

1 Area of application

This company standard applies to Thomas GmbH.

2 Description

This company standard describes the handling of the topic "technical cleanliness" in relation to suppliers of the company Thomas GmbH.

This company standard is to be understood as a superordinate and supplementary document for suppliers on the subject of "technical cleanliness".

This company standard enters into force on the day of approval for components, means of production and processes in which specifications for technical cleanliness have been established with reference to this company standard.

2.1 Concept / Philosophy

Due to constantly increasing requirements regarding product cleanliness e.g. from the automotive industry, especially regarding "technical cleanliness", it is necessary for suppliers of cleanliness-sensitive components to implement a wide-ranging cleanliness concept. To implement this concept, it is essential to think and act in an interdisciplinary manner.

Every single person, from the project purchaser to the production employee, must be aware of the importance of technical cleanliness as a functional feature of our products. It is advisable to communicate this know-how in the form of training courses.

2.2 Product

This chapter defines the most important aspects of "technical cleanliness" related to purchased parts from Thomas. The goal of the CS is to develop and implement a uniform standard of "technical cleanliness" for all relevant purchased parts. To implement this goal, the regulations and recommendations of this company standard are based on VDA 19 / ISO 16232. These can be considered as a standard work on "Technical Cleanliness", especially in the automotive industry. An exception is the technical cleanliness of electronic assemblies as purchased parts, which is additionally described in chapter **2.2.4**.

2.2.1 Drawing specification

The technical cleanliness specifications must be defined in the drawing. A uniform procedure is chosen here. This applies to all relevant purchased parts of Thomas GmbH. The nomenclature is in accordance with VDA 19.1. The use of deviating internal standards and nomenclatures for new projects (except for parts to be adopted) is not permitted. Reference must be made to the present company standard.

The VDA 19.1 nomenclature provides a description of "technical cleanliness" in accordance with the so-called CCC (Component Cleanliness Code), which must be used in every case. The CCC data can refer to a single component (reference value "N", see Figure 1) or to several components (reference value "n", see Figure 2). If the reference value "n" is used, it must be indicated on the drawing as a sampling size $n = X$ in order to determine the sampling size for the given limit values (see Figure 2).

The permissible number of particles in the respective size classes is given in whole numbers. For the reference value "N" (single component), the limit values in the CCC apply to a single component; for the reference value "n" (several components), the limit values in the CCC apply to the specified number of components (sampling size).

The particle size classes are based on the size classes according to VDA 19 / ISO 16232, but can be also combined as desired (see Figure 3-4). Unless otherwise described on the drawing, the particle size classes apply to the length of the particles, the length of a particle is defined here as Feret diameter. If it is necessary to distinguish between reflecting and non-reflecting particles, this must also be specified in the drawing. Basically, if not differently indicated on the drawing, fibers are not considered.

$$CCC = N(B755840/C43720/D36791/E938/F502/G394/H48/I7/J5/K2/L1/M1/N0)$$

Figure 1 - Specification of the CCC with a reference N, as well as particle limit values in absolute numbers per component.

$$CCC = n(H1/I-N0) \quad n=20$$

Figure 2 - Indication of the CCC with reference value n, as well as indication of the sampling size (exemplary: n = 20 components)

Number of particles per size class												
B	C	D	E	F	G	H	I	J	K	L	M	N
5	15	25	50	100	150	200	400	600	1000	1500	2000	3000
≤ x < 15	≤ x < 25	≤ x < 50	≤ x < 100	≤ x < 150	≤ x < 200	≤ x < 400	≤ x < 600	≤ x < 1000	≤ x < 1500	≤ x < 2000	≤ x < 3000	<

Figure 3 - Specification of particle size classes according to VDA 19 / ISO 16232

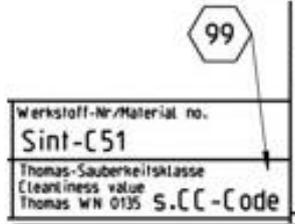
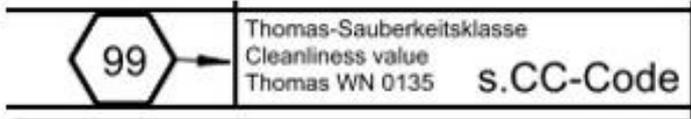
Number of particles per size class							
B - D	E	F	G	H	I	J	K - N
5	50	100	150	200	400	600	1000
≤ x < 50	≤ x < 100	≤ x < 150	≤ x < 200	≤ x < 400	≤ x < 600	≤ x < 1000	<

Figure 4 - Exemplary summary of individual size classes for simplified notation

2.2.1.1 Cleanliness information in the title block/ article sheet / comment tables:

The numbers "0-9" or "A-E" **are not permitted** for newly created drawings.

The comment "99" always belongs to this line, which refers to the comment table and contains more detailed information on this.



Werkstoff/Material				Werkstoff-Nr/Material no.			
Korrosionsschutz/corrosion protection				98		Sauberkeitsspezifikation Cleanliness specification	
Format/Size		Datum		Name		Benennung/Title	
DIN A3							
		Gez.					
		Gepr.					
		Freig.					
ISO 128-30 Methode 1		Gewicht/Weight Igl		Maßstab/Scale		Blatt/Sheet	
		 THOMAS MAGNETE GMBH Postf. 1260 D-57557 Herdorf		Artikelnummer/Item Number			Index
				Zeichnungs-Nr./Drawing-no.			Version
				EC-Nr.		Projekt Erstverw.	

Figure 5 - Reference to the standardized comment "99" in the drawings

2.2.2 Test methodology

In order to guarantee the technical cleanliness requirements of the purchased parts, regular inspections at the suppliers are necessary.

The cleanliness test at Thomas suppliers shall be carried out according to VDA 19.1. The equipment being used does not necessarily have to agree with the equipment of Thomas if a procedure according to VDA 19.1 is applied to the supplier and the equipment used has been qualified according to VDA 19.1. It is useful to coordinate the test parameters between the supplier and Thomas GmbH. The **"Form sheet Product Cleanliness FS QM 043"** is available for this purpose.

The use of an encapsulated rinsing cabinet in combination with a residual dirt microscope system is recommended, e.g.

- rinsing cabinet: company Gläser model ACM-16 or ACM-18
- residual dirt microscope system: company Jomesa

2.2.3 Tests during production

In general, the supplier is responsible for the quality of his components; this also applies to compliance with the cleanliness specifications recorded in the drawings. This must be proved regularly by the supplier. In addition, Thomas GmbH carries out regular incoming goods inspections of the relevant components, any conspicuous components are reported to the supplier.

2.2.4 Cleanliness of electronic assemblies as purchased parts

2.2.4.1 Quoted standards and applicable documents

- IPC-A-610 E ff
- VDA volume 19.2

2.2.4.2 Area of application

For all electronic assemblies that are supplied as Thomas purchased parts.

2.2.4.3 Purpose

Ensuring the required cleanliness of supplier assemblies and end products for the function.

2.2.4.4 Classification

The allocation of the assembly is based on the IPC-A-610E ff ("Acceptance criteria for electronic assemblies") with regard to the cleanliness of printed circuit boards and assemblies (Chapter "10.4 Cleanliness") in

- Class 1 ("Common electronic products"),
- Class 2 ("Designated electronic products ")
- Class 3 ("high-performance electronics").

The classification of the electronic assembly into the IPC classification is to be taken from specifications.

Unless otherwise agreed, at least the classification into Class 1 must be ensured (the classification can be found under 1.4.1 ("Classification") of IPC-A-610E ff).

2.2.4.5 Drawing entry in circuit diagrams

The reference for the cleanliness of electronic assemblies is located as a drawing entry in the circuit diagram.

2.3 Logistics / Packaging

The entire logistics and packaging concept of a Thomas product must also be adapted to the requirements of "technical cleanliness". Contamination of clean components by inadequate packaging is not permitted and will be rejected by Thomas. Thomas GmbH provides suitable packaging as agreed, the correct handling is the responsibility of the supplier.

3 Associated Documents

VDA 19 Part 1 and 2

ISO 16232

IPC-A-610E ff

4 Advice

For drawings that were released before 01/01/2014 and are based on the then valid company standard CS 0092, the following extract from the former company standard CS 0092 applies, but which should be replaced by the CC code whenever possible: This information is only used for a quick overview of the old cleanliness requirements!

Cleanliness requirements "0-9"

Thresholds:

Designation in the drawing ²⁾		Biggest hard particle [µm]	Biggest soft particle [µm]	Based on 100 cm ² area ¹⁾			Number of samples per analysis [pieces]
				Number of particles >15 µm (all) [pieces]	Number of particles >150µm (hard) [pieces]	Gravimetry [mg]	
cleanliness class 0	Component in the system without cleanliness requirements	No machining residues/dirt visible on visual inspection (without tools), individual fibers are permissible Not for new projects!					Max. 3
cleanliness class 1	Component in the system low cleanliness requirements (Cleanliness Standard 1)	800	10.000	10.000	8	5	3-10 (small parts more)
cleanliness class 2	Component in the system high cleanliness requirements (Cleanliness Standard 2)	400	4.000	2.000	2	1	3-10 (small parts more)
cleanliness class 9	Component in the system with special requirements	Individual definition by Thomas required! Definition is specified in the comment bar					

- 1) „Surface" means the area that can contaminate the customer system or is relevant from a functional point of view.
- 2) The cleanliness level in the finished device may differ from the delivery cleanliness. In these cases, the final cleanliness level of the individual part is saved in a table in the final assembly drawing. In addition, the cleanliness condition of the complete device is stated.

For all magnets, valves, actuators, dosing pumps and other Thomas end products before direct delivery to the customers.

Only for old products and adaptation projects.

Ensuring the required cleanliness

Thresholds:

Designation in the drawing		Biggest hard particle [µm]	Biggest soft particle [µm]	Based on 100 cm ² area ¹⁾			Number of samples per analysis [pieces]
				Number of particles >15 µm (all) [pieces]	Number of particles >150µm (hard) [pieces]	Gravimetry [mg]	
cleanliness class 1	devices with low cleanliness requirements	800	10.000	10.000	8	5	3-5
cleanliness class 2	devices with high cleanliness requirements	400	4.000	2.000	2	1	3-5
cleanliness class 9	devices with special (customer) requirements	Individual definition by Thomas required!					3-5

1) "Surface" means the area that can contaminate the customer system or is relevant from a functional point of view.

Also **invalid** cleanliness information for new projects and newly created drawings:

Cleanliness class "A-E"

Thomas-Cleanliness Class		Cleanliness Level
A	Highest component requirement	Finest-cleanliness
B	High component requirement	Fine-cleanliness
C	Middle component requirement	Normal-cleanliness
D	Standard component requirement	Gross-cleanliness
E	Undefined component requirement	Particular undefined cleanliness

Thomas cleanliness classes serve as the basis for specifying the:

- Measurement intervals
- Test method and test device
- Cleaning specification for manufacturing technology

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Thomas-cleanliness-class		Test method at supplier	Test interval by supplier	Cleanliness specification manufacturing technology	Packaging
A	Highest component requirement	automatic particle counting system	1 x per shipping unit or per production lot, but at least once a week. 3 components from different packaging units in a group analysis	Coordination of cleaning by outside company for all machines (2 times/year)	No wood and cardboard, Plastic, with cover, Delivery preferably as directed parts in trays, shrink-wrapped in foil, in a closed special load carrier (on factory piece geometry adapted, with foil hood)
B	High component requirement	automatic particle counting system	1 x per shipping unit or per production lot, but at least once a week. 3 components from different packaging units in a group analysis	Coordination of cleaning by outside company for all machines (2 times/year)	No wood, Plastic, with cover, delivery trays; Special load carriers closed (e.g. adapted to work piece geometry, with foil hood)
C	Middle component requirement	-	Monitoring: 2 times per year. 3 components from different packaging units in a group analysis	Coordination of cleaning by outside company for all machines (2 times/year)	No wood, Plastic, with cover, delivery trays; Special load carriers closed (e.g. adapted to work piece geometry, with foil hood)
D	Standard component requirement	-	-	Coordination of cleaning by outside company for all machines (2 times/year)	-
E	Terminal equipment-Requirements for use on device drawings.	Customer requirements			