HELP

ANTITHEFT FOR DC CABLES

Patended n. 0001411374

ANTI-THEFT FOR COPPER AND ALUMINIUM CABLES

Total protection for Photovoltaic Plants

It protects the cables of concentration trunk of field panels, alarms manholes of cable pipelines and accesses to technical rooms

Problem

Just type **"Theft of Copper of Photovoltaic systems"** on any search engine, to run into an endless list of articles documenting every day raids of this metal, also known as **"red gold"**.
The extensive damage caused by the theft of copper or aluminium conductors, it is necessary to add the costs of replacement and PV system downtime.

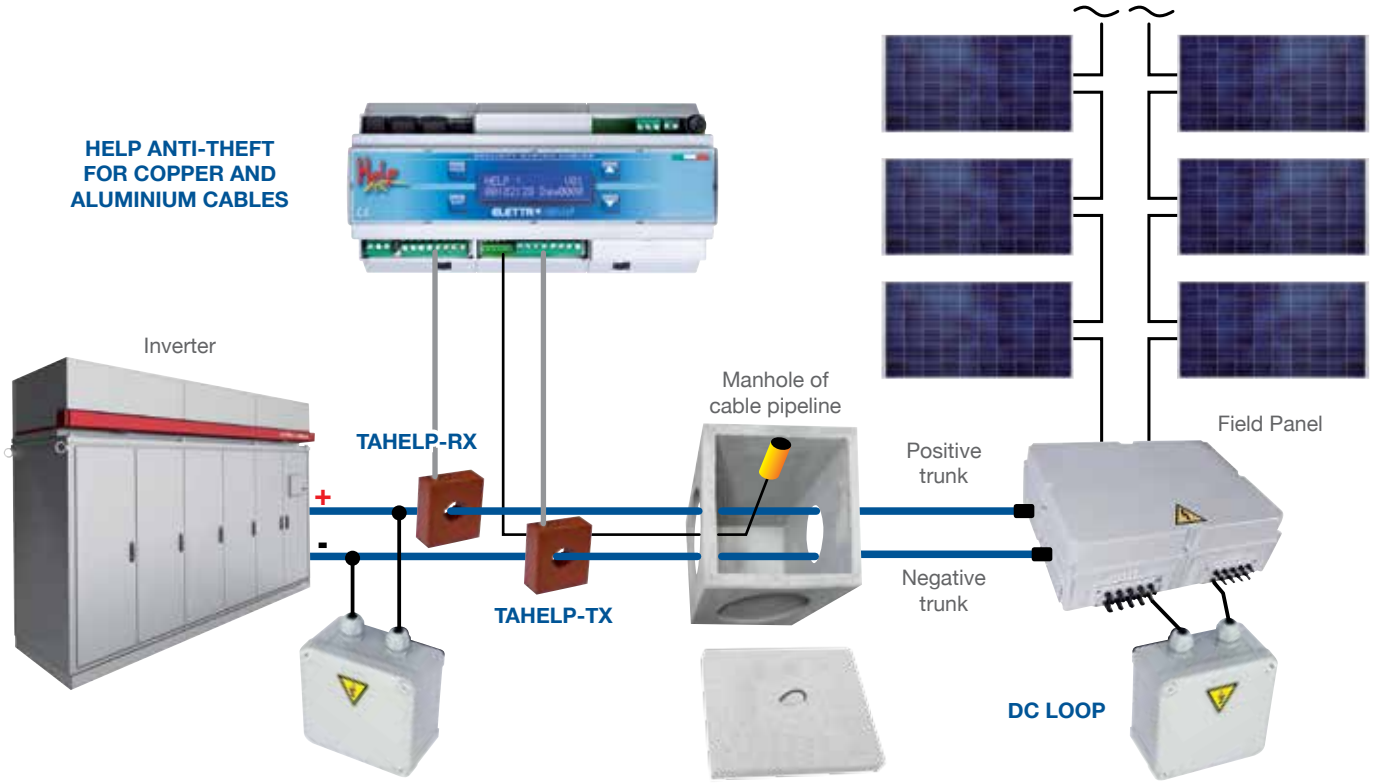
The most affected are the trunks where the copper wires connect the photovoltaic field panels to the inverter input. They are copper cables with a section up to 300 mm2, where pass currents up to 200A and voltages of 900V. The theft attempt of copper cables at night, when the photovoltaic system is not working, up to now it cannot be possible to report because in absence of voltage in the electrical lines, there was no way of noticing the cut down..

Solution

HELP is the 1st anti-theft in the World that offers total protection: of the electric cables in copper and aluminium, of the manholes of cable pipelines openings and of the technical areas.
Taking advantage on innovative patented system, first it reports the opening attempt of the manholes and then, in case one of the cables of the trunk concentration strings is disconnected or truncated, the system will send an alarm.

Example of Application

Each **HELP** control unit is able to protect up to 4 concentration trunks, for a total of 8 cables and two lines dedicated to alarm of the manholes of cable pipelines and the accesses of technical areas.



Operation

HELP indicates any opening attempts of the manholes or other access to cable pipelines and simultaneously controls the presence of the cables 2 ways: during the day measures the current flow generated by the photovoltaic modules; during the night it generates a series of pulses on the cables and through **TAHELP-TX** device the energy is transferred by electromagnetic induction to the cable arriving to the field panel where **DC LOOP** device is located that closes the circuit, the impulse retraces the cable back up to **TAHELP-RX** device. Here, still by electromagnetic induction, it is transformed into current pulse and detected by **HELP** which measures it and compares the values with those stored during the installation phase.
In case **DC LOOP** device is removed or short circuited, or even just one of the two trunk cables is cut off, or if the length is altered by a bridge, **HELP** detects a difference between the control signal and the value stored during the calibration phase and the alarm is generated.

System Composition

- **HELP control unit**, which is placed near the inverter and, therefore, in a safe area. Help may protect up to 4 trunks (4 connections of field panels-inverter), and thus 8 cable lines, as well as two dedicated lines for the protection of the manholes or the accesses to technical areas.

For each trunk (couple of copper cables-field panel) are needed:

- **TX device Cod.AF1.TAHELP-TX**
- **RX device Cod.AF1.TAHELP-RX**
- two **DC LOOP**, one installed at the input of field panel, the other on the inverter input
  The connection is made in a quick and safe way by cables with Multicontact connectors at the input of the field panel modules. Tampering or removal of this device causes the alarm. **Code AF1.DCLOOP.**
- **Proximity sensors on the manholes (optional).**

Easy Installation

Is enough disconnect the positive and negative cables of the trunk (inverter end) insert TA devices **Cod.AF1.TAHELP-TX** and **Cod.AF1. TAHELP-RX** and reconnect the cables. At this point simply join the **DC LOOP** with 2 connectors on the relative panel field, (mount the sensors in case the manholes have to be protected) and then power on **HELP.**

Autocalibration

HELP, to fit the length and characteristics of the cables, which varies from system to system, performs an autocalibration procedure during the installation phase in order to adjust power and frequency of the pulse energy of each individual channel.

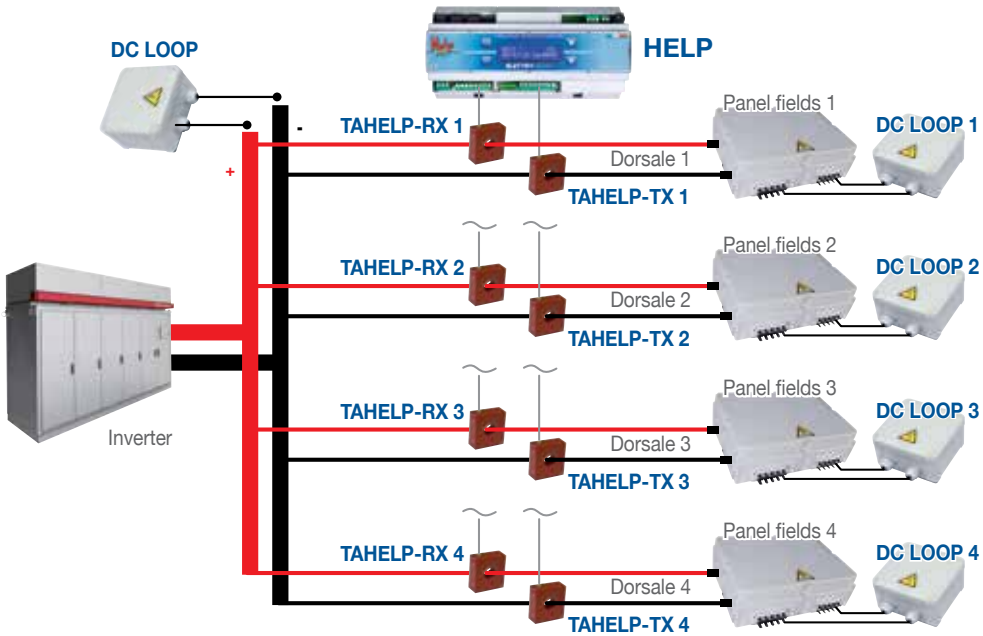
High security level

There is no electrical contact between the sensors and cables to be protected. The device has an insulation of 4kV compared to the cables.

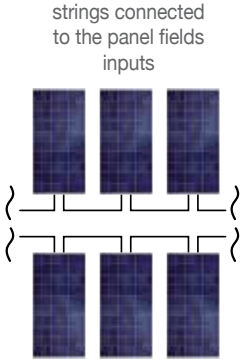
How the anti-theft communicates

HELP has an RS485 port with ModBus communication protocol, for remote monitoring; is also available a relay with changeover contact, programmable in its functionality and timing. You can monitor the system remotely through a monitoring software that is able to e-mail alarm status, from a virtually unlimited HELP-AC devices.

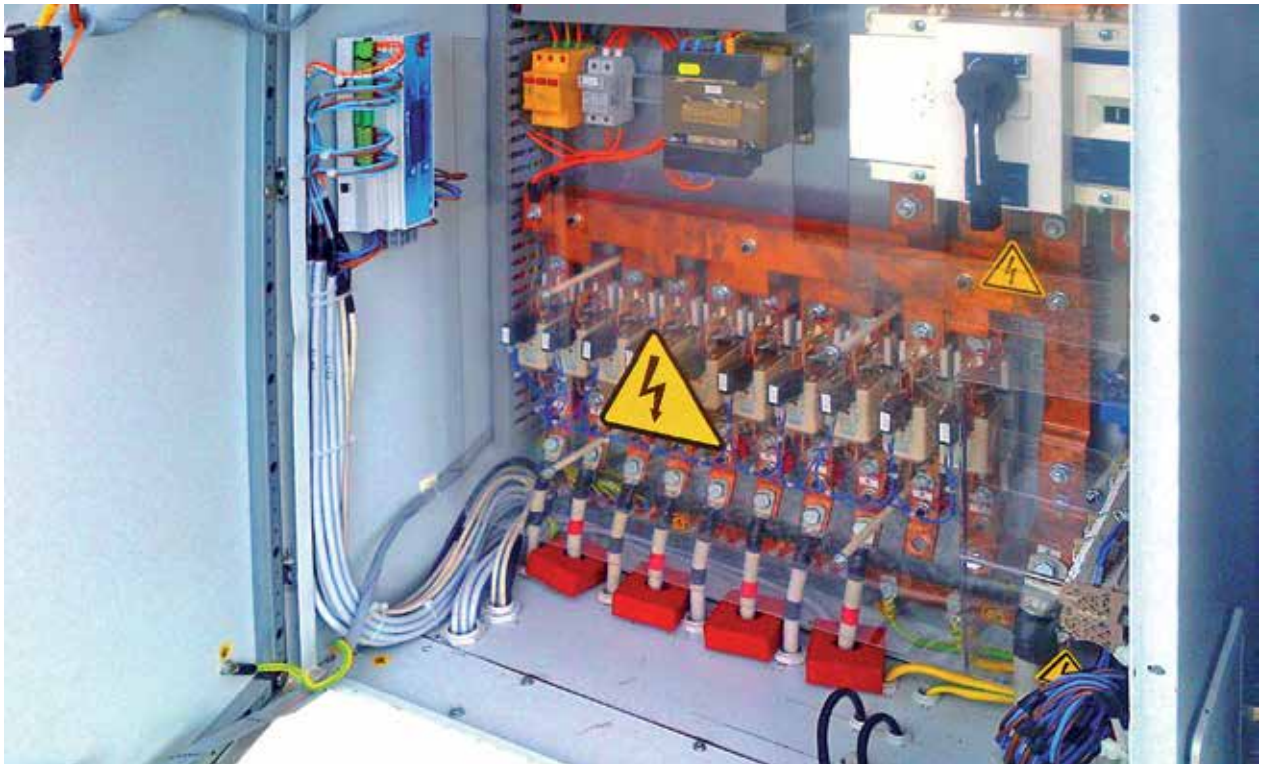
Example of an inverter with an input that brings together 4 trunks



With this connection type, it is enough to put a single DC-LOOP on the busbars of inverter input



Typical installation



Main technical characteristics of HELP device (cod AF1.HELP)	
Power supply	230V
Absorption	Max 5W in normal operation and 12W in calibration
4 control channels	composed by 4 output sensors TAHELP-TX and 4 inputs sensors TAHELP-RX
Insulation voltage	4kV between TAHELP-TX , TAHELP-RX and trunk cable
Display	Backlight 16x2 LCD with possibility of a second remotable external display
Relay output	With NC and NA contacts capacity 1A, normally powered in the absence of alarms
RS485 port	Opto isolated, with MODBUS-RTU SLAVE for remote supervision
Inputs / outputs	2 analogical/digital 0-10V, Buzzer
Alarm reset	Automatic, programmable to preset intervals
Operating temperature	-20° + 70°
Dimensions mm	62-110-213 (H x W x L)

Technical characteristics of the circuit closing device DC LOOP (cod.AF1.DCLOOP)	
Protection	Fusible 1000VDC 10A gL
Connection type	Multicontact or other on request
Cable type	Solar cable 4mmq
Cable length	90cm
Dimensions mm	105x105x55 (H x P x L)
Protection grade	IP55
Operating temperature	-55°+85°
Max. operating voltage	1100VDC

Technical features of the transmitter device TAHELP-TX (cod.AF1.TAHELP-TX) and receiver TAHELP-RX (cod.AF1.TAHELP-RX)	
Container Type	Self-extinguishing plastic UL94-HB
Dimensions mm	76-30-70 (H x W x L)
Cable type	FG7OR/4
Cable length	Mt.1,90 extendable to Mt 10
Hole Diameter	Standard 26 mm suitable for cable cross sections up to 150 mm^2 Special versions for cable up to 300 mm^2
Protection grade	IP65
Operating temperature	-20° + 85°
Insulation voltage	4kV, tests performed on 100% of production, according to EN 60742, EN 60950

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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.