

KOSTAL

KOSTAL INDUSTRIE ELEKTRIK
GmbH & Co. KG
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HAGEN

Technical notice

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

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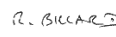
Mission completed on 24/05/2024
Avis Technique :
(Details of examinations are given in the report)

CASE NO.: 2403STC00000012
JOB NO.: 984Q0240500000000939
REPORT DATE: 05/24/2024

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 PIKO CI 100 inverter 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 PIKO CI 100 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 technical and financial 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" December 2002

REFERENCE DOCUMENTS

- Certificate of conformity IEC/EN 20109-1:2010 and IEC/EN 62109-2:2011 by TUV Rheinland. Date of issue: 22.09.2023.
- EU Declaration of Conformity - PIKO CI 100 - Date : 11.03.2024
- Technical data : Solar Inverter PIKO CI 100kW. - Ref: DOC03181998 - Date: January 2024
- Product test report - IEC/EN 62103-1 :2010, IEC/EN 20109-2 :2011. TUV Rheinland. Date 07 August 2022
- Instruction manual - PIKO CI - 100kW photovoltaic inverter

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 PIKO CI 100 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

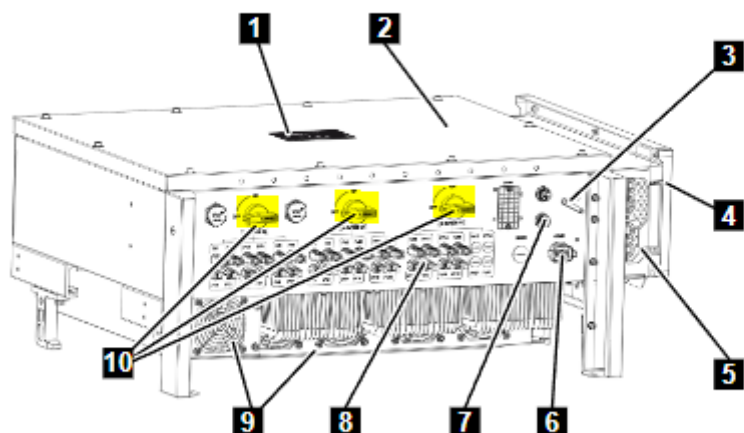
APPENDIX A: INVERTER CHARACTERISTICS



Type Designation : PIKO CI 100 14
Vmax PV [V d.c.] : 1100
Isc PV [A d.c.] : 3*50+5*45
Max. Input Current [A d.c.]: 3*40+5*32
Overvoltage Category(OVC) : II for PV Side
Rated Output Volt [V a.c.] : 3W+N+PE, 380/400/415,
Rated Output Freq. [Hz] : 50/60
Max.Output Current[A a.c.]: 168.8
Rated Output Power [kW] : 100
Power Factor: 0.80LG-0.80LD
Overvoltage Category (OVC) : III for AC mains
Protective Class : Class I
Ingress Protection (IP) : IP66
Pollution Degree (PD): PD 2(inside), PD3(outside)
Altitude [m]: 4000
Operating Temperature [°C]: -25 to 60 (>45 derating)
Type of Inverter : Non-isolated

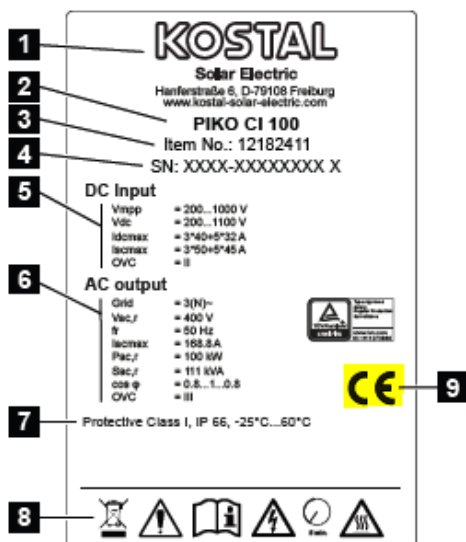
APPENDIX B: DC-SIDE SWITCH IDENTIFICATION

Onduleur PIKO CI 100



- | | |
|----|---|
| 1 | DEL d'état |
| 2 | Couvercle |
| 3 | Antenne Wi-Fi |
| 4 | Compartiment de raccordement AC |
| 5 | Entrée du câble d'alimentation réseau |
| 6 | Panneau de raccordement (RS485, RSE, NAS) |
| 7 | Connecteur (LAN) |
| 8 | Raccordements des panneaux PV |
| 9 | Ventilateur |
| 10 | Interrupteur DC |

APPENDIX C: CE MARKING IDENTIFICATION



- 1 Nom et adresse du fabricant
- 2 Type d'appareil
- 3 Numéro d'article KOSTAL
- 4 Numéro de série
- 5 Informations sur les entrées DC : Plage de tension d'entrée, tension d'entrée max., courant d'entrée max. (panneaux PV, par groupe DC), courant de court-circuit max. (panneaux PV, par groupe DC), catégorie de surtension
- 6 Informations sur la sortie AC : Nombre de phases d'alimentation, tension de sortie (nominale), fréquence du réseau, courant de sortie max., puissance de sortie max., puissance apparente de sortie max., plage de réglage du facteur de puissance, catégorie de surtension
- 7 Classe de protection selon CEI 62103, type de protection, plage de température ambiante, catégorie de surtension, exigences auxquelles la surveillance du réseau intégrée répond
- 8 Pictogrammes d'avertissement
- 9 Marquage CE

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

Côté entrée (DC)

PIKO CI	Unité	PIKO CI 100
Puissance PV max. ($\cos(\phi) = 1$)	kWc	150
Puissance DC nominale	kW	101,6
Tension d'entrée assignée ($U_{dc,r}$)	V	600
Tension d'entrée de démarrage ($U_{dc,start}$)	V	250
Tension système max. ($U_{dc,max}$)	V	1100
Plage MPP à puissance nominale ($U_{mpp,min}$)	V	540
Plage MPP à puissance nominale ($U_{mpp,max}$)	V	800
Plage de tension de fonctionnement ($U_{mpp,workmin}$)	V	200
Plage de tension de travail ($U_{dc,workmax}$)	V	1000*
Tension de travail max. ($U_{dc,workmax}$)	V	1000
Courant d'entrée max. ($I_{dc,max}$) par MPPT	A	MPPT 1 -3 : 40 MPPT 4-8 : 32
Courant de court-circuit DC max. ($I_{sc,pv}$)		
Courant DC max. par entrée DC ($I_{Stringmax}$)	A	20
Nombre d'entrées DC		16
Nombre de trackers MPP indépendants		8

Côté sortie (AC)

PIKO CI	Unité	PIKO CI 100
Puissance nominale, $\cos \phi = 1$ ($P_{ac,r}$)	kW	100
Puissance apparente de sortie ($S_{ac,nom}$, $S_{ac,max}$)	kVA	100 / 111
Tension de sortie min. ($U_{ac,min}$)	V	322
Tension de sortie max. ($U_{ac,max}$)	V	520
Courant alternatif assigné ($I_{ac,r}$)	A	145
Courant de sortie max. ($I_{ac,max}$)	A	168,8
Courant de court-circuit (crête/RMS)	A	tbd
Raccordement au réseau		3N~, 230/400 V, 50 Hz
Fréquence assignée (f_r)	Hz	50
Fréquence du réseau ($f_{min} - f_{max}$)	Hz	45/55
Plage de réglage du facteur de puissance ($\cos \phi_{AC,r}$)		0,8...1...0,8
Facteur de puissance à la puissance assignée ($\cos \phi_{AC,r}$)		1
Taux de distorsion harmonique	%	<3

PIKO CI	Unité	PIKO CI 100
Veille	W	<1

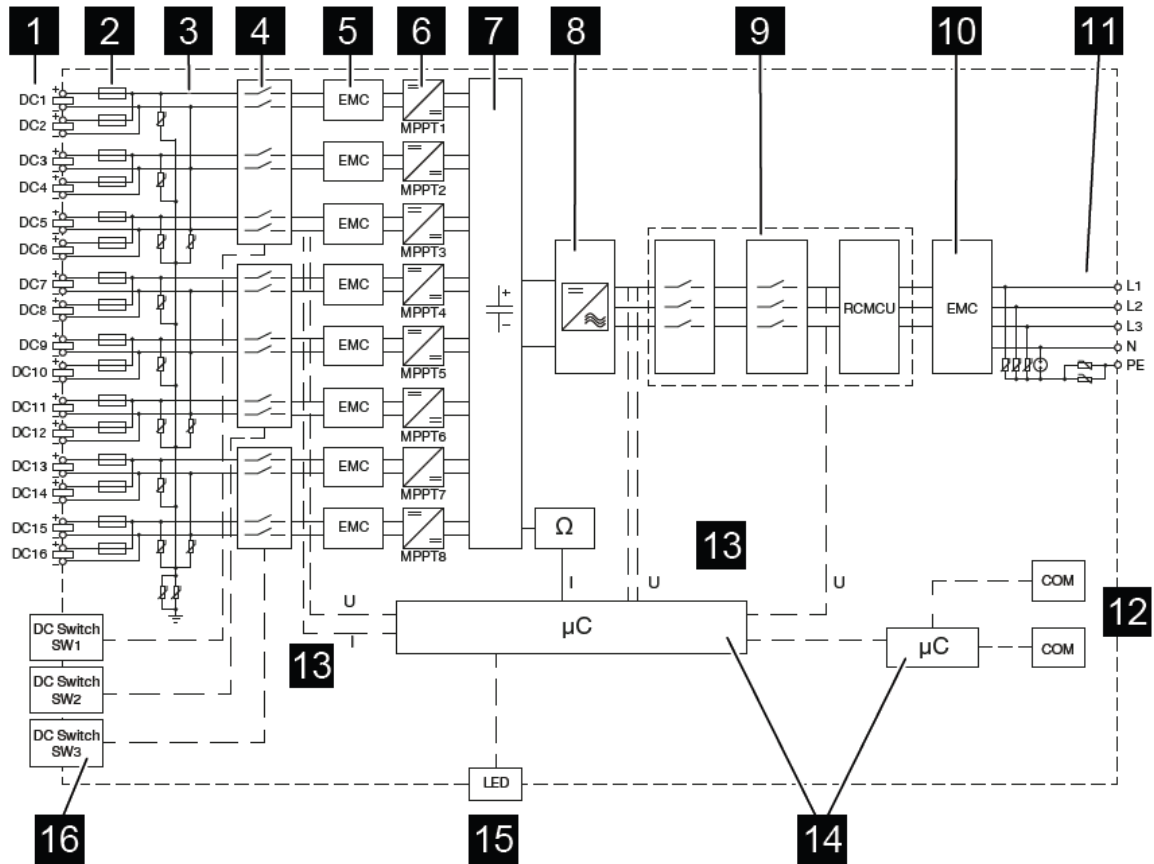
Rendement

PIKO CI	Unité	PIKO CI 100
Rendement max.	%	98,4
Rendement européen	%	98,2
Rendement d'adaptation MPP	%	99,9

Données du système

PIKO CI	Unité	PIKO CI 100
Topologie : sans séparation galvanique - sans transformateur		oui
Type de protection selon CEI 60529		IP66
Classe de protection selon la norme EN 62109-1		I
Catégorie de surtension selon CEI 60664-1 côté entrée (générateur PV)		II
Catégorie de surtension selon CEI 60664-1 côté sortie (raccordement au réseau)		III
Protection contre les surtensions DC/AC		Type 2 (Interchangeable)
Degré d'encrassement		4
Catégorie environnementale (Installation en extérieur)		oui
Catégorie environnementale (Installation en Intérieur)		oui
Résistance aux UV		oui
Diamètre du câble AC (min-max)	mm	24...69
Section du câble AC (min-max)	mm ²	Cuivre : 70...240 / Aluminium: 95...240
Section du câble photovoltaïque (min-max)	mm ²	4...6
Protection max. par fusible côté sortie (AC) CEI 60898-1	A	200 A gG/gL
Protection des personnes Interne selon la norme EN 62109-2		RCMU/RCCM type B
Point de coupure automatique selon la norme VDE V 0126-1-1		oui
Hauteur/largeur/profondeur	mm	936/678/365
Poids	kg	93
Principe de refroidissement – ventilateurs régulés		oui
Débit d'air max.	m ³ /h	tbd
Émissions sonores (typique)	dB(A)	65
Température ambiante	°C	-25...60
Altitude d'Installation max. au-dessus du niveau de la mer	m	4000
Humidité relative de l'air	%	0...100
Connectique côté DC		Connecteur mâle Amphénol H4
Connectique côté AC		M12

APPENDIX E: FUNCTIONAL DIAGRAM



- 1 Entrées DC pour les panneaux PV
- 2 Fusibles DC
- 3 Protection contre les surtensions (côté DC)
- 4 Point de coupure électronique DC
- 5 Filtre CEM (côté DC)
- 6 Actionneur DC
- 7 Circuit intermédiaire
- 8 Circuit en pont inverseur
- 9 Surveillance et coupure du réseau
- 10 Filtre CEM (côté AC)
- 11 Connexion AC
- 12 Panneaux de connexion pour les interfaces de communication
- 13 Mesure de la tension et du courant
- 14 Commande système et communication
- 15 DEL d'état
- 16 Interrupteur DC