



**XENIT**  
by ATEX

MADE IN ITALY

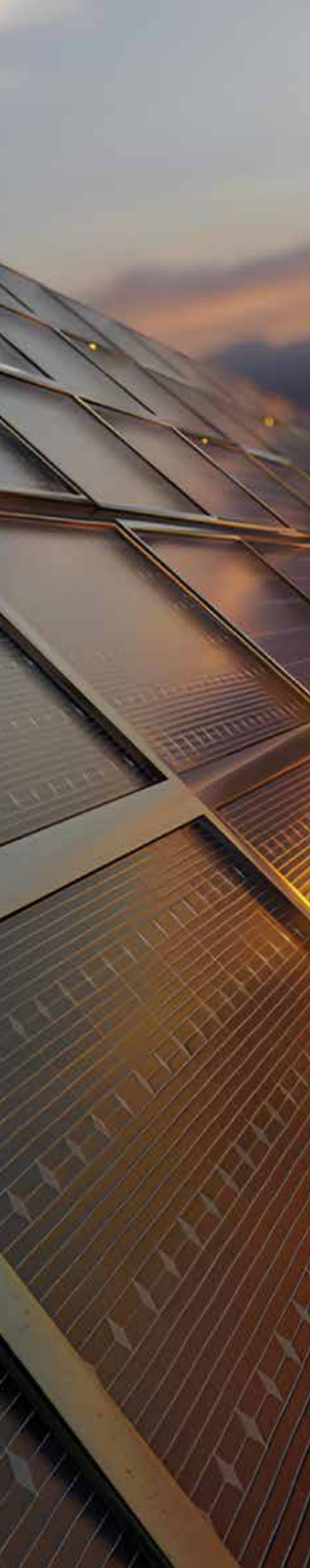
# APID

The APID range is a family of XENIT products designed to **repower photovoltaic installations** with P or N-Type cells affected by P.I.D., and **prevent** P.I.D. in new installations.



**XENIT.IT**

Xenit is a division of ATEX INDUSTRIES for Photovoltaic and Safety.



Xenit is engaged in the continuous research and development of **electronic devices for the revamping and management of photovoltaic energy**, as well as for the **safety and monitoring of AC and DC power lines**.



Discover our website

# Photovoltaic Revamping

With the APID series of devices, we restore the power of PV systems affected by P.I.D., a degradation phenomenon that causes the progressive loss of power and consequent economic damage. On new systems APID prevents the onset of P.I.D.



# Energy Management

MIA ENERGY is an automatic system that optimises the self-consumption of the energy produced by residential photovoltaic systems and improves the ability to consume the energy produced immediately and on site, shifting consumption to the peak phase of energy production.

# Electric lines monitoring

The patented HELP series makes AC and DC power lines safe, monitoring the presence of cables, energy efficiency, status and the presence of loads. HELP is an advanced system, which can be integrated with IoT services, which recovers and shares information, facilitating predictive actions.



# P.I.D.

## One of the causes of power loss in PV installations

The series of APID devices:

- Repowers photovoltaic installations affected by PID.
- Prevents **power loss** in new installations.
- Solves the problem of **revamping** on installations with N-Type modules.
- Indicative timescale for return on investment (**ROI**) of **80 days on a 1Mw installation**.
- **Easy to install**, approximately 30 minutes.
- APP for **remote management**.

For more information on P.I.D. visit [xenit.it/en/repowering](https://xenit.it/en/repowering)



## Main causes of P.I.D. and types of installation at risk

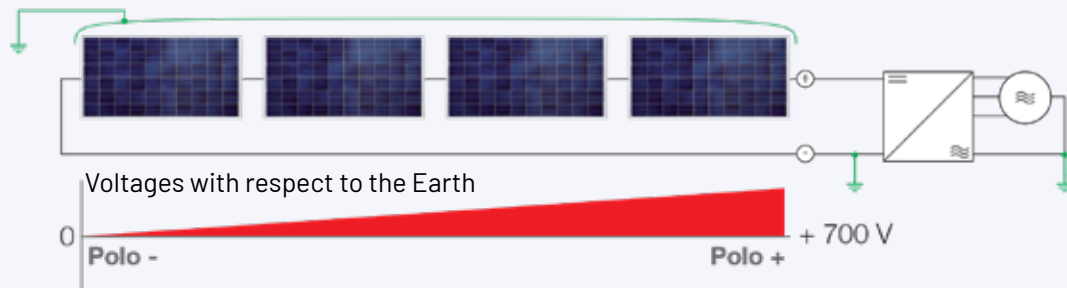
### 1. Use of new generation of Transformerless inverters on P-TYPE modules.

In **photovoltaic systems installed before 2008**, the negative pole (or positive, depending on the type of cell) of the strings is **connected to the ground**.

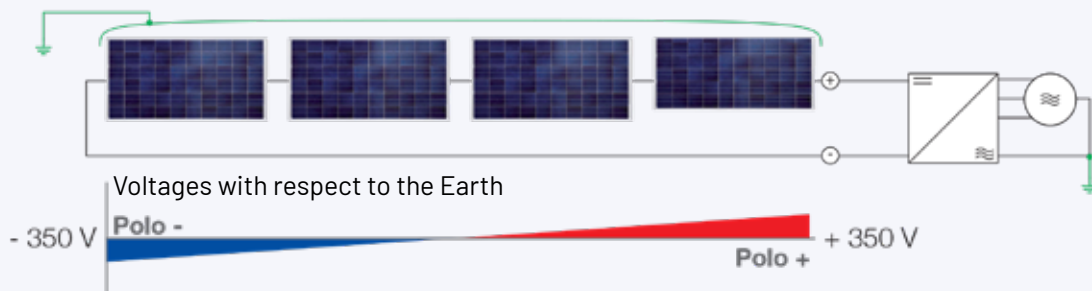
This connection, however, is **no longer compatible with the structure of the new generation of Transformerless inverters** (without an isolation transformer) because it would create a short circuit to the ground. This causes the string voltage to “centre” itself on the zero potential of the ground during operation of the inverter.

If, between the positive and the negative of a string, we have 700V, the positive pole of the string will be at about +350V with respect to the ground, whilst the negative pole will be at about -350V. The voltages may be different due to asymmetries resulting from the design of the inverter but the principle remains the same. These high voltages on the poles trigger **eddy currents that cross the entire module, to the point of causing the photovoltaic P.I.D. effect**. It is important to specify that the solar modules are certified for positive operating voltages of 1000V DC and not for negative voltages.

## Optimal situation with isolation transformer



## Installation at risk of P.I.D. without isolation transformer



## 2. Replacing the inverter on installations with N-TYPE modules.

**In N-Type modules**, which need to ground the positive pole, **the problem is the replacement of the inverters**. This is because in the models currently installed, it is **not possible to place the positive on the ground**. Hence the reason behind P.I.D., which leads to a decrease in the power of the solar panel.

### Other causes of P.I.D. include

- High **temperatures** and **humidity**.
- PV systems with **high string voltages**.
- **Quality** of the PV module.
- **Frame and metal structure** of the PV modules **connected to the ground**.

# P.I.D.-Free and High P.I.D. Resistance modules

are not immune to P.I.D. and can degrade by up to 5%

The regulation states that a module is P.I.D.-Free or High P.I.D. Resistance if it passes the IEC 62804 standard test.



### Test conditions

Applied voltage	100V
Relative humidity	85 ±5%
Temperature	85°C
Test duration	3 cycles of 96 hours

### P.I.D. Free

Modules are considered as "P.I.D. Free" or as having "High P.I.D. Resistance" when, following testing, there is a **loss of less than 5% and no serious defects are detected.**

## Find out how APID protects your investment even on new installations.

Example of consequences on a new system with P.I.D.-FREE modules, with an estimated loss of 4.9%, and the effect obtained using APID.





# How to find out that a PV system is affected by P.I.D.

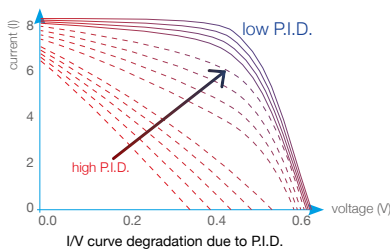
An abnormal loss of power not due to normal ageing of the modules is indicative of P.I.D. To obtain this information, the PV system must be properly monitored.

**Unlike other causes of deterioration, P.I.D. is the only one that, if stopped in time, allows the photovoltaic system's performance to be restored and recovered.**



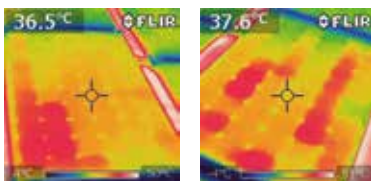
## Checking with a digital multimeter

During production, the percentage difference between the working voltages of the last PV modules on the negative and positive side. This system is to be used when it is not possible to use one of the other 3 indicated.



## Checking with IV Curve Calculator

Disconnect the suspect modules from the negative side of the system, take the measurement and compare the IV curve with the nominal curve in the module data sheet. An example of the correct interpretation of the measurement made and the possible degradation is shown here.



## Checking with Thermal camera

If it is P.I.D., we will see photos similar to these.

Yellow cells, cooler = healthy

Red cells, warmer = affected by P.I.D.



## Test with Electroluminescence

This type of test must be carried out at night. In the photo the cells affected by P.I.D. are off, the black colour highlights the short-circuit state. Dark areas show the development of the phenomenon, whereas healthy ones have a bright uniform colour.

# Effects of P.I.D.

## Technical effects

1. **P.I.D. polarisation** causes the mono-pole – or crystalline – photovoltaic cells with **P-Type/N-Type** technology to switch off. It can be inverted by promptly installing an anti-P.I.D. device from the APID series.
2. **Electro-corrosion of the TCO** – a phenomenon resulting from an electrochemical reaction between the humidity and the sodium inside the cover glass of the modules – is caused by the leakage of currents between cells and the ground. **The damage is irreversible** and necessitates the replacement of the modules.

## Economic damage

The degradation and loss of power of the photovoltaic system can upset the business plan conceived in the design phase of a photovoltaic system, with very serious and exponential economic consequences.

### An Italian example

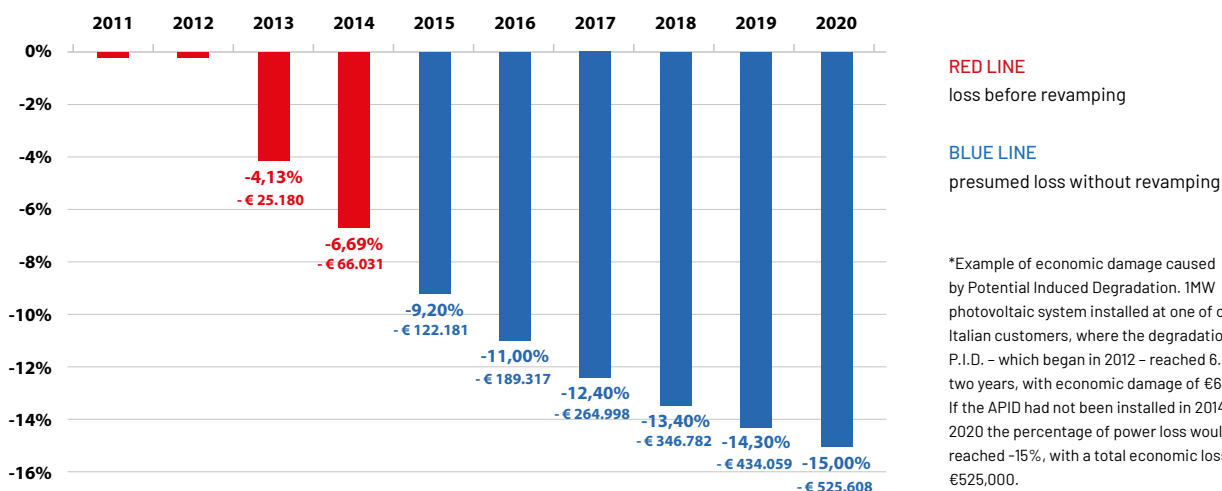
Below is an example of economic damage caused by P.I.D.

Here, we see a 1MW photovoltaic system installed at one of our Italian customers, where the degradation from P.I.D reached 6.69% in two years, with economic damage of €66,000. If the APID had not been installed, by 2020 the percentage of power loss would have reached -15%, with a total economic loss of €525,000.

In this case the timescale for return on investment (ROI) for purchasing the APID was approximately 80 days.

## Analysis of a photovoltaic system with APID

System power loss and economic damage\*





# APID

## The solution to photovoltaic P.I.D.

Using **APID** devices (for modules with P-TYPE cells) or **APID-NG** (for modules with N-TYPE cells), guarantees the protection of PV systems from power losses.

**APID is a universal voltage generator (max. 1000V)** developed **for the restoration of modules affected by photovoltaic P.I.D.** and for the **prevention** of the onset of the phenomenon in those at risk. In systems that have been installed for some time, it recovers up to 100% of lost power and protects new systems from the photovoltaic P.I.D. effect, from their first day of operation.



**APID**  
for P-TYPE cells



**APID<sup>3</sup>**  
for P-TYPE cells



**APID<sup>NG</sup>**  
for N-TYPE cells



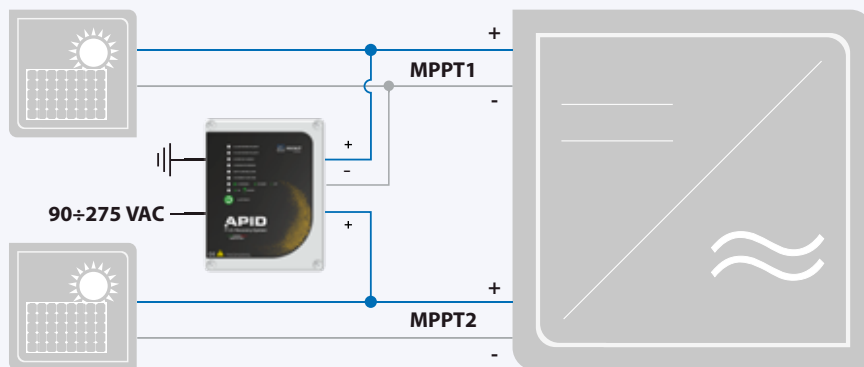
# APID series

## Connection diagrams

### APID

system with  
2 MPPT outputs

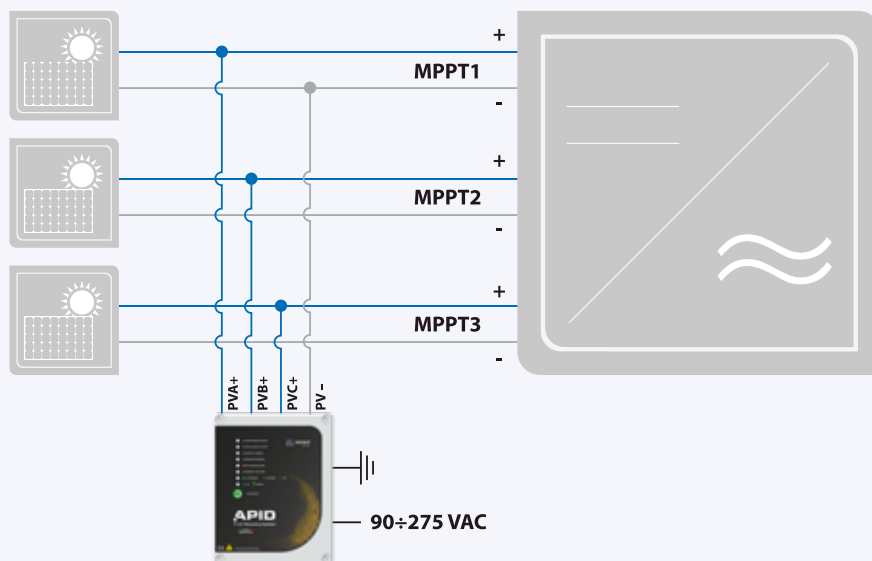
P-TYPE PV STRINGS



### APID-3

system with  
3 MPPT outputs

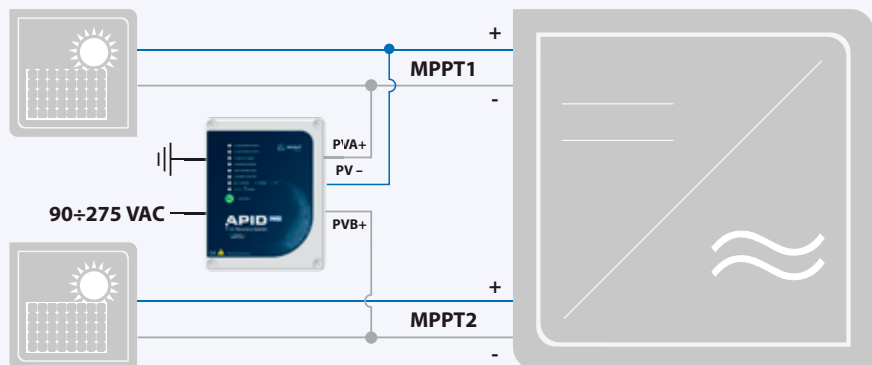
P-TYPE PV STRINGS



### APID-NG

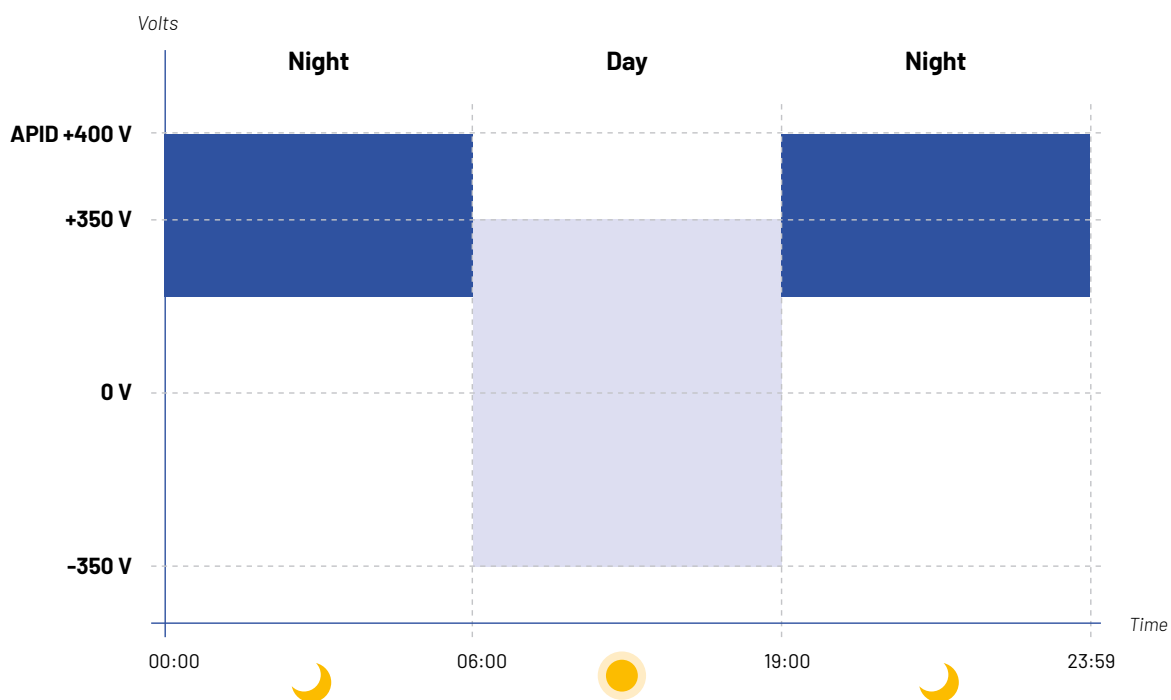
P-TYPE PV STRINGS

NEW GENERATION INVERTER  
WITHOUT POSITIVE GROUNDING



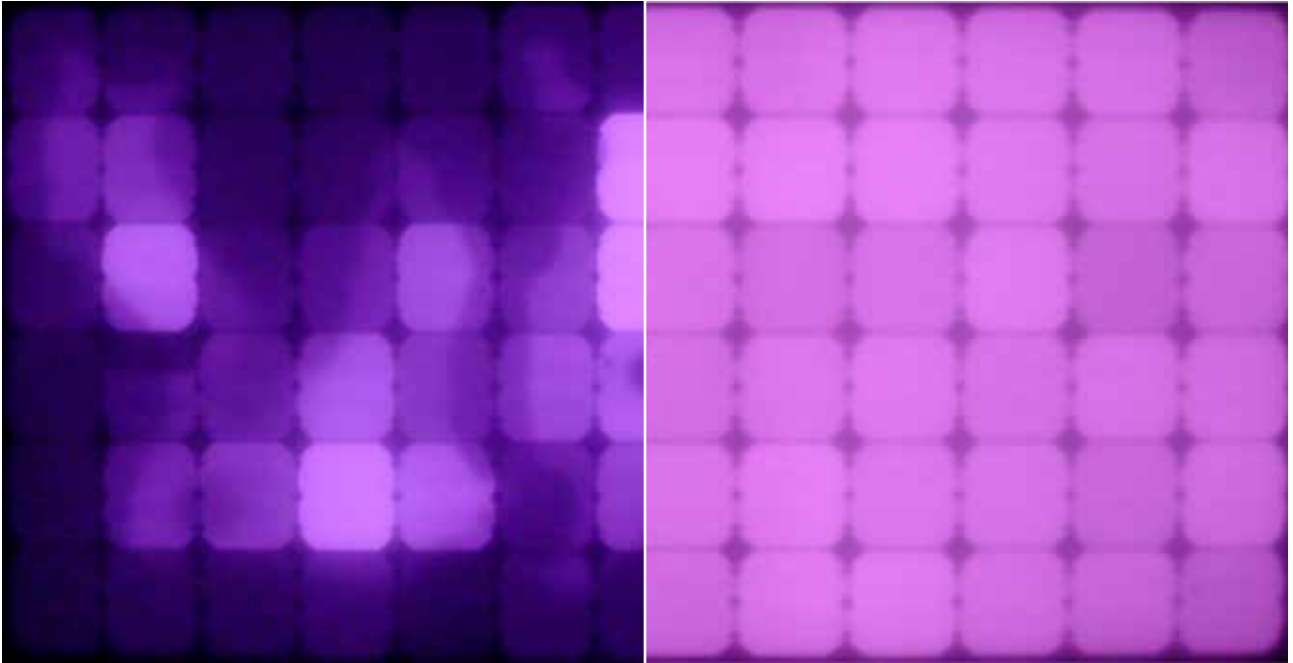
# APID/APID3

## How it works



# Result of treatment

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Module  
affected by P.I.D.



Module  
regenerated with APID



# Operation and benefits

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## Prevention

Prevents photovoltaic P.I.D., from the first day of life. APID-NG also enables the inverter to be replaced without having to change all the N-Type PV modules, preventing the onset of P.I.D.



## Profitability

Stops the economic damage caused by Potential Induced Degradation and ensures the profitability of the photovoltaic system.



## Power

Stops the loss of power in the photovoltaic system.



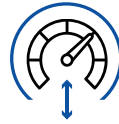
## Regeneration

Regenerates the power of photovoltaic systems by up to 100% in around 30 days.



## Protection

Immediately protects new systems with "P.I.D. Free" modules from a possible drop in power by up to 5%.



## Resistance

Measures the insulation resistance.



## 80-day ROI

Indicative timescale for return on investment (ROI), on a 1Mw installation for example, of 80 days.



## Quick installation

Easy to install, approximately 30 minutes.



FOR PV MODULES WITH CELLS

	APID	APID <sup>3</sup>	APID <sup>NG</sup>
	P-TYPE	P-TYPE	N-TYPE
MPPT OUTPUTS	2	3	2
POWER	90...275 Vac		
ABSORPTION	< Standby 0.5w Operation 2W, Maximum 20W		
INTERNAL GENERATOR	Voltage with output resistance of 165K Max. 1000 Vdc output power 2.7mA Max at 1000v - 3.9mA Max. at 800v - 6.3mA Max. at 400V - 8mA in short circuit		
AUTOMATIC MANAGEMENT OF OPERATION AND OUTPUT VOLTAGE	✓		
RELAY OUTPUT WITH NC AND NA CONTACTS FOR ALARM SIGNALLING	✓		
CLOCK/CALENDAR WITH 6 MONTHS BACKUP	✓		
ANTI-CONDENSATION VALVE	ØM12 F16 litres/hour at 0.07 bar		
CONNECTIONS TO STRINGS	MC4		
OPERATING TEMPERATURE	-20 °C/+50 °C		
WEIGHT	950 g		
CONTAINER TYPE	IP56		
DIMENSIONS (L X H X D)	240 x 190 x 90 mm		



LCDAM08	
Display	LCD 16x2 backlit with 4 keys
BUTTONS	4: Prog-Exit-Up-Down
CONTAINER	6 Modules, fastened with DIN rail or wall mounted
OPERATING TEMPERATURE	From -10°C to +50°C
DIMENSIONS (L X H X D)	105 x 110 x 65 mm
WEIGHT	180 g









**MADE IN ITALY**

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