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*Supplement of*

## **The new instrument using a TC–BC (total carbon–black carbon) method for the online measurement of carbonaceous aerosols**

**Martin Rigler et al.**

*Correspondence to:* Martin Rigler ([martin.rigler@aerosol.eu](mailto:martin.rigler@aerosol.eu))

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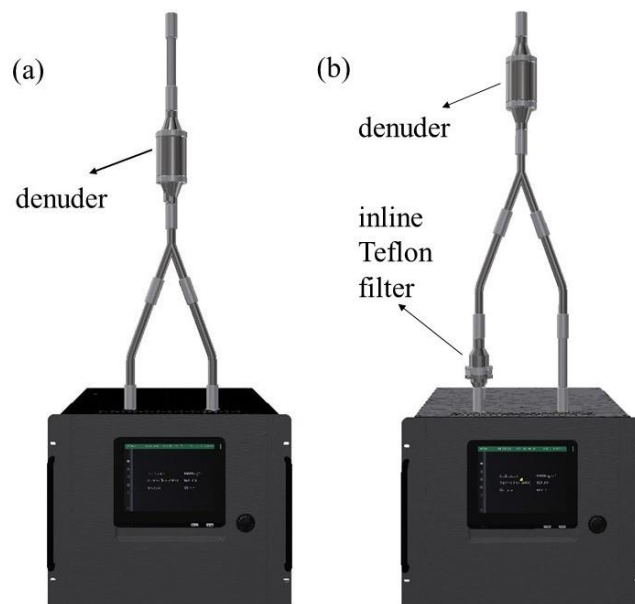
**1. Example of in-house intercomparison results of TCA08 and AE33 instruments after their assembly to the reference set of instruments**

5 **Table S1. Example of intercomparison results of TCA08 and AE33 after their assembly to the reference set of instruments as one of the tests during final inspection procedure. In-house defined requirements for successful intercomparison between new and reference set of instruments are: 1. TCA08: TC concentration range up to 75.000 ng/m<sup>3</sup>, slope between 0.95-1.05, R<sup>2</sup> above 0.98 ; 2. AE33: eBC concentrations up to 25.000 ng/m<sup>3</sup>; slope between 0.95-1.05, R<sup>2</sup> above 0.98.**

	<b>TCA08 serial number</b>	<b>Slope</b>	<b>R<sup>2</sup></b>	<b>N</b>	<b>TC<sub>max</sub> (ng/m<sup>3</sup>)</b>	<b>TC<sub>min</sub> (ng/m<sup>3</sup>)</b>
1	TCA08-S00-0131	1.02	1.00	65	45856	2732
2	TCA08-S00-0132	1.01	1.00	65	45803	2732
3	TCA08-S00-0133	1.00	1.00	19	67274	6286
4	TCA08-S00-0134	1.00	1.00	19	67274	6286
5	TCA08-S00-0135	1.00	1.00	19	67274	6286
6	TCA08-S00-0136	0.99	1.00	139	76684	2498
7	TCA08-S00-0137	1.00	1.00	65	51119	2592
8	TCA08-S00-0138	0.99	1.00	65	51119	2592
9	TCA08-S00-0139	0.96	1.00	65	51119	2592
10	TCA08-S00-0140	1.02	1.00	62	73190	2644
11	TCA08-S00-0141	1.00	1.00	22	64579	3336
12	TCA08-S00-0142	1.01	1.00	136	76466	2823
13	TCA08-S00-0143	1.00	1.00	22	64579	3336
14	TCA08-S00-0144	1.00	1.00	22	64609	3336
15	TCA08-S00-0145	0.97	1.00	137	72992	2823

	<b>AE33 serial number</b>	<b>Slope</b>	<b>R<sup>2</sup></b>	<b>N</b>	<b>eBC<sub>max</sub> (ng/m<sup>3</sup>)</b>	<b>eBC<sub>min</sub> (ng/m<sup>3</sup>)</b>
1	AE33-S08-01036	1.01	1.00	6368	19666	265
2	AE33-S08-01037	1.00	1.00	6368	19478	220
3	AE33-S08-01038	1.02	1.00	6368	21988	139
4	AE33-S08-01039	1.02	1.00	6368	20126	198
5	AE33-S08-01040	1.00	1.00	6368	21338	224
6	AE33-S08-01041	0.99	1.00	6368	20384	231
7	AE33-S08-01042	1.04	1.00	6320	22141	123
8	AE33-S08-01043	1.04	1.00	6368	21380	286
9	AE33-S08-01044	1.03	1.00	6368	21249	223
10	AE33-S08-01045	1.02	1.00	6368	21050	172
11	AE33-S08-01046	0.99	1.00	6368	20433	267
12	AE33-S08-01047	1.03	1.00	6368	20583	230
13	AE33-S08-01048	1.03	1.00	6368	21061	237
14	AE33-S08-01049	1.03	1.00	6320	20699	249
15	AE33-S08-01050	1.02	1.00	6320	20064	243

## 2. TCA08 setup for semi-continuous denuder breakthrough determination



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Figure S1. TCA08 setup when (a) sampling and (b) performing semi-continuous denuder breakthrough measurement. Note that the tubing length is identical in both setups. This permits the test to be performed at a permanent installation without disturbing the inlet plumbing.

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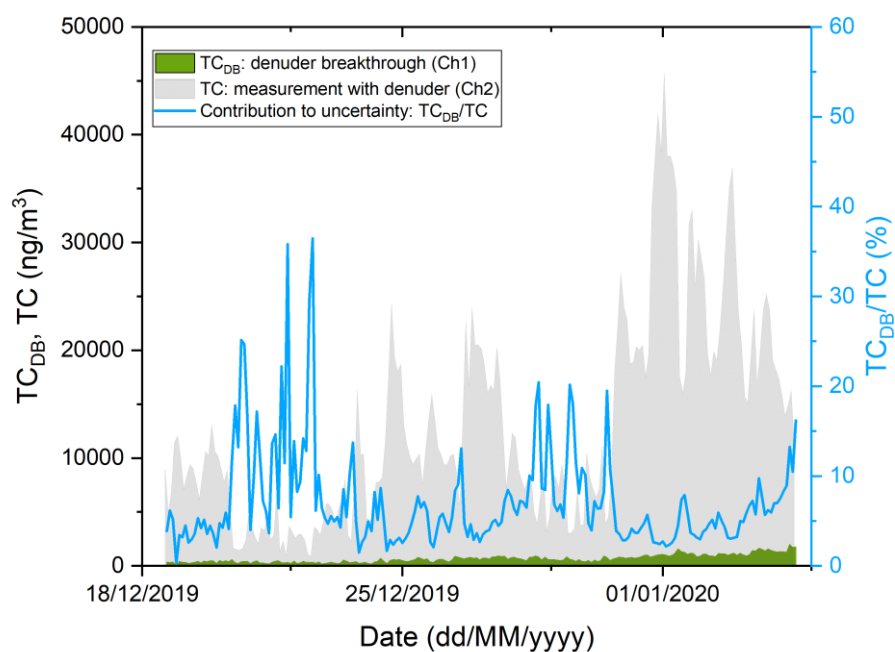
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### 3. Evaluation of denuder breakthrough contribution to the TC measurement uncertainty with inline Teflon filter method



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Figure S2. Example of evaluation of denuder breakthrough contribution to the TC measurement uncertainty with inline Teflon filter method (see Fig. S1 (b) for TCA08 setup). Denuder breakthrough ( $TC_{DB}$ ) is measured in chamber 1 where sample air stream passes denuder and inline Teflon filter. The TCA08 was operated on a 1-hour time-base, sampling  $PM_{2.5}$  fraction at 16.7 LPM. The measurement campaign was conducted between 18 December 2019 and 4 January 2020 at the urban background air quality monitoring of Aerosol d.o.o. company at 46.0715°N, 14.5018°E, elevation 302 m.

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