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Talk im Park

Hardware SPICE – Was ist drin?

Rainer Rönnebeck, Volker Lehmann

16. März 2021

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Inhalt

- → Kurze Vorstellung
- → Aufbau und Struktur
- → Prozesse
- → Fehlt da was?
- → Assessments / Trainings

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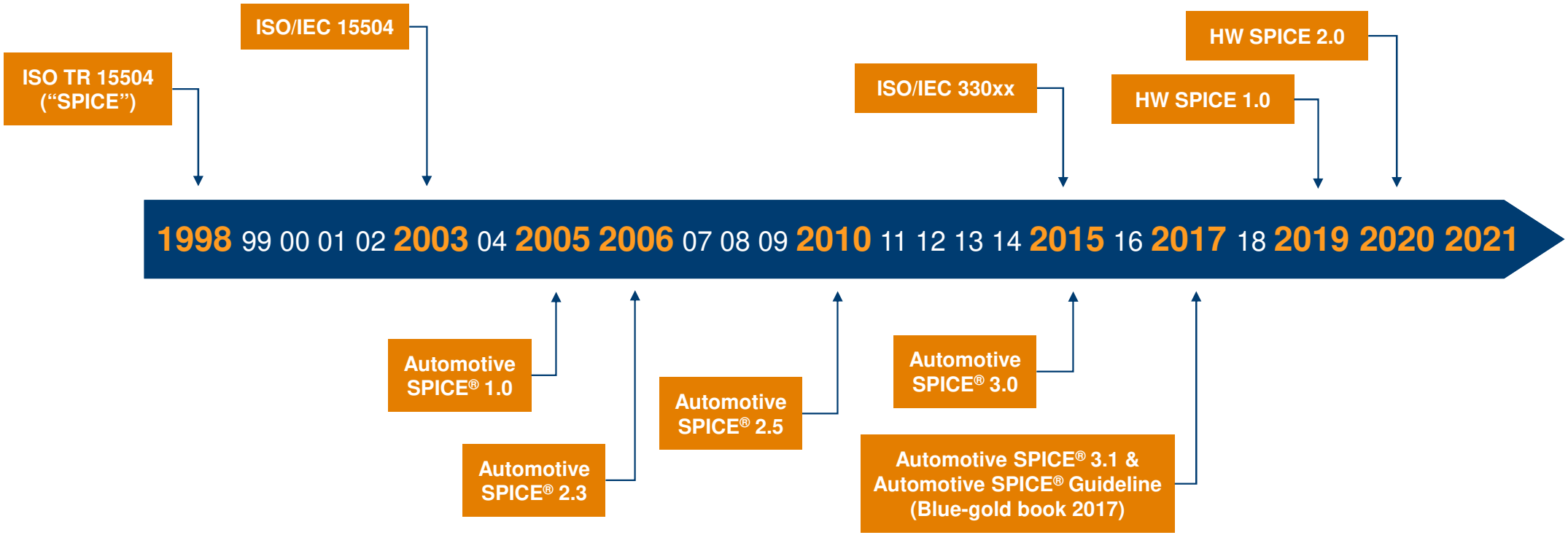
Thema – **Hardware SPICE Assessment Model – Was ist drin?**

Organisatorisches

- Bitte stellen Sie Ihre Fragen im Chat.
- Wir gehen nach dem Vortrag auf Fragen ein.

Aufbau und Struktur – **Historie**



Aufbau und Struktur – **Aufbau des Dokuments**

Hardware SPICE
intacs.info
International Assessor Certification Scheme™

intacs.info
International Assessor Certification Scheme™

Hardware SPICE

PRM/PAM

Version Control

Version:	2.0
Release date:	Dec 18th 2020
Distribution	Public
Status	Released

Hardware Engineering PRM/PAM Version 2.0 1

Quelle: www.intacs.info (kostenfrei)

- → **Kapitel 1: Document Scope**
  - → formale Informationen
  - → Referenzen
  - → Glossar
- → **Kapitel 2: Introduction**
  - → Scope
  - → Plug-In Konzept
- → **Kapitel 3: Key Concepts**
  - → Grundprinzipien
  - → System Interpretation
  - → Agile, ISO 26262
  - → Automotive SPICE®
  - → VDA Blaugold Band
- → **Kapitel 4: PRM / PAM**
  - → HWE.1 – HWE.4
  - → Rating Rules & Recommendations
- → **Kapitel 5: Capability Levels**

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→ **Annex A**

→ Work Product Characteristics

→ **Annex B**

→ Konformitätserklärungen

→ **Annex C**

→ Vorschläge zu Änderungen / Interpretationen für Automotive SPICE®

→ **Annex D**

→ Kontakte

→ **Annex E**

→ Änderungshistorie

Quelle: www.intacs.info (kostenfrei)

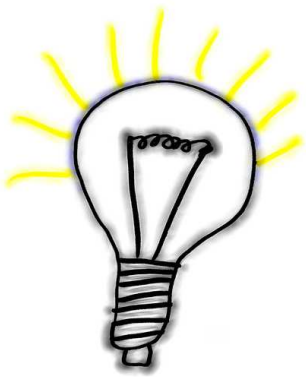
Aufbau und Struktur – **Key Concepts**

Hardware SPICE definiert

14 Grundprinzipien

(Rationales) zum

Verständnis der Prozesse



→ keine Beschaffungs- oder Produktionsprozesse in Hardware SPICE

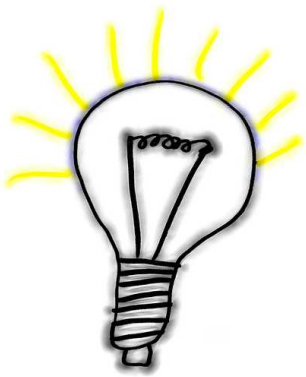
→ Anmerkungen zur ISO 26262

→ Differenzen zu „Automotive SPICE®“ und „SPICE for Mechanical Engineering“

- → Verwendung von Begriffen
- → Abweichende Base Practices (BPs)
- → Prozessgrenzen

Aufbau und Struktur – **Key Concepts**

Weitere konzeptuelle Überlegungen sind



→ In Kundenanforderungen sollte der Unterschied zwischen Anforderung und Design sichtbar gemacht werden -> Verweis auf „SYS.1 Requirements Elicitation“

→ Systemgrenzen der HW Prozesse unterscheiden sich je nach Lieferant (Halbleiter, Steuergerät, mechatronisches System)

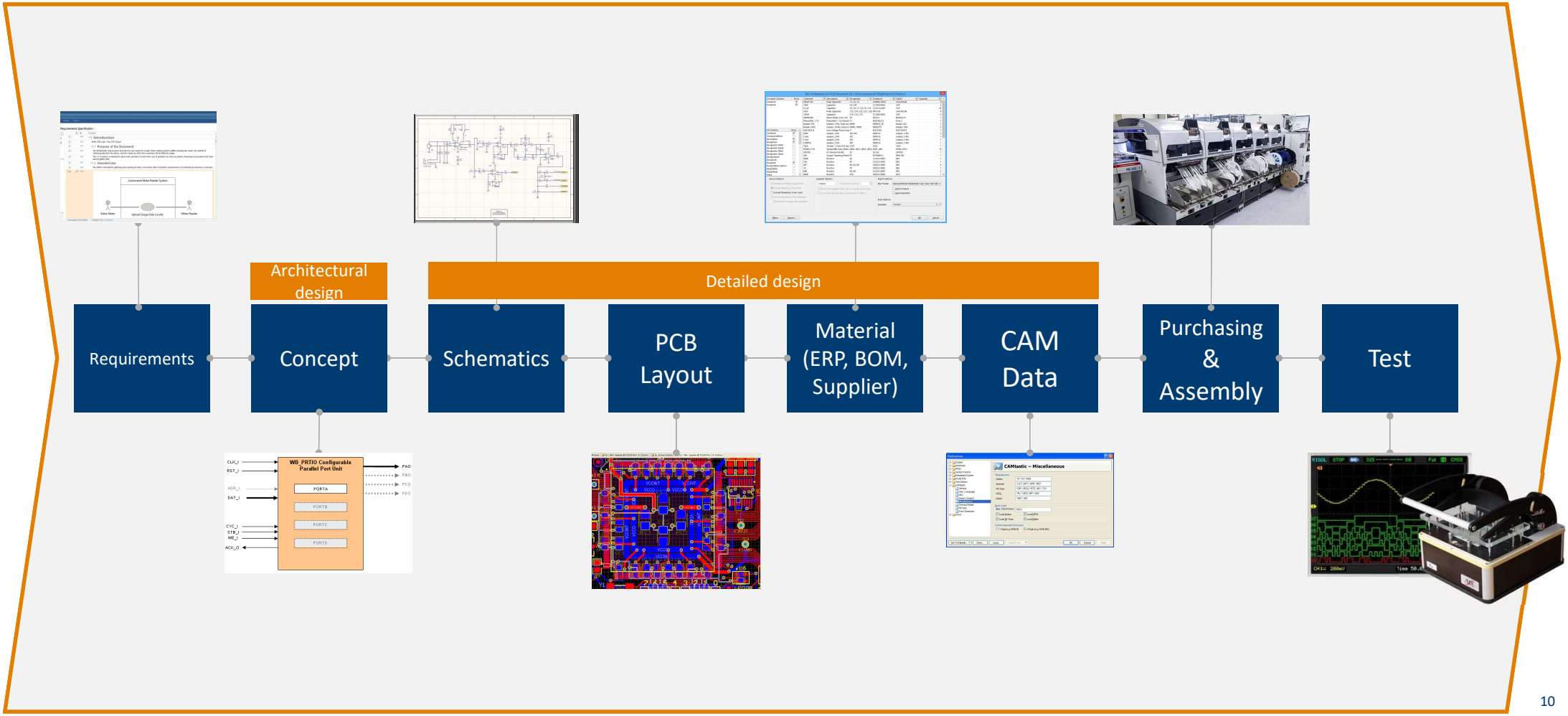
→ Es gibt keine Widersprüche zu agilen Entwicklungsansätzen

→ Referenzen zu ISO 26262

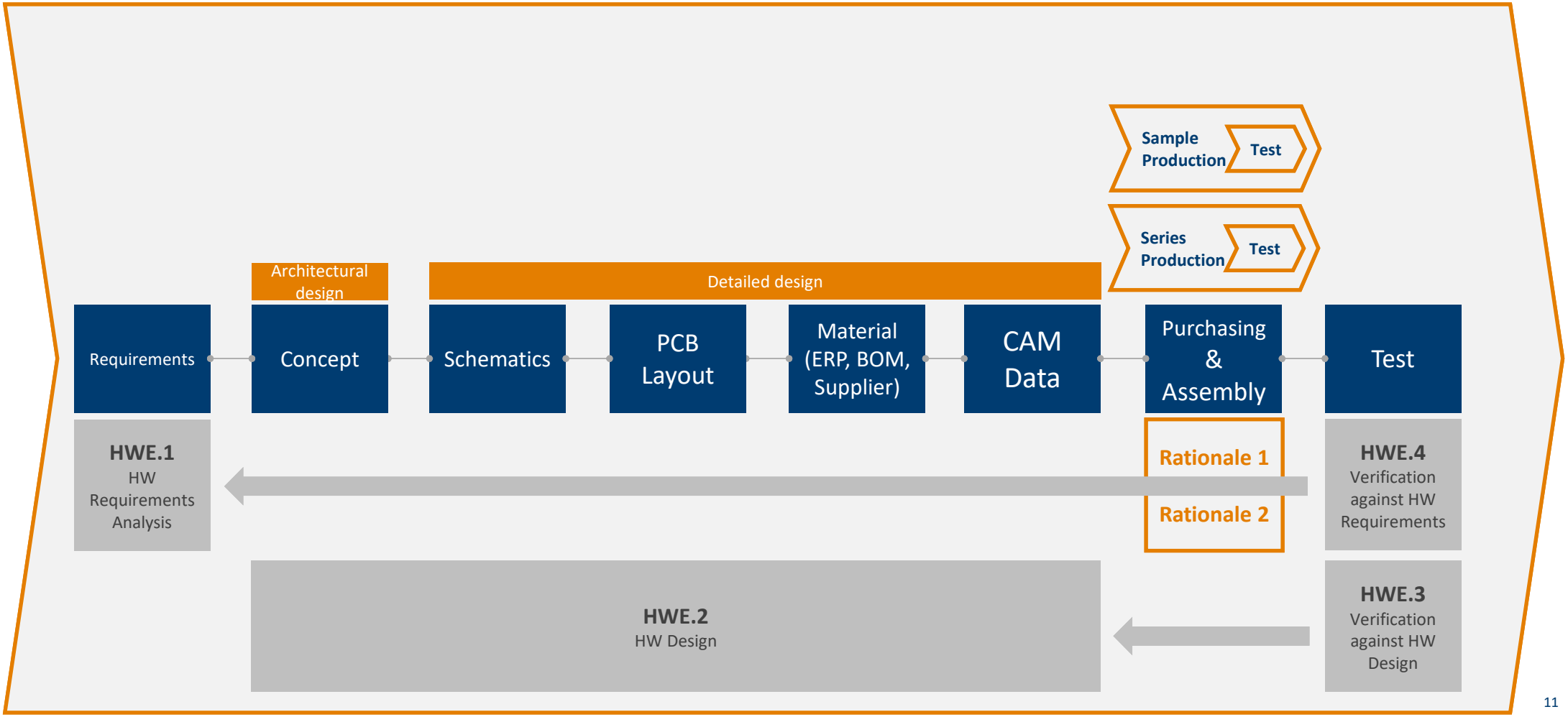
→ Referenzen zu Automotive SPICE®

→ Referenzen zu dem „VDA Automotive SPICE® Guidelines“

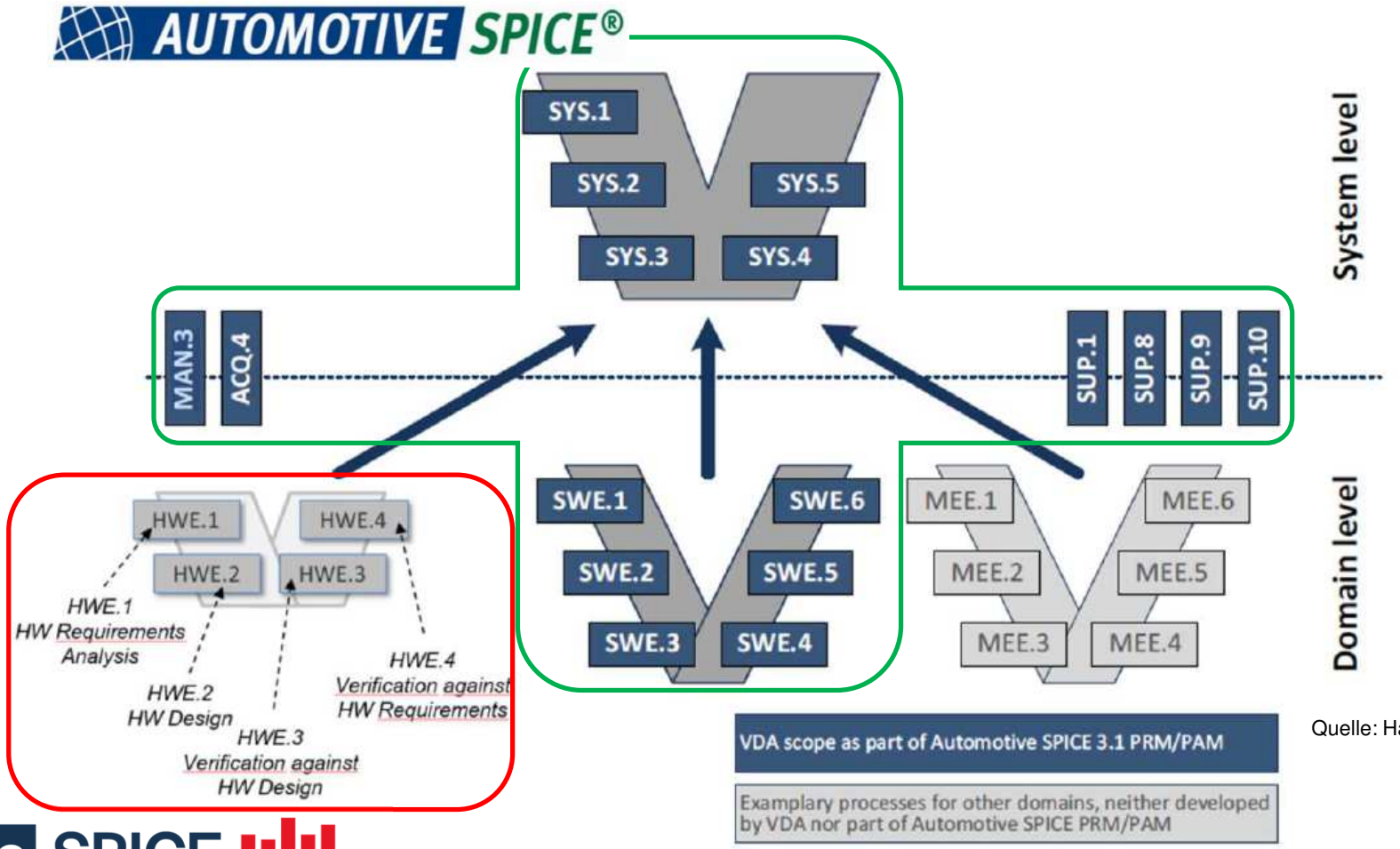
Prozesse – **HW Entwicklungs-Prozess**



Prozesse – **HW Entwicklungs-Prozess – Mapping zu Hardware SPICE**



Prozesse – **Plug-in Konzept**

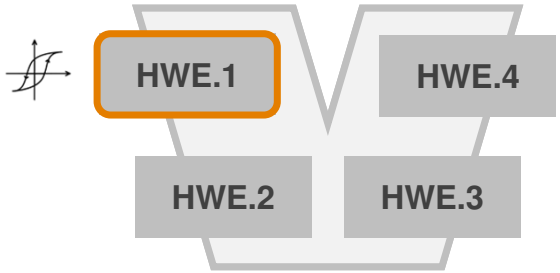


Quelle: Hardware SPICE 2.0

Hardware SPICE

Prozesse – HWE.1 HW Requirements Analysis

HWE.1



Definierte Tätigkeiten im Prozess

Base Practices

→ HWE.1.BP1: Specify **hardware requirements**.

→ HWE.1.BP2: Structure **hardware requirements**.

→ HWE.1.BP3: Analyse **hardware requirements**.

→ HWE.1.BP4: Analyse the **impact** on the operating environment.

→ HWE.1.BP5: Establish bidirectional traceability.

→ HWE.1.BP6: Ensure consistency.

→ HWE.1.BP7: Communicate agreed hardware requirements.

Arbeitsprodukte des Prozesses

Work Products

→ 13-04 Communication record

→ 13-19 Review record

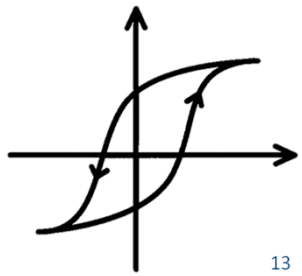
→ 13-21 Change control record

→ 13-22 Traceability record

→ 15-01 Analysis report

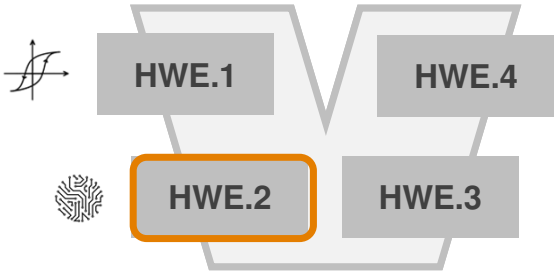
→ 17-08 Interface requirements specification

→ 17-HW01 Hardware requirements specification



Prozesse – HWE.2 HW Design

HWE.2



Base Practices

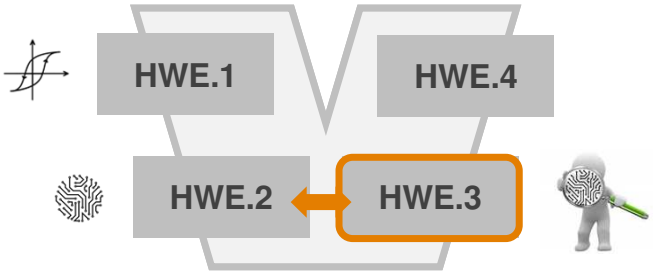
- → HWE.2.BP1: Develop hardware architecture.
- → HWE.2.BP2: Develop hardware detailed design.
- → HWE.2.BP3: Define interfaces of the hardware elements.
- → HWE.2.BP4: Describe dynamic behaviour.
- → HWE.2.BP5: Allocate hardware requirements.
- → HWE.2.BP6: Evaluate the hardware architecture and the hardware detailed design.
- → HWE.2.BP7: Establish bidirectional traceability.
- → HWE.2.BP8: Ensure consistency.
- → HWE.2.BP9: Communicate all information needed to relevant parties.

Work Products

- → 04-HW01 Hardware architecture
- → 04-HW02 Hardware detailed design description
- → 04-HW03 Schematics
- → 04-HW04 Bill of materials
- → 04-HW05 Layout
- → 11-HW01 Hardware production data
- → 11-HW02 Special characteristics
- → 13-04 Communication record
- → 13-19 Review record
- → 13-22 Traceability record
- → 15-01 Analysis report
- → 17-08 Interface requirement specification

Prozesse – HWE.3 Verification against HW Design

HWE.3



Base Practices

→ HWE.3.BP1: Develop a strategy for the verification against **hardware design**.

→ HWE.3.BP2: Develop specification for the verification against **hardware design**.

→ HWE.3.BP3: Ensure use of compliant samples.

→ HWE.3.BP4: Select verification measures.

→ HWE.3.BP5: Verify **hardware design**.

→ HWE.3.BP6: Establish bidirectional traceability.

→ HWE.3.BP7: Ensure consistency.

→ HWE.3.BP8: Summarise and communicate results.

Work Products

→ 08-HW01 Verification plan

→ 08-HW02 Verification specification

→ 13-01 Acceptance record

→ 13-04 Communication record

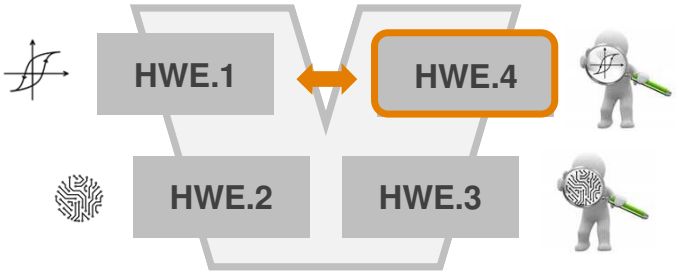
→ 13-19 Review record

→ 13-22 Traceability record

→ 13-HW01 Verification result

Prozesse – HWE.4 Verification against HW Requirements

HWE.4



Base Practices

→ HWE.4.BP1: Develop a strategy for the verification against **hardware requirements**.

→ HWE.4.BP2: Develop specification for the verification against **hardware requirements**.

→ HWE.4.BP3: Ensure use of compliant samples.

→ HWE.4.BP4: Select verification measures.

→ HWE.4.BP5: Verify **hardware.**

→ HWE.4.BP6: Establish bidirectional traceability.

→ HWE.4.BP7: Ensure consistency.

→ HWE.4.BP8: Summarise and communicate results.

Work Products

→ 08-HW01 Verification plan

→ 08-HW02 Verification specification

→ 13-01 Acceptance record

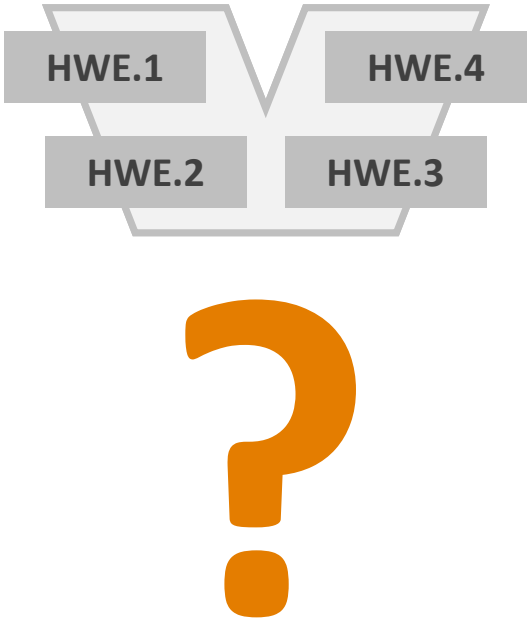
→ 13-04 Communication record

→ 13-19 Review record

→ 13-22 Traceability record

→ 13-HW01 Verification result

HW-SPICE – **Fehlt da was?**



→ HW-Eigenschaften

→ Kein Produktions-Prozess

→ Herstellbarkeit

→ HW-Samples

→ Schnittstelle HW-SW-ME

→ Synchronisation HW-SW-ME

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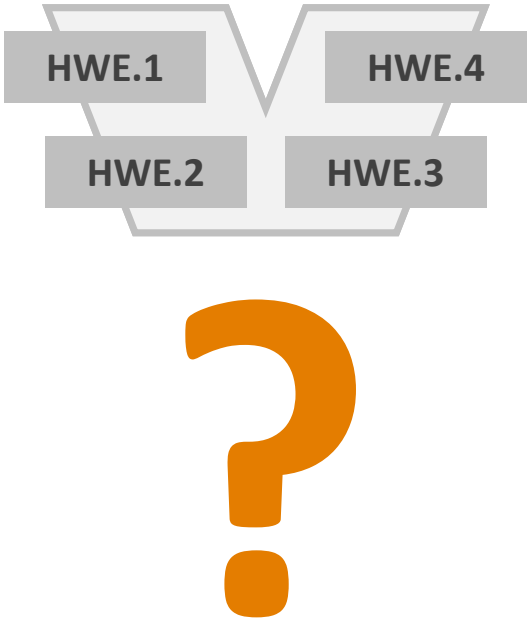
HW-SPICE – **Fehlt da was?**



→ **HW-Eigenschaften**
→ Kein Produktions-Prozess
→ Herstellbarkeit
→ HW-Samples
→ Schnittstelle HW-SW-ME
→ Synchronisation HW-SW-ME

→ Alterung
→ Wärme
→ Bauraum
→ Masse
→ EMV und ESD
→ …

Wie bildet **Hardware SPICE** diese Eigenschaften ab?

HW-SPICE – **Fehlt da was? … HW-Eigenschaften**

… werden als **System Requirements** betrachtet.

Sie werden **auf Systemebene** analysiert,

spezifiziert und getestet

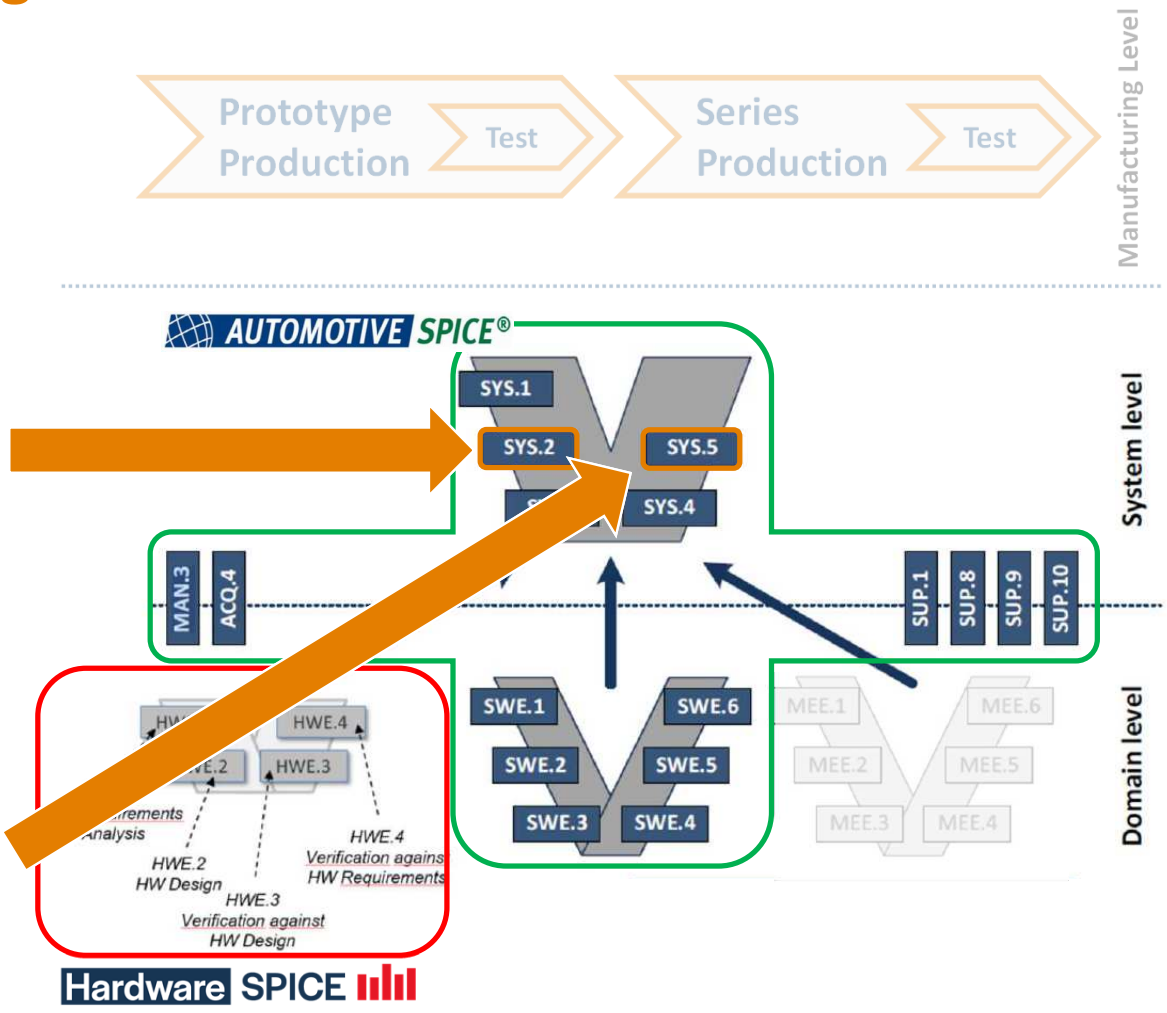
SYS.2 System Requirements Analysis

SYS.2.BP1: Specify system requirements.
Use the stakeholder requirements and changes to the stakeholder requirements to identify the required functions, **properties** and capabilities of the system. Specify functional and non-functional system requirements in a system requirements specification. [OUTCOME 1, 5, 7]
NOTE 1: Application parameter influencing functions and capabilities are part of the systemrequirements.
NOTE 2: For changes to the stakeholder's requirements SUP.10 applies.
NOTE X: Examples for properties of a system are:
- **Thermal characteristics such as heat dissipation, Dimensions, Weight, Materials**

NOTE Y: System requirements may include specific requirements regarding external interfaces such as connectors or housing.

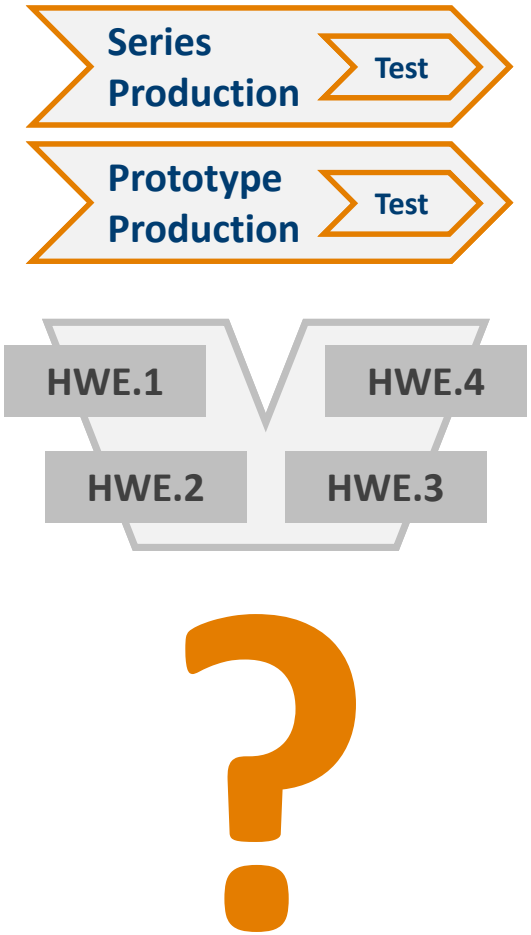
SYS.5 System Qualification Testing

SYS.5.BP1: Develop system qualification test strategy including regression test strategy.
Develop a strategy for system qualification test consistent with the project plan and the release plan. This includes a regression test strategy for re-testing the integrated system if a system item is changed. [OUTCOME 1]
Note 1: The system qualification test strategy should cover testing aspects such as thermal, environmental, robustness/lifetime, and EMC.



Quelle: Annex C: Proposals for ASPICE

HW-SPICE – **Fehlt da was?**



→ HW-Eigenschaften

→ **Kein Produktions-Prozess**

→ Herstellbarkeit

→ HW-Samples

→ Schnittstelle HW-SW-ME

→ Synchronisation HW-SW-ME

→ Nicht im Technical Scope

→ Hardwareentwicklung geht Hand-in-Hand mit Beschaffung und Produktion

→ Einfluss auf die Terminschiene und Kosten

Wie geht **Hardware SPICE** mit dem Thema Produktion um?

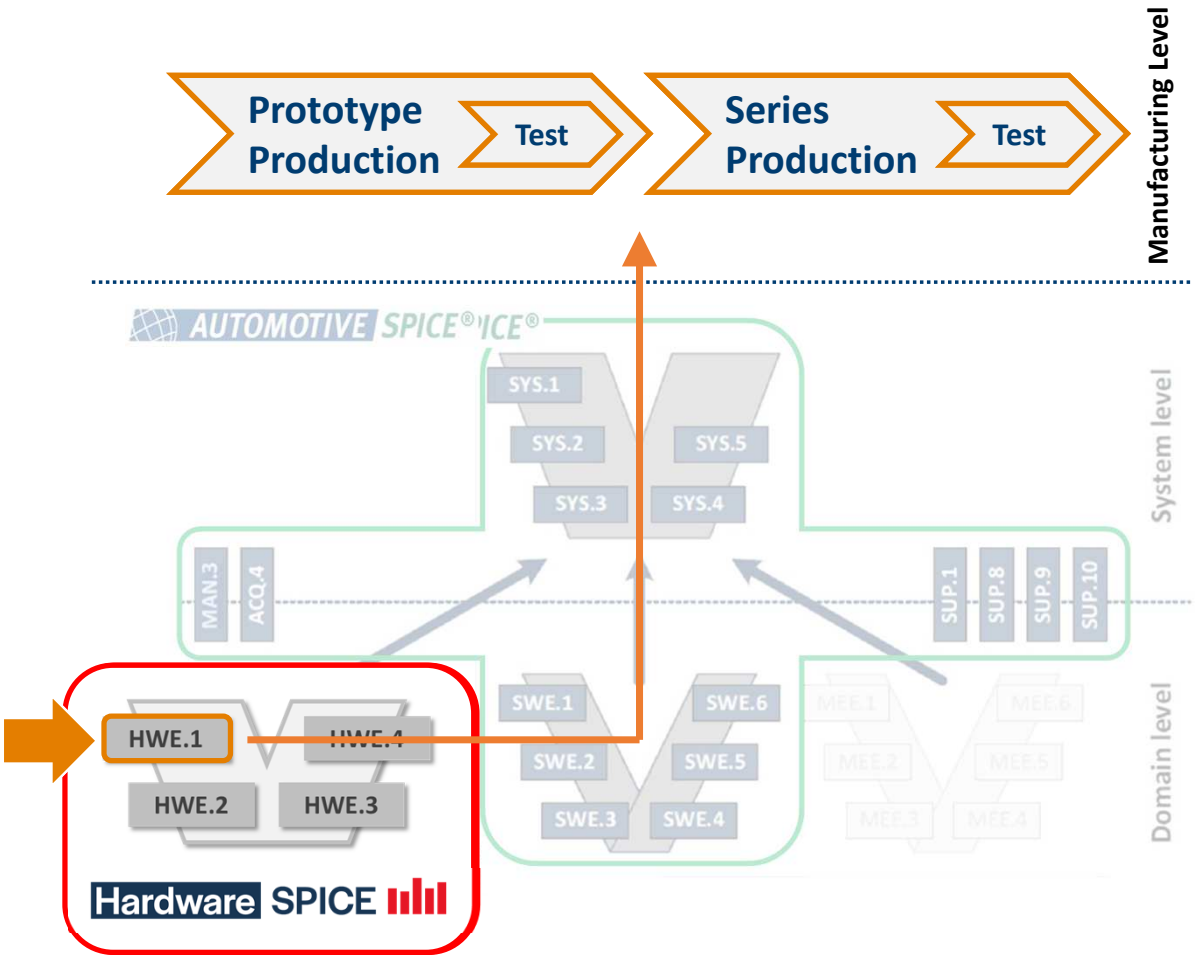
HW-SPICE – **Fehlt da was? … Kein Produktions-Prozess**

Die Schnittstelle zum Produktionsprozess (inkl. Test) wird über Daten bedient, die in **HWE.2 Hardware Design** erzeugt werden.

Process purpose	The purpose of the Hardware Design process is to provide an evaluated design, that is suitable for manufacturing, and to derive production-relevant data.

'Process interfaces' to the production domain are required. This is achieved by means of

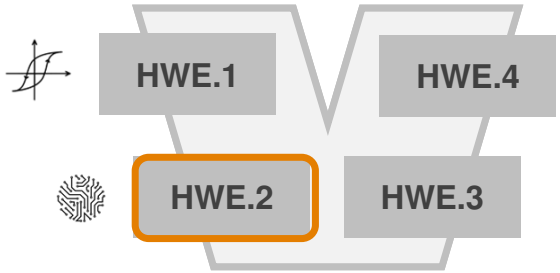
- output work product characteristics for HWE.2:
  - **11-HW01 Hardware Production Data**
    (BOM, GERBER data, Requirements for EOL test (test type, test coverage, acceptance criteria)
  - **11-HW02 Special Characteristics**
    product characteristics or production process parameters that may have an impact on safety or compliance with official regulations, the fit, the function, the performance or further processing of the product
  - **04-HW04 Bill of Materials**
    Uniquely identifies type, supplier, and amount of the complete set of all hardware parts of the hardware



Quelle: 3.2.1 Rationale 1 – No Production Process

Prozesse – HWE.2 HW Design

HWE.2



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- → HWE.2.BP7: Establish bidirectional traceability.
- → HWE.2.BP8: Ensure consistency.
- → HWE.2.BP9: Communicate all information needed to relevant parties.

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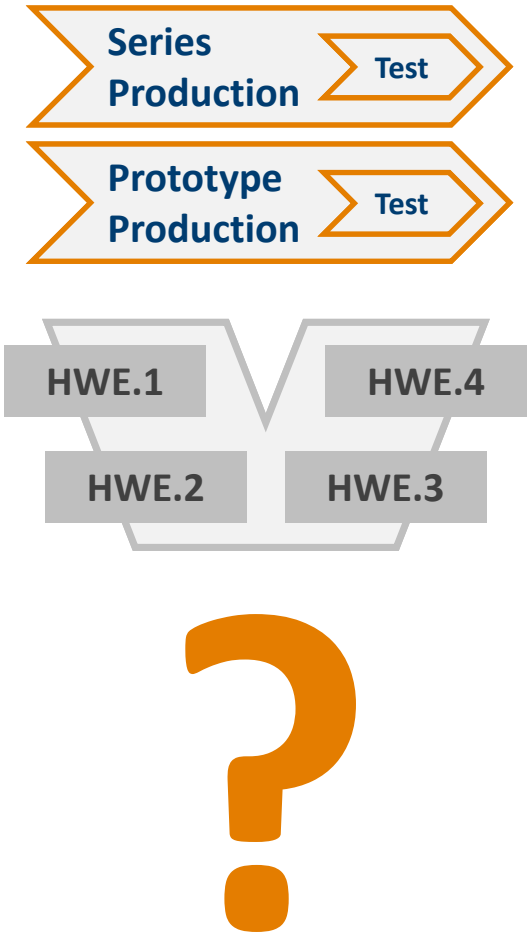
HW-SPICE – **Fehlt da was?**



→ HW-Eigenschaften

→ Kein Produktions-Prozess

→ **Herstellbarkeit**

→ HW-Samples

→ Schnittstelle HW-SW-ME

→ Synchronisation HW-SW-ME

→ Funktioniert, kann aber nicht produziert werden

→ Bauteile gibt es, sind aber nicht verfügbar

Welcher Prozess adressiert die **Herstellbarkeit**?

HW-SPICE – **Fehlt da was? … Herstellbarkeit**

Herstellbarkeit & Bauteilverfügbarkeit

werden als Aspekte der Systemarchitektur

betrachtet.

Sie müssen beim HW Design berücksichtigt

werden

HWE.2 – Hardware Design

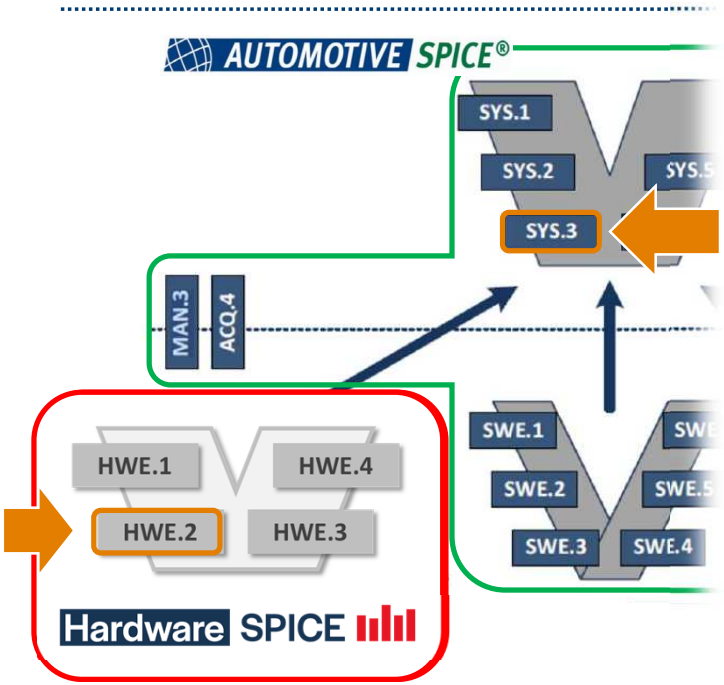
HWE.2.BP2: Develop hardware detailed design.
Develop a hardware detailed design based on components of the hardware architecture. Identify all hardware parts based on the related requirements. Describe the detailed design for intended hardware variants. [OUTCOME 1, 2]
NOTE 8: Hardware design may be subject to constraints such as

- **availability of hardware parts on the market**
- hardware design rules, layout rules
- creepage and clearance distances
- compliance of HW parts with industry standards such as AEC-Q, REACH

HWE.2.BP6: Evaluate the hardware architecture and the hardware detailed design.
Analyse and evaluate the hardware architecture and detailed design against defined quantitative or qualitative criteria, including risks, **manufacturability**, and verifiability. Identify special characteristics. [OUTCOME 5, 9]

Rating Rules
[HWE.2.RL.1] If manufacturability is not evaluated in the context of the indicator BP6, then **PA 1.1 shall be downrated**.

Quelle: Annex C: Proposals for ASPICE

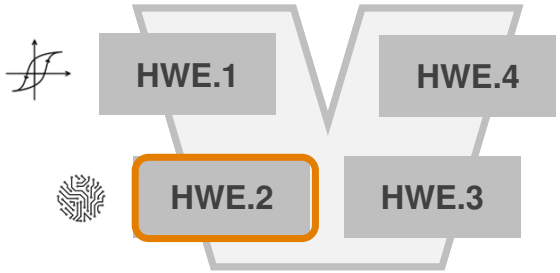


SYS.3 System Architectural Design

SYS.3.BP5: Evaluate alternative system architectures.
Define evaluation criteria for the architecture. Evaluate alternative system architectures according to the defined criteria. Record the rationale for the chosen system architecture. [OUTCOME 1]
NOTE 3: Evaluation criteria may include quality characteristics (modularity, maintainability, expandability, scalability, reliability, security realisation and usability) and results of make-buy-reuse analysis.
NOTE X: Evaluation criteria for system comprising hardware and mechanical elements may include aspects such as **manufacturability, availability of** mechanical and **hardware parts** etc.

Prozesse – HWE.2 HW Design

HWE.2



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HW-SPICE – **Fehlt da was? … Herstellbarkeit**

Evaluierung der Systemarchitektur

als **neue** Base Practice in ASPICE

SYS.3 System Architectural Design

Process Outcomes:

…

n) The system architecture is evaluated

…

SYS.3 BPx: Analyse system architecture.

Analyse the quantitative and qualitative aspects of the system architecture and evaluate them in terms of risks, **manufacturability**, and testability. [OUTCOME n]

NOTE X: For safety (comprising e.g. functional safety, electrical safety, safety of use) methods could be applied such as FMEA, FMECA, FTA, DFA.

NOTE Y: Examples for risk evaluation are

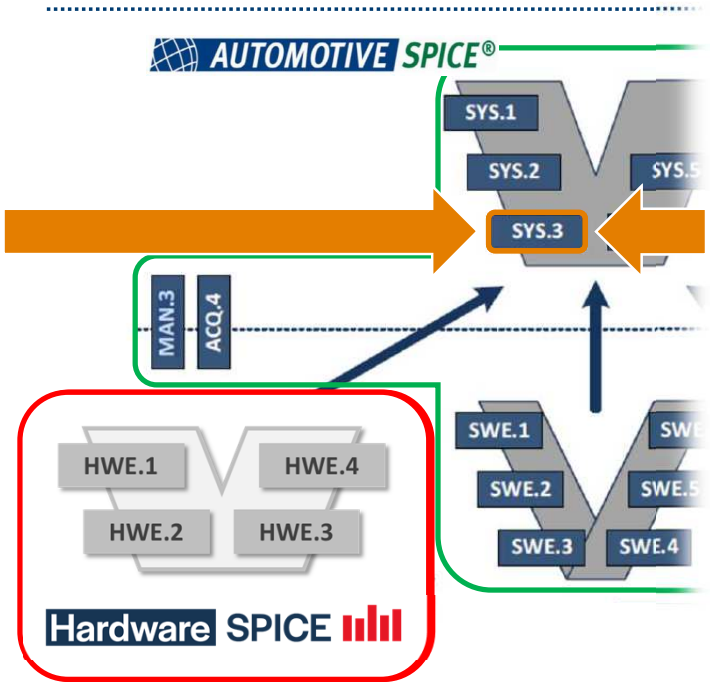
- prototype testing
- simulations such as Matlab/Simulink
- calculations such as WEIBULL, worst case analyses

NOTE W: Example for **manufacturability** are

- **evidence for conformity with production constraints**
- **evidence of availability for all system elements**
- **appropriate knowledge of production technology and their availability**

NOTE Z: Even in case of reuse of system elements, the suitability for the current application shall be evaluated.

Quelle: Annex C: Proposals for ASPICE



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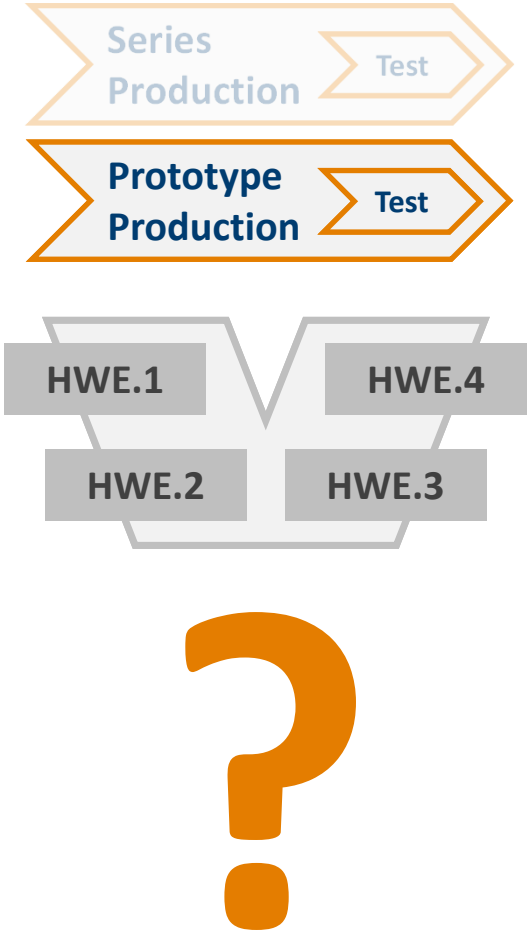
HW-SPICE – **Fehlt da was?**



→ HW-Eigenschaften

→ Kein Produktions-Prozess

→ Herstellbarkeit

→ **HW-Samples**

→ Schnittstelle HW-SW-ME

→ Synchronisation HW-SW-ME

→ HW-Samples spielen im Entwicklungsprozess eine große Rolle

→ Die Beschaffung stellt dabei oft einen zeitkritischen Faktor dar

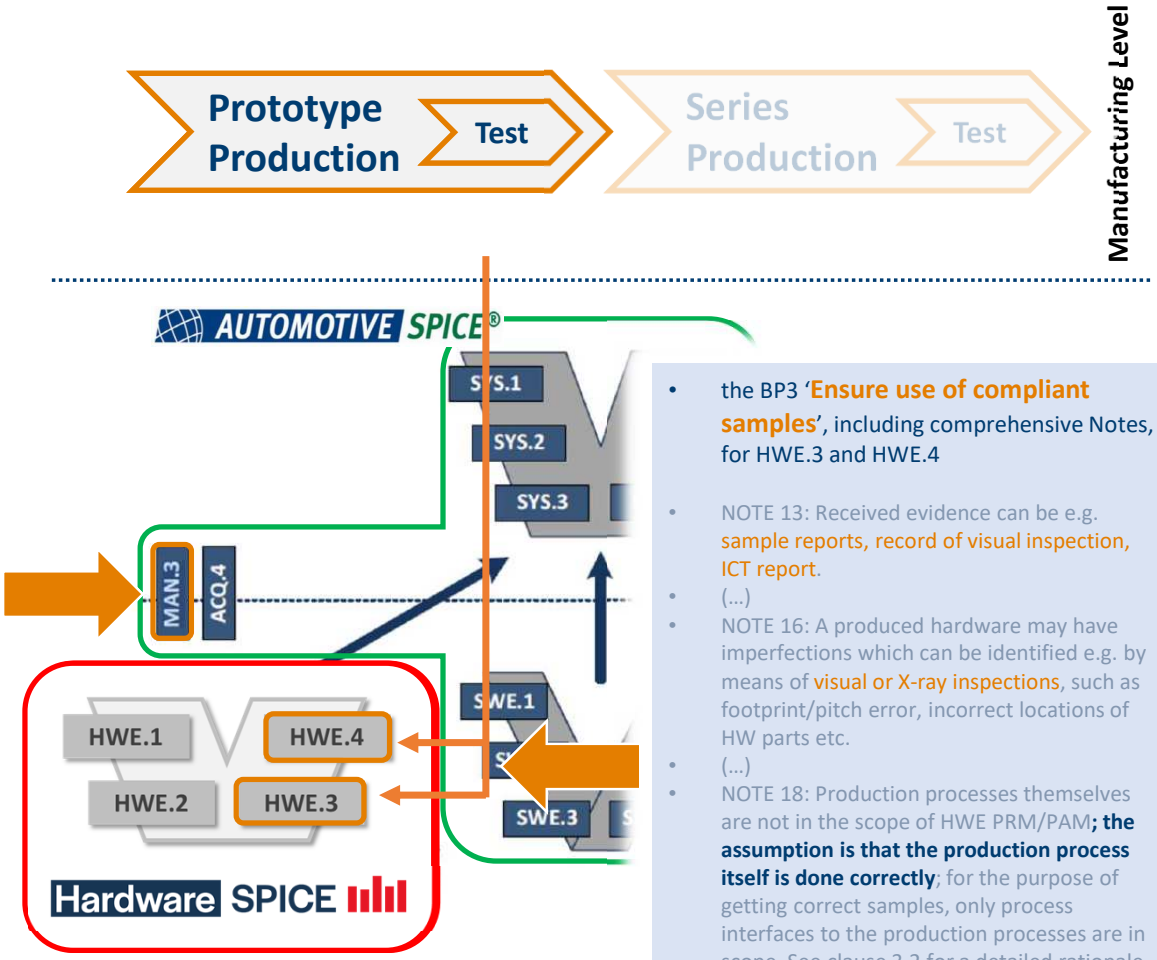
→ Falsch-positiv getestete Samples ziehen hohe Nachfolgekosten nach sich

Wie geht **Hardware SPICE** mit HW-Samples um?

HW-SPICE – **Fehlt da was? … HW-Samples**

Die Produktion liefert **Hardware Samples** zurück, deren Eignung sichergestellt werden muss.

Die Samples werden u.A. als **project resources** betrachtet und im MAN.3 Project Management behandelt.



- the BP3 '**Ensure use of compliant samples**', including comprehensive Notes, for HWE.3 and HWE.4
- NOTE 13: Received evidence can be e.g. sample reports, record of visual inspection, ICT report.
- (…)
- NOTE 16: A produced hardware may have imperfections which can be identified e.g. by means of visual or X-ray inspections, such as footprint/pitch error, incorrect locations of HW parts etc.
- (…)
- NOTE 18: Production processes themselves are not in the scope of HWE PRM/PAM; **the assumption is that the production process itself is done correctly**; for the purpose of getting correct samples, only process interfaces to the production processes are in scope. See clause 3.2 for a detailed rationale.

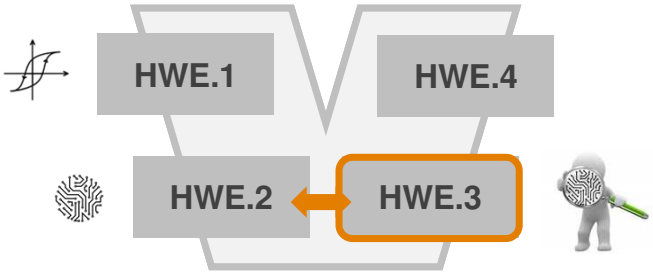
MAN.3 Project Management

MAN.3.BP5: Define, monitor and adjust project estimates and resources.
Define, monitor and adjust project estimates of effort and resources based on project's goals, project risks, motivation and
boundaries. [OUTCOME 2, 3, 7]
NOTE 4: Appropriate estimation methods should be used.
NOTE 5: Examples of necessary resources are people, infrastructure (such as tools, test equipment, communication mechanisms...) and mechanical and hardware samples, and materials for e.g. stakeholder needs and own development and testing purposes.
NOTE 6: Project risks (using MAN.5) and quality criteria (using SUP.1) may be considered.
NOTE 7: Estimations and resources typically include engineering, management and supporting processes.

Quelle: Annex C: Proposals for ASPICE

Prozesse – HWE.3 Verification against HW Design

HWE.3



Base Practices

→ HWE.3.BP1: Develop a strategy for the verification against **hardware design**.

→ HWE.3.BP2: Develop specification for the verification against **hardware design**.

→ HWE.3.BP3: Ensure use of compliant samples.

→ HWE.3.BP4: Select verification measures.

→ HWE.3.BP5: Verify **hardware design**.

→ HWE.3.BP6: Establish bidirectional traceability.

→ HWE.3.BP7: Ensure consistency.

→ HWE.3.BP8: Summarise and communicate results.

Work Products

→ 08-HW01 Verification plan

→ 08-HW02 Verification specification

→ 13-01 Acceptance record

→ 13-04 Communication record

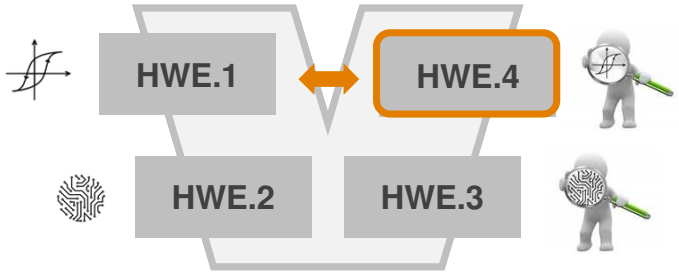
→ 13-19 Review record

→ 13-22 Traceability record

→ 13-HW01 Verification result

Prozesse – HWE.4 Verification against HW Requirements

HWE.4



Base Practices

→ HWE.4.BP1: Develop a strategy for the verification against **hardware requirements**.

→ HWE.4.BP2: Develop specification for the verification against **hardware requirements**.

→ HWE.4.BP3: Ensure use of compliant samples.

→ HWE.4.BP4: Select verification measures.

→ HWE.4.BP5: Verify **hardware.**

→ HWE.4.BP6: Establish bidirectional traceability.

→ HWE.4.BP7: Ensure consistency.

→ HWE.4.BP8: Summarise and communicate results.

Work Products

→ 08-HW01 Verification plan

→ 08-HW02 Verification specification

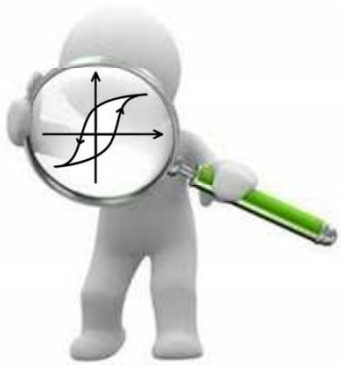
→ 13-01 Acceptance record

→ 13-04 Communication record

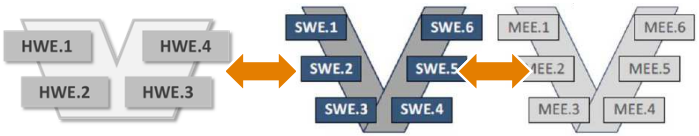
→ 13-19 Review record

→ 13-22 Traceability record

→ 13-HW01 Verification result



HW-SPICE – **Fehlt da was?**



→ HW-Eigenschaften

→ Kein Produktions-Prozess

→ Herstellbarkeit

→ HW-Samples

→ **Schnittstelle HW-SW-ME**

→ Synchronisation HW-SW-ME

→ Hardware <-> Mechanik

→ Hardware <-> Software

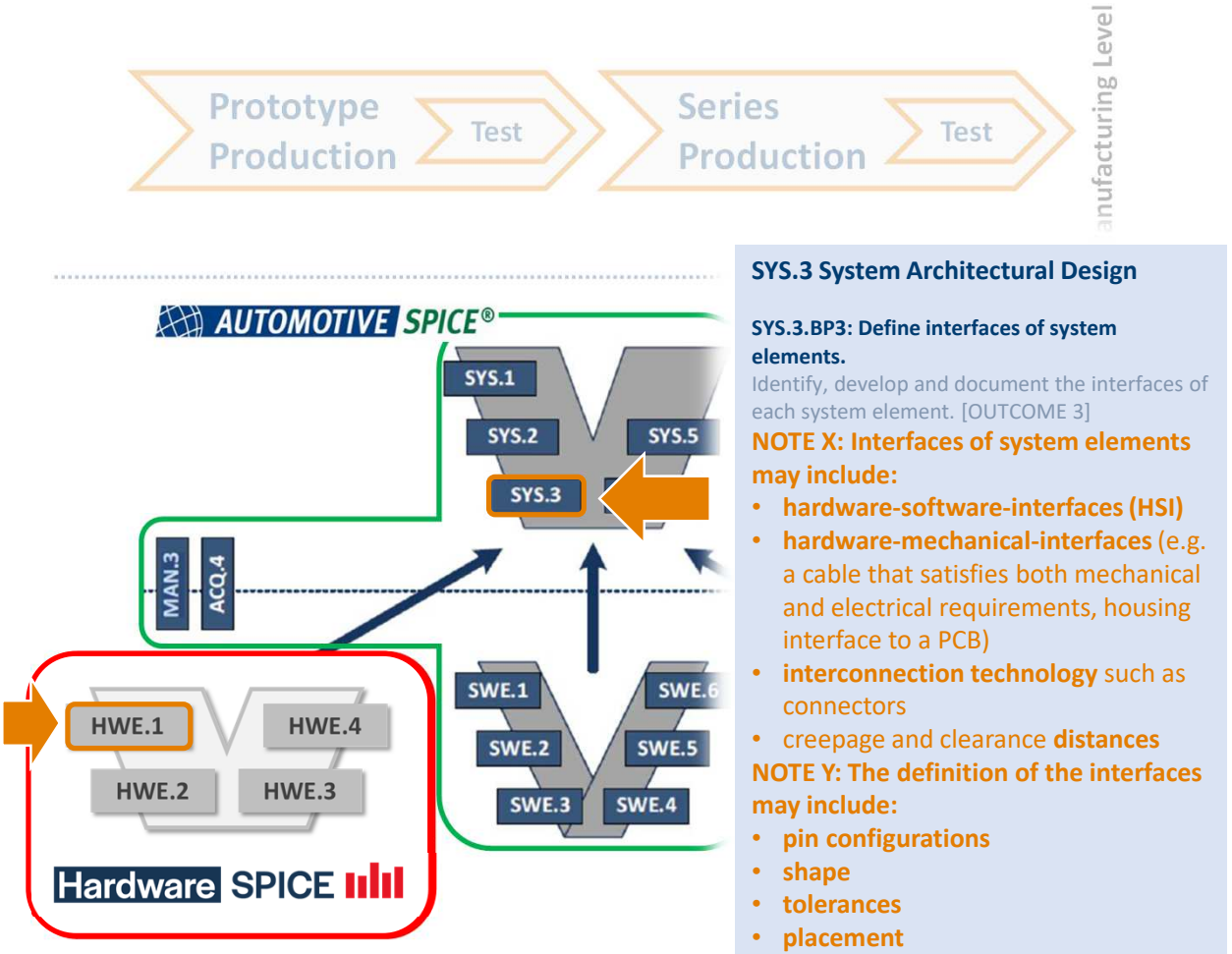
Wie bildet **Hardware SPICE** die Schnittstellen zu SW und ME ab?

HW-SPICE – **Fehlt da was? … Schnittstelle HW-SW-ME**

HW-SW-ME-Interfaces werden als

Interfaces of System Elements betrachtet.

In der HW-Requirements Analyse werden die Auswirkungen der HW-Anforderungen analysiert.



HWE.1 – Hardware Requirements Analysis

HWE.1.BP4: Analyse the impact on the operating environment.
Analyse the impact that the hardware requirements will have on interfaces of the system elements and the operating environment. [OUTCOME 3, 7]

NOTE 11: Aspects of the operation environment may be e.g.

- **the mounting space and position**
- temperature
- humidity
- **mechanical stress**
- EMC/EMI, or ESD

NOTE 12: Interfaces to the system elements may be e.g.

- connector, cable harness, optical/illumination, voltage/currents, power supply, heat dissipation

The system level (e.g. SYS.3 in Automotive SPICE®) is responsible for deciding on the connection technology of the interfaces of system elements (crimping, soldering, pressing, etc.).

SYS.3 System Architectural Design

SYS.3.BP3: Define interfaces of system elements.
Identify, develop and document the interfaces of each system element. [OUTCOME 3]

NOTE X: Interfaces of system elements may include:

- **hardware-software-interfaces (HSI)**
- **hardware-mechanical-interfaces** (e.g. a cable that satisfies both mechanical and electrical requirements, housing interface to a PCB)
- **interconnection technology** such as connectors
- creepage and clearance **distances**

NOTE Y: The definition of the interfaces may include:

- **pin configurations**
- **shape**
- **tolerances**
- **placement**

Quelle: Annex C: Proposals for ASPICE

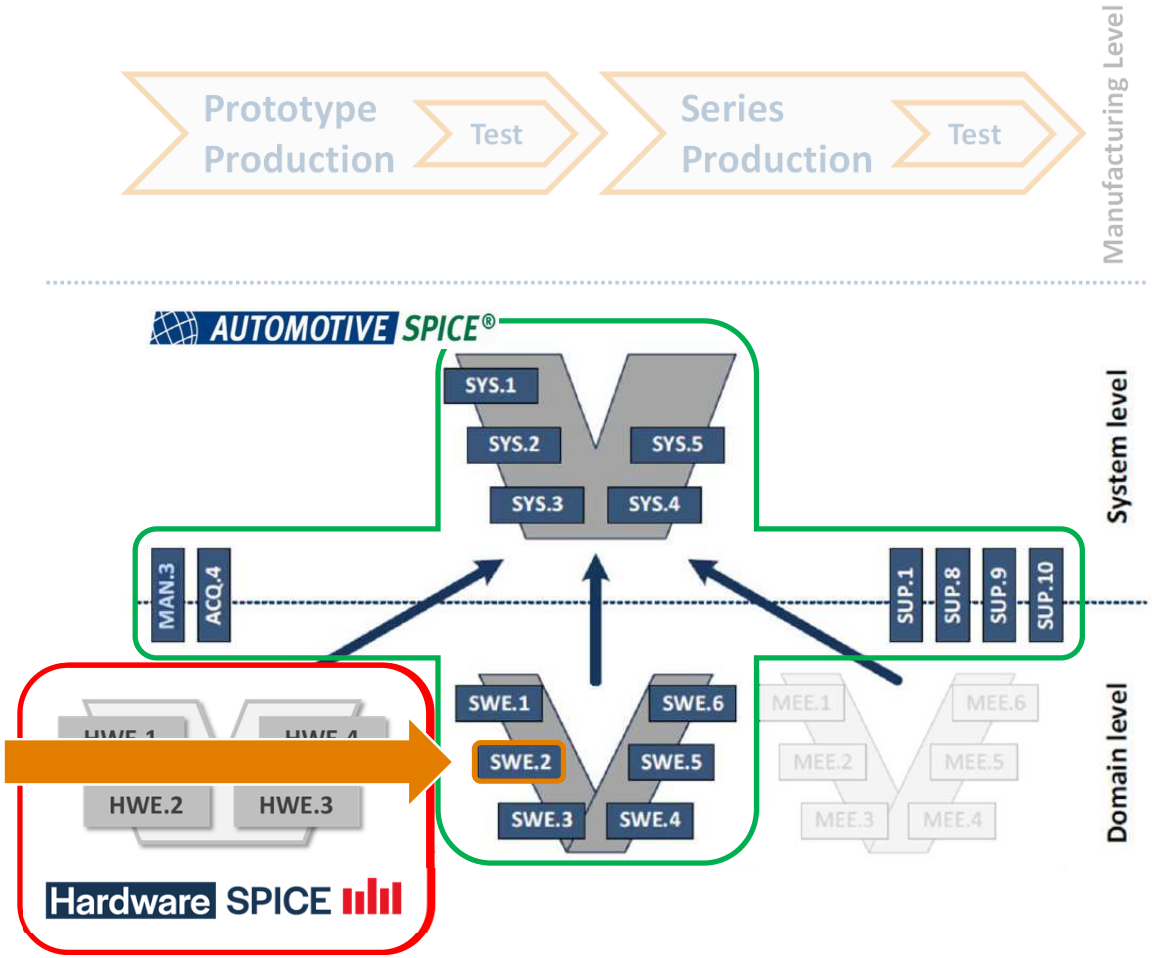
HW-SPICE – **Fehlt da was? … Schnittstelle HW-SW-ME**

HW-SW-Interfaces

werden auch als

Interfaces of System Elements

betrachtet



SWE.2 Software Architectural Design

SWE.2.BP3: Define interfaces of software elements.
Identify, develop and document the interfaces of each software element. [OUTCOME 3]
NOTE X: The hardware-software-interface (HSI) definition also relates to the hardware design. Refer to Automotive SPICE® SYS.3.

Quelle: Annex C: Proposals for ASPICE

HW-SPICE – **Fehlt da was? … Schnittstelle HW-SW-ME**

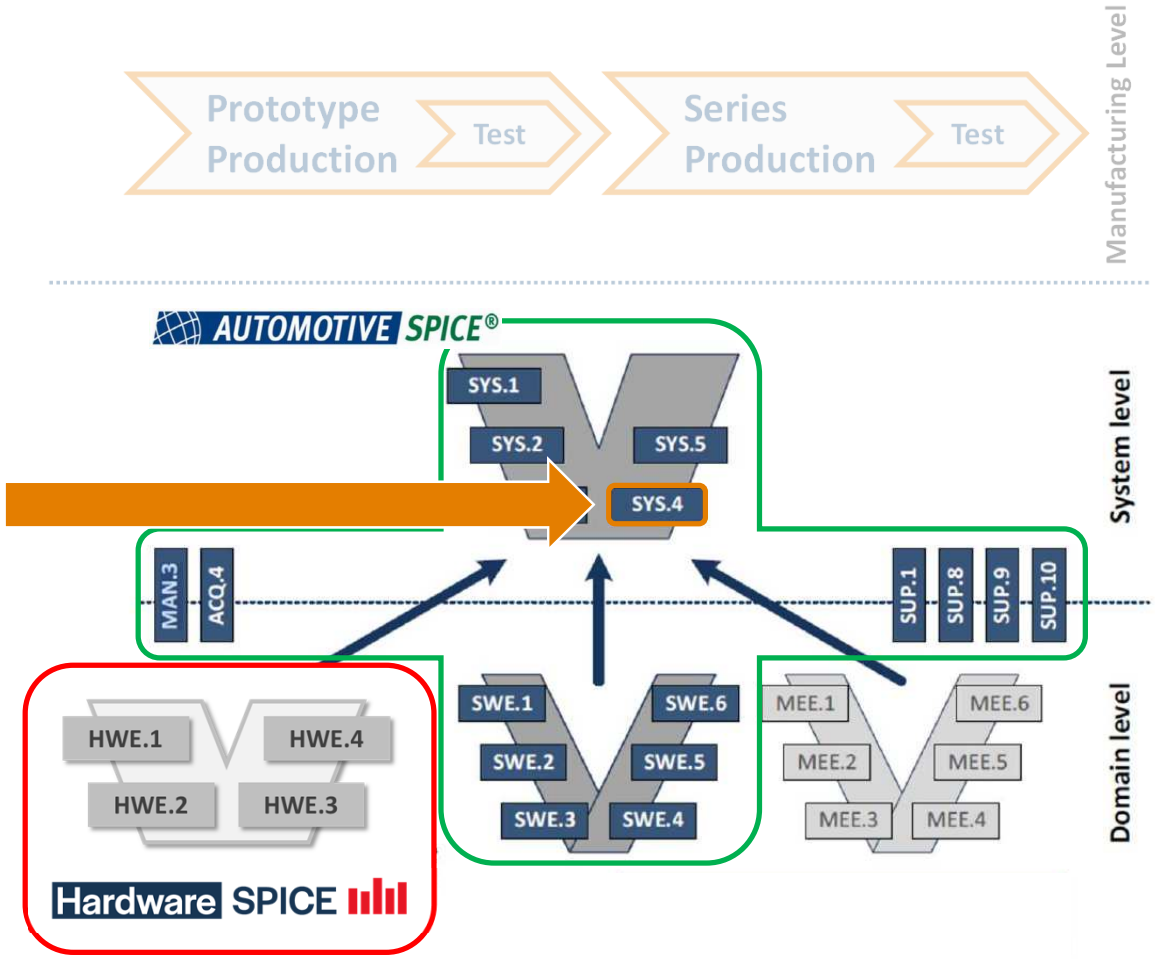
Tests von HW-SW-Interfaces und HW-ME-Interfaces finden auf System-Ebene statt

SYS.4 System Integration Testing

'SYS.4.BP3: Develop specification for system integration test.
(…)
NOTE 1: The interface descriptions between system elements are an input for the system integration test cases. **This includes e.g. hardware-software-interfaces (such as connector pin configurations), mechanical-hardware interfaces (such as mechanical dimensioning, positioning of connectors, positioning of a hall sensor in relation to the bus-bar, tolerances), and mechanical interfaces (e.g. tolerances, shape).**
(…)
NOTE 3: The **system integration test cases** may focus on
- the correct signal flow between system items
- the timeliness and timing dependencies of signal flow between system items
- the correct interpretation of signals by all system items using an interface
- the dynamic interaction between system items
- **thermal/environmental testing, lifetime/robustness testing, and EMC testing (as hardware and the housing is necessary here)**
- **interactions between hardware and software, e.g. floating IOs for µCs/MOSFETs etc.**

NOTE 4: The system integration test may be supported using simulation of the environment (e.g. Hardware-in-the-Loop simulation, vehicle network simulations, digital mock-up).'

Quelle: Annex C: Proposals for ASPICE



HW-SPICE – Fehlt da was? … Schnittstelle HW-SW-ME

HW-Interfaces

WPC 17-08 Interface requirements specification

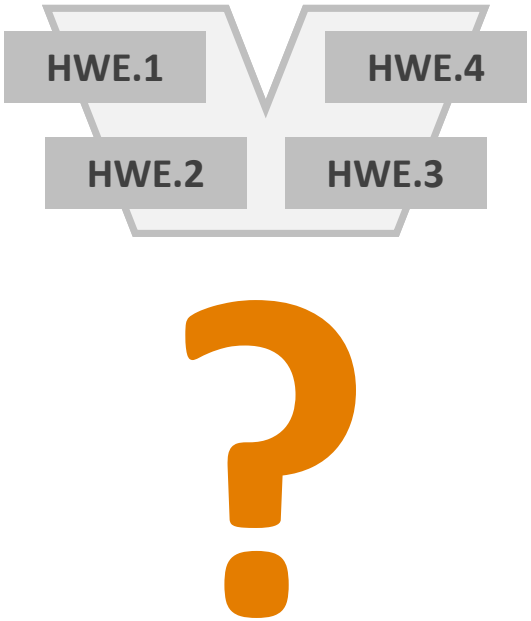
- Defines relationships between two products, process or process tasks
- Defines criteria and format for what is common to both
- Defines critical timing dependencies or sequence ordering
- Description of the physical interfaces of each system component like:
  - bus interfaces (CAN, MOST, LIN, Flexray etc.)
  - transceiver (type, manufacturer, etc.)
  - analogue interfaces
  - digital interfaces (PWM, I/O)
  - additional interfaces (IEEE, ISO, Bluetooth, USB, etc.)
  - **pin configuration**
  - **connectors, cables, mounting position & space, case/housing**
  - **optical interfaces**
  - **electromagnetic interfaces**
  - **thermal interfaces**
- Identification of the software interfaces of software components and other software item in terms of:
  - inter-process communication mechanisms
  - bus communication mechanisms
- Identification of the hardware interfaces between hardware components in terms of:
  - **electrical interconnections (e.g. voltage supply, SPI, I2C)**
  - **thermal interfaces**

Quelle: Annex C: Proposals for ASPICE

VDA QMC AUTOMOTIVE SPICE®

WP ID	WP Name	WP Characteristics
		• Intended audience defined • Identification of supported hardware/software/product release, system information • Identification of associated hardware/software/product requirements and designs satisfied by document • Identification of style, format, media standards expected definition of the intended distribution requirement • Includes storage requirements
17-08	Interface requirements specification	• Defines relationships between two products, process or process tasks • Defines criteria and format for what is common to both • Defines critical timing dependencies or sequence ordering • Description of the physical interfaces of each system component like: - bus interfaces (CAN, MOST, LIN, Flexray etc.) - transceiver (type, manufacturer, etc.) - analogue interfaces - digital interfaces (PWM, I/O) - additional interfaces (IEEE, ISO, Bluetooth, USB, etc.) • Identification of the software interfaces of software components and other software item in terms of: - inter-process communication mechanisms - bus communication mechanisms
17-11	Software requirements specification	• Identifies standards to be used • Identifies any software structure considerations/constraints • Identifies the required software elements • Identifies the relationship between software elements

HW-SPICE – **Fehlt da was?**



→ HW-Eigenschaften

→ Kein Produktions-Prozess

→ Herstellbarkeit

→ HW-Samples

→ Schnittstelle HW-SW-ME

→ **Synchronisation HW-SW-ME**

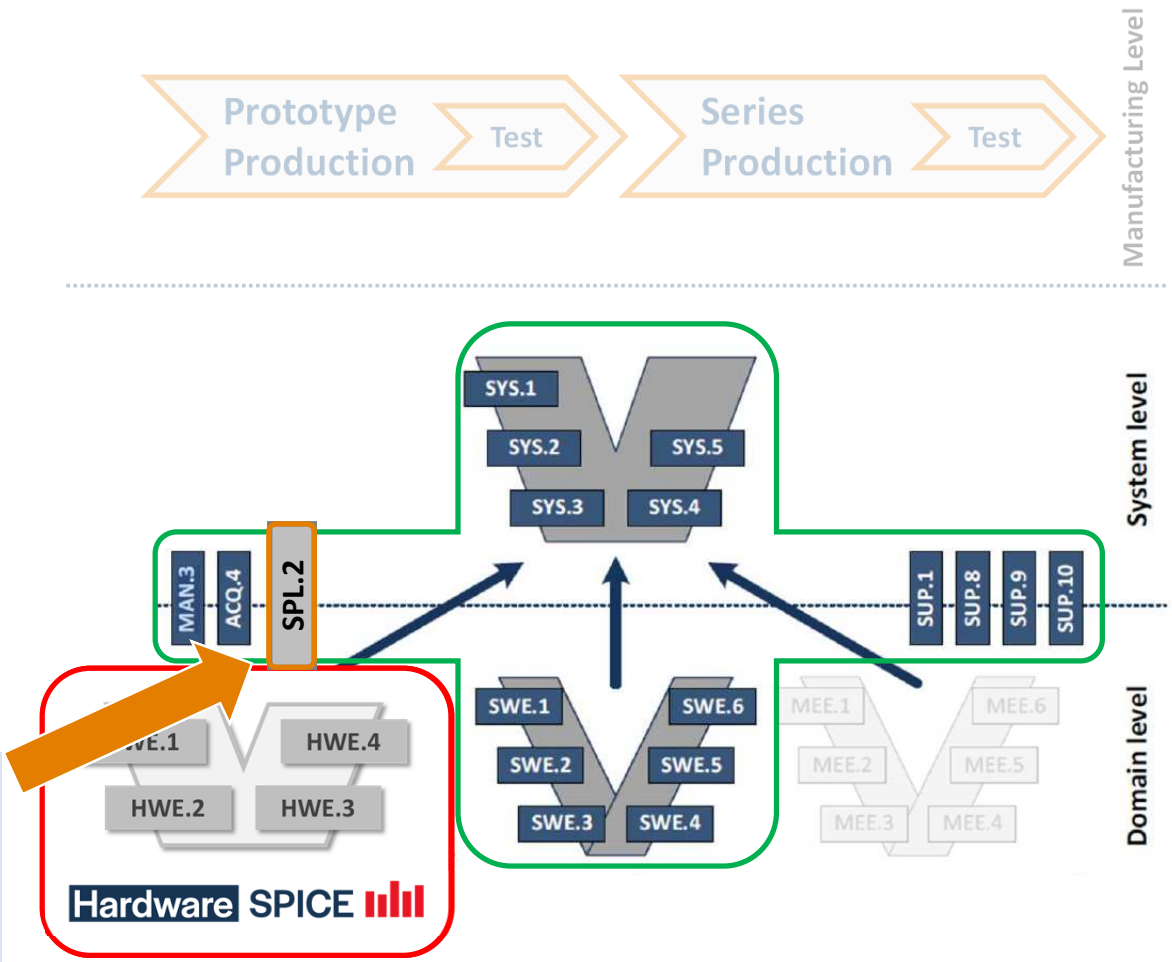
→ Hardware, Software und Mechanik müssen kompatibel sein

→ Hardware-, Software- und Mechanik-Enwicklung müssen zeitlich aufeinander abgestimmt sein

Wie bildet **Hardware SPICE** die Planung von Versionen ab?

HW-SPICE – **Fehlt da was? … Synchronisation HW-SW-ME**

Die Alignment von Hardware-, Software- und Mechanik-Versionen wird u.a. in der Releaseplanung gesehen.

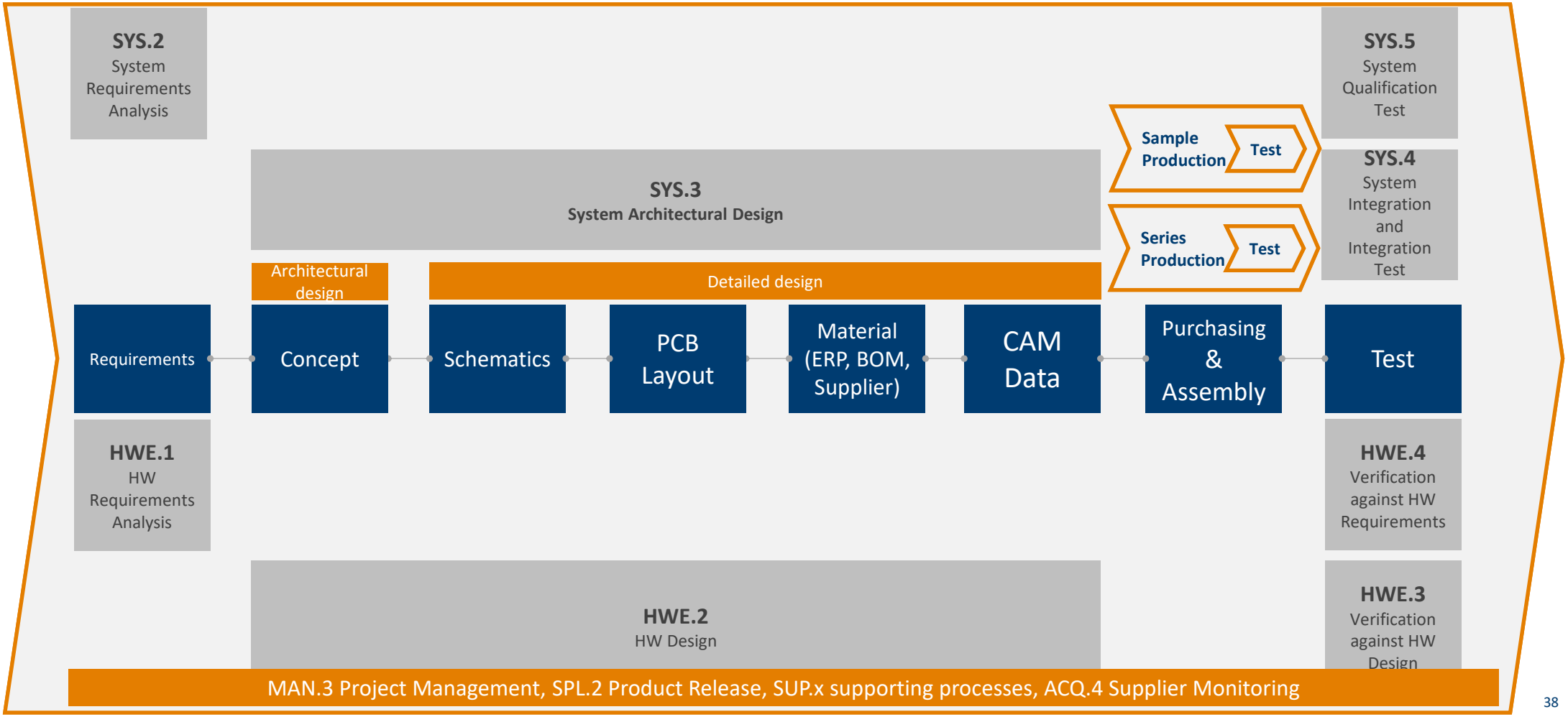


SPL.2 Product Release

SPL.2 BP1: Define the functional content of releases.
Establish a plan for releases that identifies the functionality to be included in each release. [OUTCOME 1, 3]
NOTE 1: The plan should point out **the configuration and the compatibility of mechanical, hardware, software elements, and** which application parameters influencing the identified functionality are effective for which release.

Quelle: Annex C: Proposals for ASPICE

Prozess – **HW Entwicklungs-Prozess – Mapping zu Hardware SPICE + ASPICE**



Assessments – **Assessmentdurchführung**

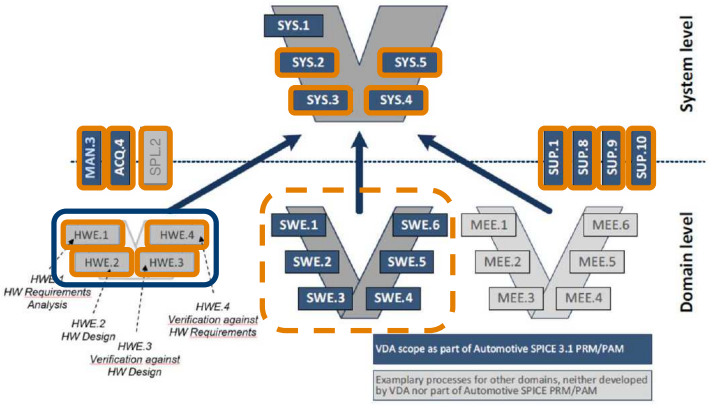


Figure 2 – Sketch of the plug-in concept, based on the corresponding Figure in [19]

Variante 1: allein stehend

→ Es werden ausschließlich die HWE.x Prozesse assessiert

→ Referenzen zu Automotive SPICE® müssen nicht berücksichtigt werden

→ Fokus nur auf das HW Engineering

Variante 2: als Plug-In

→ Es wird ein Systemprojekt assessiert

→ Die in HW SPICE fehlenden Prozesse müssen aus Automotive SPICE® hinzugezogen werden (SYS, SPL, SUP, MAN, SWE)

→ Fokus auf das gesamte Projekt

Assessments – **Assessorenausbildung**

Schulungen

→ intacs™ Kurzschulung (ca. zwei Tage)

→ Prüfung und Zertifikat

→ Die Schulung setzt kein Zertifikat voraus, es sind aber Kenntnisse in Automotive SPICE® sehr ratsam

Zertifizierung

→ Es wird eine Zertifizierung zum HW SPICE Assessor geben

→ Die Zertifizierung zum intacs™ Certified Provisional Assessor oder höher ist Voraussetzung

Assessments

→ Um ein HW SPICE Assessment durchzuführen, muss ein Lead Assessor die Zertifizierung zum HW SPICE Assessor haben

→ Es wird empfohlen, dass die Co-Assessoren ebenfalls diese Zertifizierung vorweisen können

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… noch in Diskussion innerhalb intacs™ und Certification Body

Theorie und Praxis – **Vorteile der Einführung**

Welchen

Nutzen

verspricht die Verwendung

von HW-SPICE?

→ Prozess- und Produktqualität kann ganzheitlicher betrachtet werden (Holistic Engineering)

- → bessere Verzahnung von System, Hardware, Software und Mechanik über Prozesse und Arbeitsergebnisse
- → höhere Transparenz der Prozessqualität durch mögliche Assessments
- → verbesserte Produktqualität durch Traceability

→ Die Disziplinen Hardware, Software und Mechanik erhalten eine gemeinsame Sprache, der „Culture Clash“ wird kleiner

→ Die Einbindung in Prozessmanagement-Tools (z.B. Stages) ermöglicht eine bessere Verknüpfung zu Prozessen der anderen Disziplinen und die Durchführung von Compliance Checks

Die Anwendung unterstützt den Weg zur lernenden Organisation

Ihre Fragen