Business plan for a DIN SAE SPEC project according to the PAS procedure on **“Assessment methodology for automotive LiDAR sensors”**

Status:
For developing DIN SAE SPEC, adoption 05.05.2022

Requests to participate in the project and/or comments on the business plan are to be **submitted by 2022-04-25** to **jessica.frost@din.de**[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, 2022-05-30 (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 SAE 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 jessica.frost@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 DIN SAE SPEC after adoption on 05.05.2022**

  Changes to the previous version 01:

  - Title page, clause 1: Status changed to “For developing DIN SAE SPEC after adoption on 05.05.2022”, as well as an update of the consecutive revision number (version 01 → version 02)
  - Clause 2: Table of participating organizations added
  - Clause 4: Kick-off meeting statements adjusted → e.g. “The kick-off took place (…)”
  - Clause 7: Information on consortium leader added
  - Project schedule (preliminary): adjusted

2. Initiator and other consortium members

- Initiator:

Person/Organization	Short description
Dr.-Ing. Adrian Zlocki, fka GmbH Aachen	As a partner in the automotive industry, fka GmbH Aachen offers innovative solutions and engineering services. Understanding the vehicle as a complete physical, energetical and informational system, fka develops solutions relating to the key themes of energy efficiency, safety and driving pleasure - driving innovations. Corresponding to its main areas of work, fka comprises ten departments: body, vehicle concepts, chassis, drivetrain, acoustics, electric/electronics, driver assistance systems, thermal management, driver experience as well as strategy & consulting. This wide

Person/Organization	Short description
	range of competencies enables analysing and optimising the vehicle as a whole paying attention to the complex interactions between its individual subsystems. Powerful computer resources, latest commercial simulation software, various workshops and numerous testing facilities support fka's activities. fka carries out specialised and interdisciplinary development tasks, supplemented by technical and strategic consulting.

- Other potential participants:

This DIN SAE 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 of automated vehicles and ADAS/AD functions
– Manufacturers of LiDAR sensors
– R&D personnel
– Hardware and software sensor developers
– Test track operators
– Testing organizations
– etc.

take part in the development of this DIN SAE SPEC.

- Organizations[2] that have registered for participation:

Person	Organization
Adrian Zlocki	fka GmbH
Christoph Klas	fka GmbH
John Tintinalli	SAE International
Eugene Belkin	Innoviz Technologies Ltd
Richmond Hicks	Luminar Technologies Inc.
Peter Zegelaar	Ford-Werke GmbH
Thomas Luce	MicroVision Inc.
Corinna Scheu	DIN Deutsches Institut für Normung e. V.
Jessica Frost	DIN Deutsches Institut für Normung e. V.

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

Person	Organization
Adrian Zlocki	fka GmbH
Christoph Klas	fka GmbH
Ulrich Kradepohl	fka GmbH
Amogh Sakpal	fka GmbH
Kevin Schulte	fka GmbH
Michael Schmalz	ZF Friedrichshafen AG
Walter Hagleitner	ADAS MC
Heiko Leppin	ADC Automotive Distance Control Systems GmbH
Sebastian Renken	Daimler Truck AG
Patrick Piastowski	Ford-Werke GmbH
Peter Zegelaar	Ford-Werke GmbH
Eugene Belkin	Innoviz Technologies Ltd
Christian Bornhoeft	Innoviz Technologies Ltd
Benny Prujan	Innoviz Technologies Ltd
Richmond Hicks	Luminar Technologies Inc.
Thomas Luce	MicroVision Inc.
Sascha Meyne	Physikalisch-Technische Bundesanstalt (PTB)
Rafael Eisener	Valeo Schalter und Sensoren GmbH
Ovidiu Luca-Savin	Valeo Schalter und Sensoren GmbH
David Herrmann	Valeo Schalter und Sensoren GmbH
Clement Nouvel	Valeo Schalter und Sensoren GmbH
John Tintinalli	SAE International
Corinna Scheu	DIN Deutsches Institut für Normung e. V.
Jessica Frost	DIN Deutsches Institut für Normung e. V.

3. Objectives of the project

3.1. General

LiDAR sensors are currently being deployed by many different companies. LiDAR is regarded as a key technology to improve the performance of advanced driver assistance systems and automated driving functions in road vehicles. A variety of technological principles and design parameters can be employed to implement automotive LiDAR sensors. Today no common test methodology is available to analyse and evaluate the performance of those sensors.

The first aim of this document is to present a common, defined specification sheet for the characterization of sensors. The second aim is to specify an according assessment methodology to verify the relevant sensor characteristics.

3.2. Planned scope

This document establishes an assessment methodology for LiDAR sensors independent of the design of the sensor, the specification and the technological approach. This document is applicable to car manufacturers and sensor suppliers to allow a defined assessment of the sensor performance on point cloud level, e.g. the range, accuracy, precision and robustness of the measurements. This document helps unify specification and testing. This document does not seek to establish functional safety requirements. This document is intended for R&D personnel, hardware and software sensor developers, test track operators, testing organizations and manufacturers of automated vehicles and ADAS/AD functions.

3.3. Related activities

The subject of the planned DIN SAE 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:

- DIN-Normenausschuss Automobiltechnik (NAAutomobil)
- DIN-Normenausschuss Lichttechnik (FNL)
- DIN-Normenausschuss Luft- und Raumfahrt (NL)
- DIN 5032 series of standards
- DIN 5032-9:2015-01, Lichtmessung – Teil 9:Messung der lichttechnischen Größen von inkohärent strahlenden Halbleiterlichtquellen
- ISO PWI 13228 “Road vehicles — Test method for automotive LiDAR”
- ISO 23150:2021 Road vehicles — Data communication between sensors and data fusion unit for automated driving functions — Logical interface
- ISO 26262:2018 Road Vehicles – Functional safety
- ISO/SAE 21434:2021 Road vehicles — Cybersecurity engineering
- Ggf. DIN ISO 28902-Reihe (bspw. DIN ISO 28902-1, Luftqualität - Umweltmeteorologie - Teil 1: Bodengebundene Fernmessung der Sichtweite mit Lidar (ISO 28902-1:2012); Teil 2: 2018, Teil 3: 2019)
- DIN VDE 0837, Sicherheit von Lasereinrichtungen
- LiDAR and LiDAR Systems – SAE Proposed UL 4700

4. Work programme

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

The kick-off took place on 05.05.2022 via web conference (WebEx). The project duration will be about six months.

At this kick-off meeting, the consortium for developing the DIN SAE SPEC was constituted, further organizational issues have been decided on and clarified, and, where possible, work on the subject matter has begun.

A draft for public commenting will not be published.

A total of three project meetings (kick-off meeting and work meetings) and two web conferences will be held, during which the content of the DIN SAE SPEC will be presented, discussed and approved. The content of the DIN SAE 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 SAE SPEC will be drawn up in English (language of meetings, minutes, etc.). The DIN SAE 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 SAE 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 borne by the initiator.

6. Rules of cooperation in the DIN SAE 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 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 SAE 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 SAE 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.

[2] Organizations are participating legal entities that send the experts to the DIN SAE SPEC consortium and are assigned to a corporate structure as defined by § 15 of the German Stock Corporation Act or § 271 paragraph 2 of the German Commercial Code.

If consortium members cannot be present when the DIN SAE 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 SAE 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 SAE 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 SAE 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 SAE 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 SAE 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

- Consortium leader:
  see initiator (Dr.-Ing. Adrian Zlocki, fka GmbH)

- Project manager:
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- Initiator:
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Annex: Project schedule (preliminary)

DIN SAE SPEC project	2022																							
	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Jan	
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 SAE SPEC drawn up																								
6. DIN SAE SPEC approved by consortium																								
Publication																								
7. Review and release by DIN																								
8. Publication of DIN SAE SPEC																								
Milestones									**K**				**W**		**M**		**W**			**M / A**				

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