



**Fraunhofer**

**TESTED<sup>®</sup>  
DEVICE**

Bahr Modultechnik GmbH  
Linear unit QSZ 80  
**Report No. BA 1611-858**

DUPLICATE

Statement of  
Qualification

Particle Emission

# Statement of Qualification

**Customer**  
 Bahr Modultechnik GmbH  
 Nord-Süd-Strasse 10a  
 31711 Luhden  
 Germany

**Component tested**

Category: Automation components

Subcategory: Linear Units

Product name: QSZ 80  
 (manufacturing date: 11/2/2016; identification number: 1608132-10-1;  
 overall length: 1500mm)

## 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  $\geq 0.1 \mu\text{m}$ ,  $\geq 0.2 \mu\text{m}$ ,  
 $\geq 0.3 \mu\text{m}$ ,  $\geq 0.5 \mu\text{m}$ ,  $\geq 1.0 \mu\text{m}$  and  $\geq 5.0 \mu\text{m}$

Test environment parameters:

- 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  $\pm$  0.5 °C
- Relative humidity: ..... 45 %  $\pm$  5 %

Test procedure parameters:

- Installation position: .....horizontal, slide facing upwards
- Travelling distance: ..... s = 820 mm
- Volume flow of the vacuum extraction: ..... Q = 11.7 m<sup>3</sup>/h
- Parameter Set 1:.....v<sub>1</sub> = 0.5 m/s; a<sub>1</sub> = 1.0 m/s<sup>2</sup>
- Parameter Set 2:.....v<sub>2</sub> = 1.0 m/s; a<sub>2</sub> = 2.0 m/s<sup>2</sup>
- Parameter Set 3:.....v<sub>3</sub> = 2.0 m/s; a<sub>3</sub> = 4.0 m/s<sup>2</sup>

## Test result / Classification

When operated under the specified test conditions, the linear unit QSZ 80 with vacuum extraction 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 |
|---|-----------------------|
| v <sub>1</sub> = 0.5 m/s; a <sub>1</sub> = 1.0 m/s <sup>2</sup> | 1                     |
| v <sub>2</sub> = 1.0 m/s; a <sub>2</sub> = 2.0 m/s <sup>2</sup> | 1                     |
| v <sub>3</sub> = 2.0 m/s; a <sub>3</sub> = 4.0 m/s <sup>2</sup> | 4                     |
| <b>Overall result</b>   | <b>4</b>              |

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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Place, date of first document issued

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Place, current date

on behalf of   
 Frank Bürger, Project Manager Fraunhofer IPA