FIRST LEVEL MAINTENANCE (SINGLE PHASE)

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1 Index

2 Scope

This document illustrates some simple preventive and corrective maintenance operations aimed at the recognition and resolution of problems that may occur on the Ingecon Sun Lite TL Inverters.

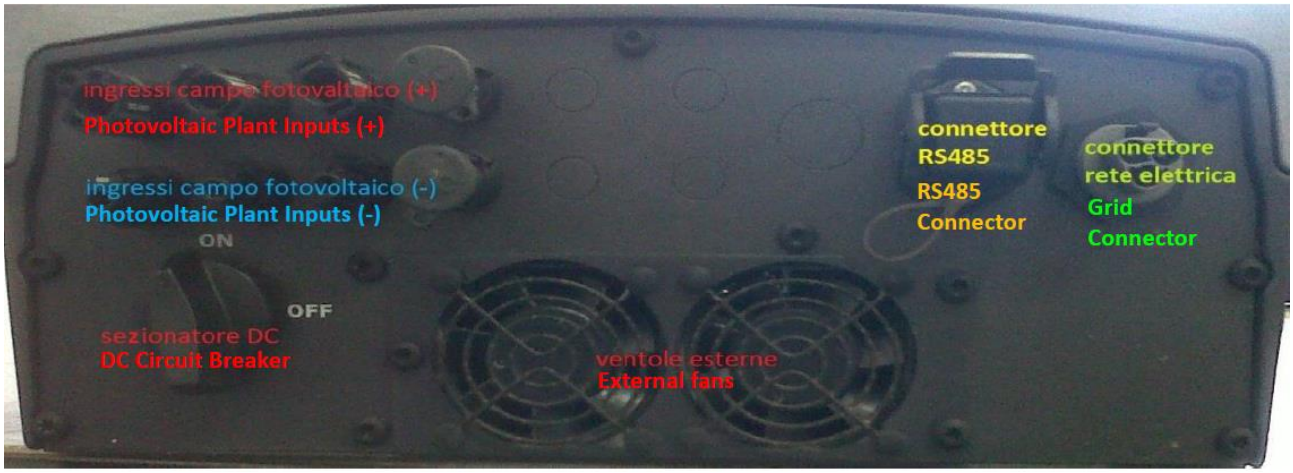
3 Technical specifications

	2.5TL	3TL	3.3TL	3.68TL	4.6TL	5TL
Input (DC)						
Recommended PV array power range[1]	2.8 - 3.3 kWp	3.2 - 4 kWp	3.8 - 4.3 kWp	3.9 - 4.8 kWp	5.2 - 6 kWp	5.7 - 6.5 kWp
Voltage range MPP	160 - 450 V	195 - 450 V	155 - 450 V	175 - 450 V	145 - 450 V	160 - 450 V
Voltage range DC[2]	125 - 550 V	125 - 550 V	125 - 550 V	125 - 550 V	125 - 550 V	125 - 550 V
Maximum current DC	17 A	17 A	22 A	22 A	33 A	33 A
DC inputs	3	3	3	3	4	4
MPPT	1	1	1	1	1	1
Output (AC)						
Rated power AC[3]	2.7 kW	3 kW	3.63 kW	3.68 kW	5 kW	5.5 kW
Maximum current AC	13 A	13.5 A	17 A	17 A	24.2 A	26.2 A
Rated voltage AC	230 / 240 V	230 / 240 V	230 / 240 V	230 / 240 V	230 / 240 V	230 / 240 V
Frequency AC	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz
Phi Cosine	1	1	1	1	1	1
Phi Cosine adjustable	Yes. Smax=2.7 kVA	Yes. Smax=3 kVA	Yes. Smax=3.63 kVA	Yes. Smax=3.68 kVA	Yes. Smax=5 kVA	Yes. Smax=5.5 kVA
THD	<3%	<3%	<3%	<3%	<3%	<3%
Efficiency						
Maximum efficiency	96.6%	96.6%	96.8%	96.8%	97%	97%
Euroefficiency	95%	95.1%	95.2%	95.2%	96%	96.1%
General Information						
Air cooling	30 m³/h	30 m³/h	45 m³/h	45 m³/h	90 m³/h	90 m³/h
Stand-by consumption[5]	<10 W	<10 W	<10 W	<10 W	<10 W	<10 W
Consumption at night	0 W	0 W	0 W	0 W	0 W	0 W
Ambient temperature	-20ºC to +70ºC	-20ºC to +70ºC	-20ºC to +70ºC	-20ºC to +70ºC	-20ºC to +70ºC	-20ºC to +70ºC
Relative humidity (non-condensing)	0 - 95%	0 - 95%	0 - 95%	0 - 95%	0 - 95%	0 - 95%
Protection class	IP65	IP65	IP65	IP65	IP65	IP65

	6TL	7.5TL	8.2TL	8.6TL	10TL
Input (DC)					
Recommended PV array power range[1]	6.3 - 7 kWp	8.7 - 10.3 kWp	9.5 - 11.2 kWp	10 - 11.8 kWp	11.6 - 13.7 kWp
Voltage range MPP	190 - 450 V	215 - 450 V	235 - 450 V	245 - 450 V	300 - 450 V
Voltage range DC[2]	125 - 550 V	125 - 550 V	125 - 550 V	125 - 550 V	125 - 550 V
Maximum current DC	33 A	35 A	35 A	35 A	35 A
DC inputs	4	4	4	4	4
MPPT	1	1	1	1	1
Output (AC)					
Rated power AC[3]	6 kW	7.5 kW	8.2 kW	8.6 kW	10 kW
Maximum current AC	26.2 A	36.1 A	36.1 A	36.1 A	36.1 A
Rated voltage AC	230 / 240 V	208 / 230 / 240 / 277 V [4]	230 / 240 / 277 V [4]	240 / 277 V [4]	277 V
Frequency AC	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz
Phi Cosine	1	1	1	1	1
Phi Cosine adjustable	Yes. Smax=6 kVA	Yes. Smax=7.5 kVA	Yes. Smax=8.2 kVA	Yes. Smax=8.6 kVA	Yes. Smax=10 kVA
THD	<3%	<3%	<3%	<3%	<3%
Efficiency					
Maximum efficiency	97%	97.5%	97.6%	97.65%	98%
Euroefficiency	96.1%	96.5%	96.55%	96.6%	96.8%
General Information					
Air cooling	90 m³/h	90 m³/h	90 m³/h	90 m³/h	90 m³/h
Stand-by consumption[5]	<10 W	<10 W	<10 W	<10 W	<10 W
Consumption at night	0 W	0 W	0 W	0 W	0 W
Ambient temperature	-20ºC to +70ºC	-20ºC to +70ºC	-20ºC to +70ºC	-20ºC to +70ºC	-20ºC to +70ºC
Relative humidity (non-condensing)	0 - 95%	0 - 95%	0 - 95%	0 - 95%	0 - 95%
Protection class	IP65	IP65	IP65	IP65	IP65

4 Preliminary checks

It is assumed that the electrical connections of the inverter, both in the DC side (photovoltaic)and in the AC side grid) have been carried out.



4.1 Inverter START-UP

- Verify that the DC circuit breaker of the inverter is in the ON position.
- Verify that the display of the inverter is switched on.

4.1.1 The display does not turn on and the led is off

- Verify the voltage and the polarity from the PV String/Array (see § **3 - Technical specifications**).

In the case of correct voltage from the PV String/Array and if the DC Breaker is in the ON position but the display is still off and the leds are off too, the inverter has to be returned for repair.

4.1.2 The display does not turn on and the red and orange led are on

The inverter has to be returned for repair.

4.1.3 The display turns on with a flashing green led and a fix orange led

- Verify that the display shows the voltage and frequency value of the grid.

Check the alarm codes of the inverter (See § 5 - Verification of alarms and events).

4.1.4 The display turns on with a flashing green led

This type of blinking indicates that the PV array is feeding the right amount of voltage to the inverter and it is about to start up. In this state, the inverter is monitoring that the grid parameters (Voltage and frequency) stay within a defined range, so that it can determine the right condition to connect to the grid.

This process takes about one minute.

4.1.5 The green led is ON while the orange led is flashing

The orange flashing LED is a non-blocking situation. According to the blinking frequency of the Orange LED the meanings are the following:

- 0.5 Seconds flashing: the external fan is not working correctly.
  Verify that the external fan(s)[1] are able to rotate freely. If one or more fans are blocked or present difficulties in rotation, check if foreign objects hinder the correct rotation of the fan.
- 1 Second flashing: the internal fan is not working correctly.
  The inverter has to be returned for repair.
- 3 Seconds flashing: inverter limiting power due to high temperature. The power limitation is caused by an high ambient temperature (> 45°C).
  In case of power limitation with an ambient temperature lower that 45°C, The inverter has to be returned for repair.

NOTE: Verify alarm codes and check all alarm codes and events of the inverter (See § **5 - Verification of alarms and events)**

Alarm Code1	0080 Hex	Over Temperature (see **5.1 - Alarm codes**)
Code1	0008 Hex	Malfunction in the internal fan
Code1	0010 Hex	Malfunction in the external fan

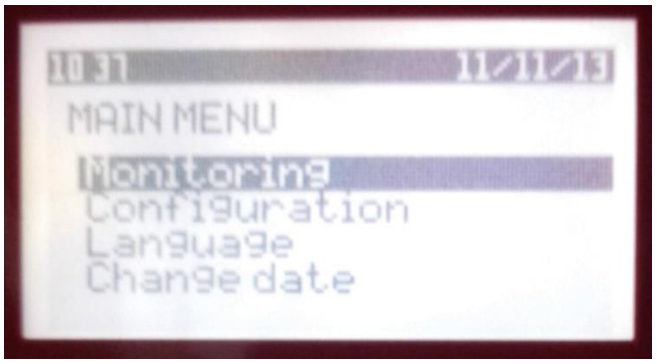
4.1.6 The display is turned on showing the following message “COM ERROR” or “COMMS!!!”

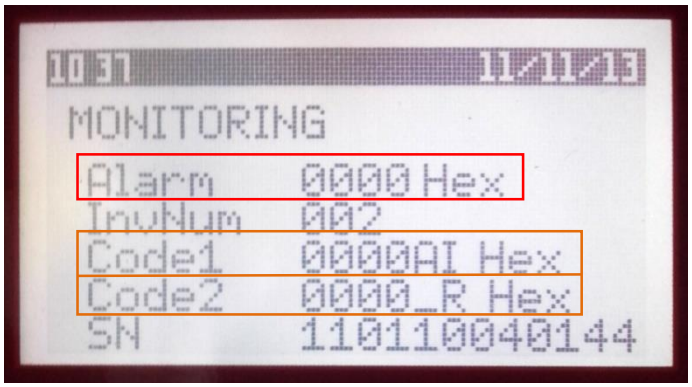
The inverter has to be returned for repair.

[1] The inverter Ingecon Sun Lite 2,5TL and 3TL do not have external fans.

5 Verification of alarms and events

Through the keypad of the inverter, access the menu "**Monitoring**" and scroll through the pages of the menu up to the list of alarms and events:





NOTE:

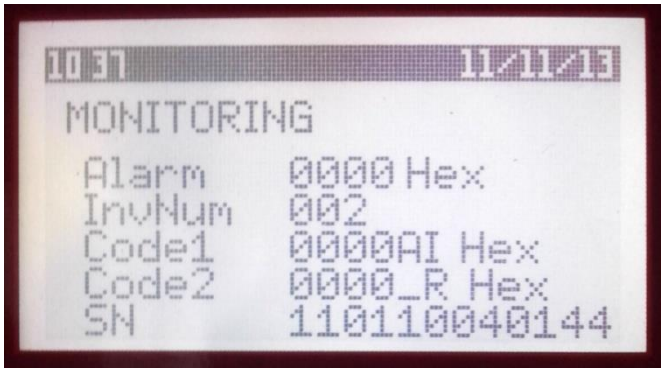
The value displayed in "Alarm", "Code1" and "Code2"can be the result of the (hexadecimal) sum of two or more of the values listed above (see chapter:**5.2 - How to read Alarm codes**).

5.1 Alarm codes

Alarm code	Description	Action
0000 Hex	No alarms	----------
0001 Hex	Input voltage out of range (VDC).	Verify the input voltage measured by the inverter and compare it with the voltage measured through the usage of a Multimeter. The alarm could be caused by an input voltage: ➢ Lower than 120Vdc ➢ Higher than 550Vdc
0002 Hex	Grid frequency out of range.	Verify the value of the frequency on the display. The inverter shows that code when the measured frequency is outside the threshold limits fixed by the legislation. Eg. Fmax 51,5Hz and Fmin 47,5Hz The frequency 0Hz is probably the absence of the grid to the inverter. In that case the alarm code is 0006.
0004 Hex	Grid voltage out of range.	Verify the value of the voltage on the display. The inverter shows that code when the measured voltage is outside the threshold limit fixed by the legislation. The Voltage 0V is probably the absence of the grid to the inverter. In that case the alarm code is 0006.
0008 Hex	Over current in the inverter bridge H IGBT.	Send the invert in for repair.
0010 Hex	Over current in the DC/DC converter.	Send the invert in for repair.
0020 Hex	Insulation fault	Procedure to determine the cause of the insulation fault: **Case A – Insulation Fault External of the inverter** 1. Disconnect the solar panel circuit from the inverter. 2. Measure both the positive pole and negative impedance referred to the ground of each string. **Case B – Insulation Fault Internal of the inverter** 1. Disconnect the solar panel circuit from the inverter. 2. Open the inverter. 3. Remove the varistors. 4. Check with a multimeter that there is high impedance in the varistor terminals and continuity in the thermal fuse terminals. If this is not the case, the varistor-thermal fuse which does not pass the check above will need to be replaced. 5. Correctly insert the three varistors before closing the unit. 6. If the problem persists and the check is correct, contact Ingeteam.
0080 Hex	Temperature out of range	Alarm for **high temperature** of the sink 84°C for 2,5TL and 3TL 81°C for 3,3TL and 3,68TL 79°C for 4,6TL, 5TL and 6TL The inverter reset the temperature alarm when the temperature of the sink drop to 70°C Verify that the external fans of the inverter are able to rotate freely (check the cleanliness of the compartment of the external fans).
0100 Hex	Bus overvoltage	Send the invert in for repair.
0400 Hex	Manual shutdown	Take action on the inverter keypad and change the status into START.
0800 Hex	Hardware error	The inverter has to be returned for repair.
2000 Hex	Detection of island mode operation	The inverter has to be returned for repair.

5.2 How to read Alarm codes

The following example is the typical demonstration of the sum of alarm codes that show an absence of the AC connected to the inverter.



- Alarm:

  0006 Hex = 0002 Hex + 0004 Hex (See § **5.1 - Alarm codes**)
  0002 Hex = Grid frequency is out of range (0Hz is an out of range).
  0004 Hex = Grid voltage is out of range (0V is an out of range)