Market Solutions Guide

Energy Market

Renewable Energy

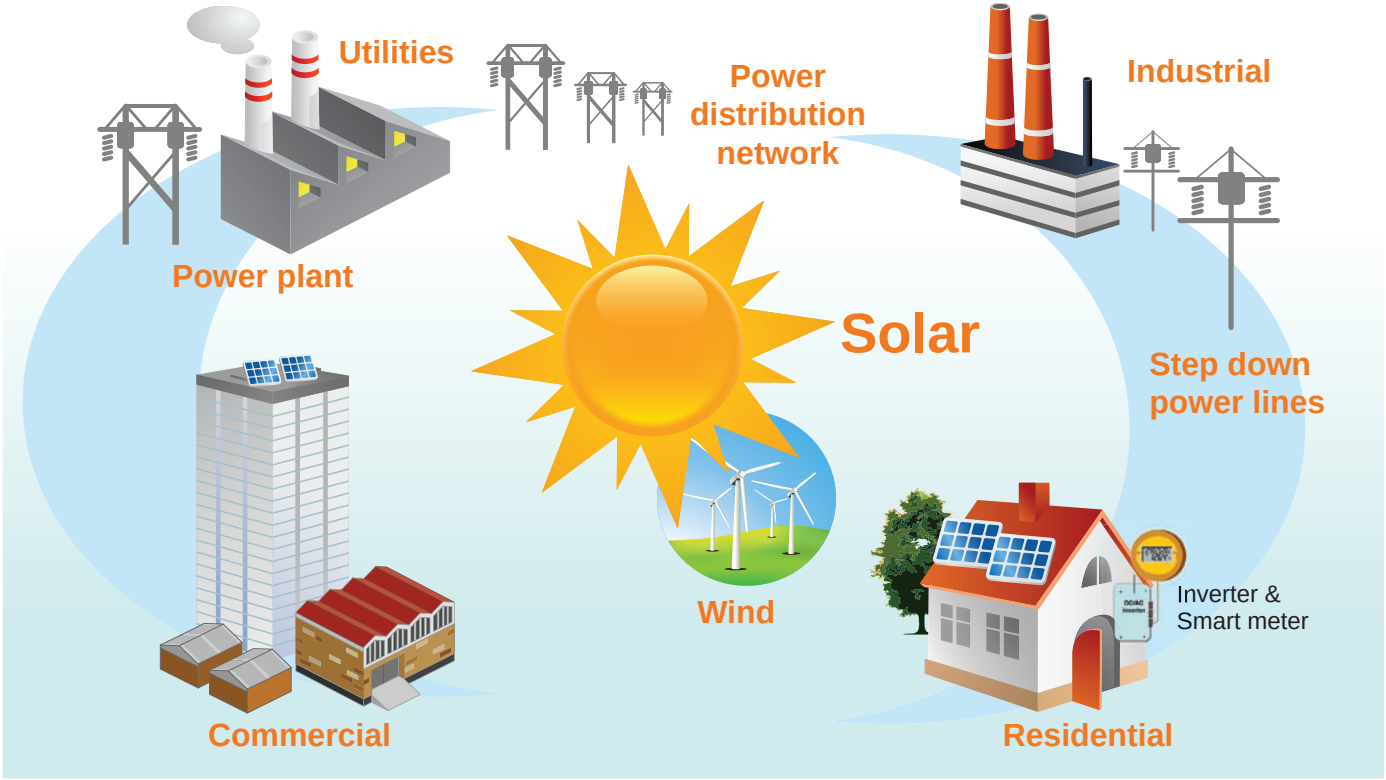
Medical Market

Test & Meas. Market

Transportation Market

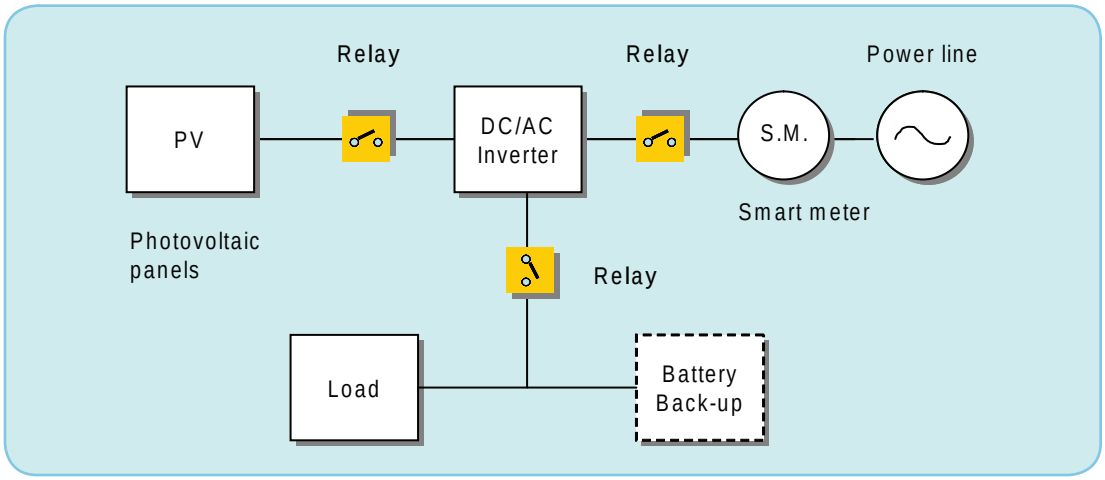
Panasonic ideas for life

Panasonic Electric Works provides optimal solutions in the renewable energy space by supplying the technology and products ideally suited for Solar power conversion and Smart Meters.



Inverters are typically used to convert DC voltages to AC voltages in both residential and commercial photovoltaic systems. Models vary widely in power range from 1 kW to >100 kW and configured serially, in parallel or as modules. Inverters connected to photovoltaic systems can be also designed in such a way to allow energy to transfer to and from the public grid. Inverter input voltage depends on needed power, and in the example of 100 W, the input voltage can be 12, 24, or 48V. Below is a basic configuration of a DC/AC Inverter for Solar photovoltaic systems.

Example of renewable power management systems



Basic solar (PV) system

Panasonic Energy Solutions

Panasonic Electric Works is committed to develop industry-leading energy conservation products in response to new global energy initiatives. Many Panasonic components are used in energy conservation and management / control systems. In the renewable space, many products are ideal for photovoltaic solar power generation and control.

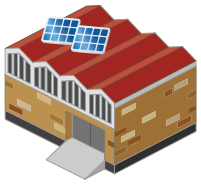
Renewable

Solar | Wind | Wave | Geothermal | Biomass | Biofuel

Photovoltaic (PV) Systems

1~5 KW — *Residential*

6~10 KW — *Commercial*



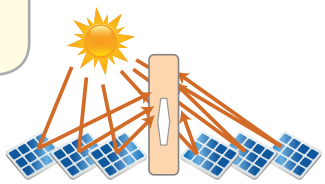
Solar Tracker / Concentrated PV

4~10 MW

- Tracks movement of the sun for maximum energy capture.
- Tilt sensor module for angle detection, and alert function for strong winds or earthquake.
- EP relay for DC breaker (remote on/off) and angle calibration.

Power Tower

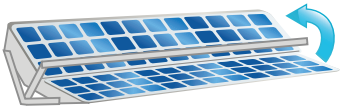
10~20 MW



- A field of movable mirrors reflecting solar radiation on a central receiver in the upper portion of the tower.
- Tilt sensor module for concentrator angle detection and alert function.

Solar Trough

50 MW



- Solar thermal energy collector using a long parabolic mirror with a tube running its length at the focal point.
- Tilt sensor module for concentrator angle detection and alert function.

PIR sensors

Light sensors

LF-G relays

HE PV relays

PhotoMOS®

EP relays

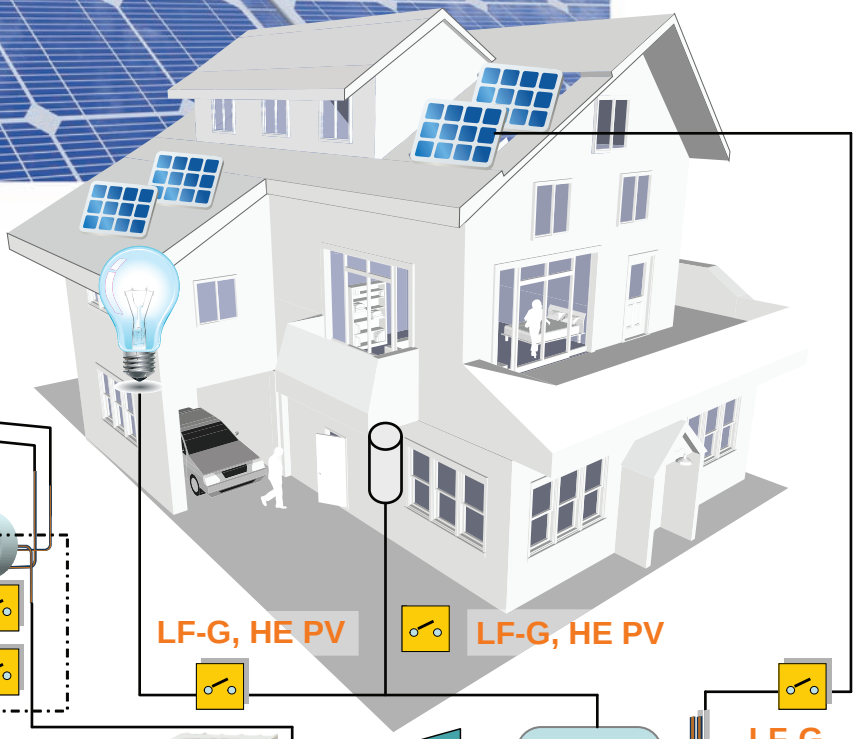
Tilt sensor

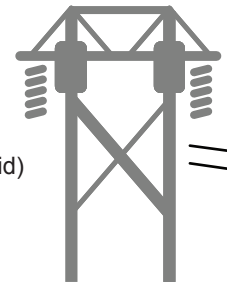
PLC

HMI

Servo system

Photovoltaic (PV) Systems - Residential





Power line (Grid)

Smart meter

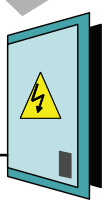
PhotoMOS® (AQV, AQW)
Power latching relay

LF-G, HE PV

LF-G, HE PV

PV panel

ECO power meter (KW4)
(V, A, KW, KWH, PF)



Utility panel

DC/AC inverter

LF-G, HE PV

EP

DC safety disconnect

DC/AC inverter

EP

EP

Batt

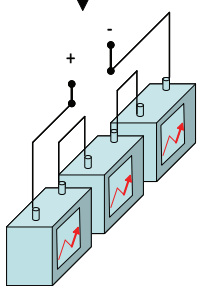
Battery disconnect

Grid

LF-G, HE PV

Load

AC safety disconnect

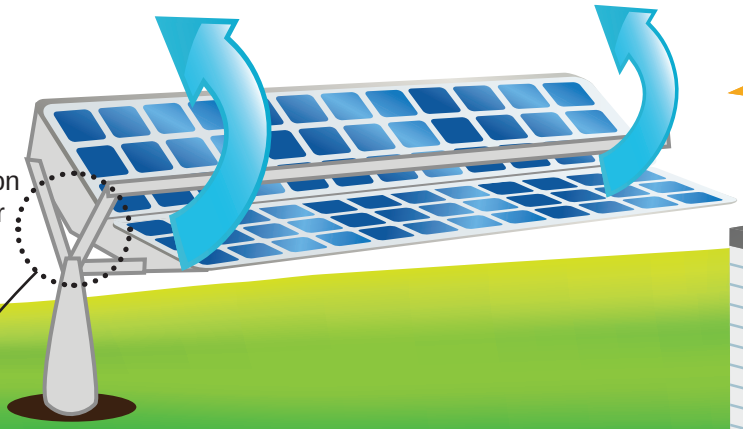


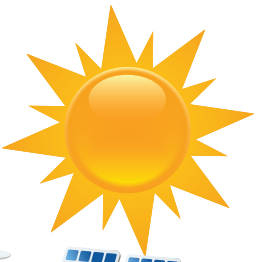
Battery back-up

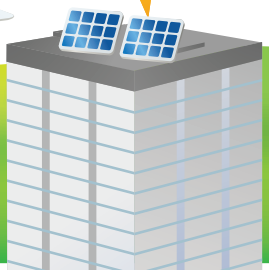
Motion Control

Tilt Control

0 - 90° detection angle range for accurate panel positioning.







A4 series Servo System

The PLC sends position commands to the servo system to move solar array panels.

SD card

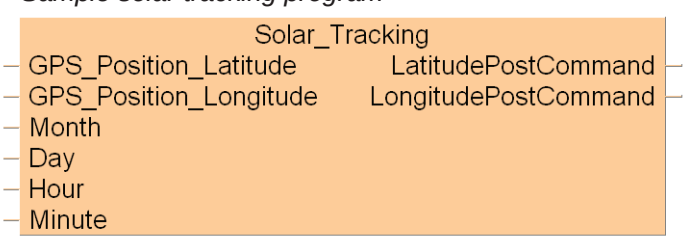
FP-X series PLC

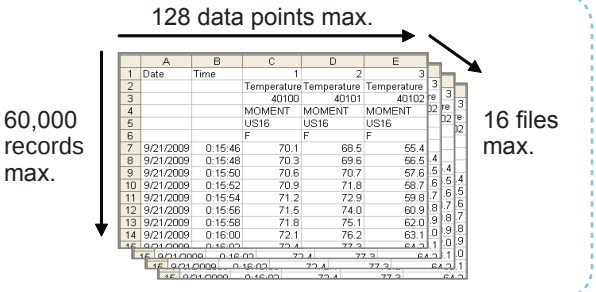
Panasonic FP-X series PLC calculates the position of the sun based on GPS coordinates and time of day.

GT series HMI

All settings can be monitored from a GT series touch panel. Logged data is saved on an SD memory card in CSV format.

Sample solar tracking program





Motion Detection

NaPiOn is a passive infrared (PIR) motion sensor that provides precise occupancy detection. PIR sensors detect a temperature difference in the form of IR radiation from humans and animals. Output is triggered by a combination of temperature change and motion. Passive components generate no outward signal into the area and are ideal for battery powered and low power consumption applications.

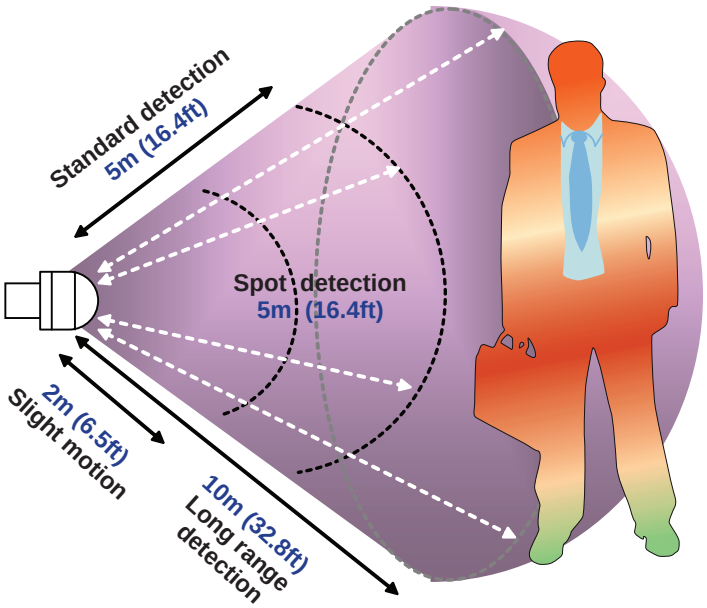
Fully integrated features unique to the NaPiOn include a built-in amplifier, comparator for digital output, power stabilizer, quad PIR element and optical filter. All components are enclosed in a TO-5 metal package delivering a fully functional sensor with added protection from noise interference. Advantages are compact size for easy integration and circuit design simplicity.

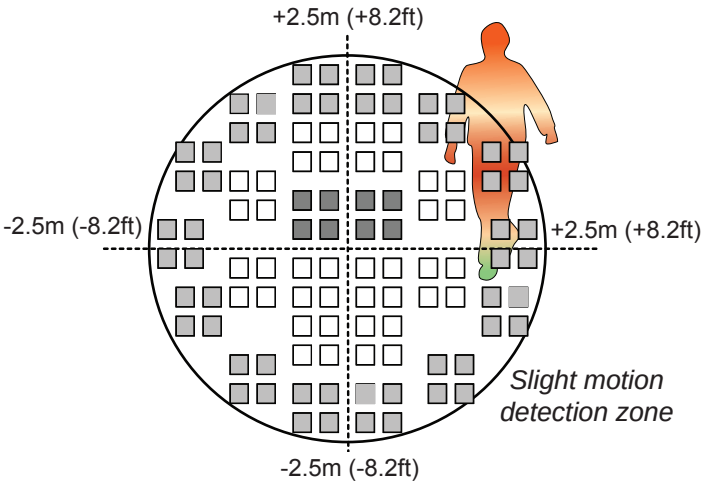
A quad sensing element differentiates the NaPiOn and provides more sensitive detection zones than a dual element. Quad element designs can identify presence even with slight motion due to a higher concentration of elements.

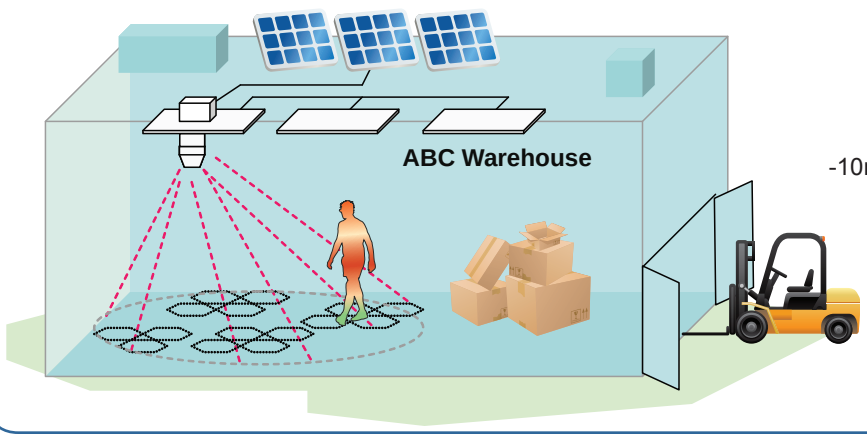
Standard (5 m) *Slight motion (2 m)* *Spot detection (5 m)* *Long range (10 m)*

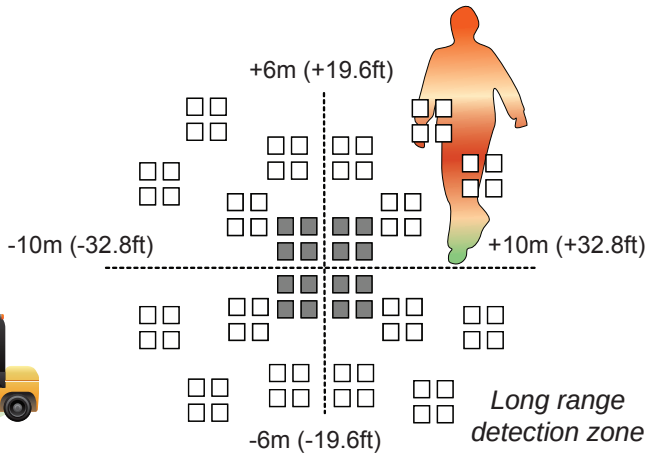
Part numbers

Part number	Type
AMN311**	Standard
AMN321**	Slight motion
AMN331**	Spot detection
AMN341**	Long range





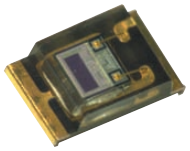




Ambient Light Detection

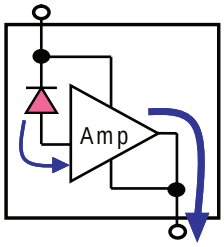
AMS104
SMD

AMS302
Through-hole



AMS402
Chip

NaPiCa
Internal circuit



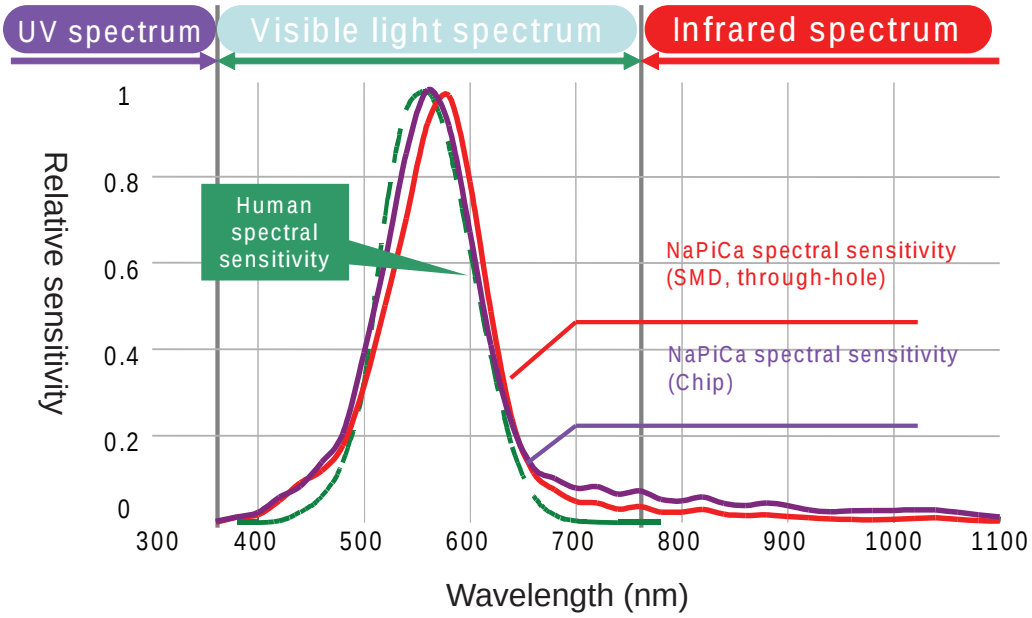
High sensitivity
(photocurrent output)

NaPiCa is a Cadmium-free light sensor with spectral response similar to that of the human eye. Design consists of a photodiode with a built-in current amplifier. NaPiCa detects visible light and converts to a linear photocurrent output that is proportional to illumination.

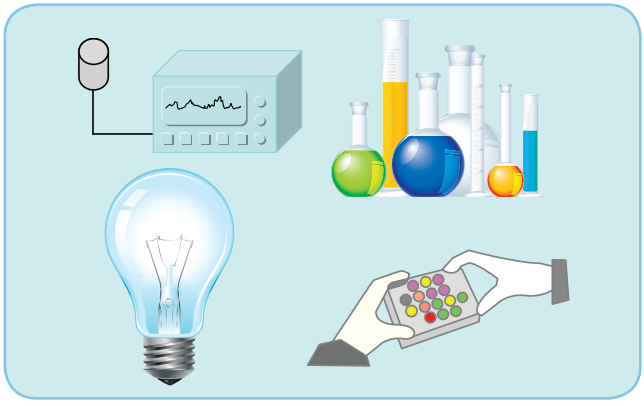
Eliminating the need for an external amplifier simplifies the circuit design, and a higher value photocurrent provides greater sensitivity with usable output. NaPiCa provides sufficient output even with incident light attenuation by an enclosure due to a built-in amplifier. Also the NaPiCa photo IC design offers minimal temperature effect on sensitivity.

All NaPiCa models feature silicon chips with a lead(Pb)-free design and RoHS compliance. 3 different models are available: Through-hole with the same terminal shape as CdS cells, SMD for automatic mounting and chip design for compact design and smallest footprint.

Light sensors are used in conjunction with occupancy sensors for daylight harvesting, where artificial lighting is dimmed in proportion to ambient natural sunlight entering a building.



Light-sensitive measurement equipment



Screen light adjustment GPS

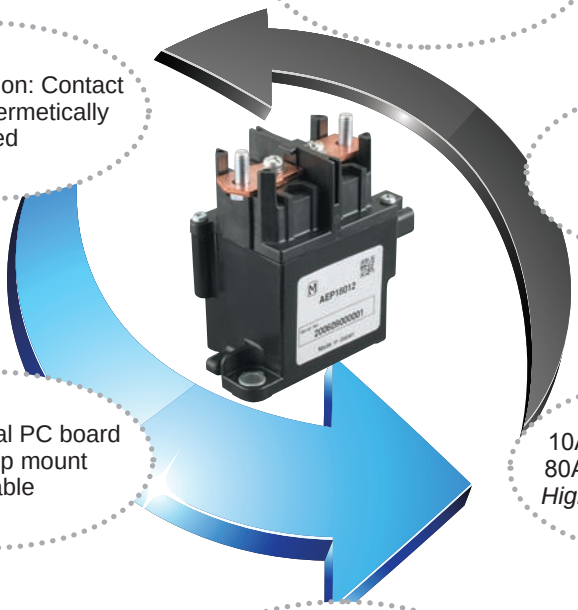
Relays

EP Series

Contact chamber is filled with H2 gas that extends the life of the relay

Safe construction: Contact chamber is hermetically sealed

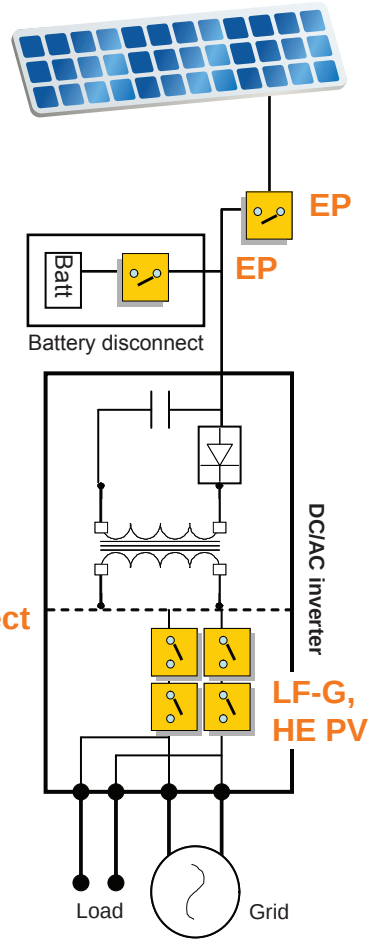
Small size



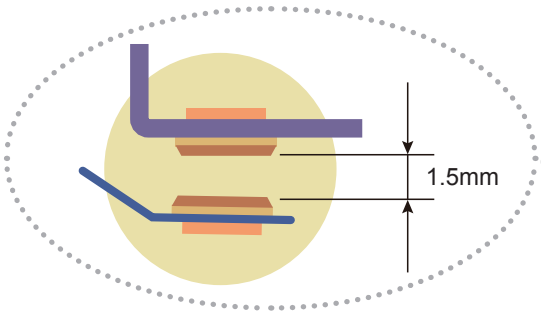
Screw terminal PC board mount - Top mount available

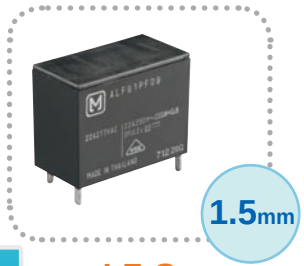
10A [400V], 60A [400V], 80A [400V], 300A [400V]
Higher voltages available

Breakdown voltage 2,500 V rms



LF-G / HE PV Series





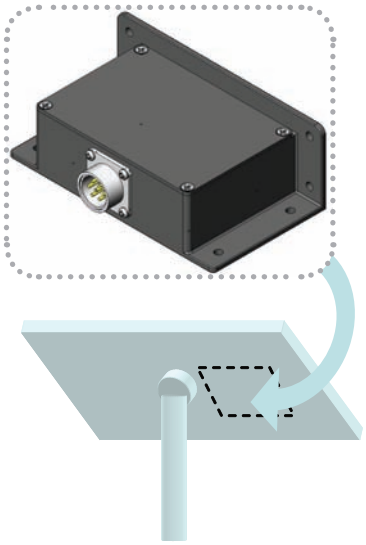
LF-G

HE PV

LF-G and HE relays are ideally suited for VDE 0126 compliance. Contact gaps of 1.5mm minimum are important on the AC side to disconnect grid feeding inverters from the power grid.

Tilt Sensor

The Tilt Sensor Module captures angle position for optimal sun tracking and maximum energy production. Adjustable upper and lower limits offer an alert function for strong winds or earthquakes.



Tilt sensor module (2 axis detection)

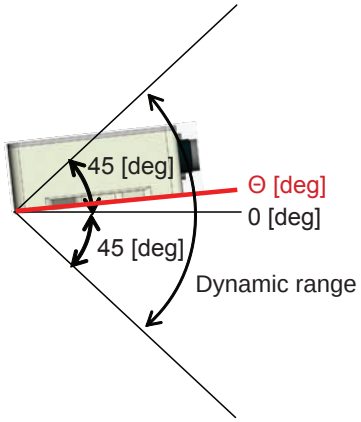
- Complete solution with acceleration sensor, microprocessor and power supply circuit.
- Dimensions: 142mm x 78mm x 49.5mm (L x W x H).
- 0 ~ 90° detection angle range (± 45°) / 0.1° typical detection accuracy.
- 21.6 ~ 26.4V operating supply voltage,
- -40°C ~ +85°C operating temperature and IP67 enclosure.
- RS485 communication with MODBUS protocol.

Adjustable offset

For ease of installation the tilt sensor module has an adjustable zero point reset function to any absolute angle θ degree.

In this mode the unit automatically compensates angle θ and output angle as follows:
Output angle = Actual absolute angle – compensatory angle θ

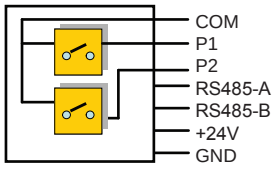
Dynamic range is ±45° and is the maximum detection range under adjustable offset mode.

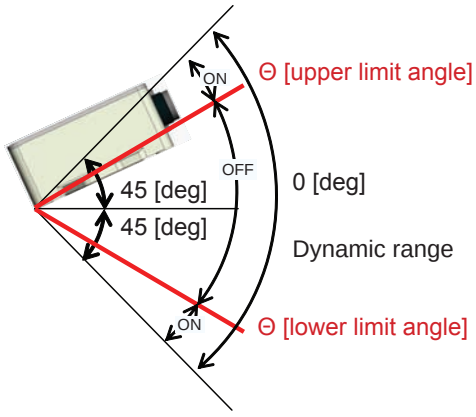


Adjustable upper and lower limit

Solid state relays in the unit turn On or Off based on designated upper and lower limits. When tilt exceeds θ upper or lower limit, P1 and P2 outputs will turn On.

This is designed as an alert function for strong winds or earthquakes.





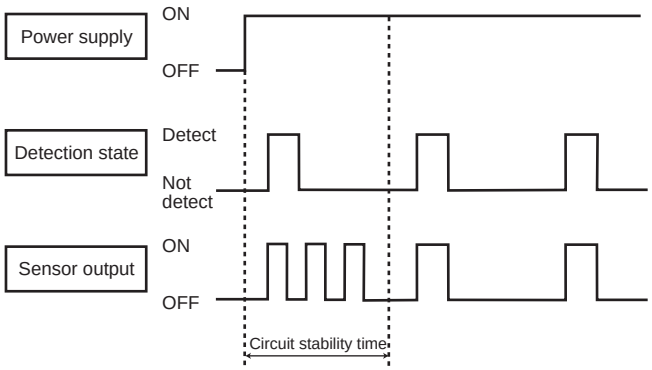
Technical Data - Motion Detection

*Standard (5 m) AMN311***
*Slight motion (2 m) AMN321***
*Spot detection (5 m) AMN331***
*Long range (10 m) AMN341***

NaPiOn Motion Sensors (AMN)

Digital Output

Items			Symbol	Specified value		Measured conditions
				Standard type	Low current consumption type	
Rated operating voltage		Minimum Typical Maximum	Vdd	3.0 V DC — 6.0 V DC	2.2 V DC — 3.0 V DC	—
Rated consumption current (Standby)		Typical Maximum	Iw	170 µA 300 µA	46 µA 60 µA	Iout = 0
Output (when **detecting**)	Current	Maximum	Iout	100 µA	100 µA	Vout ≥ Vdd - 0.5
	Voltage	Minimum Maximum	Vout	Vdd -0.5 —	Vdd -0.5 —	Open when not detecting
Circuit stability time		Typical Maximum	Twu	7 s 30 s	7 s 30 s	—

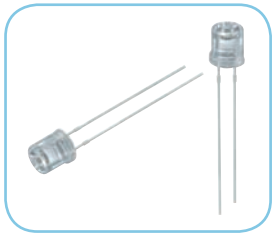


Analog Output

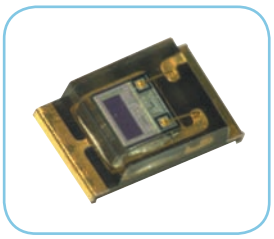
Items		Symbol	Specified value	Measured conditions
Rated operating voltage	Minimum Maximum	Vdd	4.5 V DC 5.5 V DC	—
Rated consumption current	Typical Maximum	Iw	170 µA 300 µA	Iout = 0
Output current	Maximum	Iout	50 µA	—
Output voltage	Minimum Typical Maximum	Vout	0 V 2.5 V Vdd	—
Output offset average voltage	Minimum Typical Maximum	Voff	2.3 V 2.5 V 2.7 V	Steady-state output voltage when not detecting
Steady-state noise	Typical Maximum	Vn	155 m Vp-p 300 m Vp-p	—
Circuit stability time	Maximum	Twu	45 s	—

Technical Data - Ambient Light Detection

AMS104
SMD



AMS302
Through-hole



AMS402
Chip

NaPiCa Light Sensors (AMS)

Absolute maximum ratings (Ambient temperature: 25°C 77°F)

Items	Symbol	AMS104/AMS302	AMS402
Reverse voltage	V_R	-0.5 to 8 V	-0.5 to 6 V
Photocurrent	I_L	5 mA	1 mA
Power dissipation	P	40 mW	6 mW
Operating temperature	T_{opr}	-30°C to +85°C -22°F to +185°F	-30°C to +85°C -22°F to +185°F
Storage temperature	T_{stg}	-40°C to +100°C -40°F to +176°F	-40°C to +100°C -40°F to +176°F

Recommended operating condition

Items		Symbol	AMS104/AMS302	AMS402
Reverse voltage	Minimum	V_R	1.5 V	1.5 V
	Maximum		6 V	5.5 V

Electrical and optical characteristics (Ambient temperature: 25°C 77°F)

Items			Symbol	AMS104/AMS302	AMS402
Peak sensitivity wavelength		—	λp	580 nm	560 nm
Photocurrent 1		Minimum	I_{L1}	9.1 µA	0.7 µA
		Typical		13 µA	1 µA
		Maximum		16.9 µA	1.3 µA
Photocurrent 2		Minimum	I_{L2}	182 µA	14 µA
		Typical		260 µA	20 µA
		Maximum		338 µA	26 µA
Photocurrent 3		Typical	I_{L3}	500 µA	35 µA
Dark current		Maximum	Ip	0.3 µA	0.05 µA
Switching time	Rise time	Typical	T_r	8.5 ms	1.2 ms
	Fall time	Typical	T_r	8.5 ms	1.2 ms

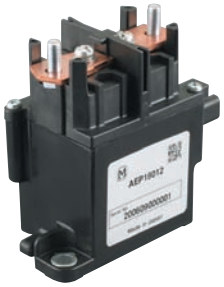
Technical Data - Relays

Electromechanical Relays

LF-G

HE PV

AC side of inverter
Grid line safety cut-off circuits



EP

DC breaker circuit
Angle calibration

Items	LF-G series	HE PV series	EP series
Contacts			
Arrangement	1 Form A	1 Form A	1 Form A
Material	$AgSnO_2$	AgNi	—
Current rating	22 A - 31 A	48 A	80 A
Voltage rating	250 V AC	250 V AC	400 V DC
Coil			
Nominal voltage	9, 12, 18, 24 V DC	6, 9, 12, 24 V DC	12, 24 V DC
Holding voltage	35% of nominal V	40% of nominal V	—
Operating power	1,400 mW	1,920 mW	4.5 W
Electrical			
Insulation resistance (initial)	1,000 MΩ (at 500 V DC)	1,000 MΩ (at 500 V DC)	100 MΩ (at 500 V DC)
Breakdown voltage between open contacts	2,500 Vrms (1 min)	2,000 Vrms (1 min)	2,500 Vrms AC (1 min)
Breakdown voltage between contact and coil	4,000 Vrms (1 min)	5,000 Vrms (1 min)	2,500 Vrms AC (1 min)
Surge breakdown voltage between contact and coil	6,000 V (initial)	10,000 V (initial)	—
General			
Ambient temperature	-40˚C to +85˚C	-50˚C to +85˚C	-40˚C to +80˚C
Expected life (mechanical)	10^6 min (180 cpm)	10^6 min (180 cpm)	2×10^5
Expected life (electrical resistive load)	3×10^4 min (20 cpm)	3×10^4 min (1 s on: 9 s off)	10^3 (L/R ≤ 1 ms)
Dimensions (L x W x H)	15.7 x 30.1 x 23.3 mm	33 x 38 x 36.3 mm	40 x 75.5 x 79 mm
Rating	UL, C-UL and VDE	UL, C-UL and VDE	—

Technical Data - Relays

PhotoMOS® Relays

Items		Symbol	Connection type	AQV212(A)	AQV215(A)	AQV217(A)	AQV210(A)	AQV214(A)	AQV216(A)	AQV214H(A)
Input	LED forward current	I_F		50 mA						
Input	LED reverse voltage	V_R		5 V						
Input	Peak forward current	I_{FP}		1 A						
Input	Power dissipation	P_{in}		75 mW						
Output	Load voltage (peak AC)	V_L		60 V	100 V	200 V	350 V	400 V	600 V	400 V
Output	Continuous load current	I_L	A*	0.55 A	0.32 A	0.18 A	0.13 A	0.12 A	0.05 A	0.12 A
Output	Continuous load current	I_L	B*	0.65 A	0.42 A	0.22 A	0.15 A	0.13 A	0.06 A	0.13 A
Output	Continuous load current	I_L	C*	0.80 A	0.60 A	0.30 A	0.17 A	0.15 A	0.08 A	0.15 A
Output	Peak load current	I_{peak}		1.2 A	0.96 A	0.54 A	0.4 A	0.3 A	0.15 A	0.3 A
Output	Power dissipation	P_{out}		500 mW						
Total power dissipation		P_T		550 mW						
I/O isolation voltage		V_{iso}		1,500 V AC						5,000 V AC
Temperature limits	Operating	T_{opr}		-40°C to +85°C -40°F to +185°F						
Temperature limits	Storage	T_{stg}		-40°C to +100°C -40°F to +212°F						

Items		Symbol	Connection type	AQW614(A)	AQW612EH(A)	AQW610EH(A)	AQW614EH(A)
Input	LED forward current	I_F		50 mA			
Input	LED reverse voltage	V_R		5 V			
Input	Peak forward current	I_{FP}		1 A			
Input	Power dissipation	P_{in}		75 mW			
Output	Load voltage (peak AC)	V_L		400 V	60 V	350 V	400 V
Output	Continuous load current	I_L		0.1 A (0.13 A)	0.5 A (0.6 A)	0.12 A (0.14 A)	0.1 A (0.13 A)
Output	Peak load current	I_{peak}		0.3 A	1.5 A	0.36 A	0.3 A
Output	Power dissipation	P_{out}		800 mW			
Total power dissipation		P_T		850 mW			
I/O isolation voltage		V_{iso}		1,500 V AC	5,000 V AC		
Temperature limits	Operating	T_{opr}		-40°C to +85°C -40°F to +185°F			
Temperature limits	Storage	T_{stg}		-40°C to +100°C -40°F to +212°F			

* Refer to technical specifications for connection schematics and wiring diagrams.

Technical Data - Motion Control

AFPX-C30T Programmable Controller

Rated voltage	24 VDC / 100~240 VAC
No. of I/O points	16 DC inputs/ 14 transistor type output
Expansion units	Up to 8 expansion units for more than 300 I/O
Program memory	32K built-in Flash ROM
Data memory	32K
Communication	RS232/USB (RS485 communication cassette)
Motion control	4 axis (up to 100KHz)
High speed counter	8 single phase channels

Minas A4 Servo System

Rated voltage	100V – 200V single-phase or 3 phase
Rated output	50 W to 7.5 KW
Rotary encoder	Built-in encoder incremental / absolute 17 bits
Speed	3,000 RPM (5,000 max.)
Motor structure	Shaft round and key-way center tap, holding brake, oil seal
Driver	Programmable: position, torque, velocity, and full control mode
Tuning	Real-Time Auto-Gain tuning
Load control	Vibration control: 2-channel notch filter, damping control Built-in dynamic brake In-rush current suppressing function

KW4 Power Meter

Rated operating voltage	100 to 120 / 200 to 240 VAC
Rated frequency	50 / 60 Hz
Voltage measurement	100 to 400 VAC
CT sensors	5A / 50A, 100 A, 250A, and 400A
Basic functions	Instantaneous electrical power Voltage and current display Built-in hour meter Integrated measured power (up to 9999.99 MWh) Built-in pulse input function
Communications	RS485 interface, MEWTOCOL Protocol, up to 99 units, maximum distance 1200 m
Dimensions	DIN48
Protective construction	IP66

GT32 Touch Screen

Rated voltage	24 VDC
Screen size	5.5 inch
Display device	TFT Color LCD
Display color, resolution	4,096 colors; 320 x 240 dots
Backlight	CFL
Memory	12 MB
Communications	Panasonic, Mitsubishi, Omron, Toshiba,Yokogawa, Keyence, Hitachi, Allen-Bradley, Siemens, LG, Modbus, General purpose
Backlight	50,000 hrs. average life

Future Energy Solutions

Smart Grid deployment in the near future will offer energy savings, cost reductions and increased reliability to our electrical infrastructure.

Smart meters provide real time energy usage with the option of two-way communication. AMI (Advanced Metering Infrastructure) is a system that measures, collects and analyzes energy usage. AMI offers a platform to control energy distribution and the ability to monitor and control appliances at consumers' homes.

Renewable energy sources are intermittent in nature and stand to benefit from implementation of a Smart Grid. A power infrastructure using renewable sources requires the means to reduce electrical demand by load shedding in periods of low power generation.

A Home Area Network (HAN) extends some capabilities of the Smart Grid into the home using standards such as Zigbee. The ability to shut down or hibernate devices when not in use can provide a significant reduction in energy use.

Conservation ← **Smart Grid** → **Management**

Lighting

Occupancy Control
Lights are automatically turned on, turned off or dimmed based on occupancy detection.

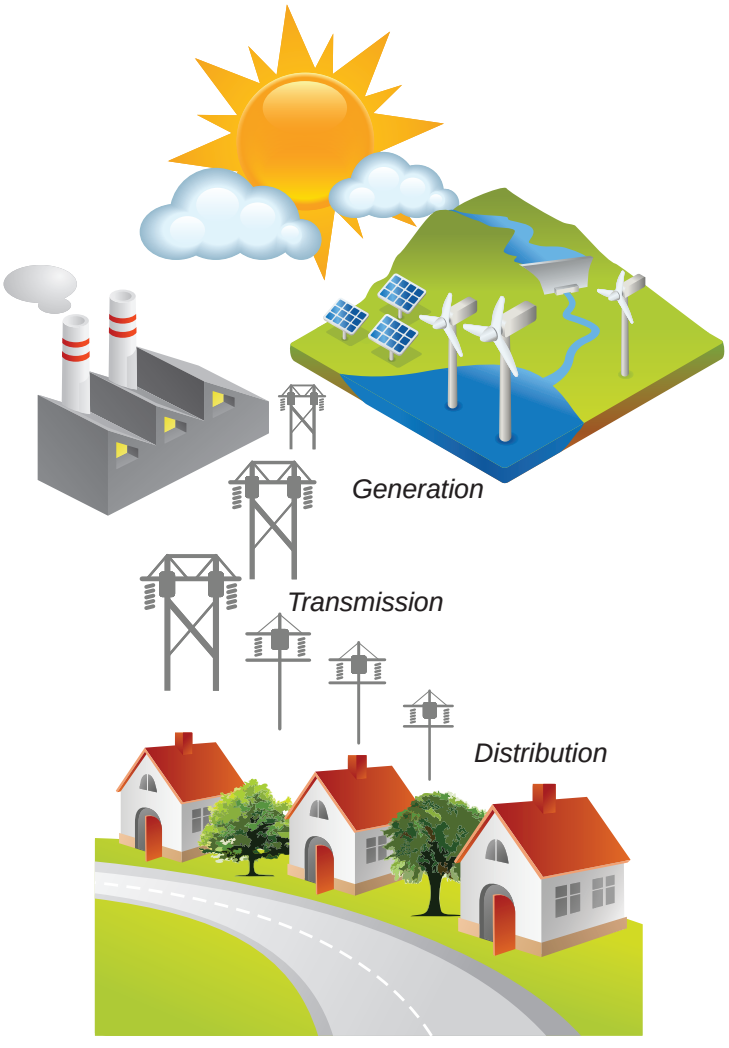

NaPiOn

Daylight Harvesting
Artificial lighting is dimmed factoring in ambient natural sunlight entering the building.


NaPiCa

Smart Time Scheduling
Scheduled switching or dimming of lights.


Power latching relay



Smart Meter
Automatic Meter Reading (AMR) utilizes relays for transmission through RF, cellular signals and power lines.


PhotoMOS

Advanced Metering Infrastructure (AMI) offers two-way communication. and control of appliances.


Power latching relay

Signal relay

Programmable Thermostat
Smart time scheduling and a PIR sensor for occupancy detection.


Signal relay

NaPiOn

Panasonic

Panasonic Electric Works Corporation of America

USA
(800) 276-6289 or (908) 464-0173

Canada
(888) 827-6628 or (908) 858-6830

http://pewa.panasonic.com

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