

# Protect PV BROCHURE

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# PROTECT PV

## UTILITY-SCALE INVERTER

**Solar Inverter for Grid Connection**  
**Utility Scale**  
250, 560, 690, 880 kVA



The Solar Inverter Protect PV product line designed by AEG Power Solutions offers professional solutions for utility-scale applications on industrial roofs and ground area installations. A key feature of the PV product line is its power stack with advance-design measuring and control technology enabling DC input voltages of up to 1000 VDC. Thin-film modules can therefore be used efficiently and savings made on wiring costs.

The combiner boxes can be designed as required with up to 6 input fuses available (PV.250 - PV.880 8 pcs., positive and negative). The AEG PS solution entitled "active earthing" provides for a safer application of module technologies that require electrical grounding for operation. Another option called "copain mode" is available in which two units operate as a highly efficient team (master/slave functionality).

Maximum Power Point Tracking is designed to meet the latest requirements for quick responses to dynamic weather conditions such as spontaneous cloud cover on a clear day, and reliable day/night detection (active/passive).

With an efficiency factor of 98.85% according to the European standard 50530, the Protect PV.880 for example well exceeds expectations for its power class. With an appropriate transformer, it can be connected to the medium voltage grid (MV, e.g. 10, 20 kV).

Monitoring and power plant integration is based on Modbus Protocol and advanced CAN BUS communication as well as via optic fiber and ethernet between the containers. This allows for cost-effective, safe and reliable remote monitoring and control of the PV plant. The monitoring and control system can be integrated into an overriding power station control technology. Because of the open structure, future requirements of the grid operators can also be taken into account.

This communication structure enables the operator to carry out continuous monitoring, failure analysis, reporting and performance statistics. Remote monitoring and remote access are available via GSM, DSL and WebPortal, for example, and programmable alarm functions via email/SMS settings.

Turnkey container solutions in different power classes integrate all necessary components and can be supplied ready for connection to the power plant on site.

With over 60 years of experience in power supply systems and solutions for power plants, AEG Power Solutions offers a comprehensive range of services aimed at securing maximum yields for your PV power installation. These services include contractual solutions with service guarantees and high inverter availability.

# PROTECT PV

TECHNICAL DATA

	Protect PV.250	Protect PV.560	Protect PV.690	Protect PV.880
DC INPUT				
Recom. PV power*1	250 - 320 kWp	500 - 680 kWp	630 - 890 kWp	800 - 1150 kWp
DC voltage window	345 - 1000 V	385 - 1000 V	465 - 1000 V	486 - 1000 V
Max. DC voltage	1000 V			
Extended U <sub>MPPT</sub> voltage range	345 - 1000 V	385 - 1000 V	465 - 1000 V	486 - 1000 V
U <sub>MPPT</sub> voltage range @ 50 °C (EN50530)	450 - 820 V	500 - 820 V	550 - 820 V	573 - 820 V
Max. DC current	600 A	1060 A	1170 A	1440 A
Quantity DC inputs	1 MCCB			
Quantity DC fuses	up to 6 pcs. (pos & neg)	up to 8 pcs. (pos & neg)		
Over voltage protection	Grade 2			
AC OUTPUT				
Nom. AC power at cos φ = 1 (@ 50 °C)		510 kVA	630 kVA	800 kVA
Nom. AC power at cos φ = 1 (@ 45 °C)	255 kVA			
Nom. AC power at cos φ = 1 (@ 25 °C)		560 kVA	690 kVA	880 kVA
Power factor, adjustable	lag 0.9 – 1 – lead 0.9			
Output voltage without transformer	255 V	283 V	345 V	360 V
Max. AC current	577 A	1144 A	1159 A	1411 A
MV-connection*2	10, 20 kV and other, as required			
Mains frequency	50 / 60 Hz			
Current distortion	< 3 %			
Over voltage protection	Grade 2			
GENERAL DATA				
Efficiency*3 (Max. / Euro / CEC)	98.7 %/98.5 %/98.5 %	98.4 %/98.2 %/98.2 %		98.9 %/98.6 %/98.7 %
External power supply	TN-S, 230 V 50/60 Hz			
Operating temperature	-10 °C to +45 °C	-20 °C to +50 °C		
Rel. humidity	15 ... 95 % max, non condensing			
Protection grade, EN 60529	IP 20			
Altitude above sea level	1,500 m	1,500 m (3,000 m max. 40 °C)		
Dimensions (W x H x D)	2100 x 2000 x 600 mm	2700 x 1800 (+230 fans) x 600 mm		
Weight	approx. 1130 kg	approx. 1650 kg	approx. 1800 kg	approx. 1850 kg
Equipment color	RAL 7035			
CE Certificate	Yes			
Grid monitoring	according to FNN (VDN, BDEW) and corresponding to local requirements			
ALARM & CONTROLS				
Earth fault monitoring	Yes			
Over voltage protection	Yes			
Contact and breaker position	Yes			
Emergency power off	Yes			
Failure indicators (acoustic/optical)	3 status LED, detailed history			
COMMUNICATION				
Display	240 x 64 graphical LC Display and 4 display keys			
Hardware	RS 485, RS 232, CAN BUS, Ethernet Freely programmable opto coupler inputs and dry contacts			
Telecom line	ISDN, GSM, GPRS, DSL			
Software/Protocol	Modbus, Profibus DP, Web portal, CANopen CiA 437			
Over voltage protection	Option			
OPTIONS				
Container solution	Yes			
MV transformer	Yes			
MV switchgear	Yes			
String monitoring	Yes			
PV plant control	Yes			
“Copain” mode (Team-Master/Slave)	Yes			No

\*1: Depending on local environmental conditions - \*2: External transformer necessary

\*3: Minimum temperature (LV/MV) - Technical data is preliminary and subject to change without prior notice.

\*1: Depending on local environmental conditions - \*2: External transformer necessary

\*3: MV switchgear (LV/MV) - Technical data is preliminary and subject to change without prior notice.

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# PROTECT PV.UL

## UTILITY-SCALE INVERTER

**Solar Inverter for Grid Connection**  
**Utility Scale**  
510 kVA, 630 kVA  
**Container applications**  
500 kVA to 1.25 MVA



Certified to UL-1741, the Protect PV.500-UL and Protect PV.630-UL inverters from AEG Power Solutions offer professional solutions for utility-scale applications. A key feature of the PV product line is its power stack with advance-design measuring and control technology enabling DC input voltages of up to 1000 VDC. In addition to savings on DC wiring and combiner boxes as a result of the higher DC input voltage, the UL-1741 Certified Protect PV.UL meets utility code requirements and facilitates AHJ approval.

With an efficiency factor over 98%, the Protect PV.UL well exceeds expectations for its power class. With an appropriate transformer, it can also be adapted to the low voltage grid (LV 480 VAC) or medium voltage grid (e.g. 12.47, 34.5 kV)

Maximum Power Point Tracking is designed to meet the latest requirements for quick responses to dynamic weather conditions, such as spontaneous cloud cover on a clear day, and reliable day/night detection (active/passive). The MPPT algorithm has been independently tested by the Fraunhofer Institute for Solar Energy Systems at eight different power levels, nine different DC voltages, and for both thin-film and crystalline solar panels.

The Protect PV utility scale inverters from AEG Power Solutions have grid management features that can be adapted to the unique requirements of the utility. With four different ways to provide reactive power control, adjustable settings for Low Voltage Ride Through, provisionable ramp parameters for start

and stop operations, options to adjust the effective power to stabilize grid frequency, and remote power control, the flexibility of the Protect PV.UL inverter is unmatched.

Monitoring and power plant integration are based on Modbus Protocol and advanced CAN BUS communication and optionally via Ethernet over fiber optic cable between the containers. This allows for cost-effective, safe and reliable remote monitoring and control of the PV plant. The monitoring and control system can be integrated into an overriding power station control technology. Because of the open structure, future requirements of the grid operators can also be taken into account.

This communication structure enables the operator to carry out continuous monitoring, failure analysis, reporting and performance statistics. Remote monitoring and remote access are available via wireless, DSL and WebPortal, for example, and programmable alarm functions via email/SMS settings. Turnkey container solutions (TKS-C) integrate all necessary components (MV Transformer, disconnects, switchgear) and can be supplied ready for connection to the power plant on site.

With more than 60 years of experience in power supply systems and solutions for power plants, AEG Power Solutions offers a comprehensive range of services aimed at securing maximum yields for your PV power installation. These services include contractual solutions with service guarantees and high inverter availability.

# PROTECT PV.UL

TECHNICAL DATA

	Protect PV.500-ID-UL	Protect PV.630-ID-UL
DC INPUT		
Recommended PV power	500 - 580 kWp	630 - 945 kWp
DC voltage window (@ nom AC voltage)	385 - 1000 V	465 - 1000 V
Max. DC voltage	1000 V	1000 V
U <sub>MPPT</sub> voltage range (w/ zone circuit breaker)	500 -820 V	550 - 820 V
Max. DC current (w/ integrated load breaker)	1000 A	1000 A
Max. DC current (w/ optional zone circuit breaker)	1060 A	1170 A
Number of DC inputs	8	8
Over voltage protection	Grade 2	
AC OUTPUT		
Nom. AC power at cos φ = 1 (@ 50 °C)	510 kVA	630 kVA
Nom. AC power at cos φ = 1 (@ 25 °C)	560 kVA	690 kVA
Power factor, adjustable	lag 0.9 – 1 – lead 0.9	
Output voltage without transformer	283 VAC	345 VAC
Max. AC current	1144 A	1159 A
Mains voltage:		
- LV-connection*1	480 V	
- MV-connection*1	Up to 34.5 kV as required	
Mains frequency	50 / 60 Hz	
Current distortion	< 3 %	
Over voltage protection	Grade 2	
GENERAL DATA		
Efficiency*2 (Max. / Euro / CEC)	98.3 % / 98.1 % / 98 %	98.7 % / >98 % / 98%
Operating temperature at full power	-20 °C to +50 °C (-4°F to 122°F)	
Rel. humidity	15 ... 95% max, non condensing	
Protection grade, EN 60529	IP 20	
Altitude above sea level	1,500 m (4,920 ft) (3000 m max 40°C)	
Dimensions (W x H x D)	2700 x 2000 x 600 mm (107 x 79 x 24 in)	
Weight	approx. 1650 kg (3,638 lbs)	approx. 1800 kg (3,968 lbs)
Equipment color	RAL 7035	
Standards	Certified to UL 1741, NEC Article 690	
Grid codes	IEEE 1547, FERC, NERC, and others can be configured	
ALARM & CONTROLS		
GFDI per NEC/UL	Yes	
Over voltage protection	Yes	
Contact and breaker position	Yes	
Failure indicators (acoustic/optical)	3 status LED, detailed history	
COMMUNICATION		
Display	240 x 64 graphical LC Display	
Hardware	RS 485, RS 232, CAN BUS, Ethernet Freely programmable opto coupler inputs and dry contacts	
Telecom line	ISDN, GSM, GPRS, DSL	
Software/Protocol	Modbus, Profibus DP, Web portal, CANopen CiA 437	
OPTIONS		
Container solution	TKS-MC 500 or 1000	TKS-MC 630 or 1250
MV transformer with switchgear	Yes	
Monitoring	Yes	
PV plant operation	Yes	
DC disconnect unit with circuit breakers	Separate cabinet with options on number and sizes of breakers	
LV disconnection switch	Separate cabinet with AC circuit breaker	

\*1: External transformer necessary - \*2: Without transformer (LV/MV) - Technical data is preliminary and can be changed without prior notice.

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# PROTECT PV.OD-UL

## COMPACT OUTDOOR UNITS FOR PV POWER STATIONS



The Protect PV solar inverter product line, designed by AEG Power Solutions, offers professional solutions for utility-scale applications on ground area installations.

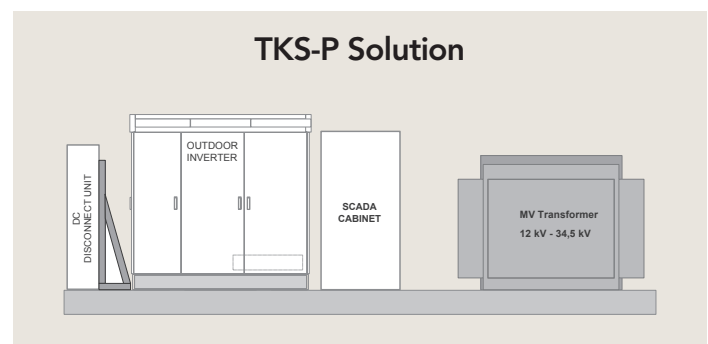
The Protect PV.Outdoor System for North America consists of a durable, external, weatherproof metal housing and an integrated, high-efficiency, solar central inverter, either the PV.500-UL or PV.630-UL. The design offers many advantages during transport, installation, and service thanks to its light weight and its small dimensions.

The PV.Outdoor offers ease of use and maintenance as is standard for all AEG products. In addition, AEG Power Solutions has developed a unique cooling system that provides optimal air circulation within the inverter. The enclosure consists of double-walled aluminum with a stainless steel plinth for mounting onto a concrete foundation. Additional components, such as transformers and medium-voltage switchgear, are part of the Skid solution, which can combine the output from two PV.Outdoor systems.

Ethernet and fiber optic communication channels connected to the datalogger in the SCADA cabinet via open standards such as ModBus or Ethernet form the foundation for communications in PV power plants using AEG PS solar central inverters. A powerful

and proven online communications platform allows owners and operators to view the current and historical system status instantaneously.

With over 60 years of experience in power supply systems and solutions for power plants, AEG Power Solutions offers a comprehensive range of services aimed at securing maximum yields for your PV power installation. These services include contractual solutions with service guarantees and high inverter availability.



# PROTECT PV

TECHNICAL DATA

	Protect PV.500-OD-UL	Protect PV.630-OD-UL
DC INPUT		
Recom. PV power*1	500 - 680 kWp	630 - 890 kWp
DC voltage window	385 - 1000 V	465 - 1000 V
Max. DC voltage	1000 V	
Extended U <sub>MPP1</sub> voltage range	385 - 820 V	465 - 820 V
U <sub>MPP1</sub> voltage range @ 50 °C (EN 50530)	500 - 820 V	550 - 820 V
Max. DC current	1060 A	1170 A
Quantity DC inputs	1 MCCB	
Quantity DC fuses	up to 8 pcs. (pos & neg)	
Overvoltage protection	Grade 2	
AC OUTPUT		
Nom. AC power at cos φ = 1 (@ 50 °C)	510 kVA	630 kVA
Nom. AC power at cos φ = 1 (@ 25 °C)	560 kVA	690 kVA
Power factor, adjustable	lag 0.9 – 1 – lead 0.9	
Output voltage without transformer	283 V	345 V
Max. AC current	1040 A	1159 A
MV-connection*2	10, 20 kV and other, as required	
Mains frequency	50/60 Hz	
Current distortion	< 3 %	
Overvoltage protection	Grade 2	
DEVICE DATA		
Efficiency*3 (Max. / Euro / CEC)	98.4%/98.2%/98.2%	
External power supply	TN-S, 230 V 50/60 Hz	
Operating temperature	-20 °C to +50 °C	
Relative humidity	15 ... 95 % max, non condensing	
Protection grade, EN 60529	IP 54, Nema3R	
Altitude above sea level	1,500 m (4,920 ft) (3000 m max 40°C)	
Dimensions (W x H x D)	2200 x 2250 x 900 mm (87 x 89 x 36 in)	
Weight	approx. 1650 kg (3,638 lbs)	
Consumption of auxiliaries during night	100 W	
Method of cooling	Air	
Range of application	Outdoor	
Required air flow	4000 m³/h	
Equipment color	RAL 7035	
CE Certificate	Yes	
Standards	Certified to UL 1741, NEC Article 690	
Grid monitoring	IEEE 1547, FERC, NERC, and others can be configured	
ALARMS & MONITORING		
Earth fault monitoring	Yes	
Overvoltage protection	Yes	
Contact and breaker position	Yes	
Emergency power off	Yes	
Failure indicators (acoustic/optical)	3 status LED, detailed history	
COMMUNICATIONS		
Display	240 x 64 graphical LC Display	
Hardware	RS 485, RS 232, CAN BUS, Ethernet Freely programmable opto coupler inputs and dry contacts	
Telecom line	ISDN, GSM, GPRS, DSL	
Software/Protocol	Modbus, Profibus DP, Web portal, CANopen CiA 437	
Overvoltage protection	Option	
OPTIONS		
Container solution	TKS-MC 500 or 1000	TKS-MC 630 or 1250
MV transformer with switchgear	Yes	
Monitoring	Yes	
PV plant control	Yes	
DC disconnect unit with circuit breakers	Separate cabinet with options on number and sizes of breakers	
LV disconnection switch	Separate cabinet with AC circuit breaker	

\*1: Depending on local environmental conditions - \*2: External transformer necessary

\*3: Without transformer (LV/MV) - Technical data is preliminary and subject to change without prior notice.

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