



Fraunhofer

**TESTED[®]
DEVICE**

NICHIGOH CABLE
RO-FLEX I II III S 4.0 x 10C
Report No. NI 1809-1066

DUPLICATE

Statement of
Qualification

Particle Emission

Statement of Qualification

Customer Nichigoh Communication Electric Wire Co., Ltd.
2175-1, Uenoyorozumachi
518-0855 Iga-City, Mie
Japan

Component tested

Category: Energy Supply

Subcategory: Cable Systems

Product name: RO-FLEX I II III S 4.0 x 10C
(manufacturing date: 3/2018; color: black; serial number: ZZ-30077)

Test result / Classification

When operated under the specified test conditions, the cable system RO-FLEX I II III S 4.0 x 10C is suitable for use in cleanrooms fulfilling the specifications of the following Air Cleanliness Classes according to ISO 14644-1:

Test parameter(s)	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
Overall result	1

Random sampling of particle emissions (airborne) at representative sites

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 $\geq 0.1 \mu\text{m}$, $\geq 0.2 \mu\text{m}$, $\geq 0.3 \mu\text{m}$, $\geq 0.5 \mu\text{m}$, $\geq 1.0 \mu\text{m}$ 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:

- Bending radius:r = 120 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.

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

NI 1809-1066
Report No. first document

Stuttgart, September 17, 2018
Place, date of first document issued

Department of Ultraclean Technology and Micromanufacturing

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Report No. current document

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Place, current date

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on behalf of 
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