



## SAE J3016™ LEVELS OF DRIVING AUTOMATION

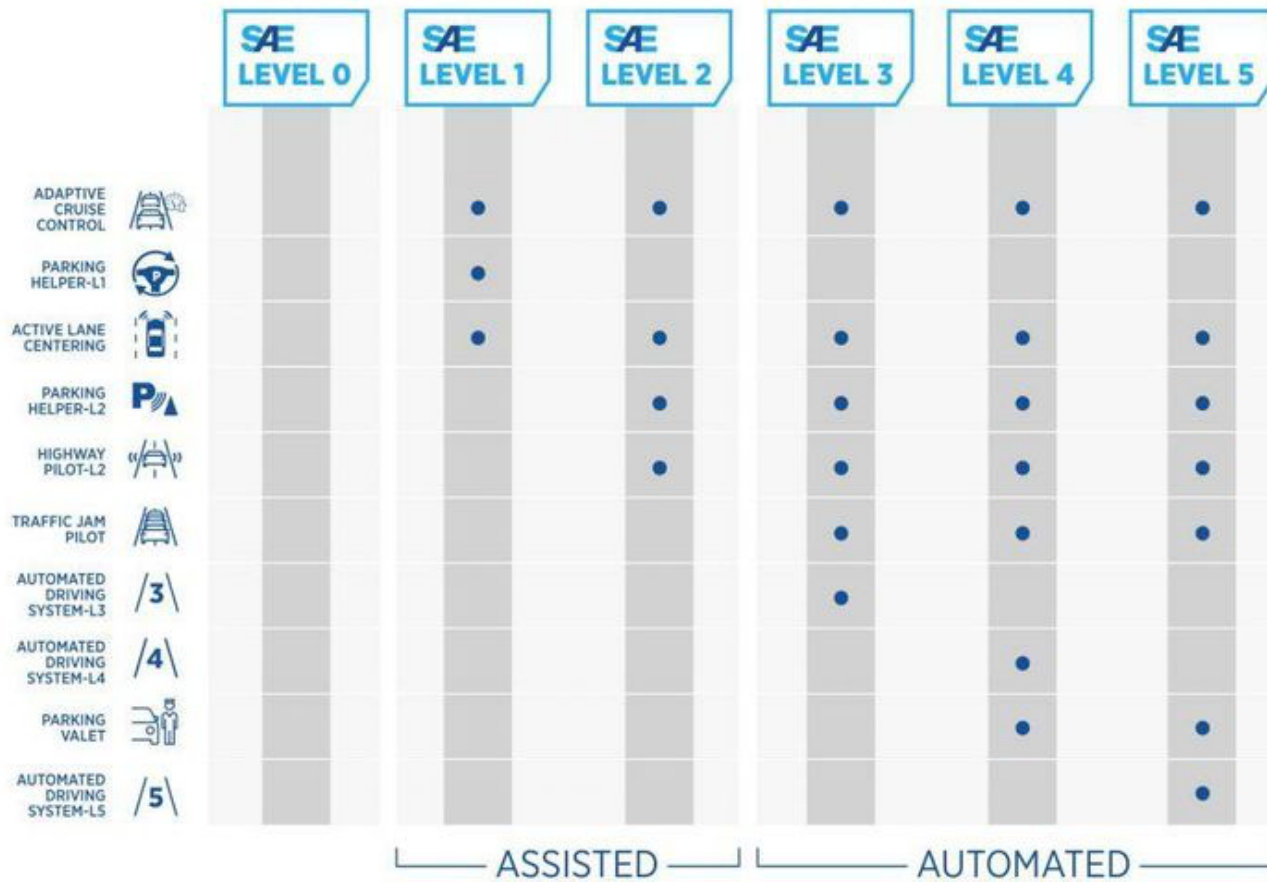
	SAE LEVEL 0	SAE LEVEL 1	SAE LEVEL 2	SAE LEVEL 3	SAE LEVEL 4	SAE LEVEL 5
What does the human in the driver's seat have to do?	You <u>are</u> driving whenever these driver support features are engaged – even if your feet are off the pedals and you are not steering			You are <u>not</u> driving when these automated driving features are engaged – even if you are seated in “the driver’s seat”		
	You must constantly supervise these support features; you must steer, brake or accelerate as needed to maintain safety			When the feature requests, you must drive	These automated driving features will not require you to take over driving	
	These are driver support features			These are automated driving features		
What do these features do?	These features are limited to providing warnings and momentary assistance	These features provide steering OR brake/acceleration support to the driver	These features provide steering AND brake/acceleration support to the driver	These features can drive the vehicle under limited conditions and will not operate unless all required conditions are met	This feature can drive the vehicle under all conditions	
Example Features	<ul style="list-style-type: none"> <li>• automatic emergency braking</li> <li>• blind spot warning</li> <li>• lane departure warning</li> </ul>	<ul style="list-style-type: none"> <li>• lane centering OR</li> <li>• adaptive cruise control</li> </ul>	<ul style="list-style-type: none"> <li>• lane centering AND</li> <li>• adaptive cruise control at the same time</li> </ul>	<ul style="list-style-type: none"> <li>• traffic jam chauffeur</li> </ul>	<ul style="list-style-type: none"> <li>• local driverless taxi</li> <li>• pedals/steering wheel may or may not be installed</li> </ul>	<ul style="list-style-type: none"> <li>• same as level 4, but feature can drive everywhere in all conditions</li> </ul>

Notes:

- Level 1 and 2 driving automation features are **called Advanced Driver Assistance Systems or “ADAS”** and are designed to support human drivers.
- Many cars on the market today have Level 1 and Level 2 automation features; some enhance safety; many enhance driver convenience.
- **Cruise, Waymo and Zoox vehicles on San Francisco streets are operated by an Automated Driving System (ADS) and strive for Level 4 driving automation.**
- There are *NO cars on the market for purchase today* that can be operated without continuous human driver attention and supervision.
- In the future, vehicles with a Level 4 Automated Driving System may retain or eliminate human controls.
- Most industry observers believe that Level 5 driving automation is decades away; thus, its description above reflects a *concept or goal*.



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### LEVELS

- 0 NO DRIVING AUTOMATION**  
You drive; vehicle can provide driving assist features
- 1 DRIVING AUTOMATION ASSISTANCE**  
Either steering or braking assist but not at the same time
- 2 PARTIAL DRIVING AUTOMATION**  
Steering AND braking assist together as support feature only; human driver must supervise
- 3 CONDITIONAL DRIVING AUTOMATION**  
Automation of full driving task with human fallback; driver must respond promptly when alerted
- 4 CONDITIONAL DRIVING AUTOMATION**  
Full automation but only in pre-determined conditions; human must drive when system is not engaged
- 5 FULL DRIVING AUTOMATION**  
You never have to drive anywhere unless you want to