Business plan for a DIN DKE SPEC project according to the PAS procedure on **"Specification of Operational Design Domain in Rail"**

Status:
For the development of DIN DKE SPEC 99004 after adoption on 21.06.2023

Requests to participate in the project and/or comments on the business plan were submitted until 19.06.2024 to syad.akkoub@din.de and ylber.azemi@vde.com[1]

Recipients of this business plan are requested to name **all patent rights** known to them to be relevant to the project and to make available all supporting documents.

Berlin, 02.07.2024 (Version 2)

1 Applications for participating in the project and comments on the business plan that are not received by the deadline do not need to be taken into consideration. Once constituted, the project workshop will decide whether or not to consider the comments received in good time.

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1. Status/version of the business plan

- **For public commenting (Version 1)**

  This business plan is intended to inform the public of a new DIN DKE SPEC project. Any interested party can take part in this project and/or comment on this business plan. Please send any requests to participate or comments by e-mail to syad.akkoub@din.de.

  Once this business plan is published, the Chairman of DIN's Executive Board decides whether or not the project is to be carried out.

  If the project is accepted, all those who have applied for participation or have commented on the business plan by the deadline will be invited to the kick-off meeting of the project consortium.

- **For developing the DIN DKE SPEC after adoption on 21.06.2024**

  Changes to the previous version 01:
  - no changes
  - Timetable might be extended until March 2025 if the safe.trAIn project gets extended too.

2. Initiator and other consortium members

- Initiator:

Person/Organization	Short description
Gereon Weiß, Fraunhofer IKS	Gereon Weiß leads the department »Automation Systems« at the Fraunhofer Institute for Cognitive Systems IKS and has been working as an expert in applied research of software-intensive systems for many years. Safe Intelligence — this forms the core brand of the Fraunhofer Institute for Cognitive Systems IKS. Connected cognitive systems drive innovation in many sectors, including mobility, healthcare, and automation in industry. Disruptive technologies such as artificial intelligence and quantum computing play a key role here. Fraunhofer IKS is conducting research to ensure that these applications are reliable and verifiably safe. We consider resilience and intelligence to be part of the same process.

- Other potential participants:

This DIN DKE SPEC will be developed in a consortium (temporary body) that is open to any interested party. The participation of other experts would be helpful and is desired. It is recommended that

– Manufacturers, system providers

– Operators

– Standardization bodies, assessors

– Technology providers

– Research and development institutions

– etc.

take part in the development of this DIN DKE SPEC.

- Organizations[2] that have registered for participation:

Person	**Organization**
Gereon Weiß	Fraunhofer IKS
Christian Breuckmann	Siemens Mobility (SMO)
Rustam Tagiew	Deutsches Zentrum für Schienenverkehrsforschung beim Eisenbahn-Bundesamt (DZSF)
Abderraouf Boussif	Université Gustave Eiffel - ESTAS
Rachel Hegemann	DB
Alex Haag	Futurail
Syad Akkoub	DIN e.V.
Deniz Serifsoy	VDE
Ylber Azemi	VDE

- Organisations that have adopted this business plan (consortium members):

Person	**Organization**
Rasmus Adler	Fraunhofer IESE
Lorea Belategi	IKERLAN
Abderraouf Boussif	Uni Eiffel
Marcel Bruckner	Siemens
Carmen Carlan	Edge Case Research

Person	Organization
Noah Carlson	Edge Case Research
Lucia Diez Robles	ITQ
Christian Drabek	Fraunhofer-Institut für Kognitive Systeme IKS
Alex Haag	Futurail
Andreas Hauschke	VDE
Rachel Hegemann	Deutsche Bahn
Michael Hennig	Siemens Mobility
Daniel Hillen	Fraunhofer IESE
Christof Hoppe	Siemens
Konstantin Kirchheim	Otto-von-Guericke-Universität Magdeburg (OVGU)
Andreas Kreutz	IKS Fraunhofer
Orhane Lahneche	Futurail
Balint Nemeth	Siemens
Youssef Radi	Siemens
Mahmud Saadawia	TÜV Rheinland
Insaf Sassi	Railenium
Rustam Tagiew	DZSF
Dario Walter	Deutsche Bahn
Thomas Waschulzik	Siemens Mobility
Gereon Weiß	Fraunhofer IKS
Ylber Azemi	DKE/VDE
Deniz Serifsoy	DKE/VDE
Syad Akkoub	DIN e.V.
Markus Letz	DIN e.V.

3. Objectives of the project

3.1. General

The concept of an Operational Design Domain (ODD) allows the explicit definition of operating conditions under which a system is intended to operate. By this, the ODD can be used as a central element in the development and operation of highly automated systems which often integrate artificial intelligence (AI) in the form of machine learning (ML) components. For example, it can be used to derive system assumptions and requirements, as input for further analyses or assessments, like safety and security, to derive relevant test scenarios, or to support coverage argumentation of ML training and testing data. For autonomous driving, there have been several activities in the automotive sector over the years on how to define an ODD, e.g., with BSI PAS

1880:2020, ISO 34503:2023, or ASAM OpenODD. Although higher levels of automation systems are increasingly planned to be used in railway systems, e.g., up to driverless trains, the definition of an ODD represents new territory for the rail sector. In order to make higher levels of automation become a reality, to enable ML deployment and to achieve a common understanding of the environmental impact and operating conditions, the specification of an ODD for rail is essential.

3.2. Planned scope

This document defines a taxonomy for the Operational Design Domain (ODD) for fully automated rail vehicles (automated driving systems in rail), which is also based on the description of other domains (e.g. automotive). This SPEC shows the extent to which common concepts or parts of the taxonomy description can be modularized or made reusable. It covers important operating conditions for railway-specific AI applications such as "Automated Train Operation", e.g. environmental or track conditions. This SPEC creates the basis for describing operating conditions (ODD) of AI-based railroad applications such as automated driving systems in a standardized and sufficient manner. However, this document does not provide specific information on concrete ODD descriptions for individual routes and the assessment of such an ODD system. This document does not specify requirements for an ODD necessary for safety functions and health protection, such as for the detection of persons in a hazardous area. This also applies to so-called assistance systems. This SPEC is not intended to be used for general automated systems. This document is intended for "users", "manufacturers", "operators", "testers" and "developers" in the described field.

3.3. Related activities

The subject of the planned DIN DKE SPEC is not at present the subject of a standard. However, there are committees, standards and/or other technical rules that deal with related subjects and thus need to be taken into account - and involved or incorporated, where necessary - in this project:

- BSI PAS 1883:2020 – Operational Design Domain taxonomy for an automated driving system (ADS) Specification
- ISO 34501:2022, Road Vehicles — Test scenarios for automated driving systems — Vocabulary
- ISO 34503:2023, Road Vehicles — Test scenarios for automated driving systems — Specification for operational design domain (Rustam)
- ISO 21448:2022, Road vehicles — Safety of the intended functionality
- ANSI/UL 4600 UL 4600: Standard for Safety for the Evaluation of Autonomous Products
- UNECE, 2022, Framework Document for Automated/Autonomous Vehicles
- ASAM OpenODD: Concept Paper, Version 1.0, 01.10.2021

- ISO IEC 22989:2022, Information technology — Artificial intelligence — Artificial intelligence concepts and terminology
- ISO/CD PAS 8800: Road Vehicles - Safety and artificial intelligence
- Draft DIN DKE SPEC 99002: Terminology – AI in railway applications
- NA 043-01-42 GA DIN/DKE Gemeinschaftsarbeitsausschuss Künstliche Intelligenz
- NA 087 DIN Normenausschuss Fahrweg und Schienenfahrzeuge (FSF)
- DKE/K 351 Elektrische Ausrüstungen für Bahnen
- DKE/K 351.1 Fahrzeuge
- DKE/K 351.3 Bahn-Signalanlagen
- DKE/K 801 System Komitee AAL
- DKE/AK 914.0.11 Funktionale Sicherheit und künstliche Intelligenz
- German Standardisation Roadmap Artificial Intelligence, 2nd Edition
- SAE AIR6988: Artificial Intelligence in Aeronautical Systems: Statement of Concerns

4. Work programme

The aim of the project is to develop a DIN DKE SPEC according to the PAS procedure (see www.din.de/go/din-spec-en). The DIN DKE SPEC shall be consistent with the body of German standards and shall not be in conflict with any DIN Standard.

The kick-off meeting took place on 21.06.2024 via virtual meeting (WebEx). The project duration will be about 6 months.

At this kick-off meeting, the consortium for developing the DIN DKE SPEC will be constituted, further organizational issues will be decided on and clarified, and, where possible, work on the subject matter will be begun.

A draft for public commenting will not be published.

A total of 1 project meetings (kick-off meeting and work meetings) and 9 web conferences will be held, during which the content of the DIN DKE SPEC will be presented, discussed and approved. The content of the DIN DKE SPEC can be drawn up by individual consortium members or in working groups.

Dates of further meetings and/or web conferences are to be agreed on within the consortium in consultation with DIN.

The DIN DKE SPEC will be drawn up in English (language of meetings, minutes, etc.). The DIN DKE SPEC will be written in English.

NOTE The calculation covers only one language version. Please keep in mind the fact that other language versions involve additional expenses; for this reason, they shall be agreed on separately. If another language version is desired, Beuth/DIN can provide a translation. Requests for translations are to be submitted after the DIN DKE SPEC manuscript has been approved for publication.

5. Resource planning

Each consortium member shall bear the expenses he/she incurs as a result of participation in the project.

If the DIN Executive Board approves the project, the initiator of the project will then conclude a contract with DIN.

Consortium membership and participation in the project meetings is free of charge, as the costs incurred by DIN throughout the performance of this project will be financed by funding from the research project "safe.trAIn – Safe AI using the example of driverless regional trains" funded by the European Union and the Bundesministerium für Wirtschaft und Klimaschutz (BMWK) as per the funding announcement Neue Fahrzeug- und Systemtechnologien (funding reference no.: 19I21039O).

6. Rules of cooperation in the DIN DKE SPEC consortium

This project is governed by the PAS procedural rules. All interested parties and consortium members are to inform themselves of these procedures by going to www.din.de/go/din-spec-en.

The consortium will be constituted during the course of the kick-off meeting. The kick-off meeting will not take place until the business plan has been published and approved by DIN's Management Board. The consortium shall comprise at least three members from different organizations[2]. It is not necessary that these members come from different areas and represent different stakeholders. By approving this business plan, the interested parties declare their willingness to participate in the consortium and will be formally named as consortium members, with the associated rights and duties. Participants at the kick-off meeting who do not approve the business plan are not given the status of a consortium member and are thus excluded from further decisions made during the kick-off meeting and from any other decisions regarding the project.

If an organization (e.g. an association) sends someone who is not an employee to the consortium, this person shall be authorized by the organization, who shall provide proof of this to DIN.

Each consortium member is entitled to vote and has one vote. If an organization sends several experts to the consortium, that organization has only one vote, regardless of how many consortium participants it sends. Transferring voting

[2] Organizations are legal entities and natural persons, insofar as they participate in business transactions on a commercial or freelance basis. If several legal entities are part of a group or a corporate structure within the meaning of Section 15 of the German Stock Corporation Act (§ 15 Aktiengesetz) or Section 271 (2) of the German Commercial Code (§ 271 Absatz 2 Handelsgesetzbuch), they are deemed to be one organization.

rights to other consortium members is not permitted. During voting procedures, decisions are passed by simple majority; abstentions never count.

As a rule, the consortium is closed once it is constituted. The current consortium members shall decide whether any additional members will be accepted or not.

During the kick-off meeting, the consortium members shall elect a consortium leader, who is responsible for content management and any decision-making and voting procedures. The leader is supported by the responsible DIN Project Manager, whereby DIN will always remain neutral regarding the content of the DIN DKE SPEC. Furthermore, the DIN Project Manager shall ensure that DIN's rules of procedure, rules of presentation, and the principles governing the publication of DIN DKE SPEC have been observed. Should a consortium leader no longer be able to carry out his/her duties, the DIN Project Manager shall initiate the election of a new leader.

The DIN Project Manager is responsible for organizing and leading the kick-off meeting, in consultation with the initiator. Further project meetings and/or web conferences shall be organized by the DIN Project Manager in consultation with the consortium leader.

If consortium members cannot be present when the DIN DKE SPEC or its draft is approved, an alternative means of including them in the voting procedure shall be used (e.g. in writing, electronically).

All consortium members who voted for the publication of the DIN DKE SPEC or its draft will be named as authors in the Foreword, including the organizations which they represent. All consortium members who voted against the publication of the DIN DKE SPEC or its draft, or who have abstained, will not be named in the Foreword.

Any expansion of the consortium at a later date is decided on by the members making up the consortium at that time. It is particularly important to consider these aspects:

a) expansion would be conducive to shortening the duration of the project or to avoiding or averting an impending delay in the planned duration of the project;
b) the expansion would not result in the project taking longer to complete;
c) the new consortium member would not address any new or complementary issues beyond the scope defined and approved in the business plan;
d) the new consortium member would bring complementary expertise into the consortium in order to incorporate the latest scientific findings and state-of-the-art knowledge;
e) the new consortium member would actively participate in the drafting of the manuscript by submitting concrete, not abstract, proposals and contributions;
f) the new consortium member would ensure wider application of the DIN DKE SPEC.

To allow the legal reproduction and distribution of results for the purposes of project work, the consortium members grant DIN rights of use on the basis of the copyright that will accrue to them for the results of their work on the DIN DKE SPEC. The transfer of these utilization rights does not prevent the consortium members from using and further developing the knowledge, experience and findings they bring to the project.

Consortium members are requested to inform DIN of all patent rights known to them to be relevant to this DIN DKE SPEC project.

Subsequent changes to the scope (Section 3.2) or to the resource planning (Section 5) require, in addition to a two-thirds majority of all votes cast, the approval of DIN.

7. Contacts

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Annex: Project schedule (preliminary)

DIN DKE SPEC project	2024																					
	Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec			
Initiation																						
1. Request and review																						
2. Business plan drawn up																						
3. Publication of business plan																						
Development phase																						
4. Kick-off meeting/consortium constituted																						
5. DIN DKE SPEC drawn up																						
6. DIN DKE SPEC approved by consortium																						
Publication																						
7. Review and release by DIN																						
8. Publication of DIN DKE SPEC																						
Milestones								**K**	**W**	**W**		**W**		**W**			**M/A**					

K Kick-off
M Project meeting
W Web conference
A Adoption of DIN SPEC