

### Drones services

As ancillary service, E&T is able to provide the thermography for photovoltaic installation. Taking advantage from drone technology as a tool for thermography in the field of photovoltaic systems. It is a safe and extremely fast solution to identify any hot spot warning due to the presence of a malfunction of the panels or modules. Thanks to this particular equipment it is in fact possible to verify the effectiveness of the panels without altering the balance of the panel, providing interventions aimed at solving the problem. In order to ensure that there is no motion blur, flight speed cannot be more than 3 m/s. The flight must be parallel along the rows of panels, with 80% overlap (frontlap) in the flight direction and 40% overlap (sidelap) between the passes.

Infrared images (thermal images):

- File format:

- radiometric xxx.jpeg

- thermal xxx.tiff

- Sampling of the plant:

- 5 cm / pixel (Ground Sample Distance - GSD) or less for defect identification at a single cell level

- 15 cm / pixel or less for the module level defect identification.

- Images contain metadata (GPS position, relative altitude, gimbal trim, timestamp, etc.)

For inspections the following hardware is used:

- Multi-copter APR quadricopter DJI Matrix M210 with gimbal

- Thermal imaging camera: FLIR radiometric camera with 640 × 512 resolution and 9-19mm lens

- High resolution camera: minimum resolution of 3000 × 4000 pixels (Zenmuse X5)