

Passenger Car Simulator „Smart Drive“

Type: F12SA-3/L43

Product Description and Technical Specification



General

The simulator serves not only the purpose that the handling of the operational elements in a short time, fuel-efficient, environment-friendly, without wear and tear, and without risk for man and machine can be trained, but it can also be used without any regard to weather and traffic conditions. Further advantages of simulators are the reproducibility of traffic situations, the replay after driving failures, the repeatability of exercises and the exact evaluation of driving and operating mistakes. A special advantage is that trainees are confronted with unexpected situations, which may happen in real traffic but, due to the danger, cannot be integrated in the educational program. So the simulator serves the operational control as well as making decisions. Due to its high-tech image and its reliable objectivity it is appreciated by all users.

Driving Stand:

The casing is a compact, robust construction with control elements. It is equipped with manual gear-box. The simulator can be used in automatic and in a manual mode. The dashboard is replaced by a flat screen and adaptable. The seat is adjustable in two degrees of freedom. The stand is equipped with the following required controls for driving of a car:

- Steering wheel
- Manual as well automatic gear shifting
- Accelerator, brake and clutch pedal
- Brake pedal
- Indicator push lever
- Various Buttons on buttonboard
- Safety Belt



Simulator Computer Hardware

For each Simulator a normal-shaped personal computer is used. The PCs are of new commercial standard.

Technical Characteristics:

Operating System: Windows 10, 64Bit
CPU: QUAD Core.
RAM: 8GB
Graphic card: NVIDEA 1660 or better

Audio System

As sound system the loadspeakers of the centre Screen are used. Optionally a soundbar can be added.

All sounds are made by sampled recordings, especially the engine sound, which is dependent upon the revolution and the torque of the simulated engine. Other sounds are starter, squeaking tyres, crashes, rain, drive wind, splash water, scratching tooth wheels, traffic and human voice.

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Solid-State-Disc – Drive
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Software Performance of the Driving Computer

The software includes driving dynamics, noise generation, graphics generation, data base, virtual objects, scenarios, training/curriculum, menu control, adaptation to the customer country's conditions and evaluation.

Driving Dynamics

The characteristics of a real vehicle are simulated. Any parameters as maximum speed, acceleration, deceleration at braking, vehicle mass, torque/revolution-characteristics, gear ratio, maximum power, and wind resistance are modifiable. Also longitudinal and lateral accelerations are computed. At excessive centrifugal acceleration in curves the tyres drift to the outside, so that the barrier may be touched.

Graphics Generation

Picture resolution 1920 x 1080 pixel per channel (Full HD), colour depth 24 bit (true colour). The images have texture mapping with anti-aliasing.

Data Base

The virtual world comprises rural, mountain and urban roads, highways and motorways. The courses include crossings, traffic lights, traffic signs, rises and falls, forest, entrances and exits for motorways. The complexity of the road-network is limited to 2 lanes per direction on intersections and 3 lanes per direction on motorways.

Virtual Objects

The system offers houses, cities, wood, many extras, traffic signs, animated pedestrians and animals. There are cars, trucks, buses, motor cycles, cyclists and other vehicles.

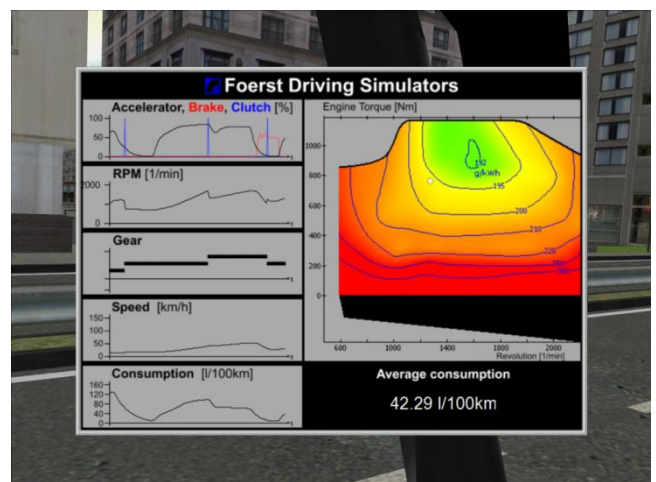
Rear Mirrors

The images for the left and the right exterior mirror are generated and displayed on LCD screens. They show all virtual objects from the back side and all following and removing road users.



Replay and diagrams

The simulator provides the possibility to show a complete replay of the last driven scenario. There is a possibility for fast forward, fast backward, stop and play. The view point is a helicopters view. Additionally the simulator can show diagrams of the most important parameters during the replay (if requested also during the ride)



Traffic

The traffic includes at least 30 road users with artificial intelligence, comprising passenger cars, trucks, pedestrians and cyclists, who may at the same time appear in the view range. They observe the traffic rules, the distance to the foregoing vehicle and the speed limits, come to a stop before red lights and crossing traffic, accelerate and decelerate in a natural way and may be passed. Obstacles are put into the scene with critical timing to cause sudden reactions. Collisions between the own car and other road users or obstacles are detected and cause reduction of the speed to zero with text edition. Run-on accidents, frontal accidents and others are detected and indicated.

Computer Diagnosis

Any technical input- and output data are shown on a diagnosis table in the menu on demand.



Curriculum & Scenarios for light Vehicles

This section gives short descriptions of the implemented scenarios. The descriptions focus on educational goals. The details of the scenario implementations depend on the difficulty level and the country version. Some scenarios may be missing on your simulator, if your simulator lacks the necessary operational elements to properly execute them.

The Simulator offers following scenario-modules:

- Basic Drivers Training
- Road Safety (Risk Awareness and Alcohol Simulations)
- Manoeuvring (with and without Trailer)
- Free Driving

The simulator offers a large collection of training scenarios. Each scenario usually has a length of one to five minutes and focuses on a particular educational goal.

The simulator offers a large collection of training scenarios for light vehicles. Each scenario usually focuses on a particular educational goal.

Basic training



Controls

The trainee is made acquainted with the positions and the functions of the most important operational elements of a vehicle. They comprise: Seat adjustment, Mirror Adjustment, Pedals, Use of Automatic gearshift and use of start button.

Clutch-In

Train to clutch in

Gear shifting

Three training scenario how to shift the gears correctly

Steering

The objective of this scenario is to train to keep the track.

Indicating and turning

During a ride through an empty urban area, the driver has to turn left and right. He trains correct usage of the indicator.

Junctions with Traffic Lights

The route leads across several junctions with traffic lights. This simple scenario is also useful for training to clutch in, start and switch gears.

Velocity

This scenario imparts a sense for correctly choosing the speed. To this end, the trainee drives through an urban area and a rural road with speed regulating signs. An additional graphical display informs about the currently recommended speed.

Stop and go at hillside

The driver hits a traffic jam moving uphill. He repeatedly has to stop and start again.

Reaction time and stopping distance

The student is confronted with several sudden situations. He should quickly react and perform a full braking. The reaction time is measured as well as the braking and stopping distance.

Priority

In an urban area the route leads across several junctions with different priority situations. Other road users have a somewhat hesitating driving style in order to force the trainee to make decisions.

Road with equal Rights

In an urban area the route leads across several junctions. For various reasons (explicit signs, no signs at all, flashing traffic lights), both roads always have the same priority.

Stop Sign

In an urban area the route leads across several junctions. At each junction, the driver must bring his vehicle to a full halt in front of a stop sign.

Traffic Light Junction with Pedestrian

In an urban area with medium traffic the route leads across several junctions with traffic lights, where the driver has to turn left and right. The driver must respect the pedestrians crossing the destination road¹.

Traffic Rules

The objective of this scenario's three variants is adherence to various traffic rules (speed limits, right of way, regulating signs).

Following situation

The student trains keeping the right distance to the man in front. A virtual distance arrow signals an insufficient distance.

Overtaking

The student trains how to overtake slower vehicles. The difficulty levels differ in road shape and traffic density.

Sight and road conditions

This scenario's objective is choosing the right speed in fog and rain.

¹ In some countries, situations like this are prevented by the pedestrian traffic lights. In such countries, this scenario is of limited use.

Gap Acceptance

In heavy traffic and various turning situations, the driver has to wait for an adequate gap in order to merge into the running traffic. He should neither endanger other traffic participants nor impede following traffic by waiting for an unnecessarily long time.

Motorway

The driver trains merging into motorway traffic, leaving the motorway, overtaking, keeping distance and choice of speed and lane.

Overland journey

This scenario expands on the knowledge gained in the preceding scenarios.

Driving in Fog

The drive starts at good sight. Suddenly a fog bank emerges, which requires an adapted speed. Various dangerous situations occur, which, at not adapted driving style, almost unavoidably lead to an accident.

Driving in Rain

The drive is absolved in dense rain. The driver has to cope with bad friction, aquaplaning and bad sight conditions.

Driving in snow

The landscape is snow-covered, but the roads are cleared. Occasionally, it might be slippery, though.

Driving at Night

The driver is confronted with the bad sight conditions at night-time

Maneuvering

Perpendicular Parking (1)

The student can train perpendicular parking forwards

Perpendicular Parking (2)

The student can train perpendicular parking backwards (left)

Perpendicular Parking (3)

The student can train perpendicular parking backwards (right)

Parking Garage (1)

The student can train perpendicular parking forwards

Parking Garage (2)

The student can train perpendicular parking backwards

Three Point Turn

The trainee can train turning the car on a narrow road.



Hazard Perception Training



City

The driver travels through an urban surrounding and is confronted with the following situations:

- A pedestrian crosses a zebra crossing.
- A car unexpectedly comes out of a gateway.
- A bus starts from the bus bay.

Interurban Ride

The driver travels through the countryside and is confronted with the following situations:

- Behind a hilltop, a lorry has lost its load, which is now blocking the road.
- A car carelessly enters the traffic.
- A ball rolls onto the street. A child follows shortly after.
- In a forest, a deer jumps onto the road.

Rural Road

The driver travels through the countryside and is confronted with the following situations:

- A lorry covers red traffic lights.
- A pedestrian unexpectedly crosses the street.
- A bicyclist must be overtaken.
- In a forest, a deer jumps onto the road.
- A car unexpectedly enters the traffic.
- Another deer jumps onto the road, this time from the opposite direction.
- A car leaves a parking lot.
- A child runs onto the road immediately after a town sign.
- A parking car opens its side door.

City

The driver travels through an urban surrounding and is confronted with the following situations:

- A child runs onto the road.
- A parking car opens its side door.
- A car reverses into the street
- A bus starts from the bus bay.

City at Dawn

At dawn the driver travels through an urban surrounding and is confronted with the following situations:

- A bus starts from the bus bay.
- At a junction a fast driving car is hidden by a truck
- A car enters the traffic

City with Roadworks

The driver travels through an urban surrounding and is confronted with the following situations:

- Negotiation of construction sites

Motorway

The driver travels on the motorway and is confronted with the following situations:

- Entering and leaving the motorway
- A car pulls out from the right to the left lane.

City in the Rain

The driver travels through an urban surrounding while it is raining. He is confronted with the following situations:

- A bus is standing on the road
- A parking car opens the driver's door
- A child is running between parking cars and enters the road

Rural Road in the Snow

The driver travels through the countryside and is confronted with the following situations:

- Black ice
- A ball rolls onto the street. A child follows shortly after.
- A slow construction vehicle has to be overtaken

Rural road in the rain

The driver travels through the countryside and is confronted with the following situations:

- A bicyclist must be overtaken
- A parking car unexpectedly enters the traffic

Motorway

The driver travels on the motorway and is confronted with the following situations:

- Entering the motorway when coming from a service station
- Driving on motorways with two and three lanes per direction

Mountains

The driver travels through a mountain range and is confronted with the following situations:

- Serpentine road
- Damaged road surface
- Tunnel
- Bridge with side winds

Ride in the Fog

The driver travels through the countryside and is confronted with the following situations:

- Changing fog density
- A pedestrian crossing the road
- A cyclist

Motorway in the Rain

The driver travels on the motorway and is confronted with the following situations:

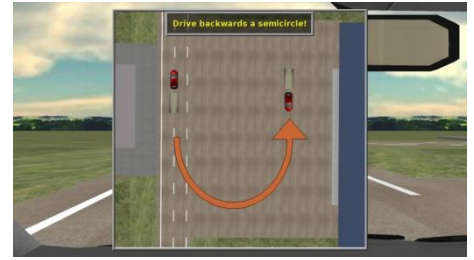
- Entering and leaving the motorway
- Aquaplaning

Ride at Night

The driver travels through the countryside and is confronted with the following situations:

1. Damaged road surface
2. Unlit truck on standing on the road
3. A deer jumps onto the road

Maneuvering with Trailer



Driving with Trailer

The driver has to pass a route with many turnings.

For this scenario it is possible to choose whether or not to have other vehicle on the road.

Slalom around Pylons

The driver is supposed to drive through a traffic cone course without hitting the cones.

Additionally you can choose to complete this exercise forwards or backwards.

Following the Road

The driver is to train driving backwards.

Selectively the route is winding or straight and the task is either to keep to the own lane or to the whole road.

Turning with Side Road

The driver should train the two different procedures to turn with the help of a side road.

Circle Drive Backwards

The student should drive a semicircle in backwards direction. After the manoeuvre, the vehicle should stand in straight position.

Parking Backwards

The driver is ordered to reverse into a gate.

It is possible to choose from which side he is coming and the width of the gate.

Free maneuvering

The driver has the possibility to train manoeuvring in different situations on a work yard.

Free Driving

Rural Area

The course begins with 2 km of curvy highway and 600 m city drive. Inside the city and at its end there are traffic lights. The course closes along a curvy highway. The road leads along a lake with sailboats through landscapes with forest and green.

Urban Area

Here you find urban roads with a high density of junctions. Some roads have one, others two lanes per direction.

Mountains

This map in particular contains a mountain drive with steep bevels, serpentine roads, a bridge and tunnels. The ride starts in the plane right before the serpentine road.

Highway

The motorway is mildly curved and runs through woody landscape. It has an entry and an exit. The ride is ended after ten minutes or when one leaves the motorway via the exit.

Mixed Area

This environment is a combination of various types of environment. There are e.g. rural roads, urban roads with one and two lanes per direction and a city motorway. This map features special locations suitable for a variety of driving tasks, e.g. parking spaces, a depot area for manoeuvring exercises and a (drivable) parking garage.

At Fog

This is a ride on a rural road and through a small town at fog. The ride starts in fog with 80 meters sight distance. Cars may suddenly approach, so that passing is dangerous.

At Rain

The sky is cloudy, it is raining and the road is wet. The road surface is slippery. If you drive faster than 80 kilometres per hour, the aquaplaning effect sets in. This is simulated by a splash water noise and a forward swimming of the car, so that in most cases an accident is unavoidable. Furthermore, weak friction of the tires on the wet road is simulated. This shows up at excessive centrifugal acceleration as well as at hard braking. The ride ends after 10 minutes.

At Night

The landscape shows winter colours. Mountains, fields and trees are snowy white. It is snowing and the road is covered with snow. The traction of the wheels is reduced. At higher speed the car starts sliding. ABS and ESP are active.

Option: Curriculum & Scenarios Heavy Vehicles

This section gives short descriptions of the implemented scenarios. The descriptions focus on educational goals. The details of the scenario implementations depend on the difficulty level and the country

The Scenarios List is available for following vehicle:

- Lorry
- Semitrailer
- Truck with drawbar combination
- Truck with tandem Trailer
- Bus



Scenario List for Heavy Vehicle

Free Driving –

After selecting his vehicle the driver can go for Free Driving in various areas..

Turning with Sideroad

Turning with aid of a sideroad

Reverse park

Drive perpendicular to the parking space

Semi-Circle

The student should drive a semicircle in backwards direction. After the manoeuvre, the vehicle should stand in straight position.

Parcour

The driver shall sequentially move to the four marked parking slots without hitting the cones..

Platform

The driver is ordered to reverse before a loading platform.

Parallel Parking

Driver should park parallel to the road

Ramp sideways

The driver manoeuvres the vehicle beside a loading ramp.

Arc backwards

The task is to drive backwards through a circular arc.

Park trailer

The driver is ordered to reverse into a gate.

Hazard in the City Variation 1-6

These hazard perception scenarios are similar to the scenarios described for the light vehicle simulation. (see chapter above)

Hazard on rural road Variation 1-4

These hazard perception scenarios are similar to the scenarios described for the light vehicle simulation. (see chapter above)

Eco Training (City, suburb, Rural Road, Motorway)

These Scenarios strains the student how to reduce his fuel consumption with a defensive driving style.

Motorway

These Scenarios strains the student how to reduce his fuel consumption with a defensive driving style.

Option: Sport Seat

The Driver seat can be replaced by a sport seat. This solution will not have a safety belt.



Option: Various Screen Sizes

The Screen Size can be adapted. Also 32 or 55" are available.

General Restrictions of Driving Simulators

The following statements are valid for any driving simulator. They are independent from a special brand or manufacturer.

Kinetosis warning:

Driving simulators might cause a kind of dizziness called kinetosis. The producers of simulators try to minimize this effect, but it cannot be avoided.

Limitation of complexity:

The full complexity of real traffic in regard of graphical environment, traffic behaviour and force-feed back can't be reached. Please check our catalogues, descriptions and products to see the current level of realism.

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