



Fraunhofer

TESTED[®] DEVICE

Knauf Ceiling Solutions
Sierra OP

Report No. KN 2409-1561

DUPLICATE

Statement of
Qualification

Single product
Particle Emission

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| Customer | Knauf Ceiling Solutions GmbH & Co. KG Elsenthal 15 94481 Grafenau Germany |
| Component tested | |
| Category: | Cleanroom Facilities |
| Subcategory: | Wall/Ceiling/Floor/Door |
| Product name: | Sierra OP (manufacturing date: 2/28/2024; color: white; article number: GR-L-36-01; size: 1200 x 1200 x 15 mm; grid system: KCS T 24) |

Random sampling of particle emissions (airborne) at representative sites under atmospheric conditions

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| Standards/Guidelines: | ISO 14644-1, -14 The norms stated generally refer to the version valid at the time of the tests. |
| Test devices: | Optical particle counter: LasAir II 110 and LasAir III 110 with measuring ranges $\geq 0.1 \mu\text{m}$, $\geq 0.2 \mu\text{m}$, $\geq 0.3 \mu\text{m}$, $\geq 0.5 \mu\text{m}$, $\geq 1.0 \mu\text{m}$ and $\geq 5.0 \mu\text{m}$ |
| Test environment parameters: | <ul style="list-style-type: none">Cleanroom Air Cleanliness Class (according to ISO 14644-1):..... ISO 1Airflow velocity:..... 0.45 m/sAirflow pattern:..... vertical laminar flowTemperature: 22 °C \pm 0.5 °CRelative humidity: 45 % \pm 5 % |
| Test procedure parameters: | The ceiling system was subjected to stress as follows: <ul style="list-style-type: none">Structure-borne noise: approx. 50 HzOscillation velocity (Ø):..... v = 5.0285 mm/sOscillation acceleration (Ø):..... a = 7.0780 m/s²Deflection of the system (Ø):..... s = 0.1855 mm |

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| Test result / Classification | When operated under the specified test conditions, the ceiling system Sierra OP is suitable for use in cleanrooms fulfilling the specifications of the following Air Cleanliness Class according to ISO 14644-1: |
|------------------------------|--|

| Test parameter(s) | Air Cleanlines Class |
|---------------------------------------|----------------------|
| Structure-borne noise = approx. 50 Hz | 2 |
| Overall result | |

It must be pointed out, that according to ISO 14644-1 cleanrooms classes 1 to 5 have a high filter occupancy, with the result that large-surface ceiling systems cannot be used in some cases. Cleanrooms with a horizontal displacement flow form an exception to this.

The test result may be influenced by the surrounding ceiling system, in particular the material pairing between the light and ceiling frame, as well as other assembly accessories. Particle emission behavior should be re-assessed in the respective assembly situation.

The cut edges/back are made of very porous material. Therefore, the use of the test piece in clean/hygienic areas is considered to be critical.

Please note: Transport damages, incorrect installation, aging behavior, corrosion etc. can influence the test result.

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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| Department of Ultraclean Technology and Micromanufacturing | -- Report No. current document | -- Place, current date |
| Nobelstrasse 12 70569 Stuttgart Germany | on behalf of Dr.-Ing. Frank Bürger, Project Manager Fraunhofer IPA | |