



**Technical Report No.: 64.290.15.04841.01**

**Rev. 00**

**Dated: 15 October 2015**

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

**Manufacturing place:** Manufacturer'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  
Factory's name: Shenzhen INVT Electric Co., Ltd.  
Address: Zone A, Juyuan Industrial areas, Tang Wei Fuyong street, Baoan  
District, 518103 Shenzhen, PEOPLE'S REPUBLIC OF CHINA

**Test subject:** Product: PV grid-interactive inverter  
Type: iMars MG750TL, iMars MG1KTL, iMars MG1K5TL, iMars MG2KTL,  
iMars MG3KTL

**Test specification:** IEC 60068-2-1:2007  
IEC 60068-2-2:2007  
IEC 60068-2-14:2009  
IEC 60068-2-30:2005

**Purpose of examination:** • Test according to the test specification

**Test result:** The test results show that the presented product is in compliance with the  
specified requirements.

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## 1 Description of the test subject

### 1.1 Function

- (1) The PGU units are non-isolated (transformerless) PV grid-interactive DC-AC inverters for connection with public low voltage grid, for outdoor or indoor use.
- (2) The PV grid-interactive inverter shall be used at specified ambient range. Temperature range: -25 °C - +60 °C, auot-derating after 45 °C; Altitude: < 2000 m; Overvoltage category: II(DC side), III(AC side); Relative humidity range: 4 % ~ 100 %.
- (3) DC Switch-disconnector is optional component. Two alternative constructions of top case, one with LCD and another without LCD.
- (4) Low voltage electrical installations shall comply with national and local regulation.

### 1.2 Consideration of the foreseeable misuse

- Not applicable  
 Covered through the applied standard  
 Covered by the following comment  
 Covered by attached risk analysis

### 1.3 Technical Data

Model	iMars MG750TL	iMars MG1KTL	iMars MG1K5TL	iMars MG2KTL	iMars MG3KTL
Vmax PV	400 Vd.c.	450 Vd.c.	450 Vd.c.	450 Vd.c.	500 Vd.c.
MPPT Range	50 – 400 Vd.c.	60 – 400 Vd.c.	80 – 410 Vd.c.	100 – 410 Vd.c.	120 – 450 Vd.c.
Max. Continuous input current	8 A	9 A	10 A	12 A	15 A
Isc PV	8,8 A	9,9 A	11 A	13,2 A	16,5 A
Max. continuous output current	3,6 A	4,5 A	6,5 A	9 A	13 A
Max. continuous output power	750 W	1000 W	1500 W	2000 W	3000 W
Frequency	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz
Nominal AC voltage	230 V	230 V	230 V	230 V	230 V
Power factor (rated power)	>0,99	>0,99	>0,99	>0,99	>0,99
Temperature	-25 °C ~ +60 °C	-25 °C ~ +60 °C	-25 °C ~ +60 °C	-25 °C ~ +60 °C	-25 °C ~ +60 °C
Protective class	I	I	I	I	I

Overvoltage Category	II(DC), III(AC)	II(DC), III(AC)	II(DC), III(AC)	II(DC), III(AC)	II(DC), III(AC)
Ingress protection	IP65	IP65	IP65	IP65	IP65

**Copy of marking plate:**

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

<p><b>invt</b> GRID-TIED SOLAR INVERTER</p> <p>Model: iMars MG750TL</p> <p>DC Input Vmax. PV: 400V MPPT Range: 50V - 400V Max. Continuous Current: 8A Isc PV: 8.8A</p> <p>AC Output Max. Continuous Current: 3.6A Max. Continuous Power: 750W Frequency: 50Hz Nominal Voltage: 230V Power Factor(rated power): ≥0.99</p> <p>Temperature: -25°C...+60°C Protective Class: I Overvoltage Category: II(DC),III(AC) IP: IP65</p> <p></p> <p>S/N: _____</p>	<p><b>invt</b> GRID-TIED SOLAR INVERTER</p> <p>Model: iMars MG1KTL</p> <p>DC Input Vmax. PV: 450V MPPT Range: 60V - 400V Max. Continuous Current: 9A Isc PV: 9.9A</p> <p>AC Output Max. Continuous Current: 4.5A Max. Continuous Power: 1000W Frequency: 50Hz Nominal Voltage: 230V Power Factor(rated power): ≥0.99</p> <p>Temperature: -25°C...+60°C Protective Class: I Overvoltage Category: II(DC),III(AC) IP: IP65</p> <p></p> <p>S/N: _____</p>	<p><b>invt</b> GRID-TIED SOLAR INVERTER</p> <p>Model: iMars MG1K5TL</p> <p>DC Input Vmax. PV: 450V MPPT Range: 80V - 410V Max. Continuous Current: 10A Isc PV: 11A</p> <p>AC Output Max. Continuous Current: 6.5A Max. Continuous Power: 1500W Frequency: 50Hz Nominal Voltage: 230V Power Factor(rated power): ≥0.99</p> <p>Temperature: -25°C...+60°C Protective Class: I Overvoltage Category: II(DC),III(AC) IP: IP65</p> <p></p> <p>S/N: _____</p>
<p><b>invt</b> GRID-TIED SOLAR INVERTER</p> <p>Model: iMars MG2KTL</p> <p>DC Input Vmax. PV: 450V MPPT Range: 100V - 410V Max. Continuous Current: 12A Isc PV: 13.2A</p> <p>AC Output Max. Continuous Current: 9A Max. Continuous Power: 2000W Frequency: 50Hz Nominal Voltage: 230V Power Factor(rated power): ≥0.99</p> <p>Temperature: -25°C...+60°C Protective Class: I Overvoltage Category: II(DC),III(AC) IP: IP65</p> <p></p> <p>S/N: _____</p>	<p><b>invt</b> GRID-TIED SOLAR INVERTER</p> <p>Model: iMars MG3KTL</p> <p>DC Input Vmax. PV: 500V MPPT Range: 120V - 450V Max. Continuous Current: 15A Isc PV: 16.5A</p> <p>AC Output Max. Continuous Current: 13A Max. Continuous Power: 3000W Frequency: 50Hz Nominal Voltage: 230V Power Factor(rated power): ≥0.99</p> <p>Temperature: -25°C...+60°C Protective Class: I Overvoltage Category: II(DC),III(AC) IP: IP65</p> <p></p> <p>S/N: _____</p>	

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.

**Model differences:**

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.

## 2 Order

### 2.1 Date of Purchase Order, Customer's Reference

1 September 2015

### 2.2 Receipt of Test Sample, Location

2 September 2015

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

### 2.3 Date of Testing

2 September ~ 15 September 2015

### 2.4 Location of Testing

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

### 2.5 Points of Non-compliance or Exceptions of the Test Procedure

N/A

## 3 Test Results

### 3.1 Positive Test Results

IEC 60068-2-1:2007, Test Ad: Clause 5.3 + Test Ae: Clause 5.4

IEC 60068-2-2:2007, Test Bd: Clause 5.3 + Test Be: Clause 5.4

IEC 60068-2-14:2009, Test Na: Clause 7 + Test Nb: Clause 8

IEC 60068-2-30:2005, Test Db: Damp heat, cyclic (12 h + 12 h cycle)

## 4 Remark to factory



- 4.1 When the product is placed on the market, it must be accompanied with safety instructions written in official language of the country. The instructions shall give information regarding safe operation, installation and maintenance.
- 4.2 The manufacturer/ Importer has to ensure the appliance placing on the market conforms to the applicable local regulation, such as LVD, EMC, RoHS, ErP, and so on.

## 5 Summary

The test specifications are met.

**TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch**  
**TÜV SÜD Group**

Engineer:   
**Richard Li**  
Project Handler

Technical Report checked:   
**Billy Qiu**  
Designated Reviewer





IEC 60068-2-1:2007, Tests – Test A: Cold

6.8	Initial measurements	Functional tests is satisfactory and no visual defects observed before conduct cold test.
5.3	Test Ad: Cold for heat-dissipating specimens with gradual change of temperature that are powered after initial temperature stabilization	
	Temperature	-25 °C as applicant's required.
	Duration	7 h, 1 cycle as applicant's required.
	State of specimen	Energizing the specimen.
5.4	Test Ae: Cold for heat-dissipating specimens with gradual change of temperature that are required to be powered throughout the test	
	Temperature	-25 °C as applicant's required.
	Duration	2 h, 1 cycle as applicant's required.
	State of specimen during conditioning	Energizing the specimen.
6.10	Intermediate measurements	Functional tests is satisfactory and no visual defects observed during the cold test.
6.13	Final measurements	Functional tests is satisfactory and no visual defects observed after the cold test.
	The specimen [ did not ] exhibit broken, cracked, bent, misaligned or torn external surface.	
	The specimen [ did not ] exhibit external faulty interconnections or koints.	
	The specimen [ did not ] exhibit visible corrosion of output connections.	
	The specimen [ did not ] exhibit cracked or damaged wire or cable.	
	The specimen [ did not ] exhibit exposed live enectrical parts.	
	The specimen [ did not ] exhibit any other conditions which may affect functioning, performance or safety.	
	The specimen [ did not ] exhibit any shorting of live terminals / live parts or cables.	
	The specimen [ did not ] exhibit any sparking of live terminals / live parts or cables.	
	The specimen [ did not ] exhibit any smoking.	
	The specimen [ did not ] stopped functioning.	

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**IEC 60068-2-2:2007, Tests – Test B: Dry heat**

6.7	Initial measurements	Functional tests is satisfactory and no visual defects observed before conduct dry heat test.
5.3	Test Bd: Dry heat for heat-dissipating specimens with gradual change of temperature that are not powered during the conditioning period	
	Temperature	+60 °C as applicant's required.
	Duration	6 h, 1 cycle as applicant's required.
	State of specimen	Energizing the specimen.
5.4	Test Be: Dry heat for heat-dissipating specimens with gradual change of temperature that are required to be powered throughout the test	
	Temperature	+60 °C as applicant's required.
	Duration	2 h, 1 cycle as applicant's required.
	State of specimen during conditioning	Energizing the specimen.
6.9	Intermediate measurements	Functional tests is satisfactory and no visual defects observed during the dry heat test.
6.13	Final measurements	Functional tests is satisfactory and no visual defects observed after the dry heat test.
	The specimen [ did not ] exhibit broken, cracked, bent, misaligned or torn external surface.	
	The specimen [ did not ] exhibit external faulty interconnections or koints.	
	The specimen [ did not ] exhibit visible corrosion of any parts of active circuit visible externally.	
	The specimen [ did not ] exhibit visible corrosion of output connections.	
	The specimen [ did not ] exhibit cracked or damaged wire or cable.	
	The specimen [ did not ] exhibit corrosion of enclosure surface.	
	The specimen [ did not ] exhibit exposed live enectrical parts.	
	The specimen [ did not ] exhibit any other conditions which may affect functioning, performance or safety.	
	The specimen [ did not ] exhibit any shorting of live terminals / live parts or cables.	
	The specimen [ did not ] exhibit any sparking of live terminals / live parts or cables.	
	The specimen [ did not ] exhibit any smoking.	
	The specimen [ did not ] stopped functioning.	

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**IEC 60068-2-14:2009, Tests – Test N: Change of temperature**

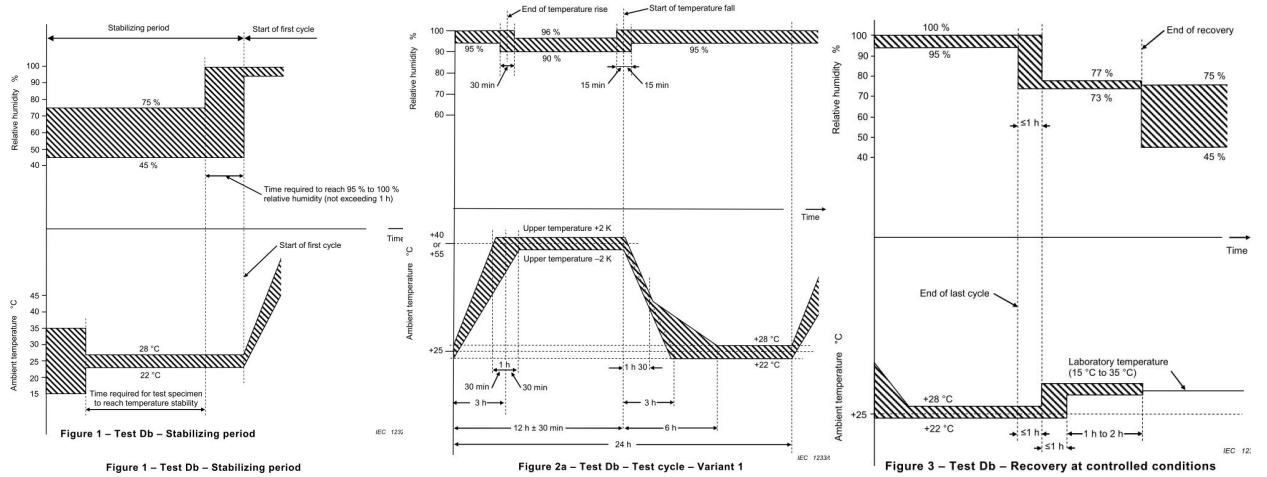
6.1	Initial measurements	Functional tests is satisfactory. No electrically and mechanically defects observed before conduct change of temperature test.
7	Test Na: Rapid change of temperature with prescribed time of transfer	
	lower temperature, $T_A$ ,	-25 °C as applicant's required.
	higher temperature, $T_B$ ,	+60 °C as applicant's required.
	exposure time, $t_1$ ,	3 h as applicant's required.
	Test cycles	2 cycles as applicant's required.
	Transformer time, $t_2$	$t_2 < 1,5$ minutes. Automatic transfer methods used.
	Choice of the duration of the transfer time	two-chamber method
	State of specimen during conditioning	De-energizing the specimen.
8	Test Nb: Change of temperature with specified rate of change	
	lower temperature, $T_A$ ,	-25 °C as applicant's required.
	higher temperature, $T_B$ ,	+60 °C as applicant's required.
	exposure time, $t_1$ ,	3 h as applicant's required.
	Test cycles	2 cycles as applicant's required.
	Rate of change of temperature	About 0,8 K/min.
	State of specimen during conditioning	De-energizing the specimen.
6.2	Final measurements	Functional tests is satisfactory. No electrically and mechanically defects observed after conduct change of temperature test.
	The specimen [ did not ] exhibit broken, cracked, bent, misaligned or torn external surface.	
	The specimen [ did not ] exhibit visible corrosion of any parts of active circuit visible externally.	
	The specimen [ did not ] exhibit visible corrosion of output connections and enclosure surface	
	The specimen [ did not ] exhibit cracked or damaged wire or cable or smoking.	
	The specimen [ did not ] exhibit any other conditions which may affect functioning, performance or safety.	
	The specimen [ did not ] exhibit any shorting of live terminals / live parts or cables.	
	The specimen [ did not ] exhibit any sparking of live terminals / live parts or cables.	
	The specimen [ did not ] stopped functioning.	

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IEC 60068-2-30:2005, Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)

6.1	Initial measurements	Functional tests is satisfactory and no visual defects observed before conduct Damp heat.
5.2	b) upper temperature: 55 °C	55 °C
	number of cycles: 1, 2, 6.	1 cycles as applicant's required.



	State of specimen during conditioning	De-energizing the specimen.
8	Intermediate measurements	Functional tests is satisfactory and no visual defects observed during conduct Damp heat.
6.2	Final measurements	Functional tests is satisfactory and no visual defects observed after conduct Damp heat.
	The specimen [ did not ] exhibit broken, cracked, bent, misaligned or torn external surface.	
	The specimen [ did not ] exhibit visible corrosion of any parts of active circuit visible externally.	
	The specimen [ did not ] exhibit visible corrosion of output connections and enclosure surface	
	The specimen [ did not ] exhibit cracked or damaged wire or cable or smoking or sparking.	
	The specimen [ did not ] exhibit any other conditions which may affect functioning, performance or safety.	
	The specimen [ did not ] exhibit any shorting of live terminals / live parts or cables.	
	The specimen [ did ] withstand dielectric strength test. 2121 Vdc / 60 s (PV and Metal enclosure), 4242 Vdc / 60 s (PV and communication port)	
	Impulse voltage test The specimen [ did ] withstand Impulse voltage test. 2768 V <sub>1,2/50 μs</sub> (PV and Metal enclosure), 4358 V <sub>1,2/50 μs</sub> (PV and communication port)	

..... End of Technical Report .....

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