APID

P.I.D. RECOVERY SYSTEM

Care PV modules with P.I.D.

STOP TO POWER LOSS

Eliminates P.I.D. effect on PV modules

When use APID:

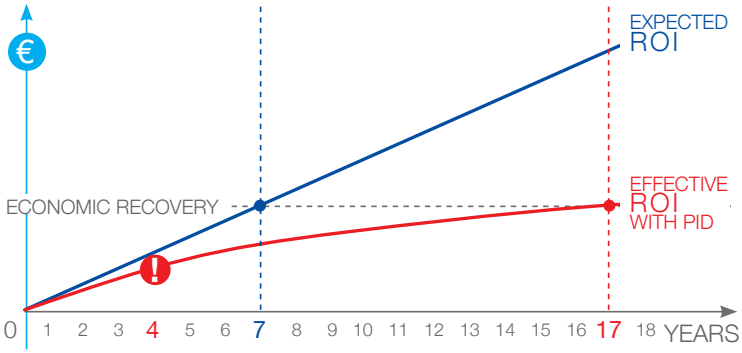
- APID restores the performance of PV modules degraded by PID effect;
- APID prevents the PID effect of PV modules at risk.

What is P.I.D.

P.I.D. (Potential Induced Degradation) indicates the phenomenon of degradation and loss of power of PV modules, highlighted especially in the last decade, following the removal of the output transformer in the inverters.
The shift to photovoltaic systems of increasing size, the use of strings with increasingly higher voltages, has led to tensions on the cells compared to the ground, with negative values enough to induce this phenomenon of polarization that lead to progressive switching off of the same modules, resulting in significant reduction of the performance of the entire system.

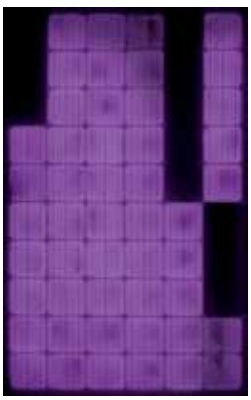
Stop the economic damage

The P.I.D. effect can disrupt the calculated business plan at the designing stage of a photovoltaic system, with very serious economic consequences. A simulation of a 200 kW system connected to the grid with the feed-in tariff in 2010 shows a loss of power to the fourth year due to P.I.D. (up to - 70%), this problem impacts the payback (ROI: Return on Investment) from seven years originally planned to more than 17 years, and of course reduces the accumulated revenue after 20 years in an amount low enough not to justify the initial investment.



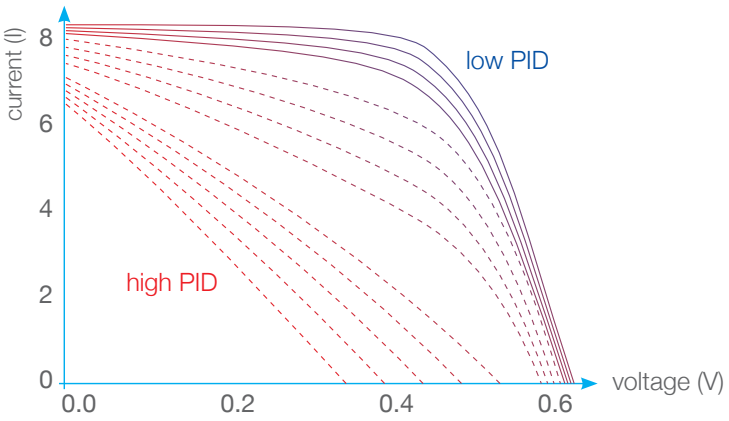
Consequences of the P.I.D. effect on photovoltaic modules:

- TCO (transparent conductive oxide) layer electroerosion.
- PV cell polarization



PV module affected by PID

Same PV module cured with APID



I/V curve degradation due to PID

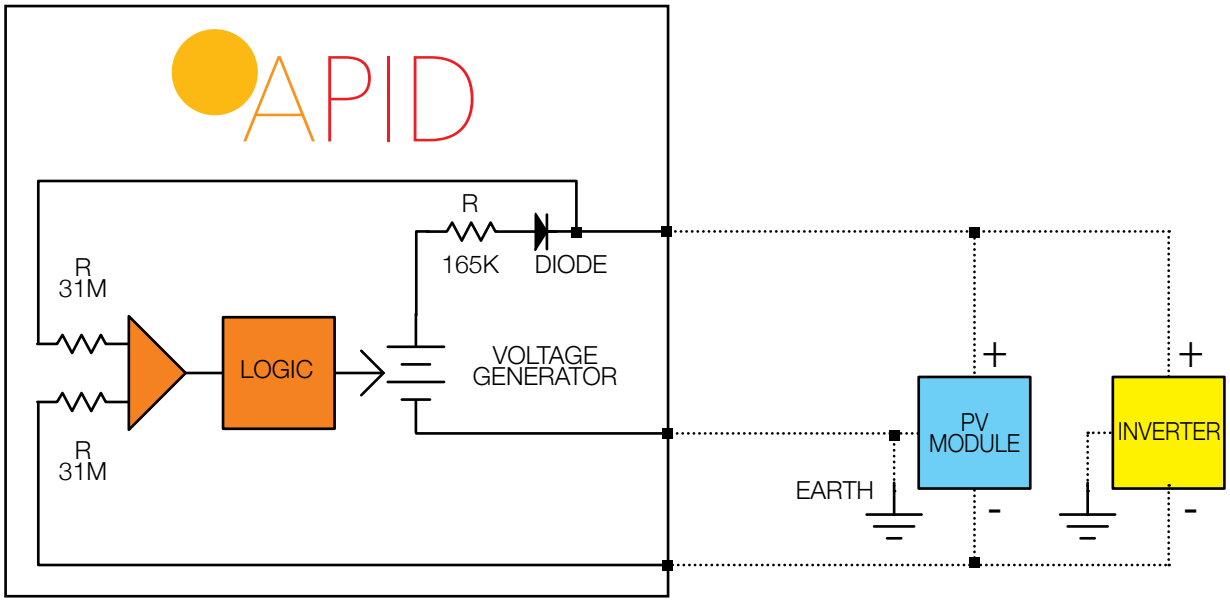
In the two photos taken with the electroluminescence technique, shows the differences between a module “healed” and one affected by the PID phenomenon. The dark cells do not work.

Description and Operation

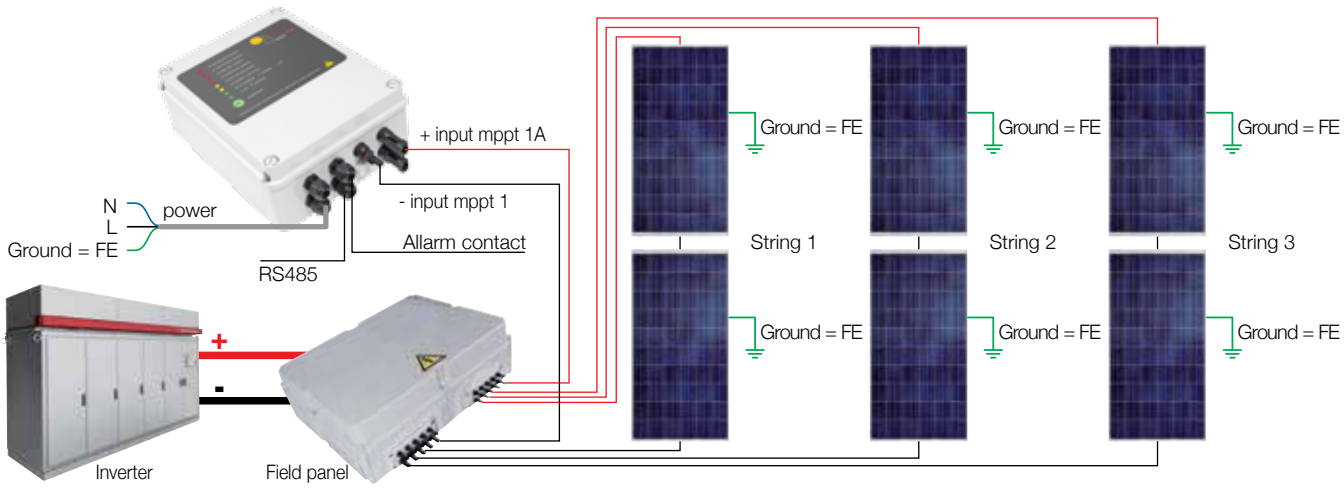
APID is a high voltage generator developed for the restoration of Photovoltaic Modules with PID, is connected like a string of modules, thus is located in parallel to the strings to be regenerated, not normally necessary to disconnect the inverter as the maximum output voltage generated from APID to Ground (1000 Vdc) is within the limits of the inverter isolation and the output current does not exceed 8mA. APID is fully automatic in both the operation and in the management of the output voltage of the PV field, during the day APID detects the voltage on the PV field and remains in standby, during the night generates a voltage equal to that detected by day in order to create an action equal and contrary, at dawn APID switches to standby.

APID is connected from one side to the network at 230Vac and the other, in parallel, to the PV modules and therefore to the inverter input, but does not take power from the electrical network to put it into the inverter input. APID produces a potential difference between the + pole of the strings and the ground (and not between the + and - poles of the strings) up to 1000v with a maximum power of 3w, the difference between the + and - poles is actually only 20..30v and is caused by the voltage drop due to the internal resistance of the modules, a too low to start the inverter. In addition, the connection between APID and the - pole of the strings takes place internally via a series of resistances for a total of 31 Mohm thus limiting the current passing through to only 32 uA obviously insufficient for switching on of the inverter.

Simplified diagram of the APID operation



APID connection diagram on field panel



A complete tool:

● Completely automatic operation management and output voltage.
● no.1 RS485/232 ModBus protocol port for remote communication, even via GSM modem.
● APID Modbus Monitor is a software for remote monitoring from PC, supplied with APID system, for direct monitoring, alarm log download of the two string voltages, via serial port RS232/485.
● Connection to the LCDAM08* device, (remote display and keyboard) allows you to modify the operating parameters of the field, read: daily string voltages, output current, generated power, alarm log display up to 100 messages.
● Monthly log in CSV format, concerning string voltages and output current for every 5 minutes, downloadable through the serial port RS232/485.

Main Technical Specifications of APID cod.AF1.APID	
Power supply	90..275 Vac
Absorption	Standby <0.5w, Operation 2W, Maximum 20W
n.2 Outputs for Strings	Strings up to 1000v (the negative must be in common)
Input resistance	31 Mohm between Negative of PV modules and APID
Internal High	voltage generator with output resistance of 165K Max 1000 Vdc and Max 8mA output currents 2,7mAMax at 1000v - 3,9mA Max at 800v - 6,3mA Max at 400v
Operation	Completely automatic operation management and output voltage
n. 1 Relay output	with NC and NA contacts for alarm activation
Clock / Calendar	with Backup of 6 months
Anticondensation valve	container ØM12 F16 liters/hour at 0.07 bar Checks the pressure to avoid condensation phenomena in the case of rapid increase in temperature inside the container.
Connections to the strings	MC4
Sizes	240x190x90
Enclosure type	IP56
Operating temperature	-20° / +50°
Weight	950 g

For more information about PID effect take a look on our website www.elettrograf.com

Images and data are generally to be considered descriptive and non binding.

*LCDAM08 tool optional

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CE In accordance with 2004/108/CEE directive and CEI EN 61000-6-3 2007-11; CEI EN 61000-6-1 2007-10 regulations.

Designed and produced in Italy.