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DEVICE

Festo AG & Co. KG
Multi-Carrier-System Size 120
Report No. FE 1611-856

Statement of
Qualification

Particle Emission

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Statement of Qualification

Customer

Festo AG & Co. KG
Ruiter Strasse 82
73734 Esslingen
Germany

Component tested

Category: Automation Components

Subcategory: Positioning Systems

Product name: Multi-Carrier-System Size 120
(manufacturing date: 9/2016; serial number: Revision 2016)

Random sampling of particle emissions (airborne) at representative sites

Standards/Guidelines: VDI 2083-9.1; ISO 14644-1
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 ≥ 0.1 µm, ≥ 0.2 µm, ≥ 0.3 µm, ≥ 0.5 µm, ≥ 1.0 µm and ≥ 5.0 µm

Test environment parameters:

- Cleanroom Air Cleanliness Class (according to ISO 14644-1): ISO 1
- Airflow velocity: 0.45 m/s
- Airflow pattern: vertical laminar flow
- Temperature: 22 °C ± 0.5 °C
- Relative humidity: 45 % ± 5 %

Test procedure parameters:

- Number of carriers: 3
- Max. travel length: 1,800 mm
- Parameter Set 1:
  - Velocity: 100 mm/s
  - Acceleration, Deceleration: 10,000 mm/s²
  - Jerk: 100,000 mm/s³
- Parameter Set 2:
  - Velocity: 1,000 mm/s
  - Acceleration, Deceleration: 10,000 mm/s²
  - Jerk: 100,000 mm/s³
- Parameter Set 3:
  - Velocity: 2,000 mm/s
  - Acceleration, Deceleration: 40,000 mm/s²
  - Jerk: 400,000 mm/s³

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Test result / Classification

When operated under the specified test conditions, the Multi-Carrier-System Size 120 is suitable for use in cleanrooms fulfilling the specifications of the following Air Cleanliness Classes according to ISO 14644-1:

Test parameter(s)		Air Cleanliness Class
Set 1	velocity = 100 mm/s; acceleration/deceleration = 10,000 mm/s²; jerk = 100,000 mm/s³	4
Set 2	velocity = 1,000 mm/s; acceleration/deceleration = 10,000 mm/s²; jerk = 100,000 mm/s³	6
Set 3	velocity = 2,000 mm/s; acceleration/deceleration = 40,000 mm/s²; jerk = 400,000 mm/s³	6
Overall result		**6**

A visual inspection of the test piece according to VDI 2083 Part 9.1 has shown clear signs of abrasion on the guiding tracks as well as on the carriers. The generated particles are not getting airborne immediately. They rather stick to the surfaces due to magnetic effects or sediment due to gravity and are therefore not detectable by optical particle counters. Those agglomerates may release large numbers of particles in an uncontrolled manner due to external effects like unpredictable air currents. This has to be considered as critical in cleanroom environments.
The guiding tracks and the carriers need to be cleaned regularly in short intervals.

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.

Fraunhofer Institute for Manufacturing Engineering and Automation IPA

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Stuttgart, December 1, 2016
Place, date of first document issued

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Place, current date

on behalf of
Frank Bürger, Project Manager Fraunhofer IPA

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