IABG

2ND CIVILIAN ARMOURED VEHICLE FORUM

Conformity of Production - What makes Vehicle Zero and Why it is important

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Content

IABG – A leading European Technology Company

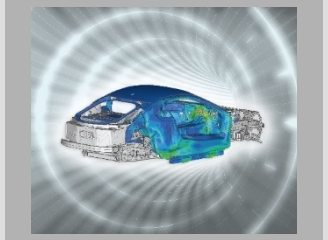
Core competence in analysis, simulation, testing, and consultancy for safety & security

- **1961** Establishment as central facility for testing & analysis
- **1993** Privatisation
- **2006** New simulation and testing centre in Ottobrunn
- **2015** New competence centre protection in Lichtenau
- **2017** New simulation centre for cyber security and new solutions based on artificial intelligence
- **2019** Commencement for Competence Centre Optics (CCO)

87,4 %
Schwarz Holding GmbH

12,6 %
IABG-Mitarbeiterbeteiligungs AG

Turnover approx. € 215 M. p.a. | approx. 1,100 employees | approx. 10 % p.a. invest for R&D, laboratories, facilities, and continuing education



Automotive

Engineering, test benches, testing & qualification of industrial products

InfoCom

Digitisation of processes and secure communication networks

Mobility, Energy & Environment

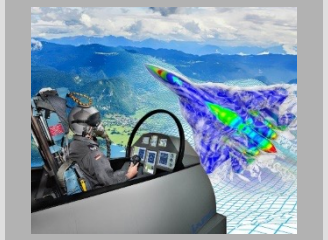
Solutions for renewable energy, power plant components, geo data, and trains & railways

Aeronautics

Testing, simulation, analysis, and engineering for the aviation industry

Space

Space test centre operation, analysis, studies, and consulting

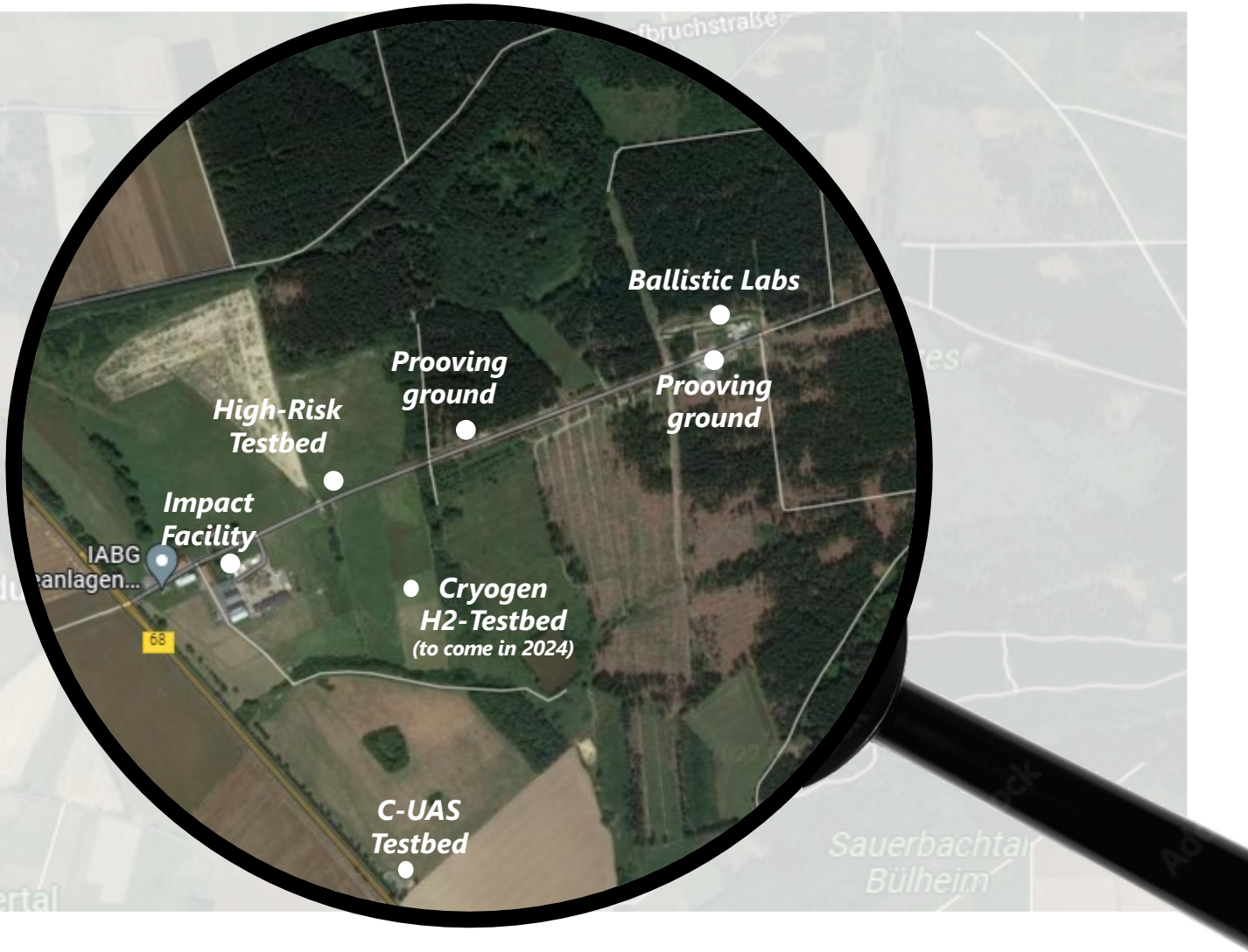


Defence & Security

Independent consultancy, testing services, and simulation for armed forces

Overview Competence Center Protection, Impact & High Risk Testing:
IABG operates a multiple purpose test site in Lichtenau, Germany

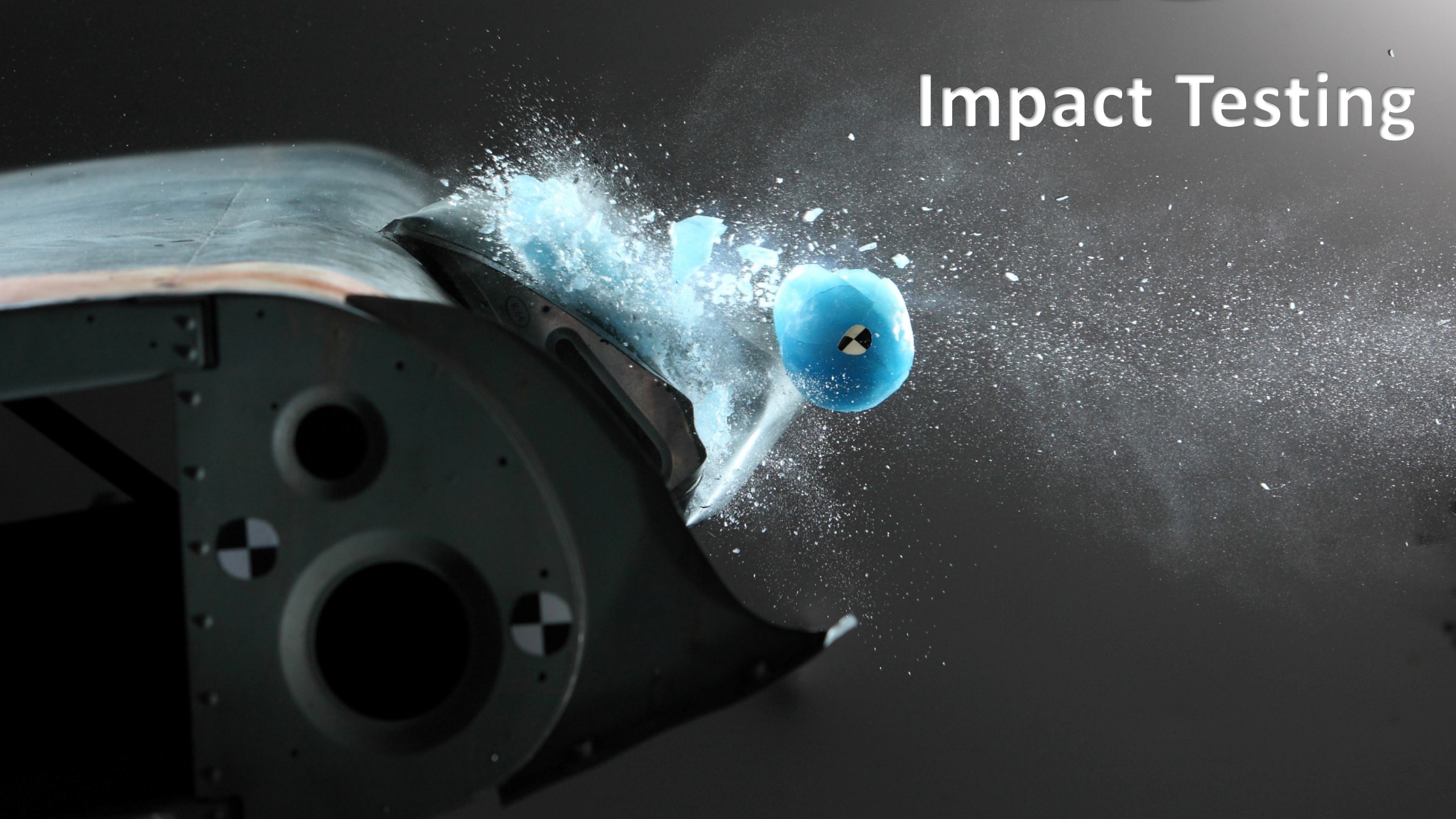
- **Site foundation in 1969**
- **Currently about 50 employees**
- **We offer our customers both:**
  Standardized and customized test services according to national and international standards in the areas of
  - **Ballistic Testing** (e.g. on materials and components, windows, facades)
  - **Blast Testing** (e.g. on armored vehicles)
  - **High Risk Testing** (e.g. fire and flammability tests)
  - **Impact Testing** (e.g. bird, gelatine, hail impact tests)
  - **Battery Testing** (e.g. crush, nail penetration, drop tests, etc.)



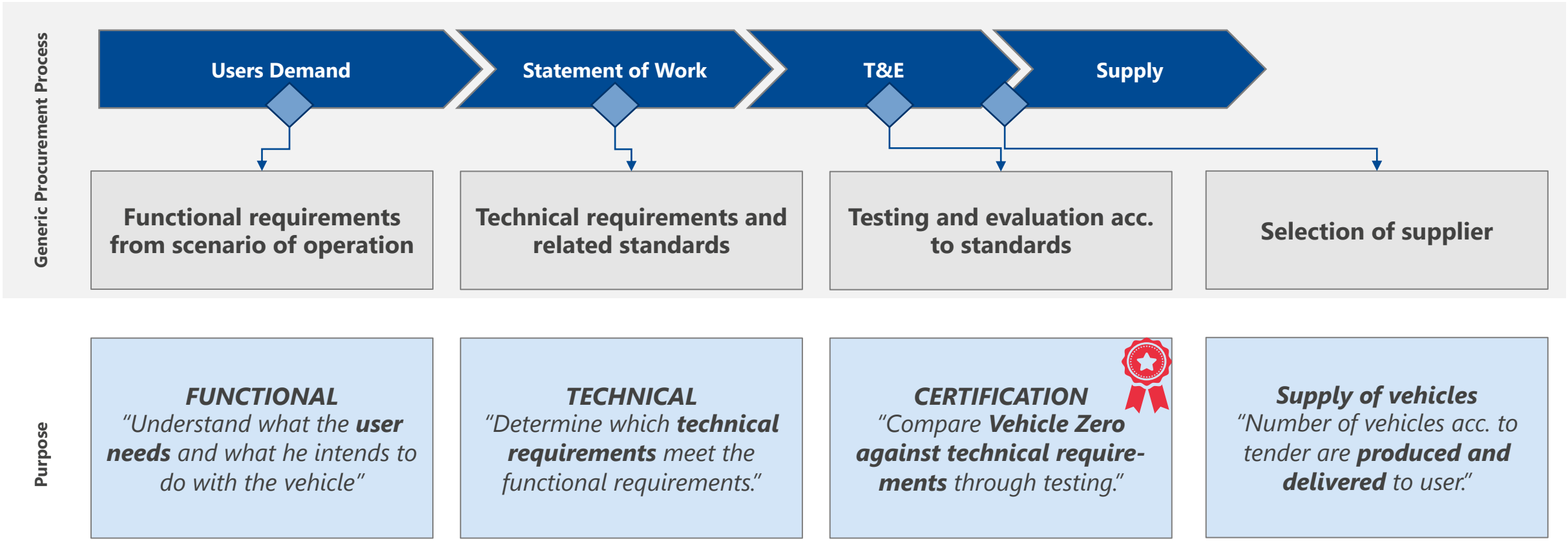
Protection Testing

Ballistic Testing

High Risk Testing


Impact Testing

Generic Procurement Process *Close cooperation between all stakeholders is recommended from the very beginning*



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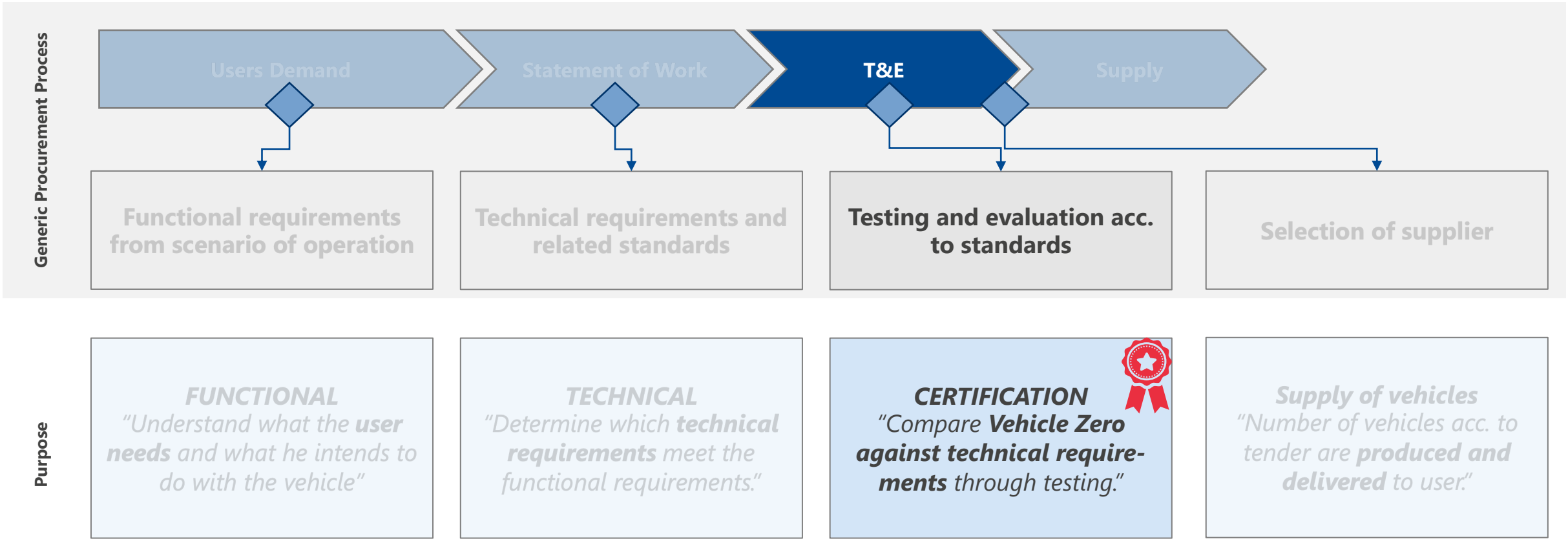
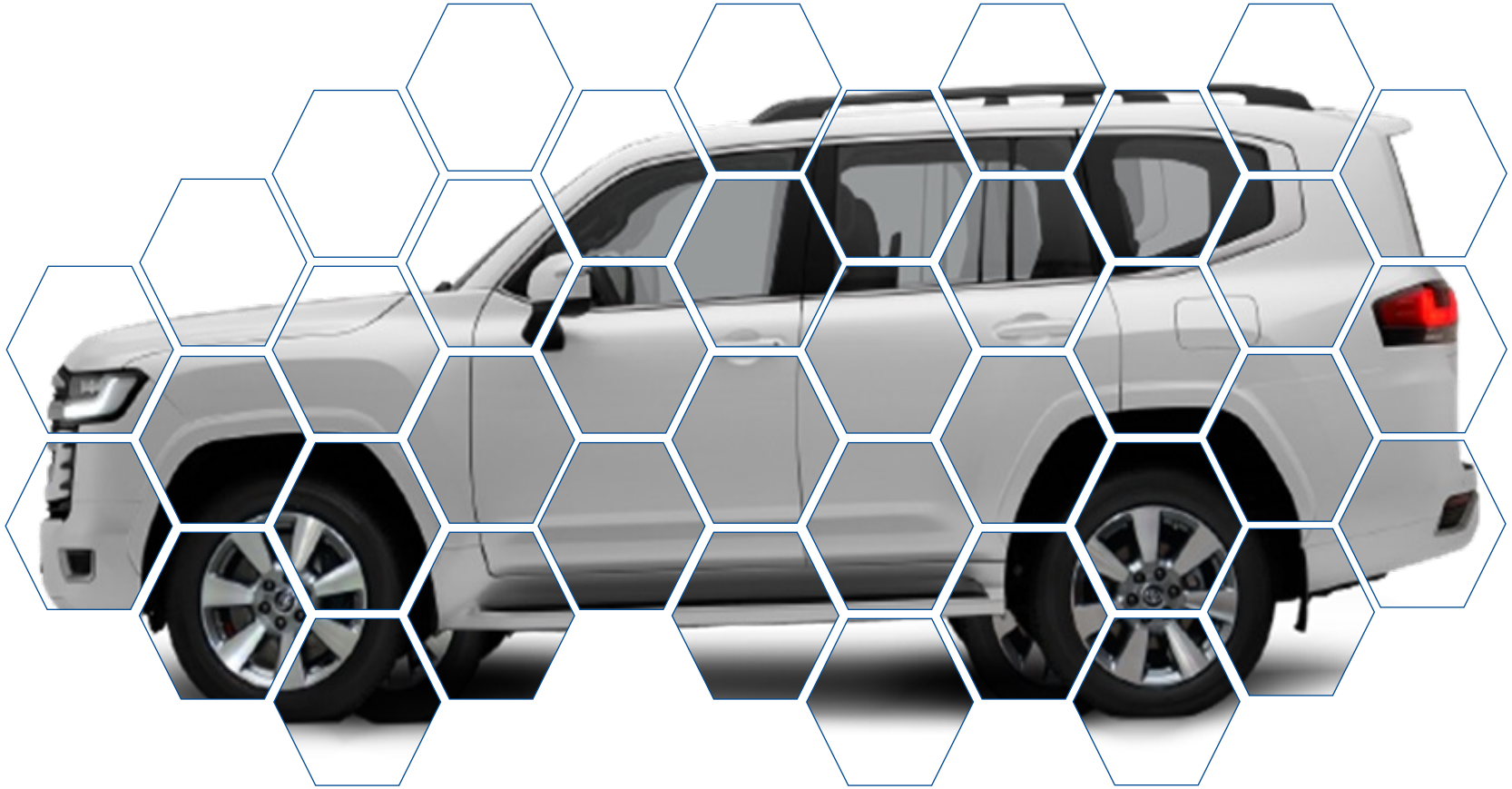
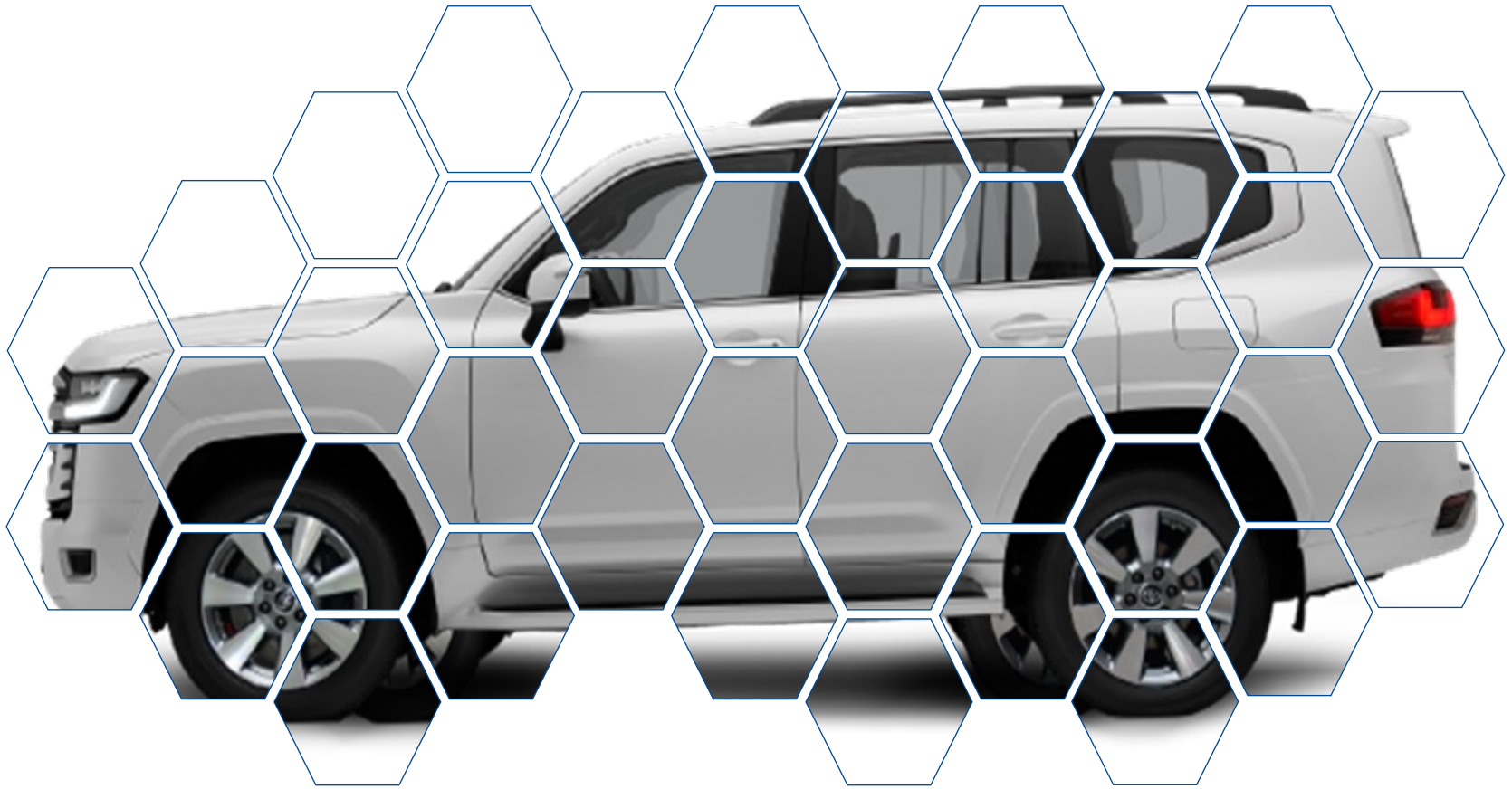


What makes “Vehicle Zero” and why it is important?
It is the basis for the certification and production



- **„Vehicle Zero“**is the **basis for the verification** of the required specifications
- **Testing & Evaluation** against the specified standards of the tender will be **carried out at “Vehicle Zero”**
- The certification is **only valid for the design status of “Vehicle Zero”**
- A **detailed inspection and documentation** of the vehicle’s essential construction features is crucial for the later traceability

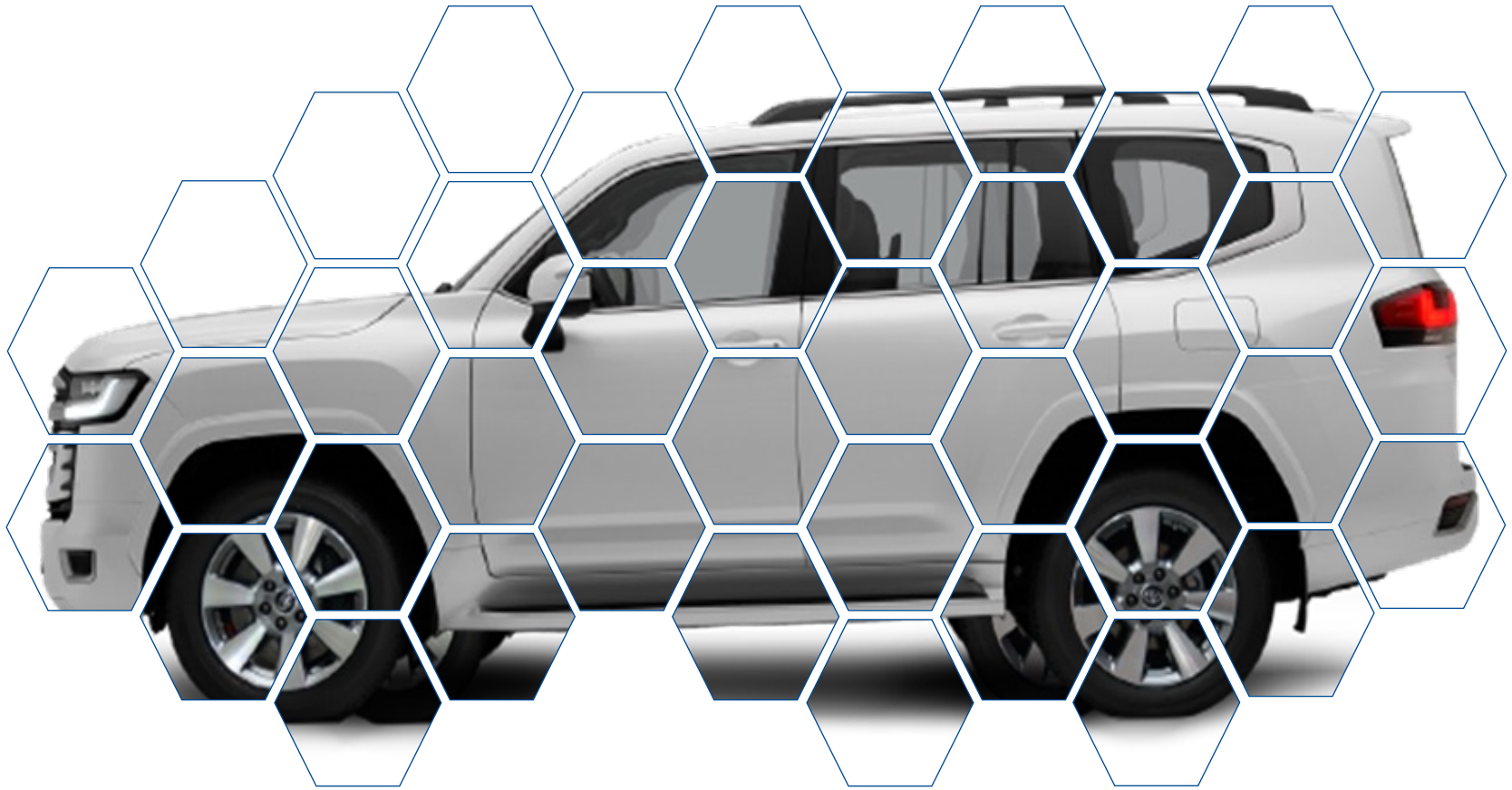
What makes “Vehicle Zero” and why it is important?
Inspection and documentation must be available



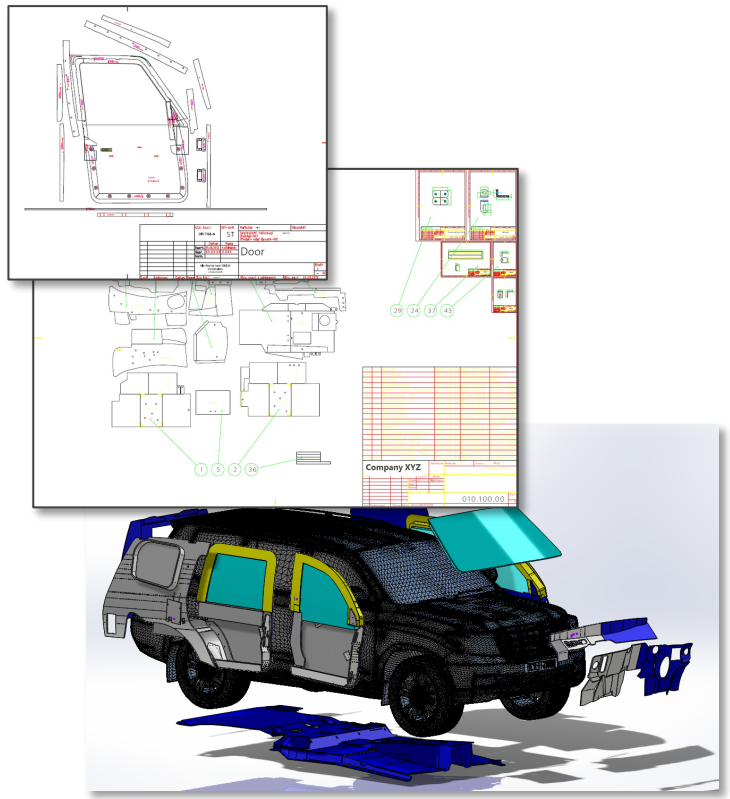
Testing Authority
Pre-Inspection of “Vehicle Zero” during construction

What makes “Vehicle Zero” and why it is important?

Inspection and documentation must be available



Testing Authority
Documentation of Vehicle Zero during testing



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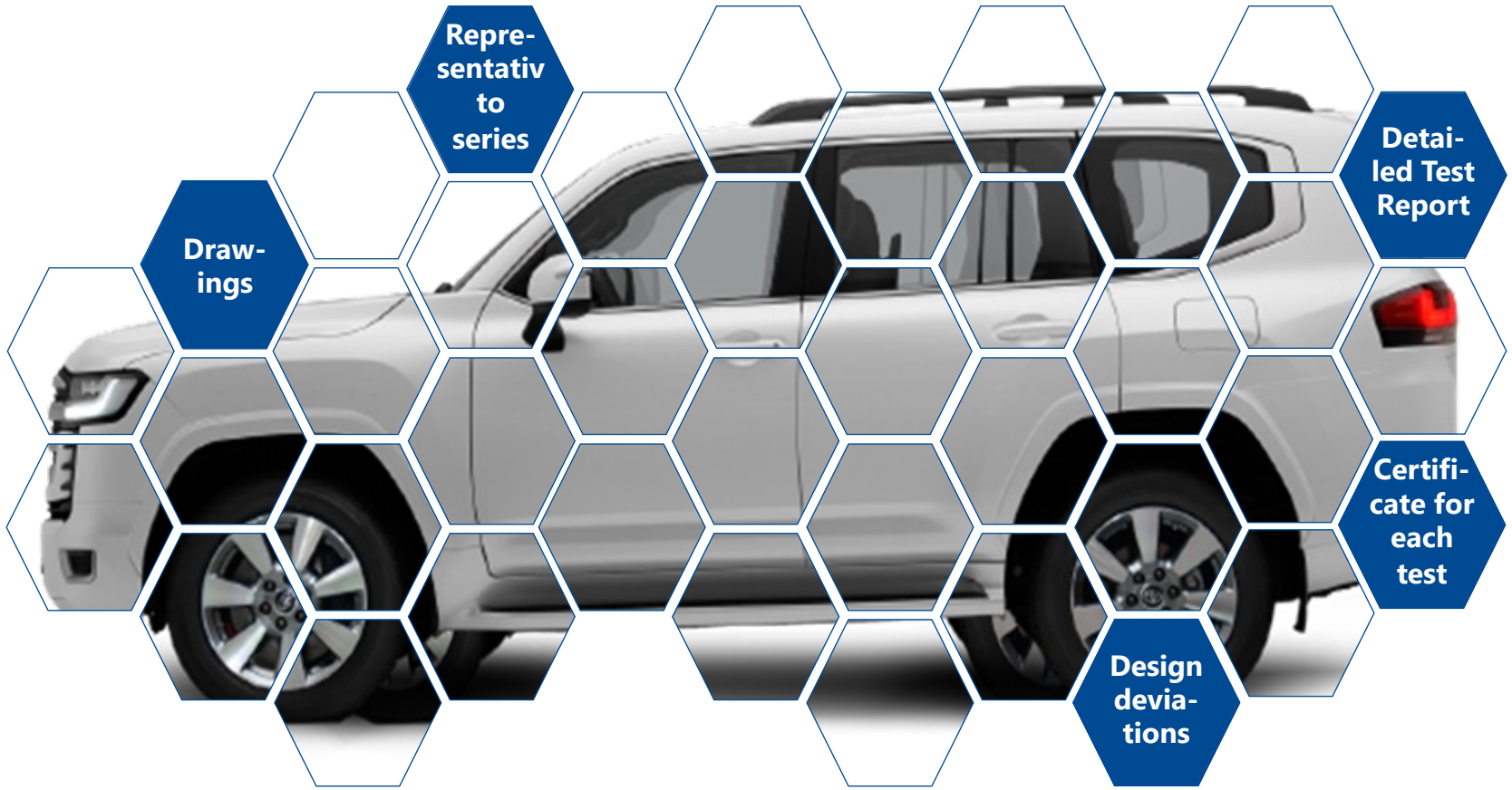
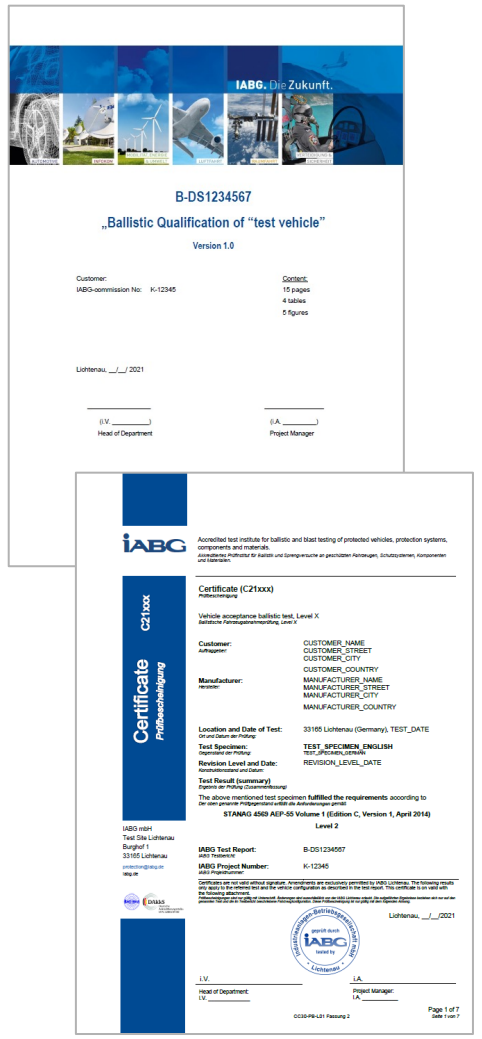




Quick Spotlight on appropriate test standards
A key for successful procurement

Ensure clarity from the start	Test standards must **be formulated in a simple and understandable way** that they can be clearly interpreted by all parties involved.
Must be fit for purpose	Standards must be **suitable for the respective vehicle type** or at least be able to be referred to as a basis.
Reproducible in application	Processes must be **clearly described** and must be allowed to be adapted if necessary.
Comparability of results	Testing according to a standard must be **reproducible, transparent, equal handling and traceable**.
Best product enabler	Standards must not limit competition but should instead **support competition and innovation**.

Different requirements for “Vehicle Zero” can be found in standards

Expertise and sufficient documentation are therefore essential

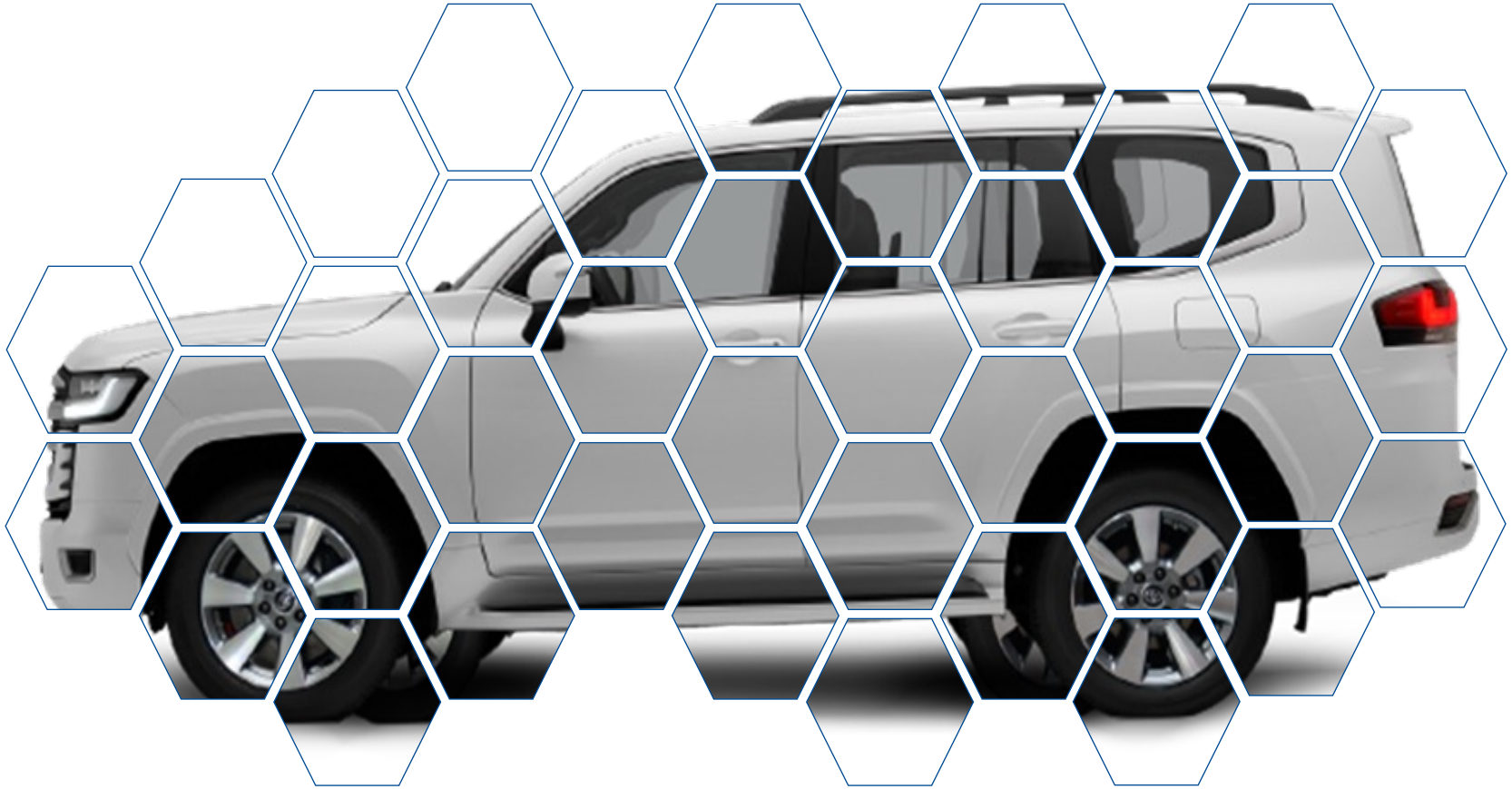
VPAM BRV	*“…Its protected area, usually the passenger compartment, must be finished. It is permissible to provide the vehicle for testing without engine, chassis and seats. These deviations must be documented in the test report.”*
VPAM ERV	*“…A vehicle with engine and chassis including tyres must be presented for the test. The area to be protected, usually the passenger compartment, must be completed and fully equipped.”*
STANAG 4569	*“…These targets constitute the actual armor systems. They may be fully functional vehicles or ballistic test target structures (vehicle minus non-armor related components such as power pack, gun system, etc.).”*
PAS 300	*“…Civilian armored vehicle with at least a fully integrated and completed armor shell, including all trim, door, seals, door latches and locks, seats, steering wheels and front dash.”*

Some Examples

"Vehicle Zero" must meet requirements in design and construction

After T&E “Vehicle Zero” was successfully certified…

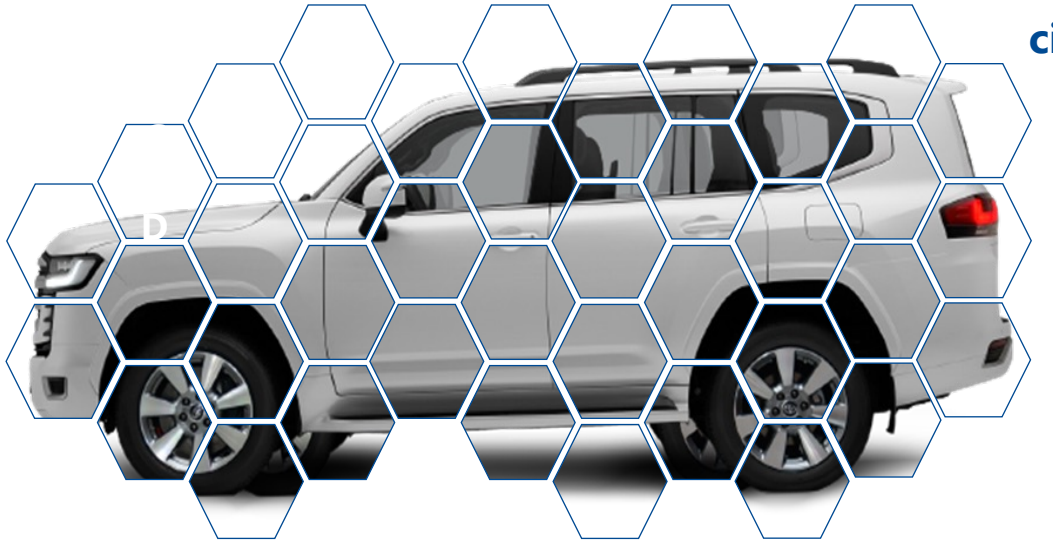
Also every other vehicle produced must comply with this certification



- It must be ensured that **each vehicle delivered** meets the user's requirements.
- For this purpose, “Vehicle Zero” has been certified and thus represents **the baseline that all other vehicles must also meet.**
- **Quality Assurance & Conformity of Production** should be considered
- **Deviations must be identified** and if necessary corrective action must be taken
- This requires **expertise and close cooperation** between stakeholders

Quality Assurance in military procurement

How is compliance with certification achieved?

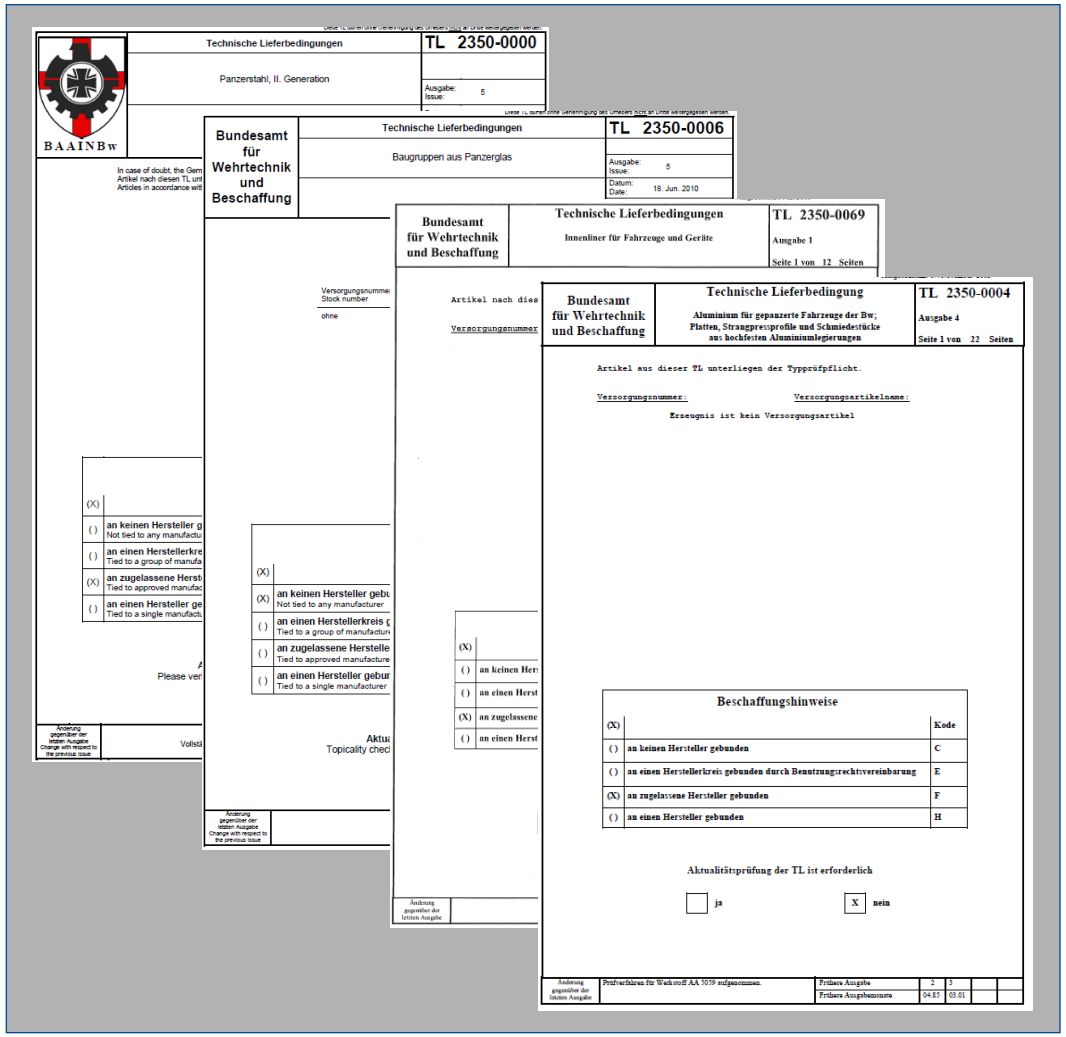


Procurement of civilian armored vehicles

Procurement of military vehicles

Principles for Quality Assurance & Conformity of Production

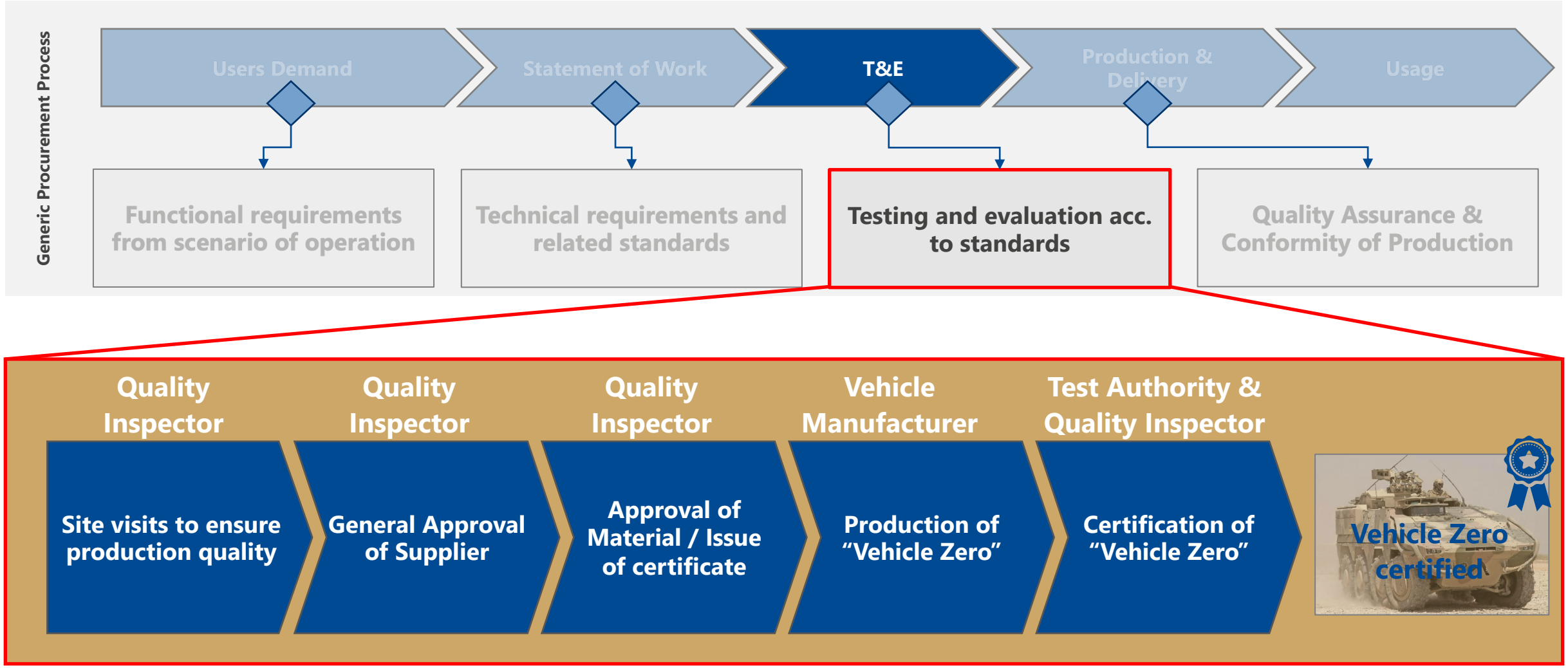
Best practice from military procurement



- **Quality Assurance** guarantees, that **all delivered product** fulfills the requirements of the Contract – therefore they accept the Product as delivered
- **Technical Delivery Terms (TL) describe the dedicated process** to ensure the quality of materials
- Only **approved materials** to be used in production, e.g.,:
  - Armoured steel (TL 2350-0000)
  - Armoured Glasses (TL 2350-0006)
  - Aluminium (TL 2350-0004)
  - Ballistic Liner (TL 2350-0069)
- **Inspection of production through quality inspector** is part of the process

In military procurement, Quality Inspection assists the certification

For Vehicle Zero, production inspected and materials are quality-tested



How do we ensure that all vehicles comply with the certification?
Conformity by approval of materials and vehicles

Generic Procurement Process

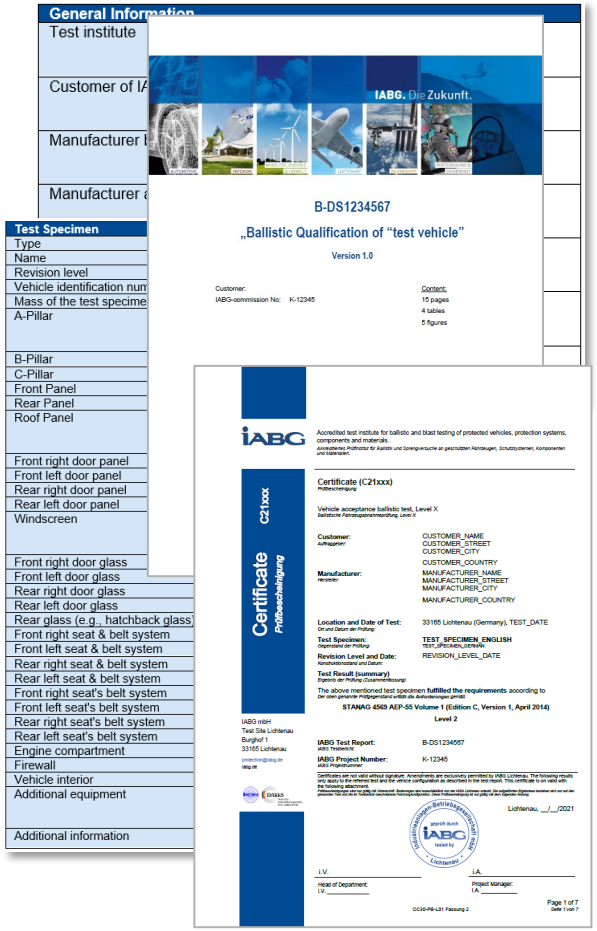
Users Demand → Statement of Work → T&E → Production & Delivery → Usage

- Functional requirements from scenario of operation
- Technical requirements and related standards
- Testing and evaluation acc. to standards
- **Quality Assurance & Conformity of Production**

Quality Inspector	Material Supplier	Vehicle Manufacturer	Quality Inspector	Quality Inspector	Vehicle Manufacturer
Approval of batch of material with regard to the requirements	Release and delivery of batch for production	Production of the vehicle with quality-tested material	Inspection during vehicle manufac-turing	Acceptance of the vehicle through handover inspection	Delivery to the user

Conformity of Production for civilian armored vehicle

Monitoring of production through inspections until handover



- **Quality management system available?**
- **Documentation process formulated?**
- **Plans for manufacturing (welding, cutting, ...)?**
- **Certifications and accreditaion?**
- **Qualification of personnel**
- **Health & Safety**

26.11.23

Modifications and Design Changes to “Vehicle Zero”

They must be recognized and measures evaluated

Summary and major take-aways
Some thoughts and ideas for discussion

- Testing & Evaluation is carried out at „Vehicle Zero“ ➔ Thus, certification is only valid for this construction

- Every other vehicle produced must comply with this certification ➔ Quality Assurance & Conformity of Production is essential
  - *Are there any gaps in procurement of civilian armored vehicles?*

- Different requirements for “Vehicle Zero” can be found in standards ➔ Expertise and sufficient documentation are therefore essential
  - *Is there any need for a more proper formulations in standards or in tenders?*

- Principles for from military procurement ensure consistent quality assurance ➔ Quality Assurance & Conformity of Production
  - *Are there any best practice solutions to transfer in procurement of civilian armored vehicles?*

- Modifications and design changes need to be recognized and appropriate measures defined ➔ How to handle Risk management?

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