valid until: June 27, 2030

Fraunhofer

TESTED®
DEVICE

Bosch Rexroth AG
ACTIVE Shuttle 2.1
Report No. BO 2503-1609

DUPLICATE

Statement of
Qualification

Single product
Particle Emission
in Cleanroom
(atmospheric)

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IPA

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IPA

Statement of Qualification · Single product

Customer

Bosch Rexroth AG
Löwentorstrasse 74
70376 Stuttgart
Germany

Tested product

Category: Automation Components

Subcategory: Robotics

Product name: ACTIVE Shuttle 2.1 Transport vehicle + CHARGER AS2.1 + CONTACTING MODULE AS2.1 WITH FRAME
(manufacturing date: 12/2024; color: traffic white (RAL 9003) and anthracite gray (RAL 7016); weight: 88 kg (with the battery); article number: 3842560099; serial number: 7211000005498)

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

Standards/guidelines: ISO 14644-1, -14
The norms stated generally refer to the version valid at the time of the tests.

Test equipment: 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
- Room temperature: ..... 22 °C ± 0.5 °C
- Relative humidity: ..... 45 % ± 5 %

Test procedure parameters:

- Parameter Set 1:
  - Max. velocity: ..... v_{max} = 1000 mm/s
  - Max. linear acceleration: ..... a = 300 mm/s²
  - Max. linear deceleration: ..... a = - 600 mm/s²
  - Max. angular velocity: ..... v_{rot} = 1.05 rad/s
  - Max. rotational acceleration/deceleration: ..... a_{rot} = 300 mm/s²
  - Attached payload: ..... m = 260 kg
  - Source/sink speed: ..... v_s = 100 mm/s
  - Source/sink stroke: ..... s_s = 16 (tolerance +2) mm
  - Travel path lengths: ..... x_1 = 1720 mm; x_2 = 4130 mm; x_3 = 1720 mm
- Parameter Set 2:
  - Attached payload: ..... m = 0 kg
  - Fan velocity : ..... v_{fan} = 4600 1/min

Test result / Classification

The ACTIVE Shuttle 2.1 Transport vehicle + CHARGER AS2.1 + CONTACTING MODULE AS2.1 WITH FRAME is suitable for use under the specified test parameters (room temperature: 22 °C ± 0.5 °C; relative humidity: 45 % ± 5 %) in cleanrooms of the following Air Cleanliness Classes according to ISO 14644-1:

Test parameter(s)	Air Cleanlines Class
Running process	5
Charging process	6
Overall result	**6**

Please note: Transport damages, incorrect installation, oil leakage, 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.

Fraunhofer Institute for Manufacturing Engineering and Automation IPA

Business unit
Testing and Certification

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-- — Place, current date

on behalf of
Dr.-Ing. Frank Bürger, head of business unit Testing and Certification

This document only applies to the named product in its original state and is valid for a period of 5 years from the date the first document was issued. The document can be verified under **www.tested-device.com**.