Business plan for a DIN SPEC project according to the PAS procedure on

“Battery swapping systems for electric heavy duty vehicles for range extension”

Status:

For developing the DIN SPEC after adoption on 03.06.2025

Requests to participate in the project and/or comments on the business plan are to be **submitted by** 2025-05-27 to maria.mensch@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, 10.06.2025 (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 1.1)**

  This business plan is intended to inform the public of a new DIN 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 max.mustermann@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.

  Changes to the previous Version 1.0:

  − The deadline for remarks to the business plan has been adapted (new date 27.05.2025).

  − The date of the Kick Off Meeting has been changed to 03.06.2025.

- **For developing the DIN SPEC after adoption on <date of kick off> (Version 2)**

  Changes to the previous version 1.1:

  – Section 2: Table of participating organizations added
  – Section 7: Information on consortium leader added

2 Initiator and other consortium members

- **Initiator:**

Person/Organization	Short description
Moneera Bobaky, Dr. Jens Jerratsch Technische Universität Berlin, Fachgebiet Fahrerverhaltensbeobachtung für energetische Optimierung und Unfallvermeidung	The department investigates innovative solutions for increasing efficiency in the transport sector. As part of our research, we deal with the implementation and standardization of battery swapping systems for heavy electric commercial vehicles. Our aim is to optimize efficiency in the use of electric commercial vehicles through technological innovations and behaviour-based analyses

- **Other potential participants:**

  This DIN 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

  – Manufacturer of heavy duty vehicles
  – Users / logistics companies
  – Manufacturer/ operator of swapping infrastructure

  take part in the development of this DIN SPEC.

- **Organizations**[Fehler! Textmarke nicht definiert.] **that have registered for participation**

Person	Organization
Moneera Bobaky, Dr. Jens Jerratsch	TU Berlin
Michael Blohm, Birgit Hofmann	BMWK
Dr. Maria Mensch	DIN e.V.

- **Organizations**[Fehler! Textmarke nicht definiert.]**, that have adopted this business plan (consortium members):**

Person	Organization
Herr Dr. Jens Jerratsch	TU Berlin
Herr Jonathan Wieczorek	TU Berlin
Herr Martin Gobernatz	TU Berlin
Herr Michael Blohm	BMWE
Herr Peter Kramer	DAF Trucks N.V.
Herr Björn-Hendrik Datz	Daimler Truck AG
Herr Max Gräbner	Daimler Truck AG
Frau Juliane Mender	eHaul GmbH
Herr David Scheffel	eHaul GmbH
Herr Lukas Schröder	Iveco GmbH
Herr Johannes Kuestner	Iveco GmbH
Herr Abdulla Jaber	Trailer Dynamics GmbH
Frau Lorena Krjunere	Trailer Dynamics GmbH
Herr Nils Lagmöller	Trailer Dynamics GmbH
Herr Jochen Mählmann	Trailer Dynamics GmbH
Herr Michael W. Nimtsch	Trailer Dynamics GmbH
Frau Doris Jonsen	Wissenschaftliche Begleitung der Systemintegration Batterie
Frau Dr. Joana Leitao	Wissenschaftliche Begleitung der Systemintegration Batterie
Herr Lars Ostendorf	Wissenschaftliche Begleitung der Systemintegration Batterie
Herr Matthias Trunk	Wissenschaftliche Begleitung der Systemintegration Batterie
Frau Dr. Maria Mensch	DIN e.V.
Herr Dr. Christian Goroncy	DIN e.V.

3 Objectives of the project

3.1 General

1. Goal of the standard:

The planned DIN SPEC aims to establish a technical standard for traction battery swap systems for electric heavy duty vehicles. This standard is intended to ensure that both the vehicle-bound swap components and the associated infrastructure are uniformly defined and compatible with each other.

This standard is to be structured in two stages:

1) Standardization of the general framing parameters (e.g. positioning and dimensions) of battery systems in electric heavy duty vehicles as well as the interfaces between the vehicle and traction battery (e. g. suspension, contacting between battery and vehicle). This enables the integration of a battery swapping system into existing battery and vehicle architectures under standardized framing conditions. The traction battery properties can be designed by the vehicle manufacturer or existing battery systems can continue to be used. The aim is to 5 standardize the requirements so that different vehicles can use the battery swapping infrastructure.
2) Standardization of traction battery systems. In addition to the parameters mentioned in 1), further parameters are to be standardized in order to enable swapping batteries between different vehicle models and manufacturers.

Explicitly not in scope of this DIN SPEC project are definition and coordination of specific use cases or economic feasibility studies for battery swapping systems.

2. Background and motivation

The development and use of electric heavy-duty vehicles is becoming increasingly important in the automotive and logistics industries. Reliable and fast options for charging and replacing batteries are particularly important for heavy road transport in order to meet the flexibility requirements of the logistics sector. As a supplement to wired solutions, battery exchange systems can:

1) Reduce charging times to increase vehicle productivity
2) Decouple charging from compulsory driving breaks to make logistics processes more flexible
3) Efficiently utilize power grid infrastructures to serve a large number of vehicles in the near time and
4) Increase the cost-effectiveness of high-performance charging systems to make the switch to zero-emission drives attractive.

Economic goals: The use of complementary battery swapping technologies in addition to conductive systems makes it possible to reduce operating costs by enabling both vehicles and infrastructures to achieve very high utilization rates thanks to the short interaction times (swapping times). The standard should enable vehicle manufacturers to develop compatible vehicle solutions and make them usable in standardized swapping infrastructures.

Ecological goals: The standard contributes to the reduction of road emissions by making the transition to heavy-duty electric commercial vehicles attractive, especially for larger fleets, thereby reducing dependence on fossil fuels.

Technological goals: Introducing German and European standards for battery swapping systems will ultimately allow larger scaled applications. The technology will contribute to ease flexibility constraints that will arise with increased coupling of the energy and transport sectors in the course of transport electrification. European players are to be enabled to further develop and shape this core technology in a market environment and to introduce innovations.

3. Technical requirements and challenges

The central challenge is the harmonization of technical specifications for battery swapping systems in electric heavy duty vehicles.

The planned standard should:

- Define uniform dimensions for compatible traction battery systems, as well as their positioning, mounting and contacting in the vehicle.
- Allow application of battery swapping technology in current series heavy-duty electric vehicles using the currently available battery systems.
- Specify safety requirements and test methods from existing norms and standards to safeguard their use in daily operation.
- Enable efficient swapping processes in the swapping stations.

4. Supporting the industry and promoting innovation

The standard should not only promote the development of new technologies but also facilitate cooperation between different players in the industry, such as vehicle manufacturers, logistics companies, as well as potential developers and operators of battery swapping stations.

Overall, the planned standard should serve as a guideline to accelerate the introduction of heavy-duty electric vehicles to the market, extend ranges of these vehicles and ensure compatibility between different providers.

3.2 Planned scope

This DIN SPEC is intended to define general requirements for battery swapping systems in electric heavy-duty vehicles for automated battery swapping stations. The described battery swapping system can be applied to both full battery replacements and partial swaps for extending vehicle range.

The DIN SPEC will define position of and requirements for the interface between battery and vehicle. The connection of this interface will be based upon existing connectors (HV, LV, communication and cooling).

The DIN SPEC will define general framing parameter for both battery and installation space in the vehicle.

The DIN SPEC will describe the mounting and unmounting process within the vehicle, but not the process of handling the battery outside the vehicle. For security and safety related requirements the DIN SPEC will refer to existing standards and not define own or new security and safety related requirements. Furthermore, occupational health and safety related measures are not the subject of the document.

3.3 Related activities

The subject of the planned DIN 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:

Committees:

- DIN Standards Committee for Electrical Engineering (DKE): This standards committee is responsible for standardization in the field of electrical engineering, including batteries and electrical energy storage. It could play a role in defining safety and performance standards for batteries.
- ISO/TC 22/SC 37: ISO Technical Committee for Electric Vehicles. This committee deals with the international standardization of electrical vehicle components and could be an important reference for international standards.
- IEC/TC 21: A committee of the International Electrotechnical Commission (IEC) that deals with accumulators and battery systems. The work of this committee is relevant to the safety and performance requirements of batteries in electric vehicles.

Standards:

- DIN EN 50604-1:2017-02, *Secondary batteries for the propulsion of electric vehicles — Part 1: General requirements and test conditions for traction batteries*. This standard deals with the safety and performance requirements of batteries in electric vehicles.
- ISO 6469-1:2022: This standard deals with the safety of electric road vehicles and could provide important guidelines for ensuring the safety of batteries and charging infrastructure.
- IEC 62660-1: This international standard specifies the requirements and tests for lithium-ion batteries in electric vehicles and could be a valuable reference for technical specifications in the project
- DIN EN IEC 62840-1/2, *Battery swap systems for electric vehicles, Part 1 general and guidance, Part 2 safety requirements*
- IEC PAS 62840-3:2021, *Electric vehicle battery swap system — Part 3: Particular safety and interoperability requirements for battery swap systems operating with removable RESS/battery systems*

Regulations:

- EU Regulation No. 2019/631: This European regulation sets CO_2 emission standards for new vehicles and could be relevant with regard to the promotion of electromobility and its impact on environmental protection
- Electromobility Act (EmoG): In Germany, this law regulates the legal framework for the use of electric vehicles and could have an indirect impact on the project, particularly with regard to charging infrastructure
- AFIR Alternative Fuels Infrastructure Regulation (EU) 2023/1804: regulates the expansion of charging infrastructure in all EU member states.

4 Work programme

The aim of the project is to develop a DIN SPEC according to the PAS procedure (see www.din.de/go/din-spec-en). The DIN 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 03.06.2025 in Berlin. The project duration will be about 6 months.

At this kick-off meeting, the consortium for developing the DIN 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 2 project meetings (kick-off meeting and work meetings) and 6 web conferences will be held, during which the content of the DIN SPEC will be presented, discussed and approved. The content of the DIN 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 SPEC will be drawn up in Englisch (language of meetings, minutes, etc.). The DIN SPEC will be written in Englisch.

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, DIN Media can provide a translation. Requests for translations are to be submitted after the DIN 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 "UniSwapHD" funded by the Federal Ministry for Economic Affairs and Climate Action as per the funding announcement Elektromobil (funding reference no.: 01MV22023A)

6 Rules of cooperation in the DIN 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

[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.

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 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 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 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 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 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 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 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 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:**

  Dr. Jens Jerratsch

  Technische Universität Berlin,

  Fachgebiet Fahrerverhaltensbeobachtung für energetische Optimierung und Unfallvermeidung

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- **Project manager:**

  Dr. Maria Mensch

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- **Initiator:**

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Annex: Project schedule (preliminary)

DIN SPEC Project	2025																									
	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 SPEC drawn up																										
6. DIN SPEC approved by consortium																										
Publication																										
7. Review and release by DIN																										
8. Publication of DIN SPEC																										
Milestones											**K**	**W**	**W**		**W**		**W**	**W**	**W**	**M / A**						

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