




2ND CIVILIAN ARMoured VEHICLE FORUM

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

Y. Szczygiel, V. Caylak, R. Schäfer

Geneva, Switzerland, 25-26 October 2023



- Introduction
- Generic Procurement Process
- "Vehicle Zero"
- Conformity of Production
- Quality Assurance in military procurement
- Modifications and Design Changes
- Summary and take-aways

# IABG – A leading European Technology Company



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



87,4 %

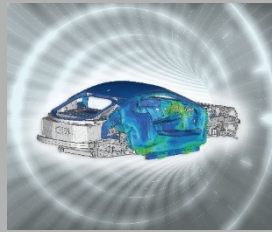
Schwarz Holding GmbH

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

- 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)



## Automotive

Engineering, test benches, testing & qualification of industrial products



## InfoCom

Digitisation of processes and secure communication networks



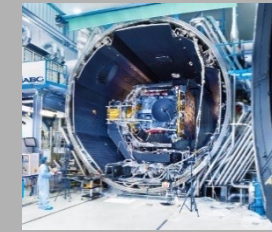
## Mobility, Energy & Environment

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



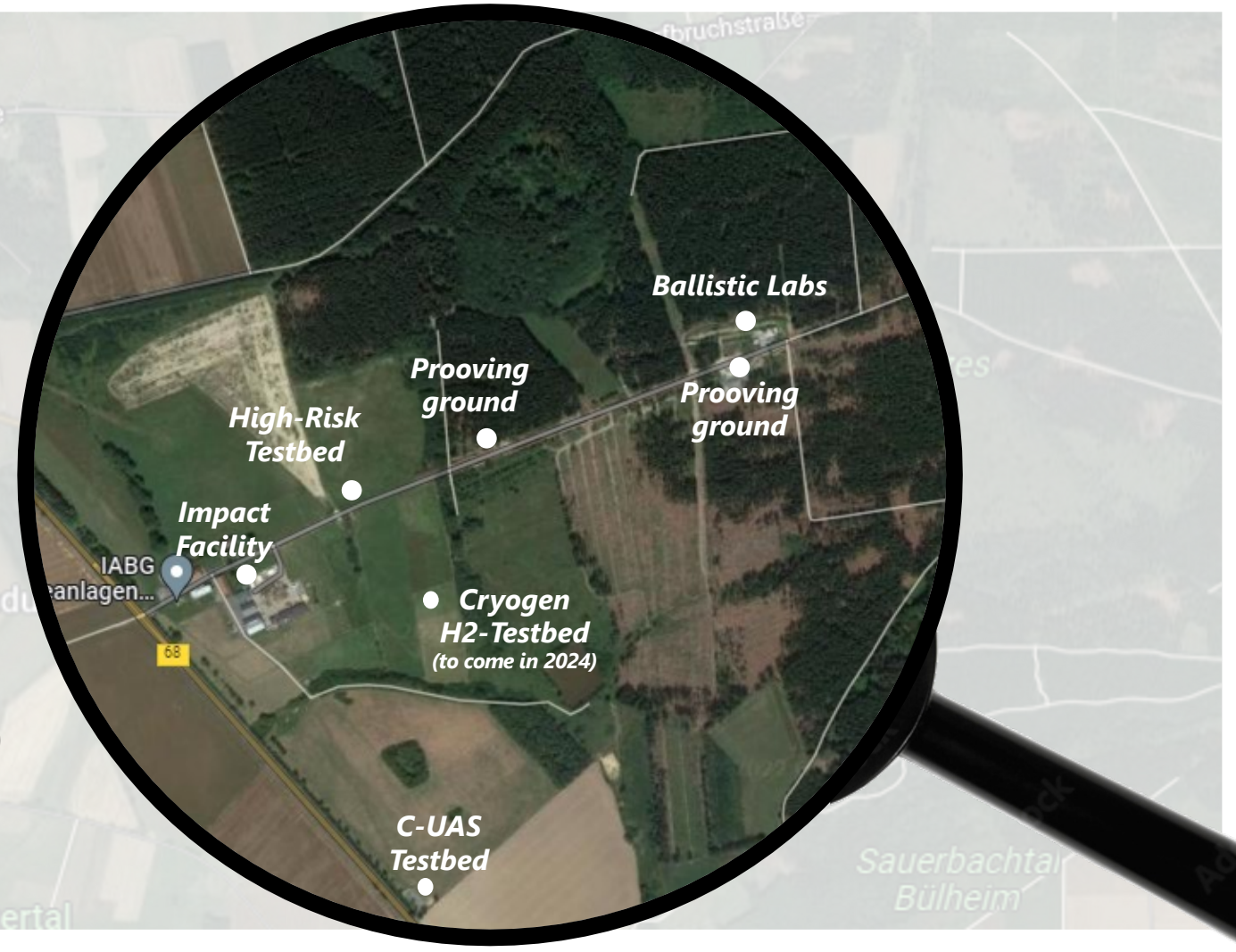
## Defence & Security

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

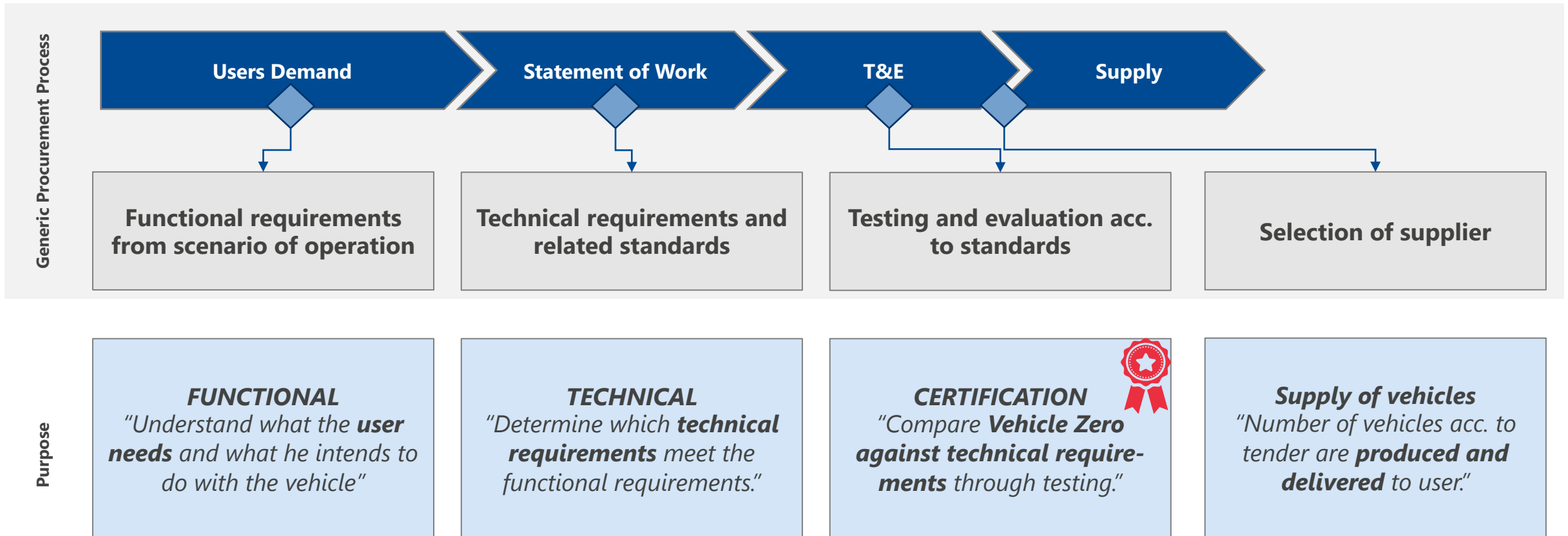




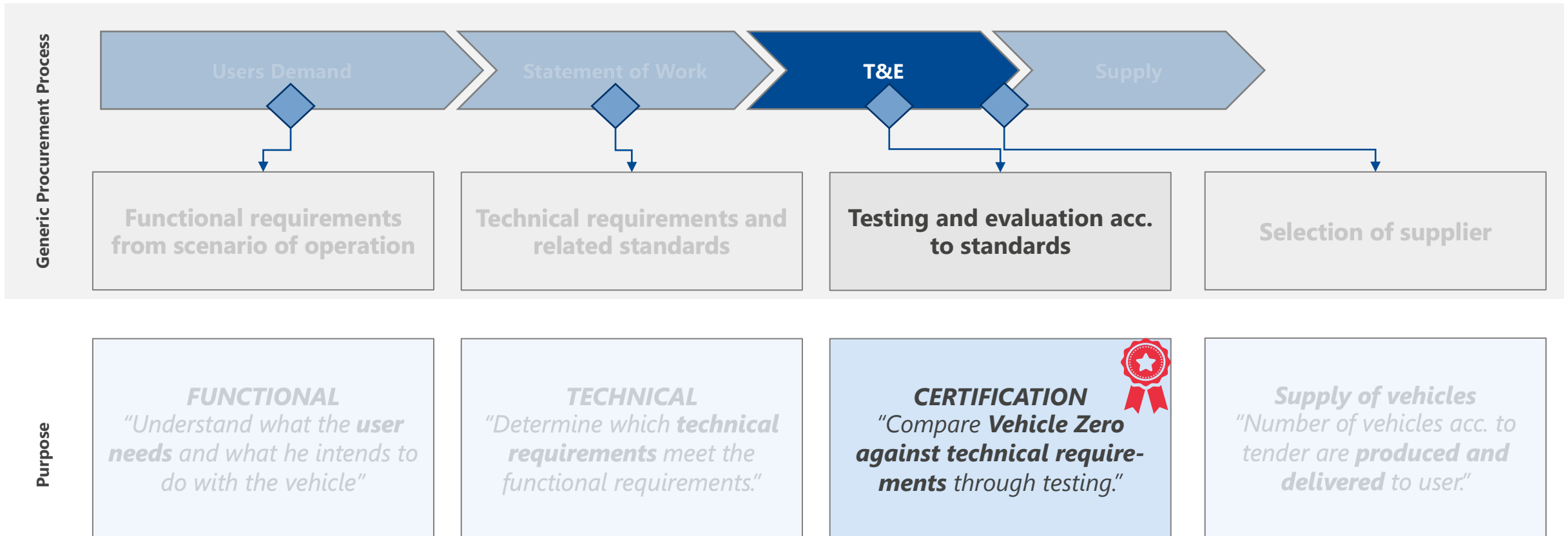
# Impact Testing



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



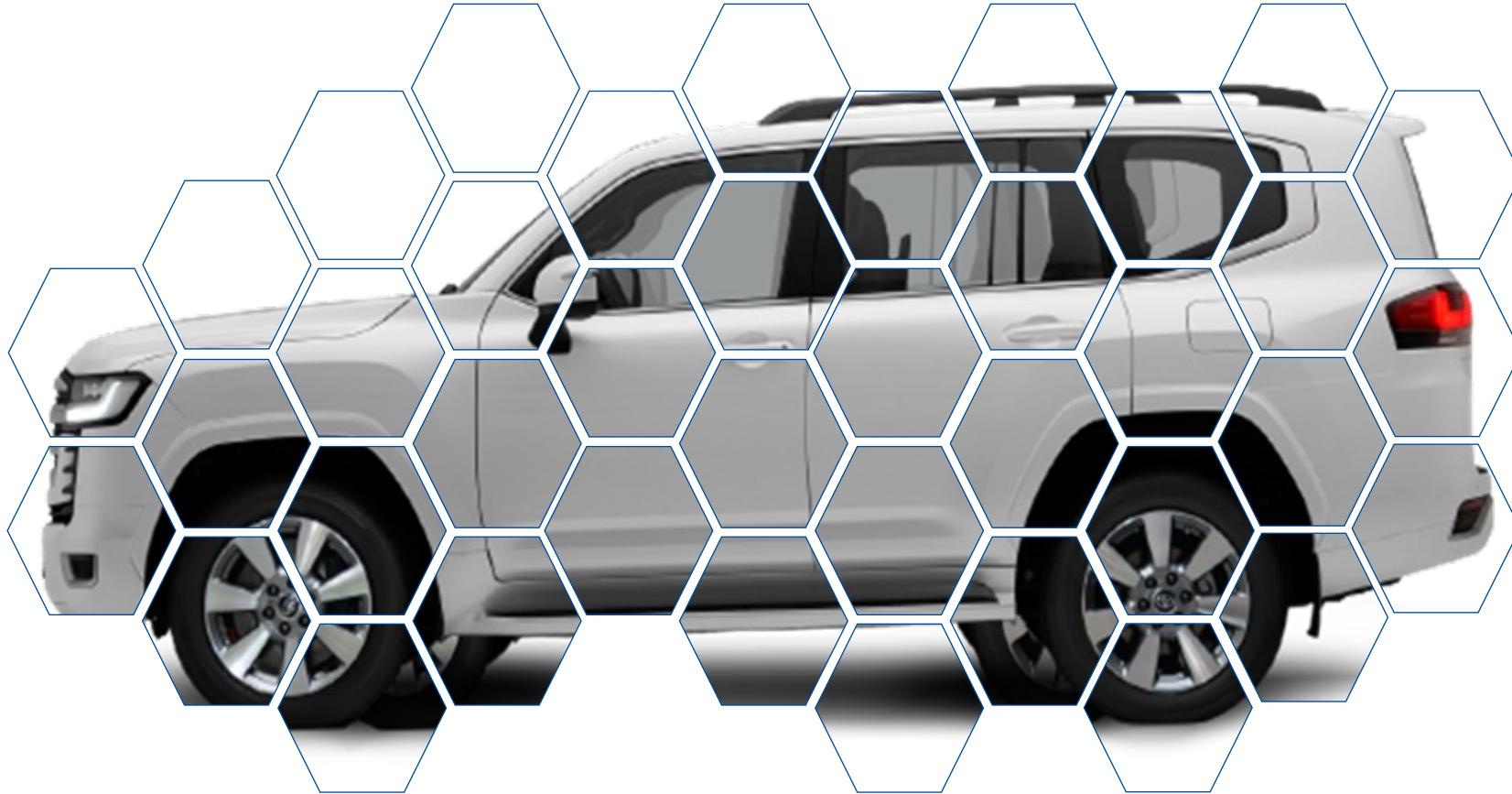
# Generic Procurement Process *Close cooperation between all stakeholders is recommended from the very beginning*





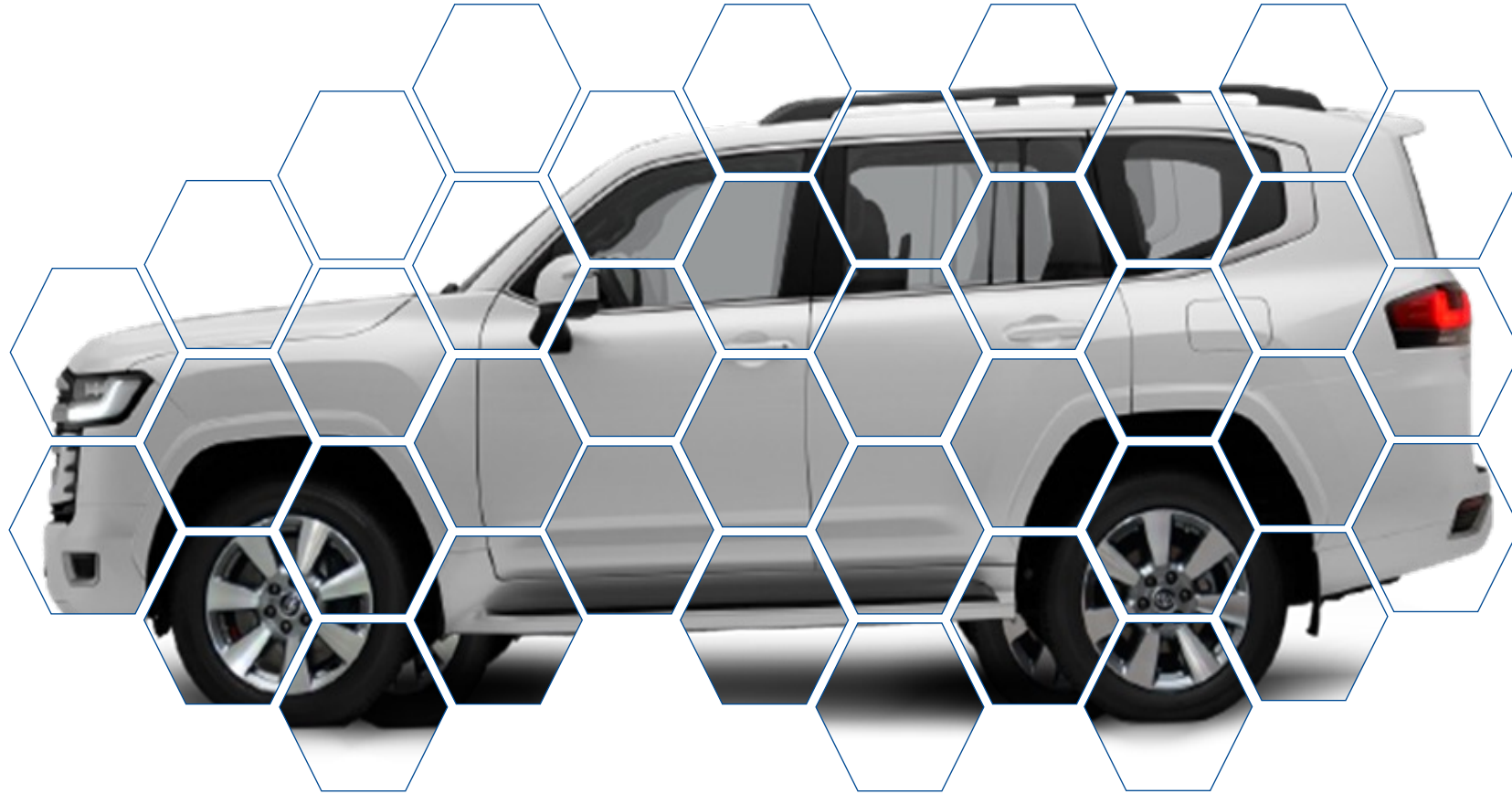
# What makes “Vehicle Zero” and why it is important?

*It is the basis for the certification and production*

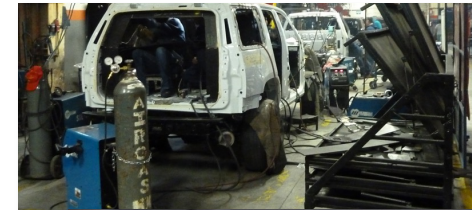


- „**Vehicle Zero**“ is the **basis for the verification** of the required specifications
- **Testing & Evaluation** against the specified standards of the tender will be **carried out at “Vehicle Zero”**
- The certification is **only valid for the design status of “Vehicle Zero”**
- A **detailed inspection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

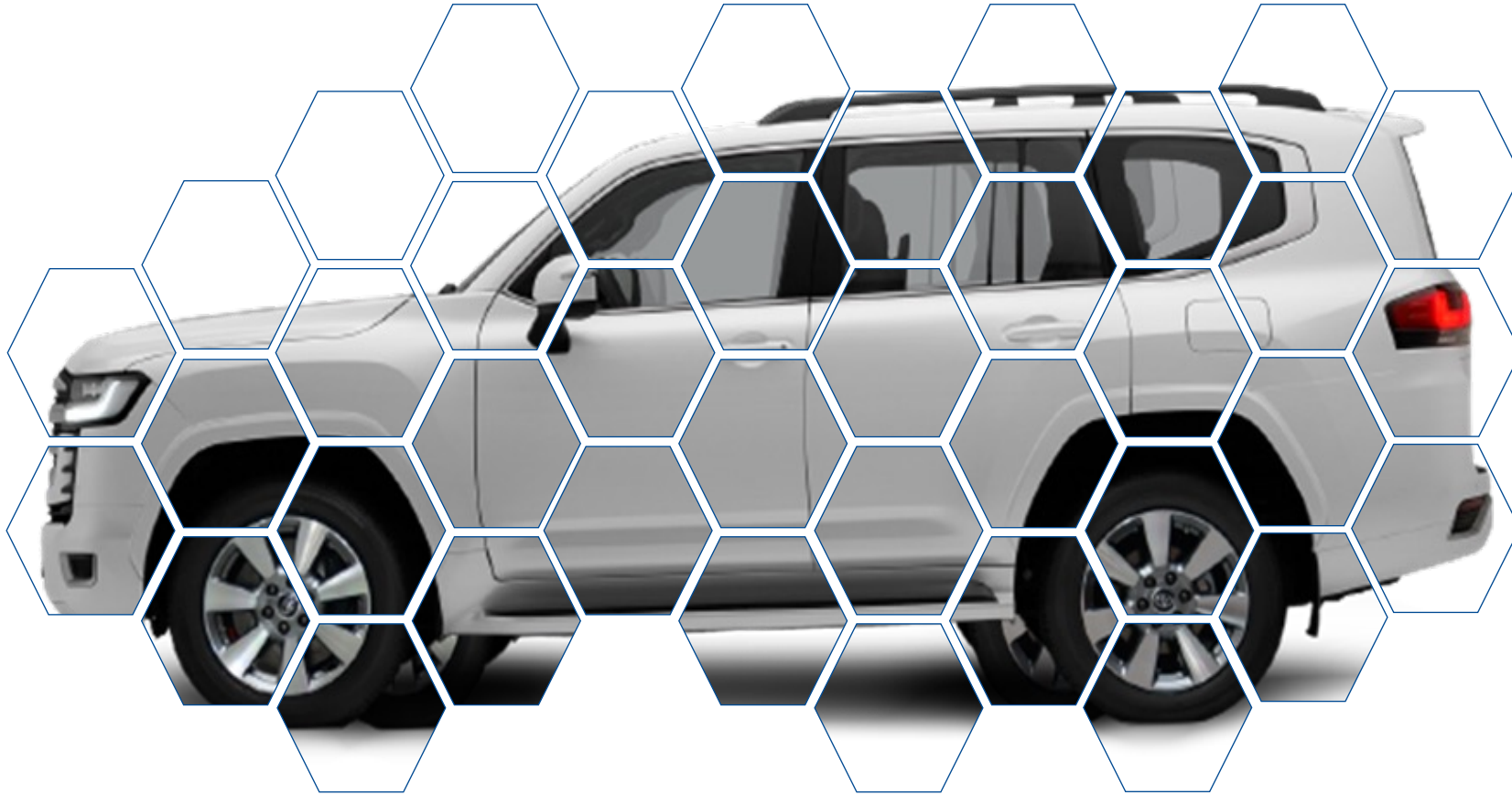
# What makes "Vehicle Zero" and why it is important? *Inspection and documentation must be available*



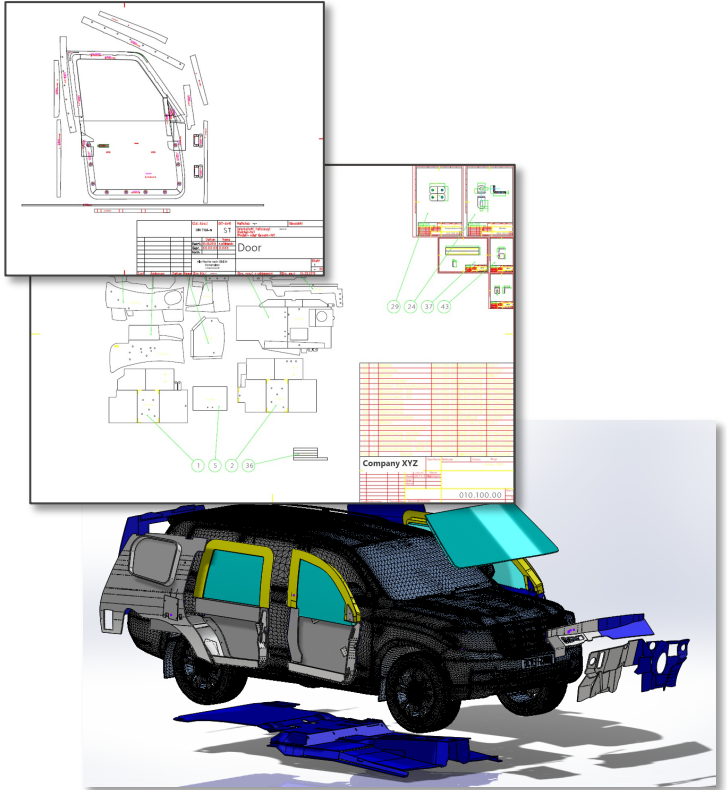
**Testing Authority**  
**Pre-Inspection of "Vehicle Zero"**  
**during construction**



# What makes "Vehicle Zero" and why it is important? *Inspection and documentation must be available*



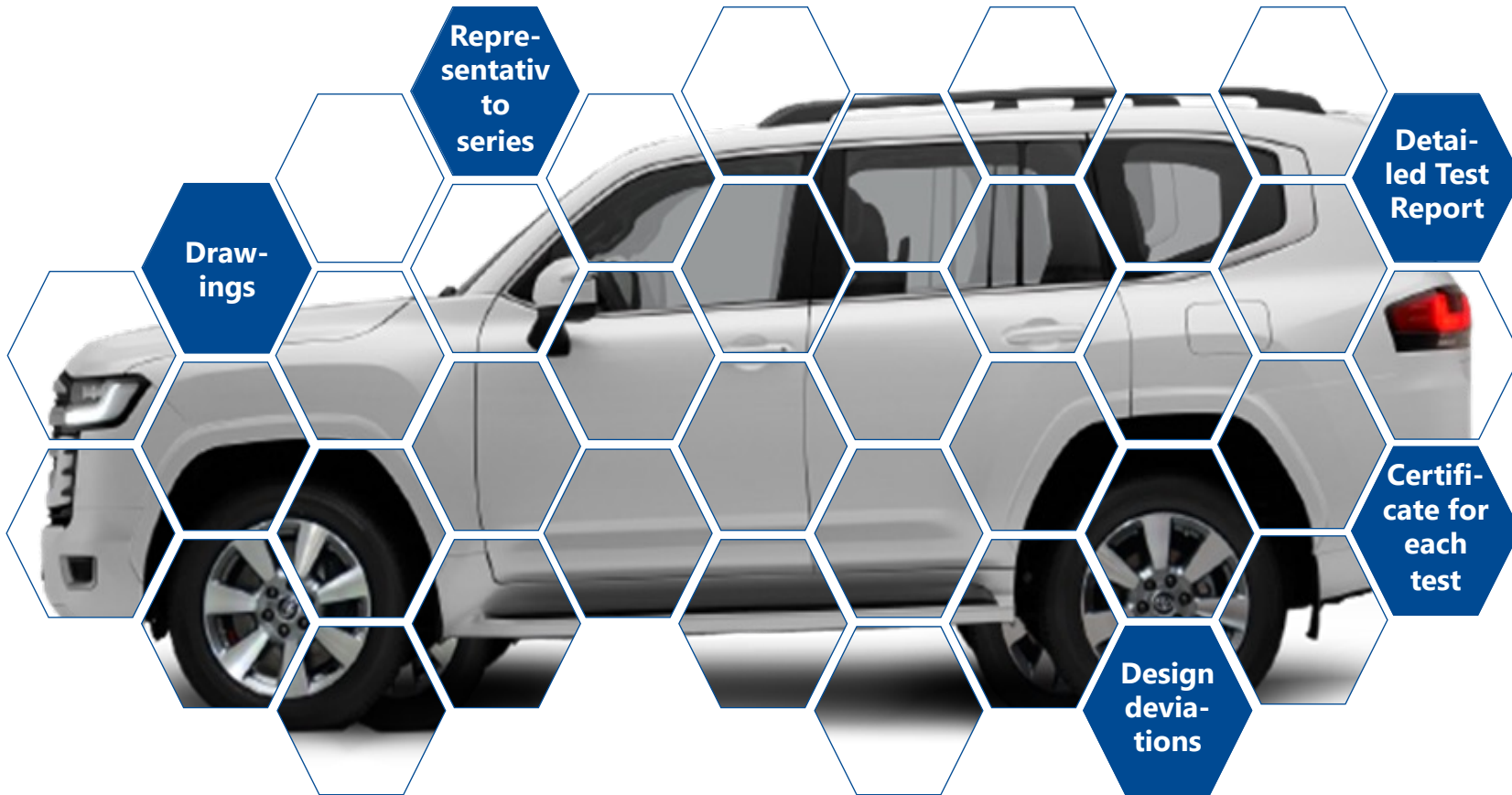
## Testing Authority Documentation of Vehicle Zero during testing





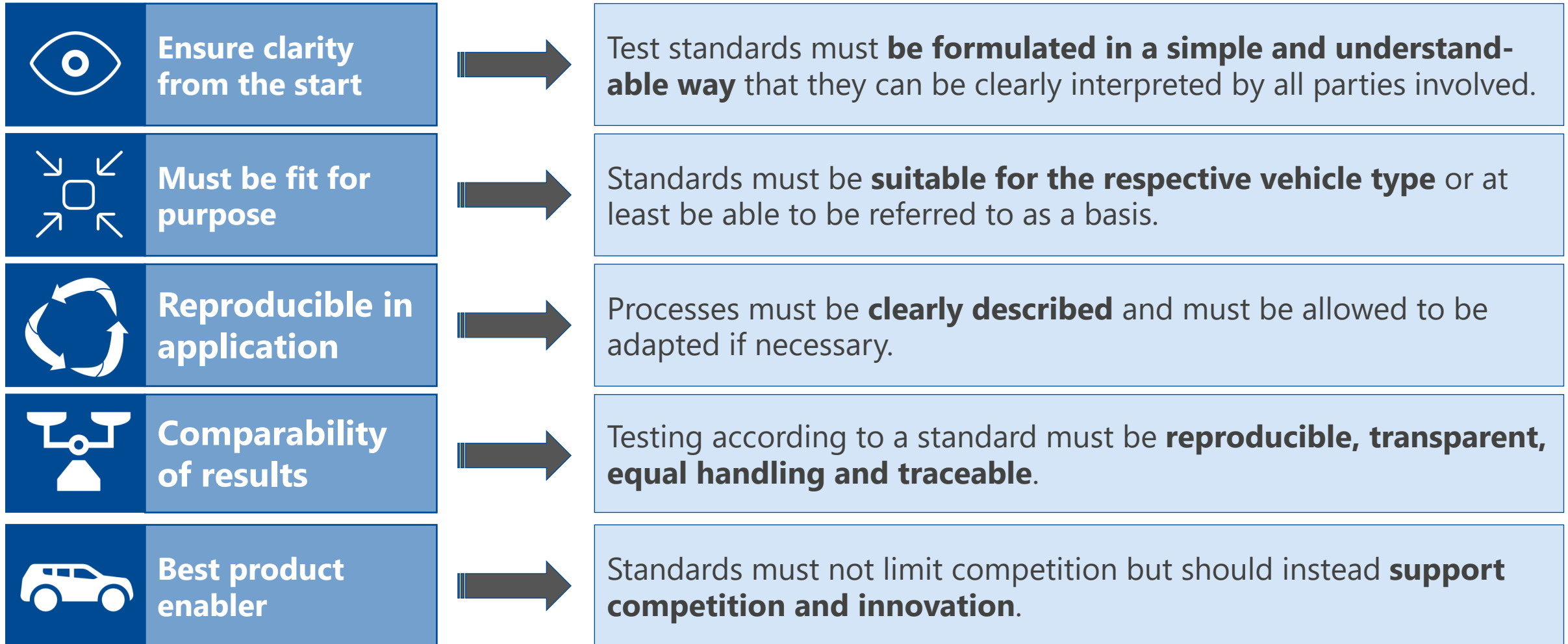
# What makes "Vehicle Zero" and why it is important?

## *Inspection and documentation must be available*



# Quick Spotlight on appropriate test standards

## *A key for successful procurement*



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

*Expertise and sufficient documentation are therefore essential*

<b>VPAM BRV</b>	<p><i>“...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.”</i></p>
<b>VPAM ERV</b>	<p><i>“...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.”</i></p>
<b>STANAG 4569</b>	<p><i>“...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.).”</i></p>
<b>PAS 300</b>	<p><i>“...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.”</i></p>



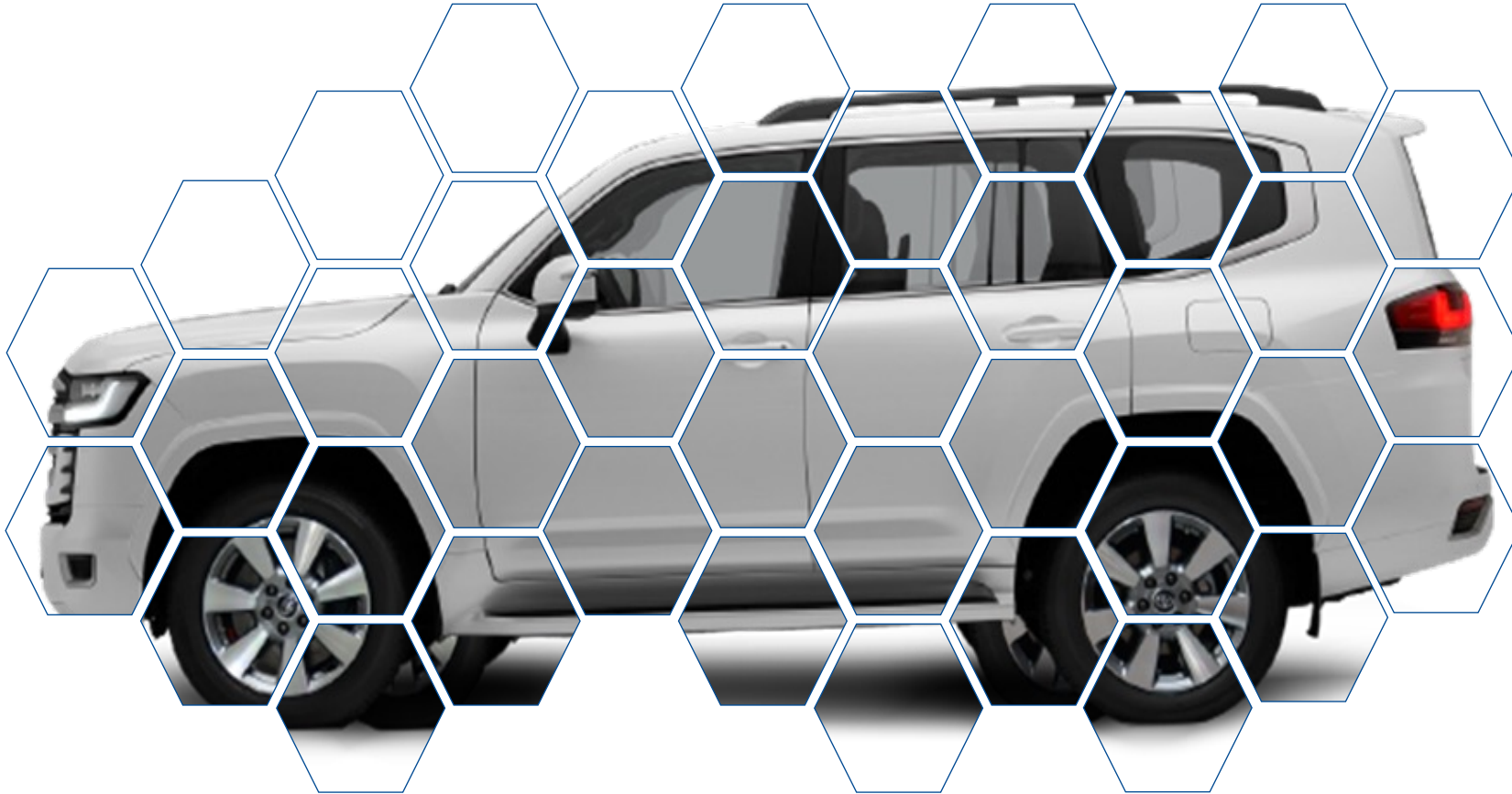
# Some Examples

*“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*

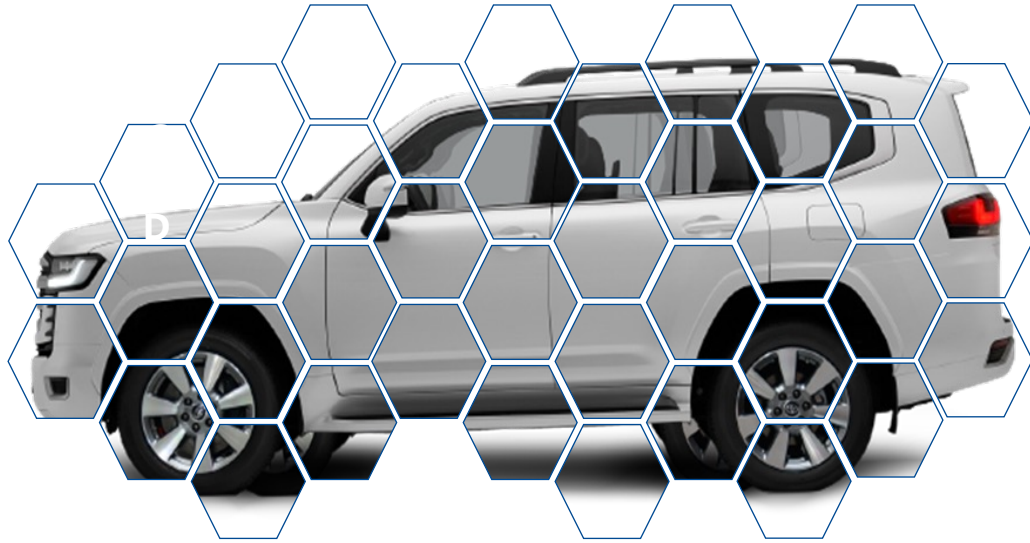


- It must be ensured that **each vehicle delivered** meets the user's requirements.
- For this purpose, “Vehicle Zero” has been certified and thus represents **the baseline that all other vehicles must also meet.**
- **Quality Assurance & Conformity of Production** should be considered
- **Deviations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

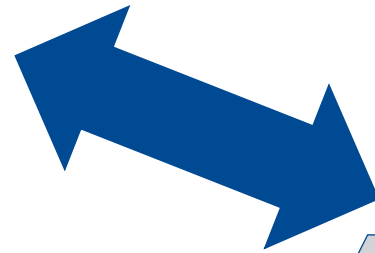


# Quality Assurance in military procurement

## *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

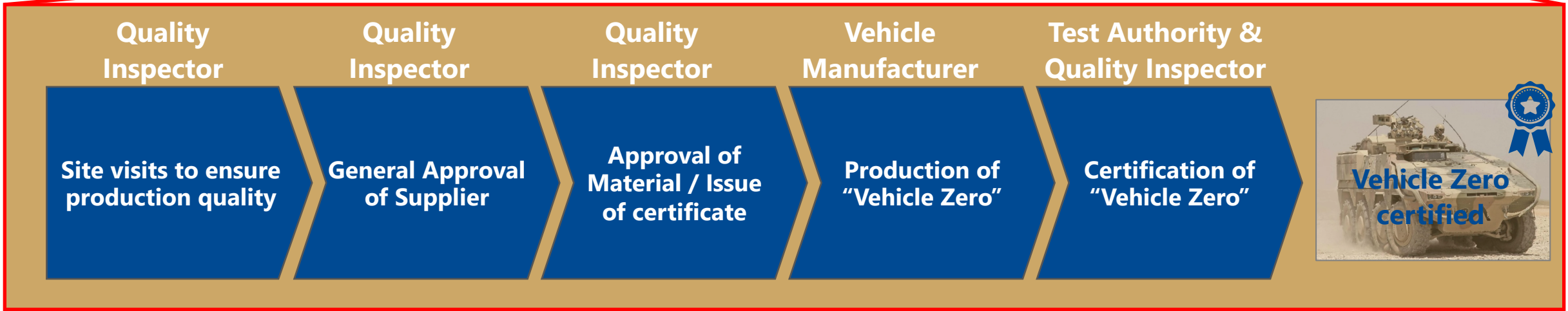
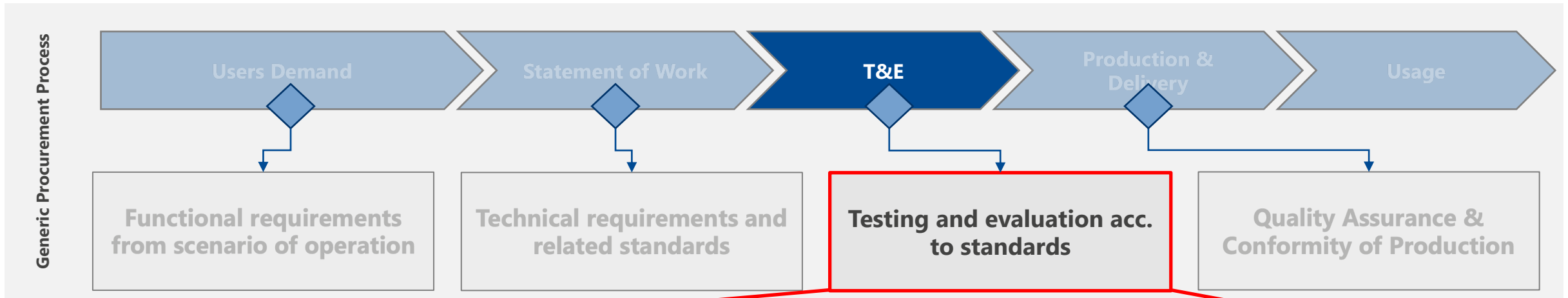
The image shows a complex technical drawing form with multiple overlapping sections, each representing a different technical delivery term (TL) for military procurement. The sections include:

- TL 2350-0000:** Technische Lieferbedingungen for Panzerstahl, II. Generation (Armored steel).
- TL 2350-0006:** Technische Lieferbedingungen for Baugruppen aus Panzerglas (Armor glass components).
- TL 2350-0069:** Technische Lieferbedingungen for Innenliner für Fahrzeuge und Geräte (Ballistic liner for vehicles and equipment).
- TL 2350-0004:** Technische Lieferbedingung for Aluminium für gepanzerte Fahrzeuge der Bw (Aluminum for armored vehicles of the German Army).

The form includes various fields for manufacturer ties, approval status, and inspection requirements. For example, under TL 2350-0004, there is a section for 'Beschaffungshinweise' (Procurement instructions) with options like 'an keinen Hersteller gebunden' (not bound to any manufacturer) or 'an zugelassene Hersteller gebunden' (bound to approved manufacturers).

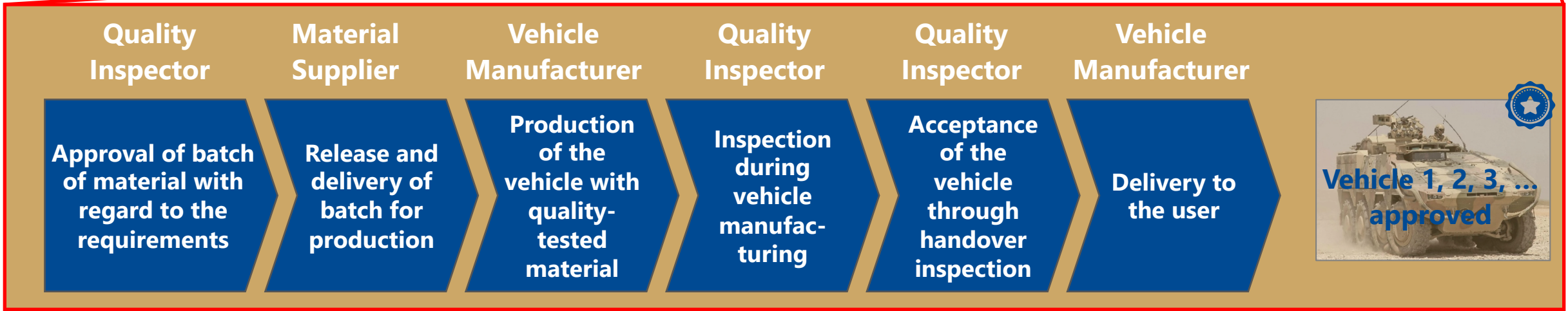
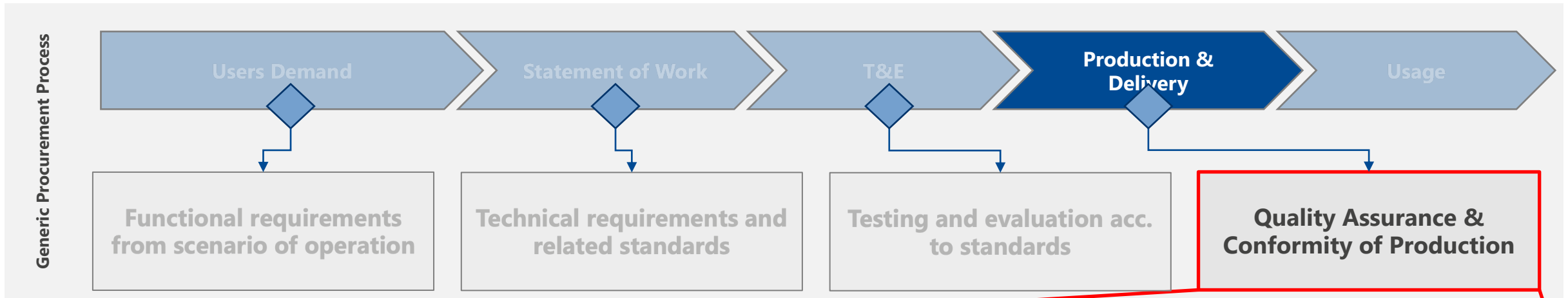
- **Quality Assurance** guarantees, that **all delivered product** fulfills the requirements of the Contract – therefore they accept the Product as delivered
- **Technical Delivery Terms (TL)** describe the **dedicated process** to ensure the quality of materials
- Only **approved materials** to be used 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*





# Conformity of Production for civilian armored vehicle

## Monitoring of production through inspections until handover

General Information																																																																					
Test institute																																																																					
Customer of IZ																																																																					
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Certificate	
Accredited test institute for ballistic and blast testing of protected vehicles, protection systems, components and materials, according to criteria for safety and temperature or penetration resistance, impact resistance and vibration.	
<b>Certificate (C2xxxx)</b> Ballistische Fahrzeugprüfung, Level X	
Vehicle acceptance ballistic test, Level X Ballistische Fahrzeugprüfung, Level X	
Customer:	CUSTOMER_NAME CUSTOMER_STREET CUSTOMER_CITY
Manufacturer:	CUSTOMER_COUNTRY MANUFACTURER_NAME MANUFACTURER_STREET MANUFACTURER_CITY MANUFACTURER_COUNTRY
Location and Date of Test:	33105 Lohrshaus (Germany), TEST_DATE
Test Specimens:	TEST_SPECIMEN_ENGLISH TEST_SPEZIFIKATION
Revision Level and Date:	REVISION_LEVEL_DATE
Test Result (Summary):	Report on PNVs (Summary)
The above mentioned test specimen fulfilled the requirements according to STANAG 4569 AEP-59 Volume 1 (Edition C, Version 1, April 2014) Level 2	
IABG Test Report:	B-DS1234567
IABG Project Number:	K-12345
Certificates are not valid without signature. Approvals are exclusively provided by IABG Lohrshaus. The following shall be applied to certificates that are not validly signed or approved by the test institute. The certificate is not valid if the signature is illegible or if the signature is not the signature of the authorized signatory.	
I.V.:	I.A.
Head of Department:	Project manager:
0330-98-121-Page 2 Page 1 of 7 2021	



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

# 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?

# Contact

## **IABG mbH**

Competence Center Protection, Impact  
and High Risk Testing

Burghof 1

33165 Lichtenau

Germany

## **Dr. Roger Schäfer**

Vice President Survivability

Email: [schaferr@iabg.de](mailto:schaferr@iabg.de)

## **Vera Caylak**

Head of Protection & Ballistic Testing

Email: [caylak@iabg.de](mailto:caylak@iabg.de)

## **Yannick Szczygiel**

Protection & Ballistic Testing

Email: [szczygiel@iabg.de](mailto:szczygiel@iabg.de)

