



Fraunhofer

TESTED[®]
DEVICE

igus GmbH
e-skin flat single pod system
Report No. IG 2110-1268

DUPLICATE

Statement of
Qualification

Single product
Outgassing Behavior
Inorganic Acids

Customer	igus GmbH Spicher Strasse 1a 51147 Cologne Germany
Component tested	
Category:	Energy Supply
Subcategory:	Cable Systems
Product name:	e-skin flat single pod system with CFCLEAN and support chain (manufacturing date: 5/10/2020; color: white; article number: SKF12O/ SKF12C/CFCLEAN)

Emission chamber measurements with gas impingement in combination with ion chromatography (IC)

Standards/Guidelines:	ISO 14644-8, -15; VDI 2452 Part 1 (impinger); ISO 10304-1 (anions); VDI 2083 Part 17 The norms stated generally refer to the version valid at the time of the tests.
Test devices:	<ul style="list-style-type: none">Measuring station:.....Metrohm Professional IC 850Sampling chamber:.....Markes International µCTE
Sample storage:	<ul style="list-style-type: none">Pre-conditioning<ul style="list-style-type: none">Cleanroom Air Cleanliness Class (according to ISO 14644-1):.....ISO 1Airflow velocity:.....0.45 m/sAirflow type:..... vertical laminar flowTemperature:22 °C ± 0.5 °CRelative humidity: 45 % ± 5 %Purified air: VOC-filtered
Test procedure parameters:	Outgassing test temperature:..... 23 °C

Test result / Classification

The outgassing behavior of e-skin flat single pod system with CFCLEAN and support chain at the stated temperatures was investigated according to VDI 2083 Part 17 and ISO 14644-15. Based on the outgassing rates determined for the specific units, the following equipment classification was made for the corresponding Contaminant Category:

Contaminant Category (x)	SER _u ¹⁾ 23 °C [g/unit·s]	ISO-ACC _u Class (x) based on 23 °C
Fluoric acid (HF)	< 2.9 x 10 ⁻¹²	< - 11.5
Hydrochloric acid (HCl)	< 2.9 x 10 ⁻¹²	< - 11.5
Hydrobromic acid (HBr)	< 2.9 x 10 ⁻¹²	< - 11.5
Nitric acid (HNO ₃)	< 2.9 x 10 ⁻¹²	< - 11.5
Phosphoric acid (H ₃ PO ₄)	< 2.9 x 10 ⁻¹²	< - 11.5
Sulfuric acid (H ₂ SO ₄)	< 2.9 x 10 ⁻¹²	< - 11.5

¹⁾SER_u: Unit-specific emission rate

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	IG 2110-1268 Report No. first document	Stuttgart, January 21, 2022 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	