

# Product catalogue 2013

TOP BRAND PRODUCTS  
DESIGN AND ENGINEERING SERVICE  
BEFORE AND AFTER-SALES SERVICES  
DESIGN OF GRID CONNECTED OR OFF-GRID SYSTEMS





# Welcome to Inam

## QUALITY AND SERVICE ▼

Inam is a **Spanish-German** company specialized in the distribution of photovoltaic energy products for professional installers. Founded in 2006 by three engineers, Jürgen Sturm, Roger Fernández and Òscar Gómez.

Since the beginning, INAM has opted for a policy of **quality** and **transparency**, offering both a professional and reliable service to installers by ensuring access to the best products and brands at the most competitive prices in the market

*“Our goal is to grow with our customers, having a proactive and close relationship with them. Through the hard work of our team we ensure the success of all our customers’ projects and the long term success of renewable energy”.*

Currently INAM operates in all of the main European markets, with headquarters in Barcelona (Spain) and an office in **KOBLENZ** (Germany).

This business model has enabled INAM to double both its revenue and customer portfolio steadily over the last 4 years.

## EXPERIENCE AND GROWTH ▼

**Experience**, **analysis**, and **direct contact** with the market are the keys to successfully improve on a daily basis as professionals in the PV sector. INAM continuously studies and analyses the market trends and then acts thus assuring its customers a **privileged position** in the areas in which they operate ahead of their competitors and consequently generating stable growth and success.

## ADDED VALUE ▼

Inam has its own **design** and **manufacturing** departments which produce assembly systems for all types of installations, adapting to the needs of our customers under the strictest quality criteria.

## PRESENCE ▼

The company has a presence in all of the major markets within the **EU** including Germany, Belgium, the United Kingdom, Greece, France, Italy, among others.

# Table of **contents**

Index |

## **Grid connected systems** 4

Solar Modules 4-21

Solar Inverters 22-43

Micro Inverters 44-45

Power Optimizers 46-47

Mounting systems 48-49

**Our services** 50

**Contact** 51



# Grid connected **systems**

## I Modules

### REC Peak Energy serie

The **REC Peak Energy Series** delivers more power per square meter due to several design improvements. Introduction of three bus bars and improved contact between the cell and metal fingers, improves the electrical flow.

The modules are easy to install with made-to-fit cables and multiple grounding points that reduce the ground wire needed in installation. Easy to lift and handle, the modules have a robust and durable design, supporting a large mechanical load.

Committed to sustainability, REC modules have an industry leading energy payback time of one year. This is a result of innovations such as the new fluidized bed reactor (FBR) silicon production process which uses 80 to 90 percent less energy than traditional methods.

REC modules are also certified to benefit from the 10 percent premium available as part of an Italian photovoltaic incentive scheme for solar systems containing European components.



### NEW INDUSTRY LEADING WARRANTY 25 YEAR LINEAR PERFORMANCE WARRANTY

REC now offers the best warranty in the business for their modules.

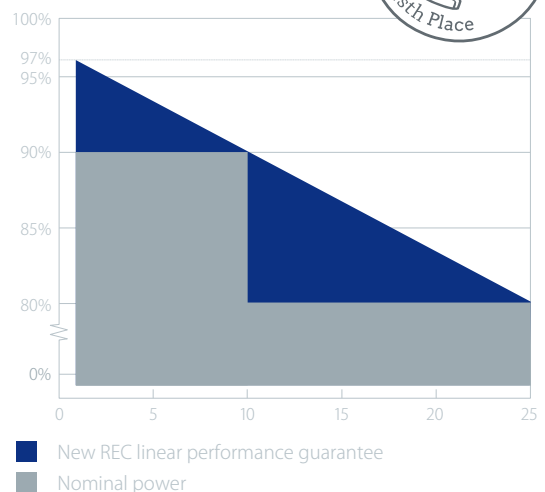
- ▶ Standard solar module warranties are simple, but unlike the modules, they do not adapt over time. REC now offers a new industry leading product and power output warranty that provides real security. REC solar modules sold from September 1st, 2011 now include a linear power output warranty. This is our assurance that your REC module will perform exactly as you expect it to – every year. We have almost doubled our product warranty to ten full years. That means real security.
- ▶ At least **97%** output guaranteed during the first year of performance.
- ▶ Maximum **0.7%** reduction of power output per year from year **2-25**.

This guarantees more than **90%** annual power output after **10 years** and more than **80%** annual power output after 25 years

### 10 YEARS OF PRODUCT WARRANTY

- ▶ REC's existing 63 month material and workmanship warranty is now changed to a 10 year product warranty. REC can stand behind this warranty due to the high quality of our products.

Guaranteed performance of the module  
Nominal power



# Grid connected **systems**

## Modules I

### Photovoltaic modules REC PEAK ENERGY SERIE

#### ELECTRICAL SPECIFICATIONS

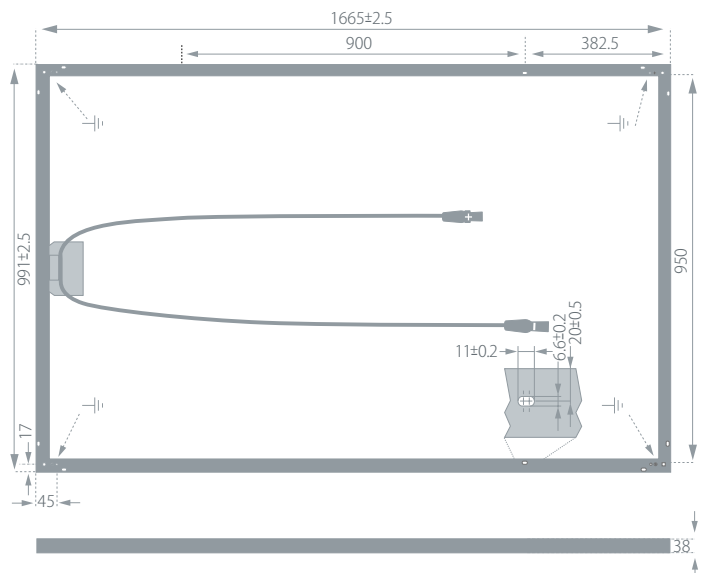
##### MODULE TYPES AND TECHNICAL DATA A STC<sup>1</sup>

Nominal value		REC235PE	REC240PE	REC245PE	REC250PE	REC255PE
Nominal power (0/+5W)	$P_{MPP}$ (W)	235.0	240.0	245.0	250.0	255.0
Voltage at $P_{MAX}$	$V_{MPP}$ (V)	29.5	29.7	30.1	30.2	30.5
Current at $P_{MAX}$	$I_{MPP}$ (A)	8.06	8.17	8.23	8.30	8.42
Open circuit voltage	$V_{OC}$ (V)	36.6	36.8	37.1	37.4	37.6
Open circuit current	$I_{SC}$ (A)	8.66	8.75	8.80	8.86	8.95
Max. system voltage	$V_{SYS}$ (V)	1000V				
Temperature coefficient $V_{oc}$	$T_K (V_{OC})$	-0.27%/ °C				
Temperature coefficient at $I_{SC}$	$T_K (I_{SC})$	0.024%/ °C				
Limiting Reverse Current	$I_R$ (A)	25				
Maximum series fuse	$I_{CF}$ (A)	25				

#### MECHANICAL SPECIFICATIONS

Length	1665 mm
Widths	991 mm
Weight	18 kg
Height	38 mm
Surface	1.65 m <sup>2</sup>
Connection cable	Solar cable Radox 4 mm <sup>2</sup> , 0.90 m+1.20 m
Connectors	MC4
Cell-Type	60 cells poly REC PE, 3 strings of 20 cells each and 4 bypass-diodes
Frame type	anodized alu-frame
Cover type	3.2 mm solar glass , with anti-reflection surface
Encapsulation	double layer highly resistant polyester

#### MECHANICAL DRAWING



# Grid connected **systems**

## I Modules

### Yingli Panda 60 cell series

With the development of the Yingli Solar PANDA module, we are proving ourselves at the forefront of **technological innovation**. By using n-doped silicon instead of the industry's standard p-type silicon, we have created our best performing module family yet. Key advantages of n-type modules include insensitivity to metallic impurities, a more efficient conversion of infrared light into electricity, and a lower initial degradation rate. Combined with high transmission glass, the result is a highly efficient, next-generation solar module that delivers impressive performance. Yingli PANDA was first realized through an in-house collaboration between the Energy Research Center of the Netherlands (ECN) and Amtech Systems, Inc, two of the world's leaders in solar power technology. Today's average cell efficiency on commercial production lines exceeds **19.0%** with up to **16.5% efficiency**. Yingli PANDA is ideal for commercial or residential projects where energy output is essential.

#### PERFORMANCE

- ▶ Yingli Solar Panda is a new monocrystalline module technology with n-type solar cells that have average efficiencies higher than **19%**. Combined with high transmission glass, module efficiencies are up to **16.5%**.
- ▶ Compared to traditional modules with p-type solar cells, Panda modules have lower initial degradation and higher performance under both high temperature and low irradiation conditions.
- ▶ Tight positive power tolerance of 0W to +5W ensures you receive modules at or above nameplate power and contributes to minimizing module mismatch losses leading to improved system yield.

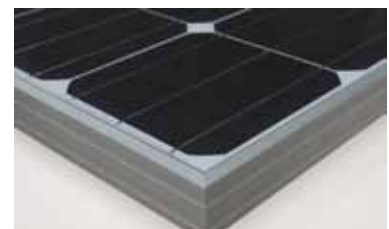
#### WARRANTIES

- ▶ **10-year** limited product warranties<sup>1</sup>.
- ▶ Limited power warranty<sup>1</sup>: **1 year** at **98%** of the minimal rated power output, **10 years** at **92%** of the minimal rated power output, **25 years** at **82%** of the minimal rated power output. In compliance with Yinglis Warranty Terms and Conditions.

<sup>1</sup>In compliance with our warranty Terms and Conditions.

#### QUALIFICATIONS AND CERTIFICATES

- ▶ IEC 61215, IEC 61730, MCS, CE, ISO 9001:2008, ISO 14001:2004, BS OHSAS 18001:2007, SA 8000, PV Cycle.



### Módulos fotovoltaicos PANDA 60 cell Series

#### ELECTRICAL SPECIFICATIONS

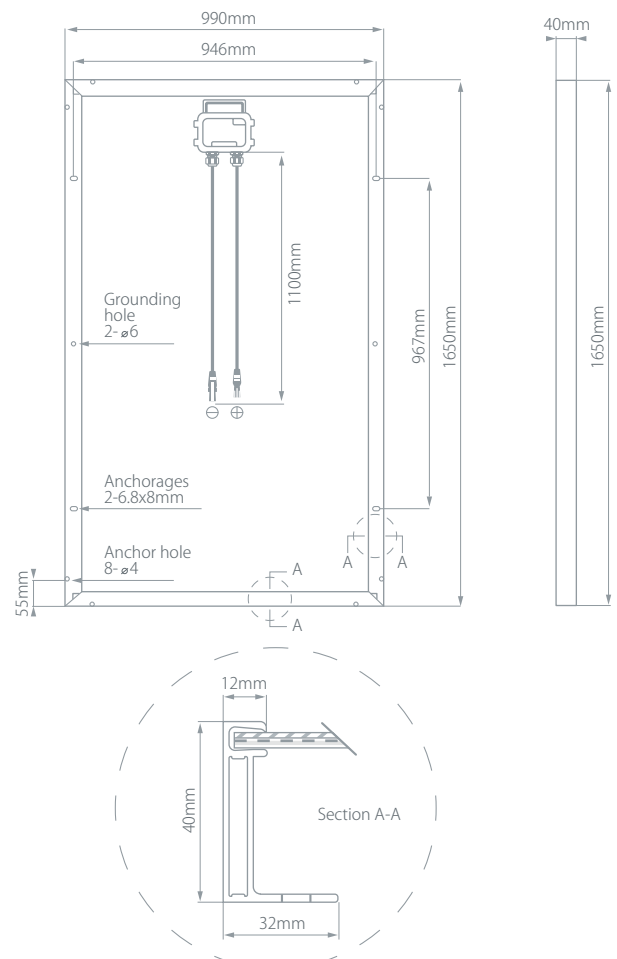
##### MODULE TYPES AND TECHNICAL DATA A STC<sup>1</sup>

Nominal values		PANDA 260	PANDA 265	PANDA 270
Nominal power (0/+5W)	$P_{MPP}$ (W)	260.0	265.0	270.0
Voltage at $P_{MAX}$	$V_{MPP}$ (V)	30.8	31.0	31.1
Current at $P_{MAX}$	$I_{MPP}$ (A)	8.46	8.55	8.68
Open circuit voltage	$V_{OC}$ (V)	38.6	39.0	39.00
Short circuit current	$I_{SC}$ (A)	8.91	8.93	9.06
Max. system voltage	$V_{SYS}$ (V)	1000		
Temperature coefficient Voc	$T_K (V_{OC})$	-0.31%/ °C		
Temperature coefficient at $I_{SC}$	$T_K (I_{SC})$	+0.04%/ °C		
Limiting reverse current	$I_R$ (A)	15		
Maximum series fuse	$I_{CF}$ (A)	15		

#### MECHANICAL SPECIFICATIONS

Length	1650 mm
Widths	990 mm
Weight	19.5 kg
Height	40 mm
Connection cable	1100 mm/ 4 mm <sup>2</sup>
Connectors	MC4 / IP67 or Amphenol H4 / IP68
Front Cover	low-iron tempered glass, 3.2 mm
Cell-type	60 / mono / 156 mm x 156 mm
Frame type	Anodized alu-frame
Encapsulation	(EVA)

#### MECHANICAL DRAWING



# Grid connected **systems**

## I Modules

### **Yingli Panda 48 cell ALL BLACK 200 Inamedition**

With the development of the Yingli Solar PANDA module, we are proving ourselves at the forefront of **technological innovation**. By using n-doped silicon instead of the industry's standard p-type silicon, we have created our best performing module family yet. Key advantages of n-type modules include insensitivity to metallic impurities, a more efficient conversion of infrared light into electricity, and a lower initial degradation rate. Combined with high transmission glass, the result is a highly efficient, next-generation solar module that delivers impressive performance. Yingli PANDA was first realized through an in-house collaboration between the Energy Research Center of the Netherlands (ECN) and Amtech Systems, Inc, two of the world's leaders in solar power technology. Today's average cell efficiency on commercial production lines **exceeds 19.0%** with up to 16.5% efficiency. Yingli PANDA is ideal for commercial or residential projects where energy output is essential:

#### **PERFORMANCE**

- ▶ Yingli Solar Panda is a new monocrystalline module technology with n-type solar cells that have average efficiencies higher than **19%**. Combined with high transmission glass, module efficiencies are up to **16.5%**.
- ▶ Compared to traditional modules with p-type solar cells, Panda modules have lower initial degradation and higher performance under both high temperature and low irradiation conditions.
- ▶ Tight positive power tolerance of 0W to +5W ensures you receive modules at or above nameplate power and contributes to minimizing module mismatch losses leading to improved system yield.

#### **WARRANTIES**

- ▶ **10-year** limited product warranty<sup>1</sup>.
- ▶ Limited power warranty<sup>1</sup>: **1 year** at **98%** of the minimal rated power output, **10 years** at **92%** of the minimal rated power output, **25 years** at **82%** of the minimal rated power output. In compliance with Yingli's Warranty Terms and Conditions.

<sup>1</sup>In compliance with our warranty Terms and Conditions.

#### **QUALIFICATIONS AND CERTIFICATES**

- ▶ IEC 61215, IEC 61730, MCS, CE, ISO 9001:2008, ISO 14001:2004, BS OHSAS 18001:2007, SA 8000, PV Cycle.

Inamedition





# Grid connected **systems**

Modules |

## Photovoltaic modules PANDA 48 cell ALL BLACK 200 Inamedition

### ELECTRICAL SPECIFICATIONS

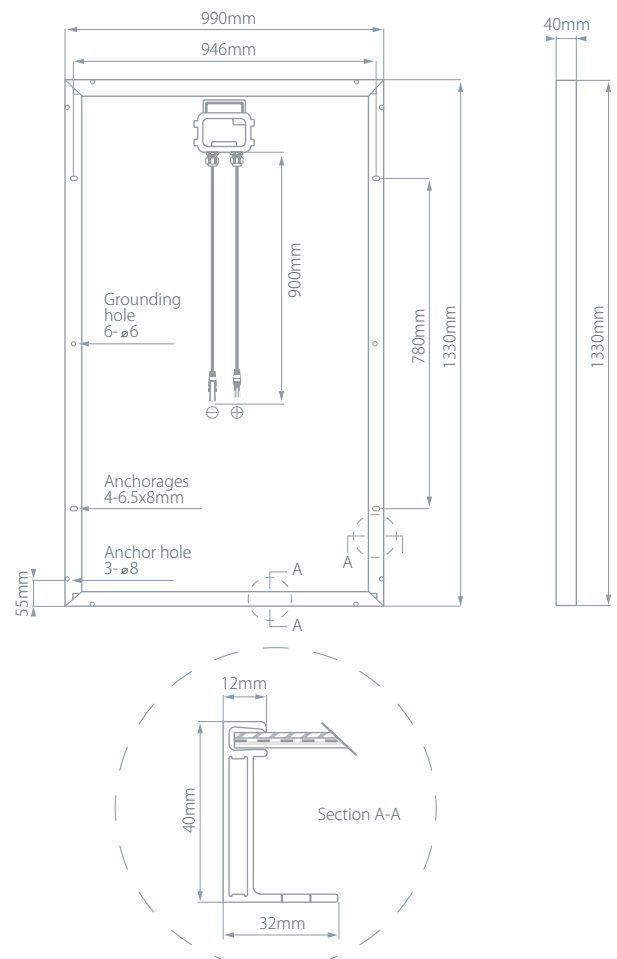
#### MODULE TYPES AND TECHNICAL DATA A STC<sup>1</sup>

Nominal values		PANDA 200 ALL BLACK Inamedition
Nominal power (0/+5W)	$P_{MPP}$ (W)	200.0
Voltage at $P_{MAX}$	$V_{MPP}$ (V)	24.3
Current at $P_{MAX}$	$I_{MPP}$ (A)	8.23
Open circuit voltage	$V_{OC}$ (V)	30.5
Short circuit current	$I_{SC}$ (A)	8.71
Max. system voltage	$V_{SYS}$ (V)	1000
Temperature coefficient $V_{oc}$	$T_K (V_{OC})$	-0.31%/ °C
Temperature coefficient at $I_{SC}$	$T_K (I_{SC})$	+0.04%/ °C
Limiting reverse current	$I_R$ (A)	15
Maximum series fuse	$I_{CF}$ (A)	15

### MECHANICAL SPECIFICATIONS

Length	1330 mm
Widths	990 mm
Weight	15.4 kg
Height	40 mm
Connection cable	1100 mm/ 4 mm <sup>2</sup>
Connectors	MC4 / IP67 or Amphenol H4 / IP68
Front Cover	low-iron tempered glass, 3.2 mm
Cell-type	48 / mono / 156 mm x 156 mm
Frame type	anodized alu-frame BLACK
Encapsulation	(EVA)
Bus bar	3

### MECHANICAL DRAWING



# Grid connected **systems**

## | Modules

### **Yingli Panda 60 cell ALL BLACK 250**

With the development of the Yingli Solar PANDA module, we are proving ourselves at the forefront of **technological innovation**. By using n-doped silicon instead of the industry's standard p-type silicon, we have created our best performing module family yet. Key advantages of n-type modules include insensitivity to metallic impurities, a more efficient conversion of infrared light into electricity, and a lower initial degradation rate. Combined with high transmission glass, the result is a highly efficient, next-generation solar module that delivers impressive performance. Yingli PANDA was first realized through an in-house collaboration between the Energy Research Center of the Netherlands (ECN) and Amtech Systems, Inc, two of the world's leaders in solar power technology. Today's average cell efficiency on commercial production lines **exceeds 19.0%** with up to 16.5% efficiency. Yingli PANDA is ideal for commercial or residential projects where energy output is essential.

#### **PERFORMANCE**

- ▶ Yingli Solar Panda is a new monocrystalline module technology with n-type solar cells that have average efficiencies higher than **19%**. Combined with high transmission glass, module efficiencies are up to **16.5%**.
- ▶ Compared to traditional modules with p-type solar cells, Panda modules have lower initial degradation and higher performance under both high temperature and low irradiation conditions.
- ▶ Tight positive power tolerance of 0W to +5W ensures you receive modules at or above nameplate power and contributes to minimizing module mismatch losses leading to improved system yield.

#### **WARRANTIES**

- ▶ **10-year** limited product warranty<sup>1</sup>.
- ▶ Limited power warranty<sup>1</sup>: **1 year** at **98%** of the minimal rated power output, **10 years** at **92%** of the minimal rated power output, **25 years** at **82%** of the minimal rated power output. In compliance with Yingli's Warranty Terms and Conditions.

<sup>1</sup>In compliance with our warranty Terms and Conditions.

#### **QUALIFICATIONS AND CERTIFICATES**

- ▶ IEC 61215, IEC 61730, MCS, CE, ISO 9001:2008, ISO 14001:2004, BS OHSAS 18001:2007, SA 8000, PV Cycle.



### Photovoltaic modules PANDA 60 cell ALL BLACK 250

#### ELECTRICAL SPECIFICATIONS

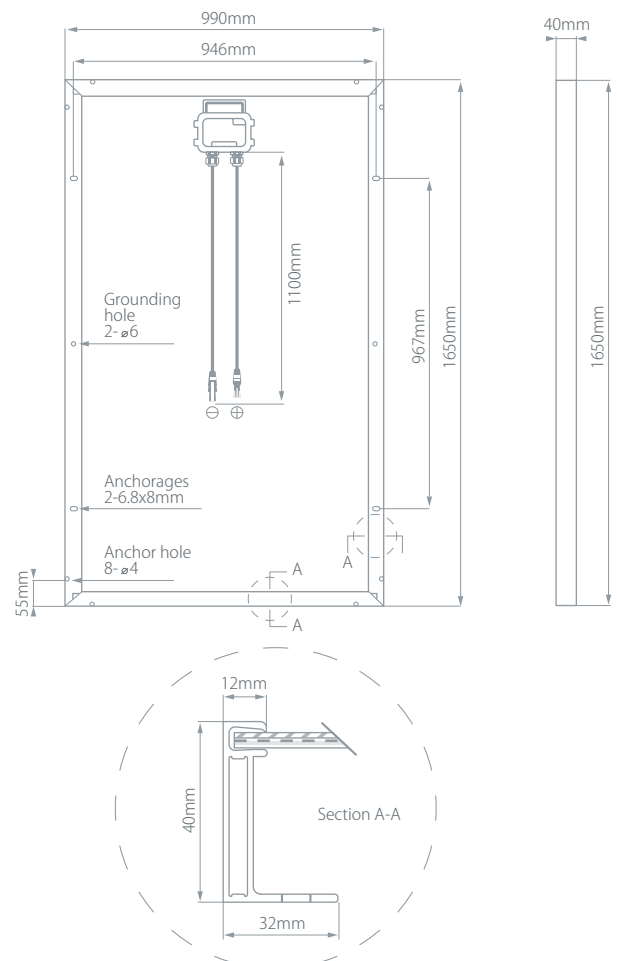
##### MODULE TYPES AND TECHNICAL DATA A STC<sup>1</sup>

Nominal values		PANDA 250 ALL BLACK
Nominal power (0/+5W)	$P_{MPP}$ (W)	250.0
Voltage at $P_{MAX}$	$V_{MPP}$ (V)	30.5
Current at $P_{MAX}$	$I_{MPP}$ (A)	8.20
Open circuit voltage	$V_{OC}$ (V)	38.10
Short circuit current	$I_{SC}$ (A)	8.71
Max. system voltage	$V_{SYS}$ (V)	1000
Temperature coefficient $V_{oc}$	$T_K (V_{OC})$	-0.31%/ °C
Temperature coefficient at $I_{SC}$	$T_K (I_{SC})$	+0.04%/ °C
Limiting reverse current	$I_R$ (A)	15
Maximum series fuse	$I_{CF}$ (A)	15

#### MECHANICAL SPECIFICATIONS

Length	1650 mm
Widths	990 mm
Weight	19.5 kg
Height	40 mm
Connection cable	1100 mm/ 4 mm <sup>2</sup>
Connectors	MC4 / IP67 or Amphenol H4 / IP68
Front Cover	low-iron tempered glass, 3.2 mm
Cell-type	60 / mono / 156 mm x 156 mm
Frame type	BLACK anodized alu-frame
Encapsulation	(EVA)

#### MECHANICAL DRAWING



# Grid connected **systems**

## I Modules

### Yingli YGE 60 cell series

Our high-performing **multicrystalline** modules have an excellent efficiency of up to **15.4%**. Used widely across commercial, residential, and utility projects, these reliable, high efficiency modules minimize installation costs and maximize kWh output. Yingli Solar's multicrystalline modules deliver above-average energy yields. Our strategic partnership with the technical inspection agency, TÜV Rheinland, ensures quality you can rely on across the entire product portfolio. Currently, we are one of the few manufacturers to provide solar modules with the independently-tested Power Controlled seal from TÜV.

#### PERFORMANCE

- ▶ High efficiency, multicrystalline solar cells with high transmission and textured glass deliver a module efficiency of up to **15.4%**, minimizing installation costs and maximizing the kWh output of your system per unit area.
- ▶ Tight positive power tolerance of 0W to +5W ensures you receive modules at or above nameplate power and contributes to minimizing module mismatch losses leading to improved system yield.

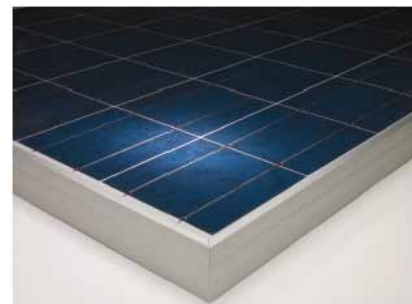
#### WARRANTIES

- ▶ **10-year** limited product warranty<sup>1</sup>.
- ▶ Limited power warranty<sup>1</sup>: **10 years** at **91.2%** of the minimal rated power output, **25 years** at **80.7%** of the minimal rated power output.

<sup>1</sup>In compliance with our warranty Terms and Conditions.

#### QUALIFICATIONS AND CERTIFICATES

- ▶ IEC 61215, IEC 61730, MCS, CE, ISO 9001:2008, ISO 14001:2004, BS OHSAS 18001:2007, SA 8000, PV Cycle.



### Photovoltaic modules YGE 60 cell series

#### ELECTRICAL SPECIFICATIONS

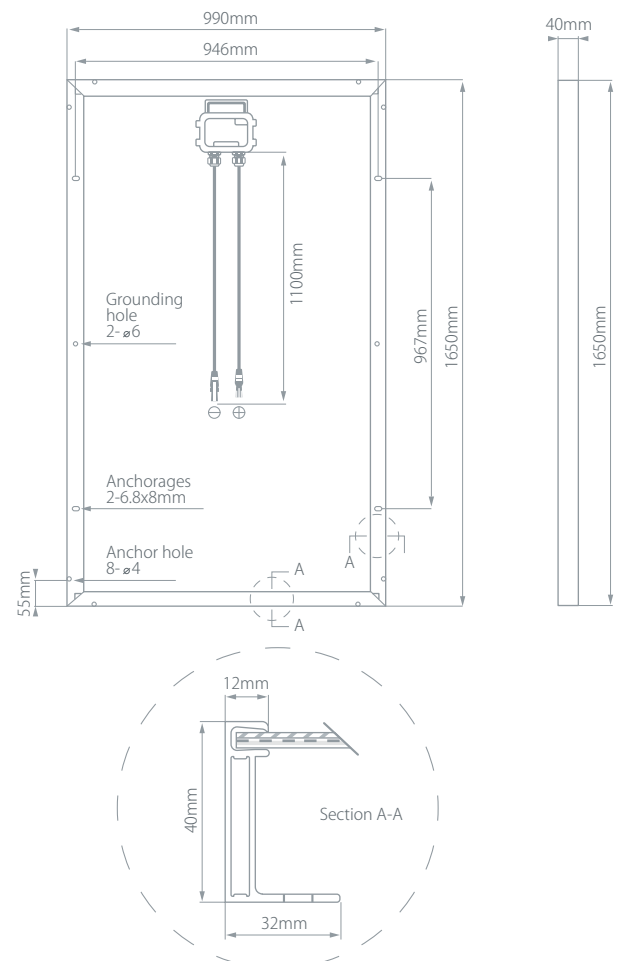
##### MODULE TYPES AND TECHNICAL DATA A A STC<sup>1</sup>

Nominal values		YGE 235	YGE 240	YGE 245	YGE 250
Nominal power (0/+5W)	$P_{MPP}$ (W)	235.0	240.0	245.0	250.0
Voltage at $P_{MAX}$	$V_{MPP}$ (V)	29.5	29.5	30.02	30.4
Current at $P_{MAX}$	$I_{MPP}$ (A)	7.97	8.14	8.11	8.24
Open circuit voltage	$V_{OC}$ (V)	37.0	37.5	37.8	38.4
Short circuit current	$I_{SC}$ (A)	8.54	8.65	8.63	8.79
Max. system voltage	$V_{SYS}$ (V)	1000			
Temperature coefficient $V_{oc}$	$T_K (V_{OC})$	-0.33%/ °C			
Temperature coefficient at $I_{SC}$	$T_K (I_{SC})$	+0.06%/ °C			
Limiting reverse current	$I_R$ (A)	15			
Maximum Series Fuse	$I_{CF}$ (A)	15			

#### MECHANICAL SPECIFICATIONS

Length	1650 mm
Widths	990 mm
Weight	19.5 kg
Height	40 mm
Connection cable	1100 mm/ 4 mm <sup>2</sup>
Connectors	MC4 / IP67 or Amphenol H4 / IP68
Front Cover	low-iron tempered glass, 3.2 mm
Cell-type	60 / poly / 156 mm x 156 mm
Frame type	anodized alu-frame
Encapsulation	(EVA)

#### MECHANICAL DRAWING



# Grid connected **systems**

## | Modules

### **Yingli YGE 48 cell series**

Our high-performing multicrystalline modules have an excellent efficiency of up to **15%**. Used widely across commercial, residential, and utility projects, these reliable, high efficiency modules minimize installation costs and maximize kWh output. Yingli Solar's multicrystalline modules deliver above-average energy yields. Our strategic partnership with the technical inspection agency, TÜV Rheinland, ensures quality you can rely on across the entire product portfolio. Currently, we are one of the few manufacturers to provide solar modules with the independently-tested Power Controlled seal from TÜV.

#### **PERFORMANCE**

- ▶ High efficiency, multicrystalline solar cells with high transmission and textured glass deliver a module efficiency of up to **15.4%**, minimizing installation costs and maximizing the kWh output of your system per unit area.
- ▶ Tight positive power tolerance of 0W to +5W ensures you receive modules at or above nameplate power and contributes to minimizing module mismatch losses leading to improved system yield.

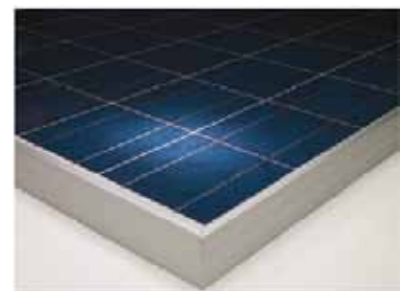
#### **WARRANTY**

- ▶ **10-year** limited product warranty<sup>1</sup>.
- ▶ Limited power warranty<sup>1</sup>: **10 years** at **91.2%** of the minimal rated power output, **25 years** at **80.7%** of the minimal rated power output.

<sup>1</sup>In compliance with our warranty Terms and Conditions.

#### **QUALIFICATIONS AND CERTIFICATES**

- ▶ IEC 61215, IEC 61730, MCS, CE, ISO 9001:2008, ISO 14001:2004, BS OHSAS 18001:2007, SA 8000, PV Cycle.



# Grid connected **systems**

## Modules |

### Photovoltaic modules YGE 48 cell series

#### ELECTRICAL SPECIFICATIONS

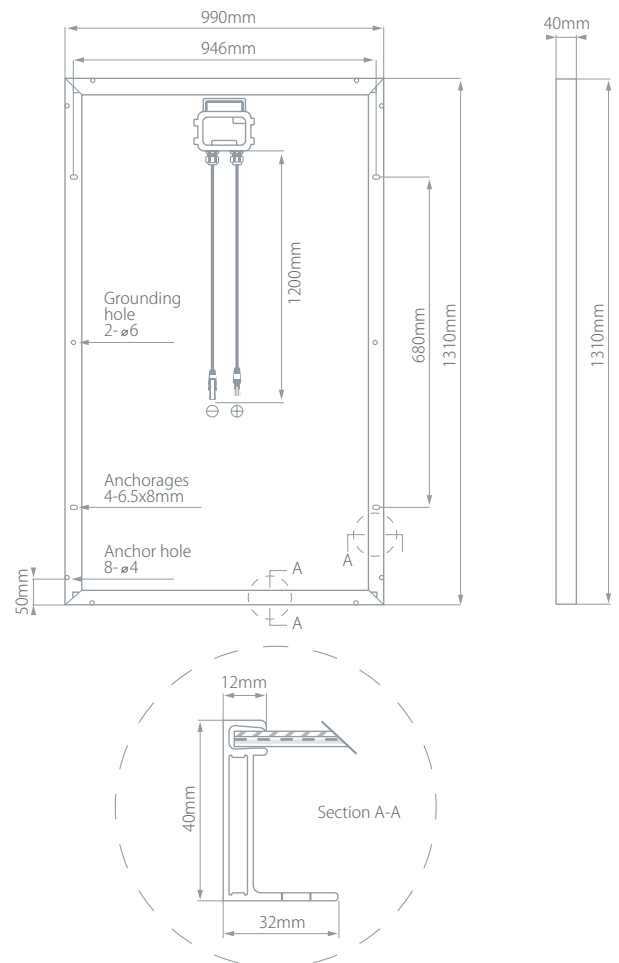
##### MODULE TYPES AND TECHNICAL DATA AT STC<sup>1</sup>

Nominal values		YL 180 P-23b	YL 185 P-23b	YL 190 P-23b	YL 195 P-23b	YL 200 P-23b
Nominal power (0/+5W)	$P_{MPP}$ (W)	180.0	185.0	190.0	195.0	200.0
Voltage at P <sub>MAX</sub>	$V_{MPP}$ (V)	23.0	23.5	23.7	24.0	24.5
Voltage at P <sub>MAX</sub>	$I_{MPP}$ (A)	7.83	7.87	8.00	8.10	8.15
Open circuit voltage	$V_{OC}$ (V)	29.5	29.5	30.1	30.3	31.0
Short circuit current	$I_{SC}$ (A)	8.30	8.45	8.48	8.62	8.73
Max. system voltage	$V_{SYS}$ (V)	1000				
Temperature coefficient Voc	$T_K (V_{OC})$	-0.33%/ °C				
Temperature coefficient at ISC	$T_K (I_{SC})$	+0.06%/ °C				
Maximum series fuse	$I_{CF}$ (A)	15				

#### MECHANICAL SPECIFICATIONS

Length	1310 mm
Widths	990 mm
Weight	15.8 kg
Height	40 mm
Cable connection	CIXI / 1200 mm <sup>2</sup> / 4 mm
Connectors	MC4 / IP67 or Amphenol H4 / IP68
Front cover	tempered glass, highly transparent
Cell type	48 / poly-cells / 156 mm x 156 mm
Frame material	Anodized alu-frame
Encapsulation	(EVA)

#### MECHANICAL DRAWING



# Grid connected **systems**

## I Modules

### **Bosch Solar Module c-Si M 60 EU30117**

Bosch **crystalline solar modules** are monitored throughout their entire processing chain, from silicon ingots pulling to module production. Measuring devices calibrated on a regular basis enable the performance of solar modules to be measured under standard test conditions. Easy and safe installation is guaranteed for our crystalline modules as a result of good mechanical stability and the ready-made holes for installing different grounding systems.

#### **PERFORMANCE**

##### ▶ **Good annual yields on a long-term basis**

The first-rate product quality in Bosch solar cells ensures excellent performance and a very high efficiency ratio (up to 240 Wp / **14.6%** modules) even with sub-optimal levels of sunlight.

##### ▶ **Global awareness of the Bosch brand**

The Bosch brand can be resold more easily as it maintains its value for end customers on a long-term basis. Bosch unites long-term strategic vision, innovative spirit and efficient processes with its core competencies to provide a basis for consistent further development throughout the company.

#### **WARRANTIES**

##### ▶ **10-year** product warranty<sup>1</sup>.

##### ▶ **25 year** performance warranty (**90%** up to **10 years**, **80%** up to **25 years**)<sup>1</sup>.

<sup>1</sup>In compliance with our warranty Terms and Conditions.

#### **QUALIFICATIONS AND CERTIFICATES**

##### ▶ Product certification in compliance with IEC 61215 (ed. 2), protection class II or IEC 61730, MCS, CE.





### Photovoltaic modules Bosch Solar Module c-Si M 60 S EU30117

#### ELECTRICAL SPECIFICATIONS

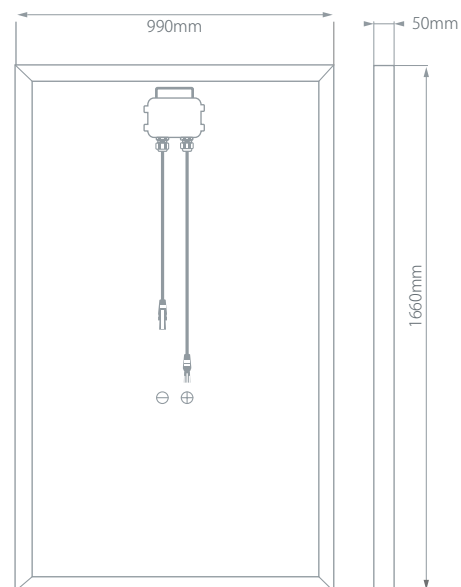
##### MODULE TYPES AND TECHNICAL DATA A STC<sup>1</sup>

Nominal values		M 225 3BB	M 230 3BB	M 235 3BB	M 240 3BB	M 245 3BB
Nominal power (0/+5W)	$P_{MPP}$ (W)	225.0	230.0	235.0	240.0	245.0
Voltage at PMAX	$V_{MPP}$ (V)	29.4	29.7	29.9	30.0	30.1
Current at PMAX	$I_{MPP}$ (A)	7.80	7.90	8.00	8.10	8.20
Open circuit voltage	$V_{OC}$ (V)	36.9	37.0	37.1	37.4	37.7
Short circuit current	$I_{SC}$ (A)	8.30	8.40	8.50	8.60	8.70
Max. system voltage	$V_{SYS}$ (V)	1000				
Temperature coefficient Voc	$T_K(V_{OC})$	-0.32%/ °C				
Temperature coefficient at ISC	$T_K(I_{SC})$	+0.032%/ °C				
Limiting reverse current	$I_R$ (A)	17				

#### MECHANICAL SPECIFICATIONS

Length	1660 mm
Widths	990 mm
Weight	21 kg
Height	50 mm
Connection cable	-800 mm/+1200 mm
Connectors	MC4
Cell-type	60 / mono / 156 mm x 156 mm
Frame type	anodized alu-frame
Junction box	(IP65) with 3 bypass diodes
Back sheet	(white) water resistant

#### MECHANICAL DRAWING



# Grid connected **systems**

## I Modules

### **Bosch Solar Module c-Si M 60 S EU30117 ALL BLACK**

Bosch **crystalline** solar modules are monitored throughout their entire processing chain, from silicon ingots pulling to module production. Measuring devices calibrated on a regular basis enable the performance of solar modules to be measured under standard test conditions. Easy and safe installation is guaranteed for our crystalline modules as a result of good mechanical stability and the ready-made holes for installing different grounding systems.

#### **PERFORMANCE**

► **Good annual yields on a long-term basis**

The first-rate product quality in Bosch solar cells ensures excellent performance and a very high efficiency ratio (up to 240 Wp / **14.6%** modules) even with sub-optimal levels of sunlight.

► **Global awareness of the Bosch brand**

The Bosch brand can be resold more easily as it maintains its value for end customers on a long-term basis. Bosch unites long-term strategic vision, innovative spirit and efficient processes with its core competencies to provide a basis for consistent further development throughout the company.

#### **GARANTÍAS**

► **10-year** product warranty<sup>1</sup>.

► **25 -year** performance warranty (**90%** up to **10 years**, **80%** up to **25 years**)<sup>1</sup>.

<sup>1</sup>In compliance with our warranty Terms and Conditions.

#### **QUALIFICATIONS AND CERTIFICATES**

► Product certification in compliance with IEC 61215 (ed. 2), protection class II or IEC 61730, MCS, CE.



### Photovoltaic modules Bosch Solar Module c-Si M 60 S EU30117 ALL BLACK

#### ELECTRICAL SPECIFICATIONS

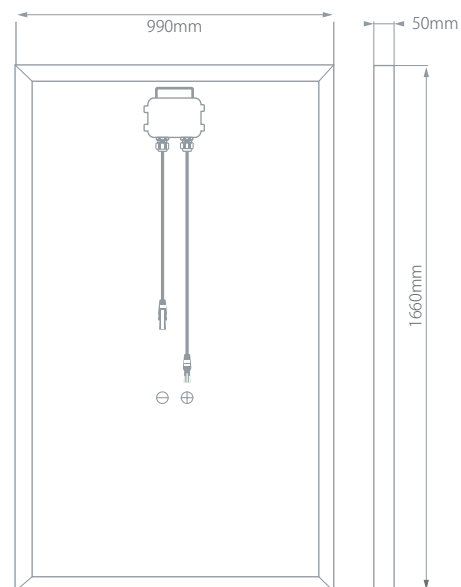
##### MODULE TYPES AND TECHNICAL DATA A STC<sup>1</sup>

Nominal values		M 225 3BB	M 230 3BB	M 235 3BB	M 240 3BB
Nominal power (0/+5W)	$P_{MPP}$ (W)	225.0	230.0	235.0	240.0
Voltage at P <sub>MAX</sub>	$V_{MPP}$ (V)	29.4	29.7	29.9	30.0
Current at P <sub>MAX</sub>	$I_{MPP}$ (A)	7.80	7.90	8.00	8.10
Open circuit voltage	$V_{OC}$ (V)	39.9	37.0	37.1	37.4
Short circuit current	$I_{SC}$ (A)	8.30	8.40	8.50	8.60
Max. system voltage	$V_{SYS}$ (V)	1000			
Temperature coefficient Voc	$T_K(V_{OC})$	-0.32%/ °C			
Temperature coefficient at ISC	$T_K(I_{SC})$	+0.032%/ °C			
Limiting reverse current	IR (A)	17			

#### MECHANICAL SPECIFICATIONS

Length	1660 mm
Widths	990 mm
Weight	21 kg
Height	50 mm
Connection cable	-800 mm/ +1000 mm
Connectors	MC4
Cell-type	60 / mono / 156 mm x 156 mm
Frame type	BLACK anodized alu-frame
Junction box	(IP65) with 3 bypass diodes
Back sheet	(black) water resistant

#### MECHANICAL DRAWING



# Grid connected **systems**

## I Modules

### **Bosch Solar Module c-Si M 48 EU30111**

Bosch **crystalline** solar modules are monitored throughout their entire processing chain, from silicon ingots pulling to module production. Measuring devices calibrated on a regular basis enable the performance of solar modules to be measured under standard test conditions. Easy and safe installation is guaranteed for our crystalline modules as a result of good mechanical stability and the ready-made holes for installing different grounding systems.

#### **PERFORMANCE**

► **Good annual yields on a long-term basis**

The first-rate product quality in Bosch solar cells ensures excellent performance and a very high efficiency ratio (up to 200 Wp / **15.07%** modules) even with sub-optimal levels of sunlight.

► **Global awareness of the Bosch brand**

The Bosch brand can be resold more easily as it maintains its value for end customers on a long-term basis. Bosch unites long-term strategic vision, innovative spirit and efficient processes with its core competencies to provide a basis for consistent further development throughout the company.

#### **WARRANTIES**

► **10-year** product warranty<sup>1</sup>.

► **25 -year** performance warranty (**90%** up to **10 years**, **80%** up to **25 years**)<sup>1</sup>.

<sup>1</sup>In compliance with our warranty Terms and Conditions.

#### **QUALIFICATIONS AND CERTIFICATES**

► Product certification in compliance with IEC 61215 (ed. 2), protection class II or IEC 61730, MCS, CE.



### Photovoltaic modules Bosch Solar Module c-Si M 48 EU30111

#### ELECTRICAL SPECIFICATIONS

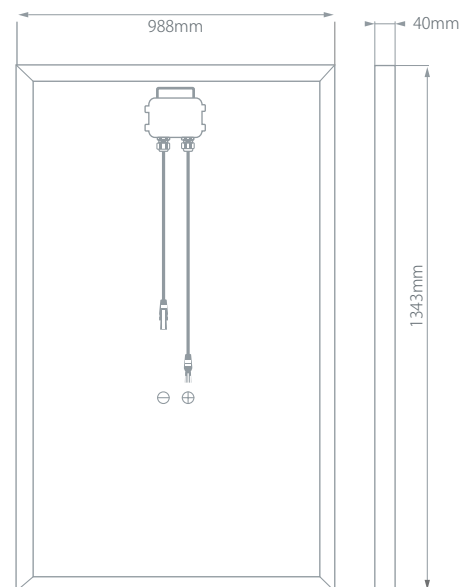
##### MODULE TYPES AND TECHNICAL DATA A STC<sup>1</sup>

Nominal values		M 185	M 190	M 195	M 200
Nominal power (0/+5W)	$P_{MPP}$ (W)	185.0	190.0	195.0	200.0
Voltage at P <sub>MAX</sub>	$V_{MPP}$ (V)	23.00	23.4	23.8	24.2
Current at P <sub>MAX</sub>	$I_{MPP}$ (A)	8.20	8.25	8.30	8.35
Open circuit voltage	$V_{OC}$ (V)	29.00	29.4	29.8	30.2
Short circuit current	$I_{SC}$ (A)	8.50	8.55	8.60	8.65
Max. system voltage	$V_{SYS}$ (V)	1000			
Temperature coefficient Voc	$T_K (V_{OC})$	-0.32%/ °C			
Temperature coefficient at ISC	$T_K (I_{SC})$	+0.032%/ °C			
Limiting reverse current	$I_R$ (A)	17			

#### MECHANICAL SPECIFICATIONS

Length	1343 mm
Widths	988 mm
Weight	16 kg
Height	40 mm
Connection cable	1000 mm
Connectors	MC4
Cell-type	48 / mono / 156 mm x 156 mm
Frame type	anodized aluminium frame
Junction box	(IP65) with 3 bypass diodes
Back sheet	(white) water resistant

#### MECHANICAL DRAWING



# Grid connected **systems**

## I Inverters

### **TLX. TripleLynx series TLX, TLX+, TLX Pro y TLX Pro+** **Transformer less 3-phase inverters power range 6 – 15 kW.**

#### **High efficiency**

The TLX inverter series, with efficiency of 98% deliver maximum energy in all conditions Transformer-less design, advanced electronics and optimized internal connections reduce potential energy losses.



#### **MAIN FEATURES**

##### **► Three-phase AC connection**

Balanced three-phase AC output ensures grid compliance at all times and precise MPP tracking at 99.9% in steady conditions and 99.8% in dynamic conditions enable the inverter to harvest all the energy of the PV modules.

##### **► Flexible system**

A large number of independently regulated MPP trackers along with 1000 VDC and asymmetrical layout options allows for endless layout possibilities. This huge flexibility makes installations from residential to large scale plants possible. Early start up and late stop of power production result in maximized yield while exact cooling minimizes energy losses. Excellent MPPT Efficiency, 98% conversion efficiency, 1000 V DC AC power burst and an excellent cooling concept provides high yield and earlier return on investment.

##### **► Multiple DC-entrances**

The TLX inverter is designed for high performance. Integrating 1000 V input range, 250-800 V MPP range and multiple DC inputs with each their own individually regulated.

##### **► Integrated master and webserver function (Pro-version)**

The TLX Pro series includes master inverter technology capable of controlling up to 100 inverters from a single inverter. Likewise, the integrated webserver, which allows you to control, monitor and adjust your PV system from any computer, comes standard on the TLX Pro.

##### **► Danfoss Smart Technologies**

The TLX inverter series includes the Danfoss Smart Technologies: a combination of features, which makes the TLX inverters unique in the market: EnergySmart™ meaning excellent MPPT Efficiency, 98% conversion efficiency, 1000 V DC AC power burst and an excellent cooling concept. DesignSmart™ for a large number of independently regulated MPP trackers along with 1000 VDC and asymmetrical layout options. TrackSmart™ including advanced Digital Tracking algorithms with efficiency of 99.9%. ControlSmart™ with integrated monitoring and control options through the Master inverter and Web server allows for management of up to 100 inverters.



### Technical data inverters Triplelynx - Triplelynx Pro series

ELECTRICAL SPECIFICATIONS					
Input values	TLX Pro 6k	TLX Pro 8k	TLX · TLX Pro 10k	TLX · TLX Pro 12.5k	TLX · TLX Pro 15k
Maximum DC power	6200 W	8250 W	10300 W	12900 W	15500 W
Maximum DC current	2 x 12 (24) A	2 x 12 (24) A	2 x 12 (24) A	3 x 12 (36) A	3 x 12 (36) A
Minimum input voltage	250 V				
Turn on voltage	250 V				
Nominal DC voltage	700 V				
Maximum DC voltage	1000 V				
MPP voltage range	260-800 V	345-800 V	430-800 V	358-800 V	430-800 V
Number of inputs / MPP-trackers	2/2	2/2	2/2	3/3	3/3
Output values	TLX Pro 6k	TLX Pro 8k	TLX · TLX Pro 10k	TLX · TLX Pro 12.5k	TLX · TLX Pro 15k
Nominal AC power	6000 W	8000 W	10000 W	12500 W	15000 W
Maximum AC-power	6000 W	8000 W	10000 W	12500 W	15000 W
Maximum AC-current	3 x 9 A	3 x 12 A	3 x 15 A	3 x 19 A	3 x 22 A
Output voltage AC (interval)	3P + N + PE - 230 V / 400 V ( ±20%)				
Grid frequency	50±5% Hz				
Distortion (THD%)	< 5%				
Power factor	> 0.97 at a load of 20%				
General data	TLX Pro 6k	TLX Pro 8k	TLX · TLX Pro 10k	TLX · TLX Pro 12.5k	TLX · TLX Pro 15k
Dimensions (le, wi, hei)	700x525x250mm				
Weight	35 kg				
Protection type	IP 54				
Consumption during night time	< 5 W				
Detection off-grid function	3-phase monitoring ( ROCOF )				
Refrigeration	electrical ventilation				
Ambient temperature range	-25..60 °C (45 °C power reduction)				
Inverter concept	transformerless				
Maximum efficiency	97,8%	97,9%	98%		
European efficiency	96%	97%	97%	97,3%	97,4%
Standards	TLX			TLX Pro	
Serial communication	RS485			RS485	
Data logger	web register			web server	
Master server	no			yes	
Grid management				PLA	
Connection				ethernet	
Reactive power	only TLX+ series			only TLX Pro+ series	

# Grid connected **systems**

## I Inverters

### **DLX PV Inverter series**

**Available in 2.0, 2.9, 3.8 i 4.6 kW**

#### **High efficiency**

The DLX series of transformer based string inverters defines a new level of efficiency, flexibility and user friendliness. Weighing between 19 and 21kg, the DLX is easy to handle and mount. The two-way interactive display offers multiple languages for easy country configuration.



#### **MAIN FEATURES**

##### ► **Flexibility gives more options**

Galvanic isolation makes the DLX suitable for all PV cell technologies. The IP65 die cast aluminium casing allows for indoor or outdoor mounting. Convection cooling gives consistent performance even under high ambient:

- Suitable for all kinds of PV module types.
- Low noise allows indoor locations.
- Multiple language options.

##### ► **Simple to monitor on, or off site**

The full-colour screen has an intuitive user-interface with clear and easy to access graphs and diagrams. A full monitoring solution is built-in and no extra PC software is required. For larger sites, a single inverter acts as a monitoring hub, to provide a single point of access for performance checks (either remotely or on-site) at any time:

- Full built-in monitoring.
- No extra PC software is required.
- Master inverter functionality.

##### ► **ConnectSmart™ compliant**

Connecting to a CLX solution provides further monitoring and control options. The ConnectSmart™ technology of the CLX series, offers real time monitoring anywhere, anytime via smartphone, tablet or computer.

##### ► **High performance**

- World leading efficiency of **97.3%**.
- Transformer-based.
- Robust design with IP65.
- Convection cooled for consistent performance.





### Technical data inverters DLX PV series

<b>ELECTRICAL SPECIFICATIONS</b>				
Input values	DLX 2.0	DLX 2.9	DLX 3.8	DLX 4.6
Maximum DC power	2625 W	3750 W	5000 W	6000 W
Maximum DC current	9.5 A	13.5 A	18.0 A	21 A
Minimum input voltage	220 V			
Turn on voltage	230 V			
Nominal DC voltage	350 V			
Maximum DC voltage	600 V			
MPP voltage range	230 V - 480 V			
Number of inputs / MPP-trackers	3/1	3/1	3/1	3/1
Output values	DLX 2.0	DLX 2.9	DLX 3.8	DLX 4.6
Nominal AC power	2000 W	2900 W	3800 W	4600 W
Maximum AC-power	2000 W	2900 W	3800 W	4600 W
Maximum AC-current	10.5 A	15.2 A	19.7 A	23 A
Output voltage AC	230±20% V			
Grid frequency	50±5% Hz			
Distortion (THD%)	2.59%		3.36%	
Power factor	1 at a load of 100%			
General data	DLX 2.0	DLX 2.9	DLX 3.8	DLX 4.6
Dimensions (le, wi, hei)	610x353x154mm			
Weight	19kg		21kg	
Protection type	IP 65			
Consumption during night time	< 1 W			
Inverter concept	transformer - based			
Refrigeration ambient	electrical ventilation			
Temperature range DC	-25 - +65 °C			
Connection type AC	screw terminals			
Connection type	SunClix			
Safety equipment	according CE			
Maximum efficiency	96.90%	97.00%	97.20%	97.30%
European efficiency	96.00%	96.20%	96.60%	96.90%

# Grid connected **systems**

## I Inverters

### Fronius IG TL series

The reliable **Fronius IG TL series** of PV inverters. Maximum flexibility with Fronius IG. The ingenious processor control and a large number of other enhancements makes them into perfect all-rounders. They work reliably and efficiently in every class thanks to Fronius' incredible experience and decades of research and development. The Fronius IG TL series has proven itself to be powerful, user-friendly and highly reliable. Equipped for every size of PV system, especially for smaller systems (e.g. on the roof of one-family houses). The combination of different types available for selection is limitless. The ingenious processor extracts the maximum energy yield from all types of PV-plants.



#### MAIN FEATURES

##### ► String detection

The inverter monitors constantly the input values of all connected strings. As a result, any malfunction of the PV-generator will be detected as soon as possible. This enables the early detection of problems in the entire system e.g. gnawing damage to cables from small animals, module failure, etc.). This can help to prevent an incremental loss of earnings.

##### ► System monitoring

Lock in your yield for the long-term System monitoring with the Status Manager comes standard in the Fronius IG TL inverter. The Status Manager immediately reports any problems thus locking in system yields for the long-term.

##### ► Detailed status codes

Should any problems occur in the system, comprehensive and precise service codes are displayed. This makes it easier to isolate the exact source of the error and saves valuable time for fault diagnostics and correction.

##### ► Direct signalling contact

A warning signal (e.g. indicator light or buzzer) can be activated when there are status changes via the 12 V signal output integrated into the inverter. Malfunctions are reported immediately.

##### **The highest efficiency via the Module Manager**

Whoever can always remain at the maximum power point (MPP), can get the most out of each ray of light. This is the job of the Fronius Module Manager with its accurate MPP tracking.

##### ► Easy data exchange via USB. A commercially-available

USB stick that can be inserted into the inverter collects data during operation. System information can then be moved to a PC at any time and then analysed and archived using Fronius Solar.access software. Time consuming cabling is no longer required. Simply pull out the DATCOM slot, remove the USB stick and load the data to your PC.



### Technical data inverters Fronius IG TL series

ELECTRICAL SPECIFICATIONS					
Input values	IG TL 3.0	IG TL 3.6	IG TL 4.0	IG TL 4.6	IG TL 5.0
Maximum DC power	3130 W	3840 W	4190 W	4820 W	5250 W
Maximum DC current	8.8 A	10.8 A	11.8 A	13.5 A	14.7 A
Minimum input voltage	350 V				
Turn on voltage	350 V				
Nominal DC voltage	350 V				
Maximum DC voltage	850 V				
MPP voltage range	350 - 700 V				
Number of inputs / MPP-trackers	6/1				
Output values	IG TL 3.0	IG TL 3.6	IG TL 4.0	IG TL 4.6	IG TL 5.0
Nominal AC power	3000 W	3680 W	4000 W	4600 W	4600W <sup>1)</sup> /5000W
Maximum AC-power	3000 W	3680 W	4000 W	4600 W	5000 W
Maximum AC-current	13.0 A	16.0 A	17.4 A	20.0 A	21.7 A
Output voltage AC	3- NPE 400 V / 230 V				
Minimum output voltage	180 V				
Distortion (THD%)	< 3% / < 3.5%				
Power factor	1				
General data	IG TL 3.0	IG TL 3.6	IG TL 4.0	IG TL 4.6	IG TL 5.0
Dimensions (hei, wi, lg)	597x413x195mm				
Weight	19.1 kg				
Protection type	IP 55 <sup>2)</sup>				
Category of voltage limitation	2 / 3				
Consumption during night time	< 1 W				
Inverter concept	transformerless				
Refrigeration	electrical ventilation				
Ambient temperature range	-20 -+55 °C				
DC connection	screw terminal connection 2.5mm <sup>2</sup> - 16mm <sup>2</sup>				
AC connection	screw terminal connection 2.5mm <sup>2</sup> - 16mm <sup>2</sup>				
Max efficiency	97.7%				
European efficiency	97.1%	97.2%	97.3%	97.3%	97.3%

1) For markets DE, AT, BE, CZ the Fronius IG TL 5.0 will be limited to AC power 4,6 kW.

2) Please check manual for correct installation and commissioning of the inverters

# Grid connected **systems**

## | Inverters

### **Fronius IG Plus series**

The reliable **Fronius IG series** of PV inverters. Maximum flexibility with Fronius IG Plus, power range: **2.6 to 12 kW**. The ingenious processor control and a large number of other enhancements makes them into perfect all-rounders. Efficiencies up to 95.9% are within the highest ranges for transformer inverters on the market.

They work reliably and efficiently in every class thanks to Fronius' incredible experience and decades of research and development. The Fronius IG TL series has proven itself to be powerful, user-friendly and highly reliable. The combination of different types available for selection is limitless. The ingenious processor extracts the maximum energy yield from all types of PV-plants.



#### **MAIN FEATURES**

##### ▶ **The first multi-purpose device**

Reliability and maximum earnings security. An outstanding addition to the family: The next generation Fronius IG Plus inverter includes a number of significant enhancements to a very successful inverter to provide maximum earnings security, versatility and the highest reliability. New power stages expand the proven Fronius IG family (from 2.6 to 12 kW). Plus numerous improvements provide consistently higher earnings.

##### ▶ **Maximum Earnings Security**

Get maximum power out of every ray of light. This is achieved through a complex interaction of different factors: 3 efficiency peaks. More earnings for every system size: The automatic transformer switching function of the Fronius IG Plus makes certain of this. This enables not one, but three equal efficiency peaks. The result: Constant efficiency over a wide input voltage range. In comparison: The efficiency of inverters without transformer switching declines steadily with an increasing input voltage. Devices without a transformer only have one efficiency peak.

##### ▶ **MIX™ concept**

You will get the maximum power harvest out of partial load ranges, e.g. on cloudy days, through a clever combination of multiple power stages in each inverter. The power stages in the Fronius inverters divide up the work depending on the operating hours.

##### ▶ **Module Manager**

The Module Manager: ensures that the Fronius IG inverters remain at the maximum power point (MPP), with fast and exact MPP tracking to ensure that you obtain the most power out of each ray of sun light. This is especially important for thin layer modules whose MPP can be more difficult to track.

##### ▶ **Completely heat and dust-free ventilation concept**

The well-thought-out ventilation concept precludes overheating or contamination. The device body is hermetically sealed. Only the cooling fins for the electronics remain on the outside. The electronics are air-cooled. The temperature-controlled fan circulates outside air through the cooling fins as required.



### Technical data inverters Fronius IG Plus series

ELECTRICAL SPECIFICATIONS										
Input values	50 V-1	70 V-2	100 V-2	55 V-3	60 V-3	80 V-3	100V-3	120 V-3	150 V-3	
Maximum DC power	4260 W	6880 W	8520 W	5250 W	6300 W	7360 W	8430 W	10590 W	12770 W	
Maximum DC current	18.5 A	29.9 A	37.0 A	22.8 A	27.5 A	32.0 A	36.7 A	46.0 A	55.5 A	
Minimum input voltage	230 V									
Turn on voltage	260 V									
Nominal DC voltage	370 V									
Maximum DC voltage	600 V									
MPP voltage range	230 - 500 V									
Number of inputs / MPP-trackers	6/1									
Output values	50 V-1	70 V-2	100 V-2	55 V-3	60 V-3	80 V-3	100V-3	120 V-3	150 V-3	
Nominal AC power	4000 W	6500 W	8000 W	5000 W	6000 W	7000 W	8000 W	10000 W	12000 W	
Maximum AC-power	4000 VA	6500 VA	8000 VA	5000 VA	6000 VA	7000 VA	8000 VA	10000 VA	12000 VA	
Maximum AC-current	17.4 A	14.1A(283) <sup>1)</sup>	17.4A(348) <sup>1)</sup>	7.3 A	8.7 A	10.2 A	11.6 A	14.5 A	17.4 A	
Output voltage AC	1-NPE 230 V	2-NPE400V/230V(1-NPE230V) <sup>3)</sup>		3- NPE 400 V / 230 V						
Minimum output voltage	180 V									
Distortion (THD%)	< 3%									
Power factor	0.85 - 1ind. /cap.									
General data	50 V-1	70 V-2	100 V-2	55 V-3	60 V-3	80 V-3	100V-3	120 V-3	150 V-3	
Dimensions (hei, wi, lg)	673x434x250mm	968x434x250mm		1263x434x250mm						
Weight	23.8 kg	36.9 kg		49.2 kg						
Protection type	IP 54 <sup>1)</sup>									
Category of voltage limitation	2 / 3									
Consumption during night time	< 1 W									
Inverter concept	transformer AF									
Refrigeration	electrical ventilation									
Ambient temperature range	-20 -+55 °C									
DC connection	screw terminal connection 1.5mm <sup>2</sup> -16mm <sup>2</sup>									
AC connection	screw terminal connection 2.5mm <sup>2</sup> -35mm <sup>2</sup>									
Max efficiency	95.7%						95.9%			
European efficiency	94.6%	94.8%	95.0%	95.0%	95.1%	95.2%	95.3%	95.4%	95.4%	

Fronius IG Plus 55V-3, Fronius IG Plus 60V-3 and Fronius IG Plus 80V-3 devices are not intended to be used in Spain, Hungary, Australia, Israel and China.  
Fronius IG Plus 55V-3, Fronius IG Plus 60V-3 and Fronius IG Plus 80V-3 devices do not comply with German medium-voltage directive.

1) Please consult manual in order to correctly install the inverter.

# Grid connected **systems**

## | Inverters

### **Fronius AGILO**

As the first central inverter in its performance class that can be completely installed and maintained by the installer, the Fronius Agilo sets new standards. Special heavy-duty castors, its compact design and the ability to replace components on the customer's premises make the Fronius Agilo unique. With a maximum output power of 75 kVA and 100 kVA the Fronius Agilo is particularly suitable **for industrial or commercial systems**.

**Easy transport / Easy location / Easy maintenance.**



#### **MAIN FEATURES**

##### ► **Practical transport features**

The Fronius Agilo is amazingly mobile. Recesses in the base for the lift truck are just the job when transporting the device over longer distances. For shorter journeys, its heavy-duty castors provide the required degree of mobility on all level surfaces. Adjustable feet guarantee a high level of stability in the long term, even on uneven floors.

##### ► **Compact design**

The Fronius Agilo is compact and light, weighing just **830 kg**, meaning it could be transported in a normal passenger lift. And as it is delivered on a Euro industrial pallet, storage requirements can be planned in advance and transport cost kept down.

##### ► **Dust-proof electronics compartment**

The electronics compartment is separated from the connection compartment. Sensitive components are located in a dedicated dust-proof area to protect them from dirt, resulting in reliable, long-term inverter operation.

##### ► **Easy service**

Maintenance and service can be carried out by the trained installer. Even the power stage can be replaced in just a couple of minutes. With the exception of the transformer and chokes, all inverter components can be replaced during customer service visits.

##### ► **Easy transport**

The Fronius Agilo convinces with its revolutionary transport technologies. Special heavy-duty castors, recesses in the base for the truck and crane eyelets guarantee maximum comfort during transport to the installation site. There, it is safely placed with adjustable feet also on uneven floors. Thanks to the compact dimensions and a weight of 830 kg, the Fronius Agilo could be transported even in the elevator.



### Technical data inverter Fronius AGILO

ELECTRICAL SPECIFICATIONS		
Input values	FRONIUS AGILO 75.0-3	FRONIUS AGILO 100.0-3
Maximum DC power	78.3 kW	104.4 kW
Maximum DC current	170.2 A	226.9 A
Minimum input voltage	460 V	
Turn on voltage	500 V	
Nominal DC voltage	460 V	
Maximum DC voltage	950 V	
MPP voltage range	460 - 820 V	
Number of inputs / MPP-trackers	2/1	
Output values	FRONIUS AGILO 75.0-3	FRONIUS AGILO 100.0-3
Nominal AC power	75 kW	100 kW
Maximum AC-power	75 kVA	100 kVA
Maximum AC-current	114 A	152.9 A
Output voltage AC	3 -NPE- 400 V/ 230	
Min/max output voltage	180 V / 270 V	
Distortion (THD%)	< 3%	
Power factor	0.8 - 1ind./cap.	
General data	FRONIUS AGILO 75.0-3	FRONIUS AGILO 100.0-3
Dimensions (hei, wi, lg)	1,800x1,100x700 mm	
Weight	750 kg	830 kg
Protection type (electronical parts)	IP 30 (IP 54)	
Protection class	1	
Consumption during night time	< 50 W	
Inverter concept	50 Hz transformer	
Refrigeration	Regulated air cooling	
Ambient temperature range	-20 -+50 °C	
DC connection	V-shape connection lug / V-box terminal clamp (70-240 mm <sup>2</sup> )	
AC connection	V-shape connection lug / V-box terminal clamp (35-95 mm <sup>2</sup> )	
Max efficiency	97.1%	97.2%
European efficiency	96.4%	96.6%

# Grid connected **systems**

## | Inverters

### **Sunny Tripower 15000TL / 20000TL ECONOMIC EXCELLENCE**

#### **The expert cost saver for high-yield, commercial plants**

Peak performance and technological perfection at a significantly reduced specific price: the new Sunny Tripower TL Economic Excellence is the next logical step in the development of the Sunny Tripower series in terms of achieving an optimum price-performance ratio. On the one hand, it brings with it a considerable reduction in investment costs, while on the other hand guaranteeing exceptionally high yields with an efficiency of 98.5 %. Hence, the Sunny Tripower TL Economic Excellence is the ideal solution for uniformly structured PV plants on the medium to very large scale. The focus is on the essentials and meets all requirements, including reactive power provision, grid support, and grid management integration.



#### **MAIN FEATURES**

##### ► **Economical**

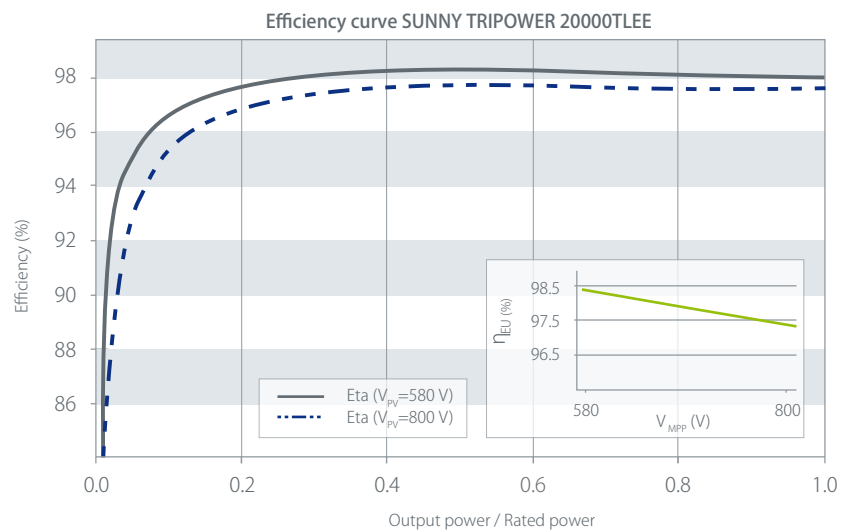
- Maximum efficiency 98.5 %.
- SMA OptiTrac MPP tracking for best MPP tracking efficiency.
- Active temperature management with OptiCool.
- *Bluetooth* communication.

##### ► **Simple**

- Three-phase grid feed-in.
- Cable connection without tools.
- SUNCLIX DC plug-in system.

##### ► **Flexible & future-proof**

- DC input voltage up to 1000 V.
- Integrated grid management functions.
- Reactive-power capable.





### Technical data inverters Sunny Tripower TL ECONOMIC EXCELLENCE series

ELECTRICAL SPECIFICATIONS		
Input values	ST 20000TLEE	ST 15000TLEE
Maximum DC power	20450 W	15260 W
Maximum DC current	36 A	
Minimum input voltage	570 V	
Turn on voltage	620 V	
Maximum DC voltage	1000 V	
MPP voltage range	580 V - 800 V	
Number of MPP-trackers	1	
Output values	ST 20000TLEE	ST 15000TLEE
Nominal AC power	20000 W	15000 W
Maximum apparent AC-power	20000 VA	15000 VA
Maximum AC-current	29 A	24 A
Output voltage AC	3 / N / PE, 230 V / 400 V	
Min/max output voltage	160 V / 280 V	
Adjustable displacement power factor	0.8 overexcited...0.8 underexcited	
General data	ST 20000TLEE	ST 15000TLEE
Dimensions (hei, wi, lg)	680x665x265mm	
Weight	45 kg	
Protection type (connection area) <sup>1)</sup>	IP65	
Protection class	I <sup>1</sup> / III <sup>2</sup>	
Consumption during night time	1 W	
Inverter concept	transformerless	
Refrigeration	OptiCool	
Ambient temperature range	-25...+60 °C	
DC connection	SUNCLIX	
AC connection	Spring clamp terminal	
Max efficiency	98.5%	98.5%
European efficiency	98.2%	98.3%

1) Protection class according to IEC 62103.

2) Protection class according to IEC 60664 -1.

# Grid connected **systems**

## I Inverters

### Sunny Tripower TL-10

#### The three-phase inverter for easy plant design

Full of pioneering technology: highly flexible plant design with the three-phase Sunny Tripower inverter. Thanks to Optiflex technology, two MPP inputs and a broad input voltage range, it is suited to almost any module configuration. It fulfills all requirements such as those for reactive power provision and grid support, and it is thus a reliable participant in grid management. The Optiprotect safety concept, with its self-learning string failure detection, electronic string fuse and integrable DC surge arrester type II, ensures maximum availability.



#### MAIN FEATURES

##### ► Economical

- Maximum efficiency of 98.2%.
- SMA OptiTrac Global Peak MPP tracking for best MPP tracking efficiency.
- Bluetooth communication.

##### ► Reliable

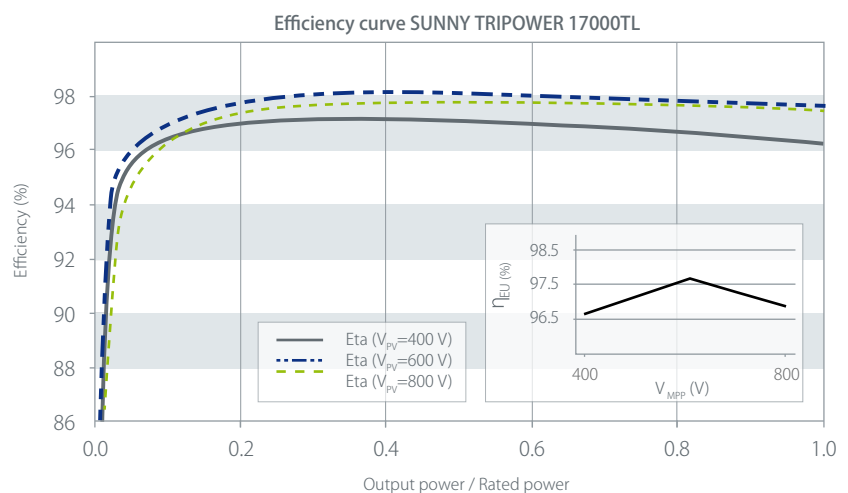
- Triple protection with Optiprotect: electric string fuses, self-learning string failure detection, DC surge arrester which can be integrated (type II).

##### ► Flexible

- DC input voltage up to 1000V.
- Integrated grid management functions.
- Tailor made plant design with Optiflex.

##### ► Simple

- Three-phase feed-in.
- Cable connection without tools.
- SUNCLIX DC plug-in system.
- Easily accessible connection area.



### Technical data inverters Sunny Tripower TL-10 series

<b>ELECTRICAL SPECIFICATIONS</b>				
Datos de entrada	STP 10000TL	STP 12000TL	STP 15000TL	STP 17000TL
Maximum DC power	10200 W	12250 W	15340 W	17410 W
Maximum DC current input A / B	22 A / 11 A		33 A / 11 A	
Maximum DC current per string input A/B	33 A / 12.5 A		33 A / 11 A	
Minimum input voltage	150 V			
Turn on voltage	188 V			
Nominal DC voltage	600 V			
Maximum DC voltage	1000 V			
MPP voltage range	320 V - 800 V	380 V - 800 V	360 V - 800 V	400 V - 800 V
Number of MPP-trackers	2			
Output values	STP10000 TL	STP12000 TL	STP15000 TL	STP17000 TL
Nominal AC power	10000 W	12000 W	15000 W	17000 W
Maximum apparent AC-power	10000 VA	12000 VA	17000 VA	17000 VA
Maximum AC-current	16 A	19.2 A	24 A	24.6 A
Output voltage AC	3 / N /PE; 220 / 380 V, 3 / N /PE; 230 / 400 V, 3 / N /PE; 240 / 415 V			
Grid frequency	50 Hz			
Adjustable displacement power factor	0.8 overexcited...0.8 underexcited			
General data	STP10000 TL	STP12000 TL	STP15000 TL	STP17000 TL
Dimensions (le, wi, hei)	690x665x265mm			
Weight	59 kg			
Protection type (connection area) <sup>1)</sup>	IP 65 (IP 54)			
Protection class	I <sup>2</sup> / III <sup>3</sup>			
Consumption during night time	1 W			
Inverter concept	transformerless			
Refrigeration ambient	OptiCool			
Temperature range DC	-25 °C ... +65 °C			
DC connection	SUNCLIX			
AC connection	Spring clamp terminal			
Maximum efficiency	98.1%		98.2%	
European efficiency	97.7%		97.8%	

1)According to IEC 60529.

2) Protection class according to IEC 62103.

3) Protection class according to IEC 60664 -1.

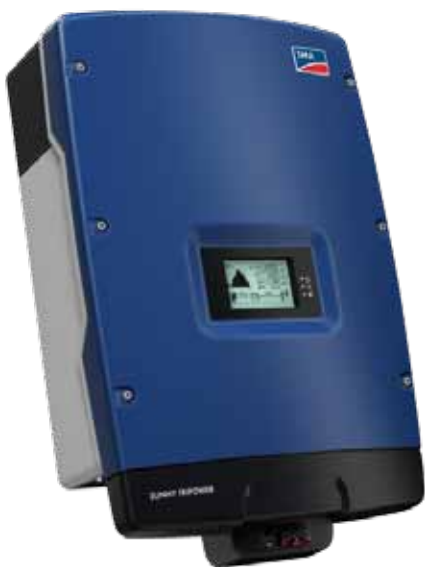
# Grid connected **systems**

## | Inverters

### **Sunny Tripower TL-5,6,7,8,9.**

#### **The three-phase inverter for your home**

At home with leading-edge technology and top yields: The Sunny Tripower PV plant with 5 to 9 kW of power is setting new standards for home systems. It features an asymmetric multi-string and Optiflex technology to ensure the highest in flexibility while combining peak efficiency with the OptiTrac Global Peak system to generate the highest in yields. In addition to communication via the external Bluetooth-antenna, the PV plant comes with a direct Sunny Portal connection via SMA Webconnect as standard – and now for the first time without data loggers. The “small” Sunny Tripower also comes with integrated grid management functions and reactive power supply.



#### **MAIN FEATURES**

##### ► **Economical**

- Maximum efficiency of 98%.
- Shade management with OptiTrac Global Peak.
- Active temperature management with OptiCool.

##### ► **Flexible**

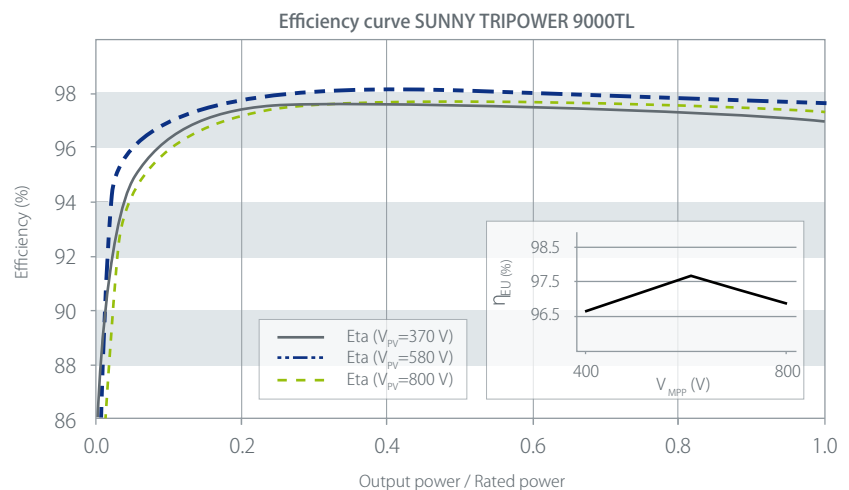
- DC input voltage of up to 1.000 V.
- Integrated grid management functions.
- Reactive power supply.
- Module-tailored plant design with Optiflex.

##### ► **Communicative**

- SMA Webconnect Portal communication.
- Bluetooth® communication.
- Simple country configuration.
- Multi-function relay as standard.

##### ► **Simple**

- Three-phase feed-in.
- Cable connection without tools.
- SUNCLIX DC plug-in system.
- Integrated ESS DC switch-disconnector.
- Easy wall mounting.



# Grid connected **systems**

## Inverters |

### Technical data inverters Sunny Tripower TL-5,6,7,8,9 Serie

ELECTRICAL SPECIFICATIONS					
Input values	STP 5000TL	STP 6000TL	STP 7000TL	STP 8000TL	STP 9000TL
Maximum DC power	5100 W	6125 W	7175 W	8200 W	9225 W
Maximum DC current input A/B	11 A / 10 A		15 A / 10 A		
Maximum DC current per string input A/B	11 A / 10 A		15 A / 10 A		
Minimum input voltage	150 V				
Turn on voltage	188 V				
Nominal DC voltage	580 V				
Maximum DC voltage	1000 V				
MPP voltage range	245 V - 800 V	395 V - 800 V	290 V - 800 V	330 V - 800 V	370 V - 800 V
Number of MPP-trackers	2				
Output values	STP 5000TL	STP 6000TL	STP 7000TL	STP 8000TL	STP 9000TL
Nominal AC power	5000 W	6000 W	7000 W	8000 W	9000 W
Maximum apparent AC-power	5000 VA	6000 VA	7000 VA	8000 VA	9000 VA
Maximum AC-current	7.3 A	8.7 A	10.2 A	11.6 A	13.1 A
Output voltage AC	3 / N / PE; 220 / 380 V, 3 / N / PE; 230 / 400 V, 3 / N / PE; 240 / 415 V				
Grid frequency	50 Hz				
Adjustable displacement power factor	0.8 overexcited...0.8 underexcited				
General data	STP 5000TL	STP 6000TL	STP 7000TL	STP 8000TL	STP 9000TL
Dimensions (le, wi, hei)	730x470x240 mm				
Weight	37 kg				
Protection type (connection area) <sup>1</sup>	IP 65				
Protection class	I <sup>2</sup> / III <sup>3</sup>				
Consumption during night time	1 W				
Inverter concept	transformerless				
Refrigeration ambient	OptiCool				
Temperature range DC	-25 °C ... +65 °C				
DC connection	SUNCLIX				
AC connection	Spring clamp terminal				
Maximum efficiency	98%	98%	98%	98%	98%
European efficiency	97.1%	97.4%	97.5%	97.6%	97.6%

1) According to IEC 60529.

2) Protection class according to IEC 62103.

3) Protection class according to IEC 60664 -1.



# Grid connected systems

## | Inverters

### Sunny Boy TL-21

**The same. Only better. The universally usable Sunny Boy.**

It all remains the best: the new transformerless Sunny Boy is the ideal solution, especially for demanding PV arrays and partly shaded plants. Version 20 of the successful Sunny Boy offers a further array of advantages. It's more flexible in its range of applications, provides even more efficient yields, and it's easier to use. The high DC voltage of 750 V proves to be a cost advantage, since fewer parallel strings are required. In addition, the integrated grid management functions make the devices suitable for universal applications and allow them to actively support the grid.



#### MAIN FEATURES

##### ► Economical

- Maximum efficiency of 97%.
- Multi-string technology in all power classes.
- Cost savings due to fewer parallel strings.
- Shade management with OptiTrac Global Peak.

##### ► Flexible

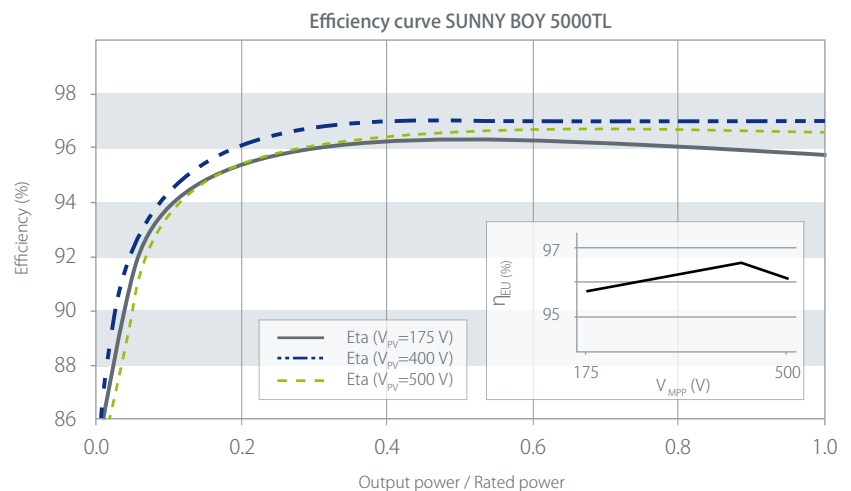
- Maximum DC input voltage of 750 V.
- Integrated grid management functions through reactive power provision.

##### ► Simple

- Without fan.
- Easier wall mounting.
- SUNCLIX DC plug-in system.
- Quick connection without tools.

##### ► Informative

- Simple country configuration.
- Bluetooth as standard.
- Multi-function relay included.



### Technical data inverters Sunny Boy TL-21 series

<b>ELECTRICAL SPECIFICATIONS</b>				
Input values	<b>SB 3000TL</b>	<b>SB 3600TL</b>	<b>SB 4000TL</b>	<b>SB 5000TL</b>
Maximum DC power	3200 W	3880 W	4200 W	5250 W <sup>1</sup>
Maximum DC current input A / B	15 A / 15 A			
Minimum input voltage	125 V			
Turn on voltage	150 V			
Nominal DC voltage	400 V			
Maximum DC voltage	750 V			
MPP voltage range	175 V - 500 V			
Number of MPP-trackers	2			
Output values	<b>SB 3000TL</b>	<b>SB 3600TL</b>	<b>SB 4000TL</b>	<b>SB 5000TL</b>
Nominal AC power	3000 W	3680 W	4000 W	4600 W
Maximum apparent AC-power	3000 VA	3680 VA	4000 VA	5000 VA <sup>2</sup>
Maximum AC-current	16 A		22 A	
Output voltage AC	220 V, 230 V, 240 V			
Grid frequency	50 Hz			
Adjustable displacement power factor	0.8 sobreexcitado...0.8 subexcitado			
General data	<b>SB 3000TL</b>	<b>SB 3600TL</b>	<b>SB 4000TL</b>	<b>SB 5000TL</b>
Dimensions (le, wi, hei)	519x490x185mm			
Weight	26 kg			
Protection type (connection area) <sup>3</sup>	IP 65 (IP 54)			
Protection class	I <sup>4</sup> / III <sup>5</sup>			
Consumption during night time	1 W			
Inverter concept	transformerless			
Refrigeration ambient	convection / OptiCool			
Temperature range	-25 °C ... +65 °C			
DC connection	SUNCLIX			
AC connection	spring clamp terminal			
Maximum efficiency	97%			
European efficiency	96%	96.3%	96.4%	96.5%

1) 4825 W with VDE-AR-N 4105.

2) 4600 VA with VDE-AR-N 4105.

3) According to IEC 60529.

4) Protection class according to IEC 62103.

5) Protection class according to IEC 60664 -1.

# Grid connected **systems**

## | Inverters

### Sunny Boy HF-30

#### A high yield performer.

Packed full of innovative technology, the Sunny Boy HF series provides the highest yields for transformer-based inverters in this power class. Installation is now easier than ever thanks to the SUNCLIX DC plug-in system, the plug-in PV array grounding and an easily accessible configuration area – all in a reduced weight unit. The wide input voltage range from 175 to 700 V gives you extraordinary flexibility for your plant design, and the modern graphic display and wireless Bluetooth communication Bluetooth make the devices highly user-friendly.



#### MAIN FEATURES

##### ► High yields

- Maximum efficiency of 96.3%.
- Shade management with OptiTrac Global Peak.

##### ► Reliable

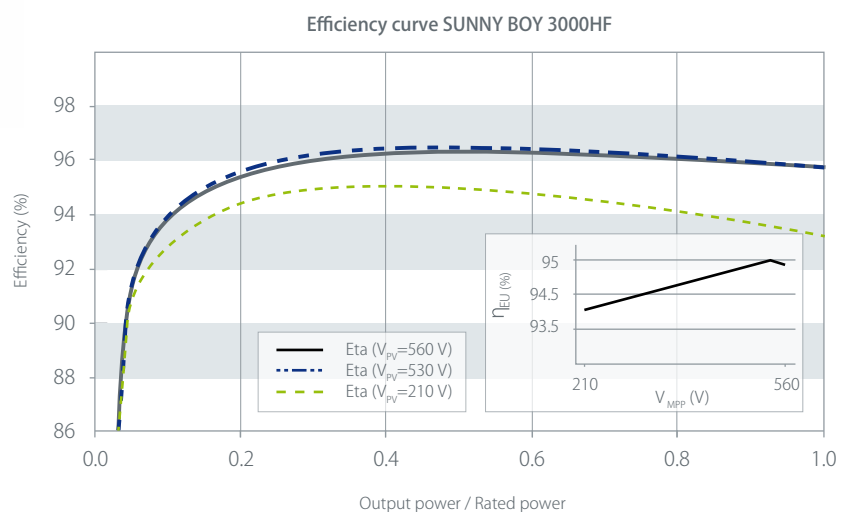
- Galvanic isolation.
- Integrated ESS DC switch-disconnector.
- Thelf protection.

##### ► Simple

- Quick and easy configuration thanks to Quick Module.
- SUNCLIX DC plug-in system.
- Suitable for PV array grounding.

##### ► Informative

- Simple country configuration.
- Graphic display.
- Bluetooth as standard.





### Technical data inverters Sunny Boy SB-HF series

<b>ELECTRICAL SPECIFICATIONS</b>			
Input values	SB 2000HF	SB 2500HF	SB 3000HF
Maximum DC power	2100 W	2600 W	3150 W
Maximum DC current	12 A	15 A	
Minimum input voltage	175 V		
Turn on voltage	220 V		
Nominal DC voltage	530 V		
Maximum DC voltage	700 V		
MPP voltage range	175 V - 560 V		
Number of MPP-trackers	1		
Output values	SB 2000HF	SB 2500HF	SB 3000HF
Nominal AC power	2000 W	2500 W	3000 W
Maximum apparent AC power	2000 VA	2500 VA	3000 VA
Maximum AC-current	11.4 A	14.2 A	15 A
Output voltage AC	220 V, 230 V, 240 V		
Grid frequency	50 Hz		
Power factor	1		
General data	SB 2000HF	SB 2500HF	SB 3000HF
Dimensions (le, wi, hei)	580x348x145 mm		
Weight	17 kg		
Protection type (connection area) <sup>1)</sup>	IP 65 (IP 54)		
Protection class	I <sup>2</sup> / III <sup>3</sup>		
Consumption during night time	1 W		
Inverter concept	HF transformer		
Refrigeration ambient	convection / OptiCool		
Temperature range DC	-25 °C ... +65 °C		
DC connection	SUNCLIX		
AC connection	connector		
Maximum efficiency	96.3%		
European efficiency	95%	95.3%	95.4%

1) According to IEC 60529.

2) Protection class according to IEC 62103.

3) Protection class according to IEC 60664 -1.

# Grid connected **systems**

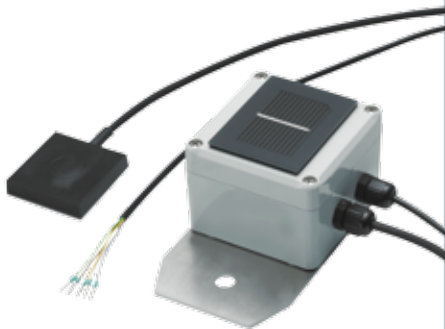
## I Inverters

### PIKO Inverters

#### Flexible, communicative and practical.

As an independent family-run business the KOSTAL group is specialised in the development of high-quality electronic and mechatronic solutions for a wide range of industrial and automobile applications.

PIKO inverters are developed and manufactured in the Industrial Electrical division's headquarters in Germany, and KOSTAL Solar Electric GmbH is responsible for distribution and service. PIKO inverters are manufactured to the highest technological standards. Strict quality controls, including a final test and inspection lasting several hours, form an integral part of the entire production process for the PIKO inverters.



#### GENERAL CHARACTERISTICS

► **Generating energy the smart way.**

- From the 4,2 kW power class upwards, the PIKO inverters provide a symmetrical three-phase feed and thus prevent unbalanced loading of the network.
- The compact construction and low weight offer distinct advantages in terms of handling and installation.

► **PIKO inverters are preconfigured and certified for the majority of European countries. Country-specific network matching takes place automatically following activation of the appropriate country setting in the inverter.**

- One PIKO for up to 30 countries.
- Simple country setting via DIP switch or display.
- Multilingual menu guidance.

► **A complete communication system, as standard.**

The communication package integrated into all PIKO inverters enables monitoring of the PV system without the need for additional components. The package includes:

- Data logger.
- Web server.
- LAN interface.
- RS485 bus.
- 50 pulse input & output.
- Analogue inputs for sensors and ripple control receivers (for active power control).

#### ACCESSORIES

► **PIKO Sensor:** for measuring temperature and irradiation via communication board.

► **Módems KOSTAL GSM** online via the mobile phone network or a dial-up connection.

► **PIKO Master Control: monitoring made easy** The software can be downloaded for free from the KOSTAL Solar Electric website.

► **PIKO Data Communicator: the essentials always at your fingertip** With the PIKO Data Communicator you can relax and monitor the yields of your PV system on a digital picture frame.



# Grid connected **systems**

## Inverters |

### Technical data inverters Piko series

ELECTRICAL SPECIFICATIONS							
Input values	PIKO 3.0	PIKO 3.6	PIKO 4.2	PIKO 5.5	PIKO 7.0 <sup>1</sup>	PIKO 8.3 <sup>1</sup>	PIKO 10.1 <sup>1</sup>
Max. recommended DC power	5-10% above rated AC output <sup>2</sup>						
Maximum DC current	9 A	9 A / 13 A <sup>3</sup>		9 A		12.5 A / 25 A <sup>3</sup>	
Minimum input voltage	180 V						
Maximum DC voltage	950 V						
Number of MPP-trackers	1	2	2	3	2		3
Output values	PIKO 3.0 <sup>1</sup>	PIKO 3.6	PIKO 4.2	PIKO 5.5	PIKO 7.0 <sup>1</sup>	PIKO 8.3 <sup>1</sup>	PIKO 10.1 <sup>1</sup>
Nominal AC power	3000 W	3600 W	4200 W	5500 W	7000 W	8300 W	10000 W
Max. AC apparent power	3000 VA	3600 VA	4200 VA	5500 VA	7000 VA	8300 VA	10000 VA
Max. AC output current	13.1 A	15.7 A	6.1 A	8 A	10.2 A	12 A	14.5 A
AC grid voltage	1/N/PE, AC, 230 V		3/N/PE, WWAC, 230 / 400V				
Rated frequency	50 Hz						
Setting range of the power factor	0.95 capacitive...1...0.95 inductive			0.9 capacitive...1...0.9 inductive			
General data	PIKO 3.0	PIKO 3.6	PIKO 4.2	PIKO 5.5	PIKO 7.0 <sup>1</sup>	PIKO 8.3 <sup>1</sup>	PIKO 10.1 <sup>1</sup>
Dimensions (Le. / Hei. / Wi.)	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	33 kg	34 kg
Protection type	IP 55						
Protection class	I						
Consumption during night time	Inverter < 1W, Communicationboard < 1.7 W						
Inverter concept	transformerless						
Refrigeration ambient	regulated ventilation						
Temperature range DC	-20 °C ... +60 °C						
DC connection	MC4						
AC connection	spring-loaded terminal strip						
Maximum efficiency	95.7 %	95.8 %	96.5 %	96.2 %	96.0 %	97.0 %	97.0 %
European efficiency	95.0 %	95.1 %	95.4 %	95.7 %	95.3 %	96.3 %	96.4 %

1) This inverter is available in two versions: with or without arc detection.

2) Depending on ambient temperature and solar radiation.

3) Con conexión en paralelo de dos seguidores PMP.



# Grid connected systems

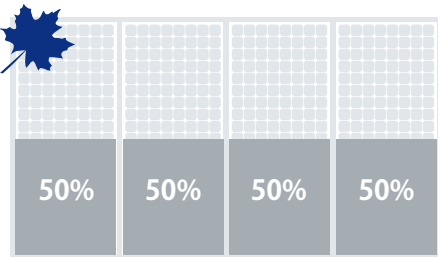
## | Micro inverters

### The Enphase Microinverter

**Enphase has pioneered a new approach to managing solar power that makes solar systems smarter and more efficient.**

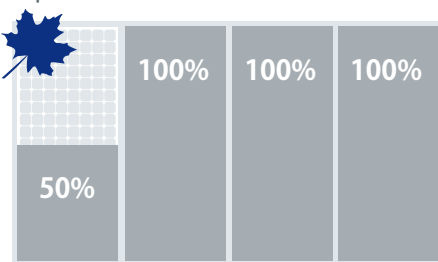
Traditionally, solar panels are connected together in series circuits fed into a single, central inverter device. This means that one inverter controls tens, hundreds or even thousands of solar panels as if they are one unit operating at the same power level. This approach reduces the overall system efficiency and limits the available information about individual panel health. Enphase replaces these large central inverters with small micro-electronics that attach to each solar panel. These devices, known as microinverters, allow each panel to operate independently, leading to significant improvements in energy production and adding a new layer of intelligence throughout the system.

#### Traditional Problem



Solar systems are constantly affected by environmental factors, such as shade, dust and debris. Using a traditional inverter means that everything is wired in series, and the lowest performing module determines the performance of the entire series. This is commonly known as "The Christmas Light Effect," and can significantly decrease the energy production of the system.

#### Enphase Microinverter Solution



Enphase Microinverters allow each solar panel to operate independently and control the power from each with 99.6% accuracy. This results in a significant increase in the performance of the entire system.

#### THE ENPHASE SYSTEM

Each Microinverters integrates with advanced networking technology and web-based software to enable new levels of intelligence and connectivity in the solar array. Specifically, the Enphase Microinverter System consists of the following components:

- ▶ The Microinverter that connects to each solar module and converts DC power to grid-compliant AC power.
- ▶ The Envoy Communications Gateway that networks with each microinverter and transmits performance information to the internet.
- ▶ The Enlighten software where Enphase customers can monitor and manage their solar power systems 24 hours a day.

#### ENPHASE M215

- ▶ Based on Enphase's third generation technology, the M215 incorporates the latest innovations in power electronics and custom microchips to deliver 95.4% Euro efficiency and a range of patented performance features that maximize the performance of 60-cell solar modules. In addition, the M215 offers a "single-bolt" mounting bracket that makes installation easier than any other inverter on the market.



#### ACCESSORIES

- ▶ **Envoy gateway** The Enphase Envoy Communications Gateway is the networking hub connecting every module and microinverter in your solar array to the internet.
- ▶ **Enlighten monitoring** The Enlighten monitoring software provides an unprecedented level of intelligence to solar power system owners and installers.
- ▶ **The Engage Cable** Is a continuous length of 2.5mm<sup>2</sup> cable with pre-installed connectors for Enphase Microinverters.



### Technical data micro inverters Enphase series

<b>ELECTRICAL SPECIFICATIONS</b>	
<b>Input values</b>	<b>M215-60-230-S22-EU</b>
Recommended input DC power range (STC)	190 - 270 W
Maximum input DC voltage	45 V
Peak power tracking range	22 V - 36 V
Operating range	16 V - 36 V
Min./Max. start voltage	22 V / 45 V
Max. DC short circuit current	15 A
Max. input current	10.5 A
<b>Output values</b>	<b>M215-60-230-S22-EU</b>
Maximum output power	215 W
Nominal output current	934 mA
Nominal voltage	230 V
Nominal frequency	50.0 Hz
Power factor	>0.95
Maximum units per 20 A branch circuit	17 (Ph + N); 27 (3Ph + N)
<b>General data</b>	<b>M215-60-230-S22-EU</b>
Dimensions (Le. / Hei. / Wi.) without mounting bracket	172 x 164 x 25 mm (6.8" x 6.5" x 1.0")
Weight	1.6 kg (3.5lbs)
Ambient temperature range	-40° C to +65° C
Operating temperature range (internal)	-40° C to +85° C
Night time power consumption	50mW
Cooling	Natural convection – no fans
Enclosure environmental rating	Outdoor – IP67
Communication	Power line
Monitoring	Free lifetime monitoring via Enlighten software
Transformer Design	High frequency transformers, galvanically isolated
Compliance	VDE-0126-1-1, DK5940, C10/11, EN62109-2, CEI_0-21, EN50438, G83/1-1
EN 50530 (EU) efficiency	95.4%
Static MPPT efficiency (weighted, reference EN50530)	99.6%

# Grid connected **systems**

## | Power optimizers

### **Tigo Energy® Module Maximizer™-ES (MM-ES)**

Tigo Energy designs the #1 PV solar optimizer SmartModule™ technology utilizing patented impedance matching technology enabling 25% more power density and efficiency on any roof or utility project, uneven string lengths and different orientations. Installers and system owners achieve the highest ROI by increasing energy production and maximum system up-time for new systems and retrofits. Headquartered in the Silicon Valley, Tigo Energy is an innovative force partnering with module, inverter and combiner box manufacturers to embed these technologies and monitor arcing, fire and safety hazards. Tigo Energy delivers the most effective string monitoring, theft prevention and fleet management.



#### **Maximizer (MM-ES)**

► For residential, commercial and utility scale photovoltaic solar arrays, the Tigo Energy® Maximizer™ system optimizes the power output of each module (solar panel); delivers module-level data for operational management and performance monitoring; and provides the ability to deactivate the high voltage DC bus for safer installation, maintenance or fire fighting. Tigo Energy Module Maximizers are key components of the system which reside at each module (one per solar module). The Module Maximizer provides data acquisition, communication to the Tigo Energy® Maximizer™ Management Unit, and energy harvesting control. The very small electronics footprint has been designed to minimize cost and maximize reliability. Tigo Energy Maximizer MM-ES is ideal for the European market and retrofit around the world.

The Tigo Energy output optimization starts with dynamic module balancing – a Module Maximizer (patented) attached to each module manages the energy harvest and sends information to the Maximizer Management Unit for reporting and control. The Tigo Energy Serial Module Maximizer (MM-ES) connects in a series topology. MM-ES maintains best-in-class system conversion efficiencies.

The Tigo Energy Module Maximizer includes a unique technology (patented) which greatly enhances the safety of a PV solar installation. As part of the Tigo Energy Maximizer system, this function can be activated with a safety button or via a remote management console. The Tigo Energy Module Maximizer includes a unique technology (patented) which greatly enhances the safety of a PV solar

installation. As part of the Tigo Energy Maximizer system, this function can be activated with a safety button or via a remote management console. The system can be installed, maintained or approached by fire personnel without the exposure to voltage levels typically in excess of 400 volts.

The Tigo Energy Module Maximizer is packaged in a NEMA3R enclosure (water and weather resistant), conforms to UL and IEEE safety standards. There are Module Maximizer options to fit any PV module, crystalline silicon or thin-film, regardless of output voltage or nominal power rating.

#### **Tigo Energy® Maximizer Management Unit™ MMU**

► The Tigo Energy Management Unit communicates between the Panel Maximizers and the inverter. It controls the Maximizer's algorithms and sends information collected from them to a remote server allowing system owners to observe and interact with the management system. The Tigo Energy Maximizers communicate with the Management unit via wireless communication protocols allowing for flexibility in the placement of this unit.



# Grid connected **systems**

Power optimizers |

## Tigo Energy® MaxiManager™ Software Data Sheet

► Tigo Energy's monitoring software manages utility, commercial, and residential PV arrays, giving system owners unprecedented visibility into module performance. System analytics track production, send alerts and proactively suggest maintenance actions to keep systems operating at maximum efficiency and uptime. For increased safety, the monitoring portal can remotely power-off each module individually, eliminating high voltage for maintenance or safety purposes. In addition, the DC arc fault circuit interrupter (DC AFCI) is a requirement according to NEC 2011 revised code, article 690.11.

## Mobile App for Solar Array Management

► Tigo Energy's monitoring and management systems is entirely accessible from iOS and Android platforms, allowing system managers to get instantaneous feedback on their array performance and manage operations remotely from any Internet connection. This gives you the visibility to view each PV module and instantly spot problems before they result in significant power losses at any time, from any place.



## Technical data Module Maximizer-ES series

### ELECTRICAL SPECIFICATIONS

Input values	MM ES50	MM ES75	MM ES110	MM ES170
Maximum power	300 W	350 W	300 W	300 W
Maximum input DC voltage (Voc)	52 V	75 V	110 V	170 V
Vmp range <sup>1</sup>	16-48 V	30-65 V	30-89 V	30-140 V
Maximum continuous current (Imp)	9.5 A	6.5 A	4.7 A	2.6 A
Maximum input current (Isc)	10 A	7.5 A	5 A	3 A
Output values	MM ES50	MM ES75	MM ES110	MM ES170
Maximum output power	300 W	350 W	300 W	300 W
Maximum continuous current	9.5 A	6.5 A	4.7 A	2.6 A
Nominal Voltage/range	0 - Voc	0 - Voc	0 - Voc	0 - Voc

General data	MM ES50	MM ES75	MM ES110	MM ES170
Dimensions (le, wi, hei)	110 x 143 x 28 mm			
Operating temperature range	-30°C +70°C			
Cooling	Natural Convection			
Enclosure environmental rating	IP-65, NEMA3R			
Panel connector	NEC 2008 compliant MC4 compatible (for retrofit) MC3 connectors			
Bus connector	NEC 2008 compliant 40AMP			
Compliance	per UL1741 FCC- part 15, class B - EN 61000			

<sup>1</sup>) Vmp = Voltage at maximum power = Maximum power voltage.

Specifications subject to change. Always check the table on the Tigo Energy Module Maximizer label for specifications as supported by that particular unit.



# Grid connected **systems**

## I Mounting systems

### **QUALITY for highest demands**

**INAM** commercializes and distributes its **own product line** of mounting systems for photovoltaic installations. Solutions for all types of roof typologies and ground mounted systems have been developed.

**Inam** collaborates with the CDEI-UPC (Centre for Industrial Equipment Design) of the Polytechnic University of Catalonia in the design and development of our own mounting systems. Within this collaborative framework the calculations for the specific resistance required to guarantee the reliability of all designs has been developed.

Inam ensures that its mounting systems meet **European standards (EN)** through static calculations. These are performed as indicated by European legislation (Euro codes) specific for the structural design requirements based upon the forces applied by both wind and snow to the photovoltaic mounting systems.

We meet the needs of our customers, the installers, engineers and distributors with our mounting systems, these needs being the basis for our development and production:

▶ **Quick and easy handling**

Maximum high level of preassembled components and minimum tool use.

▶ **Corrosion Resistance material and finishes according DIN standards**

For long life, maintenance free and full recycling.

▶ **Full compatibility with all types of modules and roof tops**

Designed to be flexible for installation on all types of roofs and compatible with all types of modules currently on the market, both with frame and laminated. The system is also adaptable for future changes.





# Grid connected **systems**

## Mounting systems | structures

### IS\_One

Pitched roof structure for PV modules with or without frame



### IS\_Two

Fixed structure for flat roofs PV modules with or without frame



### IS\_Three

For flat structures that do not allow perforation in order to anchor installation



**Flexible application** Our mounting system for pitched roofs allows for the installation of photovoltaic modules, with or without frames, to both older and newer roofs types regardless of their configuration.

**Fast assembly** Thanks to the high degree of preassembly and "Click" technology, the assembly time for our structures is minimized. In addition detailed assembly instructions allow for easy installation.

**High compatibility with photovoltaic modules** As both the middle and end clamps are adjustable in height this allows all modules with frames measuring between 28-52 mm to be mounted.

**Excellent adaptability** The specific design of the clamps, for fixing the modules to the aluminium rails, are adaptable for most of the modules with frames currently in the market.

**Maximum safety** The innovative modular structure with frame and ballast allows for maximum aerodynamic stability and ensures compliance with the effects generated by both wind and snow loads as established by the European standards for Structural design (Euro codes).

**Long lifetime** Thanks to the high quality of aluminium and stainless steel used, the system is completely resistant to external environmental conditions and from the possibility of corrosion. The materials used also ensure complete recyclability ensuring complete recycling of the materials used.

# Our **services**

| What does INAM provide?

## **Commercial Department**



Inam has a highly experienced commercial team who offer advice to our customers and propose the solution which best suits their needs. Our commercial team are involved in a continuous training process that provides a high level of knowledge of all the products and services we offer. This allows us to give our customers both a high quality and personalized service throughout the process and to deliver the best solutions from close proximity via the quality and speed of response.

## **Technical Department**



The technical department is formed by a team of engineers specializing in energy projects, which provide the necessary support and advice to any questions received from the customer. Our goal is to find the best solution and optimal result for each project and to provide a quality service from start to finish.

## **After Sales Department**



We have an after sales service which adapts to the needs of our customers whether by phone, mail or in person. We attend to all your needs and we act on all enquiries with rapid and effective responses, providing optimal solutions adapted to each customer.



# Contact

How to find us ? |

## **INAM SPAIN:**

c. tecnología 82, pasaje c nº 3  
08450 Llinars del Vallès (Barcelona) ESPAÑA

phone +34 937 323 595

fax 34 937 323 597

## **INAM GERMANY:**

Ernst-Abbe-Str, 16  
56070 Koblenz · Rheinland-Pfalz (GERMANY)

phone +49 (0) 261 927 19-003



## **Please contact directly:**

### **Commercial department**

Export Manager

E: [js@inamsl.com](mailto:js@inamsl.com)

### **Technical Department**

Technical service manager

E: [dt@inamsl.com](mailto:dt@inamsl.com)

### **Purchase Department**

Purchase manager

E: [info@inamsl.com](mailto:info@inamsl.com)

efficiency  
engineering modules  
**solarenergy**  
ecology environment  
**energy savings**

130601 VERSION

[www.inamsl.com](http://www.inamsl.com)