

## Autonomous Systems Inspection

During technical inspection all work carried out on the vehicle must be approved by a technical inspector. Please be aware that during the autonomous scrutineering the EBS will be triggered multiple times, be ready to refill the EBS energy storage.

### Required resources

- ASF hardcopy
- RES remote control
- Source code of EBS supervisor, either digital or hardcopy
- Data logger connected to the car CAN bus.

### Sensors for autonomous system

- Sensors may not come into contact with the driver's helmet when normally seated.
- Sensors must be securely and rigidly mounted to the vehicle's structure.
- Sensors must be positioned within the surface defined by the top of the roll bar and the outside edge of the four tires, with a maximum distance of 500mm above the ground and not further forward than 700mm forward of the front of the front tires. They must not exceed the width of the front axle.
- Only antennas with the longest side < 100mm protrude from the surface envelope.
- DV components behind the driver's compartment do not overhang more than 25% of their bounding box volume from the surface envelope. (compare actual locations with ASF)
- Other DV components (not sensors, antennas and compartments behind the driver) must be positioned within the surface envelope.
- All Sensors are included in the "Autonomous System Implementation" chapter of the ASF. (for additional Sensors, datasheet must be provided by the team and approved by the officials)
- Mark all sensors.

### Emergency brake system

- Emergency Brake System is identical to the system described in the ASF.
- All parts of the Emergency Brake System have to be properly mounted, no leaks.
- No push-in fittings used.
- Make sure that GLVMS, TSMS and ASMS are switched off.
- EBS can't get activated. Team must explain their solution
- A pictographic description of the location of the EBS release points is clearly visible in proximity to the ASMS (if there are any manual release points).
- Manual release points are marked by a red arrow with "EBS release" in white on it.
- All release points are in proximity to each other and easily accessible without the need for tools/removing any body parts/excessively bending into the cockpit.

### Indicators and ASMS

- ASMS is mounted in the middle of a completely blue circular area of  $\geq 50$ mm.
- ASMS is marked with „ASMS“ and fitted with lockout/tagout“.
- 2 ASSI on the vehicle side (behind the driver, 160mm below the top, 600mm above the ground.
- 1 ASSI on the rear of the vehicle, on centerline, 160mm below the top, 100mm above the brake light.
- AMI is located next to the ASMS or on the dashboard and easily readable

## Functional system test

- ▶ Lift up the vehicle and remove all driven wheels except one
- ▶ Select manual mission, switch on GLVMS and TSMS (ASMS is off!)
- AMI indicates manual mission, visible in bright sunlight
- ASSI is off
  
- ▶ Energize the EBS and try to activate the TS
- Activating the TS using the cockpit or the external activation button is not possible
  
- ▶ De-energize the EBS
- Activating the TS using the external activation button is not possible
- Activating the TS using the cockpit activation button is possible
- The steering system has to be fully operational by a driver when ASMS is in "OFF"-Position.
- ASSI is off
- Re-energization of EBS is not possible. Team must explain their solution
  
- ▶ Deactivate the TS, energize the EBS, select inspection mission and switch on the Autonomous System (ASMS on).
- AMI indicates inspection mission, visible in bright sunlight
- ASSI is off
- Activating the TS using the cockpit activation button is not possible
  
- ▶ Activate the TS using the external activation button and press go within 5 sec after TS activation
- After initial checkup transition to "AS Ready", ASSI yellow continuous.(Not "AS Driving" or R2D)
- Check functionality and visibility of ASSI (visible from any direction in bright sunlight) and AMI (visible in bright sunlight).
- Check if brakes are closed by turning the driven wheel by hand.
  
- ▶ Press RES "GO" button. **During this inspection keep safe distance from the vehicle, the wheels will rotate and the steering will operate.**
- Transition from "AS Ready" to "AS Driving" (ASSI yellow flashing) only after "GO" was given via RES.
- Check the steering actuation and if the wheels are slowly rotating.
  
- ▶ Wait for the transition from "AS Driving" to "AS Finished".
- Transition to "AS Finished" within 25 s to 30 s, ASSI blue continuous (visible in bright sunlight), brakes are engaged.
- The car must be in steady state (no rotation of the wheels or the steering wheel)
- Rotation of the wheels are not possible (brake engaged)

- EBS not triggered (no blue flashing ASSI and no sound).
- EBS error indicator is off
- TS is deactivated.

## Brake state and reactivation test

- ▶ Switch off Autonomous System (ASMS off).
- Check for brakes disengaged (manual actions without tools or excessive bending into the cockpit may be required), manual steering possible, ASSI OFF.
  
- ▶ Try to activate the Tractive System again and try to enter "AS Ready" state by pressing every button/switch/etc. with ASMS still off.
- Tractive System must stay disabled and the system must not switch to state "AS Ready".  
Shutdown test in AS Ready state
  
- ▶ Reset the car and enter "AS Ready" state (TS on, ASMS on, select Inspection mission).
- ▶ Press any shutdown button while autonomous State is "AS Ready". Test all shutdown buttons! **This step must be repeated as many times as many shutdown buttons are present.** Between the repetitions manual steps may be required to refill the EBS energy storage.
- State has to switch to "EBS Triggered" (blue flashing ASSI, EBS engaged, EBS sound).
- EBS sound level is 80-90dBA, 1-5Hz on-off, 50% duty cycle, active for 8s-15s after triggered.
- TS is deactivated.
- EBS error indicator is off
- Checked for all shutdown buttons including RES.

## Shutdown test in AS Driving state

- ▶ Reset the car and enter "AS Driving" state with inspection mission selected. (GLVMS on, TS on, ASMS on, mission select, RES go signal).
- ▶ Press any shutdown button while autonomous state is „AS Driving“. No need to test all shutdown buttons, check randomly.
- TS is deactivated.
- EBS is activated (i.e. brakes are engaged and stay engaged until ASMS is switched to "OFF" (additional Steps are allowed to release brake if they are clearly marked)).
- ASSI has to flash blue + EBS sound
- EBS error indicator is off

## Operation error tests

- ▶ Reset the car, enter „AS Driving“ state with Inspection Mission selected.
- ▶ In “AS Driving” state disconnect the EBS pressure sensor.
- Shutdown circuit opens, ASSI blue + sound.
- Rotation of the wheels are not possible (brake engaged).
- EBS error indicator is on
- ▶ Repeat with every pressure sensor
- ▶ Reset the car, enter „AS Driving“ state with Inspection Mission selected.
- ▶ In “AS Driving” state release the first EBS air pressure.
- Shutdown circuit opens, ASSI blue + sound, remaining EBS is triggered.
- Rotation of the wheels are not possible (brake engaged).
- EBS error indicator is on
- ▶ Powercycle the car, try to enter „AS Ready“ state with Inspection Mission selected.
- Can't enter to „AS Ready“ state.
- EBS error indicator is on
- ▶ Ask the team to fill the empty EBS air tank.
- ▶ Reset the car, enter „AS Driving“ state with Inspection Mission selected.
- ▶ In “AS Driving” state release the second EBS air pressure (insert fault to the redundancy brake system).
- Shutdown circuit opens, ASSI blue + sound, remaining EBS is triggered.
- Rotation of the wheels are not possible (brake engaged).
- EBS error indicator is on
- ▶ Powercycle the car, try to enter „AS Ready“ state with Inspection Mission selected.
- Can't enter to „AS Ready“ state.
- EBS error indicator is on

## Data logger

- ▶ Switch on the LV system.
- ▶ Download the log files which have the highest size and was logged during the scrutineering.
- The log file contains 0x502 and 0x191 messages.

## NON-COMPLIANCE / COMMENTS

## APPROVAL

Inspector Names

Date, Time

Signature

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