



**Fraunhofer**

**TESTED<sup>®</sup>  
DEVICE**

Mobile Industrial Robots ApS

MiR200

**Report No. MI 1805-1036**

DUPLICATE

Statement of  
Qualification

Particle Emission

# Statement of Qualification

<b>Customer</b>	Mobile Industrial Robots ApS Emil Neckelmanns Vej 15F 5220 Odense Denmark
<b>Component tested</b>	
Category:	Automation Components
Subcategory:	Robotics
Product name:	Mobile robot MiR200 (manufacturing date: 2018; color: gray; serial number: 180200011100201 MiR200 1.1; max. load: 200 kg)

## Random sampling of particle emissions (airborne) at representative sites

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"> <li>• Cleanroom Air Cleanliness Class (according to ISO 14644-1):..... ISO 1</li> <li>• Airflow velocity:..... 0.45 m/s</li> <li>• Airflow pattern:..... vertical laminar flow</li> <li>• Temperature:..... <math>22 \text{ }^\circ\text{C} \pm 0.5 \text{ }^\circ\text{C}</math></li> <li>• Relative humidity:..... <math>45 \% \pm 5 \%</math></li> </ul>
Test procedure parameters:	<ul style="list-style-type: none"> <li>• Test load:..... m = 200 kg</li> <li>• Parameter Set 1 (180°-straight-180°):               <ul style="list-style-type: none"> <li>– Velocity:..... <math>v_1 = 0.8 \text{ m/s}</math></li> <li>– Acceleration:..... <math>a_1 = 0.5 \text{ m/s}^2</math></li> <li>– Distance:..... <math>s_1 = 2 \text{ m}</math></li> </ul> </li> <li>• Parameter Set 2 (back-forth):               <ul style="list-style-type: none"> <li>– Velocity:..... <math>v_2 = 0.8 \text{ m/s}</math></li> <li>– Acceleration:..... <math>a_2 = 0.5 \text{ m/s}^2</math></li> <li>– Distance:..... <math>s_2 = 4 \text{ m}</math></li> </ul> </li> </ul>

## Test result / Classification

When operated under the specified test conditions, the mobile robot MiR200 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
Parameter Set 1 (180°-straight-180°): Test load: m = 200 kg Velocity: $v_1 = 0.8 \text{ m/s}$ Acceleration: $a_1 = 0.5 \text{ m/s}^2$ Distance: $s_1 = 2 \text{ m}$	4
Parameter Set 2 (back-forth): Test load: m = 200 kg Velocity: $v_2 = 0.8 \text{ m/s}$ Acceleration: $a_2 = 0.5 \text{ m/s}^2$ Distance: $s_2 = 4 \text{ m}$	2
<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.

Detailed information and parameters of the test environment can be found in the Fraunhofer IPA test report.

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on behalf of   
Dr.-Ing. Frank Bürger, Project Manager Fraunhofer IPA