



Report-No. 3969062, Abstract Preliminary

Type Test Report

Sampling System for Standard gravimetric measurement method for the determination of the PM₁₀ or PM_{2,5} mass concentration of suspended particulate matter

Sampler: SEQ 47/50 AV
S/N:
24/0054 (Lab and field)
24/0055 (Lab and field)
24/0149 (Field)
24/0150 (Field)

June 2025

Commissioned by:

Sven Leckel Ingenieurbüro GmbH
10829 Berlin, Germany



**Add value.
Inspire trust.**

Type test report for sampling of suspended particulate matter PM₁₀ or PM_{2,5} according to the standard gravimetric measurement method

2025



Die Akkreditierung gilt nur für den in der Urkundenanlage aufgeführten Akkreditierungsumfang.

Contractor Sven Leckel Ingenieurbüro GmbH
Wilhelm-Kabus-Straße 72
10829 Berlin, Germany

Sampler SEQ 47/50 AV

Date: 12.06.2025

Manufacturer: Sven Leckel Ingenieurbüro GmbH
Wilhelm-Kabus-Straße 72
10829 Berlin, Germany

Our sign:
IS-US1-MUC, IS-UT-IMM / an

Report no.: 396962-pr

Time period: May 2024 – January 2025

Order No.: 3969062

Excerpts from this document may only be reproduced and used for advertising purposes with the express written approval of TÜV SÜD Industrie Service GmbH









The test results refer exclusively to the units under test.










Summary

Legend			
Passed		✓	
Not passed		✗	
Not applicable		n. a.	
Performance criteria EN 12341:2023-10	Result	Decision	
5. Requirements for sampling equipment (Numbers refer to EN 12341, Table 1) Results for Lab Test (L) and Field Test (F)			
1. Sampler design The sampler design shall be as prescribed in 5.1.2, 5.1.4, 5.1.5.	The sampling system consists of the given elements: <ul style="list-style-type: none"> - Size-selective inlets with changeable nozzles - Connecting pipe-work made of anodized aluminium - Filterholder for filter with diameter of 47 to 50 mm - Flow control system - Sample changer - Storage system for new and used sample filter The connecting pipe work has from inlet to filter the exact same diameter of 27 mm. The inlet pipe is held on outside air temperature be sheath air to avoid contact with cold surfaces. The filter holders are made of POM and stainless steel	✓	
2. Inlet design The design of the inlet shall be as prescribed in 5.1.3 and Annex A	The measures of the inlet fulfill the requirements of 5.1.3 and Annex A: <ul style="list-style-type: none"> - Inlet with rain shelter - Nozzles for PM₁₀ - Nozzles for PM_{2,5} 	✓	
3. Temperature of air through the sample filter during sampling Within ± 5 K of climate chamber temperature at 20 °C (clause 5.1.5)	The temperature measured by the build in sensor directly behind the filter was at 20°C ± 5 K	✓	



Legend			
	Passed		
	Not passed		
	Not applicable	n. a.	
4. Nominal flow rate 2,3 m³/h at ambient conditions. ≤ 2,0 % of nominal flow rate at -20 °C, 20°C and 50 °C by default for out- door environments under lab tests Ambient conditions under field trial (clause 5.1.6)	The flow rate is monitored permanent by orifice and controlled regarding tempera- ture and pressure for ambient air and at orifice. The accuracy of the used sensors is suf- ficient. The maximal deviation of nominal flow in the lab test at -20°C, 20°C and 50°C and under field trial at ambient conditions is less then 2,0 %. (rated flow over sampling time)		
5. Constancy of sample volumetric flow 2,3 m³/h at ambient conditions. ≤ 2,0 % of rated flow over sampling time ≤ 5,0 % rated flow (instantaneous flow) at -20 °C, 20°C and 50 °C by default for out- door environments under lab tests (clause 5.1.6)	Lab test, maximum deviation: - rated flow over sampling time << 2% - Instantaneous flow << 5 % (1 min after start at least) tested at -20°C, 20°C and 50°C Filed test, maximum deviation monitored at field test: - rated flow over sampling time << 2% - Instantaneous flow << 5 % (1 min after start at least)		
6. Leak tightness of the sampling system $\phi_L \leq 1,0\%$ of sampling flow rate (clause 5.1.10)	The leak tightness tested in laboratory and filed is << 1% of sample flow rate		
7. Single-filter cycle time 24h (clause 5.1.9)	The accuracy of sampling start and stop time ist less than 1 min and documented by minute. The changeover time is nearly 1 minute		
8. Maximum bias of sampler clock ± 5 min (in 30 d) (clause 5.1.9)	The maximum deviation of the sampler clock is << 5 min in 30 d		
9. Maximum bias of sensor for ambient temperature measurement or, if applica- ble, the sensor for measurement of tem- perature in the flow measuring device ≤ 2 K at -20 °C, 20°C and 50 °C by default for out- door environments (clause 5.1.7)	Lab test: The maximum bias is < 2 K		



Legend			
	Passed		
	Not passed		
	Not applicable	n. a.	
10. Maximum bias of sensor for ambient pressure measurement or, if applicable, the sensor for measurement of pressure in the flow measuring device $\leq 1 \text{ kPa}$ (clause 5.1.8)	Lab test: The maximum bias is $< 1 \text{ kPa}$		
11. Maximum bias of sensors for internal temperatures (filter during sampling, filter during storage) $\leq 2 \text{ K}$ (clause 5.1.7)	Lab test: The maximum bias is $< 2 \text{ K}$		
12. Minimum hourly recording and transmission of operational parameters The sampler shall be able to record at a minimum hourly rate and transmit – at minimum – the following parameters: <ul style="list-style-type: none"> • Average flow • Sampling time and sample volume • Average air temperature in filter section • Average ambient air temperature • Average temperature of filter storage • Average ambient pressure The sampler shall continue to record these operational parameters while in standby mode, i.e. when the sampler is not actively sampling but exposed samplers remain in storage. (clause 5.1.12)	The listed operational parameters are logged at 5-minute rate internally. The listed average operational parameters are logged in 20-minute rate internally. In the user menu it is possible to activate or deactivate the recording of the parameters while in standby mode. With an serial interface it is possible to transmit the parameters to an external data logger. The system uses the Gesytec /Bayern-Hessen-Protocol		
13. Effect of failure of main voltage Instrument parameters shall be secured against loss. On return of mains voltage, the instrument shall automatically resume functioning (clause 5.1.13)	The instrument parameters are secured against loss in case of mains voltage failure. On return of mains voltage the sampler returns to function automatically		
14. Ending of sampling due to filter overloading Instruments with filter changers shall have the ability to restart automatically with a new filter if the previous filter sample was ended due to a high pressure drop across the filter (clause 5.1.14)	The user can decide between two abilities: <ol style="list-style-type: none"> 1. Restart automatically with a new filter 2. Restart with a new filter at programmed time for next filter 		



Legend	Passed	✓	
	Not passed	✗	
	Not applicable	n. a.	
15. Between-sampler uncertainty ≤ 2 µg/m³ (clause 5.3.2)	For PM ₁₀ and PM _{2,5} measurements over more than 30 days during autumn 2024 and winter 2024/2025 were performed. In the winter periode we had 3 days with PM ₁₀ concentrations > 28 µg/m³ und PM _{2,5} concentrations > 17 µg/m³ The between sampler uncertainty is < 2µg/m³ for PM ₁₀ and PM _{2,5} measurements	✓	
16. Availability At least 95 % (clause 5.3.2)	The availability has been 95% and better for each tested instrument	✓	
17. Firmware / Software / Manuals versions Shall be documented in the report. Firmware and software versions shall be recorded on the instrument (clause 5.1.15)	The firmware / software version is displayed in the menu.	✓	

Remark:

A comprehensive and detailed report will follow.