CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000040216_03

Certified AMS:	Modell 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 Institute:	TÜV Rheinland Energy & Environment 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 for Demonstration of Equivalence of Ambient Air Monitoring Methods (2010) as well as EN 15267-1 (2009) and EN 15267-2 (2023).

Certification is awarded in respect of the conditions stated in this certificate
(this certificate contains 10 pages).
The present certificate replaces certificate 0000040216_02 dated 1 July 2020.

TÜVRheinland® CERTIFIED
Suitability Tested
Complying with 2008/50/EC
EN 15267
Regular Surveillance
www.tuv.com
ID 0000040216

Publication in the German Federal Gazette (BAnz) of 1 April 2014

German Environment Agency

Dessau, 27 June 2025

Dr. Marcel Langner
Head of Section II 4

This certificate will expire on:
30 June 2030

TÜV Rheinland Energy & Environment GmbH
Cologne, 26 June 2025

ppa. Dr. Peter Wilbring

www.umwelt-tuv.eu
qal1-info@tuv.com
Tel. + 49 221 806-5200

TÜV Rheinland Energy & Environment 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 the certificate D-PL-11120-02-00.

Test report:	936/21209885/G dated 20 September 2013
Initial certification:	1 April 2014
Expiry date:	30 June 2030
Certificate:	Renewal (of previous certificate 0000040216_02 of 1 July 2020 valid until 30 June 2025)
Publication:	BAnz AT 01.04.2014 B12, chapter IV No. 7.3

Approved application

The tested AMS is suitable for continuous immission measurement of PM_{10} in stationary use.

The suitability of the AMS for this application was assessed on the basis of a laboratory test and a field test at four different locations with different time 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 that this AMS is suitable for monitoring the measured values relevant to the application.

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

Basis of the certification

This certification is based on:

- Test report 936/21209885/G dated 20 September 2013 of 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 No. 7.3, Announcement by UBA 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 ranges during the performance test:

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 institute:

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, Chap. V notification 27, Announcement by UBA dated 17 July 2014:

27 Notification as regards Federal Environmental Agency notices of 27 February 2014 (BAnz AT 01.04.2014 B12, chapter IV, No. 7.3)

The flow and the vacuum sensor of the Modell 5030i SHARP measuring system with PM_{10}-pre-separator for monitoring suspended particulate matter PM_{10} manufactured by Thermo Fisher Scientific will hereafter come with internal parylene coating. The corresponding sensor board will now be mounted vertically within the instrument. Additionally, the measuring system is fitted with a relief valve between pump outlet and bypass filter.

Statement by TÜV Rheinland Energie und Umwelt GmbH of 29 March 2014

Publication in the German Federal Gazette: BAnz AT 02.04.2015 B5, Chap. IV notification 26, Announcement by UBA 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 notification 27)

The current software version for the Model 5030i SHARP measuring system with PM_{10} pre-separator for the suspended particulate matter PM_{10}, manufactured by Thermo Fisher Scientific, is:
V 02.02.05 (111578-00).

In the future the valve for the automatic zero point equalization will have a nickel-plated housing and will be equipped with a Viton elastomer seal.

Statement by TÜV Rheinland Energie und Umwelt GmbH of 22 September 2014

Publication in the German Federal Gazette: BAnz AT 15.03.2017 B6, Chap. V notification 2, Announcement by UBA dated 22 February 2017:

2 Notification as regards Federal Environment Agency 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 notification 26)

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

Statement by TÜV Rheinland Energie und Umwelt GmbH of 22 October 2015

Publication in the German Federal Gazette: BAnz AT 22.07.2019 B8, Chap. V notification 23, Announcement by UBA 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 by TÜV Rheinland Energy GmbH of 6 March 2019

Publication in the German Federal Gazette: BAnz AT 05.08.2021 B5, Chap. IV notification 7, Announcement by UBA dated 29 June 2021:

7 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 28 June 2019 (BAnz AT 22.07.2019 B8, chapter V notification 23)

The measuring head of the ambient air monitoring system, Model 5030i SHARP, with PM_{10}-pre-separator for PM_{10} suspended particulate matter manufactured by the company Thermo Fisher Scientific was modified to increase operational safety with regard to potential leakages.
The latest software version of the measuring system is:
V 03.00.01 (111578-00)
In addition to this revision number, the following interim version is also valid:
V 03.00.00 (111578-00)

Statement by TÜV Rheinland Energy GmbH dated 24 February 2021

Publication in the German Federal Gazette: BAnz AT 20.03.2023 B6, Chap. IV notification 89, Announcement by UBA dated 21 February 2023:

89 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 29 June 2021 (BAnz AT 05.08.2021 B5, chapter IV notification 7)

The current software version of the measuring system Model 5030i SHARP with PM_{10}-pre-separator for suspended particulate matter PM_{10} from Thermo Fisher Scientific is: V 03.00.05.268
Version V 03.00.03.261 can also be used.

Statement issued by TÜV Rheinland Energy GmbH dated 16 February 2022

Certified product
This certificate 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.

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 14C 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 notes

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 manufacture of 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 & Environment 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 certification mark may be applied to the product or used in advertising materials for the certified product.

This document as well as the certification mark remains property of TÜV Rheinland Energy & Environment GmbH. With revocation of the publication the certificate loses its validity. After the expiration of the certificate and on requests of the TÜV Rheinland Energy & Environment GmbH this document shall be returned and the certificate mark must not be employed anymore.

The relevant version of this certificate and its expiration is also accessible on the internet: **qal1.de**.

History of documents

Certification of Modell 5030i SHARP with PM_{10}-pre-separator for suspended particulate matter PM_{10} based on the documents listed below and the regular, continuous monitoring of the Quality Management System of the manufacturer:

Initial certification according to EN 15267

Certificate No. 0000040216_00: 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
Publication: BAnz AT 01.04.2014 B12, chapter IV number 7.3
UBA announcement dated 27 February 2014

Notifications

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
(Hardware 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
(Soft- and hardware 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
(Hardware changes)

Renewal of certificates
Certificate No. 0000040216_01: 1 April 2019
Expiry date of the certificate: 30 June 2020

Notifications
Statement issued by TÜV Rheinland Energy GmbH dated 6 March 2019
Publication: BAnz AT 22.07.2019 B8, chapter V notification 23
UBA announcement dated 28 June 2019
(hardware changes)

Renewal of certificates
Certificate No. 0000040216_02: 1 July 2020
Expiry date of the certificate: 30 June 2025

Notifications
Statement issued by TÜV Rheinland Energy GmbH dated 24 February 2021
Publication: BAnz AT 05.08.2021 B5, chapter IV notification 7
UBA announcement dated 29 June 2021
(Soft- and hardware change)

Statement issued by TÜV Rheinland Energy GmbH dated 16 February 2022
Publication: BAnz AT 20.03.2023 B6, chapter IV notification 89
UBA announcement dated 21 February 2023
(Software changes)

Renewal of certificates
Certificate No. 0000040216_03: 27 June 2025
Expiry date of the certificate: 30 June 2030

Calculation of total uncertainty

PM10 5030i Sharp	23,8% ≥ 28 µg m-3	Orthogonal Regression				Betw een 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