SINE SOLE SILEO: THE MOST ACCURATE SUNDIAL IN THE WORLD!

MUOTTAS MURAGL

St. Moritz
ENGADIN MOUNTAINS

SUNDIALS IN GENERAL

Already in ancient times, people used the sun and moon to determine the time of day and year. Initially, they used their body to ascertain certain times by measuring the length of their shadow. Over the centuries, the construction of sundials and moondials became increasingly sophisticated, enabling time to be measured more and more precisely. In summer 2011, Fred Bangerter from Faulensee, in Canton Berne, constructed the most accurate sundial in the world and appropriately named it «SINE SOLE SILEO» (Latin for «Without the sun, I fall silent»). With this sundial, it is possible to read the time to an accuracy of an incredible 10 seconds.

FROM SOLAR TIME TO STANDARD CLOCK TIME

A sundial registers so-called «local apparent time» (solar time). However, only very seldom does this correspond to «local mean time» (standard clock time). While biologists, astronomers and sundial enthusiasts are more interested in local apparent time, «normal» observers generally also want to be able to read the current clock time. As a result, the operating instructions also include a table showing the time corrections for each day of the summer half-year. Besides the longitude of the sundial's location on Muottas Muragl, the table takes into account the so-called «equation of time» and, between spring and autumn, summer daylight saving time.

READING THE TIME DEPENDING ON THE TIME OF YEAR

SINE SOLE SILEO is an equatorial sundial. Only with this type of sundial is it possible to read the time to such an accurate degree at any given point in the day. An equatorial sundial needs to be positioned at an inclination; on Muottas Muragl, it is placed at an angle of 43.5 degrees. For meteorological, safety, aesthetic and stability reasons, it transpired that the best solution was to mount the sundial on an erratic boulder. However, this means that the sun only shines on the dial plate during the summer half of the year, between 21 March and 23 September. In the winter months, the sun is too low in the sky and only manages to reach the lower part of the dial, which is covered by the boulder. Consequently, an equatorial sundial mounted in this way only functions as a sundial between spring and autumn.

During the winter half-year, however, when the moon is relatively full, this same device can be used as a moondial to give an almost equally precise time reading. For thanks to the moon, the sun also «shines» at night; the moon simply reflects the sunlight. If the position of the moon in relation to the sun is known, it is possible to calculate the sun's position – and thus the device can also tell us the solar time at night.

CONSTRUCTION OF THE SUNDIAL

Display panel with operating instructions and time correction table

Gnomon with narrow slit

Line of light on shadow image

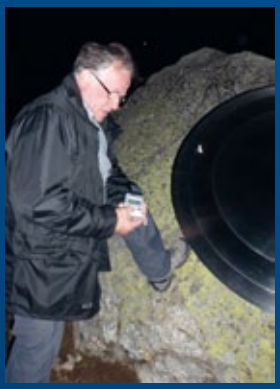
Time correction scale

Time reading scale

Fine adjustment line

Vernier scale (5-second intervals)

HOW IS THE SUNDIAL SO INCREDIBLY ACCURATE?



Over the years, amateur constructor, Fred Bangerter, has built all kinds of sundials. These include a table sundial measuring less than 12 centimetres in diameter. Despite its small size, this device is accurate to just one minute thanks to its absolutely unique construction. Fred Bangerter was convinced that a larger sundial would enable the time to be read even more precisely. And thus the most accurate sundial in the world came to be installed on Muottas Muragl. In order to achieve this record-breaking level of precision, the following improvements were made to the basic design:

1. Daily time correction

Before reading the time, the observer can precisely set the disc to a prescribed time correction value, amounting to 2.5 seconds a day. This can be taken from the time correction table on the display panel. Thus an adjustment can be made simply and precisely to compensate for the difference between the so-called local apparent time (solar time) and the local mean time (clock time).

2. Interplay between the gnomon and the adjustment line

The sun shines through a narrow slit in the gnomon, causing a thin line of light to be cast on the shadow image. This allows the adjustment line, the end of which is used to read the time, to be positioned very precisely.

3. Additional vernier scale (5-second intervals)

This additional 5-second scale enables the observer to read the time between the individual minute-markers very precisely.

FURTHER INFORMATION

Further information about the sundial/moondial, as well as instructions on how to use it, can be found on the websites, www.engadin.stmoritz.ch and www.muottasmuragl.ch, as well as on location.

The following parties contributed towards the realisation of the sundial: Engadin St. Moritz Mountains (contracting party); Fred Bangerter, 3705 Faulensee (idea & construction); Müller Schlosserei AG, 3116 Kirchdorf (manufacture & assembly); Sepp Oberholzer AG, 9213 Hauptwil (laser engraving of sundial) ; GEO Grischa AG, 7524 Zuoz (adjustment of sundial); Keller Laser AG, 7203 Trimmis (laser engraving of instruction panel).

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