Federal Ministry
Republic of Austria
Transport, Innovation
and Technology

Code of Practice

Testing of Automated Driving on Public Roads

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Inhalt

Introduction

The Austrian Federal Ministry of Transport, Innovation and Technology (BMVIT) supports tests of automated driving on public roads. The necessary legal basis for these kinds of tests has been created (KFG, AutomatFahrV) whereby further adaptations are expected. However, the general Austrian road traffic regulations (StVO 1960) must be followed at any case.

This document is designed to support and provide clarity to vehicle manufacturers and testing organizations on their path from system development to mass production. The following guidelines establish a framework and define the measures to be taken to ensure safety during tests on public roads.

The guidelines presented in this Code of Practice are not legally binding but are rather intended to promote responsible testing. These guidelines of the Code of Practice serve as a supplementary guide to testing organizations in addition to all appropriate statutory provisions, official procedures and other requirements. In all cases, adherence to the Code of Practice guidelines does not exempt the responsible parties from any liability.

Vehicle manufacturers must ensure that automated vehicle technologies have been developed and tested extensively before they go into mass production. The initial tests must take place on private test grounds and tracks. At a minimum these tests must demonstrate and ensure that a test driver or test manager can take manual control of the vehicle from the automated driving mode in order to ensure the necessary safety during testing.

Once the reliability of the systems has been proven in tests on private grounds, further testing on public roads will be necessary to test situations that may arise in real world conditions. However, testing on public roads can only be performed if the testing has been designed to minimise any associated risks or if it is mandatory for answering the research question, because only tests on public roads can fulfil these.

Purpose

This Code of Practice contains rules for testing automated vehicles of all degrees of automation on roads with public traffic. These rules are intended to ensure safety and minimise potential risks.

Through careful testing it will be possible to develop automated vehicles that will, in the future, demonstrate exemplary driving characteristics in real road traffic and thereby help improve safety for all road users.

Scope

This Code of Practice is to be used when testing:

- Automated motor vehicles.
- In the presence of a test driver who can intervene at any time to take control of the motor vehicle.
- On roads with public traffic.

This Code of Practice does **not apply** to **tests on private test grounds or tracks**!

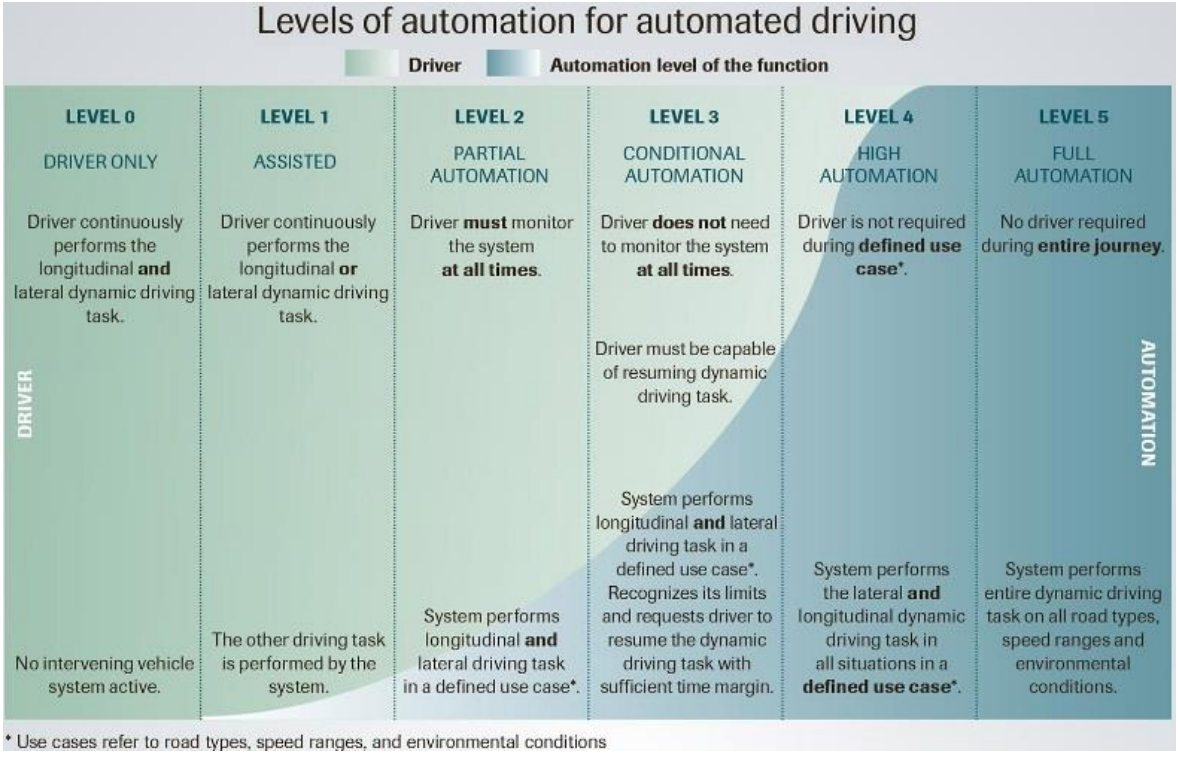
Definitions

Motor vehicle

A vehicle intended for use on roads or operated on roads, which is powered by mechanical energy and is not bound to tracks, even if its power is taken from overhead transmission lines.

Automation degree

Describes the different stages of automated driving (see figure).



Road with public traffic

A physical space intended for use by pedestrian or vehicle traffic, including buildings used to serve this traffic, which may be used by everyone under the same conditions.

Test driver

The person in the motor vehicle who can manually influence the speed and driving direction of the vehicle during the entire test operation.

Test manager

The person who is responsible for the test and who is not in the vehicle during the test. The person can override the automated system in the vehicle at any time.

Test operator

Any person, company or institution on whose behalf the test is carried out on public roads using automated vehicles, or who carries out the test itself.

Test assistant(s)

The person or group of persons who support the test driver and/or the test manager during test execution. By way of example, these persons may completely or partially monitor digital display data from the vehicle, the system or public traffic conditions.

General Provisions

Safety Precautions

The test operator is always fully responsible for the safe testing of automated motor vehicles on roads with public traffic. Simply observing the rules included in this Code of Practice is not considered sufficient to ensure safe testing.

In every case, all tests must fully comply with all existing international, European, federal and state regulations, regulations and directives regarding road traffic, and in particular police and motor vehicle regulations unless an exemption has been granted by means of a certificate within the Regulation on automated driving (AutomatFAhrV)[1]. In addition, all other reasonable and necessary measures must be taken to ensure the test can be safely completed and to minimise any existing and potential safety risks.

The test operator must ensure, prior to testing automated vehicles on roads with public traffic, that:

- Test managers and test drivers have a valid driving license for the vehicle to be tested.
- Test managers and test drivers have sufficient training with the system(s) to be tested.
- A risk analysis of the planned tests has been completed and appropriate risk-reducing measures have been implemented on the basis of the risk analysis. Possible harmful effects of the test on other road users have been evaluated and all appropriate measures have been implemented to avoid such effects.

Insurance

The statutory compulsory insurance requirements for operation of vehicles on public roads also apply to the testing of automated motor vehicles on roads with public traffic. Therefore, liability insurance must be in place during the test. Test operators should consider voluntarily increasing insurance coverage above the legally required minimums to fully cover any

[1] Regulation by the Federal Ministry of Transport, Innovation and Technology on the framework for automated driving (Automatisiertes Fahren Verordnung – AutomatFahrV), BGBl. II Nr. 402/2016

possible test risks. All other necessary (legally-required) insurance policies must also be in force before the test.

Cooperation with Governing Authorities and Institutions

For all test drives the responsible head of the provincial government must be informed in advance in writing about all planned tests, in which specific applications, on which roads, in which periods and with which vehicles are to be tested.

This mainly relates to tests on the low-ranking road network – here the provincial government authorities need to be informed one month before the beginning of the test drives the latest about which specific applications, on which roads, in which period and with which vehicles are to be tested. The respective provincial government authority then has the opportunity to raise concerns within one month after receiving this information.

If a test scenario requires certain infrastructure or testing conditions (e.g. specific traffic light circuits) it is important to coordinate with the relevant authorities (ASFINAG, municipalities, etc.) at an early stage and to get their approval.

Please find the respective contact address directly on the application form.

External Communications

Test operators should create a communication strategy that:

- Informs the public about the potential benefits of automated motor vehicles.
- Provides general information about scheduled tests.
- Provides information about the impact of tests on other road users and information on measures being taken to mitigate these impacts.
- Addresses the particular concerns of local roadway users. Special attention should be given to vulnerable groups such as people with disabilities, cyclists, motorcyclists, children and horseback riders.

The information and education campaign should serve more than simply the test operators. The test operators should make information materials available upon request to local groups and authorities in the interest of a proactive information policy. Since many of these organisations do not have the ability to independently prepare information about automated

and networked vehicles, the provision of information brochures and educational materials can be especially helpful in publicising the potential for automated and networked vehicles.

Cooperation with Rescue, Fire Brigade and Police

It is highly recommended that test operators inform and cooperate with all appropriate local rescue, fire brigade and police services in connection with carrying out tests. Test operators should provide all relevant technical information on the characteristics of the systems being tested to rescue organisations and fire brigades so they can prepare adequately for all possible incidents. The test vehicle's license plate number shall be made available to the local police well before starting the test.

The application form for testing automated vehicles shall be sent to the Contact Point Automated Mobility.

Contact Point Automated Mobility

The Contact Point Automated Mobility has been established at AustriaTech GmbH. The Contact Point is the official contact person for questions about automated driving in Austria and supports the Federal Ministry of Transport, Innovation and Technology (BMVIT) in the process of developing legal regulations in accordance with the Motor Vehicles Act. As part of this support function, the Contact Point provides potential test operators a template for proposing test scenarios which are subject to specific regulations.

The test operator must provide the following information to the Point of Contact, before beginning any testing of automated motor vehicles on roads with public traffic:

- What is being tested?
- Where is the test taking place?
- When is the test taking place?

The Contact Point can be reached at: automatisierung@austriatech.at

Requirements for the Test Driver and the Test Manager

Test Driver and Test Manager Requirements

The test driver or test manager must monitor the test vehicle at all times during the testing of automated motor vehicles on roads with public traffic. The test manager or the test driver must be able to override the automated systems at all times and whenever necessary.

The test manager and the test driver are always responsible for the safety of the test implementation, irrespective of whether the test vehicle is in manual or automated mode. The test manager and the test driver must have sufficient knowledge of the system being tested. The test manager and the test driver must be able to properly assess the systems' performance and limitations in order to recognize the need for intervention and/or taking over manual control of the test vehicle.

The test manager and the test driver shall be empowered by the test operator to exercise their respective roles and related rights and obligations. The test operator is responsible for providing adequate risk and process management. In addition, test operators must provide an appropriate training program for test managers and test drivers, and ensure that both the test manager and the test driver have a valid driving license for the vehicle to be tested.

The test operator must be aware that the provisions of the 1967 Motor Vehicle Act apply to test vehicles, with exception of those issued on the basis of the AutomatFahrV for an individual case by means of a certificate. Similarly, the regulations of the 1960 road traffic regulations apply to tests taking place on roads with public traffic. In any case, the vehicle must have an emergency device for deactivating or overriding the system in case of a critical situation.

Driving License Requirements

The test driver must possess a valid driving license for the vehicle being tested if the test is carried out on roads with public traffic. This requirement also applies when testing the fully automated system. In addition, the test driver should have several years of driving experience

with the type of vehicle being tested (car, shuttle, truck, etc.) and should be trained for the respective test case.

Test operators should not consider persons as test drivers or test managers whose driving history shows an increased risk profile or whose driving behaviour could be considered as having higher than average risk.

Test Driver and Test Manager Training

Test drivers and test managers need a higher level of knowledge and skills beyond those of normal drivers. For example, they must fully understand the performance and limits of the systems being tested and of the vehicle being tested so they are able to assess these qualities during the test, and to intervene and/or terminate the test in a timely manner, if necessary. It is preferable to acquire this knowledge through extensive experience with tests performed on private test tracks or sites.

The test operators are responsible for developing appropriate processes and procedures to ensure that their test drivers and test managers have received the necessary training and have sufficient competences to safely perform the testing.

Training must also cover all potentially dangerous situations in which the test driver or test manager may need to intervene and/or terminate the test. The specific steps for taking over manual control of the vehicle must be part of this training. The test driver and the test manager must, without exception, know every single step of taking over the control from the automated system.

Test Duration

The test driver and test manager must have the ability to pay sufficient attention to enable them to intervene at all times by taking over manual control of the vehicle in all critical situations during the entire test period.

Test operators are responsible for ensuring that test drivers and test managers are always fully alert during the test. In order to avoid fatigue and gaps in alertness, the test operator should set maximum periods for test drivers and test managers to work during test days, and also specify the maximum total duration for a test period.

Test Driver and Test Manager Behaviour

Test operators should define clear behavioural rules for test drivers and test managers, and ensure that these rules are observed.

The rules of conduct should in all cases include a strict ban on alcohol consumption with a blood level ceiling of 0.0 ‰, which goes beyond legal provisions. The behavioural rules should be designed to preserve the flawless judgment ability and avoid any impairment of test drivers and test managers.

Test drivers and test managers should be aware of their impacts on other road users during the test and should operate the vehicle as appropriate for normal driving situations (e.g., look in the appropriate driving direction).

Vehicle Requirements

General Vehicle Requirements

Any test operator who wants to test automated motor vehicles on public roads must ensure that their test vehicles comply with the applicable legal requirements, in particular the Motor Vehicles Act and any other applicable regulations. The Contact Point Automated Mobility has to be informed about possible changes on vehicles that already are registered.

All test vehicles must be roadworthy and safe to operate and comply with all applicable regulatory requirements.

Maturity of the Technologies being Tested

Any test operator who wishes to test automated vehicles on public roads must be able to demonstrate that the systems being tested have been previously tested successfully on private test grounds or test tracks.

As part of the required risk management, test operators must define processes that describe which tests must be completed successfully on private test grounds or test tracks (and at what frequency) to ensure that other road users are not exposed to additional risk when vehicle testing is performed on public roads. In all cases test operators must ensure that the automated driving mode can be transferred to the manual control at any time by the test driver or test manager. Test operators must prepare test reports documenting the internal tests performed to demonstrate these functions.

The vehicle sensors and other control systems shall be sufficiently developed to adequately respond to all road users likely to be affected in the test scenario. These systems should pay particular attention to vulnerable road users such as people with disabilities, pedestrians, cyclists, motorcyclists, children and horseback riders.

Data Recording

All test vehicles shall be equipped with a data recorder. The recorded data shall include all data from the test vehicle's sensors and control systems as well as all other data that provides information about the test vehicle's movement.

The following data must be recorded, preferably with a frequency of 10 Hz:

- Information regarding whether the test vehicle is controlled manually or if it is being operated
- Vehicle speed
- Steering commands and their activation
- Brake commands and their activation
- Use of the vehicle's lights and indicators
- Use of the vehicle's horn
- Sensor data regarding the presence of other road users or objects in the vehicle's vicinity
- Data on sensor functionality (condition monitoring)
- Data provided via remote commands that has influenced the vehicle's movement

The recorded data should make it possible to determine who or what had control over the test vehicle when an incident has occurred. The data must be securely stored and handed over to the competent authorities in a legible form, upon request. The same applies to critical incidents or "near accidents". In all cases, the test operator must fully cooperate with the investigating authorities without exception.

Test vehicles can also be equipped with a video and audio recording system. However, such a system does not release the test operators from their obligation to record the aforementioned data by means of a data recording device. In any case data protection regulations shall be taken into account

Data Privacy

The testing of automated motor vehicles may involve the processing of personal data. For example, data on the people´s position in the test vehicle during the test and how they behave can be collected and analysed. Individuals such as the test driver, the test manager or test assistant must be identifiable. The processing of personal data falls under the corresponding European and national data protection regulations. The test operator

therefore is obliged to comply with the corresponding legal requirements and to handle data lawfully, relatively and securely. Personal data may not be stored longer than it is necessary for testing.

Cyber Security

The test driver or the test manager must have the possibility of overriding the test vehicle's automated control to take control of the vehicle at all times during the entire test. Therefore the test vehicle and all the vehicle systems and prototypes, as well as any other systems or prototypes used in the test, must be sufficiently protected from unauthorised access, in particular via the internet. This threat must be fully considered in the test operator's risk management.

Test operators should comply with the provisions of CEN / TR 16742 Data Protection Aspects in ITS Standards and Systems in Europe and comply with the future regulations of ISO / IEC DIS 30754 as soon as it has been published as an ISO standard to ensure adequate security from unauthorised access.

Process for taking over the manual control of automated systems:

It is extremely important for testing the safety of automated motor vehicles that the sequences for switching control from manual mode into the automated mode, and especially from the automated mode back to the manual mode, are extremely clear and unambiguous.

The tested system must:

- Be comprehensible to the test driver and / or the test manager.
- Clearly tell the test driver and / or test manager whether the vehicle is in manual or automated mode.
- Give the test driver and / or the test manager sufficient information to determine if it is necessary to change to manual mode.
- Quickly and easily enable the test driver and / or test manager to take over manual control of the test vehicle and terminate the automated mode.

The risk involved in switching from automated mode to manual control mode must be as low as possible. Therefore it is expected that switching between modes will be an essential part of testing on private test grounds or test tracks. The test operator should ensure that switching

between modes is tested sufficiently before testing on roads with public traffic in order to eliminate risks or reduce them as far as possible.

Failure Warnings

The test driver and test manager must be made aware of any faults or errors in automated systems during the test via audio and visual warning indicators.

Automatic braking and steering systems must be designed in such a way that, in the event of malfunctions, manual braking and steering is still possible.

Software Level

Automated systems are based on the interaction and the perfect functioning of various computers and electronic control modules. It is particularly important that:

- The software being used in the test vehicle is clearly documented (e.g. which version) and changes are clearly identified.
- The system software being tested and its modifications have been extensively tested and documented. Typically, simulations are started and tests are then carried out on test stands. Only then the systems will be tested on private test grounds or tracks. After successful testing on private grounds, tests can be carried out on roads with public traffic.

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