

INSTRUCTIONS:

Fill out the hazard analysis and risk assessment below.

HA-001 should be for the lane departure warning function as discussed

HA-002 should be for the lane keeping assistance function as discussed

Then come up with your own situations and hazards for the lane assistance

When finished, export your spreadsheet as a pdf file so that a review

Hazard ID			
	Operational Mode	Operational Scenario	Environmental Details
HA-001	OM03 - Normal driving	OS04 - Highway	EN06 - Rain (slippery)
HA-002	OM03 - Normal driving	OS03 - Country road	EN01 - Normal conditions
HA-003	OM03 - Normal driving	OS05 -- Mountain Pass	EN02 - Sun blares (degraded view)
HA-004	OM04 - Backward driving	OS02 - City Road	EN07 - Snow (slippery road)

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 istance system. Fill in the HA-003 and HA-004 rows.
 er can easily see your work.

Situational Analysis		
Situation Details	Other Details (optional)	Item Usage (function)
SD02 - High Speed	Daytime	IU01 -Correctly used
SD02 - High Speed	Daytime	IU02 - Incorrectly used
SD02 - High Speed	Daytime	IU01 -Correctly used
SD03 - Normal acceleration	Nightime	IU01 -Correctly used

Situation Description	Function	Deviation
Normal driving on a highway during rain (on a slippery road) with high speed at daytime and correctly used system.	Lane Departure Warning (LDW) function shall apply an oscillating steering torque to provide the driver with haptic feedback	DV04 - Actor effect is too much
Normal driving on country roads during normal conditions with high speed (the driver is misusing the lane keeping assistance function as an autonomous function)	Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane	DV03 - Function always activated
Normal driving on a mountain pass during with sun blares condition (degraded view) with high speed at daytime and correctly used system.	Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane	DV07 - Actor action too late
Backward driving on a city road during snow (slippery road) with normal acceleration at nighttime and correctly used system.	Lane Departure Warning (LDW) function shall apply an oscillating steering torque to provide the driver with haptic feedback	DV06 - Function unexpectedly activated

Hazard Identification

Deviation Details	Hazardous Event (resulting effect)	Event Details
The LDW function applies an oscillating torque with very high torque (above limit).	EV00 - Collision with other vehicle	High haptic feedback can affect driver's ability to steer as intended. The driver could lose control of the vehicle and collide with another vehicle or with road infrastructure.
Driver cannot treat the function as an autonomous function.	EV00 - Collision with other vehicle	If the driver treats the function like an autonomous function and takes his hands off the steering wheel. The driver could lose control of the vehicle and collide with another vehicle or with road infrastructure.
The steering torque to keep the lane is applied too late.	EV06 - Front collision with oncoming traffic	The driver is driving with proportional high speed on a mountain pass and thereby the vehicle cuts a corner. The steering torque to keep the vehicle on the ego lane is applied too late and the vehicle leaves the lane and the vehicle could collide with oncoming traffic.
The LDW function applies an oscillating torque with high torque in an unexpected situation.	EV00 - Collision with other vehicle	The driver is driving backwards from stillstand (normal acceleration) in the city to get into a parking lot at the road during nighttime with snow. By heading for the parking lot the steering wheel oscillates unexpected with high oscillating torque and could distract the driver on the slippery road and the vehicle could collide with a parked vehicle at the road.

Hazard

Hazardous Event Description	Exposure (of situation)	Rationale (for exposure)	Severity (of potential harm)
Loss of control of the vehicle.	E3 - High probability	Driving on a highway during daytime with rain happens quite often but not always.	S3 - Life-threatening or fatal injuries
Loss of control of the vehicle.	E2 - Low probability	Driving on a country road with misused function is not very likely.	S3 - Life-threatening or fatal injuries
Loss of control of the vehicle.	E2 - Low probability	Driving on a mountain pass occurs a few times a year for the great majority of drivers	S3 - Life-threatening or fatal injuries
Loss of control of the vehicle.	E2 - Low probability	Heading into a parking lot in the city during nighttime and snowfall occurs not very often.	S0 - No injuries

Hazardous Event Classification

Rationale (for severity)	Controllability (of hazardous event)	Rationale (for controllability)
On highway speed of vehicle is expected to be high	C3 - Difficult to control or uncontrollable	Driving with high speed and a too high vibrational torque on the steering wheel can easily lead to uncontrollable behaviour of the vehicle for normal drivers.
On country roads speed of vehicle is expected to be high	C3 - Difficult to control or uncontrollable	Driving with high speed and additional torque of the lane keeping functions can easily lead to uncontrollable behaviour of the vehicle for normal drivers.
On a mountain pass the speed downwards is expected to be high (>50km/h)	C3 - Difficult to control or uncontrollable	Driving with high speed and a too late applied steering torque to the steering while can easily lead to uncontrollable behaviour in a stressful situation for normal drivers.
In the city during a parking event with backwards driving the speed is expected to be very low.	C1 - Simply controllable	Driving with low speed leads to an easily controllable vehicle. Backwards driving could lead to a uncontrollable situation for some drivers.

Determination of ASIL and Safety Goals	
ASIL Determination	Safety Goal
C	The oscillating steering torque from the lane departure warning function shall be limited.
B	The lane keeping assistance function shall be time limited and the additional steering torque shall end after a given time interval so that the driver cannot misuse the system for autonomous driving.
B	The reaction time of the LKA function shall not exceed a defined threshold.
QM	Unexpected high oscillating torque shall be prevented.