

# Autonomous Driving

## Overview of UNECE, EU and Swedish regulations

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The market for automated vehicles is international, whereas the regulatory framework differs between countries.

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Regulations are needed to support safe vehicles and their safe use.

Common rules only partially exist.

In an international vacuum, countries use their legal space and adopt domestic rules that are intended to function primarily in the context of that country.

It results in a fragmented regulatory framework for international traffic.

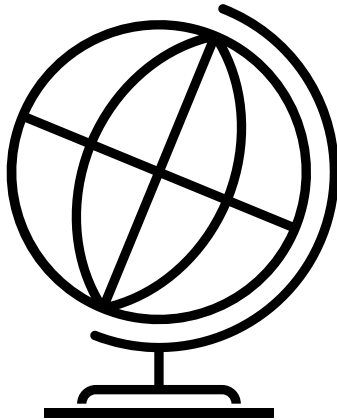
Harmonization is needed.



# The legal framework affecting AVs and AD is both international and national

- **Global level:** International conventions and agreements and UN regulations based on those legal instruments.
- **EU level:** EU regulations and directives regarding technical specifications for type approval, driving license rules, product safety and product liability, etc.
- **National level:** national vehicle regulations not covered by UN or EU regulations, national/local traffic rules, driving license rules (based on international conventions and EU rules), national rules on product liability, criminal liability, insurance, regulations for trial operations with AVs, etc.

# International conventions and agreements administered by UNECE



Technical requirements and international traffic rules are agreed by Member States of the UN in the framework of the UN conventions and agreements administered by United Nations Economic Commission for Europe (UNECE):

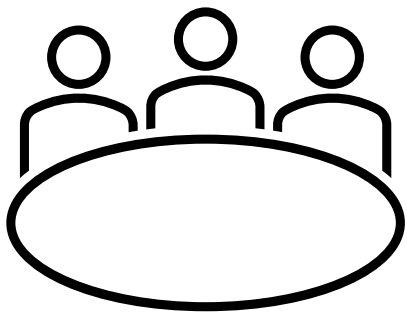
- The 1949 Geneva Convention on Road Traffic (admin by WP.1)
- The 1968 Vienna Convention on Road Traffic (admin by WP.1)
- The 1968 Convention on Road Signs and Signals (admin by WP.1)
- The 1958 & 1998 agreements on technical vehicle regulations (both admin by WP.29)
- The 1997 agreement on periodical technical inspection of vehicles (admin by WP.29)
- The 1957 agreement on transport of dangerous goods (admin by WP.15)

# Vienna Convention on Road Traffic



- The Vienna Convention on Road Traffic of 1968 aims to facilitate international road traffic and increase road safety through the adoption of uniform traffic rules.
- Most European countries have ratified the Vienna Convention (but how the convention is interpreted in terms of AD differs between countries).
- In 2016, amendments were made to the convention to allow ADAS.
- Recently, further amendments were made to enable AD. Before that the convention stated that “Every driver shall at all times be able to control his vehicle”.

# UNECE working groups WP.1 & WP.29



- In UNECE there are several **working groups**; the most important for AD are:
  - Global Forum for Road Traffic Safety (WP.1)
  - World Forum for Harmonization of Vehicle Regulations (WP.29)
- Under these there are dedicated subsidiary working groups or expert groups, for instance:
  - Working Party on Automated/Autonomous and Connected Vehicles (GRVA)
  - Group of Experts on drafting a new legal instrument on the use of automated vehicles in traffic (LIAV GE)



# WP.1 activities and outcomes

- Recent amendments to the Vienna Convention
- A resolution on the deployment of highly and fully automated vehicles in road traffic (non-binding guidelines) adopted in 2018
- A resolution on safety considerations for activities other than driving undertaken by drivers when automated driving systems issuing transition demands exercise dynamic control (SAE level 3)
- Ongoing: drafting a new legal instrument for safe use of AVs (will complement the Vienna & Geneva Conventions; will take approx. five years to complete)



# WP.29 activities and outcomes

- UN regulations (rules on technical requirements):
  - UN Regulation No. 155 Cyber security
  - UN Regulation No. 156 Software updates
  - UN Regulation No. 157 Automated Lane Keeping Systems (ALKS)
  - UN Regulation No. 160 Event Data Recorder (EDR)
- Ongoing:
  - EDR performance elements for AD and also a regulation on Data Storage System for Automated Driving (DSSAD)
  - Regulations covering "level 4" of automation (new regulations can be expected to build on the 157 regulation)



# 1958 and 1998 agreements

## 1958 agreement & annexed UN(ECE) Regulations

*Type approval*

- Agreement concerning the adoption of uniform technical prescriptions for wheeled vehicles, equipment and parts which can be fitted and/or be used on wheeled vehicles, and the conditions for reciprocal recognition of approvals granted on the basis of these prescriptions
- This enables governments (the contracting parties) to grant and accept type approvals issued in accordance with UN Regulations.
- 166 UN regulations adopted so far.
- 57 contracting parties, e.g. EU, Sweden, France, Germany, UK, Japan (not US and Canada)

## 1998 agreement & Global Technical Regulations

*Self-certification*

- Agreement concerning establishing of global technical regulations (GTRs) for wheeled vehicles, equipment, and parts which can be fitted and/or be used on wheeled vehicles
- GTRs provide a way to establish test procedures and performance requirements for use outside of type-approval systems, e.g. under self-certification regimes
- 23 GTRs adopted so far.
- 36 Contracting Parties, e.g. EU, Sweden, France, Germany, UK, Japan, US and Canada

# Vehicle approval processes

## type approval vs self-certification

### Type approval

In the EU, type approval is used. An authority in one of the Member States evaluates the vehicle and certifies that it is safe. (The remaining risk level for the assessed vehicle is considered acceptable for its entry into service. Still, the responsibility for the overall vehicle safety for the manufacturer remains throughout the vehicle's service life.)

A type approval proves that a vehicle (or component, system or device) type meets the applicable technical requirements.

When a type approval is obtained the automaker can bring out the new model.

### Self-certification

In e.g. US, the vehicle manufacturer certifies that the vehicle is safe (self-certification). It is basically the automaker who decides if the vehicle is safe (that it meet the vehicle standards)

The role of the authorities is to act when it doesn't work, through sanctions or claims for damages, etc.

# UN(ECE) Regulation No. 157 – ALKS

- First international type approval requirements for automated driving functions. Adopted in June 2020 and in force since January 2021.
- Automated lane keeping systems (SAE Level 3), under certain road conditions:
  - highway-like roads, where pedestrians and cyclists are prohibited, and which, by design, are equipped with a physical separation that divides the traffic moving in opposite directions, and
  - max. speed up to 60km/h (in force) (130 km/h adopted)
  - at first only passenger cars and vans, now extended to heavy vehicles as well (trucks, buses, coaches)
- Not allowed to change lanes (in force) (lane changes adopted)

SAE Level 3:  
From Assisted Driving to  
Automated Driving.

SAE Level 3 'conditional automation': when the car is capable of driving itself in certain scenarios, but a human driver must be ready to intervene as and when required.

# More on ALKS...

- ALKS allows the driver to hand over the DDT to the system (freeing him/her to do other things until alerted otherwise). The driver should be able to take back control within a defined period of time if prompted to do so by the system. (The regulation specifies how the driving task shall be safely handed back from the system to the driver, including the capability for the vehicle to come to a stop in case the driver does not respond appropriately.)
- On-board displays used by the driver for activities other than driving shall be automatically suspended as soon as the system issues a transition demand.
- The regulation requires a driver availability recognition system, which control both the driver's presence and availability to take back control of the vehicle.
- It also sets requirements for the use of a "black box" (DSSAD) and the retrievability of data in the event of a crash.
- It also sets requirements for cyber security and software updates in compliance with separate UN regulations UN-R155 and UN-R156)

Once activated, ALKS are in primary control of the vehicle. However, the driver must be in a position to respond to a takeover request from the system.



# EU technical requirements & procedures



- Regulation (EU) 2018/858 – approval and market surveillance of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles
- Regulation (EU) 2019/2144 (General Safety Regulation, GSR) – amends Regulation (EU) 2018/858 and updates EU type-approval requirements to ensure the general safety of vehicles and the protection of vulnerable road users.
- Commission implementing regulation (EU) 2022/1426 – type-approval of ADS of fully automated vehicles.

# Commission implementing regulation (EU) 2022/1426

- Uniform procedures and technical specifications for the type-approval of automated driving system (ADS) of *fully* automated motor vehicles.
- The approval of ADS of *automated vehicles* (not fully automated...) should not be covered by this regulation, as it is intended to cover them with a reference to UN Regulation 157, ALKS). (This is explained in the preamble.)
- ‘fully automated vehicle’ means a motor vehicle that has been designed and constructed to move autonomously without any driver supervision (article 3.22 of EU regulation 2019/2144)
- ‘automated vehicle’ means a motor vehicle designed and constructed to move autonomously for certain periods of time without continuous driver supervision but in respect of which driver intervention is still expected or required (article 3.21 of EU regulation 2019/2144)
- Subject to the provisions of Regulation (EU) 2018/858 and any relevant EU legislation, this regulation is without prejudice to *the right of Member States to regulate the circulation and the safety of operation of fully automated vehicles in traffic and the safety of operation of those vehicles in local transport services.* (Explained in the preamble.)
- Only small series = 1 500 units

## Scope of the new regulation

Type-approval of fully automated vehicles, with regard to their ADS, for the following use cases:

- a) Fully AVs (incl. dual mode vehicles) designed and constructed for the carriage of passengers or carriage of goods on a predefined area.
- b) 'Hub-to-hub': fully AVs (incl. dual mode vehicles) designed and constructed for the carriage of passengers or carriage of goods on a predefined route with fixed start and end points of a journey/trip.
- c) 'Automated valet parking': dual mode vehicles with a fully automated driving mode for parking applications within predefined parking facilities.

The scope is to be reviewed regularly to add more use cases if needed (stated in the preamble)

# Sweden

- In Sweden, legislation on **trial operations** with automated vehicles was introduced in 2017.
  - A permit from the Swedish Transport Agency is required to conduct trial operations.
  - A basic condition for obtaining a permit is that you can prove that you can conduct the trial operation in a traffic-safe manner. You do this by showing that all safety risks associated with the test have been taken care of. The automated functions in the trial must be described and shown to be safe for those in the vehicle and the surroundings.
  - To show that risks and control strategies have been analyzed and set at a minimum level, a safety plan, a system & trial definition, and a risk analysis has to be submitted.
- Going **beyond tests**, Sweden has, like many other countries, begun to rewrite the legislation for a wider adaptation of AD (SOU 2018:16 and Ds 2021:28).



- In 2015, the Swedish government decided to appoint an inquiry to develop a regulatory framework to enable AD on Swedish roads.
- In 2016, the inquiry proposed legislation for test operations.
- Legislation for test operations was introduced in 2017.
- Later, in 2018, the inquiry also proposed legislation for the deployment of AD (up to level 5 automation).
- After a referral process of the inquiry's proposal for new legislation, the government decided to investigate the liability issues further, instead of submitting the proposal to the Swedish parliament.
- The Government Offices then presented a slightly adjusted legislative proposal in 2021. The report was sent out for consideration to relevant bodies. The Government Offices now prepares the legislative proposals.

- The proposed liability regime is quite similar to those adopted in Germany and France and to the proposed rules in UK.
- In the proposal, a new driver role – “förare i beredskap” (driver on standby) – is introduced.
- It’s a new driver role with fewer but other tasks. The driver on standby is not responsible for how the ADS performs the DDT, but he/she must take control if the ADS so requests. Failure to do so may result in criminal liability.
- The owner of the vehicle is responsible for insurance of the vehicle and also responsible for ensuring that traffic rules are followed during AD. In the event of traffic offenses, a penalty fee is charged by the owner, unless the offense is due to malfunction of the driving system beyond the owner's control.
- Manufacturers, system developers etc. are responsible for product safety and they are financially responsible for damage caused by a defect product.

# France

- The French **trial operation authorization process** involves an application to the Ministry of Ecological Transition (Direction Générale de l'Energie et du Climat, DGEC), a questionnaire with about 90 questions summarizing the main issues of the test.
- In 2021, France adapted **regulation to allow for more permanent operations** of automated vehicles on public streets.
  - It sets definitions and general safety provisions for these systems, as well as requirements for the driver or the person in charge of remote intervention.
  - It covers automation levels up to fully automated systems, provided the supervision of a person in charge of remote intervention and deployed on predefined paths/zones.
  - Remote intervention is allowed for highly or fully automated vehicles, not for partially automated vehicles, and only upon system validation, safety demonstration and after an opinion of an approved notified body.

- Overview of provisions depending on use cases:
  - Partially automated vehicles:
    - The on-board driver must be able to respond to a transition demand, respond to law enforcement orders and facilitate the passage of priority vehicles.
    - Remote intervention is not allowed.
  - Highly automated vehicles:
    - The on-board driver must be able to respond to any request to take over, respond to law enforcement orders and facilitate the passage of priority vehicle
    - Remote intervention is allowed only if the system is validated by the service organizer, after safety demonstration and opinion of an approved qualified body. Remote operator can intervene according to the system's conditions of use.
  - Fully automated vehicles:
    - On-board driver is not applicable.
    - Remote intervention is allowed on the same terms as for highly automated vehicles



- Responsibilities and liability regime:
  - “Driver”
    - The new rules discharge the driver of his/her criminal liability when the ADS operates in accordance with its conditions of use. When the ADS is active, the driver no longer needs to perform the dynamic driving task. However, he/she must be ready to respond to a transition demand, follow summonses and instructions from law enforcement forces, facilitate the passage of vehicles of general interest and give way to priority vehicles of general interest.
  - Vehicle manufacturer/agent
    - When the ADS is active, the vehicle manufacturer or its agent may be criminally liable for life-threatening infractions and may also bear the pecuniary liability for traffic fines in most cases.

# Germany

- Germany was early in adapting its legislation to automated driving. Already in 2017, amendments were made to establish what rights and obligations a driver has when using automated driving functions.
  - Provided that such functions meet certain requirements, a driver should be able to trust these functions, and when such functions are in operation, the driver may engage in other things than monitoring the driving.
  - However, the driver is still obliged to take control when the ADS demands it, or when he/she realizes due to obvious circumstances or should realize that the ADS can no longer be used.

- In 2021, new rules were also introduced to enable AD at level 4 in defined operating areas on public roads. This allows companies to deploy robotaxis and driverless delivery services on public roads.
  - A technical supervisor (“Technische Aufsicht”) is necessary – a natural person who can deactivate AD and enable driving maneuvers from outside
  - The defined operating area must be approved by the competent state authority
  - The manufacturer must submit a certification that the vehicle complies with the technical requirements. The Federal Motor Transport Authority will check whether the vehicle meets the technical requirements. (The rules on technical requirements are intended as an *interim solution* until there are harmonized rules at international level.)

**Thank you**  
**Any questions?**

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