



Fraunhofer

TESTED[®] DEVICE

U.I. Lapp GmbH
UNITRONIC FD CP (TP) plus
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: UNITRONIC FD CP (TP) plus 4x2x0,14
(manufacturing date: week 42/2014; article number: 0030912;
charge number: 6301610605; color: grey)

Test result / Classification

When operated under the specified test conditions, the UNITRONIC FD CP (TP) plus 4x2x0,14 is suitable for use in cleanrooms fulfilling the specifications of the following Air Cleanliness Classes according to ISO 14644-1:

Parameter	Air Cleanliness Class
$v_1 = 0.5 \text{ m/s}; a_1 = 1.0 \text{ m/s}^2$	2
$v_2 = 1.0 \text{ m/s}; a_2 = 2.0 \text{ m/s}^2$	3
$v_3 = 2.0 \text{ m/s}; a_3 = 4.0 \text{ m/s}^2$	4
Overall result	4

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:..... $r = 75 \text{ mm}$
- 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

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i. A. 
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