# INVERTER COMMISSIONING CHECKLIST

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<th>DATE</th>
<th>CUSTOMER</th>
<th>PLANT</th>
<th>INVERTER MODEL</th>
<th>Nº OF INVERTERS</th>
<th>STRING SUPERVISORS</th>
<th>CUSTOMER PROJECT MANAGER</th>
<th>PE PROJECT MANAGER</th>
<th>PE TECHNICAL SERVICE RESPONSIBLE</th>
<th>PE AUXILIAR TECHNICAL SERVICE</th>
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INVERTERS’ LIST

Note the references and serial numbers of the inverters, as they are numerically identified in the plant:

<table>
<thead>
<tr>
<th>INVERTER</th>
<th>REFERENCE</th>
<th>SERIAL NUMBER</th>
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1. **NO VOLTAGE TEST**

   Make the following tests with all AC and DC power sources disconnected. Before energizing the transformer and having all boxes’ DC switches OFF. Apply security protocol to avoid that AC and DC power sources could be connected. Check the AC and DC voltage absence with a multimeter.

   1. Revise visually that there is an IT grounding system in the AC circuit. The transformer neutral must be isolated to ground.
   2. Revise visually using a multimeter that there is a TT grounding system in the auxiliary AC circuit. The auxiliary transformer neutral must be grounded.
   3. Check wiring, wiring connectors and wiring connections in every module.
   4. In the event of having a Disconnecting Unit, review visually (DC fuses, disconnectors, etc.)
   5. Check AC wiring. Revise visually the wires in AC disconnectors and power transformer.
   6. Check AC auxiliary circuit wiring. Revise visually the wires of the auxiliary transformer, auxiliary power panels and AC module.
   7. Before energizing the power transformer, make sure that the following devices are OFF:
      - AC power circuit disconnectors
      - Main switches of the AC auxiliary power circuit
      - ON/OFF switches of all the inverters’ modules

2. **VOLTAGE TEST**

   Once the installer has energized the transformer, switch ON all manual disconnectors of the AC power circuit, beginning from the power transformer and ending in the inverter’s disconnecter (Depending on the station’s model, the number of disconnectors can change, up to two). Follow the next steps:

   1. Revise auxiliary voltages. Check that there are 400V between phases and 230V between phases and neutral in the auxiliary transformer output. Check that voltage between neutral and ground is around 0V. In installations with concrete cabinet, this can be measured in the auxiliary panel.
   2. Once auxiliary voltages have been checked, switch ON all switches of the auxiliary power circuit except the auxiliary switch of the AC module.
   3. Check upstream the auxiliary switch of the AC module that there are 400V between phases and 230V between phases and neutral and switch it ON. At this time, modules will be powered with 230V.
   4. Check using the display that grid voltages are in concordance with the output AC voltage of the equipment (SV.1).
   5. Check that the phases sequence is correct. In the event of being incorrect, F25 will be displayed. Check it in all the inverters of the plant in order to define in which stations must be changed the phases’ sequence.
   6. Check that the equipment has the last software version installed (SV.3). Update and parameterize all inverters that don’t have this version. Software versions are as follow: **Micro:** HE_A1.0.10 - **DSP:** HE_A1.1.6

3. **MODULES WORKING TEST**

   Once the previous test has been finished, inverter’s can export energy to the grid. Customer must be in possession of a document that certifies that the DC circuit has been revised (polarity, earth leakage faults, torques, etc.).

   Installer must keep all DC disconnecting boxes opened. Only one box will be used to check modules working conditions, the nearest to the inverter and being visible from the inverter. In this DC box, the installer must leave the minimum number of fuses during the single module test (generally 1, 2 or 3 fuses will be enough).
In the event of multi-MPPT equipments, the previous steps must be made using a box which corresponds to every MPPT.

Make the following steps in each inverter module. Each module must be tested as Master, beginning from #1 until the last one.

1. Close the disconnector of the mentioned DC box.
2. Check that there is not an isolation fault in the PV field. In the event of existing, F53 will be displayed, and this DC box must be switched OFF and the test must be done with another DC box.
3. Enable using the display the function unable module (G.20).
4. Limit the AC output power to 3% using the display (G.3).
5. Check CAN parameters (G.13). In the event of having a multiple MPPT inverter, Master role must be forced in the module before switching ON the ON/OFF switch (G.13). In the event of having a single MPPT inverter, the module will become Master when the ON/OFF switch is switched ON.
6. Switch ON the ON/OFF switch of the module that must be tested.
7. Then, close the door to work safely.
8. Check using the display that the bus soft charge is made correctly. The DC voltage must be increased gradually, and must be established around the voltage value of the PV field opened circuit elapsed 20 seconds (SV.2). If there is an abnormal behaviour, switch OFF the ON/OFF switch immediately.
9. Check using the display that when the soft charge time is elapsed (60 seconds), the DC switch is closed (SV.12) and the DC bus voltage is stable (SV.2).
10. Deactivate using the display the unable module function (G.20).
11. The AC contactor will be closed and the module will begin to export energy. Check using the display that DC voltage values (SV.2), and AC voltages and currents (SV.1) are stable.
12. Increase Little by Little the AC power limit until arriving to 100% (G.3). Realize it doing 10% steps, checking in each step that DC voltage values (SV.2), and AC voltages and currents (SV.1) are stable.
13. Switch OFF the ON/OFF switch of the module.
14. Proceed equally with the other modules of the equipment.

4. EQUIPMENT WORKING TEST

Once the modules have been tested individually, they must be tested at the same time. The installer must place all the fuses in the DC box above mentioned. Proceed as follows:

1. Decrease the modules’ activation level to a low value, in order to ensure that all the modules export energy. To this end, set the Module base power parameter to 2% using the display (G.15).
2. Switch ON all the ON/OFF switches of the modules.
3. Check using the display that DC voltage values (SV.2), and AC voltages and currents (SV.1) of all the modules and stable and similar.
4. Check using the display that instantaneous power values in all modules are similar (SV.15).
5. Switch OFF all the ON/OFF switches of the modules.

In the event of having multi-MPPT equipments, make the previous steps in each MPPT individually, and then with all MPPTs at the same time.

After checking the operation of all the equipment modules with only one DC box, proceed to export with all the DC power available. The installer must close all the disconnectors of the DC boxes in the PV field. Once it is done, proceed as described above.

Once the correct operation of the equipment has been checked, with all the modules exporting energy, during 15 minutes, change the parameter Module base power to its default value 70% (G.15). In the event of having a fault F53 during the test, installer must follow the procedure established for isolation fault detection, and keep OFF the boxes that are provoking it.
5. **OTHER ACTIONS**

In installations in which it is necessary, make the following actions:

- [ ] Set parameters Ethernet modules. Parameterize in the inverter’s modules the configuration agreed with the customer: IPs, gateway and Subnet Mask (G.8.3).
- [ ] Configure String Supervisors. Detect, set and calibrate in all the inverter’s module where there are communication buses of String Supervisors connected.
- [ ] Set the GDU Display / ESA screen. TCP/IP parameterization and leave it operative.
- [ ] Freesun Data Center. TCP/IP parameterization and leave it operative.
- [ ] Energy counters. Check hour, language and that they are counting correctly.
- [ ] Revise the existence of trolleys, extinguisher, stool and MV gloves.
- [ ] Take some pictures of the installation.

6. **INSTALLATION OBSERVATIONS**

Include every comment or anomaly detected in the equipments of the plant, or about the installation.

7. **RESPONSIBLES SIGNATURE**

After finishing the commissioning process, sign the checklist of each station to finally scan and send the document to the appropriate responsible.

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<th>Customer project manager</th>
<th>PE technical service responsible</th>
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