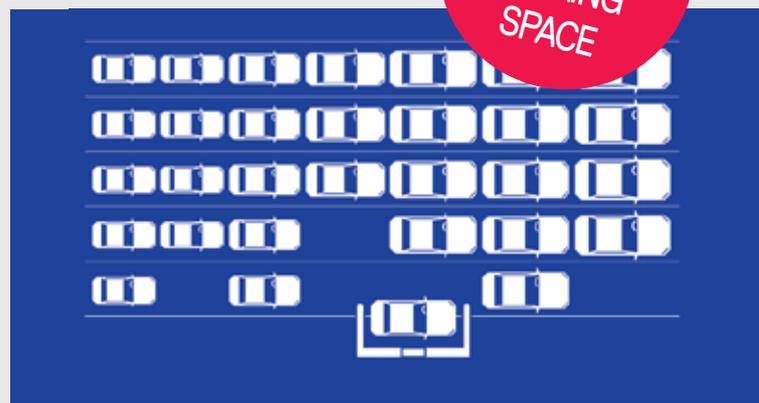




Comfortable Efficient Parking!



UP TO
60% MORE
PARKING
SPACE



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Meet RAY™

The revolutionary automatic parking system from Serva Transport Systems: maximum comfort with optimum space utilization for parking

Exploding land prices, increased space requirements and outdated car parks are a combination that is increasingly becoming a challenge in providing space for parking. Urbanization, wider vehicles and the generally growing need for mobility increases the pressure on providers of parking spaces even more. In addition, users of parking areas expect more comfort and convenience. To meet these challenges, Serva has developed a revolutionary solution that can be installed in existing parking structures, but also included in the planning of new projects, providing enormous economic benefits.

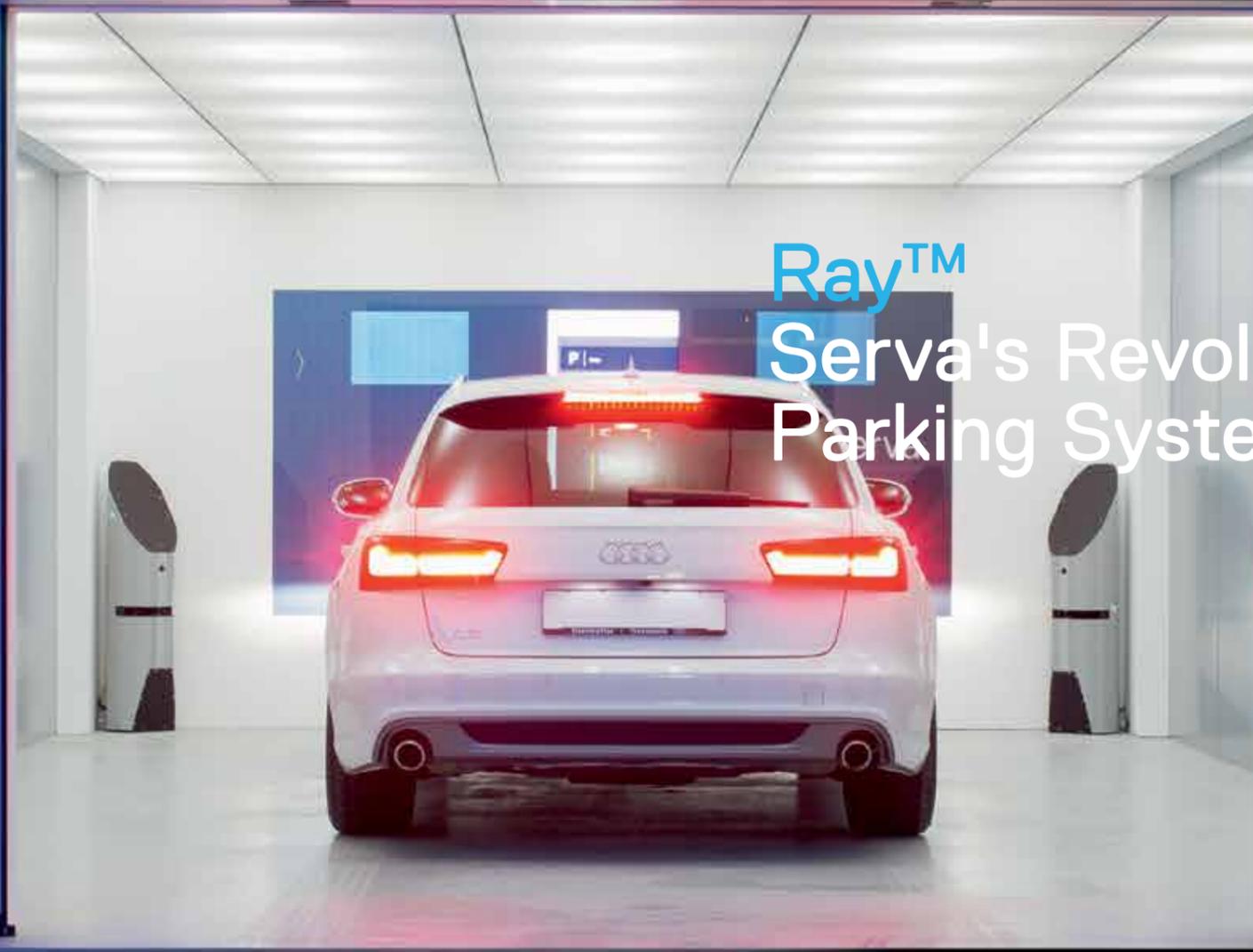
Our parking robot RAY™ parks cars up to 60% more economically, thus creating additional parking or retail space. Due to the convenience of the transfer station, RAY™ makes public parking so convenient and easy, for small cars as well as SUV's, like parking at one's own garage.

In the development of the RAY™, Serva has combined storage strategies of the logistics industry and decades of experience with automated guided vehicles (AGVs) from the automotive industry to create a unique product. Through its versatility, RAY™ operates at the high technical requirements of finished vehicle logistics as well as meets the comfort requirements of parking.

Low investment costs, easy installation, and great adaptability make RAY™ the ideal solution for the optimization of parking space as well as for the logistics industry.



Convenience
Efficiency
Simplicity

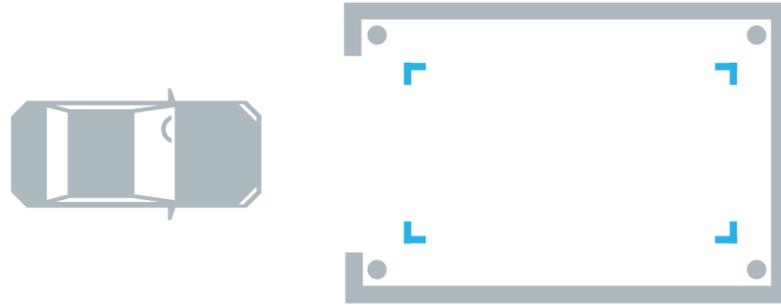


Ray™
Serva's Revolutionary
Parking System

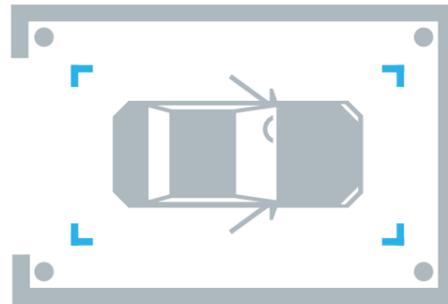
How it works

Fully automatic parking with RAY™, comfortable, space-saving and flexible.

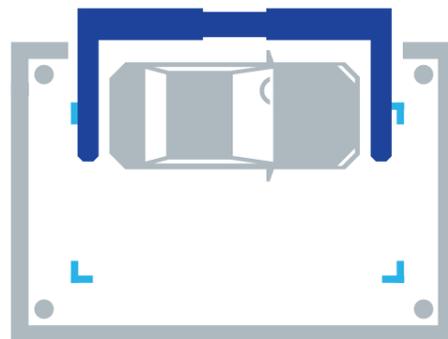
- 1 Drive-In**
Drive straight into the spacious transfer station.



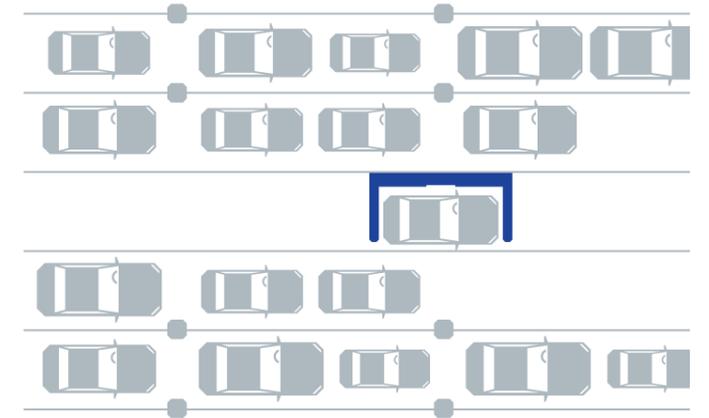
- 2 Parking and getting out**
All doors can be opened easily inside the comfortable transfer station (4 x 7 m).



- 3 Measuring and Collecting and Pickup**
After measuring the car via 3D laser scan, Ray™ adjusts to the size of your car during approach and picks it up.



- 4 Space-saving storage**
Ray™ selects the most economical parking space, avoids space losses and optimizes the utilization of the existing space.



- 5 Control**
The user can manage the car at any time using the App on his smartphone.



1 Spacious transfer stations
Unloading is not cramped anymore

2 Comfortable entry and exit
No maneuvering into tiny parking spaces

3 Always a free space
No hassle in searching for the right parking space



Convenience

We make parking at airports, shopping centers, car parks, and other public places like coming home



Parking in public parking structures is not pleasurable. Outdated parking garages and increasing space requirements within the car parks due to higher utilization and larger cars makes parking a real challenge in urban areas for many drivers.¹ With RAY™, you can offer a unique service that makes it easy and convenient to park. Just like parking in one's own personal garage.

The comfortable transfer station of RAY™ allows for driving straight into a broad, brightly lit environment as opposed to a typical cramped, dark garage. Customers can easily enter and exit the car without the risk of damaging their cars or others. All doors can be fully opened and the vehicle loaded and unloaded easily. Whether for SUV or minicars, the comfortable transfer station makes every parking maneuver easy as well as wheelchair accessible.

Place the comfortable transfer station by RAY™ near your entrance area and give your customers shortest walking distances.

Parking is done by RAY™ for your customers. Take advantage of the design space of the comfortable transfer station to communicate with your customers and provide them a positive experience from arrival.

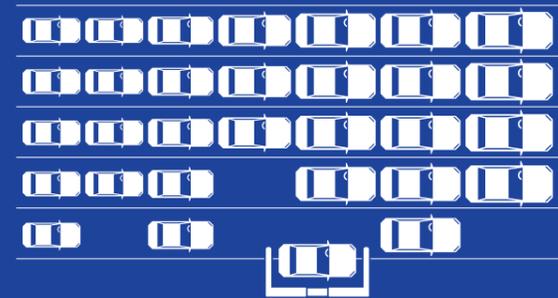
New Building

RAY™ allows you to compress your parking space to generate additional revenue or reduces construction costs and land for new projects. Consider the advantages of RAY™ at the planning stage of your project and make your parking as efficient as possible: put the comfortable transfer station directly at your commercial space and park your customer's vehicle in a space saving area.

+60%

additional parking capacity

Layout



Car sizes



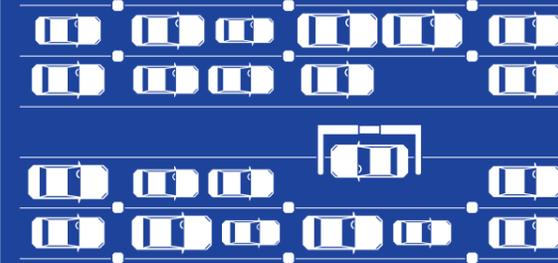
Upgrade

Due to the simple installation process, RAY™ can be easily retrofitted into existing parking without modification to the concrete structure. This upgrade normally creates up to 30 – 40% in additional parking capacity.

+40%

additional parking capacity

Layout



Efficiency

RAY™ optimizes your existing (or planned) parking and allows for efficient use of your valuable surfaces – without costly construction work

RAY™ uses principles from material logistics and deposits vehicles with maximum efficiency. RAY™ sorts vehicles by size, expected retrieval time and in a multi-depth, lateral arrangement (stacks). Supplemented by the closer proximity parking and removal of the door opening space, up to 60% more vehicles can be accommodated as compared to conventional parking configurations.

In contrast to other automated parking systems, RAY™ recognizes the size (length and width) of the vehicle to be parked, selects the corresponding most economical parking space, and eliminates idle spaces.

Including the comfortable transfer stations, RAY™ needs up to 15 square meters less area per parking space than traditional parking – without compromising the comfort of the customers. RAY™ is so flexible that it can rotate on the spot and thus requires minimal room to maneuver. Strategically selected maneuvering spaces ensures the efficiency of the system, without unnecessary loss of space.

Especially effective is the use of RAY™ in combination with lifts, providing more area gains through the elimination of ramps.



Efficiency



Convenient and safe
Park right at your destination and enjoy quick and safe travelling

Proximity

Drop your car directly at your destination and RAY™ parks for you

RAY™ enables the separation of drop-off and parking areas for cars. At an airport, for example, passengers can park right at the terminal building and RAY™ takes the cars to a more cost effective location within the vicinity of the terminal. This can be several kilometers away where land value are less costly than near the terminal.

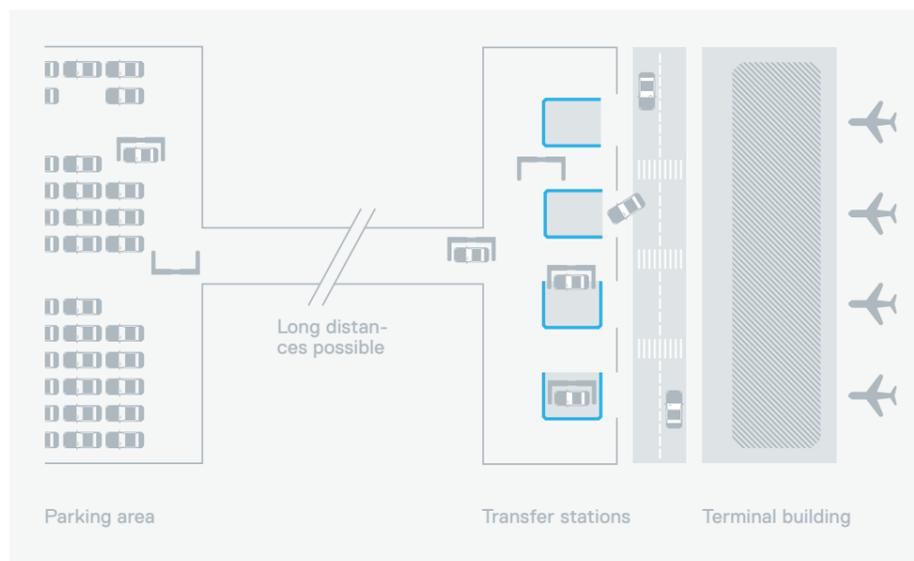
Place the comfortable transfer station of RAY™ right near your entrance area and allow your customers short walking distances. Parking is performed by RAY™ for your customers.

Create additional capacity in the most expensive areas of your building and recover additional space for retail facilities, housing, or other structures.

New traffic concepts are doable through close proximity of the vehicle transfer station to the destination of your customer. Integrate the drop off area into your service concept and create a clear added value for your customers.

Avoiding unnecessary walking distances for patients or a luggage drop off right next to the car on airports – RAY™ is flexible to all of these situations.

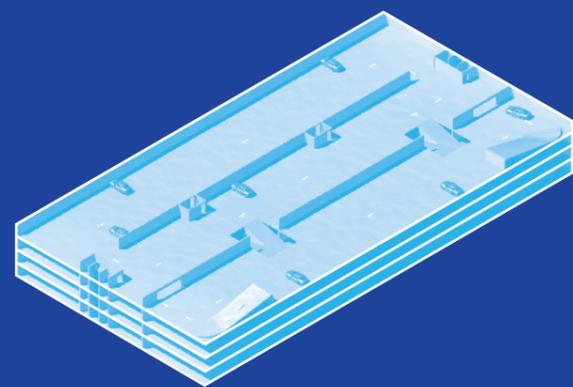
RAY™ also helps the environment. The transfer stations as the single point of entry reduce the usual internal car park search. This not only spares your customers worries, it also eliminates unnecessary emission.



Building Volume Comparison

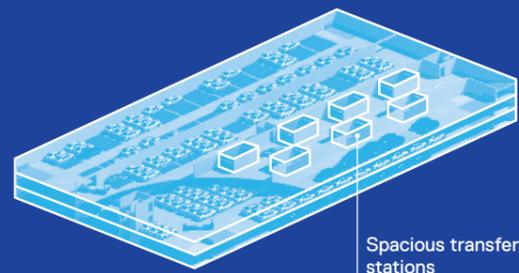
Standard Garage

The customer needs to find an open parking space in a big garage with several levels. The customer then needs to walk by foot back to the exit. Through wide driving aisles and passenger ways, a lot of space is consumed.



Serva Garage

In the Serva parking garage, the customer drives to the closest level. The customer then uses one of the easily accessible and comfortable vehicle transfer stations which are located close to the exit. From there on, RAY™ takes care of the parking process. Due to its four actively steered wheels, it can move with more flexibility than any car. That's the reason why RAY™ can save space.



Simplicity

No concrete work and minimal installation time – upgrade your existing car park with RAY™

1 Short installation times (2 to 4 weeks)

2 Ready to use 6 months after order

3 RAY™ adjusts easily to different circumstances

Unlike other automated parking systems, RAY™ is independent of rails or other fixed building structures. This makes it very flexible. The integration of RAY™ usually takes about 2 to 4 weeks, as the installation project does not require concrete work and the system (robot and comfortable transfer stations) is delivered fully assembled. Do you need to relocate? No problem, RAY™ grows with your needs, and if necessary he simply moves to a new building with you.

RAY™ is designed so that it can be effectively implemented at a minimum of just 70 spaces. The advantages are particularly evident when reaching 200 or more parking spaces. At this number, opportunities to eliminate more unused space increases.

The management of RAY™ through our innovative material flow software can be customized to fit the needs of your customers. Integration with existing payment and reservation systems is part of the installation project and can be taken over by Serva.

The RAY™ App for registration and collection of vehicles is supplied as a white label and adapted to the specific requirements of your parking process. Whether access to flight and baggage data, time recording systems, hotel check-out, rental process, etc., the RAY™ App can be specifically aligned to the needs of your customers. Alternatively, the booking / management can be integrated into an existing app.

Parking with RAY™

Comfortable

Versatile

Revolutionary



1 Convenient parking
Parking straight into the spacious transfer station. Supported by the drive-in assistant.

2 Comfortable exit
Get out of your car in a relaxed way. Lock it and take the key with you. Enjoy plenty of space for unloading.

3 Check-in
Select your desired pick-up time at the terminal. If your plans change you can easily change your pick-up time via the smartphone App.



4 RAY™ takes over
After releasing the parking process Ray™ takes over and stores the car efficiently.

5 Request car
Order your car on your way to the parking garage ahead of time.

6 Comfortable entry
Upon arrival at the transfer station, your car is waiting for you in driving direction. Enjoy plenty of space for loading.

7 Exit
Drive out of the transfer station. Straight and easy.

Variable Utilization
Continuous Utilization
Peak Utilization

Serva Use Cases

The right solution for every challenge

Objective

Enhanced comfort and additional revenue through extra spaces and increased customer service

More information online:
www.servo-ts.com



Use Case 1 – Variable Utilization

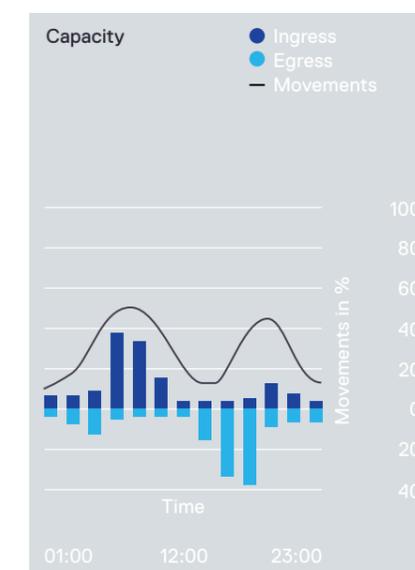
For example: Multi-purpose buildings, airports, shopping, car rental, hospitals

RAY™ is particularly suited in parking areas, where the ingress and egress are spread over several peaks a day. This includes, for example, airports (both business and leisure travelers), hotels, shopping malls, hospitals, car rentals, living / work / leisure complexes. In these structures within 3-4 one- to two-hour time slots about 80% of the daily parking movements occur.

To meet this load profile, RAY™ requires approximately 2-3 transfer stations and 1-2 robots per 100 places.

Both main advantages of the parking system become particularly apparent through the favorable ratio of transfer stations and RAY™ systems to total park area: a significant increase in parking comfort through the transfer stations and, usually, a substantial reduction of the required parking area.

This results in new sales and earnings potential through additional spaces, increased service charges, or completely new parking products result.



Reference:

Düsseldorf Airport **DUS**



Use Case 2 – Continuous Utilization

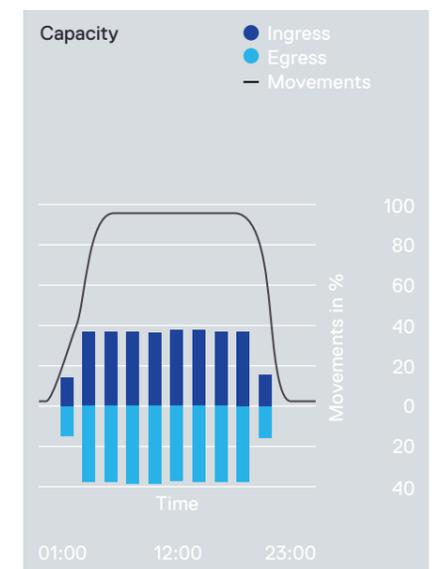
For example in
automobile production facilities
or automotive logistics

For application in areas with consistently high capacity utilization, RAY™ is equally well suited. Examples can be found particularly in automobile production, logistics, and automotive sales. In automotive production, RAY™ can, for example, automate the transfer processes at the distribution site or storage facilities and optimize the administration of special production or development vehicles. In the sales and after sales area, expensive retail or service space can be used more efficiently by RAY™. This could come to use at a large distribution center or automate processes of importers.

Here, the number of required transfer stations and robots depends on how many cars are to be moved. For applications in production and logistics with usual cycle times of 1-2 minutes per car, many more RAY™ systems are required as compared to its application in sales or development (R&D).

Thanks to professional settings, specific security techniques can be put to use, that would not be sufficient in the public car traffic. Thus, the cycle times can be optimized.

Efficiencies arise mainly through cost savings as a result of automation and reduced area requirements on some very expensive factory premises.



Reference:



Objective

Better utilization of existing capacity, avoidance of construction work, enabling new projects

More information online:
www.servo-ts.com



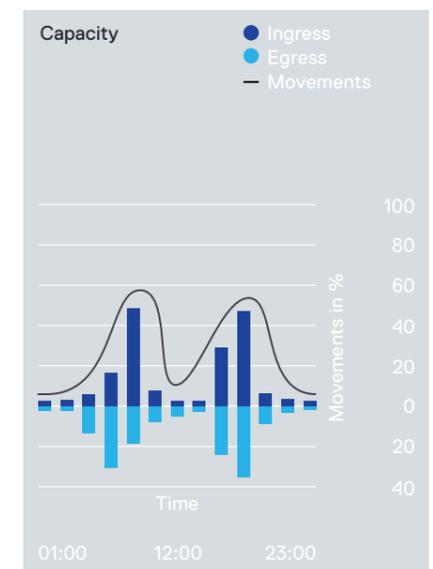
Use Case 3 – peak Utilization

For example, employee parking and pure residential buildings

In parking areas with the classic office load profile – two daily peaks provide >70% of all parking movements – the design of RAY™ must be adapted to the flow of traffic in a special way. In general, these are the parking areas of office buildings or pure urban residential complexes which have these peaks between 6-8 o'clock in the morning and between 17-19 o'clock in the evening.

To cover the required load profiles, it usually takes 3-4 transfer stations and 3-4 robots per 100 parking spaces. In addition, standard parking spaces are used as overflow space to cushion absolute peaks.

Since these are not commercially exploited parking spaces in the classical sense. As a rule, the added value of RAY™ is produced primarily by avoiding construction and land costs. In addition, the innovative character of RAY™ and the associated marketing aspect cannot be ignored, especially in luxury condominiums or technology-related companies.



Tech Specs

Comfortable transfer station

Dimensions

- › 4m wide and 7m long – can be customized

Components

- › Drive-in assistant
- › Check-in column – get your ticket and enter planned pick-up time
- › 360° camera system
- › Sensor system for measuring the car
- › License plate recognition to identify registered customers automatically
- › LED lighting
- › Gates for separating the garage from the transfer area

Drive-in assistant screen

Security gate

3D-Scan Column

Bright Rooms

The always illuminated transfer stations provide a maximum of comfort and security. Locked with gates, so just the driver and Ray™ can enter this area – no one unauthorized.



RAY™ determines its position 10 times per second to +/- 4 mm accuracy

750,000 options exist for RAY™ to navigate on the parking area between 650 orientation points

200,000 measurement points are evaluated by Ray's lasers to detect the contour of a car. It takes 0.002 seconds for an information to be distributed in the network of Ray

RAY™ communicates an average of 6,000 times per storage with the master control to bring the loaded car safely to his spot



100 times per second RAY™ checks if his driving route is free

Robot Performance

- › Maximum speed: 3 m/s nominal
- › Acceleration/deceleration: about 0.4 m/s²
- › Emergency stop deceleration in dry lane: > 1.2 m/s
- › Battery voltage: 48 V (charging voltage up to 54 V) Lithium-ion battery
- › Maximum Load capacity of the robot: 3 tons
- › Weight of the robot: 2.5 tonnes gross
- › Vehicle weight (robots and cars): max. 5.5 tons

Transportable Car

- › Maximum total weight: 3 tons
- › Axles: 2 axles with 2 wheels
- › Maximum car height: max. headroom minus 20 cm
- › Maximum car width (Incl. mirror): 2.2 m
- › Maximum car length: 5.3 m (e.g. Audi A8 L)
- › Minimum car length: 2.5 m (e.g. Smart fortwo)
- › Minimum wheelbase: 1.8 m (e.g. Smart fortwo)
- › Ground clearance: 0.12 m

Tech Specs App (Whitelabel)

Functionality

- › Reserve a parking space
- › Electronic ticket
- › Change pickup time
- › Instant retrieval
- › Display of the parking garage and surroundings on a map
- › Payment

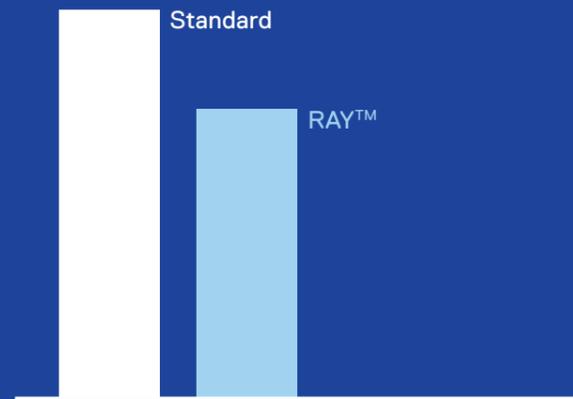


Simple and mobile

You can manage your booking at any time and from anywhere with our App. Change your pick-up time or request your car



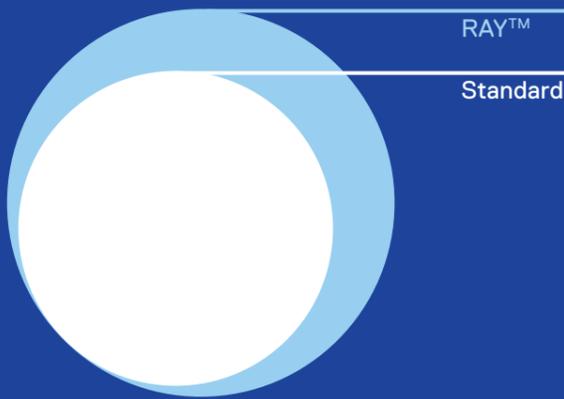
New Building



Cost per parking space

	Standard	RAY™
Required spaces	1.000	1.000
Area required /space	30	19
Total area required in qm	30.000	19.000
Cost per qm	800 €	800 €
Total cost	24.000.000 €	15.200.000 €
Investment	0 €	6.000.000 €
Cost per space	24.000 €	21.200 €
Savings	0 €	2.800.000 €

Upgrade



Revenue potential

	Standard	RAY™
Number of parking spaces	1.000	1.400
Utilization	50%	50%
Daily price ø	30 €	30 €
Service Increase	0%	15%
Revenue per year	5.475.000 €	8.814.750 €
Revenue increase	0 €	3.339.750 €
Costs per annum		2.294.160 €
• Energy/electricity		56.160 €
• Amortization of construction		50.000 €
• 1st Level Support		200.000 €
• 2nd Level Support		548.000 €
• Rental fee RAY™		1.440.000 €
Additional income through RAY™		1.045.590 €

Economic Benefits

Increase sales and lower costs through efficient use of parking space

RAY™ bears different economic advantages: In a commercially used parking structure, sales and earnings per square meter can be increased in two ways. Particularly for highly utilized parking areas (> 50%) more spaces are sold through more efficient use of space with RAY™. In the example on page 28, this effect is illustrated using the example of a garage with 1000 parking spaces (default).

But even without a substantial increase in the number of parking spaces, RAY™ allows for additional earning potential. Due to the increased comfort and service for your customers, significant price adjustments are possible in many cases. At some airports for example, customers pay up to 30% more for so-called XXL parking spaces and up to 40% more for basic Valet Services.

In new buildings, the use of RAY™ should be considered at a very early stage of planning. Thus, the economic impact of RAY™ materializes in the design of the actual construction project. Due to the reduced space requirements substantial cost of construction (civil engineering) can be saved. The example on page 28 shows the costs of a single parking space based on car park with a capacity of 1000 cars.

In both examples, an average peak load (about 30% of daily movements in 2 hours) is assumed. Higher demand increases the cost for RAY™.

In automotive logistics, the automatization of processes and the related savings adds to the commercial benefits outlined above.

Preparation

Feasibility: System Requirements

To evaluate the general applicability of RAY™, our engineers analyze the existing floor plans and existing driveways. On this basis, we develop concepts for implementing RAY™ and determine the rough system requirements. In new buildings, we work together with architects and designers to find the optimal solution.

Simulation: performance determination, problem identification

Before the detailed implementation planning, we develop a realistic scenario of parking processes on the basis of expected traffic with our simulation specialists. With the support of this simulation, we determine the performance of the system and can possibly even make adjustments to the design.

Planning

The last step in planning is the integration of RAY™ in the parking structures. In particular, for existing parking structures, we try to avoid to reduce impacts on the normal operation through the commissioning of RAY™ as little as possible.

Implementation

Adaptation hardware

The default configuration of RAY™ is generally sufficient for 90% of all applications made. If adjustments are necessary, for example, through larger vehicle types, our engineers can adapt to these requirements and make modifications in the shortest possible time.

Adaptation software

The programming of the control software and the App is performed by our development team. Whether integration into existing systems, optical adjustments to the user can be made: Our programmers strive to meet your requirements in a professional manner.

Project Management

The installation of RAY™ is conducted with professional project management to keep the on-site implementation time as short as possible. Since the technical components, i.e. transfer stations and robots, are delivered ready for installation, the pure construction time on site is usually only between 2 and 4 weeks. At this time our certified project managers ensure that a smooth working installation is accomplished.

Service and Maintenance

General

RAY™ is CE certified according to the EU Machinery Directive 2006/42/EC. The redundant design of the system ensures high availability of the parking facility.

Training

Upon delivery of the system, you will receive a comprehensive training package to prepare the site personnel to work with RAY™. The duties of the personnel on site include e.g. regular cleaning and care of the transfer stations and the robot. In addition, certain further maintenance measures can be taken independently.

Repair

In case of faults that cannot be solved by on-site personnel, the service team by serva transport system is always available. Depending on the service level agreement, our service technicians are available by phone 24 hours a day, 365 days a year, so is our electronic trouble ticket system.

Maintenance

Pro-active maintenance is essential for the longevity of mechanical products. For RAY™ such preventive maintenance must also be made. To this end, our qualified service engineers arrange on-site maintenance windows in which the most important wearing parts are exchanged and other necessary maintenance work is carried out – without affecting the normal operation.



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