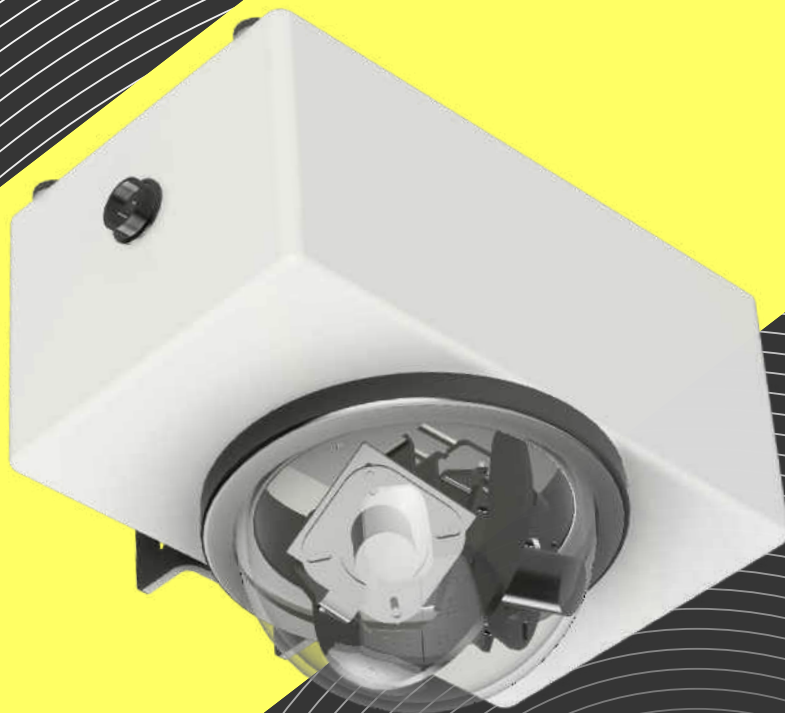


THE HARDWARE



S O NAH
SUSTAINICE URBANIZATION

HARDWARE OVERVIEW

OVERHEAD SENSORS

Machine-learning technology embedded in camera-based sensors; placed at height and able to digitize up to 72 parking spots at once; over-the-air updates and capable of multiple use-cases at once. Either retrofitted **at** or fully integrated **into** LED Lighting head.



LED SIGNS

Live displays of parking data; clear and modern signage to fit into an urban landscape; available with adaptable matrix displays.

GROUND SENSORS

Ground sensors for parking detection; both in- and onground versions available for digitizing single parking spots; transferring data via LoRa, LoRaWAN, or NB-IoT.



POWER SUPPLY

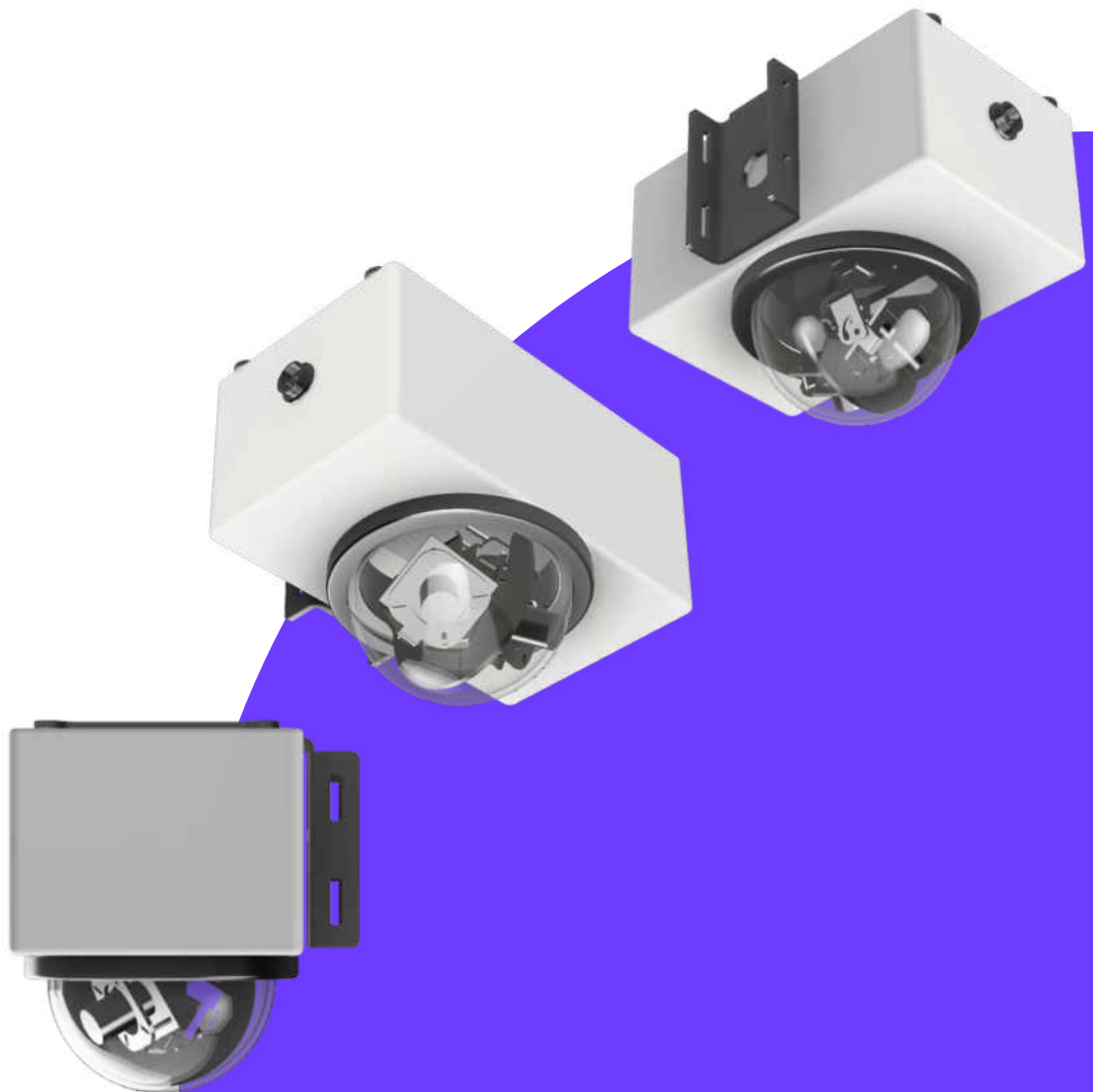
Multiple combinations of power supply for various needs; existing infrastructure integration, durable battery options, and solar-powered solutions for sustainable choices.

OVERHEAD SENSORS

This is our embedded vision sensor; a camera-based sensor which provides metadata for multiple use-cases at once. It works using a pre-trained neural network to detect, for instance, the occupancy status of all parking spots within its range of vision.

As a GDPR-compliant software, the detection process requires no images to be transferred at any time. In fact, the only 'transfer' while detecting is of metadata. This is because the sensor itself contains the computing power needed to process the visual data into metadata, e.g. occupancy of single parking spots, object classification, car counting, traffic queues and more.

For Smart Parking services, our overhead sensors have the unique benefit of being able to detect single spot occupancy for up to 72 spots at once. They are also kept updated with over-the-air updates and, with a multitude of power supply options, can be sustainably maintained with little effort.



IMPORTANT DATA

OUR EMBEDDED VISION SENSORS



DIMENSIONS
92x200x120mm

MATERIALS
Carbon, Steel

WARRANTY
2 years

PRODUCT LIFETIME
5 Years

POWER INPUT
PoE or 12v/1.5A

TEMPERATURE AREA
-30°C to 80°C

NECESSARY HARDWARE
Communication tech (4G, 5G)
Power Management
Power box

DETECTION QUALITY
Stadwerke Münster: 100%
SIEMENS — Erlangen: +98
MHP — Ludwigsburg: 98.5%
Fraunhofer Paderborn: +98%

Ø AVAILABILITY
backend, API, Sensor — 99%

INSTALLING YOUR OVERHEAD SENSOR

BENEFITS AT A GLANCE

COST EFFICIENT

Up to 72 parking spots with
a single sensor

MULTIPURPOSE

One sensor, many use cases

SEAMLESS

Easily integrated into
infrastructure

SUSTAINABLE

Long life and low
maintenance

WHEN ARE THEY THE BEST SOLUTION?

Based on our 8+ years in the market, we can say that if a single sensor can digitize more than four parking spots at the same time, overhead sensors are the most cost-efficient solution.

INSTALLATION

- Simple installation style with easy-to-follow instructions
- Each sensor can be installed within 20 minutes
- Depending on pre-existing power structures, little to no disruption of daily operations
- No need to clear out car parks to install, for instance, ground sensors in each spot
- We can install the sensors independently of the outdoor temperature

COMBINED SOLUTIONS

No 24/7 power supply or street lights powered only at night?

- » Batteries with solar panels (p.8)
- » Batteries charged overnight (p.8)

Want a counting solution, but also want to provide single spot detection for, say, disabled parking?

- » The same overhead sensor for both if the camera angle works
- » Extra overhead sensor if more than 4 spots to be detected individually
- » On/inground sensors (p.6)

GROUND SENSORS

For the detection of single parking bays, we offer two different types of sensors for in-ground and on-ground deployment.

Both sensors combine magneto with light or radar technology to create a precise and durable product.

The data from these sensors can be easily integrated into the customer's chosen interface, with connectivity provided via LoRa, LoRaWAN or NB-IoT. Each option has its advantages, and the flexibility means that we can easily integrate ground sensors into existing infrastructure.

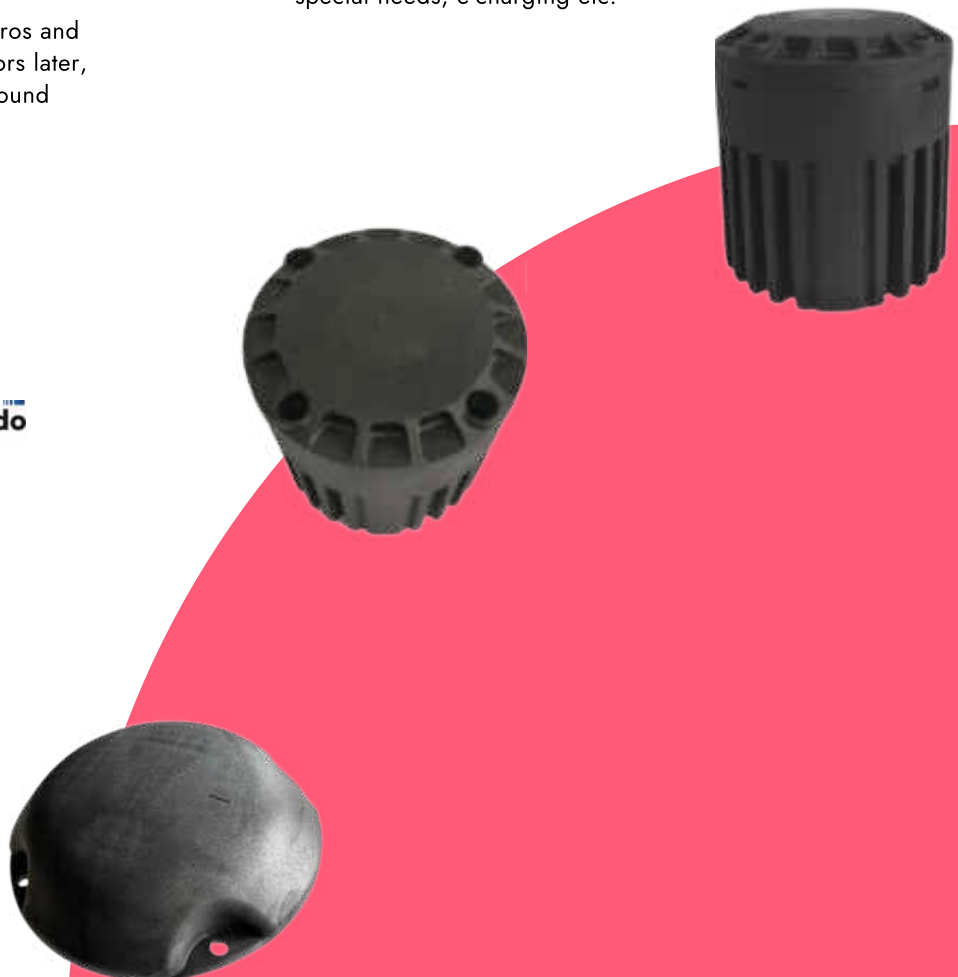
While we discuss the various pros and cons of in- and onground sensors later, the main use cases for each ground sensor are similar.

They are very useful for difficult locations that an overhead sensor cannot cover, for areas where fewer than five parking bays can be detected simultaneously by an overhead sensor, or as part of a mixed counting solution where customers require occupancy data for only a few specific locations, e.g. parking for people with special needs, e-charging etc.

SONAH partners with



for ground sensors



IMPORTANT DATA

IN- AND ONGROUND SENSORS



DETECTION QUALITY
>98%

DIMENSIONS: ONGROUND
193mm x 48mm

DIMENSIONS: INGROUND
99mm x 104mm

DETECTION REACH
2m

REACTION TIME
10 seconds

POWER INPUT
Battery

BATTERY LIFETIME
up to 10 years (replaceable)

TEMPERATURE AREA
-40°C – 85°C

STATIC LOAD
20t

INSTALLING YOUR GROUND SENSOR

BENEFITS AT A GLANCE

RELIABLE

Up to 98% detection accuracy

SYNERGETIC

Combines well with overhead sensors

VERSATILE

Multiple connectivity options

DURABLE

Up to 10 years battery life

WHEN ARE THEY RIGHT FOR YOU?

- There is a low number of parking spots to digitize in one area
- There is already a counting system in place or planned, but also a few special parking spots (e.g. disabled parking, e-charging spots) need individual detection
- A city has a LoRaWAN system deployed and is looking for ways to maximize its value
- The parking lot sees limited use, meaning the status changes per day can be kept to five (for optimum battery life)

AVOID THESE RISKS

Be sure that the area of installation is not susceptible to flooding which can both skew detection temporarily or even damage the sensor itself irreparably. One should also keep in mind that on-ground sensors may be vulnerable to willful vandalism and accidental damage via heavy/industrial vehicles like snow plows. This risk can be mitigated by using inground sensors, however.

MARKED PARKING AREAS ONLY-WHY?

Ground sensors rely on a car being parked directly above them to be able to ascertain occupancy, which is impossible to ensure without marked bays. And while they can be a great solution for when overhead sensors aren't the right choice, installation of these sensors is time-consuming.

The parking lot needs to be cleared beforehand in order to physically reach each installation area, and even more time is required if drilling to install inground sensors. So, if you're putting in that much effort, you don't want to find out that drivers are mistaking the sensors for markings!

LED SIGNAGE

LED parking guidance signs can efficiently communicate real-time parking availability. Customizable and with dynamic matrix displays, they offer versatile solutions for all cities.

The central feature indicates the number of available parking spots, aiding drivers in locating spaces promptly. These signs alleviate traffic congestion by providing accurate parking information, reducing search time for drivers and enhancing traffic flow. Their seamless integration of multiple sensors ensures up-to-date data and optimizes space utilization to inform management decisions.

For drivers, these systems offer convenience and reduce the stress associated with parking. Parking asset owners also benefit significantly, as they can expect increased utilization of bays over a wider time period. For instance, a car park commonly used by commuters during the week may become more attractive to weekend visitors as well. And, naturally, more users = more payments.

SONAH partners with

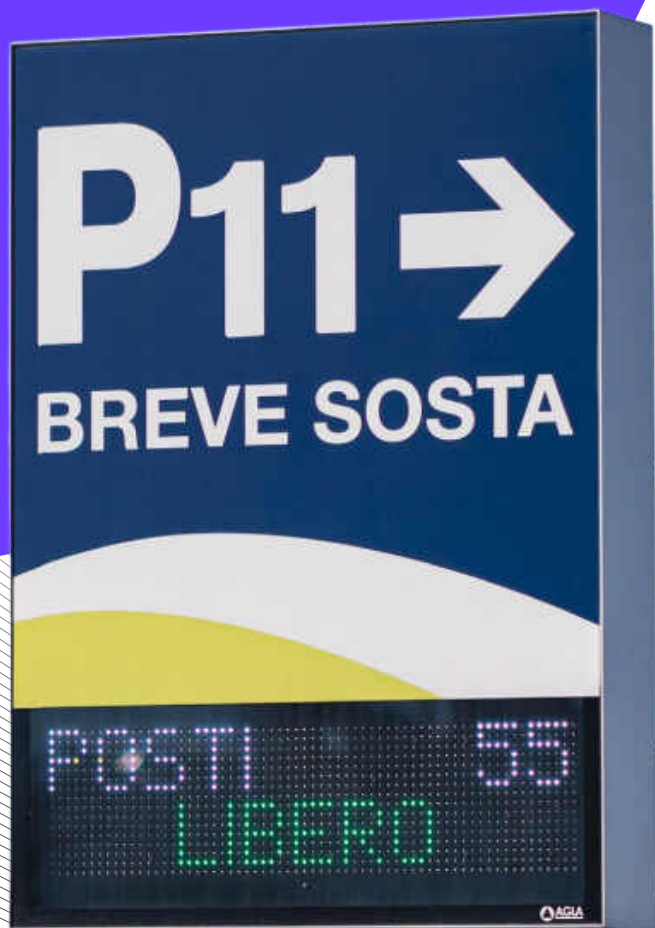


to create LED signs.



IMPORTANT DATA

LED SIGNAGE



DIMENSIONS

Fully customizable

IMPLEMENTATIONS FROM AGIA

- CITY: Guidance around the urban area
- ENTRANCE: Highlighting a parking asset
- SUMMARY: Multiple information elements in one
- AREA: Guidance within parking areas

MODULES

- Dynamic LED matrix board
- Static panel with standard road sign designs
- Static panel with high quality graphics
- Full width dynamic board

ACCESSORIES (GENERAL)

- Round pole
- Foundation plate
- Brackets
- ISPM-15 wooden crate

CONNECTIVITY

- Ethernet or PoE
- Radio/WIFI
- 4G or 5G

INSTALLING YOUR LED SIGNAGNE

BENEFITS AT A GLANCE

SLEEK

Modern urban design

FLEXIBLE

Display more than just parking data

SCALABLE

Easy to extend and add more data

ACCESSIBLE

Helps visitors and residents of all digital capabilities

WHAT PROBLEMS CAN LED SIGNS SOLVE?

- For citizens, signs mean reduced search time and stress for drivers, lower fuel consumption, and decreased emissions
- They allow cities to provide efficient parking resource management and thus the improvement of local economies
- They raise income for private and state-owned assets
- They turn smart city digitization into holistic mobility solutions by providing accessible, barrier-free solutions

WHY USE A SIGN, NOT A DIGITAL APP?

While a parking guidance system using an app is a great innovation - and massively helpful already - it isn't a holistic mobility solution alone. By using signs, you make the system accessible for less digitally-aware groups such as seniors, as well as ensuring that no-one is required to download an app for every new area they visit. However, combining onsite LED signs with online data updates e.g. via an app or even just integrated into a website, can help drivers choose alternative parking options in the moment AND before they leave the house.

INSTALLATION TIPS

You really need to invest in planning to overcome certain obstacles. Why? Because LED signs need to be powered around the clock and can only be installed with a concrete foundation, both of which are difficult due to civil engineering. In this context, the existing third-party cables at the site must be checked, the local energy supplier must be on board and the ownership of the installation site must be clarified. Ultimately, the quality of the LED modules determines that each sign offers drivers optimum visibility as they drive past.

POWER SUPPLY

Each situation and customer delivers different requirements and installations. That's why we offer several standard combinations to power our sensors, while the best approach is always a permanent power supply.

One reason we're glad to use pre-existing power supply is that we value sustainable solutions that require little extra material additions. However, we often install our sensors on street lamps which, naturally, are only powered at night. For these scenarios, we can supplement the system by installing a battery to cover daytime power supply, to be charged during the night. Alternatively, we can also use batteries charged by a solar-power solution.

The type of power supply we use is decided by what is available and what is the most reliable solution for your project. The next page will give you an insight into each of these solutions, the best practices attached to them, and their requirements.



DATA AND GUIDANCE

MONTAGE POSSIBILITIES

STREETLIGHTS

LAMP HEAD
INTEGRATION

MAST (WITHOUT
POWER)

ROOF- OR WALL-
MOUNTED

CONTINUOUS CURRENT

A continuous power supply, when already present, is preferable to all other power sources. If mounting an overhead sensor on a building or retrofitting it into a streetlight with access to continuous current, all we have to do is link our sensor into the grid.

OFF-PEAK POWER AND BATTERY

We often mount sensors on street lights which are only powered overnight when the lamp itself is needed. Fortunately, we are able to use the electricity supplied overnight to both power the sensor and charge a battery for use during daylight hours.

BATTERY & SOLAR POWER

At locations, where we set up masts for mounting the sensors ourselves, there is usually no connection to a continuous current. Here, we can offer a combination of solar power for the daylight hours which charge batteries for overnight power.

PERMANENT CURRENT BY SMART LIGHTING

You can also choose to install a fully smart city ready LED lighting head solution, which combines energy savings, lighting management services with our sensor's detection technology, fully integrated into a LED street light head.



NEXT STEPS

MEHR INFORMATIONEN ÜBER UNSERE SERVICES ANFORDERN

UNSER PARTNERÖKOSYSTEM SICHTEN

NEHMEN SIE KONTAKT MIT UNSEREM TEAM AUF

ABOUT SONAH^{GmbH}

SONAH ist ein in Deutschland ansässiges Unternehmen für intelligentes Parken, das Städte in ganz Europa bei der Lösung zahlreicher alltäglicher Park-, Verkehrs- und Abfallmanagementprobleme unterstützt. Mit kamerabasierten, embedded Vision Sensoren gibt SONAH Städten und Unternehmen die Möglichkeit, komplexe Entscheidungen zu vereinfachen und auf eine gesündere, nachhaltigere Stadtumgebung hinzuarbeiten.

KONTAKTIEREN SIE UNS

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