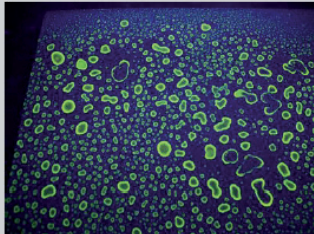

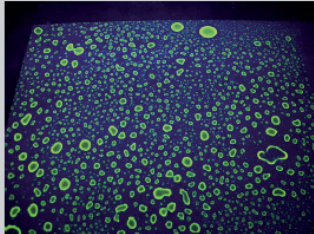
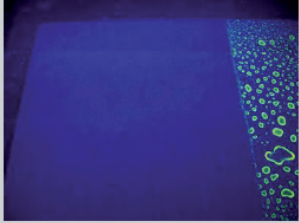
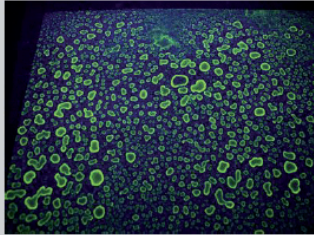



# sphera<sup>®</sup> element - Cleanability

External testing of Sphera Element according to ISO 4628-1 and VDI 2083 part 17, at Fraunhofer IPA shows that the cleanability of Sphera is "excellent". This so called "riboflavin test" is part of a series of tests on cleanroom suitability. Riboflavin, also known as vitamin B2, is a yellow-orange substance with fluorescent properties.

The test solution was sprayed uniformly onto the test surface and allowed to dry at room temperature for a period of two or three hours. The contamination was cleaned after drying. This represents the expected worst case scenario for flooring systems. The cleaning is done with ultrapure water and a microfiber cloth.

## Sphera element (gray)

Digital pictures under UV-light	
Before cleaning	After three cleaning-cycles
	
Sample 1	0; excellent
	
Sample 2	0; excellent
	
Sample 3	0; excellent
<b>Result</b>	<b>0; excellent</b>

Results for Sphera Element (gray)





# Cleanroom<sup>®</sup> Suitable Materials

Forbo-Novilon B.V.  
Report No. FO 1707-929

Sphera Element  
(smooth)

Riboflavin test: excellent

FLOORING & COATING

DUPLICATE

Riboflavin Test  
Riboflavintest

# Statement of Qualification

## Qualifizierungsbescheinigung

### Customer

Auftraggeber

Forbo-Novilon B.V.  
De Holwert 12  
7741 KC Coevorden  
The Netherlands

### Material tested

Untersuchter Werkstoff

Sphera Element (gray 50003 | Grau 50003)  
For the specific product data such as manufacturing date and serial number please refer to the test report.  
Produktspezifische Daten wie Herstellungsdatum und Seriennummer sind dem Prüfbericht zu entnehmen.

### Test result / Classification

Untersuchungsergebnis/Klassifizierung

The examination of cleanability of the Sphera Element was investigated according to VDMA information test sheet. The following test result could be provided:

Die Überprüfung der Reinigbarkeit des Sphera Element wurde anhand des VDMA Merkblatts durchgeführt. Es konnte dabei folgendes Ergebnis festgestellt werden:

Material tested Untersuchter Werkstoff	Classification Klassifizierung
Sphera Element (smooth)	excellent   exzellent

### Assessing the cleanability (fluorescent test contamination)

Untersuchung der Abreinigbarkeit (fluoreszierende Testverschmutzung)

#### Standards / Guidelines:

Standards / Richtlinien:

VDMA information sheet »Riboflavin test for low-germ or sterile process technologies – Fluorescence test for examination of cleanability«. The norms stated refer to the relevant editions applicable at the time of the tests.  
VDMA Merkblatt »Riboflavintest für keimarme oder sterile Verfahrenstechniken – Fluoreszenztest zur Prüfung der Reinigbarkeit«. Die angegebenen Normen beziehen sich jeweils auf die zum Zeitpunkt der Untersuchungen gültige Fassung.

#### Test environment parameters:

Testparameter der Prüfumgebung:

Laboratory | Labor

#### Test procedure parameters:

Testparameter der Versuchsdurchführung:

- Test solution | Testlösung: ..... 0.2 g riboflavin, 5 g hydroxyethyl cellulose ..... in 1000 ml ultrapure water ..... 0,2 g Riboflavin, 5 g Hydroxyethylzellulose ..... in 1000 ml Reinstwasser
- Application of test solution | Auftrag der Testlösung: ..... pump spray ..... Pumpsprayer
- Drying Time | Trockenzeit: ..... approx. | ca. 2 - 3 h
- Cleaning method | Reinigungsmethode: ..... wiping | Wischreinigung
- Cleaning medium | Reinigungsmedium: ..... ultrapure water ..... Reinstwasser
- Number of wiping cycles | Anzahl Wischzyklen: ..... 3
- UV-light | UV-Licht: .....  $\lambda = 366 \text{ nm}$

Cleanability can only be assessed qualitatively and is assessed based on the amount and size of defects occurring.

Die Reinigbarkeit wird qualitativ untersucht und anhand der schwer zu reinigenden Stellen bewertet.

The measuring devices used for the qualification tests are calibrated at regular intervals; their results can be traced back to national and international standards. In cases where no national standards exist, the test procedure implemented complies with the technical regulations and norms applicable at the time of the test. The relevant documentation can be viewed on request at any time.

For further information about the test environment and parameters, please refer to the Fraunhofer IPA test report.

Die für die Qualifizierung verwendeten Messeinrichtungen werden regelmäßig kalibriert und sind auf nationale und internationale Normale rückführbar. Sofern keine nationalen Normale existieren, entspricht das Messverfahren den derzeit gültigen technischen Regeln und Normen. Die Dokumentation kann bei Bedarf eingesehen werden.

Weitere Informationen bezüglich Prüfumgebung und -parameter entnehmen Sie bitte dem Prüfbericht des Fraunhofer IPA.

Fraunhofer Institute for  
Manufacturing Engineering and Automation IPA

FO 1707-929  
Report No. first document

Stuttgart, September 14, 2017  
Place, date of first document issued

Department of Ultraclean Technology  
and Micromanufacturing

--  
Report No. current document

--  
Place, current date

Nobelstrasse 12  
70569 Stuttgart  
Germany

on behalf of   
Dr.-Ing. Udo Gommel, Project Manager Fraunhofer IPA