

ORBIS<sup>®</sup>

energía inteligente<sup>®</sup>

# CHARGING SOLUTIONS FOR ELECTRIC MOBILITY



RESIDENTIAL



APARTMENT BUILDINGS



BUSINESSES

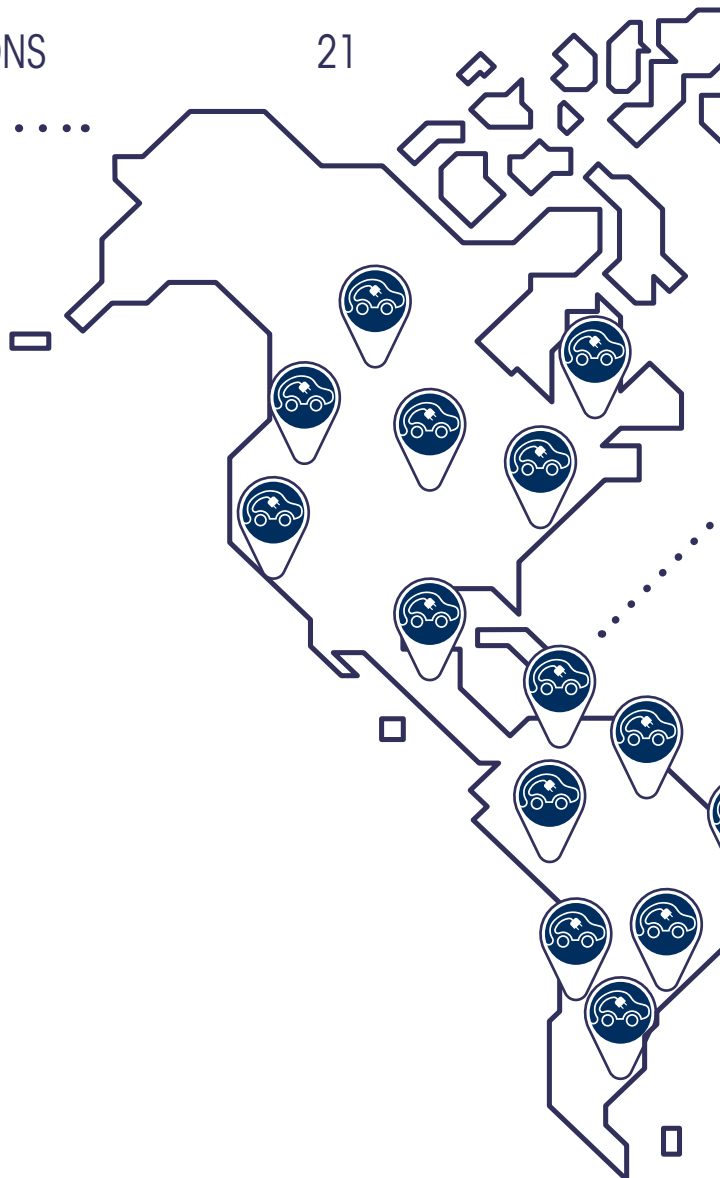


PUBLIC AREAS



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# SMART CHARGING SYSTEMS FOR ELECTRIC AND PLUG-IN HYBRID VEHICLES



# 1. CURRENT SITUATION

Electric and hybrid plug-in vehicles are becoming **a more common reality**. The proliferation of these vehicles is increasing at an ever growing pace around the world every year, and this is now an irreversible trend. **There are technical, economic and ecological reasons for the advancement** of this technology.

Several makes of cars have announced that all or a large part of their models will have electric motors in upcoming years. On a similar note, although a bit further in the future, some countries are considering **a ban on the sale or circulation of vehicles that run on diesel or gasoline**.

The introduction of electric mobility is being prompted by various **measures and subsidies**, which establish aid **for both electric vehicles and charging point infrastructures**. Some of these measures include simplifying home electricity supply procedures to facilitate the associated charging point and, in the public arena,

reviewing all provisions that might pose regulatory barriers to the development of charging infrastructures.

But a crucial conditioning factor for the successful expansion of this type of vehicle is that the charging infrastructures must grow **at a rate that is faster than that of the vehicles themselves**.

In this sense, with this guide, ORBIS TECNOLOGÍA ELÉCTRICA, S.A. intends to clarify the current situation of vehicle charging, and to present the solutions we offer with our wide range of smart chargers: **VIARIS UNI, VIARIS COMBI and VIARIS CITY**.

Below are some of the **terms to bear in mind** with regard to **Electric Vehicle charging systems**.



VIARIS UNI



VIARIS COMBI



VIARIS CITY

## 2. CHARGING TYPES

Even though the term battery charging rate is relative and there is no generally accepted grouping for this rate, we present the **most common classification**.

- **Linked charging system:** power less than **7 kW**.
- **Conventional charging system:** power equal to or greater than **7 kW**, but less than **15 kW**.
- **Semi-fast charging system:** power equal to or greater than **15 kW**, but less than **40 kW**.
- **Fast charging system:** power equal to or greater than **40 kW**, but less than **100 kW**.
- **Ultra-fast charging system:** power equal to or greater than **100 kW**.



## 3. CHARGING MODES

The electric vehicle charging modes **define certain characteristics** regarding the power and control of charging installations.

### CHARGING MODE 1

Vehicle connected directly to the mains.



- Non-dedicated power point.
  - Single cable.
  - **Risk of overheating.**

Charging is via alternating current and domestic-type sockets with an intensity no greater than 16 amps.

Since it has no electrical protection and due to the high risk of overheating of the lines and connectors, it is only used to charge bicycles and scooters with low-capacity batteries.

**MUST NOT BE USED TO CHARGE ELECTRIC CARS.**

## CHARGING MODE 2

Vehicle is connected directly to the mains via a special cable.



- Dedicated power point.
- Cable with communication and charging control device.
- **Limited charging rate.**

Charging is via alternating current using a (Schuko) socket and a special "last resort" cable **that meets minimum safety measurements.**

To prevent the risk of overheating the lines, the charge is limited to 8-10 amps, which means that the electrical power of the charge is approximately 2 kW. At this power, the full charging process for a 40 kWh battery **would take more than 20 hours.**

Since there are no specific electrical protective devices for charging electrical vehicles, it is recommended **only for sporadic use** or only in the event of an **emergency.**

## CHARGING MODE 3

Vehicle connected directly to the mains via SAVE.



- Dedicated socket with charge monitoring.
- Cable with communication and charging control device.

This mode uses the **charging points known as SAVE** (Spanish acronym for Specific Electric Vehicle Power System). It is the only charging mode compatible with all plug-in electric cars and hybrids in the market.

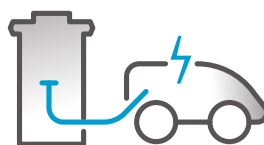
Charging is via alternating current with intensities of up to 63 amps (43.8 kW).

**It is recommended for electric cars and motorbikes,** since it permits fast and semi-fast charging times. It also does not degrade the service life of the battery, since it uses the vehicle's own internal charger.

There is a high degree of communication with the vehicle and it **ensures the safety** of both people and the installation during the charging process.

## CHARGING MODE 4

Vehicle is connected indirectly to the mains through a direct current converter.



- External direct current socket with charge monitoring.
- Cable with communication and charging control device.

Charging is via **high-intensity direct current.** It is the most common mode in charging stations, due to the short charging times it provides.

It is a **system still in development,** as these high intensities reduce the service life of batteries. No plug-in hybrid and **only certain models of fully electric cars are compatible with this charging mode.**

# 4. CHARGING CONNECTORS

## 4.1. CONNECTORS FOR ALTERNATING CURRENT MODE 3

### TYPE 1 CHARGING (SAE J1772) / IEC 62106-2

- Connector for single-phase alternating current grids of **up to 32 A** that permit charges of **up to 7.4 kW of power**.
- Includes **5 pins** (phase, neutral, earth and 2 communication).
- Known as **Yazaki**, it is the Asian standard for alternating current charging.

Some of the models that use a Type-1 SAE J1772 connector are: Nissan Leaf, Chevrolet Bolt Electric, Chevrolet Volt Hybrid, Fisker Karma, Coda Automotive sedan, Toyota Prius Plug-in Hybrid, Mitsubishi i MiEV, Honda Fit EV (concept), Ford Focus Electric, Smart electric drive, Tesla Roadster, Tesla Model S, OKA NEV ZEV AC, Th!nk City, Renault, Kangoo Z.E. (230 V – 16 A max.), Renault Fluence Z.E. and BMW ActiveE.



### TYPE 2 (MENNEKES) / IEC 62196-2

- It is the **standard solution in the European Union**, as it is the most versatile, since it is used on both **single-phase** and **three-phase grids**.
- Single phase: **5 pins** (phase, neutral, earth and 2 communication). **Up to 32 A and 7.4 kW of power**.
- Three-phase: **7 pins** (three phases, neutral, earth and 2 communication). **Up to 63 A and 43.8 kW of power**.

Some of the models that use a Type-2 IEC 62196-2 connector are: Nissan Leaf (2018), Tesla Model X, Tesla Model 3, Hyundai Kona, BMW 3 Series, BMW 2 Active Tourer Performance, Optima Phev and Mercedes S Class.



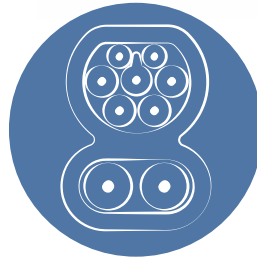
## 4.2. CONNECTORS FOR DIRECT CURRENT MODE 4 CHARGING

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### CSS (COMBO) / IEC 62190-1

- It is the **European solution** for **direct current** charging.
- It uses the Type-2 communication and earth pins and **adds two direct current terminals**.
- Vehicles equipped with this base are very **versatile and convenient**, because **they allow both alternating and direct current charging**.

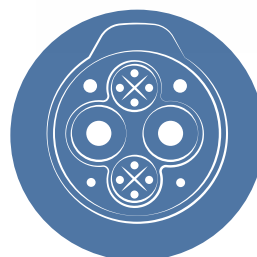
Manufacturers like Audi, BMW, Daimler, Porsche and Volkswagen already include the CSS (COMBO) / IEC 62190-1r system.



### CHADEMO / IEC 62196-1

- It is the **Asian solution** for fast direct current charging.
- It has **ten terminals** and earth and grid communication.
- Both the connector and the cable have the largest diameter available.

Some of the models that use a CHADEMO / IEC 62196-1 connector are: Nissan Leaf, Nissan ENV200, Mitsubishi Outlander, Mitsubishi iMiev, Peugeot iON, Citroën C-Zero and KIA SOUL EV.





# 5. HOW LONG DOES IT TAKE TO CHARGE AN ELECTRIC VEHICLE?

The battery charging time depends on three factors:

- Battery **capacity** in kWh.
- **Maximum power** and supply type **permitted by the vehicle** in kW.
- **Power and type of supply of the charging point** in kW.

CHARGING TIMES					BATTERY CAPACITY AND MAXIMUM POWER ADMISSIBLE		
CHARGER	CHARGING MODE	CONNECTOR	POWER	CURRENT	NISSAN LEAF 40 kWh max. 7,4 kW single-phase	RENAULT ZOE Q90 41 kWh max. 43 kW three-phase	TESLA MODEL S 100 kWh max. 16,5 kW three-phase
	MODE 2	SCHUKO	1.84 kW	8 A	22 h	22 h	54 h
	MODE 3	TYPE 2	3.7 kW	16 A	11 h	11 h	27 h
	MODE 3	TYPE 2	4.6 kW	20 A	9 h	9 h	22 h
	MODE 3	TYPE 2	7.4 kW	32 A	5 h	5 h	13 h
	MODE 3	TYPE 2	11 kW	3 x 16 A	11 h	4 h	9 h
	MODE 3	TYPE 2	22 kW	3 x 32 A	5 h	2 h	6 h
	MODE 3	TYPE 2	43 kW	3 x 63 A	5 h	1 h	6 h
KM RANGE ACCORDING TO WLTP (Worldwide Harmonised Light Vehicle Test Procedure)					285 km	300 km	461 km

Approximate charging times: first 80%, linear charge; last 20%, slow charge.

As shown in the table, **the correct combination of the three factors is essential to achieve the minimum time needed to charge car battery**. If the power of the charging point is different from that permitted by the car, the lower of the two will prevail. For example:

In the case of the Nissan Leaf, the car permits a maximum charging power of 7.4 kW (32 A) single phase, but if the charging point is

11 kW (3 x 16 A) three-phase, it will charge at only one-third of its capacity, i.e. 3.7 kW (16 A) single phase.

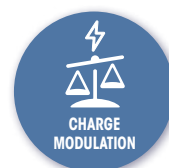
In practice, no vehicle needs a full charge of 0% to 100%, since this would mean that the battery was completely discharged and the vehicle could not even start.

# 6. DO I NEED TO INCREASE MY CONTRACTED POWER?

This is one of the first questions asked by individuals, resident associations and companies that wish to install charging points. To avoid the costs and complications associated with the increase in power, it is crucial for project planners and installers to consider the installation of smart chargers with a charging modulation system that increases or decreases the electrical charging power according to the rest of the consumption of the electrical installation. The VIARIS COMBI and VIARIS UNI models include standard a **Smart Charge Modulation System (SMI-ORBIS)** that addresses this issue in private installations with a single charging point.

For larger installations with several charging points, we have developed the **SPL-ORBIS system**, which is intended to temporarily reduce the power used to charge electric vehicles, **thus preventing a power outage** in the entire building, due to the action of fuses protecting against over-consumption on the main power line.

Thanks to this system, in many countries, **a simultaneity factor of 0.3 could be applied** to calculate the expected charge for charging electric vehicles. If there is no LPS, the simultaneity factor will be equal to 1.



0,3

**Example:**  
 Total capacity: **250 kW**  
 Total consumption of the building: **200 kW**  
 Power available: **50 kW**

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**Calculation:**  
 We wish to install **7.4 kW** chargers  
**WITHOUT LPS**=  $50 \text{ kW} \div (7.4 \text{ kW} \times 1) = 6 \text{ chargers}$   
**WITH LPS** =  $50 \text{ kW} \div (7.4 \text{ kW} \times 0.3) = 22 \text{ chargers}$



x 22

The **SPL-ORBIS** solution considers the maximum power for the building and the immediate consumption to use the available power to supply the **VIARIS** chargers. This available power is shared among all the connected vehicles. This is done by modulating the charging power, **without cutting off or discriminating against any vehicle.**

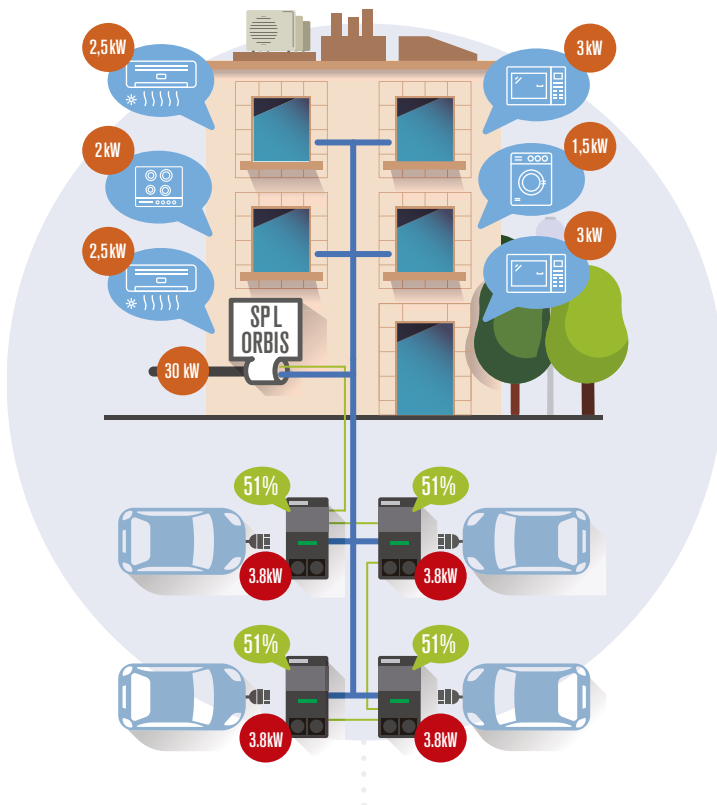


x 496

It permits managing the charging of **up to 248 VIARIS charging points with one or two outputs**, which means the capacity to manage **up to 496 vehicles.**

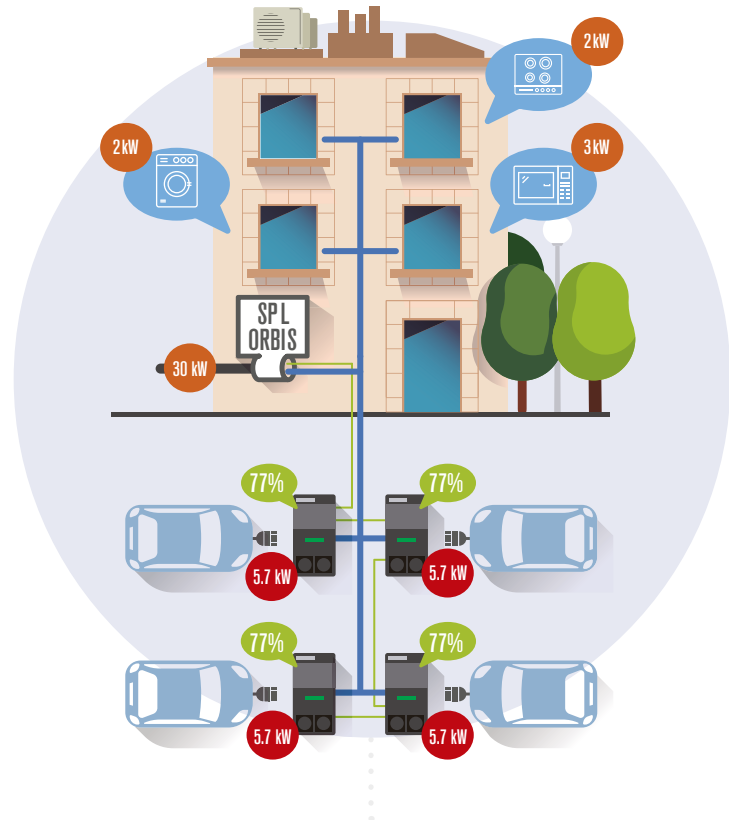
- No need to contract **additional power**.
- **No need to add additional** circuits or electrical protection.
- Prevents circuit breakers from being tripped due to **over-consumption**.
- Can be installed in both **existing buildings and new constructions**.
- Makes it possible to install **a larger number of chargers**.
- Considerably reduces the **charging time**.

## 6.1 HOW THE SPL-VIARIS WORKS



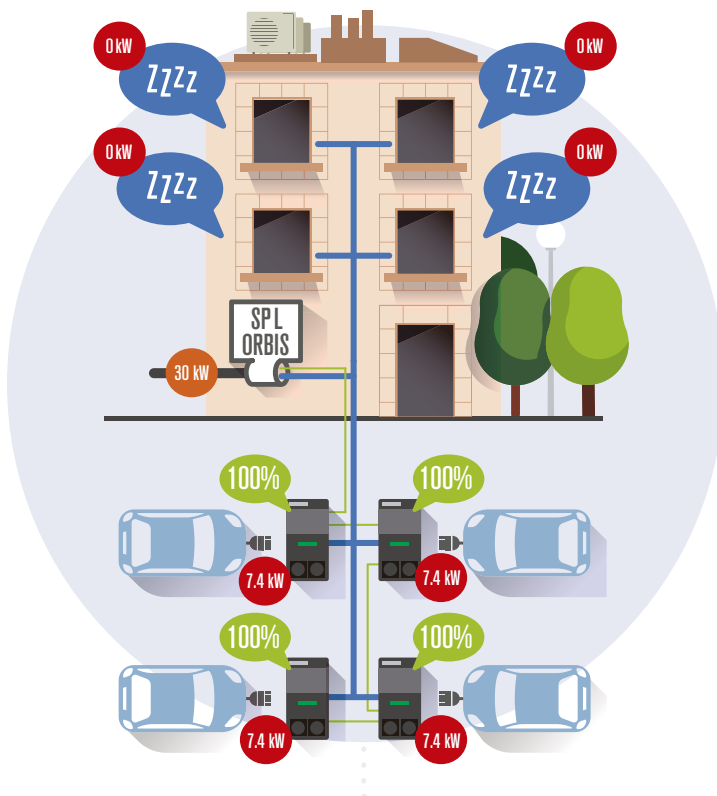
When the overall consumption of the installation is high, the **SPL-ORBIS** will reduce the charging power of the electric vehicles.

Total capacity	30 kW
Current consumption of the installation	14.5 kW
Power available for charging electric vehicles	15.5 kW



When the overall consumption of the installation so allows, the **SPL-ORBIS** will increase the charging power of the electric vehicles.

Total capacity	30 kW
Current consumption of the installation	7 kW
Power available for charging electric vehicles	23 kW



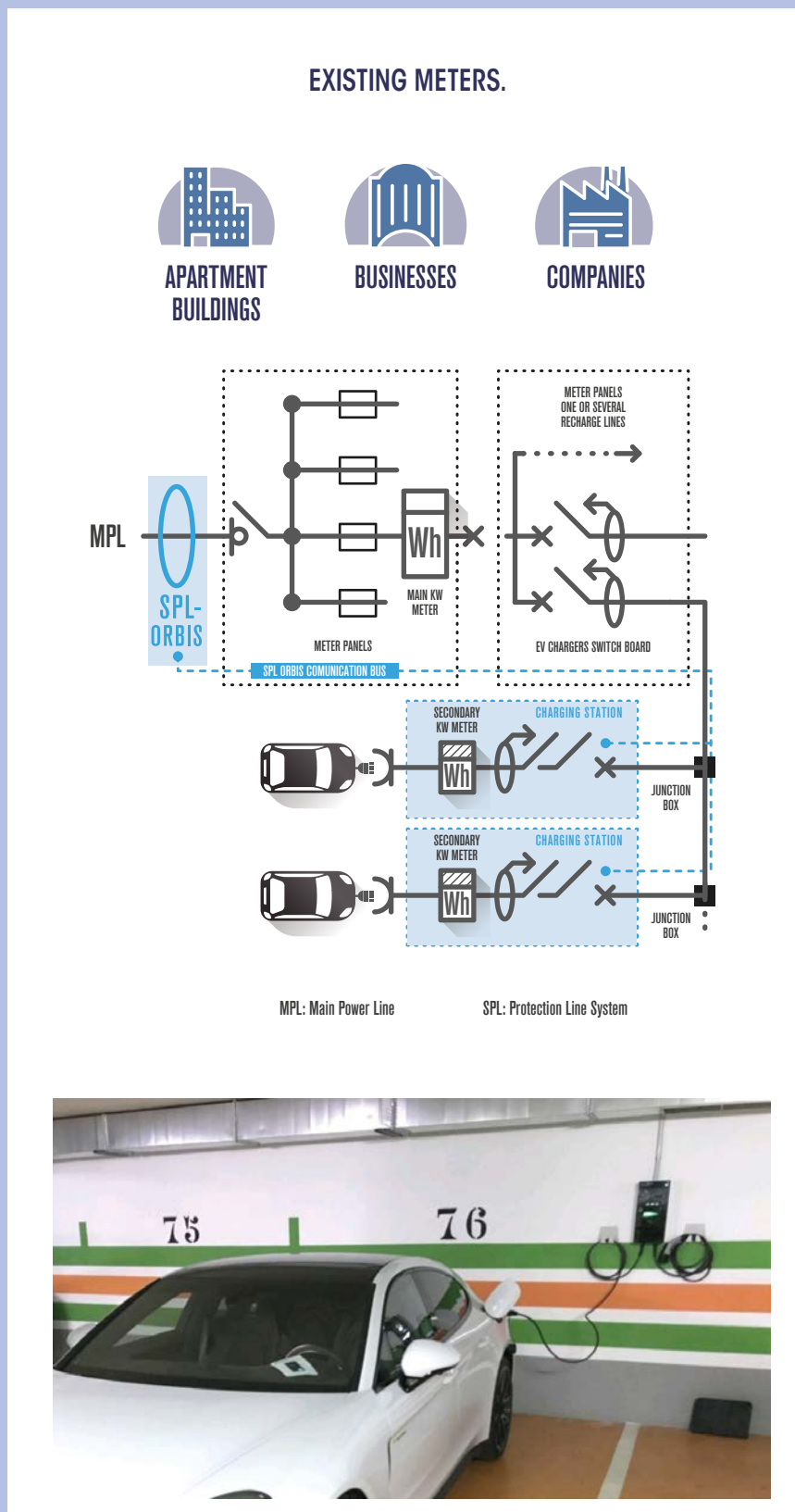
When **any variation** in the consumption of the installation occurs, the **SPL-ORBIS** will modulate the maximum charging power to the maximum amount available, thus reducing charging times.

Total capacity	30 kW
Current consumption of the installation	0 kW
Power available for charging electric vehicles	30 kW

# 7. INSTALLATION DIAGRAMS

## 7.1. EXAMPLE WITH COST DISTRIBUTION

In these configurations, a main energy meter supplies several chargers. In order to **distribute the total energy cost**, every charger must have its own MID-certified energy meter (according to Directive 2004/22/EC of the European Parliament).



# INCORPORATION OF A NEW CENTRALISATION OF DEDICATED METERS FOR CHARGING ELECTRIC VEHICLES



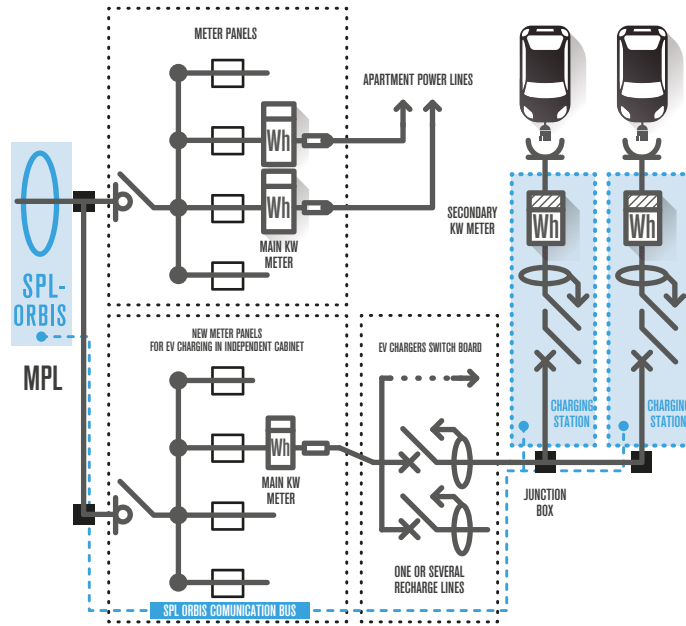
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BUSINESSES



COMPANIES



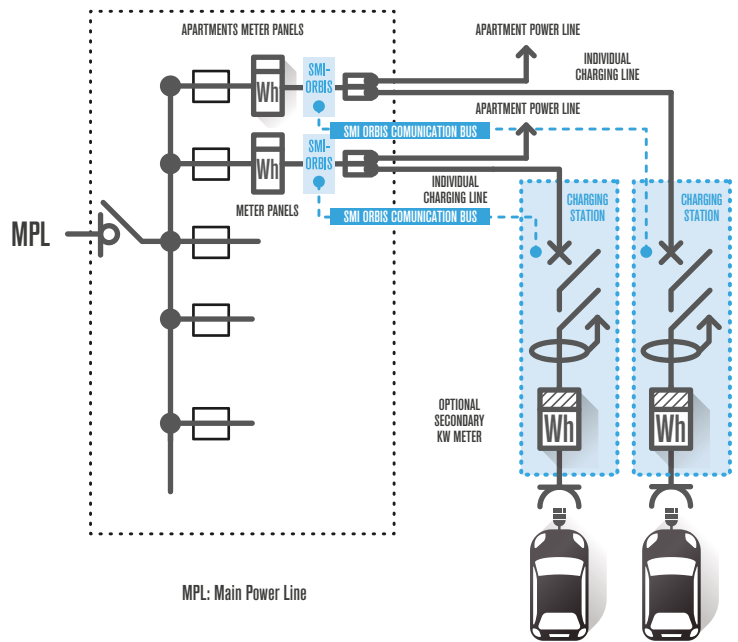
MPL: Main Power Line

SPL: Protection Line System



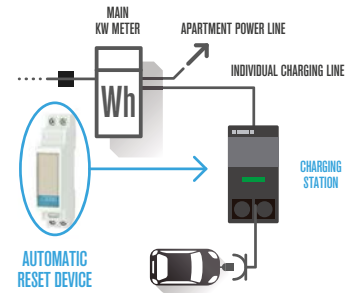
## 7.2. EXAMPLE WITHOUT COST DISTRIBUTION

### INDIVIDUAL INSTALLATION WITH A COMMON MAIN METER FOR THE HOME AND CHARGING STATION.

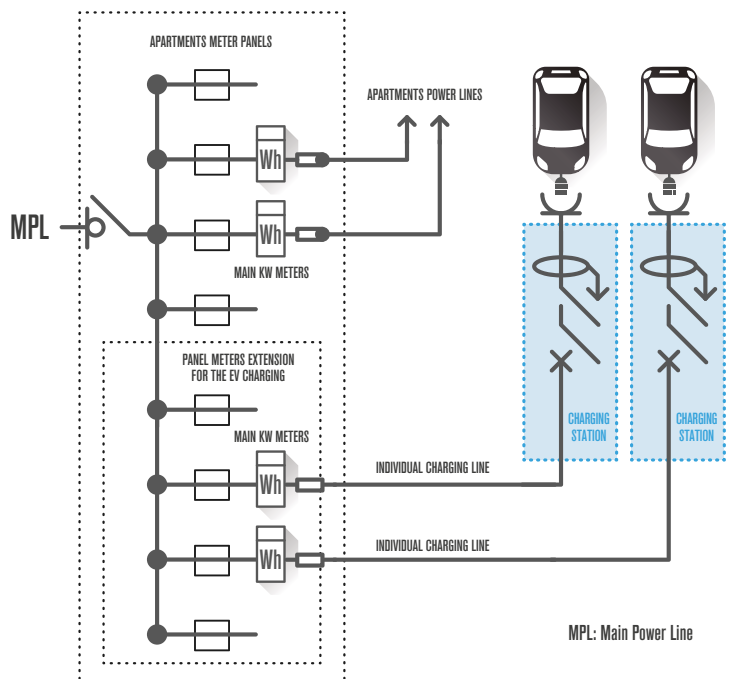


In this scheme, it is recommended to have a system that allows the smart meter to be reset from the home, eliminating the need for the user to have to go to the charging station.

For this purpose, ORBIS has designed the VIARIS COMBI AUTOMATIC RESETTING DEVICE.



### INDIVIDUAL INSTALLATION WITH HOME METER AND EV CHARGER METER

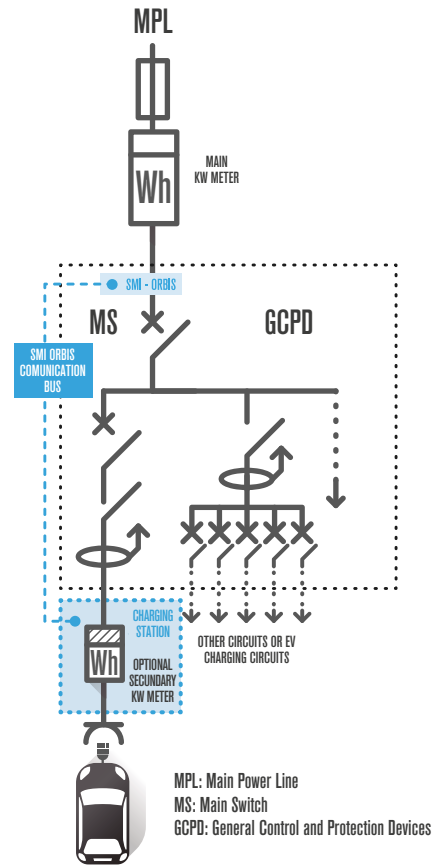


### 7.3. EXAMPLE: INSTALLATION IN A SINGLE-FAMILY HOME

#### INSTALLATION WITH AN ADDITIONAL INDIVIDUAL CIRCUIT FOR CHARGING ELECTRIC VEHICLES



SINGLE-FAMILY HOMES



### 7.4. EXAMPLE OF AN INSTALLATION USING THE MAIN SERVICE PANEL

#### INSTALLATION USING THE MAIN SERVICE PANEL



COMMUNITIES



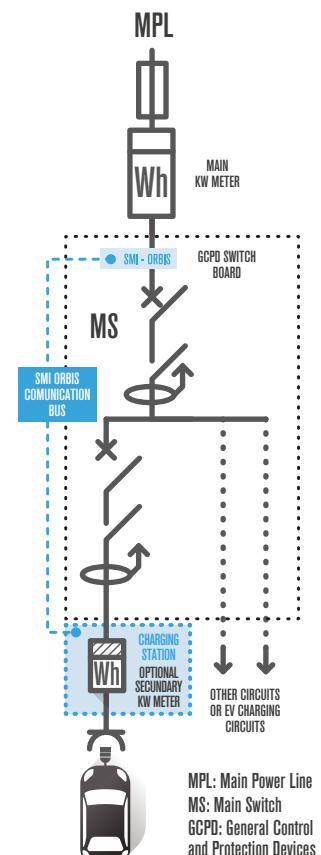
COMPANIES



BUSINESSES

This scheme can be used to charge electric vehicles in buildings, using the main service panel in garages as the starting point for the charging circuits.

The installation of a Line Protection System is recommended to prevent over-consumption on the General Power Line.



# 8. ORBIS SOLUTIONS

**VIARIS** smart chargers for charging electric vehicles are designed for both public settings and **uses** and for **private or individual use**.

All models include the Smart Modulation System (SMI-ORBIS) as standard, Wi-Fi connectivity and communication with the user through the mobile telephone app.

## VIARIS UNI

It stands out for its attractive design and is ideal for use in **single-family homes**, resident communities, **offices** and **businesses**.



## SMART CHARGER FOR PRIVATE ENVIRONMENTS

### FEATURES

- **ABS-PC heavy-duty housing with IK10 impact resistance.**
- **IP54 protection grade and high heat distortion temperature.**
- 3.7 kW - 7.4 kW single-phase power.
- 11 kW - 22 kW three-phase power.
- Charging mode 3.
- 5 metre connecting cable with Type 2 connector.
- Compatible with system integrators.

### INCLUDED AS STANDARD

- **Charging modulator**
- **Leakage current detector**
- Touch or RFID activation
- Maximum power limitation
- Charged energy measurement and recording
- **Wi-Fi communication**
- **App for remote management and control**
- Downloadable historical consumption records
- Remote firmware updating
- Mobile telephone notifications
- Embedded management and control website
- OCPP-J over MQTT protocol

### OPTIONAL

- RFID activation with 5 cards instead of a touch sensor
- Additional Schuko socket
- **SPL-ORBIS solutions**
- **VIARIS management platform**
- MID-certified meter





## VIARIS COMBI

Charging system for use in **private environments**, resident communities and by private individuals.

It features the option to include electrical protective devices for fast installation and **avoid the need for a second electrical panel**, which represents a huge savings in terms of time and money.

It includes the Smart Charging Modulation System (SMI-ORBIS) as standard, which regulates the charging electricity according to the rest of the consumption of the electrical installation.



## SMART CHARGER FOR PRIVATE ENVIRONMENTS

### FEATURES

- IK08 in accordance with EN 62262. Heavy-duty ABS-polycarbonate housing, resistant to impacts. IP54 in accordance with EN 60529
- 3.7 kW - 7.4 kW single-phase power.
- 11 kW - 22 kW three-phase power.
- **Available with one or two sockets on the base or Type 1 and 2 cable or Schuko socket (charging modes 1 and 2).**
- Models with cable include the wall bracket.
- Models with connection base socket include an interlock to prevent accidental disconnection while charging.
- Compatible with system integrators.

### INCLUDED AS STANDARD

- Smart Charging Modulation System (SMI-ORBIS).
- Built-in **Wi-Fi** communication.
- Touch sensor to activate / deactivate charging.
- Smart time scheduling to take advantage of periods with reduced kW/h costs.
- External control input, home automation control.
- Space for protective devices (9 modules wide).
- **App for mobile devices** and embedded website.
- **Remote software updating.**

### OPTIONAL

- RFID activation with 5 cards instead of a touch sensor.
- **Automatic meter resetting device** (see page 16).
- **SPL-ORBIS solutions.**
- ETHERNET communication.
- **VIARIS management platform.**
- **Electrical protection to save time and materials during installation.**
- MID-certified meter.



## VIARIS CITY

Charging system for electric vehicles especially intended for outdoor use in **public environments**.

This charger is capable of meeting different management needs, from **individual connection points, to municipal or corporate charging networks**, with a management platform on the charger.

Includes **smart load balancing** between the power outputs that distributes the available power according to the level of charge of the vehicles. In other words, VIARIS CITY gives more power to the output of the vehicle with the least charge.



## SMART CHARGER FOR PUBLIC ENVIRONMENTS

### FEATURES

- **IK10 in accordance with EN 62262**
- **IP 54 in accordance with EN 60529**
- 3.7 kW - 7.4 kW single-phase power.
- 11 kW - 22 kW - 43 kW three-phase power.
- **Charging mode 3.**
- Available with one or two Type 2 or Schuko base sockets.
- Models with connection base socket include an interlock to prevent accidental disconnection while charging.
- Compatible with system integrators.

### INCLUDED AS STANDARD

- RFID card reader.
- Built-in schedule programming.
- Built-in **Wi-Fi** communication.
- Display and configuration possible via the embedded website.
- **Tamper-proof housing.**
- **Space for protective devices (16 modules wide).**
- **Remote software updating.**

### OPTIONAL

- Electrical protection.
- MID-certified meter.
- ETHERNET and 3G modem communications.
- **Charging modulator.**
- **VIARIS management platform.**
- **SPL-ORBIS solutions.**
- Metal pedestal and fixing accessories.
- Charging modes 1 and 2. Models with cable include the **wall bracket**.

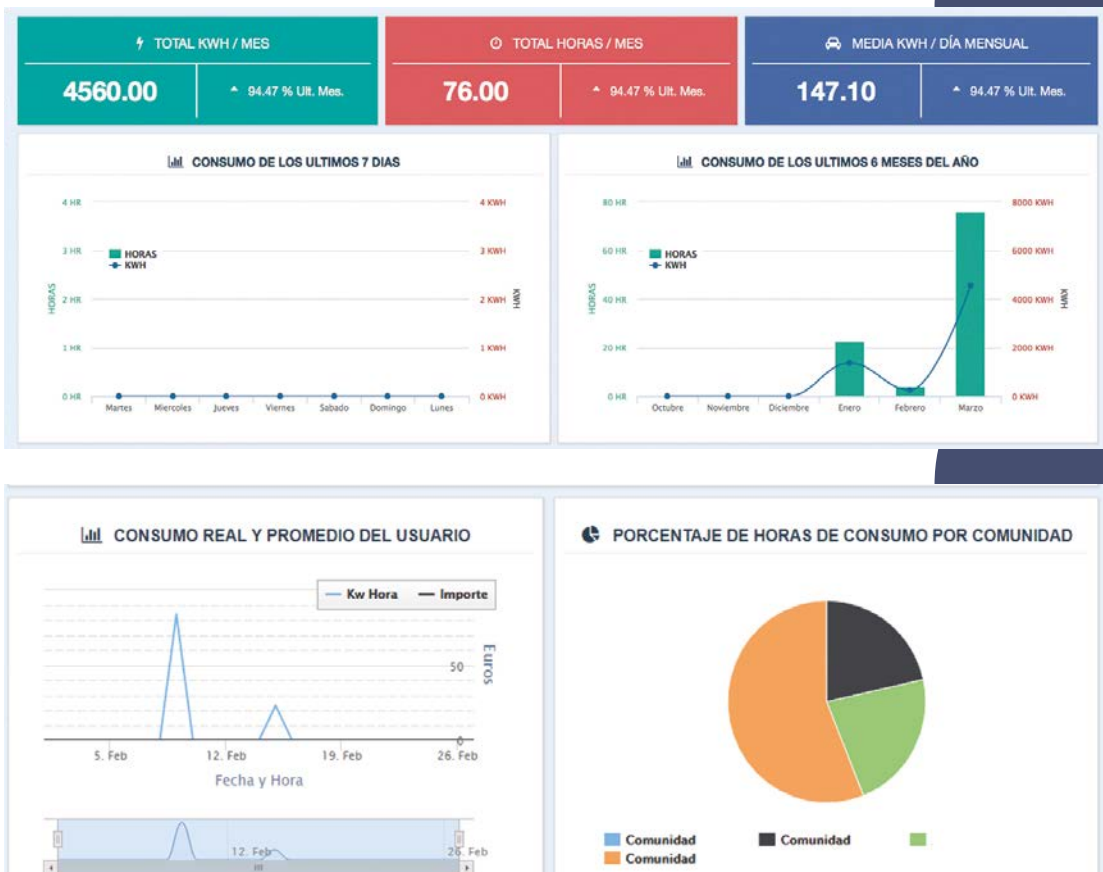
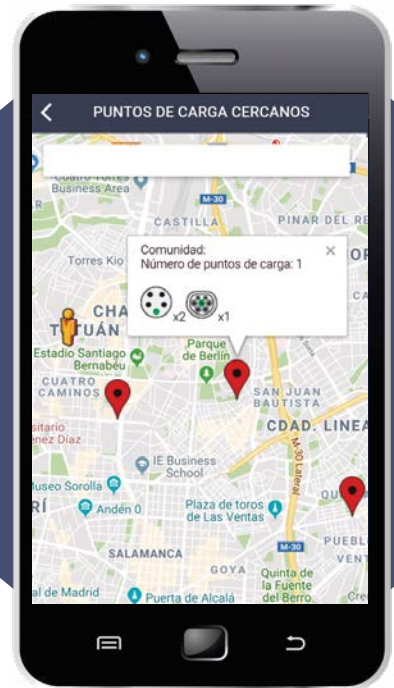


## WEB-BASED MANAGEMENT PLATFORM FOR VIARIS CHARGERS

This platform monitors, records and tracks actions with the **VIARIS** smart chargers.

### FEATURES

- Permits the management of users and communities to **distribute costs and top-up in the case of prepaid service.**
- Creates **invoices for each user.**
- Creates **reports** for each user, community or charging point.
- Provides access to historical charging records.
- Offers the possibility to **add credit** to users.
- Facilitates the **management of charger reservations** by users **through an app** that permits locating nearby charging points, viewing historical records, etc.



## VIARIS APP

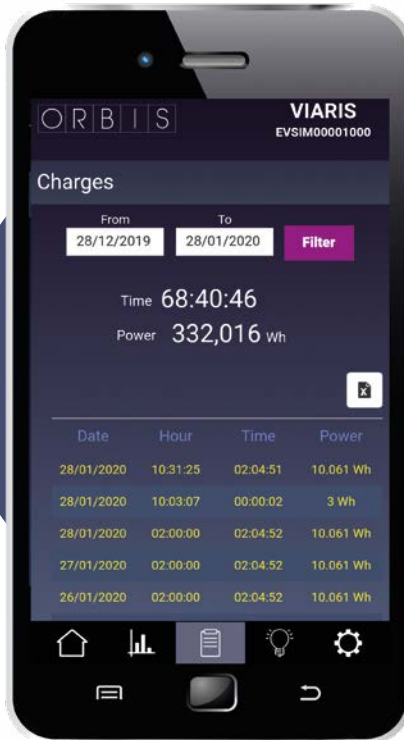
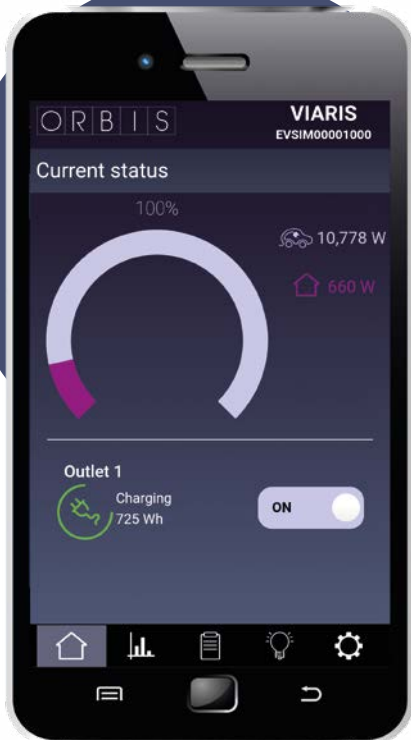
Management application to **display the energy consumption** of both the installation / home and the electric vehicle charge.

the charging schedule, which makes it possible to take **better advantage of cheaper electricity rates**.

Permits configuring the contracted power of the installation and

## FEATURES

- Recording of multiple electric vehicle chargers.
- Remote viewing of the charge status.
- Records **vehicle consumptions** and installation or home consumptions on a single app.
- Permits adding/removing users and generates a consumption report for each.



# 9. OTHER ORBIS SOLUTIONS

## VIARIS TESTER

Tool to check the operation of electric vehicle chargers and simulate the connection of an electric vehicle. Ensures that they work properly before delivery to the customer.

Invaluable tool for electric mobility professionals, installers, engineers, maintenance staff and verification bodies.



## TOOL FEATURES

- Simulates the vehicle status (connected, disconnected, charging, etc.).
- Checks the electrical protection and earth connection.
- Suitable for 13, 20, 32 and 64-amp chargers.
- Display screen: vehicle status, active phases, charger power current and voltage, checking of the earth connection.

## CHARGER VERIFICATION IN ACCORDANCE WITH UNE-EN 61851-1

- Generates vehicle statuses (CP) A, B, C or D.
- Detects charger statuses E and F.
- Simulates hose encoding (PP) 13A-20A-32A-64A.
- Measures the power provided by the charger (PWM at the CP).
- Generates Diode D malfunction of the CP.
- Generates CP-earth connection failure.

## ADDITIONAL VERIFICATIONS OF THE INSTALLATION:

- Measures the presence of phases.
- Checks the sequence of phases.
- Checks the earthing of the installation.
- AC 30mA residual current test.
- DC 6mA fault current test (RDC-DD)
- External charging socket to generate real consumption (max. 8A).

## CONNECTION HOSES

Type 2 connection cable, useful accessory for electric vehicle users.

T2-T2 5 m single-phase smooth hose. 32 A / 250 V.

T2-T2 10 m single-phase 32 A / 250 V smooth hose.

T2-T2 5 m three-phase 32 A / 250 V smooth hose.

T2-T2 10 m three-phase 32 A / 250 V smooth hose.









### Viaris Uni

You can find more information on this product at:



Video:



Dedicated website:



### Viaris Combi

You can find more information on this product at:



Video:



Dedicated website:



### Viaris City

You can find more information on this product at:



Video Viaris app

Smart Modulation System Video

Configuration tool:



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