Fraunhofer

TESTED®
DEVICE

TM Tech Co., Ltd
T-FLEX(SM-R-XXX)
**Report No. TM 2207-1337**

DUPLICATE

Statement of
Qualification

Single product
**Particle Emission**

Fraunhofer
IPA

Fraunhofer
IPA

# Statement of Qualification · Single product

**Customer**

TM Tech Co., Ltd
Pyeongtaek-si
Gyeonggi-do 451-862
Korea

**Component tested**

Category: Energy Supply

Subcategory: Cable Systems

Product name: T-FLEX(SM-R-XXX) Flexible cable for a clean room
(manufacturing date: 6/27/2020; sleeve color: white; serial number: T-FLEX 200627)

**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 ≥ 0.1 µm, ≥ 0.2 µm, ≥ 0.3 µm, ≥ 0.5 µm, ≥ 1.0 µm and ≥ 5.0 µm

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 ± 0.5 °C
- Relative humidity: ..... 45 % ± 5 %

Test procedure parameters:

- Bending radius: ..... r = 150 mm
- Stroke length: ..... s = 820 mm
- Parameter Set 1: ..... $v_1$ = 0.5 m/s; $a_1$ = 1.0 m/s²
- Parameter Set 2: ..... $v_2$ = 1.0 m/s; $a_2$ = 2.0 m/s²
- Parameter Set 3: ..... $v_3$ = 2.0 m/s; $a_3$ = 4.0 m/s²

**Test result / Classification**

When operated under the specified test conditions, the T-FLEX(SM-R-XXX) Flexible cable for a clean room is suitable for use in cleanrooms fulfilling the specifications of the following Air Cleanliness Classes according to ISO 14644-1:

| Test parameter(s) | Air Cleanlines Class |
|---|---|
| $v_1$ = 0.5 m/s; $a_1$ = 1.0 m/s² | 1 |
| $v_2$ = 1.0 m/s; $a_2$ = 2.0 m/s² | 1 |
| $v_3$ = 2.0 m/s; $a_3$ = 4.0 m/s² | 1 |
| **Overall result** | **1** |

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.

Fraunhofer Institute for Manufacturing Engineering and Automation IPA

Department of Ultraclean Technology and Micromanufacturing

Nobelstrasse 12
70569 Stuttgart
Germany

TM 1612-863 — Report No. first document
Stuttgart, January 18, 2017 — Place, date of first document issued

TM 2207-1337 — Report No. current document
Stuttgart, August 4, 2022 — Place, current date

on behalf of
Dr.-Ing. Frank Bürger, Project Manager Fraunhofer IPA

This document only applies to the named product in its original state and is valid for a period of 5 years from the current date the document was issued. The document can be verified under **www.tested-device.com**.