SOLAR ELECTRIC

KOSTAL

EN

Smart connections.

Data Sheet

PIKO-Inverter
3.0 | 3.6 | 4.2 | 5.5 | 8.3 | 10.1

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11/2011 edition, subject to technical changes and printing errors.
Current information can be found at www.kostal-solar-electric.com

Overview Technical Data

	PIKO 3.0	PIKO 3.6	PIKO 4.2	PIKO 5.5	PIKO 8.3	PIKO 10.1
Input side (DC)						
Number of DC inputs / of MPP trackers	1 / 1	2 / 2	2 / 2	3 / 3	2 / 2	3 / 3
Recommended DC power	5-10 % above rated AC output[1]					
Max. DC input voltage (open circuit voltage)	950 V					
Min. DC input voltage	180 V					
Max. DC input current	9 A	9 A / 13 A[2]		9 A	12,5 A / 25 A[2]	
Output side (AC)						
Number of feed-in phases	1		3			
AC grid voltage	1/N/PE, AC, 230 V		3/N/PE, AC, 230/400 V			
Max. AC output current	13,1 A	15,7 A	6,1 A	8 A	12 A	14,5 A
Rated AC output (cosφ = 1)	3.000 W	3.600 W	4.200 W (UK 4.000 W, PT 3.680 W)	5.500 W	8.300 W	10.000 W
Apparent power (cosφ, adj)	3.000 VA	3.600 VA	4.200 VA	5.500 VA	8.300 VA	10.000 VA
Max. efficiency	95,7 %	95,8 %	96,5 %	96,2 %	96,1 %	96,2 %
European-standard efficiency	95 %	95,1 %	95,4 %	95,7 %	95,5 %	95,6 %
Rated frequency	50 Hz					
Self-consumption at night	Inverter < 1 W, Communicationboard < 1,7 W					
Protection class	I					
Galvanic isolation	Transformerless					
Setting range of the power factor $\cos\varphi_{AC,r}$	0,9 capacitive ... 1 ... 0,9 inductive					
Type of grid monitoring	According to the countries' certificates					
Reverse polarity protection	Short circuit diode at DC side					
Personal protection	Universal current sensitive residual current circuit breaker and earth fault monitoring					
Operational conditions, ingress protection according to IEC 60529	interior + exterior, IP 55					
Ambient temperature	-20° ... 60° C					
Max. humidity	0 ... 95 %					
Type of cooling	Regulated ventilation					
Communications interfaces	Ethernet RJ45 (2x with Communicationboard 2, incl. integrated switch), RS485, S0, 4x analogue inputs					
Max. sound	< 33 dB(A)				Ventilator 25% -> 33 dB(A) Ventilator 50% -> 41 dB(A) Ventilator 75 ... 100% -> 46 dB(A)	
Connection technology at input side	MC 4					
Connection technology at output side	Spring-loaded terminal strip					
Dimensions (W x D x H)	420 x 211 x 350 mm				520 x 230 x 450 mm	
Weight	19,8 kg	20 kg	20,5 kg	21,1 kg	33 kg	34 kg
Disconnection device	Integrated electronic circuit breaker					

[1] depending on ambient temperature and solar radiation
[2] with parallel connection of two MPP trackers

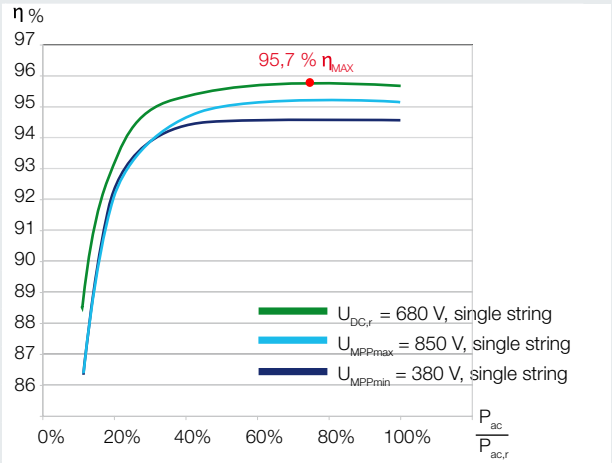
Inverter PIKO 3.0 | 3.6

- Single-phase feed-in
- Transformerless topology
- For PIKO 3.6 parallel connection of the two independent MPP trackers is possible to extend the input current range
- Integrated circuit contact for self-consumption control
- Integrated electronic DC circuit breaker
- Integrated data logger and web server for system monitoring
- Various communication interfaces included as standard: Ethernet, RS485, S0, 4x analogue inputs

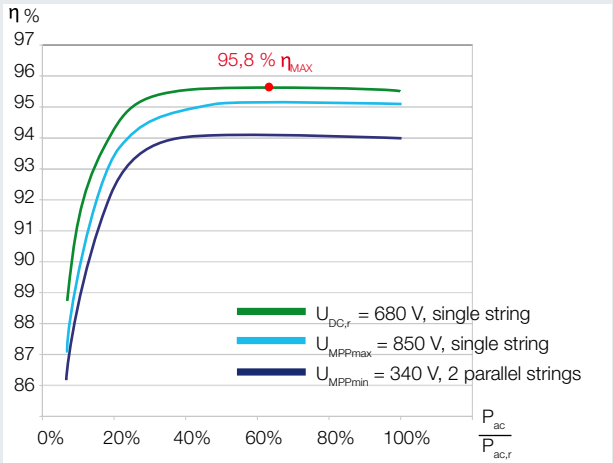
Technical Data

		PIKO 3.0	PIKO 3.6
Input side (DC)			
Number of DC inputs / number of MPP trackers		1 / 1	2 / 2
Max. input voltage (open circuit voltage)	U_{DCmax}	950 V	950 V
Min. DC input voltage	U_{DCmin}	180 V	180 V
Start-up DC input voltage	$U_{DCstart}$	180 V	180 V
Rated DC input voltage	$U_{DC,r}$	680 V	680 V
Max. MPP voltage	U_{MPPmax}	850 V	850 V
Min. MPP voltage in single-tracker operation	U_{MPPmin}	380 V	440 V
Min. MPP voltage in two-tracker or parallel operation	U_{MPPmin}	–	340 V
Max. DC input current	I_{DCmax}	9 A	9 A
Max. DC input current with parallel connection	$I_{DCmax,p}$	–	13 A
Output side (AC)			
Number of feed-in phases		1	1
AC grid voltage	$U_{AC,r}$	1/N/PE, AC, 230 V	
Max. AC output current	I_{ACmax}	13,1 A	15,7 A
Rated AC output (cosφ = 1)	$P_{AC,r}$	3.000 W	3.600 W
Apparent power (cosφ, adj)	S_{AC}	3.000 VA	3.600 VA
Power factor $cos\varphi_{ACr}$		0,9 capacitive ... 1 ... 0,9 inductive	
Max. efficiency	η	95,7 %	95,8 %
European-standard efficiency	η_{EU}	95 %	95,1 %
Rated frequency	f_r	50 Hz	50 Hz

Efficiency rate characteristic curves PIKO 3.0



Efficiency rate characteristic curves PIKO 3.6



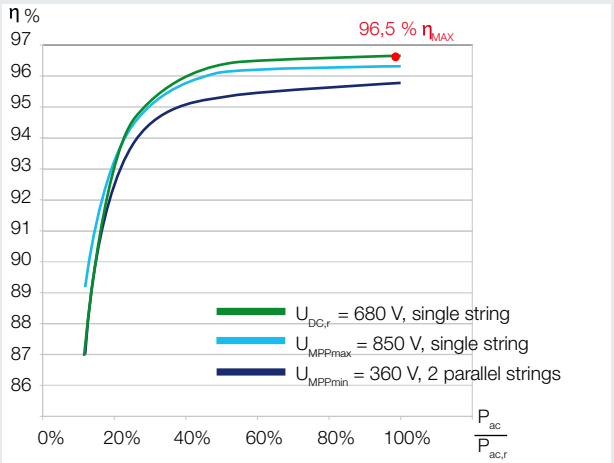
Inverter PIKO 4.2 | 5.5

- Three-phase feed-in
- Transformerless topology
- Possible parallel connection of two independent MPP trackers to extend the input current range (PIKO 4.2)
- Three independent MPP trackers (PIKO 5.5)
- Integrated circuit contact for self-consumption control
- Integrated electronic DC circuit breaker
- Integrated data logger and web server for system monitoring
- Various communication interfaces included as standard: Ethernet, RS485, S0, 4x analogue inputs

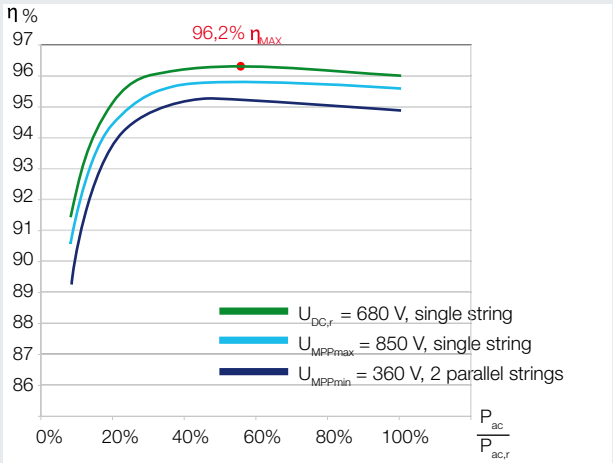
Technical Data

		PIKO 4.2	PIKO 5.5
Input side (DC)			
Number of DC inputs / number of MPP trackers		2 / 2	3 / 3
Max. input voltage (open circuit voltage)	U_{DCmax}	950 V	950 V
Min. DC input voltage	U_{DCmin}	180 V	180 V
Start-up DC input voltage	$U_{DCstart}$	180 V	180 V
Rated DC input voltage	$U_{DC,r}$	680 V	680 V
Max. MPP voltage	U_{MPPmax}	850 V	850V
Min. MPP voltage in single-tracker operation	U_{MPPmin}	500 V	660 V
Min. MPP voltage in two-tracker or parallel operation	U_{MPPmin}	360 V	360 V
Max. DC input current	I_{DCmax}	9 A	9 A
Max. DC input current with parallel connection	$I_{DCmax,p}$	13 A	–
Output side (AC)			
Number of feed-in phases		3	3
AC grid voltage	$U_{AC,r}$	3/N/PE, AC, 230 V / 400 V	
Max. AC output current	I_{ACmax}	6,1 A	8 A
Rated AC output (cosφ = 1)	$P_{AC,r}$	4.200 W UK 4.000 W, cosφ=1 Portugal 3.680 W, cosφ=1	5.500 W
Apparent power (cosφ, adj)	S_{AC}	4.200 VA	5.500 VA
Power factor $cos\varphi_{ACr}$		0,9 capacitive ... 1 ... 0,9 inductive	
Max. efficiency	η	96,5 %	96,2 %
European-standard efficiency	η_{EU}	95,4 %	95,7 %
Rated frequency	f_r	50 Hz	50Hz

Efficiency rate characteristic curves PIKO 4.2



Efficiency rate characteristic curves PIKO 5.5



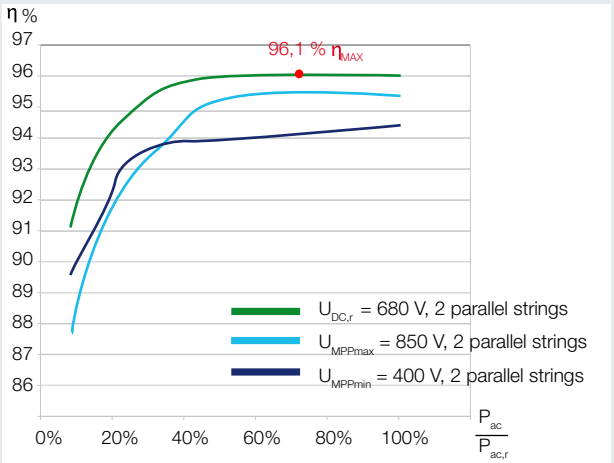
Inverter PIKO 8.3 | 10.1

- Three-phase feed-in, transformerless topology
- Possible parallel connection of two independent MPP trackers to extend the input current range
- Three independent MPP trackers (PIKO 10.1)
- Integrated circuit contact for self-consumption control
- Integrated electronic DC circuit breaker
- Integrated data logger and web server for system monitoring
- Various communication interfaces included as standard: Ethernet, RS485, S0, 4x analogue inputs
- Graphic display with 3-button control

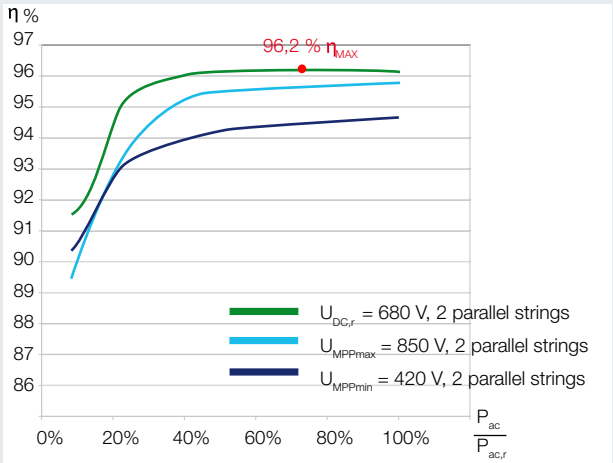
Technical Data

		PIKO 8.3	PIKO 10.1
Input side (DC)			
Number of DC inputs / number of MPP trackers		2 / 2	3 / 3
Max. input voltage (open circuit voltage)	U_{DCmax}	950 V	950 V
Min. DC input voltage	U_{DCmin}	180 V	180 V
Start-up DC input voltage	$U_{DCstart}$	180 V	180 V
Rated DC input voltage	$U_{DC,r}$	680 V	680 V
Max. MPP voltage	U_{MPPmax}	850 V	850 V
Min. MPP voltage in single-tracker operation	U_{MPPmin}	not recommended	
Min. MPP voltage in two-tracker or parallel operation	U_{MPPmin}	400 V	420 V
Max. DC input current	I_{DCmax}	12,5 A	12,5 A
Max. DC input current with parallel connection	$I_{DCmax,p}$	25 A	25 A
Output side (AC)			
Number of feed-in phases		3	3
AC grid voltage	$U_{AC,r}$	3/N/PE, AC, 230 V / 400 V	
Max. AC output current	I_{Acmax}	12 A	14,5 A
Rated AC output (cosφ = 1)	$P_{AC,r}$	8.300 W	10.000 W
Apparent power (cosφ, adj)	S_{AC}	8.300 VA	10.000 VA
Power factor $cos\varphi_{ACr}$		0,9 capacitive ... 1 ... 0,9 inductive	
Max. efficiency	η	96,1 %	96,2 %
European-standard efficiency	η_{EU}	95,5 %	95,6 %
Rated frequency	f_r	50 Hz	50 Hz

Efficiency rate characteristic curves PIKO 8.3



Efficiency rate characteristic curves PIKO 10.1



Country intercompatibility of PIKO-Inverters

		PIKO 3.0	PIKO 3.6	PIKO 4.2	PIKO 5.5	PIKO 8.3	PIKO 10.1
		name plate: Par/PIB ≥					
DE	Germany	01.00	02.00	03.04	01.03	03.00	01.00
DE NSR	Germany P(f)[1] und cosφ(P)[2]	01.09	02.09	03.18	01.19	03.15	01.16
DE MSR	Germany incl. LVRT[3]	–	–	–	–	03.13	01.12
AT	Austria	01.04	02.04	03.13	01.14	03.07	01.06
CH	Switzerland	01.00	02.00	03.04	01.03	03.00	01.00
FR	France	01.00	02.00	03.04	01.03	03.00	01.00
LU	Luxembourg	01.00	02.00	03.04	01.03	03.00	01.00
BE	Belgium	01.00	02.00	03.04	01.03	03.00	01.00
NL	Netherlands	01.00	02.00	03.04	01.03	03.00	01.00
IT	Italy	01.00	02.00	03.04	01.03	03.00	01.00
ES	Spain	01.00	02.00	03.04	01.03	03.00	01.00
PT	Portugal	01.00	02.00	03.04	01.03	03.00	01.00
GR	Greece (mainland)	01.00	02.00	03.04	01.03	03.00	01.00
GR, CY	Greece (islands), Cyprus (EU)	01.00	02.00	03.04	01.03	03.00	01.00
CZ	Czech Republic	01.00	02.00	03.04	01.03	03.00	01.00
SI	Slovenia	01.06	02.06	03.15	01.16	03.11	01.10
BA, BG, EE, HR, LV, LT, ME, RO, RS, SK, TR	Bosnia and Herzegovina, Bulgaria, Estonia, Croatia, Latvia, Lithuania, Montenegro, Romania, Serbia, Slovakia, Turkey	01.06	02.06	03.15	01.16	03.11	01.10
UK, MT	United Kingdom, Malta	01.06	02.06	03.18	01.19	–	–
DK	Denmark	01.09	02.09	03.18	01.19	03.15	01.16
SE	Sweden	01.09	02.09	03.18	01.19	03.15	01.16
PL	Poland	01.09	02.09	03.18	01.19	03.15	01.16

[1] P(f) = Frequency-dependent active power reduction [2] cosφ(P) = reactive power control [3] LVRT = Low Voltage Ride Through

Standards and guidelines for PIKO-Inverters *

DIN VDE 0100-712; IEC 60364-7-712; CEI 64-8/7; DIN EN 61000-3-2:2006; DIN EN 61000-3-3:1995 + A1:2001 + A2:2005; DIN EN 61000-6-2:2005; DIN EN 61000-6-3:2007; DIN EN 50178:1998; DIN V VDE V 0126-1-1 (VDE V 0126-1-1): 2006-02, „Eigenerzeugungsanlagen am Niederspannungsnetz“, 4. Ausgabe 2001; BDEW-TR Erzeugungsanlagen am Mittelspannungsnetz, Ausgabe Juni 2008; VDE-AR-N 4105, „Erzeugungsanlagen am Niederspannungsnetz“; ÖVE/ÖNORM E 8001-4-712:2009-12, Anhang A (AT); EN 50438:2007 (NL, PT); RD 1663/2000; RD 661/2007; C10/11-2009.05; G83/1-1; G59/2; ENEL DK 5940 Ed.2.2; IEC 60947-3:1999 + Corrigendum:1999 + A1:2001 + Corrigendum 1:2001 + A2:2005; DIN EN 60947-3; VDE 0660-107:2006-03; IEC 60364-7-712:2002-05; DIN VDE 0100-712:2006-06

* For all current certificates see www.kostal-solar-electric.com in the download area.

Country-specific switch-off limits

			U_{ACmax}	U_{ACmin}	f_{max}	f_{min}	t U_{ACmax}	t U_{ACmin}	t f_{max}	t f_{min}
			V	V	Hz	Hz	ms	ms	ms	ms
DE	Germany NSR, Germany MSR		264,5	184	51,5	47,5	200	200	200	200
AT	Austria		264,5	184	51	47	200	200	200	200
BA, BG, CH, EE, HR, LT, LU, LV, ME, RO, RS, SK, TR	Bosnia and Herzegovina, Bulgaria, Switzerland, Estonia, Croatia, Lithuania, Luxembourg, Latvia, Montenegro, Romania, Serbia, Slovakia, Turkey		264,5	184	50,2	47,5	200	200	200	200
BE	Belgium		253	195,5 (level 1) 115 (level 2)	50,5	47,5	100	1,5s/ 100	100	100
CY	Cyprus		253	207	52	47	500	500	500	500
CZ	Czech Republic		264,5	195,5	50,5	49,5	200	200	200	200
DK	Denmark		259,9	207	52	47,5	200	10s	200	200
ES	Spain	RD 661/ 2007:	253	195,5	51	48	200	200	200	3s
		RD 1663/ 2000:	264,5	195,5	51	49	200	200	200	200
FR	France		264,5	195,5	50,2	47,5	200	200	200	200
UK, MT	United Kingdom, Malta	G83/1:	264	207	50,5	47,0	1,5s	1,5s	0,5s	0,5s
		G59/2:	253 (level 1) 264,5 (level 2)	200,1 (level 1) 184 (level 2)	52,0	47,0	1,0s (level 1) 0,5s (level 2)	2,5s (level 1) 0,5s (level 2)	0,5s	0,5s
GR	Greece		264,5	184	51 (islands) 50,5 (mainland)	47,5 (islands) 49,5 (mainland)	500	500	500	500
IT	Italy		276	184	50,3 (51 if requested)	49,7 (49 if requested)	100	200	100	100
NL	Netherlands		253	184	51	48	2s	2s	2s	2s
PL, PT	Poland, Portugal		264,5	195,5	51	47	200	1,5s	500	500
SE	Sweden		264,5	195,5 / 207	51	47	200	200 / 60s	500	500
SI	Slovenia		264,5	195	51	47	200	200	200	200

Terms

Input side (DC)		
Maximum DC input voltage (open circuit voltage)	U_{DCmax}	The maximum voltage that is permitted at the DC input of the inverter.
Minimum DC input voltage	U_{DCmin}	The minimum input voltage at which the inverter feeds into the grid.
Start-up DC input voltage	$U_{DCstart}$	The input voltage at which the inverter starts feeding into the grid.
Rated DC input voltage	$U_{DC,r}$	The DC input voltage, which other data refer to.
Maximum MPP voltage	U_{MPPmax}	The maximum voltage at which the inverter can deliver its rated AC power.
Minimum MPP voltage	U_{MPPmin}	The minimum voltage at which the inverter can deliver its rated AC power.
Maximum DC input current	I_{DCmax}	The maximum DC current at which the inverter can be operated.
Maximum DC input current with parallel connection	$I_{DCmax,p}$	The maximum DC current that is allowed for parallel connection of two DC inputs.
Output side (AC)		
Maximum AC output voltage	U_{ACmax}	The maximum permissible AC voltage.
Minimum AC output voltage	U_{ACmin}	The minimum permissible AC voltage.
AC grid voltage	$U_{AC,r}$	The voltage of the network to which the inverter is connected.
Maximum AC output current	I_{ACmax}	The maximum output current that the inverter will supply.
Rated AC output	$P_{AC,r}$	The active power that can be delivered by the inverter in continuous operation at $\cos\varphi=1$.
Apparent power	$S_{AC,r}$	The connected power, which consists of actually implemented active power and additional existing reactive power.
Rated frequency	f_r	The nominal frequency of the connected network.
Maximum grid frequency	f_{max}	The maximum frequency (upper switch-off limit).
Minimum grid frequency	f_{min}	The minimum frequency (lower switch-off limit).
Self-consumption at night	P_L	The power that the inverter obtains from the public grid, when the modules do not supply sufficient power.
Power factor $\cos\varphi_{AC,r}$	$\cos\varphi$	The ratio between active power and apparent power.
Maximum efficiency	η_{max}	The maximum efficiency that the inverter can achieve.
European-standard efficiency	η_{EU}	Weighted overall efficiency.

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