



# Fraunhofer

## TESTED<sup>®</sup> DEVICE

LAPPKOREA LLC  
CR 8211 MC 3X0.14SQ  
**Report No. LA 2208-1345**

DUPLICATE

Statement of  
Qualification

Single product  
Outgassing Behavior  
VOC/SVOC

Customer	LAPPKOREA LLC 42, JANGANGONGDAN 8-GIL 18579 JANGAN-MYEON, HWASEONG-SI, GYEONGGI-DO Korea
Component tested	
Category:	Energy Supply
Subcategory:	Cable Systems
Product name:	UNITRONIC CLEANROOM FD 8211 MC 3 X 0.14SQ (manufacturing date: 6/24/2022; color: black; batch number: C/25; serial number: 85132401)

Emission measurements with purge-and-trap thermodesorption method and gas chromatography combined with mass spectrometry (TD-GC/MS)	
Standards/Guidelines:	ISO 14644-8, -15; ISO 16000-6, -9, -11, -25 The norms stated generally refer to the version valid at the time of the tests.
Testing equipment:	Measuring station: ..... PerkinElmer Clarus 600, Clarus SQ8, ATD 650
Test procedure parameters:	<ul style="list-style-type: none"><li>Retention range (VOC): ..... C6 to C16</li><li>Outgassing test temperatures: ..... 23 °C</li><li>Duration of preconditioning: ..... &gt; 10h</li><li>Flow rate purge gas: ..... 10l/h</li><li>Flow rate sampling gas: ..... 10l/h</li><li>Duration of sampling: ..... 60 min</li><li>Volume of the emission cell: ..... 10l</li><li>Emission cell material: ..... stainless steel</li></ul>

Test result / Classification	The outgassing behavior of the cable UNITRONIC CLEANROOM FD 8211 MC 3 X 0.14SQ at the stated temperatures was investigated according to ISO 14644-15. Based on the outgassing rates determined for the specific equipment, the following material classification was made for the corresponding Contaminant Category:
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Contaminant Category (x)	SER <sub>u</sub> <sup>1)</sup> 23 °C [g/unit · s]	ISO ACC <sub>o</sub> Class (x) based on 23° C
VOC	3.7 x 10 <sup>-10</sup>	-9.4
SVOC	2.2 x 10 <sup>-10</sup>	-9.6
Amines	< 4.6 x 10 <sup>-13</sup>	--
Organophosphates	< 4.6 x 10 <sup>-13</sup>	--
Siloxanes	< 4.6 x 10 <sup>-13</sup>	--
Phthalates	< 4.6 x 10 <sup>-13</sup>	--

<sup>1)</sup>SER<sub>u</sub>: 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	LA 2208-1345 Report No. first document	Stuttgart, November 18, 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	