

VDA QMC

德国汽车工业协会
质量管理中心中国分公司
CHINA

Pocket Guide / 袖珍指南

VDA Volume 5 Measurement and inspection processes

VDA 5 测量和检验过程

Innovations and improvements in the new, 3rd edition, 2021

2021 年第 3 版的创新与改进



The new VDA Volume 5

More precise, transparent, and more easily applicable

For this new edition, our focus has been on clear definitions, cost optimization and a sensible, target-oriented use of the methods.

This has for example been achieved thanks to a risk-based approach and by giving greater consideration to minimum requirements and the description of roles.

The new VDA 5 methodology is now much more comprehensible!

You will see: there is no contradiction between inspection process capability and profitability.

Further features and improvements as well as the new training concept are briefly described on the following pages.

You can order VDA Volume 5 by mailing to:

booksales@vdachina.com.cn

新版 VDA 5

更精确、透明，且更易于应用

这个新版本重点在于明确的定义、成本优化和合理的、目标导向的方法使用。

例如，这要归功于采用了基于风险的方法以及更多地考虑了最低要求和角色描述。

现在，新版 VDA 5 所述的方法更易于理解！

您将发现检验过程能力与盈利能力之间不存在任何矛盾。

接下来的页面简述了更多功能和改进情况以及新的培训理念。

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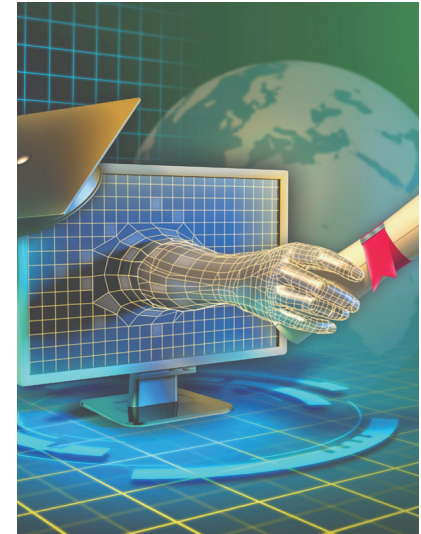
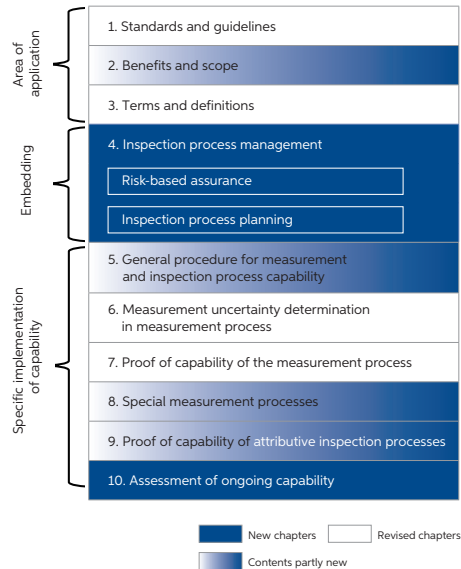
展望：“VDA 5.x” 31

Better applicability

New chapter structure
in VDA Volume 5 (Red Volume)

With supplementary practical handbook
with examples for implementation

New training concept for users
and auditors

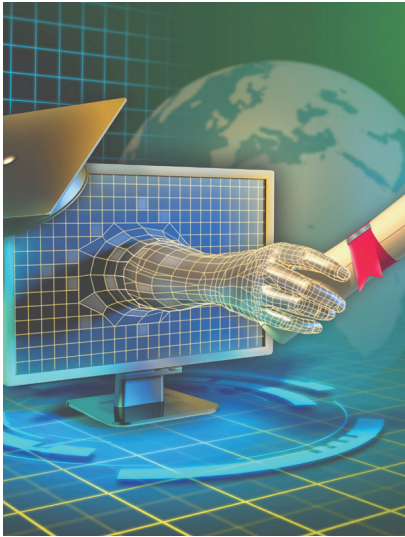
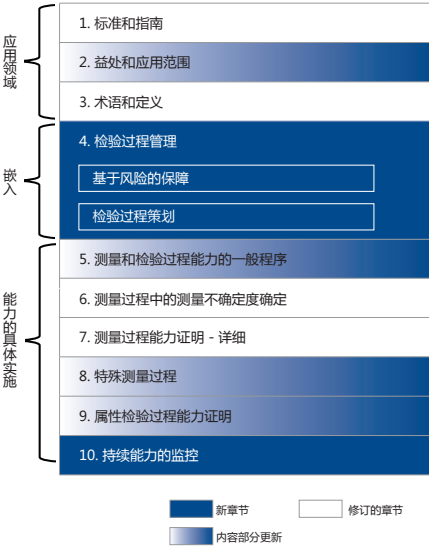


更好的适用性

VDA 5（红皮书）中新的章节结构

附有补充实用性手册及实施示例

针对用户和审核员的新培训理念



VDA 5 第 2 版和第 3 版的章节比较

Synchronization with norms and standards

<p>Consideration of GUM – ISO/IEC Guide 98-3 (Guide to the expression of Uncertainty in Measurement)</p>	<p>Consideration of the pending revision DIN ISO 22514-7 Statistical methods in process management Part 7: Capability of measurement processes</p>	<p>Consideration of DIN EN ISO 14253-1 Decision rules for verifying conformity or nonconformity with specifications</p>	<p>Comparison and reconciliation with VDI/VDE 2600, 1-3 Inspection process management - Identification, classification and proof of suit- ability for inspection processes</p>
<p>Replacement of the “Measurement system capability” reference manual of the automotive industry</p>	<p>Consideration of DIN EN ISO 15530-3 Geometrical product specifications (GPS) - Part 3: Use of calibrated workpieces or measurement standards</p>	<p>Intensive exchange with the Federal Institute of Physics and Metrology (“Physikalischen-Technischen Bundesanstalt”, (PTB))</p>	<p>Consideration of DIN ISO 31000 by inclusion of risk-based assurance</p>
<p>Strategies for harmonization with AIAG regarding Core Tool MSA (4th edition)</p>	<p>Proposed amendment to the current version of IATF 16949, chapter 7.1.5.3.2 External laboratories</p>	<p>Comparison and reconciliation with DIN EN ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories</p>	<p>Synchronization with ISO 7870- 8 Control charts - Part 8: Charting techniques for short runs and small mixed batches</p>

与规范和标准同步

<p>考虑事项</p> <p>GUM – ISO/IEC Guide 98-3 (测量不确定度表示指南)</p>	<p>待修订内容的考虑</p> <p>DIN ISO 22514-7 过程管理中的统计方法第 7 部分： 测量过程能力</p>	<p>考虑事项</p> <p>DIN EN ISO 14253-1 验证符合或不符合规范的 决策规则</p>	<p>比较与协调</p> <p>VDI/VDE 2600, 1-3 检验过程管理 - 检验过程适用性的 识别、分类和证明</p>
<p>代替汽车行业参考手册</p> <p>《测量系统能力》</p>	<p>考虑</p> <p>DIN EN ISO 15530-3 几何产品规范 (GPS) - 第 3 部分： 经校准的工件或测量标准的使用</p>	<p>与德国联邦物理技术研究所 ("Physikalischen-Technischen Bundesanstalt" (PTB)) 进行深入交流</p>	<p>考虑事项</p> <p>DIN ISO 31000 包含基于风险的保证</p>
<p>与 AIAG 的协调策略，涉及： 核心工具 MSA（第 4 版）</p>	<p>修改方案</p> <p>依据现行版本 IATF 16949， 第 7.1.5.3.2 章，外部实验室</p>	<p>比较与协调</p> <p>DIN EN ISO/IEC 17025 《检测和校准实验室能力的一般要 求》</p>	<p>与以下项目保持同步</p> <p>ISO 7870- 8 控制图 - 第 8 部分： 短期和小规模混合批次的制图技术</p>

Clear definition of measuring and inspecting

Measuring system

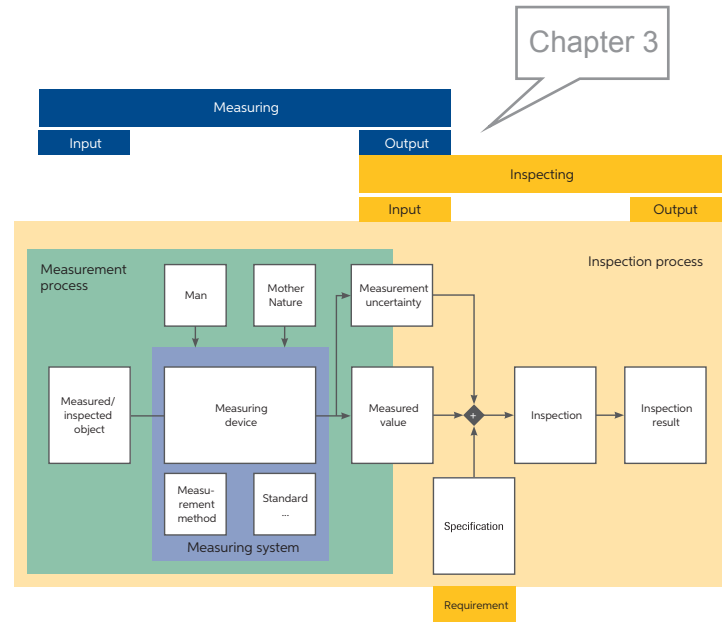
A combination of measuring devices and often other equipment and, where necessary, reagents and utilities arranged and adapted to provide information to obtain measured values within specified intervals for quantities of specified kinds.

Measurement process

Set of actions for determining a quantity value.

Inspection process

Performing an inspection and determining an inspection decision by comparing the result of a measurement process with a given specification with due consideration of the assessed measurement uncertainty.



Relationship between measuring system, measurement process and inspection process based on VIM and ISO 3534

测量和检验的明确定义

测量系统

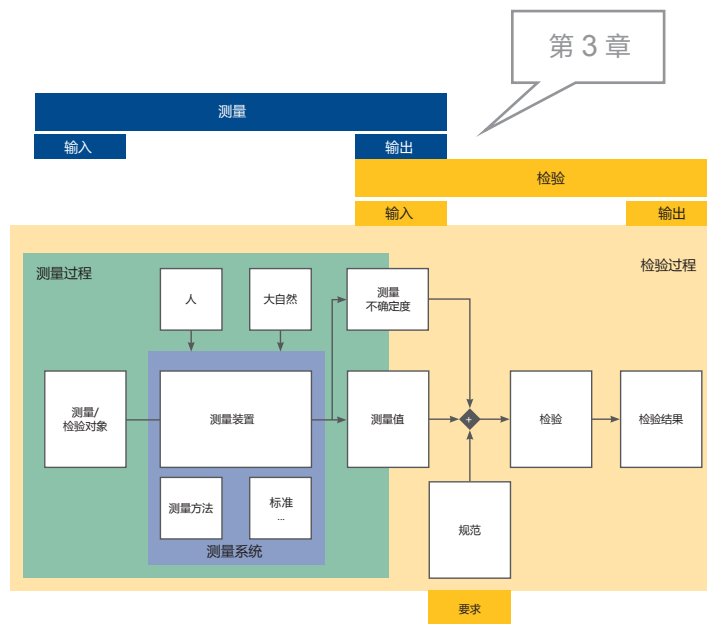
一种测量仪器的组合且通常包括其他设备，必要时还包括安排的试剂和设施，用以提供信息以在规定的区间内获得特定类型量的测量值。

测量过程

确定量值的一系列措施。

检验流程

通过将测量过程的结果与给定的规范进行比较来执行检验并确定检验评定，适当考虑评估测量不确定度。



基于 VIM 和 ISO 3534 的测量系统、测量过程与检验过程的关系

Risk based approach

Risk based assurance allows for a differentiated approach to inspection decisions by means of specifying risk classes. That way, economic requirements (among other things) are taken into consideration.

Chapter 4.3

Range of risk based assurance					
Risk class	No risk (1)	Low (2)	Medium (3)	High (4)	Highest risk (5)
Degree of assurance	Minimal assurance of inspection process capability	Risk based assurance of inspection process capability (matrix for determining level of assurance)			Highest assurance of inspection process capability
Supporting processes	Assistive devices, e.g., caliper gage of the maintenance department (no product information available)	Not relevant	Not relevant	Not relevant	Not relevant
Testing in the development and qualification phase	E.g., adjustment and assembly aids, if the characteristic is to be monitored at a later date using inspection equipment	Analysis of the basic data determination conditions	Data determination (not for approval)	Data as a basis for approvals, except in legal contexts	Release/type testing/ legal requirements
Development/ manufacture after start of production		Inspection, which is reconfirmed by higher level inspection equipment	Inspection characteristics which are not special characteristics	Special characteristic function sc/f*	Special characteristics Product Safety cc/s* and Law cc/h*
Quality inspection within the framework of the control plan/inspection plan					

*see VDA Volume "Process description covering special characteristics (SC)"

基于风险的方法

基于风险的保障允许采用差异性方法通过指定风险等级做出检验决定。则需将经济性要求（除了其他方面）考虑在内。

第 4.3 章

基于风险保障的范围

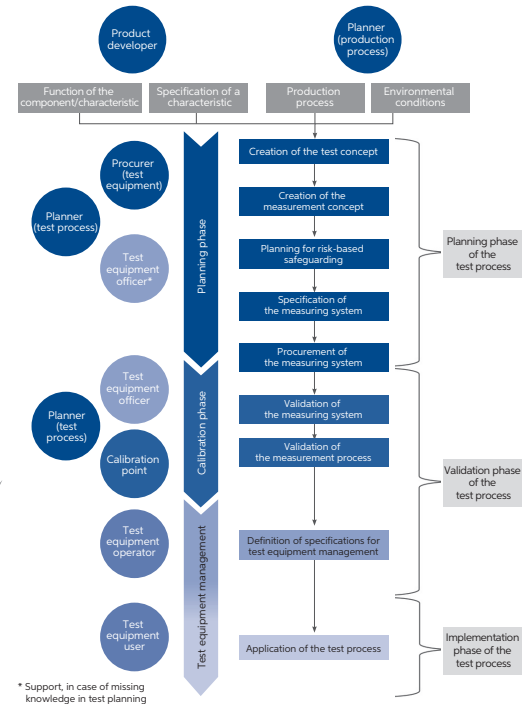
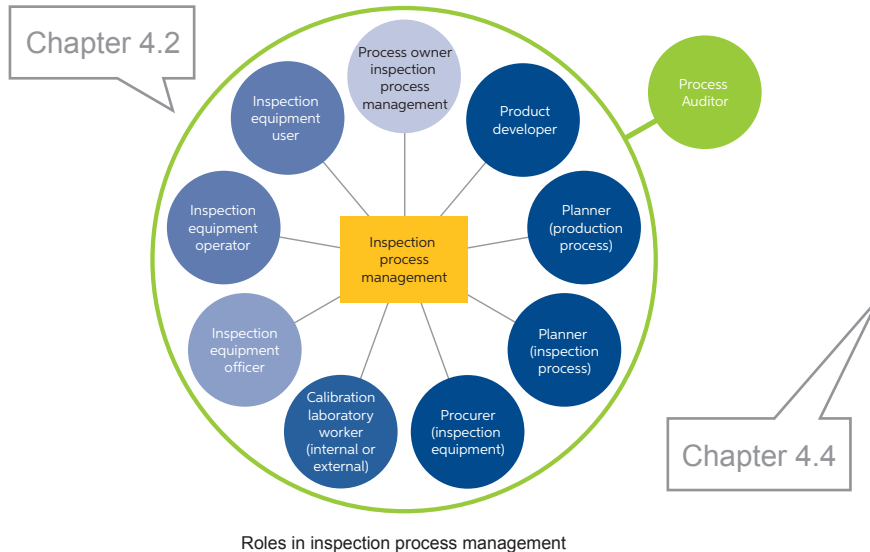
风险等级	没有风险 (1)	低 (2)	中 (3)	高 (4)	最高风险 (5)
保护程度	对检验过程能力 最低限度保护	基于风险保障的检验过程能力 (判定保障水平的矩阵)			检验过程能力的 最高保障
支持过程	辅助仪器， 例如：维修部门的卡尺 (没有产品信息可用)	不相关	不相关	不相关	不相关
开发和认证 阶段的试验	例如，如果在后期 要使用检验设备 监视特性， 调整和组装辅助工具	基本数据 分析确定条件	数据确定 (非批准)	数据作为 批准依据， 法律条文除外	放行/型式试验/ 法律要求
生产开始后的 开发/制造		由更高级 检验设备 再确认过的 检验	非特殊特性的 检验特性	特殊特性 (功能特性*)	特殊特性 (产品安全特性* 和法律特性*)
控制计划/检验计划框架内的质量检验					

*参见VDA指南《涵盖特殊特性（SC）的过程描述》

预先选择基于风险的保障的检验过程

Inspection process planning with defined roles

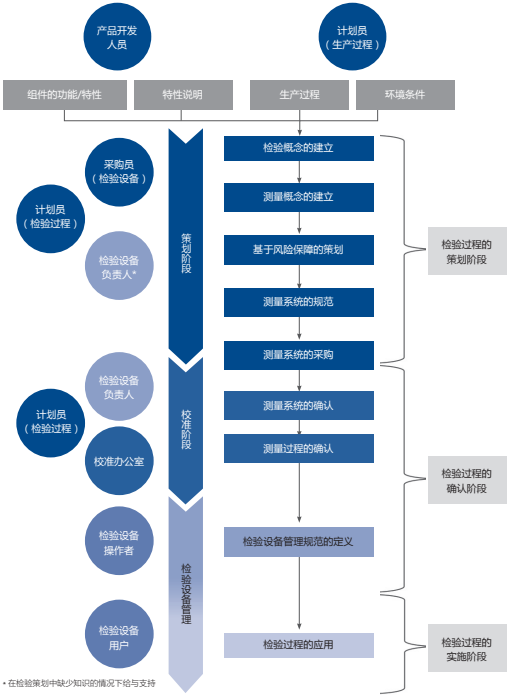
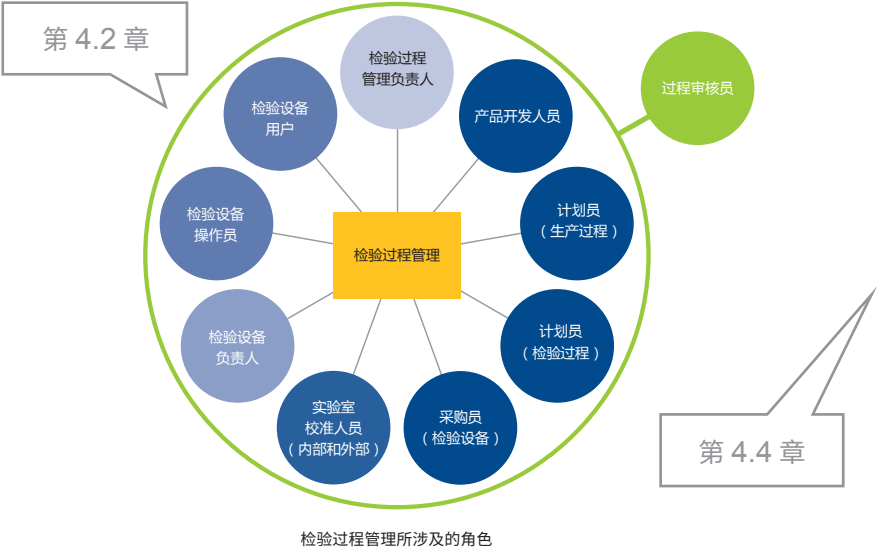
Inspection process planning is an important part of the product creation process and leads from the specification of a characteristic and proof of capability to a statement of conformity. In that regard, interdisciplinary collaboration between the relevant departments is required: For that purpose, the corresponding roles are defined and described.



Schematic sequence of inspection process planning

具有定义角色的检验过程策划

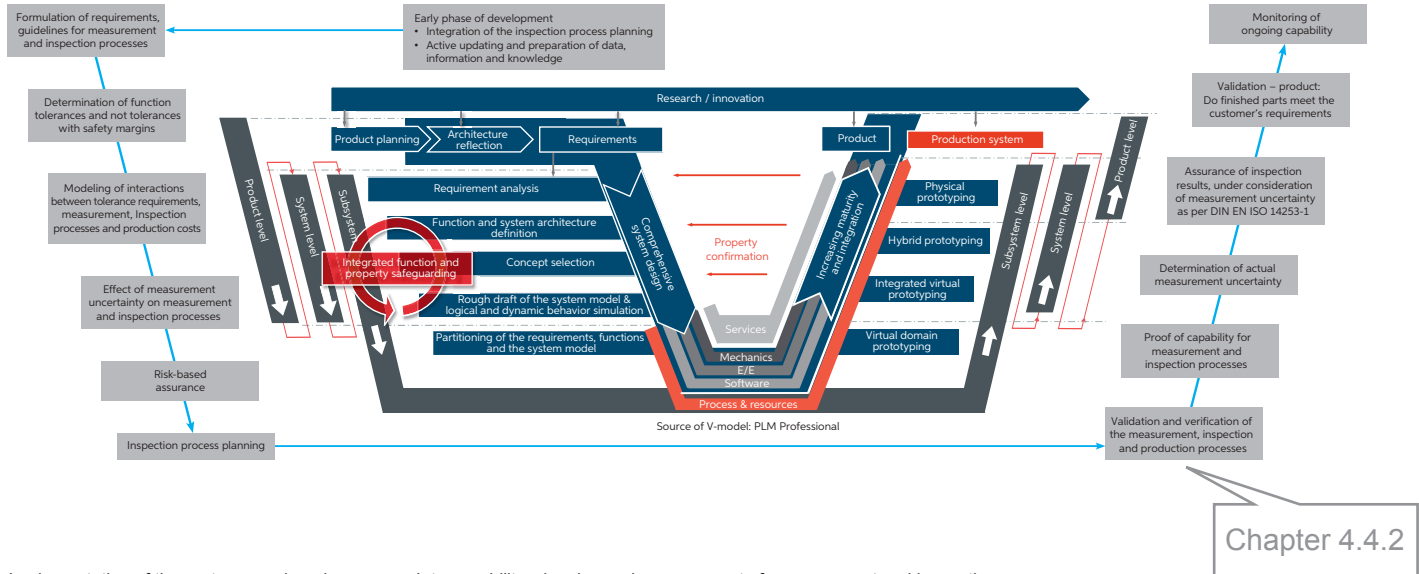
检验过程计划是产品创建过程的重要组成部分，并从特性的规范化和能力证明延伸到符合性声明。在这一点上，要求相关部门之间的跨学科合作：为此，对相应的角色进行定义和描述。



检验过程策划顺序示意图

Contribution to the systems engineering process

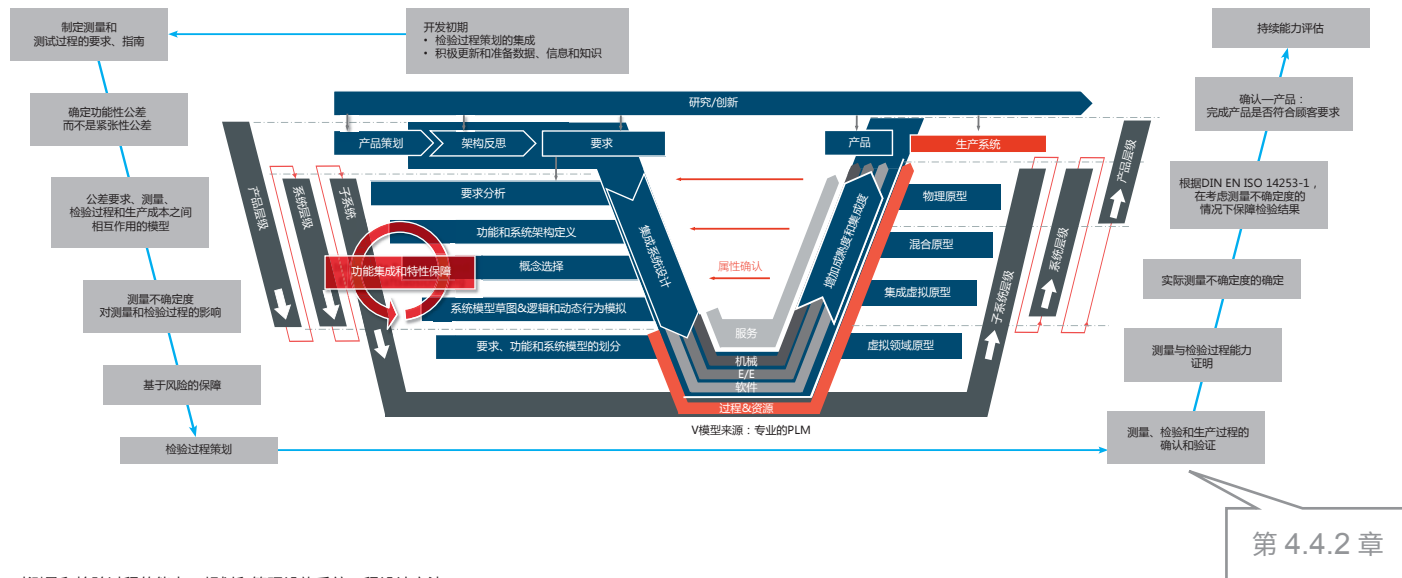
System engineering is a holistic approach for the development of complex and interconnected processes. By means of systematic structuring of the processes and early coordination between product development, production process planning and inspection process planning, capable measurement and inspection processes can be generated.



Implementation of the systems engineering approach to capability, planning and management of measurement and inspection processes

对系统工程过程的贡献

系统工程是开发复杂、相互联系的过程的整体方法。通过系统的过程结构和产品开发、生产过程策划和检验过程策划之间的早期协调，可形成有效的测量和检验过程。

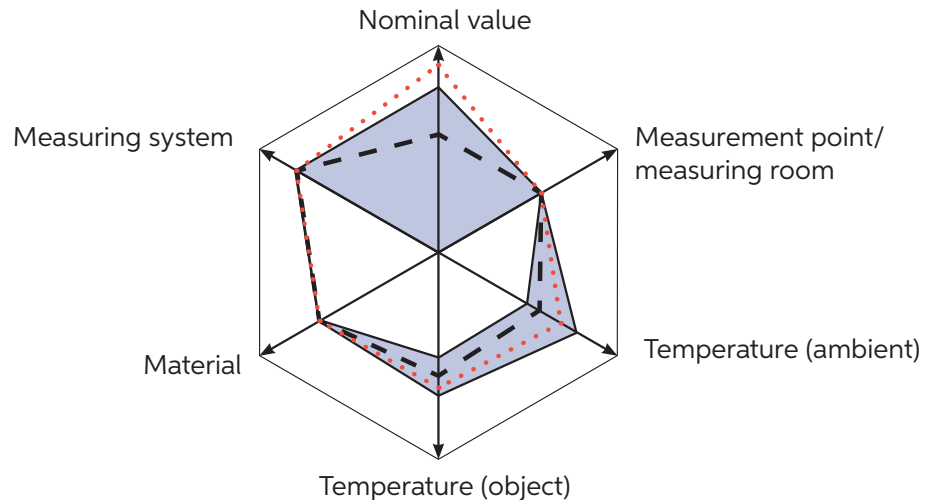


对测量和检验过程的能力、规划和管理设施系统工程设计方法

Transferability of proofs of capabilities

Under the assumption that there are no significant differences between the individual inspection processes regarding the uncertainty contributions, capability can be transferred if the boundary conditions are the same.

Transferability of proof of capabilities



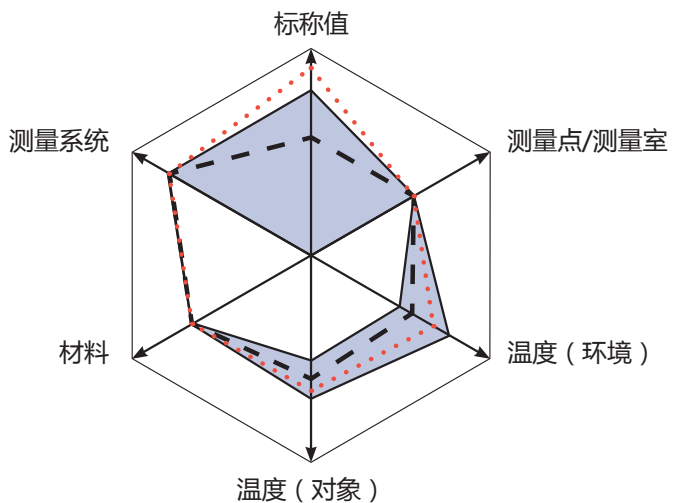
- Parameter range
- Measurement process 1
- Measurement process 2
- Not part of the parameter range

Spider's web diagram for variation of the input parameters

能力证明的可转移性

在各个检验过程之间不存在显著差异的假设下，参见不确定度所起到的影响，如果边界条件相同，则能力可能发生转移。

能力证明的可转移性



■ 参数范围

--- 测量过程 1

..... 测量过程 2

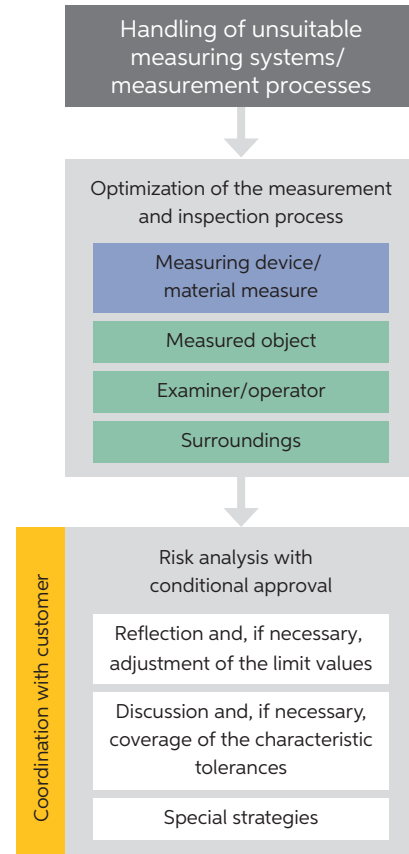
□ 不属于参数范围

输入参数变化的蛛网图

Handling of unsuitable measuring systems/ measurement processes

Various ways of dealing with unsuitable measuring systems or measurement processes are described in detail in individual chapters.

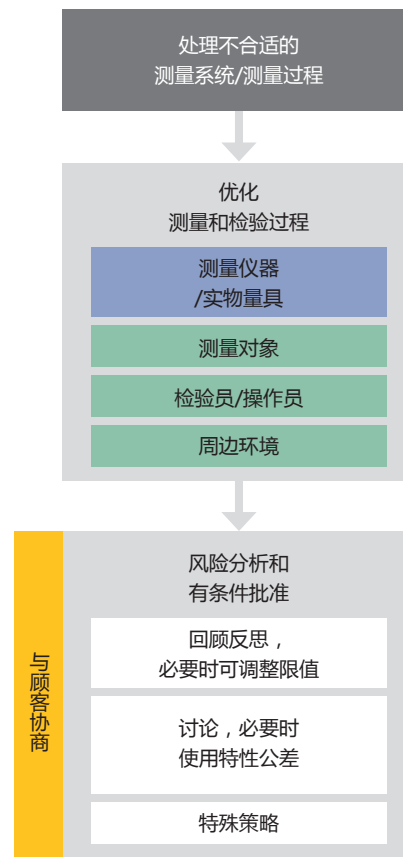
Chapter 7.4



不适合的测量系统 / 测量过程处理

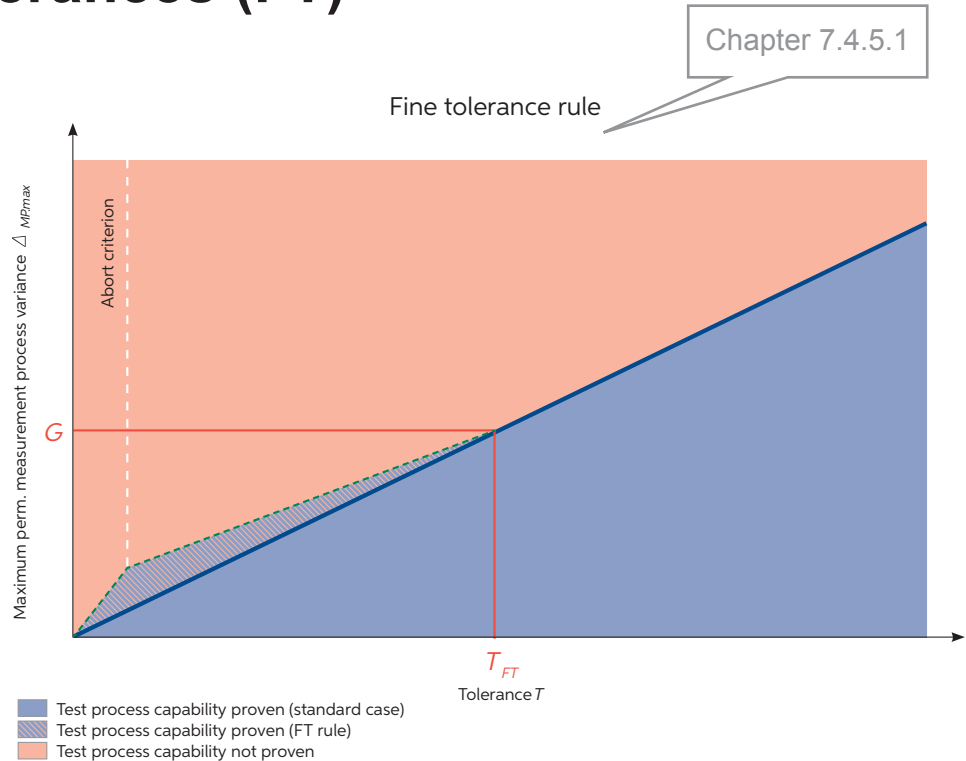
有关处理不适合测量系统或测量过程的各种方法，详见各章节内容。

第 7.4 章



Handling fine tolerances (FT)

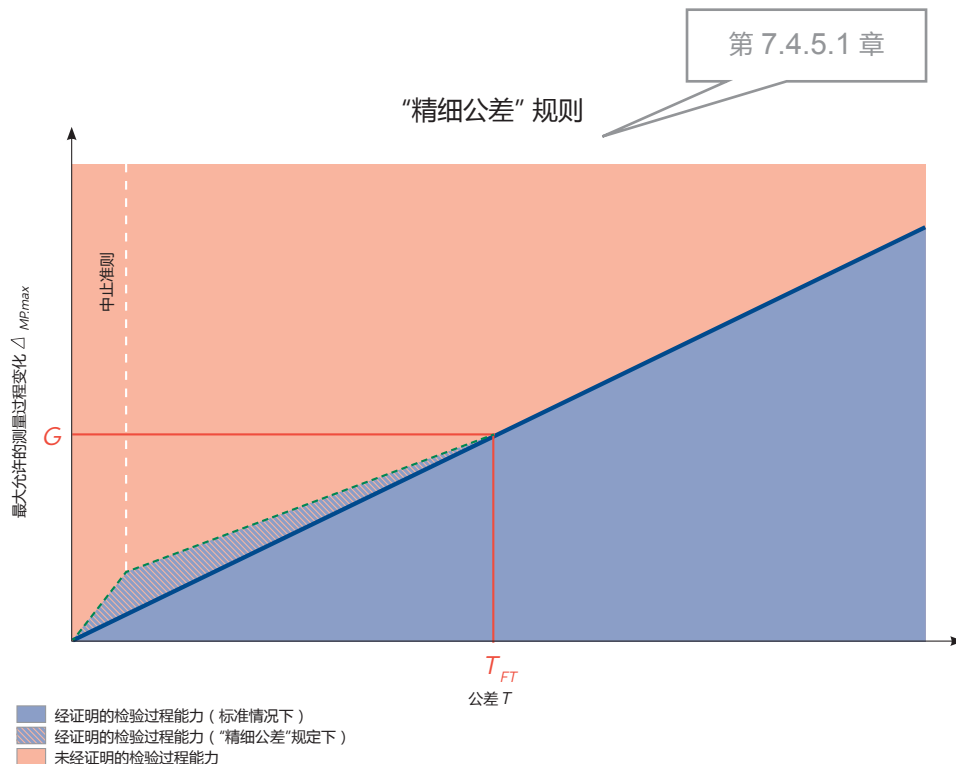
Fine tolerances are at the limit of what is technically measurable. With the FT rule ("fine tolerances") in VDA Volume 5, capability can also be proven in case of very fine tolerances. It is equally applied if no capability values or capability ratios can be obtained with the standard VDA 5 evaluation.



Schematic representation of the FT rule

处理精细公差 (FT)

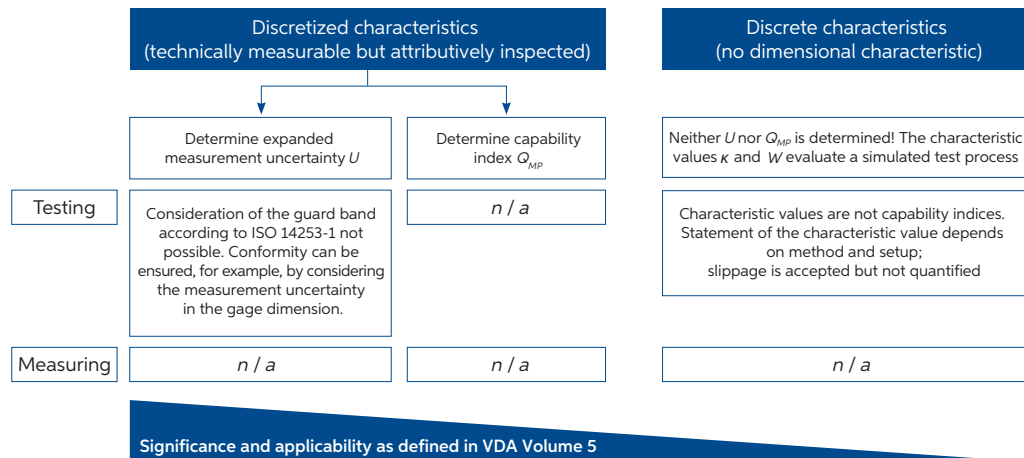
精细公差处于技术上可测量的极限。通过 VDA 5 中的 FT ("精细公差") 规则, 在公差非常精细的情况下也可以证明能力。如果标准 VDA 5 评估无法获得能力值或能力比, 则同样适用该方法。



"精细公差" 规则示意图

Current knowledge regarding attributive inspection

The new VDA Volume 5 offers a thorough overview of the methods for evaluating attributive inspection processes. These are clearly structured and subdivided into scope of application, advantages and disadvantages.

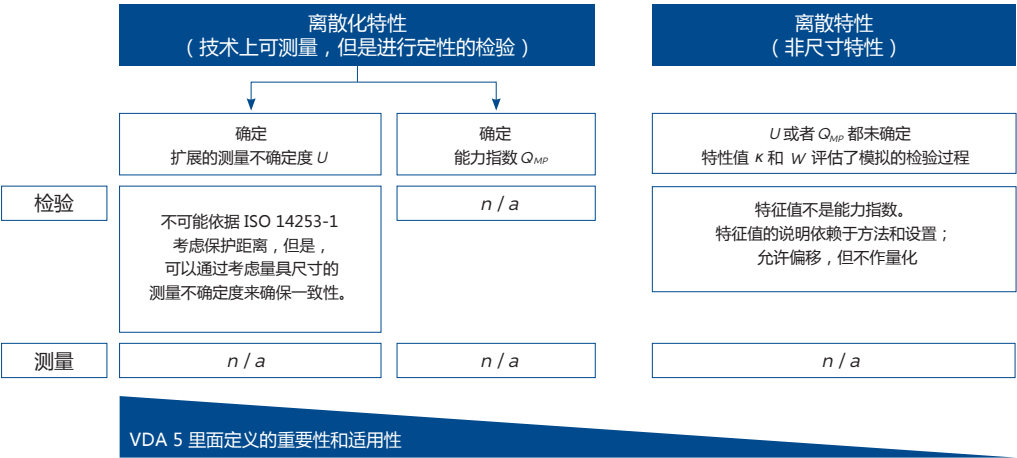


Characteristics that have been made discreet:
Signal detection, extended signal detection, analytical method

Characteristics that are discreet:
Short Method, effectiveness, Bowker test, Kappa method according to Cohen and Fleiss and concordance coefficient W according to Kendall

有关属性检查的现有知识

新版 VDA 5 全面概述了用于评估属性检查过程的方法。这些方法均具有明确的结构和细分的适用范围、优点和缺点。



离散化特性：
信号探测法和分析法

离散特性：
小样法、有效性、鲍克检验、根据 Cohen 和 Fleiss 的卡帕法和 Kendall 的一致性系数 W

New training concept

Companies do not always have their own experts for inspection process capability and inspection equipment management. However, changes with regard to standards have meant that these issues are increasingly focused on: the results could be major and minor nonconformities in audits.

The new training course offered by VDA QMC covers all aspects regarding measuring systems, measurement processes and inspection processes.

The training course includes clear and succinct specialist presentations, intensive group work and feedback provided by an experienced trainer. There will be a special emphasis on trying out and practicing the concrete activities in inspection process management based on practical examples.

That way, you will be able to build up know-how regarding measurement and inspection within your company!

Training information as well as training dates can be found on our webpage for International Training Management Tool (ITMT) <https://itmt.vda.cn>



新培训理念

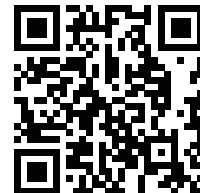
公司并不是总能拥有自己的检验过程能力和检验设备管理专家。但是，标准方面的变化就会意味着这些问题越来越受到关注：结果可能是审核中存在重大和次要不符合项。

VDA QMC 所提供的新版培训课程涵盖测量系统、测量过程和检验过程的所有方面。

该培训课程包括清晰简洁的专业陈述、密集的小组工作或任务以及由经验丰富的培训师提供的反馈等。此课程将特别强调在实际案例的基础上尝试和实践检验过程管理中的具体活动。

这样一来，您就可以在积累起企业内部有关测量和检验的专门知识！

更多课程信息及培训日期扫描右侧二维码或点击以下链接了解
全球培训管理工具（ITMT）：<https://itmt.vda.cn>

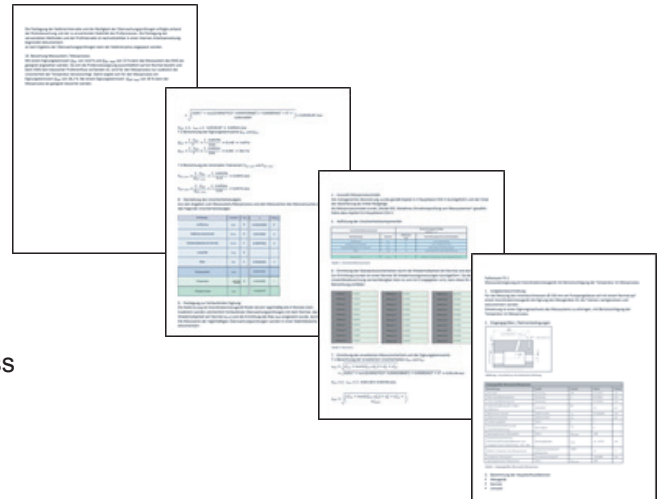


VDA 5 Practical handbook

As a supplement to the new VDA Volume 5, a practical handbook with examples from day-to-day work related to measurement and inspection processes is already developed.

All practical examples are structured in the same way, and concrete descriptions of the procedures for application are provided.

1. Task description
2. Input variables / general conditions
3. Determination of the main influencing factors
4. Measurement process model selection
5. Listing of uncertainty components
6. Determination of standard uncertainties
7. Determination of the extended measurement uncertainty and the capability ratios
8. Presentation of the uncertainty budget
9. Specification for ongoing capability
10. Evaluation of measuring system / measurement process

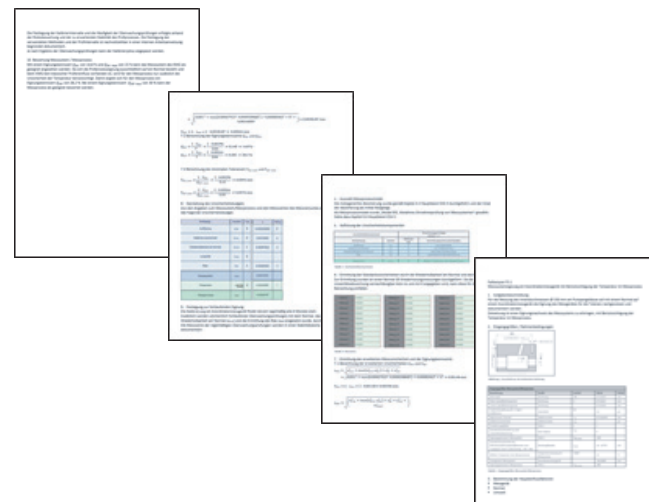


VDA 5 实用手册

作为新版 VDA 5 的补充，我们已发布一本实践手册，其中附有大量有关测量和检验过程的日常工作示例。

测量所有实例的结构均大致相同，并且同时还提供了有关应用程序的具体描述。

1. 任务描述
2. 输入变量 / 一般条件
3. 主要影响因素确定
4. 测量过程模型选取
5. 不确定度分量列表
6. 标准不确定度确定
7. 扩展测量不确定性和能力比的确定
8. 不确定度报告展示
9. 持续能力规范
10. 测量系统 / 测量过程评估



Overview: “VDA 5.x”

Besides the practical handbook as a supplement to VDA Volume 5, with examples and case studies for the individual topics, further VDA volumes relating to measurement and inspection are already revised and compiled:

- VDA 5.1 Traceable Inline Measuring Technology
- VDA 5.2 Capability of Measurement Processes for the Torque Inspection on Bolted Joints (revision)
- VDA 5.3 Capability of Inspection Processes Optical Sensors/Image Processing



概览：“VDA 5.x”

除了作为 VDA 5 补充的有关实践手册，以及针对各个主题内容的示例和案例研究以外，还已发布与测量和检验相关的 VDA 标准如下：

- VDA 5.1 可追溯的在线测量技术
- VDA 5.2 螺栓连接中静态扭矩的检验过程能力
- VDA 5.3 光学传感器和图像处理能力





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