



**Fraunhofer**

**TESTED<sup>®</sup>  
DEVICE**

hawo GmbH  
hm 4000 DC-VI

**Report No. HA 2104-1228**

DUPLICATE

Statement of  
Qualification

Single product  
Particle Emission

Statement of Qualification · Single product

Customer	hawo GmbH Obere Au 2-4 74847 Obrigheim Germany
Component tested	
Category:	Working Place and Operator
Subcategory:	Work Equipment
Product name:	sealing machine hm 4000 DC-VI (manufacturing date: 3/18/2021; color: V2A stainless steel; article number: 0.617.344; serial number: 493143; weight: 19 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 $\geq 0.1\text{ }\mu\text{m}$ , $\geq 0.2\text{ }\mu\text{m}$ , $\geq 0.3\text{ }\mu\text{m}$ , $\geq 0.5\text{ }\mu\text{m}$ , $\geq 1.0\text{ }\mu\text{m}$ and $\geq 5.0\text{ }\mu\text{m}$
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: .....22 °C <math>\pm</math> 0.5 °C</li><li>Relative humidity: ..... 45 % <math>\pm</math> 5 %</li></ul>
Test procedure parameters:	<ul style="list-style-type: none"><li>Sealing temperature:..... T = 180 °C</li><li>Throughput speed:..... v = 10 m/min</li><li>Contact pressure: ..... F = ~100 N</li></ul>

Test result / Classification

When operated under the specified test conditions, the sealing machine hm 4000 DC-VI is suitable for use in cleanrooms fulfilling the specifications of the following Air Cleanliness Class according to ISO 14644-1:

Test parameter(s)	Air Cleanlines Class
Sealing temperature = 180 °C Throughput speed = 10m/min Contact pressure = ~100N	5
Overall result	

Please note: Transport damages, incorrect installation, 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	HA 2104-1228 Report No. first document	Stuttgart, May 27, 2021 Place, date of first document issued
Department of Ultraclean Technology and Micromanufacturing	-- Report No. current document	-- Place, current date
Nobelstrasse 12 70569 Stuttgart Germany	on behalf of Dr.-Ing. Frank Bürger, Project Manager Fraunhofer IPA	