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TESTED<sup>®</sup>  
DEVICE

igus GmbH  
TRC.40.ESD + fiber rod  
**Report No. IG 2309-1461**

DUPLICATE

Statement of  
Qualification

Single product  
Particle Emission  
Dry-Cleanroom

Customer	igus GmbH Spicher Strasse 1a 51147 Cologne Germany
Component tested	
Category:	Energy Supply
Subcategory:	Cable Guiding System
Product name:	TRC.40.058.0.ESD with fiber rod module (manufacturing date: 7/6/2023; color: black; article number: TRC.40.058.0)

Random sampling of particle emissions (airborne) at representative sites in the dry room

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>• Dry and clean environment with Class (according to ISO 14644-1):..... ISO 3</li><li>• Airflow velocity:..... <math>0.1\text{ m/s} \pm 0.05\text{ m/s}</math></li><li>• Airflow pattern:..... displacement flow</li><li>• Temperature: ..... <math>22\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}</math></li><li>• Humidity/Dew point: ..... <math>-40\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}</math></li></ul>
Test procedure parameters:	<ul style="list-style-type: none"><li>• Minimum bending radius:..... <math>r_{\text{min}} = 285\text{ mm}</math></li><li>• Maximum bending radius:..... <math>r_{\text{max}} = 348.2\text{ mm}</math></li><li>• Stroke length:..... <math>s = 800\text{ mm}</math></li><li>• Parameter Set 1:..... <math>v_1 = 0.5\text{ m/s}</math>; <math>a_1 = 1.0\text{ m/s}^2</math></li><li>• Parameter Set 2:..... <math>v_2 = 1.0\text{ m/s}</math>; <math>a_2 = 2.0\text{ m/s}^2</math></li><li>• Parameter Set 3:..... <math>v_3 = 2.0\text{ m/s}</math>; <math>a_3 = 4.0\text{ m/s}^2</math></li></ul>

Test result / Classification

When operated under the specified test conditions, the cable guiding system TRC.40.058.0.ESD with fiber rod module is suitable for use in cleanrooms (with a dew point of  $-40\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$  and room temperature of  $21\text{ }^{\circ}\text{C} \pm 1.5\text{ }^{\circ}\text{C}$ ) fulfilling the specifications of the following Air Cleanliness Classes according to ISO 14644-1:

Test parameter(s)	Air Cleanlines Class
$v_1 = 0.5\text{ m/s}$ ; $a_1 = 1.0\text{ m/s}^2$	4
$v_2 = 1.0\text{ m/s}$ ; $a_2 = 2.0\text{ m/s}^2$	4
$v_3 = 2.0\text{ m/s}$ ; $a_3 = 4.0\text{ m/s}^2$	5
Overall result	5

Please note: Transport damages, incorrect installation, aging behavior, 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.

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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	