

TEST REPORT

no. E-260403-1

ISO 14644-14 CLEANROOM SUITABILITY TEST:
PARTICLE EMISSION TEST

Fabreeka GmbH Deutschland

Fabcel B30

20TH APRIL 2026

Laboratory: BNT SIGMA

Test report author: Krzysztof Zarczynski



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1. Test item

Name: Fabcel B30

Type: Elastomeric mat

Customer name and address: Fabreeka GmbH Deutschland, Hessenring 13 - 64572 Büttelborn

2. Test laboratory, contact details, date of the test

Name: BNT SIGMA (full name: Biuro Naukowo-Techniczne SIGMA), Cleanroom Technology Section

Address: Jezycka 44a/5 Street, 60865 Poznan, Poland

Website: www.bnt-sigma.pl

E-mail: info@bnt-sigma.pl

Telephone: 0048 61 624 27 22

Operator: Krzysztof Zarczynski, Senior Validation Engineer

Date of product transfer to cleanroom: 17.04.2026

Date of the tests: 18.04.2026

Date of issue of test report: 20.04.2026

3. Test methodology

3.1 Test method

Particle emission testing and product qualification (cleanroom suitability assessment) has been carried out in accordance with international standard: ISO 14644-14:2025 Cleanrooms and associated controlled environments - Part 14: Assessment of suitability for use of equipment by airborne particle concentration. Particle concentration limits for different ISO classes were based on the current version of ISO 14644-1 Cleanrooms and associated controlled environments - Part 1: Classification of air cleanliness by particle concentration (2025).

3.2 Test environment

All tests were carried out at the BNT SIGMA Laboratory, Cleanroom Technology Section, in a specially designed clean zone that meets ISO Class 1 air cleanliness requirements (according to ISO 14644-1).

Ultraclean test environment is provided by a vertical laminar air flow with a velocity of 0.45 m/s \pm 20%, filtered at the last stage of air preparation by ULPA 15 filters. The test zone is surrounded by an ISO Class 5 clean zone.

Temperature and relative humidity are controlled within the clean room to ensure stable test conditions of $21^{\circ}\text{C}\pm 2^{\circ}\text{C}$ and $50\%\pm 20\%$ RH. The results of the environmental verification are given below:

Measured values (before starting the test):

Temperature: 21.4°C

Relative humidity: 54.1%

Air velocity: 0.43 m/s

Air cleanliness verification: ISO 1*

*Based on: sample volume of 28.3l; one measurement point; particle size channels: $\geq 0.1\mu\text{m}$; $\geq 0.2\mu\text{m}$; $\geq 0.3\mu\text{m}$; $\geq 0.5\mu\text{m}$; $\geq 1.0\mu\text{m}$; $5.0\mu\text{m}$

3.3 Test setup and parameters

When the test piece was transferred to the clean room, all surfaces were wiped with isopropanol solution. The specimen was then left in the ISO Class 5 clean room and exposed to a flow of clean air to allow the residual isopropanol to dry out. The test piece was then visually inspected (no magnification, distance between the inspector and the surface being inspected approximately 30 cm). The next step was to place the test piece in an ISO Class 1 environment where the particle emission test was to be carried out. The sample at the measurement point was subjected to a static load of 20 N (applied over an area of approx.. 100 mm²).

Approximate identification of location(s) of high particle concentration

The approximate identification of high particle concentration locations (critical locations) was performed by systematically scanning the test piece with a laser particle counter equipped with a scanning probe (in beep mode; varying the distance of the probe from the test piece). The conclusions of the measurements made for the approximate identification of particle sources are qualitative in nature - any critical points identified in this step should be included in the next step of the test (precise identification of high particle concentration locations).

Precise identification of the location(s) of high particle concentration

Following the approximate identification, for each location with a high concentration of particles, a precise determination of the critical locations is carried out using a laser particle counter connected to a circular isokinetic sampling probe (sample volume per location: 28.3 litres). The location with the highest particle emission is used in the next step of the test (suitability measurement).

Suitability measurement

The suitability measurement (at the location with the highest particle emission) is performed with a laser particle counter connected to a round isokinetic sampling probe. As described in ISO 14644-14, 100 individual measurements of 28.3 litres each are performed to ensure adequate statistical relevance of the suitability result.

3.4 Measuring equipment

Critical point determination (qualitative and quantitative measurements of particle emission) and final qualification test (series of quantitative measurements of particle emission at the critical point(s) determined in the previous steps) were performed using a calibrated high-resolution laser particle counter equipped with a circular sampling probe. The laser particle counter is calibrated at regular intervals. Calibration results are traceable to national and international standards. Documentation is available on request.

Test instrument used in the test: Laser Particle Counter TSI 9110, s/n: 91101102001

Sampling efficiency: 1 cfm (28,3l/min)

Particle size channels used in the test: $\geq 0.1\mu\text{m}$; $\geq 0.2\mu\text{m}$; $\geq 0.3\mu\text{m}$; $\geq 0.5\mu\text{m}$; $\geq 1.0\mu\text{m}$; $5.0\mu\text{m}$

4. Test results

4.1 Visual inspection

No dirt, dust or surface defects are visible on the test item.

4.2 Approximate identification of location(s) of high particle concentration

All surfaces of the test item showed minimum particle emission during scanning. Individual "beeps", which were detected a few times during the entire scanning process (corresponding to 1-3 particles counted during 1 second of measurement time), were thought to be more the result of movement of the tube (connecting the scanning probe and the laser particle counter) and particles becoming detached from it, rather than particle emission from the test item itself. This was confirmed in the next step of the test.

4.3 Precise location(s) of high particle concentrations

Two sampling points were selected for measurement:

P1: Probe located approx. 1 mm above sample surface

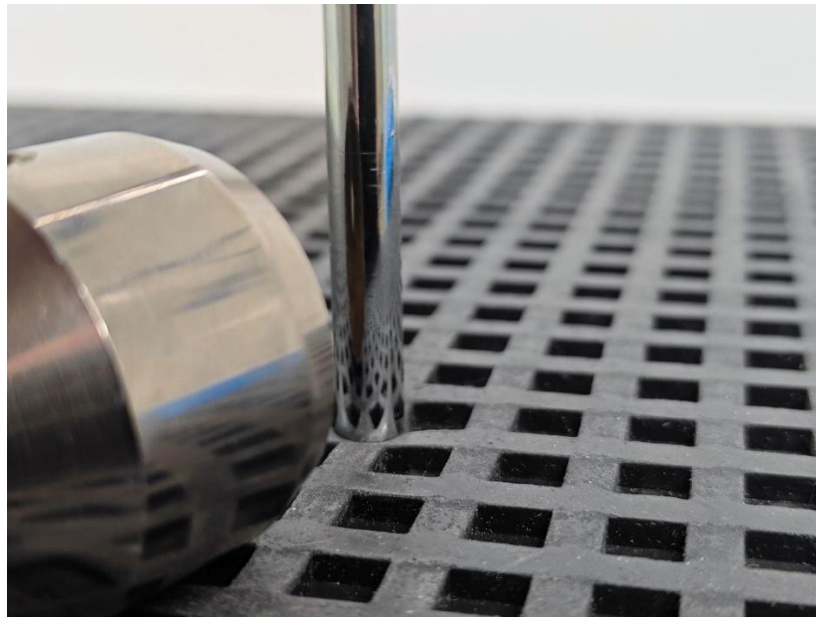
P2: Probe located approx. 5 mm above sample surface

All surfaces of the sample showed minimum particle emission during the measurement.

The number of particles measured at each sampling point is shown below (#/ft³):

Sampling point	Ch1 0.1µm	Ch3 0.2µm	Ch5 0.3µm	Ch6 0.5µm	Ch7 1µm	Ch8 5µm
P1	2	1	0	0	0	0
P2	1	0	0	0	0	0

Sampling point P1 was selected as the critical point for suitability measurement.

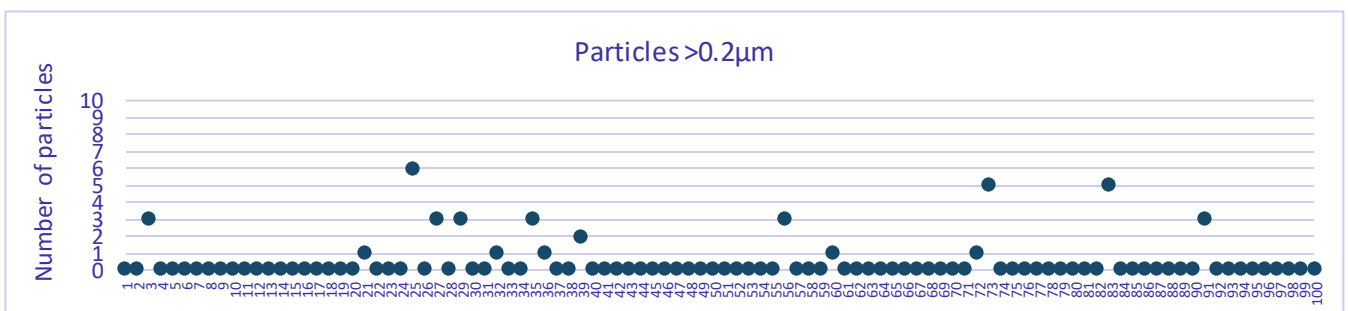
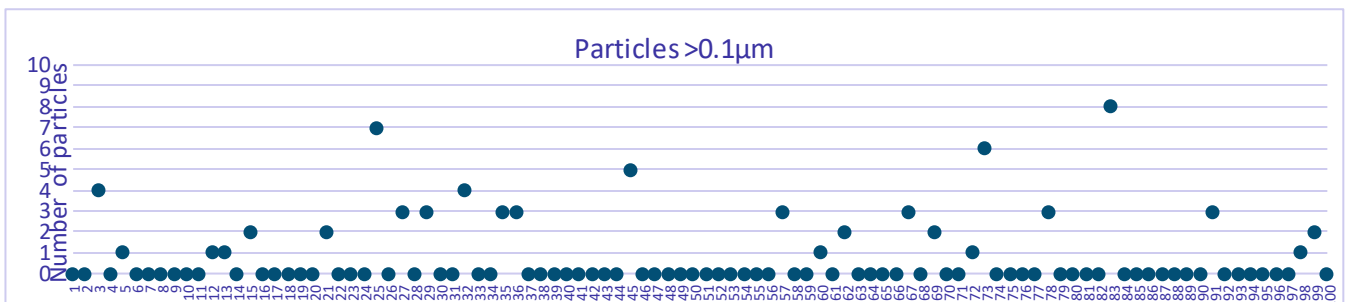


P1: Sampling probe located approx. 1mm above sample surface

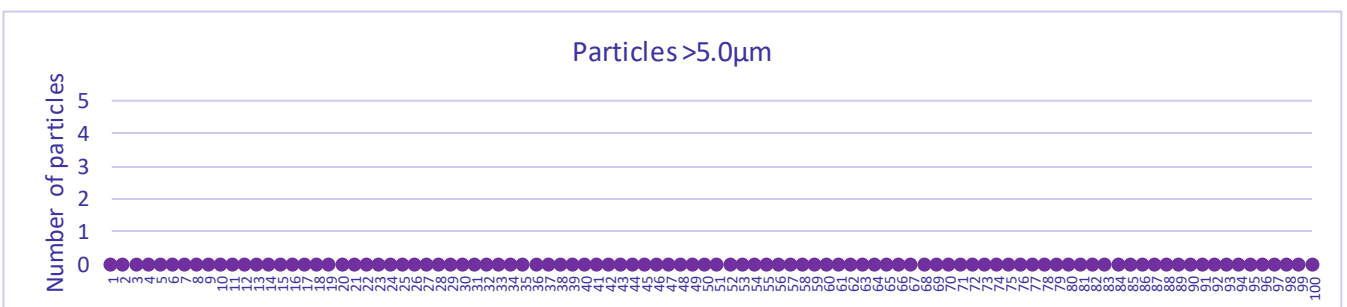
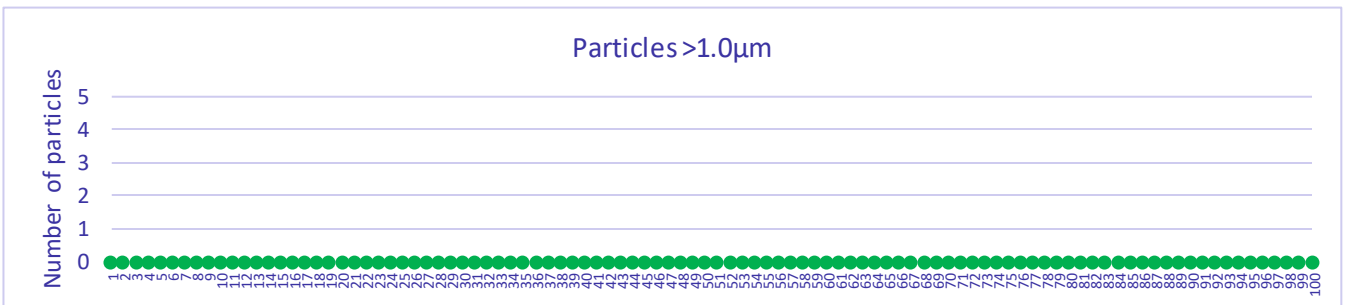
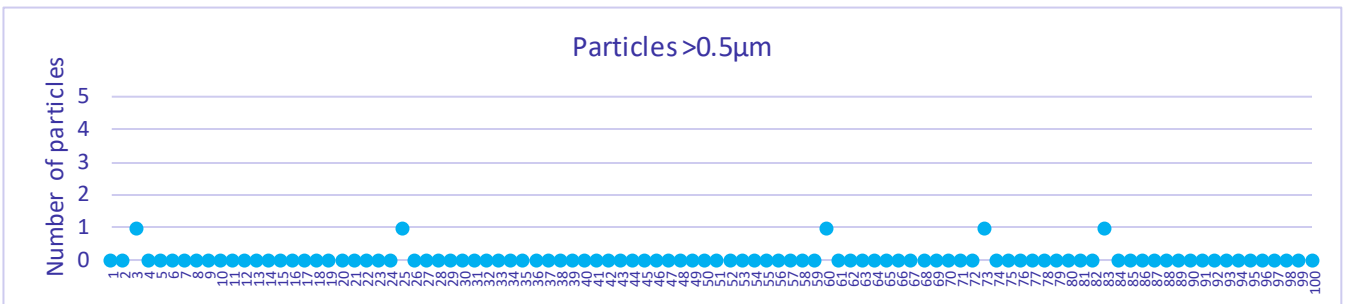
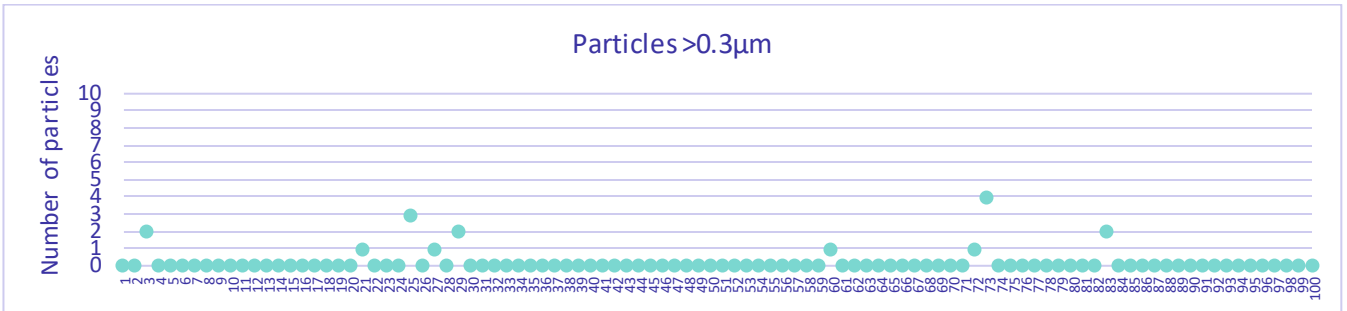
4.4 Suitability measurement

Particle emission test was carried out over a total time of 100 minutes (100 individual samples were taken; sample volume: 28.3 litres; sampling time: 1 minute).

The number of particles measured at sampling point P1 is shown in the graphs below:



Particle Emission Test



Statistical evaluation

The statistical evaluation of the data obtained from the particulate emission test was performed in accordance with ISO 14644-14 Section 6.2.9 Data processing:

	CH 0,1µm	CH 0,2µm	CH 0,3µm	CH 0,5µm	CH 1µm	CH 5µm
x (Mean value – Number of particles/1cf)	0,73	0,41	0,17	0,05		
n (Number of samples)	100	100	100	100	-	-
Pu (Upper confidence level)	2	2	1	0	0	0
ISO Class (ISO Class under consideration)	ISO 3					
G (Class under consideration limit)	28	6.71	2.89	1	Not considered for ISO 3 Class as per ISO 14644-1	Not considered for ISO 3 Class as per ISO 14644-1
Are acceptance criteria met? [Is UCL lower than G?]	Yes					
ISO Class suitability	ISO 3					

The above calculations demonstrate the cleanroom suitability of the product under test, derived from measurements for ISO Class 3 cleanrooms (0.1 µm, 0.2 µm, 0.3 µm, 0.5 µm). The probability of exceeding the ISO Class 3 cleanroom air cleanliness limit is <5%.

5. Conclusions

The Fabcel B30 elastomeric mat is suitable for use in cleanrooms that comply with ISO Class 3 - 9 (according to ISO 14644-1:2015).