



**Fraunhofer**

**TESTED<sup>®</sup>  
DEVICE**

DYDEN CORPORATION  
RMCV (Ø 5.9mm)  
**Report No. DY 1405-709**

DUPLICATE

Statement of  
Qualification

Particle Emission

# Statement of Qualification

**Customer:** DYDEN CORPORATION  
2-15-1 Minami  
830-8511 Kurume-shi, Fukuoka  
Japan

**Component tested**

Category: Energy Supply  
Subcategory: Cable Systems  
Product name: RMCV  
(d = 5.9mm; color: black; manufacturing date: April 2014)

**Test result / Classification:**  
(in acc. with ISO 14644-1)

The cable system RMCV (d = 5.9mm) is suitable for use in cleanrooms fulfilling the specifications of the following air cleanliness classes:

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 with measuring ranges  $\geq 0.1 \mu\text{m}$ ,  $\geq 0.2 \mu\text{m}$ ,  $\geq 0.3 \mu\text{m}$ ,  $\geq 0.5 \mu\text{m}$ ,  $\geq 1.0 \mu\text{m}$  und  $\geq 5.0 \mu\text{m}$

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
- Chain bending radius: ..... r = 150 mm
- Stroke length:..... s = 820 mm
- Cable length:..... l = 1100 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

Stuttgart, June 18, 2014

Place, date of first document issued

Department of Ultraclean Technology  
and Micromanufacturing

--  
Place, current date

Nobelstraße 12  
70569 Stuttgart  
Germany

*Frank Bürger*  
i. A. Frank Bürger, Project Manager Fraunhofer IPA