

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

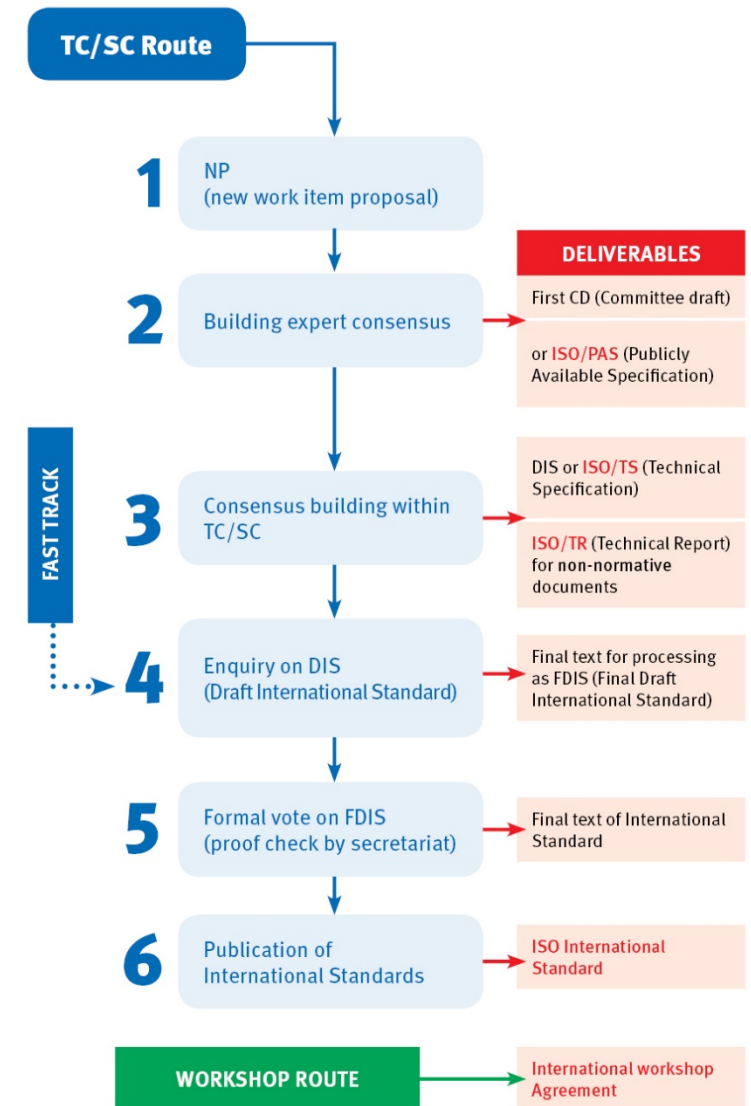
Target was to convert Safety First White Paper into an ISO/TR creating an early 1st edition to worldwide address this field by an ISO standardization activity. Avoid major changes in this step to **be fast**.

2. ISO TS 5083 by Mid 2023

Go for necessary enhancements and extensions to **cover scope in width and depth**.

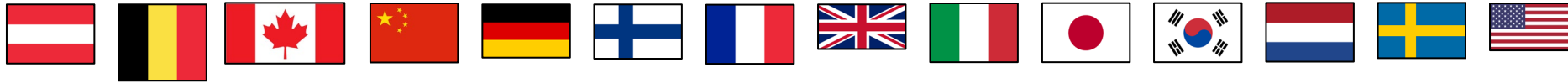
3. Continue work to proceed towards ISO IS standard

Mature worldwide industry consensus and state-of-the-art based on global product releases.

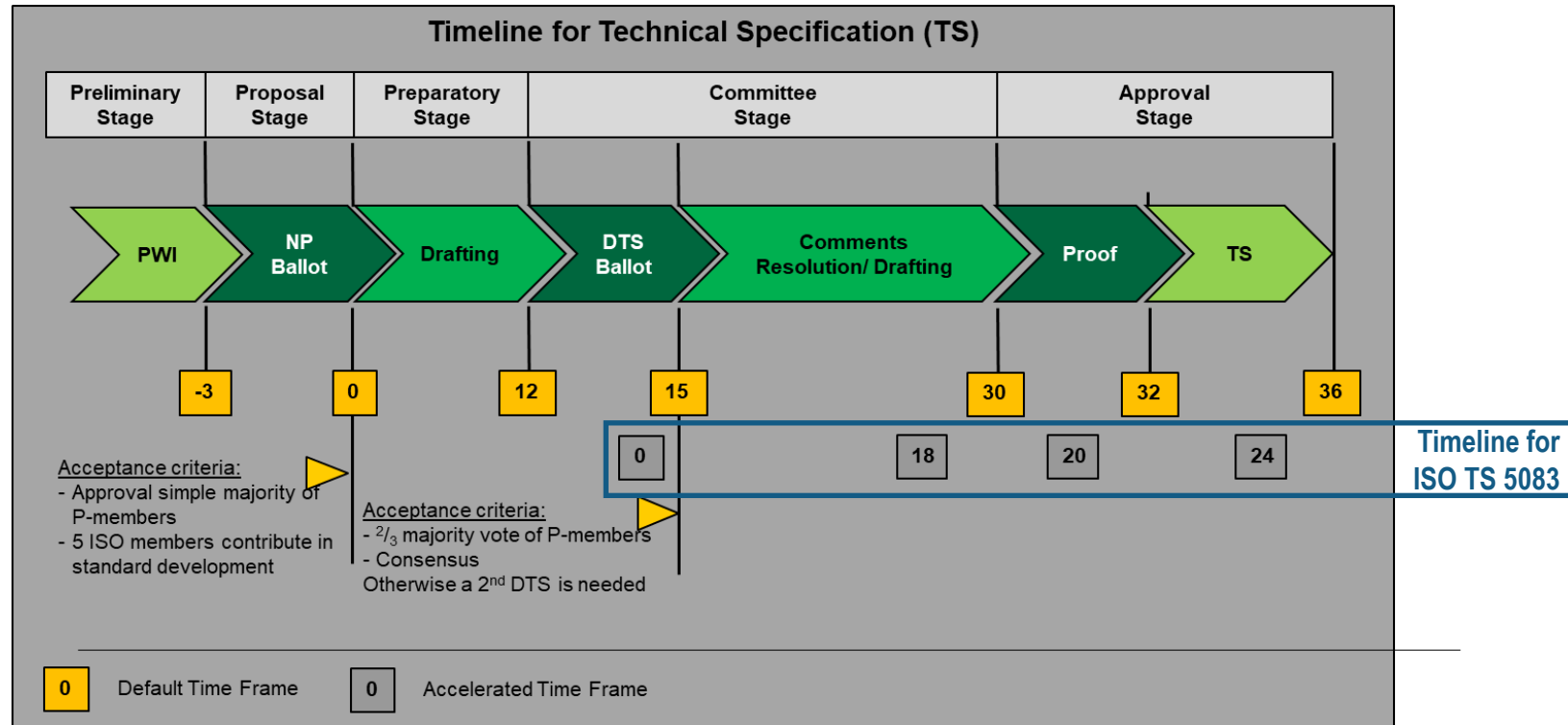


ISO TS 5083 – SAFETY FOR AUTOMATED DRIVING SYSTEMS. ISO TC22/SC32/WG13 EVOLVES ISO TR 4804 INTO ISO TS 5083.

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



- ISO TC22/SC32/WG13 evolves ISO TR 4804 into ISO TS 5083.
- Project is intended to run in a 24 month schedule, i.e. expected release date of TS 5083 is by mid 2023

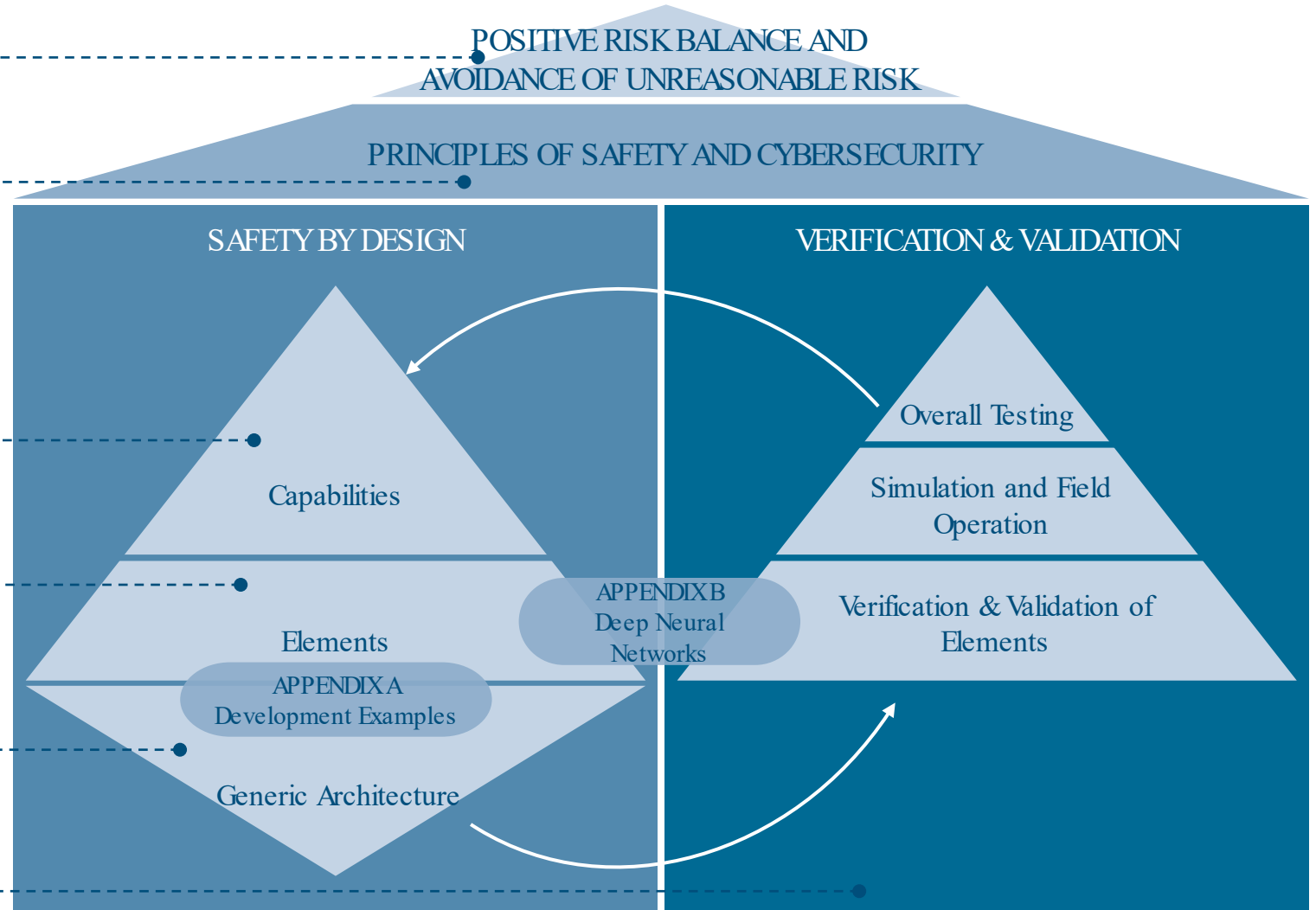


ISO TS 5083 – SAFETY FOR AUTOMATED DRIVING SYSTEMS. TIMELINE.

Release of White Paper “Safety First”	02-Jul-19	n/a	International release of White Paper as free download from all partners. Pre-work for ISO standardization
Project approval ISO TR 4804	30-Dec-19	ISO	ISO project formally approved to start.
Release of ISO TR 4804	07-Dec-20	Genève, ISO	ISO TR 4804 available at www.iso.org
Project approval ISO TS 5083	06-Dec-20	Genève, ISO	ISO project formally approved by P-members of TC22. New TC22 / SC32 / WG 13 founded to host project.
WG13 Kick-off meeting	16-Feb-21	Web meeting, ISO	Founding of intl. expert team, clarification on operational issues, collection of topics for TS 5083
WG13 plenary and sub-team meetings	2021/2022	Web meetings	Work on content of ISO TS 5083
Planned Release of ISO TS 5083	Mid 23	Genève, ISO	Expected release date of ISO TS 5083

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?



ISO TS 5083 – SAFETY FOR AUTOMATED DRIVING SYSTEMS. POSITIVE RISK BALANCE AND AVOIDANCE OF UNREASONABLE RISK.



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.

ISO TS 5083 – SAFETY FOR AUTOMATED DRIVING SYSTEMS. PRINCIPALS.

Groups of principals of safety and cybersecurity

PSC-01 Cybersecurity

PSC-02 Data Recording

PSC-03 Passive Safety

PSC-04 Safety Assessment

Automated Vehicle and
Related Aspects

PSC-05 Safe Operation

PSC-06 Safety Layer

PSC-07 Behaviour in Traffic

PSC-08 Operational Design Domain

Automated Driving System

PSC-09 Role of User

PSC-10 Driver Initiated Takeover

PSC-11 Vehicle Initiated Takeover Request

PSC-12 Interdependency between Driver and Automated Driving System

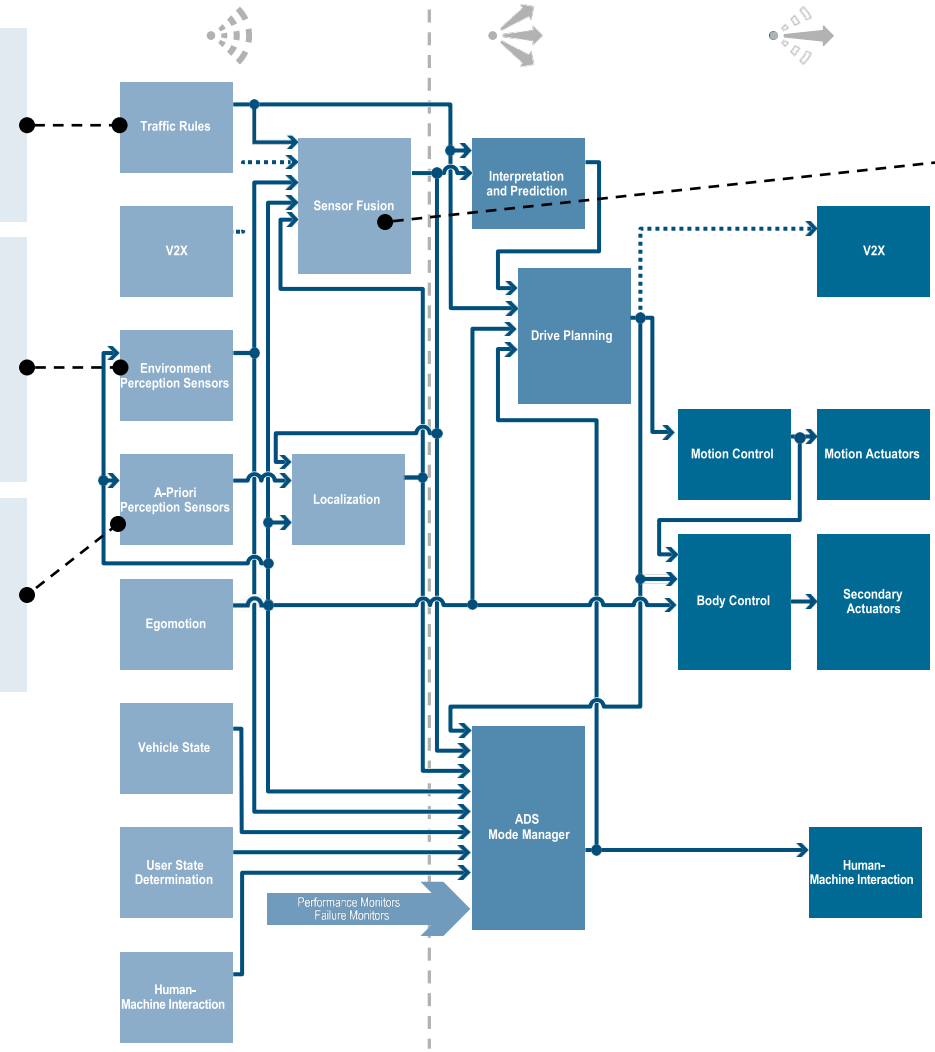
Human Factors

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).

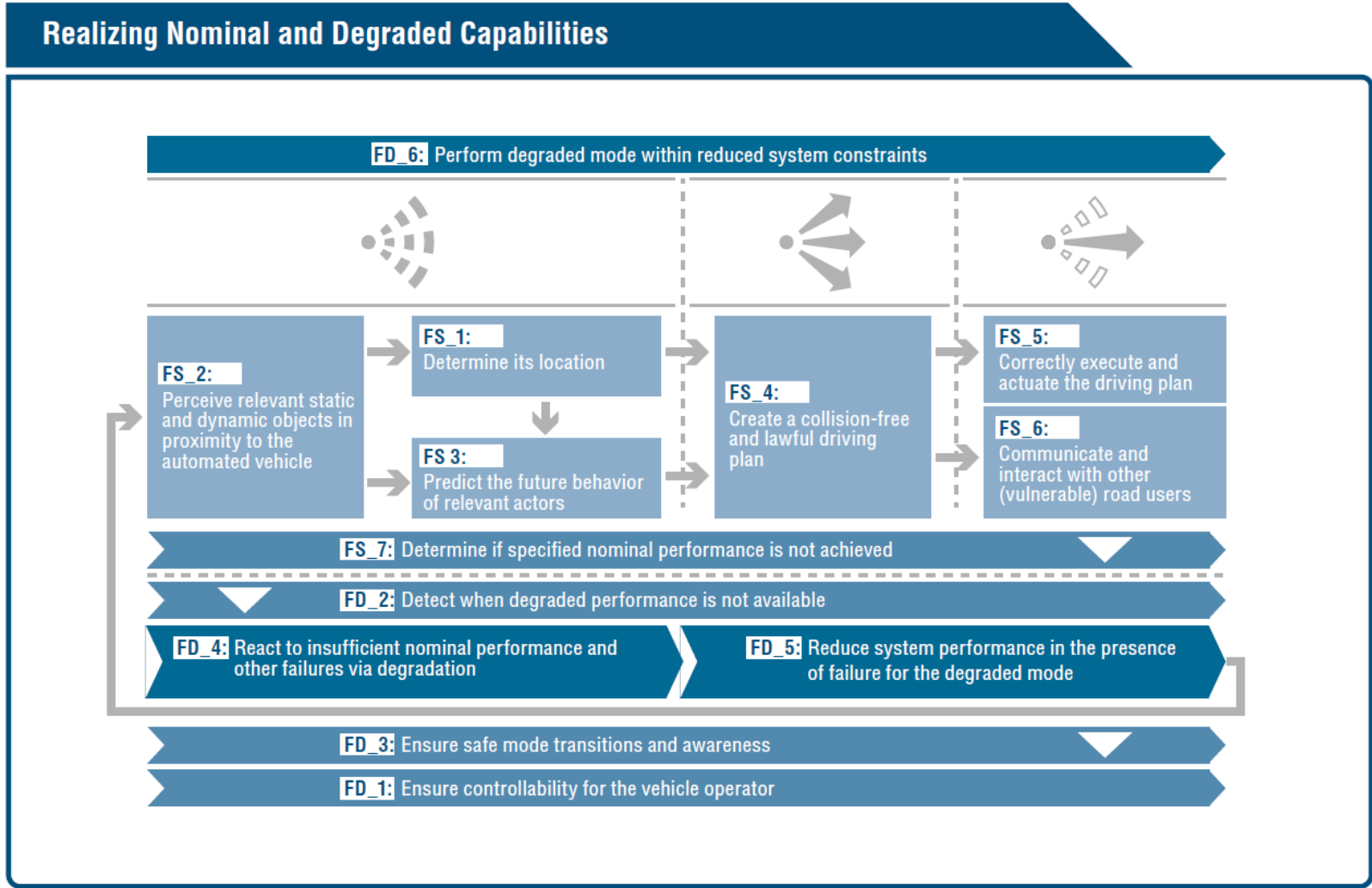
Safety measures for supervised offline trained DNNs.

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.

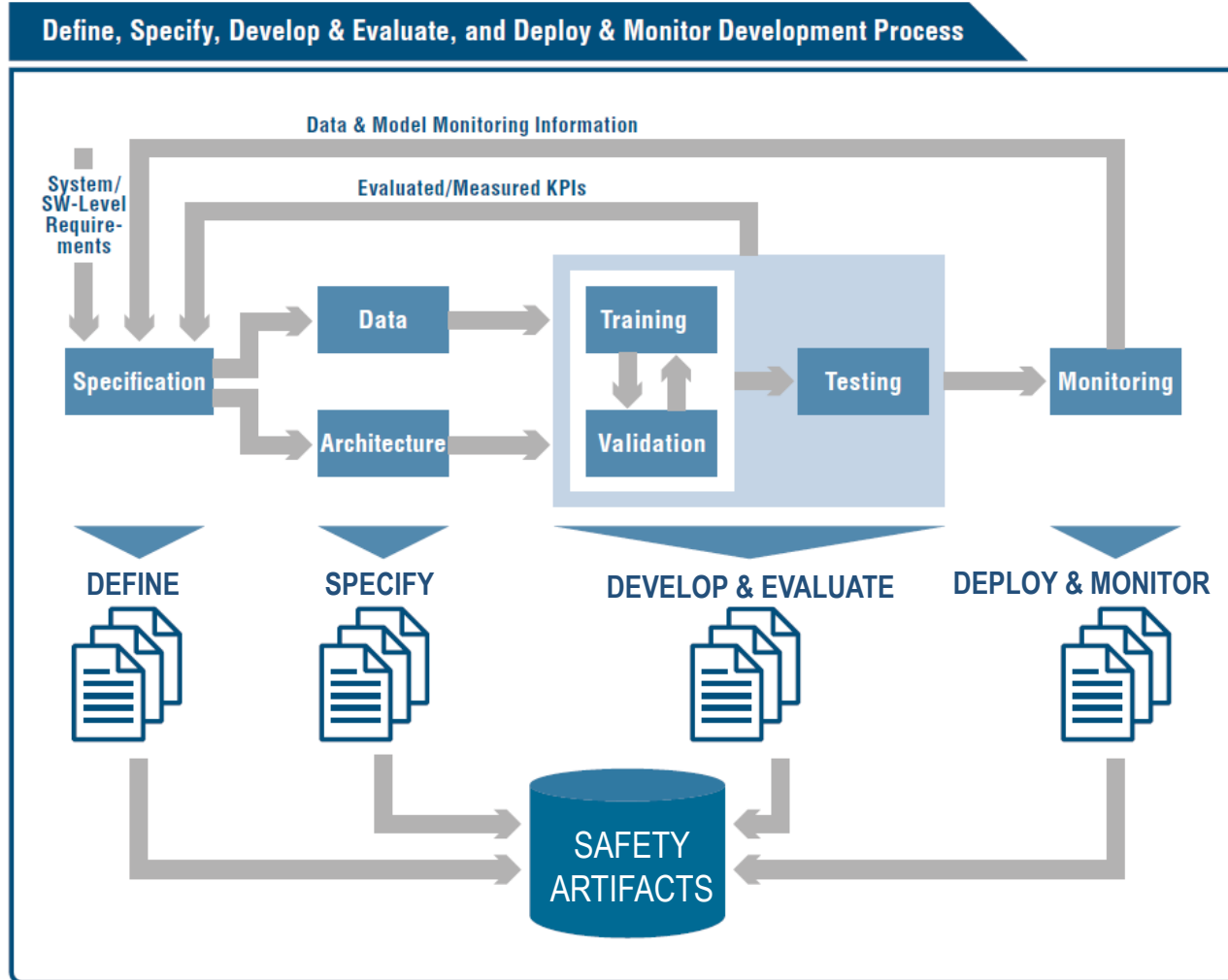


Fail Safe (FS):
After failure the risk is small or covered by *Fail Degraded*



Fail Degraded (FD):
Provide safe system for specific time until Minimal Risk Condition (MRC) is reached

ISO TS 5083 – SAFETY FOR AUTOMATED DRIVING SYSTEMS. DEEP NEURAL NETWORKS.



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

ISO TS 5083 – SAFETY FOR AUTOMATED DRIVING SYSTEMS. SUMMARY.

ISO TS 5083 can support regulations on automated driving by

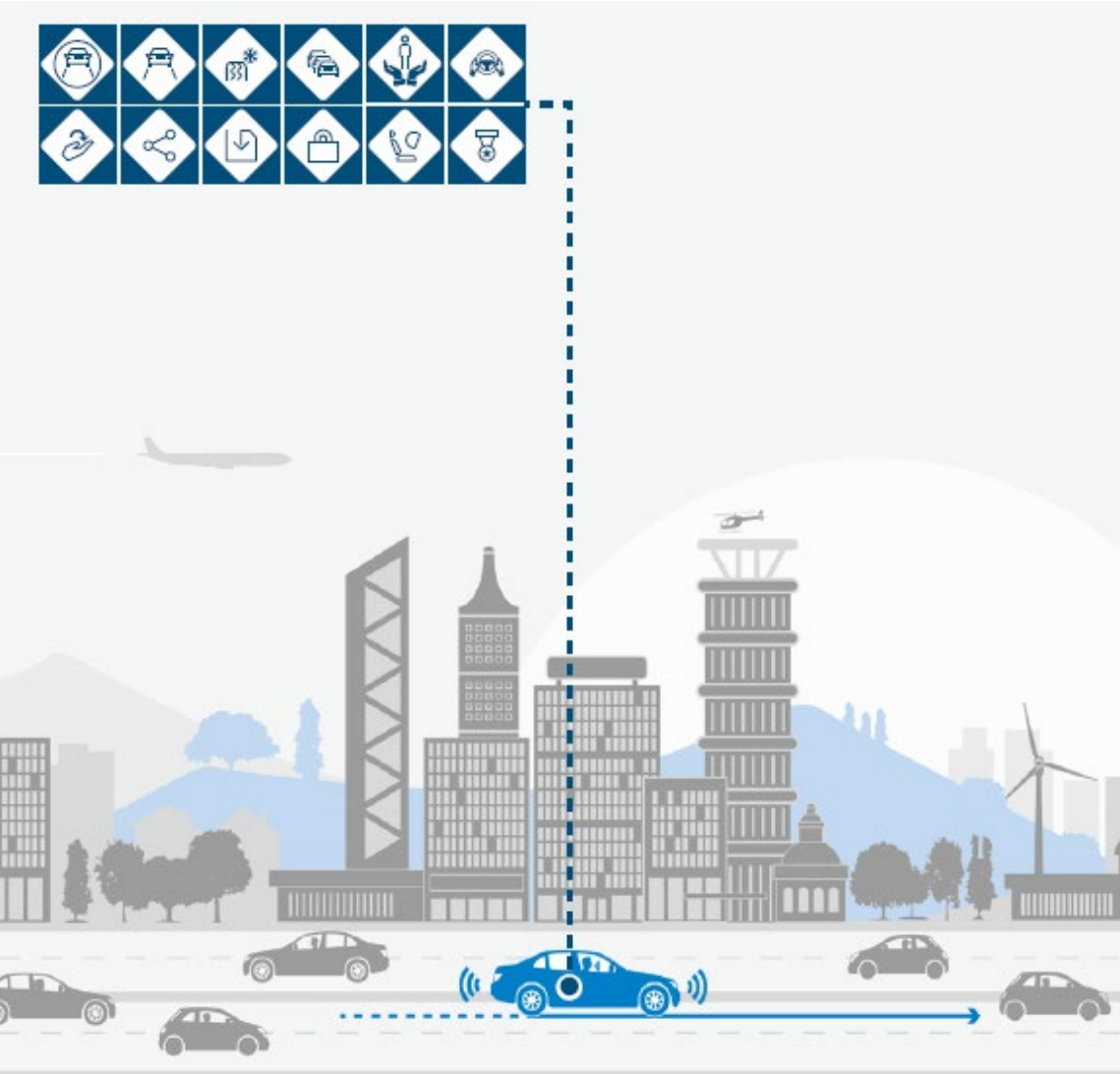
- Representing an worldwide industry consensus
- Being developed in short cycles to represent state-of-art of fast evolving field of automated vehicle
- Following an holistic safety approach for automated driving systems of SAE Level 3 and 4
- Introducing approach on safety targets
 - positive risk balance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



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Thank you for your attention!



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