

Calibration Certificate

Model	164	Serial Number	4FH20008	Firmware Version	7.80
Spectrometer	164DM	Serial Number	7H200008	Revision	S
Channels	PM-10; PM-2.5; PM-1; Counting Channels				

Calibration Method:

The reference unit is calibrated with NIST certified PSL particles and the calibration is verified every year. This is a worldwide accepted standard method referring to PTB Braunschweig and we therefore guarantee the traceability of our calibration. The absolute size calibration of the reference unit is transferred to the candidate unit with a calibration procedure using polydisperse dolomite particles.

Instruments used for Calibration:

- Reference instrument class 3 Model 107GF
- Oscilloscope ISR 6051 Serial Number 631A07962
- Flow meter Defender 520-M Serial Number 151168
- Calibration tower model 7851

Calibration Material:

- Reference unit: NIST certified monodisperse PSL particles with different diameters
- Candidate unit: Micro Dolomit DR90 polydisperse powder (0,10µm - 180µm)

Tolerance Ranges:

- Sample Flow Rate: 1,2 l/min ± 5%
- Count Correlation: ± 3% at 1µm
- Count Calibration: ± 3% ≥ 500P/l
- Relative Mass Deviation: ± 3% or ± 2 µg/m³

Mass values of spectrometers at calibration tower:

Mean Value	Reference 7H100021	Test Unit	Deviation
PM-10	236,1 µg/m³	234,5 µg/m³	-1,6 µg/m³ = -0,7%
PM-2.5	116,2 µg/m³	115,5 µg/m³	-0,7 µg/m³ = -0,6%
PM-1.0	43,4 µg/m³	42,3 µg/m³	-1,1 µg/m³ = -2,5%
Sample Volume: 0,0180 m³ / Sample Time: 15 min.			

Mass values of complete systems at ambient air:

Mean Value	Reference 8HG18FE1	Test Unit	Deviation
PM-10	24,1 µg/m³	23,2 µg/m³	-0,9 µg/m³ = -3,7%
PM-2.5	18,0 µg/m³	15,6 µg/m³	-2,4 µg/m³ = -13,3%
PM-1.0	16,2 µg/m³	16,2 µg/m³	0,0 µg/m³ = 0,0%
Sample Volume: 3,9162 m³ / Sample Time: 3264 min.			

We hereby confirm that this instrument has been successfully calibrated and passed the mass test. All work has been done by qualified and trained staff of GRIMM Aerosol Technik.

This calibration is valid until 31 July 2021

Date: 26.06.2020

Signature: C. Nisch
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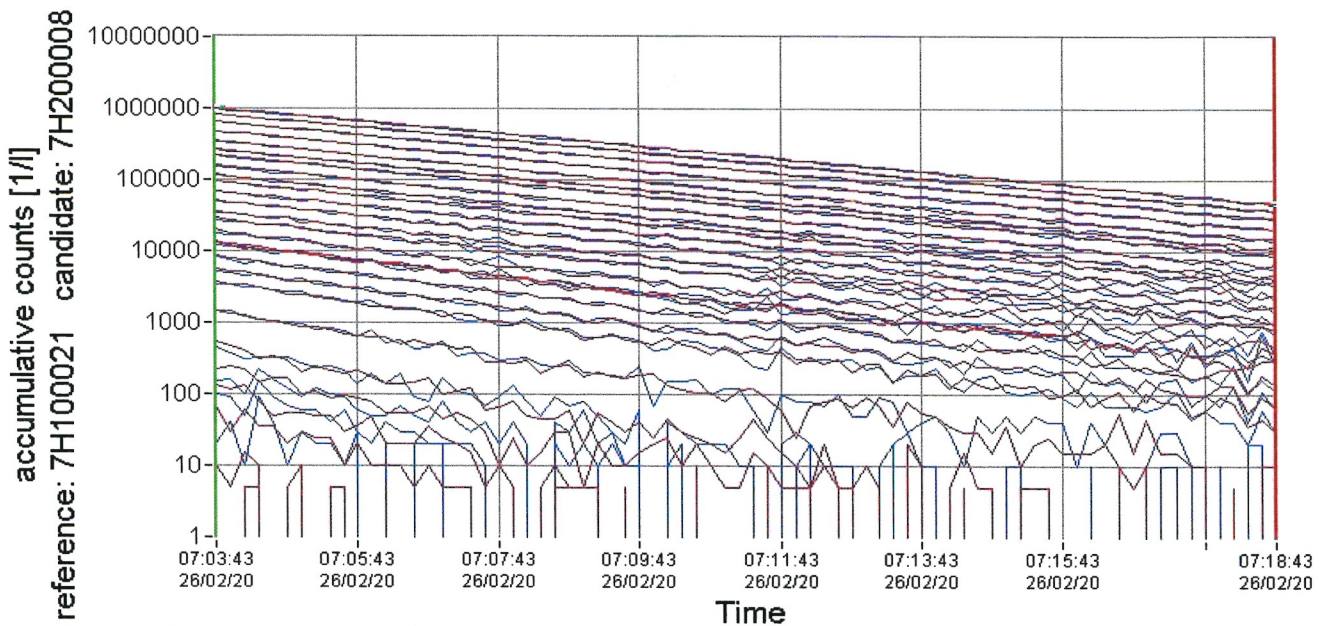
Calibration Certificate

Count values of spectrometers at calibration tower:

Channels		0	1	2	3	4	5	6	7
Diameter [µm]		> 0,25	> 0,28	> 0,30	> 0,35	> 0,40	> 0,45	> 0,50	> 0,58
Concentration [p/l]	Reference	319348	258610	199990	145382	103752	78950	65549	46228
	Test unit	312952	257989	200744	146006	104074	78767	64480	45332
Deviation [%]		-2,0	-0,2	0,4	0,4	0,3	-0,2	-1,6	-1,9
Channels		8	9	A	B	C	D	E	F
Diameter [µm]		> 0,65	> 0,70	> 0,80	> 1,00	> 1,30	> 1,60	> 2,00	> 2,50
Concentration [p/l]	Reference	33568	27310	19612	14086	9660	7470	4801	3126
	Test unit	33033	27293	19476	14103	9654	7468	4805	3136
Deviation [%]		-1,6	-0,1	-0,7	0,1	-0,1	0,0	0,1	0,3
Channels		G	H	I	J	K	L	M	N
Diameter [µm]		> 2,50	> 3,00	> 3,50	> 4,00	> 5,00	> 6,50	> 7,50	> 8,50
Concentration [p/l]	Reference	3317	2008	1258	793	266	73	33	14
	Test unit	3266	1956	1227	784	272	72	29	15
Deviation [%]		-1,5	-2,6	-2,5	-1,1	2,3	-1,4	-12,1	7,1
Channels		O	P	Q	R	S	T	U	V
Diameter [µm]		> 10,00	> 12,50	> 15,00	> 17,50	> 20,00	> 25,00	> 30,00	> 32,00
Concentration [p/l]	Reference	6	1	0	0	0	0	0	0
	Test unit	6	1	0	0	0	0	0	0
Deviation [%]		0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Sample Volume: 0,0180 m ³ /		Sample Time: 15 min.							

Count validation graph of spectrometers at calibration tower:

— Reference
— Test Unit



Date: 26.06.2020

Signature: *C. Müller*
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Calibration Certificate - QC Inspection Report

Model	164	Serial Number	4FH20008	Firmware Version	7.80
Power Supply	115V - 230V / 50Hz - 60Hz			Revision	S
Settings:	P-weight / P-volume	on	Fast Mode	off	
	Type of Date	EU			
	Channels	PM-10; PM-2.5; PM-1; Counting Channels			
Customer	XearPro S.r.l.		Order-Number	2462002079	

Mechanical Instrument End Check

Spectrometer	QC: <u>Hofmann</u>	Date:	28.05.2020
Housing	QC: <u>Hofmann</u>	Date:	25.06.2020

Electrical Instrument End Check

DC/V	79,9 mV	Vacuum	n.a.
DC_d	80,6 mV	Pneumatic tightness	passed
DC_h	111,7 mV	0-Check	passed
DC-Difference	31,1 mV	PCMCIA-Card function	passed
CO_d	0	Analog inputs	passed
CO_h	0	Battery function	n.a.
Laser Current low	59 mA	Keyboard function	passed
Laser Current high	96 mA	Software test	passed
Pump Current	51,9 %	RS-232-Interface function	passed
Air flow	1,19 l/min	RJ45-Interface function	n.a.

End Check completed	QC: <u>Hofmann</u>	Date:	25.06.2020
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Calibration Approval

Calibration at Calibration Tower	QC: <u>C. N. ich</u>	Date:	02.03.2020
Check Spectrometer at Ambient Air	QC: <u>C. N. ich</u>	Date:	03.03.2020
Check complete System at Ambient Air	QC: <u>C. N. ich</u>	Date:	18.06.2020

Final packing and shipping

All the above described test have been successfully finished and the system is completed	
Date	26.06.2020
Signature:	<u>Hofmann</u>