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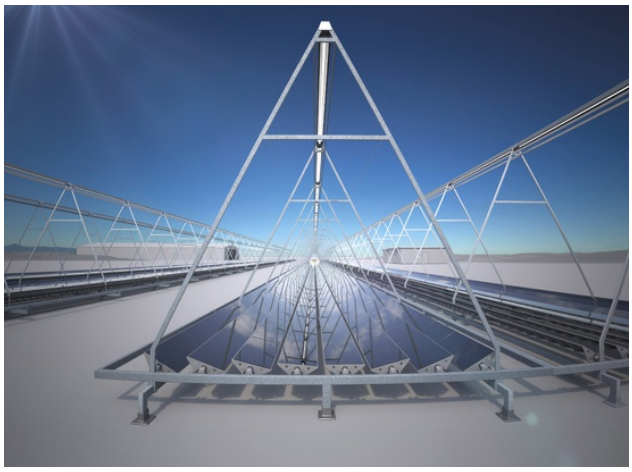
Towards the sun: inclinometers in CSP

The F199 two-axes inclinometer is designed for precision measurements and comes in a robust housing suitable for concentrated solar power (CSP) systems.



In CSP systems, there are countless mirrors reflecting sunlight onto a receiver (Source: Pepperl + Fuchs)

This article originally appeared in the June issue of the CAN Newsletter magazine 2019. This is just an excerpt.

The recently by Pepperl + Fuchs introduced tilt sensor features CANopen connectivity and supports the CiA 301 application layer and the CiA 410 profile for inclinometer. The two-axes sensor measures angles from 0° to 360° with an accuracy smaller than ±0,15° in both axes — across the entire measuring range. The legacy inclination sensors from the supplier are based on a two-piece mounting concept, which makes them sturdy. A metal mounting bracket provides the sensor module with impact protection. The F199 one-part inclination sensor supplements this existing portfolio. A corrosion-resistant aluminum housing, encapsulated electronics, and 100-g shock resistance make it robust.

To suit CSP applications, the product comes in IP68/69-rated housing. The ingress protection (IP) rating is standardized in IEC/EN 60529. The first indicates the degree of protection (of people) from moving parts, as well as the protection of enclosed equipment from foreign bodies: “6” is the protection against dust that may harm the sensor. The second digit defines the protection level that the enclosure enjoys from various forms of moisture (drips, sprays, submersion, etc.): “8” indicates a protection against temporary immersion and “9” against prolonged effects of immersion under pressure. The rugged inclinometer can be used in CSP applications to generate energy from solar heat. CSP plants typically have countless mirrors that concentrate solar radiation onto a receiver or receiver area.

A heat medium inside the receiver is heated by the sunlight and drives a steam or gas turbine, which in turn generates power. The more sunlight, the more power can be generated. To avoid scattering loss from inaccurate mirror alignment, tilt sensors detect the inclination angles of the mirrors. Besides the rugged housing, the sensors also feature an extended temperature range of -45 °C to +85 °C to meet the requirements of such challenging harsh environments. The precious measuring of the inclination angle allows the mirrors to be aligned with the sun’s rays so that as much solar radiation as possible can be converted to power. With this, the products contribute to increased effectiveness and efficiency in CSP plants.

CSP systems focuse sunbeams by using mirrors or lenses to concentrate a large area of sunlight onto a small area. Electricity is generated when the concentrated light is converted to heat, which drives a heat engine connected to an electrical power generator. This technology is not yet commercially competitive with photovoltaic (PV) systems. CSP needs a large amount of direct solar radiation.

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