

Cirprotec G-CHECK

Grounding system monitor



PROTECTING PEOPLE AND PROPERTY AGAINST
GROUNDING FAULTS

CIRPROTEC

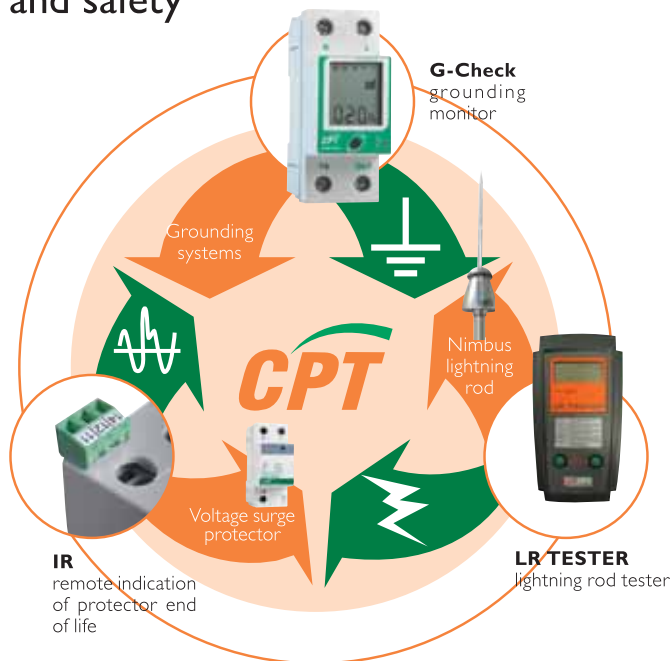
Specialists in lightning and surge protection

Cirprotec is the specialist company when it comes to lightning and surge protection which supplies the industrial, commercial and residential sectors with the widest range of solutions in the market.



- Surge protectors: transient surges and permanent (TOV) overvoltage protectors for LV supplies, telephone lines, radiofrequency, data networks, instrumentation, etc.
- ESE-type lightning rods (Early Streamer Emission), control and monitoring devices for installation ground systems, etc.
- Development of custom solutions, consulting projects and technical training.

Total solution: protection, control and safety



Innovative solutions

Since its inception, **Cirprotec** has been defined by its dedicated specialization in the design and production of innovative products to provide comprehensive protection systems. The company's growth stems from a commitment to its business mission: to provide quality technological solutions related to protection against lightning and surges in response to the needs of customers in over 60 countries.

As part of a group of independent technology companies, **CPT** leverages the advantages of having access to multiple research and development centers (R&D&i), as well as a large production infrastructure and laboratories belonging both to the company and the group.

CPT Lab

CPT Lab, our laboratory for lightning-type current discharges, is undoubtedly among the most important and modern labs of this type in the world.



The lab puts the company at the forefront of the industry as specialists in research, development and innovation.

With the generation of discharges of up to 150 kA in standardised waveforms of lightning current and surge impulses (10/350 μ s y 8/20 μ s), products are developed to comply with the requirements of regulations and standards, always under strict compliance of the company's own quality policy.





What is G-Check?

The **G-Check** is a grounding installation monitor

Cirprotec has developed a revolutionary product that checks the grounding installation status in real time and triggers a warning system if the installation is defective or deteriorated.

G-Check is the first product on the market designed for continuous monitoring of grounding installations. G-Check is a standalone, compact DIN-rail mountable device for installation in panels.



By calculating loop resistance it can detect fluctuations in the installation's grounding caused by:

Accidental grounding disconnection



Deterioration of the installation grounding or terrain



Equipment theft



Importance of grounding systems

The resistance of the grounding is one of the most important parameters of the entire installation.

Prevents contact voltages in solid metal from exceeding those permissible for people by allowing voltage leakage, and ensures correct and safe discharge of currents caused by voltage surges.

An electrical installation should be in optimal conditions to ensure safety. In case of grounding failure, the ground system installation helps protect people and equipment from harm and damage.

International standard IEC 60479 (Effects of current on human beings and livestock) Parts 1 and 2, addresses the effects of electric current on the human body in detail. These effects have fatal outcomes depending on the current and duration.

The grounding system creates a closed loop, and if the contact voltage in a metal body (conductor) is higher than permissible, it creates a leakage current which is detected and disconnected by residual current devices.

According to international standard IEC 60364 (Electrical installations of buildings) the maximum allowable contact voltages for human beings are as follows:

- 50V for dry environments
- 25V for humid environments
- 12V for wet environments (ie, outdoor worksites)

Care should be taken to provide proper grounding in order to ensure as much current continuity as possible in case of earth fault. For this reason, all metal grounds must be attached to a protective earth (PE) connector. Depending on the grounding arrangement (TT, TN or IT) this cable will have a direct connection with the installation's earth or through the earth of the transformer.

The continuity of this grounding system and its proper operation is vital to ensure a safe contact voltage for people, animals and receivers.

G-Check complies with the IEC 61010-1 international standard, *Safety requirements for electrical equipment for measurement, control and laboratory use*, Part 1 General Requirements.

- Having proper grounding and checking it regularly is very important.
- A ground in proper condition avoids risk of death for people and destruction of property.
- A ground in proper condition ensures protection against voltage surges.



Why G-Check?

Through a single button, a display and an intuitive navigation system, **G-Check** offers the following features:



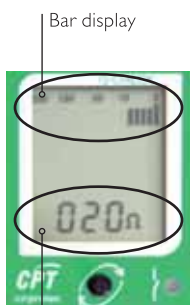
Loop resistance measurement and display.

From milliohms to over 500 ohms.



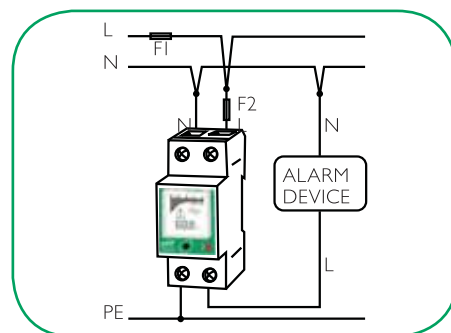
Alarm function triggered by the PE reading.

If the **G-Check** detects that the value displayed exceeds a user-specified limit, it will trigger the signal. The control circuit on the alarm device should be wired as specified in the following diagram.



Adjusting the displayed loop resistance value.

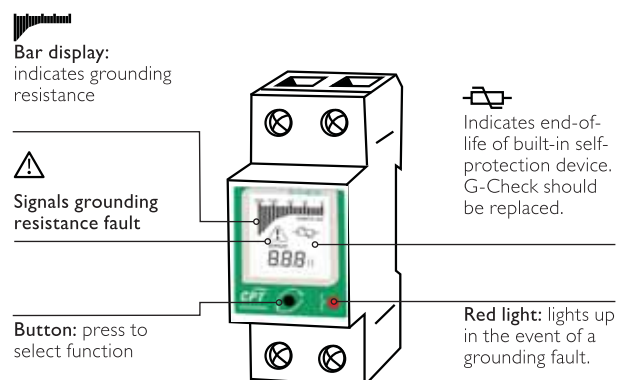
This adjustment is done by subtracting a user-defined variable from the actual value measured by the **G-Check**. This way users can match the value of the ground connection of the installation with the valued measured and displayed by G-Check. (If you select this option, the ohm symbol on the display will start blinking). The reading displayed by the **G-Check** does not necessarily have to be greater than the grounding resistance.



The alarm element should be single phase and be connected directly between the **G-Check** and the neutral outputs. The **G-Check** output connects directly to each phase, so that depending on the model and network its output will be 120 or 230V.

Instructions for use

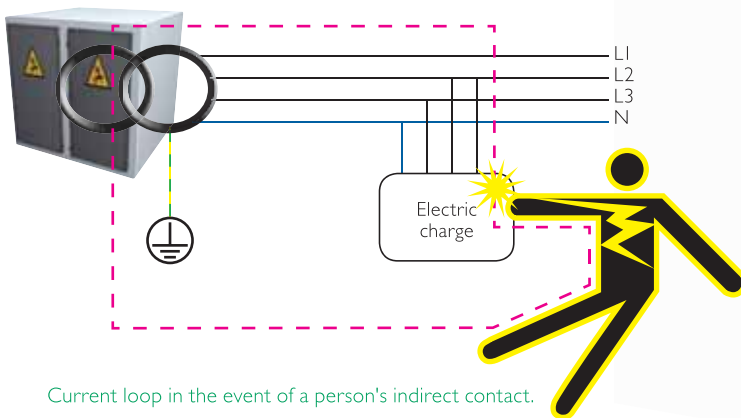
Thanks to a single button and very user-friendly menus, **G-Check** can be set up in very little time.



Method for calculating loop resistance

G-Check uses a standard method for calculating loop resistance.

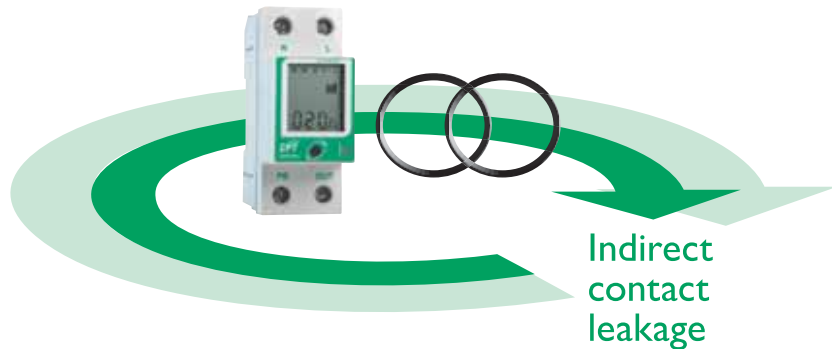
This method involves applying a voltage pulse to the grounding wire and measuring the return current on the neutral. In any of the various grounding arrangements, **G-Check** checks the impedance of the actual leakage path of an indirect contact. This is no doubt the most important parameter to monitor:



Current loop in the event of a person's indirect contact.

The earth leakage current loops, as explained in the following pages, depend on each installation's grounding arrangement. In TN systems the loop is closed by conductors (N and PE). In a TT system the earth leakage current loop consists of connecting the installation to ground with a return via the neutral wire.

The neutral is grounded at various points throughout the low voltage supply. The first point is at the transformer itself, and then it is grounded at regular intervals to ensure the electrical point of reference. The main earth leakage current loop, and therefore also the loop measured by the **G-Check**, is closed through the grounding point closest to the installation.



G-Check Advantages

The grounding system is of vital importance in installations. By continuously monitoring the status of the grounding connection with **G-Check** we gain in security and savings:

Constant monitoring of grounding installation status

- Ensuring protection of persons against indirect contact.
- Preventing the destruction of property.
- Ensuring proper protection against voltage surges.



Reducing preventive maintenance

- Ensuring adequate protection without the need for daily maintenance staff.



G-Check gives you peace of mind

G-Check detects, in TT, TNS and TNC-S systems, any situation which may affect the safety of people, thereby giving peace of mind to those in charge of plant maintenance.

When an indirect contact occurs, it creates a loop leakage current which triggers the protection elements. Any incident affecting the grounding system (theft, damage, breakage, etc.) may cause the opening of this loop and thereby put people's lives at risk.

Therefore, this loop, which varies according to each installation's grounding arrangement, is monitored by the **G-Check**.

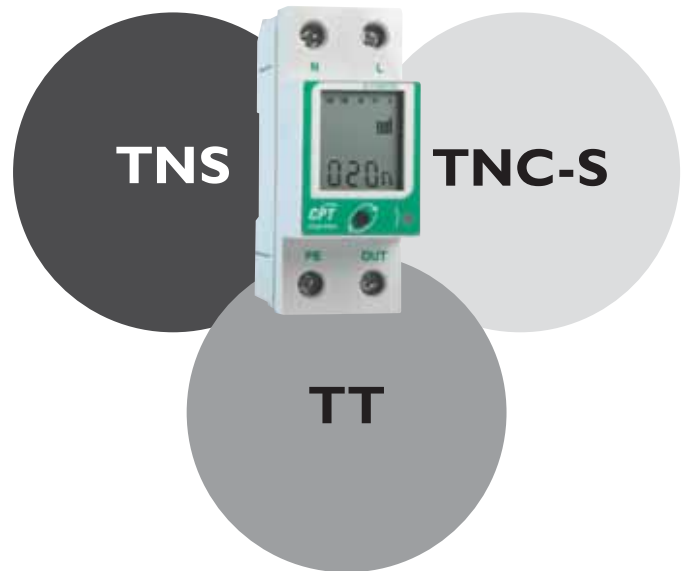
The **G-Check** ensures safety by measuring and monitoring the current leakage loop in the event of an accident.

G-Check value depending on the grounding arrangement

G-Check measurements of the current leakage loop have different meanings depending on the various types of grounding arrangements.

In the various grounding arrangements, PE and neutral cables have different trajectories, in other words, different earth-fault current loops. It is therefore normal for **G-Check** readings to have different meanings in the various arrangements.

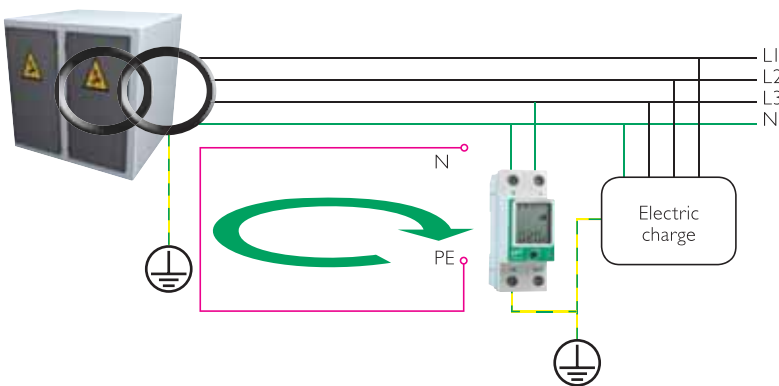
G-Check does not work for IT or TNC networks.



● G-Check in TT systems

In a TT system, the loop measured by **G-Check** is that which appears in this figure.

In this system it is checking the status of the loop, i.e. the overall value and status of the ground connection at both the installation and the transformer (or point at which the neutral is grounded) and of the resistance of the conductors themselves.



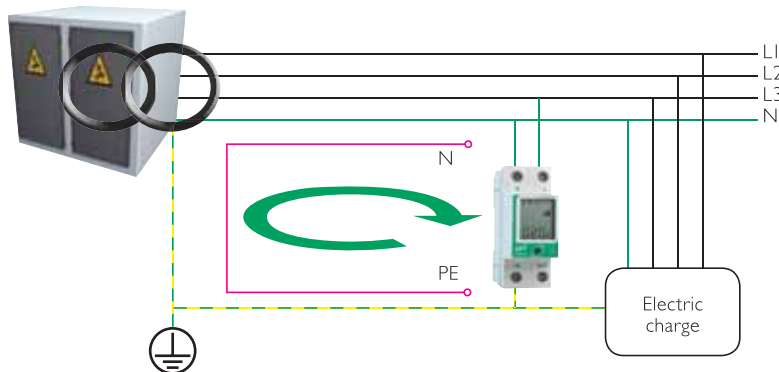
G-Check measurement loop or leakage current loop in TT systems.

In this system **G-Check** detects the following possible incidents:

- Breakage or improper wiring of the earth cable installation.
- Breakage or improper wiring of the earth cable at the transformer substation (neutral to earth connection).
- Deterioration of the installation's grounding connection due to aging of the earth rods, theft, or increased soil resistance in dry seasons.
- Deterioration of the grounding connection in the transformer substation.
- Breakage or improper wiring of the neutral cable.

● G-Check in TNS systems

In a TNS system, the loop measured by **G-Check** is that which appears in this figure. Unlike TT systems, the installation's PE cable does not have an independent grounding connection. For this reason, **G-Check** checks the resistance of the conductor loop, not the status of the grounding connection.



G-Check measurement loop or leakage current in TNS systems.

It is usual in TNS systems to connect the PE grounding cable at the entry to the installation. It becomes in effect a sort of TNS/TT system. In this case the fault current leakage loop, the loop measured by **G-Check**, takes two "paths". On one side it closes the loop via the PE conductor and on the other via the grounding connectors of the installation and the

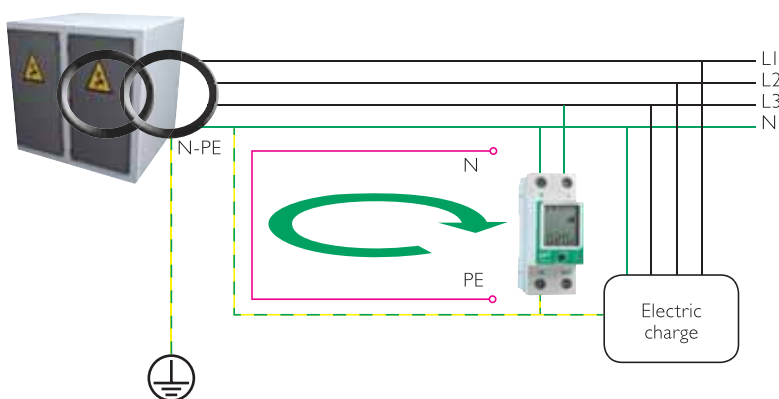
neutral wire. The PE wire loop has a much lower impedance, so it will set the **G-Check** reading value. If this loop fails (due to breakage, wear, theft, damage, etc.) the loop will continue to be closed thanks to the grounding connections, but with a much higher resistance value, so the **G-Check** would detect this problem.

In this system **G-Check** detects the following possible incidents:

- Breakage or improper wiring of the earth cable installation.
- Breakage or improper wiring of the neutral cable.

● G-Check in TNC-S systems

In a TNC-S system, the loop measured by **G-Check** is that which appears in this figure. In these systems, the loop checked by **G-Check** is the resistance of the PE and neutral cable up to the point where they split.



G-Check measurement loop or leakage current loop in TNC-S systems.

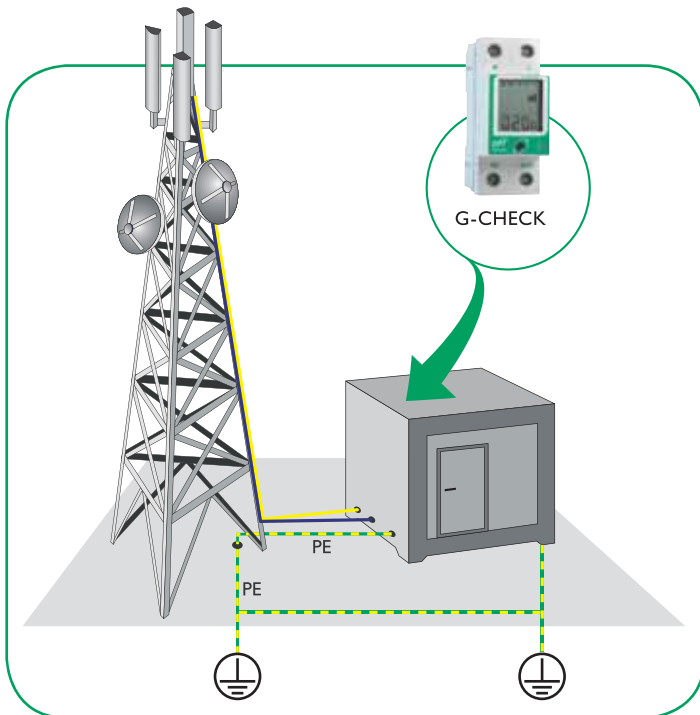
In this system **G-Check** detects the following possible incidents:

- Breakage or improper wiring of the earth cable installation.
- Breakage or improper wiring of the neutral wire from the split point between the neutral conductor itself and the PE wire.
- Proper connection between the neutral and PE wires.

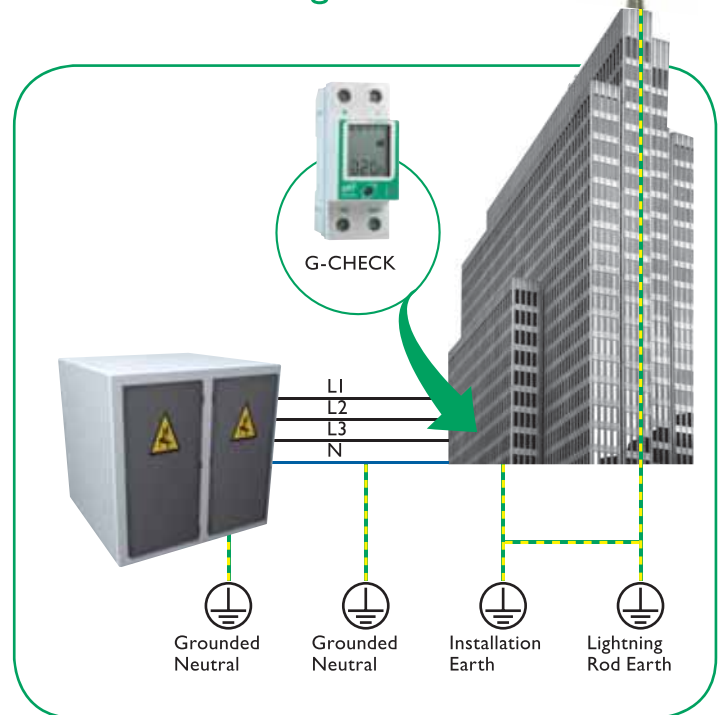
Applications

The grounding system of any electrical installation is essential. Therefore, **G-Check** is useful for any type of installation, whether remote or in the city. The following are some examples of possible applications.

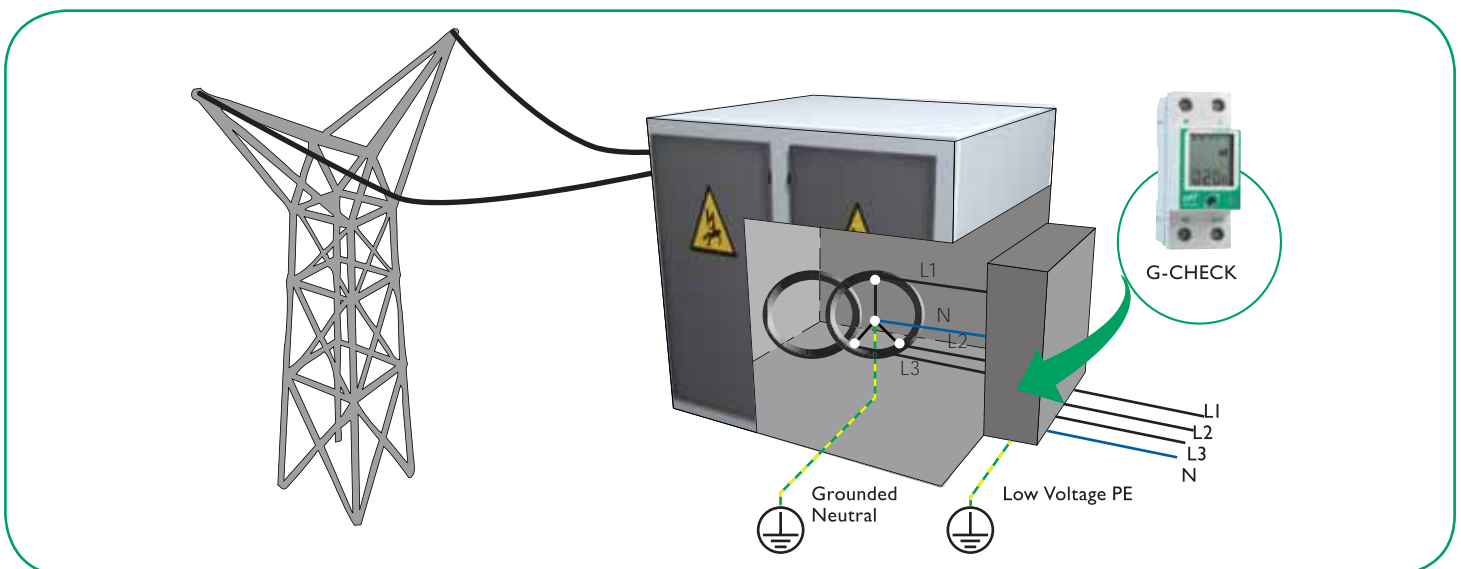
Telecommunications tower



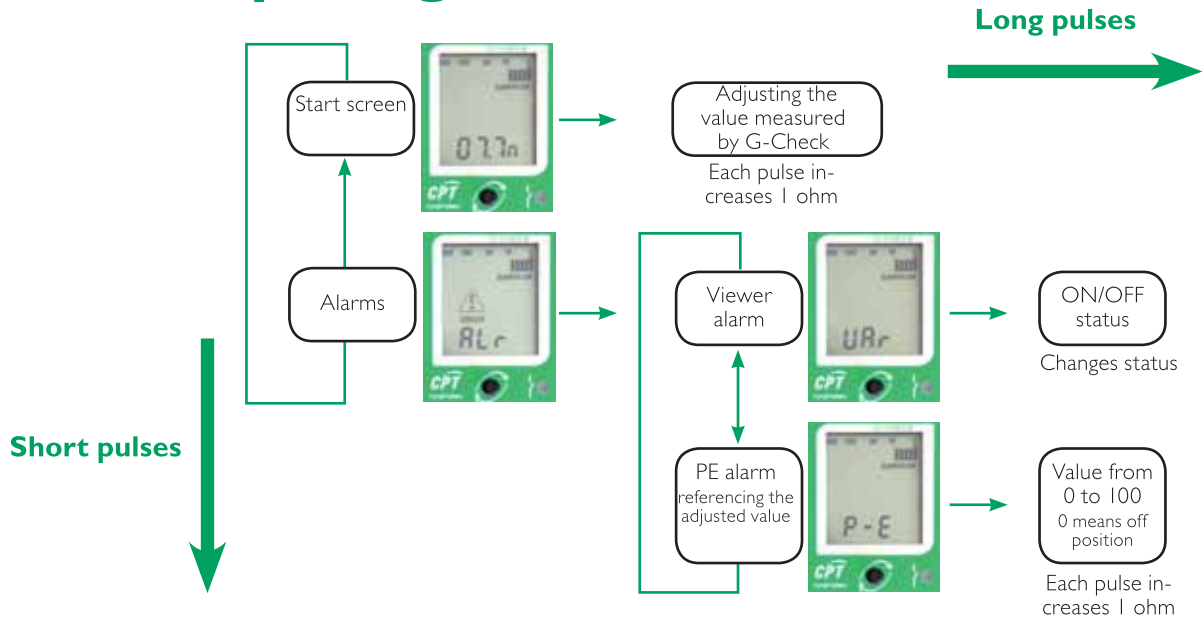
Office Building



Medium Voltage / Low Voltage Transformer



Set-up Diagram



Installation Recommendations

- To be installed only by qualified personnel. Follow terminal signs; improper connection of P-N or PE may result in distorted readings or damage to the equipment. Do not wire the neutral or phase to OUT; follow instructions in the diagram.
- Install G-Check with near upstream-located RCD and MCB protection against earth leakage, shortcircuit and overload.

- Wire all **G-Check** connections without voltage and then trigger the differential and the magnetothermal circuit breakers.

- The device reading may be affected by fluctuations of the rated voltage, the neutral voltage with respect to grounding, or high harmonic distortion.

Parts list and Specifications

Code	Part number	Description
77706500	G-CHECK 230V	230V grounding monitor with alarm output
77706550	G-CHECK 120V	120V grounding monitor with alarm output

Specification Data

Grounding system monitor for continuous status checking. It displays the measured value of loop resistance in the installation, thus ensuring safety. When the alarm value specified by users is exceeded, the G-Check triggers an alarm system through an output connection. Valid for grounding arrangements TT, TNS and TNC-S. The main specs are shown in the table below.

Specifications			
Code		77706500	77706550
Rated voltage	U_N	230 V~ +/-10%	120 V~ +/-10%
Frequency		50 Hz	
Output characteristics (referred to neutral)			
Rated current	I_{OUT}	0.3 A (70VA)	
Peak current (1 cycle)		7A	
Grounding resistance monitoring characteristics			
Alarm activation value	R_a	Adjustable	
Maximum measured value		500 ohms	



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