

# AppNote:

## T1N\_M4N

### Rugged High Mountain Meteorological Mast.



#### Motivation

Mountains play a crucial role in the climatic system, in the water cycle and are excellent indicators of climate change. Nevertheless, their complex orography, high altitude and extreme environmental conditions make automatic weather monitoring a big challenge for instruments and humans.

Very often standard structures and sensors become useless at mountains due to snow precipitation, rime or total breakage due to strong wind combined with these. It is hard to find long time meteorological series of scientific quality at mountainous regions.



*“Complexity of terrain and harsh environmental conditions make it difficult to keep long and representative data series at mountains.”*

As a result of interMET long experience on weather monitoring at mountains, we have developed a rugged ad-hoc housing for weather sensors and data logging systems.

#### Objective

The objective is to have a rugged and compact housing for scientific quality meteorological sensors, data logging, telecommunications and power systems. This housing should be easy to install and have minimum environmental impact (no fences, no civil work, low visual impact).

#### Case Study Summary

##### Services:



##### Location:

Sierra de Guadarrama National Park (2000 m.a.s.l.), Spain.

##### Equipment Used:

OTT Pluvio<sup>2</sup>, Hukseflux NR01 radiometer, Felix SL300 snow depth sensor, Rotronic HC2-S3 air temperature and relative humidity sensor, Campbell Scientific (CS) CR3000 data logger, CS AM16/32B Multiplexer, PT 1000 probes, GPRS Welotec router.

##### Measured Parameters:

Precipitation (intensity, total), air temperature, relative humidity, solar radiation four components, snow depth, underground temperature (16 depths) and soil temperature and humidity



## Methodology

The whole structure is formed by four modules of aluminium or steel for easy transportation. It can be fixed to the rock using epoxy fixings. There are no sharp edges to prevent animal or human harming.

Inner access is protected using security bolts for minimizing not authorized operation or vandalism.

OTT Pluvio2 gravimetric rain gauge is used for measuring all kinds of precipitation. The wider inlet is ideal for minimizing rime losses and snow blocking.

*“Working in mountainous areas requires a good training on labour security and environmental consciousness.”*

The huge amount of data is stored in a Campbell Scientific CR3000 logger and transmitted to a central server periodically through GPRS.

The energetic autonomy has been optimized. There is room for more than 180Ah battery bank. Even though human intervention would not be necessary for months, interMET recommends to have a maintenance program that includes regular preventive actions. These programs are specially important for mountain sites due to the harsh environmental conditions and sources of interference.



## Results

T1N\_M4N is now part of the Sierra de Guadarrama National Park and GumNet Networks (Central System, Spain).



Due to our excellent trajectory, procedures, professional competences and environmental commitment, interMET has accreditation on ISO 9001:2008 and ISO 14001:2004 for the activity: “Design, installation and management of meteorological and environmental networks”.



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