Solar Inverters

Solar inverter AX-series

1 - 5kVA Multifunctional inverter

NEU / NEW

- **PV inverter**
- **PV / Battery Charger with 3-stage charge**
- **Battery-backed power supply**
- **Sine wave inverter with charging function**
- **3 phase operation possible**
- **Parallel operation possible**

Description:

The AX Series is a multi-function inverter / PV charger with the combined functions of an inverter and MPPT solar and battery charging device.

These inverters are suitable for off-grid stand-alone operation with PV modules, but can also be operated with power from batteries, generators or the public power grid.

With insufficient power from the PV modules, the device automatically adds on battery power or when the batteries are empty it switches over to the power grid. Three AX-inverter in combination can be configured for three-phase operation.

For higher power requirements up to 4 units (4 or 5kVA models) with a maximum output of 16kW (20kVA) can be optionally connected in parallel.

EFFEKTA offers the AX-series in three model series:

AX-M Series

- **MPPT*** Solar Controller
- 800, 1600, 2400, 3200, 4000W rated power
- 24 / 48VDC

AX-P Series

- **MPPT*** Solar Controller
- With increased PV power (see specifications)
- 1600, 2400W rated power
- 24 / 48VDC

AX-K Series

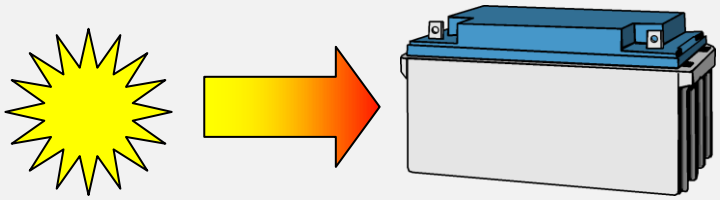
- **PWM*** Solar Controller
- 800, 1600, 2400, 3200, 4000W rated power
- 12, 24, 48VDC

*Basic information about MPPT & PWM technology on the next page

Solar Inverters

Solar inverter AX-series

Optimized for PV energy storage (improved self-consumption)



During the day any unused surplus electricity is used to charge the batteries and will not be lost. At night or in bad weather consumers are supplied from the batteries. In this way, a smaller amount of electricity must be purchased.

Features AX-series

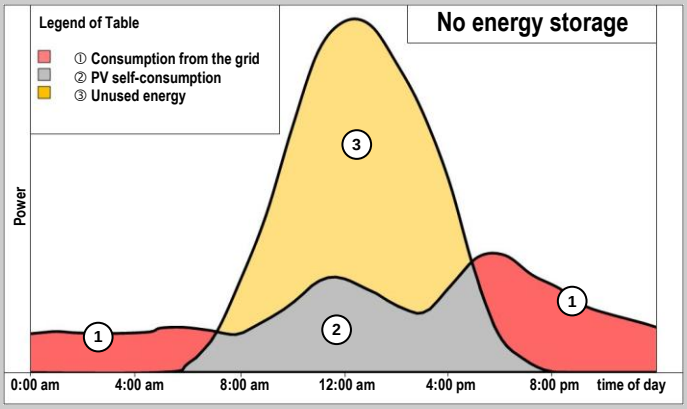
- Multiple power sources: solar power, AC power supply, 24 or 48VDC battery
- Parallel operation of several inverters possible
- 3-phase operation possible
- Pure sine wave output
- Built-in MPPT solar charge controller
- Configurable via LCD display or PC software
- Auto restart when mains power returns
- Overload / over temperature / short circuit protection
- Optimized charge process for perfect battery performance (“Smart Charger Design”)
- Island operation possible
- 12 months warranty

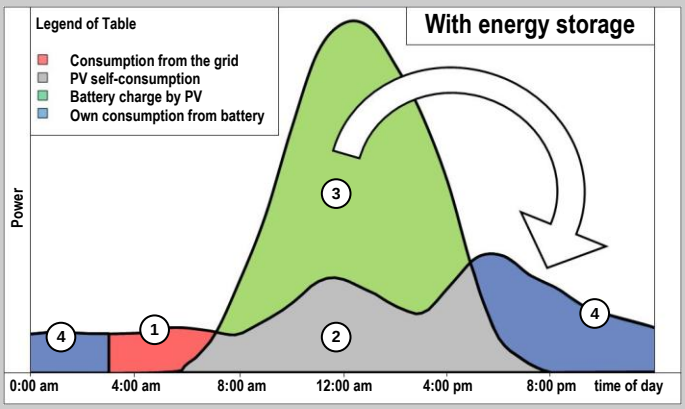
MPPT suitability / benefits

- Ideal for the optimal operating point to choose on the current-voltage curve.
- Superior in temperate regions (Ø 25° C).
- To prefer for services exceeding 500W
- Preferable with load fluctuations
- Suitable for higher yields

PWM suitability / benefits

- Suitable for constant power / charge conditions
- Suitable for uniform, hot climate conditions
- Suitable for smaller PV systems
- More cost-effective variant





Optimized own use of solar power

Left: Typical hourly energy production and consumption in a household with photovoltaic system ***without energy storage***: At night the photovoltaic system produces no electricity, so the required energy is obtained from the public grid ①. During the day excess energy gets ***lost*** ③, because the complete amount of electricity produced cannot be consumed ②.

Right: Typical Day course for a household with PV system ***and energy storage***: During the day the battery is charged with the excess energy ③. At night, a large part of the necessary energy is obtained from the energy storage device ④. The PV energy yield (② + ④) is now much higher because the purchased energy from the grid is much lower ①. Depending on the configuration of the batteries, the energy loss can decrease to negligible values.

Specifications (M & P-series)

Model AX-:		AX-M: 1kVA 24V 1kVA 48V	AX-M: 2kVA 24V	AX-M: 3kVA 24V 3kVA 48V	AX-P: 2kVA 24V 3kVA 24V 2kVA 48V 3kVA 48V	AX-M: 4kVA 48V	AX-M: 5kVA 48V
General data							
Operating temperature		0°C - 50°C					
Storage temperature		-15°C - 60°C					
Humidity		< 95% (non-condensing)					
Size (HxWxD) [mm]		355 x 272 x 128			479 x 295 x 140	540 x 295 x 140	
Weight [Kg]		7.4	7.6	8.0	11.5	12.5	13.5
Protection		IP20					
Regulations / standards	Safety	EN 60950-1					
	EMC	EN 55022 class A, EN 55024					
	Certifications	CE					
Battery bank alarm contact-load capacity (DRYCONTACT)		2A / 250VAC					

Model AX-:	M 1kVA 24V M 2kVA 24V M 3kVA 24V M 1kVA 48V M 3kVA 48V	P 2kVA 24V P 3kVA 24V P 2kVA 48V P 3kVA 48V	M 4kVA 48V M 5kVA 48V
AC-input			
AC-input waveform	Sine wave (Mains and generator)		
AC-input voltage	(120VAC) 230VAC		
AC-input voltage range	90-280VAC configuration „general home applications“ (65-140VAC)		
	170-280VAC configuration „Computer applications“ (UPS) (95-140VAC)		
Max. AC-input voltage	(150VAC) 300VAC		
AC-input frequency	50 / 60Hz (automatic)		
AC-input frequency range	40-65Hz		
Efficiency normal mode	> 95 % (at rated load and battery bank fully loaded)		
Transfer time	typical 20ms configuration „general home applications“		
	typical 10ms configuration „Computer applications“ (UPS)		

Model AX-:	M 1kVA 24V M 2kVA 24V M 3kVA 24V P 2kVA 24V P 3kVA 24V	M 1kVA 48V M 3kVA 48V P 2kVA 48V P 3kVA 48V	M 4kVA 48V M 5kVA 48V
Output			
Output voltage	(110/120VAC ± 5%) 230VAC ± 5% 4.5 kVA – models only 230VAC		
Output frequency	50Hz or 60Hz, adjustable		
Effective power	1kVA / 0.8kW 2kVA / 1.6kW 3kVA / 2.4kW	1kVA / 0.8kW 2kVA / 1.6kW 3kVA / 2.4kW	4kVA / 3.2kW 5kVA / 4.0kW
Max. Efficiency (Inverter)	90%		
Overload protection (behavior)	5s @ >150% load, 10s @ 110-150% load		
Max. load	2x nominal load for 5s		
Short circuit protection Output	Circuit breaker in the main power supply		
	Electronic fuse in the inverter operation		
Internal consumption			
Sleep operation (STANDBY):	2W		
Energy saving mode	<10W		<15W
Normal mode (no load):	<25W		<50W
Battery Bank & charger			
Nominal voltage	24VDC	48VDC	
Cold start voltage	23VDC	46VDC	
Voltage accuracy	±0.3%		
Charging algorithm	3 stage (I U o U)		

Model AX-:	M 1kVA 24V M 2kVA 24V M 3kVA 24V	M 1kVA 48V M 3kVA 48V	P 2kVA 24V P 3kVA 24V	P 2kVA 48V P 3kVA 48V M 4kVA 48V M 5kVA 48V
PV-charger				
Charging power	600W	900W	1500W	3000W
Efficiency	98%			
Nominal System voltage U_N	24VDC	48 VDC	24 VDC	48 VDC
Effective operating range MPPT U_{OP}	30-66VDC	60-88VDC	30-115VDC	60-115VDC
Max. input voltage U_{OCV}	75VDC	102VDC	145VDC	
Min. battery bank voltage for PV-mode	17VDC	34VDC	17VDC	34VDC
PV- input accuracy	±2V			

Model AX-:	M 1kVA 24V	M 2kVA 24V M 3kVA 24V P 2kVA 24V P 3kVA 24V	M 1kVA 48V M 3kVA 48V P 2kVA 48V P 3kVA 48V	M 4kVA 48V M 5kVA 48V
Mains charging unit				
Charging current 230VAC	10/20A	20/30A	10/15A	2/10/20/30/40/50/60A
Charging current 120VAC	---	10/20A	5/10A	---

Specifications

Specifications (K-series PWM)

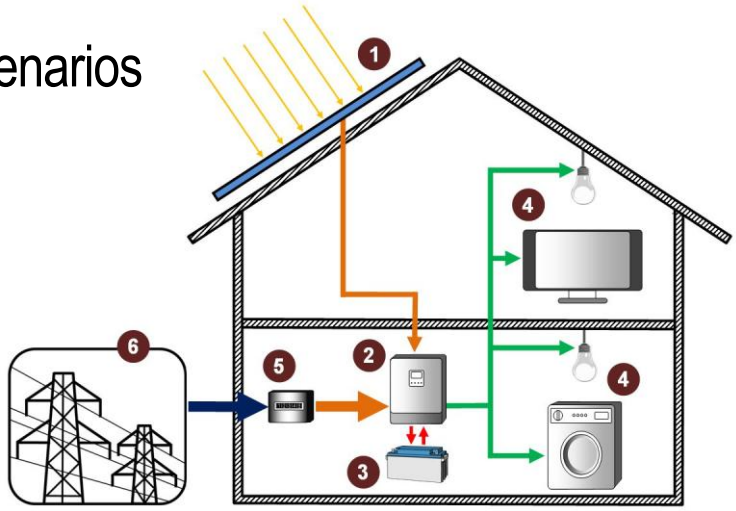
Model AX-:		K 1000-12	K 2000-24	K 3000-24	K 4000-48	K 5000-48
Nominal power		1000VA / 800W	2000VA/1600W	3000VA / 2400W	4000VA / 3200W	5000VA / 4000W
AC input						
AC input voltage		230VAC				
AC input voltage range		90-280VAC configuration „general home applications“				
		170-280VAC configuration „Computer applications“ (UPS)				
AC input frequency		50Hz or 60Hz, adjustable				
Output						
Output voltage		230VAC ±5%				
Max. power		2000VA	4000VA	6000VA	8000VA	10000VA
Max. efficiency		90%				
Output frequency		50Hz or 60Hz, adjustable				
Transfer time		20 ms configuration „general home applications“				
		10 ms configuration „Computer applications“ (UPS)				
Wave form		Sine wave				
Battery						
Battery voltage		12VDC	24VDC		48VDC	
Battery float voltage		13.5VDC	27VDC		54VDC	
Overload protection		15VDC	30VDC		60VDC	
Max. charging current		10A or 20A	20A or 30A		2/10/20/30/40/50/60A	
Solar charger (optional)						
Charging current		50A				
Maximum PV array open circuit voltage		30VDC	60VDC		105VDC	
Standby power consumption		1W	2W		2W	
General data						
Size (HxWxD) [mm]		316 x 240 x 95	355 x 272 x 100		468 x 295 x 120	
Weight (in kg)		5.0	6.4	6.9	9.8	9.8
Humidity		5% bis 95% (non-condensing)				
Operating temperature		0°C-55°C				
Storage temperature		-15°C-60°C				
Protection		IP20				
Regulations / standards	**Safety**	EN 60950-1				
	EMC	EN 55022 Klasse A, EN 55024				
	Certifications	CE				

AX-Series

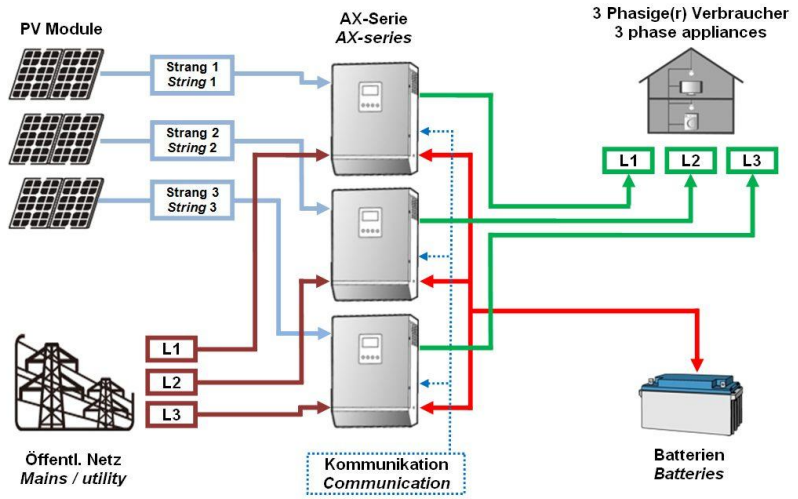
Basic principle and application scenarios

Scheme on the right: basic principle

1. PV plant
2. AX inverter
3. Energy storage (battery)
4. Consumer
5. Electric meter
6. Public power grid



Following are four application scenarios of the AX-inverter. These represent only sample configurations and can be programmed individually according to the requirements and priorities of the custome.



Note: 4 or 5 kVA models & suitable communication cards are required for 3 ph. operating

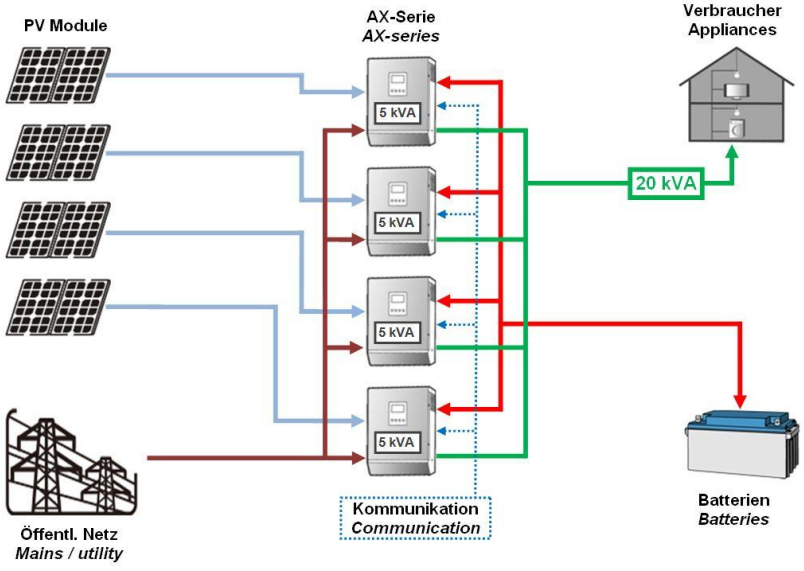
3-phase operation (4 & 5kVA models only)

A single AX inverter is required for each phase. Only one battery system is used and shared by all three inverters.

The inverters communicate with each other and generate a three phase current network.

With this configuration, an entire house can be supplied with three phase power easily through PV and energy storage.

At too low PV power, the energy required is first taken from the battery. If this is empty, the missing electricity is provided from the AC source.



Note: 4 or 5 kVA models & suitable communication cards are required for parallel operation

Parallel operation (4 & 5 kVA models only)

In the example on the left a maximum of four 5kVA inverters are connected in parallel and provide a total output of 20kVA.

Each inverter must be connected to a seperate PV array. The AC source is shared.

The energy storage device (battery) is charged by all the inverters.

At too low PV power, the energy required is first taken from the battery. If this is empty, the lack of electricity is provided from the AC source.

AX-Series

Basic principle and application scenarios

The operating principle of the AX-inverter includes the supply with batteries in case of failure of other energy sources.

Operation is possible with AGM, gel, NiCd, closed lead-acid battery (OpzS, OpzV ...). The batteries are charged via the integrated charger with 3-stage charge.

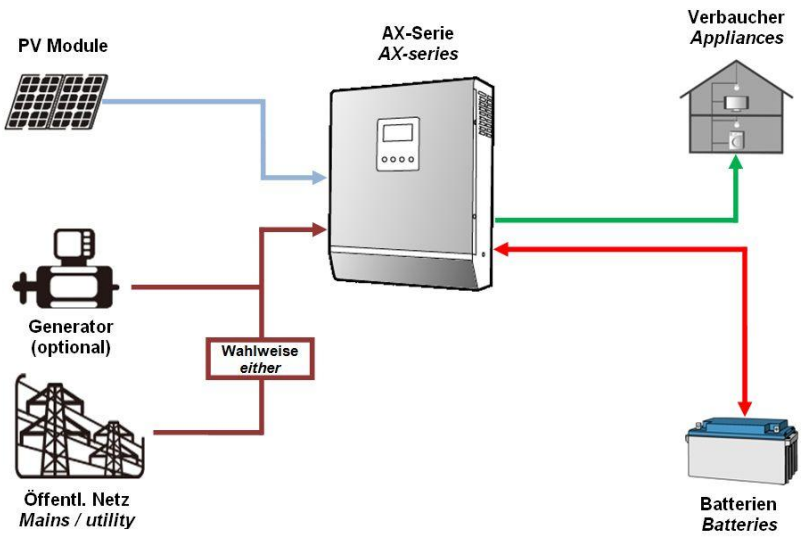
EFFEKTA® recommends Rolls ™ brand batteries of the type 4000 - T12 250 and 5000-12 CS 11P for the system. More details are available on request.

Rolls 4000 Series / Type T12 250

Vented lead-acid battery
12V (6 cells), 200Ah (C20)
391 x 178 x 365mm D x W x H
55kg max.

Rolls 5000 Series / Type 12Cs 11P

Vented lead-acid battery
12V (6 cells), 357Ah (C20)
559 x 286 x 464mm D x W x H
123kg max.



According to the needs and depending on the hardware configuration different supply priorities can be set via display or software.

Solar powered with battery backup

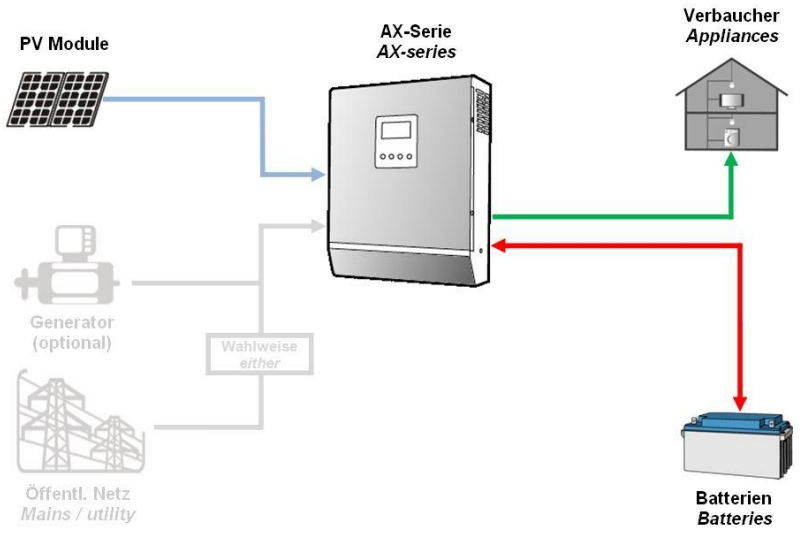
PV modules and AC source (mains or generator) are required.

Consumers primarily are powered from the PV modules.

When there is no or insufficient PV power initially, batteries provide the energy needed. When the batteries are empty the AC source jumps in.

Surplus energy of the PV modules is used to charge the batteries.

Upon failure of PV and AC power supply is powered on on batteries.



Stand-alone ("Island-") operation with battery backup

The load is supplied by the inverter, which draws the energy from the PV modules. There are no AC sources.

With sufficient PV power, the batteries are charged by PV. The charge is made exclusively with PV.

Upon failure of the PV supply (eg. night mode), consumers can be supplied via the batteries.

Missing PV power of inverter (low solar radiation) can be supplemented through the batteries.