

Checklists for Grid-Connected Tests

Description

This Form contains the checklists required for verifying the PV System for the Commissioning Test performed when the PV System is connected to the grid.

General Data and Documentation

Below is a checklist for verifying the documentation available for the tests and the general data of the PV System.

Table 1 – Checklist for Verifying the available documentation.

Checklist for Verifying the Available Documentation		
Documents required		
Item to verify	Result / Value	Notes
Final design (or As-built design in case of variations)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Site Test report	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Result	<input type="checkbox"/> Accepted <input type="checkbox"/> Not Accepted	

Table 2 refers to the general data of the PV system and the participants' data for the Commissioning Test. The checklist used for verifying the general data of the PV System is the following:

Table 2 – Checklist for Verifying the general data of the PV System

Checklist for Verifying the General Data	
General on PV system	
Name of the PV system	
Nominal Power [kW]	
P.O. Box	
Street name and number	
Location / Area	
City	
Voltage delivery	<input type="checkbox"/> 230V (1 phase) <input type="checkbox"/> 415 V (3 phases) <input type="checkbox"/> 11 kV <input type="checkbox"/> 33 kV
Exit point	
PV module installation	<input type="checkbox"/> On building <input type="checkbox"/> Other structures (e.g., canopy) <input type="checkbox"/> Ground <input type="checkbox"/> Carpark
Building installation (if applicable)	<input type="checkbox"/> Flat rooftop <input type="checkbox"/> Roof flap <input type="checkbox"/> Façade <input type="checkbox"/> Other

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Checklist for Verifying the General Data		
Building type (if applicable)	<input type="checkbox"/> Villa or small household <input type="checkbox"/> Apartment block <input type="checkbox"/> Offices <input type="checkbox"/> School/University <input type="checkbox"/> Healthcare/Hospital <input type="checkbox"/> Industrial <input type="checkbox"/> Hotel/Restaurant <input type="checkbox"/> Entertainment <input type="checkbox"/> Agricultural/Stable <input type="checkbox"/> Detention/Correctional <input type="checkbox"/> Other.	
Area of the PV array [m2]		
PV technology	<input type="checkbox"/> Mono-crystalline silicon <input type="checkbox"/> Multi-crystalline silicon <input type="checkbox"/> Thin film (specify) <input type="checkbox"/> Other (specify)	
Tracking system if any	<input type="checkbox"/> No tracking <input type="checkbox"/> Single-axis tracking <input type="checkbox"/> Two-axis tracking	
Participants		
Role	Name	Affiliation
Test engineer (mandatory)		
Installer (mandatory)		
Designer (facultative)		
Inspector (facultative)		
Inspector (facultative)		
Inspector (facultative)		
Result	<input type="checkbox"/> Accepted <input type="checkbox"/> Not Accepted	

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Verification of AC System

Below is a checklist for the verification of the AC System of the PV System.

Table 3 – Checklist for AC System verification

Checklist for AC System Verification		
AC system – General		
Item to verify	Result / Value	Notes
Means of isolating the inverter have been provided on the AC side	<input type="checkbox"/> Yes <input type="checkbox"/> No	
All isolation and switching devices have been connected such that PV installation is wired to the "load" side and the public supply to the "source" side	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Where an RCD is installed to the AC circuit feeding an inverter, the RCD type has been verified to ensure it has been selected according to the requirements of IEC 62548	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Inverters are fully compliant with the standards for PV Systems	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Interface protection (IP) is external to inverter(s)	<input type="checkbox"/> Yes <input type="checkbox"/> No (informative)	
Interface protection (IP) – internal or external – is fully compliant with the standards for PV Systems	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Interface switch is compliant with the standards for PV Systems	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Backup interface device is compliant with standards for PV Systems	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
A UPS to support the Interface protection system is present	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Earthing Measurements of the metallic parts according to Electricity Wiring Code	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Result	<input type="checkbox"/> Accepted <input type="checkbox"/> Not Accepted	

A positive final result requires that only Yes or N/A boxes are checked.

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Interface Protection Verification

The checklist to be used for verifying the Interface Protection is the following:

Table 4 – Checklist for Verifying the Interface Protection

Checklist for Interface Protection Commissioning Test		
Inspection and Test of the Interface Protection		
Item to verify	Result / Value	Notes
The enabled functions of the Interface Protection are those required by Kahramaa	<input type="checkbox"/> Yes <input type="checkbox"/> No	
The thresholds are those required by Kahramaa	<input type="checkbox"/> Yes <input type="checkbox"/> No	
The times of intervention are those required by Kahramaa	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Interface device switches off in case of power failure on command of the Interface Protection	<input type="checkbox"/> Yes <input type="checkbox"/> No	
After a power recovery, the Interface Protection recloses the Interface device	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Result	<input type="checkbox"/> Accepted <input type="checkbox"/> Not Accepted	

A positive final result requires that only Yes or N/A boxes are checked.

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Performance Monitoring

The checklist to be used for the performance monitoring test is the following:

Table 5 – Checklist for Performance Monitoring Functions in the Commissioning Test

Checklist for Performance Monitoring Functions		
General on Performance Test		
Item to verify	Result / Value	Notes
Sampling interval [s]		
Recording interval [min]		
Start test: date and time [dd/mm/yyyy hh:mm]		
Stop test: date and time [dd/mm/yyyy hh:mm]		
Valid data in the time interval [%]		
Class of the monitoring system used	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C	
Test Report		
Relevant data on the Test Engineer	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Description of the site being tested	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Description of the system being tested	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Definition of the meteorological data taken during the test	<input type="checkbox"/> Yes <input type="checkbox"/> No	
definition of the system output data collected during the test	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Description of raw data that was collected during the test	<input type="checkbox"/> Yes <input type="checkbox"/> No	
List of any deviations from the test procedure	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Summary of the correction factors for the filtered data	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Uncertainty analysis	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	

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Checklist for Performance Monitoring Functions		
Summary of the test results	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Performance Ratios		
Test Duration (when applicable)		
Performance Ratio (PR) [%]		
Temperature-corrected Performance Ratio (PR) [%] (facultative)		
Reference correction temperature [°C] (facultative)		
Result	<input type="checkbox"/> Accepted <input type="checkbox"/> Not Accepted	

A positive final result requires that all items are filled with correct information, except those indicated as *facultative*. Only Yes or N/A boxes are checked in their cells.

PV systems with a $P_n > 250$ kW may use only a Class A or B monitoring system indicated in IEC 61724.

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Verification of Sensors

The checklist to be used for verifying the sensors is the following:

Table 6 – Checklist for Verifying Sensors used in the Commissioning Test

Checklist for Verifying Sensors used in the Commissioning Tests				
List of sensors				
Sensor	Type	Accu- racy	Manufactu rer and model	Calibration
In-plane irradiance (POA)	<input type="checkbox"/> Pyranometer <input type="checkbox"/> PV cell <input type="checkbox"/> Photodiode <input type="checkbox"/> Estimated <input type="checkbox"/> N/A			<input type="checkbox"/> Yes <input type="checkbox"/> No
Global Horizontal Irradiance	<input type="checkbox"/> Pyranometer <input type="checkbox"/> PV cell <input type="checkbox"/> Photodiode <input type="checkbox"/> Estimated <input type="checkbox"/> N/A			<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
PV module temperature	<input type="checkbox"/> Measured <input type="checkbox"/> Estimated <input type="checkbox"/> N/A			<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Ambient air temperature	<input type="checkbox"/> Measured <input type="checkbox"/> Estimated <input type="checkbox"/> N/A			<input type="checkbox"/> Yes <input type="checkbox"/> No
Wind speed	<input type="checkbox"/> Measured <input type="checkbox"/> Estimated <input type="checkbox"/> N/A			<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Wind direction	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A			<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Soiling ratio	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A			<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Array voltage (DC)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A			<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Array current (DC)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A			<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Array power (DC)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A			<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Output voltage (AC)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A			<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Output current (AC)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A			<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Output power (AC)	<input type="checkbox"/> Yes <input type="checkbox"/> No			<input type="checkbox"/> Yes <input type="checkbox"/> No
Output energy	<input type="checkbox"/> Yes <input type="checkbox"/> No			<input type="checkbox"/> Yes <input type="checkbox"/> No
Output power factor	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A			<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Reduced load demand	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A			<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
System output power factor request	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A			<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Result	<input type="checkbox"/> Accepted <input type="checkbox"/> Not Accepted			

A positive final result requires that only Yes or N/A boxes are checked.

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Furthermore, depending on the Class of the monitoring system or the measurement system adopted (A, B, or C), the cells related to the used sensors shall be properly filled.

PV systems with a $P_n > 250$ kW may use only a Class A or B monitoring system indicated in IEC 61724.

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Final Result of the Commissioning Test

The final results of the Commissioning Test are in the following Table.

Table 7 – Final Result of the Commissioning Test

Commissioning Test Final Result		
Participants		
Role	Name	Signature
Test Engineer (mandatory)		
Installer (mandatory)		
Designer (if present)		
Inspector (if present)		
Inspector (if present)		
Inspector (if present)		
Notes		
Result	<input type="checkbox"/> Accepted <input type="checkbox"/> Not Accepted	