



Cell of the fifth mirror (M5) for the Extremely Large Telescope



CELL OF THE FIFTH MIRROR (M5) FOR THE EXTREMELY LARGE TELESCOPE

Cliente: European Southern Observatory (ESO) **Fecha inicio: abril del 2020**

Sener has completed the design, construction, validation and delivery of the fifth mirror cell (M5) of the ELT (Extremely Large Telescope).

The M5 cell is a **fast optical correction system**, which **stabilizes the image**, compensating for perturbations from wind, atmospheric turbulence, or the telescope mechanisms, which affect image quality. At the same time, it has an **active alignment system** capable of reconfiguring the cell position.

The optical correction stage consists of a **Tip-tilt mechanism formed by three piezoelectric actuators**. This mechanism allows correction of disturbances with accuracies of up to 50 nrad within a bandwidth of 10 Hz.

In turn, the active alignment stage allows repositioning the mirror in a range of ± 5 mm in piston and ± 5 mrad in tip-tilt with a repeatability of ± 0.1 mm and ± 0.05 mrad respectively.



Tip-Tilt correction in a range of ± 0.5 mrad

Tip-tilt mechanism formed by three piezoelectric actuators

Active alignment system in a range of ± 5 mm in piston and ± 5 mrad in tip-tilt



MAIN CHARACTERISTICS OF THE M5 CELL:

- SiC elliptical mirror, with dimensions of 2.7 m x 2.2 m and 440 kg weight (out of Sener range).
- Tip-tilt correction in a range of ± 0.5 mrad, with accuracies of 50 nrad in bandwidth up to 10 Hz.
- Tip-tilt mechanism based on three piezoelectric actuators, capable of individually moving 270 kg loads with a range of over 600 μ m. Total weight of the mechanism: 400Kg.
- Active alignment system with a range of ± 5 mm in piston and ± 5 mrad in tip-tilt with a repeatability of ± 0.1 mm and ± 0.05 mrad respectively.
- Alignment mechanism based on three highly rigid eccentric actuators, which convert rotary movements into vertical movements. Total weight of the mechanism: 950 kg.
- Total cell weight: 1350 Kg.



In 2010, Sener already designed and manufactured the M5 mirror field stabilization unit demonstrator, in which the main features of the M5 mirror field stabilization system were designed and validated.
