ISO TC22-SC32-WG13
ISO TS 5083
– Strategy and objectives
– Roadmap and timeline
– Safety goals and principles
– Safety by design and verification & validation
– Current work topics
– Summary

Road Vehicles – Safety for automated driving systems – Design, verification and validation
ISO TS 5083 — SAFETY FOR AUTOMATED DRIVING SYSTEMS. STRATEGY AND OBJECTIVES.

Overarching standard for safety for automated driving systems linking all standards addressing special automated driving related topics

Gives big picture by an holistic safety approach for automated driving systems of SAE Level 3 and 4

Application-specific standardization based on generic underlying standards like ISO 26262 (functional safety), ISO 21448 (SOTIF), ISO 21434 (automotive cybersecurity)

Shall be suitable as a basis for authorities and regulatory acts.

Standardization of the state-of-the-art in parallel with the product development

Proceed from an ISO/TR to finally release an ISO Standard.

1. ISO TR 4804, in Dec. 2020
   Target was to convert Safety First White Paper into an ISO/TR creating an early 1st edition to worldwide address this field by an ISO standardization activity. Avoid major changes in this step to be fast.

2. ISO TS 5083 by Mid 2023
   Go for necessary enhancements and extensions to cover scope in width and depth.

3. Continue work to proceed towards ISO IS standard
   Mature worldwide industry consensus and state-of-the-art based on global product releases.

- Over 120 experts from 14 countries are registered at ISO TC22/SC32/WG13.


- Project is intended to run in a 24 month schedule, i.e. expected release date of TS 5083 is by mid 2023
<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Release of White Paper “Safety First”</td>
<td>02-Jul-19</td>
<td>n/a</td>
<td>International release of White Paper as free download from all partners. Pre-work for ISO standardization.</td>
</tr>
<tr>
<td>Project approval ISO TR 4804</td>
<td>30-Dec-19</td>
<td>ISO</td>
<td>ISO project formally approved to start.</td>
</tr>
<tr>
<td>Project approval ISO TS 5083</td>
<td>06-Dec-20</td>
<td>Genève, ISO</td>
<td>ISO project formally approved by P-members of TC22. New TC22 / SC32 / WG 13 founded to host project.</td>
</tr>
<tr>
<td>WG13 Kick-off meeting</td>
<td>16-Feb-21</td>
<td>Web meeting, ISO</td>
<td>Founding of intl. expert team, clarification on operational issues, collection of topics for TS 5083</td>
</tr>
<tr>
<td>WG13 plenary and sub-team meetings</td>
<td>2021/2022</td>
<td>Web meetings</td>
<td>Work on content of ISO TS 5083</td>
</tr>
<tr>
<td>Planned Release of ISO TS 5083</td>
<td>Mid 23</td>
<td>Genève, ISO</td>
<td>Expected release date of ISO TS 5083</td>
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</tbody>
</table>
# ISO TS 5083 — SAFETY FOR AUTOMATED DRIVING SYSTEMS. ROADMAP.

<table>
<thead>
<tr>
<th>Principle schedule of WG13 plenary and sub-team meetings</th>
<th>Meeting dates:</th>
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</thead>
<tbody>
<tr>
<td><strong>Alignment phase</strong></td>
<td></td>
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<tr>
<td>▪ 2nd WG13 Meeting</td>
<td>2nd WG13 plenary</td>
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<tr>
<td>– Understand proposals on cluster and topics</td>
<td>2021-02-16</td>
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<tr>
<td>▪ 3rd/ 4th WG13 Meeting and sub-team workshops</td>
<td></td>
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<tr>
<td>– Align and detail proposals incl. initial drafting of text</td>
<td>3rd WG13 plenary</td>
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<tr>
<td>– Decide on proposals for TS 5083</td>
<td>4th WG13 plenary</td>
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<tr>
<td><strong>Integration phase</strong></td>
<td></td>
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<tr>
<td>▪ 5th/ 6th WG13 Meeting and sub-team workshops</td>
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<tr>
<td>– Drafting of text and integration into TS 5083</td>
<td>5th WG13 plenary</td>
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<tr>
<td>– Create baseline after 6th meeting</td>
<td>6th WG13 plenary</td>
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<tr>
<td><strong>Review phase</strong></td>
<td></td>
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<tr>
<td>▪ Official commenting via SC32 in ISO comments sheet</td>
<td></td>
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<tr>
<td>▪ 7th/ 8th WG13 Meeting</td>
<td></td>
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<tr>
<td>– 8th WG13 Meeting</td>
<td>8th WG13 plenary</td>
</tr>
</tbody>
</table>

*UNECE WP.29 GRVA 11th session | ISO TS 5083 | 29-Sep-2021*
ISO TS 5083 – SAFETY FOR AUTOMATED DRIVING SYSTEMS. STRUCTURE.

1. How safe must a Level 3/4 system be?
2. What aspects are necessary to achieve the overall safety vision?
3. What capabilities are needed to cover all the above aspects?
4. Which building blocks are necessary?
5. How to design a generic architecture out of these building blocks?
6. What verification and validation is needed?
Based on recommendation of the German Ethics Commission in 06/2017 (BMVI):
Maximizing the evidence of a POSITIVE RISK BALANCE of automated driving solutions compared to the average human driving performance which is different
• between Europe, US and China;
• road types e.g. highway or urban road; and
• weather, age of driver

AVOIDANCE OF UNREASONABLE RISK is the second major measure to claim an acceptable level of safety. Its evidence is based on the application of a proactive and reactive driving behavior, avoidance of accidents as much as “practically possible”. These judgements are made on basis of a combination of qualitative and quantitative assessments, and also on an understanding of good engineering practice and existing standards.
### Groups of principals of safety and cybersecurity

<table>
<thead>
<tr>
<th>Principal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSC-01</td>
<td>Cybersecurity</td>
</tr>
<tr>
<td>PSC-02</td>
<td>Data Recording</td>
</tr>
<tr>
<td>PSC-03</td>
<td>Passive Safety</td>
</tr>
<tr>
<td>PSC-04</td>
<td>Safety Assessment</td>
</tr>
<tr>
<td>PSC-05</td>
<td>Safe Operation</td>
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<tr>
<td>PSC-06</td>
<td>Safety Layer</td>
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<tr>
<td>PSC-07</td>
<td>Behaviour in Traffic</td>
</tr>
<tr>
<td>PSC-08</td>
<td>Operational Design Domain</td>
</tr>
<tr>
<td>PSC-09</td>
<td>Role of User</td>
</tr>
<tr>
<td>PSC-10</td>
<td>Driver Initiated Takeover</td>
</tr>
<tr>
<td>PSC-11</td>
<td>Vehicle Initiated Takeover Request</td>
</tr>
<tr>
<td>PSC-12</td>
<td>Interdependency between Driver and Automated Driving System</td>
</tr>
</tbody>
</table>

**Automated Vehicle and Related Aspects**

**Automated Driving System**

**Human Factors**
ISO TS 5083 – SAFETY FOR AUTOMATED DRIVING SYSTEMS. GENERIC ARCHITECTURE.

Traffic Rules: Worldwide and locally different traffic rules need to be taken into account.

Environment Perception Sensors: Different physical principles.

HD maps have to offer reliable map attributes.

Sensor Fusion: Combination of at least three sensor technologies (e.g. camera, lidar, radar).

Safety measures for supervised offline trained DNNs.

Integrated circuits need to fulfill Functional Safety requirements.

Complement verification & validation approaches by field monitoring.

Implementation of redundant safety channel.
ISO TS 5083 – SAFETY FOR AUTOMATED DRIVING SYSTEMS.
SAFETY BY DESIGN.

Realizing Nominal and Degraded Capabilities

- **Fail Safe (FS):** After failure the risk is small or covered by *Fail Degraded*
- **Fail Degraded (FD):** Provide safe system for specific time until Minimal Risk Condition (MRC) is reached
Modular-based system architecture recommends that machine learning algorithms are treated as a software component.

Development steps of deep neuronal networks

Each step should provide safety artifacts to support the safety case.
ISO TS 5083 – SAFETY FOR AUTOMATED DRIVING SYSTEMS.
CURRENT AREAS OF WORK STRUCTURED BY CLUSTER AND TOPICS.

G01 Overarching
- C01 Scope
- C23 Overarching
- C03 Terms and definitions
- C06 Principles
- C02 Alignment with other related standards
- C08 Reference safety life cycle

G04 Safety by design
- C10 Capabilities
- C12 Elements
- C21 Safety of connected vehicles
- C11 MRM and MRC
- C15 HD map
- C04 Cybersecurity
- C16 Architecture models
- C22 Electrical architecture/ network design

G03 Overall risk assessment and verification & validation
- C05 Positive risk balance and avoidance of unreasonable risk
- C07 Safety Case
- C09 Generic structure of risk assessment
- C18 Achievement of safety by fulfilled requirements
- C13 Verification & validation

G07 Development examples
- C17 Development examples
- C19 Busses and Trucks
- C20 Different Level of AD systems

G06 AI / ML
- C14 Artificial intelligence / machine learning

G02 Alignment with other related standards
ISO TS 5083 – SAFETY FOR AUTOMATED DRIVING SYSTEMS.

SUMMARY.

ISO TS 5083 can support regulations on automated driving by

- Representing an worldwide industry consensus
- Being developed in short cycles to represent state-of-art of fast evolving filed of AV
- Following and an holistic safety approach for automated driving systems of SAE Level 3 and 4
- Introducing approach on safety targets
  - positive risk balance and
  - avoidance of unreasonable risk
- Being the overarching, application specific standard covering all aspects of automated driving systems
- Linking all standards addressing dedicated AV related topics.
ISO TC22-SC32-WG13
ISO TS 5083

Thank you for your attention!

Road Vehicles – Safety for automated driving systems –
Design, verification and validation