Umwelt Bundesamt

TÜVRheinland®
Precisely Right.

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000040216_02

AMS designation:	Model 5030i SHARP with PM_{10} pre-separator for suspended particulate matter PM_{10}
Manufacturer:	Thermo Fisher Scientific 27, Forge Parkway Franklin, MA 02038 USA
Test Laboratory:	TÜV Rheinland Energy GmbH

This is to certify that the AMS has been tested and found to comply with the standards: VDI 4202-1 (2010), VDI 4203-3 (2010), EN 12341 (1998), Guide to the Demonstration of Equivalence of Ambient Air Monitoring Methods (2010), EN 15267-1 (2009) and EN 15267-2 (2009)

Certification is awarded in respect of the conditions stated in this certificate (this certificate contains 9 pages).
The present certificate replaces certificate 0000040216_01 of 01 April 2019.

TÜVRheinland® CERTIFIED

Suitability Tested
Equivalent to
2008/50/EC
EN 15267
Regular Surveillance

www.tuv.com
ID 0000040216

Publication in the German Federal Gazette (BAnz) of 01 April 2014

This certificate will expire on:
30 June 2025

German Federal Environment Agency
Dessau, 01 July 2020

TÜV Rheinland Energy GmbH
Cologne, 30 June 2020

Dr. Marcel Langner
Head of Section II 4.1

ppa. Dr. Peter Wilbring

www.umwelt-tuv.eu tre@umwelt-tuv.eu Phone: + 49 221 806-5200	TÜV Rheinland Energy GmbH Am Grauen Stein 51105 Köln

Test institute accredited to EN ISO/IEC 17025 by DAkkS (German Accreditation Body).
This accreditation is limited to the accreditation scope defined in the enclosure to certificate D-PL-11120-02-00.

Test Report:	936/21209885/G dated 20 September 2013
Initial certification:	01 April 2014
Expiry date:	30 June 2025
Certificate:	Renewal (of previous certificate 0000040216_01 dated 01 April 2019 valid until 30 June 2020)
Publication:	BAnz AT 01.04.2014 B12, chapter IV number 7.3

Approved application

The certified AMS is suitable for continuous ambient air monitoring of suspended particulate matter, PM_{10} (stationary operation).

The suitability of the AMS for this application was assessed on the basis of a laboratory test and a field test performed at four different sites and/or different periods.

The AMS is approved for an ambient temperature range of +5 °C to +40 °C.

The notification of suitability of the AMS, performance testing and the uncertainty calculation have been effected on the basis of the regulations applicable at the time of testing. As changes in legal provisions are possible, any potential user should ensure, in consultation with the manufacturer, that this AMS is suitable for monitoring the AMS readings relevant to the application.

Any potential user should ensure, in consultation with the manufacturer, that this AMS is suitable for the intended purpose.

Basis of the certification

This certification is based on:

- Test report no. 936/21209885/G dated 20 September 2013 issued by TÜV Rheinland Energie und Umwelt GmbH
- Suitability announced by the German Federal Environment Agency (UBA) as the relevant body
- The ongoing surveillance of the product and the manufacturing process

Publication in the German Federal Gazette: BAnz AT 01.04.2014 B12, chapter IV number 7.3, UBA announcement dated 27 February 2014:

AMS designation:
Model 5030i SHARP with PM_{10} pre-separator for suspended particulate matter PM_{10}

Manufacturer:
Thermo Fisher Scientific, Franklin, USA

Field of application:
For continuous ambient air monitoring of suspended particulate matter, PM_{10} (stationary operation)

Measuring range during performance testing:

Component	Certification range	Unit
PM_{10}	0–1 000	µg/m³

Software version:
V02.00.00.232+

Restrictions:
None

Notes:
1. The requirements of the variation coefficient R^2 as per Standard EN 12341 were not fulfilled by both test systems for the locations Cologne (winter), Bornheim (summer) and Teddington (summer).
2. The reference equivalence function for Teddington (summer) is not within the limits of the acceptance range as per Standard EN 12341.
3. The measuring system complies with the requirements of guideline “Demonstration of Equivalence of Ambient Air Monitoring Methods” for the component PM_{10}.
4. The measuring system must be operated inside a lockable measurement container.
5. The instrument must be calibrated on-site regularly using a gravimetric PM_{10} reference method in accordance with EN 12341.
6. It is recommended to operate the measuring system with the threshold for the relative humidity being 58%, especially at sites where the ratio of volatiles in suspended particulate matter is particularly high.
7. The test report on performance testing is available on the internet at www.qal1.de.

Test Laboratory:
TÜV Rheinland Energie und Umwelt GmbH, Cologne
Report no.: 936/21209885/G dated 20 September 2013

Publication in the German Federal Gazette: BAnz AT 05.08.2014 B11, chapter V notification 27, UBA announcement dated 17 July 2014:

27 Notification as regards Federal Environment Agency (UBA) notice of 27 February 2014 (BAnz AT 01.04.2014 B12, chapter IV number 7.3)

The flow and vacuum sensor of the Model 5030i SHARP measuring system with PM_{10} pre-separator for suspended particulate matter PM_{10} manufactured by Thermo Fisher Scientific will be equipped with an inner parylene coating in the future. The associated sensor plate is positioned vertically inside the instrument.
Moreover, the measuring system will be equipped with a pressure relief valve placed between pump outlet and by-pass filter.

Statement issued by TÜV Rheinland Energie und Umwelt GmbH
dated 29 March 2014

Publication in the German Federal Gazette: BAnz AT 02.04.2015 B5, chapter IV notification 26, UBA announcement dated 25 February 2015:

26 Notification as regards Federal Environment Agency (UBA) notices of 27 February 2014 (BAnz AT 01.04.2014 B12, chapter IV number 7.3) and of 17 July 2014 (BAnz AT 05.08.2014 B11, chapter V 27th notification)

The latest software version of the of the model 5030i SHARP with PM_{10} pre-separator for suspended particulate matter PM_{10} manufactured by Thermo Fisher Scientific is:
V 02.02.05 (111578-00).
The valve for the automatic zero point checks will have a nickel-plated housing and be equipped with a Viton elastomer seal in the future.

Statement issued by TÜV Rheinland Energie und Umwelt GmbH
dated 22 September 2014

Publication in the German Federal Gazette: BAnz AT 15.03.2017 B6, chapter V notification 2, UBA announcement dated 18 February 2016:

2 Notification as regards Federal Environment Agency (UBA) notices of 27 February 2014 (BAnz AT 01.04.2014 B12, chapter IV number 7.3) and of 25 February 2015 (BAnz AT 02.04.2015 B5, chapter IV 26th notification)

The model 5030i SHARP with PM_{10} pre-separator for particulate matter PM_{10} manufactured by Thermo Fisher Scientific can also be operated with the GAST 87R647-PDS-HV-913 vacuum pump.

Statement issued by TÜV Rheinland Energie und Umwelt GmbH
dated 22 October 2015

Publication in the German Federal Gazette: BAnz AT 22.07.2019 B8, chapter V notification 23, UBA announcement dated 28 June 2019:

23 Notification as regards Federal Environment Agency (UBA) notices of 27 February 2014 (BAnz AT 01.04.2014 B12, chapter IV number 7.3) and of 22 February 2017 (BAnz AT 15.03.2017 B6, chapter V 2nd notification)

Instead of the MOLON MOTOR & COILCORP engine type CHM-2401-1M, a TEPUMOTOR type TP-77 engine can be used for the model 5030i SHARP measuring system with PM_{10} pre-separator, for suspended particulate matter PM_{10} fraction, manufactured by Thermo Fisher Scientific.

Statement issued by TÜV Rheinland Energy GmbH dated 6 March 2019

Certified product

This certification applies to automated measurement systems conforming to the following description:

The model 5030i SHARP ambient air measuring system consists of the PM_{10} sampling head, the heated sampling tube (dynamic heating system DHS), the (optional) extension tube, the ambient air sensor (incl. radiation protection shield), the vacuum pump, the nephelometer assembly (=SHARP optics module) the central unit 5030i (=SHARP Beta module, identical with model 5014 i Beta) incl. fiberglass filter belt, the respective corresponding connection lines, cables and adapters, the roof duct incl. flange and the manual in German.

The model 5030i SHARP ambient air measuring system is based on the combination of the measuring principles particle light dispersion (nephelometry) and beta attenuation. The term SHARP stands for “Synchronised Hybrid Ambient Real-time Particulate”.

The particle sample passes through the PM_{10} sampling head at a flow rate of 1 m^3/h (=16.67 l/min) and flows to the actual model 5030i SHARP measuring system via the heated sampling tube (DHS = dynamic heating system).

The nephelometer assembly is located beneath the heated tube. The fine dust passes laterally through the insulated nephelometer and then flows into the radial tube above the radiometric assembly. The nephelometer consists of a light-dispersion based photometer with a pulsed near-IR LED which works with a central wavelength of 880 nm.

A radial, insulated tube connects to the sampling tube at the point where the nephelometer is attached to the housing of the measuring system. The nephelometer can thus be easily detached from the actual measuring system. The model 5030i SHARP measuring system (nephelometer measurement with radiometric measurement combination) can thereby be easily converted into the model 5014i BETA measuring system.

After the particle sample has passed through the nephelometer the particles are separated on the fibreglass filter tape of the radiometric measurement. The filter tape is located between the proportional detector and the ^{14}C beta emitter. The beta ray travels upwards through the filer tape and the accumulating dust layer. The increasing dust load attenuates the beta ray intensity, which in turn reduces the beta intensity measured by the proportional detector. The mass on the filter tape is calculated from the continuous integrated count rate.

In order to maintain the sample flow at its nominal value the flow and the regulation of the proportional valve are measured continuously.

The PM concentrations are displayed at the front of the measuring system as SHARP- (=hybrid values), PM (= radiometric measurement values (the same as in model 5014i BETA)) and NEPH (=scattered light measurement values). The measurement values can be provided as data in a variety of output forms (analogue, digital, Ethernet).

General remarks

This certificate is based upon the equipment tested. The manufacturer is responsible for ensuring that on-going production complies with the requirements of the EN 15267. The manufacturer is required to maintain an approved quality management system controlling the manufacturing process for the certified product. Both the product and the quality management systems shall be subject to regular surveillance.

If a product of the current production does not conform to the certified product, TÜV Rheinland Energy GmbH must be notified at the address given on page 1.

A certification mark with an ID-Number that is specific to the certified product is presented on page 1 of this certificate.

This document as well as the certification mark remains property of TÜV Rheinland Energy GmbH. Upon revocation of the publication the certificate loses its validity. After the expiration of the certificate and on request of TÜV Rheinland Energy GmbH this document shall be returned and the certificate mark must no longer be used.

The relevant version of this certificate and its expiration date are also accessible on the internet at **qal1.de**.

Document history

Certification of the Model 5030i SHARP with PM_{10} pre-separator is based on the documents listed below and the regular, continuous surveillance of the manufacturer's quality management system:

Initial certification according to EN 15267

Certificate no. 0000040216: 29 April 2014
Expiry date of the certificate: 31 March 2019
Test report: 936/21209885/G dated 20 September 2013
TÜV Rheinland Energie und Umwelt GmbH, Cologne
Publication: BAnz AT 01.04.2014 B12, chapter IV number 7.3
UBA announcement dated 27 February 2014

Notifications in accordance with EN 15267

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 29 March 2014
Publication: BAnz AT 05.08.2014 B11, chapter V notification 27
UBA announcement dated 17 July 2014
(Design changes)

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 22 September 2014
Publication: BAnz AT 02.04.2015 B5, chapter IV notification 26
UBA announcement dated 25 February 2015
(Design and software changes)

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 22 October 2015
Publication: BAnz AT 15.03.2017 B6, chapter V notification 2
UBA announcement dated 22 February 2017
(Design changes)

Renewal of the certificate

Certificate no. 0000040621_01: 01 April 2019
Expiry date of the certificate: 30 June 2020

Notifications in accordance with EN 15267

Statement issued by TÜV Rheinland Energy GmbH dated 06 March 2019
Publication: BAnz AT 22.07.2019 B8, chapter V notification 23
UBA announcement dated 28 June 2019
(Design changes)

Renewal of the certificate

Certificate no. 0000040216_02: 01 July 2020
Expiry date of the certificate: 30 June 2025

Calculation of total uncertainty

PM10 5030i Sharp	23,8% ≥ 28 µg m-3	Orthogonal Regression				Between Instrument Uncertainties	
	W_{CM} / %	n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	Reference	Candidate
All Data	9.2	202	0.967	1.009 +/- 0.013	-0.392 +/- 0.327	0.63	1.10
< 30 µg m-3	8.0	161	0.903	0.986 +/- 0.024	0.109 +/- 0.431	0.63	1.13
≥ 30 µg m-3	13.7	41	0.938	1.112 +/- 0.044	-5.181 +/- 1.940	0.63	1.22

SN3	Dataset	Orthogonal Regression				Limit Value of 50 µg m-3	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% ≥ 28 µg m-3
Individual Datasets	Bornheim Winter	42	0.976	0.987 +/- 0.024	0.975 +/- 0.745	8.46	42.9
	Cologne Winter	43	0.947	1.033 +/- 0.037	-1.570 +/- 1.256	12.91	53.5
	Bornheim Summer	71	0.952	0.986 +/- 0.026	0.461 +/- 0.534	8.69	9.9
	Teddington Summer	46	0.855	0.975 +/- 0.056	0.655 +/- 0.813	7.25	0.0
Combined Datasets	< 30 µg m-3	161	0.899	0.982 +/- 0.025	0.625 +/- 0.439	7.85	4.3
	≥ 30 µg m-3	41	0.938	1.102 +/- 0.044	-4.835 +/- 1.911	13.38	100.0
	All Data	202	0.966	0.994 +/- 0.013	0.286 +/- 0.329	9.29	23.8

SN4	Dataset	Orthogonal Regression				Limit Value of 50 µg m-3	
		n_{c-s}	r^2	Slope (b) +/- u_b	Intercept (a) +/- u_a	W_{CM} / %	% ≥ 28 µg m-3
Individual Datasets	Bornheim Winter	42	0.981	1.027 +/- 0.022	-0.073 +/- 0.689	9.19	42.9
	Cologne Winter	45	0.944	1.049 +/- 0.038	-2.653 +/- 1.250	13.58	51.1
	Bornheim Summer	75	0.935	1.017 +/- 0.030	-1.191 +/- 0.623	10.35	9.3
	Teddington Summer	46	0.833	0.921 +/- 0.057	0.304 +/- 0.831	16.19	0.0
Combined Datasets	< 30 µg m-3	167	0.876	0.996 +/- 0.027	-0.601 +/- 0.485	9.32	4.2
	≥ 30 µg m-3	41	0.929	1.128 +/- 0.048	-5.747 +/- 2.091	14.88	100.0
	All Data	208	0.960	1.029 +/- 0.014	-1.242 +/- 0.359	10.32	23.1

Calculation of the total uncertainty, corrected by the slope and intercept

PM10 5030i Sharp Slope and Intercept Corrected	23.8% ≥ 28 µg m-3	Orthogonal Regression						Between Instrument Uncertainties	
	W_{CM} / %	n_{c-s}	r^2	Slope (b) +/- u_b		Intercept (a) +/- u_a		Reference	Candidate
All Data	9.6	202	0.967	1.000	+/- 0.013	0.003	+/- 0.324	0.63	1.09
< 30 µg m-3	8.5	161	0.903	0.976	+/- 0.024	0.504	+/- 0.427	0.63	1.12
≥ 30 µg m-3	13.8	41	0.938	1.102	+/- 0.044	-4.729	+/- 1.922	0.63	1.21

SN3	Dataset	Orthogonal Regression						Limit Value of 50 µg m-3	
		n_{c-s}	r^2	Slope (b) +/- u_b		Intercept (a) +/- u_a		W_{CM} / %	% ≥ 28 µg m-3
Individual Datasets	Bornheim Winter	42	0.976	0.978	+/- 0.024	1.358	+/- 0.738	8.82	42.9
	Cologne Winter	43	0.947	1.023	+/- 0.037	-1.159	+/- 1.244	13.10	53.5
	Bornheim Summer	71	0.952	0.976	+/- 0.026	0.850	+/- 0.529	9.12	9.9
	Teddington Summer	46	0.855	0.965	+/- 0.055	1.048	+/- 0.805	7.89	0.0
Combined Datasets	< 30 µg m-3	161	0.899	0.972	+/- 0.025	1.016	+/- 0.435	8.34	4.3
	≥ 30 µg m-3	41	0.938	1.092	+/- 0.043	-4.387	+/- 1.893	13.54	100.0
	All Data	202	0.966	0.985	+/- 0.013	0.676	+/- 0.326	9.65	23.8

SN4	Dataset	Orthogonal Regression						Limit Value of 50 µg m-3	
		n_{c-s}	r^2	Slope (b) +/- u_b		Intercept (a) +/- u_a		W_{CM} / %	% ≥ 28 µg m-3
Individual Datasets	Bornheim Winter	42	0.981	1.018	+/- 0.022	0.318	+/- 0.683	9.37	42.9
	Cologne Winter	45	0.944	1.039	+/- 0.037	-2.231	+/- 1.238	13.78	51.1
	Bornheim Summer	75	0.935	1.007	+/- 0.030	-0.785	+/- 0.618	10.70	9.3
	Teddington Summer	46	0.833	0.911	+/- 0.057	0.701	+/- 0.823	16.69	0.0
Combined Datasets	< 30 µg m-3	167	0.876	0.986	+/- 0.027	-0.196	+/- 0.480	9.81	4.2
	≥ 30 µg m-3	41	0.929	1.117	+/- 0.047	-5.288	+/- 2.072	14.97	100.0
	All Data	208	0.960	1.019	+/- 0.014	-0.837	+/- 0.355	10.60	23.1