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**TESTED[®]
DEVICE**

RK Rose+Krieger GmbH
RK DuoLine Z60 Clean
Report No. RK 1404-704

DUPLICATE

Statement of
Qualification

Particle Emission

Statement of Qualification

Customer: RK Rose+Krieger GmbH
 Potsdamer Strasse 9
 32375 Minden
 Germany

Component tested

Category: Automation Components

Subcategory: Linear Units

Product name: RK DuoLine Z60 Clean
 (article number: TD15A5F1A12A02405; manufacturing date: CW 12/2014;
 stroke: 2000mm)

Test result / Classification:
 (in acc. with ISO 14644-1)

When operated without an extraction system, the linear unit RK DuoLine Z60 Clean (TD15A5F1A12A02405) is suitable for use in cleanrooms fulfilling the following air cleanliness specifications according to ISO 14644-1:

Parameter	Air Cleanliness Class
$v_1 = 0.25 \text{ m/s}; a = 4.0 \text{ m/s}^2$	ISO 6
$v_2 = 0.5 \text{ m/s}; a = 4.0 \text{ m/s}^2$	ISO 7
$v_3 = 1.0 \text{ m/s}; a = 4.0 \text{ m/s}^2$	ISO 8
Overall result	ISO 8

Random sampling of particle emissions (airborne) at representative sites

Standards/Guidelines: VDI 2083-9.1; ISO 14644-1
 The norms stated refer to the relevant editions applicable at the time of the tests.

Test devices: Optical particle counter:
 LasAir II 110 with measuring ranges $\geq 0.1 \mu\text{m}$, $\geq 0.2 \mu\text{m}$, $\geq 0.3 \mu\text{m}$, $\geq 0.5 \mu\text{m}$, $\geq 1.0 \mu\text{m}$ und $\geq 5.0 \mu\text{m}$

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:..... $22^\circ\text{C} \pm 0.5^\circ\text{C}$
- Relative humidity:..... $45\% \pm 5\%$

Test procedure parameters:

- Extraction:.....none
- Installation position:.....vertical, drive underneath
- Travelling distance:.....s = 1870mm
- Velocities:..... $v_1 = 0.25 \text{ m/s}; v_2 = 0.5 \text{ m/s}; v_3 = 1.0 \text{ m/s}$
- Acceleration:..... $a = 4.0 \text{ m/s}^2$

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

Stuttgart, March 4, 2015

Place, date of first document issued

Department of Ultraclean Technology
 and Micromanufacturing

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 Place, current date

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