



**Fraunhofer**

**TESTED<sup>®</sup>  
DEVICE**

U.I. Lapp GmbH  
ÖLFLEX ROBUST FD 12G1  
**Report No. LA 1505-765**

DUPLICATE

Statement of  
Qualification

Particle Emission

# Statement of Qualification

**Customer** U.I. Lapp GmbH  
Schulze-Delitzsch-Straße 25  
70565 Stuttgart  
Germany

**Component tested**

Category: Energy Supply

Subcategory: Cable Systems

Product name: ÖLFLEX ROBUST FD 12G1  
(manufacturing date: week 19/2015; article number: 0026517;  
charge number: 6301611166; color: black)

## Test result / Classification

When operated under the specified test conditions, the ÖLFLEX ROBUST FD 12G1 is suitable for use in cleanrooms fulfilling the specifications of the following Air Cleanliness Classes according to ISO 14644-1:

Parameter	Air Cleanliness Class
$v_1 = 0.5 \text{ m/s}; a_1 = 1.0 \text{ m/s}^2$	1
$v_2 = 1.0 \text{ m/s}; a_2 = 2.0 \text{ m/s}^2$	1
$v_3 = 2.0 \text{ m/s}; a_3 = 4.0 \text{ m/s}^2$	1
<b>Overall result</b>	<b>1</b>

## Random sampling of particle emissions (airborne) at representative sites

Standards/Guidelines: VDI 2083-9.1; ISO 14644-1  
The norms stated refer to the relevant editions applicable 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:..... $22^\circ\text{C} \pm 0.5^\circ\text{C}$
- Relative humidity:..... $45\% \pm 5\%$

Test procedure parameters:

- Energy chain:.....igus E61.29.50.075.0
- Bending radius:..... $r = 100 \text{ mm}$
- Cable length:..... $l = 855 \text{ mm}$
- Stroke length:..... $s = 820 \text{ mm}$
- Parameter set 1:..... $v_1 = 0.5 \text{ m/s}; a_1 = 1.0 \text{ m/s}^2$
- Parameter set 2:..... $v_2 = 1.0 \text{ m/s}; a_2 = 2.0 \text{ m/s}^2$
- Parameter set 3:..... $v_3 = 2.0 \text{ m/s}; a_3 = 4.0 \text{ m/s}^2$

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.

For further information about the test environment and parameters, please refer to the Fraunhofer IPA test report.

Fraunhofer Institute for  
Manufacturing Engineering and Automation IPA

Department of Ultraclean Technology  
and Micromanufacturing

Nobelstrasse 12  
70569 Stuttgart  
Germany

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Place, date of first document issued

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Place, current date

i. A.   
Udo Gommel, Project Manager Fraunhofer IPA