valid until: December 16, 2027

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TESTED®
DEVICE

HEIN Ind.-Schilder
GEM-MARK
Report No. HE 2209-1349

DUPLICATE

Statement of
Qualification

Single product
Outgassing Behavior
VOC/SVOC

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Statement of Qualification · Single product

Customer

HEIN Industrieschilder GmbH
Auwiesen 1
74889 Sinsheim
Germany

Component tested

Category: Materials

Subcategory: Coatings

Product name: Cleanroom label "GEM-MARK"
(manufacturing date: 8/23/2022; color: cyan, magenta, yellow, black, white; article number: 20000363315)

Emission chamber measurements with purge-and-trap thermodesorption method and gas chromatography combined with mass spectrometry (TD-GC/MS)

Standards/Guidelines: ISO 14644-8, -15; ISO 16000-6, -9, -11, -25; VDI 2083 Part 17
The norms stated generally refer to the version valid at the time of the tests.

Testing equipment:
- Measuring station: ..... PerkinElmer Clarus 600, Clarus SQ8, ATD 650
- Sampling chamber: ..... Markes International µCTE

Sample storage:
- Pre-conditioning:
  - Cleanroom Air Cleanliness Class (according to ISO 14644-1): ..... ISO 1
  - Airflow velocity: ..... 0.45 m/s
  - Airflow type: ..... vertical laminar flow
  - Temperature: ..... 22 °C ± 0.5 °C
  - Relative humidity: ..... 45 % ± 5 %
  - Purified air: ..... VOC-filtered

Test procedure parameters:
- Retention range (VOC): ..... C6 to C16
- Outgassing test temperatures: ..... 23 °C and 90 °C

Test result / Classification

The outgassing behavior of Cleanroom label "GEM-MARK" at the stated temperatures was investigated according to VDI 2083 Part 17 and ISO 14644-15. Based on the outgassing rates determined for the specific surfaces, the following material classification was made for the corresponding Contaminant Category:

Contaminant Category (x)	SER_a [1] 23 °C [g/m^2s]	SER_a [1] 90 °C [g/m^2s]	ISO-ACC_m Class (x) based on 23 °C
VOC	1.9×10^{-9}	2.6×10^{-7}	**-8.7**
SVOC	$< 2.8 \times 10^{-10}$	5.0×10^{-8}	**< -9.6**
Amines	$< 2.8 \times 10^{-10}$	$< 1.7 \times 10^{-9}$	**--**
Organophosphates	$< 2.8 \times 10^{-10}$	$< 1.7 \times 10^{-9}$	**--**
Siloxanes	$< 2.8 \times 10^{-10}$	$< 1.7 \times 10^{-9}$	**--**
Phthalates	$< 2.8 \times 10^{-10}$	$< 1.7 \times 10^{-9}$	**--**

[1] SER_a: Area-specific emission rate

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.

Detailed information and parameters of the test environment can be found in the Fraunhofer IPA test report.

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on behalf of
Dr.-Ing. Frank Bürger, Project Manager Fraunhofer IPA

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