



Tesla Model S

2018 ⊦

Highway Assist System



AD System Name	Autopilot	
Standard Active Safety Systems	AEB Car-to-Car	
	AEB VRU	
	LSS	
	SAS	
Available on	Tesla Model 3 (2019) Tesla Model S Tesla Model X (2019)	

Comments

'Autopilot' on the Tesla Model S gives the driver a high level of support with the vehicle primarily in control in both braking and steering scenarios. This results in a risk of over-reliance as, in some situations, the system still needs the driver to instantly correct and override the system.

The name "Autopilot" implies a fully automated system where the driver is not required. However, the limited scenarios tested clearly indicate that is not the case, nor is such a system legally allowed. The handbook mentions that the system is intended only for use on Highways and limited access roads, but the system is not geofenced and can therefore be engaged on any road with distinct lane markings. The legally-required hands-off warning requires no more than a gentle touch of the steering wheel to avoid system deactivation, rather than ensuring the driver is still in control. To avoid misuse, Tesla has implemented a so-called 'one-strike-you-are-out' where Autopilot is not available for the remainder of a journey if the driver fails to nudge the steering wheel occasionally.

In the braking tests, the Model S shows full braking support by the system in nearly all scenarios except for the cut-in and cut-out scenarios where there is limited vehicle support. The full system support in the stationary scenario may result in over-reliance. However, in the cut-in and cut-out scenarios, the driver is required to apply the brakes in due time, which may reduce the driver's over-reliance on the system.

In steering support, the Tesla does not allow the driver to input any steering himself and the system will provide all the steering required in the S-bend scenario. When system steering limits are reached, the vehicle will slow down to make the turn, again eliminating the need for driver input. In the absence of lane markings, Autopilot will stay engaged and will try to steer a safe path. However, with the sensors the Tesla has, this is nearly impossible to do reliably and implies to the driver that the vehicle can take all corners which, again, may result in over-reliance.

Overall, the Tesla system is primarily in control with a risk of driver becoming over-reliant on the system.



Human Machine Interaction

System Name	The system name, Autopilot, does not clearly indicate that this is an Assist System and could give a wrong impression about the system capabilities		
Official Manufacturer Information	AUTOPILOT		
System Features	SPEED CONTROL		
	Automatic Speed Limit Adaptation	0	
	Speed Adjustment for Road Features	0	
	STEERING SUPPORT		
	Assisted Lane Change	0	
User Manual	Description of Operational Design Domain (areas where the system can be used)		
	Description of the Driver's Role		
	Description of Adaptive Cruise Control Limitations		
	Description of Lane Centering Limitations		
	Description of Hands OFF Warning Sequence		
	Hands Off Warning timeline		
	O Visual Warning		
	Audible Warning Audible Warning Controlled Stop		
	0 20 40 60 80 time [s]	100	

Explained in user manual

○ Feature fitted as part of the system

🗙 Not explained in user manual

Feature not available as part of the system

Comments

While the user manual clearly explains the limitations of the systems and the situations in which it should be used, the system design does not limit system use as geofencing is not implemented. The role of the driver during the use of the system is also clearly stated but is not in line with the system design where the driver cannot provide any steering input. There is no mention in the handbook of specific scenarios where the driver is primarily in control or where no system response is expected.

Enabling of the systems is performed using a menu on the touch screen. Engaging the system is simple and intuitive using a dedicated stalk on the steering column behind the steering wheel.

One marketing video from Tesla clearly explains the design and functionality of the system, but many other official videos show the car apparently driving autonomously, confusing consumers about the actual capabilities of the Autopilot system.



Adaptive Cruise Control Tests



In the scenarios tested, Traffic Aware Cruise Control responds to a stationary vehicle directly ahead and the ACC function will bring the vehicle to a halt up to the maximum speed assessed. In both the slower moving and braking lead vehicle scenarios, the vehicle also responds well and provides full support across the test speed range. Very late or no system response was witnessed in the cutin and cut-out scenarios which are critical and challenging due to the rapidly changing conditions. Very late or no warning was issued to alert the driver of the possible crash in these cases.

Overall, the system performs well in the ACC scenarios, but as the vehicle is primarily in control up to the full speed tested (especially in the stationary vehicle scenario) there is an inherent risk of over-reliance in the system. The driver clearly needs to stay alert and take appropriate action in more critical day-to-day scenarios such as the sudden cut-in or cut-out situations.



Steering Support



input, which may reduce driver engagement. Where a driver wants to reposition the car within the lane, for example to avoid an obstacle or increase clearance to adjacent traffic, the system resists driver inputs initially and then deactivates steering assistance.