APID

P.I.D. RECOVERY SYSTEM

Eliminates the P.I.D. effect in PV systems

- **Stop** the power loss
- **Stop** the economic damage
- **Restore** after 30 days
- **Prevents** P.I.D. effect
- **Measure** the insulation resistance

APIDgraphics

New feature integrated data logger

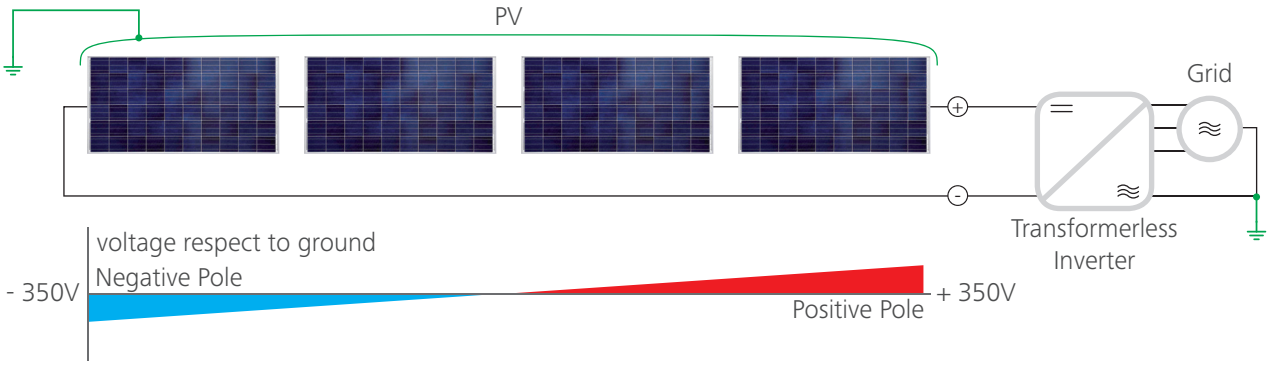
Generates graphs
of historical string voltage
and the APID generator

What is P.I.D. and what are the plants at risk

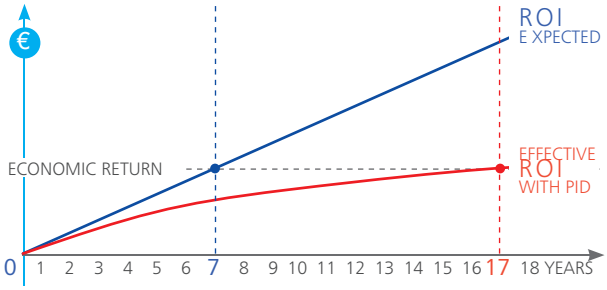
P.I.D. (Potential Induced Degradation) indicates the phenomenon of degradation and power loss in the PV modules, problem highlighted especially in the last decade, following the elimination of the output transformer in the inverter.
The transition to Photovoltaic systems of ever greater dimensions, the use of strings with increasingly higher voltages, has led to have negative voltage (with respect to ground) on the cells such as to induce this phenomenon of polarization, which leads to the progressive switching off of the modules, resulting in important reduction of the performance of the entire system.

Example of a PID risk plant

If the inverter is transformerless, PV strings are no longer anchored to the ground and then the negative pole can go to negative voltages with respect to ground , giving rise to PID effect.



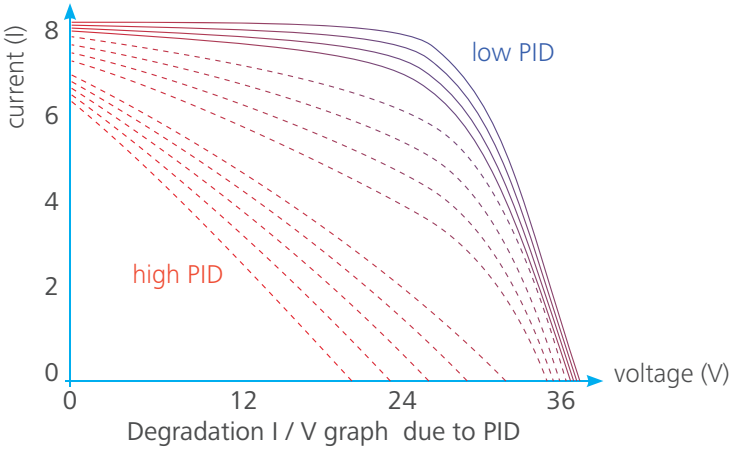
Economic damage caused by P.I.D.



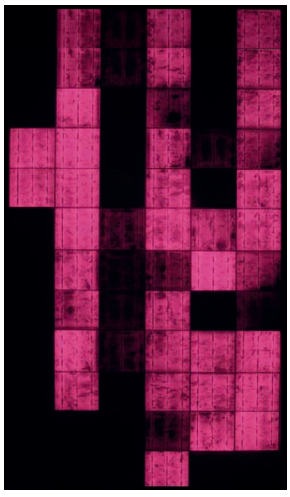
The P.I.D. effect, can distort the Business Plan calculated in step design of a photovoltaic system, with very serious economic consequences.
This simulation is relating to a grid connected 200kW plant with the second energy bill in 2010.
It shows a power decrease due to P.I.D. (Up to - 70%).
This issue moves Payback (ROI: Return on Investment) from seven years originally planned
to over 17 years, reducing the proceed accumulated after 20 years to such a low level , not to justify the initial investment.

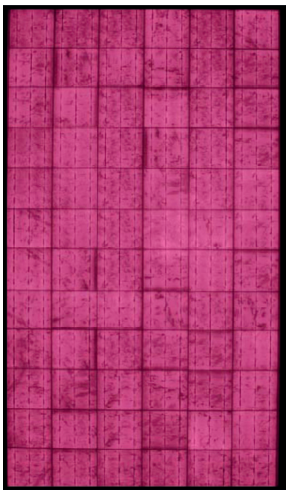
Before and after the treatment with APID

P.I.D. effect consequences on photovoltaic modules:
- Polarization of the PV cell
- Electrocorrosion of the TCO layer (transparent plastic Conductive Oxide).



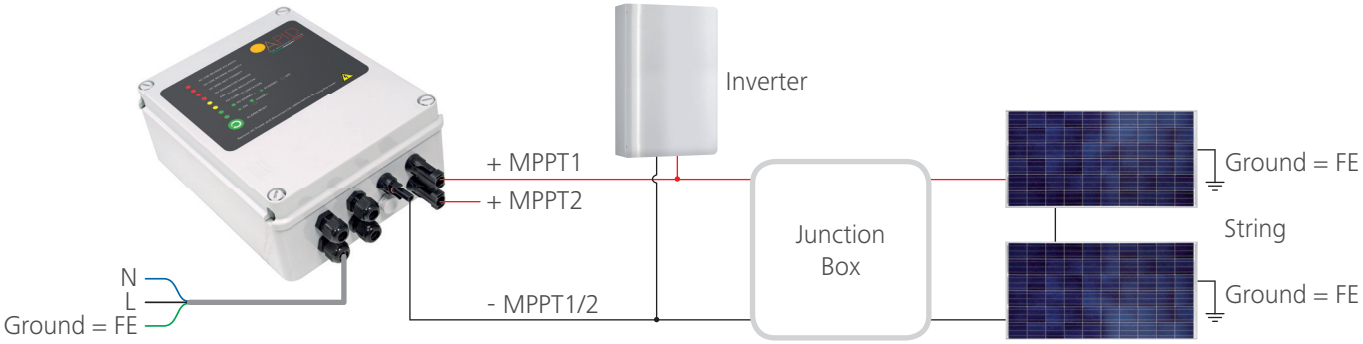
Degradation I / V graph due to PID


PV Module
with PID


Same PV module
after APID treatment

APID General Description

APID is a High voltage generator developed for the recovery of photovoltaic modules with P.I.D., is connected like a string of modules, and then is in parallel to the strings.
No need to disconnect the inverter because the default output voltage generated by APID to ground (400 Vdc) is within the limits of the inverter isolation and the output current does not exceed 8 mA.
APID is fully automatic in operation and in the management of the output voltage of the PV field; at day , APID detects the voltage on the PV Field and standby. Only at night, when inverter shut down, APID generates a high voltage on the (+) pole of the strings, this positive voltage is also found on the (-) pole due to the low internal resistance of the PV modules, this create a current that goes from the (-) to the ground, then reversing the process of degradation began the day during inverter operation, at sunrise APID returns to sleep.



APID is a comprehensive tool

1. INTERACTION ON THE FIELD

By means of the display and keyboard LCDAM08 is possible to alter the field of the operating parameters and read: day string voltages, output current, power generated by APID, the insulation resistance to Ground of the plant , the history alarms up to 100 messages.

Some display examples:

Night tension screen
MPPT1 input voltage (+ 30V)
Voltage between the positive pole of MPPT1 input and Ground (+ 500V)
The APID internal voltage generator (+ 620V)
Voltage between the negative input MPPT1 and Ground (+ 470V)

Measurement of insulation resistance between the positive pole of the string and the earth

Example of a message of Low insulation alarm

2. HISTORICAL VOLTAGES - ALARMS

APID is capable of recording a historic of 1 month with frequency "every five minutes", or 1 week, with frequency "every minute", of the voltage of its internal generator and the voltages (with respect to ground) on positive and negative poles of the strings, with an accuracy of +/- 10V.

3. REMOTELY SUPERVISION SOFTWARE

APID Modbus Monitor is a software supplied with the APID system for direct remote monitoring, downloading of the alarm history and the voltage history of the string , through serial port RS232 / 485 and ModBus Protocol, also through GSM modem.

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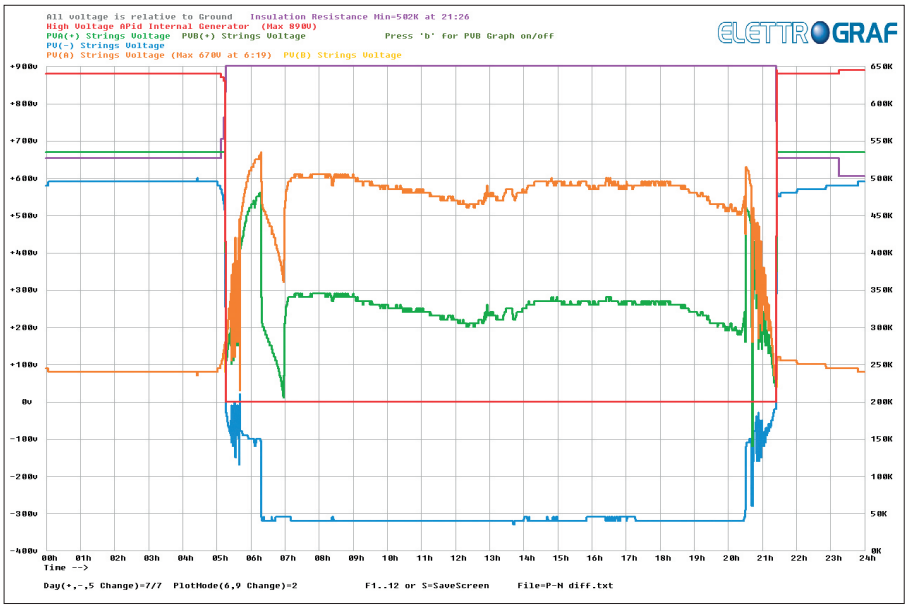
APID evolves with the new release APID GRAPHICS.
As well as prevent and restore the phenomenon P.I.D. in PV plants , with this Software APID also becomes a powerful diagnostic tool, with data logger functions, generates graphs of historian voltages both day and night.



These graphs indicate whether the PV plant function properly or if there are irregularities, such as:

- Inverter Abnormal Shutdown
- Abnormal voltages on strings
- Correct operation of APID
- Predisposition to P.I.D. phenomenon
- Insulation Losses to ground

Main Technical Characteristics of APID

Power supply	90..275 Vac
Absorption	Standby < 0,5w , Operation 2W , Maximum 20W
2 Outputs for 2 MPPT Inp.	Strings up to 1000v (the negative must be in common)
Input resistance	31 Mohm between Negative modules PV and APID
Internal generator	High voltage with output resistance of 165K Max 1000 Vdc respect to ground output currents 2,7mA Max at 1000v - 3,9mA Max at 800v - 6,3mA Max at 400v - 8 mA at short circuit
Operation	Fully automatic operation and output voltage
1 Relay output	NC and NA contacts for alarms signaling
Clock/Calendar	With 6 months Backup
Anti-condensate valve	Container ØM12 F16 litres/hour at 0,07 bar
Connections to the strings	MC4
Dimensions	240x190x90 mm
Container type	IP56
Operation Temperature	-20° / +50°
Weight	950 grams

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ISO CERTIFIED 9001: 2008

APID complies with the directives
2004/108/CEE
and standards
CEI EN 61000-6-3 2007-11
CEI EN 61000-6-1 2007-10