SOCOTEC TECHNICAL CONSULTING

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Technical notice

Inverter compliance with article 12 of guide UTE 15-712-1

KOSTALINDUSTRIE ELEKTRIK GmbH&Co.KG 58099 HAGEN	Mission completed on 24/05/2024 Avis Technique : (Details of examinations are given in the report)

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JOB NO.: 984Q0240500000000939
REPORT DATE: 4/22/2025 **REPORT REFERENCE: 984Q0/24/8002**

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PURPOSE OF THE SERVICE

The purpose of this report is to document the results of our detailed technical assessment, with a view to issuing an opinion on the conformity of KOSTAL's PLENTICORE MP S and G3 single phase inverter from 3KW to 7kW with the requirements specified in paragraph §12 of standard UTE C15-712-1. Furthermore, in the context of the installation of this inverter in France, our mission includes the validation of its system and DC operation, in accordance with the applicable standards.

NATURE OF THE ASSIGNMENT

The current mission aims to analyze the documents provided by the client, with the purpose of confirming the compatibility of the PLENTICORE MP S and M G3 inverter with the specifications required for its deployment within an electrical installation in France. This analysis falls within the scope of intervention established by our contractual agreement, following the acceptance of our proposal.

BENEFIT LIMIT

The scope of this report includes a thorough review of the documentation provided by the customer. It is important to note that this document does not represent a certificate of conformity for the equipment. Furthermore, our technical opinion is not intended to guide the design of the final installation where the inverter will be integrated. A verification in compliance with current standards, in particular with Consuel, must be carried out to ensure full compliance of the installation.

REFERENCE STANDARDS

- UTE C 15-712-1: "Photovoltaic installations connected to the public distribution network" July 2013.
- NF EN 62109-1: "Safety of power converters used in photovoltaic systems - Part 1: general requirements" July 2010
- NF EN 62109-2: "Safety of power converters used in photovoltaic systems - Part 2: Particular requirements for inverters" October 2011
- DIN VDE 0126-1-1 "Automatic disconnecting device between a generator and the public low-voltage network" August 2013
- NF C 15-100: "Low-voltage electrical installations" August 2024

REFERENCE DOCUMENTS

- Product test report - IEC/EN 62103-1 :2010, IEC/EN 20109-2 :2011. KIWA . Dateof issue: 05 december 2024 – file names:
    - - DOC03406516-0003_KOST_PLENTICO_22PP512-14_2_IEC62109-1
    - -DOC03386207-0002_KOST_PLENTICO_22PP512-15_1_IEC62109-2
- Certificate of conformity IEC/EN 20109-1:2010 and IEC/EN 62109-2:2011 by KIWA . Date of issue: 05.february.2024. File name: 2155_Z-GS_PLENTICORE G3_de_en
- EU Declaration of Conformity - PLENTICORE MP S and M G3- Date of issue: 01 March.2025 – file name: 2202_HE-EU-Konf_PLENTICORE-MP-G3_fr
- Technical data : Solar Inverter PLENTICORE MP S and M G3. - Ref : EN - DOC03535066 - - Date : January 2025- File name: DB_PLENTICORE-MP-G3_en
- Operating manual- PLENTICORE MP G3– Ref : EN - DOC03563692-0000 Date : February 2025 – file name : PLENTICORE-MP-G3_BA_en

VERIFIED ELEMENTS

- **Document review:** In-depth analysis of user manuals, certificates, test reports and declarations of conformity.
- **DC switch inspection:** Rigorous inspection of the DC switch to ensure correct operation.
- **CE Marking check:** Verification of the presence and conformity of the CE marking, attesting to compliance with European standards.
- **Evaluation of decoupling protection devices:** Confirmation of the existence and effectiveness of decoupling protection mechanisms.

TECHNICAL ADVICE

After a thorough examination of the technical specifications of the PLENTICORE MP S and M G3 single phase inverter, both on the AC and DC sides, and taking into account the previously mentioned standards, the equipment meets the required conditions for use in France.

This validation is contingent upon the entire electrical installation's compliance with current standards. It is imperative that the suitability of the entire installation be subject to detailed studies to ensure proper implementation, in accordance with the manufacturer's recommendations and the requirements of the electrical network operator.

This specifically includes the verification of compatibility of voltages, currents, frequencies, and load capacities, to ensure the optimal and safe operation of the overall electrical system, in conformity with current European standards.

In accordance with Article 12 of the UTE C15-712-1 (2013) guide, it is required to provide a disconnection device and an emergency shutdown mechanism, on both the AC and DC sides. For high-power inverters, these devices can be integrated within the same enclosure. In the case of inverters with multiple DC inputs, it is acceptable to perform the emergency shutdown via separate direct control devices. These devices can be switches, circuit breakers, or contactors. To meet these requirements, the concerned inverters are equipped with disconnect switches compliant with the IEC 60947-3 standard. The inverters with multiple DC inputs also meet the criteria for high power, allowing these devices to be integrated within their enclosure. Moreover, the presence of integrated connectors, accessible without opening the inverter, facilitates the connection of DC cables without exposure to direct contact with internal components. Consequently, the integrated DC switches meet the requirements for disconnection and emergency shutdown on the DC side, as defined by Article 12 of the UTE C15-712-1 (2013) guide. Additional measures must be considered to comply with the AC disconnection needs near the inverter, and other provisions may be required to adhere to the directives of Article 12.4, concerning Public Access Buildings (ERP) or Classified Installations for Environmental Protection (ICPE).

APPENDIX

APPENDIX A: INVERTER CHARACTERISTICS

PLENTICORE MP G3

Hybrid inverter

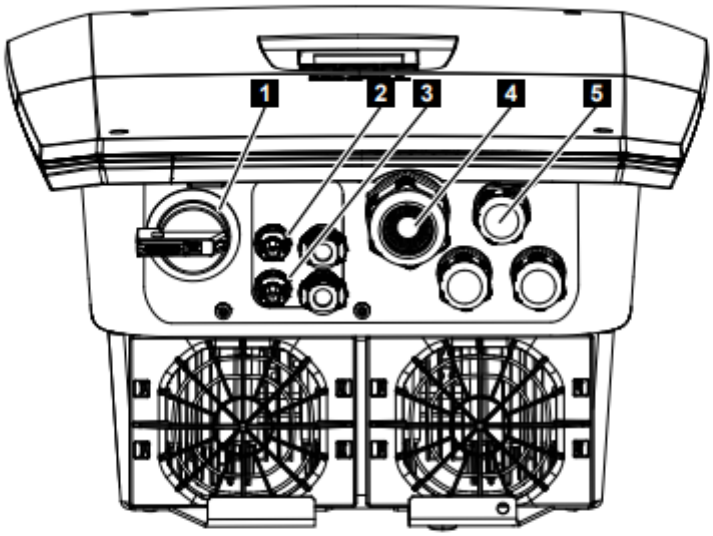
Power class

PLENTICORE MP G3	Unit	S			M			
Inverter name		PLENTICORE MP S G3			PLENTICORE MP M G3			
Power class		3.0	3.6	4.0	4.6	5.0	6.0	7.0
Basic power	kW	3.0	-	-	4.6	5.0	-	-
Optional power extension level 1	kW	-	3.6	4.0	-	-	6.0	-
Optional power extension level 2	kW	-	-	-	-	-	-	7.0

Basic power / optional power upgrade level: Power in the power level depends on country of use. Is set automatically via set of country parameters.

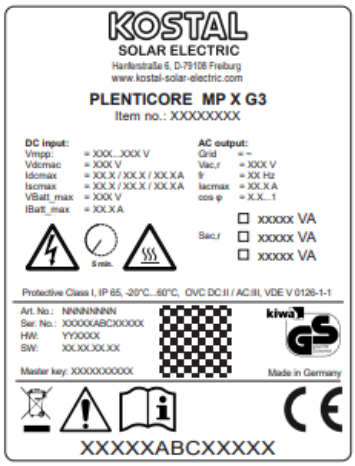
APPENDIX B: DC-SIDE SWITCH IDENTIFICATION

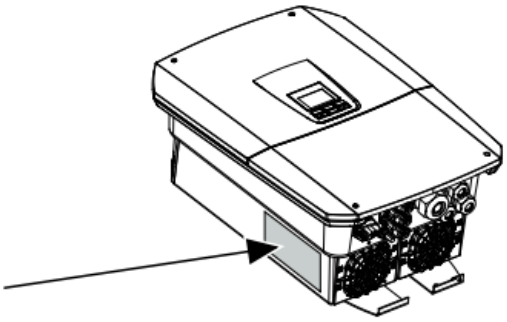
DC inputs, PLENTICORE MP S G3



1 DC circuit switch
2 DC connection 1 for PV generators
3 DC connection 2 for PV generators or a battery storage unit (optional)
4 Cable inlet for AC cable
5 Cable inlet for communication cables

APPENDIX C: CE MARKING IDENTIFICATION





Appendix D: Details of Technical Specifications and Decoupling Protective Devices in accordance with DIN VDE 0126-1

Input side (DC)

PLENTICORE MP G3	Unit	S			M			
Max. PV power (cos ϕ = 1)	kWp	4.5	5.4	6.0	6.9	7.5	9.0	10.5
Max. PV power per DC input	kWp	8.25			10.5			
Nominal DC power	kW	3.07	3.68	4.09	4.69	5.1	6.12	7.14
Rated input voltage (Udc,r)	V	650						
Start input voltage (Udc,start)	V	95						
Max. system voltage (Udc,max)	V	1000						
MPP range at rated output (Umpp,min)	V	85	125		95	105	125	145
MPP range at rated output (Umpp,max)	V	800						
Operating voltage range (Udc,workmin)	V	75						
Operating voltage range (Udc,workmax)	V	900						
Max. input current (Idc,max) DC1/DC2 input	A	17						
Max. input current (Idc,max) DC3 input	A	-			17			
Max. PV short-circuit current (ISC_PV) DC1/DC2 input	A	23.8						
Max. PV short-circuit current (ISC_PV) DC3 input	A	23.8						
Number of DC inputs		2			3			
Number of combined DC inputs (PV or battery)		1						
Number of independent MPP trackers		2			3			

Input side (DC3 battery input)

PLENTICORE MP G3	Unit	S	M
Battery input min. working voltage range (Udc,workbatmin)	V	95	
Battery input max. working voltage range (Udc,workbatmax)	V	650	
Battery input max. charge/discharge current	A	17/17	
Max. BAT power per DC input	kW	8.25	10.5

Output side (AC)

PLENTICORE MP G3	Unit	S		M				
Rated power, cos ϕ = 1 (Pac,r)	kW	3.0	3.6	4.0	4.6	5.0	6.0	7.0
Output apparent power (Sac,nom, Sac,max)	kVA	3.0/3.0	3.6/3.6	4.0/4.0	4.6/4.6	5.0/5.0	6.0/6.0	7.0/7.0
Min. output voltage (Uac,min)	V	184						
Max. output voltage (Uac,max)	V	264.5						
Rated alternating current (Iac,r)	A	13.0	15.7	17.4	20.0	21.7	26.1	30.4
Max. output current (Iac,max)	A	19.3			32.0			
Short-circuit current (peak/RMS)	A	9.1/6.4	12.4/8.8	15.9/11.3	19.2/13.6	22.6/16.0	28.2/20.0	34.1/24.1
Grid connection		~, 230 V, 50 Hz						
Rated frequency (fr)	Hz	50						
Grid frequency (fmin - fmax)	Hz	47/52.5						
Setting range for the power factor (cos ϕAC,r)		0.8...1 (ind./cap.)						
Power factor at rated power (cos ϕAC,r)		1						
THD	%	3						
Standby	W	2.5						

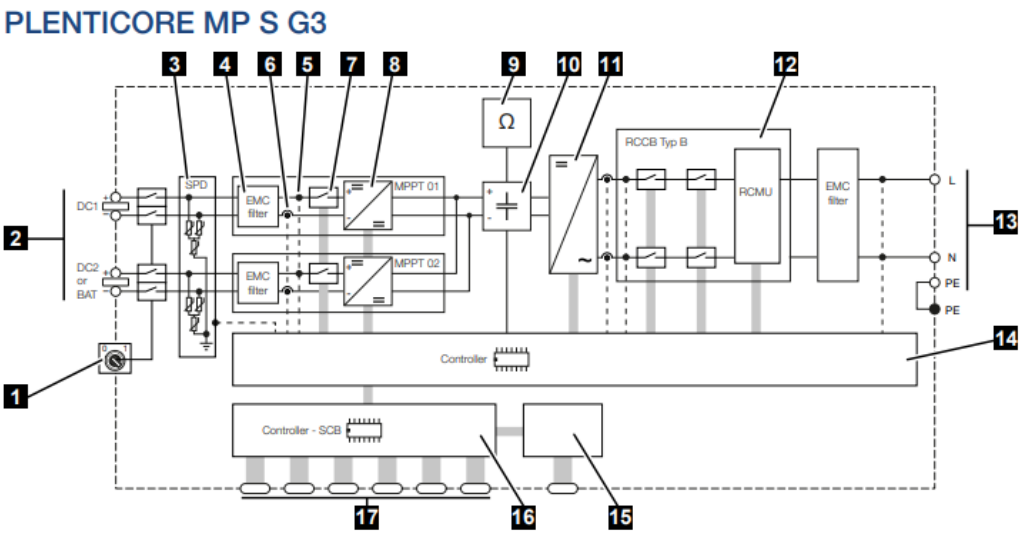
Backup mode

PLENTICORE MP G3	Unit	S	M
Backup power mode		~, 230 V, 51 Hz	
Nominal apparent power in backup mode	kVA	4.0	7.0
Nominal power per phase	kW	4.0	7.0
cos ϕ range		0...1	
Start-up apparent power for min. 5 sec at Uac,r	kVA	4.4	7.4
Max. current per phase	A	19.3	32.0

System data

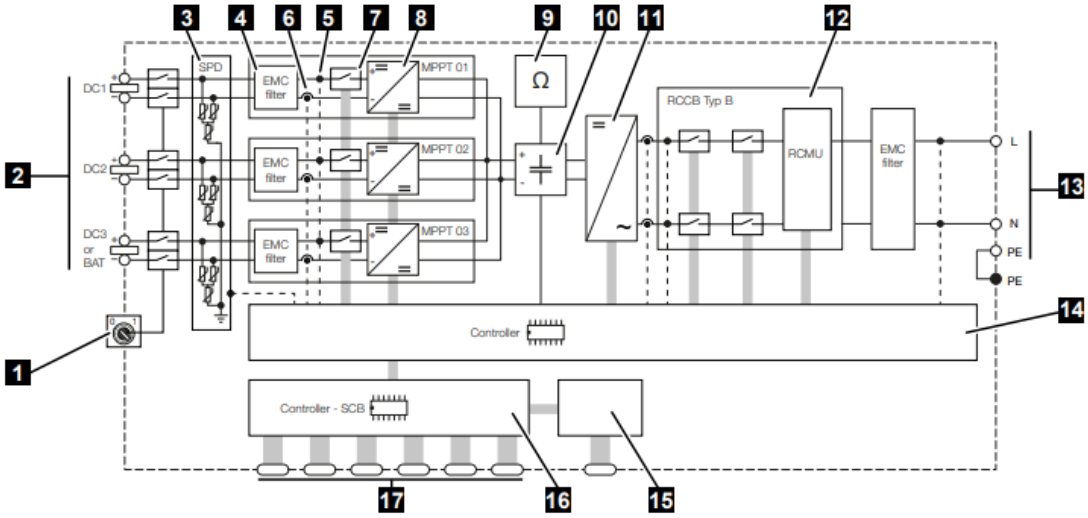
PLENTICORE MP G3	Unit	S	M
Topology: Without galvanic isolation – transformerless		Yes	
Protection class in accordance with IEC 60529		IP65	
Protective class according to IEC 62103		I	
Overvoltage category according to IEC 60664-1 on input side (PV generator)		II	
Overvoltage category according to IEC 60664-1 on output side (grid connection)		III	
DC overvoltage protection module type 2 - can be retrofitted		Yes	
Pollution degree		4	
Environmental category (outdoor installation)		Yes	
Environmental category (indoor installation)		Yes	
UV resistance		Yes	
AC cable diameter (min-max)	mm	10…28	
AC cable cross-section (min-max)	mm^2	2.5…10	4…10
DC cable cross-section (PV/BAT) (min-max)	mm^2	2,5...6 / 6...6	
Max. fuse protection on output side (AC) IEC 60898-1	A	B25/C25	B32/C32
Internal operator protection in accordance with EN 62109-2		RCCB type B	
Independent disconnection device according to VDE V 0126-1-1		Yes	

APPENDIX E: FUNCTIONAL DIAGRAM



1 DC circuit switch
2 DC input
3 SPD module with monitoring (optional/changeable)
4 Electromagnetic compatibility (EMC) filter
5 Voltage measuring point
6 Current measuring point
7 Electronic DC disconnection device
8 DC regulator
9 Insulation monitoring
10 Intermediate circuit
11 Inverter bridge
12 Grid monitoring and shutdown
13 AC output
14 System control with MPP trackers
15 Display
16 Smart Communication Board (SCB)
17 Interfaces (e.g. Ethernet, USB, energy meter)

PLENTICORE MP M G3



1	DC circuit switch
2	DC input
3	SPD module with monitoring (optional/changeable)
4	Electromagnetic compatibility (EMC) filter
5	Voltage measuring point
6	Current measuring point
7	Electronic DC disconnection device
8	DC regulator
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