

# Manufacture Declaration

TSUNESS Co., Ltd. hereby confirms that the devices stated below

Product: TSOL-M series Microinverter  
Model(s): TSOL-M350, TSOL-M400, TSOL-M800, TSOL-M1600

Have got the certification of **DIN V VDE V 0126-1-1:2006+A1:2012; DIN V VDE V 0126-1-1:2013**(Report Number: AQRN-19SE2405FCSHP-1; AQRN-19SE2405FCSHP-2; AQRN-19SE2405FCSHP-3) .These models are in conformity with the **DIN VDE 0126-1-1/A1 VFR2014; UTE C15-712-1/07.2013** requirements and contain "French Settings" option for the connection of micro-generators in parallel with public low-voltage distribution network.

The test results can be found in **Annex I**.

Date of issue 4<sup>th</sup> January 2020  
TSUNESS Co., Ltd.



#### Information:

Unless there is an explicit written confirmation by TSUNESS, this declaration of conformity is not valid any longer in these cases below:

- The product is modified, supplemented or changed in any other way;
- Components, which are not part of the TSUNESS accessories kit, are integrated in the product, as well as in case the product is used or installed improperly.

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# Annex I: Test Result

Under/Over Voltage Test								
Parameter	Under Voltage				Over Voltage			
	Voltage	Time			Voltage	Time		
Limit	<b>184.0V</b>	<b>&lt;=200ms</b>			<b>264.5V</b>	<b>&lt;=200ms</b>		
Trip value	183.6V				263.2V			
Disconnection time [ms]	188V to 178V	120	123	115	258V to 269V	120	124	123
	230V to 182V	122	121	121	230V to 269V	123	120	122
Reconnection time (fluctuation >3s)	<b>&gt;=30s</b>	40.02 s			<b>&gt;=30s</b>	40.00s		

Over Voltage Protection	
	Disconnection time: Limit:
a)	The voltage is set to 100% Un and held for 600 s. Thereafter the voltage is set to 112% Un. Disconnection must take place within 600 s.
	583.0 s 600 s
b)	The voltage is set to Un for 600 s and then to 108% Un for 600 s. No disconnection should take place.
	No disconnection Disconnection should not take place.
c)	The voltage is set to 106 % Un and held for 600 s. Thereafter the voltage is set to 114 % Un. Disconnection must take place within 300 s or about 50 % of the disconnection time measured in point a).*
	283.2 s The disconnection time should be about 50 % of the value measured in a). *

Under/Over Frequency Test								
Parameter	Under Frequency				Over Frequency			
	Frequency	Time			Frequency	Time		
Output Voltage	-	80%Un	Un	115%Un	-	80%Un	Un	115%Un
Limit	<b>47.5Hz</b>	<b>&lt;=200ms</b>			<b>50.6Hz</b>	<b>&lt;=200ms</b>		
Trip value	47.5Hz				50.6Hz			
Disconnection time [ms]	48Hz to	173	188	180	50.1Hz to	176	182	181
	47Hz	178	177	184	51.1Hz	181	177	174
Reconnection time (fluctuation >3s)	<b>&gt;=30s</b>	40.04 s			<b>&gt;=30s</b>	40.04s		

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Monitoring of DC-Injection				
TSOL-M1600				
Test conditions:	Un = 230Vac; Ui = 40Vdc; Rated Power: 1500W			
DC Injection (A)	Limits	Trip Time [ms]		
-1A	IDC: >1% of $I_{ac,nom}$ (72mA) within 0,2s	149.0	155.4	147.8
+1A		145.4	155.8	147.8
TSOL-M800				
Test conditions:	Un = 230Vac; Ui = 40Vdc; Rated Power: 700W			
DC Injection (A)	Limits	Trip Time [ms]		
-1A	IDC: >1% of $I_{ac,nom}$ (72mA) within 0,2s	153.8	147.4	148.6
+1A		145.8	154.2	143.0
TSOL-M400& TSOL-M350				
Test conditions:	Un = 230Vac; Ui = 40Vdc; Rated Power: 350W			
DC Injection (A)	Limits	Trip Time [ms]		
-1A	IDC: >1% of $I_{ac,nom}$ (72mA) within 0,2s	156.4	154.4	159.6
+1A		176.0	149.2	152.8

Anti-islanding Test			
Test conditions:	Frequency: 50+/-0,2Hz ; Un=230+/-3Vac ; RLC consumes inverter real power within +/- 3% ; Distortion factor of chokes < 3%		
Disconnection limit:	5 s		
Output power:	25%	50%	100%
Osc. Parameter:			
-5%	0.344	0.376	0.356
-4%	0.35	0.378	0.382
-3%	0.372	0.402	0.386
-2%	0.38	0.382	0.388
-1%	0.346	0.36	0.374
0%	0.372	0.552	0.374
1%	0.392	0.372	0.386
2%	0.396	0.372	0.39
3%	0.382	0.376	0.372
4%	0.35	0.372	0.386
5%	0.354	0.376	0.392
Parameter at 0%	L =210,59mH R =132,25Ω C =48,16μF	L =105,29mH R =66,13Ω C =96,32μF	L =52,65mH R =33,06Ω C =192,65μF

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Insulation Fault Test			
Condition	DC Voltage (V)	Required Insulation resistance (k Ω)	Result
DC+			
V+, the higher array voltage	48	2 k Ω	Unit can't start up, error message: Isolation fault.
V critical, the voltage level analyzed to be difficult to detect	60		
V arbitrary, any voltage within the range V- V+	40		
V-, the lower array voltage	36		
DC-			
V+, the higher array voltage	48	2 k Ω	Unit can't start up, error message: Isolation fault.
V critical, the voltage level analyzed to be difficult to detect	60		
V arbitrary, any voltage within the range V- V+	40		
V-, the lower array voltage	36		

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