TEST REPORT

IEC 61683

Photovoltaic systems – Power conditioners – Procedure for measuring efficiency

Report Number. .... :	64.290.15.04842.01
Date of issue................................. :	15 October 2015
Total number of pages	22 Pages

Testing laboratory......................... :	TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
Address... :	5F, Communication Building, 163 Pingyun Rd, Huangpu Ave. West, Guangzhou 510656, P. R. China
Testing location .... :	TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
	5F, Communication Building, 163 Pingyun Rd, Huangpu Ave. West, Guangzhou 510656, P. R. China

Applicant's name.......................... :	INVT Solar Technology (ShenZhen) Co., Ltd.
Address... :	No.7 Building Gaofa Industrial Park, Longjing, Nanshan District, 518055 Shenzhen, PEOPLE'S REPUBLIC OF CHINA

Test specification:

Standard .... :	IEC 61683:1999 (First Edition)
Test procedure .... :	Test report
Non-standard test method .... :	N/A
Test Report Form No.................... :	IEC61683A
Test Report Form(s) Originator.... :	TÜV SÜD Product Service GmbH
Master TRF.................................... :	Dated 2014-10

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General disclaimer:

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Test item description......................... :	PV grid-interactive inverter
Trade Mark..................................... :	**invt**
Manufacturer.................................. :	INVT Solar Technology (ShenZhen) Co., Ltd.
Model/Type reference..................... :	iMars MG750TL, iMars MG1KTL, iMars MG1K5TL, iMars MG2KTL, iMars MG3KTL
Ratings.. :	See page 3

Responsible Testing Laboratory (as applicable), testing procedure and testing location:

☒	Testing location / address ....:	TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch 5F, Communication Building, 163 Pingyun Rd, Huangpu Ave. West, Guangzhou 510656, P. R. China
	Tested by (name + signature) .... :	Richard Li
	Approved by (+ signature)............... :	Billy Qiu

TRF No. IEC 61683A
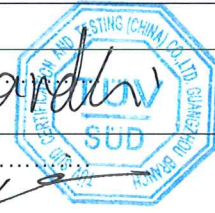
Copy of marking plate:

(1) Below electric ratings are silk-screen on label and affixed side of enclosure.

invt — GRID-TIED SOLAR INVERTER

Model:	iMars MG750TL
DC Input	
Vmax. PV:	400V
MPPT Range:	50V - 400V
Max. Continuous Current:	8A
Isc PV:	8.8A
AC Output	
Max. Continuous Current:	3.6A
Max. Continuous Power:	750W
Frequency:	50Hz
Nominal Voltage:	230V
Power Factor(rated power):	≥0.99
Temperature:	-25℃...+60℃
Protective Class:	I
Overvoltage Category:	II(DC),III(AC)
IP:	IP65

CE TÜV SÜD ⊠ RoHS

S/N:

invt — GRID-TIED SOLAR INVERTER

Model:	iMars MG1KTL
DC Input	
Vmax. PV:	450V
MPPT Range:	60V - 400V
Max. Continuous Current:	9A
Isc PV:	9.9A
AC Output	
Max. Continuous Current:	4.5A
Max. Continuous Power:	1000W
Frequency:	50Hz
Nominal Voltage:	230V
Power Factor(rated power):	≥0.99
Temperature:	-25℃...+60℃
Protective Class:	I
Overvoltage Category:	II(DC),III(AC)
IP:	IP65

CE TÜV SÜD ⊠ RoHS

S/N:

invt — GRID-TIED SOLAR INVERTER

Model:	iMars MG1K5TL
DC Input	
Vmax. PV:	450V
MPPT Range:	80V - 410V
Max. Continuous Current:	10A
Isc PV:	11A
AC Output	
Max. Continuous Current:	6.5A
Max. Continuous Power:	1500W
Frequency:	50Hz
Nominal Voltage:	230V
Power Factor(rated power):	≥0.99
Temperature:	-25℃...+60℃
Protective Class:	I
Overvoltage Category:	II(DC),III(AC)
IP:	IP65

CE TÜV SÜD ⊠ RoHS

S/N:

invt — GRID-TIED SOLAR INVERTER

Model:	iMars MG2KTL
DC Input	
Vmax. PV:	450V
MPPT Range:	100V - 410V
Max. Continuous Current:	12A
Isc PV:	13.2A
AC Output	
Max. Continuous Current:	9A
Max. Continuous Power:	2000W
Frequency:	50Hz
Nominal Voltage:	230V
Power Factor(rated power):	≥0.99
Temperature:	-25℃...+60℃
Protective Class:	I
Overvoltage Category:	II(DC),III(AC)
IP:	IP65

CE TÜV SÜD ⊠ RoHS

S/N:

invt — GRID-TIED SOLAR INVERTER

Model:	iMars MG3KTL
DC Input	
Vmax. PV:	500V
MPPT Range:	120V - 450V
Max. Continuous Current:	15A
Isc PV:	16.5A
AC Output	
Max. Continuous Current:	13A
Max. Continuous Power:	3000W
Frequency:	50Hz
Nominal Voltage:	230V
Power Factor(rated power):	≥0.99
Temperature:	-25℃...+60℃
Protective Class:	I
Overvoltage Category:	II(DC),III(AC)
IP:	IP65

CE TÜV SÜD ⊠ RoHS

S/N:

Note: The above artwork nameplate may be only a draft. For the final production, the additional markings or other words which do not conflict with this standard, may be added.

(2) Below warnings and symbols are silk-screen on label and affixed side of enclosure.

⚠ ♨ ⏱5min 📖 ⚡

Dimension(Approx.): 40x10mm

⚠ **WARNING** Risk of electric shock ⚡
- Read manual before installing.
- Wait at least 5 minutes after power off before proceeding.
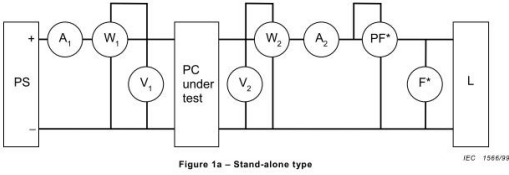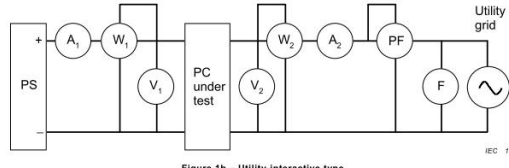- Must be grounded before operation.

Dimension(Approx.): 40x25 mm

Test item particulars.. :	
Classification of installation and use .... :	Fixed, permanent connection;
Supply Connection .... :	TN or TT system
.. :	

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 ....:	1 September 2015
Date (s) of performance of tests............................:	1 September 2015 ~ 20 September 2015

General remarks:
"(See Enclosure #)" 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.**

Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided ....:	☐ **Yes** ☒ **Not applicable**

Models different:
The five models have same PCB layout, communication port, electric circuits, electrical control circuits, and have similar software protection designed, with mainly differences as below:
(1)   Have different amounts of bus capacitors.
(2)   Have different ratings of boost and inverting inductor.
(3)   Have different ratings of power semiconductors D1, Q14, Q15, Q16, IGBT1, IGBT2.
(4)   Model iMars MG3KTL have two pairs of PV input terminals, other models have one pair.

Name and address of factory (ies) .... :
Shenzhen INVT Electric Co., Ltd.
Zone A, Juyuan Industrial areas, Tang Wei Fuyong street, Baoan District, 518103 Shenzhen, PEOPLE'S REPUBLIC OF CHINA

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Clause	Requirement − Test	Measuring result − Remark	Verdict

4	Efficiency measurement conditions		P
	Efficiency is measured under the conditions in the following clauses.		P
	Specific conditions may be excluded by mutual agreement when those conditions are outside the manufacturer's allowable operating range.		P
4.1	DC power source for testing		P
	For power conditioners operating with fixed input voltage, the d.c. power source is 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 is utilized.	photovoltaic array simulators used.	P
4.2	Temperature		P
	All measurements are to be made at an ambient temperature of 25 °C ± 2 °C.	25 °C ± 2 °C ambient temperature as applicant's required	P
	Other ambient temperatures may be allowed by mutual agreement. However, the temperature used must be clearly stated in all documentation.		N/A
4.3	Output voltage and frequency		P
	The output voltage and frequency are maintained at the manufacturer's stated nominal values.	Single phase 230 V, 50 Hz	P
4.4	Input voltage		P
	Measurements performed in each of the following tests are repeated at three power conditioner input voltages: a) manufacturer's minimum rated input voltage; b) the inverter's nominal voltage or the average of its rated input range; c) 90 % of the inverter's maximum input voltage.		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.	No battery connected	N/A
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.		P
4.6	Resistive loads/utility grid		P

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Clause	Requirement − Test	Measuring result − Remark	Verdict
	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.	The PV grid-interactive inverter can't output 120%of it's nominal power	P
	Stand-alone inverters are also measured at a power level of 5 % of rated. The power conditioner test is conducted with a specified resistive and reactive grid impedance.	grid-connected inverters	N/A
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.	grid-connected inverters	N/A
	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.		N/A
	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.		N/A
	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.		N/A
	The type of complex load is clearly stated in all documentation.		N/A

5	Efficiency calculations		P
5.1	Rated output efficiency		P
5.2	Partial output efficiency		P

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Clause	Requirement − Test	Measuring result − Remark	Verdict
5.3	Energy efficiency		N/A
5.4	Efficiency tolerances		N/A

6	Conditions of loading for output ports		P
6.1	Test circuit		P
	Figure 1a is applied to standard-alone power conditioners		N/A
			N/A
	Figure 1b is applied to utility-interactive power conditioners		P
			P
6.2	Measurement procedure		P

7	Loss measurement		P
7.1	No-load loss	Max. 5 W	P
7.2	Standby loss	Max. 0,5 W	P

Annex A	Power conditioner description		--

Annex B	Power efficiency and conversion factor		--

Annex C	Weighted-average energy efficiency		--

Annex D	Derivation of efficiency tolerance in table 2		--

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Clause	Requirement – Test	Measuring result – Remark	Verdict

TABLE	Efficiency recording and efficient calculation sheet							
Model	iMars MG750TL							
Test ambient temperature	26 °C							
Test condition	(1) PV simulators used, with settings: Vmax PV=125 Vdc, V_{mppt}=100 Vdc							
Total load, % of rated VA	5%	10%	20%	25%	30%	50%	75%	100%
Input voltage (Vdc)	99,8	100,1	100,6	100,7	100,7	99,8	100,7	100,9
Input current (Adc)	0,438	0,772	1,554	1,960	2,407	3,877	5,821	7,784
Input power (kW)	0,0436	0,0772	0,1563	0,1974	0,2448	0,3869	0,5804	0,7762
Output voltage (Vac)	229,6	229,7	229,8	229,8	229,8	230,0	230,2	230,2
Output current (Aac)	0,308	0,401	0,690	0,853	1,043	1,646	2,453	3,284
Output frequency (Hz)	50,00	50,00	50,00	50,00	50,00	50,00	50,00	50,00
Power factor (PF)	0,5377	0,7724	0,9282	0,9535	0,9691	0,9875	0,9926	0,9927
Output active power (kW)	0,0380	0,0712	0,1471	0,1868	0,2324	0,3738	0,5604	0,7504
Output apparent power (kVA)	0,0707	0,0922	0,1585	0,1959	0,2398	0,3785	0,5645	0,7559
Efficiency (η)	87,06%	92,23%	94,15%	94,64%	94,92%	96,66%	97,23%	96,65%
Supplementary information:								
(1) The above parameters are logged about 1 minutes of average values after the stabilization of the MPP tracking. MPPT range (output full load): 100 ~ 320 Vdc specified by manufacture.								

IEC 61683			
Clause	Requirement – Test	Measuring result – Remark	Verdict

TABLE	Efficiency recording and efficient calculation sheet							
Model	iMars MG750TL							
Test ambient temperature	26 °C							
Test condition	(2)PV simulators used, with settings: Vmax PV=262,5 Vdc, V_{mppt}=210 Vdc							
Total load, % of rated VA	5%	10%	20%	25%	30%	50%	75%	100%
Input voltage (Vdc)	210,2	210,0	211,1	210,8	210,1	210,2	211,0	210,6
Input current (Adc)	0,203	0,392	0,764	0,862	1,100	1,839	2,760	3,673
Input power (kW)	0,0428	0,0814	0,1612	0,1981	0,2343	0,3857	0,5851	0,7724
Output voltage (Vac)	229,8	229,9	230,0	230,1	230,1	230,2	230,3	230,4
Output current (Aac)	0,174	0,300	0,673	0,823	0,991	1,644	2,456	3,269
Output frequency (Hz)	50,00	50,00	50,00	50,00	50,00	50,00	50,00	50,00
Power factor (PF)	0,5879	0,7524	0,9597	0,9662	0,9689	0,9923	0,9946	0,9961
Output active power (kW)	0,0376	0,0751	0,1517	0,1867	0,2254	0,3754	0,5626	0,7504
Output apparent power (kVA)	0,0640	0,0998	0,1549	0,1894	0,2279	0,3783	0,6567	0,7533
Efficiency (η)	87,89%	91,78%	94,07%	94,23%	96,21%	97,21%	97,17%	97,03%
Supplementary information:								
(1) The above parameters are logged about 1 minutes of average values after the stabilization of the MPP tracking. MPPT range (output full load): 100 ~ 320 Vdc specified by manufacture.								

IEC 61683			
Clause	Requirement − Test	Measuring result − Remark	Verdict

TABLE	Efficiency recording and efficient calculation sheet							
Model	iMars MG750TL							
Test ambient temperature	26 °C							
Test condition	(3)PV simulators used, with settings: Vmax PV=400 Vdc, V_{mppt}=320 Vdc							
Total load, % of rated VA	5%	10%	20%	25%	30%	50%	75%	100%
Input voltage (Vdc)	320,5	320,7	320,9	320,5	320,2	320,1	320,0	321,1
Input current (Adc)	0,134	0,259	0,499	0,598	0,712	1,204	1,801	2,402
Input power (kW)	0,0431	0,0830	0,1597	0,1968	0,2294	0,3878	0,5800	0,7761
Output voltage (Vac)	229,7	229,7	230,0	230,0	230,1	230,1	230,2	230,4
Output current (Aac)	0,270	0,428	0,663	0,823	0,976	1,646	2,453	3,269
Output frequency (Hz)	50,00	50,00	50,00	50,00	50,00	50,00	50,00	50,00
Power factor (PF)	0,6059	0,7878	0,9534	0,9681	0,9705	0,9924	0,9947	0,9962
Output active power (kW)	0,0374	0,0750	0,1499	0,1870	0,2224	0,3759	0,5616	0,7503
Output apparent power (kVA)	0,0613	0,0949	0,1524	0,1932	0,2296	0,3788	0,5646	0,7531
Efficiency (η)	86,67%	90,67%	93,91%	94,96%	96,96%	97,63%	97,73%	97,17%
Supplementary information:								
(1) The above parameters are logged about 1 minutes of average values after the stabilization of the MPP tracking. MPPT range (output full load): 100 ~ 320 Vdc specified by manufacture.								

IEC 61683			
Clause	Requirement − Test	Measuring result − Remark	Verdict

TABLE	Efficiency recording and efficient calculation sheet								
Model	iMars MG1KTL								
Test ambient temperature	26 °C								
Test condition	(1) PV simulators used, with settings: Vmax PV=151 Vdc, V_{mppt}=121 Vdc								
Total load, % of rated VA	5%	10%	20%	25%	30%	50%	75%	100%
Input voltage (Vdc)	120,4	120,0	120,0	120,5	120,1	120,5	120,8	120,7
Input current (Adc)	0,497	0,909	1,753	2,217	2,644	4,274	6,402	8,562
Input power (kW)	0,0596	0,1090	0,2144	0,2667	0,3196	0,5176	0,7748	1,0397
Output voltage (Vac)	229,8	229,9	230,0	230,1	230,2	230,3	230,2	230,3
Output current (Aac)	0,385	0,559	0,913	1,126	1,318	2,189	3,284	4,378
Output frequency (Hz)	50,00	50,00	50,00	50,00	50,00	50,00	50,00	50,00
Power factor (PF)	0,5694	0,7793	0,9574	0,9652	0,9724	0,9894	0,9942	0,9942
Output active power (kW)	0,0501	0,1001	0,2005	0,2497	0,3011	0,5013	0,7516	1,0022
Output apparent power (kVA)	0,0877	0,1283	0,2090	0,2591	0,3094	0,5041	0,7559	1,0080
Efficiency (η)	86,26%	91,76%	93,59%	93,75%	94,18%	96,83%	97,02%	96,22%
Supplementary information: (1) The above parameters are logged about 1 minutes of average values after the stabilization of the MPP tracking. MPPT range (output full load): 121 ~ 360 Vdc specified by manufacture.								

IEC 61683			
Clause	Requirement – Test	Measuring result – Remark	Verdict

TABLE	Efficiency recording and efficient calculation sheet								
Model	iMars MG1KTL								
Test ambient temperature	26 °C								
Test condition	(2) PV simulators used, with settings: Vmax PV=301 Vdc, V_{mppt}=241 Vdc								
Total load, % of rated VA	5%	10%	20%	25%	30%	50%	75%	100%
Input voltage (Vdc)	240,9	240,6	240,7	240,6	240,8	241,6	241,5	242,0
Input current (Adc)	0,242	0,458	0,892	1,105	1,302	2,122	3,199	4,267
Input power (kW)	0,0583	0,1102	0,2146	0,2659	0,3135	0,5127	0,7727	1,0325
Output voltage (Vac)	229,8	229,8	229,8	229,8	229,8	230,2	230,2	230,1
Output current (Aac)	0,345	0,581	0,924	1,148	1,382	2,195	3,284	4,384
Output frequency (Hz)	50,00	50,00	50,00	50,00	50,00	50,00	50,00	50,00
Power factor (PF)	0,6408	0,7514	0,9509	0,9629	0,9739	0,9916	0,9916	0,9939
Output active power (kW)	0,0508	0,1008	0,2019	0,2508	0,3019	0,5011	0,7496	1,0003
Output apparent power (kVA)	0,0795	0,1340	0,2124	0,2637	0,3095	0,5053	0,7559	1,0088
Efficiency (η)	87,17%	91,47%	94,09%	94,32%	96,29%	97,73%	97,01%	96,88%

Supplementary information:

(1) The above parameters are logged about 1 minutes of average values after the stabilization of the MPP tracking. MPPT range (output full load): 121 ~ 360 Vdc specified by manufacture.

IEC 61683			
Clause	Requirement − Test	Measuring result − Remark	Verdict

TABLE	Efficiency recording and efficient calculation sheet							
Model	iMars MG1KTL							
Test ambient temperature	26 °C							
Test condition	(3) PV simulators used, with settings: Vmax PV=450 Vdc, V_{mppt}=360 Vdc							
Total load, % of rated VA	5%	10%	20%	25%	30%	50%	75%	100%
Input voltage (Vdc)	360,3	360,1	361,4	361,1	361,7	361,4	360,9	360,9
Input current (Adc)	0,159	0,307	0,595	0,730	0,862	1,410	2,129	2,835
Input power (kW)	0,0574	0,1104	0,2150	0,2637	0,3120	0,5097	0,7684	1,0233
Output voltage (Vac)	229,9	229,9	230,1	230,1	230,1	230,1	230,1	230,1
Output current (Aac)	0,382	0,563	0,912	1,137	1,347	2,194	3,293	4,373
Output frequency (Hz)	50,00	50,00	50,00	50,00	50,00	50,00	50,00	50,00
Power factor (PF)	0,5790	0,7779	0,9517	0,9617	0,9730	0,9931	0,9937	0,9949
Output active power (kW)	0,0508	0,1009	0,2013	0,2503	0,3006	0,5007	0,7515	0,9980
Output apparent power (kVA)	0,0879	0,1292	0,2110	0,2604	0,3121	0,5049	0,7578	1,0064
Efficiency (η)	88,43%	91,43%	93,63%	94,92%	96,34%	98,24%	97,80%	97,53%
Supplementary information:								
(1) The above parameters are logged about 1 minutes of average values after the stabilization of the MPP tracking. MPPT range (output full load): 121 ~ 360 Vdc specified by manufacture.								

IEC 61683			
Clause	Requirement – Test	Measuring result – Remark	Verdict

TABLE	Efficiency recording and efficient calculation sheet							
Model	iMars MG1K5TL							
Test ambient temperature	26 °C							
Test condition	(1) PV simulators used, with settings: Vmax PV=206 Vdc, V_{mppt}=165 Vdc							
Total load, % of rated VA	5%	10%	20%	25%	30%	50%	75%	100%
Input voltage (Vdc)	165,2	165,4	165,2	165,3	165,2	165,2	165,3	165,3
Input current (Adc)	0,500	0,956	1,880	2,356	2,284	4,697	7,090	9,441
Input power (kW)	0,0826	0,1581	0,3105	0,3896	0,4666	0,7760	1,1721	1,5606
Output voltage (Vac)	230,1	230,1	230,1	230,1	230,1	230,1	230,1	230,1
Output current (Aac)	0,550	0,827	1,384	1,699	2,014	3,294	4,927	6,567
Output frequency (Hz)	50,00	50,00	50,00	50,00	50,00	50,00	50,00	50,00
Power factor (PF)	0,5916	0,7927	0,9509	0,9621	0,9728	0,9916	0,9941	0,9963
Output active power (kW)	0,0753	0,1500	0,2999	0,3757	0,4507	0,7516	1,1242	1,4985
Output apparent power (kVA)	0,1279	0,1892	0,3174	0,3909	0,4635	0,7580	1,1337	1,5111
Efficiency (η)	91,16%	94,88%	96,60%	96,45%	96,59%	96,87%	95,92%	96,02%
Supplementary information:								
(1) The above parameters are logged about 1 minutes of average values after the stabilization of the MPP tracking. MPPT range (output full load): 165 ~ 360 Vdc specified by manufacture.								

IEC 61683			
Clause	Requirement − Test	Measuring result − Remark	Verdict

TABLE	Efficiency recording and efficient calculation sheet							
Model	iMars MG1K5TL							
Test ambient temperature	26 °C							
Test condition	(2) PV simulators used, with settings: Vmax PV=328 Vdc, V_{mppt}=262,5 Vdc							
Total load, % of rated VA	5%	10%	20%	25%	30%	50%	75%	100%
Input voltage (Vdc)	262,4	262,4	263,1	262,5	262,5	262,6	262,6	262,6
Input current (Adc)	0,311	0,596	1,187	1,484	1,777	2,945	4,388	5,873
Input power (kW)	0,0816	0,1564	0,3123	0,3895	0,4663	0,7733	1,1522	1,5423
Output voltage (Vac)	230,1	230,1	230,1	230,1	230,1	230,1	230,1	230,1
Output current (Aac)	0,549	0,827	1,366	1,646	1,974	3,285	4,924	6,564
Output frequency (Hz)	50,00	50,00	50,00	50,00	50,00	50,00	50,00	50,00
Power factor (PF)	0,5916	0,7873	0,9561	0,9670	0,9728	0,9914	0,9937	0,9961
Output active power (kW)	0,0751	0,1496	0,3003	0,3757	0,4505	0,7497	1,1237	1,4978
Output apparent power (kVA)	0,1267	0,1909	0,3149	0,3878	0,4633	0,7560	1,1332	1,5104
Efficiency (η)	92,07%	95,70%	96,16%	96,46%	96,62%	96,94%	97,53%	97,11%
Supplementary information:								
(1) The above parameters are logged about 1 minutes of average values after the stabilization of the MPP tracking. MPPT range (output full load): 165 ~ 360 Vdc specified by manufacture.								

IEC 61683			
Clause	Requirement − Test	Measuring result − Remark	Verdict

TABLE	Efficiency recording and efficient calculation sheet							
Model	iMars MG1K5TL							
Test ambient temperature	26 °C							
Test condition	(3) PV simulators used, with settings: Vmax PV=450 Vdc, V_{mppt}=360 Vdc							
Total load, % of rated VA	5%	10%	20%	25%	30%	50%	75%	100%
Input voltage (Vdc)	360,8	361,4	361,0	360,9	361,1	360,7	361,5	361,4
Input current (Adc)	0,229	0,435	0,862	1,079	1,289	2,125	3,220	4,322
Input power (kW)	0,0825	0,1573	0,3112	0,3892	0,4653	0,7664	1,1639	1,5616
Output voltage (Vac)	230,1	230,1	230,1	230,1	230,1	230,1	230,1	230,1
Output current (Aac)	0,549	0,830	1,380	1,698	2,014	3,289	4,926	6,586
Output frequency (Hz)	50,00	50,00	50,00	50,00	50,00	50,00	50,00	50,00
Power factor (PF)	0,5888	0,7862	0,9530	0,9650	0,9728	0,9928	0,9938	0,9954
Output active power (kW)	0,0751	0,1499	0,3012	0,3760	0,4505	0,7505	1,1241	1,5027
Output apparent power (kVA)	0,1276	0,1902	0,3157	0,3891	0,4623	0,7568	1,1336	1,5154
Efficiency (η)	91,08%	95,35%	96,78%	96,59%	96,81%	97,93%	96,58%	96,23%
Supplementary information:								
(1) The above parameters are logged about 1 minutes of average values after the stabilization of the MPP tracking. MPPT range (output full load): 165 ~ 360 Vdc specified by manufacture.								

IEC 61683			
Clause	Requirement − Test	Measuring result − Remark	Verdict

TABLE	Efficiency recording and efficient calculation sheet							
Model	iMars MG2KTL							
Test ambient temperature	26 °C							
Test condition	(1) PV simulators used, with settings: Vmax PV=225 Vdc, V_{mppt}=180 Vdc							
Total load, % of rated VA	5%	10%	20%	25%	30%	50%	75%	100%
Input voltage (Vdc)	180,0	179,8	179,8	179,9	179,8	179,7	180,0	179,7
Input current (Adc)	0,602	1,170	2,296	2,900	3,443	5,757	8,687	11,600
Input power (kW)	0,1086	0,2105	0,4128	0,5215	0,6191	1,0345	1,5641	2,0852
Output voltage (Vac)	230,1	230,5	230,5	230,5	230,5	230,5	230,1	230,1
Output current (Aac)	0,739	1,099	1,831	2,0249	2,735	4,392	6,585	8,774
Output frequency (Hz)	50,00	50,00	50,00	50,00	50,00	50,00	50,00	50,00
Power factor (PF)	0,5938	0,8059	0,9541	0,9646	0,9721	0,9927	0,9939	0,9958
Output active power (kW)	0,1006	0,2008	0,4450	0,5003	0,6001	1,0025	1,5025	2,0021
Output apparent power (kVA)	0,1702	0,2525	0,4209	0,5186	0,6302	1,0115	1,5152	2,0190
Efficiency (η)	92,59%	95,42%	97,01%	95,93%	96,93%	96,91%	96,06%	96,02%
Supplementary information:								
(1) The above parameters are logged about 1 minutes of average values after the stabilization of the MPP tracking. MPPT range (output full load): 180 ~ 360 Vdc specified by manufacture.								

IEC 61683			
Clause	Requirement − Test	Measuring result − Remark	Verdict

TABLE	Efficiency recording and efficient calculation sheet							
Model	iMars MG2KTL							
Test ambient temperature	26 °C							
Test condition	(2) PV simulators used, with settings: Vmax PV=337,5 Vdc, V_{mppt}=270 Vdc							
Total load, % of rated VA	5%	10%	20%	25%	30%	50%	75%	100%
Input voltage (Vdc)	270,1	270,8	269,3	270,4	270,2	270,1	270,0	270,2
Input current (Adc)	0,398	0,773	1,541	1,929	2,296	3,799	5,729	7,624
Input power (kW)	0,1077	0,2093	0,4150	0,5215	0,6204	1,0261	1,546,8	2,0598
Output voltage (Vac)	230,5	230,0	230,5	230,2	230,2	230,2	230,2	230,2
Output current (Aac)	0,737	1,117	1,824	2,255	2,681	4,383	6,577	8,761
Output frequency (Hz)	50,00	50,00	50,00	50,00	50,00	50,00	50,00	50,00
Power factor (PF)	0,5931	0,7930	0,9623	0,9701	0,9798	0,9917	0,9939	0,9961
Output active power (kW)	0,1005	0,2009	0,4010	0,5014	0,6009	1,0005	1,5015	1,9994
Output apparent power (kVA)	0,1675	0,2569	0,4214	0,519,9	0,6177	1,0090	1,5141	2,0163
Efficiency (η)	93,31%	95,99%	96,62%	96,16%	96,81%	97,50%	97,07%	97,07%
Supplementary information:								
(1) The above parameters are logged about 1 minutes of average values after the stabilization of the MPP tracking. MPPT range (output full load): 180 ~ 360 Vdc specified by manufacture.								

TRF No. IEC61683A

IEC 61683			
Clause	Requirement – Test	Measuring result – Remark	Verdict

TABLE	Efficiency recording and efficient calculation sheet							
Model	iMars MG2KTL							
Test ambient temperature	26 °C							
Test condition	(3) PV simulators used, with settings: Vmax PV=360 Vdc, V_{mppt}=450 Vdc							
Total load, % of rated VA	5%	10%	20%	25%	30%	50%	75%	100%
Input voltage (Vdc)	359,9	359,9	360,2	359,8	359,5	359,9	360,0	359,7
Input current (Adc)	0,299	0,588	1,145	1,438	1,71	2,864	4,315	5,772
Input power (kW)	0,1075	0,2116	0,4126	0,5175	0,6182	1,0307	1,5534	2,0763
Output voltage (Vac)	230,1	230,1	230,1	230,1	230,1	230,1	230,2	230,1
Output current (Aac)	0,735	1,119	1,827	2,252	2,681	4,404	6,583	8,760
Output frequency (Hz)	50,00	50,00	50,00	50,00	50,00	50,00	50,00	50,00
Power factor (PF)	0,6018	0,7927	0,9570	0,9649	0,9731	0,9929	0,9938	0,9961
Output active power (kW)	0,1002	0,2012	0,4003	0,5000	0,5997	1,0050	1,5024	1,9991
Output apparent power (kVA)	0,1692	0,2573	0,4207	0,5182	0,6170	1,0135	1,5151	2,0160
Efficiency (ƞ)	93,20%	95,07%	97,04%	96,62%	97,01%	97,51%	96,72%	96,28%
Supplementary information:								
(1) The above parameters are logged about 1 minutes of average values after the stabilization of the MPP tracking. MPPT range (output full load): 180 ~ 360 Vdc specified by manufacture.								

IEC 61683			
Clause	Requirement – Test	Measuring result – Remark	Verdict

TABLE	Efficiency recording and efficient calculation sheet							
Model	iMars MG3KTL							
Test ambient temperature	26 °C							
Test condition	(1) PV simulators used, with settings: Vmax PV=262,5 Vdc, V_{mppt}=210 Vdc							
Total load, % of rated VA	5%	10%	20%	25%	30%	50%	75%	100%
Input voltage (Vdc)	209,6	209,9	209,6	209,6	209,7	209,6	209,8	209,7
Input current (Adc)	0,769	1,505	2,956	3,737	4,446	7,399	11,611	14,934
Input power (kW)	0,1612	0,3158	0,6195	0,7833	0,9322	1,5509	2,3411	3,1316
Output voltage (Vac)	230,1	230,1	230,2	230,1	230,2	230,2	230,1	230,1
Output current (Aac)	1,086	1,680	2,750	4,199	4,045	6,587	9,874	13,165
Output frequency (Hz)	50,00	50,00	50,00	50,00	50,00	50,00	50,00	50,00
Power factor (PF)	0,5997	0,7797	0,9497	0,9646	0,9697	0,9928	0,9948	0,9956
Output active power (kW)	0,1500	0,3016	0,6011	0,7513	0,9029	1,5034	2,2535	3,0045
Output apparent power (kVA)	0,2500	0,3867	0,6328	0,7785	0,9309	1,5161	2,2724	3,0298
Efficiency (η)	93,05%	95,50%	97,04%	95,91%	96,86%	96,94%	96,26%	95,94%
Supplementary information:								
(1) The above parameters are logged about 1 minutes of average values after the stabilization of the MPP tracking. MPPT range (output full load): 210 ～ 400 Vdc specified by manufacture.								

IEC 61683			
Clause	Requirement − Test	Measuring result − Remark	Verdict

TABLE	Efficiency recording and efficient calculation sheet								
Model	iMars MG3KTL								
Test ambient temperature	26 °C								
Test condition	(2) PV simulators used, with settings: Vmax PV=381 Vdc, V_{mppt}=305 Vdc								
Total load, % of rated VA	5%	10%	20%	25%	30%	50%	75%	100%
Input voltage (Vdc)	304,6	305,3	305,2	305,5	305,3	305,6	305,1	304,8
Input current (Adc)	0,530	1,036	2,047	2,547	3,056	5,066	5,938	10,168
Input power (kW)	0,1614	0,3163	0,6248	0,778	0,9332	1,5486	1,8119	3,0995
Output voltage (Vac)	230,1	230,1	230,1	230,1	230,1	230,1	230,2	230,1
Output current (Aac)	1,090	1,683	2,752	3,381	4,043	6,586	7,686	13,166
Output frequency (Hz)	50,00	50,00	50,00	50,00	50,00	50,00	50,00	50,00
Power factor (PF)	0,5996	0,7796	0,9497	0,9646	0,9696	0,9917	0,9925	0,9962
Output active power (kW)	0,1505	0,3020	0,6023	0,7510	0,9025	1,5030	1,7542	3,0047
Output apparent power (kVA)	0,2509	0,3872	0,6337	0,7782	0,9304	1,5157	1,7690	3,0307
Efficiency (η)	93,25%	95,50%	96,41%	96,52%	96,72%	97,08%	96,82%	96,94%

Supplementary information:

(1) The above parameters are logged about 1 minutes of average values after the stabilization of the MPP tracking. MPPT range (output full load): 210 ~ 400 Vdc specified by manufacture.

TRF No. IEC61683A

IEC 61683			
Clause	Requirement − Test	Measuring result − Remark	Verdict

TABLE	Efficiency recording and efficient calculation sheet							
Model	iMars MG3KTL							
Test ambient temperature	26 °C							
Test condition	(3) PV simulators used, with settings: Vmax PV=500 Vdc, V_{mppt}=400 Vdc							
Total load, % of rated VA	5%	10%	20%	25%	30%	50%	75%	100%
Input voltage (Vdc)	398,4	398,4	398,8	398,8	398,0	398,0	399,6	398,6
Input current (Adc)	0,408	0,792	1,561	1,946	2,338	3,838	5,813	7,780
Input power (kW)	162,4	0,3157	0,6226	0,7559	0,9307	1,5513	2,323	3,1011
Output voltage (Vac)	230,2	230,1	230,2	230,2	4,038	230,1	230,1	230,2
Output current (Aac)	1,090	1,683	2,746	3,381	50,00	6,588	9,869	13,162
Output frequency (Hz)	50,00	50,00	50,00	50,00	0,9697	50,00	50,00	50,00
Power factor (PF)	0,5996	0,7796	0,9497	0,9646	0,9015	0,9934	0,9936	0,9961
Output active power (kW)	0,1506	0,3022	0,6011	0,7512	0,9294	1,5036	2,2524	3,0040
Output apparent power (kVA)	0,2509	0,3874	0,6328	0,7785	0,9294	1,5163	2,2713	3,0293
Efficiency (η)	92,70%	95,71%	96,51%	96,82%	96,87%	96,93%	96,96%	96,87%
Supplementary information:								
(1) The above parameters are logged about 1 minutes of average values after the stabilization of the MPP tracking. MPPT range (output full load): 210 ~ 400 Vdc specified by manufacture.								

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