

TECHNICAL CLEANLINESS

- → TRAINING
- → CONSULTATION
- \rightarrow QUALIFICATION
- → PRODUCTS
- → ANALYSIS
- → CONFERENCES



CONTENTS



- Qualification as a specialist, gualified employee, auditor • Conferences and conventions on specific topics - see the current
- offering on our homepage www.cleancontrolling.com

Consulting (15 - 39)



trained specialists and use our experience

you choose the products and processes suitable for you. Put your trust in excellently





VOLKER BURGER founded CleanControlling GmbH due to his particular fascination for the topic of "Technical Cleanliness". During his time as manager of the Process and Product Development department at an automotive supplier, he was repeatedly confronted with the topics and challenges of technical cleanliness. Based on the collective experience from the field of process and product development and technical cleanliness, Volker Burger developed the areas of consulting and training on the topic of assembly cleanliness at his company and today supports OEMs, automotive suppliers and many companies from other fields with his team.

CleanControlling GmbH is a leading international company in the field of technical cleanliness for industry and the automotive sector.

The extensive experience gained from over 45,000 cleanliness tests and the profound knowledge accumulated from over 10 years of laboratory analysis, consulting and training on the topic of technical cleanliness makes us the leading specialist in the field of technical cleanliness.

We are committed to practice-oriented technical cleanliness with active participation in the committees for creation and further development of standards, guidelines and directives, like VDA 19, ISO 16232 and in the AdhäSa industrial association on the topic of adhesive cleanliness or film contamination.

With this expertise we also continually develop our consulting services and training contents further and utilize the experience gained from over 250 consulting projects with international customers in the process. The consultations focus on the optimization of the process chain to lastingly ensure the required cleanliness of your products with the best possible cost/benefit ratio.

Our comprehensive know-how on the topic of technical cleanliness in assembly is the basis for the development of a specialized product range that supports you in meeting your requirements and objectives for the technical cleanliness of your products and processes.

The reference for this are our renowned, successful customers from the sectors:

- Automotive and supplier industry Cleaning technology
- Precision engineering
- Aerospace technology
- Medical technology

Hydraulic components

YOUR CLAIM technical cleanliness! **OUR CONTRIBUTION** We create reliable, expressive cleanliness inspections, consult you comprehensively and neutrally, can educate and train you and help

and expertise.

9

Training (6 - 14)

- Training, qualification, conferences and conventions like
- Basic training on technical cleanliness
- Specific training for production planning, product development, quality
- management, logistics, ...
- Employee sensitization

Qualification (40 - 43)

Products (44 - 45)

Development, sale and marketing of proven products for technical cleanliness Products for particle monitoring Products for assembly cleanliness Products for laboratory technology

Analytics (46)

Conferences (47)

Overview of our training and consulting services along the product development process (PDP)

PDP - product development process - focus on technical clea



CONSULTATION

Asses

Audit

Cons

Training and sensitization

of production employees

Our principles

Your objective

Our solution

- no more than necessary!

Technical cleanliness - as much as required

As we already accompany and support

you in the early concept decision phase and consult you during the entire product

development process, with us you can

achieve your cleanliness-related require-

ments quickly, specifically and with optimi-

zed effort and expense. CleanControlling

offers you exactly the independent consul-

ting service you and your products require.

As clean as necessary, not as possible!

The cleanliness specification is the starting point for us. We identify the areas of activity which represent the optimum cost/benefit ratio for our customers.

From the inside out

Particle sources are all the more critical the closer they are to the components or assemblies. We prioritize our recommendations for our customers to efficiently achieve specifications.

Also see the offering on our homepage regarding current conferences.

All services can be carried out both in German and in English.

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it					Audi
sultation	Requirement analysis		Enviromental cleanliness analysis		
Suntation		Product design assessment	Process chain analysis		Labor
			Concept assessn equipment in CA		Labor
				Microscopic component assessment	
	Standards testing		Planning and equipping of cleanline	ess areas	
		Limit determination	Creation of cleanliness-oriented	Supplier development	
		Creation of specifications	design guidelines of assembly equipment		Troub
		Creation of test specifications	Creation of logistics concept		Proce
		Creation of company standards	and packaging design		Partic
			Laboratory planning incl. equipment	t	

QUALIFICATION

Qualified employee of Technical Cleanliness

Specialist for Technical Cleanliness

Auditor for Technical Cleanliness

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Start-up	Series
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oduction cleanliness a	ssessment
Idit/potential analysis ording to VDA19 Part 2	
boratory assessment according t boratory audit	o VDA 19.1
oubleshooting in the field of techr	nical cleanliness
ocess analysis	

ticle origin identification

TRAINING



BASIC TRAINING

The basic training course teaches the core elements of technical cleanliness and offers an overview of the relevant areas and influencing factors on the cleanliness of products and components. Specific solution options for improving the cleanliness quality are also taught.

Targets

Project managers Product developers Process planners Production managers Quality managers Purchasing managers Logistics managers Sales managers Technical cleanliness managers

Training course duration 0,5 - 1 day (basic training course – in-depth basics)

Training location At your company, on request at CleanControlling

Article number 20002

Contents

- "Technical cleanliness" motivation
- Particle types
- Damage mechanisms
- Relevant standards and customer-specific regulations
- Basics of testing the technical cleanliness according to VDA19.1/ISO16232
- Particle generation and carry-over along the value chain
- Basics of assembly cleanliness according to VDA 19.2
- Influencing factors of the areas
 - Environment
 - Logistics and packaging
 - Personnel
 - Processes and assembly devices
- Solution approaches for avoiding particle generation and carry-over
- Particle monitoring

ASSEMBLY CLEANLINESS

The course on assembly cleanliness is directed at employees, who plan and design the processes within the assembly department. The course provides information on planning a cleanliness-oriented assembly department, focuses the influencing factors and describes the measures for reducing the particulate contamination.

Contents

- Cleanliness strategy along the value chain

- Personnel

- Detection and evaluation of cleanliness influences

in your company

Targets

Project managers Process planners Production managers Quality managers Technical cleanliness managers

Training course duration 1 day

Training location At your company, on request at CleanControlling

Article number 20003



- Basics of assembly cleanliness according to VDA 19.2
- Planning while taking the influencing factors into account - Environment
 - Planning of assembly environment
 - Particle monitoring
 - Logistics and packaging
 - Logistics concepts
 - Packaging concepts

 - Personnel influence
 - Clothing
 - Personnel qualification
 - Processes and assembly devices
 - Design of assembly equipment
 - Influence of processes
 - Assembly-integrated cleaning
- Verification of assembly systems according to VDA 19.1+2
 - of the assembly system
 - Particle monitoring in the process

Optional / advanced

Discussion of the topics using the example of a production line

TRAINING



EQUIPMENT DESIGN

The equipment design training course explains the design principles of a cleanliness-oriented design using practical examples. In particular, the design of product contacting surfaces and the structure of cleanliness-sensitive assembly equipment is covered.

The course also includes the possible use of assembly-integrated cleaning processes for ensuring component cleanliness.

Targets Automation specialists System designers Project managers

Training course duration 0,5 - 1 day (basic training course - advanced training course)

Training location At your company, on request at CleanControlling

Article number 20028

Contents

- Basic training course on "Assembly cleanliness" according to VDA 19.2
- Presentation of criticality within areas of the assembly systems
- (especially surfaces that contact product)
- Design of assembly devices
 - Design principles
 - Operating equipment technology (transport systems, feeding)
 - Workpiece carriers and grippers
 - Encapsulation
 - Assembly-integrated cleaning
 - Commissioning (basic cleaning)
 - System care (keeping clean)
 - Influences and evaluation of various joining processes
 - Process chain analysis

Optional / advanced

Discussion of the topics using the example of a production line in your company



PRODUCT DESIGN DEVELOPMENT

To take the customer's requirements for technical cleanliness into account, a cleanlinessoriented design must be developed in order to integrate the design criteria for technical cleanliness at an early stage. This in turn has a positive influence on particle development and carry-over.

The product development course should be seen in combination with the product design assessment workshop in which theoretical knowledge is illustrated using an actual product to jointly determine the potential for improvement.

Contents

- Basics of technical cleanliness according to VDA 19.1+2
- individual areas of use

 - and supplier requirements

Practical module - see Product design assessment workshop

Targets **Project managers** Product developers

Training course duration 0,5 days preferably in combination with the product design development workshop

Training location At your company, on request at CleanControlling



- Particle types
- CC Code, drawing entries, basics of standards
- Qualification, declining curves
- Cleanliness inspection procedure
- Damage mechanisms of particles
- Specification of cleanliness requirements for
- Specification and budgeting of requirements
- Possible escalation scheme
- Implementation and interpretation of customer
- Example of design implementation and
- its effect on product cleanliness





STANDARDS TESTING

With this training course the contents and basics of standards for technical cleanliness are trained and its importance is explained using practical examples.

The course consists of the procedure for standards testing and the interpretation of the technical cleanliness regulations.

Targets

Technical cleanliness managers Project managers Product developers Quality managers Sales managers

Training course duration 0,5 days preferably in combination with the standards testing workshop

Training location At your company, on request at CleanControlling

Article number 20006

Contents

- Basics of technical cleanliness according to VDA 19.1
- Customer and supplier requirements and their connection
- International standards structure
- Company standards of the OEMs
- Detailed joint discussion of example
- specifications and company standards
- Interpretation and implementation examples
- of customer requirements
- Approach of the standards testing

Practical module - see Standards testing workshop



The early planning and taking into account of the aspects of technical cleanliness in the

ADVANCED QUALITY PLANNING

product development process makes a major contribution to quality improvement. The course shows how technical cleanliness can be anchored in the various methods.

FMEA Mögliche

Contents

- Background of advanced quality planning
- Technical cleanliness in individual stages of APQP process

- Particle monitoring

Targets

Technical cleanliness managers Project managers Product developers Process planners Quality managers Logistics managers

Training course duration 0,5 day

Training location

At your company, on request at CleanControlling

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- Standards testing of customer company standards and drawings
- Process chain analysis for identification of
- influencing factors in manufacturing concept
- Technical cleanliness in various FMEAs
- Technical cleanliness in production steering plan/control plan
- Monitoring of product cleanliness in sample and series phase
- Planning of clean assembly
- Evaluation of suitability of assembly environment

TRAINING



CLEANLINESS INSPECTION

This course teaches the standard- and guideline-conform performance of the cleanliness inspectionfor determining the technical cleanliness.

Contents

- Basics of technical cleanliness
- Particle types
- Standard basis (ISO 16232/VDA 19.1)
- Special aspects of customer-specific standards
- CC-Code
- Filter preparation
- Extraction
- Filtration
- Analysis methods
- Qualification, declining curves
- Blank value tests
- Laboratory equipment
- Discussion of individual customer company standards
- Environmental conditions within the laboratory
 - Laboratory auditing
 - Cleanliness inspections of rooms using particle traps
- Visit of cleanliness inspection laboratory if desired

LOGISTICS AND PACKAGING

Logistics, and in particular the packaging concept, has a major influence on the component cleanliness. This course teaches both the subject-matter of the factors and the measures for reducing these influencing factors.

Contents

- Practical examples

Targets

Logistics managers Production managers Technical cleanliness managers

Training course duration 0,5 day

Training location At your company, on request at CleanControlling

Article number 20010

Targets Laboratory managers Laboratory employees Technical cleanliness managers

Training course duration 1 day

Training location At your company, on request at CleanControlling

Article number 20005



- Basics of technical cleanliness according to VDA 19.2
- Particle contamination in logistics
- Packaging types and concepts
- Constructive measures in logistics
- Operational measures in logistics
- Effect of air locks, onion-shell principle
- Cleaning packaging and verification of cleanliness
- Transport and air lock concept
- Unpacking and commissioning

Optional/advanced (additional 0.5 days)

- Inspection of the logistics routes in the company and reflection of
- the theoretical contents in practice



TRAINING



TRAINING AND SENSITIZATION OF **PRODUCTION EMPLOYEES**

The production employee is in many ways involved in the quality of the product. Sensitive handling of the products and early recognition of deviations and increased particle entry are taught. The employees are informed and sensitized with regard to technical cleanliness.

The training course is adjusted to the individual assembly system and products were possible.

Targets

Production managers Production employees Logistics employees Technical cleanliness managers

Training course duration 0,5 day

Training location At your company

Article number 20007

Theory

- Basics of technical cleanliness
- Particle types and their damage mechanisms
- Why are there cleanliness requirements in production?
- Insight into inspection of technical cleanliness
- Influencing factors for the technical cleanliness in production
- Particle monitoring

Optional / advanced

Adjustment of the course documents to the assembly and products of your production department (additional expense for creating the training documents)

Practical module

- Production tour, sensitization in production at exemplary workplaces
- Illustration of influencing factors, in particular cleanliness-sensitive handling in assembly

CONSULTATION



PRODUCTION CLEANLINESS ASSESSMENT

This inspection structured as a workshop combines theoretical basic knowledge with the practical approach so that experience can be gained using the example of one's own product and production department. The customer's requirement and/or internal requirements, as well as the specification are analyzed to focus the assessment on the necessary points. During the practical assessment along the value stream, deviations from the requirements are localized and measures and suggestions for optimization are recommended. In the process, the assembly equipment and the devices are inspected in great detail.

Targets

Project managers, product developers Process planners Production managers Quality managers Purchasing managers Logistics managers Sales managers Technical cleanliness managers

Duration

1 day The date can be expanded depending on the scope of the assembly steps to be inspected.

Location At your company

Article number 20023

Contents

- Basic training course on "Technical cleanliness" according to VDA 19.1
- Basic training course on "Assembly cleanliness" according to VDA 19.2
- Discussion of cleanliness requirements
- (internal/customer-side) of a specified product
- Assessment of the entire process chain or material flow from Receiving to Shipping
- Assessment of an example production or assembly line from the standpoint of assembly cleanliness (environment,
- logistics, personnel, assembly devices)
- Positioning and activating of particle traps for determining Illig values (cleanliness figures)

Optional / advanced

Summary of the entire workshop including discussion of the abnormalities, potential for optimization and suggestions for improvement in a comprehensive assessment report.



AUDIT / POTENTIAL ANALYSIS ACCORDING TO VDA 19.2

With the potential analysis, systematic errors of the company are analyzed and weak points in the cleanliness are recognized. As a result, the potential analysis is an aid for locating possibilities for efficiently increasing and stabilizing the cleanliness quality.

The potential with regard to the technical cleanliness is evaluated using a selected product.

Contents

- - Quality

 - Logistics

Targets

Technical cleanliness managers and those responsible from the areas of Quality, Production and Logistics

Duration 1 day

Location At your company

Article number 20027

16



- Assessment of the entire process chain based on questions
- on the potential analysis of a selected product
- Answering and evaluation of questions from the areas

 - Environment
 - Personnel
 - Assembly equipment
 - Parts cleaning

Optional / advanced

Summary of the results in a report with specification

of the weak points and solution approaches.





ENVIROMENTAL CLEANLINESS ANALYSIS

The environmental cleanliness analysis is used

- for "validation" the influence and risks of the environment on the component cleanliness
- for localizing increased "risk areas"
- for monitoring changes to the environmental conditions

Targets Production managers

Technical cleanliness managers

Duration In accordance with the number of particle traps to be activated

Location At your company

Article number 20013

Contents

The scope of the environmental analysis includes the following content

- Positioning and activating particle traps for the
- environmental cleanliness inspection by CleanControlling
 - At locations with an increased risk for
 - component cleanliness
 - In a grid for analysis of an entire area and its general influence
- Particle traps: Number depending on size of area to
- be examined and prevailing conditions
- Deactivation of particle traps (optional: by CleanControlling)
- Microscopy of particle traps
- Creation of analysis reports

Optional / advanced

 Creation of a report on the environmental cleanliness analysis with summary of the results and depiction of cleanliness figures and largest particles in a diagram, including discussion of abnormalities.

PROCESS CHAIN ANALYSIS

In this workshop the individual process steps are listed and the specific influencing factors on the technical cleanliness are evaluated accordingly. With this method the critical particle sources can be determined in order to initiate specific measures.

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Contents

- process steps.

Targets

Project managers Process planners Production managers Quality managers Technical cleanliness managers

Duration

1 day

Location At your company



- Evaluation of the influencing factors from the environment,
- logistics, personnel and assembly devices on the detailed
- Interpretation of results
- Identification of process steps with increased risk

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PROCESS ANALYSIS

During the process analysis defined processes are individually examined for their danger potential. For this analysis processes are selected which present a high risk for the technical cleanliness. In the process, different methods are possible, as described in the contents.

Contents

- Analysis of all geometries and surfaces which come into contact during the manufacturing process.
- Derivation of particle generation risks based on the interaction of the product and the process.
- If possible, visualization of the particle generation using a side light recording and a high-speed camera.
- Observation of particle generation in the process area
 - by means of pre-cleaning and particle extraction - with cleanliness inspections

CONCEPT ASSESSMENT OF ASSEMBLY EQUIPMENT IN CAD STADIUM

Before the assembly equipment is produced and change are no longer possible without additional costs, an assessment of the design is advisable.

Using the CAD data, the design is evaluated, weak points are identified and possible solutions are described.



Contents

Optional / advanced

Targets

Project managers Process planners Production managers Technical cleanliness managers

Duration 1 day

Location At your company

Article number 20011



Targets

Automation specialists, system designers, project managers, technical cleanliness managers

Duration 1 day

Location

At your company or at the system designer's location

- Assessment of equipment design according
- to the design principles of VDA 19.2
- Estimation of risk and recommendation of possible measures
- for avoiding particle generation or carry-over.
- Summary of the deviations including discussion of the abnormalities, potential for optimization and suggestions for improvement in a comprehensive assessment report.





PRODUCT DESIGN ASSESSMENT

To take the customer's requirements for technical cleanliness into account, a cleanlinessoriented design must be developed in order to integrate the design criteria for technical cleanliness at an early stage. This in turn has a positive influence on particle generation and carry-over.

The Product Design Assessment workshop should be seen in combination with the Product Design Development training course in which theoretical knowledge is taught.

Targets Project managers Product developers

Duration 0,5 days preferably in combination with the Product Development training course

Location At your company, on request at CleanControlling

Article number 20019

Contents

- Assessment of the design of a relevant product
- Description of cleanliness-related weak points
- Specification of solution approaches
- Depiction of effects of design on manufacturing process

MICROSCOPIC COMPONENT ASSESSMENT

The quality of the individual parts and assemblies flowing into the assembly decisively affect the cleanliness of the product. Decisive is, on the one hand, the component cleanliness, (measurable with the cleanliness inspection), but also the condition of the components, e.g. fixed burrs that can break during assembly. Abnormalities and damages of the surface are assessed using microscopic examination.

Contents

Duration In accordance with the components to be assessed

Location CleanControlling, on request also at your company

Article number 20020



Visual inspection of the components

 Microscopic component examinations for identification of particle generating geometries. • The individual parts are examined for particulate contamination, burrs, anomalies and other particle generating influences using a microscope.





PARTICLE SOURCE INVESTIGATION

Assessment for identification of the particle source based on detected particles from the cleanliness inspection or direct inspection.

Contents

- Particle analysis for identification of material or comparable material
 - EDX particle analyses
 - Infrared spectroscopy of particles
- Material comparison with materials used in assembly in accordance with influencing factors: environment, logistics, personnel, assembly equipment
- Assessment of localization of the particle source



PLANNING AND EQUIPPING **OF CLEANLINESS AREAS**

The workshop serves for the concept development of the cleanliness area in accordance with the requirements for the product to be produced.



Contents

- Requirement analysis

Duration 1 day

Targets

project managers

Process planners

Quality managers

Production managers

Location At your company, on request at CleanControlling

Technical cleanliness managers

Article number 20034



Duration 1 day + material analyses

Production managers

Project managers

Process planners

Quality managers

Technical cleanliness managers

Targets

Location At your company



- Training course for designing the cleanliness areas
- (cleanliness zone/cleanliness room)
- Development of concept for cleanliness area
- including inspection of the areas
 - Spatial design necessities, air lock concept if necessary
 - Clothing concept
 - Effect on logistics concept
 - Behaviors in designed cleanliness area
 - and other requirements for cleanliness area









REQUIREMENT ANALYSIS

In this workshop the customer's requirements and/or internal requirements are to be analyzed and derived.

Contents

- Detailed analysis of customer specifications for a product with reference to
 - Particle types
 - Particle quantity
 - Specification for cleanliness inspection
- Effects on production and logistics
- Depiction of requirement in dispersibility diagram
- Definition of cleanliness grade in accordance with the requirements

STANDARDS TESTING

Using a current standard, the contents are analyzed and the significance for the product and production is interpreted.

Contents

- - Personnel

Targets

Technical cleanliness managers Project managers Product developers Process planners Production managers Quality managers Sales managers

Duration

0,5 days preferably in combination with the Standards Testing training course

Location

At your company, on request at CleanControlling

Article number 20036

Targets

Technical cleanliness managers Project managers Product developers Process planners Production managers Quality managers Sales managers

Duration 0,5 days

Location At your company, on request at CleanControlling



- Testing and analysis of a specific customer standard
- Detailed joint discussion of a current company standard
- Interpretation of company standard with
- regard to implementation in areas
 - Environment
 - Logistics and packaging
 - Processes and assembly equipment



LIMIT DETERMINATION

The limit determination is carried out according to an explanation of the various methods. The corresponding, collected information is evaluated and limits determined/derived.

Methods

- Knee graph BMW
- ZVEI
- Exponential distribution
- Weibull distribution
- Johnson transformation
- Statistical methods

Topics

- Budgeting
- Escalation





artik 5 H 100 H 150 200

CREATION OF SPECIFICATIONS

To pass on the component requirements with regard to the technical cleanliness to the supplier, required measures and information on the cleanliness inspection process, etc. are summarized in a product-specific specification.

Procedure

Spezifikationen 4222 Pressure. Method A: H & 0.11 bar spray Method B: Suitable test proce 4.2.2.3 Nazzle / Connection Method A: Sold stream spray Method 8: Test of inner cleaning 4224 Duration of Washing Method A: The duration of wasi the test sample, a detailed work single part must be written by the assurance department. The ow as all bores and all accessible to out. Method B: Test to ISO 16232-5 4.3 Instructions. Component si Statively by rinsing. The rinsed di in a fiber, dried and weighed. 4.3.1 Preparation of Test Equi 43.1.1 Preparation of the FL Method II). 4.3.1.1.1 Filter preparation accor

4.3.1.1.2 Drying of the Empty (80 ± 5) minutes at (+105 ± 2) *C store in desiccator for (15 /+ 5) m The parameters are dependent is agent and shall be matched with th Parameters shall be stated in test 4.3.1.1.3 Weighing of the empty

Ascertain the weight of the filter b lytic balance and note the display 4.3.1.2 Preparation of the Set. 4.3.1.2.1 Method A Only

April 2013 - Issue No. 2

Targets Technical cleanliness managers

Project managers Product developers Process planners Production managers Quality managers Sales managers

Duration

The duration is dependent on the scope of the data to be analyzed The limits are determined by CleanControlling The evaluated data and results are discussed as part of a workshop.

Location

Determination of the limit values at/by CleanControlling

General discussion at your company, on request at CleanControlling

Article number 20037

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Targets Technical cleanliness managers

Project managers Product developers Process planners Production managers Quality managers Sales managers

Duration

The duration for creating the specification is based on the scope and the contents to be taken into account.

Location

Initial meeting at your company, on request at CleanControlling. Additional processing by CleanControlling at own company.

Article number 20038

artikellänge) r $\leq x < 100 \ \mu m$ nicht begrenzt $\leq x < 150 \ \mu m$ 200 $\leq x < 200 \ \mu m$ 100 $\leq x < 200 \ \mu m$ 50 $m \leq x < 400 \ \mu m$ 3 $m \leq x < 600 \ \mu m$ 0	500 150 75 4 0
---	----------------------------

- Determination of necessary content topics
- Development of topics
- Creation of raw version
- Discussion and creation of final version

	4222 Druck.
0 pressure	Verfahren A: (4 ± 0.1) bar Spritzdruck.
une to 150 16232.	Verfahren B. Geeignetes Prüfverfahren nach 150 18232.
	4.2.2.3 Düse / Anschluss.
nozzie, diameter: 2	Verfahren A: Rundstrahidüse, Durchmesser: 2 mm
was to ISO 16232.	Verfahren B: Durchführung der Bestimmung der Sauberkeit erfolgt nach ISO 18232.
	4.2.2.4 Dauer der Reinigung.
sing is depending on instruction for every e responsible quality rall surface, as well vities must be rinsed	Verfahren A: Die Dauer der Reinigung ist vom Prüf teil abhängig, eine detalliterie Arbeitsbeschreibung für jedes einzahlen Baubeil ist zum der zustachtigen Abtei- lung für Qualitätsschertwit zu erstellen. Die gesamte Oberfäche, soelle alle Bohrungen und alle zugängli- chen Hohlikume mössam ausgespölt werden.
5	Verfahren B: Durchführung nach ISO 16232-5.
hall be tested quan- int shall be collected	4.3 Prüfanleitung. Die Pr üfung erfolgt quantitali durch Sp ülen der Komponenten. Die ausgesp ülte Verschmutzung wird in einem Filter aufgefangen getrochnet und gewegen.
pment.	4.3.1 Vorbereitung der Prüfzusrüstung.
Filter (Method A	4.3.1.1 Vorbereitung des Filters (Verfahren A, Ver fahren B).
rding to (50 16232.	4.3.1.1.1 Filtenorbereitung nach ISO 16232.
Filter. Dry filter for in drying oven, then sinutes.	43.1.1.2 Trockmang der Iveren Filter. Filte (50 ± 5) Minuten bei (+105 ± 3) ⁵ C im Trockensutrani trocknen, dann im E-sikkator (15 /+5) Minuten lagem
t from the cleaning the respective case. it report.	Die Trockenparameter sind abhängig vom Spülme dium und müssen auf den jeweilgen Fall abgestimm werden. Die Parameter müssen im Prüfberücht ange geben werden.
ity filter (weight of	4.3.1.1.3 Wegen der leeren Filter (Gewicht leerer Fil ter):
	Gewicht des Filters mit Hilfe der Analysewaage smit tein und den Anzeigewert in mg
ry means of the ana- red value in mg.	

200 500 100 µm ≤ x < 150 µ 150 μm ≤ x < 200 μr 200 μm ≤ x < 400 μr 100 150 50 75 400 µm ≤ x < 600 µi 4 3 600 µm ≤ x < 1000 µ M 1000 µm ≤ x

Prüfvorschrift Test specification	CleanControlling					
55468_PV_Chromstahl	-					
	5	5468_PV_Chromstahl-	Kugel			
	Sauberkeitsanforderungen Deantwex waa	ienerit.				
echnischer Kontakt teineurioneit Heit Käus Ost	Gravimetrie ceunete ese Größtes metallisch glänzendes Partikel	Dokumentation Documentation Dokumentation		55468_PV_Chron	mstahl-Kugel	
dentifikation des Bauteits alentitution of the computer	Lagest netellt shing sattle Größtes nicht glänzendes Partikel ¹⁰	Dokumentation	Mikroskopie		Mensiony	
	Largest not similing surface	Disurrentation	Lichtmkroskopie		Цитенских	
6	Estraktionsverfahren Brocker retu	•	Mikroskop	JOMESA Auflichtmikroskop mit automatischem Polanisationefiter	Monage	JORFIA Inclum and increasing with automatic polarization film:
41 6 8 6 8 8	Spritzen Messue marg		Mikroskopier Malistab	2,1 pm/px	Monampit stale	21 anbx
Anne Maria (2007) Anne Maria (2007) Anne Maria (2007) Anne Maria (2007)	Laborbedingungen Laborator cinators Prüferindhung	Reinraum Reinraumklasse 6 ger Geanton Class & according to 00 14644 Dosiereinheit mit Filtration		Nach (Christ 1 and 5-10 Plue for de kiende aneldetare Partilegylite ensitives	Accessing to scharts 1, 6-10 performan	pres are economies to the process describe
autelibezeichnung Ginsweitname Chromstan-Kugel	Anajist eulement Beprobungsant Sanaing menor	Deang unt with thraten Extraktion pro Einzeiteil mit man Konsche procedure für each part with mans	Materiaklass fizierung	Dereomikroskopische unterscheidung von metallisch gänzenden sowie nicht glänzenden Partikein über das flefekonsverbalten mittes Polarisationafilter	n Narera caroficator	Deterministic per determination perseen metallic priving and non-converg particles via reflection and polarizing film:
emerkung owner Keine Fläche bekannt	Extraktorsmedium Feaces for	Kaltreiniger HAKU 10-25-921 Degreser HAKU 10-28-921	Kalbrierung	Partikeinormal JOMESA VI 1-852	(abotion	James margar (18/4
estiegung der Kontrollfläche Detresnartne okaning surtore	Extraktionsmenge	0.5 Liter / Bauteil	Excelosion	Lans to Brate Vet Store 5 10	Reciber	AND DAID OR 1 N

CREATION OF TEST SPECIFICATIONS

The inspection of the technical cleanliness can be carried out differently with a large range of methods. To obtain comparable results for a product or component, the method, process and parameters should be specified. The test specifications determine this information product and component-specific.

Targets

Technical cleanliness managers Laboratory managers Project managers Product developers Quality managers Sales managers

Duration

The duration for creating the specification is based on the scope and the contents to be taken into account.

Location

Initial meeting at your company, on request at CleanControlling. Additional processing by CleanControlling at own company.

Article number 20039

Procedure

- Determination of necessary requirements from
- customer-specific standards and specifications
- Specification of the method and parameters
- Development of process
- Creation of raw version
- Discussion and creation of final version

CREATION OF COMPANY STANDARDS

In order to regulate the standards for the topic of technical cleanliness, the individual points have to be determined. The specified measures and decisions are summarized in a company standard.

Topics, e.g.

Procedure

- Creation of a raw version

Targets

Technical cleanliness managers Project managers Product developers Process planners Production managers Quality managers Sales managers

Duration

The duration for creating the factory standard is based on the scope and the contents to be taken into account.

Location

Initial meeting at your company, on request at CleanControlling. Additional processing by CleanControlling at own company.



- Information on technical cleanliness and
- the understanding in the company
- Standard information on environmental cleanliness
- and verification measurements
- Definition of various cleanliness areas
- and clothing concepts in these areas
- General information for process devices
- General information on cleanliness inspections
- General regulations of the company

- Determination of necessary content topics
- Development of these topics
- Discussion and preparation of final version



CREATION OF CLEANLINESS-ORIENTED DESIGN GUIDELINES OF ASSEMBLY EQUIPMENT

To reduce the particle generation and carryover by the assembly systems and devices, a cleanliness-oriented design of the assembly equipment must be ensured. The design of the equipment and device is carried out according to certain criteria. These design criteria are described and detailed specifications for the individual elements of the assembly equipment are defined in the design guidelines.

Targets

Project managers Process planners Technical cleanliness managers Production managers Quality managers

Duration

The duration of the creation of the design guidelines is based on the scope and the contents to be taken into account

Location

Initial meeting at your company, on request at CleanControlling. Additional processing by CleanControlling at own company.

Article number 20041

Topics, e.g.

- General regulations of company
- Standards for process equipment
 - Design of product contacting surfaces
 - Choice of materials
 - Surface quality
 - etc.
- Equipment-specific designs
- Covers/encapsulations
- Cleanability of equipment and devices
- Assembly-integrated cleaning processes
- Measures for maintenance and repair

Procedure

- Determination of necessary content topics
- Development of topics
- Creation of raw version
- Discussion and creation of final version

TROUBLESHOOTING IN THE FIELD OF TECHNICAL **CLEANLINESS**

If short-term problem solutions and their implementation are required in the field of technical cleanliness, we will be glad to support you.

Contents

Targets

Project managers Technical cleanliness managers Production managers Quality managers Sales managers and others according to the points to be covered

Duration

Flexible adjustment in accordance with our recommendations and your specifications

Location

At your company, on request at CleanControlling and in accordance with the tasks to be carried out



- Support for the following points
- Determination of contamination risks
- Recommendation of measures for
- improving determined weak points
- Accompanying and consulting during project phase
- Communication with customer



CREATION OF LOGISTICS CONCEPT AND PACKAGING DESIGN

Contents

Collection of current logistical concept data

Creation of a logistics concept according

• Evaluation of sensitivity of components,

Development of packaging concepts

Identification of weak points

to approaches of VDA 19.2

assemblies and products

Support for packaging design

Development of possible solutions

The logistics and especially the packaging which represents a surface with direct contact in some cases plays a major role in product cleanliness. The workshop serves to identify the weak points and to develop an optimized concept.

Targets

Logistics managers Technical cleanliness managers Purchasing managers Project managers

Duration 1 day

Location At your company, on request at CleanControlling

Article number 20043



supplier

SUPPLIER DEVELOPMENT

The component cleanliness has a decisive influence on the product cleanliness. As a result, the participation of the supplier is also necessary for meeting the cleanliness requirement. The workshop offers the development of the supplier or the preparation of your employees for the development of the supplier.

Contents

- For developing the supplier
- For identifying weak points

Targets

Supplier developers Purchasing managers Technical cleanliness managers Project managers Quality managers

Duration

1 day The date can be expanded depending on the scope of the assembly steps to be inspected.

Location

At the supplier's company or at your company

Article number 20044

34



- Definition of required information and documents for suppliers Evaluation of packaging concept for supplier
- On-site appointment at supplier's plant
- Assessment with evaluation of influencing
- factors on component at supplier's plant
- If necessary, training of supplier
- Training course for supplier developer



LABORATORY ASSESSMENT

With this workshop the rooms of the laboratory and the inspection are assessed and weak points are indicated. In the process, recommended measures and potential for optimization are named and discussed, as the significance of the cleanliness inspection is directly dependent on the quality of the laboratory, the processes and the handling.

Targets

Laboratory managers Laboratory employees Technical cleanliness managers

Duration 1 day

Location At your laboratory

Article number 20045

Contents

Assessment of

- Rooms (laboratory, air lock)
- Equipment
- Processes
- Handling
- Clothing
- Documentation

Optional / advanced

Summary of the entire workshop including discussion of the abnormalities, potential for optimization and suggestions for improvement in a comprehensive assessment report.



LABORATORY AUDIT

The potentials of the laboratory are evaluated using an audit in the laboratory. The influencing factors on the results of the cleanliness inspection are evaluated using the developed list of audit questions. As a result of the audit, the degree of fulfillment of the individual evaluation criteria is determined.

Contents

Targets

Laboratory managers Laboratory employees Technical cleanliness managers

Duration 1 day

Location At your laboratory

Article number 20046



 Auditing using a specified list of questions • Tabular documentation of audit and depiction in a diagram



Establishment of your cleanliness laboratory

LABORATORY PLANNING AND EQUIPMENT

Many aspects in addition to the general and customer-specific standards and specifications must be taken into account for the establishment of a laboratory for testing the technical cleanliness. With the consulting concept describe below, we would like to support you in the establishment of your cleanliness laboratory with optimized and effective processes customized for your products and their specific requirements.

Basics, training, qualification and consulting is carried out according to VDA 19.1 and VDA 19.2

Planning and equipping

In accordance with specifications or drawing requirements of your components

Spatial detailed planning of cleanliness laboratory in accordance with requirements of your components

Training of laboratory personnel and/or laboratory management

Verification of cleanliness inspections from in-house laboratory

Advanced training/optimization of laboratory operations

Support and service

Your cleanliness specification is the starting point for us. From it we create an adjusted, reliable overall concept. Our experience of over 10 years of laboratory practice and our cooperation in the standards committees are incorporated in realizing of your laboratory and in the training of your laboratory personnel

Preparatory training course	Requirement analysis	Laboratory planning / room concept	Realization / commissioning	Personnel	Process development
Basics of technical cleanliness Preparatory practice-oriented laboratory training course in reference laboratory at CleanControlling	 Customer specifications Component range Drawing requirements Analysis volume Requirements for laboratory environment Choice of laboratory personnel 	 Development of laboratory layout Planning of supply installation Compilation of equipment and accessories Specifications Adjustment of CleanControlling Basic Laboratory Specifications to the individual conditions	Support for choice and procurement of equipment Support for commissioning of cleanliness laboratory Blank value (required basic particle cleanliness)	Training as a qualified employee for technical cleanliness including final examination	Development of structured, documented work flows for adoption in the company's own document structure

You are provided with

Your individually customized cleanliness laboratory with optimized, effective processes

Audit

Auditing and evaluation of the laboratory according to VDA 19.1

Advanced training / further development

- Annual advanced training
- Conferences
- Individual training courses on problems and integration of new test methods

QUALIFICATION



QUALIFIED EMPLOYEE OF TECHNICAL CLEANLINESS

This training teaches the detailed standard and regulation-compliant conducting of cleanliness inspections for determining the technical cleanliness. In addition, all steps from test planning to execution of the cleanliness inspection to documentation are developed and carried out in a practical module. The practical module of the training is carried out at your laboratory with your test equipment and your specific components.

Contents

- Basics of standards

- Analysis process: Gravimetry, microscopy, material determination via SEM and IR
- Qualification process: declining curve, blank value, double sampling

- Implementation of analyses (gravimetric, microscopic)
- Evaluation and report preparation

Written examination for qualified employee for technical cleanliness

After the test is successfully completed, a certificate is issued.

Number of participants limited: max 5 Person

Targets Laboratory employees Laboratory managers Technical cleanliness managers

Duration 2 days

Location At your laboratory, with your equipment

Article number 20024

QUALIFICATION

First day - Theoretic section

- Basics and background for technical cleanliness
- Detailed analysis of inspection procedure
- Filter preparation, extraction process, filtration
- Practical example of cleanliness inspection

Second day - Practical section

- Processing of test procedures in compliance with VDA 19.1 / ISO 16232
- Determination of blank value, avoidance of particle
- contamination during testing
- Practical implementation of various extractions

SPECIALIST FOR TECHNICAL **CLEANLINESS**

The training as a specialist provides knowledge required for successfully implementing and establishing the topic within the company. It comprises all aspects of technical cleanliness.

Contents

- Basics and background ofr technical cleanliness
- Basics of standards, committees for standards, corporate associations
- Inspection of technical cleanliness according to VDA19.1/ISO16232
 - Test planning
 - Extraction
 - Filtration
 - Standard analysis and further analysis
- Analysis and influence of inspecting process
- Limits of cleanliness inspection
- Cleanliness strategy along the value chain
- Quality management and technical cleanliness
- Content of VDA Volume 19 Part 2
 - Processes and assembly equipment
 - Logistics, packaging
 - Environment
 - Personnel
- Particle monitoring at assembly and cleaning systems
- Use and evaluation of particle traps
- Planning example of a cleanliness-sensitive production line
- Process chain analysis / environmental analyses with practical examples
- Assembly-integrated cleaning systems
- Technical cleanliness in product development
- Cleanliness specifications
- Limit budgeting
- Interpretation and reaction when limits are exceeded

Written test for technical cleanliness specialist After the test is successfully completed, a certificate is issued.

Prerequisite for participation in qualification training Basic knowledge of technical cleanliness

AUDITOR FOR TECHNICAL **CLEANLINESS**

The qualification as an auditor provides contents and the importance of the potential analysis of technical cleanliness according to VDA 19.2.

In a practical module the potential analysis is conducted and the results are documented in an extensive report.

Contents

2

1 What let

What cleanlin controlled? What are the product?

- Determination of goals and importance of questions

- Creation of a potential analysis report

- according to VDA 19.2

Targets

Technical cleanliness managers **Project managers** Process planners Production managers

Training course duration 2 days

Training location At your company

Article number 20032

Targets

Technical cleanliness managers Project managers Process planners Production managers

Training course duration 2 days

Training location At CleanControlling, on request also at your company

		Logistics						
		How is consistent traceability been planned and documented throughout material flow?	the entire					
		Assembly facilities		an				
	Are pro	ocesses, measuring devices, auxiliary materials and tools suitable for use	e in the					
		Staff		-				
h	o is in ch	arge of the clean area?						
	la elece	Environment						
V	els of cle	an area are planned?	_					
		Quality Control	th	-				
e	th sss requirements exist and which forms of contamination need to be							
n	equireme	ents based on and how do they affect deviations in the end-	d	nt				

- Description of implementation possibilities
- Conducting of a potential analysis for a selected product
- Written test for technical cleanliness auditor
- After the test is successfully completed, a certificate is issued.
- Prerequisite for participation in qualification training
- Basic knowledge of technical cleanliness
- Passed qualification training as Technical Cleanliness Specialist
- Conducting ideally in combination with an assessment or following an assessment already carried out with CleanControlling, as information of assessment is included in potential analysis.
- (If this is not possible, then the duration must be increased accordingly.)



PARTICLE MONITORING

Particle traps are used to evaluate the environmental influences in assembly and relevant areas.

Particle stamps are used to verify the processes.

- Particle traps
- Assembly angle for particle traps
- Particle trap stands
- Particle stamps in various sizes
- SEM particle stamps
- Sterile particle stamps
- Particle rocker
- Particle trap holders for various types of microscopes u.a.

ASSEMBLY CLEANLINESS

Cleanliness areas according to VDA 19.2 regulate the particle entry and protect the products.

The assembly cleanliness can be optimized with various measures which result from the recommendations of VDA 19.2.

CLEANLINESS AREAS

- Floor marking tape
- Barrier/marking tape
- Clean mats

u.a.

ASSEMBLY CLEANLINESS

- Suction systems
- Hand/glove cleaner
- Visualization lamps

u.a.

LABORATORY EQUIPMENT

The right laboratory equipment and accessories are decisive for the results of the cleanliness inspections.

CleanControlling offers laboratory technology matched to the needs of a cleanliness laboratory.

- Particle suction systems
- Dust-binding mats for shoe soles
- Diaphragm filters
- Laboratory clothing/clean room clothing
- Laboratory equipment
- Particles
- u.a.





















You will find more detailed information on the use and the designs in our product catalogue and our ordering shop on the Internet at www.cleancontrolling.com













ANALYSIS / CLEANLINESS TEST

CONFERENCE

Current, more detailed information on planned conferences is available at www.cleancontrolling.com

CLEANLINESS INSPECTION

Cleanliness inspections according to VDA 19.1 or ISO 16232 and specific customer standards

Liquid extraction



AIR EXTRACTION

Analysis of component cleanliness using air extraction

Analysis method for quantitative description of the component cleanliness of air-carrying components (according to ISO 16232, Part 5)

Advantages

- Analysis of components which would be destroyed by liquid treatment is possible
- Concealed inner surfaces are not moistened with liquid
- Particles cannot sediment on inner cavities
- No problems when removing test medium

The procedure is basically similar to the analysis with liquid

- The particles (residual dirt) are collected on an analysis filter and - depending on the requirements - characterized using gravimetry, microscopy or elemental analysis.
- The measuring result is highly independent of the execution of the extraction procedure.
- Calibration and capabilities of the measuring equipment used are decisive for the result of the cleanliness values to be determined.



FURTHER ANALYSIS

Analyses for determining the particle source

- ♦ IR spectroscopy
- EDX analysis of individual particles
- EDX scan

Analyses for determining filmic contamination



CONFERENCE

Einladung zur

Einladung zur

Einladung zum

Grundlagensem

Fachtagu

Fachtagung

The CleanControlling conferences not only impart the technical contents, they also provide an opportunity for networking in the world of technical cleanliness and a chance for exchanging experience.

Einladung zur Fachtagung	Fachtagung Planung und Konstruktion von sauberkeits sensiblen Montageeinrichtungen nach VDA 19 Teil 2
14. + 15. Februar 2017 Memory Medical States Medical States (Second States) Medical States (Second States)	
CleanControlling	Advanduatoray und Mohtgereingenskaan Auszuppfane und konstruktuure Auszuppfane und Nationsulte Rechardung Nigotekein und Cautoraute Rechardung Nigotekein und Cautoraute Rechardung Nigotekein und Cautoraute Rechardung Nigotekein und Cautorautereinterein Enterveihe Lautekein Nicoladonalater und Kentgungs-exertivortiche



according to VDA 19.2



of technical cleanliness



• Basics of technical cleanliness according to VDA 19.1 / VDA 19.2

• Planning and design of cleanliness-sensitive assembly devices



Additional conferences on current topics





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