



valid until: March 1, 2029

# Fraunhofer

## TESTED<sup>®</sup> DEVICE

hawo GmbH  
HM 5000 PRINTPAK MED  
**Report No. HA 2401-1488**

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: HM 5000 DC-VI PRINTPAK MED SEALING EQUIPMENT + INKJET  
consisting of:

- HM 5000 C INKJET LEIBINGER IQJET (manufacturing date: 5/2023; type: IQJET; article number: 99-007000-70-0006; serial number: 5IQ-000378)
- HM 5000 DC-VI PRINTPAK MED SEALING EQUIPMENT (manufacturing date: 4/2023; material: V2A stainless steel; weight: 22 kg; type: HM 5000 DC-VI Sealing Equipment V1.01.01; article number: 1.617.029; serial number: 545579)

## 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:

- 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:

HM 5000 C INKJET

- Flow rate: .....v = 10 m/min

HM 5000 DC-VI PRINTPAK MED

- Sealing temperature:..... T = 180 °C
- Flow rate: .....v = 10 m/min
- Contact pressure:.....F = ~100 N

## Test result / Classification

When operated under the specified test conditions, the system HM 5000 DC-VI PRINTPAK MED SEALING EQUIPMENT + INKJET 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
HM 5000 C INKJET Flow rate = 10 m/min	9
HM 5000 DC-VI PRINTPAK MED Sealing temperature = 180 °C Flow rate = 10 m/min Contact pressure ~100 N	7
<b>Overall result</b>	<b>9</b>

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

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Report No. first document

Stuttgart, March 1, 2024  
Place, date of first document issued

Department of Ultraclean Technology and Micromanufacturing

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Report No. current document

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Place, current date

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