INGECON SUN STORAGE 1PLAY

Alarm Interpretation and Troubleshooting Guide

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1 INTRODUCTION

The purpose of this document is to guide through the different ways of resolution for the events that can appear in inverters of the family of Ingecon Sun Storage 1 Play.

The document is divided in three big blocks:

- EVENTS: In this section all events are defined. Alarms, stop events and warnings are included as events.
- INCIDENT WORKFLOW: Each event has a diagram guide to solve the problem that is causing the event. Along the different diagrams there are instructions that are defined and explained in the next block
- TRAINING INSTRUCTIONS: Explanation of different operations to do in the inverter. This block is divided in other sub blocks

1.1 Revision History

Revision	Date	Change Description	Author
_	02/11/2016	Initial document	D.B.R.
_A	25/01/2017	Added: Combination of Alarm 0x0800 + Code1 0x0002 and Combination of Alarm 0x0800+Code2 0x4000	D.B.R.
_B	10/08/2017	Added: Troubleshooting for all alarms with an “Incident Workflow”	J.E.A.
_C	25/10/2017	Minor changes	J.E.A.
_D	21/03/2019	Added: Alarm 0x10000000, Stop Event 11, Warning Code3 0x0004 and Warning Code3 0x0008	D.B.R.
_E	24/04/2019	Added: Warning Code3 0x0010	J.E.A.
_F	03/10/2019	Added: Warning Code3 0x0020. Added hyperlinks to troubleshooting in the alarms and warnings descriptions.	J.E.A.

2 EVENTS

2.1 DEFINITIONS

2.1.1 Alarms

Alarms are events that produce the stop of the normal working state of the ISS 1Play. An alarm event may be transient or maintained in time as a stable condition.

It is important to understand that stopping the normal working state of the ISS 1Play does not lead to the device to be completely stopped, only part of all the alarms may force the ISS 1Play to stop. For example, while with an Alarm0x0004H (grid voltage out of range) the device will not stop in some operation modes, with an Alarm0x0008H (HW failure) will always do.

The alarm is defined by a 32bit code. Every alarm code has a display text associated and is intended to be general; so to get its complete meaning will be necessary to use the “Unit Operating Codes” (Code 1 and Code 2) and the “Stop Event” parameter too.

Every time that an alarm is produced the associated bit in the 32bit code will set. The active state of the bit will last until a new connection will be attempted. This way to process alarms without resetting the bit, will lead to a situation where it is impossible to know if the alarm displayed has occurred once or maybe it is happening continuously, on the other hand, it will let to know if transient alarms have happened.

In case that more than one alarm is shown at the same time, both hexadecimal codes will be shown together. An example with the two grid alarms (Alarm 0x0002 and Alarm 0x0004) is included below:

Alarm 0x0000000**2** Hex	=	0x	0000	0000	0000	0000	0000	0000	0000	**0010**
Alarm 0x0000000**4** Hex	=	0x	0000	0000	0000	0000	0000	0000	0000	**0100**
		↓	↓	↓	↓	↓	↓	↓	↓	↓
Alarm 0x0000000**6** Hex	=	0x	0000	0000	0000	0000	0000	0000	0000	**0110**

Alarms can be checked through:

- LED: the orange led permanently glowing (ON state) will indicate the presence of an alarm.
- Display: a specific menu lets to check the alarms in the device, it is accessible through MAIN MENU > MONITORING > ALARM MONIT.
- Datalogger. It can be checked using the Ingecon Sun Manager software.

For further information see the “Installation and Operation Manual”.

2.1.2 Unit Operating Codes (Code1 and Code2)

The Unit Operating Codes are intended to give more information about the reason why an alarm occurred. Each code is defined in a 16 bit variable, in hexadecimal and named as Code1 and Code2.

As it happens in Alarms, if more than a unit operating code is happening at the same time they are added as shown previously.

Code1 and Code2 can be checked through:

- Display: a specific menu lets to check the alarms in the device, it is accessible through MAIN MENU > MONITORING > ALARM MONIT.
- Datalogger. It can be checked using the Ingecon Sun Manager software.

For further information see the Installation and Operation Manual.

2.1.3 Stop Event

Since alarm code are intended to be general events and something understandable by users, stop events are also defined. Stop events are more specific and more descriptive codes. Therefore, one alarm code may be associated to several stop event codes. At the end, stop event will fully describe the produced alarm. It will depend on the hardware, device and any factor the developer might take into account.

Stop event is defined by a 32bit code, where the bit position means the number of the stop event.

An example, with the two stop event (1 and 10) is included below:

Stop event 1 and 10	=	0000	0000	0000	0000	0000	00**1**0	0000	000**1**

Stop events can be checked through:

- Datalogger. It can be checked using the Ingecon Sun Manager software.

2.1.4 Warning

A warning is a situation of the unit that requires maintenance. However, it does not mean a stop event.

A warning event will be highlighted by the blinking of the orange led and the corresponding bit code in the unit operating codes.

2.1.5 LEDS MEANING

The LEDs meaning is explained in the “Installation and Operation Manual”

3 Origin and description of the events

ALARMS	UNIT OPERATING CODES	STOP EVENT	DESCRIPTION
0x00000001 **Battery voltage out of range**	**Code 2: 0x0080** **Low battery voltage (Vmin).** Troubleshooting	**Stop Event: 1** The stop event is active only when the inverter is with this alarm and is not connected to a grid/genset This is because the battery is the only energy source available to feed the loads, but it is already to the minimum so the inverter must stop.	It may be caused by the battery protection, Vbat < Vbatmin (Minimum Voltage) during a temporization time (80 seconds by default). The alarm will be active until Vbat >= Vbatnom (Nominal Voltage). The battery needs to be charged from PV or Grid/Genset.
	Code 2: 0x0100 **High battery voltage.** Troubleshooting	**Stop Event: 2**	The high limit is above a temporized limit or an instantaneous limit. Each limit depends on the type of battery: • Lead-Acid: the high limit is defined as Vnom x 125%. If the lead-acid allows an equalization charge, the high limit is defined as Vequalzation x 106%. • Lithium: the high limit is defined by the battery manufacturer.
0x00000002 **Grid frequency out of range** Troubleshooting	**Code 2: 0x0008**	**Stop Event: 5** The stop event is active only when the inverter is with this alarm, is connected to a grid/genset and the backup function is disabled.	Frequency out of the configured limits. These limits depends on the type of grid: • Genset: the limits are defined by the genset manufacturer. • Grid: the limits are defined by the grid standards. If the backup function is enabled, the inverter disconnects from the grid and generates the grid itself. If the backup function is disabled, the inverter stops.
0x00000004 **Grid voltage out of range**	**Code 2: 0x0040**	**Stop Event: 5** The stop event is active only when the inverter is with this alarm, is connected to a grid/genset and the backup function is disabled.	Voltage out of the configured limits. These limits depends on the type of grid: • Genset: the limits are defined by the genset manufacturer. • Grid: the limits are defined by the grid standards.

Troubleshooting			If the backup function is enabled, the inverter disconnects from the grid and generates the grid itself. If the backup function is disabled, the inverter stops.
0x00000008 **DC/AC converter overcurrent or fault** Troubleshooting	Not used.	**Stop Event: 7**	DC/AC converter has detected an overcurrent or an IGBT fault.
0x00000010 **DC/DC converter overcurrent or fault** Troubleshooting	Not used.	**Stop Event: 8**	DC/DC converter has detected an IGBT fault.
		Stop Event: 9	DC/DC converter has detected an overcurrent.
0x00000020 **Insulation failure** Troubleshooting	**Code 1: 0x0004**	**Stop Event: 21**	Insulation failure to positive or negative PV or Battery terminals.
	Code 1: 0x0400	**Stop Event: 19**	RMS differential current failure: >240mA.
	Code 1: 0x0800	**Stop Event: 18**	Incremental differential current failure: 25, 50 or 125mA.
	Code 1: 0x1000	**Stop Event: 20**	Instantaneous differential current failure: >330mA.
0x00000040 **Synchronization alarm in 3 Phase systems** Troubleshooting	**Code 2: 0x0002**	**Stop Event: 22**	In three phase systems: Synchronization wire not properly connected or one of the inverters has a stop event.
0x00000080	Not used.	**Stop Event: 16**	Low temperature in Sink: <= -20.5ºC.

Temperature alarm Troubleshooting		**Stop Event: 17**	High temperature in PCB or Sink.
0x00000100 **DC bus overvoltage** Troubleshooting	Not used.	**Stop Event: 6**	DC bus voltage over the limits: >550Vdc
0x00000200 **Configuration change** Troubleshooting	Not used.	**Stop Event: 25**	Change in the configuration done.
0x00000400 **Inverter stopped** Troubleshooting	**Code 1: 0x2000**	**Stop Event: 10**	Inverter stopped by the display or remote communication.
	Code 2: 0x8000	**Stop Event: 4**	Inverter stopped by the digital input.
0x00000800 **HW failure** Troubleshooting	Not used.	**Stop Event: 24**	Bad readings from analog/digital converter (ADC).
	Code 1: 0x0002	Not used. This alarm is active before the inverter start-up.	Averaged grid current out of the 25%-75% full scale range.
	Code 1: 0x0020		Averaged DC/DC boost converter current out of the 25%-75% full scale range.
	Code 1: 0x0040		DC offset in the DC/AC converter current cannot be compensated.
	Code 1: 0x0080		Grid voltage measurement is out of the 25%-75% full scale range.
	Code 1: 0x0100		Averaged differential current out of 25%-75% of full scale range.
	Code 1: 0x0200		Instantaneous differential current over 25% of full scale.

	Code 2: 0x4000		Internal differential current test failed.
	Not used.	**Stop Event: 29**	Stack overflow. Reset Watchdog.
	Not used.	**Stop Event: 28**	analog/digital converter (ADC) acquisition not occurred in 1 ms.
	Code 2: 0x0020	**Stop Event: 15**	Internal AC relay test failed. The inverter cannot connect to the grid.
0x00001000 **DC/DC or AC/DC Converter Error** Troubleshooting	Not used.	**Stop Event: 23**	DC/DC or AC/DC converter has detected five IGBT fault within 5 min. The inverter will keep stopped for 1min.
0x00002000 **Overload capacity exceeded in AC Grid** Troubleshooting	Not used.	**Stop Event: 26**	Overcurrent in the AC Grid Port. The loads are higher than the AC Grid Port´s capacity during 10 seconds (check datasheet “Generator or grid maximum power”)
0x00004000 **High Battery Temperature** Troubleshooting	**Code 3: 0x0002**	**Stop Event: 17** The stop event is active only when the inverter is with this alarm and is not connected to a grid/genset.	The Lead-Acid battery temperature is too high (> 50ºC). Wait for the battery to cool down. This alarm is deleted when the battery temperature is < 47ºC. Protect the battery against temperatures above 25ºC. This helps prevent premature aging of the battery.
0x00010000 **Overload capacity exceeded in AC Loads**	Not used.	**Stop Event: 12**	Overcurrent in the AC Loads with the inverter not connected to the grid. There are 3 protection levels: 30 mins, 2 mins and 3 secs.
Troubleshooting	Not used.	**Stop Event: 11**	Overcurrent in the battery with the inverter not connected to the grid. There are 3 protection levels: 30 mins, 2 mins and 9 secs.
0x00020000	Not used.	**Stop Event: 13**	Short circuit in AC Loads. When detected (VacLoads <26 V and high current) the inverter disconnects in

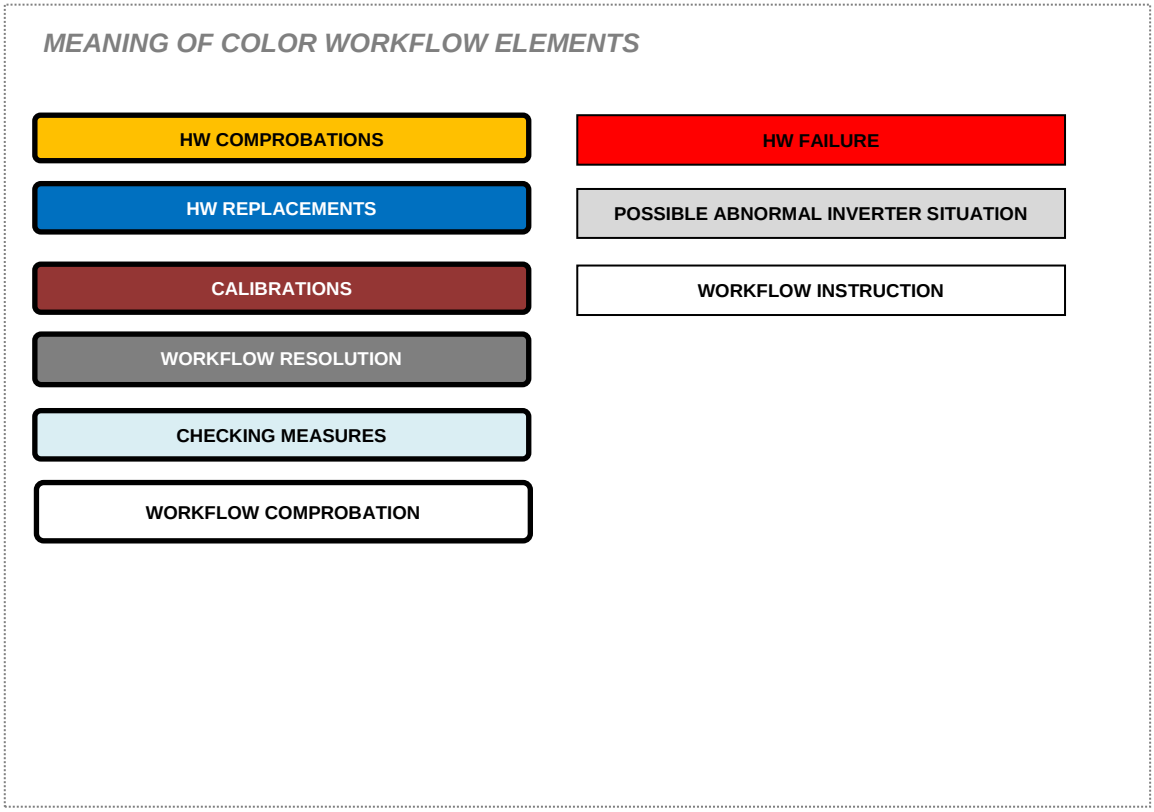
Short circuit in AC Loads Troubleshooting			40 ms.
0x00040000 **PT100 sensor** Troubleshooting	**Code 3: 0x0001**	Not used.	The PT100 temperature sensor can be disconnected or short-circuited or cable break. Ensure that the battery temperature sensor is correctly connected.
0x00080000 **Communication Error with the BMS** Troubleshooting	**Code 2: 0x0200**	**Stop Event: 3** The stop event is active only when the inverter is with this alarm and is disconnected to a grid/genset.	When the inverter is disconnected to the grid, it will stop within 5 seconds after loss of communication occurs. The inverter will recover automatically when communication is established again. If the inverter is connected to the grid, it will keep connected without using the battery.
0x00100000 **Wrong inverter serial number** Troubleshooting	Not used.	Not used. This alarm is active before the inverter start-up.	The inverter has a wrong serial number.
0x00200000 **High grid voltage** Troubleshooting	Not used.	**Stop Event: 5** The stop event is active only when the inverter is with this alarm, is connected to a grid/genset and the backup function is disabled.	Instantaneous Vac High protection: If the backup function is enabled, the inverter disconnects from the grid and generates the grid itself. If the backup function is disabled, the inverter stops.
0x00400000 **Wrong type of battery configuration**	Not used.	**Stop Event: 27**	The inverter keeps stopped if a frame of a Battery Management Systems (BMS) is detected with the configuration set to Lead Acid. The battery settings must be corrected.

Troubleshooting			
0x00800000 **BMS alarm** Troubleshooting	**Code 2: 0x2000**	**Stop Event: 30**	When the inverter is disconnected to the grid, it will stop. The inverter will recover automatically when alarm in the BMS disappears. If the inverter is connected to the grid, it will keep connected without using the battery.
0x01000000 **Overcurrent exceeded in PV input** Troubleshooting	Not used.	**Stop Event: 11**	Overcurrent in the PV input. The PV current is higher than the PV Input´s capacity during 60 seconds (check datasheet “PV array input (DC)”)
0x02000000 **Full Battery Discharge** Troubleshooting	**Code 3: 0x0040** **Low battery SOC (SOCdescx)**	**Stop Event: 1** The stop event is active only when the inverter is with this alarm and is working in off-grid (grid/genset disconnected). This is because the battery is the only energy source available to feed the loads, but it is already to the minimum so the inverter must stop.	It may be caused by the battery protection, SOC <= SOCdescx (disconnection SOC). In three phase systems there is not SOC estimation, so the condition is Vbat <= Vbatdescx (disconnection Voltage). The alarm will be active until SOC >= SOCrecx (reconnection SOC). The battery needs to be charged form PV or Grid/Genset. In three phase systems there is not SOC estimation, so the condition is Vbat >= Vbatrecx (reconnection Voltage).

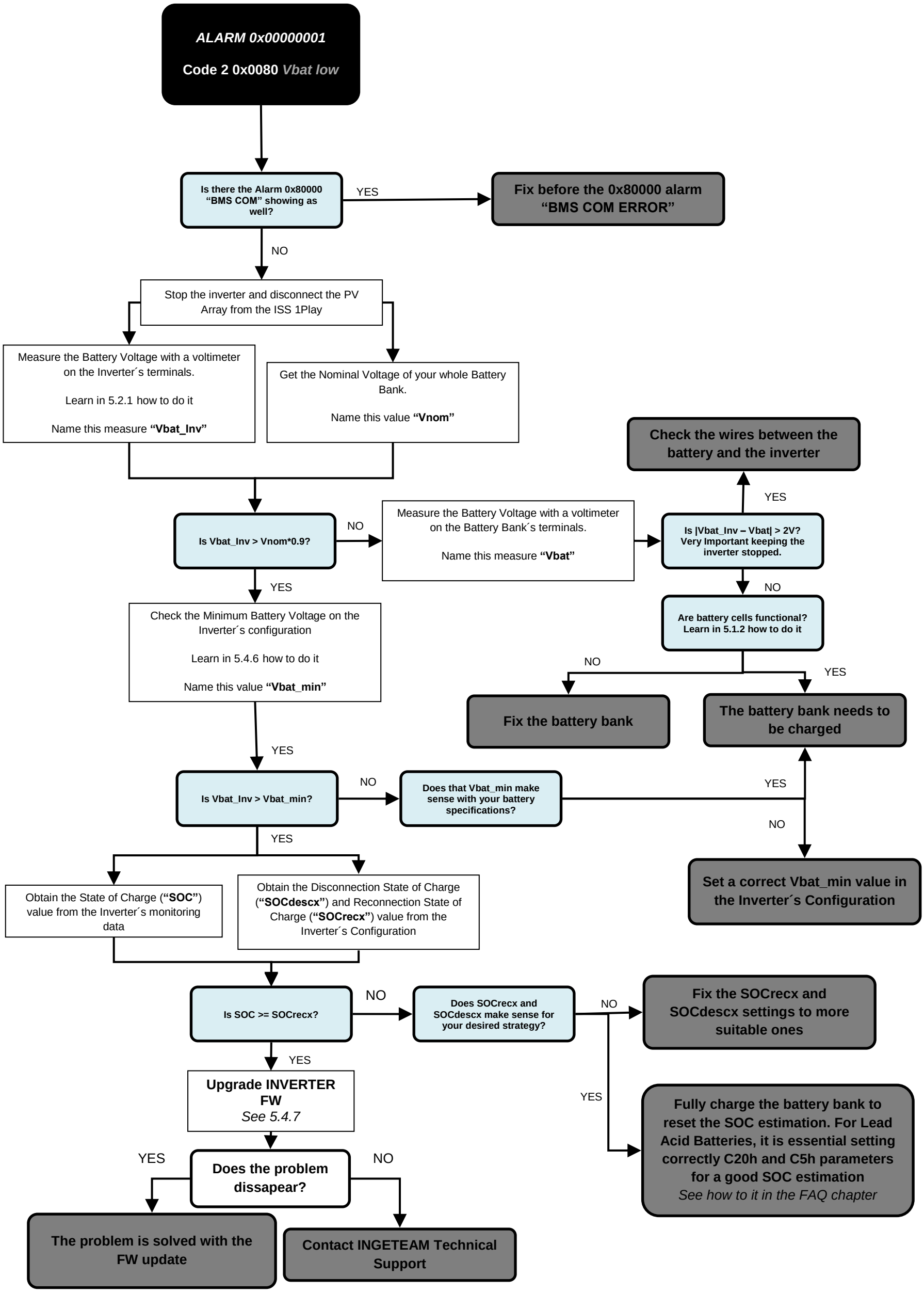
WARNINGS UNIT OPERATING CODES	DESCRIPTION
Code 1: 0x0008	Internal fan has detected a fault. The fan will keep stopped while it is blocked.
Code 1: 0x0010	External fan has detected a fault. The fan will keep stopped while it is blocked.
Code 2: 0x0001	Inverter has detected high temperature in PCB or Sink. If the inverter is connected to the grid, it will regulate AC output power.
Code 2: 0x0010	DC offset in the DC/AC converter current has been compensated without enough accuracy.
Code 2: 0x0800	Error in the phase sequence of the three-phase system. Inverter configurated as Phase S or Phase T has detected error in the phase sequence of the grid. The inverter will not connect to the grid while this warning is active.
Code 2: 0x1000	The digital input of the inverter has detected an error in the status of the external AC grid contactor.
Code 3: 0x0004	DC/DC converter cannot elevate.
Troubleshooting	
Code 3: 0x0008	Synchronization with the grid not successful.
Troubleshooting	
Code 3: 0x0010	Grid Transient Disconnection in Backup Function.
Code 3: 0x0020	Bus CAN Communication is not working correctly.
Troubleshooting	

4 INCIDENT WORKFLOW

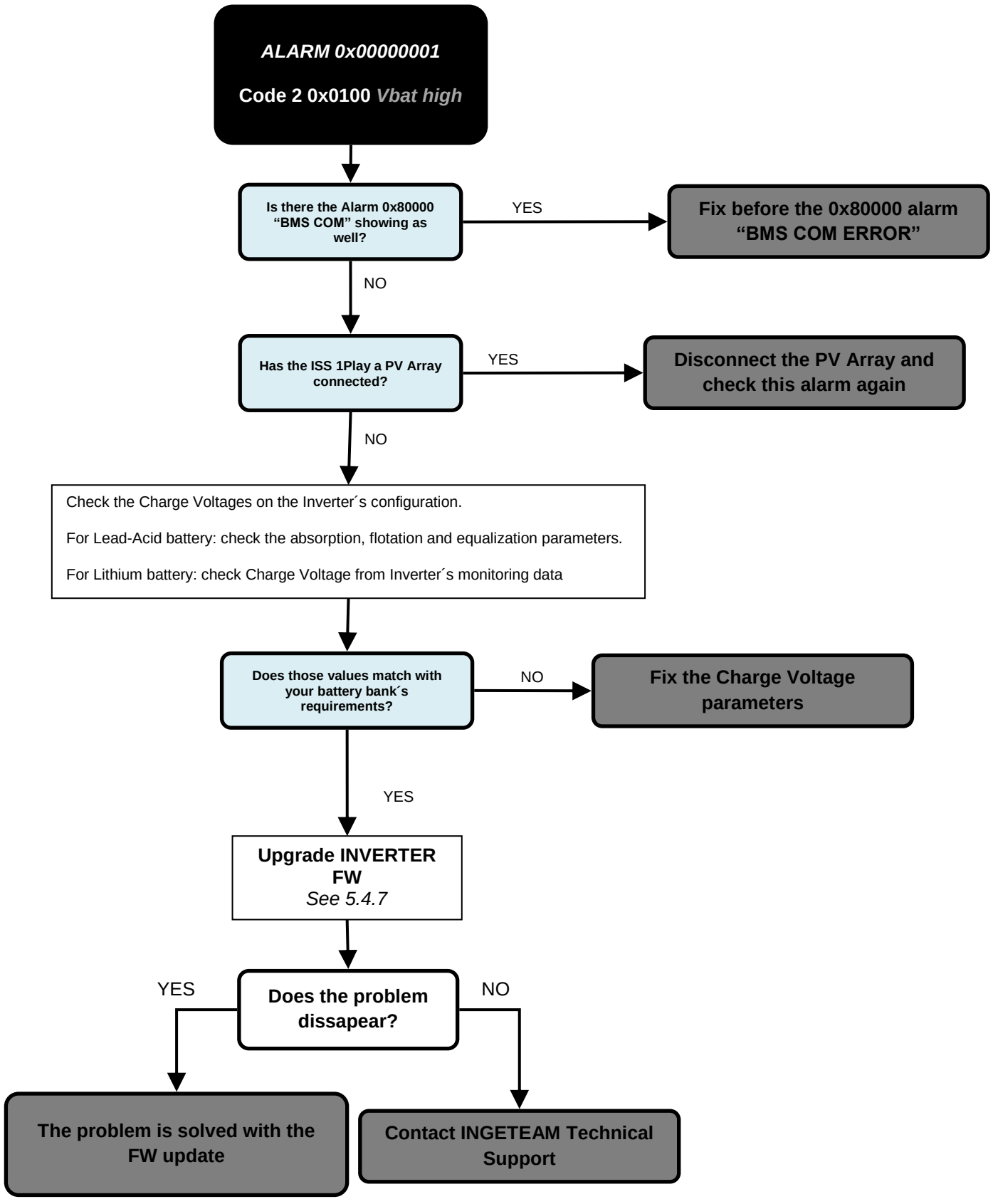
This section shows the workflow diagram necessary to follow to resolve the incidents that could be detected through the different events explained above.



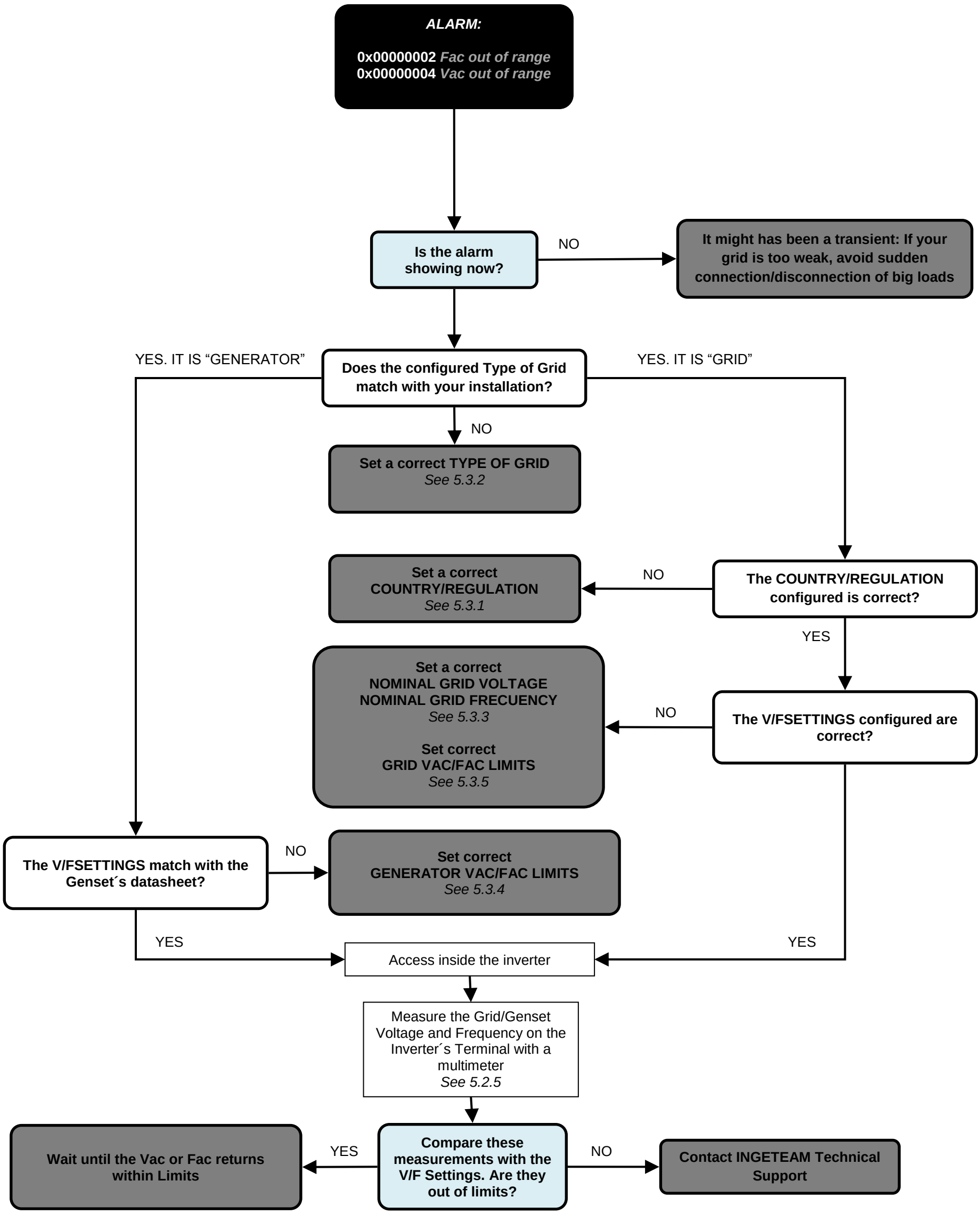
4.1 Alarm 0x00000001, Code 2 0x0080: Stop Event 1 Vbat Low (Vmin).



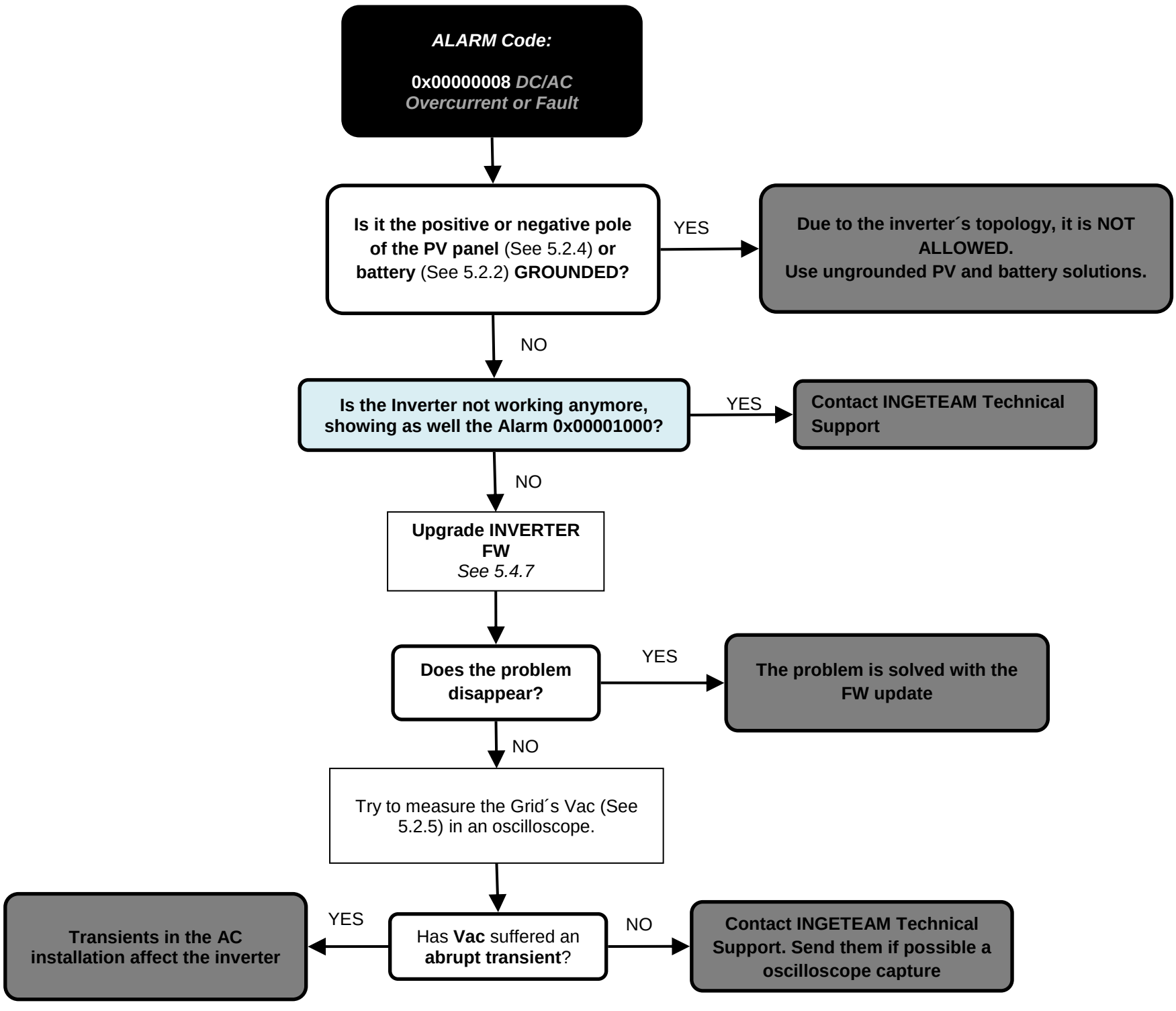
4.2 Alarm 0x00000001 Code 2 0x0100: Stop Event 1 Vbat High



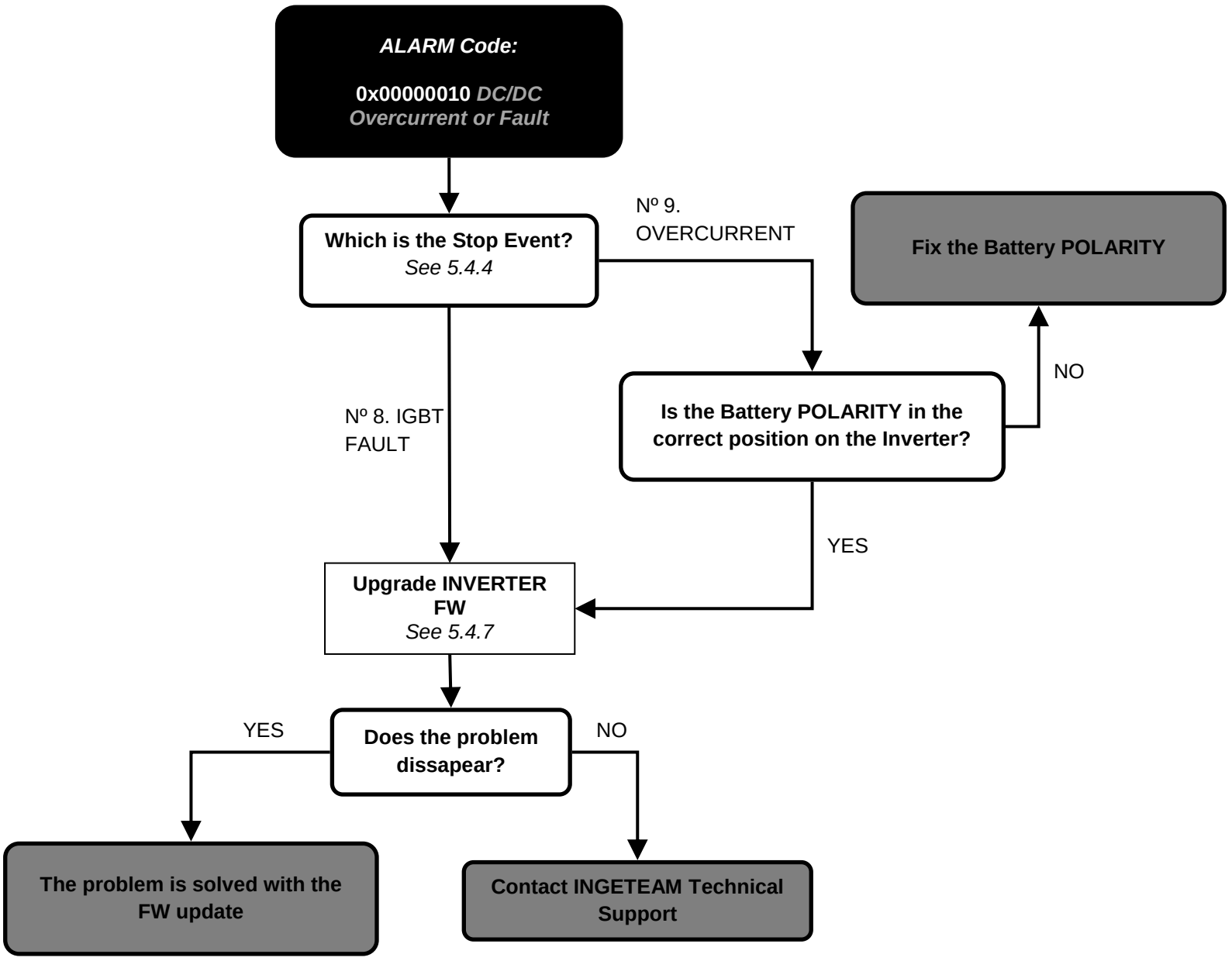
4.3 Alarm 0x00000002 and Alarm 0x0000004



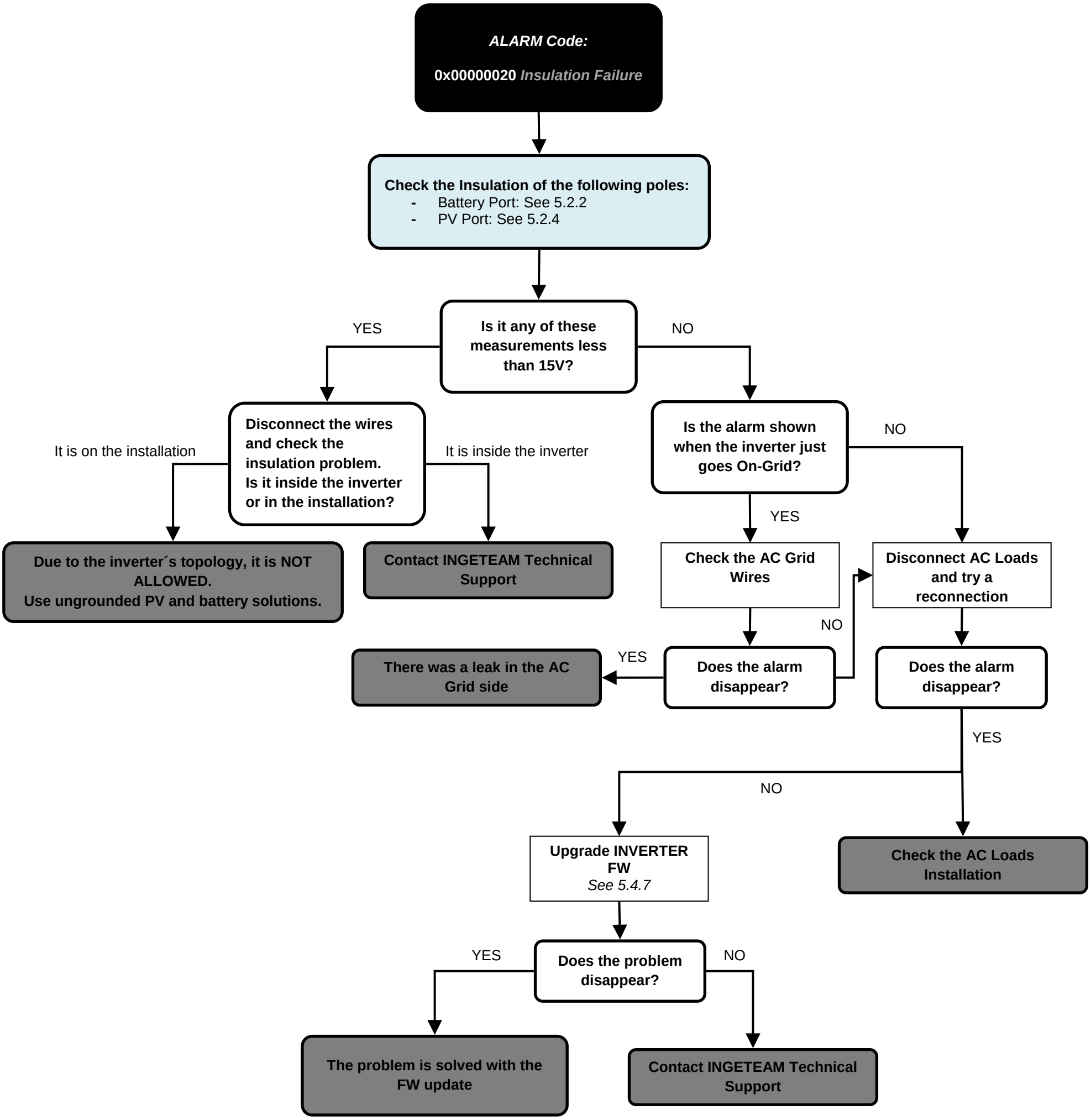
4.4 Alarm 0x00000008: Stop Event 7 DC/AC Converter´s Overcurrent or Fault



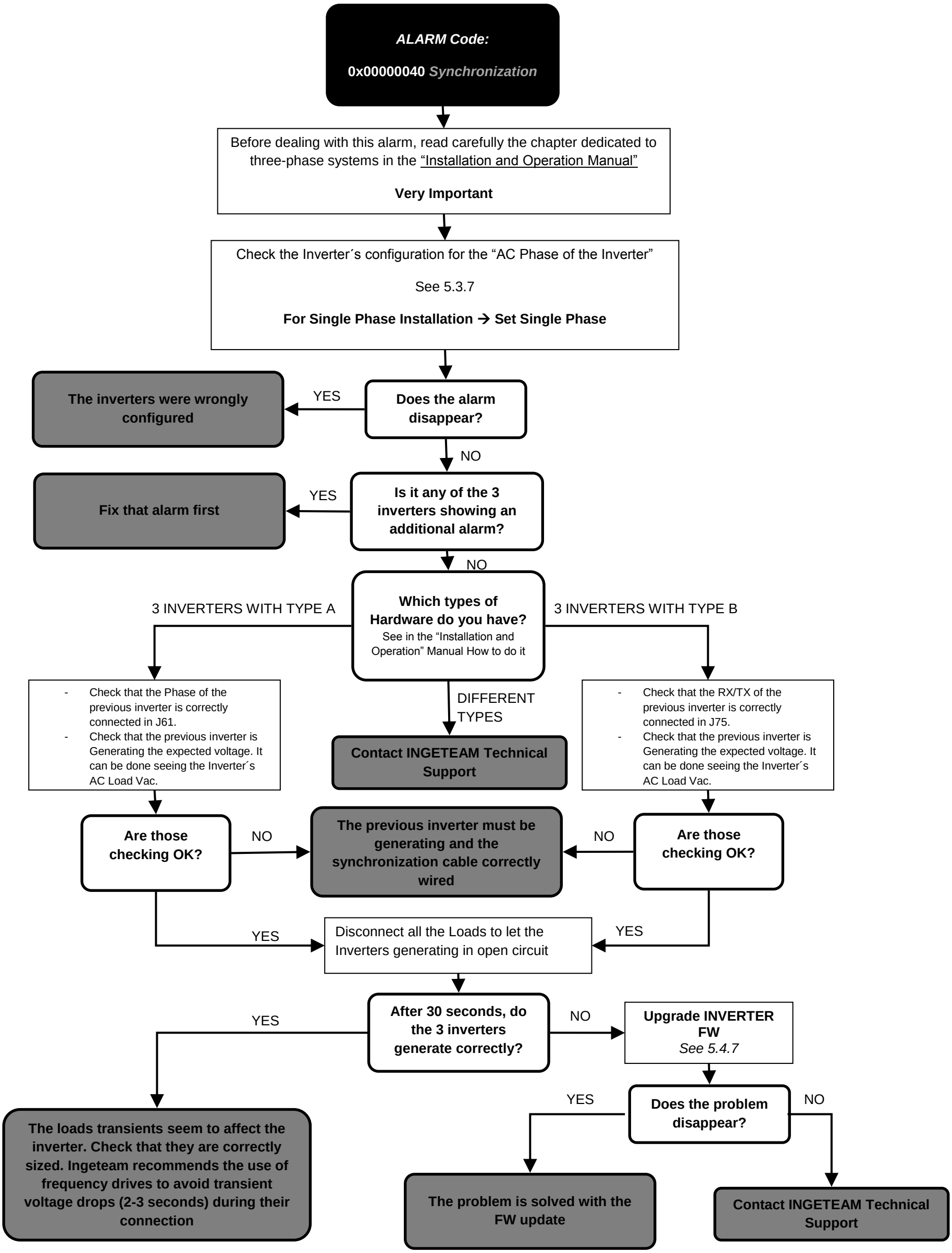
4.5 Alarm 0x00000010: DC/DC Converter´s Overcurrent (Stop Event 9) or Fault (Stop Event 8)



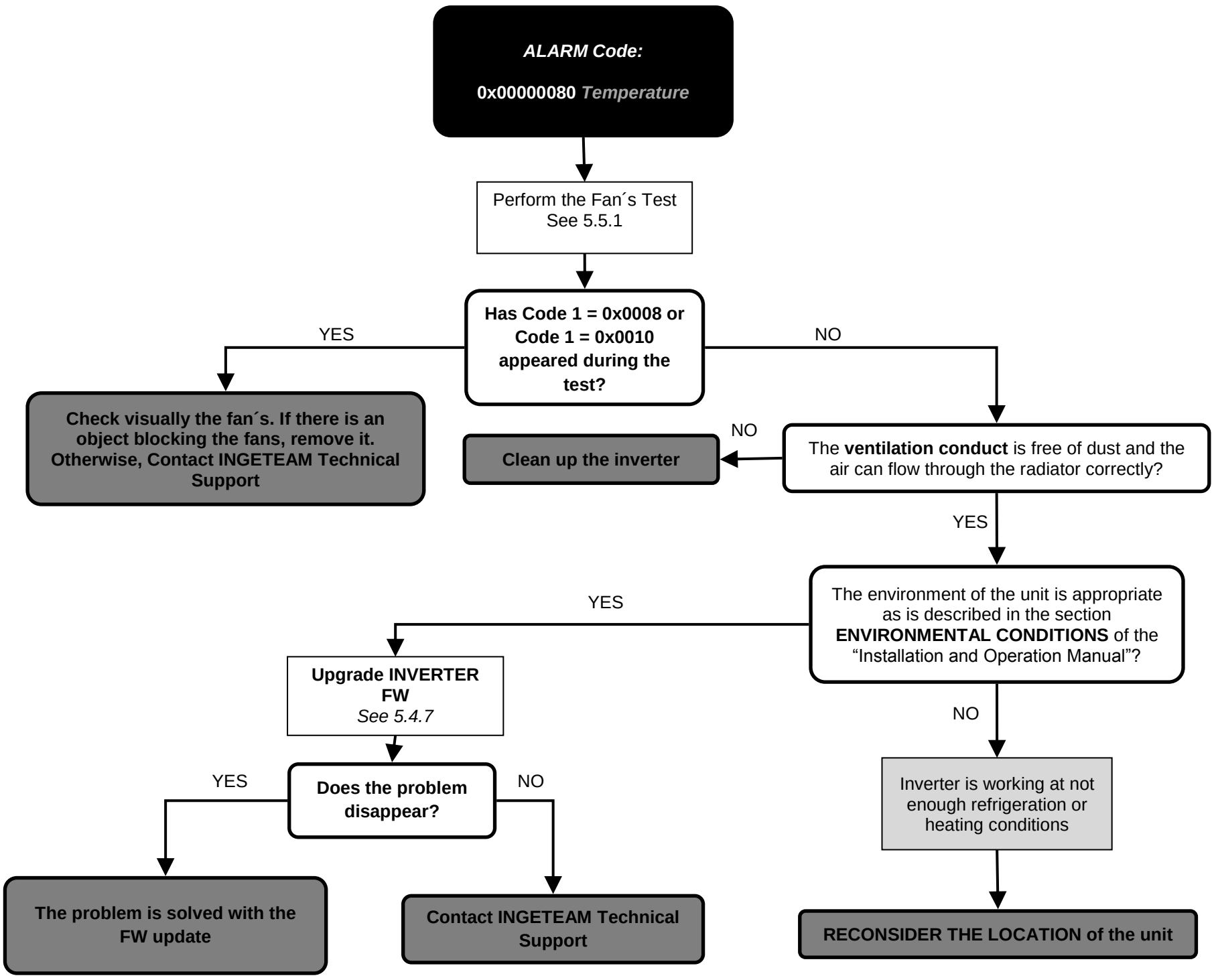
4.6 Alarm 0x00000020: Insulation failure



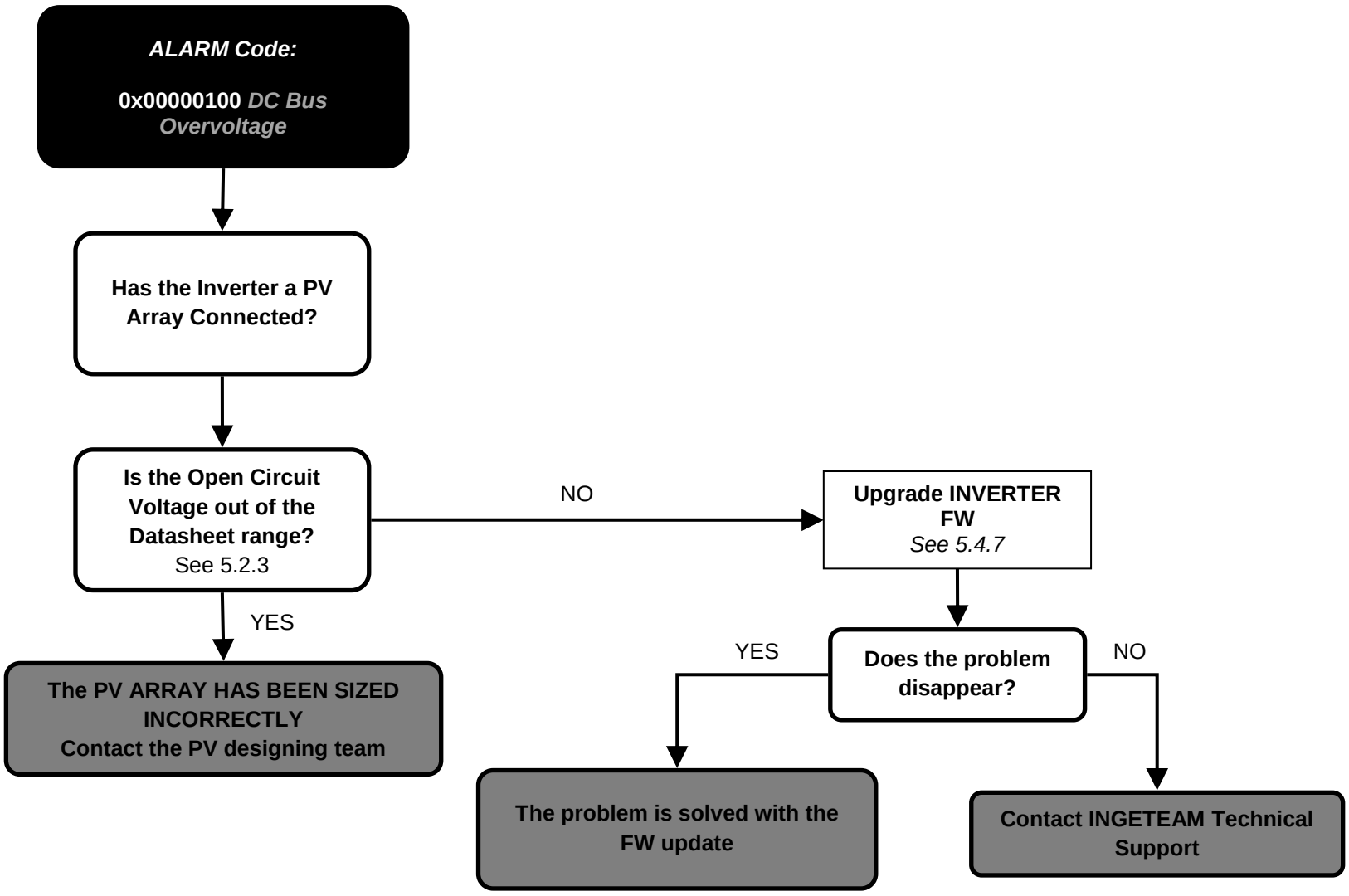
4.7 Alarm 0x00000040: Stop Event 22. Synchronization alarm in 3 Phase Systems.



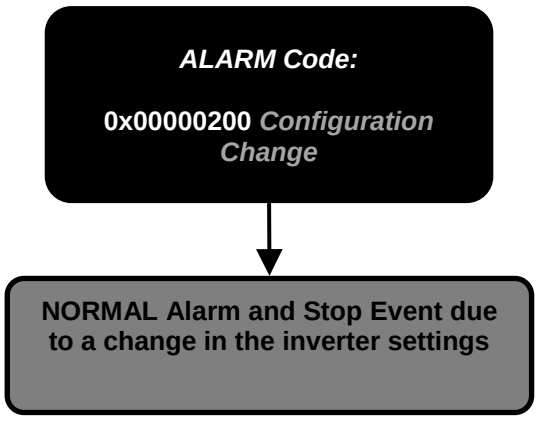
4.8 Alarm 0x00000080: Temperature. Stop Events 16 and 17.



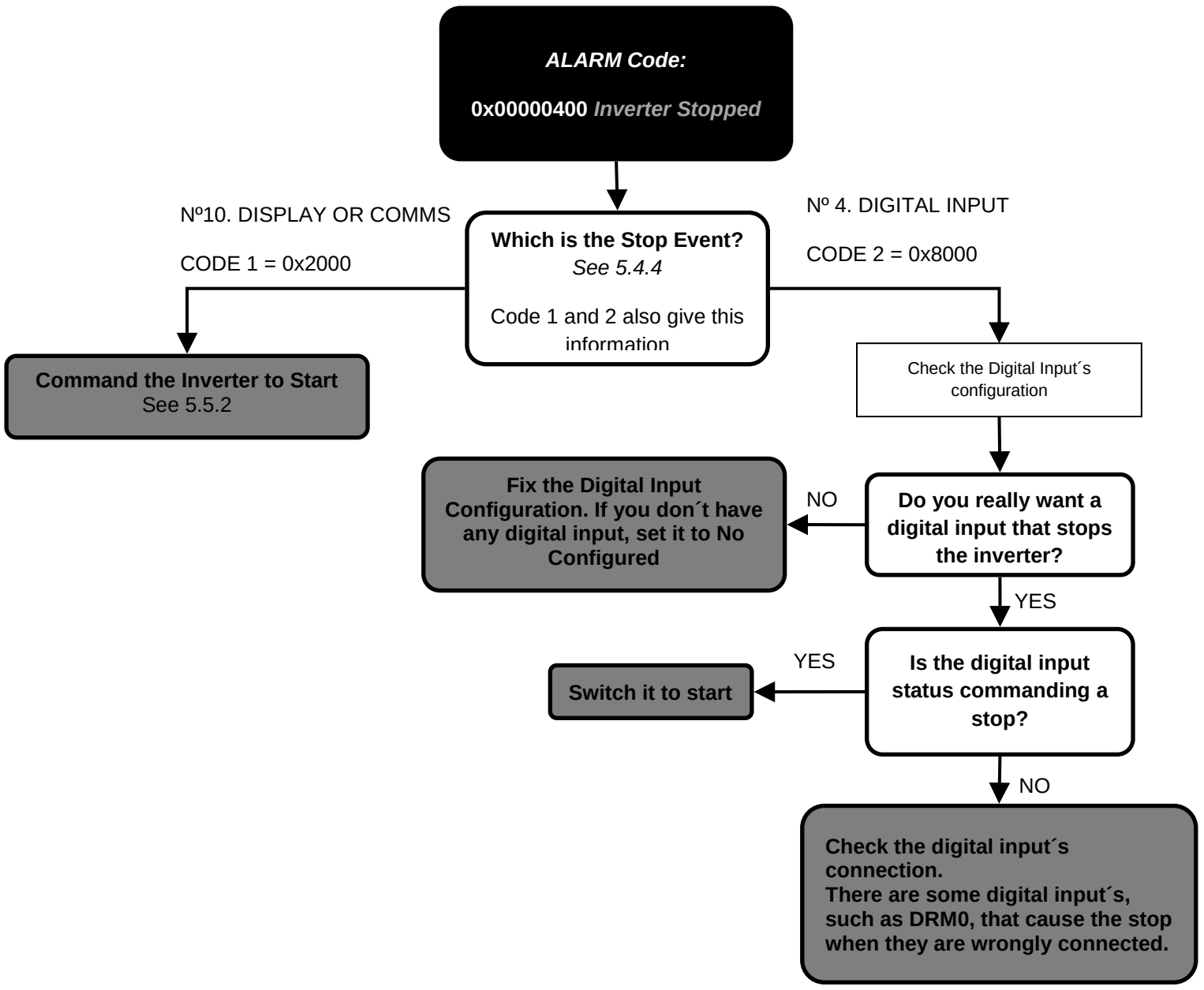
4.9 Alarm 0x00000100: DC Bus Overvoltage. Stop Event 6.



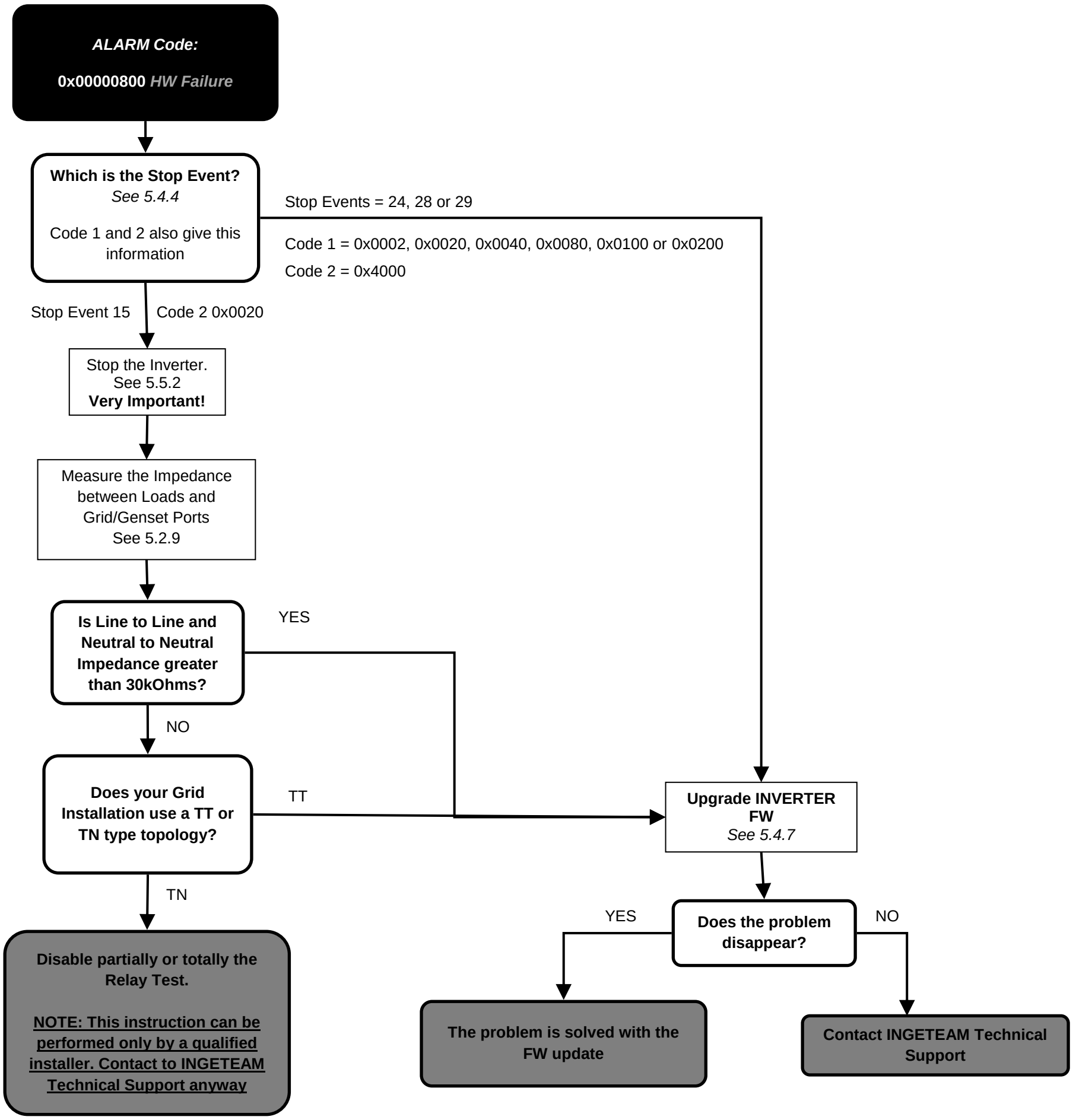
4.10 Alarm 0x00000200: Configuration Change. Stop Event 25.



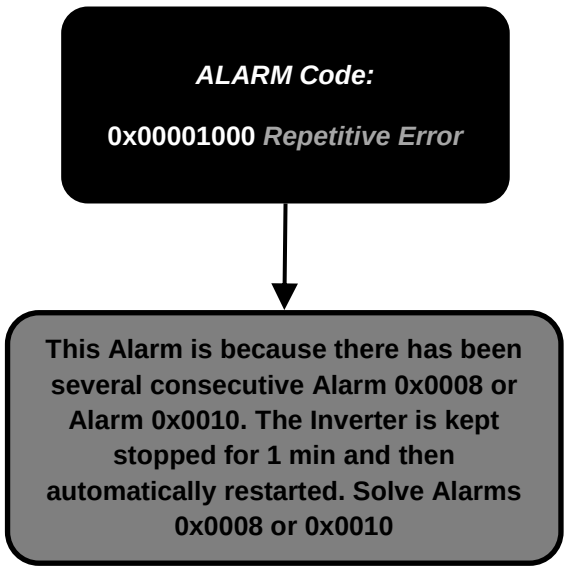
4.11 Alarm 0x00000400: Stop Inverter Command.



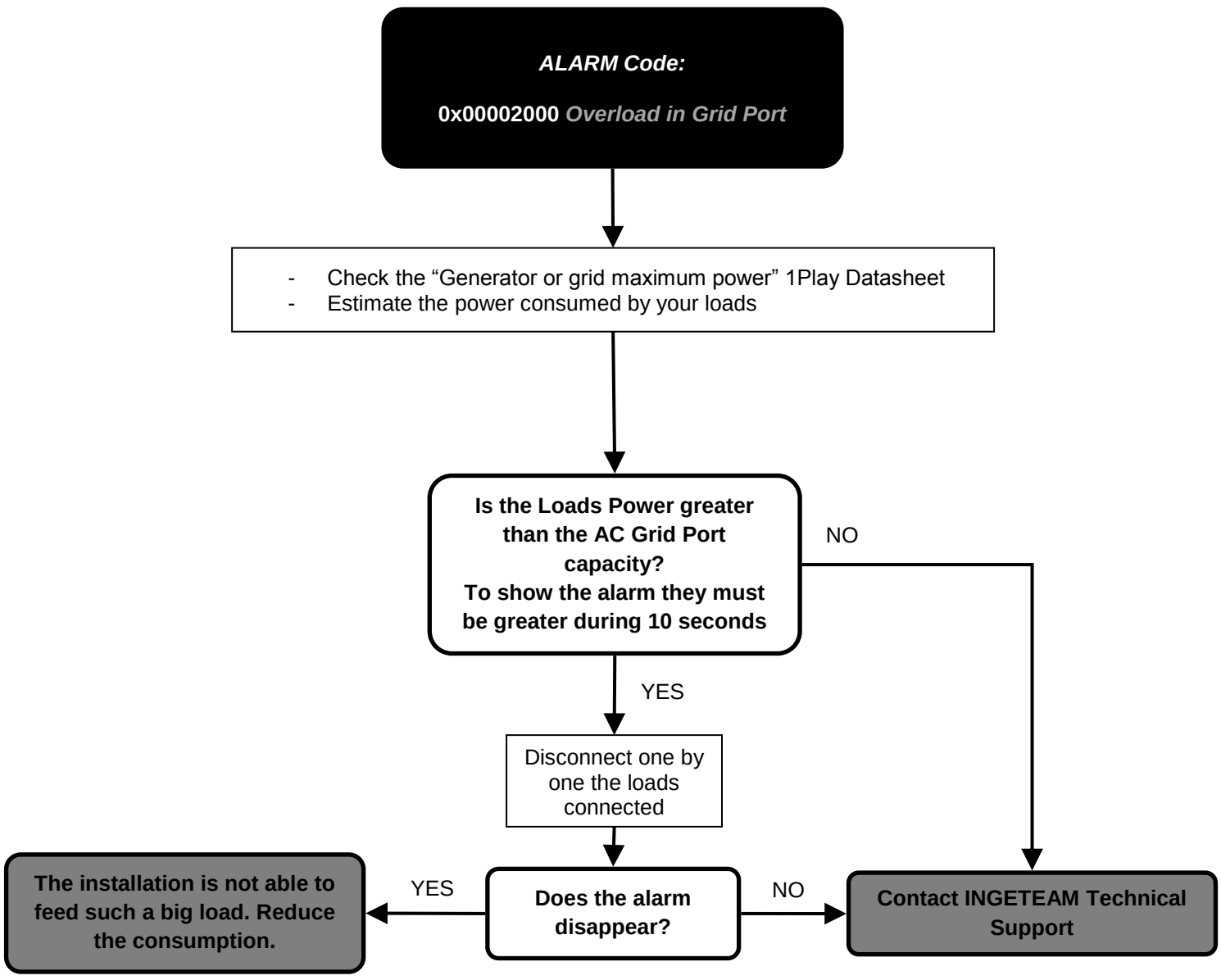
4.12 Alarm 0x00000800: HW Failure.



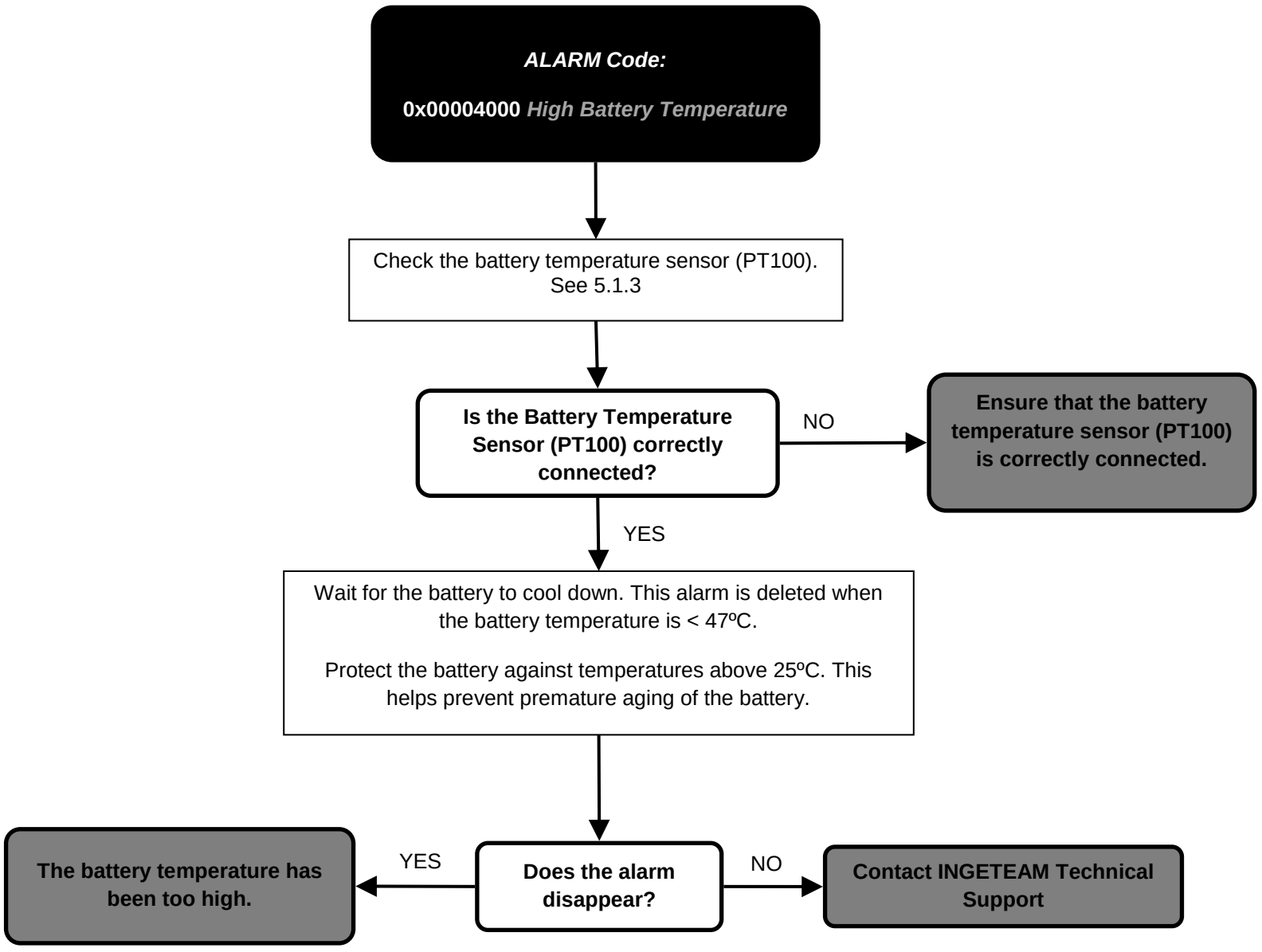
4.13 Alarm 0x00001000: Repetitive DC/DC or DC/AC Error. Stop Event 23.



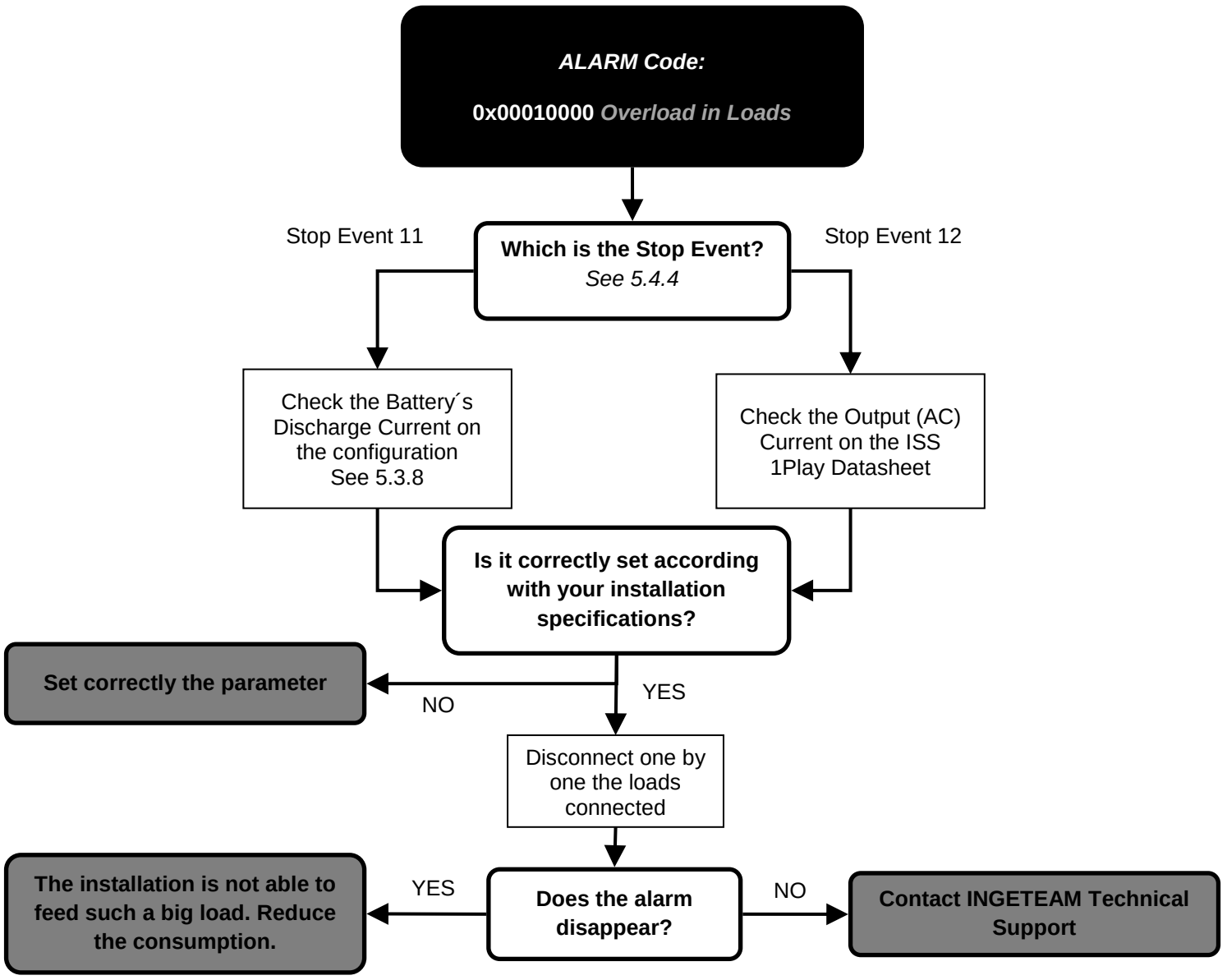
4.14 Alarm 0x00002000: Overload in AC Grid Port. Stop Events 26.



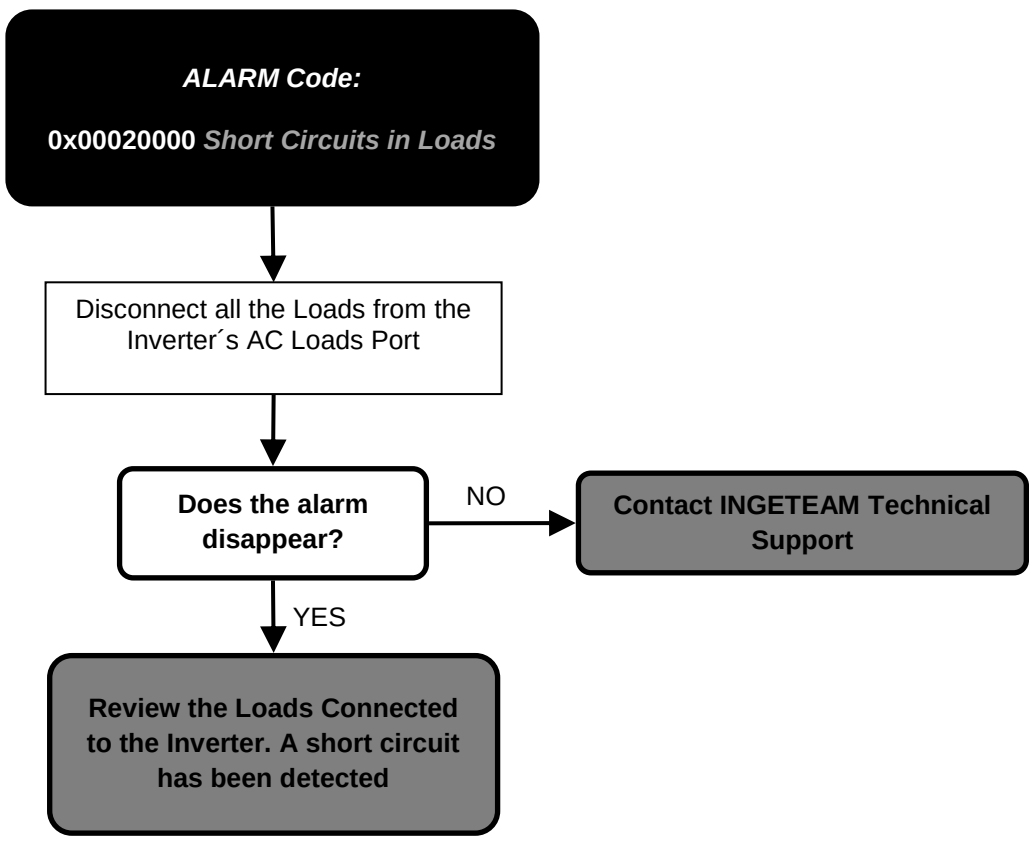
4.15 Alarm 0x00004000: High Battery Temperature. Stop Events 17.



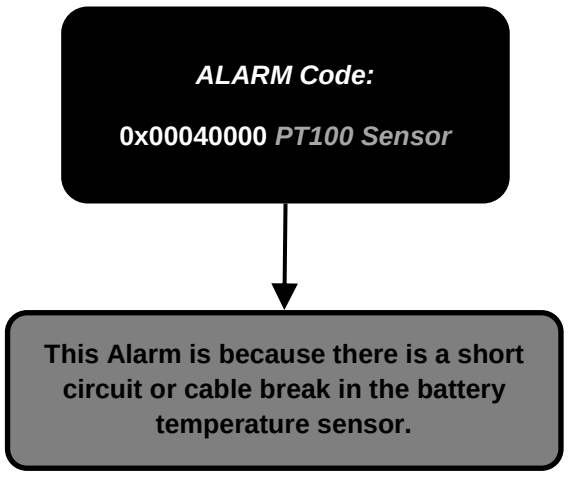
4.16 Alarm 0x00010000: Overload in AC Loads Port. Stop Events 11 and 12.



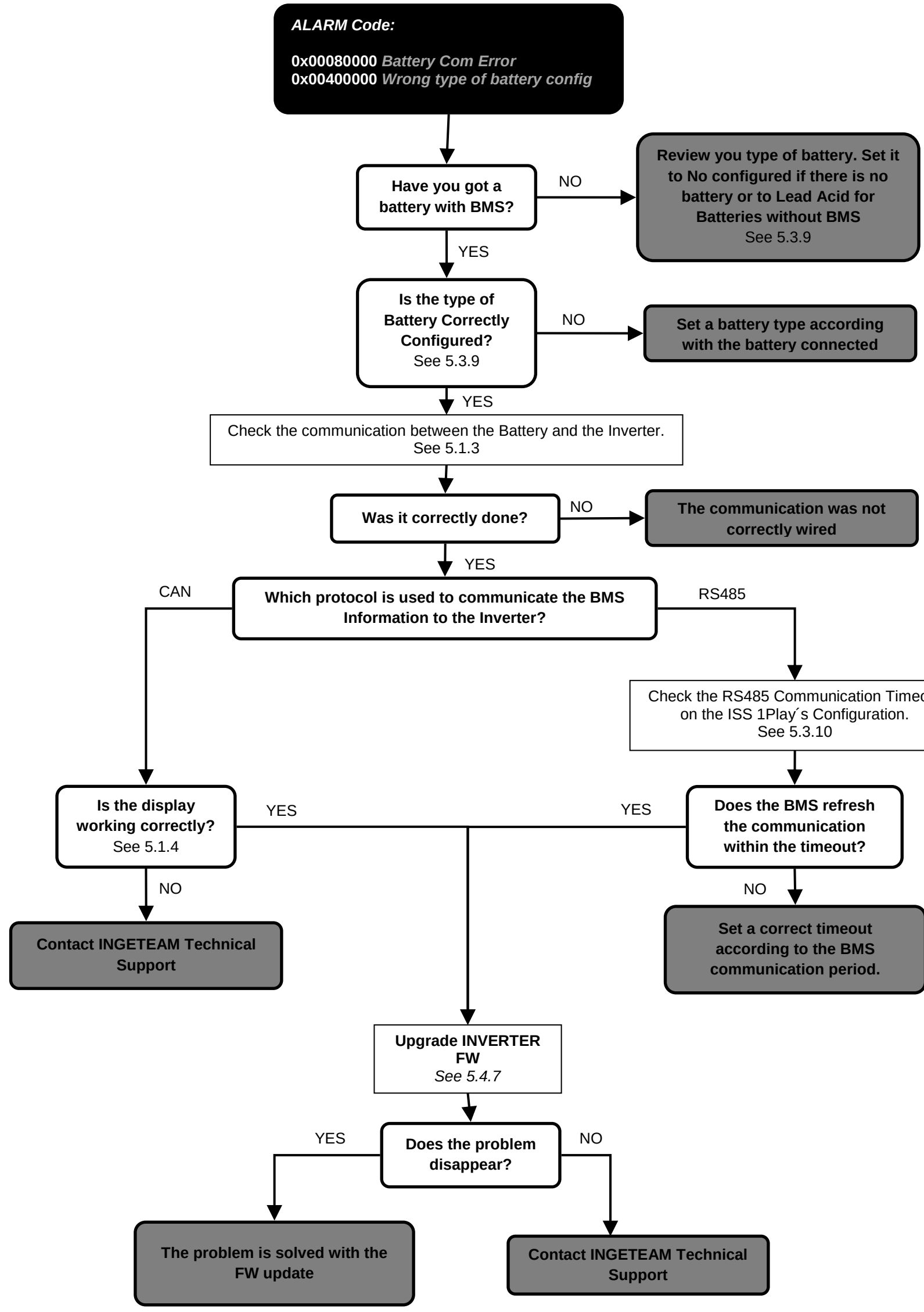
4.17 Alarm 0x00020000: Short circuit in AC Loads. Stop Event 13.



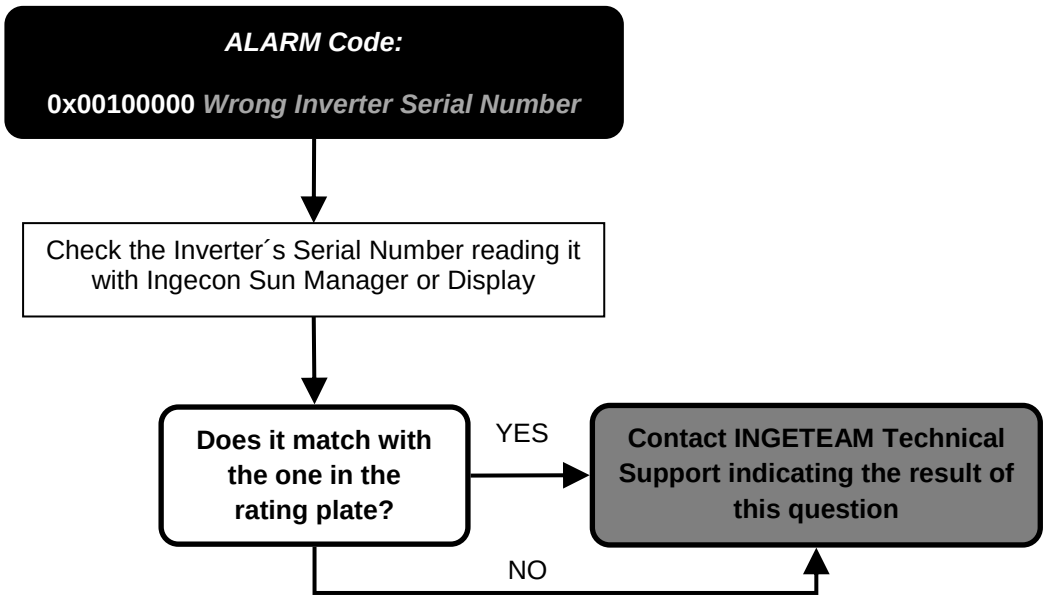
4.18 Alarm 0x00040000: PT100 Temperature sensor.



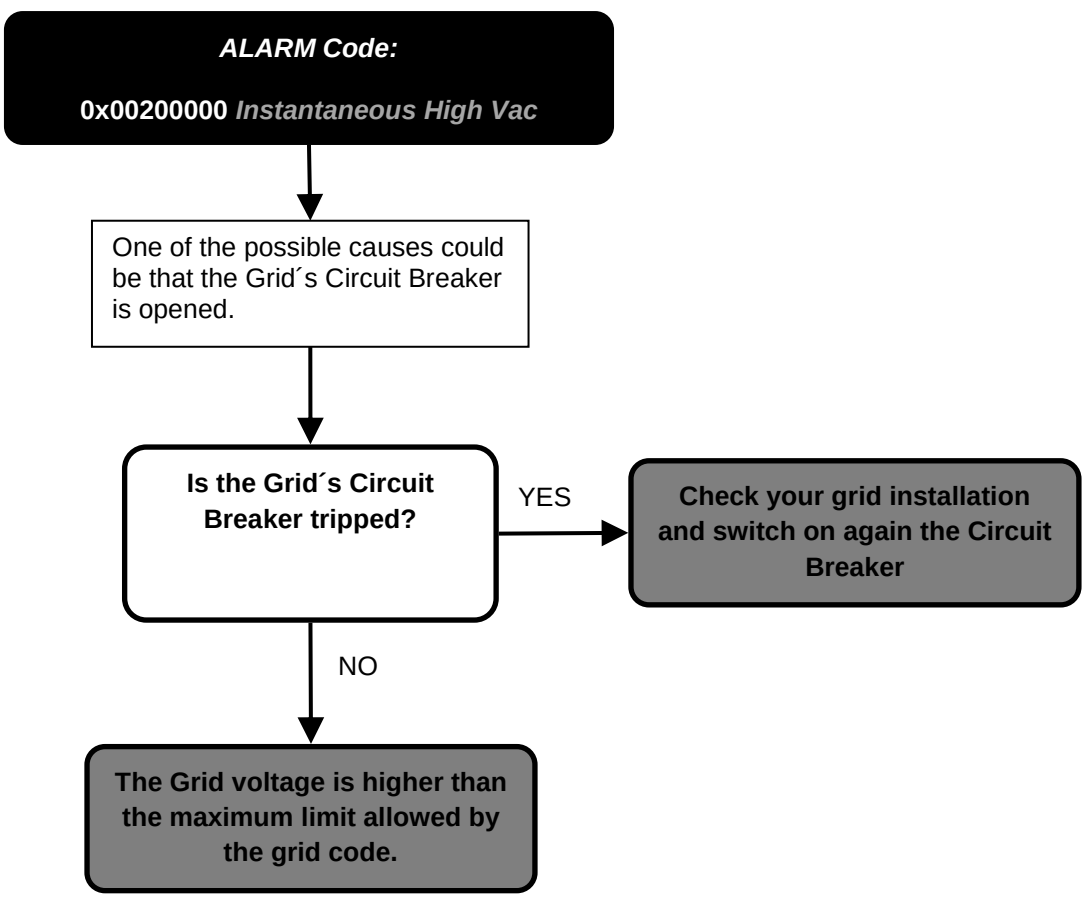
4.19 Alarm 0x00080000 and 0x00400000: Communication Error with the BMS.



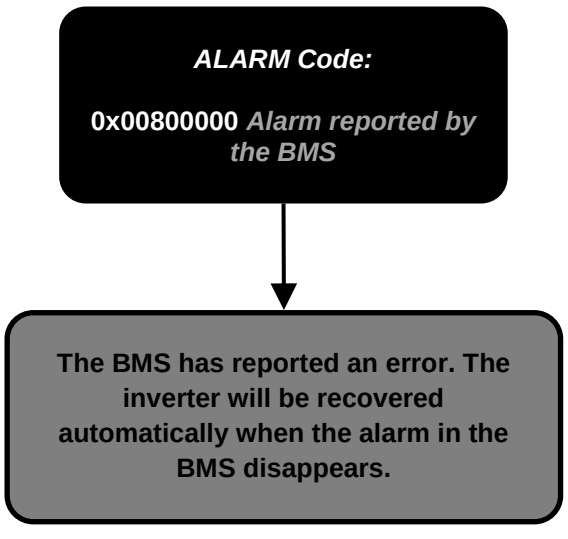
4.20 Alarm 0x00100000: Wrong Inverter Serial Number.



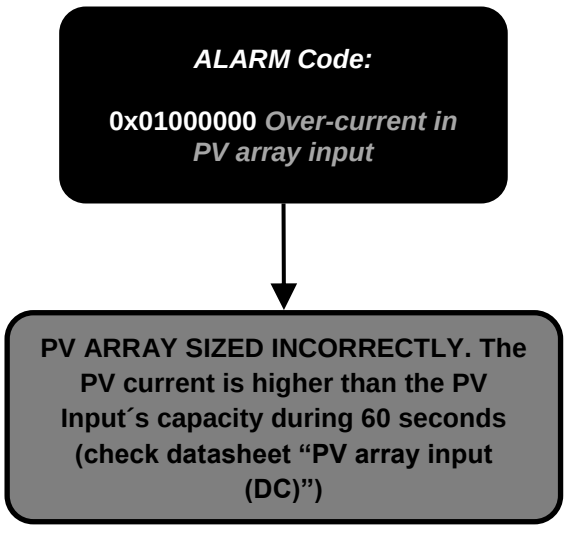
4.21 Alarm 0x00200000: High Instantaneous Grid Voltage. Stop Event 5.



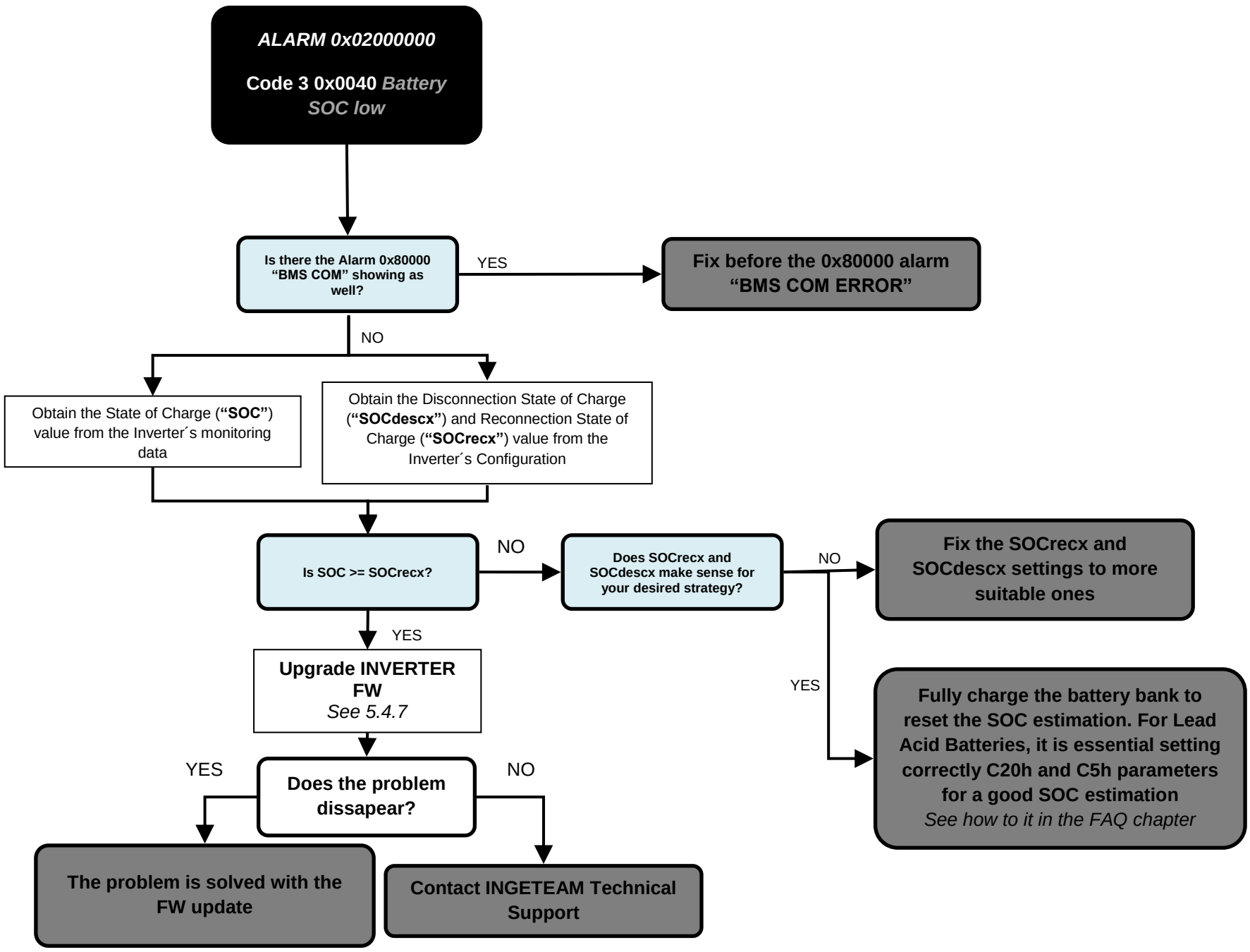
4.22 Alarm 0x00800000: Alarm in the BMS. Stop Event 30. Code 2 0x2000



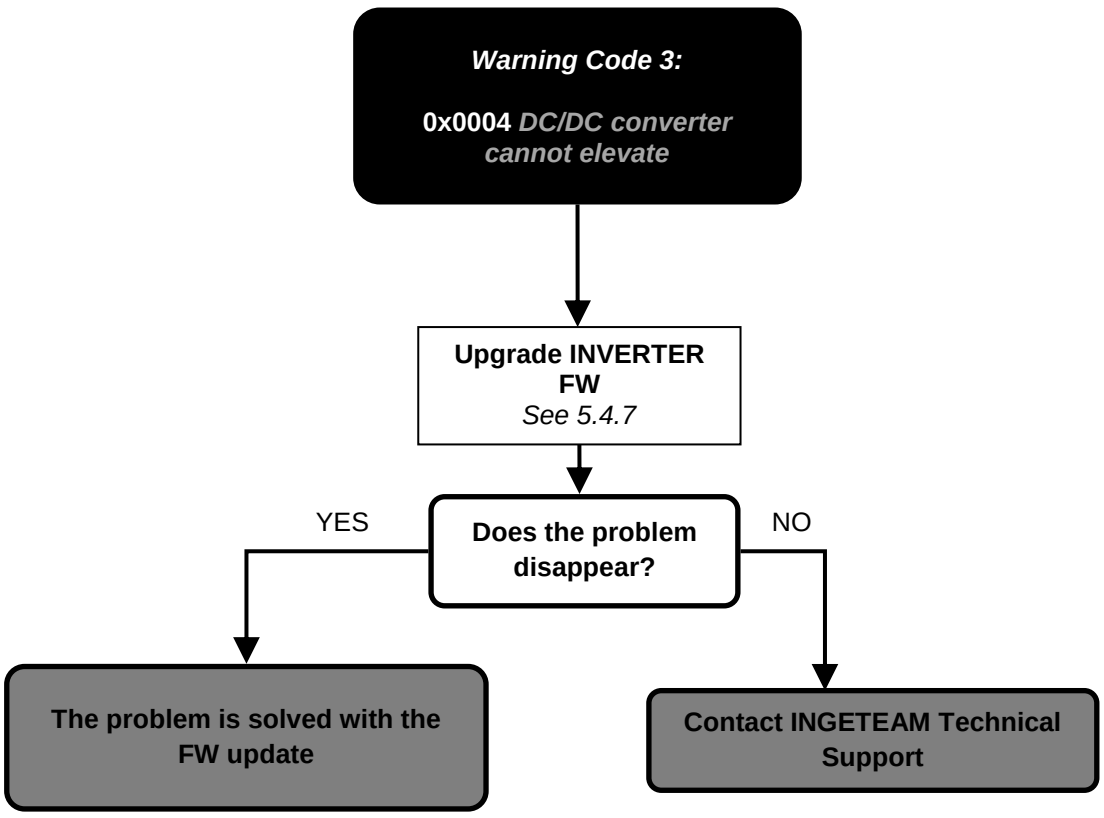
4.23 Alarm 0x01000000: Overcurrent in PV array input. Stop Event 11.



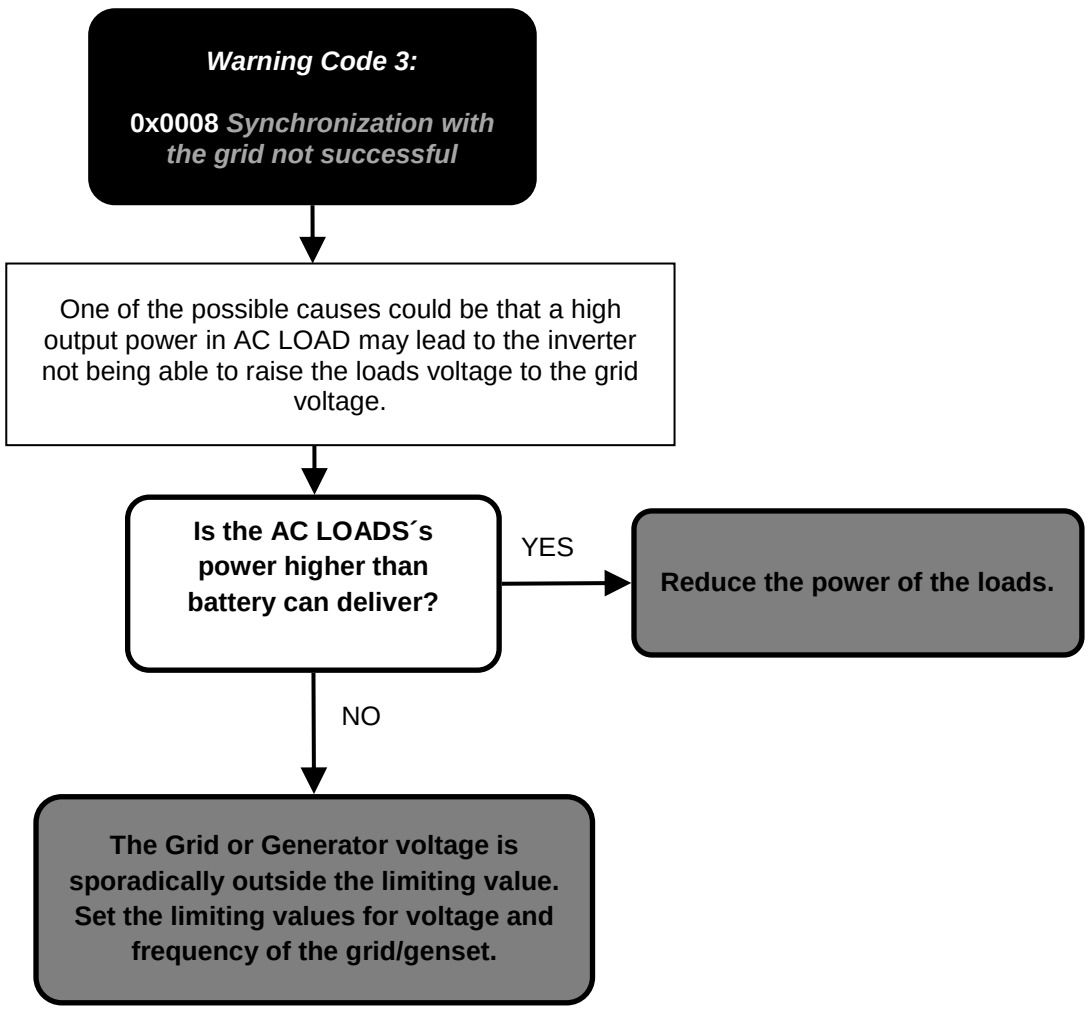
4.24 Alarm 0x02000000, Code 3 0x0040: Stop Event 1 Battery SOC Low (SOCdescx).



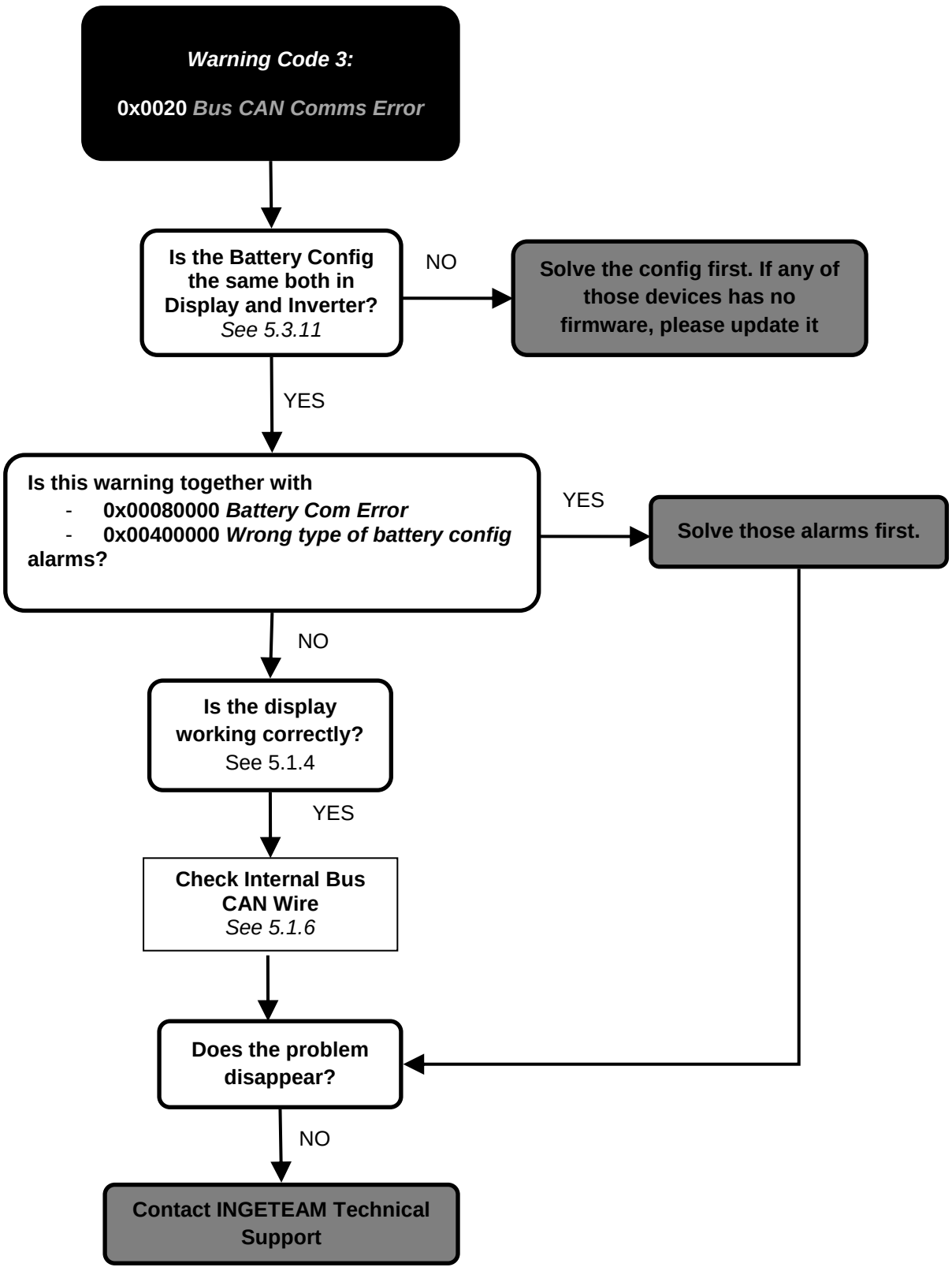
4.25 Warning: Code 3 0x0004: DC/DC converter cannot elevate.



4.26 Warning: Code 3 0x0008: Synchronization with the grid not successful.



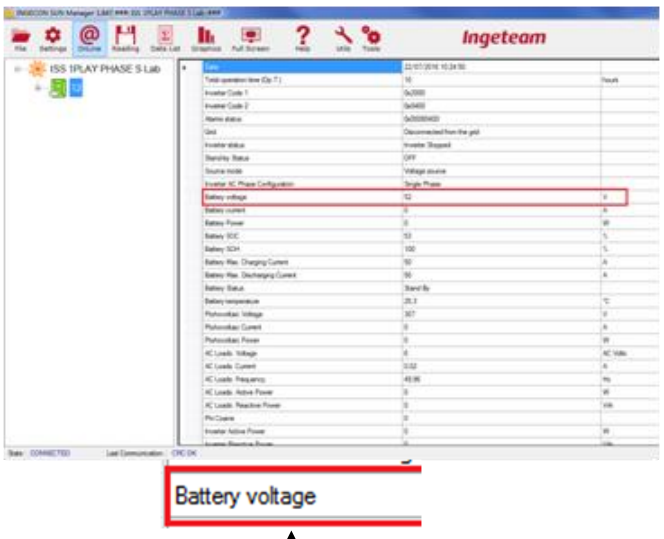
4.27 Warning: Code 3 0x0020: Bus CAN Communication Error.



5 TRAINING INSTRUCTIONS

5.1 CHECKING MEASURES

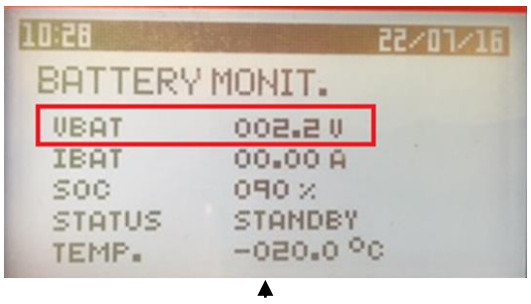
5.1.1 Inverter measures Vbat measurement is correct?



Stop the inverter

Access inside the inverter

Measure the Battery Voltage with a polimeter.
See 5.2.1 instructions



Read trough ISM or DISPLAY the **inverter measurement Vbat**

Calculate the **inverter measurement error**

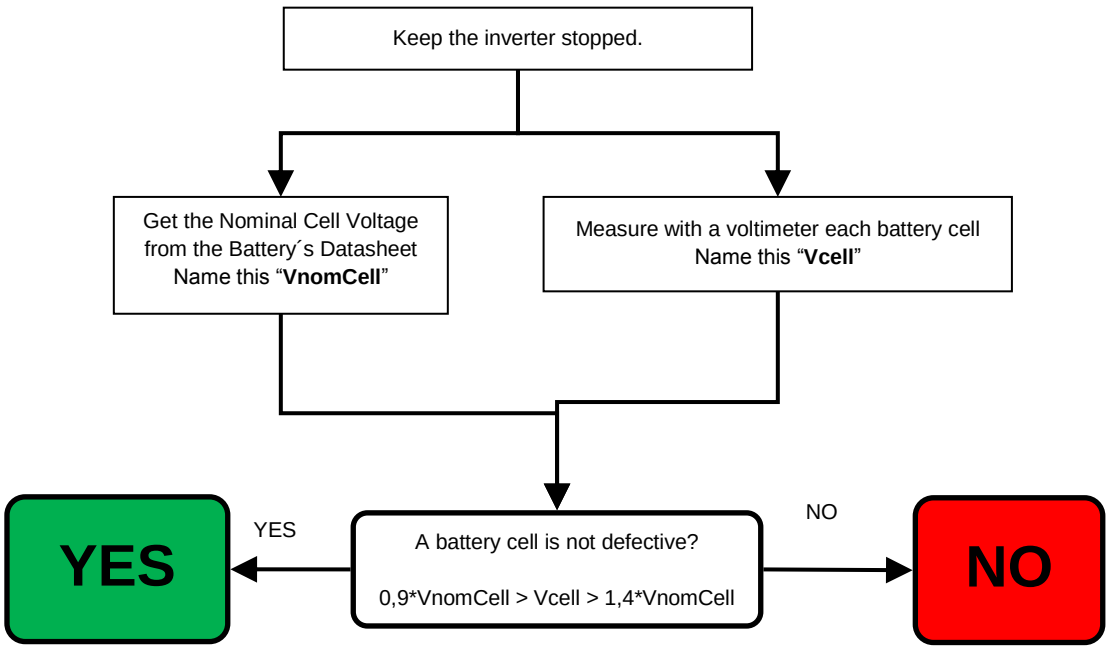
$$\%Error = \left(1 - \frac{Multimeter\ measurement}{Inverter\ measurement}\right) \cdot 100$$

$|\%Error| < 1\%$?

YES

NO

5.1.2 All battery cells are functional?



5.1.3 Check the communication between de battery and the inverter.

The communication between the battery and the ISS 1Play can be with CAN or RS485 Protocol.

Batteries with CAN Protocol

This point asks for reviewing the wiring of the CAN communication between the battery and the inverter. For a correct communication the following points must be all right:

- The battery and the inverter must be switched ON.
- The wiring must be well connected. Check the "Installation and Operation Manual" of the Inverter to see in which position are placed. Compare it with the Battery´s BMS´s wire convention.
  For some batteries, such as LG Resu model, Ingeteam released a dedicated commissioning guide. For getting those guides, Contact with Ingeteam Technical Service.

Depending on the CAN Battery connector, the text on the PCB change.

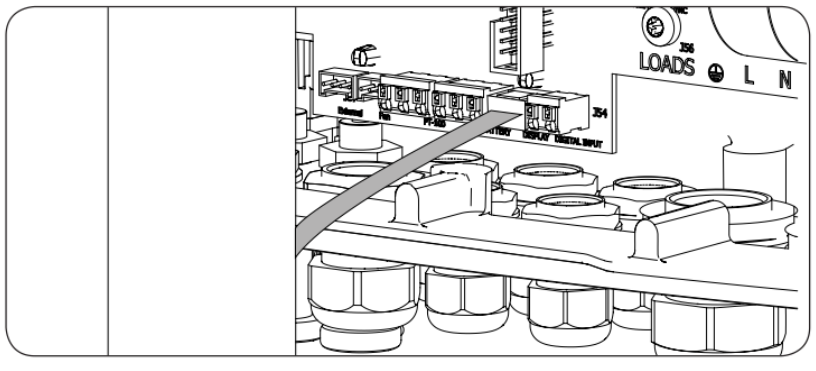
Batteries with RS485 Protocol

For a correct communication the following points must be all right:

- The battery and the inverter must be switched ON.
- The RS485 wiring must be well connected in the Inverter´s communication board. For further details, Contact Ingeteam Technical Service.

5.1.4 Check that the display is working correctly.

The display is connected to the inverter´s Printed Circuit Board through a set of wires to provide the electrical power supply and the CAN communication.

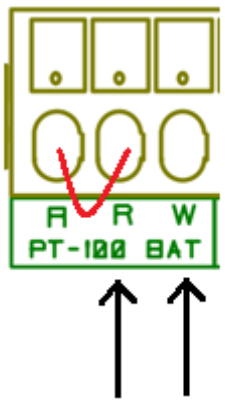


When a display is not working correctly, it is not turned on or just after turning on it starts with the hour at "00:00".

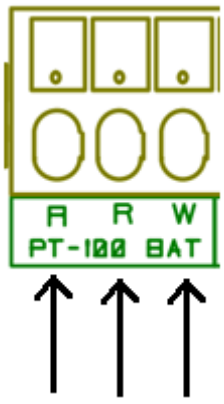
5.1.5 Check the battery temperature sensor (PT100).

This point asks for reviewing the wiring of the battery temperature sensor. For a correct temperature of the battery bank the following points must be all right:

- The wiring must be well connected. Check the “Installation and Operation Manual” of the Inverter to see in which position are placed.
- If the type of PT100 sensor is 2-wires, it is necessary short circuit the R-R pins and the PT100 (2-wires) is installed between R-W pins.

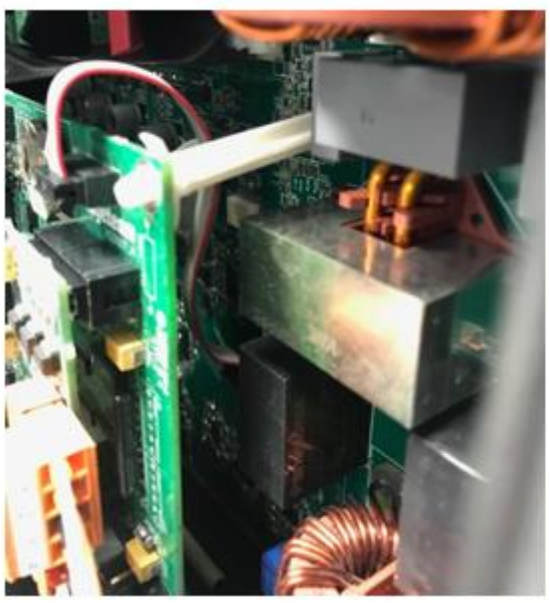


- If the type of PT100 sensor is 3-wires, the PT100 is installed in R-R-W pins.



5.1.6 Check internal CAN Bus Wire.

The internal CAN Bus Wire connects the main PCB (connector J14) to the control PCB (connector J19). Check that this wire is OK.



5.2 MEASUREMENTS ON INVERTER

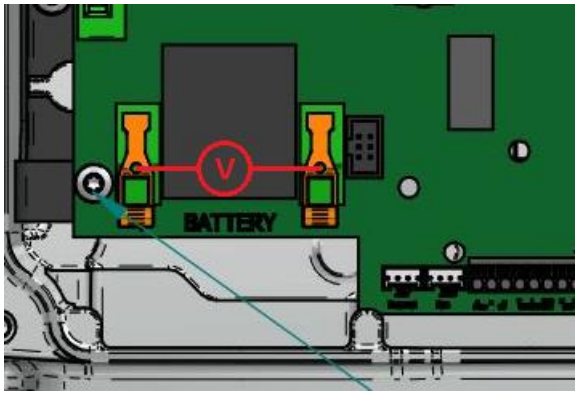
NOTE: The multimeter have to be connected on the measuring points during the entire process, calibration or checking inverter measures.

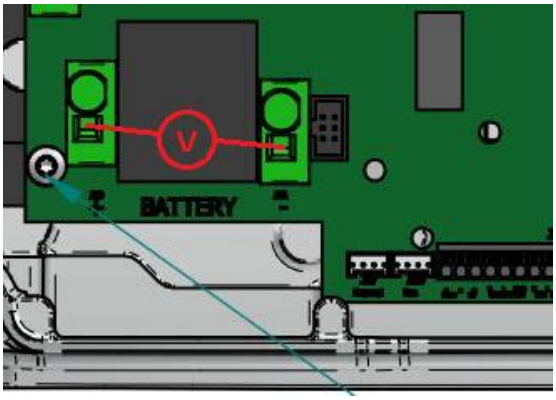
Insert and remove the multimeter on these points could affect the measures because of its internal impedance.

All the measurements must be done with the inverter powered up, if other thing is not expressly indicated. See the Safety Requiremets in the annex.

5.2.1 Measure the Battery Voltage with a voltimeter on the Inverter´s terminals.

Depending on the type of Battery Connector, the test point to place the voltimeter changes:

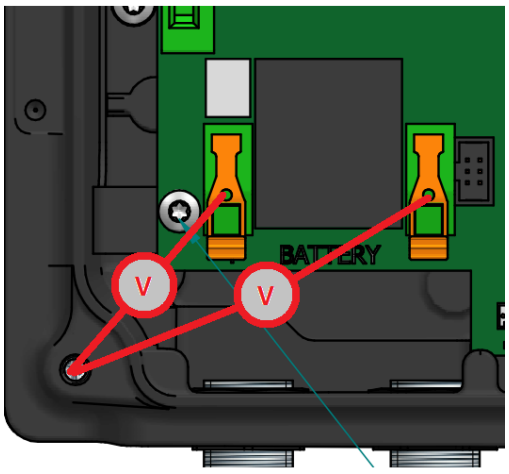


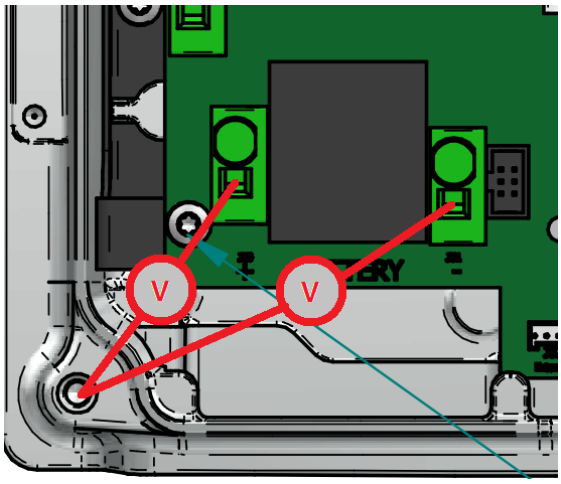


5.2.2 Check the Battery´s Insulation.

This measuremen´st goal is to check the voltage between the Positive and Negative to Ground.

Depending on the type of Battery Connector, the test point to place the voltimeter changes:





5.2.3 Measure PV panel´s open circuit Voltage.

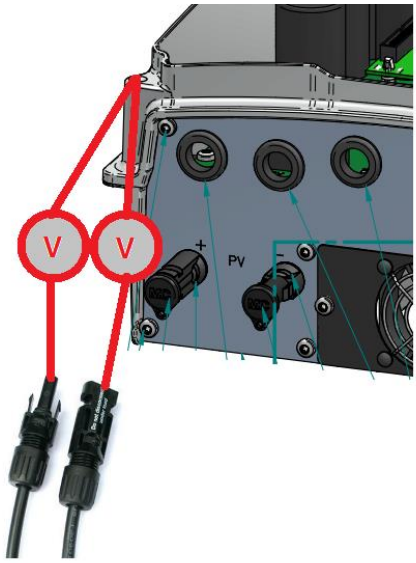
In order to have an accessible point to place the voltimeter´s probe, it is recommended to disconnect the multicontacts. To avoid an electric arc, put before the disconnection the inverter in Manual Stop.

Measure the voltage between the two Multicontact aereal conectors.

5.2.4 Check the PV Array´s Insulation.

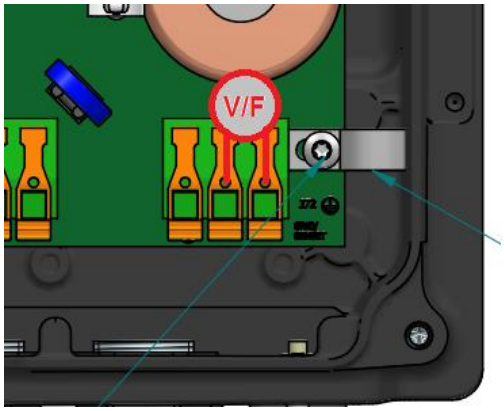
This measurement´s goal is to check the voltage between the Positive and Negative to Ground.

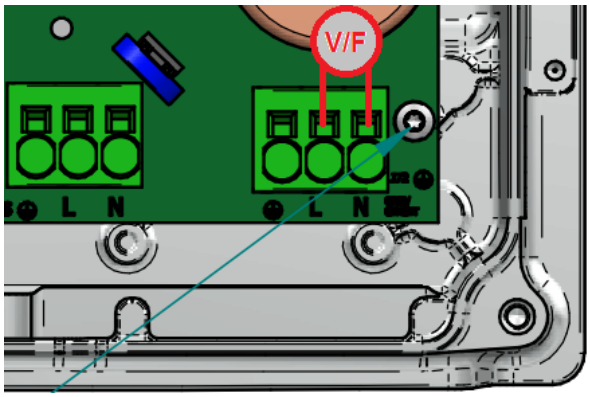
In order to have an accessible point to place the voltimeter´s probe, it is recommended to disconnect the multicontacts. To avoid an electric arc, put before the disconnection the inverter in Manual Stop.



5.2.5 Measure the Grid/Genset Voltage and Frequency on the Inverter´s terminals.

Depending on the type of Grid Connector, the test point to place the voltimeter changes:

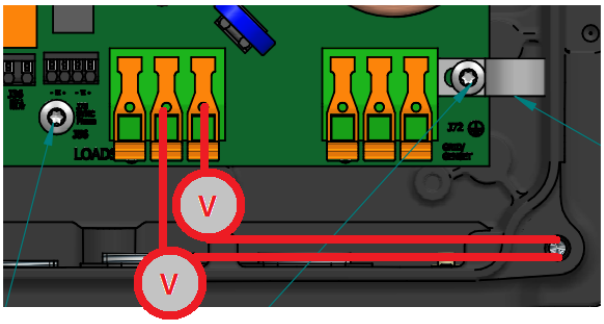


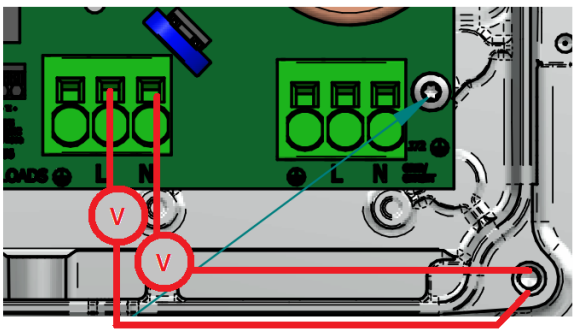


5.2.6 Check the Load Port´s Insulation.

This measurement´s goal is to check the voltage between the Line and Neutral to Ground.

Depending on the type of Battery Connector, the test point to place the voltimeter changes:

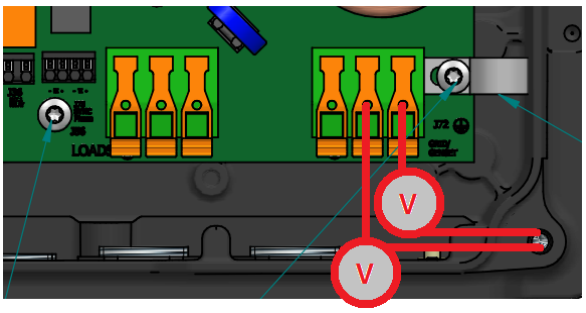


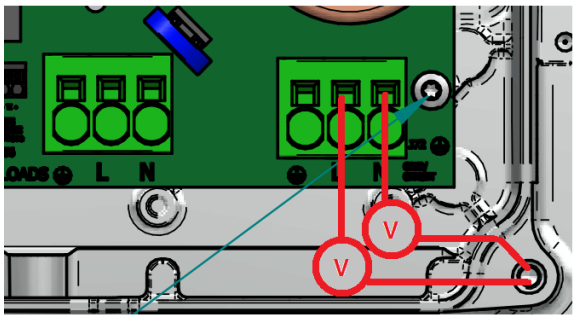


5.2.7 Check the Grid/Genset Port´s Insulation

This measurement´s goal is to check the voltage between the Line and Neutral to Ground.

Depending on the type of Battery Connector, the test point to place the voltimeter changes:

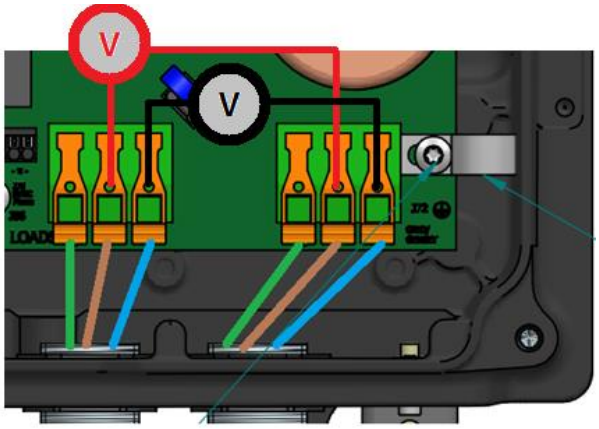


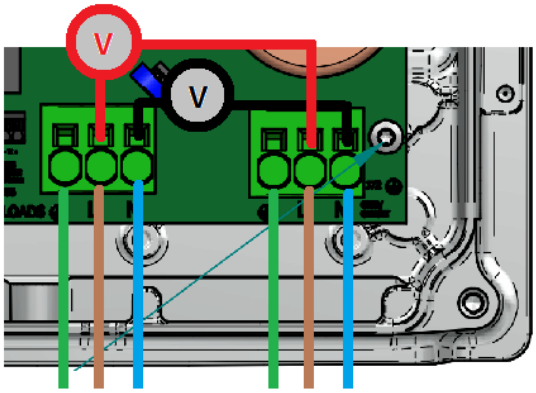


5.2.8 Measure the Voltage between Loads and Grid/Genset Ports

Measure the Voltage between Loads and Grid/Genset Ports. Do it without disconnecting the Loads Port and Grid/Genset Port´s wires but with the inverter in Manual Stopped (Very Important!).

Depending on the type of Battery Connector, the test point to place the voltimeter changes:



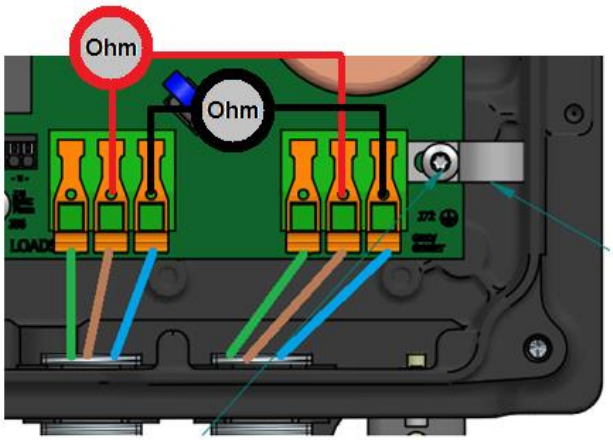


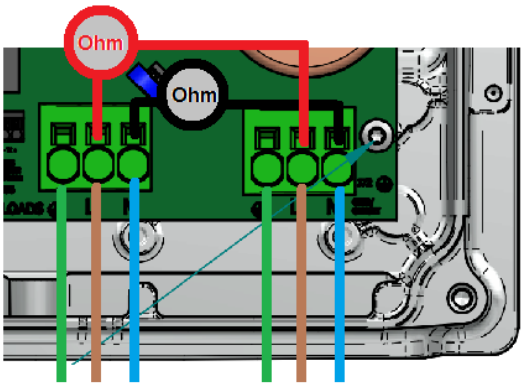
With the voltmeter in red is measured the L-L and with the one in black the N-N

5.2.9 Measure the Impedance between Loads and Grid/Genset Ports

Measure the Impedance between Loads and Grid/Genset Ports. Do it without disconnecting the Loads Port and Grid/Genset Port´s wires but with the inverter in **Manual Stopped (Very Important!).**

Depending on the type of Battery Connector, the test point to place the voltimeter changes:





With the ohmeter in red is measured the L-L and with the one in black the N-N

5.2.10 Measure the DC/AC Inductor´s Current.

Embrace the wire of the picture with a current probe:

5.3 BASIC CONFIGURATION CHANGES

5.3.1 Set COUNTRY/REGULATION

Select the country where the inverter will be installed. If the country is not on the list, select Worldwide. Then, select the applicable regulation.

This can be done using the “Ingecon Sun Manager” software package (downloadable on www.ingeteam.com) or through the display:

Using Ingecon Sun Manager:

Settings → 4.- GRID SETTINGS

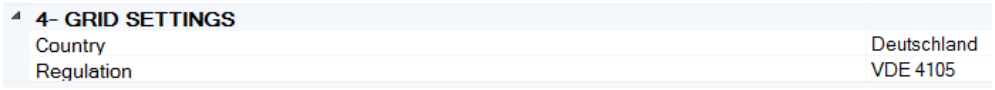


Figure 1: Country Regulation Selection on Ingecon Sun Manager

Click on the “Send” button. A screen informing that the configuration was successfully saved must appear when the settings are correctly applied to the inverter.

Using Display:

To perform any configuration change through the display, the required installer password must be entered on:

MAIN MENU > CONFIGURATION > ENTER PASSWORD

The password (0332) is indicated on the “Installation and Operation Manual”, on the chapter dedicated to configuration.

When the permission is given, go to:

MAIN MENU > CONFIGURATION > GRID/GENSET > TYPE OF GRID > GRID > COUNTRY REGULATION

Confirm the desired selection by pressing the “OK” button. A message to confirm the modification will pop up. A final screen that shows that the process has been completed will be shown on the display.

5.3.2 Set TYPE OF GRID

Select the type of grid that the ISS 1PLAY STORAGE is connected to in this moment.

This can be done using the “Ingecon Sun Manager” software package (downloadable on www.ingeteam.com) or through the display:

Using Ingecon Sun Manager:

Settings → 2.-AC INSTALLATION TYPE: Type of Grid

Click on the “Send” button. A screen informing that the configuration was successfully saved must appear when the settings are correctly applied to the inverter.

Using Display:

To perform any configuration change through the display, the required installer password must be entered on:

MAIN MENU > CONFIGURATION > ENTER PASSWORD

The password (0332) is indicated on the “Installation and Operation Manual”, on the chapter dedicated to configuration.

When the permission is given, go to:

MAIN MENU > CONFIGURATION > GRID/GENSET > TYPE OF GRID

Confirm the desired selection by pressing the “OK” button. A message to confirm the modification will pop up. A final screen that shows that the process has been completed will be shown on the display.

5.3.3 Set NOMINAL VAC AND FAC

Selecting a correct nominal AC Voltage and Frequency are essential because otherwise some malfunctionings may occur.

This can be done using the “Ingecon Sun Manager” software package (downloadable on www.ingeteam.com) or through the display:

Using Ingecon Sun Manager:

Settings → 2.- AC INSTALLATION TYPE: Nominal Voltage

Settings → 2.- AC INSTALLATION TYPE: Nominal Frequency

Click on the “Send” button. A screen informing that the configuration was successfully saved must appear when the settings are correctly applied to the inverter.

Using Display:

To perform any configuration change through the display, the required installer password must be entered on:

MAIN MENU > CONFIGURATION > ENTER PASSWORD

The password (0332) is indicated on the “Installation and Operation Manual”, on the chapter dedicated to configuration.

When the permission is given, go to:

MAIN MENU > CONFIGURATION > INVERTER > RMS VOLTAGE

MAIN MENU > CONFIGURATION > INVERTER > FREQUENCY

Confirm the desired selection by pressing the “OK” button. A message to confirm the modification will pop up. A final screen that shows that the process has been completed will be shown on the display.

5.3.4 Set GENERATOR VAC/FAC SETTINGS

Selecting a correct AC Voltage and Frequency Limits are essential for avoiding malfunctioning and protecting the genset.

This can be done using the “Ingecon Sun Manager” software package (downloadable on www.ingeteam.com) or through the display:

Using Ingecon Sun Manager:

Settings → 3.- GENERATOR SETTINGS

Set there the Generator parameters according to the one you are using.

Click on the “Send” button. A screen informing that the configuration was successfully saved must appear when the settings are correctly applied to the inverter.

Using Display:

To perform any configuration change through the display, the required installer password must be entered on:

MAIN MENU > CONFIGURATION > ENTER PASSWORD

The password (0332) is indicated on the “Installation and Operation Manual”, on the chapter dedicated to configuration.

When the permission is given, go to:

MAIN MENU > CONFIGURATION > GRID/GENSET > TYPE OF GRID > GENERATOR

Set there the Generator parameters according to the one you are using.

Confirm the desired selection by pressing the “OK” button. A message to confirm the modification will pop up. A final screen that shows that the process has been completed will be shown on the display.

5.3.5 Set GRID VAC/FAC SETTINGS

Selecting a correct AC Voltage and Frequency Limits are essential for avoiding malfunctioning and complying with the grid standard.

This can be done using the “Ingecon Sun Manager” software package (downloadable on www.ingeteam.com) or through the display:

Using Ingecon Sun Manager:

Settings → 4- GRID SETTINGS

Check all that are the Grid Settings are correct. Bear in mind that the values are referred to the Nominal Voltage and Frequency.

Click on the “Send” button. A screen informing that the configuration was successfully saved must appear when the settings are correctly applied to the inverter.

Using Display:

To perform any configuration change through the display, the required installer password must be entered on:

MAIN MENU > CONFIGURATION > ENTER PASSWORD

The password (0332) is indicated on the “Installation and Operation Manual”, on the chapter dedicated to configuration.

When the permission is given, go to:

MAIN MENU > CONFIGURATION > GRID/GENSET > TYPE OF GRID > GRID >V/F SETTINGS

Check all that all the Grid Settings are correct and then confirm the desired selection by pressing the “OK” button. A message to confirm the modification will pop up. A final screen that shows that the process has been completed will be shown on the display.

5.3.6 Set BATTERY CAPACITY VALUES (C20h and C5h)

In the batteries without Battery Management System (BMS), such as the Lead Acid ones, the State of Charge (SOC) estimation must be made by the inverter. In order to do it correctly, it is essential setting correctly the C20h and C5h parameters.

This can be done using the "Ingecon Sun Manager" software package (downloadable on www.ingeteam.com) or through the display:

Using Ingecon Sun Manager:

Settings → 4- GRID SETTINGS

Check all that are the Grid Settings are correct. Bear in mind that the values are referred to the Nominal Voltage and Frequency.

Click on the "Send" button. A screen informing that the configuration was successfully saved must appear when the settings are correctly applied to the inverter.

Using Display:

To perform any configuration change through the display, the required installer password must be entered on:

MAIN MENU > CONFIGURATION > ENTER PASSWORD

The password (0332) is indicated on the "Installation and Operation Manual", on the chapter dedicated to configuration.

When the permission is given, go to:

MAIN MENU > CONFIGURATION > GRID/GENSET > TYPE OF GRID > GRID >V/F SETTINGS

Check all that all the Grid Settings are correct and then confirm the desired selection by pressing the "OK" button. A message to confirm the modification will pop up. A final screen that shows that the process has been completed will be shown on the display.

5.3.7 Set Inverter´s configuration for the AC Phase of the Inverter

This parameter indicates if the inverter is installed in a Single Phase Installation or in a Three Phase One.

In the last case, the phase in which the inverter is installed must be specified (R,S,T). So it must be checked in the 3 inverters.

This can be done using the "Ingecon Sun Manager" software package (downloadable on www.ingeteam.com) or through the display:

Using Ingecon Sun Manager:

Settings → 2- AC INSTALLATION TYPE → AC Phase Inverter

Click on the "Send" button. A screen informing that the configuration was successfully saved must appear when the settings are correctly applied to the inverter.

Using Display:

To perform any configuration change through the display, the required installer password must be entered on:

MAIN MENU > CONFIGURATION > ENTER PASSWORD

The password (0332) is indicated on the “Installation and Operation Manual”, on the chapter dedicated to configuration.

When the permission is given, go to:

MAIN MENU > CONFIGURATION > INVERTER > AC PHASE

Check all that all the Grid Settings are correct and then confirm the desired selection by pressing the “OK” button. A message to confirm the modification will pop up. A final screen that shows that the process has been completed will be shown on the display.

5.3.8 Check and Change BATTERY´S MAXIMUM DISCHARGING CURRENT SETTING

Reading the Maximum Discharging current for the Battery

Read the Input Register 30021. It can be done with the Manager searching the name “Battery.Max.Discharging Current” in Online Data Section.

Changing the Maximum Discharging current for the Battery

The Maximum Discharging Current is specified in the configuration for Lead Acid Batteries (Using Ingecon Sun Manager: Settings → 1.1. - Lead Acid Battery Settings: Max Discharge current) or is given by the BMS for Lithium Batteries.

5.3.9 Set TYPE OF BATTERY

It is required to set the DC Source type. Select the following options:

- NO CONFIGURATION: If you don´t have a Battery Connected or it is no longer in use.
- LEAD ACID: For Lead Acid Batteries. They don´t need communications.
- OTHERS: There is a List of Approved Lithium-Ion Batteries with Ingecon Sun Storage 1PLAY. All of them needs communication to indicate to the Inverter the BMS data.

This can be done using the “Ingecon Sun Manager” software package (downloadable on www.ingeteam.com) or through the display:

Using Ingecon Sun Manager:

Settings → 1-.DC BATTERY TYPE: Type of Battery.

Figure 2: DC Source selection on Ingecon Sun Manager.

Click on the “Send” button. A screen informing that the configuration was successfully saved must appear when the settings are correctly applied to the inverter.

Using Display:

To perform any configuration change through the display, the required installer password must be entered on:

MAIN MENU > CONFIGURATION > ENTER PASSWORD

The password (0332) is indicated on the “Installation and Operation Manual”, on the chapter dedicated to configuration.

When the permission is given, go to:

MAIN MENU > CONFIGURATION > BATTERY

Confirm the desired selection by pressing the “OK” button. A message to confirm the modification will pop up. A final screen that shows that the process has been completed will be shown on the display.

5.3.10 Check the RS485 Communication Timeout.

For Batteries that use RS485 protocol, it is necessary updating the communication within the configured Timeout.

This timeout can be checked or configured with Ingecon Sun Manager.

Settings → 8.1-.Communication Settings: Timeout for Grid Support Limit

The default value is 1800 ms.

Click on the “Send” button. A screen informing that the configuration was successfully saved must appear when the settings are correctly applied to the inverter.

5.3.11 Check Battery Type Config

In this point, the battery type config must be check both in the Inverter and Display. The 2 settings must share the same battery type.

Inverter config using Ingecon Sun Manager:

Settings → 1-.DC BATTERY TYPE: Type of Battery

Using the Display:

MAIN MENU > CONFIGURATION > BATTERY

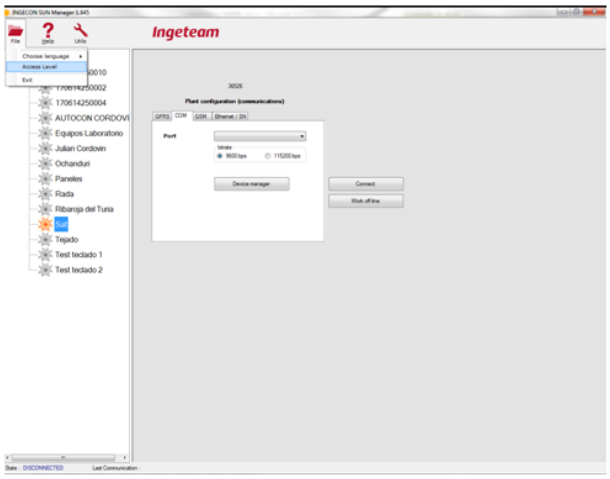
In case of incorrect settings, change them to the correct one.

5.4 BASIC INSTRUCTIONS INGECON SUN MANAGER (ISM)

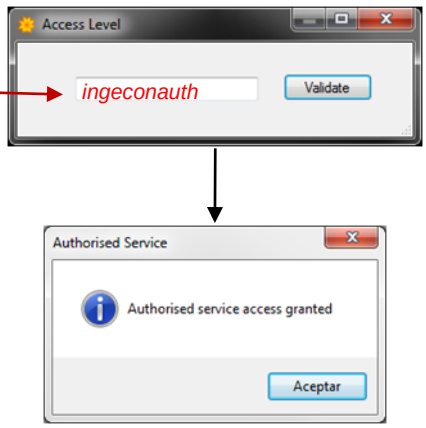
5.4.1 Access ISM as Service Level

This is the first step to access to the instructions mentioned in the document

Acces as Sevice Level ***FILE → ACCESS LEVEL***

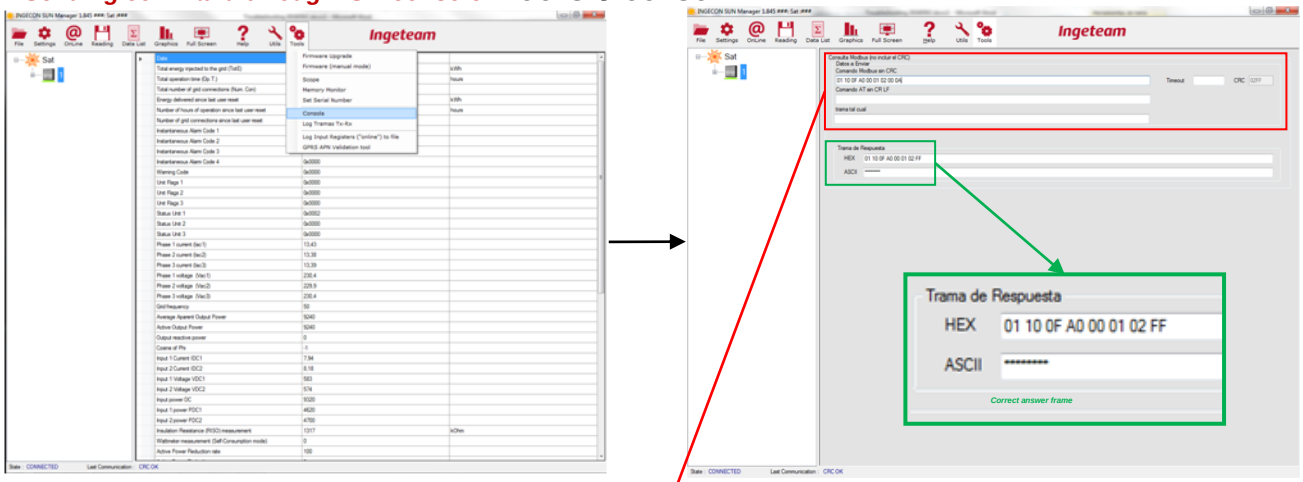


Password



5.4.2 Sending MODBUS COMANDS via ISM

Sending command through ISM console ***TOOLS → CONSOLA***

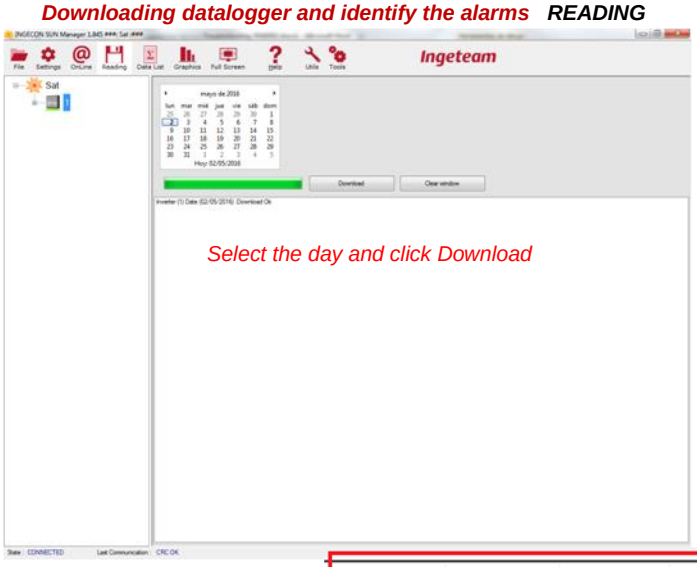


Ej: Inverter Node 1

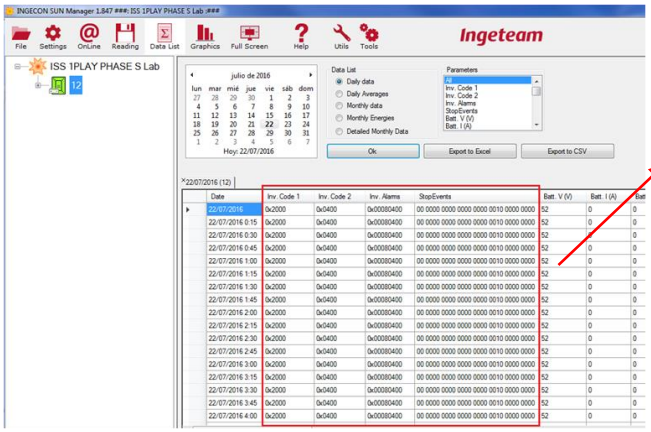
(*)Inverter node number HEXADECIMAL

5.4.3 Downloading datalogger through ISM

Downloading datalogger and identify the alarms ***READING***



Showing datalogger trough ISM ***DATA LIST***

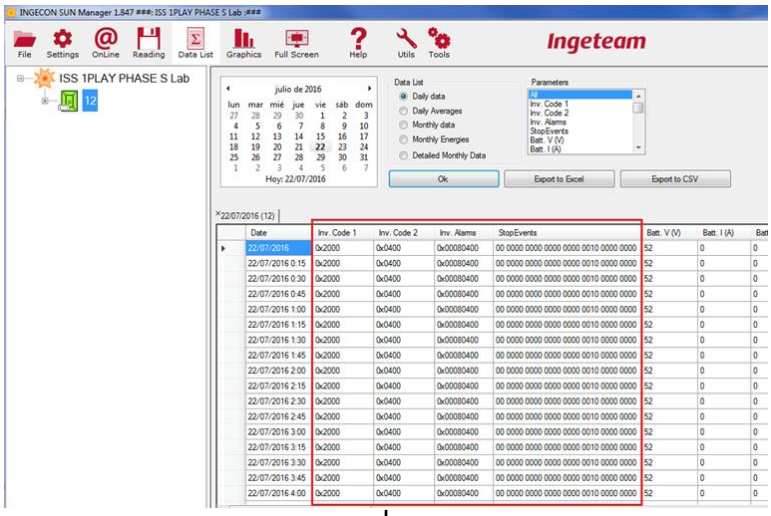


Inv. Code 1	Inv. Code 2	Inv. Alarms	StopEvents
0x2000	0x0400	0x00080400	00 0000 0000 0000 0000 0010 0000 0000
0x2000	0x0400	0x00080400	00 0000 0000 0000 0000 0010 0000 0000
0x2000	0x0400	0x00080400	00 0000 0000 0000 0000 0010 0000 0000
0x2000	0x0400	0x00080400	00 0000 0000 0000 0000 0010 0000 0000
0x2000	0x0400	0x00080400	00 0000 0000 0000 0000 0010 0000 0000
0x2000	0x0400	0x00080400	00 0000 0000 0000 0000 0010 0000 0000
0x2000	0x0400	0x00080400	00 0000 0000 0000 0000 0010 0000 0000
0x2000	0x0400	0x00080400	00 0000 0000 0000 0000 0010 0000 0000
0x2000	0x0400	0x00080400	00 0000 0000 0000 0000 0010 0000 0000
0x2000	0x0400	0x00080400	00 0000 0000 0000 0000 0010 0000 0000
0x2000	0x0400	0x00080400	00 0000 0000 0000 0000 0010 0000 0000
0x2000	0x0400	0x00080400	00 0000 0000 0000 0000 0010 0000 0000
0x2000	0x0400	0x00080400	00 0000 0000 0000 0000 0010 0000 0000
0x2000	0x0400	0x00080400	00 0000 0000 0000 0000 0010 0000 0000
0x2000	0x0400	0x00080400	00 0000 0000 0000 0000 0010 0000 0000
0x2000	0x0400	0x00080400	00 0000 0000 0000 0000 0010 0000 0000
0x2000	0x0400	0x00080400	00 0000 0000 0000 0000 0010 0000 0000
0x2000	0x0400	0x00080400	00 0000 0000 0000 0000 0010 0000 0000
0x2000	0x0400	0x00080400	00 0000 0000 0000 0000 0010 0000 0000
0x2000	0x0400	0x00080400	00 0000 0000 0000 0000 0010 0000 0000

Alarm, Codes and StopEvents

5.4.4 Identify STOP REASON through ISM

Identify STOP REASON ***Data List → Datalogger***



Date	Inv. Code 1	Inv. Code 2	Inv. Alarms	StopEvents
22/07/2016	0x2000	0x0400	0x00080400	00 0000 0000 0000 0000 0010 0000 0000
22/07/2016 0:15	0x2000	0x0400	0x00080400	00 0000 0000 0000 0000 0010 0000 0000
22/07/2016 0:30	0x2000	0x0400	0x00080400	00 0000 0000 0000 0000 0010 0000 0000

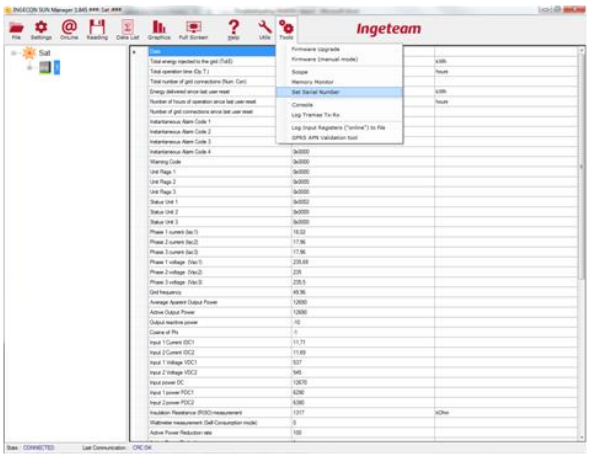
Stop events field is a 30 bit variable. Each bit defines a stop reason, starting from the least significant bit (LSB).

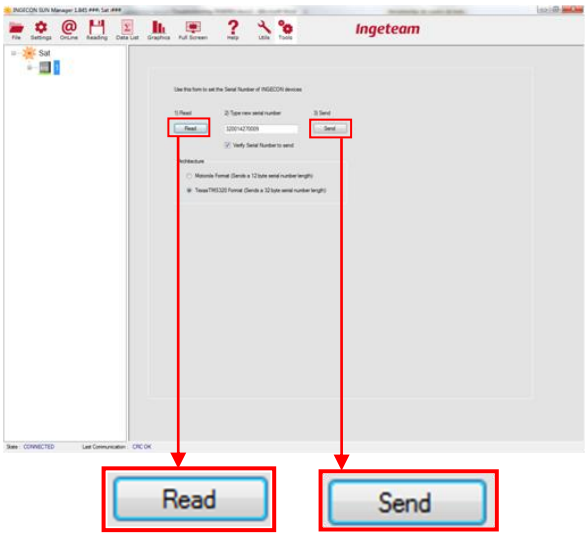
NOTE: the first bit means the first stop reason

Example, in the picture above the stop reason 10 is indicated.

5.4.5 Read/Set the INVERTER SERIAL NUMBER through ISM

Read/Set the serial number ***TOOLS → SET SERIAL NUMBER***





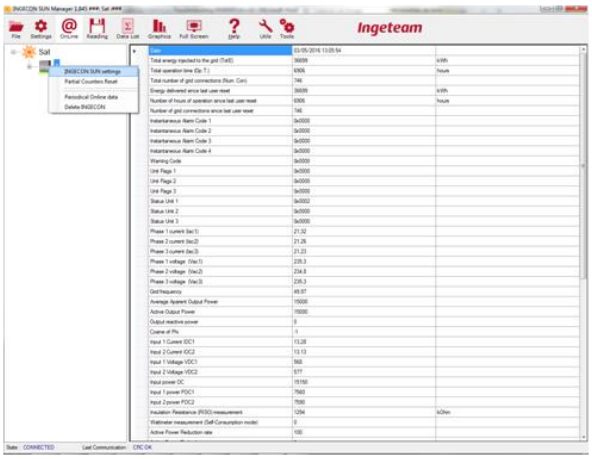
To send a new S/N

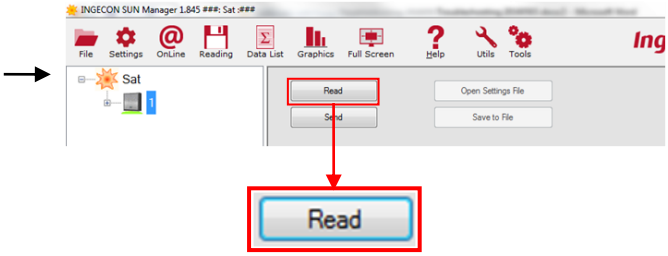
NOTE: All configuration parameters will be erased

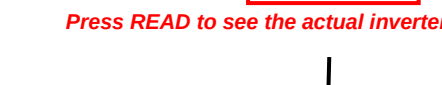
After changing de S/N the inverter configuration must be reloaded

5.4.6 Read/Set CONFIGURATION PARAMETERS trough ISM

Read INGECON SUN Settings Right click on INVERTER → INGECON SUN settings

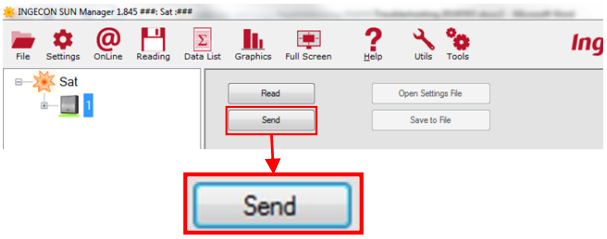






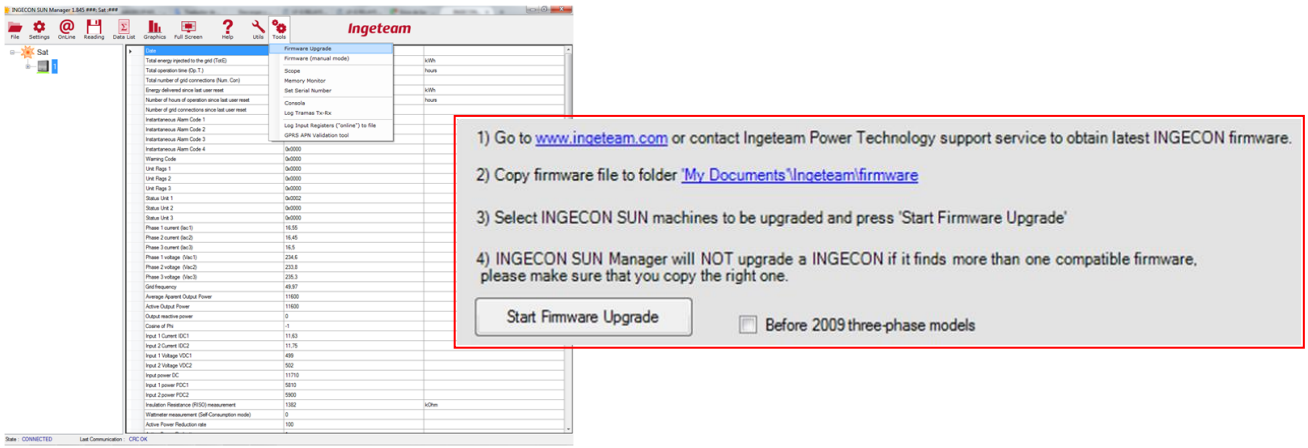
Press READ to see the actual inverter configuration

SEND button have to be pressed for the change to be effective



5.4.7 UPGRADE FW through ISM

UPGRADE FW ***TOOLS → FIRMWARE UPGRADE***



Follow the instructions indicated on ISM

5.5 OTHER TESTS

5.5.1 Fan´s Test

Perform this test to check the unit´s fans. When the test is finished, they will be switched off automatically.

This can be done with Ingeteam Commands or through the display:

Ingeteam Commands:

Send the command NUMBER 32 to launch the test.

Using Display:

The path for launching the test is the following:

MAIN MENU > MORE OPTIONS > TEST FANS

Press “OK” to confirm.

5.5.2 Start/Stop Inverter

The inverter can be commanded to Start or Stop. This can be done with Ingeteam Commands or through the display:

Ingeteam Commands:

Send the following commands:

- NUMBER 5 to Stop the Inverter.
- NUMBER 6 to Start the Inverter.

Using Display:

The path for launching the test is the following:

MAIN MENU > START/STOP

Press “OK” to confirm.

6 ANEX

6.1 Safety requirements

Important Safety Instructions

This section describes the safety warnings and the Personal Protective Equipment used in the unit.

Safety conditions

General warnings

The operations described in this manual may be performed only by qualified personnel.

The status of qualified personnel referred to in this manual will be, as a minimum, that which meets all the standards, regulations and laws regarding safety applicable to the tasks of installing and operating this unit.

You must comply with all applicable safety-related legislation for electrical work. Danger of electric shock.

Compliance with the safety instructions set out in this manual or in the suggested legislation does not imply exemption from other specific standards for the installation, place, country or other circumstances that affect the inverter.

Opening the door of the housing does not imply there is no voltage inside.

There is a risk of electric shock even after disconnecting all power sources from the system.

Only qualified personnel may open it, following the instructions in this manual.

When the solar array is exposed to light, it supplies a d.c. voltage to the inverter.

The entire manual must be read and understood in full prior to manipulating, installing or operating the unit.

Following is a list of the basic obligatory safety standards for each country:

- *RD 614/2001* in Spain.
- *CEI 11-27* in Italy.
- *DIN VDE 0105-100* and *DIN VDE 1000-10* in Germany.
- *UTE C18-510* in France.

Carry out all control and handling without voltage.

As a minimum security measure in this operation, you must always follow the so-called **5 golden rules**:

1. Disconnect.
2. Prevent any possible feedback.
3. Check there is no voltage.
4. Ground and short circuit.
5. Protect from live elements, if any, and put up safety signs around the work area.

Until you have completed these five steps, the work area cannot be considered voltage-free and any work performed will be considered to be work on live equipment.

Category III - 1000-Volt measuring instruments must be used for checking for the absence of voltage.

Ingeteam accepts no liability for any damages caused by improper use of the unit. You must propose in advance to Ingeteam any work carried out on any equipment which implies a modification of the original electrical arrangements. These must be studied and approved by Ingeteam.

Potential hazards for people

The equipment may remain charged after disconnecting the renewable power supply.

Carefully follow the mandatory steps in the manual for removing the voltage.

Always follow the indications in the manual on moving and placing the unit.

The weight of this unit can cause injury if not handled correctly.

DANGER: High temperature.

The flow of outlet air can reach high temperatures which can cause injury to anybody exposed to it.

Potential hazards for the equipment

The unit requires impurity-free air flow while it is operating.

Keeping the inlets free of obstacles is essential for this air flow to refrigerate the unit.

After all duly authorized handling, check that the inverter is ready to start operation. Only after this can you connect it, following the instructions in the manual.

Do not touch boards or electronic components. The more sensitive components can be damaged or destroyed by static electricity.

Do not disconnect or connect any terminal while the unit is operating. Disconnect and check for absence of voltage first.

Personal Protective Equipment (PPE)

When working on the unit, use the following safety equipment recommended by Ingeteam as a minimum.

Name	Explanation
Safety footwear	In compliance with standard *UNE-EN-ISO 20345:2012*
Helmet with face shield	In compliance with standard *UNE-EN 397:1995,* provided there are elements with voltage directly accessible.
Working clothes	Close-fitting, non-flammable, 100% cotton
Dielectric gloves	In compliance with standard *EN 60903:2005*

Tools and / or equipment used in live work must have at least Category III-1000 Volts insulation.

Should the country's regulations demand another kind of personal protection, you should appropriately supplement the equipment recommended by Ingeteam.

6.2 Required elements

6.2.1 Instrumentation

- Multimeter (Minimun requirements: 600V Cat IV / 1000V Cat III)

6.2.2 Documentation

- Installation and Operation Manuals ABH2013 for Sun Storage 1PLAY.
- Frequently Asked Questions FAQ Guide for Sun Storage 1PLAY.
- Technical guide for installations with INGECON SUN STORAGE 1Play.

6.2.3 PC Software

- Ingecon Sun Manager (downloadable on www.ingeteam.com).

6.2.4 Accesories

- Last versión Inverter FW
- Last versión Display FW