



**SOLAR**  
INSTRUMENTATION

# SOLAR INSTRUMENTATION

**Concentrated Solar Power (CSP) plants** are complex systems relying on the individual performance of multiple optical elements (heliostats, receiver tubes...) and the precise prediction of environmental factors (soiling, atmospheric attenuation, weather...). Getting each of these elements to work as efficiently as possible is a challenge faced by all CSP plants.

At Aragon Photonics we produce **precision instruments to help the operation, maintenance and supervision of CSP plants** that allow us to make the right decisions to guarantee the highest energy efficiency.

With a patent portfolio licensed in exclusive by ABENGOA and our in-house expertise, we are able to provide unique solutions specifically designed for field operation in CSP plants. Precision optics, high-quality manufacturing and deep knowledge of CSP needs drives our value proposition for this expanding field.



## CONVENTIONAL USERS & APPLICATIONS



THE CUSTOMER



THE APPS



OUR SOLUTION

1

**Engineering & Procurement**

Proficiency consulting

An EPC company have made a huge investment in the solar plant. Among all the supervisory work they must do, an EPC needs to control the degradation of the heliostats and thus verify the O&M company proficiency.

2

**Operation & Maintenance**

Monitoring of CSP efficiency

O&M companies, directly or through a sub-constructor, are the ones in charge of keeping maximum productivity levels of solar energy in the solar plant. For that purpose, plant managers need to monitor the reflector soiling and control the heliostat cleaning frequency.

3

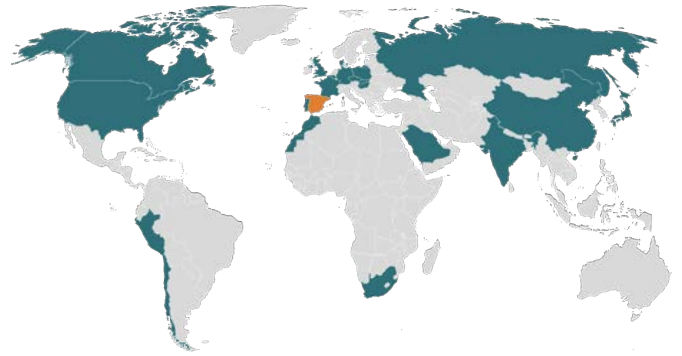
**Cleaning companies**

Optimize water and fuel consumption

Having a reflectance value after washing the heliostats helps cleaning companies in better planning their cleaning routines and methods. Besides, it helps them to reduce water and gasoline consumption and make a more sustainable world.

## OUR JOURNEY IN CSP INSTRUMENTATION

Aragon Photonics started its activities on CSP instrumentation in 2018 by licensing a patent portfolio from Abengoa of measurement devices developed by Photonics Technologies Group (GTF). GTF has been Aragon Photonics' R&D partner since it was started in 2004, with key contributions to the Optical Communications and Fiber Optic Sensing divisions patent and product portfolios and together we will continue innovating in the field and bringing new products for CSP instrumentation in the coming years.



Aragon Photonics CSP instrumentation products are used in **more than 35 commercial CSP plants worldwide.**



# CONDOR

CONDOR is a portable reflectometer designed for field measurement of reflectivity in CSP plants in less than 10 seconds with a high accuracy and precision. It can be applied to both flat and curved reflecting surfaces of up to 4 mm thickness.

CONDOR provides you with the necessary information to optimize the cleaning strategy, minimizing cost and improving the solar field overall performance.

Its ergonomics, portability and robustness make it ideal for its use on a daily basis in the solar field. It can perform more than 2000 measurements with a single battery charge and can store thousands of tagged measurements in its memory.



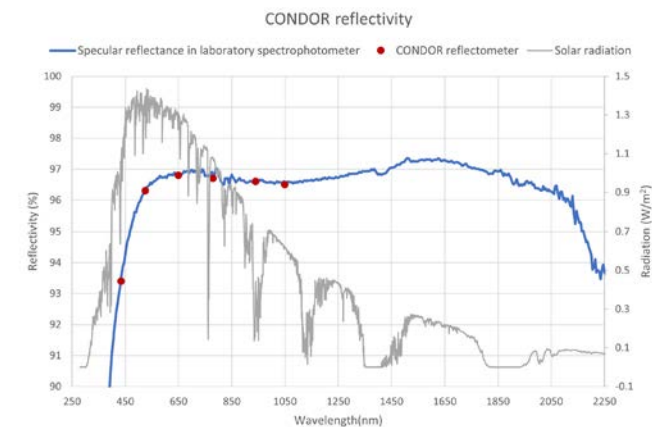
## TECHNOLOGY

CONDOR is specifically designed for the characterization of solar reflectors for CSP generation. It measures specular reflectance for solar spectral distribution (ISO 9050; AM 1,5) through measurements at 6 different wavelengths distributed in a wide range of the solar spectrum.

CONDOR can be auto-calibrated using an accessory pattern mirror, simplifying maintenance and guaranteeing the quality of the measured results.

## APPLICATIONS

- Reflector soiling monitoring
- Better planning of cleaning routines and methods
- Heliostat degradation monitoring



## KEY FEATURES

- Fast measurement (10s)
- High accuracy (<0.4%)
- Designed for CSP field use
- For flat and curved mirrors
- Ergonomic and durable
- Long battery life



## TECHNICAL SPECIFICATIONS

Measurement	
Wavelengths (nm)	435, 525, 650, 780, 940, 1050
Measurement time	10 sec.
Accuracy	±0.2 %
Repeatability	±0.1 %
Half acceptance angle	145 mrad
Measured spot size	5.85 mm <sup>2</sup>
Measurement area	23.3 cm <sup>2</sup>
Contact surface	261 cm <sup>2</sup>
Temperature operating range	-25 °C to +55 °C
Solar distribution standard	ISO 9050, ASTM
General	
Pattern mirror thickness	0 - 4 mm
Battery life (25 °C)	>2000 measurements
Single measurement size	31 Bytes
Interface	USB
Memory	Internal. 100.000 measurements

## OTHER SPECIFICATIONS

Physical & electrical	
Dimensions (mm)	217 x 130 x 145
Weight	1.4 kg
Screen size	2.5 inches
Power	3.7 V, 0.655 A
Software	
System requirements (data downloading)	Windows XP/7
Output file format	ASCII, .csv



# INCUS

INCUS is a portable spectrophotometer that allows the measuring of the receiver tube optical properties in the solar field of a parabolic trough CSP plant.

INCUS design is ergonomic and robust: with a handle on its upper side allowing to be used on any position; and with a mechanical and electrical configuration to minimize damages. It takes more than 400 measurements with a single battery charge and gives you GPS localization data store.

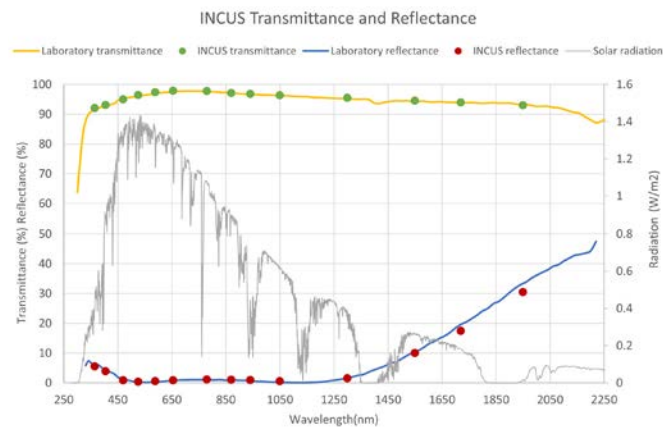
INCUS helps O&M activities such as the control of the decrease of the soiling ratio to determine the cleaning cycles.



## TECHNOLOGY

INCUS obtains the outer tube transmittance and the inner tube absorbance values rapidly and accurately for solar distribution through measurements at 14 different wavelengths including infrared and visible range.

INCUS uses an algorithm of signal processing that allows taking measurements during the day or night with no influence from the sun light.



## KEY FEATURES

- 14 wavelengths measurement, including infrared and visible range
- High accuracy levels
- GPS localization
- Easy-to-use, long battery life

## APPLICATIONS

- Monitor the evolution of tube's transmittance
- Measure the efficiency of the applied cleaning method



# Receiver tube spectrophotometer

## TECHNICAL SPECIFICATIONS

		INCUS 70	INCUS 80
<b>Measurements</b>			
Wavelengths (nm)		365, 405, 470, 525, 588, 655, 780, 870, 940, 1050, 1300, 1550, 1720, 1950	
Measurement time		40 sec.	
Accuracy (3 $\sigma$ )	Transmittance	$\pm 1.0$ %	
	Reflectance	$\pm 0.3$ %	
Uncertainty	Transmittance	$\pm 0.4$ %	
	Reflectance	$\pm 0.2$ %	
Temperature operating range		0 °C to +55 °C	
Solar distribution standard		ISO 9050, ASTM	
<b>General</b>			
Battery life (25 °C)		>400 measurements	
Measurement memory		Micro SD 16 GB	
Single measurement size		1 KBytes	
Localization		GPS	
Interface		USB	

## OTHER SPECIFICATIONS

<b>Physical &amp; electrical</b>		
Tube diameter <sup>2</sup> (inner / outer) (mm)	70 / 125	80 / 135
Dimensions (mm)	280 x 205 x 220	290 x 205 x 230
Weight	2.35 kg.	2.45 kg
Screen size	3.5 inches	
Power	3.6 V (CC), 9000 mAh	
<b>Software</b>		
System requirements (data downloading)	Windows XP/7/10	
Output file format	.txt	

2. Others on request



INCUS™ is based on technology owned by ABENGOA Solar New Technologies and protected under patents, licensed in an exclusive basis to Aragon Photonics Labs.

# INDUSTRIES & PRODUCTS



## HDAS

High Fidelity Distributed Acoustic Sensor



## BOSA

High Resolution Optical Spectrum Analyzer

## HDCA

High Definition Component Analyzer



## CONDOR

Portable solar reflectometer

## INCUS

Receiver tube spectrophotometer



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