



ENSEMBLE

EUROPEAN COMMISSION

HORIZON 2020
H2020-ART-2016-2017/H2020-ART-2017-Two-Stages
GA No. 769115

ENSEMBLE

ENabling SafE Multi-Brand pLatooning for Europe

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| Deliverable No. | D5.3 | |
| Deliverable Title | Test results for obtaining the license exemptions | |
| Dissemination level | Public | |
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| Approved by | Coordinator, Marika Hoedemaeker, TNO | 02-12-2021 |

Status

Submitted and under approval by EC

02-12-201

Please refer to this document as:

Rodríguez, P., et al., 2021. *Test results for obtaining the license exemptions*. D5.3 of H2020 project ENSEMBLE, (www.platooningensemble.eu)

Disclaimer:

ENSEMBLE is co-funded by the European Commission, DG Research and Innovation, in the HORIZON 2020 Programme. The contents of this publication is the sole responsibility of the project partners involved in the present activity and do not necessarily represent the view of the European Commission and its services nor of any of the other consortium partners.

TABLE OF CONTENTS

| | |
|---|-----------|
| Revision history | 5 |
| 1. INTRODUCTION | 7 |
| 1.1. Background | 7 |
| 1.2. Aim | 7 |
| 2. EXEMPTION’S FURTHER REQUESTS FOR OPEN ROAD TESTING IN SPAIN | 8 |
| 3. SUMMARY AND CONCLUSION | 11 |
| 4. BIBLIOGRAPHY | 12 |



TABLES

Table 1. Differences between autonomous function and support function..... 9

Table 2. Relation between function, level of autonomy and procedure for obtaining the exemption..... 10

Revision history

| Version | Date | Author | Summary of changes | Status |
|---------|------------|-------------------------|---|----------|
| 1.0 | 06/10/2021 | Eva Álvarez, IDIADA | First draft | Prepared |
| 1.1 | 08/10/2021 | Pablo Rodriguez, IDIADA | Revision | Prepared |
| 1.2 | 28/10/2021 | Dehlia Willemsen, TNO | Quality review | Prepared |
| 1.3 | 02/11/2021 | Eva Álvarez, IDIADA | Review and update | Updated |
| 2.0 | 05/11/2021 | Carlos Luján, IDIADA | Review | Reviewed |
| 2.0 | 07/11/2021 | Eva Álvarez, IDIADA | Contents update | Prepared |
| 2.0 | 09/11/2021 | Pablo Rodríguez, IDIADA | Review | Prepared |
| 3.0 | 02/12/2021 | Marika Hoedemaeker | Last comments and approval by coordinator | updated |



EXECUTIVE SUMMARY

Context

Platooning technology has made significant advances in the last decade, but to achieve the next step towards deployment of truck platooning, an integral multi-brand approach is required. Aiming for Europe-wide deployment of platooning, 'multi-brand' solutions are paramount. It is the ambition of ENSEMBLE to realise pre-standards for interoperability between trucks, platoons and logistics solution providers, to speed up actual market take-up of (sub)system development and implementation and to enable harmonization of legal frameworks in the member states.

Project scope

The main goal of the ENSEMBLE project is to pave the way for the adoption of multi-brand truck platooning in Europe in order to improve fuel economy, traffic safety and throughput. This will be demonstrated by driving up to seven differently branded trucks in one (or more) platoon(s) under real-world traffic conditions across national borders. During the years, the project goals are:

- Year 1: setting the specifications and developing a reference design with acceptance criteria.
- Year 2: implementing this reference design on the OEM's trucks as well as performing impact assessments with several criteria.
- Year 3: focus on testing the multi-brand platoons on test tracks and international public roads.

The technical results will be evaluated against the initial requirements. Also, the impact on fuel consumption, drivers and other road users will be established. In the end, all activities within the project aim to accelerate the deployment of multi-brand truck platooning in Europe.

Abstract of this Deliverable

This deliverable refers to D6.11 [1] (V1 Report on mutual recognition between involved Member States and proposal for mutual recognition procedure in Europe), in which the Spanish procedure for obtaining the license exemptions for the public road testing of automated vehicles is explained. After the analysis of the applied technologies in the Platooning Support Function, it was found that this instruction for autonomous vehicles was not adequate (less than SAE L3 because it was implemented only the support function). An easier compromise solution was agreed with the authority and **no other tests or extra documentation** were required by the road authority.

1. INTRODUCTION

1.1. Background

This document refers to the requirements for obtaining the exemption during the testing and demo activities in public roads, D6.11 [1] (V1 Report on mutual recognition between involved Member States and proposal for mutual recognition procedure in Europe).

1.2. Aim

The aim of this Deliverable is to present requirements for obtaining the Spanish license exemptions for the public roads tests with ENSEMBLE trucks (after the public road tests performed in Spain in September 2021).

Public road testing of truck platoons requires license exemptions issued at member state level. For obtaining the license exemptions, the requirements and procedures vary between the member states. In this case, we present the conclusions for obtaining the Spanish exemption.



2. EXEMPTION'S FURTHER REQUESTS FOR OPEN ROAD TESTING IN SPAIN

A very important part of the ENSEMBLE project is to validate the project results on open road. In order to do so, WP5 is working to perform the necessary tests on test track to validate the system performance and safety.

The exemption procedures are temporary and are intended for testing systems that are not already type-approved on open road. These licenses can cover both conventional and autonomous systems. Due to the high complexity of autonomous and connected vehicles, most of the countries have developed a dedicated procedure with specific requirements in order to assess the safety of these systems.

These procedures are quickly evolving along with the technology because the importance of simulating real road conditions during testing is a key aspect of assessing it.

In order to promote the development of automated technologies, the Spanish Government issued a law to authorize the testing of vehicles equipped with automated technologies (SAE L3 onwards) in open road scenarios (Instruction 15/V-113). This instruction was issued by the main Spanish body in charge of the traffic organization, the “*Dirección General de Tráfico (DGT)*” (General Directorate for Traffic) and was created with the aim of granting special authorizations to those automated vehicles which are to be tested in normal traffic conditions. The document was published in November 2015, and since then all tests with automated vehicles (SAE L3 onwards) on Spanish roads are required to fulfil the requirements of this law.

This authorization can be requested from the DGT by the vehicle manufacturer, the automated technologies component manufacturer or by an official laboratory. The universities and consortia involved in research projects are also allowed to apply for this authorization. In this case, the ENSEMBLE consortium could be the authorization's applicant.

The authorization holder is responsible for ensuring that the vehicles fulfil the minimum safety prescriptions to perform the test on public roads. The holder is also responsible for performing the test under authorized conditions. Any test or vehicle driving outside of the declared boundaries must be done in manual driving mode.

Once the authorization is issued, it shall be valid for 2 years with the possibility to extend this period for another 2 years.

An important requirement for the test vehicle is that it must be properly registered and using a legal registration plate. If the vehicle is a prototype and has not been registered, then it is compulsory to get a temporary authorization according to the Spanish GRV (General Regulation on Vehicles).

As explained before, D6.11 took the DGT instruction 15/V-113 as reference for giving the exemptions in open road testing of autonomous vehicles (SAE L3 onwards). This instruction requires, for its approval, the performance of a sequence of tests before driving on public roads in order to grant the general safety. On the other hand, there is another standard procedure for non-autonomous vehicles which leads to an easier way to obtain the exemption: TRAZA application tool (described in subchapter 6.1.1 of ENSEMBLE Deliverable 6.11).

ENSEMBLE project was focused on developing and analysing two different functions: autonomous function and support function. In Table 1, the main differences between both functions is shown.

Table 1. Differences between autonomous function and support function.

| AUTONOMOUS FUNCTION | SUPPORT FUNCTION |
|--|---|
| Automation: SAE L4 (for the following trucks). | Automation: SAE L1 |
| Both longitudinal and lateral motion of the following trucks is automated. | Only the longitudinal control (acceleration, braking) is automated for the following trucks. Lateral control (steering) is not automated. |
| Lead truck is manually driven. Can use ADAS functions but is not part of the platooning function. | Lead truck is manually driven. Can use ADAS functions but is not part of the platooning function. |
| Driver is mandatory in the lead truck. Drivers in the following trucks are optional. | Drivers have to be present in all the trucks. |
| The autonomous system is responsible for DDT (Dynamic Driving Task) and the system is the fallback. | Drivers in the following trucks are responsible for DDT (Dynamic Driving Task) and they are the fallback. |
| Operational Design Domain: Specific Hub to Hub driving routes on EU roads fall within the ODD. i.e. The vehicles drive autonomously on the highways and also on the route between the highways and the nearby transportation hubs. | Operational Design Domain: Can be used only on highways. |



| | |
|---|--|
| <p>Time gap: Since drivers are no longer responsible for DDT or are used as fallback, TGs can be lower than 1.4s.</p> | <p>Time gap: Minimum TG of 1.4s has to be maintained between the trucks.</p> |
|---|--|

Considering the autonomous function with a level of autonomy equal or higher than SAE L3, the procedure for obtaining the exemption is the DGT instruction 15/V-113 where a sequence of tests (see Deliverable 6.11) are required to be performed.

On the other hand, the support function leads the truck to a level of autonomy lower than SAE L3 and, in order to obtain the exemption, the procedure is the standard in the application tool TRAZA, where no tests results have to be presented due to the fact that the vehicle is considered as non-autonomous.

The relation between the function, level of autonomy and procedure to be followed is described in Table 2.

Table 2. Relation between function, level of autonomy and procedure for obtaining the exemption

| FUNCTION | LEVEL OF AUTONOMY | PROCEDURE TO FOLLOW | TESTS REQUIRED |
|----------------------------|-------------------|--------------------------|--|
| Support function | < SAE L3 | TRAZA Application tool | No test required for obtaining the exemption |
| Autonomous function | ≥ SAE L3 | DGT Instruction 15/V-113 | Sequence of tests explained in D6.11 |

Specifically the case of ENSEMBLE open road testing w in September 2021, after analysing in detail the applied technology and taking into account that only the support function was to be tested, it was agreed that all the trucks were not level SAE3 technology. That’s why the *instruction for autonomous vehicles* were not the correct regulations and an easier compromise solution was agreed with the Spanish authorities: use the TRAZA application tool. This procedure for obtaining the exemption does not request any test results to be presented.

3. SUMMARY AND CONCLUSION

This document refers to Deliverable 6.11: “*V1 Report on Mutual Recognition*” which contains the Spanish exemption procedure based in the DGT instruction 15/V-113 for open road testing with autonomous vehicles (SAE L3 as minimum) and TRAZA application tool for non-autonomous vehicles (level of autonomy lower than SAE L3).

This first procedure applies to automated vehicles of SAE level 3 and higher and requires a sequence of tests to be performed in order to grant the general safety. On the other hand, the second procedure (TRAZA) does not require any tests results due to the fact that the vehicle is considered as “non-autonomous” (lower SAE level of autonomy than level 3).

The ENSEMBLE demonstrator vehicles for the open road test only have implemented the Platooning Support Function. Moreover, the planned tests only focused on this support function. Because of that, it was agreed that all the trucks have a level of autonomy less than SAE L3 and the TRAZA could be followed. Hence, no extra testing was required to get the exemption for driving on Spanish public roads.

In order to obtain the license for open road testing for the ENSEMBLE trucks, the TRAZA procedure was followed by all the OEMs.



4. BIBLIOGRAPHY

[1] M. T. e. al., “D6.11: V1 Report on Mutual Recognition,” 2021.