INSTALLATION MANUAL

SICURFLEX

Protection System for Photovoltaic Cells and Fences
FLCEN

C E

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INTRODUCTION

The "SICURFLEX" protection system is a device that can be used in safety systems that protect photovoltaic panel installations and any kind of metal fences,. The system consists in an analysis unit called FLCEN, a sensor cable (FLEXCB) and a special cable for hard fences (FLEXCBVB). The total length of the sensitive cable must be no more than 500m. The sensitive cable installation procedure varies according to the type of protection to be implemented, thus being different according to the type of application: solar panels, different net models (wire mesh, wooden protection, sheet, etc.). Two additional components, FLEXTR and FLEXCN, supplied with the product, should be used in addition to the sensitive cable and analysis unit for correct installation; FLEXTR is the end-of-line unit of the sensitive cable, whereas FLEXCN components are used both to connect FLEXCB to FLCEN and to create "non-sensitive" areas along the protected perimeter (ideal solution to bypass gates, doors, etc. along the path). One piece of each component is included in FLCEN standard box.

The Sensitive cable FLEXCB must be fixed with the related fixing strips, as sensitive cable FLEXCBVB must be fixed with the same strips for hard fences.

The standard product FLCEN is composed by the analysis unit, a termination unit FLEXTR and a junction unit FLEXCN. The maximum length of the RG59 cable (used for no sensitive areas and to connect sensitive cables to the analyse unit) must be at maximum 30m, or the 10% off the total length of the sensitive cable (for example for 200mt cable length only 20mt of RG59 can be used)

The FLCEN analysis board generates an alarm (alarm relay with NC free contact) if the analogue signal detected causes the programmed alarm threshold to be exceeded.

FLEXCN

FLEXTR

FLEXCN and FLEXTR enclosed in a metal container

View from above: FLCEN unit, in a metal container

ELECTRICAL PARAMETERS

POWER SUPPLY	12V= ±15%
ABSORBED CURRENT (FLCEN)	5mA
OPERATING TEMPERATURE RANGE	-40°C / +80°C
MAXIMUM HUMIDITY AT 35°C	98%
ALARM OUTPUT	NC free contact relay
TAMPER	NC free contact relay
CABLE CUT DETECTION	YES
TERMINATION RESISTANCE	220KOhm
MAXIMUM FLEXCB LENGTH	500m
FLEXCB SECTION DIAMETER	8mm
FLEXCBVB SECTION DIAMETER	9mm
POSSIBILITY OF NON-SENSITIVE AREAS	YES (Max 30mt or 10% of sens. area)

MECHANICAL PARAMETERS

FLCEN PLASTIC CONTAINER DIMENSIONS	180mm x 135mm x 50mm
FLEXCB SECTION DIMENSIONS	115mm x 90mm x 50mm
FLCEN WEIGHT (approx.)	200g

MINIMUM DISTANCE FROM GROUPS OF PEOPLE/LARGE ANIMALS
   2m
MINIMUM DISTANCE FROM RAILWAYS   20m
MINIMUM DISTANCE FROM ELECTRICAL INDUSTRIAL
   30m
EQUIPMENT
MINIMUM DISTANCE FROM HIGH VOLTAGE LINES (500kV)
   15m

PRODUCT COMPONENTS

FLCEN   :   Logical analysis unit for FLEXCB
FLEXCB   :   Protection sensitive cable for soft fences
FLEXCBVB   :   Protection sensitive cable for hard fences and walls
FLEXTR   :   System termination unit
FLEXCN   :   Unit for connecting FLEXCB/FLEXCBVB and FLCEN/FLCENVB and delimiting the "non-sensitive" areas

ADDITIONAL

RG59   **:**   Cable to be laid in the non-sensitive areas and between
                                    FLEXCB and FLCEN
FLEXCB STRAPS: Metal   straps   supplied   by   SICURIT   on   request   for
                                    easily installing the product
GUN-FLFS100P**I**   **:**   Gun to fasten correctly the straps

NB : All the additional components are not included in the product, they must be
bought separately

FLCEN SETTINGS

Sensitivity adjustment trimmer
Jumper P1 for setting the sensitivity level (Closed = high, open = low)
Jumper P2 for activating the alarm LED (closed = working, open = not working)
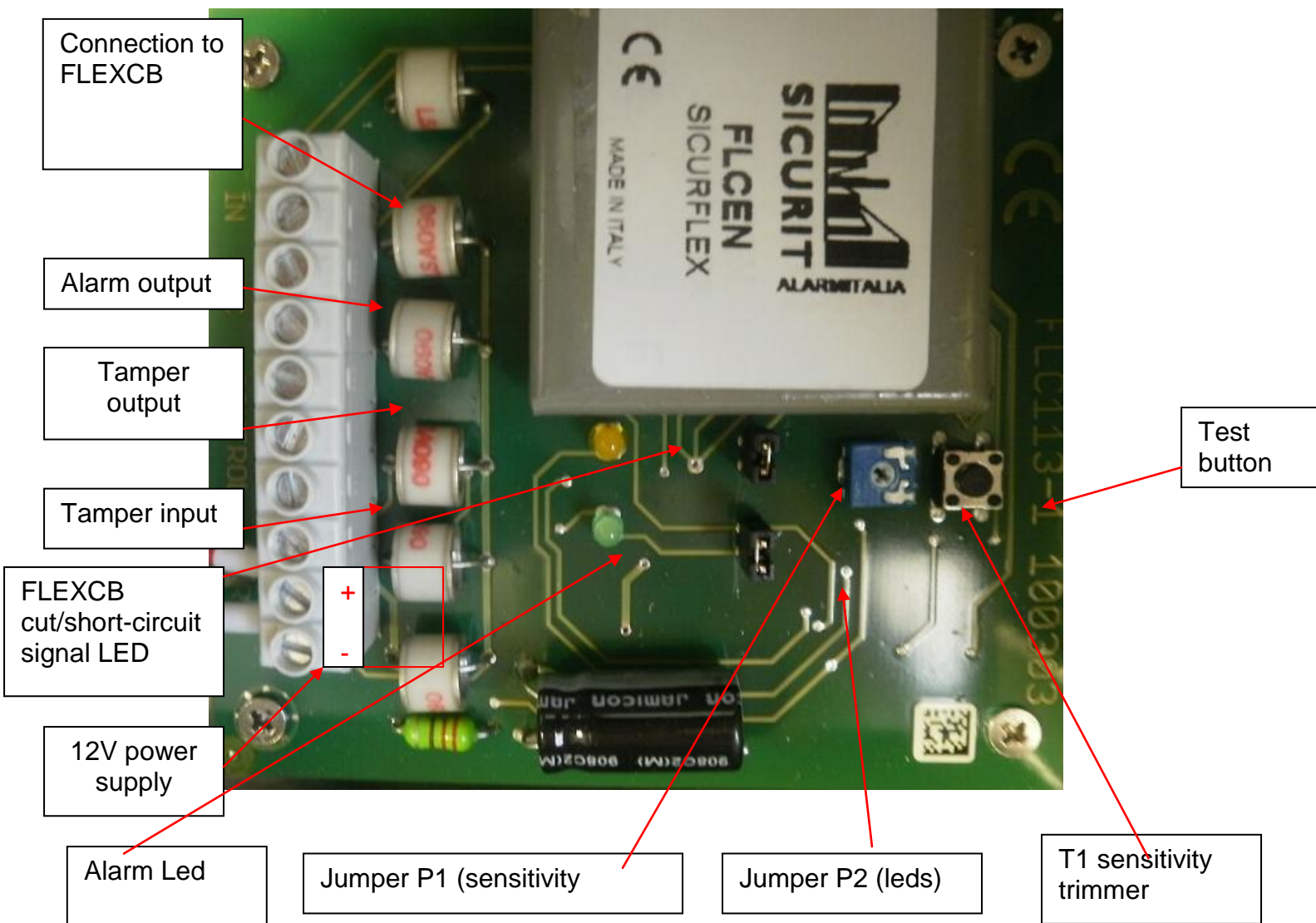Power Supply Terminals
Terminals for connecting FLCEN and the RG59 cable that communicates with
FLEXCB/FLEXCBVB
Alarm output contact
Tamper alarm output contacts
Anti-opening tamper input
Test button, create an alarm simulation

Connection to FLEXCB

Alarm output

Tamper output

Tamper input

FLEXCB cut/short-circuit signal LED

12V power supply

Alarm Led

Jumper P1 (sensitivity

Jumper P2 (leds)

Test button

T1 sensitivity trimmer

FLCEN circuit with its main components

1	2	3	4	5	6	7	8	9	10
In	Rf	C	NC	C	NC	C	NC	+	—
RG59		Al. Out		Tam out		Tam In		Supply	

FLCEN terminal board detail

On board in the corner is present a clamp to connect to a good electrical ground.
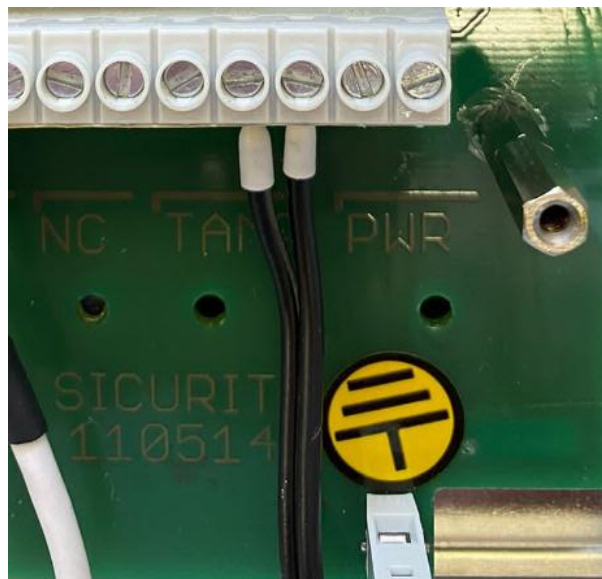
ALARM LED (GREEN)

Green color, is constantly on in stand-by mode, without alarm. If an alarm occours the led will be OFF during the alarm time.

TAMPER LED (YELLOW)

Yellow color, normally OFF (cable line correctly balance with 220KOhm). The led blinks if FLEXTR or FLEXCN boxes are opened, or if on the cable there's a short circuit. The LED is constantly ON if there's a cut or if the cable is interrupted. The led does not signalize a tamper status (the tamper relay works anyway) of the analyze unit (FLCEN/FLCENVB)

INSTALLATION

Installing SICURFLEX is normally very easy. The main steps for correct installation are given below

Laying the FLEXCB cable on the object to be protected

Positioning and installing of FLCEN/FLEXTR/FLEXCN boxes

 Connection between analyzer and FLEXCB (FLEXCBVB) by means of the RG59 coaxial cable (through FLEXCN or directly connected)

Calibrating FLCEN

Detection tests

FLEXCB CABLE

Laying the FLEXCB sensitive cable is all-important for correct system operation. The cable must be laid differently according to the object to be protected.
The cable must be fixed more liable as possible with the part to be protected, must be stretch as possible and must be fixed every 50-60cm with its strips.
ATTENTION : do not create with the cable angles wider than 30°and not create tangles that can warp the cable itself. The cable must always be carefully fixed and not pressed too much.
Set correctly the strenght of the strips gun before strips fastening.
Do not press or warp the detection cable

FLEXCBVB CABLE

Laying the FLEXCBVB sensitive cable is all-important for correct system operation. The cable must be laid differently according to the object to be protected.
The cable must be fixed more liable as possible with the part to be protected, must be stretch as possible and must be fixed every 50-60cm with its strips.
ATTENTION : do not create with the cable angles wider than 30°and not create tangles that can warp the cable itself. The cable must always be carefully fixed and not pressed too much. It's very important that the internal spring will not change it's tension, to not compromise the detection efficiency
Set correctly the strenght of the strips gun before strips fastening.
Do not press or warp the detection cable

PHOTOVOLTAIC PANELS

FLEXCB (FLEXCBV) is correctly installed on photovoltaic panels (or a panel system) by laying the cable so that all solar panels are covered. The cable must be mounted on the structure to which the panel is fastened and secured so the cable is as stretched as possible. Because of its vibration detection principle could be that an eventual use of FLEXCBVB, if used with high sensitivity, could detect also icy rain, so be careful during the calibration. The installation in environements where are present machines (presses or equivalents) or tools that could create strong vibrations (pumps, power fans etc) could create nuisance alarms if the analyzer is not set carefully, or if the vibration generated are very similar or higher of the vibrations to be detected. In this case use of tribo cable FLEXCB is strongly suggested

Example of possible FLEXCB installation on a solar panel system

FENCES

If FLEXCB must protect a perimeter fencing the cable is installed according to the type of fence. If the fence is very rigid, such as railings, typical installation requires an open loop, but NOT a closed one, along the entire perimeter. In this case, or for other strong fences, FLEXCBVB is suggested. FLEXCB must be kept as stretched as possible and well secured (it is advisable to use the metal straps provided in the optional strapping kit to make installation more stable). Make sure the strap does not cut, deform or damage FLEXCB, as the magnetic fields around the cable would be altered, thus making it unstable. It is advisable to apply a strap every 40-50cm so FLEXCB is well secured to the area to be protected; it is also highly recommended that the cable be passed in front of the vertical fencing bars and behind them alternately so as to increase its adherence and ensure better operation.

Example of cable double-placement FLEXCB/FLEXCBVB installation on the fence
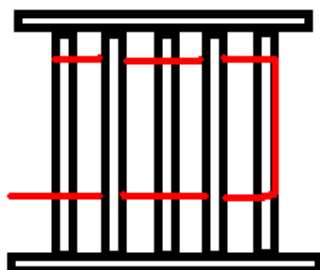
FLEXCB/FLEXCBVB passing diagram between the vertical fencing bars

FLEXCB double placement is not the only method for laying the sensitive cable. In fact the cable can be laid differently according to the types of protection; some typical applications can be a sinusoid installation (in the case of particularly soft fences, such as crossed fences, in this case FLEXCB use is suggested) or covering the fence with 3 cable segments (this could be required if there are several horizontal bars on the railing which could reduce vibration transmission. The same cautions must be observed for FLEXCBVB and FLCENVB use.
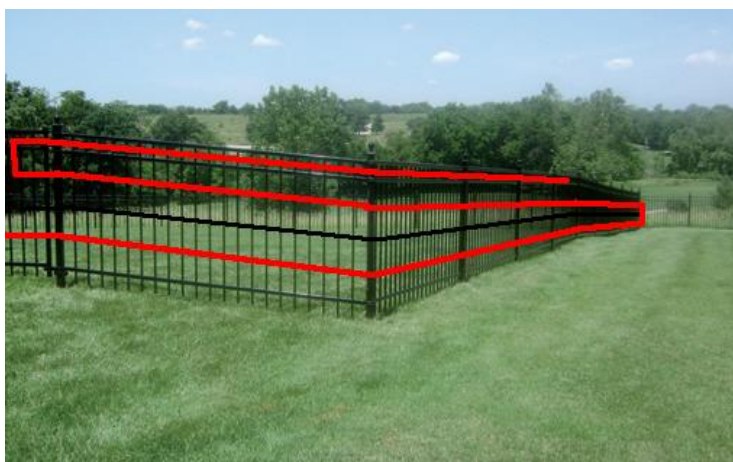
Example of FLEXCB/FLEXCBVB installation on railings that requires three cable lines
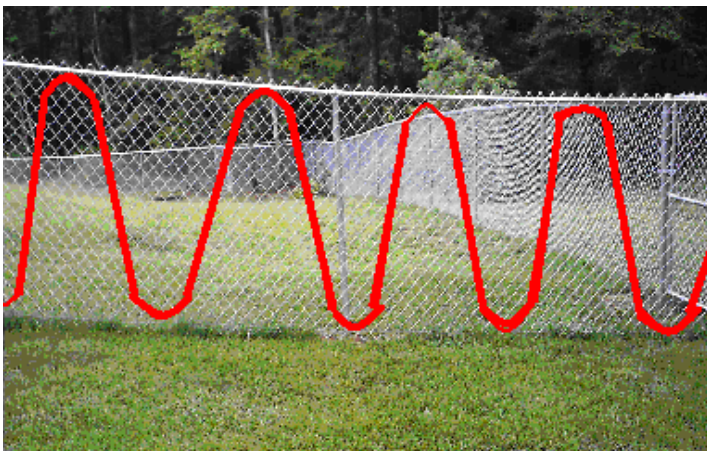
Example of FLEXCB sinusoid installation on a metal mesh fence

INSTALLATION NOTE: Pay special attention to the environmental conditions in all FLEXCB sensitive cable applications. In particular take into account the vehicles near the installation and the potential disturbance they may induce on the structure where the cable is installed. The minimum distance recommended to avoid this type of disturbance may range from 0.5m to 10m, and is strictly connected to the level of stability of the fence to be protected.

HOW TO CUT FLEXCBVB CABLE

The cutting procedure for FLEXCBVB is quite different from a normal cable cutting. In detail, when FLEXCBVB is dispatched (max 250mt for one set), the internal spring is locked by a plastic cap, like in picture.
DO NOT cut sharply the cable after its laying on the net, because:

1) The spring could retires inside the cable.
2) Also the reference wires will be cut.

To correctly cut FLEXCBVB cable please follow these steps:

1) Carefully cut the black plastic (Black color), being careful to not cut the two reference wires under it (red color). Then repeat the same operation some centimeters after, being careful to put out only the black plastic without touching the spring (yellow color) the transparent cover (lightblue color) and the reference wires (red).
2) Eventually remove the shield (green color) without removing the transparent cover and the reference wires.

3) Cut the transparent cover, being careful to not cut the spring and the reference wires.
4) Holding though the spring, cut the not necessary spring part, to prevent the retiring of the spring into the cable.
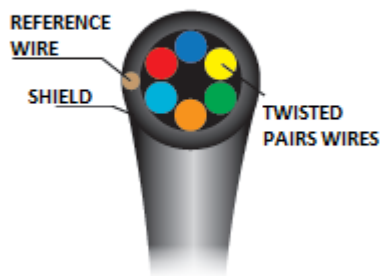

LEGENDA

BLACK : External Plastic
GREEN : Shield
RED : Reference Wires
LIGHTBLUE : Transparent cover
YELLOW : Spring

Please remember that the maximum leght of a FLEXCBVB roll is 250mt. If the sector is longer is necessary to use a FLEXCN to join the two parts.

FLEXCN AND FLEXTR

"FLEXTR" must be applied at the farthest end of the sensitive cable, which consists of an end-of-line resistor and an anti-opening tamper to prevent the cable from being tampered with. Insert the FLEXCB reference wire into the two terminals (as shown in the image below) and connect all sensitive wires together.
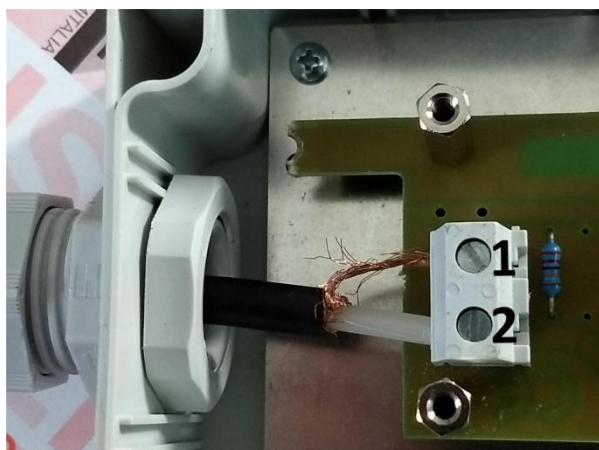
FLEXCB, DIAMETER 8mm

REFERENCE WIRE

SHIELD

TWISTED PAIRS WIRES

FLEXCBVB, DIAMETER 9mm

SENSITIVE SPRING

REFERENCE WIRES

SHIELD

PLASTIC TUBE
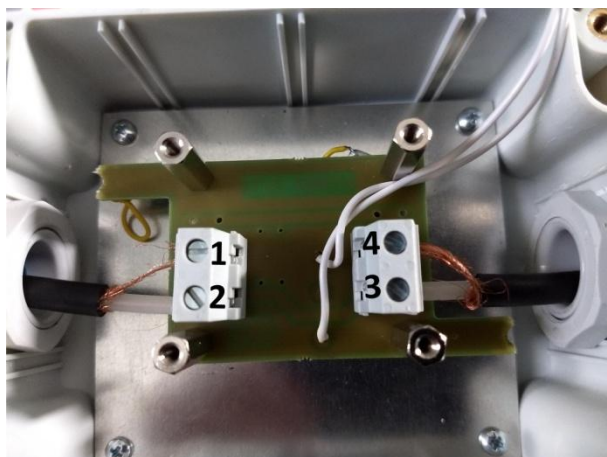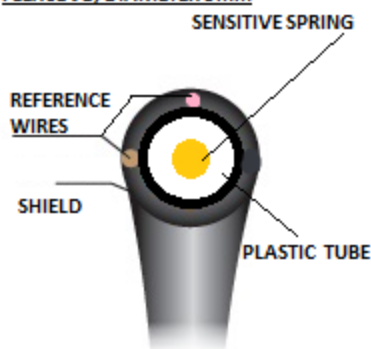
FlexCN connection FLEXCBVB sensor cable detail. The FLEXCV cable has the same connection of shield and signal wire.

FLEXTR connection FLEXCBVB sensor cable Detail. The FLEXCB sensor cable has the same connection of shield and signal cable.

If there are sections that do not need any Sicurflex protection to separate two different areas to be protected, SICURFLEX allows you to create "non-sensitive" perimeter sections (to be identified before laying the cable) up to 30 metres (or at max 10% of total sensitive part) for each FLEXCB. The FLEXCN components must be added before and after every non-sensitive area segment to create "non-sensitive" areas in the system. Connect FLEXCB to one end of FLEXCN and the RG59 coaxial cable on the other end used for delimiting the "non-sensitive" sections;

then screw the cable sensitive wires and references into their terminals (as for FLEXTR)

The same configuration must obviously be carried out at the end of the non-sensitive area.

Pay also attention to how the RG59 cable is positioned as it is not completely non-sensitive but has a lower sensitivity (about 80% less) and must not be subject to traction, deformation or trampling.

USEFUL SUGGESTIONS

1) For best cable placement on the object to be protected it is advisable that the cable be laid by two operators, one to stretch FLEXCB along the section and one to apply the straps so that cable stretching linearity and uniformity are obtained, thus ensuring even detection over the entire sensitive section.

2) The RG59 cable is, however, subject to possible deformation due to interference although it is much less sensitive than FLEXCB. The coaxial cable must therefore be fastened carefully and not be subject to external interventions such as shocks, strong vibration, etc.

3) As for FLCEN, the FLEXTR and FLEXCN metal containers **must** be housed inside plastic containers that prevent the circuits from undergoing oxidation phenomena deriving from condensate or exposure to moisture.

4) If you do not have the Sicurit cable fixing kit, do not use plastic straps as they are less safe and not sufficiently strong to keep the FLEXCB properly and reliably secured

SYSTEM GROUNDING

Grounding is a very important element for correct system operation. Correctly grounding the system requires the following operations:

- Grounding FLCEN
- Grounding the object to be protected, in case of masses or metallic objects that must be isolated from SICURFLEX system.

If the same system has to protect several perimeters (e.g. two fences separated by a non-sensitive area), ground both perimeters in the SAME grounding point (so the cable does not detect the two areas differently and unpredictably).

Use only one grounding point so as to avoid system instability phenomena due to the difference in the reference potentials.

On FLEXTR and FLEXCN clamps there is one clamp (on on input and one on output in FLEXCN) in common with the metallic shield. Test with the multimeter and with the tamper closed which is the clamp; in that one must be placed the reference wire, in the other one the sensible wires. The sensible wires on FLEXCB are all the wires in excetpion of the reference one; on FLEXCBVB the sensible part is the spring wire, and the reference part the 2 reference wires on the cable

FLCEN INSTALLATION

After the cable has been installed, the FLCEN analysis unit must be wired. The logic is supplied in a IP65 container and must be installed very close to the beginning of FLEXCB/FLEXCBVB. The SICURFLEX/WALLGUARD container must be fixed with plastic container so the cable does not bend when it moves. After FLCEN has been fastened to the plastic container, the coaxial cable must be connected to the analysis unit: let the cable slide inside the plastic container (through its cable clamp), then route it inside the container. Insert the cable reference (shield) in pin2 and the sensitive part in pin1, then block the cable using the cable clamp on the metal container. The cable must be as bound as possible even inside the cases (so that movements do not cause any false alarms). After FLCEN has been connected to the perimeter, connect the wires to the signals (alarm output and tamper).

Connect as follows:

Sensore Cable Input: terminal 1 (IN) ; terminal 2 (reference- shield)
NC alarm output: terminal 3 (NC), terminal 4 (C)
NC tamper output: terminal 5 (NC), terminal 6 (C)
Power supply 12V: terminal 9 (+), terminal 10 (-)

After the system has been installed, it is similar to the example below:
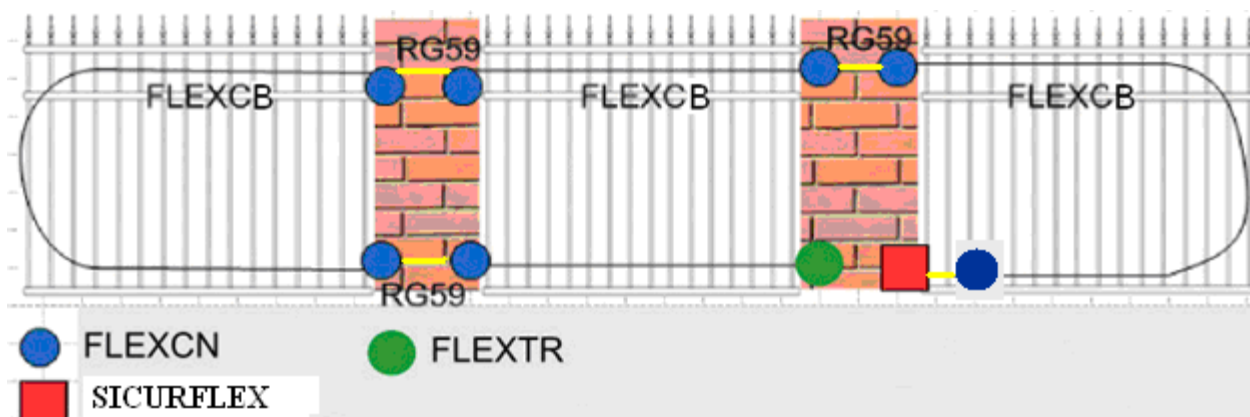
Example of Sicurflex architecture with non-sensitive areas

CALIBRATION

After the system has been wired, its sensitivity must be calibrated. This is done by using trimmer T1 with the aid of jumper P1. Jumper P1 allows a "High" or "Low" sensitivity level to be set. With P1 open, system sensitivity is set to low, with P1 closed it is set to high (51-100%). Then fine-tune the sensitivity level desired using T1: turn T1 clockwise to increase sensitivity up to the maximum value allowed by the "step" (50% or 100%); turn it counter-clockwise to decrease sensitivity to the minimum possible values (1% or 51%). There is no default sensitivity level as this may vary according to the type of installation carried out. Our experience on the field shows that for correct installations, sensitivity must not be higher than 60-70%.

Sensitivity adjustment trimmer

Level setting jumper
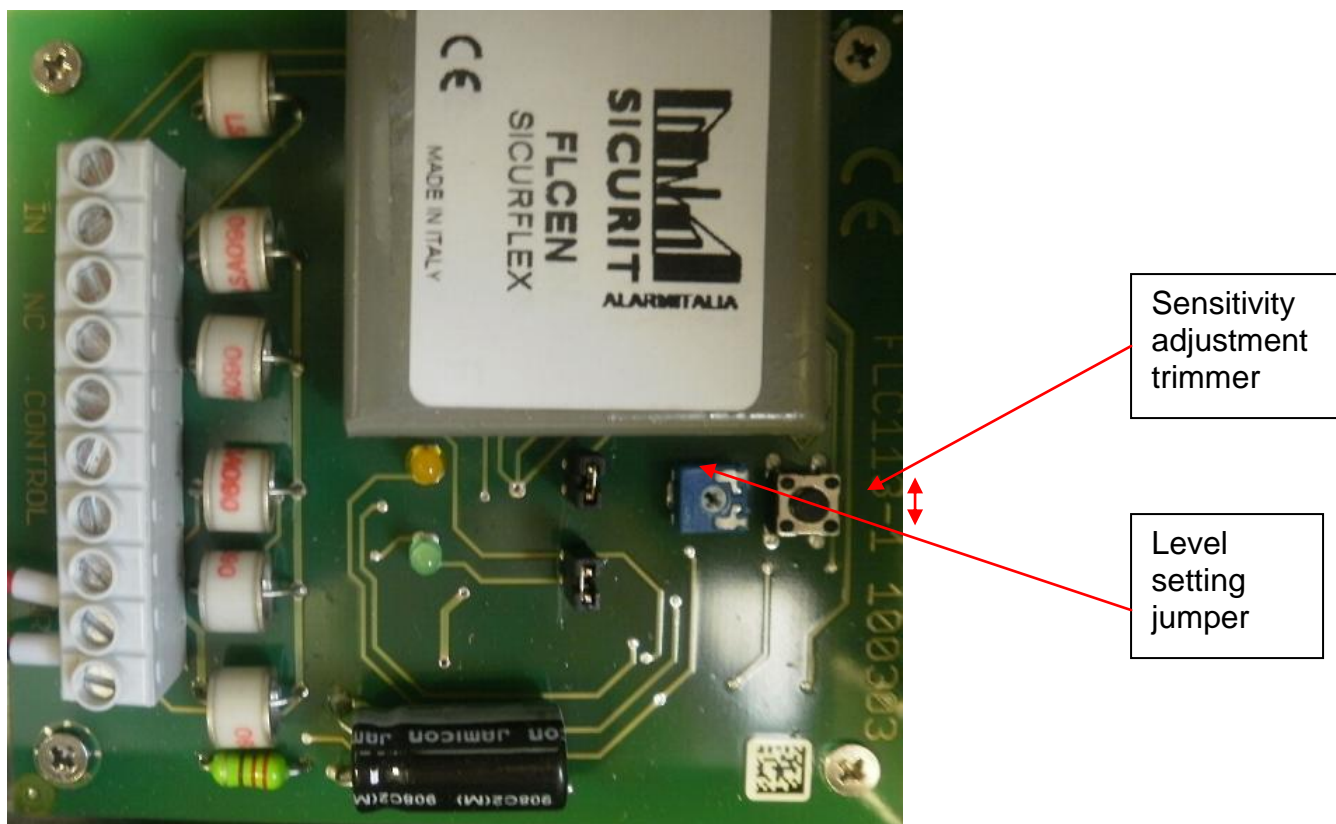
After the sensor has been adjusted, run the intrusion detection tests checking the following signals provided by FLCEN:

Under rest conditions the yellow LED on the interface must be OFF and the Green one must me in ON

If an alarm is generated, LED L2 (green led) turns OFF steady for .

If the cable is cut, yellow LED L1 remains ON steady

If no end-of-line is available, in case of cable short-circuit or FLEXCN/FLEXTR tamper opening, yellow LED L1 blinks

If FLCEN tamper is opened yellow led does not blink but the relay change its status

Deactivating the LEDs by removing jumper P2 inhibits LED L1 operation.
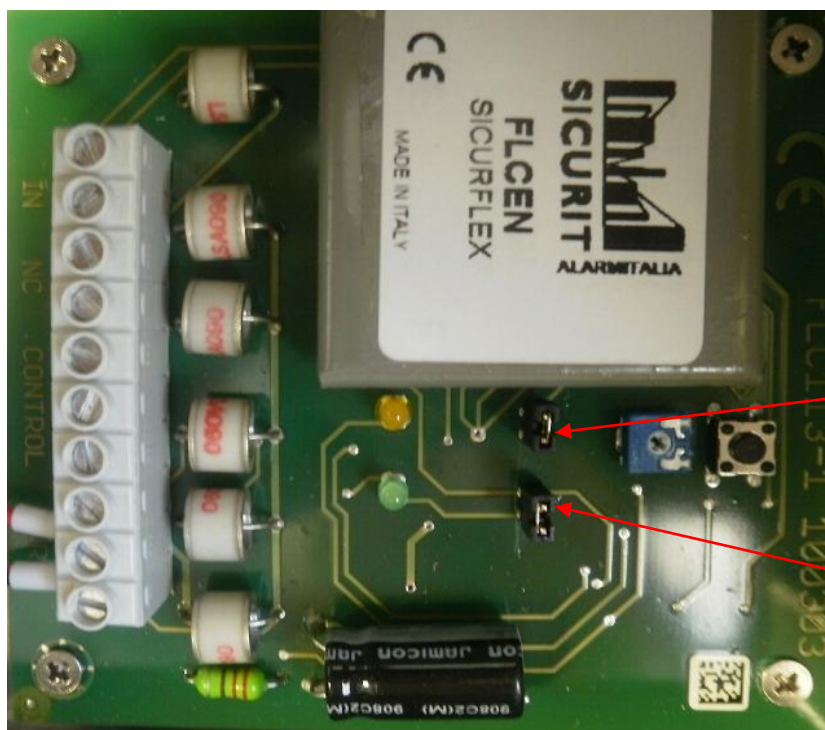
Cut/short-circuit/ tamper signal LED

Supply/ Alarm Led

FAULTS TABLE

Fault	Potential causes	Solutions
Green LED OFF	Power supply not correct Detection cable not well connected	Connect 12Vc.c. Verify the RG59 cable or the sensible cable connections, being careful to connect the parts to the correct clamps.
Green LED not swich OFF	Sensible cable not connected correctly or not well installed	Verify the RG59 cable or the sensible cable connections, being careful to connect the part sto the correct clamps. Verify the quality of strips/rings connection.

GREEN LED switches OFF without any logic cause	Wrong connections between sensible cable and FLEXTR/FLEXCN	Verify the correct polarization and connection between FLEXTR/FLEXCN and the sensible cable
	Not well stretched cable	
Note recognized alarms		Verify the cable stretching and the quality of the strips/rings connection
	Wrong grounding	
		Verify the insulation of all the units from metallic surfaces and the equipotentiality of the groundings.
YELLOW Led ON or blinking	Opened boxes	Verify the correct tamper closing of FLEXCN and FLEXTR. Verify with the tester that on the wires coming to FLCEN (disconnect them from the unit) there are 220KOhm
	Cable interrupted or in short circuit	Verify with the tester that on the wires coming to FLCEN (disconnect them from the unit) there are 220KOhm
	Unit cabling incorrect	
		Verify the cabling quality
Not recognized alarms	Too high sensitivity	Check the sensitivity of the system for what concerns P1 jumper and T1 trimmer, to give an adequate sensitivity to the system.

WARRANTY

Sicurit Alarmitalia Spa and/or its subsidiaries and/or its affiliates (" the Manufacturer") warrants its products hereinafter referred to as "the Product" or "Products" to be in conformance with its own plans and specifications and to be free of defects in materials and workmanship under normal use and service for a period of twenty-four months from the date of shipment by the Manufacturer. The Manufacturer's obligations shall be limited within the warranty period, at its option, to repair or replace the Product or any part thereof. The Manufacturer shall not be responsible for dismantling and / or reinstallation charges.

To exercise the warranty the Product must be returned to the Manufacturer freight prepaid and insured.

This Warranty does not apply in the following cases:

Improper installation, misuse, failure to follow installation and operating instructions, alteration, abuse, accident or tampering, and repair by anyone other than the Manufacturer.

This warranty is exclusive and expressly in lieu of all other warranties, obligations or liabilities, whether written, oral, express or implied, including any warranty of merchantability or fitness for a particular purpose, or otherwise. In no case shall the Manufacturer be liable to anyone for any consequential or incidental damages for breach of this warranty or any other warranties whatsoever, as aforesaid.

This warranty shall not be modified, varied or extended, and the Manufacturer does not authorize any person to act on its behalf in the modification, variation or extension of this warranty. This warranty shall apply to the Product only. All products, accessories or attachments of others used in conjunction with the Product, including batteries, shall be covered solely by their own warranty, if any. The Manufacturer shall not be liable for any damage or loss whatsoever, whether directly, indirectly, incidentally, consequentially or otherwise, caused by the malfunction of the Product due to products, accessories, or attachments of others, including batteries, used in conjunction with the Products.

The Manufacturer does not represent that the Product may not be compromised and/or circumvented, or that the Product will prevent any death, personal and/or bodily injury and/or damage to property resulting from burglary, robbery, fire or otherwise, or that the Product will in all cases provide adequate warning or protection. User understands that a properly installed and maintained alarm may only reduce the risk of events such as burglary, robbery and fire without warning, but it is not insurance or a guarantee that such

will not occur or that there will be no death, personal damage and/or damage to property as a result. The Manufacturer shall have no liability for any death, personal and/or bodily injury and/or damage to property or other loss whether direct, indirect, incidental, consequential or otherwise, based on a claim that the Product failed to function. However, if the Manufacturer is held liable, whether directly or indirectly, for any loss or damage arising under this limited warranty or otherwise, regardless of cause or origin, the Manufacturer's maximum liability shall not in any case exceed the purchase price of the Product, which shall be fixed as liquidated damages and not as a penalty, and shall be the complete and exclusive remedy against the Manufacturer.

Warning: The user should follow the installation and operation instructions and among other things test the Product and the whole system at least once a week. For various reasons, including, but not limited to, changes in environmental conditions, electric or electronic disruptions and tampering, the Product may not perform as expected. The user is advised to take all necessary precautions for his or her safety and the protection of his or her property.

Thank you to choose SICURIT Product. This product is designed and manufactured with high quality materials which can be recycled and reused.

The symbol ⌦ means that the electrical and electronic equipment, at their end-of-life, should be disposed of separately from your household waste and dispose it at your local community waste collection centre.

Please follow your local rules about electronic waste recycle.

This symbol mark and recycle system are applied in the EU (European Directivity WEEE) countries and could be not applied in other areas of the world.

NOTE:

Sicurit Alarmitalia reserves the right to change the manual without any prior notification