



# AEconversion

*Micro-Inverter*

*System Monitoring  
Control System - CO3  
Storage System*

# Micro-Inverter

## Product Overview

### Why Micro-Inverters?

AEconversion Micro-inverters guarantee the highest possible yield from each module of the system. In systems which are equipped with our components, modules operate independently, since each micro-inverter is connected directly to one or two PV modules and converts the generated direct current into grid-compliant alternating current. The so-called „Maximum Power Point Tracking“ (MPPT) on a modular level reduces the negative effects of shading and module mismatch to a minimum.

Reduce system costs!

The installation of an additional external disconnecting device is unnecessary through the use of AEconversion Micro-inverters because the required disconnecting device according to VDE-AR-N 4105 is already integrated.



Micro-Inverters from AEconversion increase the efficiency of any photovoltaic system!

The micro-inverter versions 250W/45V, 350W/60V, 350W/90V und 500W/90V, together with the communication and monitoring solutions guarantee the cost and performance efficiency of any photovoltaic system.



AEconversion Micro-Inverters offer the following advantages:

- Anti-islanding through integrated disconnecting device
- Low system cost, as some DC-components and complicated shading planning become unnecessary
- Increased yields through module-based MPP tracking
- Wide MPP tracking range increases system efficiency
- Easy installation via Plug & Play connectors and increased safety through elimination of high system voltages on the DC side
- Wide range of applications open up new customer groups
- High module compatibility
- Customer-oriented product variety



AEconversion is the right partner for the development and production of OEM inverters as well as custom power supplies for renewable energy and industry.

# Micro-Inverter

## Technical Data

		INV250-45	INV350-60	INV350-90	INV500-90
<b>Input</b>	<i>Maximum PV power</i>	250W	350W	350W	500W
	<i>Maximum DC voltage</i>	45V	60V	90V	90V
	<i>Min./Max. start voltage</i>	18V / 45V	18V / 60V	40V / 90V	40V / 90V
	<i>MPPT range</i>	20V ... 40V	20V ... 50V	40V ... 80V	40V ... 80V
	<i>Maximum DC current</i>	11A	11A	9A	11A
<b>Output</b>	<i>Maximum AC Power</i>	240W	330W	330W	480W
	<i>Nominal Current</i>	1.0A	1.4A	1.4A	2.1A
	<i>Power factor</i>	> 0.99	> 0.99	> 0.99	> 0.99
<b>Efficiency</b>	<i>Peak inverter efficiency</i>	93.5%	93.5%	95.0%	95.0%
	<i>CEC efficiency</i>	91.4%	91.8%	93.6%	94.0%
	<i>Nominal MPP efficiency</i>	99.8%	99.8%	99.8%	99.8%
<b>50Hz-Version</b>	<i>Nominal AC voltage</i> <i>Nominal AC voltage range</i> <i>Frequency</i> <i>Frequency range</i> <i>Productsafety</i> <i>EMC</i>	230V 184V ... 264V 50Hz 47.5Hz ... 51.5Hz IEC 62103:2003, IEC 62109-1:2010, IEC 55011B, EN 50178:1997 EN 61000-6-2, EN 61000-6-3			
<b>60Hz-Version</b>	<i>Nominal AC voltage</i> <i>Nominal AC voltage range</i> <i>Frequency</i> <i>Frequency range</i> <i>Productsafety</i> <i>EMC</i>	208V or 240V 184V ... 264V 60Hz 59.5Hz ... 60.3Hz UL 1741:2010, IEEE 1547:2003, CSA C22.2 FCC Part 15 Class B			
<b>Mechanical Data</b>	<i>Weight</i> <i>Operating Temperature</i> <i>Cooling</i> <i>Night time power consumption</i> <i>Max. altitude a.s.l.</i> <i>Safety class</i>	2.5kg -25°C ... +70°C Natural Convection 30mW 2000m Class I			
<b>Housing</b>	<i>Dimensions</i> <i>Protection Degree</i> <i>Enclosure material</i>	314mm x 267mm x 66,5mm (LxWxH) IP65 (50Hz-Version)   NEMA 4 (60Hz-Version) Aluminum			
<b>Features</b>	<i>MSD / (anti-islanding)</i> <i>Communication Versions</i>	integrated (acc. to VDE-AR-N 4105) PLC (Powerline) / RS485 / No Com (Unidirectional)			

Country specific approvals available and OEM versions on request.

# Features

## Advantages of AConversion Micro-Inverters

### Integrated Anti-Islanding

The AConversion Micro-Inverter is readily equipped with the in Europe legally required disconnecting device for network monitoring with an islanding protection system (grid and system protection) according to VDE-AR-N 4105. This is to guarantee that the micro-inverter automatically disconnects from the mains in case of a power failure or shutdown. An island formation and feedback into the power grid are thus prevented.

As of July 31st, 2014, the EN 62109:2 will be mandatory in Europe. AConversion is one step ahead by already integrating all demands for a "one-fault-safe" disconnecting device.



### Customer-oriented product variety

In order to ensure optimal compatibility to all PV-modules, AConversion offers a variety of micro-inverter power versions: 250W, 350W and 500W, available in input voltages of 45V, 60V and 90V (respectively). For the international market, 50Hz and 60Hz Version with output voltages of 230V or 208/240V are available. Our products are approved for use in most countries. Additional country specific approvals can be carried out upon request. AConversion provides these micro-inverters with three different communication capabilities: either PLC (Powerline), RS485 or unidirectional communication, as well as suitable monitoring devices.

On request, AConversion also offers product customizations and OEM solutions tailored to customer requirements.

### High System Efficiency

In order to achieve the maximum yield for each individual PV-module, micro-inverters perform MPP tracking on a modular basis by varying the electrical operating point based on their UI characteristic (voltage-current curve).

AConversion Micro-inverters are equipped with an extended tracking range and thus achieve higher yields per module.

### Module Compatibility

Typically, not every module can be connected to just any micro-inverter. AConversion however extends their input voltage range to a maximum, to provide a suitable inverter for almost every module on the market.

Input voltages from 20 volts to 90 volts are possible and the micro-inverters are compatible with 48 -, 54 -, 60 -, 72 -, 80 - and 90-cell modules.

# Advantages

## *Technological Advantages of Micro-Inverters*



### Reduced System Costs

In PV systems equipped with micro-inverters, the components and installation costs can be reduced by up to 15%. DC components such as DC-connection boxes or DC circuit breakers as well as skilled workers for handling high DC voltages become unnecessary.

Detailed System and shadow planning needed for string systems are eliminated and the quick and easy installation through „plug-and-play“ connectors further reduce the investment costs.

### Easy Planning and Comfortable Installation with Higher Safety

When designing the PV-systems with micro-Inverters, the shadow and string planning become unnecessary. The „plug-and-play“ connectors allow for convenient and fast installation of the system. Also, in regards to safety, the use of AConversion Micro-inverters is beneficial. Since only one or two modules are installed per inverter, there are no high DC voltages. This will considerably reduce the risks during installation and in case of fire!

### Modular MPP-Tracking

Maximum Power Point Tracking is done on a modular level in order to achieve the maximum output from each module. Installations are independent of shadow formations, module orientations or architectural obstructions such as skylights or chimneys. Also, different module tolerances have no effect on the overall system efficiency.

In conventional systems equipped with string inverters where the MPP-Tracking is performed on a string basis, some modules operate below their maximum power point due to differences in module tolerances and lighting conditions.

### Diverse Applications

Unlike for the typical PV-system with string-inverters, the modular MPP-tracking performed by micro-inverters opens a variety of application areas.

The AConversion Micro-inverter is used in small and self-consumption systems as well as in larger installations. Other uses include control, storage and off-grid systems, industrial applications or even wind turbines.

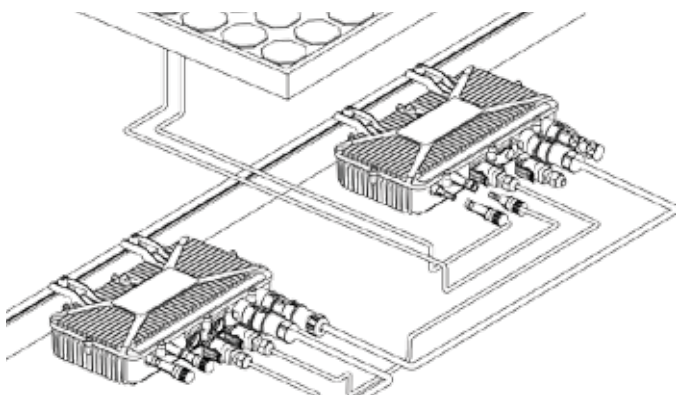


# Communication Versions

## Functionality and System Details

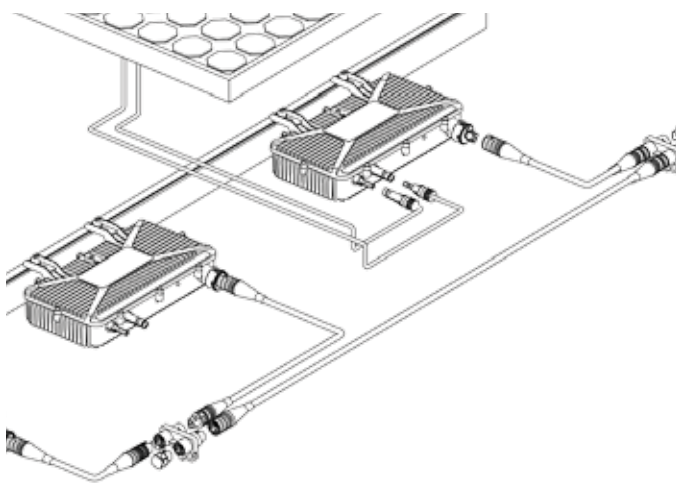
### RS485 Communication (RS485)

The RS485 communications technology as a widely used industry standard provides efficient monitoring of PV systems over long distances and in areas with strong electrical interference.



### Powerline Communication (PLC)

The Powerline communication is an effective way of communication between a PV system and your monitoring station. The main advantage of this way of communication is that the existing AC wiring is used by the inverter for data transmission. No additional connectors and wiring is needed.



### Unidirectional Comm. (NoCom)

The AEconversion offers an inverter with limited communication capabilities specifically for systems in which the monitoring of the system is simply unnecessary. Through the use of independent monitoring systems general performance data (overall yield of the system) can be monitored.



# System Monitoring

## *Datenlogger, Gateway and Adapter*

### Early Problem Detection and Cause Localization

The use of the micro-inverter in PV systems makes it possible to monitor the performance of the photovoltaic system on a modular basis, which creates the basis for accurate system monitoring and possible problem detection. Thus, not only is the performance improvement of the photovoltaic system ensured, but also protected against potential yield losses through early detection and rapid localization of problems. For comprehensive monitoring of the PV system on a modular basis AConversion provides different products, depending on the budget and scope of desired monitoring capabilities.



### AEDL-LAN Data Logger

The AConversion data logger can collect and store measured values of external transducers via three RS485 interfaces. Furthermore, the data logger has an Ethernet interface for configuration via the embedded Web server and a USB interface for data backup, storage expansion and connection of sensors or extensions. For easy configuration and display of current readings, a LC display and four capacitive buttons are used.



### AEDL-UH Data Logger

The AConversion Data Logger can monitor up to 50 inverters and stores all operational data (current performance, current income, status) for up to 2 years. The polling intervals can be adjusted individually in the range from 1 minute to 60 minutes. The display is on a 2x16-character LC-display with back light. In addition to the direct reading of the data on the display, the stored data can be copied to a USB memory stick in for graphical representation using the monitoring software.



### PLC Gateway

The AConversion gateway serves as interface between the AC power line together with the modulated data and the RS485-bus system. The gateway can direct up to 16A AC through the inverter to the subdivision. It provides a reliable filter to shield communication from external interferences. The system data is provided at the RS485 port. In order to connect all inverters with a central monitoring station, eg the AConversion Data Logger, the gateways can be connected in parallel to the RS485 bus.

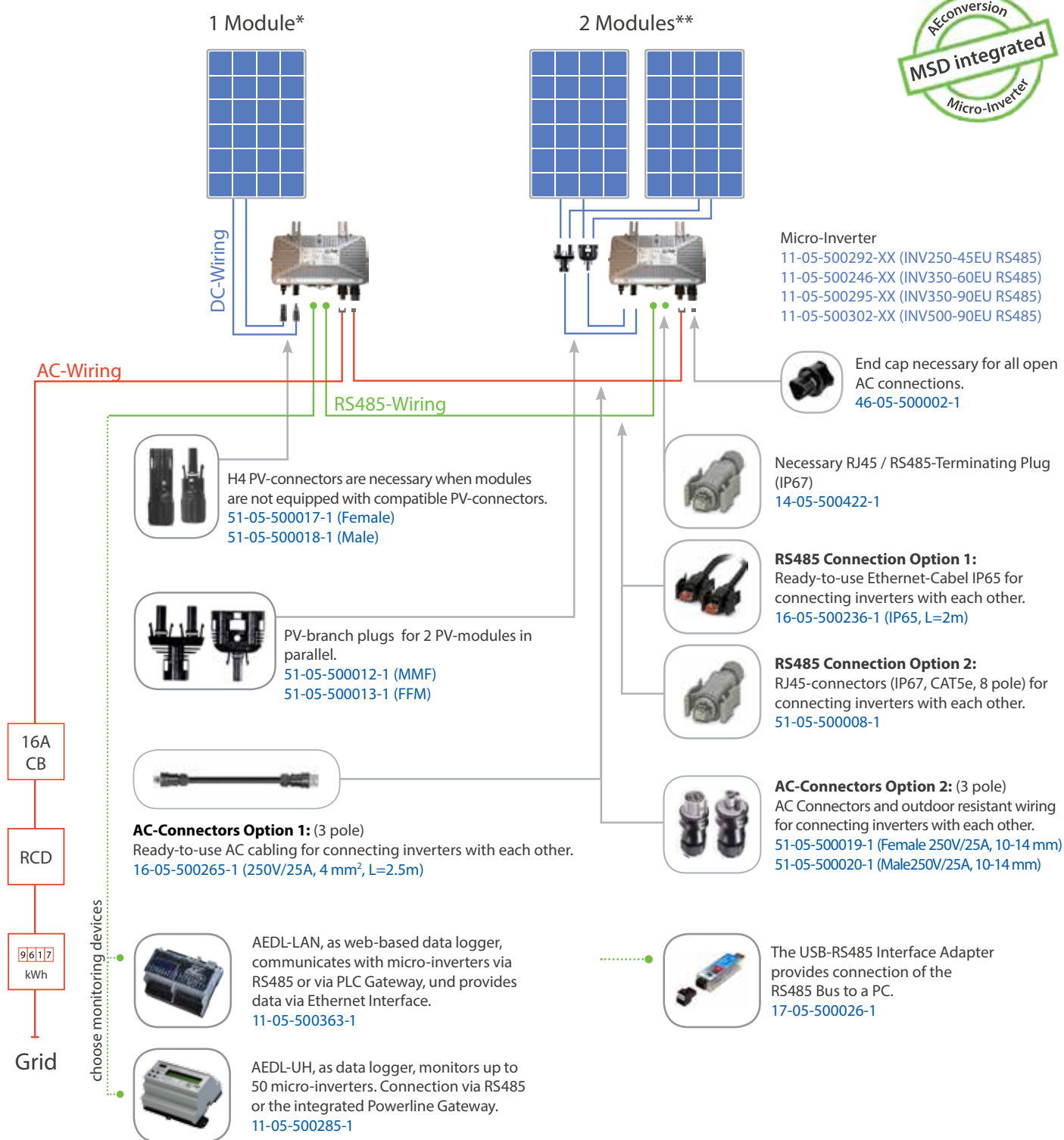
### RS485-USB-Converter

The RS485-USB converter is used to connect the RS485 bus to a PC. The software „AEsolar“ is included in the scope of delivery free of charge.



# RS485 System (50Hz)

## Micro-Inverters and Accessories



\* 1 Module: 45V, 60V or 90V max. depending on inverter version

\*\* 2 Modules: Parallel Connection - 45V, 60V or 90V max. / Series Connection: 45V, 60V or 90V max. in total depending on inverter version

CB - Circuit Breaker / RCD - Residual Current protective Device

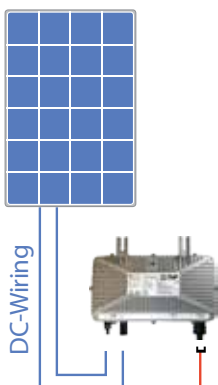


# PLC /NoCom System (50Hz)

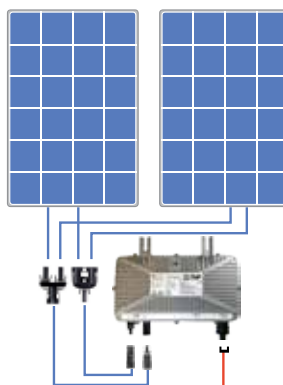
## Micro-Inverters and Accessories



1 Module\*



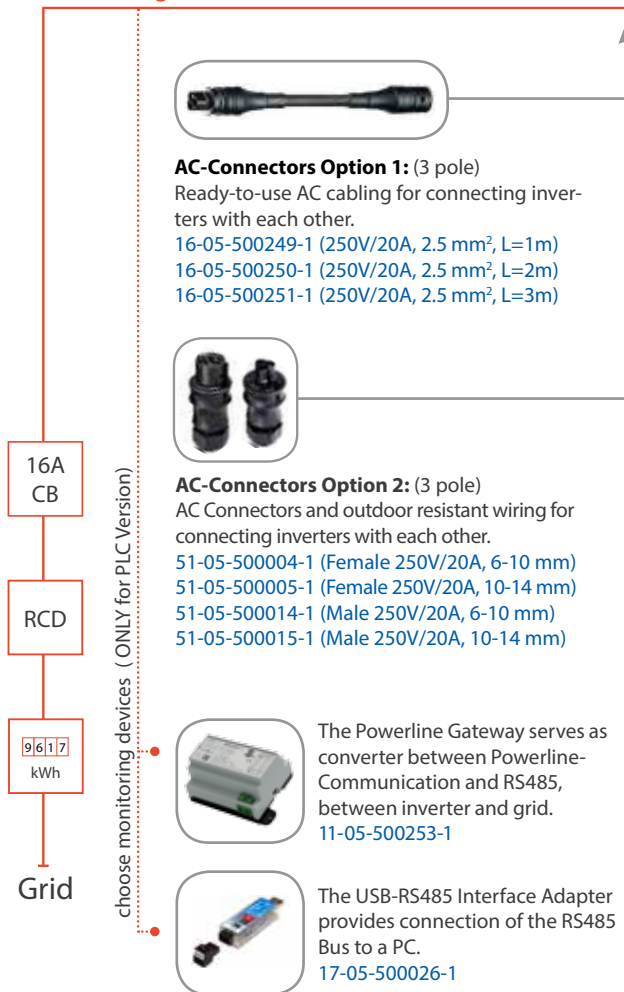
2 Modules\*\*



- Micro-Inverter PLC**  
 11-05-500293-XX (INV250-45EU PLC)  
 11-05-500247-XX (INV350-60EU PLC)  
 11-05-500299-XX (INV350-90EU PLC)  
 11-05-500303-XX (INV500-90EU PLC)

- Micro-Inverter NoCom**  
 11-05-500291-XX (INV250-45EU)  
 11-05-500190-XX (INV350-60EU)

### AC-Wiring



- AC-Connectors Option 1:** (3 pole)  
 Ready-to-use AC cabling for connecting inverters with each other.  
 16-05-500249-1 (250V/20A, 2.5 mm<sup>2</sup>, L=1m)  
 16-05-500250-1 (250V/20A, 2.5 mm<sup>2</sup>, L=2m)  
 16-05-500251-1 (250V/20A, 2.5 mm<sup>2</sup>, L=3m)

- AC-Connectors Option 2:** (3 pole)  
 AC Connectors and outdoor resistant wiring for connecting inverters with each other.  
 51-05-500004-1 (Female 250V/20A, 6-10 mm)  
 51-05-500005-1 (Female 250V/20A, 10-14 mm)  
 51-05-500014-1 (Male 250V/20A, 6-10 mm)  
 51-05-500015-1 (Male 250V/20A, 10-14 mm)

- Powerline Gateway**  
 The Powerline Gateway serves as converter between Powerline-Communication and RS485, between inverter and grid.  
 11-05-500253-1
- USB-RS485 Interface Adapter**  
 The USB-RS485 Interface Adapter provides connection of the RS485 Bus to a PC.  
 17-05-500026-1

- H4 PV-connectors** are necessary when modules are not equipped with compatible PV-connectors.  
 51-05-500017-1 (Female)  
 51-05-500018-1 (Male)
- PV-branch plugs** for 2 PV-modules in parallel.  
 51-05-500012-1 (MMF)  
 51-05-500013-1 (FFM)
- End cap** necessary for all open AC connections.  
 46-05-500002-1

- Distribution blocks** for connection of AC wiring, equipped with:  
 1 Input, 3 Outputs (3 pole)  
 51-05-500003-1 (250V/20A)

- AEDL-LAN**, as web-based data logger, communicates with micro-inverters via RS485 or via PLC Gateway, and provides data via Ethernet Interface.  
 11-05-500363-1
- AEDL-UH**, as data logger, monitors up to 50 micro-inverters. Connection via RS485 or the integrated Powerline Gateway.  
 11-05-500285-1

\* 1 Module: 45V, 60V or 90V max. depending on inverter version  
 \*\* 2 Modules: Parallel Connection - 45V, 60V or 90V max. / Series Connection: 45V, 60V or 90V max. in total depending on inverter version  
 CB - Circuit Breaker / RCD - Residual Current protective Device

# Applications

## Application Areas of Micro-Inverters

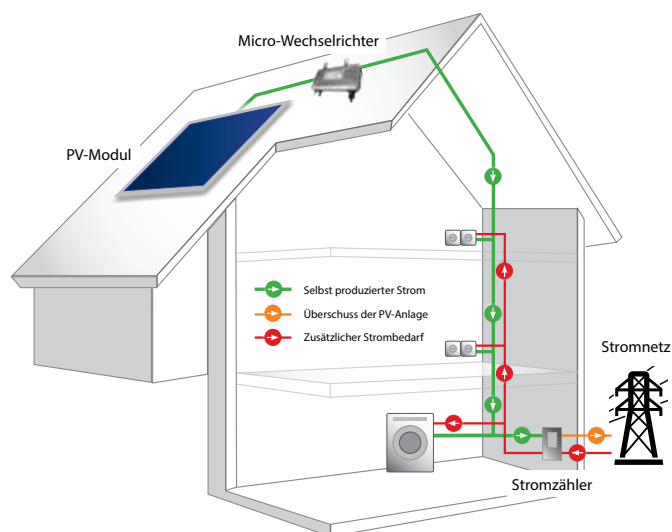
### Small PV-Systems

A typical application for micro-inverters is the small PV-system. For a system with only a small number of modules, the use of a central or string inverter is ineffective. Especially in systems for which elaborate shadow or string planning would otherwise have to be performed, the micro-inverter enables simple planning and installation. DC components, such as DC-connection boxes or DC circuit breaker as well as skilled workers for handling high DC voltages become unnecessary. Lower system costs through an integrated mains monitoring switching device (MSD) offer an additional advantage for the use of micro-inverters in small PV-systems.



### Self-Consumption Systems

A mini-PV-system with micro-inverter is a simple, straightforward and modular way for households to reduce the power consumption through the self-production of electricity. Such a mini-PV-system can consist of one micro-inverter and one photovoltaic module. The AEconversion micro-inverter is directly connected to the PV module and converts the generated direct current into grid-compliant alternating current. These systems are extremely flexible, can be expanded and they also individually adjust to the needs of the customer.



#### The advantages of self-consumption system

A mini-PV-system with micro-inverters can not only be installed on classic south-facing roof areas, but also on smaller surfaces, such as garage roofs, garden sheds, canopies, facades, balconies facing different directions and even on areas with partial shading.

This unique feature not only allows homeowners who have the appropriate roof surfaces but also tenants to reduce their individual electricity costs.

#### Significant cost advantages

On average, each household has an electric base load of 300 kWh per year. With a slightly altered consumption behavior, up to 20% of power consumption can be generated.

With the current development of electricity prices, you can expect a payback period of about 8 years for a mini-solar system.

Therefore, the investment of a self-consumption system pays back quickly without EEG allowance. Due to the difference between the electricity price and the feed-in tariff under the EEG, the self-consumed kWh already contains an added value compared to feeding in.

# Micro-Inverters in Systems

## Solutions for Self-Consumption-Optimization

### Control System - CO3



The self-consumption optimizer CO3, a new development of AEconversion, combines three functions: Self-consumption and feed-in management as well as the monitoring of systems with micro-inverters.

The combination of the AEconversion data logger and an external utility meter (energy meter) for the CO3 system guarantees an optimal use of self-generated electricity.

The power consumption is recorded and stored on the data logger.

#### Advantages of the Control System CO3

- Use of self-produced electricity
- Self-power-consumption optimization
- Smart metering
- Detection of power consumption
- No feeding into the utility grid or set control to 70% at the feed-in point possible
- Programmable, power-dependent relay contact

The feed into the electricity grid to the utility company can be completely prevented or, alternatively, set at 70% feed-in at the feed point. A configuration via a ripple control receiver according to EEG is also possible.

The AEconversion data logger provides an interface to the network and serves as a link to the communication interface with Powerline and RS485 for operation with the micro-inverters INV250-45 / INV350-60 / INV350-90 / INV500-90.

The data logger stores the current output, current income, the average consumption and other desired operating data of the connected inverters.

### Storage System

Many PV systems generate more energy than can be used directly in the household. The AEconversion PV-storage system provides a solution to store the unused energy. This prevents the inadvertent grid feedback.



With only two interfaces, the AEconversion storage system can be integrated into existing systems. The storage system of AEconversion is reduced to the minimum of necessary components to provide a small and inexpensive storage system solution to anyone.

The energy produced by the PV system is available to the consumer. The data logger records the system data and controls the charge / discharge of the PV storage. Energy not used directly used by the building load is temporarily stored in the battery.



# AEconversion

## The Company

### AEconversion GmbH & Co. KG

The AEconversion GmbH & Co. KG, headquartered in Soest/ Germany, is an emerging company that specializes in solutions for the use of adaptive energy.

The company originates from the solar division of the APtronic AG and is operating as an independent company since 2012, under the leadership of the co-founder and former managing director of APtronic.

The core staff of APtronic Solar, the technology, the product range, the location for research and development, as well as the production facility was carried over.



### Research & Development

Our experienced engineering team based in Germany, has designed and constructed: micro-inverters and compatible communication solutions for renewable energies as well as custom power supply systems for industrial applications. This includes the design and layout of power electronics and magnetics.

### Production & Delivery

The industrial production of inverters and OEM products takes place at AEconversion with the highest standards in quality assurance and control including an optimal handling of delivery and service. Even for larger quantity orders, we are able to provide a comprehensive set of flexible solutions. Delivery, packing and logistics are set according to customer specifications.

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