

Date: 10th of April 2008 Tob/The

TEST REPORT

- This translation into English was made by TSI -

No.: 200821469/2120

1	Customer	TSI GmbH Neuköllner Strasse 4 52068 Aachen Germany
2	Test specimen	Automated Filter Tester
2.1	Manufacturer	TSI
2.2	Type, designation	Testing device for the determination of particle penetration through filters / TSI 8130
	Marking	TSI 8130
2.3	Intended use	N.A.
2.4	Date of fabrication	N.A.
2.5	Further details	N.A.

3 Testing

- 3.1 Type of test Development test
- 3.2 Date of Testing November 2007
- 3.3 Test method, requirements according to DIN EN 143:2007

4 Assessment, suitability

The comparative tests have shown that - after adjustment of the aerosol particle size distribution of the aerosol generators of the TSI 8130 to the BGIA-CEN aerosol particle size distribution – the filter penetration measured by the TSI 8130 approximates the penetration measured with the CEN-TC79 test equipment. The test results thus become comparable.

Due to the changes made at the TSI 8130, the conversion ratio TSI 8130/BGIA was reduced significantly from greater than 1.8 to 1.02 for paraffin oil aerosol and from greater than 1.6 to 1.15 for NaCl aerosol, respectively. This approximation is sufficient for production quality control testing.

A statistically valid final statement about the suitability of the TSI 8130 testing device for type approval tests of respiratory protection devices at test laboratories and the comparability of filter penetrations as determined by the TSI 8130 testing device with such penetrations determined according to CEN-TC97 is not yet possible due to the presently low number of comparative values and hereby achieved standard deviations of conversion factors of greater than 0.1, which are relatively high. The standard deviation of the conversion factors includes the variance both due to the test rig as well as the tested filter samples.

A final assessment by BGIA can be made after confirming the present results based on further testing of a larger number of suitable particle filters with an accordingly modified TSI 8130 testing device.

5 Validity of Test Report

The test results apply to the tested objects only.
Limitation of validity or use of this Test Report: -

6 General remarks

The present Test Report consists of 8 pages

Pages 1 to 3 indicate the overall test result. The complete Test Report also includes the test protocol containing all pertinent details.

The present Test Report does not warrant the use of the GS-label, BG-label or CE-mark.

In all other respects the Rules of Procedure for Testing and Certification carried out by the Test and Certification Bodies in BG-PRÜFZERT shall apply in conjunction with the General Business Conditions of the Deutsche Gesetzliche Unfallversicherung e.V.

For the assessment:

For the testing:

Dipl.Ing. Hans-Ulrich Tobys
Certification officer

Claudia Lietz
Head of Test laboratory

Test protocol

- 1 Test requirements:** according to DIN EN 143:2007
- 2 Type of test:** development test
- 3 Customer:** TSI GmbH
- 4 Test specimen**
- 4.1 Type:** Testing device for the determination of particle filter penetration
- 4.2 Designation:** TSI 8130
- 4.3 Marking:** TSI 8130

5 Reason for Testing

The TSI testing device for the determination of particle filter penetration, TSI 8130, is designed for the determination of particle filter penetration according to the American Standard US 42 CFR 84.

The filter testing devices used at BGIA comply with the requirements for devices for the measurement of particle filter penetration as defined in the corresponding CEN-TC79 filter test standards (e.g. DIN EN 143:2007).

On the part of TSI GmbH (Germany), the development test should prove if appropriate modifications of the aerosol generation of the TSI 8130 testing device can lead to filter penetration measurement results which are comparable to the results obtained with the CEN filter test devices at BGIA.

6 Operating parameters for the TSI 8130

Initial tests with filter media provided by TSI as well as measurements and adjustment of the particle size distribution of the TSI 8130 to match the BGIA-CEN-equipment were used by TSI to define the operating parameters for the TSI 8130 for further tests.

With the version of TSI 8130 provided for these development tests, a paraffin oil concentration of only approximately 12 mg/m³ could be reached after adjusting the size distribution to the CEN requirements .

The NaCl aerosol concentration could be set to 8 mg/m³, which is in accordance with the European standards.

7 Particle filters for comparisons

Electrostatic flat sheet filter media of the filter classes P2 and P3 according to DIN EN:2007 as well as flat sheet glass fiber filter media of the filter class P2 were used for the comparison measurements with paraffin oil aerosol.

Glass fiber particle filters of the filter class P2 as well as electrostatic flat sheet filter media of the filter classes P2 and P3 were used for the comparison measurements with NaCl aerosol.

In order to achieve comparability of the filter penetrations measured on both test devices, flat sheet filter media samples with a cross sectional area of 100 cm² were tested.

The glass fiber particle filters for testing with NaCl aerosol were pre-classified with penetrations around 0.44% and 1.09%.

Two particle filter groups of three filters each with identical mean values of the pre-classification and with standard deviations less than 0.017 were selected for testing on both testing devices.

For better comparability of the test results, the mean value (MW) and the standard deviation (SD) of each series of measurement were calculated for both the TSI test results and the BGIA test results.

8 Filter penetration for paraffin oil aerosol

Due to the lower paraffin oil aerosol concentration in the TSI testing device of 12 mg/m³ versus 20 mg/m³ according to DIN EN 143:2007, the penetration measurement of the TSI 8130 testing device was made after 5 minutes of paraffin oil aerosol exposure in contrast to the 3 minutes of exposure for the BGIA testing device.

8.1 Test flow rate: 47.5 l/min

8.2 Test results for P2-glass fiber filter media

Prüfung	Durchlassgrad [%]	
	BGIA	TSI 8130
1	0,88	0,83
2	0,67	0,82
3	0,66	0,84
4	0,96	0,86
5	0,99	0,84
6	1,06	0,93
MW	0,87	0,85
SD	0,17	0,04

Prüfung: *Test* Durchlassgrad: *Penetration* MW: *Mean value* SD: *Standard deviation*

8.3 Test results for electrostatic P2 filter media

Prüfung	Durchlassgrad [%]	
	BGIA	TSI 8130
1	0,90	0,84
2	0,77	0,96
3	0,61	0,77
4	-----	0,89
MW	0,76	0,87
SD	0,15	0,08

8.4 Test results for electrostatic P3 filter media

Prüfung	Durchlassgrad [%]	
	BGIA	TSI 8130
1	0,089	0,090
2	0,101	0,072
3	-----	0,085
4	0,069	0,080
5	-----	0,071
MW	0,086	0,080
SD	0,016	0,008

9 Filter penetration for NaCl aerosol

9.1 Test results for glass fiber P2 particle filters – pre-classification 0.44%

Test flow rate: 95 l/min

Prüfung	Durchlassgrad [%]	
	BGIA	TSI 8130
1	0,33	0,43
2	0,37	0,42
3	0,36	0,44
MW	0,35	0,43
SD	0,02	0,01

9.2 Test results for glass fiber P2 particle filters – pre-classification 1.09%

Test flow rate: 95 l/min

Prüfung	Durchlassgrad [%]	
	BGIA	TSI 8130
1	0,89	0,92
2	0,86	0,94
3	0,85	1,03
MW	0,87	0,96
SD	0,02	0,06

9.3 Test results for electrostatic P2 filter media

Test flow rate: 47.5 l/min

Prüfung	Durchlassgrad [%]	
	BGIA	TSI 8130
4	0,12	0,10
5	0,14	0,14
6	0,14	0,15
MW	0,13	0,13
SD	0,01	0,03

9.4 Test results for electrostatic P3 filter media

Test flow rate: 47.5 l/min

Prüfung	Durchlassgrad [%]	
	BGIA	TSI 8130
1	0,017	0,017
2	0,020	0,028
3	0,018	0,023
MW	0,018	0,023
SD	0,002	0,006

The test results apply to the tested objects only.
Statements related to the uniformity of production can not be derived from this report.

Berufsgenossenschaftliches Institut
Für Arbeitsschutz – BGIA –
Im Auftrag

Sachbearbeiter

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