



Fraunhofer

**TESTED[®]
DEVICE**

U.I. Lapp GmbH
ÖLFLEX FD 810 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 FD 810 12G1
 (manufacturing date: week 48/2014; article number: 0026135; charge number: 6301611683; color: grey)

Test result / Classification

When operated under the specified test conditions, the ÖLFLEX FD 810 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
$v_3 = 2.0 \text{ m/s}; a_3 = 4.0 \text{ m/s}^2$	2
Overall result	2

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 °C \pm 0.5 °C
- Relative humidity:.....45 % \pm 5 %

Test procedure parameters:

- Energy chain:.....igus E61.29.50.075.0
- Bending radius:.....r = 86 mm
- Cable length:.....l = 880 mm
- Stroke length:.....s = 820 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

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Place, date of first document issued

Department of Ultraclean Technology
 and Micromanufacturing

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 Place, current date

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