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CARTRE

Coordination of Automated Road Transport Deployment for Europe

# D.3.8: "Guidance on National Testing Regulations – Final edition"

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| Main author(s) | Arrúe, Álvaro; Heras, Rubén |
| Co-author(s) (in alphabetical order) | Alessandrini, Prof. Adriano; Alkim, Tom; Čížková, Tereza; Dafonte, Pablo; Flament, Maxime; Gaillet, Jean-François; Gómez, Susana; Klar, Wolfram; Lytrivis, Panagiotis; Maes, Julie; Mosebach, Henning; Narula, Prasant; Page, Yves; Pichl, Martin; Pilli-Sihvola, Eetu; Riess, Hans-Christian; Rodarius, Carmen; Schiltz, Smith, Bryant Walker; Jean; Szalay, Zsolt; Vliet, Arjan van; Vlk, Tamara |
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## Contents

# 1. Executive Summary

The main goal of CARTRE is to accelerate development and deployment of automated road transport by increasing market and policy certainties in order to keep and reinforce Europe’s position as a world leader in innovative mobility.

In this effort, Task 3.4 analyses testing regulations coming into force in several European Member States, as well as at international level, in order to define a set of guidelines for future EU level projects involving vehicles with high levels of automation which will require license exemptions to test AD vehicles on public roads across Europe. To that aim, not only the competent authorities of the different European Member States or their representatives have been contacted, but also the most relevant projects and initiatives dealing with testing regulations have been considered. The output of this task will be of interest for all the actors, including research institutions and industry, which may need to run tests on European open roads and for the regulating authorities of the European member states.

This report compiles the information gathered in this effort. This includes current national regulations that need to be considered in several European countries in order to run tests involving connected and automated vehicles, the output of the CARTRE thematic working groups that most directly relates to testing and national regulations, and a compilation of the main bodies, task forces and projects dealing with national testing regulations. Testing information has been collected for most of the countries in the EU. Most of them provide the necessary information only in their official language. In these cases, an additional effort was needed in order to briefly resume the most important points of the regulations. In some cases, these resumes were made by CARTRE partners and not by the competent authorities. Therefore, the information contained in this document cannot be considered as binding.

# 2. Introduction

## 2.1.Background

The European Commission has since long recognized the importance of the automotive industry for the growth of the European Union’s economy. Therefore, many efforts have been put on this sector. As a consequence, connected and automated driving technologies have experimented a rapid development and promise a massive deployment in Europe and internationally.

In order to further push forward these technologies and maintain the position of Europe as a world leader, coordination is needed to prevent a patchwork of rules and procedures and encourage a harmonised approach in research, development, testing and deployment, therefore increasing market and policy certainties.

In this context, the CARTRE project was started in October 2016 as a coordinated approach at a European level with the aim of supporting the cooperation between the European Commission, governments and industry together with knowledge institutes.

The project is structured in six work packages active during the whole project. Three main coordination activities can be identified:

- Strategic activities (WP2, Joint Stakeholder Network) aiming at unifying current initiatives and creating a central meeting point for the European ART activities and represent Europe among the international cooperation activities;
- Operational activities (WP3-5) aiming at consolidating the knowledge and generating a common and agreed message across the stakeholders;
- Communication activities (WP6) aiming at improving the awareness and dissemination of connected and automated vehicles at international level.

The objective of WP3 is to ensure that stakeholders are well informed of past, current and future ART. Therefore, a network of ART National Contact Points (NCP) and ART project leaders reporting on their plans, progress and results shall be established as an information source for stakeholders. Furthermore, WP3 shall actively support ART pilots and test beds to provide methodology support to FOTs, exchange knowledge and experience, provide guidance on national testing regulations and support the exchange with relevant international activities.

Task 3.4 is in charge of analysing testing regulations in several European State Members, as well as at international level, in order to define a set of guidelines for future EU level projects to test AD vehicles on public roads across Europe, build consensus on the preparation towards automated vehicles admittance requirements and develop guidelines for testing conditions.

The rest of this document is structured as follows: Section 2.2 provides some relevant information regarding bodies and activities related to Task 3.4. Section 3 contains the compiled Member State testing regulations. Thematic working groups and projects dealing with national testing regulations are presented in Section 4. The conclusions extracted of the work done are reflected in Section 8. Section 9 contains a list of the references done along the document and Section 10 the list of acronyms and definitions.

## 2.2.Related Bodies and Activities

The wide recognition of the automotive industry as a key sector of growth for the EU economy has led to the rise of a high number of bodies, task forces, working groups and activities funded by the EC in the last decade. We analyse in the current section the most relevant of these efforts for the CARTRE project.

In 2014, **ERTRAC** launched a Task Force on “Connectivity and Automated Driving”: over 80 experts from industry, research institutes and public authorities gathered to work on a common European vision of automation of road transport. The objective was to gather private and public stakeholders in order to support a harmonised approach for implementing higher levels of Automated Driving in Europe. After one year of work, the Task Force delivered in 2015 a Roadmap including content on common objectives achievable thanks to automation, common definitions (levels of automation), State of the Art (listing past and current EU projects), overview of national initiatives in the EU and around the world, key challenges and objectives for R&D, deployment activities and a set of roadmaps describing the activities needed. The approach of ERTRAC is to support coordination at European level, to avoid duplication of activities and concentrate on the missing items, concerns and topics for future implementation. Considering the ever growing importance of the topic, involving large industrial investments, and seeing a multiplication of national initiatives to support the deployment of automation in Europe, it has been decided to continue the efforts of the Task Force by setting it as a permanent ERTRAC Working Group. In March 2018 an update of the Strategic Research Agenda has been published [1].

**FOT-Net** support actions (FOT-Net, FOT-Net 2 and FOT-Net Data) organize networking between European and international stakeholders, exchange knowledge and experience between FOTs (Field Operational Tests), and promote a common approach for FOTs- the FESTA methodology. FOT-Net has tackled common working issues and fostered cross-region cooperation. The three regions (Europe, Asia-Pacific and North America) cooperate on common FOT and pilot issues, such as data handling and sharing, methodology and deployment. FOT-Net is arranging its 11th international workshop in conjunction with the 25$^{th}$ ITS World Congress in Copenhagen, September 2018.

The **Amsterdam Group** is a strategic alliance of committed key stakeholders with the objective to facilitate joint deployment of cooperative ITS in Europe. The group partners (including CEDR, ASECAP, POLIS and C2C-CC) are working on all deployment issues for the initial deployment of Cooperative ITS in Europe. The Amsterdam Group brings together all corridor initiatives to discuss all issues related to the implementation and operation of C-ITS services.

The Platform for the Deployment of Cooperative Intelligent Transport Systems in the European Union (**C-ITS Platform**), which gathers public and private stakeholders, was created by the European Commission services (DG MOVE) in November 2014 with the intention to help addressing and support the emergence of a common vision across all actors involved in the value chain. The C-ITS Platform represents all of the key stakeholders along the value chain including public authorities, vehicle manufacturers, suppliers, service providers, telecom companies, etc. In its first phase (2014 –2016) it contributed towards a shared vision on the interoperable deployment of Cooperative Intelligent Transport Systems in the European Union. The Final report [2] describes the outcomes of this effort. In its

second phase (2016 – 2017) this vision is further developed towards cooperative, connected and automated mobility (CCAM) in the European Union [3].

**UNECE WP.29** works on the harmonization of vehicle regulations at international levels. WP29 decided end of June 2018 to set up a specific “Groupe Rapporteurs” (GR) for Automated, Autonomous & Connected Vehicles: the GRVA (the Vehicle Automatique). The GRVA covers two task forces “Physical certification test & audit” and “Real World Test Drive” urban and highway applications have the highest priority. WP.29 also works on the UN-ECE R79 on Automated Controlled Steering Functions (ACSF).

**UNECE WP.1** This Global Forum for Road Traffic Safety works on improving road safety. Its primary function is to elaborate legal instruments aimed at harmonizing traffic rules, traffic signs and driving behaviour. Automation requires additional explanation and partly modification of e.g. the Geneva and Vienna conventions with regard to the role of the driver. Because of the increased relation between WP.29 and WP1, there is an intensified adjustment of mutual activities.

At an international level, the **EU-US-Japan trilateral Working Group on Automation in Road Transportation** is the main reference group. The group consists of representatives of the EC, the US DoT, and the Japanese MLIT. CARTRE/SCOUT (and formerly VRA) works as EU expert group for the trilateral activities. At international level, ERTICO is the co-chair of the Trilateral EU-US-Japan ITS Collaboration WG on the Automated Road Transport.

In the Trilateral EU-US-Japan Cooperation, IDIADA, Task-leader in T3.4, has been leading the area on “Roadworthiness Testing”, addressing common challenges for testing and assessment of automated vehicles.

At **national level**, there are several activities going on in Europe. The Dutch Ministry of Infrastructure and Water Management and Rijkswaterstaat stimulate the research, FOTs and deployments of highly automated and connected vehicles. RWS, RDW, and TNO are actively contributing to the exemption framework for testing of Automated Vehicles in the Netherlands. First tests and preparations for pilots (e.g. truck platooning, C-ACC, PRTs, dual mode vehicles) are ongoing, in close collaboration with industry, and academics (TU/e, TUDelft, SWOV). The Swedish government has initiated a multi-stakeholder program, Drive Sweden, to coordinate Swedish efforts at the national level in regard to research and deployment of automated transport services for people and goods. VDI-VDE, ADAC and IKA are contributing to the German round table on automation under the coordination of the BMVI at federal level. They contributed to a very thorough research needs analysis which was published in May 2015. IDIADA contributed with the Spanish traffic authority in the definition of the Spanish exemption process for the testing of C-AVs which was published in late 2015. TfL is connected to the UK trials on automated driving and will act as a liaison. The same happens with ICCS; who is connected to the Greece trials on automated driving (e.g. CityMobil2 large-scale demo), including the legal framework implementation. VTT is one of the key players in the Finnish activities on automated driving (e.g. Nordic Way). Renault chairs the French program on automated driving, in which Vedecom plays an important role.

# 3. National Testing Regulations

The main focus of Task 3.4 has been set to the collection of information regarding the testing on public roads in EU Member States. To that aim, a template has been distributed among the partners contributing to the task in which following information has been requested:

- Country
- Testing infrastructure
- Procedure description
- Organization(s) in charge
- Contact information
- Link to procedure website
- Link to documents
- Further comments

The goal is to publish the compiled information in a Wiki-website which provides a kind of ‘Unique Information Point’; i.e. a point which can be consulted in order to find out what procedure needs to be followed and what documentation needs to be presented in order to test CAD technologies in the different EU countries.

At the moment, this information has been acquired for Austria, Belgium, Cyprus, Czech Republic, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Ireland, Luxembourg, The Netherlands, Poland, Portugal, Spain, Sweden and UK. The rest of the Member States (Bulgaria, Croatia, Denmark, Latvia, Lithuania, Malta, Romania, Slovakia and Slovenia) could not be reached. The information collected until now is presented in the following subsections. Figure 1 depicts the information availability in form of a map.

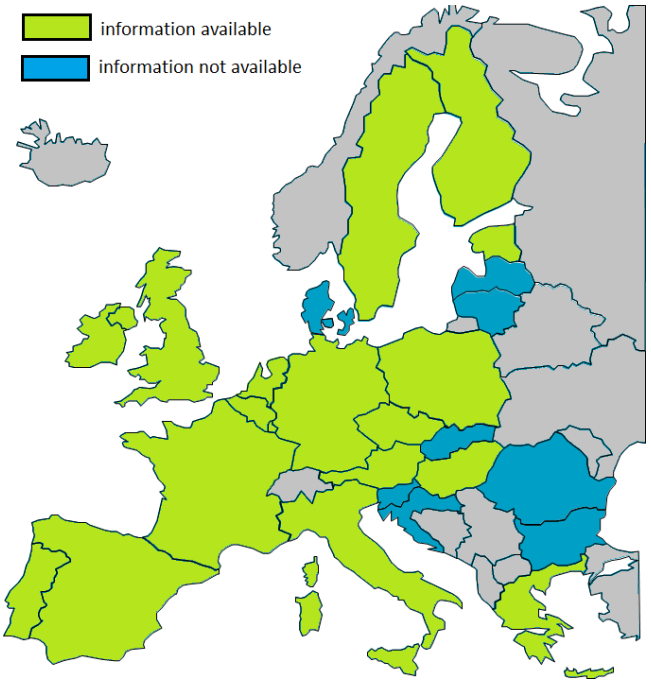


**Figure 1: Information availability regarding the documentation to be presented in order to test CAD technologies in the different EU countries.**

## 3.1.Austria

| **Country** | Austria |
|---|---|
| **Procedure description** | The current (June 2018) legal environments allows the testing of automated vehicles in the following use cases:<br>- Shuttle / pod up to 20 km/h<br>- Motorway pilot with automated lane change<br>- Automated military vehicle<br>In order to get permission for testing, the applicant needs to provide detailed information on the vehicle, the driver, a proof of insurance, information on the testing period and the road sections to be used, as well as on the functionalities to be tested. Additionally the applicant needs to acknowledge the Code of Practice which contains the general rules for the testing.<br>Depending on the different use case, evidence for a certain number of test kilometres needs to be provided.<br>The (main) steps are:<br>- Hand in the completed application form<br>- Decision and issuing of permission<br>Eventually, reporting on on-going testing to National Contact Point Automated Driving are necessary every 6 months. Testers must provide a final report at latest one month after testing is completed. |
| **Organization(s) in charge** | BMVIT - Austrian Federal Ministry for Transportation, Innovation and Technology: Responsible for the process, the decision on the applications and the issuing of the permission.<br><br>AustriaTech: National contact point for automated driving and responsible for the performing of the respective tasks within this process (consulting, communication etc.) |
| **Contact information** | AustriaTech is the national contact point and serves as coordinating interface between the applicant and the BMVIT. |
| **Link to procedure website** | http://www.austriatech.at/aktivitaeten/kontaktstelle-automatisiertes-fahren |
| **Link to documents** | Code of Practice:<br>http://www.austriatech.at/files/get/5d03a648ddf5eef9b4f3a7e37399e132/codeofpractice_22082017.pdf (Status 05.02.2018)<br><br>Application for testing permission:<br>http://www.austriatech.at/files/get/e84294088edf0d120f1f21182aa1a1df/testantrag_datenbekanntgabeautomatfahrv_22082017.docx (Status 05.02.2018) |
| **Further comments** | As the code of practice and the application form for testing permission are being updated constantly, links need to be checked regularly. Furthermore, the legal requirements may be adapted as well. |

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| **Last table update** | 21/06/2018 |

## 3.2.Belgium

| **Country** | Belgium |
|---|---|
| **Procedure description** | Steps to be followed:<br>- Discussion with organizations in charge<br>- Complete application form, including documents<br>- Agreement on communication towards other road users<br>- After approval: inform police<br>- Allow authorities (administrations and police) to assist testing<br>- Test report after testing to discuss with authorities<br><br>Documentation needed:<br>- Auditing record kept by the organiser of the test which shows that the internal tests have given sufficient results to be able to conduct tests on the public road network without this creating additional risks for road users<br>- Copy of the appropriate driving licence for every test driver<br>- Copy of an appropriate insurance policy for the test vehicle (after registration if not available during the application)<br>- Risk analysis<br>- Training plan for test drivers<br>- Copy of the roadworthiness test certificate (where appropriate)<br>- A photo of the automated vehicle |
| **Organization(s) in charge** | 1/ Federal Public Service Mobility and Transport – DG Road Transport and Road Safety<br>2/ Flemish Ministry of Mobility and Public Works<br>3/ Brussels Regional Public Service Mobility<br>4/ Walloon Regional Public Service – DGO 1 Roads and Buildings<br><br>Remark: the organizations involved depend on the region where testing will take place. In principle, 1/ will always be involved, whereas 2/, 3/ and 4/ will be involved if testing will take place in their region. Of course, a test may include two or three regions. |
| **Contact information** | 1/ website: https://mobilit.belgium.be/fr<br>2/ website: http://departement-mow.vlaanderen.be/nl<br>3/ website: http://be.brussels/mobility-and-transport?set_language=en<br>4/ website: http://routes.wallonie.be/Index.jsp |
| **Link to procedure website** | The basic information for testing organizations can be found on 1/’s website in Dutch or in French.<br>The application form is not available online: the testing |

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| | organization is supposed to contact one of the administrations and at least one meeting will take place with all the administrations involved. This will be the occasion to explain the procedure and to avoid any misunderstanding by completing an online form. |
| **Link to documents** | As explained, the application form is not available online.<br>Further information: Code of Practice autonomous vehicles<br>English / Dutch / French / German |
| **Further comments** | In 2016, the Belgian Minister of Transport presented a Code of Practice for testing automated vehicles in a real world environment in Belgium. This Code of Practice is based upon ‘The Pathway to driverless Cars: A Code of Practice for testing’ drafted by the UK Department for Transport in 2015. The Belgian Code of Practice has been drafted in cooperation with a working party consisting of different Belgian stakeholders. The stakeholders included the regional authorities of Flanders, Wallonia and Brussels; the sector federations Agoria and Febiac and the Belgian Road Safety Institute. The Code of Practice can be found on the website of the Federal Public Service Mobility and Transport.<br><br>The Belgian approach of testing automated vehicles is a pragmatic one. The procedure is not at all ‘automated’: it does not depend upon an online form that could be automatically treated. Instead, the approval will result out of discussion between the testing organisation and the authorities, possibly even illustrated with tests on private roads assisted by the authorities. Another element of the pragmatic approach includes the Code of Practice being open to evolution (and exemptions). At the current moment, the Code of practice is being updated following a change in the Belgian highway code. This change allows, on the condition that the federal Minister of Transport gives his consent, to test an automated vehicle on Belgian public roads with an operator supervising the tests from a control room. Before, an operator had to present in the vehicle.<br><br>See also:<br>David Schoenmaekers, ‘The Belgian framework for testing of automated vehicles’, paper presented at the 11th ITS European Congress, Glasgow, Scotland, 6-9 June 2016. |
| **Last table update** | 13/07/2018 |

## 3.3.Cyprus

| **Country** | Cyprus |
|---|---|
| **Testing infrastructure** | No testing infrastructure exists. |
| **Procedure description** | No testing procedure exists. |

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| **Organization(s) in charge** | There isn’t any organization involved in testing procedures. |
| **Contact information** | N/A |
| **Link to procedure website** | N/A |
| **Link to documents** | N/A |
| **Further comments** | N/A |
| **Last table update** | 14/02/2018 |

## 3.4.Czech Republic

| **Country** | Czech Republic |
|---|---|
| **Testing infrastructure** | Autonomous vehicles up to SAE level 3 are being tested in the Czech Republic. The very first autonomous car (with a human driver able to take over control in case of a need) was under operation on the motorway between Prague and Liberec in 2015. There is no dedicated testing infrastructure for testing of automated vehicles on public roads. At present, an opportunity to allow testing of autonomous vehicles of SAE level 4 and higher on highways and in cities is being verified.<br>C-ITS systems (hybrid communication based on ITS G5 and cellular technologies, the first step LTE (4G), the next step LTE-V and/or LTE-B) are being deployed on selected motorway section within the project “C-ROADS Czech Republic” (CEF Transport Mechanism funding), establishing the basis for connected and automated vehicles. “C-ROADS Czech Republic” project is also focused on urban infrastructure in the city of Brno and on prospective cross-border testing. |
| **Procedure description** | A subject (*car producer or technical service conducting approval tests*) applying for permission to conduct a field testing has to (among others):<br>- possess a homologation certificate (or confirmation that a subject has applied for homologation);<br>- undertake research and development of components, systems or independent technical units and subsequently produce vehicles, parts of systems or independent technical units in large scale;<br>- have a quality control system and fulfil standards of it<br><br>After obtaining a permission and a special vehicle registration, a subject has to:<br>- operate vehicles only for the purpose of field testing;<br>- secure that a road safety, environment or health and life of humans will not be threatened;<br>- use registration plates with special vehicle registration number; |

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| | - maintain a record/book of each conducted field test;<br>- use only vehicles with special vehicle registration and have related documents in the vehicle;<br>- have liability insurance during the whole period of field testing;<br>- report any changes of conditions on which a permission was issued to the Ministry of Transport |
| **Organization(s) in charge** | Ministry of Transport of the Czech Republic, Road Vehicles Operation Section |
| **Contact information** | Ministry of Transport of the Czech Republic |
| **Link to procedure website** | Not available |
| **Link to documents** | Not available |
| **Further comments** | |
| **Last table update** | 06/08/2018 |

## 3.5.Estonia

| **Country** | Estonia |
|---|---|
| **Procedure description** | Starting from March 2017, the testing of self-driving cars is allowed on the streets and roads of Estonia. The car to be tested must have a driver who can take control (either in the vehicle or acting remotely) of the car if need be. The testing right for Estonia's public roads applies to self-driving vehicles classified as level SAE 2 or SAE 3 vehicles according to the classification of the International Society of Automotive Engineers. There is also an expert group that is supposed to work on remaining questions such as responsibilities, insurance, privacy, ethics and other related topics. The aim is to soon reach solutions that will make it possible to let vehicles of higher autonomy (levels 4 and 5 of the SAE International standard J3016) drive on the streets. |
| **Organization(s) in charge** | Estonian Road Administration |
| **Contact information** | Head of Technical Department of the Estonian Road Administration |
| **Link to procedure website** | https://www.mnt.ee/eng/organization/estonian-road-administration |
| **Link to documents** | https://www.mkm.ee/en/news/estonia-allowing-number-self-driving-cars-streets-starting-today |
| **Further comments** | Information not available in English |
| **Last table update** | 08/06/2018 |

## 3.6.Finland

| Country | Finland |
|---|---|
| **Testing infrastructure** | Finnish national road network (AV testing allowed on all public roads)<br>Aurora Snowbox, intelligent highway E8 (http://www.liikennevirasto.fi/web/en/e8-aurora#.WbE4YLJJbRY)<br>Traffic Lab: testing ecosystems in Finland (http://www.trafficlab.fi/testing_zones#/0) |
| **Procedure description** | Applying for a test plate certificate from Finnish Transport Safety Agency (Trafi)<br>- Using form at Trafi web site<br>- Appendices<br>• Trade Register extract<br>• a general description of the trials<br>• technical specifications of the test vehicles<br>• information on the road area where the trials are intended to be conducted<br>• proof of insurance cover for third party liability<br>• description of how road safety will be ensured |
| **Organization(s) in charge** | Finnish Transport Safety Agency (Trafi) - single window for AV testing |
| **Contact information** | Finnish Transport Safety Agency |
| **Link to procedure website** | https://www.trafi.fi/en/road/automated_vehicle_trials |
| **Link to documents** | Brochure:<br>https://www.trafi.fi/filebank/a/1475139801/c715fc7cabf057b9320be4bbd6714cbe/22483-Testing_automated_vehicles_in_Finland_2016.pdf<br><br>Application form:<br>https://www.suomi.fi/citizen/services/form/6466fddd-005d-4ea3-9ead-ca543b2fc269 |
| **Further comments** | |
| **Last table update** | 18/08/2017 |

## 3.7.France

| Country | France |
|---|---|
| **Testing infrastructure** | Any technology can be tested on any infrastructure as long as the authorization is given by the Public Authorities. There is a priori no restriction. However, AD technologies of passenger cars cannot be tested on roads/streets for public transport only (bus lanes for example). Only AD technologies for public transport can be tested on these roads/streets |

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| **Procedure description** | Any applicant who wishes to conduct an experiment for AD technologies on French open roads must obey the following procedure (which was an administrative procedure till March 2018 and became a regulatory procedure ever since). Legal texts describing this procedure are available in French in the ‘Journal officiel’. The procedure is the following:<br><br>1. The applicant has to produce 4 documents: a dossier explaining what the experiment consists of (objectives, experimental design, etc.), a dossier describing the prototype(s) that will be tested and how its (their) safety has been taken into consideration, a questionnaire (about 90 questions) summarizing the main issues of the experiment; and finally the applicant has to contact the road operators and get their advices about conducting the experiments on their road network (the applicant must provide the advices of the road operators)<br>2. The experiment is presented to the Public Authorities during a meeting when questions are raised and responses are brought into the above dossiers.<br>3. The dossiers are submitted to the Public Authorities<br>4. 3 ministries (Transition Ecologique et Solidaire / Domestic Affairs / Economics) examine the dossiers and agree or disagree. Sometimes, they can raise new questions and the applicant produce the information requested<br>5. When everything is agreed, the Ministry of ecological affairs issues an authorization to get a special experimental AD registration for the prototype(s) that can be driven strictly in the conditions specified in the dossiers (especially only on the routes declared as tested routes). The authorization runs for at most two years.<br>- Delay between submission and authorization can vary between 2 months (rarely shorter) and 4 months. |
| **Organization(s) in charge** | - Ministère de la Transition Ecologique et Solidaire (in charge of Transport)<br>- Ministry of domestic affairs (in charge of Traffic Safety)<br>- Ministry of Economics. |
| **Contact information** | Ministry of Ecological Transition – Direction Générale de l’Energie et du Climat (DGEC) is the main contact to which the application for authorization is submitted |
| **Link to procedure website** | www.demarches-simplifiees.fr/commencer/autorisation-experimentation-vdptc |
| **Link to documents** | No template for documents is available |
| **Further comments** | The Public Authorities also require that an assessment is done periodically, quarter by quarter and yearly. |
| **Last table update** | 03/07/2018 |

## 3.8.Germany

| **Country** | Germany |
|---|---|
| **Testing infrastructure** | There are many test sites available in Germany; some are still under construction others are already in operation. At a short glance find below a list of the well-known ones (not being absolute complete…):<br>- “Digitales Testfeld Autobahn” (DTA) on the German motorway A9. Platform mainly for communication technologies (5G).<br>- “DLR Application Platform for Intelligent Mobility” (AIM) in Braunschweig. Urban research platform for connectivity, automation and human factors, extension to motorway planned in 2018<br>- “Testfeld Autonomes Fahren” in Baden-Württemberg, urban, rural roads and motorway<br>- “Digitales Testfeld Dresden”, urban and rural roads for connectivity technologies and automation<br>- “ITS Test site Merzig” (ITeM), V2V and V2I test site on urban and rural roads<br>- “Test site Aldenhoven”, closed test ground for sensing and automation with private access<br>- Test field “simTD”, ITS G5 – test field for development and deployment of C-ITS V2V and V2I services<br>- “C-Roads test field Germany” (Hessenmobil and Lower Saxony), test site for ITS G5 day 1 and day 1,5 application. Focus on deployment.<br>- Test site Düsseldorf, urban test site for deployment of C-ITS applications (both ITS G5 and traffic management over mobile communication |
| **Procedure description** | The relevant regulation document is the “Straßenverkehrs-Zulassungs-Ordnung” (StVZO, English Road Traffic Licensing Regulations).<br>The vehicle which is subject to dynamic driving tests can have an individual operating permit, granted under §19.6 StVZO (“registration of test vehicles”). Legal wording, translated (§19.6 StVZO): The type-approval of motor vehicles that contain parts which have been altered in the meaning of paragraph 2 (no permission in the case of degradations regarding emissions (noise and exhaust emissions), risk level towards other road users or the type of vehicle) will remain effective, if these motor vehicles are solely used for testing purposes; in this regard, the KBA (regulatory authority) does not require any additional notification. The previous sentence is only valid in case the KBA (regulatory authority) did confirm in the vehicle registration document (German “Fahrzeugschein“) that it has received the notification about the vehicle being used for testing purposes.<br><br>In case the vehicle will be testing scopes (i.e. AD |

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| | functionalities) which are not approved by current law, there’s an exemption approval required (§70 StVZO): The exemption can be granted by the KBA (Kraftfahrt-Bundesamt) (with authorization of the Federal Ministry of Transport and Digital Infrastructure (BMVI)).<br>Additionally, the law may require the approval of a special permit regarding the rules of the road (German “Verhaltensrecht”) (StVZO).<br>A major restriction regarding the range of automation functions is given by the EU regulation UN-ECE-R79 on steering systems, which allows a long-term automated steering intervention for velocities below 10 km/h only. The regulation was by June 2018 under revision.<br><br>The following steps are recommended for the owner of the vehicle in order to receive the admission:<br>1. Describe the technical modifications of the vehicle (difference to the serial type) in a technical way. Use references to existing standards and regulations as much as possible (e.g. ASIL-Levels, European EMV directive etc.).<br>2. Develop an FMEA and/or similar failure analysis models for single modules or the system as a whole. Define technical countermeasures and the way how to control them.<br>3. Define a data quality management system (such as a description of the software-framework for R&D work and the processes how to test and release your internal versions). It may be required that certain changes in SW have to be released by an internal quality process<br>4. Define organizational guidelines for your R&D-staff and for your technical personnel: How to get the keys, who has internal permission to develop and download code on the system, how do you (long-term) educate your personnel, how to prevent misuse, etc.<br>5. Once you have prepared the documentation above select an independent testing institution and contract it for consultation and for preparing an assessment report about the technical modifications of the vehicle, its safety and organizational issues/countermeasures. This assessment report may contain new requirements that you have to face to.<br>6. Get in contact with the regional government where you plan to conduct the tests. Make sure that the independent testing institution is involved in this process – the regional government may ask for the independent assessment report in order to align its requirements<br>7. Provide documentation you have created in advance of the process to the independent testing institution and prepare a demonstration with the vehicle where you show the driving functions in different situations (and e.g. with emulated mal-functions of components).<br>8. Do not forget to contact your insurance and your internal safety department of your organization – they may |

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| | have additional requirements. It is recommended to contact them when the assessment report is finalized.<br><br>For the operation of vehicles on German public roads another regulation is of high relevance: The Straßenverkehrs-Ordnung (StVO, English Road Traffic Regulations).<br>The StVO is, inter alia, implementing the Vienna Convention on Road Traffic. The amendment which became effective in 2016 allows for SAE-Level-3-Functions to be used on public roads, as the driver may (temporary) leave the operation of the vehicle to an automation system. However, fully automated or driverless vehicles are not covered by the content of the StVO, yet.<br>The StVO is currently under revision. |
| **Organization(s) in charge** | The responsible government body is the “Kraftfahrt-Bundesamt”, KBA (English: Federal Motor Transport Authority). |
| **Contact information** | KBA: http://www.kba.de/EN<br>Kraftfahrt-Bundesamt<br>Fördestraße 16, 24944 Flensburg, Germany<br>C/ Stephan Immen, Press Spokesman |
| **Link to procedure website** | StVZO: https://www.gesetze-im-internet.de/stvzo_2012<br><br>StVO: https://www.gesetze-im-internet.de/stvo_2013/ |
| **Link to documents** | Additional document for type approval : https://www.kba.de/EN/Typgenehmigung_en/Zum_Herunterladen_en/zum_Herunterladen_inhalt_en.html<br><br>UN/ECE R79, rev.2 (2006): http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:137:0025:0051:EN:PDF<br><br>Vienna Convention on Road Traffic (1968): https://treaties.un.org/doc/Treaties/1977/05/19770524%2000-13%20AM/Ch_XI_B_19.pdf<br><br>Amendment to the Vienna Convention (2016): http://www.bgbl.de/xaver/bgbl/start.xav?startbk=Bundesanzeiger_BGBl&jumpTo=bgbl216s1306.pdf |
| **Further comments** | The procedure is under responsibility of the company/institution which is owner of the vehicle. It is based on technical and organizational documentation, a formal risk analysis (including technical and organizational countermeasures) and the steps how to get in contact with the regional government (“Bundesland”).<br><br>There is one particularity in Germany: The owner has to get the admission from the regional government in which the |

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| | tests are planned to be conducted. In the required case of admission-enhancement all over Germany the regional government needs to extend the admission by a certain process, called “Bundes-Länderanfrage”. Usually this process will lead to an all-over-Germany admission without extra-effort.<br><br>It is currently planned to harmonize the enhancement-process by defined guidelines that are valid for all regional governments in Germany. But these guidelines will not be available before 2019 and even if they are available it will still be necessary to contact the relevant regional government directly.<br><br>After getting through all of the steps described above (estimated duration: a few months) you will have a “Zulassung zum Erprobungsfahrzeug” (single admission for test vehicles) which allows you to conduct you tests on open roads. But it is strongly recommended that you keep in mind that<br>- there are constraints defined in this admission that has to be fulfilled during the lifetime of the vehicle in your (owners) responsibility<br>- in case of accidents the judge may compare the constraints with reality of both – technical modification and organizational issues<br>- there is no necessity to define the concrete experiment and its boundaries in advance of the admission procedure. But this may be required by the insurance company and/or by the institution itself. E.G. the number of safety drivers in a certain scenario might be an important factor constraint (but not the only one)<br><br>Furthermore, there exists a difference between OEMs and suppliers when it comes to acquiring except permission to drive AD test vehicles. Two options exist for driving AD test vehicles on public roads in Germany:<br>1) Supplier Option:<br>a. This is the traditional option for suppliers like Aptiv, Bosch, Continental, etc.<br>2) OEM Option:<br>a. Applicable naturally to OEMs<br>b. Suppliers can also avail of this option<br>c. More time-consuming (estimated time between 3 to 9 months) but beneficial in the long term<br>d. Offers more flexibility esp. with regard to shuttled and PODs<br><br>The following steps need to be followed, if one follows the supplier option:<br>1) Build up the car and get the certification for this base car from certification authorities like TÜV<br>2) Certificate the AD test vehicle installation regarding |

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| | fail-safe strategy, take over scenarios and outer shape of the car (concerning pedestrian safety for sharp edges, etc.)<br>3) Register the car with local authorities<br>4) Get the except permission from the local govt. to be able to drive in Germany<br><br>The following steps need to be followed, if one follows the OEM option:<br>1) Except permission in this case is granted by the govt. (Kraftfahrbundesamt)<br>2) If suppliers make use of this option, then suppliers can brand the car as an OEM in the vehicle papers<br>3) With such branding certificate (as an OEM), suppliers would be allowed to drive test vehicles on public roads without TÜV approval for each car |
| **Last table update** | 25/06/2018 |

## 3.9.Greece

| **Country** | Greece |
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| **Testing infrastructure** | Currently there is no dedicated testing infrastructure for automated vehicles in Greece. In previous cases, such as the CityMobil2 project, several tests regarding the automated transport system (i.e. automated vehicles and their control centre) were conducted in a restrained environment and on the actual route the automated vehicles were planned to operate. Those tests are case dependent and a public research or educational institute is responsible for their definition. |
| **Procedure description** | The main steps of the procedure to be followed in Greece are indicated below:<br>- Operation is only allowed in a bus lane that shall be (during the operation) dedicated to the autonomous vehicle (excluding other vehicles but not bicyclists or crossing by pedestrians);<br>- The lane of use should be appropriately marked while signs indicating the operation of the autonomous vehicles (including operational timetable) should be put in place;<br>- Labelling indicating the absence of a driver on-board should be visible both in and outside of the vehicle;<br>- The vehicle shall respect traffic regulations related to traffic lights, pedestrian crossings and other traffic signs;<br>- Approval of the operation is upon the local municipality based on a traffic study that will need also to be approved in prior by the local Road Traffic Police department;<br>- The maximum operating speed is set to 25km/h;<br>- The remote operator shall receive proper and proven training with regard to the vehicle, its operation and its handling; |

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| | - The remote operator shall have the (proven) ability to stop the vehicle in case of emergency, in case of loss of visual communication with the vehicle or in case that the maximum number of passengers allowed is exceeded;<br>- The autonomous vehicle shall have the same (proven) ability to self-steer, break or stop with a conventional vehicle;<br>- Specific conditions are set for the vehicle layout, chassis, doors, seats, in-vehicle information systems to ensure and safeguard proper driving behaviour;<br>- Logs of video surveillance of the vehicle's operation should be stored for incident investigation for a period of time.<br>There are two distinct sub-periods in the process for granting the permission for operation:<br>- the testing period where the presence of an operator on-board able to perform emergency breaking is mandatory;<br>- the operation period where under specific conditions the operator could be transferred to a remote control centre. |
| **Organization(s) in charge** | Greek Ministry of Transport, Infrastructure and Networks; local stakeholders (municipality, the regional authorities, the local police and traffic regulation department) and a public Research or Educational Institute |
| **Contact information** | Greek Ministry of Transport, Infrastructure and Networks<br>http://www.yme.gr/index.php?getwhat=1&oid=531&id=&tid=531 |
| **Link to procedure website** | Not available |
| **Link to documents** | http://www.yme.gr/pdf/N_4313_2014.pdf (available only in Greek) |
| **Further comments** | Please note that the procedure was intended for authorization of autonomous buses, in the context of the CityMobil2 project. To overcome the legal barriers posed by Vienna convention (every moving vehicle shall have a driver and that every driver shall at all times be able to control his/her vehicle) the idea was to remove the “driver” (operator) outside of the vehicle.<br>In addition, it should be noted that as dictated by the current Greek law, the operation of autonomous vehicles is allowed for a specific area of operation and for a limited period of time and only under the supervision of a public Research or Educational Institute. |
| **Last table update** | 06/06/2018 |

## 3.10. Hungary

| **Country** | Hungary |
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| **Testing infrastructure** | Public roads. |
| **Procedure description** | Close cooperation with the automotive stakeholders.<br>The Hungarian approach shifted to the self-certification direction putting all the liability to the highest-ranking officer of the vehicle developer company.<br>Legislation modification date of release 12/04/2017.<br>“5/1990. (IV. 12.) KöHÉM rendelet”<br>“6/1990. (IV. 12.) KöHÉM rendelet”<br>Legislation modification date of entry into force 27/04/2017.<br>- At the Ministry of National Development the developer company must register itself as vehicle developer.<br>- The developer has to report what tests he usually performs.<br>- Tests over SAE Level 2 should be reported one by one.<br>- A specially trained test driver can perform the tests.<br>- Tests can be performed with continuous data recording to support the reconstruction of the unexpected road accident. |
| **Organization(s) in charge** | Hungarian Ministry of National Development |
| **Contact information** | Minister of National Development |
| **Link to procedure website** | Not available |
| **Link to documents** | http://www.kozlonyok.hu/nkonline/MKPDF/hiteles/MK17055.pdf |
| **Further comments** | The law modification helps the testing company/organization to make it as simple as possible to run its road tests with safety in mind. |
| **Last table update** | 12/09/2018 |

## 3.11. Ireland

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| **Country** | Ireland |
| **Testing infrastructure** | No physical infrastructure on Irish public roads for testing automated vehicles. |
| **Procedure description** | The government is considering procedures. These might be in place from H2 2018 or later. |
| **Organization(s) in charge** | The Department of Transport, Tourism and Sport is the lead department but a number of other agencies are involved. |
| **Contact information** | |
| **Link to procedure website** | http://www.dttas.ie/ |
| **Link to documents** | N/A |

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| **Further comments** | It is gaining importance and recently the Prime Minister’s office (Department of Taoiseach have pushed for action. |
| **Last table update** | 12/03/2018 |

## 3.12. Italy

There are currently two (parallel and not communicating) Italian procedures.

| **Country** | Italy |
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| **Testing infrastructure** | Any road infrastructure can be used for testing. |
| **Procedure description** | Registered car makers, research centres and universities are entitled to ask for temporary license plates (1 year duration) with which any prototype can be tested. Insurance is a normal car insurance and criminal liability resides with the holder of the plate. Only testers are allowed inside the vehicle an authorized person need to “sit behind the steering wheel”. In case there is no driver seat, nor steering wheel he/she needs to be on board and “in control”. |
| **Organization(s) in charge** | Motorizzazione civile, the branch of Italian Ministry of transport in charge of motor vehicles certification is in charge; however the license plate can be released by any Automobil Club (ACI) |
| **Contact information** | https://www.ilportaledellautomobilista.it/gms/ricerca/$N/$N;jsessionid=GP4FSbAgvV3g2X+-Di8CvtBi.eappbe03<br>http://www.aci.it/ |
| **Link to procedure website** | http://www.aci.it/i-servizi/normative/codice-della-strada/titolo-iii-dei-veicoli/art-98-circolazione-di-prova.html |
| **Link to documents** | The reference document is the road code:<br>- decreto legislativo 30 aprile 1992 n. 285 e successive modificazion<br>- Available at http://www.aci.it/i-servizi/normative/codice-della-strada.html |
| **Further comments** | No permanent application, nor fully driverless testing is foreseen with this procedure before a legal change. |
| **Last table update** | 25/09/2017 |

| **Country** | Italy |
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| **Testing infrastructure** | Applicable only on specific infrastructures and the issued certification is not transferable to similar transport systems on other infrastructures because the certification is issued to the system, which comprises the vehicles, the control system and the infrastructure. |
| **Procedure description** | A local authority (a municipality or the authority responsible |

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| | for the infrastructure) requires to the Italian Ministry of Transport division 5 the certification of a new transport system. It prepares a dossier according to the EN 50126 technical standard to make a risk assessment study. The Ministry technicians prepare observations and comments to the project which must be amended accordingly. A commission of national experts (normally chaired by a high ranking official of the Ministry; a vice minister or so) examines the dossier and when satisfied issues a temporary certification to operate in dry run mode. Results of dry runs are provided and if positive the certification to open to public is issued.<br>This procedure, though commonly used, is not standard and may vary from case to case depending on the complexity of the system |
| **Organization(s) in charge** | Division 5 of the Italian Ministry of Transport in charge of guided transport system certification |
| **Contact information** | http://www.mit.gov.it/ministero/dipartimento-trasporti-navigazione-affari-generali/dg-sistemi-trasporto-impianti-fissi-e-trasporto-pubblico-locale |
| **Link to procedure website** | http://www.aci.it/i-servizi/normative/codice-della-strada/titolo-iii-dei-veicoli/art-98-circolazione-di-prova.html |
| **Link to documents** | The reference document is the EN 50126 procedure |
| **Further comments** | One automated road transport system certified with this procedure in 2011 and never implemented |
| **Last table update** | 25/09/2017 |

## 3.13. Luxembourg

| **Country** | Luxembourg |
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| **Testing infrastructure** | Cross-border testbed between Germany, France and Luxembourg (Highway A13 and A3 for Luxembourg). |
| **Procedure description** | A formal application has to be submitted to the Ministry of sustainable development and infrastructure in Luxembourg (MDDI) with the following information:<br>- Technical information on the test vehicle, including specific modifications on the vehicle.<br>  o For type approved vehicles the original COC plus modifications done;<br>  o For non-type approved vehicles a report of a technical service.<br>- Description of any error prevention measures.<br>- Description of the safe state procedure in case of any errors.<br>- Intended track for the journey.<br>- The planed timespan for the journey.<br>- Documentation on the training of the vehicle driver. |

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| | A technical inspection of the vehicle will be performed by the Société Nationale de Circulation Automobile (SNCA) in order to verify that none of the modifications can cause security issues and a technical report will be send to Ministry.<br><br>If the SNCA does not detect any technical issues and all other provisions are fulfilled, the Ministry will grant an authorization, for the defined time lapse.<br><br>During the entire journey the vehicle needs to be equipped at the front and at the stern with a label bearing the inscription “Essai scientifique”. |
| **Organization(s) in charge** | Ministry of sustainable development and infrastructure Luxembourg (MDDI) and the Société Nationale de Circulation Automobile (SNCA) |
| **Contact information** | MDDI:<br>Department of “Circulation et sécurité routières »<br>website: http://www.developpement-durable-infrastructures.public.lu/fr/index.php<br><br>SNCA:<br>website : www.snca.lu |
| **Link to procedure website** | Not available |
| **Link to documents** | http://data.legilux.public.lu/file/eli-etat-leg-code-route-20170825-fr-pdf.pdf |
| **Further comments** | |
| **Last table update** | 09/10/2017 |

## 3.14. The Netherlands

| **Country** | The Netherlands |
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| **Testing infrastructure** | All Dutch roads are open for testing, after an exemption has been obtained from the Netherlands Vehicle Authority (RDW) and the relevant road operator(s). E.g. RWS if the testing concerns highways and other road operators if the testing concerns urban and/or city networks. Among others RDW has a closed proving ground. The A270 in Helmond can also be closed for testing. |
| **Procedure description** | The Dutch assessment framework has five steps. These steps indicate at what point the test application is in the process. The steps are as follows:<br>▪ The intake step is focused on the preparatory treatment and pre-assessment of the test application;<br>▪ The preparation step is focused on the preparation of |

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| | the assessment of the test application;<br>▪ The assessment step provides a decision on safety and whether the test can and may be carried out;<br>▪ The execution step is dedicated to carrying out the test on public roads;<br>▪ During the evaluation step, it is reviewed to see whether the process must be improved and to safeguard knowledge.<br>Each step contains criteria which must be satisfied before there can be a move to the next step. The application processing time is approximately three months. The application processing time depends on the type of vehicle, completeness and quality of the documents submitted by the applicant, experience from earlier tests, the cooperation of the relevant applicant and the primary and secondary parties, as well as the observance of the handling time. The costs of the application are based on the fixed rates 2 of the relevant type of exemption and the variable costs. These variable costs depend on, inter alia, the required man hours, any use of RDW services (such as the test centre) and the degree of preparation by the applicant and the distance to be travelled by RDW to assess the vehicle. The applicant is responsible for the payment of the incurred costs. Understanding the ‘tailored work and flexibility’ factors are important in CAD test applications. The RDW works on the basis of new insights. New insights in this context means that important learning points from previous applications can lead to direct changes in the method and the process for new and current applications. These will be clearly communicated. This is a learning process for the RDW and all other stakeholders. This may mean that the policy is regularly adjusted. This entire process falls under ISO-accreditation of the RDW. |
| **Organization(s) in charge** | The Netherlands Vehicle Authority, RDW; |
| **Contact information** | RDW: www.rdw.nl |
| **Link to procedure website** | LINK TO THE APPLICATION PROCEDURE |
| **Link to documents** | APPLICATION FORM |
| **Further comments** | LINK GENERAL INFORMATION RDW<br>Smart Mobility Embassy is a general national starting point for ITS testing |
| **Last table update** | 22/06/2018 |

## 3.15. Norway

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| **Country** | Norway |

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| **Testing infrastructure** | Fully autonomous vehicles SAE Level 5 and below without wheels and pedals.<br>Can be tested on snow, ice rain, dark road, wet road, dry road and all types of road conditions.<br>Mixed Traffic in cities etc. |
| **Procedure description** | - The organization that like to test need to apply to Nation Public road prior to the pilot test starts<br>- National Public Road has a document out that they like to be filled out in a structured way. It is important to show risk assessments of the pilot area where you like to drive, risk assessments of the vehicle, types definitions of the vehicles and documentation of the vehicle,<br>- Assessments of GDPR and how the Pilot is documented, |
| **Organization(s) in charge** | National Public Road Administration accept the application to start a Pilot Trial of Autonomous Pilot Driving at level 4 or 5. |
| **Contact information** | https://www.vegvesen.no/en/the+npra/Contact+us |
| **Link to procedure website** | https://lovdata.no/dokument/NL/lov/2017-12-15-112<br>https://lovdata.no/dokument/SF/forskrift/2017-12-19-2240 |
| **Link to documents** | https://lovdata.no/dokument/NL/lov/2017-12-15-112<br>https://lovdata.no/dokument/SF/forskrift/2017-12-19-2240 |
| **Further comments** | https://lovdata.no/dokument/SF/forskrift/1990-01-25-92/KAPITTEL_2#KAPITTEL_2 Defines requirements to the Vehicles. |
| **Last table update** | 10/07/2018 |

## 3.16. Poland

| **Country** | Poland |
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| **Procedure description** | The testing procedure of Automated Vehicles was introduced in the Electromobility and Alternative Fuels' Act (Dz. U. 2018 poz. 317) and provides the amendment to Traffic Law Act. According to its records, the testing is possible only in the case of assuring safety restrictions and obtaining necessary testing permit.<br><br>The permit is issued by the relevant road supervision entity (depending on the desired testing location). It is issued based on the formal application which needs to contain the following information:<br>- Name & Surname / Company name and the address of the applicant,<br>- Information on location and the date on the beginning and the end of test,<br>- planned testing route, |

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| | - list of people responsible for securing the testing route,<br>- signature of the test organizer<br>The permit should be additionally attached with:<br>- the confirmation of signing a compulsory liability insurance on the possible damages incurred during the test,<br>- the confirmation of paying the insurance fee,<br>- the copy of a professional vehicle registration.<br><br>The road supervision entity provides public consultations with the local community by issuing the application on its website for a certain period of time (not shorter than 7 days). The owner of a building/plot located along the proposed testing route may report an objection.<br><br>The final permit is issued after the positive decision of the relevant road supervision entity and getting an opinion of voivodeship police commander regarding the possible testing disruptions on traffic flow and safety.<br><br>The organizer of tests is obliged to:<br>- provide the Police the possibilities to ensure the traffic safety, life and health protection of people and property during the testing,<br>- ensure that a trained operator is present in the tested automated vehicle and capable to take over the control in dangerous situations,<br>- publicly announce the information about the planned tests and the testing route.<br><br>The organizer of the tests is obliged to issue an official report to Transportation Technical Supervision not late than 3 months after the testing. The report has to be structured according to the template published in a relevant Ordinance of the Minister of Infrastructure (the ordinance is currently in preparation). |
| **Organization(s) in charge** | 1. Relevant road authority (depending on the proposed route)<br>2. Voivodeship police commander<br>3. Transportation technical supervision<br>4. Secondary parties involved in the consultation (e.g. local community) & safety procedures |
| **Contact information** | 1. Road authorities in Poland are established on different levels (national, voivodeship, district, municipality). There are more around 2900 different road authorities in Poland. The biggest road authority responsible for highways and national roads is called *Generalna Dyrekcja Dróg Krajowych i Autostrad* - http://www.gddkia.gov.pl<br>2. There are 16 voivodeship police commanders in Poland (accordingly to the number of voivodeships - main |

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| | administrative subdivisions). The following webpage lists all voivodeship police headquarters and their websites: http://www.info.policja.pl/inf/jednostki/47301,Jednostki-Policji.html<br>3. Transportation technical supervision - www.tdt.gov.pl |
| **Link to procedure website** | The procedure cannot be completed online. |
| **Link to documents** | Electromobility and Alternative Fuels' Act (the procedure can be found on pp. 20-21: http://prawo.sejm.gov.pl/isap.nsf/download.xsp/WDU20180000317/T/D20180317L.pdf |
| **Further comments** | |
| **Last table update** | 13/07/2018 |

## 3.17. Portugal

| **Country** | Portugal |
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| **Testing infrastructure** | Portugal still do not have any specific regulation concerning Automated Driving tests in open roads. However, Portuguese government is working with the Spanish one to create conditions for the tests. At 10 of April 2018 was signed a memorandum between both countries about this issue.<br>National authorities are working to evaluate the changes in their road code, in the scope of European projects like AUTOCITS and C-Roads. |
| **Procedure description** | No testing procedure exists. |
| **Organization(s) in charge** | There isn’t any organization involved in testing procedures. |
| **Contact information** | N/A |
| **Link to procedure website** | N/A |
| **Link to documents** | N/A |
| **Further comments** | |
| **Last table update** | 09/10/2018 |

## 3.18. Spain

| **Country** | Spain |
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| **Testing infrastructure** | SISCOGA4CAD test bed is a permanent ITS corridor and living-lab, stablished to strongly support research, development and deployment of connected and CAD |

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| | functions, following a harmonized European multi-stakeholder approach, and being part of the European reference CAD Test-beds.<br>It is dedicated to perform different FOTs and Pilots, to test and to assess from different perspectives (technical, user acceptance, HMI, impact studies, public awareness, infrastructure needs, business models…). This corridor was created with the support of the Spanish public authorities: DGT and Vigo City Council.<br><br>Catalonia Living Labs – Testing and validation services of CAV technologies on Catalan industrial infrastructures and public roads covering all relevant environments (from highways to inner cities), supported by local industry and government. It will possibly include the provision of digital maps for autonomous driving, dedicated road side communication equipment and a client web portal for information and booking. This initiative, currently under development, aims to convert Catalonia into a one-stop-shop for development of CAV technologies for organizations worldwide.<br><br>Applus IDIADA, www.applusidiada.com<br><br>CTAG – Centro Tecnológico de Automoción de Galicia, www.ctag.com<br><br>INTA - Instituto Nacional de Técnica Aeroespacial, www.inta.es/opencms/export/sites/default/PISTAS/en |
| **Procedure description** | Instruction 15/V-113 aims at regulating the granting of special authorizations for testing and research tests conducted with SAE level 3 and above automated vehicles on roads open to general traffic. The instruction sets a number of requirements for the vehicle, the driver and the applicant that must be fulfilled before an exemption is granted:<br>**Vehicle requirements**: Uniquely identified automated vehicles, with a valid insurance policy and that have passed minimum safety and performance procedures including test track evaluation. A set of dynamic tests on closed test tracks is defined in Annex II of the instruction and an independent accredited laboratory shall perform the tests and evaluate if the vehicle fulfils the safety requirements. Vehicle authorizations issued by the competent authorities in European Union member states with equivalent procedures shall also be accepted.<br>**Driver requirements**: Identified drivers with valid driving license. They will be responsible for the driving and handling of the vehicle if requested even if not physically present in the cabin. The applicant shall submit a statement of responsibility that the driver knows or has been trained for the use of the automated vehicle. It is mandatory to have at least one driver of the vehicle. |

| | |
|---|---|
| | **Applicant requirements**: They must be eligible (OEMs, Tier1s, researchers, etc.) and provide the documentation requested in the instruction. This documentation, among others, shall describe the vehicles under test, the desired tests description, location and timing.<br>Once granted, this license lasts two years and is valid for the territory under vigilance of DGT. Any driving out of the defined test zones shall be carried out in non-automated mode. |
| **Organization(s) in charge** | Dirección General de Tráfico, DGT |
| **Contact information** | DGT: www.dgt.es |
| **Link to procedure website** | Not available |
| **Link to documents** | http://www.dgt.es/Galerias/seguridad-vial/normativa-legislacion/otras-normas/modificaciones/2017/15.V-113-Authorization-to-conduct-tests-or-research-trials-of-automated-vehicles-on-roads-open-to-general-traffic._EN.PDF (English)<br><br>http://www.dgt.es/Galerias/seguridad-vial/normativa-legislacion/otras-normas/modificaciones/15.V-113-Vehiculos-Conduccion-automatizada.pdf (Spanish) |
| **Further comments** | http://www.dgt.es/es/prensa/notas-de-prensa/2015/20151116-trafico-establece-marco-realizacion-pruebas-vehiculos-conduccion-automatizada-vias-abiertas-circulacion.shtml. |
| **Last table update** | 05/06/2018 |

## 3.19. Sweden

| **Country** | Sweden |
|---|---|
| **Testing infrastructure** | AstaZero, http://www.astazero.com |
| **Procedure description** | http://www.transportstyrelsen.se/sv/vagtrafik/Fordon/sjalvkorande-fordon-forsok/ |
| **Organization(s) in charge** | Swedish Transport Agency |
| **Contact information** | vag@transportstyrelsen.se |
| **Link to procedure website** | http://www.transportstyrelsen.se/sv/vagtrafik/Fordon/sjalvkorande-fordon-forsok/ |
| **Link to documents** | http://www.transportstyrelsen.se/globalassets/global/vag/fordon/sjalvkorande/ansokan-sjalvkorande---rev2.docx<br>http://www.transportstyrelsen.se/globalassets/global/vag/for |

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| | don/sjalvkorande/informationsdokument-tekniska-krav-sjalvkorande---rev-1.pdf<br>http://www.transportstyrelsen.se/globalassets/global/vag/fordon/sjalvkorande/informationsdokument-trafikregler---rev-1.pdf<br>https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/forordning-2017309-om-forsoksverksamhet-med_sfs-2017-309 |
| **Further comments** | The information in the links is only in Swedish. |
| **Last table update** | 29/09/2017 |

## 3.20. UK

| **Country** | UK |
|---|---|
| **Testing infrastructure** | Virtual and physical testing across a range of connected and autonomous vehicle (CAV) capabilities is taking place in a wide range of public and controlled testing environments. The UK Government is investing £100 million (2017-2021), to be matched by industry to £200 million, to upgrade and coordinate the UK’s capabilities into a world-leading, comprehensive national CAV testing ecosystem. A new “CAV Hub” called Meridian was announced in September 2017 to coordinate and promote this ecosystem.<br><br>The UK now has more than 50 CAV R&D projects, accounting for around £100 million of government investment, allocated to over 150 companies, universities, and research organisations.<br><br>Details of these projects can be found here: https://www.gov.uk/government/publications/connected-and-autonomous-vehicle-research-and-development-projects-2017<br><br>Some examples of recent, ongoing, and upcoming physical testing include:<br><br>Public (real-world testing), including but not limited to:<br>1) UK Autodrive driverless car trial (2014-present), Milton Keynes and Coventry<br>2) GATEway driverless car trial (2014-present), Greenwich (London)<br>3) Venturer driverless car trial (2014-present), Bristol<br>4) Various connected and autonomous vehicle technologies also have been and are being tested in Newcastle, Birmingham, Oxford, Culham (Oxford), Cranfield, and Stratford (London), among others, and will be tested in Manchester and Croydon among others. |

| | |
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| | Controlled (proving ground testing), including but not limited to:<br>1) Horiba Mira (Nuneaton)<br>2) Millbrook<br>3) Silverstone<br>4) Jaguar Land Rover (Gaydon)<br>5) Culham (Oxford)<br><br>Virtual testing, including but not limited to:<br>1) Leeds University ITS<br>2) Liverpool University<br>3) Bristol Robotics Laboratory<br>4) Warwick Manufacturing Group<br>5) TRL<br>6) Transport Systems Catapult (Milton Keynes) |
| **Procedure description** | In the UK, organisations wishing to test connected and autonomous vehicles (CAVs) can test on any UK road without requiring a permit, licence or other documentation, as long as they obey all relevant road traffic laws, including having:<br>- a driver or operator (a driver not in the vehicle) who is ready, able, and willing to resume control;<br>- a roadworthy vehicle;<br>- appropriate insurance.<br><br>It is the responsibility of testing organisations to satisfy themselves that all tests planned to be undertaken comply with all relevant existing laws.<br><br>It is recommended that such organisations refer to the UK Code of Practice for testing, available here:<br><br>https://www.gov.uk/government/publications/automated-vehicle-technologies-testing-code-of-practice |
| **Organization(s) in charge** | As set out in the UK Code of Practice, it is strongly recommended that those wishing to conduct testing of highly and fully automated vehicles should engage with:<br>- the highway authority (Highways England in the case of the English motorway network); and<br>- the local emergency services. This should include, where possible, establishing a single point of contact with local police and fire services to facilitate co-operation in the event of an investigation. |
| **Contact information** | Testers may also wish to contact the Centre for Connected and Autonomous Vehicles (CCAV) at:<br><br>Website: www.gov.uk/ccav |
| **Link to procedure website** | As the UK does not operate a permission based system, there is no procedure website.<br><br>It is recommended that testing organisations refer to the UK |

| | |
|---|---|
| | Code of Practice, which is available here:<br><br>https://www.gov.uk/government/publications/automated-vehicle-technologies-testing-code-of-practice<br><br>For further information on testing connected and autonomous vehicles in the UK, and for the latest announcements, publications and updates, please visit www.gov.uk/ccav. |
| **Link to documents** | As the UK does not operate a permission based system, there are no documents to complete.<br><br>It is recommended testing organisations refer to the UK Code of Practice, which is available here:<br><br>https://www.gov.uk/government/publications/automated-vehicle-technologies-testing-code-of-practice |
| **Further comments** | For any further information or questions, the Centre for Connected and Autonomous Vehicles (CCAV) can be contacted at:<br><br>Website: www.gov.uk/ccav |
| **Last table update** | 17/10/2017 |

## 3.21. Analysis of the regulations in relation to GEAR2030

In October 2017 the High Level Group (HLG) GEAR 2030 issued its report on the competitiveness and sustainable growth of the automotive industry in the EU [4]. The report offers recommendations on how the automotive industry can anticipate and adapt to current trends - thereby turning short to medium-term threats into long-term opportunities. GEAR2030 presented the principal of building blocks. The identified common building blocks create a stepping stone for the voluntary mutual recognition of approval of vehicles used for testing (see Annex 4 of Gear2030 final report [4]). Combined logically, building blocks can be derived using those requirements that are used by more countries. For allowing experiments, most countries want certainty over: the applicant/testing organization, the driver / monitor / supervisor, the vehicle, the infrastructure, behaviour, documentation.

Bearing in mind that according to the GEAR 2030 final report “*expected tasks of the driver and performance of the vehicles also need to be regulated in traffic rules and vehicle rules*” [4, p. 4], it can be noted that most of the hereby analysed countries only allow tests with SAE L3 functions which means that a driver is required when testing the vehicle. This is due to international regulations considering road transport, e.g. the Vienna Convention from 1969 and updated in 2016. Some countries request a driver’s training (e.g. Belgium) for the test drivers. However, it appears that the expectations towards the (test) drivers when operating automated and connected vehicles is not yet agreed upon; neither on national, nor on international level.

Most of the analysed countries provide the legal and technical framework for L3 testing, some also enable L4 and L5 testing. However, due to the Vienna Convention of 1969 and its

update on 2016, there must be always a driver in the vehicle being able to take over control – at least in those countries that ratified the convention on national level. For example in Greece it is also possible, under specific conditions, to test automated driving systems by having a person on the remote control outside of the vehicle. In most countries considered in this report, testing is possible on all available roads without any restriction. In Austria for example, the testing on public roads is restricted to highways and for suburban/urban roads only allowed for mini shuttle busses that commute at a speed of max. 20km/h. In many countries only the respective/proposed automated driving system (e.g. automated bus on urban road in good weather conditions) can only be operated in the dedicated/proposed ODD.

By now it seems that there hasn’t been a harmonisation of EU testing regulations among different member states. Especially in terms of cross-border testing, applicants have to face different national regulatory and procedures which might also be perceived as limitation for testing.

Also the exchange on lessons learned among member states only happens on informal level and in case project/testing applicants get in contact with each other. It can be assumed that on various national levels comparisons and benchmarks on the testing procedure and regulative framework are carried out. Hence, it would be advisable to especially engage the High Level Dialogue Group or even the Dialogue on Ministerial level to broader share information on the ongoing process and harmonisation.

Having a look at the different regulative testing frameworks it seems that there is still no framework on European level for ensuring the development of CAD related technologies and adequately facing and handling associated challenges.

When it comes to the application process for obtaining a testing permission, processes vary a lot between countries. In some countries, an application form indicating several fulfilled requirements (e.g. safety standards, test driver training) or ministerial discussions (also involving other experts) are needed. In other countries (e.g. Hungary) a “simple” description of the test case, the roads to be used and the commitment to some safety/environment recommendations is required. In fact, Hungary and Finland are working with a form of self-certification (there is no or hardly a technical assessment by an authority), whereas Germany, France and the Netherlands are sticking to an expert judgment before approval is given. Only in few countries, pre-tests e.g. simulations or travelled vehicle kilometres in a closed testbed are required before testing on public roads (e.g. Austria, Belgium, and Spain). In The Netherlands, tests can be operated either at the RDW test centre or on Dutch public roads. When testing at the RDW test centre, the applicants need to pay a certain amount of money to make use of the testing infrastructure. However, the evidence of the driver’s and the vehicles abilities as well as (liability) insurance is required broadly.

This subsection illustrated the differences and dependencies when it comes to the testing procedures in European countries. Having documents only in national language (e.g. Sweden) makes it even more difficult to harmonise or match regulations cross-border. Further, it should be distinguished between publicly and privately operated testing areas. Nevertheless, safety standards should be similar in in any case.

In this sense, still (and as stated in the GEAR 2030 final report), “EU wide focal point should be put in place to better coordinate open road testing and exchange on lessons learnt during testing on subjects of public interest.” [4, p. 42].

# 4. EU Cross-border testing information

During the IAA 2017 in Frankfurt, European Commissioners Oettinger, Bulc and Gabriel welcomed the commitment [5] from several EU Member States to engage in cross-border testing of automated driving. In a joint statement [6], the Commissioners announced that “Member States and industry commit to cross-border testing in Finland, Norway and Sweden. These new tests will complement tests already taking place between Germany, France, Luxembourg, Belgium, the Netherlands, Portugal and Spain. We expect more Member States to make commitments to such tests. Member States have also tasked the Commission to develop a common European approach to testing, to ensure that smart vehicles can travel smoothly across Europe.” The corridors so far agreed (depicted in Figure 2) are the following:

- Metz (FR) – Merzig (DE) – Luxembourg (LU)
- Rotterdam (NL) – Antwerp (BE) – Eindhoven (NL)
- Porto (PT) – Vigo (ES) and Merida (ES) – Evora (PT)
- Tromsø (NW) and Oulu (FI)
- The “Nordic Way” (SW, FI, NW)
- 'Via Baltica', Warsaw (PL) – Kaunas (LT) – Vilnius (LT)
- LT-LV-EE
- Thessaloniki (EL) – Sofia (BG) – Belgrade (RS)

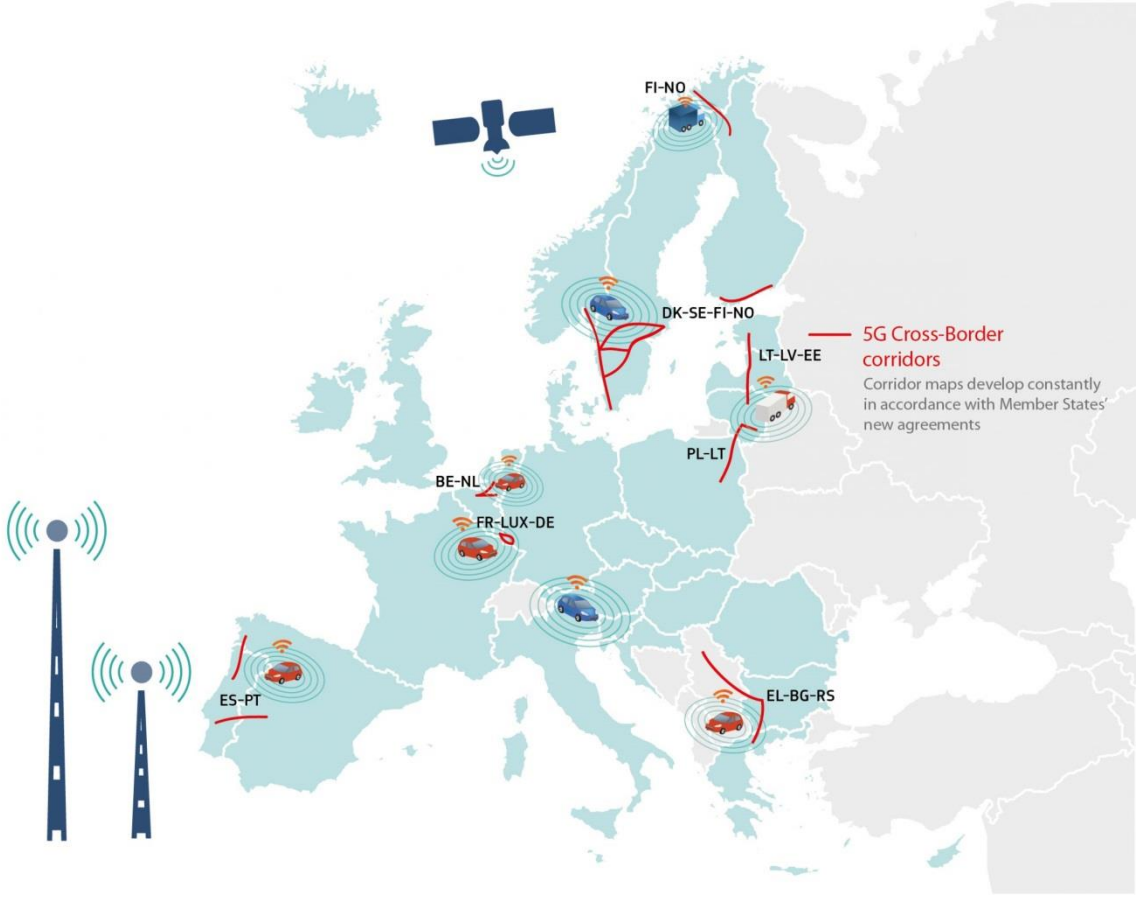


**Figure 2: European Corridors (source: https://ec.europa.eu/digital-single-market/en/cross-border-corridors-connected-and-automated-mobility-cam).**

These tests are a first salient return on the conclusions agreed on by the member states in Amsterdam and a subsequent Letter of Intent [7] prepared at the beginning of the year. Signed in March 2017 in Rome, the Letter of Intent has initiated the so-called Rome process aiming at further development of cross-border cooperation. The Commissioners also emphasised the policy dimension of these cross-border corridors: ”We have an opportunity we cannot miss: Europe can lead in the field of connected mobility, but for this, all Member States and industry have to work together closely and move into the same direction. There is no time to lose… Therefore, we call on co-legislators to act swiftly on all proposals already presented.” In this, the Commission follows up on an earlier report [8], which outlines the policy gaps that need to be addressed on connected and automated driving.

The Rotterdam – Antwerp – Eindhoven corridor is still work in progress, but no official public information is available so far on the exact status. For the LU-DE-FR corridor there is some more information in the Luxemburg Cluster Initiative website [9]. The cross-border test bed was presented along with the main objectives, the functional domains and the project’s status in a meeting, but no documentation is available online. Nevertheless, the Benelux countries are having regular meetings aimed at easing cross border testing. Meetings take place with support of the Benelux secretariat. For the corridors between Spain and Portugal, some further information could be obtained. This information is presented in the following subchapter.

Further information can be found in https://ec.europa.eu/digital-single-market/en/cross-border-corridors-connected-and-automated-mobility-cam.

## 4.1.Corridor Porto-Vigo and Merida-Evora (Lisbon – Madrid)

Spain and Portugal are strongly committed to and promote the research, development and deployment of CCAM (Connected and Cooperative Automated Mobility) to improve road safety and road efficiency. Important efforts have been done during past years by key stakeholders in the region to pave the way for cooperative and connected automated mobility. The strong business connection between the regions is an opportunity for testing CCAM in the context of 5G and ITS-5G.

With this objective, Spanish and Portuguese Authorities signed a letter of intent during the Digital Day of 2018 to create two cross-border corridors to test these new technologies: **Porto-Vigo** and **Merida-Evora**.

Both corridors are equipped with all the necessary elements to test Connected and Automated Driving functions.

The infrastructure in the Porto-Vigo corridor includes:

| SPAIN | PORTUGAL |
|---|---|
| • 3G / 4G coverage<br>• ITS-G5 coverage, urban and interurban area with 70 RSU<br>• LTE-V2X coverage and MEC (at least one node covering several stations).<br>• 32 km (interurban) and ~3 km (urban) | • 3G / 4G coverage (public network)<br>• ITS-G5 coverage<br>• 12 Antenna poles and shelters<br>• Optical fibre connectivity |

Furthermore, in the future is planned to add:

- MEC nodes with additional capabilities for interconnection with MEC nodes from other operators.
- A number of macro / small cells, initially based on 4G LTE but eventually upgradeable to 5G NR, to reinforce the coverage in either a high band (e.g. 3.5 GHz) or a low band (e.g. 800 or 700 MHz).
- A network slicing framework for proper isolation between V2X and eMBB services, based on either SDN/NFV technologies or more traditional means (like e.g. local breakout and QoS differentiation).

# 5. Regulations for different type of actors of the value chain

One topic raised in the discussions related to testing regulations was concerned with the existence of different regulations for different actors of the value chain. This topic was investigated by several CARTRE partners. As a result, it came out that this is the case in Germany, were OEM and suppliers can follow different procedures. The difference in the procedure has been already described in detail in subsection 3.8. Apparently, there could also be some differences in the procedures in France; nevertheless, it was not possible to find out more details on that.

Regarding universities, based on the received feedback from different countries, it seems that there are no exceptions or “relaxed” regulations for testing on public roads for universities or research organisations.

In **UK** general rules and regulations apply also in the case of universities.

In **Germany** there is a need to have a special permit, which can be issued by local authorities for test vehicles. Before this process the vehicle should be checked by TÜV (technical inspection agency) to ensure that all the modifications are in line with ISO 26262 and the German law (incl. technical modifications and procedures, documentation, training etc.).

In **Greece** there is not special treat for Universities too but there is an important difference compared to other EU countries in the role of research or educational institute. As dictated by the current Greek law, the operation of autonomous vehicles is allowed for a specific area of operation and for a limited period of time and only under the supervision of a public research or educational institute.

Also in the **Netherlands** the rules/legislation are applied according the national law. There is the possibility to close part of the University campus (e.g. part of a road or parking lot) for doing tests, taking into account safety regulations by the campus management, but on public roads the national law applies. On the motorway (N270/A270) between Eindhoven and Helmond all kind of automation tests can be done, but by closing the road (for a day). There is a special arrangement for that with the local involved road authorities and the frequency is about 1-2 days on average per year.

# 6. Working Groups and Projects Dealing with National Testing Regulations

Additionally to the collection of the current national testing regulations, the working groups of related thematic areas and the whole ecosystem of national, European and international bodies, task forces and projects directly or indirectly dealing with the regulations for testing automated vehicles should be followed within the CARTRE project in order to better obtain the whole picture of the current state of the art and, thus, better support the development of guidelines for framework conditions under which tests can be implemented and work towards the preparation of automated vehicles admittance requirements for their introduction in the European market.

## 6.1. Thematic Working Groups in the Scope of the Task

Within the CARTRE project a wide range of themes related to Connected and Automated Driving have been discussed in the so called Thematic Working Groups. Some of these discussions have led to the publication of position papers in several topics related to the development and deployment of CAV and their technologies as “Regulatory issues”, “In-vehicle technologies”, “Human factors” and “Connectivity”. An overview of the scope of activities regarding the development of the position papers as well as the position papers content can be found in Deliverable D5.1. The position papers will be made publicly available.

In the following, an overview of the position paper related to safety validation and roadworthiness testing, which is the one better fitting to the scope of Task 3.4, is provided; at the end of this sub-section, some notes on the key issues identified regarding human factors in relation to regulation and testing can be found:

- Safety validation and roadworthiness testing involve the definition of a comprehensive set of methodologies and tools aiming to verify whether vehicles comply with the regulatory and technological requirements. It is, therefore, one of the main building blocks needed for the safe deployment of automated road transport on public roads. The defined methodologies and tools must take into account both regulatory and technological requirements. Furthermore, they should address the whole life cycle of a vehicle.
- In order to cover the whole set of safety requirements that a vehicle must cover, reliable and continuously evolving procedures must be created. These procedures must involve different types of testing (compliance, commercial up to type approval) and different levels of granularity. Furthermore, interactions with all road users and with the environment must be considered during the whole development process of the vehicle. This implies the contemplation of a large amount of highly dynamic and highly variable scenarios. For this reason, simulation and virtual testing will play an increasingly relevant role as they provide a very effective way to deal with the high number of scenarios Connected and Automated Driving (CAD) vehicles will encounter.
- Verification and validation are very complex issues which have not yet been solved for higher automation and full connectivity. A common methodology or process for the verification and validation of SAE level 4/5 systems is still missing. Starting from the existing regulatory framework and promoting harmonization throughout Europe, further research in this area is of paramount importance.

- In the position paper, the main challenges posed to road automation and its verification and validation have been identified and analysed. This has led to a set of statements on which base a research agenda has been proposed. Finally, a brief view on the topics to be addressed in the near future, some conclusions obtained from the breakout session at the CAD conference, and a list of open issues are provided.
- Overall, it is considered that Europe’s leadership in the automotive sector can be compromised if a fair, trustworthy, harmonized and complete process for safety assessment is not developed. Furthermore, it is widely accepted that current validation and verification approaches do not suffice at higher levels of automation. This is a critical step towards the reduction of the number of road fatalities and, thus, the harvest of economic and environmental benefits of automation. For this purpose, the necessity to promote the development of a European level certification/approval scheme that fosters the development and market introduction of AD by the Industry is highlighted.

From the Human Factors positioning paper, the following statements are identified as relevant human factors issues during the migration of automation into public traffic (SAE levels 3 and 4) and therefore they should become part of large international research programs (e.g. H2020 and further EU framework programmes on research and innovation):

- Automated vehicles will change the drivers’ role from active to partly or completely passive. This will lead to new potential conflicts caused by undefined driver/automation interaction states. The methodologies concerning the identification of these states and their modules and potential countermeasures become more and more relevant with the migration of automated vehicles in public traffic scenarios. Transition of control (TOC) between the human driver and the automated function(s), is an important process and it needs to be designed in such a way that it can take place in a safe and smooth manner.
- Skill degradation, unawareness, level of trust, acceptance and misuse of the automation may cause new types of conflicts which request innovative methodologies and countermeasures to prevent accidents caused by mode-confusion effects. A model-based understanding of interaction effects between human and automation is necessary to transfer the human aspects into measurable KPIs which should serve as basis for the development of countermeasures.
- New designs of driver/machine interactions are required to solve upcoming problems caused by the co-existence of a human driver and automated functionalities in the vehicle. It is strongly recommended to define harmonised test designs, standards and evaluation procedures in order to harmonize the European-wide development of in-vehicle interaction methods and to assess their capabilities on controllable test sites.

## 6.2.GEAR2030

To ensure a co-ordinated approach and to address the challenges faced by the European automotive industry in the next 15 years, the Commission established in October 2015 a new High Level Group for the automotive industry: GEAR 2030. The group brought together Member States' authorities and key stakeholders representing the industry, services, consumers and environmental protection and road safety. The HLG was tasked with developing medium and long-term recommendations to 'address the main challenges and opportunities for the European automotive industry in the run-up to 2030 and beyond' and delivered its final report in October 2017 [4].

To remain competitive, the European automotive industry needs to quickly adapt to challenges from globalisation, changing mobility patterns, digitalisation and environmental expectations. This was the purpose of the GEAR 2030 High level group (ex: CARS 2020) gathering industry and NGOs (CEOs level) and policy makers (Ministers and relevant Commissioners). This high level group was launched on 26 January 2016 with the aim of focussing on three areas of work:

- the adaptation of the value chain to new global challenges,
- the automated and connected vehicles, and
- the trade, international harmonisation and global competitiveness.

The roadmap on highly automated vehicles develops a common vision on the development of these vehicles as well as a set of concrete actions regarding

- Regulatory and policy issues (e.g. vehicle approval, traffic rules, data issues, liabilities, responsibility issues, ethics, etc.)
- Financing and research issues
- Competitiveness/international issues.

The goal of this roadmap is to build political and stakeholder support for the different initiatives of the Commission on automated and connected vehicles and to have a coordinated approach in the Commission and in the Member States on this topic. The follow up of these ambitions is discussed in the High level meeting (follow up of the declaration of Amsterdam). Currently no road map or agenda for cross boarding testing is known.

More information as well as the working documents of GEAR 2030 may be found here:

http://ec.europa.eu/growth/tools-databases/newsroom/cf/itemdetail.cfm?item_id=8507

https://circabc.europa.eu/w/browse/f54801b8-e372-4b5f-be03-0d019a795d7c

## 6.3.HUMANIST-VCE

HUMANIST is a federation of research organisations that consists of universities, research institutes and research intensive companies. HUMANIST is a Virtual Centre of Excellence (VCE) in 4 areas (and the interaction between them): HMI (Human Machine Interaction); human behaviour in traffic; ITS (Intelligent Transportation Systems) and vehicle automation.

HUMANIST organises two network meetings per year. During these meetings, members can share their experiences and can set up scientific cooperation within the network. Every two years, HUMANIST organises an international conference where research projects related to the 4 focal areas of HUMANIST are presented and discussed. The most recent HUMANIST summer school by the time of writing this report was on 2017 in Vigo, Spain. The topic of this summer school was “Human Factor issues for the future car autonomous experience”. The most recent HUMANIST conference was in 2018 in The Hague, The Netherlands.

More information on HUMANIST-VCE and its activities can be found on the federation’s website.

## 6.4.VRA

Vehicle and Road Automation (VRA) was a support action funded by the European Union DG CONNECT aiming to create a collaboration network of experts and stakeholders working

on the deployment of automated vehicles and related infrastructure involving more than 80 organisations engaged in road automation. In this scope, the VRA D3.2.3 reviews the different national initiatives towards the creation of a correct framework for the industry to perform the needed testing while setting a framework preserving the safety of its citizens. Based on the results of this review, it was suggested to the leading EU Member States to work on pre-competitive issues beside the work done at UNECE. Most of these recommendations were brought up in 2016 into the GEAR2030 WG2-PT1 discussions which resulted in four “one-page” documents. Among the envisioned working issues, following three can be quoted here because of their tight relation with Task 3.4:

- Create a group of leading European member states and industry stakeholders who would share the common concerns about the need to make policy decisions and set concrete steps to harmonise pre-competitive legal framework.
- Ensure road authorities provide a harmonised authorisation to drive on open road.
- Ensure vehicle authorities are following same or harmonised exemption rules.

## 6.5.AdaptIVe

Website: http://www.adaptive-ip.eu/

Acronym: Automated Driving Applications and Technologies for intelligent Vehicles

Coordinator: Aria Etemad (VW)

Status: finished (June 2017)

Objectives: To develop various automated driving functions for daily traffic by dynamically adapting the level of automation to situation and driver status. To address legal issues that might impact successful market introduction.

In “SP7: Evaluation” no national testing regulations were evaluated or set up, but a set of evaluation methodologies and frameworks for testing of automated driving functions / systems were developed.

The project did include an SP on Legal issues. In this SP, the project worked heavily with the legal aspects and national regulations affecting the introduction of higher levels of automated driving systems on European roads. An overview of the relevant work is provided here: https://www.adaptive-ip.eu/index.php/legal_issues.html.

More information is provided here: https://www.adaptive-ip.eu/index.php/reader/legal-challenges-of-automated-driving.html and here: https://www.adaptive-ip.eu/files/adaptive/content/downloads/Deliverables%20&%20papers/AdaptIVe_Final%20Event_Leagal%20Aspects_Eric%20Hilgendorf_20170629.pdf.

The final outcome of the extensive analysis on legal aspects in AdaptIVe is reported in the Deliverable “D2.3 Legal aspects of automated driving” which is publicly available here: https://www.adaptive-ip.eu/index.php/deliverables_papers.html?file=files/adaptive/content/downloads/Deliverables%20%26%20papers/AdaptIVe-SP2-v1.0-DL-D2.3%20Legal%20Aspects%20of%20Automated%20Driving.pdf.

## 6.6.L3Pilot

L3Pilot (http://www.l3pilot.eu/) officially launched its activities 1st of September 2017. The Kick-off Meeting took place in Wolfsburg in 13-14 September 2017.

The work on legal aspects is foreseen to take place in the context of SP4 “Pilot preparation and support” and more specifically in WP4.6 “Legal aspects and Cyber-security”. More information will be available in the next version of this deliverable.

## 6.7.ENABLE-S3

ENABLE-S3 is dedicated to verification and validation methodologies for cooperative and automated driving: (http://www.enable-s3.eu/about-project/).

ENABLE-S3 is industry-driven and aspires at substituting today’s cost-intensive verification & validation efforts by more advanced and efficient methods by developing an innovative solution capable of combining real-world tests and simulations in an optimized manner.

The consortium consists of 71 partners from 16 countries of European Union.

## 6.8.PEGASUS

There is one large scale project funded by the German ministry for economic affairs and energy called “PEGASUS” that is dedicated to the definition of test design in terms of automated driving applications on highways (www.pegasusprojekt.de). Automated driving applications up to 100 km/h are intended to come to market in Germany in the early 2020th by some OEMs and 1st tier suppliers. During the PEGASUS project duration 2016 – 2019 the focus lies on test design and its measures and processes and the first results have been published on the half-time symposium in November 2017 – see: http://www.pegasusprojekt.de/de/pegasus-symposium.

The main goals of the PEGASUS project are:

- Definition of a standardized procedure for the testing and experimenting of automated vehicle systems in simulation, on test stands and in real environments.
- Development of a continuous and flexible tool chain to safeguard the automated driving.
- Integration of the tests in the development processes at an early stage.
- Creation of a cross-manufacturer method for the safeguarding of highly automated driving functions.

Of course, these very ambitious goals cannot be achieved in a final, industry-ready method supported by tools of a TRL 8 or 9.

What PEGASUS will likely have produced by mid of 2019 are the following results:

1. A general approach to evaluate the risk of an automated driving system (ADS) in relation to that of a human controlled car
2. An architecture for realizing the validation, identifying all necessary components, their functions, interfaces and the information flow between them
3. Unified definitions of interfaces and formats
4. A concept of test specification based on scenarios, with
    a. formats for expressing scenarios
    b. methods for their derivation

   c. generation of concrete test cases
5. A hierarchy of testing means, ranging from simulation over proving ground to real traffic in the field, with assigned roles in the process
6. Metrics to identify and evaluate challenging situations
7. A technical definition of human capabilities for comparison purposes

These results will be prototypically elaborated for the PEGASUS example application (highway pilot, an application of SAE Level 3) and its field of operation. The approach of PEGASUS is to develop its results with an eye for a generalization to further application environments. So, in particular the general approach (1) and the architecture (2) are not limited to highway applications. But, e.g., formats for scenarios (4) will certainly need nontrivial elaborations to become applicable for, say, urban environments. And tool solutions developed within the project and in parallel industrial activities will necessarily leave much room for future improvement. So, research and take-up activities will find a somewhat charted and structured field where topics can be identified and contribution be integrated into an overall meaningful approach to make the validation and verification of automated driving systems (and their components – a topic not addressed by PEGASUS) feasible and economically manageable.

Another direction for future activities indicated by PEGASUS is an international harmonization of approaches and according regulations. This has been started by the project already in 2017 and is going to continue in 2018 and 2019. Such harmonization will both serve to avoid market barriers for OEMs and Tier-1s and generally help to see automated vehicles deployed to the streets soon.

## 6.9.Further activities

As a result of the high interest that CAD has gained in the last years, there are many other activities running at the moment that have not been covered in this chapter because they do not directly address the topic of testing regulations, but are still closely related to the testing topic. This is the case, for example, of the C-Roads Platform (http://www.c-roads.eu), in which authorities and road operators join together to harmonise the deployment activities of cooperative intelligent transport systems (C-ITS) across Europe. The goal is to achieve the deployment of interoperable cross-border C-ITS services for road users, linking all C-ITS deployments and planning intensive cross-testing. A step forward is the CoEXist project (http://www.h2020-coexist.eu), which aims at preparing the transition phase during which automated and conventional vehicles will co-exist on cities’ roads. Nevertheless, a coverage of all indirectly related projects is out of the scope of this deliverable.

Recently, the **German ministry for traffic and digital infrastructure (BMVI)** has published a document containing recommended ethic guidelines for the development of automated driving functions written by leading German experts [10]. It contains 20 different recommendations to be taken into account by developers of CAD-Systems. Important key messages for CARTRE are:

- If it is proved that Connected and Automated driving systems (CAD) will cause less accidents than conventional systems a deployment of the CAD-system is strongly recommended
- In dangerous situations the protection of human beings has significantly priority over the risk of material damage

- In case of an unavoidable accident a qualification of human beings in terms of age, sex, physical or mental constitution is absolute impermissible
- In each driving situation it has to be clear who is currently in charge of the driving task: the human being or the machine
- For liability reasons: It has to be documented and logged who is driving the vehicle at every moment
- It is the driver (vehicle owner) who decides on the usage and transfer of vehicle data acquired during driving

‘The Pathway to driverless Cars: A Code of Practice for testing’ [11], drafted by the **UK Department for Transport** in 2015, provides guidance in order to conduct testing of automated vehicle technologies on public roads or in other public places in the UK. It provides details of recommendations for maintaining safety and minimising potential risks. The code applies to a wide range of vehicles, from smaller automated pods and shuttles, through to cars, vans and heavy duty vehicles. Advice on legislation relating to the use of prototype vehicles on roads can be found in: https://www.gov.uk/government/publications/prototype-vehicles. This code of practice was an action from the pathway to driverless cars review documents which were published in February 2015 [12] and provide a detailed review of regulations for automated vehicle technologies including a study of the international situation.

In addition to the commonly discussed approach to validation and verification with a focus on safety there also needs to be a debate on what the acceptable or desired behaviour of an automated vehicle is within it’s Operational Design Domain and how a methodology to assess this behaviour a priori can be developed. It should be a combination of safe and smooth (efficient) driving, especially in mixed traffic conditions. In the **Netherlands** there’s a proposal to develop such a methodology based on the analogy of a driver’s license: a driver’s license for automated vehicles. Initial thoughts on this topic have been presented at a breakout session at the Automated Vehicles Symposium 2018 in SF: http://www.automatedvehiclessymposium.org/program/2018breakout34.

# 7. Testing Regulations in Australia, Japan and USA

## 7.1.Australia

The NTC (National Transport Commission) is working on a roadmap of reform to prepare Australia for the introduction of automated road vehicles. In this context, Guidelines for Trials of Automated Vehicles in Australia were published on May 2017 [13]. Their purpose is to provide clarity to industry so that trials can take place across all states and territories in Australia and to establish minimum standards of safety. To meet the requirements to receive an exemption or permit, trialling organisations will be expected to:

- Provide key information on the proposed trial, including (where a criterion is not relevant due to the scope of the trial, the trialling organisation should explain this in their application):
  - Trial location
  - Description of the technology being trialled
  - Traffic management plan
  - Infrastructure or network requirements
  - Engagement with the public and other stakeholders
  - Managing change
- Provide a safety management plan outlining all key relevant safety risks for the trial and how they will be mitigated or eliminated. To assist in developing the safety management plan, trialling organisations could refer to standards such as the ISO 26262 – Road vehicles – Functional safety series and ISO/TC 241 – Road traffic safety management systems.
- Have appropriate insurance in place to protect against the risks associated with the trial. Appropriate insurance could include:
  - compulsory third-party insurance
  - comprehensive vehicle insurance
  - public liability insurance
  - product liability insurance
  - self-insurance
  - work or occupational health and safety insurance.
- Agree to provide certain data. Trialling organisations must bear with existing crash reporting requirements of the state or territory in which they are conducting trials. Minimum reporting conditions are contained in the Australian Road Rules (ARRs). Furthermore, they must also report other incidents to the relevant road transport agency on a monthly basis. Finally, an end-of-trial report on research outcomes must be provided.

For more precise information, trial organisations may contact the following contact points:

- **Commonwealth**. - Department of Infrastructure and Regional Development
  w: www.infrastructure.gov.au/vehicles/imports/contact_us
  e: vimports@infrastructure.gov.au
- **Western Australia** - Department of Transport
  w: www.transport.wa.gov.au/licensing/licensing.asp
  e: DVSPolicy@transport.wa.gov.au

- **South Australia** - Department of Planning, Transport and Infrastructure
  w: www.sa.gov.au/topics/driving-and-transport
  e: driverlessvehicles@sa.gov.au
- **Northern Territory** - Department of Infrastructure, Planning and Logistics, Registrar of Motor Vehicles
  w: www.transport.nt.gov.au
  e: EDTS.DoT@nt.gov.au
- **Queensland** - Department of Transport and Main Roads
  w: www.tmr.qld.gov.au
  e: michael.j.skinner@tmr.qld.gov.au
- **New South Wales** - Smart Innovation Centre, Transport for NSW
  w: www.transport.nsw.gov.au/programs/smart-innovation
  e: smartinnovationcentre@transport.nsw.gov.au
- **Australian Capital Territory** - Transport Canberra and City Services
  w: www.tccs.act.gov.au/roads-paths
  e: david.matthews@act.gov.au
- **Tasmania** - Department of State Growth
  w: www.transport.tas.gov.au
  e: anna.stevens@stategrowth.tas.gov.au
- **Victoria** – VicRoads
  w: www.vicroads.vic.gov.au
  e: cavtesting@roads.vic.gov.au

## 7.2.Japan

Testing of automated driving systems on public roads, may happen according to:

- the Guidelines for Public Road Testing of Automated Driving Systems (National Police Agency, May 2016) ;
- another procedure not complying with the Guidelines, always with preliminary advice of the police.

The basic conditions for running these tests are as follows:

- the test vehicle complies with the Safety Regulations for Road Vehicles (Ministry of Transport Ordinance nr 67 of 1951);
- the driver is seated in the driver’s seat and ensures safety, he always has to be able to operate the vehicle all by himself;
- the vehicle is driven in compliance with the rules of the Road Traffic Act.

Prior to testing on public roads, sufficient driving testing should be conducted at test facilities. Testing on public roads should start in a road environment with few unpredicted situations. Implementing Entities should check in advance the traffic environment of the public road they plan to use. A second person aboard in the test vehicle is necessary to monitor the automated driving systems. The test driver needs the drivers’ license required for the used test vehicle. The test driver keeps all legal driver responsibilities. He or she is not obliged to hold the steer but is required to monitor the surrounding traffic.

The actors that plan or implement public road testing, are called the “implementing entities”. They should take adequate measures to ensure safety and make a Public Road Testing Plan. Furthermore, the implementing entities are responsible for

- the required qualities of the test driver;
- an appropriate cybersecurity when testing on public roads;
- the recording of various data about the driving and the condition of the vehicle.

With regard to testing infrastructure, public roads, as defined in article 2(1)-1 of the Road Traffic Act (= law Nr 105 of 1960) and private testing facilities can be used. The automated driving system used in public road testing, has to be able to be operated by the test driver.

Further information to the testing regulations can be found in the following documents:

- National Police Agency: Guidelines for Public Road Testing of Automated Driving Systems (May 2016), [14]
- National Police Agency: Criteria for the permission for use of roads for public road testing of Driving Automation Systems with Remote Control Technology (June 2017)

## 7.3.United States

*(The information in this subsection has been kindly provided by Bryant Walker Smith, 24.06.2018)*

The on-road testing of automated driving systems for research or development encompasses a wide range of potential activities. In many cases, a conventional safety driver monitors the roadway from the driver’s seat while an aspirational ADS performs the dynamic driving task. But in other cases, the safety driver may be in the back seat, outside by near the vehicle, remote from the vehicle, or—in theory—absent entirely. Indeed, the line between testing and deployment is not entirely clear.[1] Furthermore, the policy discussion in the United States is increasingly focused on deployment rather than on testing.[2]

In general, typical automated driving testing activities are unambiguously legal at the federal and state levels.[3]

The federal government principally regulates the design of new motor vehicles through the federal motor vehicle safety standards (FMVSS). However, this self-certification regime is largely irrelevant to traditional testing activities for several reasons. First, it applies only to vehicles in commerce,[4] and a vehicle that is built or modified by the entity that tests it does

[1] See Bryant Walker Smith, A Legal Perspective on Three Misconceptions on Vehicle Automation, newlypossible.org

[2] For example, the Uniform Law Commission currently developing a model state law exclusively on deployment. http://www.uniformlaws.org/Committee.aspx?title=Highly%20Automated%20Vehicles.

[3] See Bryant Walker Smith, Automated Vehicles Are Probably Legal in the United States, newlypossible.org.

[4] 49 U.S. Code § 30112 (“Except as provided in this section, sections 30113 and 30114 of this title, and subchapter III of this chapter, a person may not manufacture for sale, sell, offer for sale, introduce or deliver for introduction in interstate commerce, or import into the United States, any motor vehicle or motor vehicle equipment manufactured on or after the date an applicable motor vehicle safety standard prescribed under this

not fall within this category. Second, established automakers may introduce into interstate commerce a vehicle that does not comply with these standards “solely for purposes of testing or evaluation.”[5] Third, even if the FMVSS were to apply, automated driving systems can be integrated into production vehicles in a way that is consistent with these standards.[6]

The US National Highway Traffic Safety Administration (NHTSA) has nonetheless encouraged automated driving developers to complete “voluntary safety self-assessments”[7] for testing as well as for deployment, but to date only two companies have actually released these reports. Congress is considering making these reports mandatory, but legislation is currently stalled. Even though there are no standards on automated driving systems, NHTSA also has broader authority over safety defects in motor vehicles and motor vehicle equipment and could use this authority to supervise at least some aspects of testing (by, for example, investigating certain equipment purchased by developers).

Accordingly, the regulation of on-road testing is principally a matter for US states. Roughly speaking, states already regulate driver licensing, vehicle registration, and rules of the road. These laws are generally consistent with automated driving under the supervision of a conventional driver and at least arguably consistent with automated driving even without this supervision.

Many states have added to this background law by enacting laws specific to automated driving. These laws vary widely. By legislation and administrative regulation, California imposes the most detailed set of rules for testing. These rules require testing entities to register with the state, notify the state of crashes, and submit periodic performance reports. Recommendations developed by the American Association of Motor Vehicle Administrators (AAMVA) at the request of NHTSA mirror California’s approach in many ways, and there are indications that some north-eastern states are similarly inclined. However, most states to have enacted legislation do not require registration or special reporting and impose only basic requirements (which may or may not include supervision by a safety driver). And testing is also taking place in states that have never enacted automated driving legislation.

Ultimately, testing of automated driving is regulated much more through soft law than through hard law. For example, some state governors and administrative agencies have released rules for the testing of automated driving that are probably not legally enforceable. And many companies and organizations already consult informally with governments in the states and municipalities where they are testing. As testing blurs into pilot projects and other limited deployments in specific areas, this informal approach is likely to continue.

For more on automated driving policy, please see How Governments Can Promote Automated Driving as well as the other materials at newlypossible.org.

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chapter takes effect unless the vehicle or equipment complies with the standard and is covered by a certification issued under section 30115 of this title.”).

[5] Id.

[6] See Bryant Walker Smith, Congress's Automated Driving Bills Are Both More and Less Than They Seem.

[7] https://www.nhtsa.gov/technology-innovation/automated-vehicles-safety

# 8. Conclusions

This document reports on the activities within Task 3.4 of the CARTRE project.

Most of the efforts have been devoted to the elaboration of a unified information scheme for the collection of the information from the EU member states and the actual information collection. This information has been collected for most of the countries in the EU. Most of them provide the necessary information only in their official language. In these cases, an additional effort was needed in order to briefly resume the most important points of the regulations. In some cases, these resumes were made by CARTRE partners and not by the competent authorities. Therefore, the information contained in this document cannot be considered as binding.

Generally speaking, the procedures for testing CAD technologies are currently being developed in the European member states and are, therefore, susceptible of being changed within the next few months/years. Furthermore, there is a broad range of conditions/procedures which should be fulfilled in order to be able to run the tests. While there are some member states that, putting all the liability to the vehicle developer company, adopt a self-certifying approach, as is the case for, e.g., Hungary and UK, where there is not a permission based system in operation (testing organisations are referred to the UK Code of Practice), there are other member states as, e.g., Germany and Spain, requiring vehicle assessments from accredited laboratories or from the authorities by themselves, as is the case in The Netherlands. Moreover, there are some differences in the conditions of the tests that can be done in the different member states, being possible to do tests without a human driver in the vehicles as, e.g., in Greece and UK, while this is not possible in other member states as, e.g., in Italy or Belgium, where a new legislation to allow testing without a test driver in the vehicle is in preparation.

By now it seems as if there hasn’t been a harmonisation of EU regulatory among different member states of the EU. Especially in terms of cross-border testing, applicants have to face different national regulatory and procedures which might also be perceived as limitation for testing.

# 9. References

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code-of-practice.

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# 10. Glossary: Acronyms and definitions

| Term | Description |
|---|---|
| AAMVA | American Association of Motor Vehicle Administrators |
| AD | Automated Driving |
| ART | Automated Road Transport |
| C-ITS | Cooperative Intelligent Transport Systems |
| CAD | Connected and Automated Driving |
| CAV | Connected and Automated Vehicle |
| CCAM | Connected and Cooperative Automated Mobility |
| EC | European Commission |
| EU | European Union |
| FMVSS | Federal Motor Vehicle Safety Standards |
| FOT | Field Operation Test |
| GDPR | General Data Protection Regulation |
| HLG | High Level Group |
| HMI | Human Machine Interaction |
| IAA | Internationale Automobil-Ausstellung |
| ISO | International Organization for Standardization |
| NCP | National Contact Point |
| NGO | Non-Governmental Organization |
| NHTSA | National Highway Traffic Safety Administration |
| NTC | National Transport Commission (Australia) |
| OEM | Original Equipment Manufacturer |
| SAE | Society of Automotive Engineers |
| SCOUT | Safe and Connected Automation in Road Transport |
| AMAA conference | International Forum on Advanced Microsystems for Automotive Applications |
| CARTRE | EU H2020 ART06 CSA project CARTRE, GA number 724086 |
| Public CARTRE web site | Joint CARTRE-SCOUT website with the URL http://www.connectedautomateddriving.eu/ |