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2.5.8. Detection range

The detection range shall be declared by the vehicle manufacturer and verified by the Technical Service.

This value shall be recorded during the relevant test in Annex [X] using a two-wheeled motor vehicle of category L3 as the vehicle in front.

2.5.9. Operating range

The operating range of the detection system shall be determined by multiplying the detection range by both the time-based factor and the environmental factor. This value shall be rounded down to the nearest whole number in metres.

2.5.9.1. The manufacturer shall declare the time-based factor, which accounts for wear and ageing expected during the lifetime of the system.

The manufacturer shall provide evidence to justify the declared time-based factor. This evidence shall be verified by the Technical Service.

2.5.9.2. The manufacturer shall declare the environmental factor, which accounts for performance limitations resulting from environmental conditions, e.g. rain.

The manufacturer shall provide evidence to justify the declared environmental factor, as well as information on any system strategies employed to limit the operating environment e.g. initiating a transition demand when wet conditions are detected to be likely. This evidence and information shall be verified by the Technical Service.

2.5.9.3. The Technical Service shall append details to the test report of the assessment procedures for both the time-based factor and the environmental factor. These details shall be sufficient for replication of the assessment during in-service compliance/market surveillance testing.

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2.5.8. Maximum Detection range

The maximum detection range shall be determined by applying the test prescribed in Annex XX.

2.5.9. Operating range

[The manufacturer shall have the option of determining the operating range using either the static range determination or the dynamic range determination.]

2.5.9.1. Static range determination

Note: this method may not reflect actual performance due to assumptions required for durability testing and weather testing, it may not capture variations in component quality or installation nor unexpected environmental events or other factors

[The operating range shall be determined by multiplying the detection range by both the time-based factor and the environmental factor. These factors shall be obtained using the tests prescribed in Annex XY and Annex XZ. The operating range shall be rounded down to the nearest whole number in metres. The manufacturer may opt to use a detection range, time-based factor and/or environmental factor having less capability than what is determined through the test procedures.]

2.5.9.2. Dynamic range determination

Note: this method may be difficult to apply in real-world and there may be cases where the system believes its range is greater than actual

[The system shall determine and update its current detection range with time intervals of at most 2 seconds. The operating range shall be dynamically adjusted based on the lowest determined detection range in the last 10 seconds (minimum of 5 measurements) multiplied by a safety factor of at least 0.9 and rounded down to the nearest whole number in meters.

The detection range shall be verified as per the procedures in Annex YX]

Annex XX

Note: there is currently no standard method to determine detection range, industry and CP should come to an agreement on a standard, repeatable, enforceable and practicable test method.

The detection range shall be verified using a category 3-3 vehicle as the vehicle in front.

[Daylight, no adverse weather, no elevation changes, no curves, lowest value of - right lane, centre lane and left lane]

Annex XY

Note: there are some standard durability tests which could be modified for this situation. Suggestions are below but are not meant to be an exhaustive list. Current Industry procedures should also be considered to reach an agreement on a standard test.

[The time based factor shall be calculated by dividing the range of the detection system after degradation testing by the range of the detection system prior to degradation testing.

The degradation tests shall consists of X cycles of corrosion test, humidity test, temperature exposure test, UV exposure test.]

Annex XZ

Note: there is currently no standard method to determine the impact of various weather/environmental scenarios on detection range of various sensor types (including fusion of different sensors). The table below is a possible suggestion and not meant to be a final standard. The objective is to allow a threshold for the various situations (ie can operate in light rain but not heavy rain) and taking the lowest measured value to calculate the safest "factor". Testing of some conditions may be difficult, some risk in that unknown situations may have worse performance than some of the tests.

[The environmental factors shall be determined by dividing the lowest obtained value for range of the detection system during the environment scenarios in table AA by the range of the detection system in normal daylight operation. The vehicle in front shall be a category 3-3 vehicle unless otherwise indicated. In the case where the system is not permitted to operate in certain environmental conditions, the corresponding environmental test can be omitted provided the system prevents activation in those conditions and, the system issues a transition demand within 2 seconds of exposure to those conditions.

Table AA

Environmental Condition	Test threshold	Other conditions
Identical vehicle with system active in lane adjacent (110% power?)		(test with Cat 3-3 and Trailer)
Night	<X lux	

Light Fog	(<1km visibility)	
Dense Fog	(<400m visibility)	(Day/Night)
Light rain	>2.4 mm/hr	(Day/Night)
Heavy rain	>20 mm/hr	(Day/Night)
Light snow	(<1km visibility)	(Day/Night)
Heavy snow	(<400m visibility)	(Day/Night)
Direct sunlight		(ahead/behind/side)
Hail		
Tunnel		
Overpass		

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Annex YX

Note: the objective would be to verify that the system does vary its operating range as required and within the time required. The table is meant to represent scenarios that may impact each sensor types, another approach would be to pick a few scenarios from Table AA at random.

[The manufacturer shall provide means of displaying the current detection range and operating range to the regulatory entity specified by the Contracting Party. The operating range shall not exceed the maximum detection range throughout the test procedure.

The operating range shall adapt when faced with the scenarios in Table AB and verified using a Category 3-3 vehicle unless otherwise stated.

In the case where the system is not permitted to operate in certain environmental conditions, the corresponding environmental test can be omitted provided the system prevents activation in those conditions and, the system issues a transition demand within 2 seconds of exposure to those conditions.

Table AB

Environmental Condition	Test threshold	Other conditions
Identical vehicle with system active in lane adjacent (110% power?)		(Test with Cat 3-3 and Trailer)
Dense Fog	(<400m visibility)	
Heavy rain	>20 mm/hr	
Tunnel		

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