

HelloMac Geo: Smart early warning system for rockfall protection

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Introduction

HELLOMAC GEO is a patented, compact and robust device specifically designed for the alert in rockfall protection systems such as rockfall and debris flow barriers, simple and pinned draperies, and for geostability monitoring.

The structure and the special metal alloy makes HELLOMAC GEO suitable to be installed and operate in any environmental conditions, even the most extreme ones.

HELLOMAC GEO has been designed and developed modular for detecting potential dangerous events (movements, impacts, etc.) on protection systems. The activation of the rockfall alerting system at SEL, MEL or customized requirements (i.e. for rockfall barriers), is guaranteed by a series of electronic sensors which immediately send the alarm signal. HELLOMAC GEO sends also a live signal every day for communicating the system status. Control and alarm signals are transmitted using the most modern technologies: IoT, GPRS/LTE or satellite. In this way HELLOMAC GEO can be installed in remote areas with limited or no coverage.

HELLOMAC GEO is an external device installed on the rockfall protection systems without affecting in any way the systems - certifications.

Installation

Assembling the kit on site

Place the installation kit immediately downstream, or near the main metal post of each panel to be monitored according to the configuration agreed (i.e. in number and positions defined before the installation).

Bring:

- fixed keys suitable for the used wire rope clips
- PVC ties or as alternative steel wire, in order to connect the tie-ropes of HELLOMAC GEO to the net, along its path
- pliers
- ladder

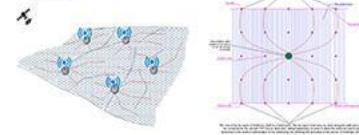


Figure 1. HELLOMAC GEO on drapery

Figure 2. Overall representation

Main installation details

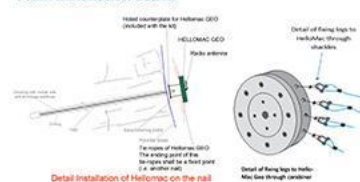


Figure 3. Fixing leg details

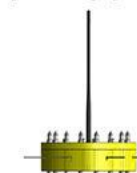


Figure 4. Overall view

The HELLOMAC GEO "legs"

Where and how to install?

Each leg should be fixed to a specific points of the drapery, as shown in fig.2.

It is recommended to use $\phi 3 - 4$ mm steel tie rods to make the HELLOMAC GEO legs.

At each end there must be a loop suitable to be connected to the head of an existing bolt of the drapery or an other fixed point. The ending point of the legs must be not suitable to be removed from the head of the bolt (or an other fixed point) if an event occurs.

The loop can be made using a sleeve or wire rope clips.

The tie rods supplied, which represent the "legs" of HELLOMAC GEO, have a fixed length, which is then resized on site according to the type of protection. For this reason, on delivery, the slots are present only at one end of each tie rod. The end of the tie-ropes of HELLOMAC GEO shall be a fixed point. The tie-ropes must not have no slack along the path and must be connected to the net with PVC ties or steel wire, without tightening, in order to allow the entire tie-rod to be tensioned in the event of deformation of the underlying rockfall mesh, allowing the activation of the sensor of HELLOMAC GEO.

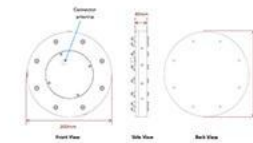


Figure 5. The body of HELLOMAC GEO

Despite the round shape, there is a precise orientation to respect during the assembly. In the upper part of the device, there is a black notch along the edge, as shown in fig. 6. This is the GPS sensor which must always be facing upwards.

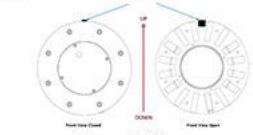


Figure 6. GPS sensor

HELLOMAC GEO must be installed as close as possible to the crest and above the rockfall mesh/es on a fixed location (ie, nails). Also, it must be compatible with the net fixing structures.

Using the provided plates and bolts, it is possible to fix the back of HELLOMAC GEO to the head of the nail without making any holes, as shown in fig. 3.

The recommended orientation of the device is shown in fig. 6.

Smart Application



Case History - Success Story

A comprehensive rockfall protection intervention, integrated with a smart real-time alarm system in Verbania, Italy

In the Northern Italy, a major road infrastructure called SS 34 runs alongside Lake Maggiore, connecting the city of Verbania with the Swiss border. Despite the beauty of driving alongside the lakeshore, this road had some hidden risks. Surveys were made and according to the findings, the slopes and ridges above the road were causing a serious risk of rockfall. Unfortunately, a fatal accident also occurred, proving how this slope instability was endangering the safety of people travelling on the road. The situation required a prompt response and Maccaferri took on the project.



The client asked for a major slope securing plan, which was to include protective measures to mitigate the risk of rockfall and also an impact warning system. The latter is not usually part of traditional rockfall protection works, but it becomes crucial when it comes to putting people's safety first. At the design stage, it was estimated that, if detachment occurred, the potentially unstable rock blocks would roll down the slope and reach the road with an energy of 500-600 kJ.



Maccaferri provided both active and passive rockfall protection systems. The active interventions were designed and implemented where the rocky ridges were close to the roadway: a double twist drapery mesh was chosen to cover the rock face and therefore to contain the falling debris.

In addition to the active system, RB1500 and RB2000 rockfall barriers were implemented. The barriers were designed at the Service Energy Level (SEL) in order to reduce the maintenance interventions in case of repeated impacts over time. Twelve lines of RB2000 barriers and two lines of RB1500 barriers were installed, all with an interception height of 4 metres, allowing more than 1 km of linear protection.

Moreover, the structural protection system was integrated with a monitoring strategy thanks to the innovative alert system by Maccaferri: HELLOMAC. The rockfall barriers were equipped with 32 HELLOMAC devices, which were all connected to the same transceiver device HUBIR. The transceiver was installed in a safe area, where it can easily checked following an impact.

Thanks to the IoT technology, the HELLOMAC App allows to monitor the system's status by daily basis and if any damage occurs, an alert will be sent right away, ensuring real-time and accurate monitoring.



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