

Drives for Antarctic Temperatures of -125°C

The Dome C telescope in the Antarctic is in constant use, even under some of the toughest weather conditions on the planet.

The Concordia Station (known as Dome C) research station lies in Eastern Antarctica at 3,200 m above sea level in one of the coldest places on Earth. Temperatures here fell recently to a new record low of -84.6°C. A telescope of the University of Nice's Astrophysics Laboratory (LUAN) has been in constant use for years in this inhospitable place - 24 hours a day, 7 days a week.



maxon

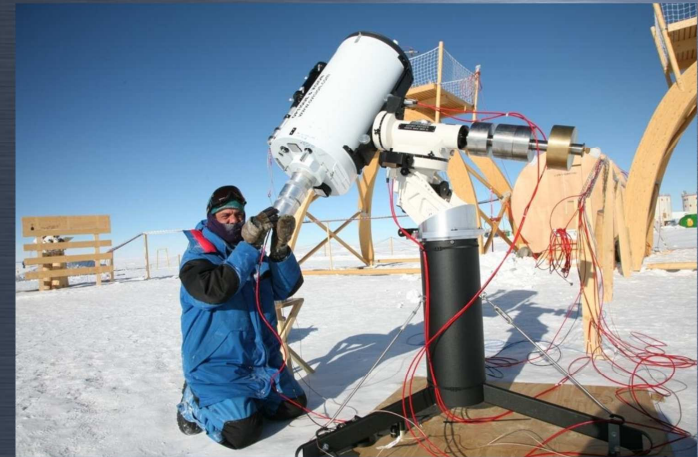
Object: LUAN telescope on Astro-Physics' 3600GTO telescope mount/ place: Antarctica / outside temperature: -75°C / wind-chill factor: intolerable

The telescope is mounted on a motorized base (telescope mount) type 3600GTO produced by the US company Astro-Physics. The company develops and produces high-precision telescope mounts and has wide experience in all kinds of application areas. Various units from the 900GTO and 1200GTO ranges have been in constant use in the Antarctic since the beginning of 2000. This trouble-free and continuous use is of great significance, as maintenance work is extremely difficult and very dangerous to set up. This is because the low temperatures and inhospitable windy conditions make it almost impossible for the maintenance team to work outside and essentially impossible in the Polar night which lasts for six months. This means that the entire system has to run perfectly 24/7 for at least half a year.

It is easy to see why the reduction gearing is one of a telescope mount's key features. This is because it must be continuously maneuvered, smoothly, without juddering so that the telescope can give a completely consistent view of a particular object in the sky. If not, the object quickly disappears from the telescope's field of vision, making it impossible to plot its trace without disruption. In order to "fix" the object in the field of vision, the heavy mount which weighs around 250 kg, must be motorized accordingly.



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Antarctic summer: installation work on the telescope



Wally Piorkowski, Head of Production at Astro-Physics and himself a scientist, speaks from experience: "Because of their high reliability and longevity, Astro-Physics only uses drives by maxon motor for all its telescope mounts". The lubricant used in the bearings is ideally geared towards the extreme temperatures experienced at Dome C in the Antarctic. Once mounted, the motors from maxon require no more lubrication, but this would be almost impossible anyway, given the ambient conditions. The motors also have coreless windings and Neodymium magnets to help deliver maximum performance in a compact construction volume. Graphite or precious metal brushes are used for the motors' mechanical commutation. Their linear characteristics make them very easy to implement in telescope mounts.

Every mount has two axes:

one - the right ascension axis is set up parallel to the Earth's axis and allows the telescope to move across the Earth's equator. To be precise, the motor drives against the Earth's rotation so that the object in the sky appears fixed. The reduction gearing was developed in-house by Astro-Physics. The second axis, known as the declination axis, is arranged at right-angles to the right ascension axis and maneuvers the telescope intermittently at the object's angular distance to the celestial equator. The motors of both axes are fitted with 3-channel encoders type HEDS 5540.

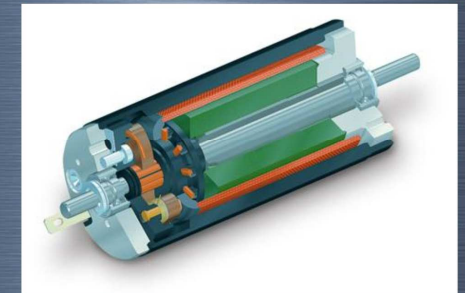
Orientation in any required direction is possible as the axes are offset at 90° to each other.

"We use maxon A-max motor for our smaller mounts, maxon RE 25 motors for telescope mounts, as used in Dome C", continues Wally. The RE 25 offers maximum torque and power density in its class. "Another major reason for using maxon motors is the fact that they have no magnetic detent" he adds. Detent is described as the jerky, sudden movement that typically occurs with most iron-core motors. By contrast, maxon motors feature an ironless core which enables them to run detent-free, even at extremely low speeds. This is a basic requirement in a telescope mount.

"Mounts are often bought separately from the telescope" explains Wally. "For instance, astronomical associations, colleges, institutes etc. buy telescopic equipment separately from the mount then assemble the two themselves." Astro-Physics' telescope mounts 3600GTO and 3600GTOPE are used in many private homes, universities, research institutes and educational establishments, astronomical associations, joint organizations or in solar technology companies.



Self-supporting ironless winding type maxon



maxon motor RE 25, Ø 25 mm, graphite brushes, 20 Watt