connection of AC external cables, two means of connection for protective earth.

System Monitoring:
Once you install the Enphase IQ Envoy and provide an internet connection through a broadband router or modem, the Enphase IQ Microinverters automatically begin reporting to Enlighten. Enlighten presents current and historical system performance trends, and informs you of PV system status.

Optimal Reliability: Microinverter systems are inherently more reliable than traditional inverters. The distributed nature of a microinverter system ensures that there is no single point of system failure in the PV system. Enphase Microinverters are designed to operate at full power at ambient temperatures as high as 65° C (150° F).

Ease of Design:
PV systems using Enphase Microinverters are very simple to design and install. You will not need string calculations or cumbersome traditional inverters. You can install individual PV modules in any combination of PV module quantity, type, age and orientation. Each microinverter quickly mounts on the PV racking, directly beneath each PV module. Low voltage DC wires connect from the PV module directly to the co-located microinverter, eliminating the risk of personnel exposure to dangerously high DC voltage.

Informazioni generali sul prodotto / *General product information***:**	
Product:	☒Static generator (Photovoltaic grid tied inverter) ☐Wind Full converter (FC) ☐Wind Doubly Fed Induction Generator
License Holder: *Address:*	Enphase Energy, New Zealand Ltd. 1 Treffers Road, Wigram – 8042 Christchurch – New Zealand
Manufacturing plant: *Address:*	Enphase Energy, New Zealand Ltd. 1 Treffers Road, Wigram – 8042 Christchurch – New Zealand
Model(s):	IQ6 PLUS-72-2-INT
N°serie / Serial n°:	121742014369
Testing Location: *Address:*	***§. N.1 Esecuzione delle prove – accreditamento*** *N.1 Testing - Accreditation* ☒EA - ISO/EN 17025 testing Laboratory *(See testing laboratory address)* ☐Manufacturing Plant / Customer facility *EA - ISO/EN 17025 testing Laboratory (witnessing)* *(see Manufacturing plant address)*
Testing Laboratory: *Address:*	TÜV Rheinland Italia S.r.l Via Mattei 3 - 20010 - Pogliano Milanese (MI) – Italy Accreditation N. 1356
Input Voltage (Rated):	MPPT range 27-45 Vdc
Output Voltage (Rated):	230Vac
Firmware version:	520-00073-r01-v02.11.00

Informazioni generali sul prodotto / *General product information***:**

DISPOSITIVO DI INTERFACCIA	PROTEZIONE DI INTERFACCIA	DISPOSITIVO DI CONVERSIONE STATICA	DISPOSITIVO DI GENERAZIONE ROTANTE
☐	☐	☒	☐

Prodotto verificato: / *Verified product*

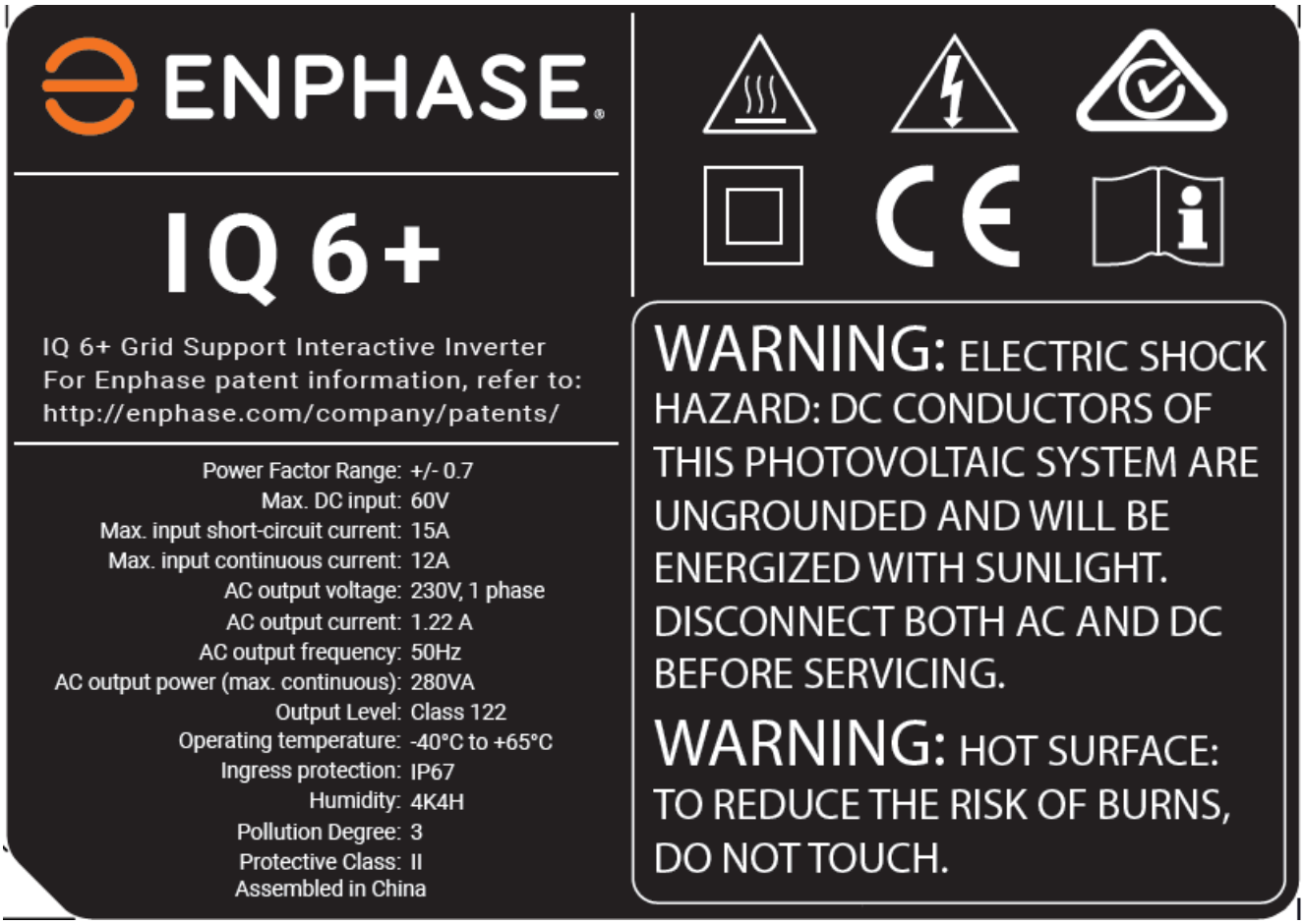
Descrizione /Description:	Enphase Energy, New Zealand Ltd.
Costruttore / Manufacturer:	Enphase Energy, New Zealand Ltd.
Modello/ Model	IQ6 PLUS-72-2-INT
N°serie / Serial n°	121742014369
Number of phases	1~NPE
Release Software:	520-00073-r01-v02.11.00

Technical information:

Specification	IQ6 PLUS-72-2-INT			
	Unit	Min	Nominal	Max
Output (AC)				
Rated output active power	W		280	
Output apparent power	VA		280	290
Power factor (adjustable, subject to max VA)		0.7 inductive	1	0.7 capacitive
Output frequency range (50 Hz system)	Hz	40	50	57
Total demand distortion at rated output power	%			5
AC Surge immunity	kV	6		
Output fault current	Arms			20
Output fault current duration	ms			200
DC injection current	mA			1
Output at 230-Vac LN				
Output voltage	Vrms	184	230	276
Extended output voltage	Vrms	179		280
Rated output current	Arms		1.22	
Maximum output current	Arms			1.52
EN50530 Euro efficiency	%		96.5	
MPPT				
MPPT static efficiency	%	99.5		
MPPT range of the rated output power	%	2		100
Trip point accuracy				
Voltage trip limit accuracy (179 – 280 Vrms)	±%	1		
Frequency trip limit accuracy (40 – 68 Hz)	±%	0.1		
Trip time accuracy	±ms			33
VRT and FRT recovery time	ms			200
Input (DC)				
Full power MPPT input voltage range	V	27	36	45
Input operating range	V	16		60
Input current limit region	V	16		27
Input current limit	A			12
Input startup voltage for power generation	V	21.7	22	22.3
Maximum input current	A	15		
Internal housekeeping power supply startup voltage	V			20
Internal housekeeping power supply low voltage shutdown	V			10
Miscellaneous				
Mechanical dimension (W x H x D, not including mounting bracket)	mm	219.0 x 191.0 x 37.9		
Weight	kg			1.5

Ambient operating temperature	°C	-40		65	
Internal operating temperature (at temp sensor)	°C	-40		85	
Storage temperature range	°C	-40		85	
Fill factor range for minimum MPPT power		0.6		0.75	
Fill factor range for MPPT static accuracy		0.56		0.78	
Fill factor range for MPPT dynamic response		0.68		0.78	
Maximum power dissipation	W			11.6	
Internal temperature sensor range	°C	-40		100	
Reporting accuracy					
Measurement tolerance, Output voltage, (179 – 280 Vrms)	±%			1	
Measurement tolerance, Output frequency (40 – 68 Hz)	Hz			0.01	
Measurement tolerance, Output real power, %FS	±%			2.5	
Measurement tolerance, Output reactive power, %FS,	±%			2.5	
Measurement tolerance, Output power factor (50% - 100% pwr)				0.01	
Measurement tolerance, Output power factor (20% - 49% pwr)				0.025	
Measurement tolerance, Output power factor (0% - 19% pwr)				-	
Measurement tolerance, Input voltage	±%			1	
Measurement tolerance, Input current	±%			1	
Measurement tolerance, Input power, %FS	±%			2	
Measurement tolerance, Internal unit temperature (-40 to +85)	±°C			3	

Example Copy of marking plate:



Block Diagram of the converter's topology

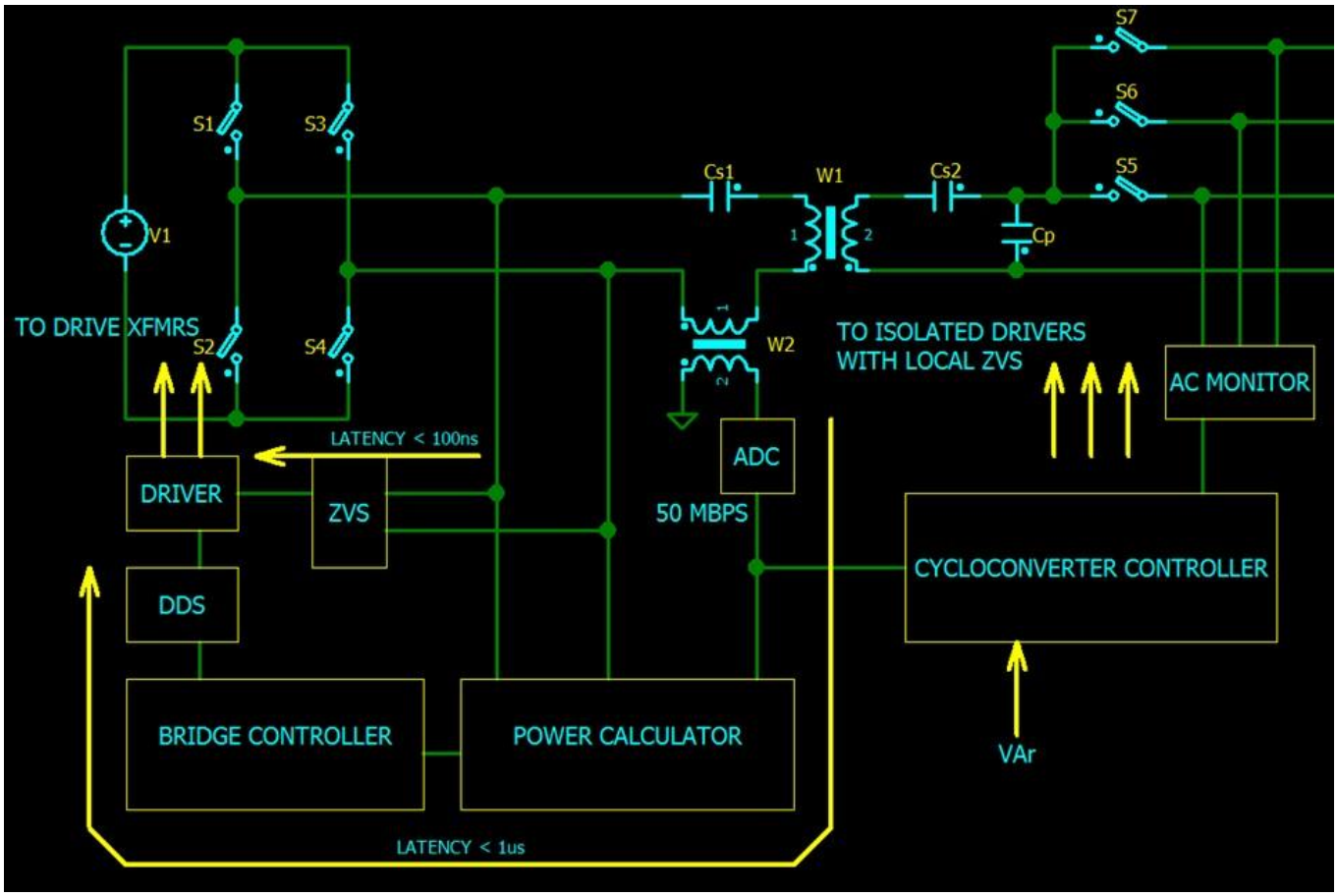


TABLE: Documents not attached recalled into this report		
Document No.	Document description	Page Numbers
1	User Manual : Quick Installation guide - Q6-plus-EN-2-INT-web	5

Clause	Requirement – Test	Result – Remark	Verdict
4	**Efficiency measurement conditions**		P
	Efficiency shall be measured under the matrix of conditions as described in the following clauses and table 1. Specific conditions may be excluded by mutual agreement when those conditions are outside the manufacturer's allowable operating range. The resulting data shall be presented in tabular form and may also be presented graphically.		P
4.1	**DC power source for testing**		P
	For power conditioners operating with fixed input voltage, the d.c. power source shall be a storage battery or constant voltage power source to maintain the input voltage.		N/A
	For power conditioners that employ maximum power point tracking (MPPT) and shunt-type power conditioners, either a photovoltaic array or a photovoltaic array simulator shall be utilized.	Photovoltaic array simulator used	P
4.2	**Temperature**		P
	All measurements are to be made at an ambient temperature of 25 °C ± 2 °C. Other ambient temperatures may be allowed by mutual agreement. However, the temperature used must be clearly stated in all documentation.	25°C ± 2 °C	P
4.3	**Output voltage and frequency**		P
	The output voltage and frequency shall be maintained at the manufacturer's stated nominal values.	230Vac, Test performed at 50Hz	P
4.4	**Input voltage**		P
	Measurements performed in each of the following tests shall be repeated at three power conditioner input voltages:		P
	a) manufacturer's minimum rated input voltage;	min. voltage full power 27Vdc	P
	b) the inverter's nominal voltage or the average of its rated input range;	nominal 37Vdc	P
	c) 90 % of the inverter's maximum input voltage.	90% of Max. voltage full power 45Vdc	P
	In the case where a power conditioner is to be connected with a battery at its input terminals, only the nominal or rated input voltage may be applied.		P
4.5	**Ripple and distortion**		P
	Record input voltage and current ripple for each measurement. Also record output voltage and current distortion (if a.c.) or ripple (if d.c.). Ensure that these measurements remain within the manufacturer's specified values. Note that ripple and distortion may not be specified at low power levels, but readings shall be recorded.	Measures recorded to maximum power	P

Clause	Requirement – Test	Result – Remark	Verdict
4.6	**Resistive loads/utility grid**		P
	At unity power factor, or at the intrinsic power factor of grid-connected inverters without power factor adjustment, measure the efficiency for power levels of 10 %, 25 %, 50 %, 75 %, 100 % and 120 % of the inverter's rating. Stand-alone inverters shall also be measured at a power level of 5 % of rated. The power conditioner test should be conducted with a specified resistive and reactive grid impedance.	The efficiency measurement was performed at 10 %, 20 %, 30%, 50 %, 75 %, 100 % because the unit does not provide overload function.	P
4.7	**Reactive loads**		N/A
	For stand-alone inverters, measure the efficiency with a load which provides a power factor equal to the manufacturer's specified minimum level (or 0,25, whichever is greater) and at power levels of 25 %, 50 % and 100 % of rated VA. Repeat for power factors of 0,5 and 0,75 (do not go below the manufacturer's specified minimum PF) and power levels of 25 %, 50 %, and 100 % of rated VA.		N/A
4.8	**Resistive plus non-linear loads**		N/A
	For stand-alone inverters, measure the efficiency with a fixed non-linear load (total harmonic distortion (THD) = (80 ±5) %) equal to (25 ±5) % of the inverter's rated VA plus sufficient resistive load in parallel to achieve a total load of 25 %, 50 % and 100 % of rated VA. Repeat the measurements with a fixed non-linear load equivalent to (50 ±5) % of the inverter's rated VA plus sufficient resistive load in parallel to achieve a total load of 50 % and 100 % of rated VA. The type of non-linear load must be clearly stated in all documentation.		N/A
4.9	**Complex loads**		N/A
	When a non-linear plus a sufficient reactive load condition is specified for stand-alone inverters, measure the efficiency with a fixed non-linear load (THD = (80 ± 5) %) equal to (50 ± 5) % of the inverter's rated VA plus a sufficient reactive load (PF = 0, 5) in parallel to achieve a total load of 50 % and 100 % of rated VA. The type of complex load shall be clearly stated in all documentation.		N/A
5	**Efficiency calculations**		P
5.1	**Rated output efficiency**		P
	Rated output efficiency shall be calculated from measured data as follows: $\eta_R = (P_o / P_i) \times 100$		P
5.2	**Partial output efficiency**		P
	Partial output efficiency shall be calculated from measured data as follows: $\eta_{par} = (P_{op} / P_{ip}) \times 100$		P
5.3	**Energy efficiency**		P

Clause	Requirement – Test	Result – Remark	Verdict
	Energy efficiency shall be calculated from measured data as follows: $\eta_E = (W_o / W_i) \times 100$		P
5.4	**Efficiency tolerances**		P
	When an efficiency value has been guaranteed, the tolerance of this value shall be within the value at rated conditions indicated in table 2.		P
6	**Efficiency test circuits**		P
6.1	**Test circuits**		P
	Figure 1 shows recommended test circuits for power conditioners which have a single-phase a.c. output or d.c. output. It can as well be regarded as a single-phase representation of a test set-up for multiphase power conditioners.		P
	Figures 1a and 1b shall be applied to stand-alone and utility-interactive power conditioners respectively.	Figure 1b was used	P
	The proposed test circuits in figure 1 are not mandatory, but together with the test descriptions, are intended to establish a base for mutual agreement between user and manufacturer.		P
	The type of power source shall be indicated on all tests and shall adhere to the requirements of 4.1.		P
6.2	**Measurement procedure**		P
	a) Efficiency is calculated with equation (1) or (2) using measured *P*i, *P*o *or P*ip, *P*op. DC input power *P*i, *P*ip can be measured by wattmeter W1, or determined by multiplying the d.c. voltmeter V1 and d.c. ammeter A1 readings. Output power *P*o, *P*op is measured with wattmeter W2.		P
	b) DC input voltage, which is measured by d.c. voltmeter V1, shall be varied in the defined range where the output current, which is measured with a.c. ammeter A2, is varied from low output to the rated output.		P
	c) An average indicating instrument shall be used for the d.c. voltmeter and d.c. ammeter. A true r.m.s. type of indicating instrument shall be used for the a.c. voltmeter and a.c. ammeter. The d.c. wattmeter W1 shall be a d.c. measuring type. The wattmeter W2 shall be an a.c. or d.c. measuring type according to the output.		P
	d) Power factor (*PF* in per cent) can be measured by a power factor meter PF, or calculated from the readings of V2, A2, W2 and as follows: *PF* = (W2/(V2 x A2)) x 100		P
	e) Each meter may be an analogue type or a digital type. The measurement accuracy shall be better than 0,5 % of the full-scale value for each power measured. Digital power instruments for W1 and W2 are also recommended.	Digital measurement devices were used for testing. The accuracy of the measurement devices fulfils the requirements.	P

Clause	Requirement – Test	Result – Remark	Verdict
	f) An MPPT dynamically adjusts the input voltage so as to maximize the output power. In principle, the monitoring equipment shall sample all of the electrical parameters, such as input voltage and current, output power and current, within the update period of the MPPT. If the MPPT and input source (PV array or PV array simulator) interact in such a way that the input voltage varies by less than 5 %, then averaging of readings is acceptable. The averaging period shall be 30 s or longer.	The dynamic MPPT was deactivated, the 60s average was used anyway.	P

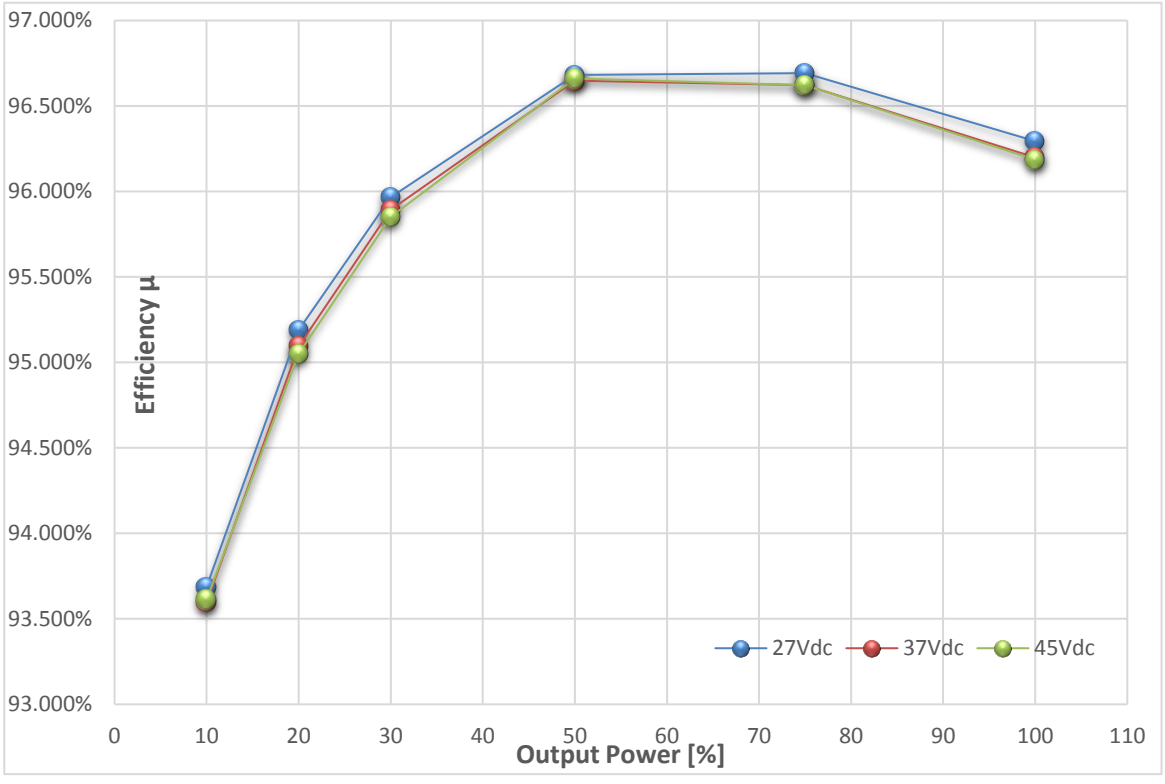
Clause	Requirement – Test	Result – Remark	Verdict
7	**Loss measurement**		P
7.1	**No-load loss**		P
	No-load loss shall be measured as follows.		P
	If the power conditioner is a stand-alone type, the reading of d.c. input voltage, output voltage and frequency is given with meters V1, V2 and F respectively in figure 1a, and shall be adjusted to the rated values.		N/A
	The no-load loss is thus the indicated value of d.c. input wattmeter, W1, when the load is disconnected from the power conditioner.		N/A
	If the power conditioner is a utility-interactive type, the reading of d.c. input voltmeter V1, a.c. output voltmeter V2 and frequency meter F in figure 1b shall be adjusted to meet the specified voltages and frequency.		P
	No-load loss is thus the indicated value of d.c. input wattmeter, W1, when a.c. wattmeter, W2, indicates a zero value. For the measurement, allow the power conditioner time to transfer to its no-load operating state, if applicable.	Inverter connected to the AC main, supplied with nominal input voltage AC contactor closed: W1= 304.9W AC contactor open: W1=0.09W	P
7.2	**Standby loss**		P
	Standby loss shall be measured as follows.		P
	If the power conditioner is a utility-interactive type, standby loss is defined as the consumption of utility power when the power conditioner is not operating but is under standby condition. Standby loss is indicated with a.c. wattmeter, W2 in figure 1b at the rated a.c. output voltage.	Inverter connected to the AC main (AC contactor opened) with input source de-energized W2=0.002W	P
	If the power conditioner is a stand-alone type, standby loss is defined as the consumption from the d.c. source when the power conditioner is not operating but is under standby condition. Standby loss is indicated with d.c. wattmeter, W1 in figure 1a (without a.c. or d.c. output voltage).		N/A
Annex A	**Power conditioner description (informative)**		
Annex B	**Power efficiency and conversion factor (informative)**		
Annex C	**Weighted-average energy efficiency (informative)**		
Annex D	**Derivation of efficiency tolerance (informative)**		

Test Result

TABLE 4.a – Efficiency measurement conditions test results				
OUTPUT Voltage:		**230 Vac**		
Input voltage (Vdc):		**27 Vdc_{min}**		
Temperature:		**25°C**		
Pn [%]	**η [%]**	**Pac [W]**	**Pdc [W]**	**Vdc [V]**
10	93.688%	28.001	29.887	27.713
20	95.190%	57.478	60.382	27.762
30	95.967%	83.666	87.182	27.807
50	96.681%	139.806	144.605	27.948
75	96.692%	211.291	218.520	28.102
100	96.294%	295.138	306.497	28.985
ηR max. [%]		**96.692%**		
No-load losses: Inverter connected to the AC main, supplied with nominal input voltage		AC contactor closed: W1= 304.9W AC contactor open: W1=0.09W		
Standby loss. Inverter connected to the AC main (AC contactor opened) with input source de-energized.		W2= 0.002W		

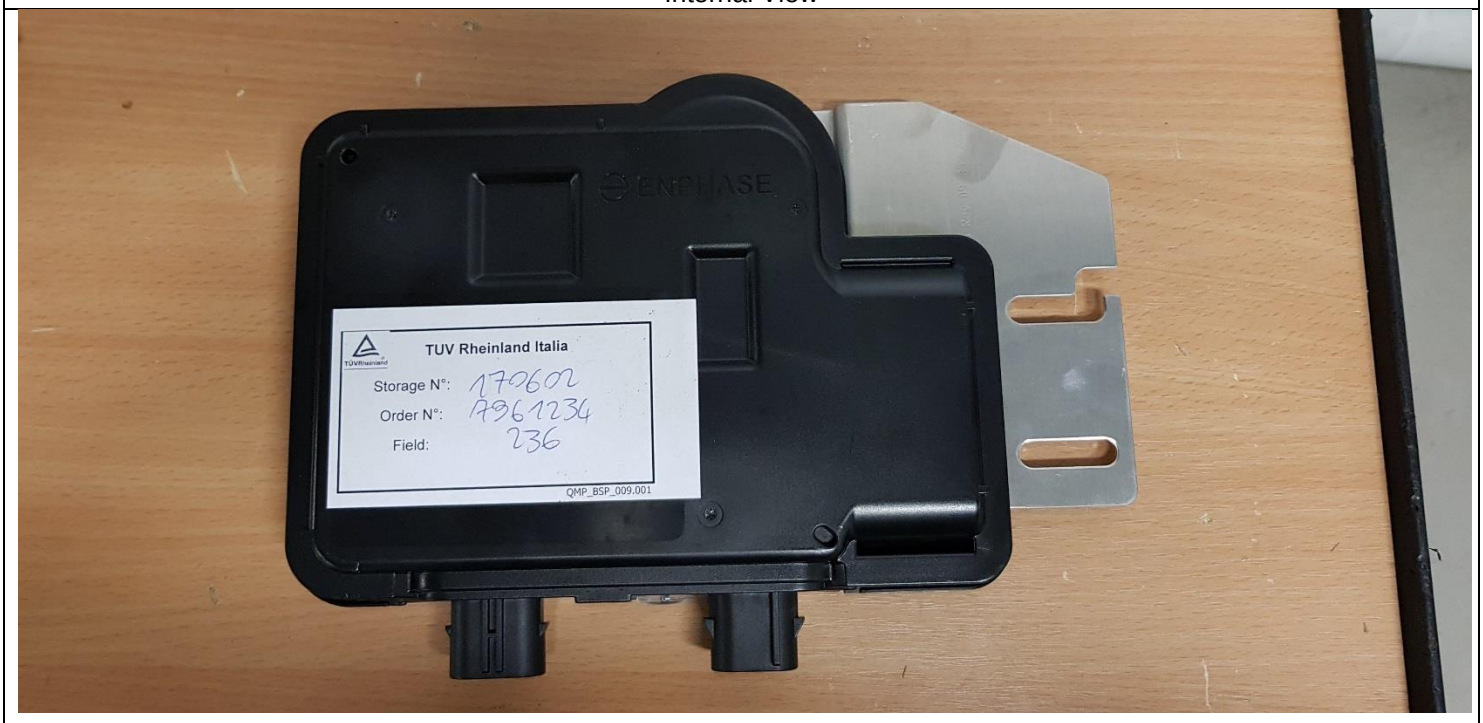
TABLE 4.a – Efficiency measurement conditions test results				
OUTPUT Voltage:		**230 Vac**		
Input voltage (Vdc):		**37 Vdc_{nom}**		
Temperature:		**25°C**		
Pn [%]	**η [%]**	**Pac [W]**	**Pdc [W]**	**Vdc [V]**
10	93.596%	29.436	31.450	37.261
20	95.094%	56.269	59.172	37.184
30	95.894%	85.550	89.213	37.500
50	96.648%	139.790	144.638	37.595
75	96.621%	210.114	217.462	37.606
100	96.199%	293.849	305.460	37.129
ηR max. [%]		**96.648%**		
No-load losses: Inverter connected to the AC main, supplied with nominal input voltage		AC contactor closed: W1= 304.9W AC contactor open: W1=0.09W		
Standby loss: Inverter connected to the AC main (AC contactor opened) with input source de-energized.		W2= 0.002W		

TABLE 4.a – Efficiency measurement conditions test results				
OUTPUT Voltage:		**230 Vac**		
Input voltage (Vdc):		**45 Vdc_{max}**		
Temperature:		**25°C**		
Pn [%]	**η [%]**	**Pac [W]**	**Pdc [W]**	**Vdc [V]**
10	93.613%	28.941	30.916	45.049
20	95.051%	56.840	59.799	45.038
30	95.852%	84.744	88.411	44.904
50	96.661%	141.601	146.492	45.073
75	96.622%	212.087	219.502	45.113
100	96.185%	292.713	304.323	45.795
ηR max. [%]		**96.661%**		
No-load losses: Inverter connected to the AC main, supplied with nominal input voltage		AC contactor closed: W1= 304.9W AC contactor open: W1=0.09W		
Standby loss: Inverter connected to the AC main (AC contactor opened) with input source de-energized.		W2= 0.002W		



Photographic documentation:

Internal View



Top View

Bottom View

AC and DC connector side

External View with cable AC and DC connected

Serial number

	INSTRUMENTS	MANUFACTURER	MODEL	TÜV RHEINLAND ITALIA Ref.
☒	Power Analyzer	YOKOGAWA	WT500	87020193
☒	Power Analyzer	YOKOGAWA	WT230	87010027
☒	Power Quality Analyzer (with 6 probes)	Chauvin Arnoux	C.A 87334B	87010232
☐	Current Shunt DC	RS	100A dc	98020198
☐	Oscilloscope	YOKOGAWA	DLM2054	87020194
☐	Current probe	YOKOGAWA	7011930	87020195
☒	Differential voltage probe	YOKOGAWA	7011926	87020196
☒	Scope corder	YOKOGAWA	SL 1400	87020239
☒	Current probe	YOKOGAWA	96033	87020240 87020241 87020242
☒	RLC Load	N.B.N AUTOMATION RLC	Load	87020226
☒	Grid Simulator	AMETEK	MX30	87010273
☒	Dc Power Supply	REGATRON	Top Con Quadro	87010278
☐	Harmonics and Flicker analyzer	EM Test	DPA503	87010274
☐	Artificial lumped impedance for flicker	EM Test	AIF503N32	87010275
☒	Digital Multimeter	AGILENT TECHNOLOGIES	U1242A	87010022
☐	Current Clamp For Digital Multimeter	ALCRON	DT-98	87010033
☐	Digital Multimeter	ISO-TECH	IDM 305	87020142
☐	Test Fingernail	ATS GALBUSERA	01.10	87010127
☐	Safety Tester	FLUKE	601PRO XL	87010179
☐	Data Acquisition Unit	AGILENT TECHNOLOGIES	34970A	87010205
☐	Probe For Oscilloscope	GMW	GE 3121	87010220
☐	Earth Continuity Tester	KIKUSUI	TOS6210	87010238
☐	HV Tester	SCHLEICH	GLP1-e HV-AC	87010239
☐	Dummy Load For HV Tester	SCHLEICH	4000987	87010240
☐	Surge Generator	EMTEST	VSS 500 N6	87010269
☐	Load Cell	LAUMAS ELETTRONICA	CTL 200	87010245
☐	Phono-meter	BRÜEL & KJÆR	2236	87020108

INSTRUMENTS		MANUFACTURER	MODEL	TÜV RHEINLAND ITALIA Ref.
☐	Thermal chamber	VÖTSCH	VT4004	87020091
☐	Thermal chamber	Angelantoni Industrie	Higros 50	87020030
☐	Thermal chamber	Weiss Technik	SB22/300/40	87020044
☐	Thermal chamber	Vötsch	VT7012S2	87020094
☐	Thermal chamber	Vötsch	VCV4057-5	87020093
☐	Caliper	MITUTOYO	CD-6"C	87020051

Metodi di Prova */Testing Methods.*	**Incertezza** */Uncertainty*	**Fattore di copertura k** */coverage factor K*
Misura di Tensione in Continua */direct voltage measurement*	0,50% lett	2,00
Misura di Corrente in Continua */direct current measurement*	0,35% lett	2,00
Misura di Tensione Alternata in regime Dinamico */Alternate Voltage measurement (Dynamic regime)*	0,75% lett	2,10
Misura di Tensione Alternata in regime Statico */Alternate Voltage measurement (Static regime)*	0,40% lett	2,00
Misura di Corrente Alternata in regime Dinamico */Alternate current measurement (Dynamic regime)*	0,75% lett	2,10
Misura di Corrente Alternata in regime Statico */Alternate Current measurement (Static regime)*	0,35% lett	2,00
Misura della Corrente di Dispersione */Leakage current test*	3,0% lett	2,00
Misura della Tensione Residua ai Capi della Spina */Residual voltage test*	5,2%	2,06
Misura dei Tempi / Frequenza */Time measurement - frequency*	0,025%	2,13
Tutte le incertezze sopra riportate sono espresse normalmente con livello di fiducia 95%. All the above mentioned uncertainties are expressed with a coverage probability of 95%.		

Through this table comma used as decimal separator

TEST REPORT END