

## Track Test Systems

### Important Safety Instructions - Driving Robots



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Registered in England and Wales. Company No.: 01658222  
Document No.: EHSR04 Issue No.: 5

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# DRIVING ROBOTS

## General

These safety instructions apply to the following types of Driving Robots:

- Steering Robots
- Pedal Robots
- Brake Robots
- Accelerator Robots
- Gearchange Robots
- Flex-0 by wire controller
- S-Brake
- Driverless Robots

All users of AB Dynamics Driving Robots MUST follow the applicable Important Safety Instructions listed below.

Driving Robots are designed to automatically steer, brake and accelerate a vehicle under computer control and may be operated either with or without a human driver in the vehicle. Driving Robots are capable of putting large inputs into the vehicle's steering and/or pedal systems at high velocities in order to test the characteristics of a vehicle. The robots, when operated together with a vehicle, are capable of generating POTENTIALLY DANGEROUS responses in the vehicle if improperly used. Vehicle testing involves an inherent general risk to the user of the vehicle and those in the vicinity where the vehicle is being tested or used.

All users of Driving Robots must be fully trained and shall receive a certificate and sign a statement verifying such training. The important safety instructions in this document shall be included as part of training.

All users of the Driving Robots must read the relevant technical documentation and follow the detailed instructions given. Reading the manual is NOT a substitute for training.

### WARNING

**POSSIBLE SERIOUS INJURY: DRIVING ROBOTS AND VEHICLES, WHEN OPERATED TOGETHER, CAN GIVE POSSIBLE DANGEROUS RESPONSES RESULTING IN: A LOSS OF VEHICLE CONTROL, COLLISION OR VEHICLE ROLLOVER. THE USER MUST ALWAYS FULLY ASSESS THE RISKS BEFORE OPERATING THE DRIVING ROBOTS.**

#### Important Safety Instructions:

- Robot controlled vehicles must only be operated on a suitable private test track and not on public highways, freeways or other roadways. The user must ensure that there is sufficient space on the test track to perform the desired test safely.
- Safety belts must be worn by all occupants in a robot controlled vehicle.
- If high speed tests are to be performed there must be a properly considered risk assessment which will depend on the severity of the testing covering the use of roll cages, outriggers, full harness, helmet and fire protection.

## Important Safety Instructions - Driving Robots

- Disable all airbags (including airbags inside the driver's seat) that could hit the installed robot or accessories such as tablet PC's, unless the robot has been specifically designed to work safely alongside the airbag i.e. Torus and Orbit robots.
- Firmly strap the robots' electrical equipment within the vehicle before any tests are performed.
- Ensure all components of the driving robot are fitted securely and correctly in the vehicle. Particular attention must be paid to safety critical components e.g:
  - Check that the brake pedal linkage, pedal bracket, and pedal module are safely and correctly attached
  - Check that the steering robot motor assembly is securely attached to the steering column
  - Ensure that the pneumatic strut torque reaction mechanism is firmly in place and pressurised
  - Check that any suction cups used to secure the robot are firmly and securely attached, and that the low pressure indicator is not visible
  - Check that any motion sensor used for control is securely attached and fitted in the vehicle
- The homing procedure (and, for Steering Robots, the Zero Steering procedure) must be carried out every single time a driving robot is installed.
- Situate and secure the emergency stop box within easy reach of the driver.
- The user must ensure that items of clothing or hair cannot get tangled in the rotating steering robot. Long hair must be tied back and loose clothing must be avoided.
- The user must ensure that all cables are carefully routed and secured away from the actuators to prevent entanglement.
- Do not continue to use the driving robot if it is damaged, or malfunctions.
- Always examine and check the configuration of a test or recorded learn/user defined data before running on the robot.
- Always try out new tests at a low speed, below 30 kph, to check that the test is correctly configured, and that the robot is functioning as expected.
- The user must ensure that software limits (e.g steering angle, velocity, acceleration, motion pack accuracy and path following error limits) are set appropriately for the test. The limits must not be set to excessively large values as this can effectively disable an important safety function.
- Vehicle exhaust fumes contain carbon monoxide, a poisonous gas. The user must ensure exhaust fumes are not allowed to accumulate within the cabin. Where the robot and vehicle are used indoors, effective exhaust extraction must be used.
- Never test or continue testing with the driving robot when tired, under the influence of drugs or alcohol, whether prescribed or otherwise.
- When operating driving robots from within the vehicle, the user must occupy the driver's seat and remain vigilant at all times. If the robot should malfunction, or if emergency intervention is required, the user must be ready to take over control of the vehicle by immediately releasing the activate switch and taking full control.

## Important Safety Instructions - Driving Robots

- Never attempt to disassemble or modify any AB Dynamics products, unless instructed to do so by AB Dynamics. Unauthorised disassembly and/or modification can result in failed or incorrectly functioning hardware, which in turn can lead to potentially dangerous situations.

### Specific Important Safety Instructions for Driverless Operation:

- Ensure the installation of the components in the vehicle has been carried out correctly and thoroughly checked. Particular attention must be paid to the installation of the braking system, as this is critical for ensuring that the vehicle can be stopped from the base station. Check that the brake pedal linkage, pedal bracket, and pedal module are securely fastened.
- Ensure the engine kill relay unit has been connected to the vehicle's electrical system, replacing the ignition fuse. The function of the engine kill relay must be tested and proven to stop the engine.
- All operation instructions in the software must be correctly followed.
- Personnel **MUST NOT** go near or stand in the path of a robot-controlled vehicle when in operation, press the E-stop button or turn off the activation key on the Safety Controller base station before approaching a vehicle under driverless operation.
- Ensure that no other vehicles are allowed to enter or are placed in the test area except for other driverless vehicles specially required as part of the testing.
- Ensure that there are no stationary obstacles in the test area that could cause a risk of collision.
- The test vehicle must only be operated if there is a direct line of sight between the base station and the test vehicle.
- The base station Emergency Stop button must be within easy reach of the user at all times.
- The software safety boundary must be set up appropriately for the test area. Note that if the vehicle is travelling parallel to the boundary and at high speed, a sudden change in direction may result in the vehicle crossing the boundary whilst still moving. Extra margin should therefore be considered around fixed objects on the test track.
- Suitable barriers must be in place at the perimeter of the test area to prevent the escape of a "runaway" vehicle and prevent access from unauthorised vehicles, pedestrians or animals.
- The user must remain vigilant at all times when operating a driverless vehicle.

**I have read the above important safety instructions and agree to comply with the requirements.**

<b>Name</b>		<b>Date</b>	
<b>Position</b>			
<b>Company</b>			
<b>Signature</b>			

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