SM

Magnetic Vehicle Presence Detection Sensor

Sensor and concentrator

General Description

Growing populations in cities entail an equally constant growth in road traffic. For this reason, urban car parks and road surfaces become jammed with traffic, resulting in few free parking spaces and bringing associated drawbacks.

In addition to this problem, there is also a growing number of special parking spaces which must be reserved and we must detect whether they have been correctly occupied or not, such as spaces for electric cars, the disabled, loading and unloading, etc.

This new situation is starting to gather strength and is being modelled as an important challenge for the future. Cities are large car parks and we must manage their space accordingly. The integration of Smart City Projects, with products designed to be integrated in urban management platforms, is one of the most ambitious objectives we are currently facing.

The solutions offered by CIRCONTROL to the market to solve these problems and achieve optimum traffic management are as follows:

Smart City solutions have been designed to gather information from special parking spaces such as parking spaces for the disabled, parking spaces reserved for hotels, loading and unloading areas with hourly controls, etc., where vehicle detection and presence systems can be used to regulate occupation times, etc. This can be seen in the diagram below.

In Smart City solutions, CIRCONTROL offers a protocol that is easy to integrate, offering all of the functions that must be implemented in our current scenario, including a minimal independent and autonomous management approach that is coordinated with the Smart City Platform.
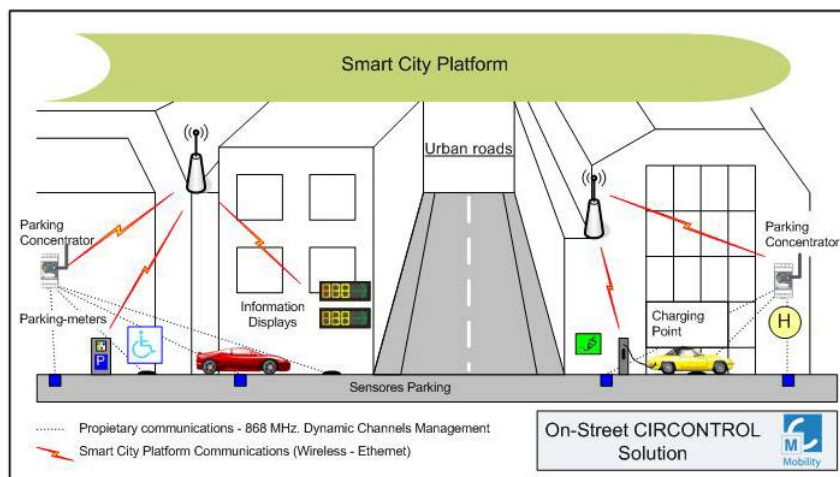

Application example

"With this solution, the CIRPARK systems installed in the efficient car park actas the management platform and can integrate different systems to optimize the car park's resources and maximize user comfort"

On-Street Solutions
Car Park Data Gathering Systems integrated in Smart City platforms.

The possibility of guiding users on roads to areas with available parking spaces, integrating these projects with time-zone payment systems, etc. are the path to the intelligent cities of the future. Likewise, specific applications are already a reality, such as the implementation of charging areas for electric cars, which must be protected; parking spaces for the disabled, reserved areas that must not be occupied by users that have not been authenticated, etc.
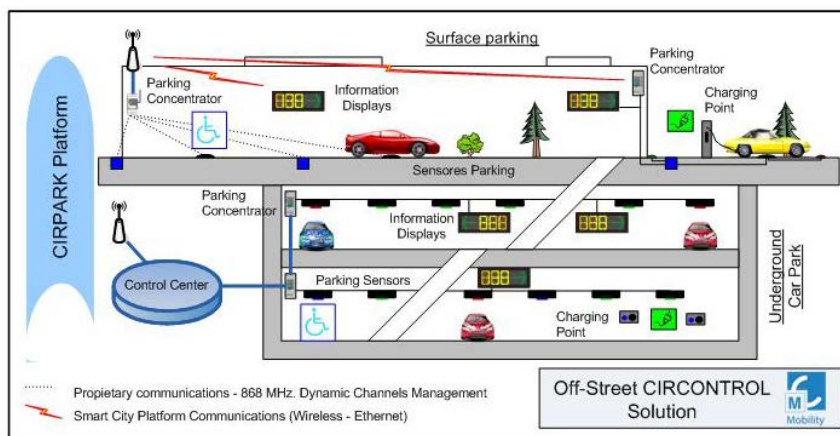

Smart City Platform

This solution is based on the installation of two types of magnetic detector in urban parking spaces: buried and surface detectors, depending on the city's road layout. Detectors are powered with long-life batteries (a minimum of 5 years), which communicate with the area's concentrators and can be connected to user information panels installed on roads.

Area concentrators use the town's Smart City platform to intercommunicate and update information on the information panels autonomously when the Smart City platform is not available. Different urban elements, such as parking meters, must be interconnected on the Smart City platform in order to allow the dynamic management of payments in payment areas; Electric car charging systems, in order to guarantee the correct usage of urban infrastructures, etc., and all systems implemented in different cities, with the purpose of improving urban traffic management procedures.

Off-Street Solutions
Outdoor Parking Area Data Gathering Systems

This section addresses parking areas in shopping centres, which combine outdoor and indoor car park solutions, etc. where the system's functionality is identical to that used in underground car parks and where the detection equipment is fully integrated with all CIRPARK efficient parking solutions.

CirPark Platform

This solution is based on the installation of magnetic detectors on the parking spaces of outdoor car park areas, off public roads. These detectors can be of the buried or surface type, depending on the type of installation, the customer's needs, etc.

One of the main features of this type of solution is the optional installation of models with no batteries or radio communication functions, i.e., models that are interconnected with cabling elements which can be powered with cables and use RS485 communications, optimising the solution's robustness while reducing maintenance to a bare minimum and ensuring as far as possible that information is rapidly updated for users, an important feature in this type of installation.

Another important feature is the optional installation of status lights to show the occupation of the parking space by means of led technologies, which is not possible in battery systems since a correct operating time cannot be guaranteed (leds can consume batteries within a very short period of time).

Magnetic Vehicle Presence Detection Sensor

Circontrol Solutions

CIRCONTROL offers a dual solution for the detection of free parking spaces in outdoor car parks: Surface detectors and buried detectors, each with a very specific functionality. A cabled or battery version can be offered for each model.

In the wireless solution, there are two sensor models, a buried SM-U model and a surface SM-F model, which use radio-frequency communications systems (RF 868 MHz) to establish communications with the area's concentrator (TCP-RF) and use 4 long-life batteries, with a minimum working life of 5 years (batteries can be replaced in both models).

In the cabled solution, sensors communicate with the TCP-PARK+ concentrator via RS485 communications. No batteries are used in this model, since sensors are also powered with cables.

Both solutions can be exchanged and can be combined and installed in the same installations, either in the case of the Smart City platform or in rotation car parks.

Magnetic detectors are installed in the geometric centre of the car park space to guarantee that the vehicle is detected.
Information Panels can be included in all solutions, with the use of the RS485 BUS in the CIRCONTROL range, with or without a cross-arrow signal.

The TCP-RF and TCP-PARK+ concentrators have built-in ethernet communications systems to manage the sensors via the CIRPARK Platform or through integration with a higher-level Smart City management platform.

Features

Surface Magnetic Detectors:

These elements are recommended to be installed in car parks that have not been built on the ground, i.e., those built on slabs where burial is costly and complex. Some car park surfaces cannot be drilled due to the type of paving or flooring elements used.

These units have been designed to withstand the weight of trucks and sudden impacts, with a minimum working life established by the size of the batteries; with a maximum working life of 5 years in the case of the radio-frequency model and with long-life batteries in the case of cabled models. An important feature of these units is their capacity to recharge internal batteries.

The basic operation of the device is as follows: the unit is activated every 10 seconds. Only the magnetic sensor measurement is activated and, in case a change in status is detected, the sensor activates the RF circuit and sends the change in status to the TCP-RF Concentrator. After communication with the master device has finished, the device returns to sleep mode.

By awakening every five seconds, the device is in RF receive mode for a given time, during which it determines whether the master has sent any configuration pattern. However, the unit will be activated every 30 minutes and send a "Live" message to the concentrator. It will also indicate the status of the parking space, the temperature reading and the battery status.

The device is equipped with a switch to disconnect the battery. The factory default state is OFF so that the battery is disconnected and does not run down.

Features

Buried Magnetic Detectors:

These elements have been designed to be installed on public roads, where all elements projecting above the road surface must be avoided in order to prevent falls, impacts, potential accidents, problems with snowploughs, etc.

The dimensions of these units have been designed for a maximum and minimum battery life of 10 and 5 years respectively (depending on the environmental operating temperature and their use). These detectors are buried in a cylindrical piece and can be larger in some cases. In principle, this product must not be replaced since the maximum degree of degradation is suffered by equipment installed on public roads and it must be fully protected against impacts, corrosion, atmospheric effects, etc. In any case, the replacement of batteries is allowed if required.

System Communications:

There are 3 Types of communications systems in magnetic detection systems:

Radio-frequency communications: In the wireless model, sensors communicate with the master unit via RF communications using the 868Mhz frequency, as a result of its high degree of penetration in materials used in car parks, such as concrete.

This communication is established intelligently, i.e., with dynamic channel management to prevent interferences, frequency inhibitors and other common problems associated with wireless communications in environments where many different systems use the same emission frequency.
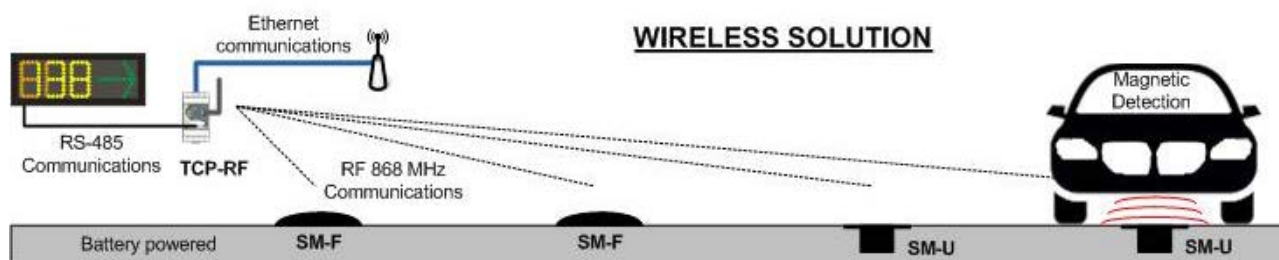
RS485 Communications: The RS485 protocol (one twisted and shielded pair cable) will be used by the concentrators to intercommunicate with the elements of the CIRPARK range, such as information panels, flow sensors, electric vehicle charging equipment, etc. Cabled sensors will also use the RS485 Bus, as in the case of all other products in the CIRPARK range.

Ethernet Communications: The Ethernet protocol will be used by the concentrators to intercommunicate with the management platforms; it can be adapted to any wireless platform in a Smart City system or any corporate network of car park installations, shopping centres, etc. where the system is implemented.

Magnetic Vehicle Presence Detection Sensor

Technical Features WIRELESS SYSTEM

SENSOR	SM-U / SM-F
Detection Technology	Magnetic Sensor: Range: ± 1000 mT Sensitivity: 0.10 mT Noise: 0.25 mT rms
Battery module	Nominal voltage of the module: 3.6 V. Nominal Capacity: 14.4 Ah. Material: primary lithium.
CPU	Micro-controller.
Radio Module	Bandwidth: 868MHz ISM Maximum Output Power: 10mW (10dBm), adjustable power output, 1-10dBm Sensitivity: 117dBm Antenna with a 50 - 100 metre range, depending on the environment
Equipment protection level	IP 67
Dimensions and Weight	SM-F: Ø254mm x 46mm and 250 g Weight / SM-U: Ø110 x 65 mm
Temperature range	-20° to +60°
Safety Regulations	EN61000-4-2 Electrostatic discharge immunity EN61000-4-3 Radio-frequency radiated electromagnetic field immunity UNE-EN55011 Measurement of emissions of radio-frequency radiated electromagnetic fields IEC61010 Electrical Safety ETSI 300-220

Example Application: Wireless Solution

Magnetic Vehicle Presence Detection Sensor

CONCENTRATOR EQUIPMENT	TCP-RF
Operating Voltage	48 - 24 Vdc ±10%
Communications	Ethernet 100Mbps RS-485 Bus, 19200, 8, N, 1 RF 868MHz ISM
Functionalities	Unit Start-up: Node status reception Information display update. Firmware update request Calibration request of a determined node. Reading the node's firmware version Reading the device type Updating the master address associated with each sensor.
Main Elements	ARM Platform RS-485 Converter Radio Module
Casing	ABS Box with DIN rail, 3 modules with: SMA Antenna connector on the front panel. RF Communication indicator LEDs RS485 Communication indicator LEDs
Usage	1.25 W
Operating temperature	-10 + 60 ºC
Equipment protection level	IP 20
Dimensions (mm) and Weight	52.3x68x85 mm and 150 g
Safety Regulations	EN61000-4-2 Electrostatic discharge immunity EN61000-4-3 Radiated electromagnetic field immunity UNE-EN55011 Measurement of emissions of radiated electromagnetic fields IEC61010 Electrical Safety EN61000-4-11 Voltage dip and interruption immunity EN61000-4-2 Electrostatic discharge immunity EN61000-4-4 Fast transient immunity EN61000-4-5 Shockwave immunity. Climatic tests